



Building Demand for Widespread Broadband Deployment



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Define Broadband *

Broadband is a convergent platform capable of supporting a multitude of applications and services linked to the Internet and computing.



- * *Broadband – Bringing Home The Bits*, pp.78-81, National Academy Press, Washington, D.C., 2002

Two Complementary Broadband Definitions By The U.S. National Research Council *

- Local access link performance should not be the limiting factor in a user's capability for running **today's applications**
 - Useful in identifying where to make investments to alleviate potential bandwidth bottlenecks within the network
 - Only correct for a given set of applications at one point in time
- Broadband services should provide sufficient **performance** – and wide enough **penetration** of services reaching that performance level – to encourage the deployment of **new applications**
 - Useful in planning and policy making
 - Interplay between deployed technology and applications
 - Interplay between technology and economic developments

* *Broadband – Bringing Home The Bits*, pp.78-81,
National Academy Press, Washington, D.C., 2002

What Do Users Demand for Broadband?

Basic Human Needs *

- **Security**
- **Adventure**
- **Freedom**
- **Exchange**

- **Power**
- **Expansion**
- **Acceptance**
- **Community**
- **Expression**

Broadband Requirements

- **Speed (Increasingly Symmetrical)**
- **Always-On**
- **Flat Rates (in Tiers)**
- **E-Commerce**

- **Privacy**
- **Education**
- **Anywhere**
- **Content On-Demand (Protection)**
- **Entertainment**

* The Nine Basic Human Needs, Institute for Management Excellence,
<http://www.itstime.com/>

Mapping Broadband Service Capabilities Onto Application Classes *

Broadband Service Capability	Broadband Application Class
Large Downstream Bandwidth	Streaming Content (e.g., Video)
Large Upstream Bandwidth	Home Publishing, CCTV
Always-On	Information Appliances
Low Latency	Interactive Games

* *Broadband – Bringing Home The Bits*, pp.78-81,
National Academy Press, Washington, D.C., 2002

Applications and Potential Growths

Law	Sarnoff	Metcalfe	Reed *	Lu
Optional Transactions	Tune In Broadcast	Connect Peers	Join/Create Groups	Search/Rank Content
Examples	OnSale, Remote Access	Yahoo! Classifieds, Email	eBay, Chat Rooms, GFN	Google, Content On Demand, CCTV
Value of N Member Net	N	N^2	2^N	N!
N=10	10	100	1,024	3,628,800

* <http://www.reed.com/Papers/GFN/reedslaw.html>

ITU Digital Access Index (DAI)* – 2002

Taiwan Ranked 9th in 2002 (22nd in 1998)

Category	Variable	Values	Goal-Post	Indicator	Weight	Index
Infrastructure	Fixed Telephone Subscribers	57.4	60	0.96	1 / 2	0.98
	Mobile Cellular Subscribers	106.4	100	1.00	1 / 2	
Affordability	Internet Access Price	99.3	100	0.99	1	0.99
Knowledge	Literacy	96.0	100	0.96	2 / 3	0.95
	School Enrollment	93	100	0.93	1 / 3	
Quality	International Internet Bandwidth	658.6	10,000	0.80**	1 / 2	0.56
	Broadband Subscribers	9.4	30	0.31	1 / 2	
Usage	Internet Users	38.3	85	0.45	1	0.45
DAI	(Average of 5 categories)					0.79

* ITU, 2003 World Telecommunication Development Report
Access Indicators for the Information Society, Chapter 5

** $(\log(658.6) - \log(0.01)) / (\log(10,000) - \log(0.01))$

Broadband Vision Is Still Rapidly Evolving!

Year	Term	Speed or Bandwidth
1980s to Early 1990s	Wideband	1.5 to 45 Mbps
	Broadband	> 45 Mbps
1995	Broadband	≥ 1.5 Mbps
2000	Advanced Telecommunications Services (FCC)	≥ 200 kbps both directions
	High-Speed Services (FCC)	≥ 200 kbps at least one direction
2002	High-Speed Data Services (H.R. 1542)	≥ 384 kbps at least one direction

U.S. Broadband Lines *

Dec. 31, 2002	Total		Residential/Small Business	
	High-Speed	Advanced	High-Speed	Advanced
ADSL	7,675,114	2,536,368	6,429,938	2,071,779
Other Wireline	1,215,713	1,215,713	250,372	250,372
Coaxial Cable	13,684,225	11,935,866	13,660,541	11,920,207
Fiber	575,613	575,057	16,132	15,751
Satellite or Fixed Wireless	309,006	64,393	288,786	46,407
Total Lines	23,459,671	16,327,396	20,645,769	14,304,515

* "High-Speed Services for Internet Access: Status as of June 30, 2003,"
www.fcc.gov/wcb/stats, December 2003.

Suggested Data Rates For Broadband Network Tasks *

Task	Data Rate
Teleworking	7 Mbps
E-Learning	7 Mbps
Telemedicine	7 Mbps
Movies-on-Demand	7 Mbps
Digital Television	7 Mbps
Video Conferencing	800 kbps
Audio-on-Demand	700 kbps
Telegames	600 kbps
Electronic Banking	400 kbps
Video Phone	200 kbps



* Rouzbeh Yassini, *Planet Broadband*, Cisco Press, September 2003

Korea Telecom Broadband Specifications *

Megapass	Technology	Down/Up Rate	Target Area
Lite	ADSL	2M / 640k	House
Premium	ADSL/VDSL	8M / 640k	House
Special	VDSL	13M / 13M	Apartment
		25M / 3M	
		50M / 7M	
Ntopia	Ethernet	10M	New Apartment
NESPOT	Wireless LAN	11M	SOHO/Hotspot

* Yong-Kyung Lee and Dongmyun Lee, "Broadband Access in Korea – Experience and Future Perspective," *IEEE Communications Magazine*, December 2003.

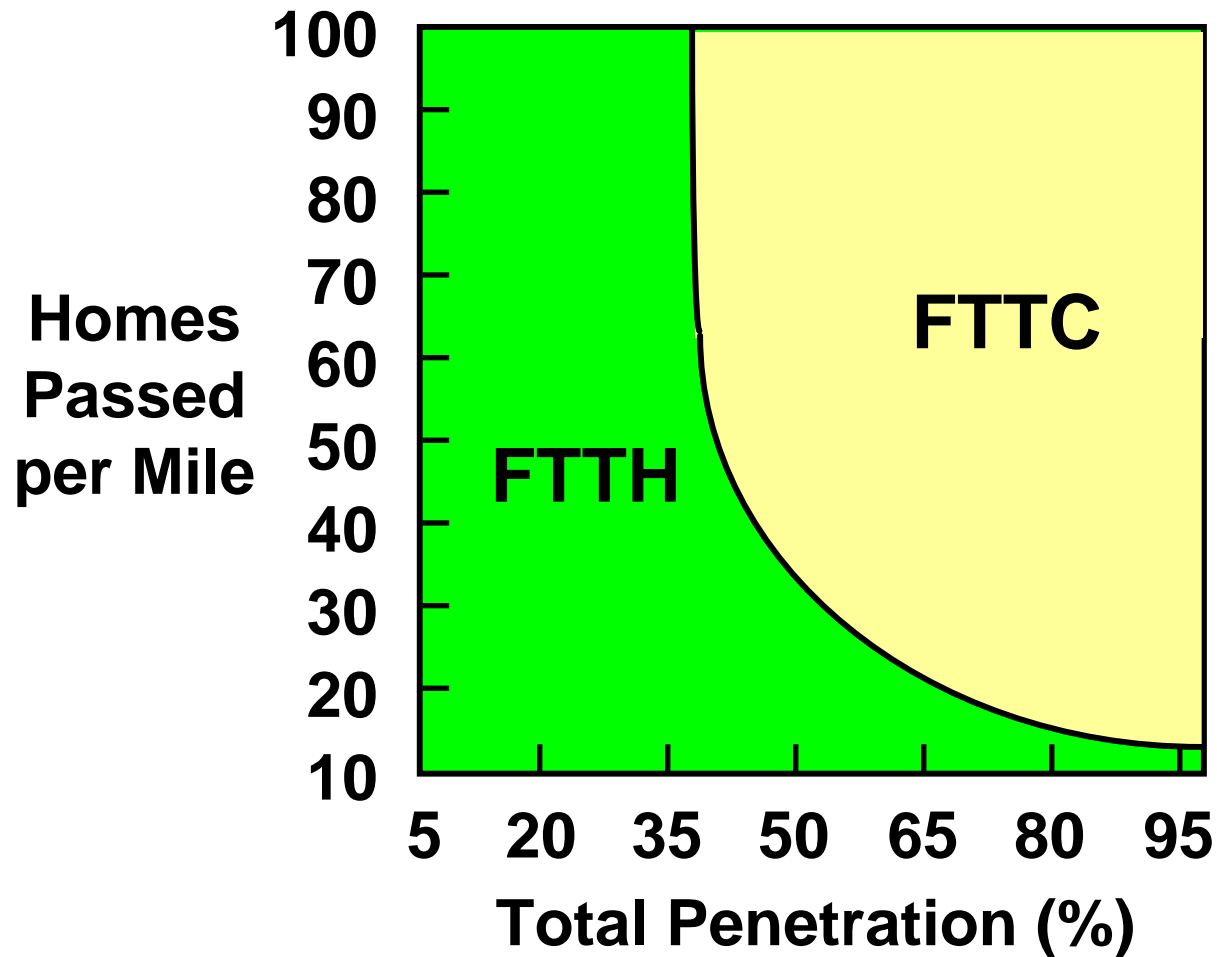
Long-Range Goals On Urgent Time Schedule

Country	Mbps	Penetration	Year
Sweden	5	98%	2005
Korea	20	70%	2005
Japan	10-100	50%	2008

- Need long-range goals on urgent time schedule for rapid, wide deployment of Ethernet networks with dedicated symmetric connectivity over fiber infrastructures at speeds reaching gigabits per second on wavelengths
- Together with complementary broadband wireless networks, gigabit Ethernet networks will facilitate convergence of data, voice, and video through a single network connection to the end-user, permitting access to content, applications, and services (CAS) from multiple suppliers with factorial choices

“Accelerating Advanced Broadband Deployment in the U.S.,”
www.ieeeusa.org/forum/POSITIONS/broadband.html, February 2003.

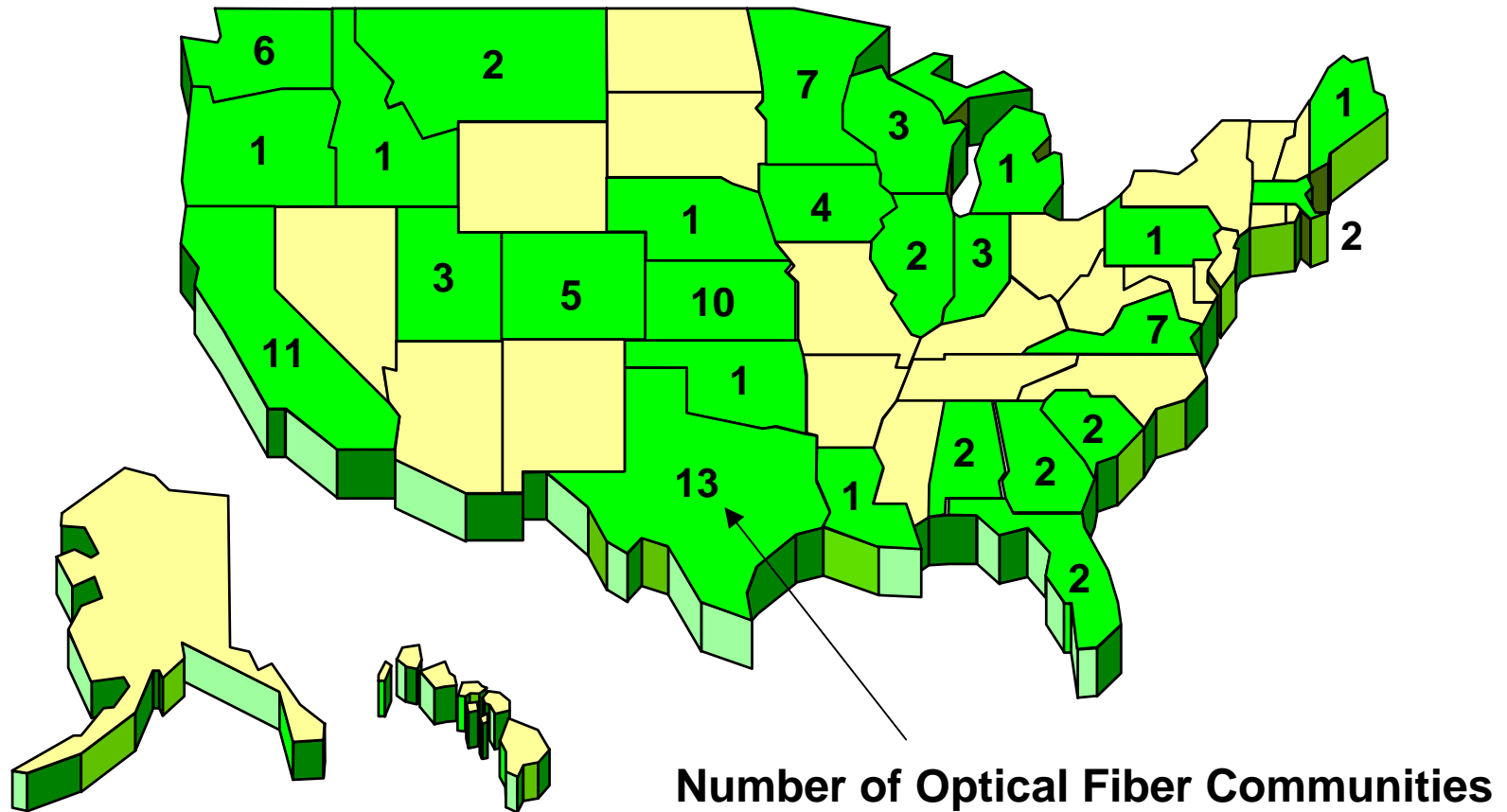
FTTH Cheaper Than FTTC In Low-Density Or High-Competition Areas *



* K. Lu, *et al.*, "Cost Comparisons of FTTC and FTTH for Various Demands and Densities," March 1997

94 Optical Fiber Communities In 26 States *

As of 10/01/03, FTTH passed 180,300 homes with 64,700 subscribers.



Significant Regulatory Relief for Investment in Last-Mile Broadband Networks *

- No unbundling requirement for **new build/greenfield** FTTH loops for both broadband and narrowband services
- No unbundling requirement for **overbuild/brownfield** FTTH loops for broadband services
- Incumbent LECs must continue to provide access to a transmission path suitable for providing narrowband service if the copper loop is retired

* FCC 03-36, “UNE Report and Order (R&O),”
Adopted on 02/20/03; Released on 08/21/03

Trends Help Build Demand for Broadband

- Single-chip, high-definition digital video recording (HD-DVR) in satellite and cable set-top boxes
- Next-generation optical disc formats (BD, HD-DVD, EVD, FVD) enable recording, rewriting, and playback of HD contents
- Digital Home Working Group (DHWG) for interoperable personal computers, consumer electronics, and mobile devices
- Multimedia over Coax Alliance (MoCA) for up to 270Mbps over existing home coaxial cable systems
- WiMedia based on ultra-wide band for wireless connectivity and interoperability in personal area networks up to 10 meters
- WiMAX (IEEE 802.16) wireless MAN connects Wi-Fi hot spots
- Ethernet in the First Mile (EFM) based on IEEE 802.3ah reduces access equipment cost and operational expense
- Fiber-to-the-premises (FTTP) deployment will start in 2004 to reach 60% within 5 years

Summary

- Broadband access technologies should support services spanning a wide range of
 - Speeds and symmetry
 - Other performance requirements such as latency and jitter
 - Types of applications
 - Market segments
- Variety of broadband capabilities suggests a series of application and infrastructure deployment milestones
 - Web browsing, e-mail, messaging, games, and audio download and streaming
 - Streaming of high-quality video such as MPEG-2 or HDTV and rapid download of other large data files, enabling true TV-PC convergence
 - Telecommuting, distance learning, telemedicine, etc. with comparable upstream speeds
 - Future applications over optical fiber with symmetrical gigabit speeds