Linux Platform Options – Selecting Linux on zSeries

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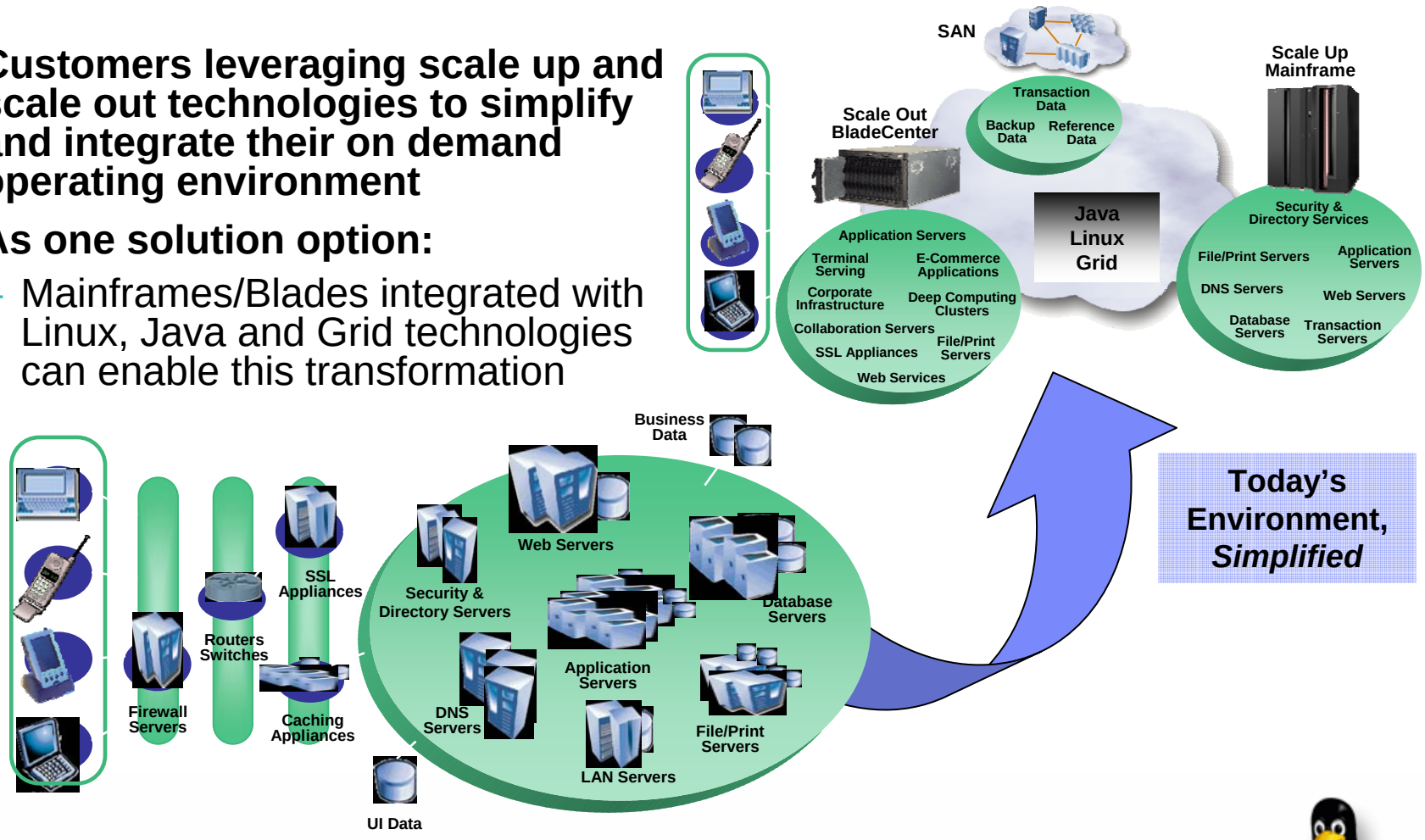
Linux Platform Options – Selecting Linux on zSeries *Session 9202*

- **Datacenters planning to adopt Linux have a key architectural choice to make in designing large-scale implementations.**
- **Is the best approach to running Linux scale-out with rack-optimized servers, to scale-up with large SMP servers, or use virtualization facilities to run many images on a single server?**
- **In this session, Jim will examine the different options and their respective advantages and disadvantages and discuss some guidelines for making this critical choice based on workload and application requirements.**
- **For many users, Linux on zSeries may be the optimal choice.**
- **Jim will describe how Linux on zSeries, in combination with z/VM, will provide a robust Linux environment which integrates well with z/OS.**

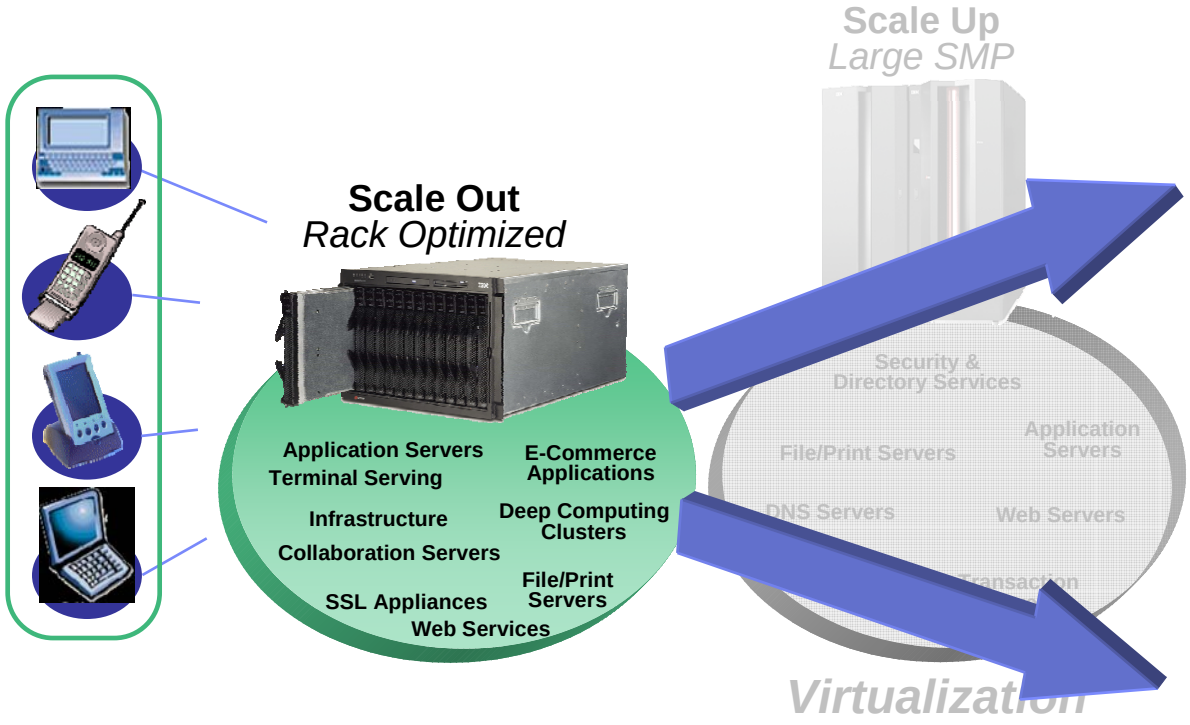
Scale-Up, Scale-Out, Virtualization

Infrastructure Simplification

- **Customers leveraging scale up and scale out technologies to simplify and integrate their on demand operating environment**
- **As one solution option:**
  - Mainframes/Blades integrated with Linux, Java and Grid technologies can enable this transformation

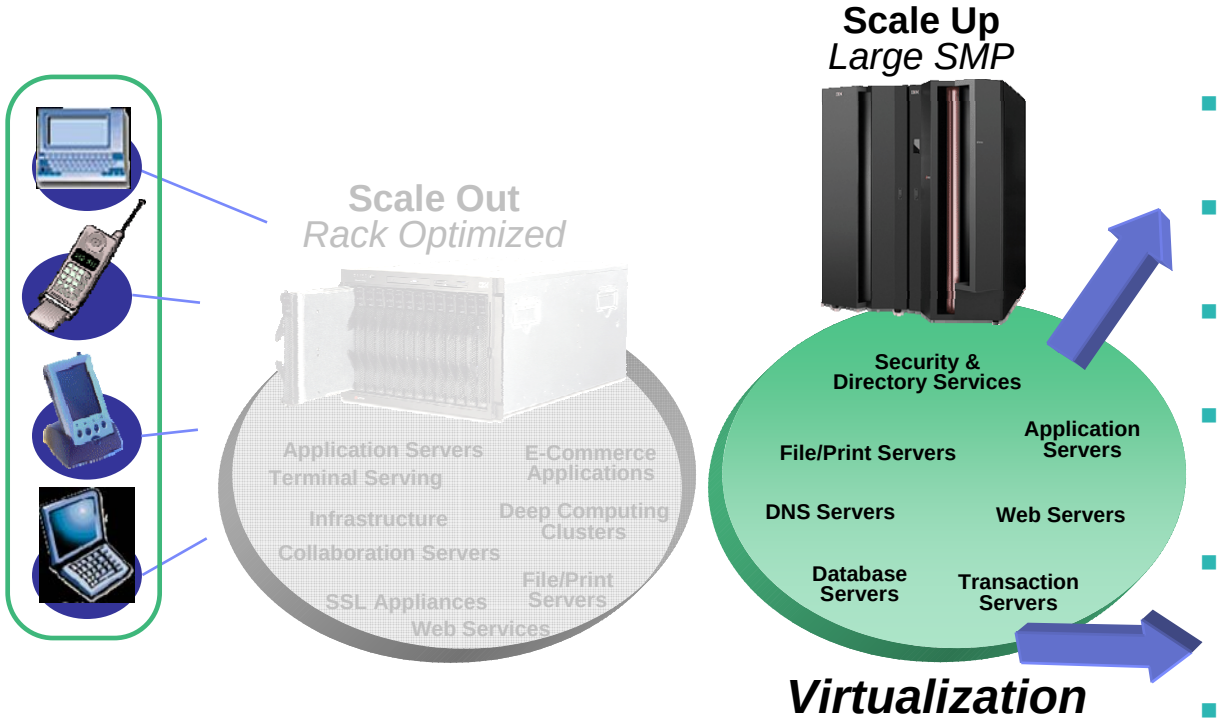


Ideal rack optimized implementations



- **Clustered workloads**
- **Distributed computing applications**
- **Infrastructure applications**
- **Small database**
- **Processor and memory intensive workloads**
- **Centralized storage solutions**

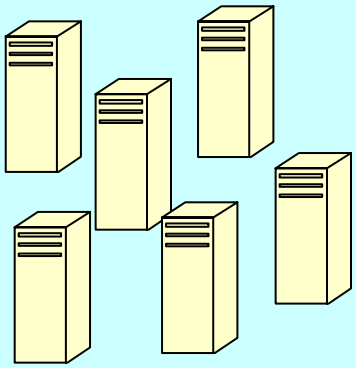
Ideal large SMP implementations



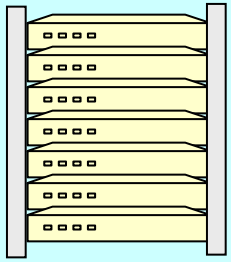
- High performance transaction processing
- I/O Intensive workloads
- Large database serving
- High resiliency and security
- Unpredictable and highly variable workload spikes
- Low utilization infrastructure applications
- Rapid provisioning and re-provisioning

Server Consolidation: Cost Savings and Operational Efficiency

Physical Consolidation

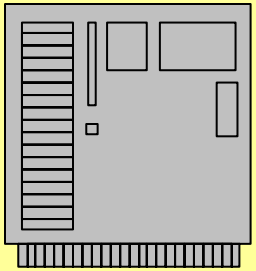


Multiple Locations



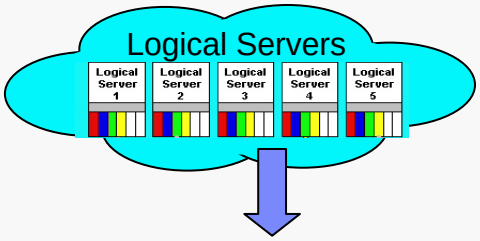
"Rack and Stack" in one location

Workload/Hardware Consolidation

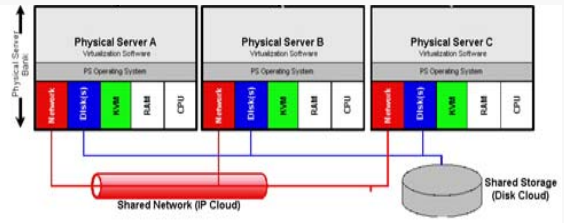


Single Multiprocessor System

Operations Consolidation



Solution engine provisions server resources as needed

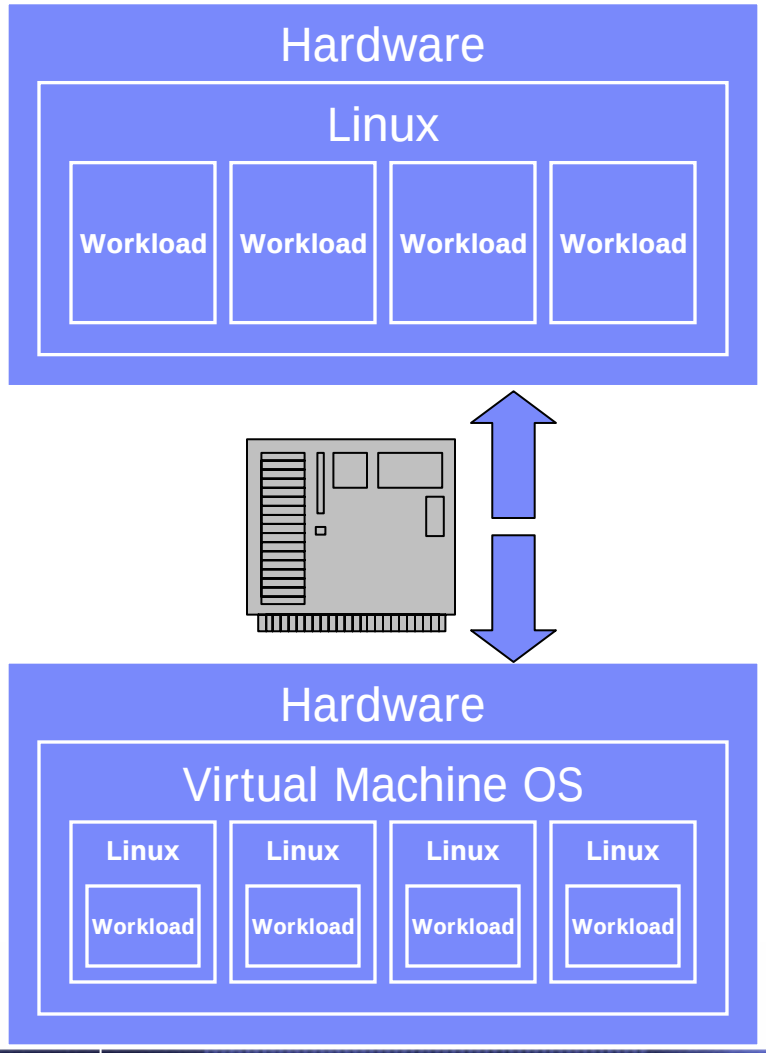


Workload vs. Operations Consolidation

- **Workload consolidation**
  - Focus on hardware cost savings
  - Operating system-level approach
  - Needs single operating system
  - No application changes
  - Simpler, potentially more robust
  - Shorter timescales
- **Operations consolidation**
  - Focus on operational effectiveness
  - Application-level approach
  - Can support multiple operating systems
  - May need application (server) changes
  - Potentially more functional
  - Longer timescales

Bottom line: Both are valid approaches with overlapping but distinct benefits.

Workload Consolidation vs. Workload Scalability



- **Issues**
  - Which is best? Native Linux or VM?
  - If native Linux, will it scale?
  - If native Linux, will it handle multiple workloads?
  - If VM, who does what?
- **Rule of Thumb**
  - If you have one very large workload, use Linux natively
  - Sweet spot for VM is server consolidation

Consolidation Factors

- **Hardware costs**
  - CPU, storage, network (cables, routers, etc.), maintenance support
- **Software costs**
  - Product, service and support
- **System occupancy costs**
  - Space, power, special environment requirements
- **People, services, etc.**
  - FTEs, financing, etc.
- **Hidden factors**
  - RAS
  - Vendor choice
  - Time to market, new business opportunities

Design / Architect Continuum – A General "ROT"

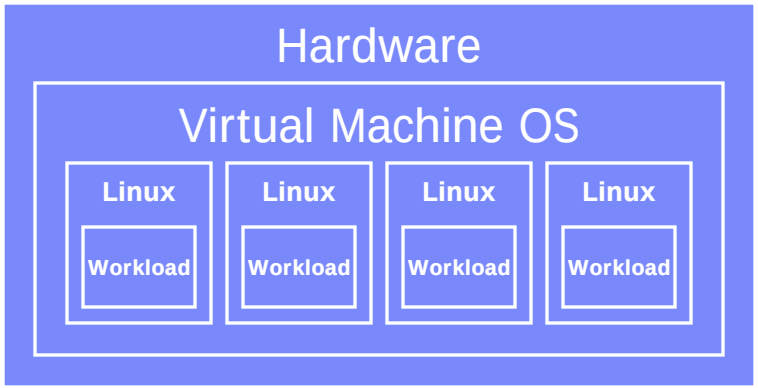
- **x86**
  - Few servers
  - Moderate to high average CPU % busy
  - Low I/O requirements
- **OpenPower, pSeries, iSeries**
  - CPU intensive
  - Large memory
  - LPAR benefits
  - Moderate I/O
- **zSeries**
  - Many servers
  - Low to moderate average CPU % busy
  - Virtual servers on demand
  - High I/O requirements

Software for Linux on various platforms

- **Most Open Source server software will run on any architecture**
- **Intel x86**
  - Largest volume of commercial software
- **Intel Itanium**
  - Limited commercial software – primarily databases, compute intensive, and ERP
- **AMD 64, Intel EM64T**
  - Tolerates x86 software, limited exploitation
- **IBM POWER – OpenPower, iSeries, pSeries, BladeCenter JS20**
  - 1000+ commercial applications available
- **IBM zSeries**
  - 900+ commercial applications available

Linux Under VM for Workload Consolidation

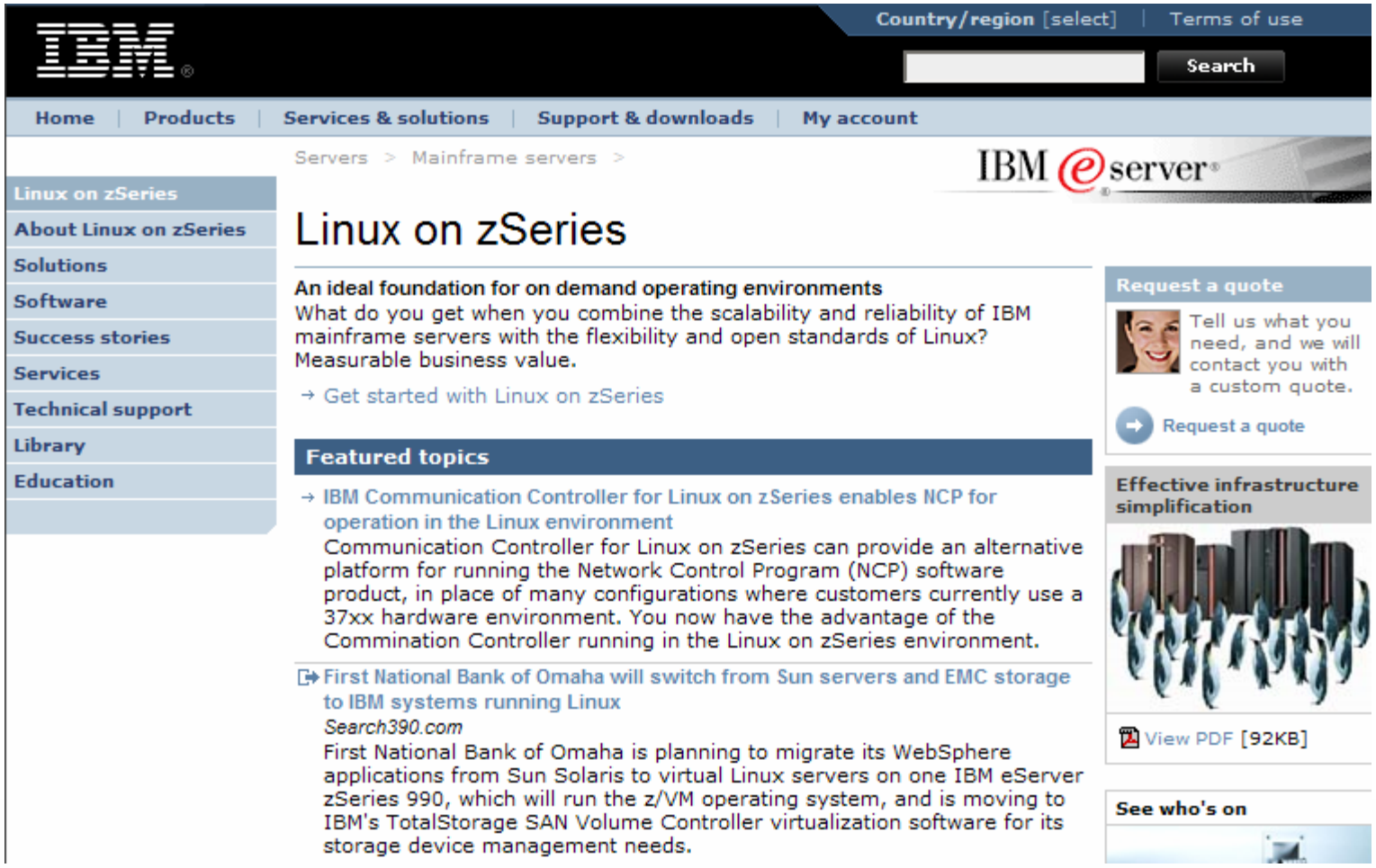
- **Primary advantage: "walls" are flexible**
  - Pay for what you use at guest level
  - Add or remove capacity at will
- **But it's not magic!**
  - Physical limits are still there
  - There is overhead and, therefore, you can overload
  - The highly CPU-intensive may work better in native operating system
- **Golden rule**
  - Don't assume – test



Linux on zSeries

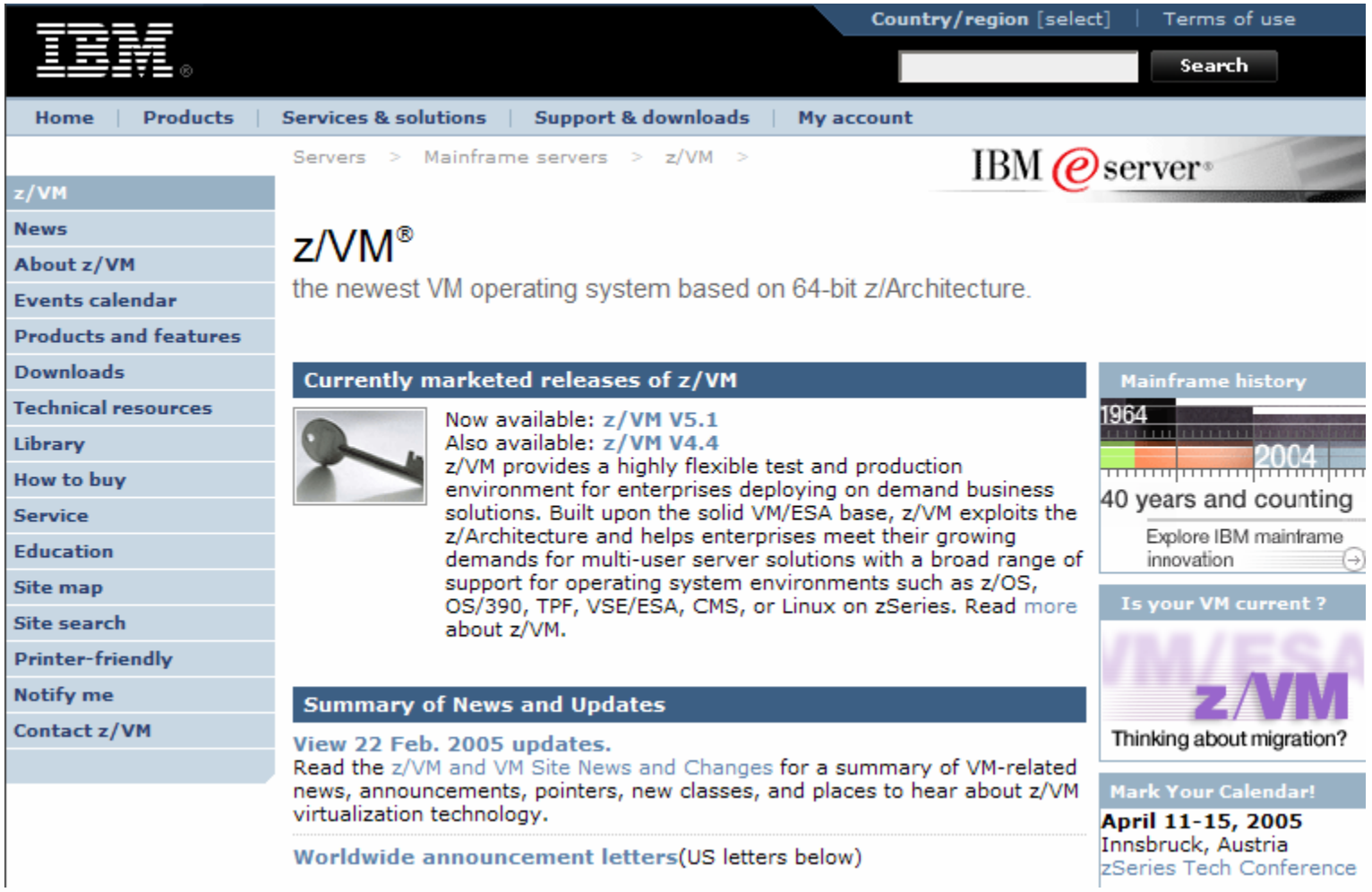
IBM Linux on zSeries Web Site

ibm.com/zseries/linux



IBM z/VM Web Site

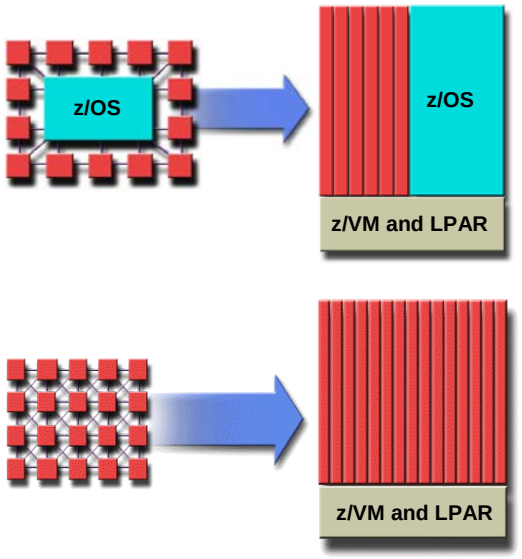
ibm.com/vm



List Server Discussions

- **VMESA-L discusses z/VM**
  - To subscribe, send a note to listserv@listserv.uark.edu. In the body of the note, write only the following line:
    - **`SUBSCRIBE VMESA-L`** *`firstname lastname`*
  - View and search the current list and archives:
    - http://listserv.uark.edu/archives/vmesa-l.html
- **LINUX-390 discusses Linux on zSeries**
  - To subscribe, send a note to listserv@vm.marist.edu. In the body of the note, write only the following line:
    - **`SUBSCRIBE LINUX-390`** *`firstname lastname`*
  - View and search the current list and archives:
    - http://www.marist.edu/htbin/wlvindex?linux-390

What is Linux on zSeries?



- **A native zSeries operating environment**
  - Exploits IBM zSeries hardware
  - Not a unique version of Linux
- **zSeries application sourcing strategy**
  - The IBM commitment to z/OS, z/VSE, and z/TPF is not affected by this Linux strategy
  - zSeries customers are offered additional opportunities to leverage their investments through Linux
  - New doors are opening for zSeries customers to bring Linux-centric workloads to the platform

Why Linux on zSeries?

1. **Increased solutions through Linux application portfolio**
2. **Large number of highly skilled programmers familiar with Linux**
3. **Integrated business solutions**
   - Data richness from zSeries
   - Wide range of Linux applications
4. **Industrial strength environment**
   - Flexibility and openness of Linux
   - Qualities of service of zSeries
5. **Unique ability to easily consolidate large number of servers**

What zSeries brings to Linux

- **The most reliable hardware platform available**
  - Redundant processors and memory
  - Error detection and correction
  - Remote Support Facility (RSF)
- **Centralized Linux systems are easier to manage**
- **Scale to 32 application processors and up to 8 dedicated I/O processors**
- **Hundreds of Linux virtual servers**
- **Designed to support mixed work loads**
  - Allows consolidation while maintaining one server per application
  - Complete work load isolation
  - High speed inter-server connectivity

What is different about Linux on zSeries?

- **Access to zSeries specific hardware**
  - Crypto support – PCICA, CPA, PCIXCC, Crypto2
  - Traditional and Open I/O subsystems
    - Disk (ECKD or SCSI) and tape
  - OSA-Express and OSA-Express2 for very high speed communication between z/OS, z/VSE, z/TPF and Linux
  - HiperSockets for ultra-high speed communication between z/OS, z/VSE and Linux
- **z/VM aware**
  - Enhanced performance
  - System management tools

Value of Linux on zSeries

- **Reduced Total Cost of Ownership (TCO)**
  - Environmental savings - single footprint vs. hundreds of servers
  - Consolidation savings - less storage, less servers, less software licenses, less server management/support
- **Improved service level**
  - Systems management (single point of control)
  - Reliability, availability, security of zSeries hardware and z/VM software
  - High performance integration with z/OS
- **Speed to market**
  - Capacity-on-demand capability on zSeries
  - Dynamic allocation of on-line users, less than 10 seconds to add a new Linux server image using z/VM and ESS

Roadblocks to Linux Adoption on zSeries

- **Wide acceptance of Linux as an enterprise-class environment, but still skepticism outside Intel platform and certain applications**
- **Be prepared to answer some tough questions:**
  - *"Why should we use Linux in the first place?"*
  - *"Why should I run a 'free' operating system on such an expensive platform?"*
  - *"What if we don't know anything about VM? Or Linux?"*
  - *"What if our end users don't like it?"*
  - *"Nobody else is doing it, right?"*
- **Be willing to accept your own answers; sometimes a different approach may be better**

How Expensive is zSeries?

- IFL processor costs – how does this compare to 20, 50 or 100 x86 or Power systems?
- If you can't utilize >50 percent of an IFL, think hard
- If current server utilization is >50 percent, think very hard
- Much more than CPUs – with z/VM, we can share memory, disk, I/O, network resources
- Virtualization has its (physical) limits – z/VM can't get 200 percent out of a processor, but it can help you get close to 100
- For critical workloads, overcommitting resources will typically degrade more gracefully in z/VM
- Think in terms of workload and reliability, not just processor capacity
- Plan, test, benchmark

When Do You Need More than "Good Enough"?

Making the Case for zSeries Virtualization

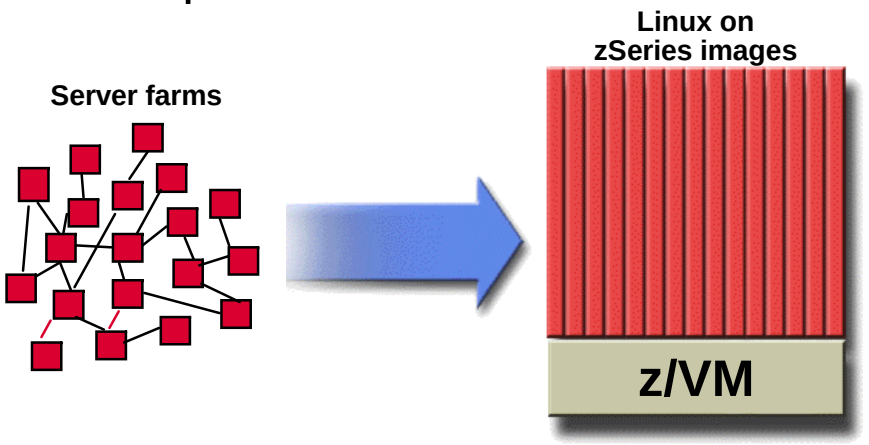
- **When workload growth and decline is difficult to predict (be it production, development, or test/assurance systems)**
- **When customer demand does not match your IT resources and business results suffer**
- **When your IT staff wants to optimize their productivity for deploying and managing virtual servers**
- **When innovation is stifled because your staff cannot experiment or develop new solutions using existing resources**
- **When speed to market affects your business results**
- **When your server applications need fast and flexible access to z/OS data and applications**
- **When business resiliency is a high priority**
- **When you want more control over your environmental expenses (e.g. floor space, cooling)**

zSeries LPAR and z/VM: World-class Server Virtualization

- **Logical Partitions (LPAR)**
  - zSeries Logical Partitioning (LPAR), introduced in 1988, has provided years of business-critical, high-performance server partitioning for the world's largest corporations
  - Hardware partitioning enabling up to 30 "logical partitions" each of which runs a separate operating system – traditional operating systems and Linux
- **Virtual Partitions (z/VM)**
  - z/VM, commercially available since 1972, has supported mixed workloads that require minimal hypervisor overhead, massive scalability, and exceptional levels of availability
  - Support for large numbers of Linux images with rich system management capabilities
- **Both LPAR and z/VM employ hardware and firmware innovations developed over the years that make virtualization part of the basic fabric of the zSeries platform**

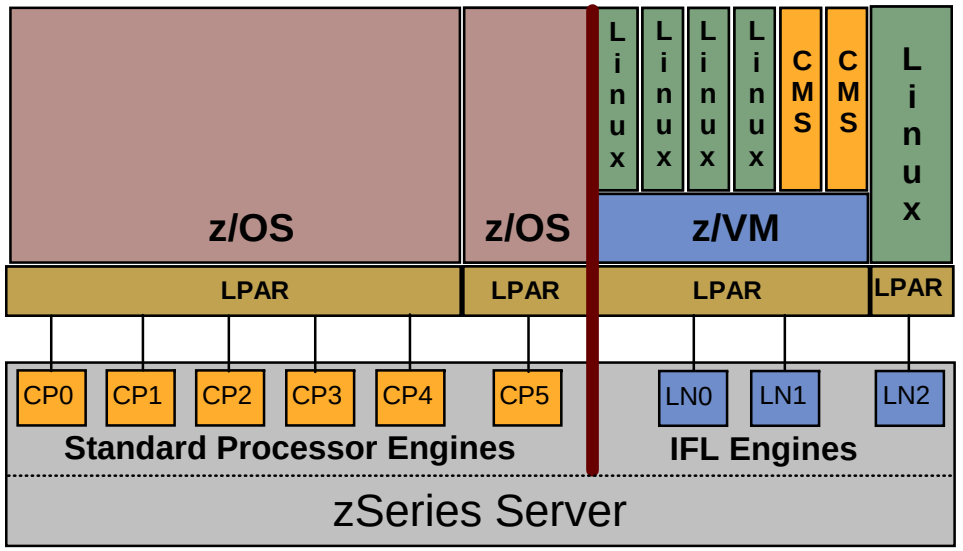
The value of z/VM for Linux

- **Enhanced performance, growth and scalability**
  - Server consolidation enables horizontal growth
  - N-tier architecture on two tiers of hardware
  - Extensive support for sharing resources
  - Virtual networking
  - Effective isolation of Linux images, if required
- **Increased productivity**
  - Development and testing
  - Production support
- **Improved operations**
  - Backup and recovery
  - Command and control

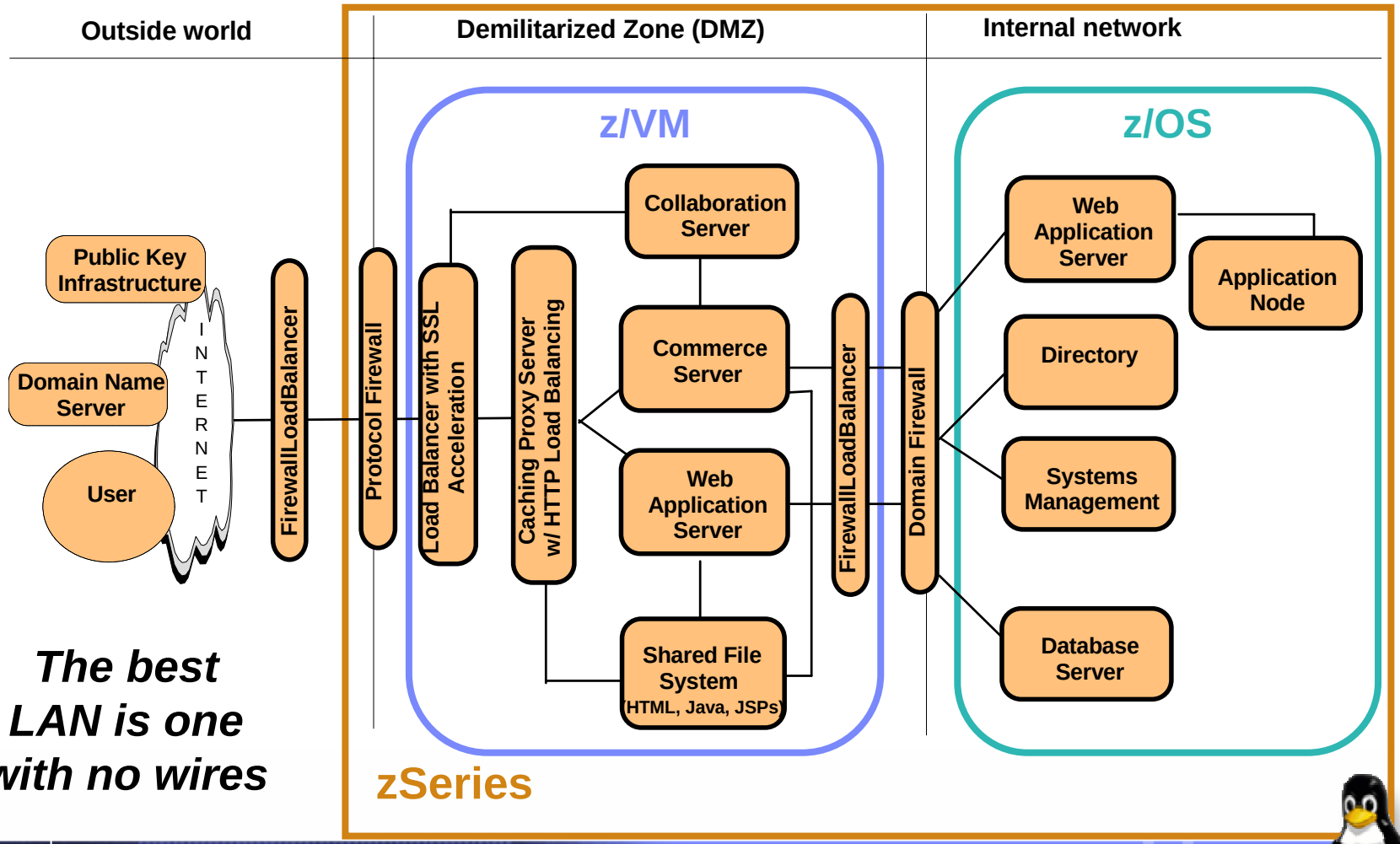


zSeries Integrated Facility for Linux

- **Additional engines dedicated to Linux workloads**
  - Supports z/VM and Linux on zSeries
- **Traditional zSeries software charges unaffected**
  - IBM zSeries software
  - Independent Software Vendor products
- **Linux and z/VM charged only against the IFLs**



Application serving with Linux on zSeries



The best LAN is one with no wires

IBM Software for Linux on zSeries

ibm.com/linux/matrix

IBM @server® zSeries

WebSphere software	Version - Release	Hardware	Kernel/Distribution	Sources
WebSphere Application Server	6.0	zSeries	Red Hat Enterprise Linux 3 Update 2, Update 3 SUSE Linux Enterprise Server 8 SP3 SUSE Linux Enterprise Server 9	**Available December 10, 2004** Software Announcement 204-289 November 30, 2004 Supported Platforms
WebSphere Application Server	5.1.1	zSeries	Red Hat Enterprise Linux 3 Update 1 SUSE Linux Enterprise Server 8 SUSE Linux Enterprise Server 8 SP3 SUSE Linux Enterprise Server 9	Supported Platforms

Next Steps

ON DEMAND BUSINESS™

- **Familiarize yourself with Linux and zSeries**
- **View Linux as a valid alternative for IT systems**
- **Incorporate open source software development into IT strategies**
- **Look at Linux on zSeries to see how it can:**
  - Lower costs
  - Increase reliability and security
  - Improve service

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