

# IBM Mainframe TS7700 Tape Update

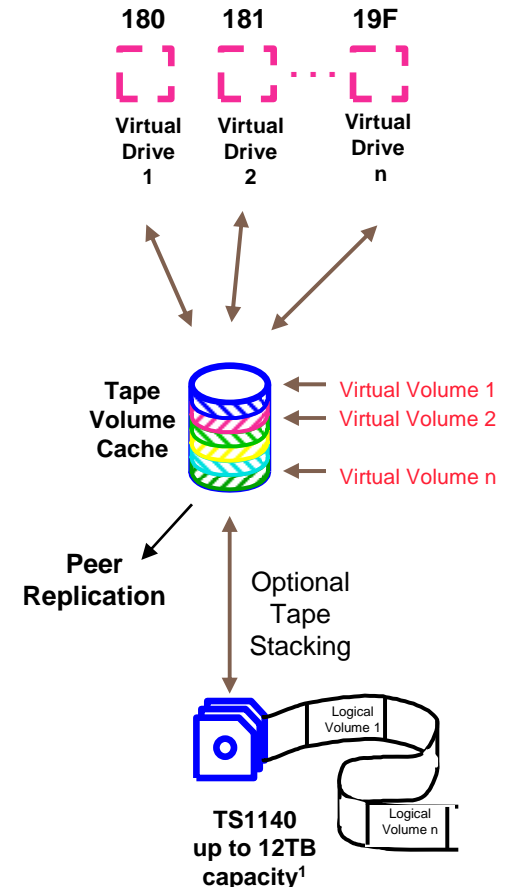
Ralph Beeston  
IBM

08/08/2012  
Session Number  
12024



# Virtual Tape Concepts

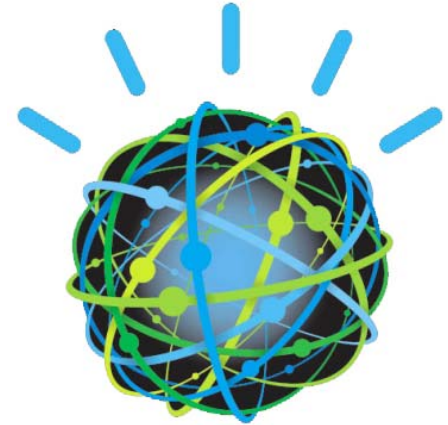
- Virtual Tape Drives
  - Appear as multiple 3490E tape drives
  - Shared / partitioned like real tape drives
- Tape Volume Caching – Disk Speeds
  - Designed to eliminate all or many physical tape delays
- Can support 100 % write and read hits
- Optional Volume Stacking
  - Designed to fully utilize IBM's cartridge and library capacity
  - Allows the capacity to grow far beyond a disk only solution
  - Stacks multiple logical volumes onto physical cartridges
  - Supports TS1140/TS1130/TS1120 and/or 3592 J1A tape drives
- Volume Replication
  - Outboard replication between virtual tape libraries for seamless business continuance



<sup>1</sup>assumes 3:1 compression

# Leveraging IBM Technology

- **System p server with IBM Power7**
  - High performance 8 core, 64 bit engines
- **IBM RAID DASD**
  - High performance AES 128bit encryption disks
- **AIX**
  - Reliable, robust, tools suites and support
- **General Parallel File System (GPFS)**
  - High performance, high capacity, highly scalable
- **DB/2**
  - Highly scalable, highly available database
- **WebSphere Message Queues**
  - Highly available messaging architecture
- **FICON host adapters**
- **Host Perform Library Function (PLF) zSeries Commands Interface**
  - True synergy with z/OS without any dependency on MTL support
- **IBM Tape and Automation Technology**
  - 3592/TS1140 → 4TB on a tape
  - TS3500 modular, scalable, highly available automation



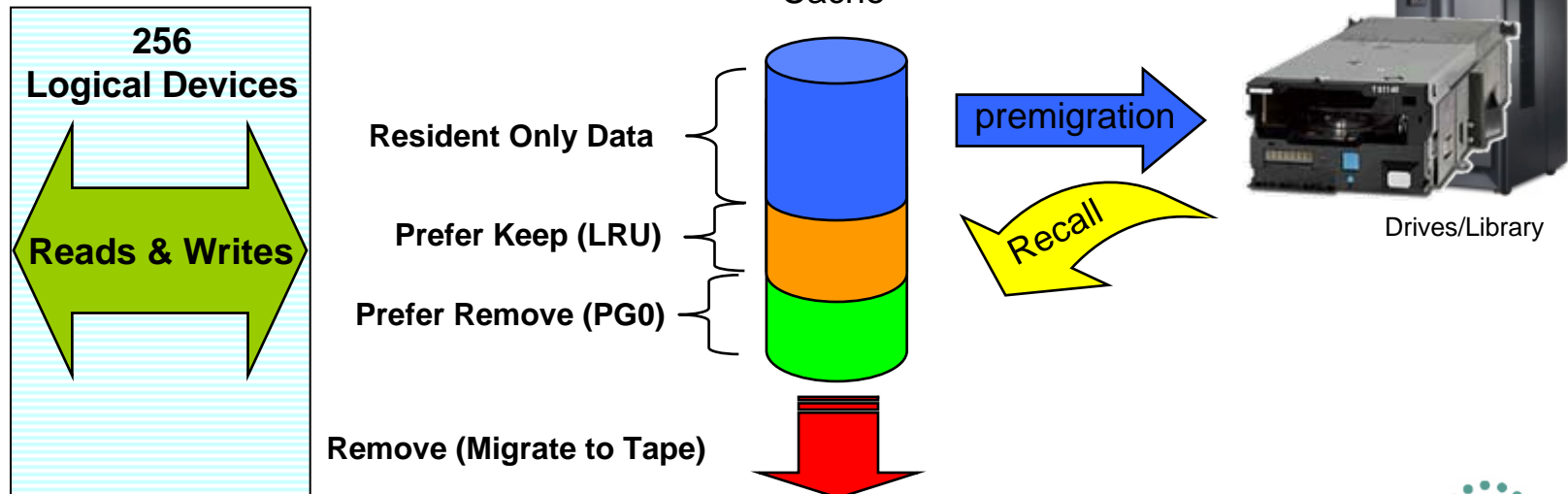
# TS7700 Virtualization Engine Solutions

- **TS7720 Virtualization Engine**
  - Access-centric applications (image data, report servers, critical backups, HSM ML2)
  - Up to 580TB disk cache
    - 1.7 PB with 3:1 compression
- **TS7740 Virtualization Engine**
  - Cost-efficient applications (HSM, general backups, aged data, archive)
  - Up to 28TB disk cache
    - 84TB with 3:1 compression
  - Over 21PB backend physical tape storage
    - 63PB with 3:1 compression



# TS7740 Intelligent Tape Integration

- **Automatic Tier Management Between Disk Cache and Physical Tape**
  - All host reads and writes are through disk cache at disk speeds
    - The host is only aware of logical devices as the access point to all volumes
  - New or modified data is stacked/copied to physical tape within the TS3500 library
  - Data remains in disk cache using policy management
    - Data can be preferred to be flushed from cache (PG0)
    - Data can be kept in cache (PG1) which relies on an LRU algorithm
  - Aged or PG0 volumes are removed from disk cache automatically leaving a copy on tape
  - Just a few terabytes of disk cache provides the benefits of disk without giving up the benefits of physical tape





# TS7700 z/OS Policy Management

- Integrated DFSMS support
  - Automatic Class Selection (ACS) Routines
  - Storage construct names assigned to logical volumes
  - Construct names passed to TS7700 during mount request
- Volume granular policy management
  - No dependency on Tape Management System pools
- Dynamic policy updates
  - Simply redefine the name or rules and a simple mount/demount enforces it
- Most TS7700 features are policy managed
  - Volume capacities, media types, replication policies, physical tape pooling, allocation assistance, tier to tape behavior and many others.



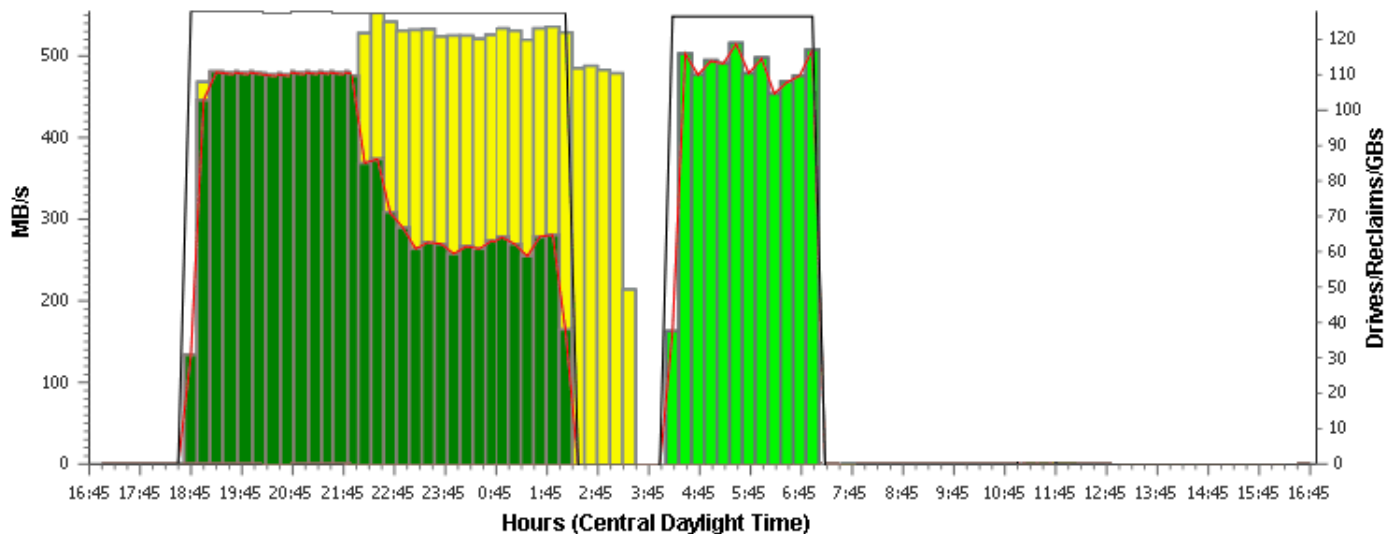
# TS7700 Monitoring/Management

- Web-based Management Interface
  - Configuration/health/performance status/statistics
- z/OS operator console
  - ‘Green Screen’
  - For operator monitoring of TS7700 status and changing of many settings
- Operational statistical data
  - Captured every 15 minutes, 90 rolling days kept outboard
  - IBM provided report formatting tools (VEHSTATS, MI Graphical Output)



# GUI Historical Statistics Panel

- Graphical summary of up to 24 hours of workload in the last 90 days
  - Determine how the TS7700 is managing host I/O, hierarchal storage management and grid replication
  - Look for potential bottlenecks which can be tuned through Library Request settings



Start Date:  Start Time:   
 Central Daylight Time

End Date:  End Time:   
 Central Daylight Time

LEGEND	
<span style="color: green;">■</span> Host Compressed Write MB/s	<span style="color: green;">■</span> Host Compressed Read MB/s
<span style="color: yellow;">■</span> Write To Tape MB/s	<span style="color: blue;">■</span> Read From Tape MB/s
<span style="color: red;">—</span> Host Raw Read/Write MB/s	<span style="color: grey;">—</span> Maximum Virtual Drives Mounted
<span style="color: orange;">—</span> Reclaim Mounts	<span style="color: purple;">—</span> GBs to Copy



# TS700 Feature Highlights

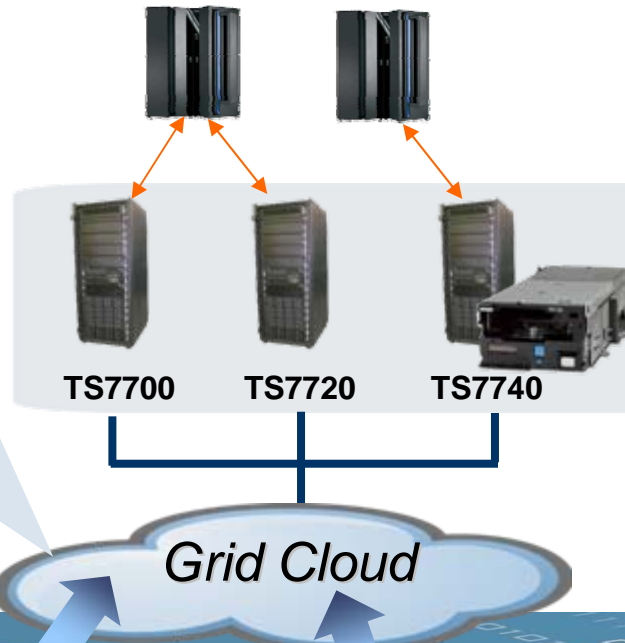
- Logical WORM
  - Achieve certification with emulated logical WORM
- LDAP Support
  - Centralized user role authentication
- SNMP Alerts
  - Audit friendly through SNMP alerts of all GUI user events
- Selective Device Access Control
  - Add a layer of security for multi-tenancy
- Optional tight integration with TS3500/TS1100 technology
  - Intelligent tiering to tape
  - Encryption, stacking, drive pooling, automatic reclamation, export/import, nearly endless capacity, transparent to TMS

# IBM TS7700 System Z Virtual Tape Engine

## Leveraging Grid as Cloud Storage for System Z Tape

### Grid Cloud

- Disk Speeds
- TS1100 Tape Integration
- Transparent Business Continuance
- Encryption



Cumulative FICON  
throughput of over 6GB/s

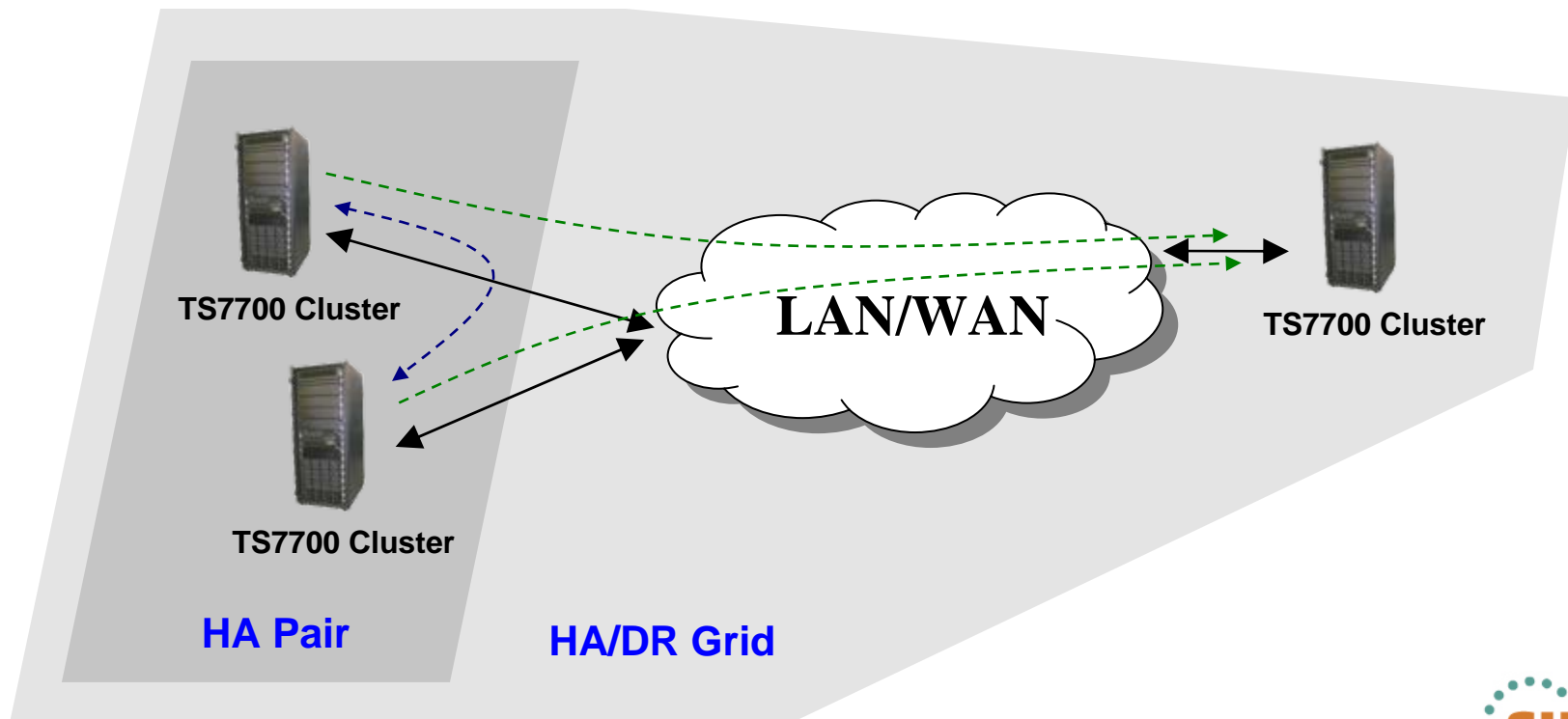
System z hosts view up to  
1536 equivalent devices

Grid access to all data  
independent of where it exists

Replication

# 3-Way HA/DR Grid Configurations

- Two production TS7700 clusters for HA both replicating into a more remote TS7700
  - Each production TS7700 can optionally replicate to its adjacent cluster
  - HA production clusters may be tightly coupled within the same location or spread apart at metro distances
  - Remote cluster contains all DR relevant data
    - Used for Disaster Recovery Testing
    - Used as a Disaster Recovery Location
    - Can also be used for production



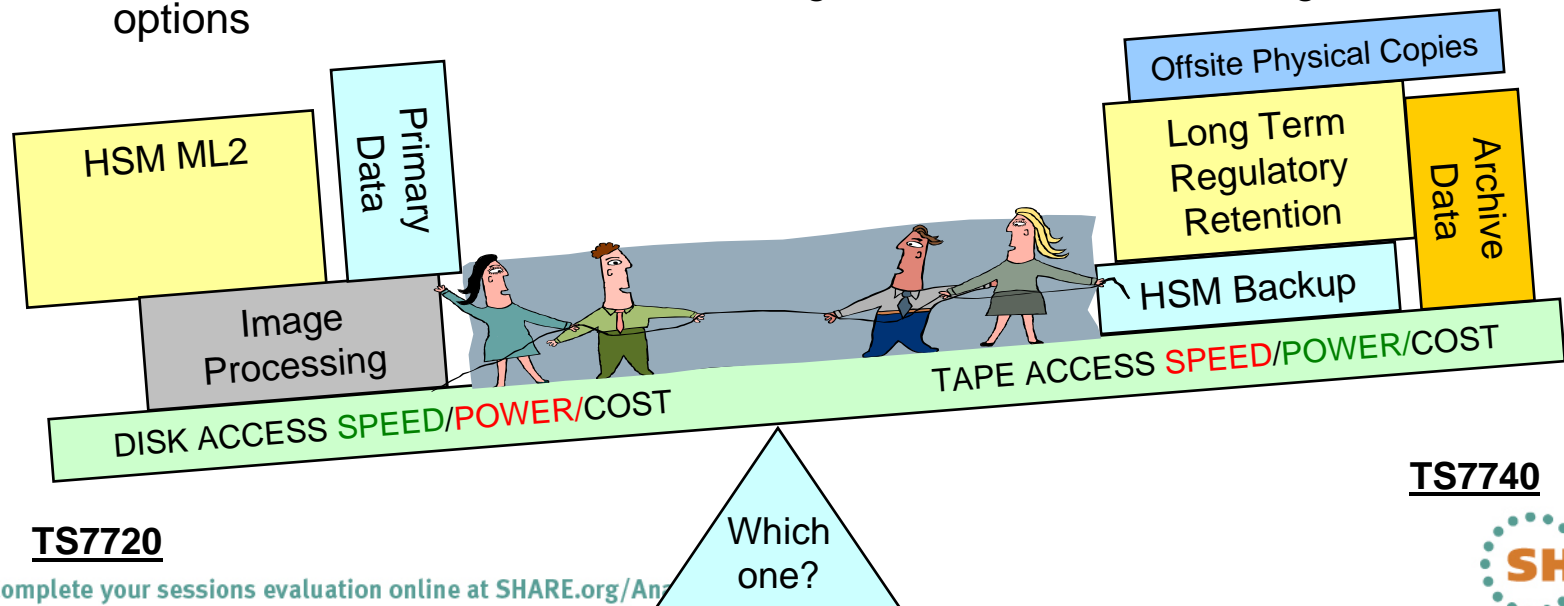
# Hybrid Grid Configurations

## • Not one size fits all

- Disk only solutions are optimal for primary data applications or applications which need fast access times
- Solutions tightly integrated with physical tape are best for archive and backup data
- Total cost of ownership also factors into a customer's choice which doesn't always agree with usage case

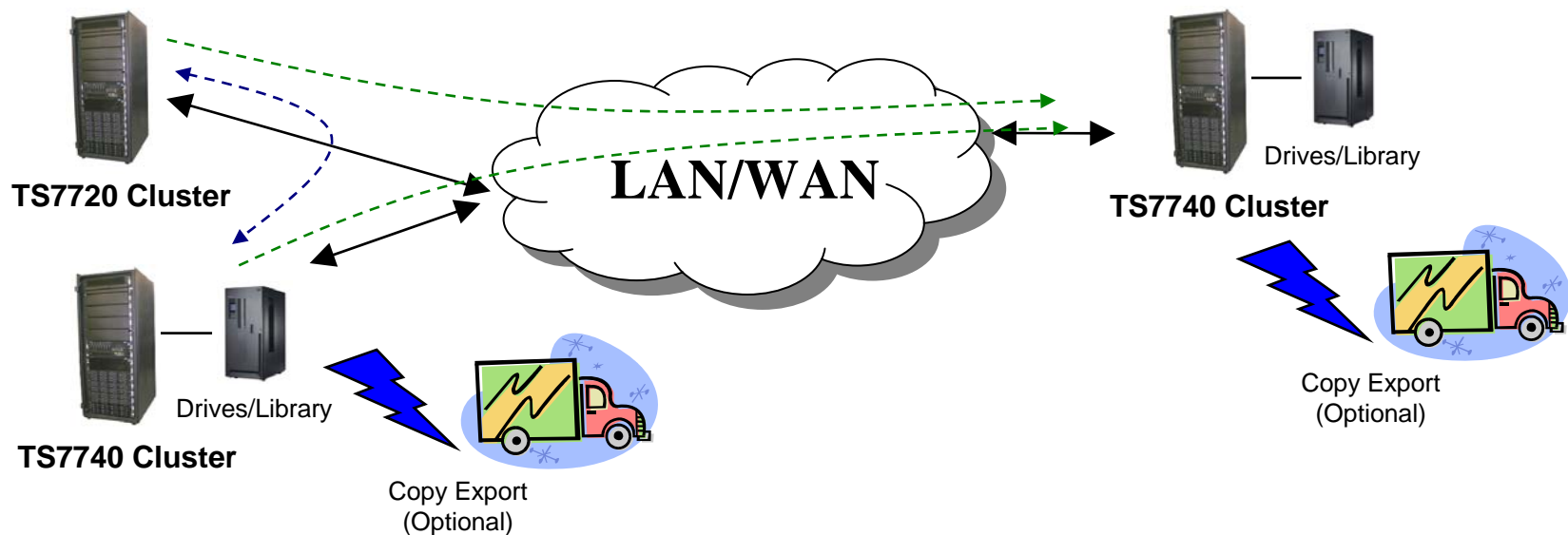
## • Hybrid is the best of both technologies

- Using Grid architecture, intermix disk only TS7720 solutions with disk/tape TS7740 solutions
- Allows customer to configure how their data is managed in order to fully benefit from an intermixed configuration
- Allows IBM to be flexible in its offerings while also differentiating itself with smarter options



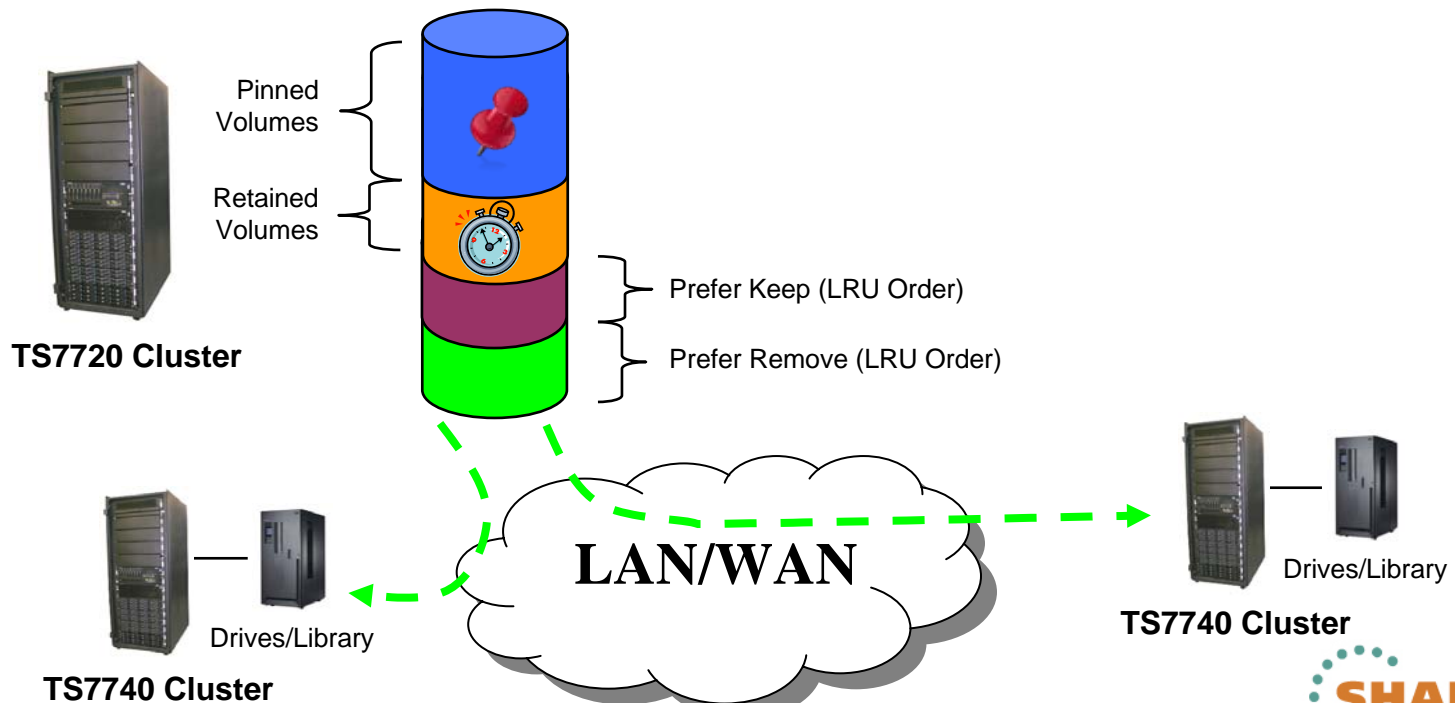
# 3-Way HA/DR Hybrid Grid Configuration

- **Production Hybrid Pair for HA both feeding into a common TS7740**
  - Deep disk cache at production for high cache hit ratios
  - Deep TS7740 capacity at both locations for cost effective long term archive & DR
  - Provides 580TB+ of HIGH PERFORMANCE production cache
  - Ability to have particular workloads favor the TS7720 while others favor the TS7740
- **Data migrates into the TS7740s**
  - If the TS7720 reaches capacity, the oldest data which has already been replicated to the TS7740 will be removed from the TS7720 cache.
  - Though not necessary, copy export can be used at both the production and DR locations



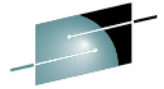
# Hybrid Intelligent Tape Integration

- TS7720 clusters in a grid are designed to run at maximum capacity
- Through policy management, data can be:
  - **Pinned** – Reside in TS7720 disk cache indefinitely
  - **Retained** – Pinned for a duration of time since last access, then Keep or Remove
  - **Prefer Kept or Removed** – Two groups using LRU algorithm
- Data is removed from TS7720 disk cache after validating data already exists on TS7740s
- Automatic and nearly transparent integration of physical tape
  - Aged or archive data naturally ends up on tape within TS7740s
  - Other workloads can be pinned or retained in cache for 100% cache hits on reads



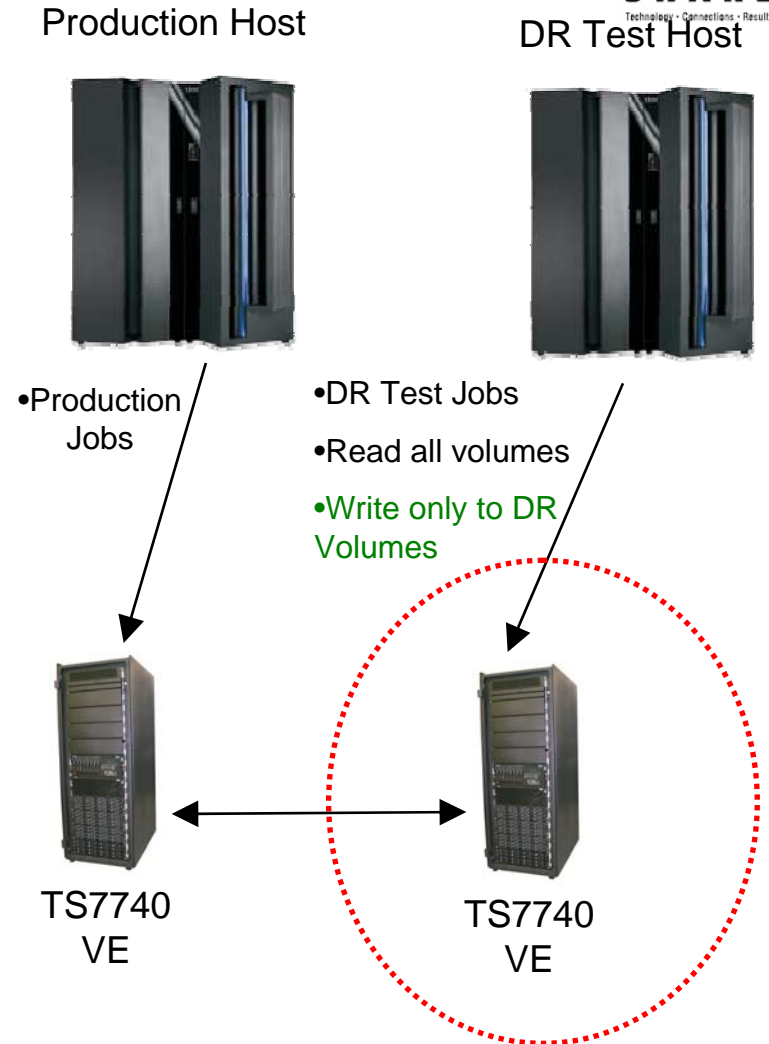
Complete your sessions evaluation online at [SHARE.org/AnaheimEval](http://SHARE.org/AnaheimEval)





# Disaster Recovery Testing

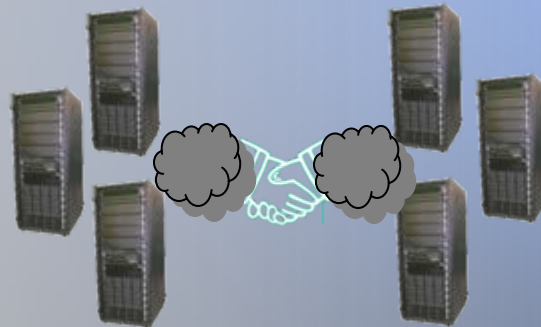
- Full support of concurrent testing
  - DR test host can run while production continues
  - Production data continues to replicate during the entire test
- Production data protection
  - Use TS7700 selective write protect to isolate DR test volumes by category for full read/write access while only allowing read access to production volumes
  - Access production volumes which have been returned to scratch as private volumes within DR location



# TS7700 R2.1 Highlights

## R2.1

- AES 128bit Disk Encryption – R2.1pga2
- Sync Mode Copy
- Remote Mount Link Failover
- Grid Merges
- Copy Export Merge
- TS1140 JA/JJ Media Support
- Copy Export Accelerator



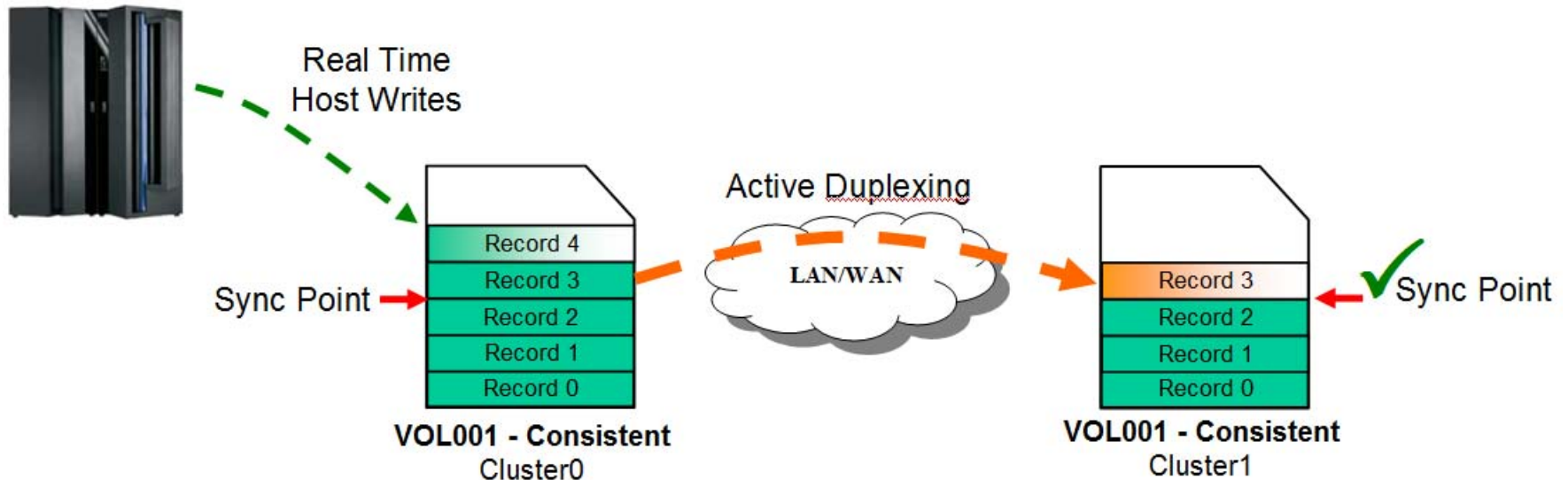
# TS7700 Encryption Support

- TS7700 Disk Encryption – Limited iRPQs
  - **TS7740 – Internal key AES 128bit encryption – R2.1pga1**
    - Limited to 7TB single drawer configuration
      - *Larger configurations available in near future release.*
  - **TS7720 – Internal key AES 128bit encryption – R2.1pga2**
    - Limited capacities
      - *Single frame - 240TB*
      - *Expandable in near future release.*



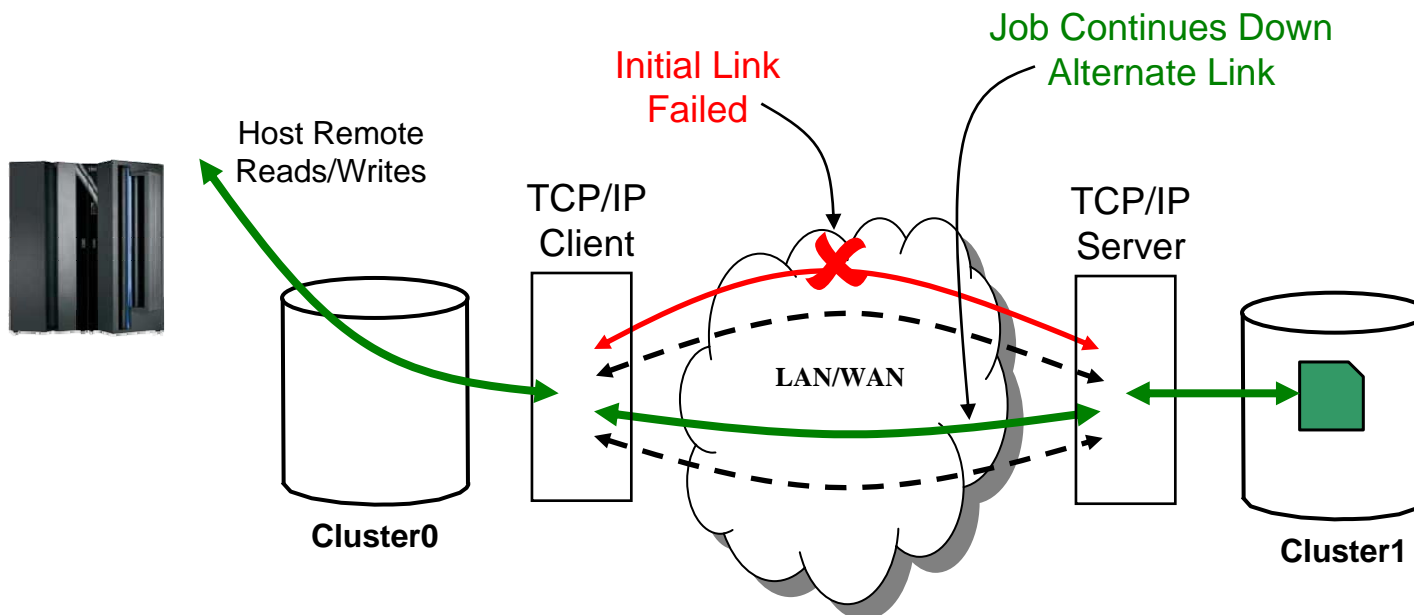
# Tapes First Mainframe Synchronous Copy

- **Volume End Guaranteed/Immediate mode copy does not provide a Zero RPO**
  - Applications which stack datasets to tape such as DFSMSHsm ML2 migrations can remove previously stacked datasets from DASD prior to end of volume processing
  - Content not yet replicated up to that point on tape is exposed to a single datacenter copy only on tape
- **TS7700 provides the first sync point granular Zero RPO synchronous copy method**
  - Up to two sites will be kept consistent after each implicit or explicit tape SYNC operation
  - Policy managed at volume granularity. Only volumes requiring sync are sync'd.
  - Provides applications, such as DFSMSHsm, dataset level replication (Zero RPO!)
  - When duplexing fails, downgrade to sync-deferred or fail job based on policy management.
  - Additional Deferred and/or Immediate copies can occur once volume is closed



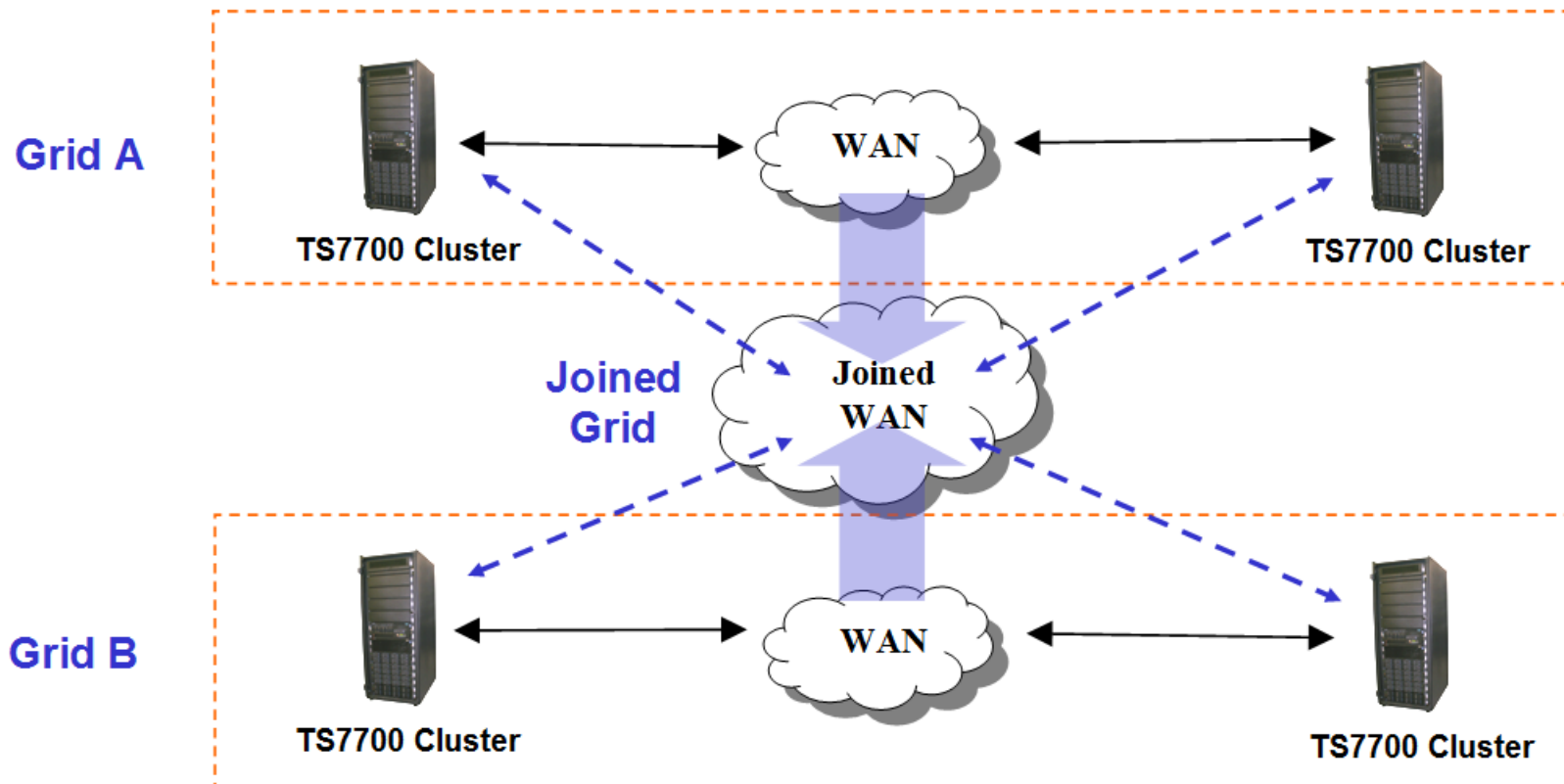
# Remote Mount Automatic IP Failover

- Automatic ability to fail over remote mounts to alternative links when a link outage is detected
  - This enhancement introduces the ability for the TS7700 to automatically re-drive the remote write or read operation down an alternate link without failing the host job
  - Up to three additional links (four link configuration) will be attempted before a job is failed



# Grid Merge

- Merge Two Existing Grids into a single Joined Grid





# TS1140 (Jag4) Support

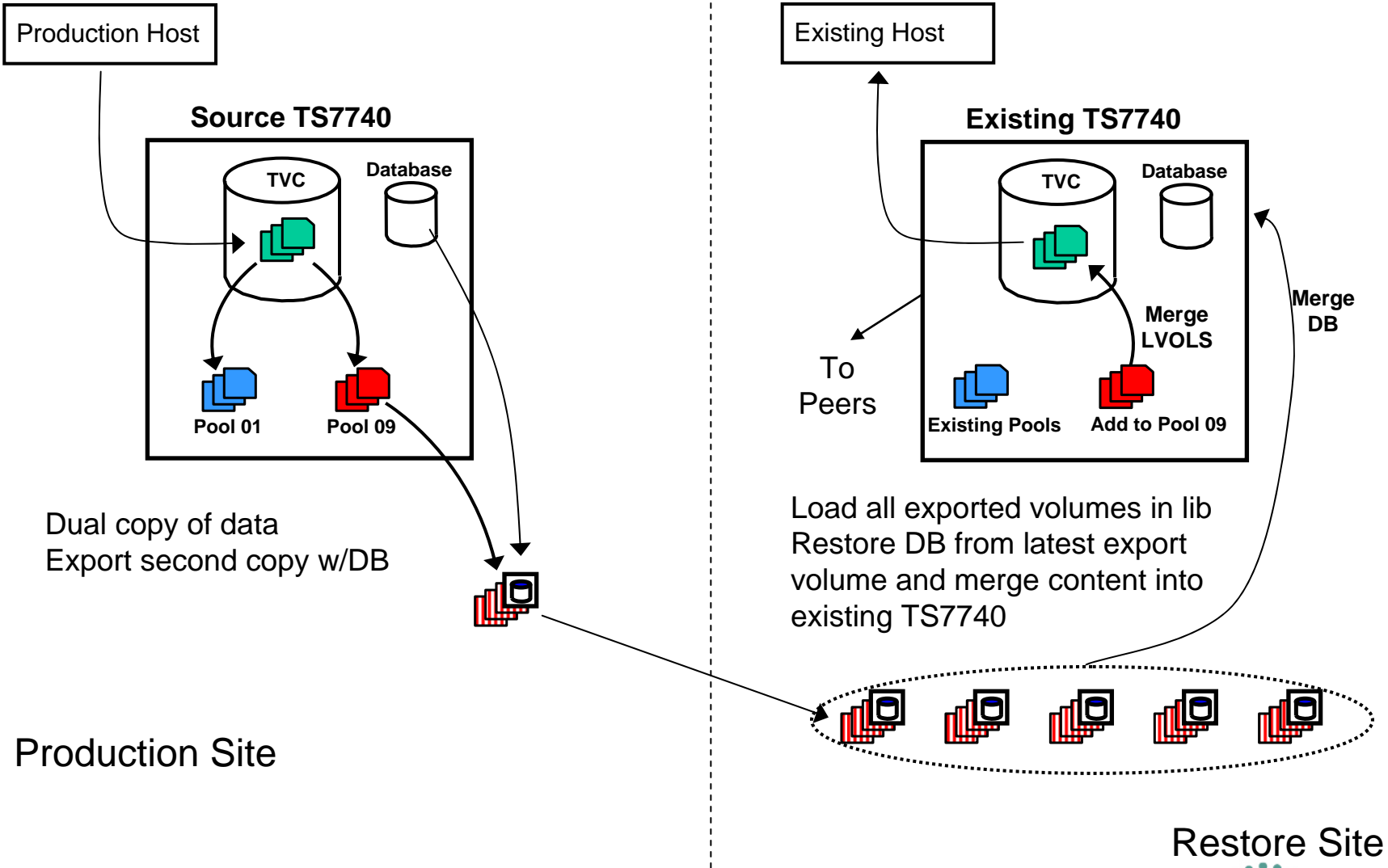
- Support read only use of JA/JJ
  - TS1140 drives will support read only use of JA/JJ
  - Retain JA/JJ footprint indefinitely or migrate to newer 4TB JC media or improved JB media at 1.6TB.

Media	TS1140
JA	Read
JJ	Read
JB	Read-E05 1.0TB-E06* 1.6TB-E07
JC	4TB
JK	500GB

\*For JB Copy Export E06 format or previously written JB-E06 appends



# Copy Export Merge





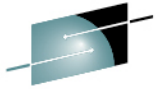
## Largest banks and thrifts in US by total assets

Pro forma for recent acquisitions

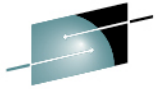
Q4'11 rank	Q3'11 rank	Change	Company (ticker)	City (state or territory)	Total assets (\$B)	Total deposits (\$B)
1	1	NC	JPMorgan Chase & Co. (JPM) <sup>1</sup>	New York (NY)	2,250.8	1,127.8
2	2	NC	Bank of America Corp. (BAC)	Charlotte (NC)	2,129.0	1,033.0
3	3	NC	Citigroup Inc. (C)	New York (NY)	1,873.9	865.9
4	4	NC	Wells Fargo & Co. (WFC)	San Francisco (CA)	1,313.9	920.1
5	5	NC	U.S. Bancorp (USB)	Minneapolis (MN)	340.1	230.9
6	7	↑	Capital One Financial Corp. (COF) <sup>2</sup>	McLean (VA)	328.6	211.2
7	6	↓	Bank of New York Mellon Corp. (BK)	New York (NY)	325.3	219.1
8	9	↑	PNC Financial Services Group Inc. (PNC) <sup>3</sup>	Pittsburgh (PA)	298.4	209.2
9	8	↓	HSBC North America Holdings Inc. <sup>4</sup>	New York (NY)	287.0	122.6
10	10	NC	State Street Corp. (STT)	Boston (MA)	216.8	157.3
11	11	NC	TD Bank US Holding Co. <sup>5</sup>	Portland (ME)	201.1	163.8
12	12	NC	SunTrust Banks Inc. (STI)	Atlanta (GA)	176.9	127.9
13	13	NC	BB&T Corp. (BBT)	Winston-Salem (NC)	174.6	124.9
14	14	NC	American Express Co. (AXP)	New York (NY)	152.3	43.0
15	15	NC	Citizens Financial Group Inc. <sup>6</sup>	Providence (RI)	129.8	93.0
16	16	NC	Regions Financial Corp. (RF)	Birmingham (AL)	127.1	95.6
17	17	NC	BMO Financial Corp. <sup>7</sup>	Chicago (IL)	117.4	75.2
18	18	NC	Fifth Third Bancorp (FITB)	Cincinnati (OH)	117.0	85.7
19	19	NC	Northern Trust Corp. (NTRS)	Chicago (IL)	100.2	82.7
20	22	↑	UnionBanCal Corp. <sup>8</sup>	San Francisco (CA)	95.5	69.0
21	21	NC	KeyCorp (KEY)	Cleveland (OH)	88.8	62.0
22	20	↓	Santander Holdings USA Inc. <sup>9</sup>	Boston (MA)	80.6	47.8
23	24	↑	BancWest Corp. <sup>10</sup>	San Francisco (CA)	78.1	55.0
24	23	↓	M&T Bank Corp. (MTB)	Buffalo (NY)	77.9	59.4
25	25	NC	Discover Financial Services (DFS)	Riverwoods (IL)	69.5	39.6
26	28	↑	Charles Schwab Bank <sup>11</sup>	Reno (NV)	66.1	60.9
27	26	↓	BBVA USA Bancshares Inc. <sup>12</sup>	Houston (TX)	63.1	46.1
28	27	↓	Comerica Inc. (CMA)	Dallas (TX)	61.0	47.8
29	29	NC	Huntington Bancshares Inc. (HBAN)	Columbus (OH)	54.5	43.3
30	30	NC	Zions BanCorp. (ZION)	Salt Lake City (UT)	53.1	42.9



**TS7700 is used by more than 75% of the US Top Banks**



# Questions?



# Thank You



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