

Bhartiya Vidya Bhavan’s

Sardar Patel Institute of Technology, Mumbai-400058

Department of Computer Science and Engineering

**OEIT1:Blockchain Technology and Applications**

**Lab-7A: Blockchain and Cybersecurity**

**Part-I**

**Develop a blockchain application for Cybersecurity**

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**Objective:** **Develop a blockchain application for Cybersecurity**

**Outcomes:** After successful completion of lab students should be able to

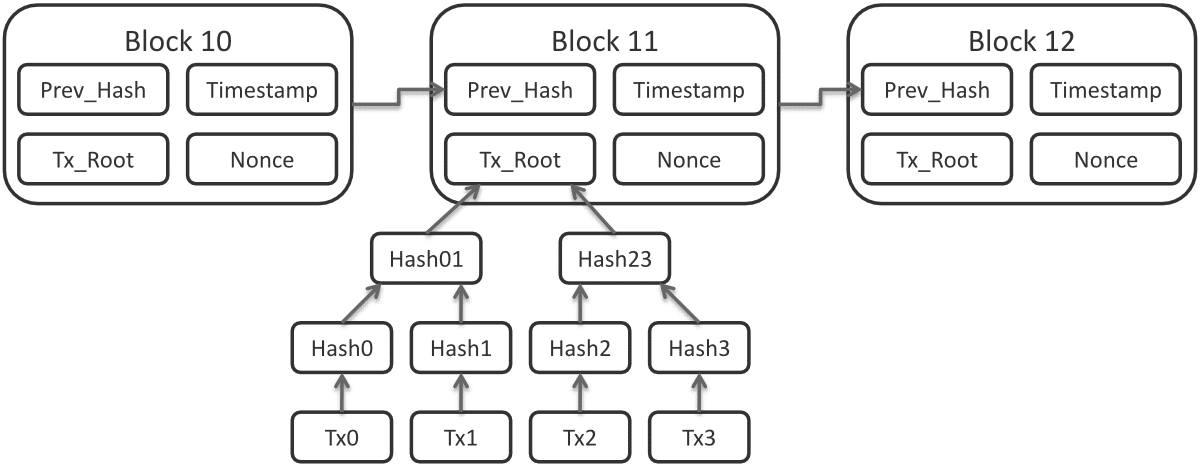
* Implement an Ethereum private blockchain
* Build two-factor authentication (2FA) using Blockchain
* Write a smart contract using Solidity Language
* Compile and run the 2FA using Ethereum Blockchain
* Use REST API and Flask microframework

**System Requirements:**

PC (C2D, 8GB RAM, 100GB HDD space and NIC),Ubuntu Linux 14.04/20.04

Internet connectivity,Python Cryptography and Pycrypto,Nodejs, Truffle,Ganache-cli

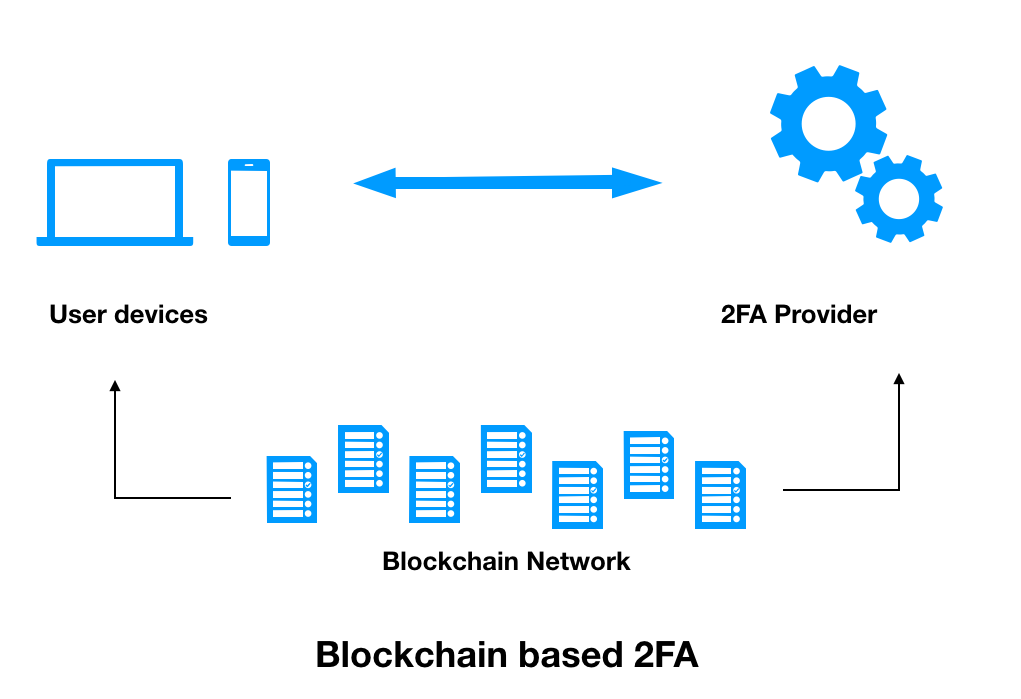
, solidity,REST API



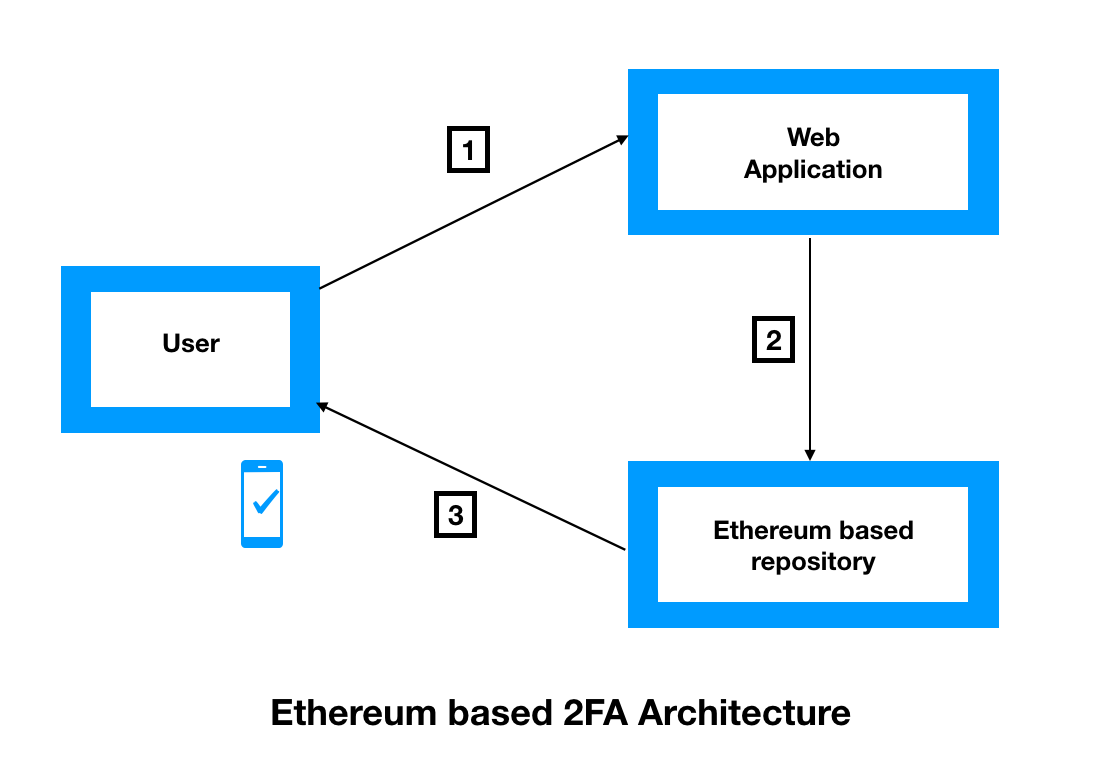
**Figure-1: Blockchain Implementation**

**Part-I: Two-Factor Authentication with Blockchain**

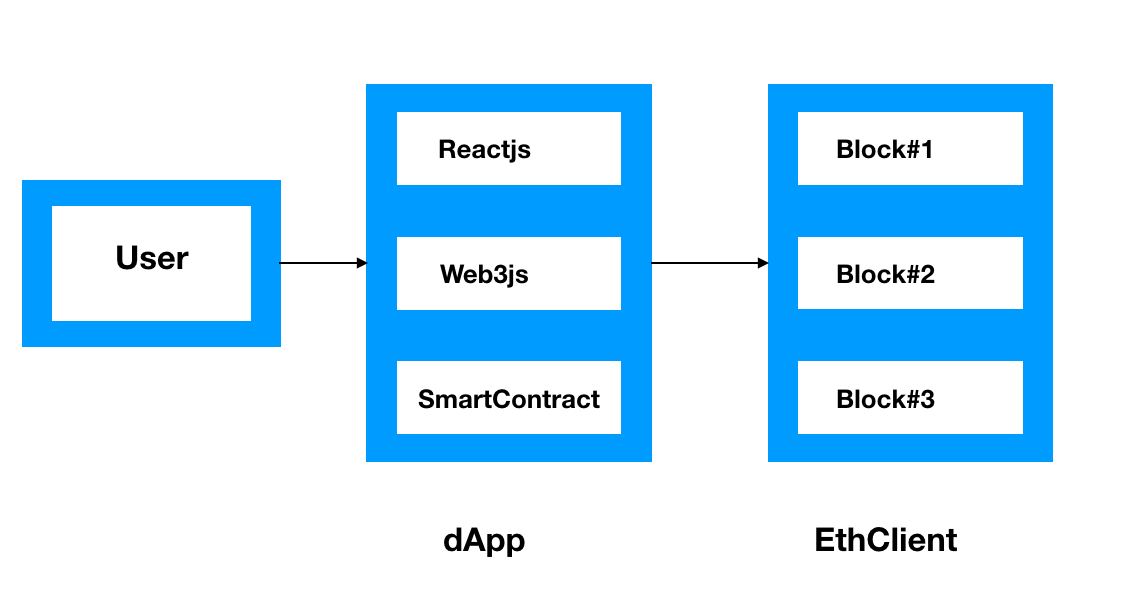
Two-factor authentication (2FA) provides an added layer to the existing credential-based system protection as a solution to this drastically growing problem.



**Figure-2: Blockchain-Based 2FA**



**Figure-3:Solution Architecture**



**Figure-4: Ethereum based 2FA**

**Procedure:**

[1]Create a directory under BTA

$cd ~

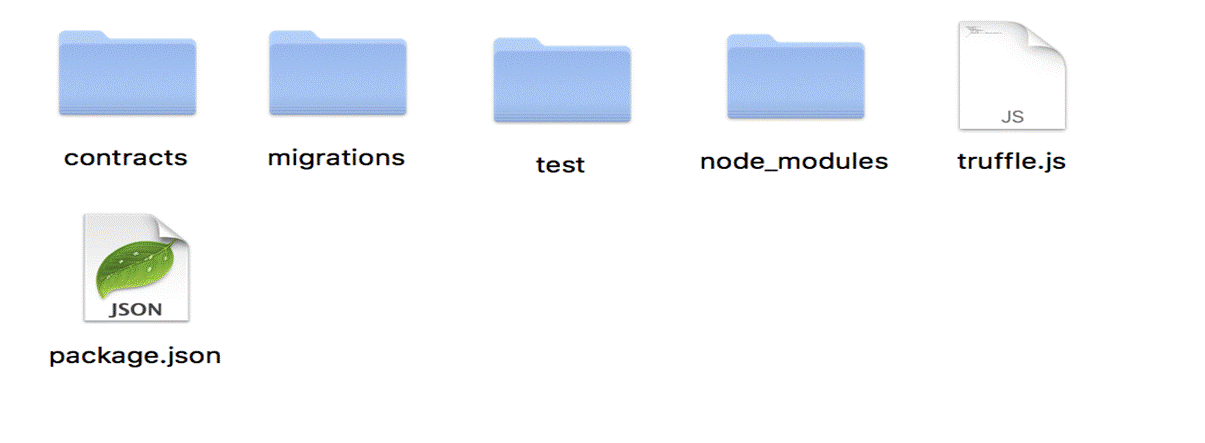
$mkdir BTA/lab7a-2FA

$cd BTA/lab7a-2FA

[2] Clone or download the Ethereum-2FA

$ git clone https:/​/github.​com/​hoxxep/​Ethereum-​2FA

$cd Ethereum-2FA



**Figure-5: Ethereum-2FA Directory and Files**

The files in the preceding screenshot are explained as follows:

**contracts:** This folder includes our smart contract, TwoFactorAuth.sol

**migrations:** This folder consists of migration files to deploy the contract to the blockchain

**test:** This folder consists of server.js, which is responsible for event authentication in our contract

**node\_modules:** This folder includes all the libraries

**truffle.js:** This configuration file consists of a set of configurations to connect to the blockchain

**package.json:** This is where we specify a configuration of our projects, such as name and scripts

[3] Install Nodejs

Refer to [2] installation of Nodejs on Ubuntu Linux

[How To Install Node.js on Ubuntu 20.04 | DigitalOcean](https://www.digitalocean.com/community/tutorials/how-to-install-node-js-on-ubuntu-20-04)

#Recommended method No. 3

#Check Nodejs version

$node -v

#Turning up Ethereum

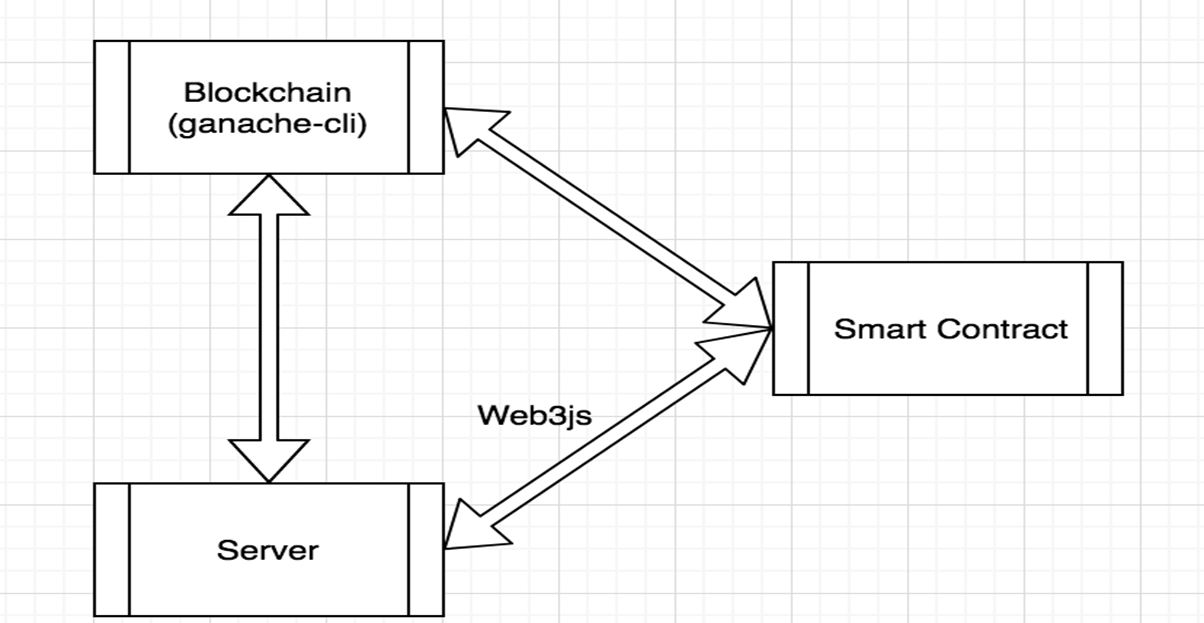
#Install ganache-cli

$npm install -g ganache-cli

**Components**

The following are the three core components of this project, shown in the following diagram:

* A blockchain network (which we will develop with the Ganache CLI)
* A smart contract
* A server communicating with the blockchain



**Figure-5: Components of Blockchain-Based 2FA**

$ganache-cli

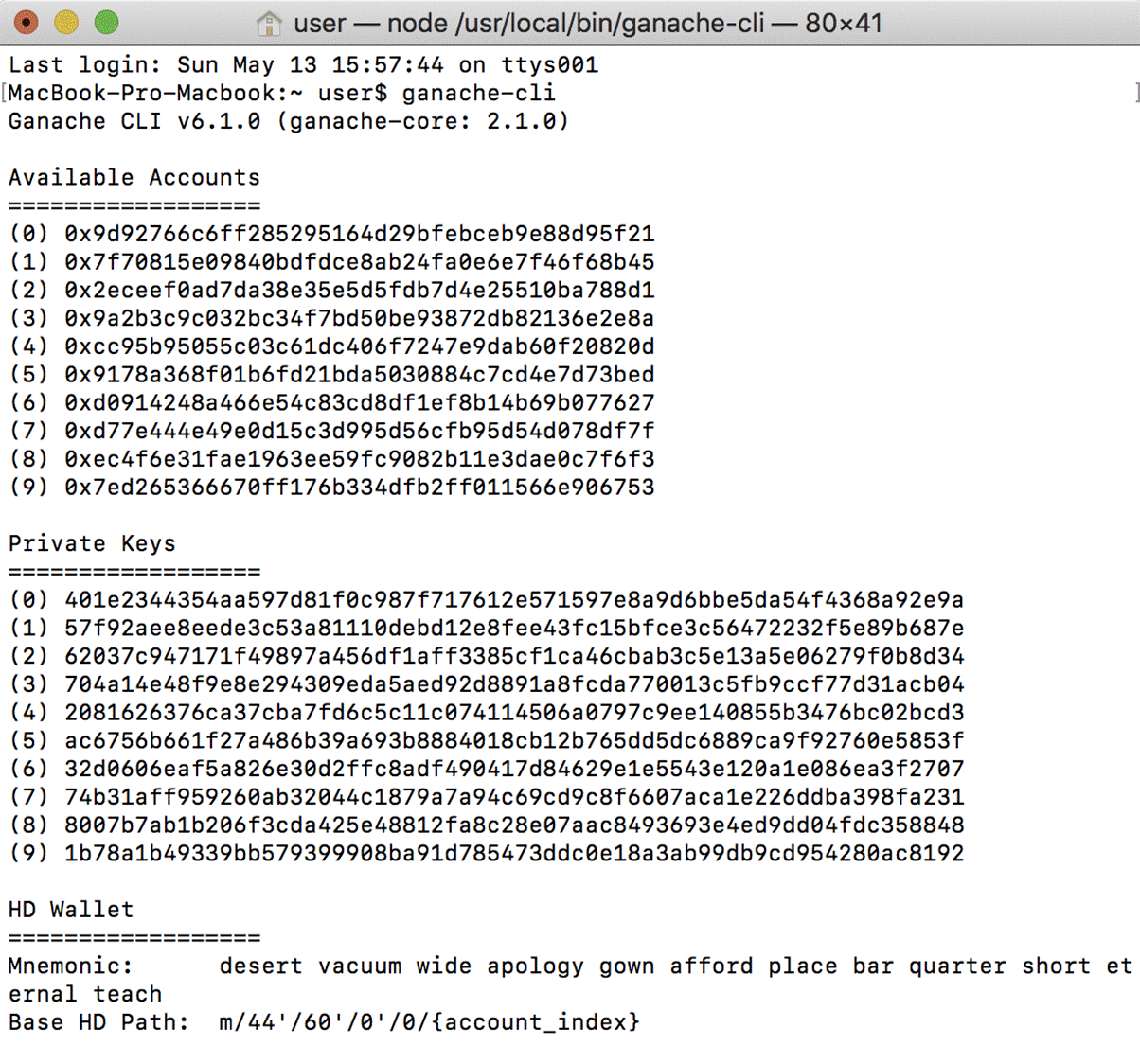
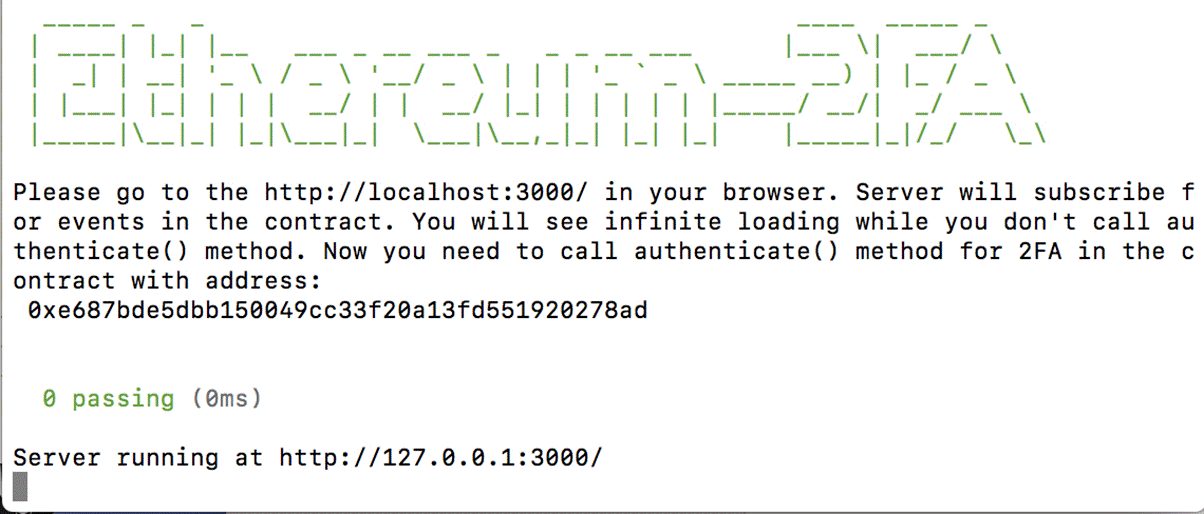


Figure-7: Ganache-cli

**Turning up the smart contract**

$cd Ethereum-2FA

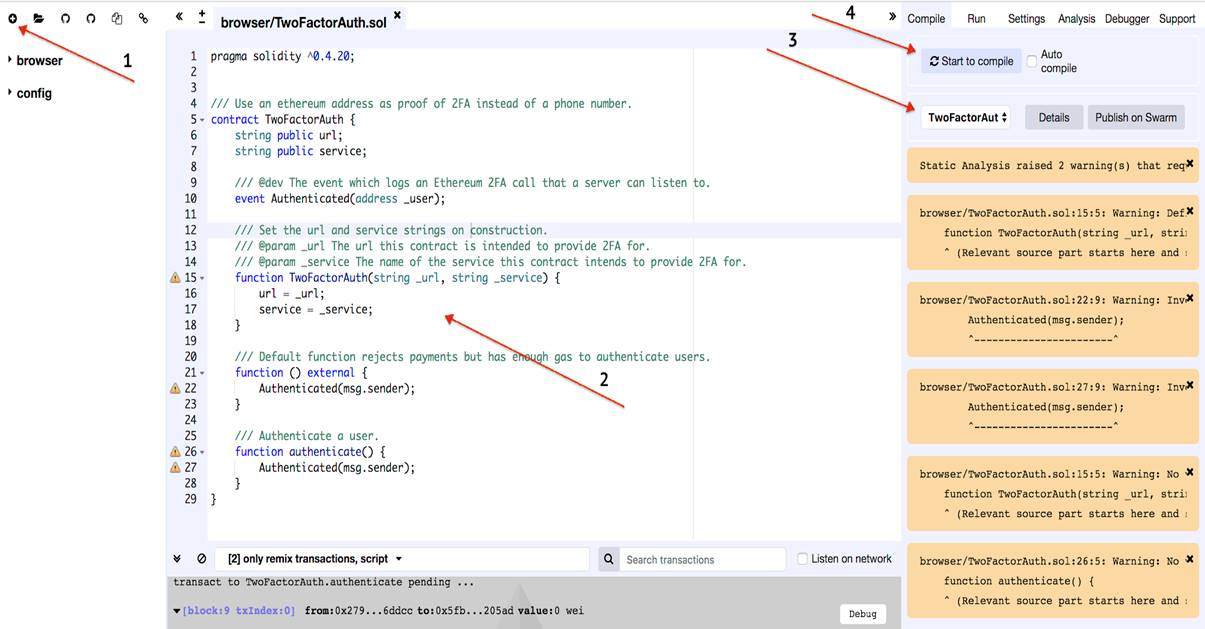
$truffle test ./test/server.js



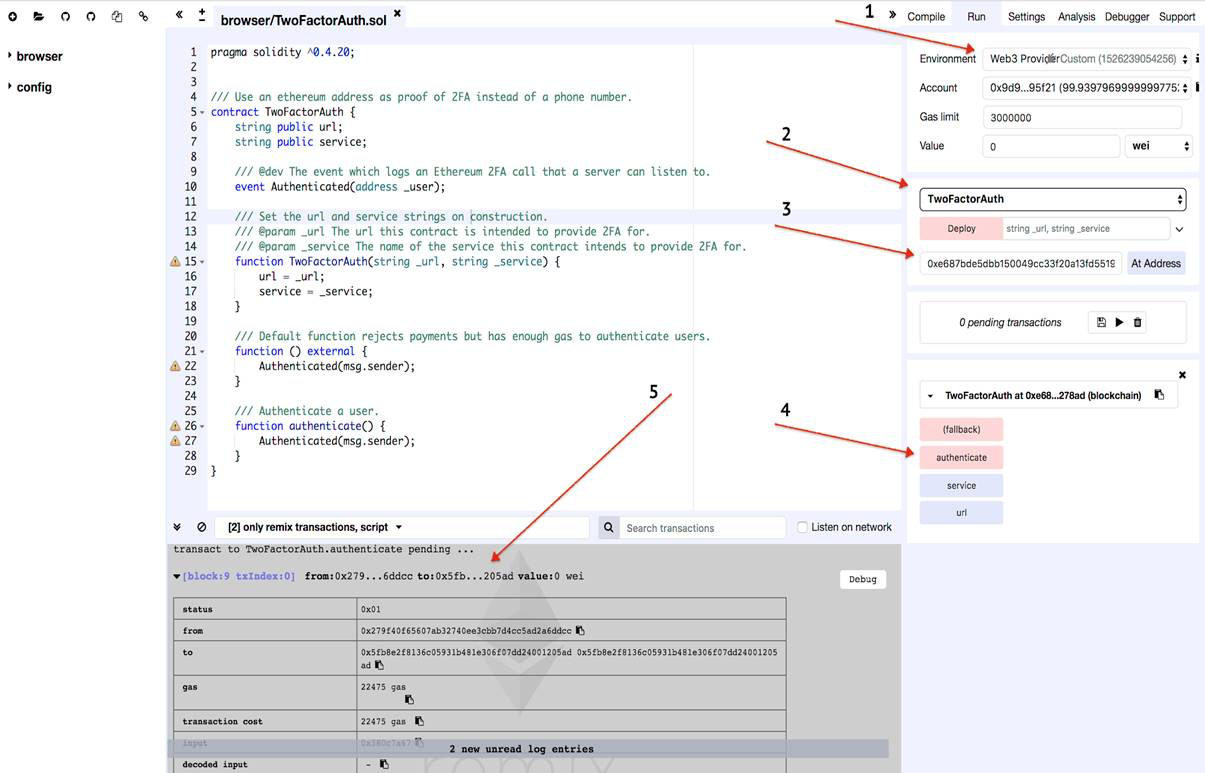
**Figure-8:Ethereum-2FA**

# Open Google Chrome and access the localhost on port 3000

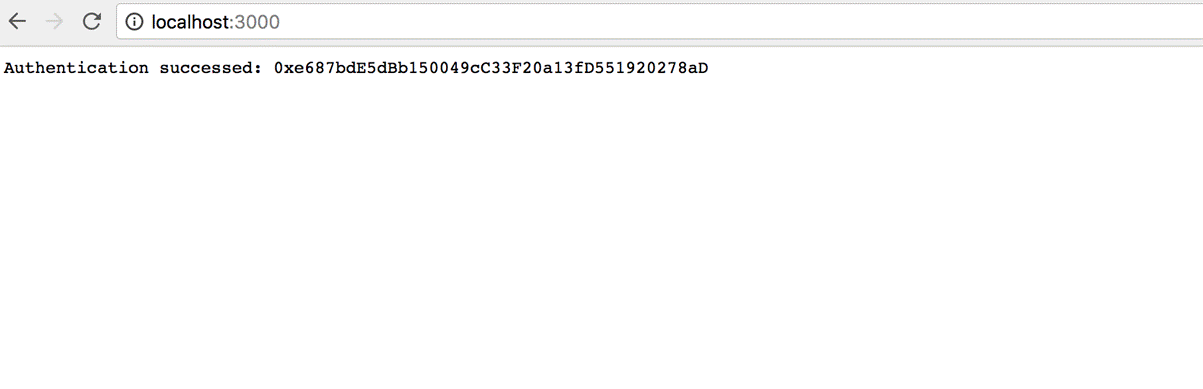
#Testing and verification



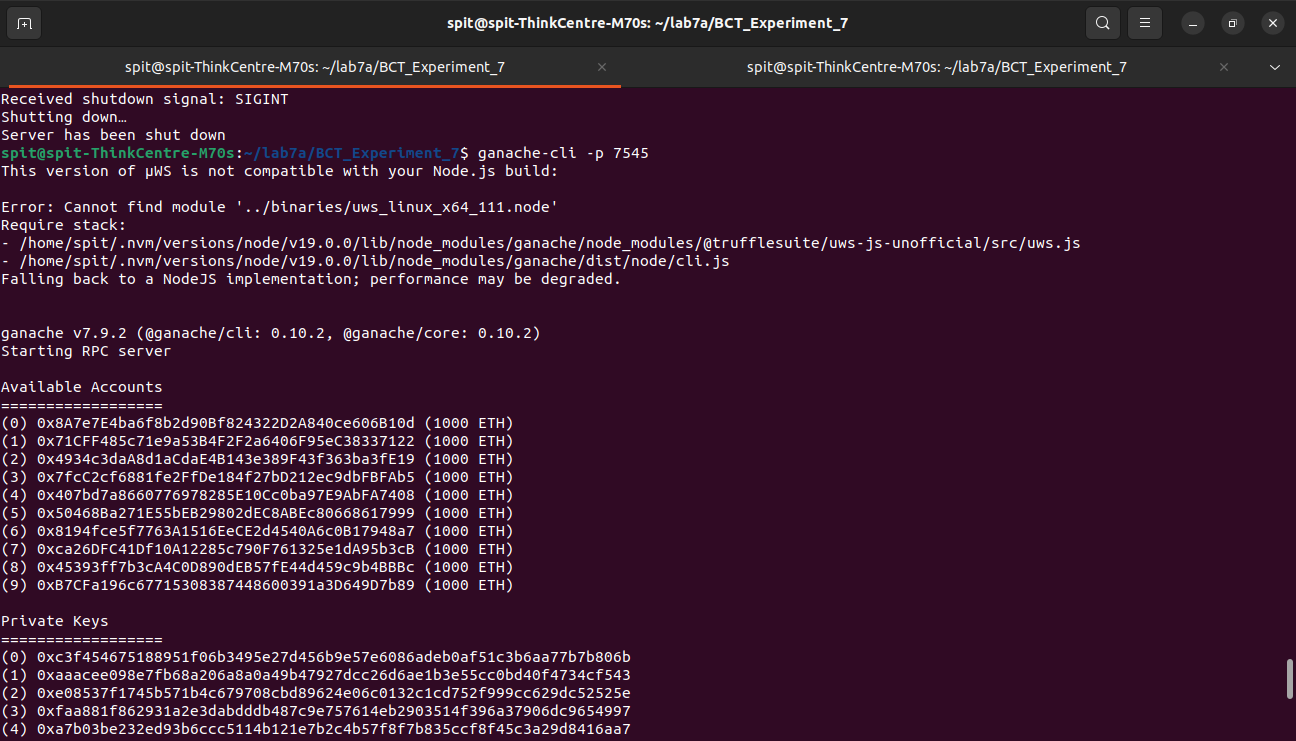
#

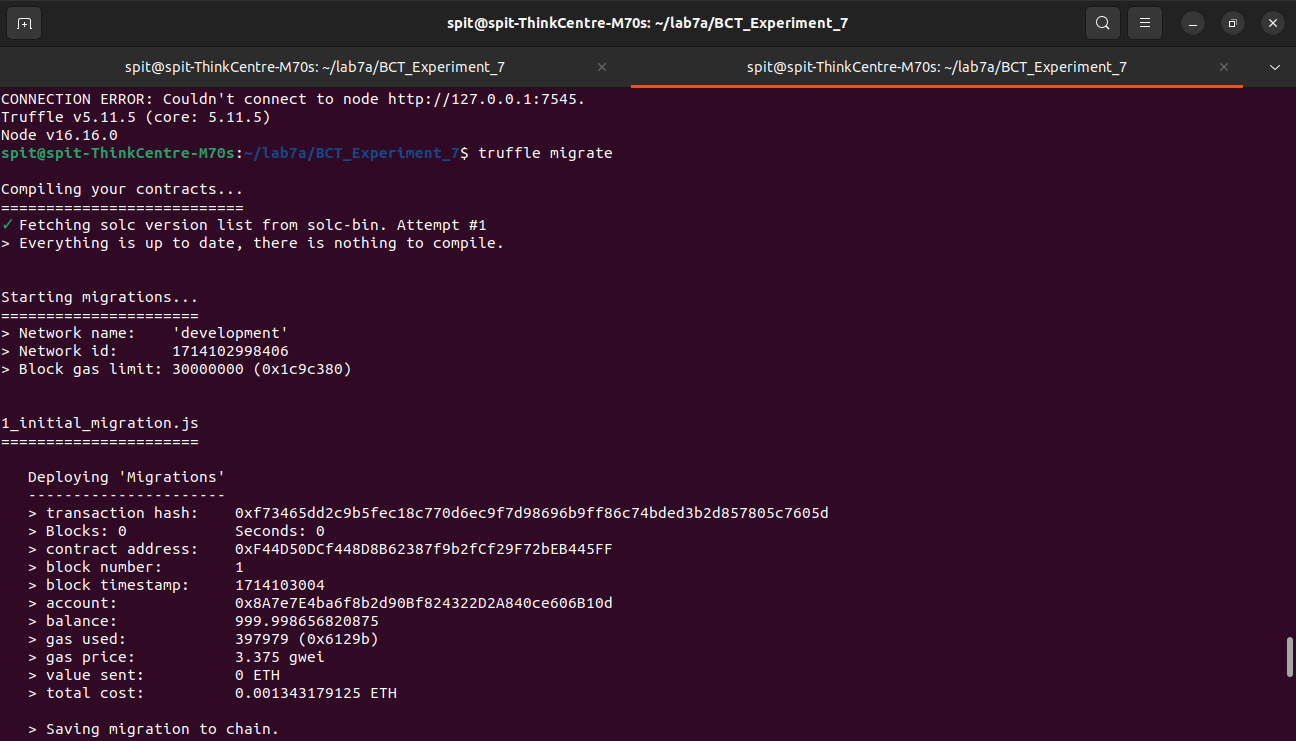


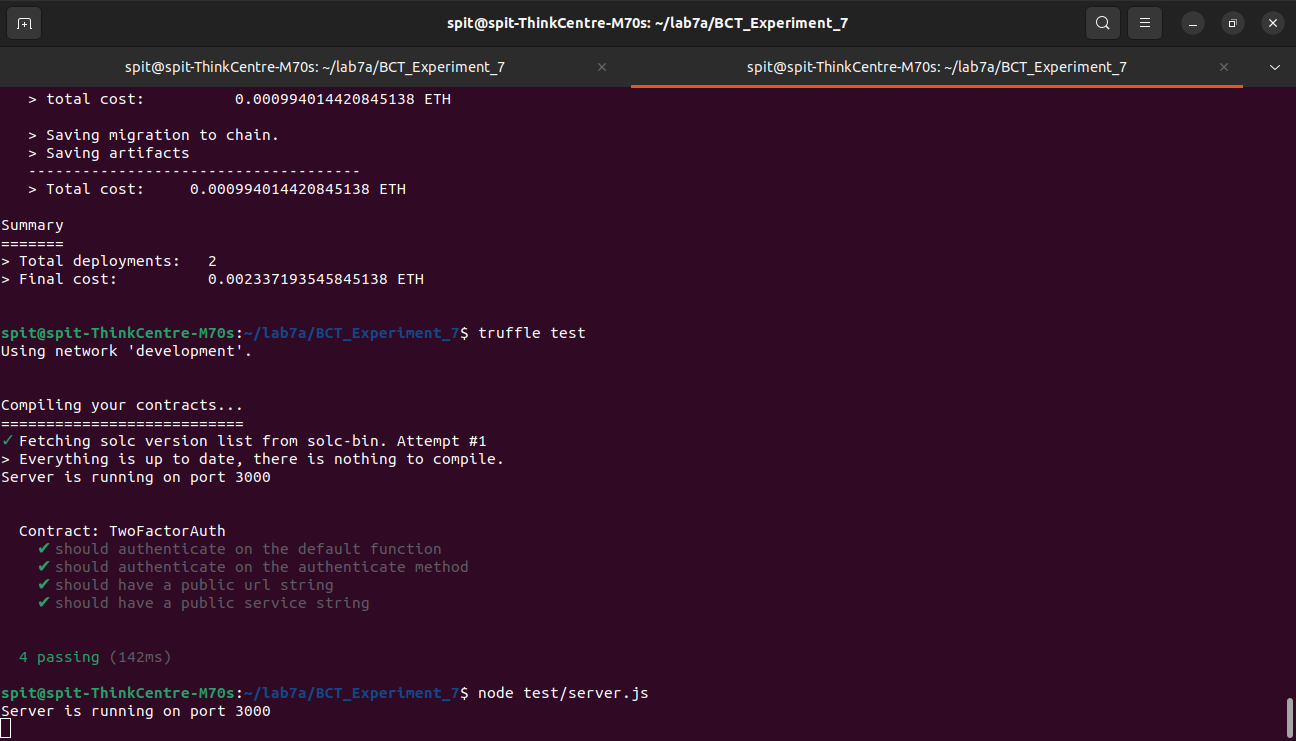
Successful authentication:

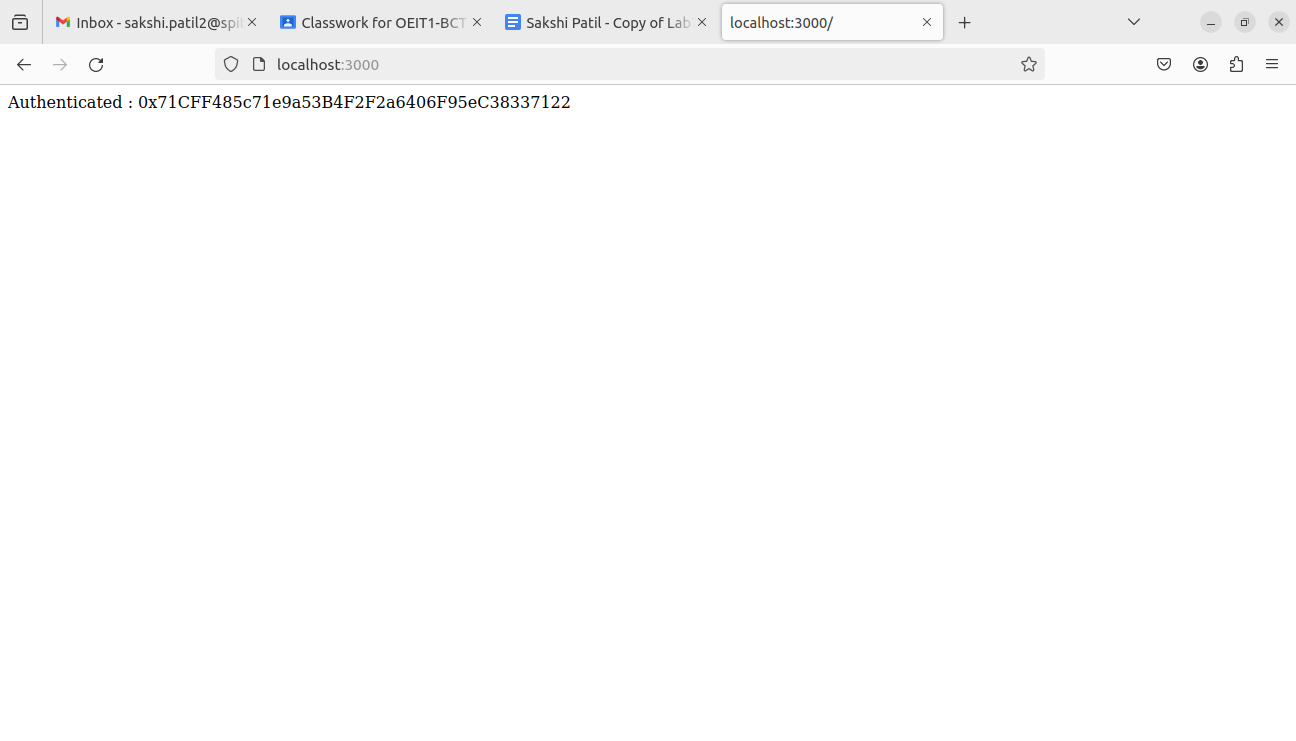


Add your system screenshots with a brief description.









**Conclusion:**

This lab experiment provided valuable hands-on experience in utilizing blockchain technology for cybersecurity enhancement. Through implementing an Ethereum private blockchain, integrating two-factor authentication (2FA), writing smart contracts in Solidity, and executing these functionalities on the Ethereum blockchain, I gained practical skills in deploying secure and decentralized solutions. Additionally, utilizing REST API and Flask microframework facilitated seamless interaction with external applications, emphasizing the importance of interoperability. Overall, this experience equipped me with foundational knowledge and practical skills to innovate and contribute effectively to cybersecurity practices.

**References:**

[1] Two-factor authentication through an Ethereum contract.

<https://github.com/hoxxep/Ethereum-2FA>

[2] How To Install Node.js on Ubuntu 20.04

[How To Install Node.js on Ubuntu 20.04 | DigitalOcean](https://www.digitalocean.com/community/tutorials/how-to-install-node-js-on-ubuntu-20-04)