Pros and cons of net neutrality:
an economic assessment

This presentation is based on a study by
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commissioned by Deutsche Telekom

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

Approach of the study

- **First step:** Some facts and challenges
- **Second step:** Stylised Internet business models (ISPs’ profit maximization point 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
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
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)

Some market participants are willing to pay for increased quality
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)
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
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 asymmetry increase the likelihood that ISPs are unable to recover their investment costs

Distribution of total Internet revenue, 2008

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

Source: AT Kearney (2010).
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
### Impact Assessment of business models: prices and participation

<table>
<thead>
<tr>
<th>End users</th>
<th>Prices</th>
<th>Participation (welfare)</th>
<th>Prices</th>
<th>Participation (exit)</th>
</tr>
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<tr>
<td>Prices</td>
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**Content provider**

<table>
<thead>
<tr>
<th>Prices</th>
<th>Participation (exit)</th>
<th>Quality Classes - Content Pays</th>
<th>Quality Classes - User Pays</th>
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<td></td>
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<td>(exit)</td>
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</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Congestion Based</th>
<th>Best Effort Plus</th>
<th>Quality Classes - Content Pays</th>
<th>Quality Classes - User Pays</th>
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<tbody>
<tr>
<td>ISPs’ investment</td>
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<td>Risk of foreclosure</td>
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**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”**
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
### Feasible business models and net neutrality regime

<table>
<thead>
<tr>
<th></th>
<th>Definition 1: Equal treatment</th>
<th>Definition 2: Reasonable network management</th>
<th>Definition 3: No discriminatory quality</th>
<th>No net neutrality regulation</th>
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</thead>
<tbody>
<tr>
<td>Congestion Based</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Best Effort Plus</td>
<td>X</td>
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<td>Quality classes – Content Pays</td>
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<td>Quality Classes – End User Pays</td>
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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.
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
Thank you!

ESMT White Paper:

Assessment of a sustainable Internet model for the near future

Available at: [http://www.esmt.org/en/293021](http://www.esmt.org/en/293021)

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