Assignment No : 1

Q.1 What are the problems associated with a centralized system?

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- Centralized systems are type of computing architecture where all or most of the processing and data storage is done on a single server or group of closely connected servers.

- This central server manages all operations, resources, and data acting as the hub through which all clients requests are processed.
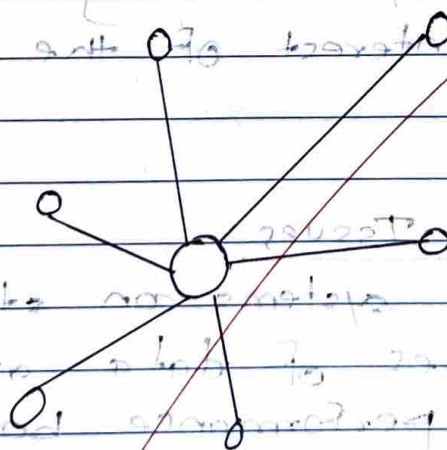
○ - server/master

O - slave

- The clients or nodes connected to the central server typically have minimal processing powers and rely on the server for most computational tasks.

- The problems associated with a centralized systems are :-

1) Single point of failure

⇒ Centralized system have a single point of failure, meaning if this central entity fails or

is compromised, the entire network can be affected.
- For e.g., in traditional centralized banking system, if a central bank's database is hacked or its operations disrupted, it can lead to widespread financial problems affecting millions of customers.

2) Control and Governance
⇒ Centralization often leads to a concentration of decision-making power in the hands of a few entities, which may not always act in the best interest of the community or users.

3) Scalability Issues
⇒ Centralized systems can struggle to handle large volumes of data and high traffic, leading to performance bottlenecks.
- For e.g., in some centralized payment processing system, during peak times such as holidays or sales events, the system may become overloaded, causing delays or even failures in processing transactions.

4) Lack of transparency
⇒ Centralized systems may lack transparency in decision-making processes, resources allocation or even in the validation and

auditing of transactions.

- For e.g., in a decentralized supply chain management system based on blockchain, if the central authority controlling the system does ~~central iou~~ not provide open access to transaction data or supply chain management information or stakeholders may not have a clear view of the entire process, leading to the distinct and inefficiencies.

5) Regulatory Risks

- Centralized systems are more suspectible to government regulations and interventions which can impact their operations and sustainability.

- For e.g., a centralized cryptocurrency exchange could be shut down or heavily regulated by the government, disrupting users access and the market.

Q.2 Differentiate between centralized, decentralized and distributed systems.

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Centralized Systems	Decentralized Systems	Distributed Systems
1) Single central server controls & manages all operation	1) Multiple nodes with independent control, no central authority	1) Multiple inter-connected nodes working together as a single system.
2) Centralized control with single point of management.	2) Distributed control, each node operates independently	2) Shared control, nodes collaborate to achieve common goals.
3) High risk, if the central server fails the whole system fail	3) Reduced risk, failure of one node does not impact entire system.	3) Reduced risk, designed for fault tolerance & redundancy
4) Limited scalability, can become a bottleneck.	4) More scalable, can add nodes independently.	4) High scalable, can add nodes to distribute the load.
5) Easier to manage centrally.	5) More complex, requires managing multiple node.	5) Complex, requires coordination & management of many nodes
6) Lower latency, as operations are managed centrally.	6) Can vary, depends on the distance between nodes.	6) Potentially higher latency due to network communication.

29/7/24   (A+)