

Application Backup and Restore using Fast Replication Services

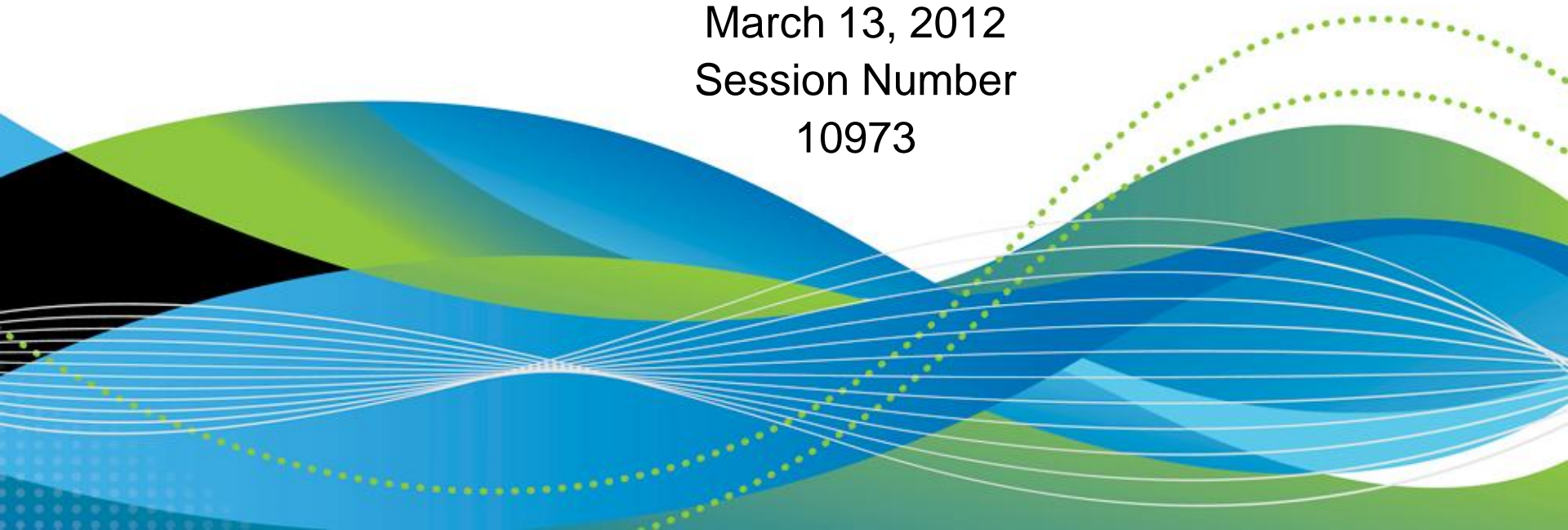
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Session Number

10973



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

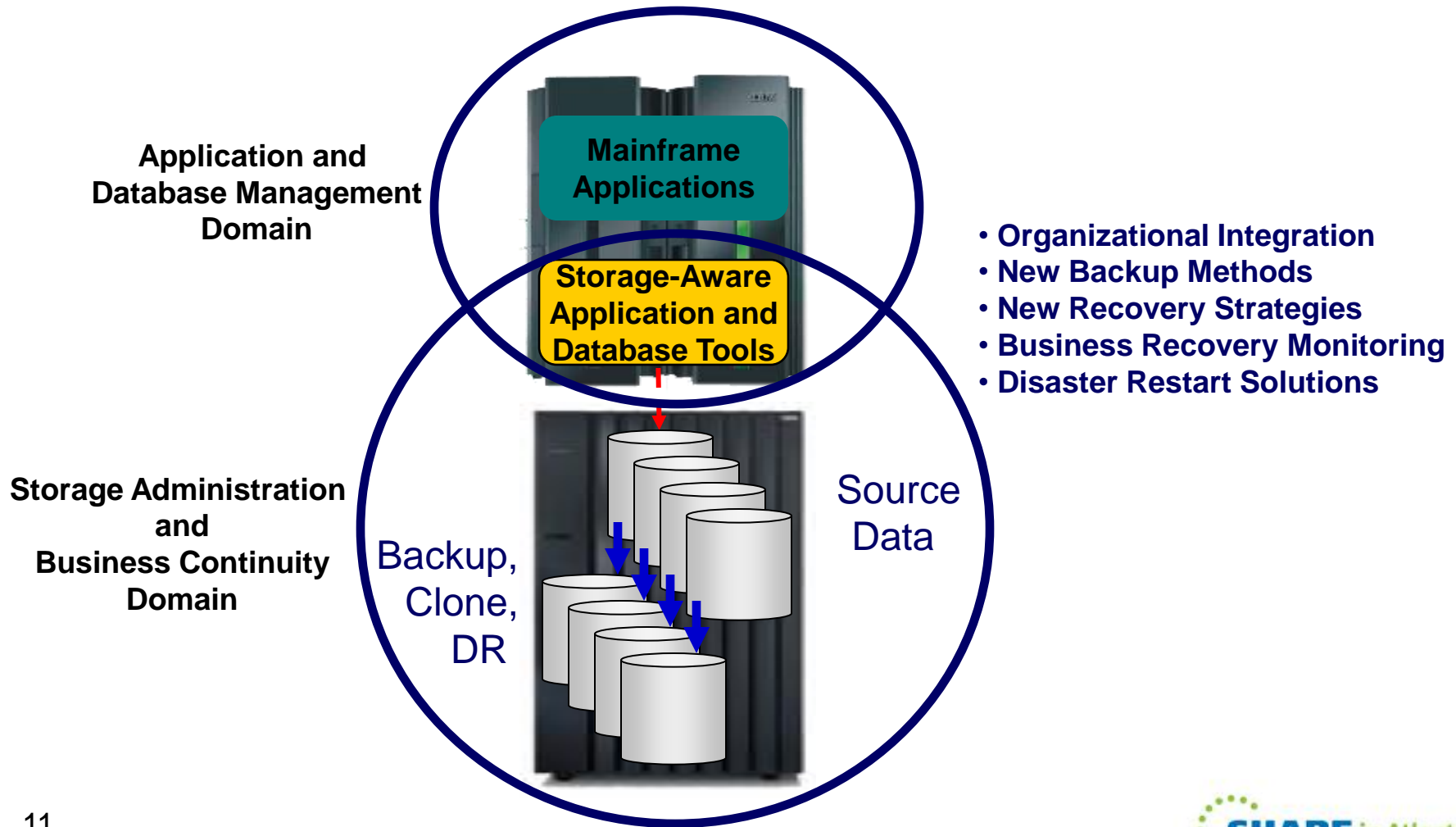
Operational Advantages

- 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

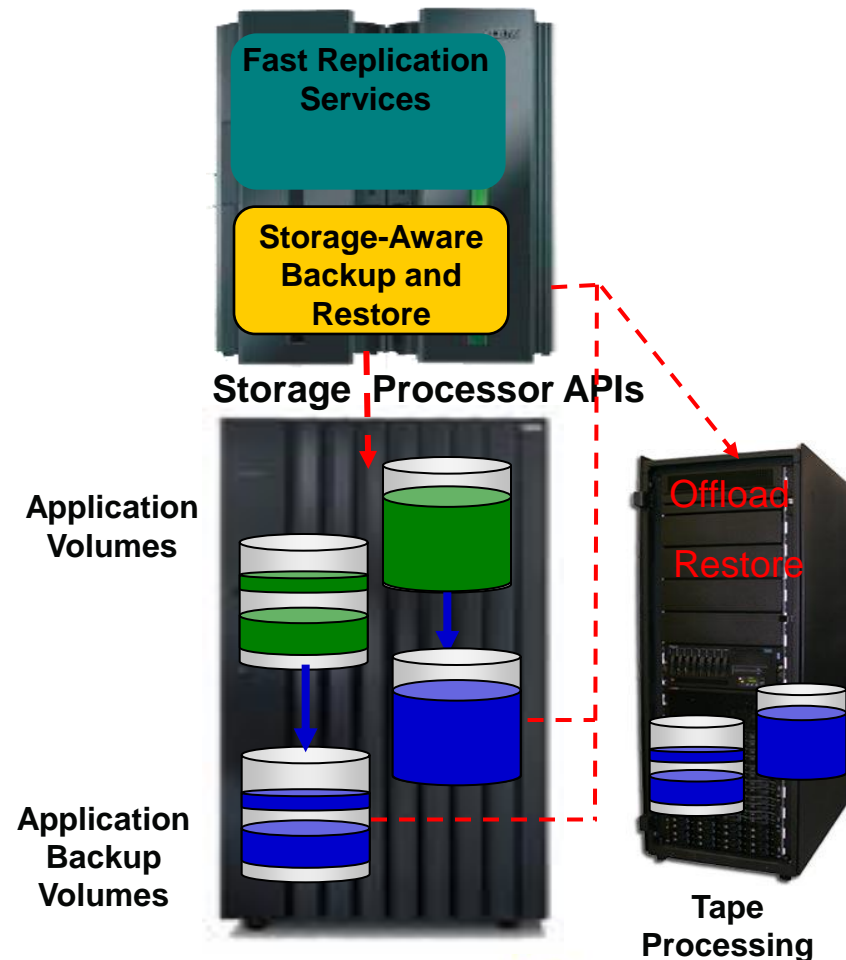
- Integrate application domains with storage-based fast replication facilities
 - Application backup and restore operations use storage subsystem
 - Leverage storage processors and fast replication investments
 - **IBM, EMC, HDS, STK**
- Reduce backup and restore costs
 - Less administration costs
 - 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



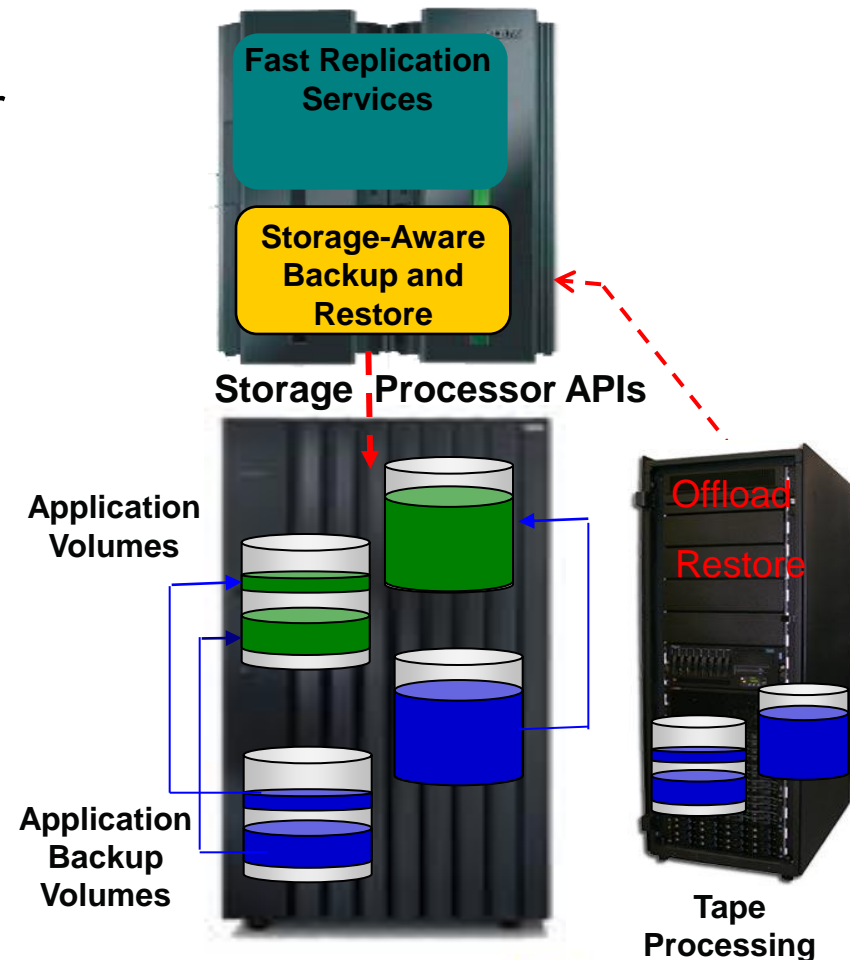
Storage-aware Application Backup

- 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



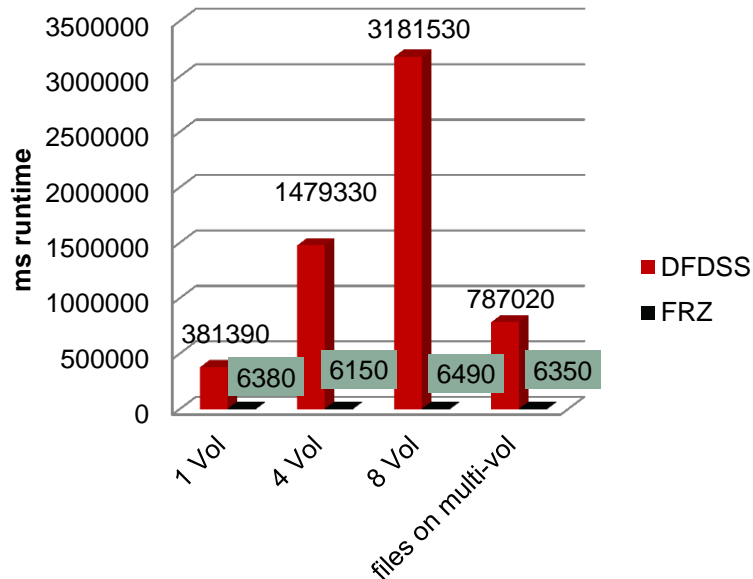
Storage-aware Application Restore

- 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

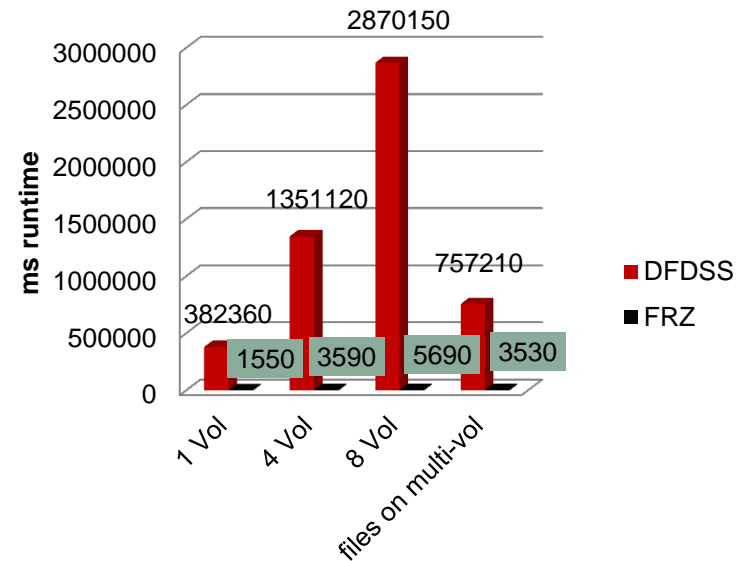


Large File Fast Replication Backup and Restore (Preliminary Test Results)

Benchmark for Large Files Backup (run time)



Benchmark for Large Files Restore with REPLACE (run time)



- 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

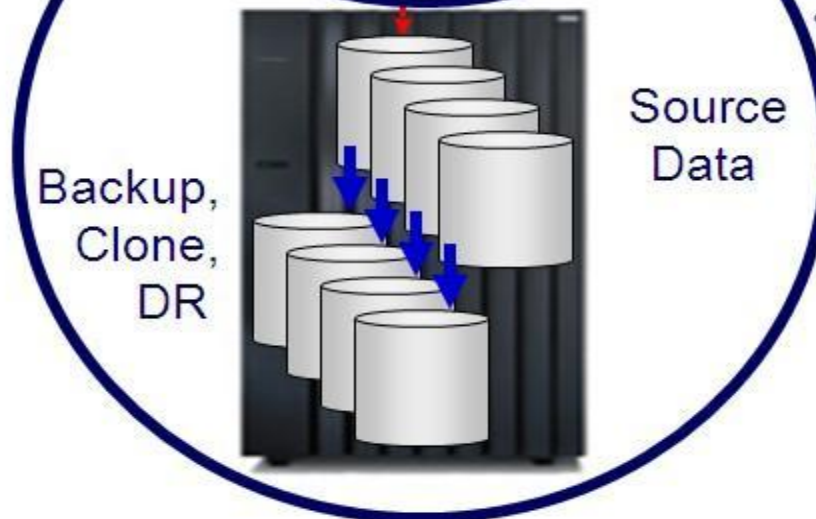
FRS Overview

Application and Database Management Domain



- Organizational Integration
- New Backup Methods
- New Recovery Strategies
- Business Recovery Monitoring
- Cloning Automation
- Disaster Restart Solutions

Storage Administration and Business Continuity Domain



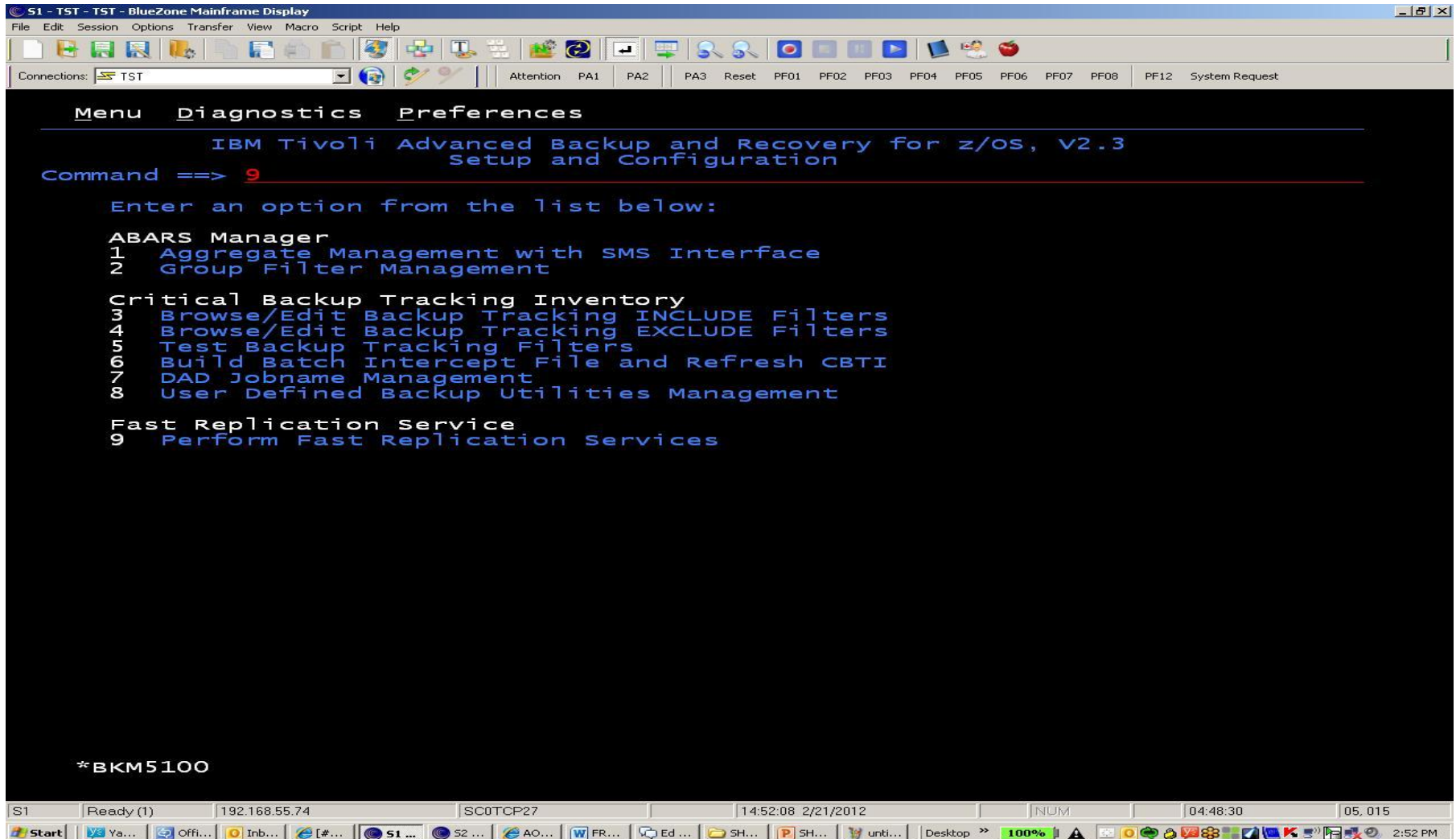
Preparing to Use FRS

- 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



The screenshot shows a terminal window titled "S1 - TST - TST - BlueZone Mainframe Display". The window has a menu bar with "File", "Edit", "Session", "Options", "Transfer", "View", "Macro", "Script", and "Help". Below the menu bar is a toolbar with various icons. The main area of the terminal displays the following text:

```
Menu  Diagnostics  Preferences
-----
          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
```

At the bottom left of the terminal window, the text "*BKM5100" is displayed. The bottom of the image shows a Windows taskbar with the Start button, several open application windows (Ya..., Offi..., Inb..., [#...), and a system tray with a 100% volume indicator and a clock showing 2:52 PM on 2/21/2012.

Define an FRS Backup Profile



S1 - TST - TST - BlueZone Mainframe Display

File Edit Session Options Transfer View Macro Script Help

Connections: TST Attention PA1 PA2 PA3 Reset PF01 PF02 PF03 PF04 PF05 PF06 PF07 PF08 PF12 System Request

Menu Diagnostics Preferences

IBM Tivoli Advanced Backup and Recovery for z/OS, V2.3
Application Fast Replication Backup
Profile Display List

User ==> RR02
SysID==> TST
Command ==> CRE

Primary Command => CRE (Create Profile) OTL (Offload Tape List)
Enter New Backup Profile Options

Line	Creator	RR02
	Profile Name	<u>APPLRR.BKPOFFL</u>
	Description	<u>Backup with offload required</u>
	Backup Method	<u>F</u> (Snap/Flash/dfsmsdss(L))
	Update Option	<u>U</u> (Update, view only, No access)

Sort D
I T S P
B * *

*FRZ\$BPR

S1 | Ready (1) | 192.168.55.74 | SC0TCP06 | 14:25:43 2/14/2012 | NUM | 06:37:10 | 14, 046

Define an FRS Backup Profile



S1 - TST - TST - BlueZone Mainframe Display

File Edit Session Options Transfer View Macro Script Help

Connections: TST Attention PA1 PA2 PA3 Reset PF01 PF02 PF03 PF04 PF05 PF06 PF07 PF08 PF12 System Request

```
FRZ#BACK ----- Update Backup Profile ----- 2012/02/14 14:30:42
Option ==> _____ Scroll ==> CSR

-----
Creator: RR02      Name: APPLRR.BKPOFFL
Share Option: U   (Upd,View,No)   Description: BACKUP WITH OFFLOAD REQUIRED
-----
Backup Options -----
Backup Method      ==> F   (Snap/Flash/Long)      Current Generation==> 00
Backup Generations==> 01
Offload Options    ==> Y   (Yes/No/Update)
Target Pool        ==> Y   (Yes/Update)
-----

*FRZ$BPA
```

S1	Ready (1)	192.168.55.74	SC0TCP06	14:35:09 2/14/2012	NUM	06:46:37	02, 015
----	-----------	---------------	----------	--------------------	-----	----------	---------

Define an FRS Backup Profile



51 - TST - TST - BlueZone Mainframe Display

File Edit Session Options Transfer View Macro Script Help

Connections: TST Attention PA1 PA2 PA3 Reset PF01 PF02 PF03 PF04 PF05 PF06 PF07 PF08 PF12 System Request

```
FRZ#BACK ----- offload options ----- 2012/02/14 14:37:18
Option ==> -----
Creator: RR02 Name: APPLRR.BKPOFFL
Share Option: U (Upd,View,No) Description: BACKUP WITH OFFLOAD REQUIRED
-----
Enter the offload options to associate with this Backup profile:

Local Primary ==> Y (Yes/No/Update)
Local Backup ==> N (Yes/No/Update)
Recovery Site Primary ==> Y (Yes/No/Update)
Recovery Site Backup ==> N (Yes/No/Update)

offload Generations ==> 05 (1 - 99)
Delete Aged Backup files ==>  (Yes/No)
Compress Data ==> (Yes/No)
Data Mover ==> (Dfmsdss, Fdr, or fdrInstant)
Encrypt Data ==> (Yes/No/Update)
Number of Tasks ==> 02 (1 - 99)

*FRZ$OFF
```

S1 | Ready (1) | 192.168.55.74 | SC0TCP06 | 14:39:33 2/14/2012 | NUM | 06:51:01 | 15.032

Define an FRS Backup Profile

S1 - TST - TST - BlueZone Mainframe Display

File Edit Session Options Transfer View Macro Script Help

Connections: TST Attention PA1 PA2 PA3 Reset PF01 PF02 PF03 PF04 PF05 PF06 PF07 PF08 PF12 System Request

```
FRZ#BACK ----- LP offload options ----- 2012/02/14 14:41:29
Option ==>-----
Creator: RRO2      Name: APPLRR.BKPOFFL
Share Option: U   (Upd,View,No)  Description: BACKUP WITH OFFLOAD REQUIRED
-----
Update DSN Specification => Y      (Yes/No)
Unit Type                => CART  (CART/SYSALLDA/etc.)
Catalog                  => Y      (Yes/No)
Data Class                => _____ (8 character class)
Storage Class            => _____ (8 character class)
Management Class         => _____ (8 character class)
Tape specific parameters (only needed if Unit Type is a Tape device):
Stack Backups on Tape    => Y      (Yes/No)
Tape stack Limit         => 005  (1 - 999)
Expiration date *or*    => _____ (YYYYDDD/YYDDD)
Retention period         => 005  (4 digit number)
Maximum Tapes            => 005  (1-256)

*FRZ$OFF
```

S1 | Ready (1) | 192.168.55.74 | SC0TCP06 | 14:42:10 2/14/2012 | NUM | 06:53:37 | 18.034

Define an FRS Backup Profile



SI - TST - TST - BlueZone Mainframe Display

File Edit Session Options Transfer View Macro Script Help

Connections: TST

Attention PA1 PA2 PA3 Reset PF01 PF02 PF03 PF04 PF05 PF06 PF07 PF08 PF12 System Request

```
FRZ#BACK ----- Target Pool Selection ----- 2012/02/14 14:46:04
Option ==>  scroll ==> CSR
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  Stogroup
SGFRETTG
***** Bottom of Data *****

*FRZ$POO
```

S1	Ready (1)	192.168.55.74	SC0TCP06	14:46:29 2/14/2012	NUM	06:57:57	02, 015
----	-----------	---------------	----------	--------------------	-----	----------	---------

Define an FRS Backup Profile



SI - TST - TST - BlueZone Mainframe Display

File Edit Session Options Transfer View Macro Script Help

Connections: TST Attention PA1 PA2 PA3 Reset PF01 PF02 PF03 PF04 PF05 PF06 PF07 PF08 PF12 System Request

Menu Diagnostics Preferences

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

User ==> RR02
SysID==> TST
Command ==> scroll ==> CSR

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

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

I	T	S	Profile Name	Description	Creator
B	U	*	APPLRR.BKPOFFL	BACKUP WITH OFFLOAD REQUIRED	RR02
***** Bottom of data *****					

FRZR069I - Profile "RR02.APPLRR.BKPOFFL" saved

*BKMFREO

SI | Ready (1) | 192.168.55.74 | SC0TCP06 | 14:50:32 2/14/2012 | NUM | 07:01:59 | 07.015

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 BKMRPROC,  
//          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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