Hyperledger Mentorship Project Presentation

November 2021

Visualization and Analysis of Cross-chain Transactions

- **Introduction**
  - **Name**: Iulia Mihaiu
  - **Location:** Brașov, Romania
  - **University:** Transilvania University of Brașov
  - **Mentor(s):** Rafael Belchior, Sabrina Scuri, Rui J. Nunes
  - **Hyperledger Project**: Visualization and Analysis of Cross-chain Transactions

Visualization and Analysis of Cross-chain Transactions

- **Project Description**:

- creating a framework to assess the performance of a BI solution
- analyzing and visualizing cross-chain transactions can help stakeholders understand bottlenecks, identify processes, discover security issues, and provide more control over a blockchain interoperability solution
- the two main research questions explored: i) How to visualize cross-chain rules?, and ii) What are the relevant metrics to assess cross-chain transactions and solutions?

- working with: Hyperledger Cactus, Fabric and Besu
- using: Typescript, Node.js

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- **Project Objectives**:
  - **Obj 1:** Understand the architecture of Hyperledger Cactus
  - **Obj 2:** Conducting a User Study
  - **Obj 3:** Implementation of the solution (CC-TX-VIZ plugin)
  - **Obj 4:** Writing of the Technical Report of the project

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- **Project Deliverables:**
  - **Deliverable 1:** User Study Plan & User Survey
  - **Deliverable 2:** Github branch/ the code for the new plugin
  - **Deliverable 3:** Technical Report

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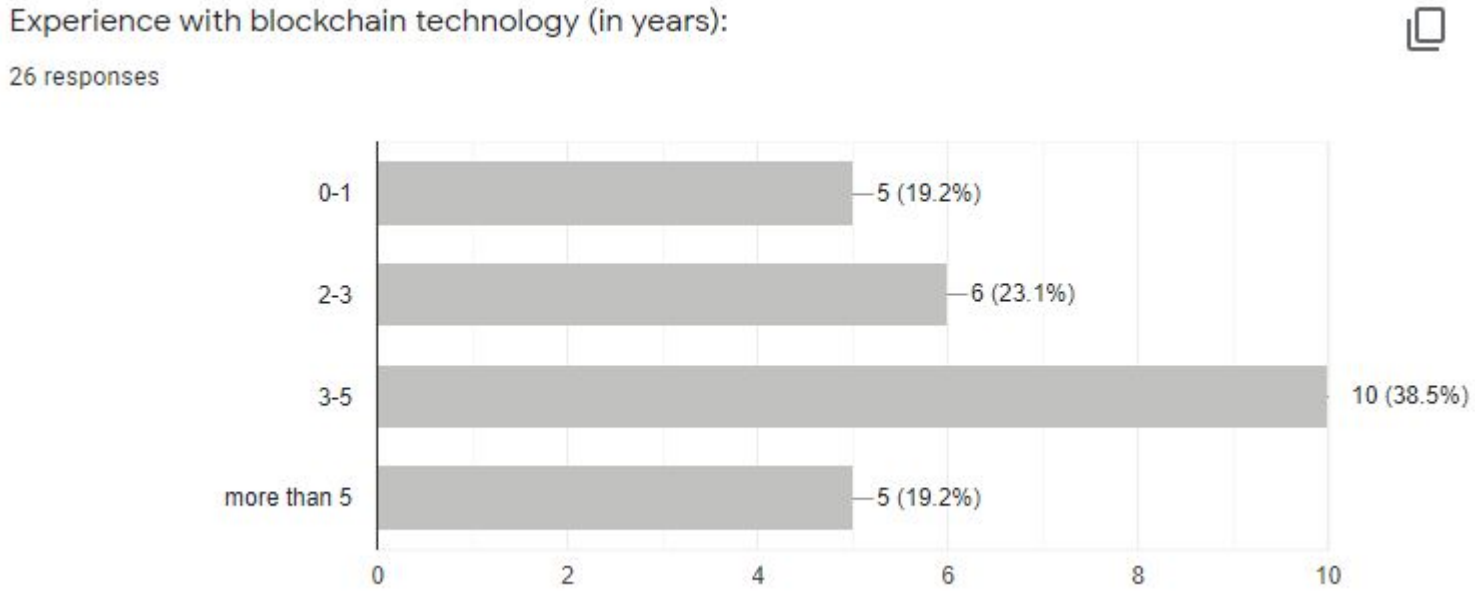
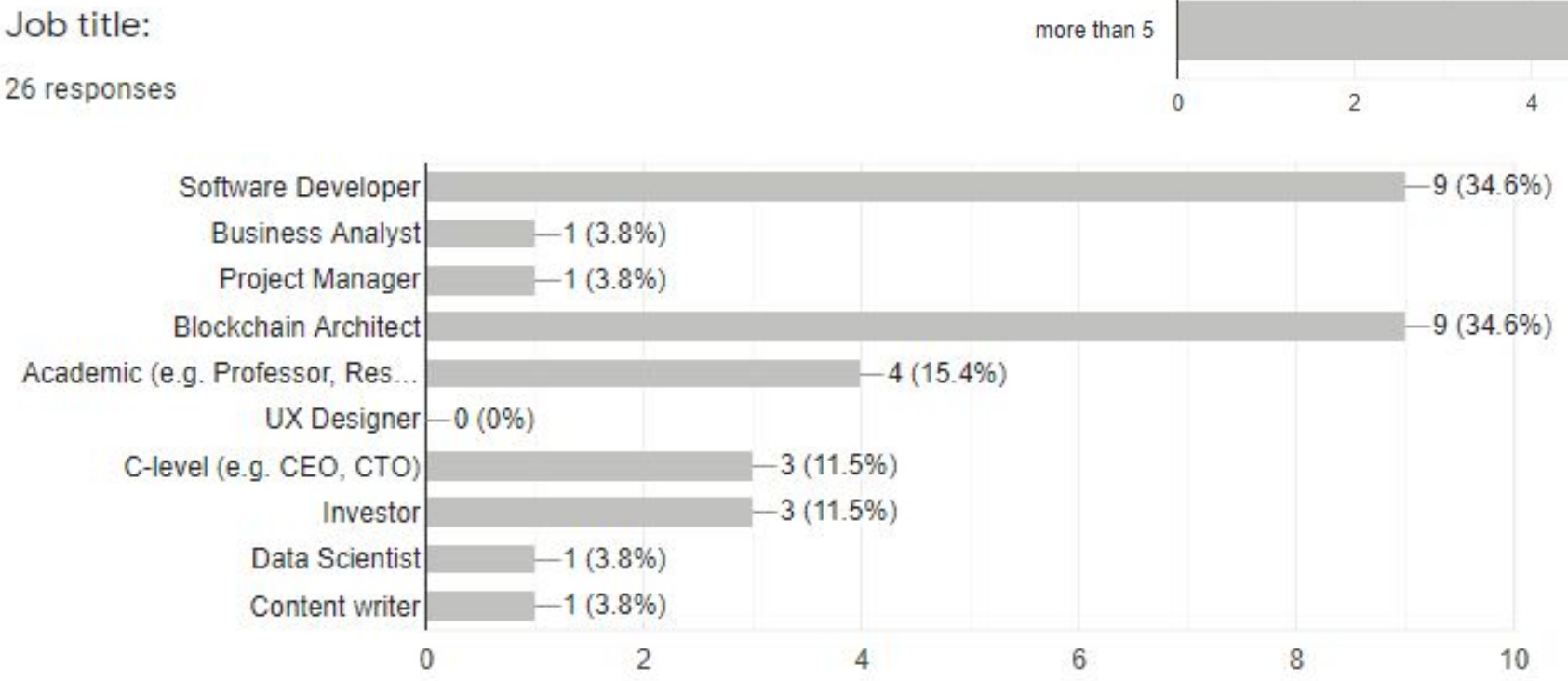
- **Project Execution:**
  <User Study>





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- **Project Execution**: <User Study - metrics>

Metrics
END TO END latency
END TO END throughput
Parties endorsing transactions
Cross-chain logic
Total transactions fees
Carbon footprint
Energetic consumption

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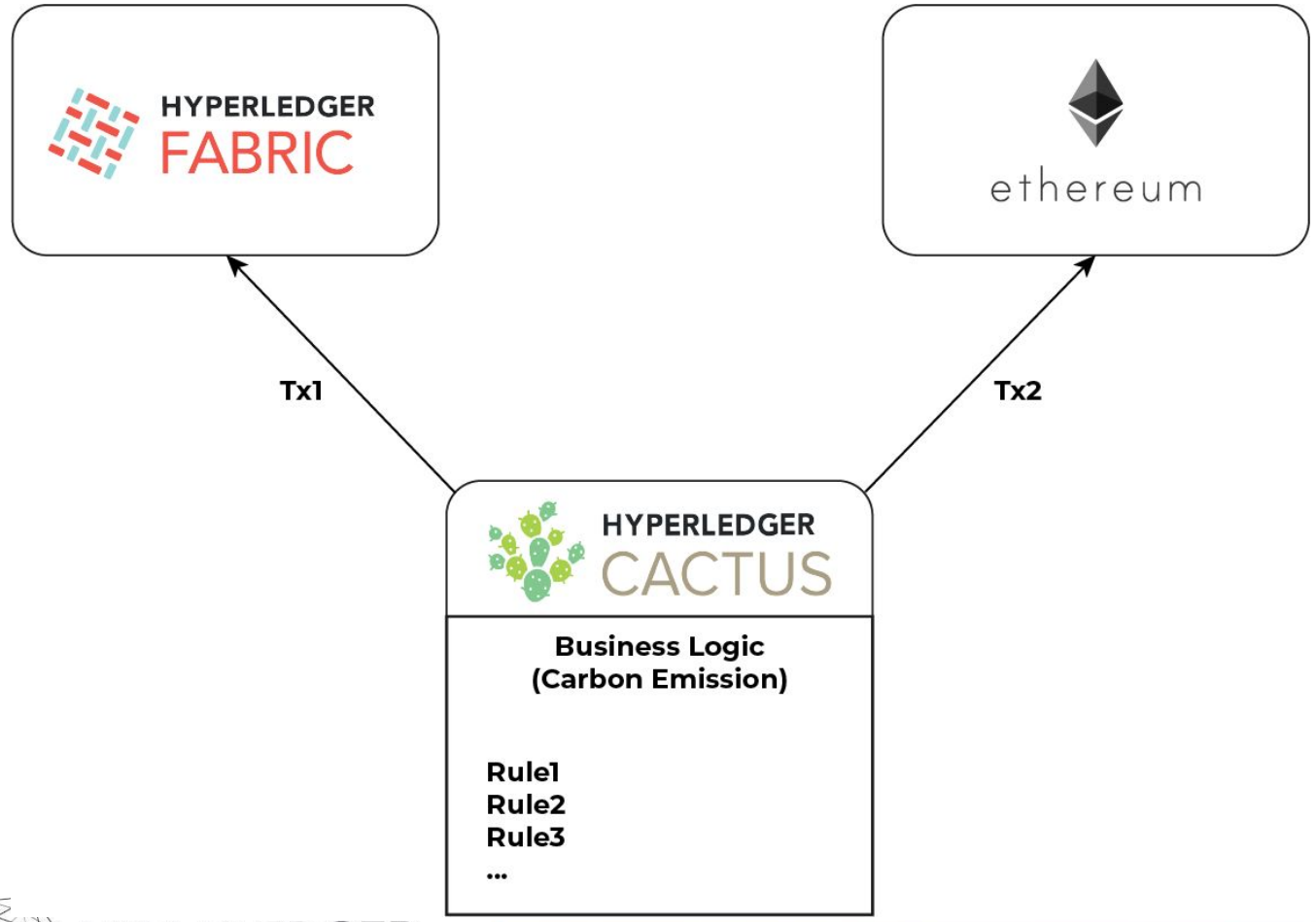
- **Project Execution**: <Cactus Carbon Emissions Use Case>



Tx1 - converting the energy into emissions
Tx2 - tokenizing the emissions

Rule1 - Fabric gathering the energy used and converting it to emissions
Rule2 - emissions are tokenized as emission tokens on the Ethereum network

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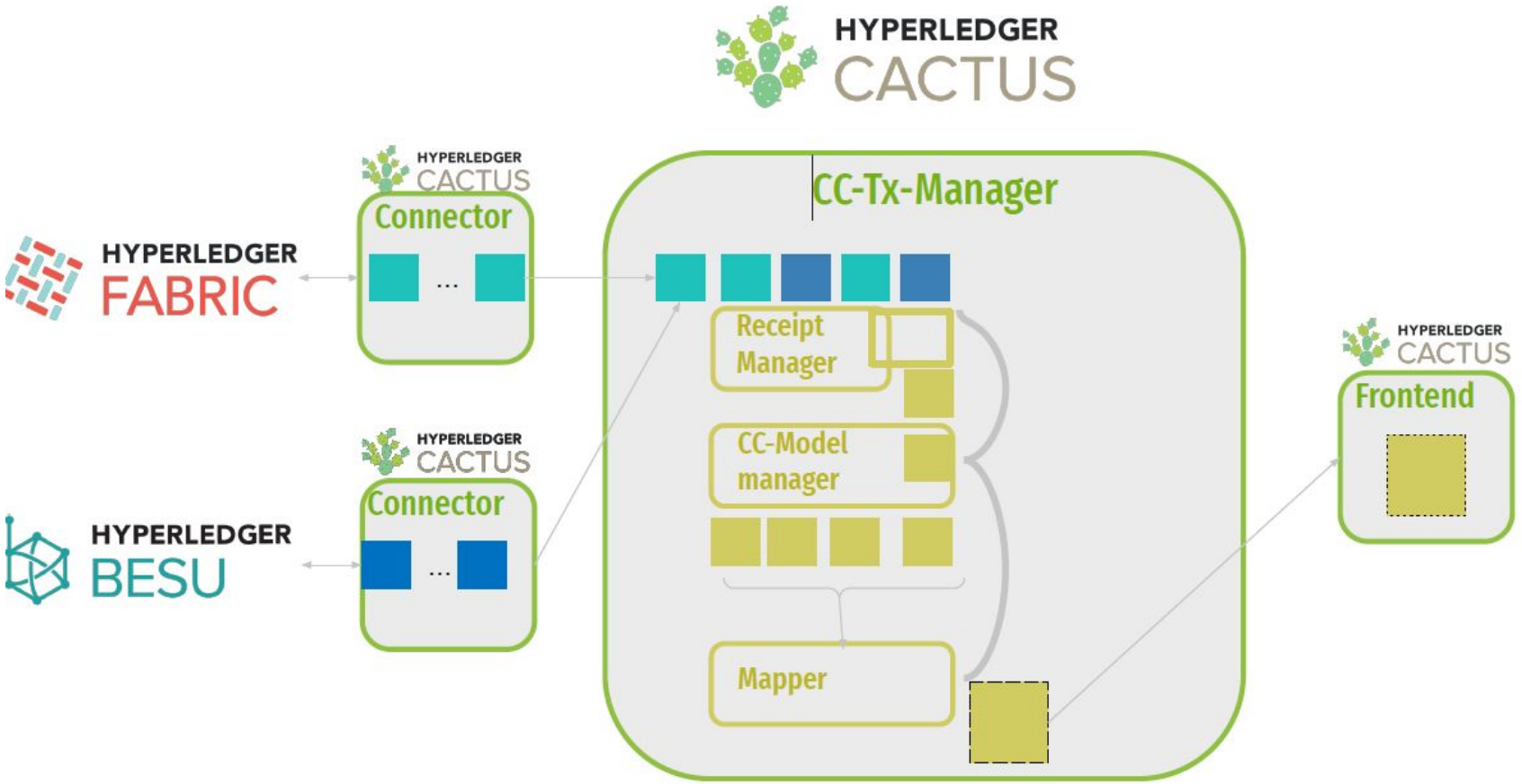
- **Project Execution:** <CC-TX-VIZ plugin architecture>



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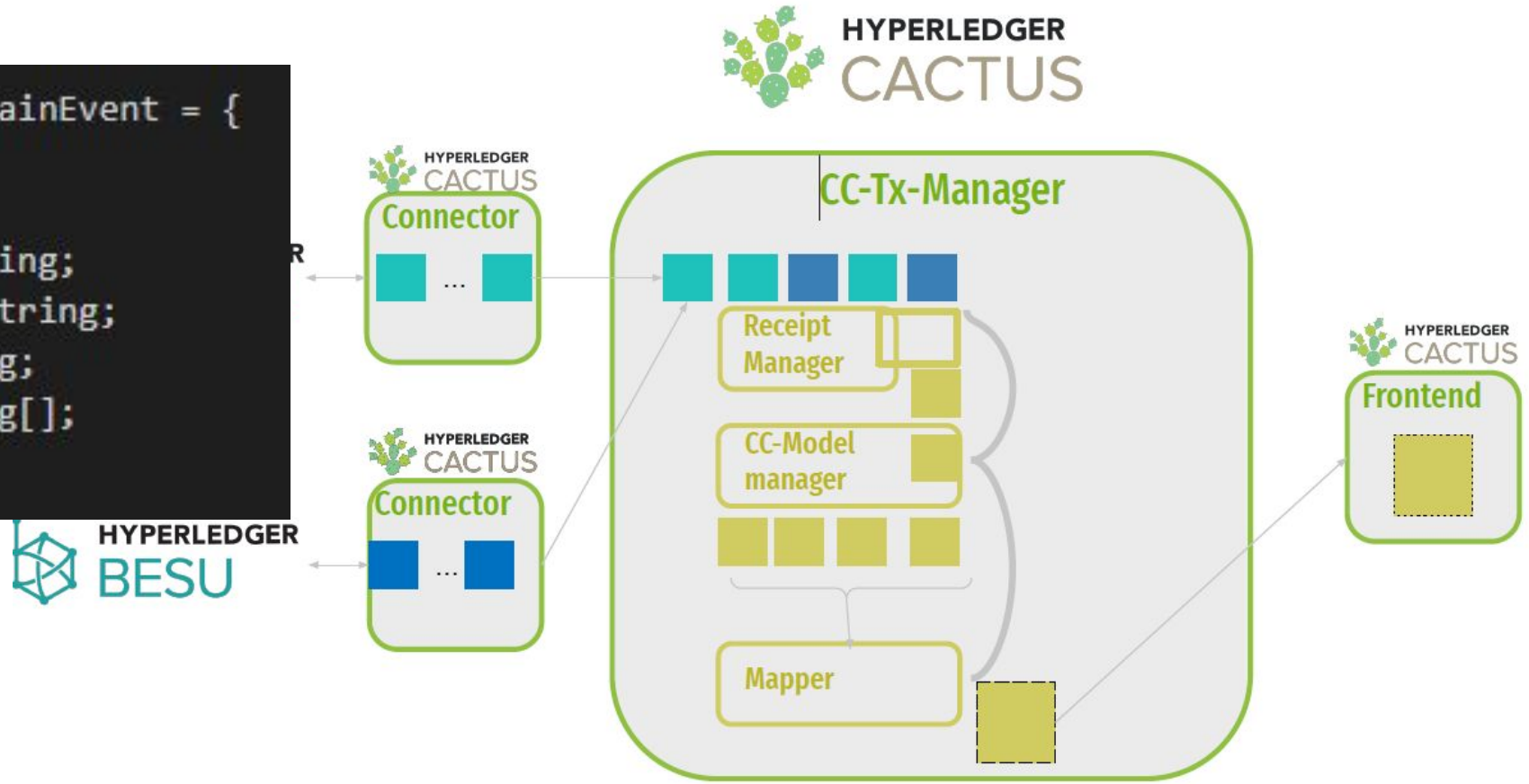
- **Project Execution**: <CC-TX-VIZ plugin architecture>

```
export type CrossChainEvent = {
  caseID: string;
  timestamp: Date;
  blockchainID: string;
  invocationType: string;
  methodName: string;
  parameters: string[];
};
```



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- **Most challenging:**
  - keeping up with the Hyperledger Cactus main branch and merging
  - finding a proper way to visualize the cross-chain logic (because there are no references)
  - getting as many responses as possible to the survey; conducting a user study in summer (as it's even harder to reach people because they are on vacation)

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- **Recommendations for future work:**
- formalizing the cross-chain logic and cross-chain state concepts;
- working towards creating an interface that allows us to visualize the most important metrics according to the respondents: end-to-end latency and throughput, total transaction fees, and visualization of cross-chain rules.

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- **Project Output or Results**:
- https://github.com/hyperledger/cactus/issues/1214
- https://github.com/hyperledger/cactus/issues/1216
- Code here: https://github.com/maramih/cactus/tree/cctxviz
- Technical report (to be finished)

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- **Insights Gained**:
- The process of open source project development
- Learned how to build a plugin and write code with better readability
- In research you need to have a lot of patience (a lot of iterations are needed to get something right)
- **Advice:**
- Take your time to learn and understand the things
- Keep up with the main branch
- Ask more specific questions and don’t be afraid to try new things

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- **A big THANK YOU to my mentors (Rafael & Sabrina) and also to the members of the community.**


THANK YOU!