

Introduction to Blockchain

Blockchain Technology

Time: 60 mins

Introduction

In this class, the student/s will be introduced to the fundamentals of blockchain technology. They will learn to set up a web server on their computer using the flask web framework, send data from the client to the server, display a block and the data received on a HTML page using jinja, a web template engine for the Python programming language.

New Commands Introduced

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| • <code>__name__</code> | Evaluates to the name of the current module it is a built-in Python variable. |
| • <code>app = Flask(__name__)</code> | Sets the route to the home folder |
| • <code>@app.route("/")</code> | Invokes the home function |
| • <code>url_for()</code> | Builds templates dynamically to avoid hard coding of URLs into the template, for example <code>url_for('home')</code> |
| • <code>If __name__ == '__main__':
app.run(debug=True)</code> | Runs the server only if the script is executed directly from the Python interpreter and not as an imported module |
| • <code>from flask import render_template, request</code> | Imports <code>render_template</code> , <code>request</code> objects |
| • <code>methods = ["GET", "POST"]</code> | Sets the HTTP methods to GET or request data from a server and POST or send data to a server |
| • <code>return render_template("index.html")</code> | Displays the index page using a jinja file |
| • <code>request.form.get("")</code> | Sends data from the HTML page to the server |

Vocabulary

- **Blockchain** is a decentralized, immutable ledger of records linked together to record transactions.
- **Immutable** means no changes can be made after it's been recorded to the shared ledger.
- **Ledger** is a collection of accounts in which accounting transactions are recorded.
- **Server** is a computer or system that provides services over a network.
- **Client** is a computer that requests access to a service provided by a server.
- **Localhost** is when both the client and server are on the computer that you are currently working on.
- **IP address** is the unique address of a device connected to the internet.

- **Port number** is the logical address of each application or process that uses a network or the internet to communicate.
- A network or system is said to be **hacked** when unauthorized access to data is gained.
- **Flask** is a web framework that handles user requests and communicates with the database to prepare a proper response.
- **Jinja** is a web template engine for the Python programming language.

Learning Objectives

Student/s should be able to:

- **Summarize** the advantages of blockchain technology to secure transactions.
- **Explain** how to set up a localhost and send data from the client to the server.
- **Demonstrate** how to create a block for the data received on the server and display it using flask and jinja .

Activities

1. Class Narrative: (2 mins)

- Brief the student/s how the blockchain transactions cannot be tampered with, as the records are immutable and at the same time all network participants have read access to the distributed ledger.
- Explain the five elements of a blockchain:
 - Peer-to-Peer Network: Peer to peer network, commonly known as P2P is a decentralized network communications model that consists of a group of devices (nodes) that collectively store and share files where each node acts as an individual peer. In this network, P2P communication is done without any central administration or server, which means all nodes have equal power and perform the same tasks.
 - Cryptography: Cryptography is the method of securing important data from unauthorized access.
 - Consensus Algorithm: A consensus algorithm is a procedure through which all the peers of the Blockchain network reach a common agreement about the present state of transactions stored in the distributed ledger.
 - Punishment and Rewards: A system of punishment and reward is used to incentivise users.
 - Market Adoption: As blockchains are built to offer security for networks with a large user-base, market adoption is necessary to keep the blockchains secure by keeping the consensus in the hands of a large number of people.

2. Concept Introduction Activity: (5 mins)

- Let the student/s undertake the explore-activity to observe how transaction data is converted to a block containing the information.

- Explain that the block contains data stored as attributes.
- Using the slides, explain that the student/s will learn:
 - to setup the local host
 - to send data to the server
 - to create the first block

3. Activity 1: Setup the Localhost (14 mins)

Teacher Activity: (7 mins)

- Explain that a client is the computer that requests for services and a server is the computer that provides the services.
- Explain that the IP address is the unique address of a device connected to the internet.
- Explain how to setup the localhost on the computer:
 - Importing the Flask library and creating an instance
 - Setting the route path
 - Defining the home function
 - Setting the path in index.html
 - Running the server

Student Activity: (7 mins)

- Guide the student/s to set up the server on their computer.

4. Activity 2: Send the Data to the Server (12 mins)

Teacher Activity: (3 mins) .

- Explain how HTML can be combined with conditional statements or loops using Jinja to make the page dynamic.
- Explain how Jinja and Flask frameworks work together to generate the response to a user request.
- Explain how to send data from the HTML page to the server using render template, request objects, and HTTP methods.

Student Activity: (9 mins)

- Guide the student/s to send data from the HTML page to the server.

5. Activity 3: Create the First Block (12 mins)

Teacher Activity: (6 mins)

- Explain how to display the block and its data when the block is clicked using a data dictionary, create the block, and display the block.

Student Activity: (6 mins)

- Guide the students to display the block and details on the webpage.

6. Introduce the Post class project: (2 min)

- Authenticate the system using blockchain to get the user details and append the details to the block.

7. Test and Summarize the class learnings: (5 mins)

- Check for understanding through quizzes and summarize learnings after each activity.
- Summarize the overall class learnings towards the end of the class.

8. Additional activities:

- Encourage the student/s to display date and time along with the block details.
- Encourage the student/s to change the route for the post method and run the server on a different port.

9. State the Next Class Objective: (1 min)

- In the next class, student/s will learn to cipher and decipher the text to secure the data.

U.S. Standards:

CSTA: 2-AP-11, 2-AP-12, 2-AP-13, 2-AP-14, 2-AP-19

Links Table		
Activity	Activity Name	Link
Class Presentation	Introduction to Blockchain	https://s3-whjr-curriculum-uploads.whjrlonline/4b28785c-a9bf-43f4-aa7b-71495969a31b.html
Explore Activity	Introduction to Blockchain	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS/tree/main/Explore

Teacher Activity 1	Setup the Localhost	https://github.com/Tynker-Blockchain/TNK-M11-C81-TAS-BP
Teacher Reference: Teacher Activity 1 Solution	Setup the Localhost	https://github.com/Tynker-Blockchain/TNK-M11-C81-TAS
Student Activity 1	Setup the Localhost	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS-BP
Teacher Reference: Student Activity 1 Solution	Setup the Localhost	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS
Teacher Activity 2	Send Data to the Server	https://github.com/Tynker-Blockchain/TNK-M11-C81-TAS-BP
Teacher Reference: Teacher Activity 2 Solution	Send Data to the Server	https://github.com/Tynker-Blockchain/TNK-M11-C81-TAS
Student Activity 2	Send Data to the Server	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS-BP
Teacher Reference: Student Activity 2 Solution	Send Data to the Server	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS
Teacher Activity 3	Create the First Block	https://github.com/Tynker-Blockchain/TNK-M11-C81-TAS-BP
Teacher Reference: Teacher Activity 3 Solution	Create the First Block	https://github.com/Tynker-Blockchain/TNK-M11-C81-TAS
Student Activity 3	Create the First Block	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS-BP
Teacher Reference: Student Activity 3 Solution	Create the First Block	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS
Student's Additional Activity 1	Display Date and Time	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS-BP
Teacher Reference: Student's Additional Activity 1 Solution	Display Date and Time	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS
Student's Additional Activity 2	Change Route and Post	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS-BP
Teacher Reference: Student's Additional Activity 2 Solution	Change Route and Post	https://github.com/Tynker-Blockchain/TNK-M11-C81-SAS
Post Class Project	Authentication System with Blockchain	https://github.com/Tynker-Blockchain/TNK-M11-C81-PCP-BP
Teacher Reference: Post Class Project Solution	Authentication System with Blockchain	https://github.com/Tynker-Blockchain/TNK-M11-C81-PCP