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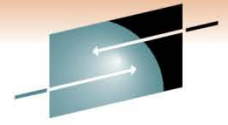
Technology • Connections • Results

CICS and VSAM/RLS User Experience

Glenn A. Schneck
SunTrust Banks, Inc.

March 3, 2011
Session 8277





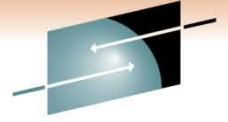
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CICS and VSAM/RLS User Experience

Agenda

- Who we are
- Environment overview
- Issue encountered
- Available Options and Selection
- Implementation and Customization
- Issues encountered
- Tips and hints

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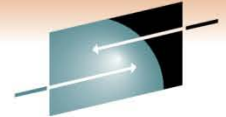
Who we are and Environment Overview

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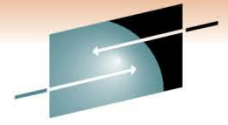
Who we are

- Headquartered in Atlanta, Ga.
- 7th Largest Bank in US
- Regional Presence in Southeast and Mid-Atlantic
- \$174+ Billion in assets



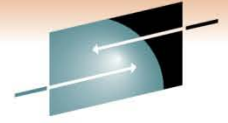
Environment Overview

- 34 LPARS
 - 6 NET390
 - 8 ICF
 - 6 DataMover
 - 1 NET390
 - 2 Control
 - 3 System Data Mover
 - 14 Application
 - 2 Tech 'Sandbox'
 - 4 Development and Integrated Testing
 - 2 QA
 - 6 Production
- z/OS 1.11
- Program Products for CICS
 - Omegamon for CICS
 - IBM Suite of PD Tools
 - GT Ivory



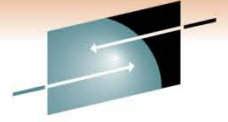
Environment Overview (cont)

- DB2 V9.0
 - 60 Subsystems
 - Multiple Data-Sharing Groups
 - New Function Mode
- WebSphere/MQ for z/OS V7.0
 - Shared Queues between High Availability LPARs (In process)
 - Clustering enabled
 - Extensive use of MQ-CICS Bridge



Environment Overview (cont)

- CICS TS 4.1
 - 266 Total Regions
 - 112 Development/Maintenance
 - 14 Training
 - 16 Integrated Testing – Release Planning Path 1
 - 16 Integrated Testing – Release Planning Path 2
 - 12 Integrated Testing – Break Fix Path
 - 32 QAPlex – Release Path 1
 - 32 QAPlex – Release Path 2
 - 32 Production
 - 26 High Availability
 - 2 WUI
 - 4 Legacy
 - VSAM/RLS
 - Temporary Storage Shared Queues
 - Extensive use of BAS
 - DVIPA, Shared IP Ports, & SYSPLEX Distributor



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Issues Encountered

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CICS and VSAM/RLS User Experience

Issues Encountered

- High Availability Environment
 - Single FOR servicing multiple LPARs
 - Potential outage if FOR or LPAR is down
 - Critical applications updating file(s)
 - 26 AORs using 1 FOR
 - Cross LPAR performance

CICS and VSAM/RLS User Experience

Available Options *Short Term*

- Move 'read-only' files to AORs
 - Reduce dependency on a single FOR
 - Reduce function shipping overhead
- Duplicate FORs
 - One on each LPAR
 - Reduce workload of a single FOR
 - Limit outage in the event the LPAR and/or FOR failed
- Automation to start FOR on remaining LPAR in the event of a failure
- Write File Control Exit to re-route request to 'hot standby' FOR
 - Concerns with file integrity
 - Emergency restarts

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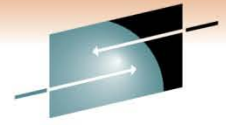
Available Options *Long Term*

- VSAM/RLS
 - No additional cost
 - No programming changes
 - New address spaces for SMSVSAM on each LPAR
 - SMSVSAM will serialize file updates
 - Local cache or cache structures used for READ/BROWSE requests
 - Coupling Facility required
 - At least 1 cache structure and lock structure must be defined
 - Dataset Catalog definition must be changed
 - Valid LOG parm definition
 - FCT change required
 - Identify file as RLS
 - New 'terminology'

CICS and VSAM/RLS User Experience

Available Options Long Term – Cont.

- VSAM Transparency
 - Purchased product
 - Migrate VSAM data to DB2 tables
 - No application changes required
 - Data available to both online and batch
 - Global exits used for CICS access
 - Separate address space required for Batch access
 - Conversion utilities available
 - Application vendor support concerns
 - Unknown performance overhead
 - JCL changes required for batch processing

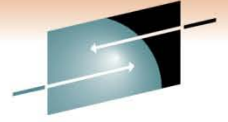


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Available Options *Long Term – Cont.*

- Transactional VSAM
 - Purchased product
 - Requires implementation of RLS
 - Recoverable data available to both online and batch concurrently
 - Vendor support concerns
 - Unknown performance overhead
 - Several application changes required
 - Modify program or JCL to request Transactional VSAM
 - Update batch programs to invoke Resource Recovery Services (RRS) for commit and backout
 - Be careful of Unit of Recovery (UR) lock contention
 - Code like CICS programs
 - New error codes
 - Exclude use of file backup/restore for job restarting
 - NOTE: Review CICS and Transactional VSAM presentation by Ed Addison, IBM Level 2 (<http://www-1.ibm.com/support/docview.wss?uid=swg27009511&aid=1>)

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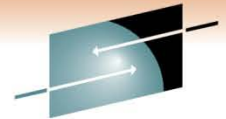
Implementation and Customization

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CICS and VSAM/RLS User Experience

Implementation and Customization

- Create SMSVSAM address space
 - Create SHCDS datasets
 - At least two Active and at least one Spare
 - Activated with V SMS,SHCDS(shcdsname),NEW and NEWSPARE commands.
 - Create cache structure(s) and lock structure.
 - Create at least one cache set
 - Cache set is an SMS object
 - Used to point an SMS Storage class to the appropriate cache structure(s)
 - Storage class must then be coded on files that are to become RLS files
 - We changed our already existing Storage classes that our VSAM files use to include the cache set, thus applications did not have to alter the Storage class of their files
 - Can create two cache structures and include both on the cache set definition – this will provide balancing and failover (this is what we did and is recommended).

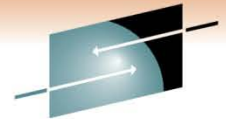


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Implementation and Customization – Cont

Create SMSVSAM address space - Cont

- Update existing Storage Classes to include cache sets, or create new Storage Classes.
- Update the IGDSMSxx member of SYS1.PARMLIB to include RLS parms:
 - RLSINIT(YES)
 - *Will automatically start SMSVSAM at IPL. (NOTE: Can be started manually with command: V SMS,SMSVSAM,ACTIVE).*
- RLS_MAX_POOL_SIZE
 - Size of the local SMSVSAM cache space, default is 100Meg
 - We increased ours to 200Meg.
- RLS_MaxCfFeatureLevel – A value of ‘Z’ is the default
 - Changing to ‘A’ may improve performance of files with greater than 4K CIsze, but may require larger cache structure
 - We are using the default of ‘Z’
- Grant UPDATE access to SMSVSAM to the SHCDS datasets

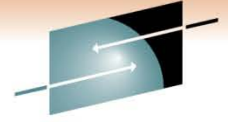


CICS and VSAM/RLS User Experience

Implementation and Customization – Cont

Create SMSVSAM address space - Cont

- Grant ALTER access to SMSVSAM to Facility Class Profile IXLSTR.IGWLOCK00 (the Lock structure).
- Bring up SMSVSAM servers either with manual command or with RLSINIT(YES) and IPL
 - No JCL stored in SYS1.PROCLIB for SMSVSAM – the system will build the server JCL itself.
- Add SIT parm RLS=YES to appropriate CICS regions and cycle them.
- Make changes to application files as needed
 - LOG Parm
 - BWO parm – Where required
 - Specifying these parms in your SMS Dataclasses will negate the need for this step
 - We had our apps change the LOG and BWO parms on their dataset definitions.



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Implementation and Customization – Cont

Create SMSVSAM address space – Cont

- Change FCT definition for files to be opened as RLS to include RLS=YES and remove remote parms
 - You can leave them in your FOR as RLS files, but then the overhead of function shipping plus RLS is incurred
 - Recommend to open the files in your AORs
 - Some shops use this as an intermediate step – we went straight to the AORs

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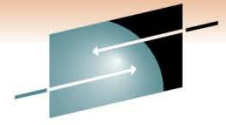
Implementation and Customization – Cont

Create SMSVSAM address space – Cont

- Grant access to MVS, Storage group and/or CICS personnel to RACF Facility class profile STGADMIN.IGWSHCDS.REPAIR
 - Required to run IDCAMS SHCDS
 - Useful in problem determination

```
//SHCDS EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
```

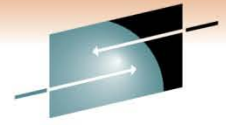
 - SHCDS LSS(ALL) ** lists all jobs/regions that are connected
RLS on this sysplex
 - SHCDS LSSDSL(CICSPR20) ** lists info for all RLS files open in this
region
 - SHCDS LISTDS(PROD2.GLVSAM.LOG) ** lists RLS info for this file.



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Implementation and Customization – Cont

- Alter files to update LOG and BWO (optional) definitions
 - LOG(NONE) – No recovery
 - LOG(UNDO) – Dynamic Transaction Backout Only
 - LOG(ALL) – DTB plus forward recovery
 - BWO(TYPECICS) – When using LOG(ALL)
 - Online files do NOT hang up during backup utilities
 - BWO(NULL)
 - BWO(NO)
 - Online file hangs up during backup when backup utilities are utilized
- Update any JCL that creates files to include appropriate LOG and BWO specifications
- Alternatively you can update the SMS definitions with the appropriate LOG and BWO specifications
- Update FCT entry Record Level Sharing (RLS) File Access Mode to RLS
- New commands added to Quiesce and Unquiesce files prior to Open/Close
 - Quiesce will close files
 - Unquiesce will not automatically open files
- Updates to old CAFC process

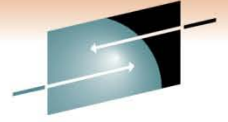


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Implementation and Customization – Cont

- SMSVSAM activation status
 - Issue D SMS,SMSVSAM, ALL
DISPLAY SMS,SMSVSAM - SERVER STATUS SYSNAME:
LPRD AVAILABLE ASID: 000A STEP: SmsVsamInitComplete
SYSNAME: LPRA AVAILABLE ASID: 000A STEP: SmsVsamInitComplete
SYSNAME: LPRC AVAILABLE ASID: 000A STEP: SmsVsamInitComplete
SYSNAME: LPRB AVAILABLE ASID: 000A STEP: SmsVsamInitComplete
SYSNAME: LPRT AVAILABLE ASID: 000A STEP: SmsVsamInitComplete
SYSNAME: LPRP AVAILABLE ASID: 000A STEP: SmsVsamInitComplete
SYSNAME: ASID: STEP:
SYSNAME: ASID: STEP:
- SmsVsamInitComplete
 - Good startup
 - If anything other, check startup messages

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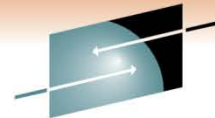
Issues Encountered

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Issues Enrountered

- BWO(TYPECICS) to avoid potential AFCK abends caused by conflicts with HSM and other backup software
 - If done before FCT changes file will not open
- DFHFC0521 CITAT201 RLS OPEN of file YYYYYYYYYY failed. Undefined LOG parameter is invalid for an RLS file with update type SERVREQs.
 - File has LOG defined as NULL – Must be NONE, UNDO or ALL



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Issues Encountered - Cont

IGW400I *****

IGW400I

IGW400I ABEND0F4 Rc1008 Rsn611BFBDA occurred to

IGW400I Job CICS RGN RPL 377B7D08 for data set

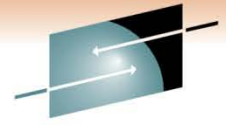
IGW400I PROD.XXXX.YYYY.ZZZZ

IGW400I

IGW400I *****

RLS bug fixed in APAR OA15595 – PTF UA29694

** PTF closed on 10/03/2006

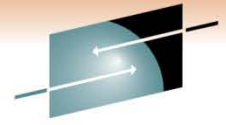


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Issues Encountered – Cont

Application design causing slow response

- **Application is using a multi-field key**
 - Datestamp & Timestamp as first two fields of key
 - Effect was to sequentially add records
 - File became high volume
 - All file activity updating same CI
- **RLS**
 - Locks on Record Level
 - Moves entire CI into cache
 - Writes entire CI to DASD on syncpoint
 - Each updating task gets it's own copy of CI in cache
 - Does CI Validation – ensure all tasks have a valid CI
 - Task A writes CI while task B has CI cache, once task B attempts write it is invalid – does not include update from task A
 - Task B retrieves CI again
 - Potential performance issues if high activity file
- **Application updates**
 - Removed unnecessary update activity
 - Randomize keys using better algorithm



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Issues Encountered – Cont

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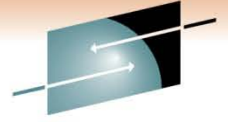
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Issues Encountered – Cont

Application design causing deadly embrace

- **Application is using low-value keys**
 - Multiple tasks accessing low-value records
 - Also DB2 access
 - Quiesce issued against the file during the embrace
- **Application updates**
 - Corrected low-value key access

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Performance

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Performance

The net effect of migrating to RLS will depend upon the original configuration:

- If the migration is from MRO - with a high proportion of requests being function shipped across XCF links - then there could be a reduction in overall CPU cost per transaction.
- If the migration is from MRO/XM or Local files, then there will be an increase in CPU cost per transaction.
- Our workload showed an approximate 5% increase in CPU cost per transaction when migrating from MRO/XM function shipping to RLS. Other workloads will vary depending on the path length of the application and the number of file requests per transaction.
- RLS has better scaling capabilities than CICS Function Shipping because it isn't limited to a single file owning region that is constrained to the speed of a CP due to its single TCB architecture.

Reference: CICS/RLS Study performed by IBM.....CICS SupportPAC CP13

<http://www-01.ibm.com/support/docview.wss?uid=swg24026507>

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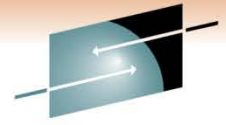
Performance – Cont

- 726 total files defined to RLS
- 24 Hour Period
 - 306,590,658 GET requests
 - 6,557,522 GET UPDATE requests
 - 313,148,180 ADD requests
 - 2,475,908 UPDATE requests
 - 1,263,926 DELETE requests
 - 97,760,829 BROWSE requests

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Performance – Cont

- 85 (of the 726) files defined to RLS as Read-Only (for the reporting period)
- 24 Hour Period
 - 65,602,703 GET requests
 - 28,316,884 BROWSE requests



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Performance – Cont

RMF Coupling Facility - Structure Details

Cache Structure : CICSVSAMRLS_STRUC1
Coupling Facility : ICFPROD1
System : *ALL

Structure Size : 566M Connection Name :
Direct. Entries Total : 270K Jobname :
Current : 268K Status :
Data Elements Total : 245K ASID :
Current : 242K CF Level :
Request Rate : 1491
Read Rate : 139.7
Write Rate : 317.4
Castout Rate : 0.0
XI Rate : 114.0
Directory Reclaims : 1571

Press Enter to return to the Report panel.
If data is missing, see Help panel.

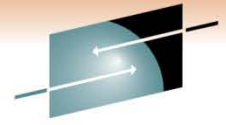
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Performance – Cont

RMF Coupling Facility - Structure Details

Cache Structure	:	CICSVSAMRLS_STRUC2
Coupling Facility	:	ICFPROD2
System	:	*ALL
Structure Size	:	566M
Direct. Entries	Total	: 248K
	Current	: 245K
Data Elements	Total	: 248K
	Current	: 246K
Request Rate	:	298.5
Read Rate	:	67.3
Write Rate	:	82.8
Castout Rate	:	0.0
XI Rate	:	17.8
Directory Reclaims	:	1010

Press Enter to return to the Report panel.
If data is missing, see Help panel.



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Performance – Cont

RMF V1R11 CF Activity - PRODPLEX Line 1 of 125

Command ==> Scroll ==> CSR

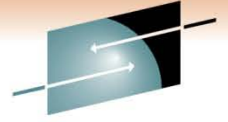
RMF Coupling Facility - Structure Details

Lock Structure	:	IGWLOCK00		
Coupling Facility	:	ICFPROD1		
System	:	*ALL		
Structure Size	:	634M	Connection Name	:
List entries	Total	: 1333K	Jobname	:
	Current	: 1374	Status	:
Lock Entries	Total	: 67.1M	ASID	:
	Current	: 11605	CF Level	:
Contention	(%)	: 5.3		
False Contention	(%)	: 0.2		

Press Enter to return to the Report panel.

If data is missing, see Help panel.

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Tips and Hints

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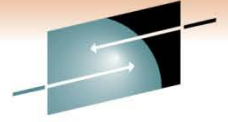
Tips and Hints

- SMF Type 42, subtypes 15-19 have performance data for RLS
- Don't be afraid of using RLS
 - Serious problems in 2000 and 2001
 - Our experience is that these issues have been resolved

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Tips and Hints - Cont

- Plan migration
- No 'big bang theory'
- Work with MVS for setup of SMSVSAM
- Work with Automation for identification and resolution of error messages
- Make file definitions changes prior to FCT changes
- Monitor performance of SMSVSAM and CICS regions
- Move READ/BROWSE only files to all AORs
- Beware of KSDS files with sequential key and heavy ADD activity



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Questions????