5.2 Clock Interrupt Handling

- Clock interrupt is the 2nd to the power-failure interrupt.
- Tasks:
  - Rearms the hardware clock if necessary
  - Update CPU usage statistics
  - Performs scheduler-related functions
  - Sends a SIGXCPU signal to the current process
  - Updates the time-of-day and other related clocks.
  - Handles callouts
  - Wakes up system processes
  - Handles alarms

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5.3 Scheduler Goals

- The scheduler must ensure that the system delivers acceptable performance to each application.
- Different applications:
  - Interactive: 50-150ms
  - Batch: scientific computation
  - Real-time: time-critical

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5.4 Traditional UNIX Scheduling

- To improve response times of interactive users, while ensuring that low-priority, background jobs do not starve.
- Priority-based:
  - User-process is preempted
  - Kernel is strictly non-preemptive

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Priority

- Kernel:0-49, user: 50-127
- proc fields:
  - p_pri: Current scheduling priority
  - p_usrpri: User mode priority
  - p_cpu: Measure of recent CPU usage
  - p_nice: User-controllable nice factor
- Kernel:
  - Sleeping priority

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User mode priority

- Depends on two factors:
  - Nice: 0-39
  - CPU usage
- Time-sharing: equal opportunity
- decay factor: for SVR3 it is 1/2, for 4.3BSD:
  - decay = (2*load_average)/(2*load_average+1)
  - p_cpu = p_cpu* decay
- p_usrpri = PUSER + (p_cpu/4) +(2*p_nice)

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Example : PUSER = 50

T1		T2		T3

P1
P_usrpri= 110
P_cpu = 80
Nice = 20
	Decay =1/2	P1
		P_usrpri= 115
		P_cpu = 100
		Nice = 20
			Decay =1/2	P1
				P_usrpri= 102
				P_cpu = 50
				Nice = 20

P2
P_usrpri= 120
P_cpu = 80
Nice=25
		P2
		P_usrpri= 110
		P_cpu = 40
		Nice = 25
				P2
				P_usrpri= 115
				P_cpu = 60
				Nice = 25

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Scheduler Implementation

- 32 run queues: doubly linked list of proc structures for runnable processes.
- whichqs: bitmask for each queue, “1” means that there is a runnable process
- swtch(): context switch by p_addr
  - Saving part of u area (pcb)
  - Loading the saved context.
- VAX ffs, ffc, INSQHI, REMQHI, LDPCTX, SVPCTX : special instructions for context switch etc.

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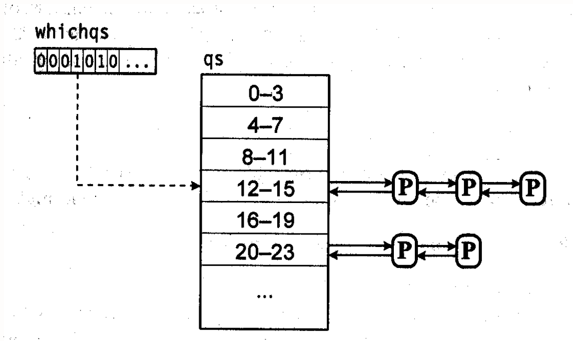

Figure 5-2. BSD scheduler data structures.

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