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IMS Cloning Tool
Faster, Automated, IMS Cloning and Refresh Operations
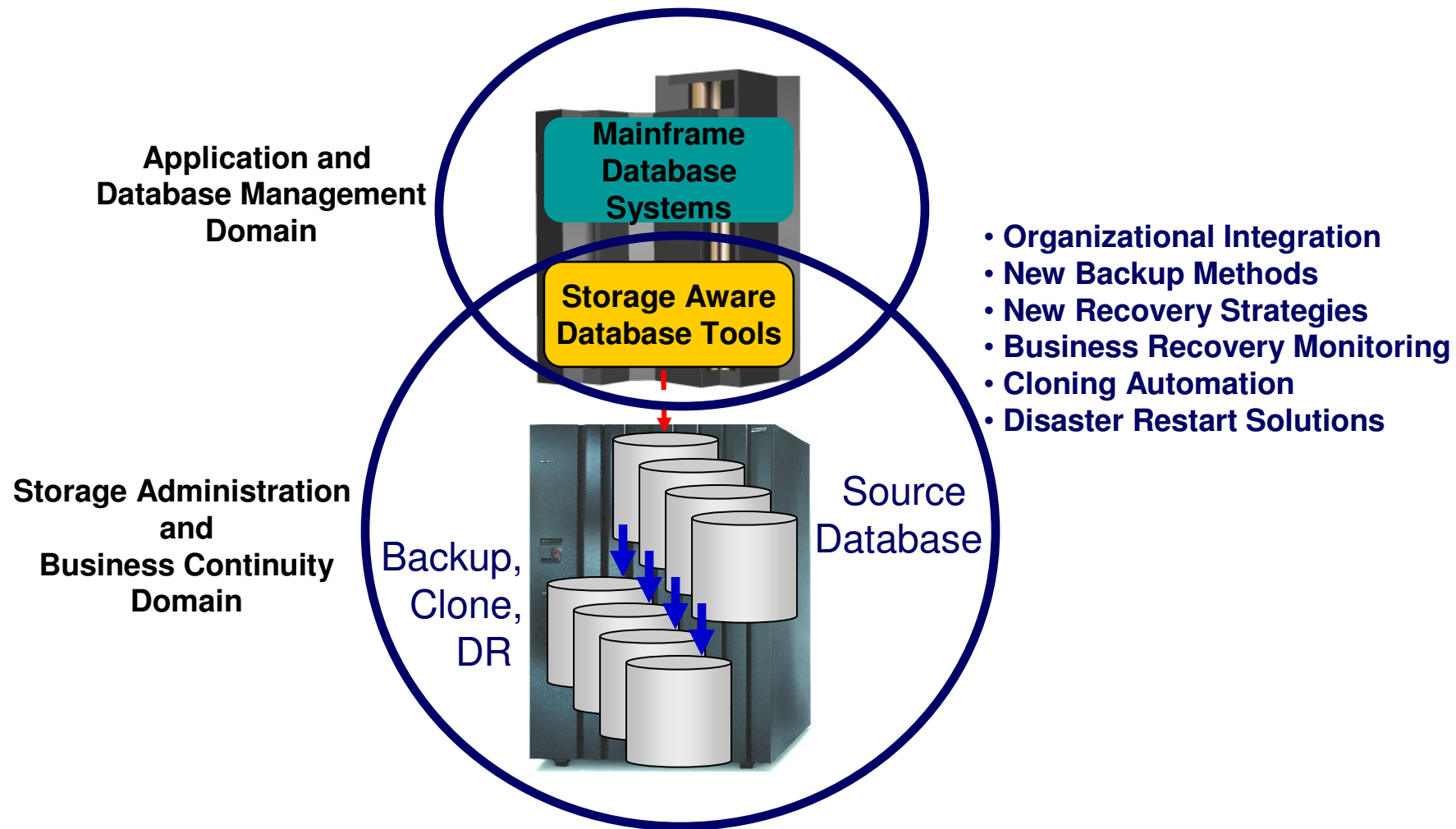
Information Management

Agenda

- **Trends and directions**

- **Cloning terminology**

- **Use cases**

- **Traditional Copy/Cloning Methods**

- **Options for copying data**

- **Clone IMS systems by volume**

- **Refresh IMS Databases by data set**

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**
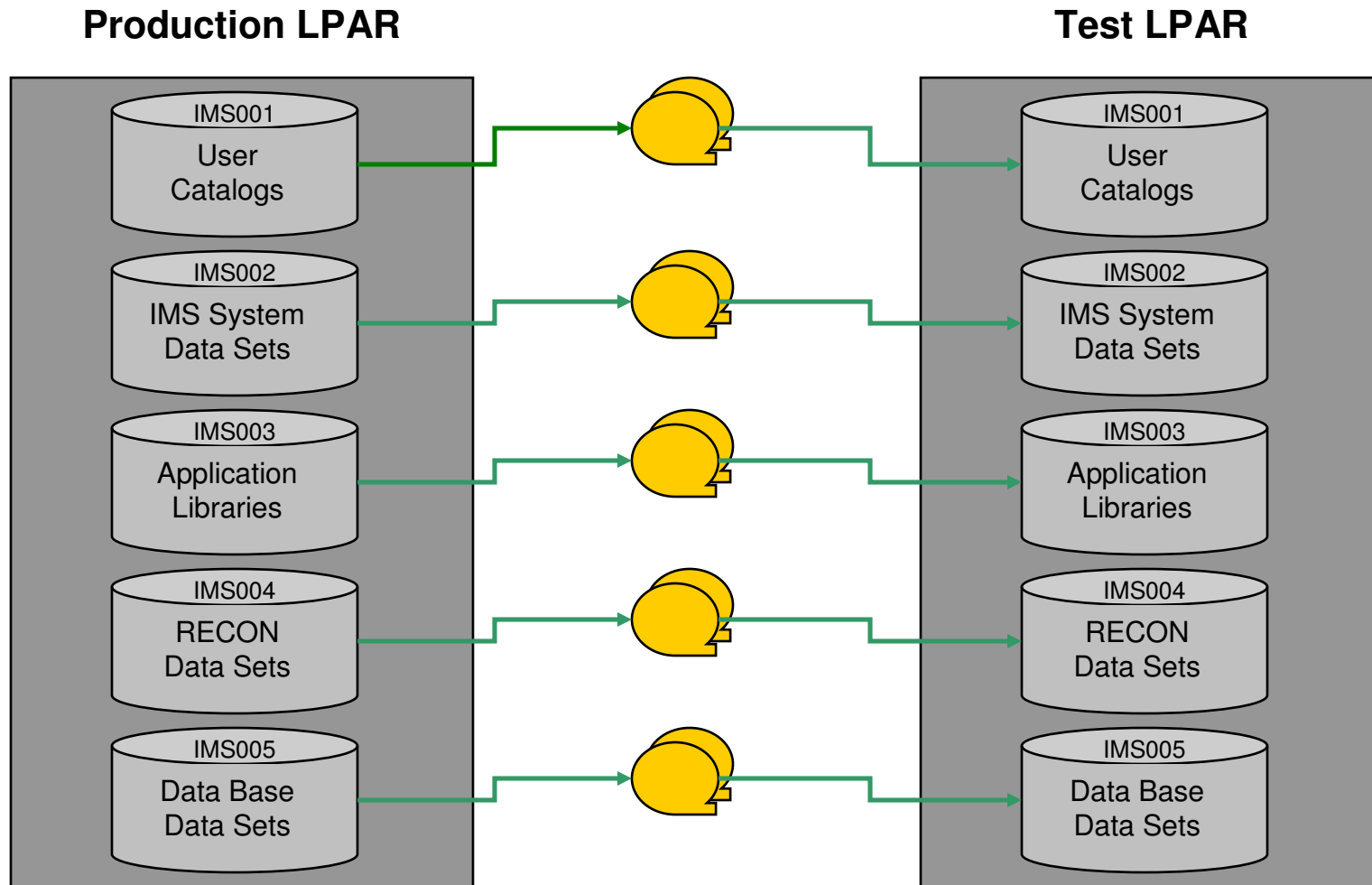
Cloning Terminology

- **A clone is an exact replica**
  - Clone an IMS system by volume
  - Clone an IMS database by data set

- **IMS system cloning and database refresh**
  - The act of replicating the data, making the replica accessible, and then using the replica in lieu of the original data

- **IMS system cloning automation**
  - Clones a complete IMS system including all its databases

- **IMS database refresh automation**
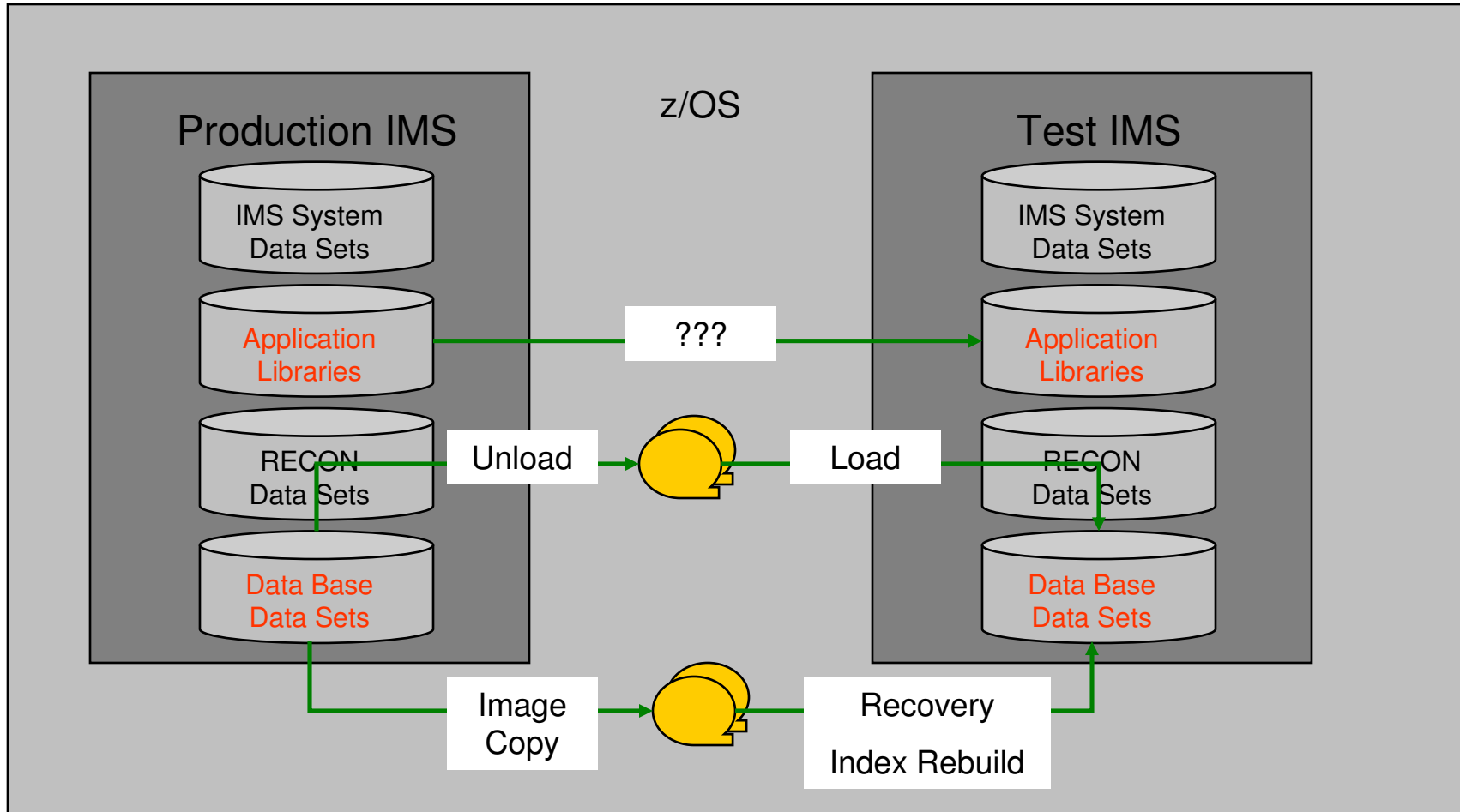 - Refreshes specific databases
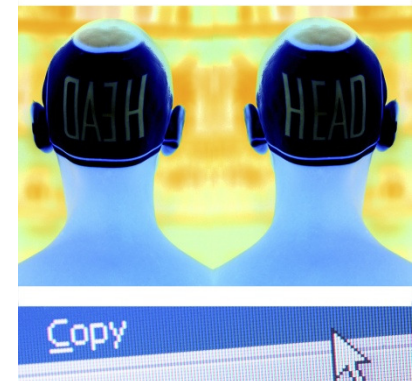
Use Cases for Cloning IMS Systems or Refreshing IMS Databases

- **Offload business reporting to an IMS clone**
  - Improve production performance
  - Run pointer checker utility from the clone

- **Create or refresh test, development, or quality assurance environments**
  - Development refresh
  - To stage data-warehouse loads

- **Aid in problem determination**
  - Troubleshoot a production problem
  - Test new releases of IMS
  - Apply maintenance and verify integrity before applying to production

- **Refresh databases into a previously cloned IMS skeleton**

IMS System Cloning Today

Production LPAR

Test LPAR

IMS001		IMS001
User Catalogs	→	User Catalogs
IMS002		IMS002
IMS System Data Sets	→	IMS System Data Sets
IMS003		IMS003
Application Libraries	→	Application Libraries
IMS004		IMS004
RECON Data Sets	→	RECON Data Sets
IMS005		IMS005
Data Base Data Sets	→	Data Base Data Sets

# IMS Database Cloning Today

IBM

Fast Replication Data Copy Options

Fast copy processes offloaded to the storage processor
No host CPU or I/O resources

- **Volume based fast replication options for IMS system cloning**
  - FlashCopy (IBM,EMC,HDS)
  - SnapShot (IBM,STK)
  - TimeFinder/Clone Volume Snap (EMC)
  - TimeFinder/Snap (EMC)
  - Mirror processes
    - PPRC (IBM,EMC,HDS)
    - TimeFinder/Mirror, SRDF (EMC)
    - ShadowImage HUR (HDS)

- **Data set based fast replication options for IMS database refresh**
  - Data Set FlashCopy (IBM,EMC,HDS)
  - Data set SnapShot (IBM,STK)
  - TimeFinder/Clone Data set Snap (EMC)

Fast Replication
Commands from
z/OS
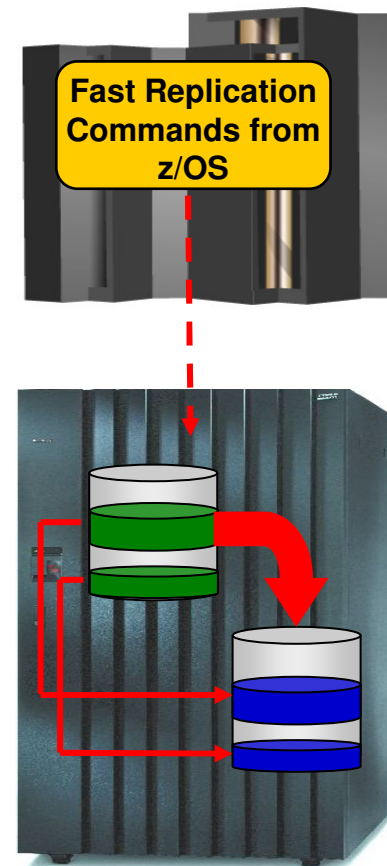
Host Based Data Copy Options

Data copy processes use host based CPU and I/O facilities
Slower than storage-based fast replication

- **Volume copy options for IMS system cloning**
  - TDMF (IBM)
  - FDRPAS (Innovation Data Processing)
  - DFSMSdss (IBM)
  - FDR (Innovation Data Processing)

- **Data set copy options for IMS database refresh**
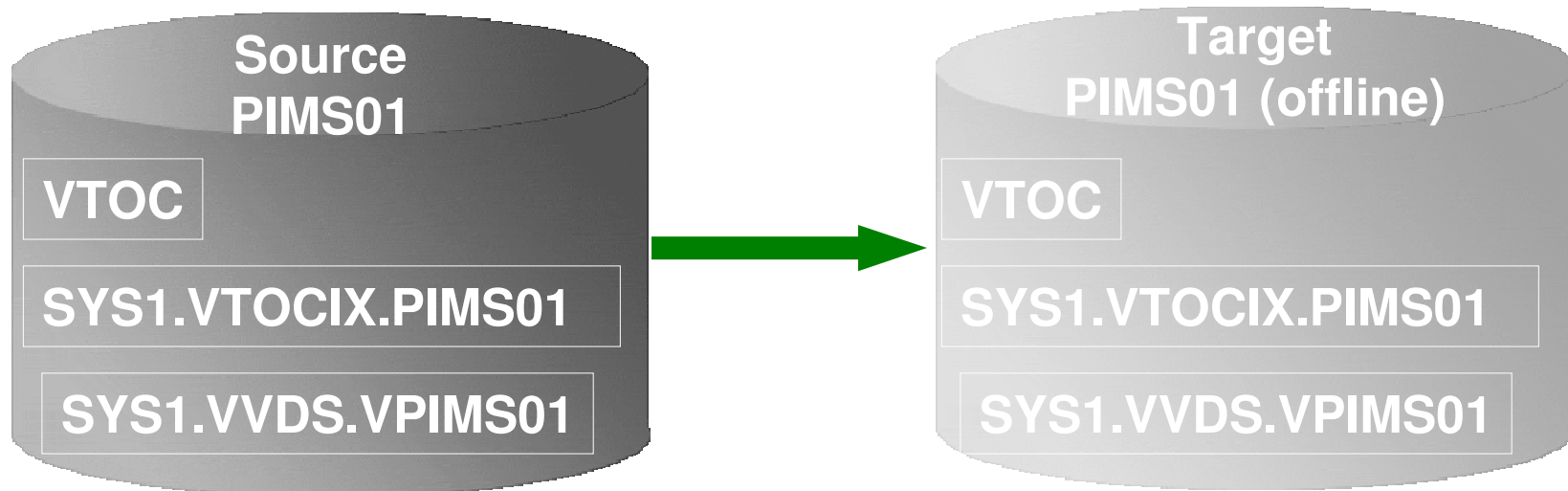 - Any traditional data set copy processes

Host-based Copy Process
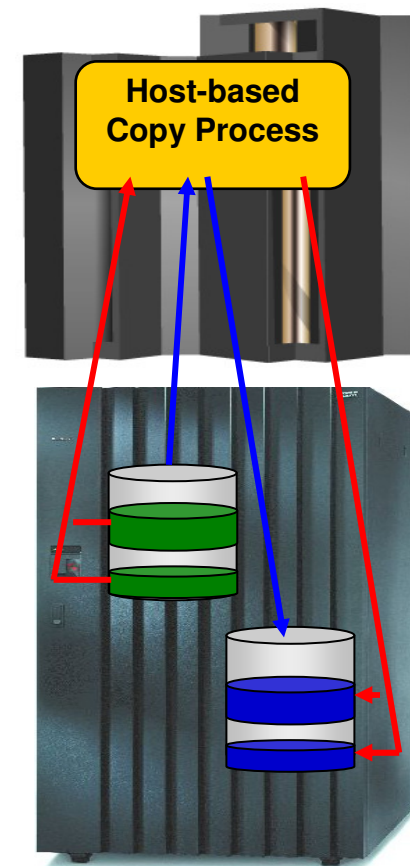
Challenges to Data Access
On the Same or Shared LPAR

- **IMS system cloning is best done using volume replication**

- **Volume data is replicated fast and easy but…**
  - How do you access the cloned data?

- **Inherent Problems:**
  - VOLSERs may have the same volume names as the source
  - Volume VTOC, VTOCIX and VVDS may be the same or different
  - Data set names are the same on source and target volumes
  - If you want to access the data from a common LPAR, how do you access the data?

Challenges to Data Access
On the Same or Shared LPAR - Volume ID Issues

Source PIMS01

VTOC

SYS1.VTOCIX.PIMS01

SYS1.VVDS.VPIMS01

Target PIMS01 (offline)

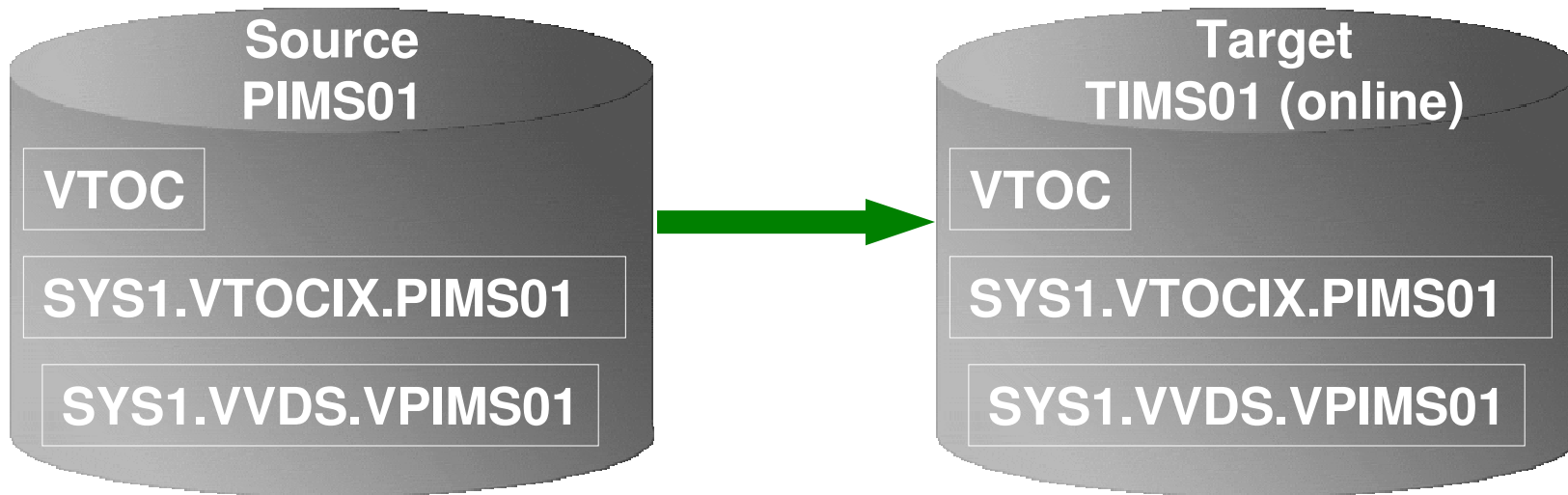VTOC

SYS1.VTOCIX.PIMS01

SYS1.VVDS.VPIMS01

Result:
1. Source PIMS01 keeps its original VOLSER on the target volume
2. VTOC, VTOCIX, and VVDS *reflect* PIMS01
3. The target volume is offline because it has the same VOLSER as the source. It could be brought online on another non-sharing system to use the clone
4. Target volume can't be used on the same or shared disk LPAR without re-labeling the volume.

Challenges to Data Access
On the Same or Shared LPAR - Volume ID Issues (2)

Source
PIMS01

VTOC

SYS1.VTOCIX.PIMS01

SYS1.VVDS.VPIMS01

Target
TIMS01 (online)

VTOC
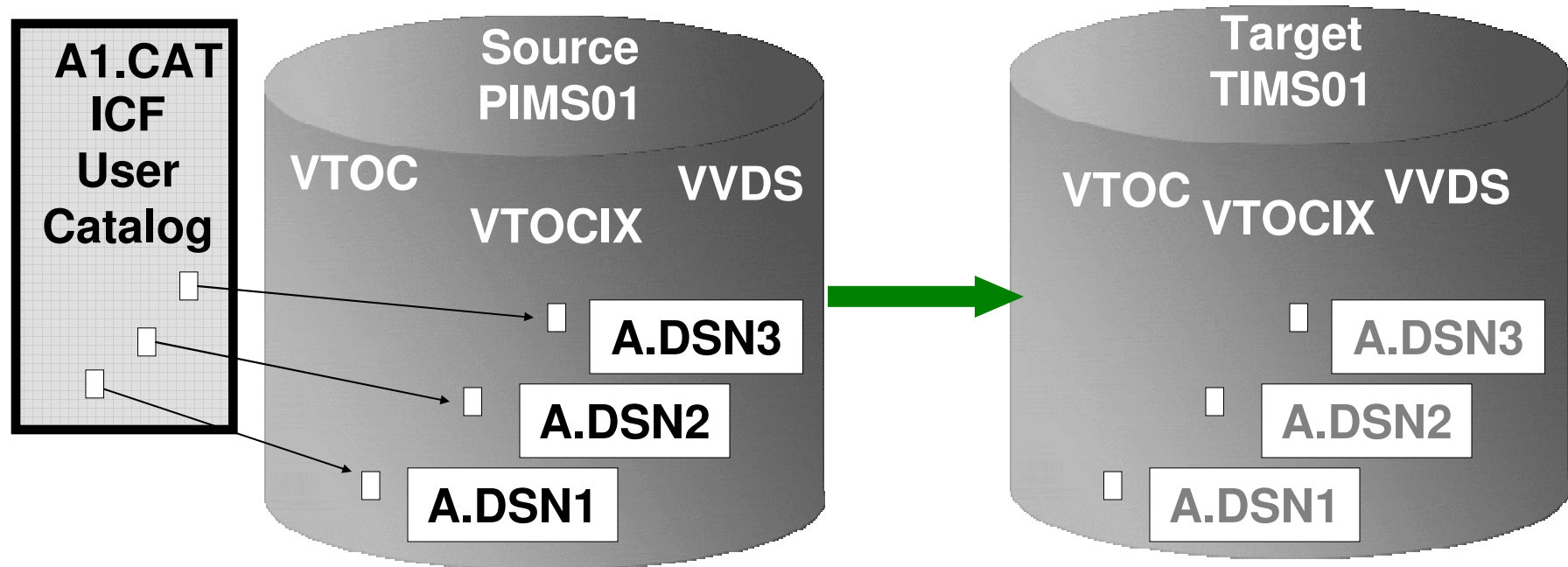
SYS1.VTOCIX.PIMS01

SYS1.VVDS.VPIMS01

Result:

1. Source PIMS01 becomes new VOLSER TIMS01 on the target volume
2. VTOC, VTOCIX, and VVDS *reflect* PIMS01

Challenges to Data Access
Data Set Name and Cataloging Issues

A1.CAT ICF User Catalog

Source PIMS01

VTOC   VVDS
VTOCIX

A.DSN3

A.DSN2

A.DSN1

Target TIMS01

VTOC   VTOCIX   VVDS
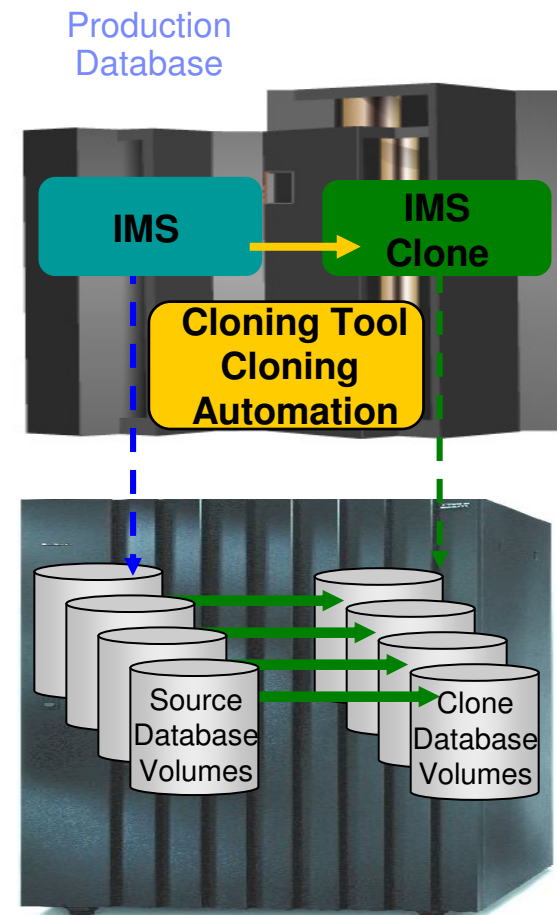
A.DSN3

A.DSN2

A.DSN1

Result:
1. Data sets on the volume are copied, but keep their original name
2. Only the source data sets are cataloged; even if the catalog is on the cloned volumes, it isn't connected to the system's master catalog

IMS Cloning Tool Provides Data Access
On the Same or Shared LPAR

- **Solution – IMS Cloning Tool**
  - **— the *Key* to Data Access**

  - Provides *access to data sets* on target volumes
    - Renames the VTOC, VTOCIX, and VVDS to match the target volume
    - Renames and catalogs all data sets to a new HLQ
    - Adjusts target IMS system to accommodate and accept the cloned data

  - Solution to enable the use of the data sets on the target volumes on the same image
    - No more complicated cloning
    - No more requirement for a separate image

Clone IMS Systems Using IMS Cloning Tool
IMS System Cloning Automation

- **Performs IMS system cloning automation**
  - Takes an existing IMS system (complete installation and system generation process completed) and creates a new, or cloned, IMS system from it without having to repeat the entire installation and system generation processes
  - Simplifies IMS 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 volumes to solve the data access challenges**
  - Target volumes retain their target volume label
  - Renames the VTOC, VTOCIX, and VVDS to match the target volume
  - Renames and catalogs all data sets to a new HLQ

- **Adjusts target IMS to accommodate and accept the cloned data**
  - IMS RECONs, PROCLIB, JOBS, JCL, MDA members

Production Database

IMS

IMS Clone

Cloning Tool Cloning Automation

Source Database Volumes

Clone Database Volumes

Pre-IMS System Cloning Steps
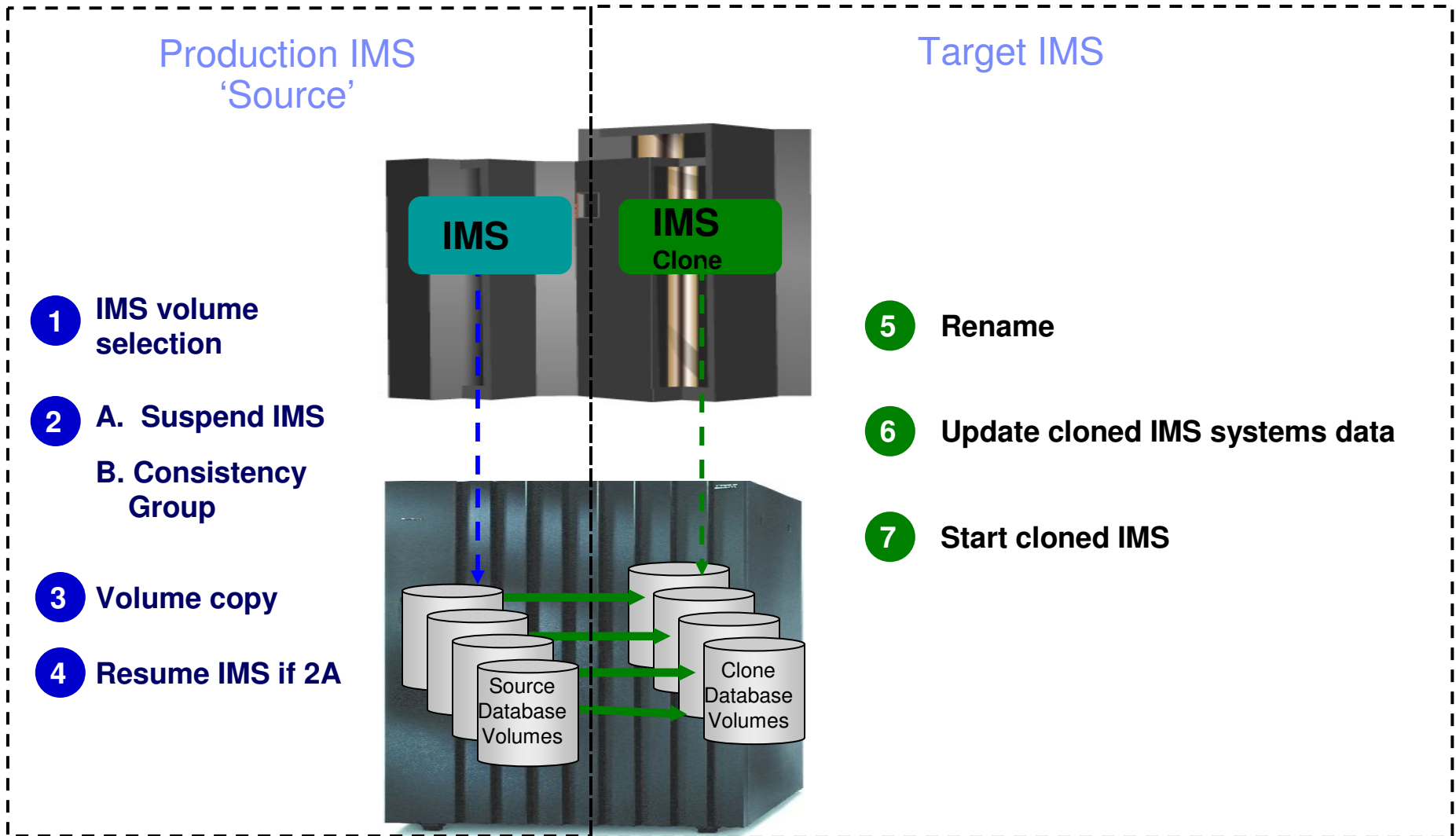## One Time Set Up - Target IMS System

- **User creation of target subsystem**
  - Determine what components and configuration options you want
  - Create target PROCLIB members in source PROCLIB
  - Create target IMS.JOBS members in source IMS.JOBS data set

- **By default, because the clone is an exact replica of the source, the clone would have the same components as the source**

IMS System Cloning Steps

Production IMS 'Source'

Target IMS

IMS

IMS Clone

1. IMS volume selection

2. A. Suspend IMS

   B. Consistency Group

3. Volume copy

4. Resume IMS if 2A

5. Rename

6. Update cloned IMS systems data

7. Start cloned IMS

Source Database Volumes

Clone Database Volumes

Status of In-Flight Transactions

- **Status of In-Flight Transactions**
  - An online cloning solution often results in transactions in flight
  - These in-flight transactions, cloned to the target system result in the same target system action that would happen on the source system if it were to have died at that same time and then restarted
  - The target restart is essentially an emergency restart of a failed system

Cloned IMS System Updates

- **RECONs data sets**
  - Data set names, IMS subsystem IDs, and VOLSERs are updated in the following RECON records: header record, database data set records, online log records, and back-out records

- **Optionally, the following RECON records are updated if they were on volumes that were cloned:**
  - Image copy records, change accumulation records
  - System log data set (SLDS) records
  - Recovery log data set (RLDS) records
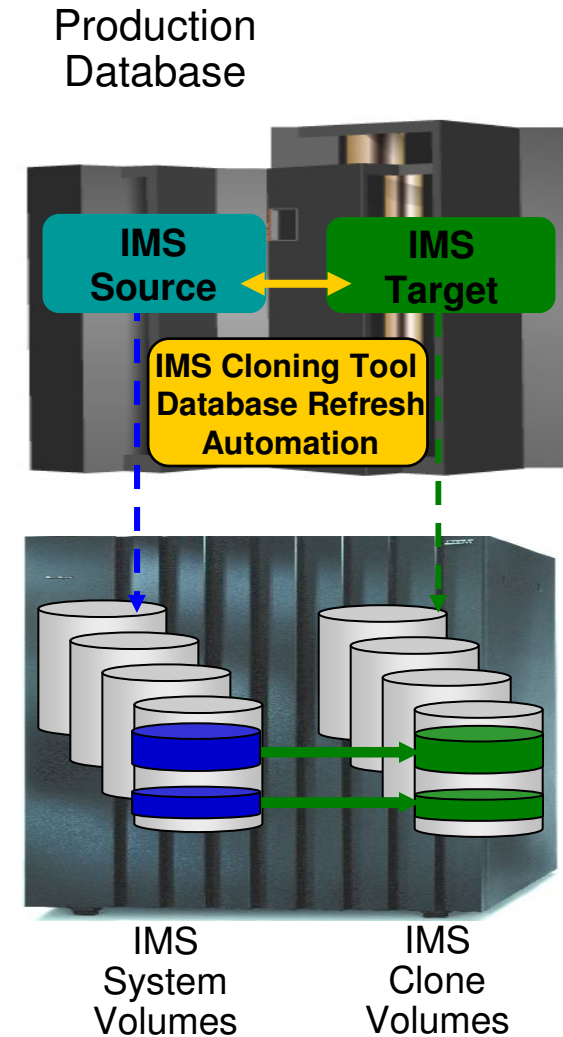
Cloned IMS System Updates

- **IMS PROCLIB and JOBS and user JCL libraries**
  - New values for IMSID, VOLSERS, and data set names in the JCL members within these libraries

- **MDA (MVS Dynamic Allocation) members for databases or system data sets, are updated to reflect the new data set names. Updates include:**
  - The RECON data sets
  - Online Log data sets (OLDS)
  - Write-ahead data sets (WADS)

- **If IMS data sharing is involved, each additional IMS data sharing member is updated**
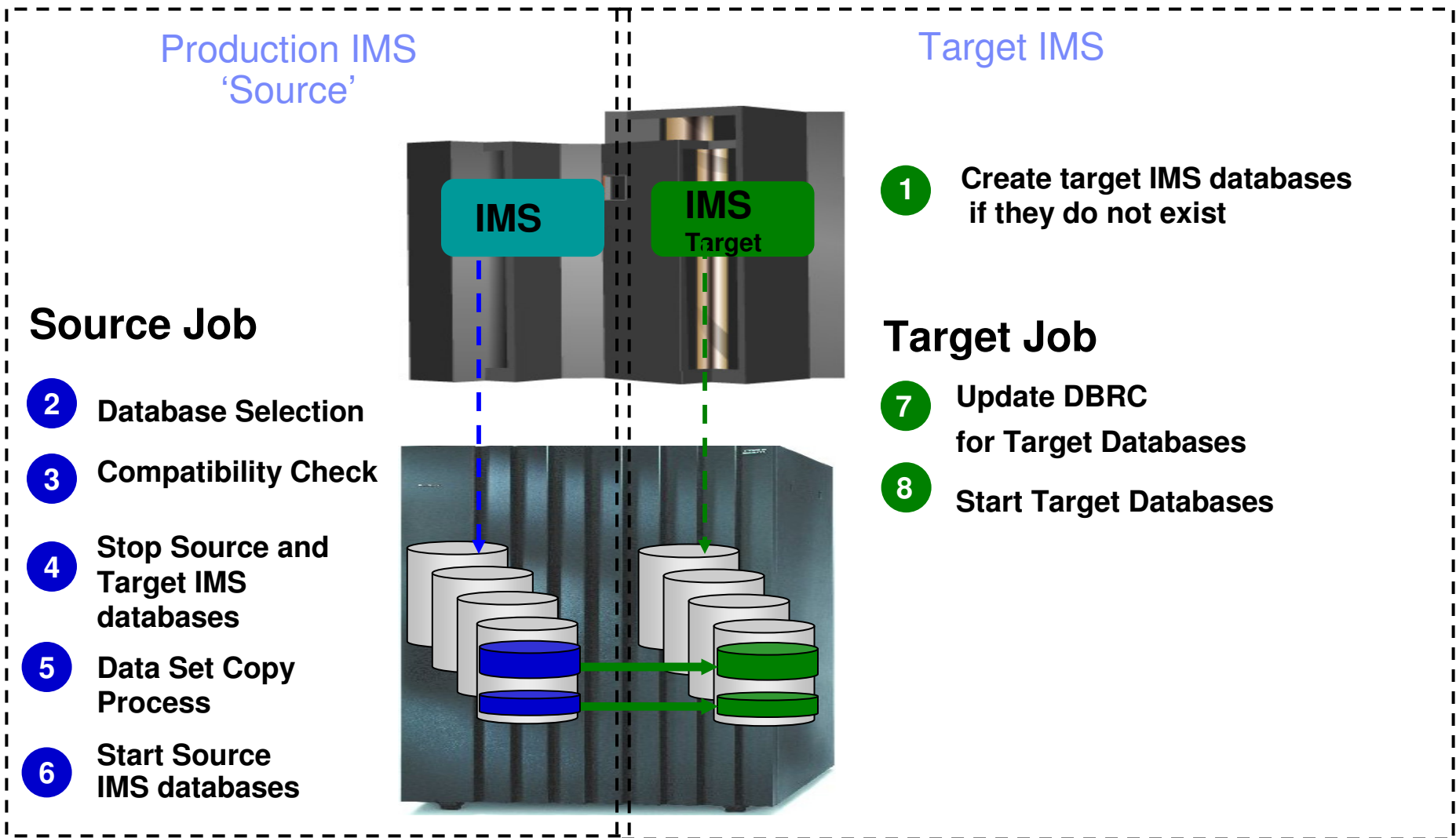
IMS Support

- **IMS Support**
  - IMS offline
  - IMS data sharing
  - IMS data sharing with many to less members
  - IMS data sharing to non-IMS data sharing

Refresh IMS Databases Using IMS Cloning Tool
Database Refresh Automation

- **Performs automated IMS database refresh operations**
  - Fast refresh of IMS databases
  - IMS DB support (FF, HALDB, DEDB)

- **Verifies source and target database compatibility**

- **IMS data copied using storage-based dataset fast-replication**
  - Target takes up the same amount of space as the source

- **Performs target system meta-data management**
  - Updates DBRC information for target databases

Production Database

IMS Source

IMS Target

IMS Cloning Tool Database Refresh Automation

IMS System Volumes

IMS Clone Volumes

Refresh IMS Databases Using IMS Cloning Tool

Production IMS 'Source'

Target IMS

IMS

IMS Target

1 Create target IMS databases if they do not exist

Source Job

2 Database Selection

3 Compatibility Check

4 Stop Source and Target IMS databases

5 Data Set Copy Process

6 Start Source IMS databases

Target Job

7 Update DBRC for Target Databases

8 Start Target Databases

IMS Database Refresh to a Cloned IMS Database Skeleton

Production IMS 'Source'

Target IMS

IMS

IMS Clone

3 Create Cloned IMS System Without Cloned Database Data

IMS System and Database Volumes

Refresh IMS Databases

1 IMS System Volume Selection

2 Perform IMS System Cloning Automation Using System Data Set Volumes Only

IMS

System Data Sets

IMS

Skeleton System

A

B

A

B

4 Refresh IMS Database A

5 Refresh IMS Database B

6 Run Offload Application on Refreshed IMS Databases

Database Selection

- **Specify database names**
  - Finds the IMS subsystem name and whether it is active
  - Finds the source and target databases and indexes
  - Determines data set names for each database and index
  - Verifies their existence

```
IMSDBREFRESH                    -
    IMS-SSID(ssids,ssidt)   -
    DBD(dbdname1,dbdname2)  -
    INDEXES(Y)              -
    REPLACE-TARGET-DS(Y)    -
    AUTO-START-SOURCE-DB(Y) -
    AUTO-STOP-TARGET-DB(Y)  -
    AUTO-START-TARGET-DB(Y) -
    GLOBAL NOFEOV
```

Compatibility

- **Verify compatibility between the source and target IMS**
  - Gets attributes of IMS databases and indexes from source and target IMS RECON, ACBLIB, and MDALIB data sets

Object type	Attributes that must be identical for source and target object
Database	Type, Access Method, Number of segments, data set groups, Blocksize, Randomizer Parameters
Partitioned Database	Number of Partitions, Partition Selection Routine, Keystrng
Segment	Length, Key start and length, Uniqueness, Pointers, Edit Routine
Index	CIsize, record length, DDATA, source and target segment codes, Sparse routine
Partitioned Index	Number of Partitions, Keystrng

Run Pointer Checker Utility on the Clone

- **DBA's have to balance the value IMS pointer checker utility analysis provides with the adverse affect it can have on running production applications**

- **The questions that database administrators must ask are:**
  - What IMS pointer checker utility functions need to run?
  - How often do they need to be run?
  - How much impact will the utility functions have to production data?
  - How can the impact to production data be reduced?

- **Running pointer checker on the clone preserves the availability and performance of running IMS applications**

Copying HALDB Databases

- **Copying HALDB databases can be complex and can affect database availability**
  - IMS Cloning Tool makes copying HALDB databases fast and easy.
    - Uses storage-based fast-replication to copy the data instantly
    - Updates the target IMS RECON to reflect the same partition and reorg numbers as the source RECON
    - Primary and secondary indexes and ILDS can be copied to eliminate index and ILDS rebuild time
    - Manages partition number and gap sequencing

IMS Cloning Tool Session Summarization

- **IMS Cloning Tool simplifies and automates database administration tasks**
  - Integrates and coordinates database and storage activities

- **Promote high availability solutions**
  - IMS Cloning Tool clones IMS systems fast and effectively
  - IMS Cloning Tool provides fast and effective refresh operations

- **Integrates storage-based fast replication**
  - Provides fast and non-intrusive cloning operations

- **Offloads copy to the storage processor**
  - Reduces host CPU and I/O resource utilization

IBM

Q & A