

Nearing 24x7 Availability with Structure Changes Too!

*Virtual IMS User Group
December 4, 2012*

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Companies need to make changes to meet ever changing business requirements, but do not have the necessary batch window.

▶ **Structure Changes**

- Take advantage of available technologies (PDF, HALDB)
 - Exceeding capabilities of technology (size limitations)
- Business application changes (add new areas/partitions/secondary indexes)
- Exceeding performance capabilities (Fast Path DEDB vs. Full Function)

▶ **Tuning Changes**

- Decrease the likelihood of split segments, excessive RAP synonym chains, Increase the size of the RAA, overflow usage
- Provide best access performance with the least amount of I/O

▶ **Space Reclamation**

- Space fragmentation within the database data sets causes performance problems when IMS is inserting segments. Too much data can be moved into overflow areas.
- Make best use of available space

Structure changes

- **Convert** Database Types (i.e. FF HDAM to PDF HDAM or PHDAM or DEDB)
- **Convert** HISAM to HIDAM or PDF HISAM
- **Convert** Access Method (VSAM to OSAM)
 - OSAM - 8 GB vs. VSAM 4 GB
 - Shorter path length, OSAM built for IMS
- **Add/Change/Delete** Secondary Indexes
- **Add/Change/Delete** partitions in a partitioned Secondary Index
- **Add/Change/Delete** Logical Relationships
 - Convert Virtually Paired Logical Relationships to Physically Paired – required to migrate to PDF or HALDB
- **Add/Change/Delete** Data Set Groups (DSGs)
- **Add/Change/Delete** Partitions (PDF, HALDB)
- **Add/Change/Delete** FP DEDB Areas

- **Segment restructuring** (more later)

Tuning Changes

- **Add/Change** Randomizers
- **Alter tuning parameters**
 - RAPs
 - Blocks
 - Bytes (contiguous inserts)
 - ROOTs - DEDBs
 - UOWs – DEDBs
- **Add/Change/Delete** Partition Selection Exit

Space Reclamation

- **Alter** data set definitions
 - Increase/Decrease space allocations
 - Move to new STORCLAS
 - Alter block sizes
- **Alter** DASD geometry
 - Convert to/from SMS
 - Increase/Decrease allocation volumes

What's needed to address these 24x7 challenges?

We need a way to keep production databases online and actively being updated by MPP transactions and BMP programs...

while you implement your changes.

High
Availability
Low
Outage

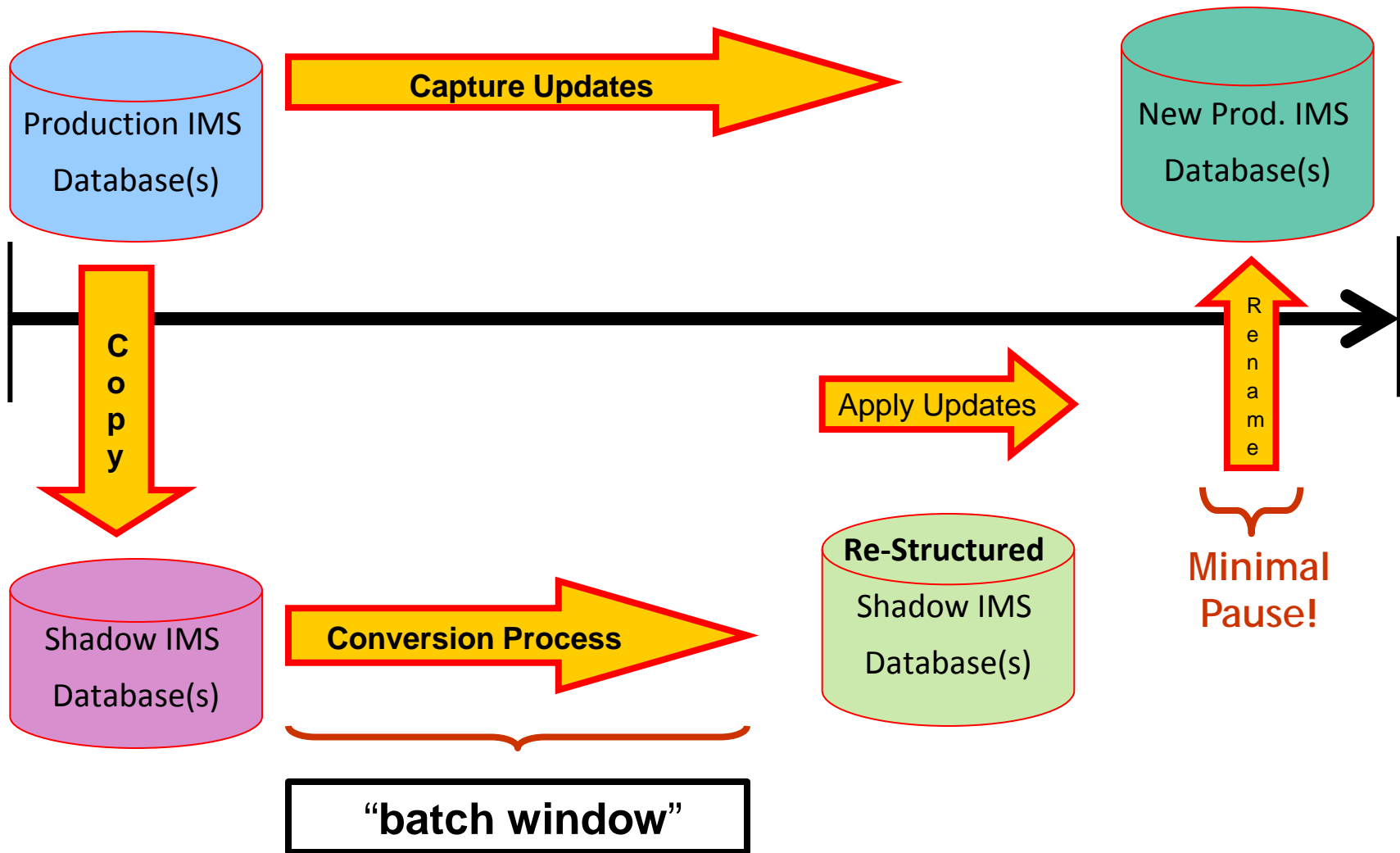
Database types

Full Function
Fast Path DEDBs
HALDB
PDF



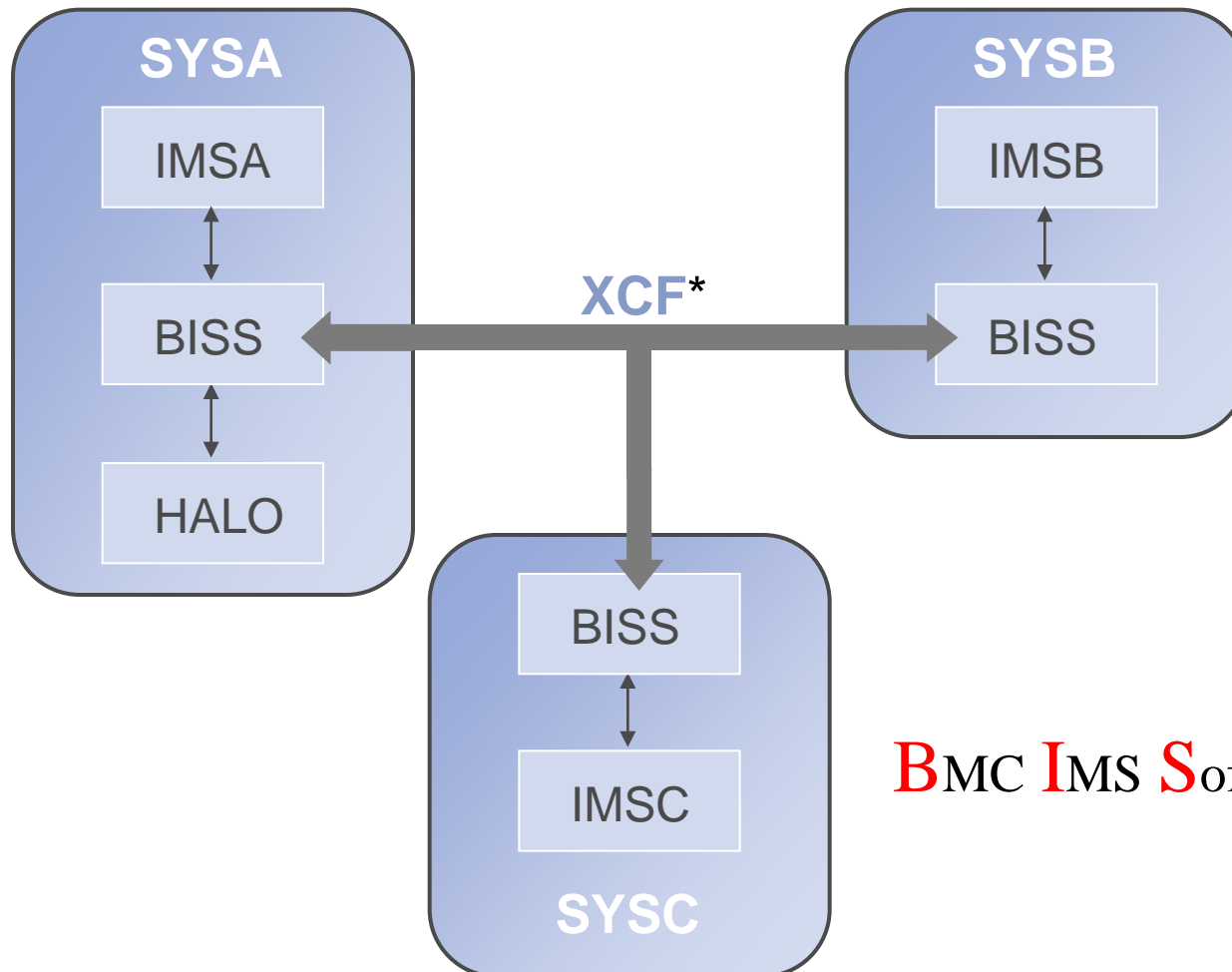
HALO

BMC HALO for IMS™ Process Overview



Database Conversion Support

TO FROM	HDAM	HIDAM	HALDB	PDF	SHISAM	HISAM	DEDB
HDAM	N/A	Y	Y	Y	Y	Y	Y
HIDAM	Y	N/A	Y	Y	Y	Y	Y
HALDB	Y	Y	N/A	Y	Y	Y	Y
PDF	Y	Y	Y	N/A	Y	Y	Y
SHISAM	Y	Y	Y	Y	N/A	Y	Y
HISAM	Y	Y	Y	Y	Y	N/A	Y
DEDB	Y	Y	Y	Y	Y	Y	N/A



BMC **I**MS **S**oftware **S**erver

* Cross-System Coupling Facility Messaging (does not require coupling facility definitions)

- ▶ **Active Subsystem**
- ▶ **No License Key required to start**
- ▶ **Uses IBM documented interfaces** to provide subsystem and sysplex services to BMC products
- ▶ **One BISS** started on each LPAR within the sysplex
- ▶ **Issues IMS commands** to the appropriate IMS region for HALO
 - /DBR
 - /DBD
 - /STA
 - /DIS
- ▶ **Issues MVS Operator commands** for HALO
 - MODIFY
 - REPLY
- ▶ (Formerly called NESS)

▶ Data Collection Facility

- Data Capture

- Capture database updates while HALO is running
- Runs inside the IMS Control Region and Dependent Regions (MPR, BMP, IFP...etc)

- Data Collection

- Collects captured database updates and hardens them to a data set (VSAM LDS)
- Runs inside the server (BISS)

- Data Application

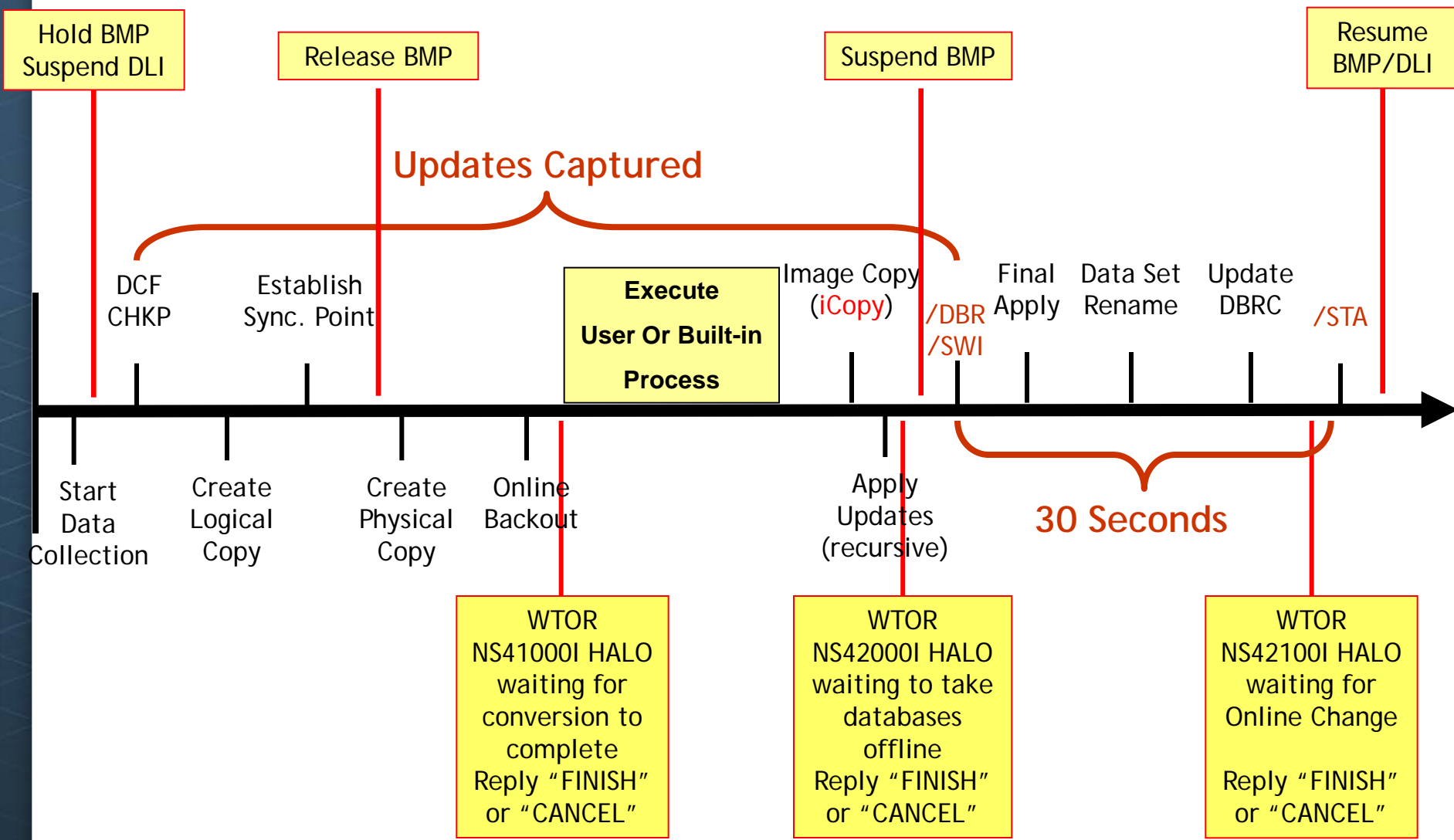
- Applies collected updates in commit time sequence
- Runs inside the HALO job

Data Collection Facility (DCF)

- ▶ **Dynamically installed** when needed by HALO
- ▶ **Dynamically removed** when no longer needed by HALO
- ▶ **Absolutely no path length when removed...** it's simply not there.
- ▶ **Multiple HALO jobs** use the first installed copy of the code
- ▶ Always run from whatever is in the HALO product library...maintenance takes effect on next job.

- ▶ **Start Data Collection**
- ▶ **DCF Checkpoint**
 - Ensure all impacted databases at syncpoint
 - Start Log Capture
 - Start Data Capture
- ▶ **Obtain Logical Copies**
- ▶ **Establish Syncpoint**
 - Ensure all impacted databases at syncpoint
 - Stop Log Capture
- ▶ **Physical Copy Completes**
- ▶ **Build “temporary” RECONS**
- ▶ **Perform Dynamic Backout**
 - Same done by IMS for online transaction update backouts

HALO Full Function Support



- ▶ **Start Data Collection**

- ▶ **DCF Fast Path Checkpoint**
 - /VUN to unload VSO areas
 - Ensure all impacted FP areas at syncpoint
 - /CHE - Simple Checkpoint to flush SDEP buffers
 - Start Log Capture

- ▶ **Obtain Logical Copies**

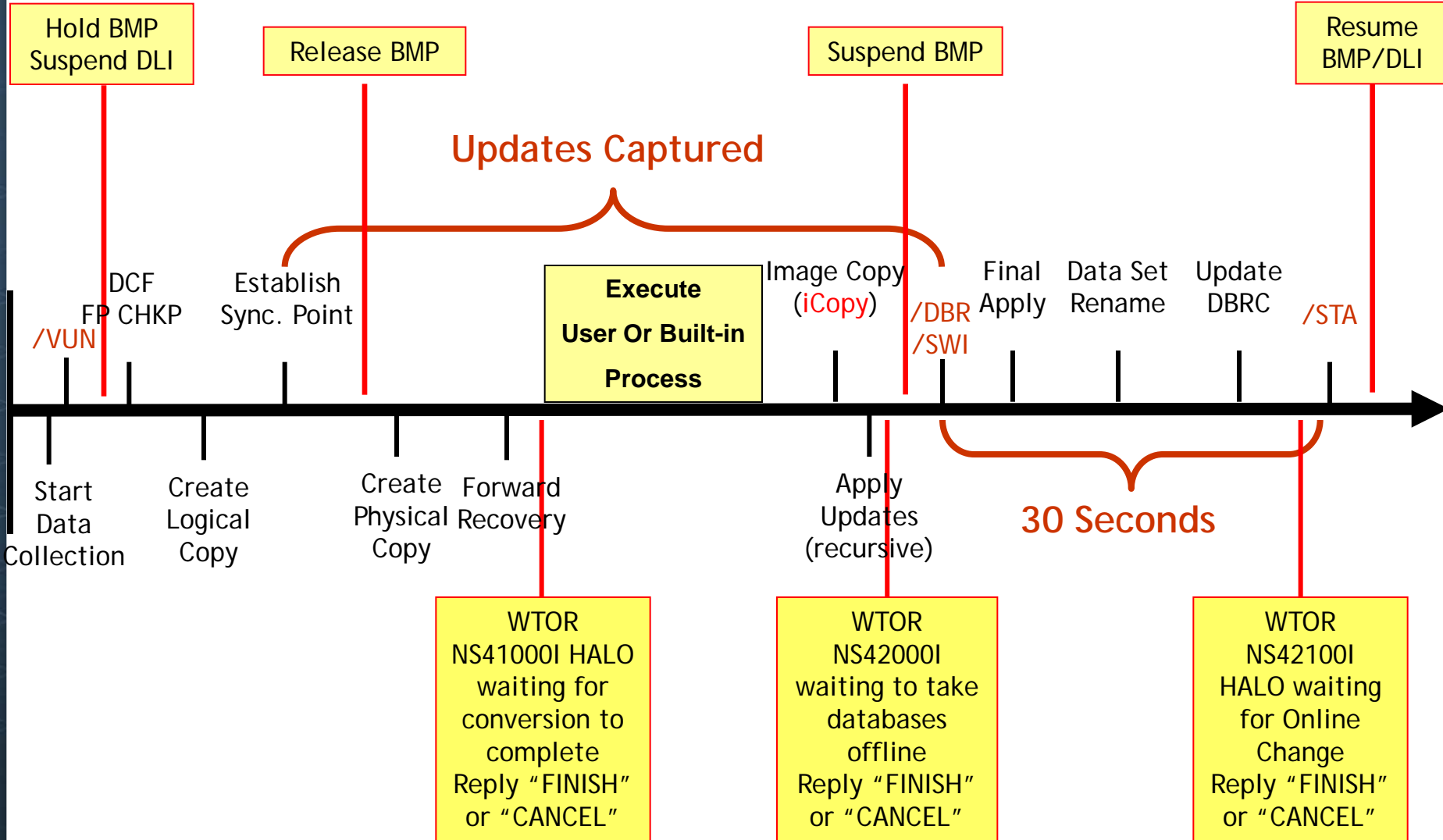
- ▶ **Establish Syncpoint**
 - Ensure all impacted FP areas at syncpoint
 - Stop Log Capture
 - Start Data Capture

- ▶ **Physical Copy Completes**

- ▶ **Build “temporary” RECONS and Log data sets**

- ▶ **Perform Forward Recovery**

HALO Fast Path Support



▶ User Process

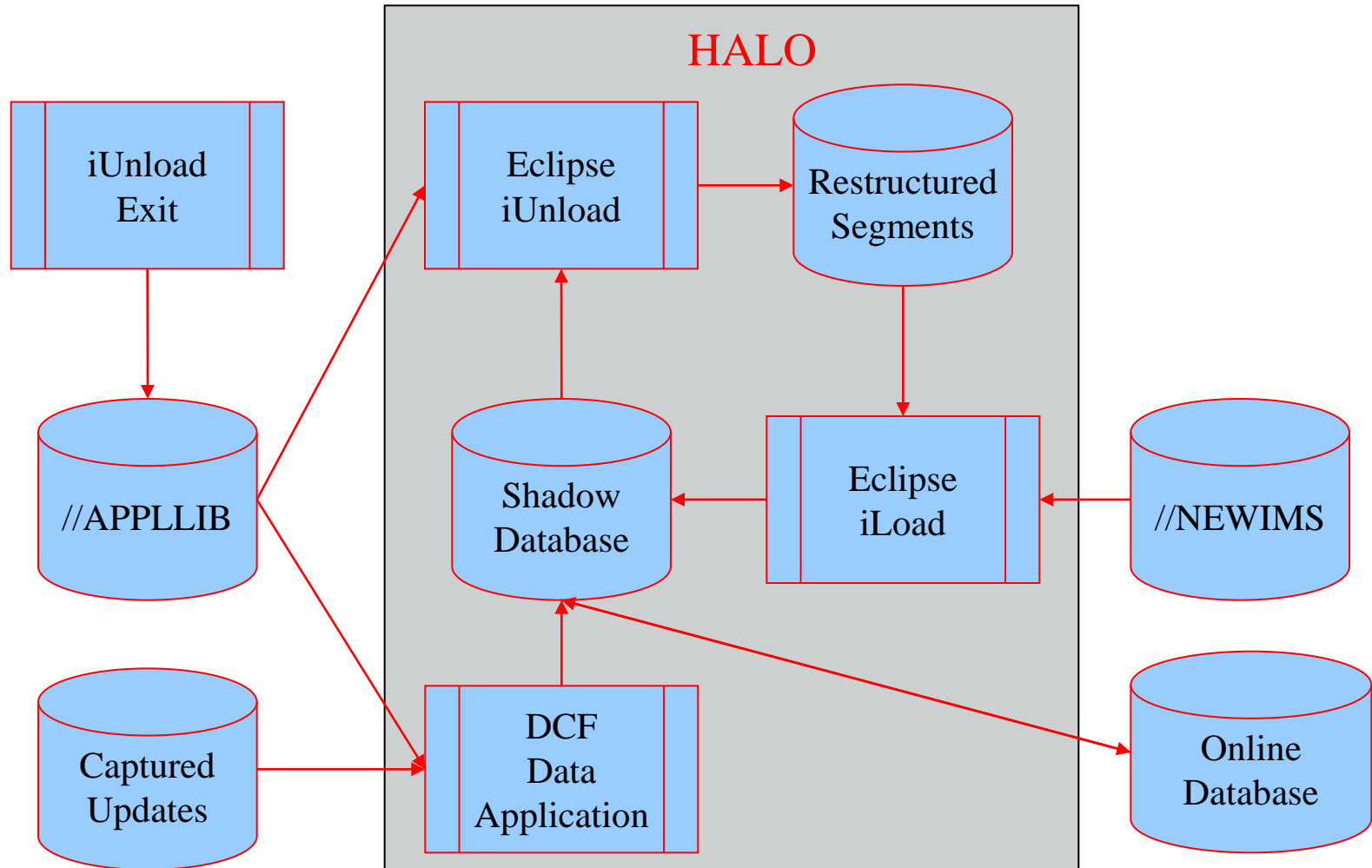
- User does normal process for making changes to Shadow databases and the temporary recons:
 - Pre-Reorg (if needed)
 - Unload with old DBD (HALO provides pre-allocated unload file)
 - Delete/Define database data sets
 - Reload with new DBD (HALO provides pre-allocated WF1 file)
 - Build secondary indexes
 - Prefix Resolution / Prefix Update (if necessary)

▶ Built-in Automated Process

- **HALO Restructure Plug-In (RPI)**
 - **HALO uses the BMC Eclipse Utilities *for IMS*[™]**
 - Pre-Reorg (if needed)
 - BMC iUnload *for IMS*
 - » BMC iExtract *for IMS* (if necessary)
 - BMC iLoad *for IMS* (Buildindexes)
 - BMC iBuild *for IMS*
 - BMC iCheck *for IMS*
 - BMC Prefix Update *for IMS* (if necessary)
 - **HALO can use the “single step” Eclipse REORG command (pipeline reorg)**
- ▶ For both methods, HALO takes the image copies (using BMC iCopy *for IMS*) of the “new” database data sets and registers them to DBRC

- ▶ **Increase/Decrease** segment length
- ▶ **Convert segments:**
 - fixed-length to variable-length
 - variable-length to fixed length
- ▶ **Move segment data**, including existing key and search fields, **within segment**
- ▶ **Add new fields** to a segment
- ▶ **Initialize segment data** (i.e., new packed fields)
- ▶ **Add new segment types**
- ▶ Others???

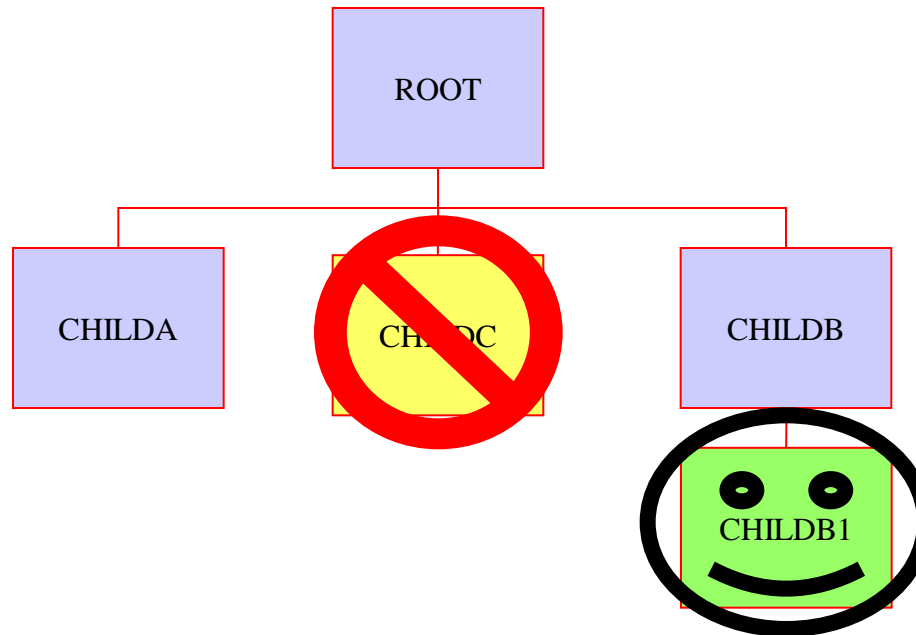
Segment Restructuring - Overview



- ▶ **Eclipse iUnload exit used to restructure database segments** – used during the iUnload process, and the HALO apply process
 - User provided program, typically coded in Assembler or COBOL
 - Supported exit formats:
 - BMC Unload Plus Exit
 - IBM HSSR FABHFSU Unload Exit
 - IBM HSSR FABHURG1 Unload Exit

- ▶ **Eclipse iUnload exit used to restructure captured database updates** for the HALO apply process
 - Alternative: provide a separate HALO I/O Area Exit (Apply side)

Cannot change existing database segment hierarchy.

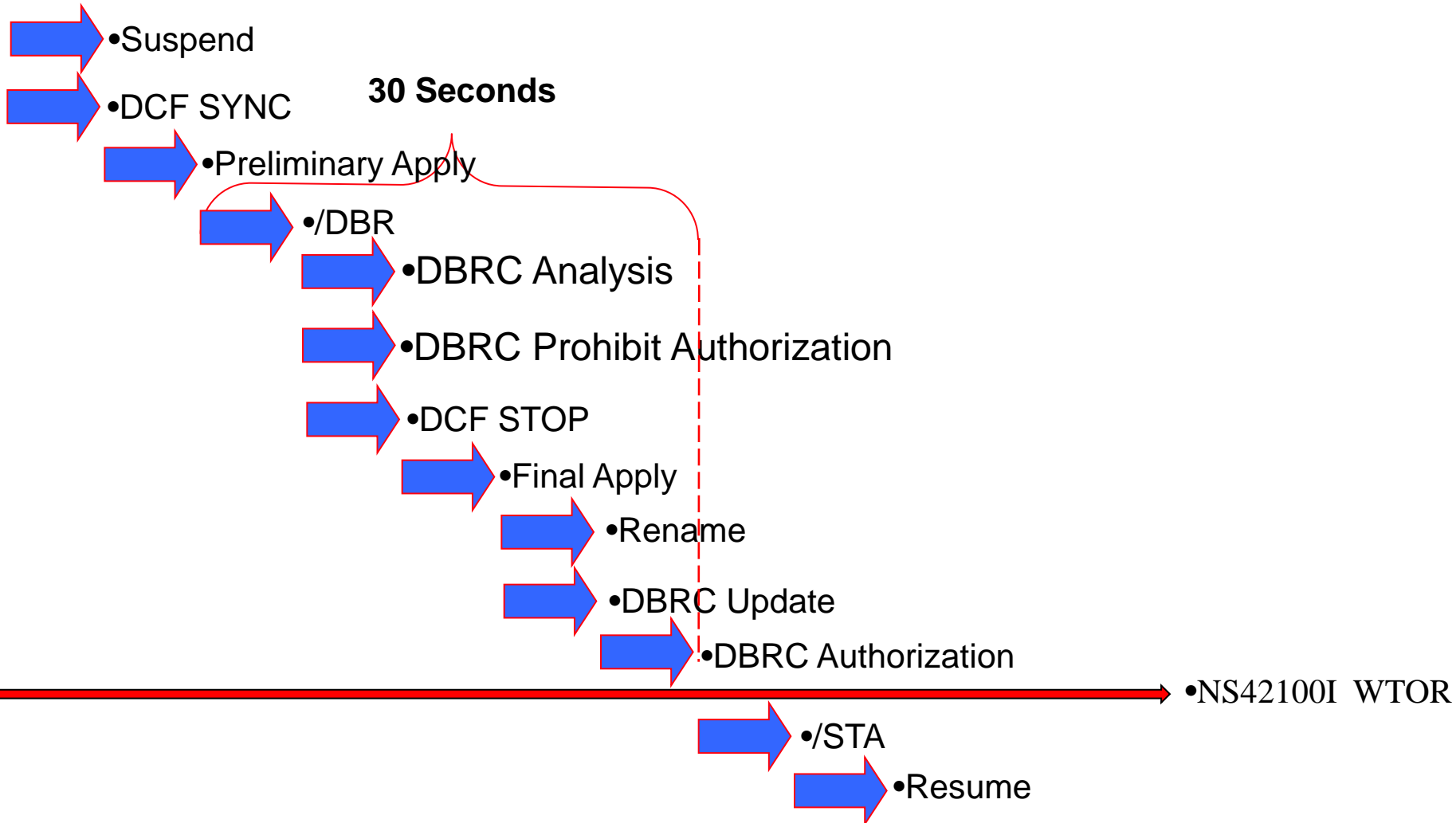


HALO does not edit for these restrictions!

- ▶ **Dynamically build** PSB and create an ACB
- ▶ **Apply collected updates** to database(s) using DL/I (DBB) interface for both full function and fast path databases
- ▶ **Apply process is recursive.** It can happen as many times as needed... before taking database(s) offline (/DBR)
- ▶ **Re-apply automatically** occurs every hour
- ▶ **Status** (update count and outage duration estimate) occurs every 15 minutes
- ▶ **Apply occurs** after “FINISH” and before /DBR in order to reduce the number of updates to be applied after the database(s) is offline

- ▶ **When you reply “FINISH”** you are committed to going forward with the new databases.
- ▶ **Cancelling the HALO job after this point** may require significant manual intervention on your part to clean up
- ▶ **DBRC commands** – both user and HALO generated commands are applied.
- ▶ **Database data set renames** are printed both to-and-from as they are renamed.

Outage Window



- ▶ **HALO is ready** for the online change process –
NS42100I – IMS Online Change required. Reply “FINISH” or “CANCEL”
- ▶ **Some things you may need to do** after this WTOR, depending upon what has changed:
 - STOP MPP programs and transactions
 - Online change for ACBLIB, FMTLIB
 - Copy staging DBDLIB/PSBLIB/MDALIB members to production
 - START MPP programs and transactions

 - **If programs have been modified** – (e.g. support larger segment)
 - STOP Message Processing Regions
 - Copy new program(s) to production
 - START Message Processing Regions

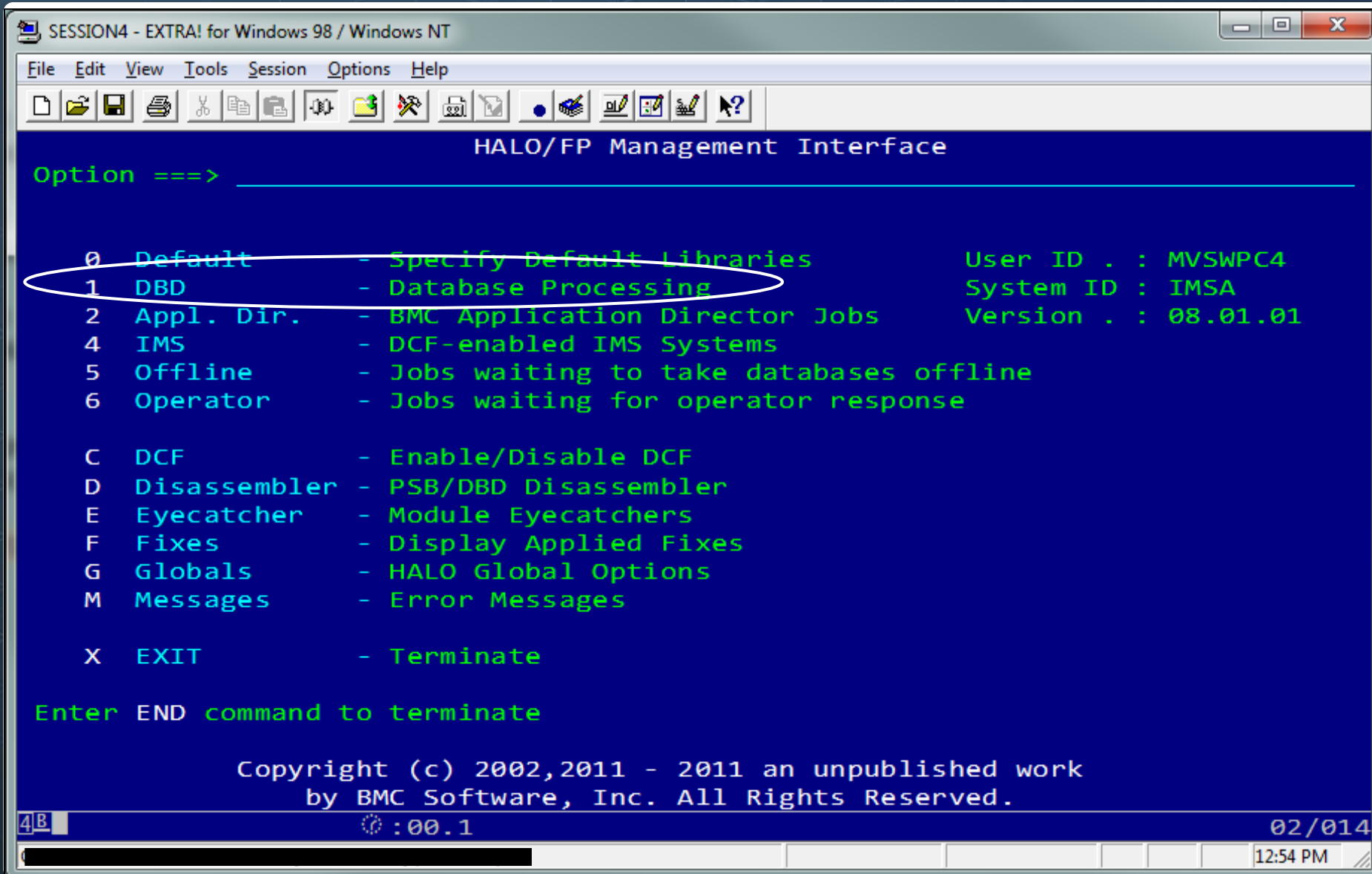
- ▶ NS41000I – Waiting for conversion to complete
- ▶ NS42000I – Waiting to take databases offline
- ▶ NS42100I – IMS Online Change required
- ▶ NS43000E – Operational Error, intervention required
 - Always receive a WTO indicating the problem along with a WTOR allowing operator to respond:

```
NS40371E Database datasets allocated to 1 other job(s) or user(s)
      System ID      Job Name
NS40372E SYSA          WPCJOB3A
*20 NS43000E DATASET_ALLOCATE command(s) failed.  Reply "RETRY" or "CANCEL"
```

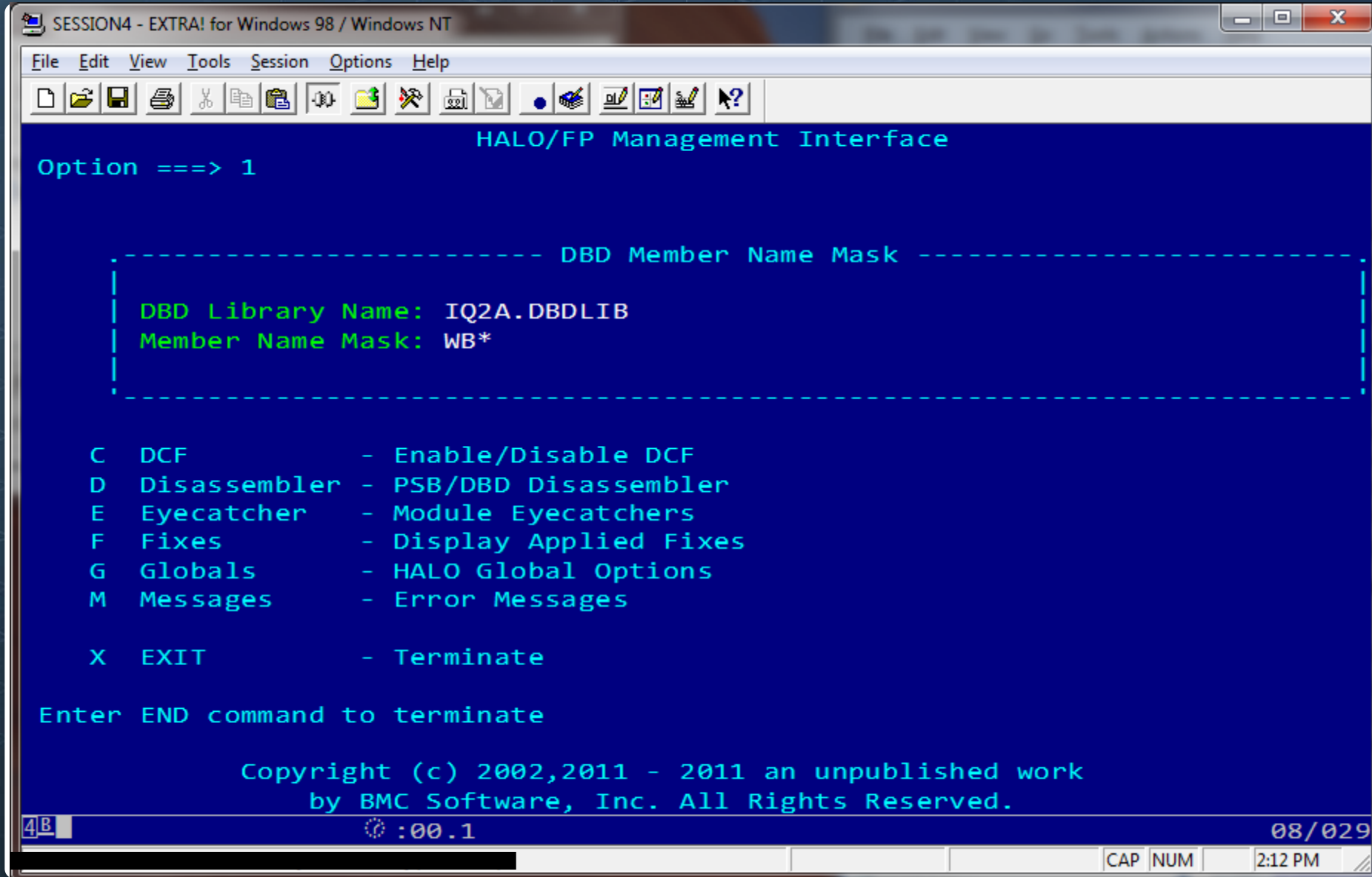
- ▶ User can reply to these WTOR messages via the HALO Management Interface panels (ISPF opt 6) ...Entered by:

```
ex '?bmcihlq.EXEC(NS4MGR)'
```

HALO Management Interface



HALO Management Interface



HALO Management Interface

SESSION4 - EXTRA! for Windows 98 / Windows NT

File Edit View Tools Session Options Help

HALO Database List Row 1 to 6 of 6
Command ==> Scroll ==> CSR

Line Cmds: S Select J JCL Generation

Database Definition Library . . . IQ2A.DBDLIB
Member Name Mask WB*

Database Name	Database Type	IMS Version	Assemble Date	Assemble Time
WBHODDA	HDAM, OSAM	1210	10/04/12	10.18
WBHODDAL	LOGICAL	1210	09/29/11	14.16
WBHVSAV	HDAM, VSAM	1210	10/04/12	10.18
WBHVSAVL	LOGICAL	1210	09/29/11	14.16
WBIVCIF	HIDAM, VSAM	1210	10/04/12	10.18
WBIVCIFI	INDEX, VSAM	1210	10/04/12	10.18

***** Bottom of data *****

4B :00.2 02/015 1:16 PM

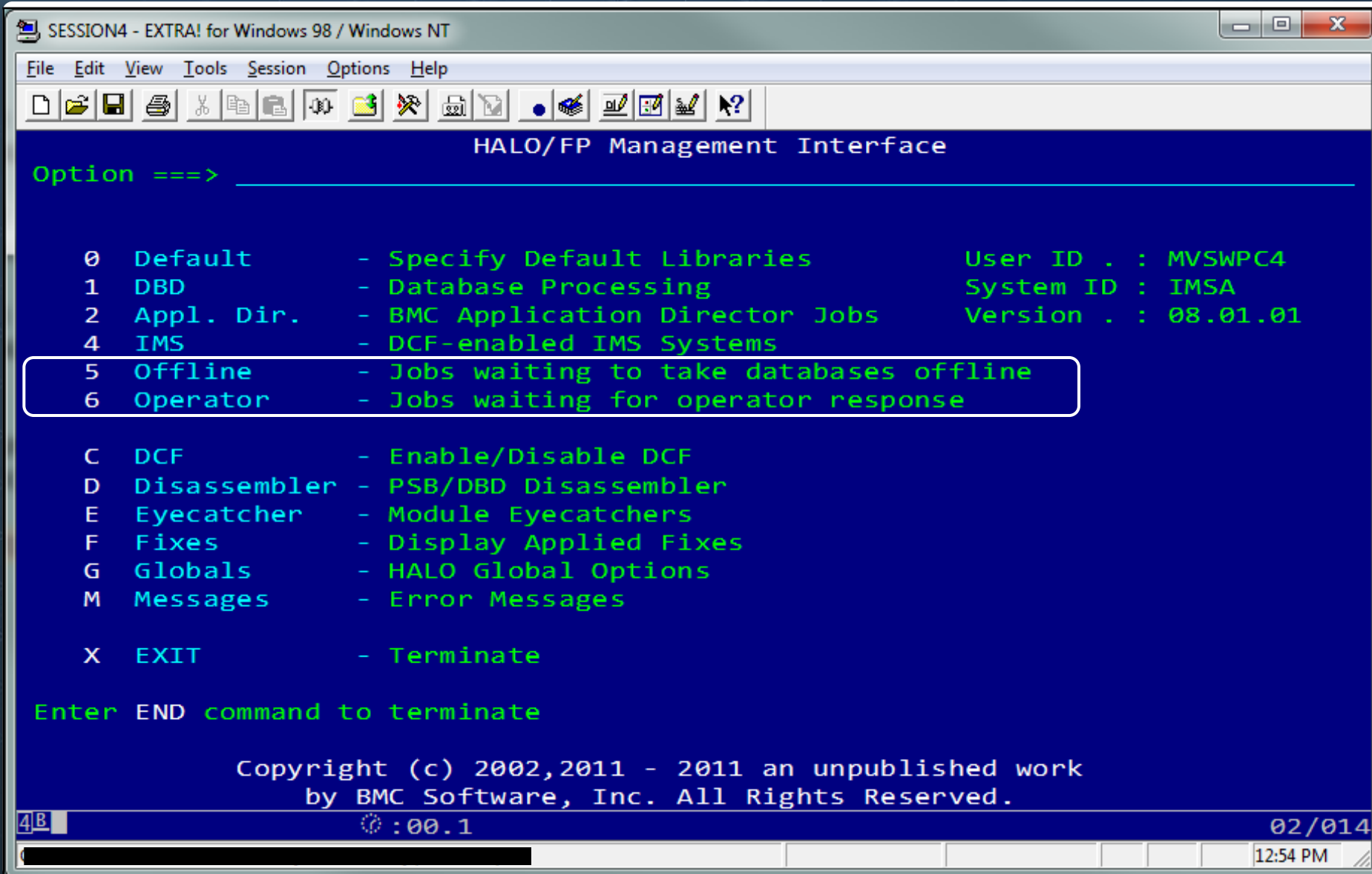
```
//HALO      EXEC PGM=NS4MAIN,REGION=0M,DYNAMNBR=2048
//STEPLIB DD DISP=SHR,DSN=BNZ.V8T.LOAD           ← Product load library (HALO / Eclipse Utilities)
//          DD DISP=SHR,DSN=BNB.IMSVS.R12.SDFSRESL ← IMS Reslib
//IMSDALIB DD DISP=SHR,DSN=IQ2A.MDALIB
//          DD DISP=SHR,DSN=BNB.IMSVS.R12.SDFSRESL
//NEWDALIB DD DISP=SHR,DSN=IQ2A.STAGING.MDALIB (STAGING)
//          DD DISP=SHR,DSN=IQ2A.MDALIB
//          DD DISP=SHR,DSN=BNB.IMSVS.R12.SDFSRESL
//IMS      DD DISP=SHR,DSN=IQ2A.PSBLIB
//          DD DISP=SHR,DSN=IQ2A.DBDLIB
//NEWIMS   DD DISP=SHR,DSN=IQ2A.STAGING.PSBLIB (STAGING)
//          DD DISP=SHR,DSN=IQ2A.PSBLIB
//          DD DISP=SHR,DSN=IQ2A.STAGING.DBDLIB (STAGING)
//          DD DISP=SHR,DSN=IQ2A.DBDLIB
//*NS4PRLOG DD SYSOUT=*
//*NS4DBRCI DD DUMMY,DCB=BLKSIZE=80 <== SHADOW DB DBRC COMMANDS
//*NS4DBRCE DD DUMMY,DCB=BLKSIZE=80 <== SHADOW REVERSAL COMMANDS
//*NS4HDBUP DD DUMMY,DCB=BLKSIZE=80 <== NEW PROD DB DBRC COMMANDS
//*NS4HDBER DD DUMMY,DCB=BLKSIZE=80 <== PROD REVERSAL COMMANDS
//NS4SYSIN DD *,DCB=BLKSIZE=80
CONVERT -           ← HALO CONVERT command
RESTRUCTURE -      ← Use HALO RPI keyword
DBD(WBHODDA)       ← Also: DBLIST( ); CAGRP( ); DBGROUP( )
```

```
//AMSPDS DD DISP=SHR,DSN=your.AMSPDS
```

- For VSAM data sets, DEFINE the shadow data sets
- For OSAM data sets, ALLOCATE the shadow data sets

The PDS member name must match the DD name of the database data set being allocated.

HALO Management Interface



Option 5 - Jobs Waiting To Take Databases Offline List

SESSION4 - EXTRA! for Windows 98 / Windows NT

File Edit View Tools Session Options Help

Jobs Waiting To Take Databases Offline List Row 1 to 1 of 1

Command ===> _____ Scroll ===> CSR

Line Cmds: F Finish A Apply Updates R Refresh Status C Cancel
S View Detail

Job Name	System ID	Estimated Outage (HH:MM:SS)	DB Updates to apply	ACTIVE Threads	Number Of Databases
HALO3RPI	IMSA	00:00:25	165	0	6

4B :00.1 02/015

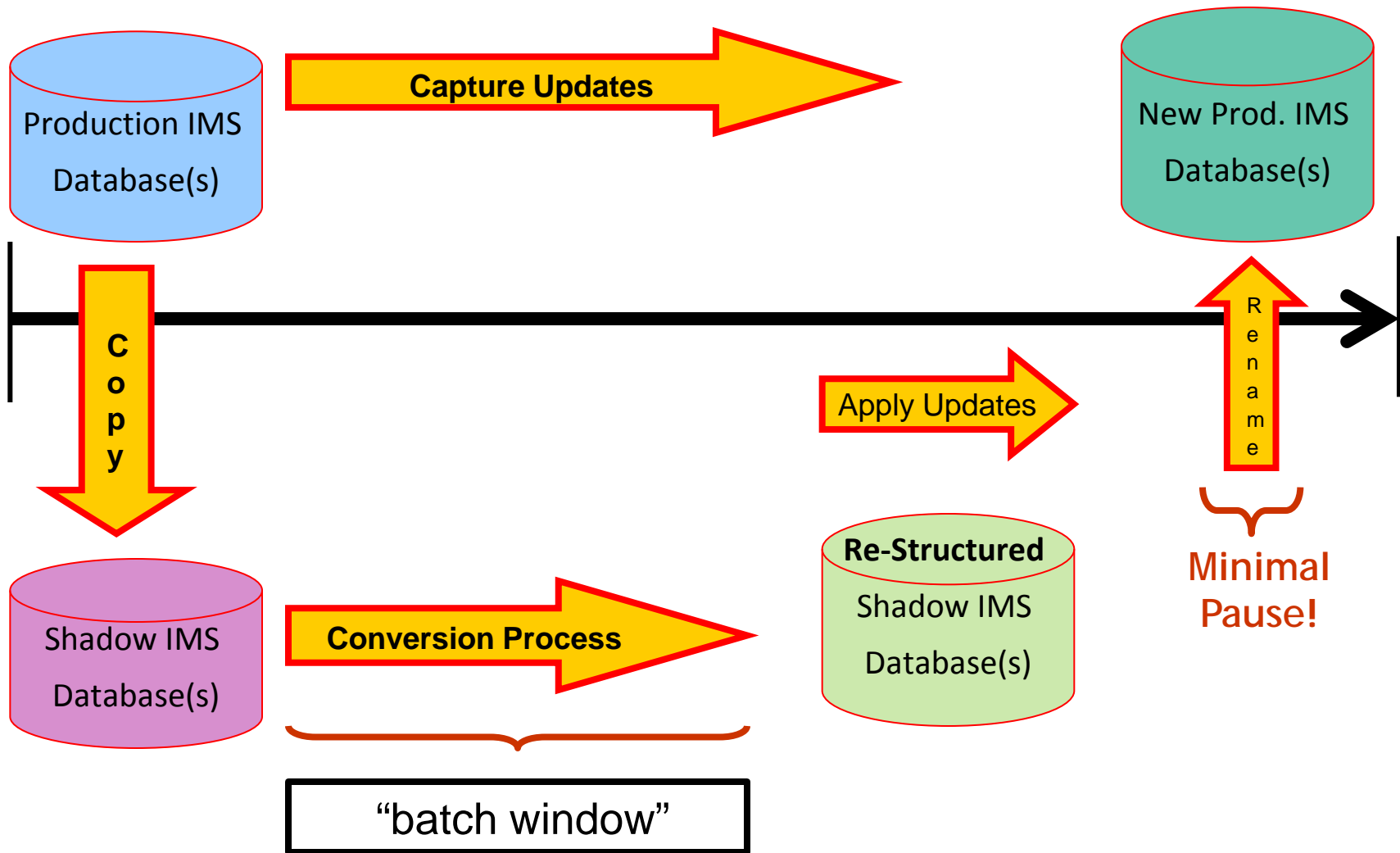
CAP 3:09 PM

Option 5 - Jobs Waiting To Take Databases Offline List

The screenshot shows a terminal window titled 'SESSION4 - EXTRA! for Windows 98 / Windows NT'. The window contains a menu bar (File, Edit, View, Tools, Session, Options, Help) and a toolbar with various icons. The main content is a text-based interface for a 'Jobs Waiting For Operator Response List'. It shows a single job entry for 'HALO3RPI' on system 'IMSA', which is 'Waiting for IMS Online Change'. The interface includes a command prompt 'Command ==>' and a 'Scroll ==> CSR' indicator. A legend for line commands is provided: 'F Finish', 'R Retry', 'C Cancel', and 'S View Detail'. The bottom of the screen shows a status bar with '4B', a timer ':00.1', and a page indicator '02/015'. The system clock in the bottom right corner shows '2:17 PM'.

```
SESSION4 - EXTRA! for Windows 98 / Windows NT
File Edit View Tools Session Options Help
[Toolbar Icons]
Jobs Waiting For Operator Response List Row 1 to 1 of 1
Command ==> [ ] Scroll ==> CSR
Line Cmds: F Finish R Retry C Cancel S View Detail
Job      System
Name     ID      Waiting Reason
_ HALO3RPI  IMSA    Waiting for IMS Online Change
***** Bottom of Data *****
4B [ ] :00.1 02/015 2:17 PM
```


BMC HALO for IMS™ Process Overview



Companies need to make changes to meet ever changing business requirements, but do not have the necessary batch window.

- ▶ Structure Changes
- ▶ Tuning Changes
- ▶ Space Reclamation

BMC HALO *for IMS* provides the solution to these 24x7 challenges for all these database types:

- ▶ Full Function
- ▶ PDF
- ▶ HALDB
- ▶ Fast Path DEDB

Want more information?

- ▶ Please contact your BMC Sales Rep or BMC Software Consultant (SC)

Any questions?



BMC HALO for IMS™ Process Overview

