Data Migration and Disaster Recovery: At Odds No More

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Mainframe Migrations

Challenges…

- Disruptive
  - To applications
  - To Disaster Recovery
- Limited migration windows
  - Usually during the night and weekends
  - Planning required before migrations
- Costly
  - Require specialized skills
  - Off hours is cost prohibitive
- Complex
  - Infrastructure interdependencies
- Inflexible
  - Different tools required for volume and dataset migrations
Current Host-Based Migration Types

Simple – Volume-to-Volume

- Same size or smaller to larger
  - 3390-3 to 3390 Model 3
  - 3390-3 to 3390-9, or -27, or -54
  - 3390-9 to 3390-27, or -54
  - 3390-27 to 3390-54
- Customer preference of tool
- Currently licensed to use tool
- Familiarity with tools from specific vendor
- Limited scalability of migration process

Complex – Dataset Migration

- Volume consolidation
  - Several 3390-3s to a single 3390-9
  - Several 3390-9s to a single 3390-27 or single 3390-54
  - Several 3390-27s to a single 3390-54
- Dataset placement
  - Free up active packs to allow UCB reclamation
  - Multivolume dataset identification requirements
- Catalog cleanup requirements
Host-Based Migration Types
Steps to a Successful Migration

• Know Your data
  • Identify
  • Quantify
  • Verify

• Always use Volume Migration (z/OS Migrator, FDRPAS or TDMF) first for
  • Like-to-like volume copies (3-3,9-9)
  • Increasing volume size (3-9,9-27)
  • Watch for VTOC size as dynamic VTOC expansion not always possible with ICKDSF
  • Volumes with APF, Linklst, HFS/zFS, Catalogs

• Some volumes require special handling and might be candidates for reallocation
  • Page Volumes. Larger Page Dataset support with z/OS 1.8 (OA20749)
  • Spool volumes. LARGEDS option allow > 64K track spool dataset
  • Sysplex Couple Dataset volumes. Evaluate current allocations
Host-Based Migration Types

Steps to a Successful Migration

- Use DFDSS or FDR to move anything not in use (TSO, Batch, System)
  - Extent consolidation
  - Catalog updates kept to a minimum
  - Easy setup

- Let HSM handle ML1 volumes (ADDVOL/FREEVOL) if going to larger ML1 volumes

- Datasets that are redefined at regular schedule will move by attrition by changing SMS volume status (GDG’s, Database Reorg etc)

- Use dataset level migration for what remains
  - Requires dataset name masking (include/exclude) to select exactly what is desired
  - High catalog activity can occur if not planned properly
  - Planning and setup can be 80% of the work for the dataset-level migration
Host-Based Migration Types
Steps to a Successful Migration

- Analyze and clean the user catalogs as needed
  - EXAMINE and DIAGNOSE
  - Use Catalog Solutions or similar products
- Obtain lists of datasets to be moved
  - Attempt to sort them into groups where a new HLQ can be used for the move
    - Allows creation of a new catalog to be used only for the migration and deleted when complete
- SMS considerations
  - DISNEW all volumes you are moving from
  - Check ACS to ensure proper allocation of interim datasets to fall on the target volumes if needed
    - Allow enough target volumes for source datasets
- Work with small groups
  - No more than 500 datasets or 15000 extents (probably less)
  - Attempt to limit the source volumes online to as few LPARs as possible
But what about Disaster Recovery protection during Migration???
Homogenous migrations

Control unit replication based migration
Example:
Using SRDF FourSite for Data Migration

SRDF/A or SRDF/S

OLD

NEW
Example:
Using SRDF FourSite for Data Migration

Example:
Using SRDF FourSite for Data Migration

Example:
Using SRDF FourSite for Data Migration

Example:
Using SRDF FourSite for Data Migration
Example: Using SRDF FourSite for Data Migration

SRDF Ad Copy

SRDF/A or SRDF/S

OLD

NEW
Example: Using SRDF FourSite for Data Migration
Homogenous migrations

Host based migration
Disaster Recovery and Host-based Migrations
Maintaining Replication Solution

- Active Migration can impact ‘Continuous Availability’ protection (Hyperswap/AutoSwap)
  - AutoSwap / HyperSwap needs to be temporary disabled during migration’s UCB swap
  - EMC z/OS Migrator handles this automatically for AutoSwap only
  - IBM TDMF handles this for both AutoSwap and HyperSwap automatically
  - IDP FDRPAS provides jobs to automatically enable/disable Hyperswap/Autoswap

- DR consistency maintained when migrating within same replication type and consistency group

- Available DR bandwidth impacts speed of migration

- DR consistency can be lost when migration source and target use different replication type
  - TDMF can detect automatically and allow override
  - FDRPAS detects and issues warning then completes migration
Disaster Recovery and Host-based Migrations
Maintaining Replication Solution

Host based migration tool

Consistency Maintained!

Consistency group
Disaster Recovery and Host-based Migrations: Switching Replication Technology: The Problem

Consistency Lost!

Replication Technology A

Replication Technology B
Disaster Recovery and Host-based Migrations

Switching Replication Technology: Current Solution

1. Suspend replication (aging RPO)
2. Migrate volumes in subsets
Disaster Recovery and Host-based Migrations
Switching Replication Technology: New Solution

1. Copy volumes then mirror

2. Swap all volumes at once
Disaster Recovery and Host-based Migrations
Switching Replication Technology: **New Solution**

1. Host-based migration
2. Non-disruptive to applications
3. Preserves remote replication at source—full disaster recovery operations
4. Supports heterogeneous storage
5. Non-disruptive to DR when migrating between business continuity solutions

Example:

- PPRC
- XRC
- HUR
- Source
- Target
- SRDF
Host-Based Data Migration Products & Offerings

z/OS Migrator Functions and Capabilities

- Full volume data migration from source to target volumes
- Supported from any Count Key Data and ECKD control units to Symmetrix
- Swaps active volumes with few exceptions
- Operations are transparent to users and applications are unaffected
- Supports multiple system data-sharing environments
Host-Based Data Migration Products & Offerings

z/OS Migrator Functions and Capabilities

- Combines smaller volumes to larger volumes
  - MOD 3s to MOD 9s, or any size
  - Relieves UCB constraints with volume consolidation
- Transparent to application

Catalog manipulation occurs to reflect new dataset location
Host-Based Data Migration Products & Offerings
z/OS Migrator Dataset-Level Functions and Capabilities

- Logical data migration
  - Enables UCB reclamation without application outage
    - Also known as ‘active completion’
  - Provides the ability to migrate data at the logical dataset (extent) level from one set of volumes to another
    - All data movement is accomplished without application downtime
  - Updates the catalog automatically while applications continue running
  - Supports all CKD/ECKD control units
  - Migration sessions are parameter-driven
  - Allows for full system sharing throughout the datacenter
  - Uses both copying and mirroring techniques to achieve source/target synchronization
Host-Based Data Migration Products & Offerings
z/OS Migrator Dataset-Level Functions and Capabilities

• Logical data migration (continued)
  • Works with pairs of datasets
  • Transparent to applications
  • Vendor independent of source and target storage arrays
  • SMS considerations
    • Storage group and other ACS parameters are honored. Target datasets are allocated using source dataset names.
    • No option to bypass SMS
      • Must ensure the ACS is properly coded to do what you want
    • No effect on last reference date; it is maintained
    • As with all SMS datasets, migrating datasets must be cataloged
Host-Based Data Migration Products & Offerings
z/OS Migrator **Dataset-Level** Limitations and Restrictions

- Application bounce required for removal of z/OS Migrator from the system but **not** to free source UCBs for reuse
- Generally limited to datasets catalogued in shared user catalogs
- The target controller must be at an **equal or higher** technology level and be downward compatible
- Extensive planning required when working at the dataset level
  - Pre-implementation catalog ‘health check’ required
Host-Based Data Migration Products & Offerings

z/OS Migrator Technical Benefits

• Provides the ability to introduce new storage subsystem technologies with minimal disruption of service
• Allows users to easily reclaim z/OS UCBs by simplifying migration of datasets to larger volumes (combining volumes)
• Ensures all metadata always accurately reflects the location and status of datasets being migrated
• Supports datasets larger than 64K tracks
Host-Based Data Migration Products & Offerings

z/OS Migrator Business Benefits

• Eliminates limited migration windows
  • Migration windows typically take place on weekends
  • Time allotted is usually very small, possibly several hours
    • During this time, applications are taken down and data can be moved
  • Allows you to move the data at leisure at any time of the day
    • Transforms a ‘once-a-week’ 2-hour migration window to an unlimited ‘full week’ (168-hour) migration window

• Eliminates business outages
  • By eliminating the migration window, businesses no longer need to plan to have extended periods of application down-time

• Lowers cost
  • Allows most migration activity to be performed during normal business hours

• Reduces hardware expenditures
  • Frees up storage resources more quickly
z/OS Migrator: A look inside
Volume-Level Migration
Volume-Level Migration -- 1

- Multi-phased process
  - Initialization (create and promote)
  - Activation
  - Copy
  - Refresh
Volume-Level Migration -- 2

- Multi-phased process
  - Initialization
  - Activation
  - Copy
  - Refresh
  - Quiesce
  - Synchronization
Volume-Level Migration -- 3

- Multi-phased process
  - Initialization
  - Activation
  - Copy
  - Refresh
  - Quiesce
  - Synchronization
  - Swap
  - Resume
  - Complete
Volume-Level Consistent Migration
Volume-Level Consistent Migration -- 1

- Multi-phased process
  - Initialization (create and promote)
  - Activation
  - Copy
  - Refresh

Diagrams showing the process involving ESCON / FICON Director, Owner, Target (offline), Source, and DASD 1, DASD 2.
Volume-Level Consistent Migration -- 2

- Multi-phased process
  - Initialization
  - Activation
  - Copy
  - Refresh
  - Quiesce
  - Synchronization
Volume-Level Consistent Migration -- 3

- Multi-phased process
  - Initialization
  - Activation
  - Copy
  - Refresh
  - Quiesce
  - Synchronization
  - Mirror
Volume-Level Consistent Migration -- 4

- Multi-phased process
  - Initialization
  - Activation
  - Copy
  - Refresh
  - Quiesce
  - Synchronization
  - Mirror
  - Consistent Swap
  - Resume
  - Complete
Volume Level Migration
Volume Support Considerations

- Volumes containing the following datasets cannot be migrated:
  - z/OS Migrator database dataset
  - Active Page datasets
  - Active CA-OPS/MVS datasets
  - Active Sysplex Couple datasets
- Volumes not supported as source or targets of a migration
  - Extended Address Volumes
  - FBA volumes
  - Virtual Devices (VDEV)
  - CSC (EMC Cross System Communication task) gatekeeper devices
  - zHPF attached volumes
z/OS Migrator: Dataset Migration
Dataset Migration -- 1

- Multi-phased process
  - Initialization
  - Activation
  - Copy
Dataset Migration -- 2

- Multi-phased process
  - Definition
  - Activation
  - Copy
  - Synchronization
  - Mirroring
Dataset Migration -- 3

• Multi-phased process
  • Definition
  • Activation
  • Copy
  • Synchronization
  • Mirroring
  • Diversion
Dataset Migration -- 4

- Multi-phased process
  - Definition
  - Activation
  - Copy
  - Synchronization
  - Mirroring
  - Diversion
  - ‘Active’ Completion
  - Completion
## Logical Migration
### Dataset Support Considerations

### Supported Datasets
- Direct Access (DA) datasets
- Extended format sequential datasets
- Extended Partitioned datasets (PDSE)
- GDG base names and GDG datasets
- Partitioned (PO) datasets
- Physical Sequential (PS) datasets
- Striped Sequential datasets
- BDAM datasets
- Extended format VSAM KSDS
- VSAM datasets
  - Alternate Index (AIX)
  - ESDS
  - KSDS
  - Linear
  - RRDS
  - Spheres
    - KSDS | ESDS + Paths + AIX
  - VRRDS

### Unsupported Datasets
- VSAM datasets with the following options specified
  - IMBED
  - KEYRANGE
  - REPLICATE
- Catalogs
- ISAM datasets
- Individual PDS members
- Page and swap datasets
- HFS / zFS datasets
- Unmovable datasets (DSORG=U|PSU)
- VTOC, VTOCIX and VVDS datasets
- Temporary datasets (&&dsn) and other uncataloged datasets

### NOTE: EAV and zHPF volumes not supported at this time
Summary:
*z/OS Migrator Use Cases*

- **Technology Refresh:** Migrate to arrays non-disruptively to both business continuity solutions and applications.
- **Move from Smaller to Larger Volumes:**
  - **VOL 1:** DS1, DS2, DS3, DS4
  - **VOL 2:** DS1, DS2, DS3, DS4
  - **VOL 3:** DS1, DS2, DS3, DS4
- **Storage Consolidation:** Multiple storage arrays into one high-capacity array.

**Technologies:***
- PPRC
- XRC
- HUR
- SRDF

**Solution:**
- Migrate to arrays non-disruptively to both business continuity solutions and applications.
Symmetrix Migrator Software Package

- Available at no-charge to Symmetrix owners
  - Symmetrix DMX and V-Max models
- Deploy the right technology to quickly and efficiently migrate data to where you need it most
  - Host based migrations for smaller projects
  - Network based migrations for environment-wide projects
  - Array based migrations for large scale system consolidation
- Comprehensive environment support
  - Open Systems
  - Mainframe
  - Mixed Open Systems/Mainframe
  - EMC and qualified third party arrays

Choice and flexibility to deliver against your business and IT migration objectives