Supporting Incremental Authorization after SSI-based Authentication

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Kick-off Presentation

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Outline

Motivation
- The general problem with identity management models
- How can one easily adopt SSI?
- Why the bridge?

Problem Statement
- The Status Quo
- Problems with the status quo approach
- How to mitigate problems associated with the status quo approach?

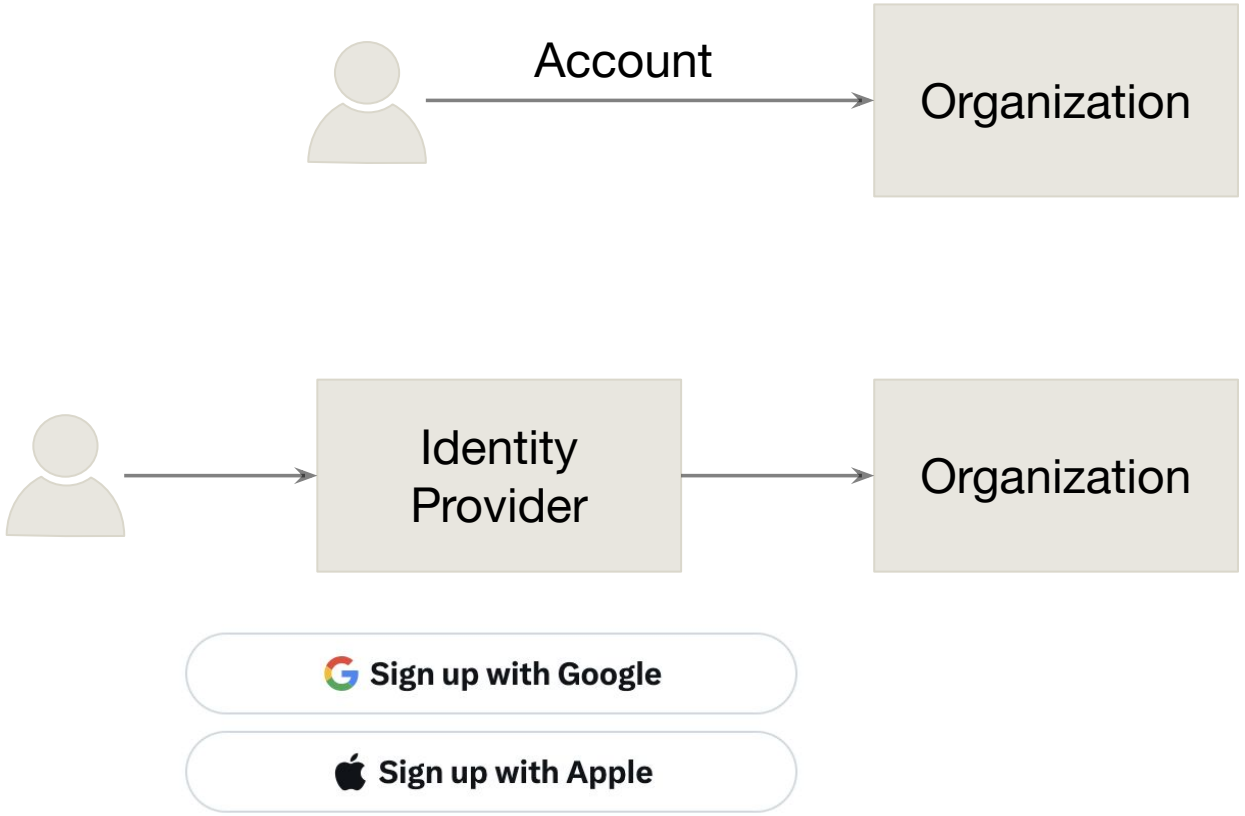
Possible Solutions
- Functional and Non-functional requirements
- Presenting a different credential
- DIDComm
- Extension to SSI-to-OIDC Bridge

Next steps
- Research Questions
- Timeline

Questions

The general problem with mostly used identity management models

- Centralized/Federated identity management is used in a big portion on the Internet.
- Attractive hacker targets
- User activity can be monitored
- Single point of failure
- Such limitations introduced the concept of SSI.



Images based on A. Preukschat, “Self-Sovereign Identity”.

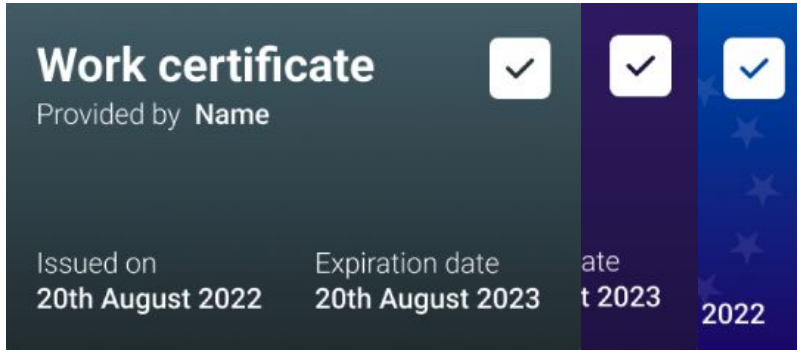
How can one easily adopt SSI?

SSI in short:

- A promising principle to decentralize and de-risk identity management.
- Use of verifiable credentials instead username, password or an account in an identity provider.

How can organizations adopt SSI?

- Requires expert knowledge, and resource to fully implement such a solution.
- There are tools that exists to make adoption easier.
  - SSI-to-OIDC bridge




```
{
   "@context": [
      "https://www.w3.org/ns/credentials/v2",
      "https://www.w3.org/ns/credentials/examples/v2",
      "https://w3id.org/security/suites/ed25519-2020/v1"
   ],
   "id": "http://university.example/credentials/3732",
   "type": [
      "VerifiableCredential",
      "ExampleDegreeCredential"
   ],
   "issuer": "https://university.example/issuers/565049",
   "validFrom": "2010-01-01T00:00:00Z",
   "credentialSubject": {
      "id": "did:example:ebfeb1f712ebc6f1c276e12ec21",
      "degree": {
        "type": "ExampleBachelorDegree",
        "name": "Bachelor of Science and Arts"
      }
   },
   "proof": {
      "type": "Ed25519Signature2020",
      "created": "2024-01-13T14:39:26Z",
      "verificationMethod": "https://university.example/issuers/565049#key,
      "proofPurpose": "assertionMethod",
      "proofValue": "
         z3FME68PHxPXLkDWY54FeE2ckhq5xicaUwPNPoPL5gubTeuWBg3Fq9wW
         ZwnTL2hVMMJfwRChKeznxfyfot5RohnvP"
   }
}
```

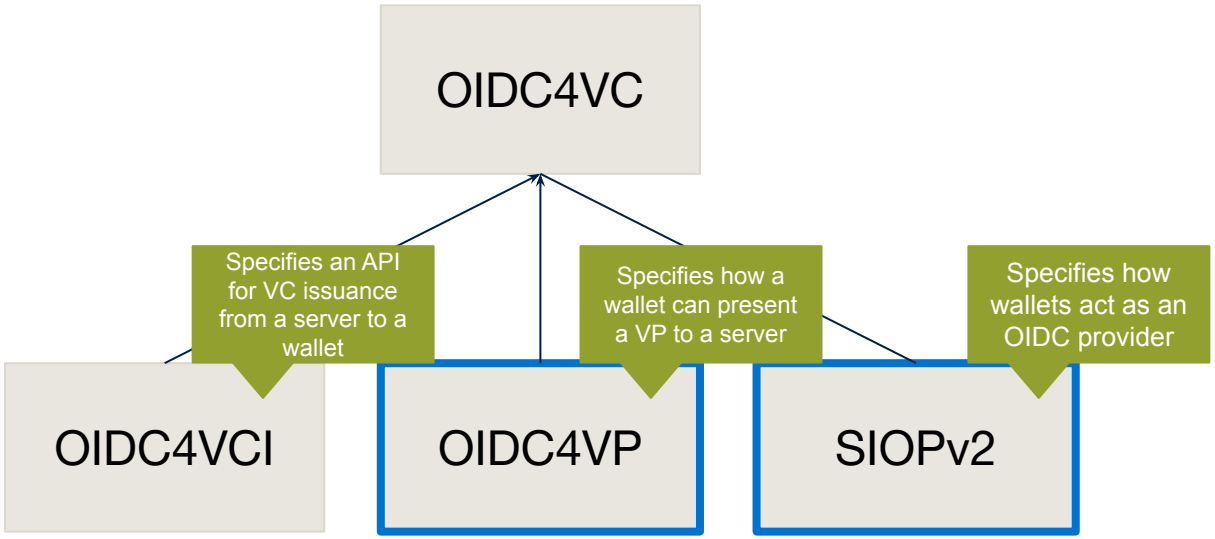

https://talao.co/sandbox/playground

Why the bridge?

- Supports SSI-based sign ins for services that support OIDC.
- Rely on OIDC4VC standards.
- Simple language to define policies to handle claims in a VC.
- **Open source, a global solution, simple to configure.**

```
[{
  "credentialID": "expected_credential_for_name",
  "patterns": [{
    "issuer": "did:example:123",
    "claims": [{
        "claimPath": "$.credentialSubject.e_mail",
        "newPath": "$.email",
        "token": "id_token"
    }]
  },
  {
    "issuer": "did:example:456",
    "claims": [{
        "claimPath": "$.credentialSubject.email",
        "token": "id_token"
    }]
  }]
}]
```

Login Policy Example



https://openid.net/sg/openid4vc/

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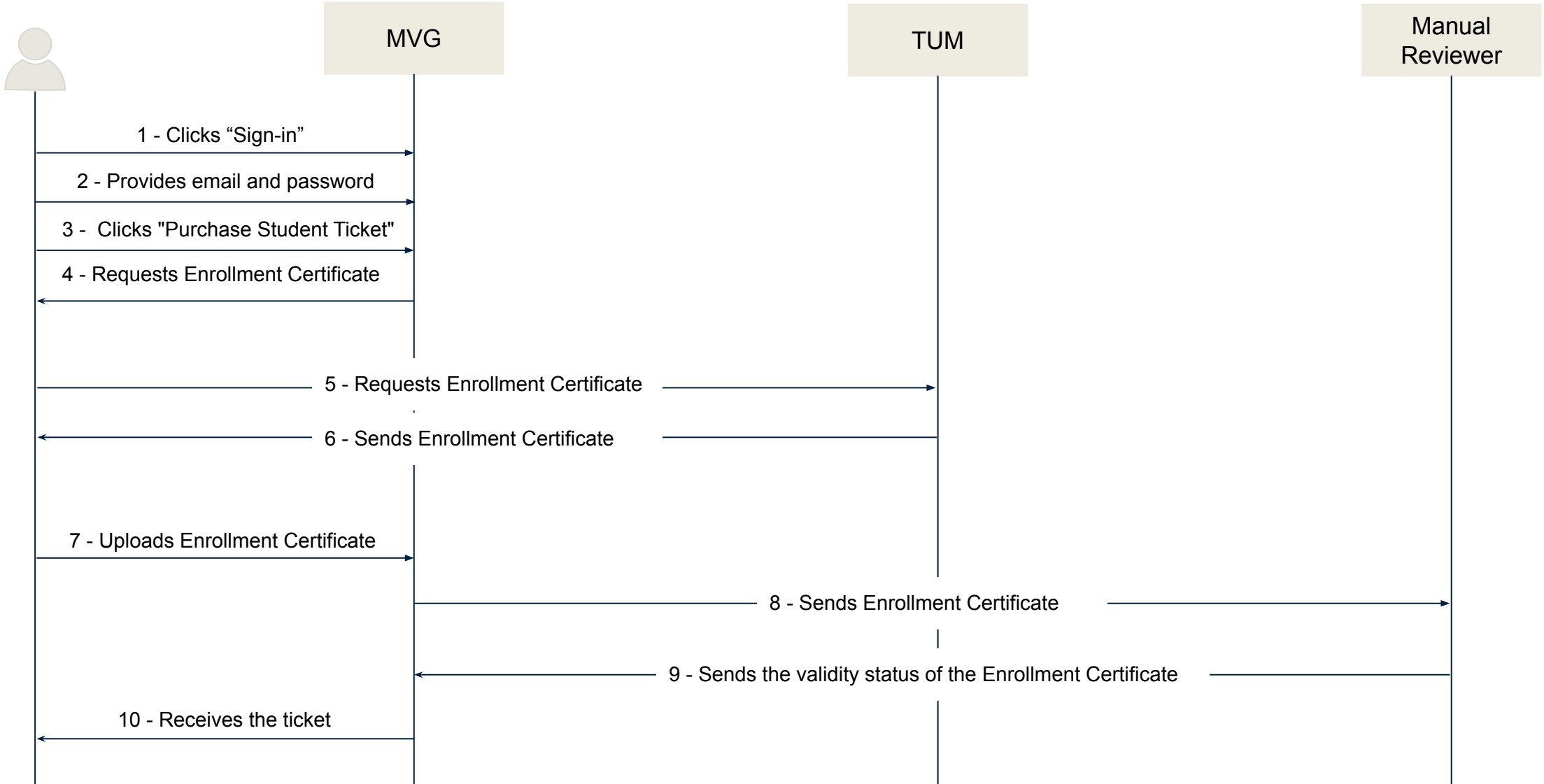
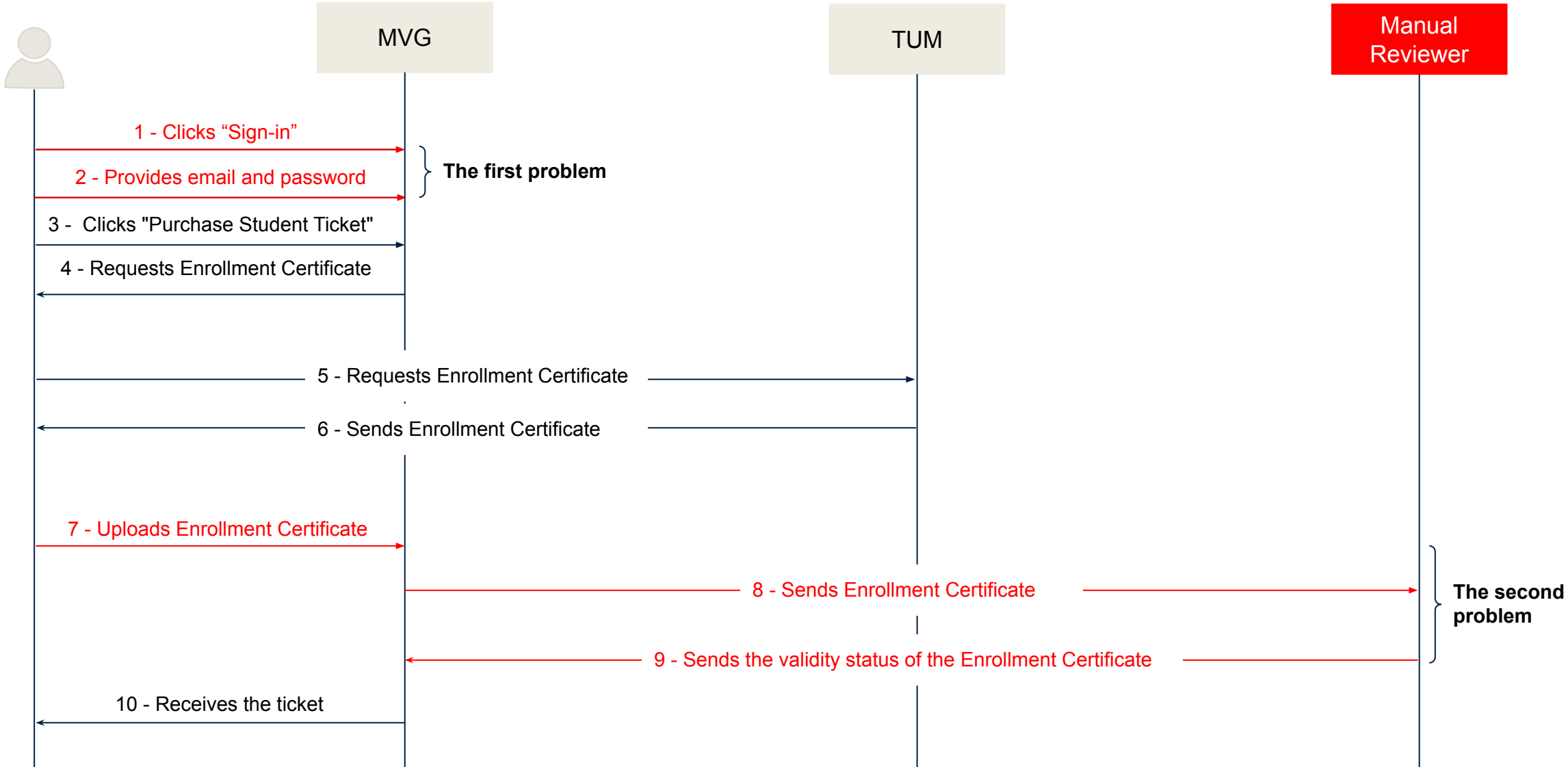
The Status Quo

- Imagine Alice, a student at TUM, wants to purchase a student ticket from MVG.



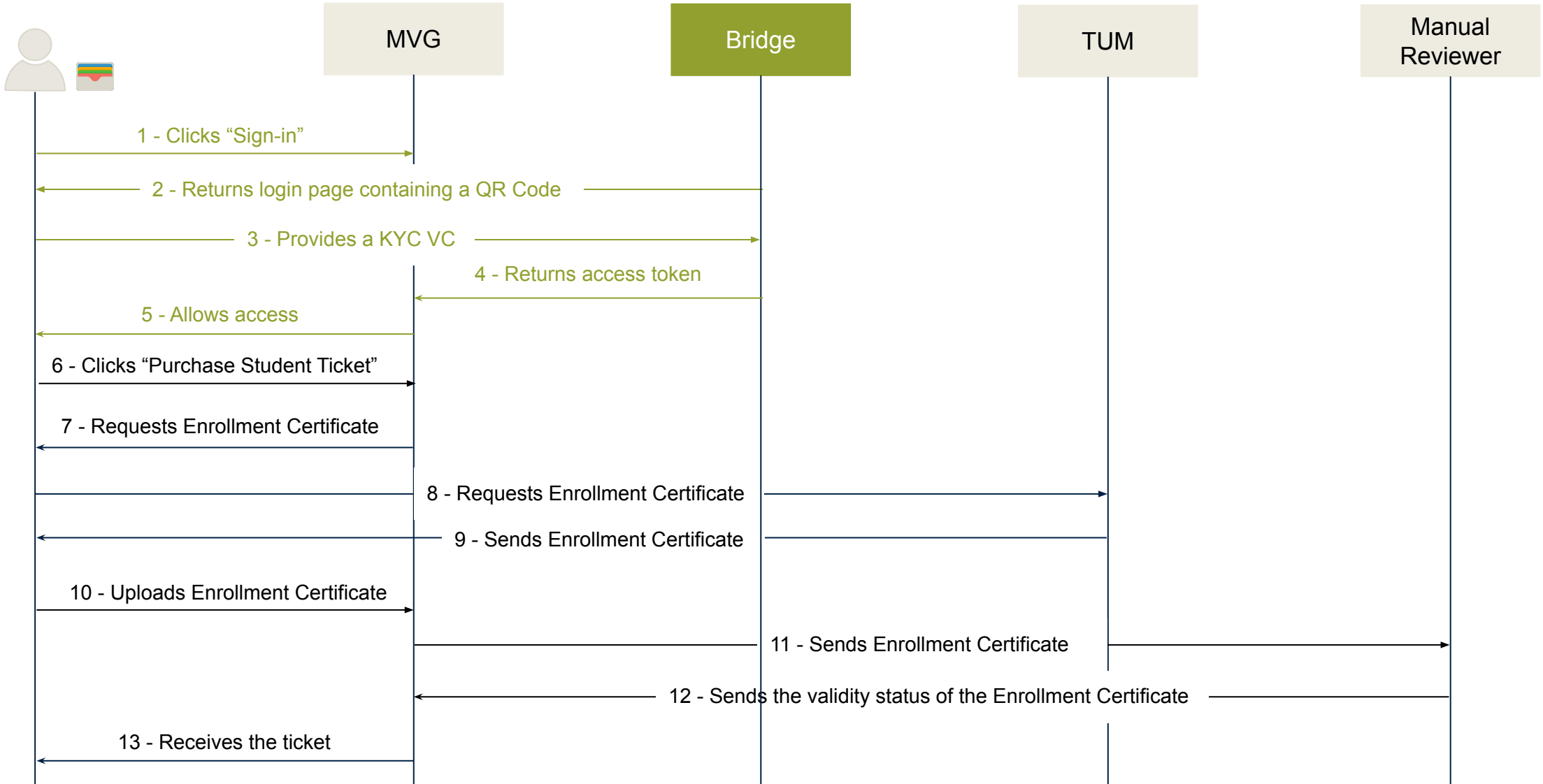
Problems with the status quo approach

- Imagine Alice, a student at TUM, wants to purchase a student ticket from MVG.



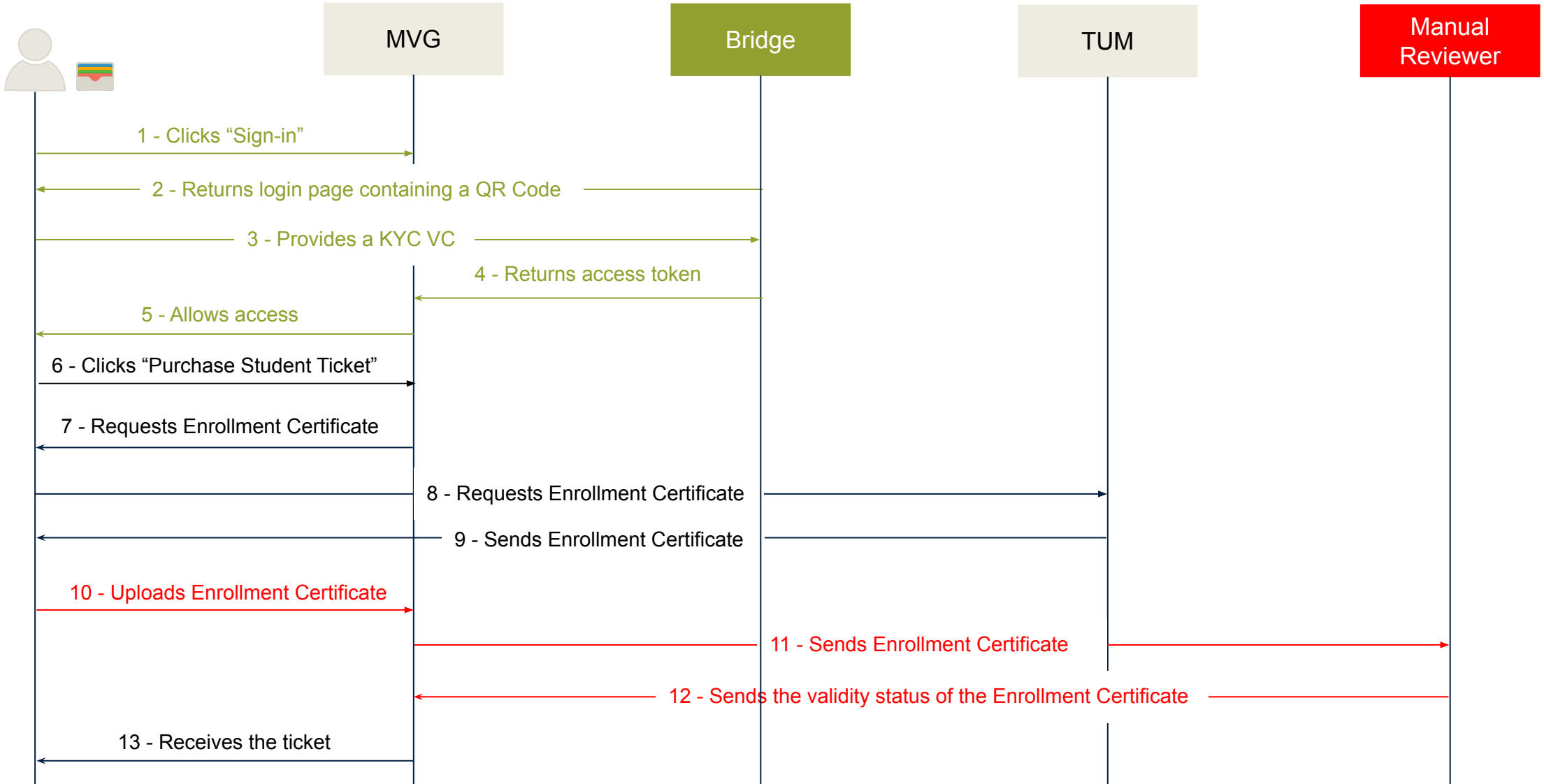
How to mitigate the first problem?

- Use the bridge.



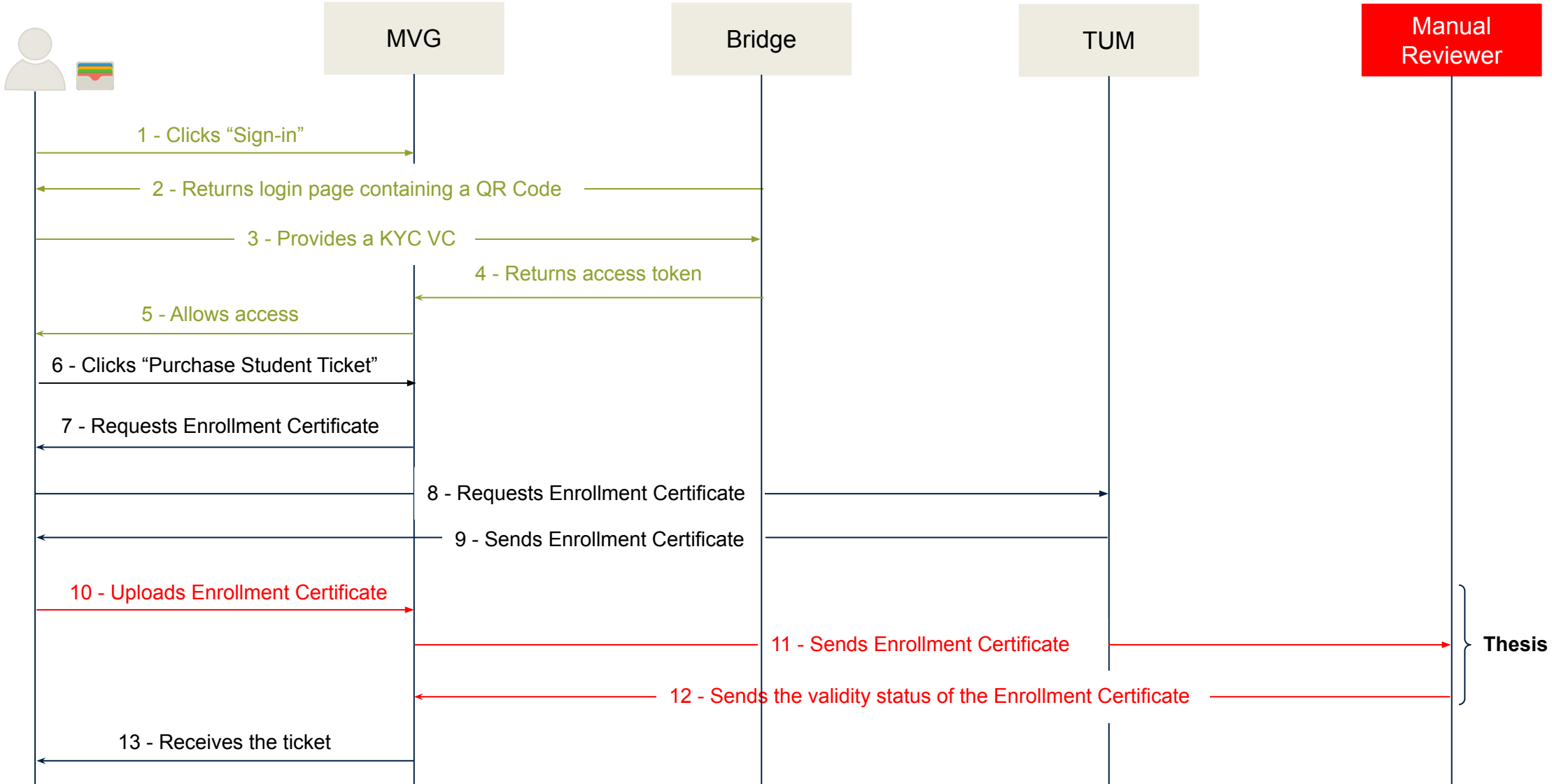
How to mitigate the first problem?

- Use the bridge.
- **The problem:** The bridge does not support anything after a login.



How do we make it fully SSI?

- Eliminate the manual reviewer.
- Ask for a digital document, VC, instead of documents like pdf.



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Functional and Non-functional requirements

Non-functional requirements:

- It should integrate with the bridge.
- It should not compromise SSI principles, security and privacy considerations.
- Simple to administrate (e.g. no need for additional server hosted)
- Simple user experience
- It should be interoperable.

Functional requirements:

- A service provider should be able to request additional VCs after login.

Presenting a different credential

- One possible solution is to perform login again with a different credential.

- **Login 1:**
  - Login with KYC credentials.
  - Request for an Enrollment Certificate credential to purchase a student ticket.
  - Logout.

- **Login 2:**
  - Login with Enrollment Certificate credential.
  - Purchase ticket using the information in the credential.

- This may introduce additional overhead for the verifier.
- There needs to be done a DID matching system to make sure the user data is not lost when the second login is performed.
- Bad user experience.

DIDComm

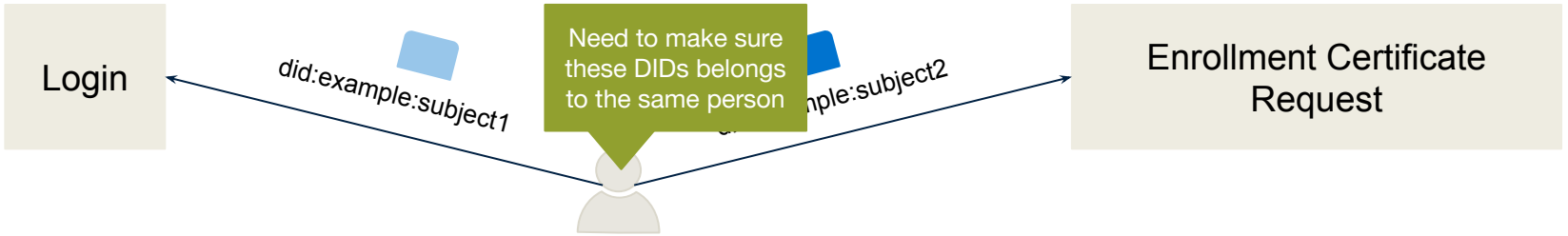
A standard that creates libraries and design patterns for two or more DID-controlling entities.

Considerations

- Search for a DIDComm protocol that enables communication between the wallet and the verifier. (WACI DIDComm - Presentation)
- Search for wallets that support DIDComm.

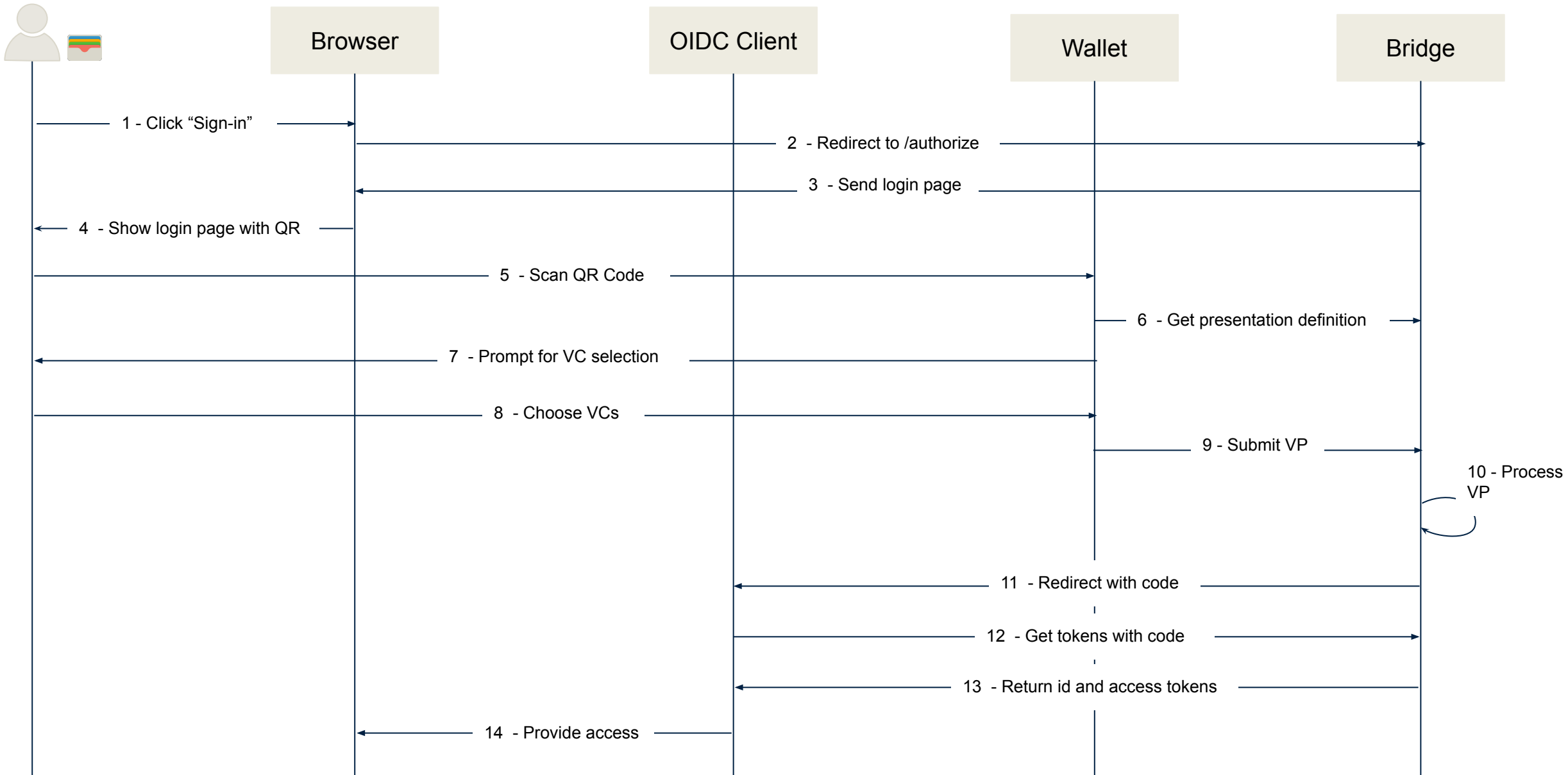
Not a good approach because

- The problem of ensuring the DIDs belong to the same person that performed the login.
- The service provider would have the responsibility to implement mechanism to check the validity of a VP.
  - e.g., DID resolution, verification of a VP, revocation status controls



Solution: Reuse the functionality in the bridge instead.

SSI-to-OIDC bridge



An Extension to the Bridge

An extension to extend functionality of the bridge.

Considerations

- A software module that can be used by any organization:
  - Must be interoperable.
- Re-use the bridge as much as possible.

A good candidate for solution to our problem.

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- The general problem with identity management models
- How can one easily adopt SSI?
- How do you get on demand data?

Problem Statement
- A Status Quo Approach
- Bridge Integration & Current Limitations

Possible Solutions
- Presenting a different credential
- DIDComm
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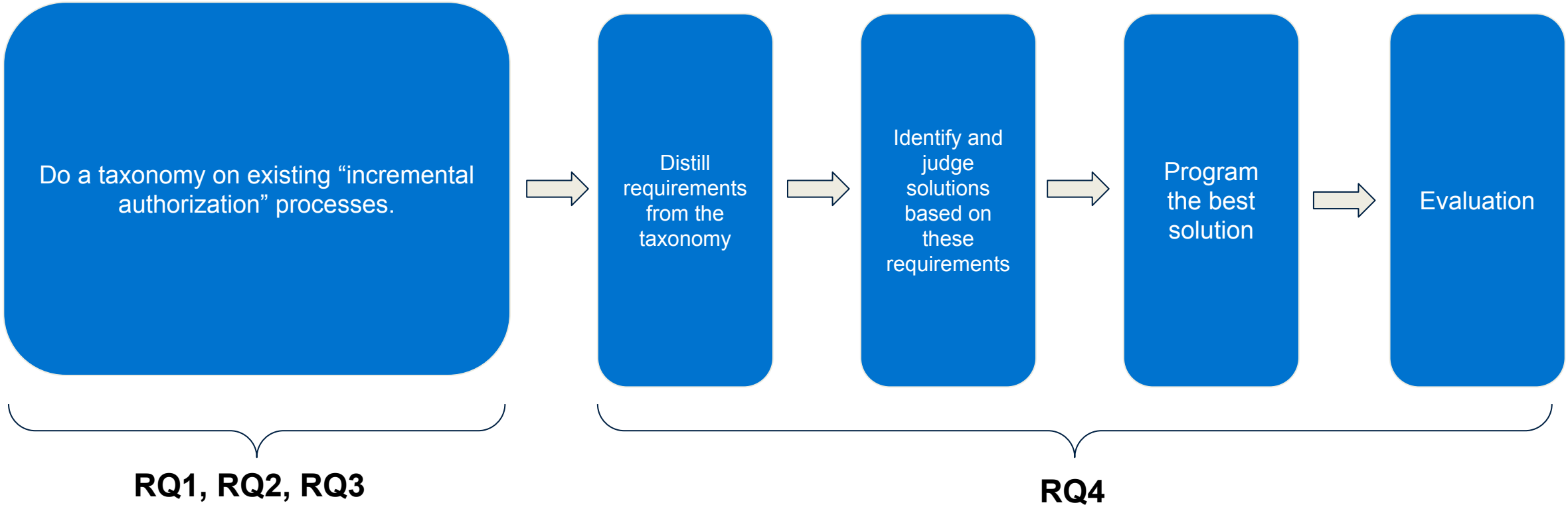
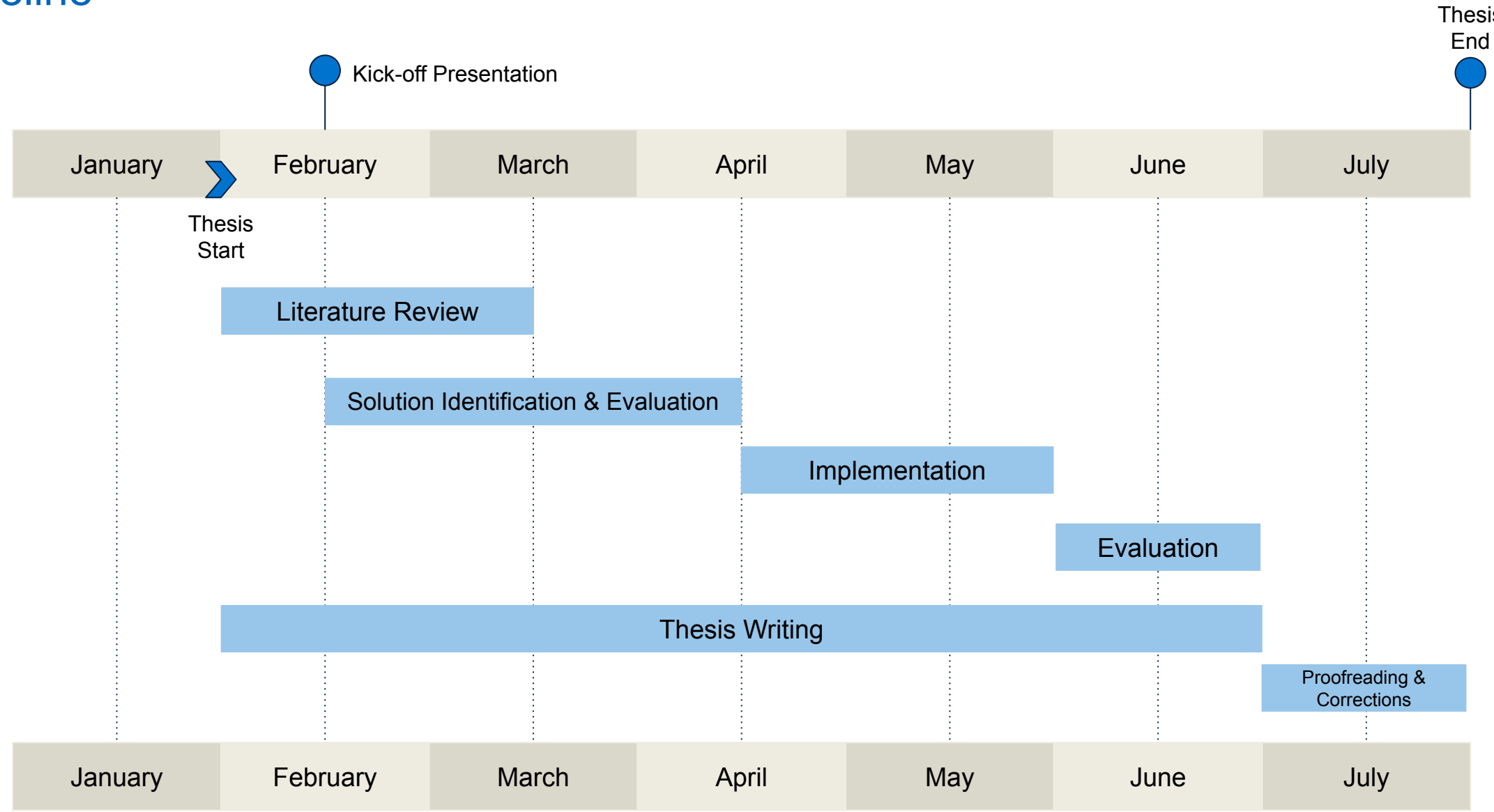
Research Questions

1. What are established ways of requesting and receiving incremental authorization data from users?
2. Which stakeholders are involved in an on-demand authorization?
3. What aspects can be used to characterize an on-demand authorization procedure?
4. How can incremental authorization work on top of an OIDC sign-in that uses Verifiable Credentials as its ground truth?



Timeline


Thesis End
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January
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Thesis Start
Literature Review
Solution Identification & Evaluation
Implementation
Evaluation
Thesis Writing
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Thank you for listening

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