# Sender Pays

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# Why is "Sender Pays" an issue at all?

Because its easier to blame *<Google | Netflix |\*>* for the weaknesses in a poor *<network design | business model | retail offering | \*>* than actually addressing the underlying changes in the carriage business model!

Which leads to the obvious question:

Why install a high speed broadband last mile access infrastructure if the interior of the carriage service was never capable of being used to its full extent?

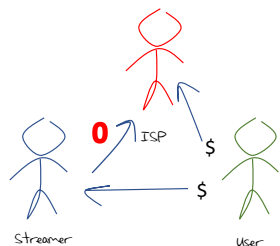# The tension between carriage and content has a long history

- Over the years each side has asserted its primacy in the relationship
  - Carriage says that content's customers lie on the other side of the carriage service – without carriage there would be no content customers
  - Content says that there is no point to the carriage service without content – without content there would be no carriage customers

# Carriage / Content settlements

- The user takes out a broadband subscription from a local Carriage Provider (CP)
- The user takes out a streaming video subscription from a video streamer via a CDN
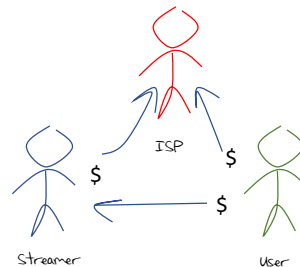- The user streams a video

**Option 1 – Settlement Free**

The CP and the streamer are both being funded by the user and there is no settlement payment between the CP and the Streamer
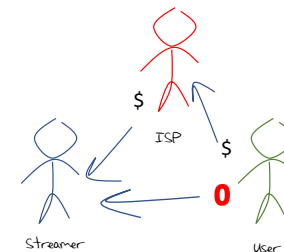


**Option 2 – Content pays for Carriage**

The streamer also pays for carriage across the CP network



**Option 3 – Carriage pays for Content**

The CP pays the streamer on behalf of its users and bundles the streaming service into its retail service

# The tension between carriage and content has a long history

- Over the years we've seen content services gather value and primacy, while the carriage service becomes more of an undistinguished basic commodity

- But that does not mean that the carriage folk are willing to quietly accept the inevitable…

# The Net Neutrality debate

Interview with SBC CEO Edward Whitacre, Business Week Online, 7 November 2005

*How concerned are you about Internet upstarts like Google, MSN, Vonage, and others?*

How do you think they're going to get to customers? Through a broadband pipe. Cable companies have them. We have them. Now what they would like to do is use my pipes free, but I ain't going to let them do that because we have spent this capital and we have to have a return on it. So there's going to have to be some mechanism for these people who use these pipes to pay for the portion they're using. Why should they be allowed to use my pipes?

The Internet can't be free in that sense, because we and the cable companies have made an investment and for a Google or Yahoo! or Vonage or anybody to expect to use these pipes [for] free is nuts! "

# Carriage Blocking

## South Korean KT Corp blocks internet access for Samsung Smart TVs

*KT Corporation, South Korea's largest telecom provider, blocked network access for Samsung smart TVs after the manufacturer refused to subsidize network access. The move has drawn criticism from government.*

By ryhei | Feb 10, 2012, 1:53am EST

*Source Korea Herald and Yonhap News Agency*

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# Enter content providers as carriage providers…

- The content sector's response to this tension is to bypass the established carriage offerings and to build their own carriage services where feasible

- These are the Content Delivery Networks (CDN) that package content services with a dedicated delivery networks

# Content as Carriers

Google's Cable activity

INFRASTRUCTURE

## All about cables: A guide to posts on our infrastructure under the sea



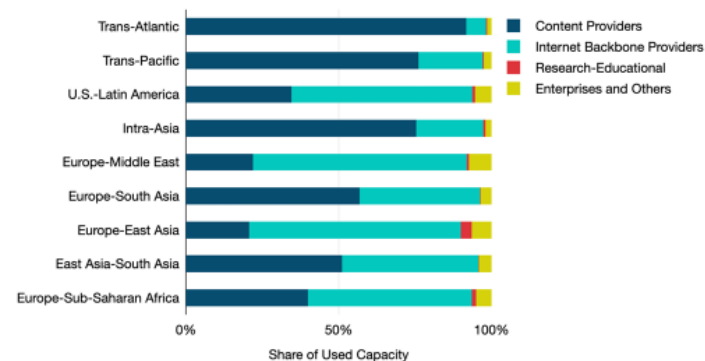**The Google Cloud content marketing team**

June 12, 2021

### Try Google Cloud

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From data centers and cloud regions to subsea cables, Google is committed to connecting the world. Our investments in infrastructure aim to further improve our network—one of the world's largest—which helps improve global connectivity, supporting users and Google Cloud customers. Our subsea cables play a starring role in this work, linking up cloud infrastructure that includes more than 100 network edge locations and over 7,500 edge caching nodes.

As it turns out, readers of this blog seem to find what happens under the sea just as fascinating as what's going on in the cloud. Posts on our cables are consistently among our most popular, which is why we brought them together for you here so you can take a deeper dive (pun intended).

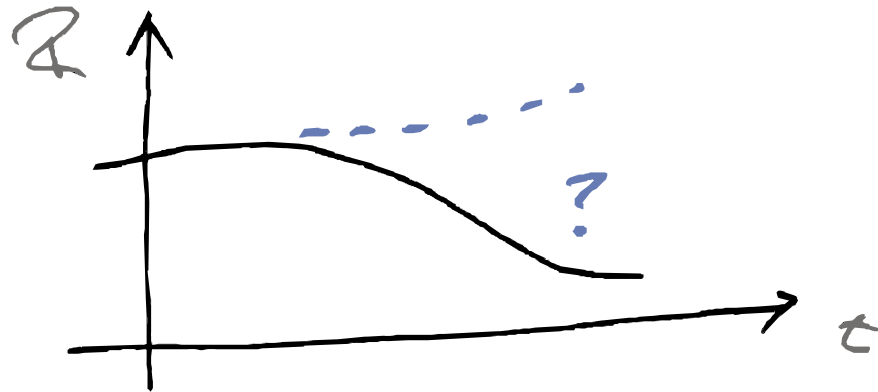
Share of Used Bandwidth by Category for Major Routes

Telegeography Analysis

—


Select Proprietary and Cloud Region Data Center — Existing Locations

# So, what's the real problem for the carriage industry?

Money!

# The Reality

- Carriage operators are losing control of **pricing**, **services**, **technology**, **content** and **customers**
  - CDNs and Over-The-Top services using IP end-to-end impact every aspect of the telco business model

  - Almost the only residual asset left for the traditional carriage provider is the local access loop
    - And that's the subject of intense pressure

# Content's Move

- Content is now exploiting encryption to hide **everything** from the carrier
    - Encrypt the content (TLS)
    - Encrypt the meta-data of the content (ECH)
    - Encrypt the DNS (DoT, DoQ, DoH)
    - Encrypt the transport protocol (QUIC)
    - Encrypt the end points from each other (Oblivious services)

- This pushes the carriage provider further into a commodity role, dealing in undistinguished opaque traffic

# What are we learning?

- "Sender Pays" does not improve the efficiency of the carriage infrastructure, nor does it benefit consumers

- Carriage is no longer an inescapable monopoly - massively replicated content can be used as a substitute for many public carriage service elements

- Structural cross-subsidies and poor regulatory responses weaken the longer-term incentives for efficient infrastructure investment

# Full Presentation Pack

# Why is "Sender Pays" an issue at all?

- There are many commodity utility enterprises in today's world
    - water, electricity, transportation,…
- Why is network infrastructure provision any different?

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Because its easier to blame *<Google | Netflix |\*>* for the weaknesses in a poor *<network design | business model | retail offering | \*>* than actually addressing the underlying changes in the carriage business model!

Which leads to the obvious question:

Why install a high speed broadband last mile access infrastructure at all if the interior of the carriage service was never capable of being used to its full extent?

# Because …

It wasn't always this way for the telco business model. They used to enjoy:

- Complete control of the network
- Complete control of the service
- Complete control of the customer

# The Converged Telco Utopia

- A small number of vertically integrated "full" service providers leveraging their underlying infrastructure investment into a high yield, high margin service delivery retail system using a single network platform for comprehensive service delivery where everyone, **including content providers**, pay for carriage

- Low cost, high value, strong service control, fantastic margins!

# Wouldn't it be wonderful…

- If you could bill the end user for the value of delivered services rather than just the packets

- Customers paid you for value-added service solutions, rather than the marginal cost of packet delivery

- Content Service Providers paid you for access to your customers

# How did we get to here?

# Inter-Provider Settlements for letter delivery

- A user buys a postage stamp from the local post office
- A user writes a letter
- A user affixes a stamp to the letter in order to prepay for the entire delivery process
- The local post operator passes the letter to the destination post operator
- **The local post operator pays the destination post operator a termination delivery fee as an inter-provider settlement**
- The letter is delivered at no cost to the receiver

# Sender Pays

- Retail Model: You send a letter, then you pay the entire cost of delivery

- Inter-provider Model: Sending PO pays the Delivery PO to complete the letter delivery
  - This model is stable for bilateral connections, less so for multi-party transactions with transit intermediaries

- In a stable state the retail model matches the inter-provider settlement model
  - When they deviate it creates the opportunity for arbitrage between providers, which becomes unstable

# Inter-Provider Settlements for telephone calls

- A user dials a phone number using a local telephone company
- The local phone company creates a connection to the destination phone company
- The destination phone company completes the call request
- The call is answered at no cost to the receiver
- The call is metered by the local phone company and the caller is charged for the entire cost of the call
- **The call is metered by the terminating phone company and a termination settlement fee is charged to the local phone company as an inter-provider settlement**

# Caller Pays

- Retail Model: You call, then you pay for the entire costs of the call

- Inter-provider Model: Call Initiator pays the Call terminator to complete the call
  - This model is stable for bilateral connections, less so for multi-party transactions with transit intermediaries

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# Enter the Internet

**What's a "call"?**

- Users pay a fee for "access"
  - There may be volume and/or access speed fee components in the fee, but this is about tiered access fees to cover more market segments

**When a packet is passed from one provider to another who pays?**

- We arrived at a simple outcome of a market-based mechanism
  - **Either** the parties agree to enter into a single customer/provider relationship for ALL data traffic between the two providers
  - **Or** the parties agree to exchange traffic between them without payment (Sender Keep All)
  - **Or** there is no interconnection at all

# The Tradition

Network Neutrality and Common Carrier Roles:

- The Carrier's network is strictly neutral with respect to carried content
- The network does not prevent the carriage of data and services
- The network does not bias its response or tariffs in favour of certain services and service providers
- The network is strictly neutral with respect to competing service providers
- **Everybody pays to use the carriage network**
- **Carriers settle between themselves**

# The Net Neutrality debate

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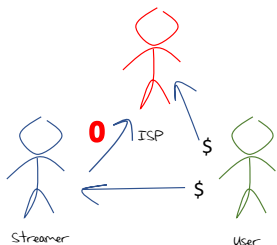
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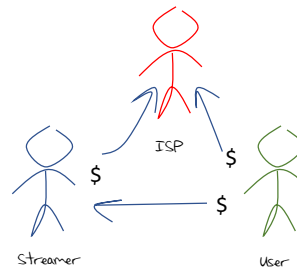- The user streams a video

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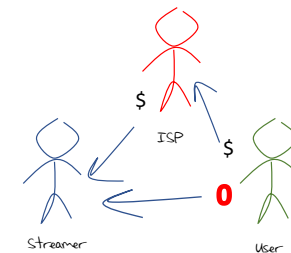


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# Content vs Carriage

Round 1:

**Content pays for Carriage**

- The carriage providers provided the connection between customers and content providers
- Customers paid the carriage access service provider to access the services
- Content providers paid the carriage service provider to access the customers
- MSN, numerous Portal Services

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# Content vs Carriage

Round 2:

**Carriage pays for Content**

- Content providers were failing in the initial rounds of pay-per-view models of content distribution
- Content providers mounted the case that the only reason why customers paid access providers for Internet access was their uniquely compelling content, generated at great expense
- Ergo: Access providers owed content providers a share of the access fees if they wanted to continue to have access to their content

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- Carriage Access Providers attempted to generate their own proprietary content as a retail differentiator
- Content was only accessible within their access domain
- Carriage enterprises purchased content generators
- Remember Telstra's tilt at Fairfax? Verizon purchasing Yahoo?

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**Content owes Carriage**

- Penetration of high speed broadband and a new round of software platforms enables a new generation of content providers
- Content engages with the advertising industry with advertiser-funded content and services
- The carriage service provider gets squeezed out of the content model completely and is relegated to undifferentiated carriage pipe provider
- The carriage provider heads off to the regulator to seek relief from the onerous common carrier provisions in order to leverage a position against content providers

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# Content vs Carriage

Round 5:

**The Dominance of Content**

- The content service industry has aggregated to the extent that they can operate their own carriage services at lower cost and greater efficiency through dedicated Content Distribution Networks

- All that's left to the old public carriage industry are a collection of last mile access networks
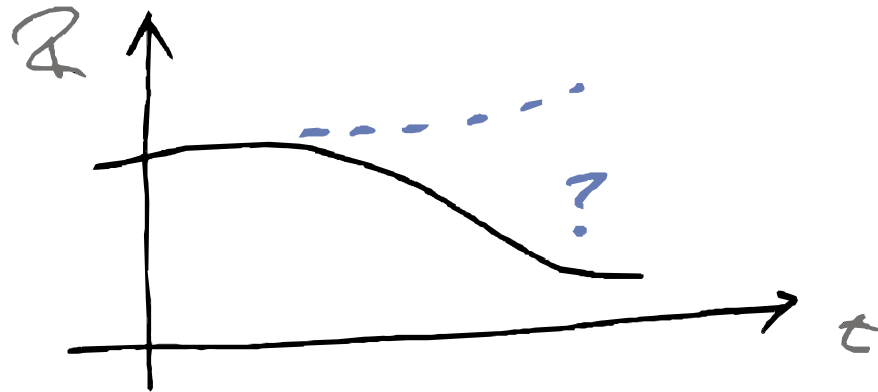
# Carriage Reality

- Deregulation, intense competition, branching role specialization at every level

- Resulting in
  - many parallel service delivery networks, many network operators,
  - industry-wide duplication of activities,
  - continual exposure to inefficient resource use,
  - extensive regulatory provisions,
  - exposure of niche markets,
  - limited planning capability,
  - high investment risks,
  - high costs,
  - low operating margins,
  - continual restatement of investor expectations,
  - negative returns on equity investments,
  - continual recycling of management and staff

# Content Reality

- Scale

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  - Almost the only residual asset left for the traditional carriage provider is the local access loop
    - And that's the subject of intense pressure

# The Reality

- The digital economy we have today is largely based on surveillance capitalism and advertising
  - Service providers sell the user to advertisers
  - Users either don't pay for the service or pay a highly subsidised price
- But carriage providers are generally prevented from entering this market due to various regulatory constraints

# The Revenge of Carriage

- Content blocking and selective damage

POLICY / SMART HOME

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By ryhei | Feb 10, 2012, 1:53am EST
Source Korea Herald and Yonhap News Agency

SHARE

# The Revenge of Carriage

- Content blocking and selective damage
- Active user tracking

## DNS – the treasure trove of information your ISP can see

**BURAGLIO**

DECEMBER 10, 2018 | 🔥 382 | **0 COMMENTS** | 🏷 DNS, PRIVACY, ZEROTIER

In recent years, the nature of privacy on the internet has become a very important topic amongst those concerned with the now lack of net neutrality. The de-facto mechanism for dealing with privacy has been to "SSL all the things", which I am very much in favor of. What many do not realize, though, is that simply using SSL for the traffic that transits a given ISP still leaves a wealth of thick, rich, delicious personal data still easily available to your ISP to harvest, sell, and do with as they please. This data comes in the form of DNS queries. DNS is the nearly-always-forgotten, crucial aspect of how the internet functions. Without DNS, nothing works. Everything appears broken and manifest as what appears to be a networking problem. ISPs typically provide what is called a recursive resolver, which for most people is handed down by a local provider to the customer premise equipment (CPE; usually a modem or optical terminal of some kind) that they install at a residence. This CPE then hands that resolver to your clients that use it to – you guessed it – recursively resolve DNS queries. These queries can be logged and then mined for browsing habits, etc. Anyone that has ever done any network forensics will know straight away that the value of the information contained in DNS query logs is very, very high.

# Enter content providers as carriage providers…

- These are the Content Delivery Networks (CDN)
- They package content services with a dedicated delivery networks and want to use SKA inter-network provider arrangements to reach their customers

# The Counter Move



- Content is exploiting end-to-end encryption to hide **everything**
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