Digital Diplomas on Hyperledger
Blockcert standard for Colombian Universities

Blockchain4OpenScience

Certificates

Certificates are a social convention use to convey information about accomplishments, membership or, more general a new set of relevant data that is related to an individual or an institution.

The current system of managing certificates (emission, storage, validation…) is cumbersome (fragmented in manual steps, low security…).

There are advances in digital solutions.

Types of Certificates (digital or not)

- School diplomas, transcripts, official documents. Partchment, Credly
- Professional and international examinations.
- Certificates of work experience.
- Badges. Open Badges, IMS Global.

Blockchain approach: issuing digital certificates

- Blockcerts: the open initiative for Blockchain certificates (MIT media Lab and Learning Machine). Propose an open standard (extends IMS Open Badges) to issue digital records on Ethereum and Bitcoin.
- Credentials for Physicians. Hyperledger Indy, uses W3C standard for verifiable claims. Sovrin.
- Lifelong Learning (PoC): combine different competencies (standard) issued by different organizations. Hyperledger Fabric. TheLedger.

Blockchain approach: issuing digital certificates

- Attores: Issue Digital Certificates & Badges
- Accredible: Blockchain Credentials
- Aversafe: verifiable digital certificates.

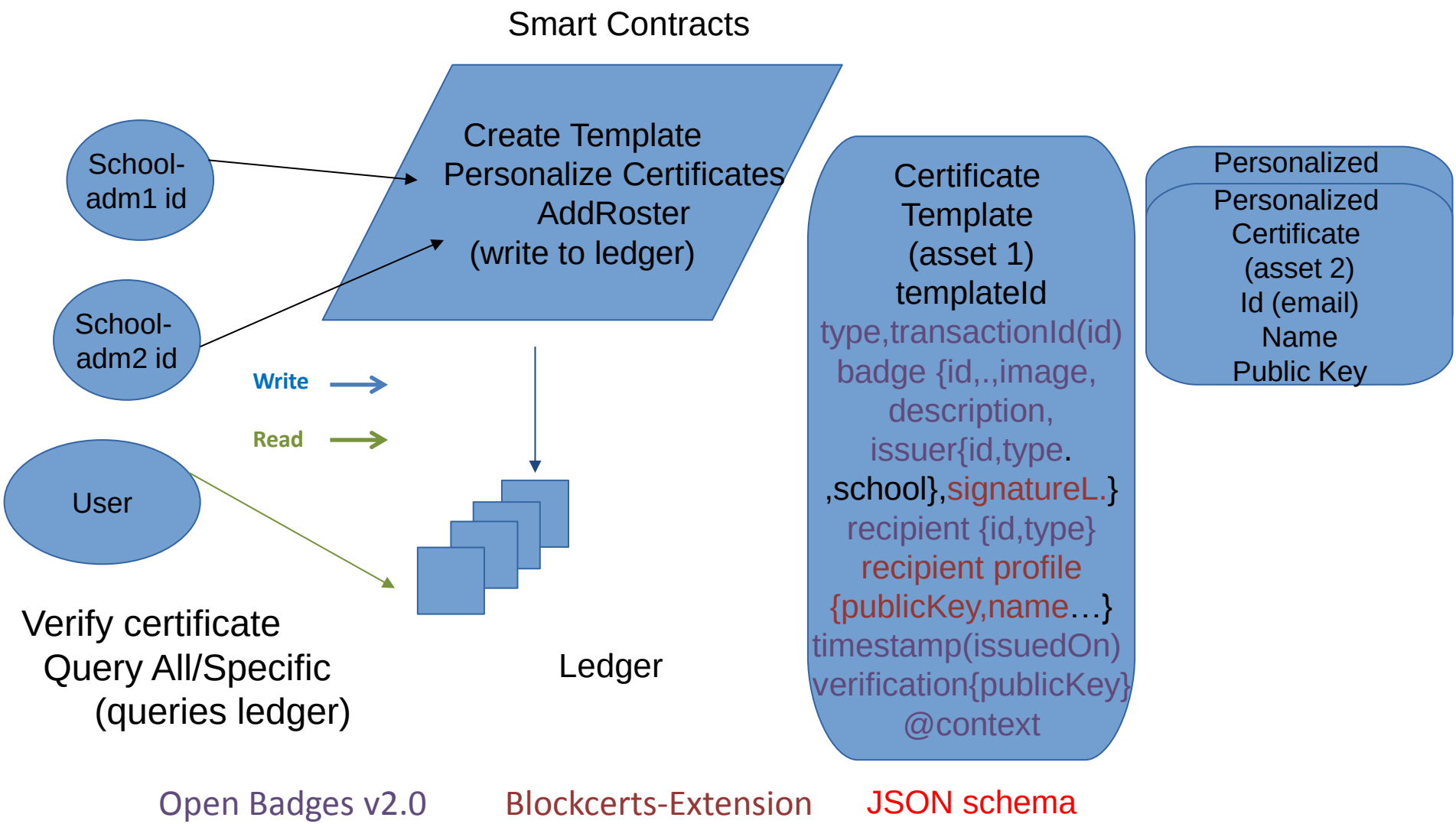
Blockcerts compliant digital diplomas

- Develop a PoC for managing academic certificates at universities
- Follow Blockcerts standard but introduce enough flexibility to accommodate different certificates issued across the university.
- Based on Hyperledger Fabric and Composer (no cryptocurrency required for issuance).
- Universities require a solution that is able to work along side their current systems, find it difficult to adjust to off-the-shelf solutions.

Business Network

- Assets
  - Certificate Template.
  - Personalized Certificates.
- Transactions
  - Create Participants
  - Create (asset) Certificate Template
  - Personalize Certificate
  - Add Roster personalize certificates from a roster (csv file) of students.
- Client-side
  - Verify the integrity of the Certificate in the ledger.
  - View and download the certificate

Business Network, (blockdegree.bna)



Verification - Blockcerts

- Certificate Integrity: The data has not been tampered. Cryptographic signature.
- Issuer authenticity: Validate the signature from the issuer (external or internal) and that the certificate has not been revoked.
- Verify the integrity of the ledger: blockchain integrity.
- For a public blockchain check transaction information.

Case

- Blockdegree: implement the blockcert schema and apply a verification process for a permissioned blockchain (certificate integrity, issuer integrity internal verification on the participant, ledger integrity).
- Universidad del Rosario: private university, +7,000 students, founded in 1653.
  - Pilot on CASAUR, >20 types of certificates.
  - Extend digital diplomas and badges and integrate to current infrastructure.

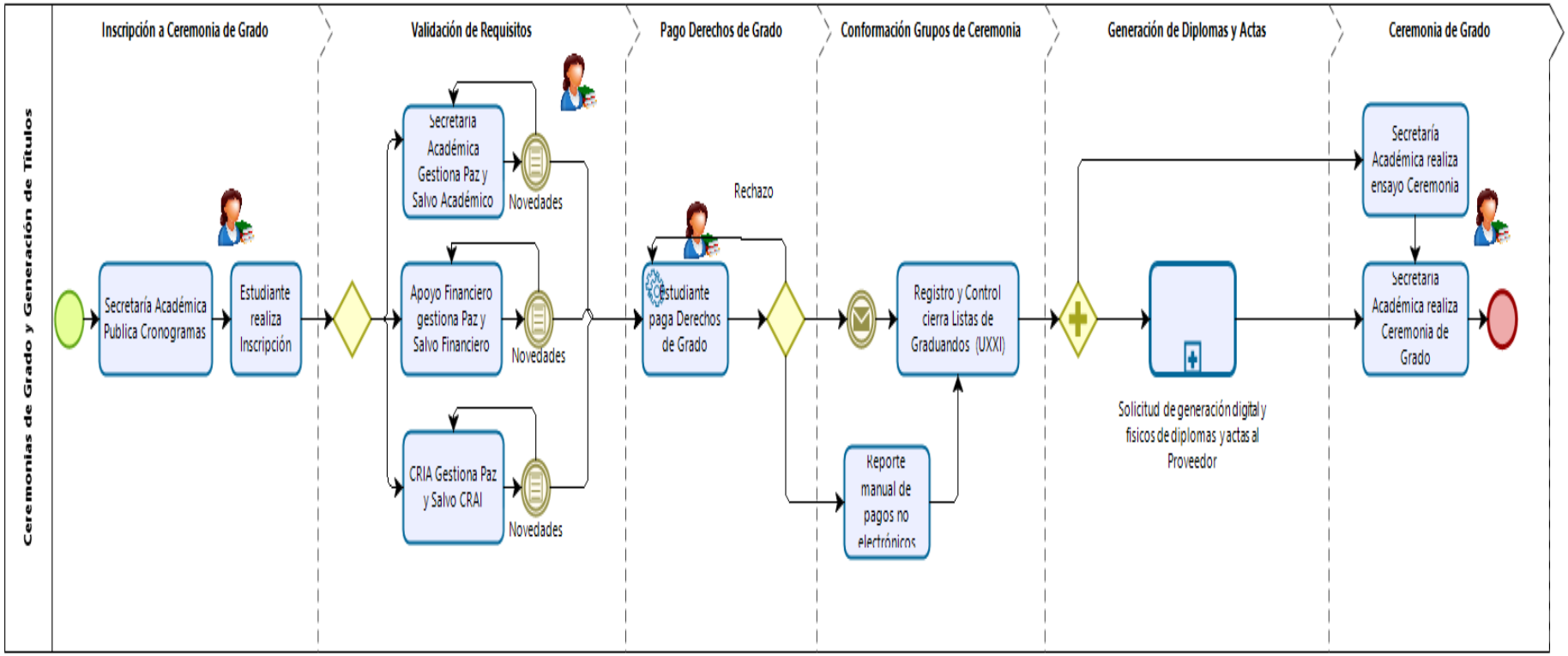
Blockdegree

Casa UR, pilot

Digital diplomas for Universidad del Rosario (scenario for most universities)

- Requirement: template creation, issue diploma and graduation record (*acta*), storage and web access.
- Participants (user stories)
  - University administrators (read, write and sign): schools, central registry, secretary general, printing service.
  - Students / employers (read)
- Asset is the digital diploma in various stages (states). The changes in state trigger events that require the interaction of at least one participant.
- Currently information is send back and forth.

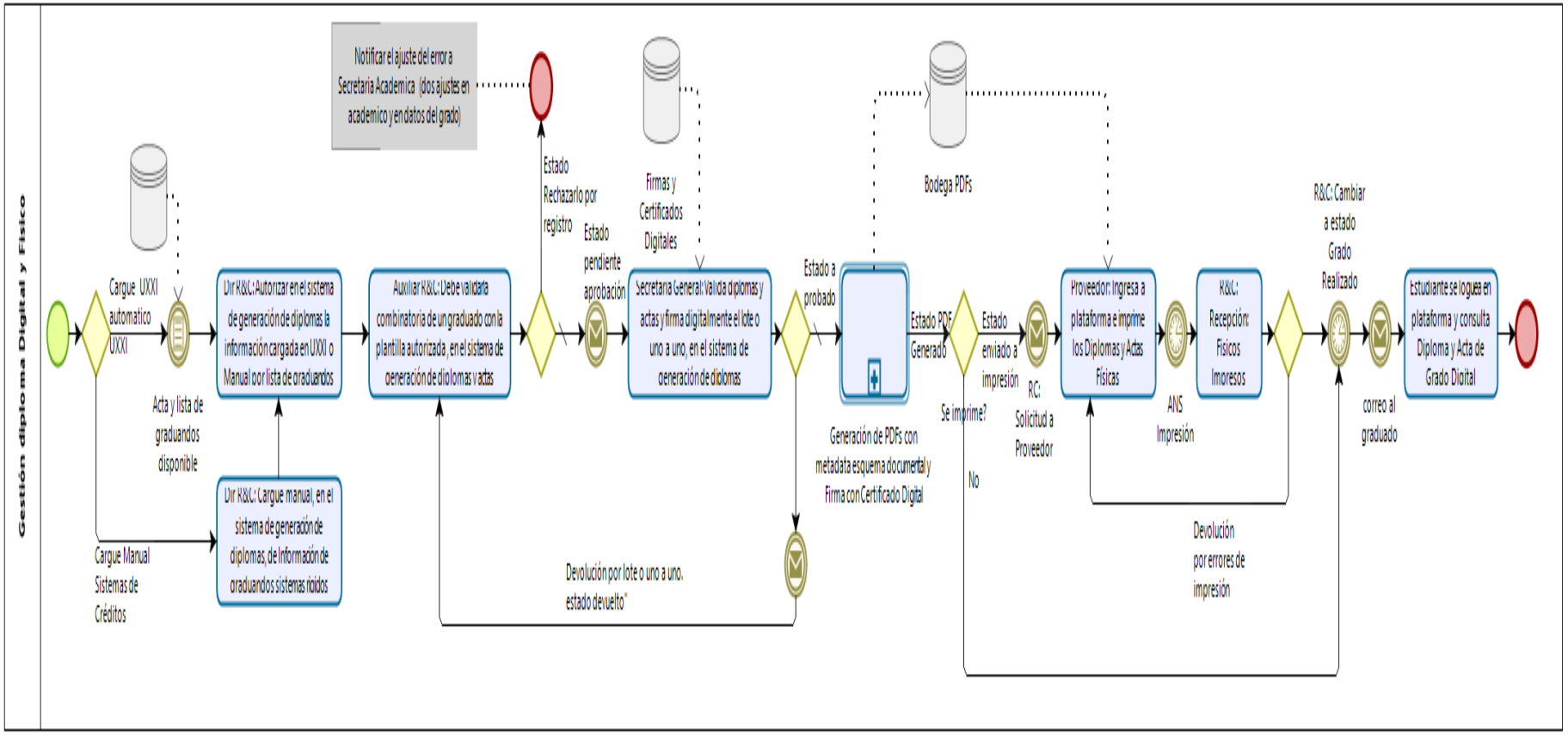
Graduation flow chart



Steps (states) to issue digital diplomas/graduation record at Universidad del Rosario

1. Central registry has closed roster of graduating students.
2. Central registry links each element in the roster to the respective template (instantiated JSON).
3. Central registry checks that the information is correct (approved/rejected).
4. Generate the digital diplomas (pending approval).
5. Office of the general secretary validates all the diplomas for that specific graduation; having access to the digital diploma (approved/returned).
6. Once approved state changes to (instantiated pdf).
7. Central registry validates the need to send to the printing services (send to print).
8. Printing services provides printed diplomas to the central registry and graduation takes place (graduation realized).
9. The pdf version of the diplomas/graduation record is emailed to each student and with a link to access the records (external consultation).

Issuance flow chart



High level design of business logic

- Each step triggers and event that changes the state of the diploma.
- An step may require intermediate validation and a signature of approval from one or more participants.
- A common ledger that administrators can access displaying the current state of the diploma will avoid sending back and forth information.
- The final digital diplomas may be externally verified by comparing the information stored in the ledger. Include QR and EVC codes.

Digital diplomas for Universidad del Rosario and extensions to other institutions

- Higher education is bound to change in the coming years: flexible, accessible and lifelong learning.
- Collection of certified (badges, diplomas..) skills provided by a series of decentralized institutions (universities, technology providers, independent scholars and educators, on the job training..)
- Building the first steps (within universities) toward a decentralized and interconnected system that validates the process of acquiring new skills.

Attores, front-end, example

- Video