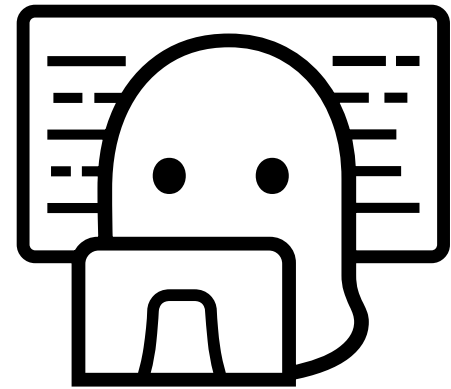


NeoBoard

Building a Real-Time Collaborative
Whiteboard Widget on Matrix

[#neoboard-froscon23:matrix.org](https://matrix.org/join/#neoboard-froscon23:matrix.org)



Dominik Henneke

Fullstack Software Engineer
Works with Matrix since 2021

<https://github.com/dhenneke>
[@dhenneke:matrix.org](https://matrix.org/#/dhenneke:matrix.org)

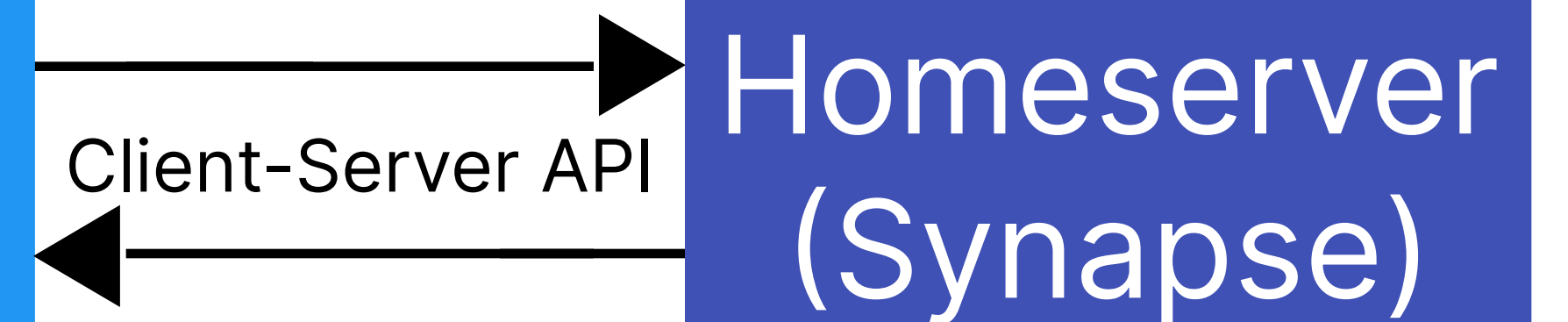
About the NeoBoard

- It's a whiteboard.
- Alternative to commercial SaaS tools.
- Matrix-native: embedded in your messenger.
- Uses the Matrix room as database.
- Not a drawing tool; it's a working tool.

Widget Architecture

Browser

Element
Messenger



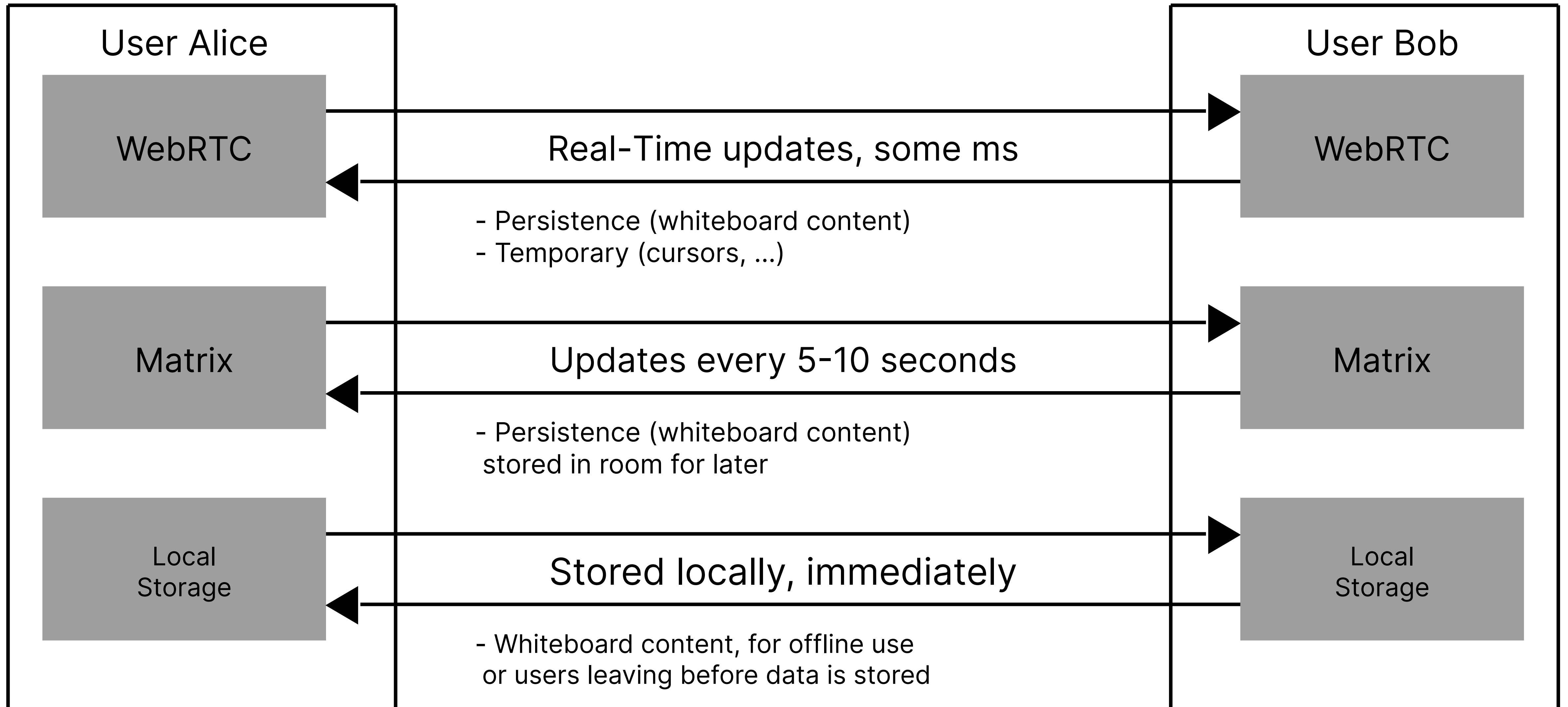
Features

- Fixed sized slides
- Add shapes and lines
- Add text to shapes
- Collaborative work

Data Storage

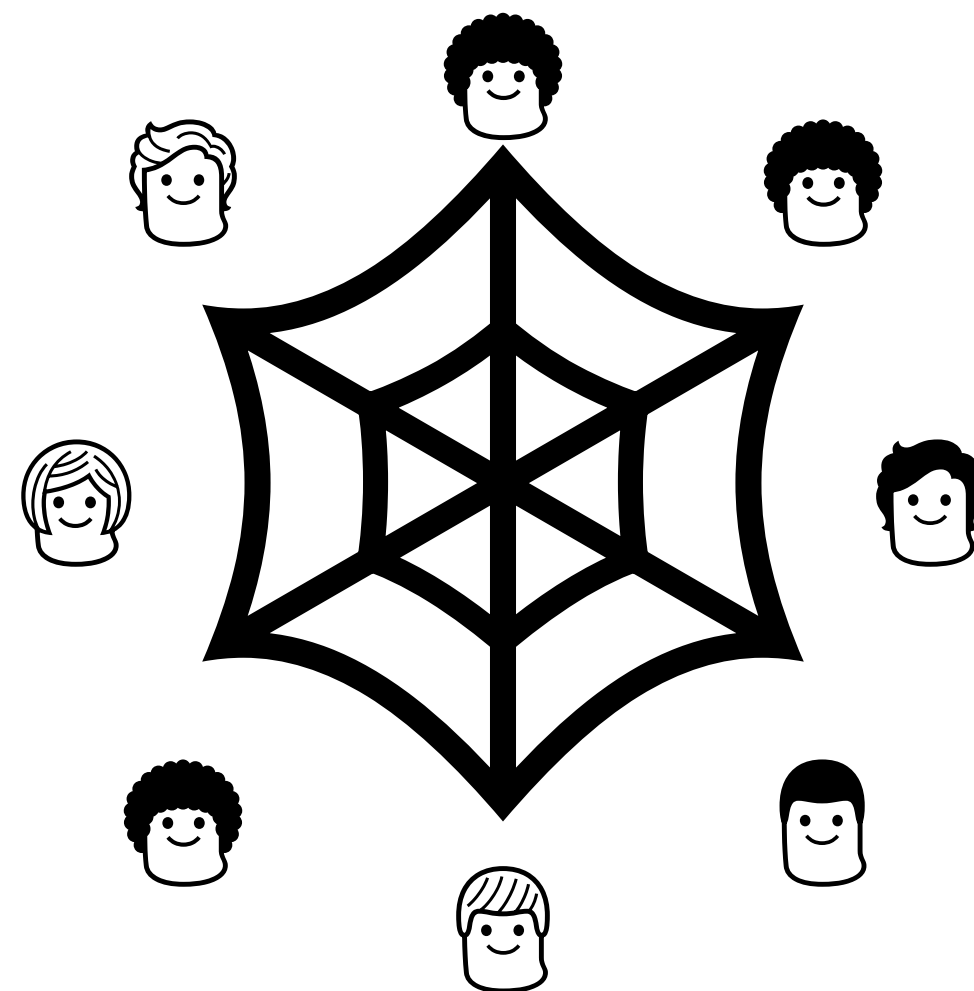


Data Storage



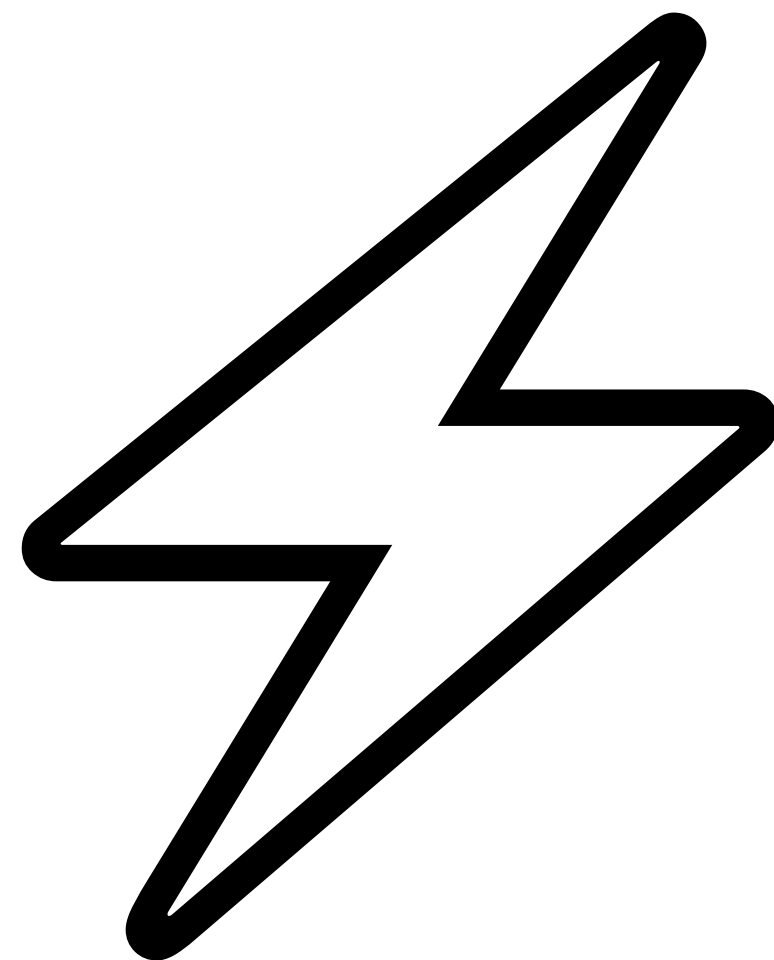
WebRTC over Matrix

- Similar approach as Element Call (MSC3401).
- WebRTC signalling using toDevice messages.
- Full mesh connection.
- May switch to MatrixRTC with SFU once fully available.



Conflict-free Replicated Data Type (CRDT)

- Different users can edit the state individually.
- Automatic (and deterministic!) conflict resolution.
- Yjs as a CRDT implementation.
- Can provide delta-updates for real-time updates.
- Our implementation is not yet reusable for us or others.



Challenges

Solved:

- Size limit of events
- How to read all events from the rooms via the widget api?
- How to efficiently search for whiteboard content in an encrypted room?

Unsolved:

- History visibility
- Rate limiting
- We spam the room with invisible events

Event Relations & Chunking

net.nordeck.whiteboard
(state_key: <whiteboard-id>)

← one state event for every whiteboard in the room

content.documentId

net.nordeck.whiteboard.document.create
(event_id -> documentId)

← one event for each whiteboard

m.relates_to: m.reference <documentId>

net.nordeck.whiteboard.document.snapshot
(event_id -> snapshotId)



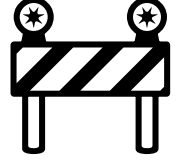
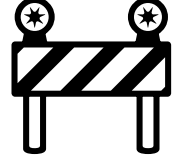
← n snapshots for each whiteboard

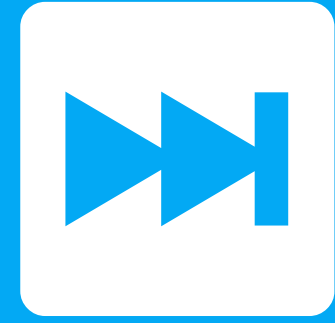
m.relates_to: m.reference <shapshotId>

net.nordeck.whiteboard.document.chunk

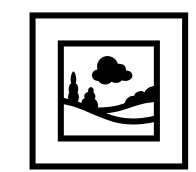
← m chunks for each snapshot

Notable upstream contributions

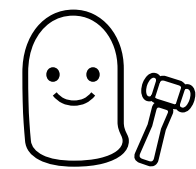
- MSC3869: Read event relations with the Widget API
- Implement MSC3869
-  MSC4039: Upload files with the Widget API 
-  Implement MSC4039 
- Extend url template variables with device_id
- Correct the dir parameter of MSC3715
- Allow downloads from widgets



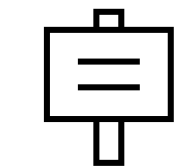
Next Steps



Upload images



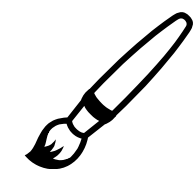
Improved rights and role model



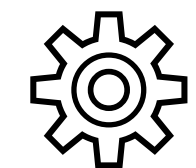
Standalone mode



Use Content Repository for snapshot storage



More formatting options



Accessibility of the slide contents



Mobile Support

...

More Info

- <https://nordeck.net>
- <https://github.com/nordeck>
- <https://github.com/nordeck/matrix-neoboard>

- Demo deployment (or self-host it)
- Read our architecture docs and ADRs in the docs/ folder