



IBM Software Group

DB2 Recovery Using IBM Tools

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IBM Information Management software

A horizontal decorative bar with a green background, featuring a series of colorful icons including a camera, a cross, a globe, a green arrow, a grid of dots, and a stack of papers.

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Agenda

- Overview of DB2 Recovery Tools
 - DB2 Log Analysis Tool
 - DB2 Change Accumulation Tool
 - DB2 Recovery Expert
- DB2 System-Level Backup
 - Benefits and considerations
 - Using Recovery Expert for system-level backup
 - DASD – a concern or not?
- Summary

Overview of DB2 Recovery Tools



Overview of DB2 Log Analysis Tool

- Allows users to mine the valuable information from the DB2 recovery log
- Has features that support the use of this log data in several ways
 - ▶ Recovery
 - Selective recovery
 - Drop recovery
 - ▶ Audit
 - Monitor changed data activity
 - ▶ Replication
 - REDO updates on another object or system
 - ▶ Reporting
 - Analyze events by looking at historical log data
- Version 3.2 new features:
 - ▶ Log Forward and Log Backward in the same run
 - ▶ Option to always choose Log Backward if possible
 - ▶ Pre-recall for migrated datasets
 - ▶ Group UNDO/REDO SQL by URID
 - ▶ Handle MASS DELETES as single SQL statement instead of individual DELETES

Overview of DB2 Change Accum Tool

- Modeled loosely after IMS Change Accumulation processes
- Alternative backup strategy for specific DB2 z/OS situations
- Can use Automation Tool profiles
- Prior to V2.1, two primary scenarios used by our customers
 - ▶ Creation of log subsets (mini-logs) to speed tablespace recovery
 - Requires user to use Change Accum with WRITE-TO-VSAM for recovery
 - DB2 RECOVER utility doesn't support Change Accum mini-logs
 - ▶ Conversion of SHRLEVEL CHANGE image copies to SHRLEVEL REFERENCE
 - Can do this for a set of potentially related objects to get common recovery point

Overview of DB2 Recovery Expert for z/OS

- Supports recovery of dropped objects including data to a point in time before the drop.
- Reads and analyzes the DB2 log to find quiet times or points of consistency for single or groups of objects.
- Analyzes all recovery assets and presents several recovery “plans” or methods with an estimated cost for each method allowing the user to choose the most appropriate and cost efficient method.
- Can generate SQL based recoveries to roll-forward or back-out changes to individual tables or groups of objects. This type of recovery is not supported by standard DB2 recovery tools.
- Supports recovering an object or application set of objects to a prior version, even if the objects DDL has changed. A recovery can be performed back to a prior version of an application if the need arises.
- Enables recovery to a point in time, given an object to be recovered, including rolling data changes backward or forward to provide for the most efficient recovery.

Overview of DB2 Recovery Expert for z/OS – Cont.

- Provides backup and recovery solutions that automate and integrate sophisticated storage processor capabilities to:
 - ▶ backup data instantaneously to a crash consistent copy of production without sacrificing availability
 - ▶ reduce CPU and I/O costs by using the storage processor to copy the data instead of z/OS
 - ▶ execute fast replication in a safe and transparent manner on behalf of the DBA
 - ▶ provide the restore of a database or database objects in parallel with the restoration process to minimize recovery time and reduce application down time
 - ▶ Adds system backup and recovery support for several vendors hardware.
- Recovery Expert System Backups can be used for:
 - ▶ Fast DB2 subsystem recovery from system backups including support to restore both data and log volumes.
 - ▶ DB2 subsystem disaster restart. Disaster recovery becomes as simple as restarting from a power failure. This saves CPU, I/O, image copy restoration and log apply time.
 - ▶ Reliable fast recovery of tablespace and indexspace datasets from system backups, even if the datasets have moved or have been deleted.

DB2 Recovery Expert for z/OS V2.2

- General available: Aug 2009
- Major new features
 - ▶ Increases parallelization of recoveries
 - ▶ Improved handling of stacked image copies on tapes
 - ▶ Extract image copies for objects from System Level Backups
 - Backup must be taken via RE
 - ▶ Support for EMC Virtual Devices
 - Copies only changed tracks
 - Enables customers to take much more frequent backups while using less DASD
 - ▶ Support for Hitachi Shadow Direct backups
 - ▶ Auto-map
 - Product assists in automating set-up to allow partial backups
 - Backups must be by volume, but can include a subset of the entire DB2 subsystem

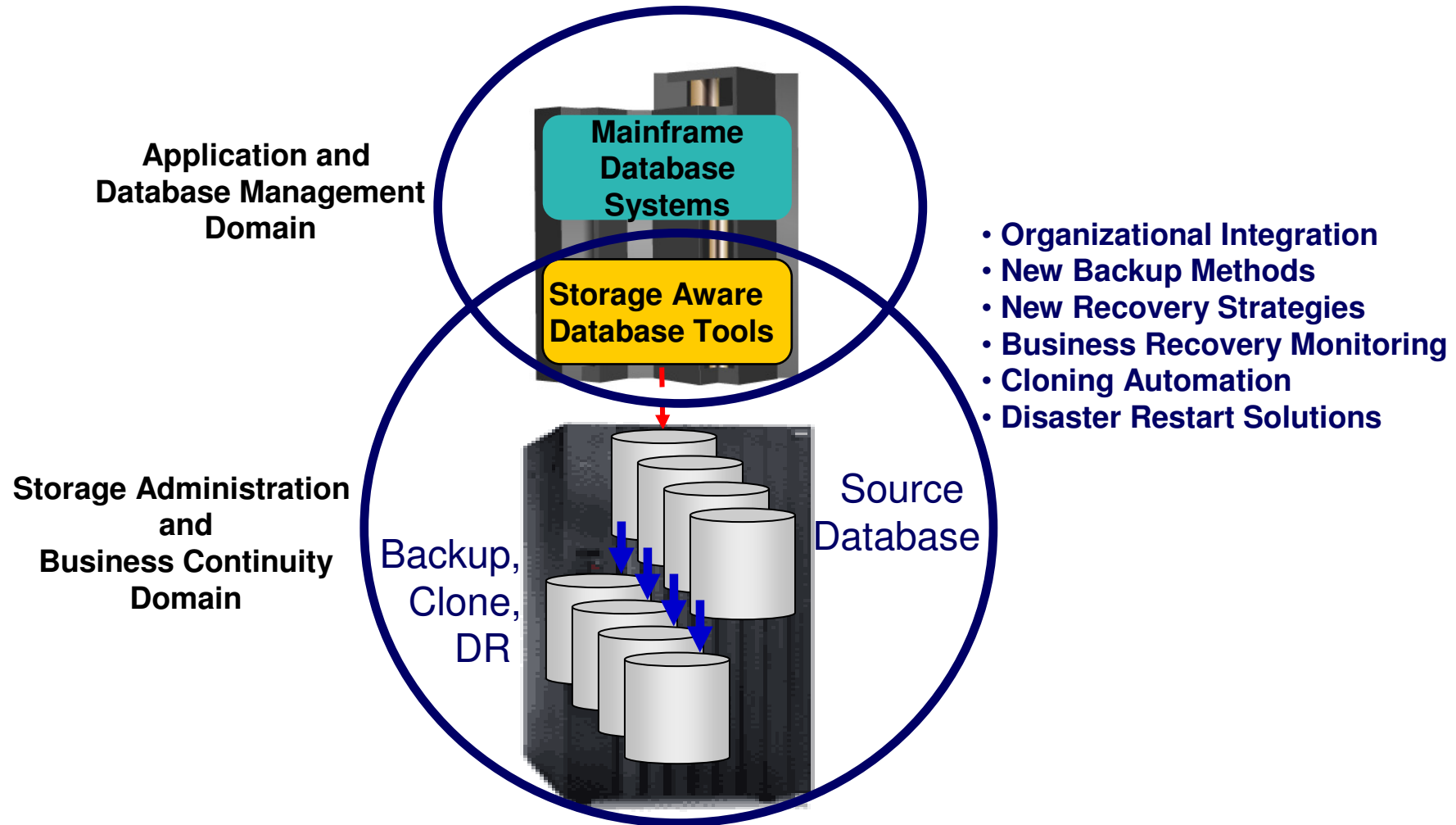
DB2 System-Level Backup



DB2 System Trends and Directions

- Large DB2 systems require high availability
 - ▶ Fast and non-intrusive backup facilities are required
 - ▶ Fast recovery capabilities required to minimize down time
 - ▶ Most backup, recovery and cloning solutions do not leverage storage-based fast-replication facilities
- Storage-based fast-replication facilities are under-utilized
 - ▶ Tend to be used by storage organizations
 - ▶ Tend not to be used by database administrators (DBAs)
- Storage aware database products allow DBAs to use fast-replication in a safe and transparent manner
 - ▶ Provides fast and non-intrusive backup operations
 - ▶ Simplifies recovery operations and reduces recovery time
 - ▶ Simplifies disaster recovery procedures

DB2 System Level Backup Database and Storage Integration



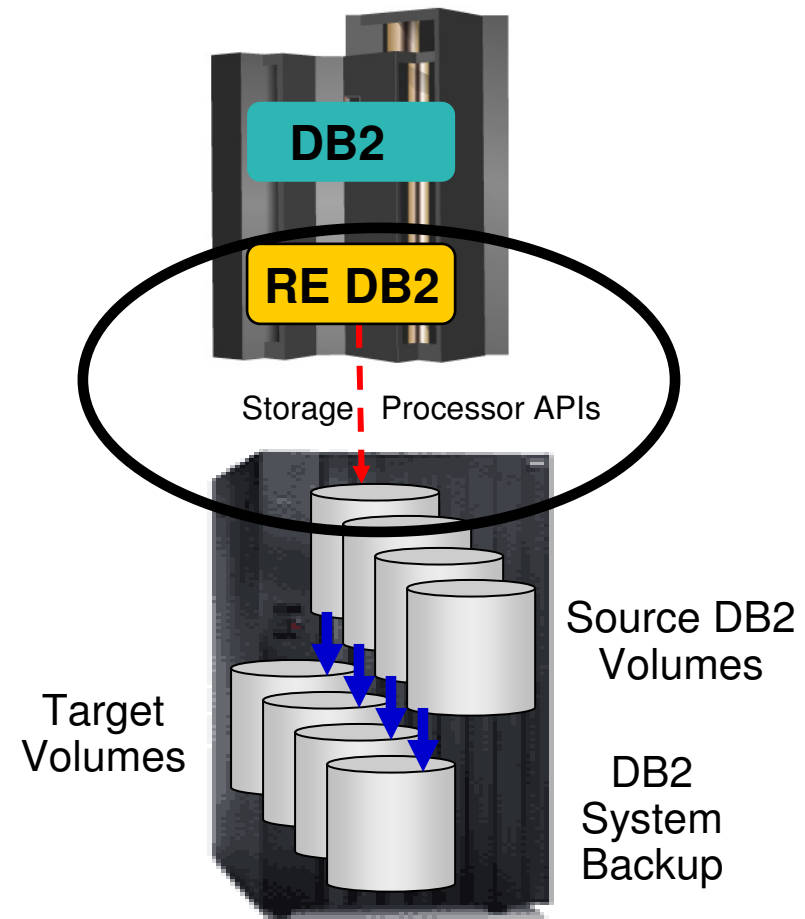
DB2 System Level Backup Operational Advantages

- Perform DB2 backups instantly
- Fast restore and parallel recovery reduces recovery time
- Reduce backup, recovery, and administration costs
 - ▶ Reduce host CPU and I/O resource utilization
- Simplify disaster recovery procedures
- DB2 and storage system integration used to drive fast-replication capabilities
 - ▶ Leverage storage processors and fast-replication investments
 - IBM, EMC, HDS, STK
 - ▶ Expose fast-replication capabilities to the DBAs **safely and transparently** using “**storage aware**” database utilities
- Requires a sophisticated infrastructure and meta-data to manage the DB2 and storage processor coordination

Recovery Expert

Creating a System Level Backup

- Storage-based API drive backup process
- Storage-based fast-replication creates backup
 - ▶ Full DB2 system backups in seconds
 - ▶ Does not use host CPU or I/O resources
- Backup DB2 without affecting applications
 - ▶ Backup windows reduced or eliminated
 - ▶ Extends processing windows
- Data consistency ensured during backup
 - ▶ DB2 Suspend (One data-sharing member)
 - ▶ Storage-based consistency functions
 - ▶ DB2 Backup System
- Automated backup archival and recall
- One backup used for many functions
 - ▶ Reduces backup CPU, I/O, and storage utilization



Recovery Expert

Partial System Level Backup

- Partial system level backup (PSLB) are used for object or application recovery only
 - ▶ Data set fast replication used to restore data
 - ▶ Log and data isolation not required
 - ▶ Desired application object data should be grouped on volumes as a best practice
- PSLB cannot be used for system recovery
 - ▶ System recovery requires all volumes in SLB
- PSLB usage
 - ▶ Large objects or applications having unique backup requirements
 - ▶ Creating image copies from a PSLB
 - ▶ Reduce disk utilization
 - ▶ Support more backup generations

Recovery Expert

Creating Image Copies

- Image copies can be generated from a Recovery Expert system level backup (SLB)
- Image copies are registered DB2 image copies
- Image copies can be used for object recovery and other operational procedures
- All image copies are created at the same point in time
 - ▶ No affect on the application for image copy creation
 - ▶ Reduces recovery scope for coordinated object recoveries
 - ▶ Reduces I/O contention caused by performing traditional IC processing during high transaction activity

Recovery Expert – Setup and Usage Flow

Main Menu

```
RCVYXPRT V2R2 ----- IBM DB2 Recovery Expert for z/OS -----
Option ==> 

                                     2009/07/29 08:20:01
                                     User: PDDAVI - ARY

-----

0. User Settings
1. System Backup Profiles
2. System Restore and Offload
3. Object Recovery Profiles
4. Disaster Recovery Profiles
5. DB2 subsystem Analysis and Configuration
X. Exit
```


Recovery Expert – System Backup Profiles

Maintain Backup Profiles

```

RCVYXPRT V2R2 ----- Update Backup Profile ----- 2009/07/29 09:00:40
Option ==> _____ Scroll ==> CSR
-----
Commands: ? - show all commands
Line Commands: I - Insert D - Delete X - Exclude U - Undo from exclude
-----
Creator: PDDAVI      Name: I9A2 FULL BACKUP      SSID: I9A2
Share Option: U    (Upd,View,No)      Description: DATA AND LOGS
-----
Backup Options
-----
Backup Method      ==> D (B/S/F/D/L)      Current Generation==> 02
Backup Scope       ==> F (Full/Data)      Setup Needed       ==> N
Backup Generations==> 02 (01 - 99)  Issue Log Suspend ==> N (Yes/No)
Offload Options    ==> Y (Yes/No/Update)  Validate DB2 Vols ==> Y (Yes/No)
                                           Enable Obj Restore==> Y (Yes/No)
-----
Volume Mappings ----- Row 1 of 12
-----
Cmd  Source  Dev  Src  Target  Message Area
    Volumes Type Unit Volumes
  █  DBTD01 3390-1 A730 DXTD01
    DBTD02 3390-1 A731 DXTD02
    DBTD03 3390-3 A836 DXTD03
    DBTL01 3390-1 A72D DXTD04
    DBTL02 3390-1 A72E DXTD05
    DBTL03 3390-1 A72F DXTD06
    DBTL01 3390-1 A72D DXTL01
    DBTL02 3390-1 A72E DXTL04
    DBTL03 3390-1 A72F DXTL02
    DBTL04 3390-1 A72E DXTL05
    DBTL05 3390-1 A72F DXTL03
    DBTL06 3390-1 A72F DXTL06
    
```

Recovery Expert – Object Level Recovery

Object Recovery Profile – Recovery Options

```

RCVYXPRT  V2R2  ----- Object Recovery Options ----- 2009/07/29  09:15:56
Option    ==> █
-----
Creator: PDDAVI      Name: DEMO DATABASE      SSID: I9A2
Share Option: U (Upd,View,No)  Description:
-----
Enter the Recovery options to associate with this Object profile:

Recovery Point      ==> 1 ( 1 To Current, 2 RBA/LRSN, 3 Last Copy,
                    4 Last Incr, 5 Last Full, 6 Last Quiesce)
RBA/LRSN            ==>
Recovery Resources  ==> A (All/Slb/Image copies)
Site                ==> Z (Zparm/Local site/Recovery site)
From Offload        ==> N (Yes/No)
Reuse (IBM recover) ==> Y (Yes/No)
Utility ID          ==>
Parallel Tasks      ==> 04 (01 - 99)
Number of Tape Units ==> 02 (01 - 99)
Edit Rebuild IX Options ==> N (Yes/No)
Online Rebuild Index ==> N (Yes/No)
  Edit Online Rbld opts ==> N (Yes/No)

```

Recovery Expert – Image Copy Profiles for Image Copy Processing

```

RCVYXPRT V2R2 ----- Objects Profile Display ----- 2009/07/29 09:22:13
Option ==> _____ Scroll ==> CSR

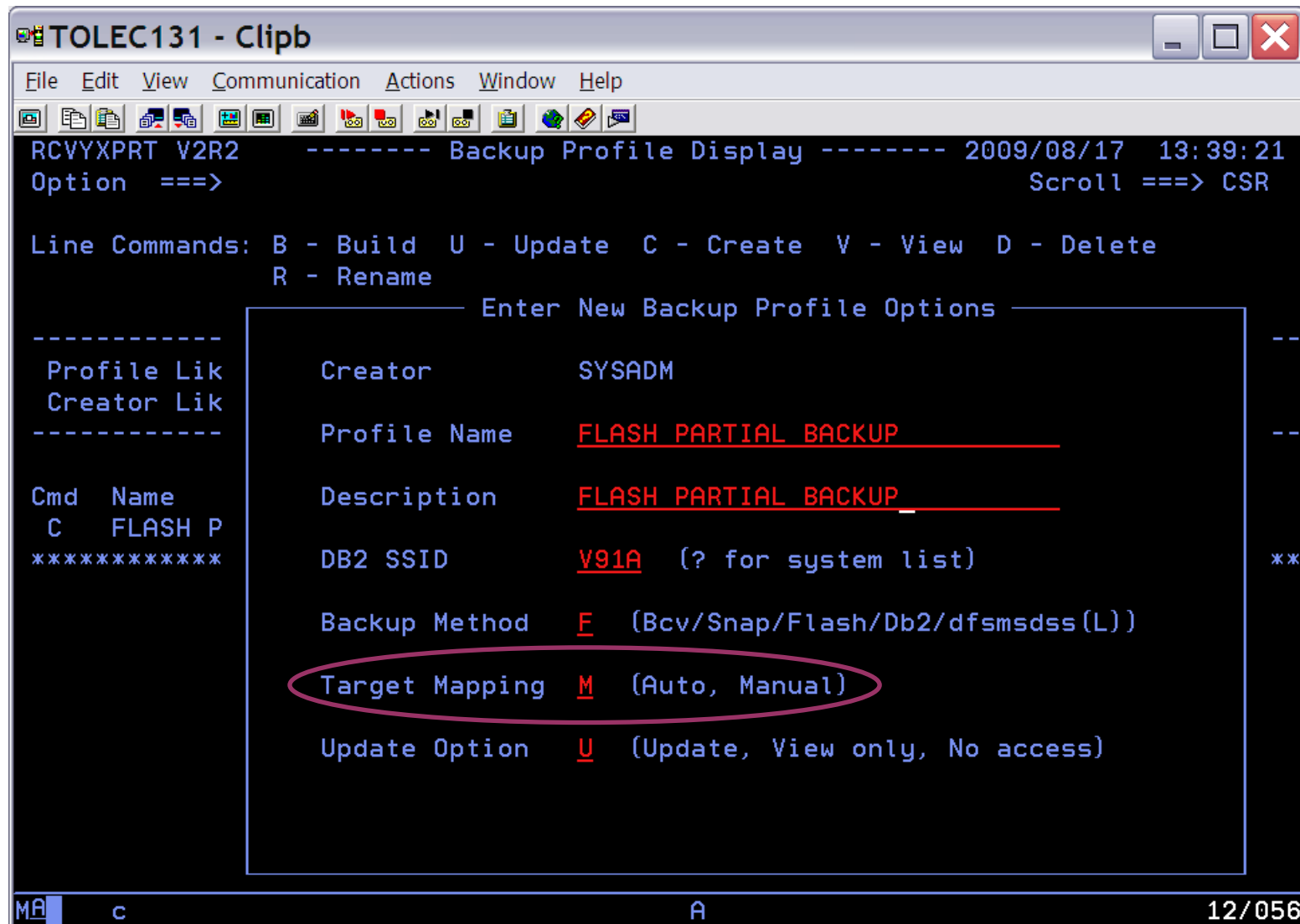
Line Commands: D - Delete U - Update B - Build
                C - Create R - Rename V - View

-----
Profile Like * _____ SSID Like * _____
Creator Like * _____ Row 1 of 21 >
-----

Cmd  Name                Creator  SSID  Updt
  1  AIB                   PDDAVI  I9A2  U
  2  ARY                   PDDAVI  I81B  U
  3  ARY RECOVER          PDDAVI  I81E  U
  4  ASDFFFF              PDDAVI  I9A2  U
  5  BARRY                PDDAVI  I9A2  U
  6  BOOT                 PDDAVI  I81B  U
  7  CLASS PROFILE        CSTHUB  I81A  U
  8  DEMO DATABASE        PDDAVI  I9A2  U
  9  DEMOXX               PDDAVI  I81A  U
 10  DMIBSAMP             DMIB01  I9A2  U
 11  IBMDB151.DAYS       CSTHUB  I81A  U
 12  IBMXXXX              PDDAVI  I81B  U
 13  I81A DEMO TS        PDDAVI  I81A  U
 14  LOTS OF STUFF       PDDAVI  I81A  U
 15  NEW ONE              PDDAVI  I81A  U
 16  OBJECTS              PDDAVI  I81E  U
 17  ORDERING SYSTEM     PDDUDE  I81E  U
 18  SHOWTHIS            PDDAVI  I81B  U
 19  SYSTOOLS OBJECT     PDDUDE  I81B  U
 20  TEST                 PDDUDE  I81E  U
 21  TOM'S PROFILE       CSTHUB  I81B  U

```

DB2 Recovery Expert Partial Backups



```
TOLEC131 - Clipb
File Edit View Communication Actions Window Help
RCVYXPRT V2R2 ----- Backup Profile Display ----- 2009/08/17 13:39:21
Option ==> Scroll ==> CSR

Line Commands: B - Build U - Update C - Create V - View D - Delete
                R - Rename

-----
Profile Lik      Creator      SYSADM
Creator Lik
-----

Cmd  Name
C   FLASH P
*****

-----
Enter New Backup Profile Options
-----

Creator      SYSADM
Profile Name  FLASH PARTIAL BACKUP
Description   FLASH PARTIAL BACKUP
DB2 SSID     V01A  (? for system list)
Backup Method E  (Bcv/Snap/Flash/Db2/dfsmsdss(L))
Target Mapping M (Auto, Manual)
Update Option U  (Update, View only, No access)
```

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Recovery Expert

- DASD consideration

- “I like Recovery Expert, but I don’t have all that DASD”

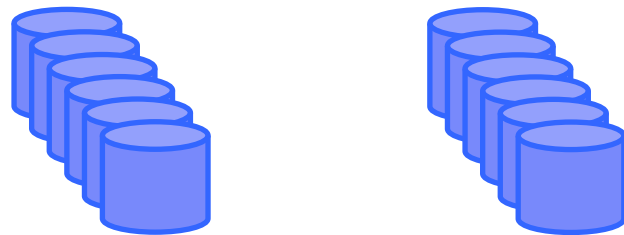
- - A concern or not?



How Does System Level Backup Save Disk Space? DASD Is A One Time Cost

System Level Backups

Production System Level Backup



DASD is a one time cost!

System Level Backups use less DASD than traditional Image Copies

Savings:

Offset some DASD cost and save significant CPU and I/O by eliminating the need for most image copies (IC).

Image Copies

Production



Image Copy costs are ongoing!

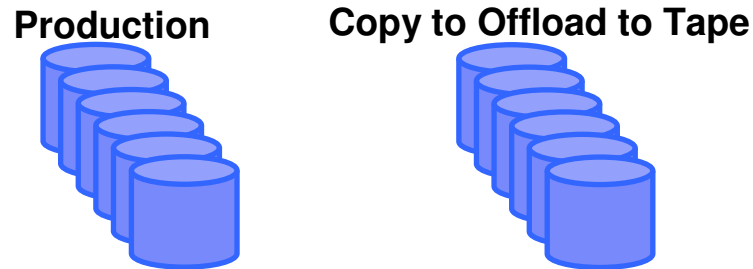
Savings:

Site with 1264 MSU's and 2868 GB of DB2 can save over 3 million dollars a year in CPU and I/O just by replacing 75% of image copies with a SLB

**Expense without replacement:
\$15 million spent in 5 years!**

How Does System Level Backup Save Disk Space? DASD May Already Exist

**Already using Volume Copies
and/or Offloading to Tape for DR?**



DASD already exists!

Savings:

The DASD currently being used can be used for BOTH local recovery and creating backups for DR which will reduce DASD costs.

Also save CPU, I/O, and DASD cost by eliminating the need for most IC's. Also reduce your DR RTO.

Image Copies

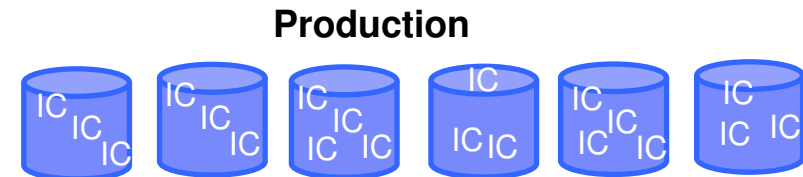


Image Copy costs are ongoing!

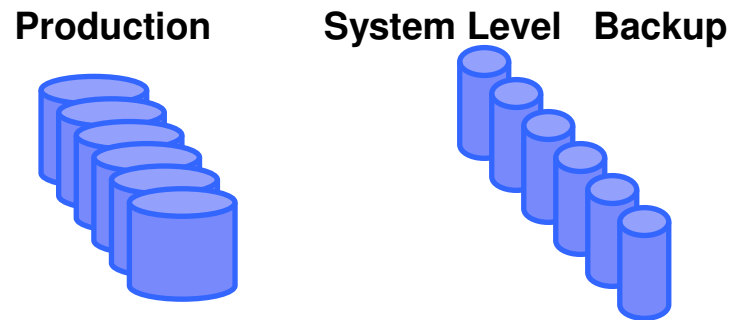
Savings:

Site with 1264 MSU's and 2868 GB of DB2 can save over 3 million dollars a year in CPU and I/O just by replacing 75% of image copies with a SLB

**Expense without replacement:
\$15 million spent in 5 years!**

How Does System Level Backup Save Disk Space? Use Virtual Devices

System Level Backups



Full DASD is not used!

Savings:

Only the data that is changed will be copied to the target reducing the DASD needed for targets which reduces DASD costs.

Offset some DASD cost and save CPU and I/O by eliminating the need for most image copies.

Image Copies

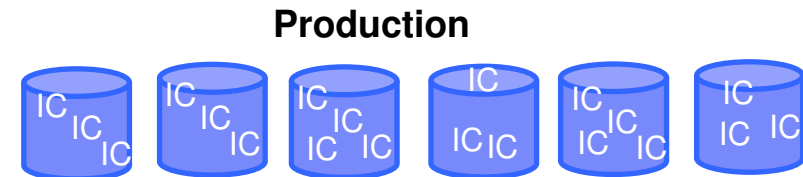


Image Copy costs are ongoing!

Savings:

Site with 1264 MSU's and 2868 GB of DB2 can save over 3 million dollars a year in CPU and I/O just by replacing 75% of image copies with a SLB

**Expense without replacement:
\$15 million spent in 5 years!**

All Savings

- The majority of image copies can be replaced with system level backups (SLB)
 - ▶ This savings can be achieved by eliminating the need for most image copies to save significant CPU and I/O costs, and to offset DASD costs.
- No downtime to back up DB2
 - ▶ Data can be backed up instantaneously to a dependent-write consistent copy of production without sacrificing availability. This saves downtime costs.
- A reduction in batch backup windows
 - ▶ This savings is achieved by replacing “image copy downtime windows” with a system-level backup that takes only seconds to create. No DB2 downtime is required. Application backup windows are significantly reduced.
- The cost of not having a backup
 - ▶ This situation can occur when an image copy job was not created or was created but not scheduled. This can result in downtime and data loss cost savings.
- A reduction in recovery time
 - ▶ The product’s use of fast replication and parallel LOG APPLY processes can reduce recovery time to seconds as opposed to minutes or hours. This downtime can be translated into real dollars of lost business.
- Provides a streamlined disaster recovery process
 - ▶ Disaster recovery becomes as simple as restarting from a power failure. This process reduces recovery time objectives (RTO) and application down time in the event of a disaster. It simplifies the disaster recovery process and saves

Summary



Summary

- Many tools/options
 - ▶ Recovery Expert is the most strategic from the IBM offering
- Consider a backup strategy using system-level backup
- Benefit of Recovery Expert for system-level backup
 - ▶ Simplifies and automates a DB2 SLB methodology
 - Leverages storage-based fast-replication
 - Fast, non-intrusive, and reduces CPU, I/O and storage utilization
 - ▶ DB2 SLBs can be used for DB2 system, application, or table and index space recovery
 - Parallel recovery reduces system and database recovery time
 - ▶ DB2 image copies can be created from a SLB
 - Simplifies DB2 backup and recovery strategies
 - ▶ DB2 SLBs simplify disaster recovery procedures
 - Transforms DB2 DR procedures into a disaster restart process
 - ▶ Less skills required to implement advanced DB2 backup, recover, and disaster recovery solutions