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Simplifying Linux Under z/VM

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Agenda

- z/VM hurdles for Linux administrators
- Linux obstacles for z/VM system programmers
- Aspirin & Tylenol for Linux and VM folks
- A solution...



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Background

Who Is Linuxcare?

- Founded in 1998 to provide enterprise Linux support
- Deep technical expertise in Linux
 - Recently added z/VM mainframe expertise as well
- Custom technologies delivered: IBM, HP, Sun, et al.
- Also provide certification and service: IBM, Dell, etc.
 - Multi-distribution developer support
 - Configuration support for PC Linux customers
 - Security audits
 - etc...
- 2002: Adding enterprise products to the mix!



Linux In the Data Center

- Linux offers excellent business case with good ROI
- Linux on zSeries with z/VM can be even better
 - Linux on z/VM == huge savings for large shops
- Linux overall is a somewhat immature technology
 - Needs care & feeding
- z/VM–Linux combination offers administrative challenges:
 - Network configuration
 - Integration with existing process frameworks
 - Account management, change management, etc.



Linux In the Data Center

More challenges:

- Relatively few, public success examples
 - Winnebago, Boscov's, Korean Air, et al.
 - But do they apply to *your* business?
 - Many more known to exist, but not public
- Difficulty generating cost saving projections
 - “Too good to be true” numbers easy to produce



Linux In the Data Center

- Confusion about
 - Applicability
 - Pricing
 - Vendor commitment and direction
- Which applications?
 - DNS, firewall
 - File & print, mail
 - Static web serving, dynamic web serving



Linux In the Data Center

- Lack of enterprise-quality tools
- Skills availability
 - “We don’t know z/VM”
 - “We don’t know Linux”
- Uniqueness/risk of Linux on z/VM
- Fear and emotion
 - “Server consolidation” = “**layoffs**”?
- Biggest challenge: “culture clash” between mainframe and distributed staff
 - Besides “turf wars”, even terminology is different!



Linux In the Data Center



“That’s not a data center...”



“Now, *that’s* a data center!”
— Crocodile Dundee



Linux In the Data Center

- Linux on z/VM requires collaboration and “buy-in” across multiple teams
- “Simple” Samba deployment involves:
 - NT team: Application source & client support
 - Unix team: Application porting, ownership, support
 - Networking: HiperSockets–Ethernet integration
 - Mainframe: z/VM platform support
- Any Linux on z/VM deployment requires 2, 3, and 4

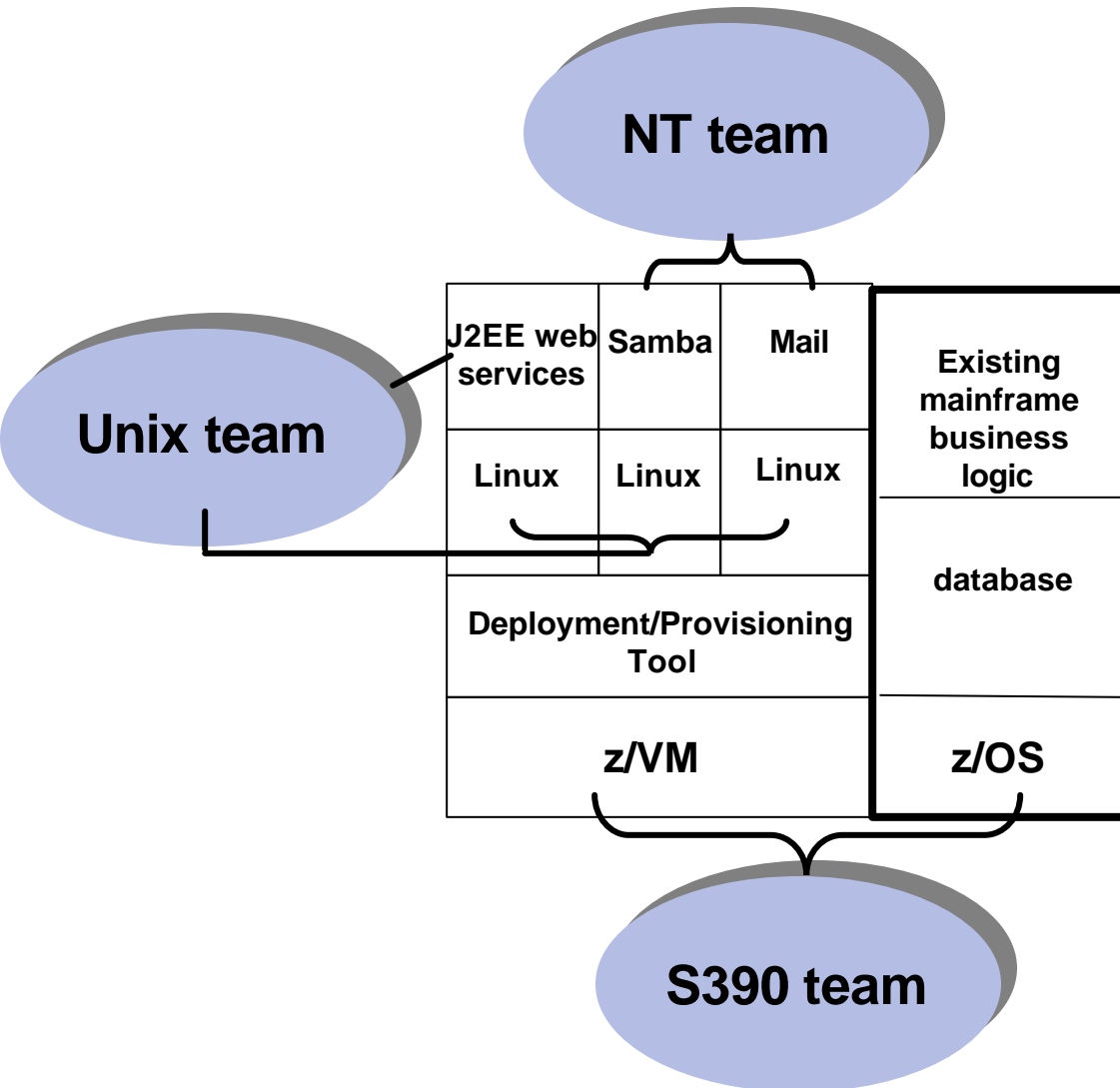


Best Practices: Linux with Data Center RAS

- Tremendous value found in data center processes
 - Disaster recovery/auditability
- Cross-team synergy
 - Managed self-service
 - Better integration of front end/back end systems
- Cost reduction
 - TCO analysis



Linux Affects All Platform Teams



Success is:

- 1) Realizing the promise of server consolidation

Success requires:

- 1) Executive sponsorship
- 2) Mainframe team providing **managed self-service** to distributed teams



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**z/VM and Linux
Annoyances**

z/VM Hurdles for Linux Folks

Itches for the seasoned Linux admin:

- Strange new IBM terminology
 - DASD == hard drive
 - Core == storage == memory == RAM
 - Storage <> disk space!
 - User == user or Linux image?
 - IPL == boot
 - IML == BIOS (more or less)
- Oddly ordered IBM documentation
 - SLSS
 - Bookshelf hard to find on the Web (well, all IBM pages can be hard to find on the Web...)



z/VM Hurdles for Linux Folks

- OCO drivers
 - Means must rely on IBM to fix problems
 - Alien to Linux theology and practice
- Gaining VM expertise is difficult
 - Not very many VM HOWTO documents out there
 - VM Primer manual no longer published
 - Little VM training available
 - No “VM For Dummies” (yet!)
 - Friendly, helpful VM community, however!
 - VMESA-L can be a lifesaver



z/VM Hurdles for Linux Folks

- Hardware is strange and different
 - Boy, that's a big tape drive!
 - And a big tape...yet it only holds **how** much?
 - 3215/3270 is very alien
 - Block mode
 - OK, PF keys are Function keys, but PA keys??
 - Wow, a whole laptop as a system console (HMC)!
- Brand new editors (XEDIT)
 - RECFM F, RECFM V, serial numbers...
 - Coupled with 3270 strangeness, **very** confusing
- All a part of learning the z/VM theology!



Linux Obstacles for Vmers

Itches for the grizzled VM sysprog:

- Case sensitivity
 - This is a surprisingly hard one to learn!
- Vowel shortage
 - VM commands are English; Linux commands are Hrd2Rd
- New and different UNIX terminology
 - “Mount” not “ACCESS”
 - What do you mean, “It’s in another file system”?
 - “How do I specify record format?”



Linux Obstacles for VMers

- ASCII
 - “Why can’t they use EBCDIC like everyone else??”
- File system fragility
 - Possible data loss after uncontrolled shutdown even after fsck (with default filesystem)
 - Hard to believe in a technology > 30 years old!
- Strange editors...none of which work on 3270s!
 - (Ok, ed and ex...but they're evil; maybe NED)
- “What do you mean, ***anyone*** can read the source?”
 - VMers believe in source—but not for end-users!
- HELP isn’t help
 - HELP is man



Long-Term z/VM Headaches

- DASD management
 - Each new guest is a new install—wasteful!
- Deploying Linux instances takes time...
 - Resource allocation & z/VM user creation
 - Moving data from .iso to CD-ROM to tape to...
- Networking with z/VM's TCPIP virtual machine
 - CTC, IUCV, Guest LANs – all have issues
 - OBEYFILE has had a lot of problems
- Tuning z/VM & Linux for optimal app performance
 - Poorly documented Linux tuning APIs
 - No existing VM tools for “watching” Linux guests



Long-Term Linux Headaches

- Linux is a greedy guest:
 - Doesn't run in a DCSS
 - Wants to hog the CPU
 - Needs gobs of DASD to be comfortable
 - Likes to have lots of storage (which means lots of paging)
- Hard to manage the configuration of Linux VMs
 - Many folks give up at ~20 production systems
- Difficult to integrate with ESMs
 - Can integrate well with LDAP, NIS, NIS+ ESMs
 - General problem of Linux user administration



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z/VM Aspirin

and

Linux Tylenol

Some Quick VM Solutions

- DASD Management
 - Use DISKMAP if not using VM:Secure/DirMaint!
 - Talk to your elder bears
 - Encapsulate DDR sequence in DISKCOPY EXEC
- Route to a Linux instance, instead of the z/VM stack
 - Allows custom firewalling
 - Faster network configuration, with no need to bring down the TCPIP virtual machine
- Networking: Apply recent PTFs to z/VM 4.2
 - Fixed Guest LAN HiperSockets emulation
 - Fixed many OBEYFILE issues



Apply Required VM Service

- TCP/IP PTFs:
 - UQ61461 Guest LAN fixes
- CP PTFs:
 - UM30225 Guest LAN fixes
 - UM30230 Hard CP loop when short on real CHPIDs
 - UM30290 HiperSockets/OSAExpress QDIO input queue stall
 - UM30495/6 Second DEFINE NIC fails after UM30230



Some Quick Linux Solutions

- Linux is a poorly behaved guest
 - Assumes it owns the entire physical system
 - Uses all storage, lots of CPU, etc.
- Some techniques to minimize the effects:
 - Use the “notimer” patch—it helps a lot!
 - Use VDISK for swap!
 - Consolidate DASD (see next slide)
- Watch paging carefully, especially 2nd level:
 - Disable z/VM minidisk cache if page space short
 - Three levels of paging is Badness – smaller virtual storage may be better

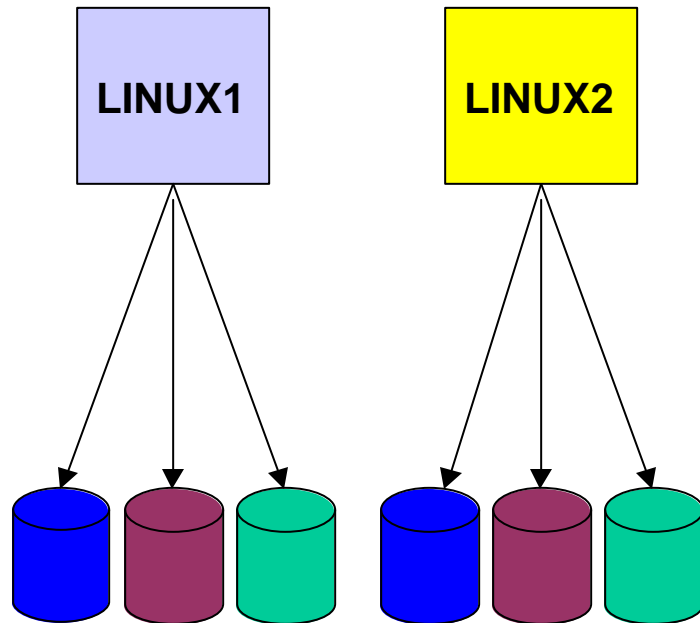


DASD Consolidation

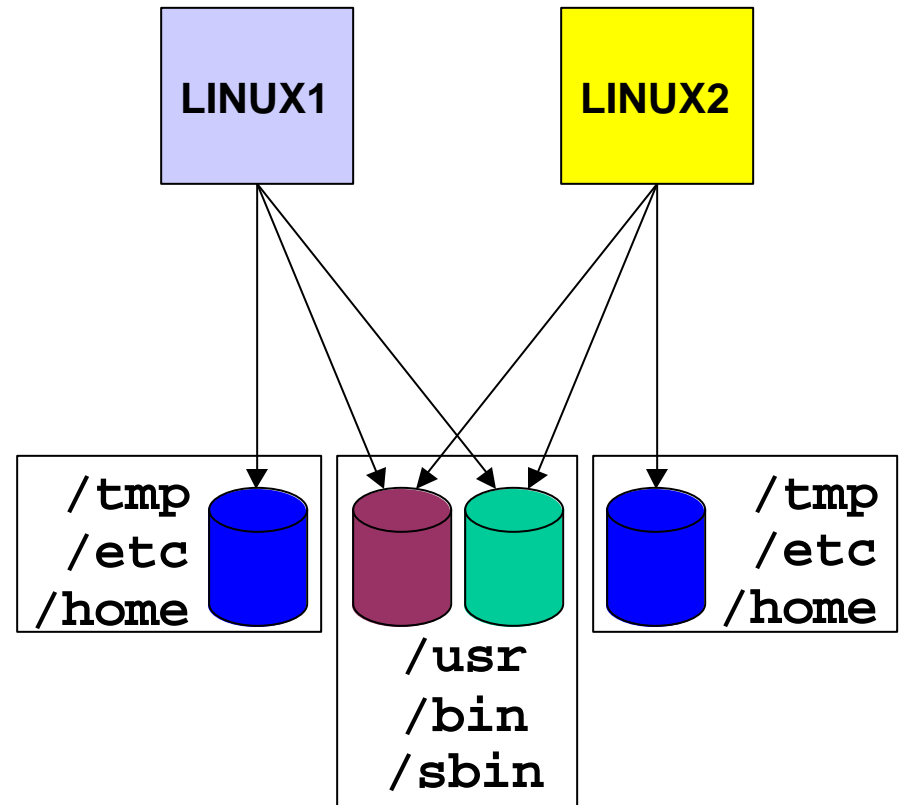
- Means using shared data to save space
- Common issue for Linux on S/390
 - Minimal Linux install at least 700 3390 cylinders
- Consolidation candidates include anything which is read-only and identical across multiple Linux instances
 - Theoretically all except /home, /var, /etc, and /tmp
 - Can be complicated, using RAMdisks, etc.
- Consolidation can save lots of DASD quickly, but...
 - Makes production upgrades more complex
- Implement using NFS or shared read-only DASD
 - Both have advantages/disadvantages



DASD Consolidation



Unshared DASD:
Private copies of
all directories



Shared DASD:
Single copy of
common, R/O data



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A Solution...

Linuxcare Relieves the Pain...

Levanta – A Linux instance manager for VM

- Completely new product
- Far beyond “cloner” functions of other products
- Created **by** Linux and VM people, **for** Linux and VM people!
 - Native VM and native Linux components



Levanta Version 1.0

- Rapid Linux instance creation and cloning:
z/VM virtual machines, Linux, applications
- Configuration change management (apply, rollback)
- Three administration interfaces
 - Web, Linux, CMS (command line; full-screen soon)
- ESM integration (VM:Secure, DirMaint)
 - Maintains existing infrastructure, operations
- Automated DASD sharing and consolidation
 - Read-only Linux binaries placed in shared DASD
 - File server redundancy avoids single point of failure



Levanta Functions

- Manage instance groups with an intuitive tool
 - Provision/deployment time reduced to 2 minutes
 - Deploy updates across servers simultaneously
 - Cycle instances remotely
- Enable change & configuration management
 - Change management
 - Rollback to prior stable version
 - Configuration templates
 - Support can have complete system copy
- Execute functions inside an instance (individually controllable by Levanta administrator)



Levanta Functions

- Instance groups
 - Startup/shutdown Linux instances en masse
 - Add/remove/modify packages
 - Schedule start-up of instances
- Package pools
 - Logical definition of a set of Linux programs
 - Can be manipulated as a single object
 - Aid in defining/controlling instances



Levanta Functions

- Templates
 - Essential concept in understanding Levanta
 - “Cookie cutters” to create Linux instances
 - Template + change log define Linux configuration
 - Change log can be “harvested” into new template
 - Untracked instance changes can be “refreshed” into change log
 - Defined in XML documents: editable, sharable



Levanta User Interface

- Users can use interface of choice
 - Unix, z/VM, and Web UIs
 - Improves collaboration, cooperation
 - Operate against single abstraction layer
- Granular functionality by user type
 - Three administrator skill/permission levels
 - Linux functions for Linux administrators
 - VM functions for VM administrators



Levanta User Interface

- Internationalization fully enabled
 - American English at GA, other languages to follow
- Use case-driven design and development
- Web interface portable and high-performance
 - All HTML, no Java etc.
- Full change log search capabilities
- Command line clients mean all functions scriptable



Levanta User Interface

Logged in as **root@localhost** (System Admin) Log Out

 **LEVANTA**

Main Menu


<h3> User Accounts</h3> <ul style="list-style-type: none">• Create User• View / Modify User• Search for a User• Delete User• Change User's Password• Create User Group• Search for a User Group• View / Modify User Group• Delete User Group	<h3> Linux Instances</h3> <ul style="list-style-type: none">• Create Linux Instance• View / Modify Linux Instances• Search Linux Instances• Delete Linux Instances• Shut Down Linux Instance• Start Up Linux Instance• Export XML Template	<h3> Instance Groups</h3> <ul style="list-style-type: none">• Create Instance Group• View / Modify Instance Group• Search Instance Groups• Delete Instance Group• Shut Down Instance Group• Start Up Instance Group
<h3> Package Pools</h3> <ul style="list-style-type: none">• Create Package Pool• Delete Package Pool• View / Modify Package Pool• Search for a Package Pool• Add Package to Package Pool• Search for a Package	<h3> Instance Templates</h3> <ul style="list-style-type: none">• Create Instance Template• View / Modify Instance Template• Search Instance Template• Delete Instance Template• Import XML Template• Export XML Template	<h3> Change Management</h3> <ul style="list-style-type: none">• Find and Roll Back Transactions• Instance Transaction Log <hr/> <h3> Levanta Administration</h3> <ul style="list-style-type: none">• View Fileserver Log• View Version Information

License | Contact Server build: 1.0-8.29, Thu Aug 29 03:00 EDT


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Levanta User Interface

Logged in as **root@localhost** (System Admin) [Log Out](#)

[Main Menu](#)

 [User: View / Modify](#)

If you wish to modify this user, click "modify" next to the section you wish to edit.
To change permissions, select the appropriate link in the Permissions section, and follow the instructions on the subsequent page.

General Information		[modify]
Name:	johnu	
Description:	John Q User	
User Owner:	root	

View/Modify Permissions	
User-related permissions	Usergroup-related permissions
Instance-related permissions	Instancegroup-related permissions
Instancetemplate-related permissions	Set package-related permissions

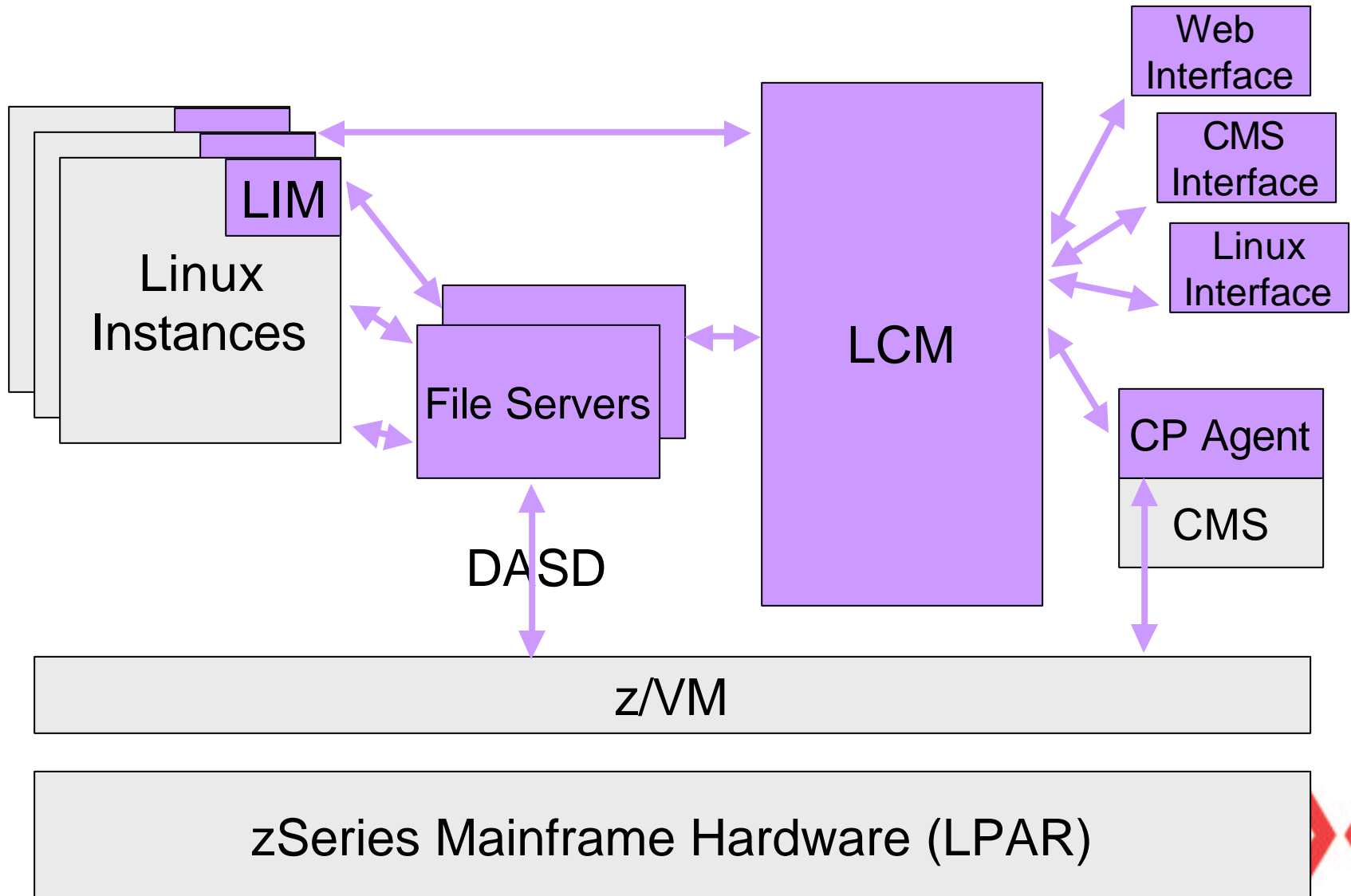
[MAIN MENU](#)

[License](#) | [Contact](#) Server build: 1.0-8.29, Thu Aug 29 03:00 EDT

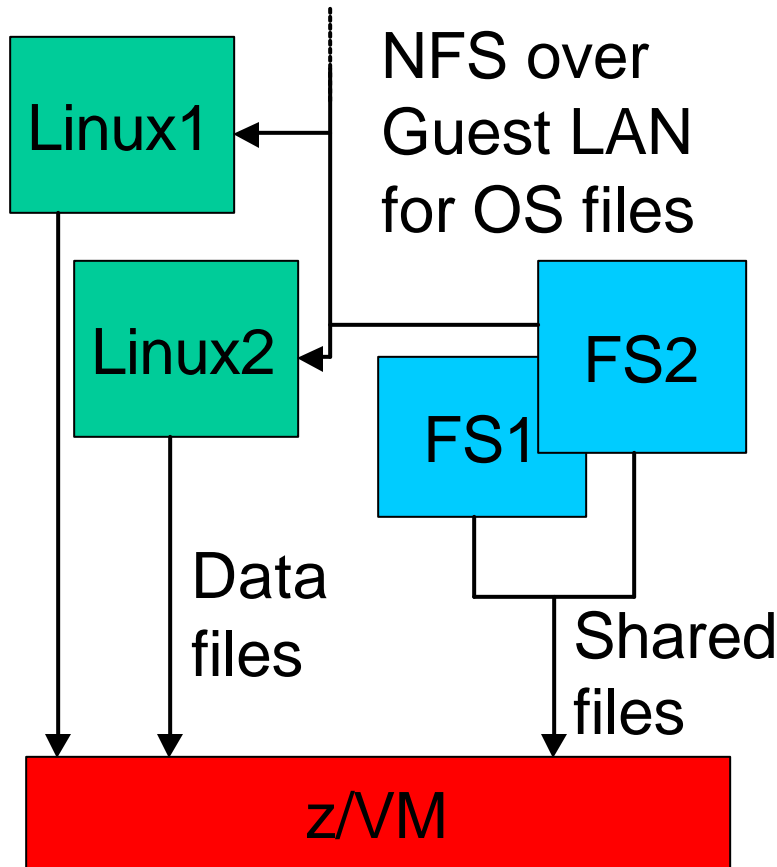
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Levanta Architecture



Levanta DASD Consolidation



Remaps files: Specific files/copies accessible only by owning instances

Is redundant: Can failover to ensure instances stay up

Bypasses shared R/O minidisk limitations:

- Need not relPL to update filesystems
- Enables fast file deployment
- Each file exists *once* no matter how often used
- Far more manageable as usage grows



Private vs. Consolidated DASD

- Situation: 20 web servers, each with 20MB of data and configuration files, 300MB of operating system files

	Individual	Consolidated
Data	20*20MB = 400MB	20*20MB = 400MB
OS files	20*300MB = 6GB	1*300MB = 300MB
Total	6.4GB	700MB



Levanta Benefits: Force Multiplier

- **Provides “force multiplier” capability:**
Can double system administrators’ effectiveness
 - Create Linux instances quickly and accurately
 - Create Linux server templates to leverage scarce skills and speed provisioning
 - Meet urgent requests for new servers by creating instances from templates in minutes
 - Group instances to leverage administration across several instances
 - Maximize administrative operational expense savings



Levanta Benefits: Best Practices

- **Enables data center best practices with Linux: Alleviates deployment and operational issues**
 - Improve change management processes with change logging/rollback
 - Codify best practices templates and groups
 - Control server configurations throughout solution development cycle
 - Standardize software deployment via package pools
 - Tailor access through user permissions
 - Integrate with existing management frameworks



Levanta Benefits: Collaboration

- **Team collaboration shortens pilot process**
 - Encourage team collaboration among Linux, mainframe, NT, networking, and other experts
 - Enable mainframe team to provide “managed self-service” access
 - Reduce cultural barriers via multiple, familiar interfaces
 - Provide safe, reasonable flexibility with granular access permissions



Levanta Timeline and Futures

- **Limited availability:** Now
- **General availability:** October 15, 2002

Possible enhancement areas:

- Console management
 - Both active (operational) and spool files
- Integration with system management frameworks
 - Tivoli Enterprise Console interface, BMC Patrol...
- Performance management
 - Quick “What are my Linuxes doing?”
 - Control if (when!) one is being a hog



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Summary

Conclusions

- Moving to Linux on z/VM can be very beneficial, even fun, but also causes pain for both Linux and z/VM folks
 - The combination is a new platform
 - New challenges to both communities
- The climb is worth the view, especially with some planning and tools
- Work with your fellow admins & sysprogs
 - Subscribe to LINUX-390@marist.edu and VMESA-L@listserv.uark.edu
 - Scan the list archives
- Linuxcare and Levanta can help!
 - “Operators are standing by...”



Questions?

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SERVERS RUNNING LINUX

