Centurion University
Shaping Lives... Empowering Communities...

School: ..... Campus: .....

Academic Year: ..... Subject Name: ..... Subject Code: .....

Semester: ..... Program: ..... Branch: ..... Specialization: .....

Date: .....

Applied and Action Learning

(Learning by Doing and Discovery)

Name of the Experiement : Build the Network – Peer-to-Peer Simulation

Objective/Aim:

To study different types of blockchain attacks and understand how blockchain ensures security against them.

Apparatus/Software Used:

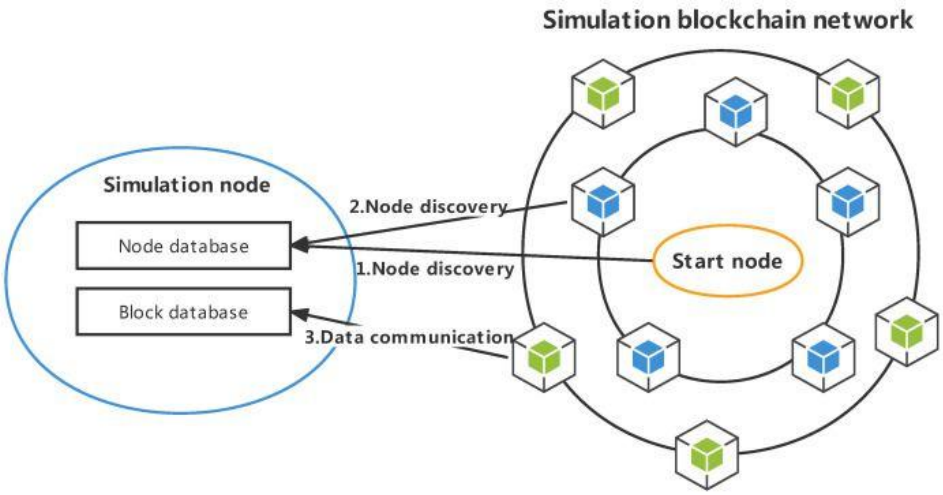
- Ms word
- Brave for searching
- https://www.blockchain-council.org/blockchain/peer-to-peer/

Theory concept:

Peer-to-Peer (P2P) Network :

- A P2P network is a decentralized system where each device (peer) acts as both client and server.
- It allows direct sharing of files, storage, and power without a central server.
- All peers have equal authority to send or receive data.
- Commonly used in online gaming, file sharing, and blockchain systems.
- Each node maintains its own data and performs similar tasks independently.
- Unstructured networks connect peers randomly; structured ones follow a fixed pattern.
- P2P networks offer better scalability, security, and transparency.

In a blockchain, P2P networking ensures every node eventually receives and validates new blocks or transactions without central coordination.



Procedure:

1. **Network Initialization:**

   Begin by defining the total number of participating nodes (peers) in the decentralized network. Assign each node a unique identifier and initialize an empty ledger or local memory to store incoming transactions and blocks.

2. **Establishing Connections:**

   Create a semi-random mesh topology where each node connects to a few other peers, enabling direct communication paths. Maintain a peer list for each node to facilitate controlled message exchange and prevent network overload.

3. **Message Propagation:**

   Select one node as the initiator to broadcast a transaction or message across the network. Connected peers receive and further forward the message to their linked nodes (excluding the sender), simulating real-world message flooding used in blockchain systems.

4. **Verification and Filtering:**

   Each node independently verifies incoming messages to ensure authenticity and freshness (i.e., not previously received). Duplicate or tampered messages are discarded, enhancing efficiency and preventing redundant communication.

5. **Ledger Synchronization:**

   Once validated, the message or block is recorded in the node's ledger, ensuring consistent data replication across the network. This step mirrors the distributed nature of block propagation in blockchain systems.

6. Consensus Mechanism (Optional):

To simulate consensus, introduce a simple validation rule—such as the "first valid message received" principle. Nodes accept the earliest valid message and reject any conflicting or delayed data, promoting network consistency.

7. Simulation Output:

Display final statistics showing how many nodes successfully received, validated, and synchronized the message. The outcome demonstrates how decentralized communication and consensus can occur efficiently without any central authority or server, reflecting the essence of blockchain's peer-to peer architecture.

Observation:

- The P2P simulation effectively demonstrated decentralized communication and synchronization without relying on a central server.
- Message validation and broadcasting processes helped ensure data integrity and consistency across all connected nodes.
- The simplified consensus model showcased how decentralized systems can achieve agreement efficiently in distributed environments.

ASSESSMENT

Rubrics	Full Mark	Marks Obtained	Remarks
Concept	10		
Planning and Execution/ Practical Simulation/ Programming	10		
Result and Interpretation	10		
Record of Applied and Action Learning	10		
Viva	10		
Total	**50**		

Signature of the Student:

Name :

Regn. No. :

Signature of the Faculty:

**As applicable according to the experiment. Two sheets per experiment (10-20) to be used.*