Blockchain Innovation Program Tutorial Framework

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Blockchain Innovation Program
Tutorial Framework

The Blockchain Innovation Program is a designed as an intensive 10-week programme which will provide students with educational and entrepreneurial support for them to develop a comprehensive understanding of what's involved in Bitcoin Application Development.
The programme will see the students complete the three bitcoin primitive courses Hash Functions, Merkle Trees, and Digital Signatures before they complete the newly refactored Introduction to Bitcoin Development.

Educators from the Bitcoin SV Academy team will prescribe weekly resource and question packs to stimulate the students to develop a deeper consideration for what is involved in creating a scalable Bitcoin application. The students will attend fortnightly tutorials where their answers to the question pack will be evaluated and discussed in greater detail.

Live session #1

Hash Functions	• Hash Functions and Hash Tables • Content Addressed Distributed Data Structures • Efficient Provable Data Possession for Hybrid Clouds

Course pre-requisite: Hash Functions (primitives)
Worksheet to complete prior to the live session: Week 1 – Hash Functions

Live session #2

Merkle Trees	• GitHub MerkleDAG • ForkBase: Immutable, Tamper-evident Storage • Substrate for Branchable Applications • Merkle-CRDTs - MerkleDAGs meet CRDTs • Merkle^2: A Low Latency Transparency Log System
Digital Signatures	• Digital Signatures • Legitimating Technologies: Digital Signatures Case Study. • Segwit, Mixing and Law • SigHash Flags

Course pre-requisite: Merkle Trees and Digital Signatures (Primitives)
Worksheet to complete prior to the live session: Week 2 Merkle Trees and Week 3 Digital Signatures.

Live session #3

Data and Databases	• What is DBaaS? • SQL vs NoSQL • What is Cloud Storage? • What is Object Storage? • Block vs File Storage • What is a Load Balancer? • Kubernetes vs Docker
API led Event-Driven & Microservices Architectures	• API vs SDK • What is API Management? • What is a REST API? • What is an API Gateway? • What is Event Driven Architecture? • What are Microservices? • Architecting a Cloud Native API Solution. • Blockchain Enabled Trustless API Marketplace • Unofficial API and Browser Extension Development for Augmenting Student Resources

Course pre-requisite: Bitcoin Development Chapter 1
Worksheet to complete prior to the live session: Week 4 Data and Databases and API led Event-Driven & Week 5 Microservices Architectures

Live session #4

Debunking the Blockchain Trilemma, CAP Theorem & Application Scalability	• Myths of Decentralisation • On Decentralisation • The Wizard of Blockchain • Cost Performance Trade-Off Evaluation in Microservices impacted by the CAP Theorem Limitations
Working Blockchain & Overlay Networks	• A Survey and Comparison of P2P Overlay Network Schemes. • Virtual Networking Explained • What is a Content Delivery Network • Mandala Network • SPV • Working Blockchain

Course pre-requisite: Bitcoin Development Chapter 2&3
Worksheet to complete prior to the live session: Week 6 Debunking the Blockchain Trilemma, CAP Theorem & Week 7 Application Scalability and Working Blockchain & Overlay Networks.

Live session #5

Intro to Git and Github	• Git and GitHub for Beginners • Git and GitHub for Beginners • Getting Started with OpenSSH Key Management. • Setting up an Nx monorepo with Angular • Setting up CI/CD with Github Actions and Vercel
Constructing Transactions & Script	• Introduction to Bitcoin Transactions • MintBlue API, SDK and Integrations

Course pre-requisite: Bitcoin Development Chapter 4-5
Worksheet to complete prior to the live session: Week 8 Intro to Git and Github and Week 9 Constructing Transactions and Bitcoin Script.

Live session #6

Metanet	• Metanet Overlay • Dagda • The Birth of Ontology & the DAG • Tutorial on directed Acyclic Graphs • A.N.N.E preview.
End of programme	• Feedback on project completed by students • Wrap up of the programme

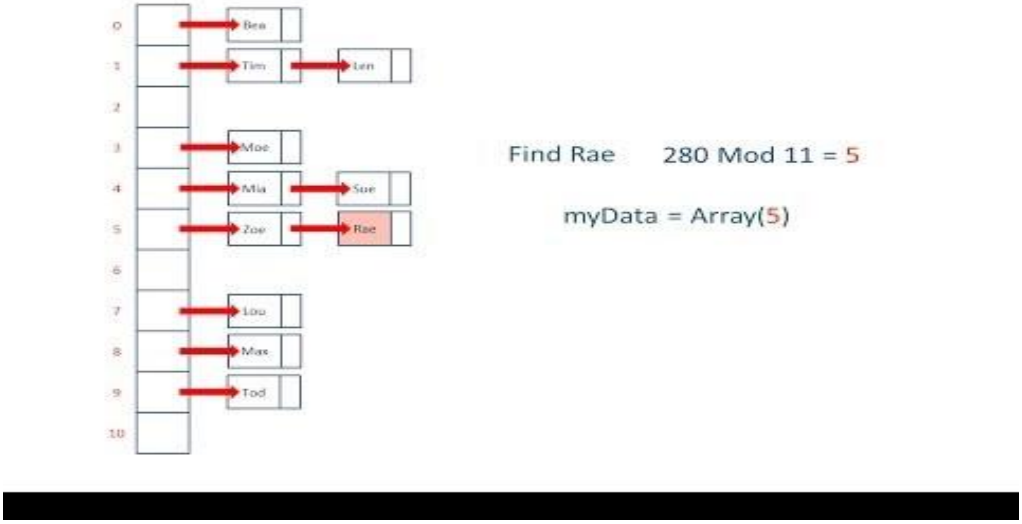
Course pre-requisite: Bitcoin Development Chapter 6
Worksheet to complete prior to the live session: Week 10 Metanet

Blockchain Innovation Program

Worksheets

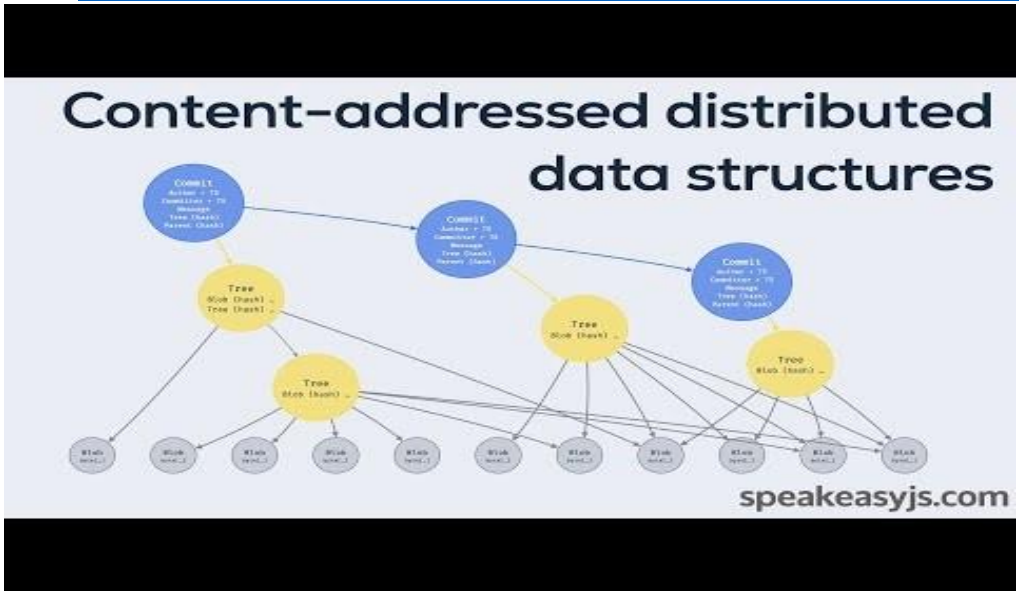
Week 1 Hash Functions

1. [Hash Tables and Hash Functions]



a. What are the benefits of a Hash Table over an array?
b. What type of mathematical operation is leveraged to create Hash Tables from an n=x data set?
c. What is a collision in the hash table?
d. What are some techniques to perform collision resolution in a Hash Table?
e. What is linear probing?
f. What is the load factor?
g. Some examples of where hashing is used are?

2. **Content-addressed distributed data structures [SpeakeasyJS]**



a. How can an address be related to the content of a particular file?
b. What are the benefits of using a hash function to create the address of content?
c. How is it that the graph of a git repository can be called a Merkle DAG?
d. How is the content addressability of the block header implicated in the Proof of Work process for Bitcoin?
e. How can hash functions be used to create efficient snap shots within file systems?

3. **Efficient Provable Data Possession for Hybrid Clouds (Introduction, 2.4, Conclusion)**

https://cse.buffalo.edu/~hongxinh/papers/CCS10.pdf

a. How can hybrid cloud models effectively provide dynamic scalability of service and data?
b. How do Hash Functions lead to an economisation of data for verification?
c. How might the blockchain fit into the model demonstrated in figure 1?