z/VM, VSE/ESA, and
Linux for S/390 and zSeries
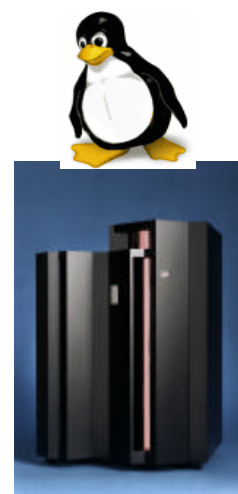
Dr. Klaus Goebel
VSE Program Manager
Böblingen, Germany
kgoebel@de.ibm.com

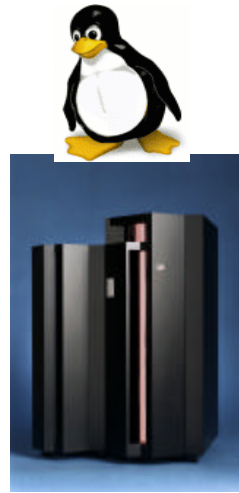IBM @server. For the next generation of e-business.

Agenda

z/VM

VSE/ESA

Linux for S/390 and zSeries

Customer Scenarios
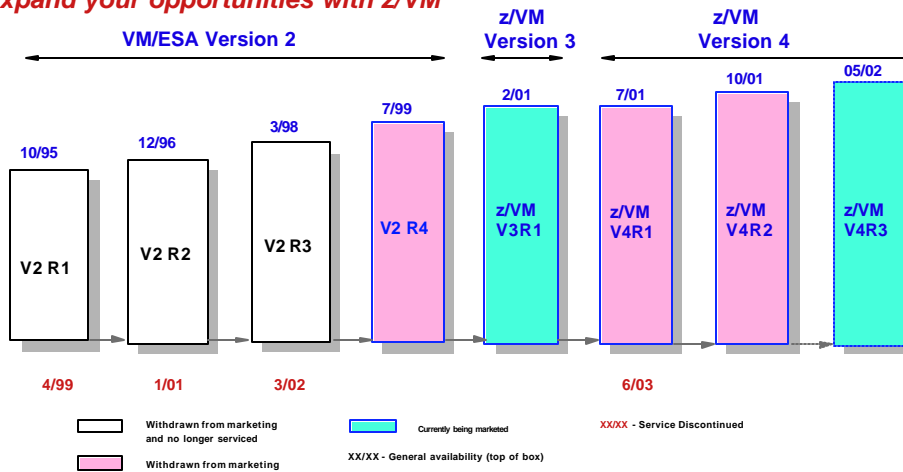
IBM @server. For the next generation of e-business.

z/VM

Status and News

IBM *e*server. For the next generation of e-business.

VM Evolution

Expand your opportunities with z/VM

| VM/ESA Version 2 | z/VM Version 3 | z/VM Version 4 |

10/95	12/96	3/98	7/99	2/01	7/01	10/01	05/02
V2 R1	V2 R2	V2 R3	V2 R4	z/VM V3R1	z/VM V4R1	z/VM V4R2	z/VM V4R3

4/99   1/01   3/02   6/03

Withdrawn from marketing and no longer serviced

Withdrawn from marketing

Currently being marketed

XX/XX - General availability (top of box)

XX/XX - Service Discontinued

IBM *e*server. For the next generation of e-business.

VM's Hardware Support

| VM/ESA V2	z/VM V3	z/VM V4
-	eServer z800, z900	eServer z800, z900
S/390 Parallel Enterprise Servers incl. G3, G4, G5, G6	S/390 Parallel Enterprise Servers incl. G3, G4, G5, G6	S/390 Parallel Enterprise Servers G5 and G6
S/390 Multiprise 2000 S/390 Multiprise 3000	S/390 Multiprise 2000 S/390 Multiprise 3000	S/390 Multiprise 3000
S/390 Integrated Server P/390 R/390	S/390 Integrated Server P/390 R/390	-
-	-	IFL for z800, z900, G5, G6, Multiprise 3000

ALS1   **ALS2**

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z/VM Version 4 Enhancements

Release 1, Release 2, Release 3
- New terms and conditions
  - OTC per processor engine (IPLA pricing)
- Support for both, standard processor and IFL (Integrated Facility for Linux) processor engines
- Enhanced guest support
  - 64-bit: z/OS, z/VM V3, Linux for zSeries
  - 31-bit: OS/390, VSE/ESA, VM/ESA, CMS, Linux for S/390
- Exploitation of new HW technology
  - HiperSockets, ESS large volume support
- Connectivity enhancements
  - Ficon, OSA-Express Token Ring, TCP/IP improvements
- Virtualization technology exploitation
  - Automated shutdown
  - Fibre Channel Protocol guest support
- Enhancements in installation, service, systems mgmt
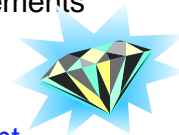
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z/VM Futures

Frequent release delivery expected to continue

Future processor and architecture support

Future device support and networking

Virtualization technology enhancements and improvements
- Extending the industry's best-of-breed hypervisor support

Application infrastructure
- Language Environment upgrade
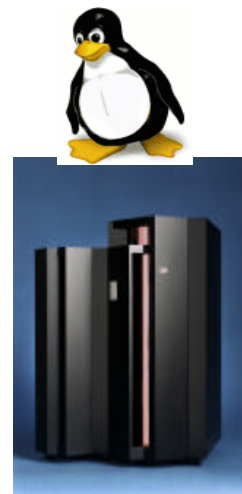- New levels of compilers

Ease-of-Use
- Configuration
- Operations
- Installation / service / release-to-release migration

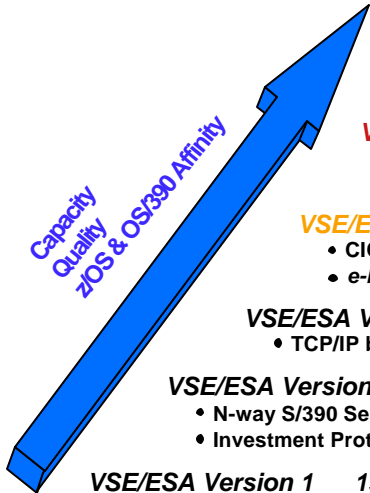IBM @server. For the next generation of e-business.

VSE/ESA

Status and News

IBM @server. For the next generation of e-business.

VSE/ESA satisfies Customer Requirements

VSE/ESA V2.6   December 2001
- Enhanced Interoperability
- Internet Security

VSE/ESA V2.5   September 2000
- Improved Interoperability
- e-business Connectors

VSE/ESA V2.4   June 1999
- CICS Transaction Server for VSE/ESA
- *e-business*

VSE/ESA Version 2.3   1997
- TCP/IP based Communication

VSE/ESA Version 2   1994
- N-way S/390 Servers
- Investment Protection - Year 2000

VSE/ESA Version 1   1990
- Constraint Relief
- ESA Exploitation

Capacity
Quality
z/OS & OS/390 Affinity

IBM @server. For the next generation of e-business.

IBM Application Framework
for e-business

World Wide Web

Databases

Transactions

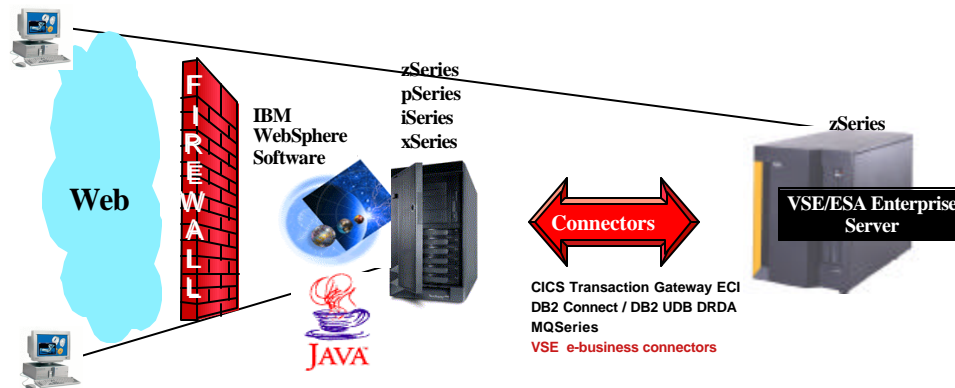**Web Application Server**

Clients   Business Services   Externe Services
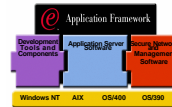
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VSE/ESA V2.5+ and the Application Framework for e-business

IBM

zSeries
pSeries
iSeries
xSeries

zSeries

IBM WebSphere Software

Web

F
I
R
E
W
A
L
L

Connectors

VSE/ESA Enterprise Server

JAVA

CICS Transaction Gateway ECI
DB2 Connect / DB2 UDB DRDA
MQSeries
VSE e-business connectors

| Client | Business Services | External Services |

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VSE/ESA V2.5 -   GA 09/2000

- **Interoperability between VSE and Web Application Server**
  - ► Server code on VSE, JavaBeans/Servlets on Web Application Server
  - ► Access to VSAM, POWER, Librarian, ICCF, VSE Console
  - ► DB2-based Connectors with access to VSAM and DL/I resources
  - ► Complements existing IBM- and Vendor-Connectors
- **Base Enhancements**
  - ► More dynamic classes
  - ► VSAM LSR Hashing
  - ► FlashCopy (ESS) support
  - ► VSAM exploitation for IXFP/SnapShot

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VSE/ESA V2.6 - GA 12/2001

IBM.

- **Enhanced Interoperability Focus**
  - ▸ TCP/IP support for the CICS External Call Interface (ECI)
  - ▸ Internet security (SSL included in TCP/IP for VSE/ESA)
  - ▸ VSAM Redirector
  - ▸ VSAM JDBC Interface
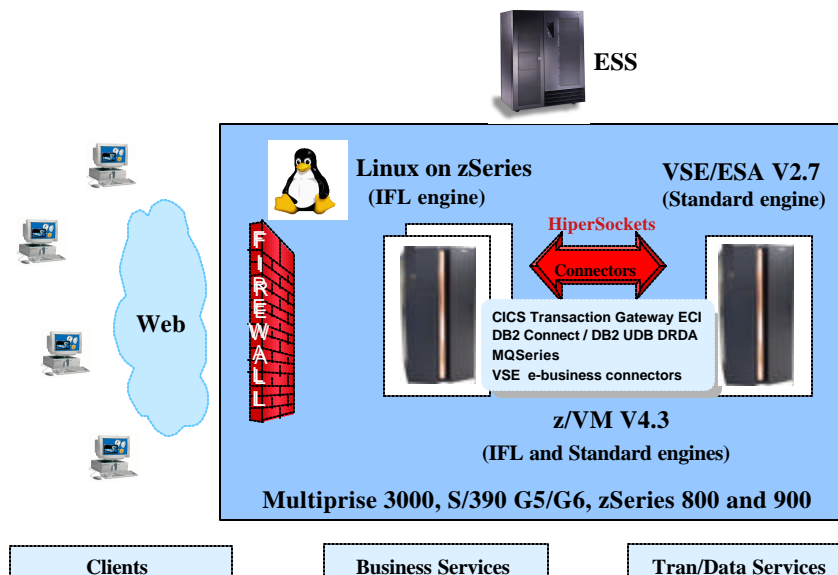 - ▸ VSE connectors updated to Java2 standard
- **More Enhancements**
  - ▸ New release of DB2 Server for VSE and VM Version 7
  - ▸ New Virtual Tape facility
  - ▸ Support for leading edge technology,
    e.g. zSeries 900 (31-bit), FICON, OSA-Express, IBM 2074, VSAM support for
    large 3390-9 DASD, ESS FlashCopy

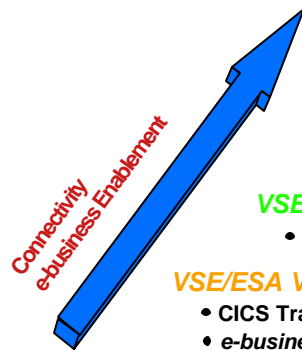*IBM @server. For the next generation of e-business.*

VSE/ESA V2.7 - GA xx/2003

IBM.

ESS

Linux on zSeries
(IFL engine)

VSE/ESA V2.7
(Standard engine)

HiperSockets

Connectors

CICS Transaction Gateway ECI
DB2 Connect / DB2 UDB DRDA
MQSeries
VSE e-business connectors

F I R E W A L L

Web

z/VM V4.3
(IFL and Standard engines)

Multiprise 3000, S/390 G5/G6, zSeries 800 and 900

| Clients | Business Services | Tran/Data Services |

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VSE/ESA Future Directions

VSE/ESA V2.7   Previewed in 2/2002
  • HiperSockets, ALS2

VSE/ESA V2.6   Dec. 2001
  • ECI via TCP/IP, SSL

VSE/ESA V2.5   Sept. 2000
  • e-business Connectors

VSE/ESA V2.4   June 1999
  • CICS Transaction Server for VSE/ESA
  • *e-business*

Connectivity
e-business Enablement

Protect your existing core VSE investments -
emphasize open, <u>hybrid</u> e-business solutions
(especially leveraging Linux on zSeries) for
many newer workloads.

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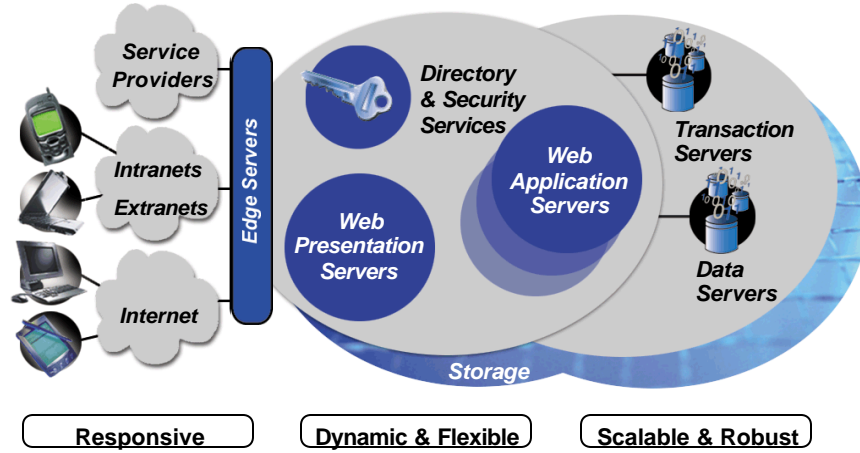

Linux on S/390 and zSeries

Status and News

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Infrastructure for e-business on Demand

Service Providers · Intranets · Extranets · Internet · Edge Servers · Directory & Security Services · Web Presentation Servers · Web Application Servers · Transaction Servers · Data Servers · Storage

Responsive · **Dynamic & Flexible** · **Scalable & Robust**

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What is Linux for S/390?

Operating system that runs in an LPAR, on VM/ESA, or on z/VM
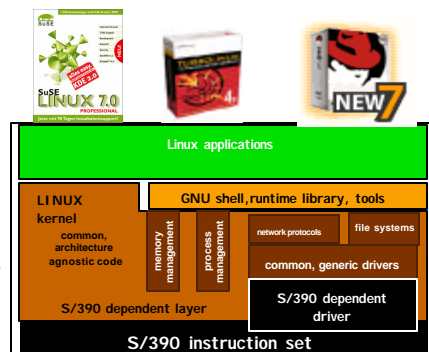• Pure Linux, an ASCII environment

Linux Distribution Partners (LDPs)
• SuSE: www.suse.com
• Red Hat: www.redhat.com

Support
• Offerings available from IBM and LDPs incl. problem resolution and 'how to'

Services
• Offerings available from IBM and LDPs incl. infrastructure, application implementation, and customized solutions

IBM @server. For the next generation of e-business.
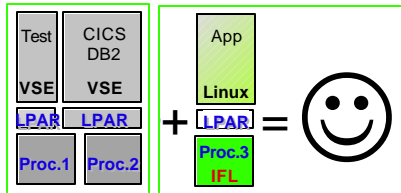
Integrated Facility for Linux (IFL)

IBM

- **Additional processing capacity exclusively for Linux workloads**
  - ▶ For zSeries: z900, z800, IBM 9672 G5/G6, Multiprise 3000 (Mod H30+H50)
- **Lower price than for standard engine**
- **Pricing concept is supported by**
  - ▶ IBM S/390 and zSeries Opering System Software and Middleware
    - e.g. z/VM, DB2, WebSphere, Tivoli, ...
  - ▶ Independent Software Vendors (ISVs)
   - e.g. BMC, CA, SAG, SAP, Oracle, ...

Test	CICS DB2
VSE	**VSE**
LPAR	**LPAR**
Proc.1	**Proc.2**

+

App
Linux
LPAR
Proc.3 IFL

= 🙂

Traditional S/390 software charges unaffected

IBM @server. For the next generation of e-business.

IFL on Multiprise 3000

IBM

- ▶ **Two new features on MP3000**
- ▶ **Upgrades from H30 and H50**
- ▶ **Additional processing capacity exclusively for Linux workloads**
- ▶ **Traditional S/390 software charges unaffected**
- ▶ **Linux SW and Services priced at one engine (1 x IFL)**
- ▶ **Processor storage increased to 4GB**

H30   H30+IFL   H50   H50+IFL   H70

Multiprise 3000

🟨 **Linux Growth Space**
🟦 **Traditional S/390**
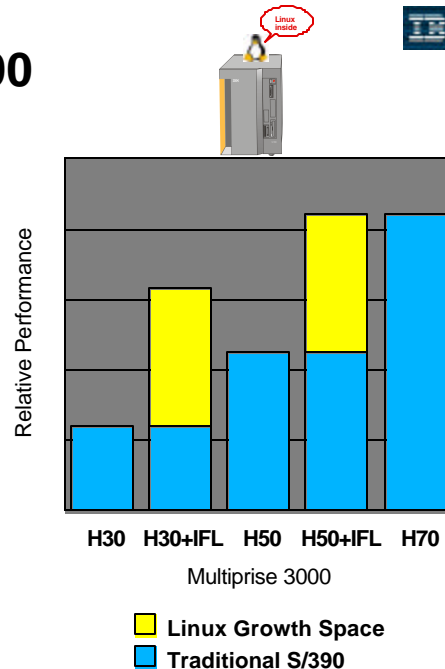
IBM @server. For the next generation of e-business.

zSeries Offering for Linux

- **zSeries Hardware**
  - z800 Model OLF
  - 1 to 4 Integrated Facility for Linux engines
  - Memory pre-configured to match enabled processor configuration
  - Includes FICON™ and OSA Connectivity
- **zSeries Virtualization Technology**
  - z/VM Version 4
- **zSeries Maintenance**
  - 3 years hardware warranty and maintenance
  - 3 years z/VM Subscription and Support License
- **TOTAL Solution Financing - optional**
  - Financing options available from IBM® Global Finance
- **IBM Global Services - optional, such as:**
  - IBM Support Line Software Services for Linux
  - IGS Linux Rapid Deployment Solution

z/VM
Maintenance & Support

IGF   IGS

IBM   zSeries Offering for Linux
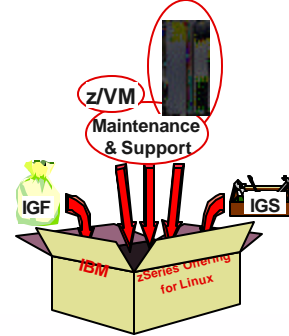
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z800 Model 0E1 - GA 10/2002

- ▶ **New General Purpose Model of z800**

- ▶ **One 40 MIP traditional engine plus one standard IFL engine**

- ▶ **Upgrade to 0A1 with microcode**

- ▶ **Downgrade from 0A1 with microcode**

- ▶ **zELC Software pricing**

VSE/ESA

(z/VM)   (z/VM)

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zSeries Entry License Charge (zELC)

- **zELC Delivers Model Based Pricing**
  - ▸ Software price performance improvements
- **Comparing Equal Software Stacks:**
  - ▸ Newest model 0E1 zELC pricing is less than H30 GOLC pricing
  - ▸ Model 0A1 zELC pricing is equivalent to H30 GOLC pricing
  - ▸ Model 0B1 zELC pricing is equivalent to H50 GOLC pricing
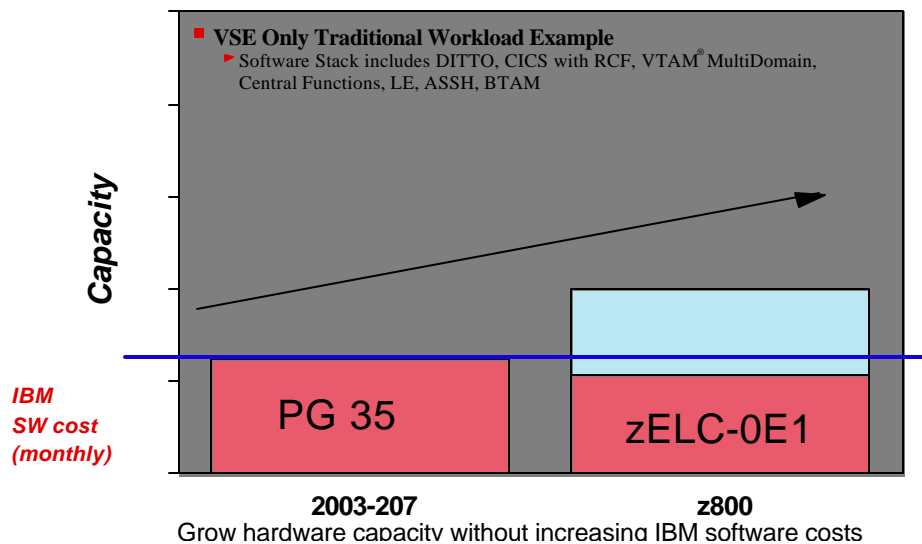 - ▸ Larger models have stepped-pricing that begin to approach PSLC

z800 machine	engines	Rated MSUs	zELC vs. PSLC Monthly License Charge Savings*
0E1	1 + IFL	7	-20%
0A1	1	13	-33%
0B1	1	20	-34%
0C1	1	25	-29%
001	1	32	-30%
0A2	2	44	-25%
002	2	60	-10%
003	3	84	-6%
004	4	108	-6%

*SW Stack Example (US prices): z/OS, DB2®, IMS™, CICS®, MQSeries®

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Example: VSE/ESA - Model 0E1 Price Compares

- **VSE Only Traditional Workload Example**
  - ▸ Software Stack includes DITTO, CICS with RCF, VTAM® MultiDomain, Central Functions, LE, ASSH, BTAM

Capacity

IBM SW cost (monthly)

PG 35 — 2003-207

zELC-0E1 — z800

Grow hardware capacity without increasing IBM software costs

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Example: 0E1 with IFL with z/VM and VSE/ESA

z800-0E1 with zELC

IFL

new

trad

CICS
DITTO
COBOL
VSE/ESA
z/VM

z/VM

- **Notes:**
  - Having the Integrated Facility for Linux (IFL) engine on the Model 0E1 does not affect IBM software license charges on the traditional engine
    - The 0E1 machine actually has 2 engines, 1 general purpose engine and 1 IFL
  - This example assumes that virtualization technology is required on IFL
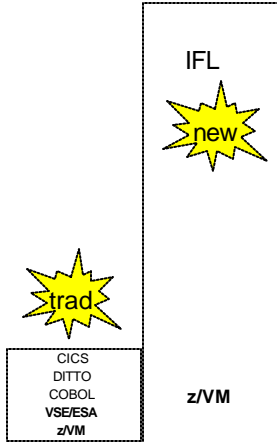
Product	License
CICS	zELC Model 0E1
DITTO	zELC Model 0E1
VSE/ESA	zELC Model 0E1
z/VM V4	IPLA for each engine - 2 copies required**

** This example assumes that z/VM is required on the IFL and the traditional engine

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Why Linux for zSeries ?

Exploding number of applications & solutions on Linux

Large number of highly skilled programmers familiar with Linux

Integrated business solutions
- Data richness from zSeries
- Web capabilities of Linux applications

Industrial strength environment
- Qualities of service from zSeries
- Flexibility and openness of Linux

Unique ability to easily consolidate large number of servers

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IBM Middleware for Linux on zSeries

- **Connectors**
  - DB2 Connect™, Version 7.1
  - MQSeries® client, Version 5.2
  - CICS® Transaction Gateway, Version 4.0
  - IMS™ Connect, Version 7

- **WebSphere® Family**
  - WebSphere Application Server Advanced Edition, Version 4.0
    - including JDK 1.3.0 & JIT
  - WebSphere Personalization, Version 3.5
  - WebSphere Commerce Suite, Version 5.1
  - WebSphere Host on-Demand, Version 5.0.3

- **Data Management**
  - DB2® Universal Database™, Version 7.2
  - DB2 Intelligent Miner™ Scoring, Version 7.1
  - DB2 Net Search Extender, Version 7.2

- **Tivoli®**
  - Tivoli Storage Manager Client 4.2
  - Tivoli Enterprise Console 3.7.1
  - Tivoli Software Distribution 4.0
  - Tivoli Distributed Monitoring 4.1
  - Tivoli Workload Scheduler 8.1

- *SW license cost consistent with Linux on other platforms*

- *SW licence cost are per engine*

- *SW products are on same product level as on other platforms*

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ISVs supporting Linux on zSeries

ERP, Production Planning, Logistics
- ABAS Software AG
- SAP

Database
- Oracle 9i
- Software AG Tamino (XML Database)

Application & e-business Integration
- Tibco
- Iona
- BEA WebLogic Server
- Aeonware (B2B/B2C)

Systems Management
- BMC Patrol
- BMC Mail Server Knowledge Agent
- BMC Web Server Knowledge Agent
- Computer Associates

Windows migration, ASP
- Halcyon Software

Stock tracking
- RTS Realtime Systems

Core Banking Applications
- Sanchez

Mail & Calender Server
- Sendmail
- Bynari

Print server
- Macro4

Development & Test Tools
- Logics Software
- Lattwein
- Rational Software
- Roguewave Software
- Dignus
- ACTS (testing)

Backup Software
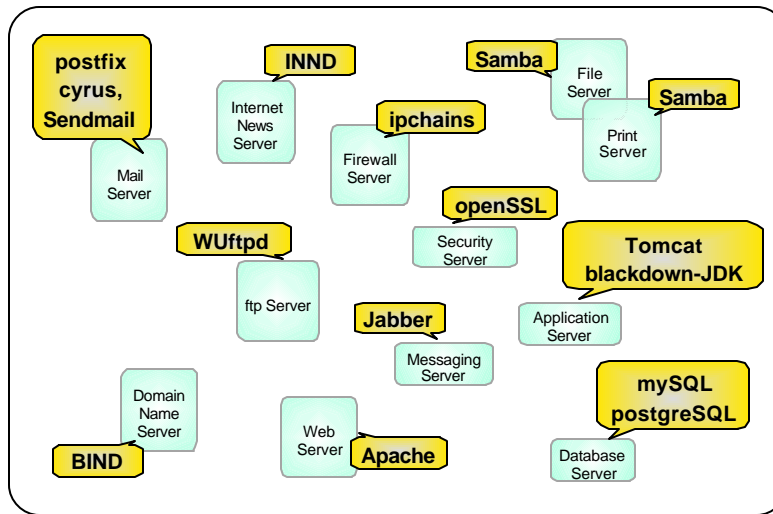- Computer Associates

Firewall
- zGuard

More than 200 applications from 100+ vendors!

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Open Source Software

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Linux Development Focus 2002/2003

- **ISV / Middleware enablement**
- **Networking**
  - → **HiperSockets**
    - Cross partition communication at "memory speeds"
  - → **High Speed Token Ring**
- **IRD (Intelligent Resource Director)**
  - → **WLM world to Linux**
- **Storage**
  - → **Enhanced Shark support**
  - → **Tape support**

- **Enhanced Security Exploitation**
  - → **Enablement of H/W Cryptography**
- **Enhanced RAS**
  - → **Dynamic I/O**
  - → **DASD error recovery**
  - → **Dump, dump analysis, trace tools**
- **Compiler optimizations**
- **64-bit Linux distributions**

- **openFCP/SCSI**
  - → **Technology demo at LinuxWorld, NYC 01/2002**
    - with ESS disks, DVD-ROM, CD-RW, 3580 LTO tape drive
  - → **Announced for z800 and z900 in 04/2002**
  - → **Limited Availability since 06/2002**
  - → **GA planned for 1H2003**

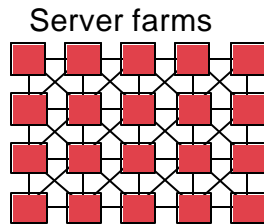IBM *e*server. For the next generation of e-business.
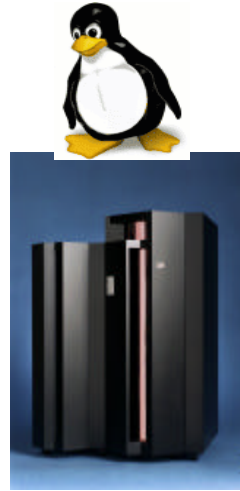
Customer Scenarios

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How Customers are using Linux for S/390 ...

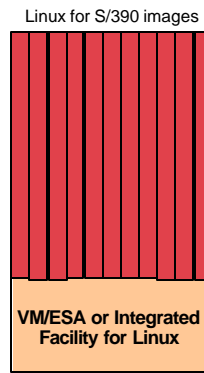Consolidation of servers

Server farms

Linux for S/390 images

Consolidation
e-business

Single purpose
Internet-related
servers

Web servers
Internet news servers
Domain name servers
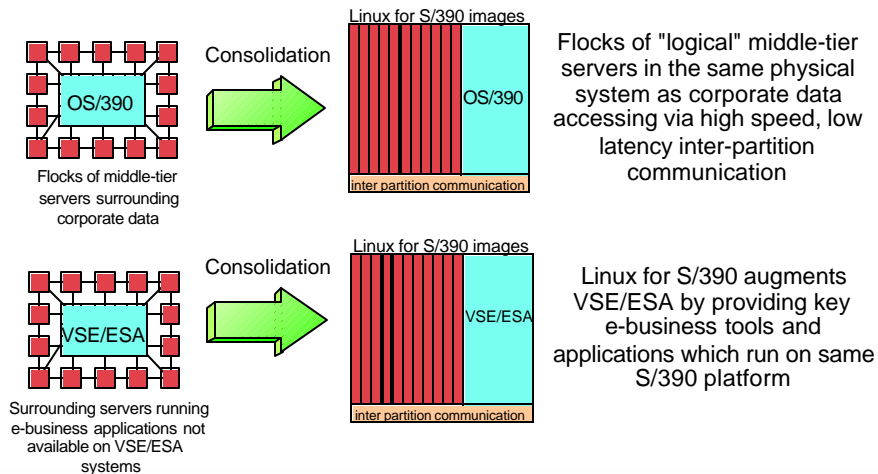**File/print servers**

**VM/ESA or Integrated
Facility for Linux**

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How Customers are using Linux for S/390

Enhancing their S/390 investment

Flocks of middle-tier servers surrounding corporate data

Consolidation

Linux for S/390 images

OS/390

inter partition communication

Flocks of "logical" middle-tier servers in the same physical system as corporate data accessing via high speed, low latency inter-partition communication

Surrounding servers running e-business applications not available on VSE/ESA systems

Consolidation

Linux for S/390 images

VSE/ESA

inter partition communication

Linux for S/390 augments VSE/ESA by providing key e-business tools and applications which run on same S/390 platform
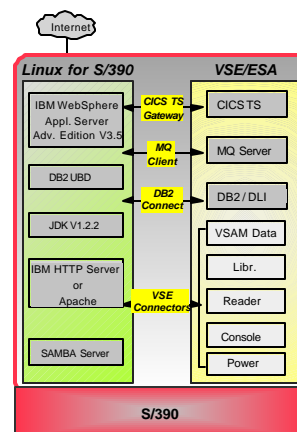
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Linux & VSE Connectors

- ■ **VSE Connectors**
  - ► **Java-based connector**
    - Connectivity via TCP/IP
    - Implemented as long running partition
    - JavaBeans on Web Application Server
    - Access to: VSAM, POWER, Librarian, ICCF, console
  - ► **DB2-based connector (using DRDA)**
    - Connectivity via TCP/IP or SNA
    - Implemented as DB2 stored procedures
    - Standard JDBC/ODBC calls on Web Application Server
    - Access to VSAM and DL/I - as well as DB2
- ■ **Java-based Solutions**
  - ► VSE Navigator
  - ► JConVSE (Java console for VSE)
  - ► JDataMig (Java data migration)
  - ► VSAM Redirector

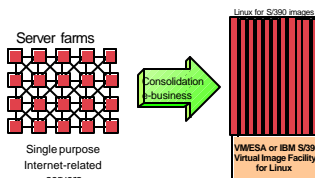*VSE is an excellent back-end system partner.*

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Customer References

Winnebago Industries
Linux for S/390 - Distributed Application Server

Linux for S/390 images

Server farms

Consolidation
e-business

In distributed application environments Linux provides:
- Highly stable Open Source operating system
- Large selection of low cost, high quality applications
- Large numbers of trained administrators & programmers

S/390 provides Linux with
- The ability to run many Linux instances on a single S/390
- Secure isolation of user workload and data
- Upgradability without repurchase
- Reliability and availability

Single purpose
Internet-related
servers

VM/ESA or IBM S/390
Virtual Image Facility
for Linux

- **Recreational Vehicle Manufacturer in Iowa**
- **Replaced Microsoft e-mail servers with Bynari Insight server on Linux on zSeries**
- **Users still use Microsoft Outlook e-mail clients**
- **'Traditional' applications run on VSE/ESA**
- **Plans to consolidate 30-40 Intel PCs on Linux**
- **Runs VSE, SuSE, and VM on Multiprise 3000**

"Upgrading to Microsoft Exchange or Novell GroupWise would cost Winnebago about $100,000. We expect Bynari Insight Server to cost a third or even a quarter of that, because Winnebago will be able to make use of excess capacity on the company's IBM Multiprise 3000 mainframe. The mainframe is our industrial-strength system that stays up, and that's where our expertise is." - Dave Ennen - Technical Support Manager - Winnebago Industries

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Grede Foundries
Linux for S/390 - Infrastucture server consolidation
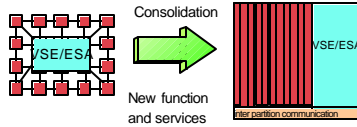
In VM and VSE environments Linux provides:
- A wide range of applications not available on VM/ESA or VSE/ESA
- The ability to leverage existing applications and data in e-business scenarios

S/390 provides Linux with
- Fast connection to VSE/ESA managed data
- Reliability and availability
- An economical alternative to stand-alone servers

- **Milwaukee-based manufacturer of iron and steel castings for the auto and heavy equipment industry**
- **Reduced costs for servers, software, and administration by _not_ adding additional NT servers**
- **Improved performance through use of S/390 internal high speed network versus external LAN**
- **DNS servers, mail servers, Apache web servers, SAMBA file servers on Linux for S/390**
- **IBM DB2 UDB for Linux, DB2 Connect**
  - **Moving to WebSphere Application Server**
- **VSE, SuSE, and VM on a Multiprise 3000**

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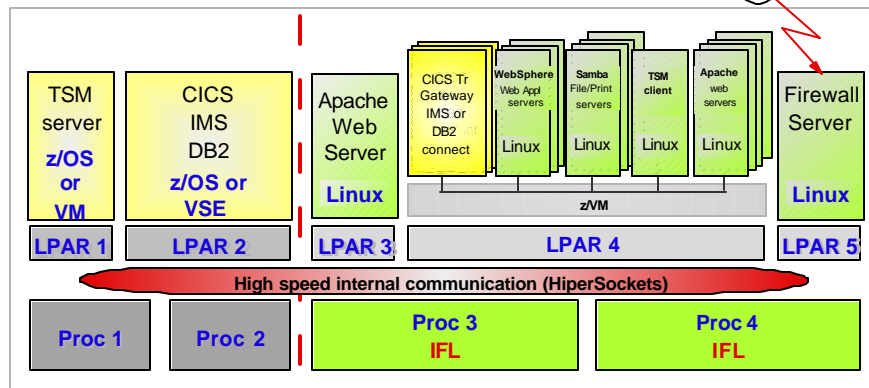

Other Examples of VSE Users running Linux

- **Health Management Associates - Healthcare (Florida)**
  - Acquires and operates hospitals
    - Exploits IT to increase efficiency and reduce cost
    - Needs to integrate existing IT infrastructures
  - WebSphere Application Server and ViaSQL
  - VSE/ESA and SuSE (under LPAR) on **Multiprise 3000**

- **Price Chopper - Retail (New York)**
  - Wanted an attractive web site
    - Online catalog shopping
    - Used Linux-based web technology
  - VSE/ESA, SuSE, and VM/ESA on **Multiprise 3000**

- **GE Capital Bank - Consumer Finance (Switzerland)**
  - Consolidation of UNIX servers under Linux on zSeries
  - VSE/ESA, SuSE, and VM/ESA on **G6**

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Bringing it all together !

e.g. z800

Internet

TSM server **z/OS or VM**	CICS IMS DB2 **z/OS or VSE**	Apache Web Server **Linux**	CICS Tr Gateway IMS or DB2 connect	WebSphere Web Appl servers **Linux**	Samba File/Print servers **Linux**	TSM client **Linux**	Apache web servers **Linux**	Firewall Server **Linux**

			z/VM	

LPAR 1	**LPAR 2**	**LPAR 3**	**LPAR 4**	**LPAR 5**

High speed internal communication (HiperSockets)

Proc 1	Proc 2	Proc 3 **IFL**	Proc 4 **IFL**

- **Integrated solution**
  - ▶ Linux applications provide front-end to DB2, CICS, IMS
  - ▶ 3-tier architecture on 2-tier hardware
  - ▶ High speed communication between virtual servers

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Summary

z/VM, VSE/ESA, and Linux on zSeries means:
Fit for e-Future (Fun)!

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