ChainHire: A Privacy-Preserving and Transparent Job Search Portal Using an Enterprise-Level Permissioned Blockchain Framework

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Publications

[1] S. Ghosh, R. Islam, A. Jaman, A. Bose and A. Roy, "ChainHire: A Privacy-Preserving and Transparent Job Search Portal Using an Enterprise-Level Permissioned Blockchain Framework," *2023 International Conference on Advances in Intelligent Computing and Applications (AICAPS)*, Kochi, India, 2023, pp. 1-6, doi: 10.1109/AICAPS57044.2023.10074582. **(Published in IEEE Xplore)**

[2] S. Ghosh, “CLI API in Hyperledger,” *GeeksforGeeks*, 03-Jan-2023. [Online]. Available: https://www.geeksforgeeks.org/cli-api-in-hyperledger/. [Accessed: 20-Feb-2023]. **(Peer-reviewed Technical Article)**

[3] S. Ghosh, A. Bose, A. Jaman, R. Islam, and A. Roy, “Hyperledger Fabric: A Game-Changer for Energy, Education, Healthcare, and Beyond.” **(Manuscript Submitted)**

Agenda

1. Introduction
2. Literature Review
3. Overview of Hyperledger Fabric
4. Proposed Model
5. Implementation
6. Evaluation
7. Conclusion and Future Work

Introduction

Background

- Job search portals provides a **platform** for both the **recruiters** and **job seekers**.
- **Sharing personal information** across unsafe channels, increases the **risk of data theft**.
- Blockchain technology is **Transparent, Immutable, Highly available,** and **Secure**.
- Blockchain is applied on **supply chain management, logistics, and financial applications**.
- **Hyperledger Fabric**, an enterprise-level open-source blockchain framework.
- Earlier **Blockchain** is **not used for Job Search Portals.**

Introduction

Motivation

Privacy	Transparency
• Job Seeker Data: No Unauthorized Sharing. • Exclusive Profile Viewing: Applied Recruiters Only. • Limited Admin Access.	• Immutable Ledger: Secure Job Records. • Verifiable Identifier. • Blockchain-Powered Job History Retrieval. • Endorsement-Based Tamper Resistance.

Literature Review

Existing Work on Job Search Platform

Features	Our Solution	Mathisugan[1], Prodhan et. al.[2], Katariya et. al.[3]	Pinjari et. al.[4]
Blockchain Platform	Yes	No	No
Smart Contract	Yes	No	No
Decentralization	Yes	No	No
Data Privacy	Yes	No	No
Data tempering	No	Yes	Yes
Technology Used	Hyperledger Fabric	MySQL	SQL Server
Implementation	Yes	Yes	Yes
Deployment	Yes	No	Yes

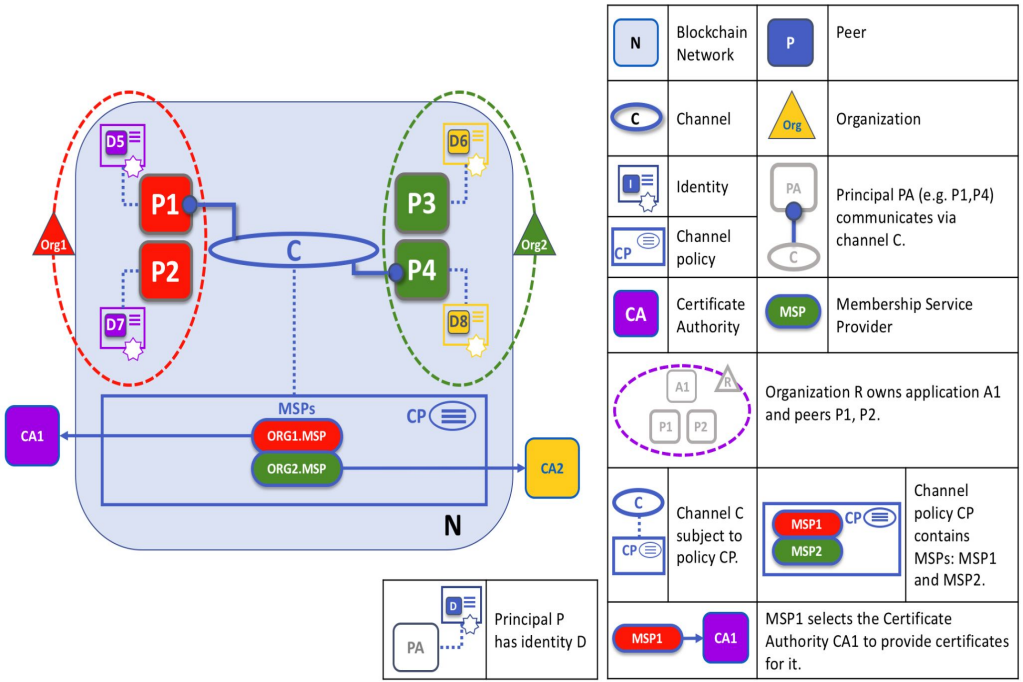
Literature Review

Existing Work on Hyperledger Fabric

Sector	Objective	Works
Energy	To trade with local energy producers.	Karandikar et. al. [5], Moon et. al.[6], Kim et al. [7]
Education	To manage student records.	Wai et. al. [8]
Healthcare	To protect patient data and supply chain management.	Amin et. al. [9], Le et. al. [10], Tang et. al. [11] Kumar et. al. [12]
Diverse Industries		BFSI [13], E-Voting [14], KYC [15], Personal Data Vaults [16], Mobile IoT devices [17], Ride-Sharing Applications [18] etc.

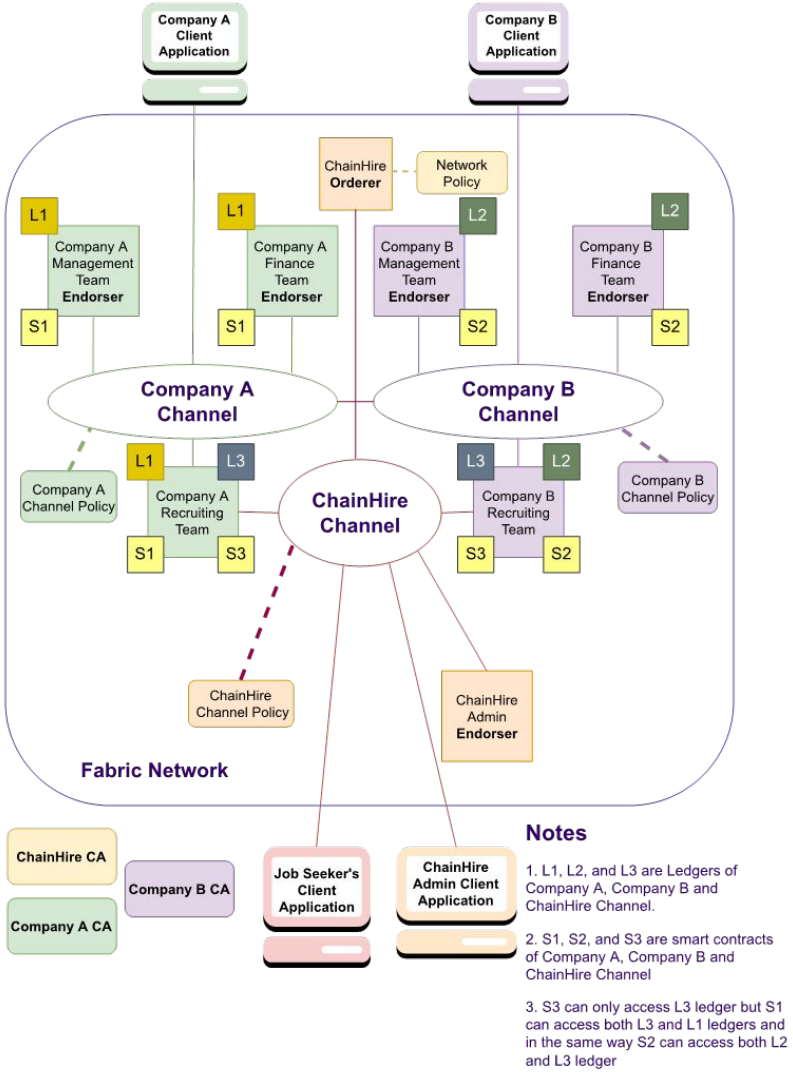
Overview of Hyperledger Fabric

- Channel
- Peers
  - Endorsing peers
  - Committing peers
  - Validating peers
  - Anchor peers
- Membership Service Provider (MSP)
- Certificate Authorities (CA)
- Chaincode
- Ledger = World State + Blockchain



Generic Hyperledger Fabric network

Proposed Model



Proposed Model

HR Contract	Admin Contract	Job seeker Contract
createJobposting()	*deleteJobseeker()*	*createJobseeker()*
hiredUpdate()	*deleteJobposting()*	*updateJobseeker()*
queryMyJobPosting()	*queryAllJobposting()*	*readJobseeker()*
readCandidates()	*queryAllJobseeker()*	*deleteJobseeker()*
deleteJobposting()		*updateJobseekerPassword()*
getJobpostHistory()		*getJobseekerPassword()*
		applyForJob()

Smart Contract Methods

Admin
View and **Moderate** job postings.
View and **Moderate** job seekers. (only basic details visible).
Recruiter
Create and **Delete** job postings.
Provides **Updates** about the **Hired** candidates.
View job seeker details (only if he/she applied for a job posted by the Recruiter).
Job seeker
Create, **View**, **Update** & **Delete** his profile.
View & **Apply** for the Job postings.

Use Case of Different Actors

Implementation

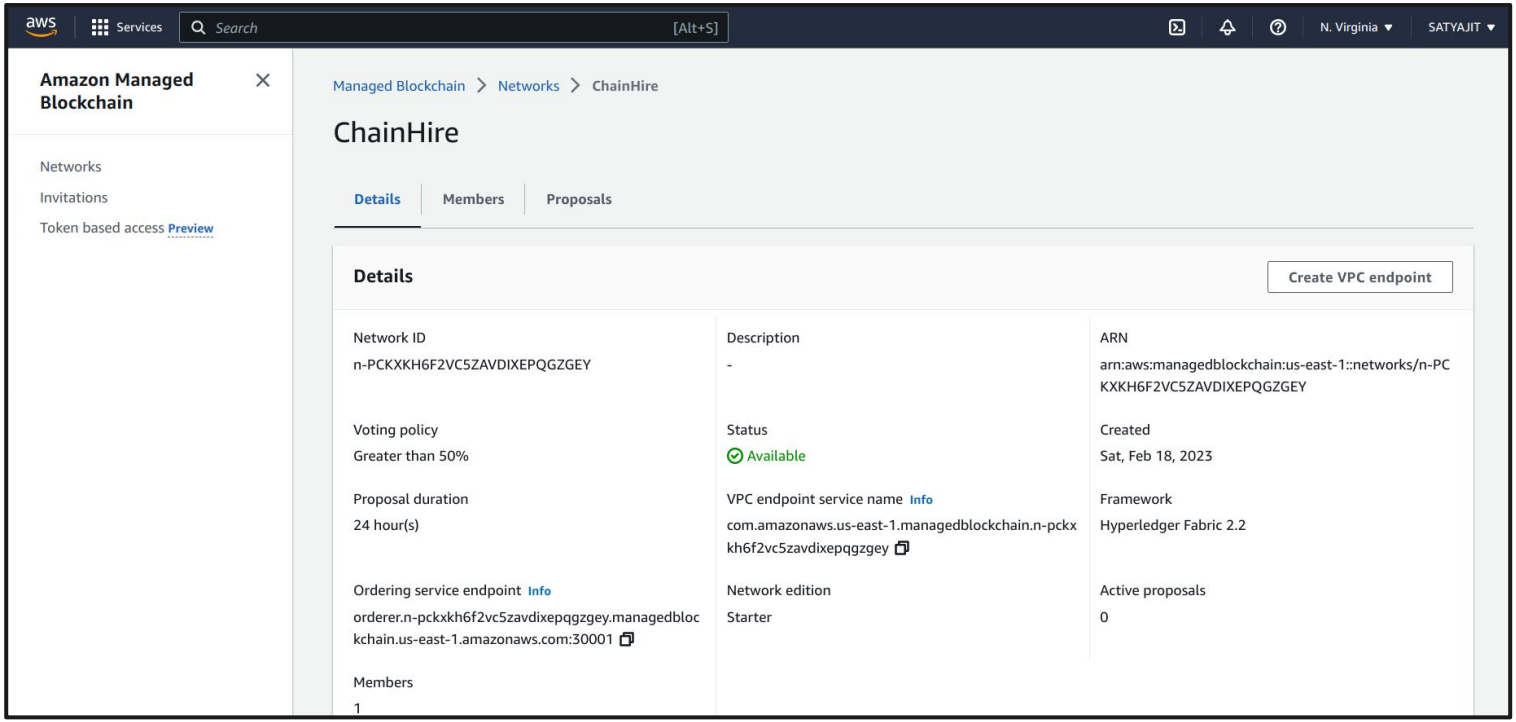
Amazon Managed Blockchain Service

Steps involved:

- Create an Amazon Managed Blockchain network.
- Configure network settings
- Create a Hyperledger Fabric channel.
- Add members to the network.
- Test and monitor the network.

Implementation

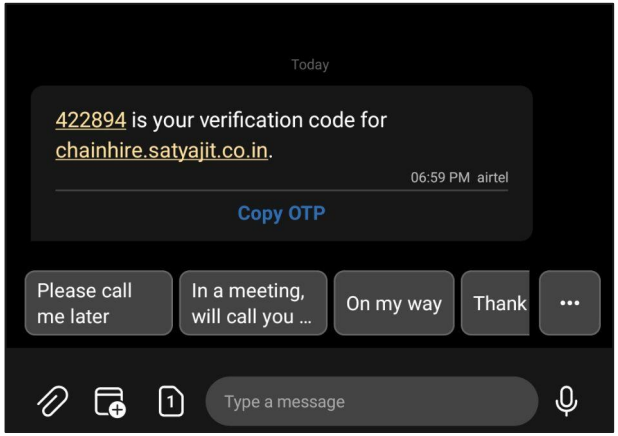
Amazon Managed Blockchain Service



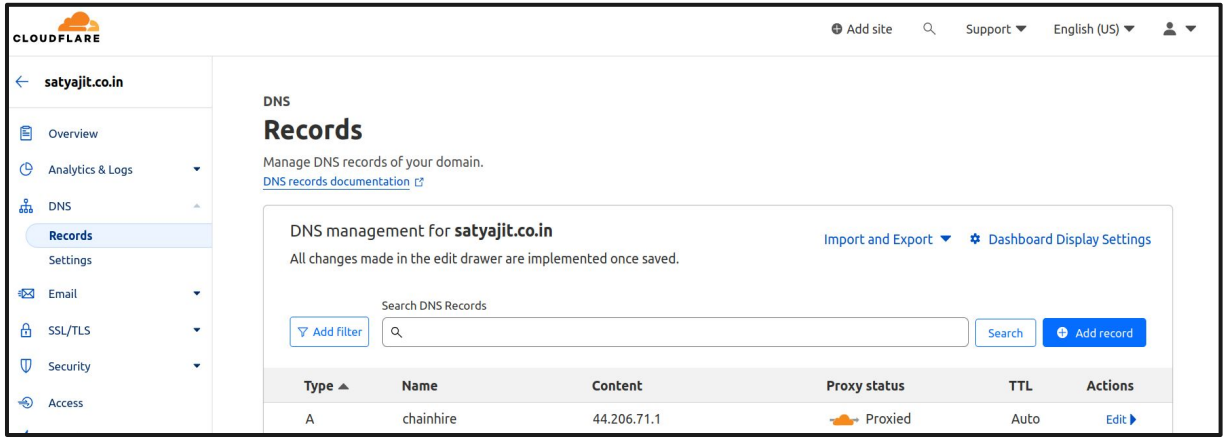
ChainHire network on Amazon Managed Blockchain Service

Implementation

Google Firebase & Cloudflare DNS



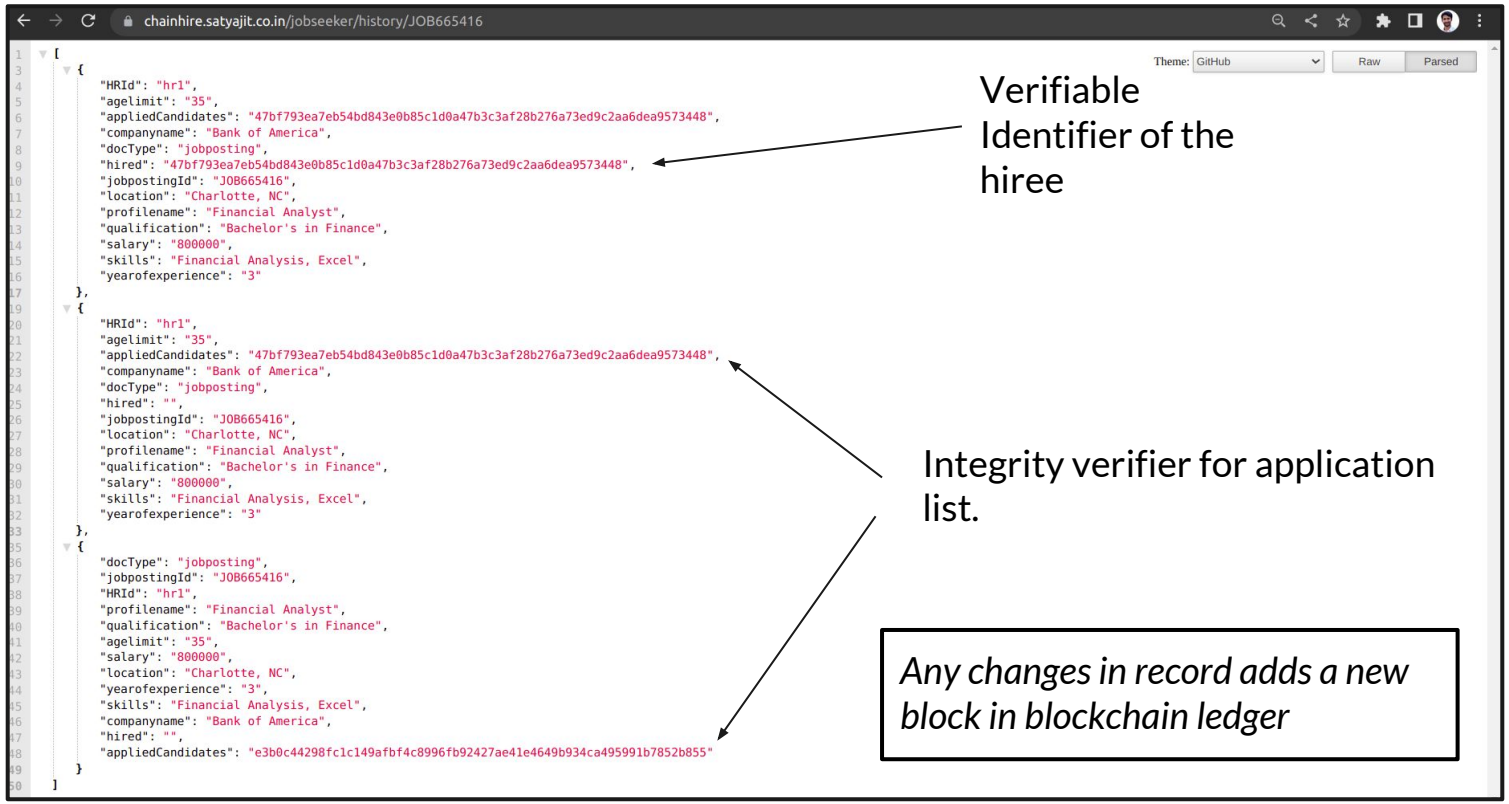
OTP verification using Google Firebase



DNS record configuration on Cloudflare

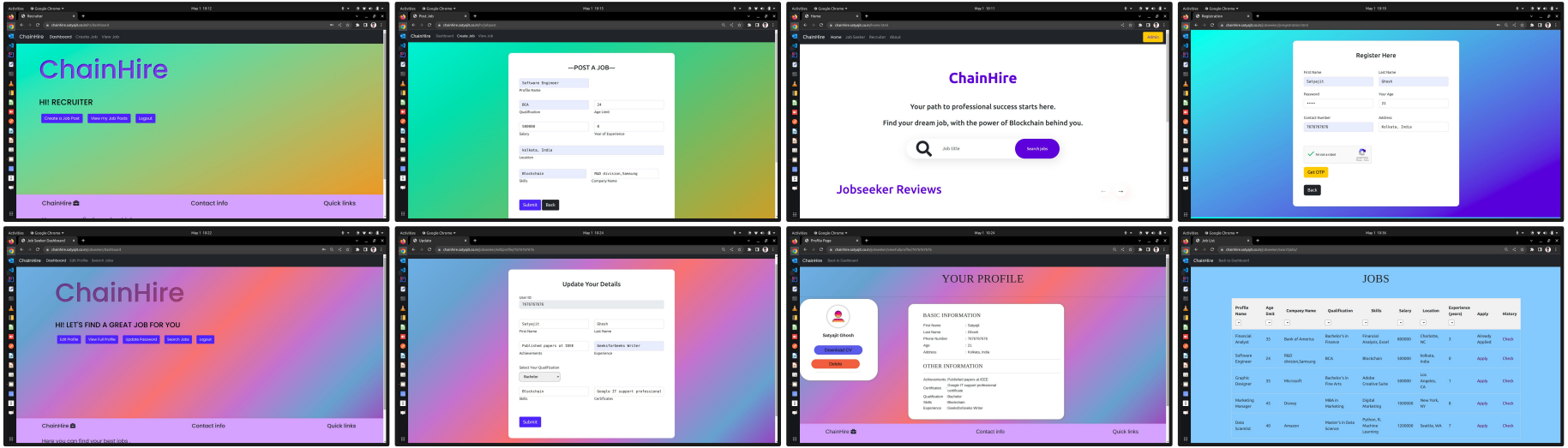
Implementation

Blockchain Ledger



Implementation

User Interface (UI)

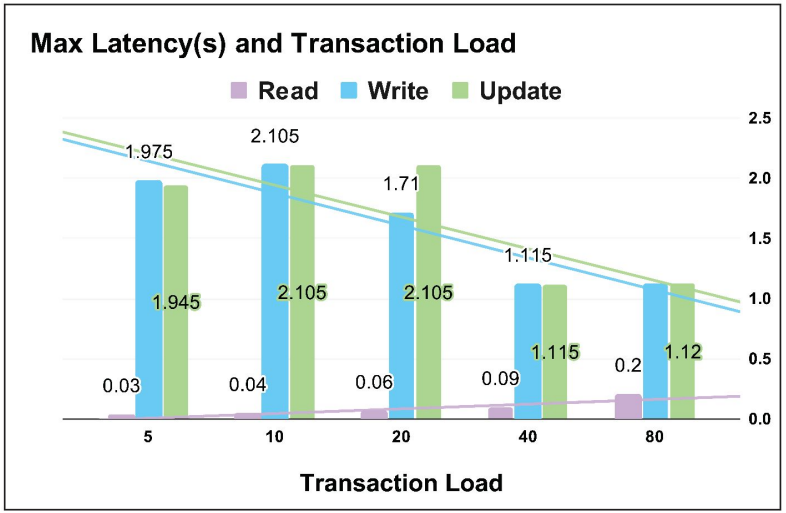


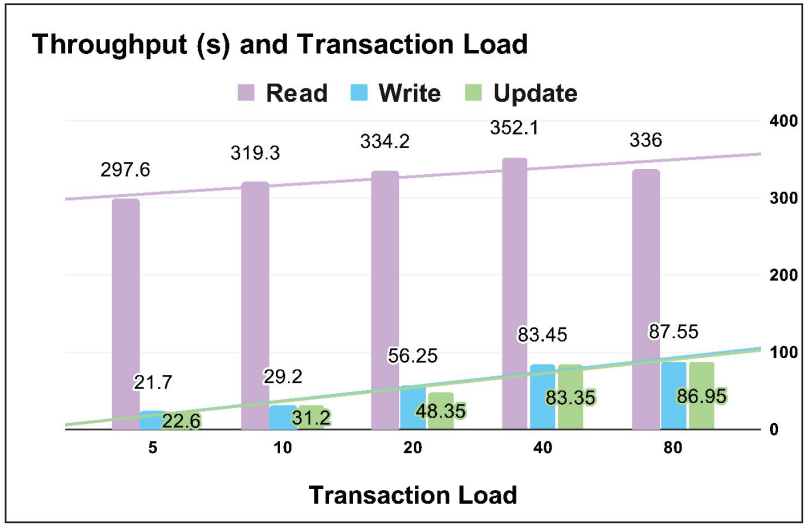
Few snippets from the User Interface(UI)

Evaluation

- **Hyperledger Caliper** is a benchmarking tool for blockchains that enables users to assess the effectiveness of a blockchain implementation.
- A system with AMD Ryzen 3 5300U processor having a base Frequency of 2.6GHz and Max Frequency of 3.8GHz with 8GB of DDR4-3200 RAM is used.
- Configured Hyperledger fabric with **Raft** ordering service with two organizations and two peers on each organization.
- The **endorsement** can be done by any peer of the organization.
- Tested with **Fixed-load** configuration that tries to **maximize throughput** by maintaining a **defined number of backlog transactions**.

Evaluation





Performance of network on different types of operation

Conclusion and Future Work

- The use of Permissioned Blockchains is **very new.**
- The use of blockchain **in non-financial sectors,** such as our proposed online job portal, **is less explored.**
- In permissioned environment blockchain **may lose** its key advantages like **trust and transparency** if endorsers are not chosen properly.
- Further research is needed to fully understand the **potential** and **limitations** of using blockchain technology in this way.
- Future plan to use **Decentralized Identifiers (DIDs)**.
- Detailed **security analysis** is required.

Conclusion and Future Work

Supplementary files and Smart Contract codes are available at

https://github.com/SATYAJIT1910/PTJSP

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Thank You

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