SHARE
Technology · Connections · Results

z/OS Communications Server VTAM and TCP/IP Performance and Storage Considerations

Angela Schmitz
AS Communication Consultant Services
email: 73064.754@compuserve.com

Friday, August 16, 2013   9:30 AM
Session 13629

SHARE
in Boston

VTAM and TCP/IP performance problems can degrade the overall performance of an entire z/OS Sysplex.

Storage usage, by VTAM and TCP/IP, is a 'major player' affecting the z/System.

Customization parameter settings in VTAM and TCP/IP determine storage usage. Too small of a setting could lead to serious performance problems with VTAM as well as TCP/IP, or worse to a TCP/IP outage.
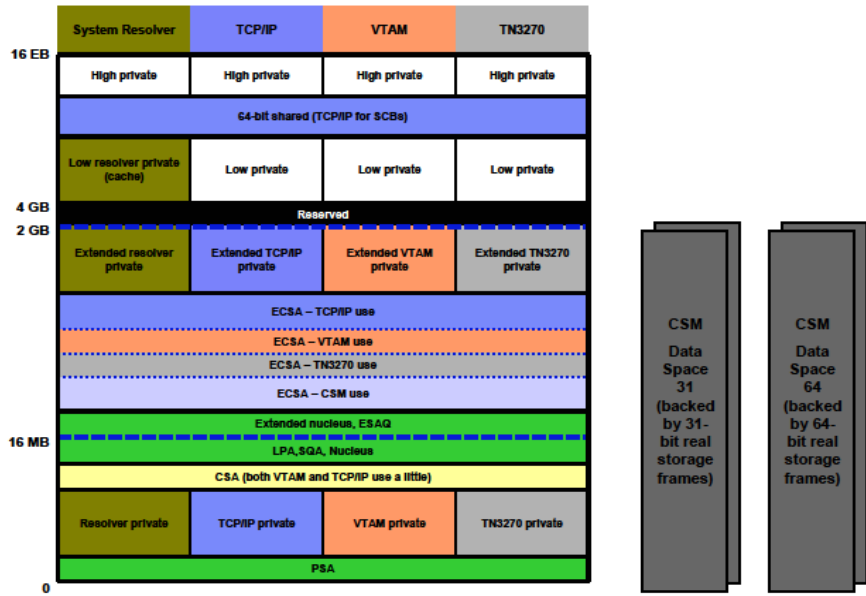
In this session we will discuss some of the key storage-related parameters, and direct you to the manuals in which they are described.

IBM Software Group – Enterprise Networking Solutions

Communications Server virtual storage usage overview

From Alfred Christensen Share presentation "Understanding zOS CS storage use"
Both TCPIP as well VTAM do have various storage needs.
In this presentation we focus on those are which are VTAM controlled and managed and used from both: CSM and VTAM buffers

```
 S TSO
IRR812I PROFILE TSO.* (G) IN THE STARTED CLASS WAS USED 632
      TO START TSO WITH JOBNAME TSO.
$HASP100 TSO    ON STCINRDR
IEF695I START TSO    WITH JOBNAME TSO    IS ASSIGNED TO USER
$HASP373 TSO    STARTED
IEF403I TSO - STARTED - TIME=09.18.58
V NET,ACT,ID=ATSO
IEE341I VTAM          NOT ACTIVE

*2406 IKT003D TCAS UNABLE TO ACCEPT LOGONS, REASON CODE=0092 REPLY

'RETRY' OR 'TERM'
```

No surprise that for a VTAM application VTAM needs to be activ, but VTAM also needs to be activ for TCPIP CSM usage and VTAM buffers

CSM Usage

Application	#users / clients	Workload Throughput	Max CSM (ECSA)	Max CSM (Dataspace)	Max CSM (Fixed)
CICS Sockets (z10, transaction = 200 / 200)	250	475.3 Trans/Sec	780 KB	20.17 MB	28.04 MB
	500	905.1	916	20.26	28.04
	1000	1589.1	1.12 MB	20.45	29.08
TN3270 (z196 with Think Time, SHAREACB option, Echo transactions, 100 / 800)	8000	266.5 Trans/Sec	800 KB	27.63 MB	33.64 MB
	16000	533.4	896	27.62	34.04
	32000	1066.7	880	27.27	34.44
	64000	2133.0	900	28.00	35.24
	128000	4259.3	1.28 MB	30.12	37.64
	256000	8433.9	1.34	31.62	40.44
FTP Inbound Data Binary Put (z196, with and without Think Time, transaction= 2 MB / 1)	1	1.30 MB/Sec	600 KB	21.73 MB	30.04 MB
	2	2.56	656	21.78	30.76
	4	5.19	692	22.41	32.32
	8	10.41	712	22.56	33.92
	16	20.80	708	2218	32.72
	32	41.53	884	22.96	33.52
	64	82.24	1.16 MB	23.96	41.88
	128	164.04	996 KB	24.85	35.12
FTP Outbound Data Binary Get (z196, with and without Think Time, transaction = 1 / 2 MB)	1	1.29 MB/Sec	1.01 MB	21.93 MB	30.76 MB
	2	2.55	672 KB	22.12	31.12
	4	5.11	1.21 MB	22.24	32.32
	8	10.24	900 KB	22.24	32.72
	16	20.43	1.60 MB	22.68	33.08
	32	40.92	2.00	22.86	33.88
	64	80.69	2.62	23.73	42.16
	128	157.93	3.74	24.67	36.40

Complete your sessions evaluation online at SHARE.org/BostonEval

SHARE in Boston

CSM is used for OSA, XCF but also for TCPIP application in
IBMs documentation "z/OS V1R13 Communications Server Performance
Summary" is an overview of the CSM need for some TCPIP applications

VTAM Buffer Usage

Application	#users / clients	Workload Throughput	IO00 Buffer	LF00 Buffer	CRPL Buffer	TI00 Buffer	CRA4 Buffer
CICS Sockets (z10, transaction = 200 / 200)	250	475.3 Trans/Sec	5	5	54	18	4
	500	905.1	5	5	54	18	4
	1000	1589.1	5	5	54	18	4
TN3270 (z196 with Think Time, SHAREACB option, Echo transactions, 100 / 800)	8000	266.5 Trans/Sec	255	3	1934	304	12
	16000	533.4	389	3	1934	453	12
	32000	1066.7	397	3	1934	626	15
	64000	2133.0	500	3	1934	626	24
	128000	4259.3	2283	3	1934	2614	28
	256000	8433.9	2283	3	1934	2614	28
FTP Inbound Data Binary Put (z196, with and without Think Time, transaction= 2 MB / 1)	1	1.30 MB/Sec	1	3	1	12	4
	2	2.56	1	3	1	12	4
	4	5.19	1	3	1	12	4
	8	10.41	1	3	1	12	4
	16	20.80	1	3	1	12	4
	32	41.53	1	3	1	12	4
	64	82.24	5	4	2	12	5
	128	164.04	1	3	1	12	5
FTP Outbound Data Binary Get (z196, with and without Think Time, transaction = 1 / 2 MB)	1	1.29 MB/Sec	1	3	1	12	4
	2	2.55	1	3	1	12	4
	4	5.11	1	3	1	12	4
	8	10.24	1	3	1	12	4
	16	20.43	1	3	1	12	4
	32	40.92	1	3	1	12	4
	64	80.69	5	4	2	12	5
	128	157.93	5	4	2	12	5

z/OS V1R13 CS Performance Summary   11/11/11

© 2011 IBM Corporation

VTAM buffers are needed for VTAM application no surprise.
IBMs documentation "z/OS V1R13 Communications Server Performance Summary" has an overview of the VTAM Buffer usage for some TCPIP applications

```
IST097I  DISPLAY  ACCEPTED
IST350I  DISPLAY TYPE = BUFFER POOL DATA
IST632I  BUFF  BUFF  CURR  CURR  MAX   MAX   TIMES  EXP/CONT   EXP
IST633I   ID   SIZE TOTAL AVAIL TOTAL  USED   EXP   THRESHOLD  INCR
IST356I  IO00  331  1936  1863  2431  2264     4    160/  655   165
IST356I  BS00  260    28    28    28     0     0     14/-----    14
IST356I  LP00 2032    80    77    80    14     0     20/-----    20
IST356I  XD00  697   140    39   140   103     0     20/-----    20
IST356I  LF00  120   960   362   960   726     0     80/-----    90
IST356I  CRPL  144  2400  1186  2400  1428     0    145/-----   225
IST356I  SF00  112   608   187   608   427     0     30/-----    64
IST356I  SP00  176    21    21    21     3     0      1/-----    21
IST356I  AP00   56    56    56    56     0     0      3/-----    56
IST356I  TI00  632   702   680   702   418     0     70/-----    84
IST356I  T100 1004   128   128   128    81     0     15/-----    32
IST356I  T200 2028   160   160   160   139     1     15/  111    32
IST356I  CRA4 4080   240   222   240    81     0     20/-----    20
IST356I  CRA8 8176   100    98   100    58     0     12/-----    12
IST449I  CSALIMIT    = 250000K, CURRENT =    21291K, MAXIMUM =   21534K
IST790I  MAXIMUM CSA  USED =    22031K
IST1667I  SYSTEM CSA LIMIT = 623820K
IST1831I  41% OF SYSTEM CSA STORAGE REMAINING =   261998K
IST449I  CSA24 LIMIT =     164K, CURRENT =      83K, MAXIMUM =      88K
IST790I  MAXIMUM CSA24 USED =      93K
IST595I  IRNLIMIT = NOLIMIT , CURRENT =       0K, MAXIMUM =      0K
IST981I  VTAM PRIVATE: CURRENT =  16531K, MAXIMUM USED =   17361K
IST924I  -------------------------------------------------------
IST1565I  CSA    MODULES =    1776K
IST1565I  CSA24  MODULES =      40K
IST1565I  PRIVATE MODULES =    8333K
IST314I  END
```

Check with D NET,BFRUSE,BUFFER=SHART the VTAM buffer usage as they are used by both part of z/CS and it is still true when VTAM Need a buffer expantion the system "waits".

Communications Storage Manager (CSM)

- **The communications storage manager (CSM) is a VTAM component that allows authorized host applications to share data with VTAM, TCP/IP and other CSM users without the need to physically copy the data.**

- **CSM includes a public application programming interface (API) that provides a way to:**
  - Obtain and return CSM buffers
  - Change ownership of buffers
  - Copy buffers
  - Manage CSM buffers

- **The storage key for CSM buffers is key 6**
  - Most CSM storage is obtained with the "System" as owner

```
  FTP  --Pointer-->  TCP/IP  --Pointer-->  VTAM
                                             |
                                          Pointer
                                             |
  It is all about     --Data-->  CSM  --Data-->  QDIO
  minimizing the            [data]
  number of data
  copies!
```
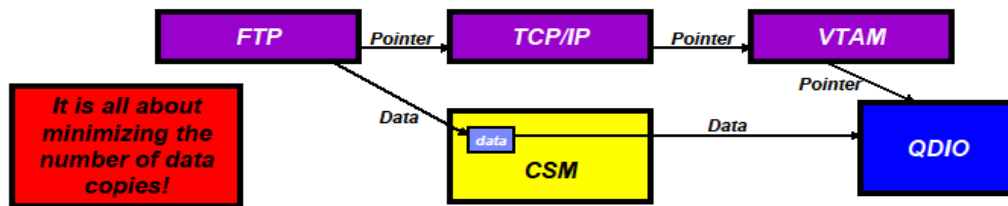
Page 25

© 2010 IBM Corporation

From Alfred Christensen Share presentation "Understanding zOS CS storage use"

CSM is a VTAM component that allows authorized host applications to share data with VTAM, TCPIP and other CSM users without the need to physically copy the data.

z/OS V1R13.0 Communications Server: New Function Summary   GC31-8771
    Defining SNA data sets
        Data sets containing information for z/OS V1R13 Communications Server
            Parmlib member for Communication Storage Manager (CSM)
                The IVTPRM00 parmlib member .....

z/OS V1R1x.0 MVS Initialization and Tuning Reference   SA22-7592

How to set CSM parameters are defined in two (2) manuels:

1. z/OS V1R13.0 Communications Server: New Function
2. z/OS V1R1x.0 MVS Initialization and Tuning Reference

IVTPRM00 (communication storage manager)

The SYS1.PARMLIB member IVTPRM00 defines CSM

IVTPRM00 (communication storage manager)

CSM storage limits are located in the SYS1.PARMLIB member IVTPRMxx. The values you can allocate are:

ECSA MAX - the maximum amount of ECSA storage that CSM can allocate.
FIXED MAX- the maximum amount of fixed storage that CSM can allocate. This includes both fixed CSM ECSA and CSM data space storage.

If you do not specify values in the IVTPRMxx parmlib member, the system uses the default values of 100m ECSA and 100m FIXED. You can change these values dynamically with the MODIFY CSM command. If the limit specified by these values is reached, results are unpredictable. TCP/IP might not be able to continue. IVTxxxx messages will be issued if CSM is unable to obtain storage. Refer to z/OS MVS Initialization and Tuning Reference for additional information on the IVTPRMxx parmlib member.

IVTPRM00 (communication storage manager)

IVTPRM00 sets parameters for the Communication Storage Manager (CSM). IVTPRM00 is read during CSM initialization when the first IVTCSM REQUEST=CREATE_POOL macro is issued. (VTAM® issues this macro when started.) The parameters can be changed without a re-IPL by editing the IVTPRM00 member and issuing the MODIFY CSM command with no command parameters specified.

Syntax format of IVTPRM00

    FIXED MAX(maxfix)
    ECSA MAX(maxecsa)
    POOL(bufsize,bufsource,initbuf,minfree,expbuf)
Note:
FIXED MAX, ECSA MAX, and POOL must begin in column 1.

IVTPRM00 (communication storage manager)

Syntax rules for IVTPRM00

IVTPRM00 member of SYS1.PARNLIB - Only the 00 suffix is allowed **but**
 System symbols can be used. For more information, see "Using MVS™ System Symbols" in the
z/OS Communications Server: SNA Network Implementation Guide.

IBM-supplied defaults for IVTPRM00

The following are the IBM-supplied defaults for the CSM buffer pools:

Bufsize	initbuf	minfree	expbuf
4K	64	8	16
16K	32	4	8
32K	16	2	4
60K	16	2	4
180K	2	1	2

IVTPRM00 (communication storage manager)

FIXED MAX   Defines the maximum amount of storage dedicated to fixed CSM buffers.

ECSA MAX   Defines the maximum amount of storage dedicated to ECSA CSM buffers.

POOL   One POOL definition can be specified for each CSM buffer pool of a particular bufsize and bufsource combination.

    bufsize   The size of the buffers in the pool to be created. (Valid Range: 4K, 16K, 32K, 60K, 180K) Default Value: None (valid range value required).

    bufsource   The storage source from which buffers are allocated. The values are:

- **ECSA**   Buffers are allocated from ECSA storage.
- **DSPACE**   Buffers are allocated from data space storage. (Each dataspace uses 2GB in size - no firther control)
- **Initbuf**   The initial number of buffers created in the pool when the first IVTCSM REQUEST=CREATE_POOL macro is issued by an application.
- **minfree**   The minimum number of free buffers allowed in the pool at any time. The storage pool is expanded the the value specified in expbuf if the number of free buffers falls below this limit.expbuf
- **expbuf**   The number of free buffers by which the pool is expanded when the free buffers fall below the minfree value.

► You must code only one blank between the keywords FIXED/ECSA and MAX. If more than one blank appears between these keywords, the system ignores the statement as a comment and no syntax error message is generated. In this case, the system uses the default.

► The FIXED/ECSA MAX statement must be completed one line.

► No blanks should be coded between the keyword MAX and "(".

```
D NET,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                5028K      284K     5312K
IVT5533I   16K  ECSA                  64K      448K      512K
IVT5533I   32K  ECSA                1056K      480K     1536K
IVT5533I   60K  ECSA                   0M      240K      240K
IVT5533I  180K  ECSA                   0M      360K      360K
IVT5535I  TOTAL ECSA                6148K     1812K     7960K
IVT5532I  -----------------------------------------------------
IVT5533I    4K  DATA SPACE 31         0M      512K      512K
IVT5533I   16K  DATA SPACE 31         0M        0M        0M
IVT5533I   32K  DATA SPACE 31         0M      512K      512K
IVT5533I   60K  DATA SPACE 31         0M        0M        0M
IVT5533I  180K  DATA SPACE 31         0M        0M        0M
IVT5535I  TOTAL DATA SPACE 31         0M        1M        1M
IVT5532I  -----------------------------------------------------
IVT5533I    4K  DATA SPACE 64     42808K     9288K    52096K
IVT5533I   16K  DATA SPACE 64       400K      368K      768K
IVT5533I   32K  DATA SPACE 64      1824K      352K     2176K
IVT5533I   60K  DATA SPACE 64         0M        0M        0M
IVT5533I  180K  DATA SPACE 64     36540K     1260K    37800K
IVT5535I  TOTAL DATA SPACE 64     81572K    11268K    92840K
IVT5532I  -----------------------------------------------------
IVT5535I  TOTAL DATA SPACE        81572K    12292K    93864K
IVT5532I  -----------------------------------------------------
IVT5536I  TOTAL ALL SOURCES       87720K    14104K   101824K
IVT5538I  FIXED MAXIMUM =      180M   FIXED CURRENT =      62897K
IVT5541I  FIXED MAXIMUM USED =   62913K SINCE LAST DISPLAY CSM
IVT5594I  FIXED MAXIMUM USED =   67077K SINCE IPL
IVT5539I  ECSA  MAXIMUM =      180M   ECSA  CURRENT =       9799K
IVT5541I  ECSA  MAXIMUM USED =    9799K SINCE LAST DISPLAY CSM
IVT5594I  ECSA  MAXIMUM USED =   10439K SINCE IPL
IVT5559I  CSM DATA SPACE 1 NAME: CSM64001
IVT5559I  CSM DATA SPACE 2 NAME: CSM31002
IVT5599I  END
```

DISPLAY CSM command
You can use this command to determine how much CSM storage is in use for ECSA and data space storage pools

The sum of the total of the storage allocated to all users of a particular pool may be greater than the total amount of storage allocated to that pool. This is due to the existence of multiple instances of a buffer created when an application program issues the IVTCSM ASSIGN_BUFFER macro. The storage displayed for each OWNERID indicates the amount of storage that must be freed by the user to enable the storage to be returned to the buffer pool.

The owner ID is the ASID of a CSM buffer owner.

VTAM API64R start option

API64R=YES default

Notes:
1. API64R is only meaningful if the machine is operating in z/Architecture® mode.
2. API64R=NO for 31-bit CSM data space

Specifies whether 64-bit backed CSM data space storage can be passed to **VTAM and TCP/IP application programs.**

Storage that is 64-bit backed is storage that, when fixed, can be assigned to real storage frames on or above the 2 Gigabyte real storage bar. With only a few exceptions, all CSM data space storage acquired by VTAM and TCP/IP when operating in z/Architecture mode is 64-bit backed.

CSM 4KDS64 is used for:

SC31-8778-14   z/OS Communications Server: SNA Resource Definition Reference

When API64R=YES, application programs that accept CSM data space buffers for a receive operation will likely be given 64-bit backed CSM data space storage. If an application attempts to issue the LRA instruction (Load Real Address) against this storage, and the storage is resident on or above the 2 Gigabyte real storage bar, a special operation exception program interrupt will occur. Note that LRA is used primarily in preparation for I/O. There are no known application programs that perform I/O directly into or out of CSM data space storage.

Check if you have the default set.

```
D NET,CSMUSE
IVT5508I  DISPLAY ACCEPTED
IVT5572I  PROCESSING DISPLAY CSMUSE COMMAND - OWNERID NOT SPECIFIED
IVT5532I  ----------------------------------------------------
IVT5575I  USAGE SUMMARY - 4KECSA   POOL TOTAL (ALL USERS) =      5044K
IVT5576I     AMOUNT   MONITOR ID   OWNERID    JOBNAME
IVT5577I     2948K       21          0043       VTAM
IVT5577I      468K       B1          0041       TCPIP
IVT5577I      428K       21          0041       TCPIP
IVT5578I  DISPLAY TOTAL FOR 4KECSA   POOL (3 USERS)       =      3844K
IVT5532I  ----------------------------------------------------
IVT5575I  USAGE SUMMARY - 16KECSA  POOL TOTAL (ALL USERS) =        64K
IVT5576I     AMOUNT   MONITOR ID   OWNERID    JOBNAME
IVT5577I       32K       B1          0041       TCPIP
IVT5578I     DISPLAY TOTAL FOR 16KECSA   POOL (2 USERS)     =    32K
IVT5532I  ----------------------------------------------------
IVT5575I  USAGE SUMMARY - 32KECSA  POOL TOTAL (ALL USERS) =      1056K
IVT5576I     AMOUNT   MONITOR ID   OWNERID    JOBNAME
IVT5577I     1056K       B1          0041       TCPIP
IVT5578I  DISPLAY TOTAL FOR 32KECSA  POOL (1 USERS)       =      1056K
IVT5532I  ----------------------------------------------------
IVT5575I  USAGE SUMMARY - 4KDS64   POOL TOTAL (ALL USERS) =     42720K
IVT5576I     AMOUNT   MONITOR ID   OWNERID    JOBNAME
IVT5577I    25008K       23          0041       TCPIP
IVT5577I    16720K       21          0043       VTAM
IVT5578I  DISPLAY TOTAL FOR 4KDS64   POOL (2 USERS)       =     41728K
IVT5532I  ----------------------------------------------------
IVT5575I  USAGE SUMMARY - 16KDS64  POOL TOTAL (ALL USERS) =       352K
IVT5576I     AMOUNT   MONITOR ID   OWNERID    JOBNAME
IVT5577I      320K       B1          0041       TCPIP
IVT5578I  DISPLAY TOTAL FOR 16KDS64  POOL (1 USERS)       =       320K
IVT5532I  ----------------------------------------------------
IVT5575I  USAGE SUMMARY - 32KDS64  POOL TOTAL (ALL USERS) =      1856K
IVT5576I     AMOUNT   MONITOR ID   OWNERID    JOBNAME
IVT5577I     1856K       B1          0041       TCPIP
IVT5578I  DISPLAY TOTAL FOR 32KDS64  POOL (1 USERS)       =      1856K
IVT5532I  ----------------------------------------------------
IVT5575I  USAGE SUMMARY - 180KDS64 POOL TOTAL (ALL USERS) =     36360K
IVT5576I     AMOUNT   MONITOR ID   OWNERID    JOBNAME
IVT5577I    36360K       B1          0041       TCPIP
IVT5578I  DISPLAY TOTAL FOR 180KDS64 POOL (1 USERS)       =     36360K
```

SHARE

SHARE
in Boston

The DISPLAY CSMUSE command allows to evaluate the use of storage managed by the communications storage manager (CSM).
The display output provides detailed information about each CSM storage pool. The detailed information describes storage as it corresponds to an identifier, which is referred to as a monitor ID. Monitor IDs describe specific z/OS Communications Server components. When CSM storage is associated with (or isolated to) a specific monitor ID, then IBM service can correlate the monitor ID to a component (usage or function) of z/OS Communications Server. This information can be useful when evaluating how z/OS Communications Server is using system storage or to help diagnose storage growth. Refer to z/OS Communications Server: IP and SNA Codes for the complete description of monitor IDs.

```
D NET,CSMUSE,POOL=4KECSA
IVT5508I  DISPLAY ACCEPTED
IVT5574I  PROCESSING DISPLAY CSMUSE COMMAND - POOL SPECIFIED
IVT5584I  USAGE DETAILS - 4KECSA   POOL - POOL TOTAL =      3588K
IVT5532I  ------------------------------------------------------
IVT5576I     AMOUNT   MONITOR ID   OWNERID    JOBNAME
IVT5532I  ------------------------------------------------------
IVT5577I     2948K      21          0027       VTAM
IVT5579I  BUFFER USE FOR 21 :    USECNT   USERDATA   MONITOR HISTORY
IVT5580I                           45    E7C3C640       00000021
IVT5580I                           44    F7F7F8F0       00000021
IVT5580I                           44    F7F5F4F0       00000021
IVT5580I                           44    F7F7C1F0       00000021
IVT5585I  DETAIL TOTAL FOR 4KECSA   POOL =      2948K
IVT5599I  END
```

For each CSM monitor ID, the user data field and monitor history field from the CSM buffer headers is provided. The user data field allows IBM service to correlate the current usage and monitor history to a specific resource, such as a device, connection, route, and so o

```
D NET,CSMUSE,POOL=4KDS64
IVT5508I  DISPLAY ACCEPTED
IVT5574I  PROCESSING DISPLAY CSMUSE COMMAND - POOL SPECIFIED
IVT5584I  USAGE DETAILS - 4KDS64   POOL - POOL TOTAL =     42928K
IVT5532I  --------------------------------------------------------
IVT5576I    AMOUNT   MONITOR ID   OWNERID    JOBNAME
IVT5532I  --------------------------------------------------------
IVT5577I    24912K      23          002B       TCPIP
IVT5579I  BUFFER USE FOR 23 :   USECNT  USERDATA   MONITOR HISTORY
IVT5580I                         3118   F0F4F4F2       00000023
IVT5580I                         3110   F0F4F5F2       00000023
IVT5532I  --------------------------------------------------------
IVT5577I    17920K      21          0027       VTAM
IVT5579I  BUFFER USE FOR 21 :   USECNT  USERDATA   MONITOR HISTORY
IVT5580I                          240   F7F8F6F0       00000021
IVT5580I                          240   F7F5F3F0       00000021
IVT5580I                          240   F6C5F2F4       00000021
IVT5580I                          240   F7F5F1F0       00000021
IVT5585I  DETAIL TOTAL FOR 4KDS64   POOL =     42832K

IVT5599I  END
```

```
D NET,CSMUSE,POOL=16KDS64
IVT5508I  DISPLAY ACCEPTED
IVT5574I  PROCESSING DISPLAY CSMUSE COMMAND - POOL SPECIFIED
IVT5584I  USAGE DETAILS - 16KDS64  POOL - POOL TOTAL =        64K
IVT5532I  -------------------------------------------------------
IVT5576I     AMOUNT    MONITOR ID   OWNERID    JOBNAME
IVT5532I  -------------------------------------------------------
IVT5577I       48K        B1         002B        TCPIP
IVT5579I  BUFFER USE FOR B1 :    USECNT   USERDATA   MONITOR HISTORY
IVT5580I                            2   00000000        000000B1
IVT5580I                            2   46786DD0        000000B1
IVT5585I  DETAIL TOTAL FOR 16KDS64  POOL =        48K

IVT5599I  END
```

CSM Monitor IDs

Range	Description
X'00' – X'1F'	CSM Monitor IDs
X'20' – X'2F'	DLC Monitor IDs
X'30' – X'8F'	VTAM Unique Monitor IDs
X'90' – X'97'	TCP/IP IF Layer Monitor IDs
X'98' – X'9F'	TCP/IP IP Layer Monitor IDs
X'A0' – X'AF'	TCP/IP Transport Layer Monitor IDs
X'B0' – X'FF'	TCP/IP Misc Monitor IDs

SC31-8791-13   z/OS Communications Server: IP and SNA Codes
► Chapter CSM Monitor IDs

CSM Monitor IDs

Hexadecimal value	Monitor ID description	Symbol	Notes
X'00' – X'1F' CSM Monitor IDs			
X'00'	CSM Owned buffer	CSM_OWN	
X'01'	CSM Get buffer	CSM_GETBUF	
X'02'	CSM Assign buffer	CSM_ASGNBUF	
X'03'	CSM Free buffer	CSM_FREEBUF	
X'20' – X'2F' DLC Monitor IDs			
X'20'	DLC Write Operation	IUT_Req	1,3
X'21'	DLC Read Operation	IUT_ReadBfr	2,3
X'22'	DLC Read Completed (Inbound ULP)	DLC Read Completed (Inbound ULP) IUT_Ind	
X'23'	DLC Cached	DLC Cached IUT_Cached	
X'24'	DLC Cached IQDR (iQDIO)	IUT_Cached_IQDR	

▶ For monitor ID X'21', the user field provide the EBCDIC subchannel read device unit address associated with this device. Some devices can configure how much read storage is used.

▶ Storage associated with DLC monitor IDs can be influenced by both SNA and TCP/IP workloads.

CSM Monitor IDs

Hexadecimal value	Monitor ID description	Symbol	Notes
X'B0' – X'FF' TCP/IP Misc Monitor IDs			
X'B0'	Streams	streams	
X'B1'	Storage	itStorage	
X'B2'	XCF	xcf	
X'B3'	PFS	pfs	
X'B4'	AFPA	afpa	
X'B5'	Firewall IPSec	fwipsec	
X'C0'	Application FTP	applFtp	
X'C1'	Application SNALINK	applSnalink	
X'C2'	Application X25	applX25	
X'C3'	Application IPSEC	applIpsec	

```
D NET,TRL,TRLE=OSAG6FA
IST097I  DISPLAY  ACCEPTED
IST075I  NAME = OSAG6FA          , TYPE = TRLE
IST1954I  TRL MAJOR NODE = TRLOSA
IST486I  STATUS= ACTIV     , DESIRED STATE= ACTIV
IST087I  TYPE = LEASED            , CONTROL = MPC , HPDT = YES
IST1715I  MPCLEVEL = QDIO       MPCUSAGE = SHARE
IST2263I  PORTNAME = POSAG6FA    PORTNUM =   0   OSA CODE LEVEL = 0C4B
IST2337I  CHPID TYPE = OSD      CHPID = FA
IST1577I  HEADER SIZE = 4096 DATA SIZE =        0 STORAGE = ***NA***
IST1221I  WRITE DEV = 0441 STATUS = ACTIVE    STATE = ONLINE
IST1577I  HEADER SIZE = 4092 DATA SIZE =        0 STORAGE = ***NA***
IST1221I  READ  DEV = 0440 STATUS = ACTIVE    STATE = ONLINE
IST924I  -------------------------------------------------------------
IST1221I  DATA  DEV = 0442 STATUS = ACTIVE    STATE = N/A
IST1724I  I/O TRACE = OFF  TRACE LENGTH = *NA*
IST1717I  ULPID = TCPIP
IST2310I  ACCELERATED ROUTING DISABLED
IST2331I  QUEUE   QUEUE     READ
IST2332I  ID      TYPE      STORAGE
IST2205I  ------  --------  ---------------
IST2333I  RD/1    PRIMARY   4.0M(64 SBALS)
IST2333I  RD/2    BULKDATA  4.0M(64 SBALS)
IST2333I  RD/3    SYSDIST   4.0M(64 SBALS)
IST2305I  NUMBER OF DISCARDED INBOUND READ BUFFERS =           0
IST1757I  PRIORITY1: UNCONGESTED PRIORITY2: UNCONGESTED
IST1757I  PRIORITY3: UNCONGESTED PRIORITY4: UNCONGESTED
IST2190I  DEVICEID PARAMETER FOR OSAENTA TRACE COMMAND = 01-01-00-42
IST1801I  UNITS OF WORK FOR NCB AT ADDRESS X'2CF3F010'
IST1802I    P1  CURRENT =      0  AVERAGE =     2  MAXIMUM =     7
IST1802I    P2  CURRENT =      0  AVERAGE =     1  MAXIMUM =    16
IST1802I    P3  CURRENT =      0  AVERAGE =     1  MAXIMUM =     2
IST1802I    P4  CURRENT =      0  AVERAGE =     2  MAXIMUM =   224
IST924I  -------------------------------------------------------------
```

VTAM IQDIOSTG start option

Notes:

1 This option only affects iQDIO devices that use a MFS of 64k. The smaller frame sizes will always use 126 SBALs.

Specifies how much storage VTAM keeps available for read processing for all HiperSockets data devices that use a MFS (Maximum Frame Size) of 64k. The HiperSockets MFS is defined in HCD. The HiperSockets storage units are defined in QDIO SBALs (QDIO read buffers). Each SBAL is 64k. For most users, the default setting will be the most suitable option. The storage used for this read processing is allocated from CSM data space 4k pool, and is fixed storage.

HiperSockets devices that are defined with a smaller MFS (16k, 24k, or 40k) are not affected by this start option. Those devices will use 126 SBALs.

If you elect to define a specific value versus the recommended values, carefully evaluate your system storage and performance needs for your HiperSockets devices. The amount of storage used is (NNN x 64k) x number of active iQDIO data devices.

2. You can use VTAM tuning stats to evaluate your needs and usage. Under a sample (typical) workload, the NOREADS counter should remain low (close to 0). If this count does not remain low you might need to consider a higher setting for IQDIOSTG. RMF™ can also be used to evaluate the correct setting for your environment. RMF records send failures, which can be an indication that the target LP (logical partition) does not have enough storage (read SBALs).

3. You can override the IQDIOSTG value for a given HiperSockets device by using the READSTORAGE parameter on the IPAQIDIO LINK statement or the IPAQIDIO6 INTERFACE statement on the TCP/IP profile.

VTAM QDIOSTG start option

Notes:
1 QDIOSTG defaults to MAX for 64-bit (z/Architecture) machines and MIN for non 64-bit machines.
Specifies how much storage VTAM keeps available for read processing for all OSA QDIO data devices. Units are defined in QDIO SBALs (QDIO read buffers). Each SBAL is 64k.
The storage used for this read processing is allocated from CSM data space 4k pool, and is fixed storage.

The IBM recommended values can be configured by specifying MAX, AVG, or MIN, which are predefined constants (number of SBALs) that are most appropriate for this type of adapter.
   MAX allows for the best performance (for example, throughput), but requires more storage.
   MIN could be used for devices with lighter workloads or where system storage might be constrained.

Also users can instead define a specific value for QDIOSTG (the exact number of SBALs),.

If you elect to define a specific value, carefully evaluate your system storage and performance needs for your QDIO devices. The following calculation is used to determine the amount of storage used: (NNN x 64K) x number of active inbound queues for each active QDIP data device. When QDIO inbound workload queueing (IWQ) is not enabled, only one inbound queue is active for each active device. When IWQ is enabled, one or more ancillary input queues might also be active. See QDIO inbound workload queueing in z/OS Communications Server: IP Configuration Guide to determine how many ancillary input queues are enabled for each QDIO data device.

VTAM QDIOSTG start option

You can use VTAM tuning stats to evaluate your needs and usage. Under a sample (typical) workload, the NOREADS counter should remain low (close to 0). If this count does not remain low you might need to consider a higher setting for QDIOSTG.

You can override the QDIOSTG value for a given OSA-Express QDIO device by using the READSTORAGE parameter on the IPAQENET LINK, the IPAQENET INTERFACE, or the IPAQENET6 INTERFACE statement in the TCP/IP profile.

```
17:27:28 Y IST1233I  DEV      = 066A        DIR      = RD/1 (PRIMARY)
17:27:28 Y IST1719I  PCIREALO =         0 PCIREAL  =   51498999
17:27:28 Y IST1720I  PCIVIRTO =         0 PCIVIRT  =    4542828
17:27:28 Y IST1750I  PCITHRSO =         0 PCITHRSH =      23373
17:27:28 Y IST1751I  PCIUNPRO =         0 PCIUNPRD =      58529
17:27:28 Y IST2316I  EARLYINO =         0 EARLYINT =          0
17:27:28 Y IST2317I  ULPRETUO =         0 ULPRETU  =          0
17:27:28 Y IST1752I  RPROCDEO =         0 RPROCDEF =         11
17:27:28 Y IST1753I  RREPLDEO =         0 RREPLDEF =        753
17:27:28 Y IST1754I  NOREADSO =         0 NOREADS  =         17
17:27:28 Y IST1721I  SBALCNTO =         0 SBALCNT  =   65596706
17:27:28 Y IST1722I  PACKCNTO =         0 PACKCNT  =  101778262
17:27:28 Y IST2185I  FRINVCTO =         0 FRINVCT  =          0
17:27:28 Y IST1236I  BYTECNTO =         2 BYTECNT  = 3778235259
17:27:28 Y IST1810I  PKTIQDO  =         0 PKTIQD   =          0
17:27:28 Y IST1811I  BYTIQDO  =         0 BYTIQD   =          0
17:27:28 Y IST924I  -------------------------------------------------------------
```

IST1754I
noreadso is reads exhausted overflow.
noreads is reads exhausted count. This value represents the accumulated number of times reads were exhausted on entry to the QDIO Program-Controlled Interrupt Exit for the QDIO READ data transfer point. This value is incremented by 1 each time the QDIO Program-Controlled Interrupt Exit is invoked and it detects that all the read buffers are full (the adapter has no place to move additional inbound data). A zero total is preferred because lack of read buffers may result in the adapter discarding inbound data. Examination of the read processing and read replenishment deferral counts may indicate the reason the QDIO device driver is not providing sufficient resources to accept the inbound data from the adapter.

```
    TNSTAT OSA

    17:27:28 Y IST1233I  DEV      = 066A        DIR      = WR/4
    17:27:28 Y IST1755I  SBALMAX  =        128  SBALAVG  =            2
    17:27:28 Y IST1756I  QDPTHMAX =         36  QDPTHAVG =            0
    17:27:28 Y IST1723I  SIGACNTO =          0  SIGACNT  =     76049837
    17:27:28 Y IST1721I  SBALCNTO =          0  SBALCNT  =    156591836
    17:27:28 Y IST1722I  PACKCNTO =          0  PACKCNT  =    533287855
    17:27:28 Y IST2242I  SIGMCNTO =          0  SIGMCNT  =            0
    17:27:28 Y IST1236I  BYTECNTO =        159  BYTECNT  =   1332153912
    17:27:28 Y IST1810I  PKTIQDO  =          0  PKTIQD   =            0
    17:27:28 Y IST1811I  BYTIQDO  =          0  BYTIQD   =            0
    17:27:28 Y IST314I   END
```

IST1755I
sbalmax is the maximum number of active SBALs at the completion of the write initiation process for the QDIO WRITE priority level. This value will be in the range 0-128 (0 meaning the priority level had no outbound activity in the interval and 128 meaning that at one point in the interval ALL the SBALs for the priority level were active).
sbalavg is the average number of active SBALs at the completion of the write initiation process for the QDIO WRITE priority level. This value will be in the range 0-128 (0 meaning the priority level had no outbound activity in the interval and 128 meaning that every time the QDIO write initiator completed, all 128 SBALs were active).

IST1721I
sbalcnt is the SBAL count. This value represents the accumulated number of SBALs used for I/O on the QDIO WRITE priority level or the QDIO READ data transfer point.

VTAM QDIOSTG start option

Each active OSA-Express QDIO DATAPATH device consumes a large amount of fixed storage. Defining a large number (for example, 8 or more devices per z/OS image) of QDIO devices can cause z/OS Communications Server to consume a significant amount of fixed storage. This could lead to degradation of overall system performance. When configuring a large number of devices, it is important to use the controls provided to manage and tune the amount of fixed storage consumed by these devices. Review the following parameters with this in mind:

- **VTAM QDIOSTG start option**
- **READSTORAGE specifications in the TCP/IP profile**
- **FIXED MAX specification in the IVTPRM00 parmlib member for Communication Storage Manager (CSM).**

CSM Usage

Application	#users / clients	Workload Throughput	Max CSM (ECSA)	Max CSM (Dataspace)	Max CSM (Fixed)
CICS Sockets (z10, transaction = 200 / 200)	250	475.3 Trans/Sec	780 KB	20.17 MB	28.04 MB
	500	905.1	916	20.26	28.04
	1000	1589.1	1.12 MB	20.45	29.08
TN3270 (z196 with Think Time, SHAREACB option, Echo transactions, 100 / 800)	8000	266.5 Trans/Sec	800 KB	27.63 MB	33.64 MB
	16000	533.4	896	27.62	34.04
	32000	1066.7	880	27.27	34.44
	64000	2133.0	900	28.00	35.24
	128000	4259.3	1.28 MB	30.12	37.64
	256000	8433.9	1.34	31.62	40.44
FTP Inbound Data Binary Put (z196, with and without Think Time, transaction= 2 MB / 1)	1	1.30 MB/Sec	600 KB	21.73 MB	30.04 MB
	2	2.56	656	21.78	30.76
	4	5.19	692	22.41	32.32
	8	10.41	712	22.56	33.92
	16	20.80	708	2218	32.72
	32	41.53	884	22.96	33.52
	64	82.24	1.16 MB	23.96	41.88
	128	164.04	996 KB	24.85	35.12
FTP Outbound Data Binary Get (z196, with and without Think Time, transaction = 1 / 2 MB)	1	1.29 MB/Sec	1.01 MB	21.93 MB	30.76 MB
	2	2.55	672 KB	22.12	31.12
	4	5.11	1.21 MB	22.24	32.32
	8	10.24	900 KB	22.24	32.72
	16	20.43	1.60 MB	22.68	33.08
	32	40.92	2.00	22.86	33.88
	64	80.69	2.62	23.73	42.16
	128	157.93	3.74	24.67	36.40

CSM is used for OSA, XCF but also for TCPIP application in
IBMs documentation "z/OS V1R13 Communications Server Performance
Summary" is an overview of the CSM need for some TCPIP applications

CSM Usage

- XCF

- OSA

- Hipersockets

- VTAM application

- TCP/IP application

▸ XCF uses CSM 4KECSA (as well VTAM TI00 BUFFER)

▸ If there is a XCF connection failure CSM 4KECSA and TI00 VTAM Buffer could increase and cause CSM problems.

CSM Error Messages

90% of CSM x storage limit value

IVT5562I CSM ECSA STORAGE AT CRITICAL LEVEL
IVT5563I CSM FIXED STORAGE AT CRITICAL LEVEL

Processing continues. Subsequent requests for CSM storage might fail. This could result in OSPF failure and even TCP/IP outage.

SC31-8790-12   z/OS Communications Server: SNA Messages

Issue the DISPLAY CSM command without the OWNERID operand to determine current storage limits and usage. Issue a DISPLAY CSM command with OWNERID=ALL to determine how much storage is in use by each application. Save the system log for the problem determination.

Verify the x storage limit value is correct. Increase storage as required using a MODIFY CSM command.

Following messages are issued when CSM fixed/ECSA storage usage has returned to normal level (at or below 80% of fixed/ECSA storage limit value).

IVT5564I CSM ECSA STORAGE SHORTAGE RELIEVED
IVT5565I CSM FIXED STORAGE SHORTAGE RELIEVED

IVTPRM00 best practice

Monitor system for one with DISPLAY CSM command to determine peak usage.

Adjust IVTPRM00 MAX ECSA and MAX FIXED values to 1.5 times the highest value indicated in DISPLAY CSM output.

Define the Pools

Set up notification for CSM IVT-messages.

Don't expect that the system will not change. Additional workload, a new application a new OSA could require a change in the definition.

And don't forget the VTAM Buffer

► NOTE: When coding IVTPRM00, FIXED MAX and ECSA MAX values must start in column one and only one space is allowed between fields.

► NOTE: If CSM MAX ECSA is coded higher than 90% of the allowable system ECSA (IEASYS00 ECSA), then CSM MAX ECSA will be adjusted to 90% of system ECSA.

z/OS Communications Server performance index:
Http://www.ibm.com/support/docview.wss?rs=852&uid=swg27005524

Alfred Christensen, Share Boston 2010:
Understanding z/OS Communications Server storage use

IBM z/OS CS Manuels
http://www-03.ibm.com/systems/z/os/zos/bkserv/r13pdf/#CS3

Thank You