Challenges in the Decentralised Web: The Mastodon Case

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Outline

- Introduction
- About Mastodon
- Measurement insights
- Conclusion

Introduction

- Decentralised Web (DW) has recently seen a renewed momentum
- DW features: Transparency, openness, democracy on the Web
- DW platforms: Mastodon, Hubzilla, PeerTube, and Diaspora

Focus of this presentation

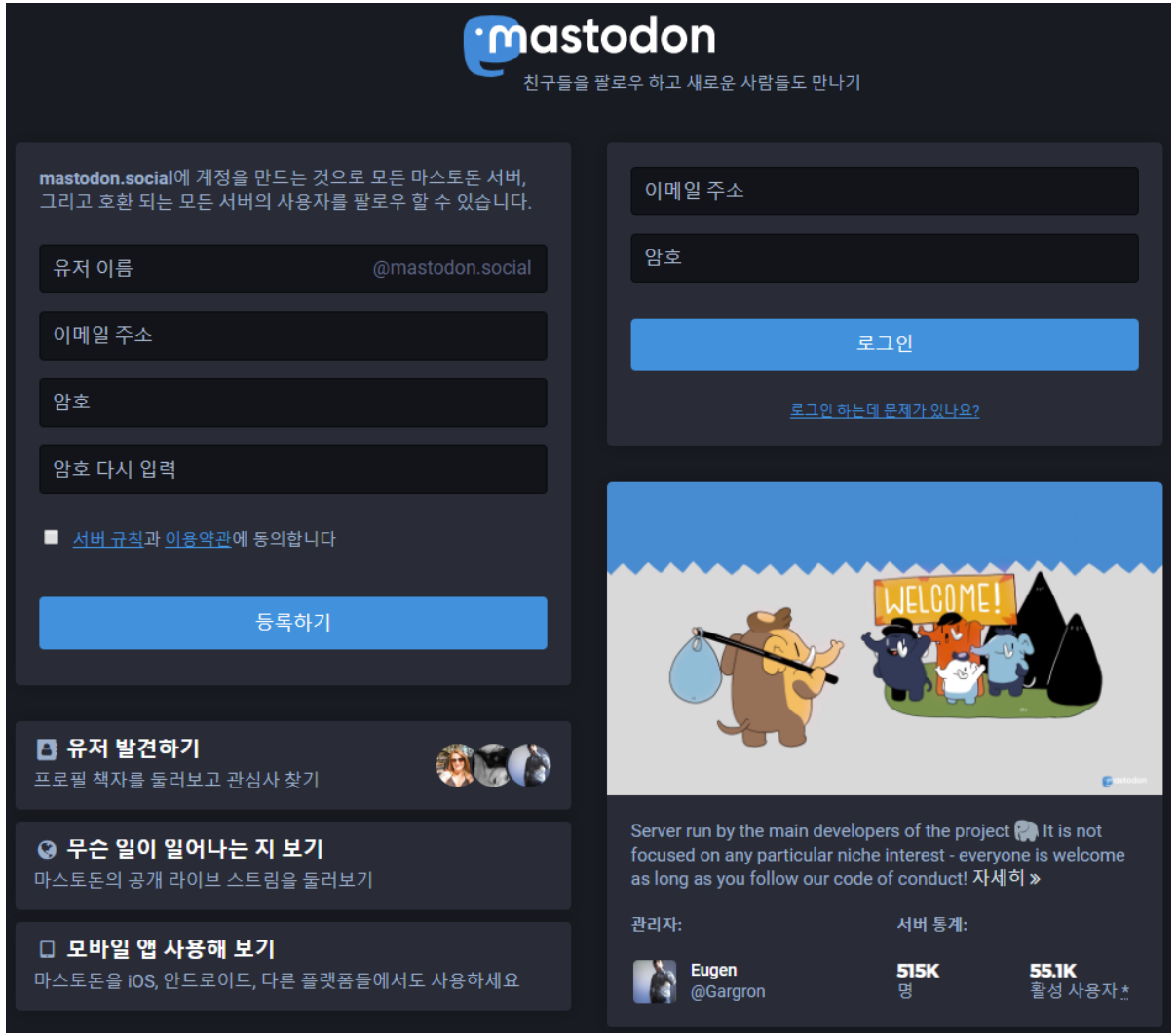
- **What** is the Mastodon

- **Insights** from measurements of the Mastodon

About Mastodon

Mastodon overview

- Decentralised microblogging platform
- Similar with Twitter
- Opensource, released in 2016



Mastodon operation

- Administrators can create independent Mastodon **instances**
- Users can register accounts on the instance
- Users can post **toots** → tweets of Twitter
- Users can **boost** toots → retweets of Twitter

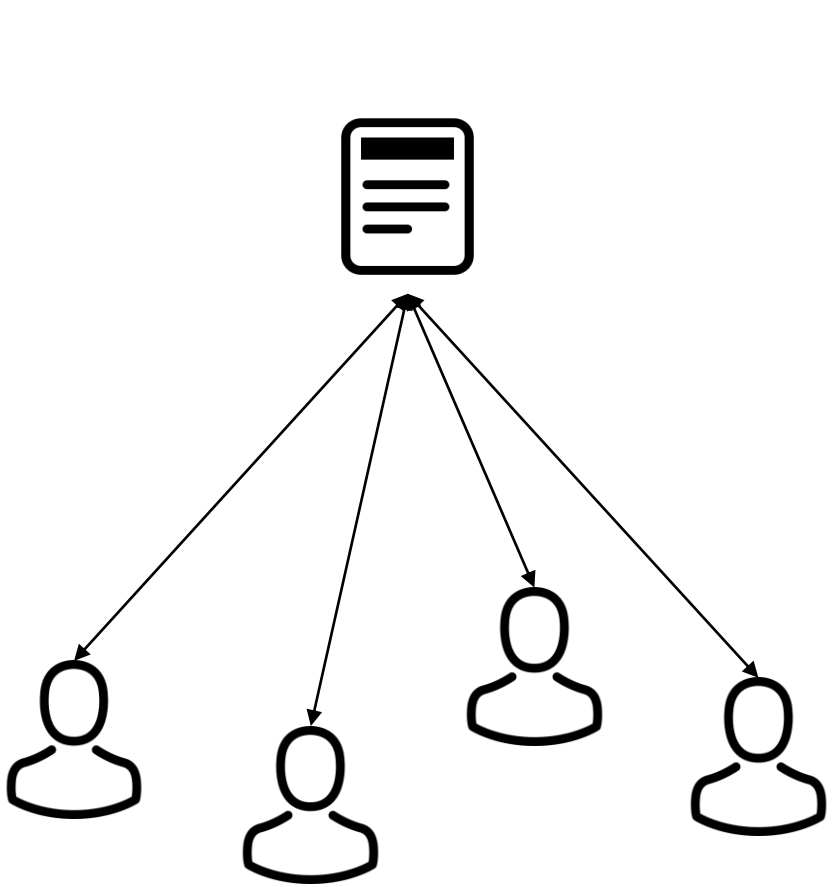
Decentralised features

- Two key innovations

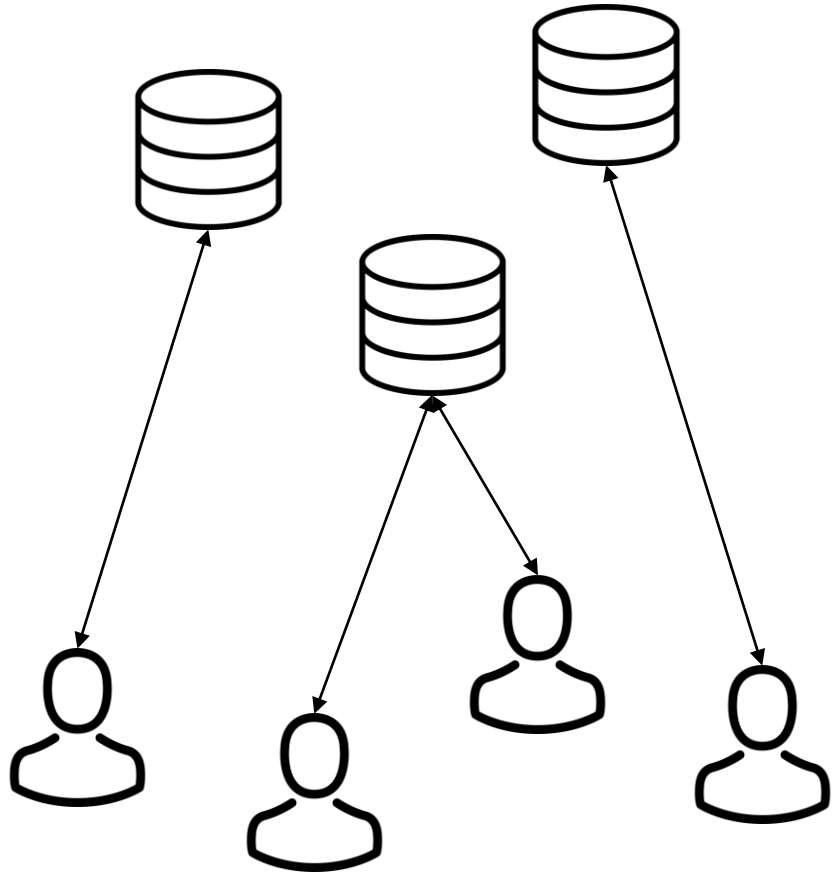
- 1. Decomposing service offerings into independent servers
  - Anybody can easily bootstrap the servers
  - The servers are called ‘instances’

- 2. Interacting between instances via ‘federation’
  - Instances using standard decentralised protocols can connect each others
  - Users of a single instance can be offered a globally integrated service

Decomposing service offerings



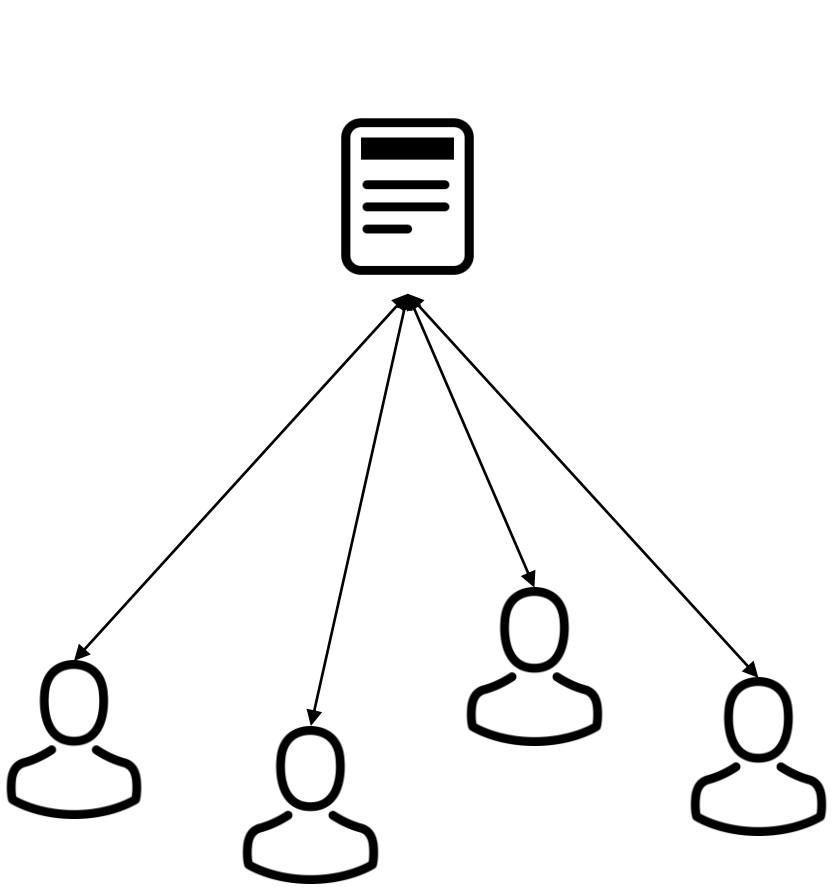
Central server offers services

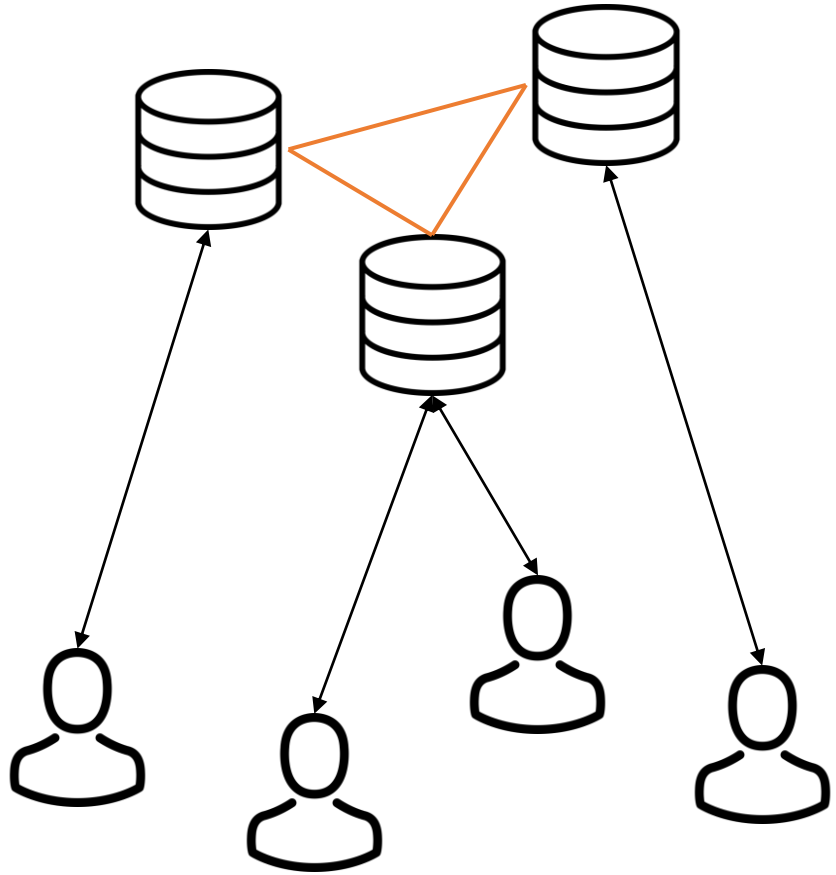


Independent instances offer services

Interacting via federation

Instances are connected with federation
(Protocols: oStatus and ActivityPub)





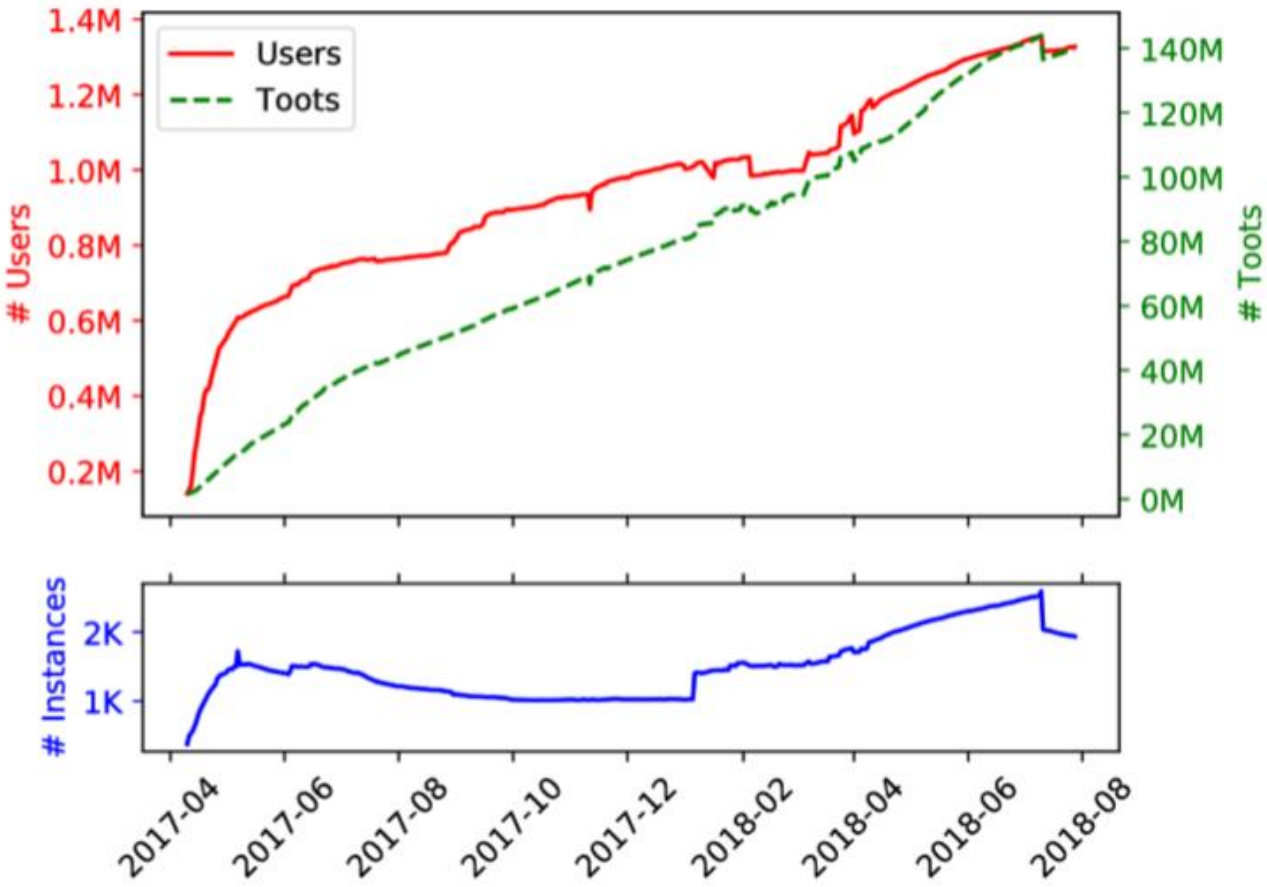
Central server offers services

Independent instances offer services

Measurement insights

Dataset

- From April 2017 to July 2018
- About instances, toots and graphs (following and federation)
- Users and toots are increasing



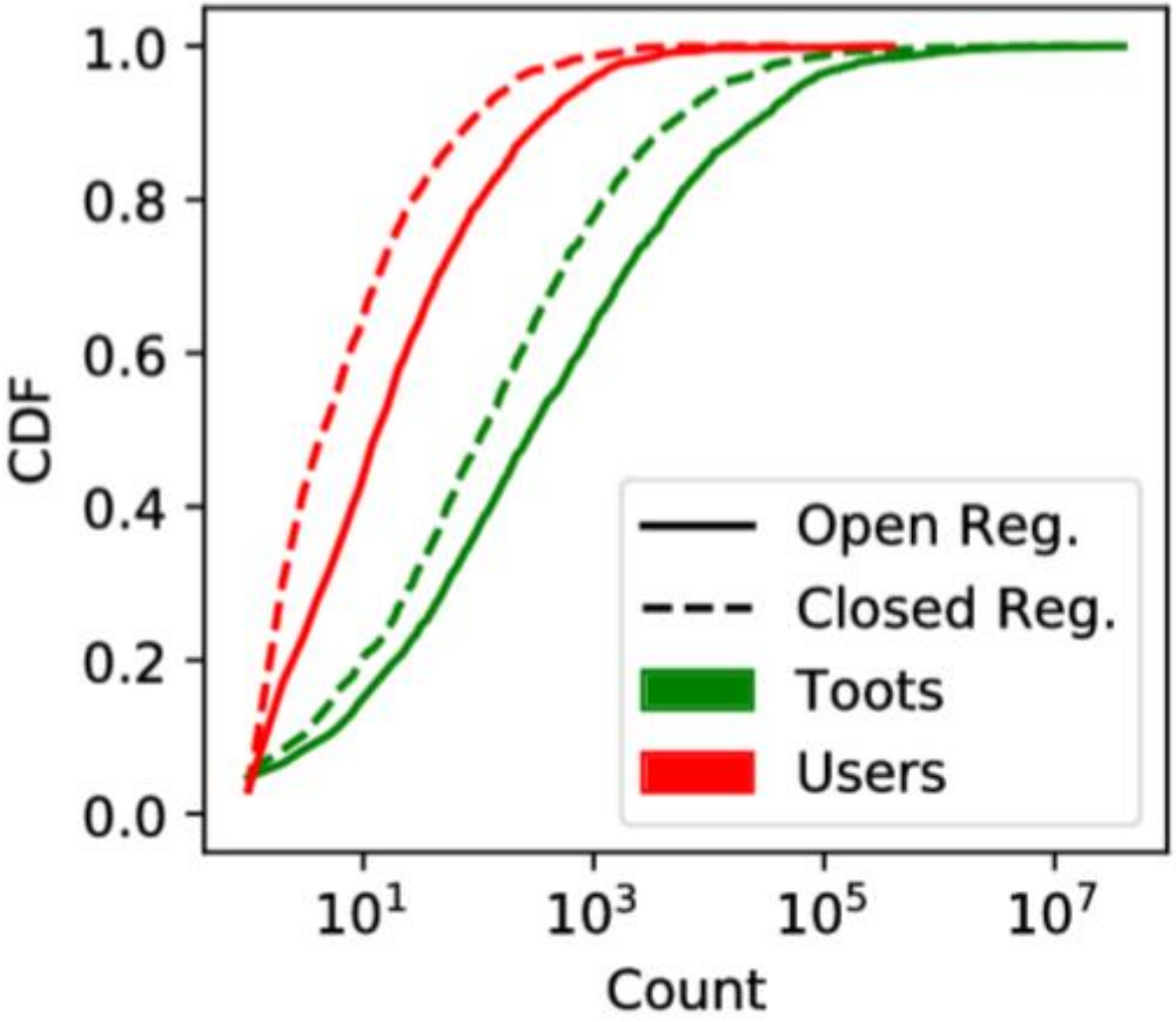
Main question

- Does Mastodon really achieve decentralisation?

Popularity

- CDF of the # of users and toots per instance
- User population is highly skewed
- The top 5% of instances have 90.6% of all users

➔ Another form of **centralisation**



Open instance: anybody can register
Closed instance: explicit invitation is needed

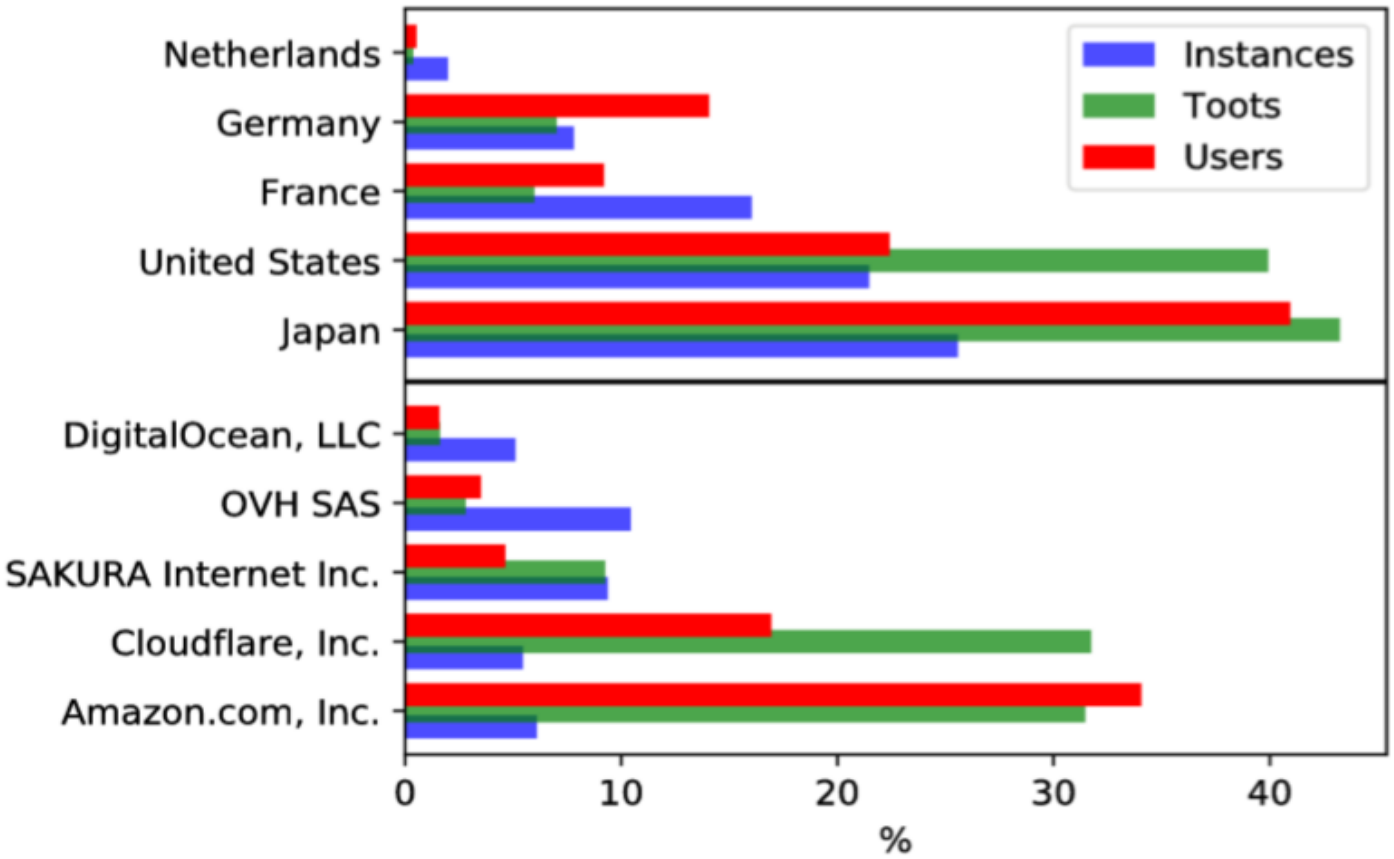
Instance hosting

- Top 3 countries hold about 80% of instances
- Top 3 countries hold about 93% of toots

➔ **Regional centralisation**

- Top 3 ASes account for 62% of global users

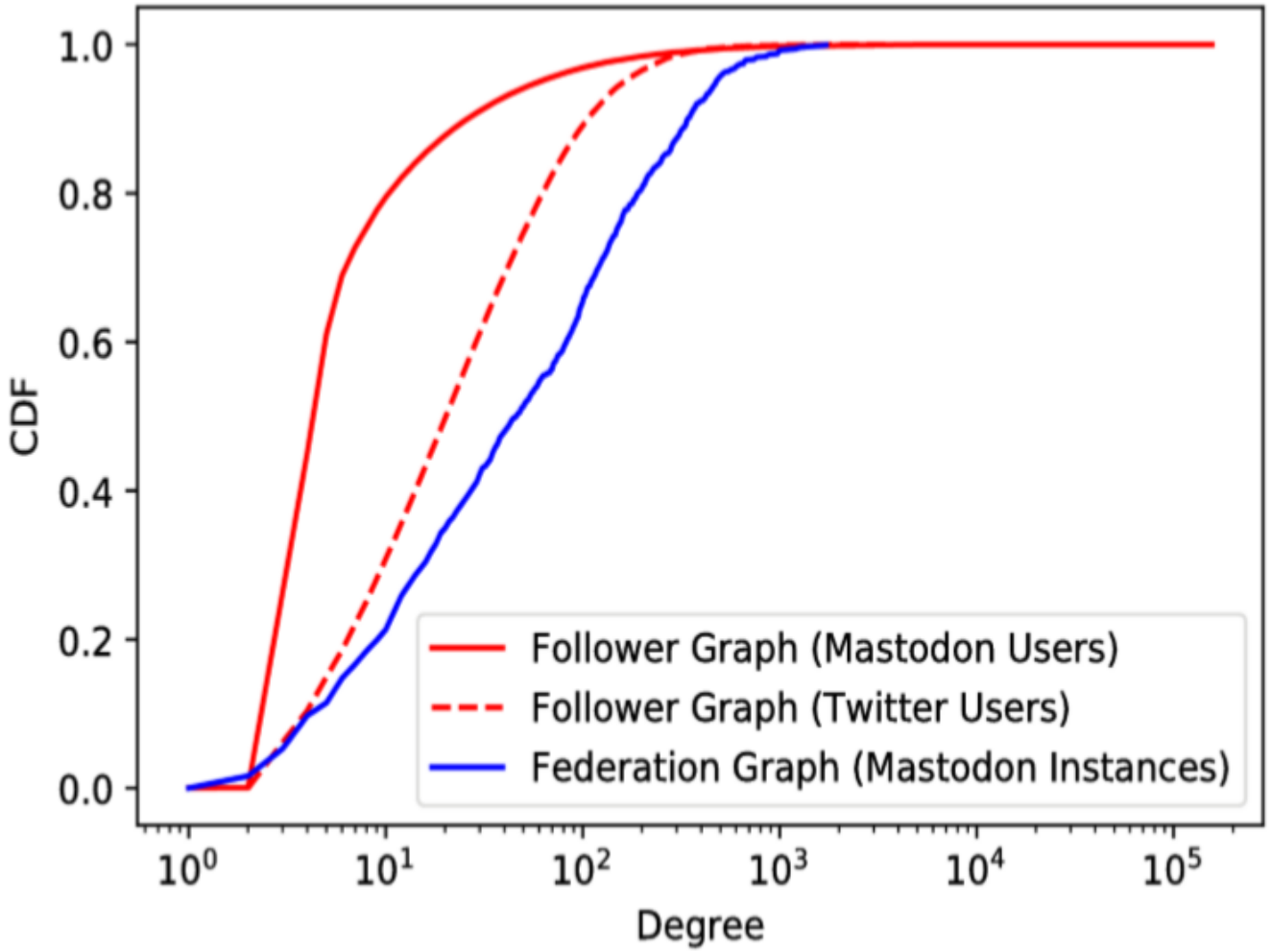
➔ Naturally, administrators are attracted to well known and low cost providers



Follower graph

- CDF of follower degree
- Graph shows traditional power law distribution

➔ **Follower centralization**, but it is **out of DW's scope**



Answer to question

- Does Mastodon really achieve decentralization?

➔ Other forms of **centralisation still exist**

e.x) Top 5% of instances hold over 90% of users

Top 3 ASes hold over 60% of instances

How to realize decentralisation?

Other forms of **centralisation**

- Top 5% of instances hold over 90% of users
- Top 3 ASes hold over 60% of instances

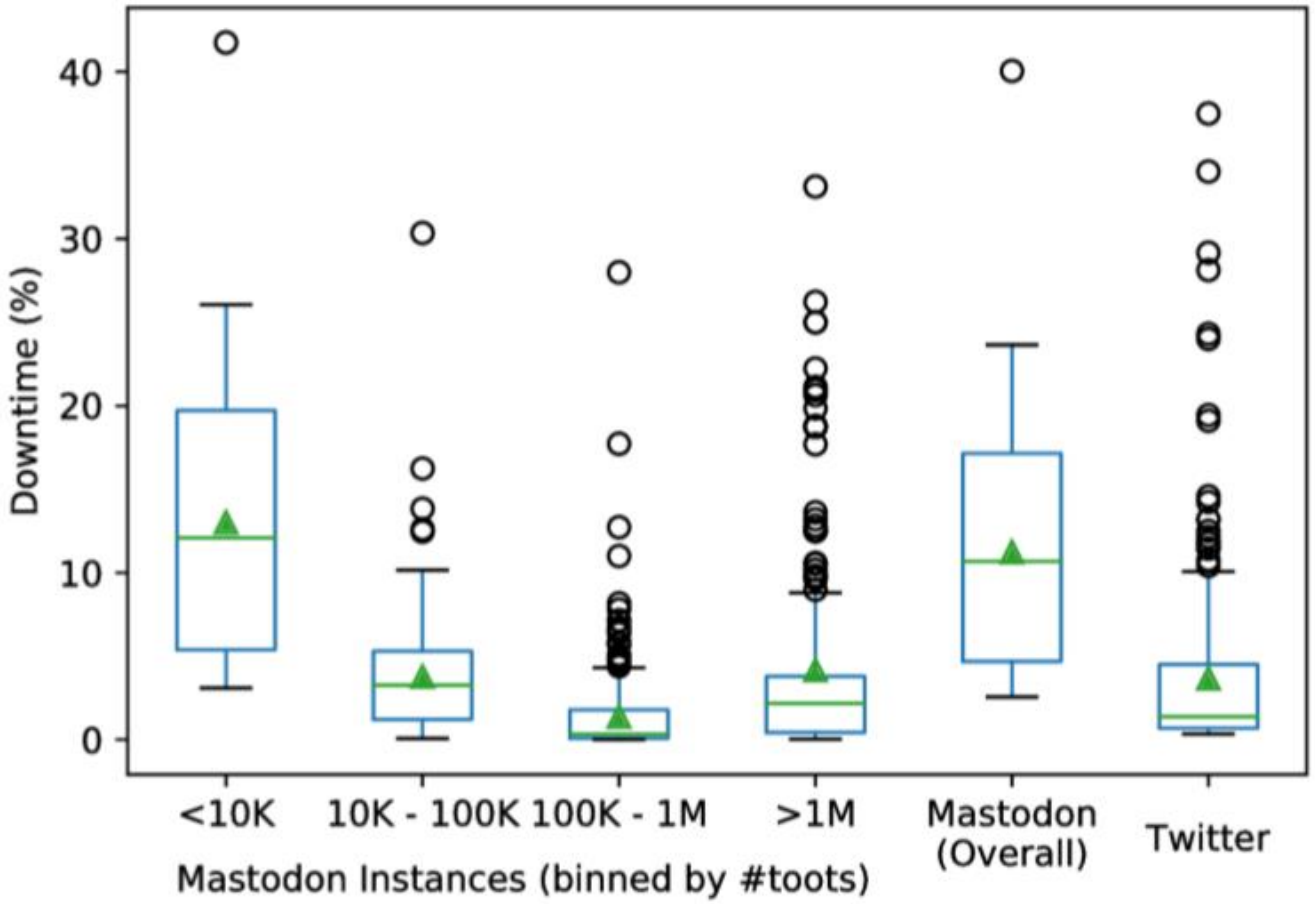
➡ Distribute users' information into other instances systematically

➡ ??

Other results

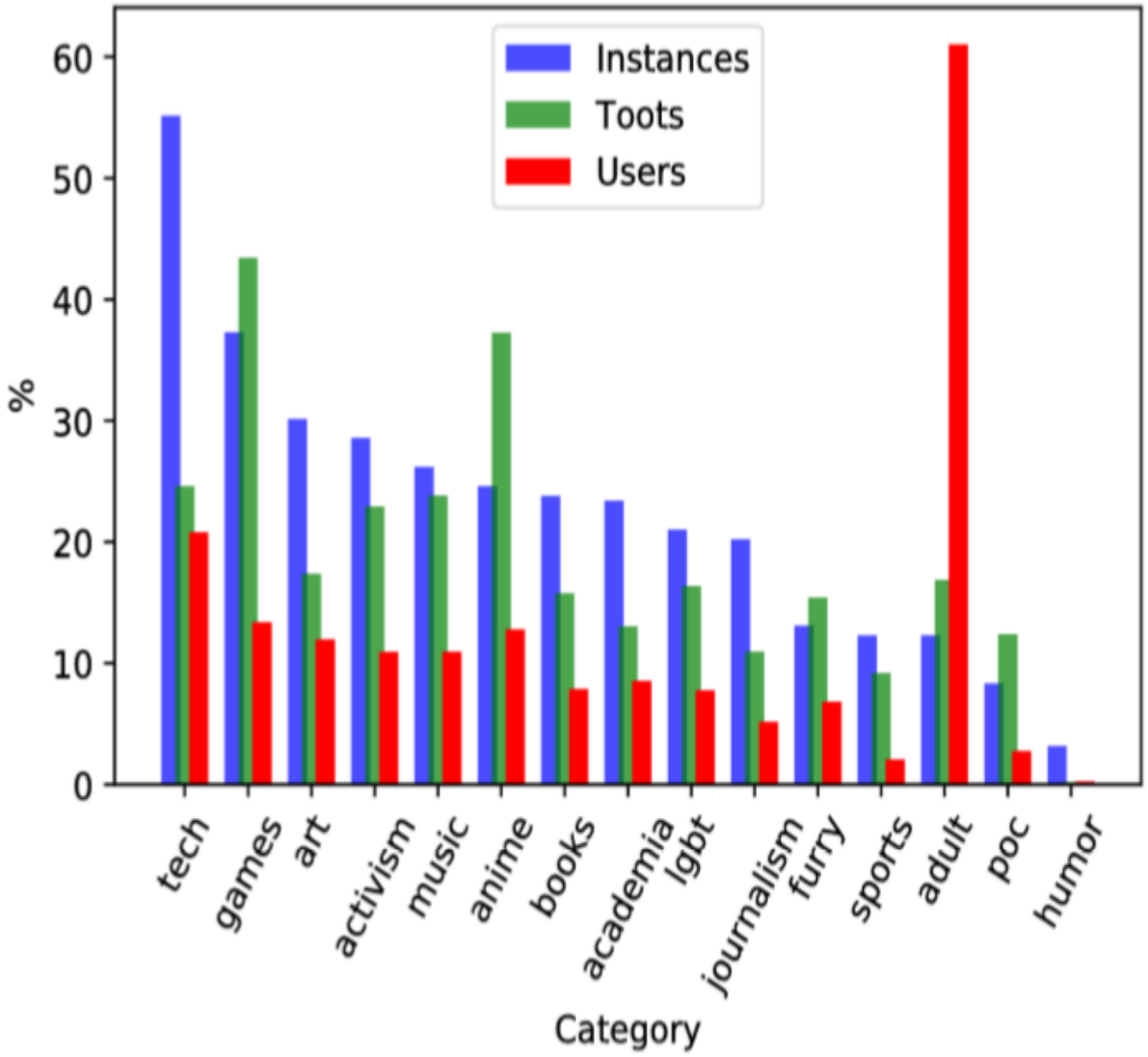
Availability

- Over 1M toots instances have more offline time than 100K-1M toots instances
- Instance offline time is not proportional to the # of toots
  - Correlation: - 0.04



Instance categories

- Tech and game is main topic of Mastodon
  - Mastodon emerged from tech community
- Adult instances constitute only 12.3% of instances, but 61.03% of users



Conclusion

- Mastodon can be one of representative Decentralised Web platform
- However, there are still other forms of centralisation
- The insights from Mastodon measurements can be clues for further decentralisation