The Rise and Rise of Content Distribution Networks

Geoff Huston
APNIC
WIE December 2017
Our Heritage

The Telephone Network:

• Connected handset to handset
• Intentionally transparent network
• Peer-to-peer service construct
• Network-centric architecture with minimal functionality in the edge devices
Computer Networks

The original concept for computer networks was like the telephone network:

• The network was there to enable connected computers to exchange data
• All connected computers were able to initiate or receive “calls”
• A connected computer could not call ”the network” – the network was an invisible common substrate
• It made no difference if the network had active or passive internal elements
Clients and Servers

• The rise of the web-based content publishing model was accompanied by the creation of specialised server computers that published data, and specialised client-side devices who could only retrieve published data

• The rise of NATs enforced this role segmentation in the network
  • And, coincidentally removed any sense of urgency associated with the transition to IPv6
Content Server
The Tyranny of Distance

But not all clients enjoy the same experience from a single service portal

Facebook presentation at NANOG 68
Content Distribution
Let them eat data!

The rise of the Content Distribution Network

- Replicate content caches close to large user populations
- The challenge of delivering many replicant service requests over high delay network paths is replaced by the task of updating a set of local caches by the content distribution system and then serving user service requests over the access network
- Reduced service latency, increased service resilience, happy customers!
Role Reversal

Service portals are increasingly located adjacent to users
And that means changes to the network:
  • Public Networks no longer carry users’ traffic to/from service portals via ISP carriage services
  • Instead, Private Networks carry content to service portals via CDN services

This shift has some profound implications for the Internet
Does Transit have a Future?

We see the CDN systems reserve a carriage resource through dedicated bandwidth / wavelength / cable purchase and effectively bypass the open IP carriage infrastructure.

Equinix to Connect its Data Centers Globally to Expand Interconnection Opportunities for Businesses

World’s Leading Interconnection and Data Center Company to Deliver On-Demand Access to Its Global Platform from Any Location

REDWOOD CITY, Calif., Dec. 4, 2017 /PRNewswire/ -- Equinix, Inc. (EQIX), the global interconnection and data center company, today announced the next phase in the evolution of its global platform through the direct physical and virtual connection of its International Business Exchange™ (IBX®) data centers around the world, enabling customers to connect on demand to any other customer from any Equinix location. Over the coming months, Equinix will announce a series of coverage, connectivity and service initiatives that will deliver increasing value to customers by enabling them to rapidly scale their digital businesses through a dynamic data center and interconnection platform.
Does Transit have a Future?

- If users don’t send packets to users any more...
- If content is now delivered via CDNs to users via discrete service cones...
- If there is no universal service obligation for content...
- If there is no visible definition of the “Internet Route Set” (‘default’) any more...
- If there is no economically viable demand for transit any more...

Then why do we still need Transit Service providers?
Exactly where are we?

• We started this journey building a telephone network for computers to communicate between each other
• But now one-way content distribution lies at the core of today’s Internet
• This content distribution role is an enterprise service framework rather than a public carriage service
• The internal parts of the carriage network are now being privatized and removed from public regulatory scrutiny
• What’s left is just the last mile
Last Mile Futures

• Can independent last mile access networks survive as independent entities in this environment?
  • Like the experience with transit markets will they fall victim to the pressure from the cashed up service provider sector and their CDNs?
  • If access networks come to rely on imposing tolls on content providers, then at what point will the folk paying the these tolls assert proprietorial control over this last mile asset?

• Is this something that markets will resolve, or will we see this as a more insidious form of market failure?
Fin!