# UNIX and Linux

THE LINUX FOUNDATION

# The Differences

- Linux is only the kernel (everything else that makes up the full operating system is drawn from a number of sources); and it is *not* UNIX, although it's clearly UNIX-like
- UNIX and Linux have had very different evolutions:
  - UNIX was developed about 1969 by Thompson, Canaday, and Ritchie, and from the very outset it was designed to be a serious enterprise operating system
  - It grew up largely outside of the Intel family of CPUs, although it was later ported to it
  - By the time Linux first appeared in 1991, UNIX had already become quite fractured: there were many varieties, grouped in two major families; **System V** arising from the original code at Bell Labs, and **BSD**, arising from the University of California at Berkeley
  - Linux, on the other hand, began as a toy operating system only on the x86 architecture; it is doubtful anyone had any idea of how robust it would become or how many architectures it would wind up supporting

# UNIX Variants

- Sorting out the fractious history and differences among the different UNIXs would be a lengthy task, but by 1991 there were many variants, often tied to a specific hardware platform and vendor:
  - SGI had IRIX
  - Sun had SunOS and Solaris
  - IBM had AIX
  - Hewlett Packard had HPUX
  - Cray had UNICOS
  - DEC had Ultrix
- Each one of these manufactures often had several varieties running even on its own universe of hardware
- SCO was one of the only variants not arising from a hardware company

# UNIX Variants (Cont.)

- While there were various efforts to achieve some standardization, most vendors had strong self-interest in keep in things proprietary
- As a minimum there were always two major flavors to be considered, **System V** and **BSD**, and their behavior could be quite different even on quite basic matters such as signal handling
- Application developers interested in portability had to resort to the use of ugly **`#ifdef`** statements
- Even where the APIs were not that different, the actual implementation could be radically different from platform to platform
- Basic kernel architectures also differed
- Each platform had its own set of basic file utilities, shells, etc.

# GNU

- The **FSF**'s (Free Software Foundation) **GNU** (GNU's not UNIX) project developed freely-distributable versions of many basic utilities, such as **tar**, **ls**, **grep**, etc., and even more important, the **gcc** compiler and the basic C-library, **libc**
- Linux could not have been born or grown without the availability of tools from the GNU project
- We will stay out of the arguments about whether Linux should properly be loosely called GNU/Linux or something similar, but just note that what is often sloppily called Linux in fact contains many GNU components; properly speaking, Linux is only the kernel

# Correlations

- While UNIX and Linux are not the same thing, Linux has always borrowed heavily from UNIX
- Most basic components of Linux, such as an **inode**-based filesystem, accessing hardware through device nodes, multi-process scheduling, process creation and destruction, are completely rooted in UNIX
- This is because the developers of Linux have always had a good footing in the UNIX world, and because of the availability of the UNIX tools from GNU and other non-GNU open-source projects
- Whenever possible, Linux has tried to accommodate both major variants of UNIX as far as the API is concerned; striving for POSIX type behavior is above that level

# Correlations (Cont.)

- As such it has never been very difficult to port UNIX applications to Linux, unless the application has relied very heavily on certain idiosyncrasies of a particular UNIX implementation
- The open nature of the Linux development model has thus far avoided the serious fracturing that took place in UNIX
- It is perhaps ironic that the easily legal possibility of having Linux fork into competing versions at any time is perhaps what has prevented it
- Many hardware vendors now seriously support Linux on their hardware and the long range future of their own versions of UNIX is often in doubt
- It could well be that the Linux plan for world domination is inevitable; at least as far as killing off other UNIX-like operating systems