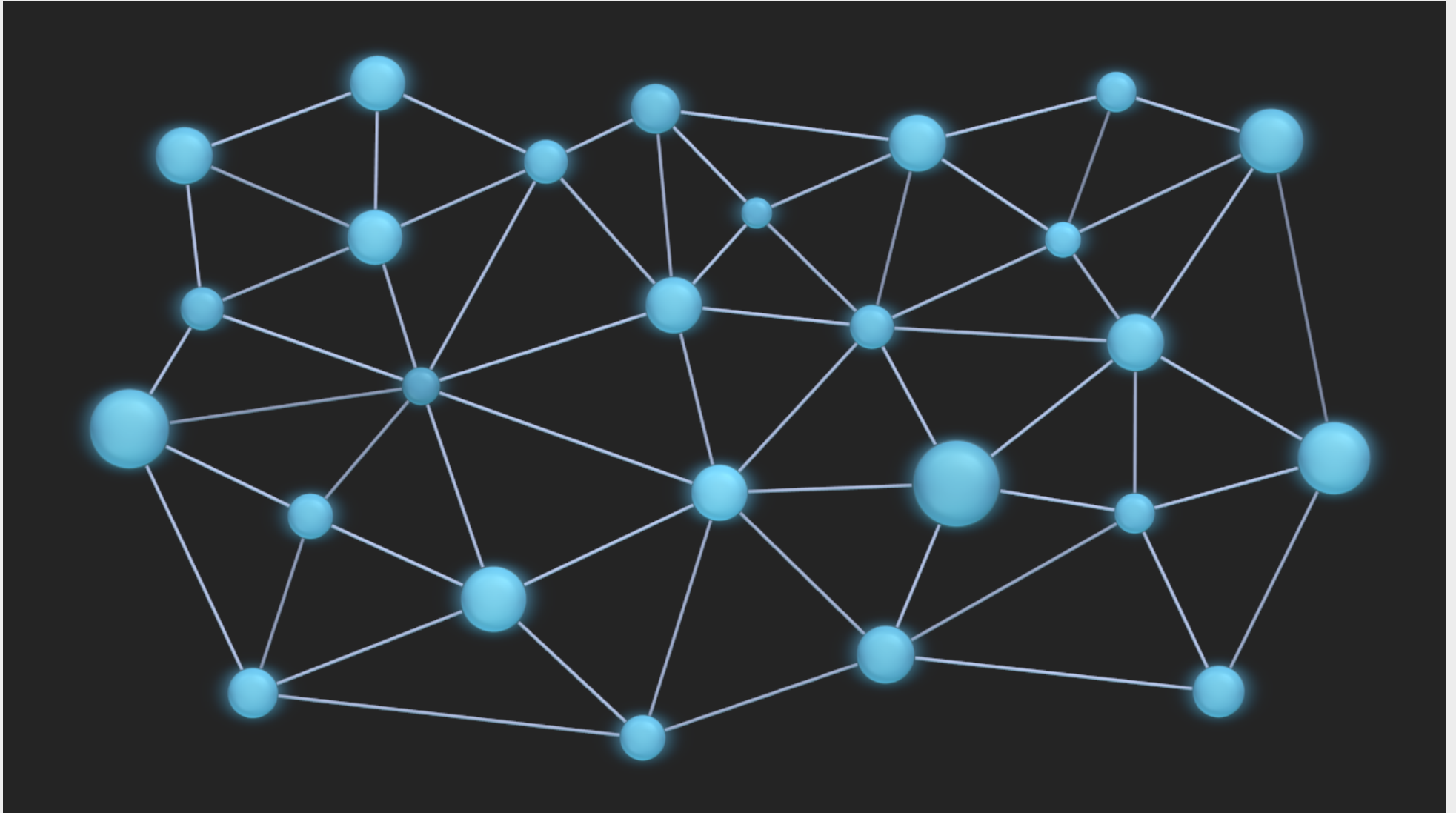


# Goblins and Spritely

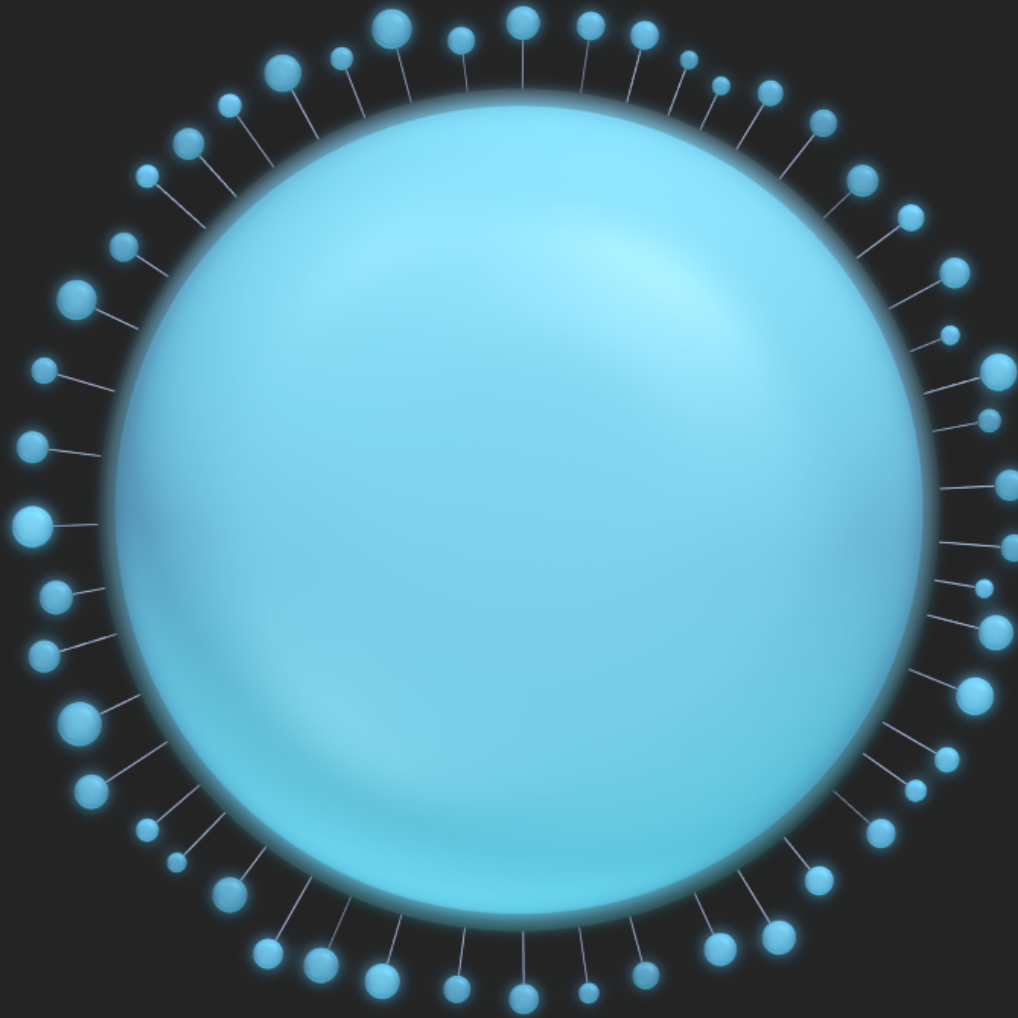
From the actor model to Distributed Virtual Worlds

By Christopher Lemmer Webber

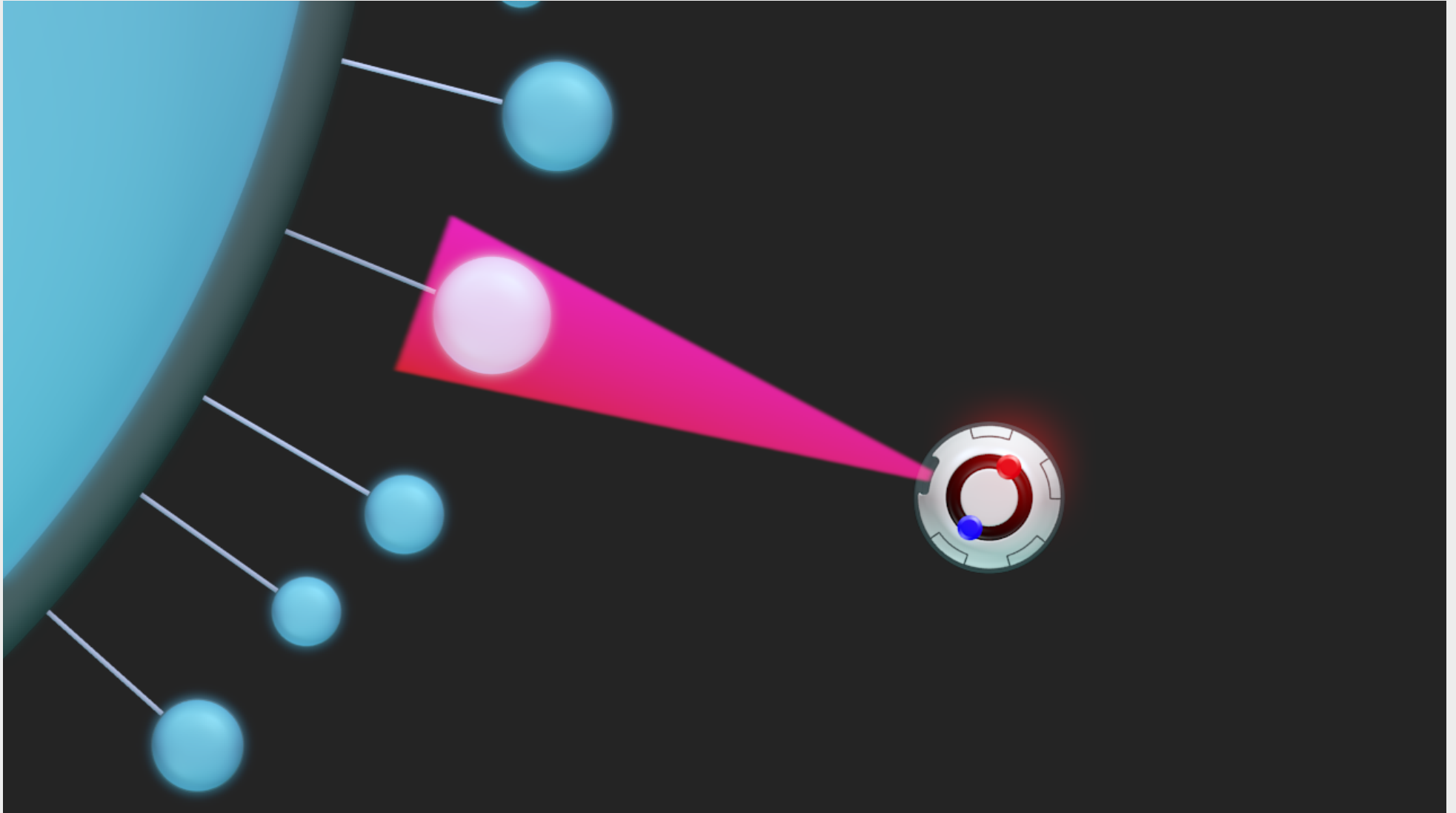
# The web we want



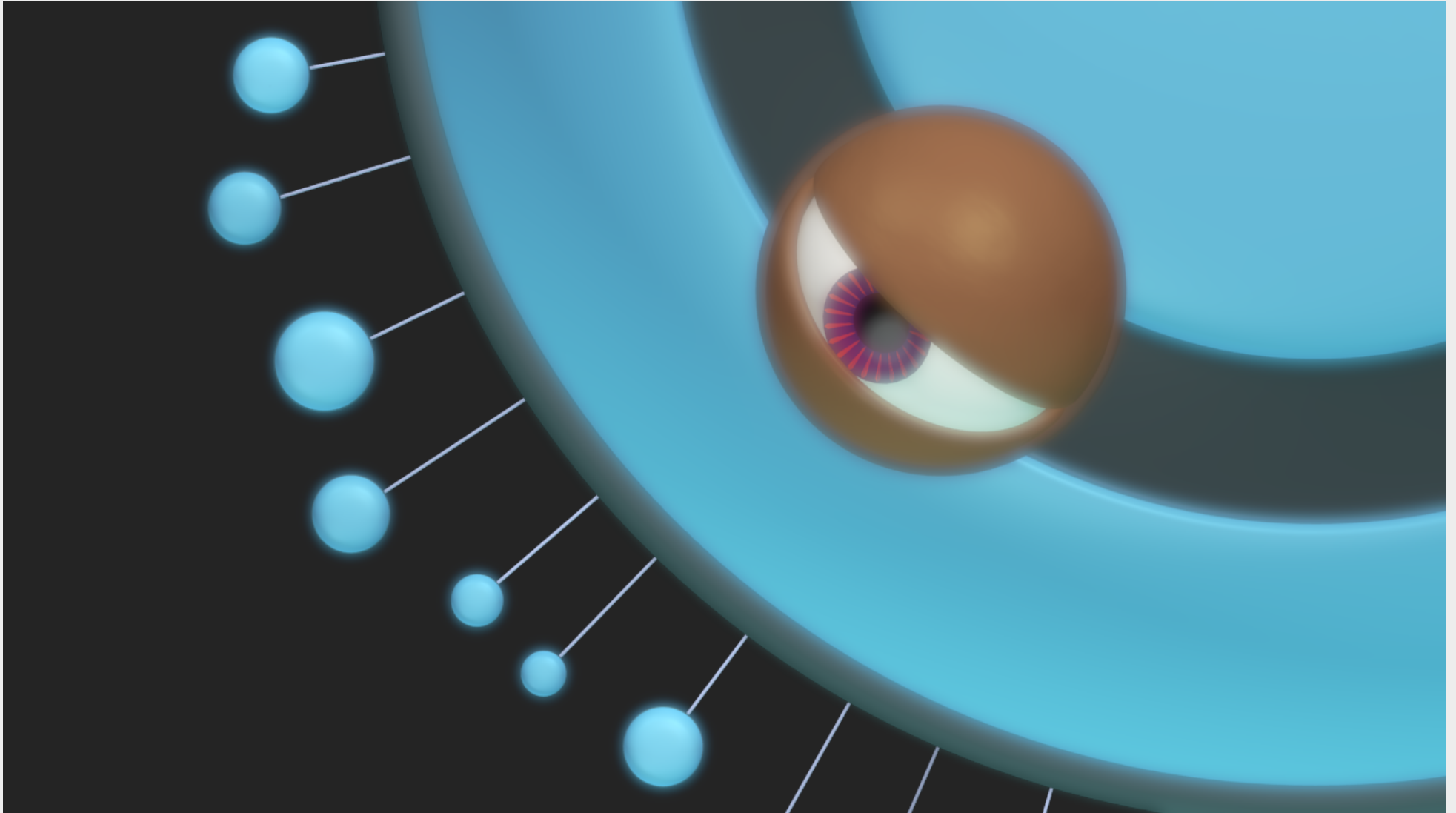
# The web we got



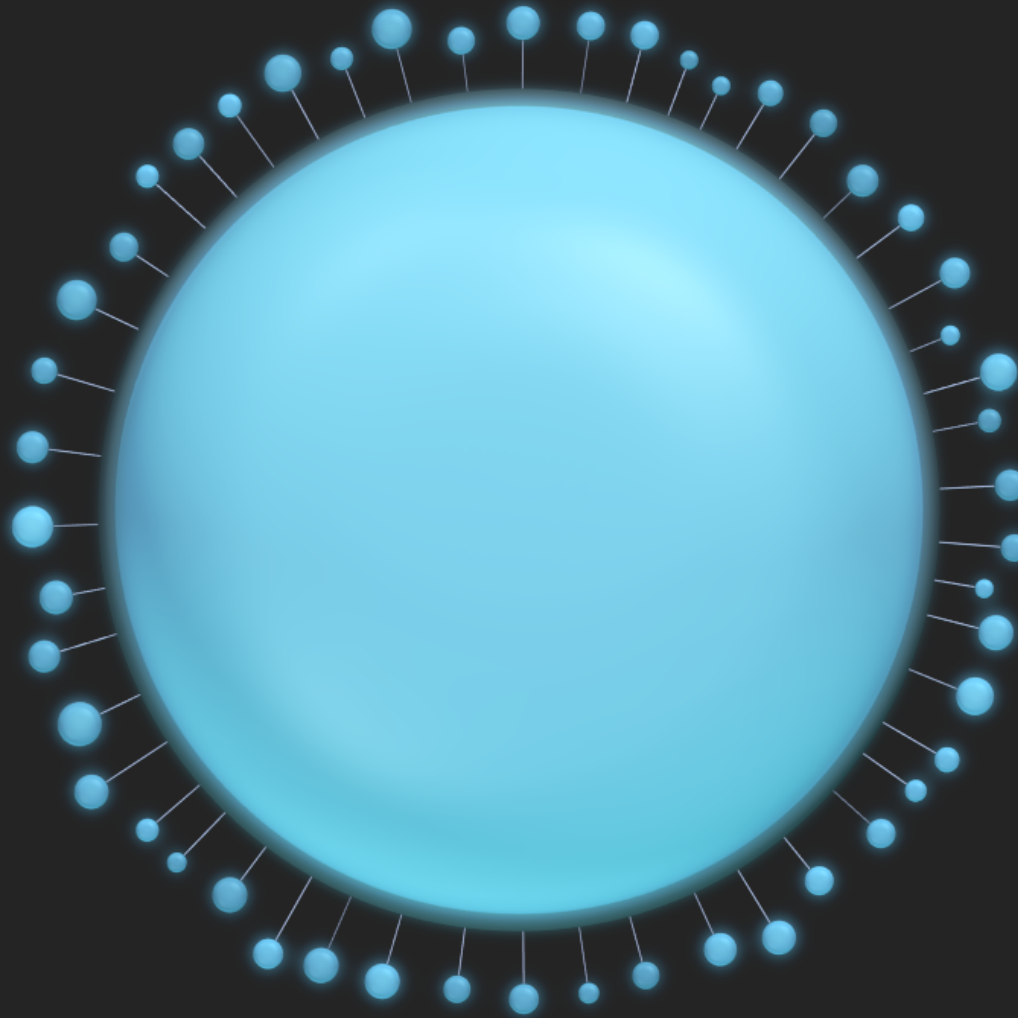
# The web we got



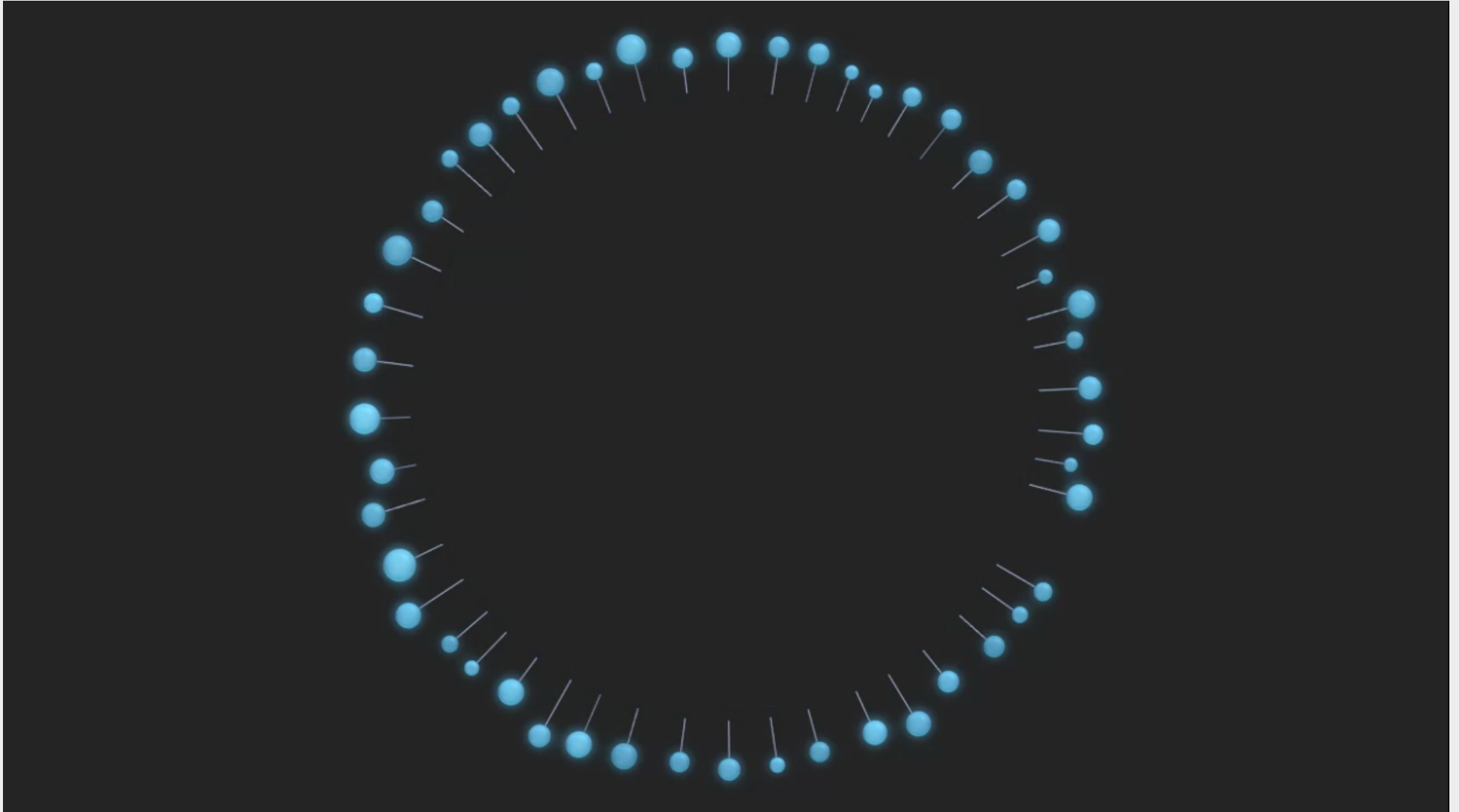
The web we got



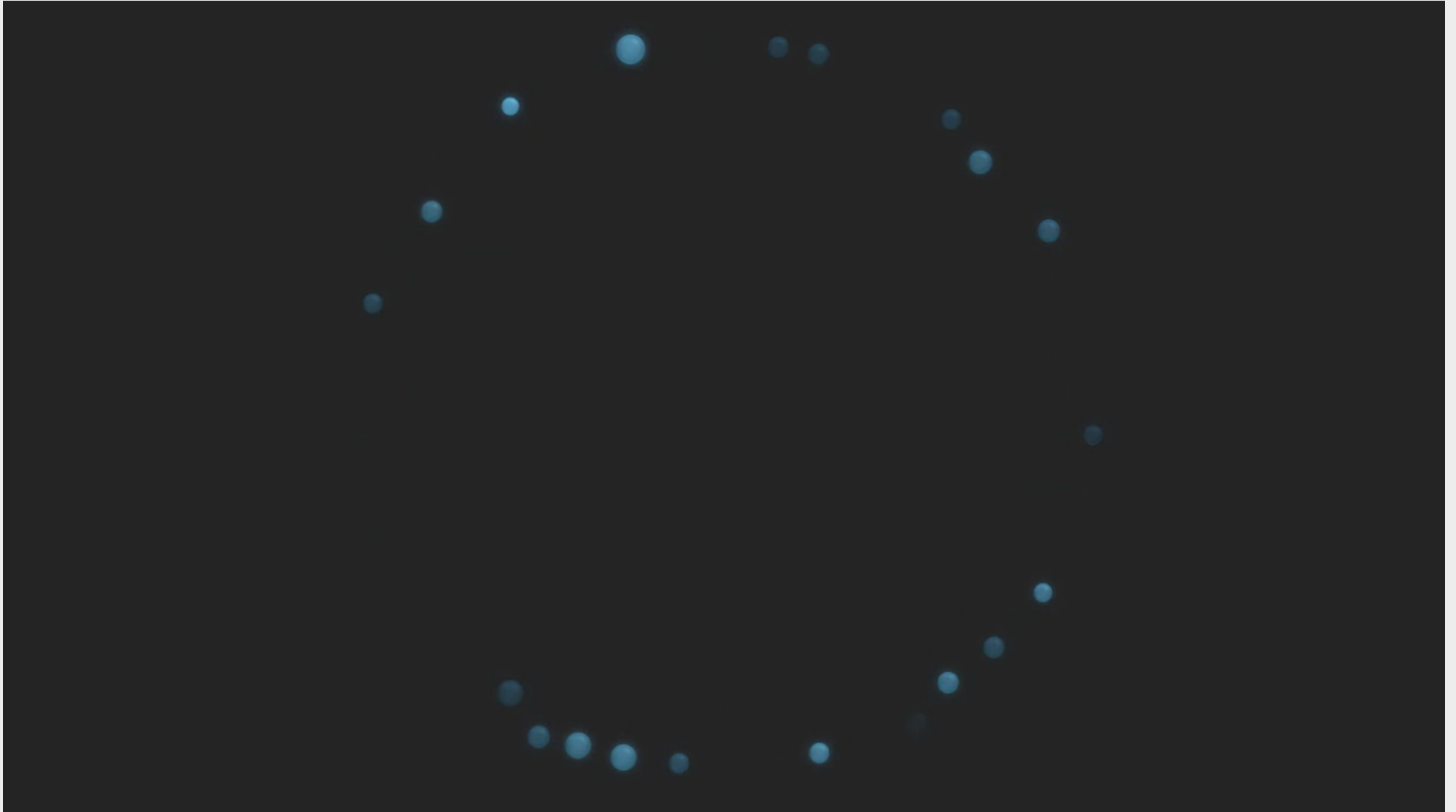
# The web we got



# The web we got



# The web we got

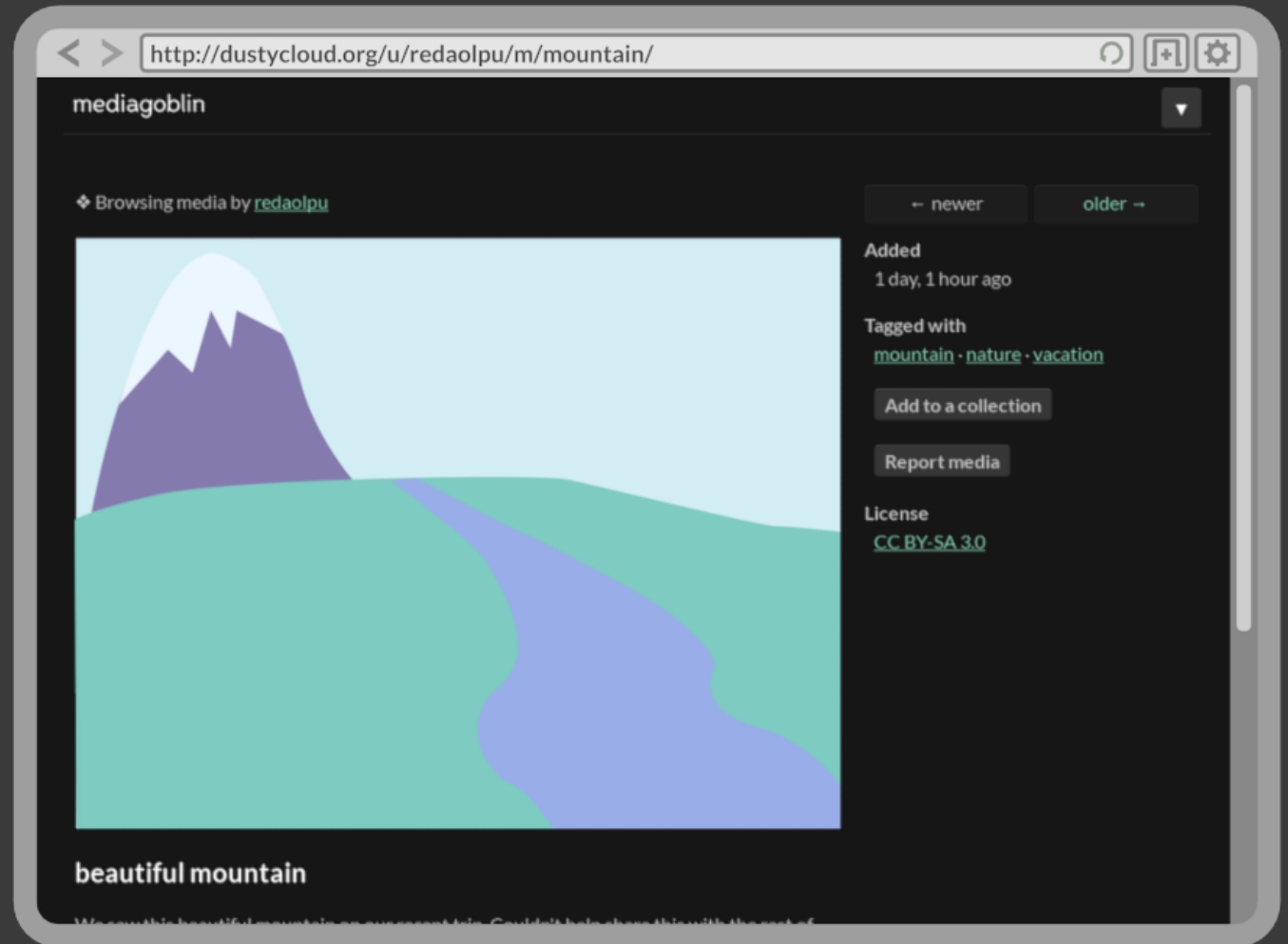




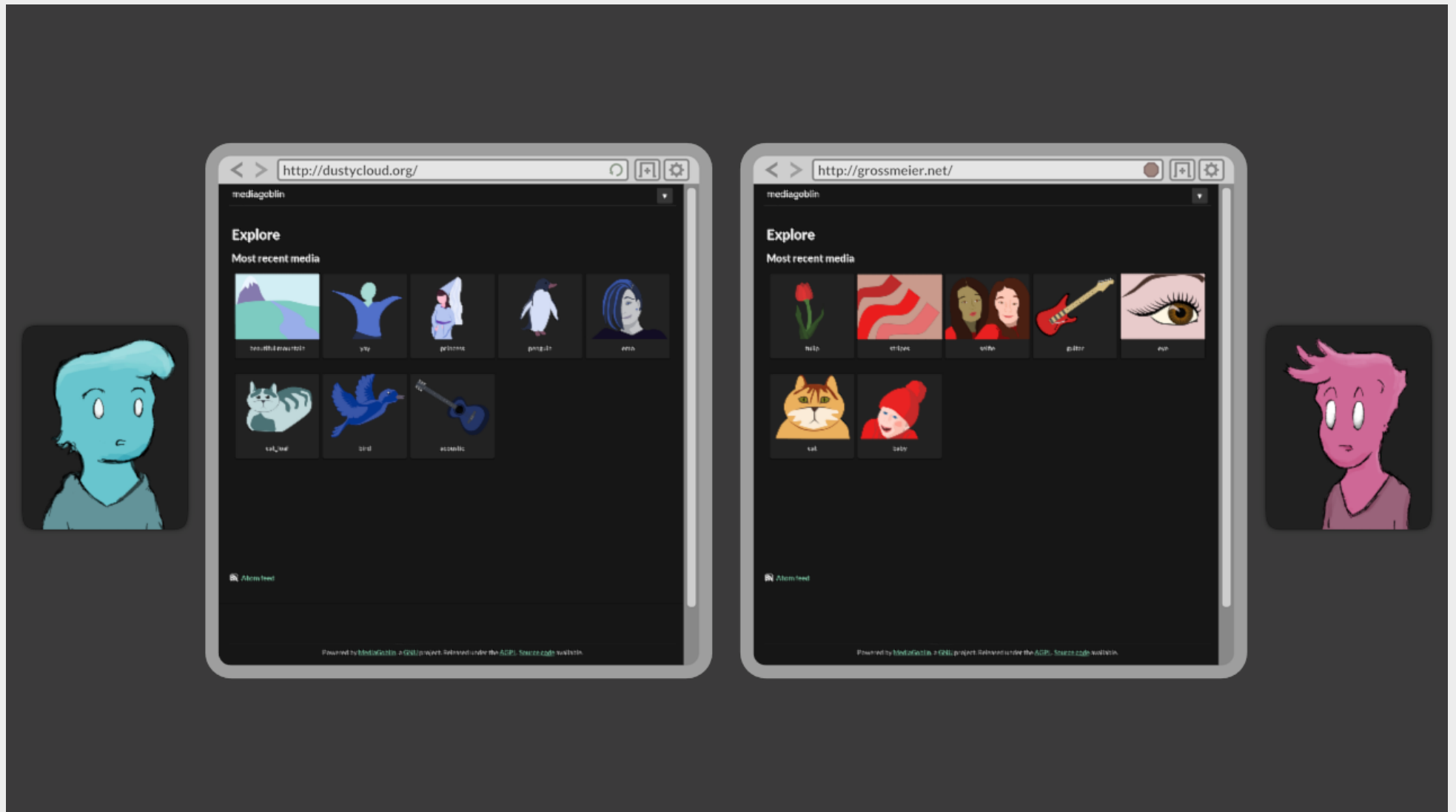
The web we got



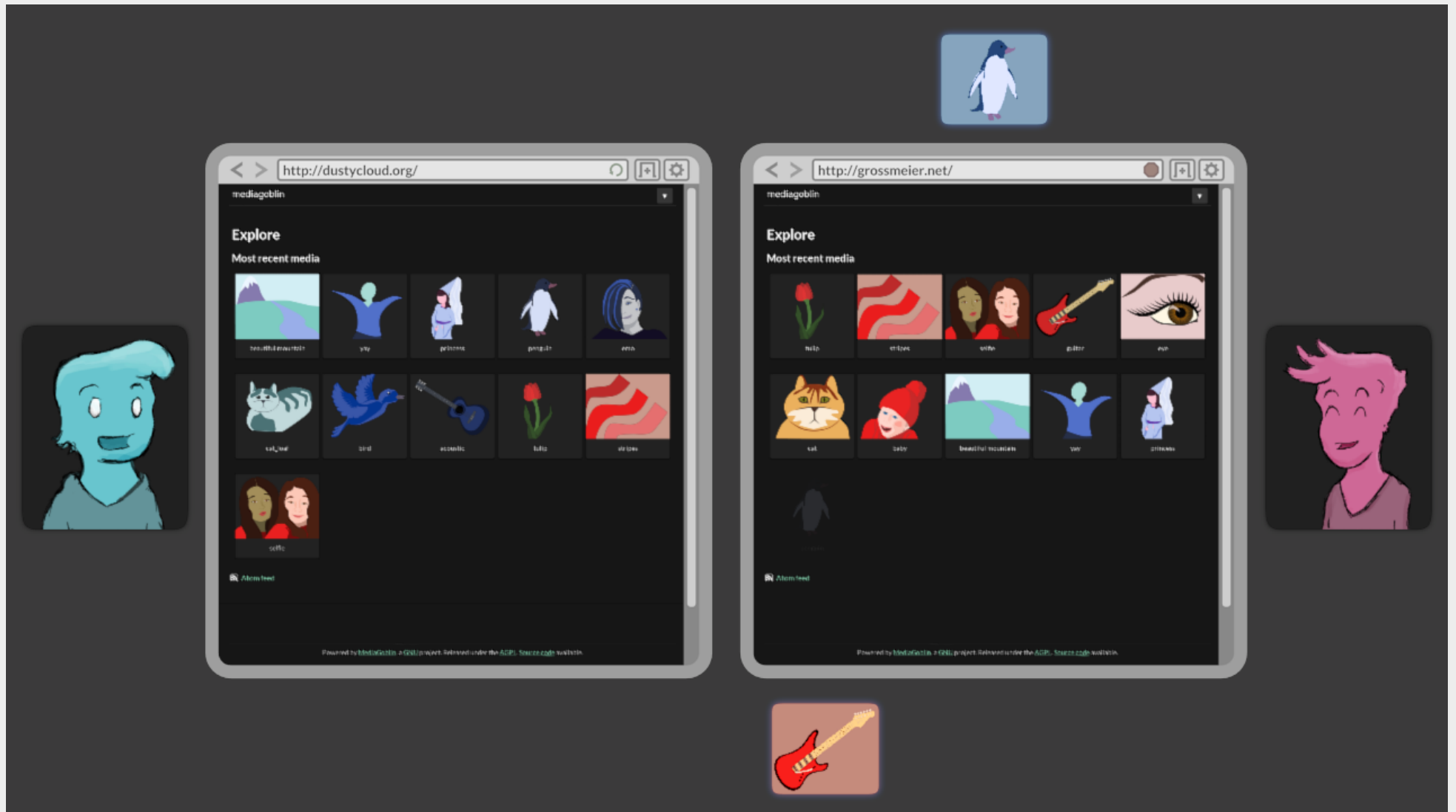
# Federation + Self Hosting to the Rescue



# Federation + Self Hosting to the Rescue



# Federation + Self Hosting to the Rescue



But wait, how to federate?

A smattering of incompatible protocols:

- OStatus
- Zot
- XMPP
- Pump
- Tent

What to do?



A federation protocol for the web!



Views: [desktop](#) [mobile](#) [print](#)

[STANDARDS](#)

[PARTICIPATE](#)

[MEMBERSHIP](#)

[ABOUT W3C](#)

MAIL, NEWS, BLOGS,  
PODCASTS, AND TUTORIALS



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[W3C](#) » [Participate](#) » [Mail, News, Blogs, Podcasts, and...](#) » [W3C News](#)

## ACTIVITYPUB IS NOW A W3C RECOMMENDATION

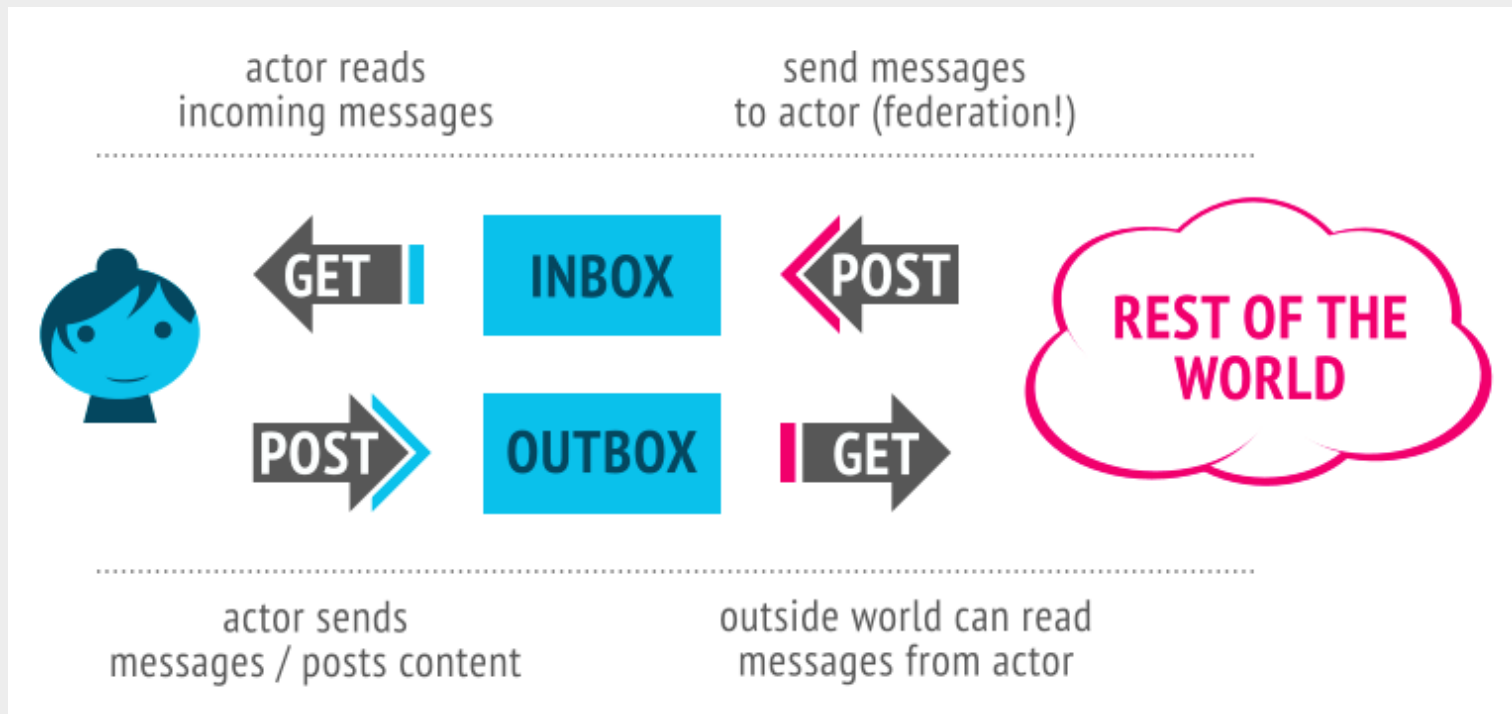
23 January 2018

The [Social Web Working Group](#) has published [ActivityPub](#) as a W3C Recommendation.

ActivityPub is a decentralized social networking protocol based upon the [ActivityStreams](#) 2.0 data format. It provides a client to server API for creating, updating and deleting content, as well as a federated server to server API for delivering notifications and content.

ActivityPub is already [implemented and deployed](#) to a number of projects and a wide userbase, including over [1 million registered users](#) across thousands of Mastodon instances. ActivityPub allows software projects both small and large to build social network offerings into their systems. Adding ActivityPub support allows interoperable social networking between applications with entirely different codebases. For example, [Mastodon](#) and [PeerTube](#) users are able to use ActivityPub to [allow users to share videos and comment](#) across different servers.

Officially standardized, too!



Provides a simple JSON based:

- Server-to-Server protocol (federation!)
- Client-to-Server protocol (mobile, desktop, web clients)



# The last year has been huge...

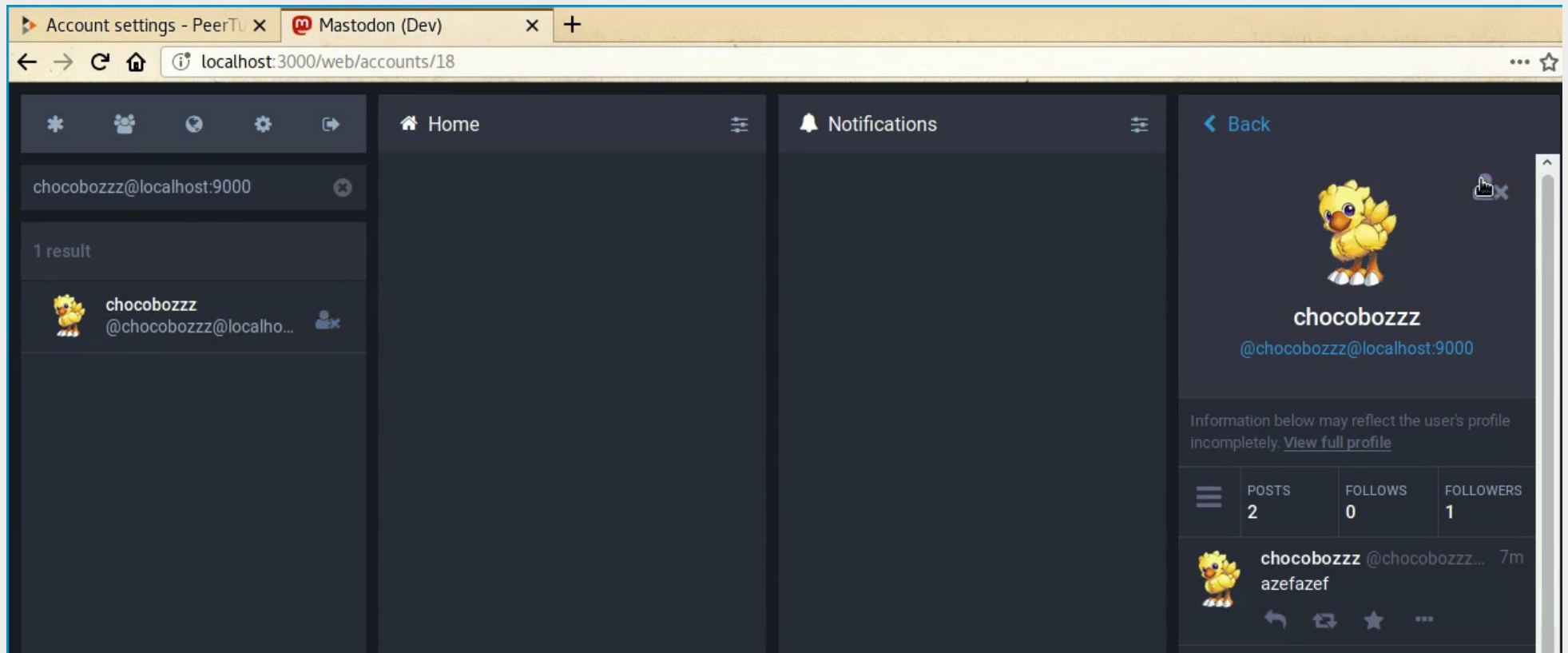
Over 1.5 million registered users

Dozens of implementations:

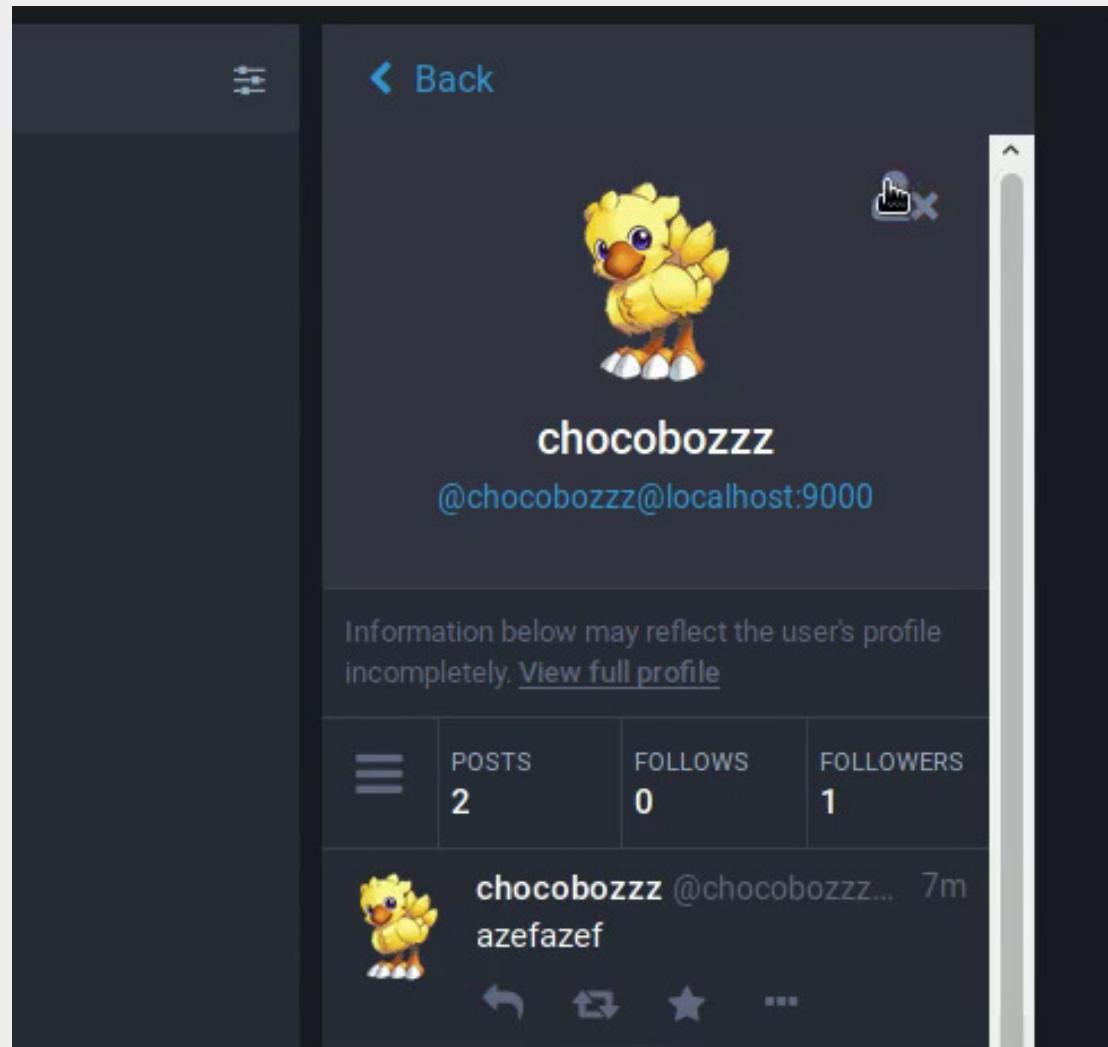
Aardwolf	Kitsune	Pubstrate
Artodon	Koype	Rustodon
Bridgy Fed	Kroeg	Smilodon
CommonsPub	Mastodon	tags.pub
distbin.com	Misskey	Pleroma
Dokieli	Nextcloud	Plume
Funkwhale	PixelFed	Prismo
Friendica	PeerTube	Pterotype
Hubzilla	places.pub	Wordpress (plugin)
	Pleroma	

... and ActivityPub has only been standardized for 1 year!


# Peertube and Mastodon interop demo!




# Peertube and Mastodon interop demo!




# Peertube and Mastodon interop demo!






**chocobozzz**  
chocobozzz@example...

VIDEOS

 Trending

 Recently added

**Upload your video**

100%

**Title**

Sintel Trailer

Sintel Trailer 1080  
sintel trailer 1080  
Sintel Trailer 480  
sintel trailer 480  
Sintel 480 trailer

**Description**

Truncated description previewComplete description preview

# Peertube and Mastodon interop demo!

The screenshot shows a web browser with two tabs: "Sintel Trailer - PeerTube" and "Mastodon (Dev)". The address bar shows the URL `localhost:9000/videos/watch/e7692f1c-25c0-4ceb-ab5f-3c96226cb03d`. The browser's search bar contains the word "Rechercher".

The main content area displays the Peertube interface. On the left, there is a sidebar with the Peertube logo, a user profile for "chocobozzz" (chocobozzz@example...), and a "VIDEOS" section with links to "Trending" and "Recently added".

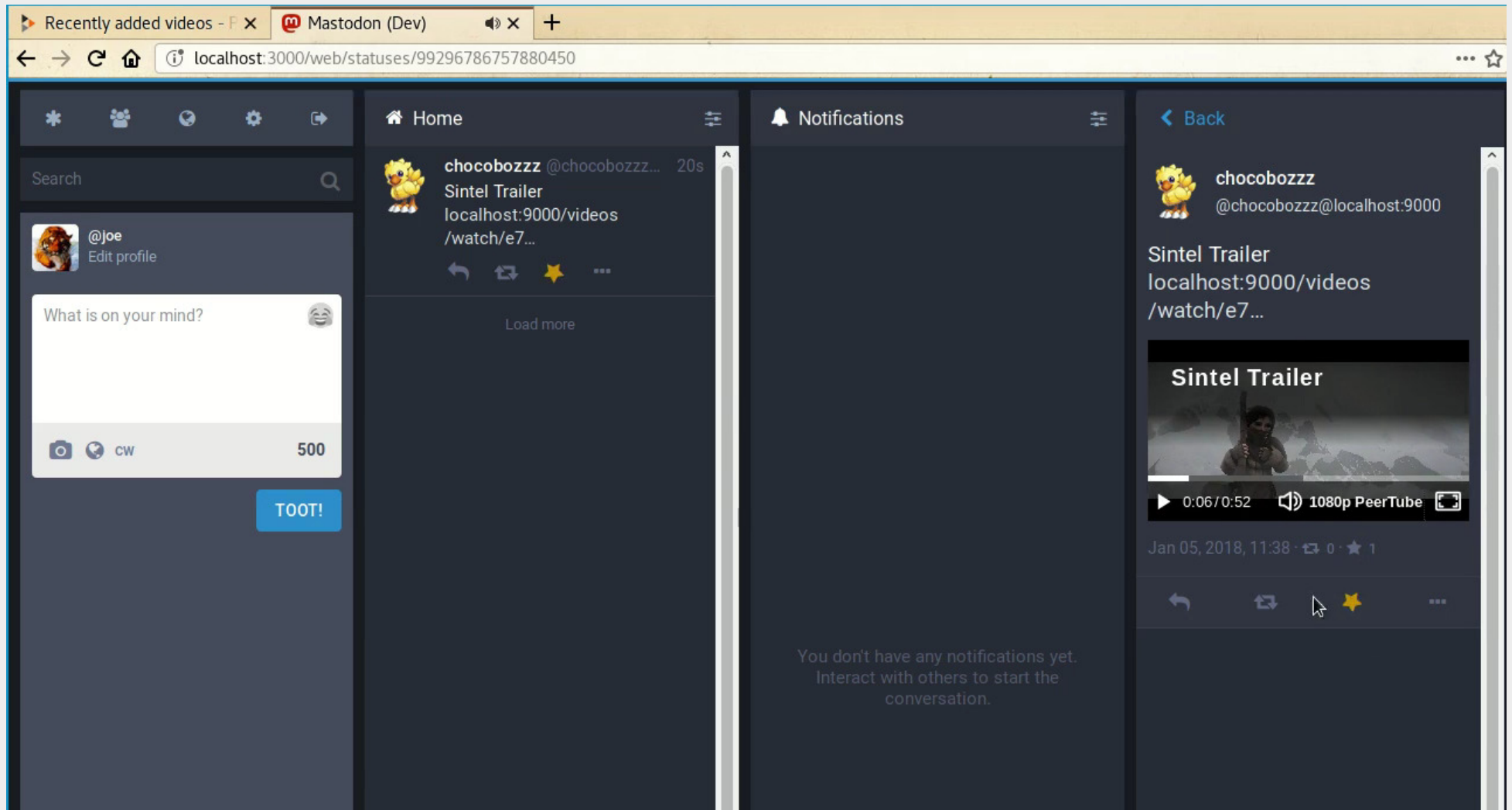
The central video player shows a Sintel Trailer video. The video is paused, displaying a large white play button over a scene of a dragon-like creature in a sunset sky. Below the video player, the video title "Sintel Trailer" is displayed, along with the upload time "5 sec ago - 0 views" and the channel name "Default chocobozzz channel" (By chocobozzz@localhost:9000). The video's metadata is shown in a table:

Property	Value
Privacy	Public
Category	Misc
Licence	Unknown
Language	Unknown
Tags	

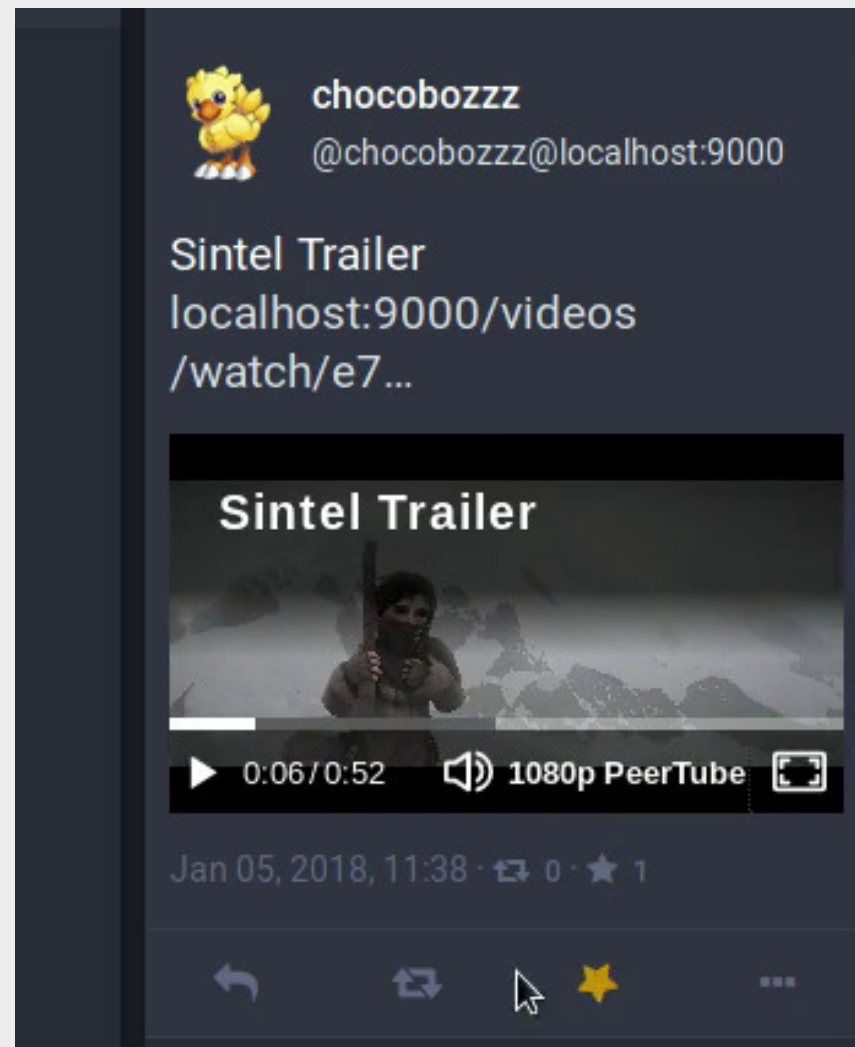
Below the metadata is a "Comments" section with a text input field labeled "Add comment...".

On the right side of the video player, there are social media sharing icons (like, dislike, share, and a menu icon). Below these is a section titled "Other videos" which lists two other videos: "Sintel Trailer" (5 sec ago - 0 views) and "conf-puppet-small" (20 hours ago - 4 views). A green success message "Success Video published." with a checkmark icon is overlaid on the bottom right of the page.

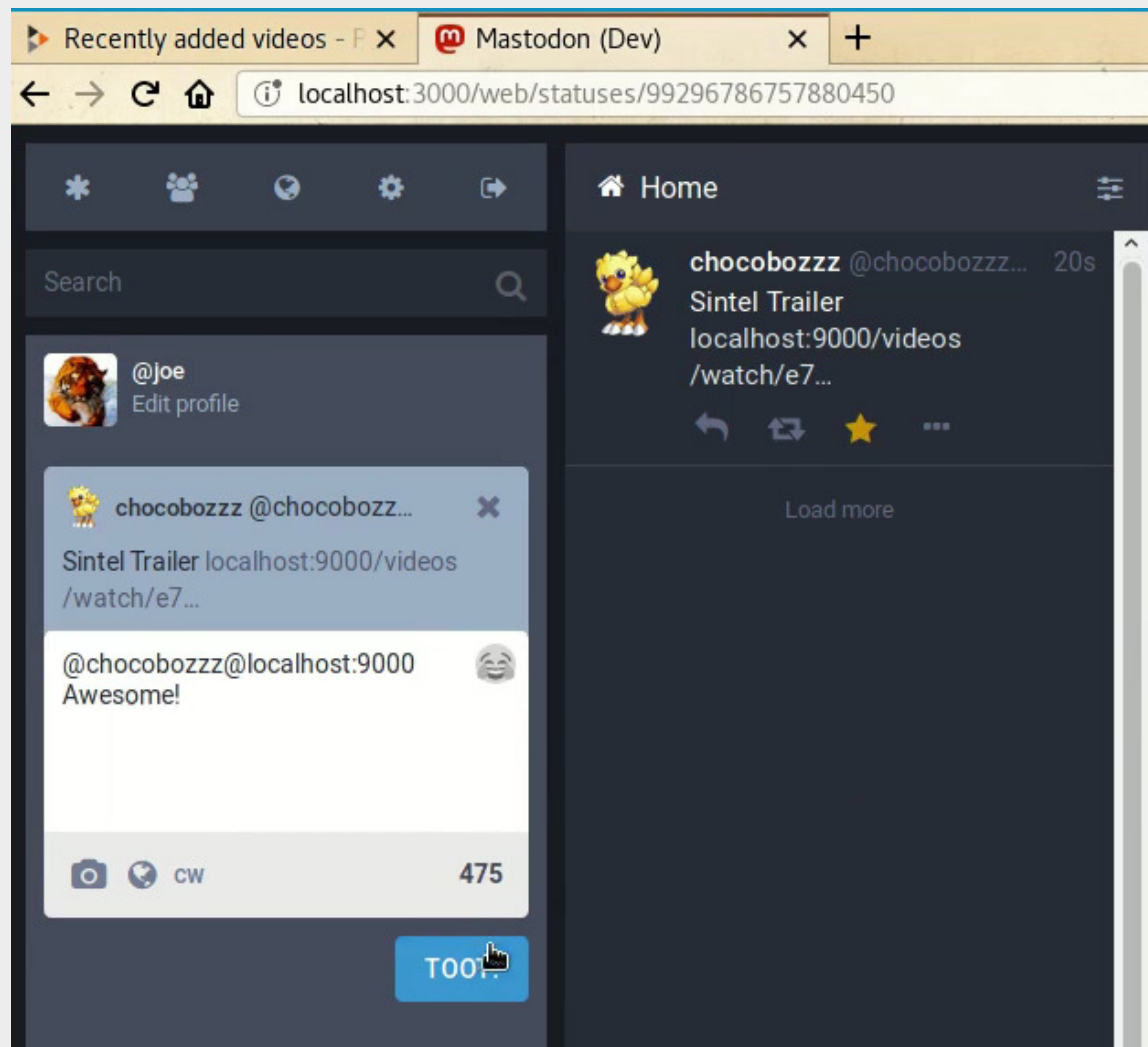
# Peertube and Mastodon interop demo!



# Peertube and Mastodon interop demo!





# Peertube and Mastodon interop demo!







# Peertube and Mastodon interop demo!


 PeerTube


 **chocobozzz**  
chocobozzz@example....


VIDEOS


 Trending

 Recently added





 Share



## Sintel Trailer

40 sec ago - 1 views

Default chocobozzz channel  
By chocobozzz@localhost:9000 🐥

Privacy Public


Category Misc


Licence Unknown

Language Unknown


Tags

### Comments



 **joe@localhost:3000** 6 sec ago  
@chocobozzz Awesome!

Reply



Post comment

# Peertube and Mastodon interop demo!

## Comments



Add comment...



**joe@localhost:3000** 6 sec ago

@chocoboxxx Awesome!

Reply



@joe Thanks!

Problem solved??!!!

# What current implementations can't do

- Content that survives a server going down
- Highly secure, rich interactions
  - Private photo gallery...
  - ... where you give access to add but not delete items
  - Virtual worlds / games

But these are possible!

ActivityPub did something right...

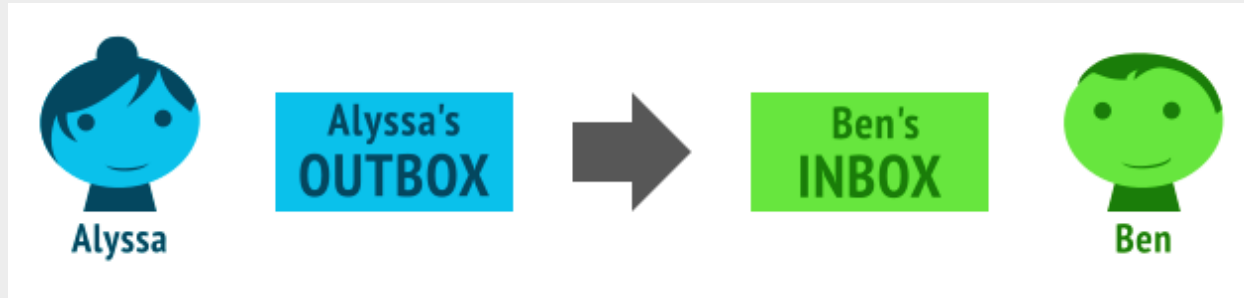
# ActivityPub is an actor model protocol



AKA message-passing-centric protocol

It (mostly) doesn't matter where an actor lives!

# ActivityPub is an actor model protocol

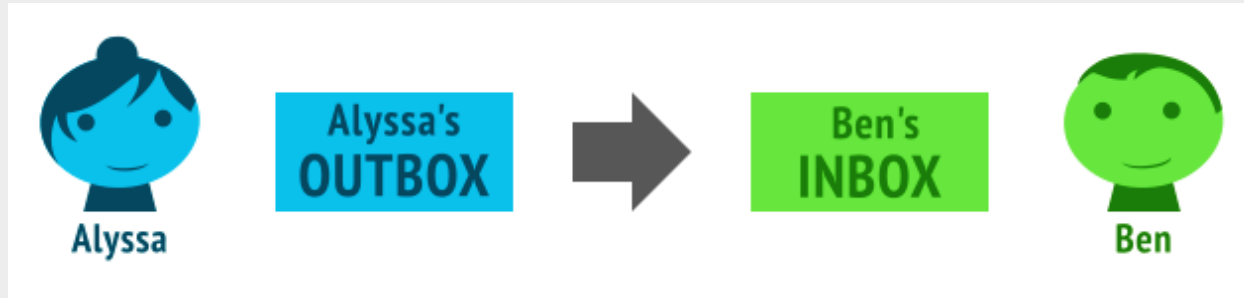


Formal definition...

In response to messages, an actor can:

- Send messages
- Create new actors
- Change its own behavior/state

# ActivityPub is an actor model protocol



Many protocols are actor model protocols...

but not all are aware of this.

Being self-aware helps!

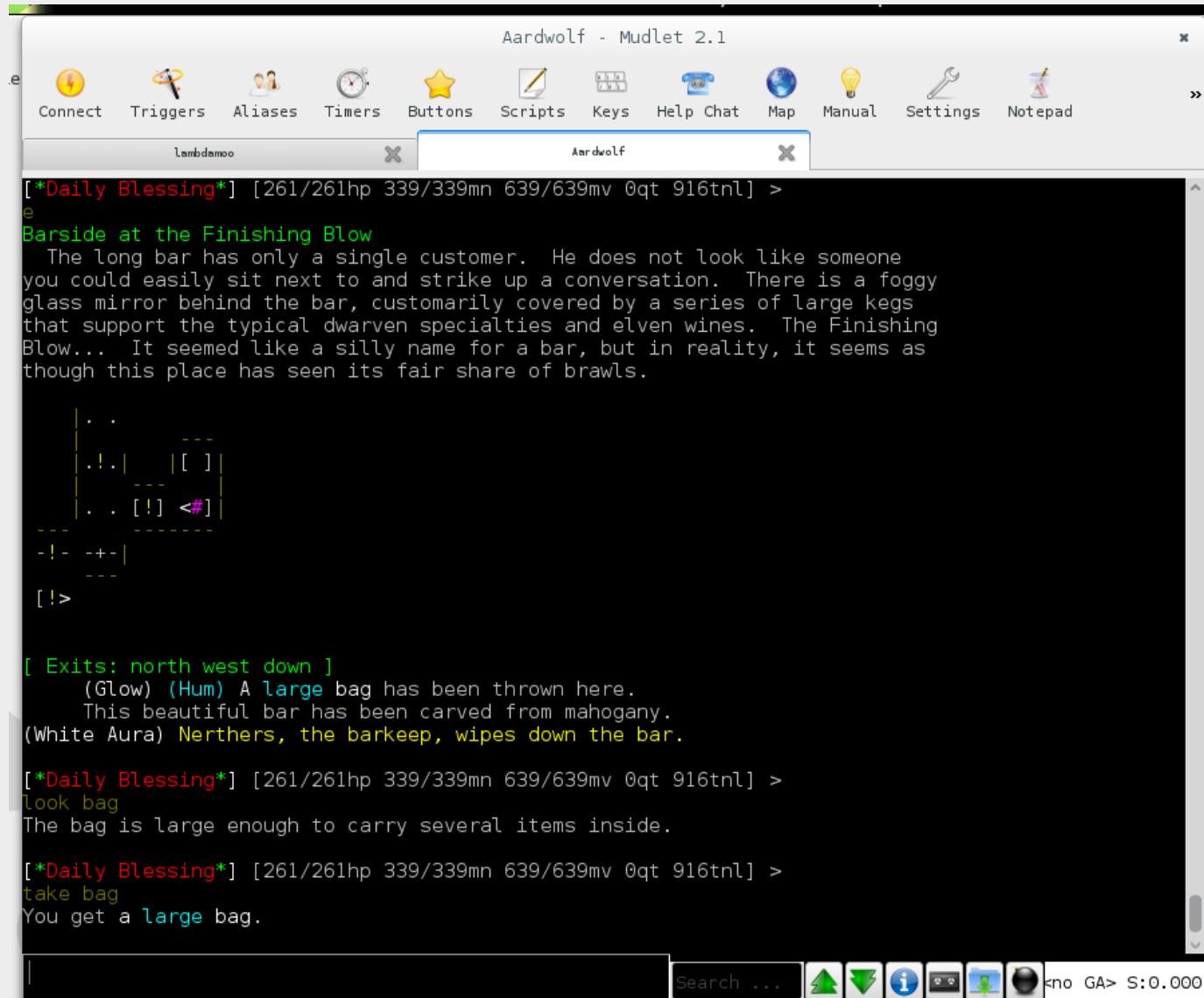
# Spritely

- A federation skunkworks in the public interest!
- Taking the actor model seriously!
- Adding object capability security!
- Stress testing the thing by building distributed games (?!?!)
- Avoiding vaporware: releasing regular artifacts/demos



# The lost cyberpunk world of social games

MUDs, MOOs, MUSHes: social spaces with a sense of place



The screenshot shows the Mudlet 2.1 application window. The title bar reads "Aardwolf - Mudlet 2.1". The interface includes a toolbar with icons for Connect, Triggers, Aliases, Timers, Buttons, Scripts, Keys, Help Chat, Map, Manual, Settings, and Notepad. Below the toolbar are two tabs: "Lambdamoo" and "Aardwolf", with "Aardwolf" currently selected. The main text area displays the following text:

```
[*Daily Blessing*] [261/261hp 339/339mn 639/639mv 0qt 916tnl] >
Barside at the Finishing Blow
The long bar has only a single customer. He does not look like someone
you could easily sit next to and strike up a conversation. There is a foggy
glass mirror behind the bar, customarily covered by a series of large kegs
that support the typical dwarven specialties and elven wines. The Finishing
Blow... It seemed like a silly name for a bar, but in reality, it seems as
though this place has seen its fair share of brawls.

  . .
  .!.|  | [ ]
  . . [!] <#]
-----
-!- +-|
-----
[!>

[ Exits: north west down ]
(Glow) (Hum) A large bag has been thrown here.
This beautiful bar has been carved from mahogany.
(White Aura) Nerthers, the barkeep, wipes down the bar.

[*Daily Blessing*] [261/261hp 339/339mn 639/639mv 0qt 916tnl] >
look bag
The bag is large enough to carry several items inside.

[*Daily Blessing*] [261/261hp 339/339mn 639/639mv 0qt 916tnl] >
take bag
You get a large bag.
```

At the bottom of the window is a search bar labeled "Search ..." and a system tray containing icons for a green tree, a green arrow, a blue 'i' in a circle, a black square, a blue square, and a black circle. To the right of these icons is the text "<nno GA> S:0.000".

# The lost cyberpunk world of social games

Habitat: massively multiplayer graphical game... in 1985!



[https://web.stanford.edu/class/history34q/readings/Virtual\\_Worlds/LucasfilmHabitat.html](https://web.stanford.edu/class/history34q/readings/Virtual_Worlds/LucasfilmHabitat.html)

# The lost cyberpunk world of social games

## Menu

[Introduction](#)  
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[Shared,](#)  
[extensible](#)  
[virtual worlds](#)  
[Conclusions](#)  
[References](#)

<mailto:vijay@saraswat.o>

Converted to HTML:  
Sun Oct 5 1997  
Last modified: Wed Apr  
23 1997  
Started work: Mon Apr 21  
1997

## Design requirements for network spaces

[Vijay Saraswat](#)

[AT&T Research](#), 180 Park Avenue, Florham Park NJ 07932

April 1997

### Introduction

A wide variety of network communities exist today, supported by many different computational platforms. As the need for new architectures for these platforms arises, so does the need to articulate what exactly should these platforms provide, abstracted from the many (and somewhat diverse and divergent) concrete realizations of these ideas (e.g. in MOO, MUSH, MUD etc).

This note presents my analysis of the desiderata for *network spaces*, my generic term for the computational platforms underlying network communities. My analysis is not driven by any attempt to understand a "least common denominator" for these different approaches. Rather it is driven by my experience starting, administering and participating in several such communities since 1994 and from my desire to find a coherent and consistent conceptual framework (e.g. one that resolves issues of objects, persistence, identity, change etc) within which system development may proceed interlinked with, and yet somewhat decoupled from, the diversity of network communities that may arise atop such spaces.

I believe this task (of articulating the desiderata of network communities) is of some urgency. Conditions are now ripe for an appropriately designed architecture and implementation to provide the basis for the development of tens of thousands of interlinked network communities all over the globe. On the side of social sciences research the extraordinary interest of these spaces as both a synthetic and analytic tool for the study of communities is now rapidly becoming evident. On the computational side the development of MOO as a basis for such spaces has come to a halt with the disintegration of groups working on this technology at PARC. On the other hand, the rapid maturation of Java and CORBA technology, and widespread deployment of networked personal computers is finally(!) providing the ubiquitous basis on which large-scale end-user populated distributed systems may be realized. Therefore this task is both timely and important.

1. In a nutshell, a network space provides an [object-oriented](#), [networked](#), [multi-person](#), [persistent](#), [programmable](#), [multi-interface](#), [distributed](#) infrastructure for the construction of [administered](#), [shared](#), [extensible virtual worlds](#). (The LambdaMOO server, running, say, with JHCore, is an example of such a system, and should be kept in mind in the following discussion.) In this, network

This existed!

Electric Communities Habitat  
Secure, decentralized virtual worlds!  
Sadly little survived, except...

# E!



## Open Source Distributed Capabilities

---

Welcome to [ERights.org](http://ERights.org), home of **E**,  
the secure distributed persistent language  
for capability-based smart contracting.

[Quick Start](#) | [What's New?](#) | [What's \*\*E\*\*?](#)  
[Smart Contracts](#) | [History & Talks](#) | [Feedback](#)

[\[California Home\]](#)   [\[Mirror in Virtual Tonga\]](#)

We do not influence the course of events by  
persuading people that we are right when we make  
what they regard as radical proposals. Rather, we  
exert influence by keeping options available when  
something has to be done at a time of crisis.

--Milton Friedman

The greatest programming language you've never heard of! Featuring:

- Actors for run-anywhere evaluation
- Local immediate evaluation
- Most importantly: object capabilities (ocaps)!

# Contrasting approaches: ACLs Don't

A dangerous program on your computer...

- It can run any program it wants as you
- It can read all your data
- It can post your secrets to any server

What program is it?

Solitaire! (Or actually any program)

# Contrasting approaches: ACLs Don't

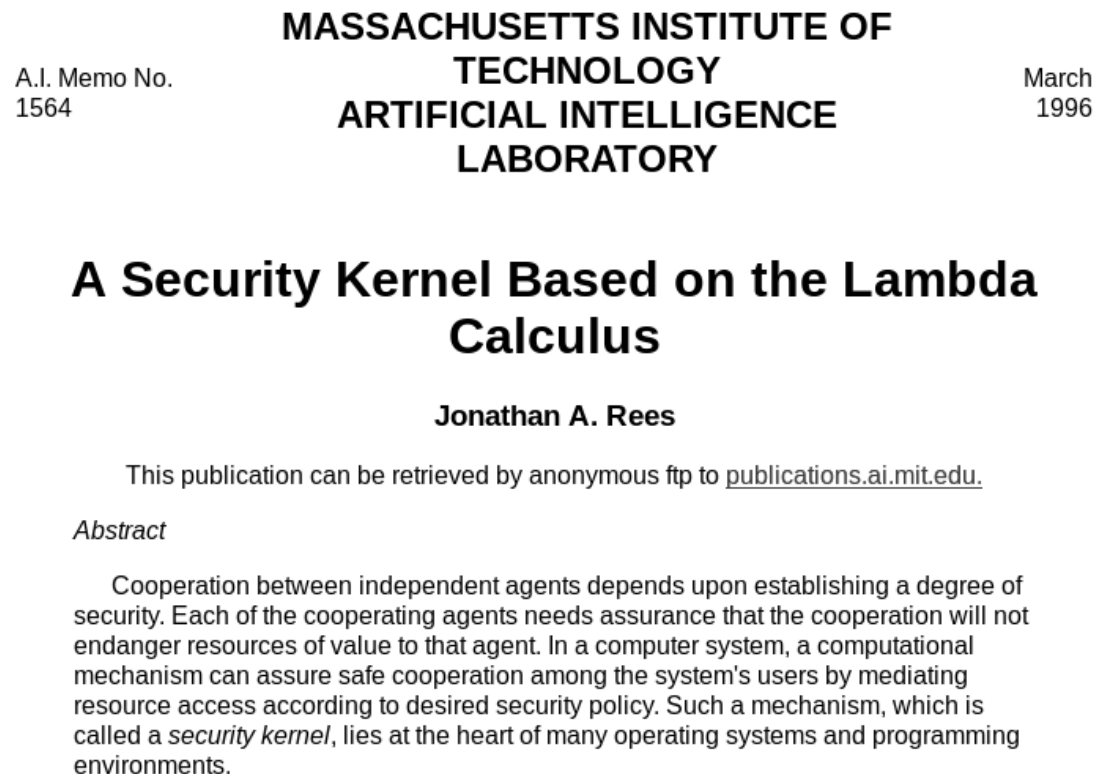
Identity-centric authority doesn't work

- Ambient/excess authority
- Confused deputy problems (ask me about Guile's REPL story if we have time)

See the paper "ACLs Don't" for more information

# Object Capabilities (ocaps)

How to allow security AND rich interactions

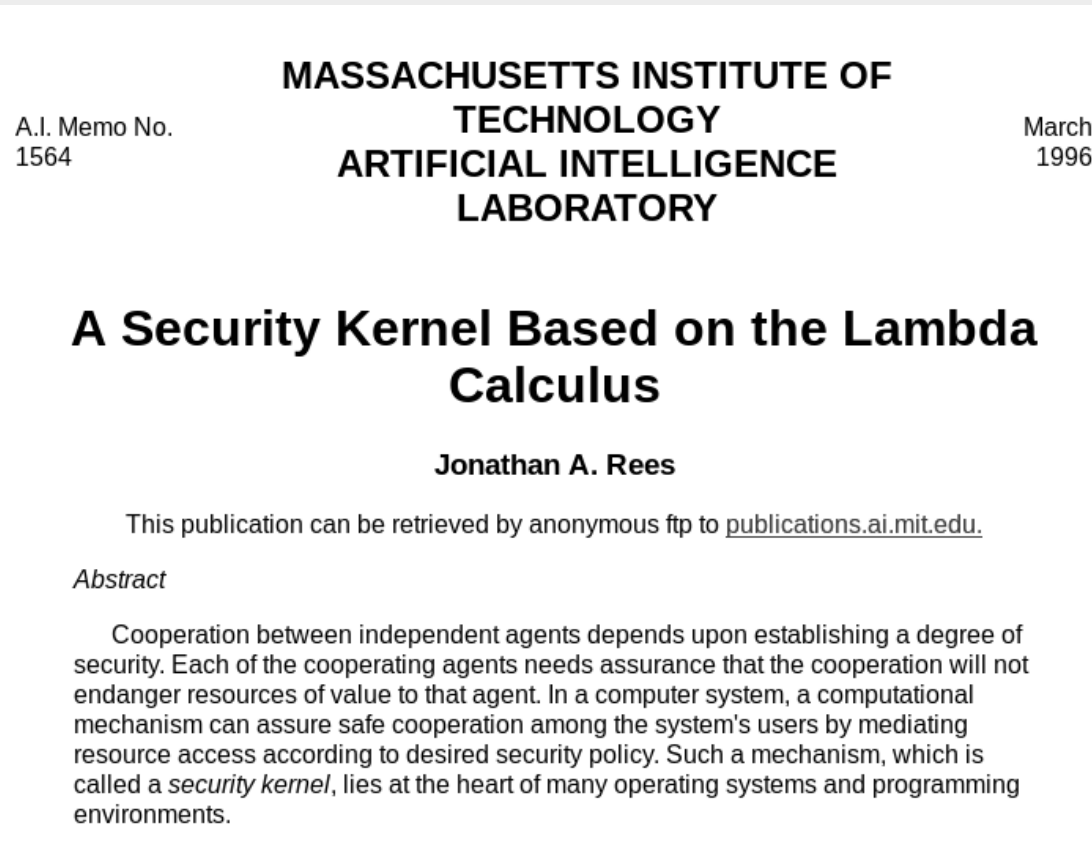


- AKA "Lambda, the Ultimate Security Mechanism"
- Lexical scope *is* your security model



# Object Capabilities (ocaps)

How to allow security AND rich interactions



- You can only access what you hold a reference to
- Works in protocols or languages!

## Another metaphor

Ye olde ocap car key metaphor goes here

## (Partially) written Spritely artifacts/demos

- Goblins: actor model library for Racket
- Magenc: private and encrypted p2p shareable content
- Petnames paper for RWoT written, demo to come
- Pre-ocap MUD demo

# Goblins: an actor model library for Racket

- Spawn actors, send messages to actors
- Currently local-only, very soon multi-machine
- Why a library? Why not a #lang?

# Enough smalltalk! Let's see a demo!

*I see what you did there*

- Spawning a lambda actor
- Spawning a class'y actor
- Sending a message: basic
- Splitchronous send with <<-
- Promises!

# <<-, friend or foe?

- Very convenient!
- Uses delimited continuations under the hood
- But... re-entrancy attacks?
- I'm conflicted, help me out language folks

But is it ocap-secure?

Racket's lexical scope: safe

Racket's module importing: not safe

Future artifact: Dungeon

# Thanks! Questions?

- Personal site: <https://dustycloud.org/>
- Fediverse: <https://octodon.social/@cwebber>
- Birdsite: <https://twitter.com/dustyweb/>
- Support this work:  
<https://patreon.com/cwebber>