Hyperledger Mentorship Project Presentation

November 2020

Towards Blockchain Interoperability with Hyperledger

› **Introduction**

    › **Name**: Sara Ghaemi

    › **Location:** Toronto, Canada

    › **University:** University of Alberta, Edmonton, Canada

    › **Mentors:** Prof Rui Cruz, Rafael Belchior, Sara Rouhani

    › **Hyperledger Project**: Hyperledger Fabric, Besu, Caliper, Explorer

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› **Project Description**:

    › Why blockchain interoperability is important?

    › Research questions:
- How can we interoperate Hyperledger technologies with other blockchains?
- What are the main design principles of a blockchain interoperability solution?

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› **Project Objectives**:

- › Obj 1: Design a blockchain interoperability solution that can be used by Hyperledger technologies.
- › Obj 2: Implement a proof of concept for the design
- › Obj 3: Compare with other interoperability solutions
- › Obj 4: Write a research paper

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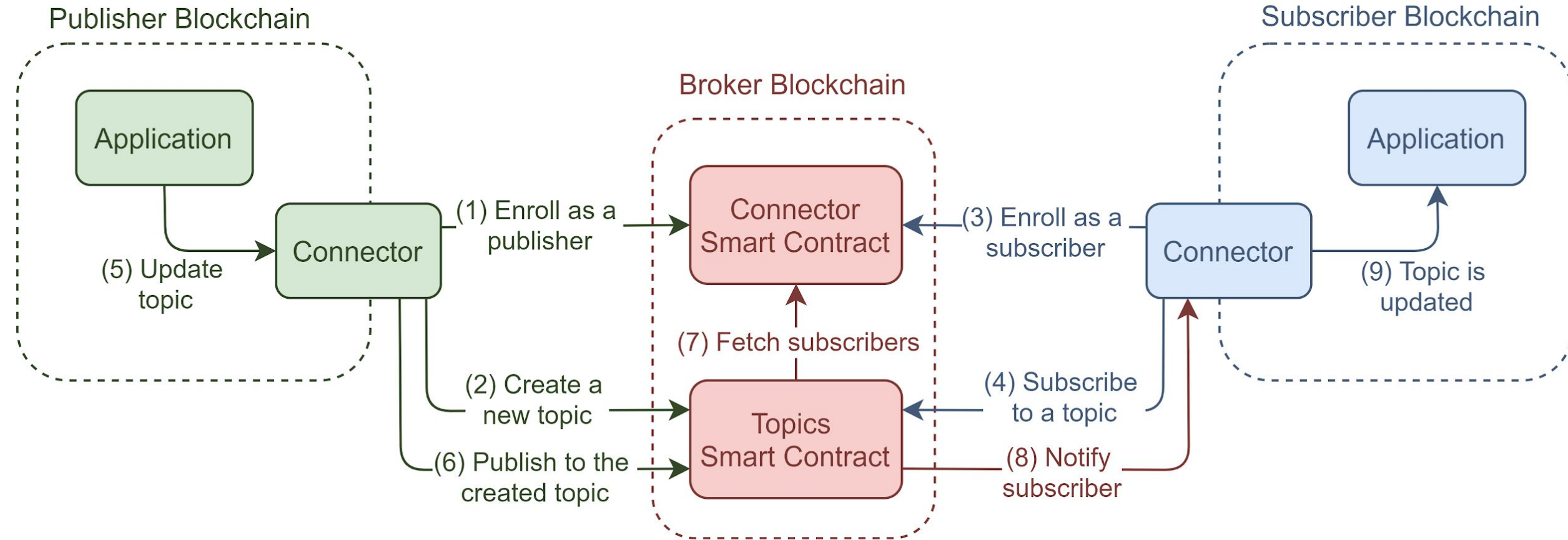
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› **Project Deliverables:**

> › Deliverable 1: System design documents
> › Deliverable 2: Code for the implemented proof of concept
> › Deliverable 3: Technical documentation
> › Deliverable 4: Research paper

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› **Project Execution & Accomplishments:**

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› **Project Execution & Accomplishments**:

  › Broker Blockchain:
    ○ Implementation ⟶ Hyperledger Fabric v2.2
    ○ Performance Analysis ⟶ Hyperledger Caliper
    ○ Monitoring ⟶ Hyperledger Explorer

  › Publisher Blockchain:
    ○ Implementation ⟶ Hyperledger Fabric v2.2

  › Subscriber Blockchains:
    ○ Implementation ⟶ Hyperledger Fabric v1.4
    ○ Implementation ⟶ Hyperledger Besu

https://github.com/hyperledger-labs/pubsub-interop

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Top-left terminal — ubuntu@interop-broker: ~/pub

```
ubuntu@interop-broker:~/pubsub-interop/blockchain-client/javascript$ node client.js queryAll
Topics
No topics found on the broker blockchain.
ubuntu@interop-broker:~/pubsub-interop/blockchain-client/javascript$ node client.js queryAll
Topics
{ Key: 'BLOCKCHAIN3_0',
  Record:
   { docType: 'topic',
     message: 'Initial message!',
     name: 'FirstTopic',
     publisher: 'BLOCKCHAIN3',
     subscribers: [] } }
ubuntu@interop-broker:~/pubsub-interop/blockchain-client/javascript$ node client.js queryAll
Topics
{ Key: 'BLOCKCHAIN3_0',
  Record:
   { docType: 'topic',
     message: 'Initial message!',
     name: 'FirstTopic',
     publisher: 'BLOCKCHAIN3',
     subscribers: [ 'BLOCKCHAIN0' ] } }
ubuntu@interop-broker:~/pubsub-interop/blockchain-client/javascript$
```

Top-right terminal — ubuntu@interop-sub-fabric: ~/

```
ubuntu@interop-sub-fabric:~/pubsub-interop/example-subscriber/Fabric1.4/client-node$ node client.js que
ryTopic --id=BLOCKCHAIN3_0
Topic does not exist!
ubuntu@interop-sub-fabric:~/pubsub-interop/example-subscriber/Fabric1.4/client-node$ node client.js sub
scribeToTopic --id=BLOCKCHAIN3_0
Querying topic from broker blockchain...
Creating an equivalent topic on the subscriber blockchain...
Subscribing to the topic on the broker blockchain...
Success!
ubuntu@interop-sub-fabric:~/pubsub-interop/example-subscriber/Fabric1.4/client-node$ node client.js que
ryTopic --id=BLOCKCHAIN3_0
{ Key: 'BLOCKCHAIN3_0',
  Record:
   { docType: 'topic',
     name: 'FirstTopic',
     message: 'Initial message!' } }
ubuntu@interop-sub-fabric:~/pubsub-interop/example-subscriber/Fabric1.4/client-node$
```
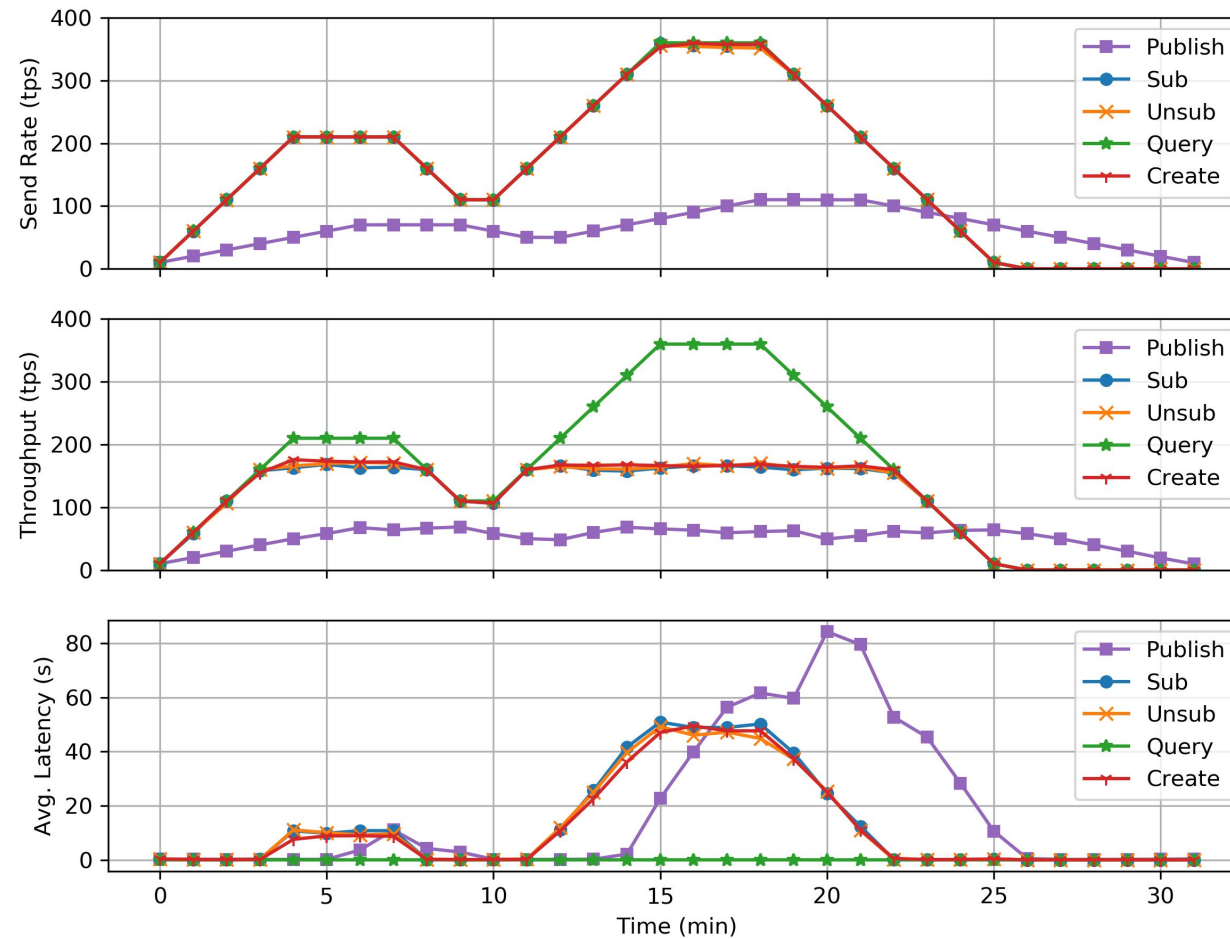
Bottom-left terminal — ubuntu@interop-pub: ~/pubsu

```
ubuntu@interop-pub:~/pubsub-interop/example-publisher/Fabric2/blockchain-client/javascript$
node client queryAllTopics
No topics found on the publisher blockchain.
ubuntu@interop-pub:~/pubsub-interop/example-publisher/Fabric2/blockchain-client/javascript$
node client.js createTopic --id=0 --name='FirstTopic' --message='Initial message!'
Transaction has been submitted
ubuntu@interop-pub:~/pubsub-interop/example-publisher/Fabric2/blockchain-client/javascript$
node client queryAllTopics
[ { Key: '0',
    Record:
     { docType: 'topic',
       message: 'Initial message!',
       name: 'FirstTopic' } } ]
ubuntu@interop-pub:~/pubsub-interop/example-publisher/Fabric2/blockchain-client/javascript$
```

Bottom-right terminal — ubuntu@interop-sub-besu: ~/p

```
ubuntu@interop-sub-besu:~/pubsub-interop/example-subscriber/besu/client$ node client.js queryTopic --id
=BLOCKCHAIN3_0
Result {
  '0': false,
  '1': '',
  '2': '',
  exists: false,
  name: '',
  message: '' }
ubuntu@interop-sub-besu:~/pubsub-interop/example-subscriber/besu/client$ node client.js subscribeToTopi
c --id=BLOCKCHAIN3_0
Querying topic from broker blockchain...
Creating an equivalent topic on the subscriber blockchain...
```

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› **Project Execution & Accomplishments:**

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› **Recommendations for future work:**

    › Adding support for other permissioned blockchains

    › Adding an access control layer

    › Enhancing the performance

    › Possible integration with Hyperledger Cactus

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› **Insights Gained**:

  › Do your research first.

  › Always ask questions.

  › People want to help you.

  › Even the small contributions can teach you a lot.

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THANK YOU!