12. Lamport's Algorithm for Distributed File

Lamport's algorithm is a distributed mutual exclusion algorithm used to control access to shared resource on distributed system. It ensures that only one process accesses a critical resource like a file in distributed file system

Basic idea

- Uses Lamport logical clock to order requests
- Requests with smaller timestamp to get priority
- Uses three message types
  - REQUEST
  - REPLY
  - RELEASE

Steps of the Algorithm

Step 1: Request Phase

When a process wants to access a shared file

- It generates timestamp using logical clock
- Sends Request message to all other nodes
- Adds request to its local queue

Step 2: Reply phase

When another node receives REQUEST

- Add request to its queue
- Sends REPLY message back

Step 3: Enter Critical Section

Process can access file only if:

- Received REPLY from all node
- Its request is at top of queue

Step 4: Release phase

After file access:

- Removes request from queue
- Sends RELEASE message to all nodes

Advantages

- Simple and easy to implement
- fully distributed
- Prevents deadlock using Timestamp ordering

Disadvantages

- High message overhead
- No fault tolerant
- Not scalable for layer system