Centralisation, Consolidation and fragmentation

One ring to rule them all?

Sheetal Kumar

Centralisation and consolidation: same but different

Both	Centralisation	Consolidation
concentration of power - whether over consumers, the technical architecture underpinning the internet, financial, or otherwise	architectural changes that create, or require, changes that are contrary to or which undermine decentralisation	consolidation is primarily concerned with market or economic trends and forces that impact the economy
Fewer entities with more control, leading to a concentration of 'choke points', and the potential for single points of failure	One example of design principles that promote decentralisation is federation: designing a function in a way that uses independent instances that maintain connectivity and interoperability to provide a single cohesive service	Market concentration and security, DNS consolidation, and supply chains
Implications for interoperability and Internet architecture as well as end users	Can be positive e.g with the DNS's centralised operation allowing for network addresses to be allocated in a globally consistent manner.	Can be positive: enabled investment in the internet's evolution by increasing resources available and facilitating the development and implementation of key protocols and infrastructure

What's fragmentation got to do with this?

First, what even _is_ fragmentation?

World Economic Forum	Policy Network on Internet Fragmentation
Commercial: business practices that constrain or prevent certain uses of the Internet to create, distribute, or access information resources	**User:** different end-users of the Internet, when trying to perform the same action online, are presented with different content, options or interfaces, specifically of concern is when this is forced up on the end-user.
Governmental: government policies and actions that constrain or prevent certain uses of the Internet to create, distribute, or access information resources	**Governance:** interactions between governance and standards bodies resulting in siloed or duplicative discussions, exclusion of specific groups from participation, duplicative or clashing standards/norms
Technical: conditions in the underlying infrastructure that impede the ability of systems to fully interoperate and exchange data packets and of the Internet to function consistently at all endpoints	**Technical:** range of challenges to interoperability at the transport layer that makes the Internet work as a medium of communications globally.

At the IETF…

IETF 117 Presentation by Nick Merrill	IETF 117 Presentation by Baltra and Heidemann	I-D by Mallory Knodel
Can measure via proxy measures re; specific layers of the internet stack, including: data laws (governance layer); website ranking locality (application layer); network interference events (transport layer), and IPV4 to IPV6 transition (network layer)	the Internet is the connected component of more than 50% of the active, public IP addresses that can reach each other	main concern relating to the internet fragmentation relates to internet norms and meaningfully connectivity
the internet reflects and impacts geopolitical relationships, and is shaped by the 'control points' that impact how and what it routes	If none of the connected components reaches 50% of the active, public IP addresses then the network of networks is so fragmented that the Internet doesn't exist any longer	Norms important: when interconnected network departs so drastically from the norms of the rest of the Internet that from a user perspective it no longer functions as part of the internet, which can result in loss of meaningful connectivity to the internet

Cont…

IETF 117 Presentation by Nick Merrill	IETF 117 Presentation by Baltra and Heidemann	I-D by Mallory Knodel
Control point=the various service providers and intermediaries that ensure that internet traffic flows to where it's meant to go	A binary event = internet exists, or doesn't exist	Only measuring technical fragmentation, for example, is not enough if content flows are tightly controlled
It is to this trend - concentration of power held by US companies over the running of the internet - that those concerned with internet fragmentation are reacting	narrow IP connectivity based perspective on fragmentation	Need assessment framework to understand at what point is a network no longer considered to be effectively part of the internet?

One ring to rule them all…

There are fewer entities (e.g. a concentration of power) in control of more and key elements of the internet, which could impact the stability of the overarching network...

Leading to a few key nexus points or ‘chokepoints’, causing the overarching network to be increasingly vulnerable to attacks and have a potential to impact the openness of the internet as a whole.

But the IETF doesn’t…

- Determine or regulate market forces
- Concern itself with regulation ?
- Do economics/politics??

But the IETF does…

- Concern itself with user needs and rights
- Recognise that end users are not a homogenous group
- Have as central to its mission, the concepts of decentralised control, edge-user empowerment, and sharing of resources (RFC 3935)
- Recognise that policy and regulation is impacting standards and vice-versa?

The evolving end-to-end principle

- The end-to-end principle is being impacted as internet architecture changes
- Rise of “third parties” or intermediaries
- Carriers may choose to provide some level of protection, but this is secondary to the primary responsibility of the end users to protect themselves? (RFC 1958)
- As the end-to-end principle itself evolves, it is worth asking
  - What the relationship of the end user to the principle is
  - What the relationship is of the end user to the development and evolution of relevant internet standards and protocols;
  - and how it could evolve

Centring the end-user - the beginnings of a framework?

- Preserving user choice, agency and control
- Considering/protecting user rights
- Impact on choke points (strengthening/neutral/undermining by promoting decentralisation)?
- Preserving the core principles of the end-to-end principle (intelligence is end to end, minimising information in the middle/in the network)

Next steps?

- Does the I-D need further work in tracing the connections between the analysis of consolidation, centralisation, fragmentation and the end-user?
- Are the use-cases in the I-D helpful?
- Are we ready/interested to develop out a framework (or messaging framework) that builds on a three-pronged approach/analysis of 1) end-user choice, control and end-user rights; 2) on choke points and 3) the end-to end principle?
- Would this be useful in helping the IETF understand what it should or must do re: these trends?

Links and resources

The I-D: https://github.com/SheetalThiam/fragcentral/blob/main/draft-todo-kumar-protocol.md

Contact the authors: sheetal@gp-digital.org; jpacis@fma.ph