BLOCKCHAIN NETWORKS

by

i-ED, Bhutan & RCS, Siliguri(India)

DAY 1

Presenting By:
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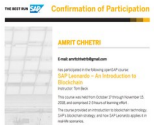
Topics Of Day 1:

- About Us
- D1S1:Blockchain Technology-Fundamentals
- D1S2:Blockchain Platforms and Tools
- D1S3:Blockchain Environment-Configurations
- D1S4:Common Terms and Quick References
- D1S5:Day-1 Assessment by Instructor

About Us:

- IED- Institute Of Excellence & Development:
  - IED is reputed IT Training and Service firm of Bhutan
  - IED had conducted first Cyber Security Training in Bhutan for IT Staffs School Department of Bhutan. < updating other details>
- RCS, Siliguri:

  RCS, is Siliguri-based IT Consulting firm and it is an ATC of EC-Council. We are know for Consulting and Training Services in the fields of
  - Cyber Security, Computer Forensic, Digital Marketing
  - Enterprise Applications, Android and BigData
- Amrit Chhetri:



  - Amrit Chhetri is Certified Cyber Security Consultant with 17 Years of IT Experience and working with RCS since last 4 years.

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D1SI (Session-1)

Blockchain Technology-Fundamentals

- Working and Architecture of Blockchain
- Blockchain Transaction & Use Cases
- Blockchain Frameworks and Protocols
- Types Of Blockchain Networks

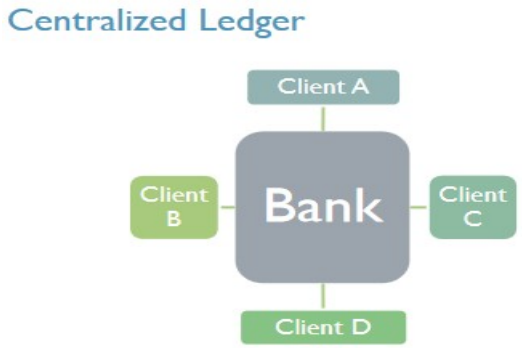
Working and Architecture of Blockchain:

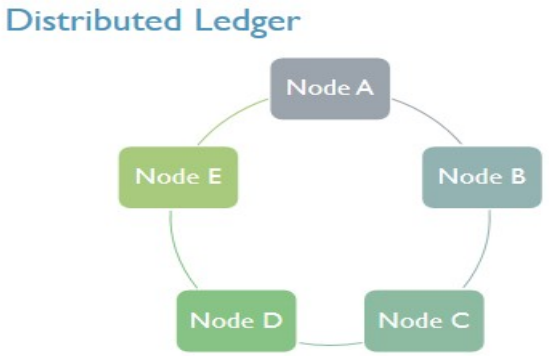
Working of Blockchain- What is Blockchain Technology

- **Blockchain Technology** is a decentralized, distributed public ledger that records the provenance of a **Digital Assets**. "The blockchain is a shared, distributed ledger that facilitates the process of recording transactions and tracking assets in a network" -IBM

Blockchain is a chain of Blocks that contain Information and the concept was conceptualized in 1991.**Bitcoin** was introduced by pseudonymous person or persons **Satoshi Nakamoto** through a paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System" in 2009, https://bitcoin.org/bitcoin.pdf

- Blockchain technology was introduced to the General Public in 2009 and it was used for Bitcoin. **Bitcoin** and other **Cryptocurrency** are the most popular examples of Blockchain usage or implementations





Summarizing, Blockchain are:

- Decentralized, Distributed
- Secure and Faster, Transparent and Immutable

Working and Architecture of Blockchain:

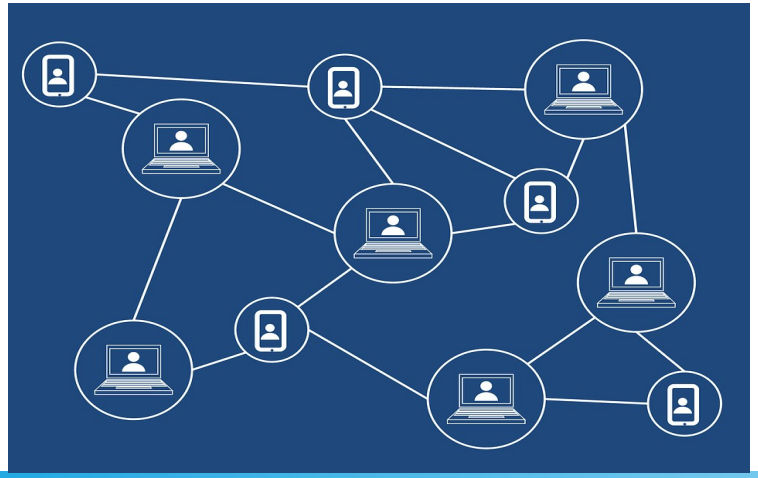
Architectures of Blockchain Systems:

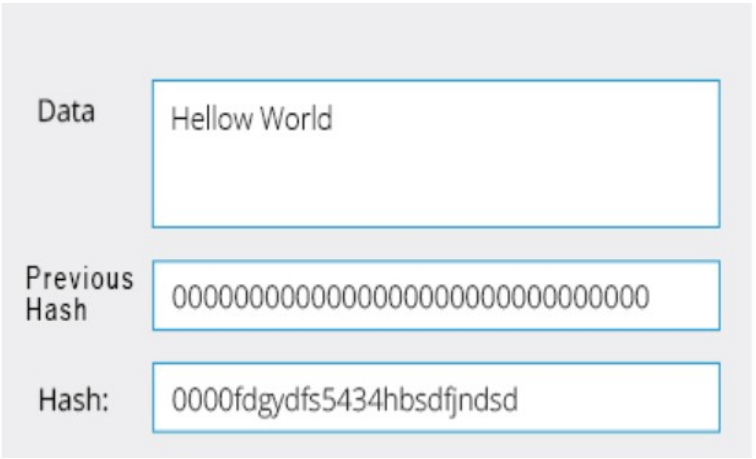
Blockchain Architectures of four categories

- **Public Blockchain Architecture** -The Blockchain Architecture that provides Data and Access to anyone who is interested to participate Example- **Ethereum**, **Bitcoin**, **Litecoin** . **Private Blockchain Architecture**- The Blockchain Architecture that provides Data and Access to authorized users or users from a specific organization. Examples: **Hyperledger Fabric**
- **Hybrid Blockchain Architecture**-Combination of both Public and Private . **Consortium Blockchain Architecture** - The Blockchain Architecture that provides Data and Access to users from sets of organizations

Decentralized Blockchain:

Every Block in Blockchain consists of three parts- Data, Previous Hash and Hash(Current Hash)

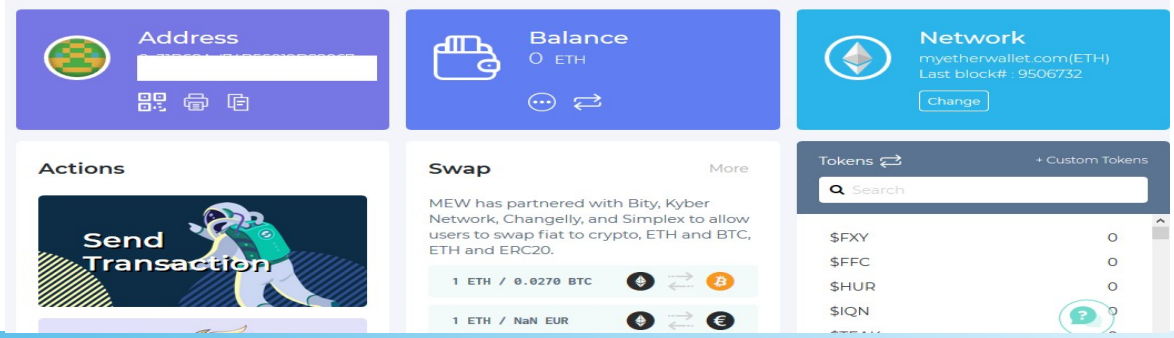




Blockchain Transaction & Use Cases:

Blockchain Transaction & Business Use Cases:

- **Supply Chain and Logistics** :Golden State Foods(GSF) working with IBM to optimize the business processes using Blockchain and IoT. Sensor Data collected are collected automatically and can be used by Machine Learning system in real time . **Automobile Industry**: PNI is working for NetObjex to create system that finds availability of parking area and Billing goes directly from Crypto. **LEA/Police**: Tracking Illegal Consignments
- **Smart Homes**: Many organizations working to resolve Data Security issues of Smarthome through Blockchain. **Pharmacy Industry**: Helps tracking movement of Drugs and Medicines starting from Factory to Consumer-Channel or Customer. **Food Chains**:To streamline the Fruits and Green Vegetables from Farms to Shops and Outlets . **FinTech** : Stock Trading(Australian Stock Exchange), NSX



Blockchain Frameworks and Protocols:

Blockchain Frameworks and Protocols

- Blockchain Networks
  - **Ethereum Network** : The most popular Public Blockchain Network
  - **HyperLedger Network** : HyperLedger Fabric is an open source framework and it is available at https://www.hyperledger.org/projects/fabric
  - **Quorum Blockchain**: Private Blockchain Blockchain from J.P. Morgan - American investment bank and financial services company

- Blockchain Protocols:
  - **Ether** : It is a Protocol used by Ethereum
  - **GHOST(Greedy Heaviest Observed Subtree)**: It is a protocol used by IOTA

Types Of Blockchain Networks :

Types of Blockchain Networks

- Types of Networks:
  - Public Blockchain
  - Private Blockchain
  - Hybrid Blockchain
  - Consortium Blockchain
- IOTA (Internet of Things tAngle):

  IOTA is Blockchain Technology which enables the digital transaction of IoT products IOTA uses DAG (Directed Acyclic Graph) for Transaction Management and it works without Mining Process. It works **GHOST**(Greedy Heaviest Observed Subtree) protocol.
- Blockchain-Based Applications:
  - Ether-Based Blockchain System-Ethereum
  - Blockchain for Business Applications-Hyper Leader
  - Blockchain-Based Database-BigchainDB
  - Dapp: Decentralized Apps based on Blockchain Technology

D1S2 (Session-2)

Blockchain Platforms and Tools

- Blockchain Development Tools
- Other Blockchain Tools

Blockchain Development Tools:

Tools for Blockchain Development:

- **Geth** - Ethereum implementation and acts as Blockchain Node , https://geth.ethereum.org/downloads/
- **Truffle**- Development Environment with Testing Frameworks and Assets Pipelines using **EVM(Ethereum Virtual Machine)**
- **Ganache** - Personal Ethereum Blockchain that works in In-Memory, https://www.trufflesuite.com/ganache
- **Solc**- Solidity Compiler , https://solidity.readthedocs.io/en/v0.5.3/installing-solidity.html
- **Remix** - Solidity IDE that runs on local System and Online , https://remix.ethereum.org/
- **Metamask**- Browser Add-Ons with connectivity to various Networks, https://metamask.io/
- **MyEtherWallet** - Cryptocurrency Wallet with support for Hot Storage(Internet Connected) and Cold Storage(Offline), https://www.myetherwallet.com/

Blockchain Testing Tools:

- **Hyperledger Composer**- Hyperledger Composer is tools for Dapps Testing during development, https://www.hyperledger.org/projects/composer
- **Ganache** -Personal Ethereum Blockchain that works in In-Memory, https://www.trufflesuite.com/ganache
- **Exonum Testkit** - It supports Business Functional Testing, https://github.com/exonum/exonum

Other Blockchain Tools :

DevOps Tools:

- **Terraform**- Cloud Infrastructure Orchestrator and it supporst multiple BAAS - AWS, Google Cloud, Heroku. It is available at https://www.terraform.io/
- **Ansible** - Configuration Automation Tool, https://www.ansible.com/
- **Prometheus & Grafana** - Transactions and Nodes Monitoring Tool, https://prometheus.io/, https://grafana.com/

Blockchain Security Tools:

- **Web Vulnerability Assessment**: Nessus, GFI Languard, Qualyse Guard
- **Port Scanning**: Netscan Tools Pro, Nmap

- Blockchain and Crypto Compliance
  - **Regulatory Supervision** : http://ciphertrace.com
  - **Crypto Compliance** : http://blockchaingroup.io , http://scorechain.com

Incident Response Tools:

- **SIEM**: AlientValut OSSIM, Splunk Enterprise
- **Forensic Analysis** :
  - OS Forensic, http://elliptic.co
  - http://cipherblade.com , http://coindesk.com , http://coincenter.org

Blockchain Technology-Fundamentals

D1S3 (Session-3)
Blockchain Environment-Ethereum (Configurations)

- Ganache & Hyperledge Fabric on Windows & Linux
- Blockchain Programming Fundamentals (Solidity, Golang and Sperpent)
- Ethereum Programming-Smartcontract on Remix IDE
- Ethereum Remix(Offline)
- Ethereum Programming-Codechain on CLI/GoLand

Blockchain Environment-Ethereum:

Ganache and Hyperledge Fabric on Windows and Linux

- On Windows :
  - Download Ganache Installer
  - Open the installer and keep defaults to complete the installation
  - Start Ganache and select "All Interface" in startup
- On Linux:
  - Start Ethereum Network Virtual Machine(Ubuntu) and login
  - Download and install Ganache Image File
- Ready-Use Blockchain Network or Ganache:
  - **Ethereum Network VM (Offline)**: https://drive.google.com/file/d/0BzlG8wGYwTrGWlp0LWctYVIxRVU/view?usp=sharing.
  - **Oracle Blockchain VM (Offline)**: https://www.oracle.com/database/technologies/blockchain-platform-enterprise-edition.html#
  - **C9 (Online)** : http://c9.io
  - **Vulnerable Ethereum**:https://github.com/kudelskisecurity/fumblechain
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Blockchain Environment-Ethereum:

Blockchain Programming Fundamentals

- Solidity:
  - Solidity is language of Smart Contracts in Ethereum
  - It is compiled using **solc compiler** in Windows, Linux, Mac OS and others
- Serpent:
  - It is another language of **Smart Contrac**t in Ethereum
  - It can be written using **Python** and compiles with Python Compiler
- GoLang:
  - GoLang is language for **Chaincode** in Hyperledger Fabric
  - It is compiled using **Go Compiler** in Windows, Linux and MAC OS

Blockchain Environment-Ethereum:

Ethereum Programming -Smartcontract on Remix IDE

- Ethereum Remix IDE comes 2 favours
  - Online - http://remix.ethereum.org/
  - Offline - Installation on Windows or Linux
- Running Smart Contract on Remix(Online)
  - Download and install **Ganache**
  - Start **NEW Workspace** with 0.0.0.0 and check RPC Server started http://0.0.0.0:7545
  - Refer “**Labs Manual- Quick Reference Day 1.pdf**” for further reference
  - Open http://remix.ethereum.org/ and write Smart Contract and compile before executing the same
  - Refere "**solidity-readthedocs-io-en-develop.pdf**" for further reference

Blockchain Environment-Ethereum:

Ethereum Remix(Offline)

- Running Default Example:
  - Start Remix IDE on Virtiual Machine , # **remix-ide**
  - Select one of the Default Examples , Compile it, deploy and run and
  - Check the Transaction Status at Right-Pane
- Running Default Example
  - Start Remix IDE on Ubuntu Virtual Machine
  - Write Code

```
pragma solidity ^0.6.0;
contract HelloWorld {
  function helloWorld() external pure returns (string memory) {
      return "Hello, World!";
}
}
```

  - Compile, deploy and run
  - Refer “**Labs Manual- Quick Reference Day 1.pdf**” for further reference

Blockchain Environment-Ethereum:

Ethereum Programming -Chaincode on CLI/GoLand

- Powershell CLI Mode(Windows) :
  - Install GoLang SDK/Compiler on Windows
    refer “Labs Manual- Quick Reference Day 1.pdf” for further details
  - Write Sample Go Lang Code

```
package main
import "fmt"
func main() {
        fmt.Println("Hello, World!") }
```

- Fabric Programming-Business Apps on Intellij/GoLand
  - Install GoLand IDE, GoLand is GoLang IDE
  - refer “Labs Manual- Quick Reference Day 1.pdf” for further details
  - Write Sample Code or Chaincode

```
package main
import "fmt"
func main() {
fmt.Println("Hello, World!")}
```

  - Right click over File and click on Run
    Refer "**solidity-readthedocs-io-en-develop.pdf**" for further details

D1S4 (Session-4)
Quick References & Assessments

- Blockchain Quick References
- Take- Aways aka Goodies
- Day 1 Assessment By Instructor

Quick References & Assessments-I:

Blockchain Quick References

- **Block :** It is collection that stores Transaction with its HASH and Data. HASH is encrypted value of Data in the BLOCK. The First Block is called Genesis Block
- **Transaction**: It is any STATE change in Blockchain Network
- **Smart Contract**: It is Self Executing contract with TERMS and CONDITIONS written in Programs using Solidity, Go, etc.
- **Chain Code**: This Smart Contract of Hyperledge and written using GoLang, etc
- **Ledger** : It is Digital Ledge which stores TRANSACTIONS in a Blockchain
- **Tokens** : Digital Assets and used in Blockchain Network
- **Cryptocurrency**: example Bitcoin
- **ICO** : It is Initial Coin Offering and it is used to start Bitcoin Mining as IPO
- **Node** : The Computer connected to Blockchain Network
- **Blockchain Platform**: Platform for creating Blockchain Networks, example Ethereum, Hyperledge,
- **BAAS(Blockchain As-A Service**): The Blockchain Platforms on Cloud which can used as needed, it is Cloud Computing for Blockchain
- **dApp**: The decentralized Application designed using Blockchain Network specially Hyperleder

Quick References & Assessments-II:

Blockchain Quick References

- **Proof Of Work(POW)** :
- **Proof Of Stake(POS)** : A transaction and block verification protocol.
- **Mining**: It is validation Process usined in Blockchain it is used by Blockchain and similar System
- **Crypto Wallet** : The Wallet which is used to Store, Send and Recieve Cryptocurrencies such as Bitcoin, Litecoin, etc
- **Byzantine Fault Tolerance Principle(BFT)**: The acceptance Category and level of errors
- **Hyperledger Composer**: Blockchain Development Framework in Hyperledge Fabric
- **Consensus** : The GENERAL AGREEMENT between the participants in the Blockchain

- **Ether** : It is Digital Asset like Bitcoin which does not require THIRT PART to approve transaction
- **SolarCoin**: Type of Digital Coin that as incentivize sustainable behaviours
- **Hyperledger Composer**: Blockchain Development Environment and
- **DAO (Decentralized Autonomous Organization)**: DAO is Virtual Organization that existed on the Ethereum Blockchain and it was **Vitalik Buterin**

Quick References & Assessments:

Take-Aways aka Goodies

You all learnt :

- **What is Blockchain?** - Distributed, decentralized ledger in which transaction is immutable
- **Different type of Blockchain Architectures ?** Private, Public, Hybrid and Consortium
- **Blockchain Use Cases?** Blockchain Network in AI Models, Swarm Learning, Stocks, FinTech
- **Common Blockchain Networks?** Ethereum, Hybperledge and Quorum
- **DevOps Tools for Blockchain**? Terraform, Ansible, Prometheus and Grafana

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Quick References & Assessments:

Day 1 Assessment By Instructor

- **Topics**: Blockchain Fundamentals & Business Apps
- **Quick Self-Revision (20 Minutes)**: “Blockchain Networks-Quick Reference Day 1.pdf”; Sections #2 , #3
- **Total Questions**: 15,MCQ
- **Time** : 23 Minutes
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THANK YOU ALL!