# CASE STUDY NO : 04



Case Study On :- Study of clock synchronisation in distributed OS.

Synchronization in Distributed System -

Distributed System is a collection of computers connected via the high speed communication network. In the distributed system, the hardware and software components communicate and coordinate their actions by message passing. Each node in distributed systems can share their resources with other nodes. So, ~~the resources with other nodes.~~ there is need of proper allocation of resources to preserve the state of resources and help coordinate between the several processes. To resolve such conflicts, synchronization is used. Synchronization in distributed systems is achieve via clock.

The physical clocks are used to adjust the time of nodes. Each node in the system can share its local time with other nodes in the system. The time is set based on UTC (Universal Time Coordination). UTC is used as a reference time clock for the nodes in the system.

The clock synchronization can be achieved by 2 ways: External and Internal Clock Synchronization.

1. External clock synchronization -

External clock synchronization is the one in which an external reference clock is present. It is used as a reference and the nodes in the system can set and adjust their time accordingly.

2. Internal clock synchronization -

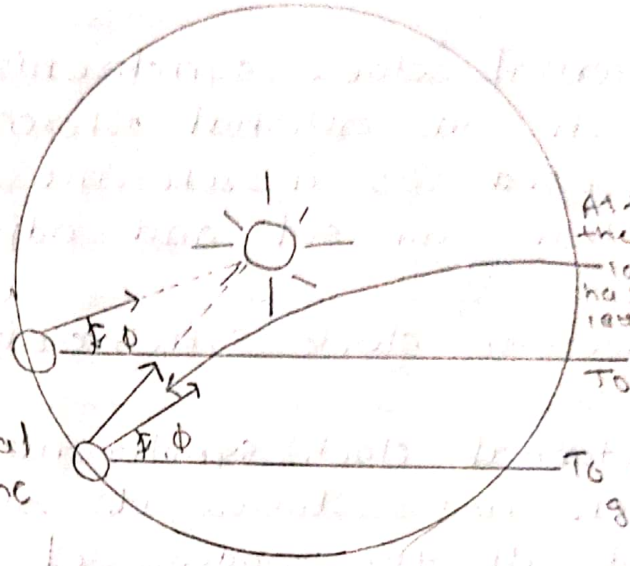
Internal clock synchronization is the one in which each node shares its time with other nodes and all the nodes set and adjust their times accordingly.

* There are 2 types of clock synchronization algorithms : Centralized and Distributed.

1. Centralized -

Centralized is the one in which a time server is used as a reference. The single time server propagates its time to the nodes and all the nodes adjust the time accordingly. It is dependent on single time server so if that node fails, the whole system will lose synchronization. Examples of centralized are - Berkeley Algorithm, Passive Time Server, Active Time Server etc.

A transit of the sun occurs when the sun reaches the highest point of the day



2. Distributed -

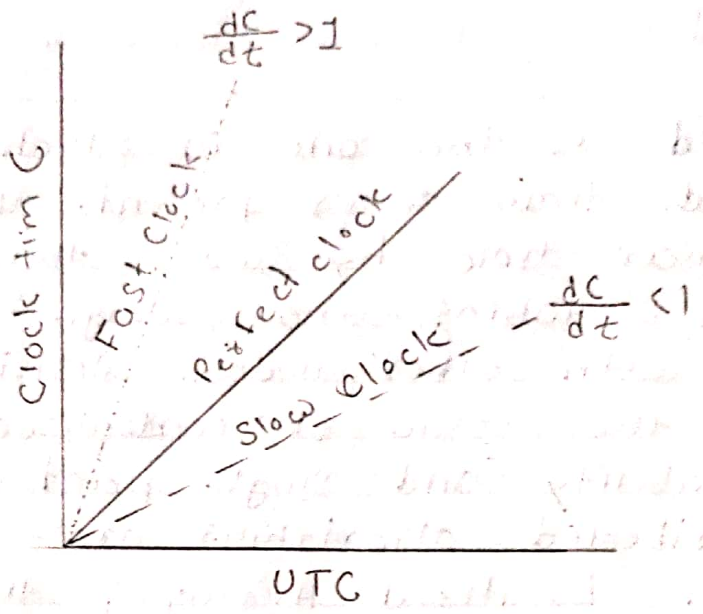
Distributed is the one in which there is no centralized time server present. Insted the nodes adjust their time by using their local time and then, taking the average of the differences of time with other nodes. Distributed algorithms overcome the issue of centralized algorithms like the scalability and single point failure. Examples of Distributed algorithms are - Global Averaging Algorithm, Localized Averaging Algorithm, NTP (Network time protocol) etc.

* Physical Clocks -

Athough Lamport's algorithm gives an unambiguous event ordering, the time values assigned to events are not necessarily close, to the actual times at which they occur. In some systems (eg. real time systems), the actual clock time is important. For these systems external physcal clocks are required. For reasons of efficiency and redundancy, multiple physical clocks are generally considered describable, ~~which~~ with real-world clocks, and (2) How do we synchronize the clocks with each other.

* Clock Synchronization Algorithms -

All the algorithms have the same underlying model of the system, which we will now describe. Each machine is assumed to have a timer that causes




Not all clocks tick precisely at correct rate.

an interrupt H times a second. When this timer goes off, the interrupt handler adds 1 to a software clock that keeps track of the number of ticks (interrupts) since some agreed-upon time in the past. Let us call the value of this clock C. More specifically, when the UTC time is t, the value of the clock on machine p is Cp(t). In a perfect world, we would have Cp(t) = t for all p and all t. In other ~~world~~ words dC/dt ideally should b 1.

★ Use of Synchronized Clocks -

Only quite recently has the necessary hardware and software for synchroning clocks on a wide scale (e.g., over the entire Internet) become easily available. With this new technology, it is possible to keep millions of clocks synchronized to within a few milliseconds of UTC. New algorithms that utilize sychronized clocks are just starting to appear. Below we summarize two of the examples discussed by Liskov (1993).