

BLOCKCHAIN PROJECT

The background features a dark, abstract design with a hexagonal pattern. It includes several curved bands in blue, purple, and pink. A small, stylized logo consisting of three interlocking squares in blue and purple is located in the upper left corner.

Subject Code : CBCA217

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Problem Statement

How to automate
the process of verification
of academic credentials ?

Current Status

A System for Academic Certificates Verification

No digitalized way to verify the certificate. Although there are some universities that ONLY store certificates in digital form.

Use of central network where there is a chance of tampering the certificate. This increases the cases of fraud.

Employers verify the students credentials using third party.

A lot of money and time is consumed in manual verification.



Drawbacks of existing system

Single point of failure

Dependency on a Central Authority

Scalability Challenges

Potential for Bias (if ML model is used in automating verification)

Data Integrity and lack of transparency

Data Accessibility & Limited User Control (process to update the databases slows down)

Cost and Time





Proposed Solution

Decentralized system
to store & verify
student credentials
using blockchain.



Software Requirements

Truffle to create the Ethereum ecosystem for building and deploying smart contracts & dApps.

Ganache CLI and GUI to develop and test Ethereum smart contracts. Ganache provides 10 accounts with fake ether which can be used for transactions while testing.

Geth and Parity are ethereum clients that enable nodes to participate in the Ethereum network by validating transactions, executing smart contracts & maintaining the blockchain.

Metamask is a digital currency wallet to store & transact on ethereum using tokens.

html, css, js for frontend.

Solidity to code the Smart Contract.

node.js Back-end is implemented using JavaScript library.

web3.js a JavaScript library to build web 3.0 applications which helps to connect front-end and back-end with smart contracts.

MySQL or **MongoDB** for database management.



Hardware Requirements

Server(s): High-performance servers with multi-core processors (e.g., Intel Xeon, AMD EPYC).

RAM: 16GB or more (depends on scale of project).

Storage: SSDs for fast access times and data integrity.

Networking: Gigabit Ethernet or higher for internal communication between nodes.

Adequate bandwidth for external connections (depends on user load).

Ethereum Blockchain Nodes

Security Measures: Firewalls, prevention systems etc...



Methodology

Select a Blockchain Platform : **ETHEREUM**

Open source and decentralized platform with Turing completeness.

Most smart contracts and DAO's are created using Ethereum.

Third-party cannot modify data.

Errors derived from personnel factors are avoided because dApps are maintained by entities & not individuals.

Blockchain does not cease to operate even if individual server crashes.

Ethereum Virtual Machine (evm) is a programmable blockchain unlike Bitcoin.



Methodology

Define Smart Contract Use Cases:

Accreditation process= criteria, evaluation & approval.

University registration= register university on blockchain after meeting accreditation requirements.

Credential verification= verify academic credentials, where students submit their info & educational institutions verify it.

Database updates= update uni database and ensure that only authorized nodes can make changes.



Methodology

Set Up a Node Network

Network of trusted nodes to host and validate the smart contracts. These nodes ensure integrity and decentralization of the system.

User Interface Development

Create user interfaces (UIs) for different stakeholders (universities, students, employers) to interact with the smart contracts.

These UIs can be web-based applications or mobile apps.



Methodology

Testing and Debugging

Using Ganache, Truffle and Geth

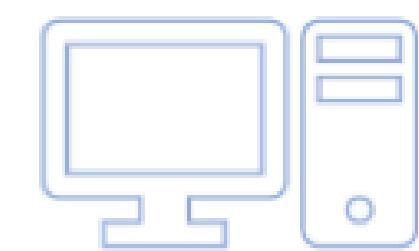
Integration with Existing Systems

Integrate smart contracts with existing systems
(university database, verification services and govt. authorities such
as
UGC and AICTE).

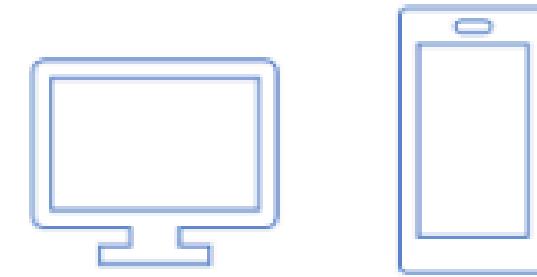
Monitoring and Upgrades

Smart contracts may need to accommodate changing
requirements.





Issuing Service

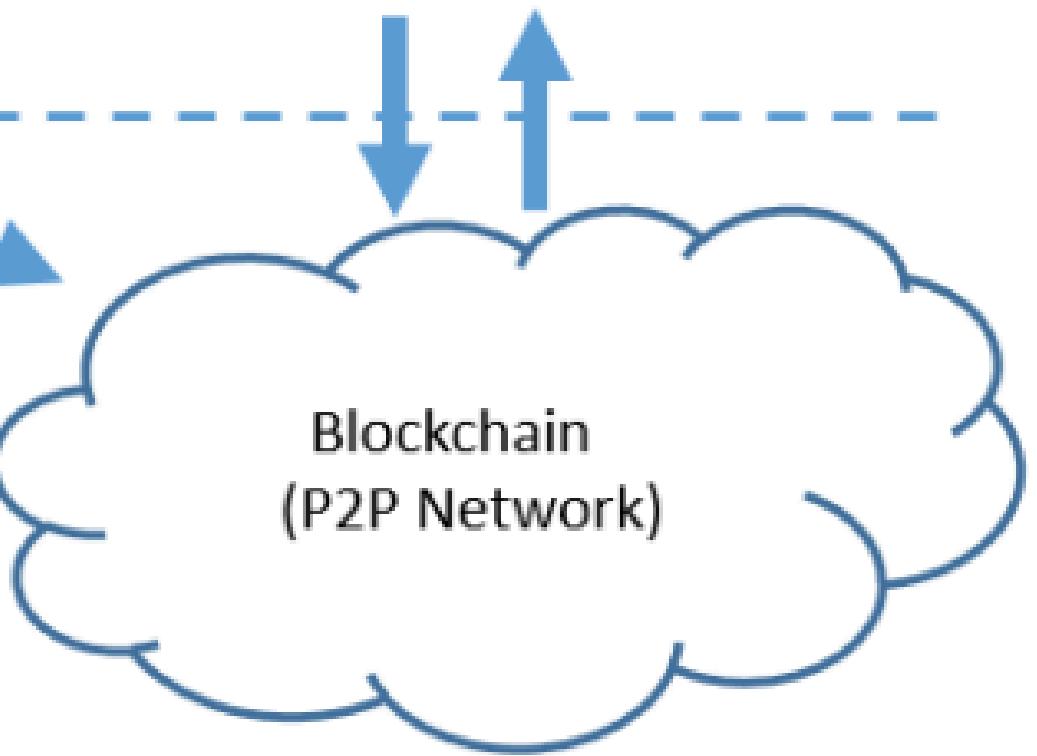


Verification Service

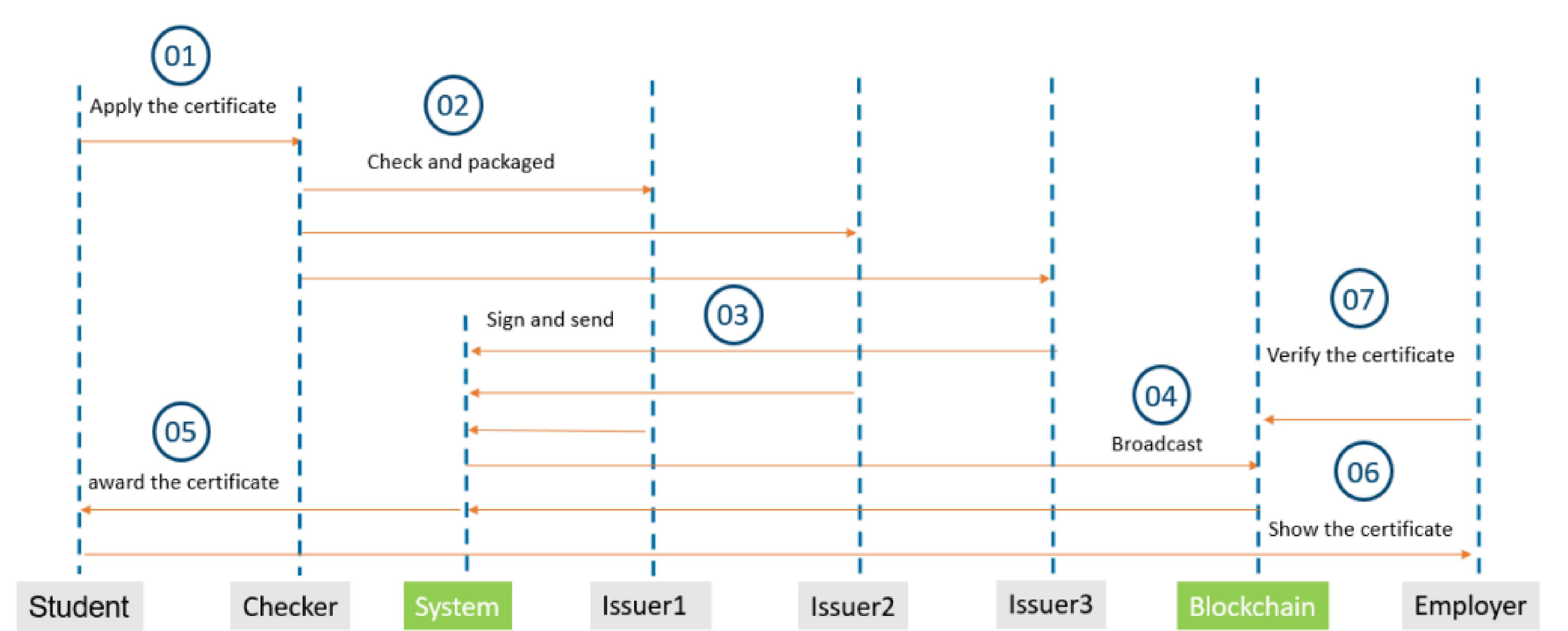


payload

hash value



top level data flow diagram
The flow is unidirectional



Prototype workflow

Costing

Server Hardware: depends on specifications & qty of servers needed.
A ballpark figure ranges from \$2,000 to \$10,000 per server.

Networking Equipment: switches, routers, load balancers range from a few hundred dollars to several thousands.

Blockchain Nodes: a basic Ethereum node setup cost a few hundred usd.

Database Licensing and Hardware: depends on the database system.

Security Measures:

Maintenance and Support:



Outcomes & Future Scope

Data security is one of the major features of blockchain technology. Blockchain is a large & open-access online ledger in which each node saves & verifies the same data. Using the proposed blockchain-based system the odds of certificate forgery are eliminated. Companies can thus inquire for info on any certificate from the system. In conclusion, the system assures information accuracy and security.

Referencing & Acknowledgement

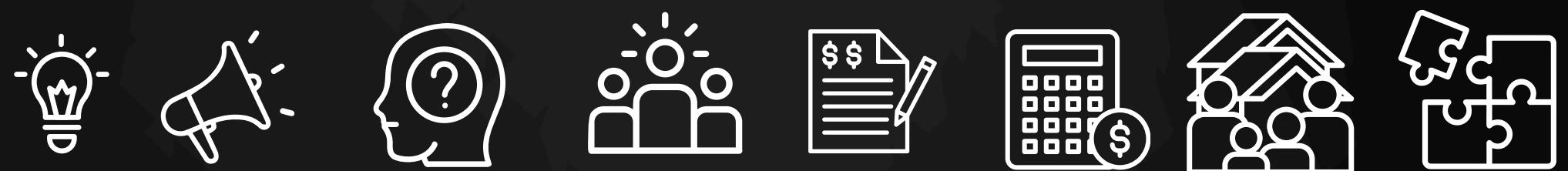
Blockchain based Academic Certificate Authentication System Overview

A System for Academic Certificates Verification Using Blockchain

Online Certificate Validation Using Blockchain



THANK



YOU

