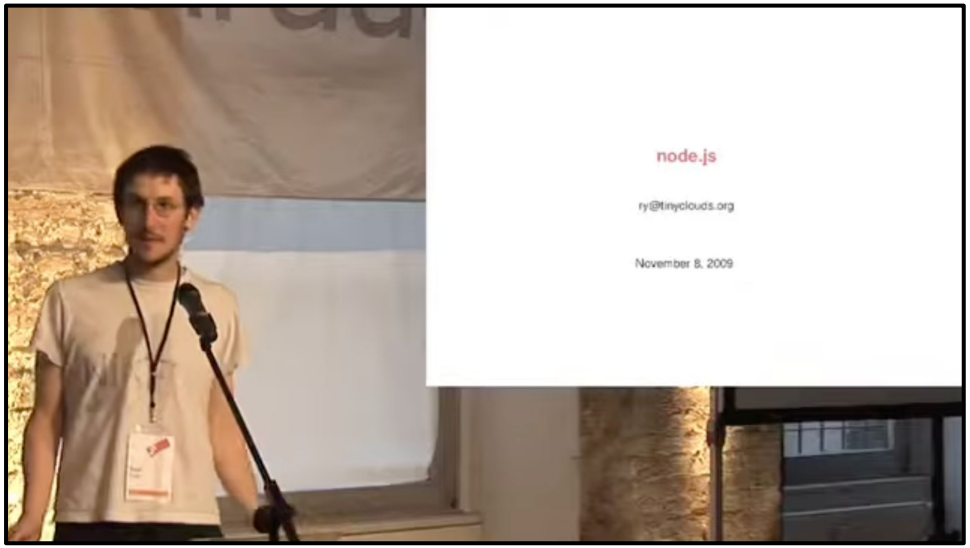


Self-Hosting Durable Objects

Ryan Dahl
Senior Principal Systems Engineer
Cloudflare

Berlin, 2009

First presentation of Node.js



The Demo in 2009

- A live IRC chat server
- 500 lines of JavaScript - shocking at the time
- The audience joined from their laptops
- original code if you're interested
  https://tinyurl.com/ircd-js

That 2009 demo has always bothered me

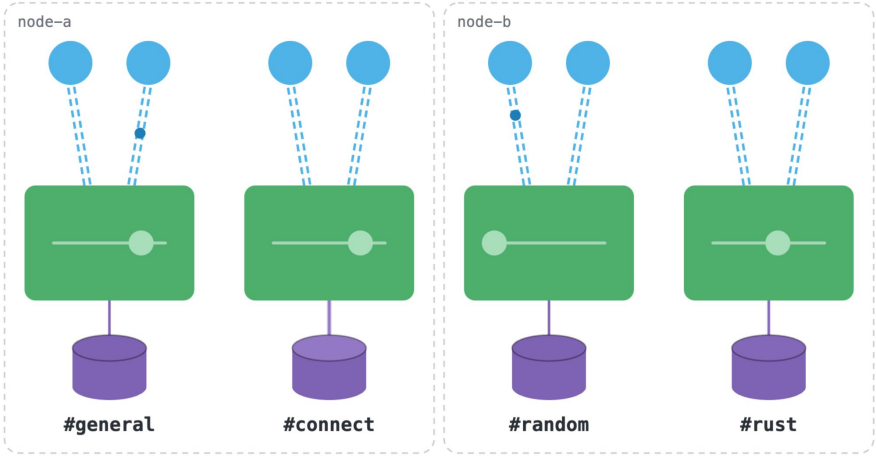
- Single threaded, single server
- Slows down as connections grow
- Scaling meant changing architecture
  - Split connections across many instances
  - Instances have to know about each other
  - Message history and accounts need storage

Everything is a server

- Everything is online, so everything is a server
- The state of the art has improved a lot in the last decade
- It's still gnarly: databases, queues, caches, orchestration, glue
- I've been looking for abstractions that make this simpler

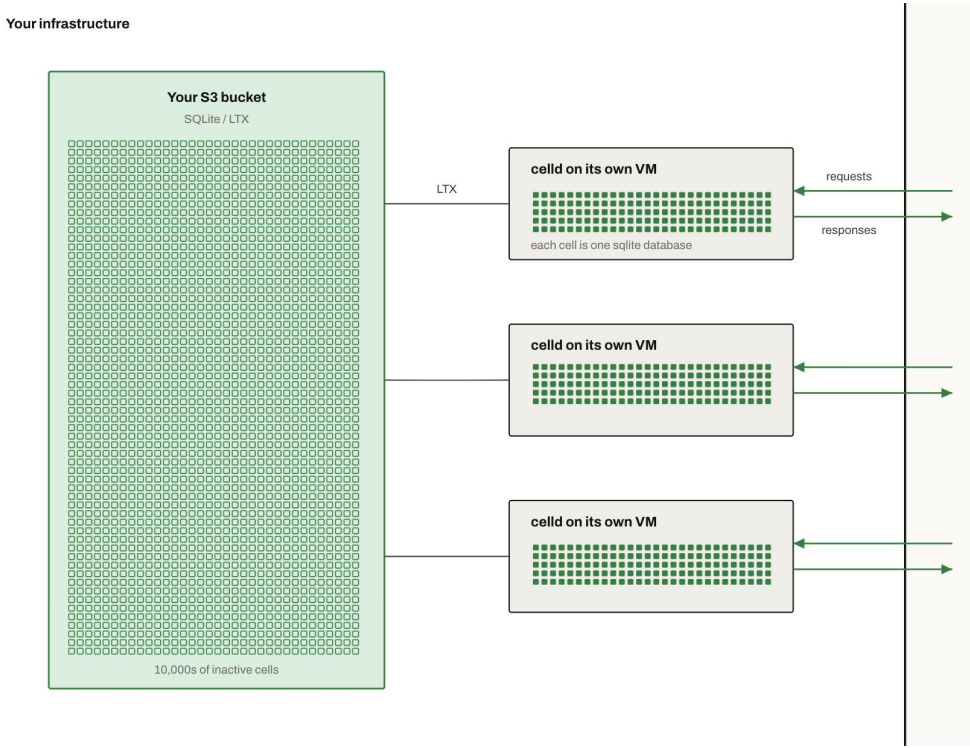
Durable Objects

- A small server you can address by name
- Handles WebSockets directly
- Single-threaded, so easy to reason about
- Each one has its own SQLite database
- One Durable Object per chat channel: connections and data split across machines automatically



celld

- One binary, written in Rust
- Run as many instances as you like
- Object storage (S3, R2) is its only external dependency
- Supports: Workers, Durable Objects, KV, Queues, D1, R2, Workflows, Cron



Demo

Three machines, one bucket



https://celld.dev/cf-connect-demo

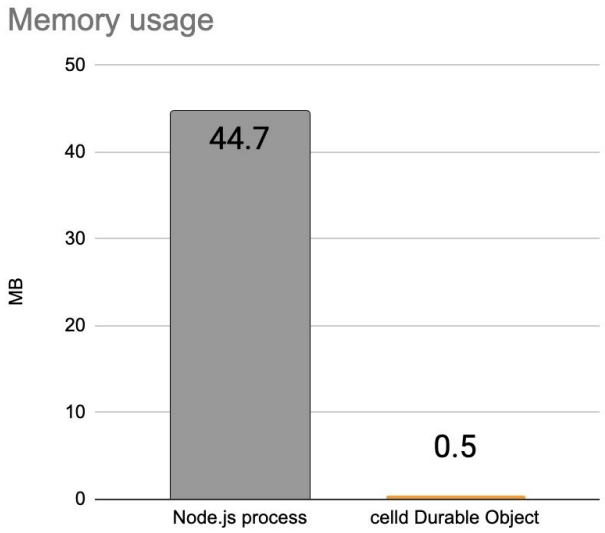
Why we're doing this

- Build on Cloudflare knowing you can run it elsewhere
- workerd is open source: the same code Cloudflare runs in production
- An open-source implementation you can run anywhere makes the platform safe to commit to
- The world runs on servers, we need a programming model that is built for this

"The Network Is the Computer"

Agents

- The number of agents is exploding
- They don't all need a Linux VM
- One Durable Object per agent: state, WebSockets, cheap to run
- Code mode: the model writes code, and it runs in a Dynamic Worker with only the bindings you grant



What’s next

- We're merging celld into workerd. More to come!
- If you want to run DOs at scale outside of Cloudflare’s network, please get in touch
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