



# Agenda

## ➤ Database Management Professionals: Improve Your Life Through...

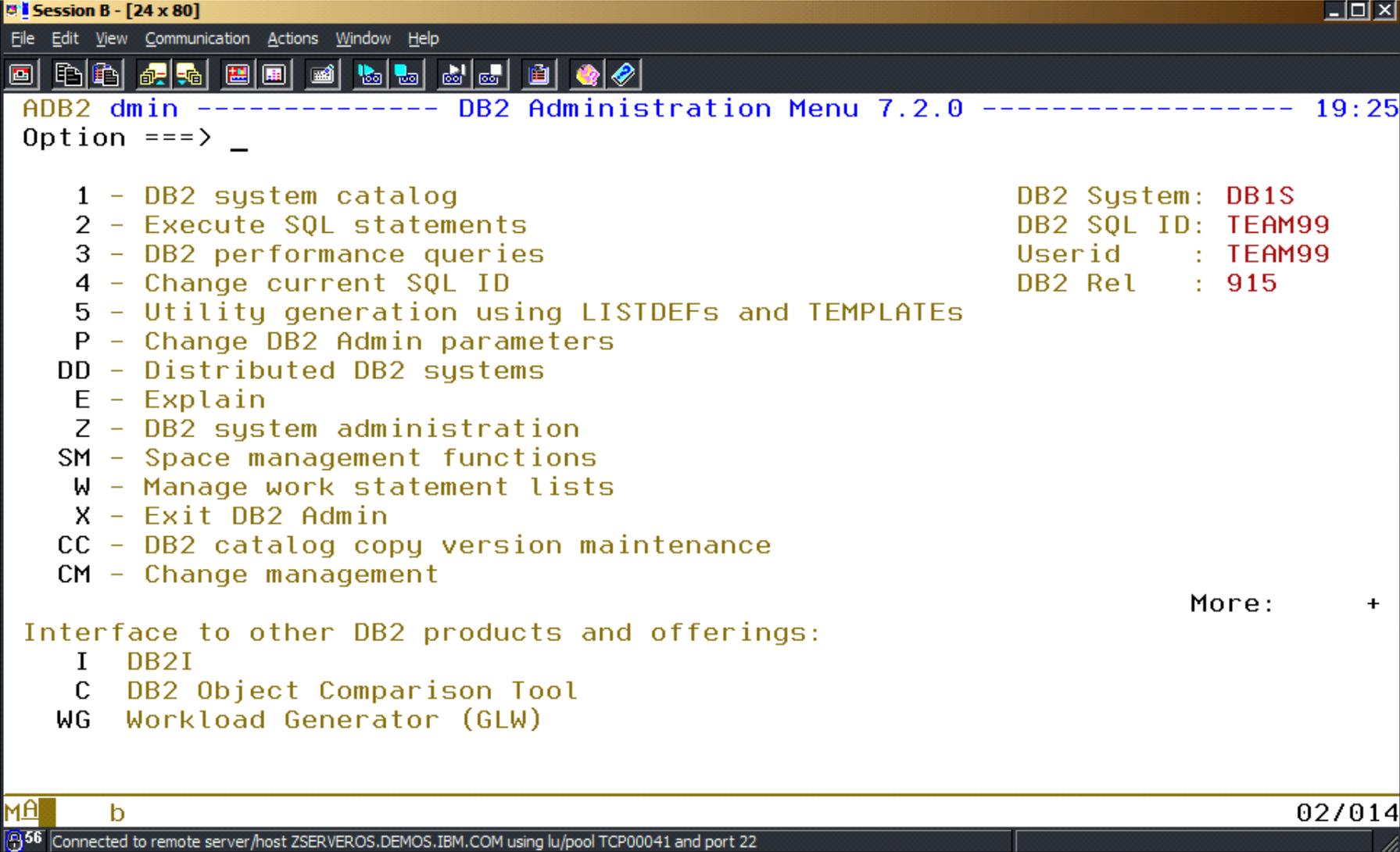
- Managing Native Stored Procedures with DB2 Administration Tool
- Benefiting from the Proactive Alerts in DB2 Query Monitor
- Leveraging Your Storage System and Managing Storage Requirements

# Managing Native Stored Procedures with DB2 Administration Tool

## DB2 9 Native SQL Procedures

- Native SQL Procedures are new to DB2 9 for z/OS
  - Native SQL Procedures are zIIP-eligible when invoked via DDF
  - Imbed application logic in SQL Procedure Language
  - Minimize network traffic
  - Build with Optim Development Studio or IBM Data Studio
- 
- Are you prepared to manage Native SQL Procedures?

## DB2 Administration Tool



```
Session B - [24 x 80]
File Edit View Communication Actions Window Help
ADB2 dmin ----- DB2 Administration Menu 7.2.0 ----- 19:25
Option ==> _

  1 - DB2 system catalog                DB2 System:  DB1S
  2 - Execute SQL statements            DB2 SQL ID:  TEAM99
  3 - DB2 performance queries          Userid       :  TEAM99
  4 - Change current SQL ID            DB2 Rel      :  915
  5 - Utility generation using LISTDEFs and TEMPLATES
  P - Change DB2 Admin parameters
  DD - Distributed DB2 systems
  E - Explain
  Z - DB2 system administration
  SM - Space management functions
  W - Manage work statement lists
  X - Exit DB2 Admin
  CC - DB2 catalog copy version maintenance
  CM - Change management

                                     More:      +

Interface to other DB2 products and offerings:
  I  DB2I
  C  DB2 Object Comparison Tool
  WG Workload Generator (GLW)

Mâ  b                                     02/014
56 Connected to remote server/host ZSERVEROS.DEMOS.IBM.COM using lu/pool TCP00041 and port 22
```

# Easily Navigate to Stored Procedures

```
Session B - [24 x 80]
File Edit View Communication Actions Window Help
ADB21 min ----- DB1S System Catalog ----- 15:30
Option ==>

Object options:
  AO - Authorization options
  G - Storage groups
  D - Databases
  S - Table spaces
  T - Tables, views, and aliases
  V - Views
  A - Aliases
  Y - Synonyms
  X - Indexes
  C - Columns
  N - Constraints
  DS - Database structures

  P - Plans
  L - Collections
  K - Packages
  M - DBRMs
  H - Schemas
  E - User defined data types
  F - Functions
  O - Stored procedures
  J - Triggers
  Q - Sequences
  DSP - DS with plans and packages

More: +
DB2 System: DB1S
DB2 SQL ID: DBA104

Enter standard selection criteria (Using a LIKE operator, criteria not saved):
Name ==> TB_TEACHER_ACCOUNT > Grantor ==> >
Owner ==> TEAM76 > Grantee ==> >
In D/L/H ==> > Switch Catalog Copy ==> N (N/S/C)
And/or other selection criteria (option xC shows you columns for option x)
Column ==> > Operator ==> Value ==>
```

# Manage Stored Procedures

```

Session B - [24 x 80]
File Edit View Communication Actions Window Help
ADB210 in ----- DB1S Stored Procedures ----- Row 78 from 219
Command ==> Scroll ==> PAGE

Commands: GRANT
Line commands:
AH - Schema Auth  A - Auth  DROP - Drop  AL - Alter  K - Package  PA - Parms
DIS - Display  STO - Stop  STA - Start  GR - Grant  COM - Comment
? - Show all line commands

Sel  Schema  Name  Version  A Lang Parms  Res  S  Q  S  P  C  External
      T*      *      *      * *      *      * * * * * * *
-----
TEAM76  READ_EMP  V2      Y SQL      2      0 N R N      N
TEAM90  READ_EMP  V1      Y SQL      2      0 N R N      N
TEAM77  ACCOUNTLIST  V1      Y SQL      3      0 N M N      N
TEAM77  ASSIGN    V1      Y SQL      3      0 N M N      N
TEAM77  SHOWFULLACCOUNTS  V1      Y SQL      0      0 N M N      N
TEAM77  EXERCISE9  VERSION2 Y SQL      4      0 N M N      N
TEAM81  READ_EMP  V1      Y SQL      2      1 N R N      N
TEAM79  READ_EMP  V2      N SQL      2      0 N R N      N
TEAM92  READ_EMP  V2      Y SQL      2      0 N R N      N
TEAM94  READ_EMP  V2      Y SQL      2      1 N R N      N
TEAM91  READ_EMP  V2      Y SQL      2      1 N R N      N
    
```

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56 Connected to remote server /host ZSERVEROS.DEMOS.IBM.COM using lu/pool TCP00041 and port 22

# Deploy from Development to Production

```

Session B - [24 x 80]
File Edit View Communication Actions Window Help
ADB210 in ----- DB1S Stored Procedures ----- Row 220 from 221
Command ===> Scroll ===> PAGE

Commands: GRANT
Line commands:
AH - Schema Auth  A - Auth  DROP - Drop  AL - Alter  K - Package  PA - Parms
DIS - Display  STO - Stop  STA - Start  GR - Grant  COM - Comment
? - Show all line commands

Sel  Schema  Name  Version  A Lang Parms  Res  Q S P C External
      TEAM99* *      *      * *      *  * * * * * * *
----->-----
GEN  TEAM99  FIND_EMP  D0126201  N SQL      2  0 N R N  N
      _TEAM99  FIND_EMP  D0126V2  Y SQL      2  0 N R N  N
***** END OF DB2 DATA *****
    
```

# Easily Add new Versions for Problem Determination

```

Session B - [24 x 80]
File Edit View Communication Actions Window Help
ADB210 in ----- DB1S Stored Procedures ----- Row 218 from 220
Command ==> Scroll ==> PAGE

Commands: GRANT
Line commands:
AH - Schema Auth  A - Auth  DROP - Drop  AL - Alter  K - Package  PA - Params
DIS - Display  STO - Stop  STA - Start  GR - Grant  COM - Comment
? - Show all line commands

Sel  Schema  Name  Version  A Lang Params  Res  Q S P C External
----->----->----->----->----->----->----->----->----->
T*  *  *  *  * *  *  *  * * * * * *
----->----->----->----->----->----->----->----->----->
TEAM80  READ_EMP  V2  Y SQL  2  1 N R N  N
TEAM79  READ_EMP  V1  Y SQL  2  0 N R N  N
ADDV TEAM99  FIND_EMP  D0126201 Y SQL  2  0 N R N  N
***** END OF DB2 DATA *****
    
```

## Stored Procedure Commands

A	Show authorizations
<b>ACT</b>	<b>Activate version</b>
<b>ADDV</b>	<b>Add version</b>
AH	Show schema authorizations
AL	Alter procedure
<b>BIND</b>	<b>Bind Deploy</b>
BLD	Show build options
COM	Create a comment/remark
CRE	Create procedure
<b>DDL</b>	<b>Generate DDL for the procedure only</b>
DIS	Display procedure status
DROP	Drop procedure
<b>DRPV</b>	<b>Drop version</b>
ENV	Show environment variables
GEN	Generate SQL for procedure from DB2 catalog
GR	Grant procedure privileges
I	Details on procedure
K	Show packages on procedure
PA	Show parameters for procedure
<b>REG</b>	<b>Regenerate version</b>
REM	Create a comment/remark
REP	Generate report from the DB2 catalog
<b>REPV</b>	<b>Replace version</b>
RO	Show owner role
SRC	Show source
STA	Start procedure
STO	Stop procedure

## Proactive Alerts Using DB2 Query Monitor

# Surprising Things You Can Do with DB2 Query Monitor

Something for the DBA, Appl. Programmer & System Programmer

1. Research DB2 Commands
2. Display Host Variables
3. Exploit DB2 Resource Limit Facility
4. Display SQL Communications Area
5. Determine SQL Error Patterns

6. Explore Dynamic SQL Overhead
7. Identify Resource Unavailable - 904 Errors
8. Determine Access Path Changes
9. Identify Logging Increases
10. Display DB2 Subsystem Statistics

# DB2 Query Monitor

**DB2 Query Monitor (CASNDG1NETVNA01:tg5444)**

File Edit View Tools Help

Activity Browser [Trees] [Property Table]

Trees

Perspective: Activity Summaries(Structural)

- TextMetrics
- Pageset
- Object
- TextMetrics
- DSNRLST
- DSQDBCTL
- KAD10R1
  - Buffer Pool
    - BP1
      - Pageset
        - KASTS123
          - Object
            - KAT123\_COMPONENTS
              - Usage
              - TextMetrics
            - TextMetrics
          - Object
            - TextMetrics
        - BP2
          - Pageset
          - Object
          - TextMetrics
      - OAMADMIN

Collector Overview(40 Rows)

Clear History [Top N] 08:08:21 PM

Smf Id	SSID	Active	Monitored	QM Version	QM Subsy...	Profile Na...	QM Stat
AA00	DBA3	1	ACTIVE	230	DBA3	DBA3	ACTIVE
AA00	DA6A	1	ACTIVE	230	DA6A	DA6A	ACTIVE
AA00	DA1A	1	ACTIVE	230	DA1A	DA1A	ACTIVE
AA00	DA8A	1	ACTIVE	230	DA8A	DA8A	ACTIVE
AA00	DA5A	1	ACTIVE	230	DA5A	DA5A	ACTIVE
CAST	DB2P	1	ACTIVE	230	DB2P	DB2P	ACTIVE
CAST	DB2N	1	ACTIVE	230	DB2N	DB2N	ACTIVE
CAST	DGW2	1	ACTIVE	230	DGW2	DGW2	ACTIVE
CAST	DB2B	1	ACTIVE	230	DB2B	DB2B	ACTIVE
CAST	DGX2	1	ACTIVE	230	DGX2	DGX2	ACTIVE
CAST	DB2T	1	ACTIVE	230	DB2T	DB2T	ACTIVE
CAST	DB2H	1	ACTIVE	230	DB2H	DB2H	ACTIVE
CBBH	DB3A	1	ACTIVE	230	DB3A	DB3A	ACTIVE
CBBH	DGW3	1	ACTIVE	230	DGW3	DGW3	ACTIVE
CBBH	DB1A	1	ACTIVE	230	DB1A	DB1A	ACTIVE
CBBH	DGX3	1	ACTIVE	230	DGX3	DGX3	ACTIVE
CBBH	DB2R	1	ACTIVE	230	DB2R	DB2R	ACTIVE
CQ90	DB2Q	1	ACTIVE	230	DB2Q	DB2Q	ACTIVE
CQ90	DB2Y	1	ACTIVE	230	DB2Y	DB2Y	ACTIVE
CQ90	DB2C	1	ACTIVE	230	DB2C	DB2C	ACTIVE

Alert Browser Priority: [Icons] Columns Filters

Received	SubSystem	Exception Type	Summary	Syst...	Rep...	Pri.	Ack.
Mar 14, 2009 ...	DB2Y	Resource Unavailable Error	Query received code -904, indicating that a resource w...	CQ90	1	2	<input type="checkbox"/>
<a href="#">Query received code -904, indicating that a resource was unavailable (e.g., -904: unsuccessful execution caused by an unavailable resource)</a>							

Nothing selected.

Default Message Board (1)

1 message (1 unacknowledged) Ready.

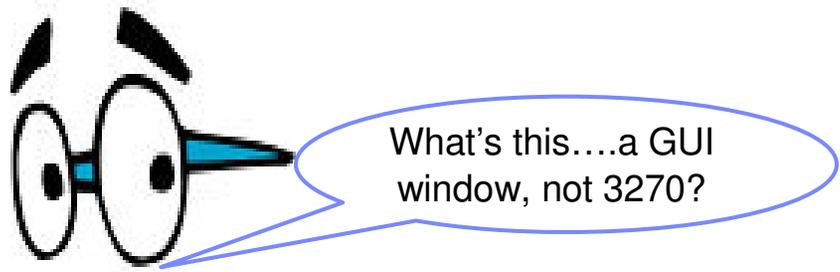
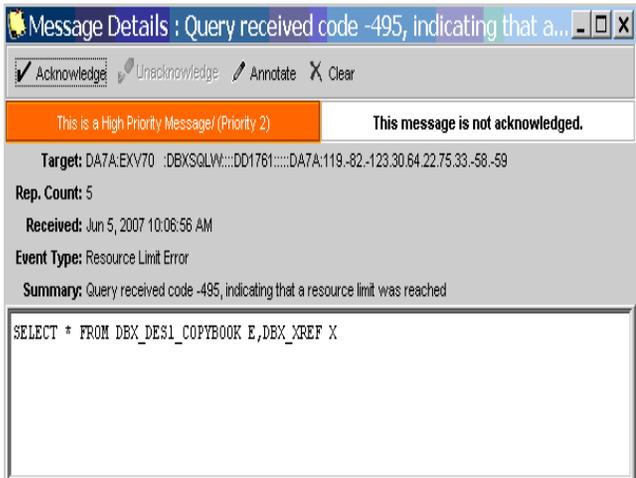
# DB2 Query Monitor

## Resource Limit Facility (RLF)

The screenshot shows a window titled "Message Details : Query received code -495, indicating that a...". Below the title bar is a toolbar with four buttons: "Acknowledge" (checked), "Unacknowledge", "Annotate", and "Clear". Below the toolbar are two status boxes: an orange box on the left that says "This is a High Priority Message/ (Priority 2)" and a white box on the right that says "This message is not acknowledged." Below these boxes, the message details are listed: "Target: DA7A:EXV70 :DBXSQLW:::DD1761:::DA7A:119.-82.-123.30.64.22.75.33.-58.-59", "Rep. Count: 5", "Received: Jun 5, 2007 10:06:56 AM", "Event Type: Resource Limit Error", and "Summary: Query received code -495, indicating that a resource limit was reached". At the bottom of the window is a text area containing the SQL query: "SELECT \* FROM DBX\_DES1\_COPYBOOK E, DBX\_XREF X".

# DB2 Query Monitor

## Resource Limit Facility (RLF)



## CAE (Consolidation and Analysis Engine)

# DB2 Query Monitor

The screenshot displays the 'DB2 Query Monitor Profiles & Configurations' window for 'CASNDG1NETVNA01:tg5444'. The interface is divided into several sections:

- Left Navigation Panel:** Contains icons for Profiles/Thresholds, DB2 Monitoring, Optional Alert Keys, Scopes, Monitoring, and Overrides. The 'Actions' section is highlighted.
- Tree View:** Shows a hierarchy of actions. Under 'CAE-Server-based Actions', 'RLF SQL Email' is selected and highlighted in blue. Other actions include Automatic Cancel Thread, Monitoring Agent Failure Email, Sample WTO, Catalog and DSN Object Restriction Email, DASD Read Delay Email, High CPU SQL Email, High Getpage Email, Large Sync IO Delay Email, Low BP Hit Ratio Email, QM Subsystem Terminated Email, SampleEmailAction, and Timestamp Errors on Support Plan\_Packages Em.
- Configuration Panel (Right):**
  - Action Group:** CAE-Server-based Actions
  - Subject Type:** DynamicDb2SqlStatement
  - Event Type:** ResourceLimitError
  - Related Event Type:** <none>
  - To:** x
  - From:** y,,,,,z,,,,,
  - Cc:** zzzzz@qat.com
  - Bcc:**
  - Subject:** RLF Errors / \${subject.db2Ssid}.....\${event.HighestSqlCode}
  - SMTP Host:**
  - SMTP Username:**
  - SMTP Password:**
  - File Attachment:**
  - Message:** Jobname: \${event.getAttribute("JOBNAME")}  
Correlation ID: \${event.getAttribute("CorrelationId")}  
User ID: \${subject.user}  
Connection Type: \${event.getAttribute("CONNECTION\_NAME")}

Two red arrows point from the 'RLF SQL Email' entry in the tree view to the 'To:' and 'Message:' fields in the configuration panel.

# DB2 Query Monitor

## Resource Limit Facility (RLF)

The screenshot shows an email window titled "DB2QM: RLF Errors / DB2Q.....-495 - Message (Plain Text)". The email header includes "From: DB2 HELP", "To: DB2 HELP", "Subject: DB2QM: RLF Errors / DB2Q.....-495", and "Sent: Thu 6/7/2007 9:42 AM". The body of the email contains the following text:

```
Jobname: DB2QDIST
Correlation ID: QMF for Wind
User ID: RB3400
Connection Type: SERVER

Plan: DISTSERV
Collection ID: QFW72K
Package/DBRM: RAARDBX3
Version: null
SQL Type:
Cursor Name: CURSOR2

IF SQL IS STATIC:
SQL Statement Number: 0
SQL Section Number from SYSSTMT or SYSPACKSTMT: 2

IF SQL IS DYNAMIC:
SQL Statement Text: SELECT DISTINCT A.DOC_CD, A.DOC_SECTN_CD, A.SLN_SEQ_ORD_CD,
A.DOC_LOGC_LN_CD, A.PRJCT_CD, A.BEG_EFF_DT FROM #CIBCTT1.DSL_SECTN_LN_SEQ A
WHERE NOT EXISTS (SELECT * FROM #CIBBCM6.SLA_SECT_LN_ASSGN B WHERE
B.MKTG_FRMT_OPTN_ID = 9999 AND A.DOC_CD = B.DOC_CD AND A.DOC_SECTN_CD =
B.DOC_SECTN_CD AND A.SLN_SEQ_ORD_CD = B.SLN_SEQ_ORD_CD AND A.DOC_LOGC_LN_CD =
B.DOC_LOGC_LN_CD) AND A.LN_TYPE_CD IN ('D','P','M') AND A.DOC_SECTN_CD NOT IN
('C00500','C0100N','C01000','C02000','C03000','C03010','C03020','C03030',
'C03040','C03050','B00005','B01680','C90010',
'B00230','B00235','B00237','B00240','B01210','B01215','B01217'); FOR FETCH ONLY
OPTIMIZE FOR 50000 ROWS
```

Red annotations on the screenshot include:

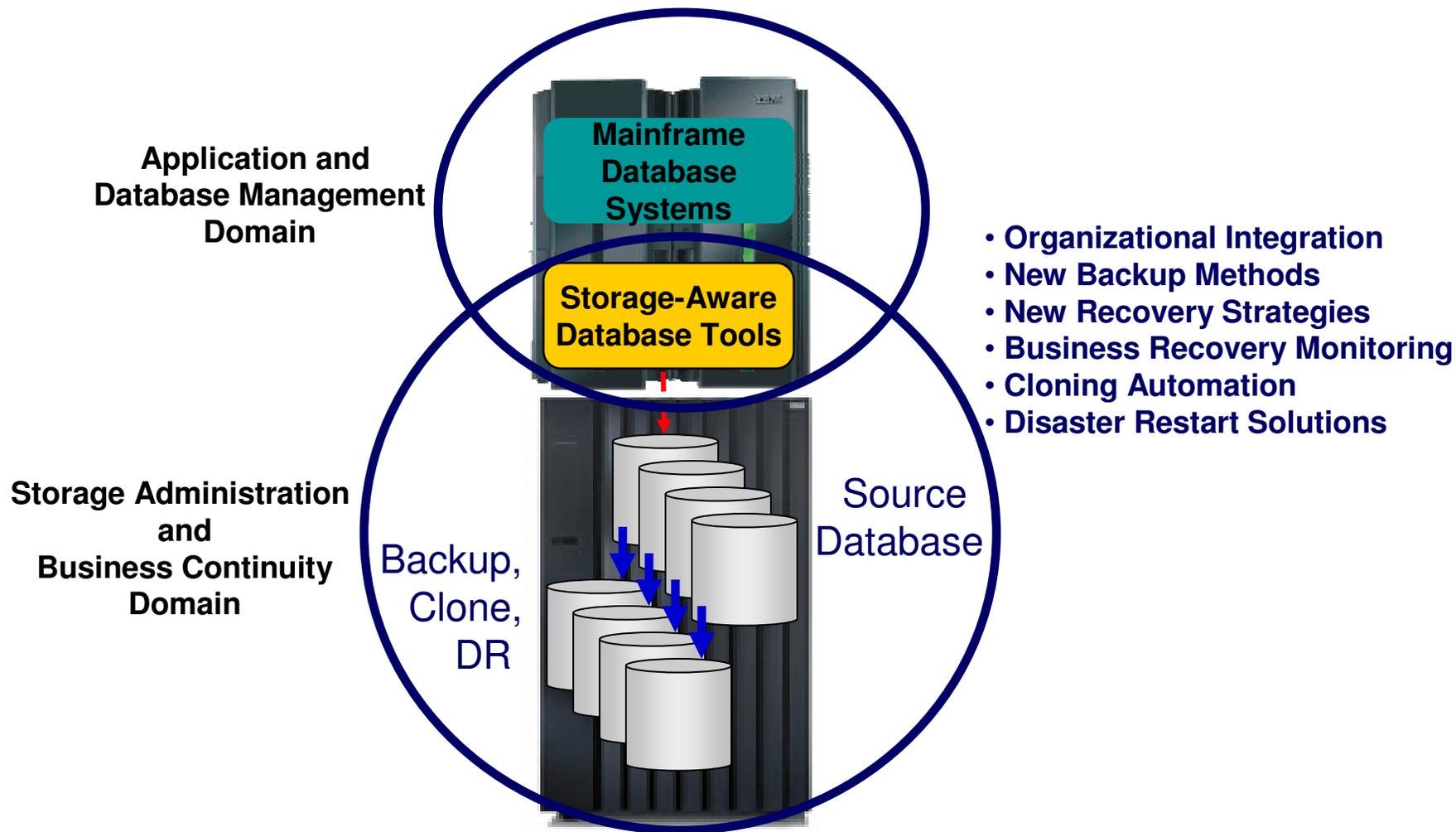
- A red arrow pointing from the subject line "DB2QM: RLF Errors / DB2Q.....-495" to the text "-495".
- A red arrow pointing from the word "Query" to the SQL Statement Text block.

# Storage-Aware Data Management Solutions

Leveraging Your Storage System  
and Managing Storage Requirements

Ron Hauptert  
Rocket Software Inc.

## Database and Storage Integration



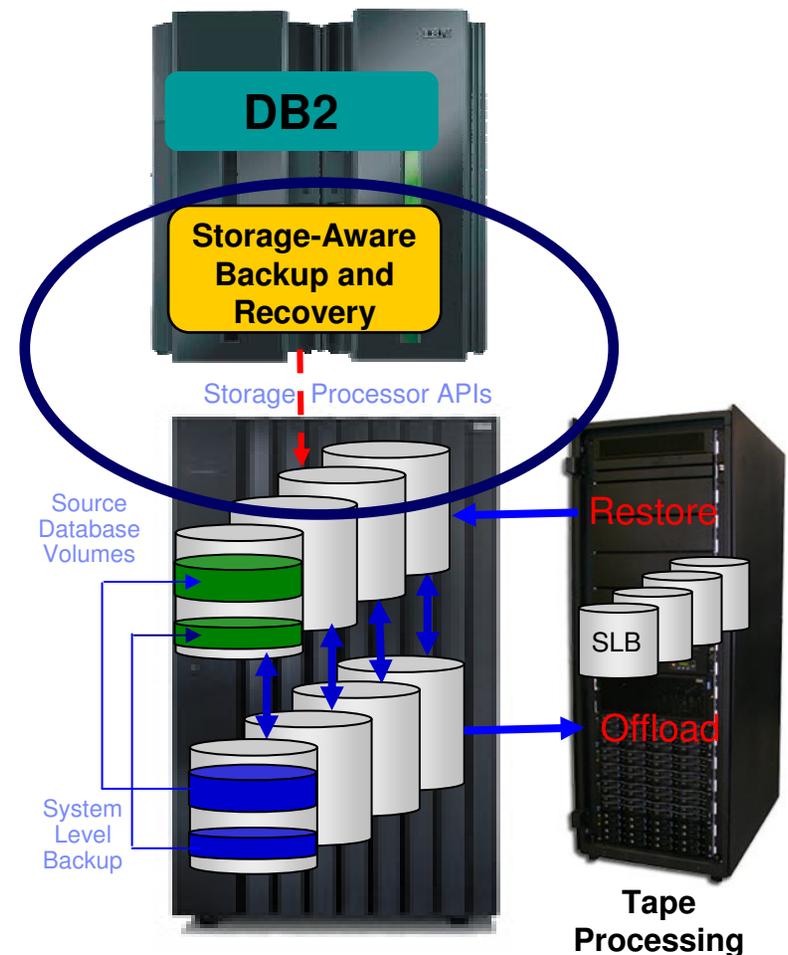
## Database and Storage Integration Operational Advantages

- Reduce backup, recovery, and cloning administration costs
- Reduce host CPU and I/O resource utilization
- Perform backups and create clone copies instantly
- Fast restore and parallel recovery reduces recovery time
- Simplify disaster recovery operations and procedures
- DBMS and storage-based fast-replication integration
  - 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
- Provide a sophisticated infrastructure and metadata to manage the DBMS and storage processor coordination

## DB2 Recovery Expert - System Level Backups

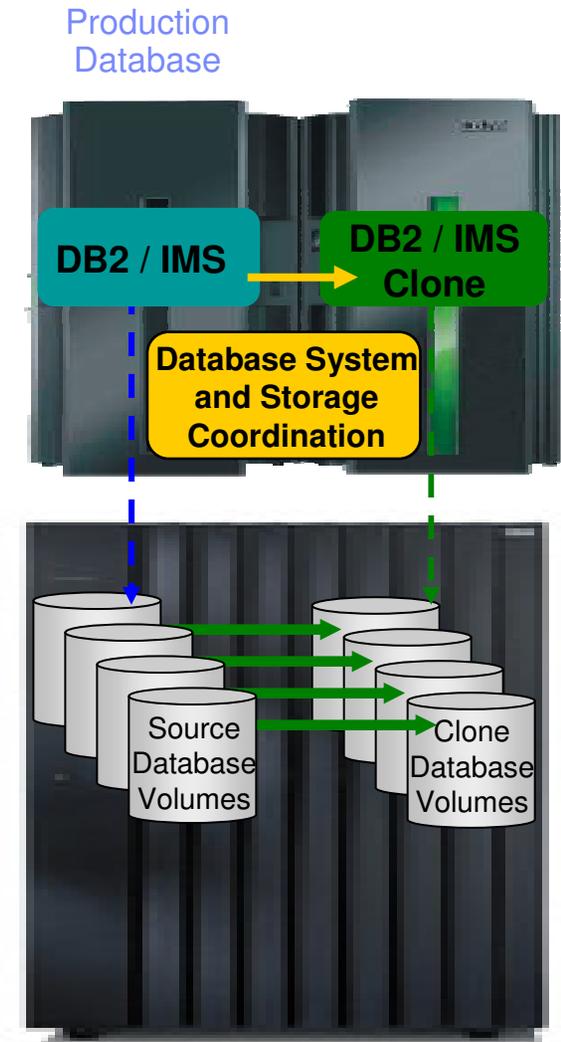
### Functional Requirements

- Integrate DB2 backup, restore, and recovery process with storage-based fast replication
- Provide easy and fast backup and restore of DB2 systems and applications
- Support common storage systems
  - IBM – FlashCopy (FC)
  - EMC – TimeFinder/Mirror/Clone/Snap, FC
  - HDS – Shadow Image, FC
- Feature requirements include:
  - Database system discovery and configuration management
  - Database system backup and recovery operations
  - System backup validation
  - Object and application recovery
  - Active metadata repository
  - Encrypted tape offload support
  - DR preparation and management



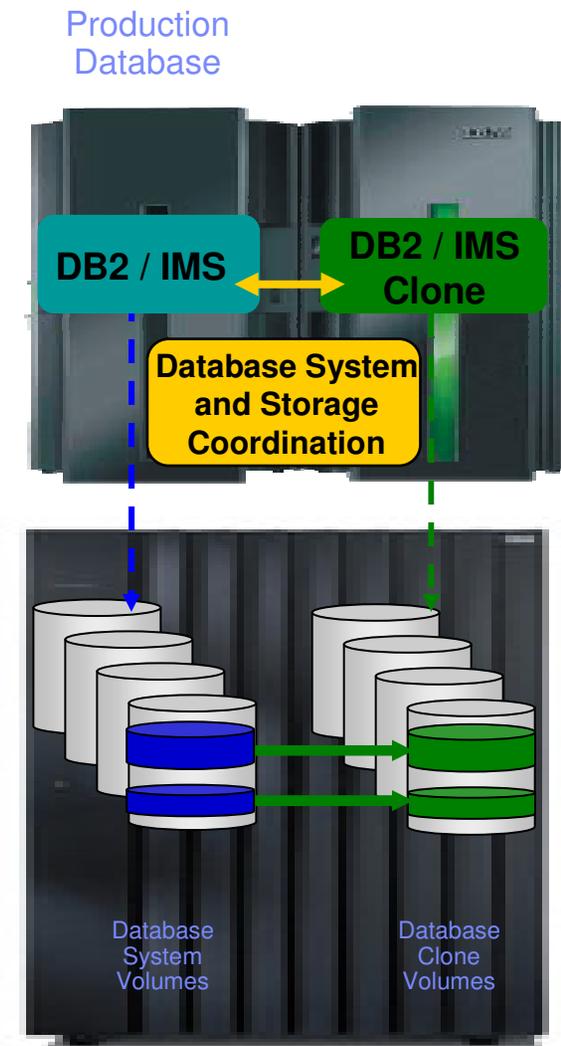
## Cloning Database Management Systems Using DB2 and IMS Cloning Tools

- Performs DBMS cloning automation
  - Simplifies database system cloning processes
  - Reduces cloning time and administration costs
- Leverages fast-replication facilities to clone data
  - Data can be cloned while online or offline
- Performs rapid volume reconditioning and data set renaming on cloned database volumes
  - Critical component of the database system cloning process
- Adjusts target database system to accommodate and accept the cloned data
  - DB2 catalog, directory, BSDS, active / archive log, etc.
  - IMS RECONS, PROCLIB, JOBS, JCL, MDA members



## Refreshing Database Objects Using DB2 and IMS Cloning Tools

- Performs automated IMS database and DB2 table and index space refresh operations
  - Fast refresh of database objects
  - DB2 RI relationships, LOBS, and Identity columns
  - IMS DB support (FP, HALDB, DEDB)
- Verifies source and target database compatibility
- Objects copied using storage-based data set fast replication
  - Target takes up the same amount of space as the source
- Performs object ID translations and target system metadata management



## Storage-aware Data Management Implementation Planning Considerations

- **System level backup usage**
  - Determine how SLB(s) will be used
- **SLB type**
  - Determine full, data-only, or partial SLB requirements
- **Backup frequency and space utilization**
  - Determine backup frequency, performance, and space efficient fast-replication requirements
- **Disaster restart considerations**
  - Determine offsite disaster restart resources and preferences (RTO, RPO) to define appropriate disaster recovery profiles
- **Copy blade selection**
  - Determine storage processor capabilities, available facilities and fast-replication preferences

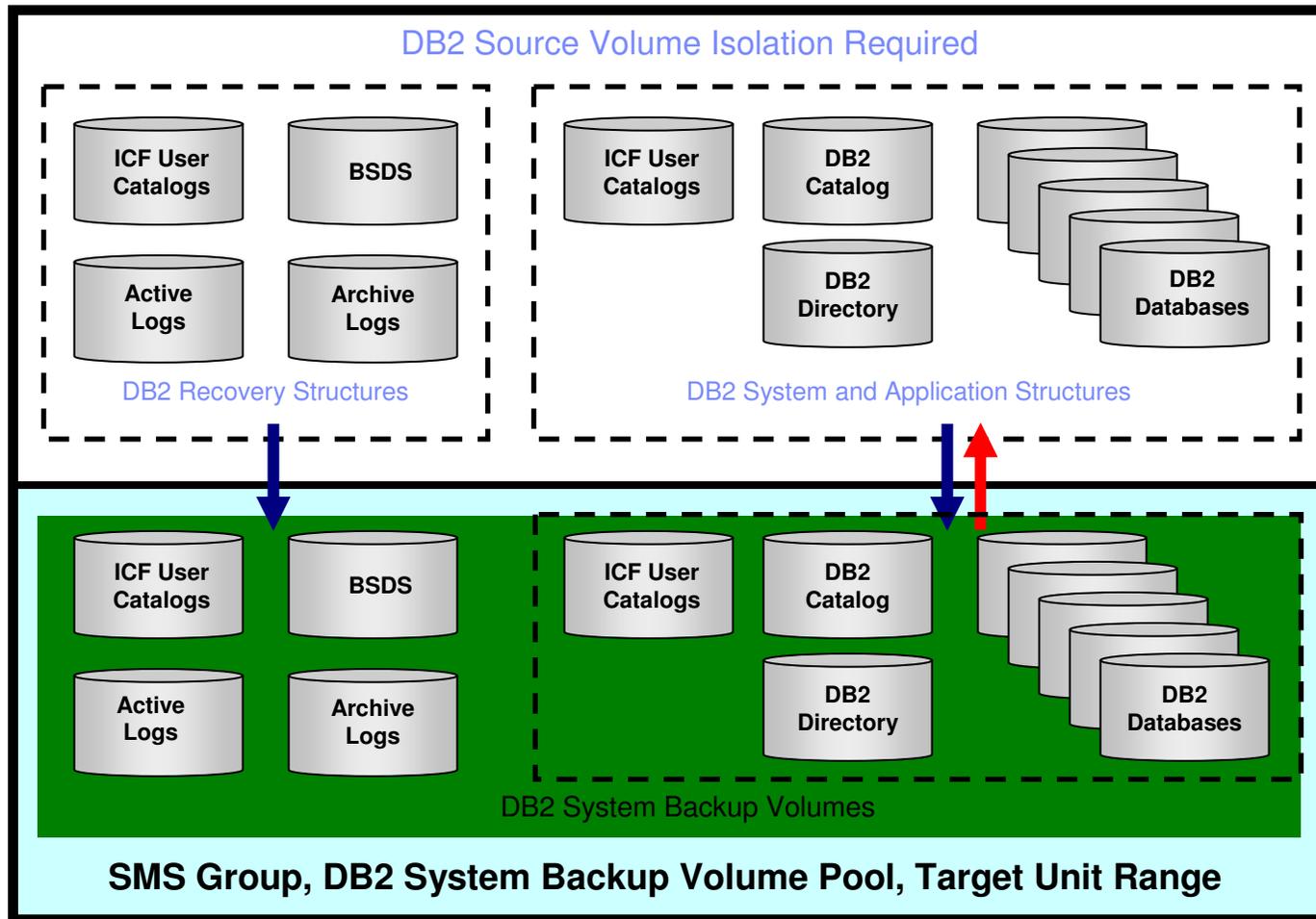
## System Level Backup Usage and Data Set Layout Considerations

- SLB used for local **system** recovery
  - Database data and recovery structure isolation required
  - Database system isolation may be required
    - *Non-database data sets will get restored when database system is restored*
    - *User catalogs will get restored*
- SLB used for application, object (DB2), or database recovery
  - Data and recovery structure isolation is not required
- SLB used for remote disaster restart operations
  - Recovery structure isolation is not required
  - Database system isolation may be required
    - *Non-database data sets will get restored when database system is restored*
    - *User catalogs will get restored*

# DB2 System Level Backup Usage

## Data Set Layout for Full Backup / System Recovery

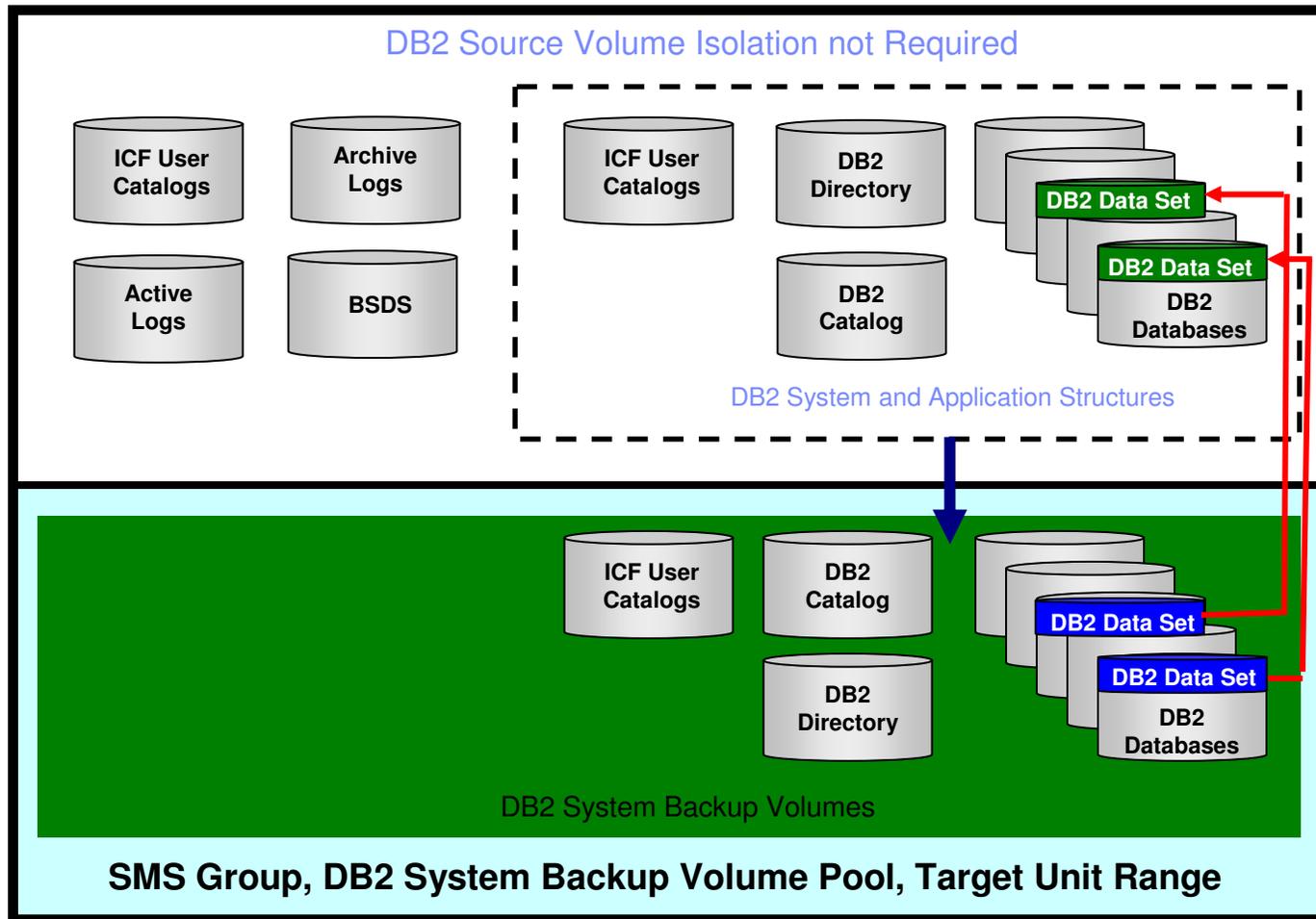
DB2 on z/OS System and Database Environment



# DB2 System Level Backup Usage

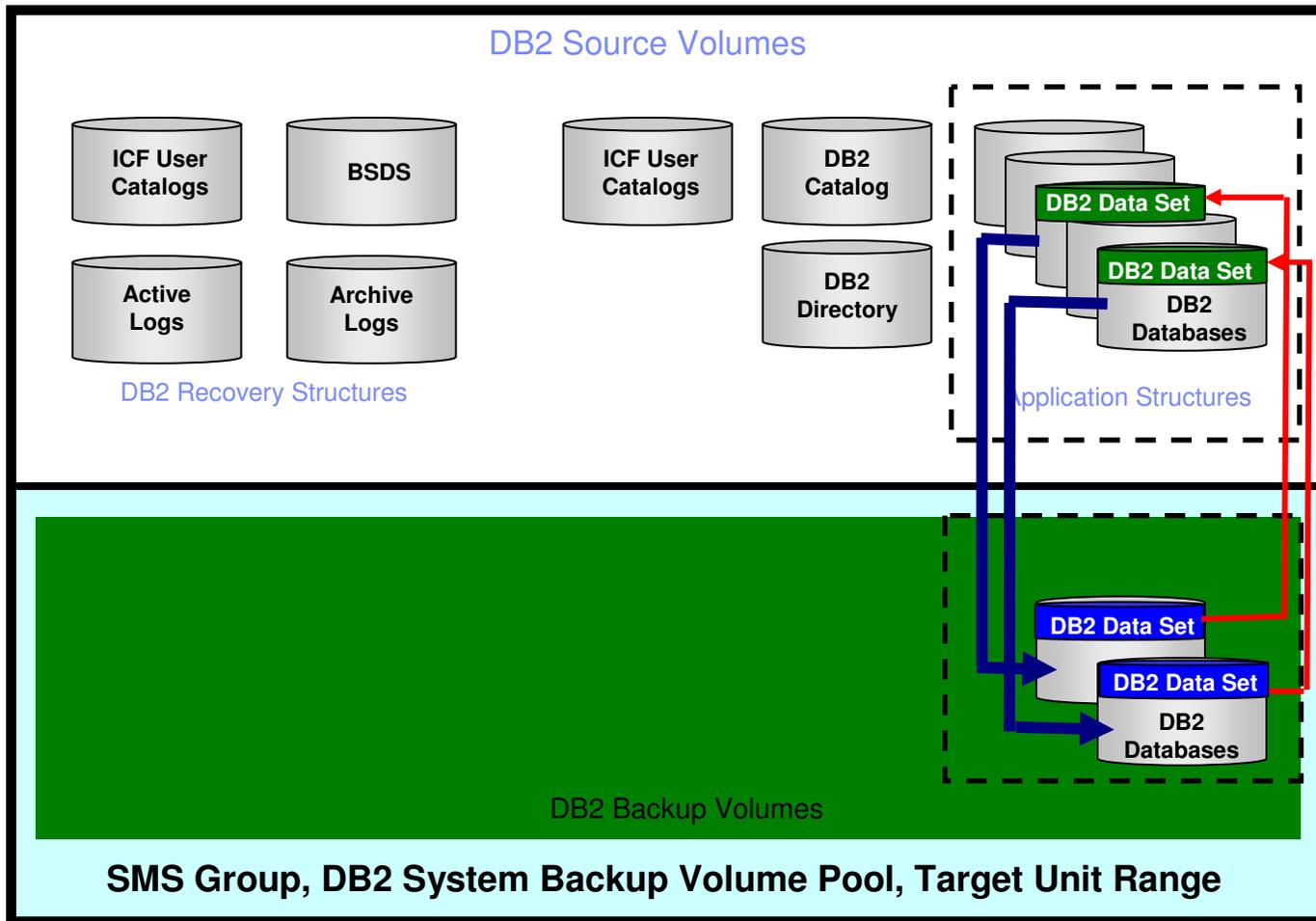
## Data Set Layout for Data Only / Application Recovery

DB2 on z/OS System and Database Environment



# DB2 Partial System Level Backup Data Set Layout for Application Recovery

## DB2 on z/OS System and Database Environment



## Partial System Level Backup

- Partial system level backup (PSLB)
  - Backup volumes representing a subset of the database system
  - PSLB's used for database or application recovery only
  - Data set fast replication used to restore data
  - Log and data isolation not required
  - Desired application database 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 databases or applications having unique backup requirements
  - Creating image copies from a PSLB
  - Reduce disk utilization
  - Support more backup generations

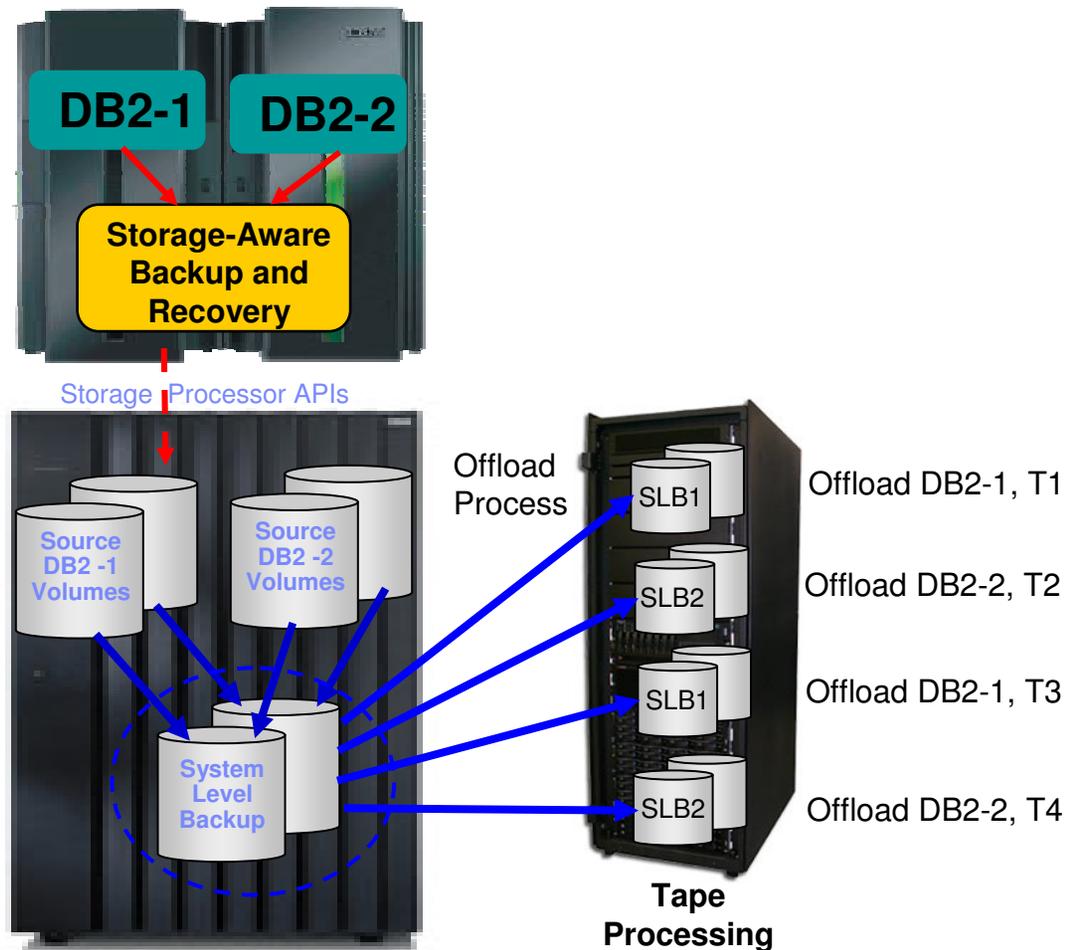
## Implementation Planning

### Backup Frequency, Space, and Resource Usage

- SLB type: full, data-only, or partial – shown in previous slides
- Determine optimal backup frequency
- Determine number of backups to keep online (on disk)
  - Establish online backup duration requirements
    - SLB or PSLB used for IC creation may be deleted after ICs complete
- Determine offline (tape) backup requirements
- Consider incremental fast-replication options to reduce background copy time and resources
- Consider using one set of volume targets to support multiple database systems – next slide
  - Saves fast-replication target volume storage requirements
- Consider using space efficient FlashCopy methods to save space – later slides
- Consider cloning database systems to space efficient volumes using a full volume clone or SLB as the source – later slides

# One Set of Backup Volumes Used for Multiple Database Systems

- Backup DB2-1
  - SLB-1 created on disk
  - Archive SLB-1
  - Backup volumes are available after archive completes
  
- Backup DB2-2
  - SLB-2 created on disk
  - Archive SLB-2
  - Backup volumes are available after archive completes
  
- Repeat for DB2-1
- Repeat for DB2-2



## Creating Image Copies from a System Level Backup

- Image copies can be generated from a DB2 Recovery Expert generated 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 image copy processing during high transaction activity

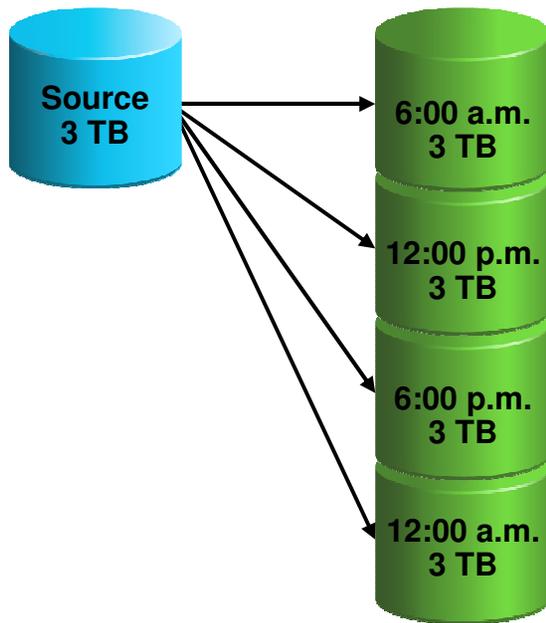
## Full Volume vs Space Efficient FlashCopy Operations

- Full volume copy
  - Clone requires same amount of storage as the source
  - Relationship can be retained with production volume
  - Allows incremental resynchronization
  - Full volume restore used for system restore operations
  - Data set level FlashCopy used for application or object recovery from non-archived backups
  
- Space efficient FlashCopy
  - Requires minimal additional storage
  - Allows incremental restore
  - Can have multiple volumes associated with production volume
  - Full volume restore used for system restore operations
    - Changed tracked restored from repository in extent pool
  - DFSMSdss **host** copy methods used for application or object recovery from non-archived backups

# Space Efficient FlashCopy Usage Economics

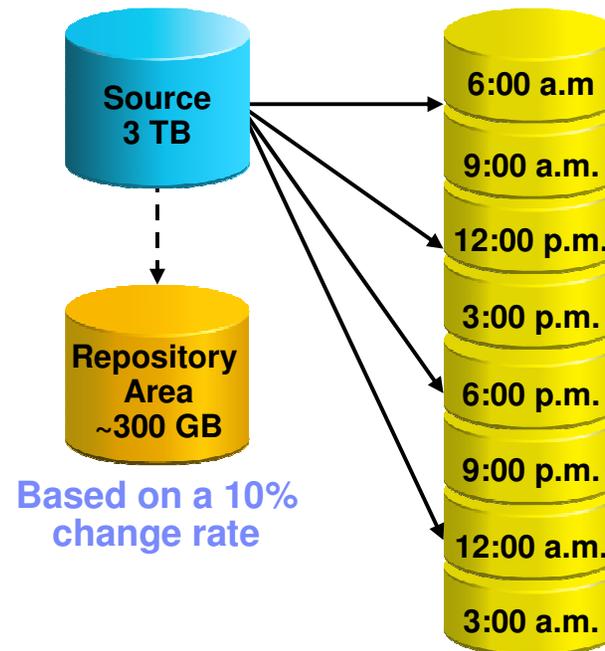
## Enable Frequent SLB or Clone Copies

Full-volume SLB or clone copies



Requires 12 TB of additional capacity

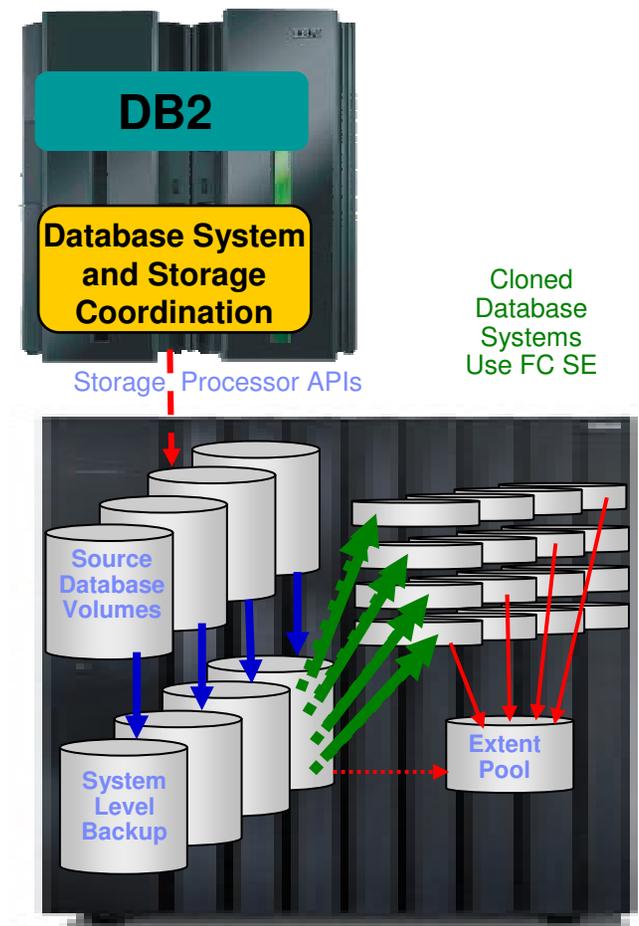
Space-efficient SLB or clone copies



Requires ~300 GB of additional capacity (repository usage in the extent pool)

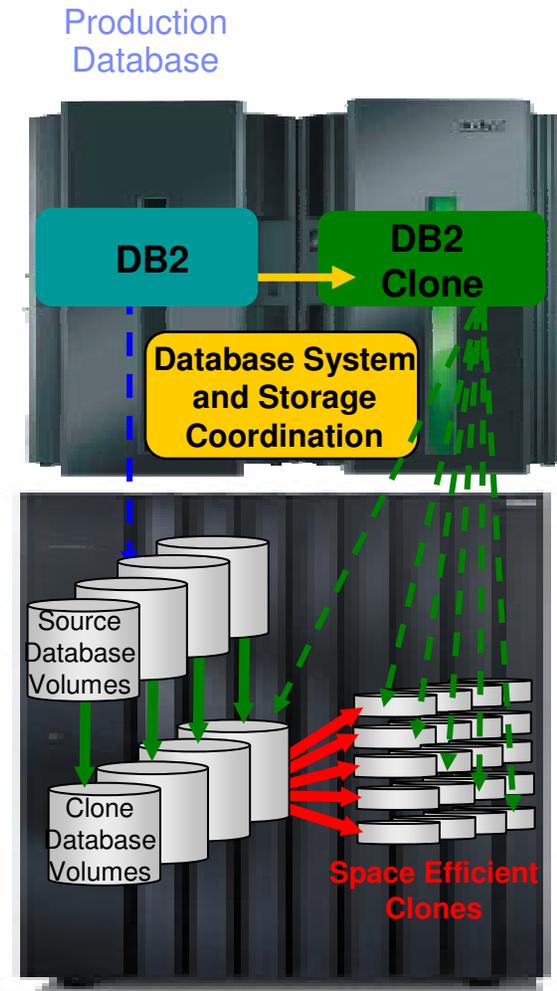
## Clone from a System Level Backup without using Additional Storage

- Full system-level backup created using full volume fast-replication
- Database clone operations performed using SLB backup volumes as source
- Cloned database systems use Space Efficient FlashCopy
  - SLB volumes are used to service I/O for database clone access
  - Database clone writes (few) go to save pool
  - SLB writes (none) go to save pool
- Storage-aware database tools provides infrastructure and metadata to manage database and storage processor coordination



## Make Multiple Clones without Duplicating Storage Requirements

- Perform full volume DB2 cloning automation
  - Requires same amount of space as the source
- Perform space efficient clone operations
  - Use full volume clone as the source
  - No real space used for space efficient clones unless they are updated
- Operational automation may be required to re-instantiate space efficient clones when the full volume clone is re-instantiated



## Implementation Planning

### Disaster Restart Considerations

- SLB should contain database system data only
  - Can contain other data that is restarted together
    - Recovering database and other data together may require using a storage based consistency function to create the SLB
    - Cannot roll forward if database and other data require consistency
- Use disaster recovery profiles to prepare for roll-forward recovery at the DR site
  - Disaster recovery profiles specify options on how to copy log data for DR site, etc.
  - Ensure DB2 Recovery Expert disaster recovery PDS metadata is taken offsite with archive logs and image copies
  - Reduces recovery point objectives (RPO)
- SLBs can provide an excellent and cost effective tertiary DR solution

## Using DB2 Recovery Expert with XRC and PPRC

- DB2 Recovery Expert provides “Remote Pair FlashCopy” DS8000 support (PPRC Metro Mirror)
  - Preserve Mirror support option specified in installation ParmLib (FCTOPPRCP)
    - N - Do not allow the PPRC primary to become a FlashCopy target
    - Y - The pair can go into a duplex pending state
    - P - It preferable that the pair does not go into a duplex pending state.
    - R - It is required that the pair not go into a duplex pending state (Requires Remote Pair FlashCopy support enabled)
  
- Using DB2 Recovery Expert with XRC and PPRC without Remote Pair FlashCopy
  - Backup target volumes must not be in a PPRC or XRC relationship
    - SLB volumes will not be remotely replicated
  - Backup volumes **cannot** be used for DB2 system recovery without duplex pending
    - SLB volumes cannot be “Flashed” to PPRC primary volumes (Duplex pending)
  - DB2 application and object recovery **is** allowed
    - DB2 Recovery Expert performs application and object recovery by copying data sets from the backup volumes (SLB) to the source volumes
    - DFSMSdss used to copy data sets
    - Fast Replication Preferred option used to copy data
    - DFSMSdss uses slow copy methods as data sets cannot be Flashed to source PPRC or XRC volumes

## Implementation Planning

### Copy Blade Selection

- Know your storage processing infrastructure
  - What storage processors are used (EMC, IBM, HDS)
  - What fast-replication facilities are licensed and preferred
- Determine storage blade and fast-replication facilities to use
  - IBM DB2 Backup System Blade
  - IBM DFSMSdss Blade
  - IBM FlashCopy Blade
  - EMC TimeFinder Blade
  - HDS ShadowImage Blade
- Determine which type of consistency function is best for your environment
  - DB2 Backup System
  - DB2 suspend
  - Storage-based consistency

## Session Summary

- Storage-aware database utilities provide storage integration to simplify database administration tasks
- Database system 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
  - Backups can be used for system, application, disaster restart
  - Parallel recovery reduces system and application recovery time
- Database system cloning automaton allows production data to be leveraged easily and effectively
- DB2 table spaces refreshed easily
- Less skills required to implement advanced backup, recover, disaster recovery, and cloning solutions
- Implementation planning is important to optimize the benefits



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