

# Process Synchronization



## Practice Exercises

- 6.1 In Section 6.4 we mentioned that disabling interrupts frequently could affect the system's clock. Explain why it could and how such effects could be minimized.
- 6.2 *The Cigarette-Smokers Problem.* Consider a system with three *smoker* processes and one *agent* process. Each smoker continuously rolls a cigarette and then smokes it. But to roll and smoke a cigarette, the smoker needs three ingredients: tobacco, paper, and matches. One of the smoker processes has paper, another has tobacco, and the third has matches. The agent has an infinite supply of all three materials. The agent places two of the ingredients on the table. The smoker who has the remaining ingredient then makes and smokes a cigarette, signaling the agent on completion. The agent then puts out another two of the three ingredients, and the cycle repeats. Write a program to synchronize the agent and the smokers using Java synchronization.
- 6.3 Give the reasons why Solaris, Windows XP, and Linux implement multiple locking mechanisms. Describe the circumstances under which they use spinlocks, mutexes, semaphores, adaptive mutexes, and condition variables. In each case, explain why the mechanism is needed.
- 6.4 Explain the differences, in terms of cost, among the three storage types volatile, nonvolatile, and stable.
- 6.5 Explain the purpose of the checkpoint mechanism. How often should checkpoints be performed? Describe how the frequency of checkpoints affects:
  - System performance when no failure occurs
  - The time it takes to recover from a system crash
  - The time it takes to recover from a disk crash
- 6.6 Explain the concept of transaction atomicity.

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- 6.7 Show that some schedules are possible under the two-phase locking protocol but not possible under the timestamp protocol, and vice versa.
- 6.8 The `wait()` statement in all Java program examples was part of a `while` loop. Explain why you would always need to use a `while` statement when using `wait()` and why you would never use an `if` statement.