OS + VM COMPUTER SYSTEMS

Week 10 : 4th Dec 2015

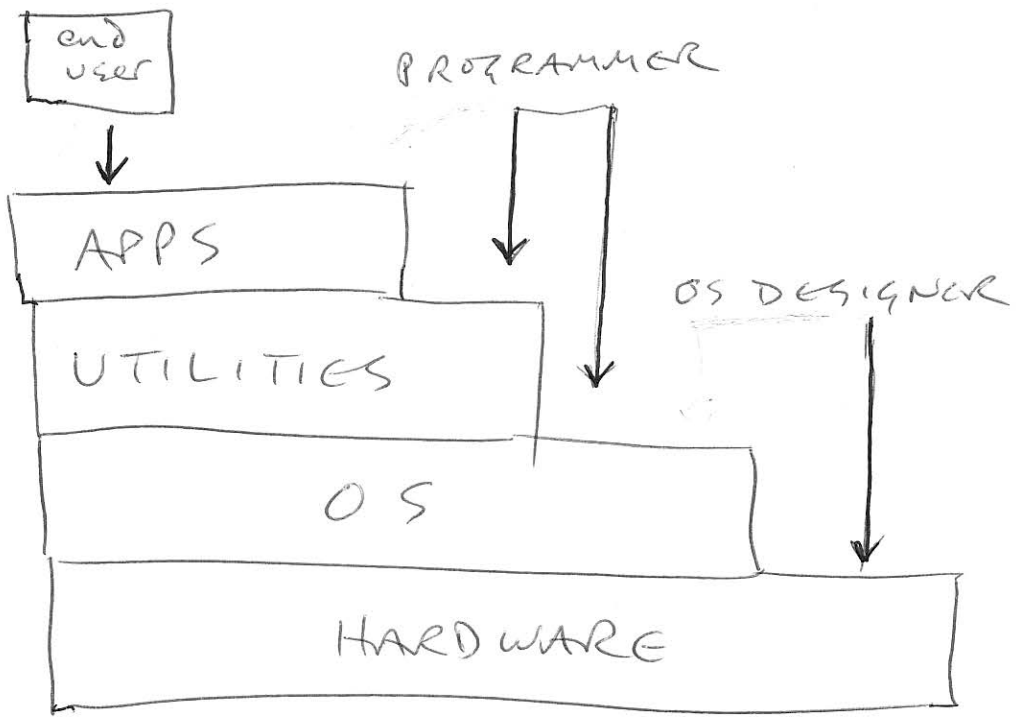
Jed Gibbs
for
Charlton Rodda

OPERATING SYSTEMS

2 MAIN - WINDOWS WIMP/GUI
- UNIX-LIKE COMMAND LINE

Hide complexity from programmers + users.

Windows often running 70 or so programs in the background before you add your own apps.



OS KERNEL SERVICES

MEMORY MANAGEMENT - Allocate available RAM to programs, manage virtual memory,

TASK MANAGEMENT - launch processes and maintain process list, timeslicing

FILE MANAGEMENT

open, read, write, close files; set + check permissions; buffering.

DEVICE MANAGEMENT

printers, scanners, cameras, VDUs, keyboard, mice

ESSENTIAL HARDWARE FEATURES

memory protection for OS + to allow OS to protect apps from each other.

TIMER - to prevent one app monopolising CPU/RAM

PRIVILEDGED instructions and interrupts

SCHEDULING

PROCESS

PROGRAM that is running, inc. code, data, resources, register state

context switching is the capture of the current state, saving and replacing it with the next app, before eventually switching back.

PCB Process Control Block

Identifier, state, volatile environment: prog. counter, memory pointers, context data priority, I/O status, accounting info.

MEMORY MANAGEMENT

32 bit — 0 – 4 billion memory locations are the maximum available (no matter how much physical RAM). 4 GB

64 bit — 16 EByte (Exa = $10^{18} \cong 2^{60}$)
(WINDOWS 7 = 128 GB limit?)

VIRTUAL MEMORY allows the program to believe it has access to the maximum allowed.

- Analogy — a treadmill that puts enough current memory in place, as opposed to running along a real, finite length of road.

VM has 4 different techniques, usually combined.

swapping; partitioning; paging; virtual memory.

SWAPPING

writing processes to the HD/SSD as required to free up memory for other apps, later getting the info back from HD/SSD and loading it back into RAM.

PARTITIONING

Fixed often better set up logarithmically
dynamic can get fragmented

Physical and Logical Addresses

By tagging the addresses in such a way that the process written back has at least kept the addresses in order, offset from the new address.
Base displacement address.