Columbus United
A Byzcoin visualization project

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Lucas Trognon
Sophia Artioli
Objectives

- Creating a visualization tool for ByzCoin and its underlying Skipchain
- Usability and accessibility for all kinds of users
- Help users acquire more knowledge about ByzCoin
Timeline

Week 1-3 ✓
- Setting up the project
- Defining features to implement
- UX study

Week 3-8 ✓
- Implementing the features on different branches

Week 8-10 ✓
- Merging our work
- New feedback with UX studies

Week 10-13 ✓
- Implementing possible Improvements needed

Week 14-16 ✓
- Refactoring code
- Writing the report and documentation
Initial feedback on the previous explorer

- No visibility over the structure of the Skipchain
- Navigation is rigid
- Lacking key information
- Lacking readability and usability
- Instance tracking not working
Features implementation

- Typescript as the front-end language
- RXJS as the react library
- Uikit as the CSS framework
- D3 as the visualization library
## Planned features: Chain visualization

<table>
<thead>
<tr>
<th>Chain visualization</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Search bar: search by block height, transaction hash/ID, contract name</td>
<td>1</td>
</tr>
<tr>
<td>Dedicated space for the last validated block</td>
<td>1</td>
</tr>
<tr>
<td>On-hand information on the last validated block</td>
<td>1</td>
</tr>
<tr>
<td>Build dedicated space for chain and display block heights</td>
<td>1</td>
</tr>
<tr>
<td>Highlight forward links and backlinks between blocks by adding arrows</td>
<td>1</td>
</tr>
<tr>
<td>adding “colored stickers” to blocks on chain representing transactions</td>
<td>2</td>
</tr>
<tr>
<td>Make arrows between blocks clickable to display at the right scale all blocks linked</td>
<td>2</td>
</tr>
<tr>
<td>“go to home” reloads the latest block and displays the chain from block 0</td>
<td>3</td>
</tr>
<tr>
<td>Statistics:</td>
<td>3</td>
</tr>
<tr>
<td>- average number of transactions per block</td>
<td></td>
</tr>
<tr>
<td>- average validation time</td>
<td></td>
</tr>
<tr>
<td>- most popular contracts</td>
<td></td>
</tr>
<tr>
<td>- number of accepted transaction vs non accepted</td>
<td></td>
</tr>
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Implementation & Challenges

Chain
- Displaying blocks by their heights
- Adding arrows between blocks
- Starting the visualisation from the end of the chain

Last added block
- Building a dedicated space
- Display of information on-hand

Search-bar and translation
- Building the search bar
- Making requests
- Chain translation
- “Chunk” loading of the chain
Skipchain visualization: Block heights and arrows

Challenges

- Fit all block heights in the container
- Linking the blocks
- Keeping the proportions & making it aesthetic
- No overlaps
Skipchain visualization: End of chain display

Challenges

- Broken links
- Pagination requests when close to the end of the chain
Skipchain visualization: Last added block

Challenges

● Interaction with the client not working because of forward links
● Choice of on-hand information
● Making it pretty
Skipchain visualization: Search-bar and translation

Challenges

- Differentiating block hashes, indexes and instance ID
- Optimal loading of the chain into “Chunks”
- Translation of the chain
## Finished features: Chain visualization

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# Planned features

**Block visualization**

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<th>Priority</th>
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<tr>
<td>Overhaul the general design of the page</td>
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<tr>
<td>Add interactive fields to replace hashes (blockies, links, …)</td>
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</tr>
<tr>
<td>Add more fields to the block details column (i.e. validation time)</td>
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<tr>
<td>Fix and redesign the instance tracker</td>
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**Other**

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Implementation & Challenges

Block and transaction details
- Designing a usable interface
- Apprehending a large and scarcely documented project

Instance tracker modernizing
- Overhauling convoluted code
- Moving the tracker to the main page
- Offering granularity in the search while keeping it simple

Integrating the feedback to the explorer
- Design good UX studies
- Design concise UX studies
- Make compromises
Challenges:

- Designing a usable interface
- Apprehending a large and scarcely documented project
Instance tracker

Challenges:
- Overhauling convoluted code
- Moving the tracker to the main page
- Offering granularity in the search while keeping it simple
Integrating the feedback to the explorer

First round

Goals:
● Figure out what’s wrong with Columbus

Design choices:
● 10 participants (novices and intermediates)
● Very broad questions
● Mostly unguided

Second round

Goals:
● Refresh our priority list
● Tailor the user workflow around the lab use cases
● Get immediate feedback while in lockdown

Design choices:
● Google form
● Streamlined
● More complex and precise questions

Third round

Goals:
● Validate our changes
● Find potential improvements

Design choices:
● 15 participants (both new and familiar with Columbus)
● Mostly unguided
● Precise questions on features afterward
Second round of UX study (guided)

Feedback from the lab:

- Some features were overseen or difficult to use
- Many suggestions were made
- Navigation is improved
- Overall interactions are quick and pleasant
## Finished features: Block visualization

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<td>Modal search-bar</td>
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<td>Flash messages improvements</td>
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<td>Animated translations</td>
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<td>Automated versioning</td>
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Third round of UX study

Observations:

- Visibility of the features improved
- Efficient for expert users
- Learnable for beginners
- Users could infer some concepts about Byzcoin from the interface
Improvements to the Byzcoin implementation

Columbus is not only a Byzcoin visualization tool, it also helped discover bugs and strengthen the Byzcoin implementation

- Discovered some links were broken -> blocks were not accessible
- More functionalities for proxy nodes
- QoL improvements such as a beautifier
- Various bug fixes (timeouts, etc.)
- Optimizations
Conclusion - Demo
Thank you!
Q&A