

Assignment

Q Analyse time Complexity of Banker's Algorithm.

Solution The Banker's algorithm is a resource allocation and deadlock avoidance algorithm often used in operating systems. Its main goal is to determine if a system is in a safe state by checking if resources can be allocated to processes in a way that avoids deadlock.

Key steps of the Banker's Algorithm

1) safety check: It checks if a sequence of processes exists that can finish without leading to deadlock. This is achieved by simulating resource allocation and verifying if each process can complete given the currently available resources.

2) resource request: It examines if a process can be safely allocated the requested resources by temporarily granting the request and checking for a safe state.

Complexity Analysis

The Complexity depends on:-

- $n \rightarrow$ number of processes
- $m \rightarrow$ number of resource types

▷ Safety Algorithm Complexity

The safety check requires iterating over all processes to check if each process can finish given the current resources. For each process:

- It iterates through the resources to ensure enough resources are available.

This results in a complexity of $O(n \cdot m)$ for each check.

The algorithm may need to check each process multiple times (upto n times in the worst case) to confirm a safe sequence. Therefore the total complexity for the Safety algorithm becomes:

$$O(n^2 \cdot m)$$

▷ Resource request algorithm Complexity

The resource request algorithm performs the following steps:

▷ Temporarily check allocate resources.

▷

The Safety algorithm has a complexity of $O(n^2 \cdot m)$ and since this must be done each time a resource is requested, the overall complexity of handling a single request is also

$$O(n^2 \cdot m)$$

Overall Complexity :

• Safety algorithm : $O(n^2 \cdot m)$

• single resource request : $O(n^2 \cdot m)$

Thus for a single request, the complexity of the banker's algorithm is dominated by $O(n^2 \cdot m)$.