User Experience with DataMart on Linux for System z at FMS

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Overview

• Goals Of the DataMart Project
• VM Environment & Infrastructure for Linux applications
• DataMart Architecture
• Lab Environment a.k.a. “sandbox”
• Establishing the Baseline Application Server
• Server Security Considerations
• Finalizing the Baseline Server & Cloning
• DataMart Server Configuration
• DataMart Developement in the Lab
• Deploying DataMart across 4 Environments
• How is the DataMart doing? Were the goals met?
Goals of the DataMart Project

- Proof of concept – Linux on z Series Application Servers
- Establish the z/VM infrastructure for running SLES-based Virtual Linux Application Servers
- Develop a secured SLES server image for cloning
- Establish Roles & Responsibilities for running Linux on z Series
- Deploy a DataMart for executive review
z/VM Environment for Linux Apps

- IBM z10 w/ 4 IFL's
- Used z/VM 5.2 (currently upgrading to 6.1)
- Virtual switches (trunk & access) used for network access
- zFCP adapters used to access SAN Disk & LTO Tape
- 3390 DASD used for server infrastructure
- SAN Disk used for server data
z/VM Environment for Linux Apps

- Already had a z/VM LPAR established for Linux
- TSM Server used for server backup & restore (both virtual & real)
- CCL Server used for z/OS SNA traffic (replaced 3745 controllers)
z/VM Infrastructure for Linux Apps

• 5 Environments: Lab, Dev, QA, Pre-Prod & Prod
• TSM Linux Server used for SAN Disk backup/restore
• MVS-based backup/restore used for 3390 DASD volumes
• 2-Step Server Recovery:
  1. Restore 3390's via MVS & IPL server
  2. Restore SAN Disk via TSM from running server
• Future: use XRC-based DASD mirroring for 3390 DASD volumes (after VM 6.1 upgrade)
z/VM Infrastructure for Linux Apps

- Servers are associated to one of the 5 environments by connection & name

![Diagram showing server environments]

<table>
<thead>
<tr>
<th>Server</th>
<th>Partition</th>
<th>Volume</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1b0</td>
<td>/boot</td>
<td>60 Cyls</td>
<td></td>
</tr>
<tr>
<td>1b1</td>
<td>/</td>
<td>500 Cyls</td>
<td></td>
</tr>
<tr>
<td>1b2</td>
<td>Swap</td>
<td>VDisk</td>
<td></td>
</tr>
<tr>
<td>1b3</td>
<td>Swap</td>
<td>VDisk</td>
<td></td>
</tr>
<tr>
<td>1b4</td>
<td>Swap</td>
<td>VDisk</td>
<td></td>
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<tr>
<td>1b5</td>
<td>/local</td>
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<tr>
<td>1b6</td>
<td>/var</td>
<td>1019 Cyls</td>
<td></td>
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<tr>
<td>1b7</td>
<td>/usr</td>
<td>2290 Cyls</td>
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<tr>
<td>1b8</td>
<td>/opt</td>
<td>489 Cyls</td>
<td></td>
</tr>
<tr>
<td>1b9</td>
<td>/tmp</td>
<td>5557 Cyls</td>
<td></td>
</tr>
</tbody>
</table>

SHARE in Orlando 2011
DataMart Architecture

• Adopted a 3-tiered Zone Architecture
  • Web (Front-end), App (Middle) and DB (Back-end) zones
  • Determined DataMart servers should reside in back-end DB zone (Info Server and DB Server)

• DataMart Process
  • DataMart Info Server Extracts, Transforms & Loads (ETL) records from DB Servers into the DataMart DB2 Server
  • (AIX) WAS-based App middle server accesses DataMart DB2 server to build reports
  • Executives access reports from HTTP Web server which accesses the WAS-based App server
3-Tier Zone Architecture

- At first, thought that the IBM InfoSphere DataStage server would go in the App Zone...
3-Tier DataMart Architecture

- IBM InfoSphere DataStage Server was relocated in DB Zone for better performance
Lab Environment

- Lab environment is completely isolation from rest of network via a tunnel
- Used isolated lab environment for two major tasks:
  1. Establish server baseline for application servers
  2. Build prototype DataMart servers (w/o baseline)
- Once baseline image is ready, use it for cloning
- Use baseline image to clone new DataMart Servers
Lab Environment (Tunnel)

- Tunnel connects Lab servers to the Lab environment
- Using VLANs to maintain separation between 3 zones.
Establishing the Baseline App Server

- Initially developed SLES 9 prototype baseline servers in Lab
  - SLES 9 was based on a monolithic R/W root file system
  - Discovered IBM InfoServer required SLES 10 (+ bug fixes)
- Built new servers using SLES 10 SP2
  - Server image based on a 3390-9 DASD volume
  - SLES 10 servers were also configured to allow for a read-only root file system
Server Security Considerations

- Established a new security hardened SLES baseline
- Based on security standards used for other (Unix) platforms, including:
  - HIDS (Host Intrusion Detection Software) requirement
    - Failed – working on solution with chosen vendor (Now Solved!)
  - Two-factor authentication, i.e. SecurID requirement
    - Failed – working on solution with vendor (Now Solved!)
  - Single sign-on management software requirement - OK
  - Configuration Management (CM) software requirement – OK
  - Meanwhile, failures are mitigated through external solution
External Security Solution

- 2-Factor authentication must be performed before the servers can be accessed
- Auditing is enabled and Syslog facilities monitored for intrusion activity
Finalizing the Baseline Server & Cloning

- Security Baseline Validation
  - Subjected to a vulnerability scan in the Lab
  - Issues were identified and resolved (patches applied, etc.)

- Deployed baseline server outside of Lab environment
  - Placed on development network segment
  - Confirmed connectivity with infrastructure servers
  - Finalized server baseline image for cloning
Finalizing the Baseline Server

- Final baseline server image takes a whole 3390-9 DASD volume
- Extra space is needed for some of the baseline software, i.e. HIDS, CM & auditing
Cloning the Baseline Server Image

- Cloning uses the Flashcopy Service (when available)
- After cloning, server is IPLed & network reconfigured
- Initially, we are working with a R/W root file system
- Once the baseline image with a R/O root file system is finalized, then will start cloning R/O baseline servers
DataMart Server Configuration

- Two servers were cloned for DataMart from the baseline image and customized:
  - Cloned the baseline image for the IBM InfoServer
    - Installed IBM Information Server Version 8.1
    - Server has 2 CPs, 5 GB Storage, 3390 DASD, no SAN space
    - Also established directory structure for (4) DataMart projects
  - Cloned the baseline image for the DataMart DB Server
    - Installed DB2 Version 9.5 on DB Server
    - Server has 2 CP’s, 2 GB Storage, 3390 DASD + SAN space
z/VM Environment With DataMart

- DataMart Servers were added to z/VM Hosted LPAR with existing infrastructure Linux servers
- Employ z/VM controls as needed – QUICKDSP, SET SHARE
Deployed DataMart in 4 Environments

Deployed 1st pair of servers in Development environment
  • Began ETL testing with a few thousand records
  • Initial testing of DataMart report code

Deployed 2nd pair of servers in QA environment
  • Increased ETL testing to millions of records
  • Further testing of DataMart report code

Deployed 3rd pair of servers in Pre-Prod environment
  • Increased ETL testing to 10's of millions of records
  • Pre-tested using full set of records
  • Final testing/confirmation of DataMart report code
Deploying DataMart in 4 Environments

Deployed 4th pair of servers in Production environment

- Using full set of records
- Records coming from multiple DB sources
- Over 70 million records currently loaded
- Growth rate estimated at over 10 million records annually
- Performing Daily/Weekly/Monthly DB ETLs & Updates
Deployed Configuration

• In this DataMart implementation, DB zone is on z Series
• Web & App zones are on mid-tier (AIX) servers
How is the DataMart Doing?

- Executives are very excited about the DataMart results
- Performance
  - CPU peaks during ETL processing, up to 60-70% (4 IFLs)
  - Storage over commit ratio is 3:1 – so far, so good
- Additional projects are being added to original project
  - Planning to make the DataMart available to a wider audience
- Growing pains
  - As DataMart projects are added, demand for resources increases
    - Already see the need for more CPU, storage and SAN space
Were the goals met?

- We proved the concept – we now have Linux Application Servers running on z Series
- We establish the z/VM infrastructure for running SLES-based Virtual Linux Application Servers
- We developed a secured SLES server image for cloning
  - However, still resolving a couple of issues (Resolved now!)
- We establish roles & responsibilities for running & maintaining Linux App Servers on z Series
- We deployed a DataMart for executive review
Next Steps

• Planning to upgrade Info Server & DB2 versions
  • Developing a server upgrade & roll-out strategy
• Upgrading z/VM to Version 6.1
  • Planning to employ XRC-based DASD mirroring
  • Employing new SSL Server for secure access to z/VM
  • Employing Terminal Server for centralized access to servers
• Creating another Linux LPAR for Production Linux servers
• Preparing to add another project that completed a proof of concept in the Lab environment
Thank You For Attending!

- Questions?

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