EduCTX: A Blockchain-Based Higher Education Credit Platform

MUHAMED TURKANOVIĆ , MARKO HÖLBL

KRISTJAN KOŠIČ, MARJAN HERIČKO AND AIDA KAMIŠALIĆ

Seoul National University of Science and Technology

Computer Science and Engineering

Tcydenova Erzhena

STCIS

Seoul National University of Science and Technology
Cryptography and Information Security Laboratory

Contents

1 Introduction

2 Related works

3 Background

4 The proposed EduCTX platform

5 Prototype implementation

6 Discussion

7 Conclusion

I. Introduction

This paper proposes a global blockchain-based higher education credit platform, named EduCTX based on the concept of the European Credit Transfer and Accumulation System.

In order to create a globally trusted higher education credit and grading system the proposed system aims to exploit the benefits of the blockchain, offering:

- security,
- anonymity,
- longevity,
- integrity,
- transparency,
- immutability
- global ecosystem simplification.

I. Introduction

A. Motivation

The majority of higher education institutions (HEIs):

- keep their students' completed course records in proprietary formats;
- have their own specialized system for keeping students completed course records;
- do not share their students' data;
- store data records in different standards;
- sometimes do not give access to students to the online academic grading system.

Consolidated standards for the academic credit system like the ECTS, the adoption and implementation of a global decentralized, trusted, secure credit platform, is a challenge.

I. Introduction

B. Contribution

Blockchain-based decentralized higher education credit platform EduCTX:

- It builds on the distributed peer-to-peer (P2P) network system.
- These systems are flexible, secure and resilient.
- It transfers the higher education credit system from the analog and physical world into a globally efficient, simplified, ubiquitous version.
- The platform is the basis of EduCTX initiative, which envisions a unified, simplified and globally ubiquitous higher education credit and grading system.

II. Related works

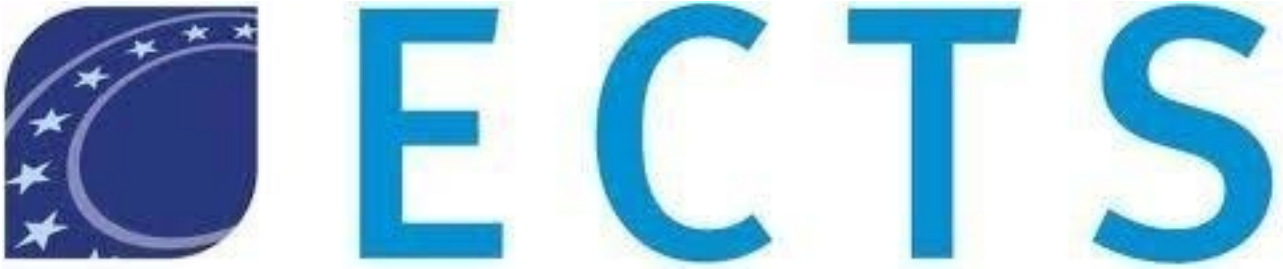
Blockchain is used in several domains:

- healthcare;
- government and business;
- logistics and transportation;
- Internet of Things (IoT);
- higher education.

III. Background

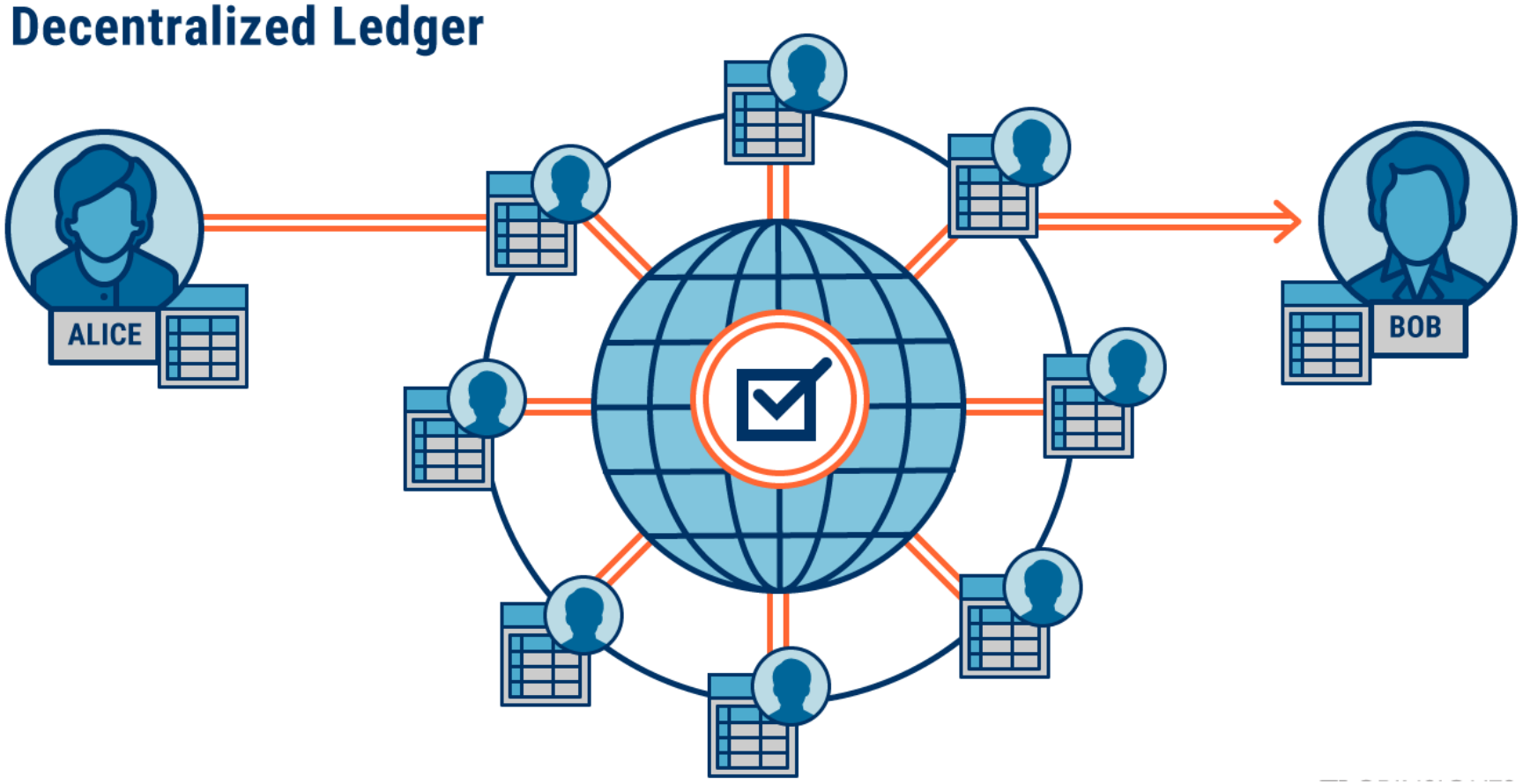
A. European credit transfer and accumulation system

The European Credit Transfer and Accumulation System (ECTS) is a framework for the higher education grading system developed by the European Commission and agreed to by the EU member states. The objective of this learner-centered system is to facilitate planning, delivery and evaluation of study programs as well as to facilitate student mobility by recognizing prior learning achievements, qualifications, experience and learning periods.



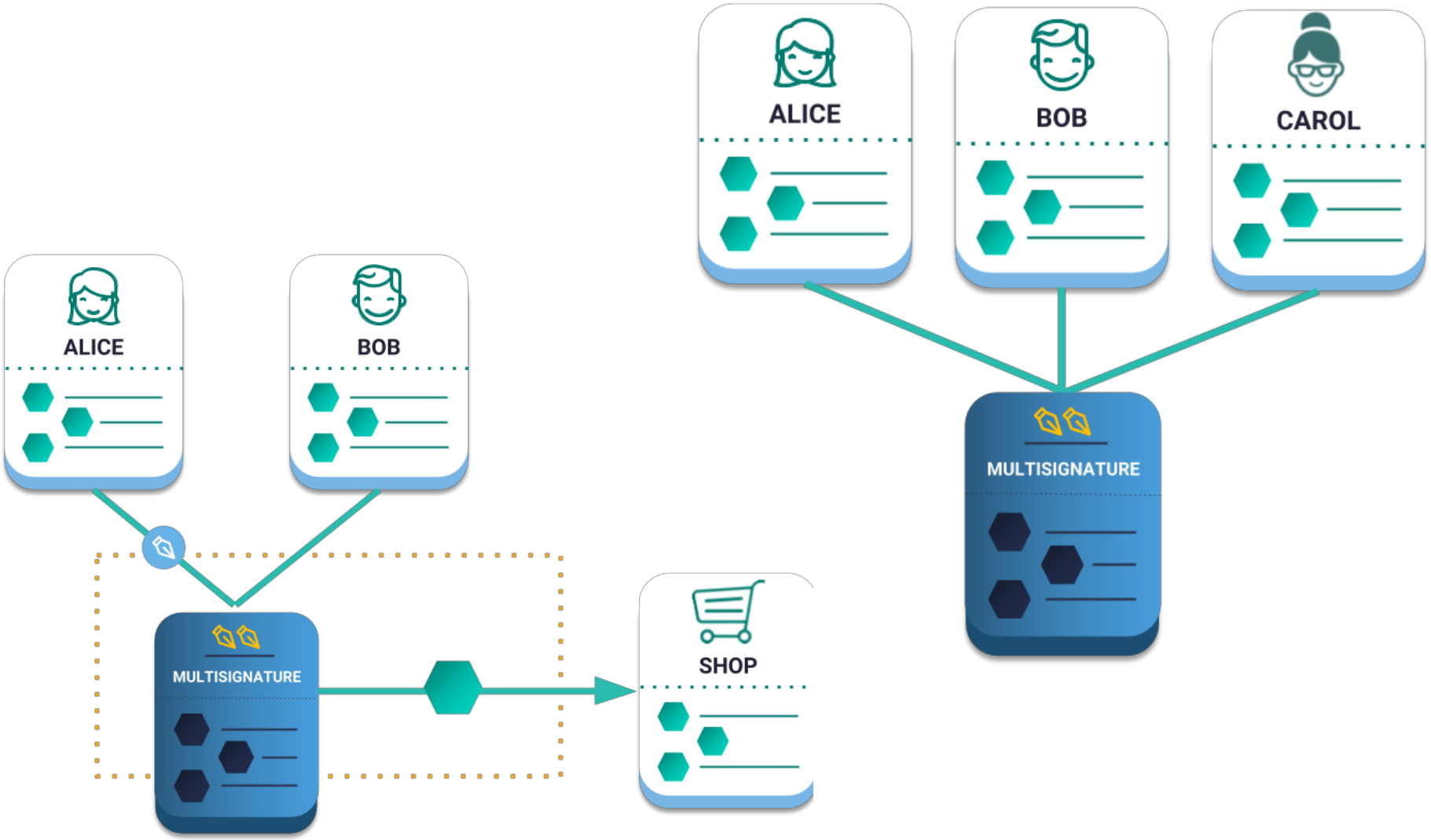
III. Background

B. Blockchain – distributed ledger technology

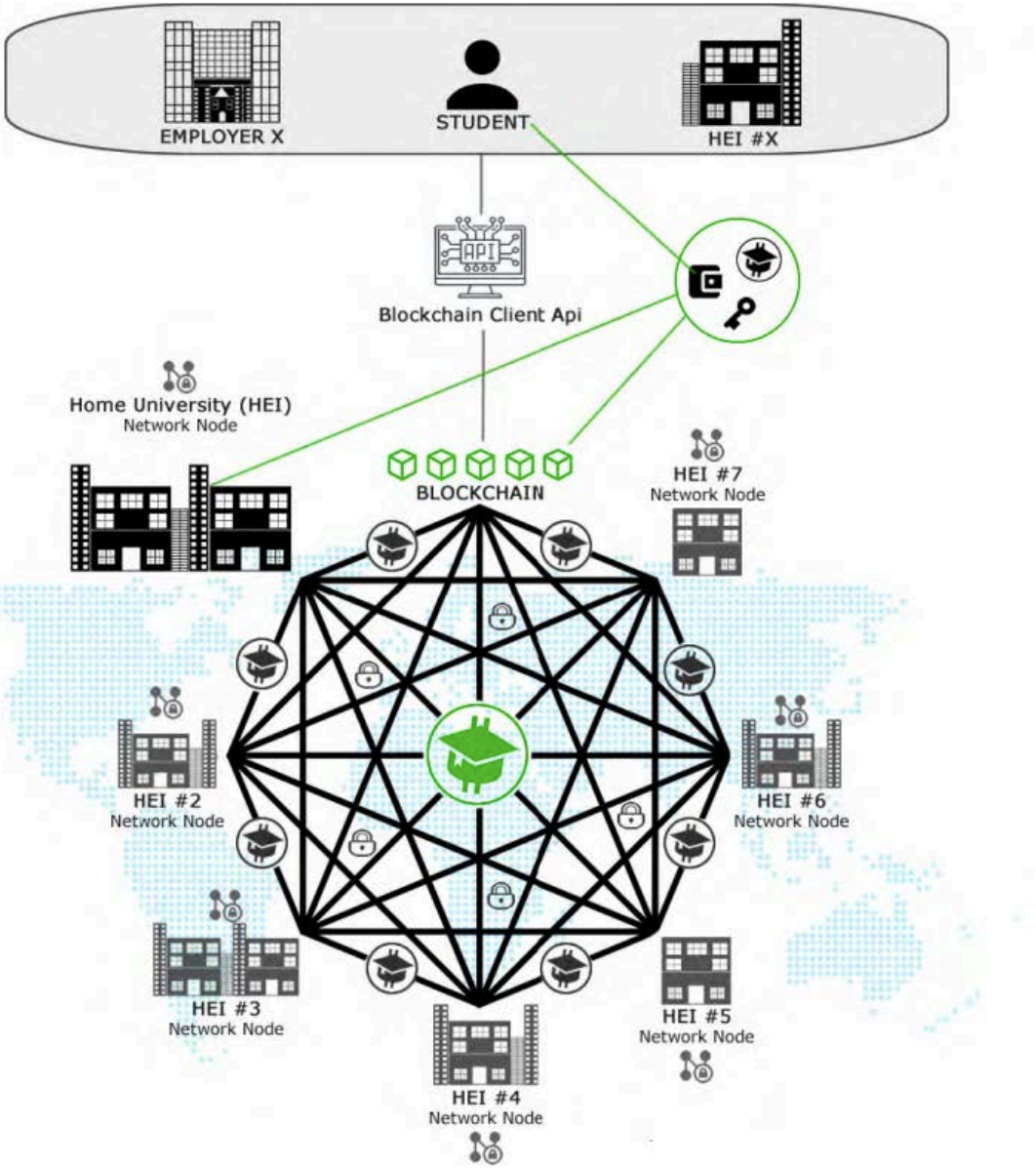


III. Background

C. Multisignature protocol



IV. The proposed EduCTX platform



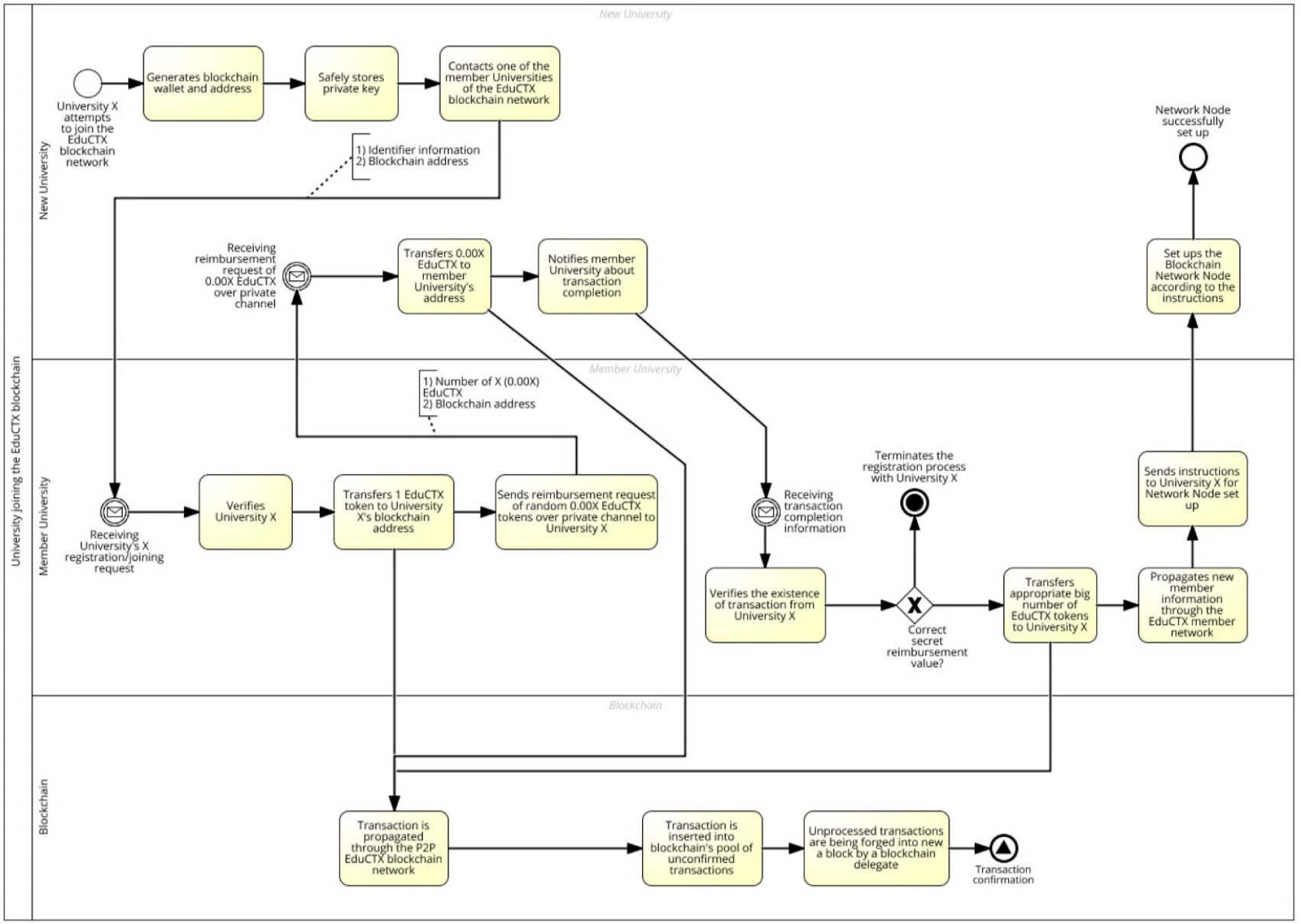
IV. The proposed EduCTX platform

The transfer information is stored on the blockchain, where the following data is stored:

1. the sender is identified as the related HEI with its official name;
2. the receiver - student is anonymously presented;
3. token - course credit value;
4. course identification.

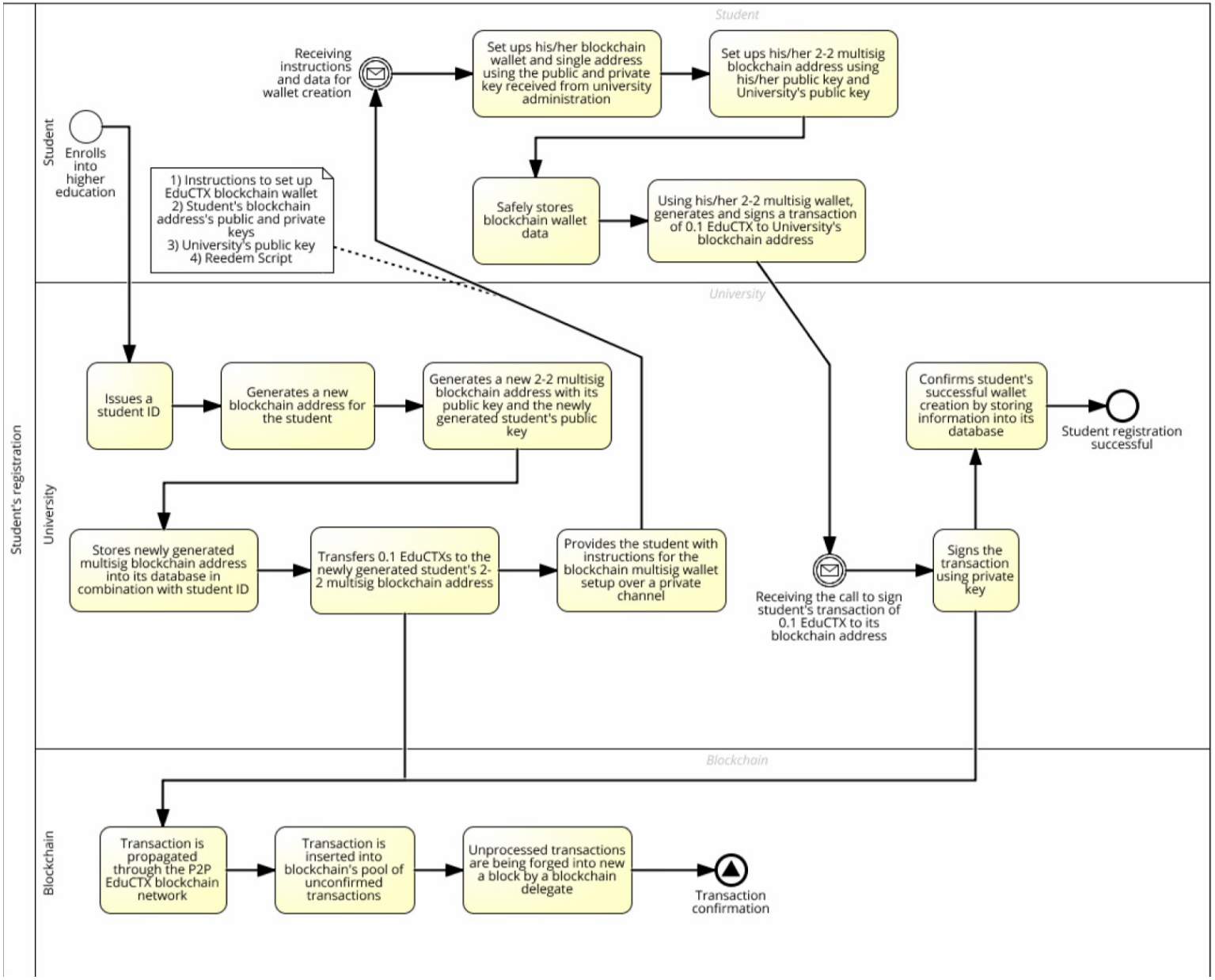
IV. The proposed EduCTX platform

A. HEI joining the EduCTX network



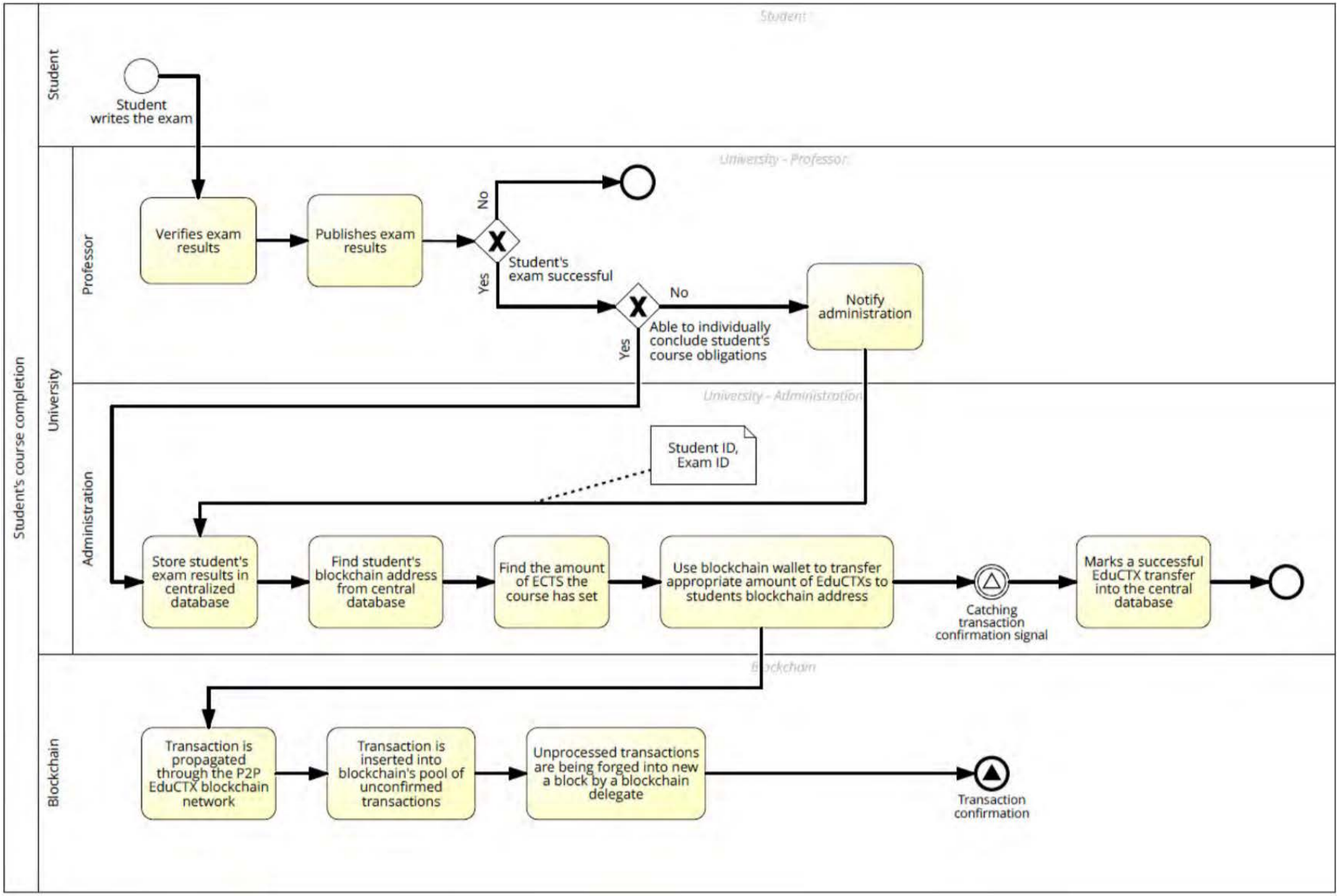
IV. The proposed EduCTX platform

B. Students registration



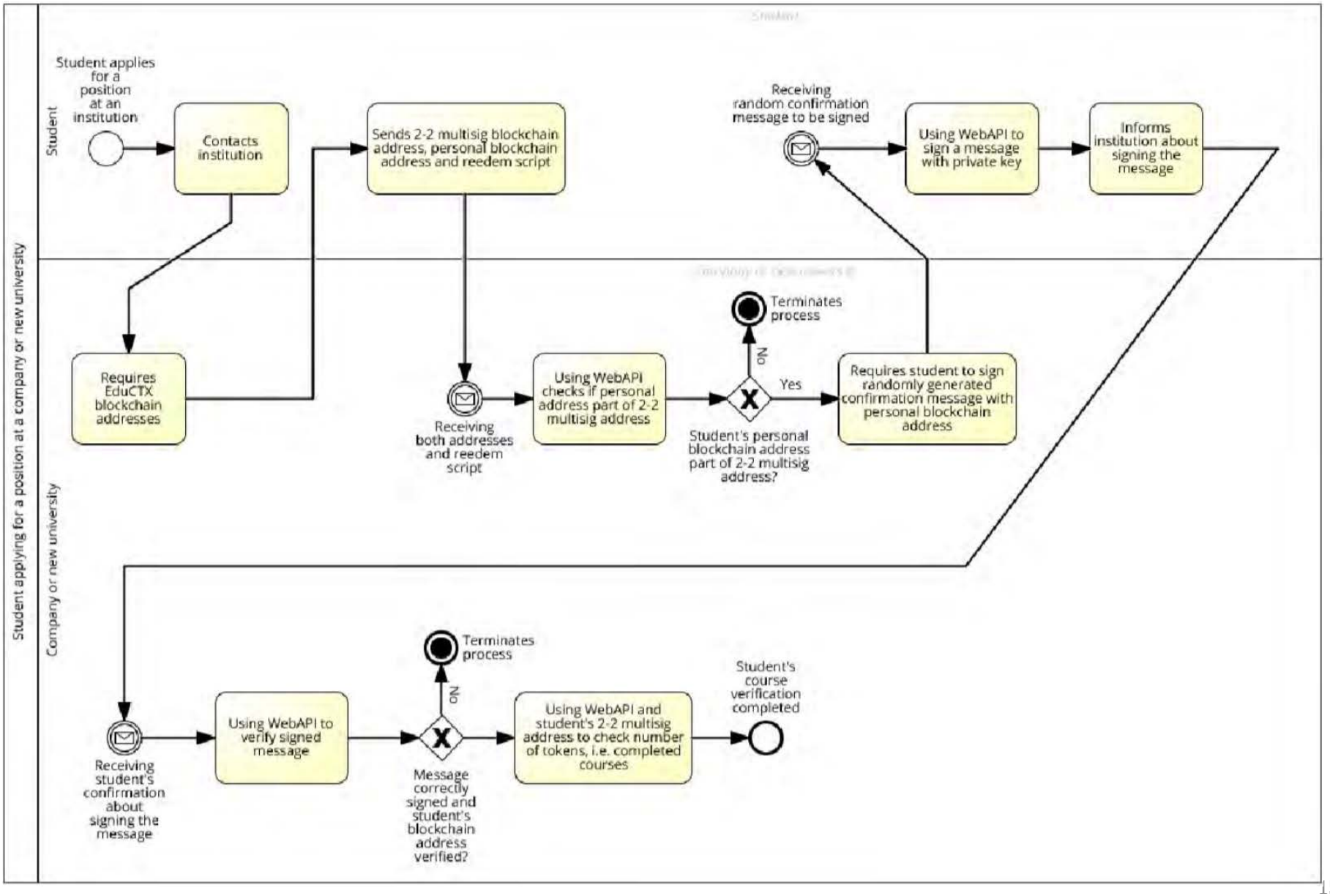
IV. The proposed EduCTX platform

Student's course completion



IV. The proposed EduCTX platform

C. Organization verifies students credit record



V. Prototype implementation

As the underlying technology of EduCTX platform was selected the ARK Blockchain:

- a cryptocurrency;
- an ecosystem meant for blockchain mass adoption;
- flexibile;
- open-source;
- available for a client API implementations;
- provides more than 12 different programming languages of client implementations.

V. Prototype implementation

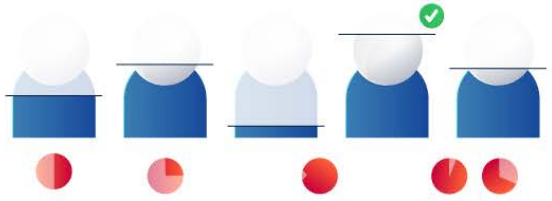
A. EduCTX Ecosystem building blocks

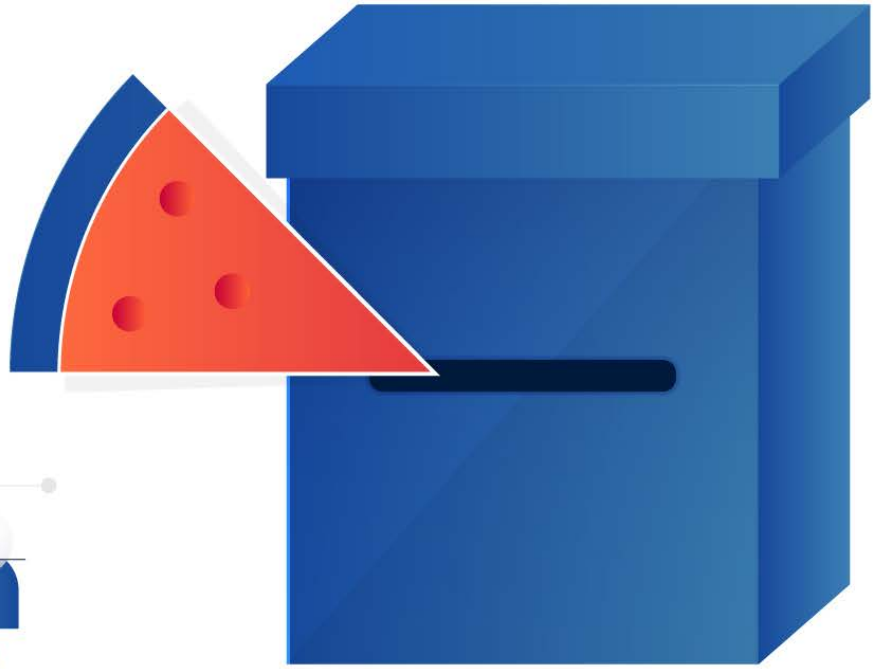
Delegated Proof of Stake

*In **Delegated Proof of Stake**, the voting power is dedicated to determining who will fill the role of delegate, maintaining the network and validating transactions.*

1 Anyone who holds the blockchain base currency can vote for a validator.

2 The valitador with the most votes gets to become a delegate, validating transactions and collecting the rewards for doing so





V. Prototype implementation

A. EduCTX Ecosystem building blocks

In terms of the security and validity of the EduCTX records on the blockchain they defined several rules, to ensure the safety and validity of student course completion records:

- Every student is anonymous.
- Students cannot send received ECTX tokens to another address.

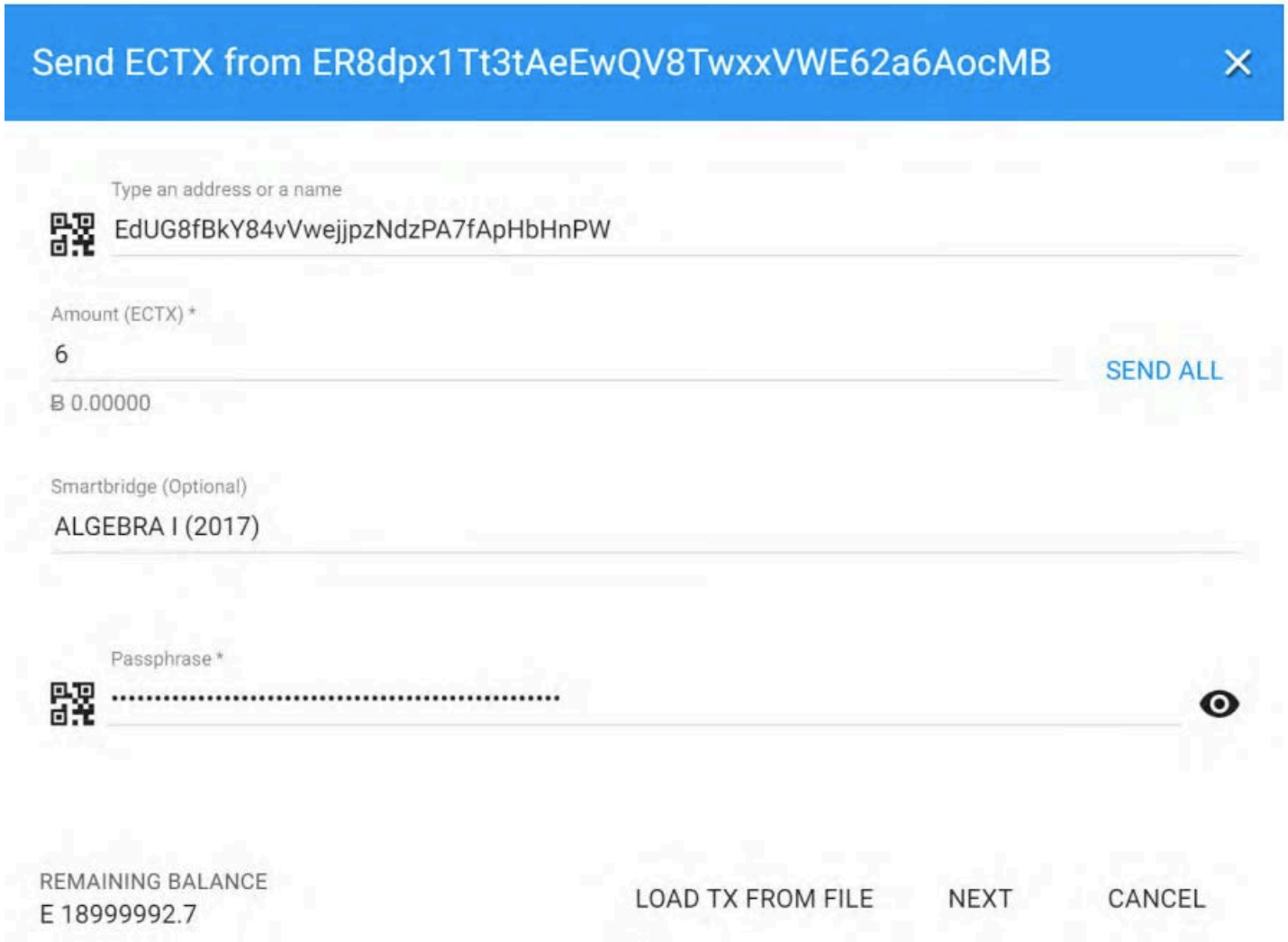
V. Prototype implementation

B. Joining EduCTX Ecosystem

- The EduCTX code is published on GitHub and licensed under the MIT License.
- It is designed in a modular manner.
- It can be seamlessly integrated with existing HEI's information systems.
- The blockchain end points are REST APIs that can be consumed by already published and available client APIs.
- The EduCTX platform can firstly co-exist with existing HEI information systems.

V. Prototype implementation

B. Joining EduCTX Ecosystem



V. Prototype implementation

B. Joining EduCTX Ecosystem

In order to join the EduCTX ecosystem, the applying HEI has to provide a technical base and prove its identity. The basic steps include:

1. Preparing an EduCTX node;
2. Joining the EduCTX network;
3. Becoming a permissioned EduCTX member.

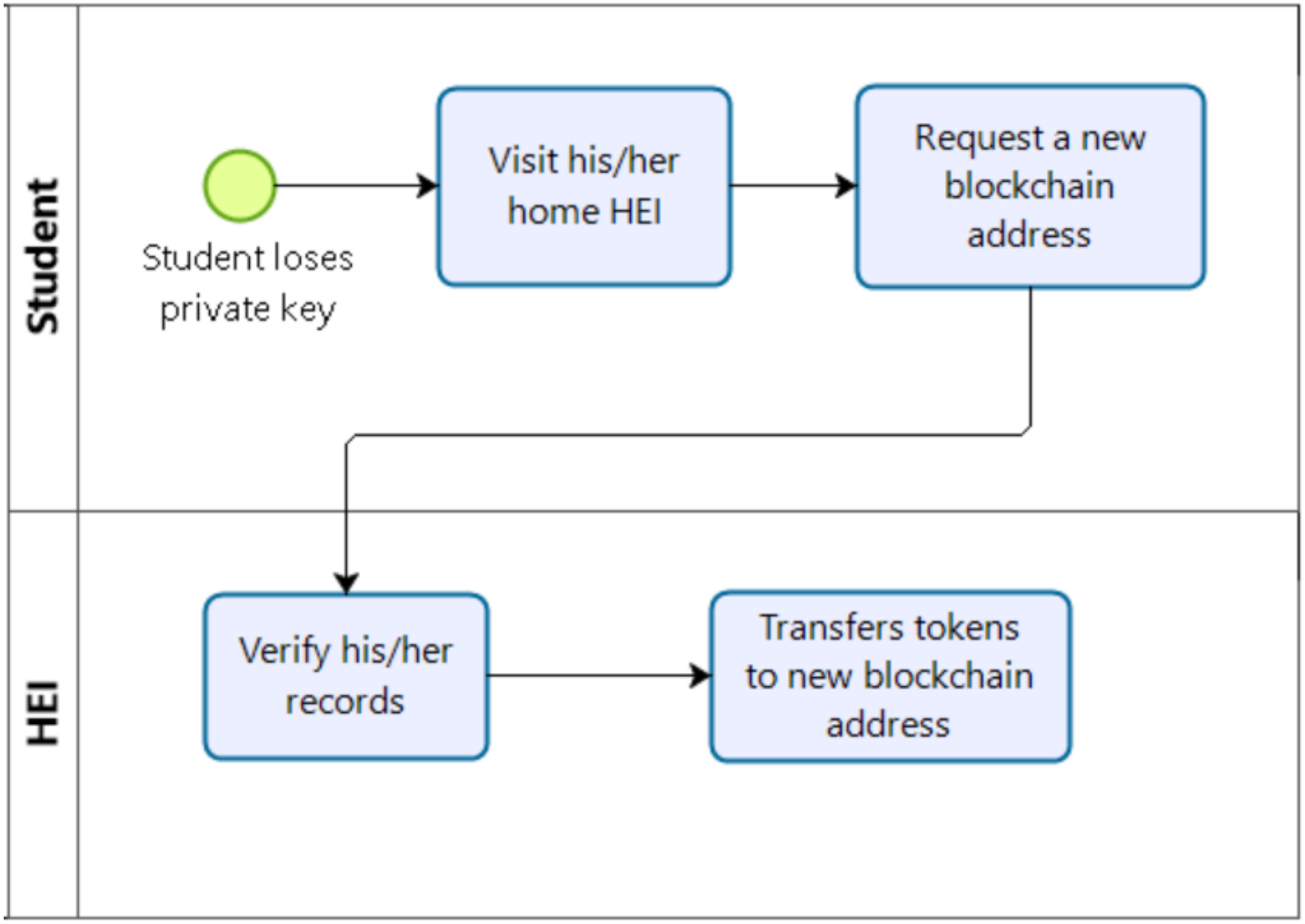
The EduCTX ecosystem has been designed to run efficiently, securely and non-invasively. Integration with existing information systems will be conducted based on their requirements by using the REST APIs.

VI. Discussion

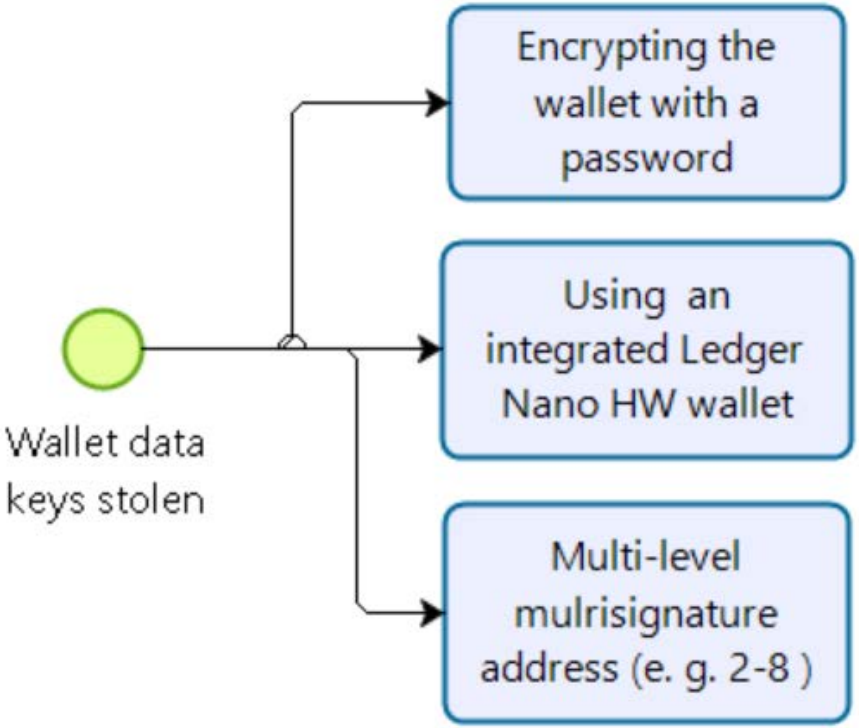
There are several advantages for various stakeholders using a platform such as EduCTX:

- It enables organizations the possibility of checking academic records of potential employees in a transparent way.
- HEIs get an open, decentralized and transparent way of validating records for students and their obligations.
- The proposed platform supports the HEIs in their activities related to students and provides the possibility of fraud detection and prevention.
- The students are offered the possibility of transparency and an overview of their academic obligations within the scope of their study programs.

VI. Discussion



VI. Discussion



VII. Conclusion

- EduCTX was proposed as a global blockchain-based higher education credit platform. The proposed platform takes the advantage of the blockchain in order to create a globally trusted higher education credit and grading system.

- A prototype implementation of the EduCTX platform was presented which is based on the open-source Ark blockchain platform.

Thank you