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FACULTY OF EGINEERING AND TECHNOLOGY

Distributed Systems(BCS-701)
LECTURE-07

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OUTLINE

- Message Passing Process Communication Model
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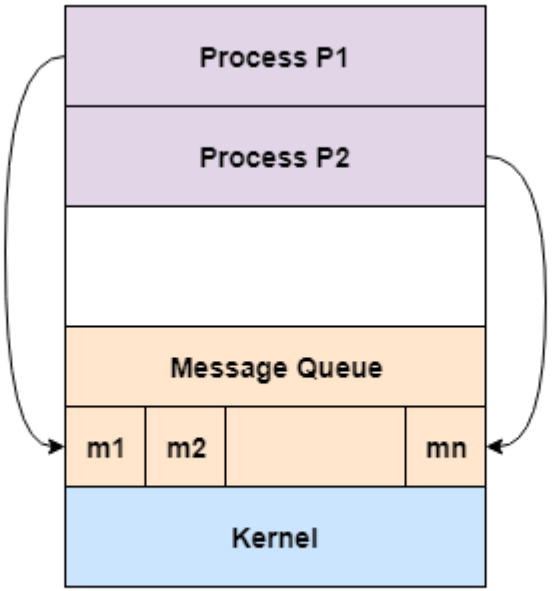
Message Passing Process Communication Model

Message passing model allows multiple processes to read and write data to the message queue without being connected to each other. Messages are stored on the queue until their recipient retrieves them. Message queues are quite useful for interprocess communication and are used by most operating systems.

A diagram that demonstrates message passing model of process communication is given as follows −

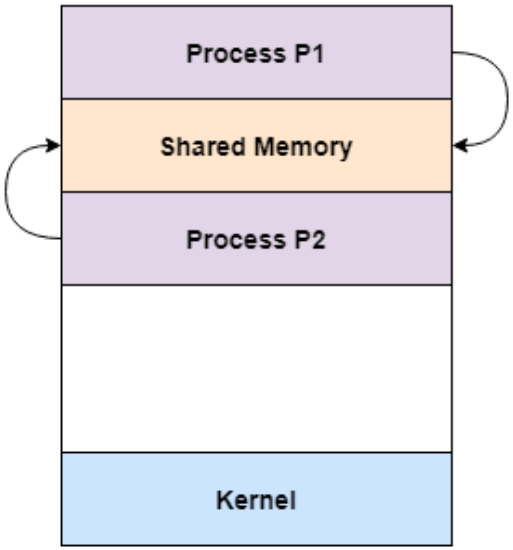


Message Passing Model

Shared Memory Process Communication Model

➢The shared memory in the shared memory model is the memory that can be simultaneously accessed by multiple processes. This is done so that the processes can communicate with each other. All POSIX systems, as well as Windows operating systems use shared memory.

➢A diagram that illustrates the shared memory model of process communication is given as follows:



Shared Memory Model

Distributed Shared Memory

➢**Shared memory** is the memory block that can be accessed by more than one program. A shared memory concept is used to provide a way of communication and provide less redundant memory management.

➢**Distributed Shared Memory** abbreviated as DSM is the implementation of shared memory concept in distributed systems. The DSM system implements the shared memory models in loosely coupled systems that are deprived of a local physical shared memory in the system. In this type of system distributed shared memory provides a virtual memory space that is accessible by all the system (also known as nodes) of the distributed hierarchy.

Some common challenges that are to be kept in mind while the implementation of DSM −

- ➢Tracking of the memory address (location) of data stored remotely in shared memory.
- ➢To reduce the communication delays and high overhead associated with the references to remote data.
- ➢Controlling the concurrent access of the data shared in DSM.

Distributed Shared Memory

➢Based on these challenges there are algorithms designed to implement distributed shared memory. There are four algorithms −

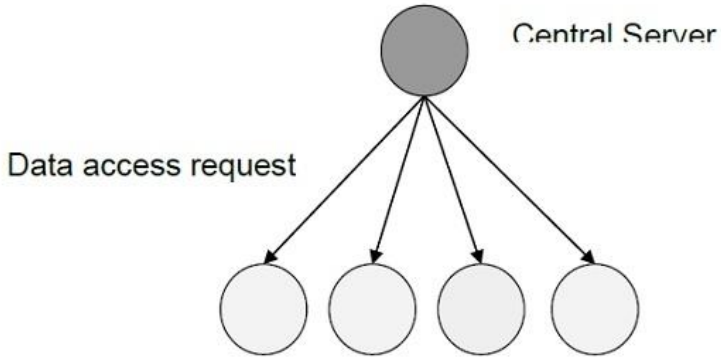
- ➢**Central Server Algorithm**
- ➢**Migration Algorithm**
- ➢**Read Replication Algorithm**
- ➢**Full Replication Algorithm**

Central Server Algorithm

All shared data is maintained by the central server. Other nodes of the distributed system request for reading and writing data to the server which serves the request and updates or provides access to the data along with acknowledgment messages.

These acknowledgment messages are used to provide the status of the data request is served by the server. When the data is sent to the calling function, it acknowledges a number that shows the access sequence of the data to maintain concurrency. And time-out is returned in case of failure.

For larger distributed systems, there can be more than one server. In this case, the servers are located using their address or using mapping functions.

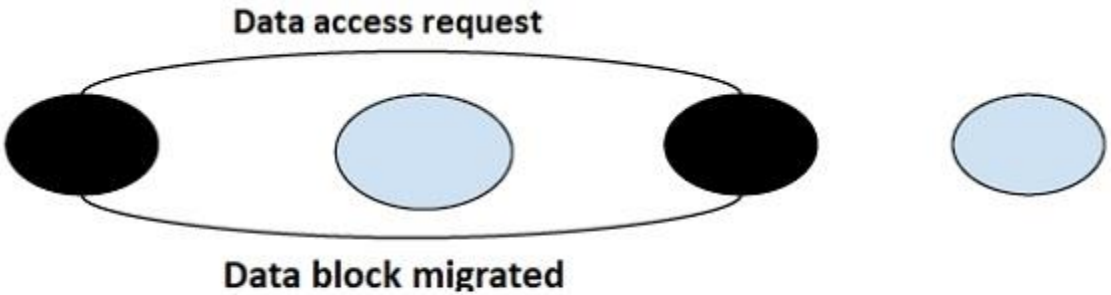


Migration Algorithm

As the name suggest the migration algorithm does the work of migration of data elements. Instead of using a central server serving each request, the block containing the data requested by a system is migrated to it for further access and processing. It migrates the data on request.

This algorithm though is good if when a system accesses the same block of data multiple times and the ability to integrate virtual memory concept, has some shortcomings that are needed to be addressed.

Only one node is able to access the shared data element at a time and the whole block is migrated to that node. Also, this algorithm is more prone to thrashing due to the migration of data items upon request by the node.

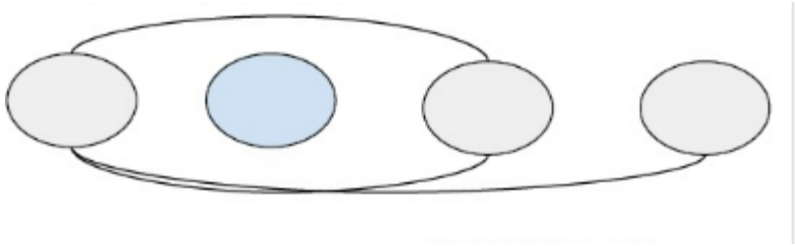


Read Replication Algorithm

In the read replication algorithm, the data block that is to be accessed is replicated and only reading is allowed in all the copies. If a write operation is to be done, then all read access is put on halt till all the copies are updated.

Overall system performance is improved as concurrent access is allowed. But write operation is expensive due to the requirement of updating all blocks that are shared to maintain concurrency. All copies of data element are to be tracked to maintain consistency.

Data Access Request



Invalidate and Update

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