



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 Experiment :** Build the Network – Peer-to-Peer (P2P) Simulation

### Objective

To simulate a peer-to-peer (P2P) network where nodes can directly connect, communicate, and share data without relying on a centralized server — demonstrating decentralization and message propagation principles used in blockchain networks.

### Apparatus/Software Used:

- Node.js (alternative, using net module)
- Localhost for simulation
- Command-line terminal for running multiple peers

### Theory/Concept:

A peer-to-peer (P2P) network is a decentralized communication model where each node (peer) acts as both a client and a server. Instead of relying on a central authority, nodes share resources directly.

**Key Concepts:**

Peers: Independent nodes connected to the network.

Decentralization: No single point of failure.

Communication: Each peer exchanges data directly with others.

Use in Blockchain: Nodes validate transactions and share block data through P2P communication.

**Advantages:**

High fault tolerance

Decentralized control

Resource sharing efficiency

## Procedure :

### Initialize peers:

- Assign unique IDs and ports to each node.
- Define IP address (127.0.0.1 for local testing).

### Create socket connections:

- Each peer opens a socket to listen for incoming connections.
- It can also connect to other peers' sockets.

### Broadcast messages:

- When a peer sends data, it's broadcasted to connected peers.
- Each peer relays the data to its own connections (propagation).


### Simulate network growth:

- Add new peers to the network dynamically.
- Observe communication between existing and new peers.

### Terminate peers:

- Gracefully close socket connections at the end of simulation.

## Observation table:

S.No	Peer	Port No.	Action Performed	Message Received / Sent	Result	
1	Peer A	5000	Started server	—	Peer A listening	
2	Peer B	5001	Connected to Peer A	"Hello from B"	Message received by A	
3	Peer C	5002	Connected to Peer A and B	"Hi from C"	Message broadcast to all	
4	Peer B	5001	Sends another message	"Transaction Block Sent"	Message seen by A & C	

## ASSESSMENT

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

**Signature of the Student:**

Name :

Regn. No.

**Signature of the Faculty:**

