ESMT Competition Analysis

Pros and cons of net neutrality: *an economic assessment*

Dr. Hans W. Friederiszick
Dr. Simone Kohnz

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Editorial note:
ESMT Competition Analysis has been renamed to E.CA Economics

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Background

- Internet is changing dynamically:
  - Increasing demand for bandwidth due to data intense applications
  - Increasing commercial importance

- Commercial success of existing business models in question

- Ongoing debate on net neutrality in the US and Europe

→ Should, and if so how should the Internet be regulated?

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Approach of the study

- First step: Some facts and challenges
- Second step: Stylised Internet business models (ISPs' profit maximization piont of view)
- Third step: Impact assessment of the business models (prices, output, congestion, incentives to invest/innovate, foreclosure)
- Fourth step: Feasibility of business models under various net neutrality regulations

Note: A complete welfare ranking of business models is not possible

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Central facts and challenges: increasing traffic and congestion

Fact 1: Traffic is expected to increase significantly in particular due to video based applications

- The number of Internet users rose from 16 million in 1995 to 1.7 billion in 2009 representing an annual growth rate of 40% (AT Kearney 2010)
- Cisco: wired traffic will soar fourfold between 2009 and 2014
- The share of Internet video alone will increase from about 30% of consumer Internet traffic to about 57% in 2014 (Cisco VNI forecast)

→ The booming traffic requires future capacity investments

Fact 2: Over the course of the day, traffic volumes fluctuate greatly and high levels of congestion might be reached

- Internet traffic is characterised by significant daily volatility (Sandvine 2010)
  - In Europe, peak bandwidth utilisation from 3:30pm to 8pm
  - In terms of volume, daily traffic trough is less than 20% of peak traffic
  - Web browsing and real-time entertainment account for most of the downstream traffic

→ Need to develop strategies to efficiently manage the congestion

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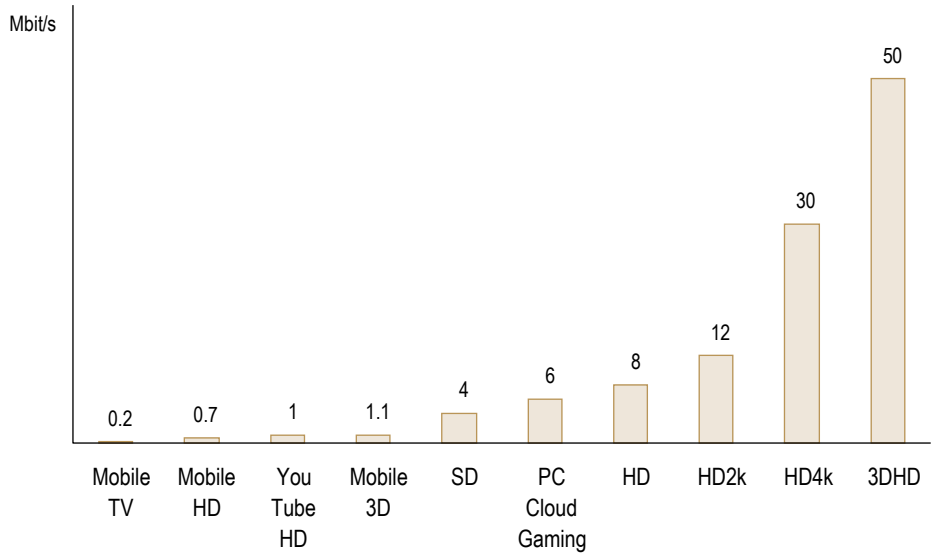
Central facts and challenges: increasing quality requirements

Fact 3: New applications require high quality transmission standards

- New applications generate not only higher transmission volumes, but require also high quality of transmission
- Some content providers pay premiums to content delivery networks (CDN) for services providing quality exceeding that of a best effort network
- Revenues of CDNs specialising in video content will increase from below 300 million US$ in 2007 to over 1.4 billion US$ in 2012 representing an annual growth rate of 36% (Buyya, Pathan and Vakali 2008)

Requirements of applications with respect to speed



Source: Deutsche Telecom

→ Some market participants are willing to pay for increased quality

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Central facts and challenges: incentive to generate traffic and balance of payments

Fact 4: End consumers are currently priced such that they experience no or little incentives to control the traffic they generate

- End consumers typically pay flat rates
- Top 25% of users consumed 100 times more data than the bottom 25% of users (Lowry 2009)
- Inefficient allocation with flat fees:
  - Large consumers are subsidised to the detriment of moderate users
  - The most price sensitive customers are priced out of the market

→ Need for more differentiated rates

Fact 5: Peer-to-peer applications might jeopardise the payment balance under traditional transit agreements

- Peer-to-peer technology circumvents partially transit via lower tier providers
  - Transit payments by content providers is reduced
- The amount content providers pay under transit agreements might not be a good approximation of the costs they produced on the entire network (negative externalities)

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Central facts and challenges: network management practices

Fact 6: Network management practices allow a more cost effective way to satisfy demand than over-provisioning

- New Internet content and applications require higher quality of service than traditional content
  - additional investments by ISPs necessary
- Net neutrality: all traffic has to be treated equally on a best effort level
  - ISPs would need to invest 60% more into infrastructure capacity than when allowed to offer differentiated quality for different types of traffic (Houle et al 2007)

→ Net neutrality makes high-quality experience of streaming video and online gaming significantly more expensive for consumers

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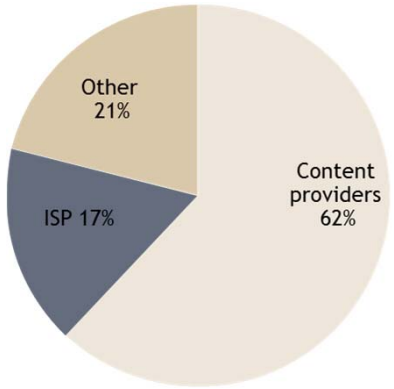
Central facts and challenges: distribution of revenues and concentration of content providers

Fact 7: Content providers earn the largest share of the overall revenue in the Internet value chain

- Sources of revenue for content providers
  - Commissions for e-commerce transactions
  - Delivering advertising
  - Selling content and services to end users
- Revenues earned by content providers have gone up
- Prices charged by the Internet service providers have declined

→ Revenue asymetry increase the likelihood that ISPs are unable to recover their investment costs

Distribution of total Internet revenue, 2008



Source: AT Kearney (2010).

Fact 8: The segment of content providers becomes increasingly concentrated

- Market share of top 10 websites more than doubled in the last decade (in terms of U.S. page views, source: Compete): from 31% in 2001, to 40% in 2006 and to 75% in 2010
- An increasingly concentrated content provider side can deteriorate the share of the jointly generated surplus that ISPs can appropriate

→ Revenue split between ISPs and content providers is likely to shift more towards content providers

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Four different business models from the point of ISPs' profit maximisation

- Congestion Based Model
  - Focuses on solutions of congestion problems within a uniform quality regime
  - Indiscriminate peak load period prices for all content providers

- Best Effort Plus
  - Separates traditional and innovative services
  - Best effort for traditional services and individual agreements for innovative services

- Quality Classes – Content Pays
  - Implements quality classes on the basis of application needs
  - Indiscriminate access to quality classes for content providers

- Quality Classes – User Pays
  - Puts the focus on consumer choice for higher quality levels
  - Choice of quality classes for end users

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Impact Assessment of business models: prices and participation

		Congestion Based	Best Effort Plus	Quality Classes – Content Pays	Quality Classes – User Pays
End users	Prices	↑↓	—	↓	↑↓
	Participation	↑ (welfare)	— ↑	↑	↑↓
Content provider	Prices	↑↓	—	↑↓	↓
	Participation	↑↓ (exit)	— ↑	↑↓	↑

→ Price reduction for all end users (and increased participation) most likely under "Quality Classes – Content Pays"

→ Price increase for content provider in all business models, except for "Quality Classes – Users Pays"

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Impact Assessment of business models: congestion, ISP investment and foreclosure

	Congestion Based	Best Effort Plus	Quality Classes – Content Pays	Quality Classes – User Pays
ISPs' investment	(two effects) ⇧	⇧	⇧ ⇩	⇧ ⇩
Risk of foreclosure	–	⇧	⇧	–

→ Increased incentives to invest; risks to degrade quality under the two "Quality Classes" models limited, if competition.

→ Ability to foreclosure under "Best Effort Plus" and "Quality Classes – Content Pays"

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Definitions of net neutrality – possible regulatory regimes

- No commonly agreed notion of net neutrality

- Definitions discussed in the literature are:

  Definition 1: identical treatment of all traffic (unrealistic)

  Definition 2: reasonable network management, with no payment for higher qualities by content providers (status quo)

  Definition 3: non-discriminatory access to different quality classes

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Feasible business models and net neutrality regime

	Definition 1: Equal treatment	Definition 2: Reasonable network management	Definition 3: No discriminatory quality	No net neutrality regulation
Congestion Based	✗	✓	✓	✓
Best Effort Plus	✗	✗	✗	✓
Quality classes – Content Pays	✗	✗	✓	✓
Quality Classes – End User Pays	✗	✓	✓	✓

→ Definition 2 rules out models that let content provider stronger contribute to the costs of the services; such a policy emphasizes incentives to invest in pure content innovation more then in infrastructure based content innovation

→ Definition 3 potentially rules out highly specialised innovative services

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Conclusion

- All of the four identified business models affect end consumer, content provider and the overall functioning of the internet differently.
- Different forms of net neutrality regulation impact business models differently. Accordingly, regulation has strong implications. An important policy question.
- Policy questions:
  - Do we want to rule out a **higher contribution of content providers** to the costs of the services (Def.1 und 2 vs. Def. 3 or no regulation)?
  - Do we want **walled gardens** to emerge or enforce **non-discriminatory** quality classes (Def. 3 vs. no regulation for specific services)?
- These decisions have to be taken in a situation of **high uncertainty** (we understand that market participants are unsure about which models emerge)
- The case for light **regulation, not restricting business models (ex post vs. ex ante regulation)**
  - Static allocative effects (two-sided markets, etc.) not an a priori reason to regulate
  - Investment and innovation a matter of access - foreclosure
  - Foreclosure needs to be monitored and enforced effectively (*ex post)*
  - A priori, foreclosure appears less of a concern in Europe than in US
    - access price regulation
    - lower degree of vertical integration among ISPs

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Thank you!

ESMT White Paper:

Assessment of a sustainable Internet model for the near future

Available at: http://www.esmt.org/en/293021

ESMT Competition Analysis

Schlossplatz 1
10178 Berlin
Germany

Phone: +49 (0) 30 212 31-7009
Fax: +49 (0) 30 212 31-7099

CompetitionAnalysis@esmt.org
www.esmt.org