

# Challenges in the Decentralised Web: The Mastodon Case

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Internet Measurement Conference (IMC) `19

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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

The screenshot displays the Mastodon website interface. At the top, the Mastodon logo is visible with the tagline "친구들을 팔로우 하고 새로운 사람들도 만나기". Below the logo is a registration form with fields for "이메일 주소" (Email address), "암호" (Password), and "암호 다시 입력" (Repeat password). A blue "로그인" (Login) button is positioned to the right of the password fields. Below the form, there is a "등록하기" (Register) button. To the right of the registration form, there is a "로그인 하는데 문제가 있나요?" (Having trouble logging in?) link. Below the registration form, there are three sections: "유저 발견하기" (Discover users) with a search icon and profile pictures, "무슨 일이 일어나는 지 보기" (See what's happening) with a globe icon, and "모바일 앱 사용해 보기" (Try the mobile app) with a smartphone icon. At the bottom right, there is a server information section with a "WELCOME!" sign and a group of cartoon animals. Below this, there is a message: "Server run by the main developers of the project. It is not focused on any particular niche interest - everyone is welcome as long as you follow our code of conduct! 자세히 >". At the bottom, there is a "관리자:" (Admin) section with a profile picture of Eugen (@Gargron) and a "서버 통계:" (Server stats) section showing "515K 명" (515K members) and "55.1K 활성 사용자 \*" (55.1K active users).

mastodon  
친구들을 팔로우 하고 새로운 사람들도 만나기

mastodon.social에 계정을 만드는 것으로 모든 마스토돈 서버, 그리고 호환 되는 모든 서버의 사용자를 팔로우 할 수 있습니다.

유저 이름 @mastodon.social

이메일 주소

암호

암호 다시 입력

■ 서버 규칙과 이용약관에 동의합니다

등록하기

유저 발견하기  
프로필 책자를 둘러보고 관심사 찾기

무슨 일이 일어나는 지 보기  
마스토돈의 공개 라이브 스트림을 둘러보기

모바일 앱 사용해 보기  
마스토돈을 iOS, 안드로이드, 다른 플랫폼들에서도 사용하세요

로그인

로그인 하는데 문제가 있나요?

WELCOME!

Server run by the main developers of the project. It is not focused on any particular niche interest - everyone is welcome as long as you follow our code of conduct! 자세히 >

관리자: Eugen @Gargron

서버 통계: 515K 명 55.1K 활성 사용자 \*

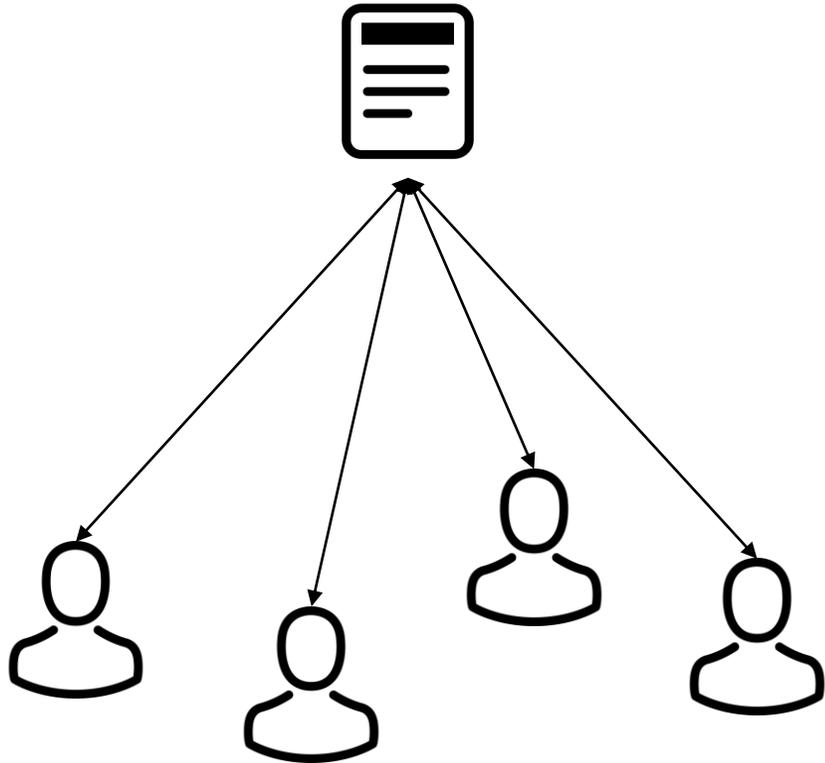
# Mastodon operation

- 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

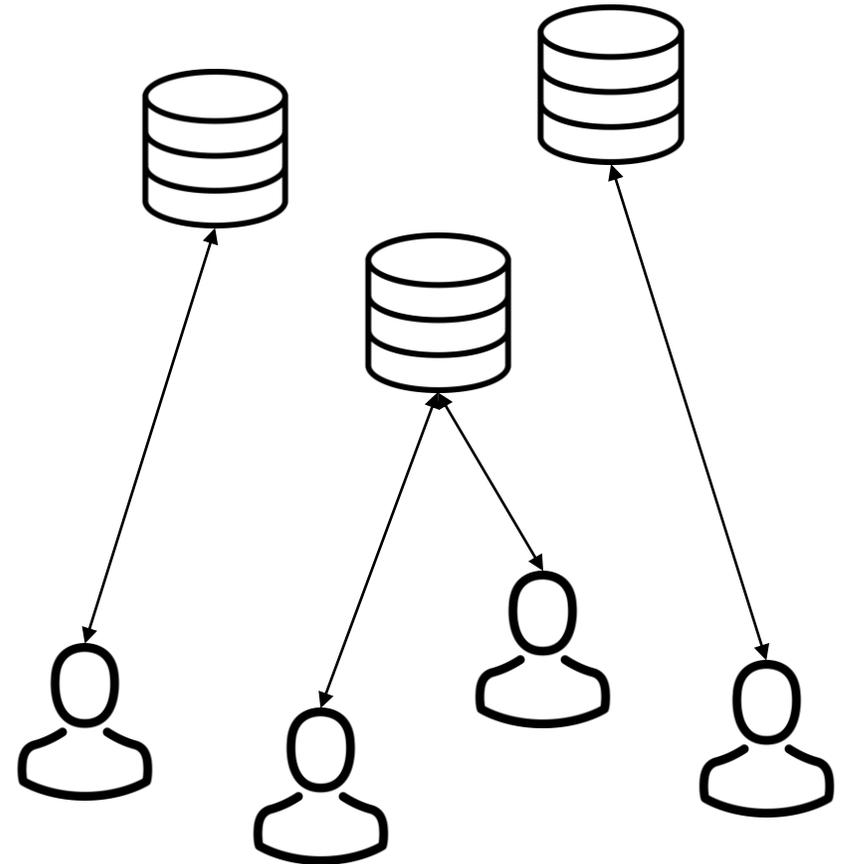
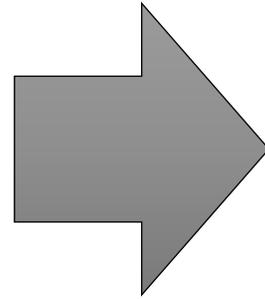
# Decentralised features

- 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



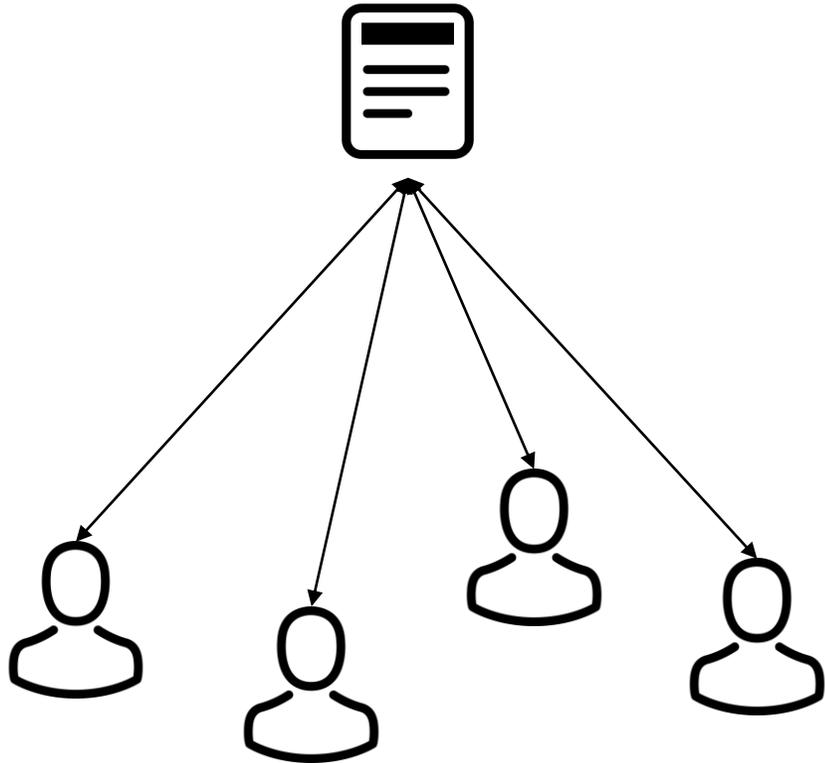
Central server offers services



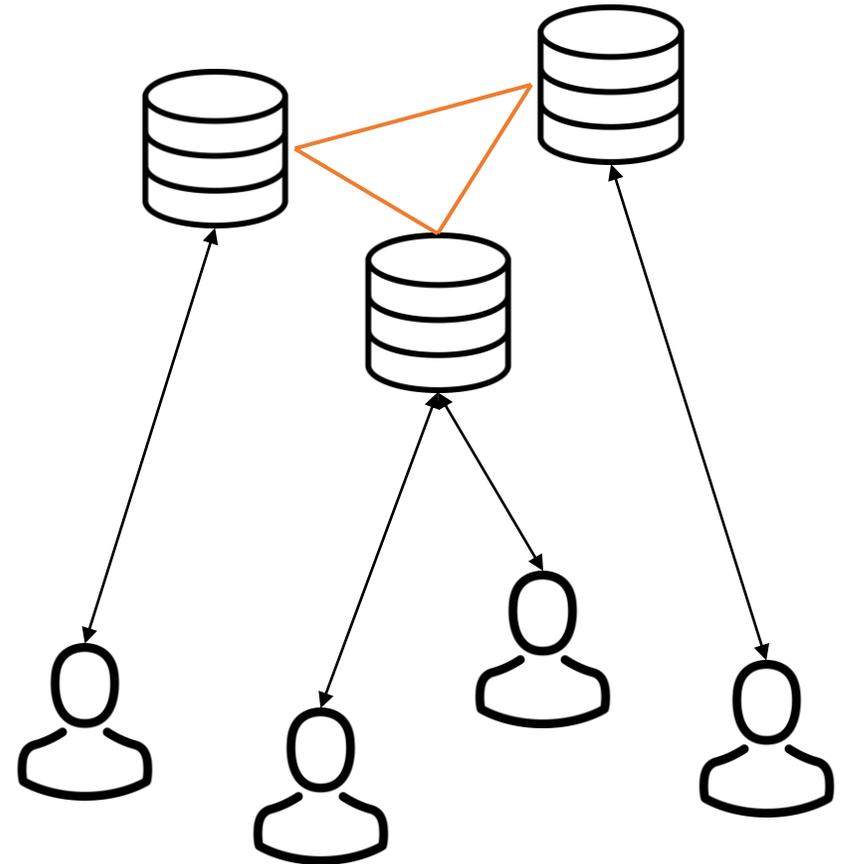
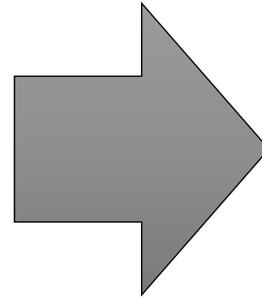
Independent instances offer services

# Interacting via federation

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



Central server offers services

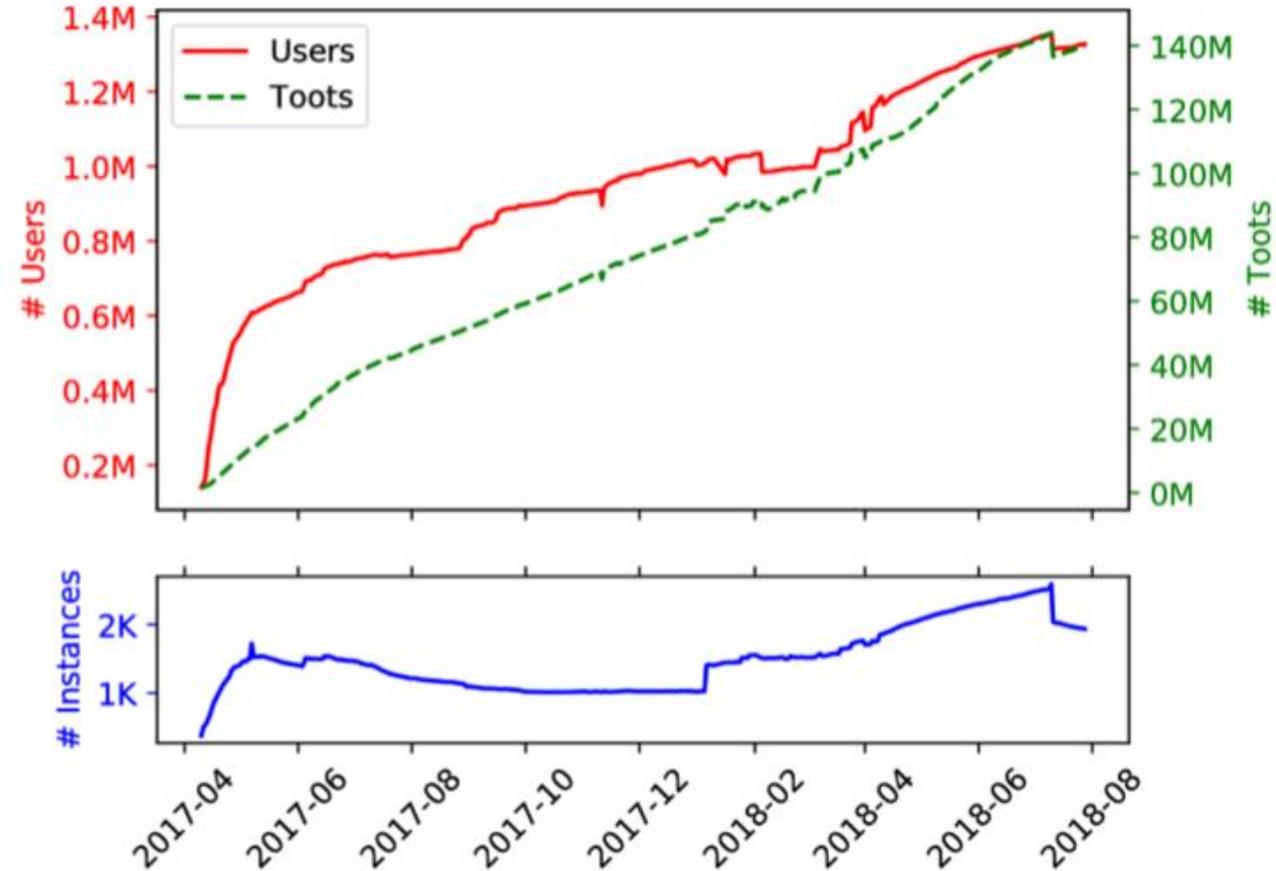


Independent instances offer services

Measurement insights

# Dataset

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

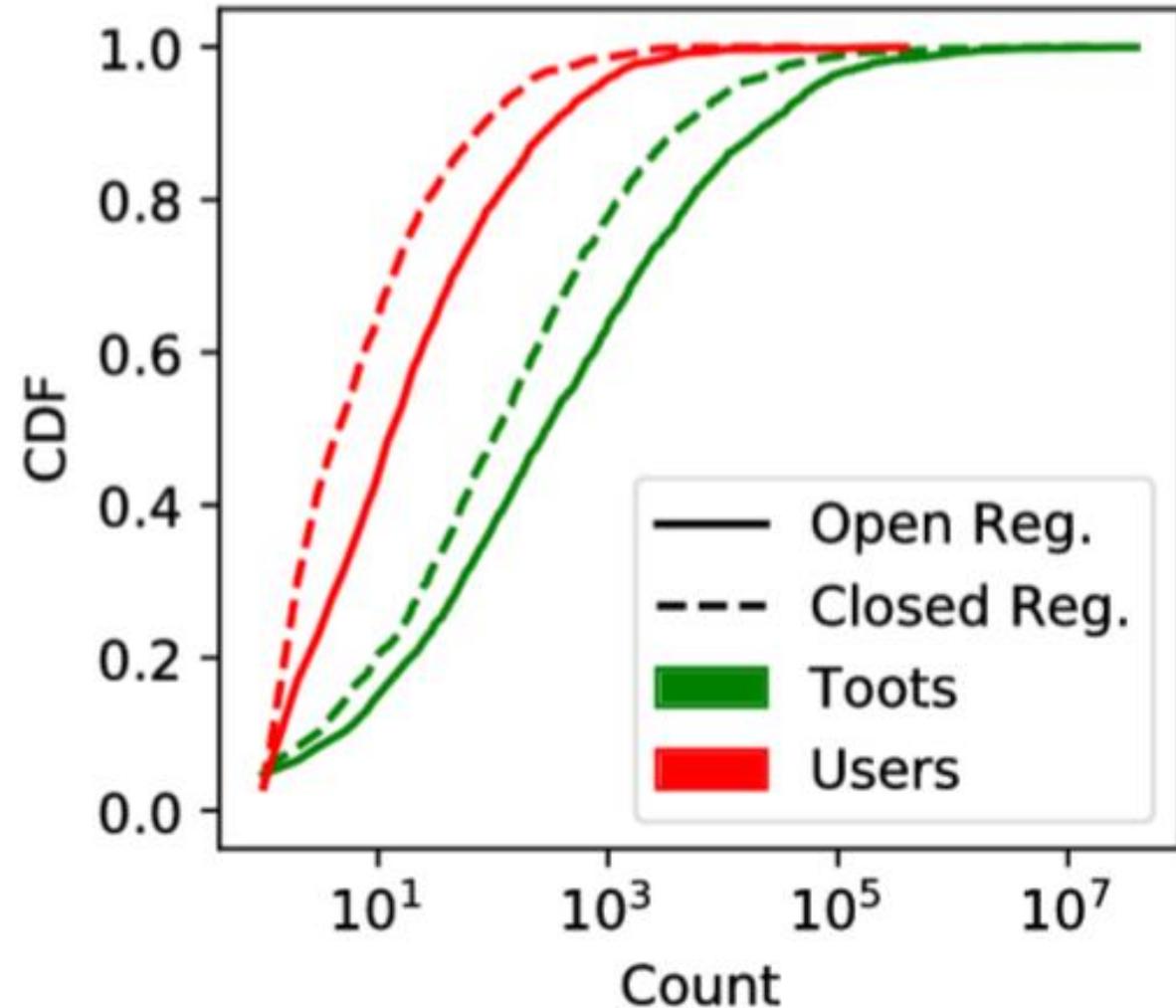


# Main question

- Does Mastodon really achieve decentralisation?

# Popularity

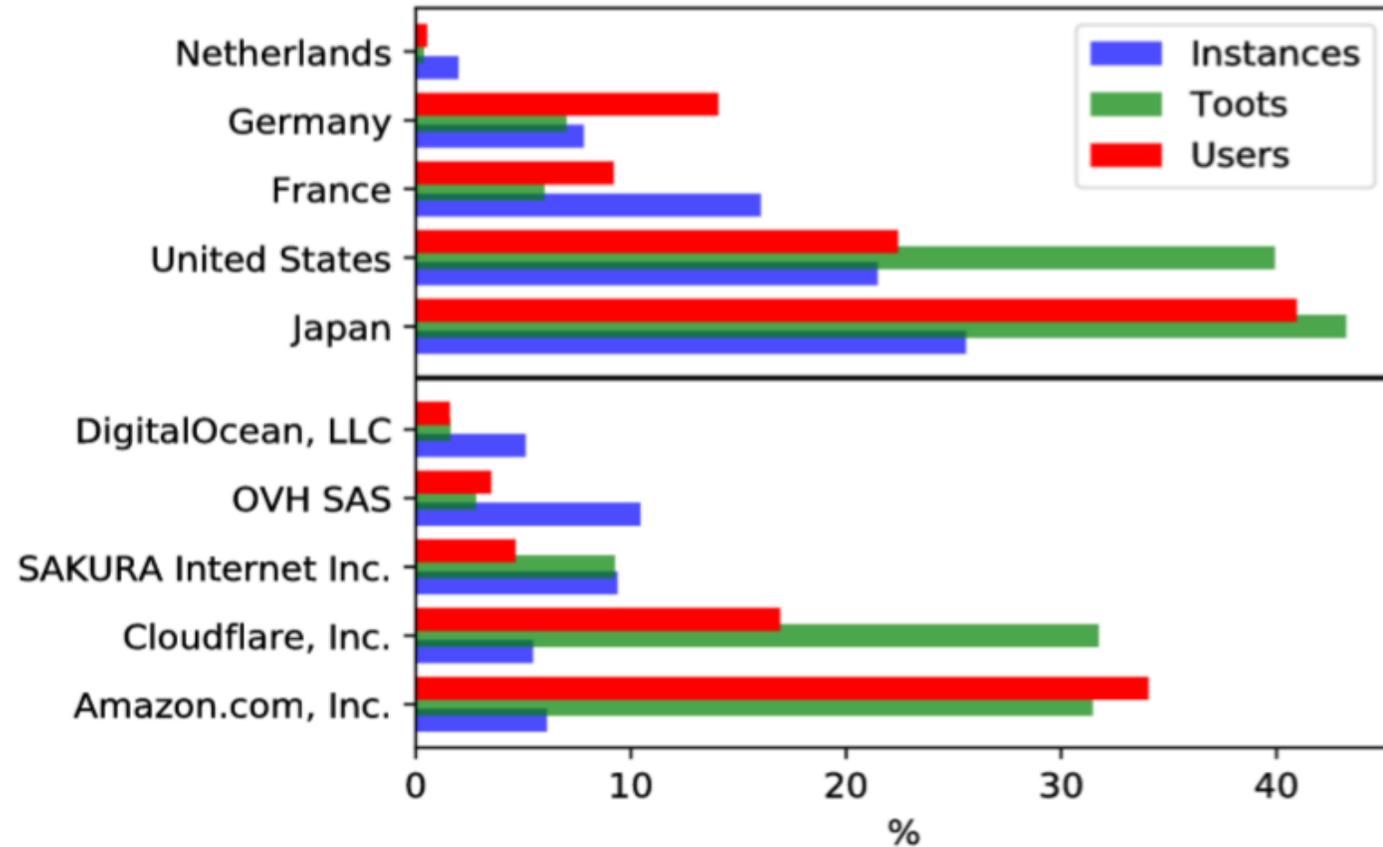
- CDF of the # of users and toots per instance
  - User population is highly skewed
  - The top 5% of instances have 90.6% of all users
- ➔ Another form of **centralisation**



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

# Instance hosting

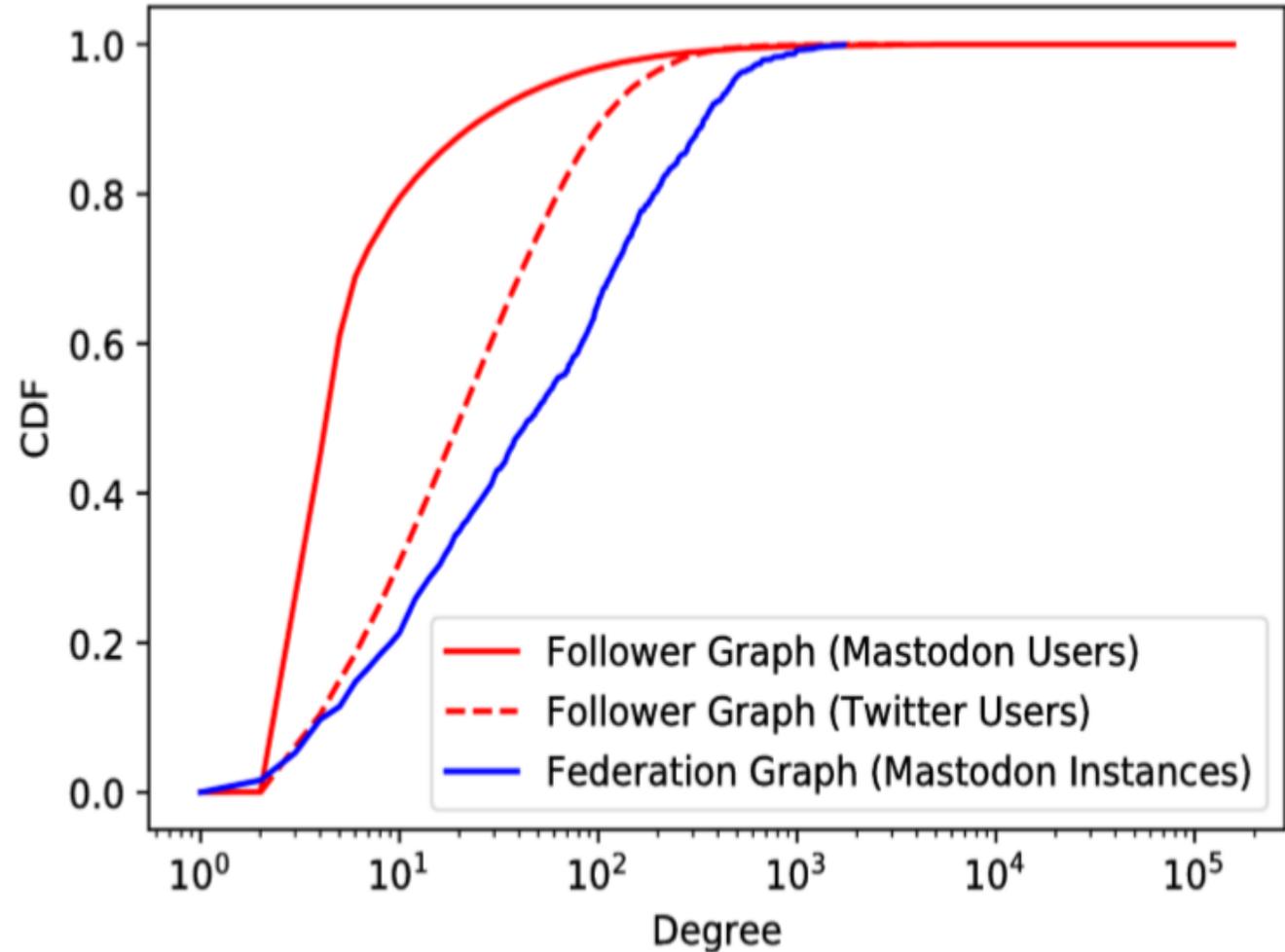
- Top 3 countries hold about 80% of instances
  - Top 3 countries hold about 93% of toots
- **Regional centralisation**
- Top 3 ASes account for 62% of global users
- Naturally, administrators are attracted to well known and low cost providers



# Followe graph

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

→ **Followe 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

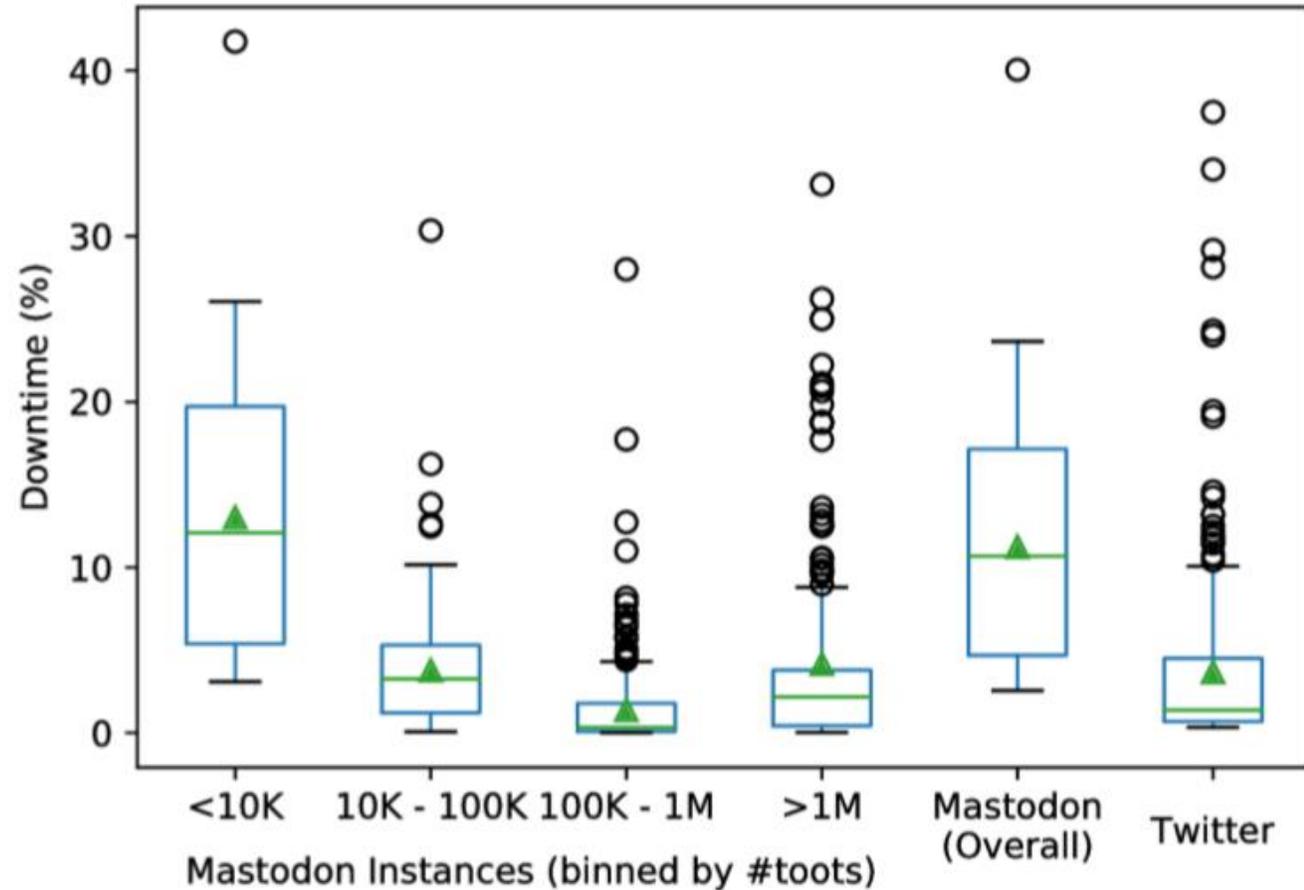
➡ Distribute users' information into other instances systematically

➡ ??

Other results

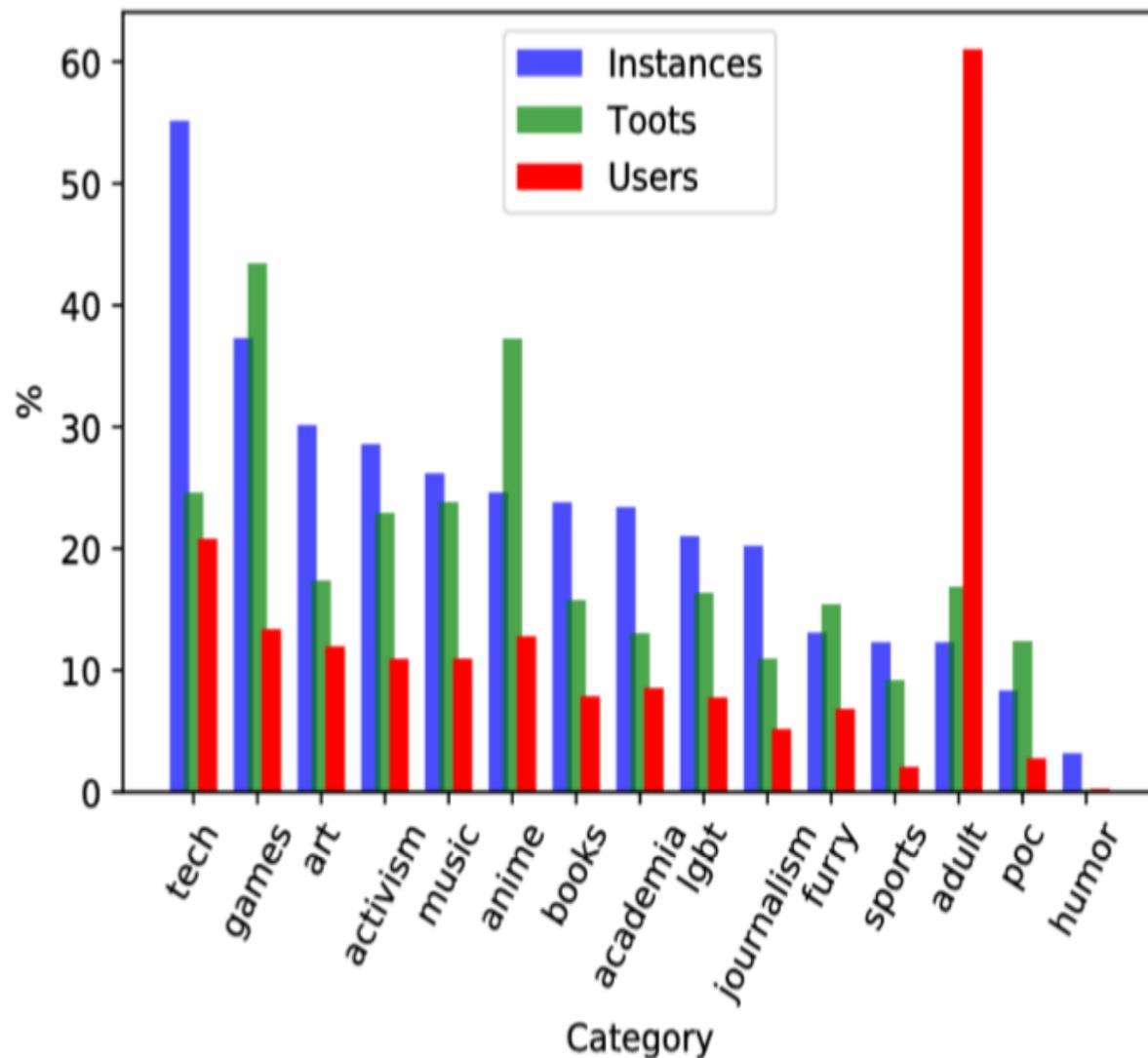
# Availability

- 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

