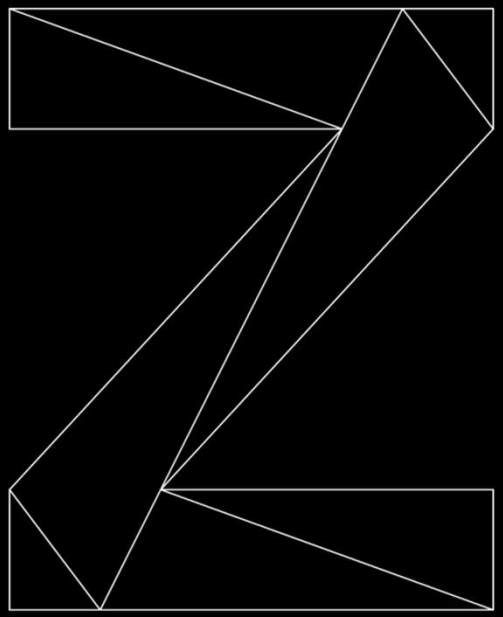
IMS Backup and Recovery
Better, Smarter, Faster



Rick Engel

Technical Team Leader and CTP

IBM NA Technical Sales

IBM

AGENDA

- Why Backup and Recovery ?
- Better, Faster, Smarter
  - Overview
  - Backup
  - Recovery
  - Change Accumulation
  - Disaster Recovery
  - Recovery Autonomics
- Summary

Question: What is probably the most important task that you would ever have to perform as an IT person if you were called upon to perform it?

IT disruptions effect more than just the bottom line

…. They have an enormous impact on the business

THE WALL STREET JOURNAL.

September 9, 2008
London Stock Exchange
Paralyzed by Glitch (Network Connection)

COMPUTERWORLD

April 21, 2011
Amazon Cloud Computing (Network Maintenance)

InformationWeek

September 6, 2010
Virginia Grapples with IT Outage (Memory Board)

GOVMONITOR
Public Sector News & Information

August 4, 2010
Singapore Censures DBS Bank For
System Outage On July, 5 2010 (Network Cable)

Lessons Learned from 9/11

Successful recovery needs more automation

- Critical skilled personnel were not always available
- IMO: Automation = “Smarter Programmatic” capabilities

Recovery and Primary sites needed compatible HW

- “Capacity Backup Option” (CBU) useful
- Primary and Remote sites needed same encryption HW

After successful recoveries, secondary DR plan needed

- Without primary site, all data now located in one place
- Solid business continuity plans are built on “redundancy”

End-to-end Business Recovery was not considered

- Successfully completing transactions
  - Required other vendors/BPs

Source: IBM Storage Infrastructure for Business Continuity, White Paper, October 11, 2005, Bob Kern (IBM), Victor Peltz (IBM)

Overview

IBM IMS Recovery Solution Pack

Delivered Components

IMS Recovery Solution Pack (HAHM210)

- IMS Database Recovery Facility
- IMS Database Recovery Facility / Extended Functions
- IMS High Performance Change Accumulation

- IMS High Performance Image Copy (H1J0420)
- IMS Index Builder (H22O310)
- IMS Recovery Expert (HAEP220)

IMS Tooling Solutions

Designed For

"Smarter, Better, Faster"

IBM IMS Recovery Solution Pack

Processes Delivered

IMS Recovery Solution Pack provides proven solutions to protect your IMS system through intelligent backup and recovery processes

- Backup Solutions
  - Image Copy, System Level Backup (SLB)
- Change Accumulation Solutions
  - Normal CA, Point-in-Time CA (PITCA)
- Recovery Solutions
  - Current, Timestamp, Point-in-Time (PITR), LASTIC, PITCA, LASTPITCA
  - Image copy, change accumulation, point-in-time change accumulation (PITCA), archived logs, SLB
- Disaster Recovery Solutions
  - SLB and/or IC based solution
- Recovery Autonomics Solutions
  - Identify potential problems that can affect recovery

Backup Solutions

IBM IMS Recovery Solution Pack

Backup

High Performance Image Copy

- Create as-is image copies of one or more database data sets in parallel
  - Batch or concurrent, compressed or uncompressed, stacked or not stacked
- Reduced CPU utilization and elapsed time by using the High Performance I/O (HPIO) function
- Create near instantaneous image copies by invoking Advanced Copy Services which leverages FlashCopy, SnapShot Copy, and Concurrent Copy technologies
  - Do you leverage your organization's investment in modern DASD technology for IMS backup processing ?
- Automatically /DBR and /STA database data sets around the IC process using the IMS Tools Online System Interface
- Perform HASH check function to check database pointers as the image copy is created
- Collect database statistics (sensor data) and store in a central repository for use by autonomics processes

IBM IMS Recovery Solution Pack

Backup

IMS Recovery Expert

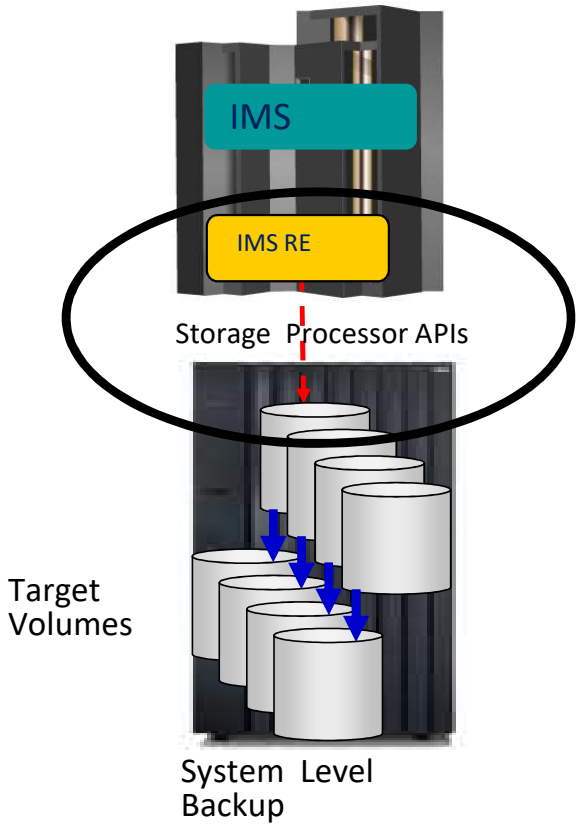
- Backup an entire IMS environment (full or data only) using storage-based fast-replication technologies: IBM FlashCopy, EMC TimeFinder, HDS ShadowImage, IBM DFSMSdss
  - Almost instantaneous backup of multiple volumes with little to no impact to the active IMS subsystems
  - Referred to as a System Level Backup (SLB)
  - Can include a single IMS system, multiple IMS systems in a data sharing environment, multiple IMS systems (data sharing or not) or one or more IMS systems (data sharing or not) and one or more DB2 subsystems (data sharing or not)
    - Inclusion of DB2 subsystems requires the companion product IBM DB2 Recovery Expert
- SLB effectively contains image copies (batch or concurrent) for all databases associated with the system at the time the SLB was created
  - Optionally register IC records in DBRC (RECONs) as SLB is taken or create standard ICs from SLB
- Offload SLB to create up to four copies for local recovery and/or DR site recovery
- All information related to SLBs and other IMS RE processes are stored in our Meta Data Repository

IBM IMS Recovery Solution Pack

Backup

System Level Backup Overview – The "Next Level" of Backup

- 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 a volume level backup
  - Backup completed in seconds or less
  - Offloading data copy process to the storage processor saves CPU and I/O resources
- Backup DBMS without affecting applications
  - Backup windows can be reduced by replacing image copies
    - Fact: 60% of data management are in 'backup processing'
  - Extends processing windows
- Data consistency ensures data is dependent-write consistent
  - IMS Log Suspend (optional, not recommended)
  - Storage-based consistency functions
- Image Copies can be created from SLB



IBM IMS Tools

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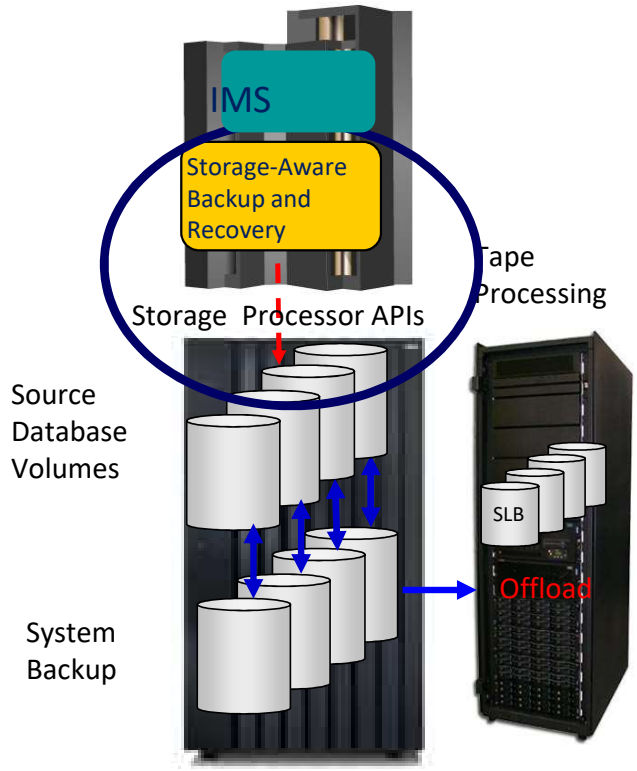
Backup

System Level Backup Overview – The "Next Level" of Backup

- Can automatically offload SLB
  - Copy SLB from fast replication disk to disk or tape for use at either local or DR site (or both)
  - Can create up to 4 copies
    - 1 or 2 for local recovery
    - 1 or 2 for DR
- Fast replication disk can then be freed up and ready for the next SLB to be created



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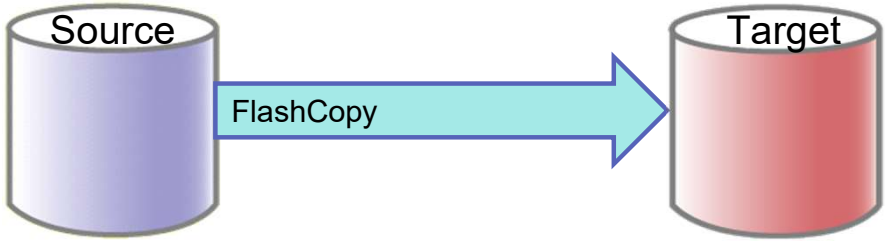
Backup



Specifications

1) 13 TB of data
2) 461 volumes
3) DS8300
4) 2817-M80 z196
5) 4,075.28 trans/second

6) Backup Elapsed = 0.37 secs

```
                IMS Recovery Expert for z/OS
                    Backup Summary Report
Utility Executed:..... Backup
Profile Name:......... ROCKET1.BKUP1
IMS Subsystem:........ IMSP
IMS Version:.......... 12.1
Backup Type:.......... Flash Copy
Backup Contains:...... Database, Log Data (Mixed)
Partial Backup:....... No
Nbr of Volumes:....... 0461
Backup Date:.......... 02/01/2012
Backup Time:.......... 2012-02-01-17.03.20.671934
Consistency Method:... Flash Consistency Group
Supports Database Restore: No
I/O Suspend Time:..... 2012-02-01-17.03.20.671932
I/O Resume Time:...... 2012-02-01-17.03.21.042397
Backup Elapsed:....... 00.37 Seconds
```


IBM IMS Tools

Recovery Solutions

IBM IMS Recovery Solution Pack

Recovery

IMS Database Recovery Facility

- Recover multiple database data sets and Fast Path areas simultaneously
  - Highly scalable environment
  - Process up to 14k DBDS per job
  - Recover up to 250 DBDS in parallel
- Integrate recovery related tasks into a single job step:
  - Index rebuild (FF, FP, HALDB)
  - Post-recovery IC
  - HASH check DB pointers
- Automatic /DBR and /STA of database data sets around recovery
- Includes an API to IMS Recovery Expert to support SLB as IC
  - Allows the use of an SLB as an image copy if it is the best fit based on the recovery time

IBM IMS Recovery Solution Pack

Recovery

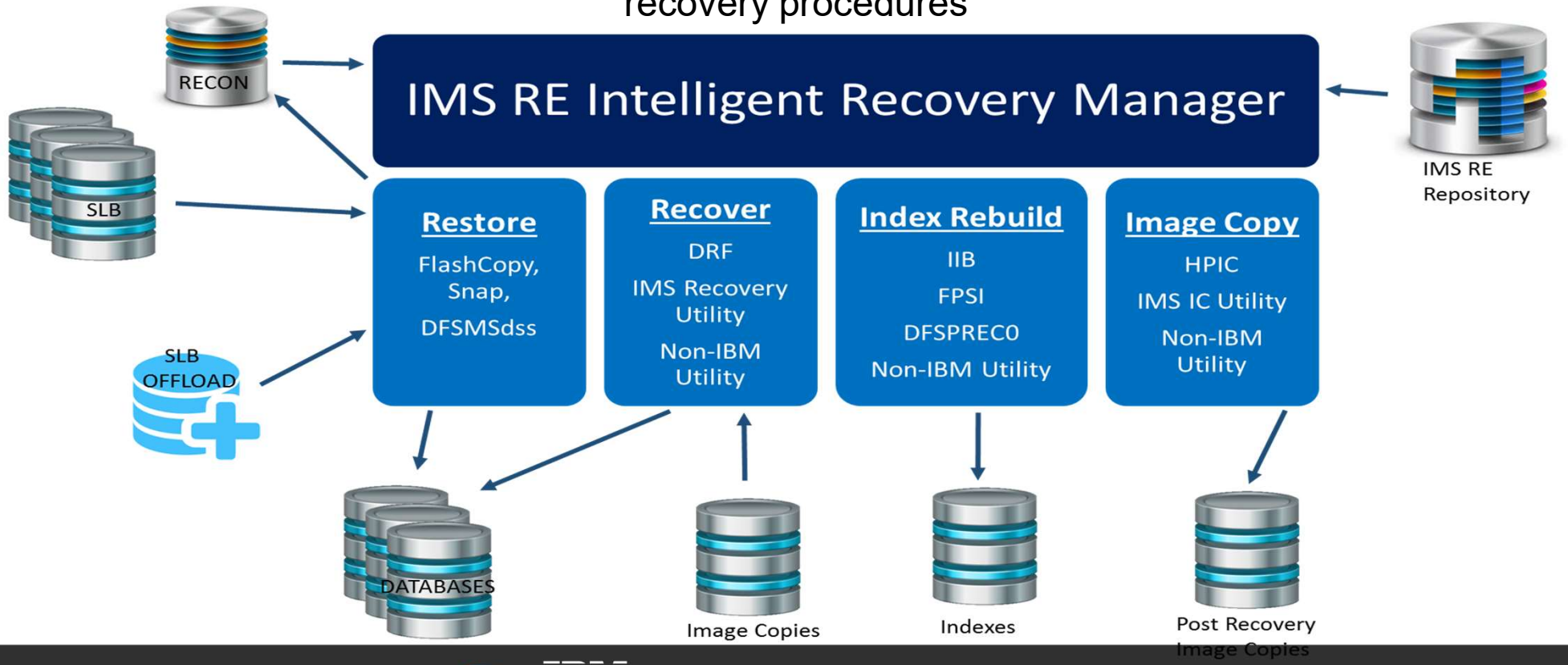
IMS Recovery Expert

- Intelligent Recovery Manager determines best possible method for recovery and drives the processes necessary to accomplish recovery
  - SLBs are not a requirement for using IMS Recovery Expert to drive recovery
- Executes and monitors the processes necessary to perform recovery and related tasks
  - Automatic /DBR and /STA of databases and mark DBDS as recovery needed around recovery
  - Recovery using IC or SLB
  - Forward recovery using CA and/or archived logs
  - Rebuild associated indexes (FF, FP, HALDB)
  - Perform post-recovery IC
- JCL to drive the processes needed to perform recovery and related tasks is created dynamically using skeletons you tailor to your environment
  - Sample skeletons are shipped with the product ready to be tailored

IBM IMS Recovery Solution Pack

Recovery

Analyze recovery assets and establish optimal recovery procedures



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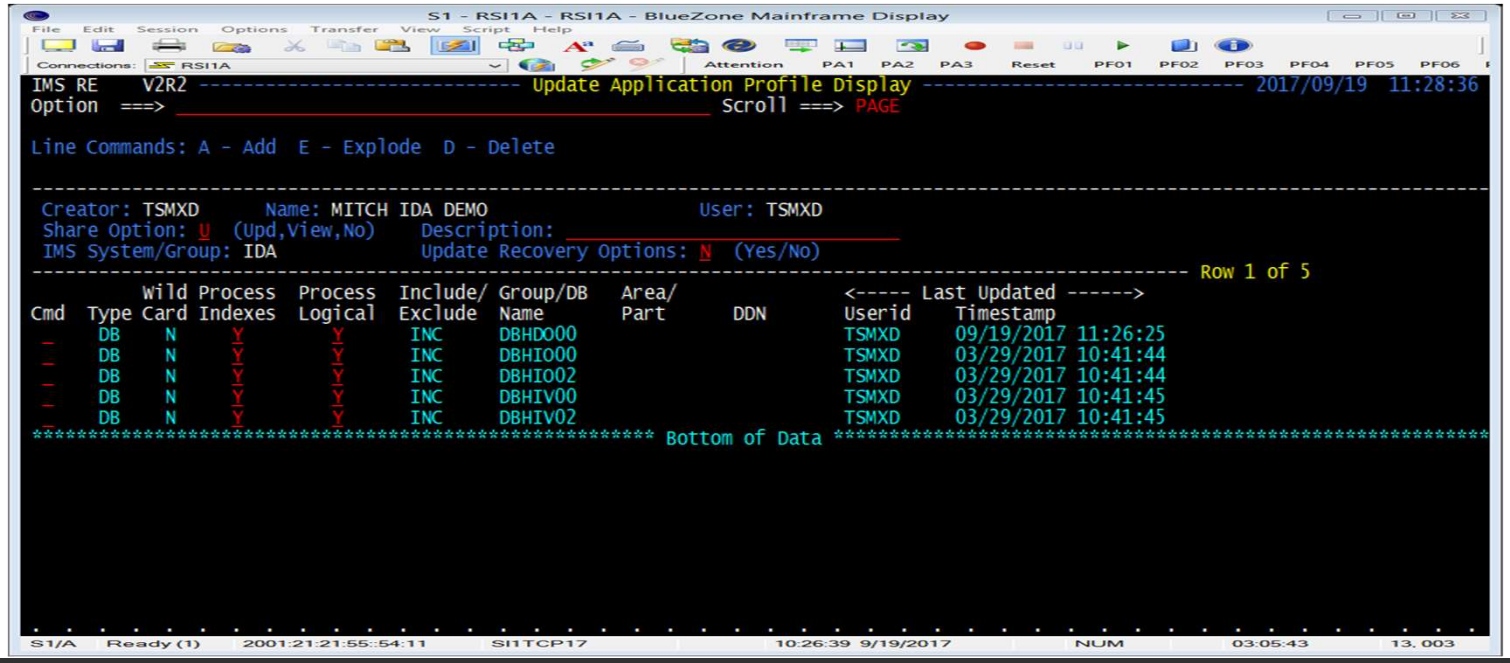
Recovery

IMS Recovery Expert

- Application Profile specifies IMS objects to be recovered
  - Auto-include indexes and logically related databases



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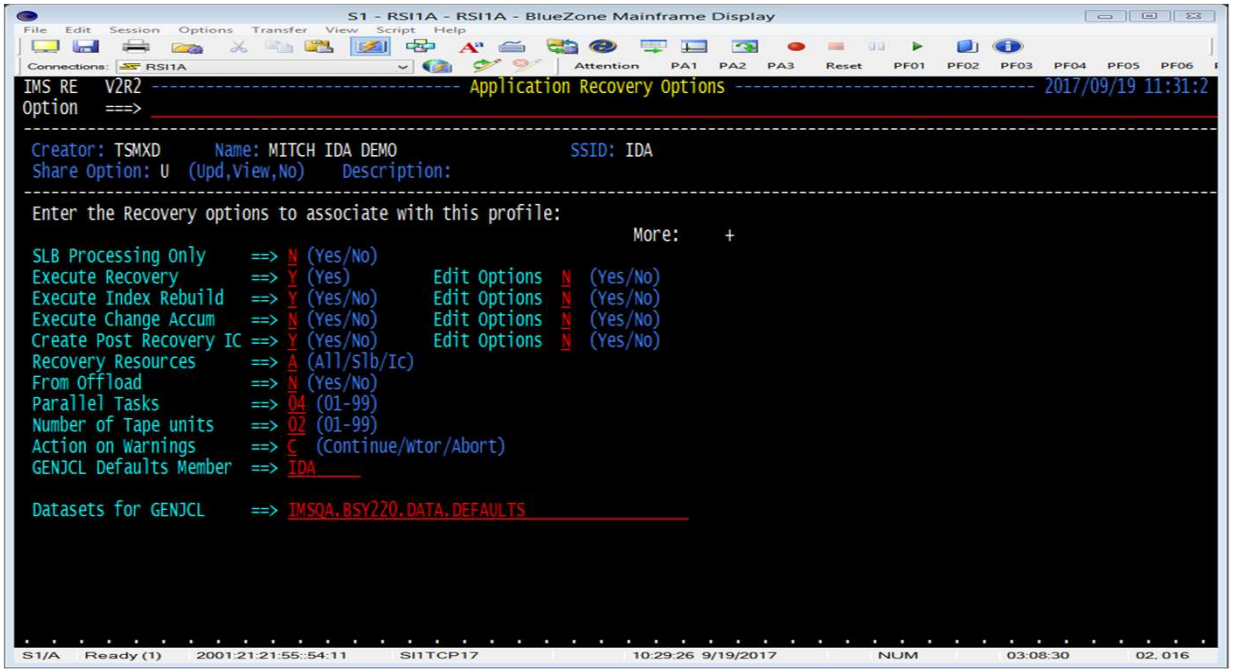
IBM IMS Recovery Solution Pack
Recovery

IMS Recovery Expert

- Recovery options specify processes to be performed with recovery
  - Optionally drive the 4 processes

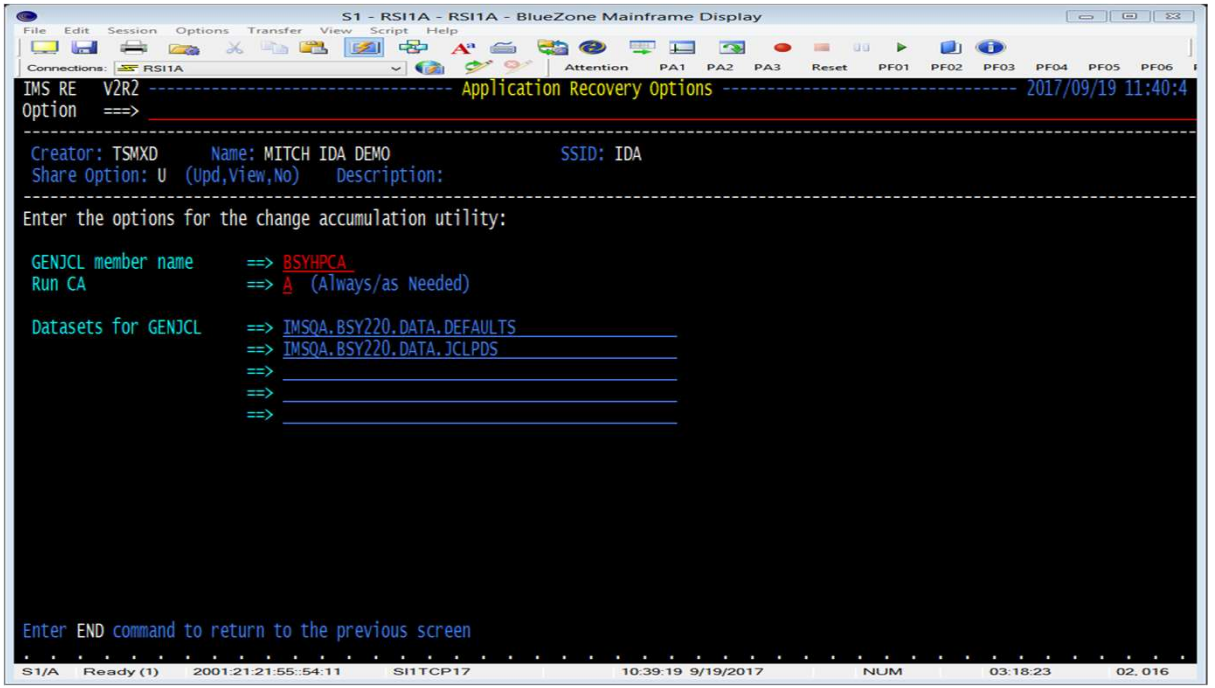


IBM IMS Tools

IBM IMS Recovery Solution Pack
Recovery

IMS Recovery Expert

- Change Accumulation utility options



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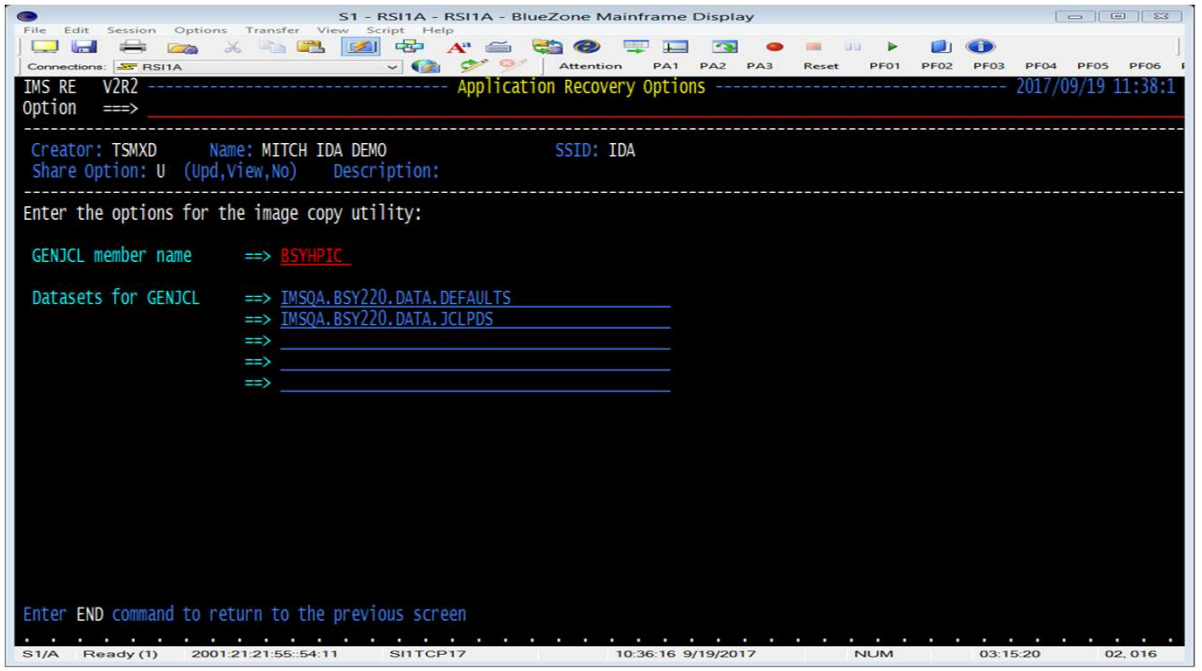
IBM IMS Recovery Solution Pack
Recovery

IMS Recovery Expert

- Post recovery Image Copy utility options



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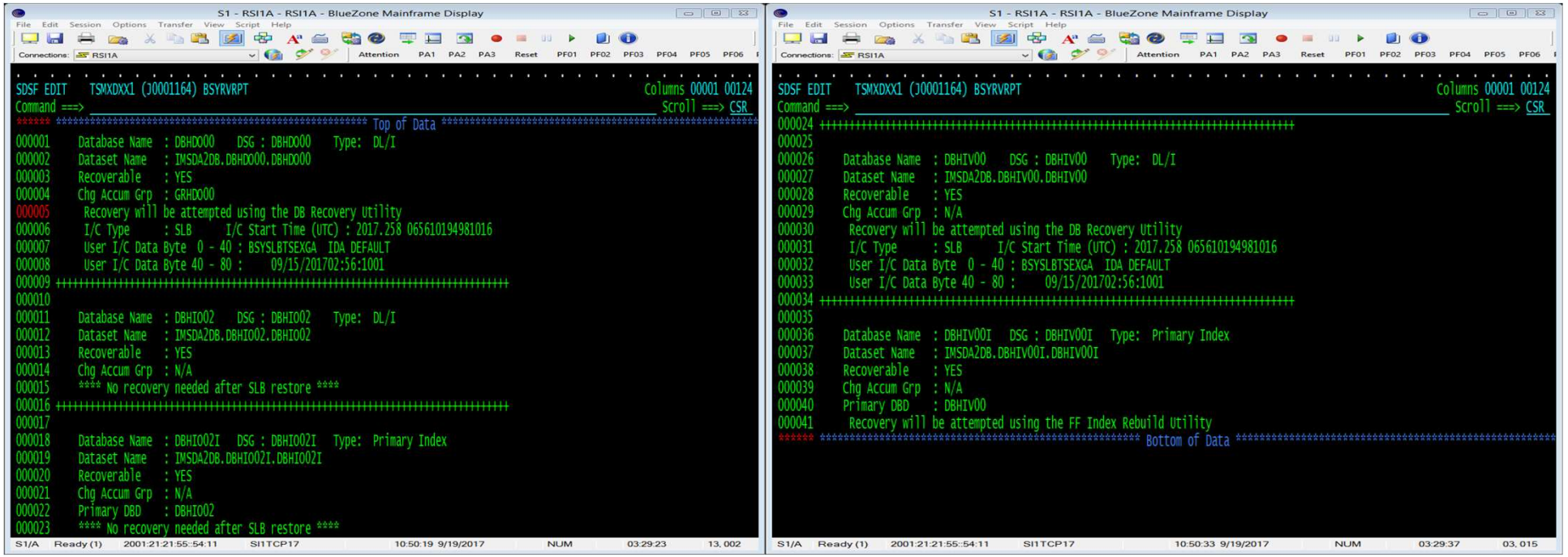
IBM IMS Recovery Solution Pack

Recovery

IMS Recovery Expert

- Recovery report indicates how each DB / Index will be recovered



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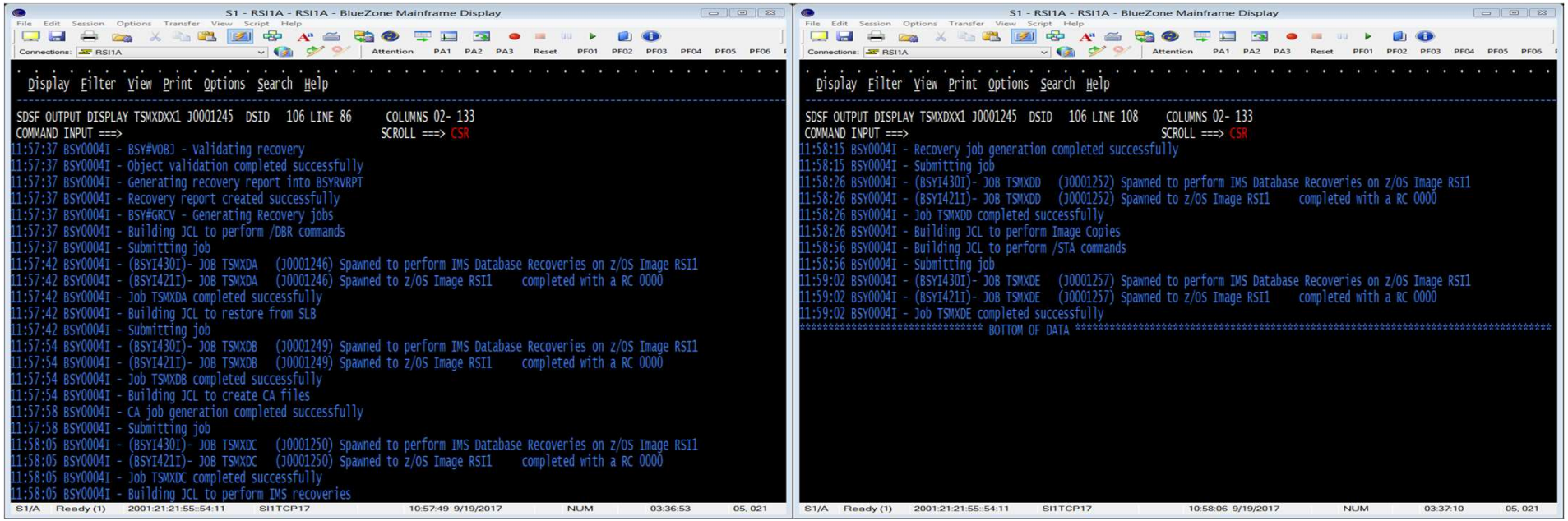
IBM IMS Recovery Solution Pack
Recovery

IMS Recovery Expert

- Post-Recovery Image Copy Utility Options



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Change Accumulation Solutions

IBM IMS Recovery Solution Pack

IMS Change Accumulation

High Performance Change Accumulation

- High-speed creation of change accumulation data sets
- Multiple change accumulation groups processed in parallel
  - Multiple address space architecture provides better throughput
  - Single read of log data sets
- Reduces the number of archived logs needed for recovery
- Create point-in-time change accumulation (PITCA) which contains only committed changes to the specified point in time
  - Beneficial for disaster recovery or cloned system recovery

Disaster Recovery Solutions

IBM IMS Recovery Solution Pack

Disaster Recovery

IMS Recovery Expert

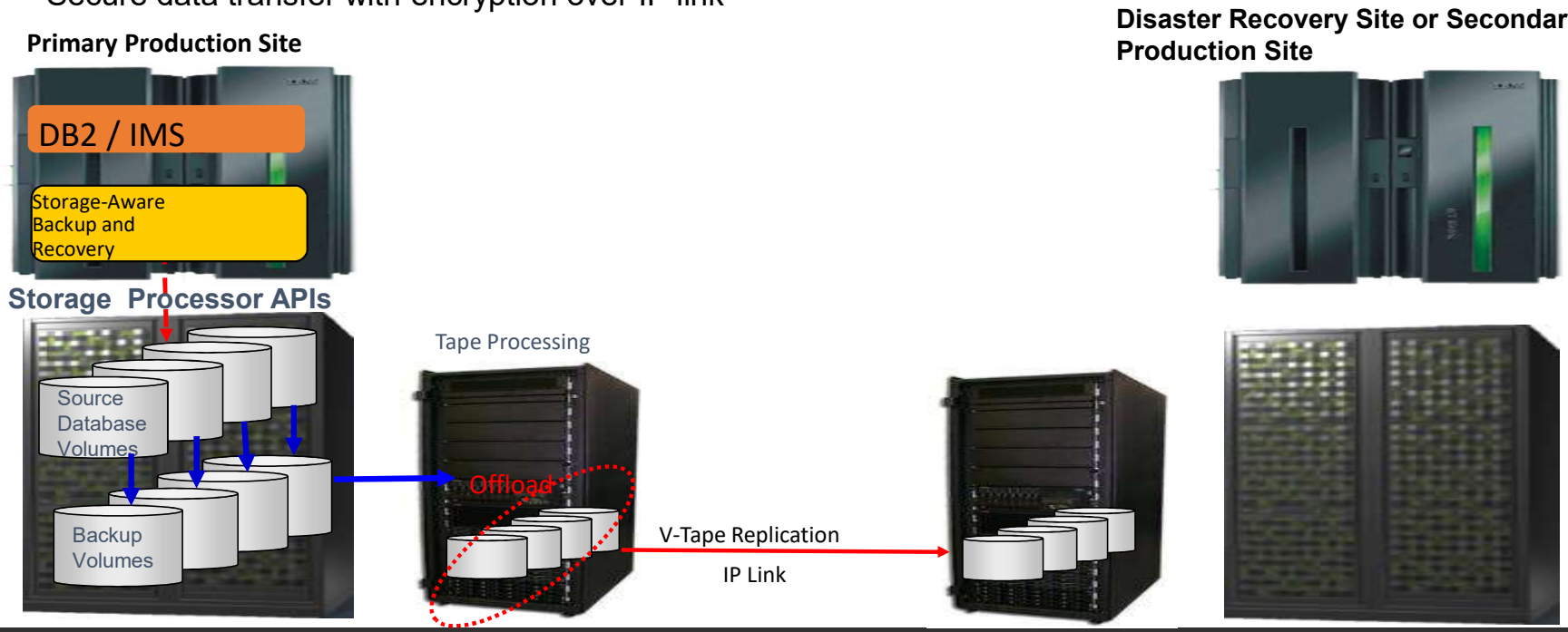
- Reduce **recovery time objectives** by transforming disaster recovery into a disaster restart process
  - Highly tailorable process which runs on the local site, at any user defined time and as frequently as needed, to identify recover assets, prepare the resources and jobs needed at the DR site to perform disaster recovery
    - Conditions a copy of the RECON data sets based on the most current recovery assets available
    - System Level Backup or Image Copy (or mixed) based DR
    - Creates a DR PDS which contains a series of jobs which restore the IMS RE repositories, IMS system, and IMS database data sets
    - Works well with VTAPE technology to allow resources to be immediately available at the DR site
  - Integrates with DRF/XF HCHECK function at the local site to identify problems which could affect DR
  - Coordinated IMS and DB2 DR when paired with the IBM DB2 Recovery Expert product

IBM IMS Recovery Solution Pack

Disaster Recovery

Virtual Tape and Replication – Used by Many Customers

- Initially designed to improve backup processing speed
- Through replication, 'Tape' becomes available at remote site
- Secure data transfer with encryption over IP link



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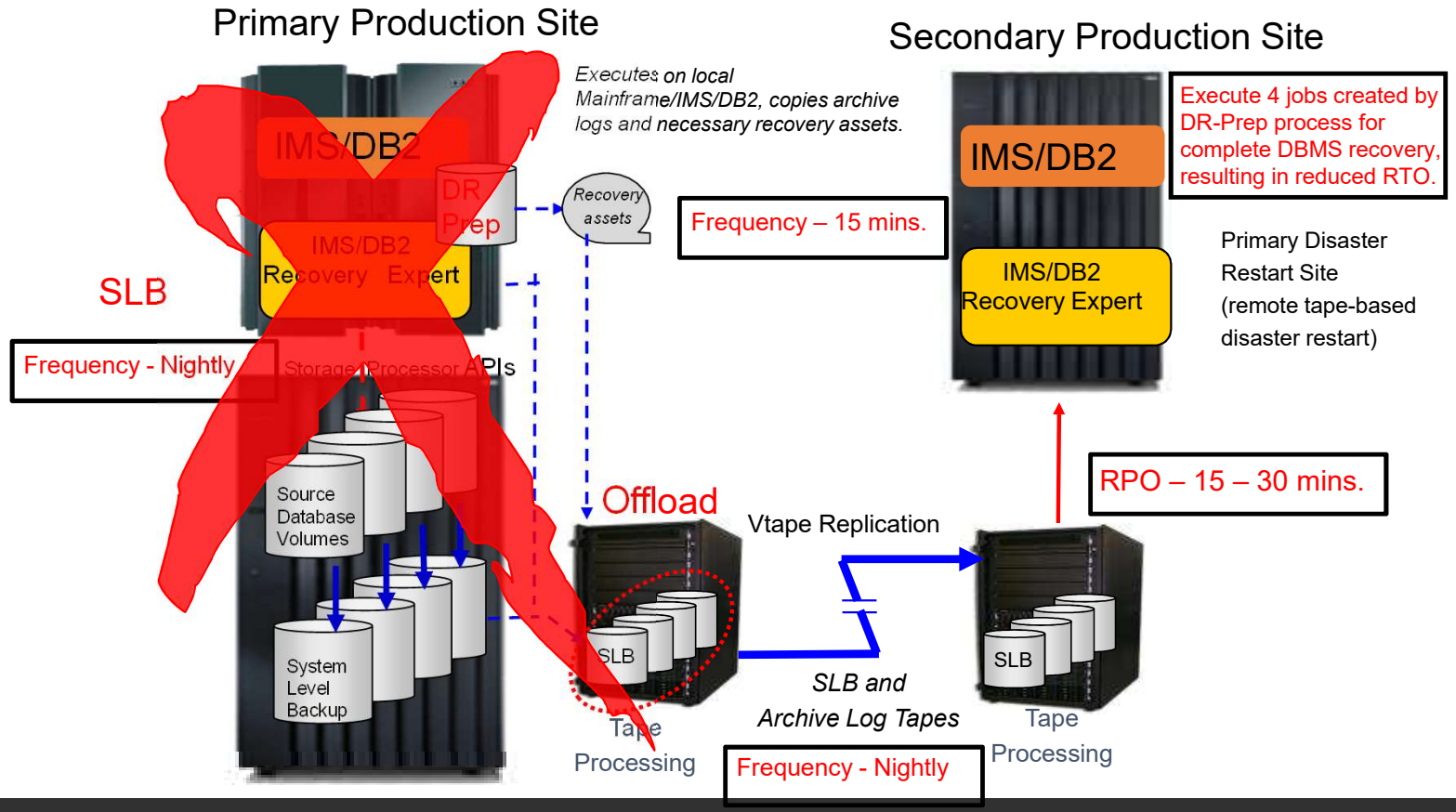
Tape Based Disaster Recovery Process



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Recovery Autonomics Solutions

IBM IMS Recovery Solution Pack

Recovery Autonomics

- Benefits
  - Save time/work for DBAs, IMS Systems Programmers
  - Automated detection of issues effecting database recovery
  - Present a clear global view of all issues in all RECONs
  - Provide easily accessible views to focus on problem details
  - Recommend appropriate actions
  - Passive autonomics support at this time – no actions taken
- Components
  - Recovery Sensor, Autonomics Director, Policy Services, ITKB Repository
- IMS Recovery Autonomics is implemented by the following products
  - IMS Recovery Solution Pack
  - IMS Tools Base

IBM IMS Recovery Solution Pack

Recovery Sensor: Data Elements

- Some data elements associated with Recovery Autonomics collected by Recovery Sensor
- Split into four new categories
  - Image copy
  - Recovery
  - Database backout
  - Change accumulation
- Source for data elements
  - RECON Flags
  - Elapsed times since last IC/CA
    - Timestamp of last IC/CA collected to calculate elapsed times at evaluation
- Recovery Sensor is a batch job that can be scheduled through any job scheduler or the Autonomics Director

Image Copy
- DB_DBRC_IC_NEEDED
- DB_DBRC_IC_RECOMMENDED
- DB_IS_IN_A_DBRC_CAGRP
- DB_HOURS_SINCE_LASTIC

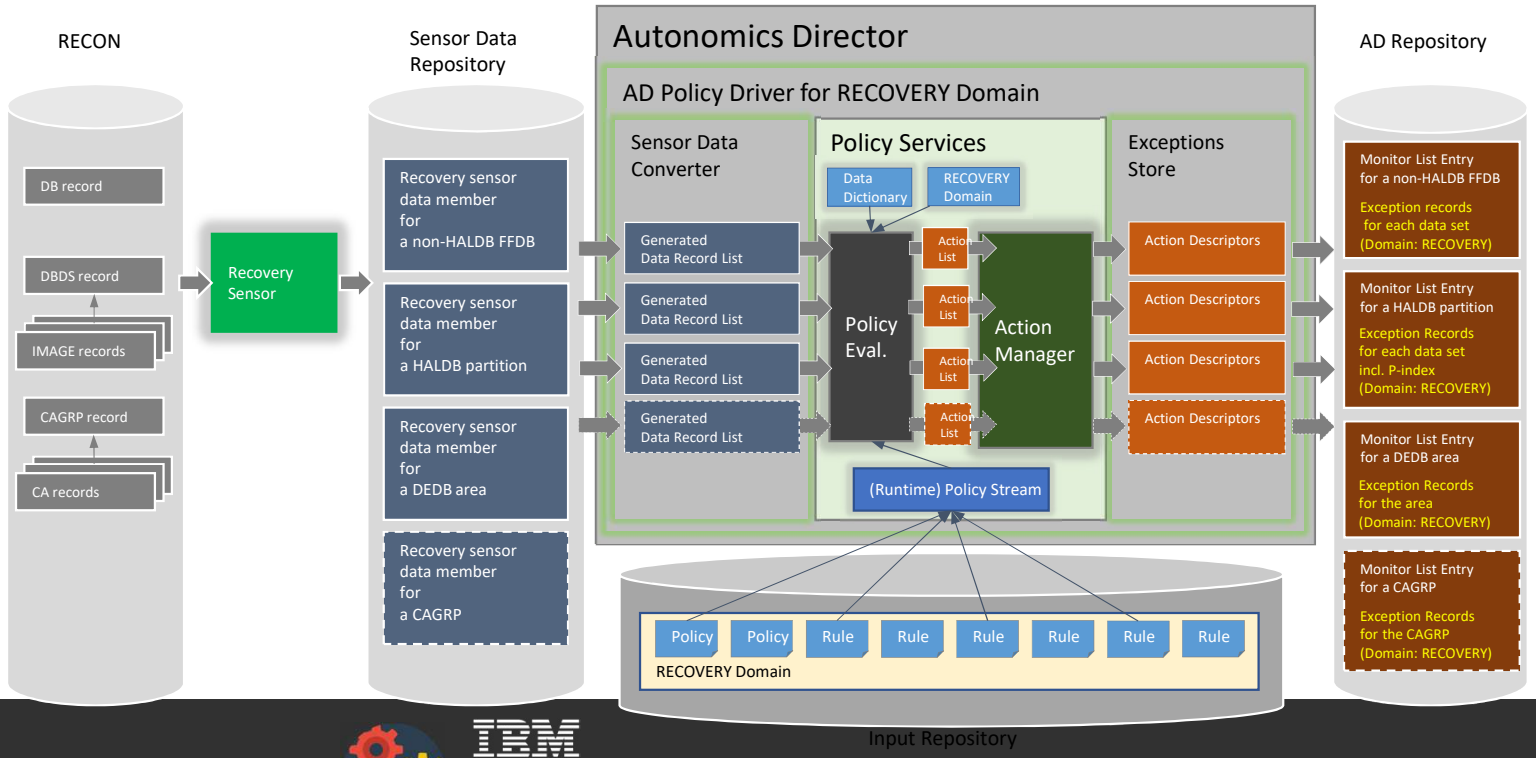
Recovery
- DB_DBRC_EEQE_COUNT
- DB_DBRC_RECOV_NEEDED

Database Backout
- DB_DBRC_BACKOUT_NEEDED

Change Accumulation
- DB_HOURS_SINCE_LASTCA

Autonomics Components: Data Flow

- An action list is created only when an exception is detected by Policy Service



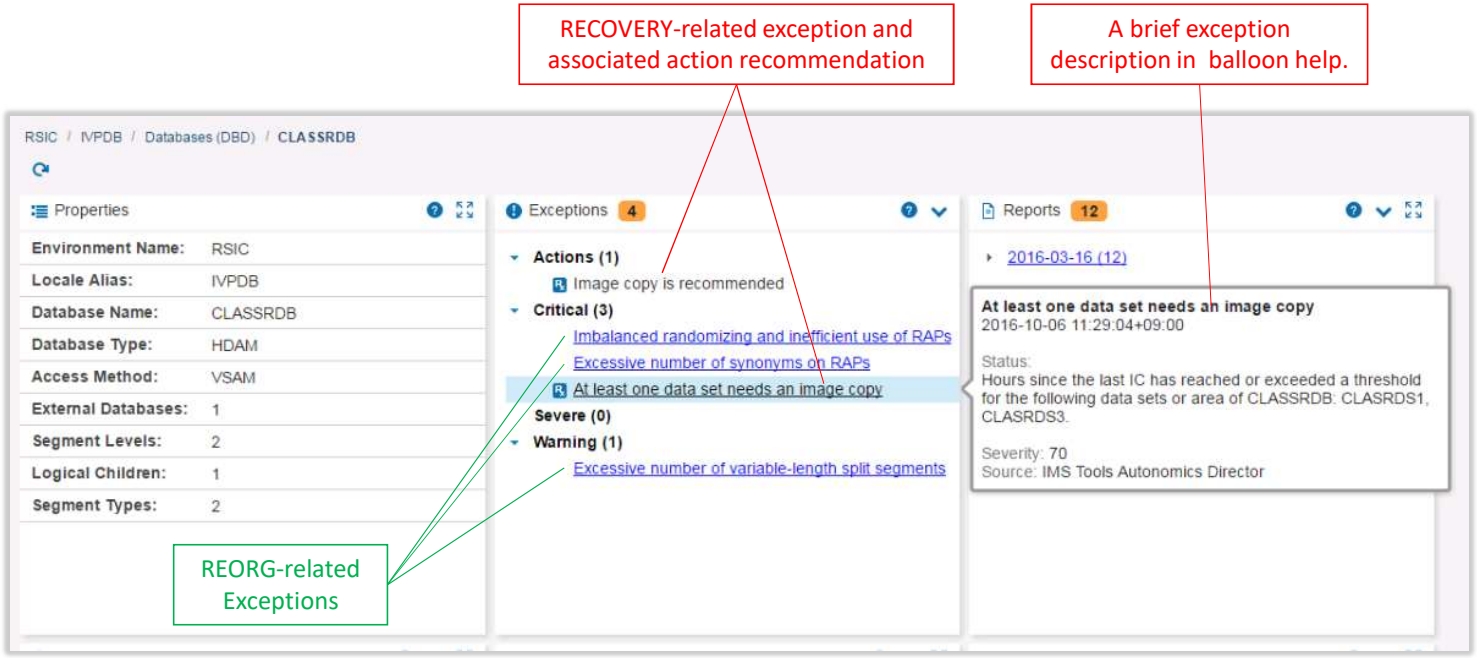
IBM IMS Tools

IBM Management Console for IMS and DB2

- Management Console (MC) integrates with Autonomics Director to provide comprehensive and customizable views of all IMS environments across your enterprise
- You can view statistics for IMS databases from any of your IMS environments within a single MC session
- **Exceptions widget** on MC
  - Shows exceptions that are generated when database states cross thresholds that are specified in policies that you define in Policy Services
  - Helps you to focus on those databases that need your attention and eliminate unnecessary manual analysis and routine preemptive tuning
  - Provides recommendations to help you address certain types of exceptions
    - This reduces DBA's data analysis work and help DBA move more quickly from a potential problem to a resolution.

Exceptions Widget Enhancement for Recovery Exceptions

- Support for exceptions detected in RECOVERY policy domain
  - This enhancement was provided as APAR PI72225 (PTF UI44512) for IBM Management Console for IMS and DB2 for z/OS V1.1 (5655-TAC)



IBM IMS Tools

Summary
and
Wrap Up

Your IBM IMS Customer Facing Team for North America

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