

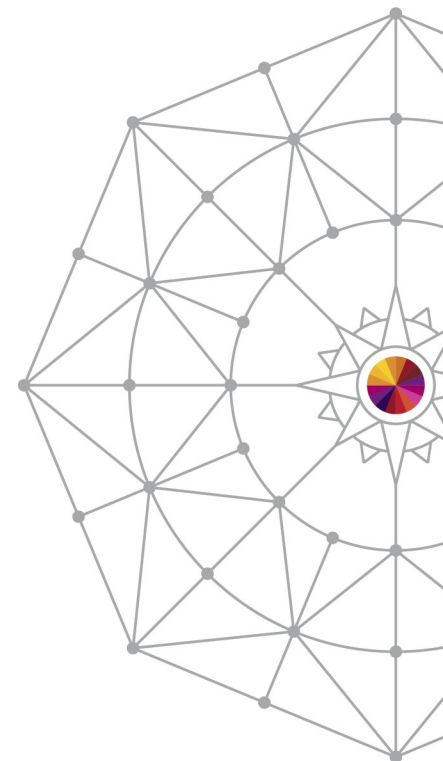
DFSMS:Advanced RLS Diagnostics and Recovery

Neal Bohling

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

August 4, 2014

Session# 16124



#SHAREorg



Goal of this Presentation / Agenda

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



Agenda

- Review of RLS
- Overview of types of potential RLS issues
 - ABENDs
 - Request Failures
 - Hangs
 - Lost / retained locks
- Touch on performance
- Summary

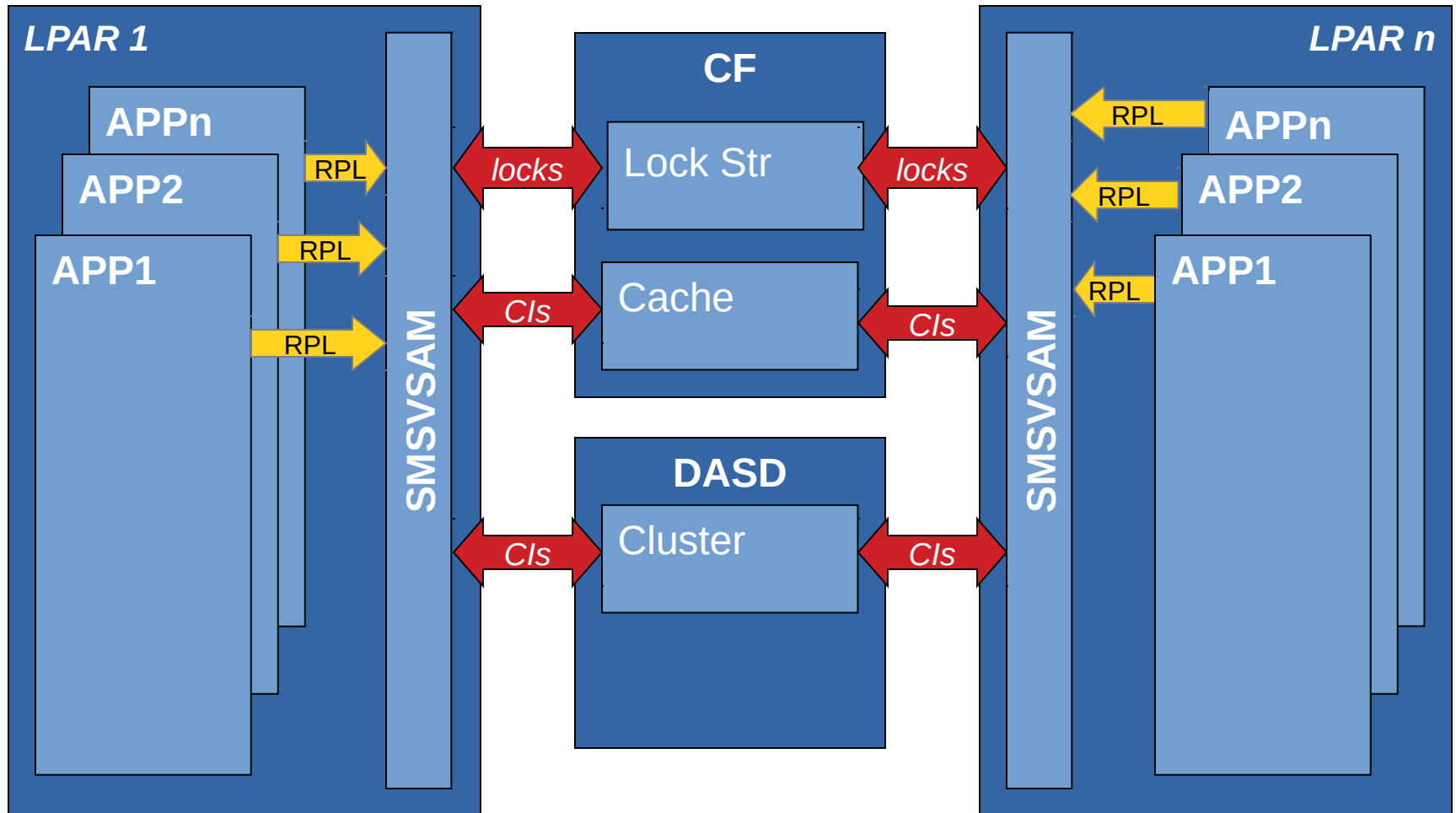
Any other topics?

Let me know what you'd like to hear.

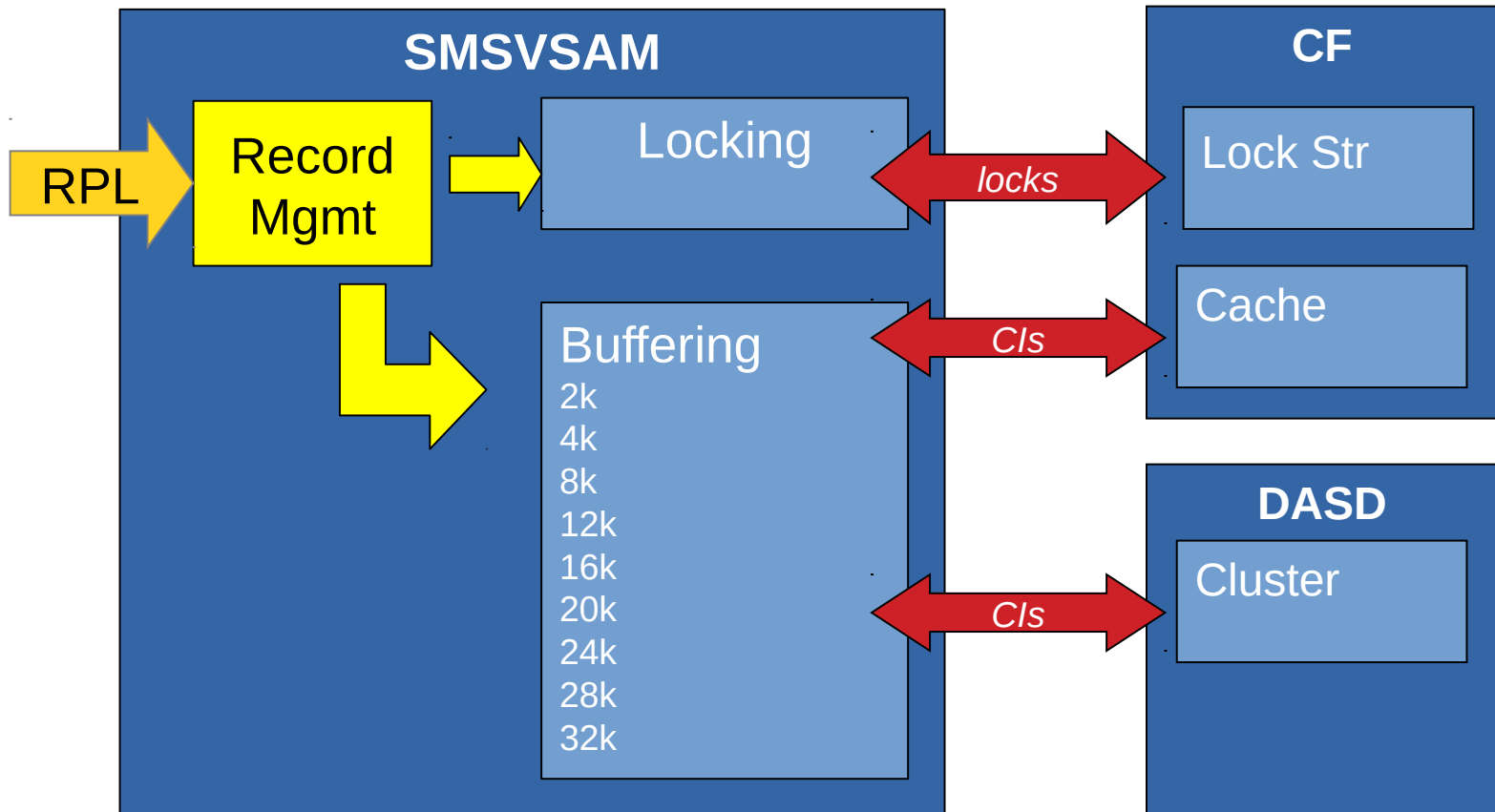
Review of RLS

- 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

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 ENQs
 - 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
 - V SMS,MONDS(flags),ON|OFF

Controls
SMSVSAM and
some of the
constructs

Commands Summary

- IDCAMS SHCDS commands:

- LISTDS(base-cluster)
- LISTSUBSYS(subsys|ALL)
- 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

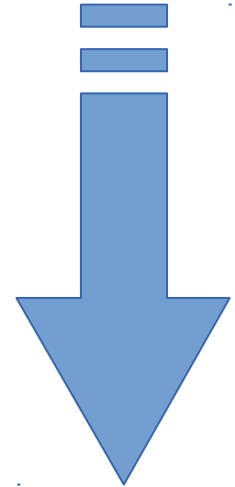
FORCE SMSVSAM,ARM

Emergency Shutdown if ARM fails

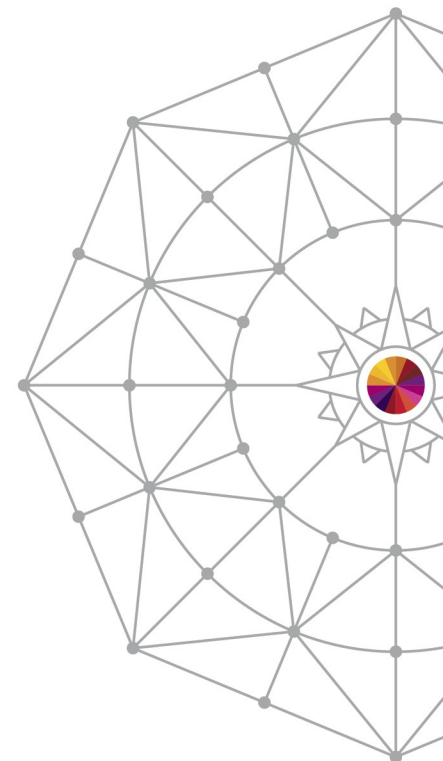
FORCE SMSVSAM

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



ABENDS



#SHAREorg



Copyright (c) 2014 by SHARE Inc.  Except where otherwise noted, this work is licensed under <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Before doing anything else,
Take plex-wide DUMPS

Types of ABENDs

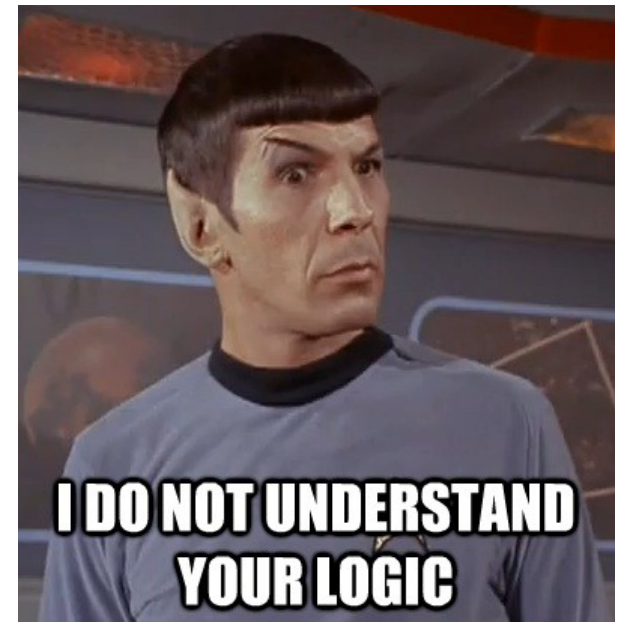
- **ABEND0F4 – logic error**
- **ABEND0C4 – coding error**
- **ABEND878 – somebody is memory hungry**
- Note: SMSVSAM usually has intelligent recovery

ABEND0F4s

- **Logic Error inside RLS**

DUMP TITLE=COMPID=DF122,CSECT=IGWLN19+07F6,DATE=05/04/11,MAINT
ID=UA59944 ,ABND=0F4,RC=00000024,RSN=66692402

- RC doesn't tell you much (Reg15)
 - 24 = logic error
 - 1008 = I/O errors
- RSN code tells us exactly where the problem occurred (Reg 0)
- You may also get IGW400I, IEC161I, or IEC070I



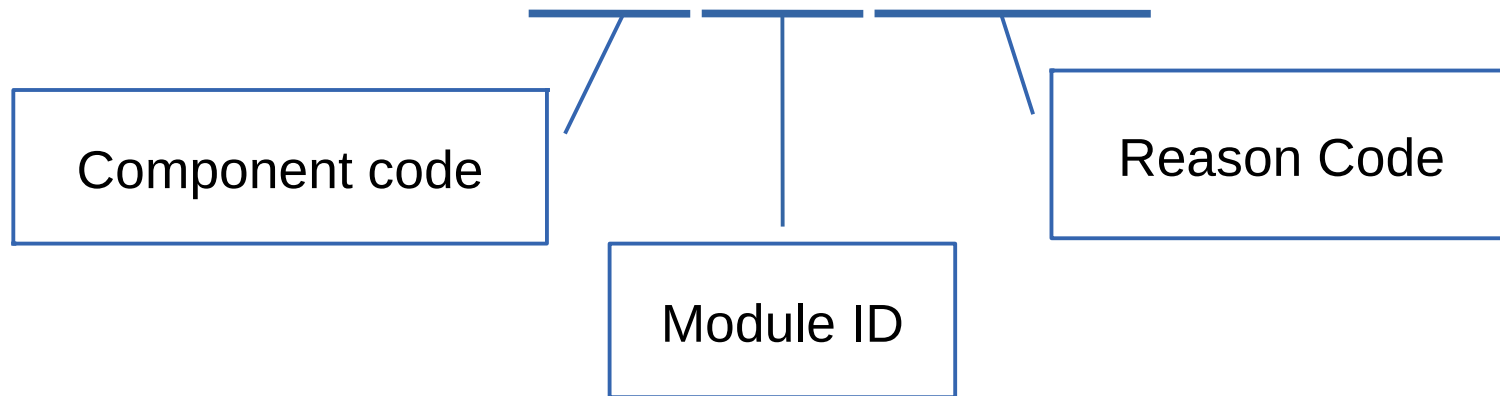
Example of IGW400I

```
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<20a
IGW400I   AeFfC1CoDBCyCqDSDJDKDMOD0eDNWA0A<SCuCz
IGW400I   CsDBDADEAfA1Ai<14cMSMkMiMm<S1e||=>1l1a
IGW400I   1p40414mMSMkMhMm<SL0LbLbLbM0MaMbMcDr<r
IGW400I   4t4dFgC2CGRSRARBRCODFB0f0ALA<ACNRz<XLN
IGW400I
IGW400I *****
```

ABEND0F4

Reason Code Format:

XX YY ZZZZ



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

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 = Sub-component – 66 means locking
- 69 = Module ID – IGWLNL19
- 2402 = actual RSN code, in this case means “failed”
- Points support to the exact line of code

Component IDs

- 60 – Open / Close
- 61 – Record management
- 62 – Startup / initialization / shutdown
- 65 – Cache manager
- 66 – Locking
- 67 – Share control (related to SHCDS)
- 6A – Buffering
- 6C – Quiesce
- 6D – MMF (statistics gathering)

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:

FgC2CEDADECGRSRARBRC0D0f0A<SDqDn<qC2CGRSRARBRC0D0f0A<SDqDn<qFoFhC2<2FfC1CoDADECyCq

DSDJDKDMOD0eDNOA<SCuCzCsDADEEC0

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

What can I do with that?

- Use the RSN to search for APARs
- 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*



ABEND0F4 Summary

- Indicates a Logic Error inside SMSVSAM
- RC/RSN and SMSXDATA can help pinpoint the source
- If you think there's a bug, grab the dump and open a PMR
- Recovery:
 - *Depends on the type of error*
 - *Normally, RLS cleans up after itself*
 - Retry the request
 - If it persists, it may require a restart of SMSVSAM
 - Others may require more action

ABEND0Cx

- Collect full doc and open a PMR
 - SYSLOG
 - EREP
 - Dump
- Expect an APAR
- Might be caused by:
 - Timing issues with locking
 - 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 existing 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 (for now)
- Opening > 25000 data sets
 - Some control blocks reside below the bar
 - Design changes are underway

VSMDATA

- IP VERBX VSMDATA 'owncomm summary'

ASID	Job Name	Id	St	Total 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 ~2MB

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

SMSXDATA

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

```

DFSMS verbexit processing
Title:TEST2
DSN::SYS1.DUMP.EZU208.D130730.T144852.S00004
Function=P00LS
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
  
```

UNSUPPORTED TOOL

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. 119 528,482,304 43,008 11,121 0 50 BMF 12K BUFFER POOL
6. 50 419,430,400 102,400 100,515 0 50 BMF 2K BUFFER POOL
7. 29 243,269,632 29,696 29,508 0 50 BMF 8K BUFFER POOL
8. 1 7,340,032 256 146 0 50 BMF 28K BUFFER POOL
9. 41 343,932,928 83,968 83,968 0 50 BMF 4K BUFFER POOL
```

```
*****4
Total Space Used: 1,542,520,832 Actively Used Space:1,339,150,598
```

```
*****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
```

UNSUPPORTED TOOL

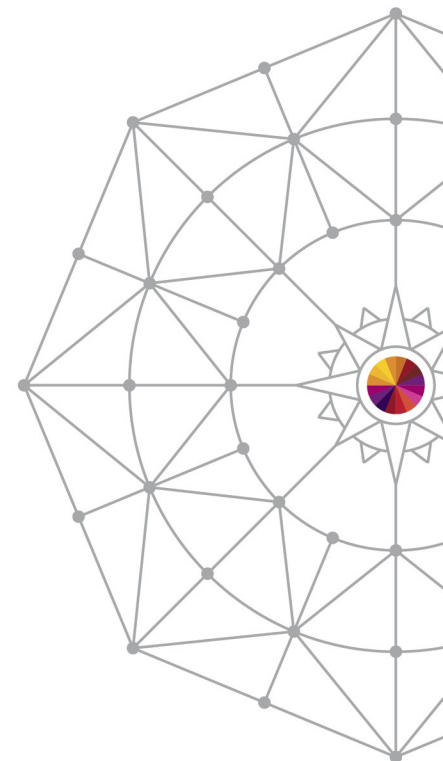
878 Recovery

- In general, a restart of SMSVSAM is required
- Other options depending on the largest pool:
 - If buffers, lower the RLSMAXPOOLSIZE and let LRU run
 - If related to data sets, try closing some data sets
- If you're unsure, take a dump and Level 2 can tell you

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
- Recovery:
 - An SMSVSAM restart is likely required, but not always
 - If in doubt, open a PMR

Request Failures



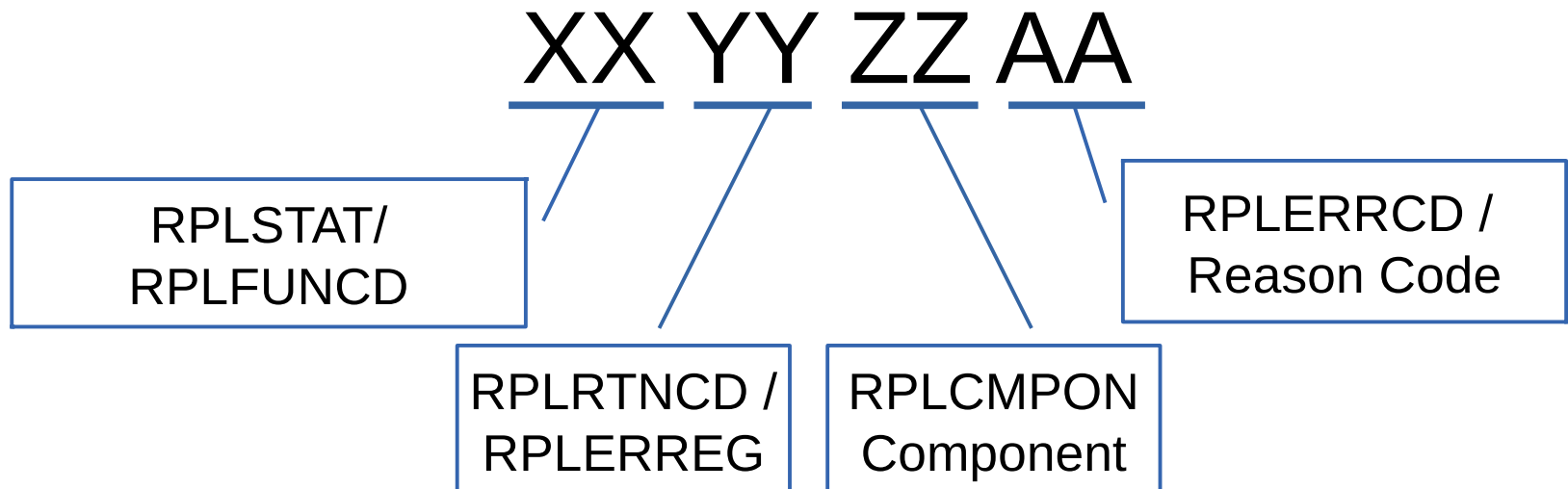
#SHAREorg



Copyright (c) 2014 by SHARE Inc.  Except where otherwise noted, this work is licensed under <http://creativecommons.org/licenses/by-nc-sa/3.0/>

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

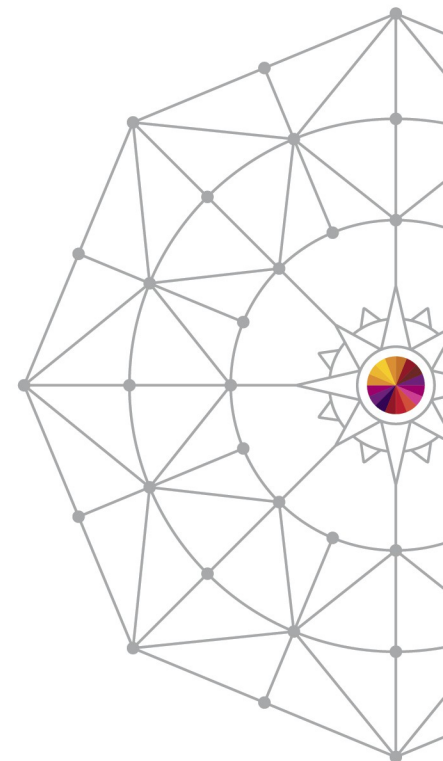
Beyond the Obvious

- 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
- Before anything else, retry the request
- If it persists, open a PMR. We'll likely need a dump.

HANGS



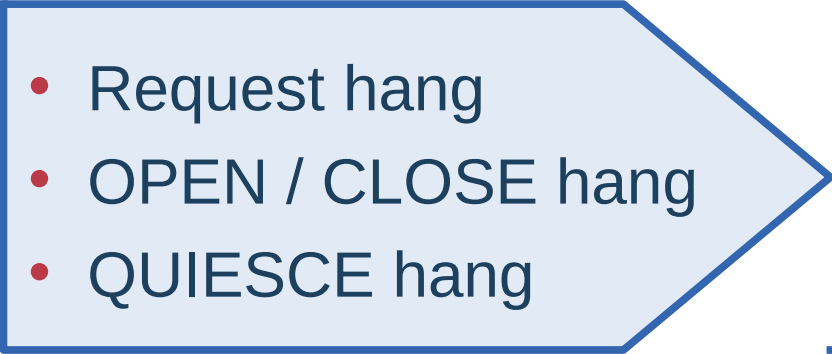
#SHAREorg



Copyright (c) 2014 by SHARE Inc.  Except where otherwise noted, this work is licensed under <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Hangs

- **Symptoms**

- 
- Request hang
 - OPEN / CLOSE hang
 - QUIESCE hang

Causes:

- **ENQs**
- **Latches** (GRS and RLS)
- 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 SMSVSAM 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 SMSVSAM MY.DATASET.IS.STUCK...B

SYSNAME	JOBNAME	ASID	TCBADDR	EXC/SHR	STATUS
P102	SMSVSAM	000A	009D21C8	EXCLUSIVE	OWN
P101	SMSVSAM	000A	009C8108	EXCLUSIVE	WAIT

SMSVSAM ENQS

- SYSVSAM:
 - ...B = “busy” ENQ
 - ...S = “sphere” ENQ
 - ...R = “read” ENQ
 - ...W = “write”
 - ...N = “non-rls”
- SYSZIGW3
 - VsamRlsLockTableEnq-IGWLOCK00
 - IGWSHC01-03 – SHCDS enqs
- Each is used by a different part of SMSVSAM
- **Note: SMSVSAM ENQS should be SYSTEMS (see II14439)**
 - If using MIM, ensure it is up before SMSVSAM and down after

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

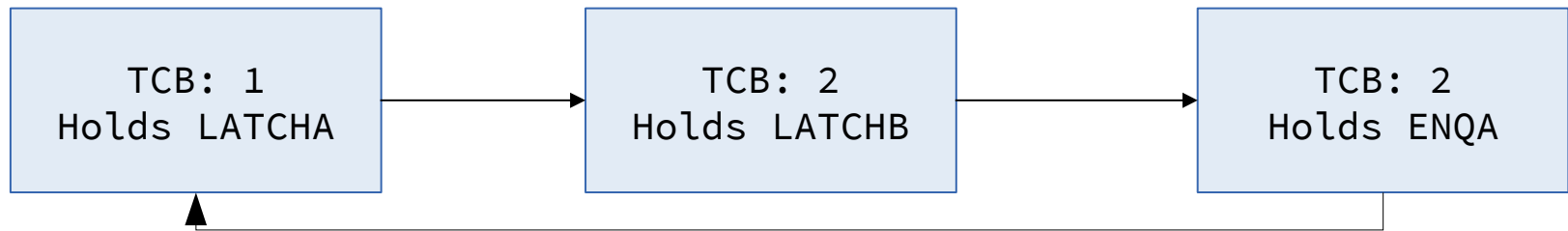
- VERBX SMSXDATA 'f(as) jobname(smsvsam)'

	Latch Name	Holder	Waiter(s)
1.	IGWLPA NC(7F2DC000)+18	(76)014D:009C00B8	(73)014D:009C0938 (328)014D:009B2E88 (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
2.	IGWLYSVG(7F43EE80)+70	(73)014D:009C0938	

UNSUPPORTED TOOL

HANGS – Finding the Holder

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



- Watch for deadlocks

The Holder – More Info

- Run tool:
 - 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
```

UNSUPPORTED TOOL

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:

FgC2CEDADECGRSRARBRCOD0f0A<SDqDn<qC2CGRSRARBRCOD0f0A<SDqDn<qFoFhC2<2FfC1CoDADECyCq

DSDJDKDMODOeDNOA<SCuCzCsDADEECeH0

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

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

TCB:009C0938

FVSP:72361E68 IGWLQSUB

SQM Submit Work:

SQM Token@:7F1F3028 SQMToken:7F40F6B0-6DE2D8D4

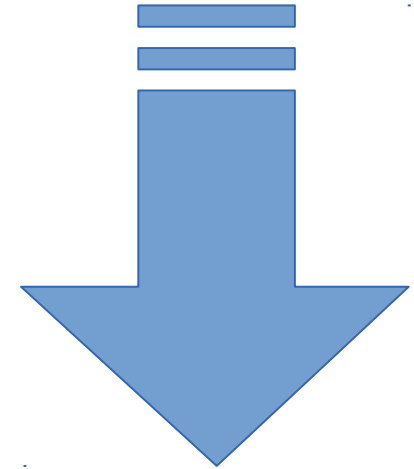
Entrypoint:2F656848 Parameter:733C5740 Alet:00000000

Value:00000002 Sync request

UNSUPPORTED TOOL

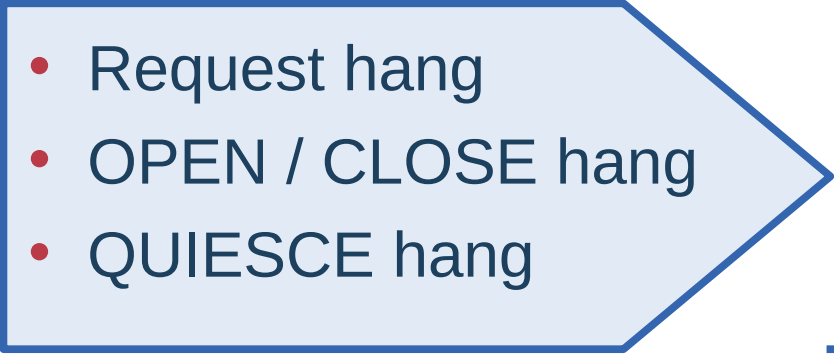
Once holder is identified:

- 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 CICSJOBBA 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 CICSJOBBA OE4A 01769 2703 CICSUSRA.

Transaction OE5B (95809) unit of work X'C50AE27517CED387' running in job CICSJOBBA with applid CICSJOBBA in MVS SYSTEM3 holds exclusive lock on key X'F1F2F3F4F5F64000000000000000' in data set RLS.MYDATA.IS.STUCK causing true contention.

SHCDS LISTSUBSYS(ALL)

SHCDS LISTSUBSYS(ALL)

----- LISTING FROM SHCDS ----- IDCASH03

SUBSYSTEM NAME	STATUS	RECOVERY NEEDED	LOCKS HELD	LOCKS WAITING	LOCKS RETAINED
SMSVSAM	BATCH --ACTIVE	NO	0	0	0
DATA SETS IN LOST LOCKS-----					
DATA SETS IN NON-RLS UPDATE STATE--					
TRANSACTION COUNT-----					
CICSJOB	ONLINE--ACTIVE	YES	201	0	0
DATA SETS IN LOST LOCKS-----					
DATA SETS IN NON-RLS UPDATE STATE--					
TRANSACTION COUNT-----					
CICSJOBA	ONLINE--ACTIVE	YES	0	0	2
DATA SETS IN LOST LOCKS-----					
DATA SETS IN NON-RLS UPDATE STATE--					
TRANSACTION COUNT-----					
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:'000000001C918'X-'44FD20A8'X/RSHSKey='A09C9A28000000000000000000000000'X

Ownership SS:CICSJ0BA U0WID:'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	IGWLN12	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:CICSJ0BA Sidb_JobName:CICSJ0BA U0WID:'C91895B4AF9FE9A4'X

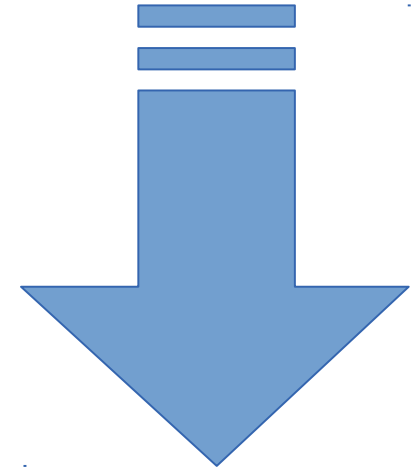
WHBTRACE AREA Current Entry:1

++ 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

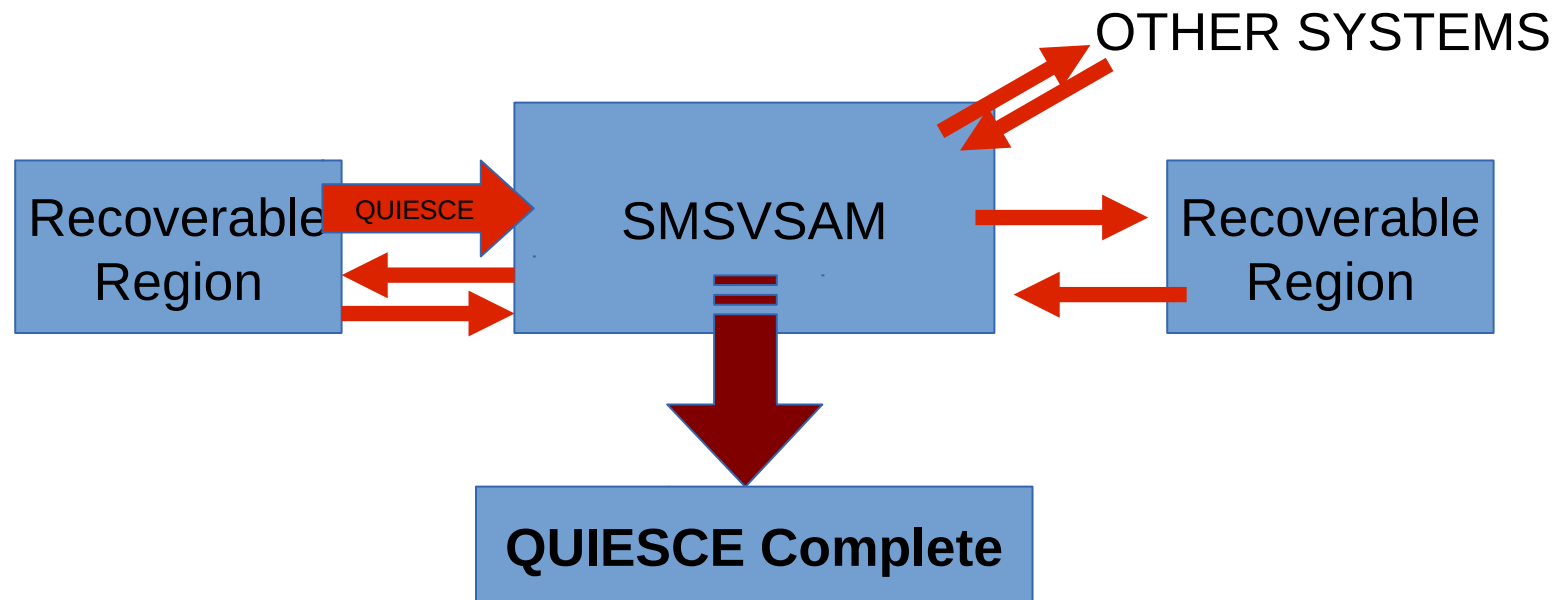
- Request hang
- OPEN / CLOSE hang
- QUIESCE hang

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)'

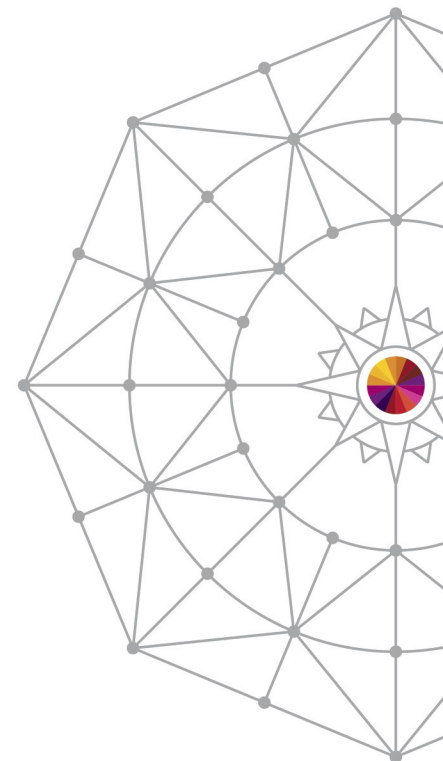
```
Subsystem collection for QSet (7F5ED3C0), Cardinality:5
Ifgquies cb@=1E52ED80 dsn=DS.QUIES.CEIS.TUK
Quitype:02 Quiertok:C6BAF5623D744E08
QSSY:7F5D2610 MYREG001 C1D6D9F0F0D4F4F9
  Scheduled=10/15/2010 03:02:09.166163 Completed=10/15/2010
03:02:09.170859
QSSY:7F5D25D0 MYREG002 C1D6D9F0F1D4F4F9
  Scheduled=10/15/2010 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

Lost and Retained Locks



#SHAREorg



Copyright (c) 2014 by SHARE Inc.  Except where otherwise noted, this work is licensed under <http://creativecommons.org/licenses/by-nc-sa/3.0/>

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 6, 17, or 18
 - RPL feedback R15=x'8' ERRCD=x'18'
 - Non-RLS access is prohibited
 - Access to those records will be denied
- Lost Locks
 - IEC161I 6, 17, 241 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 ----- IDC3H03

SUBSYSTEM NAME	STATUS	RECOVERY NEEDED	LOCKS HELD	LOCKS WAITING	LOCKS RETAINED
SMSVSAM	BATCH --ACTIVE	NO	0	0	0
DATA SETS IN LOST LOCKS-----					
DATA SETS IN NON-RLS UPDATE STATE--					
TRANSACTION COUNT-----					
CICSJOB	ONLINE--ACTIVE	YES	0	0	0
DATA SETS IN LOST LOCKS-----					
DATA SETS IN NON-RLS UPDATE STATE--					
TRANSACTION COUNT-----					
CICSJOBA	ONLINE--ACTIVE	YES	0	0	2
DATA SETS IN LOST LOCKS-----					
DATA SETS IN NON-RLS UPDATE STATE--					
TRANSACTION COUNT-----					

IDC0001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0

More Displays

SHCDS LISTSUBSYS(S)(RETLK05A)

----- LISTING FROM SHCDS ----- IDC0004

SUBSYSTEM NAME----- RETLK05A		SUBSYSTEM STATUS-----ONLINE--ACTIVE					
DATA SET NAME /		RETAINED	LOST	NOT	RECOVERY	NON-RLS	PERMIT
CACHE	STRUCTURE	LOCKS	LOCKS	BOUND	REQUIRED	UPDATE PERMITTED	FIRST TIME 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

```

-----
DATA SET NAME                RETAINED  LOST      LOCKS      NON-RLS      UPDATE      PERMIT
                              LOCKS      LOCKS      NOT        RECOVERY     PERMITTED   FIRST TIME
                              -----
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

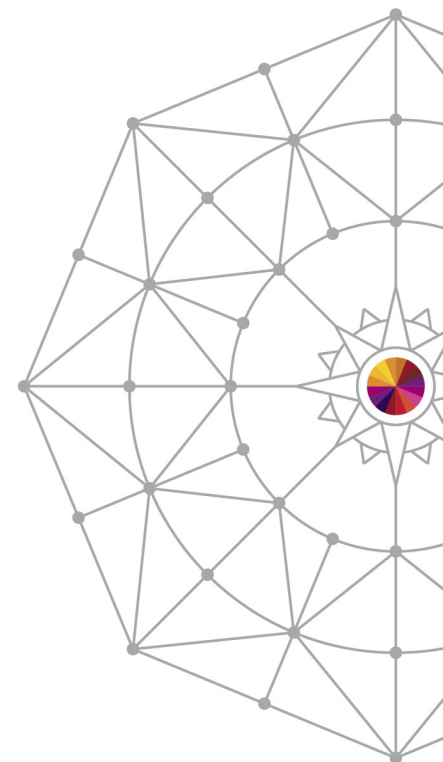
- Check for URIDs with outstanding recovery
 - D SMS,SHUNTED
 - SHCDS LISTSHUNTED
 - INQUIRE UOWDSNFAIL
- Retry the failed work
 - CICS - SET DSNAME ACTION(RETRY)
 - TVS – SHCDS RETRY URID(xx)
- Purge the failed work
 - TVS – SHCDS PURGE URID(xx)

Resolving Lost Locks

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



Performance / Tuning



#SHAREorg



Copyright (c) 2014 by SHARE Inc.  Except where otherwise noted, this work is licensed under <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Performance / Tuning

- This is a big topic
- SMSVSAM provides a LOT of data
 - SMF42 subtype 16-19
 - RMF Mon III
 - OMEGAMON XE
 - D SMS,CFLS
- Potential performance issues:
 - Long request times / timeouts
 - High CPU

Common Causes

- Long Request Times
 - Usually the result of high contention
 - Check the size of your lock structure
 - Check the size of your buffers and cache
 - Occasionally is due to SPLIT contention
 - Find and eliminate the cause
- High CPU
 - Sometimes related to buffer LRU
 - Increase buffer size to prevent Accelerated or Maint mode
 - Sometimes related to pool growth
 - Requires an SMSVSAM restart

Regarding Catalogs

- CATALOG is a user of SMSVSAM just like any region
- Does not use recoverable data sets (LOG=NONE)
 - No retained lock issues
 - No lost lock issues
 - One request, one lock
- If you find CATALOG is waiting for SMSVSAM:
 - Use displays / DUMP and SMSXDATA to check for contention
 - Find holder and address – take action if possible
 - Restart SMSVSAM – CATALOG waits for it to return
 - Remove a catalog from RLS: F CATALOG,RLSQUIESCE(xx)

Summary

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

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

- For more information on Best Practices:
 - Session 16125 – VSAM RLS Best Practices
Wed @ 11:15, this room

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)*

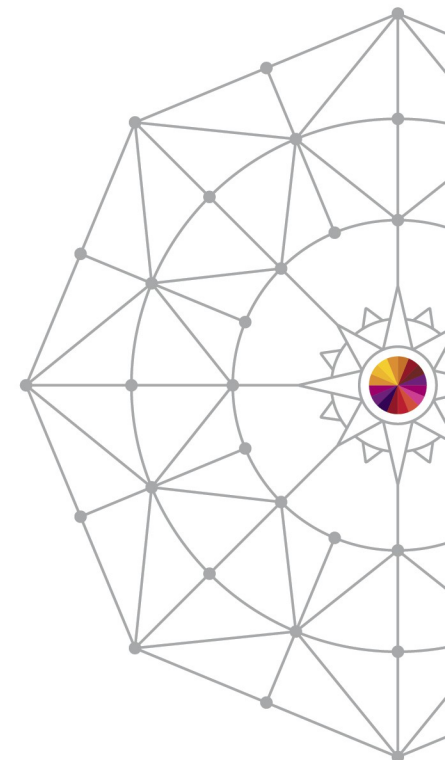
DFSMS:Advanced RLS Diagnostics and Recovery

Neal Bohling

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

August 4, 2014

Session# 16124



#SHAREorg



Notices & Disclaimers

Copyright © 2013 by International Business Machines Corporation.

No part of this document may be reproduced or transmitted in any form without written permission from IBM Corporation.

Product information and data has been reviewed for accuracy as of the date of initial publication. Product information and data is subject to change without notice. This document could include technical inaccuracies or typographical errors. IBM may make improvements and/or changes in the products and/or programs described herein at any time without notice.

References in this document to IBM products, programs, or services does not imply that IBM intends to make such products, programs or services available in all countries in which IBM operates or does business. Consult your local IBM representative or IBM Business Partner for information about the product and services available in your area.

Any reference to an IBM Program Product in this document is not intended to state or imply that only that program product may be used. Any functionally equivalent program, that does not infringe IBM's intellectually property rights, may be used instead. It is the user's responsibility to evaluate and verify the operation of any non-IBM product, program or service.

THE INFORMATION PROVIDED IN THIS DOCUMENT IS DISTRIBUTED "AS IS" WITHOUT ANY WARRANTY, EITHER EXPRESS OR IMPLIED. IBM EXPRESSLY DISCLAIMS ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR INFRINGEMENT. IBM shall have no responsibility to update this information. IBM products are warranted according to the terms and conditions of the agreements (e.g., IBM Customer Agreement, Statement of Limited Warranty, International Program License Agreement, etc.) under which they are provided. IBM is not responsible for the performance or interoperability of any non-IBM products discussed herein.

Notices & Disclaimers

The performance data contained herein was obtained in a controlled, isolated environment. Actual results that may be obtained in other operating environments may vary significantly. While IBM has reviewed each item for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere.

The responsibility for use of this information or the implementation of any of these techniques is a customer responsibility and depends on the customer's or user's ability to evaluate and integrate them into their operating environment. Customers or users attempting to adapt these techniques to their own environments do so at their own risk. **IN NO EVENT SHALL IBM BE LIABLE FOR ANY DAMAGE ARISING FROM THE USE OF THIS INFORMATION, INCLUDING BUT NOT LIMITED TO, LOSS OF DATA, BUSINESS INTERRUPTION, LOSS OF PROFIT OR LOSS OF OPPORTUNITY.**

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not necessarily tested those products in connection with this publication and cannot confirm the accuracy of performance, compatibility or another claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

The provision of the information contained herein is not intended to, and does not, grant any right or license under any IBM patents or copyrights. Inquiries regarding patent or copyright licenses should be made, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

Any statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Trademarks

DFSMSdfp, DFSMSdss, DFSMShsm, DFSMSrmm, IBM, IMS, MVS, MVS/DFP, MVS/ESA, MVS/SP, MVS/XA, OS/390, SANergy, and SP are trademarks of International Business Machines Corporation in the United States, other countries, or both.

AIX, CICS, DB2, DFSMS/MVS, Parallel Sysplex, OS/390, S/390, Seascape, and z/OS are registered trademarks of International Business Machines Corporation in the United States, other countries, or both.

Domino, Lotus, Lotus Notes, Notes, and SmartSuite are trademarks or registered trademarks of Lotus Development Corporation. Tivoli, TME, Tivoli Enterprise are trademarks of Tivoli Systems Inc. in the United States and/or other countries.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both. UNIX is a registered trademark in the United States and other countries licensed exclusively through The Open Group.

Other company, product, and service names may be trademarks or service marks of others.