# Net Neutrality on the Internet

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# Network Industries: Increasing Returns to Scale in Consumption

- Increasing (fulfilled expectations) demand (in price)
- Strategic decisions on compatibility/incompatibility
- Distributed computing
- Security issues
- **Two-sided pricing**: network firms can set price(s) on either or both sides of a market
- Examples (vertically integrated):
  - Adobe Acrobat and Adobe Reader
  - Originating and terminating charges in (old) AT&T monopoly
  - Cantor Fitzgerald subsidized Salomon Brothers in secondary market for US Government bonds
- Examples (vertically disintegrated, components made by different companies):
  - Operating systems and applications
  - Game platform/console and games (software)
  - Clients and servers

# Two-sided Pricing in Vertically Disintegrated Setups

- Who pays whom?
  - OSs subsidize applications
  - Game platforms collect from software developers
  - In credit cards, the Visa and MasterCard networks have set a fixed percentage discount (price) between issuer and acquirer banks (price fixing?)
- Should we apply regulation? How?
  - When regulation is possible on both sides of the market
  - When regulation is possible on one side only
    - with cost-based pricing on the other side
    - with monopoly pricing on the other side
    - with duopoly pricing on the other side

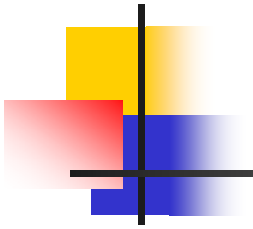
# Interview with Ed Whitacre
## BusinessWeek November 7, 2005

- **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?

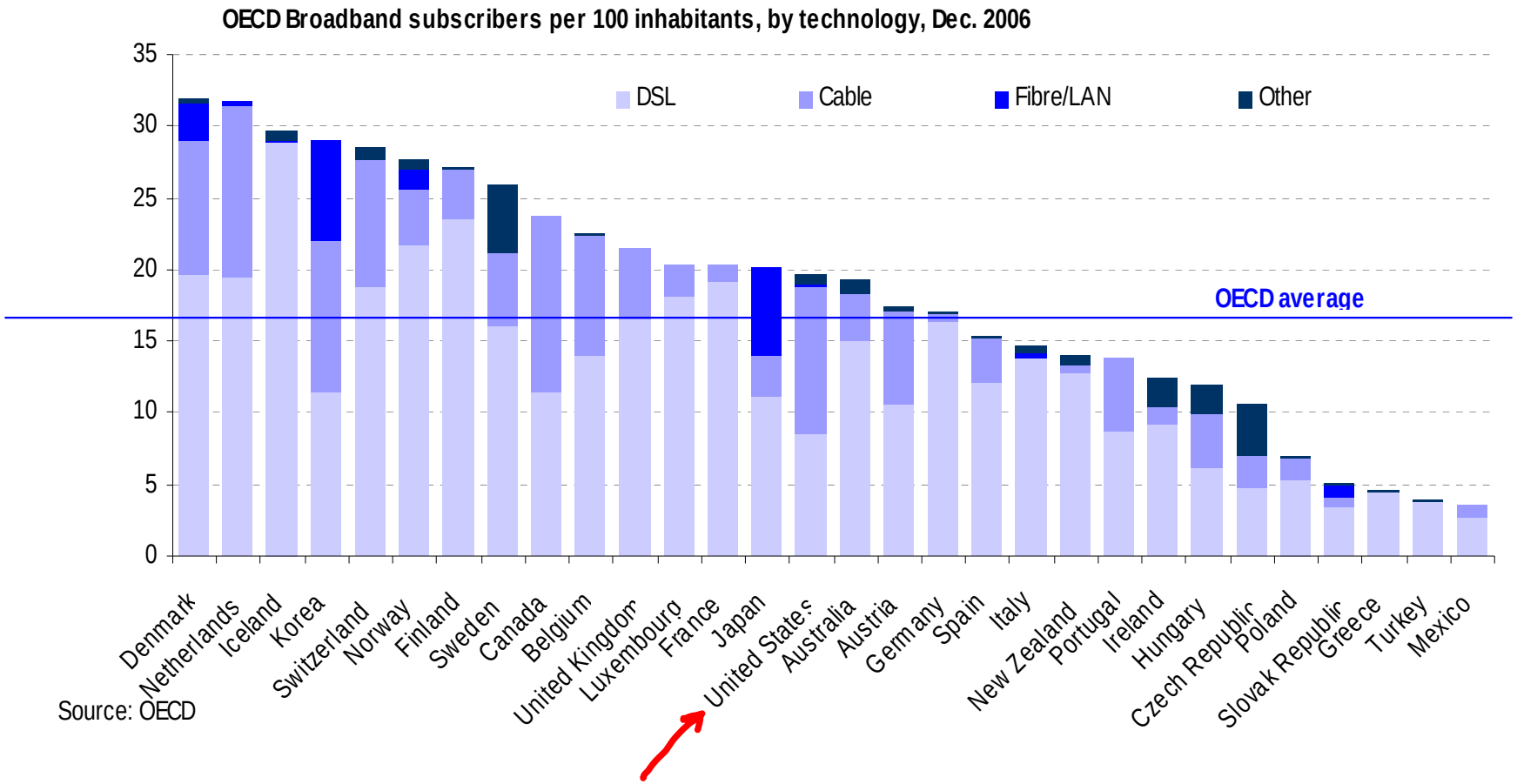
  The Internet can't be free in that sense, because we and the cable companies have made an investment and for a Google or Yahoo! or Vonage or anybody to expect to use these pipes [for] free is nuts!"

# But Both Sides Pay for "Transit" on the Internet



- All hosts on the Internet pay according to bandwidth use: there is no "free lunch" on the Internet
- AT&T, Verizon, and others are paid by ISPs according to bandwidth use
- Actually Internet backbones are paid twice for any transmission, by the originator of traffic and by the terminator of traffic (through their respective ISPs)

# US Lagging in Broadband

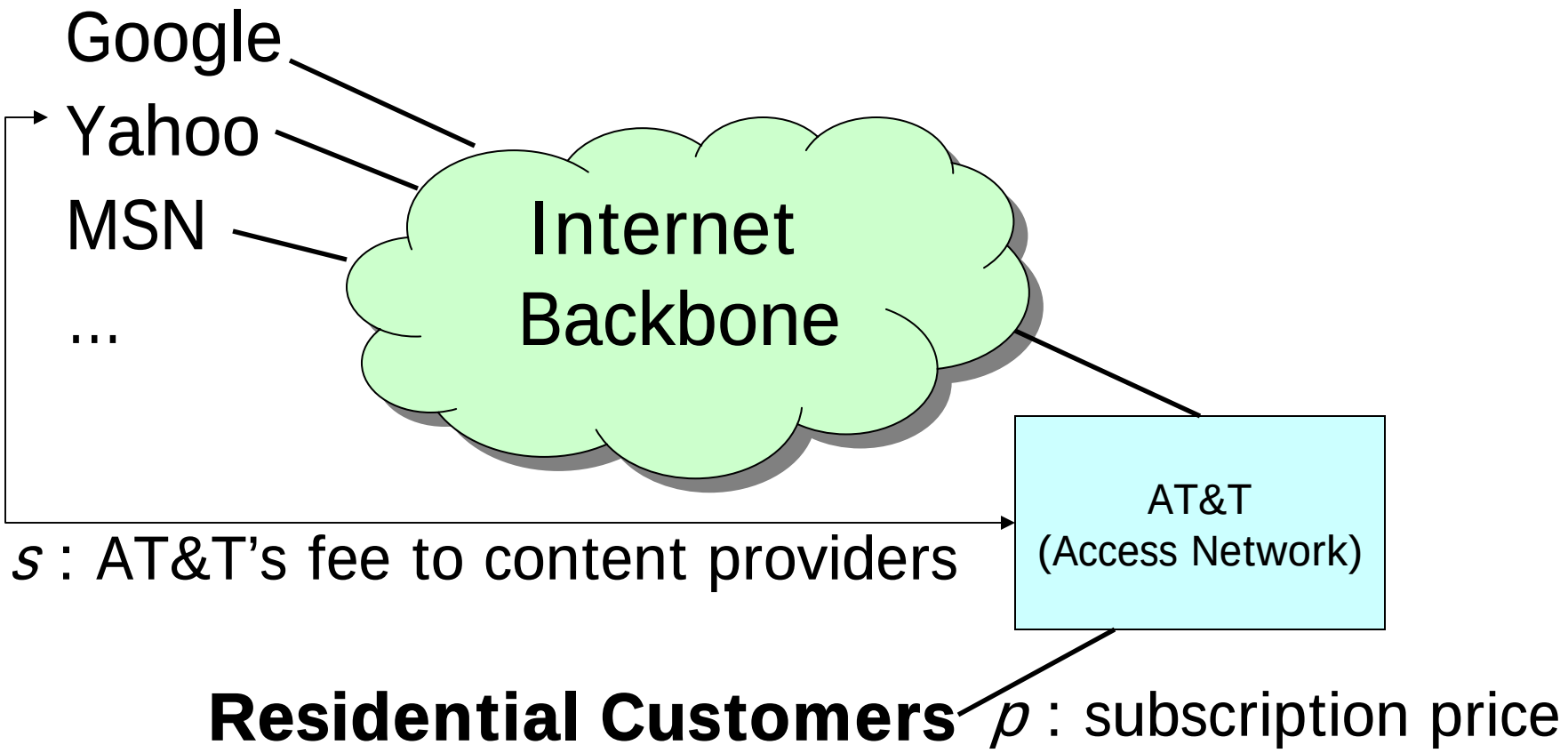



Source: OECD

# So What Do AT&T, Verizon and Cable TV Companies Want?

- Abolish the regime of “net neutrality”
- Set up a pricing schedule where, besides the basic service for transmission of bits, there will be additional charges by the broadband Internet access provider applied to the originating party (such as Google, Yahoo, or MSN).
- The new pricing model without net neutrality would be closer to the traditional pre-Internet telecommunications model where customers pay per service
- This would also be a very sharp departure from the way the Internet has been designed and run since its inception

# Two-sided Pricing in the Absence of Net Neutrality



# The Internet Was Based

- on three basic separate levels of functions of the network:
  - (i) the hardware/electronics level of the physical network
  - (ii) the (logical) network level where basic communication and interoperability is established
  - (iii) the applications/ services level
- The Internet separates the network interoperability level from the applications/services level
- Unlike earlier centralized digital electronic communications networks, such as CompuServe, AT&T Mail, Prodigy, and early AOL, the Internet allows a large variety of applications and services to be run “at the edge” of the network and not centrally

# Six Consequences of Departure from Net Neutrality

1. Introduction on the Internet of *two-sided pricing* where a transmission company controlling some part of the Internet (here last mile access) will charge a fee to content or application firms "on other side" of the network
   - Starting to charge a positive price on the "other side" of the market is desirable to an access monopolist (or duopolists) but **not** desirable for society. See Economides & Tag (2007), "Net Neutrality on the Internet: A Two-sided Market Analysis."

# Optimal One-sided Regulation in the Presence of Monopoly on the Other Side of the Market

- A regulator/planner setting a fee $s$ to content providers expecting the platform monopolist to set his profit-maximizing subscription price $p(s)$ maximizes the constrained total surplus function (platform profits plus content providers' profits plus consumers' surplus) will choose a below-cost fee (that is, a subsidy) to content providers
- Why? Because regulator/planner internalizes the network effects from the other side of the market better than the platform monopolist
- Even paying the below-cost fee, the platform makes positive profits
- Same results for platform duopoly

# Six Consequences of Departure from Net Neutrality

2. Introduction of prioritization which may enhance the arrival time of information packets that originate from paying content and application firms “on the other side,” and may also degrade the arrival time of information packets that originate from non-paying firms
   - The present plans of access providers are to create a “special lane” for the information packets of the paying firms while restricting the lane of the non-payers without expanding total capacity
   - By manipulating the size of the paying firms’ lane, the access provider can guarantee a difference in the arrival rates of packets originating from paying and non-paying firms, even if the actual improvement in arrival time for paying firms’ packets is not improved over net neutrality

# Six Consequences of Departure from Net Neutrality

3. If the access providers choose to engage in "identity-based" discrimination, they can determine which one of the firms in an industry sector on the other side of the network, say in search, will get priority and therefore win
   - This can easily be done by announcing that prioritization will be offered to only one of the search firms, for example the one that bids the highest
   - Thus, the determination of the winner in search and other markets on the other side will be in hands of the access providers and not determined by innovative products or services on the other side
   - This can create very significant distortions since the surplus "on the other side" of the Internet is a large multiple of the combined telecom and cable TV revenue from residential Internet access

# Six Consequences of Departure from Net Neutrality

4. New firms with small capitalization (or those innovative firms that have not yet achieved significant penetration and revenues) will very likely not be the winners of the prioritization auction.
   - This is likely to reduce innovation.
   - Network externalities arise because a typical subscriber can reach more subscribers in a larger network
     - Under no net neutrality, access providers can limit the size and profitability of new firms on the “other side

# Six Consequences of Departure from Net Neutrality

5. The access networks can favor their own content and applications rather that those of independent firms
   - Examples: independent VOIP, video
   - This is likely to distort competition and reduce total surplus

# Six Consequences of Departure from Net Neutrality

6. Since the Internet consists of a series of interconnected networks, any one of these, and not just the final consumer access ones, can, in principle, ask content and application providers for a fee.
   - This can result in multiple fees charged on a single transmission and lead to a significant reduction of trade on the Internet

# Abolition of Net Neutrality Raises Both Horizontal and Vertical Antitrust Issues

- Horizontal
  - Last mile carriers (who are in duopoly or monopoly) may reduce capacity of “plain” broadband Internet access service and/or degrade it so that they can establish a “premium” service for which they will charge additionally content/applications provider
  - Coordinated reduction of capacity in “plain” service is reminiscent of cartel behavior

# Horizontal Effects Continued

- In general, the coordinated introduction of price discrimination schemes may reduce output
- General theorem in economics that price discrimination that reduces output reduces total surplus
- Therefore introduction of coordinated price discrimination may have anti-competitive consequences

# There is a Variety of Potentially Anti-competitive Vertical Effects

- Two examples:
- Carrier favors own content or application or service over that of independent
  - Example: own video, VOIP
- Carrier contracts with (say) a search engine to put it alone in “premium” service
  - Searches using other search engines have considerable delays
- Generally carrier leverages market power in broadband access to the content or applications markets

# Net Neutrality Allows for Intelligence and Innovation at the Edge of the Network

- Abolition of net neutrality is likely to diminish innovation “at the edge” of the network
- Would allow once more for vertical leveraging of market power from a concentrated market (residential Internet broadband access) to other markets

# Should We Intervene or Wait Instead for Antitrust Suits?

- It is better to impose the non-discrimination restrictions by law?
  - Suits take time and much damage can be done before; not resolved in “Internet time”
  - There is a variety of antitrust concerns; each suit will typically deal with one issue
  - The Internet is a key essential network for growth of the US economy
  - US already lagging behind a number of countries in Internet penetration (dropped from 12$^{th}$ to 15$^{th}$ in broadband penetration in 2006)
  - Increasing prices will not increase network traffic or grow the network!

# Conclusions

- Starting to charge a positive price on the "other side" of the market is desirable to an access monopolist (or to access duopolists) but not desirable for society (in terms of total surplus)
- More complex pricing schemes (take-it-or-leave-it contracts, identity-based price discrimination, degradation of "basic" service) are likely to hurt consumers even more