

# IBM Mainframe and EMC



## Compatibility, Protection and Optimization: A Powerful Combination

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Director – Mainframe Business Segment



## Mainframe Considerations

### Compatibility

- Unmodified use of existing tools
- Leverage EMC storage

### Optimization

- Mainframe / EMC synergy
- Improve performance
- Improve utilization
- Simplify management
- Improve economics



### Protection

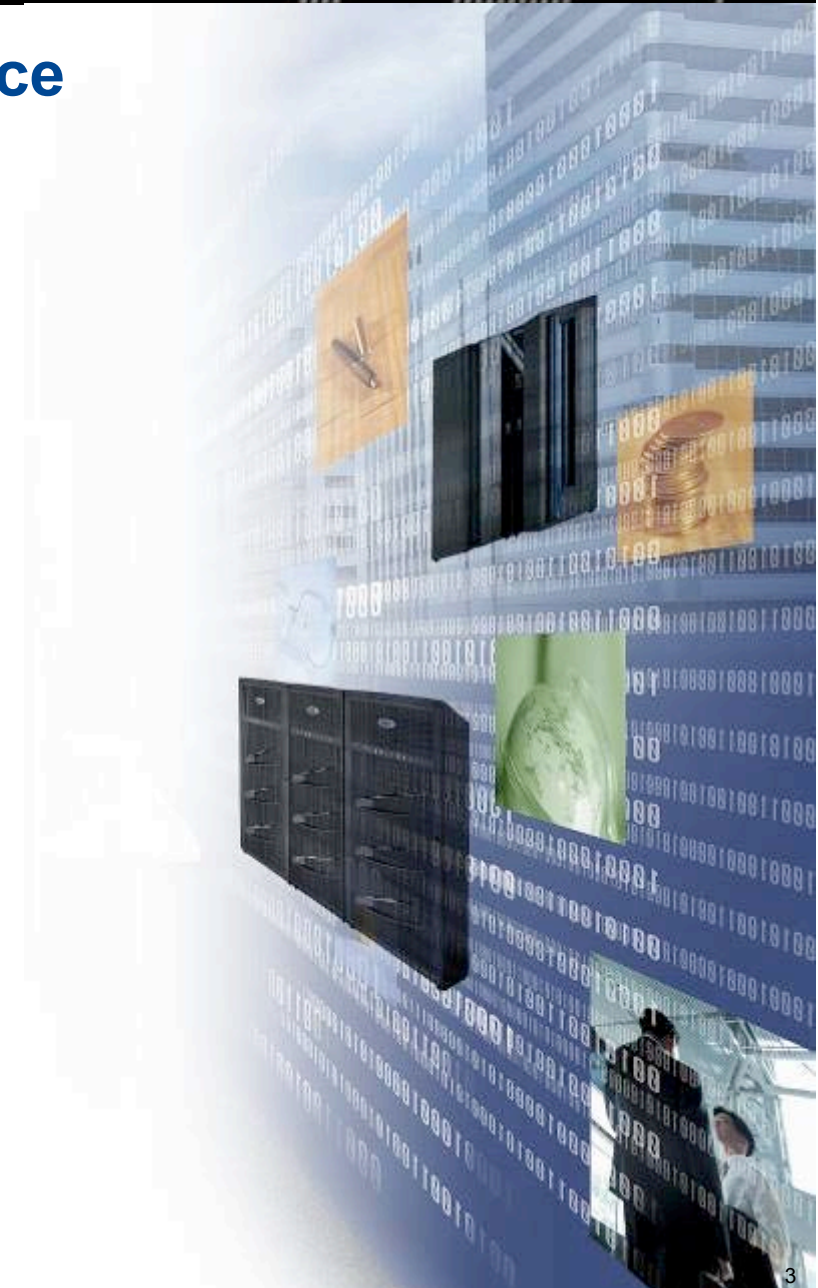
- Data integrity
- Rapid recovery
- Disaster recovery
- Application availability
- Business recovery

### EMC Can Help...

- Mainframe-replication products and utilities
- Mainframe-integrated management software
- Mainframe Services and Proven Solutions
- Long-term technology agreements

## Mainframe Compatibility and Choice

- In-depth compatibility
  - Host / storage
  - Management software
  - Local replication
  - Remote replication
- In-depth investment
  - Licensing of key IBM technologies
  - Advanced access to new IBM product releases
  - Joint testing and certification
  - Cooperative Support Agreement
- EMC offers choice
  - Compatible offerings
  - Innovative offerings from EMC
- EMC innovation
  - Information protection
  - Information optimization



## Base Compatibility

- Operating system support
  - z/OS 1.4 through 1.7
  - z/VM 4.4 or later
  - z/TPF 4.1 or later
  - z/VSE 3.1 or later
  - Linux for zSeries
  - EMC supports all current IBM-supported mainframe operating systems
- Storage network support
  - ESCON
  - FICON
- Features supported include (but are not limited to):
  - Channel Command Emulation for IBM ESS 2105
  - Concurrent Copy
  - Static and dynamic Parallel Access Volumes (PAVs), Multiple Allegiance
  - Dynamic Channel Path Management (DCM)
  - Dynamic Path Recognition (DPR)
  - Logical Path and Control Unit (CUADD) Address
  - Host data compression
  - Multi-system imaging
  - Mainframe systems Hypervolumes
  - Partitioned Data Set (PDS) Search Assist

## Base Compatibility Continued

### Symmetrix scalability (based on DMX-3)

- 1 PB raw capacity
  - Up to 2,400 disk drives
- 64,000 UCBs
- 64,000 DMX logical volumes / devices
- 255 hypervolumes per physical drive
  - Up to the 64,000 system limit
- 255 PAV aliases



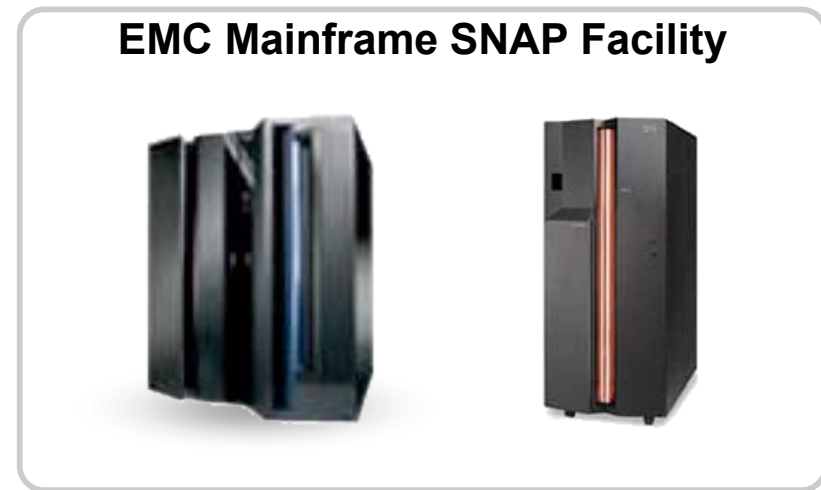
# Mainframe Information Protection



**Local Replication for Rapid Recovery**  
**Remote Replication for Disaster Recovery**  
**Mainframe Tape Solutions**

## Local Replication—Mainframe-Compatible

- Compatibility with IBM local replication
  - Compatible with StorageTek Snapshot Copy and IBM Snap products
  - Creates full or snapshot point-in-time copies
  - Supports copies at the dataset level or full volumes
  - Supports creation of copies across arrays



Mainframe-  
initiated

Datasets or  
volumes



Mainframe Snap Facility is packaged with the TimeFinder/Clone product

*TimeFinder/Clone*

## Understanding Data Consistency

- Simple definition: Ensuring applications are always restartable (*i.e.*, consistent) as of a defined point in time
- Common situations demanding consistency:
  - Databases
    - Database on one array, logs on another
  - Large applications—**EMC exclusive**
    - Spanning two or more arrays
  - Interdependent (federated) applications—**EMC exclusive**
    - Multiple business applications that implement a single business process
- EMC pioneered replication consistency in 1998



# Local Replication—TimeFinder Family

## EMC Exclusive

### TimeFinder/Clone

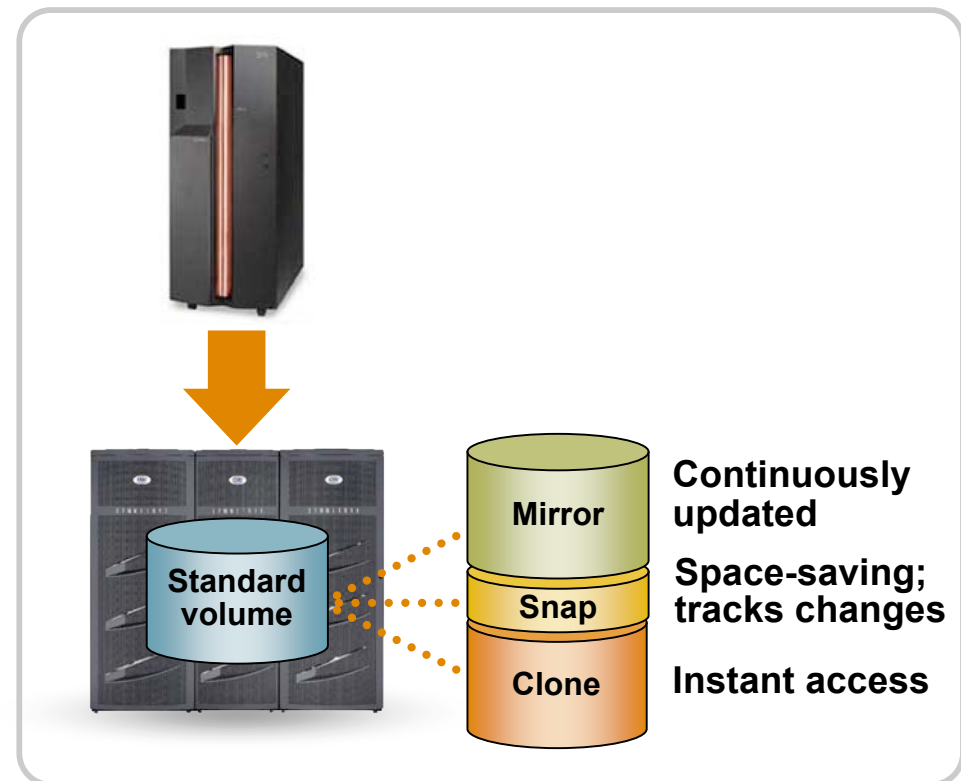
- Full volume and Dataset level
- High-performance logical copies
- Any-to-any protection type
  - Including RAID 5
- Clones immediately accessible

### TimeFinder/Snap

- Space-saving snapshot images
- Typically requires less than 30% additional capacity
- Support for RAID 5-protected snapshots
- Support for Consistent Snap operations

### TimeFinder/Mirror

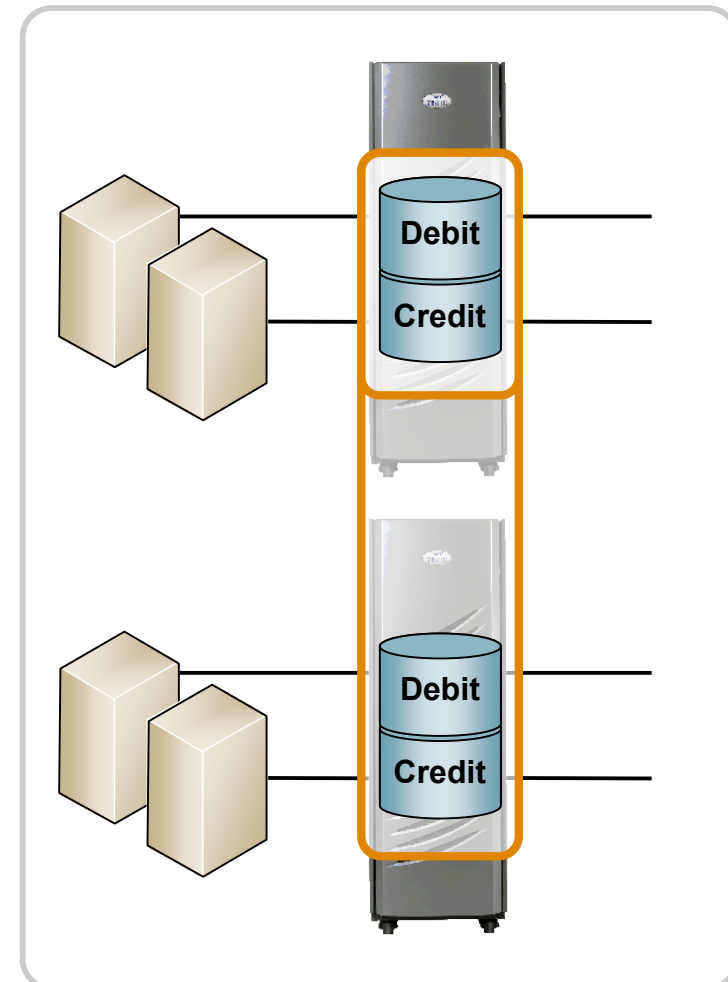
- High-availability, full-volume mirror
- Ultra-high-performance mirrors
- Support for RAID 1 and unprotected mirrors



## Data Consistency—TimeFinder Family Consistency Groups

### EMC Exclusive

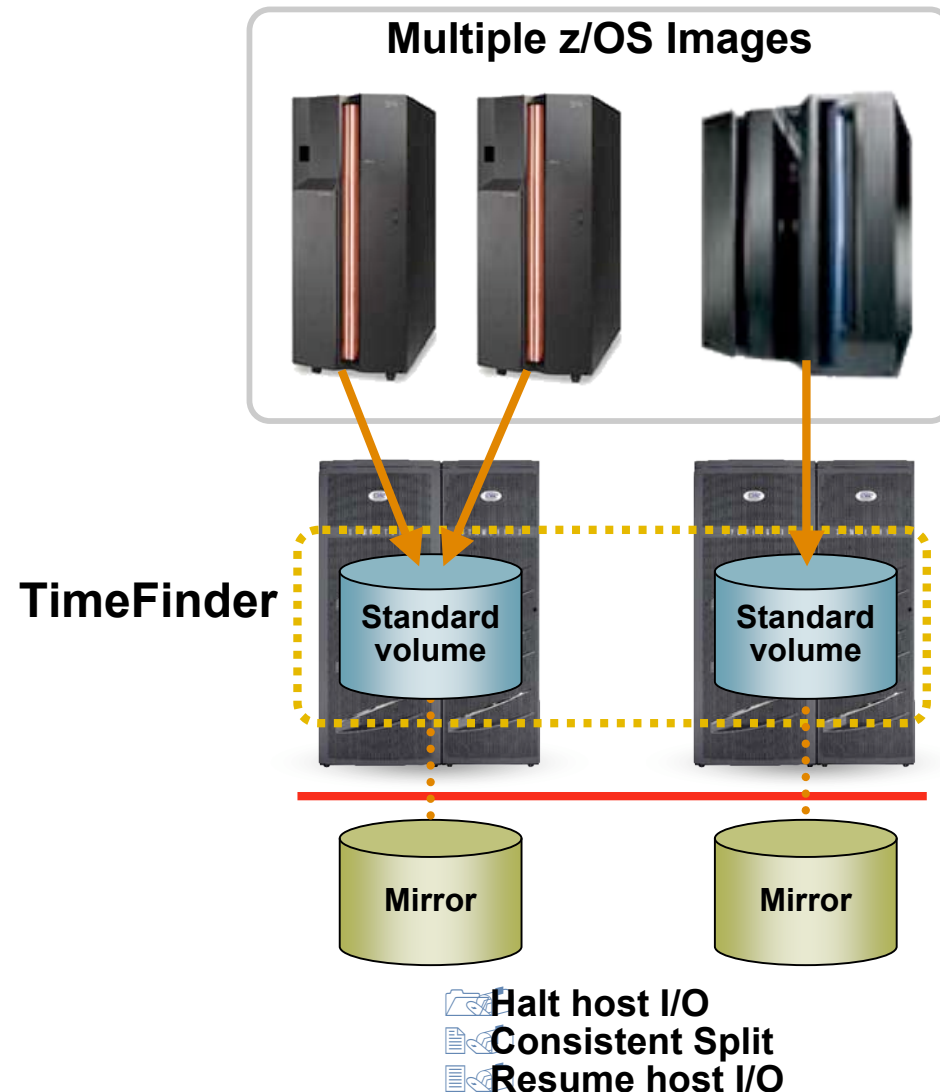
- Used to create a consistent point-in-time copy of related data
- Multiple volumes activated or “snapped” as one logical unit
  - Ensures consistency across multiple volumes or systems
- Consistency Groups can span:
  - An associated set of volumes
  - An entire database
  - An entire system
  - Across systems



## Multi-Image Consistent Split—TimeFinder Family

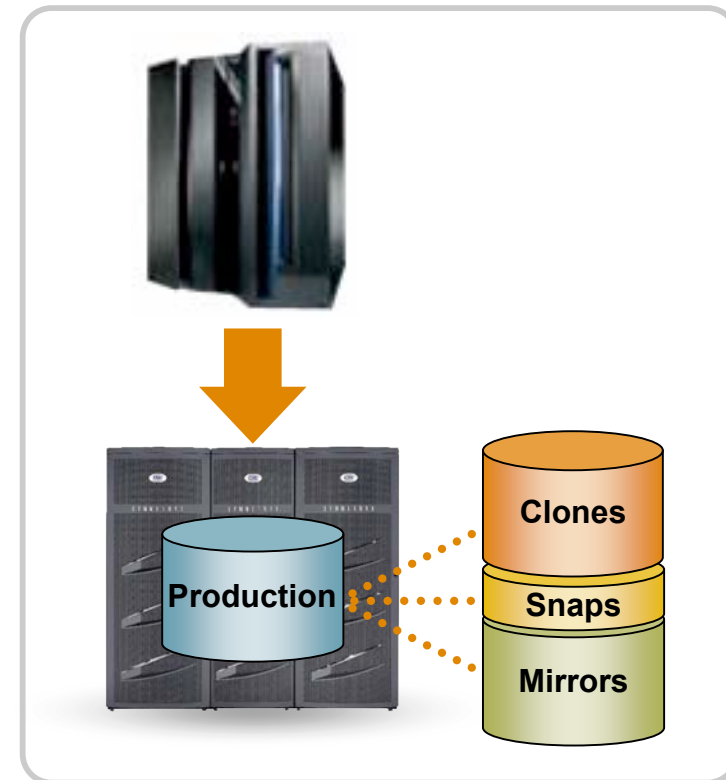
### EMC Exclusive

- Create restartable image of databases or systems
- Supports any number of Symmetrix systems
- Supports multiple z/OS images
- This feature used by single or multi-hop SRDF family



## Local Replication—TimeFinder Utility

- Batch utility to relabel volumes and rename / re-catalog datasets
  - Allows BCV to be used with the same LPAR
  - Operates on any vendor's DASD
  - Rename VSAM and non-VSAM files
    - Place in existing catalog
    - Place into a newly created catalog
  - High performance
    - Re-catalog 40,000 VSAM files in less than one hour



## Replication—Mainframe-Compatible

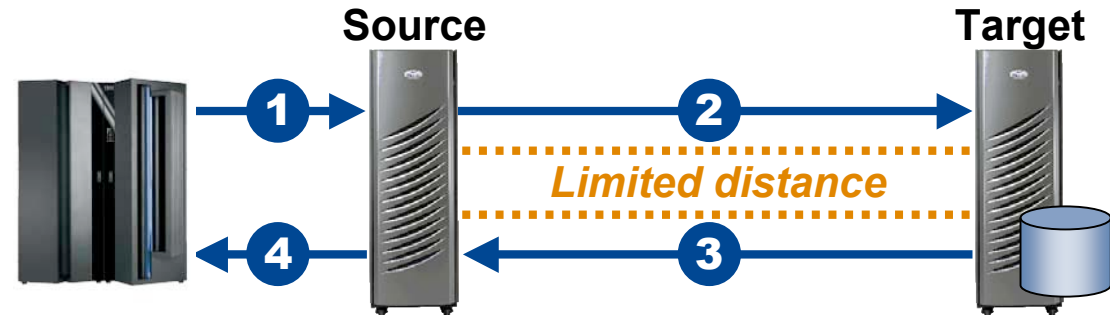
- Compatibility with IBM remote-replication software
  - Compatible with Metro Mirroring and Global Mirroring (XRC and PPRC)
  - Compatible with Geographically Dispersed Parallel SYSPLEX (GDPS) configurations
    - PPRC Level 3 + 4
    - Includes planned and unplanned HyperSwap
    - Includes Failover/Failback
  - Compatible with FlashCopy Commands
    - Host based FlashCopy emulation
  - Multi-year technology license agreement with IBM



## Remote Replication—SRDF Family

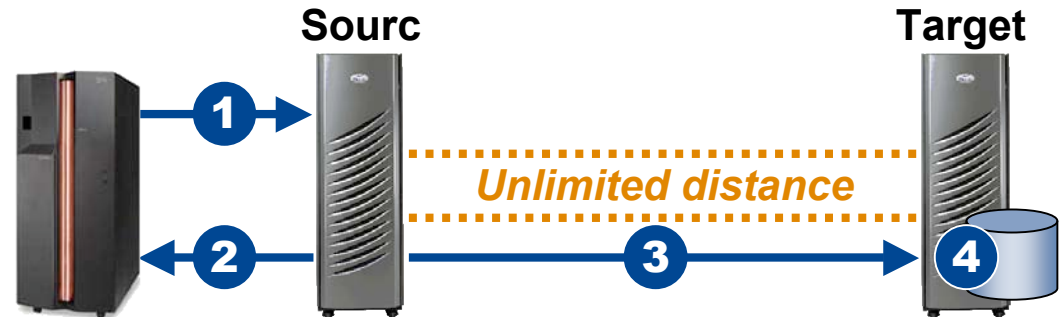
### SRDF/Synchronous

- No data exposure
- Some performance impact
- Limited distance



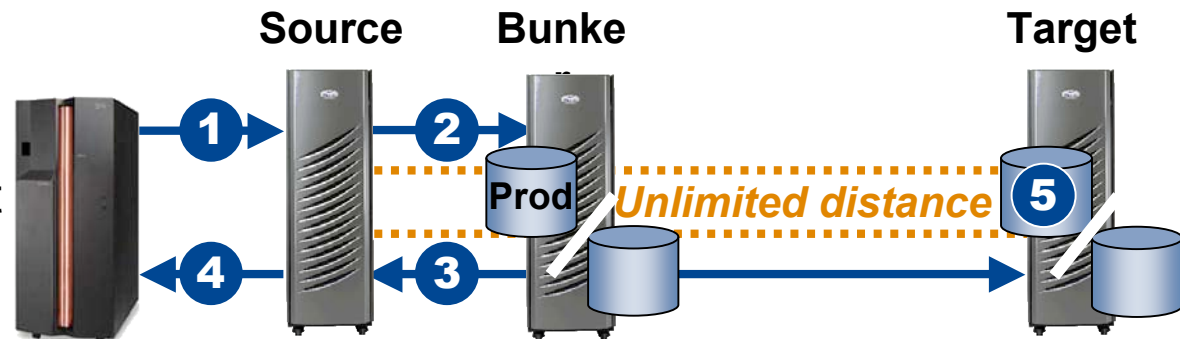
### SRDF/Asynchronous

- Predictable RPO
- No performance impact
- Unlimited distance



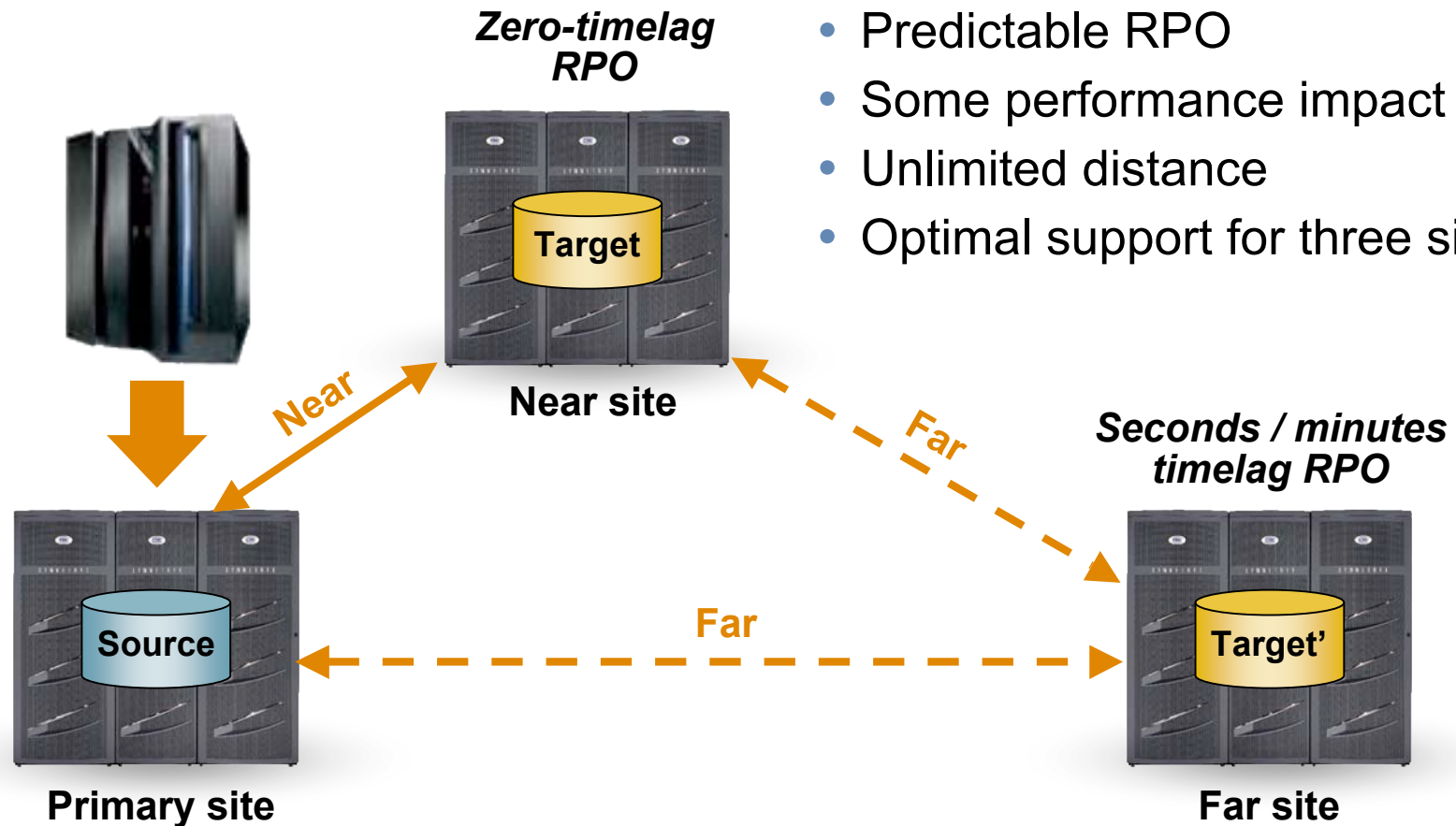
### SRDF/AR Multi-hop

- Predictable RPO
- Some performance impact
- Unlimited distance



# Remote Replication—SRDF/Star

## EMC Exclusive



- Predictable RPO
- Some performance impact
- Unlimited distance
- Optimal support for three sites

## Remote Replication—SRDF Family Continued

### SRDF/S

- Protects every write, no data loss
- Multi-array
- Continuous replication

### SRDF/A and SRDF/AR

- Extends disaster recovery to any distance
- No impact on production performance
- Multi-session and multi-array
- Can take snap of SRDF/A target volumes

### SRDF/Star

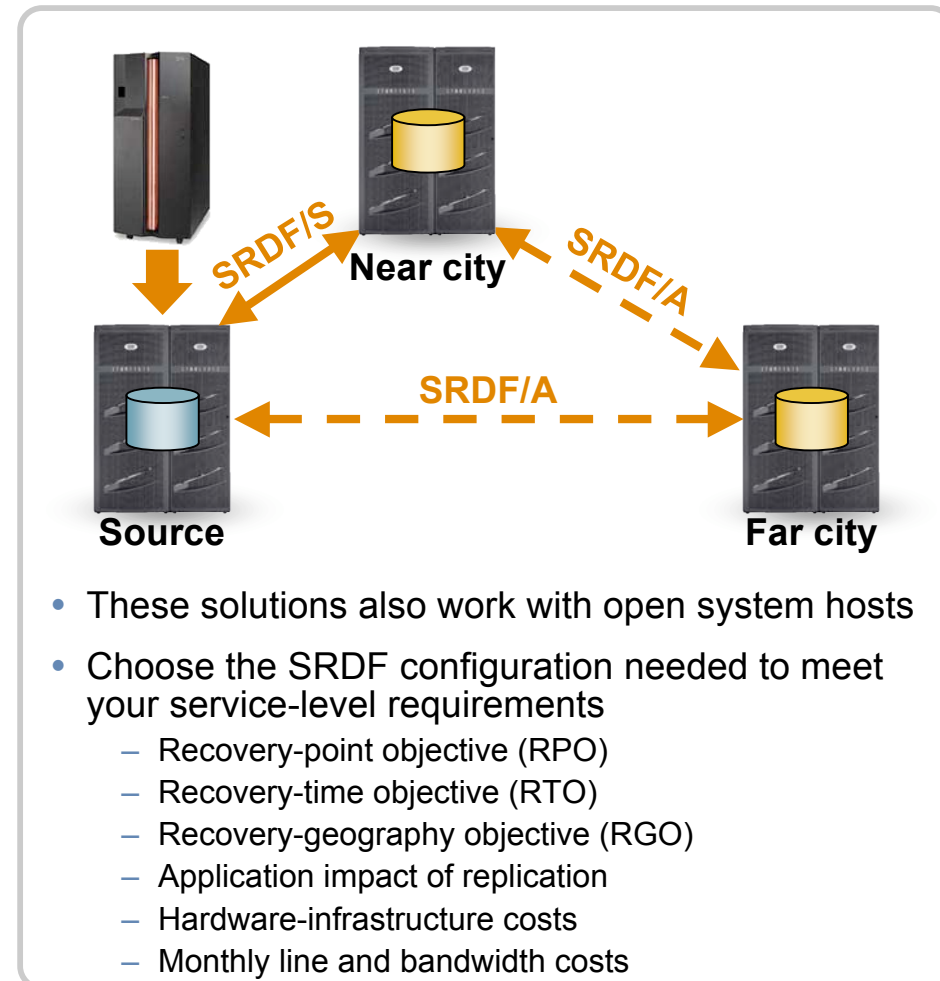
- Continuous replication between three sites
- Automatic resynchronization if any site fails

### Concurrent synch / asynch SRDF

- Single source with two targets
- SRDF/Star support

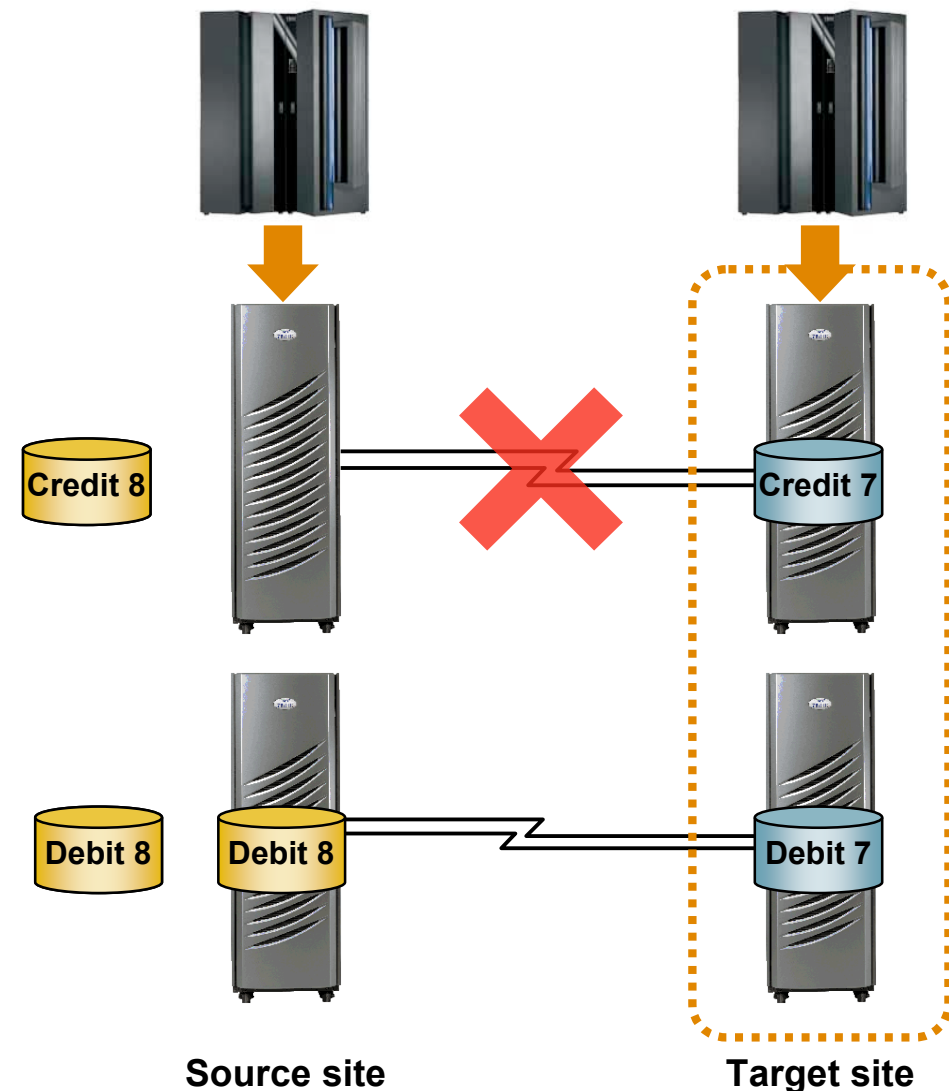
### SRDF mode switching

- Switch between Synchronous and Asynchronous modes of replication
- Workload / bandwidth optimization



## Remote-Replication Data Consistency—SRDF Family

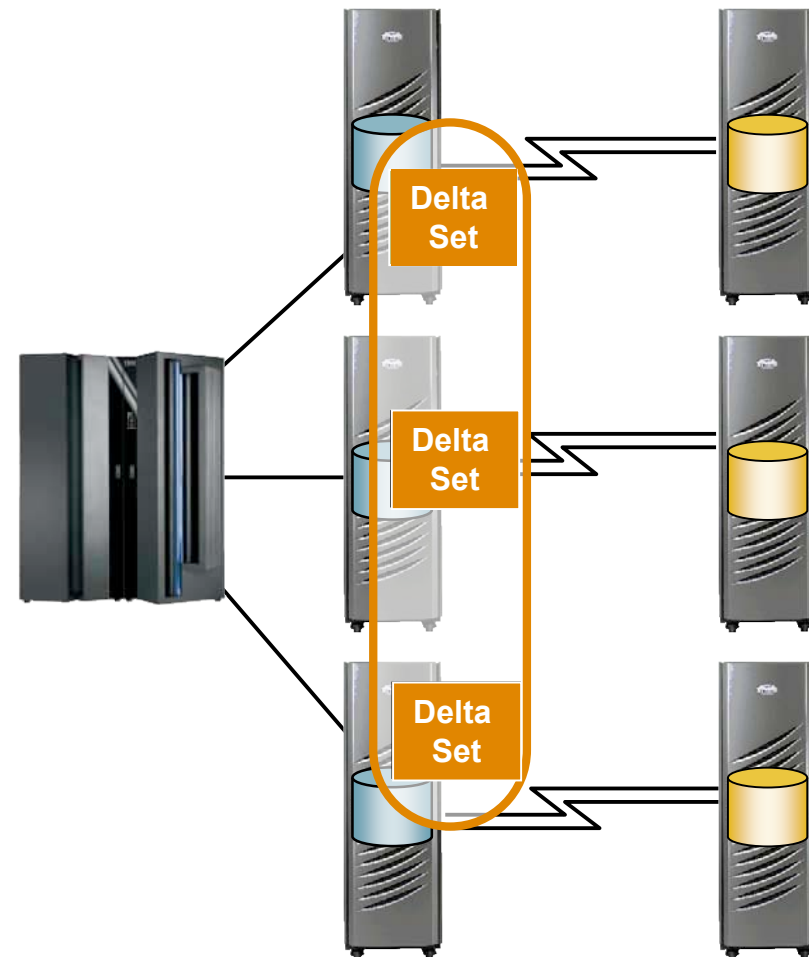
- Supported in all SRDF family configurations
  - Synchronous, Asynchronous, Multi-hop
- Data consistency with Consistency Groups
  - Supports any number of Symmetrix systems
  - Supports multiple asynchronous sessions
  - Supports multiple z/OS images
  - Supports mix of mainframe and open systems
- Accelerates reliable recovery from disasters
  - Data is restored from disk, not tape
  - Replay of logs is often not required
  - Copies are application-aware to ensure no loss of data
  - For application recovery (not just data)



## Remote Replication—SRDF/A Multi-Session Consistency

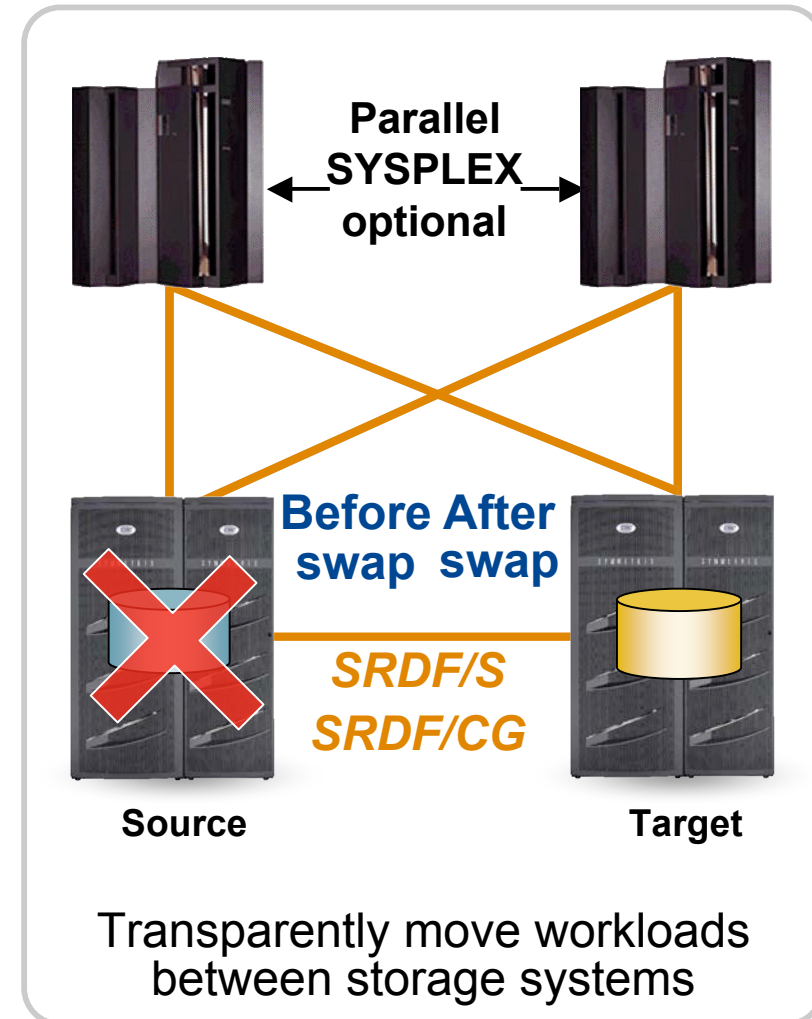
### EMC Exclusive

- SRDF/A groups that span Symmetrix systems
  - Used when related data resides on more than one system
- The SRDF/A MSC group is acted on as a single entity
  - Ensures a complete, restartable point-in-time remote copy



## Remote Replication—AutoSwap

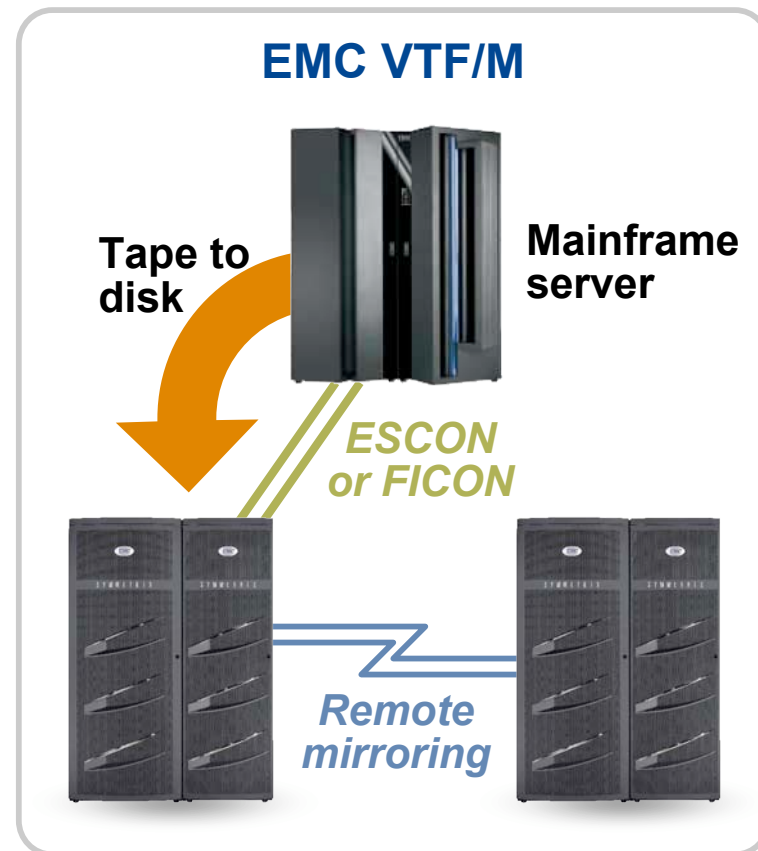
- Improve performance
  - Workload balancing without downtime
  - Move primary data center, or just an application
- Protect against planned or unplanned system outages
  - Workload swaps between ECM storage systems
  - Supports EMC storage outage
  - Parallel SYSPLEX supports mainframe outage
- Reliable automated rapid recovery
  - Test disaster scenarios
  - Transparent to mainframe
  - Support for system / page datasets
  - Maintains consistency
- Cost-effective subset of GDPS functionality
  - SYSPLEX timer not necessary



# Tape Emulation—VTF/M from Diligent Technology via EMC Select

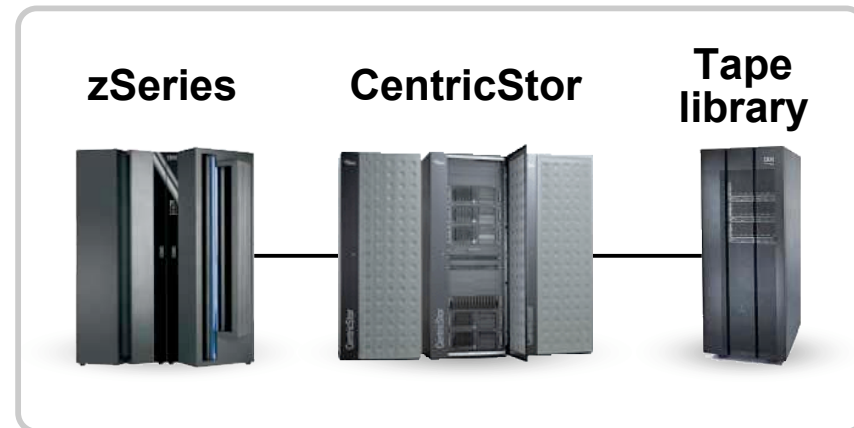
## Formerly Known as CopyCross

- VTF/M: Virtual Tape Facility/Mainframe
- Transparently redirects tape data to disk
  - Emulates 3480, 3490, 3590 tape
  - ESCON / FICON connected disk
  - Remote Mirroring capable
- Eliminates tape pain points
- Shrinks batch window and dataset size
  - Optional host compression
- You choose data for VTF/M
- Benefits:
  - Increased backup and recovery performance
  - Improved backup media and process reliability
  - Less tape
  - Rapid, reliable disk-based local / remote recovery



## Tape Emulation—CentricStor Virtual Tape Appliance From Fujitsu-Siemens

- Fujitsu-Siemens manufactures this virtual tape appliance, which emulates IBM and STK tape libraries
- Currently available through EMC Select in North America and EMEA
- Emulates 512 MF and Open tape drives and over 300k virtual volumes
- Designed for high-capacity environments spanning heterogeneous operating systems and heterogeneous tape libraries
- CentricStor is based on CLARiiON storage array technology

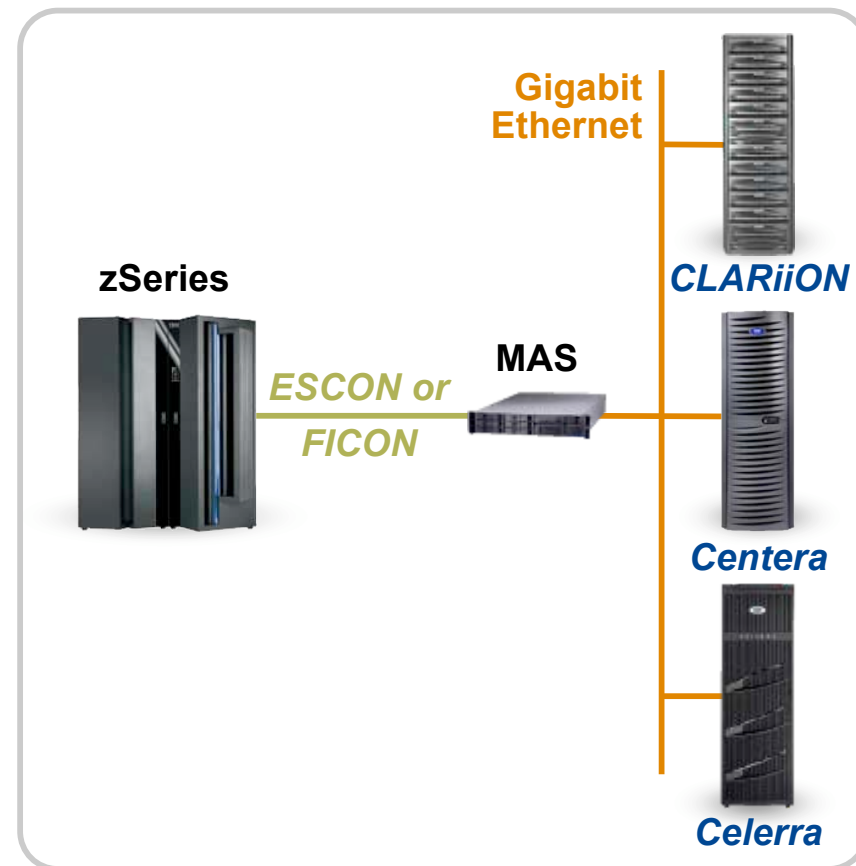


### Benefits

- Backup and recovery performance
  - Disk performance versus tape
  - Up to 2,500 MB/s
- Scalable
  - Supports up to 176 TB (528 TB compressed) disk buffer
  - Up to 512 virtual tape drives, over 300k virtual volumes
- Reliable
  - RAID protection, redundancy, assured recovery

## Tape Emulation—Bus-Tech MAS Emulation Gateway

- Bus-Tech manufactures mainframe appliance for storage (MAS) that emulates IBM tape drives
- Available through EMC Select
- MAS emulates up to 256 IBM 3480 and 3490 tape drives
- MAS connects to IBM mainframes using one to three ESCON channels and FICON channels
- Mainframe-based applications store tape data on SAN, NAS, and CAS systems
- A good fit for handling the long-term (Migration Level 2) mainframe tier



### Benefits

- Backup and recovery performance
  - Disk performance versus tape
  - Up to 2,500 MB/s
- Affordable
  - Low-cost ATA disk storage
  - Better storage utilization
  - Lower maintenance and electrical costs
- Reliable
  - RAID protection, redundancy, assured disaster recovery

# Mainframe Optimization and Management



**Storage Resource Management, Archiving, and Data Mobility**

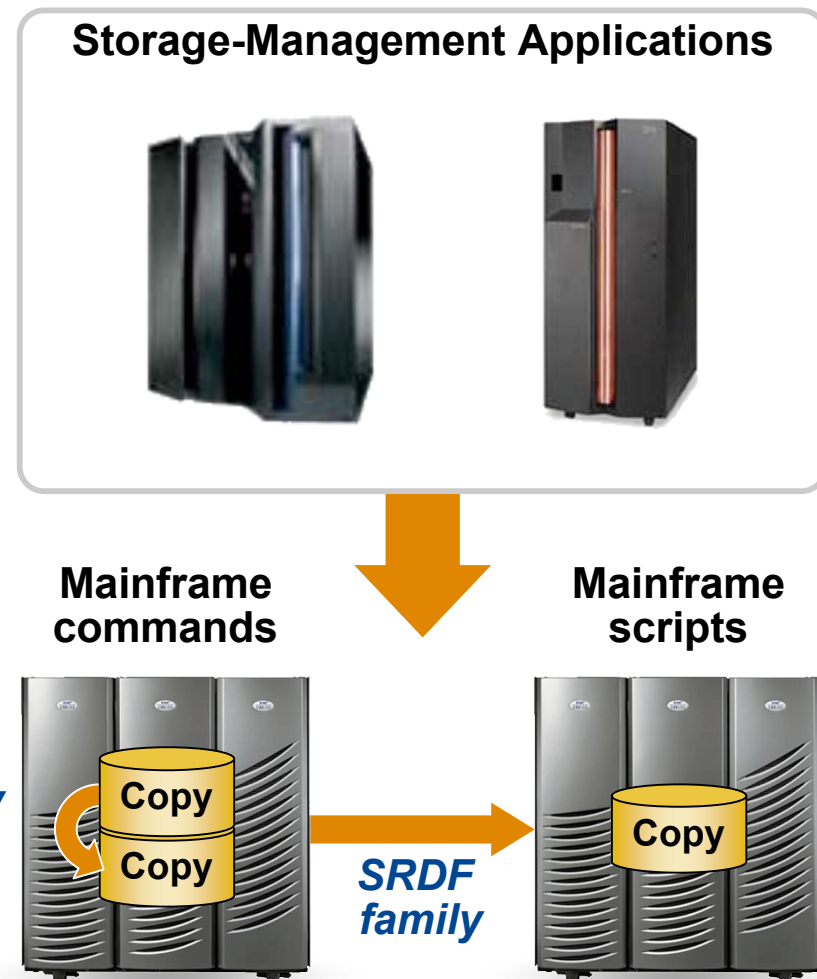
## Storage Resource Management—Mainframe-Compatible

- Compatibility with IBM mainframe management software
  - 100% compatibility with standard management commands
  - Supports all mainframe storage-management applications
  - Rexx, SPE, Job Control Language (JCL), and / or TSO script support
- Access to advanced EMC storage-management functions
  - EMC z/OS Storage Manager
  - Symmetrix Management Console
  - TimeFinder Host Component
  - SRDF Host Component

*TimeFinder family*

### Operating System Support (Host)

- All current IBM-supported mainframe operating systems



## Storage Resource Management—z/OS Storage Manager

- Manages both storage resources and storage-related mainframe resources
  - Discover and view Symmetrix
  - SMS / HSM management
  - Thresholding
  - Mainframe-centric approach
- Future versions
  - Integration with ControlCenter and SMC
  - Monitor Symmetrix's SRDF / TimeFinder families
  - Configure Symmetrix's SRDF / TimeFinder families
  - Configure and allocate Symmetrix storage
  - LDMF integration
  - Catalog Solution integration



### Benefits

- Simplifies resource management
  - Manage multiple LPARs and storage arrays from a single console
  - Early awareness of potential problems
  - Manage all mainframe and storage-related resources
- Reduces total cost of ownership
  - Maximize the storage that a Storage Administrator can manage
  - Minimize skill requirements
  - Provides a common tool interface
  - Provides more efficient resource usage



## Storage Resource Management—ResourcePak

- ResourcePak Base
  - Common API for EMC and ISV products
  - Improves communication between the mainframe and EMC storage
  - Monitors capacity and communication status
    - TimeFinder/Snap save area
    - AutoSwap, SRDF/A
  - Group Name Service (GNS)
    - Define a group once, in one place
    - Then use across multiple EMC products / platforms
- ResourcePak Extended
  - Utilities to improve the use of EMC and mainframe applications
    - DB2 utilities
    - Change Tracker
    - PermaCache
    - Data removal
    - Quality of Service for SRDF family
    - PAV management
    - Compare logical volumes
    - Write protection



## Storage Resource Management—Mainframe-Productivity Tools

### EMC Catalog Solution

- Ensures the health of z/OS catalogs

### EMC Performance Essential

- Eliminates manual application tuning
- Reduces batch-processing times

### EMC VSAM Assist

- Reduces file-backup and -restore time

### EMC TeraSAM

- Segment VSAM datasets for parallel backup and application processing
- Reduces batch and backup processing times

### EMC VSAM Quick Index

- Builds alternate indexes quickly and easily
- 50–80% faster than IBM's BLDINDEX

#### Mainframe-productivity tools

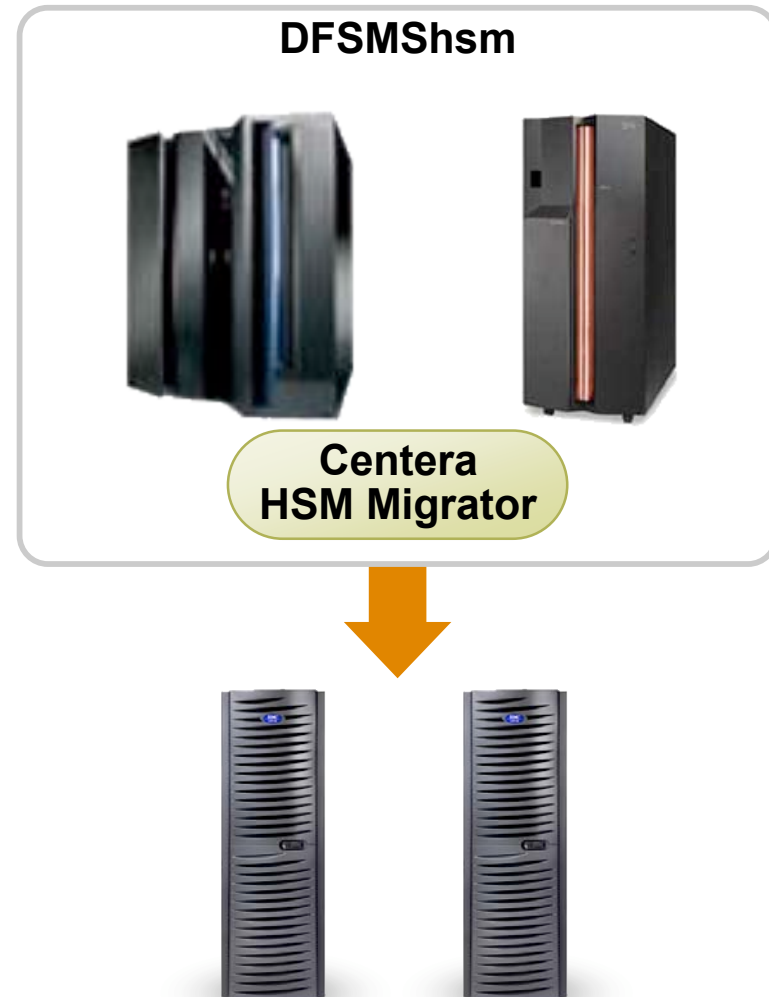


## Archiving—DFSMSHsm-Compatible Centera HSM Migrator

- Centera HSM Migrator is a DFSMSHsm “plug-in”
  - Intercepts datasets traditionally targeted for tape and stores them on Centera
  - Recall is transparent to the end user and application
  - Eliminates the need for RECYCLE

### Benefits

- Assured content authenticity
- Rapid retrieval of fixed content
- Lower costs
- More mainframe MIPS efficiency



## Archiving—Centera Content Addressed Storage (CAS) EMC Exclusive

- Long-term online archiving of fixed content
- Rapid retrieval
- Increased availability
  - Multiple entry points (access nodes)
  - Dual power grid
  - Minimum two copies of every object
  - Content assurance
- Improved recoverability
  - Low-cost, IP-based replication
  - Built-in disaster-recovery solution
- Meets regulatory and governance requirements
- Active archiving improves backup performance



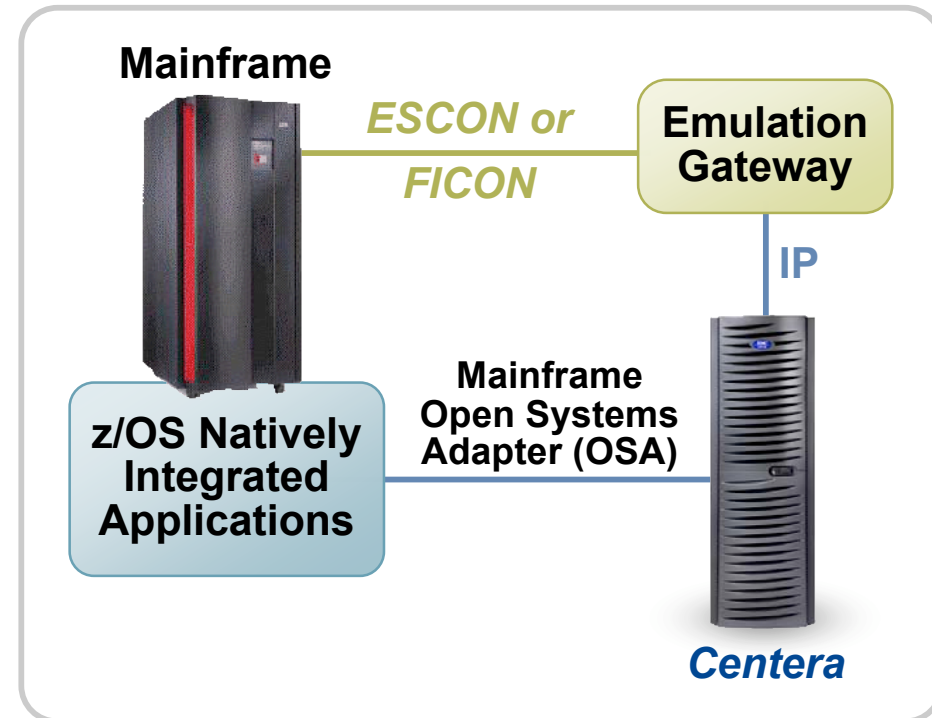
**Centera**

### Benefits

- Online-like disk
- WORM-like optical
- Optimized cost per MB, like tape
- Replaces optical (3995)

## Centera Mainframe Connectivity—Two Options

- Emulation Gateway (such as the Bus-Tech MAS appliance)
  - No change to existing mainframe applications
  - Channel attached via ESCON, FICON
- z/OS Mainframe API
  - No external hardware, applications upgrade
  - Network attached via IP



## Archiving—Centera Mainframe SDK

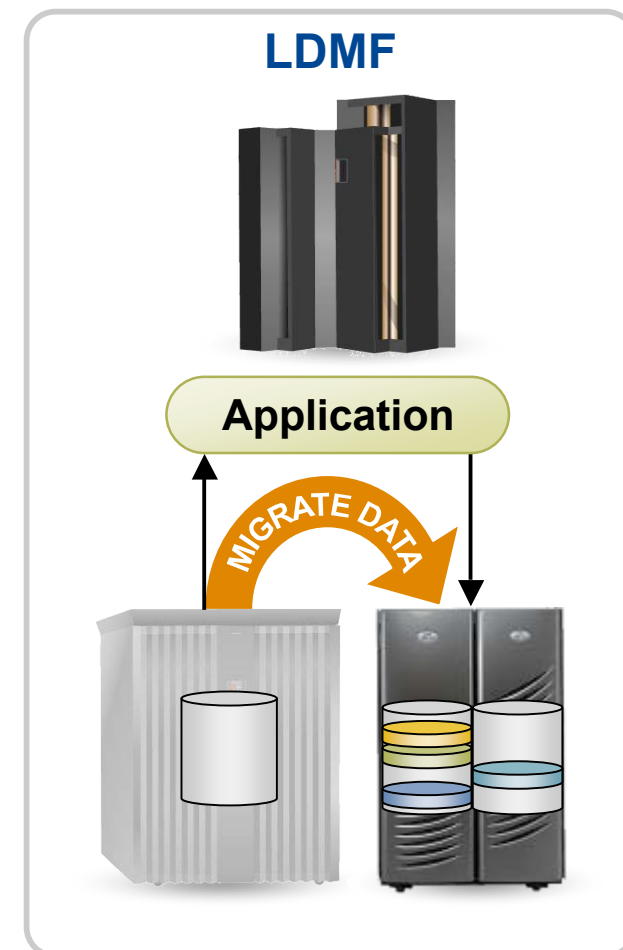
- The Centera API allows mainframe applications to access Centera directly.
  - Takes full advantage of Centera features
  - Reduces / eliminates tape or optical management
  - API available at no charge
- Centera-integrated applications:
  - Database Archiving
    - Princeton Softech (Active Archive v5.1)
  - ECM / Output Management
    - BMC (Control-D v6.0.03)
    - BETA Systems (VIDiDOC, BETA 93)
    - Mobius (ViewDirectTCM V6.3)
    - RSD (EOS)
    - SI Software (LDMS)
    - Systemware (Xact, Xptr v4.1)



## Data Mobility—Logical Data Migration Facility

### Online Dataset Migration, Storage Utilization, and Performance Optimization for z/OS—EMC Exclusive

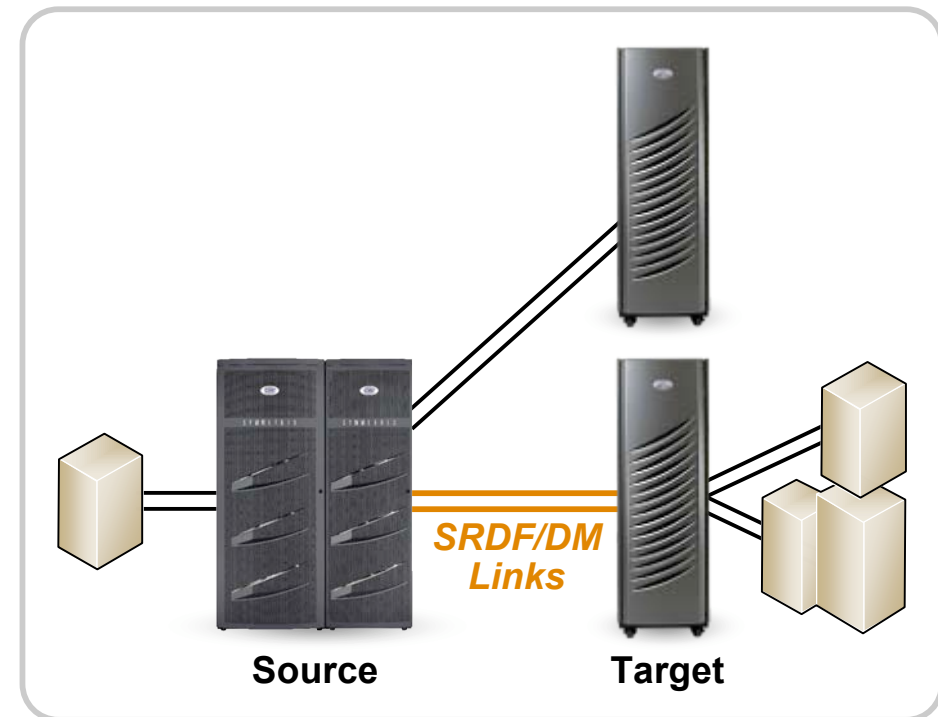
- Granular migrations
  - Only product in industry that performs migrations at the dataset level
- Nondisruptive migrations
  - Updates catalog while applications continue to run
- Improves storage utilization
  - Frees up Unit Control Blocks
  - Fewer logical volumes required
- Optimizes performance
  - Load-balances at dataset level
  - Tiered storage within the array



## Data Mobility—SRDF/DM

### EMC Exclusive

- Efficient Symmetrix-to-Symmetrix data mobility
- Copy and move data from where it was created to where it can be used most effectively
- Data mobility enables:
  - Sharing of data
  - Delivery of service levels
  - Application development
  - Test and development
  - Building data warehouses
  - Data and process consolidation
- Local and / or remote data movement
- Bi-directional data movement

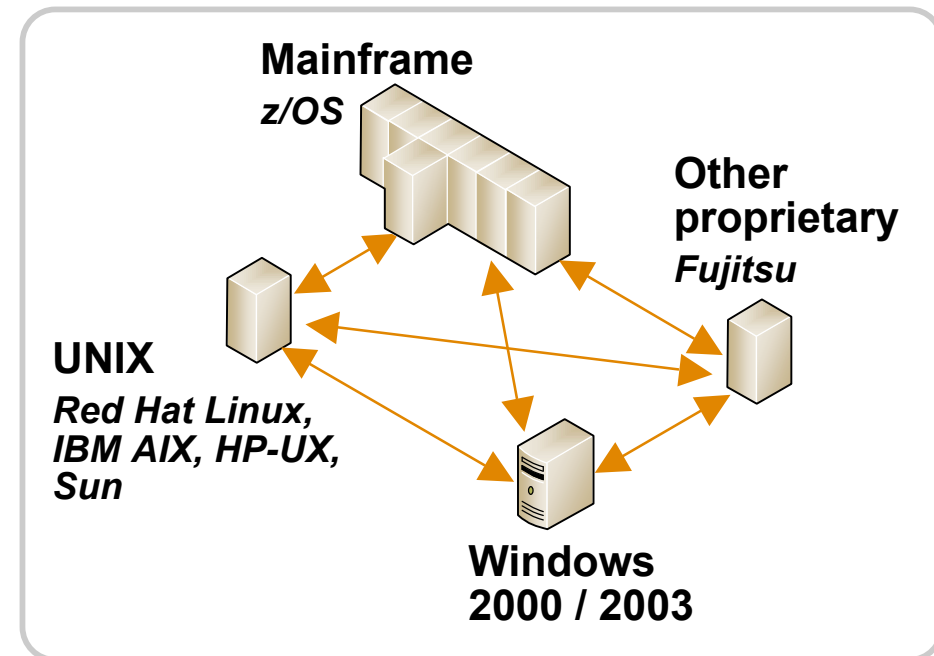


### Benefits

- Easily replicate / migrate data to multiple locations
- Speed data distribution and centralized collection
- Accelerate development time for new applications
- Meet mixed service-level requirements
- Offload server and network resources
- Economic, efficient, high-speed data mobility

## Data Mobility—InfoMover Family

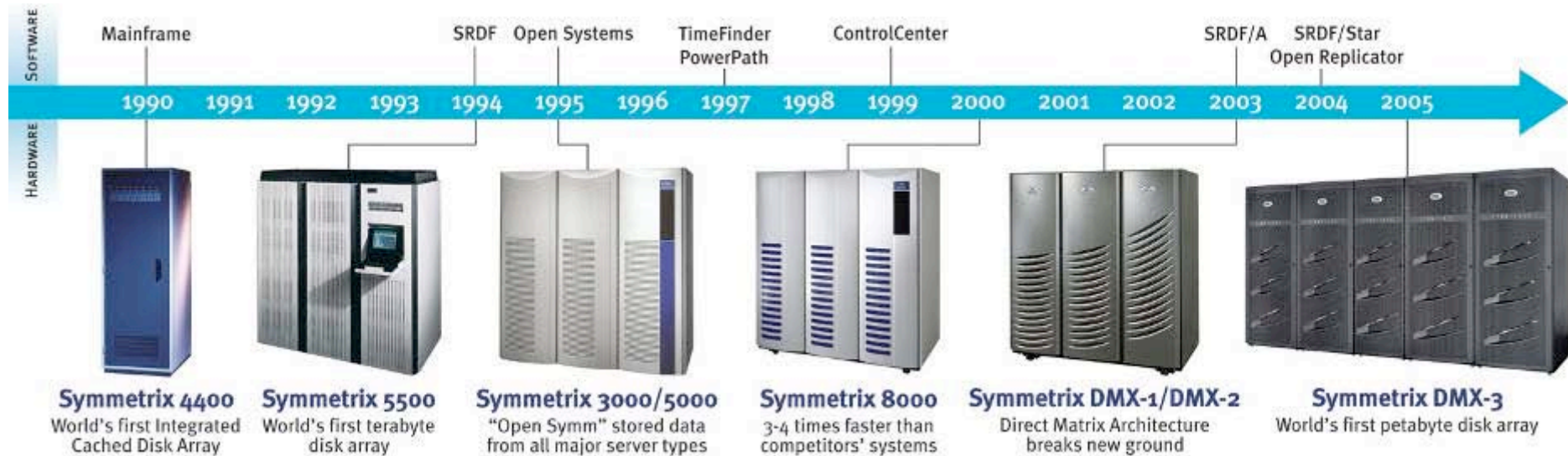
- InfoMover File System (IFS)
  - Efficient mainframe-data access
  - Access z/OS data from UNIX, Linux, and Windows
  - Share data across platforms
  - “Plug and play” with existing applications
    - Catalog and dataset browsing / editing
    - *Ad hoc* data filtering, cleansing, report generation
  
- InfoMover File Transfer (IFT)
  - Fast, reliable data movement
  - Supports multiple operating systems and data formats
    - ASCII / EBCDIC data translation
  - Bi-directional transfers
  - CLI or GUI interface



### Benefits

- Better information sharing
- Accelerated information delivery
- Better decision making with timely data

## EMC Mainframe Experience and Expertise



### Years of Experience

- Since 1990 and the 24 GB Symmetrix 4400
- 2,400 installed customer deployments today
- 1,000 mainframe-knowledgeable professionals
  - Technology Solutions (residencies and partners)
  - Customer Service
  - Engineering
  - Marketing

## EMC Mainframe Partner Network

- **IBM**
  - Regularly scheduled executive level meetings
  - Direct developer to developer relationships
  - IBM licenses mainframe technology to EMC
  - Early beta release program for early interoperability testing
  - Cooperative Support Agreement (Customer Service)
- **Cisco: FICON Directors**
- **Eastern Computing: Reseller and Service Provider**
- **Platform Solutions Inc. (PSI): Mainframe systems**
- **Softek: Reseller and Mainframe Software Developer (co-develop with EMC)**
- **Stack Computing: Reseller**
- **EMC Select Partners: Provide broad range of virtual tape, tape, and switch products**
  - **Bus-Tech**
  - **Diligent Technology**
  - **Fujitsu-Siemens**



## EMC Mainframe Services

- Technology Solutions
  - 3,800 employees and growing
  - Residencies
  - Partners
  
- Mainframe Proven Solutions and Services
  - Data Migration Assessment and Planning Service
  - Information Consolidation Program
  - Host-based Migration for Mainframe
  - Storage Replication Implementation for Mainframe
  - FICON Planning, Design, and Implementation
  - Backup, Recovery, and Archive
  - Virtual Tape Solutions for Mainframe—Assessment
  - Virtual Tape Solutions for Mainframe—Migration
  - Compatible Copy Services Design and Implementation
  - z/OS Storage Manager Installation Service



### Mainframe Services:

- Migration
- Consolidation
- High Availability
- Business Continuity

# Mainframe Compatibility and Support



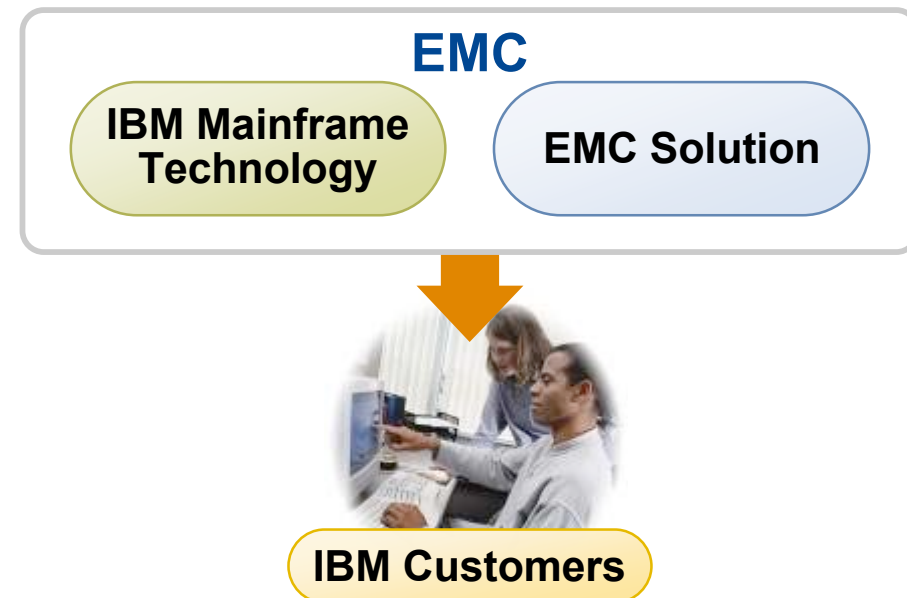
**Licensing of IBM Technologies**  
**E-Lab Testing and Qualification**  
**Cooperative Support Agreement**

# Mainframe Technology Licensing

## Assured Mainframe Compatibility

### Mainframe Technology Licenses

- IBM Replication
  - XRC, PPRC, GDPS, FlashCopy
- IBM Volume Management
  - Parallel Access Volumes (PAV), Dynamic Parallel Access Volume (DPAV)
  - Multiple Allegiance (MA)
- Other technologies
  - Priority I/O Queuing
  - New 2105 CCWs
  - Concurrent Copy
  - Control Unit Initiated Reconfiguration (CUIR)
  - Sequential Data Striping
  - Partitioned Dataset Search Assist



### Benefits

- Protects your investments in mainframe software and deployments
- Ensures robust business continuity deployments
- Long-term technology agreement assures compatibility into the future
- Compatibility is assured with direct access to mainframe technology

## Testing and Qualification

### zSeries Software Development, E-Lab Test and Quality Assurance, and Customer Service

- 44 zSeries CPUs
- 40,658 MIPS
- 409 logical partitions
- Eight Parallel SYSPLEXes
- 6,049 channels
  - FICON, ESCON, parallel
- 80,000 MF DASD devices defined
- z/OS, z/VM, Linux, z/TPF
  - 16 different releases

Storage systems, servers, switches, hubs, host adapters, bridges, tape systems...



*Proving that it works*

## EMC / IBM Cooperative Support Agreement Ensuring Robust Mainframe Deployments

### EMC / IBM 2005 CSA

- Covers all strategic product families from both companies
- Automatically adds new products within these families
- Allows addition of other product families
- Complements and extends earlier point-product CSAs
- Provides clear escalation procedures and outlines details of EMC / IBM cooperation



EMC<sup>2</sup>  
where information lives<sup>®</sup>

IBM

# Customer Case Studies



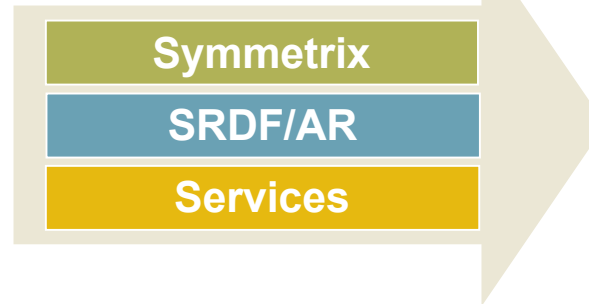
## Customer Case Study—USAA

USAA offers its 5 million members—primarily members of the U.S. military and their families—a comprehensive range of insurance, banking, and investment products and services designed to help them meet their financial needs

### Business Objectives:

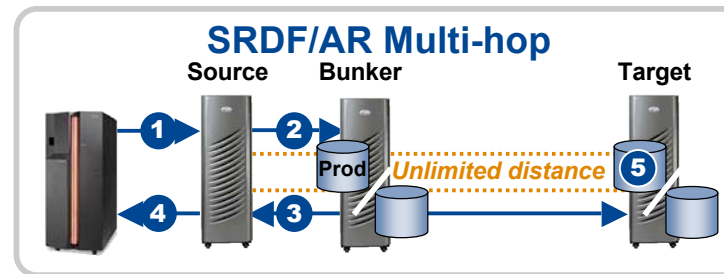
- 100% availability to customers
- Increase performance
- Comprehensive disaster recovery
  - Improve recovery point objective (RPO)
  - Lower recovery time objective (RTO)

### EMC Products



### Solution:

- Remote replication for mainframe and open systems
- Consistency Group technology
- Migration Services



### Benefits:

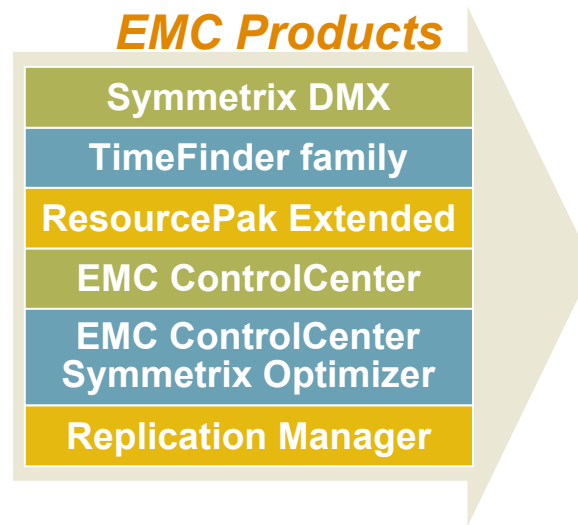
- Performance and availability improved by elimination of planned and unplanned outages
- Potential outage costs reduced by a factor of 10
- RTO reduced from greater than 36 hours to one hour
- RPO reduced from 24 hours to four hours
- Total solution implemented in 30 days, significantly ahead of expectations

## Customer Case Study—Laboratory Corporation of America

Laboratory Corporation of America is one of the top providers of Clinical Laboratory Services in the world, with about 47 major laboratories and 1,200 services sites nationwide

### Business Objectives:

- Improve performance to support growth
  - Reduce batch-processing time
  - Improve I/O-response time
- Improve availability
  - Support longer hours of online operation
  - Improve disaster-recovery capability



### Solution:

- Improve I/O-response and batch-processing performance with Symmetrix DMX
- Improved disaster-recovery capability with implementation of asynchronous replication (SRDF/A) through Symmetrix DMX Gigabit Ethernet with data compression

### Benefits

- I/O response time improved by 50%
- Batch time reduced by two hours, or approximately 30%
- Disaster-recovery RPO reduced from two hours to seconds
- Bandwidth capacity between production and second site effectively doubled

## EMC for Mainframe: Your Strategic Decision

- ✓ Exceeds the most demanding requirements
- ✓ Compatible with your mainframe investments
- ✓ Industry-leading data protection
- ✓ Optimized management and performance
- ✓ EMC proven expertise and Services

*Compatible with the present...*

*...innovative for the future*

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