PDC ALM - 3

2200030301--Hemanth

1: List the characteristics of distributed System.

Ans Characteristics of Distributed Systems

Concurrency – Multiple processes run simultaneously on different machines.

Lack of global clock – No single clock to synchronize events across nodes.

Resource sharing – Resources like files, printers, or databases are shared.

Fault tolerance – The system continues to function even if some nodes fail.

Scalability – Easily expandable by adding more nodes.

Transparency – Users are unaware of the underlying distribution:

Access transparency (same interface)

Location transparency (doesn't matter where resources are)

Concurrency transparency

Replication transparency

Failure transparency

2: Explain the characteristics of synchronous execution

Ans Characteristics of Synchronous Execution

Bounded delay – Communication and processing take place within known time limits.

Global clock assumption – Processes have synchronized clocks.

Deterministic behavior – Execution order and timing are predictable.

Simpler reasoning – Easier to design algorithms due to known constraints.

Q3: Explain how communication happened between the processes of distributed network.

Ans Communication in Distributed Systems

Message Passing is used instead of shared memory.

Two primary types:

Synchronous: Sender waits for acknowledgment.

Asynchronous: Sender proceeds without waiting.

Protocols used:

TCP/UDP, RPC (Remote Procedure Call), REST, gRPC.

Messages can carry:

Data payload

Timestamp (for ordering)

Sender/receiver process info

Q4: Write a formula for how any process, numbered Pi, sends message to other process in synchronous message passing system.

Ans Formula for Sending in Synchronous Message Passing
for a process

P_i P)

Here, m is the message, and the sender blocks until P_j P_j executes a corresponding receive()

Q5: Write a formula for how any process, numbered i, receives a message from other processes in a synchronous message-passing system

Ans Formula for Receiving in Synchronous Message Passing
For a proce) Process P

i

blocks until it receives message m from P

j

Q6: What is condition for happen before casual precedence relation ( ) within the same process?

Ans Condition for Happen-Before Relation ($\rightarrow$) in Same Process
Let
Then:
$e \rightarrow e' \Leftrightarrow$
e occurs beforee' $Pe \rightarrow e$
$' \Leftrightarrow$ e occurs before e ' in P
This is a local ordering of events within a process.

Q1: Illustrate how does a process Pi update its vector Clock in distributed environments?

Ans Updating Vector Clock (VC) at Process

Let
]
VCi[i]+1VC i

[i]=VC
i

[i]+1
On sending message m:
Attach
V
C
i
VC
i

to message m.

On receiving message m from
i

[k]=max(VC
i[k],Vm[k]) for all k i[i]=VC i[i]+1

Q8: Illustrate how does a process Pi update its Lamport Clock in distributed environments?

Ans Updating Lamport Clock (LC) at Process

On receiving message m from
PjPj:LCi=max(LC i,LCm +1