



# SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

**An Autonomous Institution**

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**COURSE NAME : 19OE622 BLOCKCHAIN TECHNOLOGY**

IV YEAR / VII SEMESTER

Unit 1- INTRODUCTION TO BLOCKCHAIN

Topic 3 : Distinction between databases and blockchain and  
Distributed ledger



## Problem in Database



- Slow Read-Write Speeds. Performance slowdowns can occur due to high latency for disk read/writes. ...
- Scaling Problems. ...
- Incorrect Virtual Machine Setup. ...
- Lack of Backup and Monitoring. ...
- Query Performance. ...
- User and Query Conflicts. ...
- Configuration. ...
- Capacity.



## Blockchain – Database



### Database:

Generally a database is a data structure which is used for storing information. It is a organized collection or storage of data which is able to store a new data or access a existing data. The data stored in a database can be organized using a database management system. The database administrator can modify the data stored in the database. A database is implemented using the client-server network architecture.




## Blockchain




### Blockchain

A blockchain is a growing list of records, called blocks, that are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data. Here, modification of data is not permissible by design. It allows decentralized control and eliminates the risks of modification of data by other parties with sufficient access to the system.



## Blockchain - Blockchain terminologies



### 101 Blockchains | BLOCKCHAIN VS DATABASE

**WHAT IS BLOCKCHAIN?**

Blockchain is a peer-to-peer decentralized distributed ledger technology. It was first introduced in 2009.

**WHAT IS A DATABASE?**

Databases are centralized ledger which stores data in a structured way and is managed by an administrator.

#### BLOCKCHAIN V/S DATABASE

Blockchain is decentralized and has no centralized approach. However, there are private blockchains that may utilize some form of centralization.	<b>AUTHORITY</b>	Databases are controlled by the administrator and are centralized in nature.
Blockchain uses a distributed ledger network architecture.	<b>ARCHITECTURE</b>	Database utilizes a client-server architecture.
Blockchain utilizes Read and Write operations.	<b>DATA HANDLING</b>	The database supports CRUD (Create, Read, Update and Delete).
Blockchain data supports integrity.	<b>INTEGRITY</b>	Malicious actors can alter database data.
Public blockchain offers transparency.	<b>TRANSPARENCY</b>	Databases are not transparent. Only the administrator decides which the public can access data.
Blockchains are comparatively harder to implement and maintain.	<b>COST</b>	The database being an old technology is easy to implement and maintain.
Blockchain is bogged down by the verification and consensus methods.	<b>PERFORMANCE</b>	Databases are extremely fast and offer great scalability.

**BEST USE CASES FOR DATABASE**

- Apps or systems that utilize the continuous flow of data
- Storing confidential information
- Online transaction processing that needs to be fast
- Apps or systems where data verification is not needed
- Relational data



**BEST USE CASES FOR BLOCKCHAIN**

- Transfer value
- Storage value
- Monetary transactions
- Trusted data verification
- Voting systems
- Decentralized apps (dApps)

	Database	Hybrid/Federated Blockchain	Public Blockchain
Type	Permissioned	Permissioned	Public
Control	Centralized	Hybrid with few features centralized	Decentralized
Architecture	Client-Server architecture	Closed Peer-to-Peer architecture	Public peer-to-peer architecture
Data Persistence	non-persistence	Immutable	Immutable
Chance Of Failure	Yes	No	No
Performance	Extremely fast	Slow to medium	Slow

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SN	Blockchain	Database
1.	Blockchain is decentralized because there is no admin or in-charge.	The database is centralized because it has admins and in-charge.
2.	Blockchain is permissionless because anyone can access it.	The database required permission because it can be accessed only by entities who have rights to access.
3.	Blockchains are slow.	Databases are fast.
4.	It has a history of records and ownership of digital records.	It has no history of records and ownership of records.
5.	Blockchain is fully confidential.	The database is not fully confidential.
6.	Blockchain has only Insert operation.	The database has Create, Read, Update, and Delete operation.
7.	It is a fully robust technology.	It is not entirely robust technology.
8.	Disintermediation is allowed with blockchain.	Disintermediation is not allowed with the database.
9.	Anyone with the right proof of work can write on the blockchain.	Only entities entitled to read or write can do so.
10.	Blockchain is not recursive. Here, we cannot go back to repeat a task on any record.	The database is recursive. Here, we can go back to repeat a task on a particular record.

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## Block Chain Technology in Distributed ledger - Cont..



- **Blockchain** is one type of a **distributed ledger**. Distributed ledgers use independent computers (referred to as nodes) to record, share and synchronize transactions in their respective electronic ledgers (instead of keeping data centralized as in a traditional ledger).
- Blockchain organizes data into blocks, which are chained together in an append only mode.



## Distributed Ledger



### What is Distributed Ledger Technology (DLT)?

A distributed ledger is a database that is spread across various computers, nodes, institutions, or countries accessible by multiple people around the globe.



## Distributed Ledger - Cont..



- ❑ It is a decentralized technology and every node will maintain the ledger, and if any data changes happen, the ledger will get updated.
- ❑ The process of updating takes place independently at each node.
- ❑ Even small updates or changes made to the ledger are reflected and the history of that change is sent to all participants in a matter of seconds.
- ❑ This is a decentralized database managed by multiple participants.
- ❑ All the nodes in this technology have equal status in terms of authority.
- ❑ In this technology, there is no central server or authority managing the database, which makes the technology transparent





## Block Chain Technology - Cont..



### Types of Distributed Ledger Technology

The Distributed Ledgers can be categorized into three categories:



- ✓ **Permissioned DLT:** Nodes have to take permission from a central authority to access or to make any changes in the network. Mostly these types of permissions include identity verification.
- ✓ **Permissionless DLT:** There is no central authority to validate transactions, rather existing nodes are collectively responsible for validating the transactions. Various consensus mechanisms are used to validate transactions based on predefined algorithms. In the case of bitcoin proof of work consensus mechanism is used.
- ✓ **Hybrid DLT:** It is combined with both permissionless and permissioned DLTs can benefit from both of them.

 **Distributed Ledger - Cont..** 

**Types of Distributed Ledger Technology**

- BLOCKCHAIN**  
The transaction records are stored in the ledger in the form of a chain of blocks. It contains every single record of each transaction.
- HASHGRAPH**  
foundation of Hashgraph is consensus building. Nodes do not have to validate transactions on the network
- DAG**  
Transaction is stored in sequence. nodes have to verify at least previous two transactions on the ledger to confirm their transaction
- HOLOCHAIN**  
It is type of DLT, which moves from data-centric structure to agent-centric structure
- RADIX**  
Radix or Tempo is a type of DLT in which transactions are added on the ledger in the order on events rather than time

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 **Activity** 

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## Disadvantages



### Some Disadvantage of Distributed Ledger Technology

- 51% Attack:** The 51% attack is a bit concerning part of this distributed Ledger technology that is to be checked routinely.
- Costs of Transaction:** The connected nodes are expected to validate the transaction of a given Distributed Ledger Technology which gives high transaction cost as the other nodes are paid incentives to validate the transaction.
- Slow Transaction Speed:** The major disadvantage of this DLT is slow speed of transaction as multiple nodes are attached with this network and it takes time to validate the transaction by all the other nodes.
- Scalability Issues:** Due to low speed and high transaction cost DLT faces very difficulties to expand on a large scale.



## Advantages



- Time reduction:** In the financial industry, blockchain can allow the quicker settlement of trades. It does not take a lengthy process for verification, settlement, and clearance.
- Unchangeable transactions:** Blockchain only allows insertion of data, which means when a new block is added to the chain of ledgers, it cannot be removed or modified.
- Reliability:** Blockchain certifies and verifies the identities of each interested parties. This removes double records, reducing rates and accelerates transactions.
- Security:** Blockchain uses very advanced cryptography to make sure that the information is locked inside the blockchain. It uses Distributed Ledger Technology where each party holds a copy of the original chain, so the system remains operative, even the large number of other nodes fall.
- Decentralized:** It is because there is no central authority supervising anything. There are standards rules on how every node exchanges the blockchain information.



## Assessment 1



1. List out the Advantages types of Block Chain Technology

- a) \_\_\_\_\_
- b) \_\_\_\_\_
- c) \_\_\_\_\_
- d) \_\_\_\_\_

2. Identify the Applications types of Block Chain Technology

- a) \_\_\_\_\_
- b) \_\_\_\_\_
- c) \_\_\_\_\_
- d) \_\_\_\_\_



### 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.

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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.

## THANK YOU