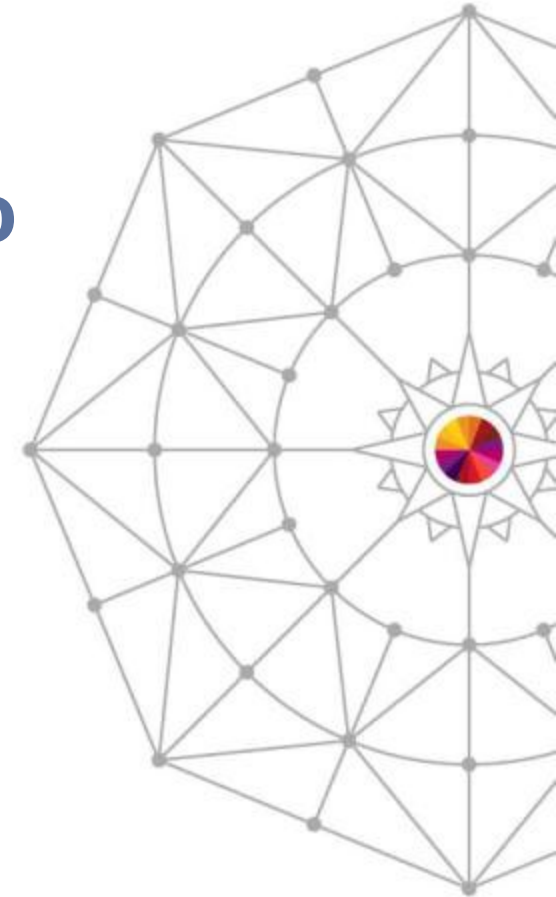


RLS and Catalogs A Practical Guide / How-to

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Session 15089



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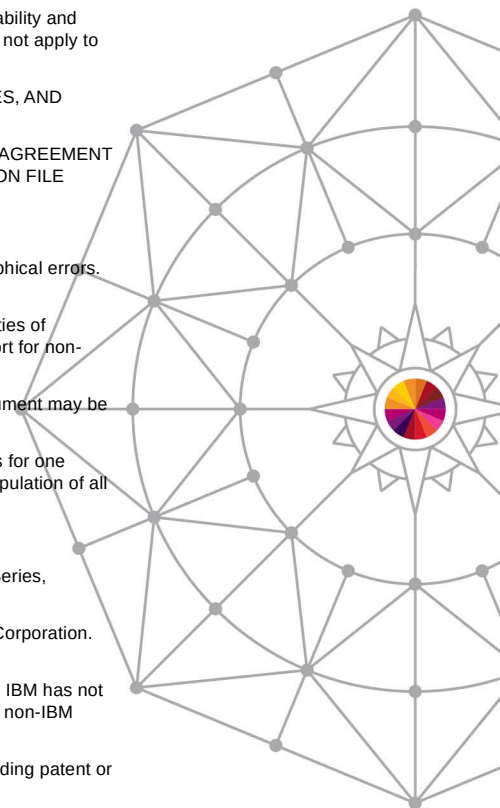
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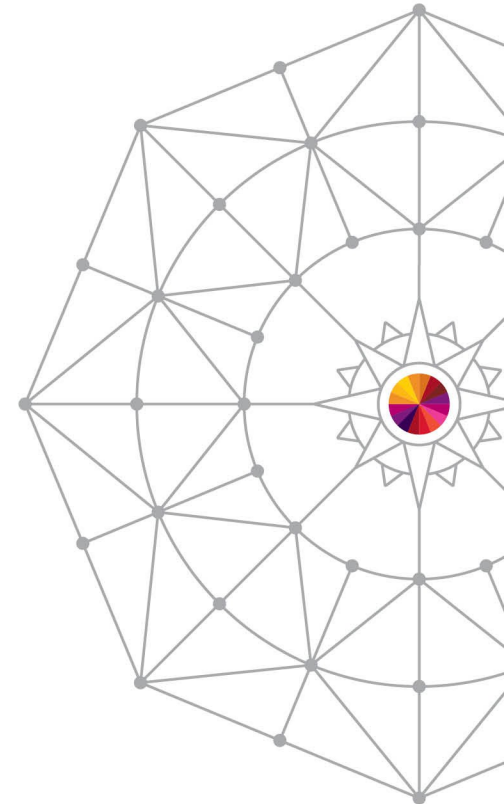
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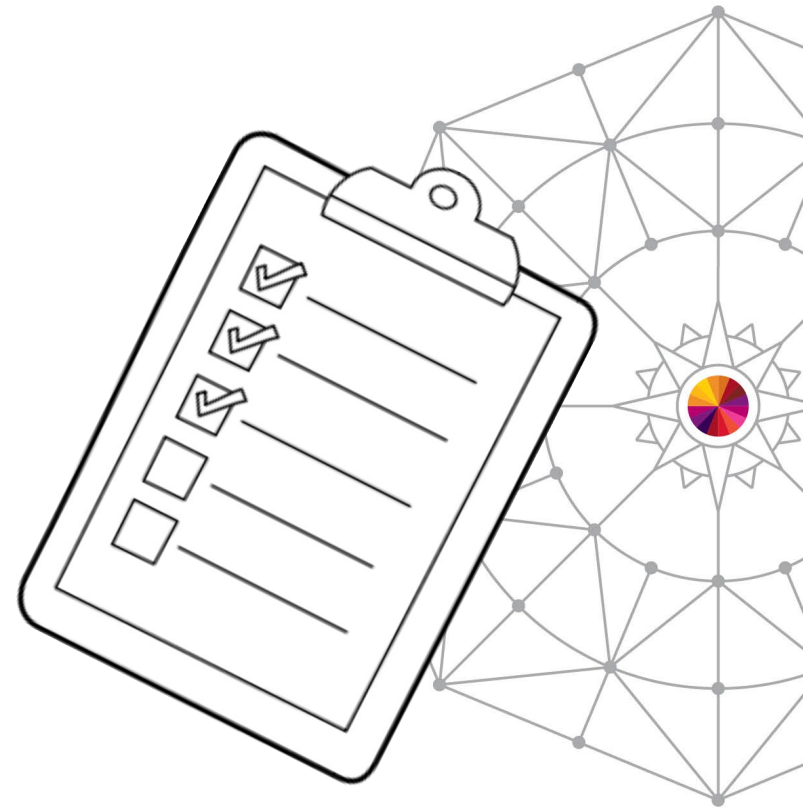
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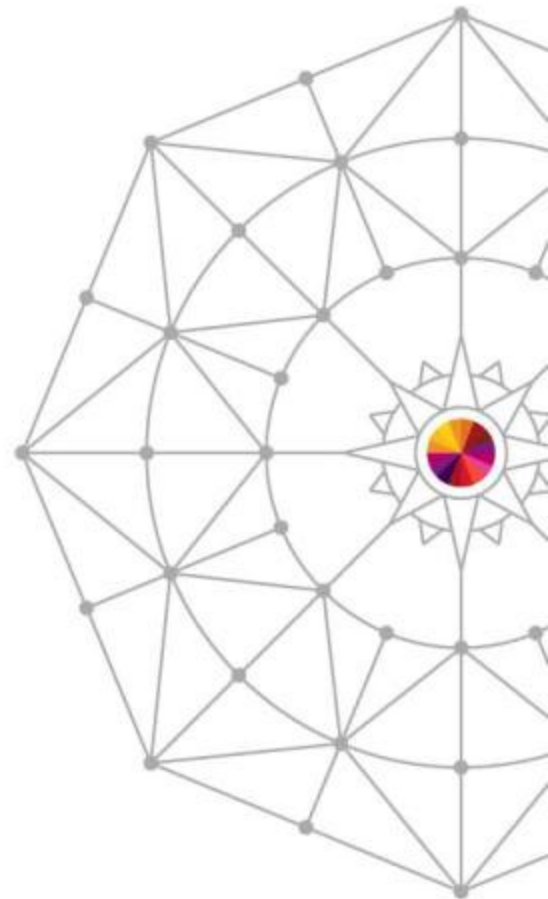


Master Agenda

- **Why use RLS for catalogs?**
 - Getting it Going
 - Monitoring
 - Maintenance
 - If things go wrong

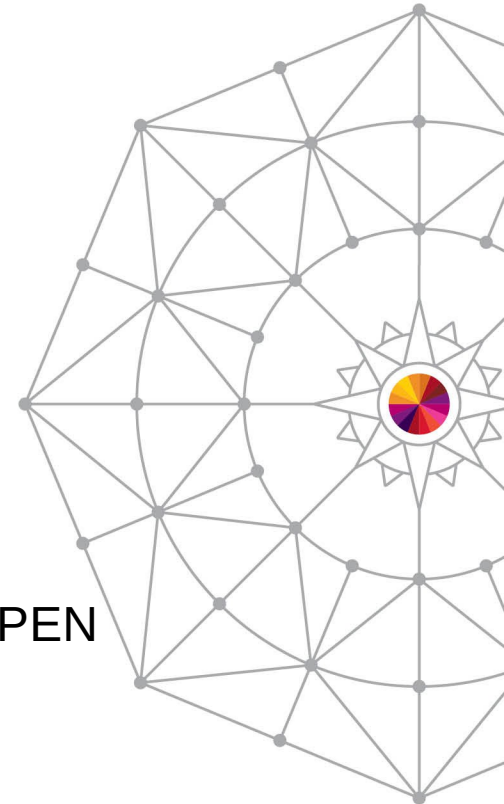


Why RLS

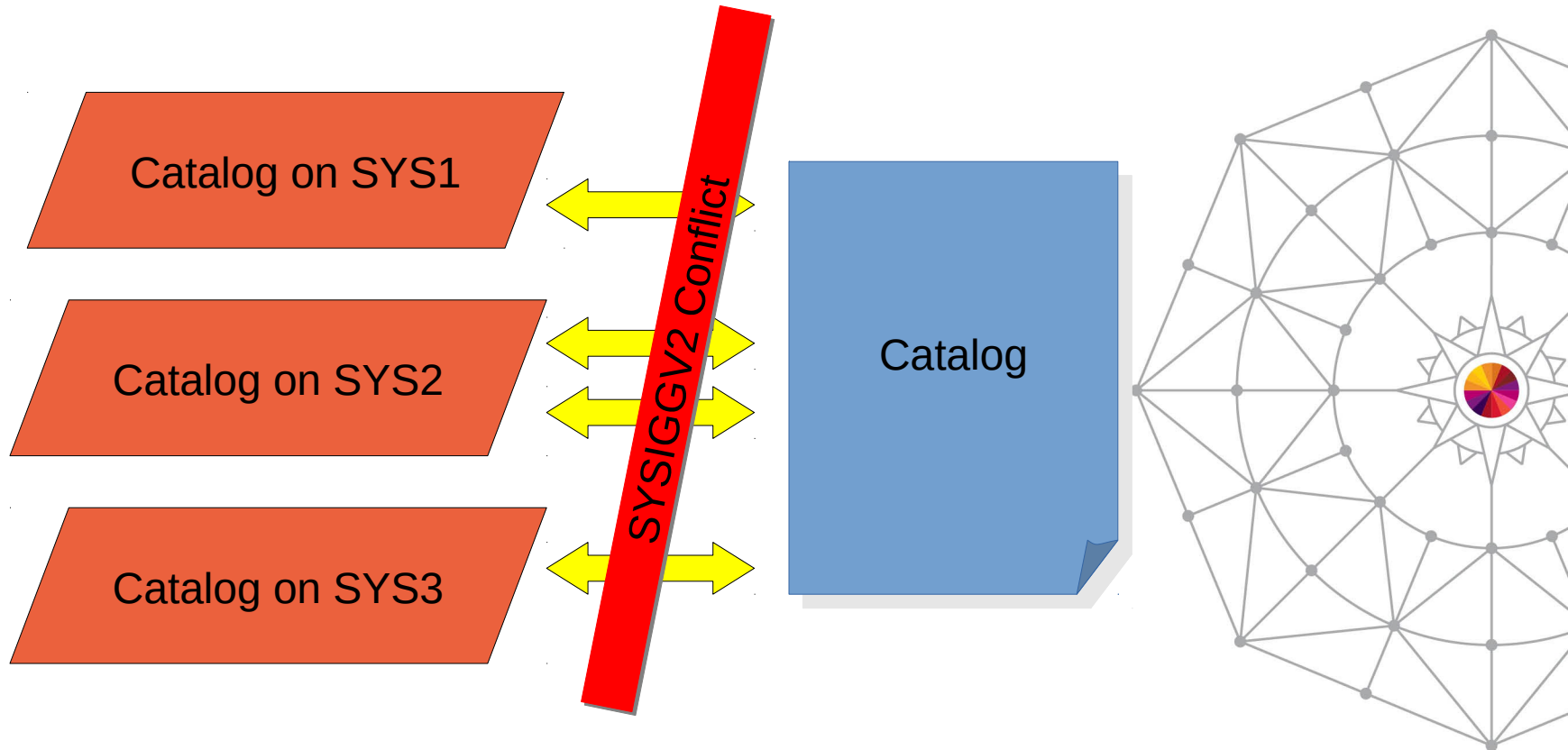


Current Catalog Limitations

- **Performance**
 - Contention on SYSIGGV2 when updating
 - Limited catalog buffering and buffer invalidation
 - Limited VSAM buffers/strings/storage
- **Availability**
 - Catalogs need to be split to resolve contention
 - Catalogs unavailable during split / recovery
- **Integrity**
 - Catalogs can be damaged by utilities updating while OPEN
 - Lack of SYSPLEX control and serialization
- **Recovery**
 - Long / error prone forward recovery process

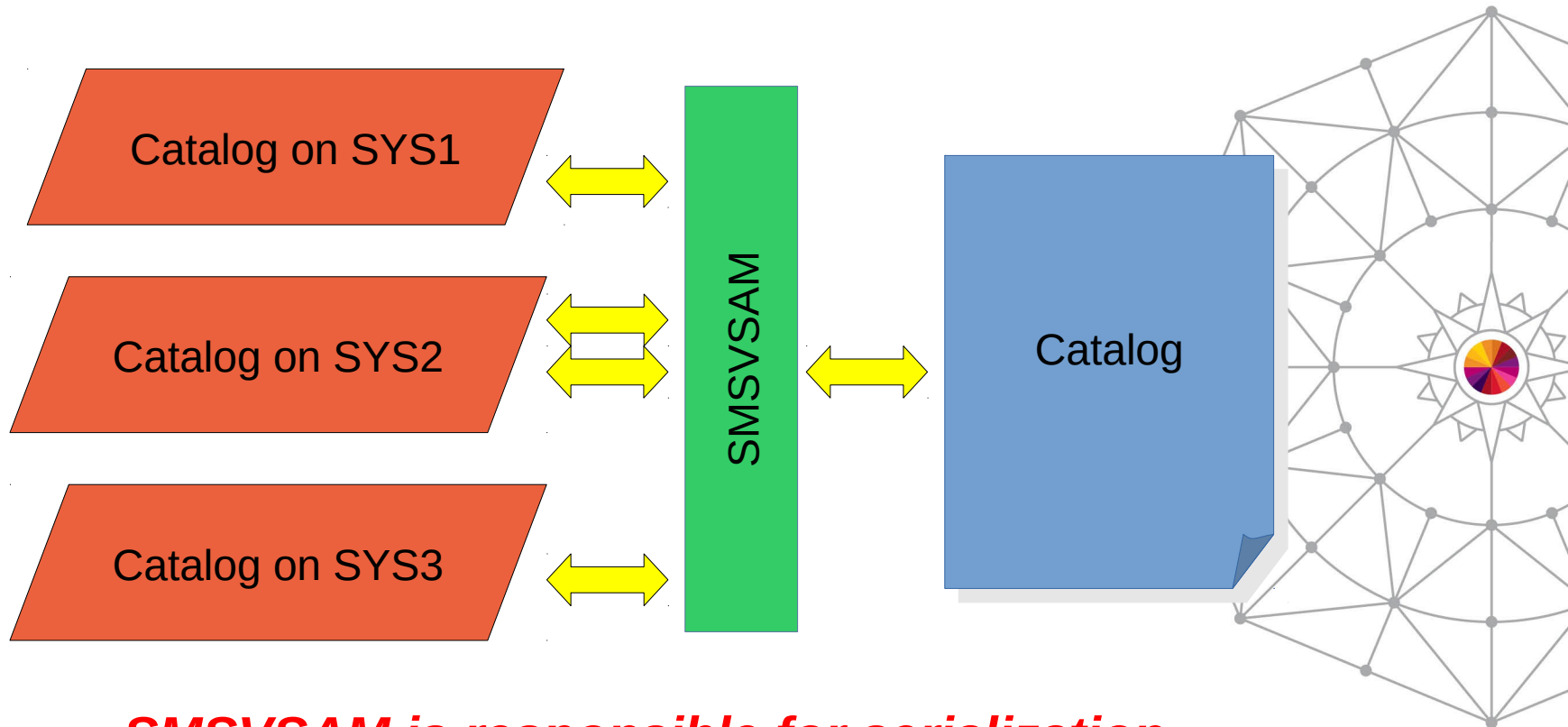


Regular Catalog Access



Potential contention on SYSIGGV2 'ucat' during updates

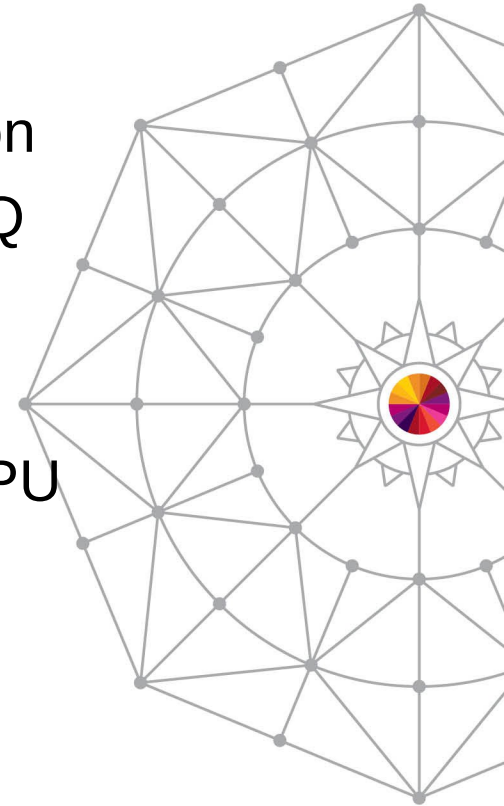
RLS VSAM Access



***SMSVSAM is responsible for serialization.
Serialization is at the RECORD level instead of DS
No more SYSIGGV2 'ucat' ENQ contention***

Improvements RLS Offers

- **Reduced contention**
 - Eliminates SYSIGGV2 'UCAT' ENQ contention
 - Plans to remove the SYSIGGV2 'sphere' ENQ
 - No need to split catalogs to lower contention
- **Higher throughput**
 - Significant improvement in elapsed time & CPU
 - Much shorter wait times
- **Improved control**
 - Suspend / resume ALL catalogs, plex-wide
 - Prevents unserialized updates



Performance Benchmark Test

Test	Elapsed Time (min)		CPU* (sec)		Deltas	
	Non-RLS	RLS	Non-RLS	RLS	Elapsed	CPU*
DELETE	80.42	8.42	1269.3	298.7	89.51%	76.46%
DEFINE	48.84	21.42	685.6	130.8	56.13%	80.91%
SEQ READ	7.40	5.03	65.1	75.2	32.08%	-15.52%
DIR READ (first sys)	26.77	20.33	94.0	109.6	24.1%	-14.3%
DIR READ (second sys)	26.86	20.29	95	109.9	24.5%	-13.5%

*CPU reduction in GRS, CATALOG may see a small increase – best to compare per request

Test environment: Z10 2097 E12, 3 LPARs, 7 CPUs, 1 CF, z/OS 2.1

Catalog parms: TASKMAX=180, CISIZE(32768) and CISIZE(4096), STRNO(255)

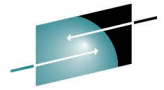
RLSABOVETHEBAR(NO) RLSCFCACHE(ALL) RLSMAXPOOLSIZE(100M) CF Cache size 1G

Catalog RLS vs Catalog VLF at z/OS 2.1

Tests: 300,000 data sets, 100 jobs using 1000 data sets on each LPAR

Source: "Unclog your Systems with z/OS 2.1 – Something New and Exciting for Catalog" by Terri Menendez, IBM

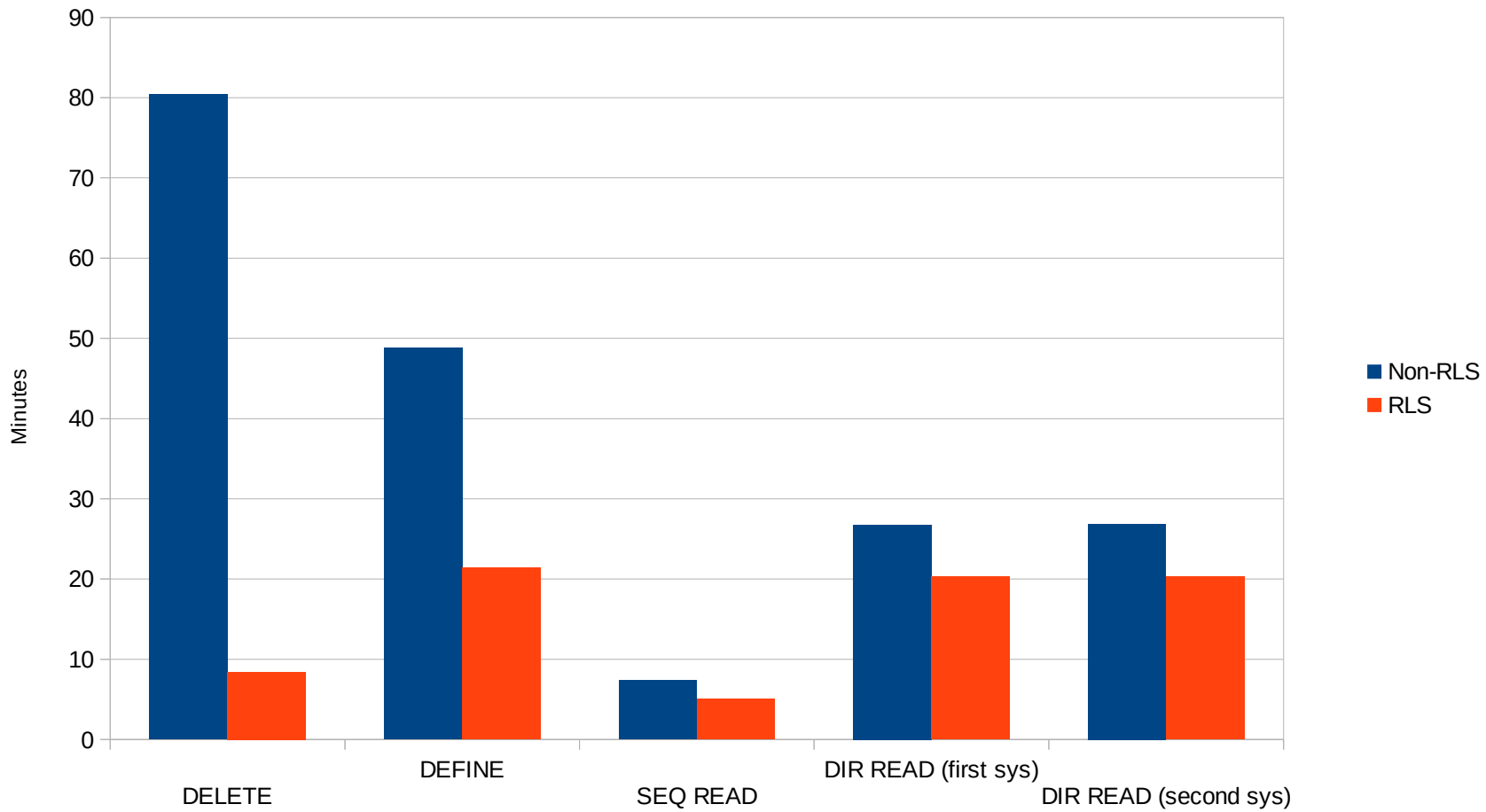
Spring 2013 Session #12977, 12978



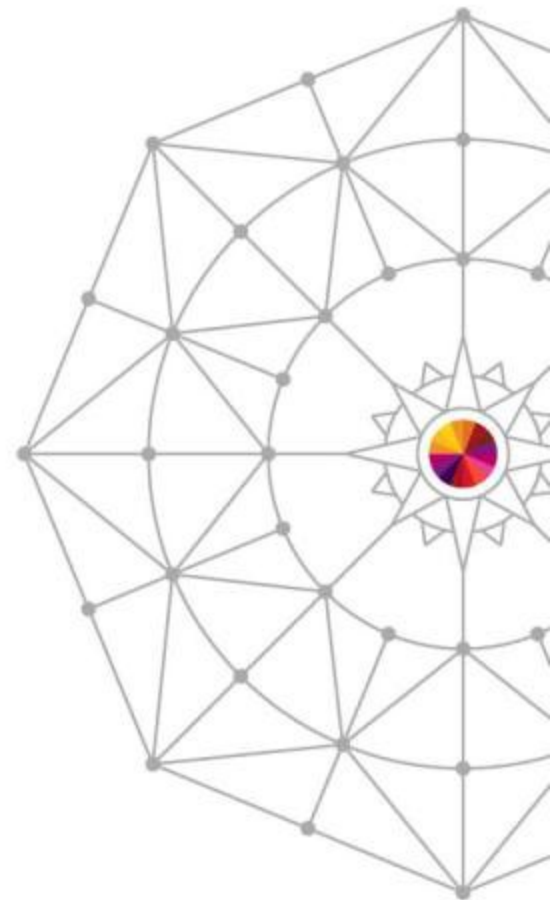
SHARE

Connections • Results

Performance Benchmark Test

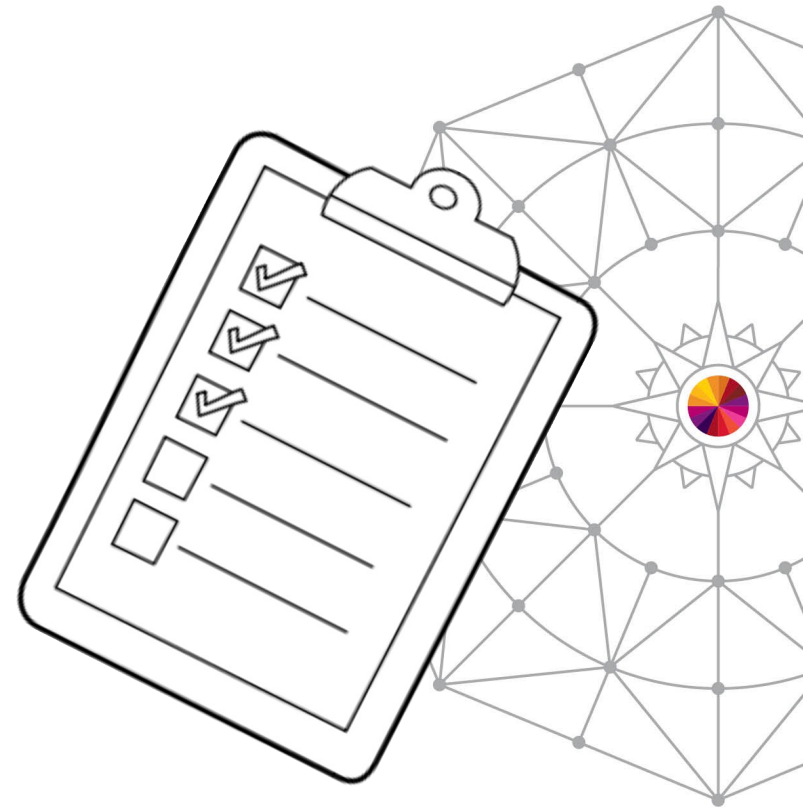


Enough, let's do it!



Master Agenda

- Why use RLS for catalogs?
 - **Getting it Going**
 - Monitoring
 - Maintenance
 - If things go wrong



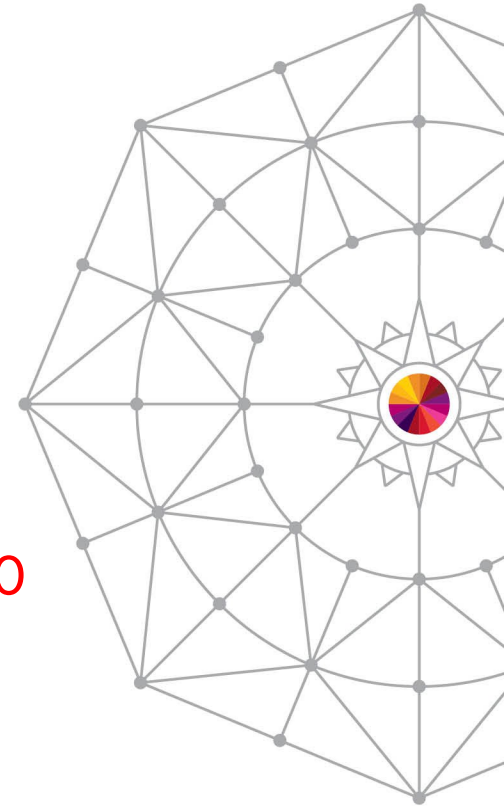
Simplest Case

- If you already have SMSVSAM running

1. IDCAMS ALTER ucat LOG(NONE)
2. F CATALOG,RLSENABLE(ucate)

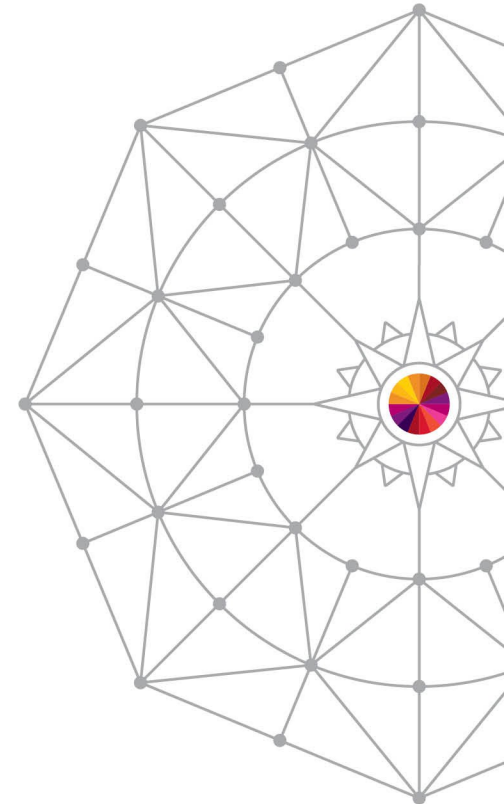
- Message:

IEC352I MODIFY CATALOG cat.name TO
STATE RLSENABLE SUCCESSFUL



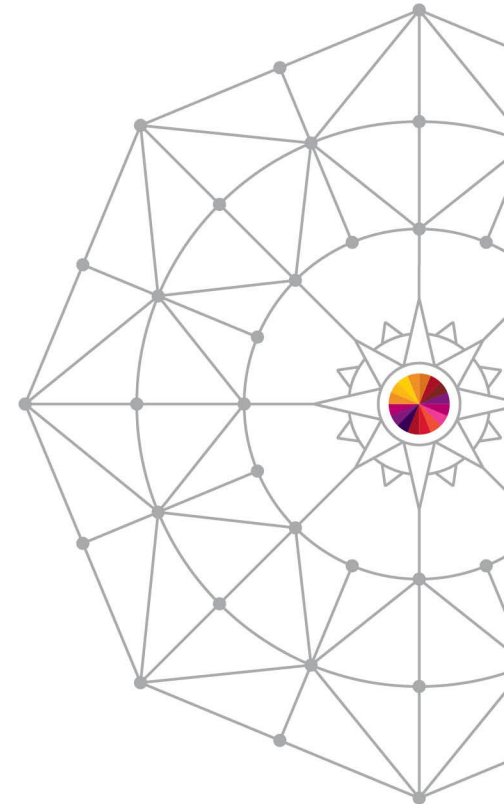
Getting Going

- **Prepare Systems**
- Configure SMS / SMSVSAM
- Configure Catalog Data Set Params
- Turn it on!



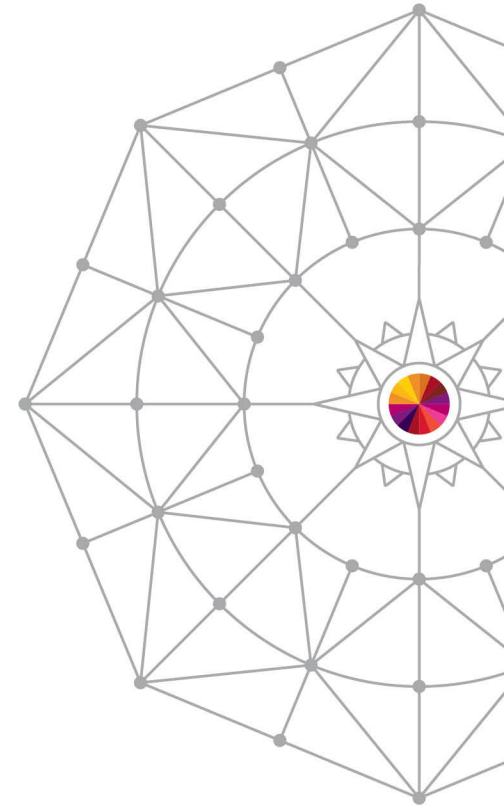
Preparation

- If possible, migrate all systems to z/OS 2.1
 - **Catalog in RLS-mode will not share with < 2.1**
- Install toleration and roll-up maintenance
 - OA36403, OA36409, OA36916, OA36492, OA36422, OA36414, OA40447, OA41517, OA42489
- SMSVSAM should be on all systems
 - Even pre-2.1
- Choose your catalogs
 - All catalogs benefit, but master not supported yet
 - Frequent contention
 - Cross-system sharing



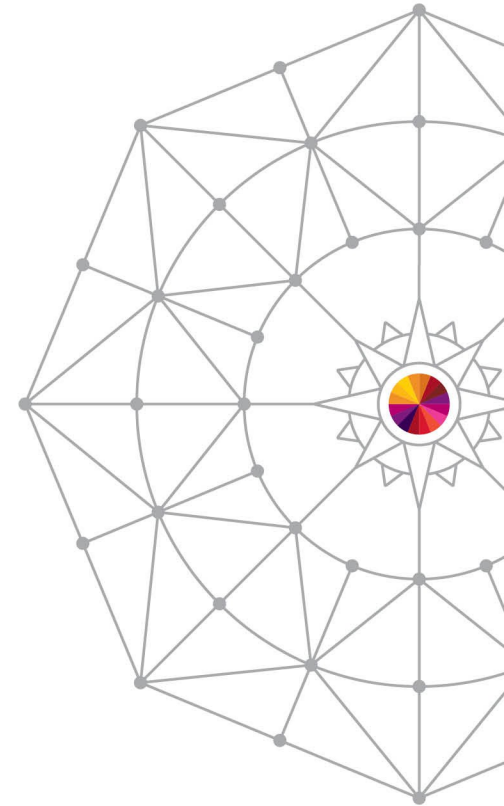
Getting Going

- Prepare Systems
- **Configure SMS / SMSVSAM**
- Configure Catalog Data Set Params
- Turn it on!



Configuring SMS / SMSVSAM

- **No SMSVSAM**
 - How to Set Up SMSVSAM
 - Start SMSVSAM
- With existing SMSVSAM
 - Buffering considerations
 - Caching considerations
 - Making the changes



Configure SMSVSAM – From Scratch

- Define SHCDS
 - Two ACTIVE, one SPARE
 - Linear VSAM DS, named SYS1.DFPSHCDS.qualifier.Vvolser
 - CISIZE(4096), SHR(3,3), single volume
 - At least 13MB, see manual for sizing
- Define CFRM Policy
 - One cache (any name)
 - At least 30MB
 - The larger the better, but no bigger than total size of shared catalogs
 - One CF lock structure (IGWLOCK00) – at least 20MB per system
 - Use CFSIZER to help size structures:
<http://www-947.ibm.com/systems/support/z/cfsizer/vsamrls/>

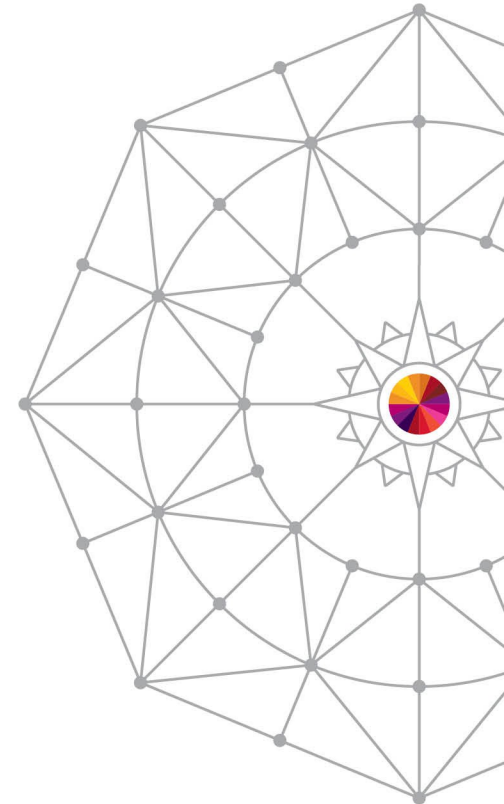
* see *z/OS DFSMSdfp Storage Administration (SC23-6860)*, section “Preparing for VSAM record-level sharing” for complete details



Configure SMSVSAM – From Scratch

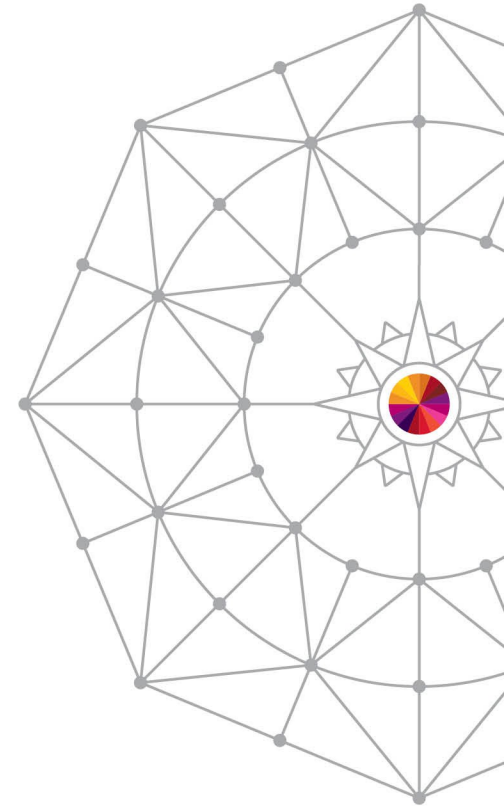
- Edit IGDSMSxx parmlib member
 - **RLSINIT(YES)**
 - RLS_MAX_POOL_SIZE(100)
 - RLS_MAXCFFEATURELEVEL(A|Z)
- Update SMS Configuration
 - Add cache set to base config / create cache set
 - Specify cache set in Storage Class (CF Cache Set)
- Start SMSVSAM
 - Started at IPL with RLSINIT(YES)
 - V SMS,SMSVSAM,ACTIVE

* see *z/OS DFSMSdfp Storage Administration (SC23-6860)*, section “Preparing for VSAM record-level sharing” for complete details



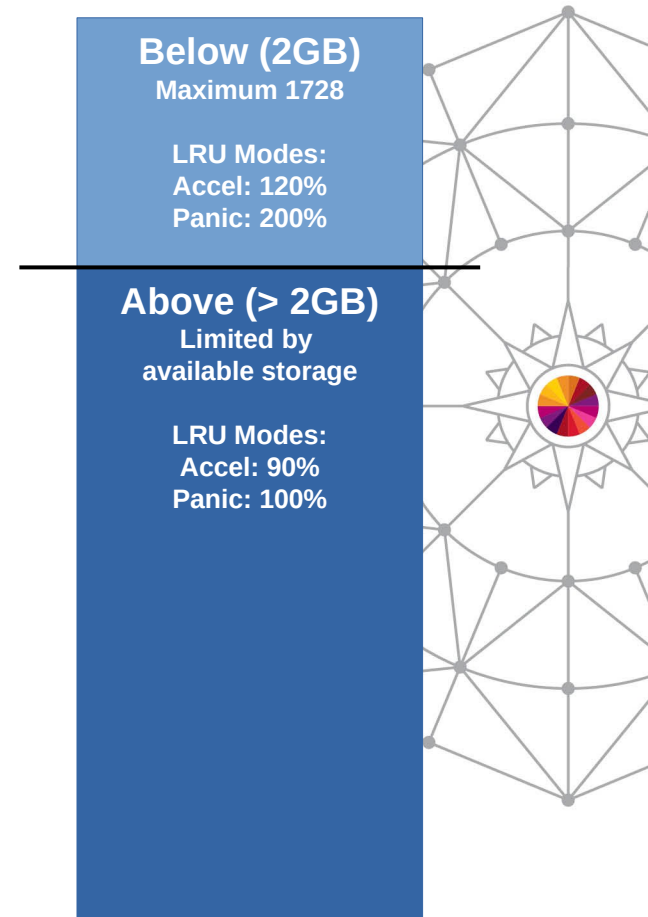
Configuring SMS / SMSVSAM

- No SMSVSAM
 - How to Set Up SMSVSAM
 - Start SMSVSAM
- **With existing SMSVSAM**
 - Buffering considerations
 - Caching considerations
 - Making the changes



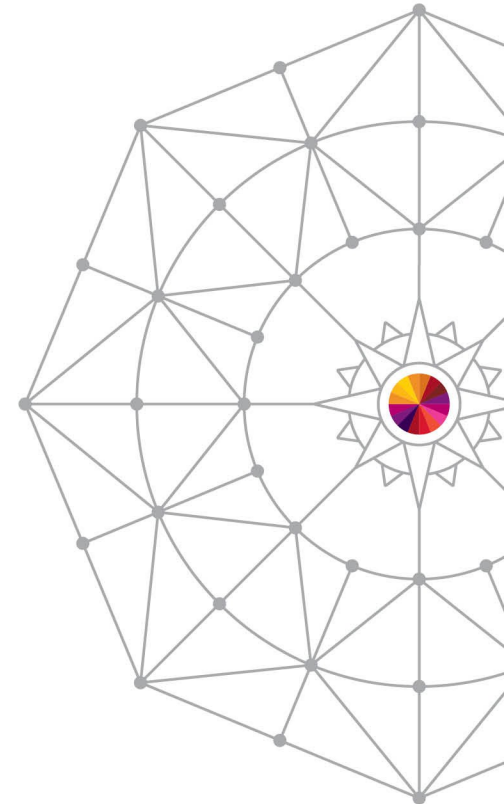
Configure SMSVSAM – Existing Config

- **Buffering Considerations**
 - How large are your catalogs?
 - Above or Below the bar? (64-bit buffering)
 - Add catalog amount to current setting
- Available RLS Buffering
 - Below-the-Bar:
 - Maximum 1728 MB
 - < 850 MB recommended setting
 - Same on all systems
 - Accelerated LRU starts at 120%
 - Above-the-Bar
 - Limited by real memory
 - Specified per-system
 - Good for high-volume activity
 - Accelerated LRU starts at 90%



Configure SMSVSAM – Existing Config

- Update configuration accordingly
 - Parmlib (IGDSMSxx)
 - RLS_MAX_POOL_SIZE(850)
 - RLSABOVETHEBARMAXPOOLSIZE(xxxx)
 - Data Class
 - RLS Above the 2-GB Bar (Y|N)
- Recommendations:
 - At least enough space to hold your catalogs
 - See session #15090 for RLS Best Practices



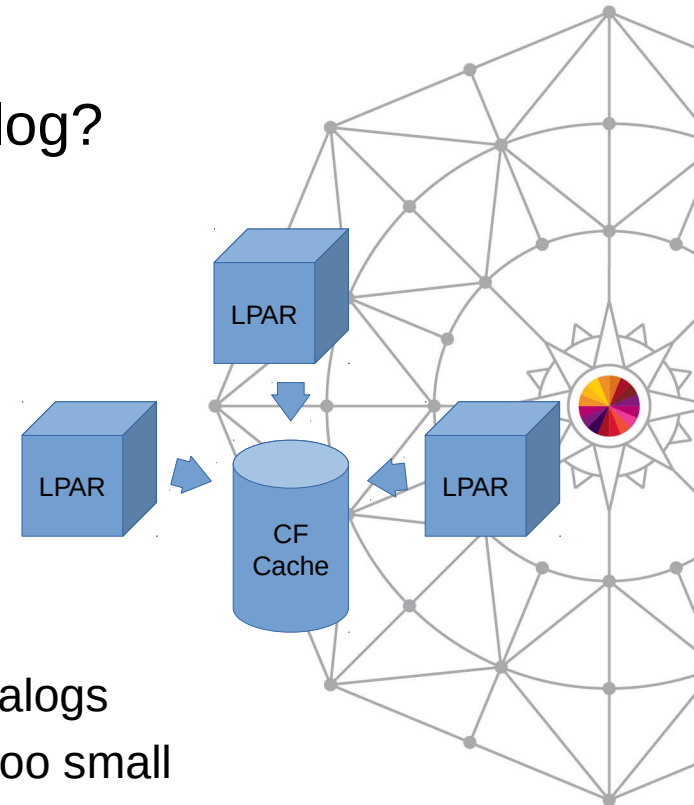
Configure SMSVSAM – Existing Config

- **Caching Considerations**

- Do you want a new cache just for catalog?
- Re-using existing storage class?
- How much cross-system exists?

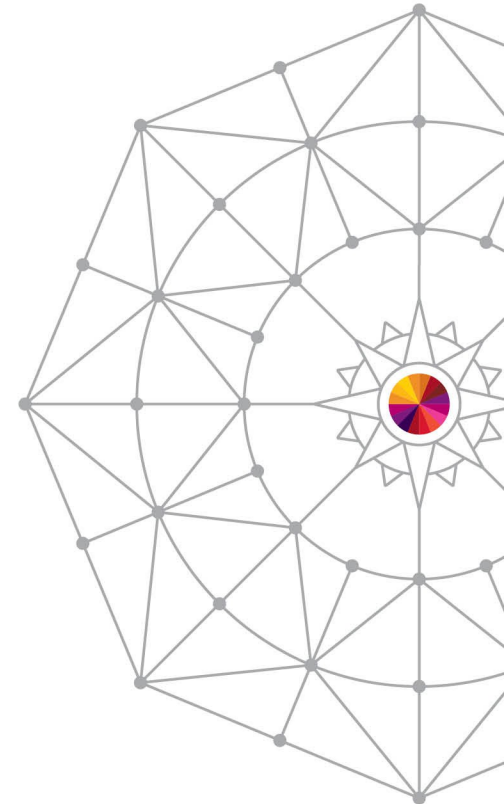
- **Sizing Notes:**

- Limited by CF availability
- Too small can result in cross-invalidation, increasing response time
- Minimum: 30mb, Maximum: size of all shared catalogs
- Watch BMF False Invalid rate to determine if it's too small
- Use CFSIZER to help find best size:
<http://www-947.ibm.com/systems/support/z/cfsizer/vsamrls/>



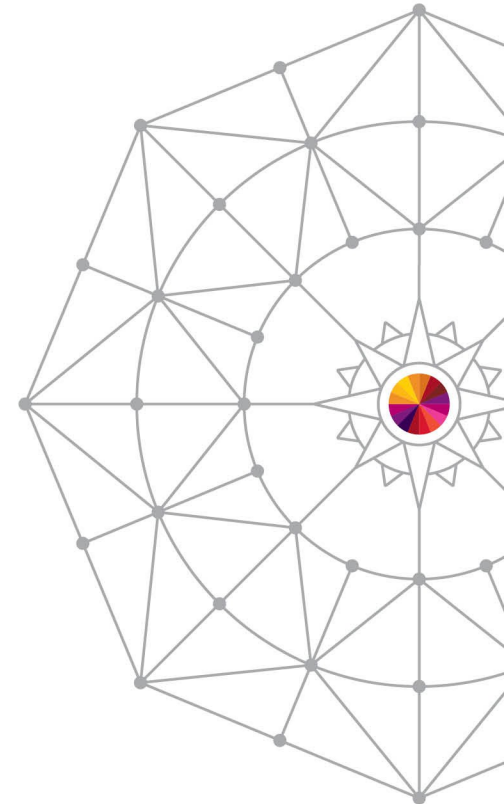
Configure SMSVSAM – Existing Config

- Make the changes
 - Define / size your cache via CFRM Policy
 - Use INITSIZE = SIZE = MAXSIZE
 - Update SMS
 - Cache sets in Base Configuration
 - Update Storage Class - CF Cache Set Name
 - Update Data Class - RLS CF Cache Value
 - Update ACS



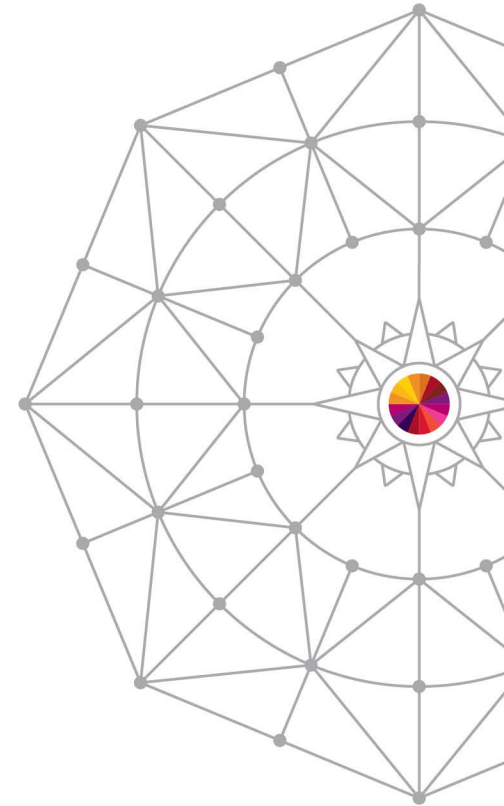
Summary of SMS Changes

- IGDSMSxx Parmlib:
 - RLS_MAX_POOL_SIZE
 - RLSABOVETHEBARMAXPOOLSIZE
 - RLS_MAXCFFEATURELEVEL(A)
 - RLSINIT(YES)
- Base configuration – add/update cache set
- Storage Class - CF Cache Set Name
- Data Class
 - RLS Above the 2-GB Bar
 - RLS CF Cache Value
- ACS routines – assign the correct storage class



Getting Going

- Prepare Systems
- Configure SMS / SMSVSAM
- **Configure Catalog Data Set Parms**
- Turn it on!



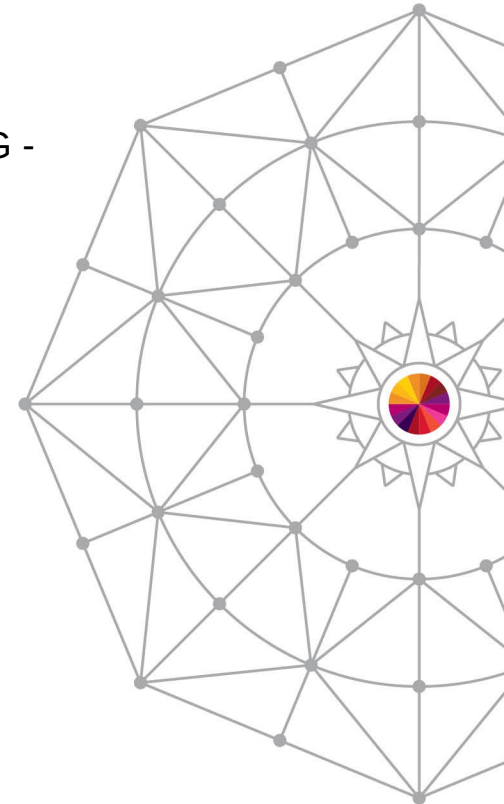
Data Set Parameters

- New IDCAMS parameters for RLS:

DEFINE USERCATALOG(NAME(bcsname) ICFCATALOG/VOLCATALOG -
LOG(NONE) -
RLSQUIESCE/RLSENABLE -
SUSPEND/RESUME -
RECONNECT
LOCK/UNLOCK
STORCLAS(storclasname))

ALTER 'bcsname' -
LOG(NONE) -
RLSQUIESCE/RLSENABLE -
SUSPEND/RESUME -
LOCK/UNLOCK -
NULLIFY(LOG))

DELETE USERCATALOG(NAME(bcsname) -
NODISCONNECT)



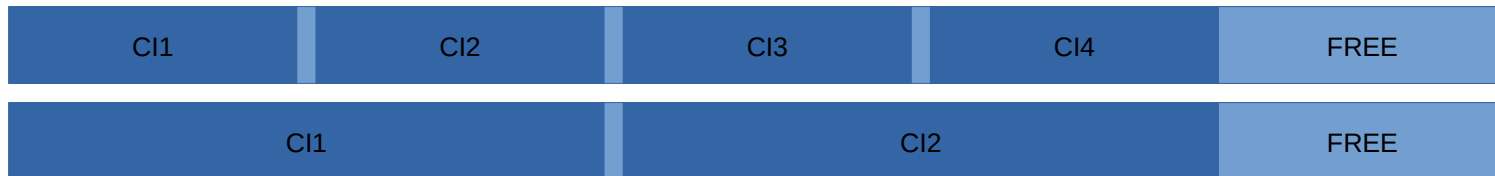
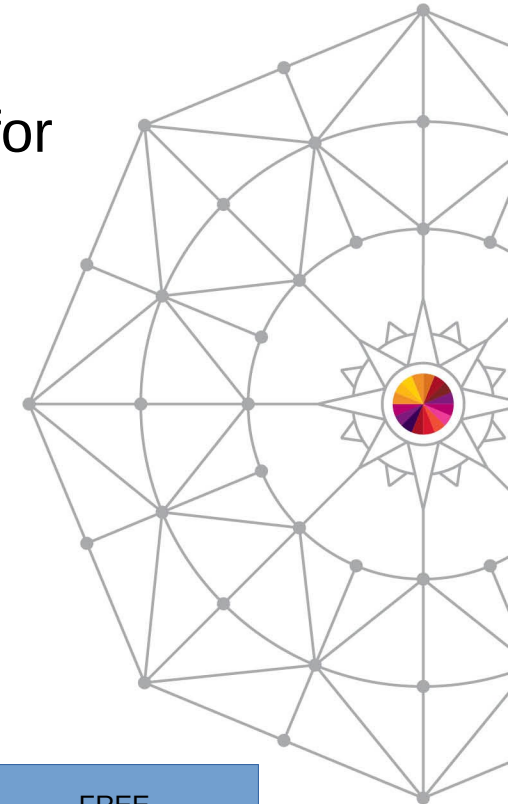
New Data Set Parameters

- **LOG(NONE)**
 - Makes a catalog RLS-eligible
 - Defines logging quantity – use NONE for Catalog
- **RLSQUIESCE / RLSENABLE**
 - Enabled – use RLS when accessing catalog
 - QUIESCE – don't use RLS
- **SUSPEND / RESUME**
 - Suspends or resumes activity against that catalog
- **NODISCONNECT / RECONNECT**
 - Does not delete UCONN / Alias info
 - Reuses UCONN / alias info during define



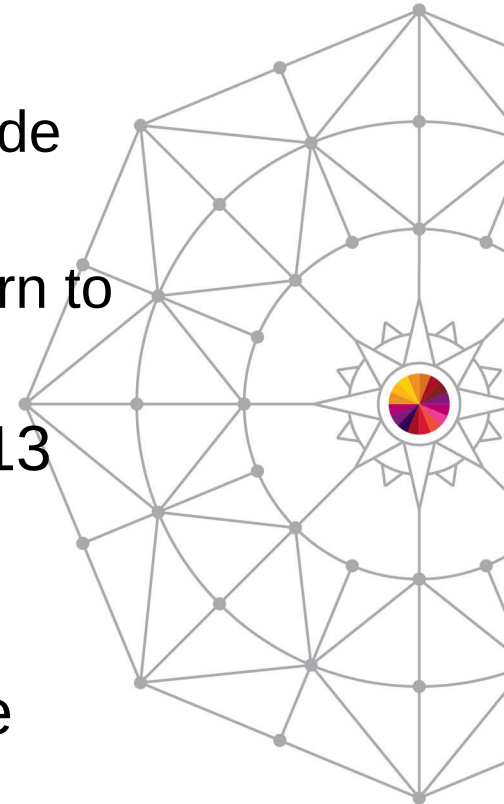
Other Data Set Considerations

- **CISIZE**
 - With RLS, contention may be at the CI level for CI/CA split, or spanned records
 - **Larger CISIZE** recommended for:
 - SEQ accessed catalogs
 - High INSERT/ERASE
 - Avoiding spanned records
 - **Smaller CISIZE** recommended for
 - High UPDATE catalogs



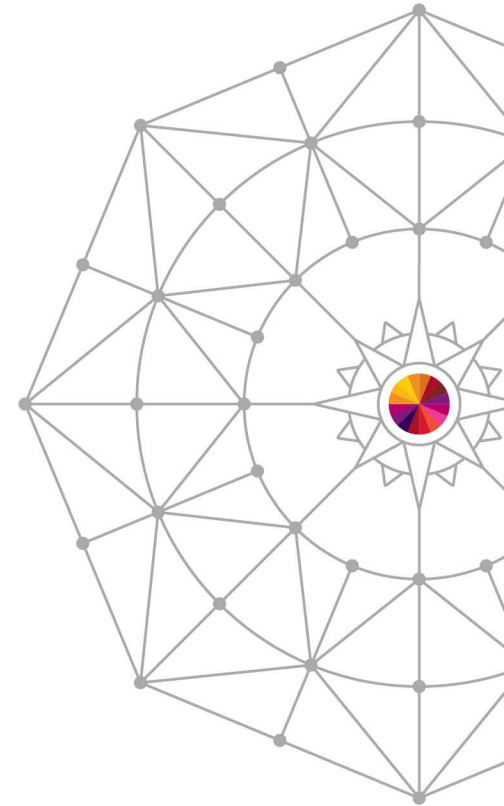
What about VVDS or ECS mode?

- No immediate change is necessary
 - Issuing RLSENABLE will stop the current mode and switch to RLS
 - Issuing RLSQUIESCE will stop RLS and return to ECS or VVDS
- If OPEN in VVDS or ECS on a system at 1.13 or lower, 2.1 will use the same method
- Over time, you may be able to reduce space allocated for ECS or VVDS mode



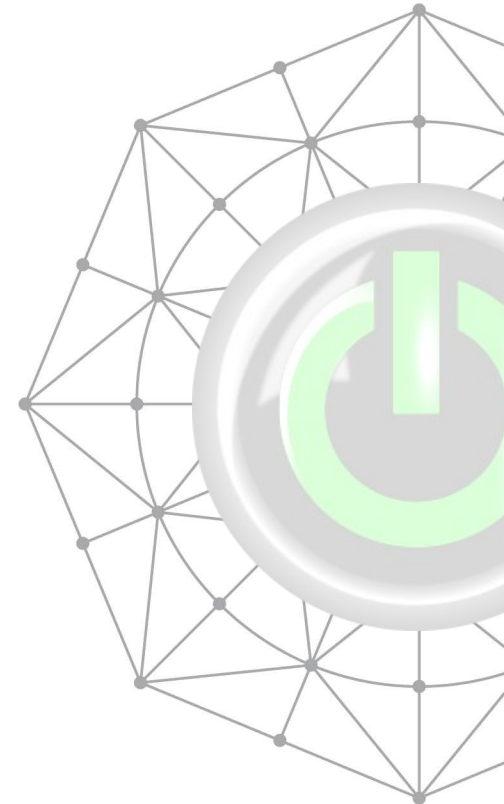
Getting Going

- Prepare Systems
- Configure SMS / SMSVSAM
- Configure Catalog Data Set Params
- **Turn it on!**



Turn it on!

- Double check:
 - Cache defined?
 - SMS updated?
 - SMSVSAM running?
 - Closed on all systems running < 2.1?
 - LOG(NONE) on desired user catalogs?
- **Enable via one of the following:**
 - **F CATALOG,RLSENABLE(ucatname)**
 - **F CATALOG,RLSENABLE,SYSTEM**
 - Closes non-RLS accesses and uses RLS at next reference



Trust, but Verify

F CATALOG,ALLOCATED

IEC348I ALLOCATED CATALOGS 118

```
*CAS*****
*  FLAGS -VOLSER-USER-CATALOG NAME                                %  *
*  YSU-R-  XP0301 0001 BOHLING.RLS.UCAT                            1  *
*  Y-I---  USRPAK 0001 SYS1.MVSRES9.MASTCAT                        1  *
*****
*  Y/N-ALLOCATED TO CAS, S-SMS, V-VLF, I-ISC, C-CLOSED, D-DELETED,  *
*  R-SHARED, A-ATL, E-ECS SHARED, K-LOCKED, U-RLS, W-SUSPENDED    *
*CAS*****
```

D GRS,RES=('SYSIGGV2',*)

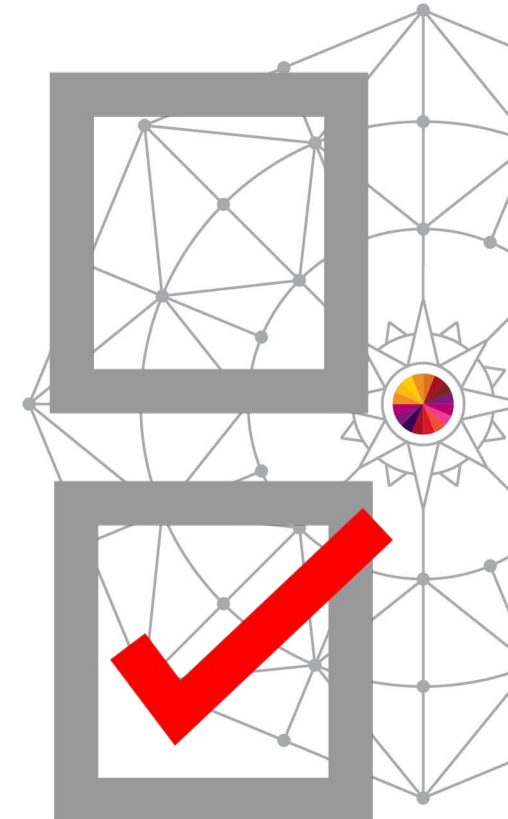
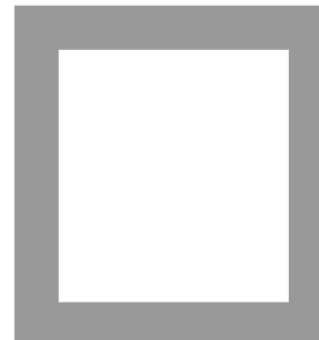
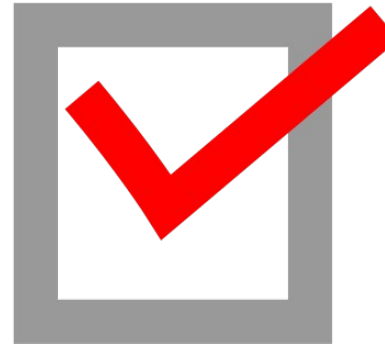
ISG343I 16.27.56 GRS STATUS 077

S=SYSTEMS **SYSIGGV2 BOHLING.RLS.UCAT**

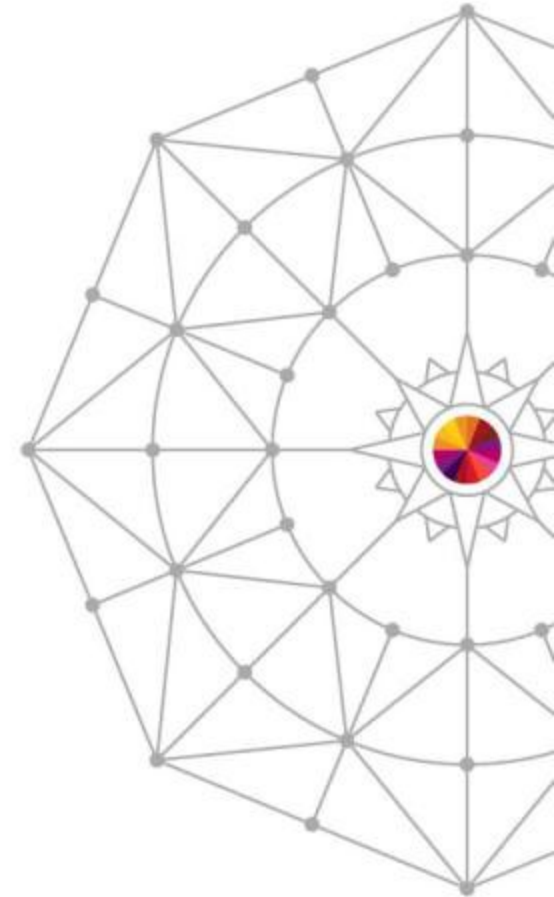
SYSNAME	JOBNAME	ASID	TCBADDR	EXC/SHR	STATUS
SYSTEM1	SMSVSAM	0037	008FA680	SHARE	OWN

Complete Checklist

- Update maintenance
- Update CFRM:
 - Cache(s)
 - IGWLOCK00
- Update SMS
 - Update IGDSMSxx
 - RLSINIT(YES)
 - RLS_MAX_POOL_SIZE(yyyy)
 - RLSABOVETHEBARMAXPOOLSIZ
 - RLS_MAXCFFEATURELEVEL(A)
 - Update Cache Sets
 - Update Storage Class - CF Cache Set Name
 - Update Data Class
 - RLS Above the 2-GB Bar
 - RLS CF Cache Value
 - Update ACS
- Ensure SMSVSAM is up
- Close from all non 2.1 systems
- Update Data Set Parms - LOG(NONE)
- RLS Enable the user catalog
 - F CATALOG,RLSENABLE(ucat)

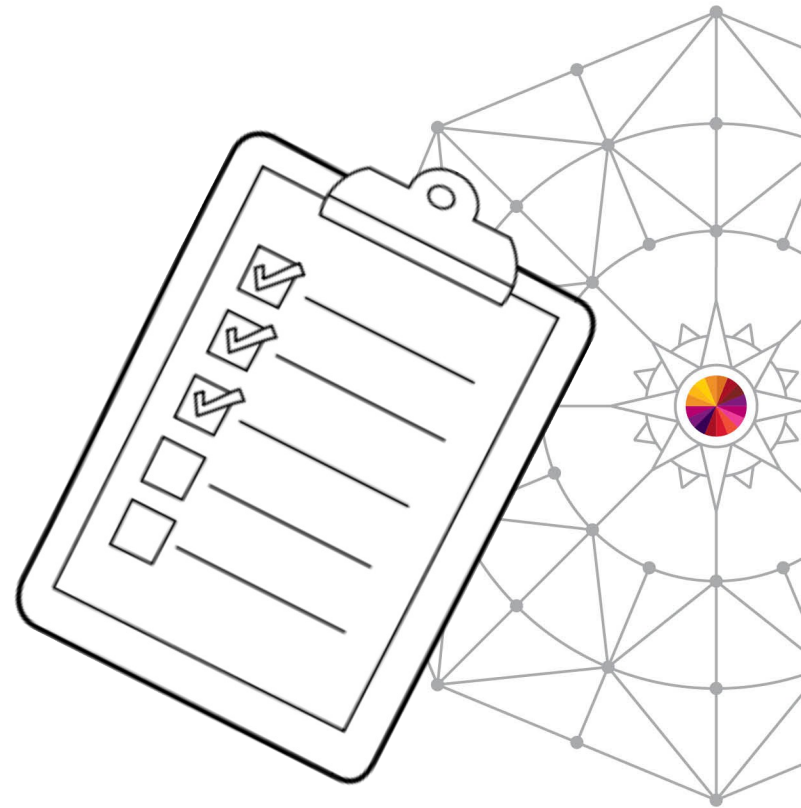


Monitoring



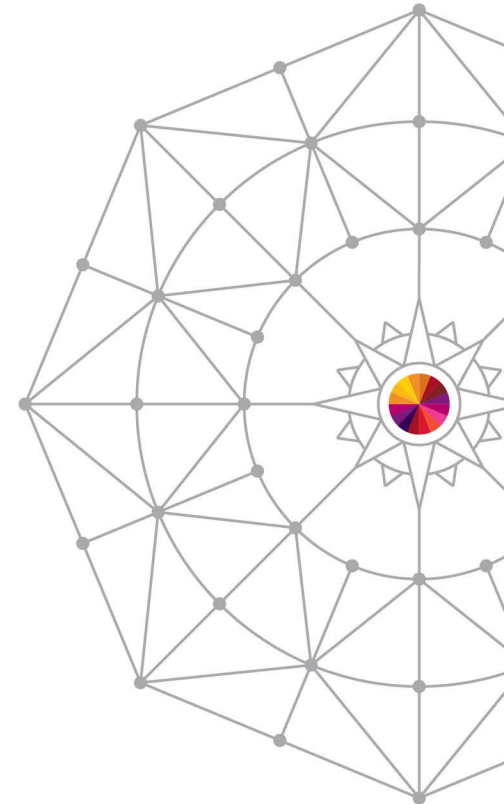
Master Agenda

- Why use RLS for catalogs?
 - Getting it Going
 - **Monitoring**
 - Maintenance
 - If things go wrong



Monitoring Options

- Messages
- Catalog side:
 - F CATALOG,ALLOCATED
 - F CATALOG,REPORT,PERFORMANCE
 - F CATALOG,REPORT,CATSTATS
 - F CATALOG,REPORT,CATSTATX(catname)
 - SMF60-66 records
- RLS side:
 - D SMS,CFLS
 - RMF Mon III
 - Omegamon XE
 - SMF42 subtype 15-19
- Both
 - SYSIGGV2 and SYSVSAM ENQ tracking

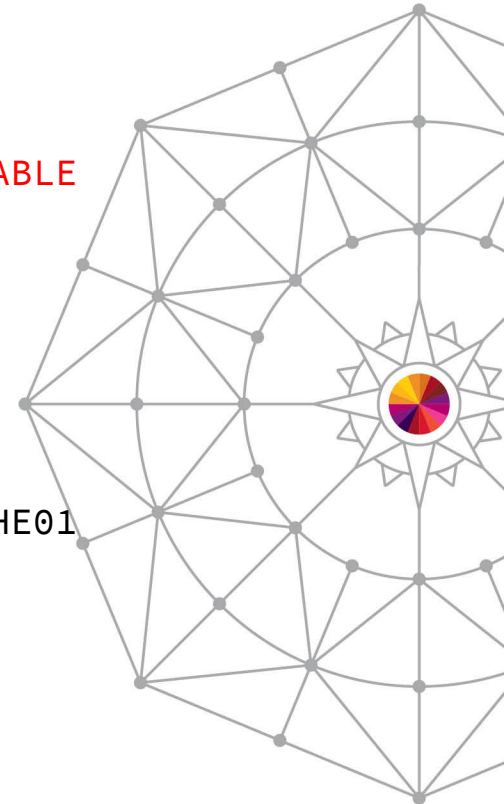


Messages

- Catalog will show successful change:
 - F CATALOG,RLSENABLE(BOHLING.RLS.UCAT)
IEC351I CATALOG ADDRESS SPACE MODIFY COMMAND ACTIVE
IEC352I MODIFY CATALOG BOHLING.RLS.UCAT TO STATE RLSENABLE
SUCCESSFUL
- SMSVSAM will issue message on CACHE connect
 - IGW453I SMSVSAM ADDRESS SPACE HAS SUCCESSFULLY 700
CONNECTED TO DFSMS CACHE STRUCTURE CACHE01

IGW468I DFSMS STATISTICS TASK FOR CACHE STRUCTURE: CACHE01
IS RUNNING ON SYSTEM: SYSTEM1

IGW500I DFSMS CACHE CONNECT PROTOCOL HAS DETECTED THAT
SYSTEM SYSTEM1 IS USING RLS MAX FEATURE LEVEL=A.
DFSMS DATACLASS VALUE SPECIFIED IN KEYWORD
RLSCFCACHE WILL BE USED FOR
DFSMS VSAMRLS SPHERES ASSIGNED TO DFSMS
CACHE STRUCTURE CACHE01



F CATALOG,ALLOCATED

F CATALOG,ALLOCATED

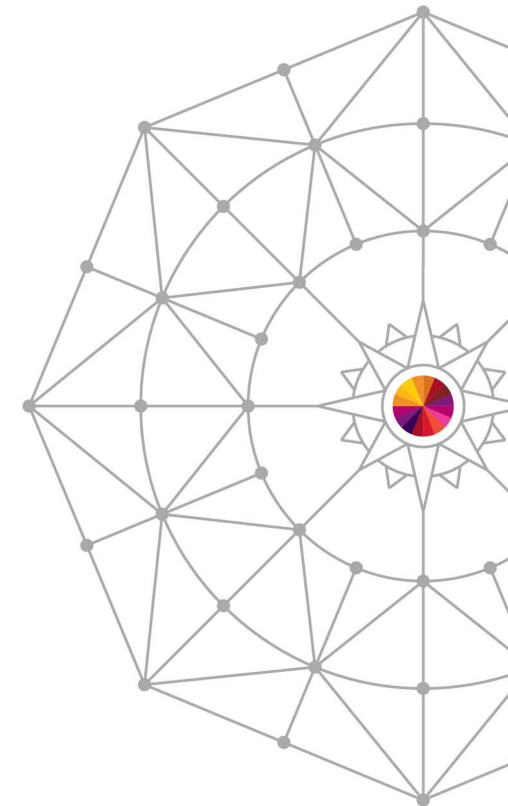
```
IEC348I ALLOCATED CATALOGS 118
*CAS*****
*  FLAGS -VOLSER-USER-CATALOG NAME                                %  *
*  YSU-R- XP0301 0001 BOHLING.RLS.UCAT                            1  *
*  Y-I--- USRPAK 0001 SYS1.MVSRES9.MASTCAT                        1  *
*****
*  Y/N-ALLOCATED TO CAS, S-SMS, V-VLF, I-ISC, C-CLOSED, D-DELETED, *
*  R-SHARED, A-ATL, E-ECS SHARED, K-LOCKED, U-RLS, W-SUSPENDED  *
*CAS*****
```

F CATALOG,REPORTS,PERFORMANCE

```

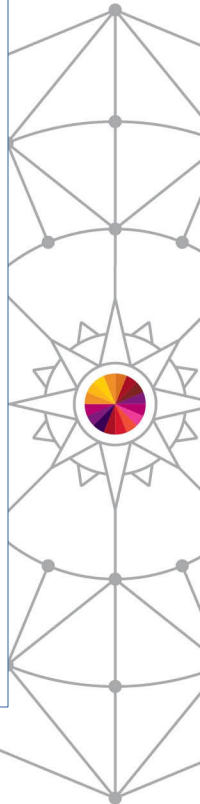
IEC359I CATALOG PERFORMANCE REPORT 127
*CAS*****
* Statistics since 21:45:12.84 on 03/07/2014 *
* -----CATALOG EVENT----- --COUNT-- ---AVERAGE--- *
* Entries to Catalog           840      27.624 MSEC *
* BCS ENQ Shr                   636      0.036 MSEC *
* BCS ENQ Shr Sys                380      9.266 MSEC *
* BCS ENQ Excl                    5      0.013 MSEC *
* BCS ENQ Excl Sys                5      9.830 MSEC *
* BCS DEQ                       1,255      3.879 MSEC *
* BCS Allocate                   13     58.862 MSEC *
* SMF Write                       35      0.020 MSEC *
* CAS MLA Lock                    1      0.288 MSEC *
* VVDS Format                      2     10.147 MSEC *
* MVS Allocate                     6    127.281 MSEC *
* SMS Active Config                3      0.073 MSEC *
* SYSVSAM S ENQ Excl              13     36.419 MSEC *
* SYSVSAM S DEQ                   13      8.585 MSEC *
* SYSVSAM D ENQ Shr                13      4.689 MSEC *
* SYSVSAM D DEQ                   13     10.067 MSEC *
*CAS*****
* (truncated to fit)

```



F CATALOG,REPORT,CATSTATS

```
IEC359I CATALOG I/O STATS REPORT 143
*CAS*****
*      ADDS   UPDATES      GETS   GETUPD  DELETES  BUFNI  BUFND  STRNO  *
*
* BOHLING.RLS.UCAT
*          4         1        36        3      0         1         2       180  *
* SYS1.MVSRES9.MASTCAT
*          2         3    2,352         3      0         4         4         2  *
*CAS*****
```

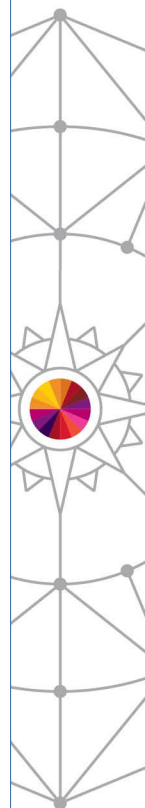


F CATALOG,REPORT,CATSTATX(ucat)

IEC359I EXTENDED CATALOG STATS 279

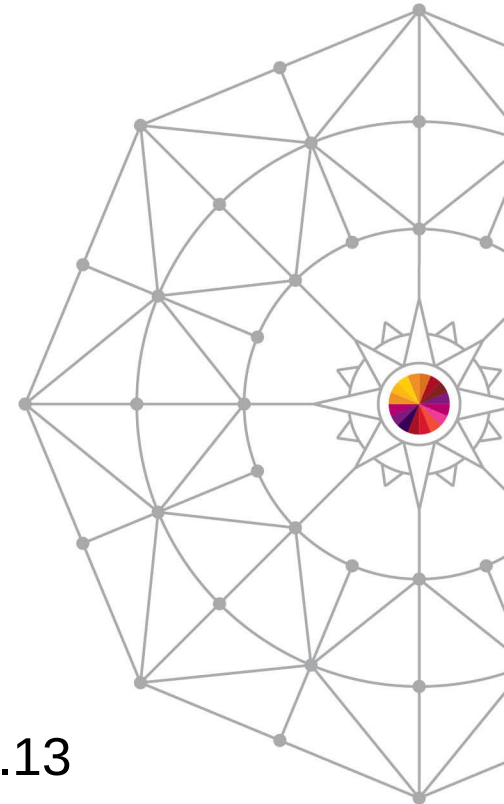
```

*CAS*****
*  CATALOG NAME      = BOHLING.RLS.UCAT
*  INSERTS (ADDS)    =          19
*  UPDATES           =          13
*  RETRIEVES         =       3,776
*  RETRIEVES FOR UP =          210
*  ERASES (DELETES) =          12
*  CA-RECLAIMS       =          N/A
*  CA-REUSES         =          N/A
*  BUFNI SETTING     =           1
*  BUFND SETTING     =           2
*  STRNO SETTING     =          180
*  AVG ELAPSED TIME  =       3.608 MSEC
*  AVG CPU TIME      =       525.240 USEC
*CAS*****
  
```



Measurements – SMF 60

- SMF 6x types
 - **Type 60** - VVR Updated
 - **Type 61** - ICF Define
 - **Type 62** - VSAM Open
 - **Type 64** - VSAM Close*
 - **Type 65** - ICF Delete
 - **Type 66** - ICF Alter
- Type 64 records stats on catalog close as of z/OS 1.13



D SMS,CFLS

```
IGW320I 15:23:13 Display SMS,CFLS(IGWLOCK00 )
PRIMARY STRUCTURE:IGWLOCK00 VERSION:CCD2152BAFB5342A SIZE:4096K
RECORD TABLE ENTRIES:10358 USED:6
SECONDARY STRUCTURE:IGWLOCK00 VERSION:CCD2152C352A9010 SIZE:4096K
RECORD TABLE ENTRIES:10358 USED:6
LOCK STRUCTURE MODE: DUPLEXED STATUS: ENABLE
```

System	Interval	LockRate	ContrRate	FContrRate	WaitQLen
SYSTEM1	1 Minute	1079.9	0.000	0.000	0.00
SYSTEM1	1 Hour	42.5	0.000	0.000	0.00
SYSTEM1	8 Hour	5.3	0.000	0.000	0.00
SYSTEM1	1 Day	-----	-----	-----	-----

*** No other systems provided data

***** LEGEND *****

LockRate = number of lock requests per second
 CONTRATE = % of lock requests globally managed
 FCONTRATE = % of lock requests falsely globally managed
 WaitQLen = Average number of requests waiting for locks



RMF MON III – RLSSC & RLSDS

RMF V2R1 VSAM RLS Activity - CAPTKEN1 Line 1 of 5

Samples: 100 Systems: 1 Date: 03/08/14 Time: 15.23.20 Range: 100 Se

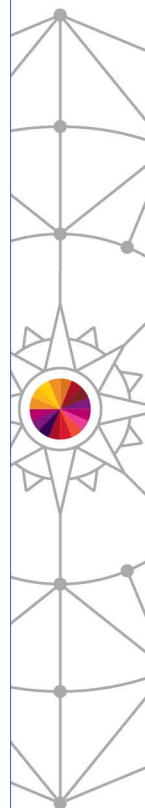
< 2GB / > 2GB

LRU Status : Good / Good

Contention % : 0.0 / 0.0

False Cont % : 0.0 / 0.0

Stor Class	Access	Resp Time	----- Read Rate	----- Read BMF%	----- Read CF%	----- Read DASD%	----- BMF Valid%	----- BMF False Inv%	Write Rate
RLS									
Below 2GB	DIR	0.000	0.00	0.0	0.0	0.0	0.0	0.00	0.00
	SEQ	0.000	0.00	0.0	0.0	0.0	0.0	0.00	0.00
Above 2GB	DIR	0.001	2254	99.4	0.0	0.6	100	0.00	1137
	SEQ	0.000	0.00	0.0	0.0	0.0	0.0	0.00	0.00

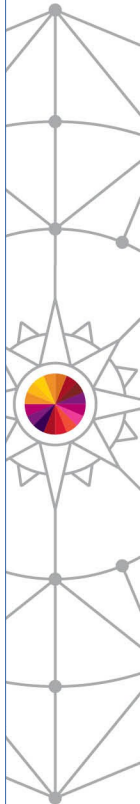


RMF MON III - RLSLRU

RMF V2R1 VSAM LRU Overview - CAPTKEN1 Line 1 of 3

Samples: 100 Systems: 1 Date: 03/08/14 Time: 15.23.20 Range: 100 Sec

MVS System	Avg CPU Time	- Buffer Goal	Size - High	Accel %	Reclaim %	----- BMF%	Read CF%	----- DASD%
SYSTEM1								
Below 2GB	<.001	100M	10M	0.0	0.0	0.0	0.0	0.0
Above 2GB	<.001	1000M	328M	0.0	0.0	99.4	0.0	0.6



Omegamon XE

See session 14614, Tuesday at 3 in Grand Ballroom Salon B



RLS Summary - dem17inx.democentral.ibm.com - Vickie Dault

File Edit View Help

Navigator View: Physical

- Virtual Tape Subsystems
- SMS Storage Groups Performance
- SMS Storage Groups Space
- User DASD Groups Performance
- User DASD Groups Space
- DFSMShsm Status
- Tape Management Status
- Record Level Sharing**
- Dataset Attributes System Summary
- Dataset Group Summary
- SMS Configuration
- Storage Toolkit

Storage Dashboard Physical

RLS Lock Structure CF Details

Lock Name	Sysplex Name	Entries Used Pct	Total Entries	Used Entries	Structure Size	Lock Mode	Lock Status	Primary Version	Secondary Version	Duplex Time

RLS Overview

Lock Name	System Sysplex Name	Systems Reporting	Interval	Lock Rate	Contention Rate	False Cont Rate	Avg Queue Length	Statistics Level

Lock Structure Summary

Lock Table Name	System Sysplex Name	DWA Lock Requests	DWA Lock Requests per Minute	DWA Lock True Contention Pct	DWA Lock True Contention Min	ATE Lock False Cont Pct	ATE Lock False Cont Per Minute	Exp Path True Contention Pct	Exp Path False Cont Lock Req Per Minute	Main Path True Contention Pct	Main Path True Cont Lock Req Per Minute	Rec Lock True Contention Pct	Rec Lock Reg True Con Minute	Upgrade Locks True Cont Pct
IGWLOCK00	DEMOPLX	0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0

Buffer LSU Summary

Location	System Sysplex Name	BMF Panic Mode Pct	BMF Panic Mode	BMF Accelerated Mode Pct	BMF Accelerated Mode	XCF Castout Lock Cont Retry Pct	XCF Castout Lock Retries	Current BMF Read Hit Pct	Min BMF Read Hit Pct	Curr Recursive Local Cl Ref Pct	Minimum CF Cache Read Hit Pct	Average CF Cache Read Hit Pct	Current DASD Hit Pct	Avg Recursive Local Cl Ref Pct	Average Cl Ref
Above the bar	DEMOPLX	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below the bar	DEMOPLX	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Storage Class Summary

Storage Class	System Sysplex Name	Average Response Time	DWA Lock Requests	DWA Lock Requests per Minute	DWA Lock True Contention Pct	DWA Lock True Contention Min	DWA Lock Percent	BMF Requests	BMF Requests per Minute	BMF False Invalid percent	BMF False Invalids	BMF False Invalids per Minute	Lock Requests	Lock Requests per Minute	Lock Contention Percent	False Lock Contention Pct

Performance Measurements – SMF 42

- SMF 42 Subtypes
 - **Subtype 15** - RLS statistics by storage class
 - **Subtype 16** - RLS statistics by data set
 - **Subtype 17** - RLS CF lock structure usage
 - **Subtype 18** - RLS CF caching statistics
 - **Subtype 19** - Buffer Manager LRU statistics
- Note: Only one system in the sysplex collects the SMF 42 records. The system collecting the records is displayed in the D SMS,SMSVSAM operator command.
- Must use V SMS,MONDS(spherename),ON to collect subtype 16 statistics



Monitor ENQs

- SYSIGGV2 'UCAT' will be held SHARED by SMSVSAM
- SYSIGGV2 'sphere' will be held by Catalog whenever updating that particular sphere record

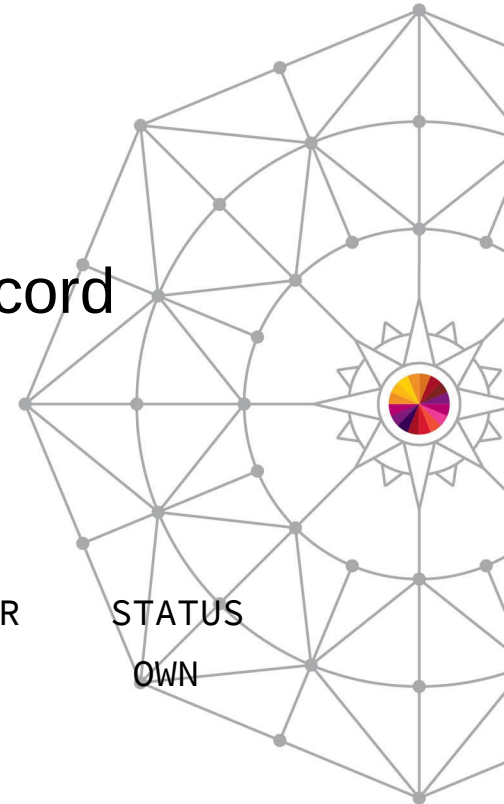
```
D GRS,RES=('SYSIGGV2',*)
```

```
ISG343I 16.27.56 GRS STATUS 077
```

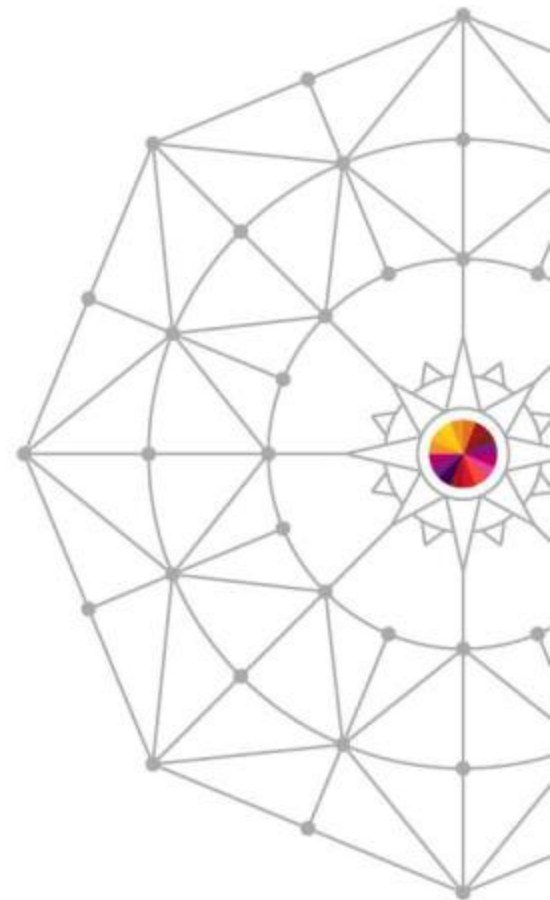
```
S=SYSTEMS SYSIGGV2 BOHLING.RLS.UCAT
```

SYSNAME	JOBNAME	ASID	TCBADDR	EXC/SHR	STATUS
SYSTEM1	SMSVSAM	0037	008FA680	SHARE	OWN

- SMF Type 77 also tracks ENQ use

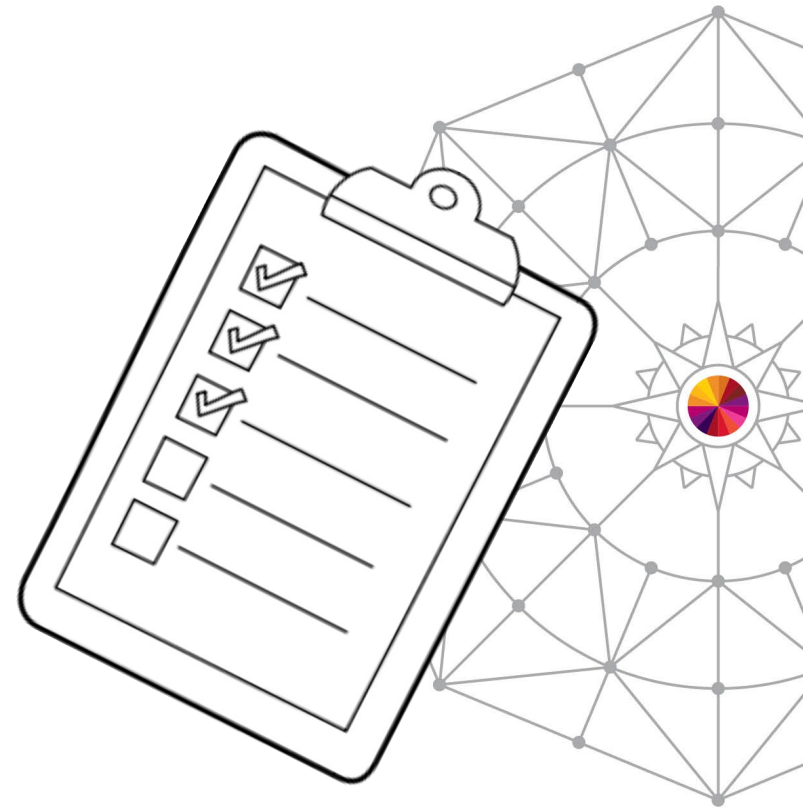


Maintenance



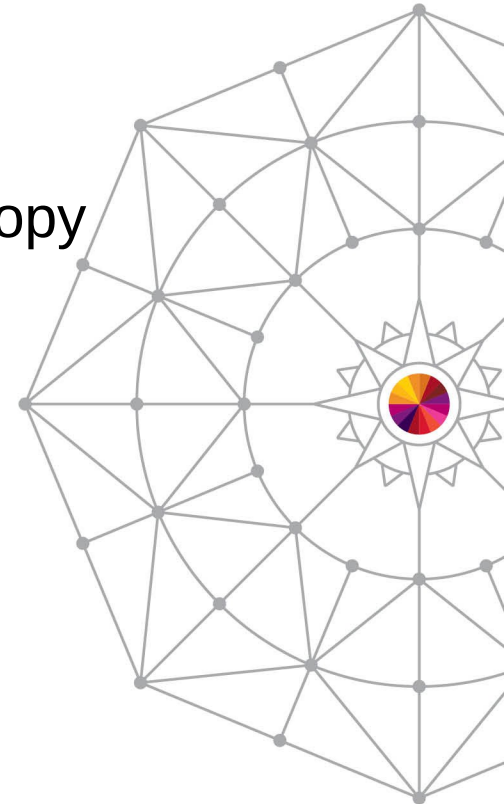
Master Agenda

- Why use RLS for catalogs?
 - Getting it Going
 - Monitoring
 - **Maintenance**
 - If things go wrong



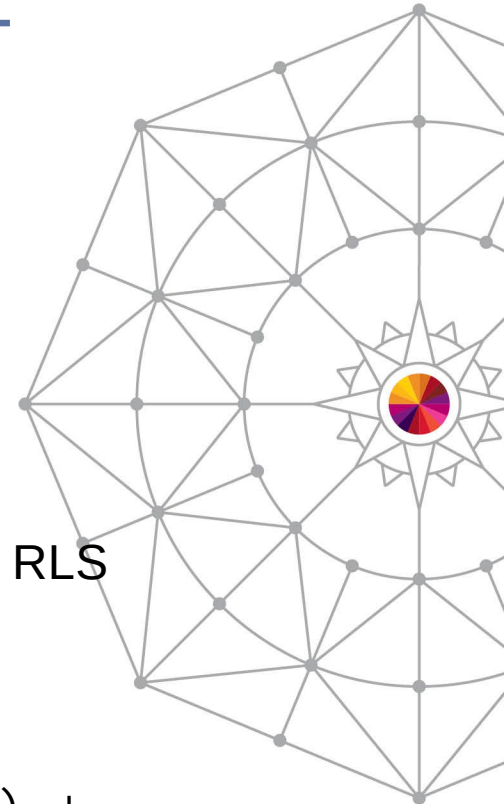
Maintenance Modes

- **Quiesced for Copy**
 - Temporarily pauses all activity to that catalog
 - Used by DSS during COPY to get accurate copy
- **Suspended**
 - Catalog CLOSED, new requests WAIT
 - Used as part of recovery
 - Can be RESUMED
- **Locked**
 - Catalog CLOSED, new requests FAIL
 - Locks Catalog from update



Maintenance

- **IDCAMS PRINT / REPRO / IMPORT / EXPORT**
all support RLS at z/OS 2.1
- New Parameters:
 - **RLSSOURCE()** and **RLSTARGET()**
 - YES = Use RLS to open SOURCE / TARGET
 - NO = Use NSR / Non-RLS VSAM to open
 - QUIESCE = Quiesce the activity before opening via RLS
- Example:
REPRO INDATASET(TEST.FROM) OUTDS(TEST.TO) +
RLSSOURCE(YES) RLSTARGET(NO)



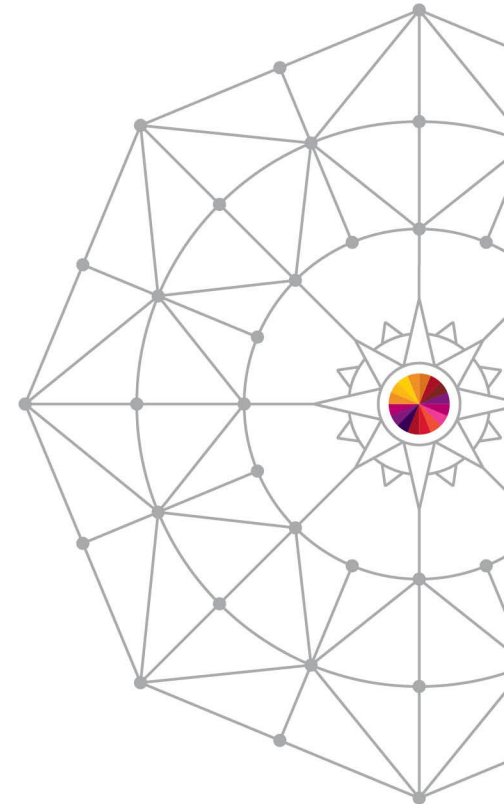
Backups with DSS

- **DSS DUMP:**
 - Automatically issues QUIESCE for COPY the catalog in order to get a serialized copy
 - For Non-RLS, uses standard SYSIGGV2 to serialize
- **DSS RESTORE**
 - BCSRECOVER(LOCK/SUSPEND) – new parameter
 - LOCK – closed catalog plex-wide and fails requests
 - SUSPEND – closes catalog and holds requests
 - If used, DSS will unlock/resume after RESTORE
 - RESTORE will fail if not locked or suspended – so if DSS doesn't do it, administrator should

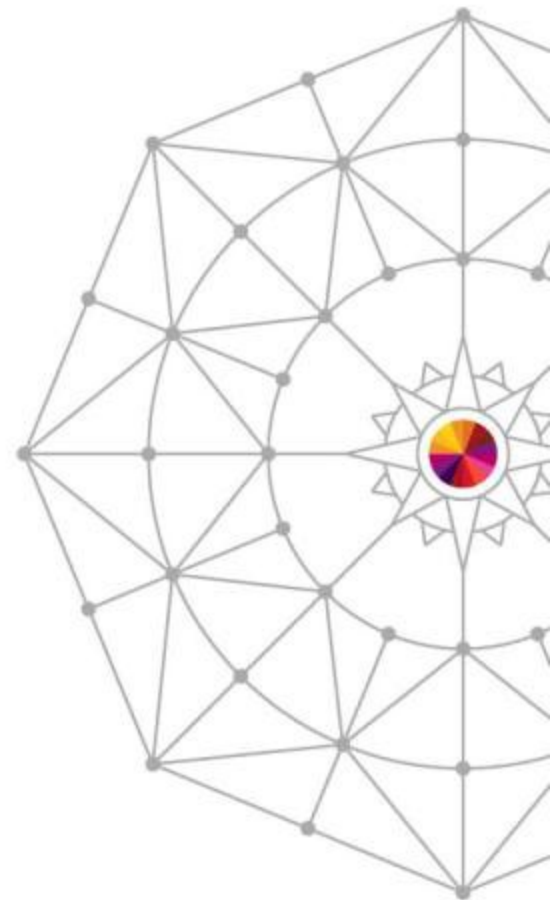


Forward Recovery (to a new volume)

- **Ensure you have a backup**
- **Suspend or lock the catalog**
 - F CATALOG,RECOVER,SUSPEND(ucat) or
 - F CATALOG,RECOVER,LOCK(ucat)
- **DELETE ucat NODISCONNECT**
 - Deletes DSCB and VVR, but saves alias information
- **DEFINE UCAT NAME(ucat) RECONNECT VOL(volser2) SUSPEND**
 - Defines the user catalog, reconnects to alias information
 - SUSPEND ensures it remains suspended
 - Optionally add LOG(NONE) RLSENABLE for RLS access
- **IMPORT CONNECT VOL(volser2) ALIAS**
 - Run on other systems sharing the UCAT with different MCATs
 - Updates the UCONN with new volume
- **Restore backup copy**
 - DSS RESTORE – DSS will detect empty pre-existing target and will copy from backup
 - OEM utilities should perform the same way
- **Apply updates using ICFRU or other utility**
- **Resume catalog**
 - F CATALOG,RECOVER,RESUME(ucat) or UNLOCK(ucat)

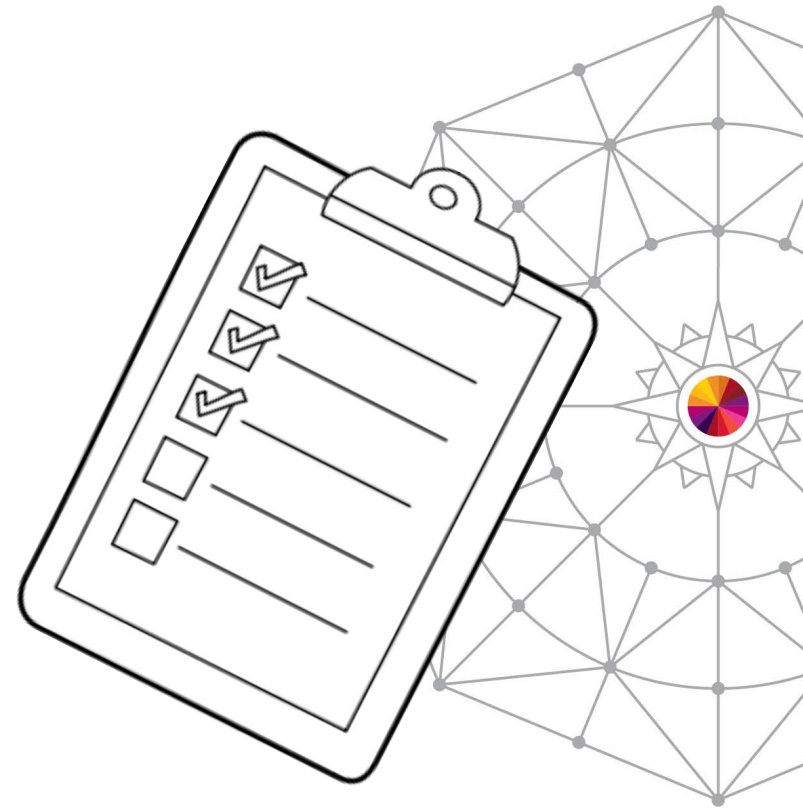


If Something Goes Wrong



Master Agenda

- Why use RLS for catalogs?
 - Getting it Going
 - Monitoring
 - Maintenance
 - **If things go wrong**



If SMSVSAM becomes unavailable

- **IGW408I** SMSVSAM SUCCESSFULLY TERMINATED AT END OF MEMORY
- **IGW416I** TERMINATING ERROR DETECTED IN SMSVSAM SERVER ADDRESS SPACE.
RETURN CODE (IN HEX): return-code REASON CODE (IN HEX):
reason-code
- If already opened:
 - **IEC251I** 016-0609 ,CATALOG,ALLOCATE,SYS00008,, ,BOHLING.RLS.UCAT
 - **IEC365D** SMSVSAM ADDRESS SPACE STILL NOT AVAILABLE FOR CATALOG ADDRESS SPACE. REPLY RLSQUIESCE OR CANCEL
- If not currently open:
 - **IEC161I** 009-0663 ,CATALOG,ALLOCATE,SYS00015,, ,BOHLING.RLS.UCAT
- To Resolve:
 - Start SMSVSAM – will respond to IEC365D
 - Respond to IEC365D with RLSQUIESCE
 - F CATALOG,RLSQUIESCE(ucat) or ,SYSTEM
 - IEC352I MODIFY CATALOG BOHLING.RLS.UCAT TO STATE RLSQUIESCE SUCCESSFUL



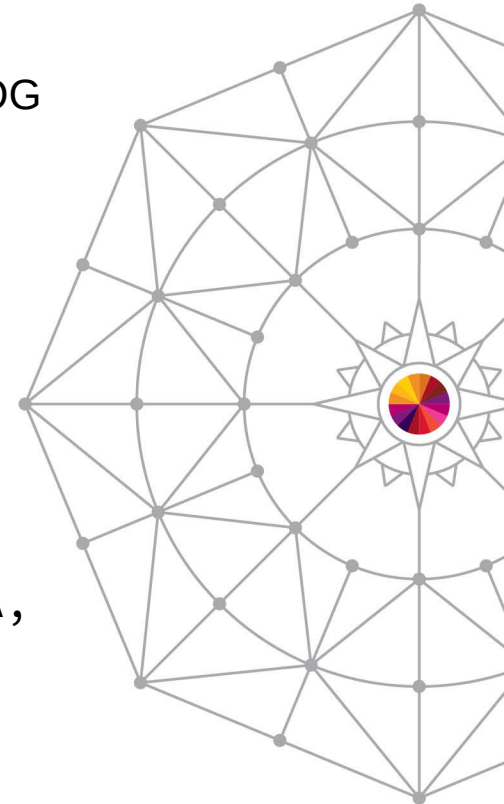
Gathering Diagnostic Data

- F CATALOG,TAKEDUMP(SYSPLEX)
 - Automatically takes plex-wide dumps of SMSVSAM and CATALOG
- F CATALOG,DUMPON(rc,rsn,*)
 - Also updated to automatically dump RLS when involved

- Console dump:

```
DUMP COMM=(some meaningful dump title)
R xx,JOBNAME=(CATALOG,XCFAS),CONT
R yy,DSPNAME=('SMSVSAM'.*),CONT
R nn,SDATA=(PSA,NUC,SQA,LSQA,SUM,RGN,GRSQ,LPA,
TRT,CSA,XESDATA),CONT
R zz,REMOTE=(SYSLIST=(*('SMSVSAM'))),
DSPNAME,SDATA),END
```

- See session #15090 for RLS Best Practices



On the Fly Diagnostics

- Is the request hung in CATALOG or RLS?

- F CATALOG,LIST

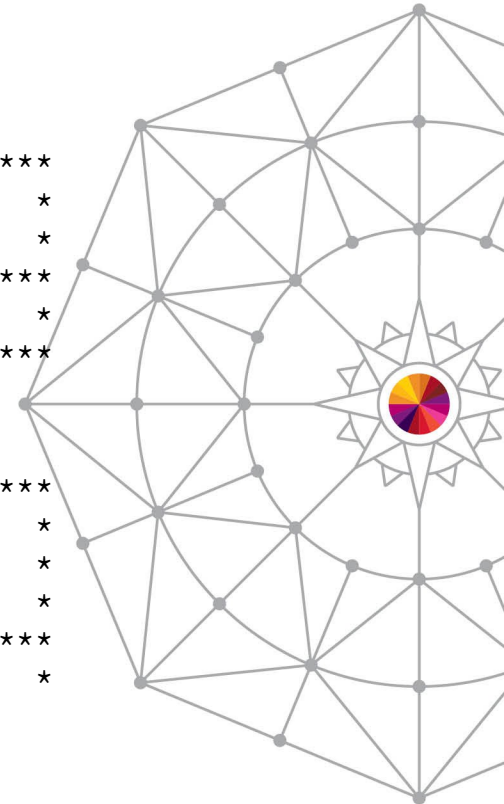
- IEC347I LIST CATALOG TASK(S)

```
*CAS*****
* FLAGS - TASK ADDRESS - JOBNAME / STEPNAME - ELAPSED TIME - ID *
* -W---L      005AB2A8      ACCTING / SORTSTEP      00.08.26      04 *
*****
* O-OLDEST, W-WAIT, A-ABEND, E-ENQ, R-RECALL, L-RLS *
*CAS*****
```

- IEC347I LIST CATALOG TASK(S)

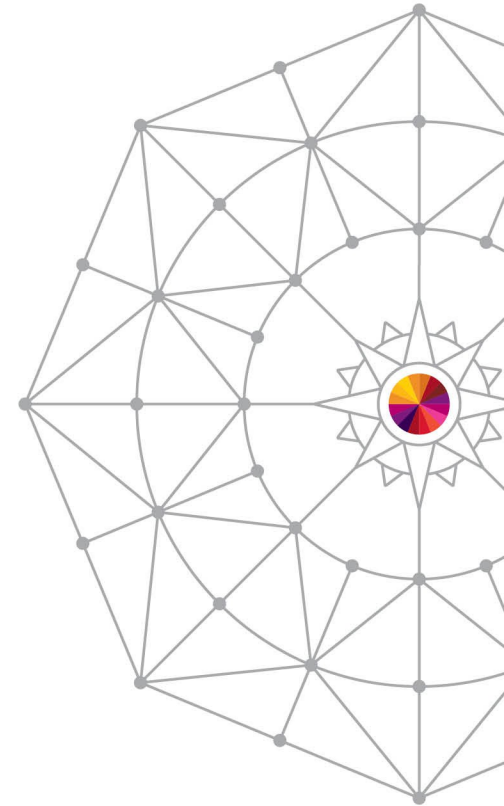
```
*CAS*****
* FLAGS - TASK ADDRESS - JOBNAME / STEPNAME - ELAPSED TIME - ID *
* -W-E--      00974E88      #PMF0663 / MFA8401      00.32.19      01 *
* WAITING FOR SPHERE ENQ Excl Sys FROM 2268D8E8 FOR 00.32.19 *
*****
* O-OLDEST, W-WAIT, A-ABEND, E-ENQ, R-RECALL, L-RLS *
```

- D GRS,RES=('SYSIGGV2',*)
- D GRS,RES=('SYSVSAM',*)
- D SMS,SMSVSAM,DIAG(C)



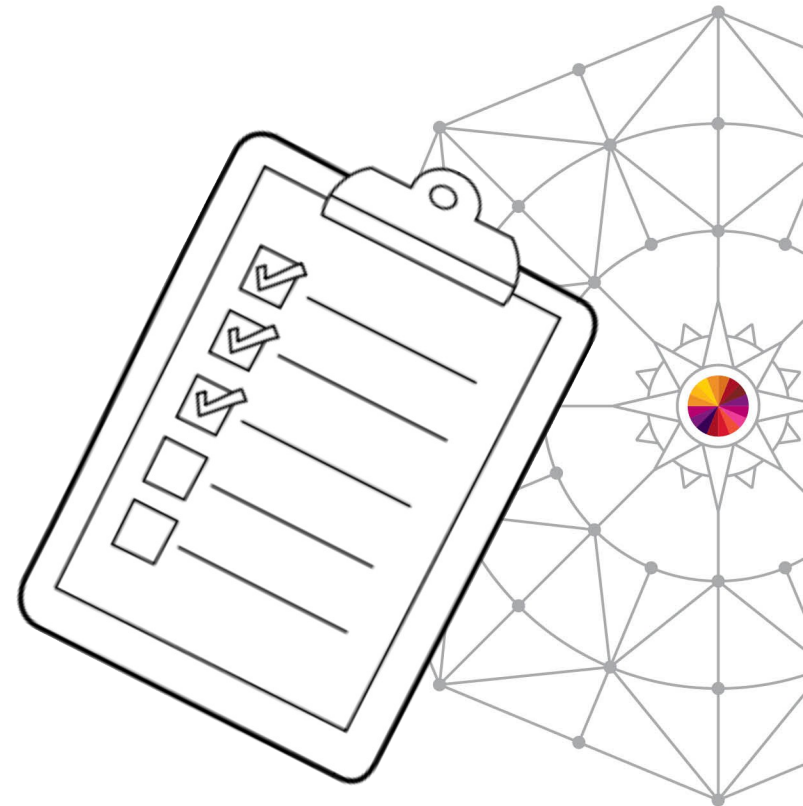
Restarting

- To retry a task:
 - F CATALOG,LIST to get task id
 - F CATALOG,END(id),REDRIVE
 - F CATALOG,ABEND(id)
- To stop / restart SMSVSAM
 - FORCE SMSVSAM,ARM
 - V SMS,SMSVSAM,TERMINATESERVER
 - V SMS,SMSVSAM,ACTIVE
- To restart CATALOG
 - F CATALOG,RESTART



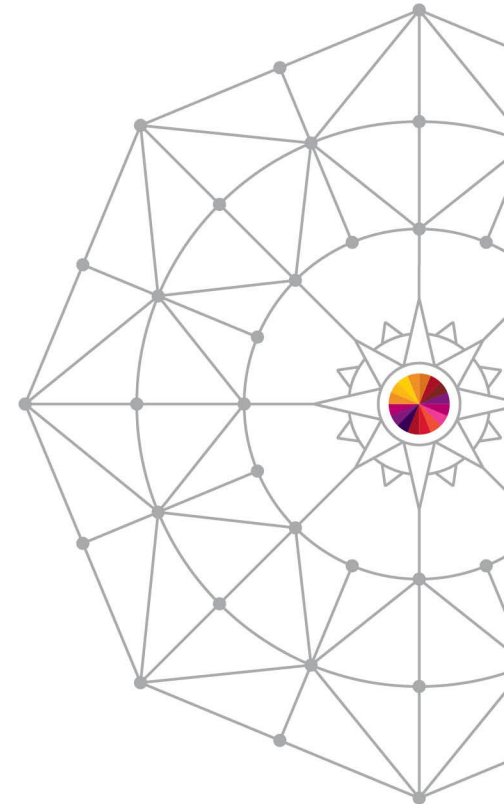
Master Agenda

- Why use RLS for catalogs?
 - Getting it Going
 - Monitoring
 - Maintenance
 - If things go wrong



References

- ***DFSMS Managing Catalogs***
 - SC26-7409
- ***DFSMS Access Methods Services for Catalogs***
 - SC26-7394
- ***DFSMS Diagnosis Reference***
 - GY27-7618
- ***MVS Initialization and Tuning Reference***
 - SA22-7592
- ***MVS System Commands***
 - SA22-7627
- ***MVS System Management Facilities (SMF)***
 - SA22-7630
- **“Unclog Your Systems with z/OS 2.1 – Something New and Exciting in Catalog”** by Terri Menendez
 - Share in San Francisco, Spring 2013, Session #12977 / 12978



Special Thanks to:

Terri Menendez, for her input and session
“Unclog Your Systems with z/OS 2.1”

Frank McCune, for his help with the presentation



RLS and Catalogs A Practical Guide / How-to

Neal Bohling, IBM

March 11, 2014
Session 15089

