



Digital Certificates using Blockchain

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Problem Statement

- The problem here is the wide **forgery** of School, Bachelor and Masters Degrees in Egypt which may have disastrous impact on the society and the inconvenience of the process of **requesting** and **issuing** a certificate and the huge waste of time it costs.

Introduction (1/3)

- 94% of the forged certificates in Kuwait were Egyptian in 2018.
- 44 of the 47 fraud certificate cases were Egyptian universities.



Introduction (2/3)

What is Blockchain?

Characteristics of Blockchain:

- Consensus
- Provenance
- Immutability
- Finality

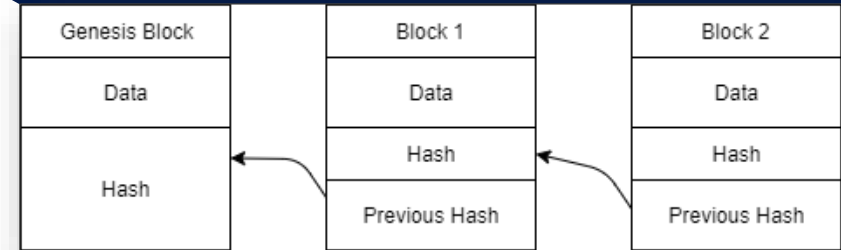


Figure 1: Blockchain



Introduction (3/3)

Types of Blockchain:

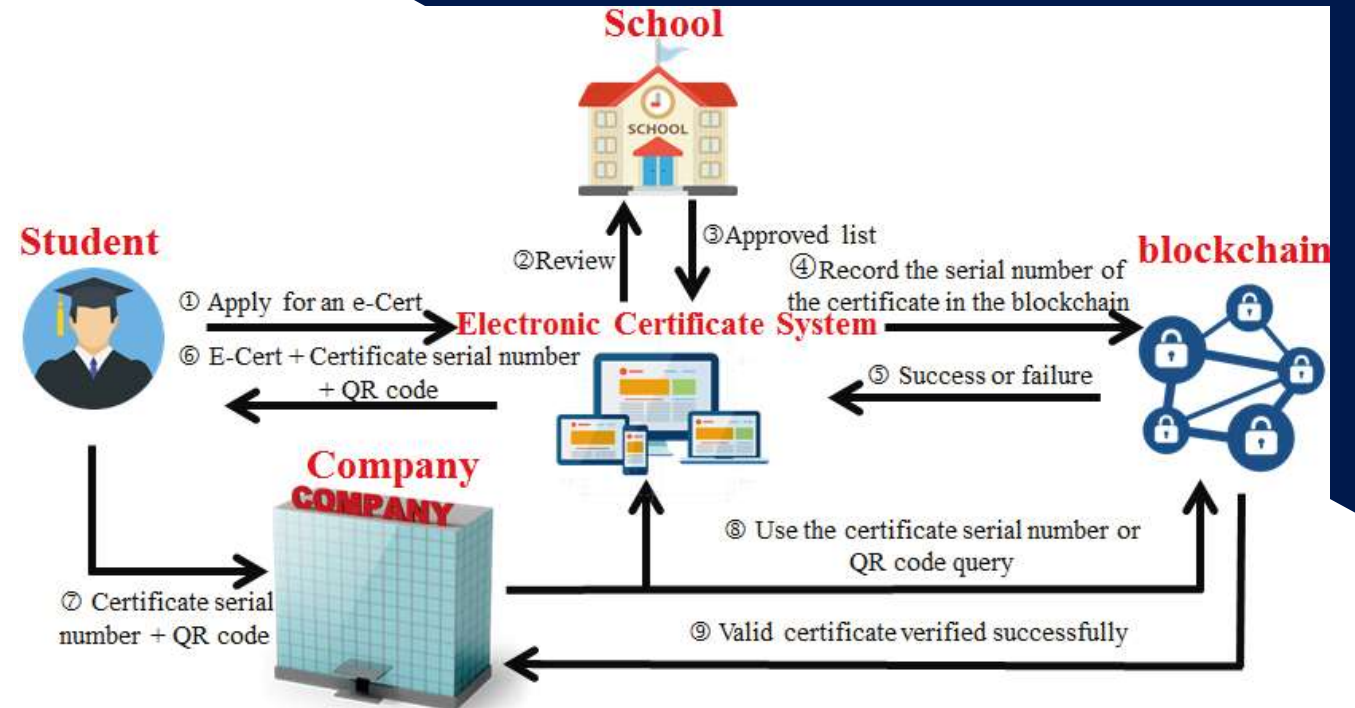
- Public
- Private
- Permissioned



Related Work (1/2)

Blockchain and Smart Contract for Digital Certificates. (2018)

- Technologies used:
 - Ethereum Virtual Machine.
 - Solidity
 - Smart Contracts
- Outcome:
 - An Electronic-Certificate.
 - Serial Number.
 - Data recorded on the Blockchain



Related Work (2/2)

Point of Comparison	Framework Used	Network Type	Permission	Assets	Participants
Blockcerts	BitCoin Blockchain	Public	Not Permissioned	All types of Certificates	Institutes , Universites , School , Students
CVSS	Ethereum Blockchain	Public	Permissioned	Educational Certificates	Institutes , Universites , Schools , Students
EduCTX	ARK Blockchain	Public	Permissioned	Educational Certificates	Institutes , Universites , Schools , Students
Our System	Hyperledger Fabric	Private	Permissioned	University Certificates	Institutes , Universites , Schools , Students

Technologies

Hyperledger Fabric: (Used)

- Private permissioned blockchain
- Includes Smart Contracts.

We also tried:

- Hyperledger Indy: **(Not Used)**
- Ethereum Blockchain: **(Not Used)**

	Ethereum	Hyperledger fabric	Hyperledger indy
Purpose	For business and generalized application	General purpose and high flexibility of permissions	built for decentralized identity
Mode of Peer Participation	Permissionless, Public	Permissioned, Private	Permissioned, Public or Private
Consensus Mechanism	Proof-of-Work algorithm	No mining required	No mining required
Smart contract	Smart Contract written in (e.g., Solidity)	Smart Contract written in (e.g., Go, JavaScript (Node.js))	Not supporting any smart contract
Cryptocurrency	Cryptocurrency called ether	No built-in cryptocurrency	No built-in cryptocurrency
Governance	Ethereum developers	Linux Foundation	Linux Foundation

System Overview(1/2)

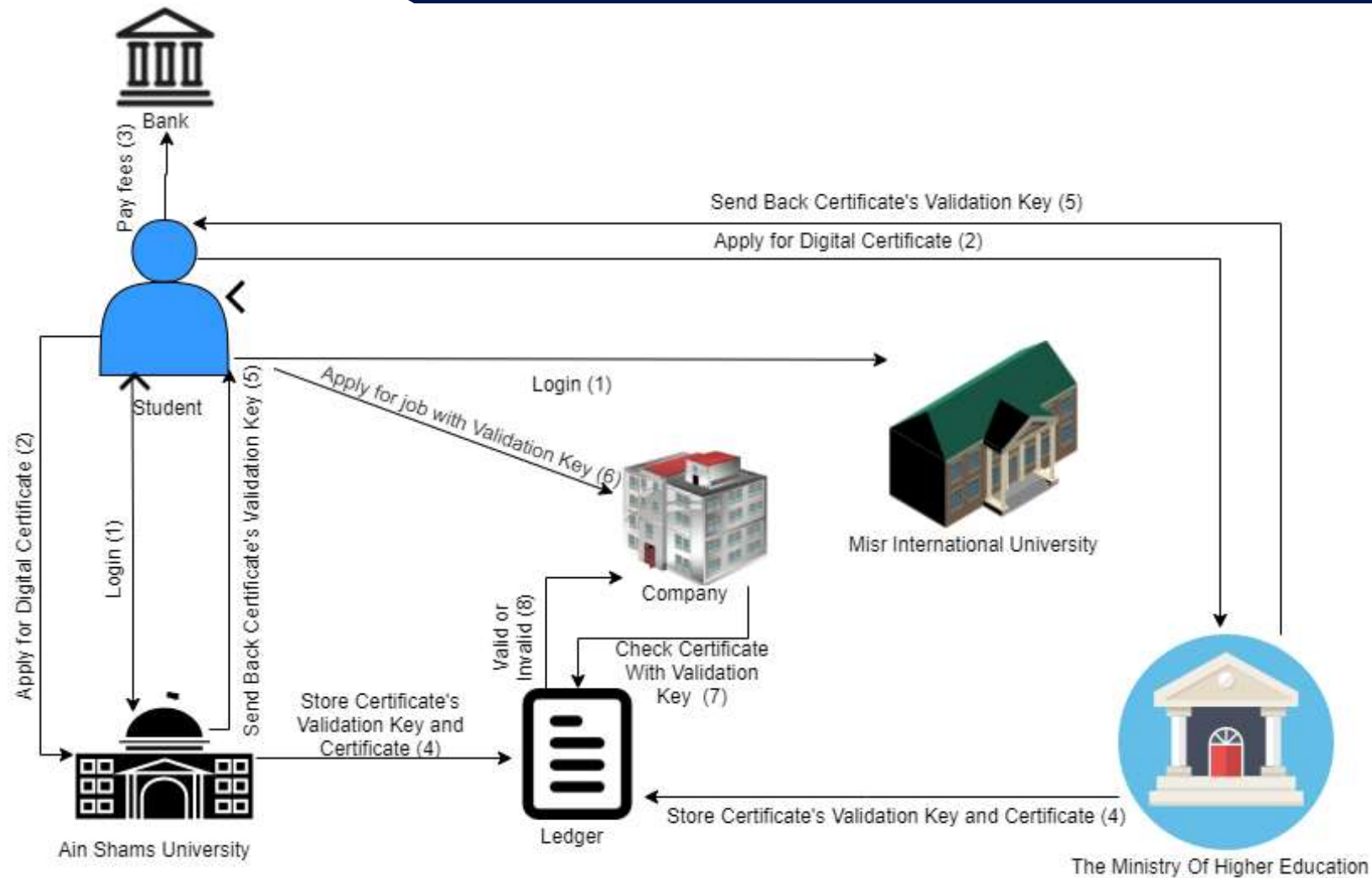


Figure 4: System Overview.

System Overview(2/2)

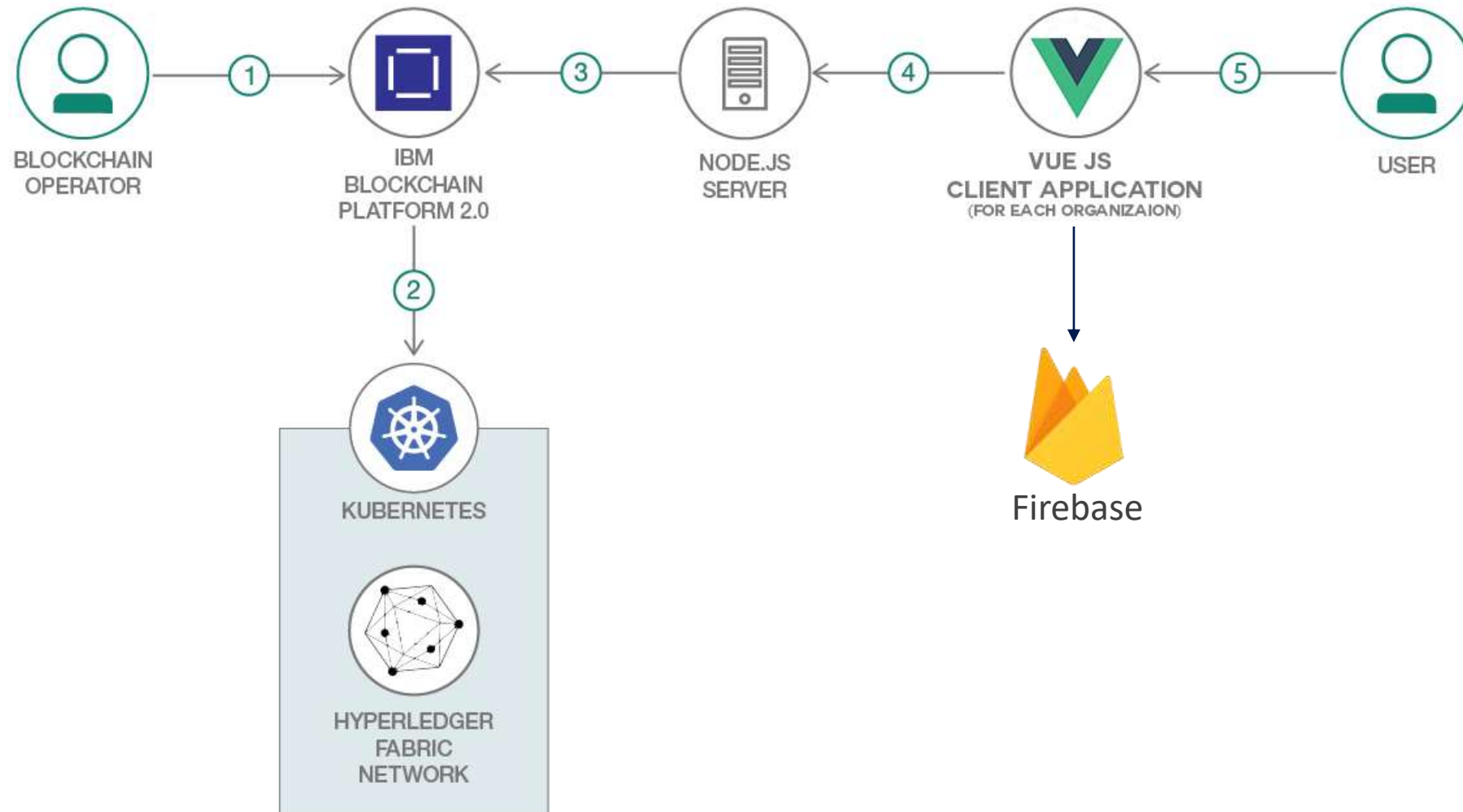


Figure 5: System Overview.

Network Topology

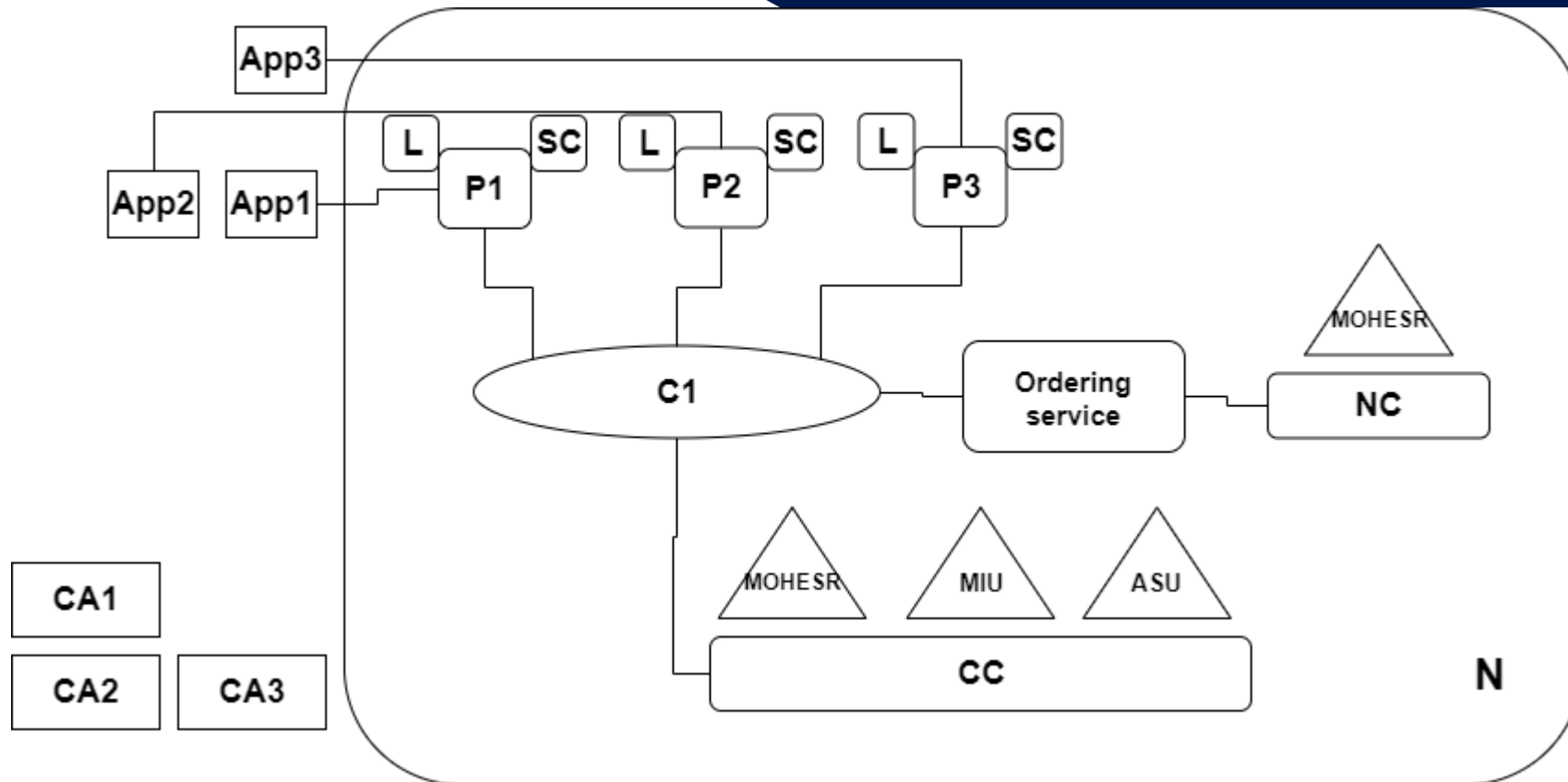
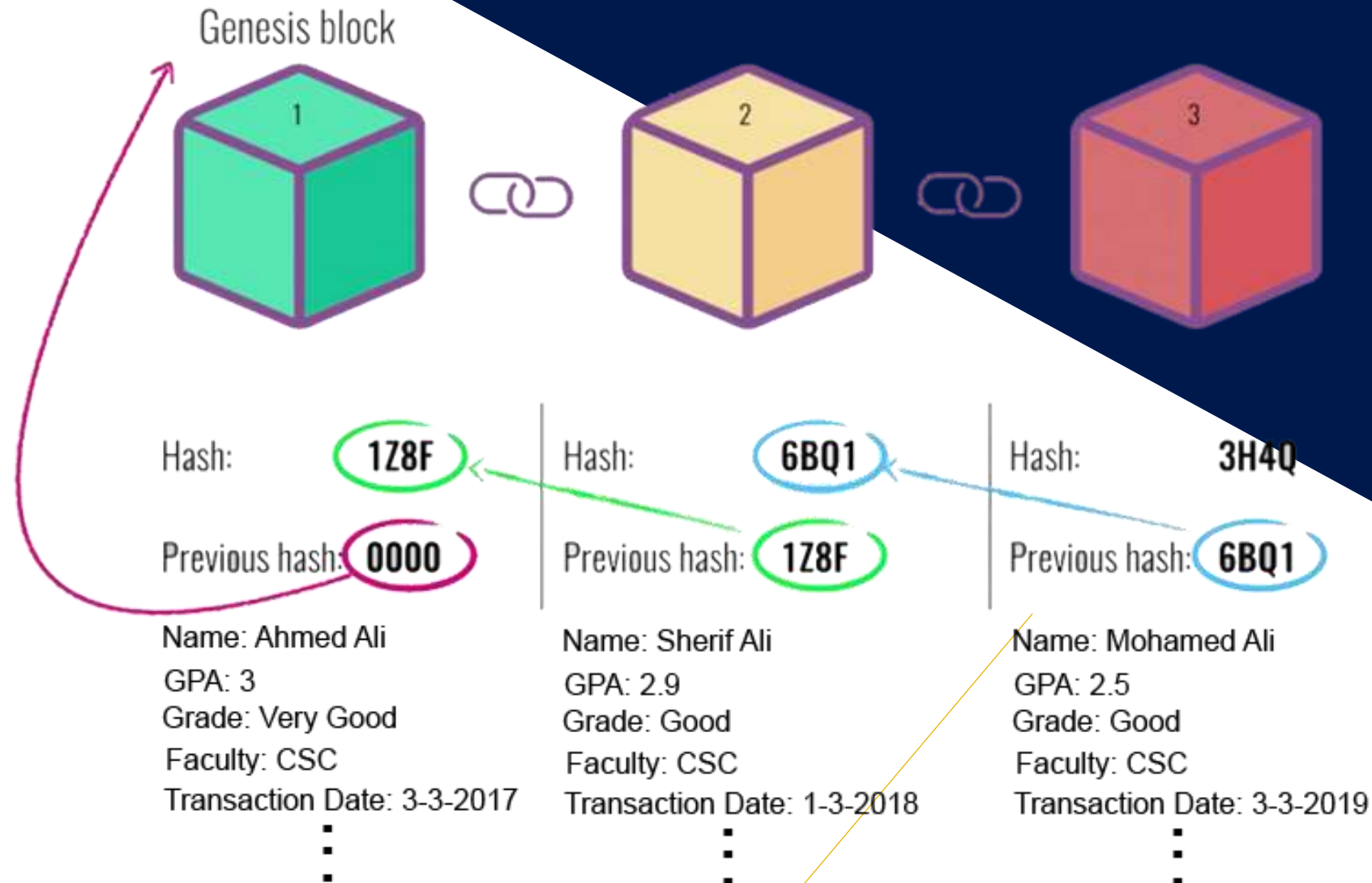


Figure 14: Network Topology.

Blockchain Representation



GUI (Graphical User Interface)(1/3)

PUBLIC UNIVERSITY Home Logout Student ID: 0000

- Register Admin
- View All Certificates
- Statistics
- Request Certificate
- View Requests
- Logout

Please fill the certificate information

Full Name
Full Name is required

National ID
National ID is required

GPA
Minimum GPA is required

Grade
Grade is required

Faculty
Faculty is required

Please upload a snapshot of the certificate
File name is required

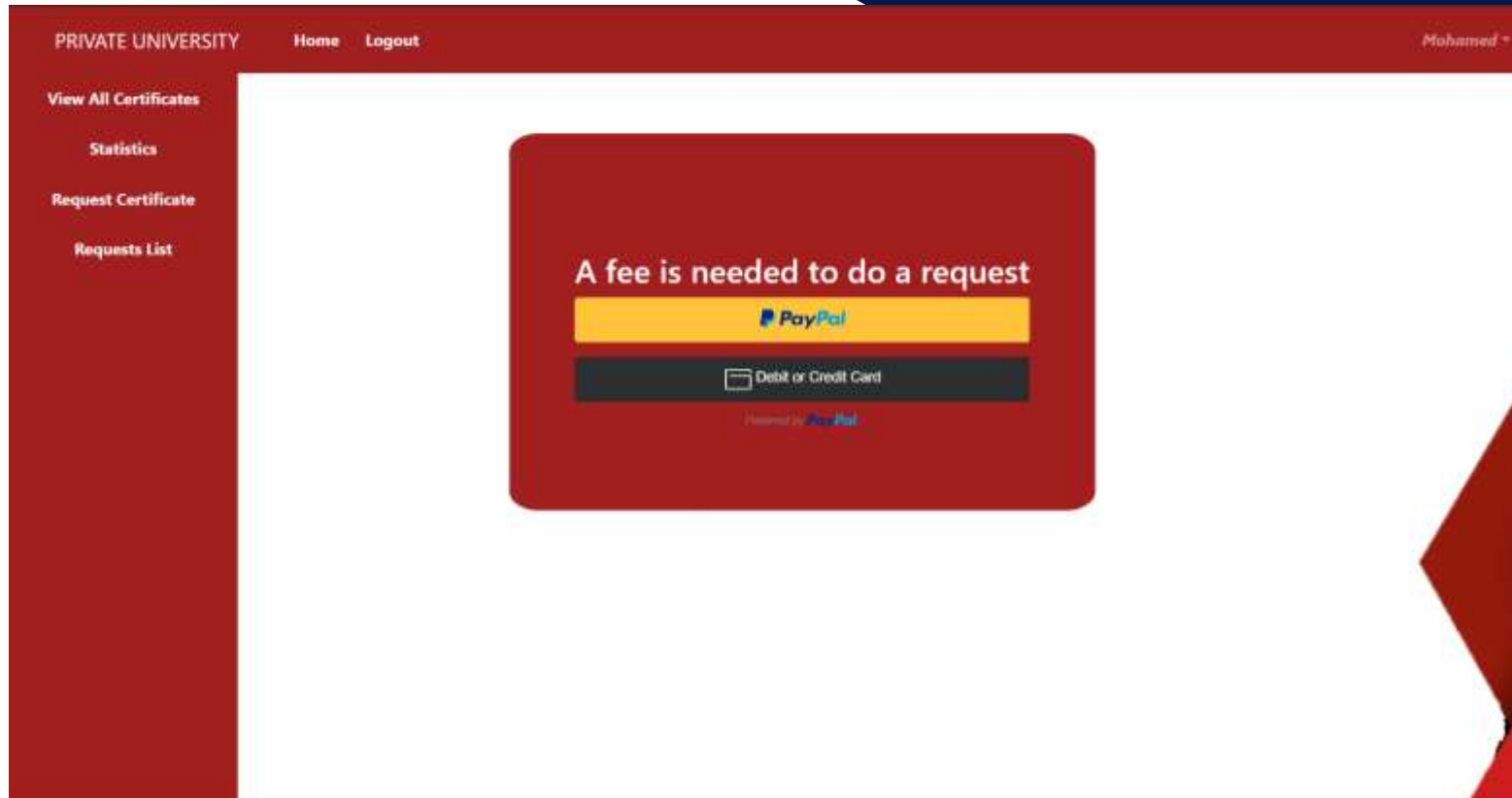
PUBLIC UNIVERSITY Home Logout Student ID: 0000

- Register Admin
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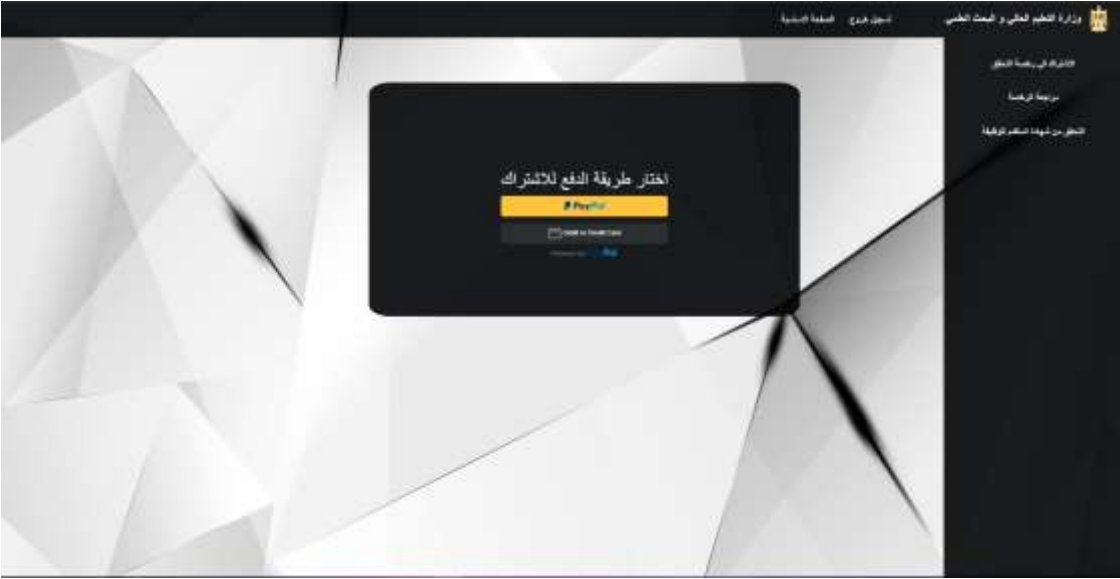
A fee is needed to do a request

[Pay Now](#)

GUI (Graphical User Interface)(2/3)



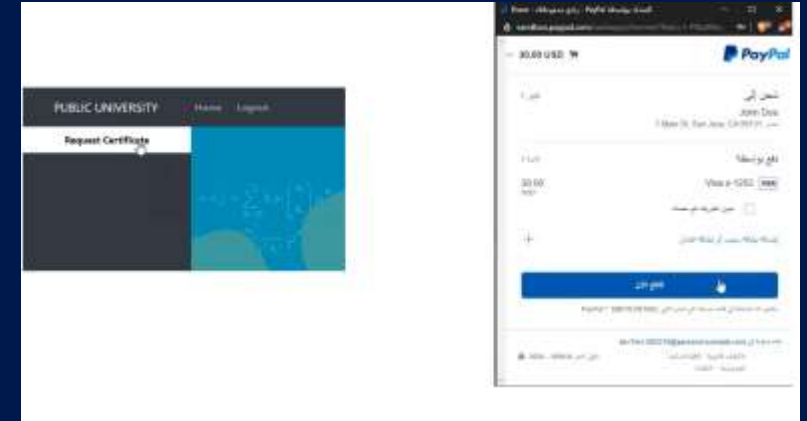
GUI (Graphical User Interface)(3/3)



Experiment (1/3)

Evaluating payments reliability - Students

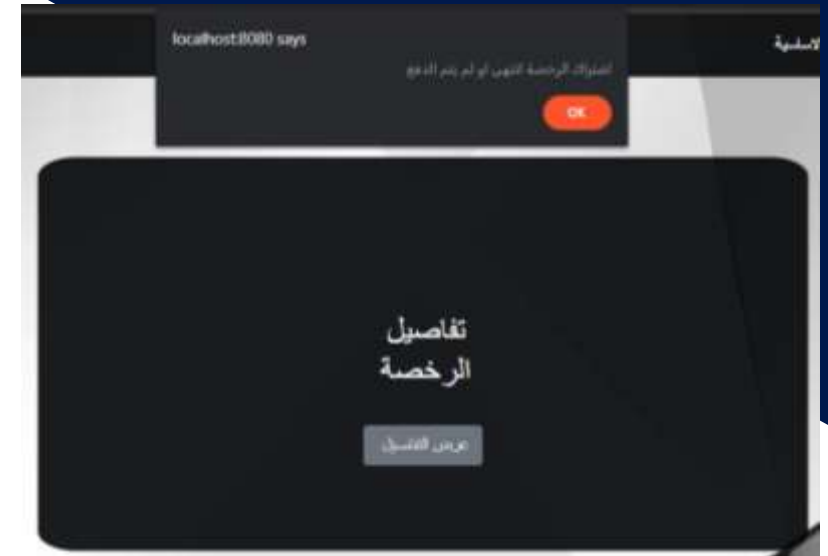
- Goal:
 - Make the student's certificate available on the blockchain for one year till expiration
- Result:
 - Accepting the student's request.
 - Fill his certificate information then put it on the blockchain.



Experiment (1/3)

Evaluating payments reliability - Recruiting Company

- Goal:
 - The goal is to make the company able to verify their employees or newly hired certificate once the company's payment is confirmed.
- Result:
 - After paying the required fee, the company now has access to the portal which they can verify certificates on it for only until paying duration expire



Experiment (2/3)

Evaluating Certificate Validation

- Goal:
 - To check the applied student's certificate whether it is valid or not valid.
- Result:
 - When the admin enters the student's serial number The system should respond with a feedback if it is valid or invalid.



Experiment (3/3)

Evaluating Statistical Analysis

- Goal:
 - Making a visual representation of the data on the blockchain through statistical charts.
- Result:
 - Represent stored data in blockchain in appropriate way to help in making decisions.



System Results

- Ministry of Higher Education and Scientific Research and Public Universities will be able to put students certificates on the blockchain.
- Students will have easier issuance cycle of certificates than the traditional way.
- Companies and employers will be able to verify the certificates of their employees or who applied for a job.
- Since certificates were digitized they can be used for statistical analysis easily.
- Most importantly the certificates will be secured from forging.

Paper Submission:

- 9th International Conference on Software and Information Engineering (ICSIE 2020)

Notification of Acceptance of ICSIE 2020-E062



icsieconf <icsieconf@163.com>

to alley1602890, mohamed1608694, sherif1611233, shehabEldin1603312, ayman.nabil, Radwa.mohamed

Mar 3, 2020, 11:43 AM (3 days ago)



Dear Alley El-Dorry, Mohamed Reda, Sherif Abd El Khalek, Shehab El-Din Abo El-Rejal, Ayman Nabil and Radwa Mohamed,
Thank you for your waiting.

After reviewing, the reviewer recommend that your paper can be included and published into the following journal. **Journal of Advances in Information Technology (JAIT)**, which will be indexed EBSCO; Google Scholar; CrossRef; etc. If you choose publish your paper in JAIT journal, you can have 100\$ discount during your registration.

But if you don't want to publish the paper in the journal, you can choose include and publish your paper into ICSIE 2020 conference proceeding by International Conference Proceedings Series by ACM (ACM (978-1-4503-7721-8). Which will be indexed by **Ei Compendex** and **Scopus**.

For more information, pelase refer to the attached notification of acceptance.

Demo



Any Questions?
Thank You