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User Experience with DataMart on Linux for System z at FMS

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Overview

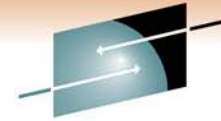
- Goals Of the DataMart Project
- VM Environment & Infrastructure for Linux applications
- DataMart Architecture
- Lab Environment a.k.a. “sandbox”
- Establishing the Baseline Application Server
- Server Security Considerations
- Finalizing the Baseline Server & Cloning
- DataMart Server Configuration
- DataMart Development 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

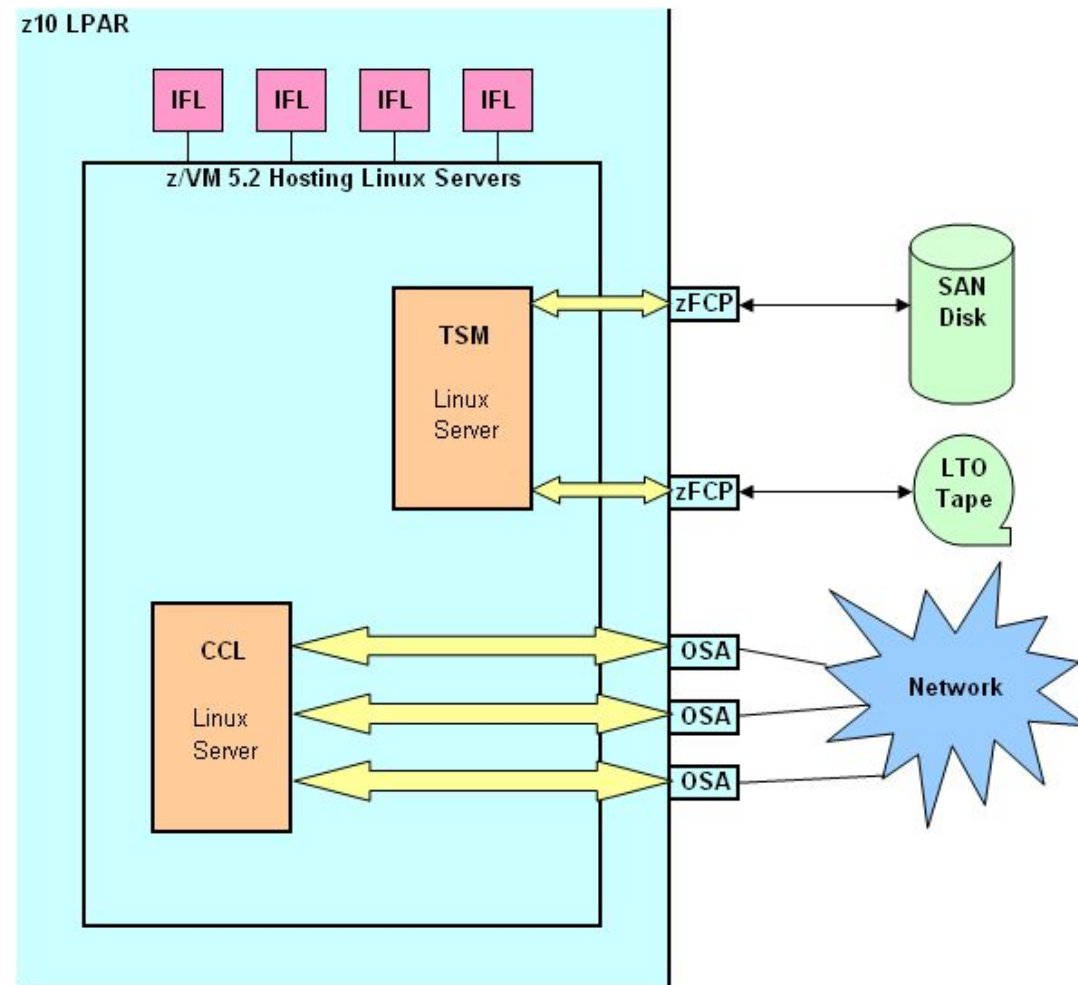
z/VM Environment for Linux Apps

- 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)



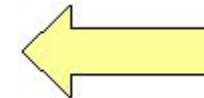
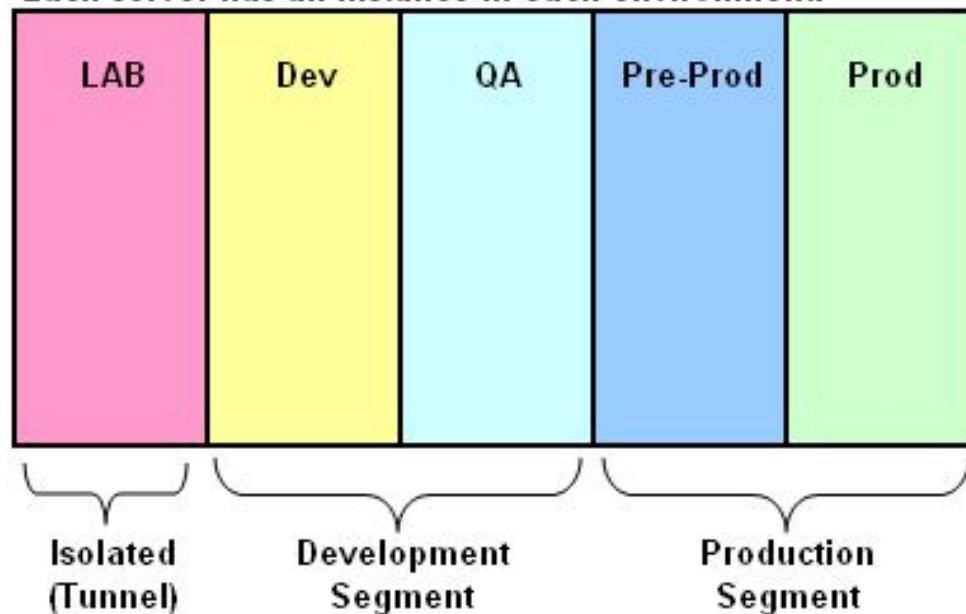
z/VM Infrastructure for Linux Apps

- 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

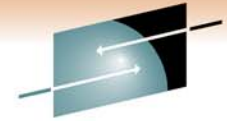
Each server has an instance in each environment:



3390-9 (10016 Cyls)		
1b0	/boot	60 Cyls
1b1	/	500 Cyls
1b2	Swap	VDisk
1b3	Swap	VDisk
1b4	Swap	VDisk
1b5	/local	100 Cyls
1b6	/var	1019 Cyls
1b7	/usr	2290 Cyls
1b8	/opt	489 Cyls
1b9	/tmp	5557 Cyls

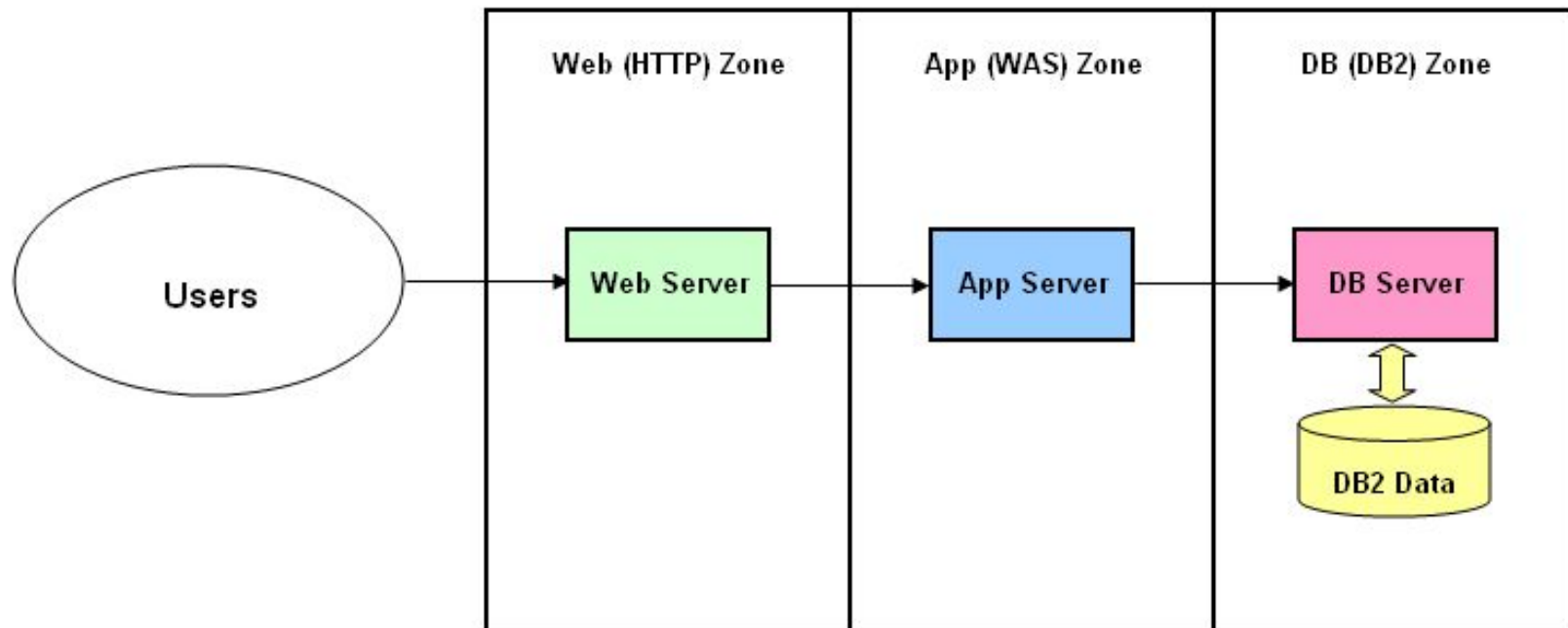
DataMart Architecture

- 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

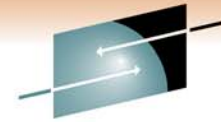


3-Tier Zone Architecture

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

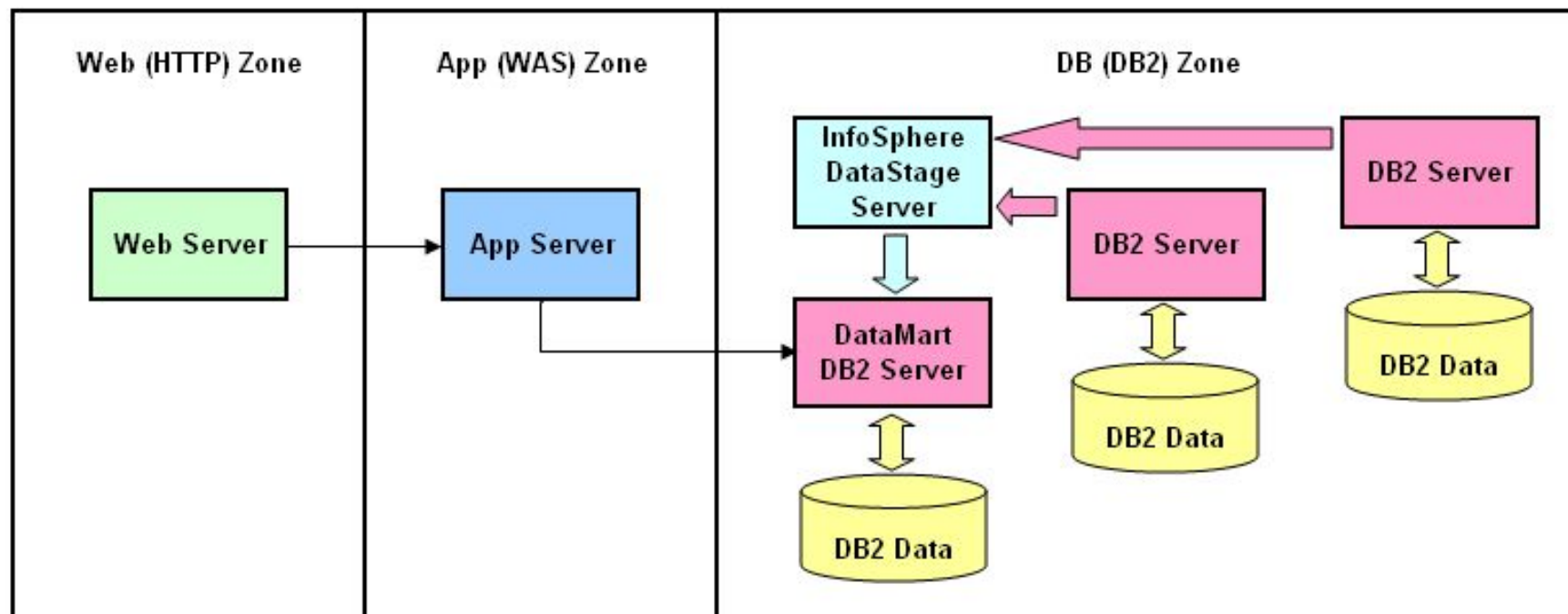


Zones Are Separated By Firewalls



3-Tier DataMart Architecture

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



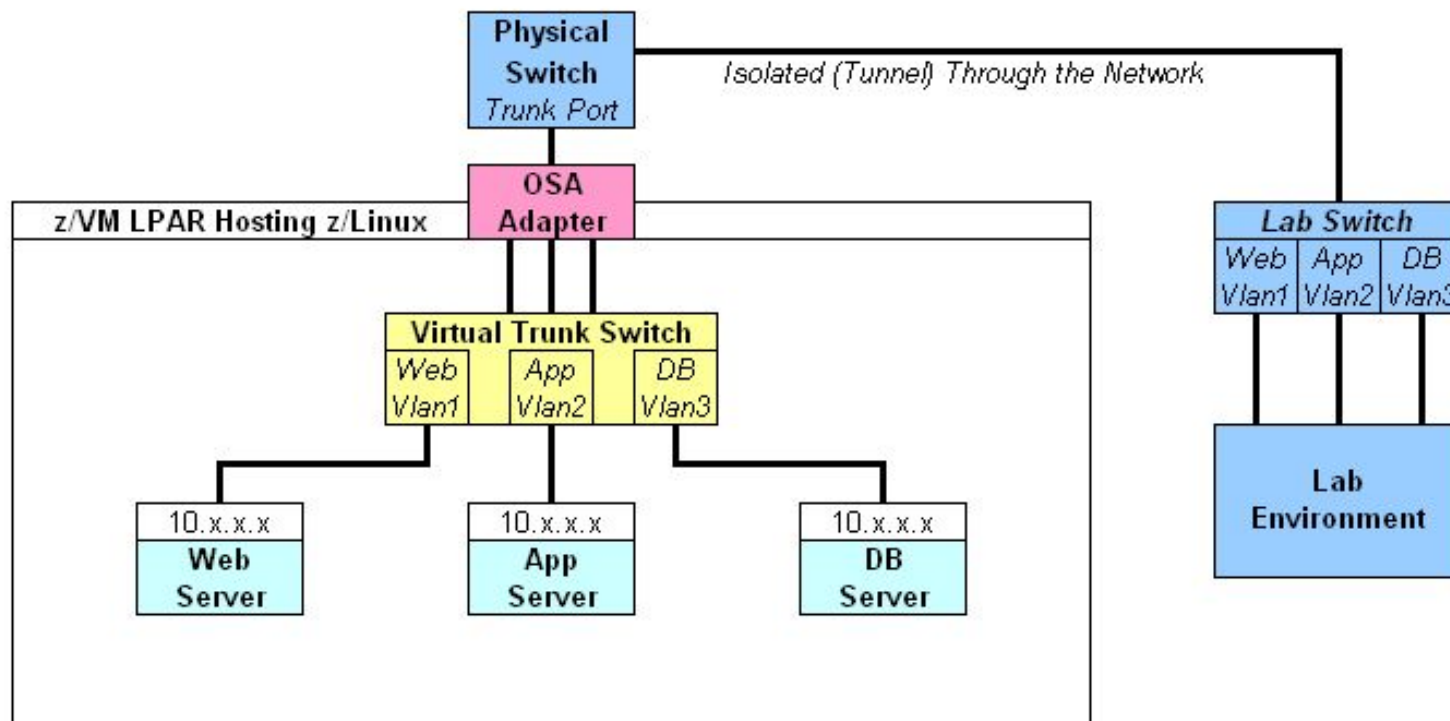
3-Tier Zone Structure For DataMart

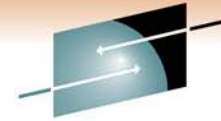
Lab Environment

- 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.

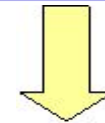




Establishing the Baseline App Server

- 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

3390-3 (3339 Cyls)		
100	/	3038 Cyls
101	Swap	VDisk
102	Swap	300 Cyls



3390-9 (10016 Cyls)		
1b0	/boot	60 Cyls
1b1	/	500 Cyls
1b2	Swap	VDisk
1b3	Swap	VDisk
1b4	Swap	VDisk
1b5	/local	100 Cyls
1b6	/var	1019 Cyls
1b7	/usr	2290 Cyls
1b8	/opt	489 Cyls
1b9	/tmp	5557 Cyls

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
 - Two-factor authentication, i.e. SecurID requirement
 - Failed – working on solution with vendor
 - Single sign-on management software requirement - OK
 - Configuration Management (CM) software requirement – OK
 - Meanwhile, failures mitigated through external solution

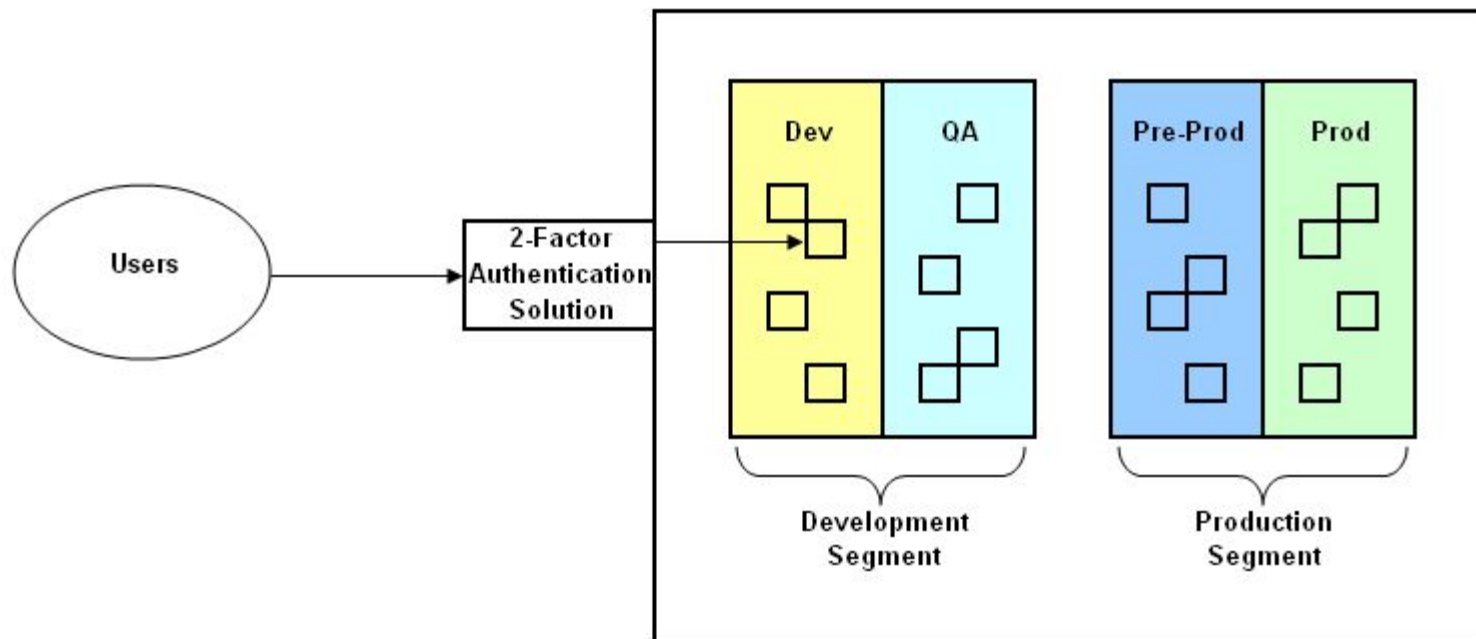


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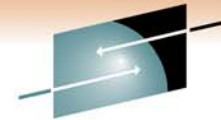
External Security Solution

- 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

R/W Server Configuration

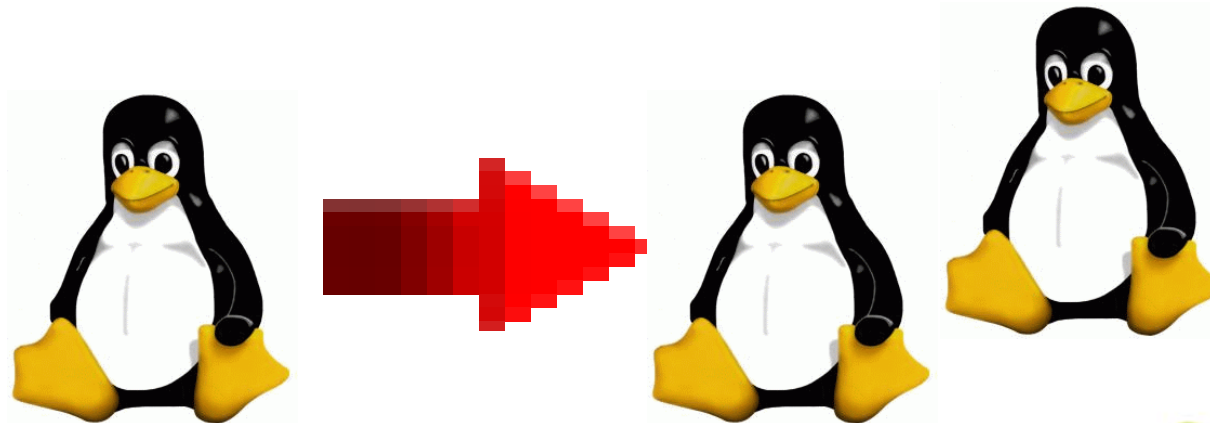
1b0	/boot	R/O	60 Cyls
1b1	/	R/O	500 Cyls
1b2	Swap	VDisk	64 MB
1b3	Swap	VDisk	64 MB
1b4	Swap	VDisk	512 MB
1b5	/local	RAW	100 Cyls
1b6	/var	RAW	1019 Cyls
1b7	/usr	R/O	2290 Cyls
1b8	/opt	R/O	489 Cyls
1b9	/tmp	RAW	5557 Cyls

Total Cylinders: 10015 100%

3390-9 (10016 Cyls)		
1b0	/boot	60 Cyls
1b1	/	500 Cyls
1b2	Swap	VDisk
1b3	Swap	VDisk
1b4	Swap	VDisk
1b5	/local	100 Cyls
1b6	/var	1019 Cyls
1b7	/usr	2290 Cyls
1b8	/opt	489 Cyls
1b9	/tmp	5557 Cyls

Cloning the Baseline Server Image

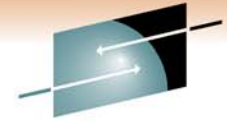
- Cloning uses the Flashcopy Service (when available)
- After cloning, server is IPLed & network reconfigured
- Initially, we are working with a R/W root file system
- Once the baseline image with a R/O root file system is finalized, then will start cloning R/O baseline servers



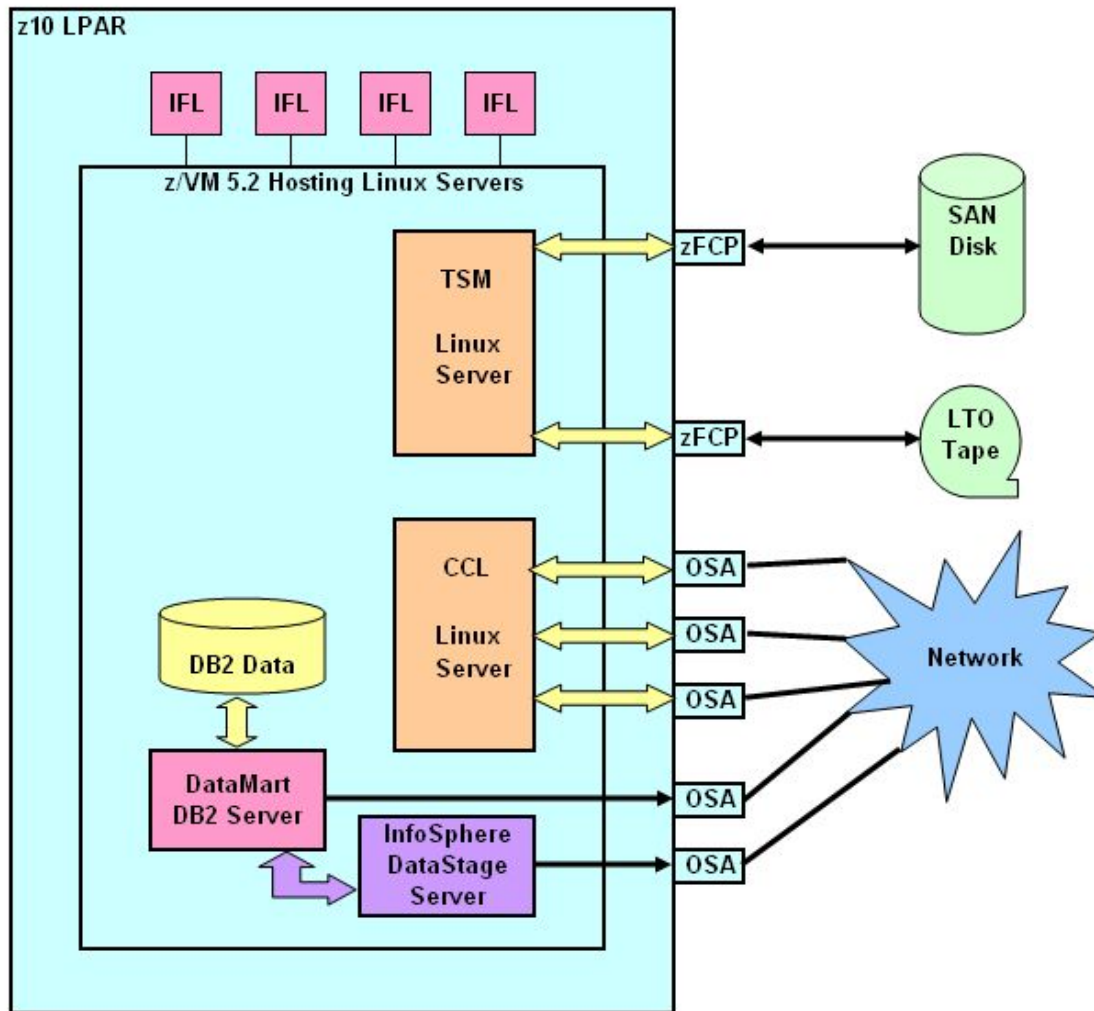
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DataMart Server Configuration

- 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 7.5.1
 - 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



Deploying 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

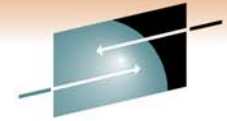
Deployed 3rd pair of servers in Pre-Prod environment

- 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

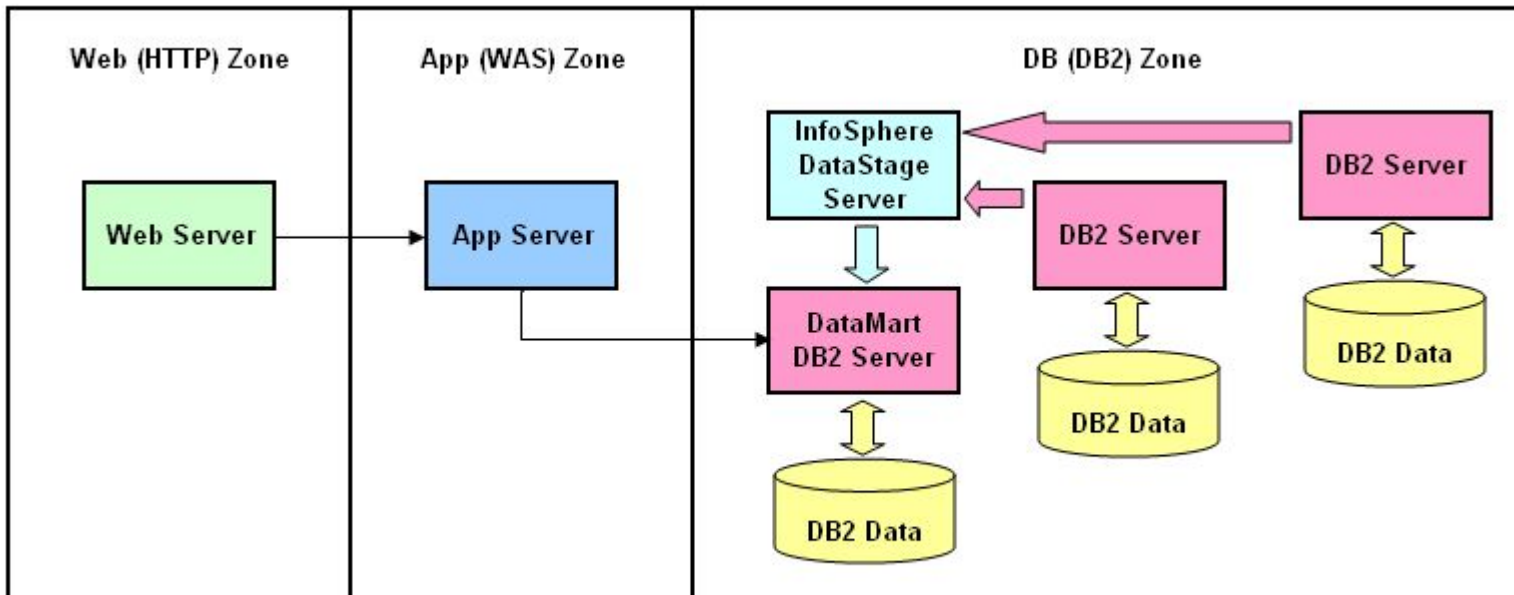
Deployed 4th pair of servers in Production environment

- 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



3-Tier Zone Structure For DataMart

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
- We establish roles & responsibilities for running & maintaining Linux App Servers on z Series
- We deployed a DataMart for executive review