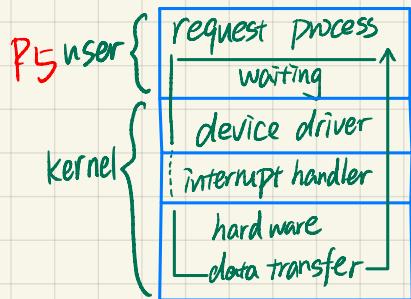
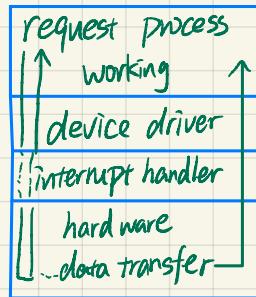


COMP2432 Final Exam Revision

1. Synchronous I/O processing



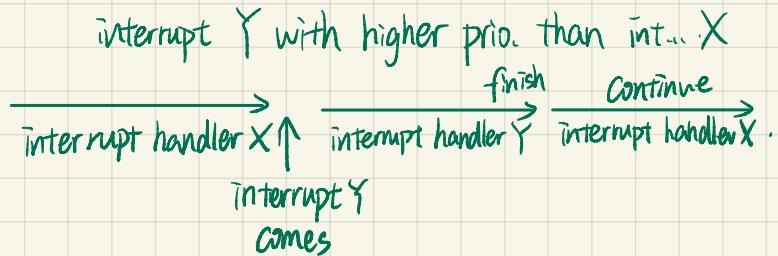
Asynchronous I/O Processing



p5 - **Interrupt:** signal to CPU to tell it about occurrence of major event & turn attention to other activities & manage resource, because interrupt seize CPU

p8 - **2 types of interrupts:** ① maskable int...: ignore or handled later with lower priority.
 ② non-maskable int...: cannot be ignored, must handle immediately.

p11 - **Diagram:** how interrupt "interrupt" another interrupt.



p14 - **Timer interrupt:** purpose → handle time-related activities

3. - **kernel/supervisor mode:** can execute all instructions (OS process execute here)

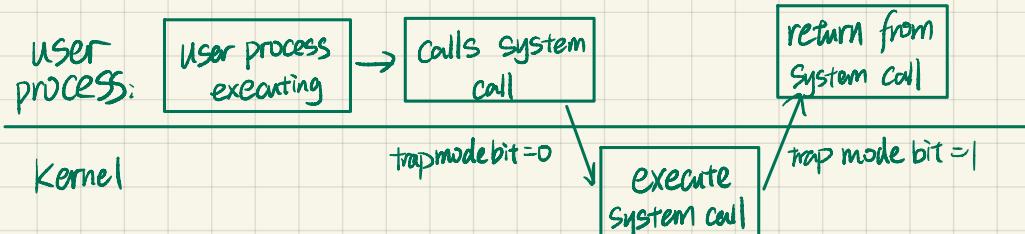
p16 - **User mode:** can only execute normal instruction, not privileged instructed

p16 - **mode bit:** a process running with user mode bit on → user process
 off → kernel process

- instruction executed in kernel mode: system call

p18 - **definition - system call:** programming interface to service by OS.

p17 - **How system call implement**



p23 - **typical types of system calls:** process control, file management, device management, info maintenance, communications.

p27 - **Common types of system program:** file manipulation, status info, file modification, communications, programming language support, program loading & execution, utilities

4. - common types of OS

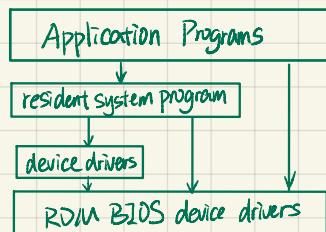
P30-33 batch processing, multiprogramming, Time-sharing, real-time, distributed.

simple OS, layered DS

- difference (simple OS & layered DS)

P32,33

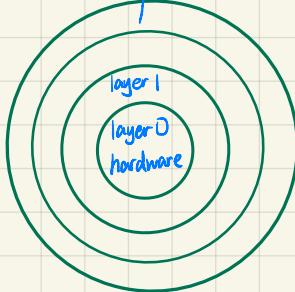
simple OS



layered DS

layer N

↑ user interface



- advantage of micro-kernel system: easier to extend a microkernel, easier to port OS to new architecture/
P40

more reliable & secure

- disadvantage of micro-kernel system: performance overhead of user space to kernel space communicate.

P34

- advantage of Unix & Linux: reliability, security, speed, free, open source

5. - local variable: ^{lower case} only valid within the shell when it is defined.

P22
- environment variable: valid across all shells created by existing shell when it is defined
^{↳ upper case}

P31 quote & backquote 'Str' → command to be execute
 `Str` → literal enclosed string

Programming write a bash shell script program to do abc

What would following bash script program xyz produce

P3
6. Process definition: program in execution

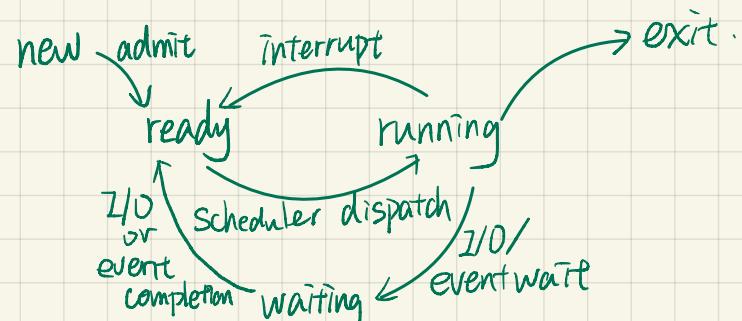
P6 PCB definition: each process is represented by PCB.

Process state State of process

common process state. new, running, waiting, ready, terminate.

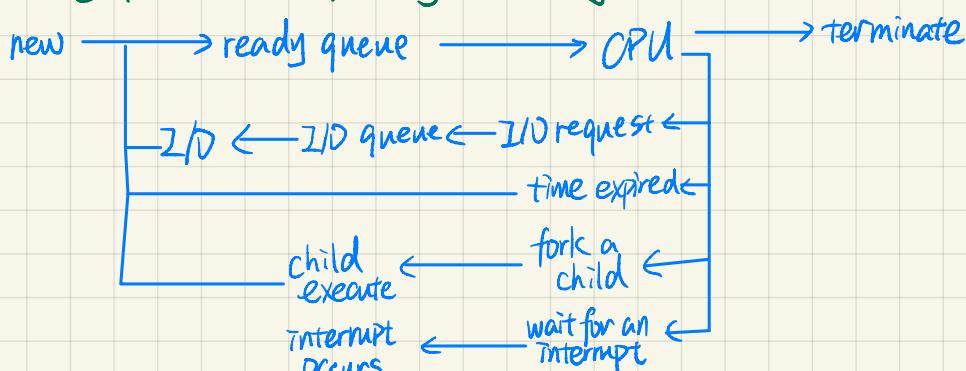
how to transit between states

P5.



relationship between life cycle of process & queues used in OS.

I/O queue is one part in life cycle of process, I/O queue goes into I/O then goes to ready queue, then processing is running



7. 3 main type of Scheduler

long term scheduler, short-term scheduler, medium-term scheduler function

P14-16 Long term scheduler: make decision to maintain a good mix of CPU-bound & I/O-bound process

short-term scheduler: make decision on which process to get CPU

medium-term scheduler: make decision on remove few process from ready queue, then return to ready queue after few process using CPU.

P17 sequence of events to bring CPU from an executing process to another.

8. P22 How to create child process use fork system call

P25 relation between child & parent resource sharing, execution, address space

process hierarchy hierarchy of parent process & child process

P23 zombie & orphan process zombie: complete child process that is not pick up by parent.

orphan: a process without parent.

9. advantage of cooperating processes

information sharing, computation speed-up, modularity, convenience
common application producer & consumer.

10. direct & indirect communication (distinguish in message passing).

process 1 directly send message to Process 2 in direct communication.

message are directed and received from mailbox or port

common issue in message passing

how are links established? Can link be associated with more than 2 processes?

what is the capacity of a link? Is a link unidirectional/bidirectional?

11. key issue in buffering & synchronization between sender & receiver

sender may have sent several message and receiver has not read them. so we need buffering for unread message.

12. non-preemptive & preemptive scheduling

no forced taken of CPU forced to taken of CPU

performance criteria in scheduling response time.

CPU utilization, throughput, turnaround time, waiting time

13. explain operation of scheduling algorithm

FCFS: served according to arrival order

shortest job first: served according to order of job's burst time.

shortest remaining time: according to order of shortest remaining time.

priority: according to priority.

Round Robin: serve each process with equal unit of time

problems: FCFS: ^{starvation} convoy effect happens when single long process blocking other process

SJF: ^{starvation} convoy effect when there's a long process using CPU, blocking shorter process.

SRT: starvation

Priority: starvation

RR: excessive context switching

14. P₂₃ Common queue in multi-level queue scheduling

System queue, interactive queue, batch queue
(Priority) (RR) (FCFS/SRT)

P₃₅ key parameter in feedback mechanism

number of queues, scheduling of each queue

method of determine when to upgrade/downgrade a process to higher/lower priority

15. Draw a Gantt Chart for following set of processing using different scheduling algorithm and compute the required performance metrics

1b. 3 types of address binding

Address binding: compile time, load time, execution or run time

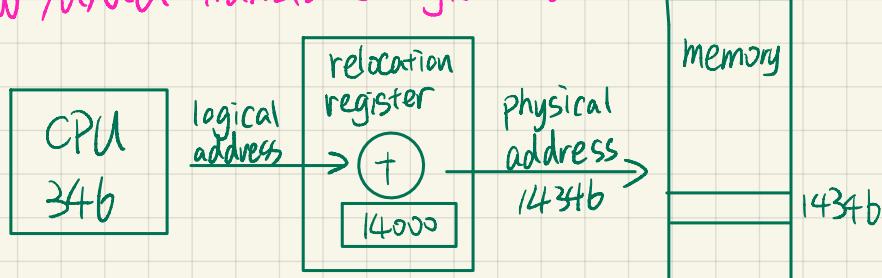
P7 logical & physical address

logical address: address generated by CPU

physical address: address sent to main memory

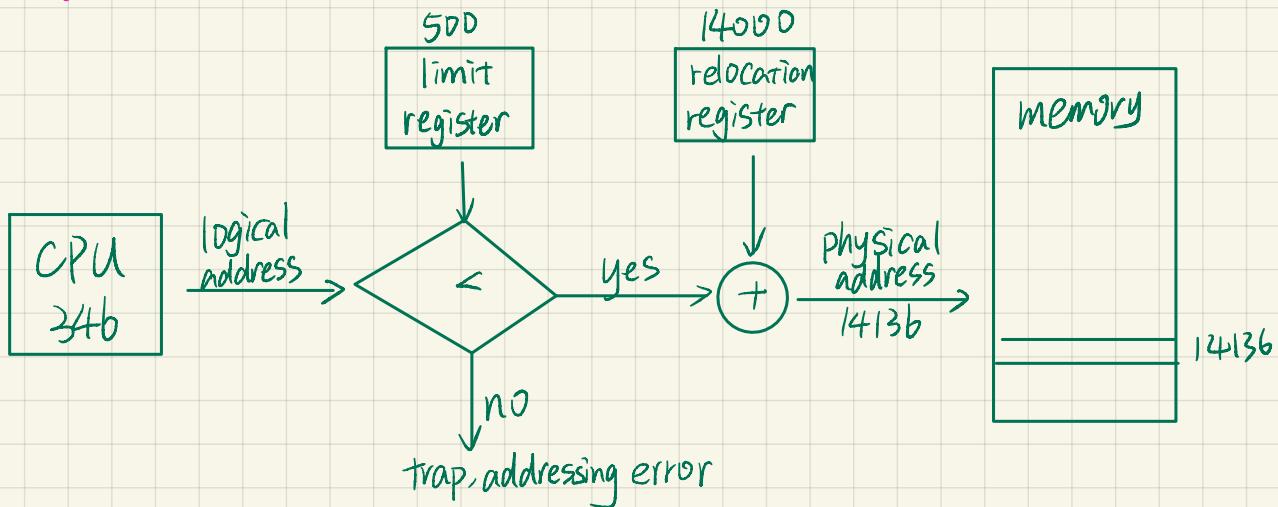
how MMU translate logical address

P9



how delete invalid address

P12



17. MFT and MVT

MFT: multiprogramming with a fixed number of tasks

MVT: multiprogramming with a variable number of tasks

common algorithm in contiguous allocation

worst-fit, best-fit, first-fit

fragmentation & segmentation

fragmentation: when memory is available, but somehow could not be used.

Segmentation: memory management scheme that support user view of memory with segments.

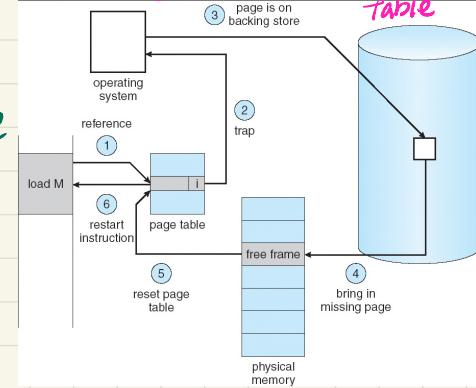
21. Demand Paging bring a page into memory only when it is needed.
P11
& Anticipatory Paging predict what pages a process would need in near future and bring them in before hand

P17
$$\begin{aligned} \text{virtual} \\ \text{effective memory access time} &= (1-f) \times \text{memory access time} \\ f = \text{page fault rate} &\quad + f \times \text{page fault service time} \\ * \text{effective memory access time} &= \text{cache access time} + (2-h) \times \text{memory access time} \end{aligned}$$

22. procedure to serve page fault

- P15
- ① get empty frame from free frame list
 - ② schedule I/O to upload the page on disk into free frame
 - ③ update the page table to point to loaded frame
 - ④ set valid-invalid bit to be valid
 - ⑤ Restart instruction that caused the page fault.

hit rate
↑
how virtual page can be mapped to physical frame with page Table



23. why there's a need a Page replacement

P19 if all frames are still in use, try to find some frame that is probably not used and remove it.

reference string → different page replacement algorithm & Show page fault.

24. Deadlock each one is waiting for other to yield; no one can make any progress;
P³ it can only be resolved if one car backs up.

Livelock each one tries to make a move to avoid forever waiting; no one
P⁴ can make any progress, but it can be resolved if people are more lucky.

4 necessary condition to deadlock.

P⁸ mutual exclusion, hold & wait, no preemption, circular wait.

4 methods to handle deadlock

- P¹⁴
1. ignore deadlock problem & pretend that deadlock never occur in the system.
 2. ensure that system will never enter deadlock state.
 3. allocate resource very carefully so that system will not enter deadlock state.
 4. allow system enter deadlock state, detect it and then recover from it.

25. detect system state safe or not.

obtain its needed resource, execute \Rightarrow safe \Rightarrow request granted
 \rightarrow Banker's algorithm
no safe \Rightarrow put request until some resource return

26. detect system state suffering from deadlock

Cycle in wait-for graph

27. critical section Shared resource

3 properties that solution to critical section should satisfy.

1. mutual exclusive: at most one process could be in CS
2. Progress: at least one process could enter CS.
3. bounded waiting: no starvation.

28. solution to producer/consumer problem

① shared buffers (variables)

② critical sections (shared resource)

29.

30. semaphore (2 operation)

binary semaphore: initialize to 1 (int value 0/1)

counting semaphore: int value any positive

31. attribute for file name, identifier, type, location, size, owner identification, protection, time/date information

Common operation for file create, read, write, reposition, delete, truncate.

Common operations for directory search for a file, create a file, delete a file, list a directory rename, traverse.

differentiate NFS, SAN, Cloud

NFS: distributed file-sharing method

SAN: large storage capacity to a large

Cloud: over the cloud

32. protection & security P38

internal OS, mechanisms & policy to keep program & user from accessing / changing stuff

external OS, authentication of user, validation of messages, malicious or accidental introduction of flaw

policy & mechanism difference P39

Mechanism: stuff build into OS to make production work

Policy: information that says who can do what to whom

Domain collection of object & their operation

Object unique name & can be accessed through well-defined set of operation

Domain, Object store in access matrix

Access (i,j) is operation that process executing in Domain i, can invoke Object j.

3 implementation of access matrix

global table, access control list for object, capability list for domain.