Mainframe Linux Update

Sessions *5536 and 9200*
Share 98 - Winter 2002

Jim Elliott

Linux Advocate
Linux Sales and Marketing
IBM Canada Ltd.

Chart 1

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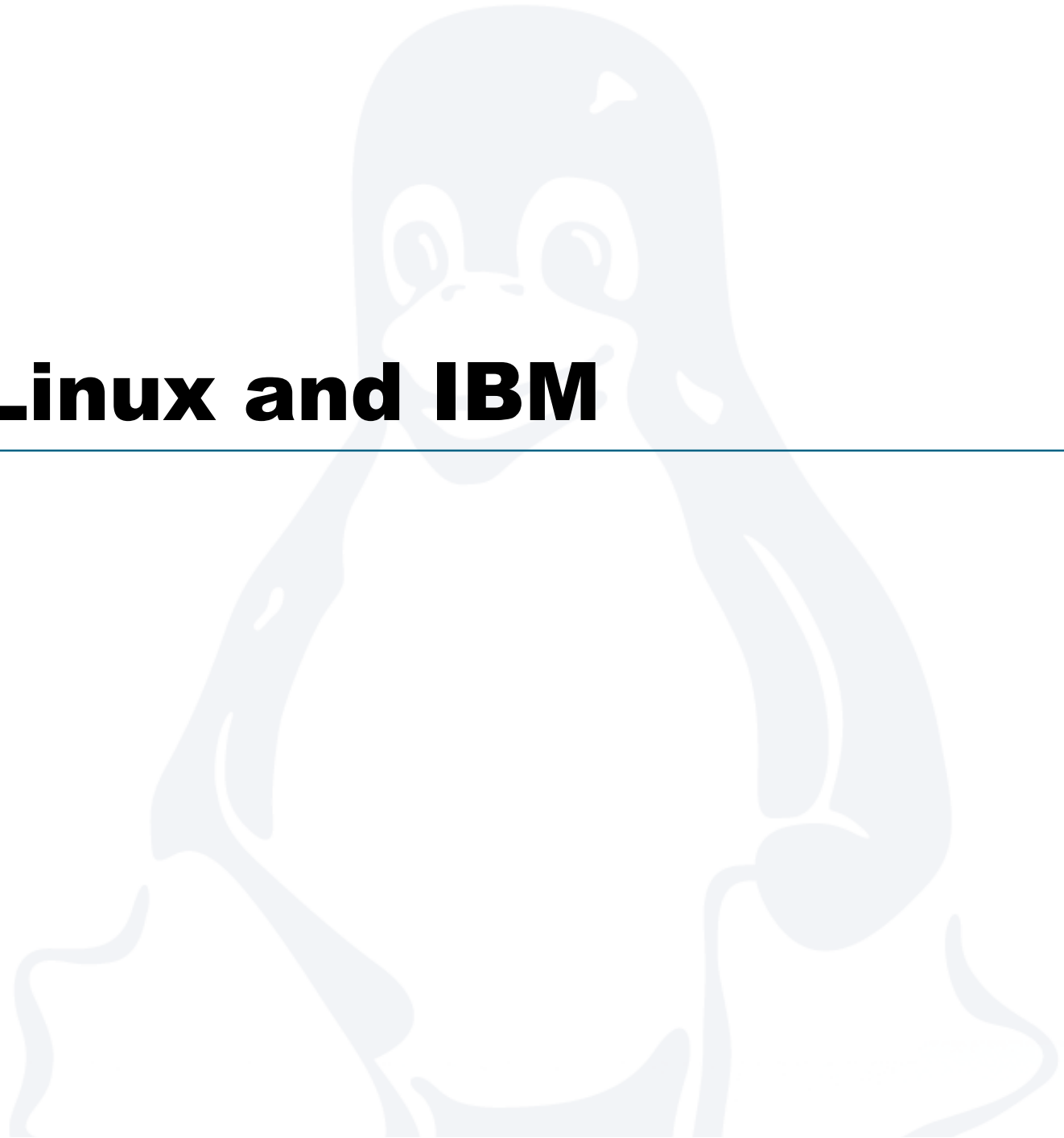
Chart 2

Linux and IBM

Chart 3

What is Linux?

- **Linux is the kernel of a Unix-like operating system, originally developed by Linus Torvalds**

- **How do you pronounce Linux?**

- **How did a penguin become the Linux mascot?**

- **Developed / tested by the Open Source community**
  - ►**Highly disciplined / structured**
  - ►**High quality**
  - ►**Secure**
  - ►**Stable**

- **Not just for Intel-powered PCs**
  - ►**Power PC, Sparc, Alpha, S/390, ...**
  - ►**Over 100 platforms supported today**

Chart 4

Linux Distributions

- **The kernel plus utilities including TCP/IP**
  - ► **Built-in firewall using IP Tables function**

- **The GNU set of utilities from the Free Software Foundation**
  - ► **Complete system often referred to as GNU/Linux**

- **Graphical user interfaces - KDE and GNOME**

- **Applications included**
  - ► **Apache and related applications for web serving**
  - ► **Samba for file and print serving**
  - ► **IMAP/POP mail servers**
  - ► **Open Source databases**
  - ► **Plus 100s of others**

- **Caldera, Red Hat, SuSE, Turbolinux are major distributors**
  - ► **Other regional distributors include Red Flag, Connectiva, Mandrake, ...**

Chart 5

Linux as a Game Changer

- **Growing Marketplace Acceptance**
  - ► The continual compound growth of Linux deployments and large skill pool attests to the market acceptance

- **Industry Wide Initiative**
  - ► Linux is the first operating system that the entire industry has rallied around. Not just select vendors

- **Multi-platform**
  - ► Linux runs on every platform, there is no other operating system with this characteristic

- **Basis of Innovation**
  - ► Because of its open nature, Linux is the basis for new and innovative uses of technology

Open Source

No single vendor

Coexistence

Born on the web

Small and modular

Community developed and owned

Unix heritage

Chart 6

IBM Linux Strategy

- **Leverage Linux to create a pervasive application development and deployment environment that will drive applications growth**
  - ▶ **Responsible participation with the Open Source community**
  - ▶ **Support a native Linux on all server platforms**

- **Ease the deployment of Linux applications on IBM servers**
  - ▶ **Develop IBM Linux based offerings**
  - ▶ **Platforms, services and packaged solutions**

- **Expand IBM Linux Technology Center**
  - ▶ **Partner and contribute IBM technology and skills to the open source community**
  - ▶ **Enhance IBM Linux and Open Source technical skills**

Chart 7

IBM Linux Technology Center

- **Mission - Enterprise enable the Linux Operating System through the development and contribution of utilities, tools and code (i.e. - "make Linux better")**
  - ► ibm.com/developerworks/opensource/linux

- **Not just the Kernel**

- **250+ worldwide Developers**

- **Industry leadership supporting Linux/OSS**
  - ► Open Source Software projects
  - ► Community access to enterprise hardware and software (e.g. Open Source Development Lab)
  - ► Support Open Source organizations and initiatives
  - ► Linux support across IBM
  - ► Distribution Partner alliances
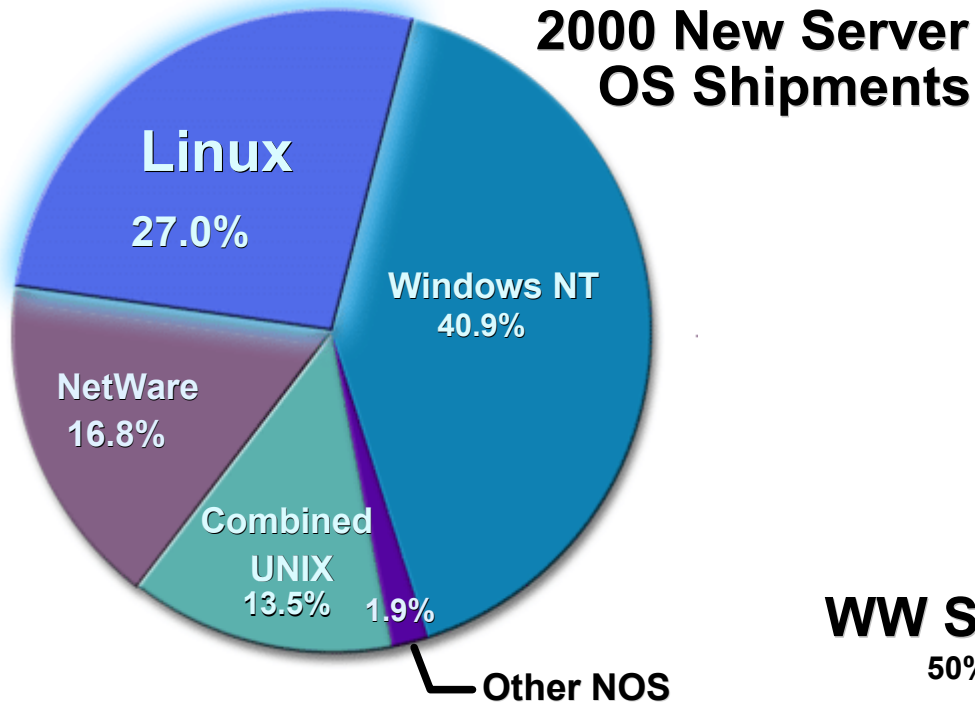
Chart 8

Linux Carrier Grade Project

- **Objectives:**
  - ► **Provide value of Linux - speed, cost, flexibility - to all core network solutions**
- **Roadmap to make Linux "carrier grade"**
  - ► **"Harden" Linux to meet the stringent requirements for telecom network infrastructure solutions**
    - – **High availability (zero downtime)**
    - – **Rapid failover (switch in milliseconds)**
    - – **Real-time performance (fast, predictable)**
    - – **Online / concurrent service/update (no network disruption)**
    - – **Robustness, scalability and performance validation**
- **Working with partners to deliver complete solutions**
  - ► **Open Source community**
  - ► **Linux distributors**
  - ► **Middleware software vendors**
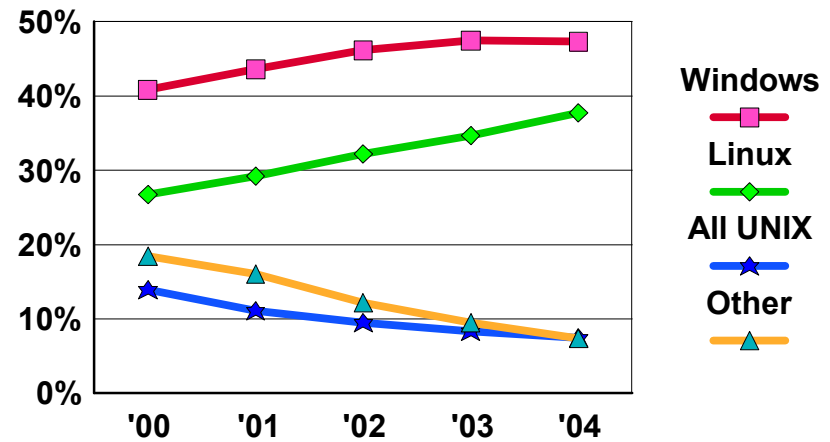 - ► **Network equipment providers**
  - ► **Network application ISVs**

Chart 9

Linux Momentum

2000 New Server OS Shipments

Linux 27.0%

Windows NT 40.9%

NetWare 16.8%

Combined UNIX 13.5%

1.9% Other NOS

Linux 23.6% Growth

WW Server OS License Share (units)

Year	'00	'01	'02	'03	'04

Windows

Linux

All UNIX

Other

IBM

Chart 10

Linux Application Deployment

Application	Today	Within 2 years
Web server	51%	76%
Web Application Server	34%	61%
Firewall Server	35%	60%
E-mail server	40%	59%
File and Print Server	39%	59%
Database Server	29%	55%
Development System	29%	43%
Workgroup Server	18%	40%
Transaction Server	11%	22%

Legend: ■ Today ■ Within 2 years

Chart 11
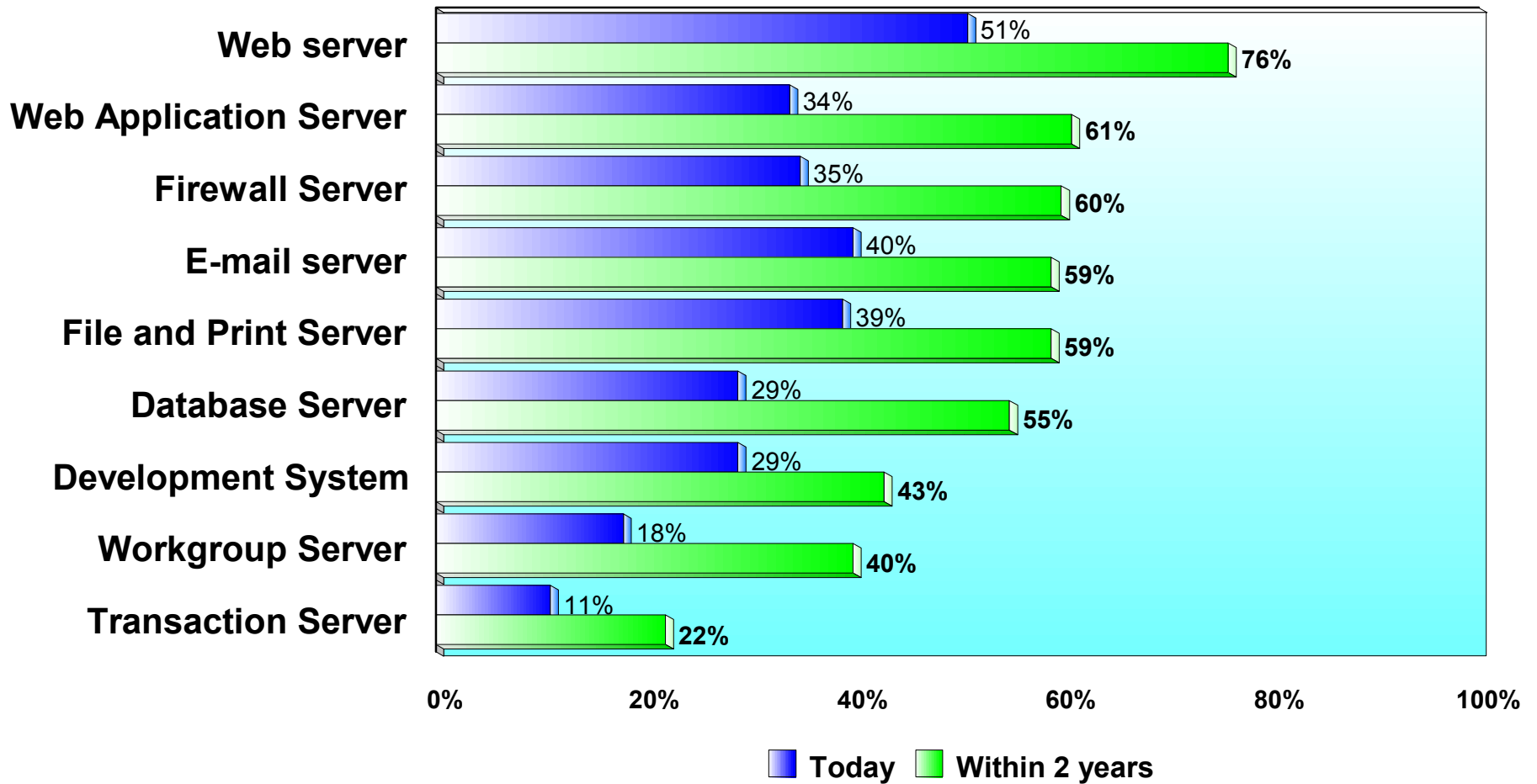
Industry's Broadest Linux Server Line

Linux for @server xSeries

The Point of Entry - Where Industry Standards Meet Enterprise Capabilities

Appliance Servers
- web servers
- NAS servers

Scalable Web Application Servers
- rack optimised
- Clusters

General Purpose Servers
- price / performance
- High Availability

Data and Transaction Servers
- X-architecture
- Clusters

Linux for @server pSeries

The Point of Integration - Where Linux Meets UNIX

- Linux for RS/6000 (32-bit)
- Linux for pSeries (64-bit)
- Exploit Power3 / Power4 Floating Point, 64-Bit Performance, I/O Bandwidth and RAS
- AIX Toolbox for Linux Applications in AIX 5L

AIX
Linux

Linux for @server iSeries

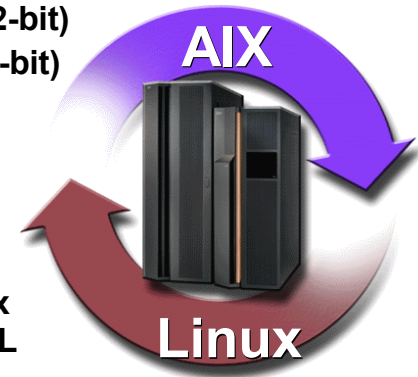*The Point of Coexistence - Where Linux Complements Integrated e-business Solutions*

LPAR1 OS/400 VxRx	LPAR2 OS/400 VxRx	LPAR3 Linux

Primary Partition
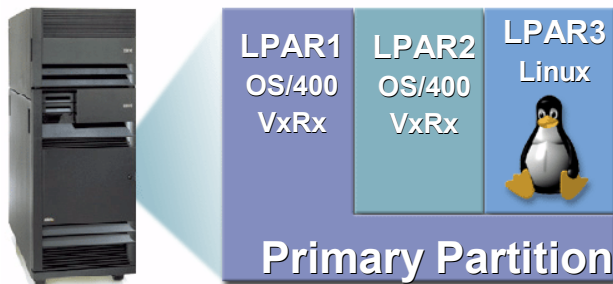
- Linux in a partition
- Integrates new ebusiness applications

Linux on @server zSeries

The Point of Consolidation - Linux Ascends to the Mainframe

- Pure Linux OS
- Exploits zSeries hardware
- Scalable, protected partitions
- Shared infrastructure
- Reduced cost of ownership

LINUX FOR S/390...
...IT'S COOL.

Chart 12

Linux for Developers

- **developerWorks**
  - ► **Dedicated "Linux Zone"**
  - ► **Open Source Center**
  - ► **ibm.com/developerworks/**

- **Linux Porting Centers for ISVs**

- **zSeries Linux Community Development System**
  - ► **ibm.com/zseries/os/linux/lcds**

- **IBM Software Evaluation Kit for Linux**
  - ► **120,000+ kits shipped**
  - ► **No charge for development use**
  - ► **Full function, market-available products**
  - ► **ibm.com/linux/**

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Stuttgart

Chicago

Montpellier

Paris

Greenock

Budapest

San Mateo

Waltham

SOFTWARE EVALUATION KIT
for LINUX
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Linux at IBM

Linux education

LINUX for S/390

IBM

Chart 13

IBM's Commitment to Linux

Hardware	Software	Services	Alliances	Open Source
Servers Desktops	All Major Applications	Support And Training Consulting	Distributor Partnerships	Code Contributions Techical Resources
zSeries, pSeries, iSeries, xSeries, ThinkPads, NetVista	WebSphere, Domino, DB2, Tivoli, VisualAge Java, MQ Series, ViaVoice	Learning Services, Redbooks, Supportline, Consulting Services	Major 4 Distributors Caldera, Red Hat, SuSE, Turbolinux	Manpower, Knowledge, Technology

Chart 14

Linux on zSeries

Chart 15
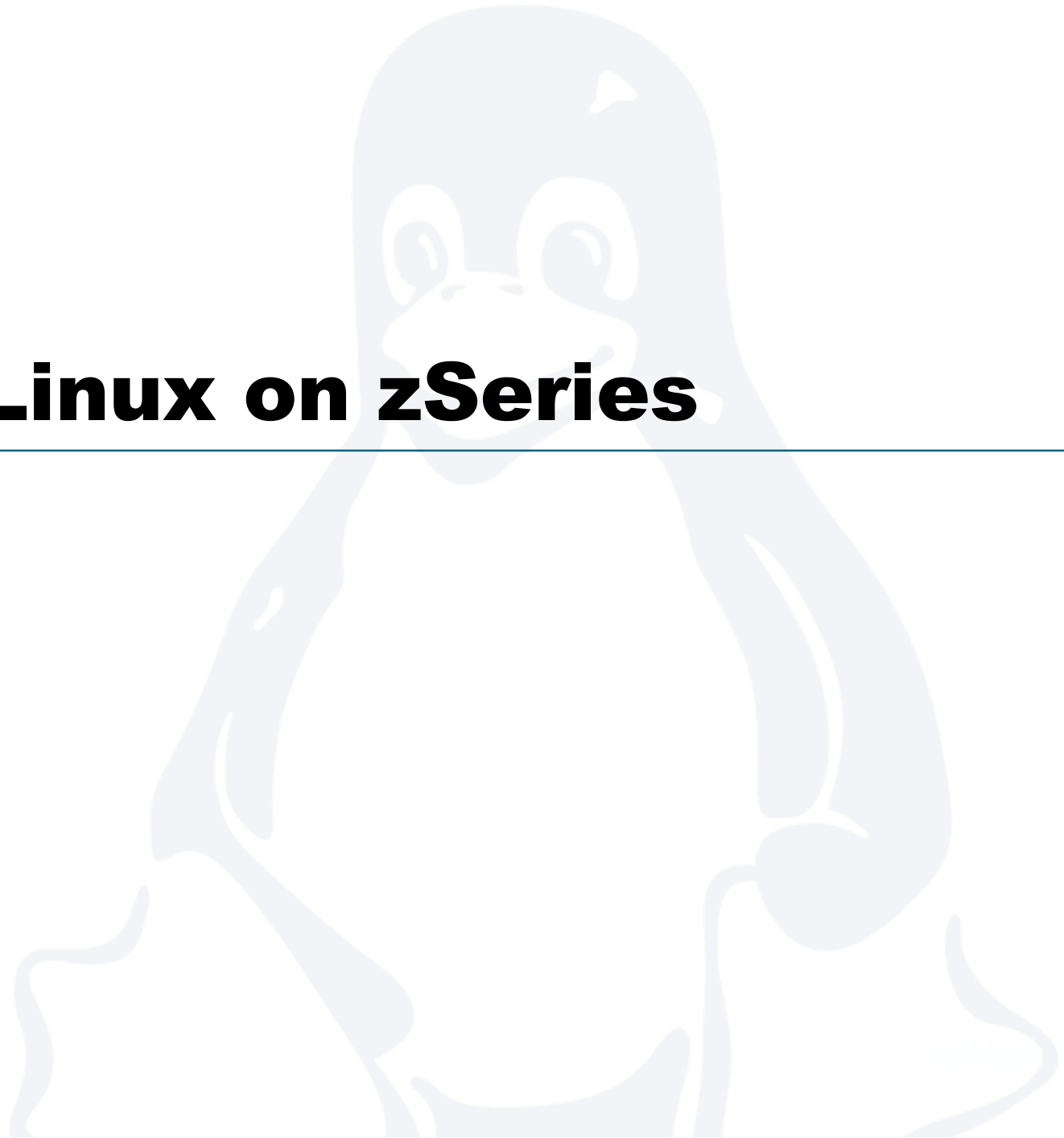
What is Linux on zSeries?

- **A native zSeries operating environment**

  - ▶ **Pure Linux, an ASCII environment**

  - ▶ **Exploits IBM S/390 hardware, including IEEE floating point**

  - ▶ **Linux for S/390 - 32-bit**

  - ▶ **Linux for zSeries - 64-bit**

- **Not a unique version of Linux or other operating system**

- **Not a replacement for other IBM zSeries operating systems**

Chart 16

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**

Chart 17

zSeries Application Sourcing Strategy

- **The IBM commitment to z/OS and VSE/ESA 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**

- **Application sources**
  - ►**z/OS and VSE/ESA - Traditional**
  - ►**z/OS - Unix System Services**
  - ►**Linux on zSeries**
  - ►**WebSphere - Java, Enterprise Java Beans, CORBA**

Chart 18

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**

- **Scalability**
  - ► Physical - scale to 16 application processors and up to 3 dedicated I/O processors
  - ► Logical - scale to hundreds of Linux images
  - ► Non-disruptive capacity upgrade on demand

- **Designed to support mixed work loads**
  - ► Allows consolidation while maintaining one server per application
  - ► Complete work load isolation
  - ► High speed inter-server connectivity

Chart 19

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

- **Speed to market**
  - ► Capacity-on-demand capability on zSeries
  - ► Dynamic allocation of on-line users, less than 60 Seconds to add a new Linux server image using z/VM

Chart 20

Discrete vs Consolidated

Driving workload consolidation

Discrete servers	Consolidated solution
Larger support staffs are required to maintain servers and network gear	Smaller support staffs are required to maintain 1 or 2 servers
Disaster recovery very difficult for large / complex server farms	Disaster recovery very easy for virtual server farms
Lower hardware reliability	Higher hardware reliability
Software resource must be duplicated for each server	Software resource shared among virtual servers
Higher software application cost due to more hardware processors	Lower software application cost due to fewer hardware processors
Failover is provided by additional server hardware in "hot standby mode"	Failover is provided by virtual server in "hot standby mode"
Discrete servers may require significant amounts of power and floor space	Server and disk storage subsystem require minimal power and floor space

Chart 21

Operating Environments

- **Logical Partitions (LPAR)**

  - ► **Hardware partitioning enabling up to 15 "logical partitions" each of which runs a separate operating system, traditional operating system and Linux**

- **Virtual Partitions (z/VM)**

  - ► **zSeries virtualization technology**

  - ► **Support for large numbers of Linux images with rich system management capabilities**

  - ► **Very flexible, great for server consolidation**

Chart 22

Integrated Facility for Linux

- **Additional engines dedicated to Linux workloads**
  - ► Supports z/VM, Linux for S/390 and Linux for zSeries
  - ► Available on 9672 G5/G6, Multiprise 3000 and zSeries 900

- **Lower price than for standard engines**

- **Begin deployment or consolidation of Linux, UNIX and NT workloads to zSeries immediately**

- **Traditional zSeries software charges unaffected**
  - ► IBM zSeries S/390 software and middleware
  - ► Independent Software Vendor products

z/OS IMS	z/OS CICS	z/OS DB2	WAS DB2 Samba Apache Linux z/VM
		zSeries	

IBM
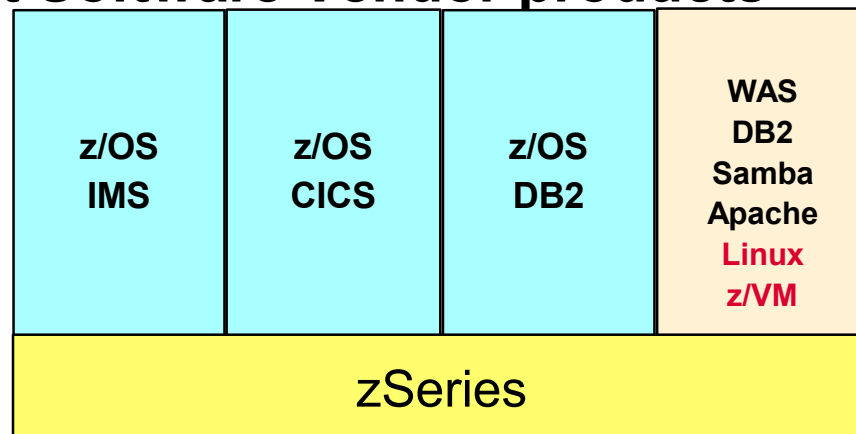
Chart 23

IBM zSeries Virtualization Technology
z/VM Version 4

- **Combination of hardware, firmware and software**
  - ▶ **Over 30 years of development experience**

- **Supports ten to thousands of images, depending on workload**

- **Supports Linux for S/390 and Linux for zSeries guests**

- **Complements the zSeries Integrated Facility for Linux with attractive pricing terms and conditions**

- **z/Architecture exploitation**
  - ▶ **64-bit real storage support - real storage constraint relief**
  - ▶ **64-bit virtual support - run 64-bit guest systems on zSeries**

- **Extensive systems management software from IBM and ISVs**

Chart 24

z/VM in 2001

- **z/VM V3.1 - February 2001**
  - ► New processor architecture support
    - − Exploitation of larger real/virtual storage - 64 bit
  - ► TCP/IP enhancements including stack security
- **z/VM V4.1 - July 2001**
  - ► New terms and conditions
  - ► Support for Integrated Facility for Linux processors
  - ► Guest support enhancements for Linux
  - ► Installation and service enhancements
- **z/VM V4.2 - October 2001**
  - ► Cryptography enhancements
  - ► Performance improvements
  - ► HiperSockets
  - ► Guest LAN
  - ► TCP/IP - IMAP and stack improvements
  - ► Systems administration enhancements
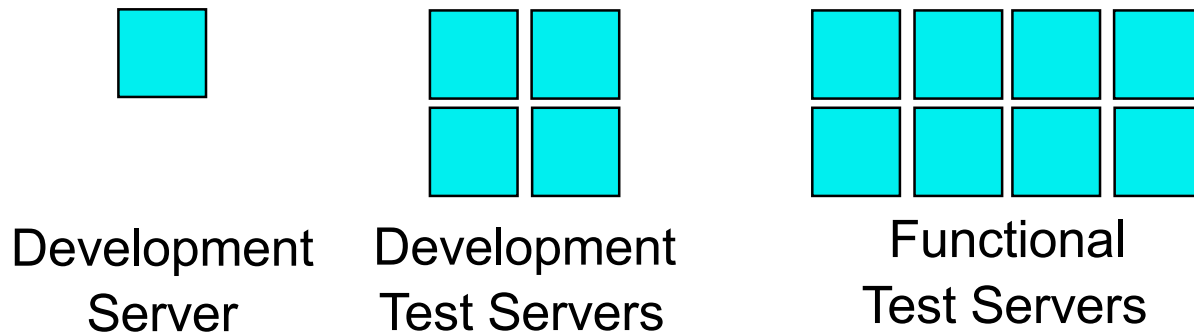
Chart 25

The Value of z/VM for Linux

- **Increased performance, growth and scalability**
  - ►Server consolidation enables horizontal growth
  - ►Three-tier architecture on two tiers of hardware
  - ►Extensive support for sharing resources
  - ►Virtual networking
  - ►Complete isolation of Linux images if required

- **Increased productivity**
  - ►Development and testing
  - ►Production support

- **Improved operations**
  - ►Backup and recovery
  - ►Command and control

Server farms

Linux on zSeries images

z/VM

Chart 26
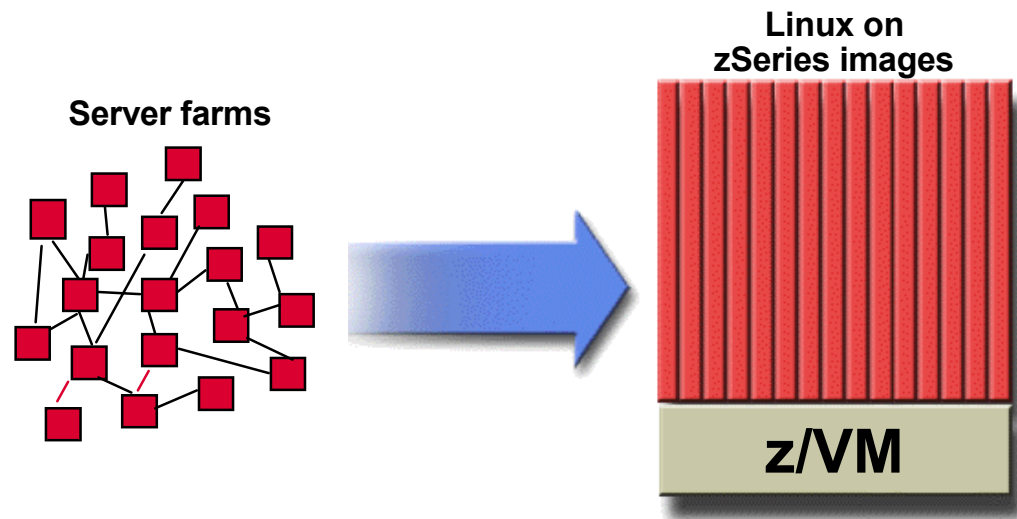
Development and Testing
Traditional

■ **Application development - release 1**

Development
Server

Development
Test Servers

Functional
Test Servers

■ **Application development - release 2**

Development
Server

Development
Test Servers

Functional
Test Servers

IBM
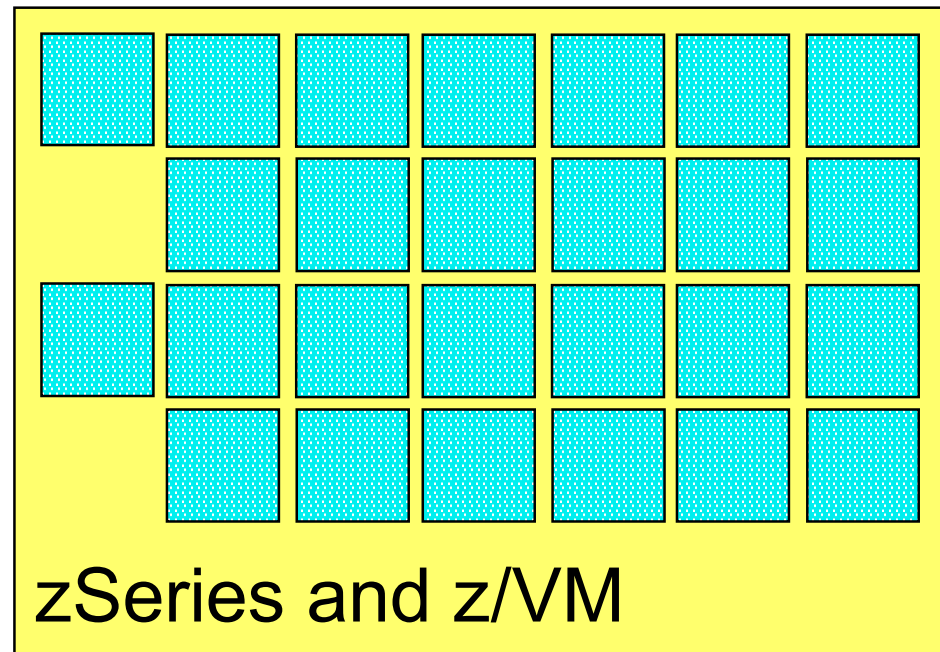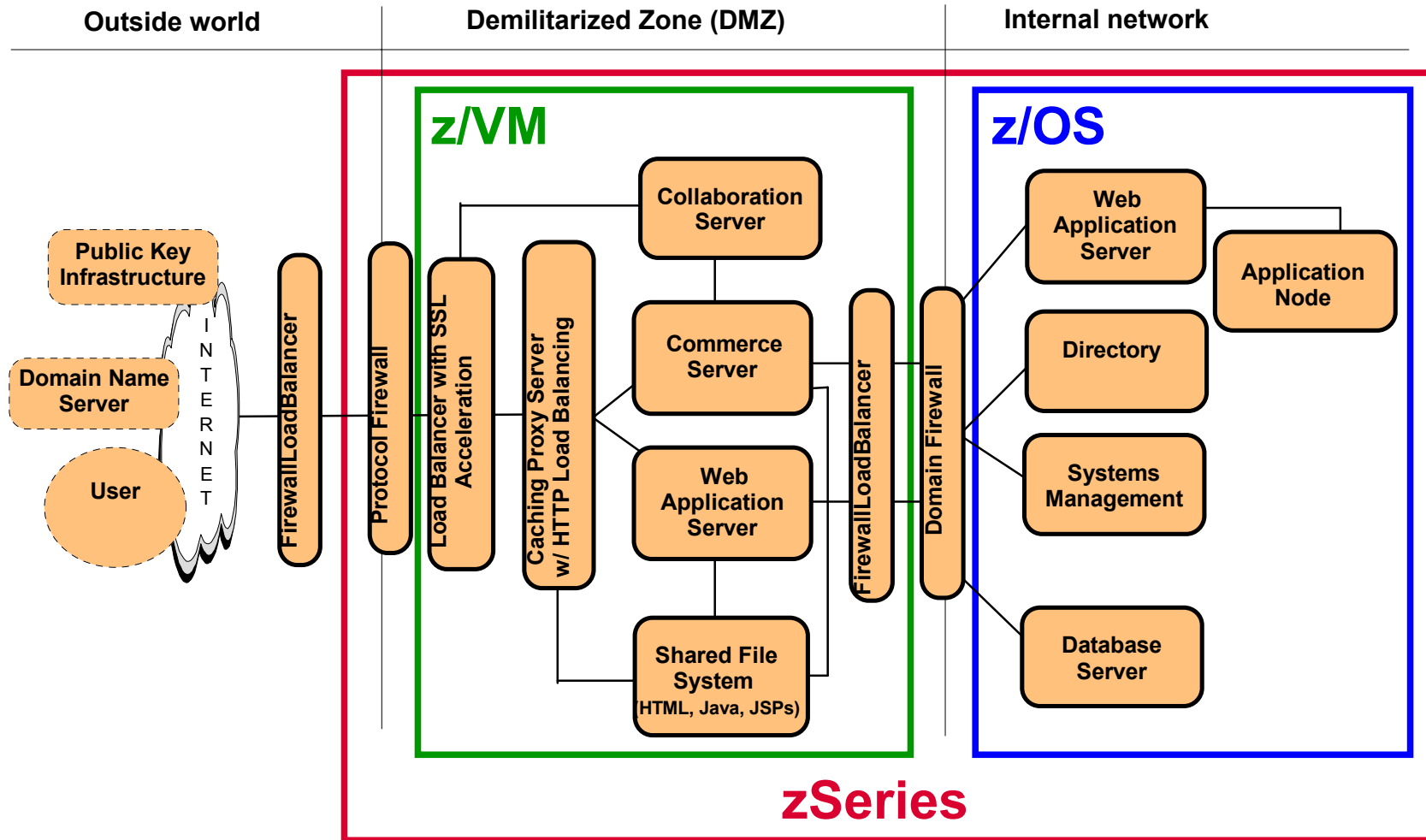
Chart 27
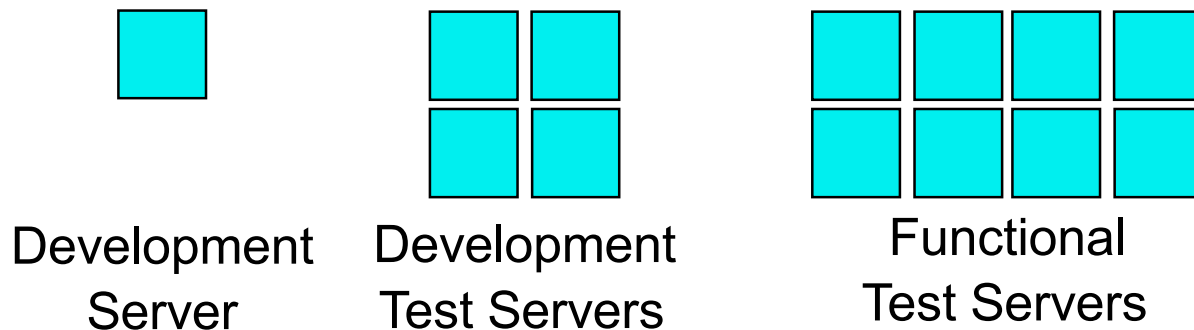
Development and Testing
Using z/VM and Linux on zSeries

- **Using resources only when required**
  - ► Images are online when needed, not all the time

- **Development and test servers are all virtual**
  - ► Shared networking hardware
  - ► Shared memory
  - ► Shared disk
  - ► etc.

zSeries and z/VM

Chart 28

Application Serving with Linux

Outside world | **Demilitarized Zone (DMZ)** | **Internal network**

z/VM

z/OS

zSeries

Public Key Infrastructure

Domain Name Server

User

INTERNET

FirewallLoadBalancer

Protocol Firewall

Load Balancer with SSL Acceleration

Caching Proxy Server w/ HTTP Load Balancing

Collaboration Server

Commerce Server

Web Application Server

Shared File System (HTML, Java, JSPs)

FirewallLoadBalancer

Domain Firewall

Web Application Server

Application Node

Directory

Systems Management

Database Server

IBM

Chart 29

IBM Software for Linux on zSeries

- **Data management**
  - ► **DB2 Universal Database**
  - ► **DB2 Intelligent Miner Scoring**
  - ► **DB2 Net Search Extender**
  - ► **Informix C-ISAM**
- **WebSphere family**
  - ► **WebSphere Application Server Advanced Edition**
  - ► **WebSphere Commerce Suite**
  - ► **WebSphere Host on Demand**
  - ► **WebSphere Personalization**
- **Connectors**
  - ► **DB2 Connect, CICS Transaction Gateway, IMS Connect, MQSeries client**
- **Tivoli**
  - ► **Tivoli Storage Manager client**
  - ► **Tivoli Framework**
- **Pricing generally consistent with Linux applications on xSeries**
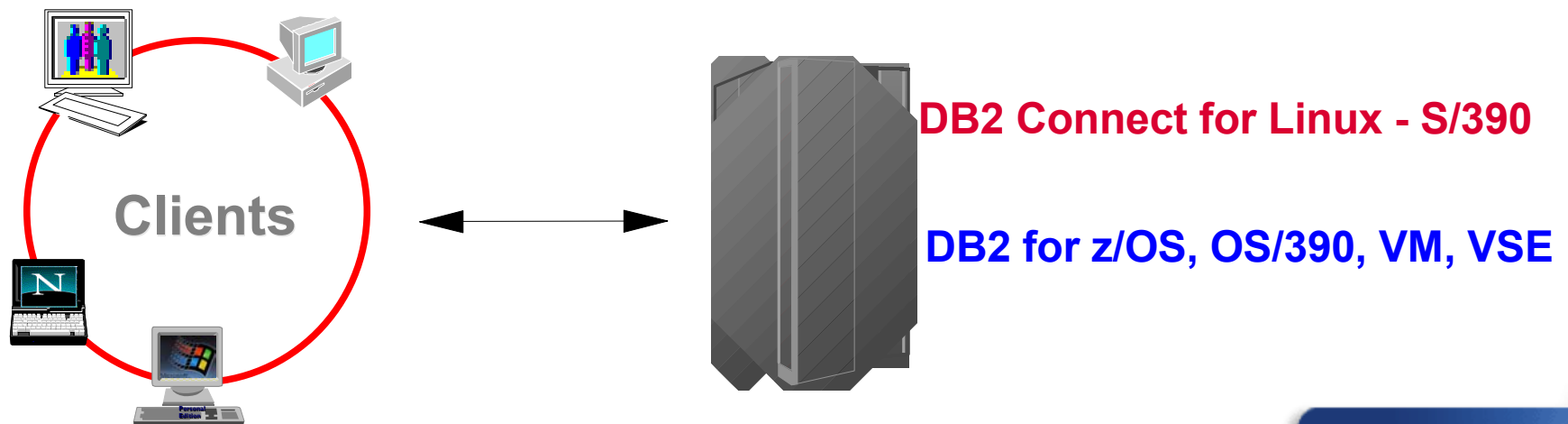
Chart 30

DB2 Connect

Middle tier of gateway servers was needed

Clients

**DB2 Connect for
UNIX, Windows, OS/2**

**DB2 for z/OS,
OS/390, VM, VSE**

Eliminate middle tier with DB2 Connect

After

Clients

DB2 Connect for Linux - S/390

DB2 for z/OS, OS/390, VM, VSE

IBM

Chart 31

ISVs Supporting on Linux on zSeries

- **ACTS**
  - ▶ Testing tools
- **Aeonware**
  - ▶ B2B/B2C
- **BMC Software**
  - ▶ Systems management
- **Bynari**
  - ▶ Mail and calendar server
- **Computer Associates**
  - ▶ Systems management
- **Compuware**
  - ▶ Systems management
- **Dignus**
  - ▶ Development tools
- **Halcyon Software**
  - ▶ Windows migration

- **Logics Software**
  - ▶ Development tools
- **Macro4**
  - ▶ Print server
- **Rational Software**
  - ▶ Development tools
- **Rogue Wave Software**
  - ▶ Development tools
- **RTS Realtime Systems**
  - ▶ Stock tracking
- **SAP**
  - ▶ ERP
- **Sendmail**
  - ▶ Mail server
- **Software AG**
  - ▶ XML Database

Note: This is only a partial list of ISV software available for Linux for zSeries and S/390
For more information check **ibm.com**/zseries/solutions/s390da/linuxproduct.html

Chart 32

Linux Distribution Partners

- **Red Hat**
  - ▶ **Red Hat Linux 7.2 for S/390 - Standard Edition**
  - ▶ **Red Hat Linux 7.2 for S/390 - Premium Edition**
  - ▶ **A 64-bit version of Red Hat Linux 7.1 is expected shortly**
  - ▶ **Trial versions of Red Hat Linux 7.2 for S/390 are available**
  - ▶ **www.redhat.com**

- **SuSE**
  - ▶ **SuSE Linux Enterprise Server (SLES) 7 for S/390 and IBM @server zSeries**
  - ▶ **Evaluation copies of SLES 7 for S/390 are available**
  - ▶ **www.suse.com/us/products/suse_business/sles/sles_s390/**

- **Turbolinux**
  - ▶ **Turbolinux Server 6.5 for zSeries and S/390 - Media Kit**
  - ▶ **Turbolinux Server 6.5 for zSeries and S/390 - Full Distribution**
  - ▶ **www.turbolinux.com/products/s390/**

Chart 33

Red Hat Linux 7.2 for S/390

- **Red Hat Linux 7.2 for S/390 - Standard Edition is a 31 bit implementation**
  - ► **The major features of Red Hat Linux 7.2 for S/390 are as follows:**
    - – **2.4.9 kernel**
    - – **gcc 2.95.3**
    - – **glibc 2.2.4**
  - ► **Customers who purchase Red Hat Linux 7.2 for S/390 receive installation media (CDs), documentation, and one year software maintenance updates delivered through the Red Hat Network, and one year prime shift defect support**
  - ► **On-site installation is included in the price**

Chart 34

Red Hat Linux 7.2 for S/390 ...

- **Red Hat Linux 7.2 for S/390 - Premium Edition includes all the features of the Red Hat Linux 7.2 for S/390 - Standard Edition and adds the following:**
  - ► **24x7 defect support. On site support available after appropriate problem escalation**
  - ► **Single point of contact - A Red Hat Account Manager is assigned as a single point of contact for the customer**
  - ► **Expanded support services are included. For example installation and configuration support for DNS, Web Servers, File/Print etc. is included**

- **All of the source and binary packages that make up Red Hat Linux 7.2 for S/390 are available on Red Hat's public ftp servers**

Chart 35

SuSE Linux Enterprise Server 7 for S/390 and IBM @server zSeries

- **SLES 7 for S/390 comes on two CDs together with a manual, a developer's kit with more than 1,300 applications on five CDs, and 30 days support**
- **The free system maintenance for 12 months includes the posting of quality-checked fixes, patches, and updates to the SuSE Maintenance Web, as well as the accompanying installation support from the SuSE experts**
- **Ongoing maintenance alerts are provided to customers via e-mail**
- **SLES 7 for S/390 also supports the journaling filesystem ReiserFS, HiperSockets, RawIO devices, and GuestLan support**
- **The levels of the major components of SLES 7 For S/390 and IBM @server zSeries are:**
  - ▶ **2.4.7 kernel**
  - ▶ **gcc 2.95.3**
  - ▶ **glibc 2.2.2**

Chart 36

Turbolinux Server 6.5 for zSeries and S/390 - Media Kit

- A customized tape built to restore directly in to your environment with physical device and network addresses, initial userID definitions on Linux, and VM Integration of Linux with z/VM for:
  - ► Automated operations via the programmable operator (PROP)
  - ► Disk savings via the segmentation of the distribution into read/only and read/write segments
  - ► Operational procedures for startup and shutdown.
- A copy of the distribution (including documentation on CD-ROM)
- An extended installation manual that includes extensive documentation on using Linux and VM together including Programmable Operator (PROPs) scripts

Turbolinux Server 6.5 for zSeries and S/390 - Media Kit ...

- Pre-installation setup for popular built-in Linux functionality, providing rudimentary working configurations for:
  - ► Apache
  - ► Samba
  - ► DNS
  - ► e-mail
  - ► Firewall security

- 30 days of installation support.

- The levels of the major components of Turbolinux Server 6.5 for zSeries and S/390 are:
  - ► 2.2.19 kernel
  - ► gcc 2.95.2
  - ► glibc 2.1.3

Chart 38

Turbolinux Server 6.5 for zSeries and S/390 - Full Distribution

- A Turbolinux Server 6.5 for zSeries and S/390 full distribution is also available

- It includes everything in the Turbolinux Server 6.5 for zSeries and S/390 Media Kit as described above, plus the following:
  - ▶ 24 x 7 defect support - Defect support includes functional problems with any RPM-packaged component, performance problems, and product currency issues
  - ▶ The ability to purchase additional Turbocare support packages
  - ▶ The right to renew each year at 21% of the original list price for continued distribution versions and continued 24x7 defect support

Chart 39

IBM @server zSeries 800

Chart 40

IBM @server zSeries 800

- **All of the unique qualities of the zSeries repackaged in a new family of servers, packaged and priced for the smaller data center**

  - ▶ **The Quality of service you need to improve your cost effectiveness and extend your reach**

  - ▶ **The flexibility to respond to Business priorities**

  - ▶ **Consolidation on zSeries to drive out costs**

Chart 41

z/Architecture
The Foundation of the zSeries

- **Designed for e-business**
  - ► Able to run unpredictable high volume workloads
  - ► Capable of near zero downtime operations

- **Key Architecture Features**
  - ► Full 64-bit support for:
    - – Virtual and real memory addressing
    - – General registers
    - – Integer arithmetic
  - ► HiperSockets
    - – High speed internal TCP/IP network

- **Full PR/SM and z/VM support**

- **Coexistence**
  - ► ESA/390 and z/Architecture operating system supported
    - – Basic or LPAR mode
  - ► Trimodal memory addressing
    - – For 24, 31 and 64-bit addressing coexistence

Chart 42

zSeries 800 Highlights

- **z/Architecture: 64-bit**

- **1 - 4-way Flexible Models**
  - ▶ **8 general purpose**
  - ▶ **CF Model**
  - ▶ **Linux-only model**

- **Performance**
  - ▶ **Uniprocessor: 1.3 to 1.4 times G5 R16**
  - ▶ **System: 1.4 to 1.5 times G5 RD6**
  - ▶ **z900 104 is 1.2 to 1.3 times the z800 004**

- **Latest Technology I/O subsystem**

- **Advanced zSeries Functionality**

- **Upgrades within z800 and to z900**

Chart 43

zSeries 800 Performance

Chart 44
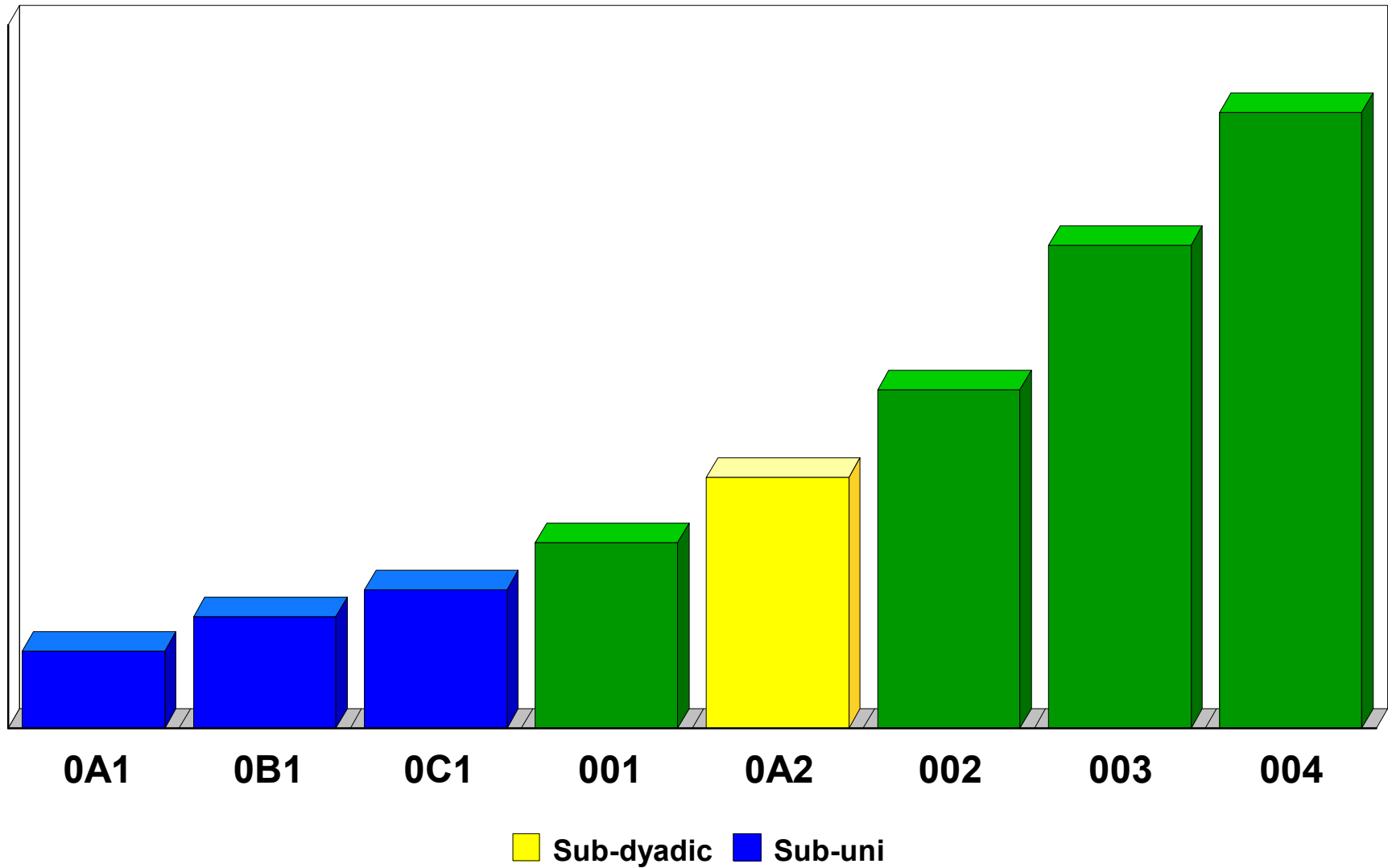
zSeries 800 Memory Options

- **Memory Options**
  - ► **8 GB**
  - ► **16 GB**
  - ► **24 GB**
  - ► **32 GB**

- **All z800 models include 8 GB memory in the base price**

- **Characteristics**
  - ► **Extra chips available for dynamic sparing**
  - ► **Error Checking and Correcting on DIMMs and memory bus**
  - ► **Field pluggable for upgrades**
  - ► **Single bus memory subsystem**

Chart 45

zSeries 800 Processor

- **Same design as z900**

- **64-bit z/Architecture implemented**

- **Enhanced branch prediction**

- **Compression engine in hardware**

- **Improved from G5/G6 decimal performance**

- **Improved from G5/G6 IEEE Floating Point**

- **Improved storage organization**
  - ►**L1 cache split - I/D (instructions/data)**
  - ►**Large L1 cache 512 KB**

- **Different cycle time**
  - ►**z800 1.6ns to eliminate need for closed loop cooling**
  - ►**z900 1.3ns**

Chart 46

zSeries CMOS Technology Evolution

	G3	G4	G5	G6	z900	z800
Year	1996	1997	1998	1999	2000	2002
Technology (CMOS Level)	5X	6S	6X	7S (copper)	8S (copper)	8SE (PU) 8S(SC/SD) (SOI)
Gates (PU Chip)	1M	2 M	6.25 M	6.25 M	11 M	11 M
Lithography (microns)	.5	.35	.25	.20	.18	.18
L-eff (microns)	.25	.2	.15	.12	.092	.092
Metal Levels	5	5	6	6	7	7
Voltage (V)	2.5	2.5	1.8	1.8	1.5	1.5
Transistors PU Chip L2 Cache Chip	6 M 18 M	8 M 20 M	25 M 60 M	25 M 121 M	44 M 234 M	44 M 234 M
Cycle Time (nsec)	6.6 - 5.9	3.3 - 2.7	2.6 - 2.0	1.8 - 1.57	1.3	1.6

IBM

Chart 47

zSeries 800 - Single Frame System

- **Central Electronic Complex (CEC) Cage**
  - ► Memory and processor subsystems
  - ► Power

- **z800 I/O cage**
  - ► Slots for 16 z technology I/O cards
    - – Up to 15 ESCON channels per card
    - – Two FICON Express channels per card
    - – Two OSA-Express ports per card
    - – All hot plug (concurrent add/repair)
  - ► Up to 240 channels in a single cage
  - ► Up to 256 CHPIDS

- **Channel CHPID Assignment**
  - ► Any port any CHPID
  - ► No blocked CHPIDs
  - ► CHPID Availability Mapping Tool

Chart 48

Networking and Connectivity Options

- **High Bandwidth and Flexibility**

- **Channels**
  - ► **FICON Express**
  - ► **ESCON**

- **OSA-Express**
  - ► **Gb Ethernet**
  - ► **Fast Ethernet**
  - ► **155 ATM**
  - ► **Token-Ring**

- **Parallel Sysplex Connections**
  - ► **Integrated Cluster Bus - 3rd generation (ICB-3)**
  - ► **InterSystem Channel - 3rd generation (ISC-3)**
  - ► **Internal Coupling Channel - 3rd generation (IC-3)**

- **HiperSockets**

Chart 49

OPTICA Converter for Parallel Attachments

- **34600 FXBT ESCON Converters**
  - ► **Provides ESCON to parallel protocol conversion**
  - ► **One converter required for each Parallel Channel**
  - ► **Compatible with IBM 9034**
  - ► **Standalone unit or rack mountable (8 per rack)**
  - ► **Fully field installable, configurable, maintainable**
  - ► **Maintenance provided by IBM or Optica**
- **Available directly from Optica at:**
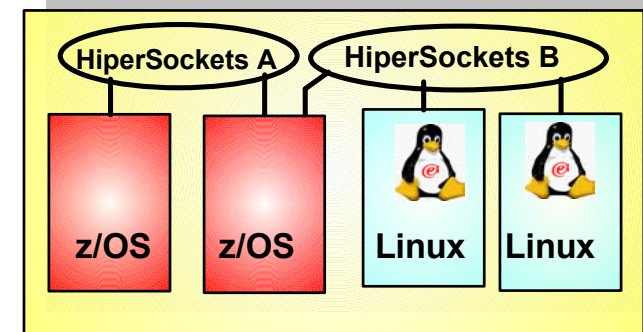 - ► **www.opticatech.com**

Chart 50

HiperSockets - Network in the Box

- **IP networking among virtual servers in a z800 or z900**
  - ► **Improved response time due to low latency**
    - – **High Speed connectivity via memory bus**
  - ► **Highly Secure**
    - – **Data never flows outside the server**
  - ► **Highly available**
    - – **Integrated zSeries hardware, no external parts**
  - ► **Cost savings**
    - – **No external network, attachment, or cables**
  - ► **Flexible**
    - – **Combinations of z/OS™, Linux, and z/VM**
  - ► **Simple to install, operate, maintain**
    - – **Transparent to applications**

- **Minimum pre-requisites**
  - ► **z/OS 1.2, Linux kernel 2.4, z/VM V4R2**

z800 or z900

z/VM | Linux | z/OS

z/OS
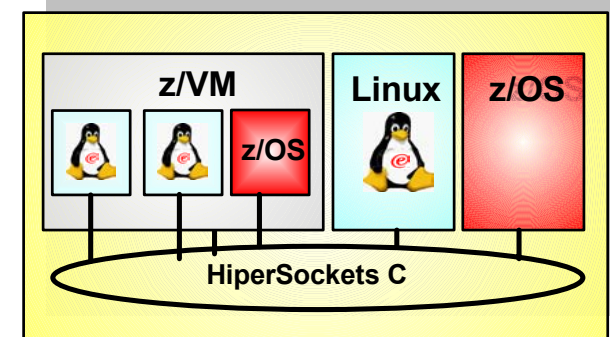
HiperSockets C

z800 or z900

HiperSockets A | HiperSockets B

z/OS | z/OS | Linux | Linux

IBM

Chart 51

HiperSockets Configuration

- **Fast data movement between LPARs**
  - ► **Provides up to four "internal LANs" HiperSockets**
  - ► **Up to 1,024 devices (TCP/IP images)**
  - ► **Up to 4,000 IP addresses**
  - ► **Similar to cross-address-space memory move using memory bus**
  - ► **Does not use CPU cache, thus no effect on other activity**

- **I/O configuration with new CHPID type = IQD**
  - ► **Controlled like regular CHPID**
  - ► **Each OS image configures its own usage of available HiperSockets CHPIDs**

- **Works with both standard and IFL CPs**

- **Both 64-bit and 31-bit OS images**

- **No physical media constraint, no physical cabling**

zSeries 800 Availability Overview

- **Availability improvement to Multiprise and 9672s**
  - ► **Hot pluggable I/O**
  - ► **Memory sparing**
  - ► **ESCON sparing**
  - ► **Automatic Service Element switch**
  - ► **Hot recovery for channel failure**

- **Nondisruptive upgrades**
  - ► **Nondisruptive emergency upgrades and downgrades**
    - – **Capacity BackUp Upgrade (CBU) requires contract with IBM**
  - ► **Nondisruptive upgrades**
    - – **Capacity Upgrade on Demand (CUoD) for 1, 2 or 3 engines**

- **Full Function Parallel Sysplex**

Chart 53

zSeries 800 Operating System Support

Operating System	ESA/390 (31-bit)	z/Archictecture (64-bit)
z/OS Version 1 Release 1, 2, 3, 4 and 5	No	Yes
z/OS.e Version 1 Release 3	No	Yes
OS/390 Version 2 Release 10	Yes	Yes
OS/390 Version 2 Release 8 and 9	Yes	No
Linux for zSeries	No	Yes
Linux for S/390	Yes	No
z/VM Version 4 Release 1 and 2	Yes	Yes
z/VM Version 3 Release 1	Yes	Yes
VM/ESA Version 2 Release 4	Yes	No
VSE/ESA Version 2 Release 4, 5, 6 and 7	Yes	No
TPF Version 4 Release 1 (ESA mode only)	Yes	No

Linux on zSeries

The point of consolidation - where
Linux ascends to the mainframe

- **Flexible design**

- **IBM support and services**

- **Distribution Alliances**

- **IBM middleware**

- **ISV applications**

- **Open Source applications**

LINUX for S/390...

...IT'S COOL.

IBM

Chart 55

Some Important Web Sites

IBM Linux	**ibm.com**/linux
IBM Global Services	**ibm.com**/linux/support
IBM developerWorks	**ibm.com**/developerworks
IBM zSeries	**ibm.com**/zseries
IBM Linux for zSeries	**ibm.com**/zseries/linux
IBM z/VM	**ibm.com**/zseries/zvm
Red Hat	www.redhat.com
SuSE	www.suse.com
Turbolinux	www.turbolinux.com
Linux for S/390 discussion group	www.marist.edu/htbin/wlvindex?linux-390

Chart 56

Contact Information

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ibm.com/zseries/zvm/devpages/jelliott/

Chart 57