Multiple Target PPRC with IBM DS8870

Session 17839

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DS8000 Copy Services

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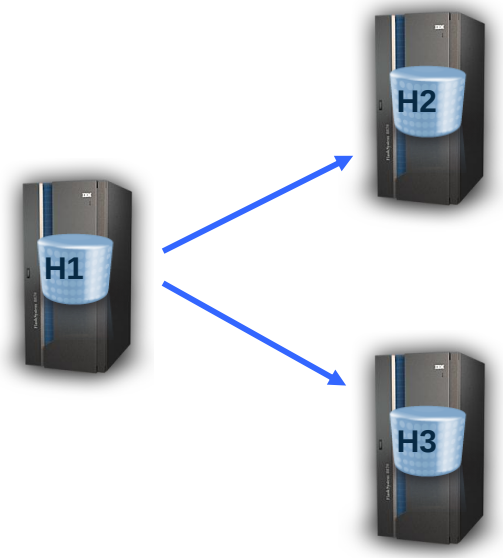
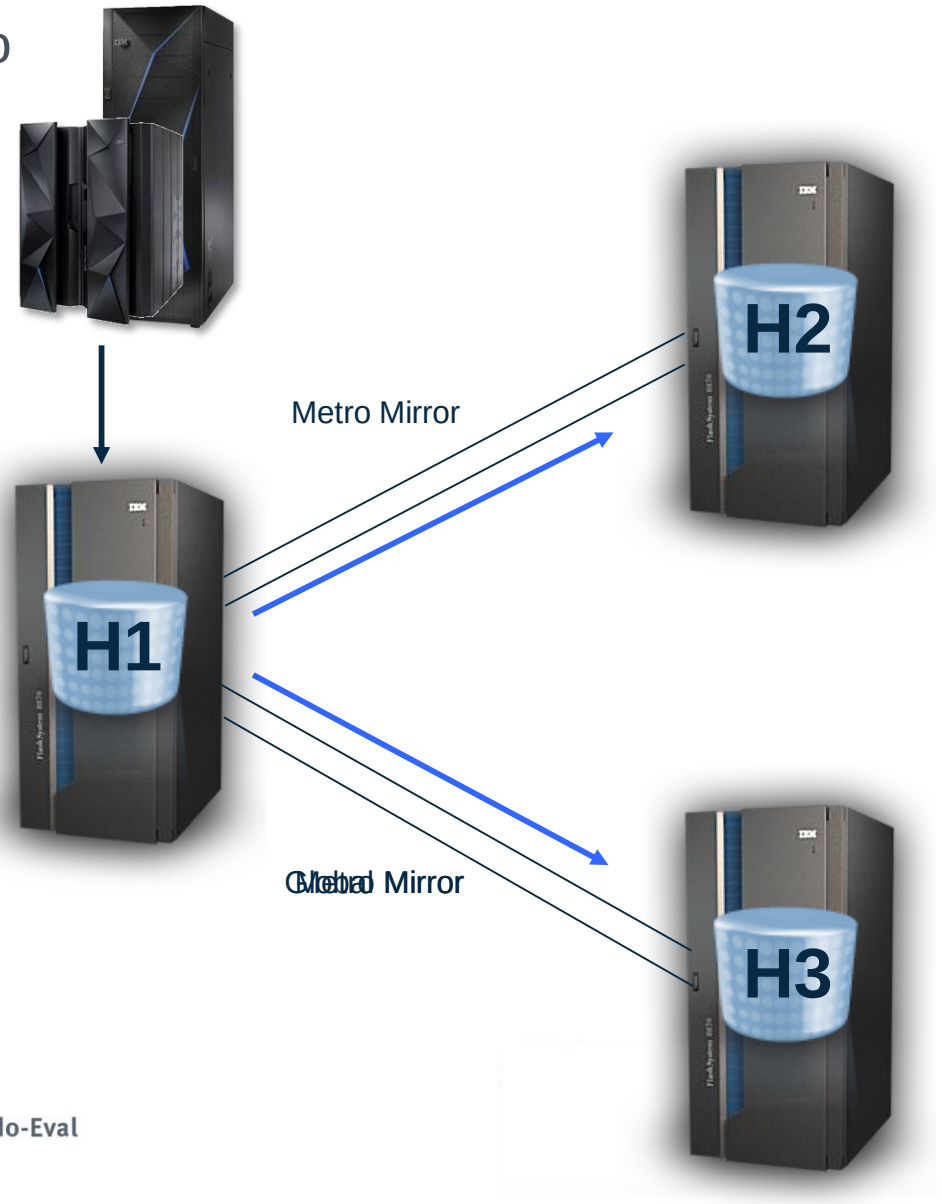
Agenda

- Multiple Target Topologies
- Multiple Target Metro Mirror
- Incremental Resynchronization
- Failure Recovery Scenarios
- Command and Interface changes
- Software Support
- Migration using Multiple Target
- Metro Global Mirror (MGM) Topologies
- Additional Topologies



Multiple Target PPRC

- A volume is the source for two separate relationships.
- Multiple Target Metro Mirror
  - Two Synchronous relationships
  - Limited Availability in Release 7.27
- Additional topologies
  - Both synchronous and asynchronous replication
  - General Availability in Release 7.4

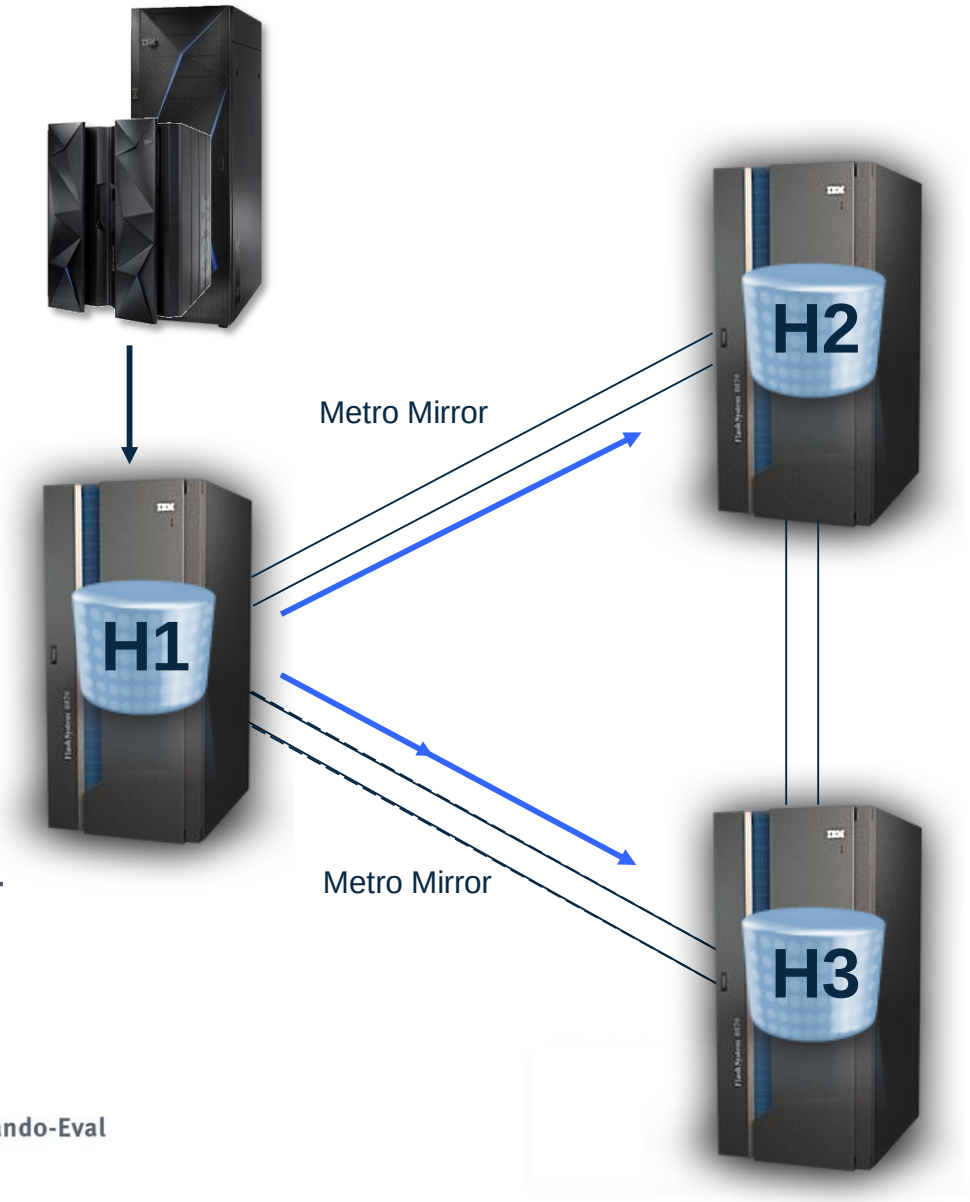


Topologies

- Two Synchronous Metro Mirror
- Synchronous Metro Mirror + Asynchronous Global Mirror/Global Copy
- Two Asynchronous
  - Global Mirror and Global Copy
    - But not two Global Mirror
- Multiple Target with MGM or Mz/GM

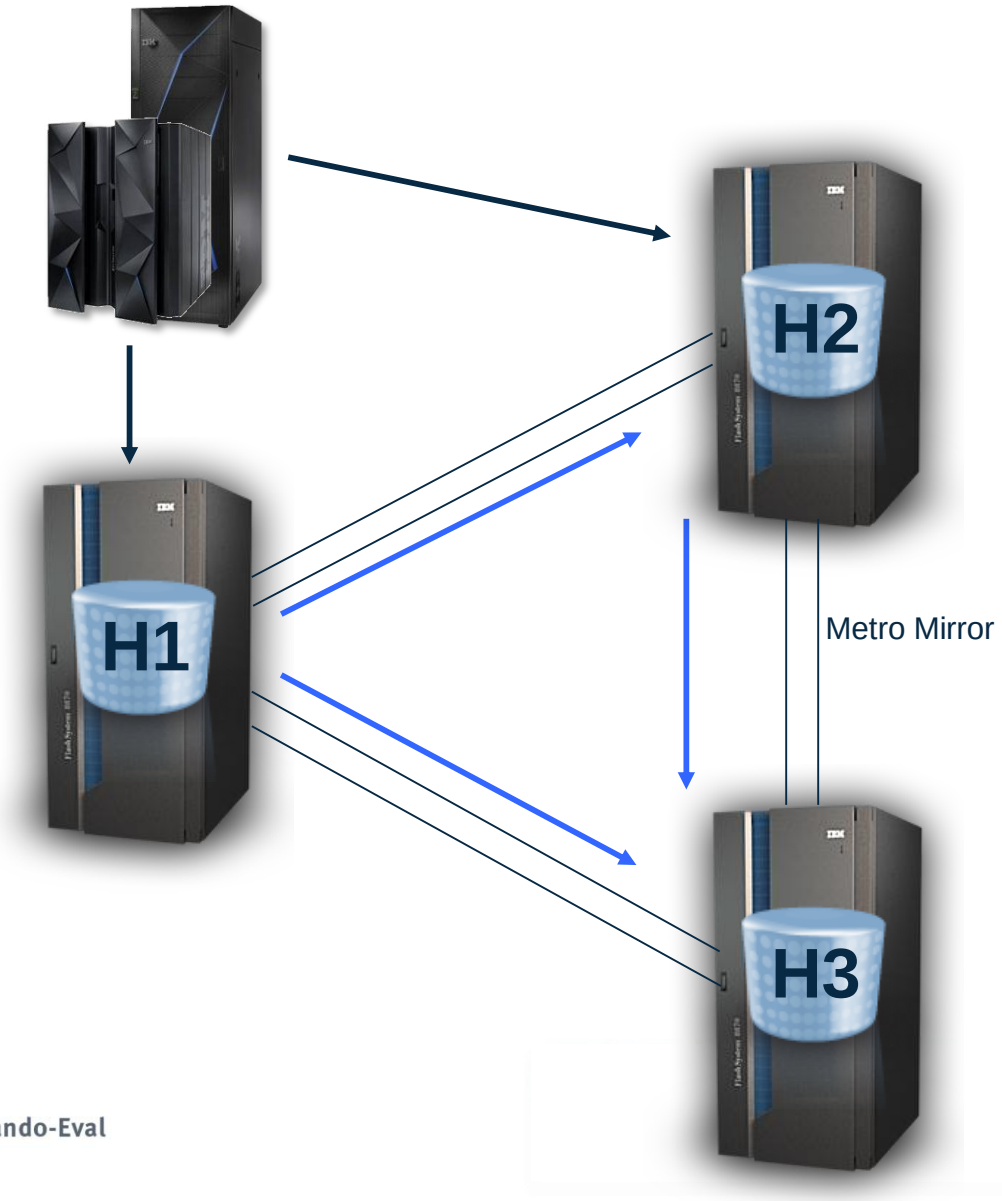
Multiple Target Metro Mirror

- Data is transferred to both targets in parallel
- Pairs operate independently of each other
  - Pairs may be established, suspended or removed separately
- HyperSwap capability is maintained
- Multiple Target restored after remote site is recovered



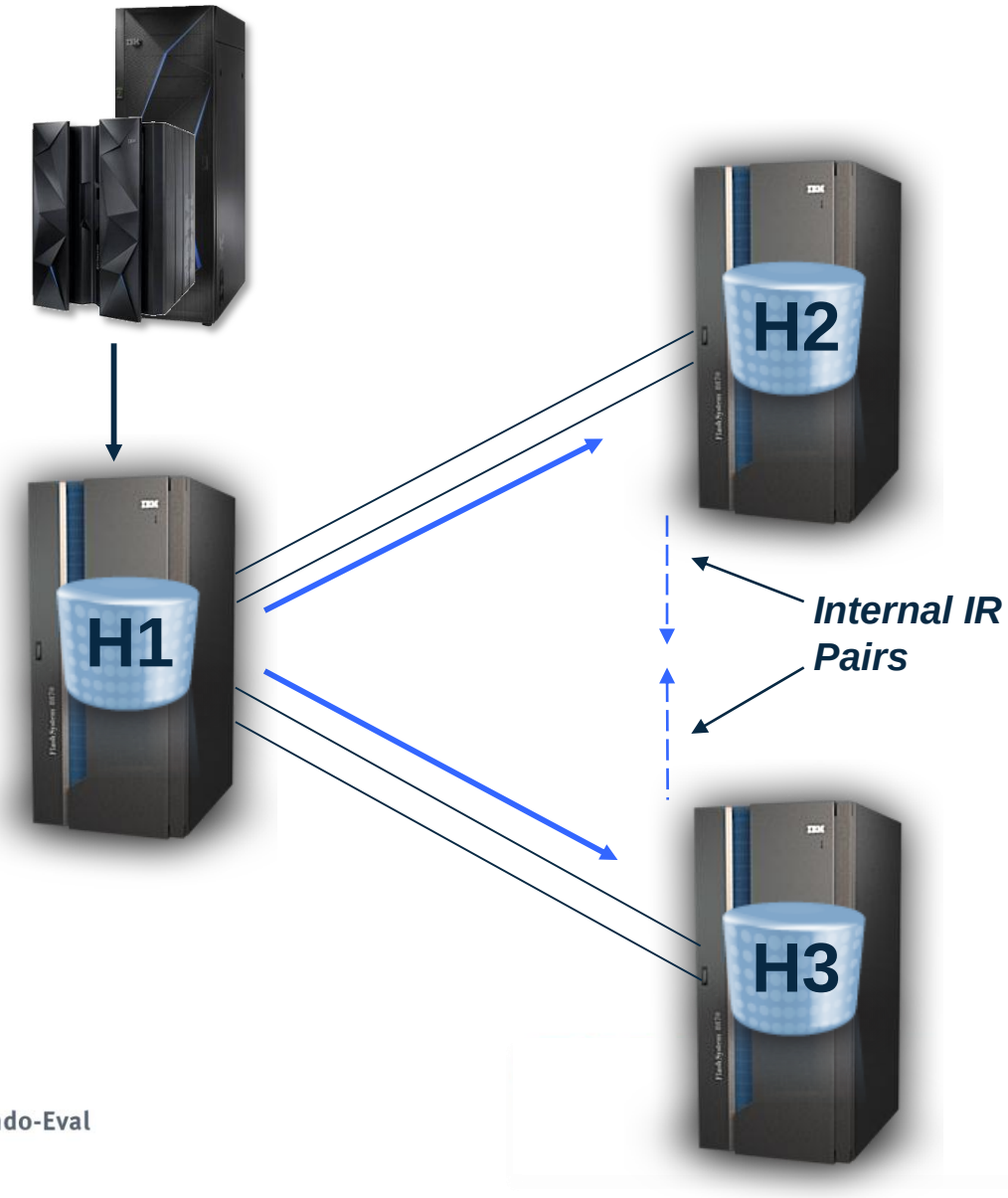
Restore Mirroring after HyperSwap

- Mirroring restored after a HyperSwap
- Incremental Resync used to quickly restore mirroring



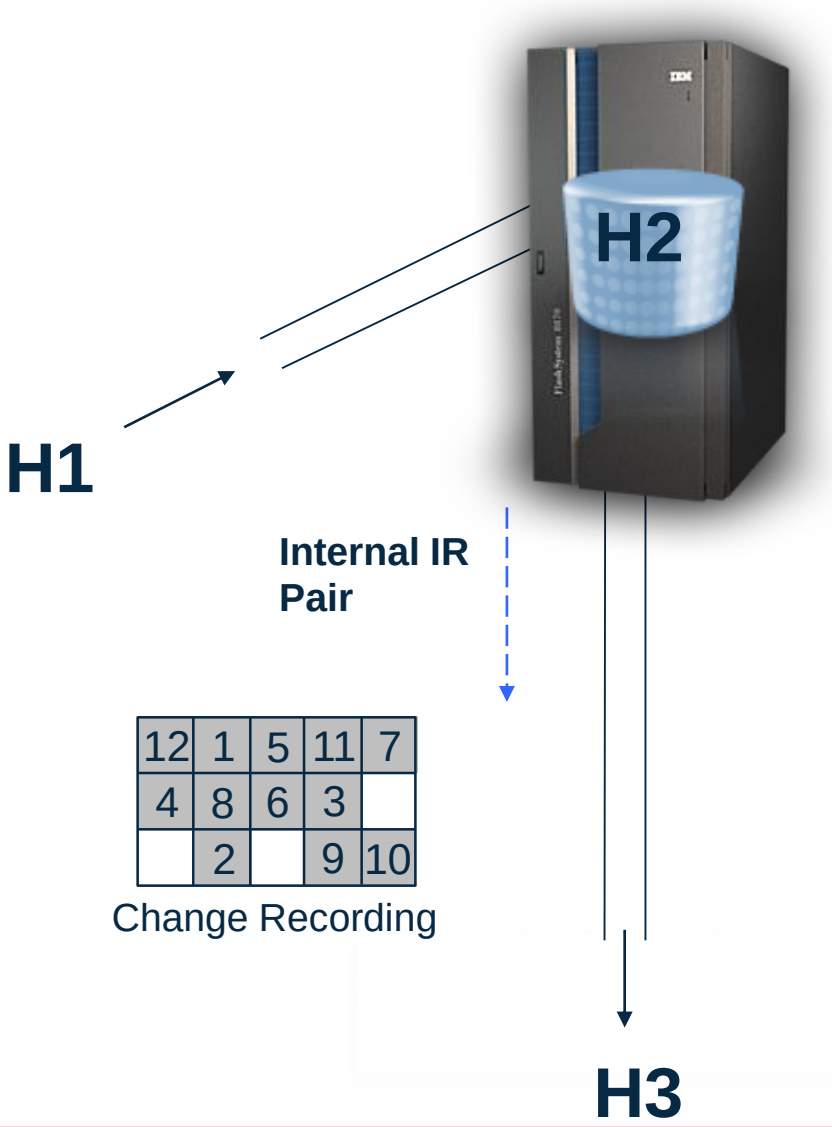
Internal Incremental Resync Pairs

- Automatically created in a Multiple Target topology
- Track the data difference between the remote volumes
- Are converted into active pairs when needed



Change Recording with Internal Pairs

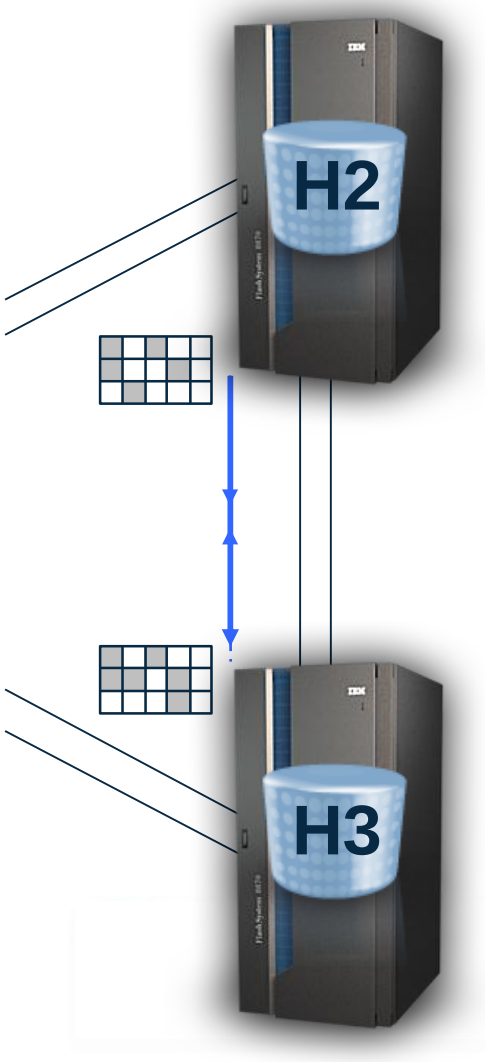
- Internal Pairs have a Change Recording structure
- Information added as writes are received
- Information deleted after update to the partner volume is confirmed
- When internal pairs are synchronized, only the changed data is copied
- Out of sync percentage may be queried



Resynchronization Using IR Pairs

- The Internal IR pairs are synchronized using the existing Failback command.

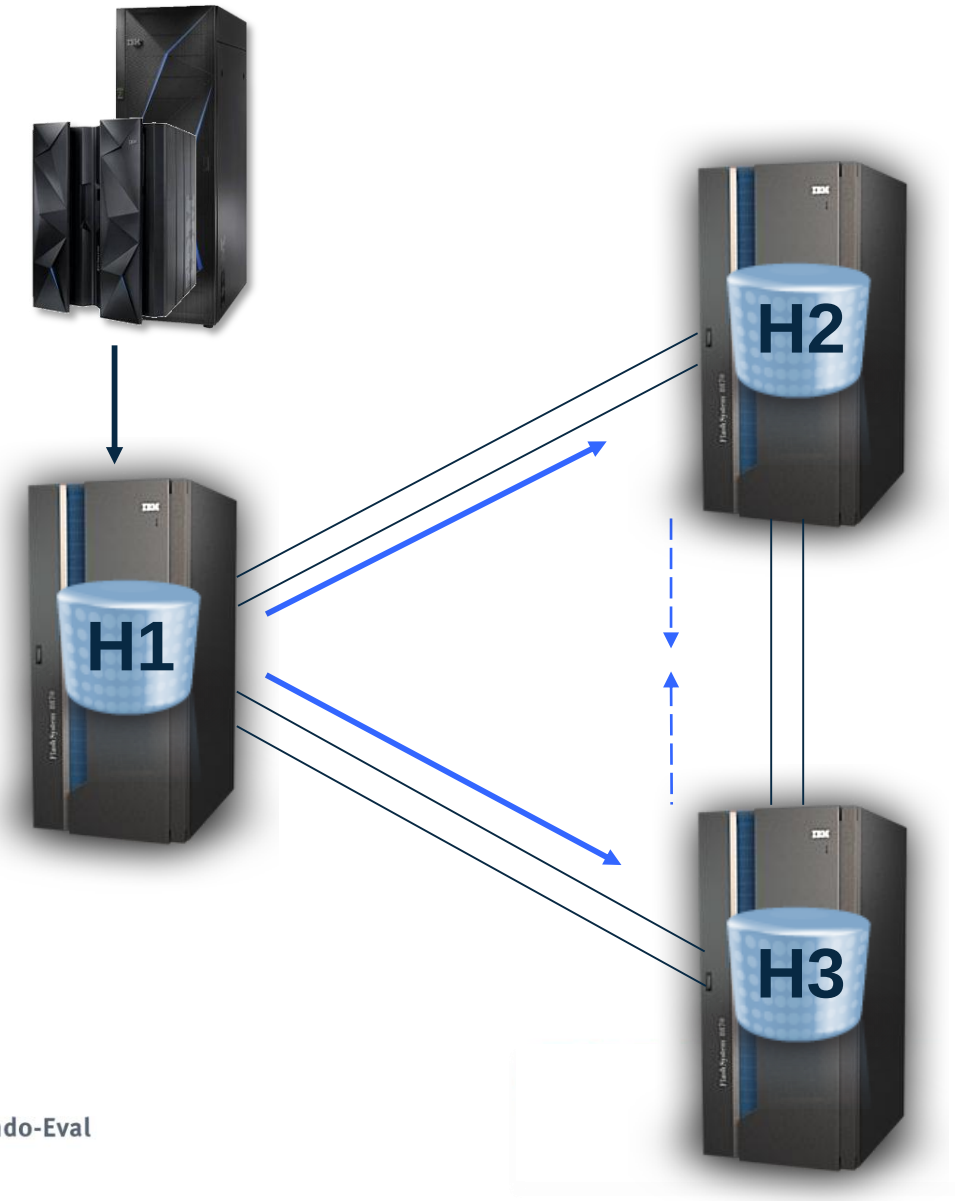
- The Change Recording structures for H2 and H3 are merged and only the changed data is transferred.



Creating a Multiple Target PPRC Topology

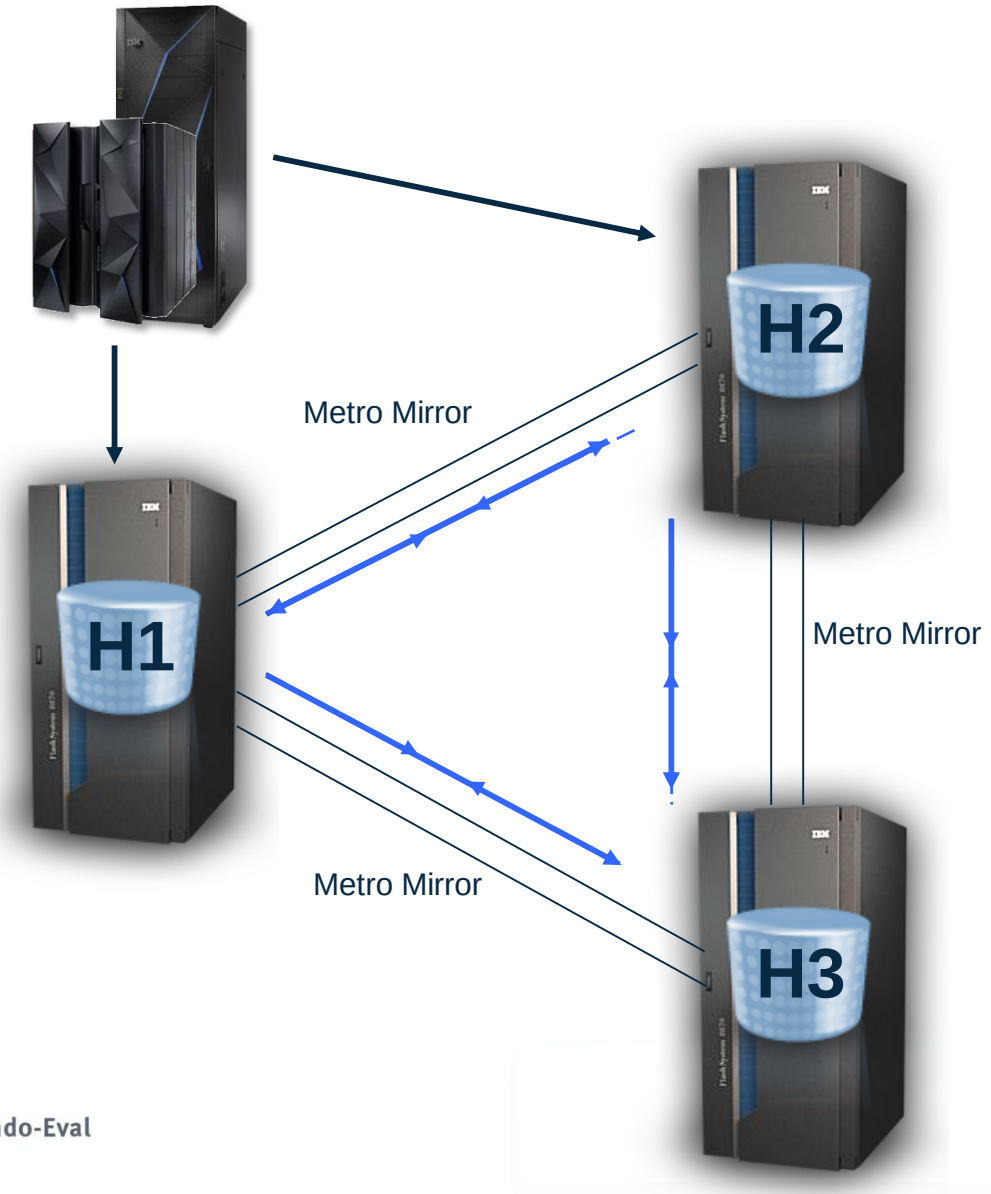
- Establish first pair
- Establish second pair
- Internal pairs are automatically created

- If pair removed
  - Internal pairs also removed



Recovery after H1 failure

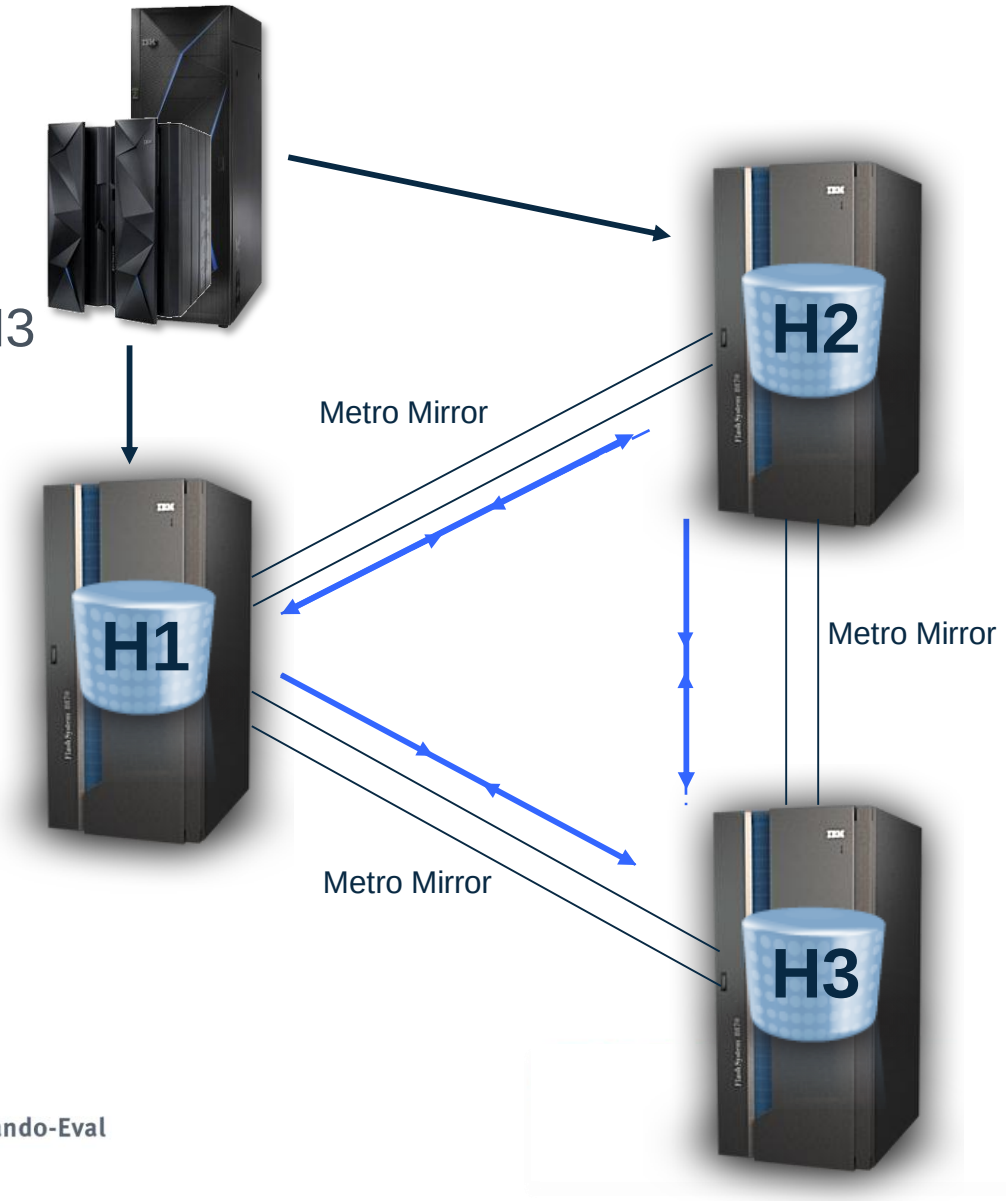
- Failure at H1
- HyperSwap to H2
  - Failover H2→H1
  - Move I/O to H2
- Resume H2→H3 with Incremental Resync
  - Failover H3→H1
  - Failback H2→H3
  - Mirroring is quickly resumed
- Site H1 recovered
  - Failback H2→H1



Return to H1

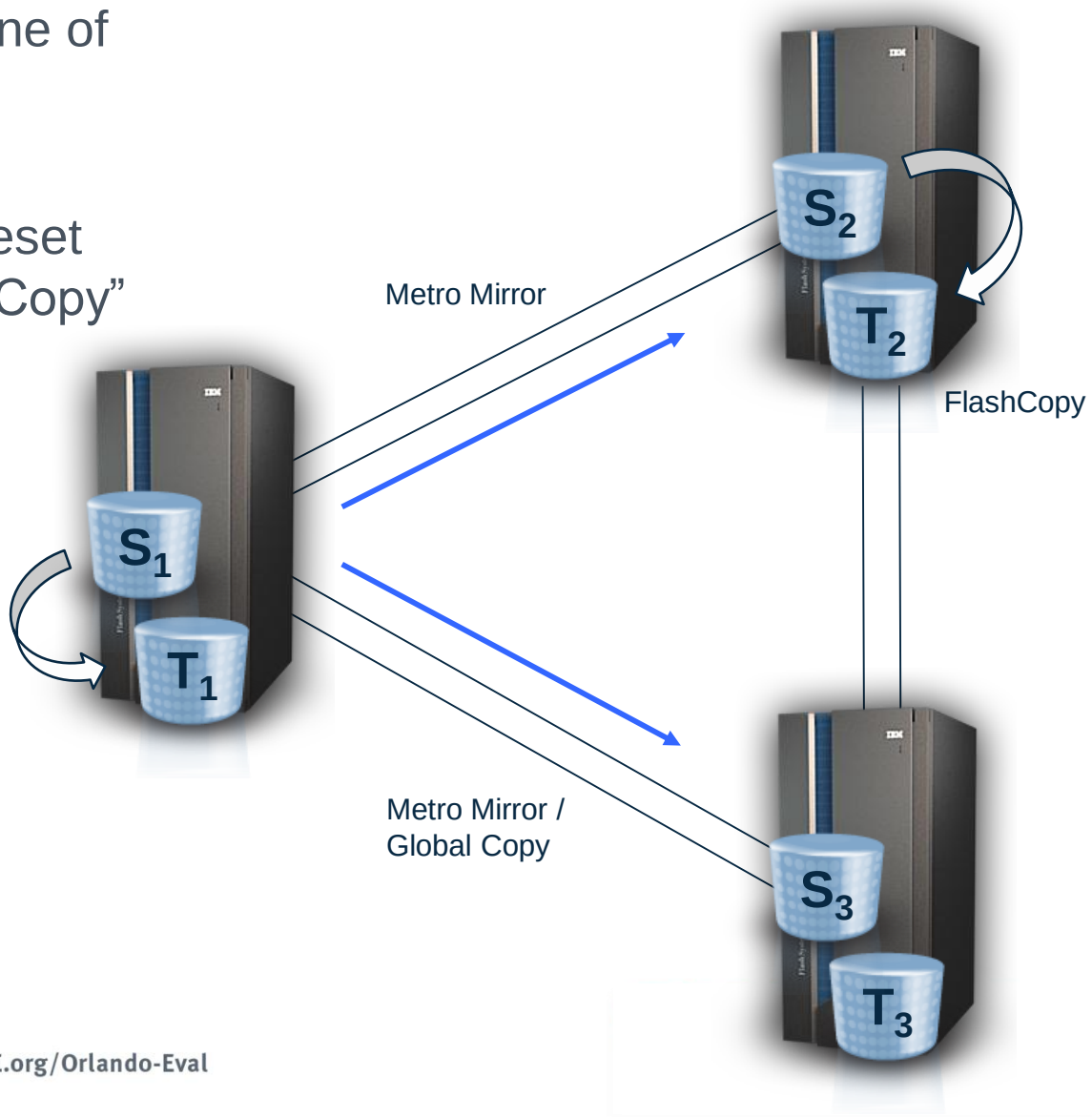
- HyperSwap to H1
  - Failover H1→H2
  - Move I/O to H1

- Resume H1→H2 and H1→H3 pairs.
  - Failover H3→H2
  - Failback H1→H2
  - Failback H1→H3



Remote Pair FlashCopy

- FlashCopy mirrored to one of the secondary volumes.
- New command to Set/Reset "Use Remote Pair FlashCopy" for a PPRC pair.



Command Modifications

- Changes to Establish Pair command
  - None
- Changes to Suspend, Terminate, Freeze, etc
  - None
- Changes to Failover / Failback commands
  - New option on Failover to convert to Multiple Target
  - Otherwise, no changes
- Query commands
  - Display multiple relationships on a volume
  - Display both normal and internal pairs
- Global Mirror Join Session

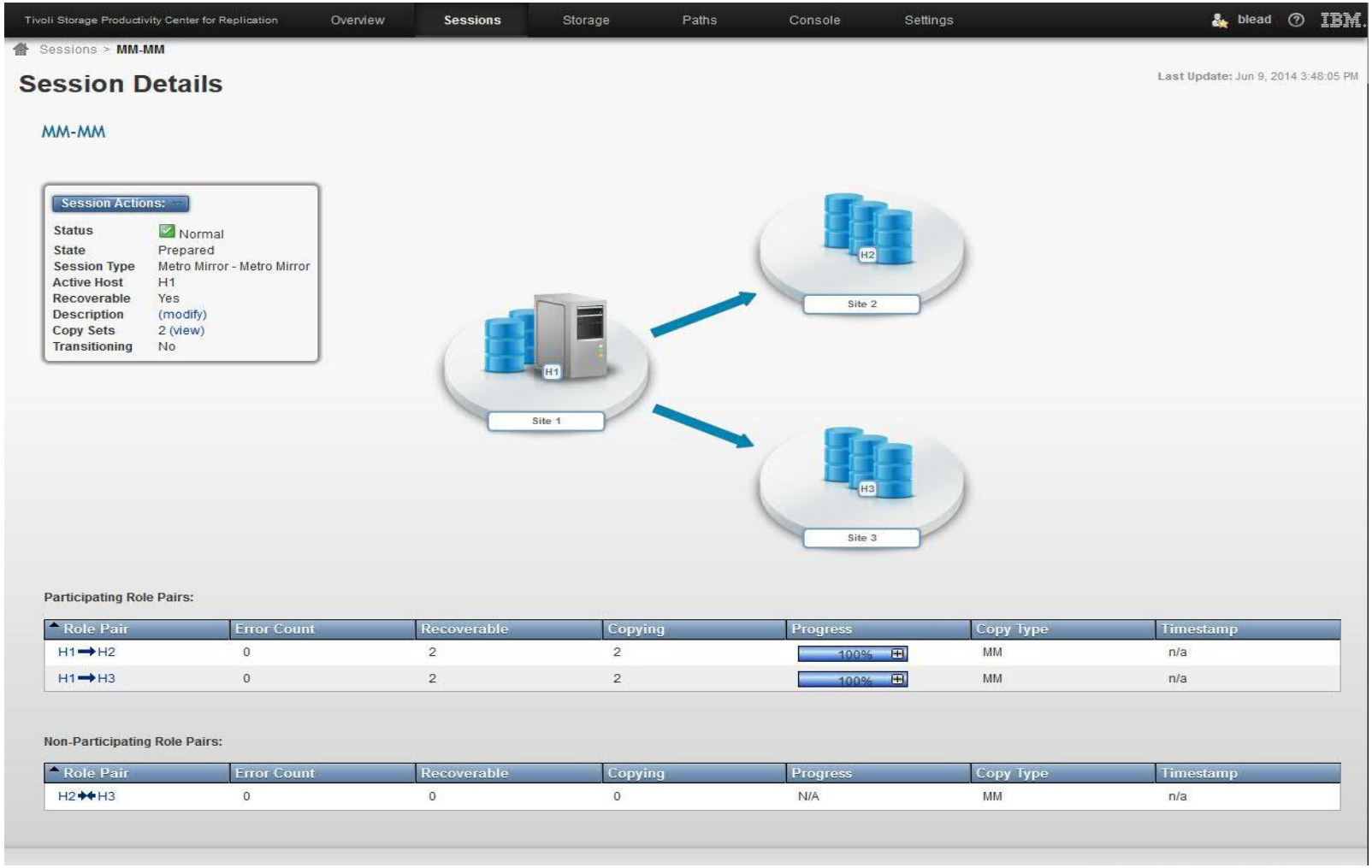
DSCLI

```
dscli> lspprc 0003
Date/Time: September 12, 2014 12:09:22 PM MDT IBM DSCLI Version: 7.7.40.161 DS: IBM.2107-75LD581
ID        State       Reason Type         SourceLSS Timeout (secs) Critical Mode First Pass Status
=============================================================================================
0003:0103 Full Duplex -      Metro Mirror 00        120            Disabled      Invalid
0003:0203 Full Duplex -      Metro Mirror 00        120            Disabled      Invalid



dscli> lspprc 0103
Date/Time: September 12, 2014 12:09:48 PM MDT IBM DSCLI Version: 7.7.40.161 DS: IBM.2107-75LD581
ID        State               Reason Type         SourceLSS Timeout (secs) Critical Mode First Pass Status
=============================================================================================================
0003:0103 Target Full Duplex -      Metro Mirror 00        120            Disabled      Invalid



dscli> lspprc -multtgt 0103
Date/Time: September 12, 2014 12:09:57 PM MDT IBM DSCLI Version: 7.7.40.161 DS: IBM.2107-75LD581
ID        State               Reason                 Type         SourceLSS Timeout (secs) Critical Mode First Pass Status
=============================================================================================================================
0003:0103 Target Full Duplex -                       Metro Mirror 00        120            Disabled      Invalid
0103:0203 Suspended          Multi-target Internal Global Copy  01        120            Disabled      True
```

TSO

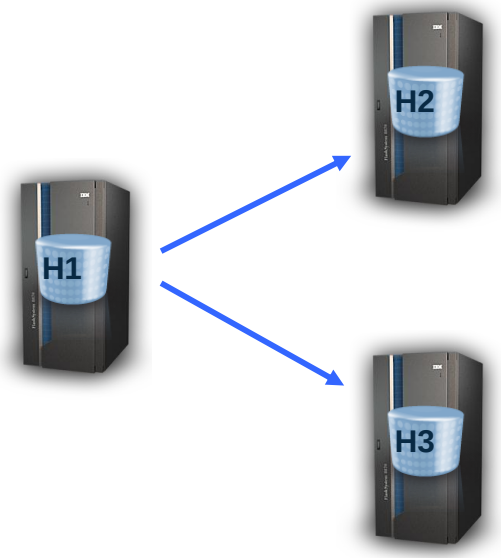
```
ANTP0090I CQUERY FORMATTED LVL 6
VOLUME REPORT
************** PPRC REMOTE COPY CQUERY - VOLUME ********************
*                                        (PRIMARY)   (SECONDARY) *
*                                       SSID CCA LSS SSID CCA LSS*
*DEVICE   LEVEL      STATE     PATH STATUS  SERIAL#     SERIAL#    *
*------ ---------  ----------  ----------- ---------    ---------  *
* 0F51  PRIMARY..  DUPLEX....   ACTIVE..   D400 00 30   D000 00 30 *
* SCH(0) CRIT(NO).......      CGRPLB(YES) 0000000CRB41 0000000CRB31*
*       INCRES(NO).           AUTORESYNC(NO).                      *
*THIS PAIR HAS BEEN IDENTIFIED TO BE USED FOR PRESERVE MIRROR.     *
* PATHS PFCA SFCA STATUS: DESCRIPTION                              *
* ----- --------- ------  -------------------                      *
*   1   0033 0232   13    PATH ESTABLISHED...                      *
*       ---- ----   00    NO PATH.............                     *
*       ---- ----   00    NO PATH.............                     *
*       ---- ----   00    NO PATH.............                     *
*  SUBSYSTEM         WWNN                   LIC LEVEL             *
* -----------  ----------------            -----------            *
* PRIMARY....  5005076305FFD70E            7.7.40.291             *
* SECONDARY.1  5005076305FFD70C                                   *
* SECONDARY.2  5005076305FFD710                                   *
********************************************************************
VOLUME REPORT
************** PPRC REMOTE COPY CQUERY - VOLUME ********************
*                                        (PRIMARY)   (SECONDARY) *
*                                       SSID CCA LSS SSID CCA LSS*
*DEVICE   LEVEL      STATE     PATH STATUS  SERIAL#     SERIAL#    *
*------ ---------  ----------  ----------- ---------    ---------  *
* 0F51  PRIMARY..  DUPLEX....   ACTIVE..   D400 00 30   D812 00 31 *
* SCH(0) CRIT(NO).......      CGRPLB(YES) 0000000CRB41 0000000CRB71*
```

TPC-R


Tivoli Storage Productivity Center for Replication
Overview
Sessions
Storage
Paths
Console
Settings
blead
IBM
Sessions > MM-MM
Session Details
Last Update: Jun 9, 2014 3:48:05 PM
MM-MM
Session Actions:
Status Normal
State Prepared
Session Type Metro Mirror - Metro Mirror
Active Host H1
Recoverable Yes
Description (modify)
Copy Sets 2 (view)
Transitioning No
H1
Site 1
H2
Site 2
H3
Site 3
Participating Role Pairs:
Role Pair | Error Count | Recoverable | Copying | Progress | Copy Type | Timestamp
H1 ➡ H2 | 0 | 2 | 2 | 100% | MM | n/a
H1 ➡ H3 | 0 | 2 | 2 | 100% | MM | n/a
Non-Participating Role Pairs:
Role Pair | Error Count | Recoverable | Copying | Progress | Copy Type | Timestamp
H2 ⬌ H3 | 0 | 0 | 0 | N/A | MM | n/a

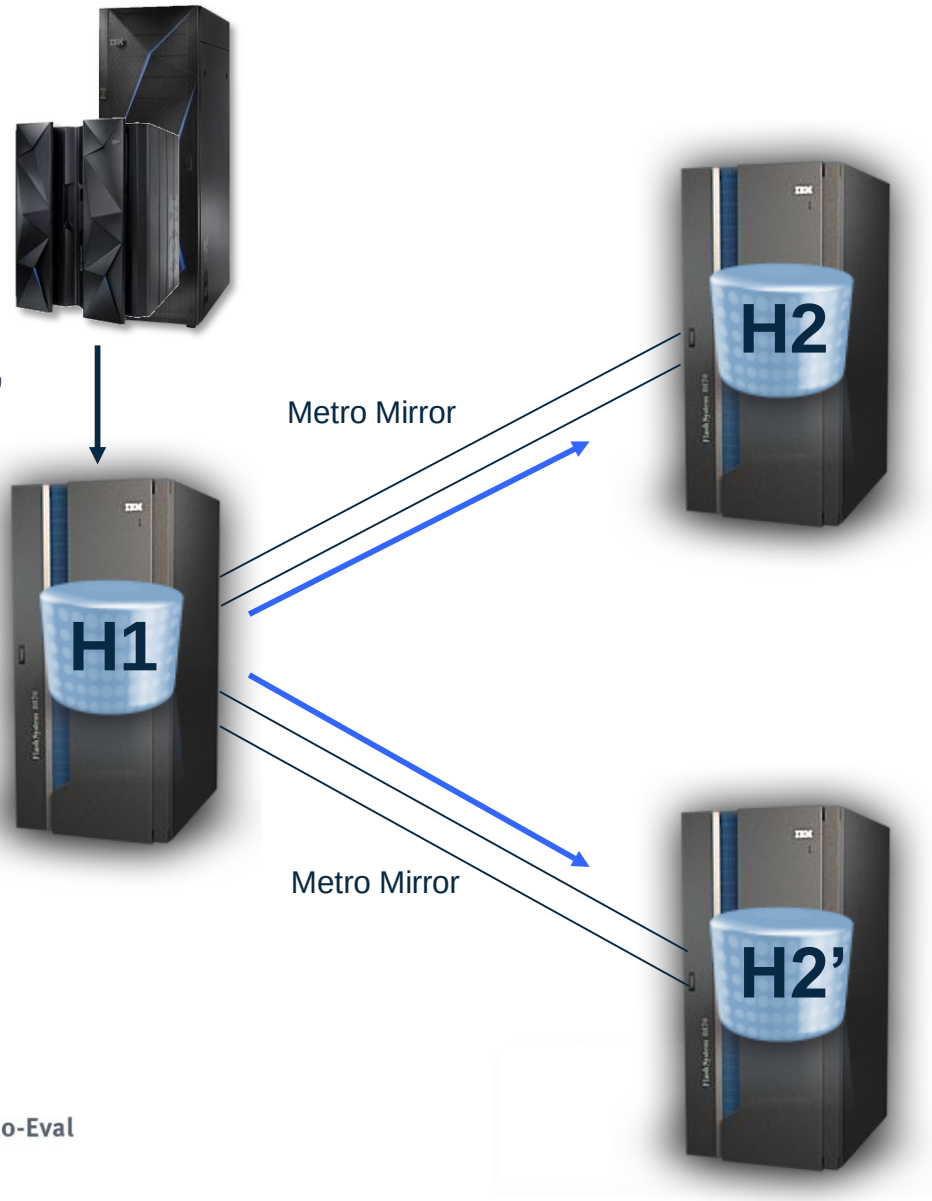
Migration

- Multiple Target simplifies migrations
- Data may be mirrored to new DS8870 while maintaining the current mirror
- No need to remove current mirror until after the new mirror is in place



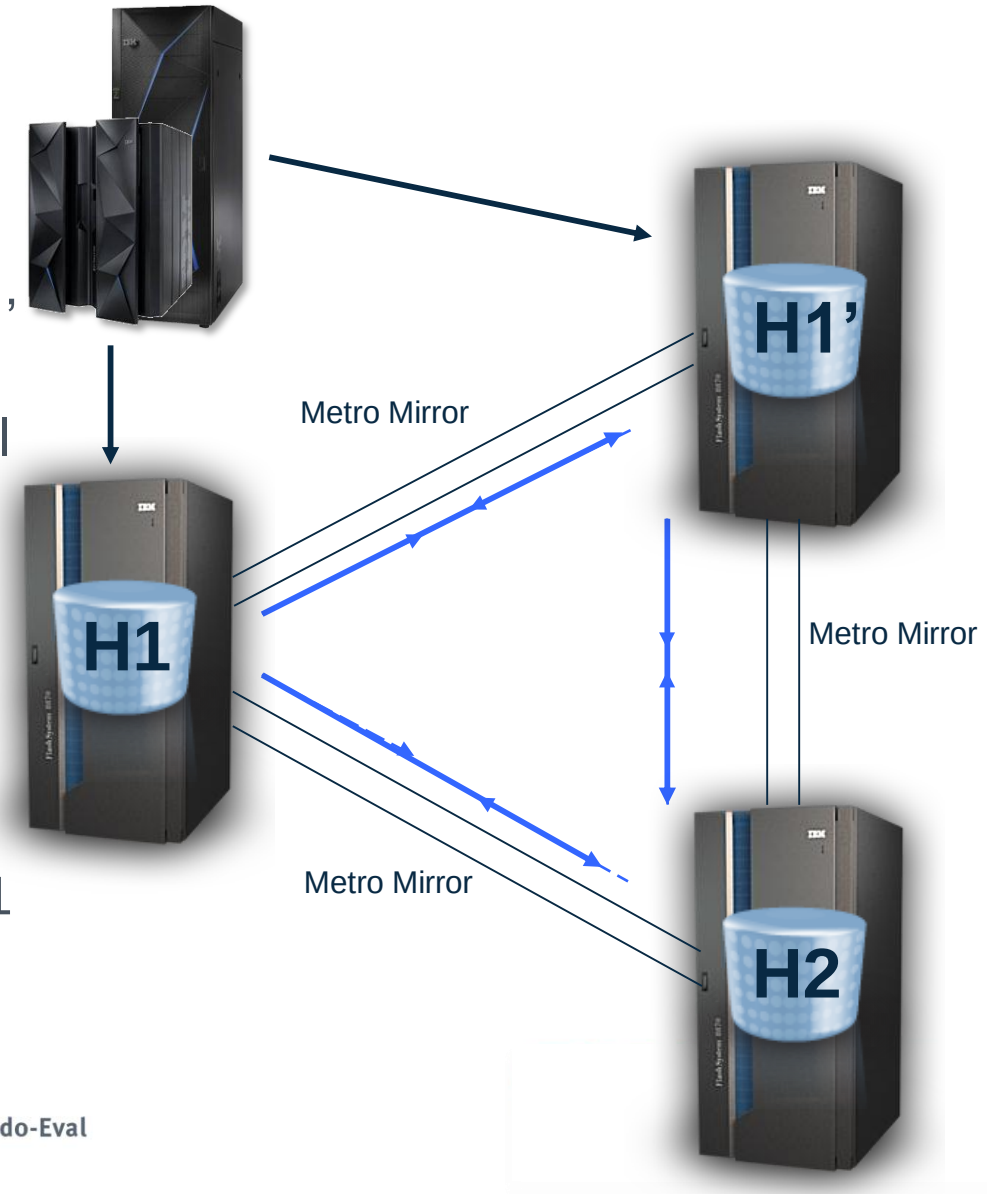
Migration – Secondary

- Starting with an existing H1→H2 pair
- Install new secondary H2'
- Start Metro Mirror for H1→H2'
- Wait for H1→H2' to reach Full Duplex
- Terminate H1→H2
- Remove original H2



Migration – Primary

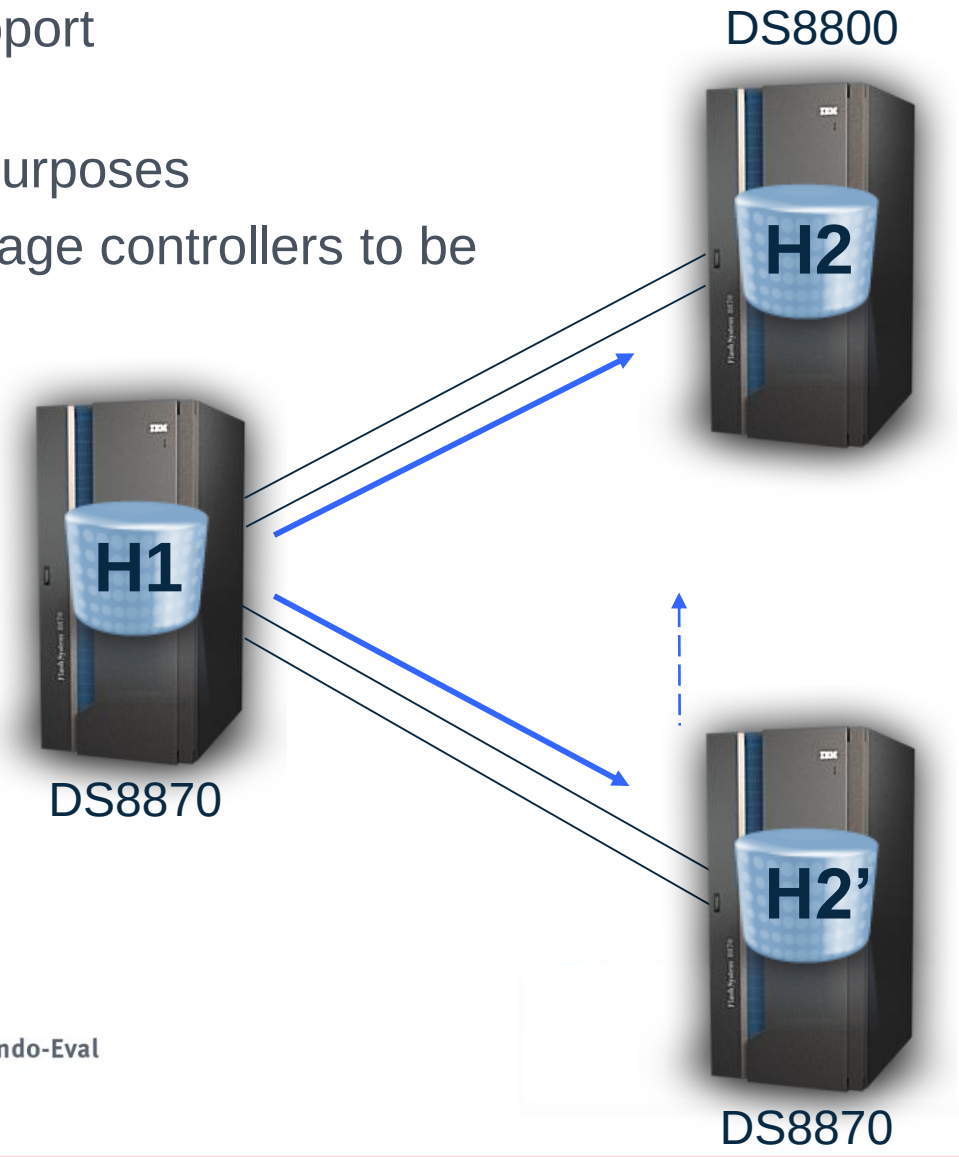
- Starting with an existing H1→H2 pair
- Install new H1'
- Start Metro Mirror for H1→H1'
- Wait for H1→H1' to reach Full Duplex
- HyperSwap to H1'
- Resume H1'→H2, using Incremental Resync
- Terminate relationships on H1 and remove it



RPQ – For Migration

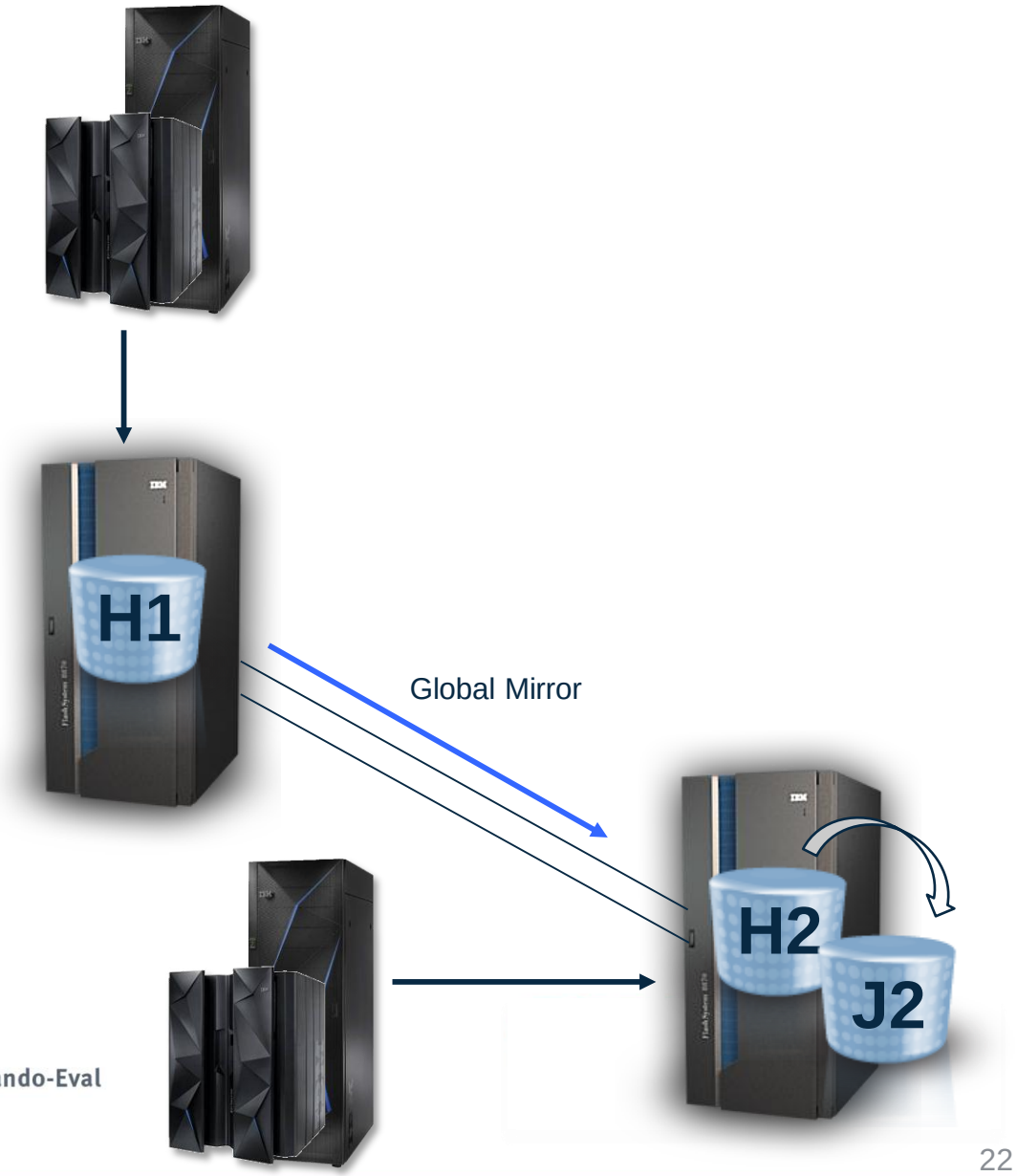
- Multiple Target PPRC requires that all DS8870s have the Multiple Target PPRC support

- RPQ available for migration purposes
  - Allows the secondary storage controllers to be earlier DS8000 models
  - Primary must be DS8870 with Multiple Target PPRC support



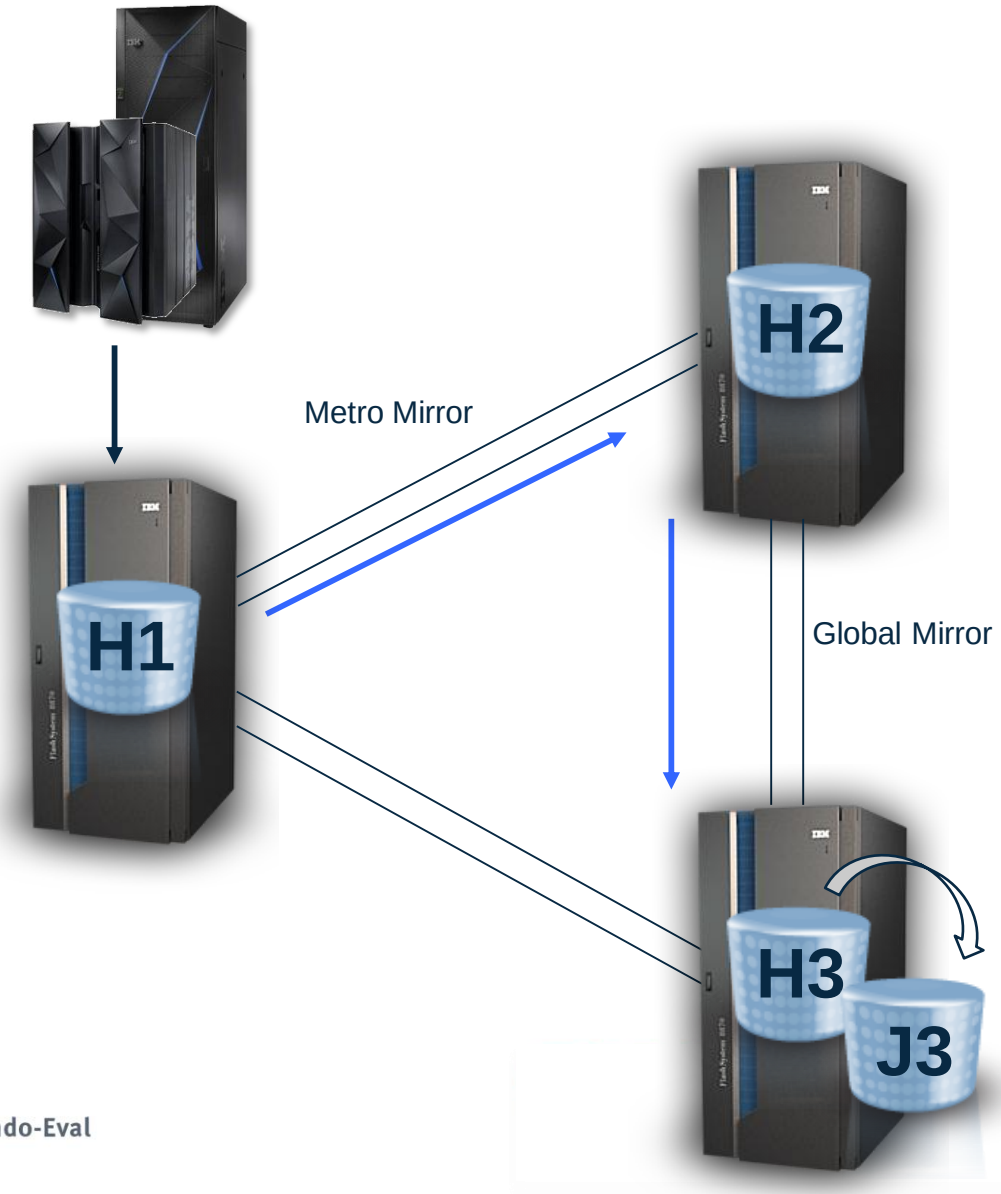
Global Mirror

- Asynchronous replication
- Out of region Disaster Recovery capability
- In the event an outage, production may be restarted at the remote recovery site



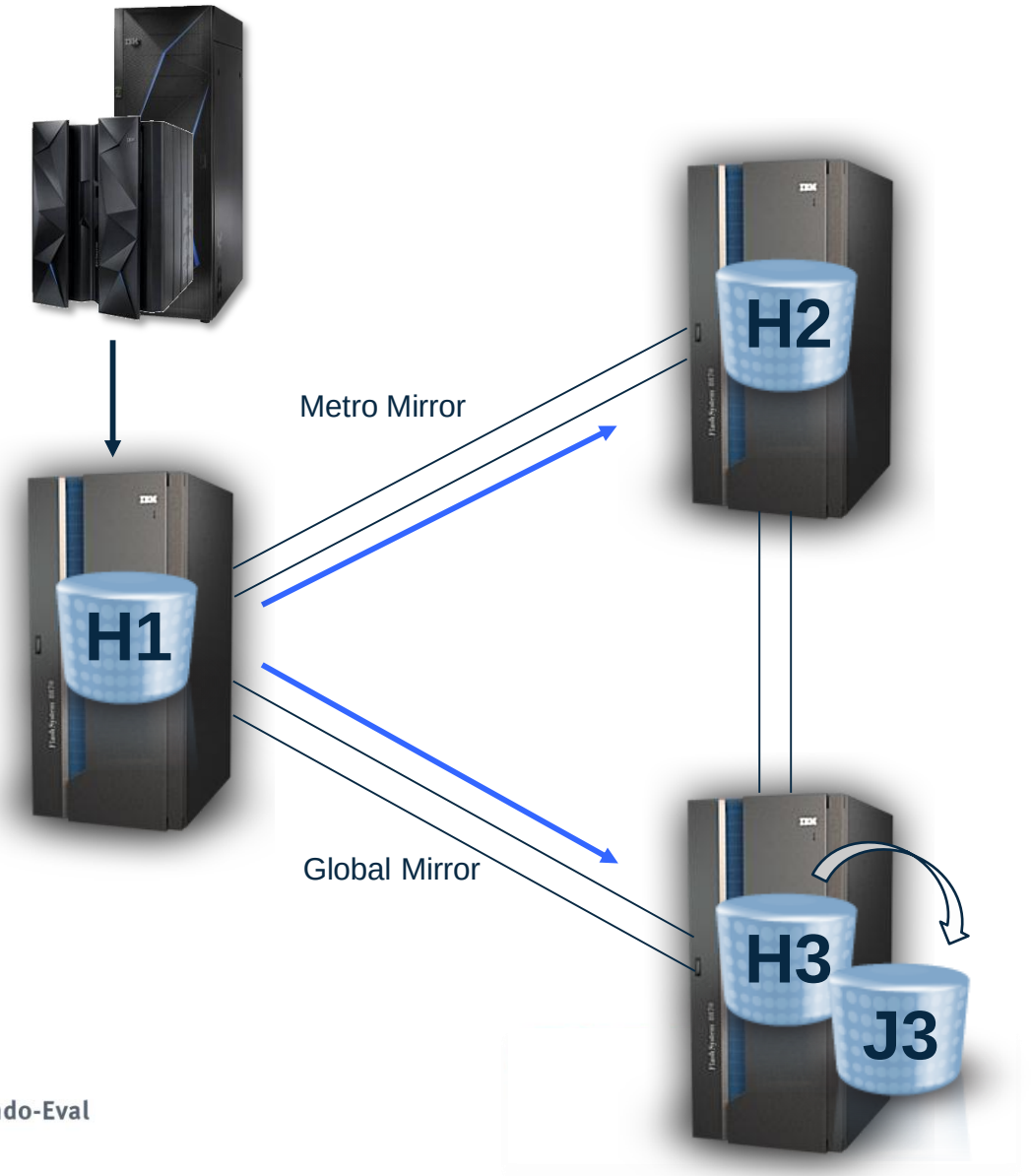
Metro Global Mirror - Cascaded

- Local HyperSwap capability
- Asynchronous replication
  - Out of region DR capability



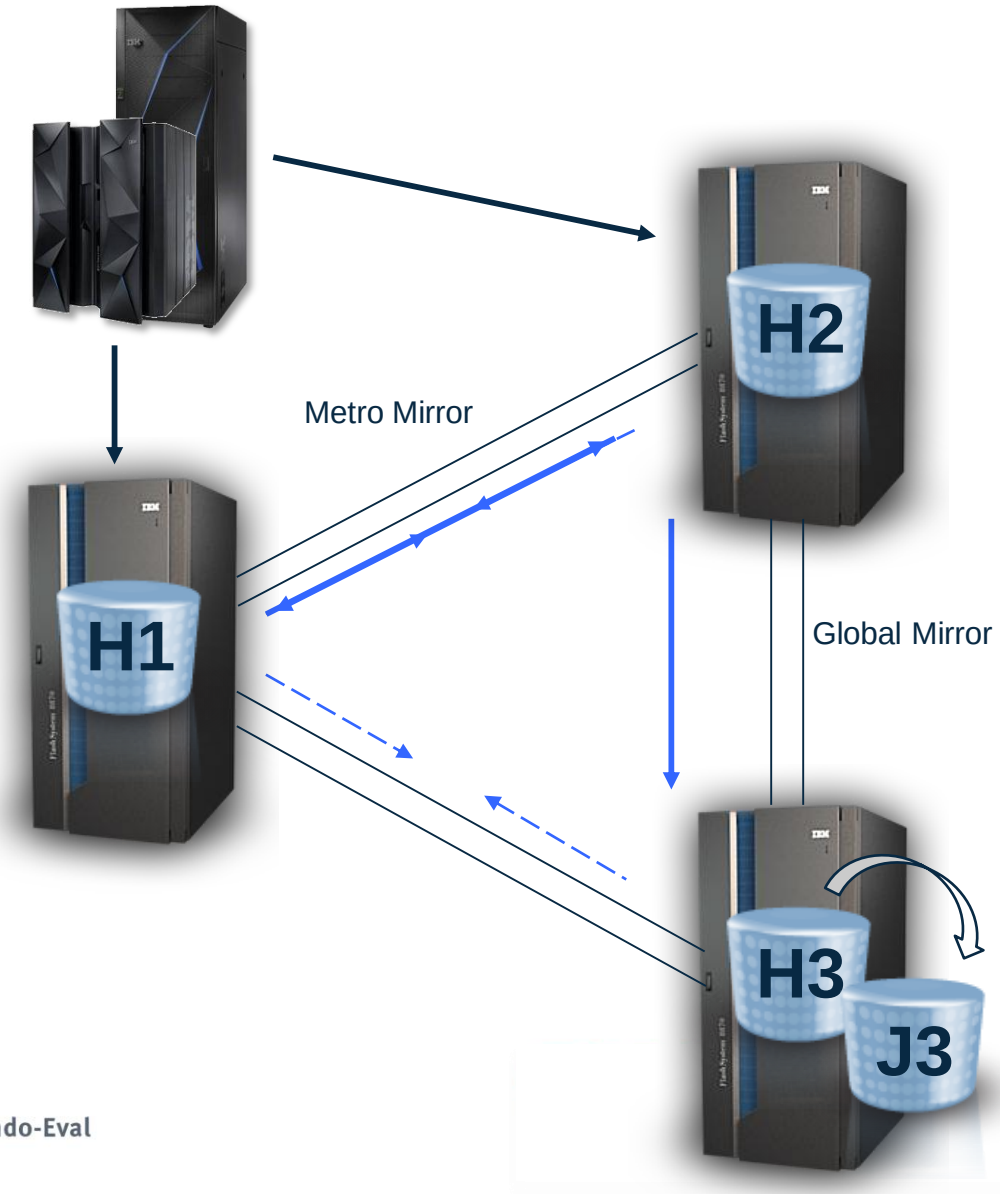
Metro Global Mirror – Multiple Target

- Local HyperSwap capability
- Asynchronous replication
  - Out of region DR capability



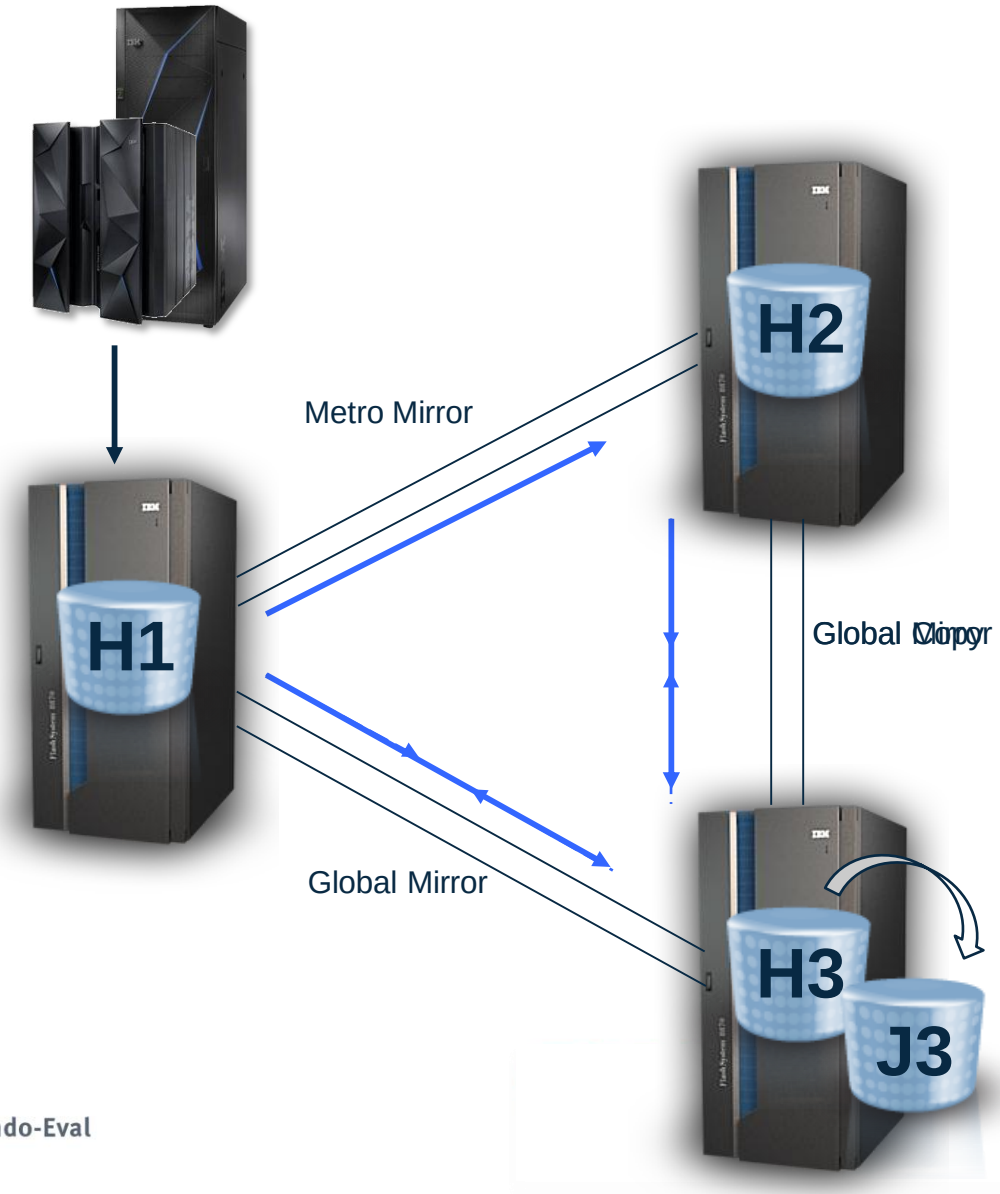
Cascaded to Multiple Target Conversion

- HyperSwap to H2
  - Failover H2→H1
  - Move I/O to H2
- Failback H2→H1
  - Internal pairs created



Multiple Target to Cascaded Conversion

- Failover H3→H1
- Failback H2→H3
  - Global Copy
- Start Global Mirror
- Delete H1←→H3



MGM – Cascaded Improvement

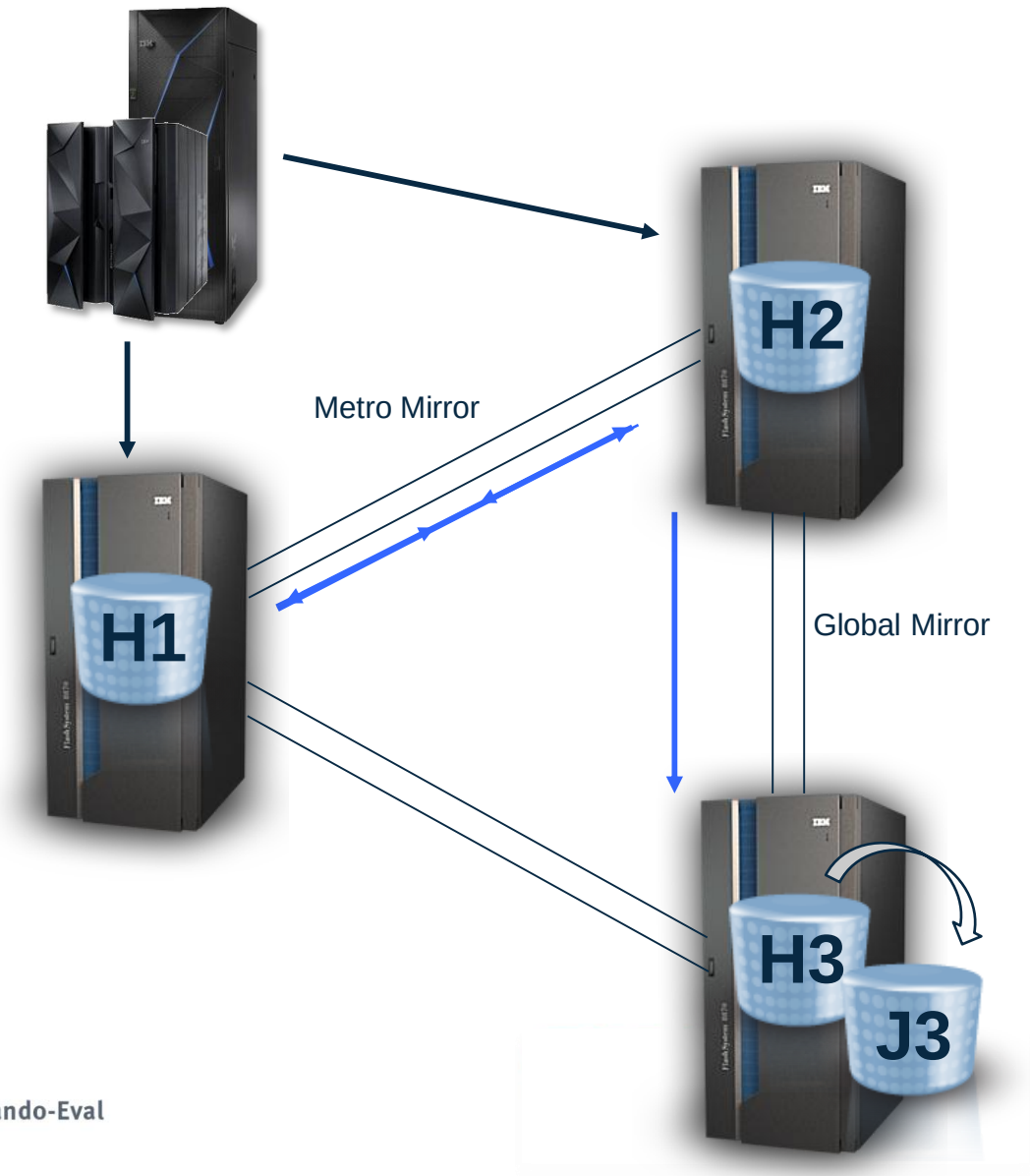
- Multiple Target simplifies MGM Cascaded scenario

- Failure at H1
- HyperSwap to H2
  - Failover H2→H1
  - Move I/O to H2

- When H1 is recovered
  - Failback H2→H1

- HyperSwap back to H1
- Failback H1→H2

- *Global Mirror to H3 runs throughout*



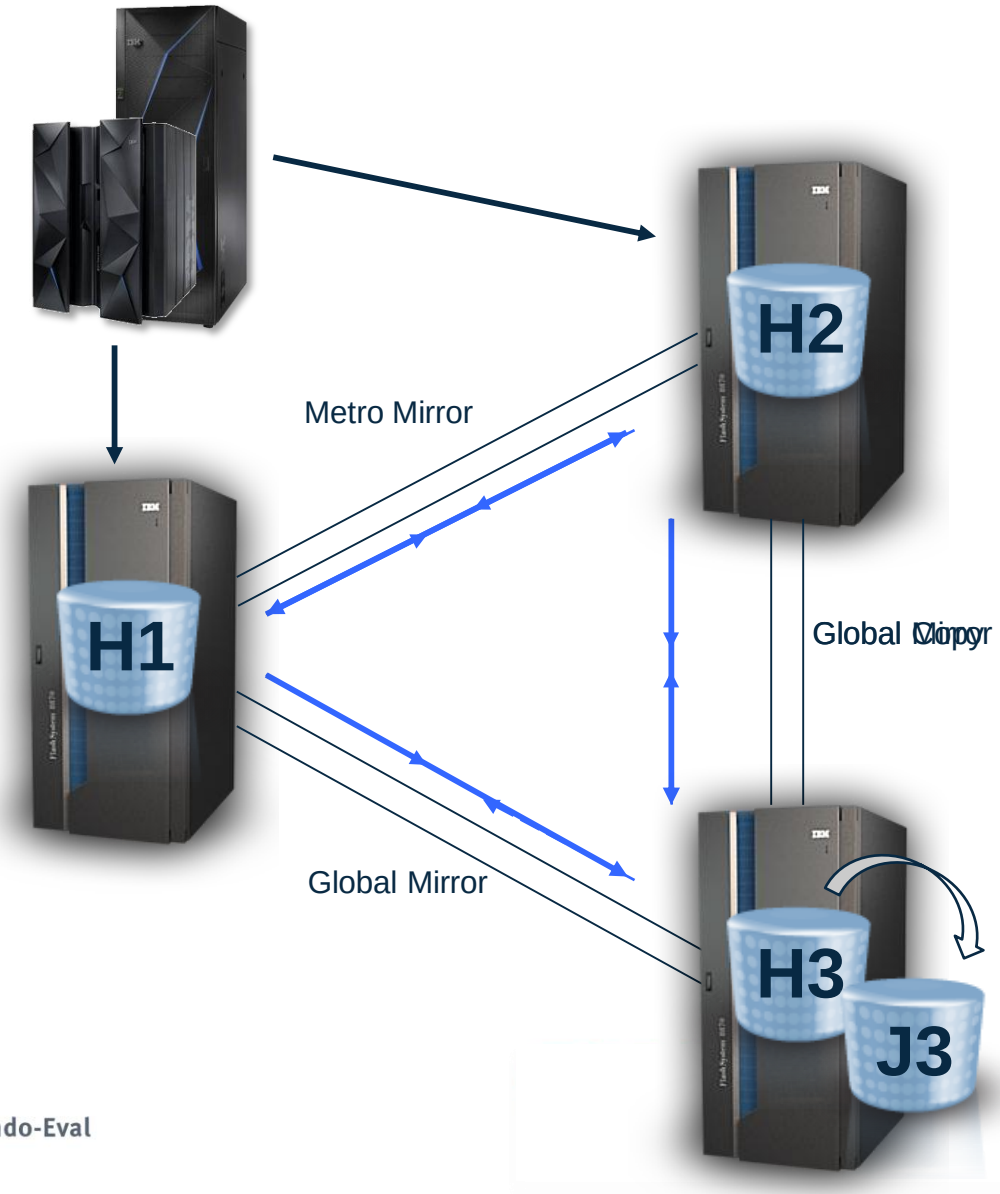
HyperSwap with MGM - Multiple Target

- Asynchronous replication
- Out of region DR capability
- HyperSwap capability

- Failure at H1
- HyperSwap to H2
- Incremental Resync H2→H3
  - Global Copy
  - Start Global Mirror

- When H1 is recovered
- Failback H2→H1

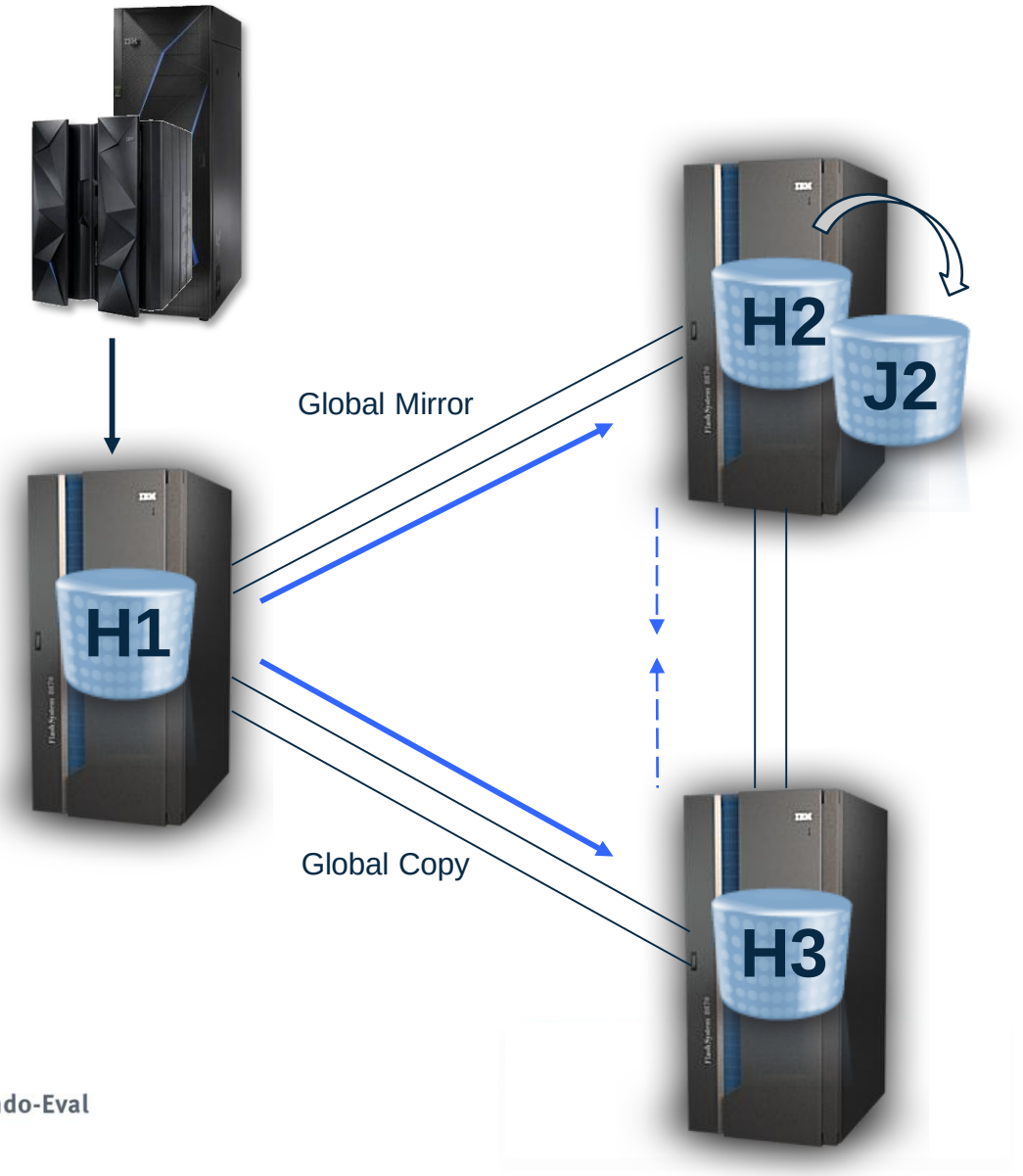
- Multiple Target restored



Asynchronous 3-Site Topology

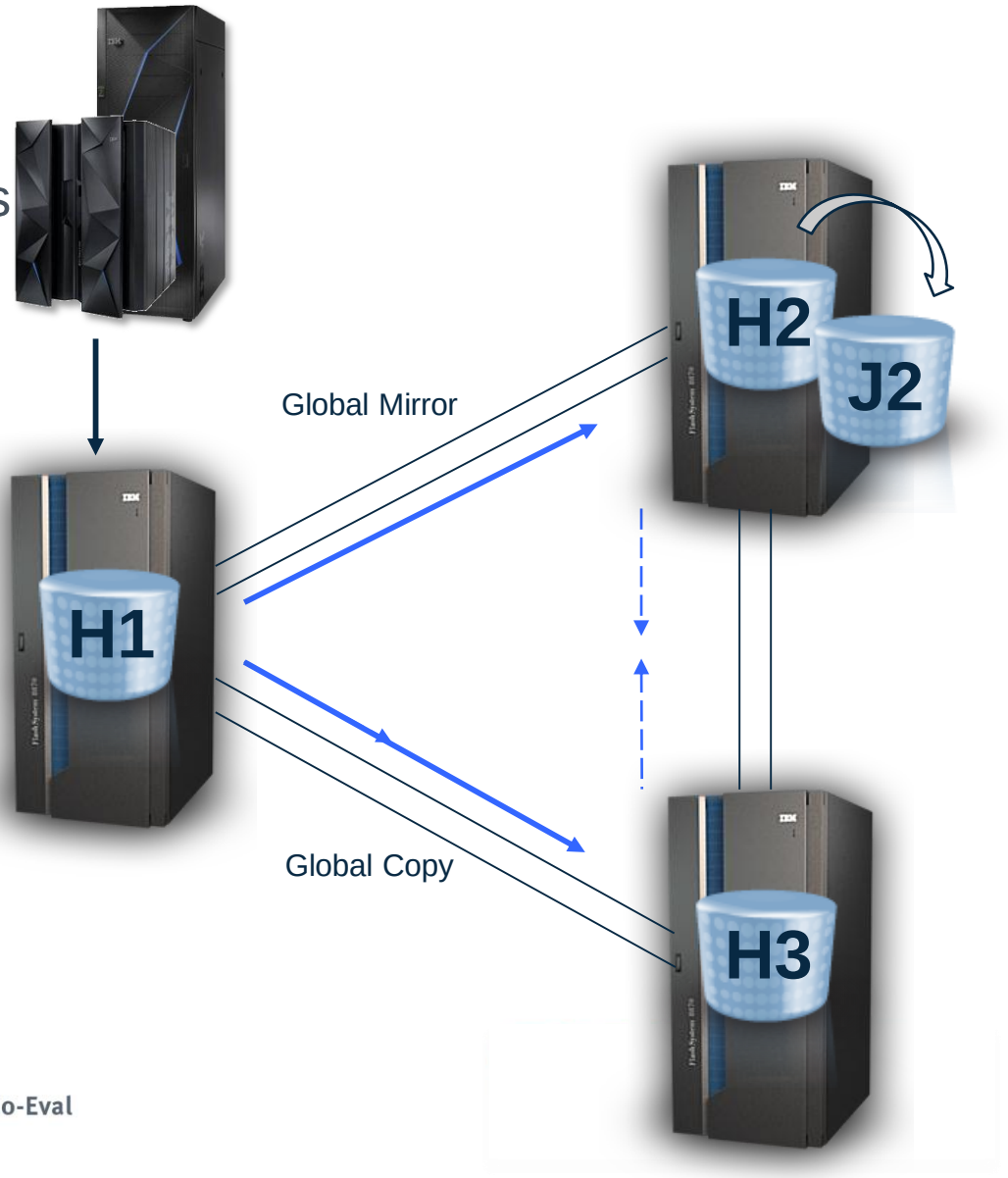
- Two Asynchronous Copies
  - One Global Mirror
  - One Global Copy

- Each site in a different region



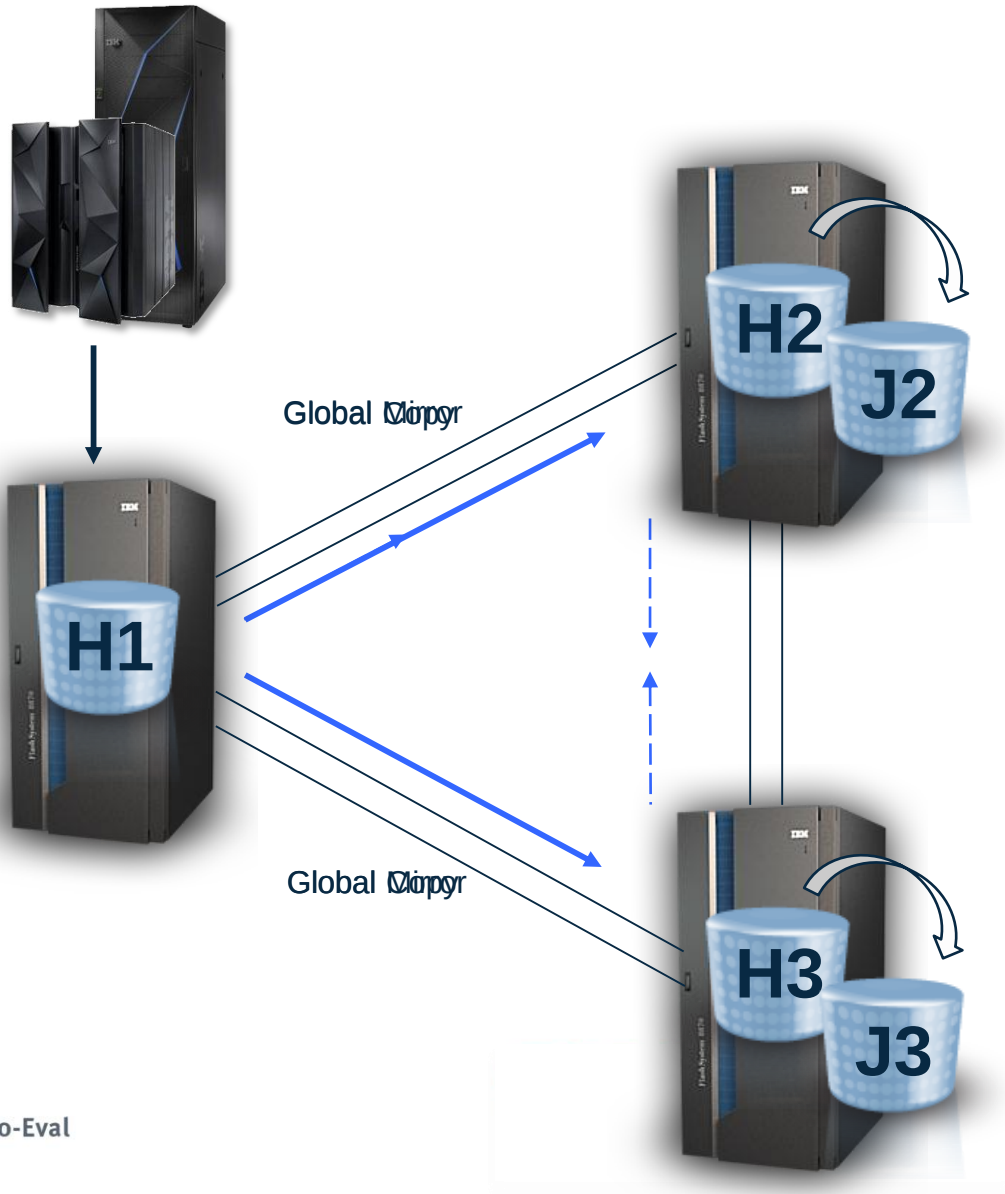
Asynchronous 3-Site – H3 failure

- Failure at H3 (GC Secondary)
- Global Mirror H1→H2 remains active
  - Disaster Recovery capability maintained
- When H3 recovered
  - Resume H1→H3



Asynchronous 3-Site – H2 failure

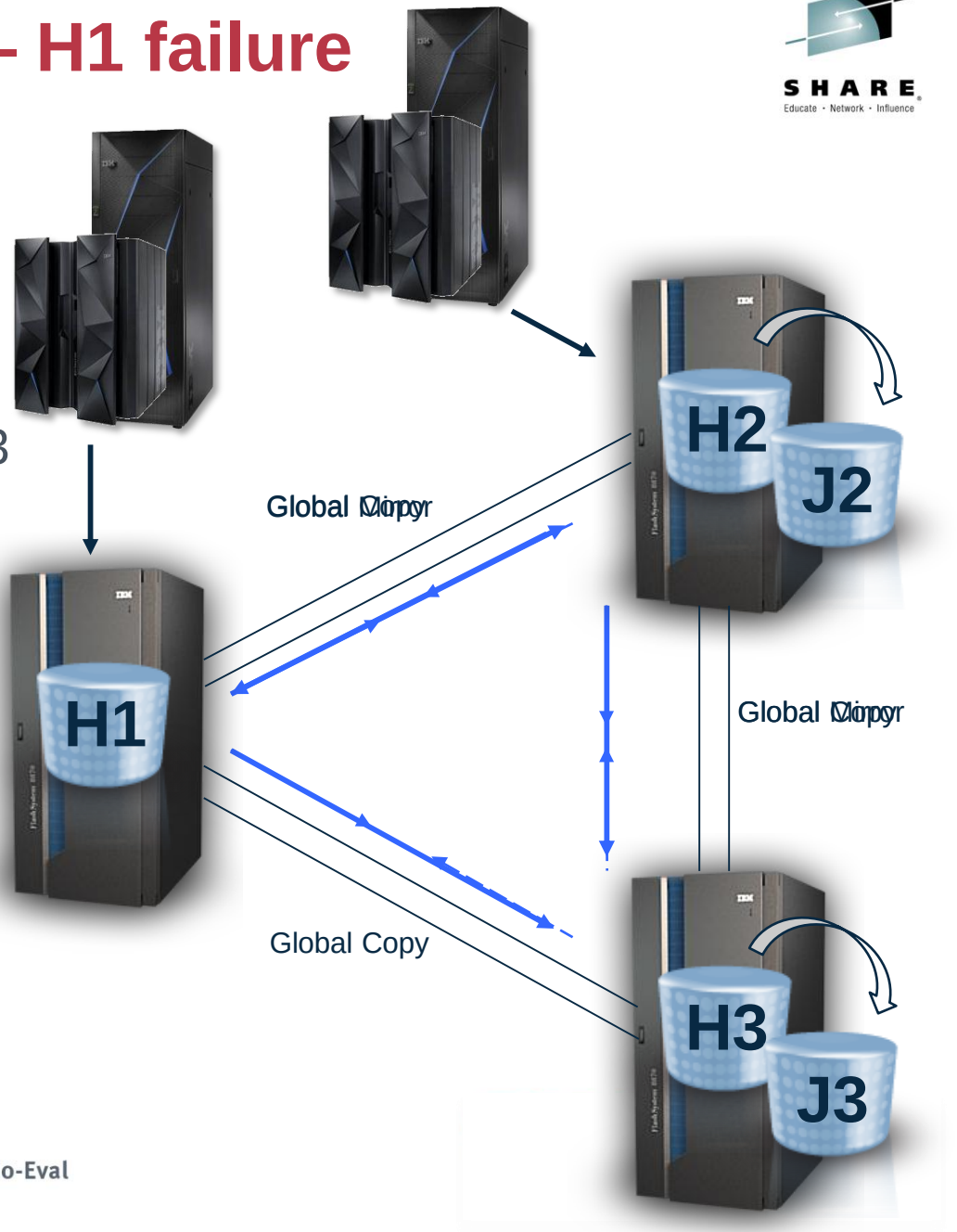
- Failure at H2 (GM Secondary)
- Convert H1→H3 Global Copy to Global Mirror
- Disaster Recovery capability restored
- When H2 recovered
  - Resume H1→H2, Global Copy



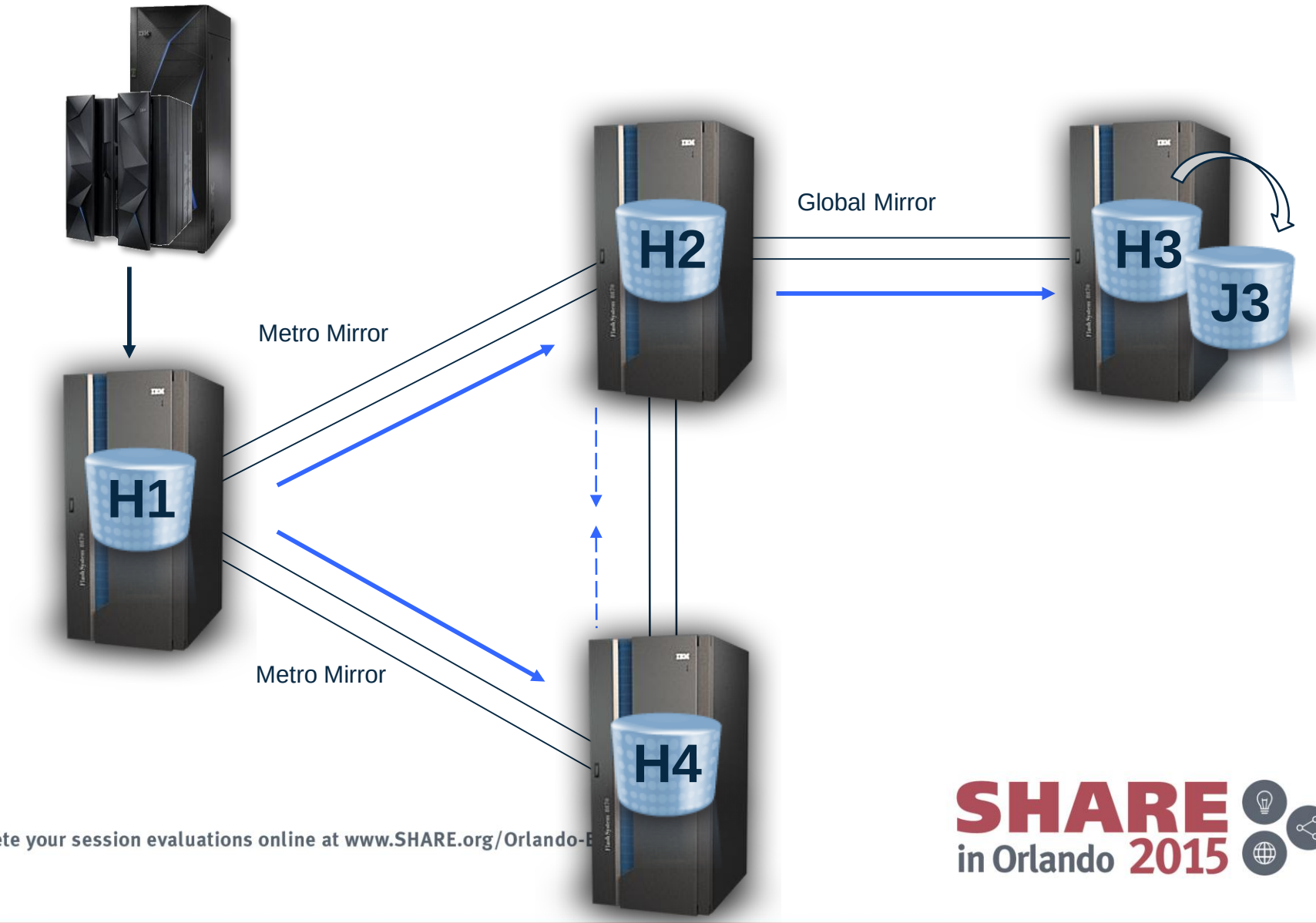
Asynchronous 3-Site – H1 failure

- Failure at H1
- Recover at DR site H2
- Failback H2→H3
  - Global Copy
- Start Global Mirror for H2→H3

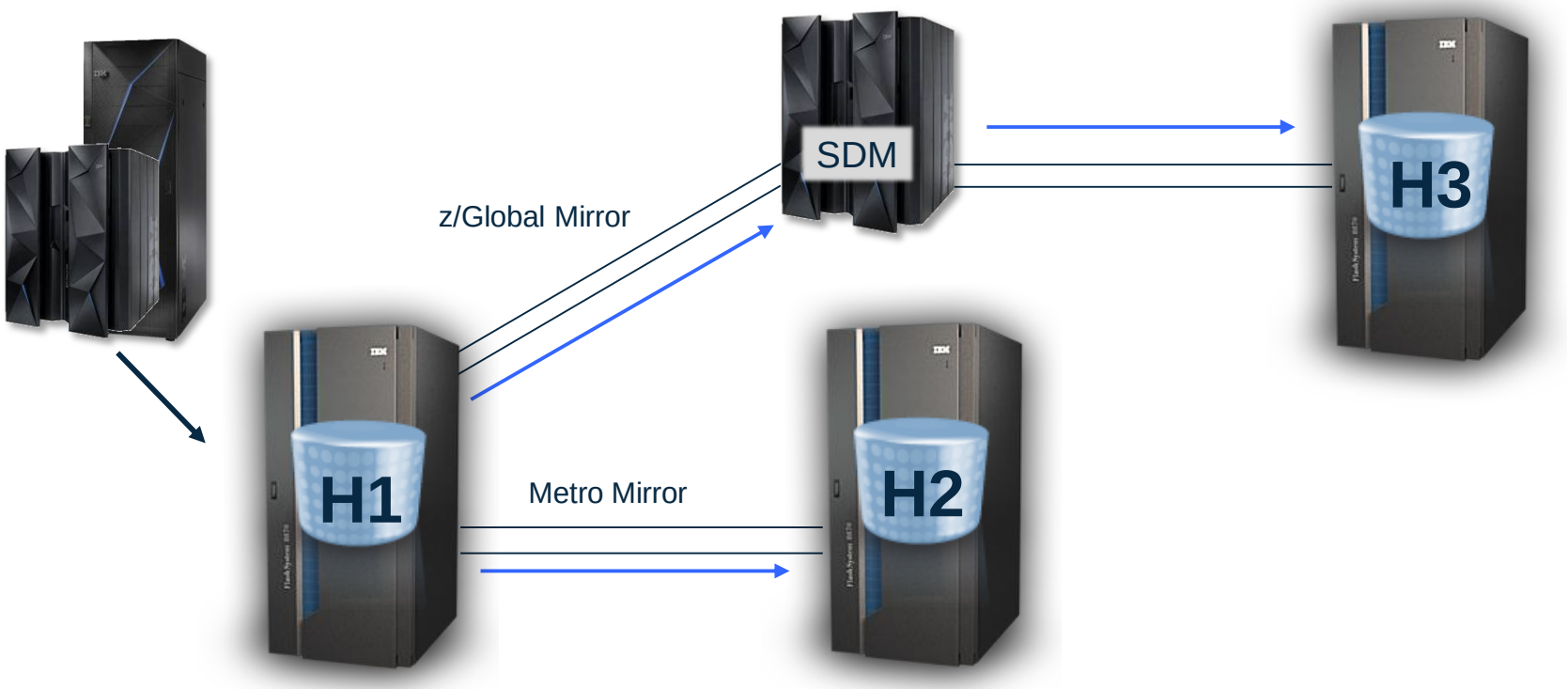
- When H1 is recovered
  - Failback H2→H1



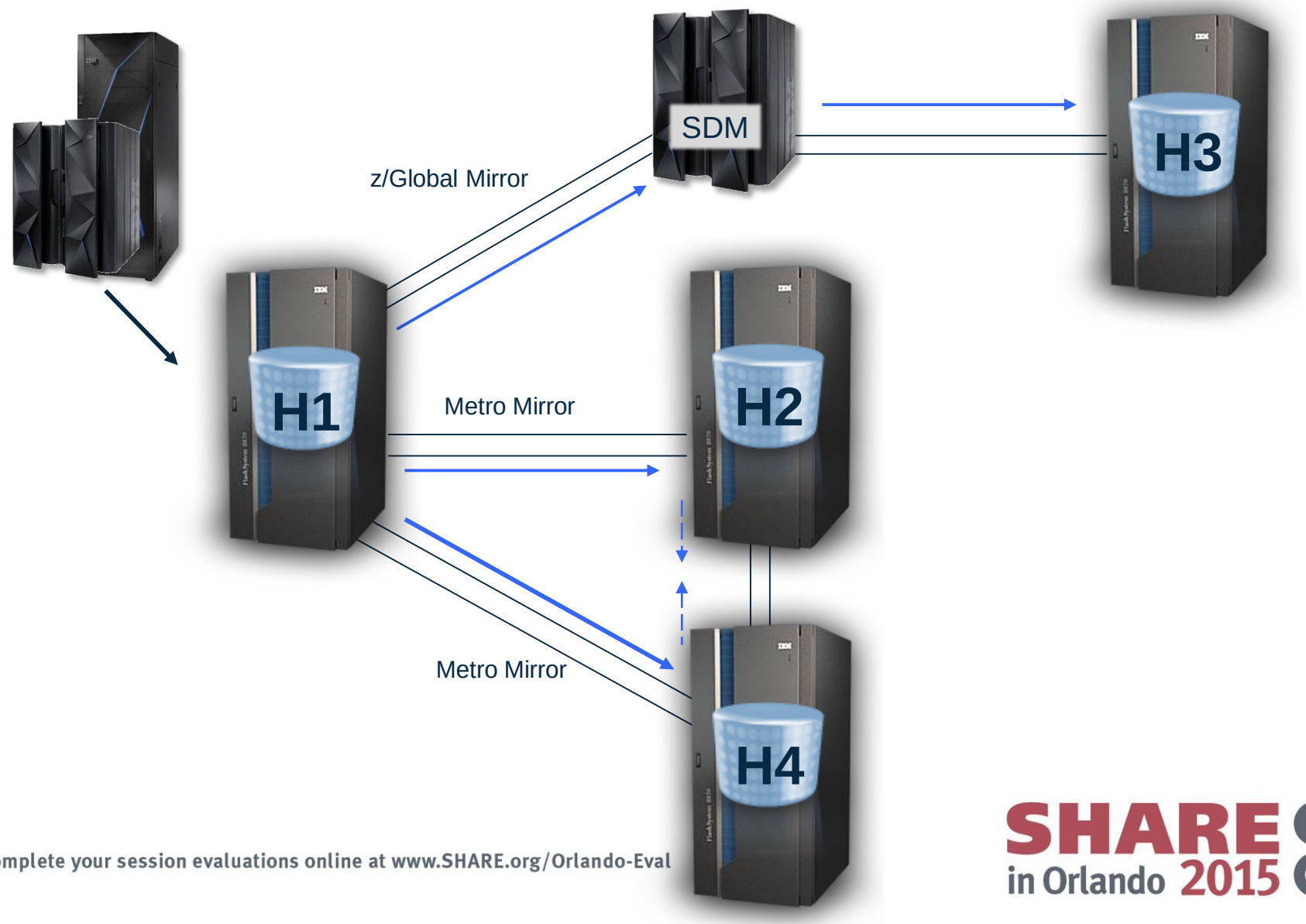
MGM + Multiple Target Metro Mirror



Mz/GM

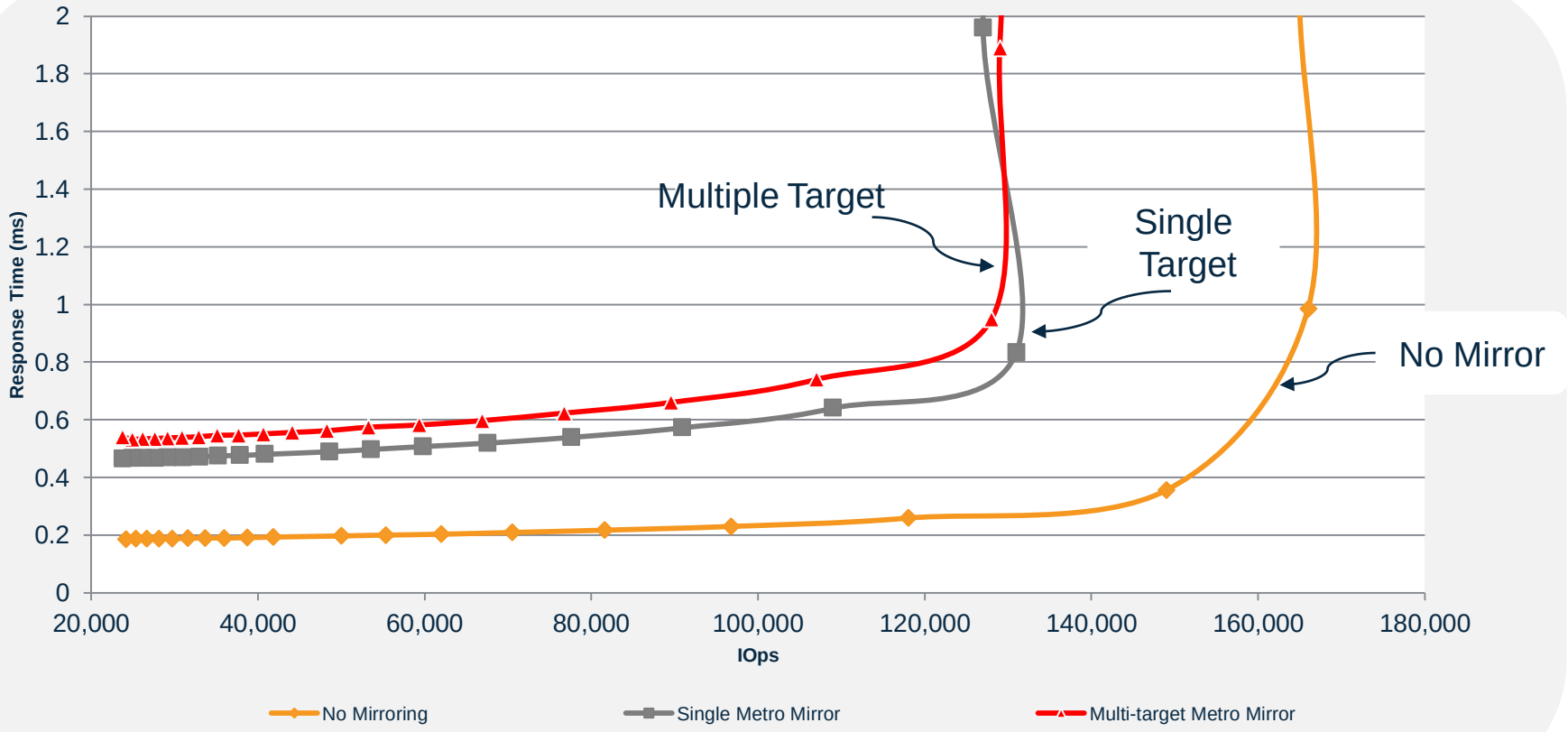


Mz/GM with Multiple Target



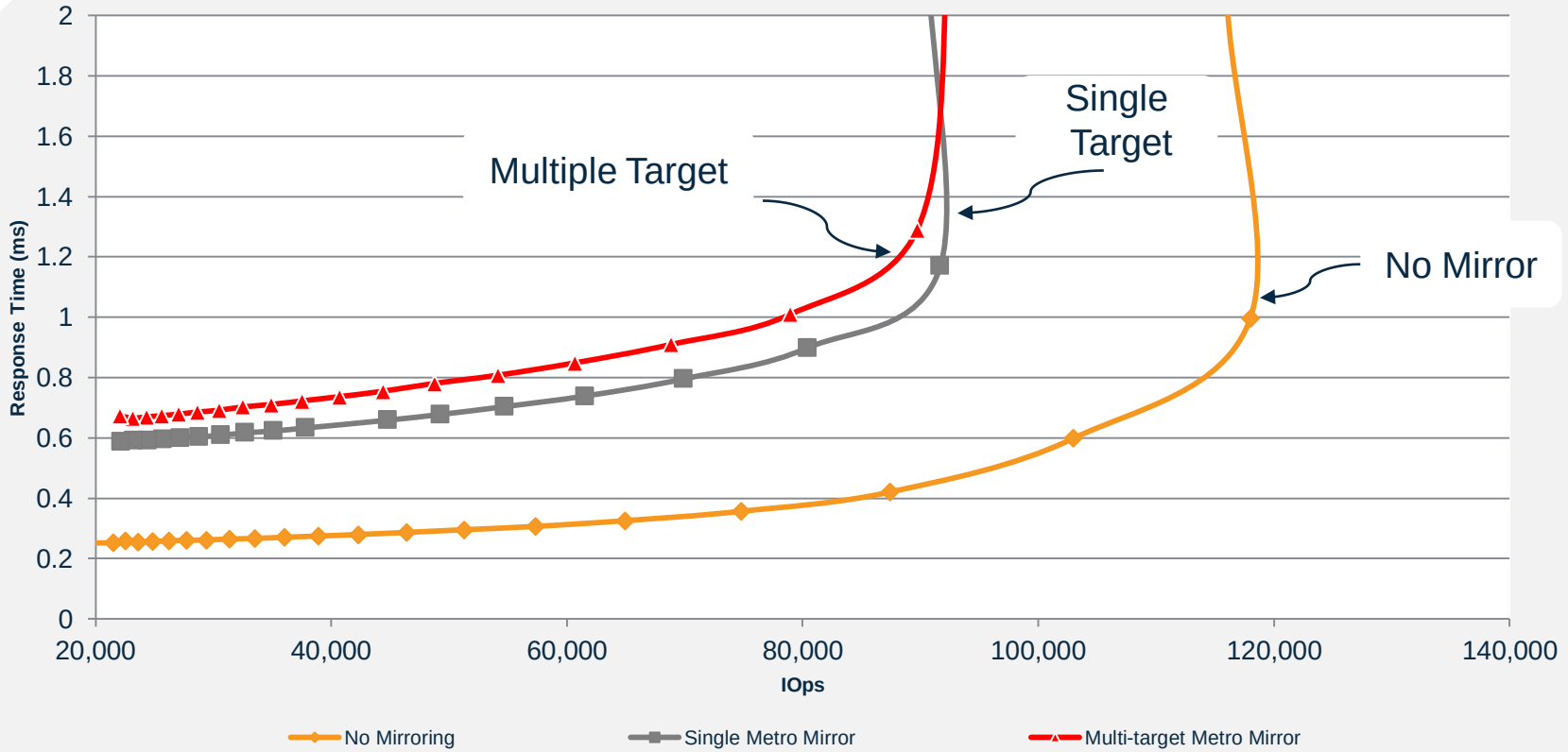
Multiple Target Metro Mirror Performance

4KB Writes



Multiple Target Metro Mirror Performance

27KB Writes



Further Information

- IBM DS8870 Multiple Target Peer-to-Peer Remote Copy, REDP-5151

  http://www.redbooks.ibm.com/abstracts/redp5151.html?Open

Summary

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- Failure Recovery Scenarios
- Command and Interface changes
- Software Support
- Migration using Multiple Target
- Metro Global Mirror (MGM) Topologies
- Additional Topologies