VSAM – Record Level Sharing (RLS)

Need to Know RLS basics

By: LPAR Team - State of Nebraska

1) What is Record Level Sharing (RLS)?

RLS is a new **VSAM** function provided by DFSMS and exploited by CICS Transaction Server. VSAM datasets opened in RLS mode are shared among many CICS applications in many CICS regions. Files that are opened in RLS mode by CICS are available for batch to read without closing them. Under RLS mode VSAM files are locked at the record level unlike the current way where files are managed at the Control Interval level. RLS gets effective at open time of a file. It is not a parameter specified at define time, although other define time parameters impact RLS abilities. Datasets must be 'SMS managed' to get the benefits of the RLS mode.

2) How do I benefit by implementing RLS?

The primary benefit derived from RLS is in its use with CICS. It removes single point of failure within the overall system. RLS will allow multiple CICS regions to access VSAM files with full data integrity. It provides dynamic backout logic at the record level with forward file recovery if the CICS region were to crash or the file was corrupted for other reasons. RLS improves availability.

3) What goes hand in hand with RLS, to achieve these benefits?

Apart from the RLS function, these benefits are achieved by implementing SMSVSAM server to control VSAM files, Backup While Open (BWO) feature, and by using CICSVR product to forward recover VSAM files.

4) How does SMSVSAM server differ from Files Owning Regions (FORs)?

The SMSVSAM server runs as a started task in its own address space. Control of VSAM files is now placed outside of the CICS File Owning Region under SMS management, localizing all buffers in one address space (much like IMS and DB2) and maintaining integrity of VSAM files across all regions. If a region were to crash, the In-Flight records would go to an "in doubt" status and would need to be handled upon recovery of the region.

5) How do Shareoptions differ under RLS mode?

The IDCAMS Shareoptions are suspended in RLS access mode. If a VSAM file is opened in non-RLS mode in CICS or Batch, the old Shareoption rules apply again. It seems unlikely that we would ever need to open a VSAM file in non-RLS mode unless dictated by the batch schedule.

6) What is Backup While Open (BWO)?

BWO is a way for backing up RLS VSAM files at a point in time while they are open to CICS. In a recovery situation you would want to restore from the latest backup and apply log records, known as images, going forward from that point in time. It is preferable that such BWO backups are taken during periods of low usage due to the amount of potential overhead processing required during this time.

7) How are VSAM RLS files opened and closed for CICS?

VSAM files in RLS mode are automatically opened on each individual CICS region. The files have shared read and/or update access regardless of which processor the CICS region is running on. Although QUIESCING a file on the SMSVSAM server shuts off access to the file on all regions, it would be a proper protocol to close a file on all applicable regions before Quiescing such file.

8) What are the different available modes in RLS?

VSAM files are Defined/Altered in one of the following RLS modes in the ICF catalog using the IDCAMS utility with the following parameters;

IDCAMS Options	RLS Recoverable files Back Out Only	RLS Forward Recoverable files with Backup While Open
SHR	(2,3)	(2,3)
DATACLASS	DCRLS02	DCRLS02
LOG	UNDO	ALL
FRLOG	NONE	REDO
LOGSTREAMID	cics.fwdrecovlog.DFHJnn	cics.fwdrecovlog.DFHJnn
BWO	NO	TYPECICS

[1]

RLS Recoverable files - Back Out Only: Recovery is limited only to back-out the uncommitted "in doubt" records with the before image from the Journal log file. Backup While Open is not available under this mode. This mode is appropriate for test VSAM files. Most UNT, STRING and CAT level files should be setup this way.

RLS Forward Recoverable files with Backup While Open: have to be backed up **before and after** a batch update and before unquiescing the file again. This method would allow forward recoverability of the file by applying the logged CICS updates to the Post batch update backup. The CICS team will be reviewing and coordinating the need for backups with in Batch Jobs during VSAM file conversion to RLS. In the near future a new release of VSAM RLS is planned where batch updates will be logged, but for now it's important that Pre- and Post- batch update VSAM backup copies are taken in order to maintain the recoverability of an SMSVSAM managed file.

In Forward Recoverable mode SMS will write LOG records on all updates that take place to the file under CICS. Recoverable VSAM files in RLS mode **can not** be updated from batch but can be read. There is significant overhead in logging VSAM updates and this overhead should be avoided when recovery processing is not required. In order to update a recoverable VSAM file in Batch and to maintain data integrity the file has to be quiesced on the SMSVSAM server.

9) What does RLS mean to Batch?

Current process under FORs: Batch access is governed by the SHAREOPTIONS setting. Most VSAM files in use by IMServices today have a setting of (2,3). The first, being the cross-region parameter and the second the cross-system parameter. Under this setting it is possible to have a VSAM file open to one on-line region and to browse the file from a batch program using DISP=SHR in the JCL.

Process under the SMSVSAM server: There are two modes of access, namely RLS and non-RLS. The non-RLS mode is similar to how it works today. When a VSAM file is opened in RLS mode by use of the "RLS=" parameter the Share options rules are suspended and RLS rules the access. This parameter is used only if a file is open in batch and it is available for on-lines. If the file is closed for CICS, this parameter is not needed in the JCL.

There are two parameters for RLS mode access in the DISP parameter;

a) RLS=**NRI** allows the batch program to open the file and read records before locks on those records are released by a competing on-line application. This method is commonly referred as the "dirty read" method.

[1] Note by Antonio Lopez: those values are for reference, each file should be reviewed individually.

b) RLS=**CR** causes the program to wait for the release of a lock before the batch program is allowed to process the record.

These two settings for RLS type access are similar to DB2's ISOLATION parameter CS (Cursor Stability) or UR (Uncommitted Read). Dirty read access is faster but consideration on what happens to the business function is needed, if an uncommitted record update is rolled back after that record is read and processed.

10) How will the VSAM RLS conversion be done?

VSAM files can be converted to RLS individually. Application groups will convert their VSAM files to RLS mode. CICS Systems Definitions of the RLS files and the creation of Journal log will be done by the CICS team.

Programs should be coded to anticipate the new File-Status and Return code. The conversion process testing effort will show us how and at what extent we need to pursue this issue.

RLS parameter will need to be added to the JCL for browse type access for now and for update access in the future. This is needed only if the files are accessed in batch when they are available online.

11) What new status codes should be handled for RLS files?

The following new status codes along with old ones should be handled in application programs.

File status of	**93**	- file is not available for update access if it is already open for CICS.
VSAM status of	**16**	- SMSVSAM server is not available.
CICS abend code	**AFCW**	- request to acquire record level lock failed as the wait time exceeded the Maximum wait time.

All the new OPEN messages and codes are available through the message **IEC161I** with documentation.

12) What is the drawback in not converting files to RLS?

Application availability can not be improved for the following reasons:

a) Files need to be closed before backups causing application outages.
b) Files need to be closed even for read access in batch, again causing file outages.
c) Forward recovery can not be implemented because changes are not logged.
d) Files can not be shared between CICS regions, thereby decreasing the 24 x 7 availability.

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Frequent Q & A.

By: LPAR Team - State of Nebraska

1) How do we make sure that the VSAM file is 'SMS' managed?

When LISTCAT on the base cluster lists the following information then it is SMS managed,

```
SMSDATA
  STORAGECLASS -------       MANAGEMENTCLASS--
  DATACLASS ---------
```

For non-SMS managed these values won't be in the listing.

There are some non-SMS managed VSAM datasets. If the production VSAM dataset is not SMS managed and if that needs to be converted into RLS, first that dataset must be converted to SMS managed. Leon Vanslyke or Kathy Jensvold can help in this conversion process.

2) How do we identify a VSAM files as being under RLS?

Under CICS defintions if you CEMT the files, you will see **RLS** for the files which were defined as RLS

```
Fil(LPRESDS0) Vsa Clo Ena Rea Upd Add Bro Del     Sha Rls
       Dsn( LPR4.LPARTST0.DTVSE                        )
Fil(LPRESDS1) Vsa Clo Ena Rea Upd Add Bro Del     Sha Rls
       Dsn( LPR4.LPARTST1.DTVSE                        )
Fil(LPRESDS2) Vsa Clo Ena Rea Upd Add Bro Del     Sha Rls
       Dsn( LPR4.LPARTST2.DTVSE                        )
Fil(LPRESDS3) Vsa Clo Ena Rea Upd Add Bro Del     Sha Rls
       Dsn( LPR4.LPARTST3.DTVSE                        )
Fil(LPRESDS4) Vsa Clo Ena Rea Upd Add Bro Del     Sha
       Dsn( LPR4.LPARTST4.DTVSE                        )
Fil(LPRKSDS0) Vsa Ope Ena Rea Upd Add Bro Del     Sha Rls
```

And when you LISTCAT a VSAM file, you will see the below parameters with similar values;

```
     DATACLASS -------DCRLS01     LBACKUP ---2001.311.1459
   BWO STATUS------00000000     BWO TIMESTAMP---01313 15:27:16.0
   BWO------------TYPECICS
 RLSDATA
   LOG ------------------ALL   RECOVERY REQUIRED --(NO)   FRLOG -------- [2]
NULL)
   VSAM QUIESCED -------(NO)    RLS IN USE --------(YES)
   LOGSTREAMID------------TSTONLN.LPARTST.DFHJ05
   RECOVERY TIMESTAMP LOCAL-----X'B6B3CE134A7C1700'
```

2.a) Does it require changes to the define of the dataset or is it controlled in the procedures that access the dataset or both?

[2] Note by Antonio Lopez, This value should be FRLOG(REDO) for recoverable files.

To convert a file into RLS mode, definitions of the dataset along with CICS system definitions of that file are enough. Only minimal changes if not none, will be required in the program like handling the new error codes and SYNCPOINTing your updates more often.

3) What changes if any need to be made to activate BWO and the logging process?

A log file must be associated with the VSAM file by ALTERing using IDCAMS utility along with other parameters that I had mentioned in the tabular column of my note.

4) How would I setup my JCL to take Pre- and Post- backups of a dataset ?

Pre- backup Job would be the first step/job of the batch cycle and Post- backup would be the last step/job of the batch cycle. The JCL to take the backups will look as below;

```
//BKABD  EXEC PGM=ADRDSSU,REGION=4M
//SYSPRINT DD SYSOUT=Q
//OUTDD1   DD DSN=backup-gdg(+1),
//            DISP=(NEW,CATLG),RECFM=VB,LRECL=23472
//SYSIN    DD DISP=SHR,DSN=pdsname(bkup1)
//*
```

the SYSIN member will have,

```
DUMP DATASET(                                    -
     INCLUDE(dataset-name))                      -
     OUTDDNAME(OUTDD1)                           -
     TOLERATE(ENQFAILURE)                        -
     WAIT(3,12)
```

5) Will the recovery be accomplished via a request job, or is it an automated process?

CICS team will do recovery by making a request to them. Nature of recovery can be mentioned like either just to Back Out the changes or to recover from the latest backup and to apply the log changes.

5.a) If it's a request job, will the batch team be responsible for building and maintaining these jobs?

Recovery would not be a request job. Taking the Pre- and Post- backup of the batch updates are the responsibility of a batch job.

6) Do we have a target date for RLS and BWO changes being made and tested?

Applications heads, based on their applications need to go 24 X 7 and to reduce outages could prioritize and decide the time line of the implementation.