Achieving Continuous Availability for Mainframe Tape

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Discussion Topics

- “Needs” in mainframe tape
  - Past to present… small to big?
- How Have “Needs” Affected Technology?
- The next evolutionary steps
- Use cases
- What’s the next “Need”?
“Needs” in Mainframe Tape
Did Technology Define Needs, or Did Needs Define Technology?

- Physical tape
  - Better recording technologies (3480, 3490, 3590)
- Robotics (automated tape loading)
  - Dual robotic arms
  - Higher slot counts
- Virtual tape (disk cache with physical tape back store)
  - Replication of disk cache
- Encryption
- Tapeless (no physical tape)
  - Deduplication
  - GRID
  - Synchronous replication
  - Cloud storage
How Have “Needs” Affected Technology?

**Technology**
- Physical tape
- Robotics
- Virtual tape
- Encryption
- Tapeless

**Effects**
- Performance
- Capacity
- Media utilization
- Data Security
- Host devices
- RPO/RTO capabilities
- Copy creation
  - Number of copies
  - Number of locations
- Operational accessibility
- Impact of equipment failure
- Impact of media failure
How Have “Needs” Affected Technology?

**Technology**
- Physical tape
- Robotics
- Virtual tape
- Encryption
- Tapeless
- **Synchronous Tape Matrix**

**Effects**
- Performance
- Capacity
- Media utilization
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- Impact of equipment failure
- Impact of media failure
Synchronous Tape Matrix (STM)

- **Continuous Availability**
  - Resilient architecture instantly and automatically adjusts to multiple failures without interruption
  - Data is always available for I/O
  - No downtime from failover or restore processes
- **No idle components to buy**
  - All components contribute to day-to-day operations, not just during failure events
- **Easy to implement**
  - No host scripts or policies required
- **Scalable**
  - No limitations for throughput, capacity or degrees of redundancy
- **Modular design ensures investment protection**
- **Supports dissimilar storage systems and compression/deduplication technologies**
Simplified STM Configuration with $n$-Sites

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<thead>
<tr>
<th></th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site $n$</th>
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<tr>
<td><strong>COMPUTE LAYER</strong></td>
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<td><strong>CONTROL UNIT LAYER</strong></td>
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Operational STM Configuration with Multiple Failures Across Layers and Sites

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STM Configuration Examples
Active-Active Host/Storage

Production Site A

Production Mainframe

Mirrored Writes

Standby Mainframe

Production Mainframe

Virtual Tape

Continuous Availability – Production Sysplex

Production Site B

Continuous Availability – Production Sysplex

Virtual Tape

Standby Mainframe

Production Mainframe

Mirrored Writes

Production Mainframe

Virtual Tape

Continuous Availability – Production Sysplex
STM Configuration Examples
Active-Active-DR Host/Storage

Production Site A
Production Mainframe
Mirrored Writes
Production Mainframe
Virtual Tape

Production Site B
Virtual Tape
DR or Bunker Site
DR Mainframe (optional)
Virtual Tape
Asynchronous Replication
STM Configuration Examples
Active-Standby Host, Active-Active Storage

Production Site
- Production Mainframe
- Mirrored Writes
- Virtual Tape

Continuous Availability

Standby Site
- Standby Mainframe
- Virtual Tape

Zero RPO DR
STM Configuration Examples
Active-Standby Host, Active-Active Storage

Production Site
- Production Mainframe
- MirroredWrites
- Critical Data
- Other Data
- Virtual Tape
- Asynchronous Replication

Standby Site
- Standby Mainframe
- Critical Data
- Other Data
- Virtual Tape
- Asynchronous Replication

Continuous Availability (critical data)
Asynchronous Replication (other data)

Zero RPO DR
STM Configuration Examples
Active-DR Host, Active-Active Local Storage with DR

**Production Site**
- Production Mainframe
- Local Mirrored Storage

**DR Site**
- Standby Mainframe

**Asynchronous Replication**

**Virtual Tape**

**WAN**
STM Configuration Examples
Active-DR Host, Active-Active Local Storage (Disparate) with DR

Production Site

- Production Mainframe
- Storage Type A
- Storage Type B
- Local Mirrored Storage

Asynchronous Replication

DR Site

- Standby Mainframe
- Storage Type B
- Virtual Tape

- Continuous Availability with disparate storage types
- Zero RPO DR

- Leverage the strengths of one storage type
- Minimize the weaknesses of another
STM Configuration Examples

Active-Active Local Storage

Production Site

- Production Mainframe
- Local Mirrored Storage
- Virtual Tape

Continuous Availability – Single Site
Prepare for the Future, Don’t Forget About the Past

- Disaster recovery preparedness
- Security (Encryption)
- Migrations
RepMon: Replication Monitor

Provides **real-time status monitoring and logging** of virtual tape data writes and replication to a remote disaster recovery site at the VOLSER level

- Identifies Write and Replication Status of Mainframe Tape VOLSERs
- Identifies if virtual tape data at DR is still consistent with the primary datacenter
- Provides visual and audit capabilities to confirm when backups reach DR
Push Button DR Testing
Replication During Normal Operations

Site A
Tape Data

1 Primary

Replication to Secondary Site or DR Site

Secondary 2

Tape Data

Site B
Push Button DR Testing
Replication During DR Testing

Site A
- Primary 1
- Tape Data

Replication to Secondary Site or DR Site continues uninterrupted

Site B
- Secondary 2
- Tape Data
- DR Test Data
- Read/Write Testing

Start DR

Prepares DR environment for read/write testing; original Tape Data remains untouched

Tape Data
Replication to Secondary Site or DR Site continues uninterrupted
Push Button DR Testing
After DR Testing is Completed

Site A

1 Primary
Tape Data

Replication to Secondary Site or DR Site continues uninterrupted

2 Secondary
Tape Data

Site B

DR Test Data is purged

Optionally, DR Test Data can be automatically replicated back to Site A for auditing purposes

Stop DR
Encrypted Data At Rest and Data In Transit

- Better than simple self encrypting drives, data remains encrypted for all local or wide area network traffic, including replication
- AES-GCM or AES-ECB modes
- CGSafe solutions use AES-256, AES-192 or AES-128
- Encryption, compression, authentication and CRC in a single pass
- Configurable for auto-hardware-to-software encryption failover

Key Management

- Full Key Lifecycle Management
- Optionally Integrates into existing key management infrastructure for a single-point-of-management
- Supports KMIP standard
- Dynamic creation of keys
- Master keys (KEKs) based on storage pools
Luminex offers Tape Migration Services to migrate to STM

- Elegantly designed to work with TMACS to move tape data without touching the tape catalogs
- Current VOLSER #s and all historical information are retained in the new environment as well
- Supports all existing tape library and virtual tape environments for z/OS

TMACS (Tape Monitoring and Allocation Control Software) is optional host-based software to automate device allocation steering for complex environments
For current Luminex virtual tape environments

- Luminex offers Media Migration to non-disruptively migrate to the new storage target
- Entirely off-host, no mainframe MIPS required
- Current VOLSER #s and all historical information are retained in the new environment (no changes to tape catalogs)
- Volumes will acquire the characteristics of the new configuration
More Options… A Better Fit Makes A Better Solution

**OPTIONAL FEATURES**

- **RepMon**
  - Monitor replication at the VOLSER level

- **CGSafe**
  - Encryption and key management

- **LTMon**
  - Integrated, centralized management from the mainframe console

- **Push Button DR**
  - with non-disruptive DR testing

- **Multi-site Disposition Change**
  - with reverse replication

- **Synchronous Tape Matrix**
  - Continuous Availability

**STORAGE OPTIONS**

- **CGX**
  - Core product with up to 8Gb FICON, SMEs & hundreds of customers going tapeless

- **Internal Storage**

- **Enterprise storage options**

- **Modular storage options**

- **Compression**
  - at the control unit level

- **Deduplication**
  - DataStream Intelligence further reduces bandwidth & storage requirements

- **Cloud**
  - Cloud-based tape vaulting solution for mainframes

- **Replication**
  - Single source for Virtual Tape and Tape Migration

- **Tape Monitoring (Device) and Allocation & Control System**

- **RepMon**
  - Integrated, centralized management from the mainframe console

- **CGSafe**
  - Encryption and key management

- **Push Button DR**
  - with non-disruptive DR testing

- **Synchronous Tape Matrix**
  - Continuous Availability

- **Tape Migration Software & Services**

- **Vault**
  - Cost-effective replacement for physical tape vaulting
What does the mainframe do today that you never thought possible?

What do you want the mainframe to do in the future?
What does the mainframe do today that you never thought possible?

What do you want the mainframe to do in the future?
Luminex’s Heritage of Innovation

- 1st to enable tape encryption solutions for mainframe physical tape
  - 1st to enable deduplication storage for mainframe virtual tape
    - Using Luminex DataStream Intelligence
- 1st to enable DASD and tape data consistency through unified replication
- 1st to provide 8Gb FICON for mainframe virtual tape
- 1st & Only virtual tape vendor to directly provide tape migration services for z/OS w/o third-party contracting
- 1st vendor to enable cloud storage for mainframe tape
- 1st to provide replication monitoring at VOLSER level
- 1st to deliver wire-speed FICON performance with CGX product release
- 1st to provide truly scalable continuous availability with Luminex Synchronous Tape Matrix
- 1st to provide cost-effective mainframe virtual tape vaults as an alternative to physical tape vaults
Achieving Continuous Availability for Mainframe

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