Competition: Can Technology Save US? Or Is the Cup Half Full or Half Empty?

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Is the Tail Wagging the Dog in Communications Policy?

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Competition: Can Technology Save US?

- Rephrase question:
  - "Will advances in technology result in sufficiently robust facilities-based competition to eliminate last-mile bottlenecks?"
- Technology delivering lots more options for providing last-mile access
  - Moore's Law: faster, cheaper, modular
  - Convergence computing/communications: from single-purpose "silos" to IP platform networks. Separation of apps and physical infrastructure.
  - Wireless: 3G, Fixed (WiFi/WiMax), Satellite, Other (FSO)
  - FTTx & optical networking
  - Other: BPL, hybrid architectures
- A wild ride: from TA96 => Dot.com boom => Telecom Meltdown 2000 => ??
- Potential welfare/economic growth impact huge
  - Technology makes old cheaper, but what we want to do keeps growing
  - In an Information Economy, last-mile access is critical infrastructure
  - Market, technical, & regulatory uncertainty endemic
  - Lots new investment needed ($100 billions)

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Competition cup: half full or half empty?

- What's our horizon: Near-term v. Next-gen broadband platforms?
  - Progress to date "because of" or "in spite of" policy (TA 96)?
- What services?
  - Voice: ILEC/CLEC v. Cable (VoIP) v. Mobile v. Other
  - Video: Cable v. DBS (ILEC?) v. Other (TiVo)
  - Data: Cable v. DSL v. Other (BPL? WiFi? 3G?)
  - Bundled offering: who can offer triple play?
- Is there a bottleneck? If so, how to regulate sharing (open access)?
- Role of policy
  - Access to asymmetric legacy infrastructure v. symmetric future?
    - UNEs v. Open access cable v. VoIP
  - Universal Service
  - CALEA, 911, etc.
- Policy ⇔ Technology ⇔ Business Strategy

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Near-term prognosis

- Service-by-service
  - Telephone: remonopolization of fixed line services underway.
    - CLECs critically harmed by loss of UNEs. ILEC market power resurgent.
    - Cable telephony best hope, but will take time.
    - Mobile imperfect substitute for fixed line, but major impact LD & 2nd lines
    - VoIP uncertain and depends on extent of BB competition
  - Video: cable v. DBS duopoly
  - Data: cable v. DSL duopoly
- Where are the promised innovations? Convergence? Internet/eCommerce evolution?
- Platform competition
  - Best case: duopoly telecom (+DBS) v. cable (+VoIP)
  - Worst case: monopoly telecom v. monopoly cable
  - 3rd wire into the home? Wireless is best option, but lots of challenges
  - Who will invest in broadband platform of future???

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Telephone Competition

- Local: 16% CLEC, 88% ILEC (Dec03) (181 million fixed lines)
  - From 1984-1991, AT&T share fell 27% from 90% to 63%
  - CLEC mass market 14% v. enterprise 25%
  - 87% CLEC lines use leased ILEC facilities. <3% mass market customers served via non-ILEC facilities
- Mobile a substitute? 50% HH have mobile
  - But ~5% only have mobile => complement, not substitute
  - LD and second lines (children) most affected by mobile
  - ILECs own most of mobile
  - 3G coming (?)
- VoIP? maybe someday but depends on duopoly cable/telco competition
  - 2.5 million cable telephony subs
  - Vonage, etc. : QoS issues, marginal player today
  - Uncertain regulatory/technical future. Best promise is with new platform services.
- Remonopolization of telecom underway?
  - TSR uneconomic, UNE-P going away
  - CLEC scaling back/scrapping entry plans; ILEC price hikes
  - S271 approval => LD/Local bundled => ILEC shares LD ~30%

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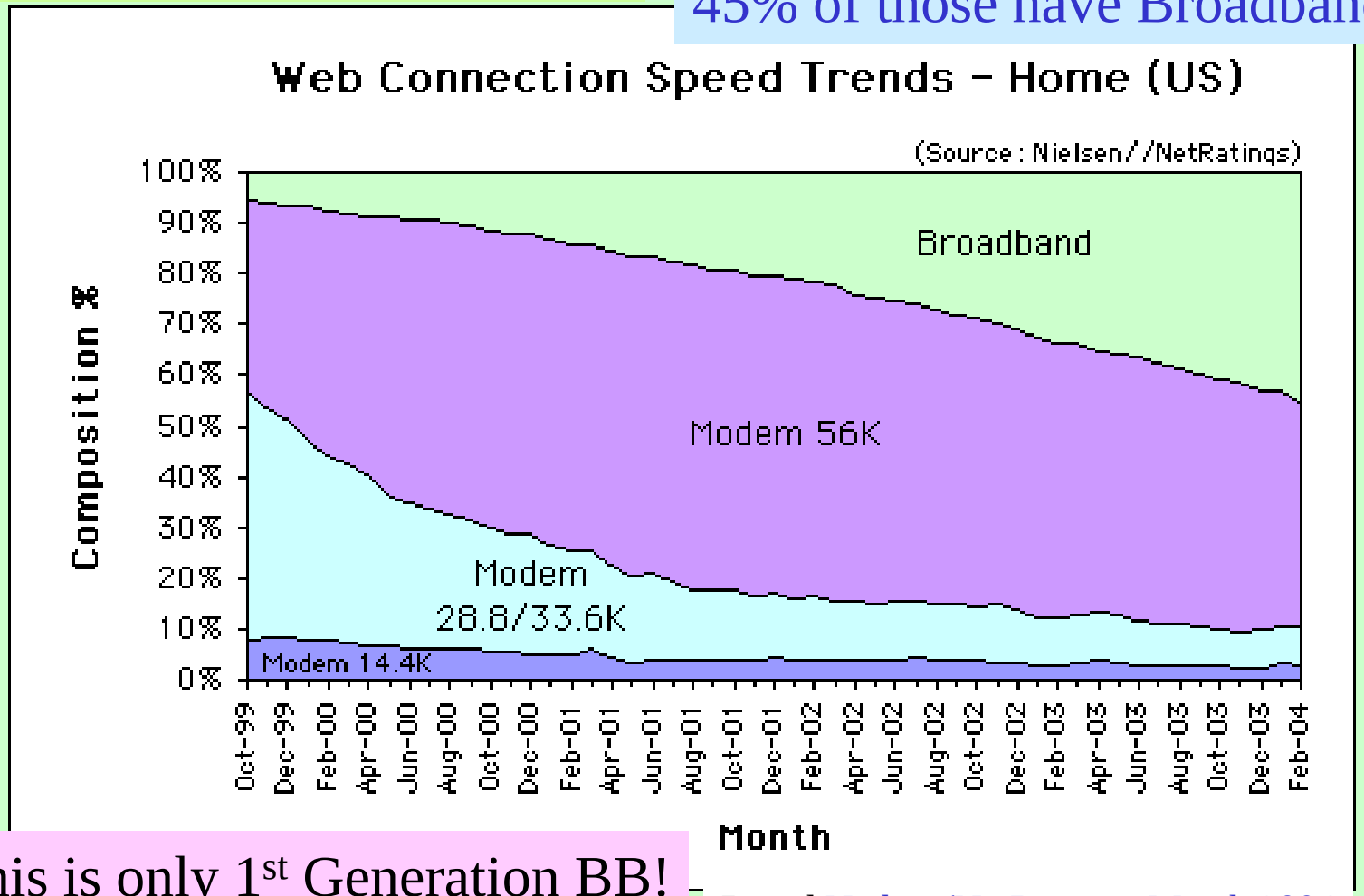
Data Services: Transition to BB Underway!

75% US HH have Internet Access

45% of those have Broadband



But, this is only 1st Generation BB!

Based Nielsen/NetRatings, March 2004

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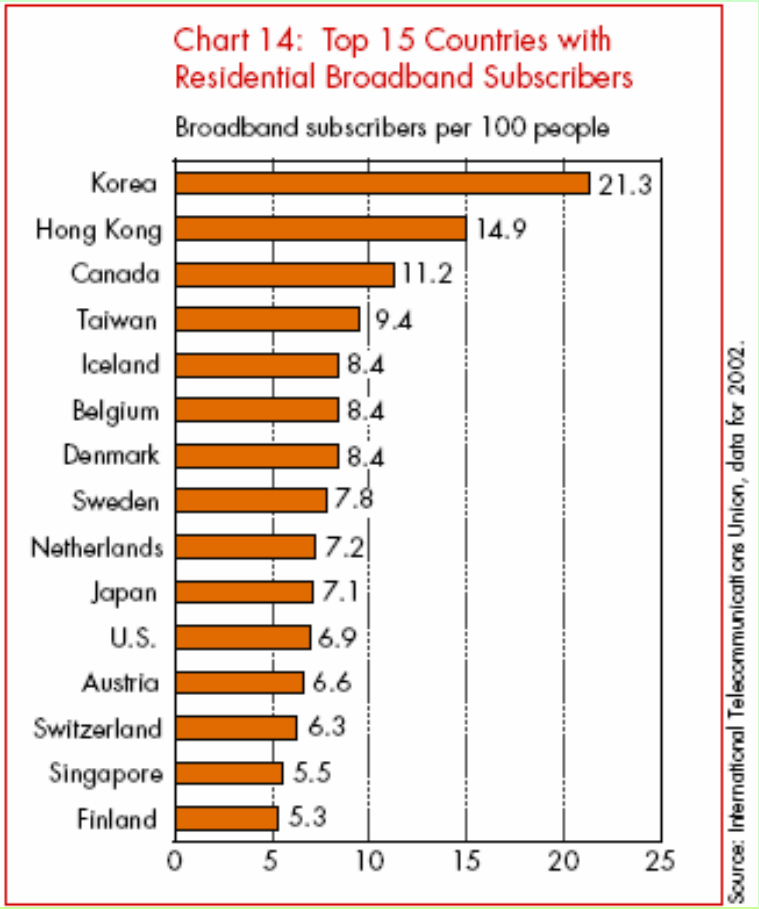
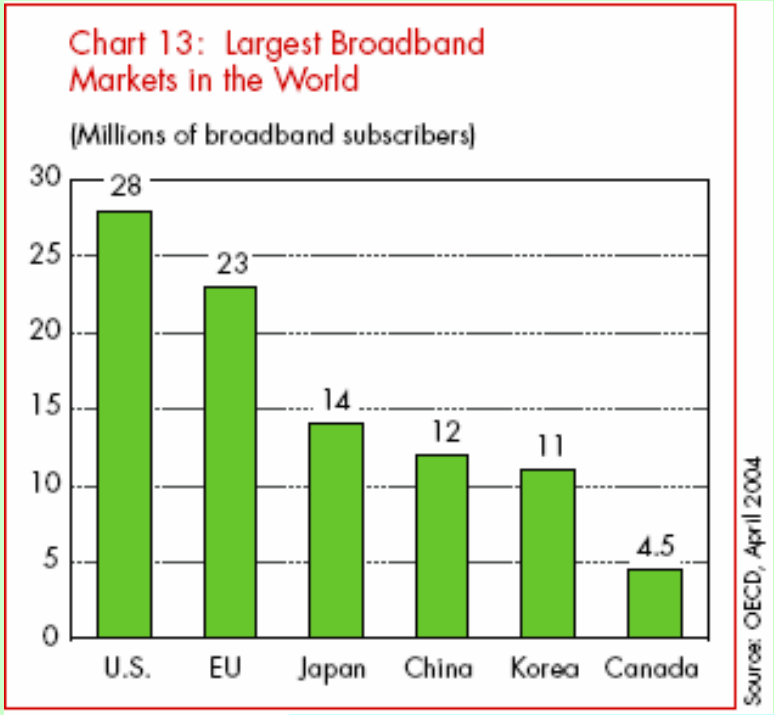
Source: "US Broadband Penetration Jumps to 45.2% (Feb04)" from http://www.websiteoptimization.com/bw/0403/

Broadband in the US





US a huge market, though…

US Lags in penetration, and quality of service

Source: FCC 4th Sec706 Advanced Services Report

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Towards a broadband platform future

- Vision of future: ubiquitous/pervasive computing
  - Chips in everything (RFID), always connected, unaware/automatic, personalized/customizable services
  - Wireless/wired integration, intelligent/adaptive networks
- Vision of the future next generation network
  - 10s-100s Mbps per home (maybe Gbps..)
  - 2-way, multimedia capable (voice, video, & data)
    - P2P, interactive video, “follow-me” anywhere
    - New services (but not sure what killer app is yet)
- Lots of new investment
  - $100s billions
  - Lots of fiber (natural monopoly?)
  - Multiple integrated technologies/networks
    - PANS/LANS/WANs, Wireless/Wireline
- How many “fat pipes” to home can survive?
  - Integrate platforms for QoS/end-to-end service management
  - Large fixed/sunk costs of broadband last-mile platforms

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Competition: Can Technology Save US? Conclusions

- (1) Competition does not depend on technology alone
  - Business models, regulation, legacy issues shape direction of technology and *visa versa*
  - Technology not eliminating sunk/fixed costs, scale/scope economies that source of economic challenges; nor need for new investment
  - Regulation and infrastructure investment not inconsistent
- (2) Competition prospects in near-term not great
  - Unclear how robust cable & telecom duopoly competition will be.
  - CLECs seem unlikely to be major force unless current policies change
  - Hopes for 3rd wire competition limited and geographically localized
  - Remonopolization of telecom is underway…
- (3) Competition prospects longer-term also not great
  - If near-term competition robust, who will (can) invest in next-gen?
  - Competition for next-gen BB platforms may not be sufficient
- (4) Policy matters
  - Good policy today can enhance likelihood that (a) Next gen infrastructure will be built and whole economy will benefit; and (b) it will be as competitive as feasible

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Lots of Wireless Technology

- All along the RF spectrum (different RF not perfect substitutes)
  - Microwave
  - Satellite (geosync, LEO)
  - Cellular 3G (4G?)
  - WLANs (e.g., WiFi) => WISPs and MESH (Tropos)
  - BWFA: MMDS => Alvarion => WiMax (802.16)
  - Free Space Optics, UWB, etc.
- Lots of complementary technology
  - Smart antennas, software radio, MUD, ad hoc routing, mesh networking, OFDM, etc.
- Licensed and Unlicensed (shared) spectrum use models

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FTTx Last Mile Networks

- FTTx
  - HFC: cable drops
  - Hybrid Fiber/Wireless
  - x = Neighborhood, Block, Curb, Home?
- Architectures:
  - Dedicated fiber or wave division multiplexing
  - Active (switched) or Passive (PON)
  - ATM or GigE
- Services:
  - Voice/video/data options per home
  - Bandwidth per HH (back-haul requirements?)
  - Video/voice carried as packets on data or as separate streams
- FTTH supports very high bandwidth ~1Gbps/HH
  - What about backbone? Backhaul?
  - What about sharing fiber access?

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Sharing Fiber Access Infrastructure: Layering of Broadband Access

0	Conduit and collocation facilities shared
1 (Physical Layer)	Dark fiber leasing or maybe optical layer unbundling (wavelength)
2 (Data Link Layer)	Ethernet-based VLAN or ATM-based PVCs for each carrier
3 (Network Layer)	IP Layer 3 unbundling to support MPLS-based VLAN

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ADDITIONAL MATERIALS (available http://itc.mit.edu)

•Sirbu, Lehr, & Gillett (2004), "Broadband Open Access: Lessons from Municipal Network Case Studies," paper to be presented at TPRC, Alexandria VA, October 2004.

•Lehr, Sirbu & Gillett. (2004), "Municipal Wireless Broadband: Policy & Business Implications of Emerging Access Technologies," paper presented at London Business School Conference on Competition in wireless and wireline services, May 14, 2004.

•Lehr (2004), "Economic Case for Dedicated Unlicensed Below 3GHz," paper presented at conference on unlicensed hosted by New America Foundation, April 16, 2004.

•Lehr & McKnight (2003), "Wireless Internet Access: 3G vs. WiFi?," *Telecommunications Policy*, 27 (2003) 351-370.

•Lehr & Hubbard (2003), "Economic Case for Voluntary Structural Separation," paper presented at TPRC, Alexandria VA, September 2003.

•Willig, Lehr et al. (2002) "Stimulating Investment and the Telecommunications Act of 1996," white paper, submitted on behalf of AT&T, October 2002.

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