AS/400e

What's new in BRMS for V4R3 and V4R4

*John Davenport IBM
Technology Solutions Center*

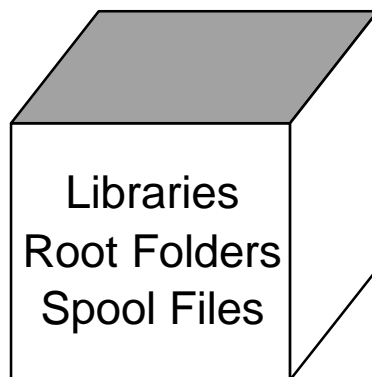8 Copyright IBM Corporation, 2000. All Rights Reserved.

IBM

AGENDA

- **V4R3 Enhancements**
  - ◆ **HSM**
  - ◆ **ADSM/400 Client**
- **V4R4 Enhancements**
- **Other BRMS Enhancements**
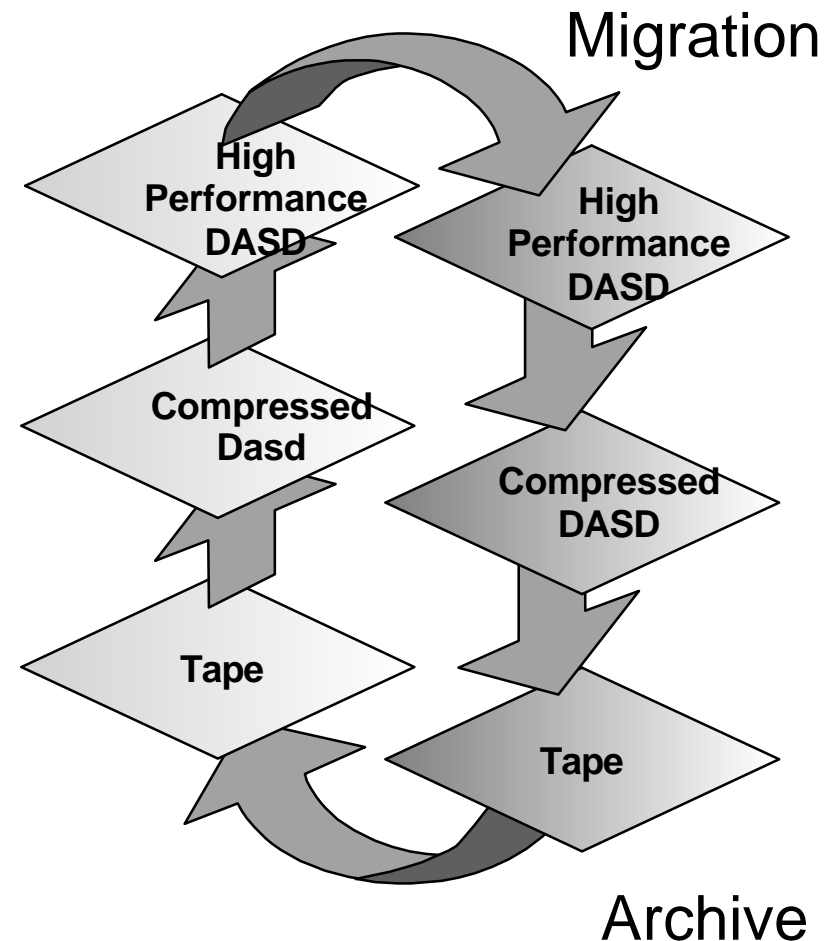- **OS/400 MLB Enhancements**
- **Hints and Tips**
- **Resources**

Hierarchical Storage Management

The HSM function allows the automatic migration of data among expensive/fast disk and less-expensive/slower disk, and out to tape according to age/usage criteria.

Migration

High Performance DASD

High Performance DASD

Compressed Dasd

Compressed DASD

Tape

Tape

Archive

Libraries
Root Folders
Spool Files

Why?
* Cost Savings
* Data Warehousing
* Managing Large Amounts of Data

Hierarchical Storage Management - notes

Mainframe customers have used "Hierarchical Storage Management" (HSM) for many years to migrate their data among storage media for cost-effective management. Data that is being accessed frequently is typically moved to newer, faster dasd, and data that is being accessed less frequently is moved to slower, less expensive media such as older dasd or tape.

On the AS/400, we have had partial HSM for several years using the BRMS Archive and Auto-Recall functions. Beginning at V4R3, BRMS offers a more full-functioned HSM solution whereby data can be migrated between ASPs according to policies, and then migrated to tape for later auto-recall. In this initial release, objects that are eligible for migration between ASPs are full libraries, and root level folders. Spoolfiles can be moved between ASPs using the MOVSPLFBRM command. Also at V4R3, the object types that are eligible for auto-recall from tape will be enhanced to include database members (which have been available for auto-recall since V3R1), documents, and streamfiles.

At V4R3, IBM also introduced "compressed DASD" whereby existing disk units can store 2-4 times as much data, when compressed by a compression-capable IOP. The DASD performance will be slightly reduced due to the compression. Many customers will find compressed DASD helpful to create a 3-tier HSM model with data migrating from standard disk, to compressed disk, and then out to tape.

Restrictions in the initial release of HSM will be as follow:
- Compressed DASD can only be used in user ASPs, not the system ASP
- Compressed DASD will not be supported on the 17GB DASD units initially
- Full libraries must be migrated between ASPs as a unit, rather than object-by-object.
- Libraries that contain journalling objects and journal receivers cannot be migrated
- Libraries that have files with database dependencies outside the library cannot be migrated
- Libraries cannot be migrated while they are in use, or while they are in the library list of any active job on the system.
- Only first level root folders can be migrated and none of their sub folders can be in use when being migrated
- Only one migration job can be active on the system at a time

HSM will be of great interest to customers who have large amounts of data that they would like to make accessible to their users in a cost-effective fashion. For further information on HSM and compressed dasd, look on the BRMS Web Page.

V4R4 HSM ENHANCEMENTS

Integrated HSM Within an ASP

- STRASPBAL
  - CAPACITY
  - USAGE
  - HSM

HSM - STRASPBAL - notes

The Start ASP Balance (STRASPBAL) command allows the user to start the auxiliary storage pool (ASP) balancing function for one or more auxiliary storage pools (ASPs). Three types of ASP balancing can be started:

 1. CAPACITY BALANCING - The data on all the units within the ASP will be balanced so each unit has an equal percentage used and unused space. This is useful when new units are added to an ASP. Instead of having several units with the majority of the data and several new ones with no data, the user can spread the data evenly across all the units.

 2. USAGE BALANCING - The high-use and low-use data on each unit in the ASP is redistributed to balance the arm utilization of each unit within the specified ASP. *USAGE balancing cannot be done until the trace controlled by the Trace ASP Balance (TRCASPBAL) command has collected usage statistics. TRCASPBAL starts the trace function that will identify the high-use and low-use data on each unit. This information will be used when the Start ASP Balance (STRASPBAL) TYPE(*USAGE) command is run. After this balance activity has run to completion the trace information will be cleared. Usage balancing is useful when the ASP contains large capacity disk units.

 3. HIERARCHICAL STORAGE MANAGEMENT BALANCING - The high-use and low-use data on each unit in the ASP is redistributed so that the high-use data resides on high performance units and the low-use data resides on low performance units. The ASP being balanced in this manner must contain the correct mixture of slow and fast units to perform this type of balance. This allows the low-use data on the high performance units to be moved to low performance units. Data that is high-use that resides on slow units will be moved to the fast disk units. *HSM balancing cannot be done until the trace controlled by the Trace ASP Balance (TRCASPBAL) command has collected usage statistics. TRCASPBAL starts the trace function that will identify the high-use and low-use data on each unit. This information will be used when the Start ASP Balance (STRASPBAL) TYPE(*HSM) command is run. After this balance activity has run to completion the trace information will be cleared. *HSM balancing is useful when the ASP contains compressed disk units.

The user may specify a time limit that the function is to run for each ASP being balanced or the balance can be set to run to completion. If the balance function needs to be ended, use the End ASP Balance (ENDASPBAL) command. A message will be sent to the system history (QHST) log when the balancing function is started for each ASP. A message will also be sent to

V4R3: ADSM/400 CLIENT

ADSM PC **Client**

ADSM Backup

Tape Backup

ADSM/400 **Client**
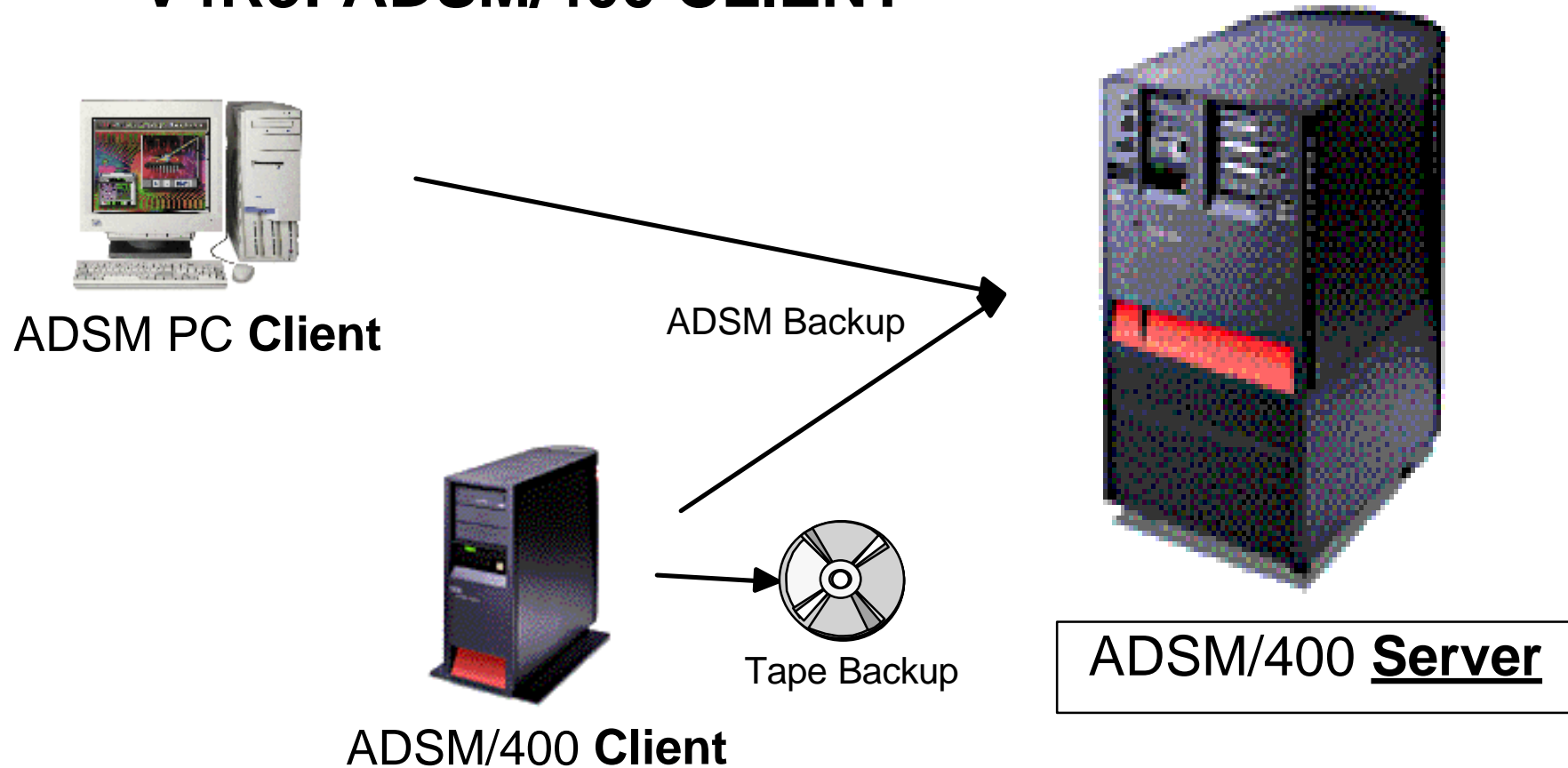
ADSM/400 **Server**

* AS/400 has been an ADSM Server for many years
* Starting at V4R3, the AS/400 can be used as an ADSM Client
* The ADSM Client will utilize BRMS
* ADSM Server (any platform) will be seen as BRMS media

ADSM/400 CLIENT - notes

ADSTAR Distributed Storage Manager is a Backup Management product for distributed systems environments. It gathers data from smaller systems and sends it to larger systems where the data is cataloged and optionally spilled to tape. Restoring data is simplified since the data is managed at a central site, and the ADSM catalog identifies the media required to restore to whatever date the user requests. ADSM has a large number of different platforms, both IBM and non-IBM, that can be used as both an ADSM server and an ADSM client.

For many years, the AS/400 has been available as an ADSM server, that can collect data from smaller systems. Beginning at V4R3, the AS/400 can also be an ADSM client, whereby it will be able to send its data to a larger system for storage. That system could be either an AS/400, or another platform running the ADSM Server code. The ADSM/400 client code will be BRMS/400, which is being enhanced to include parameters that will let it send the backup to the ADSM server as opposed to a tape or savefile. This code will use new OS/400 API's that gather data as though they were making a savefile on disk, but will instead transmit that data across the network to the ADSM server. The BRMS Recovery Report will include new steps to connect the AS/400 client to the ADSM Server after a failure, and pull down the appropriate code that will be used in conjunction with traditional BRMS saves to restore the system.

The ADSM/400 client is intended for low-volume saves of user data. System saves will still need to be written to tape, just as the other ADSM clients create a "boot diskette" in preparation for complete system restores. Performance will be approximately 80% of the performance of savefile saves, thus making this a good solution for a network of small systems that need to backup their data files each day without the benefit of an AS/400 operator at the remote site.

V4R3: General BRMS Enhancements

- BRMS Log now tracks Media Monitor on/off

- Large Tape File Sequence Numbers

- WRKLNKBRM lets you select SAVTYPE

- WRKSPLFBRM lets you select ASP #

- New Object Detail Parameter *ERR

- WRKMEDiBRM "Objects saved" has
  asterisk re: omitted vs. missed objects

V4R3 Backup Enhancements - notes

BRMS Log now tracks Media Monitor on/off
In the past, customers have turned the BRMS media monitor off (using the system policy parameter) either intentionally or inadvertently, and have run into problems because BRMS was no longer tracking their saves. To make it easier to identify this situation, the BRMS Log will now include a message indicating that the media monitor has been turned off.

Large Tape File Sequence Numbers
Up until recently, OS/400 and BRMS used a 4-character field to track file-sequence number. In order to support the newer, denser tape technologies, this field has been increased in size, and file sequences up to 16,777,215 are now supported. Partial support for this was added at V4R1 and V4R2, but as of V4R3, the large file sequences are supported for both save/restore commands (e.g. SAVLIB, SAVLIBBRM), and other commands (e.g. CPYTOTAP). The BRMS screens (e.g. WRKMEDiBRM) have been enhanced to show all digits of the file sequences.

WRKLNKBRM lets you select on SAVTYPE
You can now select on the SAVTYPE parameter when looking at the objects-in-directories that have been saved

WRKSPLFBRM lets you select on ASP #
You can now select on ASP# when looking at spoolfiles saved through BRMS. This change compliments the new MOVSPLFBRM command that can move outQ's and their contents into different ASPs.

Object Detail *ERR
BRMS includes an "object level detail" parameter in the BRMS control group and on the SAVLIBBRM and SAVOBJLBRM commands, and on the control group defaults screen. In the past, the valid options for this parameter were *YES or *NO. For customers who chose *YES, information was provided on WRKOBJBRM and DSPLOGBRM indicating the names of objects that were missed in the save. Customers who chose *NO had to look in the joblog for this information.
Beginning at V4R3, there will be a third option on the "object level detail" parameter, namely *ERR. It will gather object-level detail on ONLY objects that do not save successfully, in order to provide information about these objects within BRMS. When V4R3 is installed, BRMS will change values of *NO on this parameter to *ERR to allow all customers to take advantage of this additional level of tracking

V4R3 Backup Enhancements

- **OS/400 saves are eligible for BRMS Recoveries**

- **PRTSYSINF for Recovery**

- **Omitobj on SAVLIBBRM, SAVOBJBRM, SAVOBJLBRM**

- **New *USRASPAUT + RSTAUTBRM functions**

V4R3 Backup Enhancements - notes

OS/400 Saves are eligible for BRMS Recoveries
In the past, if an OS/400 save was written to a BRMS-enrolled tape, BRMS recorded the items that were saved on the tape, but did not include them on the recovery report, and they were not eligible for restore using the BRMS commands (e.g. WRKMEDiBRM option #7=restore). Beginning at V4R3, these objects WILL be included in BRMS recovery functions. Note that their save-type will still show as *FILE. Note also that other BRMS data about the tape needs to be updated manually, e.g. text and move policy.

PRTSYSINF for Recovery
In preparation for CISC-to-RISC upgrades, a PRTSYSINF command was created that documents many important parameters about a system that are needed for recovery. Beginning at V4R3, it is possible to use this command from within BRMS using STRRCYBRM PRTSYSINF(*YES) or STRMNTBRM PRTRCYRPT(*SYSINF). This information should be printed periodically and stored in a safe place for recovery. Note that it generates 8 screens of spoolfiles, including the following: System Values, PTF listing, Network Attributes, Config List, Hardware Resources, Software Resources, System Reply List, Subsystem Descriptions, Journals, QSECOFR user profile, QDFTJOBD job description, cleanup parameters, power on/off schedule, SNADS queues, service attributes, access path recovery times, edit descriptions, and a list of all libraries showing their last backup date.

Omitobj on SAVLIBBRM, SAVOBJBRM, SAVOBJLBRM
At V4R2, OS/400 added an "omit object" parameter on the SAVLIB, SAVOBJ, and SAVCHGOBJ commands. This parameter is included on the corresponding BRMS commands at V4R3 (since BRMS skip-shipped V4R2)

*USRASPAUT + RSTAUTBRM
When a customer loses his system ASP, he needs to reload his user profiles and his objects. This creates a table that is later used by RSTAUT to re-link the objects to their private authorities. If customers have user ASPS, they also need to re-load those, even if the data in them was not damaged, in order to build the table so RSTAUT can be run for that ASP too. Starting at V4R3, BRMS customers have another option in this situation .... if they run a BRMS SAVSYS or SAVSECDTA save, BRMS will record the private authorities for the user ASPs so they can be restored using the RSTAUTBRM command, rather than requiring a re-load of the user ASP. Note that this function will increase the time required for the security data to be saved ... in a test, it grew from 7 minutes to 27 minutes on a large customer system. However, it will be a big time-saver should a restore ever be required. If a customer does

V4R3 BRMS Archive Enhancements

- *FLR and *LNK list now available for archive

- New Archive Selection Criteria - Object Size and ASP Storage

- Archive control group can set "Retention after auto-recall" parameter

V4R4 ARCHIVE/RETRIEVAL ENHANCEMENTS

- *QHST Special Value Now Available For Archive

- New Selection Criteria:
    - ◆ Ability to archive stream files, documents, and database files based on frequency

- Ability to reset frequency counters on dynamic retrieval

V4R3 Enhancements

*FLR and *LNK lists now allowed for Archive

BRMS backup has always offered lists to backup a series of DLO's and Objects in Directories. Beginning at V4R3, these will also be available for archive.

New Archive Selection Criteria - Object Size and Low ASP Storage

In the past, the only criteria for selecting objects for archive was days-since last use/change. Starting at V4R3, the control group attributes also include parameters for minimum object size in MB, and low ASP storage threshold. The "object size greater than" parameter allows you to restrict archiving to large objects only. By default, it is set to *ARCPCY which defaults to 0 MB, thus allowing any object listed to migrate if it meets the other criteria. The "low storage threshold" value determines what level you should stop emptying the ASP at. By setting it to 0% (the default) or *NONE, you can encourage archiving since the ASP full % will always exceed this.   By setting it to 100%, you can prevent any archiving from this ASP, since the ASP will never exceed 100% full.

Archive control group can set "Retrieved object retention" parameter

In a recent release, a new parameter called "retrieved object retention" was added to the retrieve policy and SETRTVBRM. This allowed automatic cleanup of auto-recalled files a certain number of days after they were recalled (assuming they have not been updated). Initially, this parameter was on the Retrieve Policy where it controlled ALL auto-recalls on the system, and SETRTVBRM where it controlled all auto-recalls for the user who ran the command. Starting at V4R3, this parameter can be set at archive time using the "retrieved object retention" parameter, to allow granularity in retention based on control group.

V4R4 Enhancements notes

<u>Dynamic Retrieval Support for QHST libraries</u>
History files can be saved with SAV(*FREE) but it cannot be dynamically retrieved.   A *QHST special value is now available for an archive operation.

<u>New selection criteria</u>
1. 'Days used count' parameter defined as the number of   days an object has been used on the system (incremented when a
    dynamic retrieval would have occurred).

2. The capability to reset the 'days used count' through a command or an API.

3. The 'date use count reset' timestamp is required when the 'days used count' has been reset.

4. The capability to return the 'date use count' through a command or an API.

5. A save operation will not cause the count to be incremented.

Restoring a new object will cause the 'days used count' to be set to blanks.   Restoring over an existing object will preserve the 'days used count' and the 'date use count reset' timestamp from the original object on the machine.

BRMS will add the 'days used count' as another criteria in the archive policy, in addition to age, size and date last used, to
determine when 'historical data' should be archived.   BRMS will provide the user an option to reset the count after the
object has been dynamically retrieved.

V4R3: Archive Selection Criteria

Change Archive Control Group Attributes

Group . . . . : ARCTEST

Type information, press Enter.

Include:
ASP low storage threshold 0   **ASP, 0-99%, *ARCPCY**
Date type for archival . . . . *BOTH   *BOTH, *CHANGE, *USE...
  Inactivity limit 0   0-9999 days, *ARCPCY
Object size greater than 0   **0-999999 MB, *ARCPCY**
Objects able to be freed . . . . *ARCPCY   *YES, *NO, *ARCPCY
  Retain object description . . . . *ARCPCY   *YES, *NO, *ARCPCY
Objects not able to be freed . . . .*ARCPCY   *YES, *NO, *ARCPCY
Days used (per month) less than. 0   **0-31, *ARCPCY**

<u>ASP Low Storage Threshold</u>: only archive if the ASP exceeds this percentage full
<u>Object Size Greater than</u>: only archive objects that are bigger than this many MB
<u>Days Used (per month) less than</u>: number of days an object as been used on the system

V4R3: Archive Retention Setting

```
                   Change Archive Control Group Attributes


Group  . . . . . . . . . . . . . : Arctest


Type information, press Enter.


IPL after archive  . . . . . . . *NO       *YES, *NO, *ARCPCY
   How to end  . . . . . . . . . *ARCPCY   *CNTRLD, *IMMED, *ARCPCY
   Delay time, if *CNTRLD  . . . *ARCPCY   Seconds, *NOLIMIT
   Restart after power down  . . *ARCPCY   *YES, *NO, *ARCPCY
   IPL source  . . . . . . . . . *ARCPCY   *PANEL, A, B, *ARCPCY
Retrieved object retention . . . 30        0-9999, *NOMAX, *ARCPCY
```

Auto-recall retention can be set at time of Archive, thus basing it on objects, rather than as a system-wide parameter in the Retrieve Policy, or a user-wide parameter in SETRTVBRM.

BRMS Auto-Recall Enhancements

- **Auto-Recall**
  - ◆ Folders and streamfiles can now be auto-recalled

- **Retrieve Policy has ASP high threshold**

- **Extend Retention on Usage**

V4R3 Backup Enhancements - notes

Folders and streamfiles can be auto-recalled
In the past, many different object types could be archived, but only *FILE objects could be auto-recalled. Beginning at V4R3, folders and streamfiles are also able to be dynamically retrieved. (Think of "streamfiles" as objects in directories)

Retrieve Policy has ASP high threshold
In the past, BRMS looked at the system setting for the ASP threshold, and didn't allow an auto-recall if it would cause the system to exceed that threshold. Beginning at V4R3, BRMS now looks at a new parameter in the Retrieve Policy, called "ASP high storage threshold". If desired, a value of *SYS can be used in this parameter to tell BRMS to use the system setting.

Extend Retention on Usage
In the early days, if an object was auto-recalled, another archive operation was needed to remove the object from the system again, even if the object had not been changed. More recently, a new parameter called "retrieved object retention" was added to the Retrieve Policy, and SETRTVBRM. This parameter indicated the number of days that the object should be kept on the system after being auto-recalled. At the end of that time, the object was removed, without re-archiving it (unless it had been updated, in which case it was left on the system and would need to be re-archived). Starting at V4R3, another new parameter called "Extend Retention on Usage", has been added to the Retrieve Policy and SETRTVBRM to allow better control still. Now if an object is auto-recalled, and then is reused during the time period it is retained on the system, that time period will be extended to keep the object for longer still since it is clearly needed.

As an example: suppose the parameters are set to keep the object on the system for 15 days, and extend for 10 days if the object is used. On day number 1, the object is auto-recalled. Then suppose that on the 9th day, someone else uses the object. BRMS will extend the retention by 10 days from the day the object was touched, thus it will keep the object for 19 days from the initial auto-recall.

Now consider the above example, but this time, someone touches the object on the 3rd day after the initial auto-recall. BRMS will still keep the object for 15 days as specified in the "retrieved object retention" parameter.

ASP High Threshold on Retrieve Policy
Retention After Auto-Recall

```
                    Change Retrieve Policy


Retrieve device  . . . . . . . *MEDCLS     Name, F4 for list
Retrieve confirmation:
   Interactive operation  . . . *VERIFY     *VERIFY, *NOTIFY, *DELAY.
   Batch operation  . . . . . . *NOTIFY     *NOTIFY, *DELAY, *VERIFY.
Retrieve authorization . . . . *OBJEXIST  *OBJEXIST, *READ, *UPD...
End of tape option . . . . . . *REWIND     *REWIND, *LEAVE, *UNLOAD
Option . . . . . . . . . . . . *ALL        *ALL, *NEW, *OLD, *FREE
Allow object differences . . . *NONE       *NONE, *ALL
ASP high storage threshold . . *SYS        *ASP, *SYS, 1-95
Retrieved object retention . . 0           0-9999, *ARC, *NOMAX
Extend retention on usage  . . 5           0-9999
```

Previously BRMS used the ASP threshold from the system settings to determine whether there was enough space to auto-recall an object.

If an object is auto-recalled, and then continues to be used, it will stay on the system.

OS/400 MLB Enhancements

- Aborted jobs release tape drives from *LEAVE processing

- WRKMLBSTS shows which job is using the drive

- New Parameters to control saves to MLBs

```
                    Display Tape Status Information


Library device . . :    TAPMLB06   Category . . . . . :    *NONE
Number of drives . :    1          Category system  . :
Total slots  . . . :    819        Cartridge order  . :    *NONE
Available slots  . :    536        Target category  . :    *NONE
Number of stations :    10         Target system  . . :


Tape        Device   Device   Cartridge   Category   Leave
Resource    Type     Model    ID          Mounted    Processing
TAP08       3590     B1A      004197         NO         *YES
```

MLB Enhancements - notes

Leave Status on MLB Resource when job ends
In the past, if a job ended abnormally while it was using a tape resource, the tape volume it was using stayed in the drive, and prevented other jobs from using it, until someone noticed and did a CHKTAP *UNLOAD. Beginning at V4R3, OS/400 will now unload any drives when the job ends. Note the DSPTAPSTS command that is a handy way to see which tape is in an MLB drive, without having to leave your desk!

WRKMLBSTS shows jobname
The WRKMLBSTS screen has been enhanced to show the name of the job that is using each drive, similar to the function that is provided on the WRKCFGSTS screen for standalone drives.

The Library Resource Manager (as it relates to the new MLB Attributes!)
On CISC AS/400s, and when using standalone drives on CISC or RISC systems, if a save is issued to a drive that is already busy, the save fails. However, starting at V3R6, a new OS/400 function called the "library resource manager" (LRM) was introduced to manage a queue of saves directed at tape libraries. This code receives the tape requests, prioritizes them, then assigns them to tape drives as the MLB tape resources become available. This means that on a RISC system, even if there are only 1-2 tape drives in the MLB, all the evening's saves could be requested at end-of-day, and the LRM would hold the requests until drives became available.

Prior to V4R3, this code was controlled by the following parameters:

Tape Operation Priority: There was no parameter for this prior to V4R3 ... the tape operation was given a priority equal to that of the job that requested the operation, thus high priority jobs got the next available tape resource

Maximum Device Wait Time: When the MLB definition was created, either by auto-config or with CRTDEVMLB, the Max Dev Wait time was set to indicate how long jobs would wait for a tape resource to be assigned before they would fail. Note that this parameter applied to ALL tape mounts in the save, both the initial one, and subsequent ones.

WRKMLBSTS

```
                    Work with Media Library Status
                               System:   RCHASCAT
 Type options, press Enter.
  1=Vary on   2=Vary off   3=Reset resource      4=Allocate resource
  5=Allocate unprotected   6=Deallocate resource   8=Work with description


        Device/                                          Job
 Opt    Resource        Status              Allocation   name
    MLB01            VARIED OFF
    MLB02            VARIED OFF
    TAPMLBBRM        VARIED OFF
    TAPMLB01         VARIED ON
    TAP16            OPERATIONAL      UNPROTECTED      DSP01
    TAPMLB02         VARIED OFF
    TAPMLB03         VARIED OFF
    TAPMLB04         VARIED OFF
    TAPMLB06         VARIED OFF
    TAPMLB07         VARIED OFF
```

New MLB Parameters

- **New Parameters to control saves to MLBs**

- **WRKMLBRSCQ command to view LRM queue**

- **New MLB Attributes**

  - RSCALCPTY - Resource allocation priority

  - INLMNTWAIT - Initial mount wait time

  - EOVMNTWAIT - End of volume wait time

- **New API's QTARJMA, QTACJMA to retrieve/change them**

New MLB Parameters - notes

New MLB Parameters and WRKMLBRSCQ command
Beginning at V4R3, new parameters were added to allow MLB tape operations to use different parameters from the other aspects of the job. An example might be a low priority night run that needed quick access to the tape drive when requested .. the job priority would be low, but the tape priority would be high.

 The following parameters can now be set for each job, using the new CHGJOBMLBA or WRKJOB *MLBA commands.

Resource Allocation Priority: sets the priority for any tape operations requested by this job

Initial Mount Wait and End-of-volume Mount Wait: determines how long the tape operation will wait to get its first/subsequent tapes mounted. The job will fail if the tape is not mounted within that time period. *NOMAX is a valid value for this parameter.

A new command, WRKMLBRSCQ has been added to display the requests that are awaiting drive assignments and allow the parameters to be adjusted. For example, if a job is not normally urgent, but needs to be rushed on a certain day, its MLB attributes can be adjusted while the tape operation waits in the queue

New API's, QTARJMA and QTACJMA, have been added to allow these parameters to be retrieved and/or changed by a program. For example a customer who had a program registered to the BRMS auto-recall exit point, might want to add some code to change the tape priority to high priority just prior to a recall to ensure good response, then set it back prior to returning control to the interactive job.

MLB WRKMLBRSCQ CMD

```
                    Work with MLB Resource Queue


Library Device:      TAPMLB06


Type options, press Enter.
   2=Change Request MLB Attributes     5=Work with job


                             Wait
Opt  User        Priority    Time       Media      Resource


2_   JONES          35       *NOMAX     003347    TAP01
__   SMITH           8       *NOMAX     004129    TAP03
__   *SYSTEM        19           5      004697
__   QSYSOPR        20         600      004115
__   DOUGLAS        29          18      003987
```

WRKMLBRSCQ CMD - notes

New WRKMLBRSCQ command
The WRKMLBRSCQ command was created to show the tape operations that are waiting for the library resource manager (LRM) to assign them to an available tape drive, and provide the opportunity to change them.   Information about this display is as follows:

Only the userid of the job that requested the tape operation is shown on this screen due to space constraints (fully qualified job names are 26 characters long). To see the job name, use 5=work with job to drill down.

Requests that have already been assigned to a drive, are displayed at the top of the list. The remaining requests are sorted in priority sequence ... i.e. the top one on the list will get the next available drive. If the first unassigned request in the list has a higher priority than one of the requests that already has a drive, then it will be swapped in as soon as one of the jobs that has a drive reaches end-of-volume.

The "wait time" indicates the value of the initial-mount-wait-time or end-of-volume-wait-time parameter, whichever one controls the mount that has been requested.

*SYSTEM jobs are tape mounts that are requested by the system. An example would be if you were using a drive without a barcode reader (e.g. 3590) in random mode, and someone issued a command that required an inventory of the MLB ... the tape mounts associated with the inventory would be marked as *SYSTEM in the "user" field.

Note that job and tape operation priorities should be assigned in such a way that the job gets enough CPU cycles to drive the tape at rated speed

CHGJOBMLBA CMD

New CHGJOBMLBA command
If you need to change the MLB attributes of a job, you can do so with the CHGJOBMLBA command. Note that at
V4R3, these parameters can only be changed after the job is running ... there are no corresponding parameters in
the job description, etc.

```
              Change Job MLB Attributes (CHGJOBMLBA)


  Type choices, press Enter.


  Job name . . . . . . . . . . . . *       Name, *
    User . . . . . . . . . . . .           Name
    Number . . . . . . . . . . .           000000-999999
  Library device . . . . . . . . *ALL    Name, *ALL
  Resource allocation priority .    20  1-99, *SAME, *DEV, *JOB
  Initial mount wait time  . . .   600  1-600, *SAME, *DEV, *JOB...
  End of volume mount wait time.     5  1-600, *SAME, *DEV, *JOB...
```

Conversion to the New MLB Parameters - notes

```
            Create Device Desc (Media Lib) (CRTDEVMLB)


Device description . . . . . .          Name
Device class . . . . . . . . .          *OPT, *TAP
Resource name  . . . . . . . .          Name, *NONE
Device type  . . . . . . . . . *RSRCNAME  *RSRCNAME, 3995..
Online at IPL  . . . . . . . . *YES       *YES, *NO
Unload wait time . . . . . . . *SYSGEN    *SYSGEN, 1-120
Maximum device wait time . . . *SYSGEN    *SYSGEN, 1-60
Resource allocation priority . *JOB       *JOB, 1-99
Initial mount wait time  . . . *JOB       *JOB,*IMMED,*NOMAX..
End of volume mount wait time  *JOB       *JOB,*IMMED,*NOMAX..
Generate cartridge ids . . . . *VOLID     *VOLID,*SYSGEN
Robot device description . . . *NONE      Name, *NONE
```

How are these parameters set when you first upgrade to V4R3?
At upgrade time, OS/400 will set the new parameters such that your operations will continue as they have done in the past, unless you specifically change them:

For jobs, the MLB attributes will default to *DEV which means they will continue to pick up their parameters from the MLB device description, as always.

For MLB's that exist at the time of the V4R3 upgrade, OS/400 will copy the value of the Maximum Device Wait Time into the fields for the 2 new parameters. Note that thereafter, the max-dev-wait-time will only be applicable to optical drives.

For MLB's that are created after upgrade time, the new parameters will be set to *JOB, which means that if no parameters are supplied with the tape request, the MLB should use the old method of determining these parameters (i.e. the one that was used if you specified *SYSGEN in the max-dev-wait-time prior to V4R3) which was to base them upon the other job parameters ... i.e. set the resource allocation priority equal to the job priority, and set the two mount-wait parameters to the value of the default job wait time rounded off to the nearest minute.

** It will behave the way it always did, unless you change it! **

V4R4 Enhancements

PRODUCT RESTRUCTURE

- Standard Product and Two Features
  - ◆ BRMS Standard (STD)
  - ◆ BRMS Network Feature (NET)
  - ◆ BRMS Advanced Function Feature (ADV)

PARALLEL TAPE SUPPORT

ONLINE DOMINO BACKUP

GENERAL ENHANCEMENTS

V4R4 ENHANCEMENTS

Product Restructure
STD (Standard)

- All of Backup/Recovery and Media Management for a single system

- Shared tape devices

- Automated tape libraries

- Backup to an ADSM server

- Functional Usage Model

- Unlimited number of media volumes

  - Usage based pricing removed

  - Tier Priced

V4R4 Enhancements

Product Restructure

Networking Feature

- Share Media Inventory

- Share Policies

- Media Managed across multiple systems

V4R4 Enhancements

Product Restructure

Advanced Function Feature

- HSM
  - ◆ Archive
  - ◆ Dynamic Retrieval
  - ◆ Migration

Product Restructure - notes

BRMS Standard
The standard product will provide a lower-price point when compared to the V4R3 product using processor based tier pricing. BRMS Standard offers many of the base functions needed by AS/400 users to implement a fully automated, single system, backup, recovery and media management strategy using shared tape devices, automated tape libraries, ADSM servers, unlimited number of media volumes, and functional authority.
The standard product will not support archive, dynamic retrieval, automated migration operations, or shared media.

BRMS Network Feature
The BRMS Network feature enables a BRMS system to be interconnected via a network to other BRMS networked systems. A networked BRMS system can share the inventory and policies associated with media managed by a central BRMS system.

BRMS Advanced Functions Feature
The BRMS Advanced Functions feature enables BRMS advanced function like archive with dynamic retrieval, and automated ASP object migration.

For ease of use, menu and parameter options only show if the feature is installed.

When BRMS Standard and the two features are installed, the system License Management function will determine if the user is licensed to use the function, then either execute or terminate the function based on the License Manager response.

After installation, the end user will have uninhibited access to the available functions for a grace period of 70 days. A license
key must be entered by the end user to enable the function beyond the grace period. The grace period is 70 days. A separate key is required
 for each of the four controlled functions.

The BRMS product key is loaded into License Manager manually by the person installing the product. The key is provided to the

V4R4 ENHANCEMENTS

Parallel Tape Support

- Shorten Backup Window

- Save to Multiple Devices at the Same Time

  - Devices end at the same time

- Recover from Fewer Number of Drives Than were used in the Backup, If Necessary (Disaster Recovery)

- Designed for Large Amounts of Data

  - Large Libraries or Objects

- Some Restrictions

  - No special values, generics

  - No documents, folders or IFS

- Hides Media Definition

Parallel Tape Support - notes

Parallel backup is the ability to backup individual objects or a library to different tape devices at the same time, writing pieces of the library or object to multiple tape volumes. The goal is to utilize the full throughput potential of the tape device; a single library that is backed up in parallel will have as its goal that all volumes being used finish at the same time, as opposed to having the data split among the tape volumes equally.

Save/Restore will be implementing changes to allow large objects and libraries to be save to multiple devices, parallel, at the same time.   This is to minimize the backup window.   This parallel concept will reduce the amount of time it takes to save the objects.   You will also be able to recover from a fewer number of drives than were used in the backup, i.e. at a "hot site".

The following commands will be enhanced to control parallel saves.

- Save Library using BRM (SAVLIBBRM)
- Save Object using BRM (SAVOBJBRM)
- Save Object List using BRM (SAVOBJLBRM)
- Restore Library using BRM (RSTLIBBRM)
- Restore Object using BRM (RSTOBJBRM)
- Work Control Groups using BRM (WRKCTLGBRM)

Today, when multiple devices are specified on an OS/400 or BRMS/400 command (i.e. DEV(TAP01 TAP02 TAP03)), it means
sequentially.   It means use TAP01 and at end of volume, use TAP02, then TAP03, and then back to TAP01, as it cycles
around. Parallelism on the other hand needs to allow DEV(TAP01 TAP02 TAP03) to save at the same time to all three
devices, keeping in mind that each device may span volumes creating a set of volume sets that are linked together.

This parallel save was designed for large amounts of data only. BRMS allows multiple libraries, but will restrict use of a *synclib with multiple. There are some restrictions at this time. They will include:
    No special values, generics

Save Types - notes

To clarify the differences between the types of backup, the definitions are below:

SERIAL BACKUP (always)
The concept of using one tape device at a time to backup objects or libraries. The output volume may span to more than one volume creating a volume set.

CONCURRENT BACKUP (V4R1)
The ability to backup different objects from the same library (or different libraries) using separate jobs (commands) to different save/restore devices at the same time. The goal is to allow the user access to save multiple large objects in the same library at the same time.

PARALLEL BACKUP (V4R4)
The ability to backup individual objects or a library to different tape devices at the same time, writing pieces of the library or object to multiple tape volumes.   The goal is to utilize the full throughput potential of the tape device; a single library that is backed up in parallel will have as its goal that all volumes being used finish at the same time, as opposed to having the data split among the tape volumes equally.

New Parameter for Parallel Saves

```
                    Change Backup Control Group Attributes

Group  . . . . . . . . . . . . . . . . : *SYSGRP

Type information, press Enter.

Media policy for:
  Full backups . . . . . . . . . . . . . . . SAVSYS    Name, F4 for list
  Incremental backups  . . . . . . . . SAVSYS    Name, F4 for list
Backup devices . . . . . . . . . . . . . *BKUPCY   Name, F4 for list




Parallel device resources:
  Minimum resources  . . . . . . . . . . *AVAIL    1-32, *NONE, *AVAIL
  Maximum resources  . . . . . . . . . .*AVAIL    1-32, *AVAIL, *MIN
Sign off interactive users . . . . . . . . . . . *YES       *YES, *NO, *BKUPCY
Sign off limit . . . . . . . . . . . . . . . . . . . . .30            0-999 minutes, *BKUPCY
Default weekly activity  . . . . . . . . . . . . *BKUPCY    SMTWTFS(F/I), *BKUPCY
Incremental type . . . . . . . . . . . . . . . . *BKUPCY    *CUML, *INCR, *BKUPCY
```

Online DOMINO B/U before SF60285

ENDDOMSVR
or

||

ENDDOMSVR

SAVBRM
or *LNK
List
or SAV

READ 25.000 MB

To Back up mail folders it was necessary to:
- End the server, b/u and restart or
- Replicate the Server, end and save the replicant, restart and resync

Online DOMINO B/U after SF60285

READ 25,000 MB

STRBKUBRM QDOMINO01

READ 25,000 MB

STRBKUBRM QDOMINO02

&

READ 25,000 MB

STRBKUBRM QDOMINO
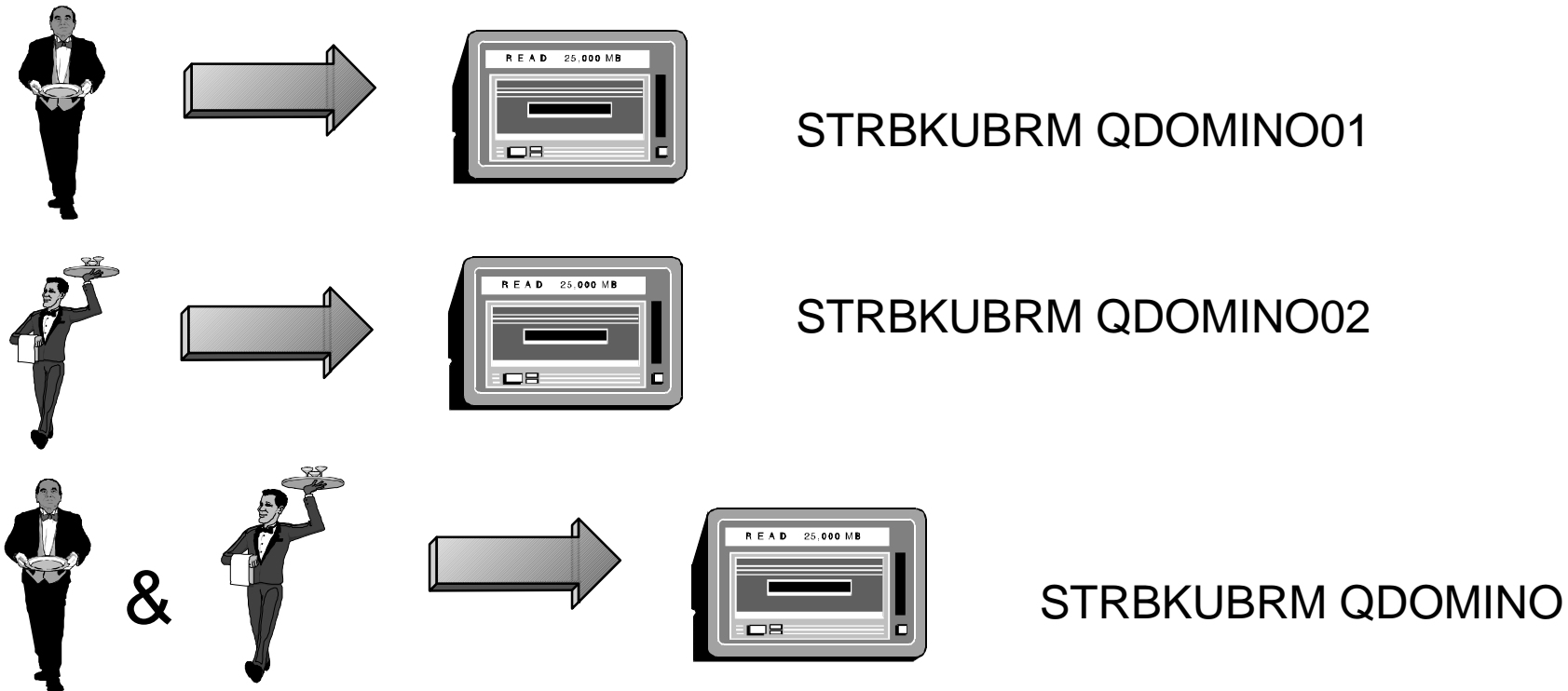
- BRMS Ease of use
- Better than SWA - no sync points
- Included in Disaster Recovery Reports
- Control Groups created via INZBRM *DATA > PTF
- Simplify RESTORE of user data - next 2 foils

Online Domino B/U - Restore via BRMS

```
                    Select Recovery Items              RCHASBDS

 Type options, press Enter.  Press F16 to select all.
   1=Select   4=Remove   5=Display   7=Specify object


       Saved                       Save    Volume              Exp    Objects
 Opt  Item       Date     Time     Type    Serial   File Seq   Date   Saved
  7   home.nsf  1/31/00  10:00:52  *FULL   04ABB4      3      2/02/00   6
```

```
                    Restore Object (RST)


Type choices, press Enter.


Device . . . . . . . . . . . . . > '/QSYS.LIB/MLB3575C.DEVD'
Objects:
 Name . . . . . . . . . . . . . > '/rchasbds/lotus/notes/data/rrs/Securitygateway.nsf'
```

- **No need to enter complex DEVD**
- **Ease of changing path on restore**

Online Domino B/U - Restore via BRMS

- RSTBRM

```
        Restore Object using BRM (RSTBRM)

Type choices, press Enter.


Device . . . . . . . . . . . . . . . . . .*MEDCLS     Name, *MEDCLS
Objects:
  Name . . . . . . . . . . . . . . . .   '*'


  Include or omit  . . . . . . . . . . *INCLUDE    *INCLUDE, *OMIT
  New object name  . . . . . . . . *SAME

        + for more values
Directory subtree  . . . . . . . .   *ALL        *ALL, *DIR, *NONE, *OBJ
Save level . . . . . . . . . . . . . . .   *CURRENT 1-99, *CURRENT
End of tape option . . . . . . . .   *REWIND    *REWIND, *LEAVE, *UNLOAD
Option . . . . . . . . . . . . . . . . .   *ALL         *ALL, *NEW, *OLD
Allow object differences . . .   *NONE       *NONE, *ALL, *AUTL, *OWNER


Object ID  . . . . . . . . . . . . . . .   *SAVED     *SAVED, *SYS
From system  . . . . . . . . . . . . . *LCL
```

- **No need to enter complex DEVD**
- **Ease of changing path on restore**

Online Domino B/U - notes

In order to b/u Domino prior to SF60285 it was necessary to either end server or replicate the sever and end it. It's now possible to b/u the server - w/o any replication necessary - online. Using BRMS this is accomplished via 'control groups'.

BRMS control goups are automatically created by issuing the INZBRM *DATA command after the PTF is applied. A control group for each server (QDOMINO00-99) as well as one for ALL servers (QDOMINO) is created. BRMS also creates a LINK LIST (QDOMEXCL) that can be added to another control group to b/u all the IFS data EXCEPT Domino databases..

Domino will b/u the databases while they are active, and upon completion will b/u a secondary file and associate it with the first by using a package concept in BRMS. The secondary file contains all of the changes that occurred during the b/u, such as transaction logs or journal type information.

Recovery can be greatly simplified by drilling down into the BRMS data base and selecting the item(s) to be restored. No need to enter a complex name for the tape device as well as the ease of changing the path of the restore. Changing the restore path prevents the overlaying of any data created/received since the original save.

To restore an individual document (say a piece of mail that you want to retrieve) from a saved database, do the following:
Restore the database (ie: server/datadir/mymail.nsf) to a new named database:
   wrkmedibrm and use option 9 to drill down to database that you want to restore
   select option 7 on the database line to Restore object
   select option 7 and hit enter again to Specify Object
   page down and enter the New object name (ie: server/datadir/mymail2.nsf) and hit enter
Open the restored database (ie: server/datadir/mymail2.nsf) from your client
Locate the document to restore, right click on it and select copy
Open the database where you want to put the document (ie: server/datadir/mymail.nsf)
Right click in the folder/view you want to place the document and select paste
The document is restored !

Restrictions:
 Specifying expiration dates or versions in a media policy is not supported.
 Restoring using BRMS network support only works for Domino packages if receive media info is set to
 *LIB

See http://www.as400.ibm.com/service/brms.htm for further information

V4R4 ENHANCEMENTS

General Enhancements

- **Functional Usage Model**

- **WRKMEDBRM CMD**

  - New Command Line

  - Last clean date and last used date eliminated

  - Shows owning system

- **SAP Support**

- **Support for End all Subsystems from Control Group**

- **New BRMS Manual**

Functional Usage Model

- **Ability to control usage to BRMS functions**
  - Restrict access to a user from an area of BRMS function (backup, recovery, archive, movement....)
  - Allow usage, but restrict access to change specific BRMS objects (control groups, list, and policies)
- **Does not replace OS/400 Security**
- **Ease of Use: Set a user's usage to BRMS operator or administrator**

Functional Usage Model - Setusrbrm

- **Requires *SECADM authority**

- **An <u>very basic</u> CL command has been provided to easily give administrators the way to set the majority of controllable functions**

- **SETUSRBRM provides two settings**
  - *ADMIN
    - An *ADMIN gets full function to all BRMS functions
  - *OPERATOR
    - Basic usage to Backup. Archive, Media Migration, Movement
    - Restricted from Recovery, Retrieval and System Functions

- **SETUSRBRM can be applied to a user or *DEFAULT**

Functional Usage Model - Setusrbrm

Set User Usage for BRM (SETUSRBRM)

Type choices, press Enter.

User . . . . _____   Character value, *DEFAULT
Usage . . . .   *OPERATOR   *OPERATOR, *ADMIN

 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this
display F24=More keys

Functional Usage Model - notes

The Set User Usage for BRM (SETUSRBRM) command allows you to set or reset function usage values for a user or group profile.   *SECADM authority is required to use the SETUSRBRM command.   The Advanced Functions feature is required to use this command.   This command will use the registration facility to set the BRMS recommended usage options for each BRMS function registered with the system. SETUSRBRM does not control security to BRMS objects. Use OS/400 security to maintain user authority to BRMS objects.

For more information, see chapter 9 in the Backup, Recovery and Media Services manual.

The command parameters are as follows:

User (USER)
Specifies the user or group profile to be given usage of BRMS functions. This is a required parameter.
The possible values are:

user-or-group-profile
        Specify the name of an existing user or group profile. The usage for the specified user or group profile will be set for BRMS functions.

*DEFAULT
        The default public usage will be set for BRMS functions.

Functional Usage Model - notes

The second parameter on the SETUSRBRM command is:

Usage (USAGE)

Specifies the usage that will be given to the user or group profile specified in the USER parameter.

Note: To specifically add or remove additional functional usage from the user, use the Operations Navigator interface to change the usage of the specific function. To do so, go to the Operations Navigator and choose the File menu option. Click on Application Administrator. You will find AS/400 under the host applications tab. The possible values are:

*OPERATOR
     The user or group profile specified in the USER parameter will be given usage to BRMS functions recommended for operators.
          These include:
          o Basic archive activities
          o Basic backup activities
          o Basic media activities
          o Basic migration activities
          o Basic movement activities
*ADMIN
     The user or group profile specified in the USER parameter will be given usage to all BRMS functions recommended for administrators.

Functional Usage Model - Ops Nav

Functional Usage Model - Ops Nav. Objects/ users can be controlled

Functional Usage Model - Ops Nav - notes

- **Operations Navigator allows tailoring or initial setup of BRMS functional usage by taking**
  - the File option from the menu Bar
  - Application Administration
  - selecting the Host tap
  - select Backup and Recovery Media Services/400
  - select the Subfunction required

- **BRMS has been registered along with each of its functions**

- **If a user does not have access for a requested function, they will obtain a BRM4040 ACCESS DENIED message**

WRKMEDBRM

```
                    Work With Media
                                    System:   RCHASCAT
Position to  . . . . .           Starting characters


Type options, press Enter.
 1=Add   2=Change   4=Remove   5=Display   6=Work with serial set   7=Expire
 8=Move   10=Reinitialize ...


    Volume            Creation  Expiration             Move      Media          Dup
Opt  Serial   Expired  Date      Date       Location   Date      Class          Sts


   S1                12/16/98 01/20/99 *HOME     *NONE   QIC2GB
   TAPE25            01/04/99 02/08/99 *HOME     *NONE   QIC2GB
   TAPE27 +          12/07/98 01/14/99 *HOME     *NONE   QIC2GB
                                        More...
```

Parameters or command:

===>

F3=Exit F4=Prompt F5=Refresh **F11=Volume system** F12=Cancel F17=Top
F18=Bottom   F23=More options

WRKMEDBRM

```
                         Work With Media

                                    System:   RCHASCAT

Position to  . . . . .              Starting characters


Type options, press Enter.

  1=Add   2=Change   4=Remove   5=Display   6=Work with serial set
      7=Expire   8=Move   10=Reinitialize ...



   Volume                          Move       Serial  Parallel

Opt  Serial          System        Policy      Set      Set



    000BCA +     APPN.RCHASCAT      *NONE      *NO     *NO

    000BE6 +     APPN.RCHASCAT      *NONE      *YES    *NO

    000C3C       APPN.RCHASCAT      *NONE      *NO     *NO
```

SAP SUPPORT

BRMS BACKUP WHILE
R/3 IS STILL ON-LINE

- SAVR3SYS Support

Notes: SAP

The following information applies only to backups that are made when the R/3 System is running (online backups). To back up the data library with BRMS, you have to select "save-while-active" by specifying *SYNCLIB.

Direct use of the SAVR3SYS commands in BRMS does not make sense. We recommend instead that you enter the following two user exits in the backup control group directly before the backup entry for the data library:

    DSCR3SYS SID(<SID>)
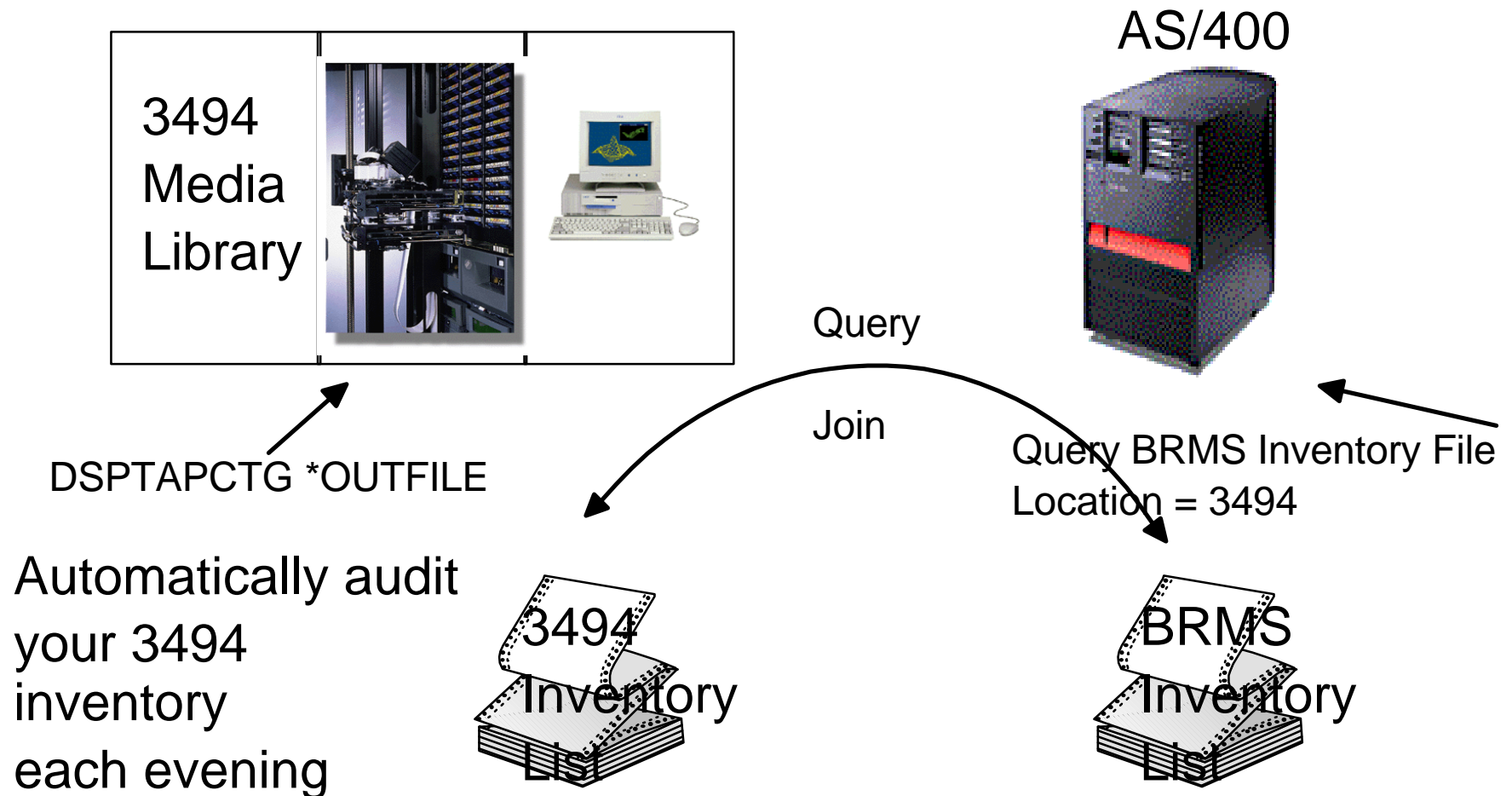   MONSWABRM LIB(R3<SID>DATA) CMD(RCNR3SYS SID(<SID>)

    o The command DSCR3SYS forces all R/3 jobs to reach a commitment boundary within 5 minutes. This may happen of its own accord if a job is already at a commitment boundary or reaches one within 5 minutes. If not, a job is forced to a commitment boundary by means of a ROLLBACK. At the end of the 5 minutes, all R/3 jobs have reached a commitment boundary and have to wait until the command RCNR3SYS is executed

    o The command MONSWABRM executes the given command as soon as the save-while-active checkpoint is reached.

    o The command RCNR3SYS signals to all R/3 jobs that work can continue immediately. If you want to be on the safe   side, you can add an additional user exit with the command RCNR3SYS SID(<SID>) to the backup control group after the entry for saving the data library. If the command RCNR3SYS is really executed twice, the second call   returns the message BFC0007, which can be ignored in this case.

The commands DSCR3SYS and RCNR3SYS are R/3 commands. To avoid authorization problems, these should be carried out under the user profile <SID>OFR or a privileged user. To set the library list, call program R3<SID>400/R3INLPGM, rather than directly specifying the kernel library name:

    CALL PGM(R3<SID>400/R3INLPGM)

Other Hints and Tips
3494 Inventory Check Program

AS/400

3494
Media
Library

DSPTAPCTG *OUTFILE

Query

Join

Query BRMS Inventory File
Location = 3494

Automatically audit
your 3494
inventory
each evening

3494
Inventory
List

BRMS
Inventory
List

MLB Inventory Check Program

Customers should periodically audit their BRMS Storage Locations to ensure that the proper tapes have been moved there according to the BRMS Reports. If a customer has a tape library, the audit of the tapes in that location can be done automatically by comparing a list of the tapes that are physically in the MLB to the tapes that BRMS believes are in the MLB. To do this, first create an outfile showing the tapes that are physically in the MLB using the DSPTAPCTG *OUTFILE command. Then run a query over the BRMS media master file, QUSRBRM/QA1AMM to select just the tapes in the given location. Then join the two files and ask Query to print a list of the tapes that are in one file but not in the other. This list shows the disparities in your inventory.

A sample program to do the Automated Inventory Check on a 3494 Tape Library is shown in the appendix of the BRMS Redbook.

Other Hints and Tips

BRMS Web Page

http://www.as400.ibm.com/service/brms.html

*   Description of New Functions
*   PTF listings
*   Frequently Asked Questions
*   BRMS Tip of the Month
*   Technical Topics
*   Education Courses
*   Customer Testimonials

BRMS/400 Resources

Course #N1974
Introduction to BRMS/400
4.5 Days w/ Hands-On Labs
1-800-IBM-TEACh

Course #BRMS2
Advanced BRMS/400
2.5 Days w/ Hands-On Labs
1-800-IBM-TEACh

BRMS Internet Home Page http://www.as400.ibm.com/service/brms.htm

BRMS Redbook: "Practical Guide to Managing BRMS/400" SG24-4840
Availability Redbook: "The Systems Administrators Guide to Availability and Recovery " SG24-2161

IBM Support Line @ 1-800-237-5511 - AS/400

Rochester Technology Solutions Center (TSC)
507-253-9025   rchsymgt@us.ibm.com

NOTICE:

This publication may refer to products that are not currently available in your country.

IBM makes no commitment to make available any products referred to herein.

TRADEMARKS:

IBM, AS/400, OS/400, ADSTAR, and CISC are trademarks of the IBM Corporation in the United States or other countries or both.

Other company, product, and service names may be trademarks or service marks of others.