Hungryserv

A Homeserver Optimized for Unfederated Use-Cases

Sumner Evans

26 August 2022

Beeper

A bit about me

My name is Sumner, I'm a **software engineer at Beeper**.

- I graduated from Colorado School of Mines in 2019 with a master's in CS.
- I teach as an adjunct professor at my alma mater.
- I enjoy skiing, volleyball, and football (soccer).
- I'm a 4th degree black belt in ATA taekwondo.

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What I work on at Beeper

I am on the newly created *Scaling* team.

Our current objective is to prepare Beeper for rocket-ship growth.

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Notable projects include:

- Writing the LinkedIn bridge
- Implementing massive stability improvements in the Signal bridge
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Overview

1. A bit about Beeper
2. A bit about Beeper’s current architecture
3. Our new architecture

This talk is interactive!

If you have questions at any point, feel free to interrupt me.

A bit about Beeper

Beeper’s mission

Our mission is to:

make it easy for everyone on Earth to chat with each other.

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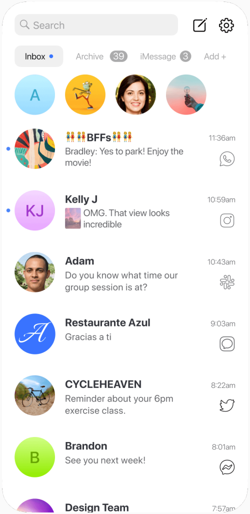
What is Beeper?

Beeper is an app that brings all of your chat networks together into a single inbox.



What is Beeper?

Beeper allows you to consolidate messages from 15+ chat apps into a single inbox.

- Beeper is available on on macOS, Windows, Linux iPhone, iPad, Android and Chrome OS.
- Beeper is built on top of the Matrix protocol.
- Beeper encrypts all chats, including bridged chats, by default[1].

[1] We have to momentarily decrypt your chat messages to translate from the other network to Matrix, but we never log or store your unencrypted messages.

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We see bridges as a way to onboard users into the Matrix ecosystem.

Users can switch to a new app without loosing a single conversation!

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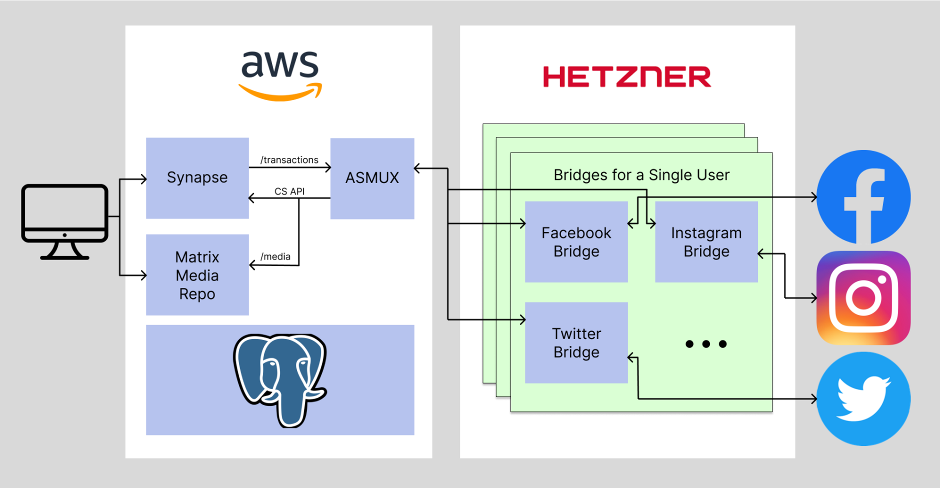
A bit about Beeper’s current architecture

A diagram



Each user gets their own bridge for each network they connect.

Advantages of our architecture

- ASMUX allows us to dynamically change what bridges are running
- Each users' bridge is **isolated**
- We can deploy **different bridge versions** to different sets of users
- Bridges can be stopped and started individually
- Double puppeting

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Disadvantages of our architecture

- We have to run a **lot** of bridges
- Synapse is not designed for a dynamic numbers of bridges
- If two users join the same chat on an external network, we end up with two rooms with the same data
- We run Synapse on AWS which is relatively expensive
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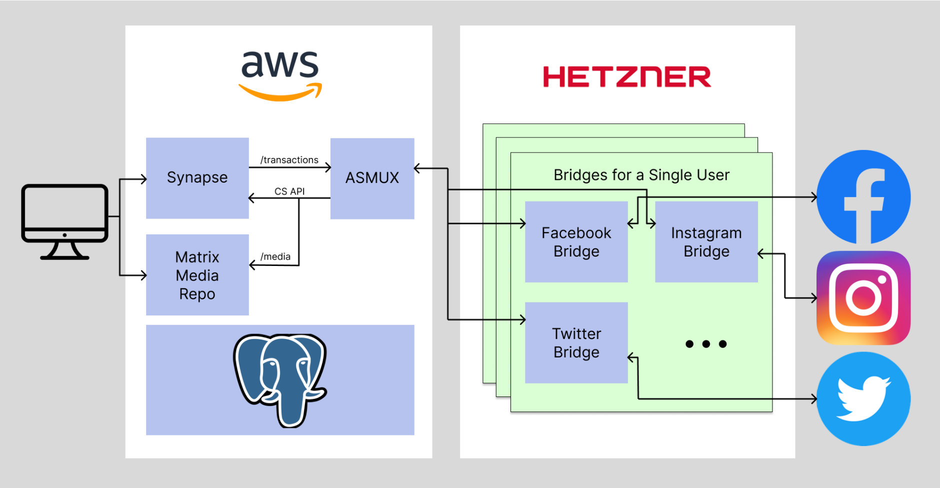
Back to the diagram



The core software in this architecture is Synapse.

Stats

Because we encourage users to connect every chat network, we have a lot of puppet users.

On average, each user brings 4716 puppeted users.

All of these puppets represent real people on other networks, so they each generate their own traffic.

On average, each user and their puppets collectively account for 100k events!

None of that traffic is federated, but it has to go to Synapse which is designed with federation front-and-center!

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A few more notes

- **Synapse is aggressively federated**
  Synapse has no special handling of federated vs unfederated rooms.
- **Synapse does not handle message floods well**
  Synapse falls over when users bridge some large Telegram chats and Discord servers.
- **Deleting rooms from Synapse is hard**
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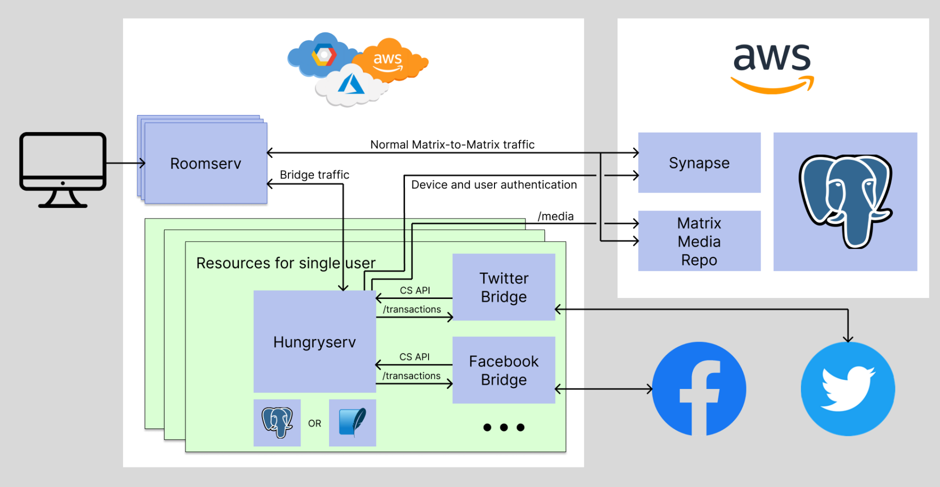
Solution: shard our homeserver based on bridged vs. unbridged traffic

Our new architecture

A sharded future



Let's talk about the differences from the old architecture...

Splitting the homeserver, keeping the protocol

This new architecture allows us to handle Matrix-native federated traffic separately from our high-throughput unfederated bridge traffic.

All while maintaining API compatibility with clients, bridges, and the Matrix federation!

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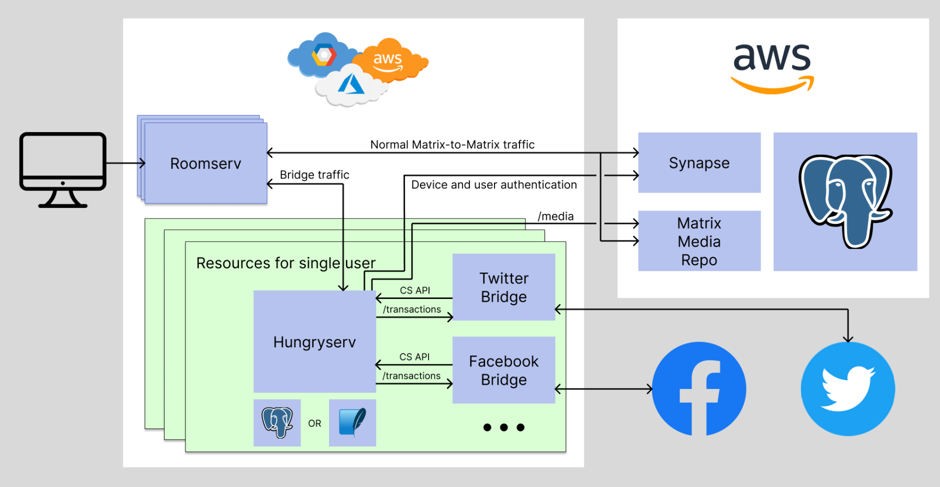

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Hungryserv: why is it hungry?

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We run a **Hungryserv** instance for every user to handle that user’s bridge traffic.

- If there’s a message flood from a bridge, it only affects that user.
- We don’t have to store all of the bridge events and users in our Synapse database.
- Synapse is less resource constrained and can do what it does best: federate with other Matrix homeservers.

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Hungryserv: aggressively unfederated

Each bridge belongs to a single user, so federation is unnecessary.

> *When your DAG is a linked-list, don't store it as a DAG.*

Being unfederated means that:

- we can avoid implementing the state resolution algorithm,
- event storage requires less metadata,
- deletions can be optimized, and
- infinite backfill becomes an simple batch SQL operation.

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Hungryserv: goals, and non-goals

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- Be fast
- Be compatible with Beeper clients (and mostly compatible with Element clients)
- Be API-compatible with the Appservice API for bridges

Non-goals

- Be federated
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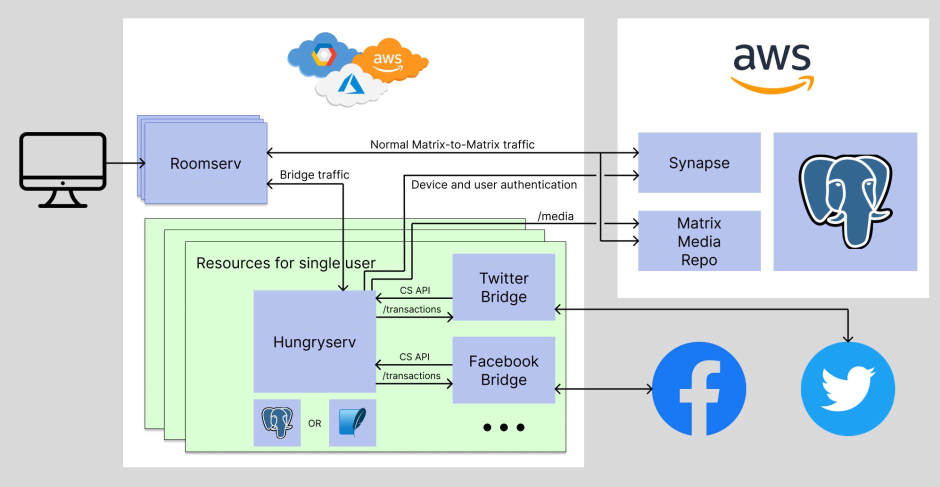

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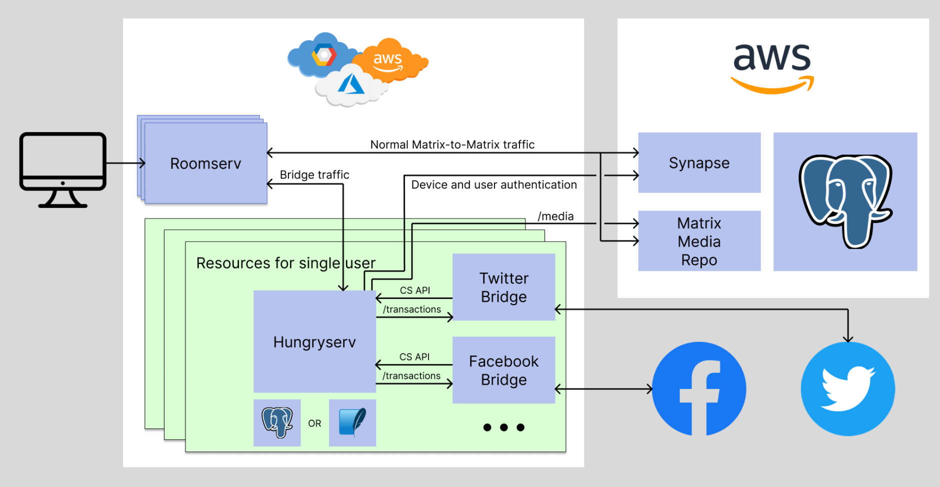
Roomserv

Roomserv is a service which splits client requests between Synapse and Hungryserv.

Roomserv merges the responses from the two homeservers to make it appear as a single homeserver to the client.

A sharded future



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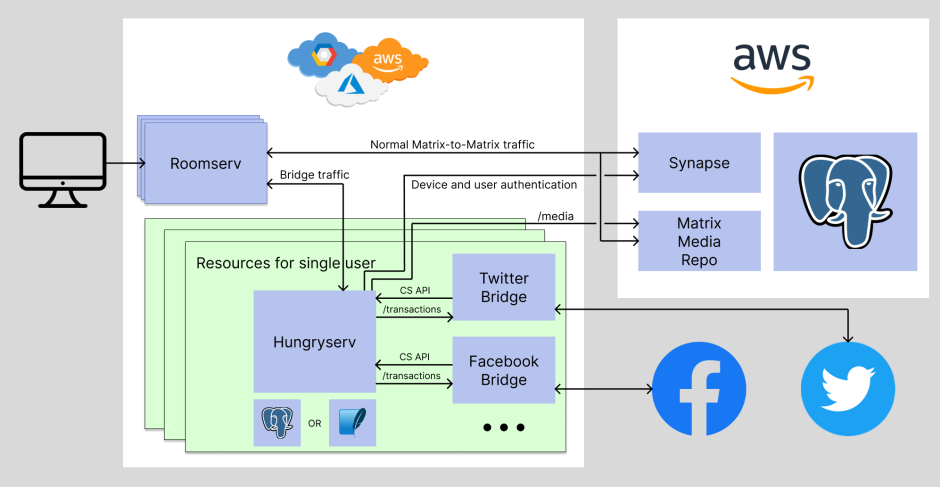

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A multi-cloud future?

The resources for each user can be moved closer to them using a multi-cloud, or multi-region strategy.

This will help reduce latency (especially to bridged networks) and allow for us to deploy in more flexible and cost-effective environments.

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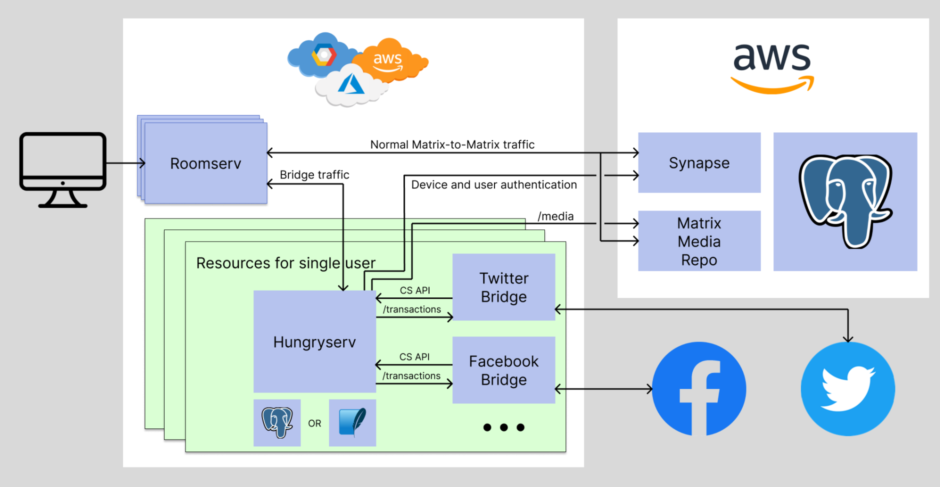

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Demo!

Questions?