Popular Network Operating Systems

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Novell	UNIX	Windows	Linux
Netware	HP-UX	NT	Red Hat
IntraNetWare	Sun Solaris	2000 Server	Caldera
	BSD	.NET Server	SuSE
	SCO		Debian
	AIX		Slackware

1. **Performance**
   A NOS must perform well at reading and writing files across the network between clients and servers. It must be able to maintain fast performance under heavy loads, when many clients are making requests. Consistent performance under heavy demand is an important standard for a NOS.
2. **Management and monitoring**
   The management interface on the NOS server provides the tools for server monitoring, client administration, file, print, and disk storage management. The management interface provides tools for the installation of new services and the configuration of those services. Additionally, servers require regular monitoring and adjustment.

NOS Considerations

FIGURES

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NOS Considerations		
Security	encryption	user authentication
Robustness	balanced workloads	redundancy
Performance	consistency under increasing load	
Scalability	ready for growth	
Management	system administration	

3. **Security**
   A NOS must protect the shared resources under its control. Security includes authenticating user access to services to prevent unauthorized access to the network resources. Security also performs encryption to protect information as it travels between clients and servers.
4. **Scalability**
   Scalability is the ability of a NOS to grow without degradation in performance. The NOS must be capable of sustaining performance as new users join the network and new servers are added to support them.
5. **Robustness/fault tolerance**
   A measure of robustness is the ability to deliver services consistently under heavy load and to sustain its services if components or processes fail. Using redundant disk devices and balancing the workload across multiple servers can improve NOS robustness.

Windows OS

FIGURE 6.1.5 Microsoft NT, 2000, and .NET

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Windows 2000 Professional is not designed to be a full NOS. It does not provide a domain controller, DNS server, DHCP server, or render any of the services that can be deployed with Windows 2000 Server.

Windows NT	• Workstation • Server	• Corporate users • Departmental Server
Windows 2000	• Professional • Server • Advanced Server • .NET	• Corporate users or small businesses • internet or remote access server • Departmental Server • Enterprise server • Enterprise internet server

- Windows 2000 **Server** adds the normal server-specific functions.
- It provides integrated connectivity with Novell NetWare, UNIX, and AppleTalk systems and can also be configured as a communications server.
- **Windows .NET** Server is built on the Windows 2000 Server kernel to run enterprise-level web and FTP sites.
- Equivalent to Linux and UNIX server operating systems.

UNIX Varieties

FIGURES

6.1.6 UNIX, Sun, HP, and LINUX

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CPU Manufacturer	UNIX OS version	Other Proprietary OSs
IBM	AIX, Linux	MVS, VM
Hewlett Packard	HP-UX, Linux	MPE
Digital Equipment Compact	Tru64, Ultrix, Linux	VMS
Sun Microsystems	Solaris, Linux	
Intel	Solaris, Linux	NetWare, Win9x, NT, Win2000

- Industry standards based operating system
- Powerful, flexible, scalable, and secure
- Supported by various equipment manufacturers
- Mature and stable operating system
- Tightly integrated with TCP/IP Protocols
- Widely used for mission critical applications

- UNIX is the name of a group of operating systems that trace their origins back to 1969 at Bell Labs.
- Since its inception, UNIX was designed to support multiple users and multitasking.
- It was originally sold to run powerful network servers, not desktop computers.
- Solaris is currently the most widely used version of UNIX in the world for large networks and Internet websites.

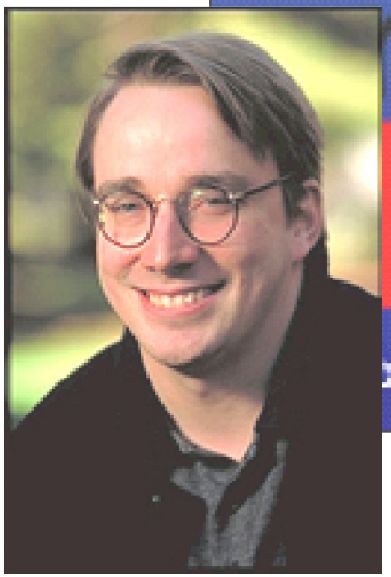
Common Linux Distributions

Caldera OpenLinux	http://www.caldera.com
Corel Linux	http://linux.corel.com
Debian GNU/Linux	http://www.debian.org
Linux Mandrake	http://linux-mandrake.com/en
Red Hat Linux	http://www.redhat.com
Slackware Linux	http://www.slackware.com
SuSE Linux	http://www.suse.com
Turbo Linux	http://www.turbolinux.com

- Linux is one of the most powerful and reliable operating systems in the world today.
- Linux has already made inroads as a platform for power users and in the enterprise server arena.
- Linux is less often deployed as a corporate desktop operating system.
- Recent distributions of Linux have networking components built in for connecting to a LAN, establishing a dialup connection to the Internet, or other remote network.
- TCP/IP is integrated into the Linux kernel instead of being implemented as a separate subsystem.

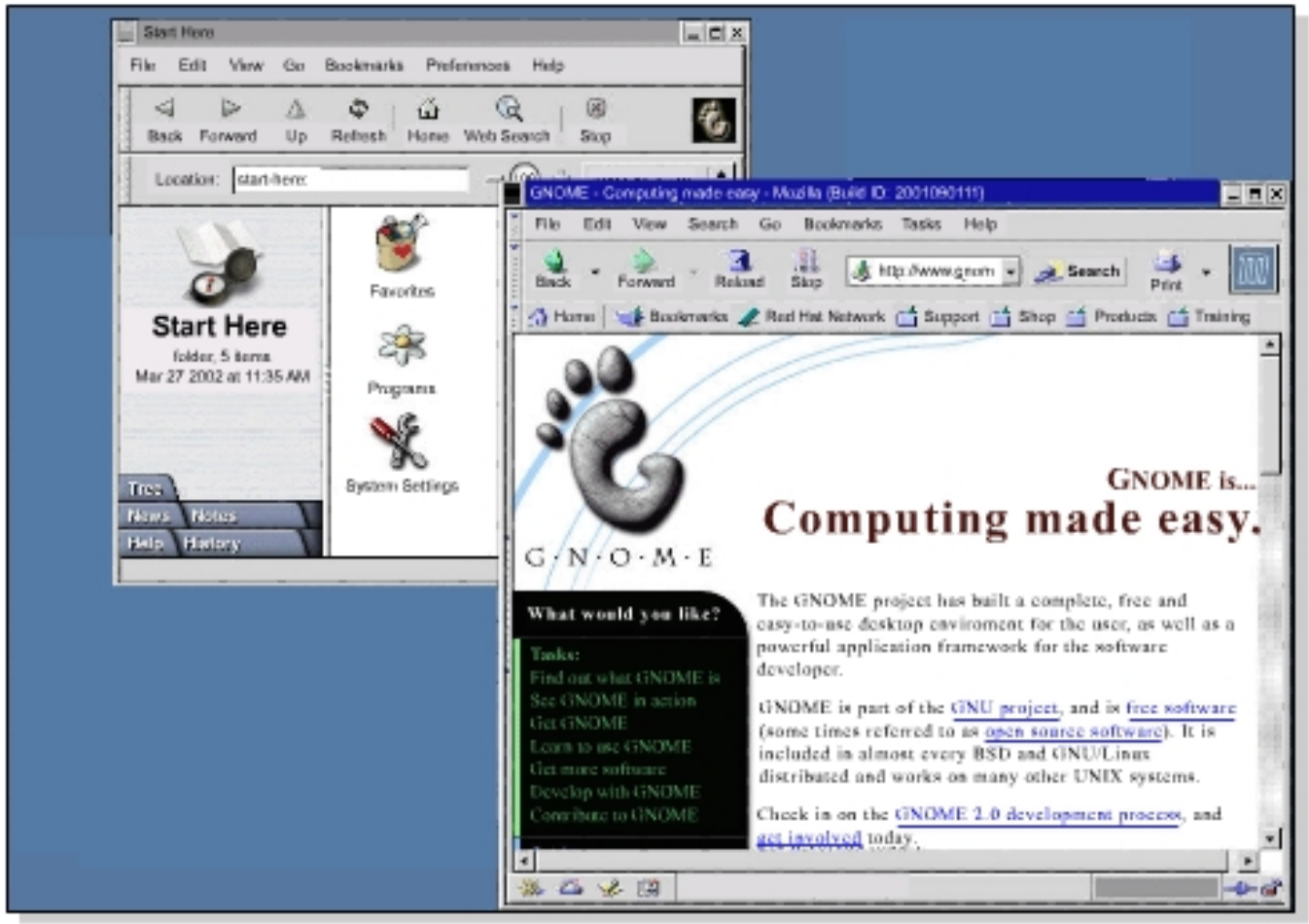
6.1.6 UNIX, Sun, HP, and LINUX

•In 1991, a Finnish student named Linus Torvalds began work on an operating system for an Intel 80386-based computer.



6.1.6 UNIX, Sun, HP, and LINUX

Torvald's work led to a world-wide collaborative effort to develop Linux, an open source operating system that looks and feels like UNIX.



KDE Graphical User Interface

FIGURES

6.1.6 UNIX, Sun, HP, and LINUX

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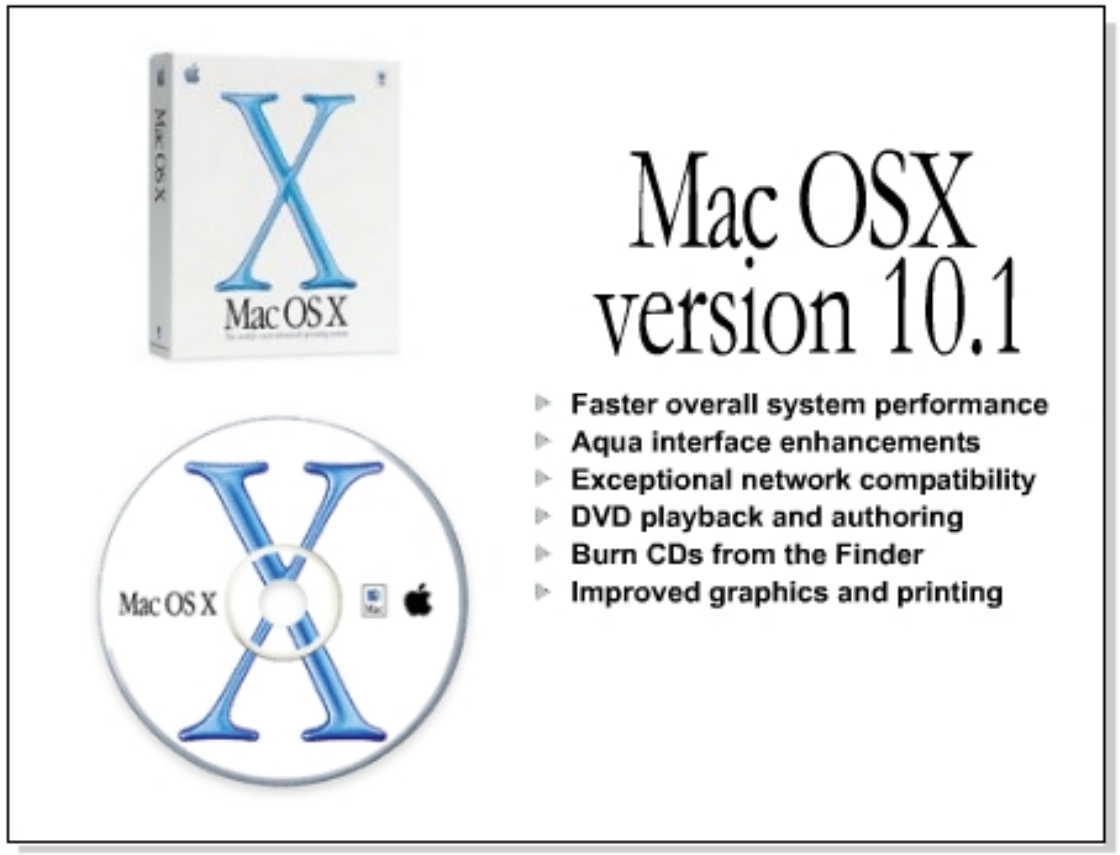
Some advantages of Linux as a desktop operating system and network client:

1. It is a true 32-bit operating system.
2. It supports preemptive multitasking and virtual memory.
3. The code is open source and thus available for anyone to enhance and improve.



- Mac OS X provides a new feature that allows for AppleTalk and Windows connectivity.
- The Mac OS X core operating system is UNIX-based.
- The Mac GUI resembles a cross between Windows XP and Linux X-windows GUI.

Server Applications and Protocols

FIGURES

6.1.8 Concept of service on servers

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- Web services (HTTP)
- File transfer (FTP)
- Domain Name System (DNS)
- E-mail (POP3, SMTP, and IMAP)
- File sharing (NFS, SMB)
- Print services (LPD)
- Dynamic IP allocation (DHCP)

1. Remote management allows administrators to configure networked systems that are miles apart.
2. Network processes are referred to as
   - services in Windows 2000
   - daemons in UNIX and Linux.

Server Functions and Protocols

FIGURES

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6.1.8 Concept of service on servers

The two most common web server software packages are
1. Microsoft Internet Information Services (IIS) – Windows platform
2. Apache Web Server – Unix and Linux platform

Description	NFS	DHCP	HTTP	POP3	FTP	DNS	SMTP	SMB	NAT	LPD
Web Services			✓							
File Transfer					✓					
Domain Name System						✓				
E-mail				✓			✓			
File Sharing	✓							✓		
Print Services										✓
Dynamic IP allocation		✓								
Firewall									✓	

TCP/IP Based Services

FIGURES

6.1.8 Concept of service on servers

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1. Most popular network processes rely on the TCP/IP suite of protocols.
2. TCP/IP are vulnerable to unauthorized scans and malicious attacks.
   - Denial of service (DoS) attacks
   - computer viruses
   - fast-spreading Internet worms
3. Recent versions of popular NOSs restrict the default network services.

Service	TCP/IP Protocol
World Wide Web	HTTP
File Transfer	FTP, TFTP
File Sharing	NFS
Internet Mail	SMTP, POP3, IMAP
Remote Administration	Telnet
Directory Services (Internet)	DNS, LDAP
Automatic Network Address Configuration	DHCP
Network Administration	SNMP