# Challenges in the Decentralised Web

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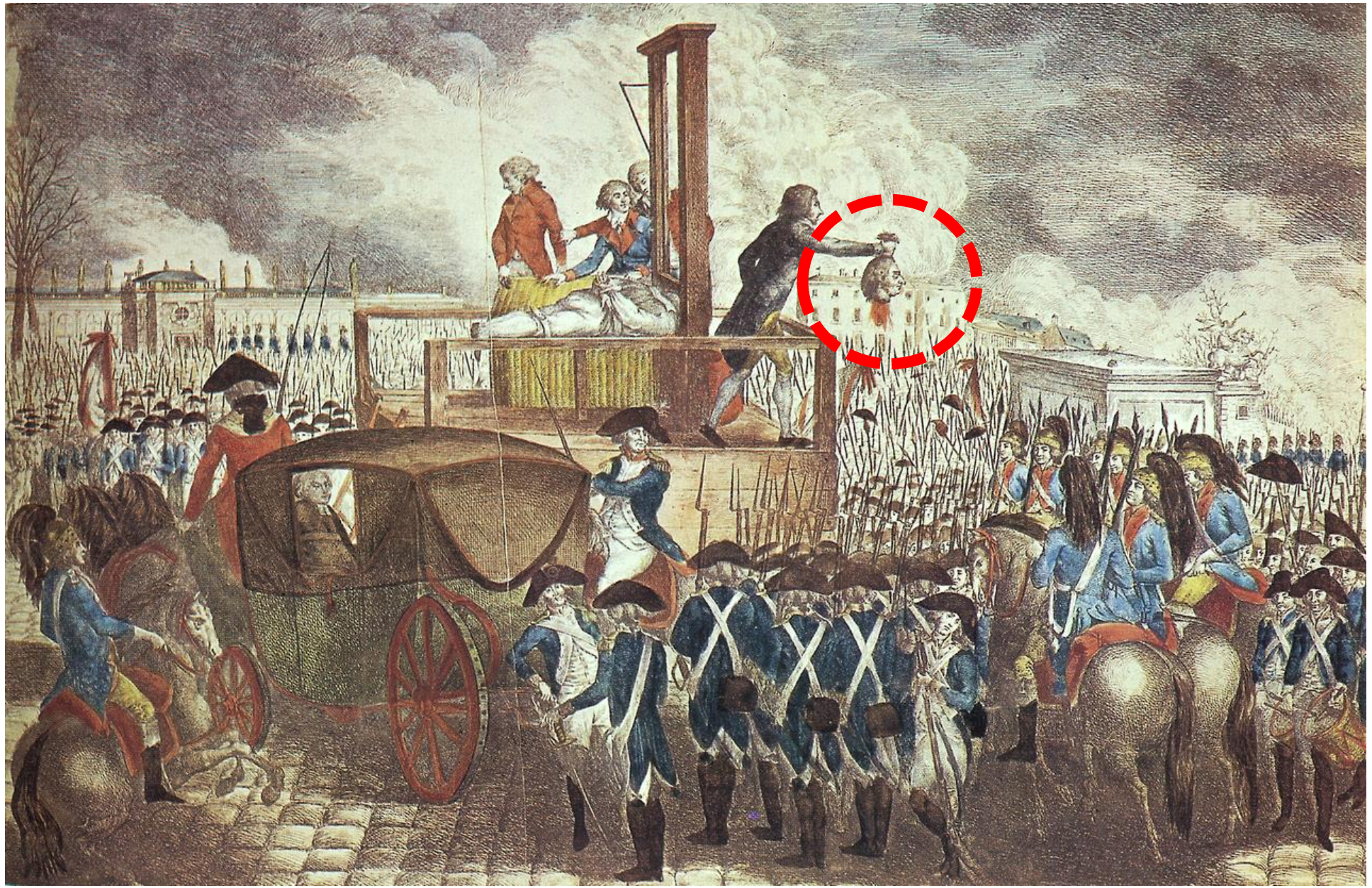
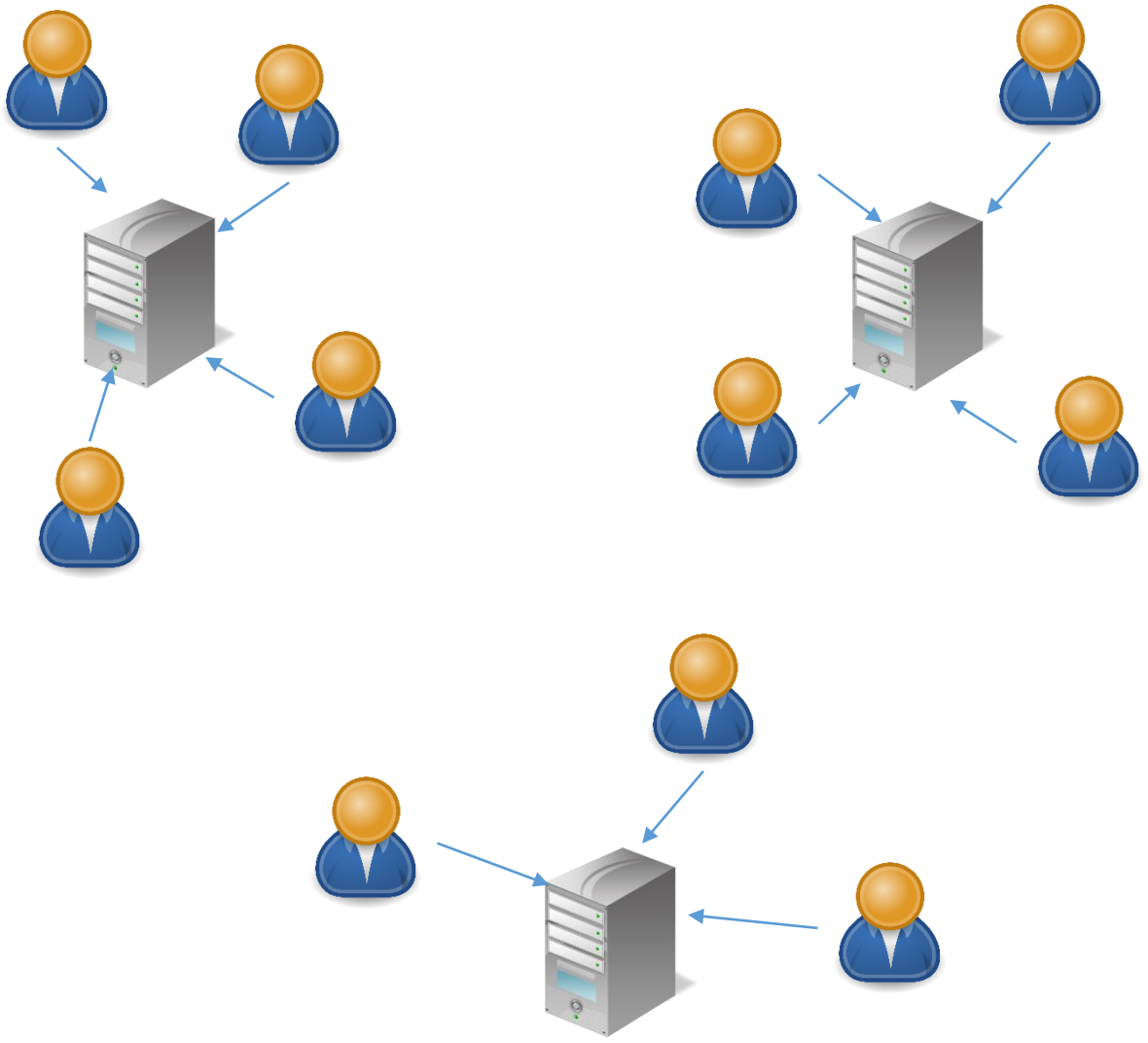
Aravindh Raman, Sagar Joglekar, Emiliano De Cristofaro, Nishanth Sastry and Gareth Tyson. *Challenges in the Decentralised Web: The Mastodon Case*. In 19th ACM Internet Measurement Conference (IMC), Amsterdam, Netherlands (2019)

# It’s damn hard to decentralise the web

“A push towards decentralization…in the end, [became] an extension of centralization”

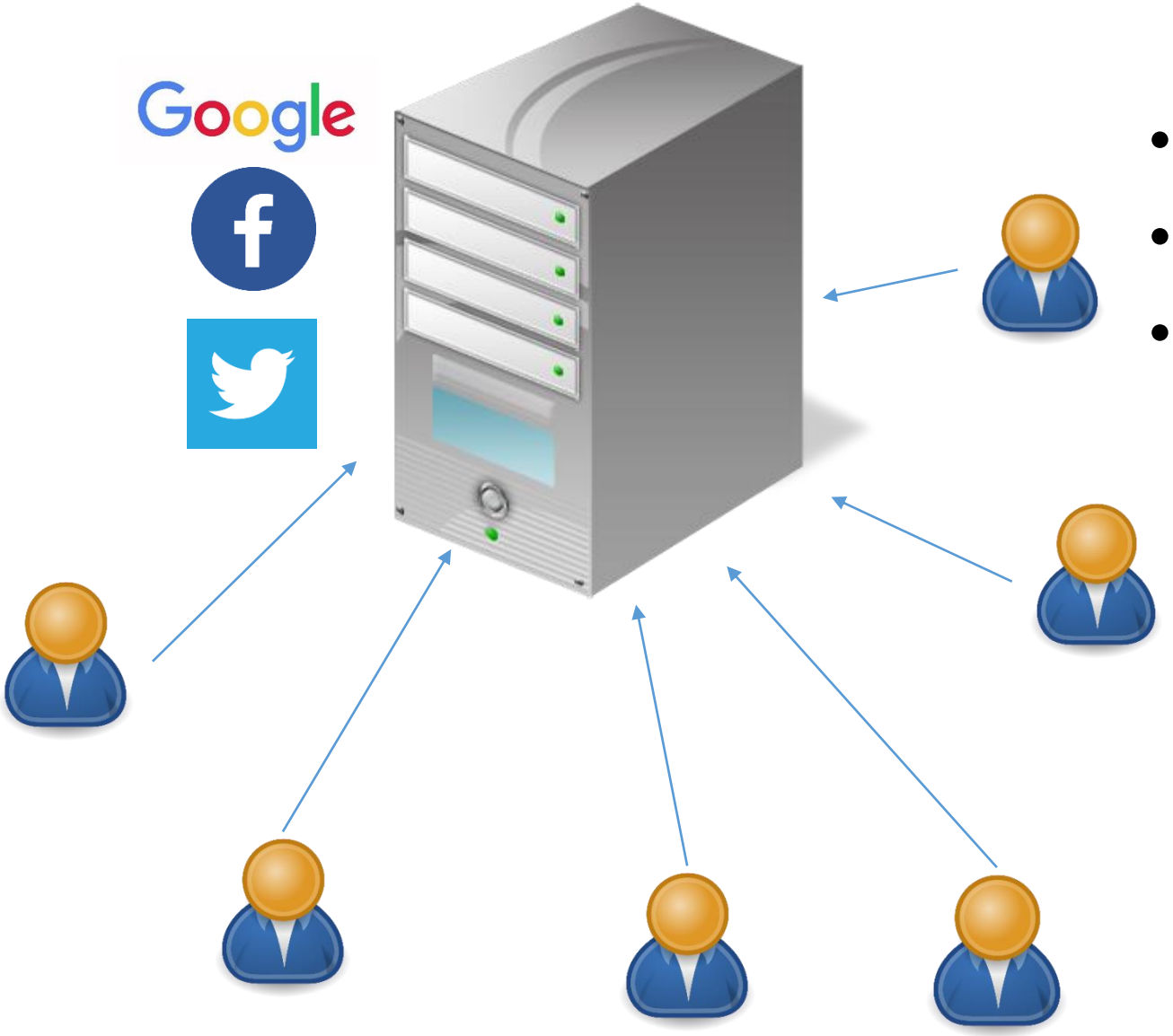


# How *did* the web work?



- More symmetrical power structures?
- More resilient?
- No central points of failure?
- Superior privacy?

# How *does* the web work?




- Critical mass of user?
- Orchestrated deployments?
- Economies of scale?

Can we get the best of both worlds?!

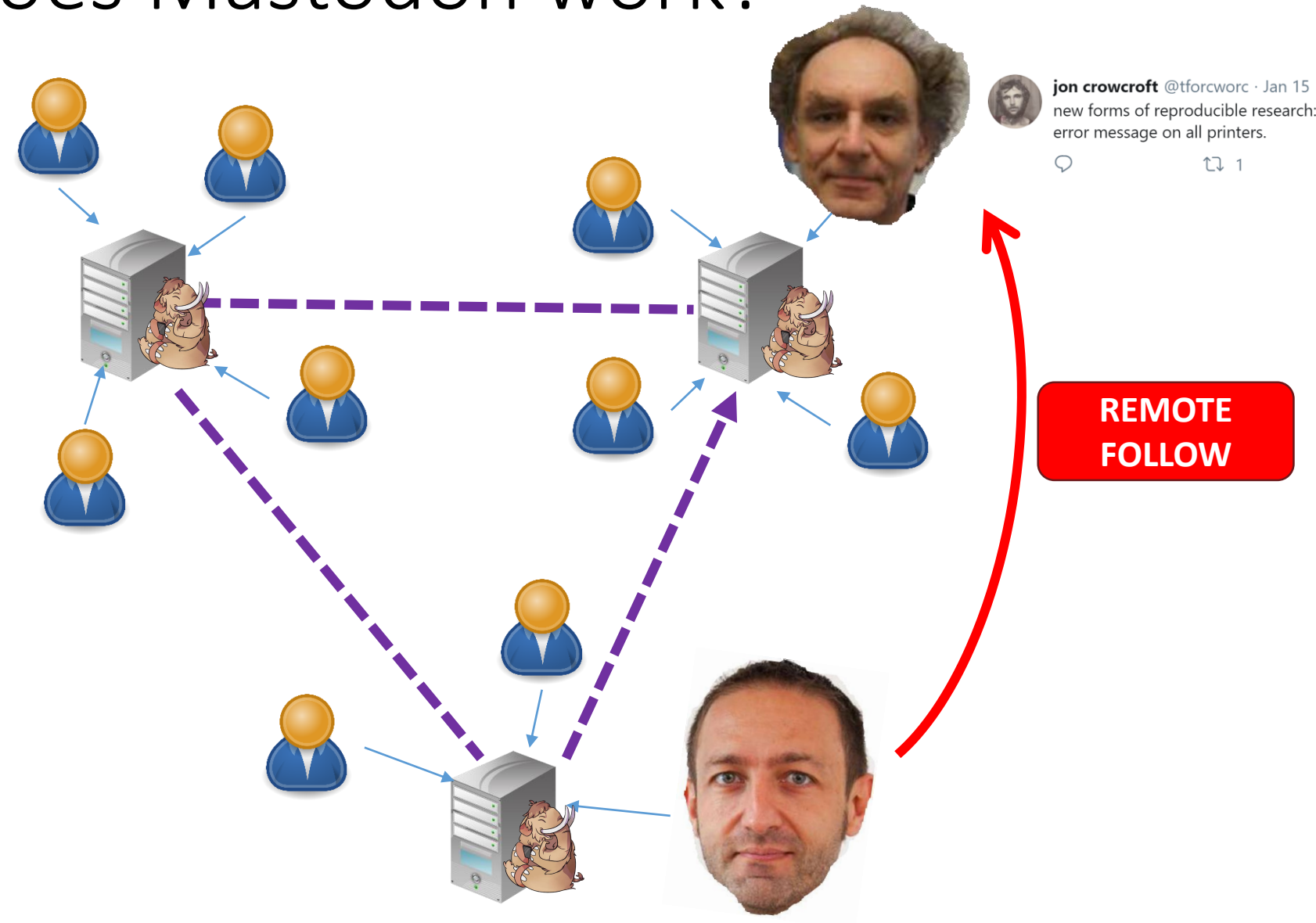
The “**Decentralised Web”** has many open-source implementations

diaspora*

Federated versions of popular services like Facebook, Twitter and YouTube

IPFS

# How does Mastodon work?



# Great!!!
# We have decentralised!

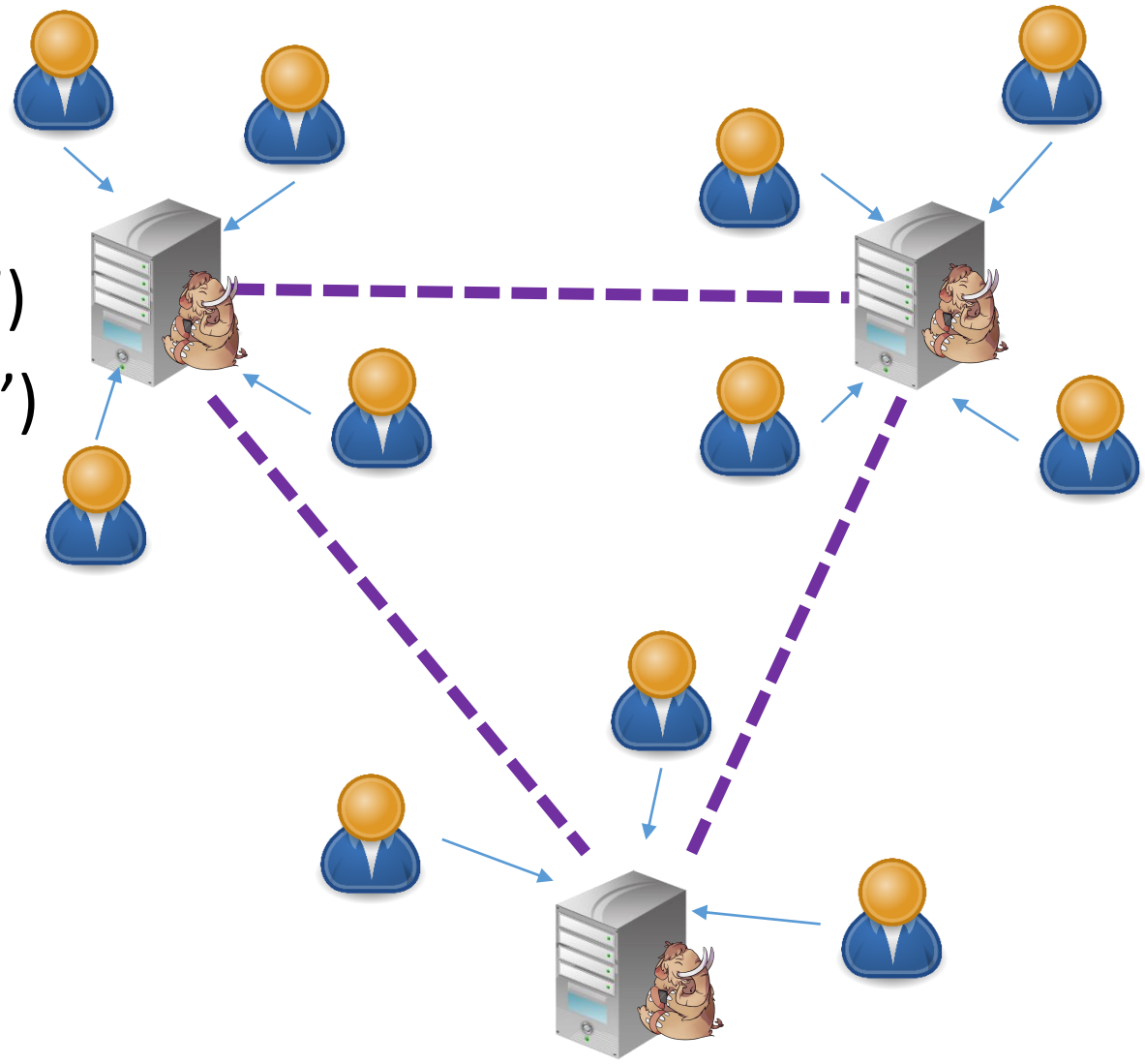
**No you've not!**

Decentralised Louis XVI

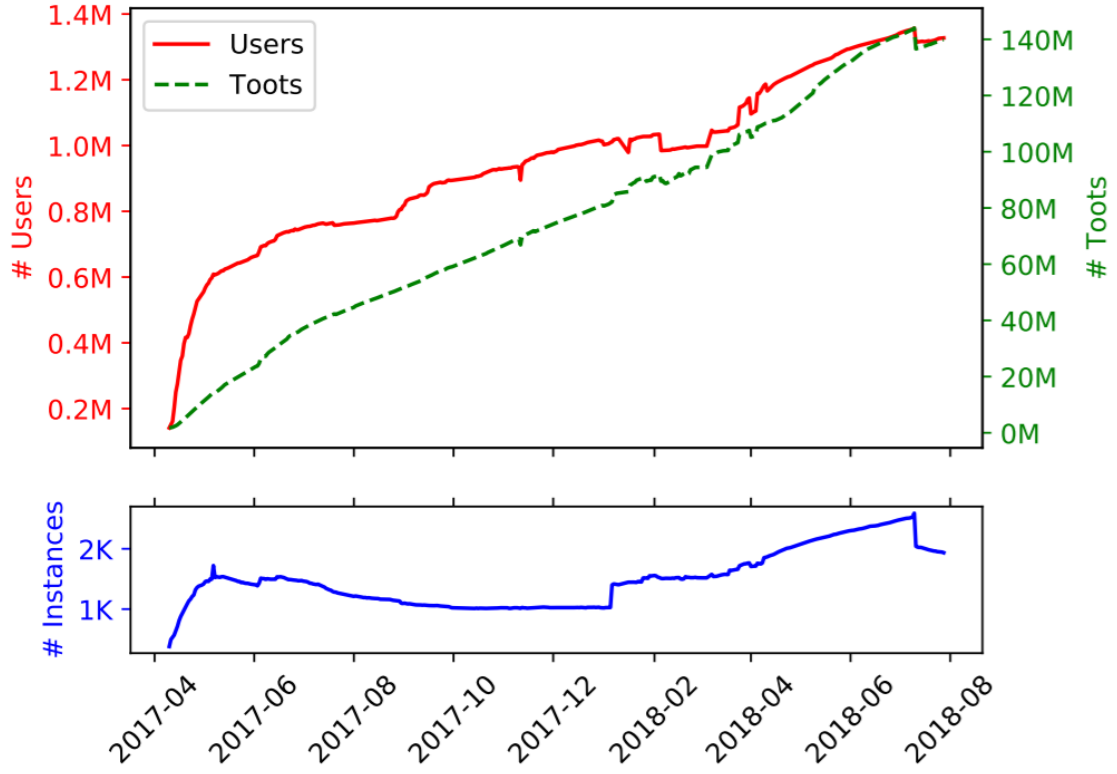
# Let’s measure Mastodon!

- Around 4K servers (aka “instances”)
- 67M Mastodon tweets (aka “toots”)

- What pressures towards centralisation exist?



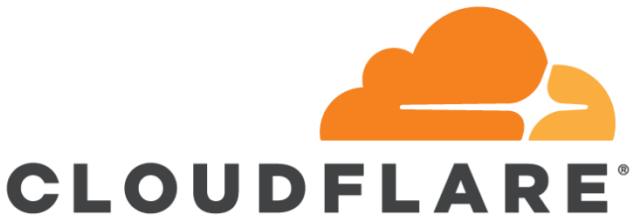
# Found a growing system!

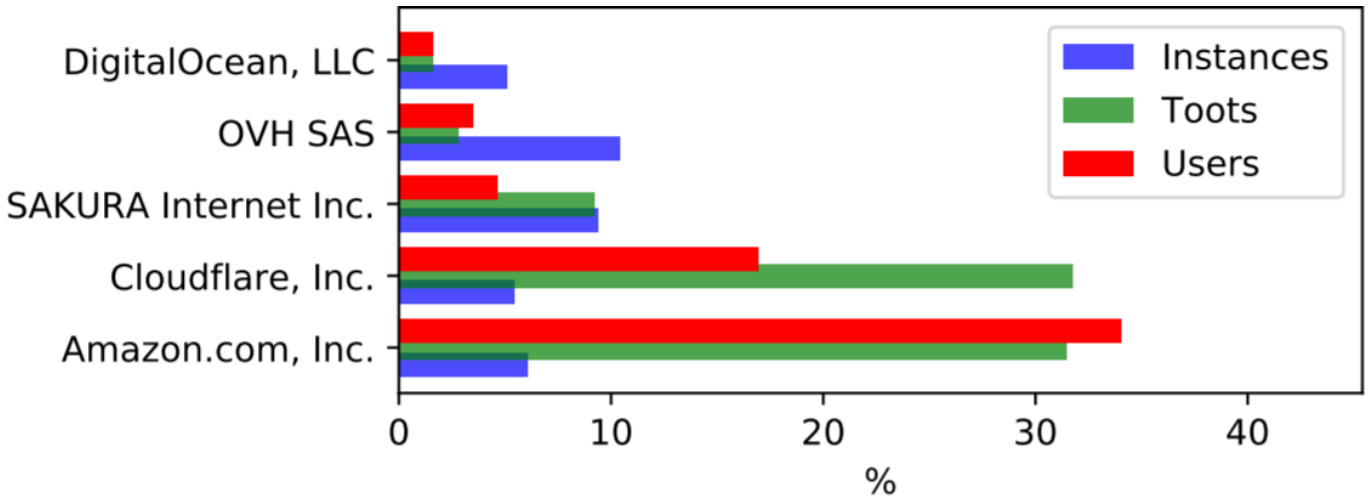



- Helped along by things like the #DeleteFacebook campaign

Let’s go through a thought experiment…

# Where would you host your server?!



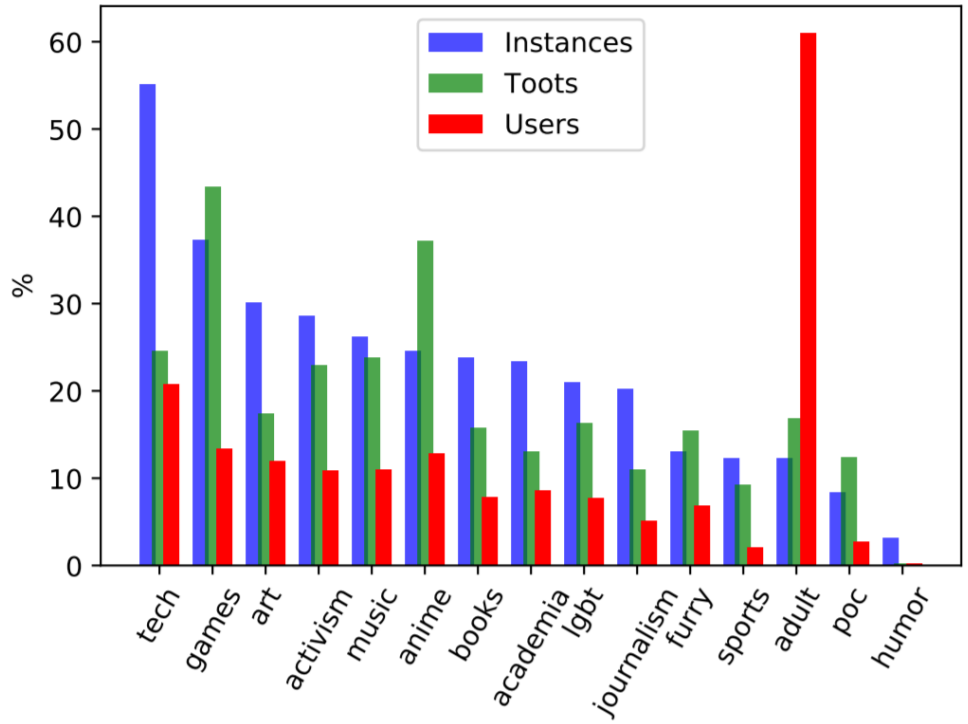

**Half of users are reliant on just 3 networks!**

**…and 2/3 of content**

# Which instance would you join?!

**90% of users join top 5% of the instances**

Linux



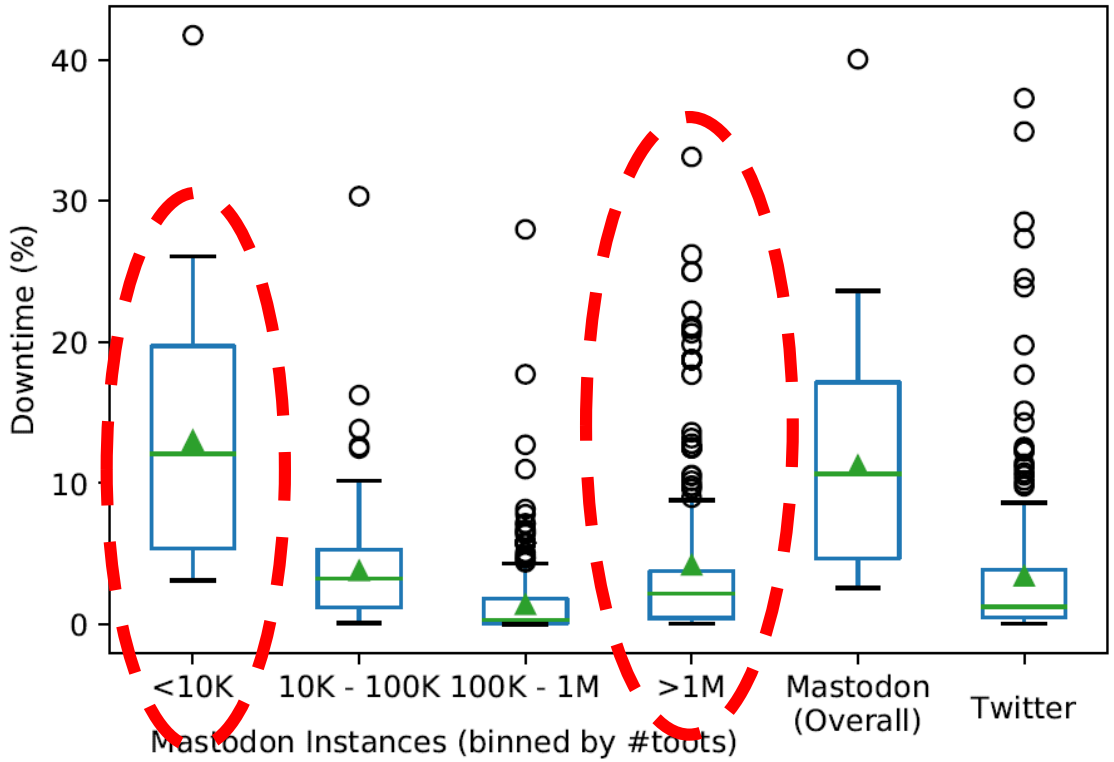

**Top 5% of instances have 95% of content!**

# But at least decentralised == reliable, right?

# Hmmm, not quite…

**11% instances inaccessible for half of time**

**Only 5% have 99.5%+ uptime**



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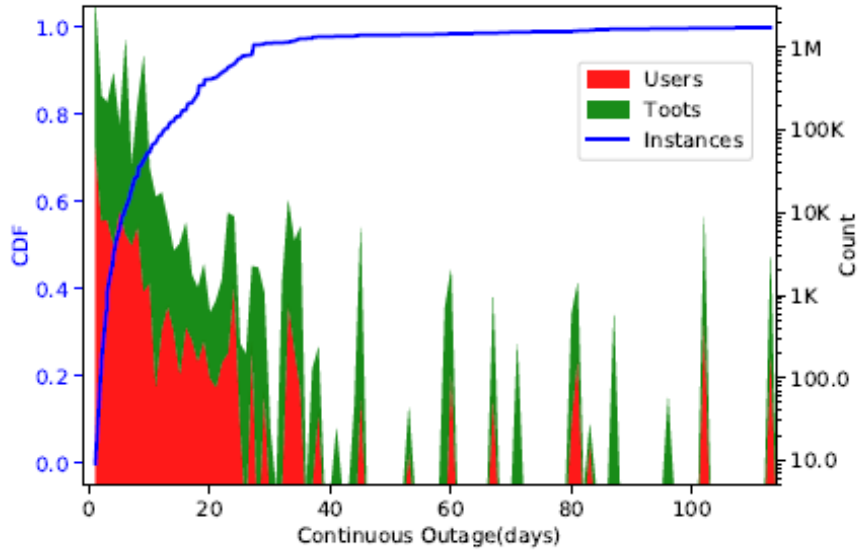
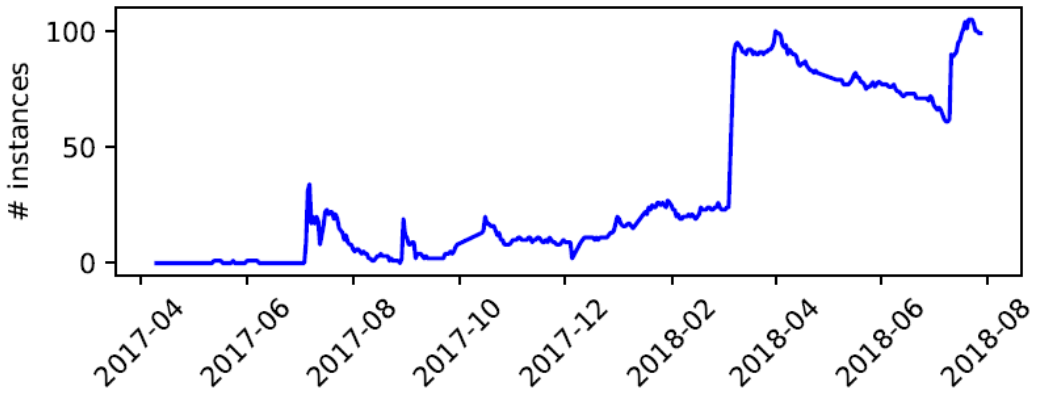
**11% instances inaccessible for half of time**

**…still has central dependencies!**




**6 entire network outages**

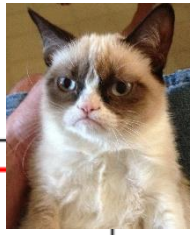


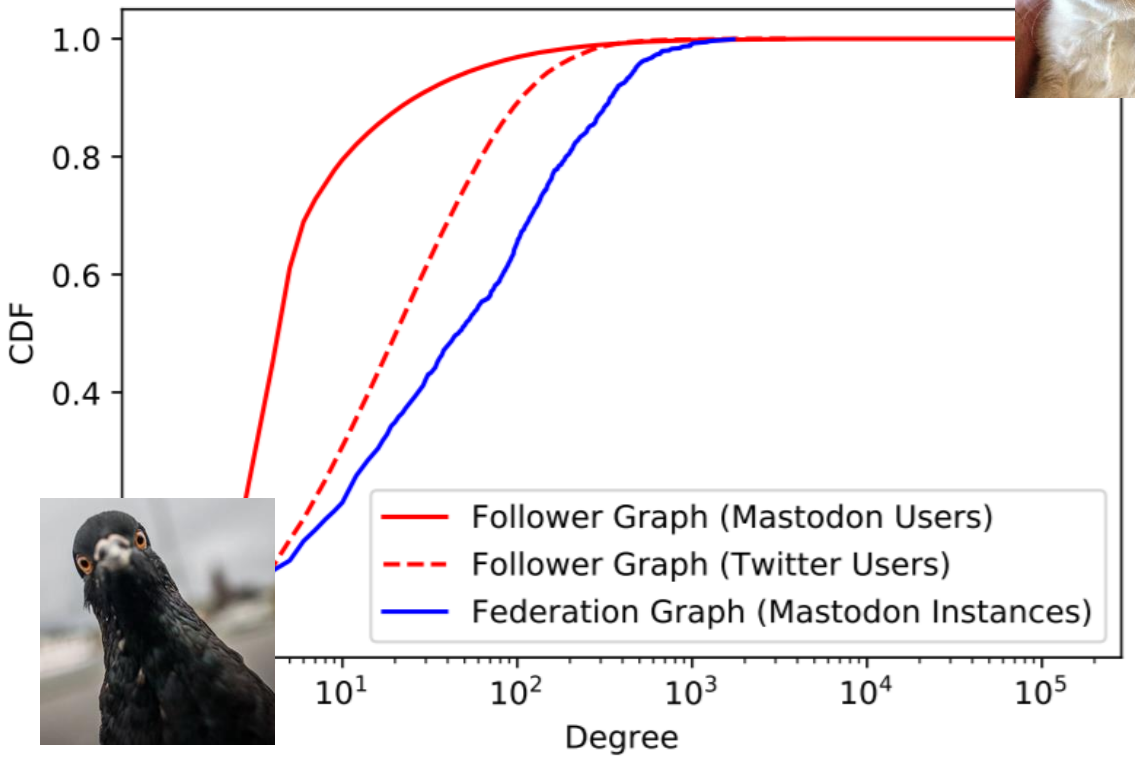

**85% of instances use one Certificate Authority**

# And you folks don’t help with this

# Who you gonna follow?

**The top 5% accumulate the majority of followers**

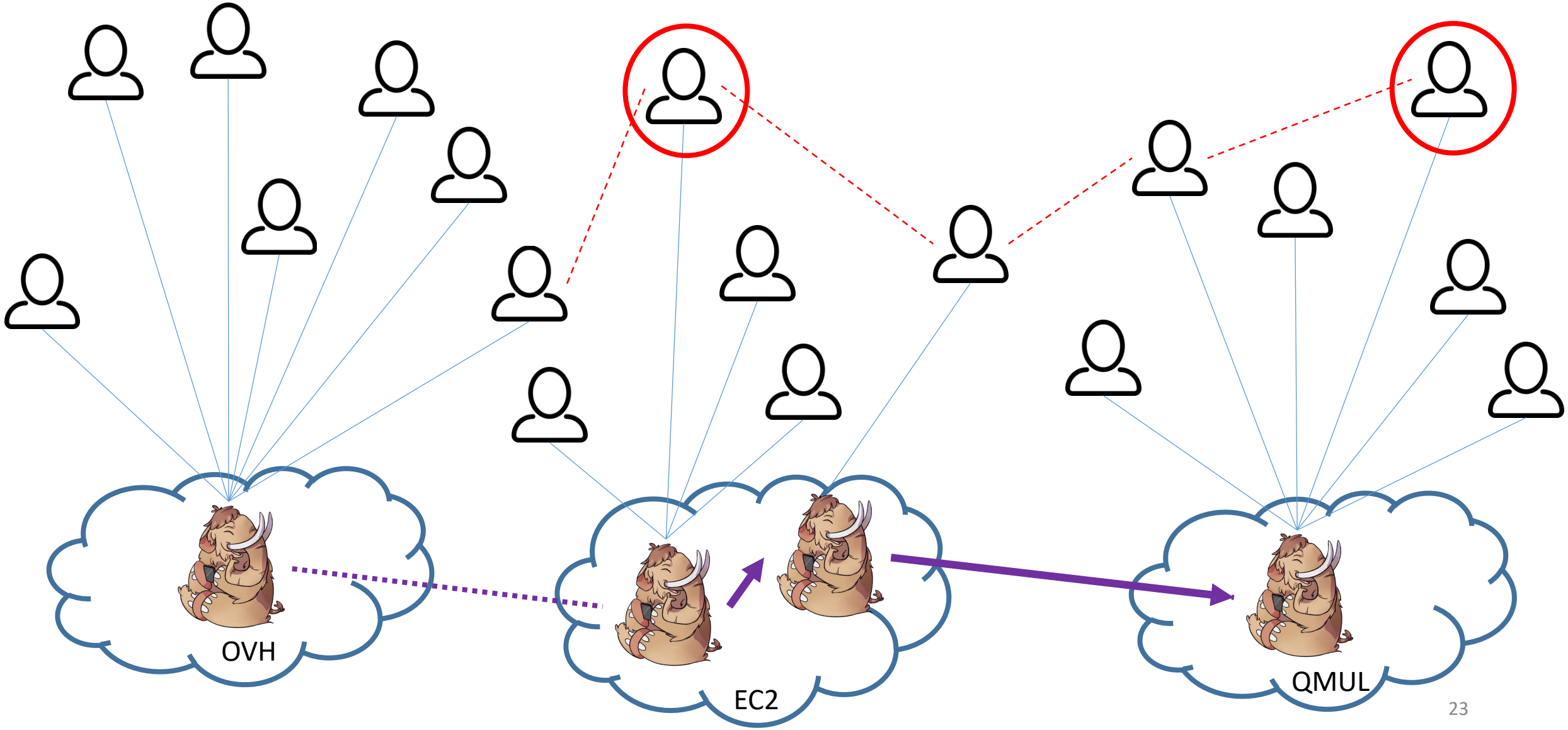







**What if Grumpy Cat's server goes offline?!**

# And this is more complicated than it looks



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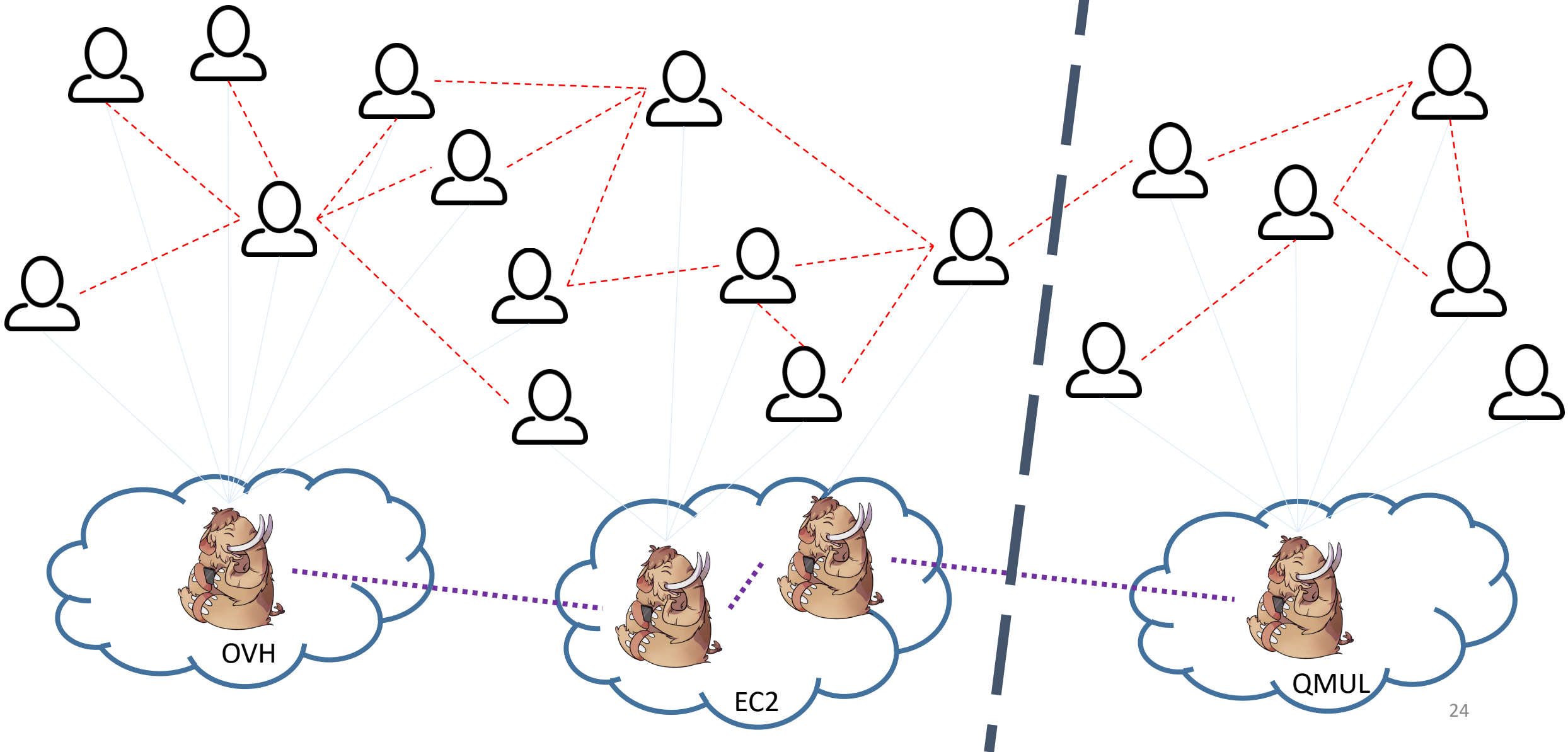
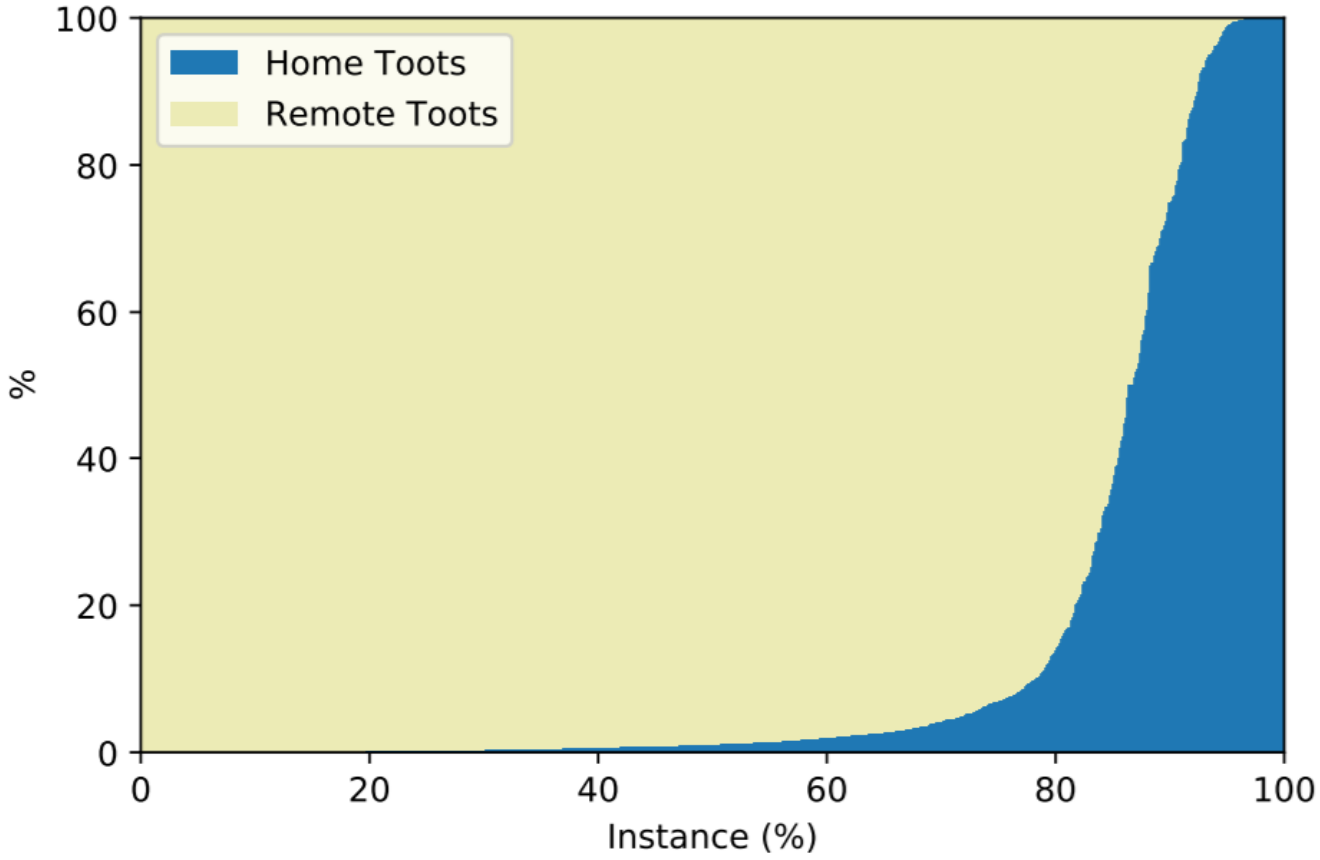


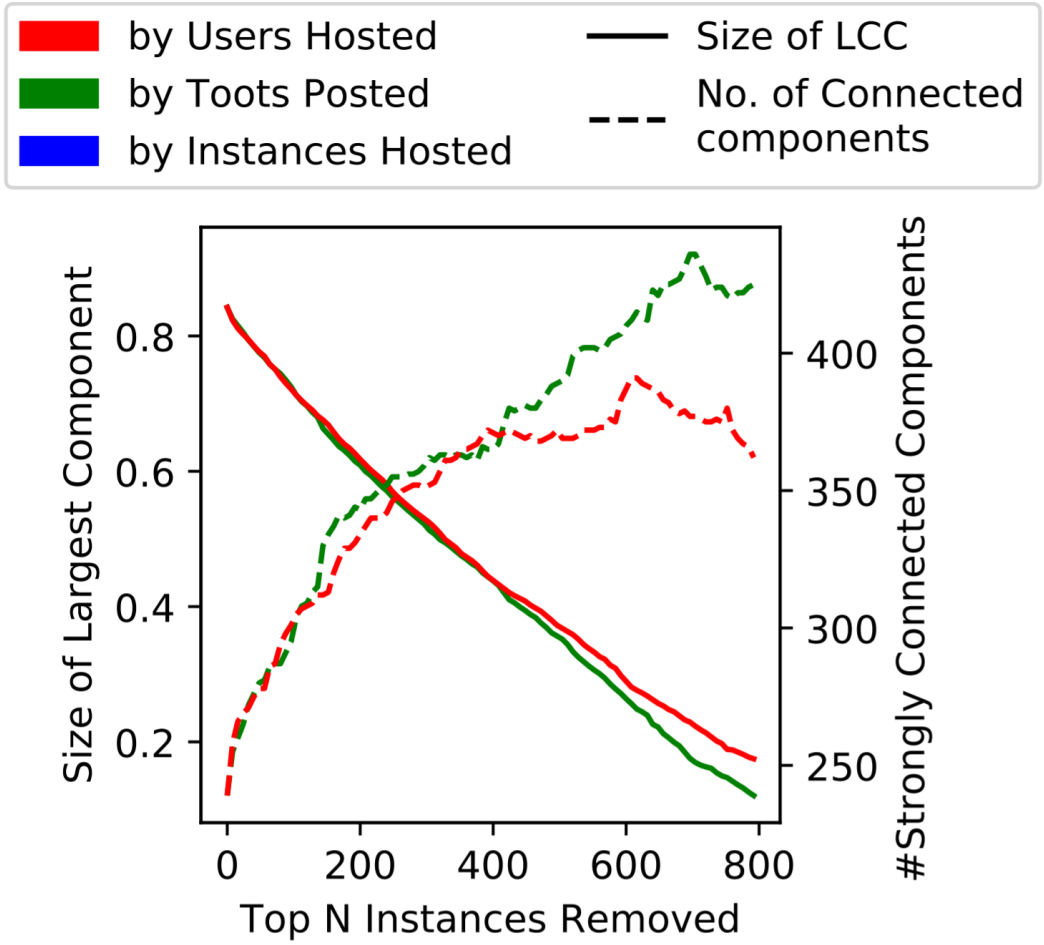
# This isn’t localised! It can be very damaging!

**Most instances depend on ‘foreign’ content**

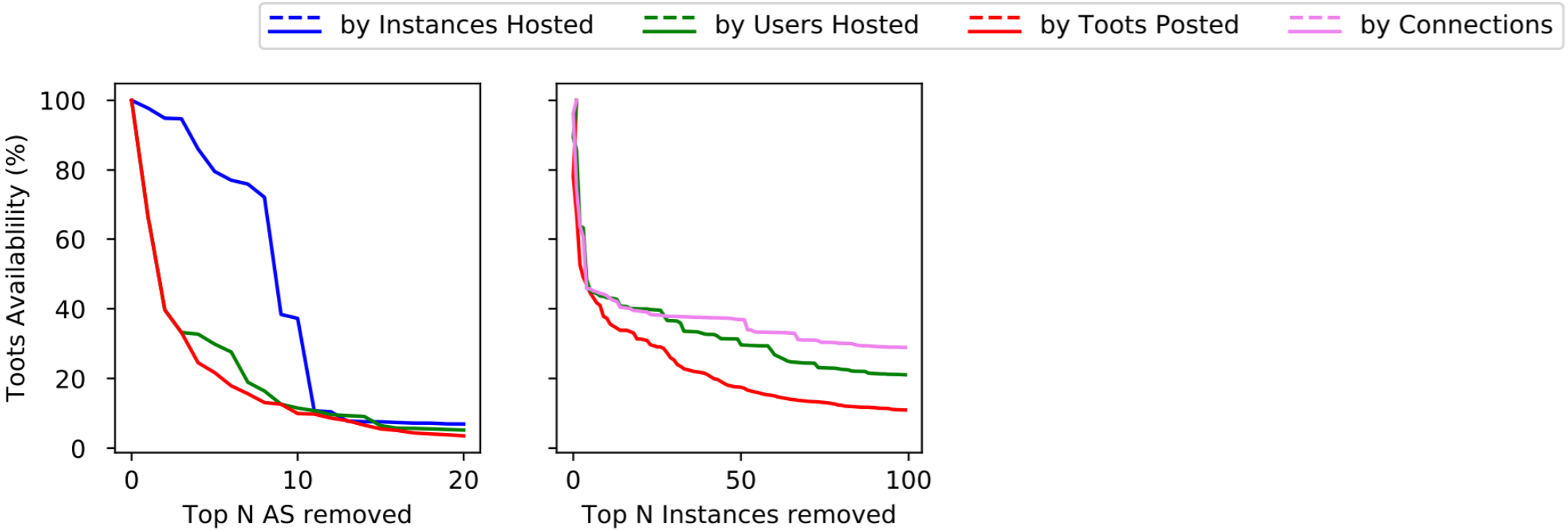


# Let’s test this…

- Removing top 1% of **accounts** decreases the LCC to 26.38%
- Removing the top 5 **Ases** shatters the social graph into 272 components



# And what happens to the content?



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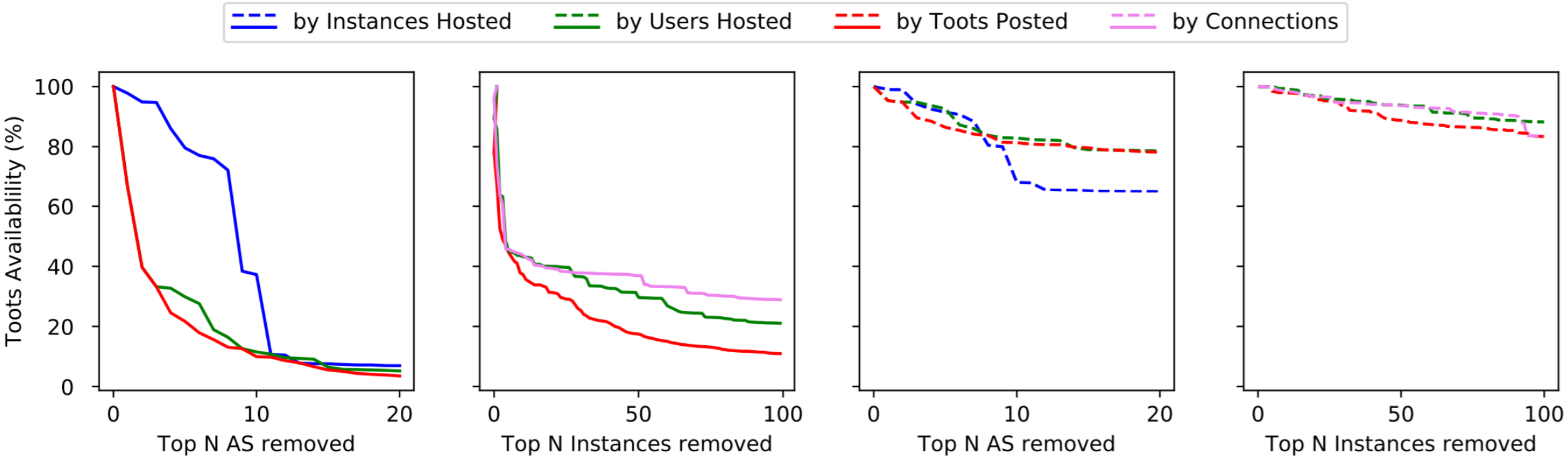
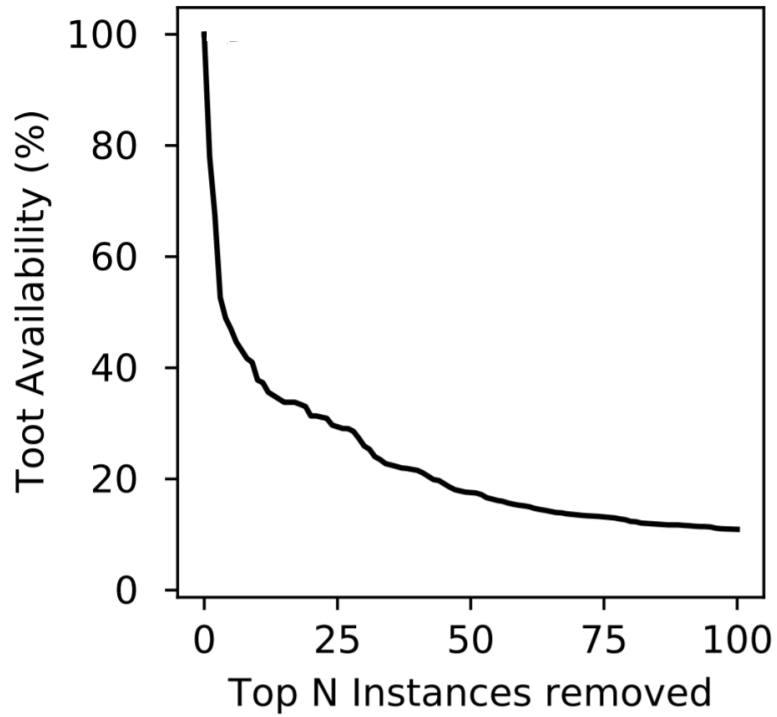


# How can we improve this?




Random replication achieves **99%** availability

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