FACULTY OF EGINEERING AND TECHNOLOGY

Distributed Systems (BCS-701)

LECTURE -12

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▪**Non Token Based Algorithm**

    ▪**Lamport's Algorithm for Mutual Exclusion in Distributed System**

    ▪**Algorithm**

    ▪**Message Complexity**

    ▪**Drawbacks of Lamport's Algorithm**

    ▪**Performance**

▪**MCQ**
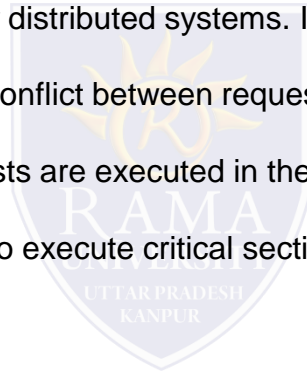
▪**Reference**

Non Token Based Algorithm

1. Lamport's Algorithm for Mutual Exclusion in Distributed System

Lamport's Distributed Mutual Exclusion Algorithm is a permission based algorithm proposed by Lamport as an illustration of his synchronization scheme for distributed systems. In permission based timestamp is used to order critical section requests and to resolve any conflict between requests.

In Lamport's Algorithm critical section requests are executed in the increasing order of timestamps i.e a request with smaller timestamp will be given permission to execute critical section first than a request with larger timestamp.

Non Token Based Algorithm

1. Lamport's Algorithm for Mutual Exclusion in Distributed System

In this algorithm:

❑ Three type of messages (REQUEST, REPLY and RELEASE) are used and communication channels are assumed to follow FIFO order.

❑ A site send a REQUEST message to all other site to get their permission to enter critical section.

❑ A site send a REPLY message to requesting site to give its permission to enter the critical section.

❑ A site send a RELEASE message to all other site upon exiting the critical section.

❑ Every site Si, keeps a queue to store critical section requests ordered by their timestamps. request_queuei denotes the queue of site Si

❑ A timestamp is given to each critical section request using Lamport's logical clock.

❑ Timestamp is used to determine priority of critical section requests. Smaller timestamp gets high priority over larger timestamp. The execution of critical section request is always in the order of their timestamp

Algorithm

➤ **To enter Critical section**

➤ When a site Si wants to enter the critical section, it sends a request message Request(tsi, i) to all other sites and places the request on request_queuei. Here, Tsi denotes the timestamp of Site Si

➤ When a site Sj receives the request message REQUEST(tsi, i) from site Si, it returns a time stamped REPLY message to site Si and places the request of site Si on request_queuej

➤ **To execute the critical section**

➤ A site Si can enter the critical section if it has received the message with timestamp larger than (tsi, i) from all other sites and its own request is at the top of request_queuei

Algorithm

> **To release the critical section**

When a site Si exits the critical section, it removes its own request from the top of its request queue and sends a time stamped RELEASE message to all other sites

When a site Sj receives the timestamped RELEASE message from site Si, it removes the request of Si from its request queue.
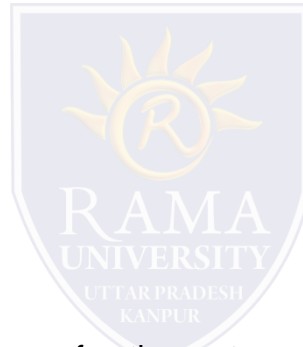
Message Complexity

Lamport's Algorithm requires invocation of 3(N – 1) messages per critical section execution. These 3(N – 1) messages involves.

1. (N – 1) request messages

2. (N – 1) reply messages

3. (N – 1) release messages

Drawbacks of Lamport's Algorithm

Unreliable approach:

failure of any one of the processes will halt the progress of entire system.

High message complexity:

Algorithm requires 3(N-1) messages per critical section invocation.

Performance

❑ Synchronization delay is equal to maximum message transmission time

❑ It requires 3(N – 1) messages per CS execution.

❑ Algorithm can be optimized to 2(N – 1) messages by omitting the REPLY message in some situations.

MCQ

1. What is the access point (AP) in a wireless LAN?

a) device that allows wireless devices to connect to a wired network

b) wireless devices itself

c) both device that allows wireless devices to connect to a wired network and wireless devices itself

d) all the nodes in the network

2. In wireless ad-hoc network _____

a) access point is not required

b) access point is must

c) nodes are not required

d) all nodes are access points

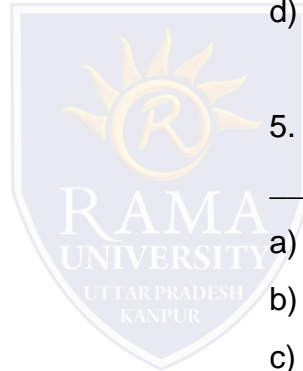3. Which multiple access technique is used by IEEE 802.11 standard for wireless LAN?

a) CDMA

b) CSMA/CA

c) ALOHA

d) CSMA/CD

4. In wireless distribution system _____

a) multiple access point are inter-connected with each other

b) there is no access point

c) only one access point exists

d) access points are not required

5. A wireless network interface controller can work in _____

a) infrastructure mode

b) ad-hoc mode

c) both infrastructure mode and ad-hoc mode

d) WDS mode

REFERENCES

❑ http://cs-www.cs.yale.edu/homes/aspnes/classes/465/notes.pdf

❑ https://www.geeksforgeeks.org/mutual-exclusion-in-distributed-system/

❑ https://www.vidyarthiplus.com/vp/attachment.php?aid=43022

❑ http://www.cs.fsu.edu/~xyuan/cop5611/lecture8.html