Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE
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Coimbatore- 49

DEPARTMENT OF COMMERCE WITH INFORMATION TECHNOLOGY

21UCI505 – BLOCKCHAIN AND DISTRIBUTIVE LEDGER

Unit-5: Key Components of Ethereum Architecture

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Ethereum- Meaning

- a decentralized, open-source blockchain platform
- enables developers to build and run smart contracts and decentralized applications (DApps) without relying on a central authority.
- proposed by Vitalik Buterin in 2013
- mainly focused on digital currency transactions
- provides a programmable blockchain where developers can create automated digital agreements and applications.

Key Components of Ethereum's Architecture

1. Ethereum Blockchain

The **Ethereum Blockchain** is a distributed ledger that records all transactions and smart contract executions. Each block contains a list of verified transactions and is linked to the previous block, forming a continuous chain. The blockchain ensures **transparency, immutability, and security** because data once recorded cannot be easily altered.

2. Ether (ETH)

Ether is the native cryptocurrency of Ethereum. It is used to:

Pay transaction fees

Reward validators for maintaining the network

Execute smart contracts and decentralized applications

In simple terms, Ether acts as the **fuel of the Ethereum network**.

Key Components of Ethereum's Architecture

3. Smart Contracts

Smart Contracts are self-executing programs stored on the Ethereum blockchain.

These contracts automatically perform actions when predetermined conditions are met.

Example:

If a user sends **₹5,000**, a digital service or asset can automatically be delivered without manual intervention.

Key Components of Ethereum's Architecture

4. Ethereum Virtual Machine (EVM)

Ethereum Virtual Machine is the runtime environment that executes smart contracts on the Ethereum network. It ensures that smart contracts run exactly as programmed across all nodes in the network. The EVM makes Ethereum a **programmable blockchain platform**.

5. Gas

Gas is the **transaction fee mechanism** used to pay for computational work on the Ethereum network. Every operation, such as executing a smart contract or transferring Ether, requires gas. This prevents network abuse and compensates validators for processing transactions.

Key Components of Ethereum's Architecture

6. Nodes

Nodes are computers connected to the Ethereum network that store a copy of the blockchain and validate transactions. Nodes help maintain the **decentralized nature of the network** by verifying and distributing information across the system.

7. Decentralized Applications (DApps)

Decentralized Applications are applications built on Ethereum that run on a decentralized network rather than centralized servers. These applications use smart contracts for backend operations and provide services such as finance, gaming, and digital identity.

Key Components of Ethereum's Architecture

8. Consensus Mechanism

Ethereum uses a consensus mechanism called **Proof of Stake** to validate transactions and add new blocks to the blockchain. Validators stake Ether to participate in securing the network and confirming transactions.

THANK YOU