Linux @ IBM

Linux Platform Options – Selecting Linux on IBM System z9 and zSeries

Jim Elliott
Advocate – Infrastructure Solutions
Manager – System z9 and zSeries Operating Systems
IBM Canada Ltd. ibm.com/vm/devpages/jelliott

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Selecting Linux on System z9 and 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 System z9 and zSeries may be the optimal choice.**
- **Jim will describe how Linux on System z9 and zSeries, in combination with z/VM, will provide a robust Linux environment which integrates well with z/OS.**

Scale-Up, Scale-Out, Virtualization

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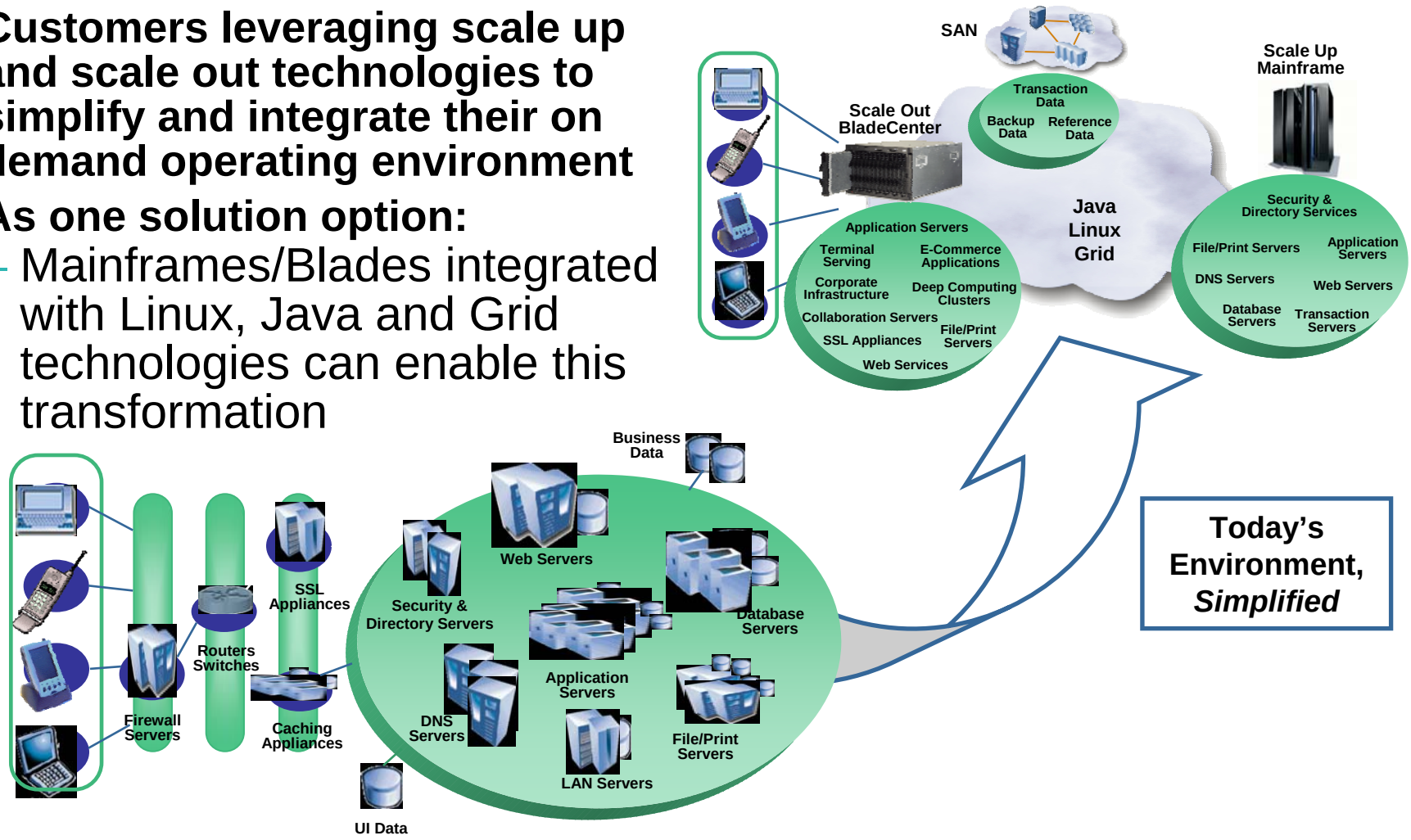
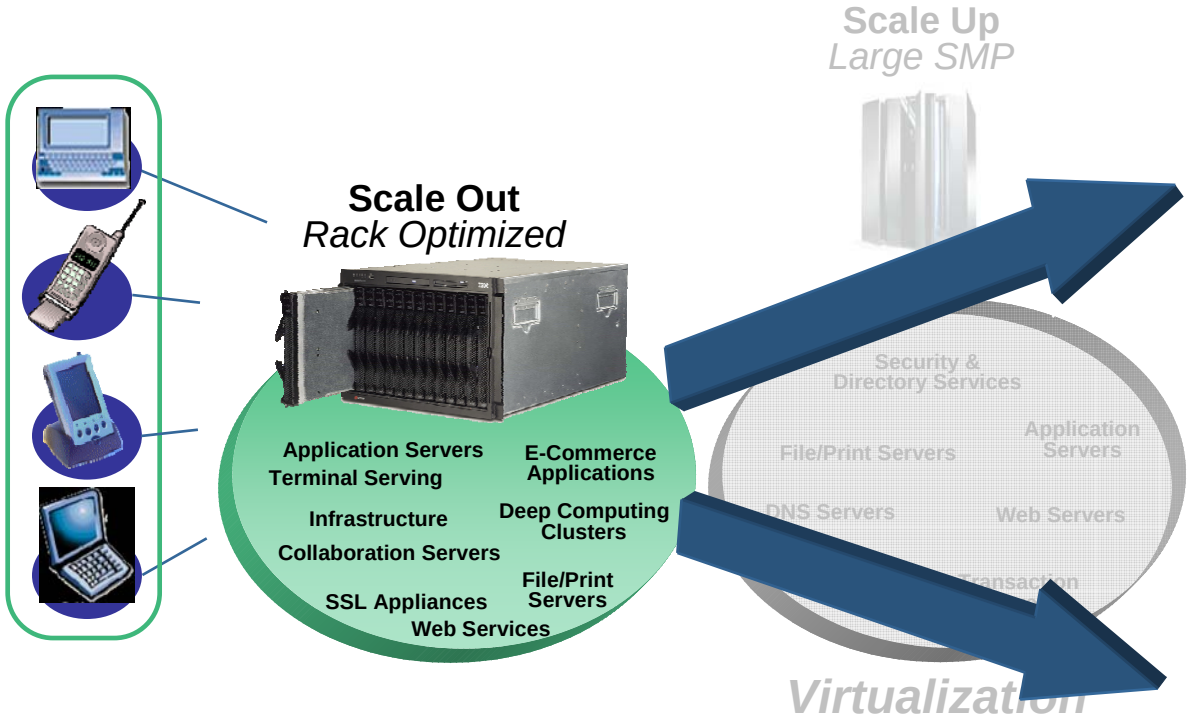
Infrastructure Simplification

- **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

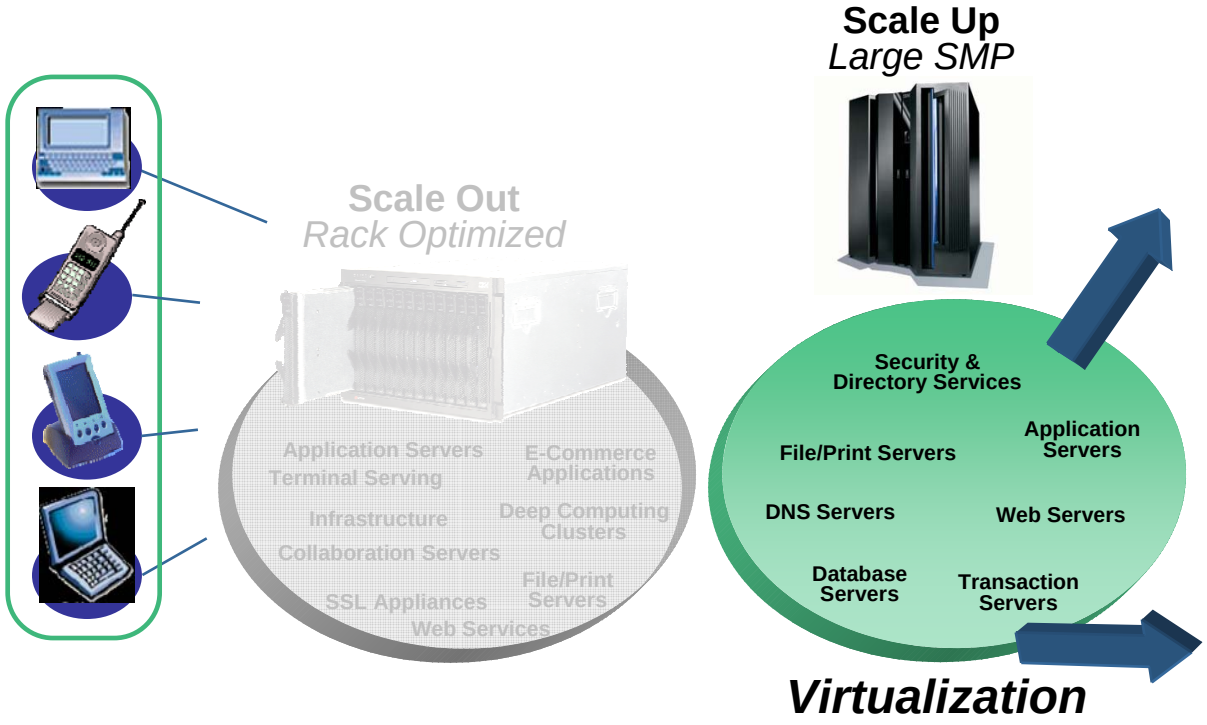


Ideal rack optimized implementations



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

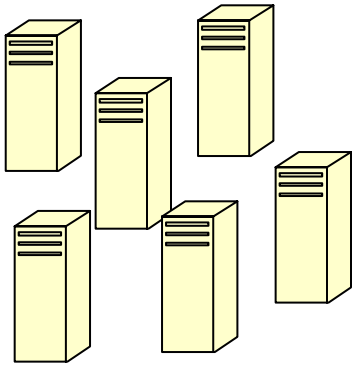
Ideal large SMP implementations



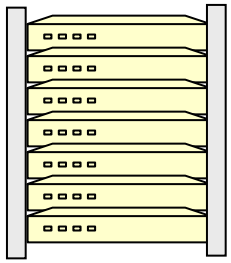
- High performance transaction processing
- I/O Intensive workloads
- Large database serving
- High resiliency and security
- Unpredictable and highly variable workload spikes
- Low utilization infrastructure applications
- Rapid provisioning and re-provisioning

Server Consolidation: Cost Savings and Operational Efficiency

Physical Consolidation



Multiple Locations

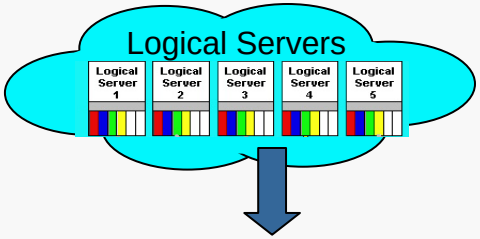


"Rack and Stack" in one location

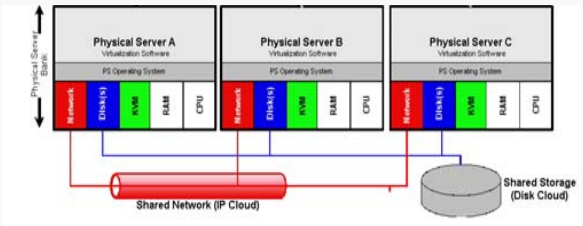
Workload/Hardware Consolidation

Single Multiprocessor System

Operations Consolidation



Solution engine provisions server resources as needed

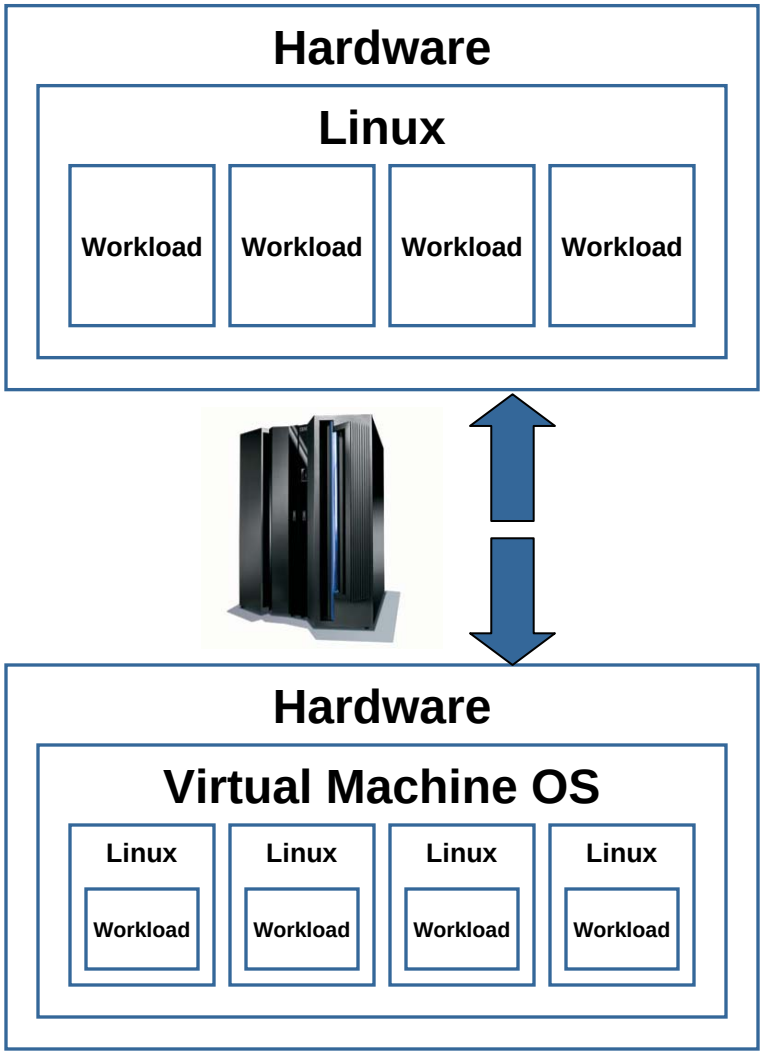


Workload vs. Operations Consolidation

- **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
- **IBM POWER – OpenPower, p5/pSeries, i5/iSeries**
  - CPU intensive
  - Large memory
  - LPAR benefits
  - Moderate I/O
- **IBM System z9 and 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, i5/iSeries, p5/pSeries, JS20**
  - 1000+ commercial applications available
- **IBM System z9 and zSeries**
  - 800+ commercial applications available

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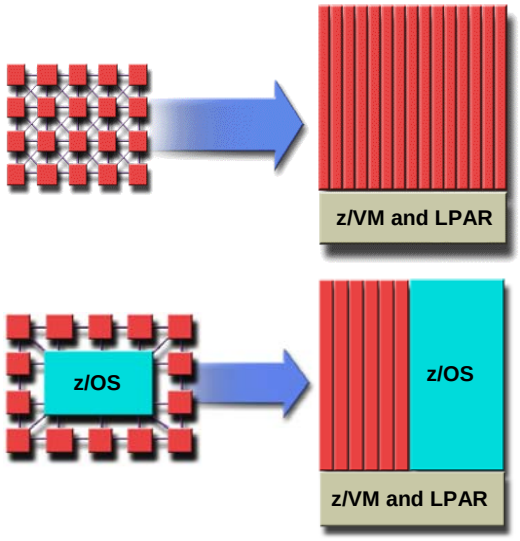
Linux on System z9 and zSeries

What is Linux on System z9 and zSeries?

- **A native mainframe operating environment**
  - Exploits IBM System z9 and zSeries hardware
  - Not a unique version of Linux
- **Application sourcing strategy**
  - The IBM commitment to z/OS, z/VSE, and z/TPF is not affected by this Linux strategy
  - Customers are offered additional opportunities to leverage their investments through Linux
  - New doors are opening for customers to bring Linux-centric workloads to the platform



Why Linux on System z9 and 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 mainframe
   - Wide range of Linux applications
4. **Industrial strength environment**
   - Flexibility and openness of Linux
   - Qualities of service of mainframe
5. **Unique ability to easily consolidate large number of servers**

Customers Perceive a Distinct Gap Between Mainframe Capabilities and Other Platforms

Server Platform Perceptions – Ratings on a Scale of 1-5

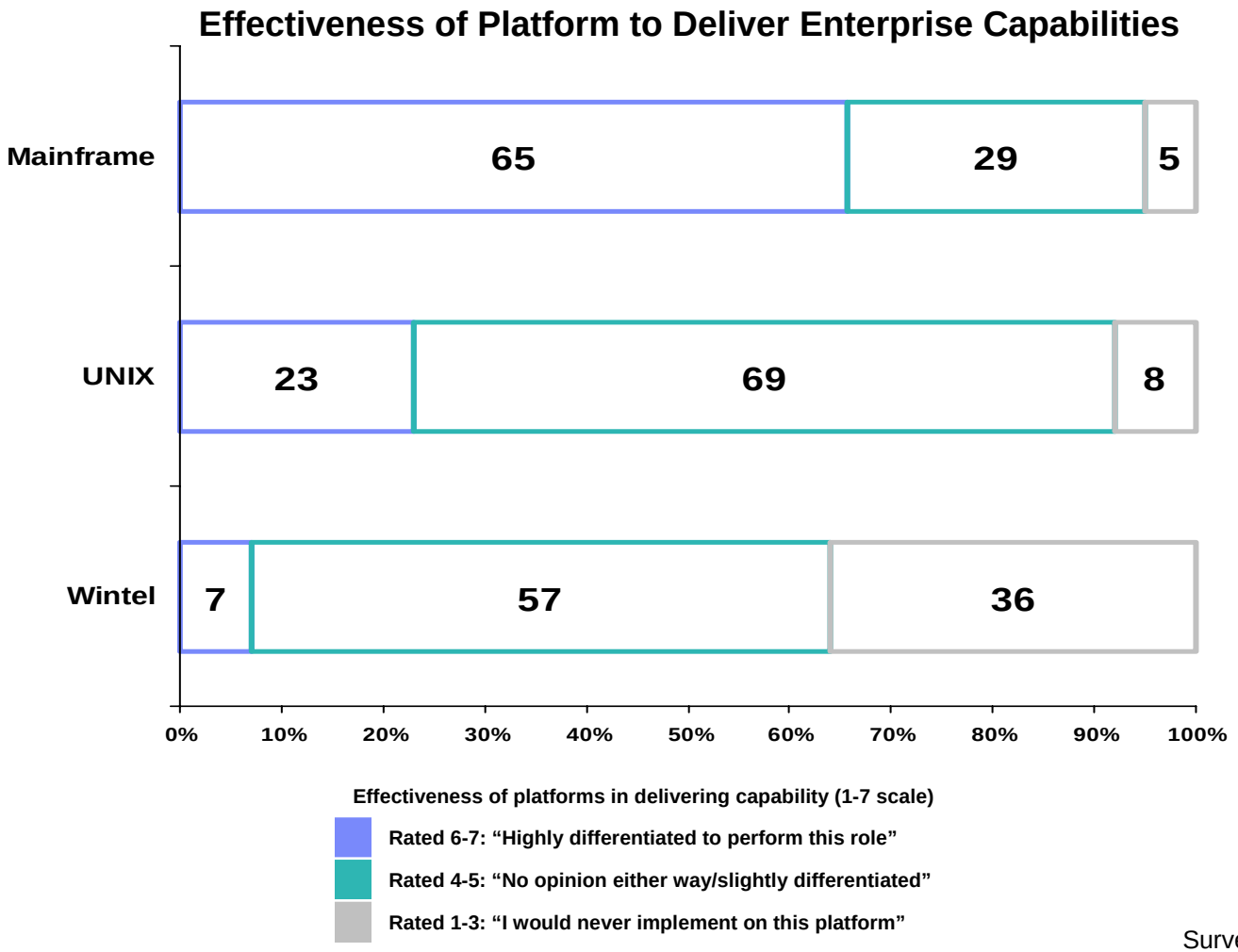
Attribute	Rating by Platform		
	Mainframe	UNIX	"Wintel"
Availability	4.81	3.59	2.64
System Integrity / Security Controls	4.65	3.30	2.27
Backup and Recovery (Including Disaster Recovery)	4.54	3.35	2.70
Workload Management	4.49	3.07	2.23
Average Response Time	4.15	3.60	2.96
Data and Transaction Processing	4.49	3.61	2.75
Integration of data, applications across business processes	3.59	3.47	3.09
Average	4.39	3.43	2.66

Survey of over 700 existing zSeries customers. Question: For each attribute shown below, please rate each platform based on your experience / perceptions. (Note that you may rate different platforms as having equivalent levels). 0 = Not sure; 1 = Poor, 2, 3 = Average, 4, 5 = Best-in-class

Respondents consistently view the mainframe as differentiated in its capabilities

Compared to market research in 2000, mainframe lead over Wintel has increased, gap over UNIX maintained

Customers Viewed the Mainframe as Best Suited to Deliver Enterprise Wide Capabilities



The mainframe is seen as substantially better suited to perform all Enterprise Roles, compared to other platforms

It is seen as most differentiated in its ability to deliver enterprise workload management

CIOs/CTOs belief in the mainframe's ability to deliver Enterprise Roles equivalent to that of other decision makers

Survey of over 700 existing zSeries customers.

What System z9 and 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**
- **Scalability**
  - eServer zSeries 990 scales to 32 application processors
  - System z9 109 scales to 54 application processors
  - 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 System z9 and 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 System z9 and 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 mainframe hardware and z/VM software
  - High performance integration with z/OS, z/VSE and z/TPF
- **Speed to market**
  - Capacity-on-demand capability
  - Dynamic allocation of on-line users, less than 10 seconds to add a new Linux server image using z/VM and DS8000

Roadblocks to Linux Adoption on System z9 and 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 are System z9 and zSeries?
Some general considerations

- **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, over committing 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 System z9 and zSeries Virtualization

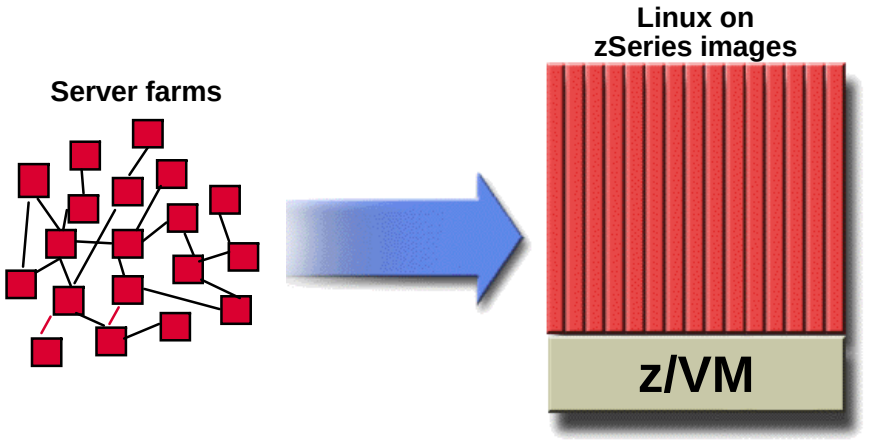
- **When workload growth and decline is difficult to predict (be it production, development, or test/assurance systems)**
- **When customer demand does not match your IT resources and business results suffer**
- **When your IT staff wants to optimize their productivity for deploying and managing virtual 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)**

System z9 and zSeries LPAR and z/VM: World-class Server Virtualization

- **Logical Partitions (LPAR)**
  - Mainframe 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 60 "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 System z9 and zSeries platforms**

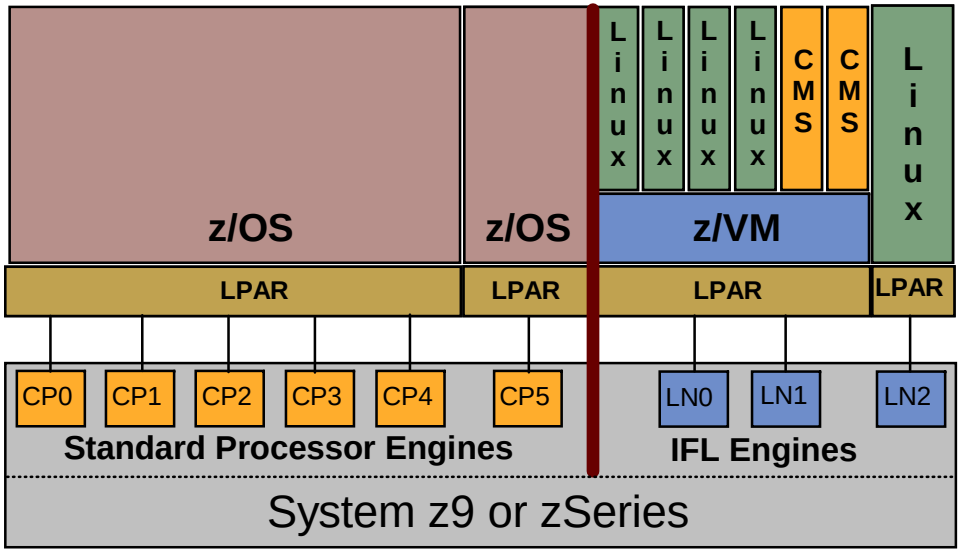
The value of z/VM for Linux

- **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

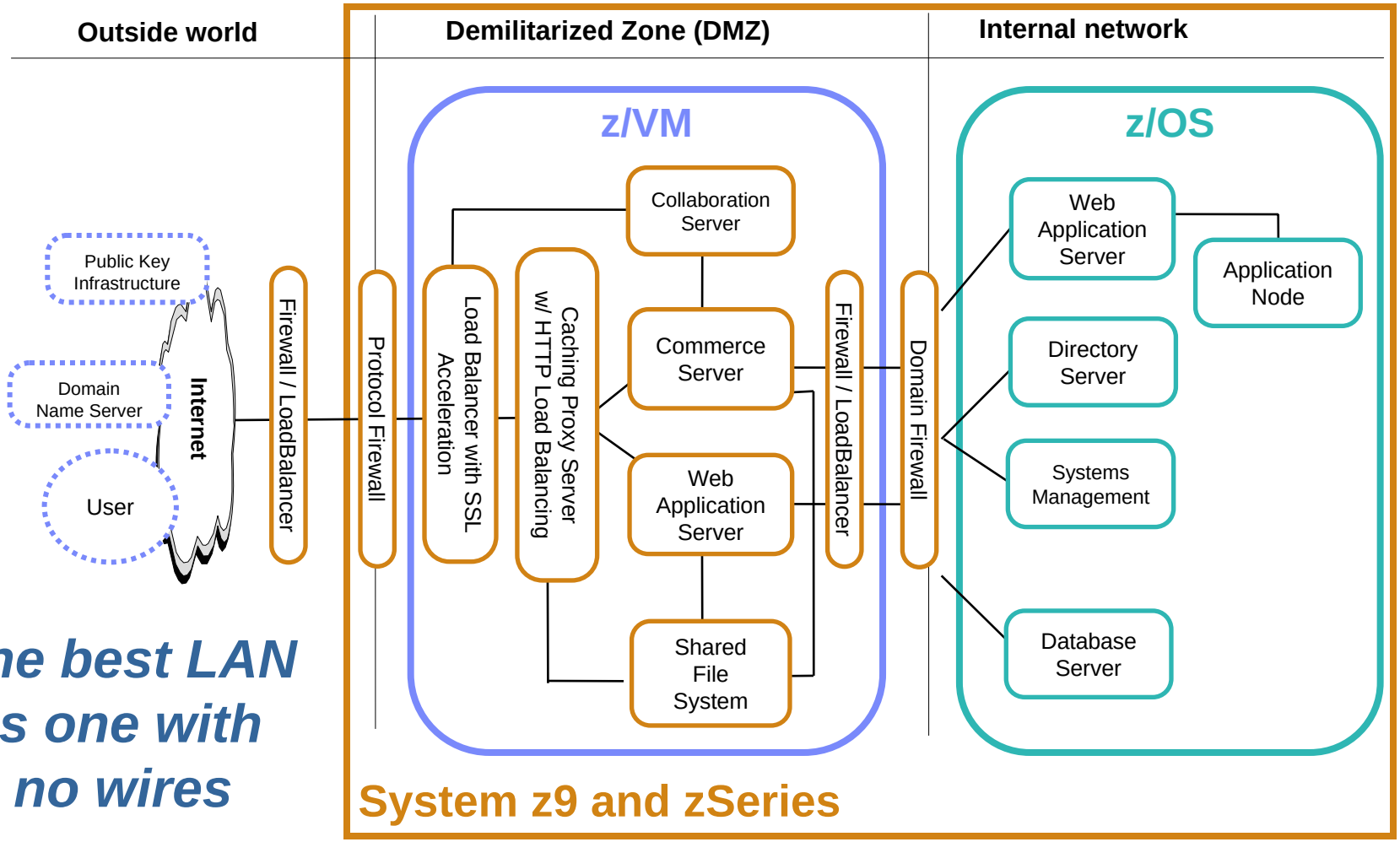


Integrated Facility for Linux

- **Additional engines dedicated to Linux workloads**
  - Supports z/VM and Linux on System z9 and zSeries
  - IFLs on “sub-uni” z890 and z800 systems run at “full speed”
- **Traditional mainframe software charges unaffected**
  - IBM mainframe software
  - Independent Software Vendor products
- **Linux and z/VM charged only against the IFLs**



Application serving with Linux on System z9 and zSeries

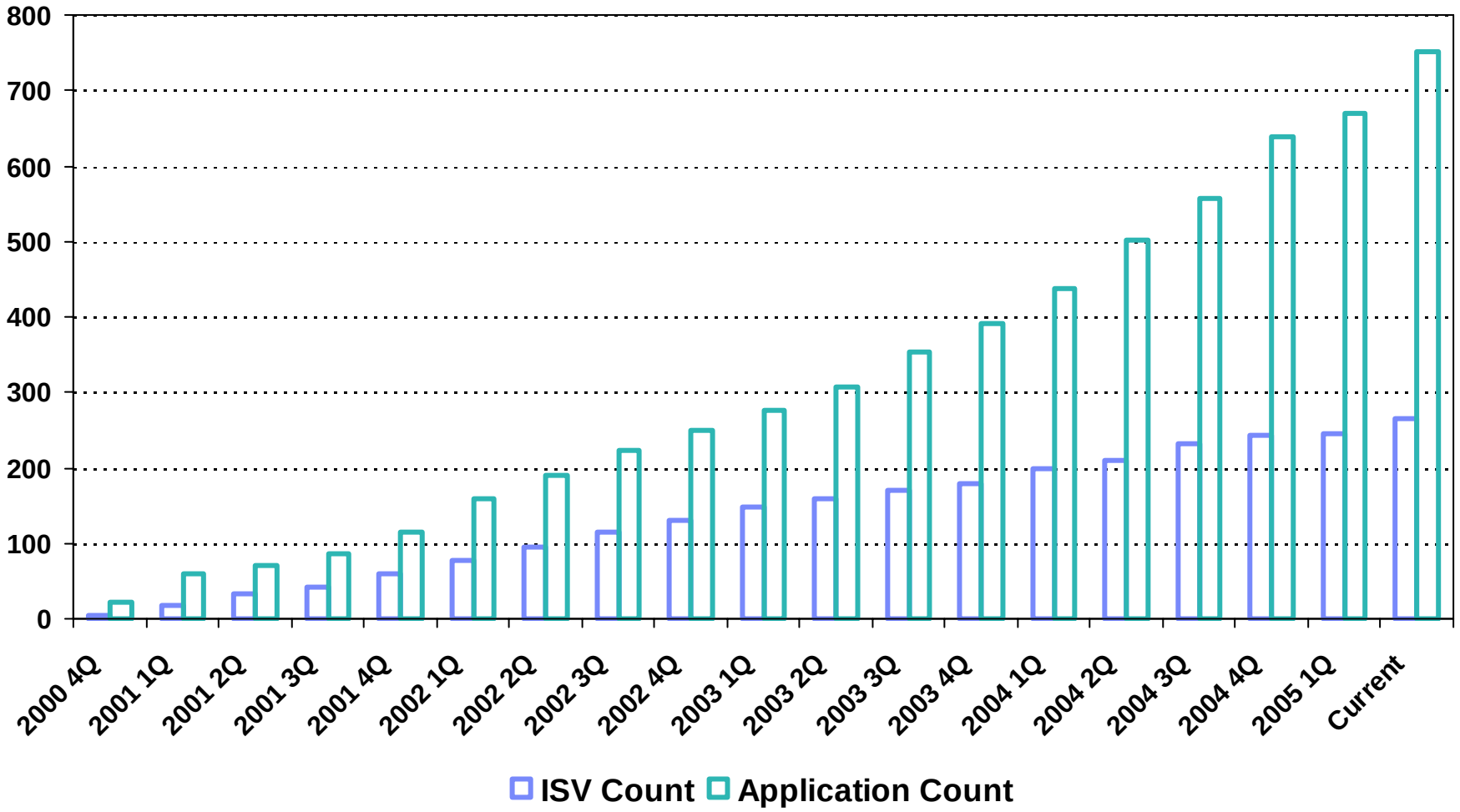


The best LAN is one with no wires

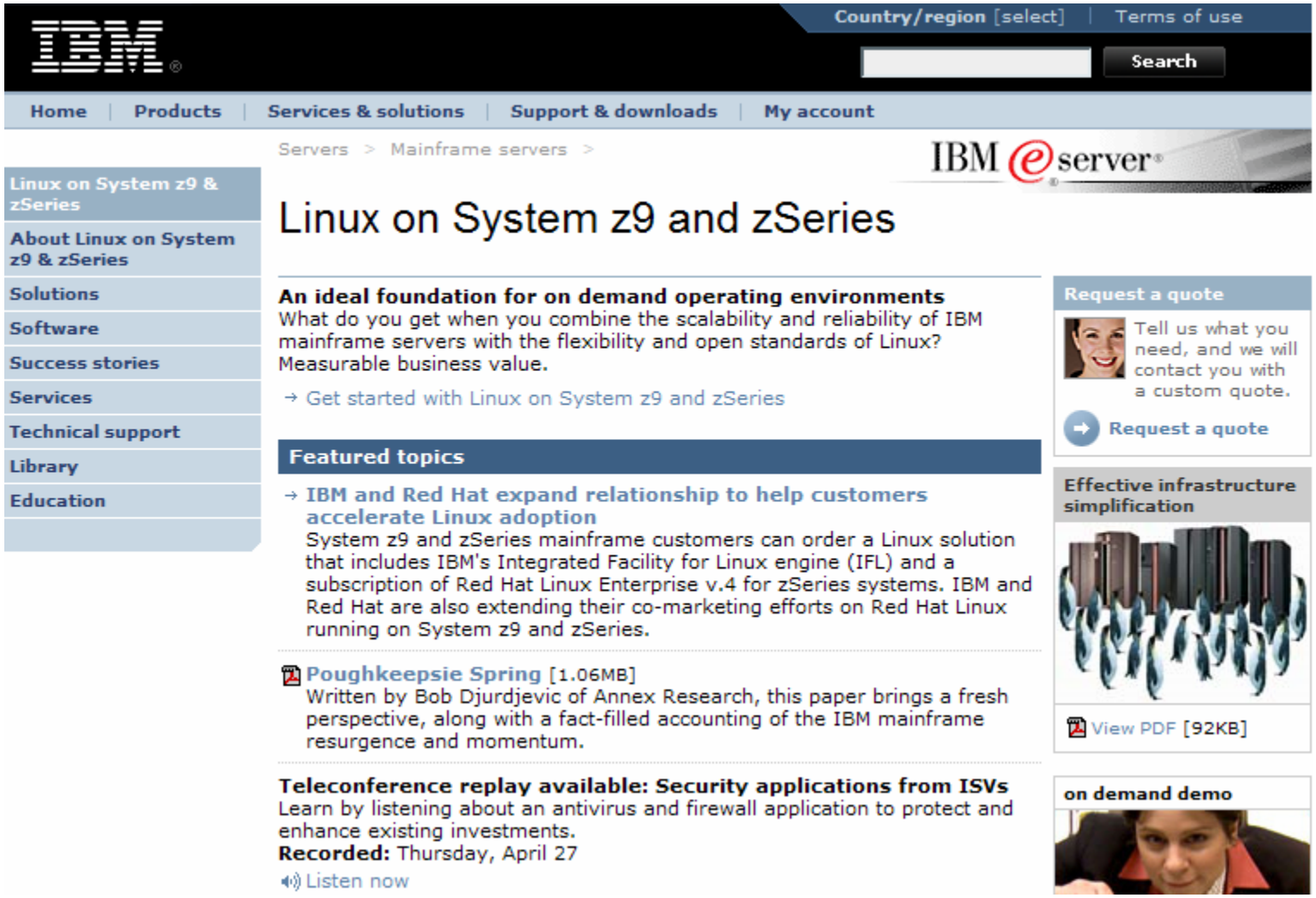
IBM Software for Linux on System z9 and zSeries
ibm.com/linux/matrix

Core Products	SLES	RHEL
DB2 Universal Database Enterprise Server Edition	X	X
Lotus Domino Server	X	X
Rational ClearCase	X	
Tivoli Access Manager for e-business	X	X
Tivoli Configuration Manager	X	X
Tivoli Directory Server	X	X
Tivoli Enterprise Console	X	X
Tivoli Monitoring	X	X
Tivoli Storage Manager	X	
WebSphere Application Server	X	X
WebSphere Business Integration Server Foundation	X	X
WebSphere Commerce Business Edition for Linux	X	X
WebSphere Portal for Multiplatforms Enable	X	X
IBM Developer Kit for Linux , Java 2 Technology Edition Java Technology development environment	X	X

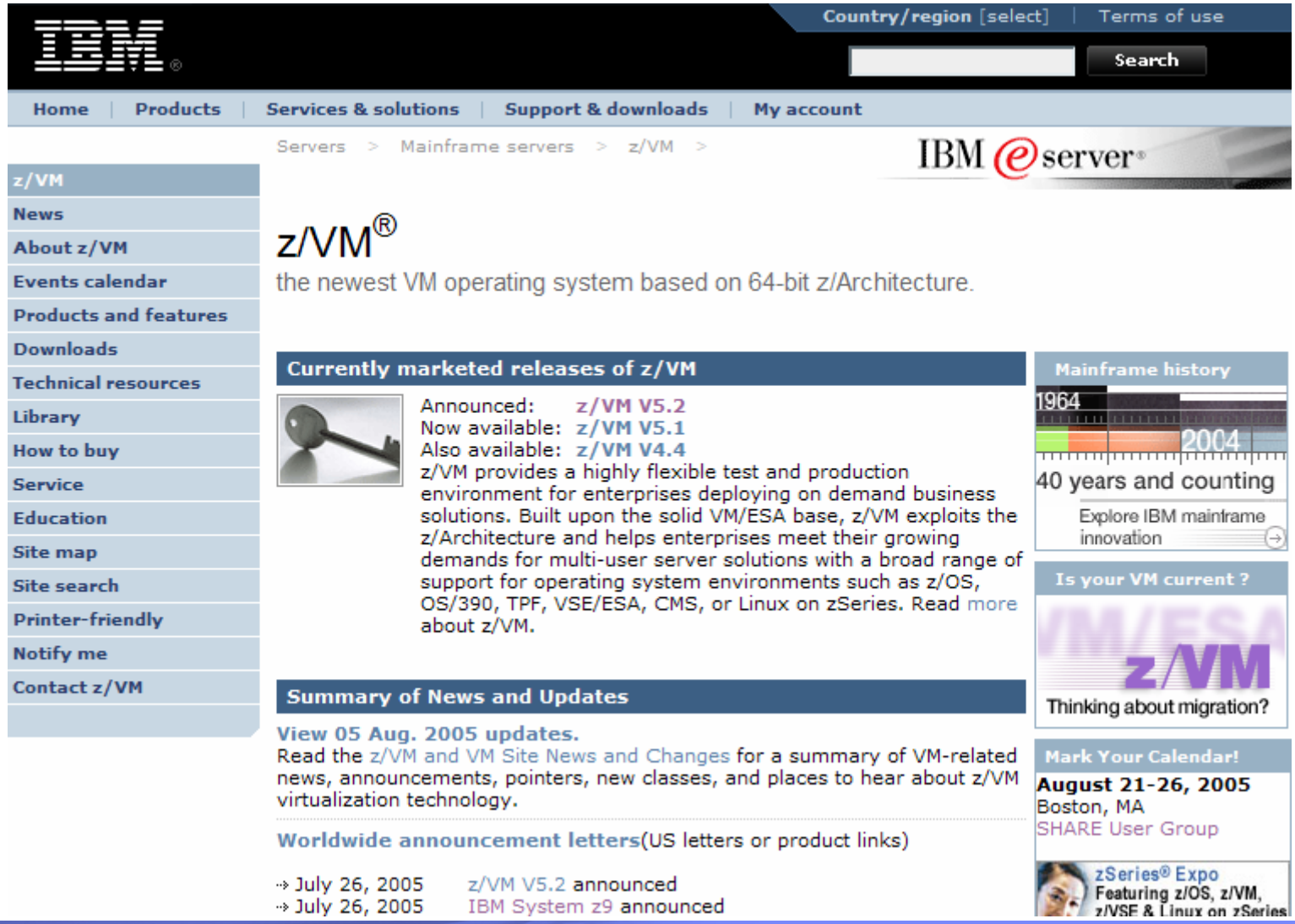
Linux on System z9 and zSeries ISV Status



Linux on System z9 and zSeries Web Site
ibm.com/zseries/linux

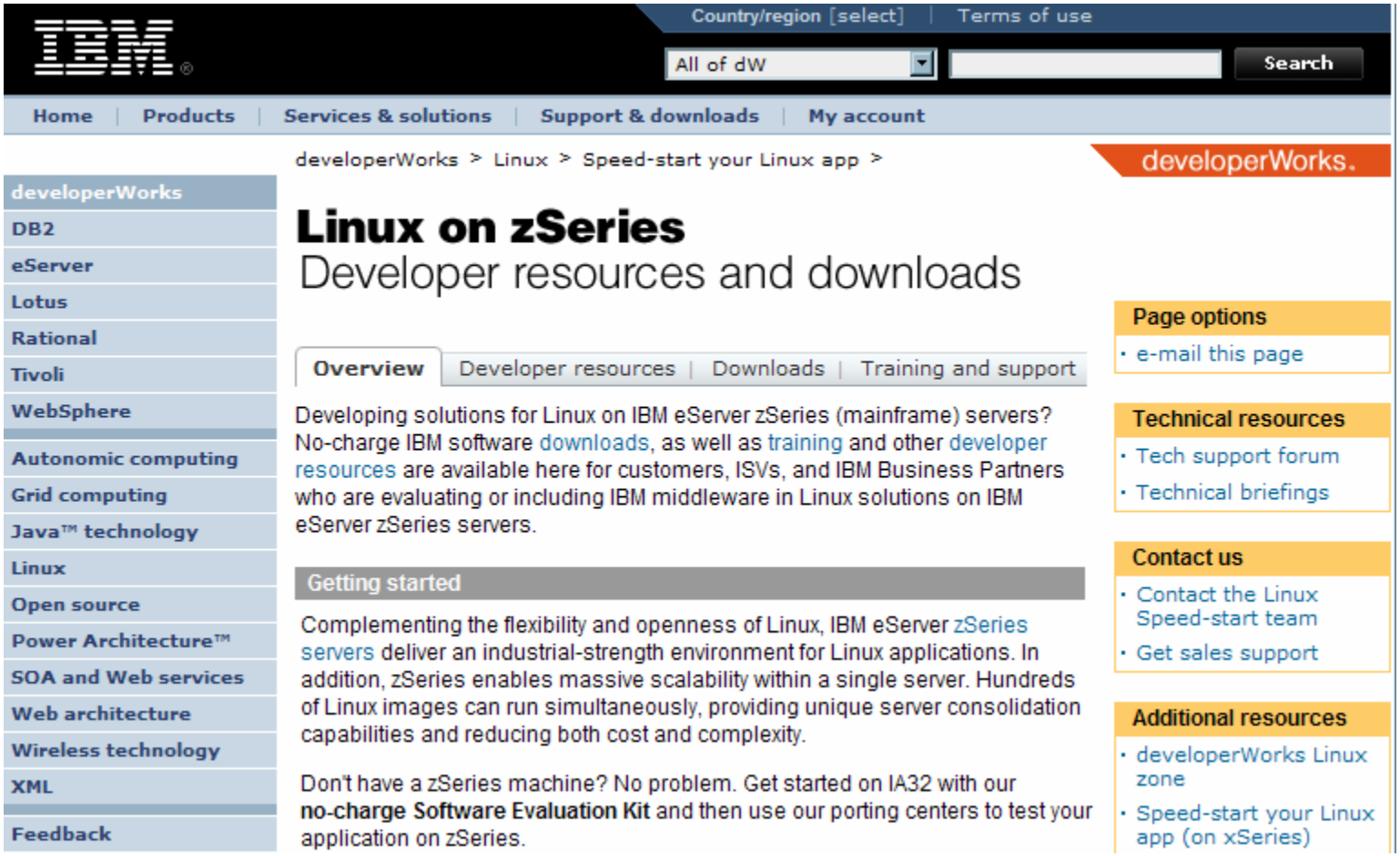


z/VM Web Site
ibm.com/vm



Linux on zSeries Developer Resources

ibm.com/developerworks/offers/linux-speed-start/download-z.html



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 System z9 and 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

Next Steps

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- **Familiarize yourself with Linux, System z9 and zSeries**
- **View Linux as a valid alternative for IT systems**
- **Incorporate open source software development into IT strategies**
- **Look at Linux on System z9 and zSeries to see how it can lower costs, increase reliability and security, and improve service**

Jim Elliott
Advocate – Infrastructure Solutions
Manager – IBM System z9 and zSeries Operating Systems
IBM Canada Ltd.
jim_elliott@ca.ibm.com
ibm.com/vm/devpages/jelliott

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