IBM Software Group

DB2 Information Management Technical Conference:

F06 Data Recovery Now and Future Using IBM's Recovery Tools

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DB2 Information Management Software

e business on demand software

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Abstract

Business availability is more than just having a reliable hardware and database platform. It also includes the requirement to quicky diagnose and fix both physical and (especially) logical errors. This presentation will review all types of data recovery; IBM's current recovery offerings; IBM's recovery tooling philosophy, including autonomic functions; and point to high priority requirements that we are working on in the laboratory today.

Agenda

- Executive Summary
- Types of Recovery (and some terminology)
- IBM Recovery Management Products Today
- Recovery Components
- Future

Executive Summary

- Target/scope for IBM's DB2 and IMS Tools Recovery Solution
  - "Logical" recovery scenarios (as opposed to HW failures)
  - Fine grained - minimum recovery scope for the application
  - Autonomic capabilities
- Strategy / Value Proposition
  - Increased application availability and reliability
  - Reduced TCO including skills
  - Support for skill levels from novice to expert
    - Increasing autonomic behavior release by release
  - Side effect feature
    - Comprehensive data activity and security auditing

Executive Summary

- Fundamental Components
  - Log Analysis
  - Object Restore / Selective Application Versioning
  - DBMS Recovery Utilities and Change Accumulation
  - Autonomic
  - Disaster Recovery / Business Continuity
  - Fast Backups (Hardware exploitation)
- Autonomic Capabilities
  - Perform expert analysis
    - Wizard driven
    - Manage recovery via policies: Recovery Policy – Insure that I can recover an application (set of DBMS objects) within twenty minutes to any point in time in the last week

Types of Recovery

	Application	DBMS System-level		Subcritical HW Failure
	Local	Local	Remote	Local
Point in Time (PIT)	√ or IMS Batch backout	√		
Current			√	√

Disaster Recovery

- Application Recovery
  - Caused by application logic error
  - Always recover to point in time (PIT)
- DBMS System-level Recovery
  - Caused by application logic, middleware/operating system, or hardware error
  - Includes DBMS Catalog/DBRC, Logs (active and archive), and User Data
    - DB2 for z/OS only: Other Files/Databases (BSDS, Directory, ZPARM, DECP, etc.)
    - IMS only: RECON dataset, etc.
    - DB2 for LUW only: Control Files (LFH, RHF, SYSBOOT, etc.)
- Recovery from sub-critical hardware failures
  - Failure of less than a critical threshold of resources
  - Always recover to current

Terminology:

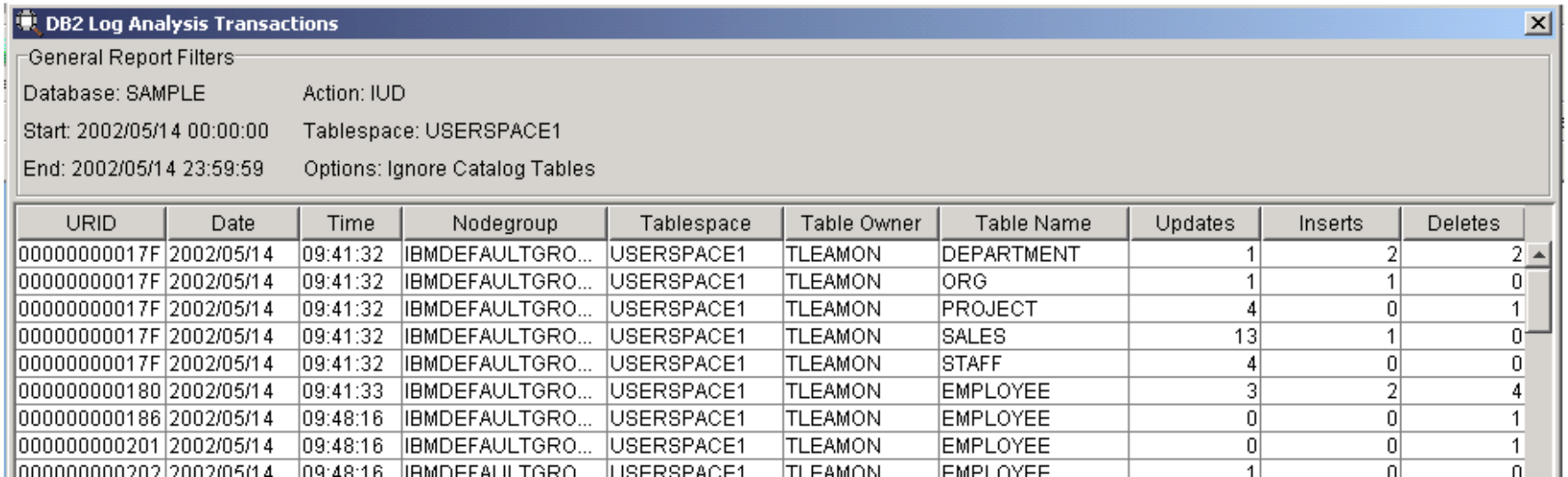
- Remote (or Recovery) Site = A separate hw system (distance 0=> ∞) needed upon site failure (proc or many disks)
- DBMS Disaster Recovery = DBMS System-level Recovery to current @ Remote Site
- Full System Disaster Recovery = DBMS Disaster Recovery + OS, Middleware, Application Code Recovery

IBM Recovery Management Products Today

- DB2 for Linux, UNIX, and Windows
  - DB2 Recovery Expert for Multiplatforms
- DB2 for z/OS
  - DB2 Log Analysis Tool for z/OS
  - DB2 Object Restore Tool for z/OS
  - DB2 Archive Log Accelerator for z/OS
  - DB2 Change Accumulation for z/OS
  - DB2 Recover Utility (part of the DB2 Utilities Suite for z/OS)
  - Application Recovery Tool for IMS and DB2 Databases
- IMS
  - IMS Data Entry DB Fast Recovery for z/OS
  - IMS Image Copy Extensions for z/OS
  - IMS High Performance Change Accumulation Utility for z/OS
  - Application Recovery Tool for IMS and DB2 Databases
  - IMS Database Recovery Facility for z/OS

Recovery Components: Log Analysis

- Ability to
  - View user data changes (with filters at many levels) from the log for auditing or for recovery analysis purposes
    - What happened to my tables last night?
    - What tables were updated by plan XYZ yesterday?
    - What INSERTs were performed on table ABC this morning?
    - Had batch job APPLY updated any tables at the point it ABENDed?



DB2 Log Analysis Transactions

General Report Filters

Database: SAMPLE Action: IUD

Start: 2002/05/14 00:00:00 Tablespace: USERSPACE1

End: 2002/05/14 23:59:59 Options: Ignore Catalog Tables

URID	Date	Time	Nodegroup	Tablespace	Table Owner	Table Name	Updates	Inserts	Deletes
00000000017F	2002/05/14	09:41:32	IBMDEFAULTGRO...	USERSPACE1	TLEAMON	DEPARTMENT	1	2	2
00000000017F	2002/05/14	09:41:32	IBMDEFAULTGRO...	USERSPACE1	TLEAMON	ORG	1	1	0
00000000017F	2002/05/14	09:41:32	IBMDEFAULTGRO...	USERSPACE1	TLEAMON	PROJECT	4	0	1
00000000017F	2002/05/14	09:41:32	IBMDEFAULTGRO...	USERSPACE1	TLEAMON	SALES	13	1	0
00000000017F	2002/05/14	09:41:32	IBMDEFAULTGRO...	USERSPACE1	TLEAMON	STAFF	4	0	0
000000000180	2002/05/14	09:41:33	IBMDEFAULTGRO...	USERSPACE1	TLEAMON	EMPLOYEE	3	2	4
000000000186	2002/05/14	09:48:16	IBMDEFAULTGRO...	USERSPACE1	TLEAMON	EMPLOYEE	0	0	1
000000000201	2002/05/14	09:48:16	IBMDEFAULTGRO...	USERSPACE1	TLEAMON	EMPLOYEE	0	0	1
000000000202	2002/05/14	09:48:16	IBMDEFAULTGRO...	USERSPACE1	TLEAMON	EMPLOYEE	1	0	0

Recovery Components: Log Analysis

- Diagnosis of activity
- Report activity by objects and users

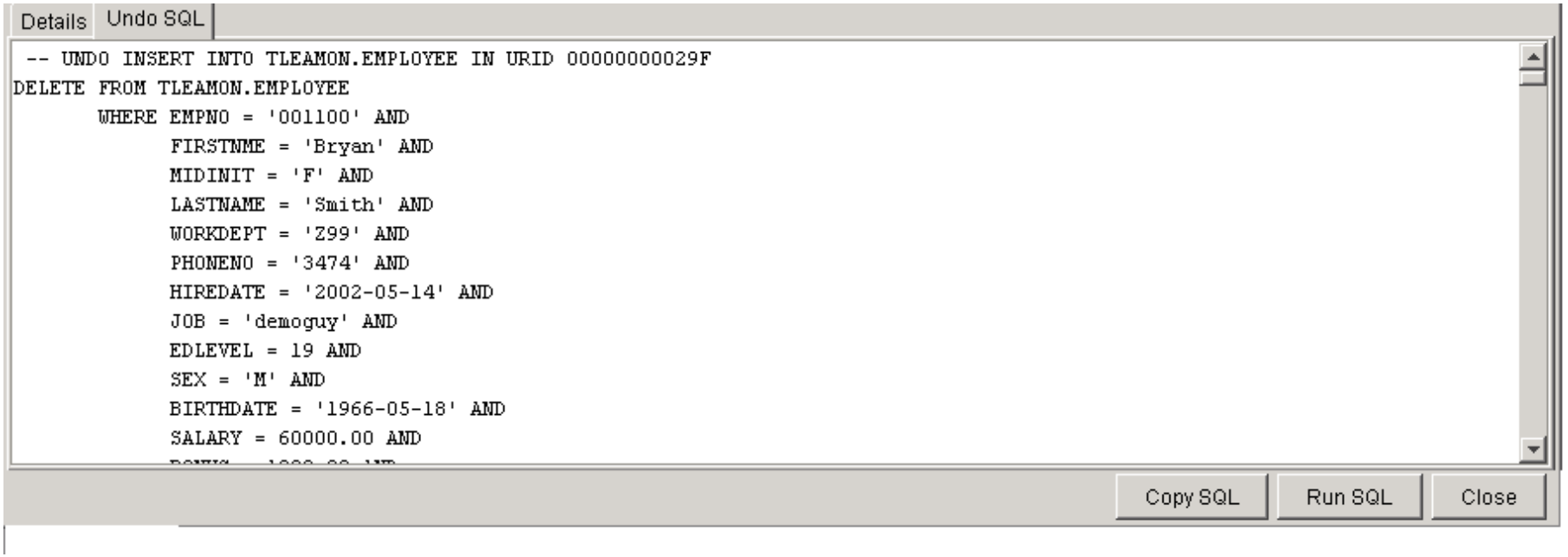
Details | Undo SQL

ACTION	ROW STATUS	EMPNO	FIRSTNME	LASTNAME	WORKDEPT	PHONENO	JOB	SALARY	BONUS	COMM	SE
INSERT	POST-CHAN...	001100	Bryan	Smith	Z99	3474	demoguy	60000.00	1000.00	0.0	M
	PRE-CHANGE	-	-	-	-	-	-	-	-	-	-
INSERT	POST-CHAN...	001200	Dan	Wardman	Z99	4574	toolman	1500000.00	100000.00	0.0	M
	PRE-CHANGE	-	-	-	-	-	-	-	-	-	-
UPDATE	POST-CHAN...	000010	CHRISTINE	HAAS	A01	3978	PRES	52750.00	1000.00	4220.00	F
	PRE-CHANGE	000010	CHRISTINE	HAAS	A00	3978	PRES	52750.00	1000.00	4220.00	F
UPDATE	POST-CHAN...	000110	VINCENZO	LUCCHESSI	A01	3490	SALESREP	46500.00	900.00	3720.00	M
	PRE-CHANGE	000110	VINCENZO	LUCCHESSI	A00	3490	SALESREP	46500.00	900.00	3720.00	M
UPDATE	POST-CHAN...	000120	SEAN	O'CONNELL	A01	2167	CLERK	29250.00	600.00	2340.00	M
	PRE-CHANGE	000120	SEAN	O'CONNELL	A00	2167	CLERK	29250.00	600.00	2340.00	M
DELETE	POST-CHAN...	-	-	-	-	-	-	-	-	-	-
	PRE-CHANGE	000100	THEODORE	SPENSER	E21	0972	MANAGER	26150.00	500.00	2092.00	M
DELETE	POST-CHAN...	-	-	-	-	-	-	-	-	-	-

Does NOT require DATA CAPTURE for any tables*

Recovery Components: Log Analysis

- Generate undo or redo operations from selected log records

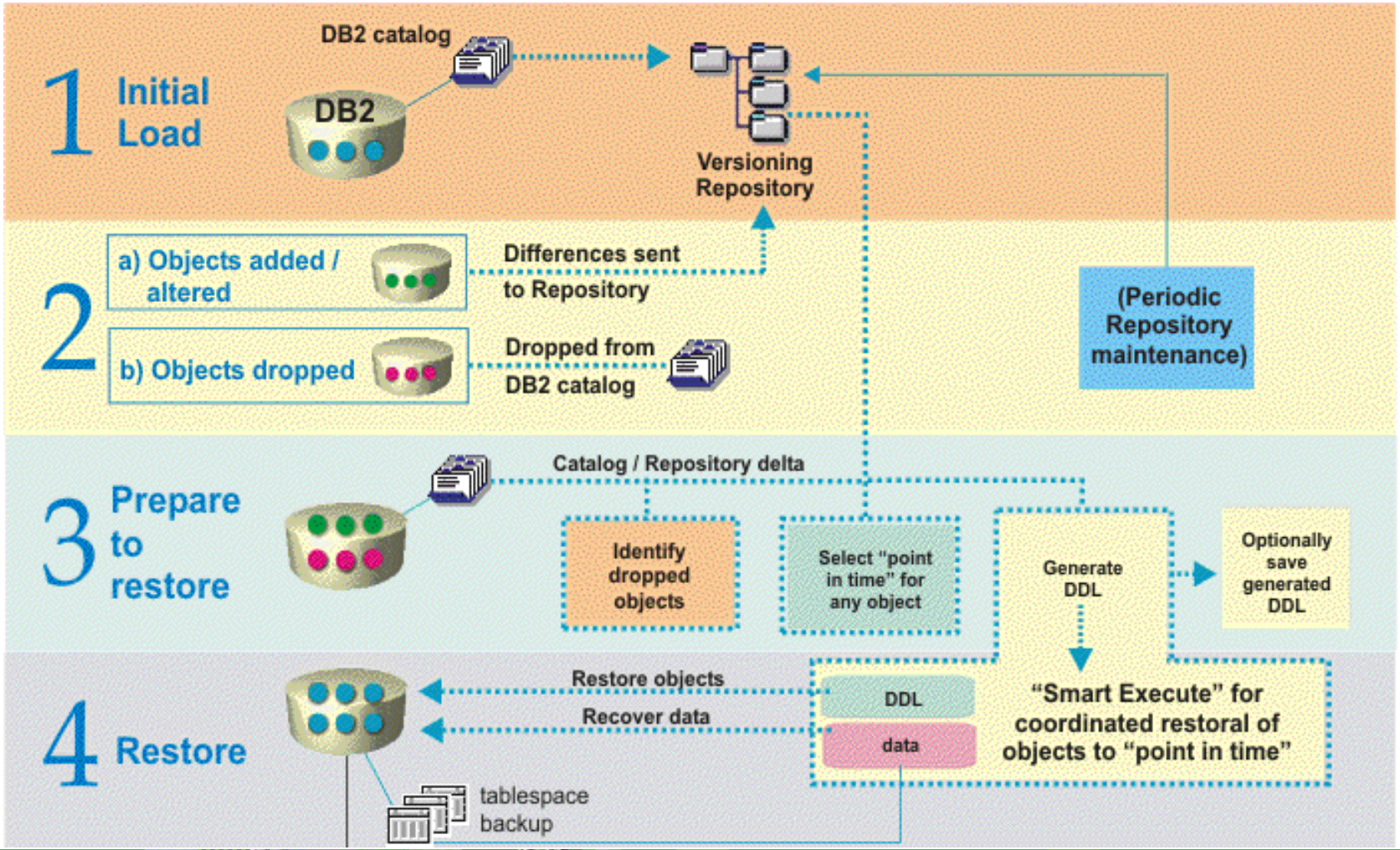


Detect quiet times (coming soon)

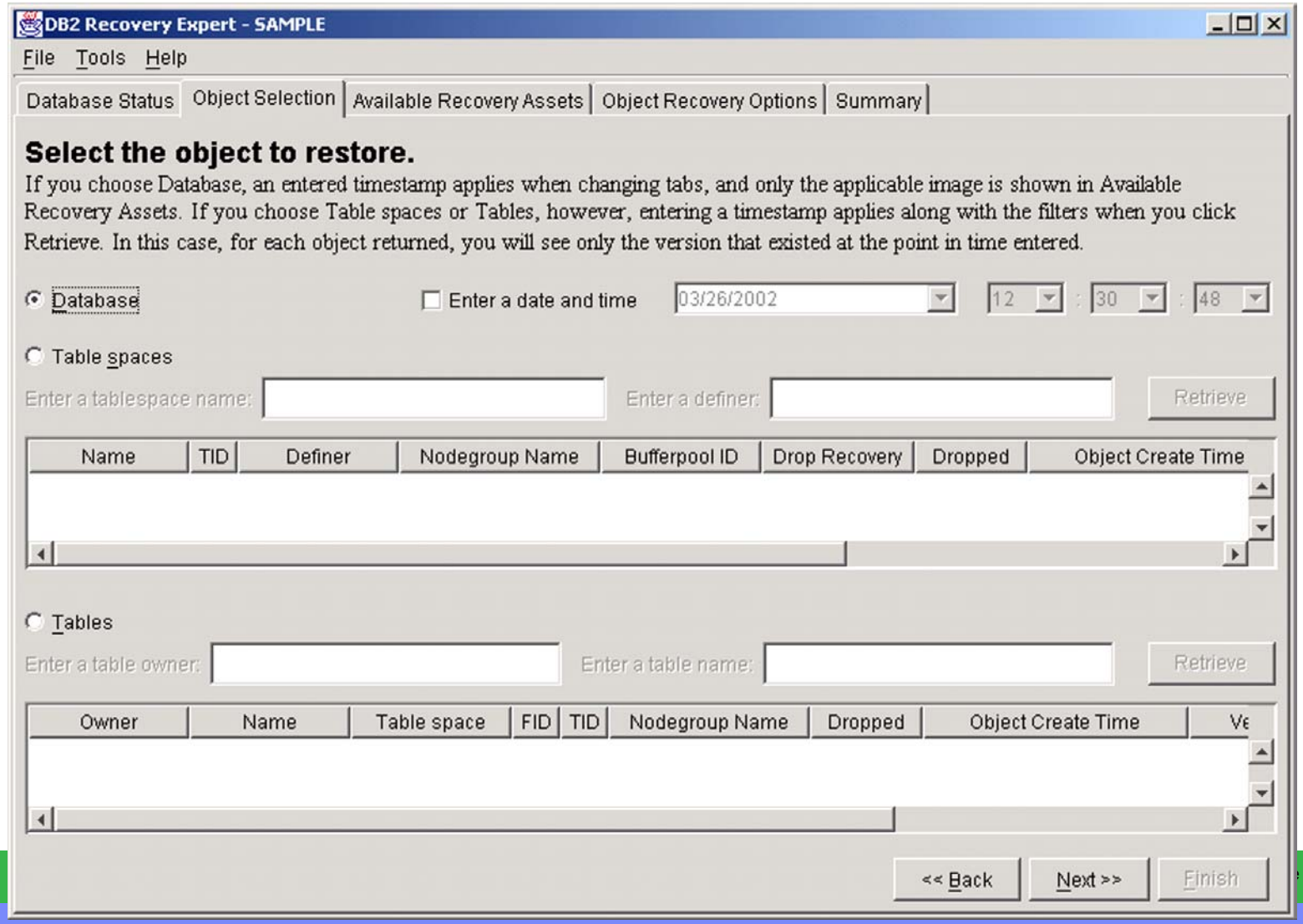
Recovery Components: Object Restore

- Ability to
  - Recover to a prior definition of an object set (including undrop)
  - Include all dependent objects and data
  - Optionally, just generate DDL
- Implemented by
  - A Version Repository
  - Component to update the version repository with changes

Recovery Components: Object Restore



Recovery Components: Object Restore



Recovery Components: DBMS Recovery Utilities and Change Accumulation

- DBMS Recovery Utilities
  - Ability to
    - Restore from a backup/image copy
      - Taken by DB2
      - Taken outside of DB2
    - Apply log records to an objects to a PIT
    - Manage backups
- Change Accumulation
  - Ability to
    - Create specialized recovery assets (image copies or minilogs) for present or past without disrupting your applications
    - Reduce the management of many image copy datasets by creating minilogs containing changes for multiple objects

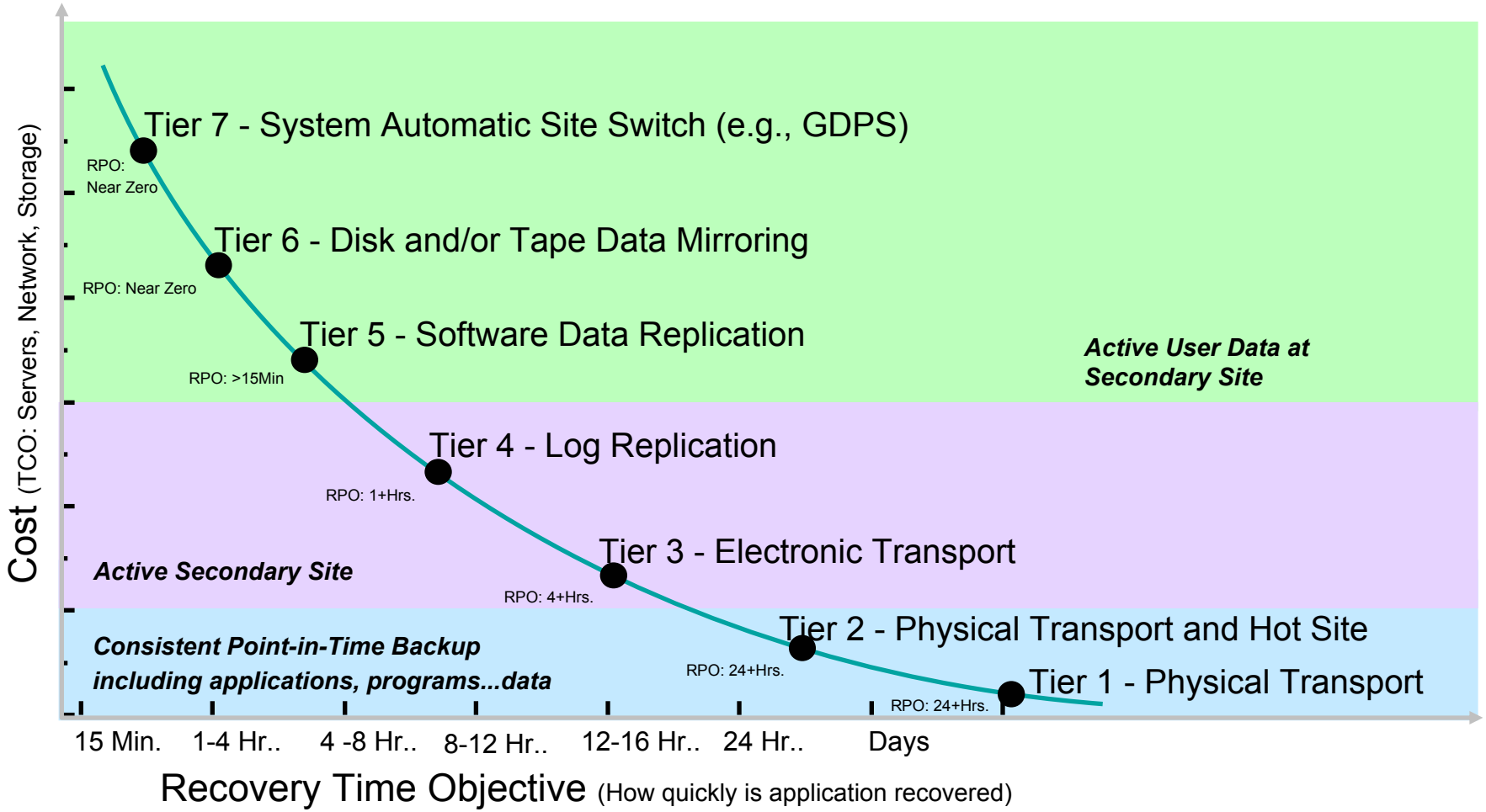
Recovery Components: Autonomic Components

- Ability to
  - Perform expert analysis
    - Wizard driven
      1. Object selection (Database, Table space, Table,…… Multiple objects supported)
      2. Point in time selection (Time, Quiesce point, Backup point, Log point)
      3. Recovery Paths / alternate recovery resources
      4. Options
      5. Summary
    - Analyzes all possible recovery paths for a version and attaches a relative cost to each
    - Recommends the least cost recovery path while allowing other paths to be chosen
    - Recovery paths include
      - Traditional restore and log apply (forward recovery)
      - Generating undo operations (backward recovery)
  - Recommend set of objects to recover (DB2 Grouper)
    - Prompts the user to show related objects
    - Assists in including these objects in the recovery process
  - Manage recovery via policies: Recovery Policy – Insure that I can recover a set of DBMS objects (application) within twenty minutes to any point in time in the last week. {Supercedes the need for a backup policy} Integrates with eWLM.

Recovery Components: Disaster Recovery

- Ability to
  - Prepare assets to be transported to remote site
    - Inventory and report on the assets (logs, backups, change accum files, etc.)
    - Recommend a frequency of preparation in order to meet DR goals
  - Assist in performing a DBMS System-level Recovery to current at the remote site
    - Initially addresses Tiers 1, 2, and 3 only (next slide)
    - Provides means to prioritize order of object recovery
- Assumptions
  - Always recover to as close to current as possible
  - Always remote site (site could be inches or thousands of miles away)
  - Always DBMS System-level Recovery
  - Variable is Recovery Time Objective (RTO): how fast
  - Input is Recovery Point Objective (RPO): how much data could be lost (next slide)
  - Recovery assets are transported to remote site as defined by Tiers 1, 2, and 3 (next slide)
  - Applications must be data consistent
  - Supporting data and metadata (programs, authorizations....) must be included

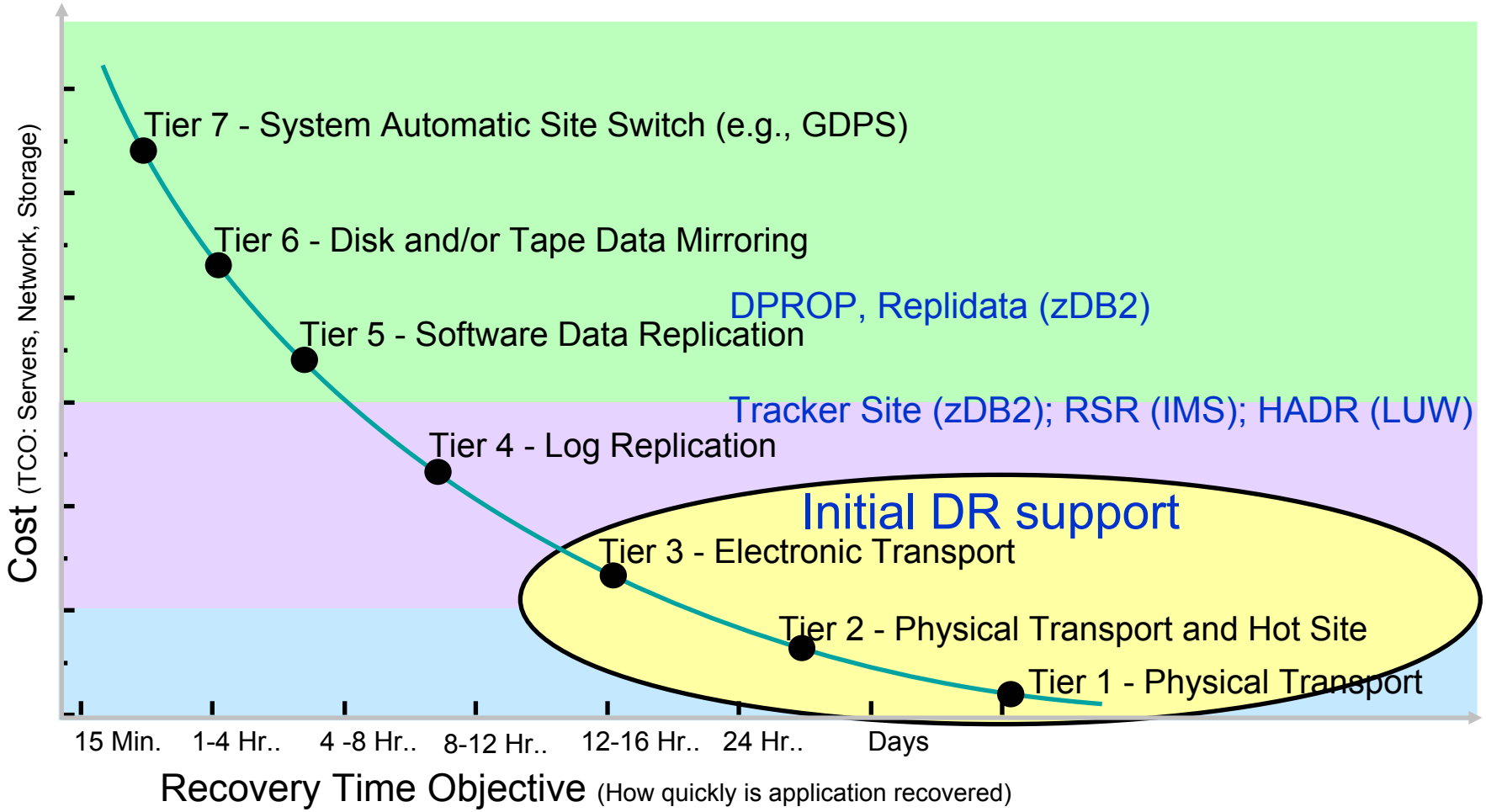
Recovery Components: Disaster Recovery
Recovery Point Objectives (Amount of lost data)



Ref: http://www.eservercomputing.com/mainframe/articles/index.asp?id=781

Tiers developed by SHARE Technical Steering Committee circa late 1980s

Recovery Components: Disaster Recovery
Recovery Point Objectives (Amount of lost data)



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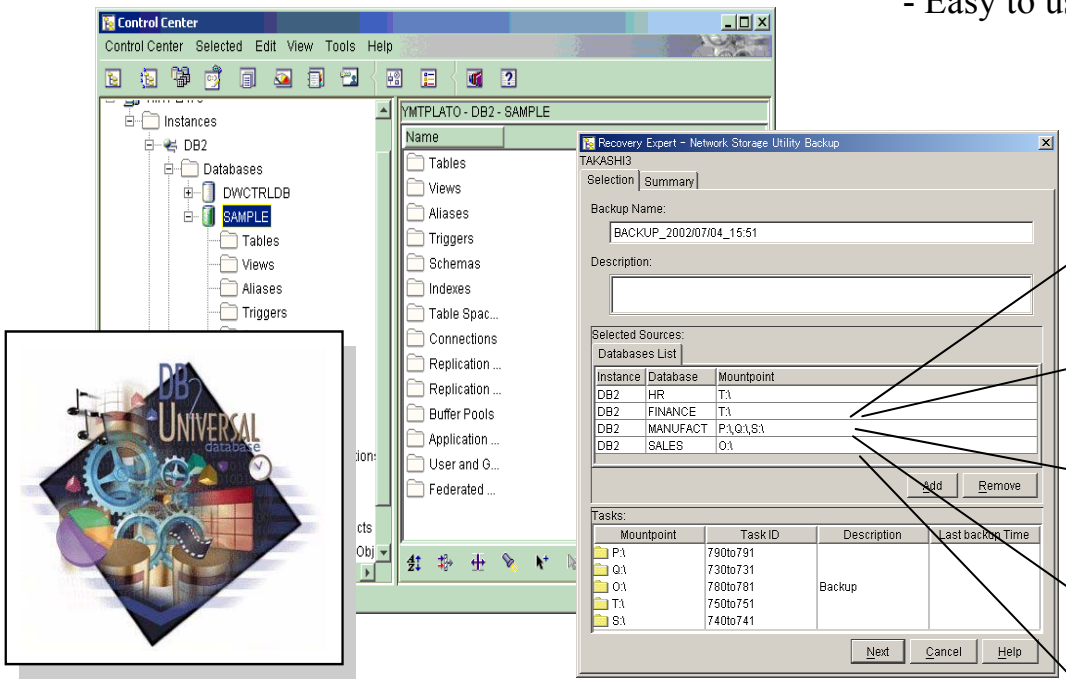
Tiers developed by SHARE Technical Steering Committee circa late 1980s

Fast Backup

- Fast Backup of database & table space
  depending on HW device / OS support
- Supports several storage devices
- Unified GUI and callable API
- Easy to use



IBM (SAN)

EMC (SAN)

NetApp Filer (NAS)

Hitachi (SAN)

NEC (SAN)

Future

A## Session this week

- z/OS
  - DB2 Version 8
    - BACKUP/RESTORE SYSTEM with ESS FlashCopy Z34
    - Parallel RECOVER Z06
  - Recovery Expert (DB2, IMS)
- Multiplatforms
  - New releases of Recovery Expert D41
    - Fast Backup
    - DB2 Grouper
      - A component that discovers and maintains relationships between tables
      - Used by IBM's DB2 tools to recommend inclusion of objects

Recovery Expert Products

DB2 Recovery Expert for Multiplatforms

DB2 Recovery Expert for z/OS

IMS Recovery Expert

- Expert Analysis
  - Analyzes and recommends best recovery process
    - Log Analysis
    - Explores all assets (Minilogs / Change Accum Files)
  - via Wizard (subsumes PIT Assist)
  - Forward and backward recovery
  - Can back out selective changes
- Object Restore
- Disaster Recovery
- Application scope recovery of objects (DB2 Grouper or IMS Groups)
- Recovery Policy - Take backups as needed to deliver recovery goal

Summary

- There are different types of recovery and different approaches to each
- Recovery tools deliver an important component of autonomic computing
- Common terminology and user interfaces simplify recovery processes
- Advances in hardware technology provide new approaches to business continuity

- Gracias!

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