15-Minute Guide to Mainframe Environments

Compatibility and Innovation
Information Protection
Data Mobility and Migration
Storage Management
Mainframe Productivity
Application and Database Integration
Archiving Content and Records Management
Mainframe Best Practices
Today’s Choices for Mainframe Environments

Innovation, Performance, Compatibility, and Availability

EMC’s strategy for mainframe customers is to deliver solutions with the powerful combination of IBM compatibility, together with industry-leading innovation, performance, and availability.

Commitment Mainframe Environments:

Compatibility, Innovation, and Performance
Leverage EMC’s powerful combination of IBM compatibility and industry-leading innovation, performance and availability to meet the most demanding workloads in mainframe environments.

IBM and EMC have a long-standing technology partnership and Cooperative Support Agreement. This is EMC’s commitment to the mainframe market and proves to be beneficial when supporting customers on new storage innovations and compatibility in mainframe environments. EMC is part of the IBM zSeries Early Ship Program (ESP), giving EMC first-hand knowledge of new IBM mainframe offerings. EMC® Symmetrix® V-Max™ and DMX systems are IBM z10 qualified and supported. Additionally, IBM is part of the Early Ship Program (ESP) for EMC Symmetrix offerings.

Improve Availability:

Information Protection
Business continuity is more than just disaster recovery. It provides a competitive advantage by ensuring that business can continue as usual during planned and unplanned outages. Continuity solutions take into account the requirements for high availability service-level agreements, recovery-time objectives (RTOs), and recovery-point objectives (RPOs). In today’s complex IT environment, all these objectives are met with data consistency spanning many applications with complex interdependencies, best-of-breed local and remote replication, and automated disaster restart, i.e., Geographically Dispersed Disaster Restart (GDDR).

Data Mobility and Migration
Ensuring that information is available in the right place at the right time without compromising availability is a challenging task. EMC data mobility and migration solutions allow for movement and migration of information while maintaining continuous access and business continuity. These tools and services facilitate improved asset utilization and deployment without negatively impacting the business.

Storage Management
EMC provides the mainframe customer with choices to manage their storage. Host-based storage management and array-based storage management. EMC z/OS Storage Manager (EzSM) provides a host view of storage using the familiar ISPF screens. With EzSM, the storage administrator can view all storage arrays that are connected to the host, regardless of their physical location. EzSM manages TimeFinder® and SRDF® replication as well as viewing Symmetrix configuration. Symmetrix Management Console (SMC) is an array-based solution that helps manage TimeFinder and SRDF replication, manage and monitor QoS functionality, and provision storage using a web-based GUI.
Application and Database Integration

EMC further simplifies complexity by tightly integrating array-based software and utilities with the functions and capabilities of applications and databases to efficiently manage and optimize resources. Additionally, partnerships with companies like independent software vendors (ISVs) ROCKET and Innovation Data Processing (IDP) further the integration of Symmetrix utilities in mainframe environments.

Archiving/Content Management:

Archiving

Disk Library for Mainframe (DLM)

The EMC Disk Library for mainframe (DLM) is the industry’s first “tapeless” virtual tape system for use in IBM mainframe environments. The EMC DLM enables high-performance disk-based backup and recovery, batch processing, and storage while eliminating the challenges associated with traditional tape-based operations to lower your data center operating costs.

EMC Centera Content-Addressed Storage

EMC has enabled cost-effective online archiving for mainframe customers by providing a mainframe API integration for the EMC Centera® content-addressable storage platform. The EMC Centera HSM Migrator solution works with IBM DFSMS, allowing EMC Centera to participate in a system managed storage environment, typically designated as an ML2 tape replacement.

Achievable Results:

EMC Mainframe Service Offerings

Comprehensive services focus on mainframe environments and range from design and assessment services, to implementation services, to onsite residencies. These services cover such areas as specific migrations from traditional storage platforms to high-performing tiered storage platforms (Symmetrix DMX and Symmetrix V-Max), developing Disaster Restart workstreams, to focusing on the transformation to an information infrastructure to meet the service-level requirements of the business.
Compatibility

To ensure compatibility with all mainframe environments, EMC signed a technology licensing agreement with IBM. The technology agreement also improves EMC’s ability to provide multi-vendor storage management software.

As IBM adds new functionality to mainframe environments, EMC will be in sync to provide best-of-breed capabilities and compatibility. Additionally, EMC is the first and only vendor with a Geographically Dispersed Parallel Sysplex (GDPS) lab that is used to test and develop functionality in GDPS environments.

EMC licenses these and other key technologies from IBM, ensuring best-of-breed storage infrastructure compatibility with core mainframe technologies:

- HyperPAV
- DynamicPAV
- Extended Address Volume (EAV)
- Extended Distance FICON
- IBM Metro Mirror (PPRC)
- IBM z/OS Global Mirror (XRC)
- HyperSwap
- FlashCopy
- Geographically Dispersed Parallel Sysplex (GDPS)

In addition to supporting IBM-compatible local and remote replication solutions, EMC offers industry-leading local and remote replication solutions such as TimeFinder and SRDF, respectively. Both these solutions are tightly integrated into mainframe environments with EMC Mainframe Enablers (Reference Figure 1) which have utilities that seamlessly integrate into the mainframe.
Innovation

To provide customers with value-add capabilities, EMC’s mainframe strategy also focuses on innovation.

The world’s most trusted storage platform, EMC Symmetrix supports some of the largest and most critical mainframe environments in the world and is the industry’s only storage array to support Enterprise Flash drives for “Tier 0” ultra-performance requirements. EMC innovation has created many of the industry-wide storage categories available today, such as high-end enterprise storage, “in-the-box” tiered storage, advanced local and remote replication, advanced multi-site replication (SRDF/Star), and support for up to several PBs of capacity with a single storage array.

Innovative software solutions—like EMC Geographically Dispersed Disaster Restart (GDDR)—ensure that information is constantly protected and exposure is limited in the event of planned or unplanned outages. The latest addition to the EMC mainframe software solutions, EMC GDDR automates the entire disaster restart process, including the host system, applications, and storage.

The EMC Disk Library for mainframe (DLm) combines low-cost ATA drives, RAID 6 protection, and hot standby disks with tape emulation and hardware compression—and doesn’t require tape. DLm connects directly to the IBM mainframe using FICON or ESCON channels and appears to the mainframe operating system as standard IBM tape drives.

EMC Centera is a secure repository for information archiving to store your unchanging and infrequently changing digital information. With EMC Centera, the search and retrieval of content with metadata and other online data is faster, less costly, and is compliant with government regulations. These innovations allow you to meet the most demanding application workloads, provide the highest service levels, and meet the most stringent cost of ownership requirements.

Information Protection

Today, IT organizations are being tasked to create an environment that protects the entire business.

EMC’s tiered protection and recovery offerings improve the availability of the information for a business (Reference Figure 2).

EMC’s tiered protection and recovery offerings listed here can be used for multiple applications that improve availability through:

- Shortening backup and restore times
- Performing non-disruptive hardware and software maintenance and upgrades
- Local and remote information protection
- Surviving a disaster and restarting the enterprise
- Testing new applications against real data and in real-world environments
- Moving and migrating data
- Facilitating database consistency checks
  - Cloning of databases
  - Application testing
- Enabling parallel processing
  - Data warehouse, reports, queries
- Providing multiple recovery “checkpoints”
Tiered Protection and Recovery
The success of protection and recovery depends on the ability to access a separate copy of the data. These copies can be local or remote—you can select from various recovery-point objectives (RPOs), recovery-time objectives (RTOs), and distance options. These additional copies can allow the performance of support operations on production data while providing data protection.

Local and Remote Replication
EMC offers the following choices for local replication (Reference Figure 3):

- **EMC TimeFinder/Clone Mainframe Snap Facility** creates a high-performance full-volume, independent host-addressable local-point-in-time copy of a Symmetrix production device. TimeFinder allows up to 16 active clones of a single production device, all of which are immediately available for both read and write access and can use RAID 1, RAID 5, RAID 6, and RAID 10 protection schemes. Additionally, this product operates at both the dataset and volume level.

- **EMC TimeFinder/Snap** creates a space-saving, independent host-addressable logical, local-point-in-time copy of a Symmetrix production device. TimeFinder allows up to 128 active snapshot copies of a single production device which are immediately available for both read and write access and can use RAID 1, RAID 5, RAID 6, and RAID 10 protection schemes.

- **EMC TimeFinder/Consistency Groups (TF/CG)**, provided at no additional cost, ensures dependent write consistency of the application data when creating a point-in-time image across multiple devices associated with an application within a single Symmetrix system, or applications that also span multiple Symmetrix systems.

- **EMC TimeFinder/Clone Emulation** enables the use of existing TimeFinder/Mirror scripts on the newest generation Symmetrix system that were developed and deployed on previous-generation Symmetrix systems. Obtained at no additional cost with each purchased TimeFinder/Clone license, it provides investment protection in existing jobs and has been successfully used in newly adopted TimeFinder/Clone customer environments.

Figure 3:
Local Replication with TimeFinder/Clone and TimeFinder/Snap
EMC offers the following choices for remote replication:

- **The EMC SRDF family** is designed to create remote replicas of data for Symmetrix storage systems. There is a wide choice within the SRDF family to meet a range of service levels. (Reference Figure 2)

- **EMC SRDF/Synchronous (SRDF/S)** maintains a realtime synchronized mirror of a Symmetrix production data device to a secondary site, usually at campus, metropolitan, or regional distances, providing a recovery-point objective of zero data loss.

- **EMC SRDF/Asynchronous (SRDF/A)** maintains a near-realtime synchronized mirror of a Symmetrix production data device to a secondary site, usually at an extended or out-of-region distance, providing a recovery-point objective that could be as minimal as a few seconds.

- **EMC SRDF/MC (Mode Change)** dynamically and consistently switches between asynchronous and synchronous operation for balancing performance during peak periods. Dynamic SRDF provides source/target switching, enabling the reconfiguration of synchronized SRDF volumes, causing source volumes to become target volumes, resulting in reverse data flow to facilitate disaster recovery readiness.

- **EMC SRDF/Data Mobility (SRDF/DM)** provides for the transfer of a Symmetrix production data device to a secondary site. This can be at any distance, permitting information to be periodically mirrored for disaster restart, information sharing for decision support or data warehousing activities, or for data migration between Symmetrix systems.

- **EMC SRDF/Star** is a three-site disaster-restart solution that can enable resumption of protection with no data loss between two remaining sites, providing continued remote-data mirroring and preserving disaster-restart capabilities.

   It offers a combination of continuous protection, changed-data resynchronization, and enterprise consistency between two remaining sites in the event of the workload site going offline due to a site failure, fault, or disaster event.

   As more businesses require solutions to provide the highest levels of disaster restart capabilities with zero to minimal data loss, and low RTO, SRDF/Star is the industry’s first solution to enable organizations to satisfy those requirements.

   Note, all mainframe SRDF/Star deployments require EMC Geographically Dispersed Disaster Restart (GDDR) for automated disaster restart.
• **SRDF Concurrent** option enables the ability to remotely mirror a Symmetrix production site data device to two secondary sites simultaneously using either SRDF/S or a combination of SRDF/S and SRDF/A.

• **SRDF Cascaded** option is an advanced three-site solution that can synchronously mirror a Symmetrix production site data device with SRDF/S to a secondary device, then asynchronously mirror that secondary Symmetrix data device with SRDF/A to an out-of-region Symmetrix data device, with no data loss in the event of a production site disaster event.

• **EMC SRDF/Extended Distance Protection (SRDF/EDP)** is a new two-site disaster restart solution providing customers the ability to achieve no data loss at an out-of-region site at a lower cost. Using the cascaded SRDF mode of operation as the building block for this solution, combined with the use of the new diskless device in the intermediate site, allows the intermediate site to provide data pass-through to the out-of-region site.

• **EMC SRDF/Consistency Groups (SRDF/CG)**, provided at no additional cost, ensure application-dependent write consistency of the application data being remotely mirrored by SRDF in the event of a disaster, across multiple Symmetrix systems or across multiple devices within a Symmetrix, providing for a business point of consistency for remote site disaster restart for all identified applications associated with a business function.
Recovery/Consistency Innovations

In many complex IT environments, information access extends across multiple control units, operating systems, databases, and applications. For instance, order entry, inventory, web-based commerce, and service records all may share common databases and therefore need to be consistent with each other at the transaction level. In order to restart a portfolio of applications that spans multiple servers, operating systems, databases, and applications, all data must be consistent across the enterprise, at a single point in time.

EMC offers the following choices for recovery and consistency:

- **EMC TimeFinder Enterprise Consistency Groups** provide point-in-time local replication with cross-volume and storage-system consistency.

- **Multi-Hop (SRDF/S+SRDF/AR)** is an implementation of SRDF that provides synchronous replication to a separate local Symmetrix, plus an asynchronous replica to a second remote Symmetrix. This allows point-in-time copies with no data loss and no distance constraints.

- **EMC AutoSwap** transparently moves application workloads from disks in one Symmetrix system to disks in another, with no disruption to operations. EMC AutoSwap is similar to IBM HyperSwap, but does not require the complexity of an IBM GDPS environment. (Reference Figure 7).

![Figure 7: Moving Application Workloads with AutoSwap](image)

Prior to the swap, the source volumes are online to z/OS. When AutoSwap is involved, z/OS moves I/O operations to the target volumes, transparently moving application workloads between Symmetrix systems. The Swap can be done manually or automatically when AutoSwap detects a failure or a pre-defined criteria.
Automated Disaster Restart

EMC Geographically Dispersed Disaster Restart (EMC GDDR) automates restart procedures at remote sites at the time of planned or unplanned outage. EMC GDDR automates the restart of host-level availability, system tasks, critical applications, and array-level availability. Symmetrix mainframe environments are assured of safe failover to one or more sites in case of a planned or unplanned outage. GDDR is available for all the EMC supported three-site and two-site replication solutions.

Figure 8: Two-Site Automated Disaster Restart GDDR

Figure 9: GDDR is Mandatory for All Mainframe Star Deployments
Data Mobility and Migration

EMC offers multiple solutions for data mobility and data migration in mainframe environments. They include:

InfoMover
EMC InfoMover is software that facilitates the movement of information among heterogeneous platforms without compromising the standard data network. InfoMover has the following functionality:

- **InfoMover File Transfer (IFT)** copies flat files between a source and target host. Data can be translated during the copy or left “as is,” depending on the customer requirement.

Enhanced Virtual LUN Technology (VLUN)
VLUN enables the migration of Symmetrix logical volumes between disk types as well as protection types, thereby providing the ability to non-disruptively change either, or both, the drive type and the protection type of the volumes. CKD volumes can be migrated non-disruptively to the attached hosts and other internal Symmetrix applications such as TimeFinder and SRDF.

Disk Library for Mainframe (DLm)
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Mainframe Productivity

EMC helps you efficiently manage and optimize host and storage resources across the enterprise to lower costs and improve operational efficiency.

- **EMC Catalog Solution** is utilized for managing and maintaining a working catalog, catalog impacts of workload migrations, as well as catalog diagnosis and recovery tasks.

- **EMC Performance Essential** eliminates manual tuning efforts through automation and reduces batch application elapsed time.

- **EMC VSAM Assist** reduces the time required to back up and restore files. It allows you to back up and restore the VSAM datasets that comprise entire applications with a simplified instruction set.

- **VSAM Quick Index** builds indexes up to 80 percent faster than IDCAMS BLDINDEX. Working with your house-sort utility, it builds multiple alternate indexes with a single pass of the base cluster. It also builds alternate keys from non-contiguous portions of base records.

- **TeraSAM** transparently segments large VSAM files and allows segmented data sets to be accessed via alternate indexes. TeraSAM improves storage utilization by placing only high activity segments on high-performance storage. It improves performance by allowing allocation of free space, buffers, and cache devices to parts of the file with high activity levels.

Application and Database Integration

EMC further simplifies complexity by tightly integrating software and utilities with the functions and capabilities of applications and databases to efficiently manage and optimize resources. New choices for mainframe application and database environments include DB2 and IMS integration and utilities.

EMC partners with independent software vendors such as Rocket and IDP for the following functionality. Solutions from ISVs tightly integrate EMC’s superior replication solutions with mainframe utilities and software.

- **DB2 Integration** Standard DB2 backup, recovery, and cloning methods can be difficult to manage and time-consuming. EMC partners provide alternative solutions to traditional DB2 utilities for cloning systems, backup and recovery, and disaster recovery for business continuity.

- **System Cloning Automation**: Cloning an instance of DB2 within the same LPAR or to a different LPAR is easily accomplished with TimeFinder through an automated process.

- **Object Cloning Automation**: Cloning DB2 objects between two databases involves managing the metadata and cloning the data. DBUtilities in ResourcePak Extended automate changing the metadata between the two databases. TimeFinder is used to clone the object.
• **SRDF and IBM Data Propagator Integration:** By utilizing SRDF, EMC Consistency Groups, TimeFinder with IBM DataPropagator, business-critical data is synchronized at a remote site for alternate processing or business continuance in the event of the local host no longer being available. The remote instance is started keeping selected tables synchronized with the source.

• **IMS Database Cloning using TimeFinder:** Cloning IMS data with TimeFinder minimizes mainframe host resources by moving data within the Symmetrix, bypassing host I/O and CPU utilization. This procedure also minimizes database unavailability and reduces database I/O contention. Database cloning enables parallel processing to perform backups and testing for example.

• **IMS Recovery Automation:** Recovery can be accomplished utilizing a traditional IMS Image Copy or with a quiesced non-IMS Copy. EMC provides modules to automate the TimeFinder and IMS Image Copy integration.

• **Database Archiving** allows active data to be archived with associated metadata. EMC Centera integration with Princeton Softech Active Archive safely converts structured, relational data into the unstructured, fixed-content format required by EMC Centera. Active archive solutions uniquely preserve the complex referential integrity and meta data information necessary for easy access to database content.

**Archiving/Content and Records Management**

Choices for archiving/content and records management are provided through integrated solutions from EMC or select partners. The solutions include content-addressed storage, output management, database archiving, and gateways.

**Content-Addressed Storage:**

• **EMC Centera** is the world’s first storage solution expressly designed to provide cost-effective online access to fixed, unchanging content such as document images, digital x-rays, and electronic records/business documents. EMC Centera greatly simplifies management, protection, and distribution of large amounts of fixed content and provides major TCO, time-to-market, and return-on-investment benefits. EMC Centera in a mainframe environment requires z/OS 1.2 and application support for API. EMC and select partners have native integrations for the z/OS environments including:
Centera Partners

**EMC Centera HSM Migrator**: EMC Centera Mainframe HSM Migrator is a software module that runs on z/OS mainframes. The software enables the EMC Centera storage system to “plug in” to DFSMShsm (Data Facility Storage Management Subsystem) and use standard user exits for archiving data to EMC Centera. EMC Centera Mainframe HSM Migrator intercepts datasets and stores them on EMC Centera. Recall is completely transparent to the end user or application. Customers will utilize the EMC Centera Mainframe HSM Migrator running on z/OS to intercept HSM migrated datasets traditionally targeted for ML 2 (tape) storage and archive them directly to EMC Centera. Recall of these datasets will be completely transparent to batch processes requiring access to these datasets. The end result allows EMC Centera to become a seamless piece of the DFSMShsm infrastructure. The product was designed using public APIs published and supported by IBM. The EMC Centera Mainframe HSM Migrator is sold and supported by EMC as a purpose-built extension of DFSMShsm. Archiving to EMC Centera allows users to take advantage of EMC Centera’s self-managing capabilities for efficient data storage and assured content authenticity.

- **BMC Control-D**: automates and integrates all aspects of enterprise-wide output management, eliminates human error, improves information throughput, and maximizes resource use. Control-D will handle all your output management activities across your enterprise while optimizing related cost.

- **Mobius ViewDirectTCM**: a solution that meets all enterprise requirements for storing, accessing, and delivering content in any format from any source.

- **Systemware**: enterprise content integration software solution that supports high-volume capture, management, indexing, archival, and presentation of enterprise information across disparate platforms from a scalable, virtual-central repository.

- **Beta Systems**: output management software designed to process large printing volumes and different print formats. The print data streams can originate from any application on UNIX, Windows, and mainframe platforms.

- **Si Software LDMS** stores all data from different application programs immediately after they have been created and automatically archives them. When implement on z/OS systems, LDMS allows thousands of users to access archived data simultaneously from different locations even on the very same document.

- **RSD solutions** ensure fast and secure access to business critical data within an organization by managing enterprise content. RSD’s transparent integration with EMC Centera provides the end-user benefit of effortless retrieval of all information necessary for business processes via a Web-enabled RSD thin client or a customized enterprise application.

*Database Archiving allows active data to be archived with associated metadata.*

- **Princeton Softech Active Archive for DB2** safely converts structured, relational data into the unstructured, fixed-content format required by EMC Centera. Active archive solutions uniquely preserve the complex referential integrity and meta data information necessary for easy access to database content.
Gateways enable mainframe interface to EMC Centera as optical (IBM 3995) and tape archive replacement.

- **BusTech’s Mainframe Appliance for Storage (MAS)** automates and intelligently manages the archiving of data from an IBM mainframe to an EMC Centera system. With this powerful integrated solution, EMC Centera provides a central storage archive that’s safe and secure, so you can utilize those fixed-content assets from anywhere at anytime for product development, customer transactions, meeting government regulations, or other applications.

- **Intercom Computer Systems GmbH** provides mainframe connectivity through optical disk and tape drive emulation for EMC Centera.

### EMC Mainframe Professional Services

The EMC Services organization is focused on designing, building, and managing an information infrastructure to support your business. EMC has developed specific services and partnered with leading experts that are focused solely on the mainframe market.

- **The EMC Data Migration Assessment and Planning Service** is designed to provide significant value by engaging experienced EMC professionals to develop a “best-practice”-based migration strategy focused on mitigating business, technical and operational risks associated with planning, and conducting storage migrations.

- **EMC Information Consolidation Program** is a services-led approach to helping customers move to a more agile tiered networked storage infrastructure. It includes a broad set of service offerings supported by EMC’s comprehensive data migration capabilities aligned to a customer’s criteria for cost, risk, and business impact.

- **EMC Mainframe-Specific Assessments and Services** include ESCON to FICON migration, logical data migration, and CopyCross virtual tape assessment. These services have also been broadened through partnerships focused on the mainframe environment with companies like Eastern Computer and Diligent Technology.

- **EMC Mainframe Business Continuity Services** provide customers with the impact analysis, physical design, capacity planning, sizing, and tuning required to deploy a complex infrastructure. These services support all of EMC continuity offerings including AutoSwap and SRDF S/A/AR/Star. EMC also provides simulation services for remote replication ensuring recovery plans can be met.

- **EMC AutoSwap High-Availability Design and Implementation Service** provides AutoSwap planning, installation, and integration within an existing mainframe data center infrastructure. EMC AutoSwap provides the ability to transparently move workload from DASD in one Symmetrix subsystem to DASD in another without operational interruption.
15-Minute Guides to:
Backup, Recovery, and Archiving
Business Continuity
Consolidation
Content Management

Mainframe Environments
Optimizing Microsoft Exchange
Oracle Applications and Databases
Optimizing SAP

Take the next step
For more information on specific ways EMC can improve the operation of your information infrastructure, contact your EMC sales representative, call 1-866-464-7381, or visit our website at www.EMC.com/ILM/choices.