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Coordinated Recovery for IMS, DB2, and VSAM

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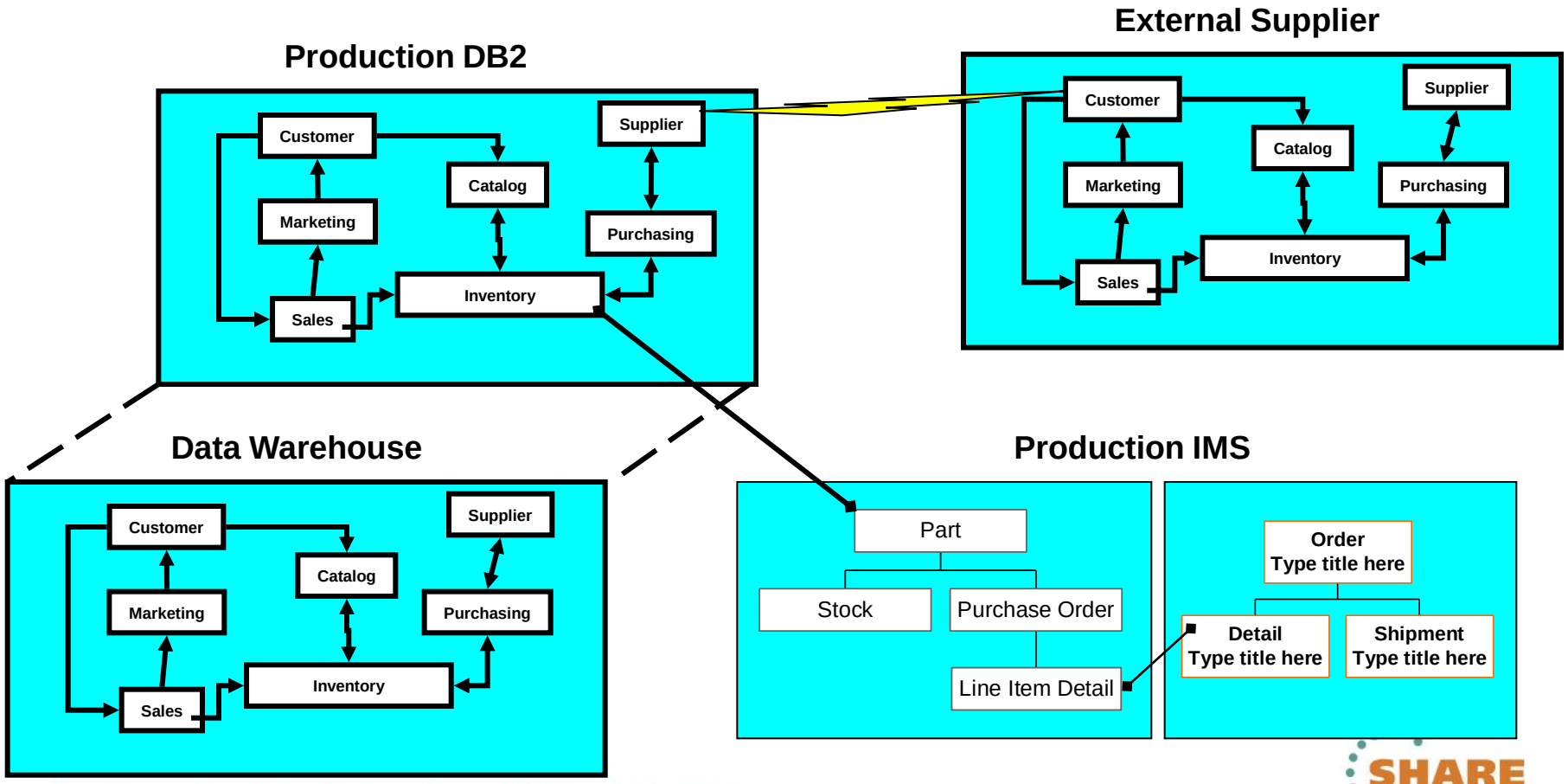
Today we will discuss….

- The need for Coordinated Recovery
- What can cause an outage?
- BMC Building blocks – solutions for local and disaster recovery
- Backup strategies and solutions
- PIT recovery options
- Local DB2 PIT recovery considerations
- Disaster declaration?
- BMC Coordinated Disaster Recovery support

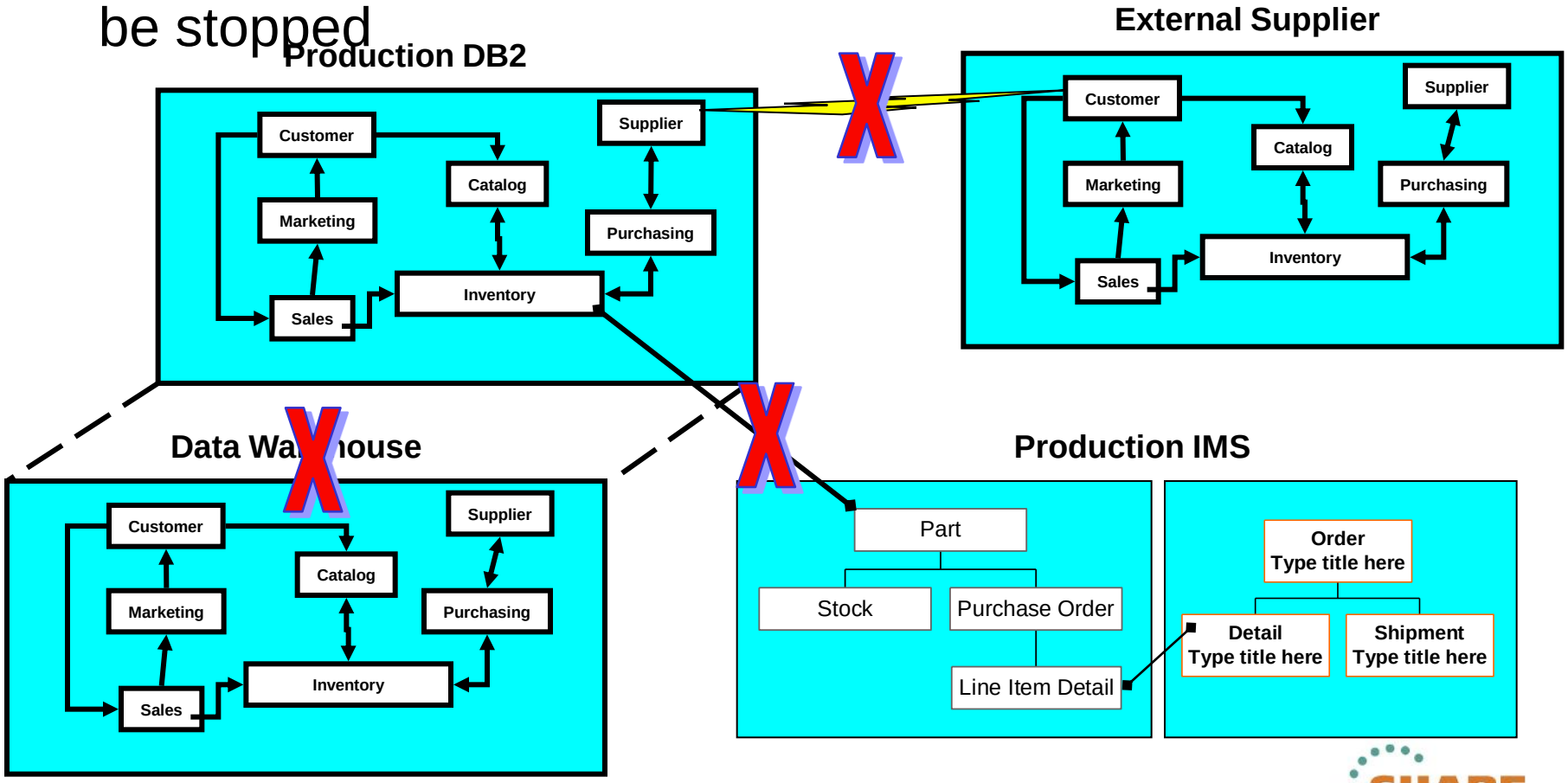
Complexity Creep

- Relationships within and between unlike DBMSes
- Relationships outside the organization



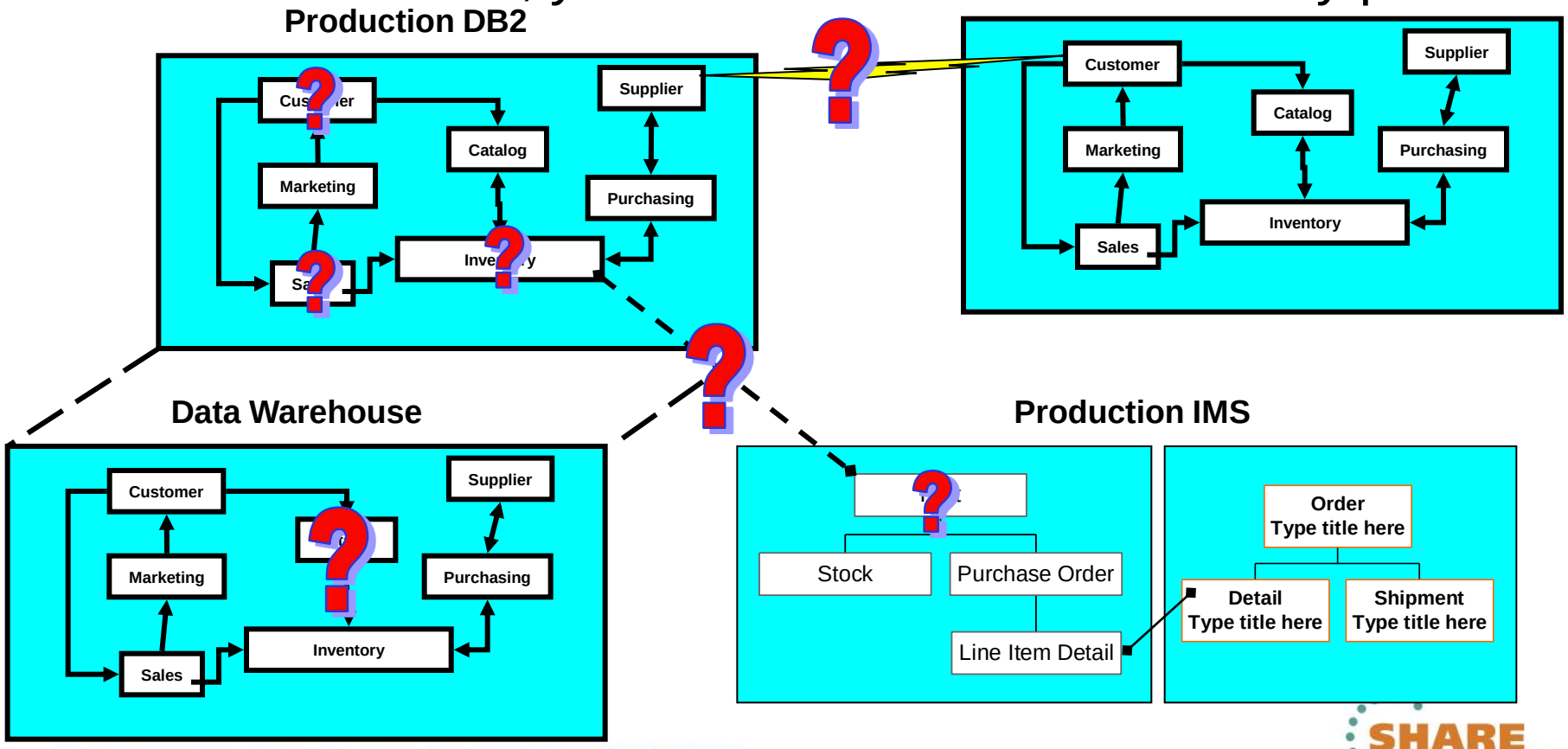
SWPOC Impact

- To get a System Wide Point of Consistency, services must be stopped



No SWPOC Impact

- If your availability requirement is such that you cannot obtain a SWPOC, you have no consistent recovery point



What can cause an application outage?

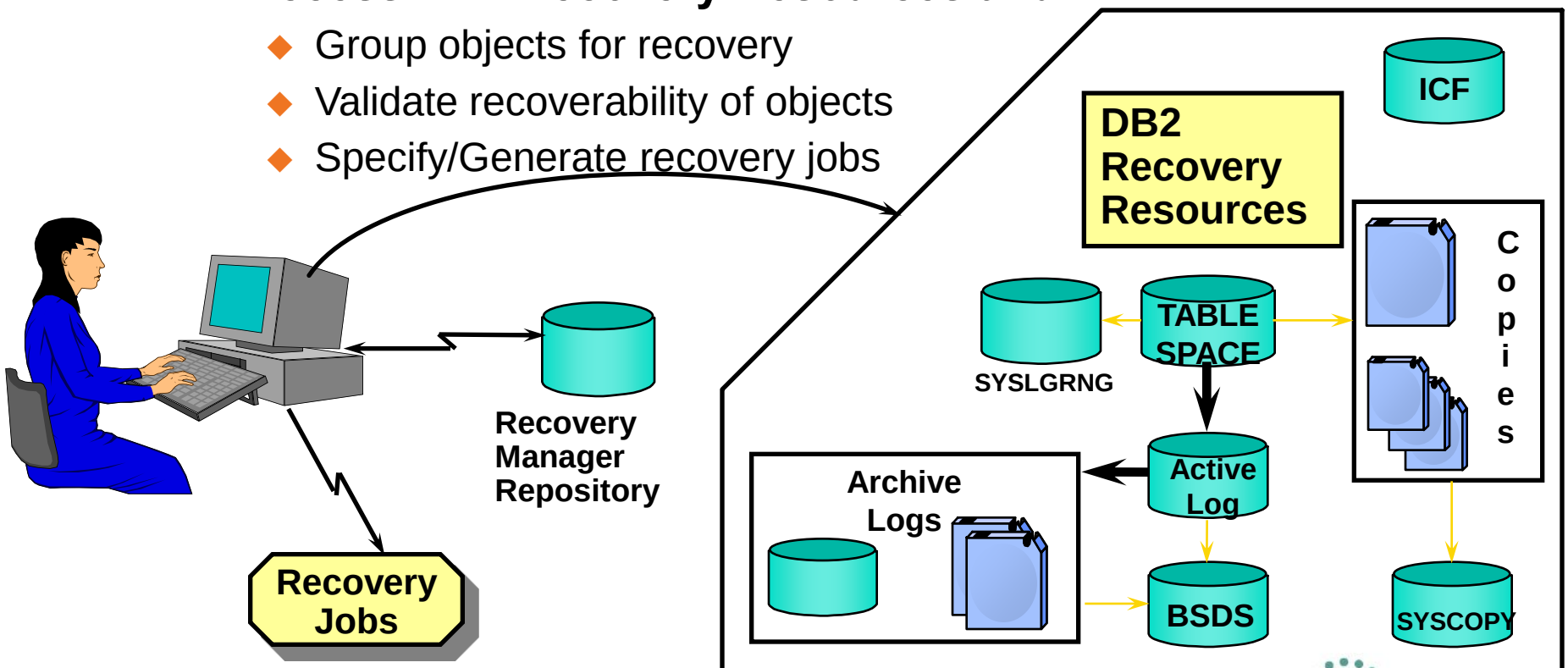
- Some events are planned:
  - Database maintenance
  - Data migration
  - Schema change implementation
  - Hardware upgrades
  - Software upgrades
  - Disaster recovery preparation
- Other events are unplanned
  - Site disasters (floods, power outages, storms, fire, etc.)
  - Hardware failures (disk, CPU, network, etc.)
  - Operating system failures
  - DBMS failures
  - Operation errors
  - Batch cycle errors
  - Improper data feeds
  - User errors
  - Deliberate data corruption
  - Application software errors

The BMC Building Blocks

- **Recovery Management for DB2**
  - Define Application Recovery Groups, generate recovery jobs
  - Automate Conditional Restart process for local and remote subsystem recovery
  - Find Quiet Points
  - Recover to ***ANY*** Point in Time
  - Copy data with no outage
- **Backup and Recovery for IMS**
  - Define Application Recovery groups, generate recovery jobs
  - Extract log switch information from RECONs
  - Find Quiet Points
  - Recover to ***ANY*** Point in Time
  - Copy databases with no outage
- **RECOVERY UTILITY for VSAM**
  - Define Application Recovery groups, generate recovery jobs
  - Recover to ***ANY*** Point in Time
  - Copy data with no outage

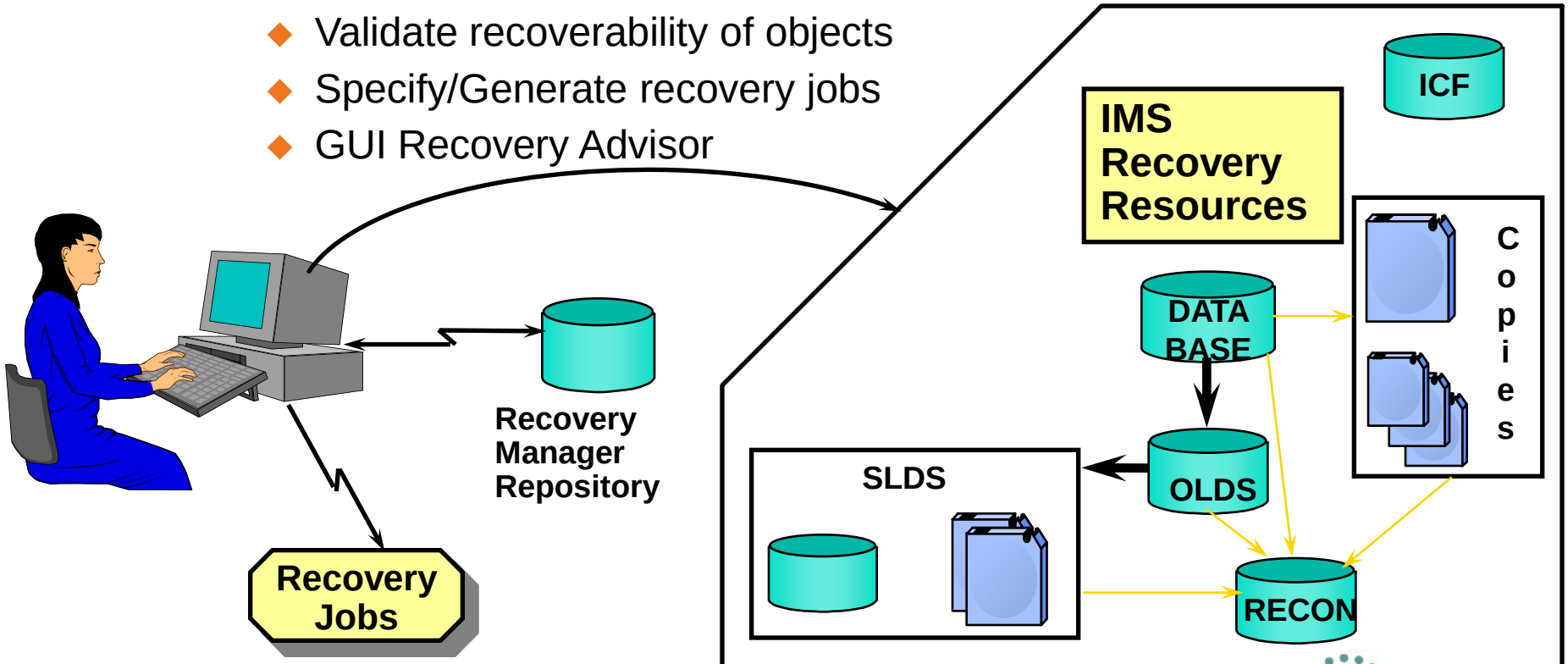
DB2 Recovery Management Overview

- **ISPF application with DB2 repository tables**
  - **Access DB2 Recovery Resources and …**
    - Group objects for recovery
    - Validate recoverability of objects
    - Specify/Generate recovery jobs



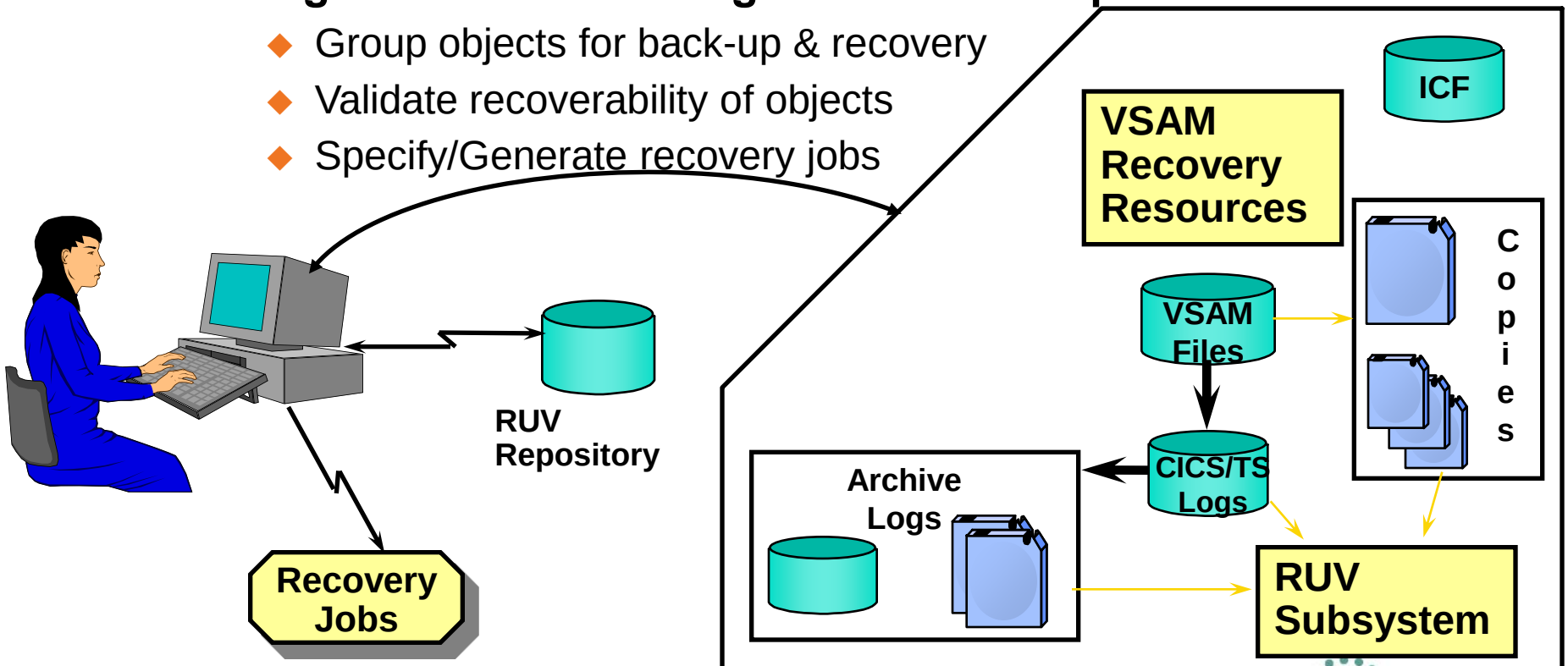
IMS Recovery Management Overview

- **ISPF application with repository datasets**
  - **Access IMS Recovery Resources and …**
    - Group objects for recovery
    - Validate recoverability of objects
    - Specify/Generate recovery jobs
    - GUI Recovery Advisor



VSAM Recovery Management Overview

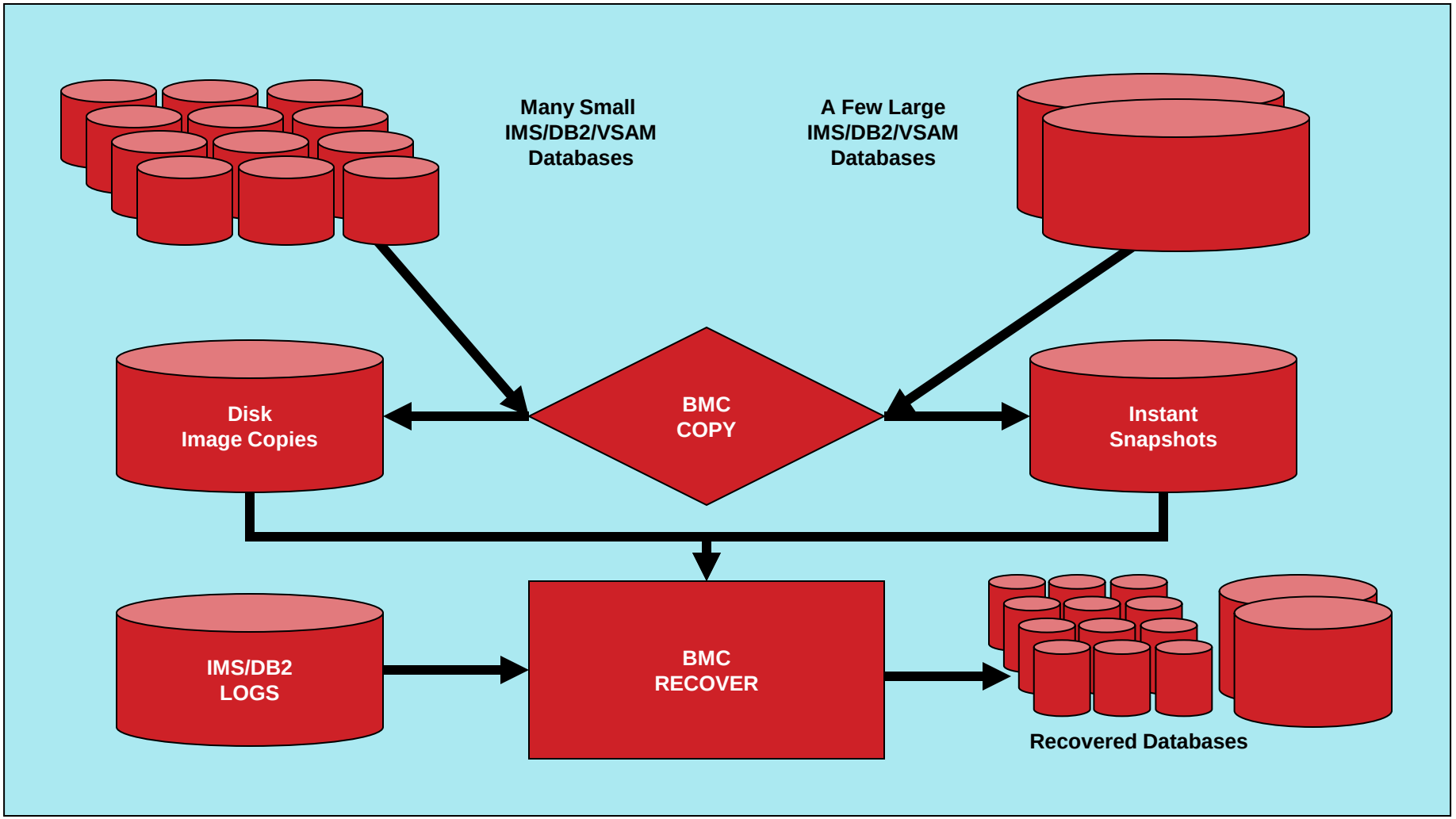
- **ISPF application with VSAM repository tables**
  - **Registration and management of backups …**
    - Group objects for back-up & recovery
    - Validate recoverability of objects
    - Specify/Generate recovery jobs



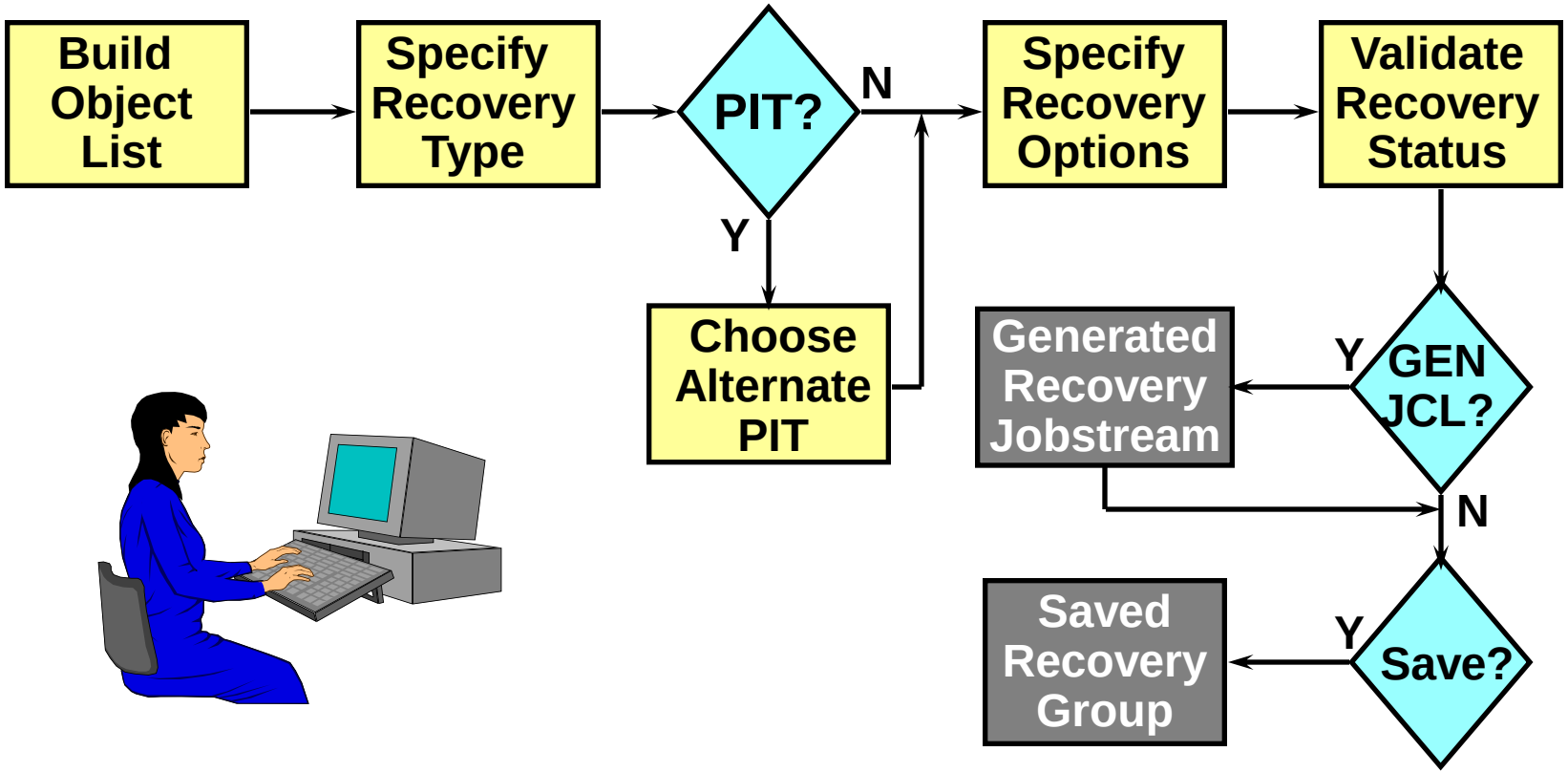
Backing into the Backup Strategy

- Determine your local Recovery Time Objective
  - Generally 1-2 hours
  - Driven by cost of downtime – imagine your worst case scenario!
  - Total Site Disaster is a special case – plan for it but not only for it
- Examine your application environment
  - Size and number of objects in mission critical applications
  - Number of transactions per day on active objects
- Your backup strategy needs to support your RTO
  - May need more frequent backups to support SLA
  - You need low/no outage inexpensive backups

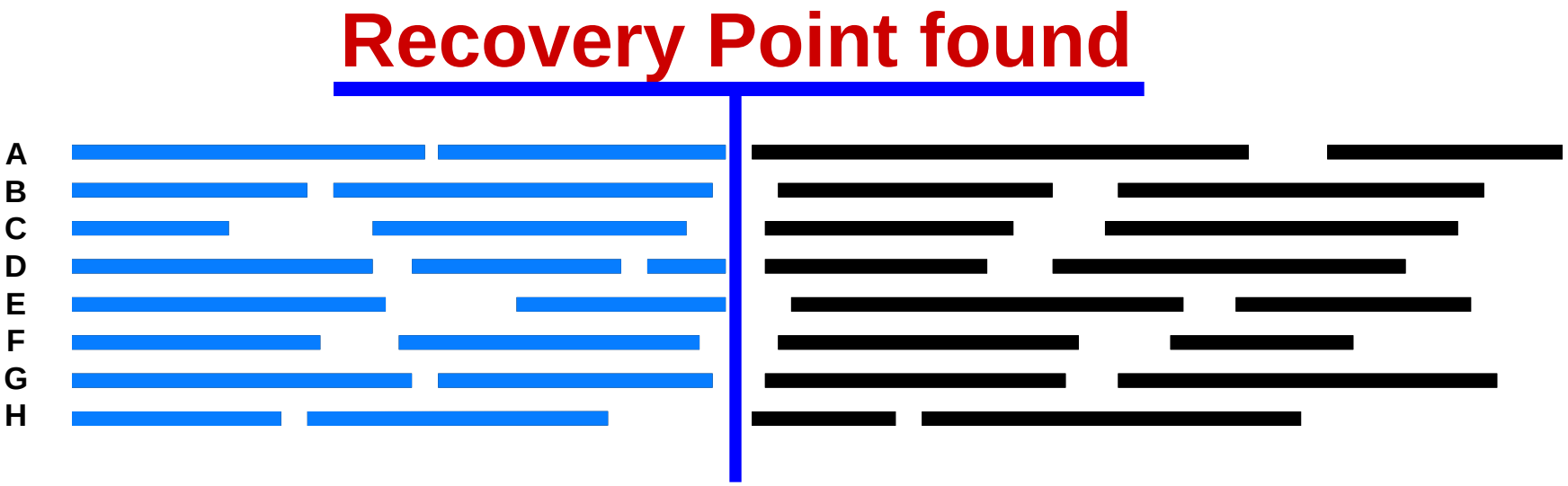
Hybrid Copy – No Outage, high speed, low CPU



Recovery Interface Process Flow



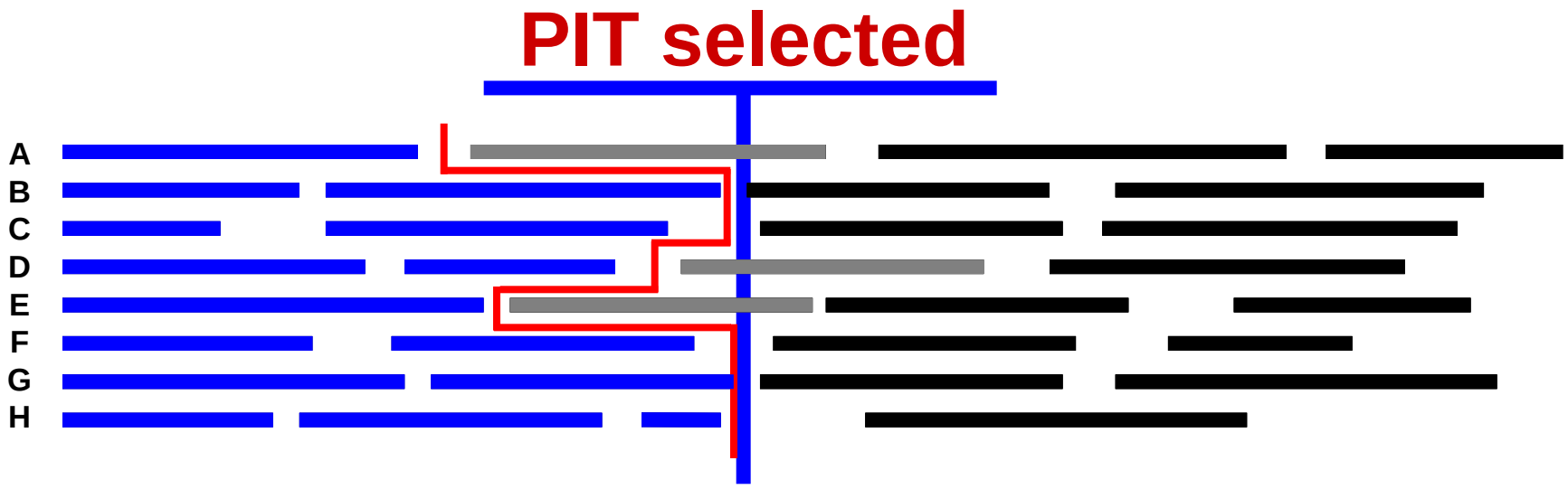
Find DB2 Recovery Points



Use the *Log Master for DB2* "Quiet Point Report" feature to determine when there are "quiet points" of no transaction activity (from DB2 logs)

Activity before the recovery point is recovered

Force DB2 Recovery point

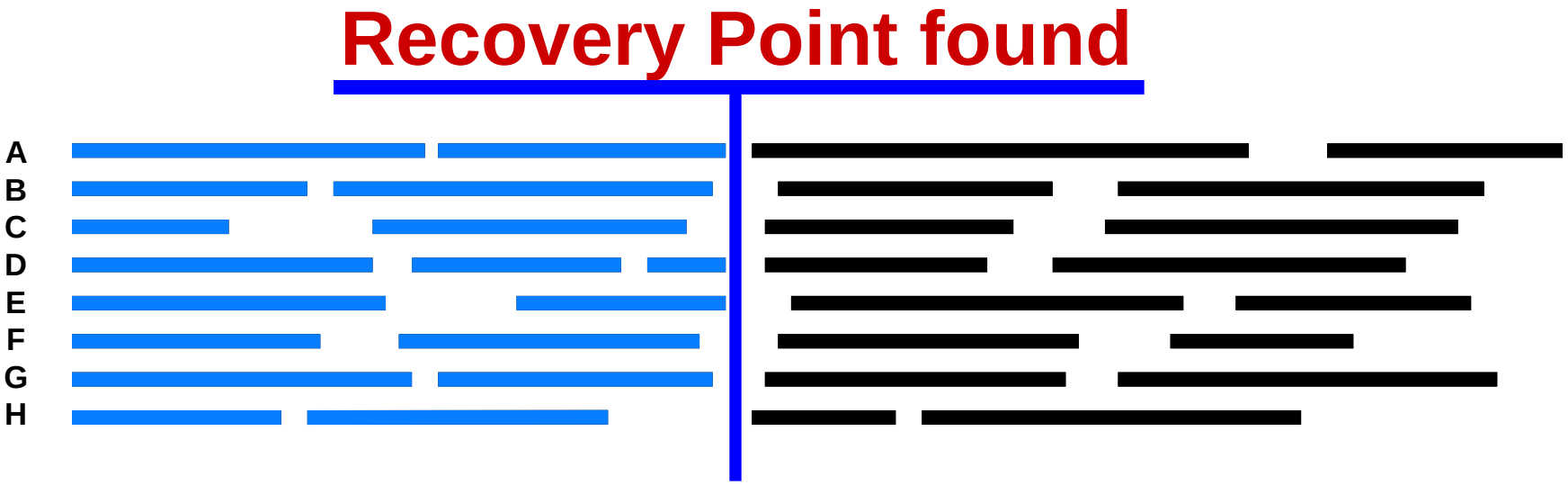


Use the ***Recovery Management for DB2*** "Recover to Timestamp" function to recover to ***ANY*** Point in Time (PiT)

Transactions that finished **before** the PiT are applied

Transactions that finished **after** the PiT are ***not*** applied

Find IMS Recovery Points

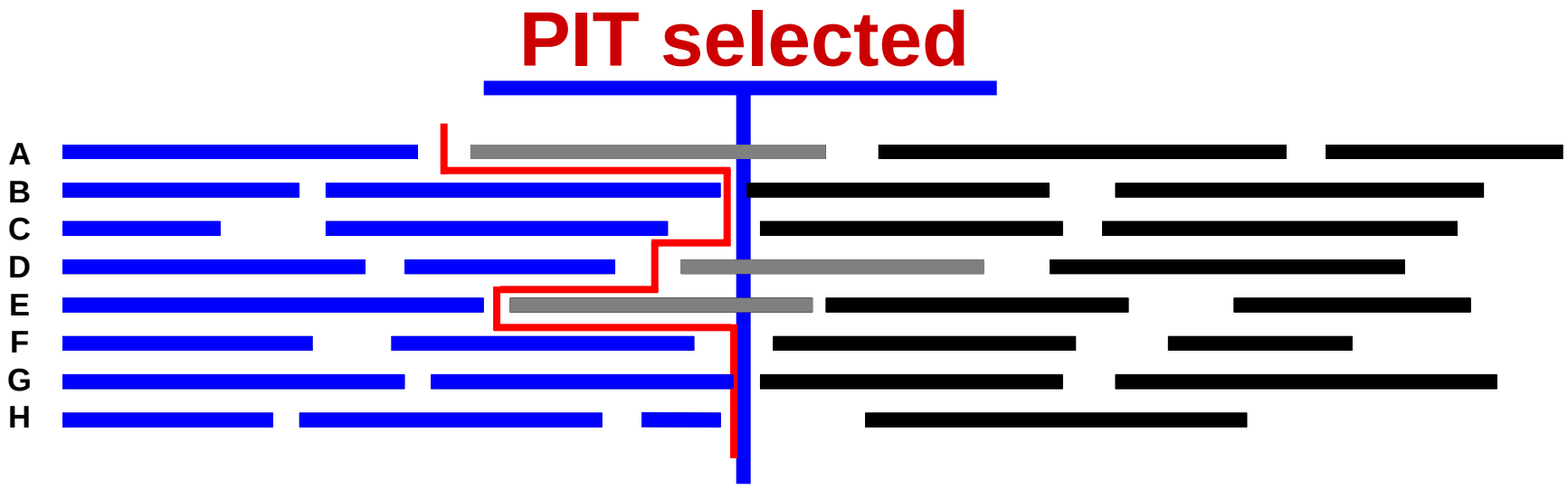


Use the *Recovery Manager for IMS* "Find Recovery Points" feature to determine when there are …

- standard DBRC recovery points (from RECONs)
- "quiet points" of no transaction activity (from IMS logs)

Activity before the recovery point is recovered

Force IMS Recovery point

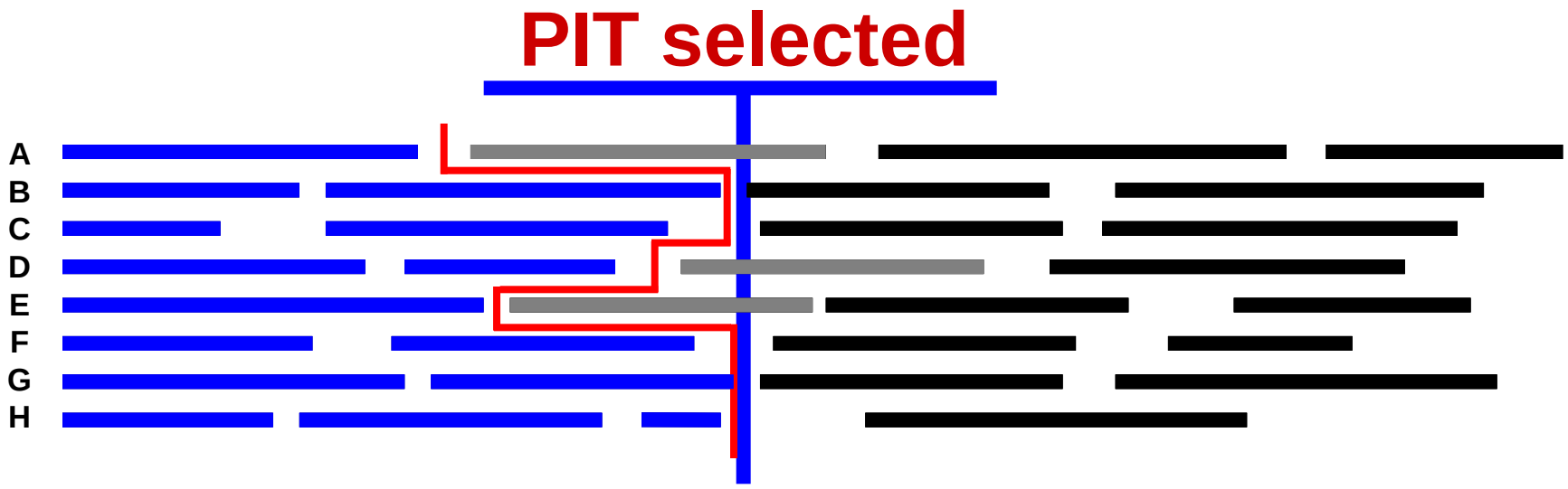


Use the ***RECOVERY PLUS for IMS*** "Recover to Timestamp" Utility syntax to recover to ***ANY*** Point in Time (PiT)

Transactions that finished **before** the PiT are applied

Transactions that finished **after** the PiT are ***not*** applied

Force VSAM Recovery point

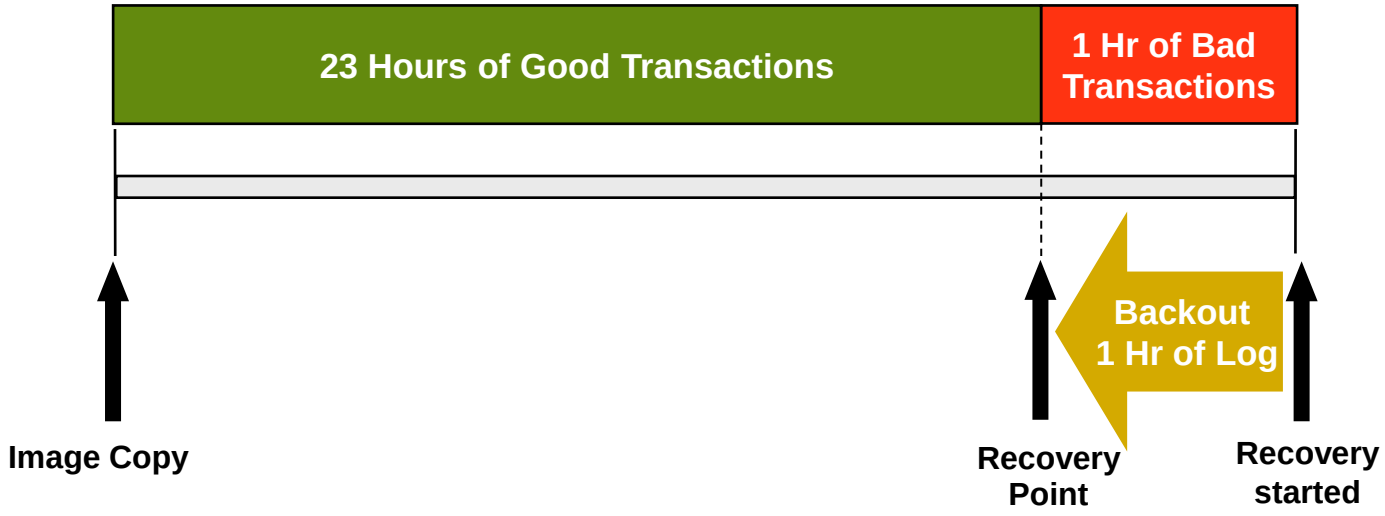


Use the Recovery Utility for VSAM "Recover to Timestamp" syntax to recover to *ANY* Point in Time (PiT).
Transactions that finished before the PiT are applied

Transactions that finished after the PiT are *not* applied

Point in Time Recovery – Physical Backout

- The fastest way to get the database to the point prior to the application error is to remove one hour of records
- Very powerful for **local** PIT recovery where Storage is not the issue

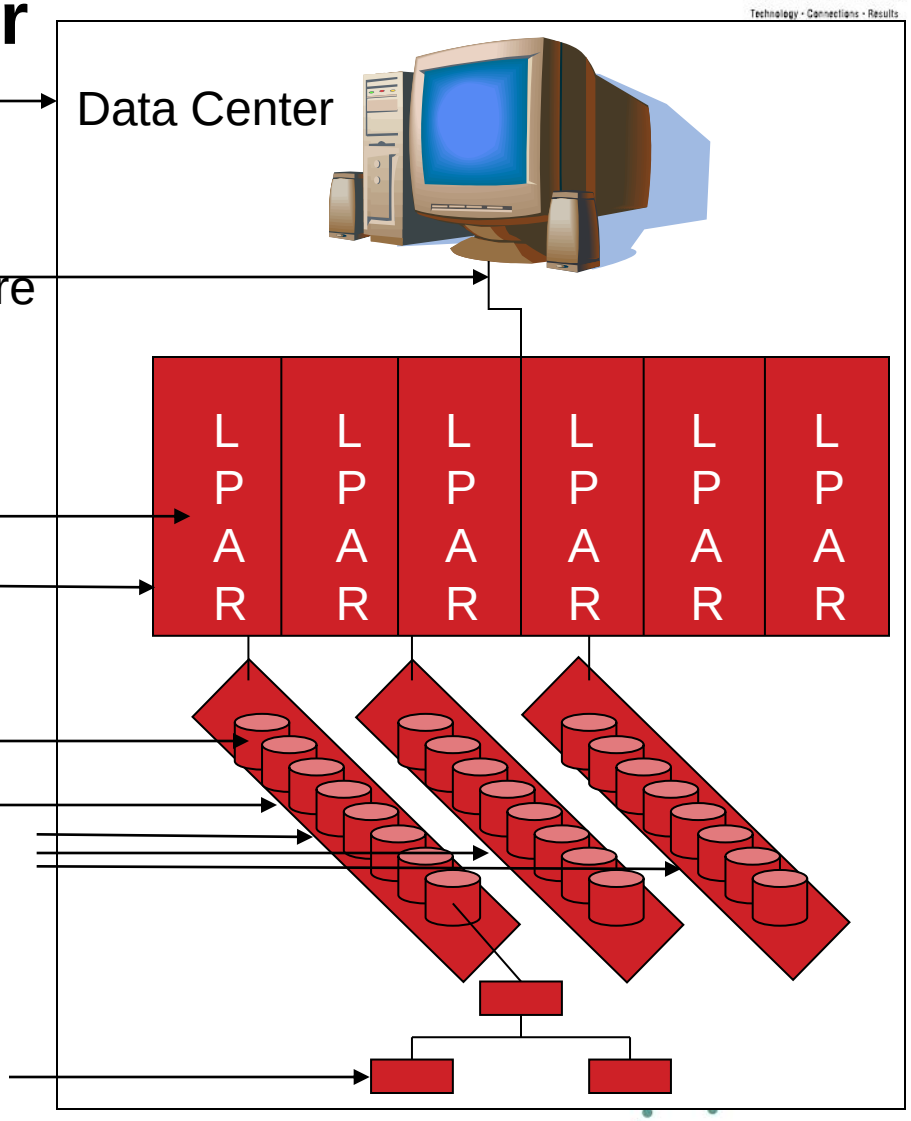


DB2 Local PIT Recovery considerations

- DB2 recovery groups can range from one object to entire subsystem
- Local Recovery of a DB2 subsystem to a prior point in time may require a catalog recovery and conditional restart
  - If DDL has executed since the desired recovery point, recover/restart catalog, then recover application data
  - If no DDL has executed, bypass catalog recover/restart and just recover application data
- Local Subsystem Recovery may be required for ERP type subsystem recovery, or for wide impact outage not worthy of DR declaration (e.g. storage controller failure)
- *Recovery Management for DB2 automates the analysis and if required creation of the local subsystem conditional restart*

When to Declare Disaster

- Site-wide calamity - declare
- Lose Network connectivity – maybe declare
  - Estimate repair time
  - > nn hours, declare (BCP Group)
- Lose 1 LPAR – no declare
- Lose entire CPU – maybe declare
  - Estimate repair time
  - > nn hours, declare (BCP group)
- Lose one volume – no declare
- Lose one disk controller – no declare
- Lose all disk controllers – maybe declare
  - Estimate repair time
  - > nn hours, declare (BCP group)
- Lose one application, one database - no declare
  - Most likely event



Coordinated Disaster Recovery - Opportunities

- IMS, DB2, & CICS/VSAM allow for ‘online’ copies
- IMS, DB2, and CICS allow for log switch with no outage
- IMS and DB2 have repositories of B&R information
  - IMS RECONs
  - DB2 Catalog and Directory
- DB2 allows for a subsystem-wide restart to any RBA/LRSN
  - Inflight transactions are automatically backed-out at restart

Recovery Management for DB2 Programs and Utilities

- **ARMBTSI**
  - **Insert timestamp into RM repository**
- **ARMBCRC**
  - **Translate timestamp into equivalent RBA/LRSN**
- **ARMBLOG**
  - **Issues ARCHIVE LOG command and waits for completion.**
- **ARMBARC**
  - **Copy ARCHIVE LOG (copies 3 & 4 for offsite)**
- **ARMBSRR**
  - **Generate DB2 Subsystem Restart jobs (200+ job steps)**
- **ARMBGEN**
  - **Generate Application Recover jobs based on Application Groups**
- **ARMPGPV**
  - **Performs Application Recovery Group Validation**
  - **Ensures new objects are added, dropped objects are deleted**
- **ARMPGPS**
  - **Creates a set of balanced groups for the entire subsystem**
  - **Ensures new objects are added, dropped objects are deleted**
  - **Local Subsystem Recovery Conditional Restart Analysis and Avoidance**

Backup and Recovery for IMS Programs and Utilities

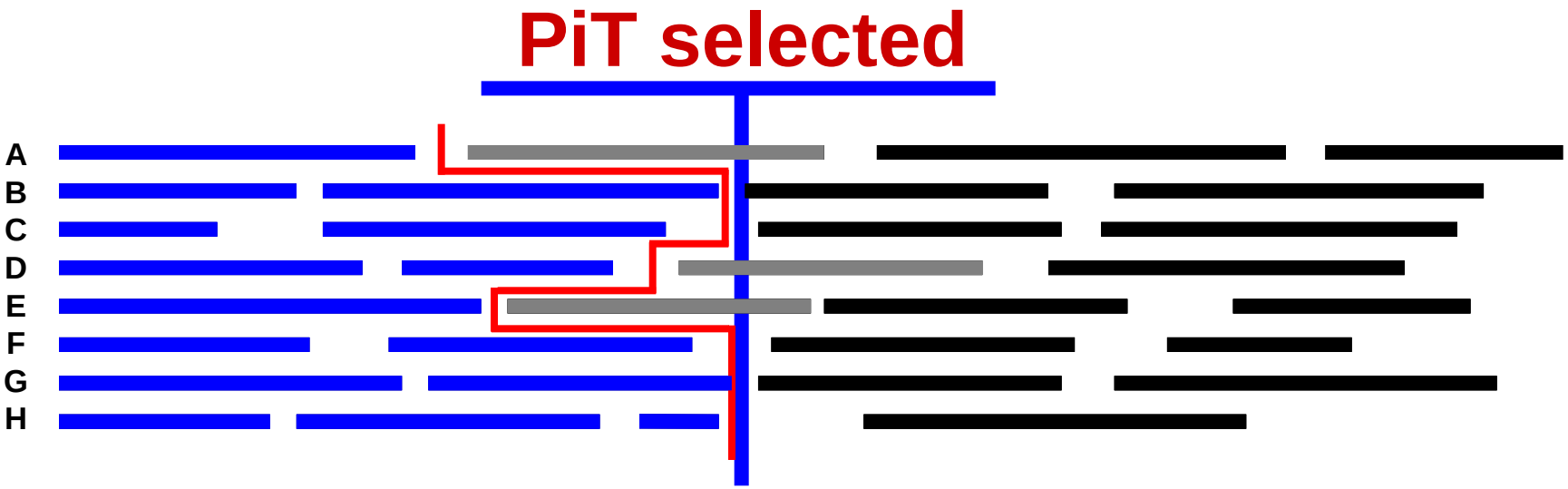
- DRAMS
  - Capture AMS (Delete/Define) information for DR
- DRRCN
  - RECON Cleanup utility – prep for DR
  - Can be run in ‘CHECK’ mode to obtain information
  - CRPREXX can fetch log switch PIT and feed DB2 process
- IRMBATCH
  - Generate RECOVERY PLUS jobs to specified timestamp

Coordinated Disaster Point – Timestamp based *(NO LOCAL SITE OUTAGE)*

- **IMS**
  - **Log Switch performed**
  - **Timestamp available to recover applications**
  - **Timestamp fed to DB2 process via CRPREXX**
- **VSAM**
  - **Switch Journals or Archive Log Streams**
  - **Use IMS Timestamp as recovery point**
- **DB2**
  - **IMS Timestamp stored in RMGR for DB2 repository**
  - **Issue ARCHIVE LOG command**
  - **ARMBCRC converts IMS timestamp into RBA/LRSN**
    - ***RBA/LRSN is then used to prepare and recover DB2 subsystem***

- **This example is based on an IMS log switch being the 'driver' of the process.**
- **It could have just as easily have been a DB2 log switch, or an arbitrary point in time.**

IMS Recovery point



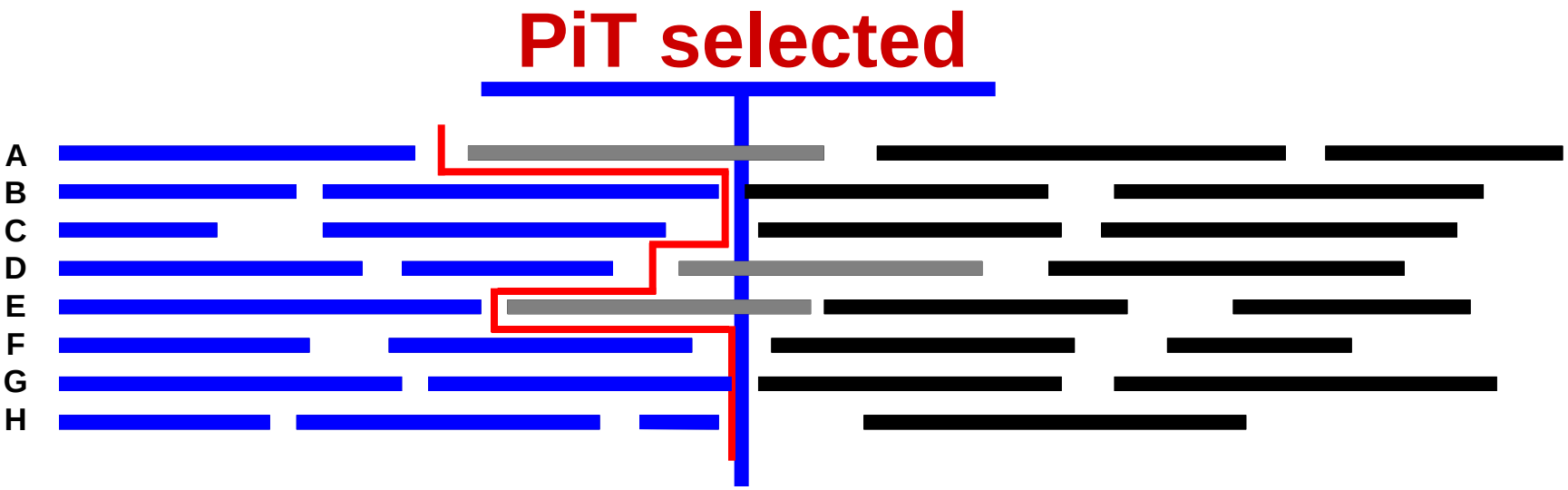
Use the ***RECOVERY PLUS for IMS*** "Recover to Timestamp" Utility syntax to recover to ***ANY*** Point in Time (PiT)

Transactions that finished **before** the PiT are applied

Transactions that finished **after** the PiT are ***not*** applied

The timestamp of the 'latest greatest PiT' can be obtained from the IMS Recovery Manager DRRCN utility

VSAM Recovery point



Use the *Recovery Utility for VSAM* "Recover to Timestamp" syntax to recover to *ANY* Point in Time (PiT)

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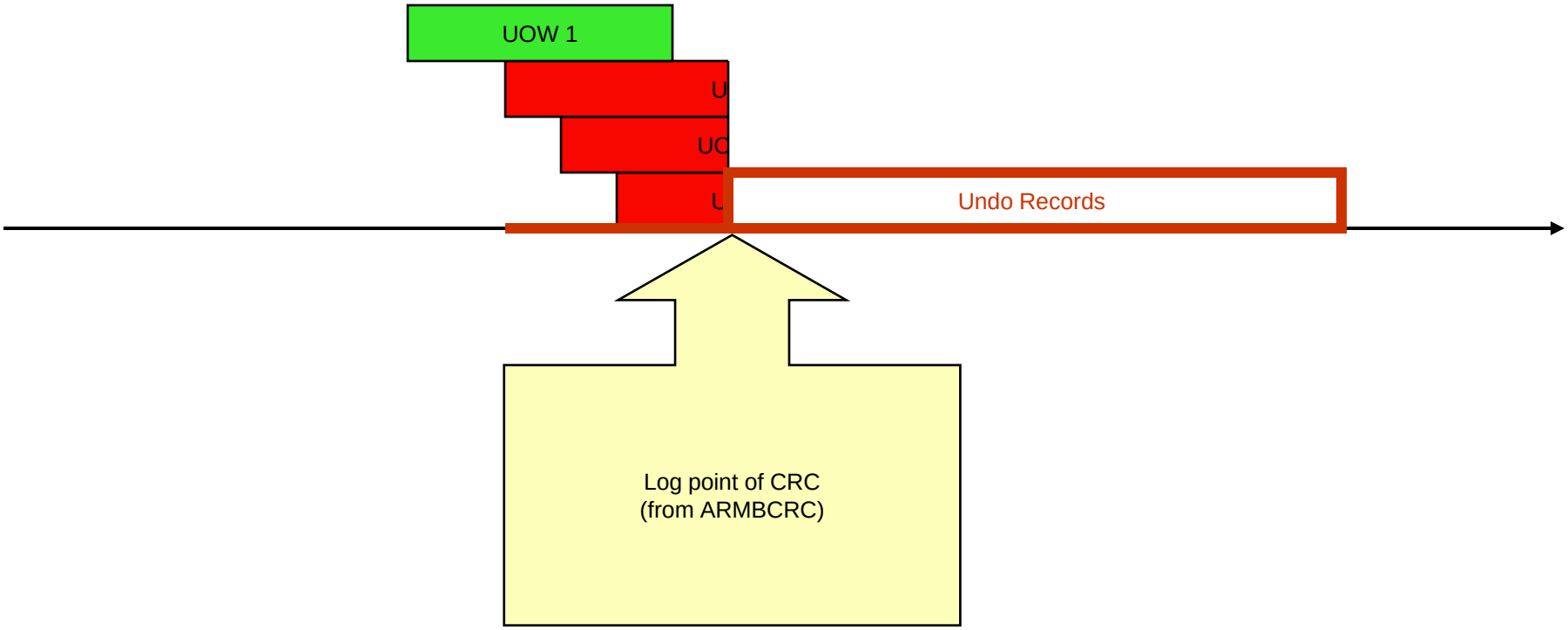
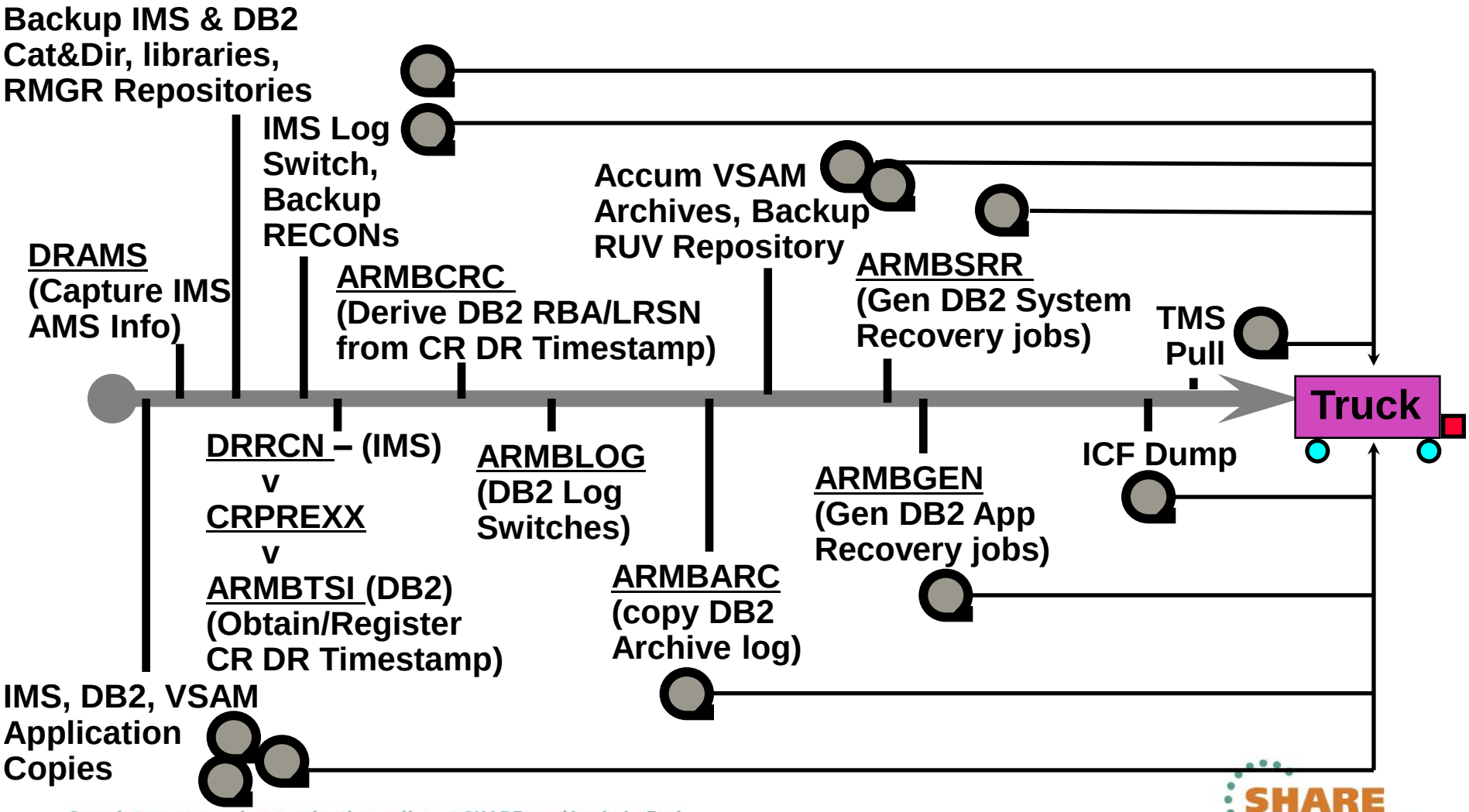
DB2 Conditional Restart point



The 'latest greatest PiT' timestamp is translated to an RBA/LRSN by the DB2 Recovery Manager ARMBTSI/ARMBCRC utilities

Coordinated DR Support
Local Site Processes (IMS event driven)



DR Site Recovery procedures

- IMS
  - Prepare RECONs
  - Recover Application databases to DR Timestamp
  - Brings Application to point of consistency at that point
  - Backs out any in-flight transactions
- DB2
  - Execute Subsystem Recovery JCL to DR Timestamp
  - DB2 Restart will backout any transactions in-flight
  - Recover Applications to Current (DR Timestamp)
- VSAM
  - Generate and run RUV recoveries to DR timestamp
  - RUV will backout any inflight activity

DR RECON Cleanup Utility

Closes open PRILOGs

Deletes PRIOLDs

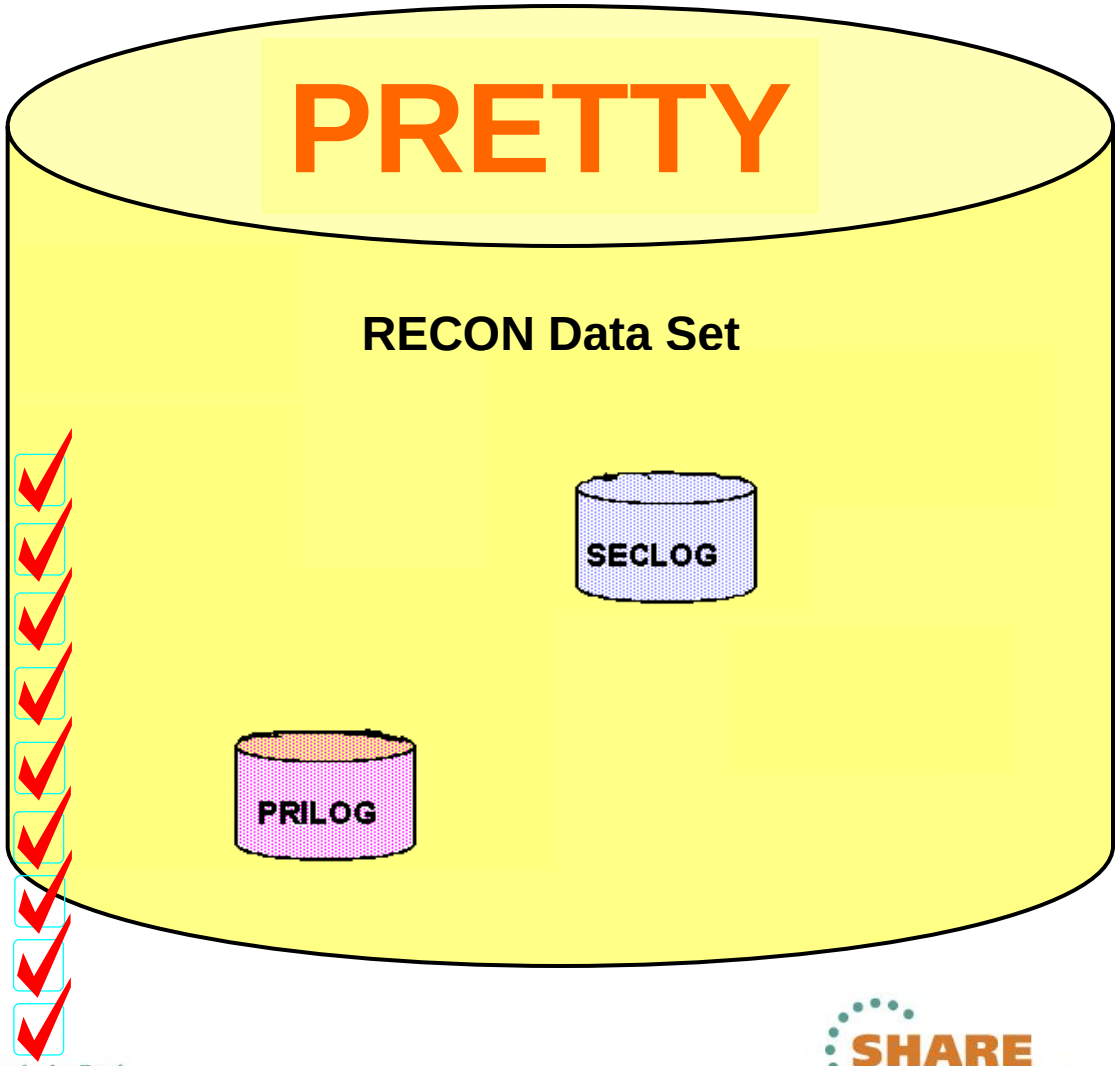
Closes open SECLOGs

Deletes SECOLDs

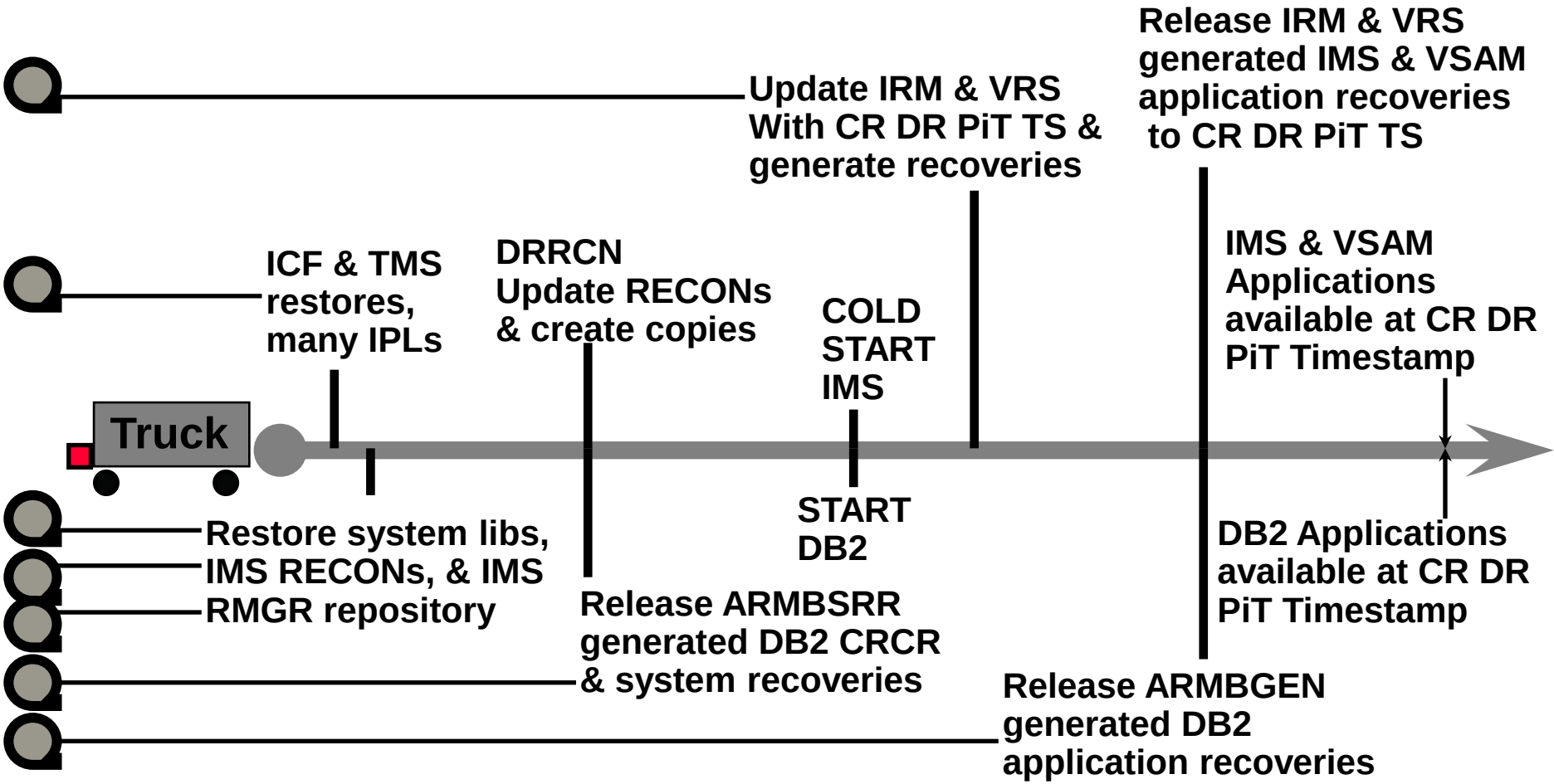
Deletes SUBSYS records

Performs other cleanup...

- Updates/deletes ALLOCs
- Updates/deletes LOGALLs
- Closes open PRISLDs
- Closes open SECSLDs
- Marks CA runs “invalid”
- Marks DBs as “recov needed”
- Provides detailed reports
- Provides Suggested PIT
- Provides Suggested CA time



Coordinated DR Support
Remote Site Processes



BMC Software
Coordinated Recovery

- Building on years of expertise in IMS, DB2 & VSAM
- Providing tools to solve the HARD problems
- Leveraging knowledge and innovation

Delivering Coordinated Recovery for DB2, IMS, & VSAM with NO LOCAL SITE OUTAGE, and CONSISTENT DATA

BMC Recovery Management for z/OS