Simple And Reliable End-To-End DR Testing With Virtual Tape

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Agenda

- Why Tape For Disaster Recovery
- The Evolution Of Disaster Recovery Testing
- Tape Replication Methods
- Testing Methodologies
- Fundamental Design Considerations
- Replication Timing Differences

In The Beginning (Circa 1980) Economics Established The Policy

- DASD Street Price ~$10/MB
- Tape Prices:
  - $14/Tape
  - $0.07/MB
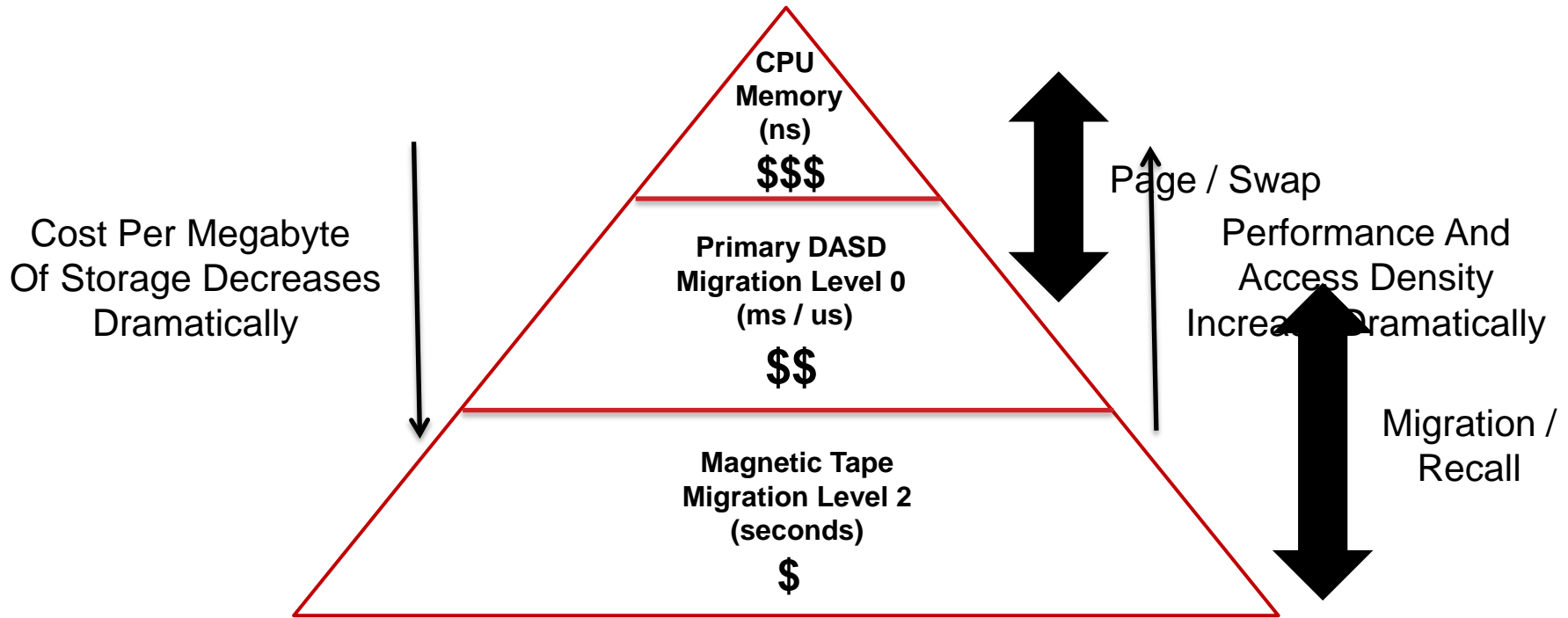- Sequential Files To Tape
- Tape To DASD Ratio ~10:1

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Tape Automation Enables Tape As A Secondary Tier Of Storage

- Tape Automation Introduced "Consistent" Tape Mount Times

- DASD Space Management Facilities Widely Embraced

- Datasets Automatically Move From Tier To Tier Based Upon Storage Policies

- Tape Is Now Even More Critical Than Before

Space Management Systems Create A New Tier Of Storage

CPU
Memory
(ns)
$$$

Primary DASD
Migration Level 0
(ms / us)
$$

Magnetic Tape
Migration Level 2
(seconds)
$

Cost Per Megabyte
Of Storage Decreases
Dramatically

Page / Swap

Performance And
Access Density
Increases Dramatically

Migration /
Recall

- Policy-Based Placement Of Data On Appropriate Storage Tier

- Tape Is To DASD As DASD Is To Central Storage

Disaster Recovery Testing
Tape-Based System Restore

- Anticipating The Test
  - Quiesce Critical Systems
  - Full-Pack Backups To Tape
  - Ship Tapes To D/R Site
- Start Of Test
  - Restore Starter System(s)
  - Restore Databases Loadlibs And JCL Libs
- Issues
  - Bad Tapes
  - Missing Tapes
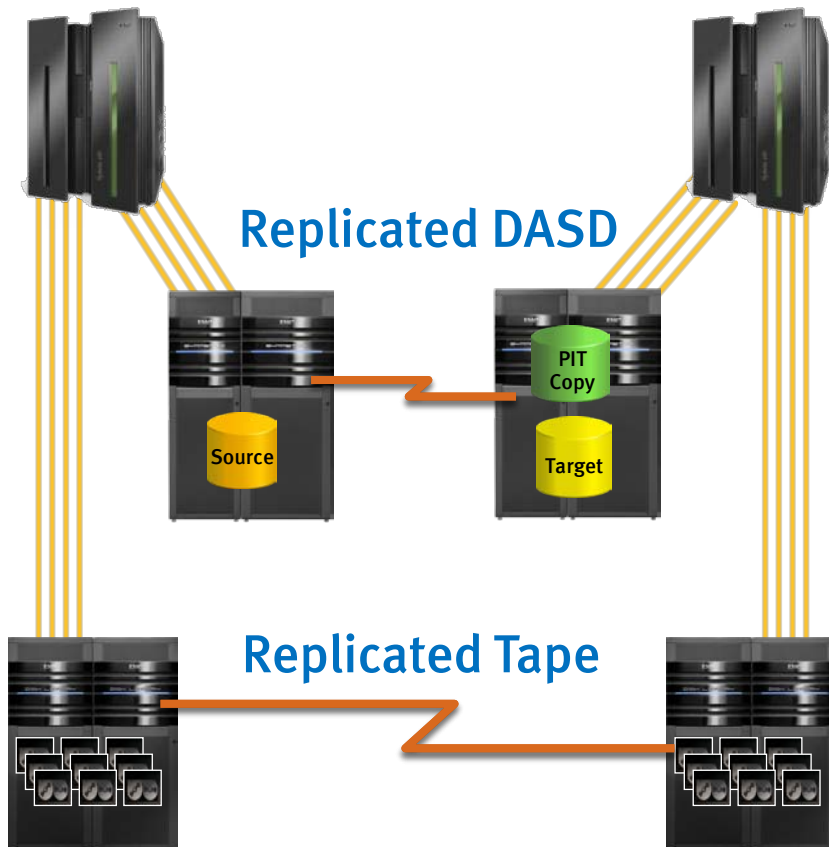 - Too Many Tapes?

Disaster Recovery Testing Replicated DASD

- Fundamental D/R Testing
- Fast IPL Of Systems By Avoiding Laborious Tape Restores
- Testing Limited To Data Bases And Onlines
- What's Missing?
  - HSM ML2
  - Large Sequential Files
  - Traditional Batch Processing

DC1   DC2

PIT Copy

Source   Target

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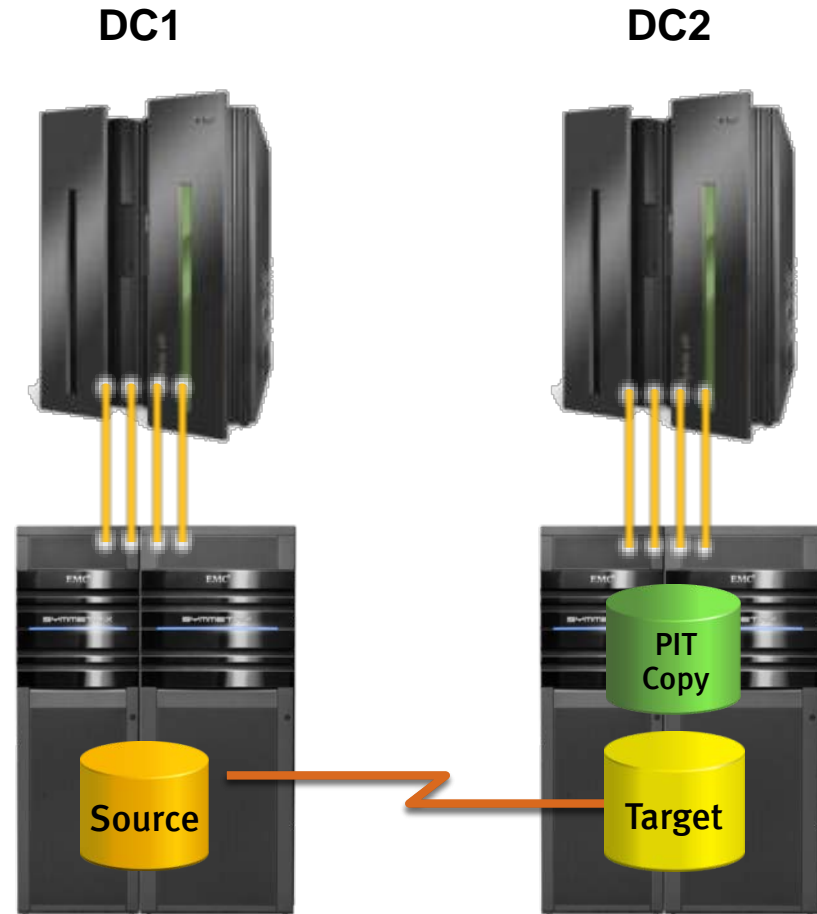
Disaster Recovery Testing Replicated DASD And Tape

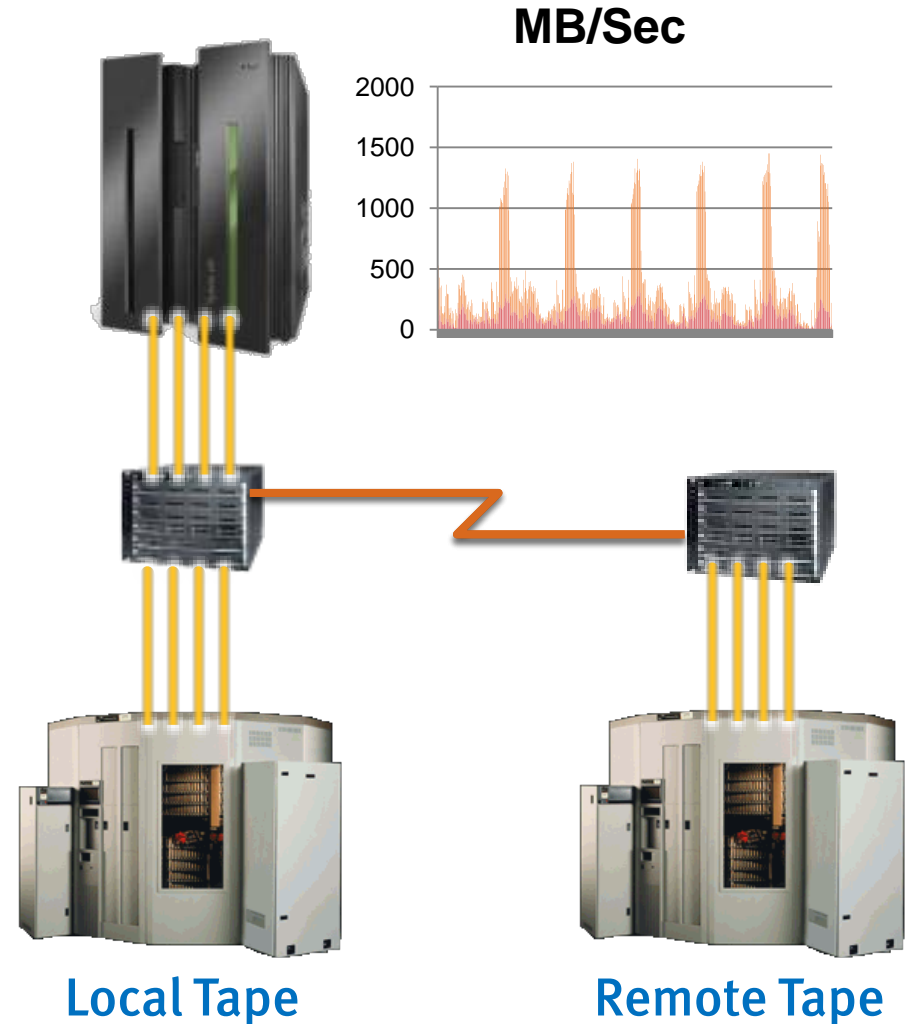**Replicated DASD**

Source

PIT Copy

Target

Replicated Tape

- The Rest Of The Story……
- Minimizes Or Eliminates Offsite Vaulting
- Accelerates Recovery
- How Much Tape Data Gets Replicated?
- Required For End-To-End Testing – Onlines <u>AND</u> Batch
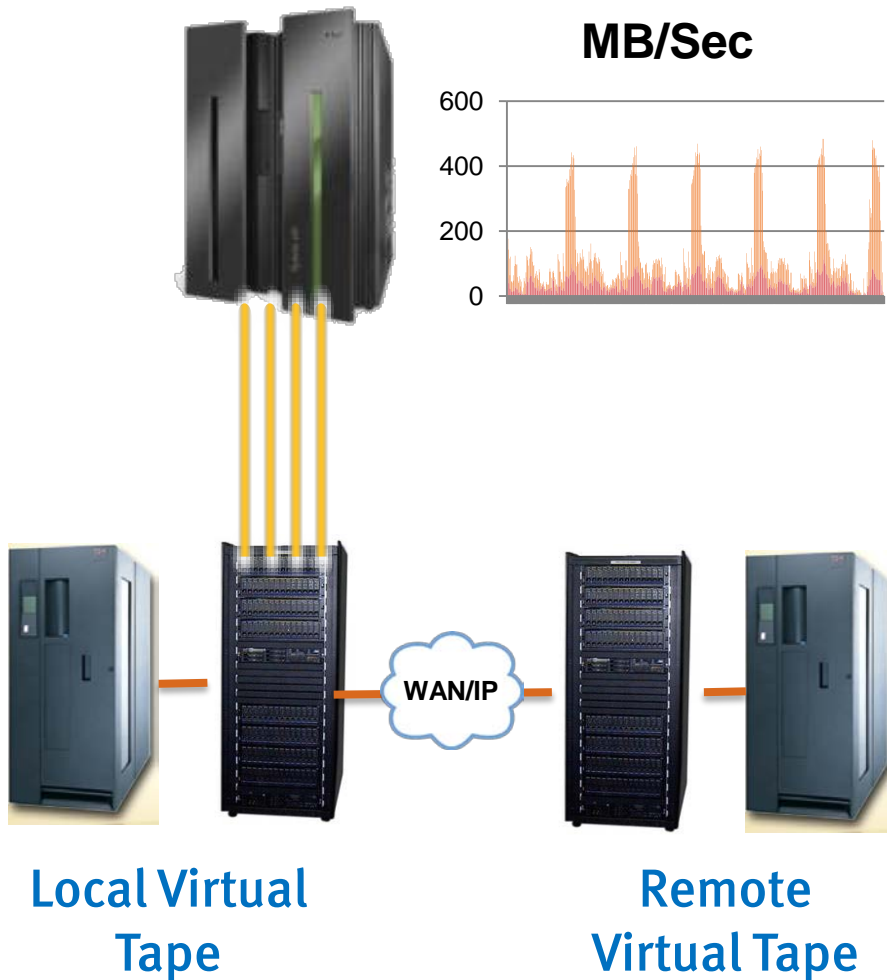
Tape Replication Methods
Channel-Extended Tape

- Electronic Vaulting
- Cascaded ESCON/FICON Directors Or Fibre Channel (FCIP) Extended CHPIDs
- Risk Mitigation (Lost Tapes)
- Manual In Nature, Requiring JCL Changes
- Bandwidth Considerations
- Selective Uses - "What's Important And Who Decides?"

MB/Sec

2000
1500
1000
500
0

Local Tape   **Remote Tape**

Tape Replication Methods
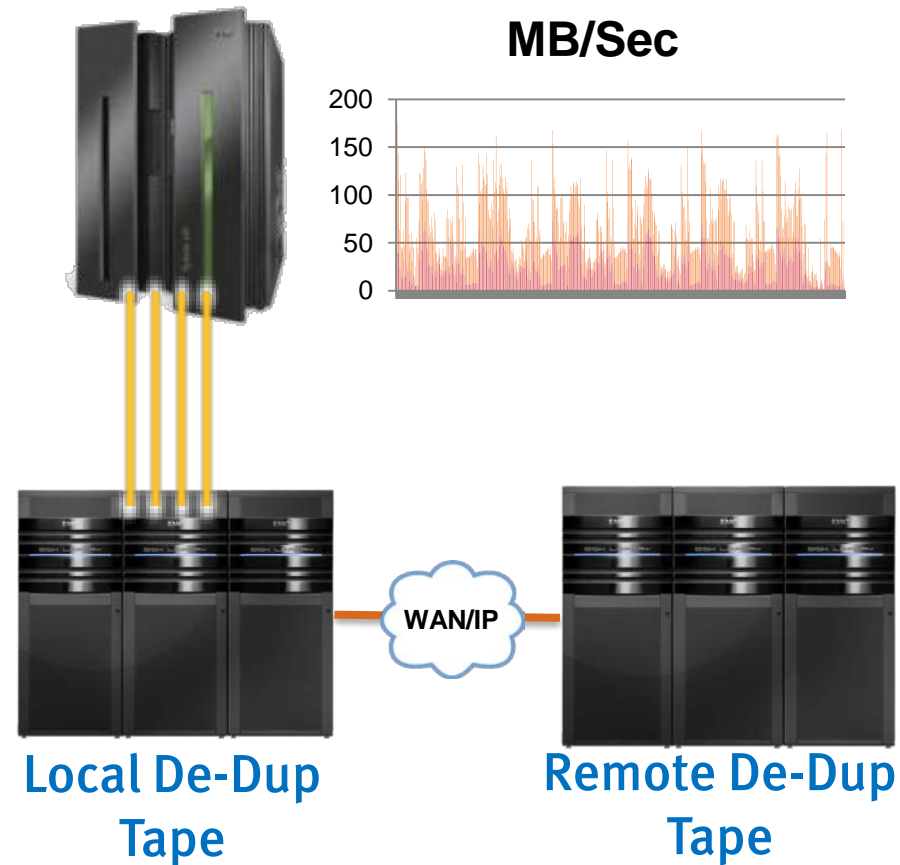# Traditional Virtual Tape Systems

MB/Sec

- Realize The Benefit Of Hardware-Compression For Bandwidth Reduction
- Cost Justifiable To Replicate More Tape Datasets
- Replication Is Automated / Policy-Based
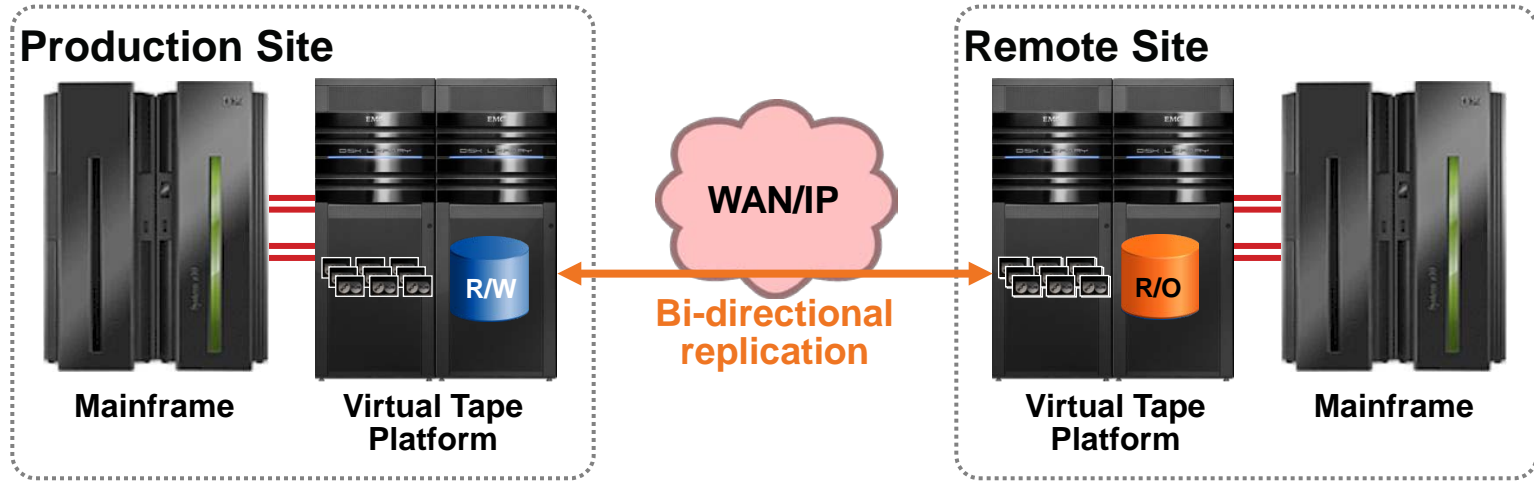- Enables End-To-End D/R Testing
  - Onlines
  - Batch

WAN/IP

Local Virtual Tape

Remote Virtual Tape

Tape Replication Methods
Virtual Tape Systems With De-Duplication

- Significant Bandwidth Reduction For Peak Write Workloads
  - Full Volume Dumps
  - Image Copies
- Lower Peak Bandwidth Requirements Permits Replication Of All Tape Datasets
- Longer Retention Periods And / Or More Copies Are Easily Justified

MB/Sec

Local De-Dup Tape

WAN/IP

Remote De-Dup Tape

Testing the Disaster Recovery Environment

Production Site

Mainframe | Virtual Tape Platform

WAN/IP

R/W

Bi-directional replication

Remote Site

R/O

Virtual Tape Platform | Mainframe

Read-only mounts

- Confirm that tapes can be mounted and all required data can be accessed
- No incremental storage capacity required
- Testing Issues
  - No Modification Allowed
  - Separate Scratch Pool
  - Data Changing "Under The Covers" Unless Replication Is Suspended

R/W Snapshots

- Disk arrays allow creation of "read-write" snapshot
- Some incremental storage capacity required
- Enables "Fully Destructive" Testing
- True Disaster Declaration Simulation
- Replication continues to run maintaining Production data center protection

But Is That Enough?

D/R Testing Considerations

- Test Environment Should Mimic The Production Environment
  - UCB Addresses
  - SMS Constructs
  - Cataloged Datasets
- Test Vs. Failover Procedures
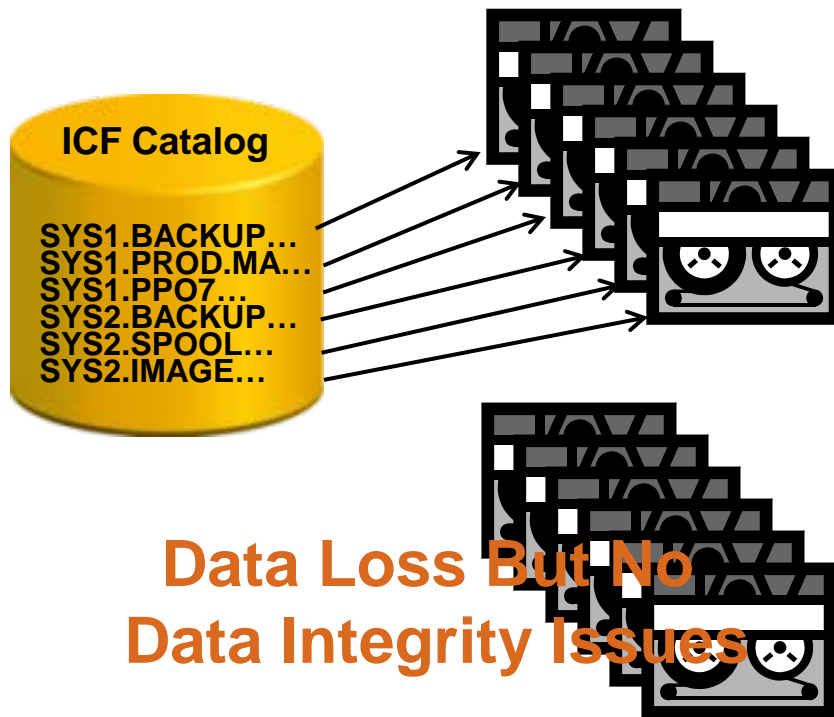- Bring Data Home?
- Data Loss Exposure

Complete your sessions evaluation online at SHARE.org/AnaheimEval

Replication Timing Differences
Tape Ahead Of DASD

Tape Replication Running With 15 Minute Replication Cycle

DC1

WAN/IP

DC2

WAN/IP
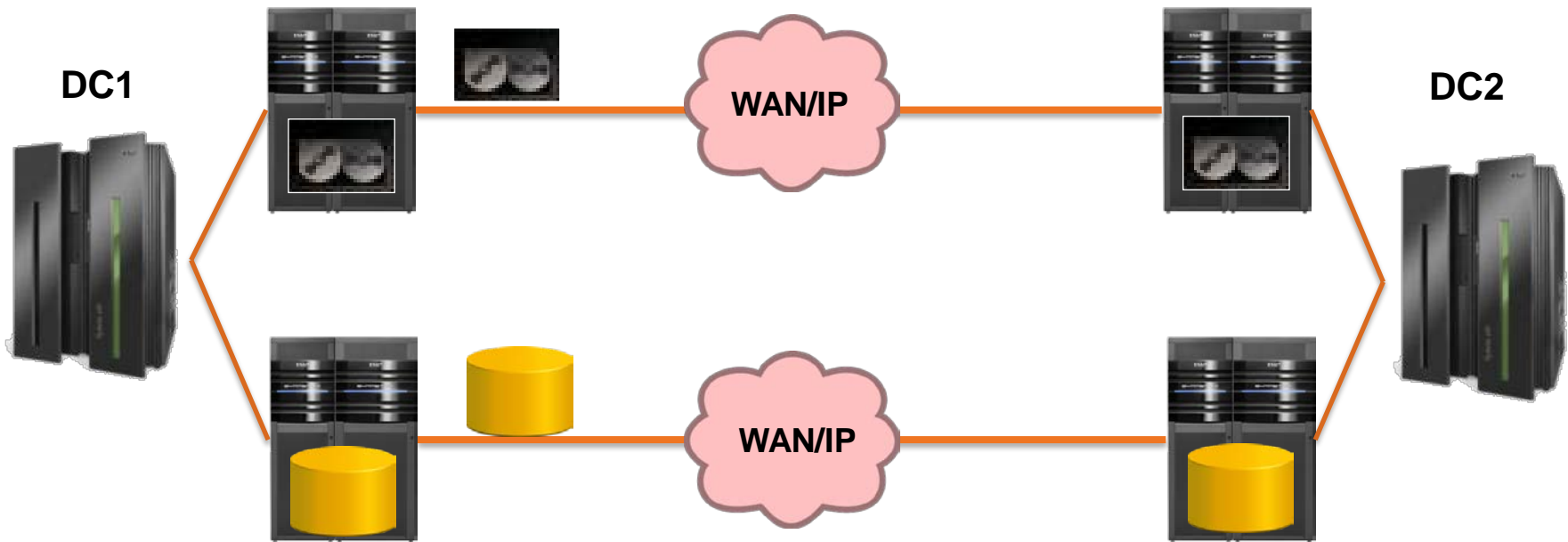
DASD Replication Running With 12 Hour Replication Cycle

State Of The Environment
Tape Ahead Of The DASD

ICF Catalog

SYS1.BACKUP…
SYS1.PROD.MA…
SYS1.PPO7…
SYS2.BACKUP…
SYS2.SPOOL…
SYS2.IMAGE…
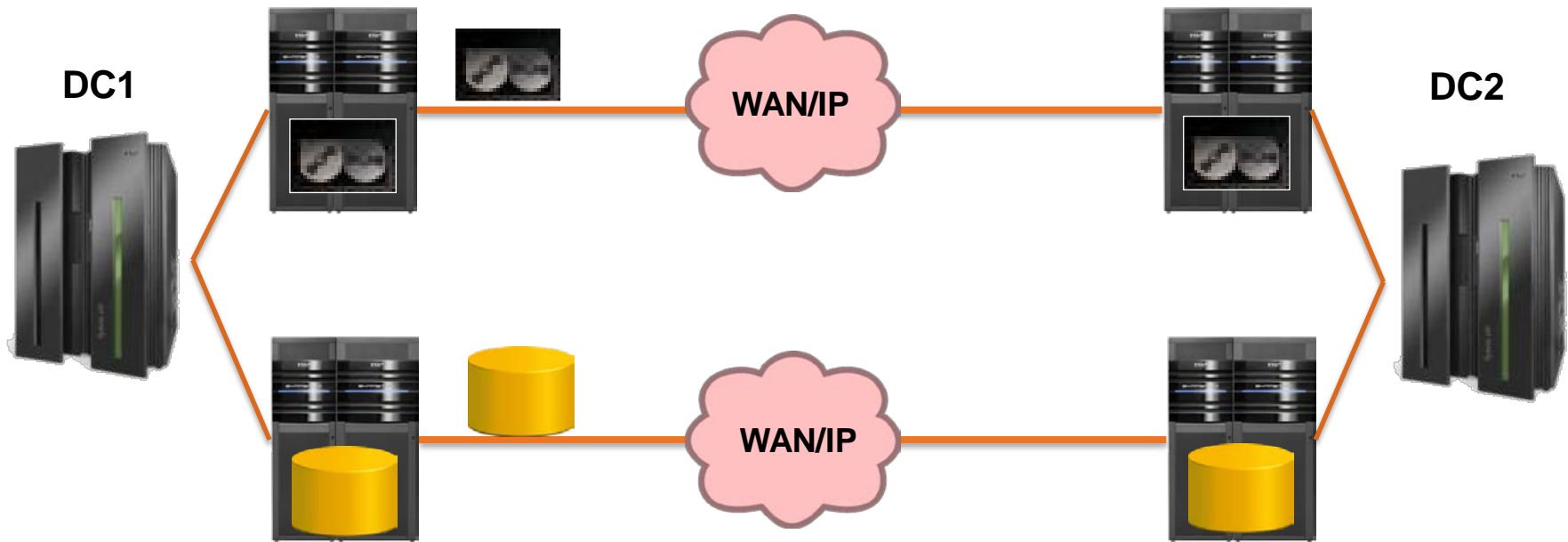
Data Loss But No Data Integrity Issues

- Catalogs Up To 12 Hours Old

- Last Tape Replicated 15 Minutes Ago

- For Every Catalog Entry, There's A Tape Dataset Present

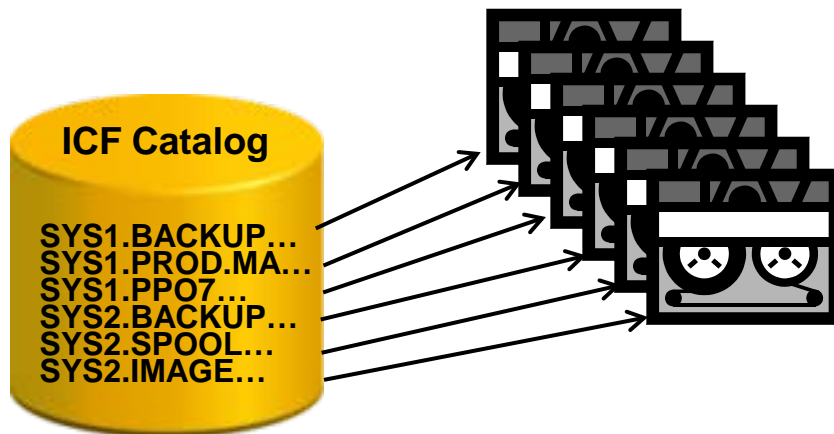- Additional Uncataloged Tape Datasets Present

15

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Replication Timing Differences
DASD Ahead Of Tape

Tape Replication Running With 15 Minute Replication Cycles

DC1

WAN/IP

DC2

WAN/IP

DASD Replication Running With 15 Second Replication Cycles

Complete your sessions evaluation online at SHARE.org/AnaheimEval

State Of The Environment
DASD Ahead Of The Tape

ICF Catalog

SYS1.BACKUP…
SYS1.PROD.MA…
SYS1.PPO7…
SYS2.BACKUP…
SYS2.SPOOL…
SYS2.IMAGE…

Data Loss <u>AND</u>
Data Integrity Issues

- Catalogs 15 Seconds Old

- Last Tape Replicated 15 Minutes Ago

- Catalogs Have Entries Pointing To Tapes That Have Not Been Replicated

- ML2-Resident Datasets Are Gone

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Minimizing The Exposure(s)
"Synchronous" Tape

Tape Replication Running With 15 Minute Replication Cycles

DC1

WAN/IP

DC2

JOB

WAN/IP
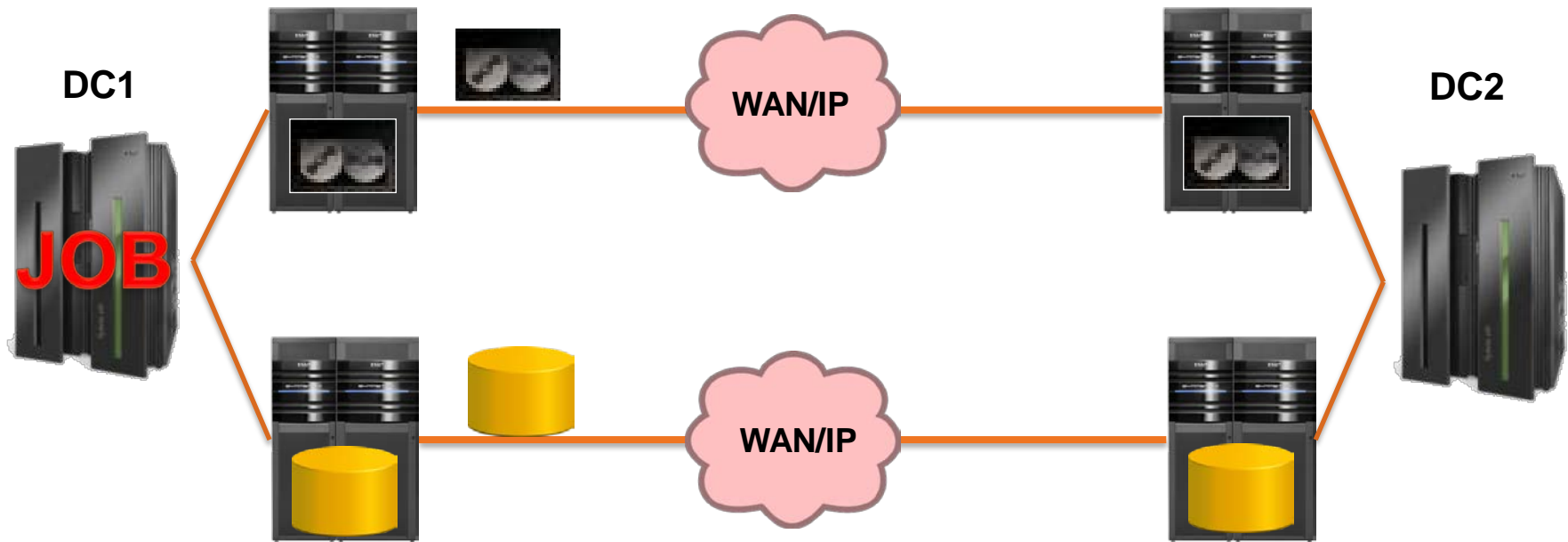
DASD Replication Running With 15 Second Replication Cycles

State Of The Environment "Synchronous" Tape

ICF Catalog

SYS1.BACKUP…
SYS1.PROD.MA…
SYS1.PPO7…
SYS2.BACKUP…
SYS2.SPOOL…
SYS2.IMAGE…
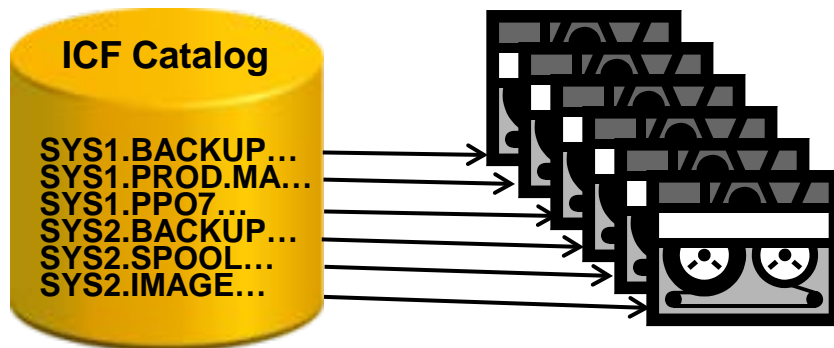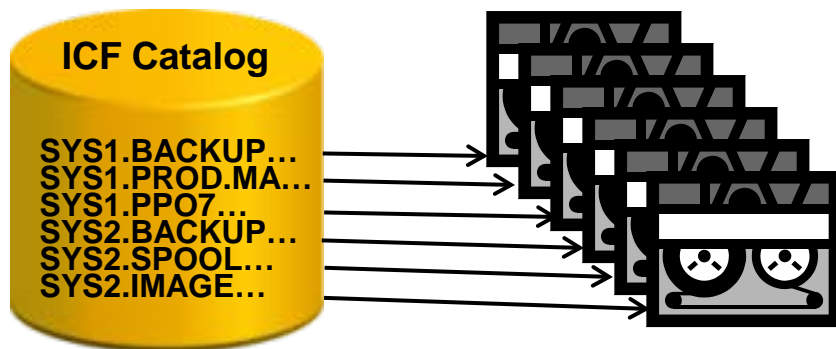
- All Synchronous Tape Completed Replication Before Catalogs Updated
- Dramatically Minimizes Data Loss Exposure
- Issues:
  - Job Runtime Elongation
  - UCB Starvation
- Selective Use Cases

Closing The Gap
Tape & DASD Consistency

Consistency Group Encompassing Both Tape & DASD

DC1

WAN/IP

WAN/IP

DC2
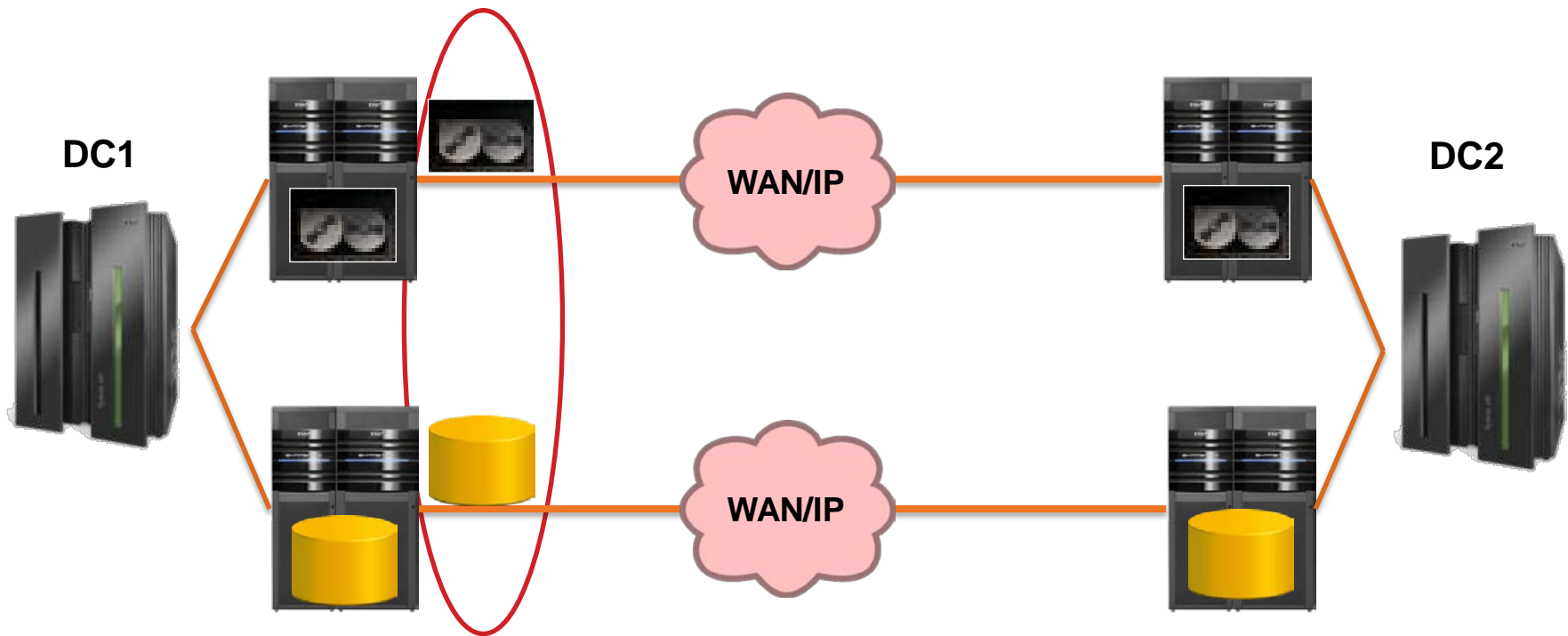
State Of The Environment
Tape & DASD Consistency

ICF Catalog

SYS1.BACKUP…
SYS1.PROD.MA…
SYS1.PPO7…
SYS2.BACKUP…
SYS2.SPOOL…
SYS2.IMAGE…

- Zero Data Loss Using Synchronous Replication

- Minimal Data Loss Using Asynchronous Replication

- Replicated Tape And DASD Consistent To One Another Using Either Replication Technology

Complete your sessions evaluation online at SHARE.org/AnaheimEval

Summary

- Tape Is Not Just For Backup – It's An Active Storage Tier In Mainframe Data Processing

- Because Of The Critical Nature Of Tape, It's Imperative To Include It In Disaster Recovery Planning To Ensure Business Resumption

- Technologies Have Evolved To More Easily Justify Tape Data Replication

- Design Test Plans To Follow Actual Disaster Declarations As Much As Possible

- Be Aware Of Data Loss / Data Integrity Issues

Thank You!

Enjoy The Rest Of The Conference!