CLOCKS

Module Number 5. Section 4
COP4600 – Operating Systems
Richard Newman

INPUT/OUTPUT HANDLING

- Hardware – handling low-level I/O
- Software – layering
- Mass storage
- Clocks 
- Keyboard
- Mouse
- Monitor
- Thin Clients
- Power Management
- Minix3 I/O

CLOCKS

- Need for clocks
- Clock hardware
- Clock software
  - Time of day
  - Timers

CLOCKS

Need clock:

- Time of day
- Retry attempts
- Preempt running process
- Wake up process (as requested)

CLOCK HARDWARE

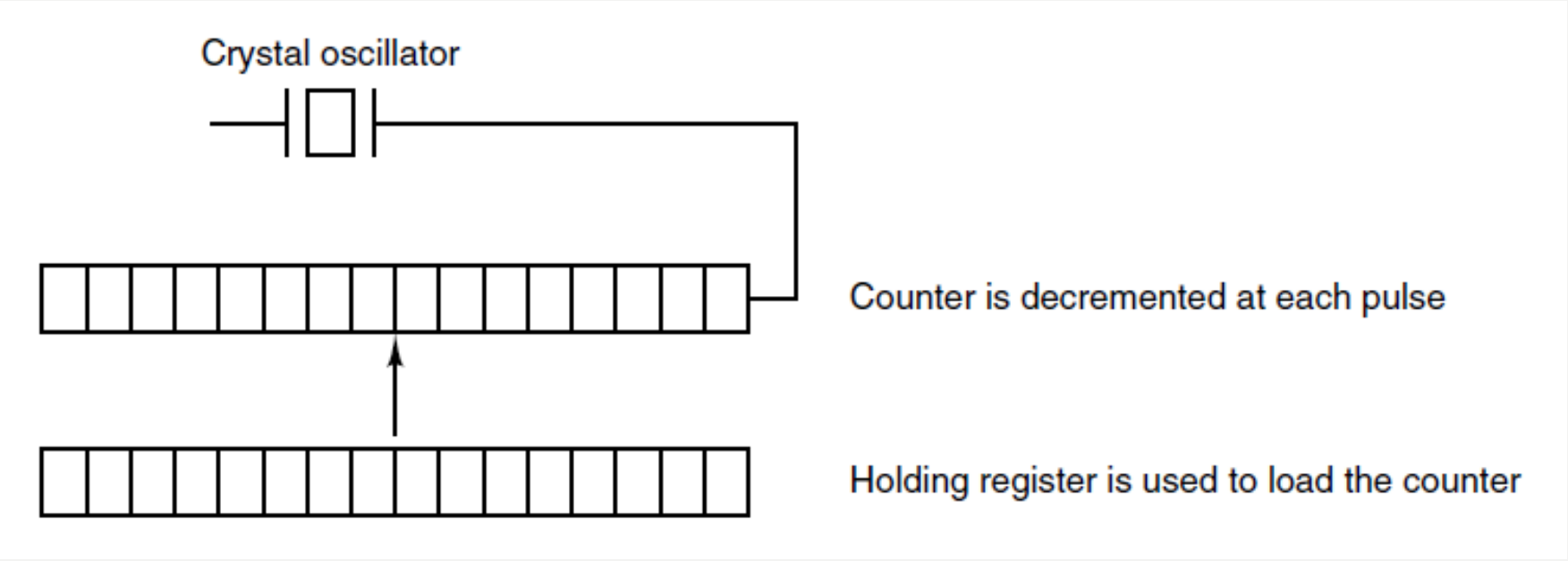


Figure 5-28. A programmable clock.

CLOCK SOFTWARE

Typical duties of a clock driver:

1. Maintaining the time of day.
2. Preventing processes from running longer than allowed.
3. Accounting for CPU usage.
4. Handling alarm system call from user processes.
5. Providing watchdog timers for parts of system itself.
6. Profiling, monitoring, statistics gathering.

TIME OF DAY FORMATS

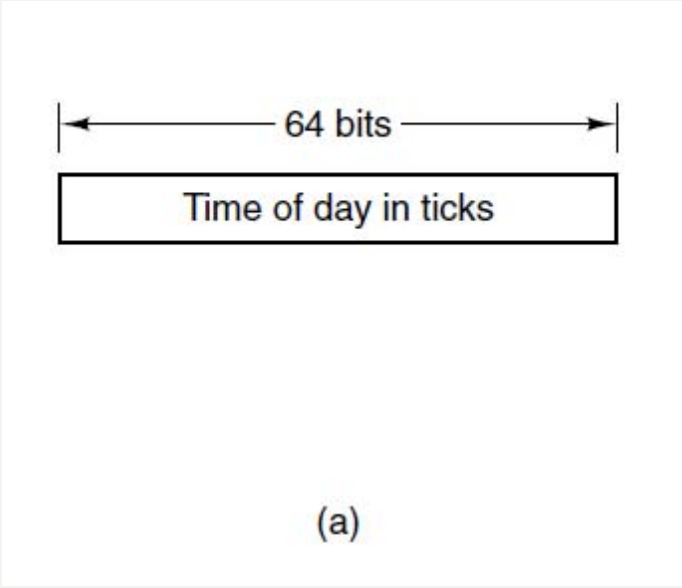


Figure 5-29. Three ways to maintain the time of day.

Time is measured since midnight 1 January 1972

SIMULATING MULTIPLE TIMERS

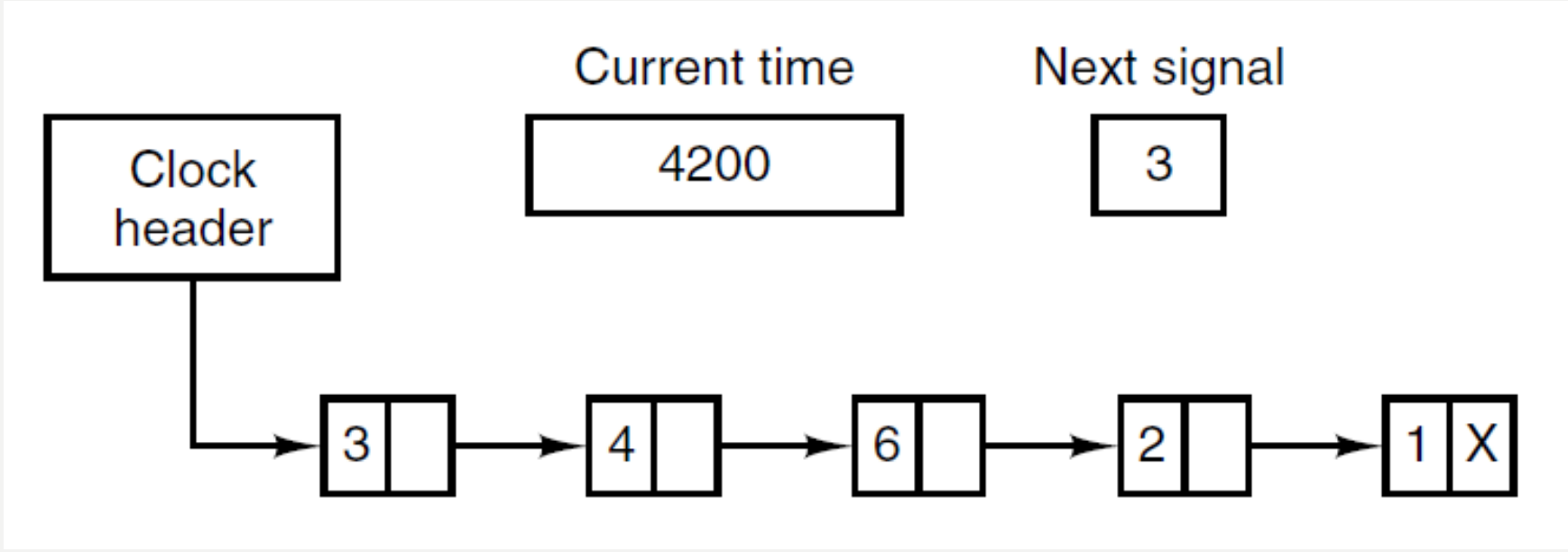
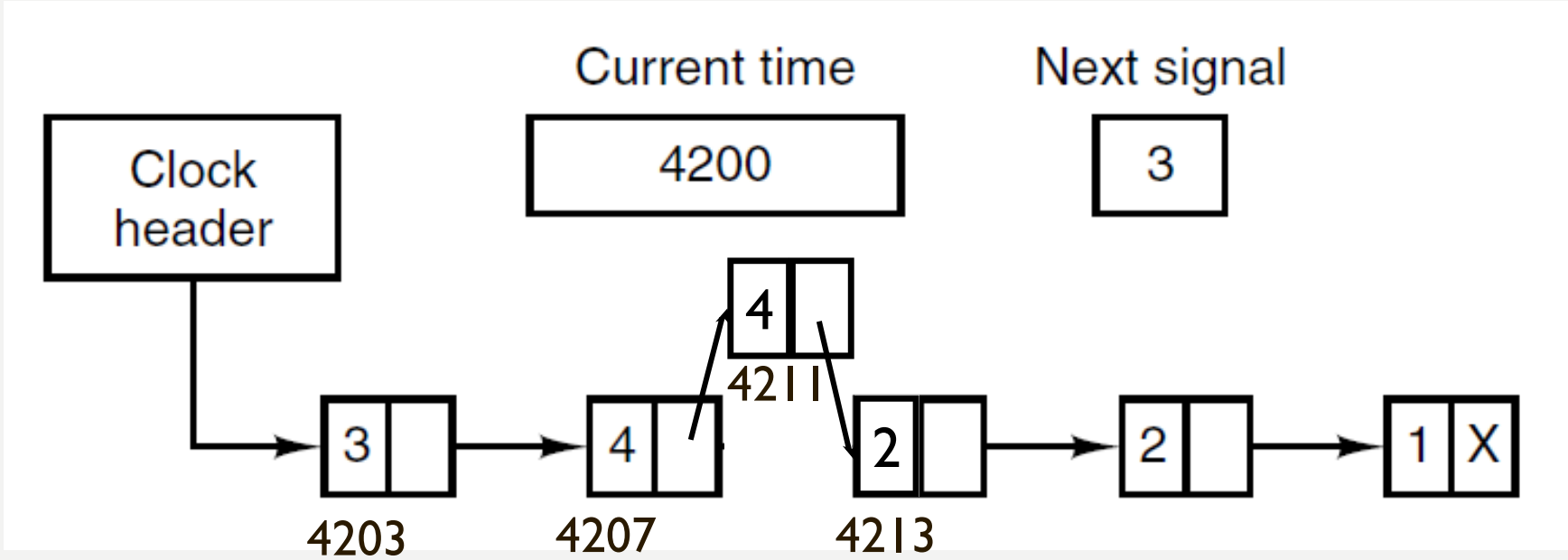


Figure 5-30. Simulating multiple timers with a single clock.

SIMULATING MULTIPLE TIMERS



Inserting an alarm at time 4211

SOFT TIMERS

Soft timers avoid interrupts by checking to see if a (soft) timer has expired when done with another kernel task.

Soft timers stand or fall with the rate at which kernel entries are made for other reasons. These reasons include:

1. System calls.
2. TLB misses.
3. Page faults.
4. I/O interrupts.
5. The CPU going idle.

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