What's New With OAM Object Support?

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IBM

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9009

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OAM Object Support Enhancements

- **z/OS V1R8**
  - **Large Object Support (stage 1)**
    - Add DB2's binary large object support to store object data (today **256MB** object takes **8000+ rows** to store in our 32K data table)
    - Stage 1 towards getting to larger object sizes
  - **Tape enhancements (stage 1)**
    - Immediate backup copy
    - Automatic tape recycle selection capability
- **z/OS V1R9**
  - **Tape enhancements (stage 2)**
    - Add additional tape sub level to OAM storage hierarchy

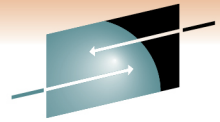
OAM Object Support Enhancements

z/OS V1R10

- **Large Object Support Stage 2**
  - 256MB is the current max object size for the DASD, tape, and optical layers of the OAM storage hierarchy
  - extends object size to 2000MB for the DASD layer
  - Major change to OAM API
  - Includes infrastructure for Large Object Stage 3

- **Usability Enhancements**
  - Mark Tape Permanently Full
  - OSMC Hard Stop
  - Option to Query Backup
  - Adding Lost Reason for Automatic Access to Backup
  - Automatic Access to Backup for CBROAMxx PARMLIB Member
  - ONLYIF for CBROAMxx PARMLIB Member

OAM Object Support Enhancements



z/OS V1R11

- **Large Object Support Stage 3**
  - extends object size to 2000MB for the DASD and tape layer

- **OAM Archive Retention Enhancements**
  - Deletion Hold
  - Event Based Retention
  - Deletion Protection
  - Retention Protection

- **Miscellaneous User Enhancements**
  - Generic search for OSREQ QUERY
  - CHGCOL utility to set default MC and SC
  - CBRUXSAE enhancements

OAM Object Support Enhancements

z/OS V1R12

- **OAM RAS Enhancements**
  - Volume Recovery performance improvement
  - CICS Threadsafe Support
  - Display OSMC operator command enhancement
  - Storage Group Multi-System Enablement
  - Expanded Start DB2 Indications

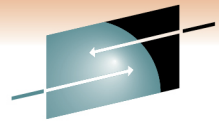
- **Infrastructure for Disk Sublevel Support**

OAM Object Support Enhancements

z/OS V1R13

- **Disk Sublevel Support (Stage 1)**

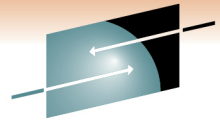
- **OAM Usability and Reliability Enhancements**
  - Wildcard in F OAM,S,STORGRP command
  - Extend object expiration beyond 27 years
  - Dynamic update of SGMAXTAPERETRIEVETASKS and SGMAXTAPESTORETASKS settings
  - Improved media migration
  - Enhanced OAM messages for specific DB2 errors
  - SMF counter scalability
  - CTICBR00 Parmlib member
  - CBR9875I Recycle candidates display enhancement
  - Misc internal RAS enhancements



z/OS V1R10

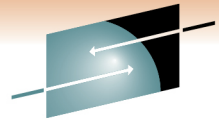
DFSMSdfp OAM Large Object Support (Stage 2) (aka OAM 2000MB Support (Stage 1)), and Usability Enhancements

R10 Large Object Support Overview



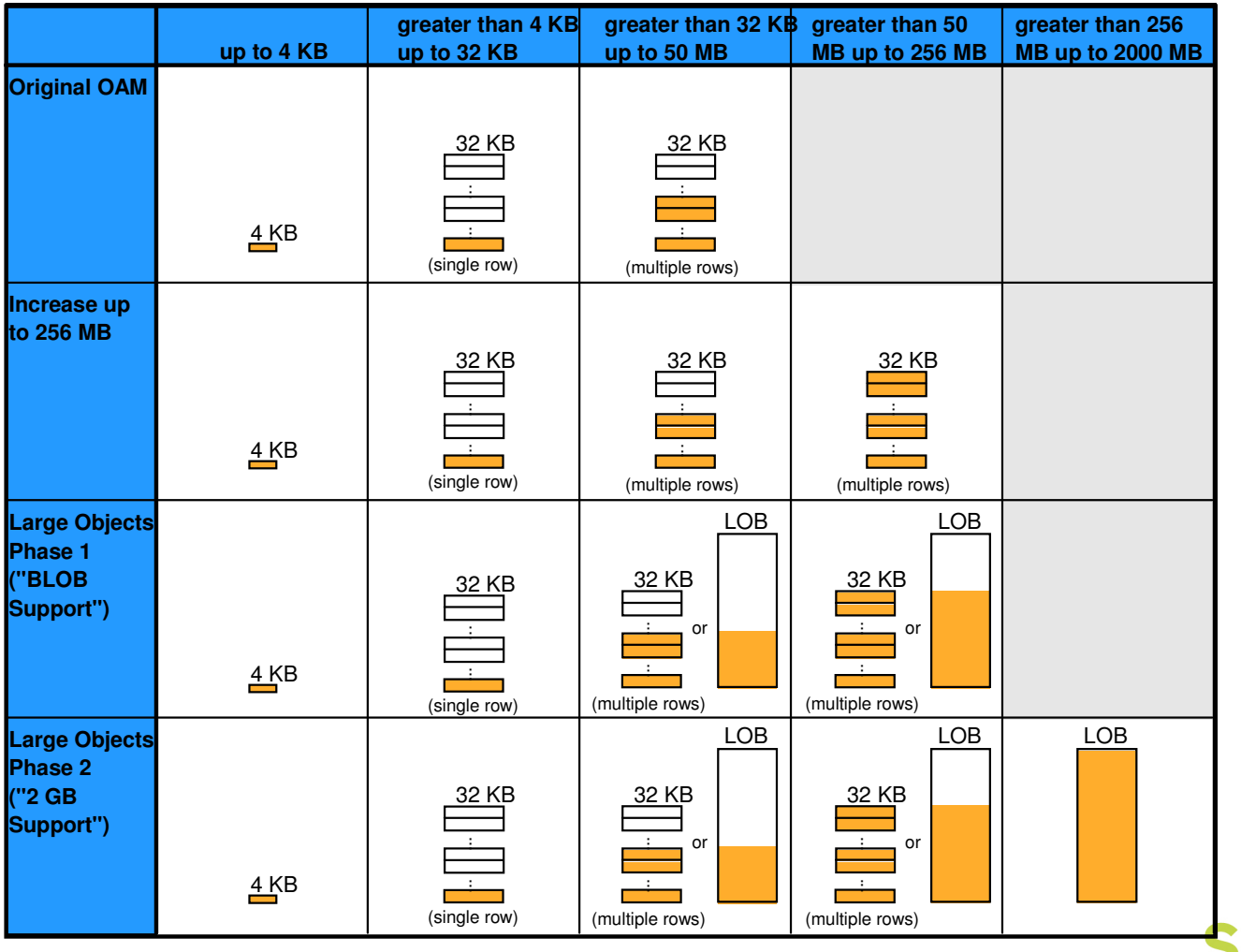
- **Problem Statement / Need Addressed:**
  - Extend the maximum object size that can be accepted and managed by OAM.
    - Prior maximum object size of 256 MB
    - User data larger than 256 MB has to be split into multiple OAM Objects.
  - Customer requirements answered
    - MR1218033353: Larger OAM Object Size Support
    - MR0606025754: Increase S/390 OAM limit to 380 MB
    - IBM internal requirement to support objects up to 2 GB.

R10 Large Object Support Overview



- **Solution:**
  - Enhanced the OSREQ application programming interface so that objects larger than 256 MB and up to 2000 MB in size can be stored, in parts, sequentially to the “DASD” level of the OAM storage hierarchy
    - Objects >256 MB only supported on “DASD” level of OAM storage hierarchy (“Tape” support positioned to follow later)
- **Benefit:**
  - Improved scalability
  - Simplified user applications that handle object data larger than 256 MB

Large Object Support Overview



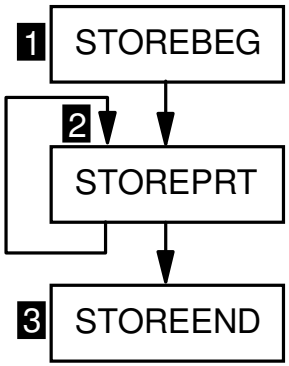
R10 Large Object Support (cont)

- **PARMLIB**
  - **OAM1** entry in member IEFSSNxx **MOS=xxxx** changed to allow specification of new **2000 MB** maximum object size for storing new objects via OSREQ API
  - For **exploitation**, now **requires OAM DB2 LOB definitions** in storage groups to contain objects >256 MB (and **LOB=** on OAM1 entry in PARMLIB member IEFSSNxx must specify **'P'** or **'A'** for exploitation in some or all storage groups)
  - **OAM1** entry in member IEFSSNxx **QB=x** added to specify whether an OSREQ QUERY request results in a call into the OAM address space to retrieve the backup retrieval order keys.

R10 Large Object Support (cont)

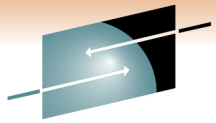
- **OSREQ API**
  - New **STOREBEG, STOREPRT,** and **STOREEND** OSREQ store sequence functions to store objects >256 MB
  - New store sequence functions used internally in **OSREQ TSO/E command processor** for storing “test” objects >256 MB
  - Example usage illustrated in new **CBROSR2** SAMPLIB program
- **SMF**
  - OAM SMF Record Type 85 (x’55’) new subtypes and field changes for **STOREBEG**, **STOREPRT**, and **STOREEND**
- **OAM CBRUXSAE API Authorization Installation Exit**
  - Unchanged; new store sequence functions presented to exit as OSREQ STORE

R10 Large Object Support (cont)



- **OSREQ API Changes**
  - New store sequence functions for objects >256 MB
    - **STOREBEG** to begin the store sequence
    - one or more **STOREPRT** to store each “part” of the object
    - **STOREEND** to end the sequence and complete the storage of the object or cancel the sequence
  - Only applications *exploiting* this support need to be changed
    - Application provides object to be stored in series of parts
    - Objects >256 MB retrieved using existing OSREQ RETRIEVE (*for a partial object*)

R10 Large Object Support – OSREQ API




```
OSREQ STOREBEG,MF={L|(M,parameter_list[,COMPLETE])|(E,parameter_list[,COMPLETE])}
        ,TOKEN={token_area|(token_area_pointer)}
        ,STOKEN={stoken_area|(stoken_area_pointer)}
        ,COLLECTN={collection_name_area|(collection_name_area_pointer)}
        ,NAME={object_name_area|(object_name_area_pointer)}
        ,SIZE={object_byte_word|(object_byte_word_pointer)}
        [,STORCLAS={storage_class_area|(storage_class_area_pointer)}]
        [,MGMTCLAS={management_class_area|(management_class_area_pointer)}]
        [,RETPD={retention_period_word |(retention_period_word_pointer)}]
        [,MSGAREA={message_area|(message_area_pointer)}]
        [,RETCODE={return_code_word|(return_code_word_pointer)}]
        [,REACODE={reason_code_word|(reason_code_word_pointer)}]
        [,TTOKEN={tracking_token|(tracking_token_pointer)}]
```

- New OSREQ STOKEN (store sequence token) parameter required for STOREBEG to receive token as an output which will be used on subsequent STOREPRT and STOREEND store sequence requests
- STOREBEG syntax similar to STORE, but no data buffers provided.

R10 Large Object Support – OSREQ API (cont)


```
OSREQ STOREPRT,MF={L|(M,parameter_list)[,COMPLETE])|(E,parameter_list{,COMPLETE})]
        ,TOKEN={token_area|(token_area_pointer)}
        ,STOKEN={stoken_area|(stoken_area_pointer)}
        ,SIZE={object_byte_word|(object_byte_word_pointer)}
        ,OFFSET={offset_of_starting_byte|(offset_of_starting_byte_pointer)}
        ,BUFLIST={buffer_list|(buffer_list_pointer)}
        [,RELBUF={NO|YES}]
        [,MSGAREA={message_area|(message_area_pointer)}]
        [,RETCODE={return_code_word|(return_code_word_pointer)}]
        [,REACODE={reason_code_word|(reason_code_word_pointer)}]
        [,TTOKEN={tracking_token|(tracking_token_pointer)}]
```

- New OSREQ STOKEN (store sequence token) parameter required
- SIZE and OFFSET specify size of “part” and offset into object where the part is to be stored

R10 Large Object Support – OSREQ API (cont)


```
OSREQ STOREEND,MF={L|(M,parameter_list{,COMPLETE})|(E,parameter_list{,COMPLETE})}
        ,TOKEN={token_area|(token_area_pointer)}
        ,STOKEN={stoken_area|(stoken_area_pointer)}
        ,SIZE={object_byte_word|(object_byte_word_pointer)}
        ,CANCEL={NO|YES}
        [,MSGAREA={message_area|(message_area_pointer)}]
        [,RETCODE={return_code_word|(return_code_word_pointer)}]
        [,RETCODE2={return_code2_word|(return_code2_word_pointer)}]
        [,REACODE={reason_code_word|(reason_code_word_pointer)}]
        [,TTOKEN={tracking_token|(tracking_token_pointer)}]
```

- New OSREQ STOKEN (store sequence token) parameter required
- New *optional* OSREQ CANCEL parameter can be used to terminate the store sequence without storing the object
- SIZE specifies total object size (sum of all parts) of object to be stored

R10 Large Object Support (cont)

- OAM SMF Record Type 85 (x'55')
  - New Subtypes
    - 8 for STOREBEG
    - 9 for STOREPRT
    - 10 for STOREEND
  - Field Changes (only subtype specific changes shown):

160 (x'A0')	ST8FLGS	4	Binary	Flags (new field definition for new subtype 8)
160 (x'A0')	ST9FLGS	4	Binary	Flags (new field definition for new subtype 9)
160 (x'A0')	ST10FLGS	4	Binary	Flags (new field definition for new subtype 10)
164 (x'A4')	ST1STOK	16	Binary	OSREQ STOKEN (new field definition for new subtypes 8,9,10)
180 (x'B4')	ST1RC2	4	Binary	RETCODE2 (new field definition for existing subtypes 2 and 3 and new subtype 10)

R10 Usability Enhancements

- **Problem Statements / Needs Addressed:**
  - Allow tape volumes to retain full status across OAM initializations.
  - Add the capability to stop OSMC scheduled work quicker.
  - Enable OSREQ QUERY requests to return the object's size quicker.
  - Automatically retrieve an object's backup copy if the primary copy has been marked lost or undefined.
  - Retain Auto Access to Backup settings across OAM starts.
  - Allow a single CBROAMxx PARMLIB member to be shared across all the systems in a sysplex.

R10 Usability Enhancements (cont)

- **Solution:**
  - The MODIFY OAM,UPDATE operator command is updated to optionally mark a tape or optical volume's full status to *permanently* full by updating FULL to 'P'.
  - The **MODIFY OAM,STOP,OSMC** command supports the FORCE keyword to allow the operator to stop all OSMC processing immediately.
  - A new optional keyword is added to the IEFSSNxx PARMLIB member to indicate whether OAM is to retrieve backup volume information when processing the OSREQ QUERY command.

R10 Usability Enhancements (cont)

- **Solution (cont):**
  - To support the new LOST feature, the existing **MODIFY OAM,START,AB** and **MODIFY OAM,STOP,AB** operator commands include LOST as an additional reason.
  - The SETOPT statement of CBROAMxx PARMLIB member supports the following new keywords to configure Automatic Access to Backup: ABUNREAD, ABOFFLINE, ABNOTOPER, ABDB2ERROR, ABLOST, and ABALL.
  - The CBROAMxx PARMLIB member allows a new ONLYIF statement to specify whether specific statements within the CBROAMxx PARMLIB member are to be processed on a given system:
    - `ONLYIF SYSNAME(MAINSYS1)` *`statement`*

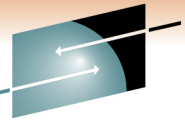
R10 Usability Enhancements (cont)

- **Benefit:**
  - Enhance user' ability to recycle tape volumes
  - Improve disaster recovery planning process
  - Stop both scheduled and unscheduled OSMC work
  - Increase performance of the OSREQ QUERY command
  - Automatically retrieve backup object data that resides on volumes that have been marked lost or not-defined
  - Eliminate the need to continually re-enter automatic access operator commands after OAM initializations
  - Allow a single CBROAMxx PARMLIB member to be shared across all the systems in a sysplex.

R10 Usability Enhancements (cont)

Operator Command	New	Changed Syntax	Changed Results / Display
MODIFY OAM,STOP,OSMC,FORCE	No	Yes	Yes (OSMC Hard Stop)
MODIFY OAM,START,AB,LOST	No	Yes	Yes (Automatic Access to Backup)
MODIFY OAM,STOP,AB,LOST	No	Yes	Yes (Automatic Access to Backup)
MODIFY OAM,DISPLAY,SETOPT	No	No	Yes (Automatic Access to Backup)
MODIFY OAM,UPDATE,VOLUME, volume,FULL,{Y|N|P}	No	Yes	Yes (Enhancement to the MODIFY OAM,UPDATE,VOLUME Command)
DISPLAY SMS,OAM	No	No	Yes (Automatic Access to Backup)

R10 Migration & Coexistence Considerations



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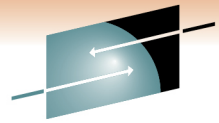
- Modify and run CBRPBIND, CBRIBIND, CBRABIND and any application binds.
- V1R10 Coexistence PTFs must be installed on any pre-V1R10 level systems prior to starting OAM the first time on V1R10.
  - PTF UA39931 for V1R6
  - PTF UA39932 for V1R7
  - PTF UA39933 for V1R8
  - PTF UA39934 for V1R9
- Pre-V1R10 levels will
  - Detect and fail the partial retrieval and deletion of an object larger than 256 MB and up 2000 MB in size.
  - Skip all OSMC processing for an object larger than 256 MB and up to 2000 MB in size.
  - Recognize the new 'P' value in the FULL column of the TAPEVOL and VOLUME tables as permanently marked full.



z/OS V1R11

DFSMSdfp OAM Large Object Support (Stage 3) (aka OAM 2000MB Support (Stage 2)), Archive Retention Enhancements, and Miscellaneous User Enhancements

R11 Overview 2000 MB Object Support (Stage-2)

- **Problem Statement / Need Addressed:**
  - Extend the maximum object size that can be accepted and managed by OAM for tape media.
    - Prior maximum object size of 256 MB on tape
    - No backup or transition support for GT256M objects
    - Customer data GT 256 MB has to be split into multiple OAM objects if targeted for tape

R11 2000 MB Object Support (cont)

- **Solution:**
  - Extend the 2 GB Object Support Phase 1 introduced in R10 for DASD to include tape media.
    - Enhance the OSREQ application programming interface so that objects larger than 256 MB and up to 2000 MB in size can be stored, in parts, sequentially to the “DASD” and “tape” levels of the OAM storage hierarchy
- **Benefit:**
  - Improved scalability
  - OSMC backup, transition, recovery functionality
  - Simplified user applications that handle GT 256 MB object sizes.

R11 2000 MB Object Support (cont)

- Using OAM 2000 MB Object Support Stage 2, you can:
  1. Store objects up to 2000 MB in size to the DASD and tape layers of the OAM storage hierarchy.
- Value:
  1. Enables full OAM function on tape media (OSMC transitions, backups, recovery and movevol)

R11 Archive Retention Enhancements

- **Problem Statement / Need Addressed:**
  - More control required in ensuring object data not deleted or changed prior to expiration criteria
  - Dynamic mechanism required to set expiration criteria

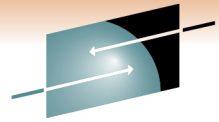
R11 Archive Retention Enhancements (cont)

- **Solution: OAM archive retention enhancements**
  - **Deletion-hold:** Prevent object deletion while object is in deletion-hold mode.
  - **Retention-protection:** Prevent object deletion prior to object's expiration date, and don't allow expiration date to be changed (explicitly or implicitly) to an earlier date.
    - ***Note****: RP in effect for life of object. If expiration date is ever set to 'forever' the object can never be deleted.*
  - **Deletion-protection:** Prevent object deletion prior to object's expiration date.
  - **Event-based-retention:** Object expiration date dependent on external event notification.

R11 Archive Retention Enhancements (cont)

- **Benefit:**
  - You will have greater control to prevent object change or deletion before expiration

R11 Overview Usability Enhancements



- **Problem Statement / Need Addressed:**
  - Generic search request for OSREQ QUERY needs to be more robust/powerful.
  - Manual procedure required to change default storage class and management class values for an object collection.
  - CBRUXSAE security exit needs more granularity.

R11 Usability Enhancements (cont)

- **Solution: OAM archive retention enhancements**
  - OSREQ **QUERY** will now support a generic search where one or more **percent sign** (%) and/or **underscore** (_) wildcards can be placed anywhere in the object name.
  - New **CHGCOL** utility can now be used to modify the default SC and MC values associated with an object collection.

R11 Usability Enhancements (cont)

- **Solution: OAM archive retention enhancements (cont)**
  - **CBRUXSAE** accommodates more granular return codes, allowing installations to (for example):
    - Allow a given user to STORE to existing collections but not create new collections.
    - Bypass the exit for a subset of OSREQ functions while still being called for other OSREQ functions.

R11 Usability Enhancements (cont)

- **CBRUXSAE (cont)**

  Return codes from CBRUXSAE are interpreted as follows:

  0: User is authorized to perform this function.

  16: Bypass this exit for all OSREQ functions.

  224-252: Reserved for IBM.

  253: -- For an OSREQ STORE function: User is authorized to store into an existing collection only. Attempts to store into a collection that does not exist will fail. -- For all other functions (OSREQ RETRIEVE, QUERY, CHANGE or DELETE): User is not authorized to perform this function.

  254: Bypass this exit for the current OSREQ function in ***restricted-store*** mode.

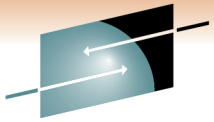
  255: Bypass this exit for the current OSREQ function in ***normal-store*** mode.

  Other: User is not authorized to perform this function.

R11 Usage & Invocation

- **PARMLIB**
  - **OAM1** entry in **IEFSSNxx** Parmlib member
    - **MOS=xxxx** changed to allow specification of new 2000 MB maximum object size for storing new objects via OSREQ API
    - **LOB='A' or 'P'** required to store object GT 256 MB to disk.
    - **DP='A' or 'P'** required to enable deletion-protection mode.

R11 Usage & Invocation



- **ISMF:** 2 new parameters for object storage group definitions
  - **OAM Retention Protection:**
    - New objects stored into an object storage group with this parameter enabled are flagged as retention-protected for the entire life of the objects. A retention-protected object cannot be deleted prior to its expiration date, and its expiration date can never move to an earlier date.
  - **OAM Deletion Protection:**
    - This parameter, in concert with the DP=P keyword in IEFSSNxx PARMLIB member, determines the current deletion-protection mode (enabled or disabled) for all objects in this object storage group. This value is ignored when DP=A or DP=N. When deletion-protection is enabled, objects in this object storage group cannot be deleted prior to their expiration date. Deletion-protection does not restrict any changes to an object's expiration date.

R11 Usage & Invocation (cont)

- **New DB2 columns added to Object Directory Tables:**
  - ODSTATF: Status flags for this object
    - ODSTATF_RETPROT: Retention-protection enabled
    - ODSTATF_DELHOLD: Deletion-hold enabled
    - ODSTATF_EBR: Event-based-retention active
  - ODRETDT: Contains latest (furthest out in time) expiration date derived for this retention-protected object.
  - ODINSTID: placeholder for future enhancement.

R11 Usage & Invocation (cont)

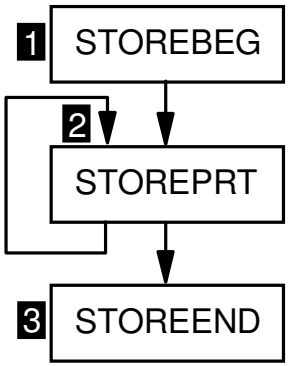
- **Operator Commands / Displays**

Operator Command	New	Changed Syntax	Changed Results / Display
DISPLAY SMS,OAM	N	N	IEFSSNxx parms and CBRUXSAE status for each OSREQ function.
DISPLAY SMS,SG	N	N	Retention-Protection and Deletion-Protection mode.
LIBRARY RESET,CBRUXSAE	N	N	Reset status for all OSREQ functions.
OAMUTIL CHGCOL (TSO cmd)	Y	-	Modify default SC and/or MC values for specified collection.

R11 Usage & Invocation (cont)

- **Externals**
  - **OSREQ API**
    - New STOREBEG, STOREPRT, and STOREEND OSREQ store sequence functions to store objects GT 256 MB (introduced in R10 for OAM disk support)
    - New store sequence functions used internally in OSREQ TSO/E command processor for storing “test” objects >256 MB
    - Example usage illustrated in new CBROSR2 SAMPLIB program

R11 Usage & Invocation (cont)



- **OSREQ API Changes**
  - New store sequence functions (introduced in R10) for objects GT 256 MB
    - STOREBEG to begin the store sequence
    - one or more STOREPRT to store each “part” of the object
    - STOREEND to end the sequence and complete the storage of the object or cancel the sequence
  - Only applications *exploiting* this support need to be changed
    - Application provides object to be stored in series of parts
    - Objects GT 256 MB retrieved using existing OSREQ RETRIEVE (for a partial object)

R11 OSREQ API


```
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          ,STOKEN={stoken_area|(stoken_area_pointer)}
          ,COLLECTN={collection_name_area|(collection_name_area_pointer)}
          ,NAME={object_name_area|(object_name_area_pointer)}
          ,SIZE={object_byte_word|(object_byte_word_pointer)}
          [,STORCLAS={storage_class_area|(storage_class_area_pointer)}]
          [,MGMTCLAS={management_class_area|(management_class_area_pointer)}]
          [,RETPD={retention_period_word |(retention_period_word_pointer)}]
          [,MSGAREA={message_area|(message_area_pointer)}]
          [,RETCODE={return_code_word|(return_code_word_pointer)}]
          [,REACODE={reason_code_word|(reason_code_word_pointer)}]
          [,TTOKEN={tracking_token|(tracking_token_pointer)}]
          [,STIMEOUT={stimeout_word|(stimeout_word_pointer)}]
          [,DELHOLD={HOLD|NOHOLD}]
```

R11 OSREQ API (cont)


```
OSREQ STORE,MF={L|(M,parameter_list[,COMPLETE])|(E,parameter_list[,COMPLETE])}
         ,TOKEN={token_area|(token_area_pointer)}
         ,COLLECTN={collection_name_area|(collection_name_area_pointer)}
         ,NAME={object_name_area|(object_name_area_pointer)}
         ,BUFLIST={buffer_list|(buffer_list_pointer)}
         ,SIZE={object_byte_word|(object_byte_word_pointer)}
         [,STORCLAS={storage_class_area|(storage_class_area_pointer)}]
         [,MGMTCLAS={management_class_area|(management_class_area_pointer)}]
         [,RETPD={retention_period_word |(retention_period_word_pointer)}]
         [,MSGAREA={message_area|(message_area_pointer)}]
         [,RETCODE={return_code_word|(return_code_word_pointer)}]
         [,REACODE={reason_code_word|(reason_code_word_pointer)}]
         [,TTOKEN={tracking_token|(tracking_token_pointer)}]
         [,RETCODE2={return_code2_word|(return_code2_word_pointer)}]
         [,DELHOLD={HOLD|NOHOLD}]
```

R11 OSREQ API (cont)


```
OSREQ CHANGE MF={L|(M,parameter_list[,COMPLETE])|(E,parameter_list[,COMPLETE])}
         ,TOKEN={token_area|(token_area_pointer)}
         ,COLLECTN={collection_name_area|(collection_name_area_pointer)}
         ,NAME={object_name_area|(object_name_area_pointer)}
         [,STORCLAS={storage_class_area|(storage_class_area_pointer)}]
         [,MGMTCLAS={management_class_area|(management_class_area_pointer)}]
         [{,RETPD={retention_period_word |(retention_period_word_pointer)} |
          ,EVENTEXP={number_of_days_word |(number_of_days_word_pointer)}}]
         [,MSGAREA={message_area|(message_area_pointer)}]
         [,RETCODE={return_code_word|(return_code_word_pointer)}]
         [,REACODE={reason_code_word|(reason_code_word_pointer)}]
         [,TTOKEN={tracking_token|(tracking_token_pointer)}]
          [,DELHOLD={HOLD | NOHOLD}]
```

R11 Usage & Invocation

- **SMF:** OAM records SMF records in the SMF data sets to account for OAM activity. The OAM SMF record is a type 85 (X'55'). *Documented in OAM PISA for Object Support.*
  - SMF Type 85 records for subtype 8 and 10 (STOREBEG and STOREEND) records will be modified to report activity associated with processing GT 256 MB objects on tape.
  - SMF Type 85 records for subtypes 2, 5 and 10 (STORE, CHANGE and STOREEND) will be modified to report information associated with the new archive retention parameters.

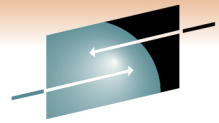
R11 Migration & Coexistence

- **CBRSMR1B** sample migration job to add new ODSTATF, ODRETDT and ODINSTID columns to OAM's DB2 Object Directory tables.
- Modify and run CBRPBIND, CBRIBIND, CBRABIND and any application binds.
- Verify CBRUXSAE exit is not using IBM reserved values (224-255).

- V1R11 Coexistence APAR OA26334 must be installed on any pre-V1R11 level systems prior to starting OAM the first time on V1R11. Pre-V1R11 levels behavior varies by release. Documented in APAR text.

R11 Migration & Coexistence (cont)

- Pre-V1R11 level systems in the OAMplex will NOT be cognizant of the archive retention enhancements introduced in V1R11, and therefore *could inadvertently bypass the protection modes defined on the V1R11 level system*.
  - *For this reason, it is highly recommended that installations do not exploit the archive retention enhancements until all the systems in the OAMplex are migrated to z/OS V1R11 or higher.*



z/OS V1R12

DFSMSdfp OAM Enhancements

OAM Enhancements for R12

- Volume Recovery performance improvement
- CICS Threadsafe Support
- Display OSMC operator command enhancement
- Storage Group Multi-System Enablement
- Expanded Start DB2 Indications

R12 Volume Recovery Performance

- **Problem Statement / Need Addressed:**
  - Performance: In some situations, first access of physical media is long after utility starts
- **Solution:**
  - Utility redesigned to more efficiently access object information
- **Benefit:**
  - Improved performance when recovering objects from a large number of collections on a large number of volumes
    - Reduced time between start of utility and first media access
    - Small reduction in time to access objects on physical media

R12 Volume Recovery Performance (cont)

- No change to invocation
- New/Changed External Output:
  - Statistics displayed now include the count of object remaining on the recovered volume (i.e. that were NOT recovered)

```
CBR9863I Volume Recovery status for volumes CMW099
  and N/A.
Total: 1043, Attempted: 1043, Successful: 1043,
  Unsuccessful: 0, Remaining: 0.
```

  - Values for statistics that could not be determined are now shown as **** instead of 0

```
CBR9863I Volume Recovery status for volumes CMW212
  and N/A.
Total: 4636, Attempted: 1496, Successful: ****,
  Unsuccessful: ****, Remaining: ****.
```

  - It is somewhat more likely than in the past that the total number of objects will not be known if the recovery is stopped before completion.

R12 CICS Threadsafe

- **Problem Statement / Need Addressed:**
  - Performance of OSREQ requests from CICS applications
  - Customer requirements answered
    - MR0314053229 / MR0427055622 / MR0512051550: Avoid ATTACH/DETACH of a TCB for each OSREQ request
    - MR0529074418: Support CICS threadsafe

R12 CICS Threadsafe (cont)

- **Solution:**
  - Task Switch Reduction
    - **Reduced number of 'task switches' for CICS applications that invoke the OAM OSREQ API**
      - ***Threadsafe applications***
        - Fewer task switches on entry/exit of OAM API if EXECKEY(CICS)
        - No task switches within OAM code between SQL calls
      - ***Non-threadsafe applications benefit as well***
        - No task switches within OAM code between SQL calls
  - Attach Elimination
    - **MVS ATTACH and MVS DETACH eliminated for every OSREQ macro invocation**
      - ***Both CICS threadsafe and non-threadsafe applications will benefit***

R12 CICS Threadsafe (cont)

- **Benefit:**
  - **Performance improvement for CICS applications that use the OAM OSREQ API**
    - **Reduced CPU time**
      - ***Reduction of CICS TCB switches***
      - ***Elimination of an MVS ATTACH and DETACH***
      - ***All applications will see some reduction in CPU time***
        - *Applications defined as CONCURRENCY(THREADSAFE) will see the most improvement*
    - **Increased application throughput**
      - ***Multi-processor CPU***
        - *Threadsafe applications can run in parallel with other CICS work*

R12 CICS Threadsafe (cont)

- **No externals changes**
- **No application changes required to get CPU reduction**

R12 Display OSMC Command Enhancement

- **Problem Statement / Need Addressed:**
  - The MODIFY OAM,D,OSMC command does not include 'Immediate Backup' and 'Recall to DB2' queue statistics
- **Solution:**
  - The Display OSMC command output now includes the number of Immediate Backup and Recall To DB2 tasks currently processing and queued to process
- **Benefit:**
  - Immediate Backup and Recall to DB2 task counts are easily displayed

R12 Display OSMC Command Enhancement (cont)

- **The support is invoked by:**
  - Display OSMC operator command (F OAM,D,OSMC or D SMS,OSMC)
- **New/Changed External Output:**
  - New message CBR9364I is issued after existing message CBR9350I in response to a Display OSMC operator command to show the number of processing and queued Immediate Backup and Recall to DB2 tasks

R12 Display OSMC Command Enhancement (cont)

- Example:

```
F OAM,D,OSMC
CBR9350I  OSMC Summary Status :
TASK        TASK    TASK    START       OBJECTS       OBJECTS
NAME        TYPE    STAT    TIME        COMPLETED     ACTIVE
Z00229        M       A     08.43.25            0       21390
A00229        M       A     08.43.28            0        5000
CBR9364I OSMC Summary Status 2:
           TASK    TASKS     TASKS
ACTIVITY   TYPE    ACTIVE    QUEUED
IMBKUP     I            1         0
RCLDB2     B            1         0
End of Display Summary
```

R12 Storage Group Multi-System Enablement

- **Problem Statement / Need Addressed:**
  - OAM processing restricts a Storage Group to only be enabled to single system in a non-OAMplex environment
- **Solution:**
  - Allow Object and Object Backup Storage Groups to be enabled to more than one system in a non-OAMplex environment
- **Benefit:**
  - A storage group name can be used on one system in a non-OAMplex environment even if it is used for a different sets of objects on one or more other systems in the OAMplex

R12 Storage Group Multi-System Enablement (cont)

- **The support is enabled by:**
  - Specifying SETOPT MULTISYSENABLE(YES) in the CBROAMxx PARMLIB member

- **New/Changed External Output:**
  - New informational message CBR0165I is issued during OAM startup if SETOPT MULTISYSENABLE(YES) is specified and one or more storage groups are defined to more than one system
  - Output from the MODIFY OAM,DISPLAY,SETOPT,GLOBAL operator command will now include the setting of MULTISYSENABLE, e.g.

    CBR1075I GLOBAL value for MULTISYS is NO

R12 Start DB2 Indications

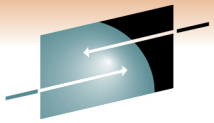
- **Problem Statement / Need Addressed:**
  - OAM only issues message CBR7530E once if DB2 goes down. If the operator clears that message from the screen, it is not obvious later on why OAM commands do not work.
- **Solution:**
  - OAM will reissue CBR7530E after every subsequent OAM operator command entered until DB2 is brought back up or OAM is canceled
- **Benefit:**
  - Better communication to operator about why OAM commands are not working

R12 Interactions & Dependencies

- Hardware Dependencies
  - No changes
- Software Dependencies
  - If the OSREQ macro is invoked from a CICS transaction, then IBM CICS Transaction Server 2.2 or higher is required

R12 Migration & Coexistence

- Storage Group Multi-System Enablement in a non-OAMplex environment requires that all systems using a common storage group name be at V1R12.
  - OAM in a non-OAMplex environment on a pre-V1R12 system will not recognize an object or object backup storage group that is defined as connected to more than one system. “Connected” is any storage group status other than NOTCON (i.e. ENABLED, DISNEW, DISALL).



z/OS V1R13
Disk Sublevel Support (Stage 1)
(aka OAM File System Support),
and
OAM Usability and Reliability Enhancements

OAM Enhancements for R13

- **Disk Sublevel 2 Support (Stage 1)**
- **OAM Usability and Reliability Enhancements**
  - Wildcard in F OAM,S,STORGRP command
  - Extend object expiration beyond 27 years
  - Dynamic update of SGMAXTAPERETRIEVETASKS and SGMAXTAPESTORETASKS settings
  - Improved media migration
  - Enhanced OAM messages for specific DB2 errors
  - SMF counter scalability
  - CTICBR00 Parmlib member
  - CBR9875I Recycle candidates display enhancement
  - Misc internal RAS enhancements

R13 Disk Sublevel 2 (Stage 1)

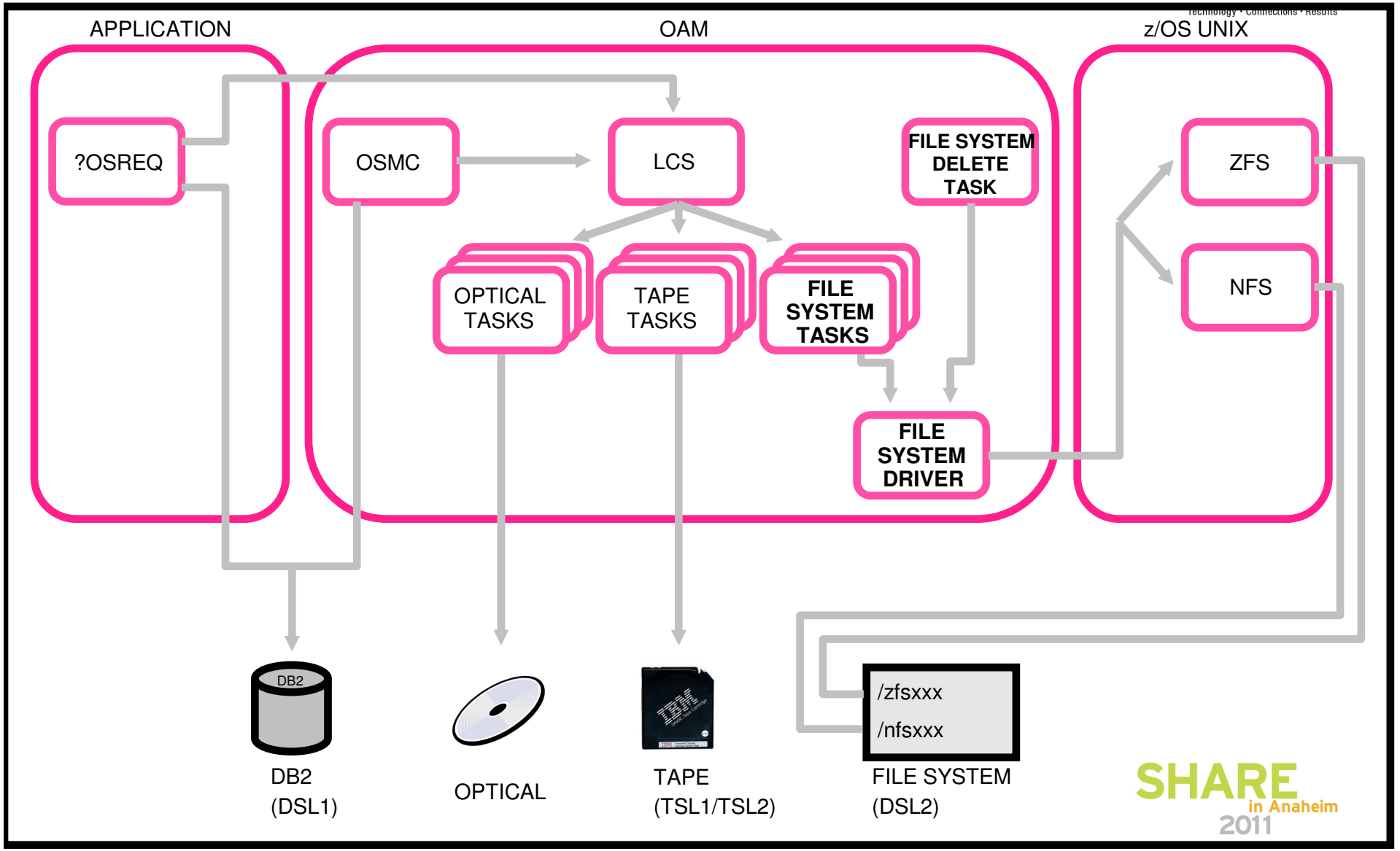
- Problem Statement / Need Addressed
  - Provide an additional “Disk” destination in OAM storage hierarchy Note: Existing hierarchy can consist of Disk (implemented via DB2 tables on DASD), Optical, and Tape

R13 Disk Sublevel 2 (cont)

- Solution
  - New OAM storage hierarchy file system destination for primary objects stored as files in z/OS UNIX file system hierarchy
    - zFS (on native attached DASD)
    - NFS (wide variety of storage options and technologies on network attached NFS file servers)
  - Disk Level now comprised of
    - Disk sublevel 1 (existing DB2 sublevel using DB2 tables)
    - Disk sublevel 2 (new file system sublevel using zFS or NFS)

R13 Disk Sublevel 2 (cont)

- Benefit / Value
  - Additional flexibility in constructing OAM storage hierarchy
  - Reuse older/slower DASD devices for zFS file system storage
  - May reduce storage costs with NFS file servers
  - Can use file system as “cache” in OAM with 'Recall to Disk' functionality


APPLICATION
OAM
z/OS UNIX
?OSREQ
OSMC
LCS
FILE SYSTEM DELETE TASK
ZFS
NFS
OPTICAL TASKS
TAPE TASKS
FILE SYSTEM TASKS
FILE SYSTEM DRIVER
DB2
/zfsxxx
/nfsxxx
DB2 (DSL1)
OPTICAL
TAPE (TSL1/TSL2)
FILE SYSTEM (DSL2)

R13 Disk Sublevel 2 (cont)

- **ISMF Storage Class**
  - OAM Sublevel value of 2 when Initial Access Response Seconds=0 directs objects to new file system sublevel of OAM storage hierarchy

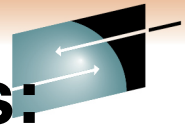
R13 Disk Sublevel 2 (cont)

- **PARMLIB**
  - New SETDISK statement in CBROAMxx to configure file system
    - Specify file system type (zFS or NFS)
    - Specify file system directory location within z/OS UNIX file system hierarchy where file system is mounted
  - New configuration for existing SETOPT statement in CBROAMxx
    - Specify 'Automatic Access to Backup' for file system errors
  - New configuration for existing SETOSMC statement in CBROAMxx
    - Specify disk sublevel for 'Recall to Disk'
      - *1 – existing DB2 sublevel*
      - *2 – new file system sublevel*

R13 Disk Sublevel 2 (cont)

- **DB2**
  - Existing ODINSTID field in OAM Object Directory now may contain value to identify unique instances of OAM files in file system sublevel
  - Existing ODLOCFL field in OAM Object Directory now may contain new values
    - 'E' when object located in new file system sublevel
    - '2' when object recalled to new file system sublevel
  - New File System Delete Table to identify objects to be deleted from the file system:
    - Deferred delete for “delete” requests from file system
    - Undo write for uncommitted “store” requests to file system

R13 Usability and Reliability Enhancements: Wildcard on START,STORGRP Command



- Problem
  - Operators had to enter command for each object and/or object backup storage group he wanted OAM to process. Customers requested mechanism to cut back on keystrokes.
- Solution
  - The **MODIFY OAM,S,STORGRP,*groupname*** command has been enhanced to support a single asterisk wildcard in the *groupname*.
    - Ex: **F OAM,S,STORGRP,GROUP*** starts processing for all object or object backup storage groups starting with GROUP.
    - Ex: **F OAM,S,STORGRP,*** starts processing for all object or object backup storage groups defined in the ACDS.
      - **Note**: F OAM,S,OSMC command can be used to start processing of all object storage groups, but ignores object backup storage groups.

R13 UaRE Extend Object Expiration

- Problem
  - Prior to this support, the maximum expiration criteria specified via SMS management class definition (other than NOLIMIT) is 9999 days (roughly 27 years).
- Solution
  - Objects can still be retained FOREVER (or NOLIMIT) however the 9999 day maximum associated with management class Retention Limit, Expire after Date/Days, and Expire after Days Non-usage has been expanded to 93000 days.
  - Additionally, the maximum number of days specified via the RETPD and EVENTEXP keywords on the OSREQ API has also been expanded to 93000.

R13 UaRE Dynamic Update of SGMAXTAPE Settings

- Problem
  - In order to change the distribution of tape drives allocated for OAM object and object backup storage groups, installations had to modify SGMAXTAPESTORETASKS and SGMAXTAPERETRIEVETASKS values in the CBROAMxx Parmlib member and restart OAM.
- Solution
  - Values specified for the SETOAM keywords SGMAXTAPERETRIEVETASKS and SGMAXTAPESTORETASKS, are dynamically changeable via the F OAM,UPDATE,SETOAM operator command. No restart of the OAM address space is required.

R13 UaRE Media Migration Performance

- Problem
  - When processing volumes with a large number of collections, a significant amount of time could elapse between the time the MOVEVOL command is issued and the time of the first write to a new volume.
  - Running MOVEVOL on one member of an OAMplex resulted in measurable CPU usage on ‘idle’ members in the OAMplex in reaction to XCF messages broadcast by the ‘active’ member.

R13 UaRE Media Migration Performance (cont)

- Solution
  - OAM's media migration utility, MOVEVOL, is changed to no longer process objects on a collection boundary.
  - With this support, the frequency of the broadcast messages relating to all tape reads and writes (not just MOVEVOL) from the 'active' member will be significantly reduced.

R13 UaRE DB2 Error Message Enhancement

- Problem
  - OAM currently issues generic messages that display DB2 SQL codes when a DB2 error is encountered. The system programmer must convert the hex return/reason code into a negative decimal SQL code and then look up the codes in DB2 manuals.
- Solution
  - This enhancement will print out additional information for 'common' SQL codes.
- Benefit / Value
  - Save the operator and storage administrator the trouble of having to derive the SQL codes and look up the codes in the DB2 manuals.

R13 UaRE SMF Counter Scalability

- Problem
  - Some 4 byte counter fields in SMF Type 85, subtypes 32-35 and 87 containing kilobyte values potentially could overflow as workloads and tape capacity increase.
- Solution
  - New 8 byte counter fields have been added to SMF Type 85, subtypes 32-35 and 87 to protect against potential overflow. The new 8 byte counters contain values in bytes.
- Benefit / Value
  - This enhancement avoids inaccuracies due to counter overflow (the 4 byte counters will contain X'FFFFFFFF' if overflow condition is detected).
  - The new 8 byte counters provide more granularity. They contains number of bytes (vs number of kilobytes in the old 4 byte fields).

R13 UaRE SMF Scalability (cont)

- The following OAM Subtype 32-35 counters are 4-byte fields which could potentially overflow. A value of X'FFFFFFFF' in one of these fields indicates an overflow was detected. New 8-byte fields are introduced in R13 which supersede these 4-byte fields.
  - ST32PDWK ST32PDRK ST32PDDK ST32POWK ST32PORK
    ST32PODK ST32PTWK ST32PTRK ST32PTDK ST32BOWK
    ST32BORK ST32BODK ST32BTWK ST32BTRK ST32BTDK
    ST32B2OWK ST32B2ORK ST32B2ODK ST32B2TWK ST32B2TRK
    ST32B2TDK ST32RCLK ST32PUWK ST32PURK ST32PUDK

- The following OAM Subtype 87 counters are 4-byte fields which could potentially overflow. A value of X'FFFFFFFF' in one of these fields indicates an overflow was detected. New 8-byte fields are introduced in R13 which supersede these 4-byte fields.
  - ST87NKBW ST87NKBR

R13 UaRE SMF Scalability (cont)

- New 8 byte counter fields for SMF Subtypes 32-35 are added to prevent overflow. The new fields are listed in the following table.

OFFSETS	NAME	LEN	FORMAT	DESCRIPTION
268 10C	ST32PEWO	4	binary	Number of primary objects written to disk sublevel 2 (file system).
272 110	ST32PERO	4	binary	Number of primary objects read from disk sublevel 2 (file system).
276 114	ST32PEDO	4	binary	Number of primary objects deleted from disk sublevel 2 (file system).
280 118	ST32PDWB	8	binary	Number of bytes of primary object data written to disk sublevel 1 (DB2).
288 120	ST32PDRB	8	binary	Number of bytes of primary object data read from disk sublevel 1 (DB2).
296 128	ST32PDDB	8	binary	Number of bytes of primary object data deleted from disk sublevel 1 (DB2).

R13 UaRE SMF Scalability (cont)

304	130	ST32POWB	8	binary	Number of bytes of primary object data written to optical.
312	138	ST32PORB	8	binary	Number of bytes of primary object data read from optical.
320	140	ST32PODB	8	binary	Number of bytes of primary object data deleted from optical.
328	148	ST32PTWB	8	binary	Number of bytes of primary object data written to tape.
336	150	ST32PTRB	8	binary	Number of bytes of primary object data read from tape.
344	158	ST32PTDB	8	binary	Number of bytes of primary object data deleted from tape.
352	160	ST32BOWB	8	binary	Number of bytes of backup object data written to optical.
360	168	ST32BORB	8	binary	Number of bytes of backup object data read from optical.
368	170	ST32BODB	8	binary	Number of bytes of backup object data deleted from optical.

R13 UaRE SMF Scalability (cont)

376	178	ST32BTWB	8	binary	Number of bytes of backup object data written to tape.
384	180	ST32PTRB	8	binary	Number of bytes of backup object data read from tape.
392	188	ST32BTDB	8	binary	Number of bytes of backup object data deleted from tape.
400	190	ST32B2OWB	8	binary	Number of bytes of BACKUP2 objects written to optical.
408	198	ST32B2ORB	8	binary	Number of bytes of BACKUP2 objects read from optical.
416	1A0	ST32B2ODB	8	binary	Number of bytes of BACKUP2 objects deleted from optical.
424	1A8	ST32B2TWB	8	binary	Number of bytes of BACKUP2 objects written to tape.
432	1B0	ST32B2TRB	8	binary	Number of bytes of BACKUP2 objects read from tape.
440	1B8	ST32B2TDB	8	binary	Number of bytes of BACKUP2 objects logically deleted from tape.

R13 UaRE SMF Scalability (cont)

448	1C0	ST32RCLB	8	binary	Number of bytes of recalled objects processed this storage group cycle. Valid only for subtype 32.
456	1C8	ST32PUWB	8	binary	Number of bytes of primary objects written to tape sublevel 2.
464	1D0	ST32PURB	8	binary	Number of bytes of primary objects read from tape sublevel 2.
472	1D8	ST32PUDB	8	binary	Number of bytes of objects deleted from tape sublevel 2.
480	1E0	ST32PEWB	8	binary	Number of bytes of primary objects written to disk sublevel 2 (file system).
488	1E8	ST32PERB	8	binary	Number of bytes of primary objects read from disk sublevel 2 (file system).
496	1F0	ST32PEDB	8	binary	Number of bytes of primary objects deleted from disk sublevel 2 (file system).

R13 UaRE SMF Scalability (cont)

New 8 byte counter fields for SMF Subtype 87 are added to prevent overflow. The new fields are listed in the following table.

OFFSETS	NAME	LEN	FORMAT	DESCRIPTION
68 44	ST87NBW	8	binary	Number of logical bytes of object data written to this tape volume while it was mounted.
76 4C	ST87NBR	8	binary	Number of bytes of object data read from this tape volume while it was mounted.

R13 UaRE CTICBR00 Parmlib Member

- Problem
  - Installations had to copy CBRCTI00 member from SAMPLIB into PARMLIB with a rename to CTICBR00 in order to define OAM default trace options via PARMLIB member.
- Solution
  - OAM will ship CTICBR00 directly to PARMLIB therefore the copy/rename step is no longer required.
- Benefit / Value
  - Simplifies OAM installation / migration.

R13 UaRE RECYCLE Display Enhancement

- Problem
  - When an F OAM,START,RECYCLE command is issued, the Recycle Candidates display message, CBR9875I, followed by a list of up to 40 volumes that have met the criteria specified by the RECYCLE command is generated and sent to hard copy SYSLOG.
  - The total number of volumes that meet the criteria for the RECYCLE command is not displayed.
- Solution
  - The message line that is displayed at the end of the Recycle Candidates display is updated to show a count of the total number of volumes that met the criteria specified in the RECYCLE command.

R13 Migration / Coexistence

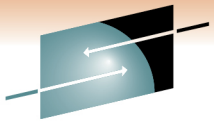
- **Migration**
  - CBRSMR1D sample migration job to add the new DB2 File System Delete Table
  - Modify and run installation tailored CBRPBIND, CBRIBIND, CBRABIND, CBRHBIND, and any application BINDs

R13 Migration / Coexistence (cont)

- **Coexistence**
  - In mixed level OAMplex, V1R13 coexistence APAR OA33022 must be installed on any pre-V1R13 level systems prior to starting OAM the first time on V1R13
    - Note: OAM on pre-V1R13 level systems will not process objects in the disk sublevel 2.
    - MC Retention Limit and/or Expiration Attribute value of 9999-93000 is interpreted as 9999 on pre-R13 level system. *This implies OSMC running on a R13 vs pre-R13 level system will set different expiration dates for objects with the same MC.*

Appendix

- *z/OS DFSMS Object Access Method (OAM) Planning, Installation, and Storage Administration Guide for Object Support*, SC35-0426
- *z/OS DFSMS Object Access Method (OAM) Application Programmer's Reference*, SC35-0425
- *z/OS DFSMSdfp Diagnosis Reference*, GY27-7618
- *z/OS System Messages Vol 4 (CBD-DMO)* , SA22-7634
- *z/OS Migration Guide*, GA22-7499
- *z/OS DFSMS Using the New Functions*, SC26-7473
- *z/OS DFSMSdfp Storage Administration*, SC26-7402



Thank You!