Application Backup and Restore using Fast Replication Services

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Session Agenda

• What is IBM Tivoli Advanced Backup and Recovery (AB&R)?
• AB&R Basic Functions and Operational Advantages
• Storage-aware capabilities
  • Storage-aware Application Backup Process Flow
  • Storage-aware Application Restore Process Flow
• Using Fast Replication Services (FRS)
• Summary
What is AB&R?

- Expert backup, recovery, and disaster recovery manager for non-database managed data
  - Performs application dataset discovery
  - Supports backup tracking and inventory management
  - Manages local recovery operations
  - Manages disaster recovery operations
  - Provides audit and compliance reporting
- Integrates with storage hardware to drive storage-based fast replication
  - Minimizes backup and recovery down time
  - Promotes high availability
  - Reduces processing costs
  - Leverages hardware investment
Basic Functions: Application Discovery

- Real time application dataset usage analysis
  - Identifies all datasets referenced by an application
- Application level critical dataset identification
  - Dataset name list created at end of application cycle
  - Used as input to backup jobs
  - Used for application cycle point recovery
  - Used for audit and compliance reporting
Basic Functions: Backup Event Tracking and Inventory Management

- Track and inventory existing backup jobs without JCL changes
- Identify critical application files not being backed up
- Verify critical application files are backed up
- Facilitate application cycle point backup recording
- Facilitate application audit and compliance reporting
Basic Functions: Local Recovery Management

- Search backup inventory to locate all available backups
- Dynamically build recovery jobs for dataset recovery
- Perform selective dataset or complete application restore
- Facilitate application cycle point recovery
Basic Functions: Disaster Recovery Management

• Dynamically build application recovery jobs for disaster recovery site
• Provide compliance and audit reporting
• Search backup inventory to locate all available backups
• Perform selective dataset restore
Basic Functions: Audit and Compliance Reporting

- Identify application critical datasets
  - Required for application execution
- Search backup inventory for critical dataset backups
  - Required to restore and execute application
- Report any missing critical dataset backups
  - Facilitates necessary corrective action
- Report all required critical dataset backups exist
  - Proves application is recoverable
  - Used for audit and compliance
Operational Advantages

- Automate application critical dataset identification
- Reduce down time and support high availability initiatives
- Simplify and speed up backup operations
- Simplify and speed up recovery processing
- Reduce administration and CPU costs
- Assist installations in meeting Sarbanes-Oxley and other government or industry regulations
Storage-aware Backup and Restore

- Integrate application domains with storage-based fast replication facilities
  - Application backup and restore operations use storage subsystem
  - Leverage storage processors and fast replication investments
    - IBM, EMC, HDS, STK
- Reduce backup and restore costs
  - Less administration costs
  - Reduce host CPU and I/O resource utilization
- Create backup copies instantly
- Create offload copies asynchronously
- Fast restore reduces recovery time
- Provide infrastructure and metadata to manage the backup and restore operations
Application Backup and Recovery Using Storage Integration

Mainframe Applications

Storage-Aware Application and Database Tools

Application and Database Management Domain

Storage Administration and Business Continuity Domain

Backup, Clone, DR

Source Data

- Organizational Integration
- New Backup Methods
- New Recovery Strategies
- Business Recovery Monitoring
- Disaster Restart Solutions
Storage-aware Application Backup

- Fast Replication Services
  - Integrates application backup and restore processes with storage-based fast replication
- Volume-based fast replication used to perform backup
  - Application backups complete in seconds
  - Backup performed without host CPU or I/O
  - Backup windows are reduced or eliminated
  - Extends online or batch processing windows
- Application suspend processes required to ensure data consistency
- Automated volume level offload management
Storage-aware Application Restore

- Fast Replication Services used to restore application objects from tape or disk automatically
- Dataset based restore used to perform application or selective dataset restore from tape
- Dataset based fast replication used to perform application or selective dataset restore from disk
  - Datasets snapped to restore data
  - Instantaneous restore process
  - Restore performed without host CPU or I/O
  - Application down time is reduced
- One backup used for local or remote restore operations
Large File Fast Replication Backup and Restore (Preliminary Test Results)

- Tests 1-3 = Four large datasets on each 3390 Mod27 volume
  - 122,820 track (6.5 GB) datasets
- Test 4 = One large dataset on each of 8 volumes
  - 122,820 track (6.5 GB) datasets
Using Fast Replication Services (FRS)

- Overview
- Preparing to Use FRS
- Backup Process
- Restore Process
- Application Cycle Execution and Backup Sample Scenario
FRS Overview

- Storage-aware backup and recovery solution
  - Integrates storage processor fast replication facilities
  - Performs instantaneous backups
  - Reduces recovery time
  - Simplifies disaster recovery procedures
  - Uses less CPU, I/O and storage resources
- Invoked and managed using AB&R
  - Application critical dataset discovery
  - FRS backup and offload
  - Application backup inventory management
  - FRS restore using backup and offload
Preparing to Use FRS

• Install the Fast Replication Engine (FRE)
  • Product FMID HFRZ110
• Configure the target volume environment
  • Dedicated FRZ Storage Group(s)
• APF authorize the FRZ LOADLIB
• Define and initialize the FRZ Repository and Control files
  • Sample jobs in product JCL members BKM#REPO and BKM#CNTL
• Specify the BKMINI FRS and FRZ token values
  FRS_ACTIVE
  FRZ_CNTL_FILE_DSN
  FRZ_LOADLIB
  FRZ_ISPPLIB
  FRZ_ISPMLIB
Preparing to Use FRS

- Define an FRS backup profile
  - Used to assign application dataset backup processing options
  - Name and textual description
  - Backup method (SNAP, FLASH, Long)
  - Update option (Update, View only, No access)
  - FRZ target pool (dedicated SG)
  - Backup generations to be retained
  - Offload options (number of copies, RETPD, dsname, etc.)
Define an FRS Backup Profile

IBM Tivoli Advanced Backup and Recovery for z/OS, V2.3
Setup and Configuration

Command ==> 9

Enter an option from the list below:

ABARS Manager
1 Aggregate Management with SMS Interface
2 Group Filter Management

Critical Backup Tracking Inventory
3 Browse/edit Backup Tracking INCLUDE Filters
4 Browse/Edit Backup Tracking EXCLUDE Filters
5 Test Backup Tracking Filters
6 Build Batch Intercept File and Refresh CBTI
7 DAD Jobname Management
8 User Defined Backup Utilities Management

Fast Replication Service
9 Perform Fast Replication Services

*BKMS100
Define an FRS Backup Profile

IBM Tivoli Advanced Backup and Recovery for z/OS, v2.3
Application Fast Replication Backup
User ===> RR02
SYSID ===> TST
Command ===> CRE

Primary Command => CRE (Create Profile) OTL (Offload Tape List)

Creator RR02
Profile Name APPLRR_BKPOFFL
Description Backup with offload required
Backup Method F (Snap/Flash/dFsmsdss(L))
Update Option U (Update, View only, No access)
Define an FRS Backup Profile

Option ===>

Creator: RR02
Share Option: U (Upd,View,No)
Name: APPLRR.BKPOFFL
Description: BACKUP WITH OFFLOAD REQUIRED

Backup Method ===>
Backup Generations===>
Current Generation===>
Offload Options ===>
Target Pool ===>

*FRZ$BPA
Define an FRS Backup Profile

----- Offload Options -----

<table>
<thead>
<tr>
<th>Option</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Primary</td>
<td>Y</td>
<td>(Yes/No/Update)</td>
</tr>
<tr>
<td>Local Backup</td>
<td>N</td>
<td>(Yes/No/Update)</td>
</tr>
<tr>
<td>Recovery Site Primary</td>
<td>Y</td>
<td>(Yes/No/Update)</td>
</tr>
<tr>
<td>Recovery Site Backup</td>
<td>N</td>
<td>(Yes/No/Update)</td>
</tr>
<tr>
<td>Offload Generations</td>
<td>05</td>
<td>(1 - 99)</td>
</tr>
<tr>
<td>Delete Aged Backup files</td>
<td>N</td>
<td>(Yes/No)</td>
</tr>
<tr>
<td>Compress Data</td>
<td>N</td>
<td>(Yes/No)</td>
</tr>
<tr>
<td>Data Mover</td>
<td>N</td>
<td>(DFSAmsdss, Fdr, or fdrInstant)</td>
</tr>
<tr>
<td>Encrypt Data</td>
<td>N</td>
<td>(Yes/No/Update)</td>
</tr>
<tr>
<td>Number of Tasks</td>
<td>02</td>
<td>(1 - 99)</td>
</tr>
</tbody>
</table>

*FRZ$OFF*
Define an FRS Backup Profile

---

Update DSN Specification => Y
Unit Type => CART
Catalog => Y
Data Class => 8 character class
Storage Class => 8 character class
Management Class =>
Tape specific parameters (only needed if Unit Type is a Tape device):
Stack Backups on Tape => Y
Tape Stack Limit => 005
Expiration date *or*
Retention period => 005
Maximum Tapes => 005

*FRZ$OFF*
Define an FRS Backup Profile

**FRZ#BACK**

Option ===>

----------------- Target Pool Selection ----------------- 2012/02/14 14:46:04

Line Commands: I - Enter  D - Delete

Creator:  RR02  Name:  APPLRR.BKPOFFL
Share Option: U (Upd,View,No)  Description:  BACKUP WITH OFFLOAD REQUIRED

----------------- Target Range Options -------------------

Enter by Unit or SMS Storage Group ==> S (Unit/Storgroup)

----------------- Enter Storage Groups ---------------------  Row 1 of 1

Cmd  Storgroup

SGFRETTIS

******************************************************************************

*FRZ$POO

| 91 | Ready (1) | 192.168.55.74 | 0C0TCP06 | 14:46:29 2/14/2012 | |  | | 08:57:52 | 02:015 |
Define an FRS Backup Profile

IBM Tivoli Advanced Backup and Recovery for z/OS, V2 Row 1 to 1 of 1
Application Fast Replication Backup
Profile Display List

User => RRO2
SysID => TST
Command => scroll => CSR

Primary Command => CRE (Create Profile) OTL (Offload Tape List)
Line Command => REF (Refresh) D (Delete)
               (Create) S/V (Select/View)
               (Rename) (Update)

Sort By => N C (Creator) D (Description) N (Name) S (Share Option)
Sort Direction => A T (Type)
                A (Ascending) D (Descending)

I T S Profile Name Description Creator
  B** B***** APLLRR.BKPOFFL BACKUP WITH OFFLOAD REQUIRED RRO2

FRZRO69I - Profile "RRO2.APLLRR.BKPOFFL" saved

*BKMFRE0
Backup Process

• Create selection dataset (SDS) containing critical dataset names
  • Static list
  • Dynamically generated using AB&R APPLEND or other tools
• Select desired backup profile
  • Backup only – no offload permitted
  • Backup with offload required
• Submit FRS backup job
  //FRSBKUP  EXEC BKMFPROC
  //SYSIN      DD      *
  FRE BACKUP  OWNER(RR02)   +
        PROFILE('APPLRR.BKPOFFL')   +
   SELDSN(RR02.APPLRR.SELECT)
Backup Process

• AB&R submits request to FRE and waits for completion
• FRE communicates with storage subsystem
• Storage subsystem performs fast replication backup
• FRE records backup copy information in FRE repository
• FRE notifies AB&R request complete
• AB&R records backup in Inventory DataSet (IDS)
Offload Process

- Select backup profile used for a completed backup
  - Backup and offload attributes
- Determine fast replication backup version to be offloaded
  - Current, -1, etc.
- Submit FRS offload job
  
  ```
  //FRSOFFL EXEC BKMFPROC
  //SYSIN DD *
  FRE OFFLOAD OWNER(RR02) +
  PROFILE('APPLRR.BKPOFFL') +
  GEN(+0)
  ```
Offload Process

- AB&R submits request to FRE and waits for completion
- FRE copies fast replicated backup to tape
- FRE records offload copy information in FRE repository
- FRE notifies AB&R request complete
- AB&R records offload in Inventory DataSet (IDS)
Restore Process

• Use ISPF panels to locate desired backup in IDS
  • View specific dataset backups
  • View tracked backup jobs
  • View application cycle point backups (BackupEnd)

• Use ISPF to build restore job
  • Quick restore to build job and submit
  • Set up restore to build and save job for later submission
Restore Process

• Submit FRS restore job

  //FRSREST EXEC PGM=BKMFRE50,REGION=0M
  //STEPLIB DD DISP=SHR,DSN=BKM0203.SBKMLOAD
  // DD DISP=SHR,DSN=FRZ0110.LOADLIB
  //FRZCNTFL DD DISP=SHR,DSN=FRZ0110.CONTROL
  //INI DD DISP=SHR,DSN=BKM0203.SBKMPARM(BKMINI)
  //BKMIDS DD DISP=SHR,DSN=BKM.IDS
  //SYSIN DD *

  FRE RESTORE TOKEN(26) +
  INCLDSN(ABRFRS.APPLRR.DATASET1) +
  ABRFRS.APPLRR.DATASET2 +
  ABRFRS.APPLRR.DATASET3 +
  ABRFRS.APPLRR.DATASET4)
Restore Process

- AB&R submits request to FRE and waits for completion
- FRE searches repository for requested backup version
  - If FR backup copy on target disk volume(s) available it will be used
  - If FR backup copy on target disk volume(s) not available an offload copy will be used
- FRE uses storage subsystem for restore from FR backup
- FRE uses DFSMSdss for restore from offload
- FRE notifies AB&R request complete
Application Cycle Execution and FRS Checkpoint Backup Scenario

Cycle Start jobA1
JobA2
JobA3
Checkpoint FRS backup jobB1
JobA4
JobA5
Checkpoint FRS backup jobB2
JobA6
JobA7
Checkpoint FRS backup jobB3
JobA8
JobA9
Cycle End jobA10
FRS cycle end backup and offload job(s)
Sample FRS Checkpoint Backup Job

• Submit FRS backup and build restore job
  
  //APPLCPB1 JOB ............................
  //FRSBKUPA EXEC BKMFPROC
  //SYSIN DD *
  FRE BACKUP OWNER(RR02) +
  PROFILE('APPLRR.BKP') +
  SELDSN(RR02.APPLRR.SELECT)
  //BLDRESTJ EXEC BKMRFPROC,
  //JCLOUT='RR02.$FRS.ABR.CNTL'
  //CONTROL DD *
  MEMBEROUT APPLCPR1
  JOBNAMEOUT APPLCPR1
  BLDREST JOBNAME(APPLCPB1) GEN(0)
Sample FRS Cycle End Backup and Offload Jobs

• Submit FRS backup job
  //FRSBKUP EXEC BKMFPROC
  //SYSIN DD *
  FRE BACKUP OWNER(RR02) +
    PROFILE('APPLRR.BKPOFFL') +
    SELDSN(RR02.APPLRR.SELECT)

• Submit FRS offload job
  //FRSOFFL EXEC BKMFPROC
  //SYSIN DD *
  FRE OFFLOAD OWNER(RR02) +
    PROFILE('APPLRR.BKPOFFL') +
    GEN(+0)
Summary

- Storage-aware data management utilities provide storage integration to simplify backup and restore administration tasks
- Storage-aware backup solutions leverage storage-based fast replication facilities and investments
  - Fast and non-intrusive backup operations with less administration
  - Reduces host CPU, I/O and storage utilization
  - Fast restore reduces application recovery time
- Fewer skills required to implement advanced backup and restore solutions
- Implementation planning is important to optimize the benefits
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