CSCI 4210 OPERATING SYSTEMS

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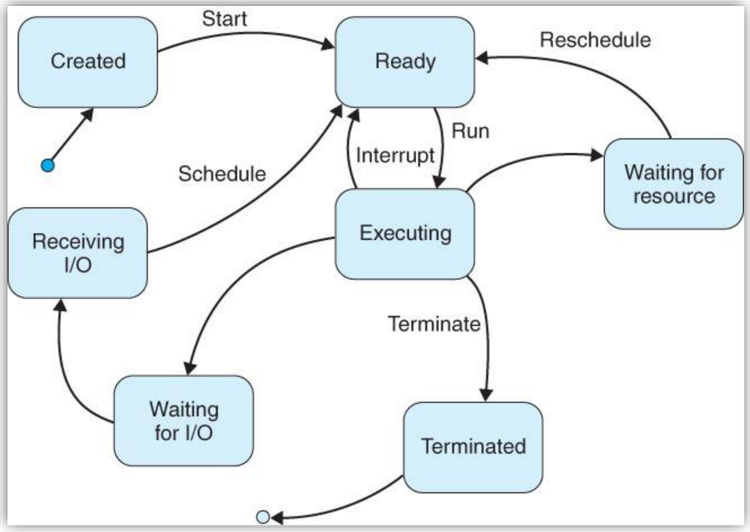
PROCESS STATES

Each process in an operating system is in a specific state

State changes occur for a variety of reasons, e.g., an interrupt occurs, a resource becomes available, a signal is received, etc.

Most of the time, processes are in a "waiting" state of some sort



From Garrido et al [ISBN 978-1-449-62634-1]

HISTOGRAM OF CPU BURST TIMES

CPU burst times for a typical process…

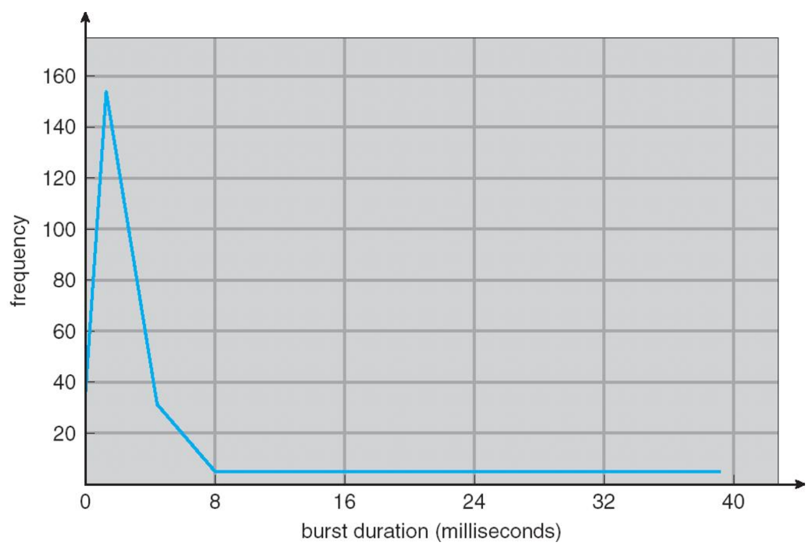


Figure 6.2 of Silberschatz et al [ISBN 978-1-118-80492-6]

CONTEXT SWITCH

A context switch occurs each time the operating system switches its *context* from one process to another

The operating system maintains a Process Control Block (PCB) for each process, regardless of process state

PCBs contain register values, program counter, file descriptor table, page tables, etc.

$t_{context\text{-}switch} \ll t_{cpu\text{-}burst}$

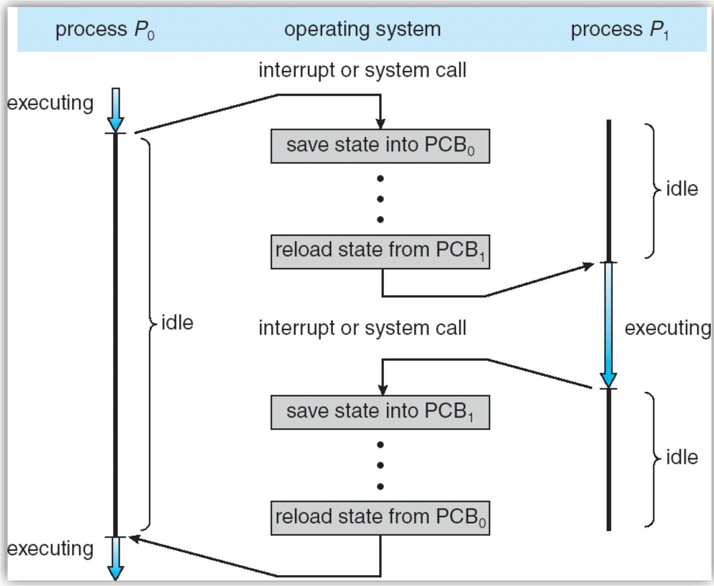


Figure 3.4 of Silberschatz et al [ISBN 978-1-118-80492-6]

CPU UTILIZATION & MULTIPROGRAMMING

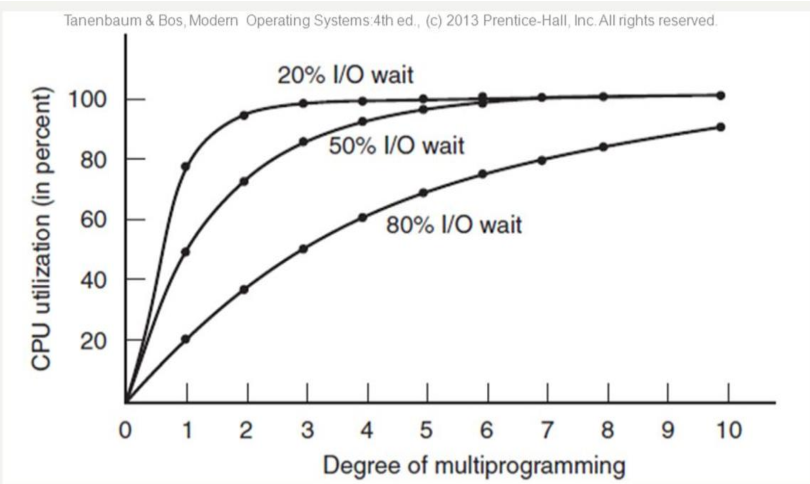


Figure 2-6. CPU utilization as a function of the number of processes in memory.

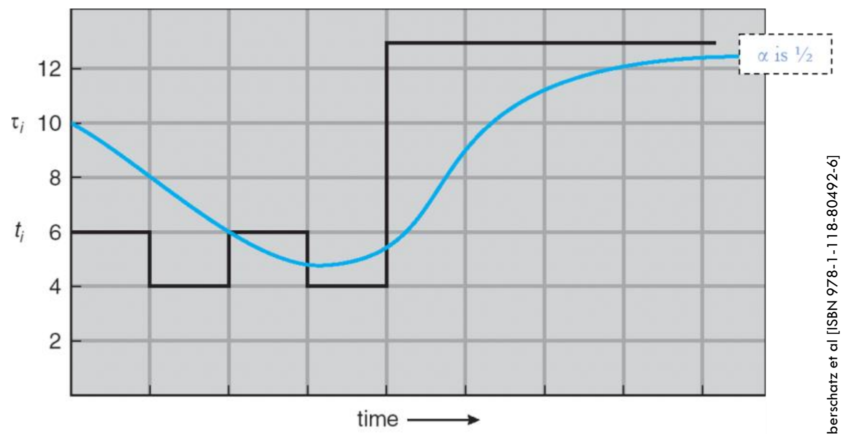
Figure 2.6 of Tanenbaum and Bos [ISBN 978-0-133-59162-0]

EXPONENTIAL AVERAGING FOR PREDICTION

The black line shows actual CPU burst times, whereas the blue line shows our predicted burst times

We must perform this analysis separately for each process

Try recalculating using different α values (e.g., 0.1, 0.75, 0.9)



CPU burst (t_i)		6	4	6	4	13	13	13	…
"guess" (τ_i)	10	8	6	6	5	9	11	12	…

Figure 6.3 of Silberschatz et al [ISBN 978-1-118-80492-6]

VIRTUAL MEMORY…

We previewed this picture during the Part III video lecture just to emphasize that processes go through different phases of execution

In these different phases of execution, CPU burst times will change accordingly…

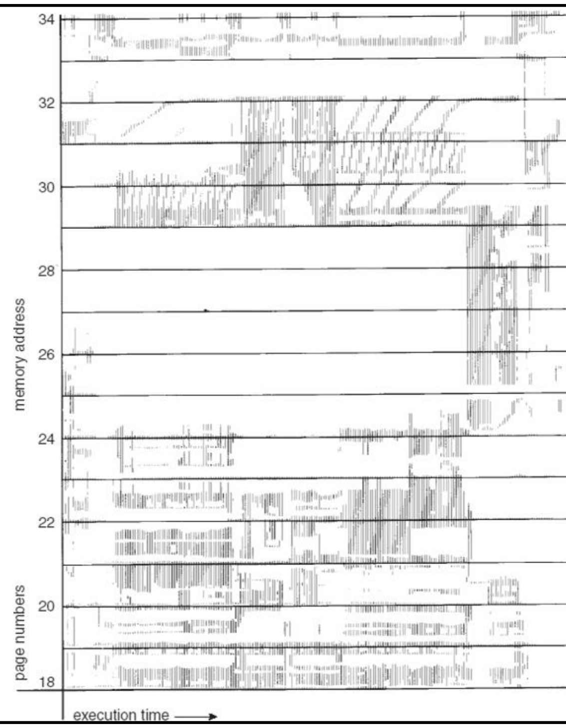
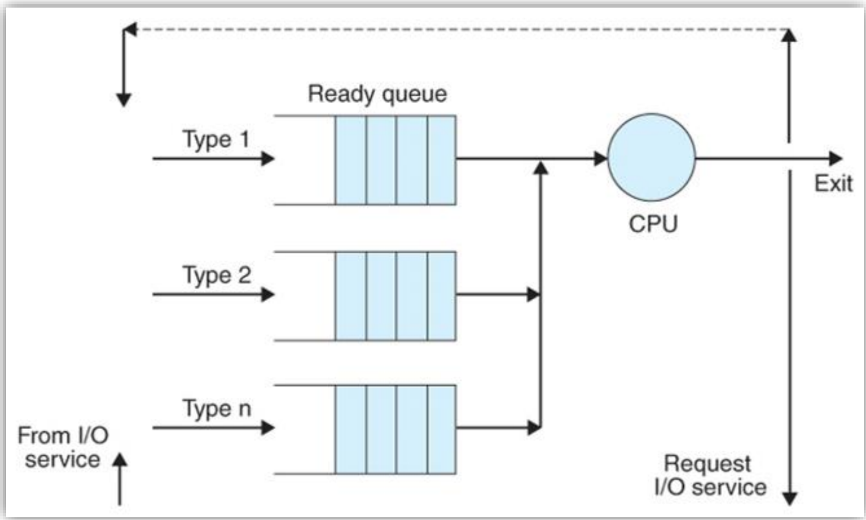


Figure 8.19 of Silberschatz et al [ISBN 978-1-118-80492-6]

MULTICLASS SYSTEMS

Combine different CPU scheduling algorithms by using multiple ready queues

Introduces the problem of how to classify processes into different "types"



From Garrido et al [ISBN 978-1-449-62634-1]

MULTILEVEL FEEDBACK QUEUE (MFQ)

Combine similar scheduling algorithms with multiple levels (priorities) based on real-time data

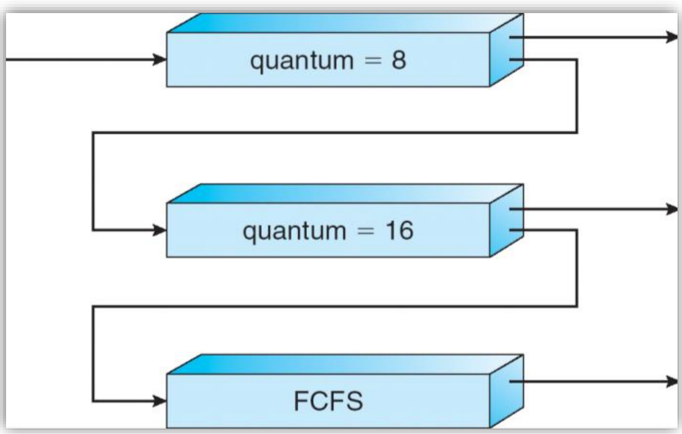


Figure 6.7 of Silberschatz et al [ISBN 978-1-118-80492-6]