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DFSMS:Advanced RLS Diagnostics and Recovery

Neal Bohling
DFSMS Defect Support, IBM
bohling@us.ibm.com

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Goal of this Presentation / Agenda

- Present a guideline for troubleshooting
  - Outline types of problems in RLS
  - Discuss how to address each type
  - Demonstrate the tools available

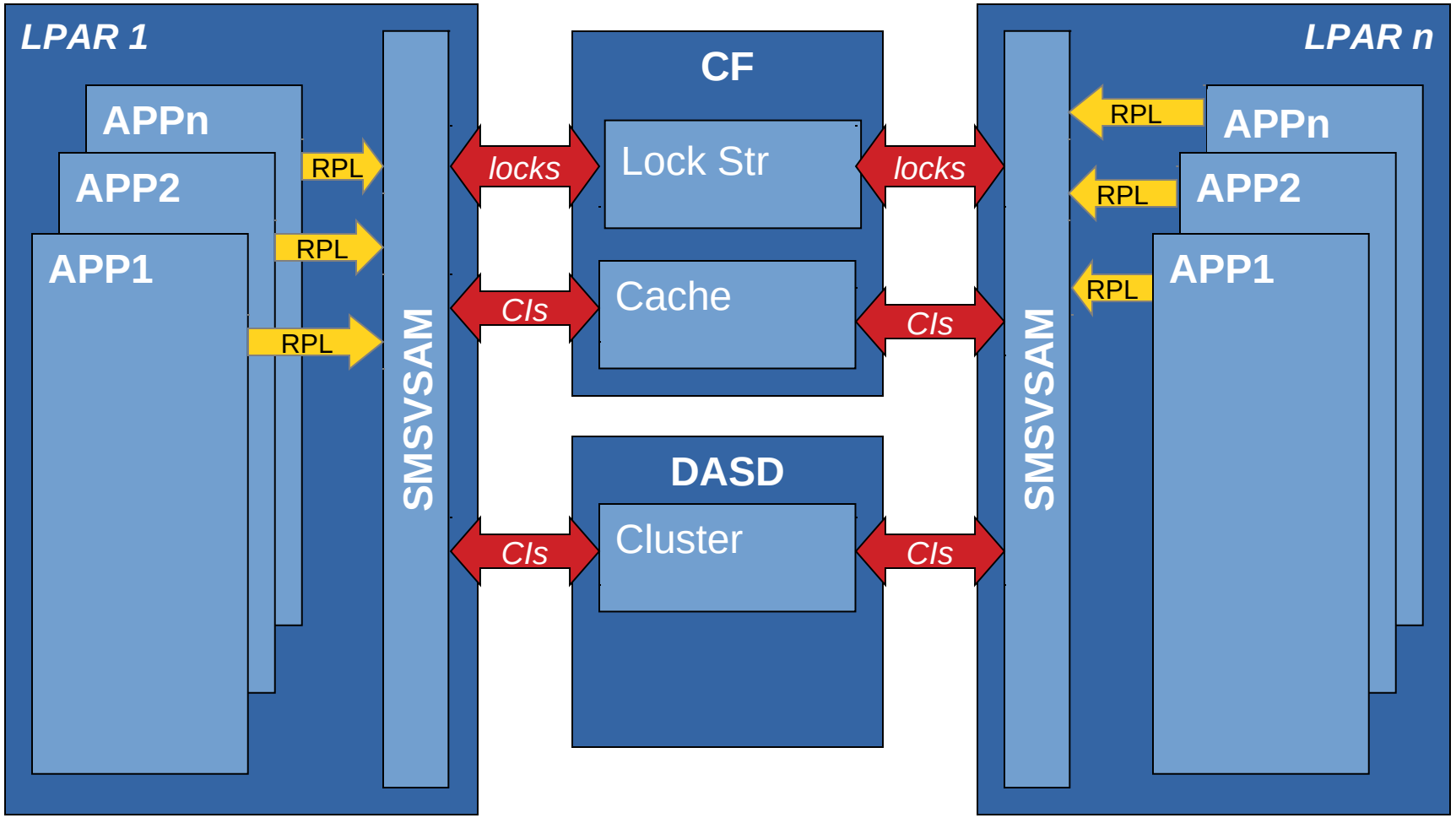
Review of RLS

- RLS = “Record Level Sharing”
  - A form of VSAM buffering
  - Serializes at the record level
  - Uses its own address space (SMSVSAM)
  - Allows simultaneous access from multiple applications across multiple systems
  - Significantly higher throughput for simultaneous access

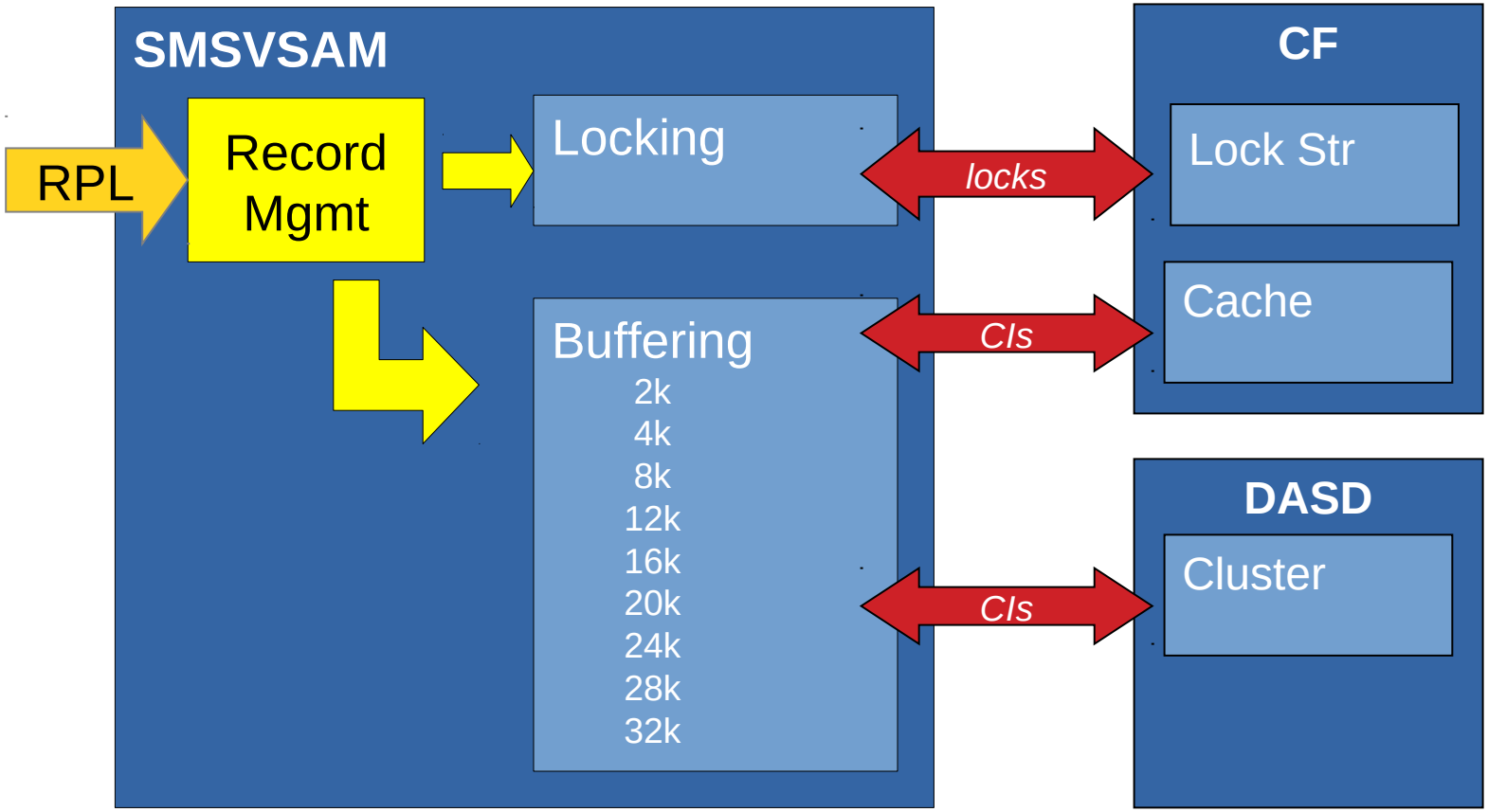
Review of TVS

- TVS stands for Transactional VSAM
  - A layer on top of RLS
  - Allows batch to act like a recoverable region (like CICS)
  - This allows batch jobs and online regions to run simultaneously
  - Eliminates “batch window”

Typical RLS Setup



SMSVSAM Overview



Common Types of Problems

- ABENDS
  - *0F4, 0Cx, 878*
- Request Failures
  - *RPL feedback > 0*
- HANGs
  - *Latch, lock, ENQ, quiesce*
- Lost locks, retained locks

Commands Summary

- Console DISPLAY commands:
  - D SMS,SMSVSAM,DIAG(C) - shows latch contention
  - D SMS,SMSVSAM,QUIESCE - shows quiesce activity
  - D GRS,C - shows GRS contention
  - D GRS,RES=(SYSVSAM,*) - show RLS ENQ information
  - D SMS,CFCACHE(structure|*) - cache information
  - D SMS,CFLS,ALL|lockstructurename - lock structure
  - D SMS,SHCDS - SHCDS state
  - D SMS,SHUNTED,{SPHERE(sphere)|UR({urid|ALL}} – shunted URs
  - D SMS,TRANVSAM[,ALL][,ALLLOGS] - TVS state
  - D SMS,URID(urid|ALL) - status of a URID

Commands Summary

- Vary Console Commands
  - V SMS,SMSVSAM,ACTIVE
  - V SMS,SMSVSAM,TERMINATESERVER
  - V SMS,TRANVSAM(tvsid),E|Q|D
  - V SMS,LOG(logid),Q|E|D
  - V SMS,SMSVSAM,SPHERE(sphere),Q|E

Controls SMSVSAM and some of the constructs

Commands Summary

- IDCAMS SHCDS commands:
  - LISTDS(base-cluster)
  - LISTSUBSYS(subsys
  - LISTSUBSYSDS(subsys|ALL)
  - LISTRECOVERY(base-cluster)
  - LISTALL

  List information about registered subsystems and their locks and recovery

  - REMOVESUBSYS(subsysname)
  - PURGE SPHERE(sphere) | URID(urid)
  - RETRY SPHERE(sphere) | URID(urid)

  Used for cleanup

Restarting SMSVSAM

Normal Shutdown

V SMS,SMSVSAM,TERMINATESERVER

Abnormal Shutdown / During Hang

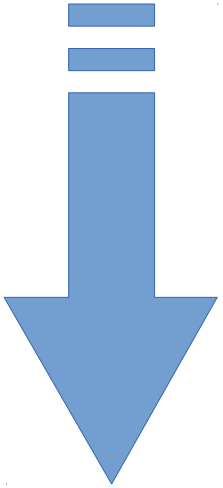
FORCE SMSVSAM,ARM

Emergency Shutdown when ARM fails

FORCE SMSVSAM

Overall Process

- Identify symptoms
- Collect documentation
- Do initial review of messages / codes / etc
- Make changes accordingly
- Search APARs
- Dig into the code – find bug / review doc
- New APAR



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ABENDS

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Before doing anything else,

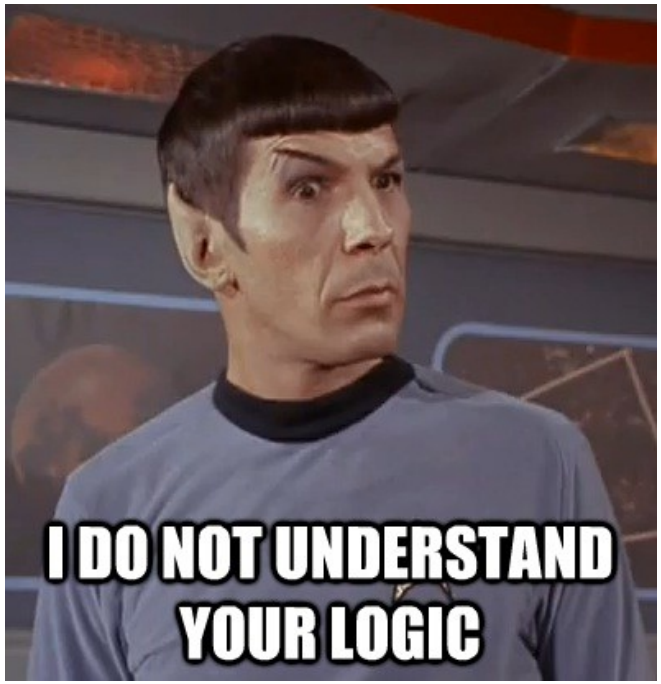
Take plex-wide DUMPS

Types of ABENDs

- **ABEND0F4 – logic error**
- **ABEND0C4 – coding error**
- **ABEND878 – somebody is memory hungry**
- SMSVSAM has intelligent recovery

ABEND0F4s

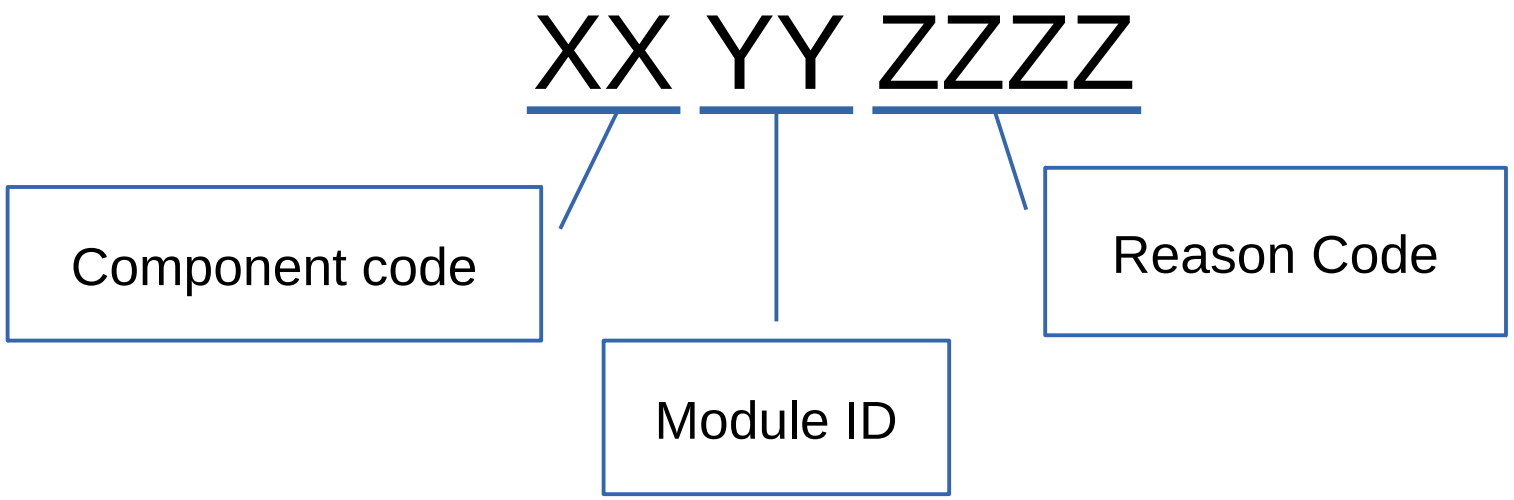
- **Logic Error inside RLS**
- RC doesn't tell you much (Reg0)
- RSN code tells us exactly where the problem occurred (Register 0)
- You may also get IGW400I, IEC161I, or IEC070I




```
DUMP TITLE=COMPID=DF122,CSECT=IGWLNL19+07F6,DATE=05/04/11,MAINT
          ID=UA59944 ,ABND=0F4,RC=00000024,RSN=66692402
```

ABEND0F4

Reason Code Format:

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          ID=UA59944 ,ABND=0F4,RC=00000024,RSN=66692402
```

Example of IGW400I

```
IGW400I ************************************
IGW400I
IGW400I ABEND0F4 Rc0024 Rsn650D1944 occurred to
IGW400I request PUT      with options 40868000.
IGW400I The PUT was for rec key (1st 78 bytes):
IGW400I 158200A020000
IGW400I Job CICSJOBA, UASID 001E, TCB 009E65F8,
IGW400I URPL 2DBC3A18, dsp RPL 00037A00, file
IGW400I MY.RLS.DATASET
IGW400I Footsteps: <1FfC1<1FhC2<2FfC1<1FhC2<2Oa
IGW400I  AeFfC1CoDBCyCqDSDJDKDMODOeDNWAOA<SCuCz
IGW400I  CsDBDADEAfA1Ai<14cMSMkMiMm<S1e||=>1l1a
IGW400I  1p40414mMSMkMhMm<SL0LbLbLbM0MaMbMcDr<r
IGW400I  4t4dFgC2CGRSRARBRCODFBOfOALA<ACNRz<XLN
IGW400I
IGW400I ************************************
```

ABEND0F4 Example:

- RSN = 66692402
- Dump header:

```
DUMP TITLE=COMPID=DF122,CSECT=IGWLNL19+07F6,DATE=05/04/11,MAINT
            ID=UA59944 ,ABND=0F4,RC=00000024,RSN=66692402
```

- 66 = Subcomponent – 66 means locking
- 69 = Module ID – IGWLNL19
- 2402 = actual RSN code, in this case means “failed”

- Points support to the exact line of code

What can I do with that?

- Figure out which component failed
- Check the health:
  - Buffering – check if buffers are full
  - Cache – make sure structures are available
  - Quiesce – do you see quiesce messages?
  - MMF – you can turn it off
    - V SMS,MONDS(IGWMMF.STATUS),OFF
- If you suspect a bug, open a PMR!
- Some reason codes are documented in *DFSMSdfp Diagnosis*

SMSXDATA

- IP VERBX SMSXDATA 'f(q) jobname(smsvsam)'

```
Primary Asid:00B0 Secondary Asid:00F8 PSATOLD:00000000
-------------------------------------------------------------------------------
Looking for SSF thread by Register 13:787ADCC0
FVSA:787A8040 Asid:00B0 SMSVSAM
FVSP:787ADC70 IGWSDWRS <<<<<input FVSP
FVSP:787AD288 IGWBVLC2
  Entering IGWBVIP1
FVSP:787AC7C0 IDAVRBFM
FVSP:787AC3B8 IDAVRRH0
FVSP:787ABE68 IDAVRRE0
FVSP:787AB9C0 IDAVRRM0
FVSP:787AB010 IDAVRR41
FVSP:787AA938 IDAVRR40
FVSP:787A9780 IDAVRR10
  VSAM RECORD MANAGEMENT REQUEST
    User RPL:29E1D2B8    Dataspace RPL:00037A00    PLH:00037CC4
    Request:01  RPLPUT
    FOOTPRINT:
    FgC2CEDADECGRSRARBRCODOfOA<SDqDn<qC2CGRSRARBRCODOfOA<SDqDn<qFoFhC2<2FfC1CoDADECyCq
    DSDJDKDMODOeDNOA<SCuCzCsDADEEcH0
  VSAM DATA SET INFORMATION
    Sphere Name:   MY.DATA.SET
      ACB:02585C58    AMBL:02503318    BIB:02505228
    Data Component:MY.DATA.SET.D
      AMB:025056D8    AMDSB:025057F0
    Index Component:MY.DATA.SET.I
      AMB:02505B58    AMDSB:02505C70
FVSP:787A9438 IDAVRPS2
Displaying Recovery FVSA associated sequences
```

UNSUPPORTED TOOL

Example of IGW400I

```
IGW400I ************************************
IGW400I
IGW400I ABEND0F4 Rc0024 Rsn650D1944 occurred to
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IGW400I MY.RLS.DATASET
IGW400I Footsteps: <1FfC1<1FhC2<2FfC1<1FhC2<2Oa
IGW400I  AeFfC1CoDBCyCqDSDJDKDMODOeDNWAOA<SCuCz
IGW400I  CsDBDADEAfA1Ai<14cMSMkMiMm<S1e||=>1l1a
IGW400I  1p40414mMSMkMhMm<SL0LbLbLbM0MaMbMcDr<r
IGW400I  4t4dFgC2CGRSRARBRCODFBOfOALA<ACNRz<XLN
IGW400I
IGW400I ************************************
```

ABEND0Cx

- Collect full doc and open a PMR
  - SYSLOG
  - EREP
  - Dump
- Expect an APAR

- Sometimes caused by:
  - Buffer status – running out of space / heavily taxed?
  - Cache status – heavily used?
  - Lots of simultaneous requests for the same lock?

ABEND878

- Out of memory
  - Might be SMSVSAM
  - Might be someone else

- Check storage usage
  - Omegamon
  - Dump – VERBX VSMDATA 'owncomm summary'

- Check for APARs

ABEND878

- SMSVSAM does have limits:
  - Buffering below-the-bar ~2GB
    - Set your RLSMAXPOOLSIZE to 850MB
  - Lots of buffering above-the-bar
    - RLS keeps copies of in-use buffers below the bar
    - Going away in the future
  - Opening > 25000 data sets
    - Some control blocks reside below the bar
    - Also going away in the future

SMSXDATA

VERBX SMSXDATA 'f(pools) jobname(smsvsam) comp(vsamrls)'

```
DFSMS verbexit processing
Title:TEST2
DSN::SYS1.DUMP.EZU208.D130730.T144852.S00004
Function=POOLS
Dump compatible with IGWFPMAN version:HDZ1D10
PrivatePools*********************************************
FVPT:0000000000000000
FVPH:7FF98000 POOL OF LOCAL FVPHS
Pool Description(31):POOL OF LOCAL FVPHS
Pool is not compressible
Pool should not be serialized during expansion
  Subpool ID:124 Key:50
  Cell Size:288
    Start:7FF9A000 End:7FF9BE60 Size:8,192
    Start:7F42D000 End:7F42EE60 Size:8,192
    Start:7F15E000 End:7F15FE60 Size:8,192
    Start:7BF1B000 End:7BF1CE60 Size:8,192
    Start:7AC2F000 End:7AC30E60 Size:8,192
    Start:79F59000 End:79F5AE60 Size:8,192
  Number of cells:168
  Cells in use:142
  NumberOfExtents:6 TotalSizeOfPool: 49,152
  ***Warning FVPH indicates TotalPoolSize:0
```

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SMSXDATA

VERBX SMSXDATA 'f(pools) jobname(smsvsam) comp(vsamrls)'

```
*********************************************************************************************************
*   Below the Bar Storage
          Extents        TotSize       TotCells     InUseCells   SP Key Description--------------------
*********************************************************************************************************
1.              6         49,152            168            142  124  50 POOL OF LOCAL FVPHS
2.              1          8,192             22              0  229  50 CDM Extended Directory Token
3.              1          4,096             32              0  229  50 CDM Extended File Token
4.              1          4,096             85              4  230  50 SLS LSTL - Private
5.              1          8,192             64              0  230  50 SLS LSQE - Private
6.              1         12,288             42              3  125  50 DSSB CELL POOL
7.              1          4,096             25              0  229  50 VSAM Quiesce Anchor Block(QANB)
8.              1          4,096             17              0  229  50 VSAM Quiesce Set (QSet)
138.            1         16,384             37              0  230  50 Tree Roots Cell Pool
139.            1         16,384            256              0  230  50 Tree Nodes Cell Pool
*********************************************************************************************************4
Total Space Used: 73,916,416 Actively Used Space:3,935,756,644

*********************************************************************************************************4
*   Above the Bar Storage
       _Extents   ___Total_Size_of_the_Pool    _TotCells  InUseCells Fixed FProt Key Description-----------------------4
*********************************************************************************************************4
1.             1                 10,485,760       72817           0    NO   YES 50  RLS DIAG SERVICES LIST ENTRIES
2.             1                  1,048,576         978           0    NO   YES 50  RWE      Storage Pool
3.             1                  5,242,880          18           1    NO   YES 50  GMMFLOCKTABLE POOL
4.             1                  1,048,576        4096         256    NO   YES 50  SCM SVIB Pool - CACHE01
*********************************************************************************************************4
Total Space Used: 17,825,792
```

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VSMDATA

- IP VERBX VSMDATA 'owncomm summary'

```
                                Total
ASID Job Name Id       St Length   SQA    CSA    ESQA     ECSA     CAUB
---- -------- -------- -- -------- ------ ------ -------- -------- --------
0000 *SYSTEM* ........ Ac 0175BC38 050D10 0152A8 005E2B18 01113168 022F2700
0001 *MASTER* ........ Ac 001F27A0 007C30 012E70 000DAA60 000FD2A0 022F27E0
0002 PCAUTH   ........ Ac 00000738 000028 000000 00000710 00000000 03472010
0003 RASP     ........ Ac 00000568 000000 000000 00000568 00000000 03472078
0004 TRACE    ........ Ac 00001190 000000 000000 00001190 00000000 034720E0
0005 DUMPSRV  ........ Ac 000056C0 000048 000000 00005638 00000040 03472148
0006 XCFAS    ........ Ac 0007C5F8 0000B0 000000 0007C548 00000000 034721B0
0007 GRS      ........ Ac 00008BE8 0003D8 000000 00007F08 00000908 03472218
0008 SMSPDSE  ........ Ac 00000830 000000 000000 00000830 00000000 03472280
0009 SMSPDSE1 ........ Ac 000007A8 000000 000000 000007A8 00000000 034722E8
000A SMSVSAM  ........ Ac 00238968 000048 000000 00002248 002366D8 03472350
```

- Note: list is not sorted
- More on this documented in
  z/OS V1R13.0 MVS IPCS Commands

ABEND Summary

- Main types of ABENDS:
  - ABEND0F4 – look up the component, check the health
  - ABEND878 – look for any hungry application
  - ABEND0C4 – Check APARs, open a new PMR
- SMSVSAM tries to intelligently recover
  - Won't bring down the server unless it needs to

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Request Failures

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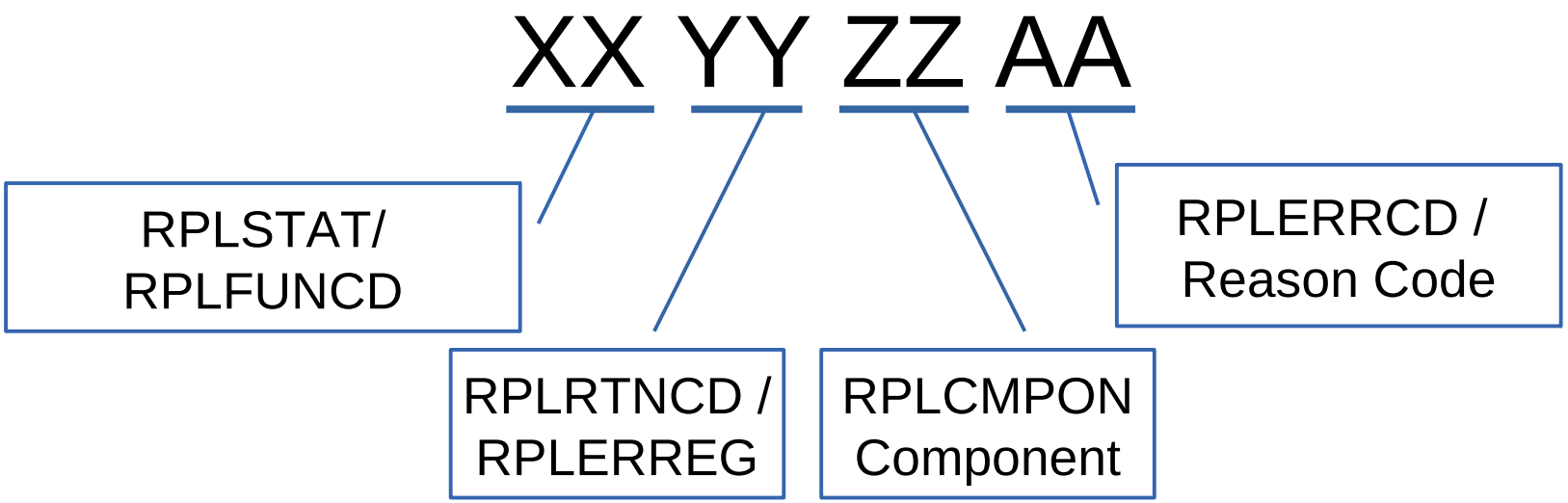
Request Failures

- All requests use an RPL
- Can be accompanied by IEC161I or IEC070I
- RPL Feedback (RPLFDBK) at +C



RPL Feedback Codes

- For return code (yy)
  - 00 = no error
  - 04 = invalid control block
  - 08 = illogical request or logic error
  - 0C = physical I/O error
- Codes vary by function (OPEN/GET/PUT/etc)
- Full return / reason codes documented in *z/OS DFSMSdfp Diagnosis* (GY27-7618)

Failed Requests

- Most codes are fairly straight foward:
  - Reg15 = 8, ERRCD = x10 – Record not found
  - Reg15 = 8, ERRCD = x08 - Duplicate record
  - Reg15 = 8, ERRCD = x58 - SEQ Get/Put issued without being positioned
- Most codes are well documented
  - *DFSMSdfp Diagnosis* (GY27-7618) chapter 20
  - *DFSMS Macro Instructions for Data Sets* (SC26-7408) chap 3
- Some are not so obvious and can have other causes

Beyond the Obvious

- Logical Errors (Reg15 = 8)
  - ERRCD = xBC
    - Sphere in LOST LOCKS
  - ERRCD = x15 or x16
    - RLS Deadlock / Timeout processing canceled the request
    - Does not necessarily indicate a problem – Retry later
  - ERRCD = xB8 or xC1
    - SMSVSAM took an abend – look for dumps or IGW400I
  - ERRCD = xBD
    - Couldn't get a lock because the structure is full
    - Change the INITSIZE on IGWLOCK00 and rebuild

Request Failure Summary

- Look up the code:
  - *DFSMSdfp Diagnosis* (GY27-7618) - chapter 20
  - *DFSMS Macro Instructions for Data Sets* (SC26-7408) - chapter 3

- Look for any messages (IEC161I / IEC070I)
- Attempt to resolve the issue

- Retry the request

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HANGS

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Hangs

Symptoms

- Request hang
- OPEN / CLOSE hang
- QUIESCE hang

Causes:

- **ENQs**
- **Latches**
- Locks
- Quiesce response

Goal: find the holder, understand why it's stuck

ENQ contention

- D GRS,C
- IP ANALYZE ALL

```
ISG343I 08.34.12 GRS STATUS 494
S=SYSTEMS SYSVSAM  MY.DATASET.IS.STUCK...B
SYSNAME        JOBNAME          ASID     TCBADDR    EXC/SHR    STATUS
P102       SMSVSAM             000A       009D21C8 EXCLUSIVE    OWN
P101       SMSVSAM             000A       009C8108 EXCLUSIVE    WAIT
S=SYSTEMS SYSVSAM  MY.DATASET.IS.STUCK...B
SYSNAME        JOBNAME          ASID     TCBADDR    EXC/SHR    STATUS
P102       SMSVSAM             000A       009D21C8 EXCLUSIVE    OWN
P101       SMSVSAM             000A       009C8108 EXCLUSIVE    WAIT
```

SYSVSAM ENQS

- ...B = “busy” ENQ
- ...S = “sphere” ENQ
- ...R = “read” ENQ
- ...W = “write”
- ...N = “non-rls”

- Each is used by a different part of SMSVSAM
- Based on same DSNAME, so be sure to note the suffix

- SMSVSAM ENQS should be SYSTEMS (see II14439)

Latches

- Latches are SMSVSAM-internal serialization
- D SMS,SMSVSAM,DIAG(C)

```
IGW343I VSAM RLS DIAG STATUS (V.01)
  |----RESOURCE---| |------ WAITER ------| |--HOLDER---| ELAPSED
  TYPE        ID    JOB NAME ASID   TASK   ASID   TASK     TIME
  -------- -------- -------- ---- -------- ---- -------- ---------
  LATCH    7AF522B8 SMSVSAM  000A 009AFE88 000A 009D20B8  00:09:50
  LATCH    7AF522B8 SMSVSAM  000A 009AFAD0 000A 009D20B8  00:09:52
  LATCH    7AF522B8 SMSVSAM  000A 009B1140 000A 009D20B8  01:09:50
  LATCH    7AF522B8 SMSVSAM  000A 009B07F0 000A 009D20B8  01:09:52
  LATCH    7AF522B8 SMSVSAM  000A 009B1360 000A 009D20B8  02:09:50
  LATCH    7AF522B8 SMSVSAM  000A 009B17A0 000A 009D20B8  02:09:52
  LATCH    7AF522B8 SMSVSAM  000A 009B19C0 000A 009D20B8  03:09:50
```

Latches

- VERBX SMSXDATA 'f(as) jobname(smsvsam)'

```
     Latch Name                Holder                  Waiter(s)
1.   IGWLPANC(7F2DC000)+18     (76)014D:009C00B8       (73)014D:009C0938
                                                       (328)014D:009B2E88
2.   IGWLYSVG(7F43EE80)+70     (73)014D:009C0938       (181)014D:009AC828
                                                       (180)014D:009ACA48
                                                       (179)014D:009ACC68
                                                       (178)014D:009ACE88
                                                       (177)014D:009A9108
                                                       (146)014D:009B2CF0
                                                       (92)014D:009BD438
                                                       (147)014D:009B2B58
                                                       (82)014D:009BEE88
                                                       (89)014D:009BDE88
                                                       (79)014D:009BFA48
                                                       (91)014D:009BD658
```

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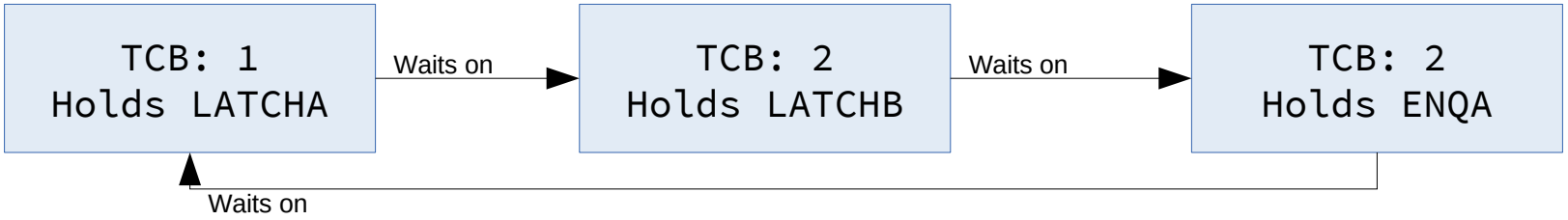
HANGS – Finding the Holder

- Compare the TCBs between the latches and the ENQs
- Find the ultimate holder



- Watch for deadlocks

The Holder – More Info

- VERBX SMSXDATA 'f(as) jobname(smsvsam)'
- Search for the TCB
- **Request may show DATA SET or REQUEST**
- Scan upwards to find ASCB line

```
ASCB:00F93880 CICSJOBA ASID:00A5 SSys:23F4AC80 *-* *-* *-*
              SubsystemName:CICSJOBA
```

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Example

- IP VERBX SMSXDATA 'f(q) jobname(smsvsam)'

```
Primary Asid:00B0 Secondary Asid:00F8 PSATOLD:00000000
-------------------------------------------------------------------------------
Looking for SSF thread by Register 13:787ADCC0
FVSA:787A8040 Asid:00B0 SMSVSAM
FVSP:787ADC70 IGWSDWRS <<<<<input FVSP
FVSP:787AD288 IGWBVLC2
  Entering IGWBVIP1
FVSP:787AC7C0 IDAVRBFM
FVSP:787AC3B8 IDAVRRH0
FVSP:787ABE68 IDAVRRE0
FVSP:787AB9C0 IDAVRRM0
FVSP:787AB010 IDAVRR41
FVSP:787AA938 IDAVRR40
FVSP:787A9780 IDAVRR10
  VSAM RECORD MANAGEMENT REQUEST
    User RPL:29E1D2B8    Dataspace RPL:00037A00    PLH:00037CC4
    Request:01  RPLPUT
    FOOTPRINT:
    FgC2CEDADECGRSRARBRCODOfOA<SDqDn<qC2CGRSRARBRCODOfOA<SDqDn<qFoFhC2<2FfC1CoDADECyCq
    DSDJDKDMODOeDNOA<SCuCzCsDADEEcH0
  VSAM DATA SET INFORMATION
    Sphere Name:   MY.DATA.SET
      ACB:02585C58    AMBL:02503318    BIB:02505228
    Data Component:MY.DATA.SET.D
      AMB:025056D8    AMDSB:025057F0
    Index Component:MY.DATA.SET.I
      AMB:02505B58    AMDSB:02505C70
FVSP:787A9438 IDAVRPS2
Displaying Recovery FVSA associated sequences
```

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When task is SMSVSAM

- Try to track it backwards by searching on the WRB PARM

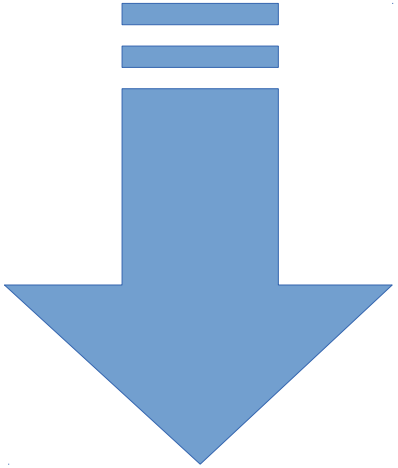
```
TCB: 009C00B8
   FVSP:798C8438 IGWLQDTT
     SQM Daughter Task:
       WRB Address=7F35F080
         EntryPoint:2F656848 Parameter:733C5740 ParmAlet:00000000

TCB:009C0938
   FVSP:72361E68 IGWLQSUB
     SQM Submit Work:
     SQM Token@:7F1F3028 SQMToken:7F40F6B0-6DE2D8D4
         Entrypoint:2F656848 Parameter:733C5740 Alet:00000000
     Value:00000002 Sync request
```

UNSUPPORTED TOOL

Once holder is identified:

- Cancel holding request when possible
- Cancel / restart holding task
- Consider restarting SMSVSAM



Hangs

Symptoms

- Request hang
- OPEN / CLOSE hang
- QUIESCE hang

Causes:

- ENQ
- Latches
- **Locks**
- Quiesce response

Locks

- Like latches, but PLEX-wide
  - Uses the lock structure IGWLOCK00 (or secondary)
- To find the lock holder:
  - CICS messages DFHFC0164, DFHFC0165, DFHFC0166, and DFHFC0167
  - SHCDS LISTSUBSYS(ALL)
  - VERBX SMSXDATA 'f(smls) jobname(smsvsam)'

CICS Messages Example

```
DFHFC0164 11/05/2009 06:43:21 CICSJOBA OE4A 01769 2703 CICSUSRA.
  A request has timed out waiting for an RLS lock. There are 1
  transactions or Transactional VSAM units of recovery holding this
  lock.


DFHFC0165 11/05/2009 06:43:21 CICSJOBA OE4A 01769 2703 CICSUSRA.
  Transaction OE5B (95809) unit of work X'C50AE27517CED387' running
  in job CICSJOBB with applid CICSJOBB in MVS SYSTEM3 holds
  exclusive lock on key X'F1F2F3F4F5F640000000000000' in data set
  RLS.MYDATA.IS.STUCK causing true contention.
```

SHCDS LISTSUBSYS(ALL)

```
  SHCDS LISTSUBSYS(ALL)
----- LISTING FROM SHCDS ----- IDCSH03
-------------------------------------------------------------------------------------------
                                 RECOVERY            LOCKS          LOCKS          LOCKS
SUBSYSTEM NAME   STATUS          NEEDED              HELD           WAITING        RETAINED
--------------   --------------  --------------   ----------------------------------------
SMSVSAM          BATCH --ACTIVE  NO                     0              0              0
    DATA SETS IN LOST LOCKS------------         0
    DATA SETS IN NON-RLS UPDATE STATE--         0
    TRANSACTION COUNT------------------         0
CICSJOBB         ONLINE--ACTIVE  YES                  201              0              0
    DATA SETS IN LOST LOCKS------------         0
    DATA SETS IN NON-RLS UPDATE STATE--         0
    TRANSACTION COUNT------------------         5
CICSJOBA         ONLINE--ACTIVE  YES                    0              0              2
    DATA SETS IN LOST LOCKS------------         0
    DATA SETS IN NON-RLS UPDATE STATE--         0
    TRANSACTION COUNT------------------         1
IDC0001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0
```

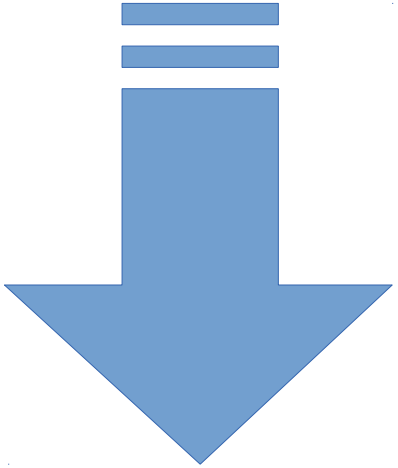
SMSXDATA Report

- VERBX SMSXDATA 'f(smls) jobname(smsvsam)'

```
RHT Entries 0:6631 were empty.
  Rhb:7F6A3000 Version(1) Size=676:(000002A4) Rht Index:6632
    Lock Request Issued, Lock Held
    Key=THIS.IS.A.KEY
    Locking Start Time:C91895B4B5810DA7:02/08/2012 19:40:48.73 End Time:C91895B4B5828BA7:02/08/2012 19:40:48.73
      ++XES RequestIssued/currently held
    CCB@:63C998E0 DTS@:71157E00
    Component Name:MYDATA.SETIS.LOCKED.DATA
    Cluster Name:MYDATA.SETIS.LOCKED
    Sphere Name:MYDATA.SETIS.LOCKED
    RTE:1/SphereName:'00000001C918'X-'44FD20A8'X/RSHSKey='A09C9A2800000000000000000000000'X
        Ownership SS:CICSJOBA UOWID:'C91895B4AF9FE9A4'X
                  LockState:02 Flag:40
    Trace Record Table follows, Index:00000001
         Queue     LockState XESFunc RTFunc  SMLSFunc XES Rs Module   RLB
      1.UnQueued   EXclusive Obtain  Null    Obtain   0000   IGWLNL12 7F6A3218
    HOLD QUEUE    follows:
      QStatus:H(Holder) Rlb:7F6A3218 Version(0) Size=1400000008C) TOD(C91895B4B580C827) 02/08/2012 19:40:48.73
          LockClass:'01'X (RecordLock) QStatus:H (Holder) CurrentState:'00000002'X (EXclusive)
          Last LockFunction:LockRecord
          RplID:38039358 Rhb@:7F6A3000 RWE@:00000000
        WHB:7F695000 Version(01) Size=232(000000E8) No Retained Locks
          SidB:7F641A30 SidbName:CICSJOBA Sidb_JobName:CICSJOBA UOWID:'C91895B4AF9FE9A4'X
          WHBTRACE AREA Current Entry:1
      ++ RLB WAIT QUEUE     is empty ++
RHT Entries 6633:16383 were empty.
```

Once holder is identified:

- If TCB / request can be identified:
  - Cancel request
  - Cancel OPEN / CLOSE
- When only ASID can be identified:
  - Consider restarting that task / region
  - NOTE: May cause RETAINED locks
- If no information can be found:
  - Consider restarting SMSVSAM



Hangs

Symptoms

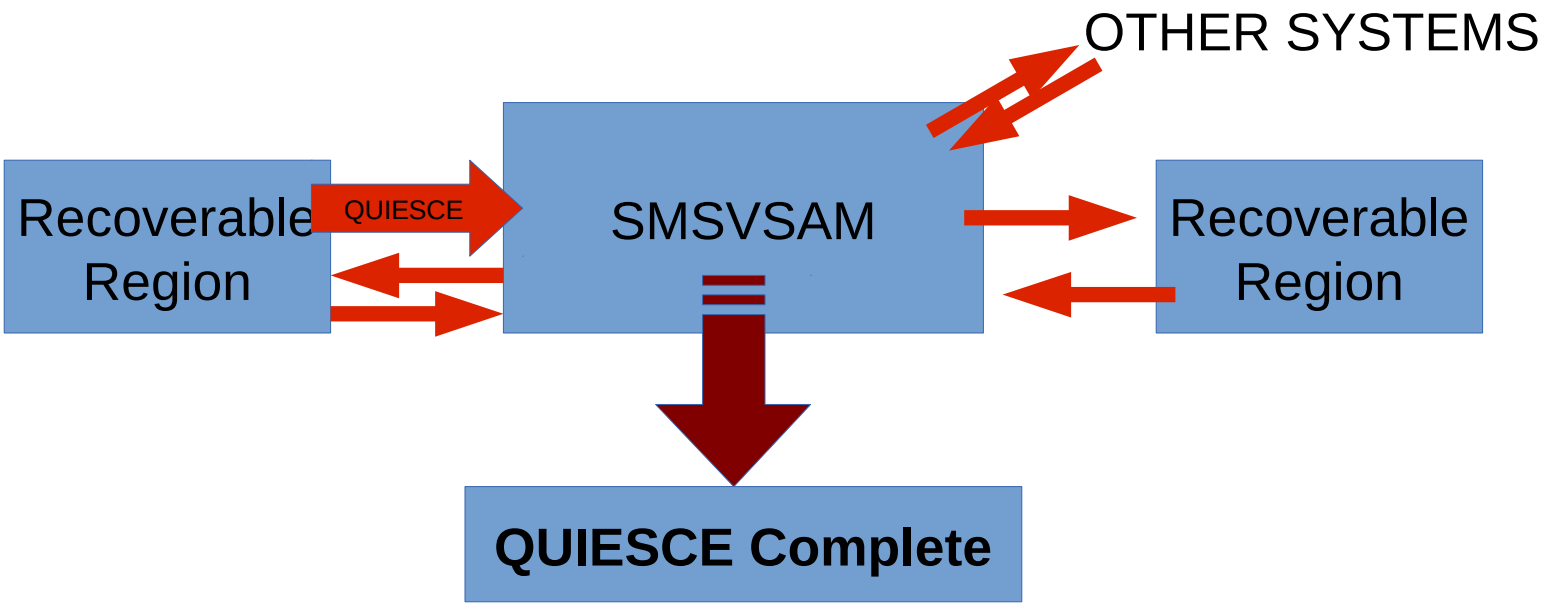
- Request hang
- OPEN / CLOSE hang
- QUIESCE hang

Causes:

- ENQ
- Latches
- Locks
- **Quiesce response**

QUIESCE Hangs

- During QUIESCE event, recoverable regions must respond
  - QUIESCE – only registered subsystems with DS open
  - UNQUIESCE – all registered subsystems



QUIESCE Hangs

- Sometimes one region will fail to respond
  - If UNQUIESCE, often it will be a test region
  - Sometimes the task is busy (OPEN/working)

- To find it:
  - Track CICS messages: DFHFC6001, DFHFC6020
  - D SMS,SMSVSAM,QUIESCE
  - VERBX SMSXDATA 'f(quiesce) jobname(smsvsam)'

CICS Quiesce Messages:

SYS1 +DFHFC6001 APPLICAA DATA SET SUCCESSFULLY QUIESCED BY USER. DATA SET MY.TEST.DATA

SYS3 +DFHFC6001 APPLICCA DATA SET SUCCESSFULLY QUIESCED BY USER. DATA SET MY.TEST.DATA

SYS2 +DFHFC6001 APPLICBA DATA SET SUCCESSFULLY QUIESCED BY USER. DATA SET MY.TEST.DATA

SYS1 +DFHFC6001 APPLICAA DATA SET SUCCESSFULLY UNQUIESCED BY USER. DATA SET MY.TEST.DATA

SYS3 +DFHFC6001 APPLICCA DATA SET SUCCESSFULLY UNQUIESCED BY USER. DATA SET MY.TEST.DATA

SYS2 +DFHFC6001 APPLICBA DATA SET SUCCESSFULLY UNQUIESCED BY USER. DATA SET MY.TEST.DATA

Displays

- D SMS,SMSVSAM,QUIESCE

```
IGW540I 22.56.56 DISPLAY SMS,SMSVSAM,QUIESCE
 SPHERE NAME: DATA.QUIESCE.BREAKING
 SYSTEM NAME: SYS1     START TIME: 22.10.24 TOTAL ELAPSE TIME: 00.46.32<<
 PARTICIPATING SUB-SYSTEM STATUS:      SCHEDULED:  COMPLETED:  ELAPSE:
  SUB-SYSTEM NAME:  REGIONA            22.10.24    22.10.24    00.00.00
  SUB-SYSTEM NAME:  REGIONB            22.10.24    22.10.24    00.00.00
  SUB-SYSTEM NAME:  REGIONC            22.10.24    22.10.24    00.00.00
  SUB-SYSTEM NAME:  REGIOND            22.10.24    22.10.24    00.00.00
  SUB-SYSTEM NAME:  REGIONE            22.10.24    22.10.24    00.00.00
  SUB-SYSTEM NAME:  REGIONF            22.10.24    22.10.24    00.00.00
  SUB-SYSTEM NAME:  REGIONG            22.10.24    00.00.00    00.46.32<<
  SUB-SYSTEM NAME:  REGIONH            22.10.24    22.10.24    00.00.00
  SUB-SYSTEM NAME:  REGIONI            22.10.24    22.10.24    00.00.00
```

Quiesce Info from a DUMP

- VERBX SMSXDATA 'f(quiesce) jobname(smsvsam)'

```
MOB:7F668140  Next:7F6680F0
  MsgNum:00001797  HeldResponses:0 PendingResponses:1 UserData:000000007F6D1400
    RCB:7F6660C0
      MBB:7AF364F0
        Message:
        7AF36510 - 02000201 E2C1F2C4 F4F1048E 0000C9C4 **....MYVOLA....DS**
        7AF36520 - 4BE2C2C9 D54BD3D4 E5D2D3D4 F4C14040 **.QUIS.CEIS.TUK  **
        7AF36530 - 40404040 40404040 40404040 40404040 **                **
        7AF36540 - 40404040 40404040 40400000 00000000 **          ......**
        7AF36550 - C9C7E6C7 D4C9C240 00000080 08000000 **IGWGMIB ........**
        7AF36560 - 81DCF438 81DCF43E 277157C0 -------- **a.4.a.4.....    **
      Rdb:7F663400
        XMB:7F66A0F0 System:SYS1     Member:IDAVQUI0AL2E
         Request Status( Responded) Resends:0
      Rdb:7F663440
        XMB:7F66A0A0 System:SYS2     Member:IDAVQUI0AL2D
         Request Status( Waiting) Resends:0
```

UNSUPPORTED TOOL

Quiesce Info from a Dump

- VERBX SMSDATA 'f(quiesce) jobname(smsvsam)'

```
Subsystem collection for QSet (7F5ED3C0), Cardinality:5
Ifgquies cb@=1E52ED80 dsn=DS.QUIES.CEIS.TUK
Quitype:02 Quiertok:C6BAF5623D744E08
QSSY:7F5D2610 MYREG001 C1D6D9F0F0D4F4F9
 Scheduled=10/15/2010 03:02:09.166163  Completed=10/15/2010 03:02:09.170859
QSSY:7F5D25D0 MYREG002 C1D6D9F0F1D4F4F9
 Scheduled=10/15/2010 03:02:09.166169  Completed=10/15/2010 03:02:09.170915
QSSY:7F5D2510 MYREG00X   C3D4C1E2F4F94040
 Scheduled=10/15/2010 03:02:09.166176  Completed=
QSSY:7F5D2590 MYREG001 E3D6D9F0F0D4F4F9
 Scheduled=10/15/2010 03:02:09.166204  Completed=10/15/2010 03:02:09.170975
QSSY:7F5D2550 MYREG001 E3D6D9F0F1D4F4F9
 Scheduled=10/15/2010 03:02:09.166208  Completed=10/15/2010 03:02:09.181463
```

UNSUPPORTED TOOL

Resolving Hung QUIESCE

- If hung because of a failed response
  - Identify region
  - Shut down / restart that region

- If NOT hung because of failed response
  - Check ENQs for a deadlock
  - Check Latches for contention
  - Restart SMSVSAM

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Lost and Retained Locks

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Retained and Lost Locks

- RETAINED LOCKS:
  - Locks held to ensure data consistency
  - Holder did not COMMIT or BACKOUT before ending
  - Lock-specific
- LOST LOCKS
  - IGWLOCK00 connection was lost
  - SMSVSAM fails
  - SMSVSAM loses all knowledge of locks
  - Data-set specific

Issues Related to Retained Locks

- Retained Locks
  - IEC161I RC
  - RPL feedback R15=x'8' ERRCD=x'18'
  - Non-RLS access is prohibited
  - Access to those records will be denied
- Lost Locks
  - IEC161I or IEC070I
  - RPL feedback R15=x'8' ERRCD=x'BC'
  - OPEN marks ACB with ACBERFLG = x'65' – x'67'

Associated Displays

- SHCDS LISTSUBSYS(ALL) and LISTSUBSYSDS(ALL)

```
  SHCDS LISTSUBSYS(ALL)
----- LISTING FROM SHCDS ----- IDCSH03
-------------------------------------------------------------------------------------------
                                 RECOVERY            LOCKS          LOCKS          LOCKS
SUBSYSTEM NAME   STATUS          NEEDED              HELD           WAITING        RETAINED
--------------   --------------  --------------   ----------------------------------------
SMSVSAM          BATCH --ACTIVE  NO                      0              0              0
    DATA SETS IN LOST LOCKS------------         2
    DATA SETS IN NON-RLS UPDATE STATE--         0
    TRANSACTION COUNT-----------------          0
CICSJOBB         ONLINE--ACTIVE  YES                     0              0              0
    DATA SETS IN LOST LOCKS------------        15
    DATA SETS IN NON-RLS UPDATE STATE--         0
    TRANSACTION COUNT-----------------          0
CICSJOBA         ONLINE--ACTIVE  YES                     0              0              2
    DATA SETS IN LOST LOCKS------------         0
    DATA SETS IN NON-RLS UPDATE STATE--         0
    TRANSACTION COUNT-----------------          0
IDC0001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0
```

More Displays

```
 SHCDS LISTSUBSYSDS(RETLK05A)
----- LISTING FROM SHCDS ----- IDCSH04
-------------------------------------------------------------------------------
SUBSYSTEM NAME---- RETLK05A      SUBSYSTEM STATUS----ONLINE--ACTIVE
                                        LOCKS                NON-RLS     PERMIT
DATA SET NAME /     RETAINED   LOST     NOT       RECOVERY   UPDATE      FIRST TIME
CACHE  STRUCTURE    LOCKS      LOCKS    BOUND     REQUIRED   PERMITTED   SWITCH
---------------     --------   -----    -------   --------   ---------   -----
SYSPLEX.KSDS.PERMIT.CLUS2
CACHE01             YES        NO       NO        NO         NO          NO
SYSPLEX.KSDS.RETAINED.CLUS1
CACHE01             NO         YES      NO        YES        NO          NO
SYSPLEX.KSDS.SHARED.CLUS4
CACHE01             YES        NO       NO        NO         NO          NO
IDC0001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0
```

List Recovery

```
SHCDS LISTRECOVERY(SYSPLEX.LOSTLOCK.CLUS1)
----- LISTING FROM SHCDS ----- IDCSH05
-------------------------------------------------------------------------------
                                                    LOCKS    NON-RLS              PERMIT
                                 RETAINED  LOST     NOT      RECOVERY   UPDATE    FIRST TIME
DATA SET NAME                    LOCKS     LOCKS    BOUND    REQUIRED   PERMITTED SWITCH
---------------------------      --------  -----    -----    --------   -------   ----------
SYSPLEX.LOSTLOCK.CLUS1           NO        YES      NO       NO         NO        NO
                            SHARING SUBSYSTEM STATUS
  SUBSYSTEM    SUBSYSTEM         RETAINED    LOST     NON-RLS UPDATE
  NAME         STATUS            LOCKS       LOCKS    PERMITTED
  ---------    --------------    --------    -----    --------------
  RETLK05A     ONLINE--FAILED    NO          YES      NO
IDC0001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0
```

Resolving Retained Locks

- Check for URIDs with outstanding recovery
  - D SMS,SHUNTED
  - SHCDS LISTSHUNTED
  - INQUIRE UOWDSNFAIL
- Retry the failed work
  - CICS - SET DSNAME ACTION(RETRY)
  - TVS – SHCDS RETRY URID(xx)
- Purge the failed work
  - TVS – SHCDS PURGE URID(xx)

Resolving Lost Locks

- Must be handled by last region to have it open
- Most region auto-handle
- If that isn't working:
  - Start CICS COLD
  - SHCDS REMOVESUBSYS(xx)
  - Rename the data set
  - Delete / redefine the data set

Summary

- RLS Overview
- ABENDS
- Request Failures
- HANGs
- Lost locks, retained locks

- Remember: always get the dumps!
  - SMSVSAM, SMSVSAM dataspace, XCF

References

- *DFSMSdfp Diagnosis (GY27-7618)*
- *DFSMS Macro Instructions for Data Sets* (SC26-7408)
- *DFSMS AMS for Catalogs* (SC26-7394)
- *MVS System Commands* (SA22-7627)
- Redbook *VSAM Demystified* (SG24-6105)
- *CICS Recovery and Restart Guide* (SC34-7180)

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DFSMS:Advanced RLS Diagnostics and Recovery

Neal Bohling
DFSMS Defect Support, IBM
bohling@us.ibm.com

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