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# PROCESS SYNCHRONIZATION

**(THE CRITICAL-SECTION PROBLEM)**

# The Critical-Section Problem

- Consider a system consisting of  $n$  processes  $\{P_0, P_1, \dots, P_{n-1}\}$ . Each process has a segment of code, called a *critical section*, in which the process may be changing common variables, updating a table, writing a file, and so on.

```
do {  


entry section

  
    critical section  
  


exit section

  
    remainder section  
} while (true);
```

- The important *feature* of the system is that, when one process is executing in its critical section, no other process is allowed to execute in its critical section.

# The Critical-Section Problem: Solution

- A solution to the critical-section problem must satisfy the following three requirements:
- Mutual exclusion
- Progress
- Bounded waiting

# Mutual exclusion

- If process  $P_i$  is executing in its critical section, then *no other processes* can be executing in their critical sections.

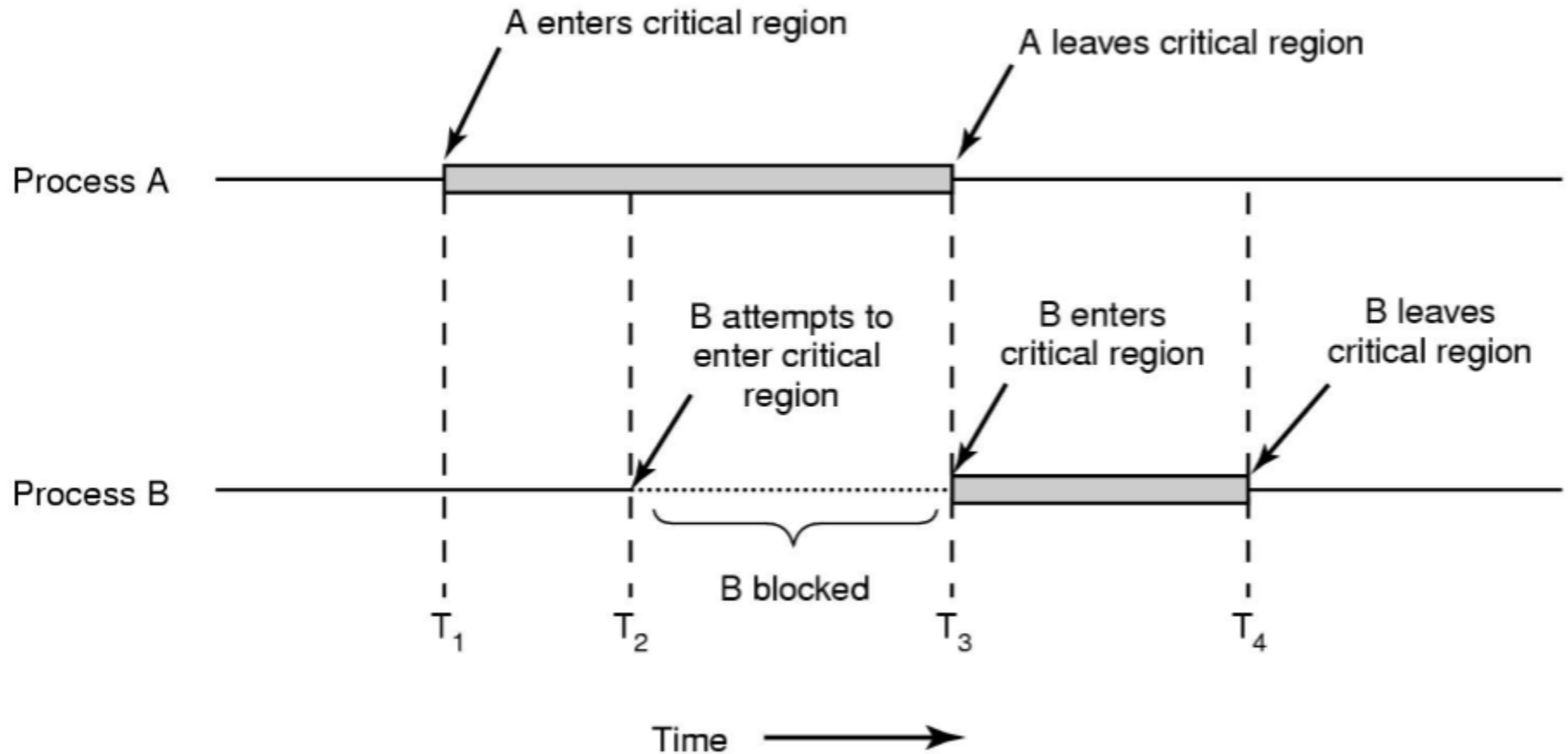
# Progress

- If no process is executing in its critical section and some processes wish to enter their critical sections, then only those processes that are not executing in their remainder sections can participate in deciding which will enter its critical section next, and this selection *cannot be postponed indefinitely*.

# Bounded waiting

- There exists a *bound*, or limit, on the number of times that other processes are allowed to enter their critical sections after a process has made a request to enter its critical section and before that request is granted.

# The Critical-Section Problem: Solution





# References

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley.
2. William Stallings, “Operating Systems: Internals and Design Principles”, 6<sup>th</sup> Edition, Pearson Education.
3. D M Dhamdhere, “Operating Systems: A Concept based Approach”, 2<sup>nd</sup> Edition, TMH.

**Thank You.**

