DFSMS Basics: VSAM

Transactional VSAM (TVS) Basics and Implementation

Enhancing your RLS applications through transactional processing of VSAM data sets

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Session : 9955
What is TVS?

- “Transaction-alizes” VSAM data set access
  - Groups updates into atomic units
  - Commit and backout

- A Bridge between Recoverable and Non-Recoverable access to VSAM data sets:
  - Recoverable : CICS and the like
  - Non-recoverable : batch jobs

- Net result: Recoverable and (formerly) Non-Recoverable applications can access the same data set simultaneously and ensure data consistency.
Metaphor

This is your CICS workload

A truck moving a house is your batch load

Really only one or the other can use the road because they have different rules

TVS allows the truck to act like a car so both can run together
Agenda

• RLS & TVS Overview – what’s the problem?
• Transactional VSAM Overview – what’s the solution?
• Setup and Use – how do I use it?
• Performance Considerations
• Commands – tracking what’s going on
• References – for more information
Quick Background - RLS

Problem:
- One data set, many users, many systems
- Serialization can get messy and data can get lost.

Previous solution:
- CICS FOR (Function Shipping)

RLS Solution:
- VSAM Record Level Sharing
  - All access goes through SMSVSAM
  - Plex-wide serialization through locks in the CF
RLS Access

App 1 → System 1 → SMSVSAM → DATA SET → System n → App n

App 2 → System 1

App 3 → System n
Quick Background – RLS & CICS

New Problem:
- Any recoverable data set open is READ ONLY to non-recoverable access (RLS and non-RLS)
- Ex. CICS through RLS and “batch” using RLS.

Common Solutions:
- Quiesce current activity
- Move CICS activity to a different file
- “Batch Window”

TVS Solution:
- Non-CICS jobs using TVS become Recoverable Registered Regions
- Jobs using TVS can run simultaneously with CICS
- TVS Manages Recovery
RLS Access

Recoverable App 1 → System 1
NON-CICS With TVS

“Batch” TVS → System n
CICS n

SMSVSAM

DATA SET
TRANSACTIONAL VSAM

Design Objective:

Enhance VSAM Record Level Sharing (RLS) to provide data recovery capabilities for any application exploiting VSAM RLS.

Recovery Capabilities include:

• Transactional Recovery
• Data set recovery

VSAM RLS becomes a “Transaction-alized" access method, hence "Transactional VSAM" (TVS).
TVS Overview

*Transactional VSAM allows* any job that uses RLS (such as batch jobs) to be recoverable

**Implications:**

- Cross-system record-level serialization through RLS
- *Recoverable subsystems (such as CICS) need not come down to allow other RLS activity (such as batch) (24x7 avail)*
- Fully able to interact with other recoverable regions
Data Set Recovery

• Two types of recovery:

• BACKWARD:
  • Allows the last update or set of updates to be undone
  • ‘UNDO’
  • Uses atomic updates / transactions
  • Uses logs to store changes

• FORWARD
  • Allows utilities to rebuild a file from backup
  • Uses logs to store forward-changes
Transactions and Transactional Recovery

- A **Transaction or Unit of Recovery** is a set of updates or changes that act as one unit of processing

- **Atomic update**
  - All of nothing

- **Commit**
  - Finalizes a set of updates

- **Backout**
  - Removes a set of updates
  - Based on logged updates

- **Referred to in TVS as a UR**
Transaction Example

Buying a cup of coffee:

Series of steps to complete:

1. You order
2. They name the price
3. You pay
4. Change
5. Coffee!
6. Transaction complete!
    Coffee in Hand!

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Recoverable data sets are data sets that support backout (and potentially forward recovery) when opened by a recoverable region (such as CICS or TVS)

<table>
<thead>
<tr>
<th>RECOVERABLE</th>
<th>NON-RECOVERABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can do transaction recovery</td>
<td>Cannot recover</td>
</tr>
<tr>
<td>LOG(UNDO) – backward</td>
<td>LOG(NONE) or undefined</td>
</tr>
<tr>
<td>Changes are logged</td>
<td>Changes are not logged</td>
</tr>
<tr>
<td>Changes can be backed out</td>
<td>Changes cannot be undone</td>
</tr>
<tr>
<td>Read ONLY for non-RLS access</td>
<td>R/W from all regions</td>
</tr>
<tr>
<td>LOG(ALL) – forward recovery</td>
<td></td>
</tr>
</tbody>
</table>

Recoverable data sets are data sets that support backout (and potentially forward recovery) when opened by a recoverable region (such as CICS or TVS).
Recoverable Regions

Recoverable Subsystems are applications capable of:
- Transactional Recovery (backward recovery)
- Data set Recovery (forward recovery)
- Data set changes are logged
- An example of an IBM recoverable region is CICS, IMS, DB2
- Also called a Resource Manager

A Recoverable Subsystem Manager is capable of:
- Managing transactional recovery between one or more recoverable subsystems
- An example of an IBM Recoverable Subsystem is the z/OS Recoverable Resource Manager (RRS)
- Recoverable Subsystems Register with Manager
- Uses ‘Units of Recovery’ (UR, transaction)
- Also called a Syncpoint Manager
Recovery (Backward)

If there is a failure:

- Locks will be held to maintain integrity (RETAINED locks)
- Read the log file to retrieve unmodified data
- Restore data to unmodified state
- Release the serialization

If a BACKOUT fails:

- Log the backout failure in another log, the SHUNTLOG
- Maintain serialization on the modified data (RETAINED locks)
Transaction Example

Buying a cup of coffee:

*Series of steps to complete:*

1. You order
2. They name the price
3. You pay
4. Change
5. Coffee!
6. Transaction complete! Coffee in Hand!
A Technical Example – successful

Application / UR
1. Read UPD record 4
2. Modify record 4
3. PUT modified 4-a
4. Insert record 7 PUT
5. Commit
6. End of Transaction!

TVS
Lock record 4
Log unmodified rec 4
Write modified rec 4
Lock record 7
Log unmodified data
Write record 7
Update logs
Release locks

Data Set
2
4-a
6
7
8
10

Session 9955 - TVS
A Technical Example – Failure!

**Application / UR**
1. Read UPD record 4
2. Modify record 4
3. PUT modified 4-a
4. Insert record 7 PUT
5. Backout
6. End of Transaction!

**TVS**
- Lock record 4
- Log unmodified rec 4
- Write modified rec 4
- Lock record 7
- Log unmodified data
- Write record 7
- Retrieve logged data
- Restore data
- Update logs
- Release locks

**Data Set**
- 2
- 4
- 6
- 8
- 10
Logging

- Data Set updates are written to the LOG
  - Stores ‘Before’ picture of data
- TVS, RRS, CICS all take advantage of it in different ways
- TVS uses System LOGGER (IXLOGR)
- Uses LOGSTREAMS
  - Defined in the LOGR Policy in the coupling facility
TVS Logs

- **Undo Log** (required) – Primary System Log
  - One per image
  - Holds the changes made by URids on that system
  - Used for backout

- **SHUNT Log** (required) – Secondary System Log
  - One per image
  - Holds URs that TVS cannot complete (I/O error, etc)
  - Holds Long-running URs (moved from Undo log)

- Forward recovery logs (optional)
  - Plex-wide logs
  - Shared between CICS and TVS
  - Assigned to data sets during data set allocation (LOGSTREAMID)

- Log of Logs (optional)
  - Holds tie-up records and file-close records
  - Used by recovery applications such as CICSVR
TVS Component Interaction

Three basic functions necessary for transactional recovery:

- **Resource locking (VSAM RLS)**
  - Serialized access to changed resources
  - At the record level
  - Uses the coupling facility

- **Resource Recovery Logging (LOGGER)**
  - Keep track of backward changes (UNDO)
  - Keep track of forward changes (REDO / FR)

- **Two-phase commit and backout protocols (RRS)**
  - Ensures ATOMIC operation (transactions)
  - COMMIT
  - BACKOUT
The Overall Flow

- As TVS comes up:
  - Registers with SMSVSAM as a recoverable subsystem
  - Dynamically connect to the BACKOUT and SHUNT logs

- When a request is issued (GET/PUT/etc):
  - Register transaction with RRS and get a Unit of Recovery ID
  - Hold record-level serialization for the duration of URid
  - Log the unmodified data via IXLOGR to the backout log, and optionally the change in the forward recovery log

- When a COMMIT is issued:
  - Commit can be issued explicitly (via RRSCMIT)
  - Commits are implicitly issued during EOT
  - Release the locks
  - Log the successful COMMIT
SETUP

Hardware / Software changes to enable TVS
System Requirements

- **Hardware:**
  - Coupling Facility
  - At least one z/OS LPAR (monoplex or parallel sysplex)

- **Software:**
  - z/OS 1.4 or higher (current lowest release is z/OS 1.10)
  - z/OS VSAM RLS (SMSVSAM) Implemented
  - z/OS Transactional VSAM (separately priced feature)
  - z/OS RRMS Implemented (RRS)
  - z/OS System Logger Implemented
  - CICS VSAM Recovery (CICSVR) Utility (optional)
Overview of Setup

1. Add some lines to IGWSMSxx PARMLIB
2. Define CFRM and LOGR policies
3. Change IDCAMS Define Statements
4. Change Application (optional)

Success!
Required Parmlib Configuration

- **IGDSMSxx Parmlib Member**
  (Note, this does not include RLS/SMSVSAM parameters)

- **SYSNAME**(sysname1,sysname2,...) *
  - Systems on which TVS is to run
  - Same order is TVSNAME

- **TVSNAME**(nn1,nn2,..) *
  - TVS Instance names
  - Suffix to IGWTV

- **TV_START_TYPE**(COLD|WARM,COLD|WARM,..) *
  - Type of startup
  - Same order as TVSNAME
  - COLD – deletes any information in UNDO & SHUNT logs and starts
  - WARM – reads the UNDO & SHUNT log and performs any actions needed
Parmlib Configuration (Optional)

- **LOG_OF_LOGS**(logstreamid)
  - Specifies LOG of LOGS logstream
  - Used for forward recovery

- **MAXLOCKS**(nnn,iii)
  - Specifies when to issue warning messages about the number of held locks

- **AKP**(nnn,nnn,…)- Activity Keypoint trigger
  - Helps TVS maintain the UNDO and SHUNT logs
  - Removes entries that are no longer needed (URid no longer in use)
  -Defaults to 1000

- **QTIMEOUT**(nnn|300)
  - Number of seconds to wait before QUIESCE EXITS assume that the QUIESCE will not complete
TVS Startup Messages:

IGW865I TRANSACTIONAL VSAM INITIALIZATION HAS STARTED.
IGW414I SMSVSAM SERVER ADDRESS SPACE IS NOW ACTIVE. 327

IGW860I TRANSACTIONAL VSAM HAS SUCCESSFULLY REGISTERED WITH RLS

IGW848I 02182011 11.45.28 SYSTEM UNDO LOG IGWTVO01.IGWLOG.SYSLOG 553
INITIALIZATION HAS STARTED
IGW848I 02182011 11.45.29 SYSTEM UNDO LOG IGWTVO01.IGWLOG.SYSLOG 577
INITIALIZATION HAS ENDED
IGW848I 02182011 11.45.29 SYSTEM SHUNT LOG IGWTVO01.IGWSHUNT.SHUNTLOG
INITIALIZATION HAS STARTED
IGW848I 02182011 11.45.29 SYSTEM SHUNT LOG IGWTVO01.IGWSHUNT.SHUNTLOG
INITIALIZATION HAS ENDED

IGW865I TRANSACTIONAL VSAM INITIALIZATION IS COMPLETE.
IGW886I 0 RESTART TASKS WILL BE PROCESSED DURING TRANSACTIONAL VSAM
RESTART PROCESSING
IGW866I TRANSACTIONAL VSAM RESTART PROCESSING IS COMPLETE.
Logger Configuration

- Update the CFRM Policy to contain list structures for the LOGS

```plaintext
//POLICY EXEC PGM=IXCMIAPU
//SYSIN DD *
DEFINE STRUCTURE
  NAME(LOG_IGWLOG_001)
  LOGSNUM(10)
  MAXBUFSIZE(64000)
  AVGBUFSIZE(2048)
```

- Update the LOGR Policy to contain the SMSVSAM logs

```plaintext
//POLICY EXEC PGM=IXCMIAPU
//SYSIN DD *
DEFINE LOGSTREAM
  NAME(IGWTVO01.IGWLOG.SYSLOG)
  STRUCTURENAME(LOG_IGWLOG_001)
  LS_SIZE(1180)
  STG_DUPLEX(YES)
  DUPLEXMODE(COND)
  HIGHOFFLOAD(85)
  LOWOFFLOAD(15)
  DIAG(YES)
```
Data Set Allocation

- Add the following to IDCAMS define:
  - **LOG( )**
    - **NONE** – non-recoverable data set. Any RLS application can read/write.
    - **UNDO** – Recoverable data set requiring backout logging. Can be opened for read/write by any RLS Recoverable Subsystems (CICS or TVS).
    - **ALL** – Recoverable data set requiring backout and forward recovery logging. Can be opened for read/write by any RLS Recoverable Subsystem.
  - **LOGSTREAMID(logs_id)**
    - Logstream ID for any data set defined with LOG(ALL).

```define cluster (  
  name(recoverabledataset) -  
  recordsize(100 100) -  
  storclas(storclasname) -  
  fspc(20 20) -  
  log(all) -  
  shareoptions(2 3) -  
  logstreamid(logs_id) -  
  cisz(512) -  
  keys(06 8) indexed -  
) -  
  data(  
  name(recoverabledataset.data) -  
  volume(volser) -  
  tracks (1,1) -  
  index(  
  name(recoverableds.index) -  
  volume(volser) -  
  tracks (1,1) ) 
```
Application Changes

• Data sets will be accessed via TVS when:
  • Any RLS access for recoverable data set
    • Via ACB:
      • `ACB MACRF=(RLS, OUT)` for recoverable data set
      • `ACB MACRF=(RLS, IN), RLSREAD=CRE`
    • Via DD:
      • `//ddname DD DSN=recoverable.dsn, DISP=SHR, RLS=(CR NRI) and ACB MACRF=(OUT)`
      • `//ddname DD DSN=recoverable.dsn, DISP=SHR, RLS=(CRE) and ACB MACRF=(IN)`
Application Changes (cont)

• Recommendations:
  • RLS Applications using TVS should be modified to include:
    • SSRCMIT – commit
    • SSRBACK – backout
  
  • SSRCMIT and SSRBACK will either COMMIT or BACKOUT the UR provided by SMSVSAM on behalf of the application
  
  • Can be EXPLICIT – add command to your job
  • Can be IMPLICIT – will run during End-of-Job if you don’t add it.
  
  • Periodic explicit COMMIT/BACKOUT will release the locks in a timely fashion. Failure to do so may hold up other jobs.

• High-Level Language Support:
  • PLI, C & C++, COBOL, Assembler
Performance Considerations

- TVS does add overhead
  - Increased code path length
  - Cross-Address Space access to server
  - Loss of NSR chained sequential I/O
  - Loss of LSR deferred write
  - New overhead of record locking
  - New overhead of CF cache access
  - Logging (for already RLS work)

- Commit Frequency
  - Too many can add unnecessary overhead
  - Too few can cause delays due to lock contention

- “Parallelizing” the workload
  - Spreading out the work reduces individual overhead and increases overall efficiency
  - Several TVS streams can work simultaneously
Application Example (Commit)

Explicit Commit:

```verbatim
//ddname DD DSN=Recoverabledatasetname,DISP=SHR,RLS=CRE
//step1   EXEC  PGM=vsamrlspgm
Begin JOB Step   ---------------------------------- --- No locks held
OPEN   ACB MACRF=(NSR,OUT)
(U1)
GET UPD record 1----------------------------------  Obtain an exclusive lock on record 1
PUT UPD record 1 ---------------------------------  Lock on record 1 remains held
GET repeatable read record n----------------------  Obtain a shared lock on record n
PUT ADD record n+1---------------------------------  Obtain an exclusive lock on record n+1
GET UPD record 2 ---------------------------------  Obtain an exclusive lock on record 2
PUT UPD record 2 ---------------------------------  Lock on record 2 remains held
Call SRRCMIT -------------------------------------  Commit changes, all locks released.
CLOSE
End of JOB Step
```

Implicit Commit:

```verbatim
//ddname DD DSN=Recoverabledatasetname,DISP=SHR,RLS=CRE
//step1   EXEC  PGM=vsamrlspgm
Begin JOB Step   ---------------------------------- --- No locks held
OPEN   ACB MACRF=(NSR,OUT)
(U1)
GET UPD record 1----------------------------------  Obtain an exclusive lock on record 1
PUT UPD record 1 ---------------------------------  Lock on record 1 remains held
GET repeatable read record n----------------------  Obtain a shared lock on record n
PUT ADD record n+1---------------------------------  Obtain an exclusive lock on record n+1
GET UPD record 2 ---------------------------------  Obtain an exclusive lock on record 2
PUT UPD record 2 ---------------------------------  Lock on record 2 remains held
CLOSE ---------------------------------------------- All Locks are retained
End of JOB Step  (normal)-------------------------- Commit changes release all locks
```
Application Example (Backout)

Explicit Backout

```
//ddname DD DSN=Recoverabledatasetname,DISP=SHR,RLS=CRE
//step1 EXEC PGM=vsamrlspgm
Begin JOB Step ------------------------------------ --- No locks held
OPEN ACB MACRF=(NSR,OUT) (UR1) GET UPD record 1----------------------------------- --- Obtain an exclusive lock on record 1
PUT UPD record 1 --------------------------------- --- Lock on record 1 remains held
GET repeatable read record n----------------------- --- Obtain a shared lock on record n
PUT ADD record n+1--------------------------------- --- Obtain an exclusive lock on record n+1
GET UPD record 2 ---------------------------------- --- Obtain an exclusive lock on record 2
PUT UPD record 2 ---------------------------------- --- Lock on record 2 remains held
Call SRRBACK -------------------------------------- --- Undo changes, all locks released.
CLOSE
End of JOB Step
```

Implicit Backout

```
//ddname DD DSN=Recoverabledatasetname,DISP=SHR,RLS=CRE
//step1 EXEC PGM=vsamrlspgm
Begin JOB Step ------------------------------------ --- No locks held
OPEN ACB MACRF=(NSR,OUT) (UR1)
GET UPD record 1----------------------------------- --- Obtain an exclusive lock on record 1
PUT UPD record 1 --------------------------------- --- Lock on record 1 remains held
GET repeatable read record n----------------------- --- Obtain a shared lock on record n
PUT ADD record n+1--------------------------------- --- Obtain an exclusive lock on record n+1
GET UPD record 2 ---------------------------------- --- Obtain an exclusive lock on record 2
PUT UPD record 2 ---------------------------------- --- Lock on record 2 remains held
Call SRRBACK -------------------------------------- --- Undo changes, all locks released.
CANCEL
End of JOB Step (abnormal) ------------------------ --- Undo changes release all locks
```
Restart Considerations

- Restarting applications that use TVS must be done from the last COMMIT point.
- Restarting from the beginning could result in data integrity problems.
- A checkpoint / restart type system should be implemented to determine restart point of the application.
Commands

• D SMS,TRANVSAM

D SMS,TRANVSAM
RESPONSE=SYSTEM1
IEE932I 006
IGW800I 22.48.15 DISPLAY SMS,TRANSACTIONAL VSAM

DISPLAY SMS,TRANSACTIONAL VSAM - SERVER STATUS
System   TVSNAME  State   Rrs  #Urs  Start      AKP    QtimeOut
-------- -------- ------ ----- -------- --------- ------- - --------
SYSTEM1  IGWTV001 ACTIVE REG 0 WARM/WARM 200    400

DISPLAY SMS,TRANSACTIONAL VSAM - LOGSTREAM STATUS
LogStreamName          State      Type       Connect  Status
---------------------- ---------- -------- ---------------
IGWTV001.IGWLOG.SYSLOG Enabled  UnDoLog    Connected
IGWTV001.IGWSHUNT.SHUNTLOG Enabled  ShuntLog    Connected
Commands

- D SMS,LOG(logid|ALL)
  - Shows information about the logs currently in use by TVS
- D SMS,SHUNTED,SPHERE|URID()
  - Shows shunted work across the plex
- D SMS,URID(urid)
  - Displays information about the unit of recovery
- D SMS,JOB(jobname)
  - Displays information about the job, and for TVS, gives UR information
Commands

- **V SMS,TRANVSAM(***|ALL),Q|E|D**
  - Sets the state of the specified TRANSVSAM instance
- **V SMS,LOG(logstreamid),Q|E|D**
  - Enables/disables a given log stream – disables TVS
Commands

- SHCDS commands provide a myriad of capabilities:
  - List information kept by SMSVSAM / TVS about subsystems and data sets:
    - LISTDS, LISTSUBSYS, LISTSUBSYSDS, LISTRECOVERY, LISTALL, LISTSHUNTED
  - Control Forward Recovery
    - FRSETRR, FRUNBIND, FRBIND, FRRESETRR, FRDELETEUNBOUNDLOCKS
  - Allow NON-RLS update – use sparingly
    - PERMITNONRLSUPDATE, DENYNONRLSUPDATE
  - Reset various information about subsystems or RLS
  - Handling SHUNTED work:
    - RETRY, PURGE
SHCDS Commands Example

ISPF Command Shell
Enter TSO or Workstation commands below:

```plaintext
===>   SHCDS LISTDS('recoverabledataset*')
----- LISTING FROM SHCDS ----- IDCSh02 ------------------------------------

DATA SET NAME----recoverabledataset
  CACHE STRUCTURE----CACHE01
  RETAINED LOCKS--------YES  NON-RLS UPDATE PERMITTED--------NO
  LOST LOCKS------------NO   PERMIT FIRST TIME---------------------NO
  LOCKS NOT BOUND-------NO   FORWARD RECOVERY REQUIRED----------NO
  RECOVERABLE-----------YES

SHARING SUBSYSTEM STATUS
  SUBSYSTEM    SUBSYSTEM     RETAINED     LOST     NON-RLS UPDATE
  NAME         STATUS        LOCKS       LOCKS       PERMITTED
  -----------  -------------- -----------  ----------  ------------------
  IGWTv001    ONLINE--FAILED YES          NO          NO

***
```
Summary

- Transactional VSAM allows:
  - Concurrent access with recoverable regions (such as CICS)
  - Full data set recovery through logging and atomic updates
- Eliminates the Batch Window
- Requires minimal changes to existing jobs
- Provides plex-wide consistency
- Overall, provides a more effective way to integrate recoverable and non-recoverable workloads (ex. CICS and NON-CICS such as batch)
References:

- DFSMStvs Planning and Operating Guide, SC26-7348
- DFSMStvs Overview and Planning Guide, SG24-6971
- VSAM Demystified, SG24-6105
- MVS Initialization and Tuning Reference, SA22-7592
- MVS System Commands, SA22-7627
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Thank you!
Backup Slides / Additional Reference
Typical RLS Setup

LPAR 1

APPn
APP2
APP1

SMSVSAM

CF

Lock Str
Cache

DASD

Cluster

LPAR n

APPn
APP2
APP1

SMSVSAM

Session 9955 - TVS
Example of TVS startup:

**IGW865I** TRANSACTIONAL VSAM INITIALIZATION HAS STARTED.
**IGW414I** SMSVSAM SERVER ADDRESS SPACE IS NOW ACTIVE. 327
**IGW467I** DFSMS TVSNAMES PARMLIB VALUE SET DURING 510
  SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SYSTEM1
  TVSNAMES: IGWTV001
  CURRENT VALUE: ENA-ED 1
**IGW467I** DFSMS TRANSACTIONAL VSAM UNDO LOG PARMLIB VALUE SET DURING 513
  SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SYSTEM1
  UNDO LOGSTREAM NAME: IGWTV001.IGWLOG.SYSLOG
  CURRENT VALUE: ENA-ED 1
**IGW467I** DFSMS TRANSACTIONAL VSAM SHUNT LOG PARMLIB VALUE SET DURING 514
  SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SYSTEM1
  SHUNT LOGSTREAM NAME: IGWTV001.IGWSHUNT.SHUNTLOG
  CURRENT VALUE: ENA-ED 1
**IGW467I** DFSMS TRANSACTIONAL VSAM ACTIVITY KEY POINT PARMLIB VALUE SET DURING 516
  SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SYSTEM1
  CURRENT VALUE: 200
**IGW467I** DFSMS TRANSACTIONAL VSAM TVS_START_TYPE PARMLIB VALUE SET DURING 517
  SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SYSTEM1
  TVSNAMES VALUE: IGWTV001
  CURRENT VALUE: WARM 1
**IGW467I** DFSMS TRANSACTIONAL VSAM LOG_OF_LOGS PARMLIB VALUE SET DURING 524
  SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SYSTEM1
  LOG_OF_LOGS LOGSTREAM NAME: IGWTVS1.LOG_OF_LOGS
  CURRENT VALUE: ENA-ED 1
Example of TVS startup:

**IGW860I** TRANSACTIONAL VSAM HAS SUCCESSFULLY REGISTERED WITH RLS

**IGW876I** TRANSACTIONAL VSAM INITIALIZATION WAITING FOR RRS

**ATR201I** RRS COLD START IS IN PROGRESS.

**ASA2011I** RRS INITIALIZATION COMPLETE. COMPONENT ID=SCRRS

**IGW877I** TRANSACTIONAL VSAM INITIALIZATION RESUMING AFTER WAIT FOR RRS

**IGW848I** 02182011 11.45.28 SYSTEM UNDO LOG IGWT001.IGWLOG.SYSLOG 553

**INITIALIZATION HAS STARTED**

**IXC582I** STRUCTURE TVS_LOG001 ALLOCATED BY SIZE/RATIOS. 566

- PHYSICAL STRUCTURE VERSION: C75A333B 5A6E2E32
- STRUCTURE TYPE: LIST
- CFNAME: FACIL02
- ALLOCATION SIZE: 12 M
- POLICY SIZE: 12000 K
- POLICY INITSIZE: 0 K
- POLICY MINSIZE: 0 K
- IXLCONN STRSIZE: 0 K
- ENTRY COUNT: 873
- ELEMENT COUNT: 7567
- ENTRY:ELEMENT RATIO: 1 : 9

ALLOCATION SIZE IS WITHIN CFRM POLICY DEFINITIONS

**IXL014I** IXLCONN REQUEST FOR STRUCTURE TVS_LOG001 567

WAS SUCCESSFUL. JOBNAME: IXGLOGR ASID: 0017

CONNECTOR NAME: IXGLOGR_SYSTEM1 CFNAME: FACIL02
Example of TVS startup:

IXL015I STRUCTURE ALLOCATION INFORMATION FOR 568
STRUCTURE TVS_LOG001, CONNECTOR NAME IXGLOGR_SYSTEM1
CFNAME ALLOCATION STATUS/FAILURE REASON
-------- ---------------------------------------- FACIL02 STRUCTURE ALLOCATED CC001800
FACIL01 PREFERRED CF ALREADY SELECTED CC001800
IXG283I STAGING DATASET IXGLOGR.IGWTV001.IGWLOG.SYSLOG.SYSTEM1
ALLOCATED NEW FOR LOGSTREAM IGWTV001.IGWLOG.SYSLOG
CISIZE=4K, SIZE=442368
IGW474I DFSMS VSAM RLS IS CONNECTING TO 576
TRANSACTIONAL VSAM LOGSTREAM IGWTV001.IGWLOG.SYSLOG
SYSTEM NAME: SYSTEM1
TRANSACTIONAL VSAM INSTANCE NAME: IGWTV001
IGW848I 02182011 11.45.29 SYSTEM UNDO LOG IGWTV001.IGWLOG.SYSLOG 577
INITIALIZATION HAS ENDED
IGW848I 02182011 11.45.29 SYSTEM SHUNT LOG IGWTV001.IGWSHUNT.SHUNTLOG
INITIALIZATION HAS STARTED
IXG283I STAGING DATASET IXGLOGR.IGWTV001.IGWSHUNT.SHUNTLOG.SYSTEM1 585
ALLOCATED NEW FOR LOGSTREAM IGWTV001.IGWSHUNT.SHUNTLOG
CISIZE=4K, SIZE=442368
IGW474I DFSMS VSAM RLS IS CONNECTING TO 587
TRANSACTIONAL VSAM LOGSTREAM IGWTV001.IGWSHUNT.SHUNTLOG
SYSTEM NAME: SYSTEM1
TRANSACTIONAL VSAM INSTANCE NAME: IGWTV001
IGW848I 02182011 11.45.29 SYSTEM SHUNT LOG IGWTV001.IGWSHUNT.SHUNTLOG
INITIALIZATION HAS ENDED
Example of TVS startup:

IGW848I 02182011 11.45.29 LOG OF LOGS IGWTVS1.LOG.OF.LOGS 589
INITIALIZATION HAS STARTED
IXG283I STAGING DATASET IXGLOGR.IGWTVS1.LOG.OF.LOGS.SYSTEM1 595
ALLOCATED NEW FOR LOGSTREAM IGWTVS1.LOG.OF.LOGS
CISIZE=4K, SIZE=442368
IGW474I DFSMS VSAM RLS IS CONNECTING TO 597
TRANSACTIONAL VSAM LOGSTREAM IGWTVS1.LOG.OF.LOGS
SYSTEM NAME: SYSTEM1
TRANSACTIONAL VSAM INSTANCE NAME: IGWTVO01
IGW848I 02182011 11.45.30 LOG OF LOGS IGWTVS1.LOG.OF.LOGS 598
INITIALIZATION HAS ENDED
IGW865I TRANSACTIONAL VSAM INITIALIZATION IS COMPLETE.
IGW886I 0 RESTART TASKS WILL BE PROCESSED DURING TRANSACTIONAL VSAM
RESTART PROCESSING
IGW866I TRANSACTIONAL VSAM RESTART PROCESSING IS COMPLETE.
IGW467I DFSMS TRANSACTIONAL VSAM QTIMEOUT PARMLIB VALUE SET DURING 602
SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SYSTEM1
CURRENT VALUE: 400 1
IGW467I DFSMS TRANSACTIONAL VSAM MAXLOCKS PARMLIB VALUE SET DURING 603
SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SYSTEM1
CURRENT VALUE: 100 50 1
Recovery (Forward)

• To Recover a data set with retained locks:
  • Stop any current transactions
  • DELETE recoverable.dataset
  • Restore backup copy
  • Apply committed changes since last backup
  • Restart access (Retry SHUNTED work)

• CICSVR automates this process
  (does not retry shunted work)
Recovery (Forward)

To Recover a data set with retained locks, take following steps:

- **SHCDS FRSETRR(recoverabledataset)** – sets the FR indicator
- **SHCDS FRUNBIND(recoverabledataset)** – unbinds the retained locks, allowing delete
- **DELETE recoverabledataset**
- **<Restore backup copy>**
- **<apply committed changes since last backup (must set ACBRECOV)>**
- **SHCDS FRBIND(recoverabledataset)** – reattach retained locks
- **SHCDS FRRSETTRR** – re-enable access to dataset
- **SHCDS LISTSHUNTED SPHERE(recoverabledataset)** – display information about shunted work
- **SHCDS RETRY SPHERE(recoverabledataset)** – retry the syncpoint

CICSVR automates this process (does not retry shunted work)