

CrediChain – Blockchain-Based Academic Record Management

PHASE 1 – Proposal and Idea submission

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Problem Statement:

Traditional academic record systems are often centralized, prone to data breaches, and lack transparency. Students face challenges in verifying and sharing their credentials, especially across institutions or international borders. Educational institutions struggle with inefficient record-keeping processes, and employers often find it difficult to authenticate academic qualifications, leading to increased risks of fraud.

Proposed Solution

CrediChain is a blockchain-based academic record management system designed to ensure secure, tamper-proof, and verifiable storage of student credentials. By leveraging blockchain's decentralized architecture, CrediChain enables institutions to issue academic records that are cryptographically secured and permanently recorded on-chain. Students gain full control over their credentials, with the ability to share them securely with third parties. This solution promotes trust, transparency, and efficiency in academic record verification for students, institutions, and employers alike.

Objectives

- Build a secure, tamper-proof academic record management system using a custom blockchain.
- Develop a user-friendly web interface for students, institutions, and employers.
- Implement RESTful APIs for record issuance, verification, and access control.
- Utilize Docker for consistent, portable, and scalable deployment.
- Store academic records in an encrypted SQLite database with future migration planned to MongoDB.
- Ensure adherence to academic data privacy standards and best practices.

Innovation & Uniqueness

- **Custom Blockchain Implementation:** Built from scratch in JavaScript with no reliance on third-party blockchain platforms, ensuring full control and transparency.
- **Role-Based Access Control:** Distinct roles for students, institutions, and verifiers, with fine-grained access permissions.
- **Immutable Ledger:** Academic records are cryptographically hashed and stored on-chain, enabling tamper-evident verification.
- **Full Dockerization:** Containerized architecture for easy deployment and testing across environments.
- **Secure Data Handling:** Incorporates encryption, data integrity checks, and education-compliance inspired safeguards to protect sensitive academic data.

Technologies to be Used

Component	Technology
Frontend	HTML, CSS, JavaScript
Backend	Node.js
Blockchain	Custom-built in JavaScript
Database	SQLite
Deployment	Docker
Dev Tools	Python scripts for DB testing

Expected Outcome

- A fully functional web-based blockchain system for managing and verifying academic records.
- Frontend interfaces for students, faculty, and institutions to interact with the system.
- A RESTful backend providing APIs for academic record issuance, verification, and user management.
- A custom-built blockchain that logs academic transactions with tamper-proof integrity.
- Dockerized deployment for seamless testing, portability, and future scalability.

Scope for Extension

- Deployment on IBM Cloud Front or other cloud platforms for global accessibility.
- Migration to MongoDB for enhanced performance and flexible, document-based storage.
- Development of a mobile version of CrediChain for students and faculty on-the-go.
- Integration of analytics and data visualizations (e.g., CGPA trends, performance insights).
- Interoperability with external systems, such as other educational institutions or verification agencies.
- Enhancement of blockchain consensus mechanisms and potential decentralization for wider trust and adoption.