Improve and Automate IMS Backup and Recovery
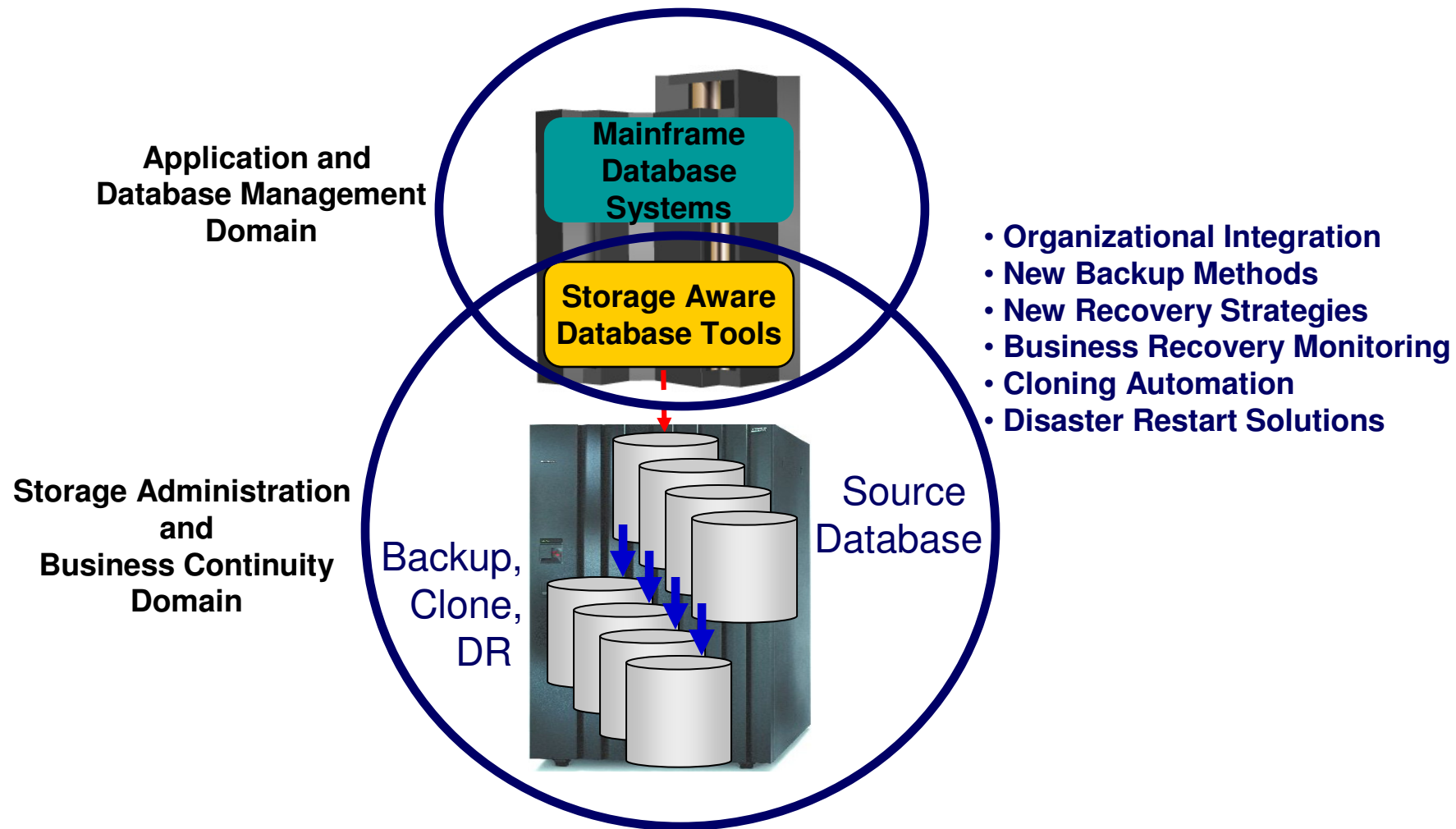## - Using IMS Recovery Expert V2.1

Information Management

Agenda

- **Trends and Directions**

- **IMS Recovery Expert V2.1**

- **System Level Backup Overview**

- **Intelligent Recovery Manager**
  - System level backup recovery
  - Application recovery from a system level backup

- **Intelligent Disaster Recovery Manager**
  - Image copy method
  - System level backup method

- **System Level Backup Usage Considerations**

Database and Storage Administration
Trends and Directions

- **Large DB2 and IMS systems require high availability**
  - Fast and non-intrusive backup and cloning facilities are required
  - Fast recovery capabilities are required to minimize downtime and promote high availability
  - 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 <u>not</u> to be used by database administrators (DBAs)

- **Storage aware database products**
  - Allow DBAs to use fast-replication in a safe and transparent manner
  - Provide fast and non-intrusive backup and cloning operations
  - Simplify recovery operations and reduces recovery time
  - Simplify disaster recovery procedures

Database and Storage Integration

Application and Database Management Domain

Mainframe Database Systems

Storage Aware Database Tools

Storage Administration and Business Continuity Domain

Backup, Clone, DR

Source Database

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

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**

IMS Recovery Expert V2.1

- ***Announced:*** **August 10, 2010**

- ***Generally available:*** **August 20, 2010**

- **Database and Storage-aware backup and recovery tool**

Definitions

- **Restore**
  - Restoring database environment to a previous copy
    - Database, index, application, system

- **Recover**
  - Explicit application of database logs to a point of consistency
    - Database, index, application, system

- **Restart**
  - Implicit application of database logs that happens during the normal database initialization process
  - Implicit backout of uncommitted changes performed by IMS during emergency restart
    - System
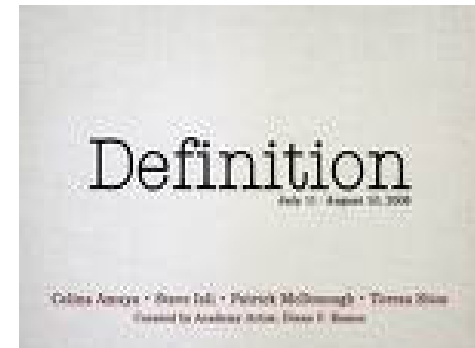
Backing Up IMS Data

- **IMS Databases**
  - Image Copies

- **IMS Systems and Application Libraries**
  - Volume Dumps
  - DFSMSdss data set copies
  - DFSMShsm

- **Remote Mirroring/Replication**
  - XRC, PPRC, SRDF
  - Disaster Recovery only

- **New with IMS Recovery Expert V2.1!**
  - IMS System Level Backup
    - IMS Databases, IMS Systems, Recovery Structures, and Application Libraries in one backup at same point in time
  - Automated offloading and encryption of data
  - Meta-data repository to maintain information on system level backups
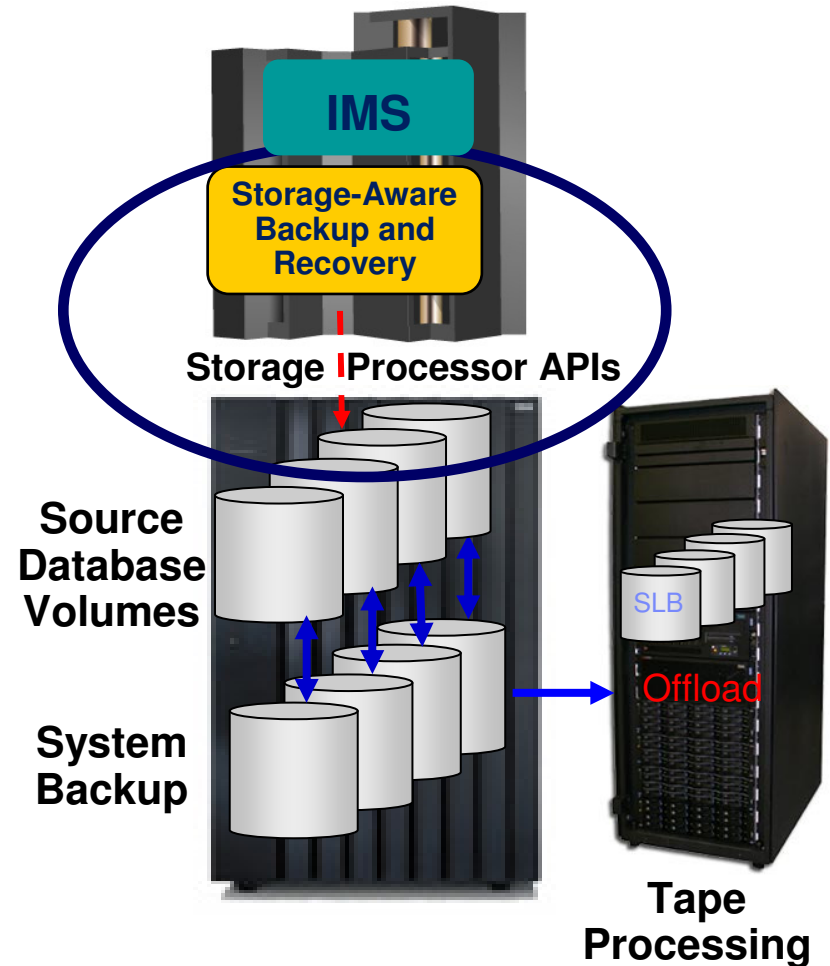
System Level Backup Overview

- **A System Level Backup is a backup of the entire DBMS environment at a point in time**
  - Recorded in IMS Recovery Expert Meta data repository

- **Leverages storage-based fast replication to drive the volume backup**
  - Backup in seconds
  - Offloading data copy process to the storage processor saves CPU and I/O resources
  - Significantly faster than data set copies

- **Backup DBMS without affecting applications**
  - Backup windows reduced by replacing image copies
  - Extends processing windows

- **Data consistency ensures data is dependent-write consistent**
  - Database Suspend Process
  - Storage-based consistency functions
  - Equivalent to a power failure

IMS

IMS RE

Storage Processor APIs

Source DBMS Volumes

Target Volumes

System Level Backup
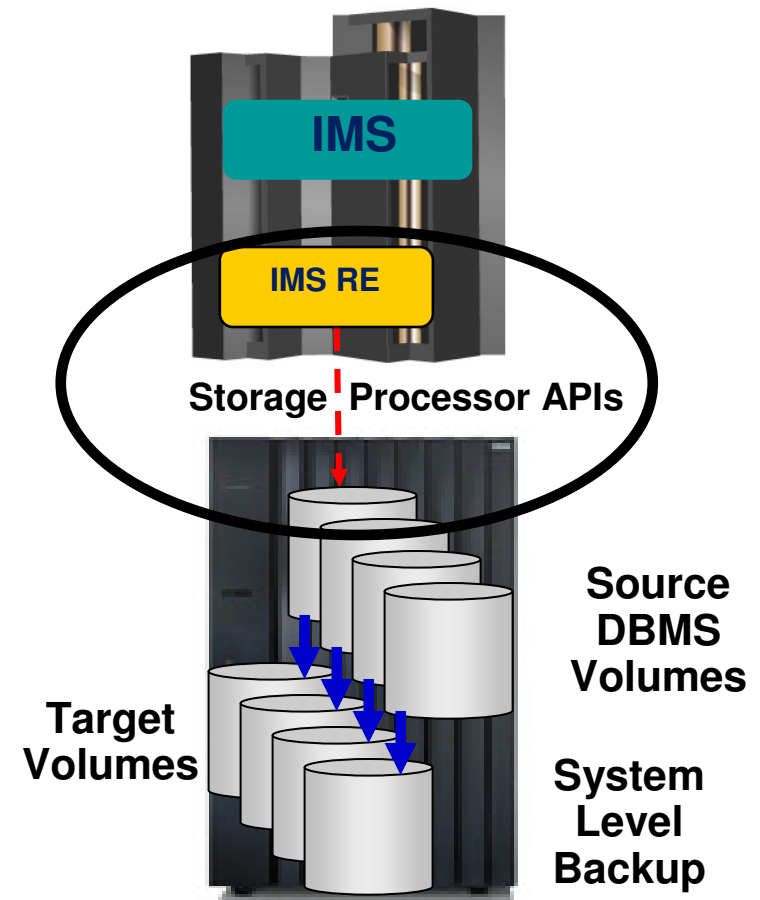
System Level Backup Overview
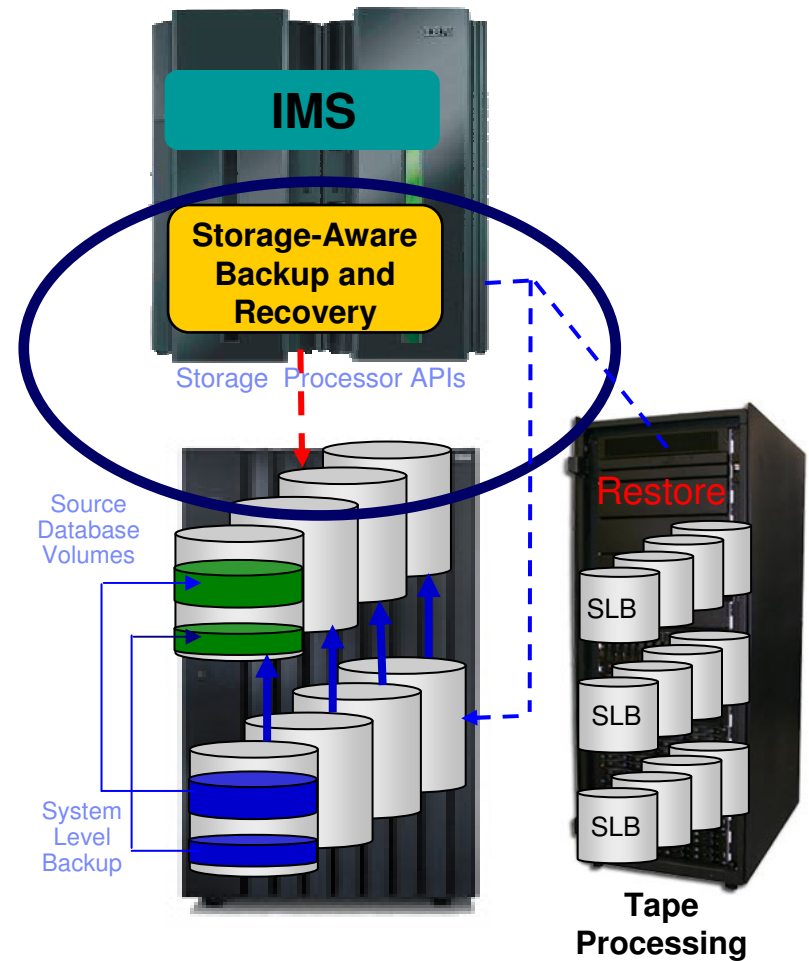## - System Level Backup

- **Backup validation each time ensures successful recoveries**
  - Insurance that a backup is available

- **Automated backup offload (archive/recall)**
  - Copies system backup from fast replication disk to tape for use at either local or disaster site (or both)

- **Can be used in combination with other backups (image copies)**

IMS

Storage-Aware Backup and Recovery

Storage Processor APIs

Source Database Volumes

SLB

Offload

System Backup

Tape Processing
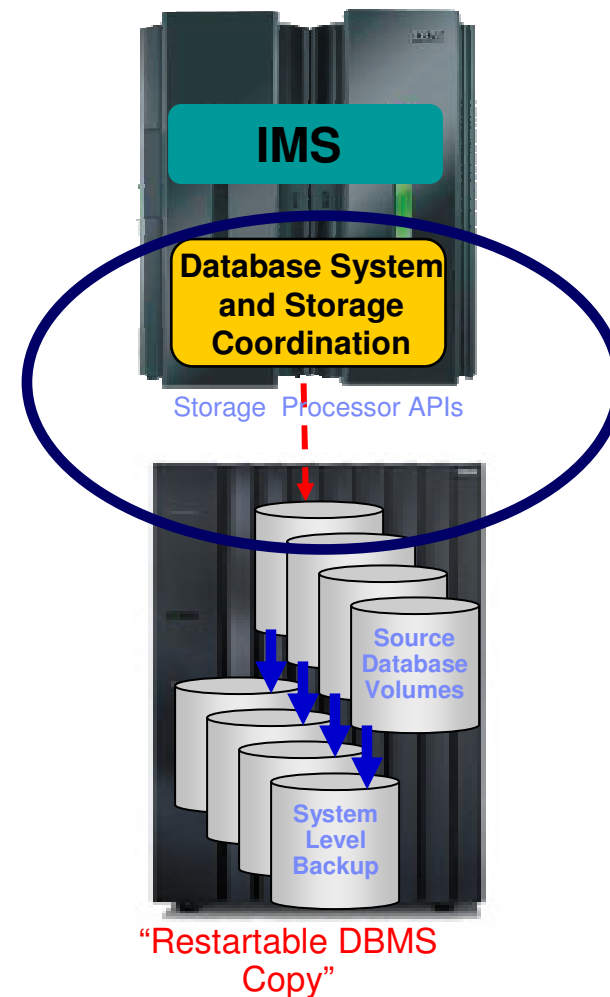
System Level Backup
- System and Application Recovery

- **Recover IMS systems, applications, or database from disk or tape automatically**

- **Intelligent Recovery Manager invoked to optimize recovery plans**
  – Integrates with traditional recovery tools

- **Faster recovery**
  – Instantaneous system or application restore process
  – Parallel recovery minimizes downtime

- **System backup can be used for database or application recovery**
  – Data set fast-replication used to restore data
  – Parallel log apply reduces recovery time

- **One system backup used for system, application, and disaster recovery**

IMS

Storage-Aware Backup and Recovery

Storage Processor APIs

Source Database Volumes

Restore

SLB

SLB

SLB

System Level Backup

Tape Processing

System Level Backup
- Disaster Recovery

- **Simplifies disaster recovery operations**
  - System level backup for restart
  - System level backup and roll forward

- **System backup is "restartable"**
  - Restore volumes containing the last SLB
  - Performs recovery during normal database initialization or emergency restart process
  - Disaster recovery is as simple as restarting from a power failure

- **Intelligent Disaster Recovery Manager**
  - Prepares recovery assets and manages remote restore and recovery operations

- **Reduced recovery time at a DR site**

- **Transform disaster recovery procedures into a tape-based disaster restart process**
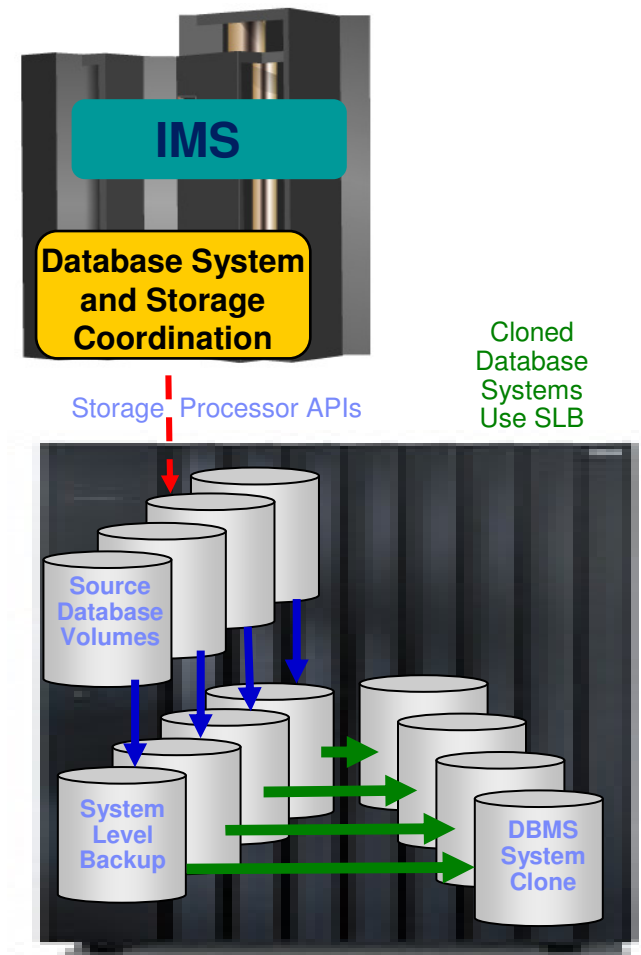 - Similar benefits as storage-based remote replication solutions

IMS

Database System and Storage Coordination

Storage Processor APIs

Source Database Volumes

System Level Backup

"Restartable DBMS Copy"

System Level Backup
- Storage

- **Reduce storage and processing costs by utilizing one backup for multiple purposes**
  - Local system recovery
  - Local application recovery
  - Disaster restart/recovery

- **Leverages storage-processor and fast-replication software investments**
  - Saves CPU, I/O, and processing resources

- **Expose fast copy capabilities to the DBAs** *safely and transparently* **using "storage-aware" database utilities**

- **Provides a sophisticated infrastructure and metadata to manage DBMS and storage processor coordination**

- **Multiple storage vendor support**
  - IBM - FlashCopy
  - EMC - TimeFinder/Mirror/Clone/Snap, FlashCopy
  - Hitachi – ShadowImage, FlashCopy
  - IBM RAMAC Virtual Array, STK – SnapShot

- **Perform IMS system cloning operations from a system level backup**

IMS

Storage-Aware Database Tools

DBA Domain

Source Database Volumes

System Level Backup

Storage Domain
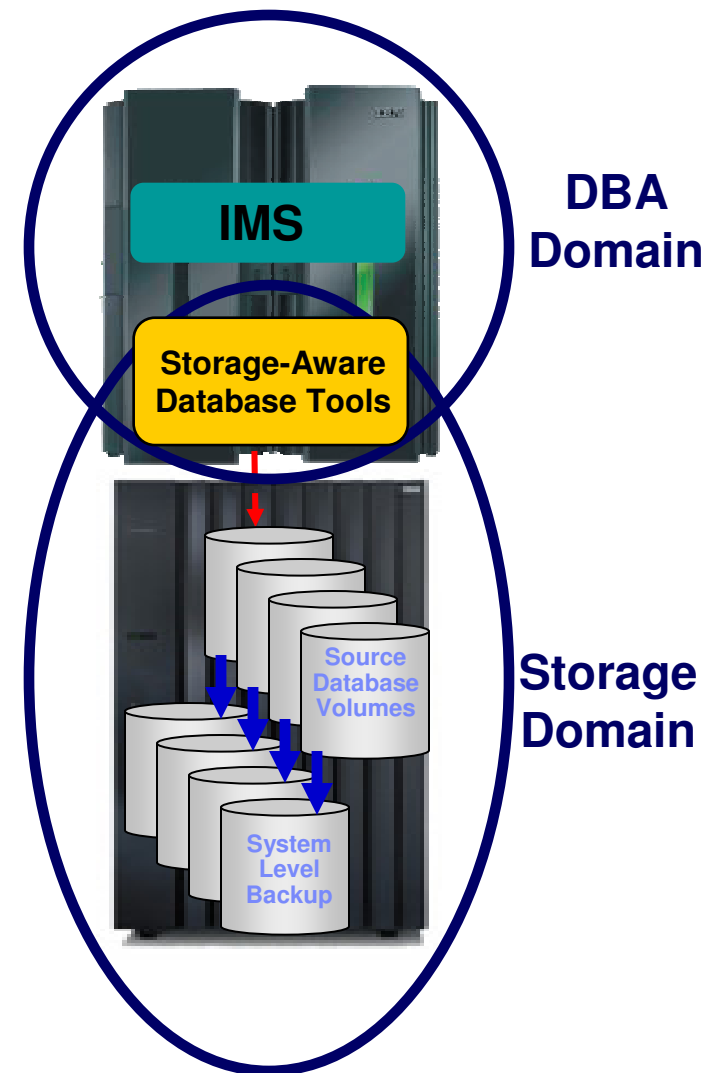
Clone from a System Level Backup

- **Full system-level backup created using full volume fast-replication**

- **Database clone operations performed using SLB volumes as source**

- **Storage-aware database tools provides infrastructure and metadata to manage database and storage processor coordination**

IMS

Database System and Storage Coordination

Cloned Database Systems Use SLB

Storage Processor APIs

Source Database Volumes

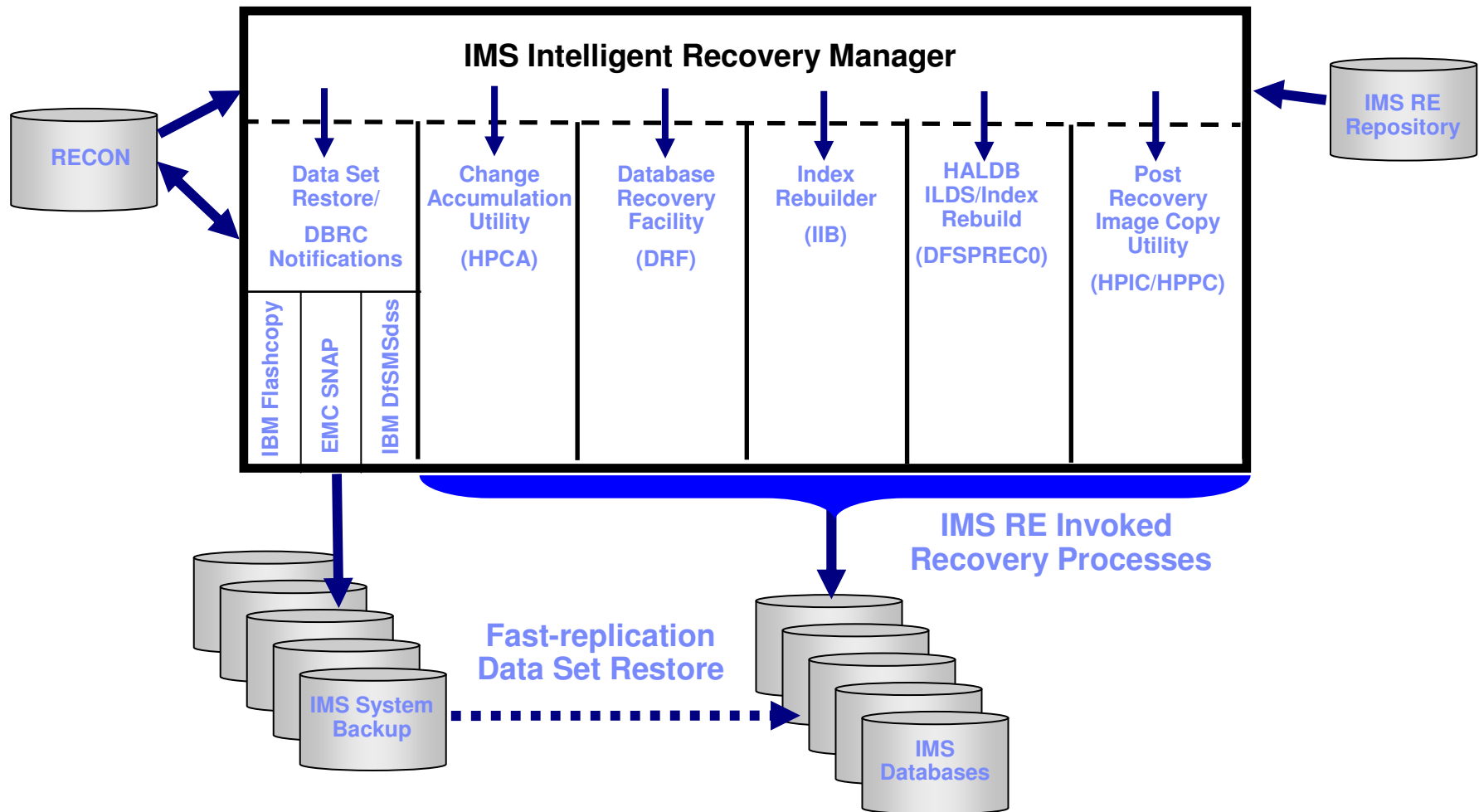System Level Backup

DBMS System Clone

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Intelligent Recovery Manager

Intelligent Recovery Manager

- **Performs efficient local recoveries using available recovery resources and tools**

- **IBM IMS backup and recovery utilities look like a single product from the end-users perspective**
  - Centralizes backups and recovery processes
  - Only one product is needed for all recovery processes (local recovery, disaster recovery, rebuilding damaged index, application relationship analysis, etc.)
  - Sophisticated ISPF interface

- **Simplifies and automates recovery processes:**
  - Related databases (application) can be grouped and saved (in advance)
  - Recovery JCL can be built in advance
  - Run-time analysis to determine recovery resources available
    - *Combination of SLB and other IMS recovery assets*
    - *Can be directed to use IMS recovery assets only*
  - Run-time analysis of what recovery utility to invoke and in what order
  - Spawns jobs to perform recovery tasks
  - Takes the technical knowledge out of having to create complex recovery JCL

System and Application Recovery
IMS Intelligent Recovery Manager

IMS Intelligent Recovery Manager

RECON

IMS RE Repository

| Data Set Restore/ DBRC Notifications | Change Accumulation Utility (HPCA) | Database Recovery Facility (DRF) | Index Rebuilder (IIB) | HALDB ILDS/Index Rebuild (DFSPREC0) | Post Recovery Image Copy Utility (HPIC/HPPC) |

IBM Flashcopy
EMC SNAP
IBM DfSMSdss

IMS RE Invoked Recovery Processes

IMS System Backup

Fast-replication Data Set Restore

IMS Databases

Intelligent Recovery Manager Overview
- System Level Recovery

- **Analyzes system backup and DBMS that will restore/recover the system in quickest way possible**

- **Automates volume restore process from either fast replication disk or from tape copy**

- **Full DBMS Restore**
  - Restore Entire DBMS
    - Includes active and archive logs, IMS RECON, ICF catalogs and z/OS control datasets
    - Can be used for disaster restart or local restart of an entire DBMS

- **Data Only Recover**
  - Restore volumes that contain IMS databases and indexes
  - Recovery of all databases is performed to a specified point in time after the SLB
  - Detects objects that had a non-recoverable event occur in recovered log range
    - Automatically runs recovery using Image Copies and rebuild indexes for those objects
  - Can be used at disaster site to replace traditional image copy recovery methods
    - SLB volumes are restored at DR site from a system backup on tape

Intelligent Recovery Manager Overview
- Application Recovery

- **Enables recovery of an application or individual databases or indexes to a point-in-time**
  - Recover to current
  - Recover to a timestamp

- **Application profile created in advance**
  - Single database or group of databases
  - Supports wildcards to select multiple databases
  - Supports DBRC groups
  - Saves recovery time because related applications are defined ahead of time and used when application needs recovery

- **Analyzes all datasets in the profile and generates the most appropriate recovery method for each data set**
  - Logically related databases and indexes can automatically be included
  - Can restore datasets from either IC or SLB
  - Indexes that cannot be restored are rebuilt
  - Recovery (log apply) occurs in single step eliminating multiple passes of the logs
  - Access to databases is automatically stopped and restarted at end of recovery

- **Storage-based fast-replication is used to perform restore (if available)**
  - Performs an instantaneous data set restore process
  - Fast replication from SLB is available even if data set has moved or was deleted or after SLB
  - Recovery (log apply) is performed in parallel with data set restore process if fast replication is used

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Define an Application

```
BSY$OPRU              --------------------- Update Application Profile Display ----------------------
Option  ===> _____  Scroll ===> CSR

Line Commands: A - Add  E - Explode  D - Delete


-------------------------------------------------------------------------------
 Creator: PDBISC     Name: IAA HDAM                        User: PDBISC
 Share Option: U  (Upd,View,No)   Description: HDAM CA GROUP
 IMS System/Group: IAA            Update Recovery Options: N  (Yes/No)
-------------------------------------------------------------------------------
           Wild Process  Process  Include/ Group/DB  Area/    DDN   <----- Last Updated ------>
Cmd  Type  Card Indexes  Logical  Exclude  Name      Part           Userid   Timestamp
 _    GC   N    N        N        INC      HDAM                      PDBISC   04/27/2010 14:03:26
 _    DB   N    Y        Y        INC      DBHD002                   PDBISC   02/04/2009 12:35:24
 _    DB   Y    Y        Y        INC      DBHI*                     PDBISC   04/27/2010 14:02:44
 ****************************************** Bottom of Data *****************************************
```

Define Recovery Utilities and Options

```
BSY$DRFO V2R1 -------------------------------- Application Recovery Options ---
Option   ===> _____

--------------------------------------------------------------------------------
  Creator: PDBISC      Name: IAA HDAM                        SSID: IAA
  Share Option: U  (Upd,View,No)    Description: HDAM CA GROUP
--------------------------------------------------------------------------------
  Enter the Recovery options to associate with this profile:
                                                               More:      +
  Recovery Point       ==> 1 ( 1 To Current, 2 To Point In Time, 3 RPID)
  Timestamp            ==> _____
  Verify before recovery ==> Y (Yes/No)        Edit Options  N  (Yes/No)
  Recovery Utility     ==> D (Drf/User)         Edit Options  N  (Yes/No)
  Index Rebuild Utility ==> I (Iib/User/None)   Edit Options  N  (Yes/No)
  HALDB PINDEX/ILDS Rbld ==> I (Ims/User/None)  Edit Options  N  (Yes/No)
  Change Accum Utility ==> H (Hpca/User/None)   Edit Options  N  (Yes/No)
  Post Recovery IC     ==> H (Hpic/User/None)   Edit Options  N  (Yes/No)
  Recovery Resources   ==> A (All/Slb/Ic)
  From Offload         ==> N (Yes/No)
  Parallel Tasks       ==> 04 (01-99)
  Number of Tape units ==> 02 (01-99)
  Action on Warnings   ==> C  (Continue/Wtor/Abort)
  Datasets for GENJCL  ==> SIR.IAA.JCLPDS_____
                       ==> _____
                       ==> _____
                       ==> _____
                       ==> _____
```

IBM

Steps to Perform an Application Recovery

- **Create an Application profile (*in advance*)**
  - Define recovery options
    - Recovery utilities / Recover to point
- **'Build' JCL for the application profile you want to recover (*in advance*)**
- **Execute JCL:**
  - IMS Intelligent Recovery Manager
    - Information from DBRC and DBR for IMS repository analyzed
      - What are the most recent backups
      - What recovery utilities to use
  - Storage-based fast-copy is used to perform restore
    - Instantaneous data restore process
    - Parallel recovery to roll-forward logs

IMS

IMS RE

Storage Processor APIs

Source IMS Volumes

Data set Restore

IMS System Backup
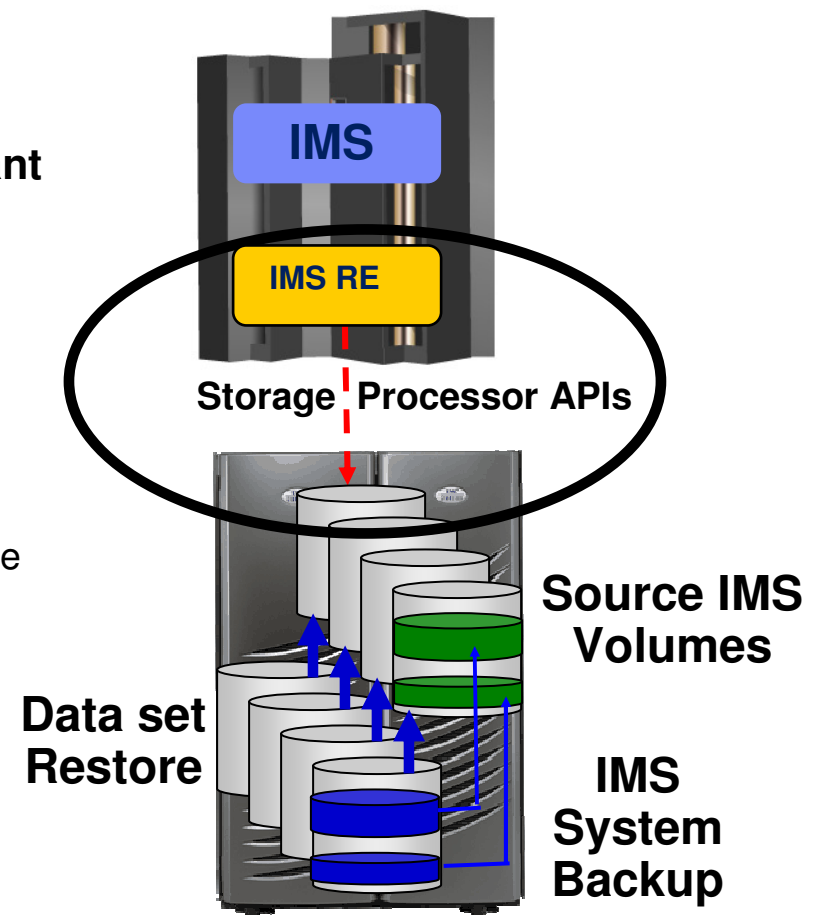
Intelligent Disaster Recovery Manager

Intelligent *Disaster* Recovery Manager

- **Performs:**
  - Local site procedures to prepare for offsite disaster recovery or disaster restart
    - Image copy method
    - System level backup method
  - Remote site restore operations and appropriate recovery or restart procedures
  - Simplifies and automates disaster recovery processes

- **Disaster recovery or disaster restart creation of jobs to:**
  - Perform traditional disaster recovery process
  - Restore system level backup and restart DBMS
  - Restore system level backup, restore RECON, run recovery to point in time, restart DBMS

Local Site Preparation for DR

- **Run IMS Intelligent *Disaster* Recovery Manager on some schedule**
  - Based on the desired recover to time
    - After SLB is offloaded?
    - After log is archived?
    - Certain time of day?

- **What IMS Intelligent *Disaster* Recovery Manager does**
  - Create copy of RECON

  - Identify image copies, change accumulations, and archive logs for transport to DR site
    - Copy any recovery assets if specified
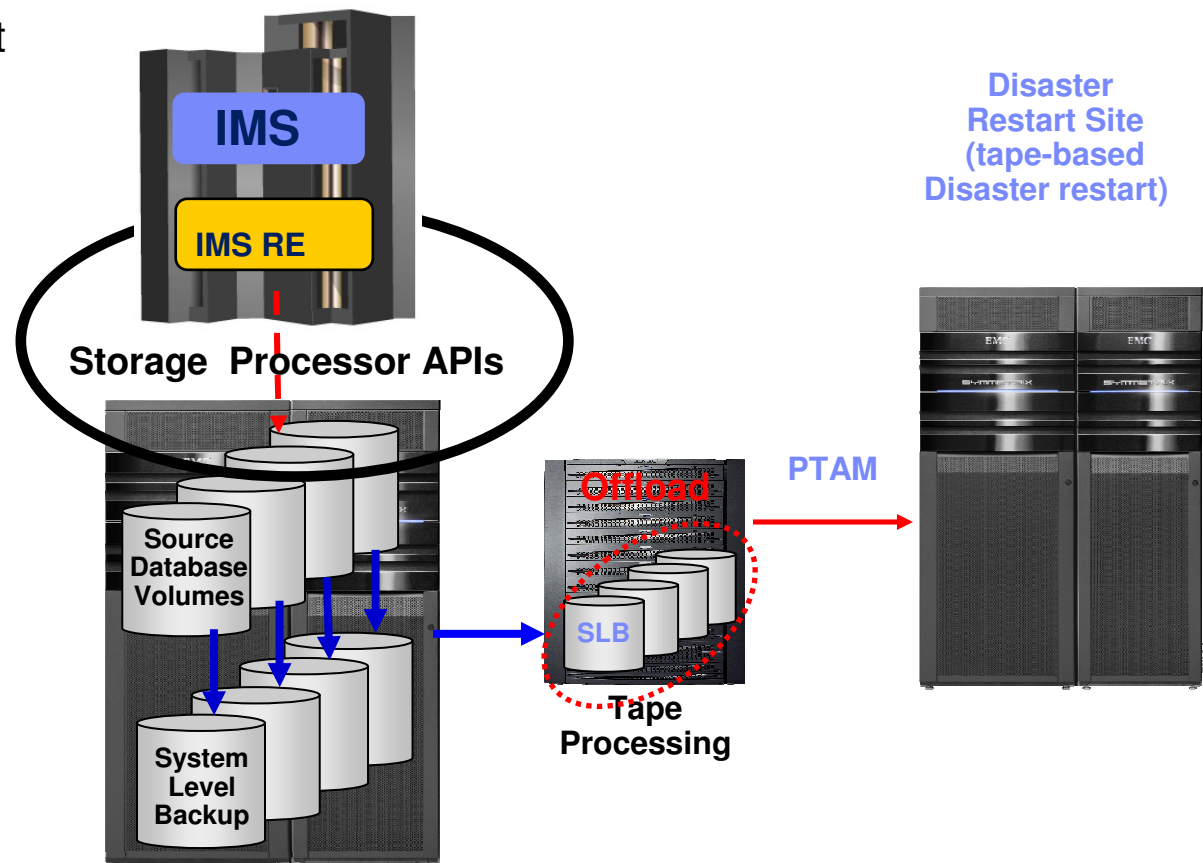   - Tapes can be identified from pick list

  - Condition copy of RECON with any logs, change accums and image copies being sent to DR site
    - Removes the requirement to modify the RECON at the DR site
    - If logs and change accums aren't required, they are marked in error in the conditioned recon so they won't be pulled in

  - IMS RE repository backed up and sent offsite

  - Recovery JCL is created, backed up, and sent offsite
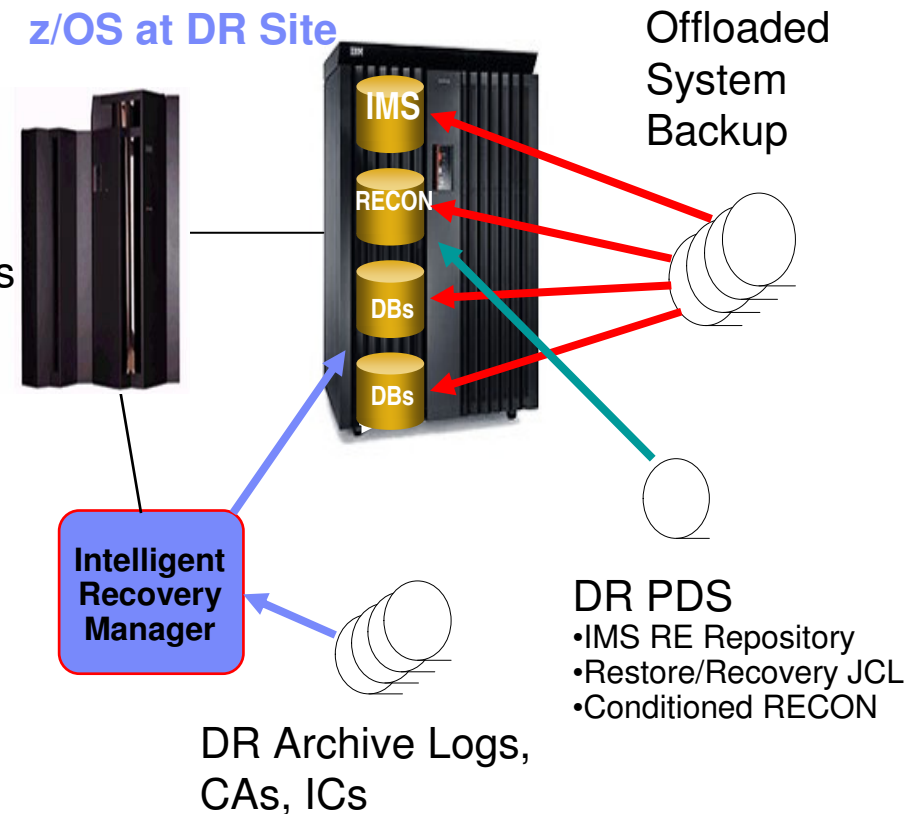
Steps to Perform a Disaster *Restart*
to System Backup

1. Restore IMS RE DR PDS
2. Run JCL to restore IMS RE Repository
3. Run JCL to restore SLB
4. IMS emergency restart

IMS

IMS RE

Disaster Restart Site (tape-based Disaster restart)

Storage Processor APIs

Offload

PTAM

Source Database Volumes

SLB

Tape Processing

System Level Backup

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Steps to Perform a Disaster *Restart*
with Image Copies and Logs

1. Restore IMS RE DR PDS
   - Contains all JCL needed to run remaining steps

2. Run JCL to restore IMS RE Repository
   - Contains information on SLB

3. Run JCL to restore SLB
   - Restores IMS, Application Libraries, Databases

4. Run JCL to restore pre-conditioned RECONs

5. Run JCL to invoke IMS Intelligent Recovery Manager to recover databases

6. Cold start IMS

z/OS at DR Site

IMS

RECON

DBs

DBs

Offloaded System Backup

Intelligent Recovery Manager

DR Archive Logs, CAs, ICs

DR PDS
- IMS RE Repository
- Restore/Recovery JCL
- Conditioned RECON

System Level Backup
Usage and Implementation Considerations

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 IMS system is restored
    - User catalogs will get restored

- **SLB used for IMS application or database recovery only**
  - 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 IMS system is restored
   - User catalogs will get restored

System Level Backup Usage Considerations
- Data Set Layout for Local System Recovery

▪ **SLB used for local system recovery and disaster restart**
  – Database data and recovery structure isolation required
  – Non-database data sets will get restored when database system is restored
  – ICF User catalogs will get restored
  – System level recovery must have IMS recovery structures isolated on separate volumes from those that support the IMS system and application data sets
  – Separation ensures system and application data can be restored from the backup volumes while allowing roll-forward recovery using the source volumes that support the recovery structures
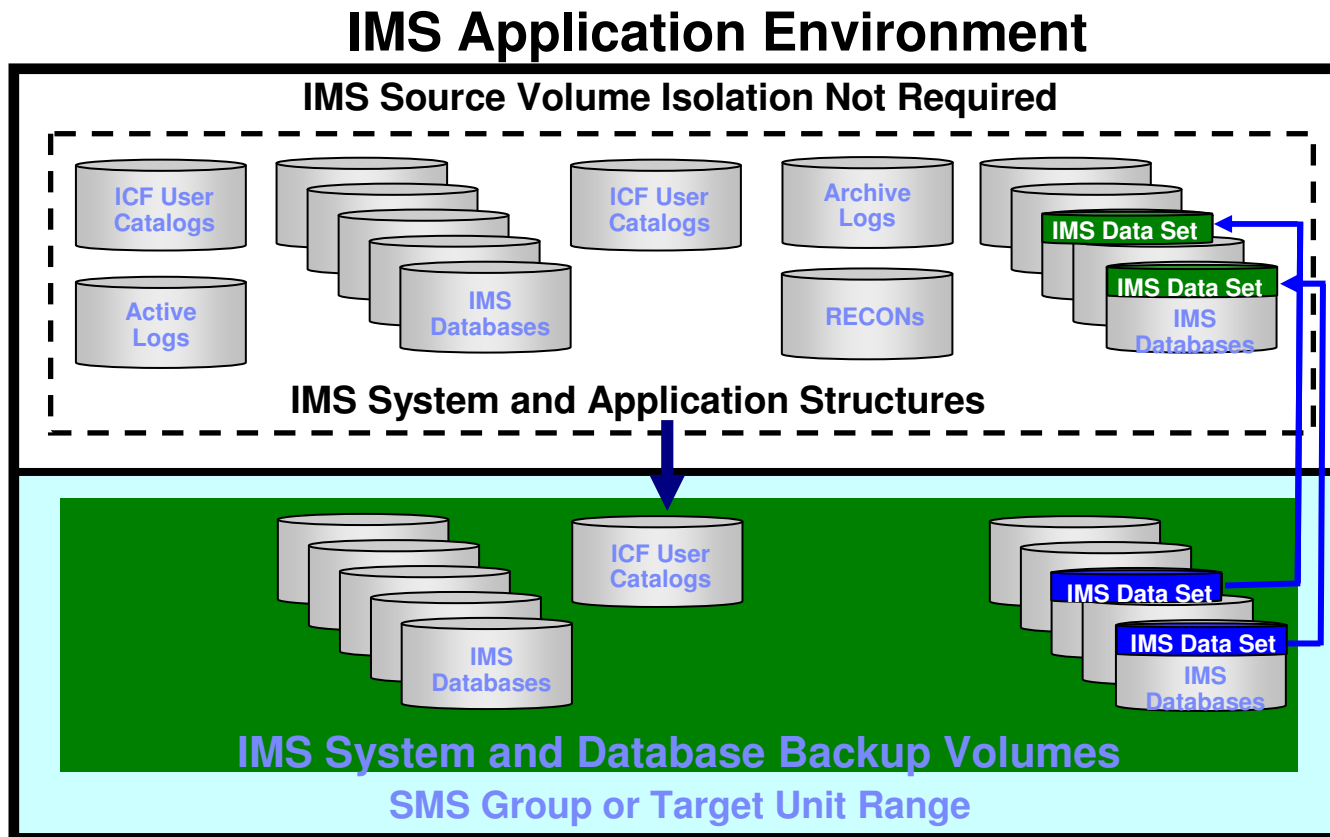
IMS System and Database Environment

© 2010 IBM Corporation
© 2010 Rocket Software
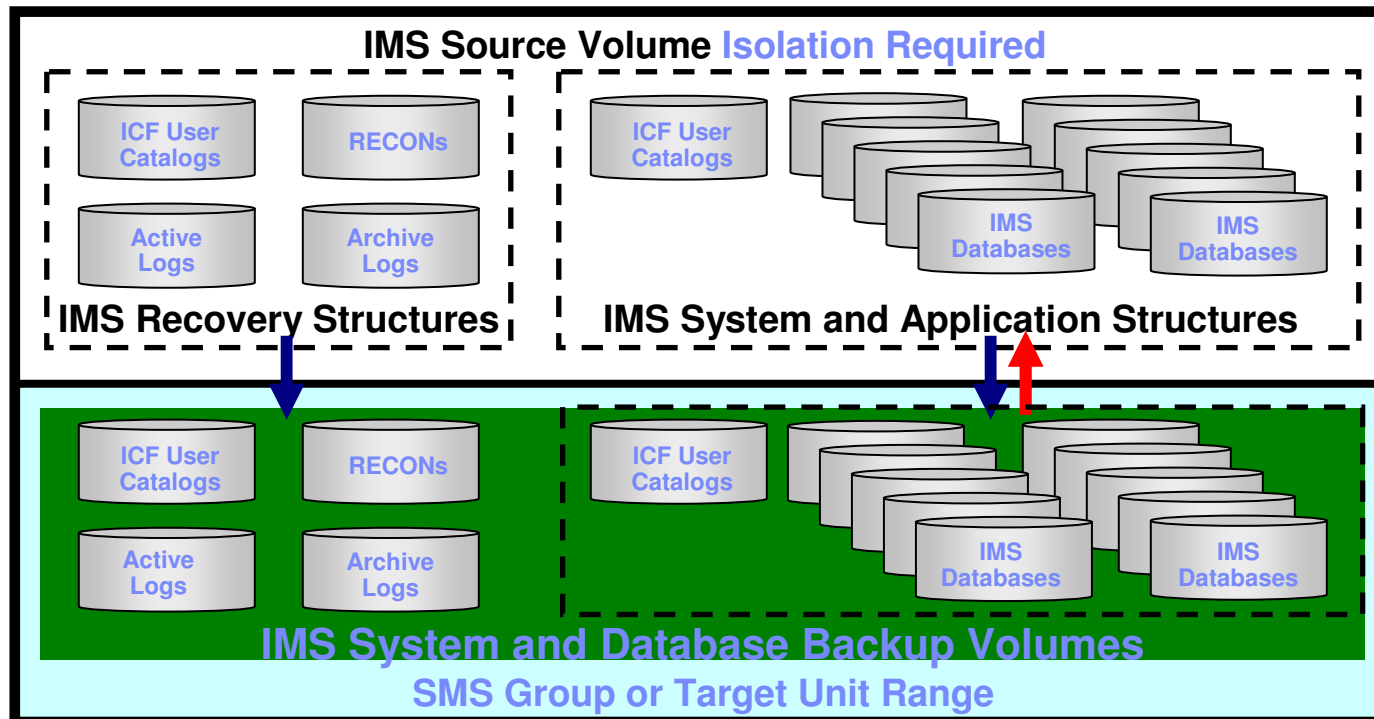
System Level Backup Usage Considerations
- Data Set Layout for Application Recovery **Only**

- **SLB used <u>only </u>for application, or database recovery**
  - Data and recovery structure isolation is not required
  - Does not require data set separation as only IMS data sets will be restored from the system level backup

IMS Application Environment

IMS Source Volume Isolation Not Required

ICF User Catalogs   ICF User Catalogs   Archive Logs   IMS Data Set   IMS Data Set

Active Logs   IMS Databases   RECONs   IMS Databases

IMS System and Application Structures

ICF User Catalogs   IMS Data Set   IMS Data Set

IMS Databases   IMS Databases

IMS System and Database Backup Volumes

SMS Group or Target Unit Range

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 <u>only</u>
  - 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 <u>cannot</u> 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
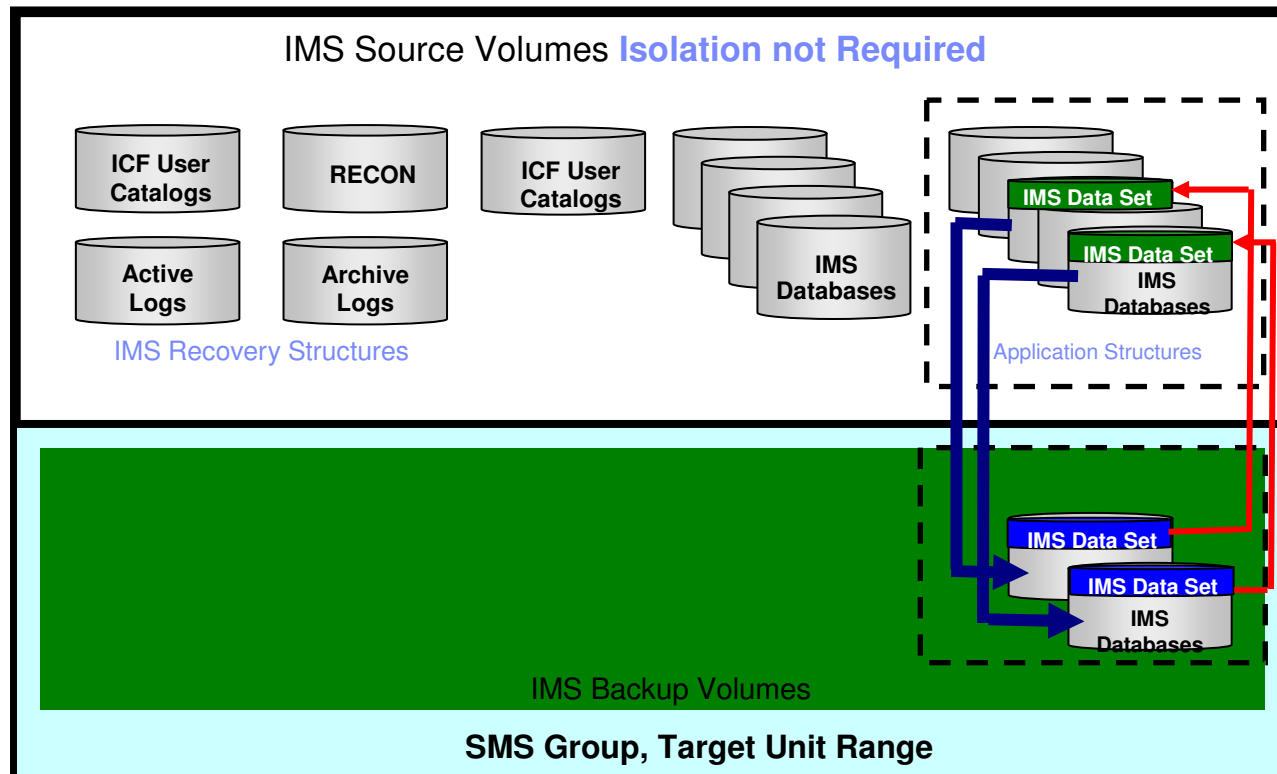 - Support more backup generations

IMS System Level Backup Usage Considerations
- Data Set Layout for Partial SLB / Application Recovery

- **Partial system level backup (PSLB)**
  - Backup volumes represent a subset of the database system
  - Does not require data set separation as only IMS data sets will be restored from the partial system level backup

IMS System and Database Environment

IMS Source Volumes **Isolation not Required**

ICF User Catalogs

RECON

ICF User Catalogs

IMS Data Set

IMS Data Set

IMS Databases

IMS Databases

Active Logs

Archive Logs

IMS Recovery Structures

Application Structures

IMS Data Set

IMS Data Set

IMS Databases

IMS Backup Volumes
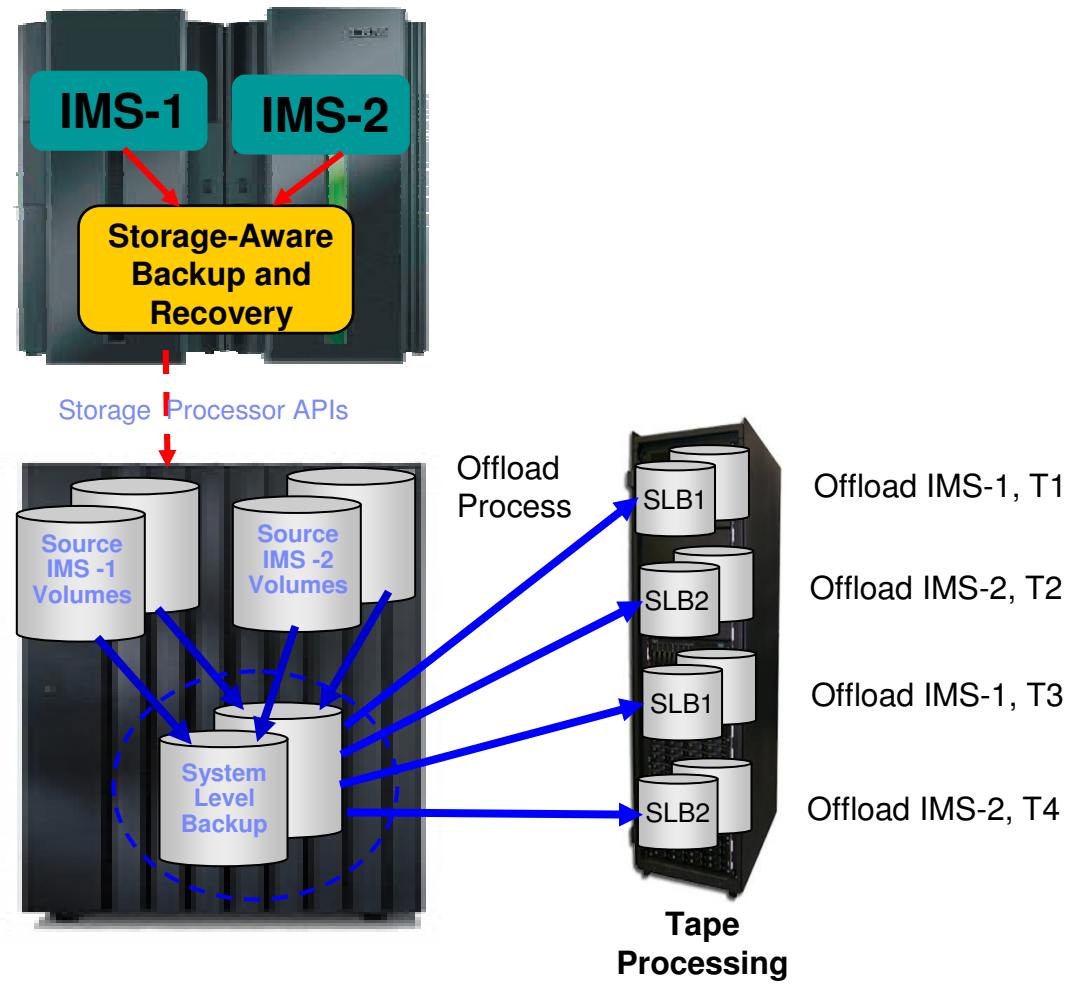
SMS Group, Target Unit Range

One Set of Backup Volumes for Multiple IMS Systems

- **Backup IMS–1**
  - SLB-1 created on disk
  - Archive SLB-1
  - Backup volumes are available after archive completes

- **Backup IMS–2**
  - SLB-2 created on disk
  - Archive SLB-2
  - Backup volumes are available after archive completes

- **Repeat for IMS-1**

- **Repeat for IMS-2**

IMS-1   IMS-2

Storage-Aware Backup and Recovery

Storage Processor APIs

Source IMS -1 Volumes

Source IMS -2 Volumes

System Level Backup

Offload Process

SLB1   Offload IMS-1, T1

SLB2   Offload IMS-2, T2

SLB1   Offload IMS-1, T3

SLB2   Offload IMS-2, T4

Tape Processing

System Level Backup Implementation Considerations
- Use of Space Efficient Fast-replication Technologies

- **Consider:**
    - Incremental fast-replication options to reduce background copy time and resources
    - Space efficient methods to save space
    - Cloning database systems to space efficient volumes using a full volume clone or SLB as the source

System Level Backup Implementation Considerations
- Use of Space Efficient Fast-Replication Technologies

- **Volume vs Space Efficient Operations**
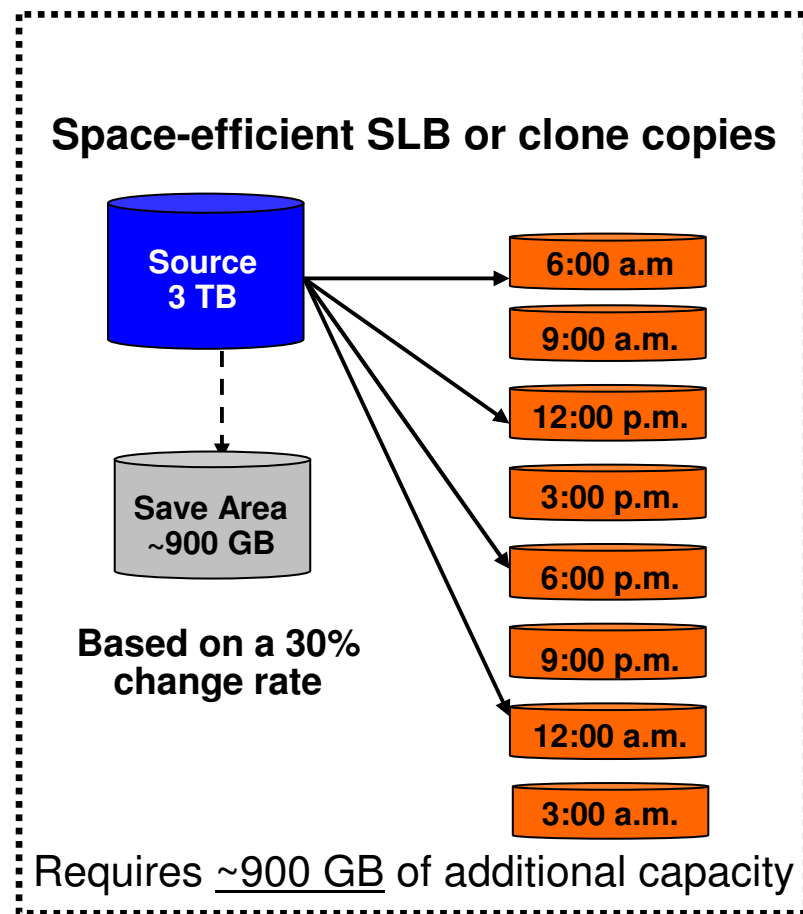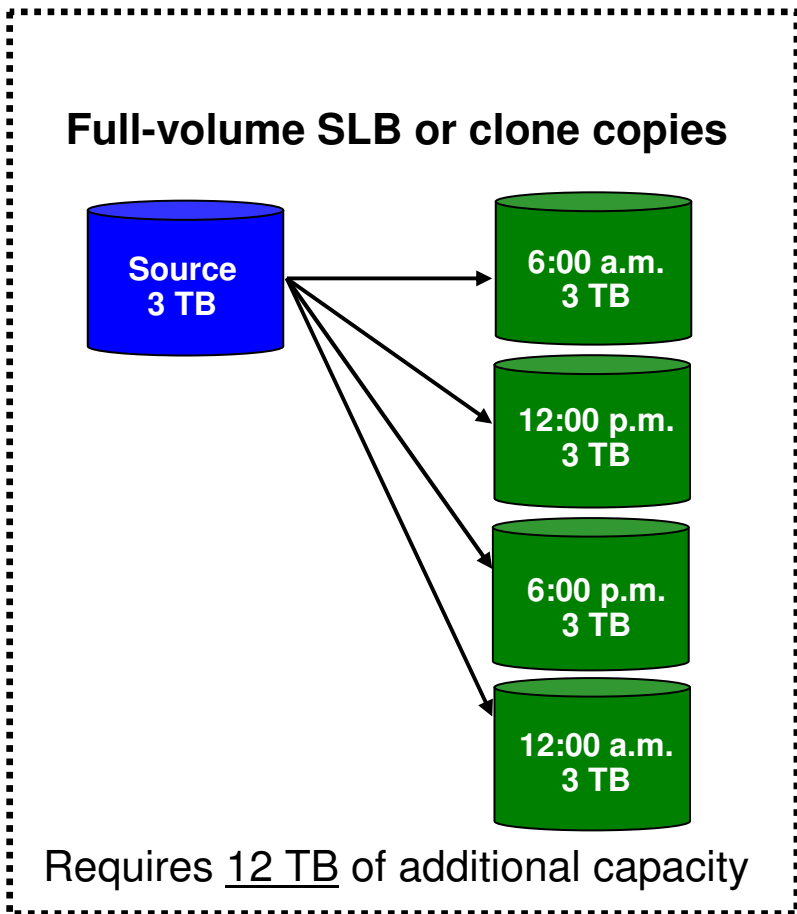
- **Full volume copy**
  - Copy requires same amount of storage as the source
  - Relationship can be retained with production volume
    - Allows incremental resynchronization
  - Full volume restore used for system restore operations
  - Fast replication data set level copy used for application or object recovery from non-archived backups

- **Space Efficient Devices**
  - Requires minimal additional storage
  - Restores changed tracks
  - Can have multiple volumes associated with production volume
  - Full volume restore used for system restore operations
    - Changed tracks restored from repository in save or extent pool
    - Full volume backup needed for catastrophic loss of source volume because only changed tracks are copied back
  - DFSMSdss **host** copy methods used for application or object recovery from non-archived backups
  - *Available for EMC TimeFinder/Snap, IBM/STK SnapShot, (IBM FlashCopy coming soon)

Space Efficient Usage Economics
- Enable Frequent SLB or Clone Copies

Full-volume SLB or clone copies

Source 3 TB

6:00 a.m. 3 TB

12:00 p.m. 3 TB

6:00 p.m. 3 TB

12:00 a.m. 3 TB

Requires <u>12 TB</u> of additional capacity

Space-efficient SLB or clone copies

Source 3 TB

Save Area ~900 GB

Based on a 30% change rate

6:00 a.m

9:00 a.m.

12:00 p.m.

3:00 p.m.

6:00 p.m.

9:00 p.m.

12:00 a.m.

3:00 a.m.

Requires <u>~900 GB</u> of additional capacity
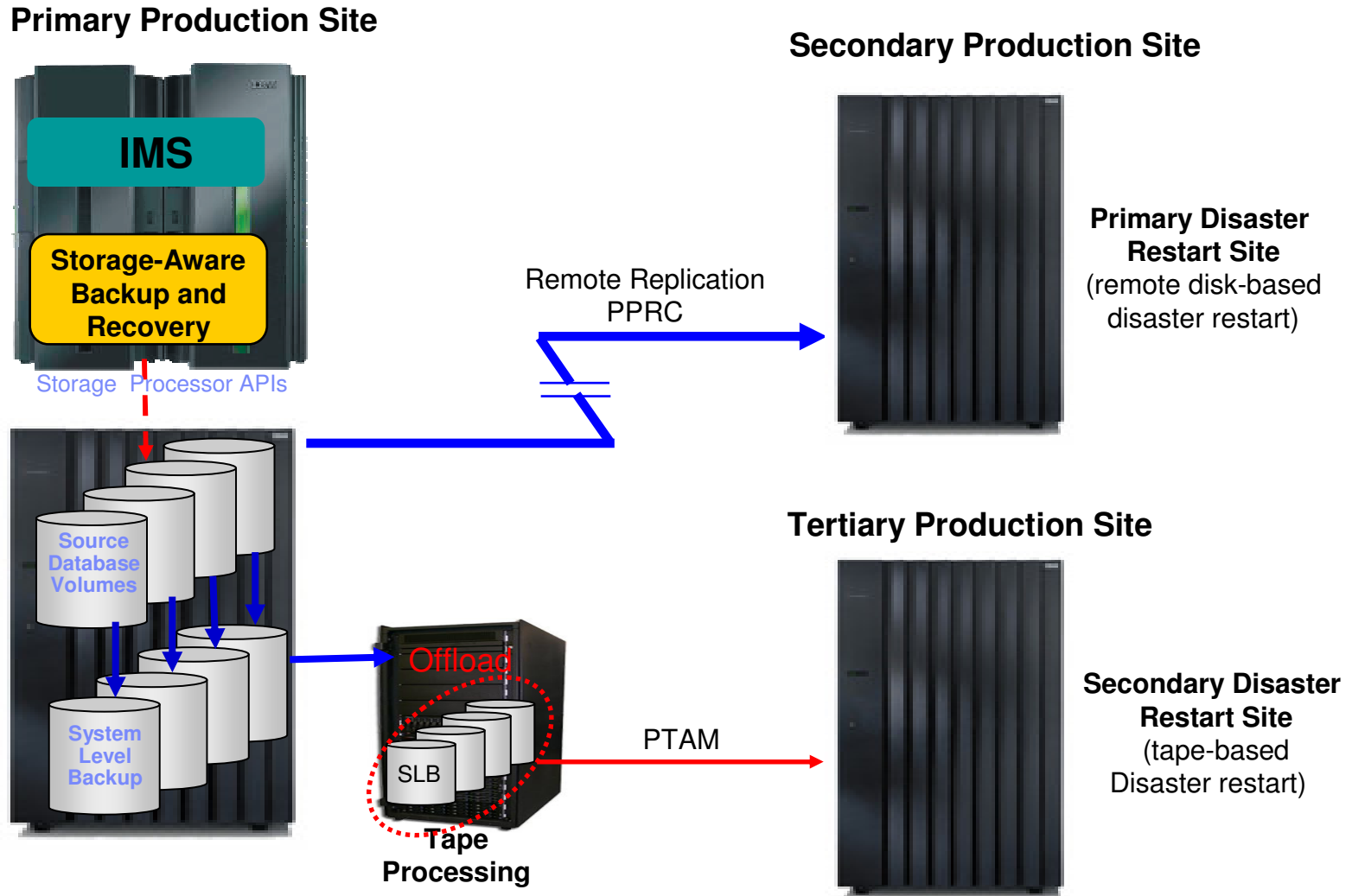
Space Efficient Cloning Using an SLB

- **Full system-level backup created using full volume fast-replication**

- **DBMS clone operations performed using SLB backup volumes as source**

- **Cloned DB systems use virtual storage devices (VDEVs)**
  - SLB volumes are used to service I/O for DB clone access
  - DB clone writes (few) go to save pool
  - DB SLB writes (none) go to save pool

- **Storage-aware database tools provides infrastructure and metadata to manage database and storage processor coordination**

- **Operational automation may be required to re-instantiate space efficient clones when the full volume clone is re-instantiated**

- ***FlashCopy SE, EMC TimeFinder/Snap, STK SnapShot**

IMS

Database System and Storage Coordination

Storage Processor APIs

Cloned IMS Systems on VDEVs

Source Database Volumes

System Level Backup

Save Pool
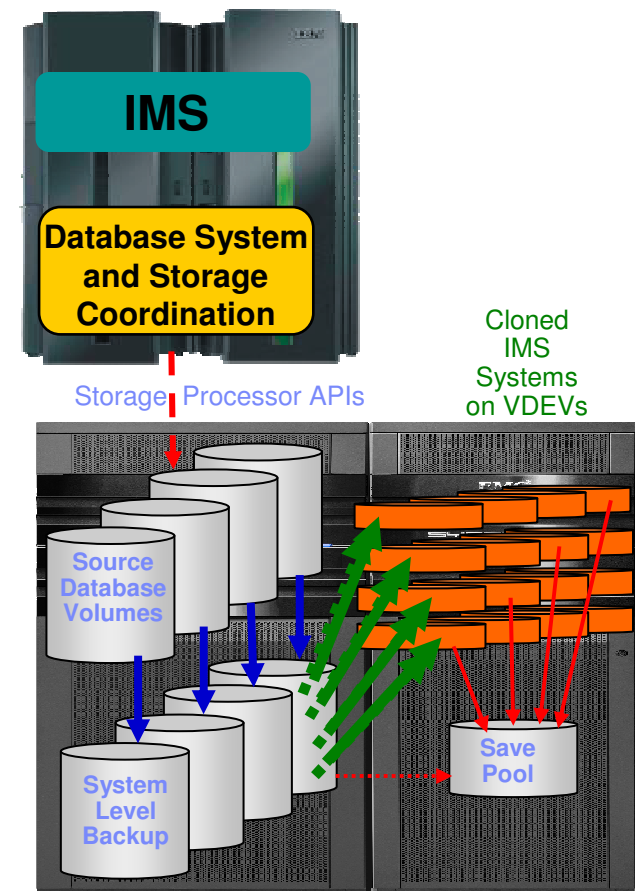
System Level Backup Implementation
- Copy Blade Selection

- **Know your storage processing infrastructure**
  - What storage processors are used (EMC, IBM, HDS)
  - What fast-replication facilities are licensed and preferred

- **Determine copy blade and fast-replication facilities to use**
  - IBM DFSMSdss
  - IBM FlashCopy
  - EMC TimeFinder
  - HDS ShadowImage

- **Determine which type of consistency function is best for your environment**
  - Database suspend process
  - Storage-based consistency

Using SLBs for a Tertiary DR Site

Primary Production Site

Secondary Production Site

IMS

Storage-Aware Backup and Recovery

Storage Processor APIs

Remote Replication
PPRC

Primary Disaster Restart Site
(remote disk-based disaster restart)

Source Database Volumes

Tertiary Production Site

System Level Backup

Offload

SLB

Tape Processing

PTAM

Secondary Disaster Restart Site
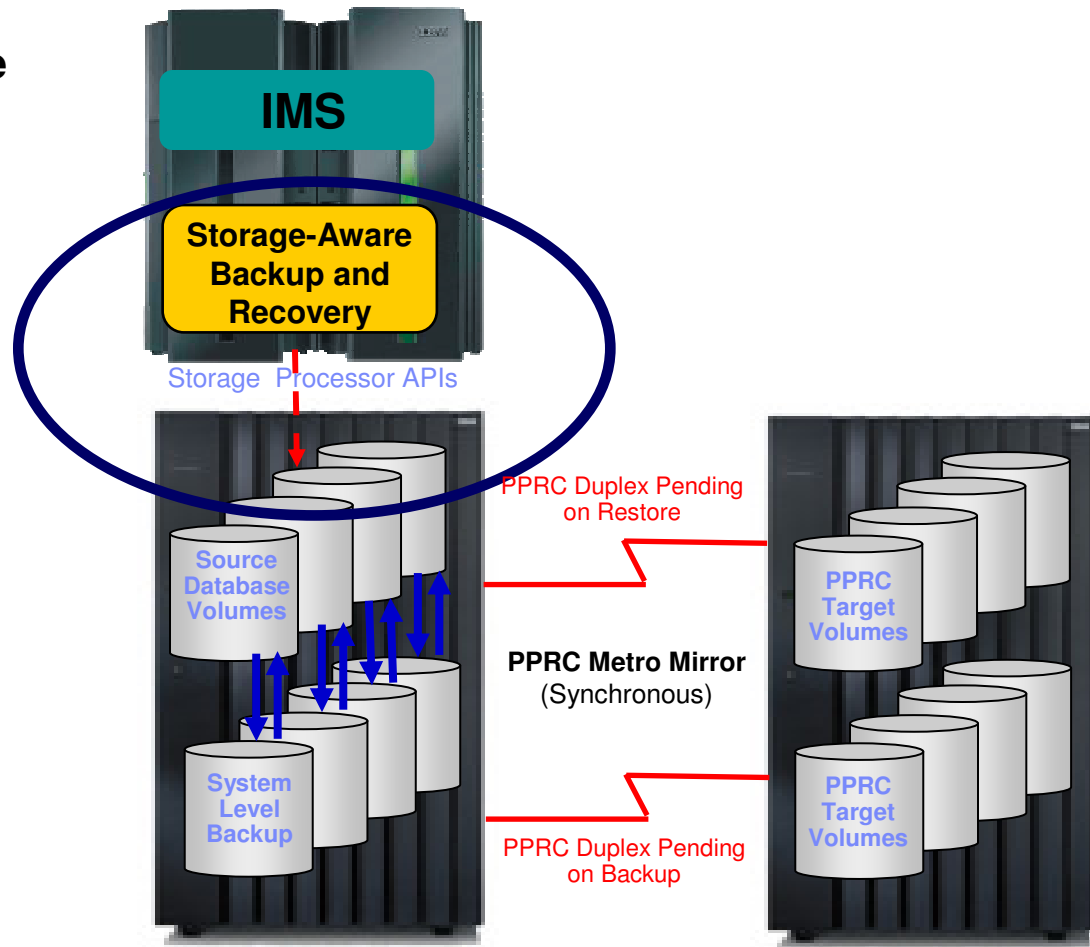(tape-based Disaster restart)

System Level Backup with PPRC Remote Pair FlashCopy

- **Storage Aware Backup/Recovery and "Remote Pair FlashCopy" Support**
  - FlashCopy to PPRC Primary volume **while maintaining Full Duplex**
  - FlashCopy Metro Mirror implementations only

- **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

- **Copy Blade Support**
  - FlashCopy Blade
  - DFSMSdss copy blade

System Level Backup Without Remote Mirror FlashCopy

- **SLB causes backup volume data to be copied through PPRC link**

- **SLB can cause PPRC duplex pending state**

- **SLB restore can cause PPRC duplex pending state**

IMS

Storage-Aware Backup and Recovery

Storage Processor APIs

Source Database Volumes

System Level Backup

PPRC Duplex Pending on Restore

PPRC Target Volumes

PPRC Metro Mirror (Synchronous)

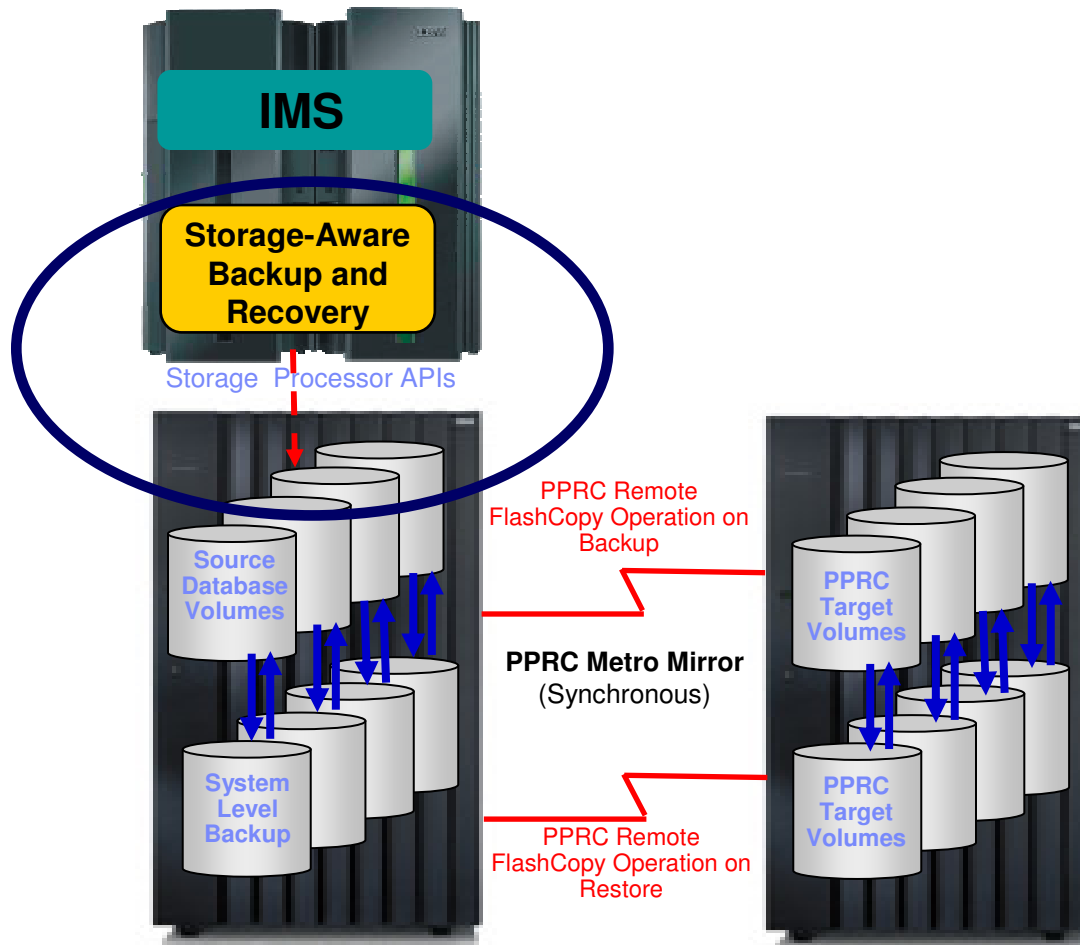PPRC Duplex Pending on Backup

PPRC Target Volumes

System Level Backup With Remote Mirror FlashCopy

- **FlashCopy data is not copied over PPRC links**

- **SLB drives remote pair FlashCopy operation**
  - Remote PPRC production volumes Flashed to remote PPRC SLB volumes

- **System level restore drives remote pair FlashCopy operation**
  - Remote PPRC SLB volumes Flashed to remote PPRC production volumes

IMS

Storage-Aware Backup and Recovery

Storage Processor APIs

Source Database Volumes

System Level Backup

PPRC Remote FlashCopy Operation on Backup

PPRC Metro Mirror (Synchronous)

PPRC Target Volumes

PPRC Target Volumes

PPRC Remote FlashCopy Operation on Restore

SLBs with XRC and PPRC without Remote Pair FlashCopy

- **Assume source volumes are primary volumes in a PPRC metro mirror or XRC relationship**

- **Backup target volumes must not be in a PPRC or XRC relationship**

- **Backup volumes cannot be used for DBMS system recovery without duplex pending state**

- **Application and database recovery allowed**
  - RE performs application and database recovery by copying data sets from the backup volumes 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.

Session Summary

- **Storage-aware database utilities provide storage integration to simplify database administration tasks**

- **System-level 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

- **Application recovery can leverage existing products**
  - Intelligent Recovery Manager can be implemented with or without SLBs
  - Implementation of an SLB methodology can be done over time

- **Intelligent Disaster Recovery Manager can support image copy or SLB method**

- **Less skills required to implement advanced backup, recovery, and disaster recovery solutions**

- **Implementation planning is important to optimize the benefits**