



# BlockEduc

Blockchain Based Assignment Management System

Module : Blockchain Fundamentals

conducted by  
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# Project Team



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# General Introduction

**“Nowadays, digital platforms are widely used to manage academic activities such as assignments and evaluations.**

**As these systems grow in complexity, ensuring trust, fairness, and accountability becomes essential.**

**Assessment processes involve multiple actors and sensitive data, requiring reliable mechanisms for security and traceability.”**

**Therefore, How can digital systems effectively support transparent and secure academic interactions?**

# Plan

1 Problem Statement

2 Existing Solutions

3 Next-Generation System

4 Technology Stack

5 Blockchain Development

6 Platform Development

7 System Demonstration

# **Problem Statement**

## Problem Statement: Project Context



### Structural Limitations

Traditional online platforms suffer from fundamental architectural flaws:

**Limited Transparency:** Academic processes are opaque; students cannot verify the integrity of their grades.

**Centralized Control:** A single entity holds absolute power, creating a single point of failure.

**Weak Trust:** The lack of verification mechanisms breeds



### Critical Consequences

The absence of a secure and verifiable system leads to:

**Integrity Issues:** High susceptibility to cheating and unfair grading practices.

**Data Vulnerability:** Poor protection of sensitive academic data against tampering.

**No Traceability:** Instructors lack tamper-proof mechanisms for assignment management.

## Problem Statement: Project Objectives

To address these limitations, our project designs a Blockchain-Based Assignment Management System focused on three core pillars:



### Encrypted Submissions

Ensuring absolute confidentiality. Submissions are encrypted before upload, protecting sensitive academic data from unauthorized access.



### Cheat Prevention

Leveraging Immutability. Once recorded, submission timestamps and content hashes cannot be altered, preventing retro-active cheating.



### Trustworthy Interactions

Providing a verifiable system where students and instructors can audit grades and processes transparently via the Blockchain.

# Existing Solutions

## Existing Solutions: Centralized Educational Systems

### Legacy Centralized Educational Systems



#### Centralized Data Ownership

Data is managed by a single authority, giving administrators full control over academic records.



#### Lack of Traceability

Grades and submission logs can be modified without leaving an immutable audit trail.



#### Weak Submission Confidentiality

Assignments are often stored in readable formats, exposing them to cheating and data leakage.



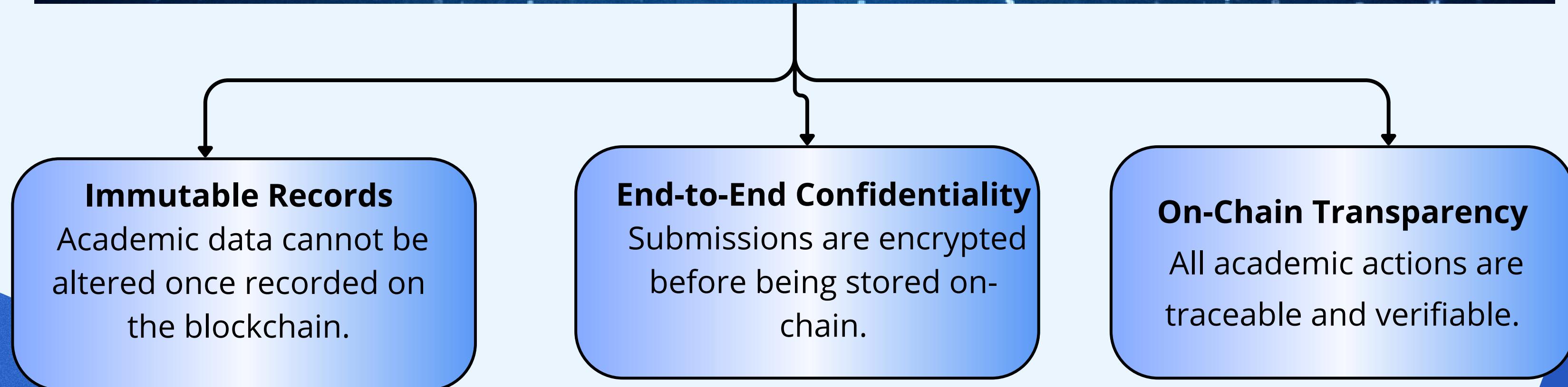
#### No Verifiable Integrity

Students have no independent way to verify the authenticity or integrity of grades and academic records.

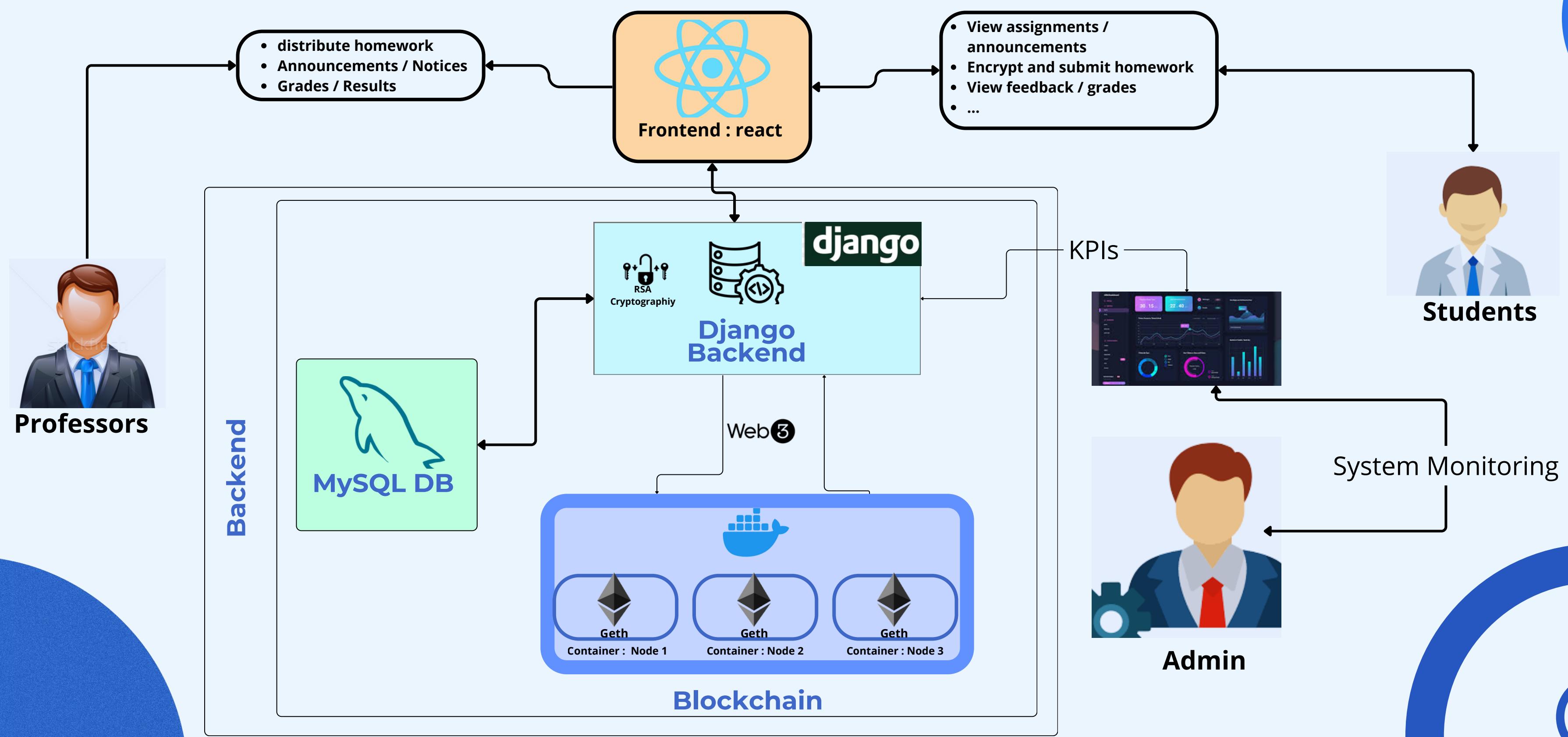
These limitations motivate the transition to a Transparent & Tamper-Proof solution

# **Next-Generation System**

## Next-Generation System: Blockchain Revolution



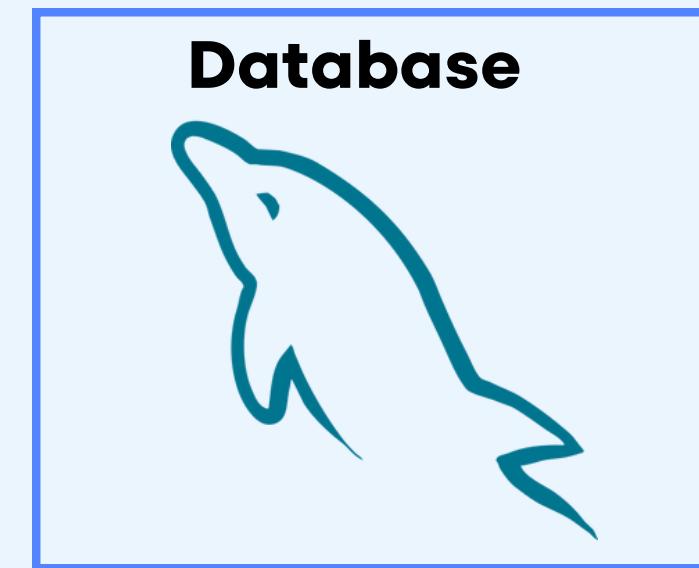
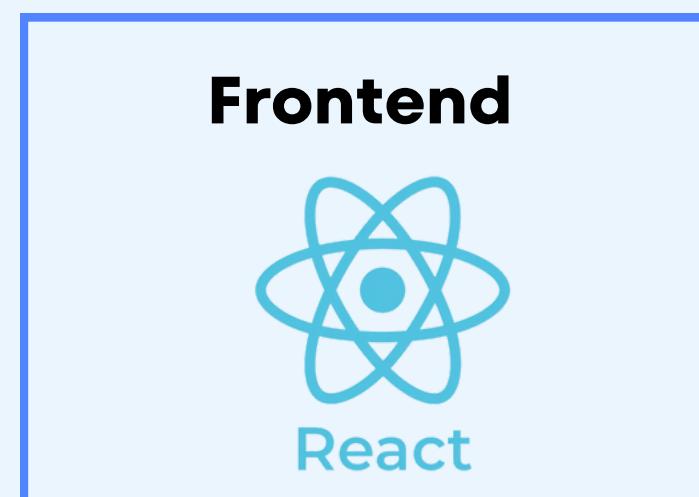
## Next-Generation System: System Architecture



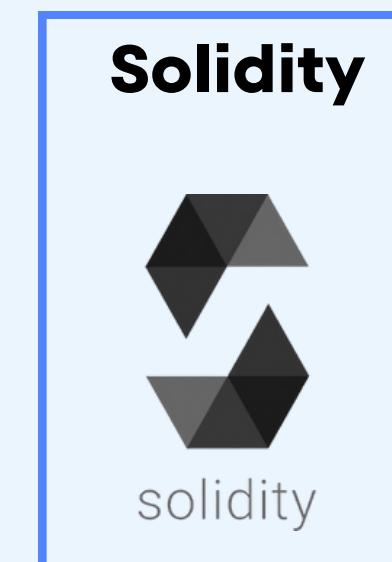
# Technology Stack

## Technology Stack

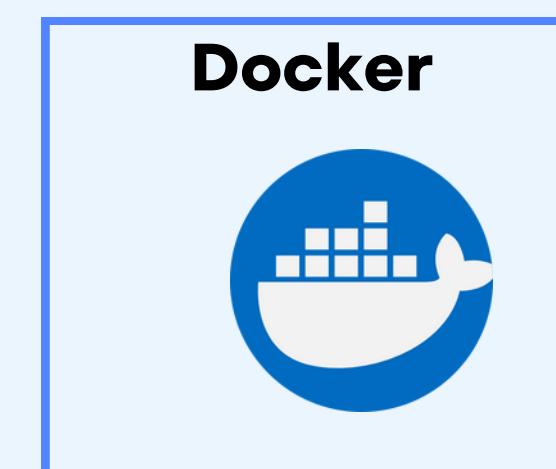
### Platform



### Blockchain



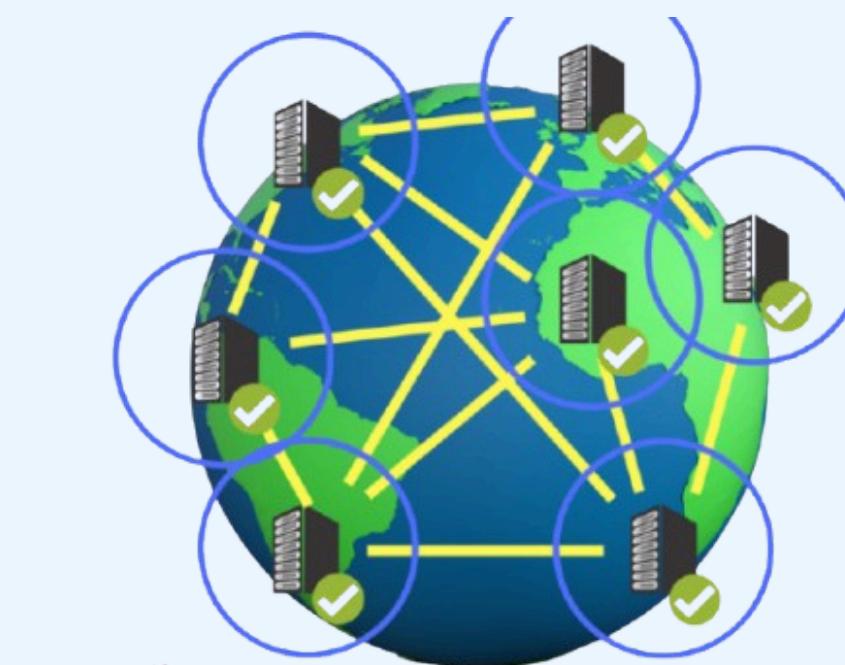
### Infrastructure & Security



# **Blockchain Development**

## Blockchain Development

### Choice of Blockchain Type



Public Blockchain

- Fully open and decentralized
- High latency
- Gas fees for every transaction
- Limited privacy for academic data



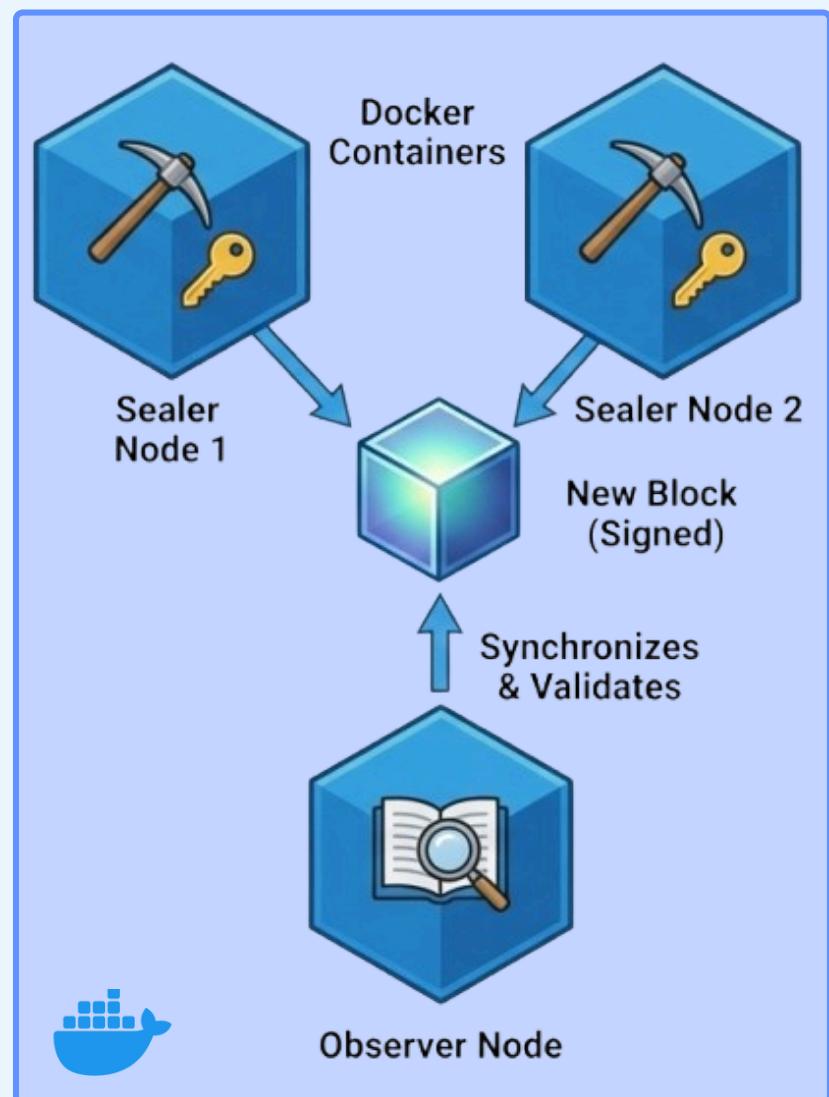
Public Blockchain

- Access restricted
- Supports privacy and regulatory compliance
- Faster block confirmation
- No transaction fees

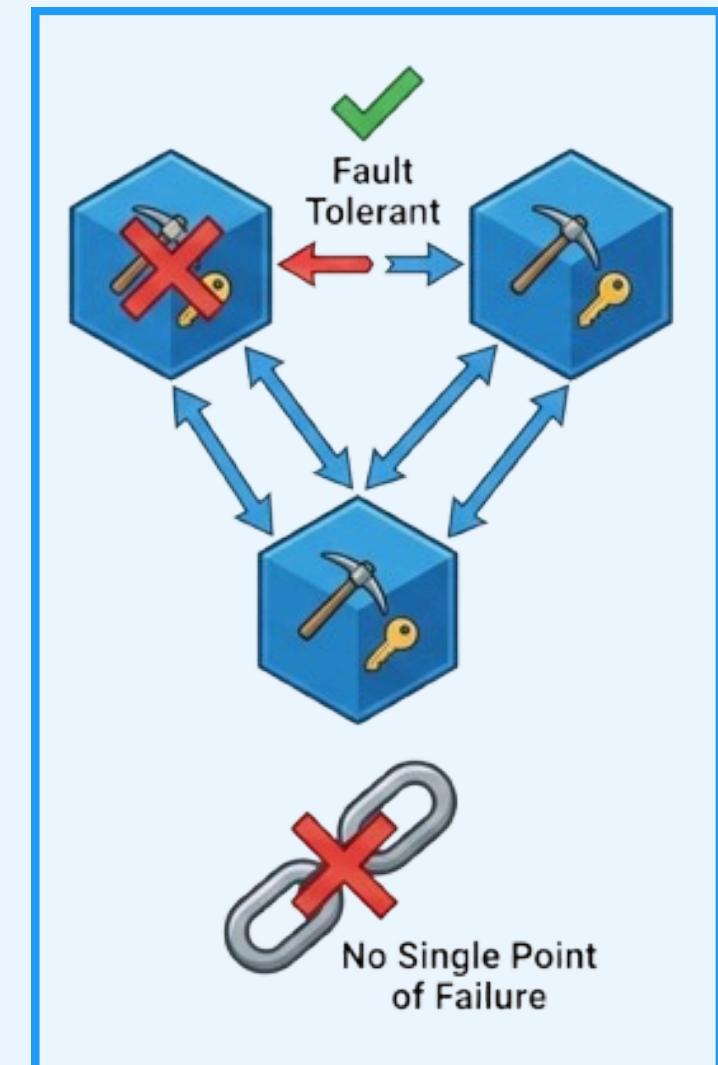
## Blockchain Development

### Blockchain Configuration

Three node architecture containerized using Docker : Two sealer nodes and One observer.



Fault tolerance and avoids a single point of failure



Proof of Authority consensus mechanism



## Blockchain Development

### Genesis Block Configuration



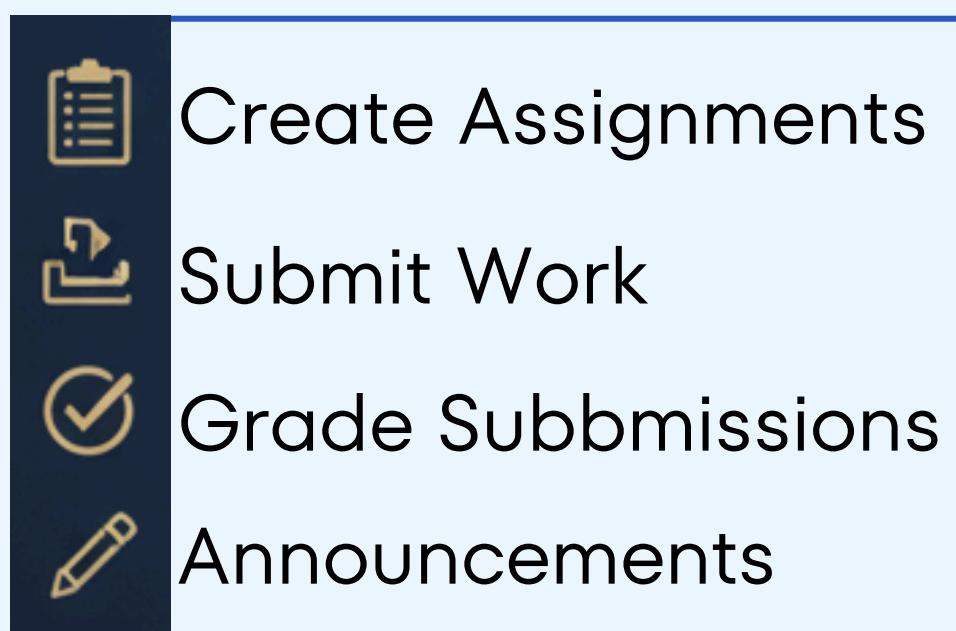
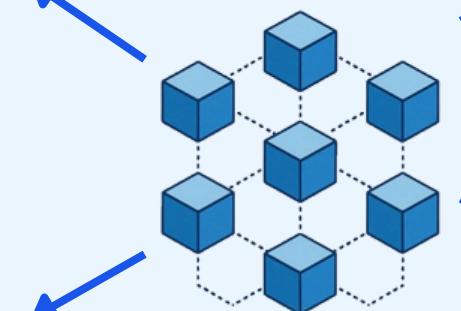
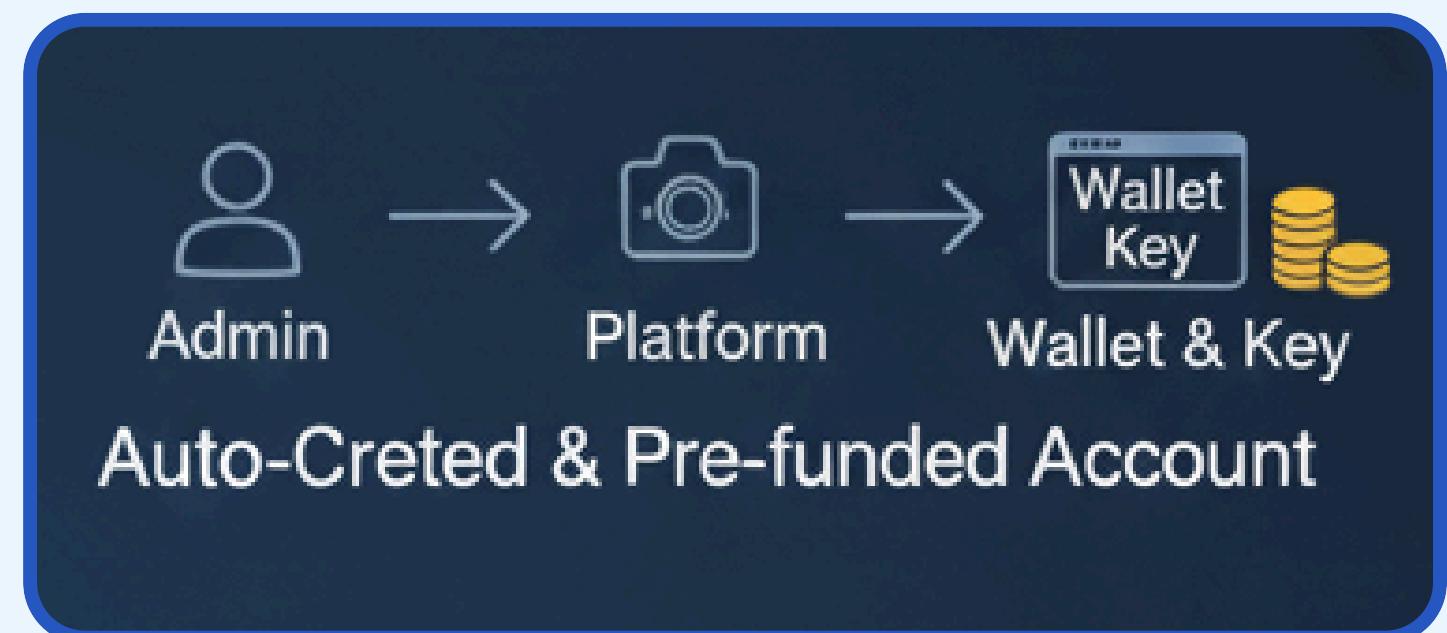
- Blockchain initialized with genesis block
- Genesis block defines :

- Consensus mechanism : Proof of Authority
- Block period : 1 second
- Chain ID : 1337
- Extra data : the list of authorized signers

ALLOC: ○ Pre funded Ethereum accounts

## Blockchain Development

### Blockchain Transactions Flow



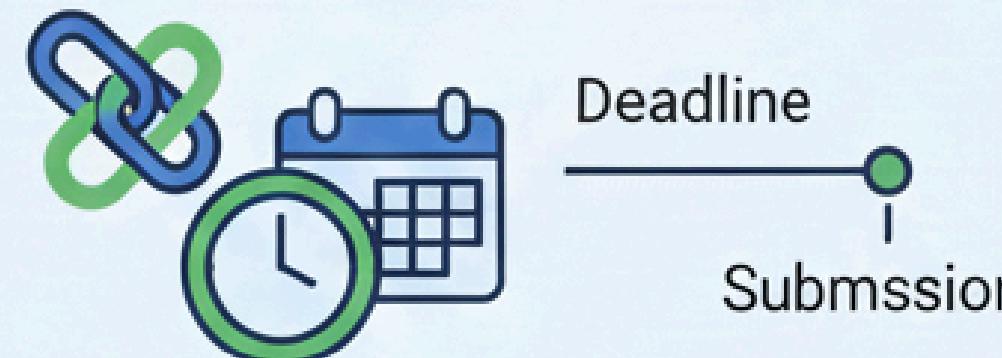
## Blockchain Development

### Security and Confidentiality

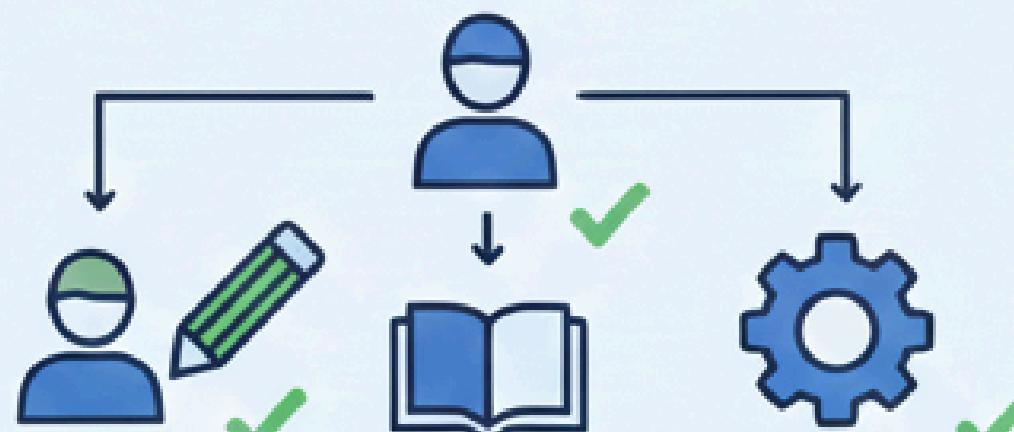
#### Data Privacy: Hashing



#### Anti-Cheating: Traceability & Timestamp



#### Access Control: Roles

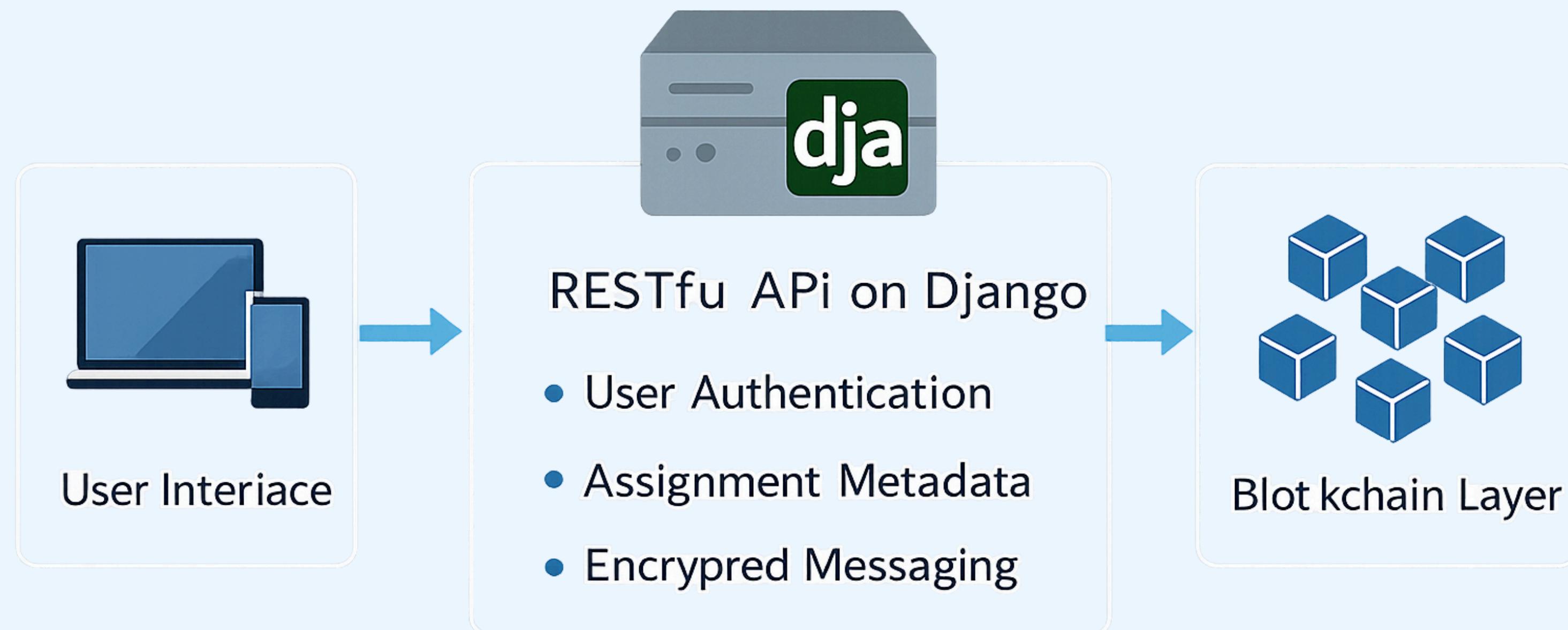


#### Data Protection: Encryption



# Platform Development

## Platform Development: API Development & Backend Logic



Scalability



Maintainability



System Clarity

## Platform Development: Data Model & Information Flow

### -Data Model Design Principles-

data model is designed to balance efficiency and transparency.



#### Off-Chain Data Storage

- User profiles are stored off-chain for performance reasons.
- Assignment descriptions are also stored off-chain to reduce blockchain load.



#### Encrypted Submissions

- Student submissions are encrypted before being processed.
- Submissions are linked to blockchain transactions rather than stored directly on-chain.

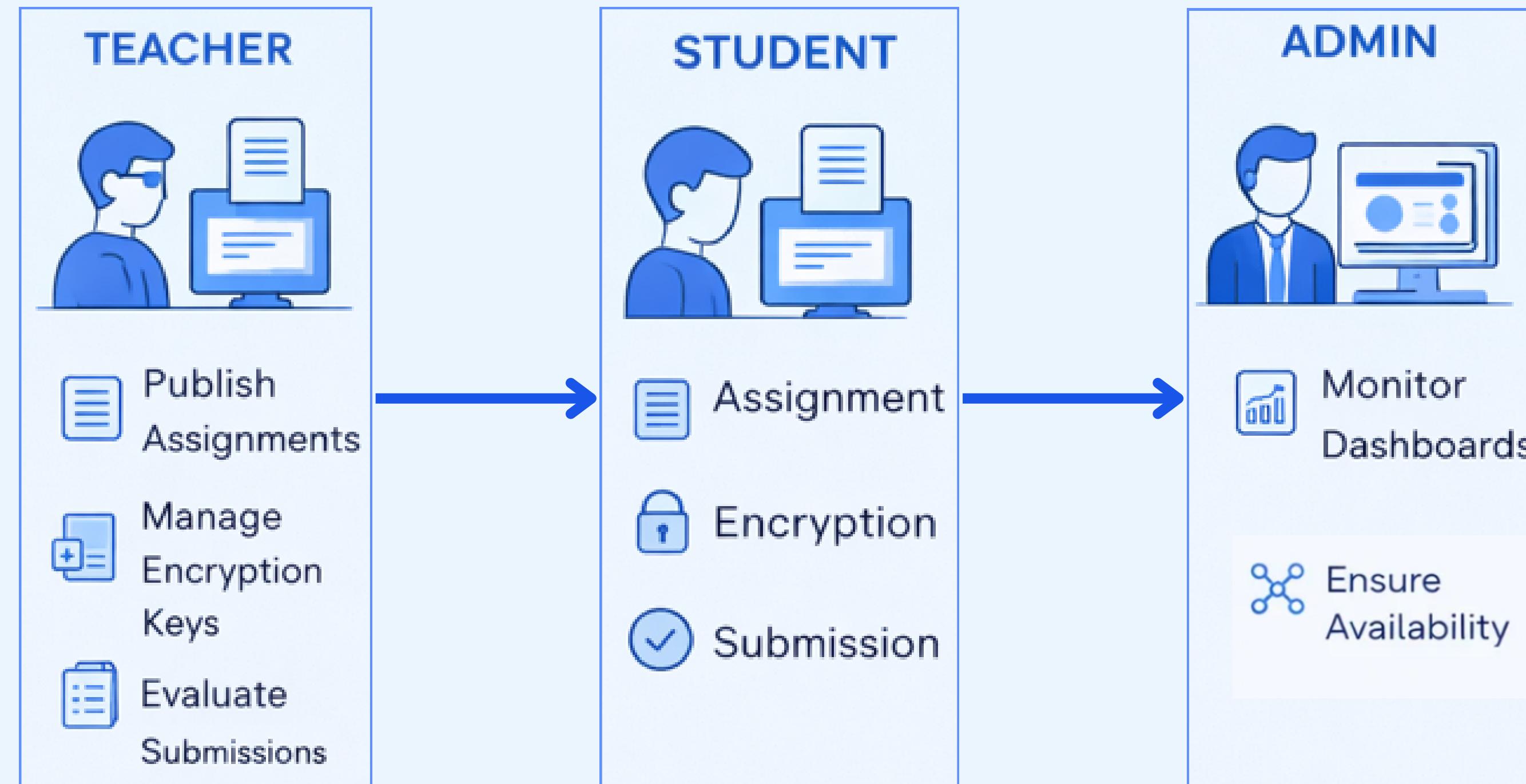


#### Results and Integrity

- Grades and results are referenced using immutable blockchain hashes.
- This approach ensures data integrity while avoiding unnecessary data exposure.

## Platform Development: User Interface & Interaction Workflow

Secure, Role-Based UI with Blockchain Transparency

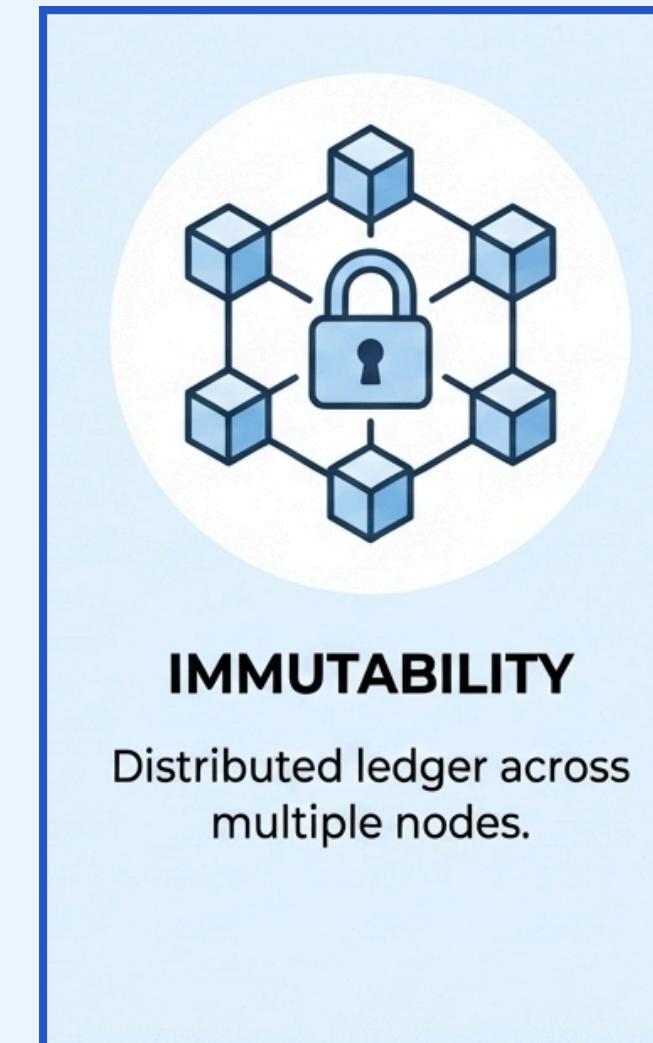
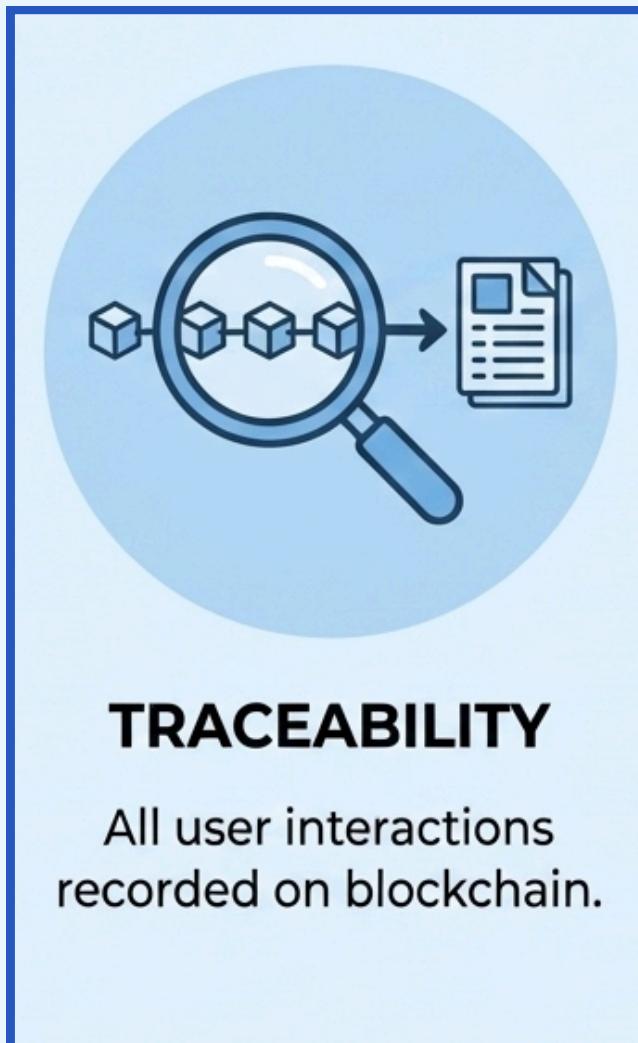


# **System Demonstration**

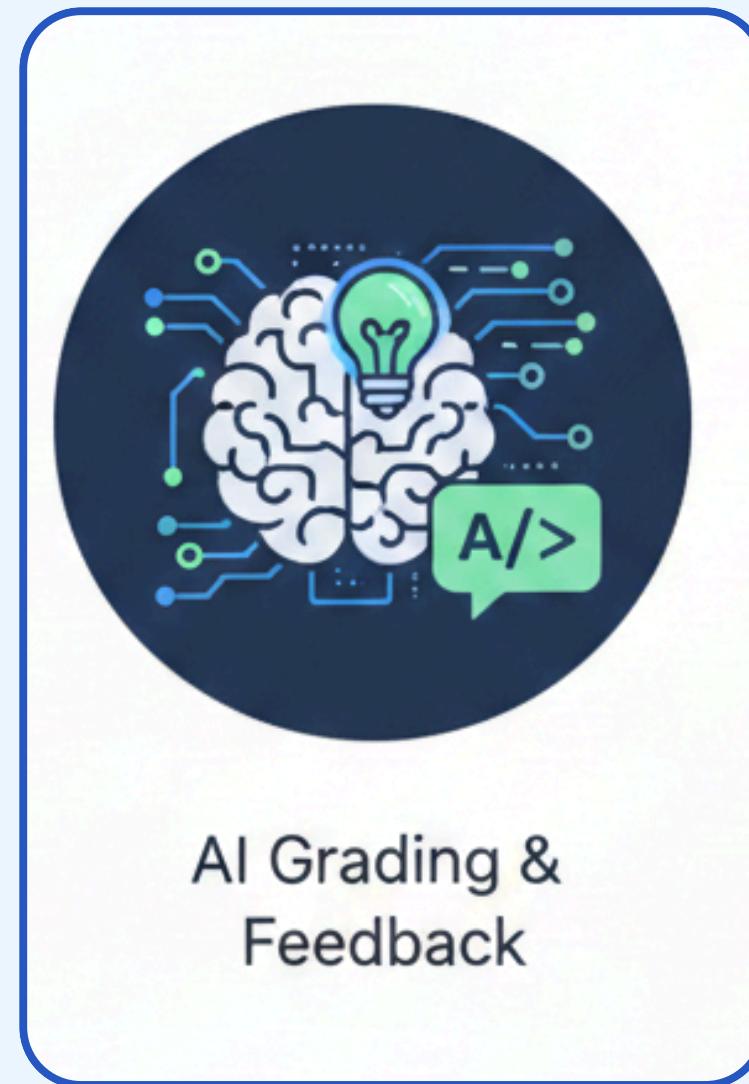
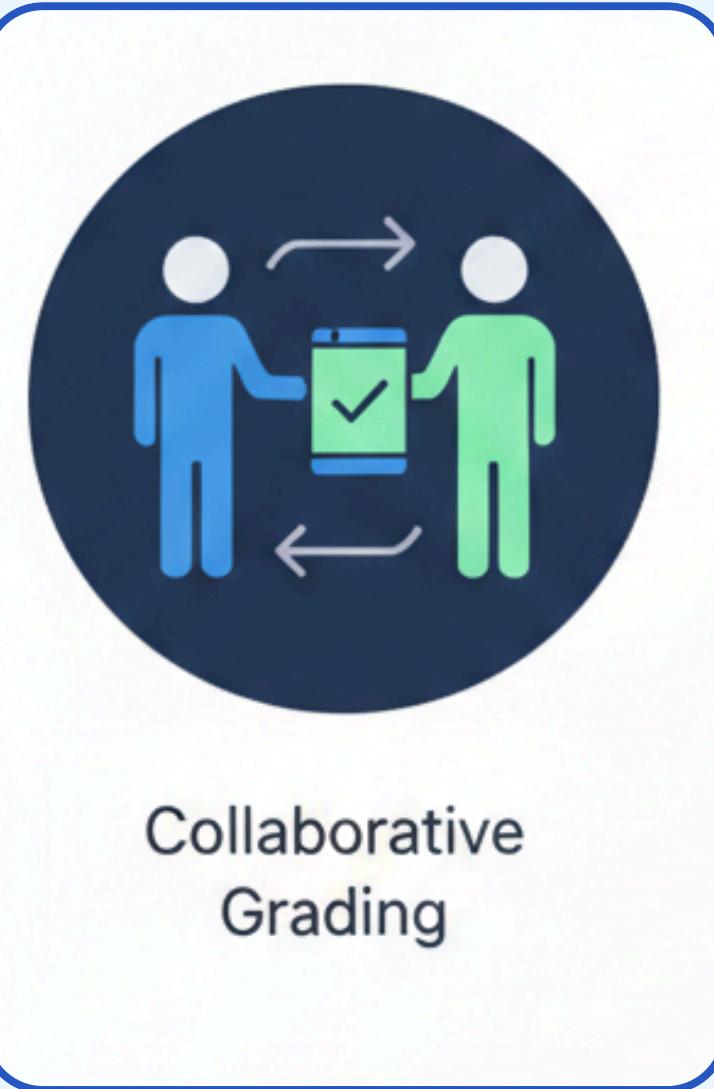
# **Conclusion & Perspectives**

# Conclusion

## PROJECT OBJECTIVES:



# Perspectives





**Thank You !**