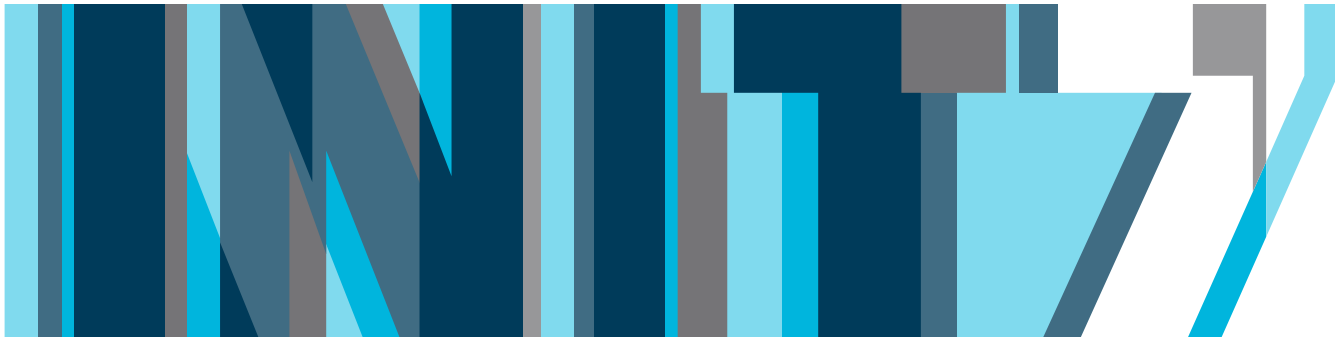


Buffering Sucks!

DENOG #7

Darmstadt – 29. October 2015

COPYRIGHT

DISCLAIMER

Kontakt

Fredy Künzler
Init7

kuenzler@init7.net
http://www.init7.net/

Init7 (Schweiz) AG
St.-Georgen-Strasse 70
CH-8400 Winterthur

Skype: flyingpotato

Twitter: @kuenzler / @init7 / @fiber7_ch

Buffering Sucks!

Buffering root causes #1

Streaming Video – degraded user experience

- Lack of bandwidth: with a 2Mbps DSL or Edge connection HD video (3-5Mbps, depending on compression) is not possible
- Client has insufficient CPU power (these days no longer relevant)
- WiFi Quality – common but individual issue
- Over-Subscription of the shared node (mainly cable networks)

Buffering root causes #2

Streaming Video – degraded user experience

- Streaming source too far away (i.E. source in the US; dependency of Throughput and Latency)
- Adaptive Streaming: HD changes into SD, then into LowRes – it works, but...
- Routing / Algorithm issues: client-server mismatch (beware of inefficient Anycast routing!)
- Last but not least: Oversubscribed interconnection

Buffering root causes #3

[Tech insertion] Anycast Routing

- Accidentally we preferred Twitch AS46489 Anycast prefix 199.9.248.0/21 in New York due to lower MED. A change shifted the Twitch ingress traffic to London, which improved the user experience a lot.

```
SSH@r1lon1.core#sh ip bgp 199.9.248.0/21
Number of BGP Routes matching display condition : 8
Status codes: s suppressed, d damped, h history, * valid, > best, i internal
Origin codes: i - IGP, e - EGP, ? - incomplete
    Network            Next Hop        MED    LocPrf     Weight Path
*>i 199.9.248.0/21     London          3      150        0      46489 i
*i  199.9.248.0/21     Amsterdam       3      150        0      46489 i
*i  199.9.248.0/21     New York        2      150        0      46489 i
*i  199.9.248.0/21     New York        2      150        0      46489 i
*i  199.9.248.0/21     Amsterdam       3      150        0      46489 i
*i  199.9.248.0/21     Frankfurt       3      150        0      46489 i
*i  199.9.248.0/21     Frankfurt       3      150        0      46489 i
*   199.9.248.0/21     [Transit]       1      60         0      1299 46489 i
```

Daniel Manser @Thaek_ · 15. Okt.

@TwitchSupport Streaming using swiss @fiber7_ch IP results in traffic from SanFrancisco not EU datacenter (often severe buffering), pls fix!

Fiber7. No Limits.
@fiber7_ch

Folgen

@Thaek_ please send us (noc at init7 dot net) the source IP of the Twitch stream, we'll check this with @TwitchSupport

Übersetzung anzeigen

11:43 - 18. Okt. 2015

Daniel Manser @Thaek_ · 20. Okt.

@Twitch traffic now coming from London for #Fiber7 - no issues anymore. Thx @fiber7_ch for contact @TwitchSupport so they finally fixed this

1

Fiber7. No Limits. @fiber7_ch · 20. Okt.

@Thaek_ it was a wrong preference of @init7 traffic towards @Twitch as they use anycast. Thanks for the heads-up. @TwitchSupport @tdeutsch

IP Interconnection / Peering #1

„The caller pays…“

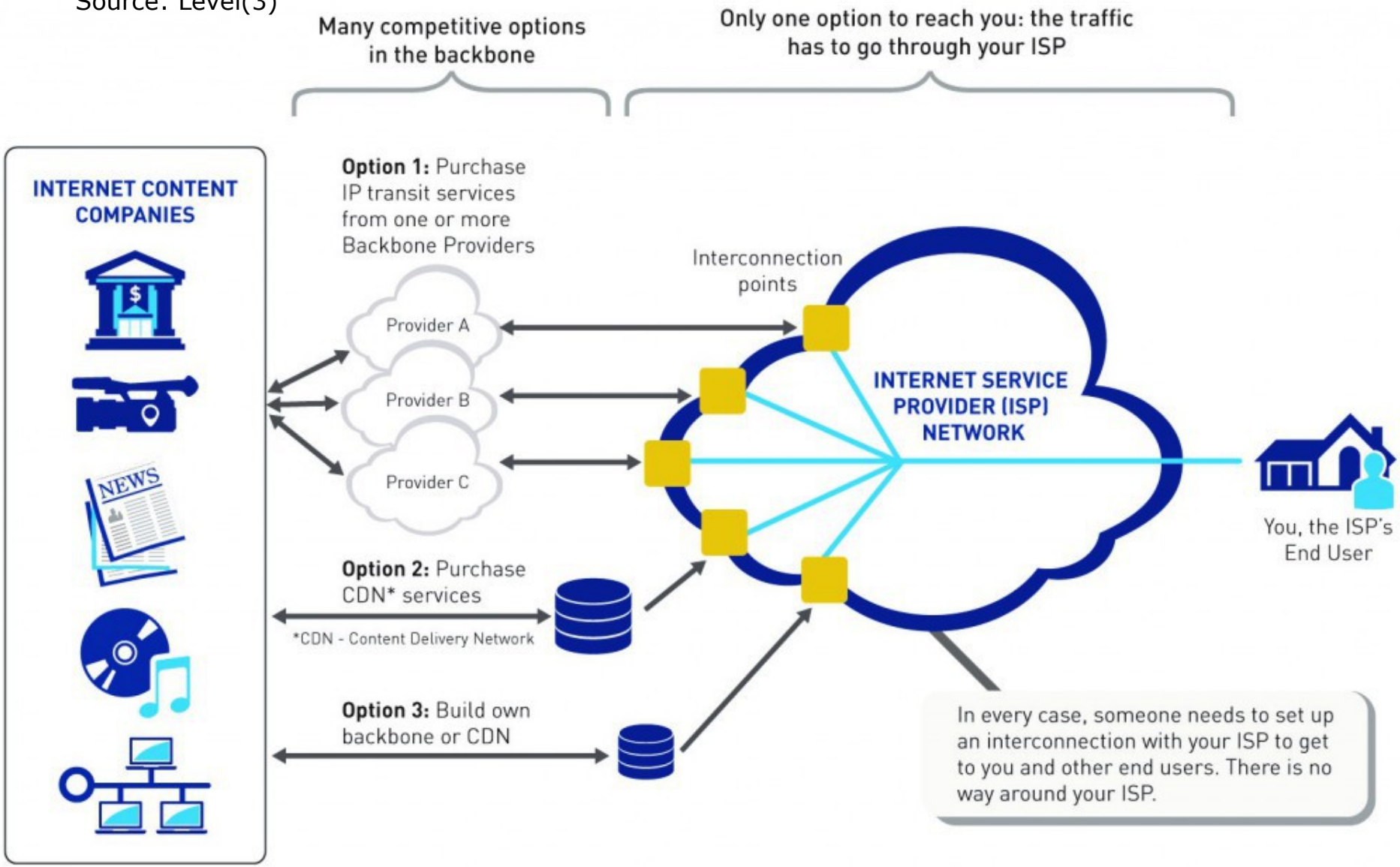
IP Interconnection / Peering #2

„The caller pays…“

- Who is calling with an IP connection?
- Broadband customer calls the Youtube server?
- ...or vice versa: is Youtube server calling the broadband customer?
- 95% of the data is flowing from server to client (end customer), but as a matter of fact, the client is causing the traffic

IP Interconnection / Peering #3

Source: Level(3)



IP Interconnection / Peering #4

Broadband provider can monopolize his end customers – at least momentarily

- There is no alternative way: data towards the end customer must compellingly flow via interconnection points
- Zero-Settlement-Peering is most common and is the foundation of the internet
- Broadband provider (mainly incumbents or large cable operators) tend to become more and more restrictive providing sufficient interconnection

IP Interconnection / Peering #5

Broadband provider can monopolize his end customers – at least momentarily

- Not upgrading interconnection capacity to the requirements is nowadays a common passive-aggressive behavior

- End customers are suffering: Buffering is very common, especially during prime time

IP Interconnection / Peering #6

Broadband provider can monopolize his end customers – at least momentarily

- Asymmetric traffic ratio – Video (i.e. Netflix) has up to 50 times more outbound traffic
- Typical traffic ratio of a broadband provider is 1:5 bis 1:10 (outbound:inbound)
- Some large broadband operators require traffic ratio of 1:1,5 bis 1:3 from their zero settlement peers

IP Interconnection / Peering #7

Broadband provider can monopolize his end customers – at least momentarily

- Those who don't meet this required traffic ratio (no content provider can!) have to pay excessive prices for peering capacity
- If you don't pay: your data is stuck in congestion
- Large broadband operators want to get paid twice: due to the temporary monopoly the can force the double sided market

IP Interconnection / Peering #8

Broadband provider can monopolize his end customers – at least momentarily

Economic damage of buffering #1

Peering [is | would be] cheap

- IP Interconnection / Peering is cheap: the business cost per broadband customer is just a few cent per month – for the sake of happier customers
- Content Provider are easy to deal for peering or dedicated cache servers (please talk to our community fellows at A, A, A, F, G, L, N, T, Z...)

Economic damage of buffering #2

Traffic congestion is costly

- Damage to the national economy caused by traffic congestion – «Die Welt» (Dec. 2013):

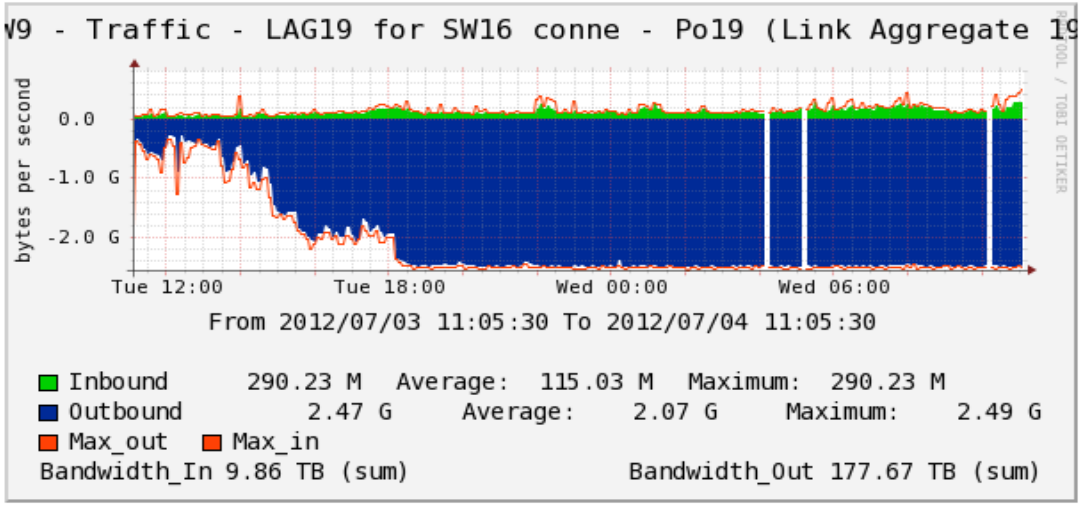
«Staus kosten jeden Haushalt 509 Euro im Jahr»

http://www.welt.de/motor/article123059457/Staus-kosten-jeden-Haushalt-509-Euro-im-Jahr.html

Economic damage of buffering #2

Cost calculation of interconnection congestion

- Damage to the national economy caused by interconnection congestion seems to be an unexplored field so far...



PS. random traffic graph from images.google...

Economic damage of buffering #3

Cost calculation of interconnection congestion

- Quick calculation (Milchbüechlirächnig):

  - 30Mio broadband connections in Germany
  - average accumulated buffering time per day: 1 Minute
  - Cost per hour waiting: 5€ *)

  *) a debate on its own. See "Reservationslohn" at Wikipedia for background information
  https://de.wikipedia.org/wiki/Reservationslohn

Economic damage of buffering #4

Cost calculation of interconnection congestion

- Quick calculation (Milchbüechlirächnig):
- Avg. buffering time per year:
  360 days * 1 min = 6 hours
- Avg. buffering cost per broadband customer:

6 hours * 5 € = 30 € per year

- Economic damage per year in Germany:
  30 Mio broadband subscribers * 30€ = 900 Mio €

Economic damage of buffering #5

Conclusion

- A large part of Buffering is caused by insufficient interconnection, which is a result of the restrictive peering policy of the incumbent and other large broadband providers
- The ability to force the double sided market results in a few million extra revenue for the incumbent
- However the economic damage sums up to at least 900 Million € per year

Economic damage of buffering #6

Conclusion

- In democratic countries like western Europe the economic gain of a multi billion company at the expense of the general public is commonly not tolerated
- When will the regulators wake up and force every market participant to cooperative peering and interconnection?

Regulation #1

Exposure to the regulator

- Zero settlement peering is common. Unbalanced traffic ratio must no longer be a used to refuse peering.
- Disputes about interconnection must be resolved much quicker.
- Any broadband provider must be committed to act in the interest of their own end customer base (zero buffering).

Regulation #2

Exposure to the regulator

- Telekom manages to get paid by everyone due to their market power (~18, 20 Mio broadband customers + mobile). This must not be tolerated.
- Other incumbents use Telekom as a leverage to force their restrictive peering policy.
- Regulators don't do much... quote of Marc Furrer, Chief ComCom Switzerland: «nur ein fauler Regulator ist ein guter Regulator» *)

*) http://www.nzz.ch/wirtschaft/nur-ein-fauler-regulator-ist-ein-guter-regulator-1.18569005

Kontakt

Fredy Künzler
Init7

kuenzler@init7.net
http://www.init7.net/

Init7 (Schweiz) AG
St.-Georgen-Strasse 70
CH-8400 Winterthur

Skype: flyingpotato

Twitter: @kuenzler / @init7 / @fiber7_ch