

# How to Use IPCS to analyze VTAM/TCPIP CSM Storage Problems

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# The Problem

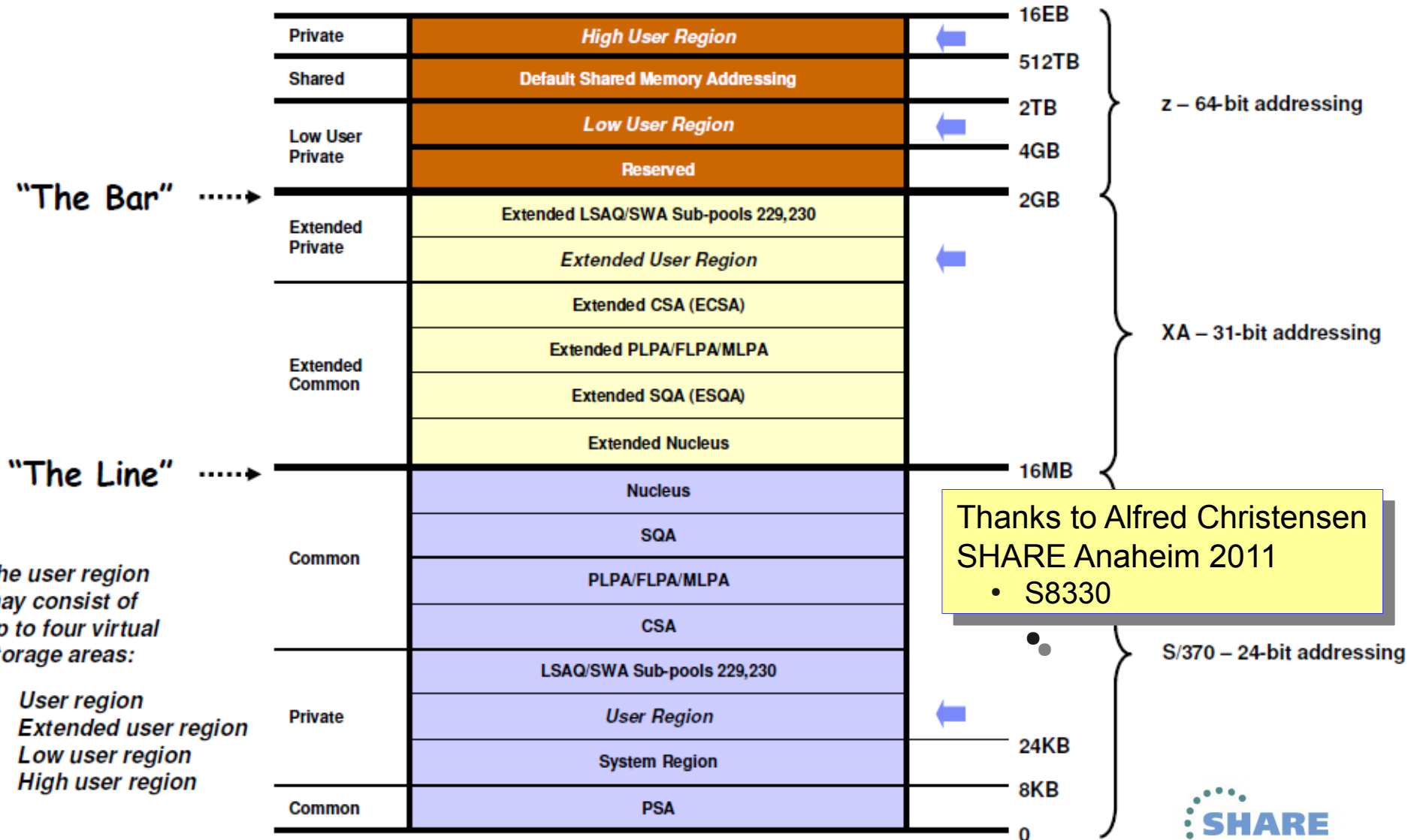
```
ONTOP.TCPIP.DBUG2013.CSMFIXED.DUMP20
----- GENERAL DUMP INFORMATION FOLLOWS -----
DUMP TITLE:          CSM
DUMP OF ASIDS:
X'0010'  JOBNAME:  OMVS
X'0096'  JOBNAME:  B0CSM
X'006B'  JOBNAME:  B0TCPIP
X'0073'  JOBNAME:  B0NET
X'0061'  JOBNAME:  B0ROUTED
```



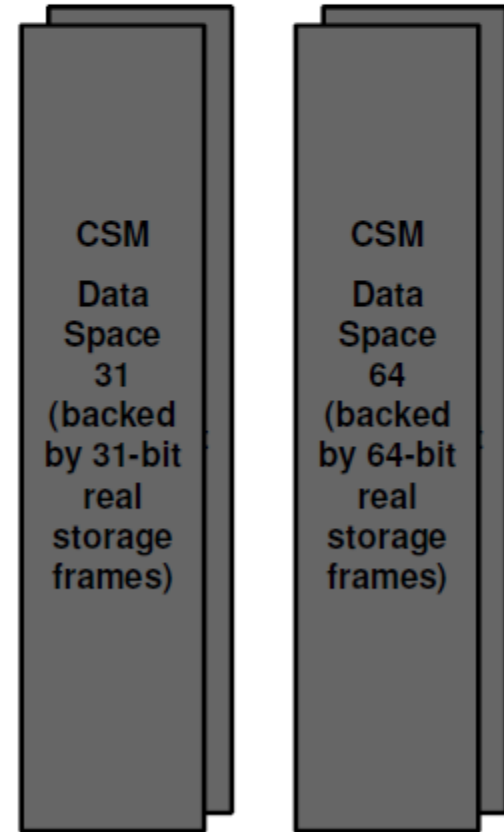
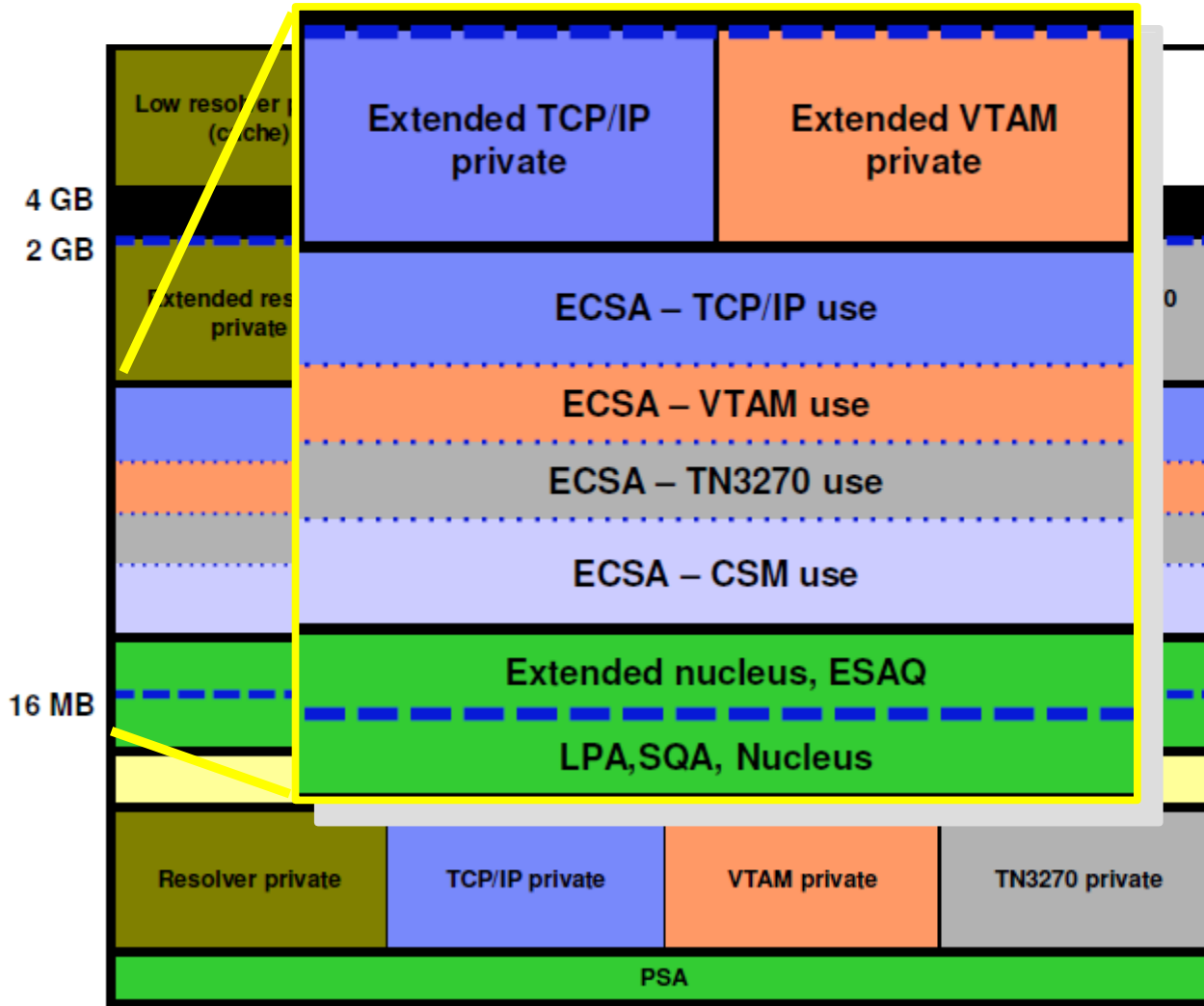
- Steady CSM 4K ECSA Storage increase
  - CSM constrained level reached
    - EZD1974E B0TCPIP CSM HAS BEEN CONSTRAINED FOR
    - IVT5592I CSM FIXED STORAGE AT CONSTRAINED LEVEL
    -
- Did anybody suffer?
  - Yes, OMPROUTE and other applications getting ENOBUF

# z/OS Storage Map

## From the Line to the Bar up the Wazoo



# Where does CSM storage reside? Dataspace and ECDSA



# CSM Storage Pools

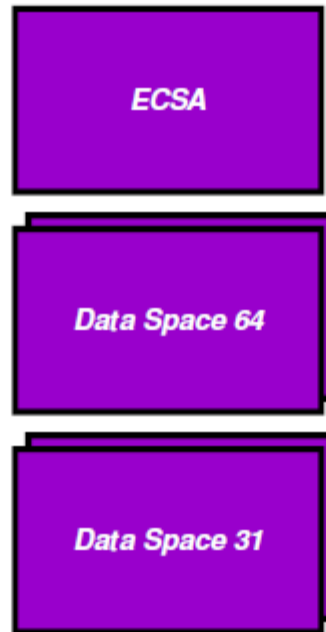
## Grouped by size and location

*CSM buffer pools*



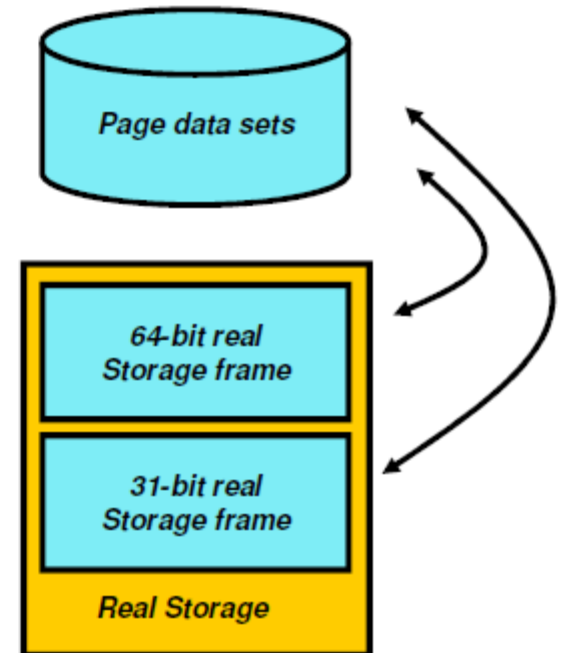
*CSM location of buffer pools*

*CSM buffer source*



*MVS backing of virtual storage*

*CSM buffer residency*



# VTAM CSM Display

## The initial approach



IKV0016I ONTOP.GS033.P17402.C724.D0529.SYSA.DUMP04 (Dump of z/OS)  
IKV0017I ***DNET CSM***

```
-----  
IVT5508I DISPLAY ACCEPTED  
IVT5529I PROCESSING DISPLAY CSM COMMAND - OWNERID NOT SPECIFIED  
IVT5530I BUFFER BUFFER  
IVT5531I SIZE      SOURCE                INUSE      FREE      TOTAL  
IVT5532I -----  
IVT5533I      4K  ECSA                5292K      148K      5440K  
IVT5533I     16K  ECSA                 96K       160K       256K  
IVT5533I     32K  ECSA                2080K     2016K         4M  
IVT5533I     60K  ECSA                 180K       180K       360K  
IVT5533I    180K  ECSA                 540K     1260K     1800K  
IVT5535I TOTAL    ECSA                 8188K     3764K    11952K  
IVT5532I -----  
IVT5533I      4K  DATA SPACE 31                0M       256K       256K  
IVT5533I     16K  DATA SPACE 31                0M         0M         0M  
IVT5533I     32K  DATA SPACE 31                0M       384K       384K  
IVT5533I     60K  DATA SPACE 31                0M         0M         0M  
IVT5533I    180K  DATA SPACE 31                0M         0M         0M  
IVT5535I TOTAL    DATA SPACE 31                0M       640K       640K  
IVT5532I -----
```



# VTAM CSM Display

## The initial approach



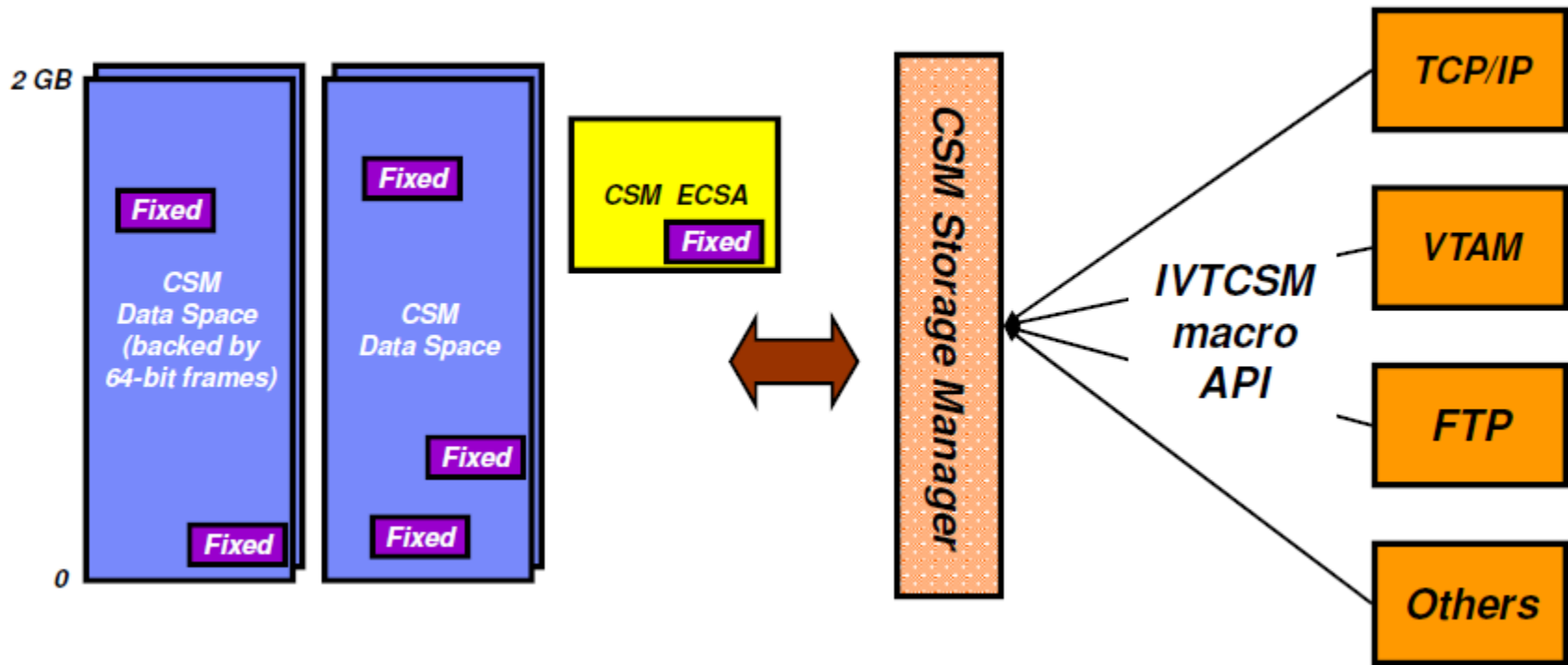
IKV0017I *DNET CSM*

```

-----
IVT5530I BUFFER BUFFER
IVT5531I SIZE SOURCE INUSE FREE TOTAL
IVT5532I -----
IVT5533I 4K DATA SPACE 64 50304K 1216K 51520K
IVT5533I 16K DATA SPACE 64 704K 320K 1M
IVT5533I 32K DATA SPACE 64 1632K 1952K 3584K
IVT5533I 60K DATA SPACE 64 240K 240K 480K
IVT5533I 180K DATA SPACE 64 1260K 900K 2160K
IVT5535I TOTAL DATA SPACE 64 54140K 4628K 58768K
IVT5532I -----
IVT5535I TOTAL DATA SPACE 54140K 5268K 59408K
IVT5532I -----
IVT5536I TOTAL ALL SOURCES 62328K 9032K 71360K
IVT5538I FIXED MAXIMUM = 120M FIXED CURRENT = 69481K
IVT5541I FIXED MAXIMUM USED = 69545K SINCE LAST DISPLAY CSM
IVT5594I FIXED MAXIMUM USED = 85157K SINCE IPL
IVT5539I ECSA MAXIMUM = 120M ECSA CURRENT = 14098K
IVT5541I ECSA MAXIMUM USED = 14098K SINCE LAST DISPLAY CSM
IVT5594I ECSA MAXIMUM USED = 27024K SINCE IPL
IVT5559I CSM DATA SPACE 1 NAME: CSM64001
IVT5559I CSM DATA SPACE 2 NAME: CSM31002
IVT5599I END
  
```



# CSM Storage – Fixed or Pageable CSM Pages on a real storage frame





# CSM Storage Limit Definitions

## SYS1.PARMLIB(IVTPRM00)



Technote 1318426 <http://www.ibm.com/support/docview.wss?uid=swg21318426>

Parameters: [MVS Initialization and Tuning Reference](#)

```
SYS1.PARMLIB(IVTPRM00)
FIXED MAX(120M)
ECSA MAX(120M)
```

SNA Operation: [VTAM Modify CSM Command](#)

```
>>-MODIFY procname,CSM--+-----+--+-----+--><
                        '-,ECSA=maxecsa-'  '-,FIXED=maxfix-'

                                .-DYNAMIC-.
>>-MODIFY procname,CSM,MONITOR=+-YES-----><
                                '-NO-----'
```

IP and SNA Codes: [CSM monitor IDs](#)



# VTAM CSM Display : CSM Buffer Pools

Following is a list of valid CSM pool names and their explanations:

**4KECSA**

4 KB buffer size ECSA storage pool.

**16KECSA**

16 KB buffer size ECSA storage pool.

**32KECSA**

32 KB buffer size ECSA storage pool.

**60KECSA**

60 KB buffer size ECSA storage pool.

**180KECSA**

180 KB buffer size ECSA storage pool.

**4KDS**

4 KB buffer size data space storage pool.

**16KDS**

16 KB buffer size data space storage pool.

**32KDS**

32 KB buffer size data space storage pool.

**60KDS**

60 KB buffer size data space storage pool.

**180KDS**

180 KB buffer size data space storage pool.

**4KDS64**

4 KB buffer size data space backed by 64-bit real storage pool.

**16KDS64**

16 KB buffer size data space backed by 64-bit real storage pool.

**32KDS64**

32 KB buffer size data space backed by 64-bit real storage pool.

**60KDS64**

60 KB buffer size data space backed by 64-bit real storage pool.

**180KDS64**

180 KB buffer size data space backed by 64-bit real storage pool.

# VTAM CSM Displays

## On the console and against a dump

VTAM Console Command:

```
                .-, POOL=ALL----- .
>>-DISPLAY NET,CSMUSE--+-----+----->
                '-, POOL=-+-ALL-----+-'
                    '-poolname-'

                .-OWNERID=ALL----- .
>--+-----+-----<<
                '-, OWNERID=-+-ALL-----+-'
                    '-ownerid-'
```

### TSO DNET Syntax in a CSDUMP

```
                .- POOL (ALL) ----- .
>>-TSO DNET CSMUSE--+-----+----->
                '- POOL (-+-ALL-----+)'
                    '-poolname-'

                .- OWNERID (ALL) ----- .
>--+-----+-----<<
                '- OWNERID (-+-ALL-----+)'
                    '-ownerid-'
```

# CSM MonitorIDs

## Who is using my CSM storage?

IKV0017I **DNET CSMUSE POOL (4KECSA)**

```

IVT5508I DISPLAY ACCEPTED
IVT5574I PROCESSING DISPLAY CSMUSE COMMAND - POOL SPECIFIED
IVT5584I USAGE DETAILS - 4KECSA POOL - POOL TOTAL = 50784K
IVT5532I -----
IVT5576I AMOUNT MONITOR ID OWNERID JOBNAME
IVT5532I -----
IVT5577I 20108K B1 006B BOTCPIP
IVT5579I BUFFER USE FOR B1 : USECNT USERDATA MONITOR HISTORY
IVT5580I 8306 28548EC0 00000B1
IVT5580I 27 28548DB0 912093B1
IVT5580I 5 28548DB8 99B199B1
IVT5580I 4 28548EC8 00000B1
IVT5532I -----
IVT5577I 8948K A9 006B BOTCPIP
IVT5579I BUFFER USE FOR A9 : USECNT USERDATA MONITOR HISTORY
IVT5580I 3497 7E7C86F0 2093B1A9
IVT5580I 66 7E7C86F0 A5A4B1A9
IVT5580I 40 7E7C86F0 9EA4B1A9
IVT5580I 11 7E7C86F0 9899B1A9
  
```

Monitor IDs are documented in z/OS Communications Server: IP and SNA Codes Chapter 4

# CSM Monitor IDs



Range	Description	X'A0' - X'AF' Transport Layer Monitor IDs		
X'00' - X'1F'	CSM Monitor IDs	X'A0'	Raw Inbound	rawInbound
X'20' - X'2F'	DLC Monitor IDs	X'A1'	Raw Outbound	rawOutbound
X'30' - X'8F'	VTAM Unique Monitor IDs	X'A4'	TCP Inbound	tcpInbound
X'90' - X'97'	TCP/IP IF Layer Monitor IDs	X'A5'	TCP Outbound	tcpOutbound
X'98' - X'9F'	TCP/IP IP Layer Monitor IDs	X'A8'	UDP Inbound	udpInbound
X'A0' - X'AF'	TCP/IP Transport Layer Monitor IDs	X'A9'	UDP Outbound	udpOutbound
X'B0' - X'FF'	TCP/IP Misc Monitor IDs	X'AC'	EE Inbound	eeInbound
		X'AD'	EE Outbound	eeOutbound
		X'B0' - X'FF' TCP/IP Misc Monitor IDs		
		X'B0'	Streams	streams
		X'B1'	Storage	itStorage

```

IVT5577I      20108K      B1      006B      B0TCPIP
IVT5579I BUFFER USE FOR B1 :  USECNT  USERDATA  MONITOR HISTORY
IVT5580I      8306      28548EC0      000000B1
IVT5581I X'B1'      Storage      27      28548DB0      912093B1
IVT5582I      5      28548DB8      99B199B1
IVT5580I      4      28548EC8      000000B1
IVT5532I -----
IVT5577I      8948K      A9      006B      B0TCPIP
IVT5579I BUFFER USE FOR A9 :  USECNT  USERDATA  MONITOR HISTORY
IVT5580I      3497      7E7C86F0      2093B1A9
IVT5581I X'A9'      UDP Outbound      66      7E7C86F0      A5A4B1A9
IVT5582I      40      7E7C86F0      9EA4B1A9
IVT5580I      11      7E7C86F0      9899B1A9
    
```



# CSM MONITORID A9 UDP outbound USERDATA field: \*UCB



*IP L 7E7C86F0 ASID(x'6B') LE(2048)*

```

7E7C86F0  5CE4C3C2  00000000  CB79EDF8  A3642540  | *UCB.....`.8t..
7E7C8700  00000000  6853761D  00000000  6809EFB9  | .....
7E7C8710  00000000  001FD0C9  00000000  00202EDC  | .....}I.....
7E7C8720  00000000  00000000  00000000  D2290401  | .....K...
7E7C8730  00000000  00000000  1C137E4A  00000000  | .....=ç....
7E7C8740  00000000  00000000  0000FFFF  0AE8480D  | .....Y..
7E7C8750  00000000  00000003  00000000  00000000  | .....
7E7C8760  00000000  00000000  0000FFFF  0000FFFF  | .....
7E7C8770  00000000  45000000  00000000  3C110000  | .....
7E7C8780  0AE8480D  0AE8480D  00000000  00000000  | .Y...Y.....
7E7C8790.:7E7C87AF. LENGTH(X'20')--All bytes contain X'00'
7E7C87B0  0000FFFF  FFFF0000  60000000  000011FF  | .....-.....
7E7C87C0.:7E7C87EF. LENGTH(X'30')--All bytes contain X'00'
7E7C87F0  11008080  00000000  00000000  00000000  | .....
7E7C8800.:7E7C886F. LENGTH(X'70')--All bytes contain X'00'
7E7C8870  00000000  00000000  E6C1C6D5  C4F0F140  | .....WAFND01
    
```



# Monitor A9 – UDP Outbound USERDATA TCPIPES UCB CLIST



IKV0017I **DNET CSMUSE POOL (4KECSA)**

IVT5579I BUFFER USE FOR A9 :  
IVT5580I

USECNT    USERDATA  
3497      7E7C86F0

MONITOR HISTORY  
2093B1A9

## IP TCPIPES UCB

UCB	ResrcID	ResrcNm	TpiState	Port	IPAddr
7F05E690	0000000C	B0TCPIP	WLOUNBND		::
7EBDEC10	00000133	SYSLOG	WLOIDLE	514	::
7EBD3150	000000A2	B0SNMPDB	WLOIDLE	1066	::
7EBD82F0	00000063	B0SNMPD	WLOIDLE	161	::

4 UCB(s) FOUND

4 UCB(s) FORMATTED

IPv4 Unicast Hash Table

7F29F650	00000004	B0TCPIP	WLOUNBND		0.0.0.0
7EBDEC10	00000133	SYSLOG	WLOIDLE	514	0.0.0.0
7EBD3150	000000A2	B0SNMPDB	WLOIDLE	1066	0.0.0.0
7E69E4B0	000B4938	WAFDMGR	WLOIDLE	32314	10.232.72.13
7E7C86F0	000B4B46	WAFND01	WLOIDLE	32330	10.232.72.13
7EBD82F0	00000063	B0SNMPD	WLOIDLE	161	0.0.0.0



# UDP Sockets with data on queues

## TCPIPES UCB(\* DATAQ)

### IP TCPIPES UCB

IPv4 Unicast Hash Table

7F29F650	00000004	B0TCPIP	WLOUNBND		0.0.0.0
7EBDEC10	00000133	SYSLOG	WLOIDLE	514	0.0.0.0
7EBD3150	000000A2	B0SNMPDB	WLOIDLE	1066	0.0.0.0
7E69E4B0	000B4938	WAFDMGR	WLOIDLE	32314	10.232.72.13
<b>7E7C86F0</b>	000B46	WAFND01	WLOIDLE	32330	10.232.72.13
7EBD82F0	00000063	B0SNMPD	WLOIDLE	161	0.0.0.0

### IP TCPIPES UCB (\* DATAQ)

UCB	ResrcID	ResrcNm	TpiState	Port	IPAddr
7E69E4B0	000B4938	WAFDMGR	WLOIDLE	32314	10.232.72.13

RECV\_QLEN: 00005DB9 Oldest Data(GMT): 2013/06/05 10:07:19

### IP ST

Dump Title: CSM

CPU Model 2817 Version 00 Serial no. 039317 Address 000

Date: 06/07/2013 Time: 13:18:16.849013 Local

Original dump dataset: P77DD06.D130607.T131816.SC000020.#MASTER#



# Problem Summary

## The facts

- Steady CSM 4K ECSA Storage increase
  - Eventually CSM constrained level reached
    - EZD1974E BOTCPIP CSM HAS BEEN CONSTRAINED FOR
    - IVT5592I CSM FIXED STORAGE AT CONSTRAINED LEVEL
  - MONITOR ID indicate “A9: UDP outbound” Component
- Local UDP socket sending data to another local UDP socket
  - Receiving Socket is NOT receiving for days!!!!
- Did anybody in application land complain?
  - No, as this is UDP, it's best effort delivery
- Did anybody suffer?
  - Yes, OMPROUTE and other applications getting ENOBUF

# Problem Summary

## The possible solutions

- Fix the application
  - Contact the vendor, raise severity, hope for fix soon
    - ... and next time it's yet another application!
- Dynamically adjust the CSM settings using F NET,CSM
  - Use automation to trigger on IVT messages
- Provide a limit for UDP applications
  - UDPQUEUELIMIT in TCPIP PROFILE UDPCONFIG
    - Max 2000 datagrams queued to a socket
    - For all UDP applications (except VTAM/EE!)
  - IDS Traffic Regulation
    - Writes a message to SYSLOG when limit is reached
    - Kill the failing application before it kills you!

# Commands used to analyze the dump:



- **DNET CSM**
  - Display CSM command to monitor CSM storage usage
- **DNET CSMUSE POOL(4KECSA)**
  - Display the CSM storage usage of CSM Pool 4KECSA
- **IP TCPIP CS UCB**
  - Identify the UDP sockets in a TCPIP stack
- **IP TCPIP CS UCB(\* DATAQ)**
  - Find any UDP sockets with data on the SEND() or RECV() queue
- **IP ST**
  - Display status information of the system



# IPCS CLISTs Panel

## VTAM – CSM Analysis

### VTAMMAP Analysis Menu

Command ==> \_\_\_\_\_

(C) Copyright IBM Corporation 1993,2006. All rights reserved.  
Select one of the following. Then press Enter.

- 1. APPC . . - APPLCONV, PARTNRLU, APPLMODE, APPMODAL
- 2. APPN . . - APPNBASE, FNDADJCP, FNDANDCB, FNDCOS, FNDDECB, etc
- 3. General. - HOST, VTAM, VTBASIC, VTFNDMOD, VTMODS, VITAL, etc
- 4. Queues . - PABSCAN, VTCVTPAB, VTREADYQ
- 5. Resource - RDTCHECK, RDTFULL, RDTHIER, RDTSUM, VTNODE
- 6. Session. - ATMDATA, FINDDSIB, FINDSIB, MNPS, SES, SIBCHECK
- 7. Search . - SRTFIND
- 8. Storage. - SPANC, STORAGE, VTBUF, VTRPH
- 9. **CSM. . . - CSMALL, CSMBUF, CSMCMPID, CSMOWNER, CSMPOOL**
- 10. Unit . . - VTURF

### VTAMMAP CSM

Command ==> \_\_\_\_\_

Select one of the following. Then press Enter.

- 1. CSMALL . - format CSM data structures for all pools <Immed>
- 2. CSMBUF . - display CSM buffer storage
- 3. CSMCMPID - list the addresses of all CSM buffers for a COMPID
- 4. CSMOWNER - list the addresses of all CSM buffers for an owner
- 5. CSMPOOL. - format CSM data structures for a specific pool

# IPCS CLISTs Panel

## TCPIP – UDP Sockets

### TCP/IP Analysis Menu

Command ==> \_\_\_\_\_

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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

### TCP/IP Format

Command ==> \_\_\_\_\_

Select one of the following. Then press Enter.

- 1. PROTOCOL . - Format RAW, TCP, and UDP control blocks
- 2. RAW. . . . - Format RAW control blocks
- 3. TCB. . . . - Format TCP control blocks
- 4. **UDP**. . . . - **Format UDP control blocks**

# Prerequisites for enrollment in CE usage Feel like home in dumps!



<http://tinyurl.com/ipwizards>

IP WIZARDS

[ip.wizards@groups.facebook.com](mailto:ip.wizards@groups.facebook.com)

Keep clean. Solitaire TopCoat. RODENSTOCK



# Thank You

cs  
muse  
pool  
DNET  
st  
DATAQ  
UCB  
ECSA  
MonitorIDs  
ip  
storage  
UDP  
CSM