SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with ‘A’ Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY

COURSE NAME: 19CS622-Blockchain Technology

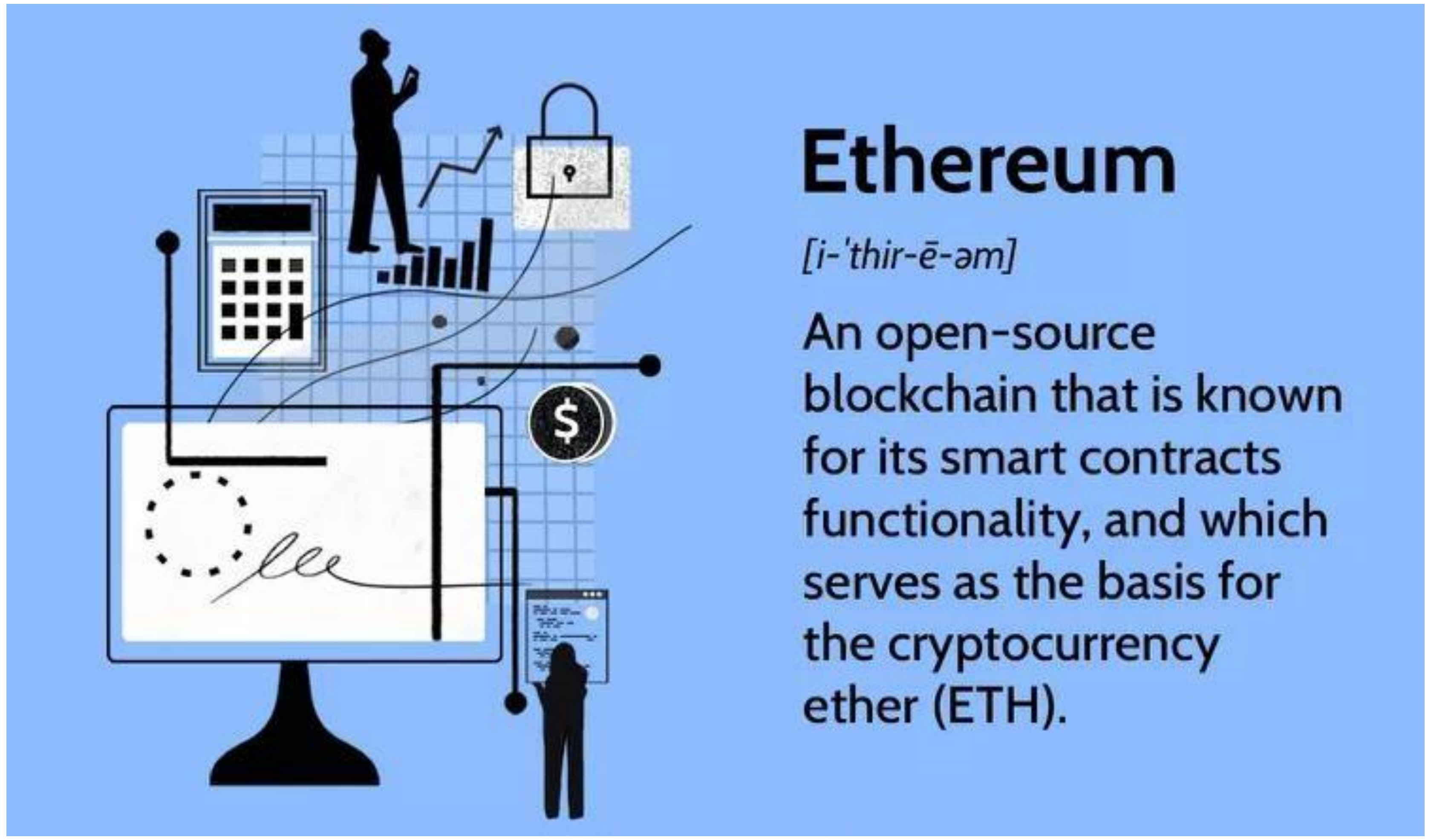
III YEAR /VI SEMESTER

Unit III- ETHEREUM

Topic : Optimization of Ether

Definition

- Ethereum is a blockchain-based development platform known for its cryptocurrency, ether (ETH).
- The blockchain technology that powers Ethereum enables secure digital ledgers to be publicly created and maintained.
- Ethereum uses a proof-of-stake transaction validation mechanism.
- Ethereum is the foundation for many emerging technological advances based on blockchain.



Ethereum

[i-'thir-ē-əm]

An open-source blockchain that is known for its smart contracts functionality, and which serves as the basis for the cryptocurrency ether (ETH).

Optimization of Ether - 1. Use Mappings Instead of Arrays

- There are two data types to describe lists of data in Solidity, arrays and maps, and their syntax and structure are quite different, allowing each to serve a distinct purpose.

- While arrays are packable and iterable, mappings are less expensive.

- For example, creating an array of cars in Solidity might look like this:

```
string cars[];
cars = ["ford", "audi", "chevrolet"];

mapping(uint => string) public cars
```

- When using the mapping keyword, you will specify the data type for the key (uint) and the value (string).
- Then you can add some data using the constructor function.

```
 constructor() public {
        cars[101] = "Ford";
        cars[102] = "Audi";
        cars[103] = "Chevrolet";
    }
}
```

Optimization of Ether -2. Enable the Solidity Compiler Optimizer

- The Solidity compiler *optimizer* works to make complex expressions simpler, which minimizes the size of the code and the cost of execution via inline operations, deployments costs, and function call costs.
- The Solidity *optimizer* specializes in inline operations. Even though an action like in lining functions can result in significantly larger code, it is frequently used because it creates the potential for additional simplifications.
- Deployment costs and function call costs are two more areas where the compiler optimizer impacts your smart contracts' gas.

Optimization of Ether -2. Enable the Solidity Compiler Optimizer

```
module.exports = {
  solidity: {
    version: "0.8.9",
    settings: {
      optimizer: {
        enabled: false,
        runs: 200,
      },
    },
  },
};
```

Increasing runs to 10,000 and setting the default value to true:

```
module.exports = {
  solidity: {
    version: "0.8.9",
    settings: {
      optimizer: {
        enabled: true,
        runs: 10000,
      },
    },
  },
};
```

Optimization of Ether - 3. Minimize On-Chain Data

- Using events to store data is a popular
- but ill-advised method for gas optimization
- because, while it is less expensive to store data in events relative to variables,
- the data in events cannot be accessed by other smart contracts on-chain.

Optimization of Ether – 4.Batching Operations

- Batching operations enables developers to batch actions by passing dynamically sized arrays that can execute the same functionality in a single transaction, rather than requiring the same method several times with different values.

- Consider the following scenario: a user wants to call *getData()* with five different inputs.
- In the streamlined form, the user would only need to pay the transaction's fixed gas cost and the gas for the *msg.sender* check once.

```
function batchSend(Call[] memory _calls) public payable {
       for(uint256 i = 0; i < _calls.length; i++) {
           (bool _success, bytes memory _data) = _calls[i].recipient.call{gas: _calls[i].gas, value: _calls[i].value}(_calls[i].data);
           if (!_success) {

               assembly { revert(add(0x20, _data), mload(_data)) }
           }
       }
   }
```

Optimization of Ether – 5. Use Indexed Events

- Events in Solidity are a shortcut to speed up the development of external systems working in combination with smart contracts.
- All information in the blockchain is public, and any activity can be detected by closely examining the transactions.

```
event myFirstEvent(address indexed sender, uint256 indexed amount, string message);
```

Assessment 1

- *The [smallest unit or denomination](#) of ether is a wei.*
- *There are seven total denominations: Wei, Kwei, Mwei, Gwei, micro-ether (Twei), milli-ether (Pwei), and ether.*

References

TEXT BOOKS

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas M Antonopoulos 2018
2. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Second Edition, Packt Publishing, 2018.
3. https://101blockchains.com/blockchain-vs-database-the-difference/

REFERENCES

1. William Mougayar, “Business Blockchain Promise, Practice and Application of the Next Internet Technology, John Wiley & Sons 2016.
2. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.
3. Arvind Narayanan, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, July 19, 2016.
4. Henning Diedrich, Ethereum: Block chains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations-2016

Thank You