

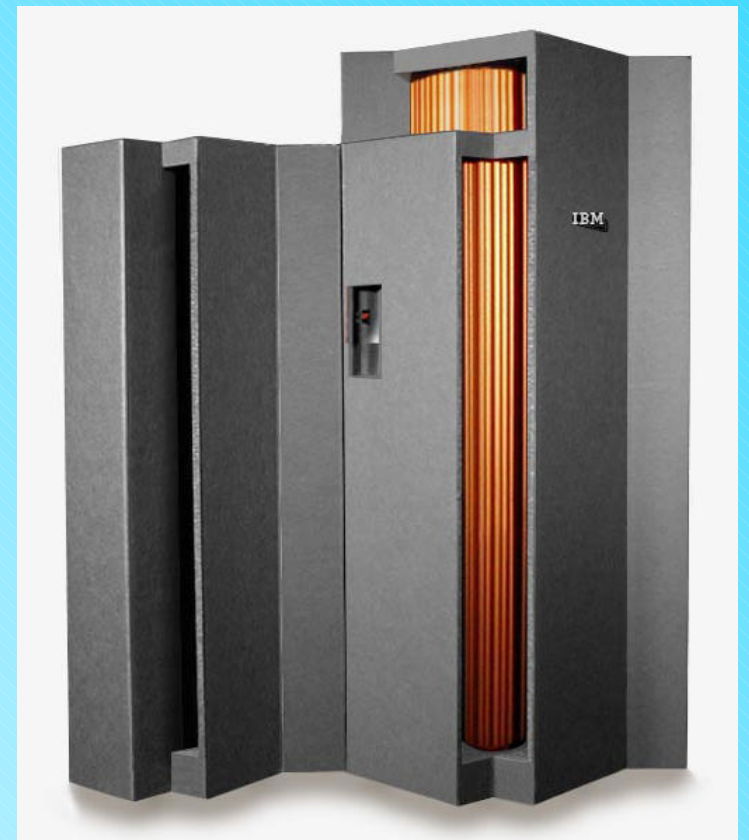
IBM



by zSeries 900

LUGS Meeting 30.8.2001

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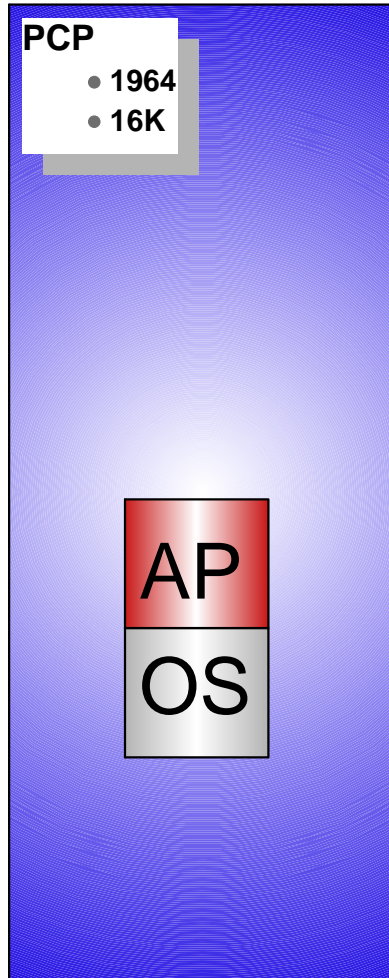


What is LINUX

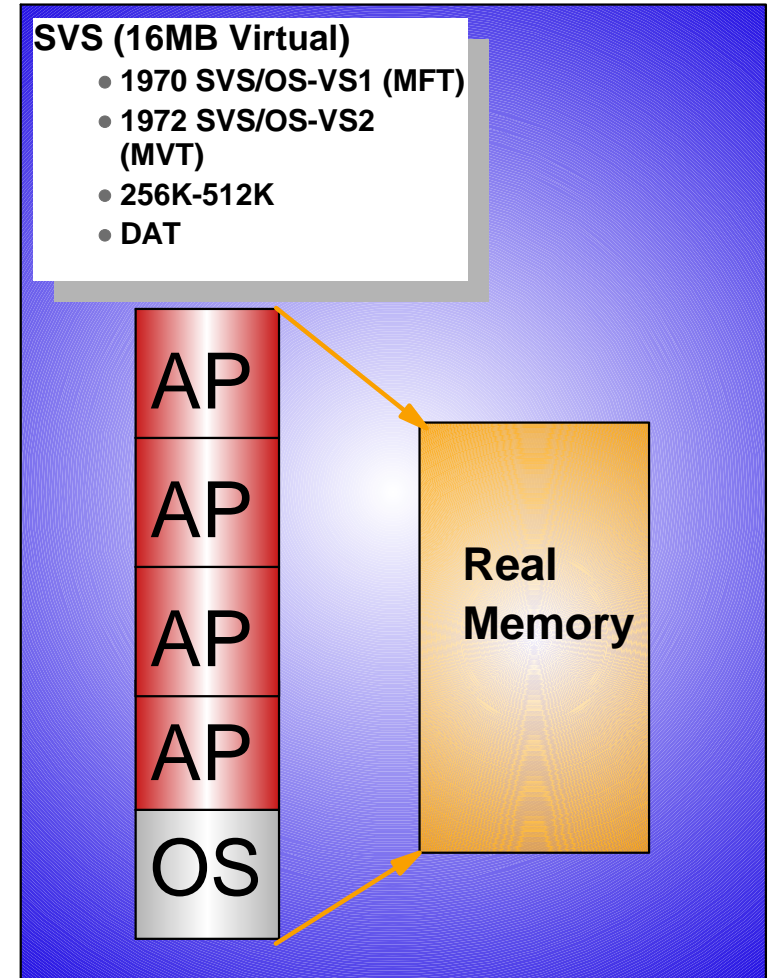
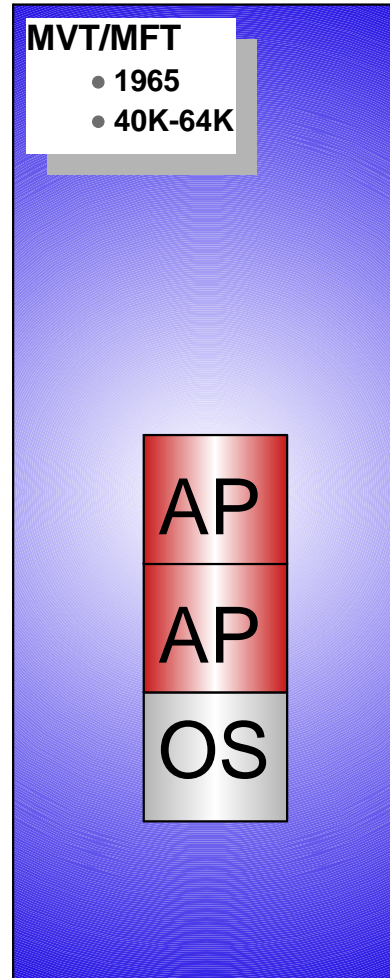
- Popular UNIX-like operating system
- Developed by Linus Torvalds in 1991
- Developed & tested by Open Source community communicating via Internet
- Open Source Software distributed under terms of the GNU Public License (GPL)
- Packaged and distributed by distributors which offer support (SuSE, RedHat, Caldera, Turbo Linux, et. al.)



Roots of Strength

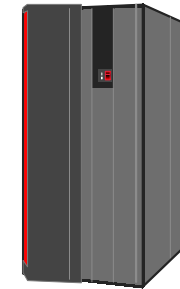


/360

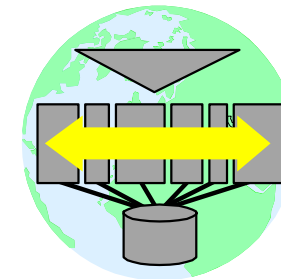


/370

- **Bipolar (ECL) to CMOS Technology**
 - ▶ Reduce Costs - Compete with alternative platforms
 - ▶ Restructure/Retool - engine size equivalent to 9X2

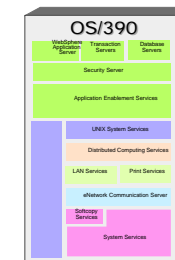


- **Single System Image to Parallel Sysplex**
 - ▶ Traditional OLTP focused
 - ▶ Availability base for 24 X 7
 - ▶ Scale beyond largest Single Image
 - ▶ Workload Manager



- **MVS to OS/390 to zOS**

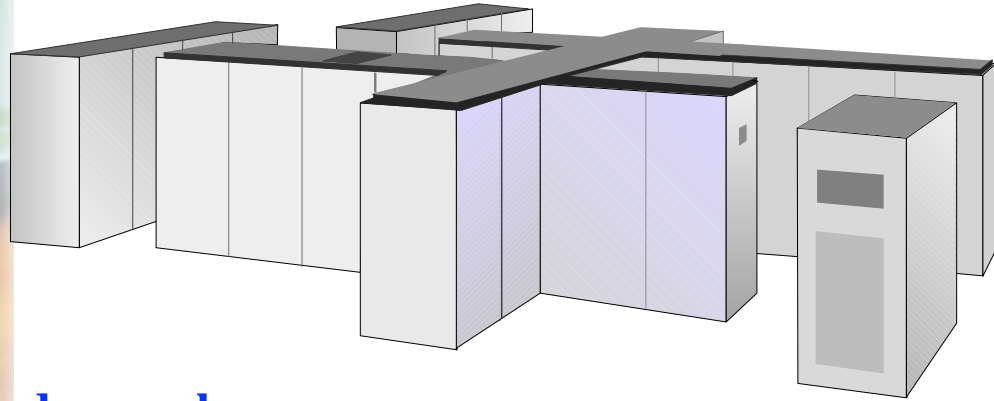
- ▶ Attract packaged Applications - Unix Interfaces
 - ▶ Easier to Install - OS/390 package



System Management Services

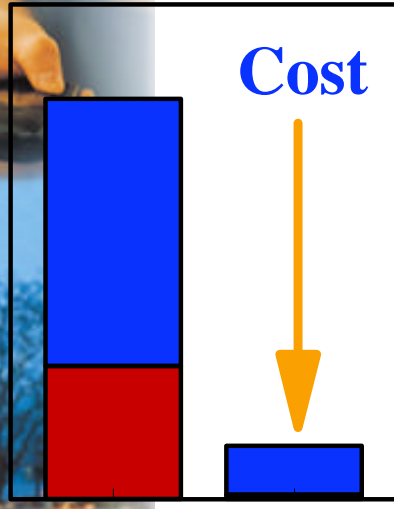
Downsizing to the Mainframe

ECL



CMOS

reduced annual running costs



Type	9x2	RY5	
Mips	468	446	-4.7%
Power	206kVA	2.8kVA	-96%
Heat	192kW	2.7kW	-96%
Weight	11.5Tons	0.6Tons	-94,8%

Bipolar CMOS

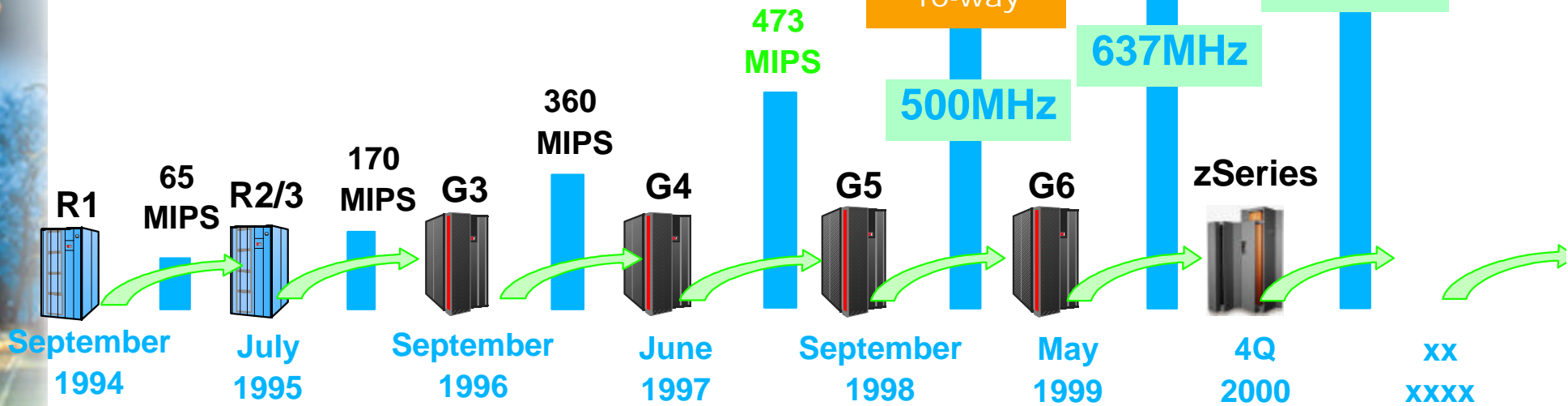
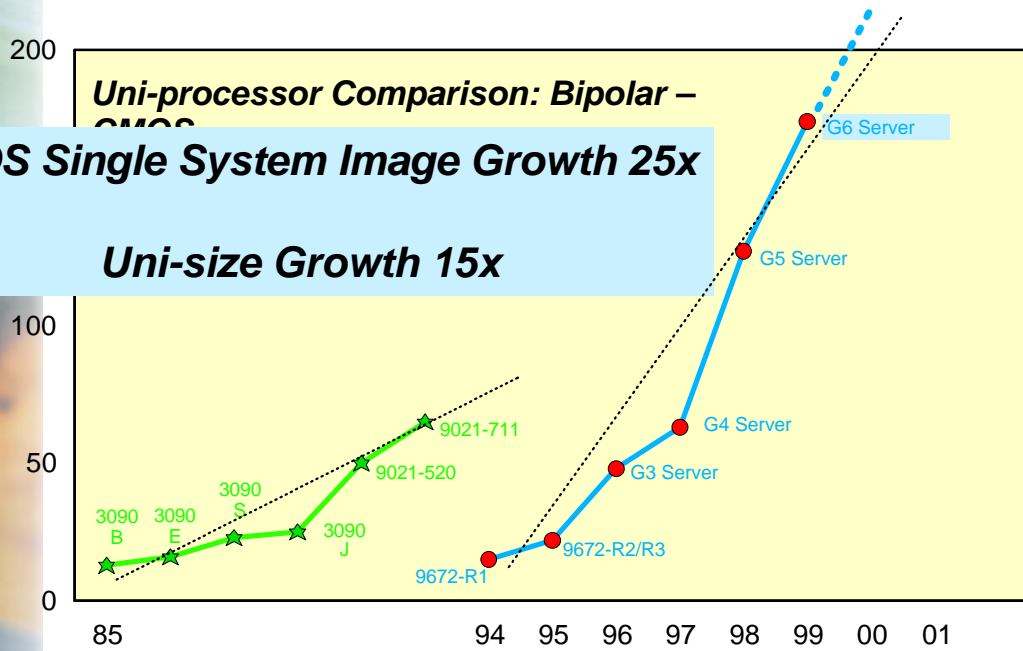
with full ESA/390 Function

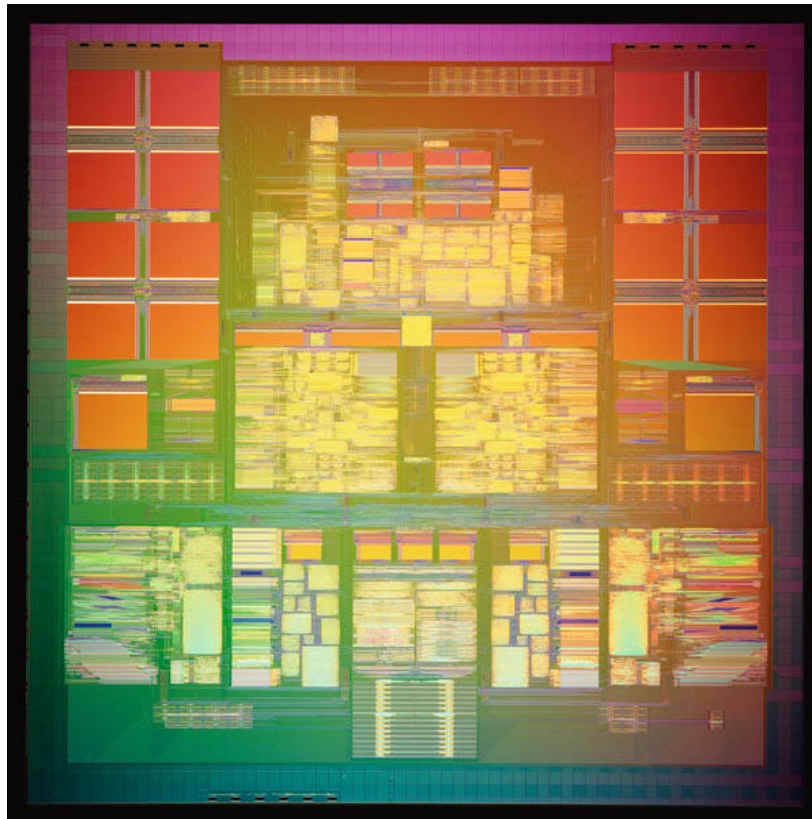
- ✓ ESCON Channels
- ✓ Full Sysplex Support
- ✓ ICMF, ICF
- ✓ EMIF
- ✓ CICS SSP and SGF
- ✓ DB2 Sort and ADMF
- ✓ Data Compression
- ✓ OSA
- ✓ Enhanced PR/SM
- ✓ Cryptographic co-processor

Capacity/Performance

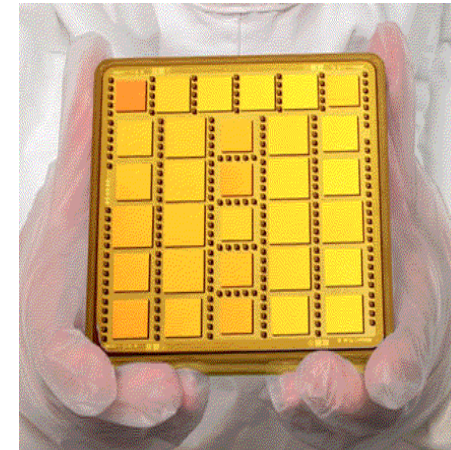
CMOS Single System Image Growth 25x

Uni-size Growth 15x





zSeries CMOS Chip



copper - 770MHz

20 Processors on one
Multilayer Ceramic
Module 12x12cm



Memory Bandwidth

24GB
Memory
Bandwith

Security Bandwidth

Crypto with
Triple DES
(up to 16000
TXs/sec)

Network Bandwidth

up to 24
Gb Ethernet
Adapters



Parallel Sysplex Bandwidth

Internal Coupling
Channel 4GB/sec

Integrated Couple
Bus 1GB/sec

Hiper Sockets

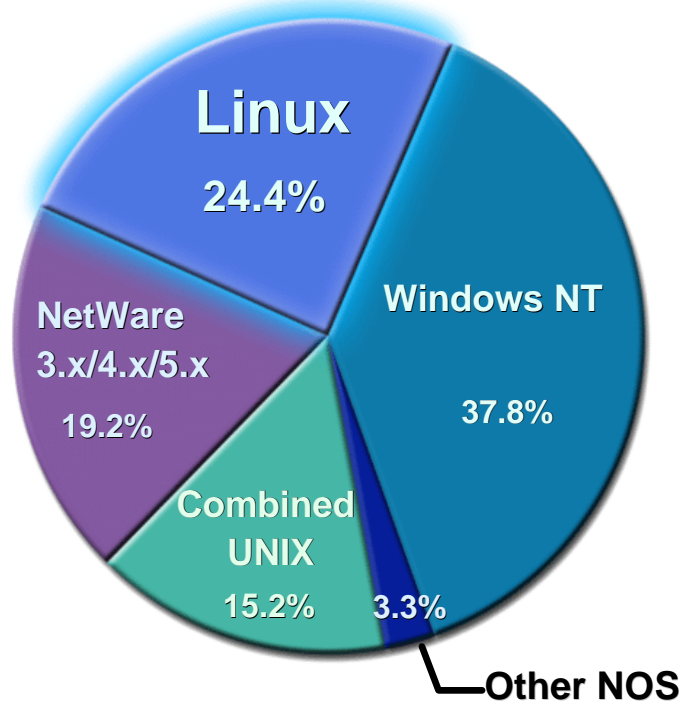
Application Access to Data Bandwidth

96 FICON
Channel
100 MB/sec

20 Processors, appx. 2'700 MIPS, LPAR Clustering

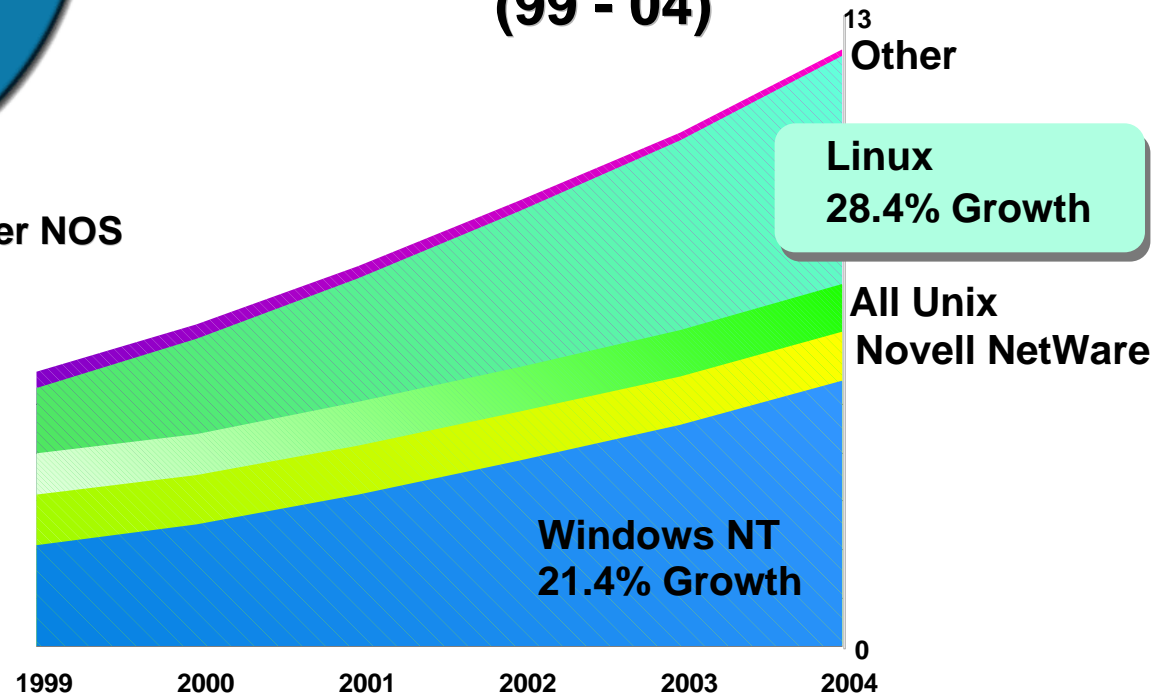
Linux Momentum Building

1999 New Server OS Shipments



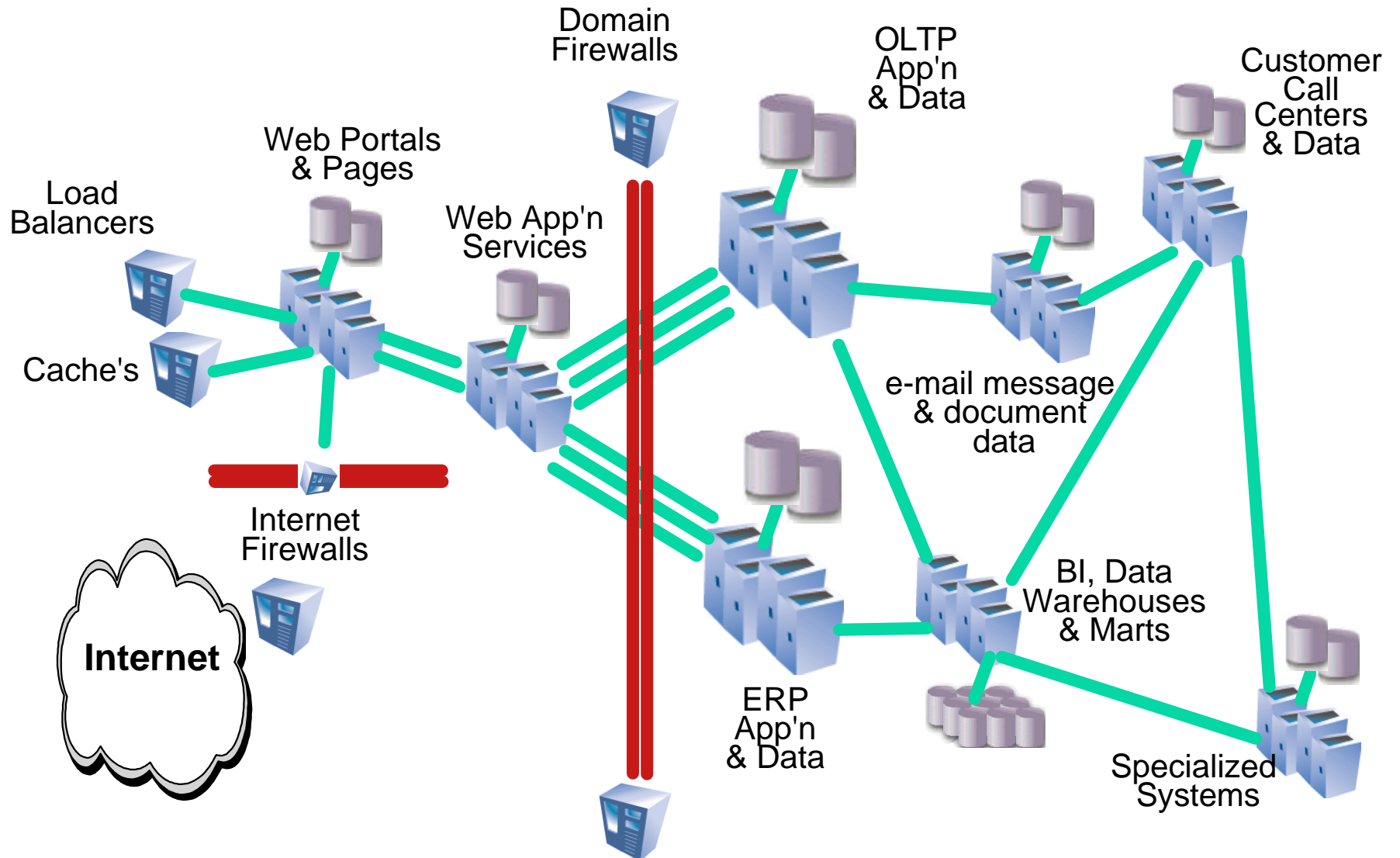
- 1998 - 1999 Linux shipments grew 93.3% YTY
- 1999: #2 volume OS
- Linux shipments projected to have highest growth (99 - 04)

New Server OS License Forecast (99 - 04)



from IDC "Server Operating Environments Market Forecast & Analysis" June 2000

A Distributed - Multi-tier - Heterogeneous Structure with Multiplication of Servers





... and the resulting Challenges

- **Explosion of transactions and servers**
- **Management of Response time**
- **Unpredictability**
- **Continuous Service**
- **E2E Security**
- **Rapid deployment of new Applications**
- **Average Utilization of Hardware**
- **Variability of Server and Communication Hardware**
- **Number of SW Licenses**
- **Managability**
- **Cost !**

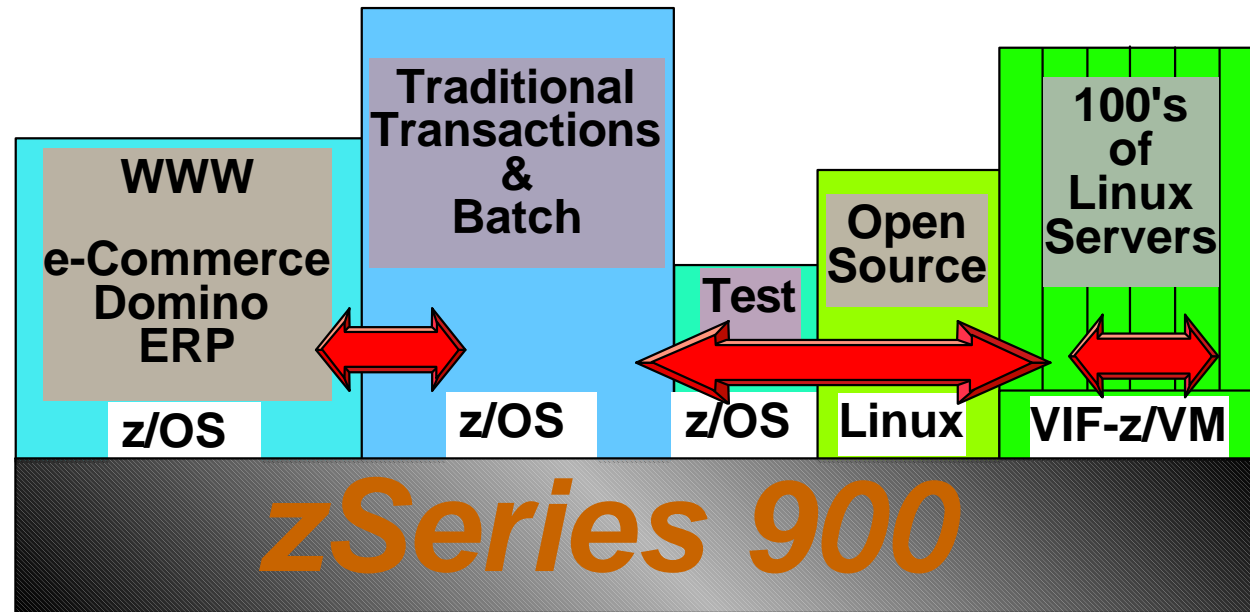


Why run Linux on zSeries ?

- **Reliability**
 - The most reliable hardware platform in the world. Period.

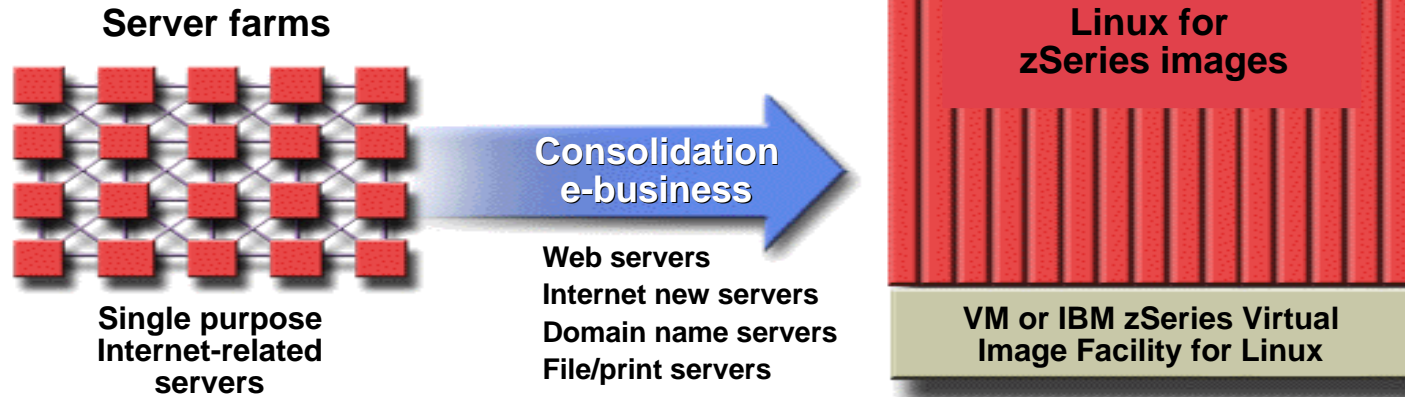
- **Scalability**
 - 15 Linux images possible on native hardware
 - Virtually unlimited Linux images possible with VM/ESA - VIF

- **Manageability**
 - Centralized Linux systems easier to manage / duplicate
 - Use management functions from S/390 operating systems for Linux (z/OS or z/VM)



Unmatched Virtualization of Hardware

- Shared Processors
- Shared Channelsubsystem(PAV,MA,I/O Priority)
- Shared Memory (SoD)
- Virtual Highspeed Network
- I/O Bandwith



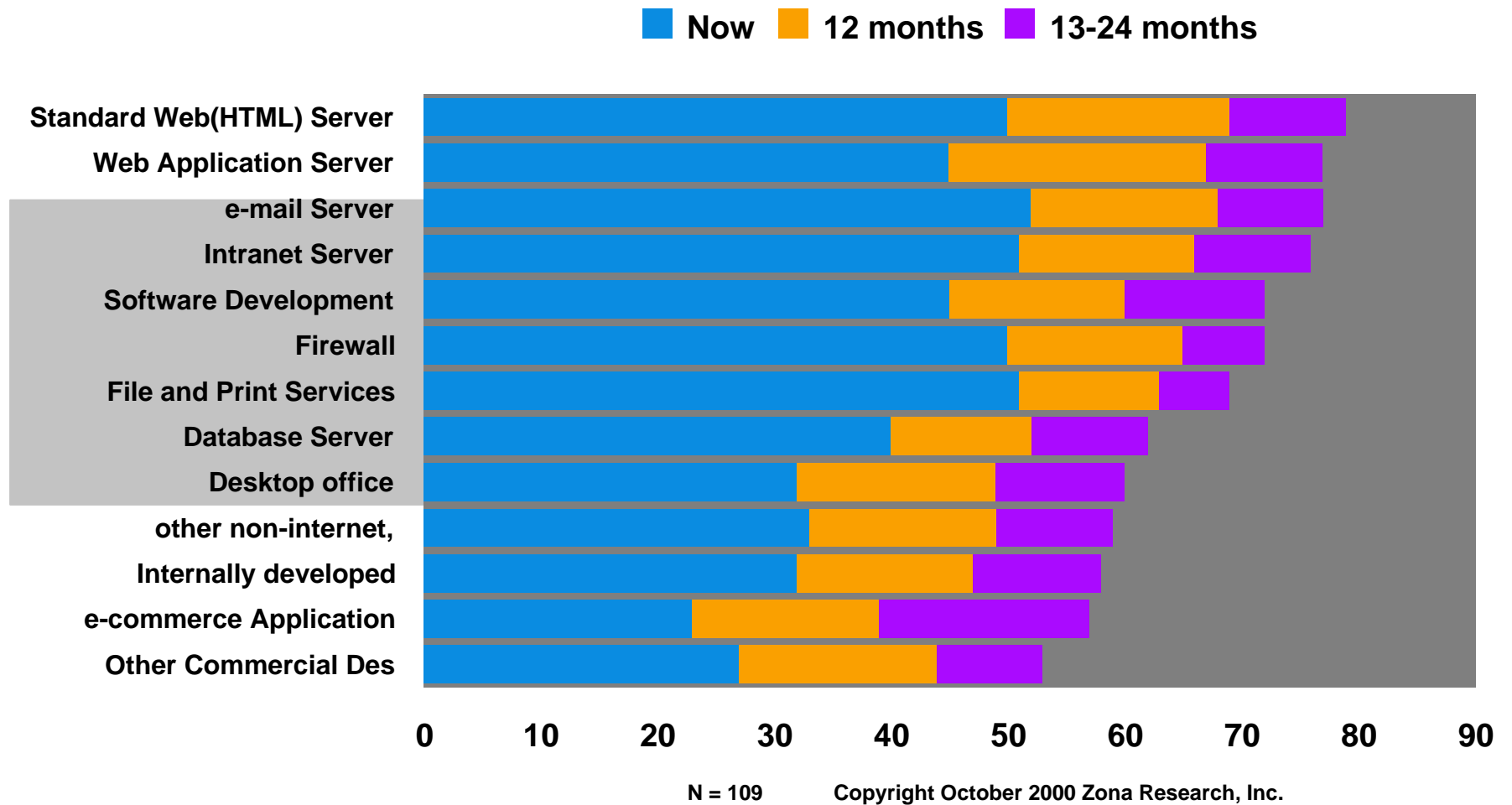
Solution area	Discrete solution	zSeries solution
Server hardware	\$10,970,000	\$676,000
Network hardware	\$1,200,000	\$375,000
Facilities rental	\$270,000 / month	0
Facilities hardware	\$585,000	\$12,000
Management servers	\$1,462,500	\$34,000 / year
Salaries	\$1,600,000 / month	\$60,000 / month
Three Year Cost Totals	\$53M	\$7M

*David Boyes, Sine Nomine Associates
http://www-1.ibm.com/servers/eserver/zseries/library/whitepapers/linux_trilogy.html
<http://www.linuxplanet.com/linuxplanet/print/3139/>



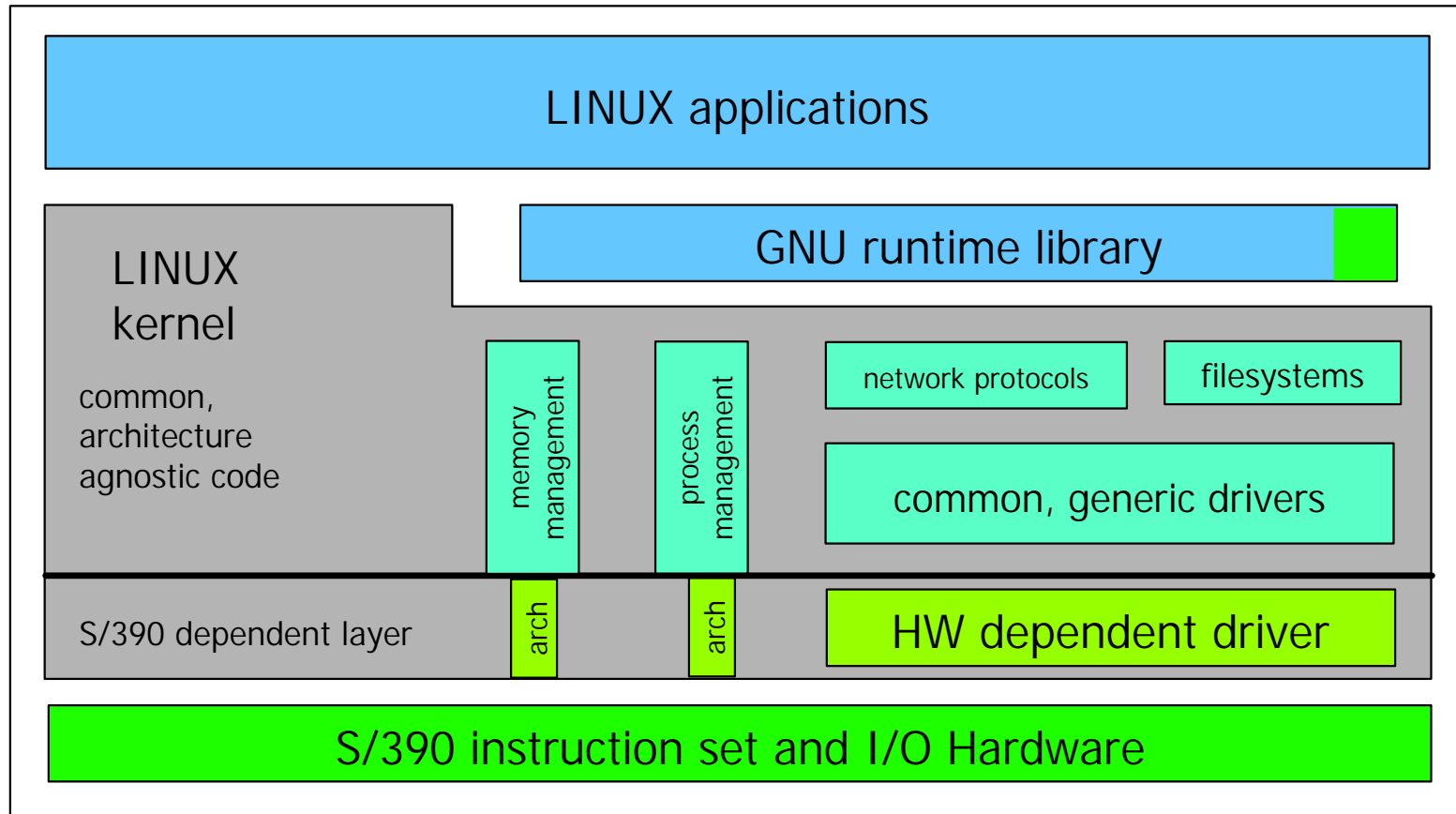
Linux Application Strengths

What Services are running on your Servers ?





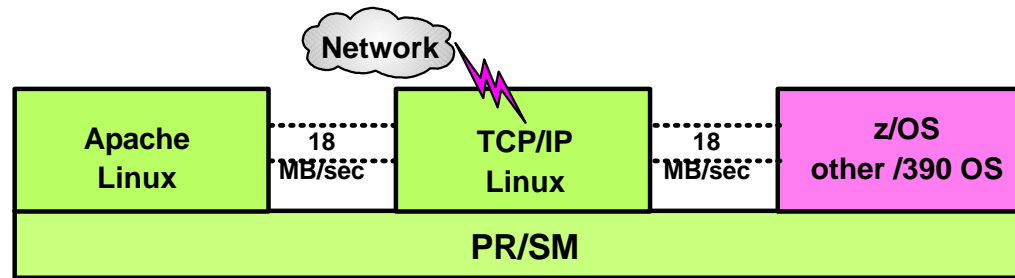
Linux for S/390 structure



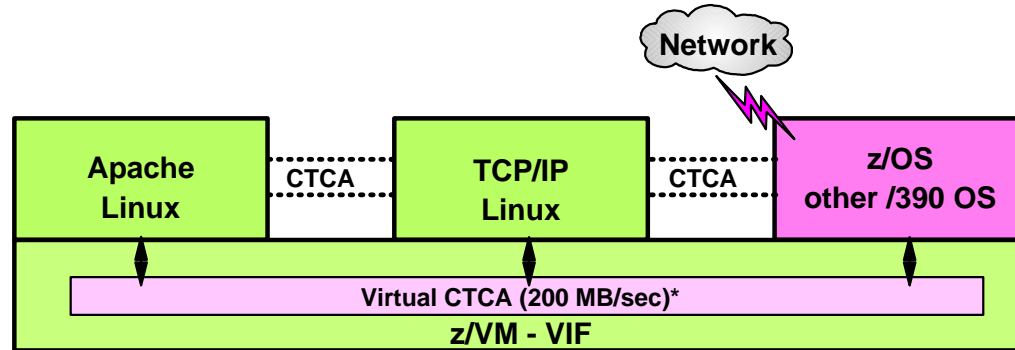
Linux - modular and highly portable.
0.85% code changes are S/390 specific



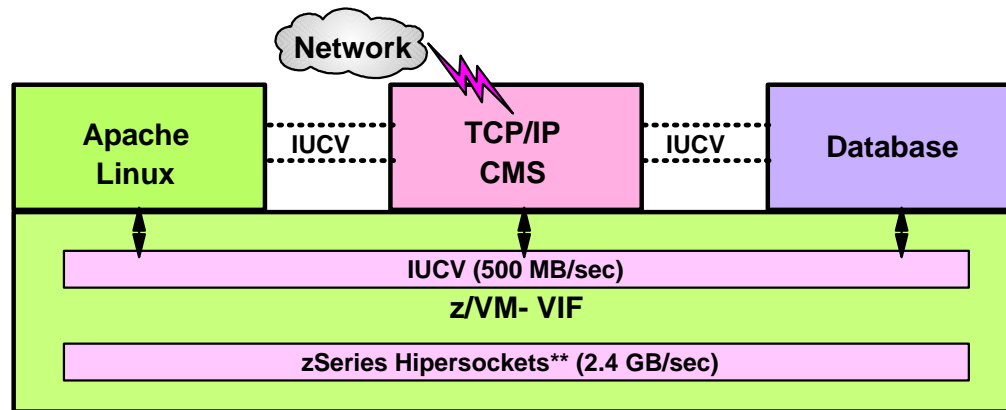
Linux for S/390 Network Constructs



Limit of 15 Logical Partitions

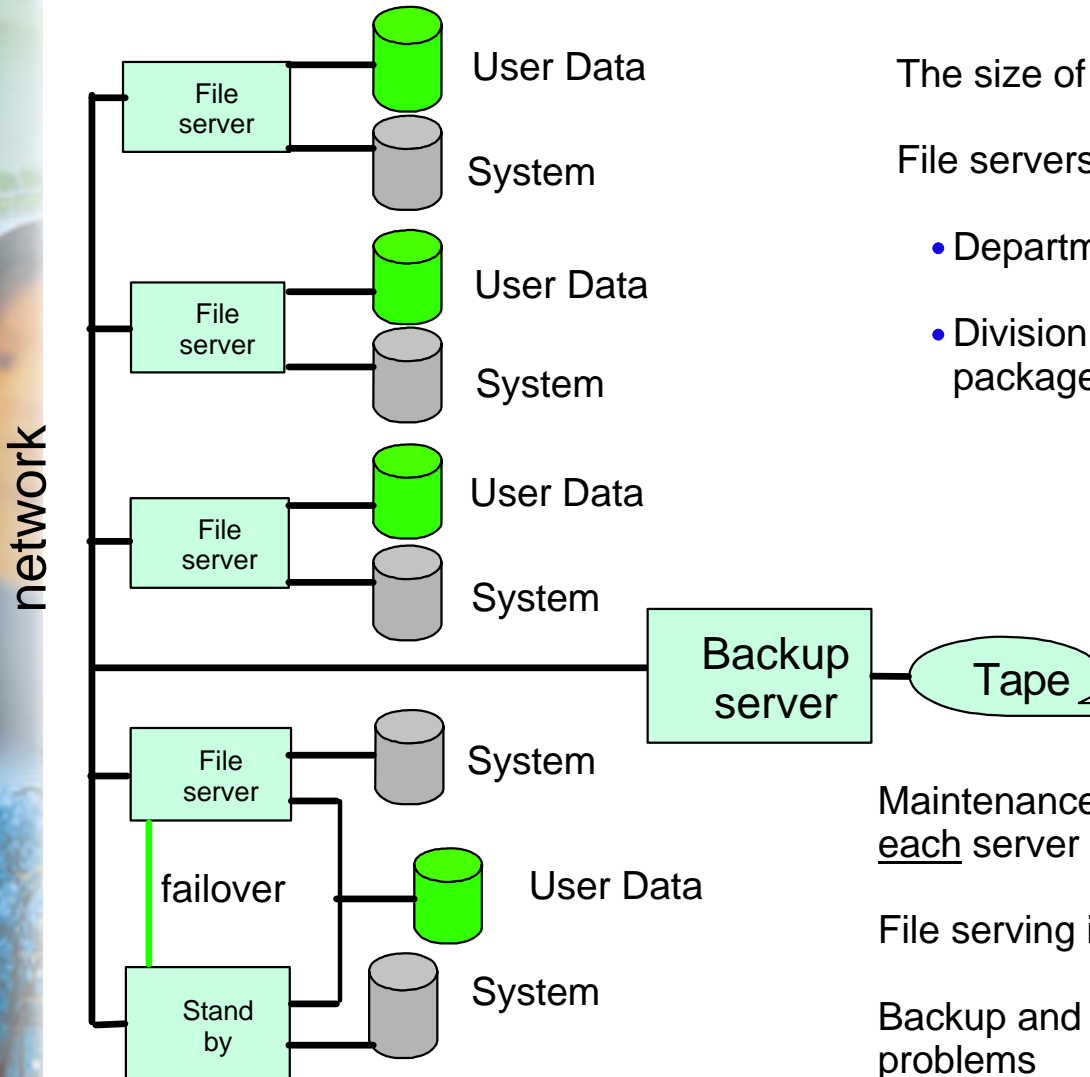


Virtually unlimited number of virtual machines



*Model Dependant: G5 G6 zSeries

File Serving - Classical Scenario



The size of many file servers is small to medium

File servers are distributed because

- Departments want to control their own servers
- Division of data and users into small manageable packages

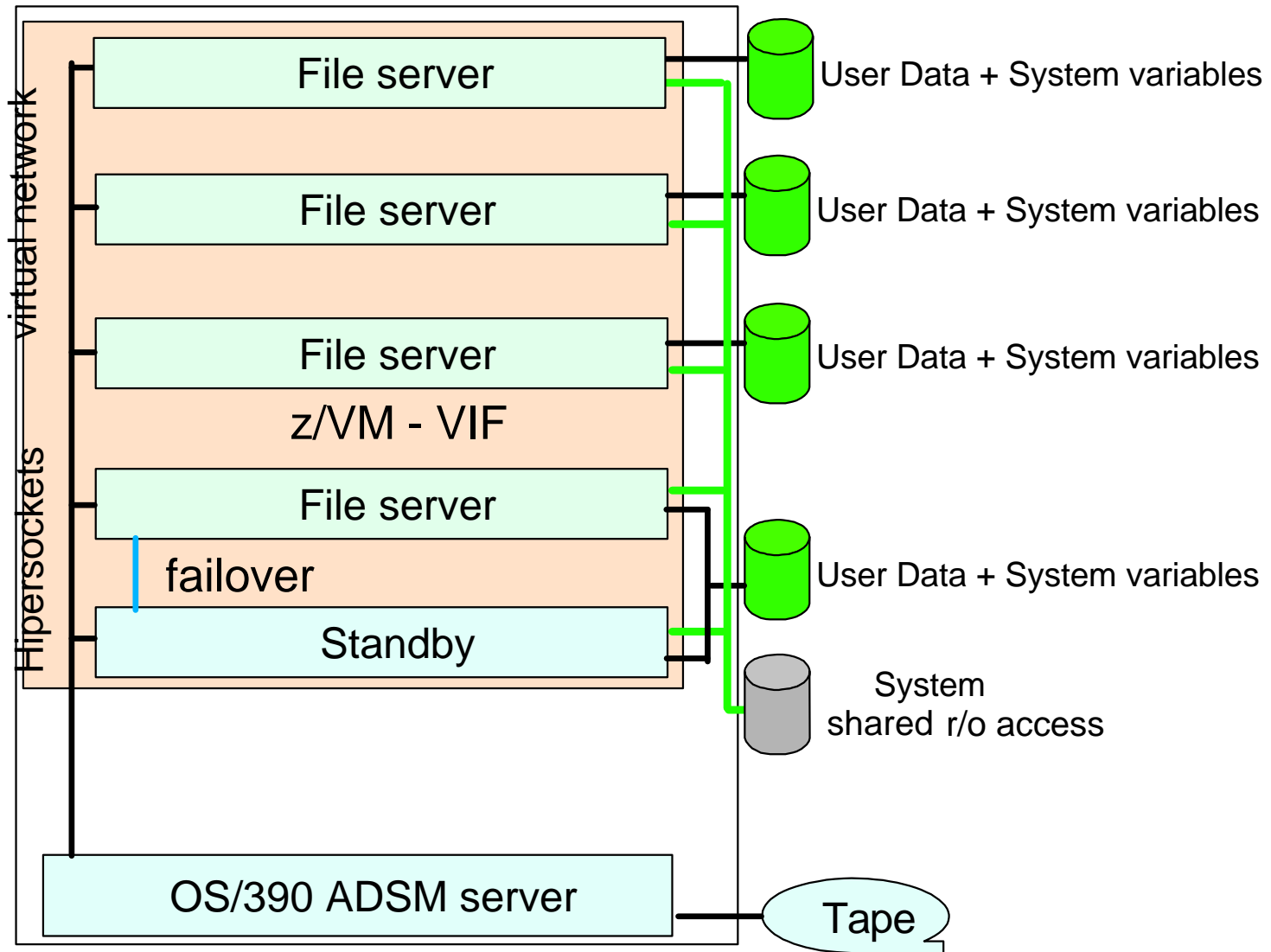
Maintenance and system updates have to be done for each server

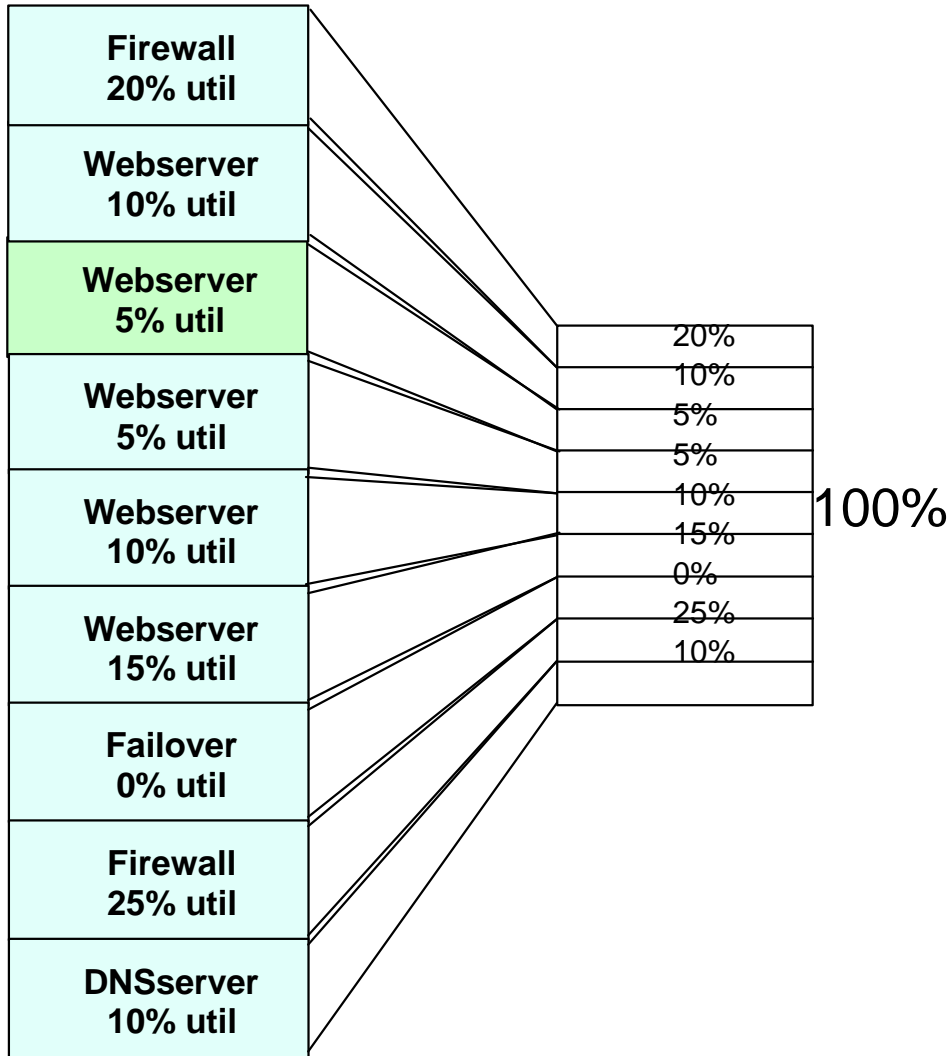
File serving is I/O intensive, CPU utilization low

Backup and recovery over network causes bandwidth problems



File Serving with Linux on zSeries





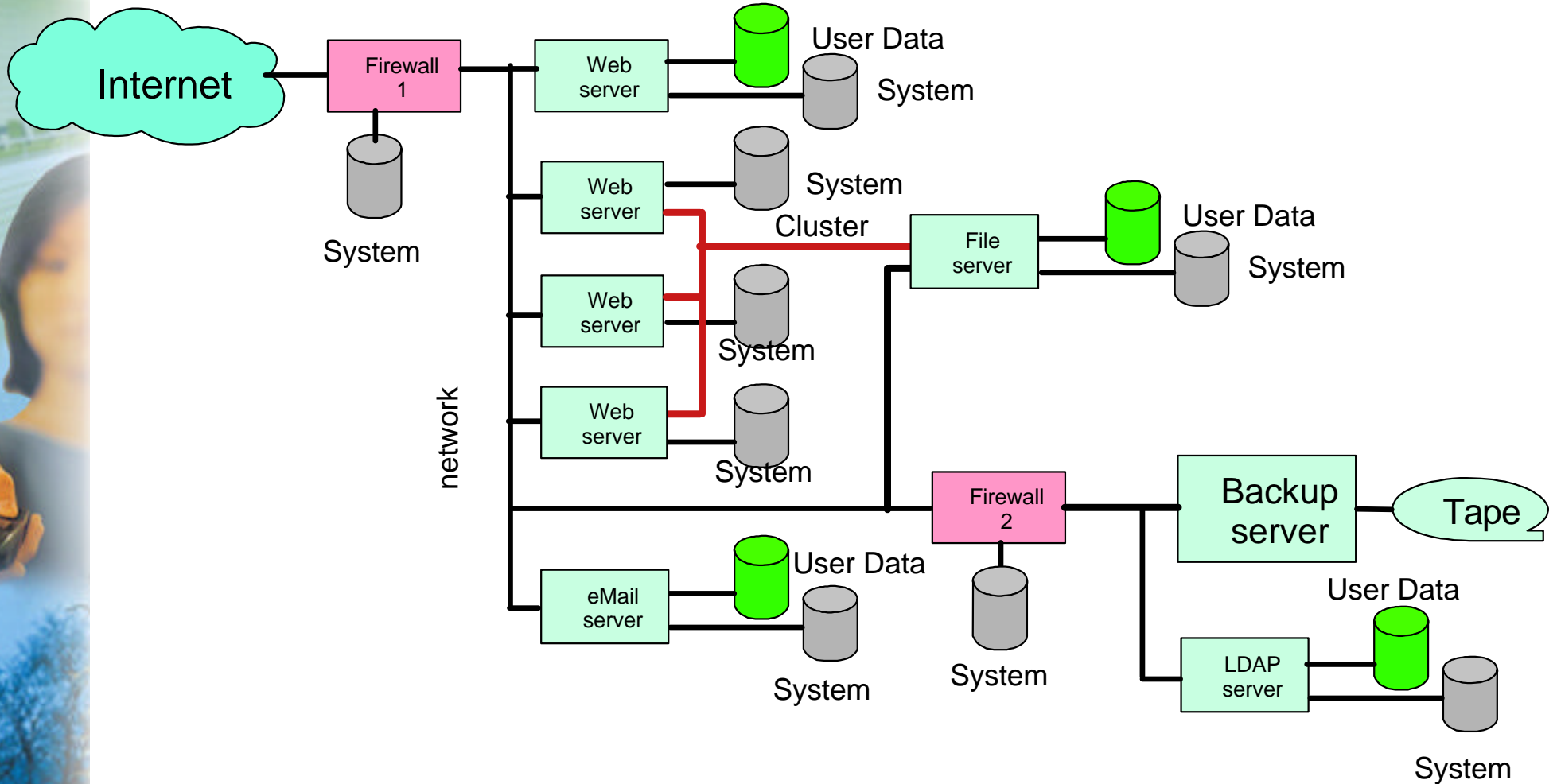
The ISP specialty

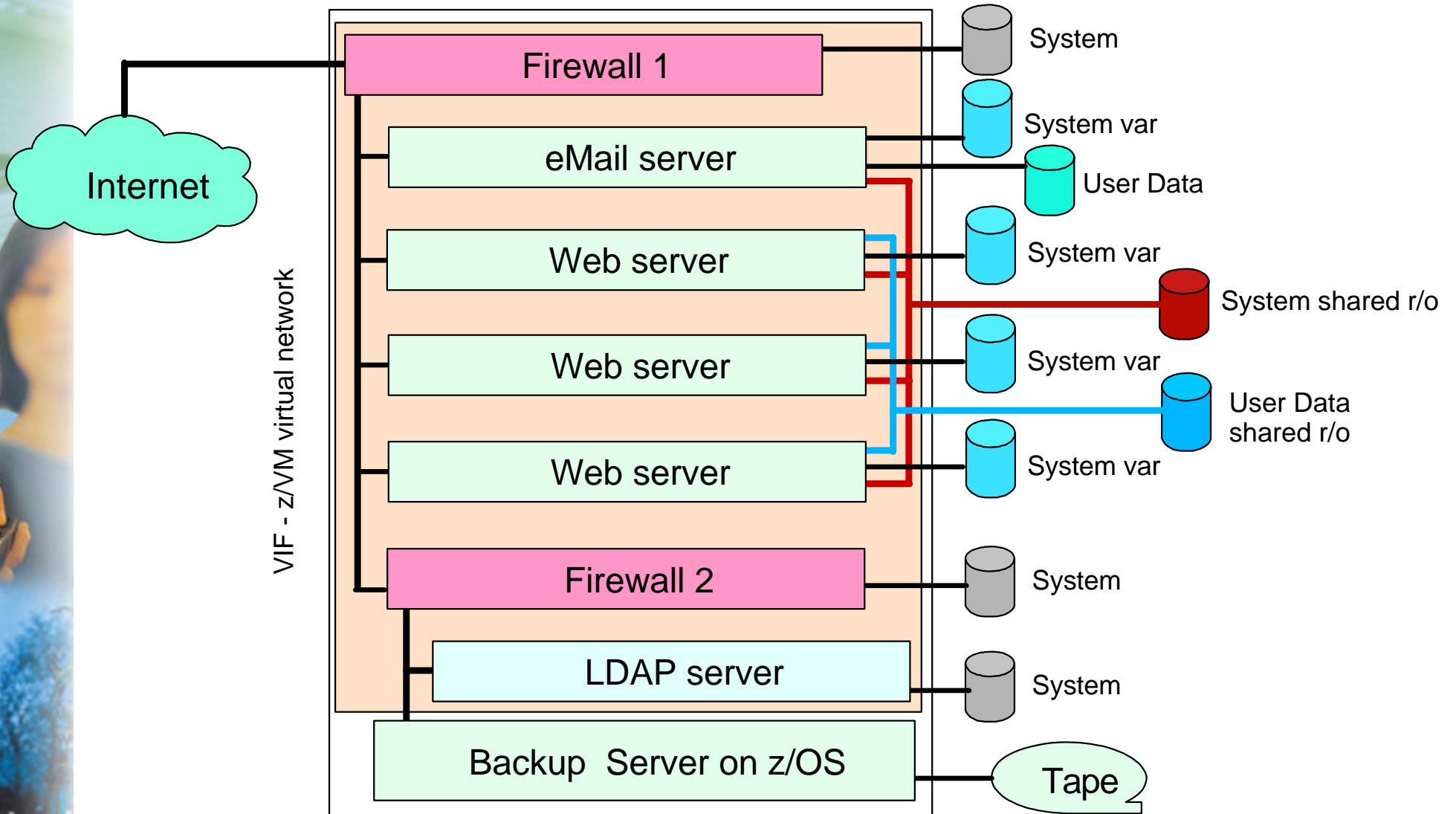
- Websites with self written applications (CGI, servlets) have to run each on it's own server
- Many of these are small, <100MB disk space
- CPU utilization is in most cases very low

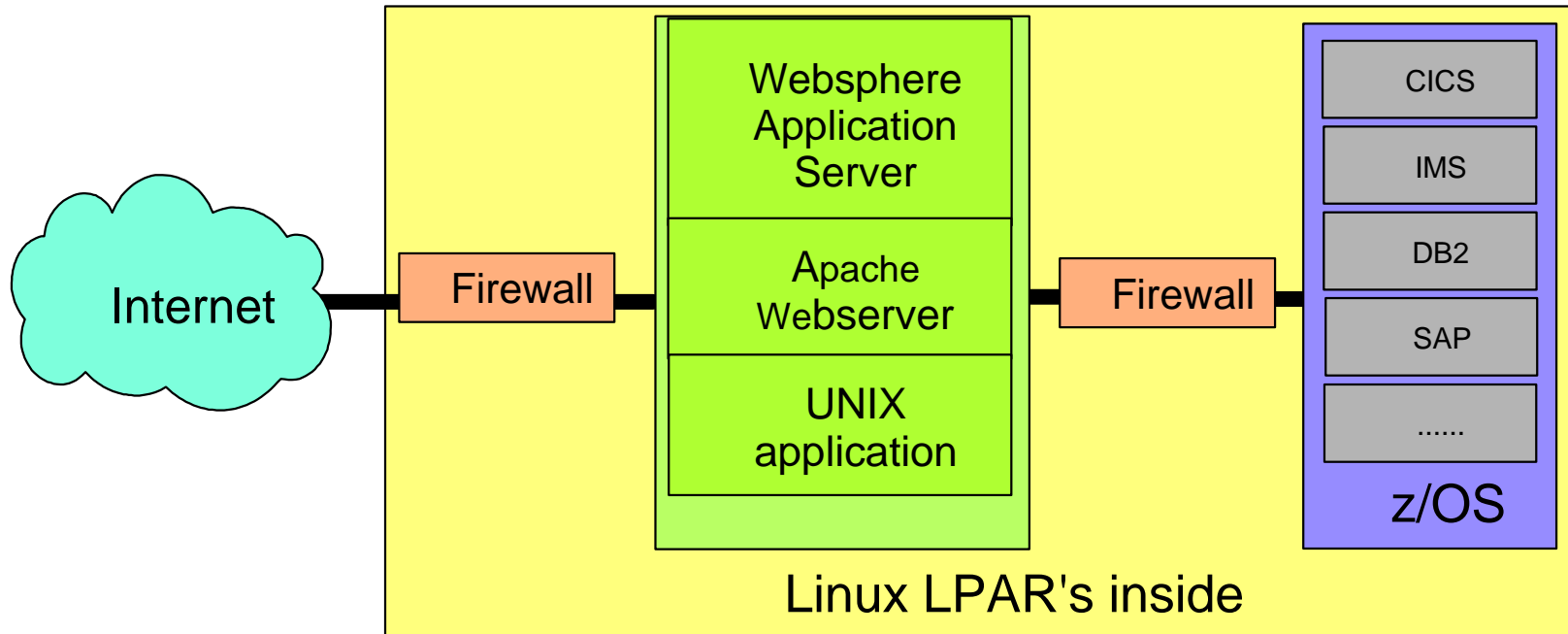
Many server can be consolidated on one zSeries or S/390 CPU

Mix of consolidated servers allow for less white space for peak performance

Web Serving Classical Scenario



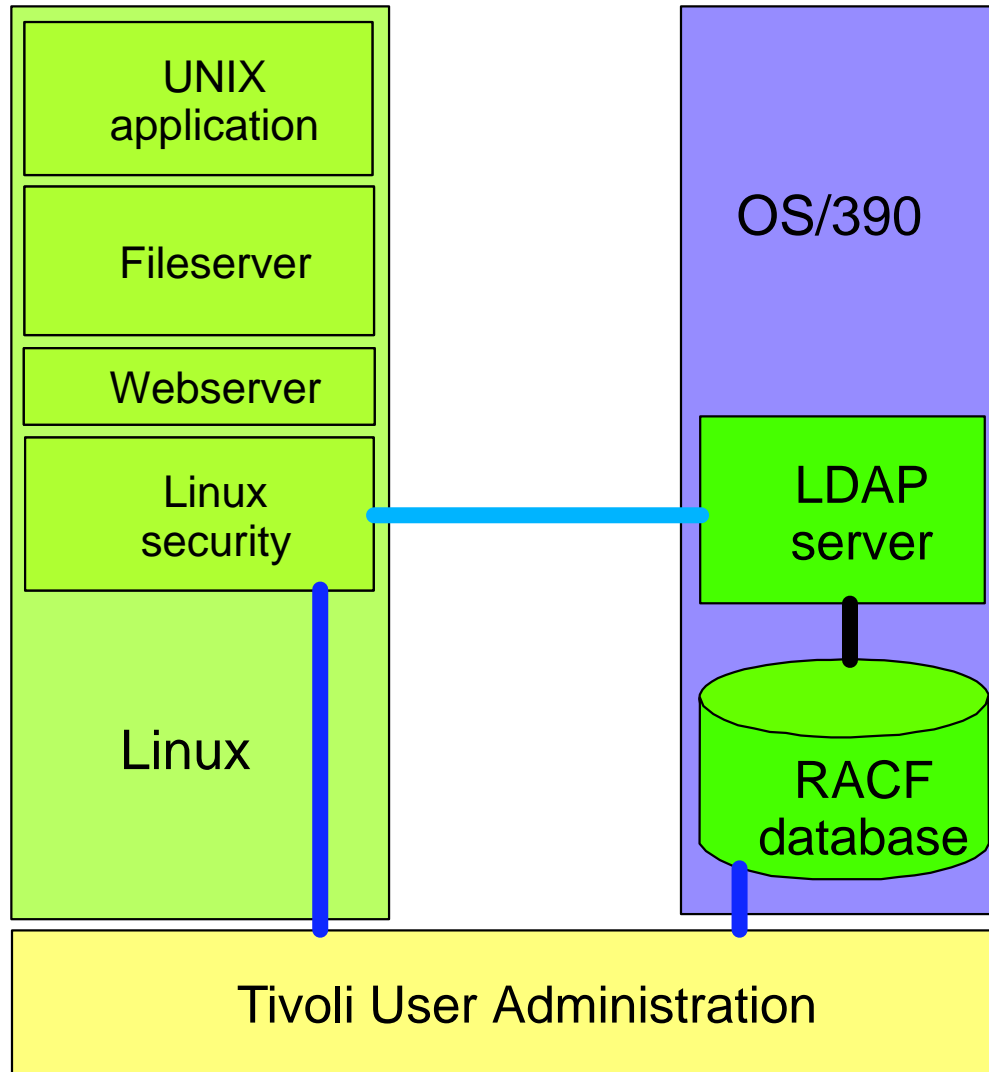




Application Integration

- ✓ Using of Linux and WebSphere Application Server as Web front-end to classical back-end applications like DB2, CICS, IMS
- ✓ Using of firewalls on Linux instances makes it possible to have the DMZ with webserver plus back-end application on one piece of hardware
- ✓ Hyper sockets and IUCV connections provide high bandwidth between servers

Backend integration... continued

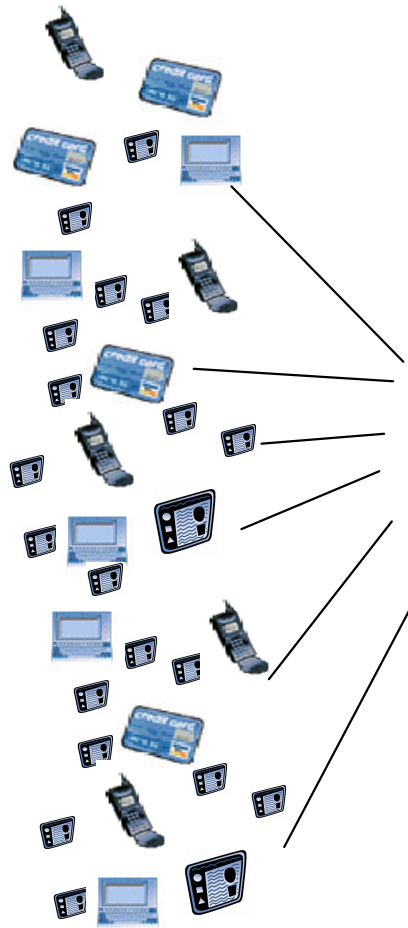


Security integration with z/OS

- ✓ Connection of Linux to RACF via LDAP allows for single user ID and password space in the systems, e.g. fileserving
- ✓ Easy development and deployment of new applications using back-end z/OS resources

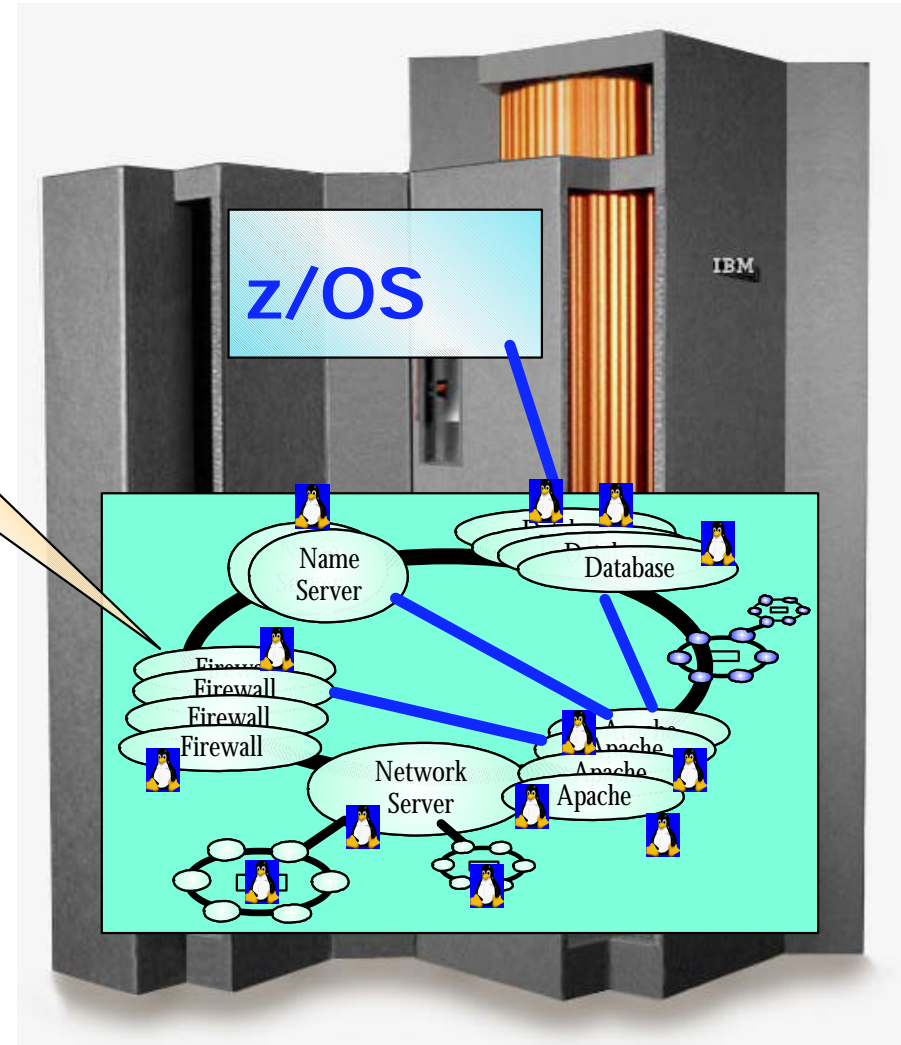
Other important directory services in z/OS are: NetWare Directory Services (NDS), the Java Naming and Directory Interface (JNDI) and the Domino® Name and Address Book.

A Winning Combination



1 Physical Server

MAPS 100-1000's of Servers
Provides a SHARED I/O configuration
Eliminate Encryption / Decryption between Servers





mySAP.com® on Linux for zSeries



generation @ business

CeBIT, Hannover, Germany, March 22, 2001...

"With IBM supporting Linux on the eServer zSeries, customers now benefit immediately from the availability of mySAP.com on this hardware platform. The early SAP commitment to Linux proves to be the right decision."



Karl-Heinz Hess, member of the SAP Extended Executive Board

"This combination of technologies -- with mySAP.com and the z900 at its core --- provides our mutual customers with superior reliability, outstanding systems management, and breadth of applications available on Linux, all at a competitive price."



Dan Colby, general manager, Enterprise Servers, IBM



from the Internet to the Enterprise...



generation @ business

- Open Source projects with IBM active in the community
 - ▶ Networking
 - ▶ Systems Management - cluster installation
 - ▶ Journalled File System - JFS port to Linux
 - ▶ Kernel performance - scheduler, Java
 - ▶ glibc/mathlib work - IA-64 high-precision math functions
 - ▶ Linux Standards Base participation
 - ▶ Logical Volume Manager
- More Open Source in the works
(Scalability, clustering, RAS, networking...)
- IBM Linux Technology Center
- Building world-wide IBM Linux technical team
 - ▶ Austin, Portland, Raleigh, Rochester, Poughkeepsie, Endicott, Somers, Yorktown, Boeblingen, Haifa, TRL, India, Hursley...





Websites and contacts

Linux at IBM

<http://www.ibm.com/linux>

IBM zSeries

<http://www.ibm.com/eserver/zseries>

Linux Application Tools

<http://www.ibm.com/eserver/zseries/os/linux/ldt>

IBM developerWorks website with Linux for S/390 modifications

<http://oss.software.ibm.com/developerworks/opensource/linux390/index.html>

Marist College Linux for S/390

<http://linux390.marist.edu>

SuSE Linux Enterprise Server for S/390

<http://www.suse.com/en/produkte/susesoft/s390>

Princeton University Linux for S/390 site - compiled tools / applications

<http://penguinvm.princeton.edu/>

Thinking Objects Linux for S/390 site - compiled tools / applications

<http://linux.s390.org>