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IPCS for Networkers Part 2 of 2: Tales from the Crypt: How we solved some recent TCP/IP Problems

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https://ibm.biz/BdR29S

SHARE in Anaheim

Communication Server Diagnosis Detectives at Work

High CPU Utilisation in Socket Application

- CTRACE SYSTCPIP TCP,PFS

Increasing number of "`OUTBOUND PACKETS IN ERROR`"

- CTRACE SYSTCPIP INTERNET,FIREWALL
- Dump of TCPIP

Slow FTP file transfer to AIX FTP Server

- CTRACE SYSTCPDA
- DUMP of TCPIP

IPCS Primary Option Menu
CTRACE SYSTCPIP

```
                ------------------------------------- CTRACE DISPLAY PARAMETERS  ---
.  -------      COMMAND ===> S
.  OPTION         System      ===>           (System name or blank)
.                 Component   ===> SYSTCPIP  (Component name (required))
.     0  D        Subnames    ===> B0TCPIP
.     1  B
.     2  A        GMT/LOCAL   ===> L                        (G or L, GMT is default)
.     3  U        Start time  ===>                          (mm/dd/yy,hh:mm:ss.dddddd or
.     4  I        Stop time   ===>                           mm/dd/yy,hh.mm.ss.dddddd)
.     5  S        Limit       ===> 0         Exception ===>
.     6  C        Report type ===> SUMMARY   (SHort, SUmmary, Full, Tally)
.     7  V        User exit   ===>           (Exit program name)
.     8  T        Override source ===>
.     9  D        Options         ===>
.     T  T
.     X  E        To enter/verify required values, type any character
.                 Entry IDs ===>   Jobnames ===>   ASIDs ===>   OPTIONS ===>   SUBS ===>
.  Enter E
                  CTRACE COMP(SYSTCPIP) SUB((B0TCPIP)) LOCAL SUMMARY


                  ENTER = update CTRACE definition.  END/PF3 = return to previous panel.
                  S = start CTRACE.  R = reset all fields.
```

Problem: Hi-CPU in Socket Application IPCS CTRACE SYSTCPIP TCP

IP CTRACE COMP(SYSTCPIP) SUB((B0TCPIP)) OPT((TCP)) FULL

```
SYSA   TCP    4003008A 09:35:09.154761  Fast read exit
HASID..00A2   PASID..0161   SASID..0011   USER...BBV01000
TCB....008C7E88 MODID..EZBTCFRD REG14..2D0941C4 DUCB...CF000046
CID....002CC199 PORT...7872   CPUA...04
IPADDR. 172.19.65.91
 ADDR...00000000 00000000_2CCC7DD8 LEN....000084 local variables
   +0000 00000010 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | .....
   +0020 00000000 00000000 00000000 00000000 00000000 00000000 00000000 7F2B69A0 | .....
   +0040 00000000 00000000 00000000 20000000 00000000 00000000 00000000 00000000 | .....
   +0060 00000000 00000000 00000000 00000A00 00000000 00000000 00000000 00000000 | .....
   +0080 00000000                                                  | ....
 ADDR...00000000 00000000_7D0701C8 LEN....00000C recv queue info
   +0000 00000000 00000000 00000000                                | .....
 ADDR...00000000 00000000_7D070160 LEN....00000C user recv info
   +0000 207835E5 20778835 207835E6                                | ...V.
 ADDR...00000000 00000000_2CCC6B20 LEN....00000C return value errno errnojr
   +0000 FFFFFFFF 0000044E 76650000                                | .....
 ADDR...00000000 00000000_00000000 LEN....000000 SMC Control Block
=============================================================39DC6F02
```

Problem: Hi-CPU in Socket Application IPCS CTRACE SYSTCPIP PFS

```
IP CTRACE COMP(SYSTCPIP) SUB((B0TCPIP)) OPT((PFS)) FULL LOC

 SYSA   PFS    6001003D 09:35:09.154762  Fast Socket Send/Recv Exit
HASID..00A2
TCB....008C7E8
CID....002CC19
IPADDR. 172.19
 ADDR...00000(
   +0000 D6E2C                                                    | OSI .
   +0020 0000(                                                    | .....
   +0040 3400(                                                    | ..o..
   +0060 0000(                                                    | .....
   +0080 0000(                                                    | .....
   +00A0 C9100001 C9100002 C6E2D9C5 00000038 00000000 00000000 00000000 2CCC6000 | I...I
 ADDR...00000000 00000000_34009718 LEN....000078 Fast Sockets R/W Parameter List
   +0000 C6E2D7F1 00000078 00000080 340094F0 000001F0 417F1E30 00000007 34009570 | FSP1.
   +0020 FFFFFFFF 0000044E 76650000 000002D8 00000010 00000000 00000000 3313683C | .....
   +0040 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | .....
   +0060 00000000 00000000 00000000 00000000 00000000 2AD786C0           | .....
ERRNO..-1,  1102, 76650000
 RetCode: EDC8102I Operation would block.
```

```
IPCS OUTPUT STREAM -----------------------------------------
Command ===> IP ERRNO E 044E
 ************************************************************
 Errno: 0000044E(1102) : EWOULDBLOCK
   Description: The descriptor is marked nonblocking, and the
                Requested function cannot complete immediately
Command ===> IP ERRNO M 7665
 ************************************
 ModuleId: 7665(30309) : EZBTCFRD EZBTIINI
```

Problem: Hi-CPU in Socket Application IPCS CTRACE SYSTCPIP PFS

```
IP CTRACE COMP(SYSTCPIP) SUB((B0TCPIP)) OPT((PFS)) FULL LOC

 SYSA   PFS    6001003D 09:35:09.154762  Fast Socket Send/Recv Exit
HASID..00A2
TCB....008C7E8
CID....002CC19
IPADDR. 172.19
 ADDR...000000
   +0000 D6E2C                                                    | OSI .
   +0020 00000                                                    | .....
   +0040 34009                                                    | ..o..
   +0060 00000                                                    | .....
   +0080 00000                                                    | .....
   +00A0 C9100001 C9100002 C6E2D9C5 00000038 00000000 00000000 00000000 2CCC6000 | I...I
 ADDR...00000000 00000000_34009718 LEN....000078 Fast Sockets R/W Parameter List
   +0000 C6E2D7F1 00000078 00000080 340094F0 000001F0 417F1E30 00000007 34009570 | FSP1.
   +0020 FFFFFFFF 0000044E 76650000 000002D8 00000010 00000000 00000000 3313683C | .....
   +0040 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | .....
   +0060 00000000 00000000 00000000 00000000 00000000 2AD786C0           | .....
 ERRNO..-1,  1102, 76650000
 RetCode: EDC8102I Operation would block.
```

APAR OA43312

Error description

Application doing selectex (BPX1SEL) for READ with greater than 50 socket descriptors for a TCPIP fastpath socket results in the selectex() always returning status indicating that the socket is ready for READ, even when data is not available. The subsequent recv() completes with rv=-1, RC=EWOULDBLOCK (44Ex) indicating that no data was received. This results in a tight loop of selectex(), recv().

Problem: Hi-CPU in Socket Application 0x044E=1102 EWOULDBLOCK

```
IP CTRACE COMP(SYSTCPIP) SUB((B0TCPIP)) OPT((PFS)) FULL LOC

 SYSA   PFS    6001003D 09:35:09.154762  Fast Socket Send/Recv Exit
HASID..00A2   PASID..0011   SASID..00A2   USER...BBV01000
TCB....008C7E88 MODID..EZBPFFSR REG14..34113A46 DUCB...CF000046
CID....002CC199 PORT...7872   CPUA...04
IPADDR. 172.19.65.91
 ADDR...00000000 00000000_34009570 LEN....0000C0 OSI
   +0000 D6E2C940 000000A0 00000000 00000000 00041B8E 32B4E8D0 013DEF38 00000000 | OSI .
   +0020 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00401ED0 | .....
   +0040 34009628 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | ..o...
   +0060 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | .....
   +0080 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | .....
   +00A0 C9100001 C9100002 C6E2D9C5 00000038 00000000 00000000 00000000 2CCC6000 | I...I
 ADDR...00000000 00000000_34009718 LEN....000078 Fast Sockets R/W Parameter List
   +0000 C6E2D7F1 00000078 00000080 340094F0 000001F0 417F1E30 00000007 34009570 | FSP1.
   +0020 FFFFFFFF 0000044E 76650000 000002D8 00000010 00000000 00000000 3313683C | .....
   +0040 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 | .....
   +0060 00000000 00000000 00000000 00000000 00000000 21D7[illegible]C0           | .....
 ERRNO..-1,  1102, 76650000
 RetCode: EDC8102I Operation would block.
```

OA43312

http://tinyurl.com/OA43312

Problem: HI CPU in Socket Application Summary

OEM Application using FASTPATH Sockets started to use too much CPU when z/OS was migrated to V2R1

CTRACE SYSTCPIP PFS,TCP revealed that the application was very busy on FAST READ calls all getting an 0x44E error indicating that the operation “would block” the thread.
The application wasn't using other (synchronous) calls than before on the V1R13 z/OS.

OMVS APAR OA43312 describes this problem

IPCS Commands used in this problem diagnosis

- IP CTRACE COMP(SYSTCPIP)
- IP ERRNO

Problem: Outbound Packets in Error Increasing number in NETSTAT DEV

IP VERBX MTRACE

```
14049 15:31:44.59 AAUTO344 D TCPIP,,N,DEV,INTFNAME=ARP2I
14049 15:31:44.59 S0346398 EZZ2500I NETSTAT CS V1R13 TCPIP 368
                368 INTFNAME: ARP2I              INTFTYPE: IPAQENET   INTFSTATUS: READY
                368     PORTNAME: ARP2      DATAPATH: 1372     DATAPATHSTATUS: READY
                368     CHPIDTYPE: OSD
                368     SPEED: 0000000100
                368     INBPERF: DYNAMIC
                368     CHECKSUMOFFLOAD: YES           SEGMENTATIONOFFLOAD: NO
                368     SECCLASS: 255                  MONSYSPLEX: NO
                368     ISOLATE: NO                    OPTLATENCYMODE: NO
                      ...
                368   INTERFACE STATISTICS:
                368     BYTESIN                              = 8551549
                368     INBOUND PACKETS                      = 2227973
                368     INBOUND PACKETS IN ERROR             = 0
                368     INBOUND PACKETS DISCARDED            = 0
                368     INBOUND PACKETS WITH NO PROTOCOL     = 0
                368     BYTESOUT                             = 14905538
                368     OUTBOUND PACKETS                     = 737119
                368     OUTBOUND PACKETS IN ERROR            = 420812
                368     OUTBOUND PACKETS DISCARDED           = 0
```

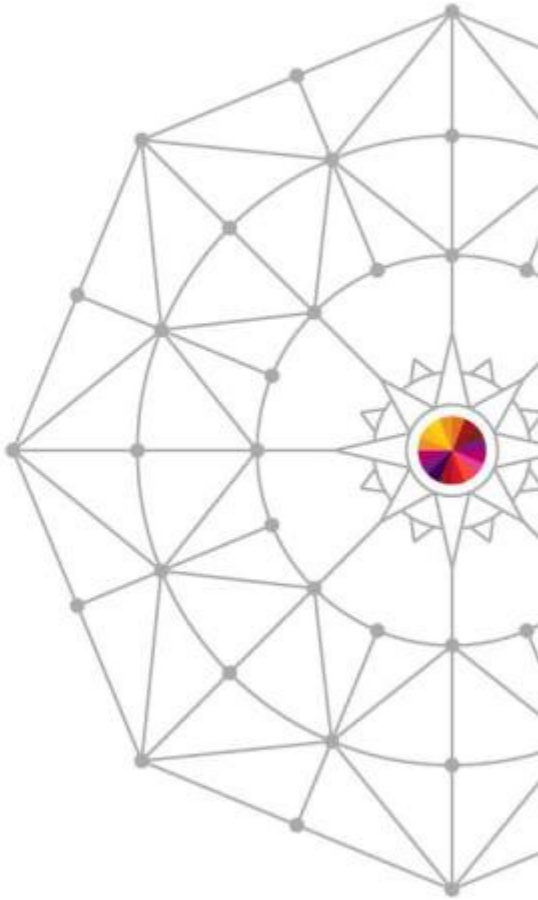
IPCS: Formatting SYSTCPIP CTRACE MINIMUM Trace – Exeption records only

```
IP CTRACE COMP(SYSTCPIP) SUB((TCPIP))

COMPONENT TRACE SHORT FORMAT
COMP(SYSTCPIP)SUBNAME((TCPIP))
**** 02/17/2014
SYSNAME   MNEMONIC  ENTRY ID    TIME STAMP      DESCRIPTION
-------   --------  --------  ---------------  -------------
A44       INTERNET  30010080  04:43:19.061015  !Outbound_Error
A44       INTERNET  30010080  04:43:36.063991  !Outbound_Error
A44       INTERNET  30010080  04:43:39.564520  !Outbound_Error
A44       INTERNET  30010080  04:43:56.566985  !Outbound_Error
A44       INTERNET  30010080  04:44:00.068900  !Outbound_Error

A44       INTERNET  30010080  23:59:58.972722  !Outbound_Error
**** 02/18/2014
SYSNAME   MNEMONIC  ENTRY ID    TIME STAMP      DESCRIPTION
-------   --------  --------  ---------------  -------------
A44       INTERNET  30010080  00:00:03.473938  !Outbound_Error

A44       INTERNET  30010080  14:32:00.453733  !Outbound_Error
A44       INTERNET  30010080  14:32:04.454184  !Outbound_Error
A44       INTERNET  30010080  14:32:20.956730  !Outbound_Error
```



CTRACE reveals: This has been going on 24*7

Problem: Outbound Packets in Error SYSTCPIP shows error 6F in EZBIPOUT

IP CTRACE COMP(SYSTCPIP) SUB((TCPIP)) FULL

```
 A44       INTERNET  30010080  14:32:20.956730  !Outbound_Error
HASID..0039      PASID..003F      SASID..0039      USER...SNA
TCB....00000000  MODID..EZBIPOUT  REG14..146973EE  DUCB...AE000022
CID....00000000  PORT...0         CPUA...00
IPADDR. 0.0.0.0
  ADDR...00000000  00000000_1469F94C  LEN....000004  error code
     +0000  0000006F                                                  | ...?
  ADDR...00000000  00000000_1431DC10  LEN....00002C  message block
     +0000  E2D2D4C2  00000000  00000000  1431DB10  00000000  00000000  1431DC40  00000000  | SKMB
                                                                      | ....
  ADI IpHeader: Version : 4                Header Length: 20
      Tos              : C0                QOS: Internetwork Normal Service  000  00000000  | IUDR
      Packet Length    : 168               ID Number: E0CB                   000  00000000  | ....
      Fragment         : DontFragment      Offset: 0                         000  00000000  | {yI.
      TTL              : 64                Protocol: UDP CheckSum: 0000 619C 0A2  00020000  | ....
      Source           : 194.76.102.92                                       000  00000000  | =;j.
      Destination      : 57.20.88.153                                        000  00000000  | ....
     UDP                                                                    000  00000000  | ....
      Source Port      : 12000 (EE-XID)    Destination Port: 12000 (EE-XID)  000  00000000  | ....
      Datagram Length  : 148               CheckSum: BAFB 0000               000  00000000  | .*..
    Ip Header          : 20                IP: 194.76.102.92, 57.20.88.153   000  00000000  | ....
    000000 45C000A8 E0CB4000 40110000 C24C665C  39145899                     AFB               | .{.y
    Protocol Header    : 8                 Port: 12000, 12000    Offset: 14
    000000 2EE02EE0 0094BAFB
```

Command: IP IPHDR 1513AB88

Problem: Outbound Packets in Error SYSTCPIP FIREWALL shows RC 2

IP CTRACE COMP(SYSTCPIP) SUB((TCPIP)) FULL

```
 A44       FIREWALL  5005000A  10:32:16.105226   IP Outbound FW Reject
HASID..0039      PASID..003F      SASID..0039      USER...SNA
TCB....00000000  MODID..EZBIPOUT  REG14..14694FEA  DUCB...5A00001F
  ADDR...00000000  00000000_13EB09ED  LEN....000001  FW return code
     +0000  02                                                        | .
=====================================================================00091C4A
 A44       INTERNET  30010080  10:32:16.105226  !Outbound_Error
HASID..0039      PASID..003F      SASID..0039      USER...SNA
TCB....00000000  MODID..EZBIPOUT  REG14..146973EE  DUCB...5A00001F
CID....00000000  PORT...0         CPUA...00
IPADDR. 0.0.0.0
  ADDR...00000000  00000000_1469F94C  LEN....000004  error code
     +0000  0000006F                                                  | ...?
  ADDR...00000000  00000000_13112290  LEN....00002C  message block
     +0000  E2D2D4C2  00000000  00000000  1431DA10  00000000  00000000  131122C0  00000000  | SKMB
     +0020  15136028  15136184  00000000                                                    | ..-.
  ADDR...00000000  00000000_15136028  LEN....00015C  I_UNITDATA_REQ
     +0000  C9E4C4D9  3000C400  00010001  00000000  00000000  00000000  00000000  00000000  | IUDR
     +0020  00000000  00000000  00000000  00000000  C0A8C902  00000000  00000000  00000000  | ....
     +0040  C0A8C90B  00000000  00000000  00000000  00000000  00000000  00000000  00000000  | {yI.
     +0060  00000000  7E585A30  00000000  00000000  00000000  00000000  000000A4  00020000  | ....

     +0140  45C000A8  170C4000  40110000  C24C665C  39145899  2EE02EE0  0094BAFB            | .{.y
  SrcPort..12000 SrcIPAddr. 194.76.102.92
  DstPort..12000 DstIPAddr. 57.20.88.153
```

Problem: Outbound Packets in Error SYSTCPIP FIREWALL shows RC 2

IP CTRACE COMP(SYSTCPIP) SUB((TCPIP)) FULL

```
 A44       FIREWALL  50050024  10:32:16.105219   Filter Search Results
HASID..0039      PASID..003F      SASID..0039      USER...SNA
TCB....00000000  MODID..EZAFPCKT  REG14..16357F56  DUCB...5A00001F
CID....00000000  PORT...0         CPUA...00
IPADDR. 0.0.0.0
  ADDR...00000000  00000000_13EB05FC  LEN....000004  Flags
 +0000  12000000                                                          | ....
  ADDR...00000000  00000000_13EB0394  LEN....000004  Return Code
 +0000  00000002                                                          | ....
  ADDR...00000000  00000000_13EB06E8  LEN....000031  Packet filter selectors
 +0000  C24C665C  39145899  00000000  00000000  00000000  00000000  00000000  | B<.*...r.....
 +0020  00000000  00000000  2EE02EE0  11000000  00                        | .........\.\.....
  ADDR...00000000  00000000_13EB037C  LEN....000004  Pkt Option
 +0000  00000002                                                          | ....
  ADDR...00000000  00000000_13EB0670  LEN....000001  NATT deny reason
 +0000  00                                                                | .
  ADDR...00000000  00000000_7EBE8258  LEN....000010  Binding Info
 +0000  000000A4  00020000  7E5E9110  00000000                            | ...u....=;j.....
  ADDR...00000000  00000000_7E5E9110  LEN....000254  Static Filter
 +0000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  | ................
 +0020  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  | ................
 +0040  00000000  00000000  00000000  00000000  00000000  00000000  02000000  00A20200  | ................
 +0060  00000000  00000000  00000000  00000000  00000000  00000004  00000000  00000000  | ................
 +0080  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  | ................
 +00A0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  | ................
 +00C0  00000000  02000000  7E5E9230  529A9C25  529A9C25  01C80000  00000000  00000000  | ........=;k.....H
 +00E0  00000000  00000000  00000000  00000000  A0000000  00000000  00000000  00000000  | ................
 +0100  00000000  00000000  00000000  D2370702  00000000  00000000  00000000  00000000  | ............K.....
 +0120  33000000  00000000  00000000  C48595A8  C19393D9  A493856D  C7859585  9981A385  | ..DenyAllRule_Generate
 +0140  846D6D6D  6D6D6D6D  6D6D6D6D  D6A4A382  95840000  00000000  00000000  00000000  | d_________Outbnd....
```

IPCS Formatting TCPIP Dumps
TCPIPCS CLIST – IPSEC

```
. ----------
. OPTION  ==
.
.     0  DEFA
.     1  BROW
.     2  ANAL
.     3  UTIL
.     4  INVE
.     5  SUBM
.     6  COMM
.     7  VTAM
.     8  TCPI
.     9  DFSM
.     T  TUTO
.     X  EXIT
.
. Enter END command to terminate IPCS dialog
```

TCP/IP Analysis Menu

```
Command ===> ____________________________________________________________
Copyright IBM Corporation 1998,2011. All rights reserved.
Select one of the following. Then press Enter.

__    1.  General . . . - HEADER, MTABLE, STATE, TSDB, TSDX, TSEB
      2.  Protocol. . . - PROTOCOL, RAW, TCB, UDP
      3.  Configuration - CONFIG, CONNECTION, PROFILE, ROUTE
      4.  Resources . . - COUNTERS, LOCK, MAP, STORAGE, TIMER
      5.  Execution . . - DUAF, DUCB, TRACE
      6.  Interfaces. . - API, SOCKET, STREAM
      7.  Structures. . - HASH, TREE
      8.  Functions . . - FRCA, IPSEC, POLICY, TELNET, TTLS, VMCF, XCF
      9.  Headers . . . - ICMPHDR, IPHDR, SKMSG, TCPHDR, UDPHDR
      10. Converters. . - ERRNO, SETPRINT, TOD
      11. Applications. - RESOLVER
```

IPCS: Formatting IPSEC Filter Rules
List all FW Filter Rules

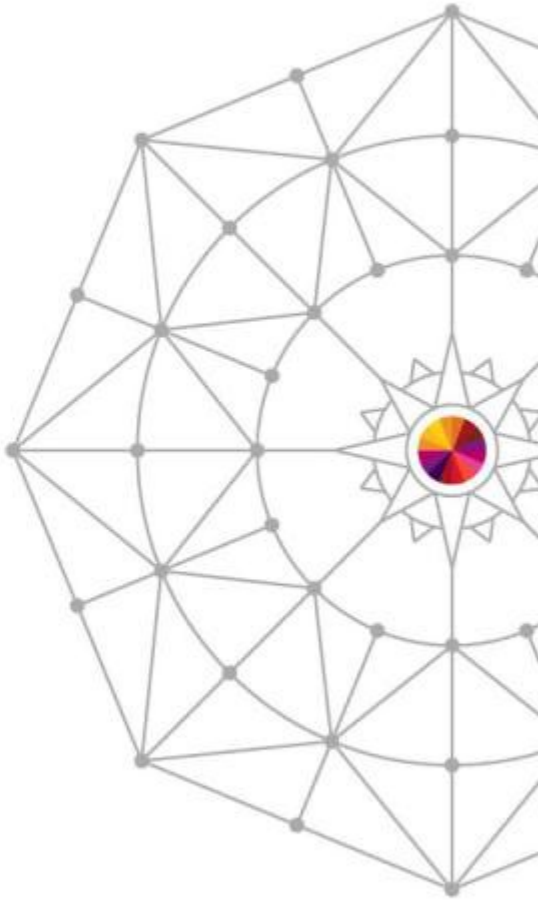
```
IP TCPIPCS IPSEC((* )  SUMMARY FILTERS ) TCP (TCPIP)

TCPIP Ipsecurity Analysis
IPSEC on ZIIP     Yes

IPv4 Ipsecurity Filters

Filter@  Action  SPrt1 SPrt2 DPrt1 DPrt2 Protocol
                 Src@
                 Dst@
7E68E290 Permit  16310     0  1024 65535   6 (TCP)
                 0.0.0.0/0
                 0.0.0.0/0
7EBE18B0 Permit   1024 65535 16310     0   6 (TCP)

= = =  =
7E5E9390 Deny        0     0     0     0 All
                 0.0.0.0/0
                 0.0.0.0/0
7E5E9110 Deny        0     0     0     0 All
                 0.0.0.0/0
                 0.0.0.0/0
```



No EE (UDP 12000) PERMIT filters found

Problem: Outbound Packets in Error VTAM Internal Trace – MSG Option

IP VERBX VTAMMAP 'VTVIT LIST(Y)' → REPORT VIEW → X ALL → F MSG ALL

```
D4E2C7E2 39000000 E2C1E9F4 F4D7D7E3 004089B9 C9E2E3F1 F4F1F1C9 4040C9D5 | MSGS....SAZ44PPT. i.IST1411I IN
D4E2C7F2 D6D740C7 C5D5C5D9 C1E3C5C4 40C6D6D9 40C5C5D3 F0F0F140 10000100 | MSG2OP GENERATED FOR EEL001 ....
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
D4E2C740 3900E4F2 F5F9C9C4 C5C3D8F4 1672CF08 96696808 00000000 00000000 | MSG ..U259IDECQ4....o...........
D4E2C7F2 C5E7E2E6 E2F0F240 F0F14040 40404040 40404040 40404040 40404040 | MSG2EXSWS02 01
D4E2C7F2 40404040 40404040 40404040 40404040 40404040 40404040 40404040 | MSG2
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
D4E2C740 3900E4F1 F1F4F1C4 C5C3C6F7 1672D0C8 96676E94 00000000 00000000 | MSG ..U1141DECF7..}Ho.>m........
D4E2C7F2 E5C1D9E8 40C4C9C1 D340C5E7 E2E6E2F0 F2404040 40404040 404040E2 | MSG2VARY DIAL EXSWS02      S
D4E2C7F2 D6C6E340 C9D5D6D7 40000000 00000000 00000000 00000000 00000000 | MSG2OFT INOP ...................
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
D4E2C740 3900E4F1 F4F1F6C4 C5C3C6F7 1672D0C8 96676E94 00000000 00000000 | MSG ..U1416DECF7..}Ho.>m........
D4E2C7F2 C5E7E2E6 E2F0F240 40404040 40404040 40000000 00000000 00000000 | MSG2EXSWS02     ...........
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
D4E2C7E2 39000000 E2C1E9F4 F4D7D7E3 004089BA C9E2E3F1 F4F3F0C9 4040D9C5 | MSGS....SAZ44PPT. i.IST1430I RE
D4E2C7F2 C1E2D6D5 40C6D6D9 40C9D5D6 D740C9E2 40E7C9C4 40D6D940 D3C4D3C3 | MSG2ASON FOR INOP IS XID OR LDLC
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
D4E2C740 3900E4F5 F9F0C9C1 C3C3D7F5 1672D088 965EC96A 00000000 00000000 | MSG ..U590IACCP5..}ho;I.........
D4E2C7F2 D6E4E3C6 C1C9D3C5 C4404040 4040C5E7 E2E6E2F0 F240C5C5 D3F0F0F1 | MSG2OUTFAILED   EXSWS02 EEL001
D4E2C7F2 40400000 00000000 00000000 00000000 00000000 00000000 00000000 | MSG2 ...........................
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
D4E2C740 3900E4F6 F2F1C9C4 C5C3D7F4 1672D598 96699C40 00000000 00000000 | MSG ..U621IDECP4..Nqo.. ........
D4E2C7F2 D9C5C3D6 E5C5D9E8 40E2E4C3 C3C5E2E2 C6E4D340 4040C5E7 E2E6E2F0 | MSG2RECOVERY SUCCESSFUL  EXSWS0
D4E2C7F2 F2400000 00000000 00000000 00000000 00000000 00000000 00000000 | MSG22 ..........................
```

Problem: Outbound Packets in Error Summary

NETSTAT DEV shows increasing outbound packets in error

SYSTCPIP MINIMUM shows EZBIPOUT rejecting VTAM's outbound EE packets with RC 6F - Permission Denied

SYSTCPIP FIREWALL shows the FW returns a RC 2 indicating no Permit Filter Rule matched

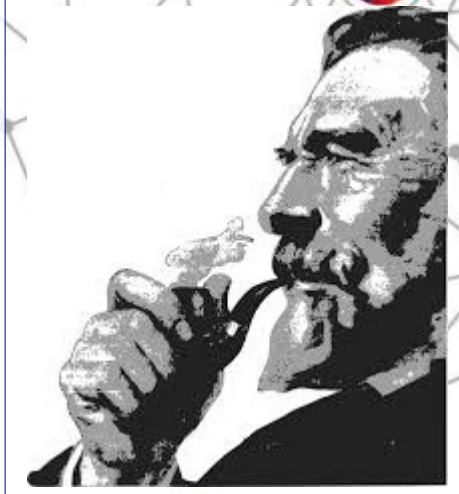
IPCS Commands used in this problem diagnosis

- IP VERBX MTRACE
- IP CTRACE COMP(SYSTCPIP)
- IP TCPIPCS FIREWALL
- IP VERBX VTAMMAP 'VTVIT LIST(Y)'

IPCS: Formatting SYSTCPDA CTRACE SESSION Report

IP CTRACE COMP(SYSTCPDA) SUB((TCPIP)) OPT((SESSION))

```
106259 packets summarized
 Local Ip Address:                          10.111.119.1
 Remote Ip Address:                       10.254.127.151
Host:                              Local,          Remote
 Client or Server:                SERVER,          CLIENT
 Port:                             38398,              20
 Application:                          ,         ftp-data
 Link speed (parm):                   10,              10 Megabits/s
Connection:
 First timestamp:          2013/11/04 11:59:11.100297
 Last timestamp:           2013/11/04 12:00:44.155121
 Duration:                            00:01:33.054824
 Average Round-Trip-Time:                        0.002 sec
 Final Round-Trip-Time:                          0.032 sec
 Final state:                TIME_WAIT (ACTIVE CLOSE)
 Out-of-order timestamps:                            0
Data Quantity & Throughput:        Inbound,        Outbound
 Application data bytes:      4294967295,       985944960
 Sequence number delta:                2,      985944962
 Total bytes Sent:                     0,       984591308
 Bytes retransmitted:                  0,               0
 Throughput:                           0,     10346.987 Kilobytes/s
 Bandwidth utilization:            0.00%,         846.46%
```



IPCS Formatting Packet Traces
SESSION Report - SPEED matters !

```
COMMAND ===>

  System      ===>            (System name or blank)
  Component   ===> SYSTCPDA   (Component name (required))
  Subnames    ===> TCPIP

  GMT/LOCAL   ===> G                        (G or L, GMT is default)
  Start time  ===>                          (mm/dd/yy,hh:mm:ss.dddddd or
  Stop time   ===>                           mm/dd/yy,hh.mm.ss.dddddd)
  Limit       ===> 0          Exception ===>
  Report type ===> SHORT      (SHort, SUmmary, Full, Tally)
  User exit   ===>            (Exit program name)
  Override source ===>
  Options         ===> SESSION SPEED(100,100)

  To enter/verify required values, type any character
  Entry IDs ===>   Jobnames ===>   ASIDs ===>   OPTIONS ===>   SUBS ===>

  CTRACE COMP(SYSTCPDA) SUB((TCPIP)) SHORT OPTIONS((SESSION SPEED(100,100)))


  ENTER = update CTRACE definition.  END/PF3 = return to previous panel.
  S = start CTRACE.  R = reset all fields.
```

IPCS: Formatting SYSTCPDA CTRACE SESSION Report SPEED matters!

```
IP CTRACE COMP(SYSTCPDA) SUB((TCPIP)) OPT((SESSION SPEED(100,100)))
```

```
106259 packets summarized
 Local Ip Address:                          10.111.119.1
 Remote Ip Address:                       10.254.127.151
Host:                              Local,          Remote
 Client or Server:                 SERVER,          CLIENT
 Port:                              38398,              20
 Application:                           ,         ftp-data
 Link speed (parm):                   100,             100 Megabits/s
Connection:
 First timestamp:          2013/11/04 11:59:11.100297
 Last timestamp:           2013/11/04 12:00:44.155121
 Duration:                            00:01:33.054824
 Average Round-Trip-Time:                        0.002 sec
 Final Round-Trip-Time:                          0.032 sec
 Final state:                TIME_WAIT (ACTIVE CLOSE)
 Out-of-order timestamps:                            0
Data Quantity & Throughput:        Inbound,        Outbound
 Application data bytes:      4294967295,       985944960
 Sequence number delta:                2,       985944962
 Total bytes Sent:                     0,       984591308
 Bytes retransmitted:                  0,               0
 Throughput:                           0,       10346.987 Kilobytes/s
 Bandwidth utilization:             0.00%,          84.64%
```

Problem: Slow FTP transfer
IPCS: TCB – TCP Control Block

IP TCPIPCS TCP(TCPIP) TCB(* DATAQ DETAIL)

```
Dataset: ONTOP.TCPIP.DBUG2014.FTP22.DMP13
Title:   FTP SLOW CLIENT SIDE

The address of the TSAB is: 161B1000

Tseb     SI Procedure Version Tsdb     Tsdx

161B1040  1 TCPIPXCF  V1R13   161AE000 161AE0C8
161B10C0  2 TCPIP     V1R13   14CDC000 14CDC0C8

   2 defined TCP/IP(s) were found
   2 active  TCP/IP(s) were found

   2 TCP/IP(s) for CS     V1R13 found

IPv4 TCB ResrcID  ResrcNm  TcpState    TpiState
```

```
TCB: 7E6DB310
+0000  TCB_EYE_CATCH..... TCB CTRL
+0008  TCB_TCP_STATE..... 0005
+000A  TCB_TPI_STATE..... 0009

+0060  TCB_RCV_WND..... 00200000
+0064  TCB_RCV_PUSH..... 08C187F5
+0068  TCB_MAX_SEG_SIZE..... 05A8
+006C  TCB_CWND..... 0003FFC9
+0070  TCB_SSTHRESH..... 0000FFFF
+0074  TCB_SEND_Q@..... 1260B090
+0078  TCB_SEND_QTAIL@..... 1260BB90
+007C  TCB_SEND_QLEN..... 0009710C
+0080  TCB_SO_SNDBUF_SIZE..... 00100000
+0084  TCB_SNDBUF_SIZE..... 00100000

+033C  TCB_SND_SCALE..... 03
+033D  TCB_RCV_SCALE..... 05
+033E  TCB_REQUESTED_S_SCALE.... 03
+033F  TCB_REQUEST_R_SCALE..... 05
```

```
...
7E6DB310 00012D9E UBZMRH1  Established WLOXFER   Local  10.111.119.1..13772
                                                 Remote 10.254.127.151..20
SEND_QLEN: 0009710C  RECV_QLEN: 00000000  Oldest Data(GMT): 2013/11/29 09:28:53
```

Problem: Slow FTP Transfer
IPCS SYSTCPDA SESSION Report

IP CTRACE COMP(SYSTCPDA) SUB((TCPIP)) OPT((SESSION SPEED(1000,1000)))

Local Ip Address:		
Remote Ip Address:		
Host:		
Client or Server:		
Port:		
Application:		
Link speed (parm):		
Connection:		
First timestamp:		
Last timestamp:		
Duration:		
Average Round-Trip-Time:		
Final Round-Trip-Time:		
Final state:		
Out-of-order timestamps:		
Data Quantity & Throughput:		
Application data bytes:		
Sequence number delta:		
Total bytes Sent:		
Bytes retransmitted:		
Throughput:	0,	**15339.573 Kilobyt[illegible]s**
Bandwidth utilization:	0.00%,	12.56%
Average Ack Time:	0.000620,	0.000000
Maximum Ack Time:	0.014739,	0.000000

Window Stats:	Inbound,	Outbound
Number of windows:	0,	10451
Maximum window size:	**32761,**	0
Largest window advertised:	32761,	65535
Average window advertised:	32752,	65535
Smallest window advertised:	23034,	65535
Window scale factor:	0,	0
Window frequency:	0,	1545.2287
Time Stamp updates:	13,	3533
Total Round Trip Time:	**0.013312,**	6.763520
Average Round Trip Time:	0.000000,	0.000000
Maximum Data in Pipe:	0,	**262088**
Maximum retransmisson:	0,	0

Time Spent on:	Inbound,	Outbound		
(.) In-order data:	00.000000,	00:00.201374	(0.00%),	(2.32%)
(a) Acknowledgments:	**06.560241,**	00:00.000000	**(75.77%),**	(0.00%)
(+) Data and ACK:	00.000000,	00:00.000000	(0.00%),	(0.00%)
(u) Duplicate ACKs:	00.000000,	00:00.000000	(0.00%),	(0.00%)

IPCS: Formatting SYSTCPDA CTRACE Batch Job to convert to tcpdump

```
//BURKSNIF JOB (7904,NCS),BURKHAR,MSGLEVEL=(1,1),MSGCLASS=K,CLASS=A,
//    NOTIFY=&SYSUID.,REGION=0M,TIME=150
//    SET INDUMP='ONTOP.GS033.P36746.C724.PKTSYSC.$DUP0001'
//     SET SNIFF='ONTOP.GS033.P36746.C724.D0305.SYSC.PCAP'
//*             OTHERWISE THE SNIFFER FILE WILL BE EMPTY|||
//*  THIS JOB CONVERTS A PACKET TRACE TO SNIFFER
//*  ATTENTION: PLEASE VERIFY THE TCPIP JOBNAME IS CORRECT
//*             OTHERWISE THE SNIFFER FILE WILL BE EMPTY|||
//IPCSBTCH EXEC PGM=IKJEFT01,DYNAMNBR=30
//IPCSDDIR DD DISP=SHR,DSN=&SYSUID..ZOS1B.DIRECTRY
//IPCSDUMP DD *
//SYSTSPRT DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//INDMP    DD DISP=SHR,DSN=&INDUMP.
//SNIFFER  DD DSN=&SNIFF.,
//  DISP=(NEW,CATLG),LRECL=27994,SPACE=(CYL,(250,50)),RECFM=VB,DSORG=PS
//IPCSPRNT DD SYSOUT=*
//IPCSTOC  DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//SYSTSIN  DD *
 PROFILE MSGID
  IPCS NOPARM
  SETD PRINT NOTERM LENGTH(160000) NOCONFIRM FILE(INDMP)
  DROPD
  CTRACE COMP(SYSTCPDA) SUB((TCPIP))    -
         OPTIONS((SNIFFER(65535 TCPDUMP))) ENTIDLIST(4)
 END
```

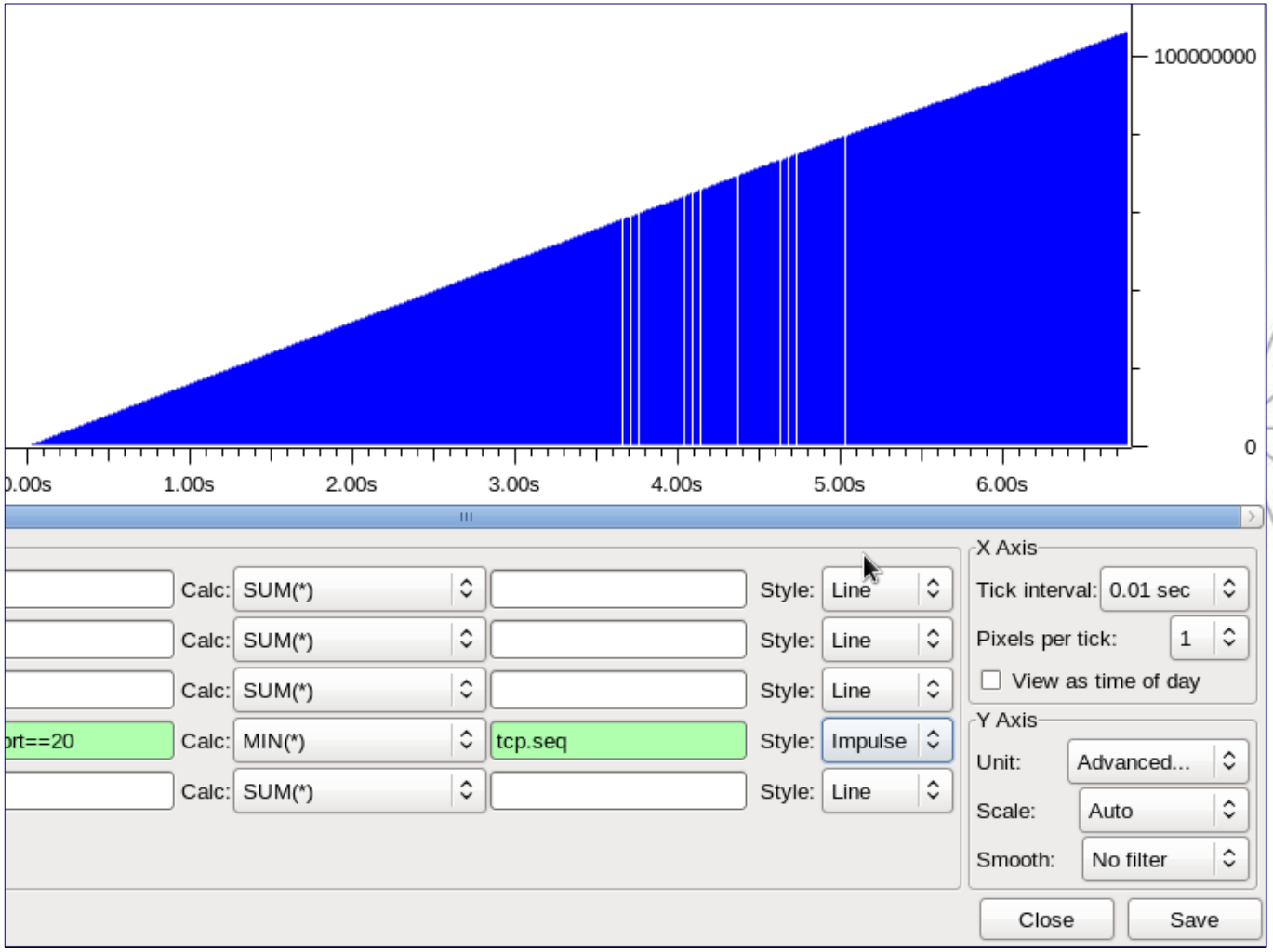
Problem: Slow FTP Transfer
tbc: wireshark Hands On Lab Thu 4:30PM

Filter: tcp.stream eq 1 | Expression... | Clear | Apply | Save | p0f | 3wayHS | rxmit | TLS | TLS_hidden

No.	Time	Source	ip_id	TTL	sPort	dPort	seq	tcp.len	nxt_seq	ack	RTT	TS_val	inflight	Coloring Rule Name
27	0.018093	AIX_FTP_SRVR	0xd119	54	20	13772	0	0				1385793715		SYN --> SYNRCVD
28	0.000090	zOS_ftp-client	0x8864	60	13772	20	0	0		1	0.0000	1466902113		<-- SYN ACK SYNRCVD
29	0.016296	AIX_FTP_SRVR	0xd11a	54	20	13772	1	0		1	0.0162	1385793715		3-way_HS complete ! ESTABLISHED
32	0.000402	zOS_ftp-client	0x8866	60	13772	20	1	1448	1449	1		1466902129	1448	
33	0.000000	zOS_ftp-client	0x8867	60	13772	20	1449	1448	2897	1		1466902129	2896	
34	0.000000	zOS_ftp-client	0x8868	60	13772	20	2897	1448	4345	1		1466902129	4344	
35	0.000000	zOS_ftp-client	0x8869	60	13772	20	4345	1448	5793	1		1466902129	5792	
36	0.023363	AIX_FTP_SRVR	0xd11d	54	20	13772	1	0		5793	0.0233	1385793715		
37	0.000034	zOS_ftp-client	0x886a	60	13772	20	5793	1448	7241	1		1466902152	1448	
38	0.000000	zOS_ftp-client	0x886b	60	13772	20	7241	1448	8689	1		1466902152	2896	
39	0.000000	zOS_ftp-client	0x886c	60	13772	20	8689	1448	10137	1		1466902152	4344	
40	0.000001	zOS_ftp-client	0x886d	60	13772	20	10137	1448	11585	1		1466902152	5792	
41	0.000000	zOS_ftp-client	0x886e	60	13772	20	11585	1448	13033	1		1466902152	7240	
42	0.000000	zOS_ftp-client	0x886f	60	13772	20	13033	1448	14481	1		1466902152	8688	
43	0.000001	zOS_ftp-client	0x8870	60	13772	20	14481	1448	15929	1		1466902152	10136	
44	0.000000	zOS_ftp-client	0x8871	60	13772	20	15929	1448	17377	1		1466902152	11584	
45	0.016414	AIX_FTP_SRVR	0xd11f	54	20	13772	1	0		15929	0.0164	1385793715		
46	0.000035	zOS_ftp-client	0x8872	60	13772	20	17377	1448	18825	1		1466902168	2896	
47	0.000001	zOS_ftp-client	0x8873	60	13772	20	18825	1448	20273	1		1466902168	4344	
48	0.000000	zOS_ftp-client	0x8874	60	13772	20	20273	1448	21721	1		1466902168	5792	
49	0.000000	zOS_ftp-client	0x8875	60	13772	20	21721	1448	23169	1		1466902168	7240	
50	0.000001	zOS_ftp-client	0x8876	60	13772	20	23169	1448	24617	1		1466902168	8688	
51	0.000000	zOS_ftp-client	0x8877	60	13772	20	24617	1448	26065	1		1466902168	10136	
52	0.000000	zOS_ftp-client	0x8878	60	13772	20	26065	1448	27513	1		1466902168	11584	
53	0.000001	zOS_ftp-client	0x8879	60	13772	20	27513	1448	28961	1		1466902168	13032	
54	0.000000	zOS_ftp-client	0x887a	60	13772	20	28961	1448	30409	1		1466902168	14480	

Frame 268249: 66 bytes on wire (528 bits), 66 bytes captured (528 bits)
Ethernet II, Src: SYSTCPDA_6f:77:01 (08:00:5a:6f:77:01), Dst: SYSTCPDA_fe:7f:97 (08:00:5a:fe:7f:97)
Internet Protocol Version 4, Src: AIX_FTP_SRVR (10.254.127.151), Dst: zOS_ftp-client (10.111.119.1)
Transmission Control Protocol, Src Port: 20 (20), Dst Port: 13772 (13772), Seq: 1, Ack: 345999393, Len: 0

Problem: Slow FTP Transfer wireshark IO Graph



Problem: Slow FTP transfer Summary

FTP PUT to external FTP server on AIX is not fast enough

Maximum streaming throughput is dominated by the tcp send and receive buffers and the round trip time.

The BDP Bandwidth Delay Product helps to identify what throughput can be achieved.

IPCS commands used in this problem diagnosis

- IP CTRACE COMP(SYSTCPDA) OPT((SESSION))
- IP CTRACE COMP(SYSTCPDA) OPT((SNIFFER))
- IP TCPIPCS TCB(* DATAQ DETAIL)

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IPCS for Networkers Part 2 of 2: Tales from the Crypt: How we solved some recent TCP/IP Problems

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Session 15192

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