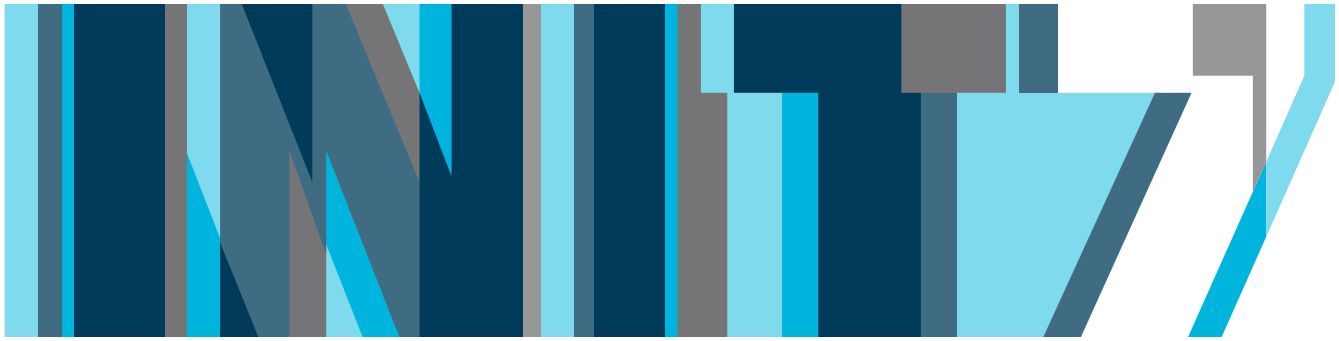
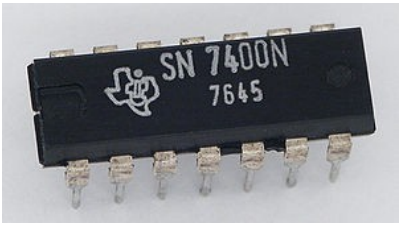


# Buffering Sucks!

## #3C32

## Hamburg – December 28, 2015

# About me




**Fredy Künzler**
*1968, married, 1 son (2009)

~1978-80: digital experiments
1984-1988: FEAM apprenticeship (Fernmelde- und Elektronik-Aparate Monteur)
1991: IT business
1996: self employed / first internet projects
2000: Init7 was founded
2004-2009: President of SwissIX association
2006-2008: Network Architect at Zattoo (OTT IP-TV)
2008-...: Member of the city parliament in Winterthur (Social Democrats)
2014: Fiber7 was launched: Gigabit-FTTH for residential customers «the fastest internet of Switzerland»)
2015: Group of Internet Experts SP Schweiz

# 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

# IP Interconnection / Peering #1

## „The caller pays…“

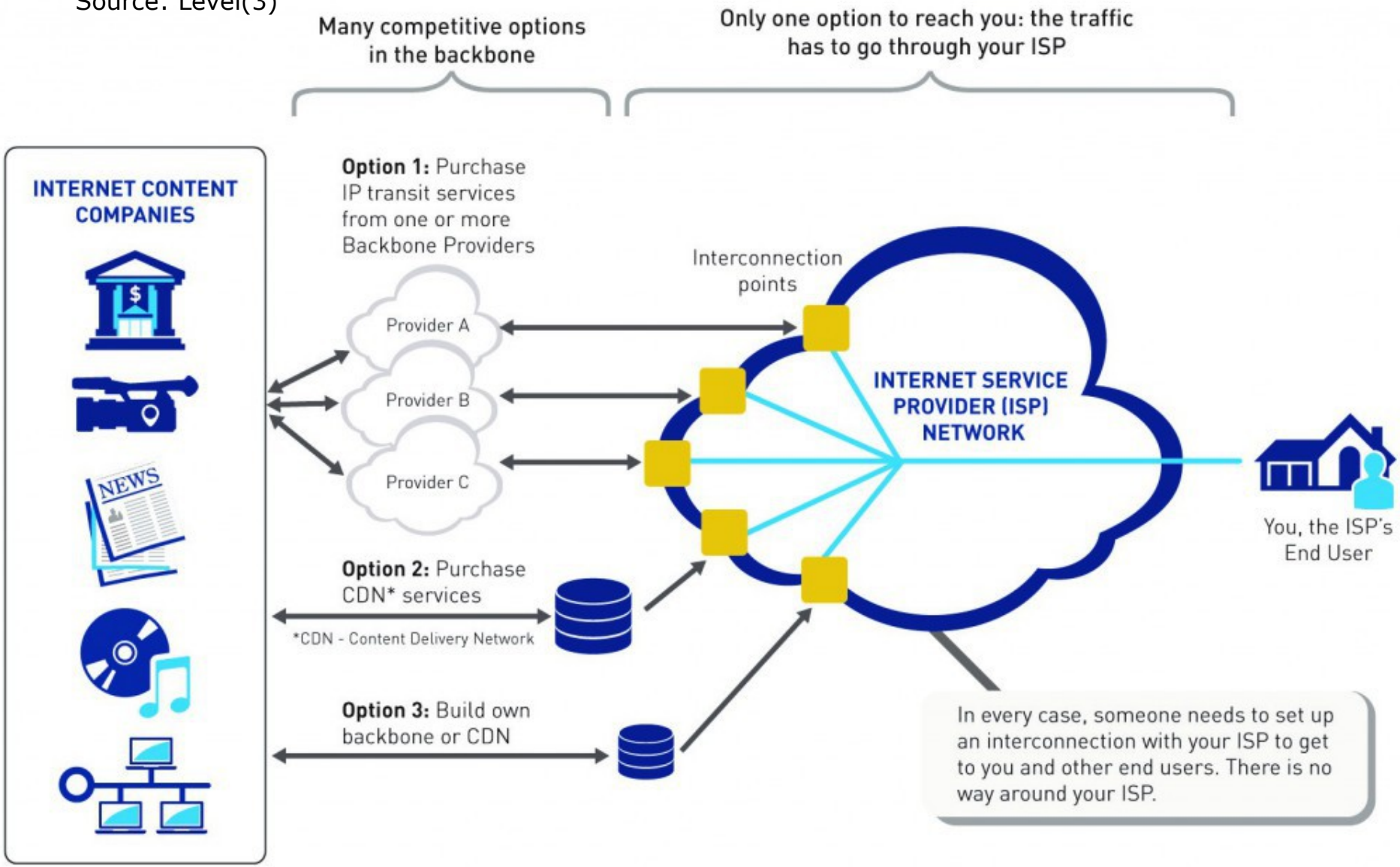
# IP Interconnection / Peering #2

## „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.
  The provider locks in their customers...
  #GatedCommunity

# 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):

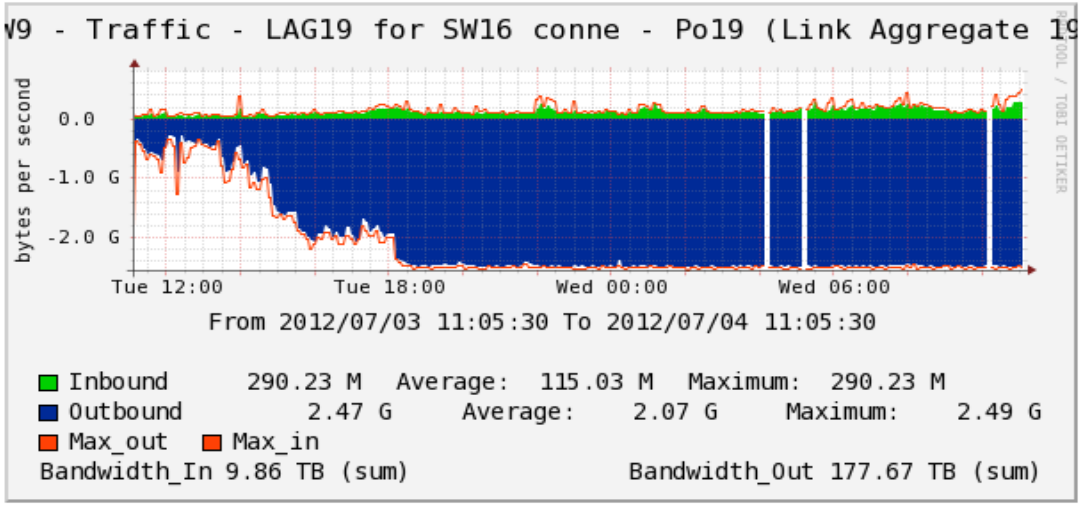
**«Staus kosten jeden Haushalt 509 Euro im Jahr»**

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 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

# Contact

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