

The Ups and Downs of Directing OAM Data to Tape

Session Number 17591

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Agenda

- Overview of OAM
- Where does Tape Fit
- Examples of Tape Definitions
- Examples of DB2 Metadata for OAM
- Summary

Overview of OAM

- What is an Object?
 - An Object is a named stream of bytes
 - OAM is not aware of the content within the stream of bytes
 - No restrictions are placed on the data within the byte stream
- Object Size Limits
 - 2 GB
 - Disk and Tape
 - 256MB
 - Optical Platters
- No concept of records within an object
- Large Numbers of Objects to manage

Overview of OAM

- OAM Components
 - OSR
 - Object Storage and Retrieval
 - OSMC
 - Object Storage Management Control
 - LCS
 - Library Control Services

Overview of OAM

- OAM Handles data much like HSM
 - Data is classified by a “Collection” name
 - The “Collection” name relates to SMS constructs to control placement of data for optimal performance based on usage
 - Data can transition from one storage media to another under SMS control
 - Data retention is also controlled through SMS constructs at the object level
- Many Objects can reside in a single z/OS data set
- Each Object is controlled separately by OAM
 - A DB2 database is used to maintain and control all Objects
- OAM completely supports Parallel Sysplex

Overview of OAM

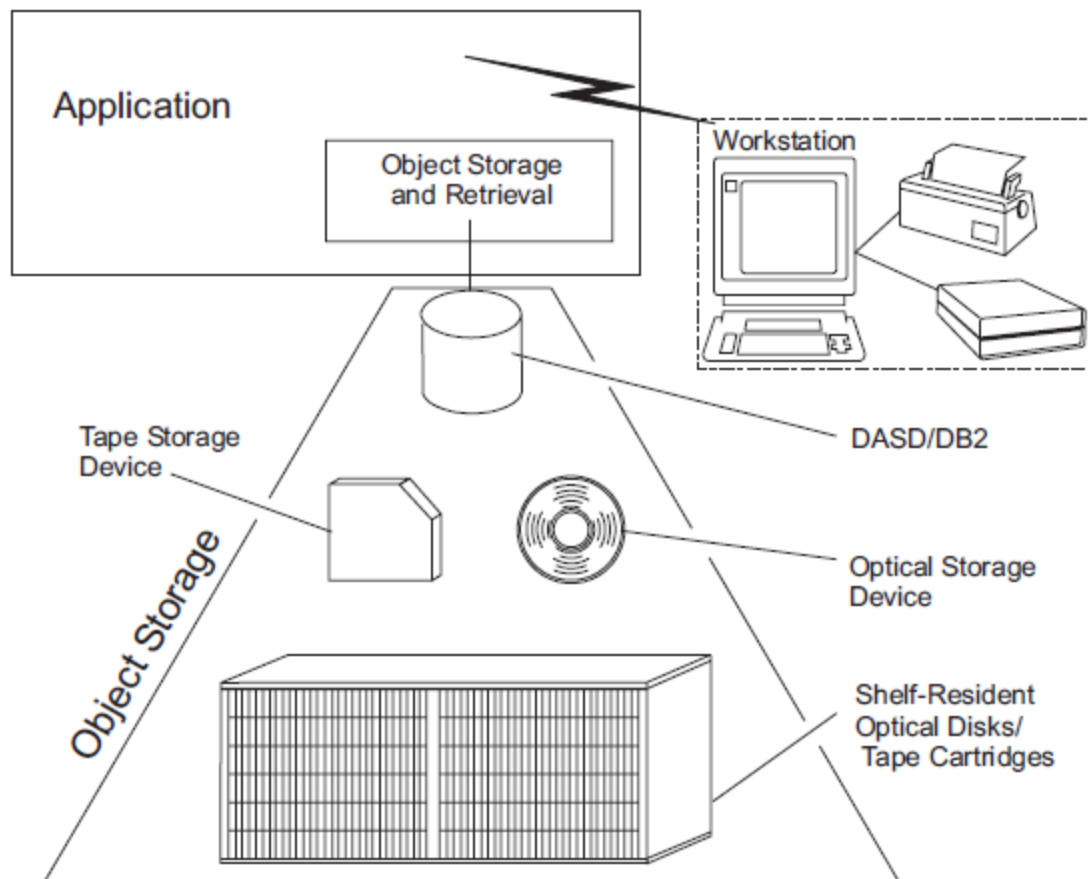


Figure 2. OAM Application Illustration

Where does Tape Fit?

- Originally
 - Tape was used for Backup, not Primary Storage Media
- Hardware Changes Occurred
 - Optical remained unchanged
 - TCO became unattractive
 - Tape changed
 - Virtual changed performance and cost
 - TCO became very attractive
- OAM support for tape was not straight forward

Where does Tape Fit?

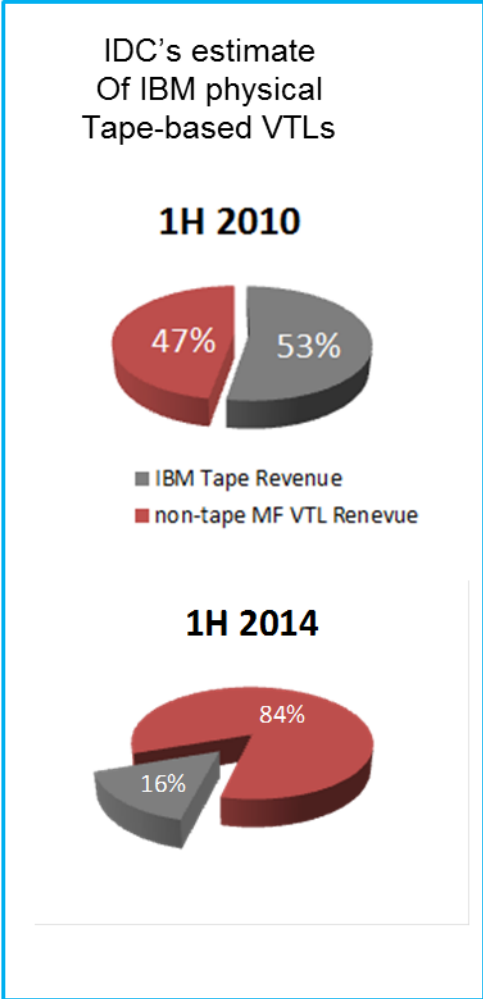
- Virtual Tape Advantages
 - Fast Access to Objects
 - Even slow disk at 5400 RPM are faster than Optical Platters
 - Virtual Tapes are automatically mounted and do not required manual intervention
 - Maintenance is low cost
 - Virtual Tape solutions are in wide use which keeps the cost down
 - Optical Towers are seldom used and most are on month to month high cost maintenance

A majority of mainframe tape data has already moved to disk



Then

- \$/GB of tape was 1/10 that of disk
- D/R: Tape cartridges were “vaulted” offsite
- Downtime for tape system updates
- D/R recovery time: days
- <100% D/R test success tolerated
- Loss of a cartridge was acceptable
 - plenty of backups
- Electronic vaulting more expensive than physical vaulting
- SLAs for tape were more forgiving



Now

- Disk can be more cost effective with deduplication
- Increased datacenter security dictates “nothing leaves”
- Tape systems must stay online during updates
- 100% D/R success must be achieved
- No one can afford to even “misplace” a cartridge – ever
- Electronic vaulting affordable and more secure than moving physical tape
- Physical tape recovery often can’t meet SLAs

Examples of Tape Definitions

- OAM Requirements for Tape
 - Any Storage Groups/MTL used for tape storage must be coded in the CBROAMxx parmlib member
 - The definition of these Storage Groups and MTL can be done with SMS, but the names must be coded in the CBROAMxx

CBROAMxx Member Example

SETOAM MOUNTWAITTIME (5)	00010001
TAPEEXPIRATION (1999/365)	00020001
DEMOUNTWAITTIME (300)	00030001
MAXTAPERETRIEVETASKS (1)	00040001
MAXTAPESTORETASKS (6)	00050001
SETOAM STORAGEGROUP (BACKUP	00060001
TAPEUNITNAME (3590-1)	00070001
NOTAPECOMPACTION	00080001
MAXTAPESTORETASKS (5)	00090001
TAPEFULLTHRESHOLD (200)	00100001
MAXTAPERETRIEVETASKS (1)	00110001
TAPEDRIVESTARTUP (1)	00120001
TAPEPERCENTFULL (97)	00130001
DATACLASS (DCOBJBK)	00140001
)	00150001
SETOAM STORAGEGROUP (OBJECTS	00160001
TAPEUNITNAME (3590-1)	00170001
MAXTAPESTORETASKS (6)	00180001
TAPEFULLTHRESHOLD (200)	00190001
MAXTAPERETRIEVETASKS (1)	00200001
TAPEDRIVESTARTUP (1)	00210001
TAPEPERCENTFULL (97)	00220001
DATACLASS (DCOBJECT)	00230001
)	00240001

Storage Group Referenced by CBROAMxx

OBJECTS

(3)	SG TYPE	-	OBJECT
...	Lines Omitted to fit the slide ...		
(17)	LAST MOD USERID	-	TMOULD1
(18)	LAST DATE MODIFIED	-	2015/06/17
(19)	LAST TIME MODIFIED	-	09:36
...	Lines Omitted to fit the slide ...		
(26)	QUALIFIER	-	COLL00
(27)	CYCLE START TIME	-	NONE
(28)	CYCLE END TIME	-	NONE
(29)	LIBRARY NAME	-	DLMOBJ00
(30)	LIBRARY NAME	-	-----
(31)	LIBRARY NAME	-	-----
(32)	LIBRARY NAME	-	-----
(33)	LIBRARY NAME	-	-----
(34)	LIBRARY NAME	-	-----
(35)	LIBRARY NAME	-	-----
(36)	LIBRARY NAME	-	-----
(37)	VOLUME FULL THRESHOLD	-	----
(38)	DRIVE START THRESHOLD	-	----
(39)	VOLUME FULL AT WRITE ERROR	-	---
(40)	OSMC SYSTEM	-	
...	Lines Omitted to fit the slide ...		

Storage Group Requirements

- SG Refers to an MTL (DLMOBJ00)
 - Be sure to create the MTL
 - Direct it to the correct DLM
 - Create enough scratch tapes to support the application
 - No need to set
 - Expiration Date or
 - Retention Period
 - All managed by OAM at the object level
 - Tapes will be used and extended until full
 - As objects expire tape usage will decrease until all objects have expired and then tape will be expired and returned to scratch pool

Data Class Referenced by CBROAMxx

DCOBJECT

```

(3)   RECORG           -           --
...   Lines omitted to fit on the slide ...
(14)  VOLUME COUNT    -           25
...   Lines omitted to fit on the slide ...
(23)  LAST MOD USERID -           TMOULD1
(24)  LAST DATE MODIFIED -         2015/06/15
(25)  LAST TIME MODIFIED -         09:18
(26)  DATA SET NAME TYPE -         -----
(27)  EXTENDED ADDRESSABILITY -         NO
(28)  COMPACTION      -           ----
(29)  MEDIA TYPE      -           MEDIA4
(30)  RECORDING TECHNOLOGY -         128TRACK
(31)  PERFORMANCE SCALNG/SEGMENTN -         --- / ---
...   Lines omitted to fit on the slide ...

```

Management Class Referenced by CBROAMxx

MCOBJECT

(3)	EXPIRE NON-USAGE	-	NOLIMIT
(4)	EXPIRE DATE/DAYS	-	365
(5)	RET LIMIT	-	NOLIMIT
(6)	PARTIAL RELEASE	-	NO
(7)	PRIMARY DAYS	-	2
(8)	LEVEL 1 DAYS	-	60

... lines omitted to fit on the slide ...

(12)	BACKUP FREQUENCY	-	1
(13)	# BACKUPS (DS EXISTS)	-	2
(14)	# BACKUPS (DS DELETED)	-	1
(15)	RETAIN DAYS ONLY BACKUP	-	60
(16)	RETAIN DAYS EXTRA BACKUPS	-	30
(17)	ADM/USER BACKUP	-	BOTH
(18)	AUTO BACKUP	-	YES
(19)	LAST MOD USERID	-	TMOULD1
(20)	LAST DATE MODIFIED	-	2015/06/13
(21)	LAST TIME MODIFIED	-	12:18

... lines omitted to fit on the slide ...

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Examples of DB2 Metadata for OAM

- DB2 database contains
 - OSM_OBJ Table with a row for every object and information to manage that object
 - TAPEVOL Table contains a row for every tape volser that is in use by OAM
- DB2 is updated real time as changes are made
- DB2 is used by OSMC to transition objects from one media to another

DB2 Object Information Table

ODVER	CHAR (1)	NOT NULL,
ODSIZE	INTEGER	NOT NULL,
ODCREATS	TIMESTAMP	NOT NULL,
ODEXPDT	DATE	NOT NULL,
ODLREFDT	DATE	NOT NULL,
ODPENDDT	DATE	NOT NULL,
ODMCASDT	DATE	NOT NULL,
ODSCNUM	SMALLINT	NOT NULL,
ODMCNUM	SMALLINT	NOT NULL,
ODLOCFL	CHAR (1)	NOT NULL,
ODLSLOC	CHAR (6)	NOT NULL,
ODSECLOC	INTEGER	NOT NULL,
ODBKLOC	CHAR (6)	NOT NULL,
ODBKSEC	INTEGER	NOT NULL,
ODCLID	INTEGER	NOT NULL,
ODNAME	VARCHAR (44)	NOT NULL,
ODBK2LOC	CHAR (6)	NOT NULL WITH DEFAULT,
ODBK2SEC	INTEGER	NOT NULL WITH DEFAULT,
ODLOBFL	CHAR (1)	NOT NULL WITH DEFAULT,
ODSTATF	SMALLINT	NOT NULL WITH DEFAULT,
ODRETDT	DATE	NOT NULL WITH DEFAULT '0001-01-01',
ODINSTID	INTEGER	NOT NULL WITH DEFAULT

DB2 Tape Volume Table – Part 1

VOLSER	CHAR (6)	NOT NULL,
UNITNAME	CHAR (8)	NOT NULL,
MEDIATYP	CHAR (2)	NOT NULL,
STORGRP	CHAR (8)	NOT NULL,
TYPE	CHAR (1)	NOT NULL,
CREDATE	DATE	NOT NULL,
MNTDATE	DATE	NOT NULL,
WRDATE	DATE	NOT NULL,
EXPDATE	DATE	NOT NULL,
CAPACITY	INTEGER	NOT NULL,
FRESpace	INTEGER	NOT NULL,
LSTBLKID	INTEGER	NOT NULL,
PFULL	SMALLINT	NOT NULL,
NUMLBLKS	INTEGER	NOT NULL,
NUMLKBW	INTEGER	NOT NULL,
NUMPKBW	INTEGER	NOT NULL,
NUMLKBDE	INTEGER	NOT NULL,
FULL	CHAR (1)	NOT NULL,

DB2 Tape Volume Table – Part 2

READABLE	CHAR (1)	NOT NULL,
WRITABLE	CHAR (1)	NOT NULL,
INUSE	CHAR (1)	NOT NULL,
COPIED	CHAR (1)	NOT NULL,
AVOLSER	CHAR (6)	NOT NULL,
COMPACT	CHAR (1)	NOT NULL,
EPI	SMALLINT	NOT NULL WITH DEFAULT,
MEMBER	CHAR (16)	NOT NULL WITH DEFAULT,
BKTYPE	CHAR (1)	NOT NULL WITH DEFAULT,
OUNITNAM	CHAR (8)	NOT NULL WITH DEFAULT,
DATACLAS	CHAR (8)	NOT NULL WITH DEFAULT,
DSNFMT	CHAR (1)	NOT NULL WITH DEFAULT,
SUBLEVEL	CHAR (1)	NOT NULL WITH DEFAULT,
CAPACITYO	INTEGER	NOT NULL WITH DEFAULT,
FRESPEAO	INTEGER	NOT NULL WITH DEFAULT,
NUMLKBWO	INTEGER	NOT NULL WITH DEFAULT,
NUMPKBWO	INTEGER	NOT NULL WITH DEFAULT,
NUMLKBDEO	INTEGER	NOT NULL WITH DEFAULT,
VOLATTRF	SMALLINT	NOT NULL WITH DEFAULT)

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8/11/2015

Summary

- OAM manages objects stored on Virtual Tapes
- Detailed Information is available
- Transition of data is possible
 - To Less costly media
 - To reduce replication costs for Recovery
 - Managed automatically through SMS definitions
 - Monitored through DB2 tables using SQL
- OAM is not intuitive when storing on Tape
- Hopefully this presentation provided tips to make it easier