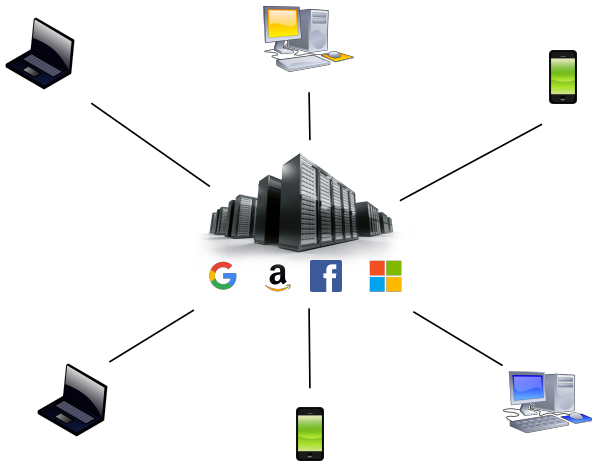


WIDE Team Meeting

Alex Auvolat

July 3, 2019

Centralized Architecture



The Barriers to Overthrowing Internet Feudalism

Tai Liu
NYU-AD
tai.liu@nyu.edu

Jay Chen
NYU-AD
jay.chen@nyu.edu

Zain Tariq
NYU-AD
zain.tariq@nyu.edu

Barath Raghavan
ICSI / Nefeli Networks / USC
barath@icsi.berkeley.edu

ABSTRACT

Today's Internet scarcely resembles the mythological image of it as a fundamentally democratic system. Instead, users are at the whims of a small number of providers who control nearly everything about users' experiences on the Internet. In response, researchers and engineers have proposed, over the past decade, many systems to re-democratize the Internet, pushing control over data and systems back to the users. Yet nearly all such projects have failed. In this paper we explore why: what are the goals of such systems and what has caused them to run aground?

1 INTRODUCTION

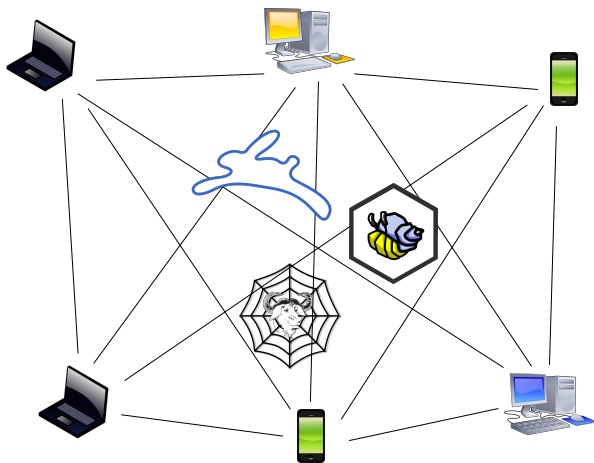
Five years ago, Bruce Schneier noticed something curious

contact lists after we've lost our phones. We want our calendar entries to automatically appear on all of our devices. These cloud storage sites do a better job of backing up our photos and files than we would manage by ourselves...

The de facto reality of the Internet of the 1990s and early 2000s matched its de jure architecture: a federated network of many autonomous providers with little centralized control of services or infrastructure. Today's Internet, while governed by many of the same protocols, scarcely resembles its past.

None of this is news to networking researchers and engineers who, unsettled at the notion of becoming vassals to powerful companies, have designed and built numerous systems that aim to upset this power balance and re-democratize

Peer-to-peer Architecture



Issues:

- Slow

Issues:

- Slow
- Data is not always available

Issues:

- Slow
- Data is not always available
- Not easy to use

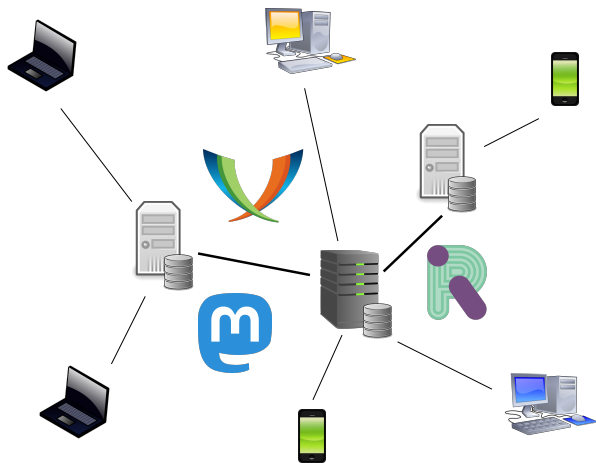
Issues:

- Slow
- Data is not always available
- Not easy to use
- Not suited to mobile battery-powered devices

Issues:

- Slow
- Data is not always available
- Not easy to use
- Not suited to mobile battery-powered devices
- Privacy is hard

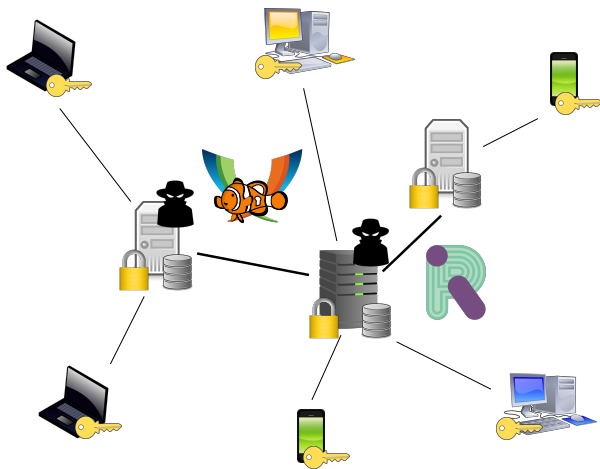
Federated Architecture



Issues:

- Privacy

Federated Architecture with End-to-end Encryption



Issues:

- Privacy

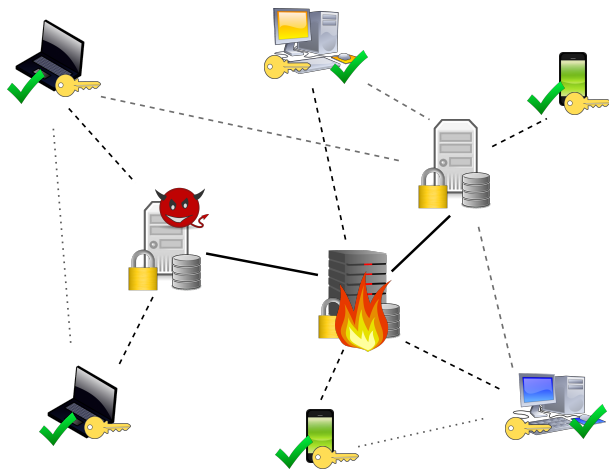
Issues:

- Privacy
- Not resilient to server downtime

Issues:

- Privacy
- Not resilient to server downtime
- Must trust the servers

Resilient Server-Assisted Architecture



How to do this:

- Decentralized identities with public key cryptography
- Decentralized content with CRDTs
- Safety with cooperative verification by users
 - A. Feldman et al., *Social Networking with Friendegrity: Privacy and Integrity with an Untrusted Provider*, USENIX Security 2012
- Efficiency with suitable Merkle data structures
 - A. Auvolat, F. Taïani, *Merkle Search Trees: Efficient State-Based CRDTs in Open Networks*, SRDS 2019