Blue Cross Blue Shield of Minnesota - Replication and DR for Linux on System z

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Objectives

At the end of this session, you will be able to

• Discuss replication in a Linux on System z environment, including z/VM and z/OS

• Describe managing replication from z/OS for z/VM and Linux as a guest virtual machine

• Understand different backup scenarios for z/VM and Linux on System z
Linux on System z
Disk Attachment Options

IBM system z CPC

FICON Director
FC SAN

FICON
FCP

z/VM

LPAR

zFCP

LPAR

SCSI

FBA

SE

Linux device names

/dev/dasdx

DASD DD=
DASD Device Drivers

SE=Solutions Enabler
(no minidisk support)

Linux on System z
Disk Attachment Options

SE

Linux device names

/dev/dasdx

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DASD Device Drivers

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(no minidisk support)
Linux on System z CKD Device Relationship Path

DMX SLV Assigned device address, mapped to EF Port

DMX SLV w/Internal Identifier

DMX Physical disks

Linux

System z

Symmetrix DMX

z/VM CHPID

System z channel

z/VM IODEVICE Address

Linux Device Address

Linux Device /dev/dasdX

Linux LVM and/or filesystem

Linux on System z CKD Device Relationship Path

DMX SLV w/Internal Identifier

DMX Physical disks

Linux

System z

Symmetrix DMX
Replication – Business Recovery Tools

- **TimeFinder – Local Replication**
  - Clone – Full Volume copy, Source device size = Target device size
  - Snap - Pointer Based Replication,
    - Target Device is a virtual device housing a collection of pointers between the Source and a reserve area for a point-in-time view

- **SRDF – Remote Replication**
  - Allows the movement of data between storage systems in the same room, to different buildings located across town, or thousands of miles apart
  - Offers various disaster recovery levels
  - Enables the following operations:
    - Disaster recovery, Disaster restart testing
    - Recovery from planned outages, Remote backup
    - Data center migration, Data replication and mobility
Symmetrix Remote Data Facility: Two Site Solutions

**SRDF/Synchronous**
- No data exposure
- Some performance impact
- Limited distance
- Source = Target

**SRDF/Asynchronous**
- Predictable RPO
- No performance impact
- Unlimited distance
- Only two copies of data required
- Source ≠ Target

**SRDF/AR**
- Data Movement solution
- No performance impact
- Unlimited distance
EMC Replication Management Options

• Solutions Enabler – 7.1 and later
  • Linux on System z – SUSE 10/11 and Red Hat 5.4+
  • Open Systems hosts – Windows, Linux, UNIX
• Mainframe Enablers
  • z/OS
  • Symmetrix Management Console (SMC)
  • Windows, Linux (x86), UNIX
• EMC z/OS Storage Manager (EzSM)
  • ISPF-like panel menu interface
• EMC products for TPF
  • TimeFinder Controls for TPF
  • SRDF Controls for TPF
  • ResourcePak for TPF
Blue Cross Blue Shield of Minnesota
Blue Cross Blue Shield Hardware - Today

Local Site (z10) 24 channels

Remote Site (z10) 24 channels

Symmetrix DMX-4 Symmetrix DMX-4

EMC DLm EMC DLm

FICON Channels

EMC DLm EMC DLm
z/OS Environment

- z/OS LPARs – 7 Total
  - Production - 3
  - Test – 2
  - Backup - 1
  - Sandbox - 1
- z/OS 1.11
- CICS, IMS, DB2, SAP
- Symmetrix
  - CKD – mod-3, 9, and 27
- Remote Site
  - 14 z/OS LPARs normally deactivated
z/VM Environment

- z/VM LPARs – 5 Total
  - Production - 3
  - Test – 2
- z/VM 6.1
- 200 Linux virtual machines across 7 LPARs and 2 sites
- Symmetrix
  - CKD only
  - All minidisks, no dedicated devices to guest virtual machines
- No backup software lives on z/VM
Linux Environment

- All Linux under z/VM
- Linux is on CKD minidisks
  - Full pack
  - Partial pack
- SLES 10 SP3
- 200 Linux guests and growing
  - subset of guests are active/active
- TSM backup agents on Linux
- Database communication to z/OS
  - Hipersocket
  - OSA
Why Linux on System z?

• Prototyping Linux on System z for years
• Traction took hold 3-4 years ago when implementing SAP
• Moved it from x86 talking to z/OS DB2 to mostly Linux on z talking to z/OS DB2
• This was our first production scale Linux application implemented
• Very successful!
• Continuing to look at additional workload
  • WAS
Replication
Disaster Recovery Environment - 2005

One Site (z900s)
SRDF - 2005

- One RDF Group in 2005
  - Included everything - z/OS, z/VM and Linux on System z
  - Normal operation – SRDF AR from DMX3000 to DMX3000
  - Strictly for Disaster Recovery
- Backups occurred each 24 hour period via a script
  - Switch to SRDF Synchronous mode which enforces consistency across all devices maintaining application interrelationship consistency
  - Once invalid tracks reached zero, performed ConGroup trip, splitting off all R2s
  - RDF Group is suspended
  - Performed backup to tape
  - Switch back to Asynchronous
The Future Beckons…

What is the right path for our Disaster Recovery?
SRDF Groups – Local to Remote Site Setup

- RDF Group 2
  - SRDF/A (asynchronous) from Local to Remote Site
  - Includes z/OS, z/VM and Linux on System z
  - Consistency maintained across application environment
  - ~53TB

- RDF Group 5
  - Normally suspended
  - Includes z/OS, z/VM, Linux “Work” devices – page, swap, etc.
  - Data structures of volumes required, but not day-to-day data
  - Synchronized when changes are made
  - Data Distribution mode from Local to Remote Site
  - ~ 2TB
SRDF Groups – Remote to Local Site Setup

- RDF Group 10
  - SRDF/A (asynchronous) from Local to Remote Site
  - z/VM and Linux on System z
  - Consistency maintained across application environment
  - ~4TB

- RDF Group 11
  - Normally suspended
  - Includes z/VM, Linux “Work” devices – page, swap, etc.
  - Data structures of volumes required, but not day-to-day data
  - Synchronized when changes are made
  - Data Distribution mode from Local to Remote Site
  - ~ 0.5 TB
Recovery Objectives

- RPO and RTO in 2005
  - RPO was 3-4 days
  - RTO was ~ 72 hours
- RPO and RTO in 2008
  - RPO 30-60 seconds normally
    - 2-3 minutes, worst case
  - RTO 2-4 hours
- Includes z/OS, z/VM, Linux
- How often it’s tested?
  - Reduced Test Set
    - Test at will –when changes occur with minimal personnel
  - Corporate Participation
    - Two times a year
Recovery Considerations

- z/OS and Linux considerations
  - SAP – distributed application across z/OS and Linux
  - Application environment can be spread across many Linux instances
  - Consistency maintained via SRDF group
  - z/VM environment is also maintained
- Currently manual failover and reintegration between site
- Exploring GDDR for future automation
Backups for z/OS, z/VM and Linux on System z
Backups from z/OS

- Backups taken from local and remote TF clones
- Point in Time backups take 3 times per week from z/OS which includes
  - z/OS
  - z/VM
  - Linux on System z – contained in z/VM minidisks
- All z/VM R2 Clone devices are seen from the z/OS backup LPAR
  - Seen as 100% allocated, no free space
  - No datasets
- Backup products
  - DFDSS
    - use CPVOLUME option to backup z/VM DASD
  - DBS – DASD Backup Supervisor from OpenTech Systems
- 3592 tape drives
Backup Environment - 2011

Local Site (z10)

Remote Site (z10)

FICON Channels

1Gbps 1Gbps 1Gbps 1Gbps

RDF group 2 RDF group 5

RDF group 10 RDF group 11

clone clone

clone clone

R1 R1

R1 R1

R2 R2

R2 R2
WAN Backup – Remote Clone to Local Tape Drives

- Split Clone volumes in remote DMX-4
- Bring remote Clone volumes online to local z10
- Run backup jobs
- Bring remote Clone volumes offline to local z10
- Re-Establish Clone volumes in remote DMX-4
Restoration Options from z/OS

- z/OS
  - Full volume
  - Datasets
- z/VM and Linux on System z
  - Full volume
  - Minidisk - restoration via specific cylinder range
- Restores full volumes encompassing Linux environment
  - Ability to access minidisk, restart Linux and pull information if necessary
Advantages of "WAN Backup"

• Allows us to dual-purpose remote Clone volumes
• Original purpose was DR Tests
• Now used for DR Tests as well as three-times-per-week backups to tape
• Uses network "white space" as most replication traffic was Local --> Remote, while "WAN Backup" traffic is Remote --> Local
Backups from Linux on System z

- Tivoli Storage Manager agents live on Linux
- Incremental file level backups performed nightly
- Tivoli Storage Manager Server lives external to the mainframe environment
  - Current Tivoli Storage Manager 5.4.4
  - Converting to TSM 5.5.4.1
  - Investigating moving to Linux on System z
- Advantage of Linux backups
  - Ability of Linux administrators to restore individual files
Replication Management
Replication Management from z/OS

- z/OS using EMC Software:
  - ResourcePak Base 5.8
  - SRDF 5.6
  - TimeFinder/Clone Snap 5.8
  - TimeFinder Mirror 5.6
  - TimeFinder Utilities 5.4

- Migrating to Mainframe Enablers 1Q2011
Future Plans

• Evaluating Linux next steps
• Planning upgrade to z/OS 1.12 Summer 2011
• EMC GDDR
• Mainframe Enablers
• Investigating other applications to move to Linux
• Symmetrix VMAX
Related EMC Technical Documentation

- White paper: Configuring EMC Symmetrix arrays for Linux-on-System z
- Linux on IBM System z: RHEL 5.x and SLES 10.x Installation and Configuration Guide, P/N 300-007-955, REV A01
- EMC Solutions Enabler Installation Guide