

# **DECENTRALIZED SOCIAL NETWORKS**

**PROS AND CONS OF THE MASTODON PLATFORM**

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# WHAT IS MASTODON?

We see a lot of the same  
problems on social networks,  
trolling, spam, deplatforming,  
changing terms of service...

# WHAT IS MASTODON?

Under the hood, these networks  
are all very similar,  
and so end up with the same  
problems.

# WHAT IS MASTODON?

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Is this the only way to build  
social networks?

# OUTLINE

- What is Mastodon?
  - ▶ Decentralization
  - ▶ Federation
- What makes it different?
  - ▶ Benefits
  - ▶ Differences
  - ▶ Drawbacks
  - ▶ Mitigation
- What have we learned?

# WHAT IS MASTODON?

Mastodon is

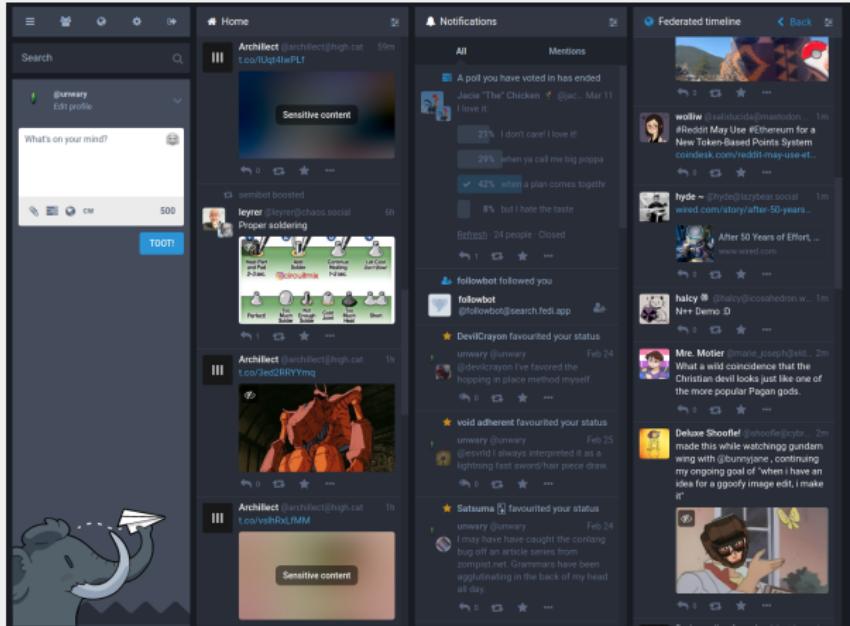
- A social network
- Open source
- Decentralized & Federated
- Compatible with W3C standards [1]



# WHAT IS MASTODON?

Here we see from left to right

- The toot editor
- The toots from those I follow
- Notifications
- The federated timeline



# **DECENTRALIZATION: NOBODIES IN CHARGE HERE**

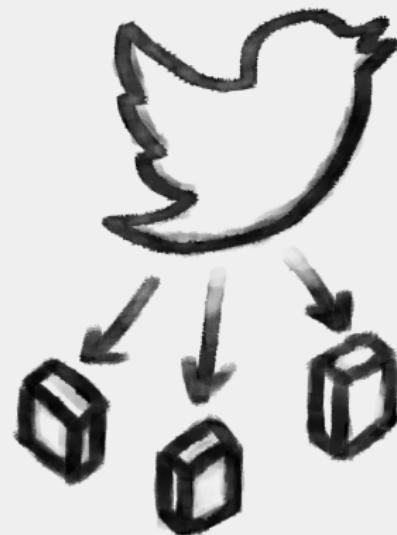
# DECENTRALIZATION



Let's start with Twitter

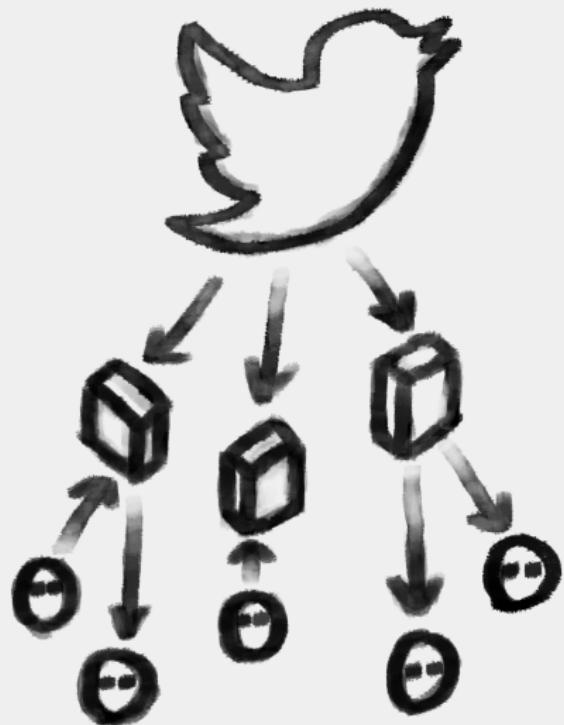
# DECENTRALIZATION

Twitter Inc. runs the servers that run Twitter



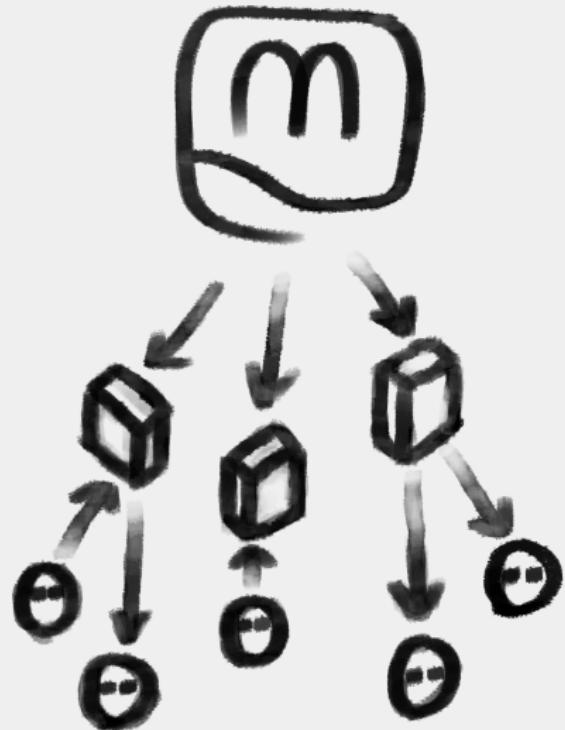
# DECENTRALIZATION

Users connect to those servers, and post their tweets, read their feeds, etc.



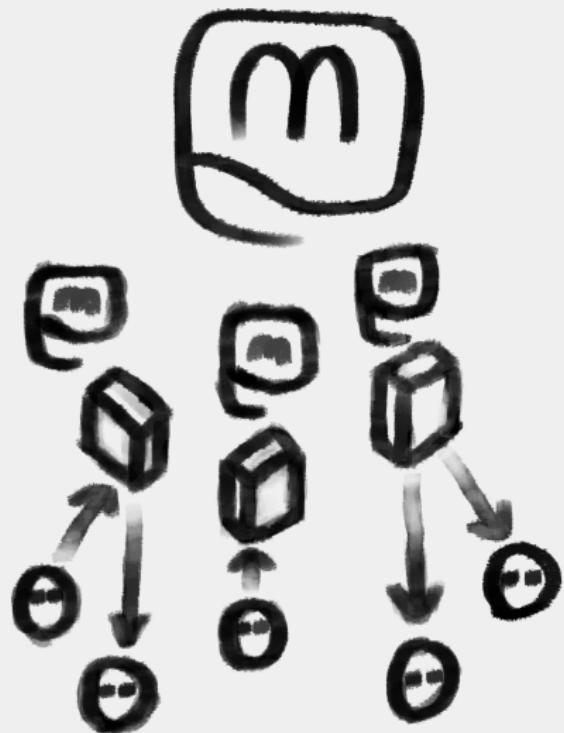
# DECENTRALIZATION

In Mastodon, things are different



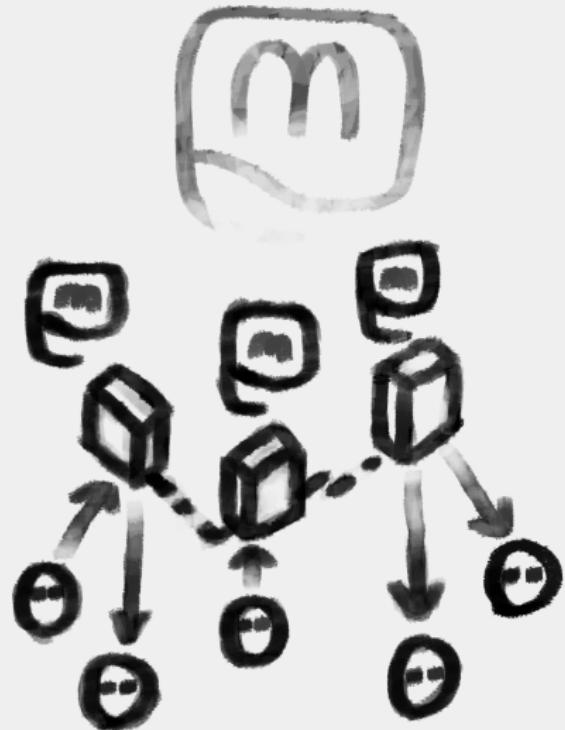
# DECENTRALIZATION

Each server independently runs Mastodon software



# DECENTRALIZATION

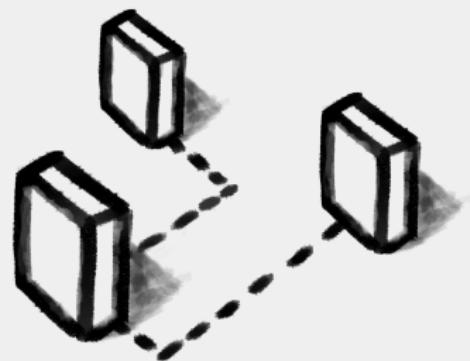
Servers interconnect to handle requests, and don't need a central authority



# **FEDERATION: MORE THAN THE SUM OF ITS PARTS**

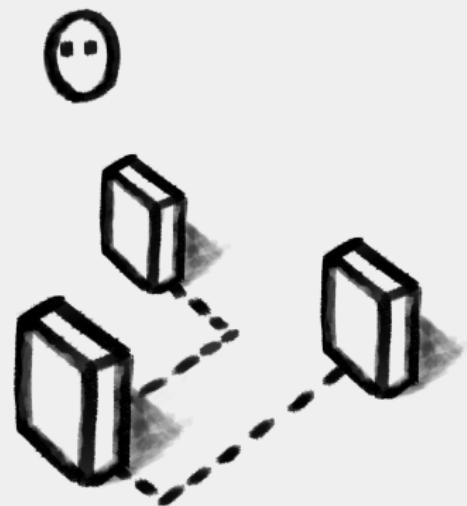
# FEDERATION

We have three Mastodon servers, and some are already connected



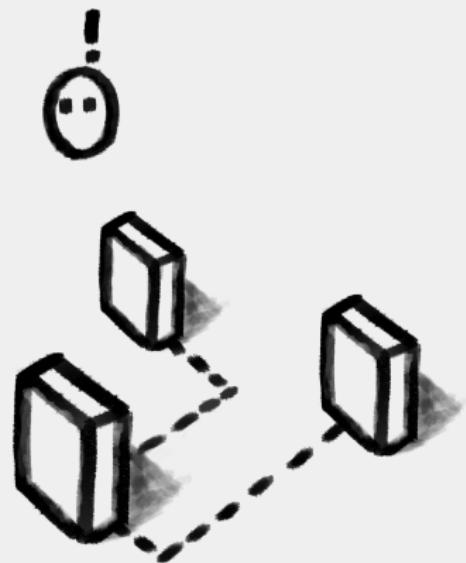
# FEDERATION

Alice is a user on the first server.



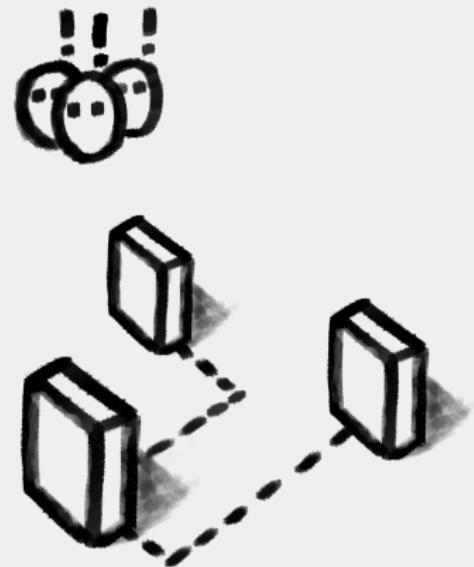
# FEDERATION

She posts a public message.



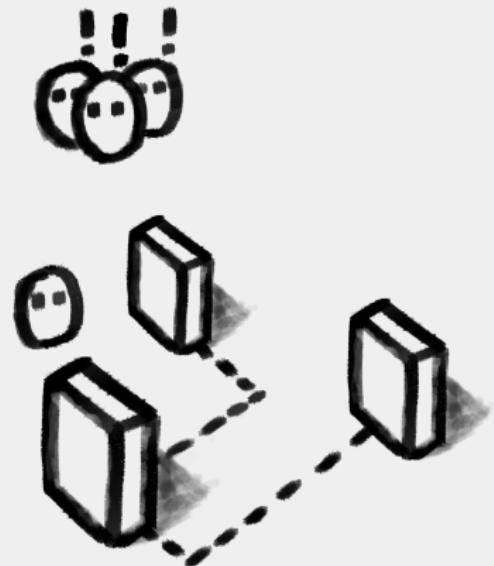
# FEDERATION

As a local, public message,  
everyone on her server sees it.



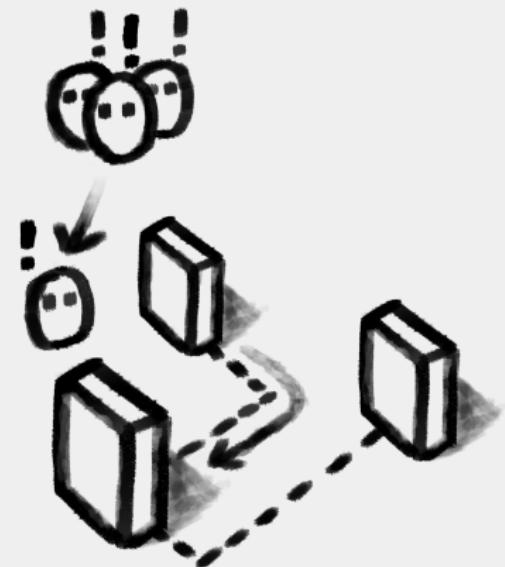
# FEDERATION

Bob is a user on a different server than Alice.



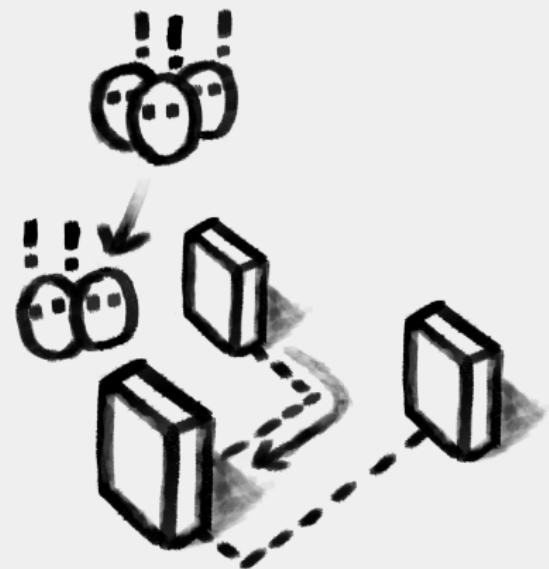
# FEDERATION

As Bob is a follower of Alice,  
Alice's server sends his server a  
copy of her public message.



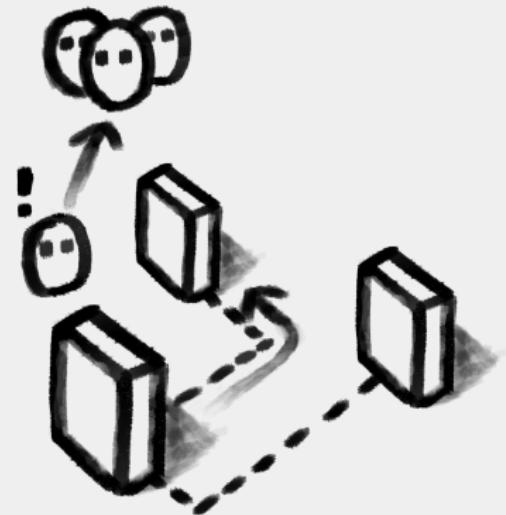
# FEDERATION

All the other users in Bob's server see a copy of Alice's public message in their federated timelines.



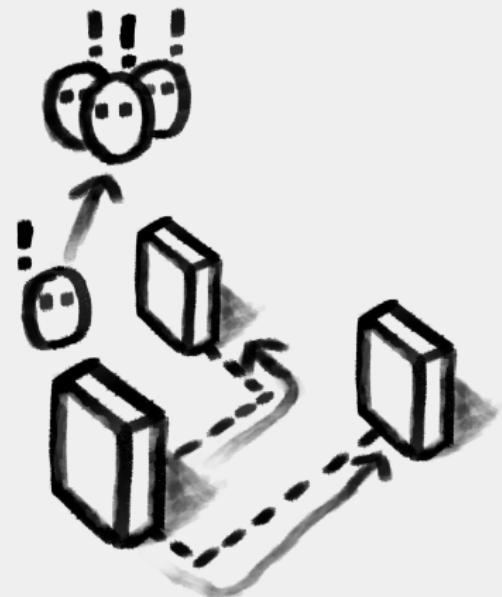
# FEDERATION

Bob publicly posts a reply to Alice's message.



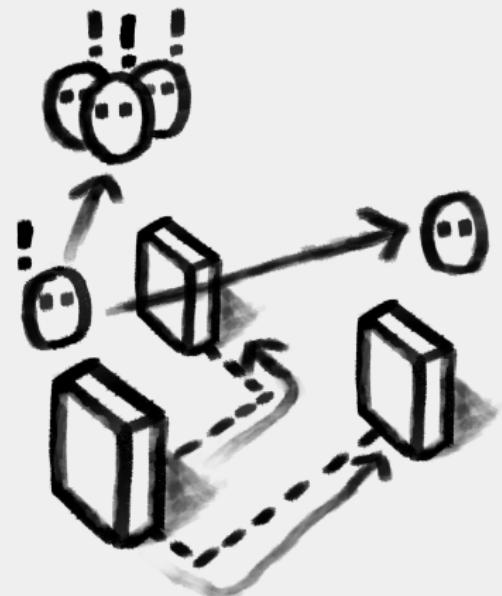
# FEDERATION

Bob's public response goes out to all his followers.



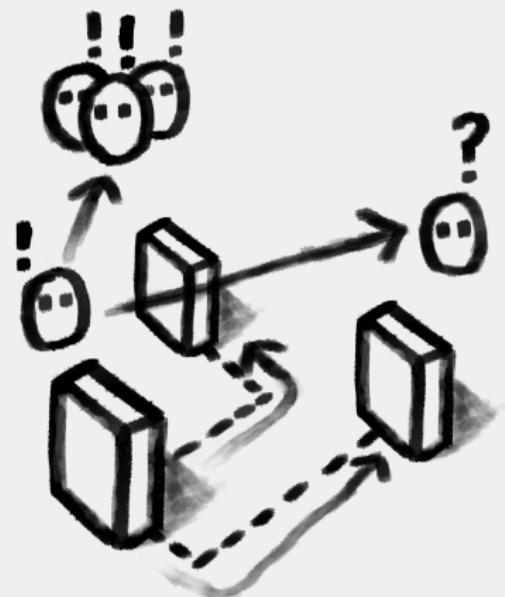
# FEDERATION

Charlie is a follower of Bob, so his server gets sent a copy, and it's shown to him.



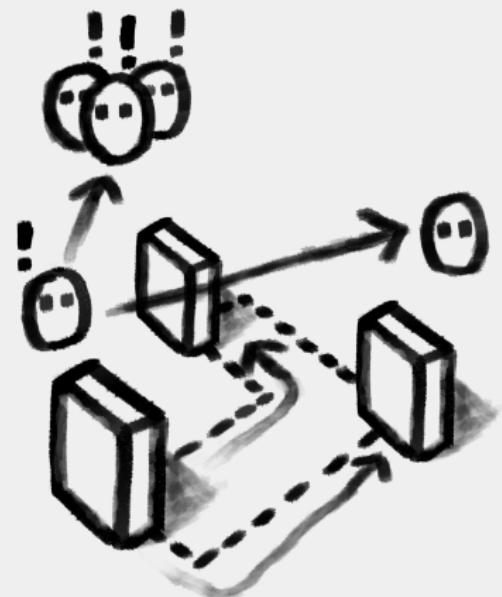
# FEDERATION

Charlie however, has never heard of Alice.



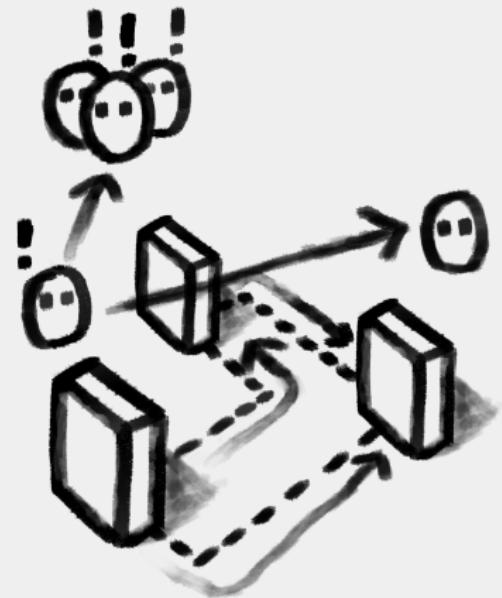
# FEDERATION

Behind the scenes, Charlie's server opens a connection to Alice's.



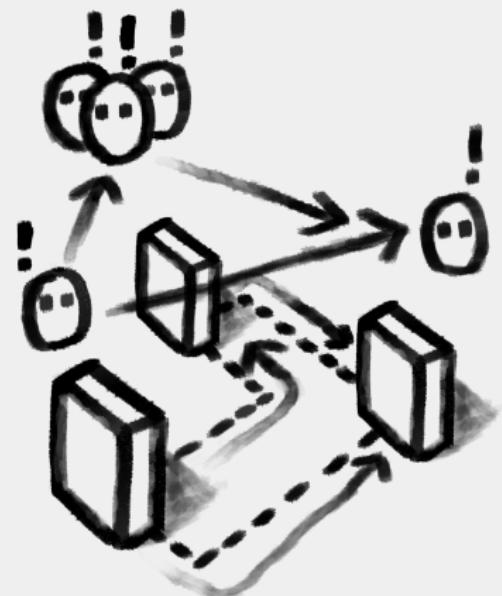
# FEDERATION

It asks for Alice initial post by ID.



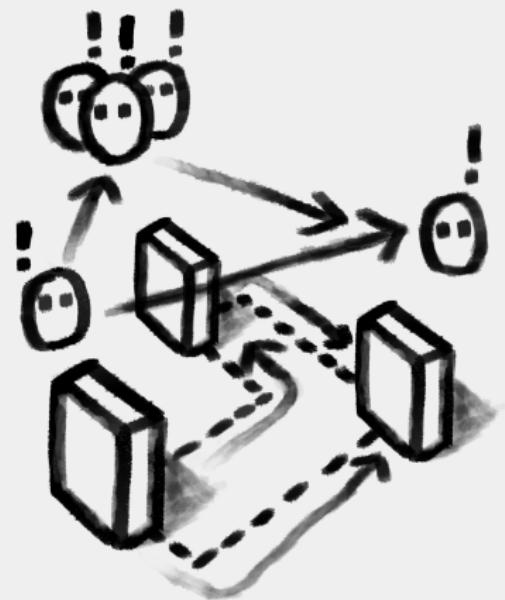
# FEDERATION

Charlie can now see Alice's post,  
direct from her server.



# FEDERATION

Charlies enjoys Alice's post, and becomes a follower of hers. Their two servers work to maintain the connection in the future.

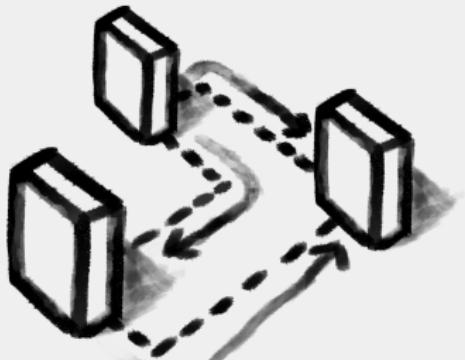


**The takeaway:**

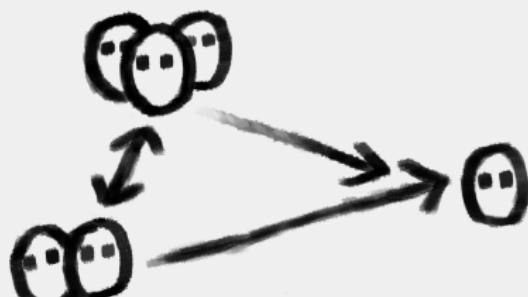
Mastodon operates on two intertwined layers.

# FEDERATION

The network graph, directly driven by the users social actions.



The social graph, shaped in subtle ways by the network graph that underpins it.

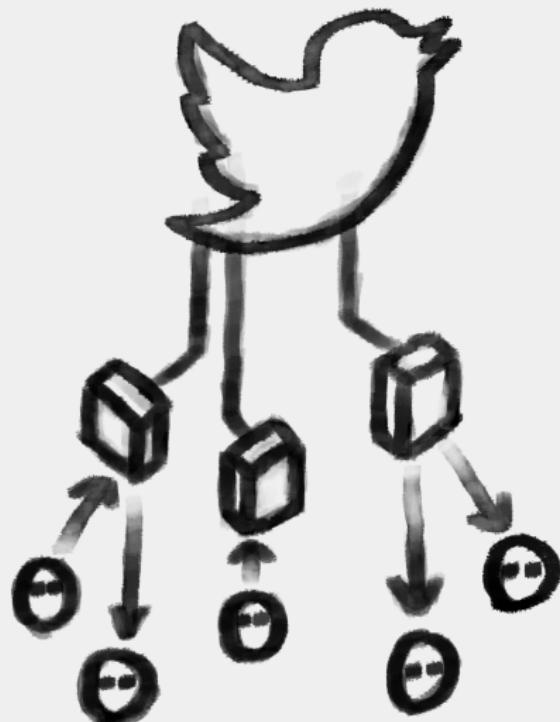


# **BENEFITS: TRIUMPH OF THE COMMONS**

# BENEFITS: A PUBLIC SPACE

Twitter isn't a public space [2]

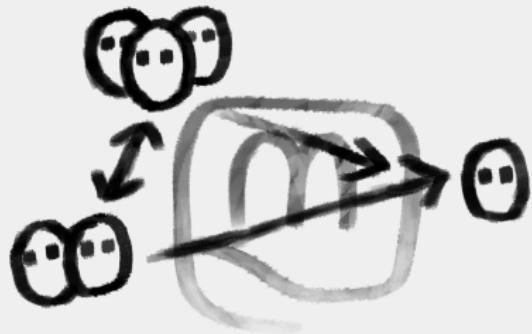
- Run for profit
- Geared towards engagement
- Monitors and controls



# BENEFITS: A PUBLIC SPACE

Mastodon gets closer to a public space

- Open source
- Network of independents
- Not predicated on profit



## BENEFITS: DIVERSITY

Mastodon supports a diverse set of communities

- Instances are independent
- No need for one-size-fits-all moderation
- Instances can specialize if they wish

## BENEFITS: PRIVACY

Mastodon encourages good privacy

- Explicit and incremental setting for toots
- No singular group in charge of all data
- Host your own server for maximum control

# **DIFFERENCES: WHEN IN ROME...**

## DIFFERENCES: TOPIC

Different instance can declare their topics of interest



[3]

## DIFFERENCES: TOPIC

Some topics have many smaller servers focused on them

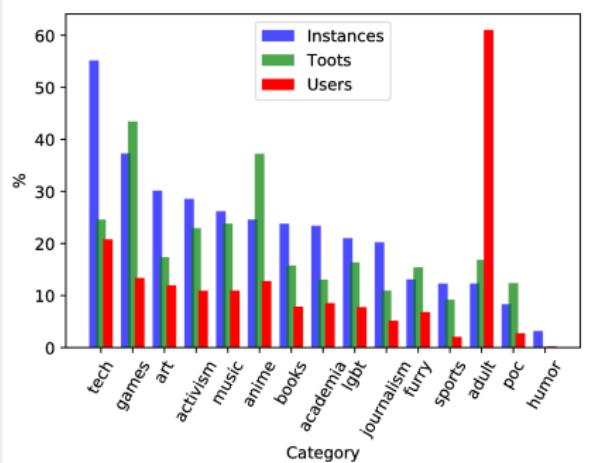
- General
- Journalism

Other topics have fewer servers, but more users in them

- Gaming
- Anime

# DIFFERENCES: TOPIC

Breaking it down by category



[4]

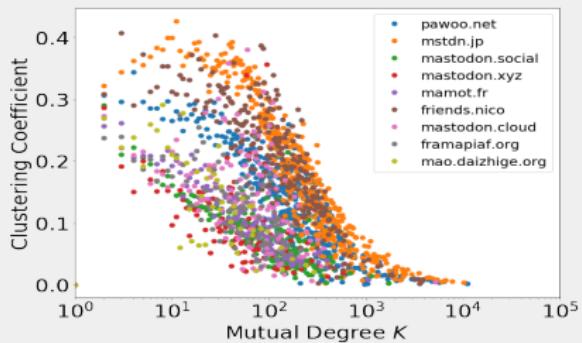
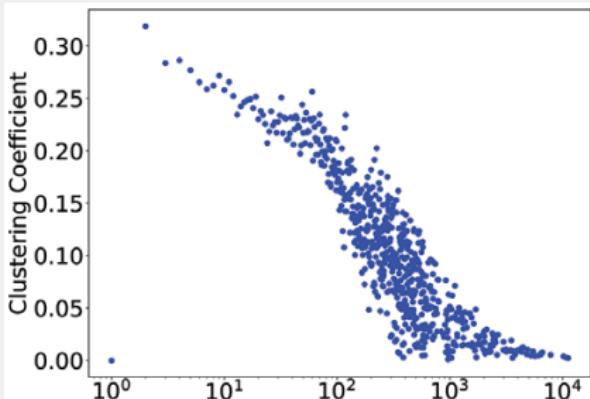
# DIFFERENCES: CLUSTERING

Users also show differing behavior patterns in different instances

- Following users on same instance
- Following users on different instances
- Following someone back

# DIFFERENCES: CLUSTERING

How clustered users are across the whole network, versus on the four biggest instances



## DIFFERENCES: NATIONALITY

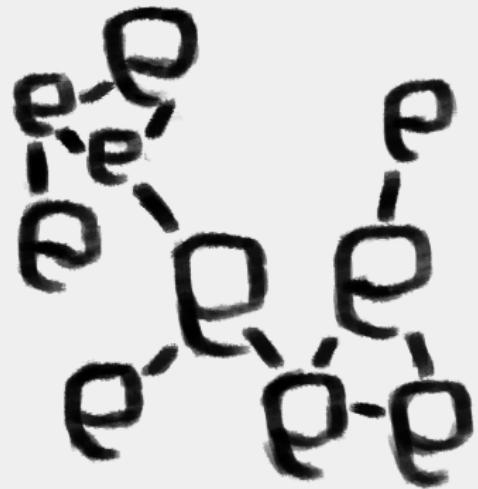
Users overwhelmingly connect to users in the same country [4]

# **DRAWBACKS:**

# **DIVIDED WE STAND...**

# DRAWBACKS

A healthy Mastodon network



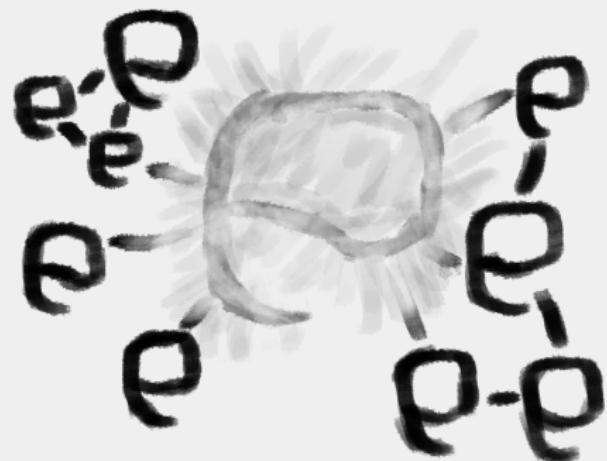
## DRAWBACKS

One node gains unbalanced prominence



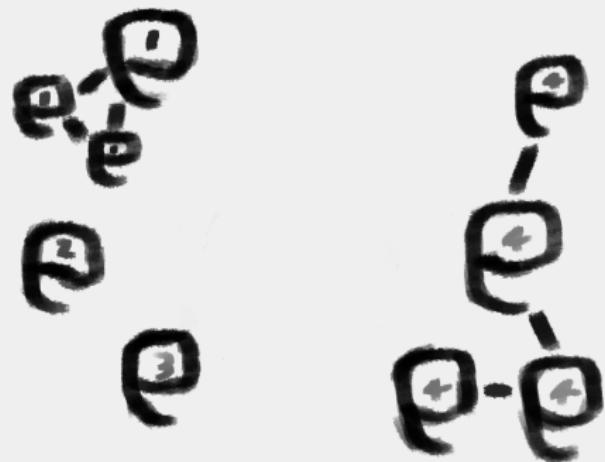
## DRAWBACKS

If that node fails, the network is damaged



# DRAWBACKS

- 1s are strongly interconnected
- 2 is isolated
- 3 is also isolated
- 4s are the largest group, but weakly connected



# DRAWBACKS

There are many ways towards failure

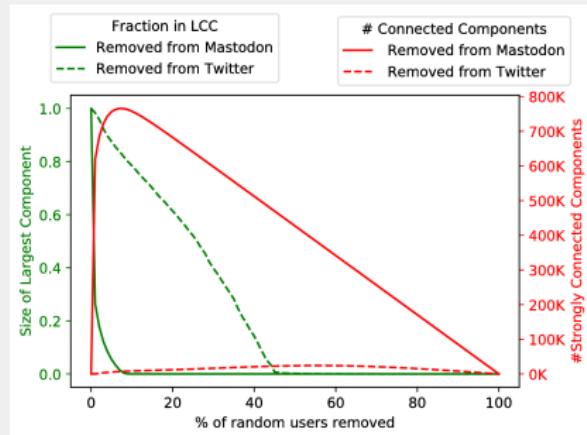
- Celebrity Users
- Large Instances
- Unstable Servers
- Common Infrastructure

## DRAWBACKS: USER ABANDONMENT

Users find each other, through  
users

# DRAWBACKS: USER ABANDONMENT

Users find each other, through  
users



[4]

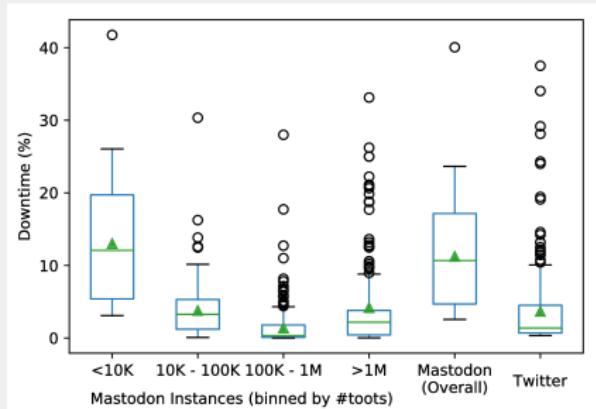
## DRAWBACKS: LARGE INSTANCES

Massive servers have undue influence

**10% of servers host 52% of all users[4]**

# DRAWBACKS: UNRELIABLE SERVERS

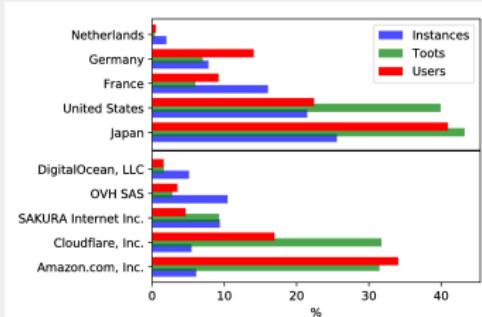
A robust network tends to be imperfect



[4]

# DRAWBACKS: COMMON INFRASTRUCTURE

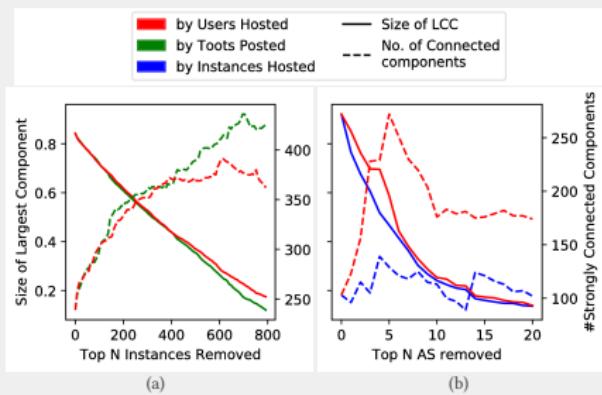
Mastodon servers are often run as cheaply as possible



[4]

# DRAWBACKS: COMMON INFRASTRUCTURE

Anything that effects many, many servers is concerning



[4]

**MITIGATION:**  
**AS LONG AS ONE STILL STANDS...**

## MITIGATION: REPLICATION

Replication has copies of every message that get saved to other servers

## MITIGATION: REPLICATION

Subscription based replication stores copies of subscribed messages on subscribers servers

# MITIGATION: REPLICATION

Removing the top ten servers by toots loses 62.69% of all toots

The same scenario with subscription replication loses only 2.1%

# MITIGATION: REPLICATION

There are downsides

- 23% of toots have 10+ replicas
- 9.7% of toots have none

## MITIGATION: REPLICATION

Randomized replication places the copies on random servers, to avoid clustering

# MITIGATION: REPLICATION

Removing the top 25 servers by number of toots loses 5% of all toots

The same scenario with a single random replication loses only 0.8%

# MITIGATION: REPLICATION

Still have downsides

- Need a common index of all instances
- Potential for abuse
- Hosting random data on behalf of others

# **CONCLUSIONS: THEORY MEETS PRACTICE**

# CONCLUSIONS

Mastodon offers a public space, with a diverse set of communities, and mechanisms to protect that diversity.

# CONCLUSIONS

Although these are serious scenarios, they are hypothetical at present.

Mastodon is growing steadily, with over a million users, and eight hundred contributors. [5]

# CONCLUSIONS

Questions?



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# ABOUT THE AUTHOR

## Charlot Shaw (They/Them)

Charlot is interested in making technology that is fundamentally equitable, and belongs to the users. This includes open source, indie and distributed web technology.

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