31268 Web Systems

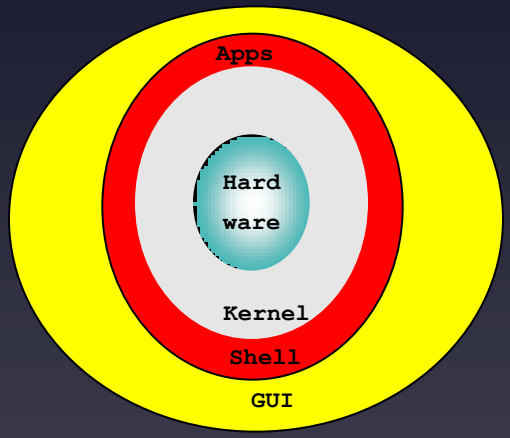
Week 2: Operating Systems

Part 1: Unix

31268 Web Systems

UNIVERSITY OF TECHNOLOGY SYDNEY
Faculty of Information Technology

Week 2

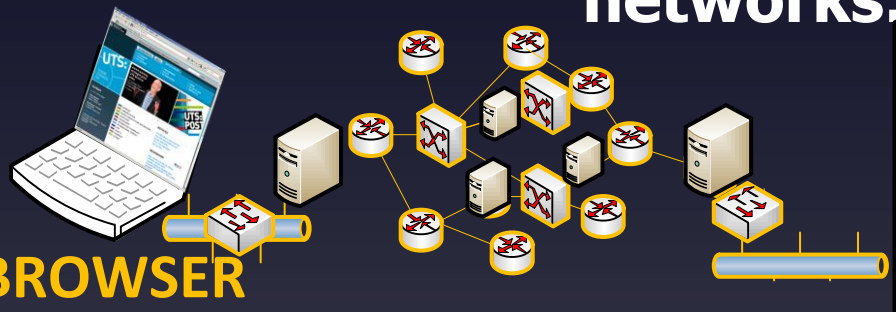


Operating Systems
A History lesson...

The web…

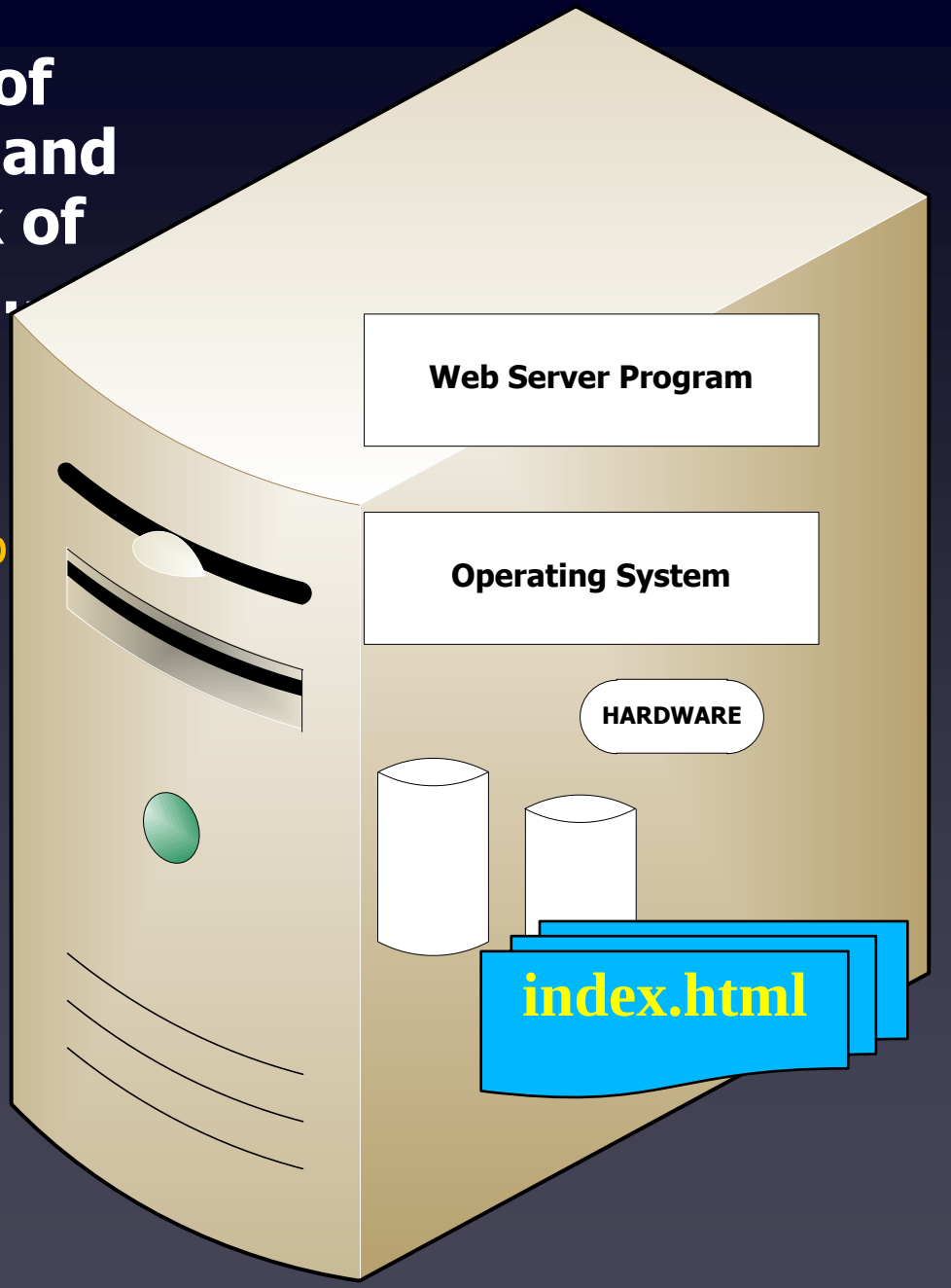
- Is It …

A bunch of computers and a network of networks.



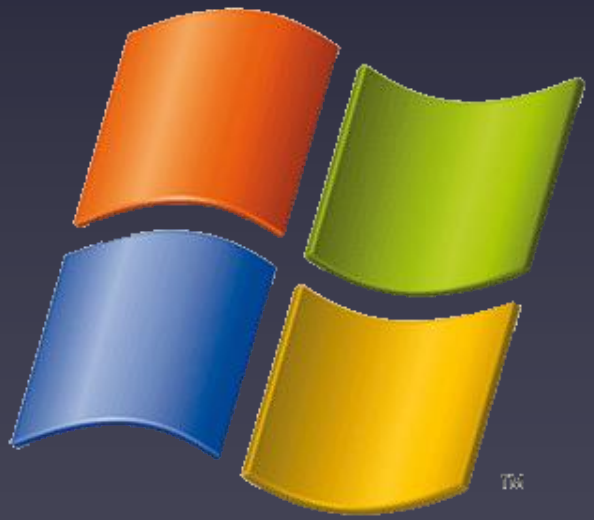
BROWSER

… and a whacking **big** computer running the **web site program** on an **operating system** running on **HARDWARE**



Revision:
What is an Operating System ?

Definition: An operating system is a piece of **software** that sits between all programs and the computer's hardware.



Examples of Operating Systems

- Unix based
  - Mac OSX, iPhoneOS
  - Linux
  - Solaris
  - freeBSD
- Windows NT based
  - Windows XP, Windows 7, Windows 2003
- Symbian
  - Nokia mobile phones

Unix

Where is Unix used?

- Unix has been used continuously since 1969.
- Unix is used on most of the computers running the Internet
  - (web servers, domain name servers, email servers, web hosting)
- *"Unix is not popular for ordinary users….."*

Where is Unix used?

- Unix has been used continuously since 1969.
- Unix is used on most of the computers running the Internet
  - (web servers, domain name servers, email servers, web hosting)
- *"Unix is not popular for ordinary users….."*
- **But…..**

  Mac OS/X is based on UNIX !
  (also iPhone and iPod Touch !)

Where is Unix used?

UNIVERSITY OF TECHNOLOGY SYDNEY
Faculty of Information Technology

- Unix has been used continuously since 1969.
- Unix is used on most of the computers running the Internet
  - (web servers, domain name servers, email servers, web hosting)
- *"Unix is not popular for ordinary users....."*
- But.....

  Mac OS/X is based on UNIX !
  (also iPhone and iPod Touch !)

- **But.....**

  Motorola phones!!
  Google Android phones!!
  Netbooks
  Routers

.... & so on

Evolution of Unix

Many versions of Unix. Most are based from 2 original versions:

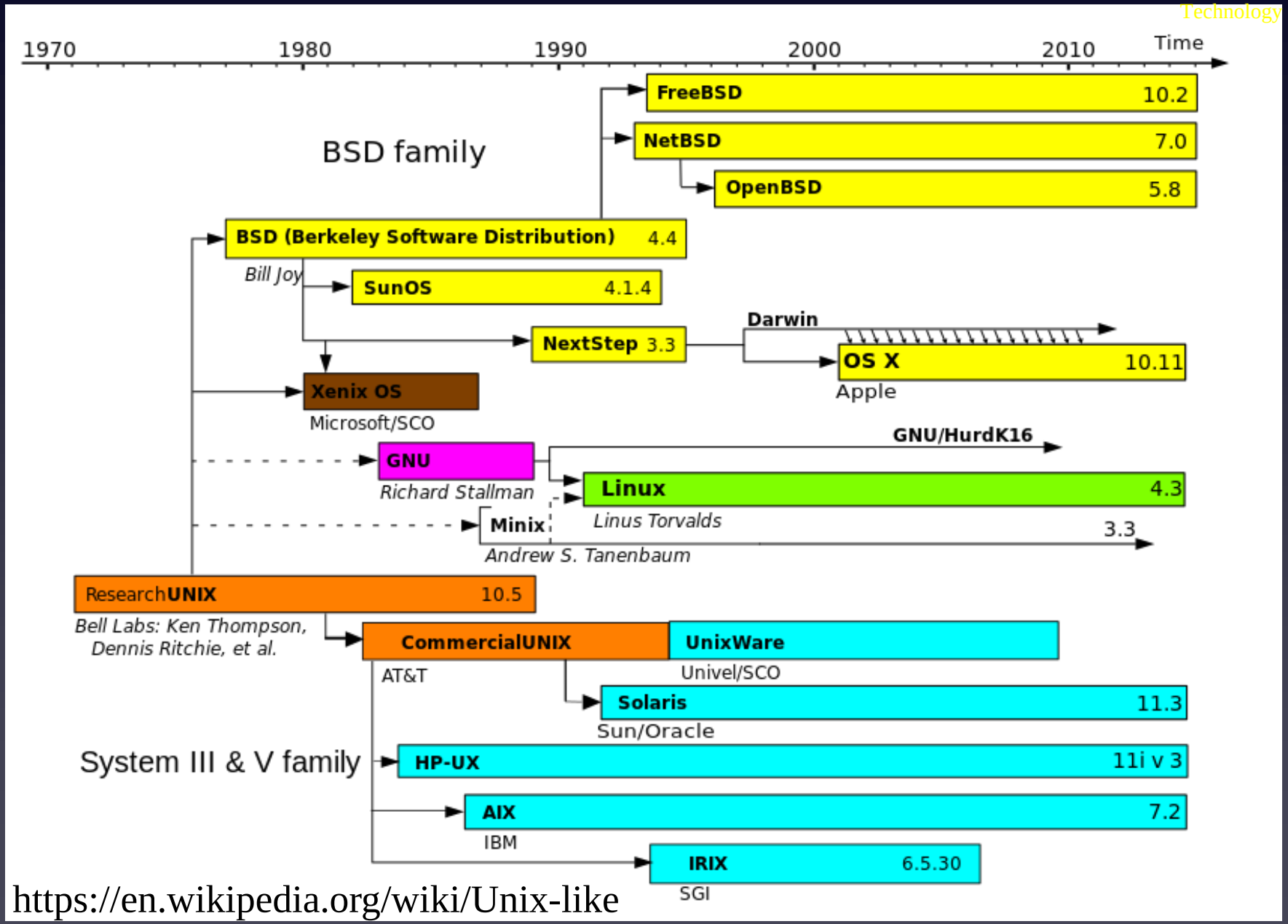
- **System V** - the original version from AT&T
- **BSD** - from the University of California at Berkeley

Lots of little differences - commands with different options, different structure of directories for system administration.

See http://www.makeuseof.com/tag/3-unix-like-operating-systems-arent-linux/

NOTE: I've mixed Unix and Unix-like – for this subject treat them as the same!

Unix History (wikipedia)



https://en.wikipedia.org/wiki/Unix-like

Unix Irregularities

- Ad Hoc Development:
  - Quite a lot of Unix, especially the various scripting languages and the individual commands grew up in an ad-hoc and unregulated, haphazard fashion.
  - While this resulted in a much more powerful and versatile operating system, it also results in being rather confusing at the user level.

A Standard for Unix commands?

- IEEE tried to standardise Unix:
  - Called IEEE 1003, or better known as "**POSIX**"
  - Defined: commands, utilities, system interfaces, scripting language.

A Standard for Unix commands?

- IEEE tried to standardise Unix:
  - Called IEEE 1003, or better known as "**POSIX**"
  - Defined: commands, utilities, system interfaces, scripting language.

- POSIX has been largely ignored by vendors - $$$ and too complex → 1990's *UNIX wars*

Result: inconsistency and difficulty in transferring code between systems.

A Standard for Unix commands?

Finally, 2002, new Single Unix Specification (SUS) agreed. If version meets spec → can be called ***UNIX***. Otherwise called "**Unix-like**"

NOTE: I've mixed Unix and Unix-like – for this subject treat them as the same!

Operating Systems

- Only one Operating System has been in continuous use for longer than Unix.

Operating Systems

- Only one Operating System has been in continuous use for longer than Unix.

➔ IBM **VM/CMS:**
Virtual Machine/Conversational Monitor System (1966!)

–used on mainframes

Operating Systems

→ The longevity of Unix (despite its faults) is noteworthy and prompts a question:

Why has Unix survived ?

Why has Unix survived? (1)

No one owns these ideas.

Why has Unix survived? (1)

No one owns these ideas.

- **Unix is a set of ideas**, none of which are secret.
- **Any person or group is free to implement these ideas**. There have been court cases over specific lines of code in "official" Unix (System V) , but the lines of code are only a specific implementation of these principles.

Why has Unix survived ? (2)

UNIVERSITY OF TECHNOLOGY SYDNEY
Faculty of Information Technology

Unix is based on simple concepts:

Why has Unix survived ? (2)

Unix is based on simple concepts:

i.e.: Files, processes, permissions and users.

- Even hardware devices e.g. /dev/mouse are represented as files.
- This has simplified the conceptual picture of Unix (if not the internal code)
- It has also allowed Unix to incorporate new ideas and technologies quite easily.

Why has Unix survived? (3)

Unix is portable

Why has Unix survived? (3)

Unix is portable

- Unix is written in the programming language **C.**
  - → i.e.: not tied to any particular CPU.
  - → Any computer with a C compiler can usually compile the source code
- The technology of computer hardware has evolved enormously since 1970, but is still conceptually the same.

Why has Unix survived ? (4)

Unix (at least some varieties) is free

Why has Unix survived ? (4)

Unix (at least some varieties) is free

- 1993/1994 onwards: free versions of Unix (**Linux, FreeBSD**)
- Especially available to cheap Intel based PCs - lots of them around because of Microsoft Windows.

Why has Unix survived ? (5)

Unix is efficient, stable and relatively secure

Why has Unix survived ? (5)

UNIVERSITY OF TECHNOLOGY SYDNEY
Faculty of Information Technology

Unix is efficient, stable and relatively secure

- Unix is **fast** and **stable** (system crashes are rare).
- Designed for **security for multi-user systems** – files have owners, security permissions are tight

  → therefore fewer viruses for Unix.

Why has Unix survived? (6)

The Unix as a set of tools approach

Why has Unix survived? (6)

The Unix as a set of tools approach

- The Unix CLI has some very powerful features. Specifically, **simple commands, pipes and I/O redirection**.

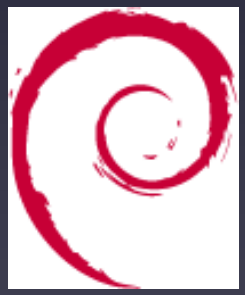
- You can create very powerful ad hoc tools
  → by passing the output of one command to another command

- → This has a great appeal to many technically oriented users.

Aside: the labs

- At UTS, we use 2 versions of UNIX
  - Solaris 10 (on rerun.it.uts.edu.au)
  - Linux "Redhat Enterprise" on the B11 Lab workstations

- Our labs use LinuxGym
  → based on Debian linux



Exercise

- Logon to rerun.it.uts.edu.au

- Use ssh *userid*@rerun.it.uts.edu.au
  - where *userid* is your alphabetic IT userid

  - Compare the common commands between Linux and Solaris: e.g. man ls
  - Look at the root directory: ls /