

Linux Basics

Purpose of an Operating System

- To manage hardware and software resources in a system
 - Memory, processor, disk space, programs
- To ensure the system behaves in a predictable way
- To provide a stable, consistent high-level interface to the hardware
 - Individual applications do not need to know hardware implementation details

When is an Operating System Needed?

- When you want to abstract away from the hardware
 - You want your program to run on different hardware platforms
- When systems must be multi-functional
 - To run different kinds of programs

When is an Operating System Not Needed?

- When the system does only one thing and flexibility is not needed.
 - E.g., a microwave

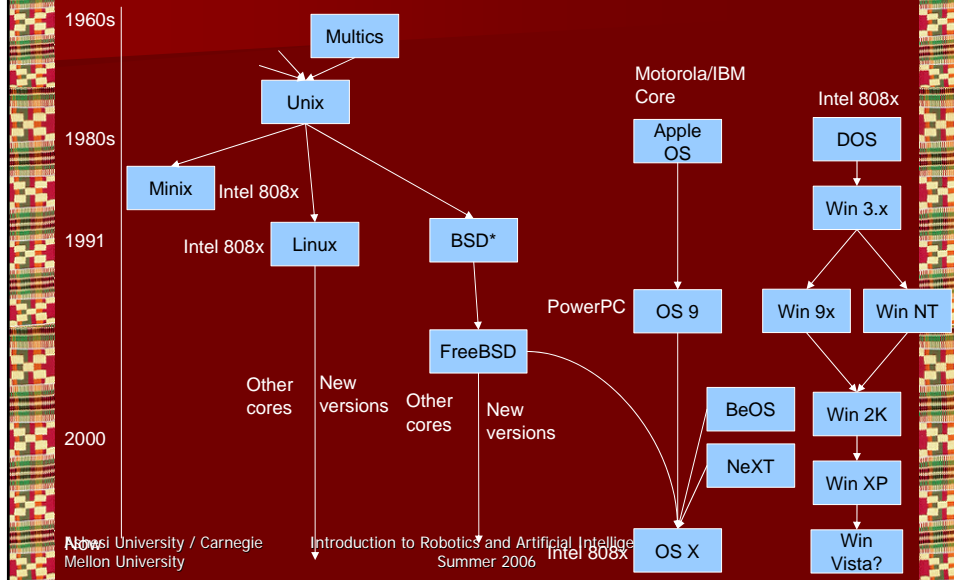
Types of Operating Systems

- Real-time operating system (RTOS)
 - e.g. Symbian OS, RTOS, QNX, uCOS ...
- Single-user, single-task
 - e.g. Palm OS ...
- Single-user, multi-tasking
 - e.g. Windows 95/98, Macintosh 9.x ...
- Multi-user
 - e.g., Linux, BSD, Windows NT ...

History of Linux (and Unix)



Some Common Operating Systems



Once there was Unix

- One of the early Operating Systems
- Features
 - Multi-threaded, multi-user
 - Extensively Networkable (Support TCP/IP/IPC)
 - Supported on many systems (but not PCs!)
- Was originally free, and source code was available
- By late 1980s was commercial, expensive, non-available source, and came in many flavors

Minix Enters the Scene

- Created by Prof. Andrew Tanenbaum
 - Created Minix as an education resource, not a usable system
- Features
 - Low cost compared to Unix but not free
 - Open Source (you need to buy the book)
 - Some community development (controlled by Tanenbaum), but poor distribution model
 - Microkernel architecture

Linus Enters the Fray

- In 1991 Linus Benedict Trovalds created Linux
 - Was a 2nd year CS student at University of Helsinki !!!
- Features
 - Open Source and Free (Based on Stallman's GNU project)
 - Community development and Internet release
 - Monolithic architecture, and uses GNU GCC
 - POSIX and Unix compatible



Fast Forward to 2006

- Linux has become a powerful system
 - Dominates the server market
 - Some desktop and embedded market usage
- Very strong international community support
 - Coordination through Internet (mostly email/chat)
 - Linus mostly coordinates development
 - Many *distributions* now available

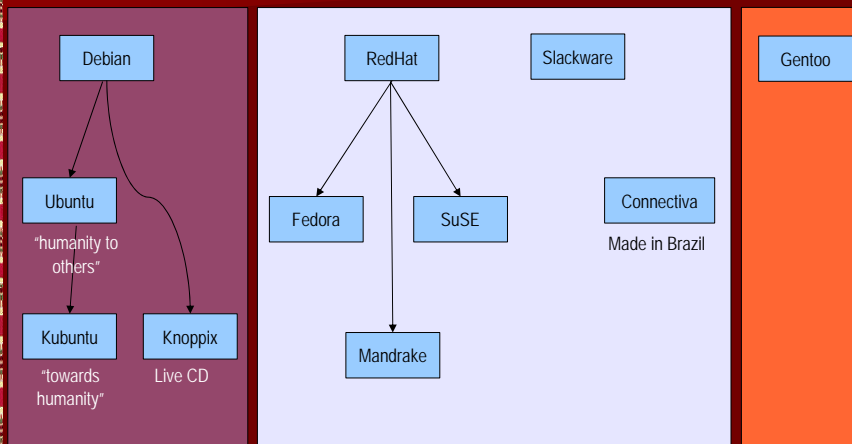
A Brief Linux Overview

- Linux is really just the *kernel*
 - Handles process/thread management and synchronization
 - Socket-based communications (TCP/UDP/IPC)
 - Handle Device driver management
 - e.g. hard disks, screens, video etc
 - Undergoes regular updates (now at 2.6.18 and counting)
- A useful system requires much more
 - Shells, window servers/managers, utility programs

What is a Linux Distribution?

- Provides a complete *usable* system
- Usually includes
 - At least one version of the kernel
 - An install system, base device drivers, utilities, and networking
 - A software package system, selection, and update mechanism
- Package systems
 - Debian, RPM, source code

A Small Sampling of Distributions



Useful Links

- Google
- www.kernel.org
- www.linux.org
- www.ubuntu.com, www.kubuntu.org,
www.debian.org
- www.redhat.org

Why are we learning Linux

- The importance of open source
- Importance of understanding different operating systems
 - Especially as a CS major
- Needed if you would like to work with embedded devices / robots
- In many ways, Linux is better

Using Linux

Now, find the nearest Linux machine
to use ...

The Linux User Interface

- GNOME graphical user interface
- The shell / terminal / command prompt
 - See handout for useful commands

A Note on Paths

- Root directory: /
- An absolute path:
 - /home/amtettey/robotics/src
- Examples of relative paths:
 - .
 - ..
 - src/myfile
 - ../robotics/src/myfile

A Note on File Permissions

- Example output from typing 'ls -l'

permissions	file or directory?	user	group	size	modified date	filename
<code>drwxr-x---</code>	2	mayank	freeos	4096	Dec 28 04:09	tmp
<code>-rw-r--r--</code>	1	mayank	freeos	969	Dec 21 02:32	foo
<code>-rwxr-xr-x</code>	1	mayank	freeos	345	Sep 1 04:12	myfile

Annotations:

- permissions for everyone else (points to the last three characters of the permissions string)
- permissions for group (points to the middle three characters of the permissions string)
- permissions for user (points to the first three characters of the permissions string)
- directory? (points to the first character of the permissions string)