

A quick summary of DINRG Workshop on Centralization in the Internet June 3, 2021

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All meeting materials:

<https://datatracker.ietf.org/meeting/interim-2021-dinrg-01/session/dinrg>

Workshop recording: <https://youtu.be/1kbsbvjb1zu>

Many Efforts in Identifying & Mitigating Centralization

A rather incomplete list:

- Centralised Architectures in Internet Infrastructure: [draft-arkko-arch-infrastructure-centralisation-00](#)
- Protocol and Engineering Effects of Consolidation: [draft-lazanski-consolidation-04](#)
- Centralization, Decentralization, and Internet Standards: [draft-nottingham-avoiding-internet-centralization-05](#)
- Report from the IAB workshop on Design Expectations vs. Deployment Reality in Protocol Development: <https://datatracker.ietf.org/doc/html/rfc8980>
- Internet Threat Model Evolution: Background and Principles: [draft-arkko-farrell-arch-model-t-redux-01](#)
- Challenges and Changes in the Internet Threat Model: <https://datatracker.ietf.org/doc/html/draft-arkko-farrell-arch-model-t-04>
- Security Considerations for Protocol Designers: <https://datatracker.ietf.org/doc/draft-lazanski-protocol-sec-design-model-t/05/>
- Privacy Pass: Centralization Problem Statement: <https://datatracker.ietf.org/doc/html/draft-mcfadden-pp-centralization-problem-00>

The goal of DIN RG 2021 workshop

- To find effective cure, we want to first identify the root cause
 - What are the driving forces?
 - How did consolidation/centralization happen?
 - What can be learned from what we've observed?
- Caveat
 - The discussions were limited in scope
 - Mostly focused around app service centralization
 - One effort into exploring the problem space; more needed

From History to Today: Market Centralization Is Not New

- Observation from the history:
 - Economy of scale drives consolidation, resulted in centralized control over industry sectors
 - Big corporates' interests \neq user and society's interest
 - Regulations necessary: 1890 Sherman Antitrust Act
 - prohibiting companies from colluding or merging to form an effective monopoly
- Internet industries today: followed the footstep of the past giants
 - Past giants exploited labor force to accumulate profits
 - Internet giants accumulated personal data to profit from advertisement

Some specifics (I)

- Internet centralization started with companies investing into providing needed new services
 - Search, email, social networking ...
 - More services added over time
- Positive feedback loop:
 - More users \Rightarrow more inputs for better services \Rightarrow attract more users, get higher revenues
- Proliferation of free services \Rightarrow surveillance economy
 - The more the app providers know about specific users \Rightarrow the better services
 - AND the more influence they have over users, blurring the line between service and implicit control

Some specifics (II)

- Networking started from dominance of carriage
 - Then moved to dominance of platforms
 - Then the dominance by application services
- 👉 Over time the locus of value and money shifted up the protocol stack
 - Where one can exploit centralization with minimized cost
 - Lower layer services became commodity services

Some specifics (III)

- Application service providers seem taking over the control of everything, creating their own ecosystem
- Decentralized competitors likely face uphill battles against centralized monopolies
 - Decentralized solutions requires standards
 - Standard developments cost efforts and time
 - It is far easier, simpler, and faster for monopoly service providers to develop new apps, add new features

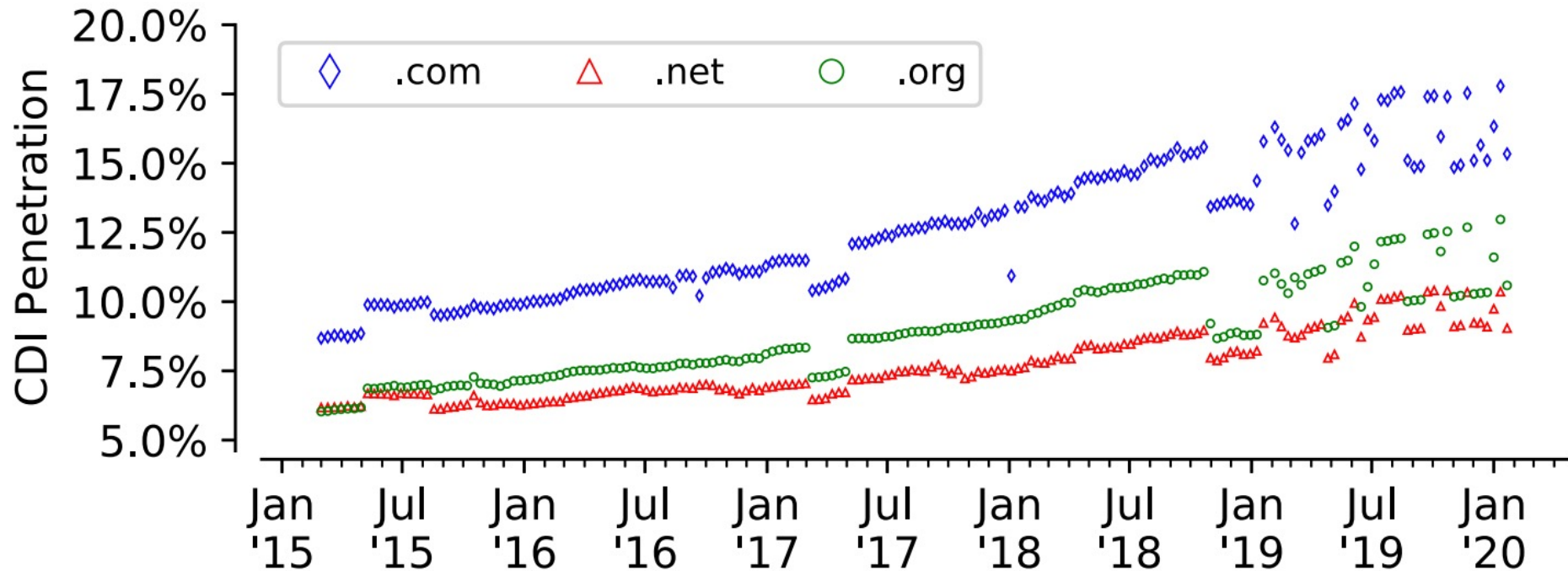
Can Network Protocols Prevent Centralization?

- Protocols simply facilitate the movement of packets from one place to another
 - As carriers, protocols do not dictate where packets go
 - It is application deployments who make that decision.

Why early decentralized apps got consolidated

- In early days of Internet, organizations ran application servers to provide services for their users
 - they were not doing it as revenue generating business
 - Once network apps becoming revenue-generating businesses: economy of scale drives towards consolidating all
 - Bigger sizes \Rightarrow afford more investment in better services, defense against failures/attacks \Rightarrow make outsourcing services more attractive \Rightarrow more organizations outsource services
- security threats increased over time too*

Time series of CDI penetration for .com, .net, and .org



The majority of Web content delivery increasingly concentrated on a few companies that provide Content Delivery Infrastructures (CDIs) such as Content Delivery Networks (CDNs) and cloud hosts.

Adopted from “**An Empirical View on Consolidation of the Web**” ACM Transactions on Internet Technology, Feb 2022.

<https://doi.org/10.1145/3503158>

Contributing Factors to Centralization

- Driven by Economy of Scale, applications Got Centralized
- Security Threats Further Intensified Centralization

What to take away

- Today's centralization resulted from few regulatory constraints on a market driven by economy of scale
 - Economy of scale motivates corporations to grow big
 - Major concern: their control power & influence over users and society
- Security challenges
 - Today we absorb DDoS attacks as the means of mitigation
 - Only massive systems have capabilities to absorb all forms of DDoS
 - Limitation of the existing web security framework
 - user – user communications are thru cloud apps
 - Difficulties in developing/deploying security solutions

Reflections

- The society thrives on the balance between economy, regulation, and technology
 - Today's balance tilted to economy
 - Regulations: exactly what to regulate and how?
 - Technologies: falling behind security threats
- Effective regulation and legislation will be a deciding factor in curtailing unconstrained market
- The technical community must act
 - Help the regulatory sectors on what/how to regulate
 - Work with regulations in concert by providing new security solutions
 - Effective solutions to curtail DDoS threats
 - Direct user-to-user communications for new generation of apps

What's next

- Further discussions needed
 - Consolidation did not happen overnight, a full comprehension also takes some time
- Making DINRG as a focal point to collect all related inputs and to organize discussions?
- Questions to ponder:
 - What do we wish see as the “ideal” outcome? that can take into account/balance out
 - The benefit from big data, the gain from economy of scale
 - Users’ privacy and sovereignty

Can we gain back the control without necessarily dissolving the giants?
 - What regulations to suggest ?
 - Proposing new regulations requires hard evidence: what to collect?

Next step

- **Discussion**
 - What is missing?
 - Suggested directions?
 - Suggested ways of working?
- Limited time today – let's try to get as many good ideas as possible
 - Limit contributions to about 3 minutes
 - Defer in-depth discussions to list and next meeting