

Broadband Basics

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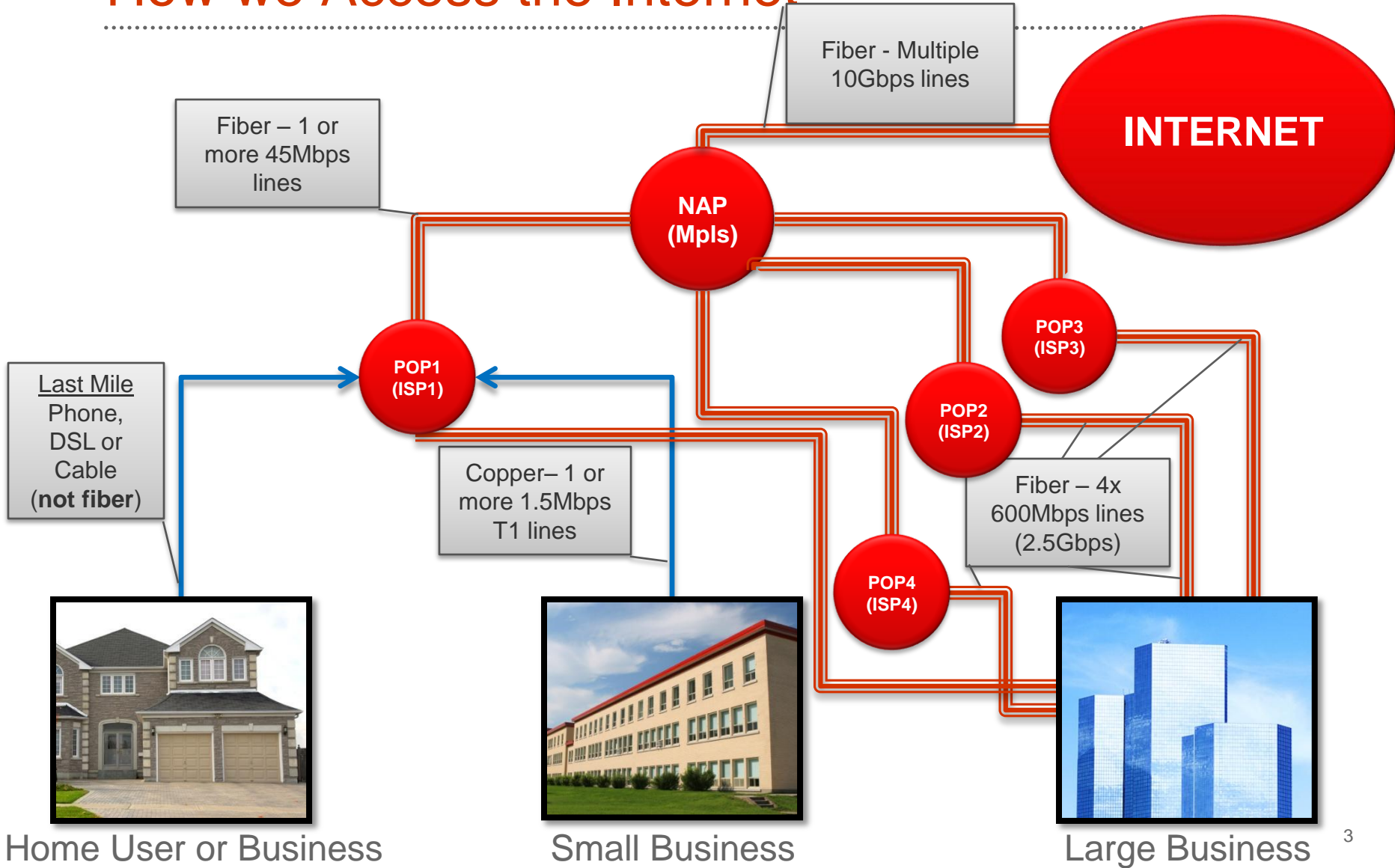


Agenda

1. How we access the internet
2. Broadband defined
3. Delivery Methods
4. Need & Speed
5. Rankings around the world
6. Economic impact of broadband
7. Current and future broadband applications
8. Broadband Task Force



How we Access the Internet



Home User or Business

Small Business

Large Business

How we Access the Internet

- **The Internet is simply a network of networks.**
 - Every computer that is connected to the Internet is part of a network.
- Computers connect through an **Internet Service Provider (ISP)**.
 - The ISP may then connect to a larger network and become part of their network.
- Communications companies have their own dedicated **backbones** connecting various regions.
 - Each company has a **Point of Presence (POP)**, a place for local users to access the company's network.
 - There are several high-level networks connecting to each other through **Network Access Points** or NAP



How we Access the Internet

- Backbones are typically fiber optic trunk lines.
 - The trunk line has multiple fiber optic cables combined together to increase the capacity.
 - A high-level backbone can transmit **at 2,488 Mbps** (2.488 Gbps).
- Many companies operate their own high-capacity backbones
 - All of them interconnect at various NAPs around the world.
- The entire Internet is a gigantic, sprawling agreement between companies to intercommunicate freely.



Broadband Defined

- Refers to the ability of delivering information over the internet at a high speed.
- FCC Definition of Broadband
 - Until June 2008: 200Kbps
 - Now: 768Kbps
- 50 Mbps – fastest available speed to Minnesota consumers



Broadband Defined

Kilobyte (KB) = 10^3
Megabyte (MB) = 10^6
Gigabyte (GB) = 10^9
Terabyte (TB) = 10^{12}
Petabyte (PB) = 10^{15}
Exabyte (EB) = 10^{18}
Zettabyte (ZB) = 10^{21}
Yottabyte (YB) = 10^{24}



Delivery Methods

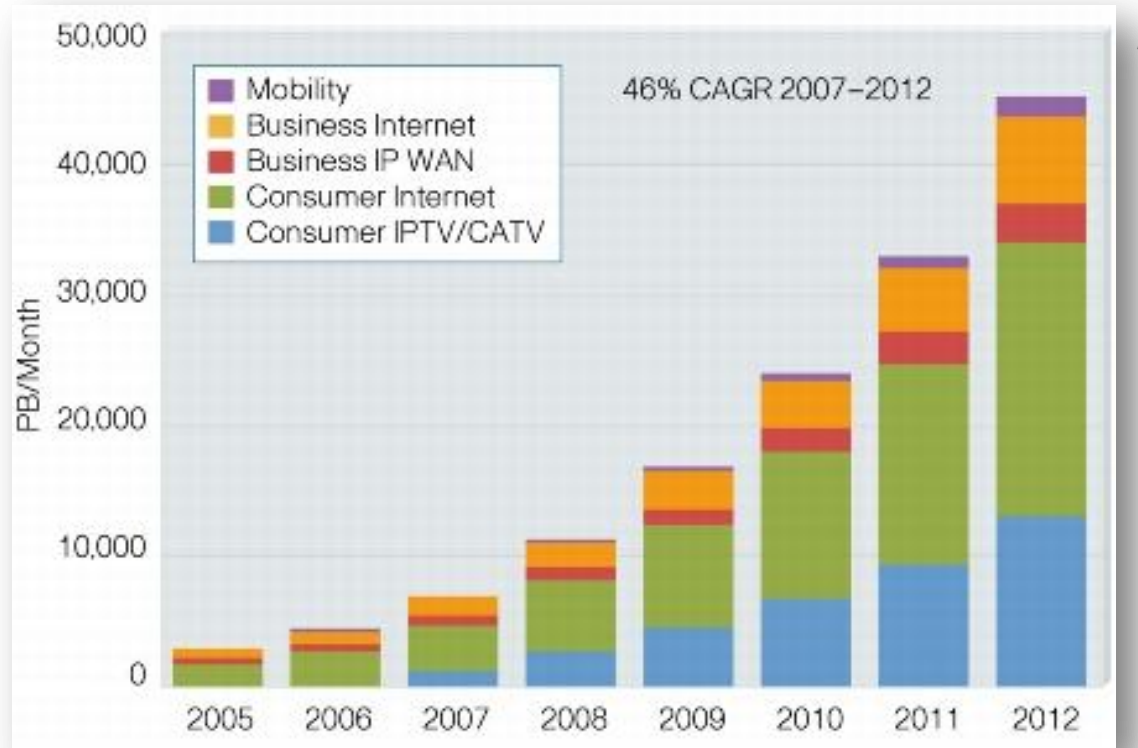
Technology	Method	Download Speed
Fiber to the Home	Fiber optic networks built for voice, video, and data	Over 1 Gbps
Cable Modem	Broadband service deployed over cable TV networks	1 – 50 Mbps
DSL	Broadband service over existing telephone lines	1 – 20 Mbps
Wireless	Wireless networks built specifically for broadband Existing cell phone networks upgraded to offer broadband	Up to 54 Mbps
Broadband over power lines (BPL)	Broadband service over electrical power lines	Up to 200 Mbps

Delivery Methods

Technology	Download Speed	New Construction Required	Services Enabled	Use of Existing Assets	Cost
Fiber to the Home	Over 1Gbps	Entire fiber network	Voice Data Video	Minimal, some regional fiber	\$\$\$\$\$
Cable Modem	1 – 50 Mbps	Regional fiber network New last mile coax	Voice Data Video	Moderate, neighboring fiber & nodes	\$\$\$\$
DSL	1 – 20 Mbps	Some regional fiber	Voice Data Some video	High, existing fiber and last mile phone lines	\$\$\$
Wireless	Up to 54 Mbps	Towers Backhaul network	Voice Data Limited video	Moderate to low towers and spectrum	\$\$
Broadband over power lines (BPL)	Up to 200 Mbps	Regional fiber network Power grid replacement	Voice Data Limited video	Moderate, last mile and some fiber	\$\$\$

Need and Speed

- New content and functionality require more broadband every day (tele-medicine, educational programs, YouTube)

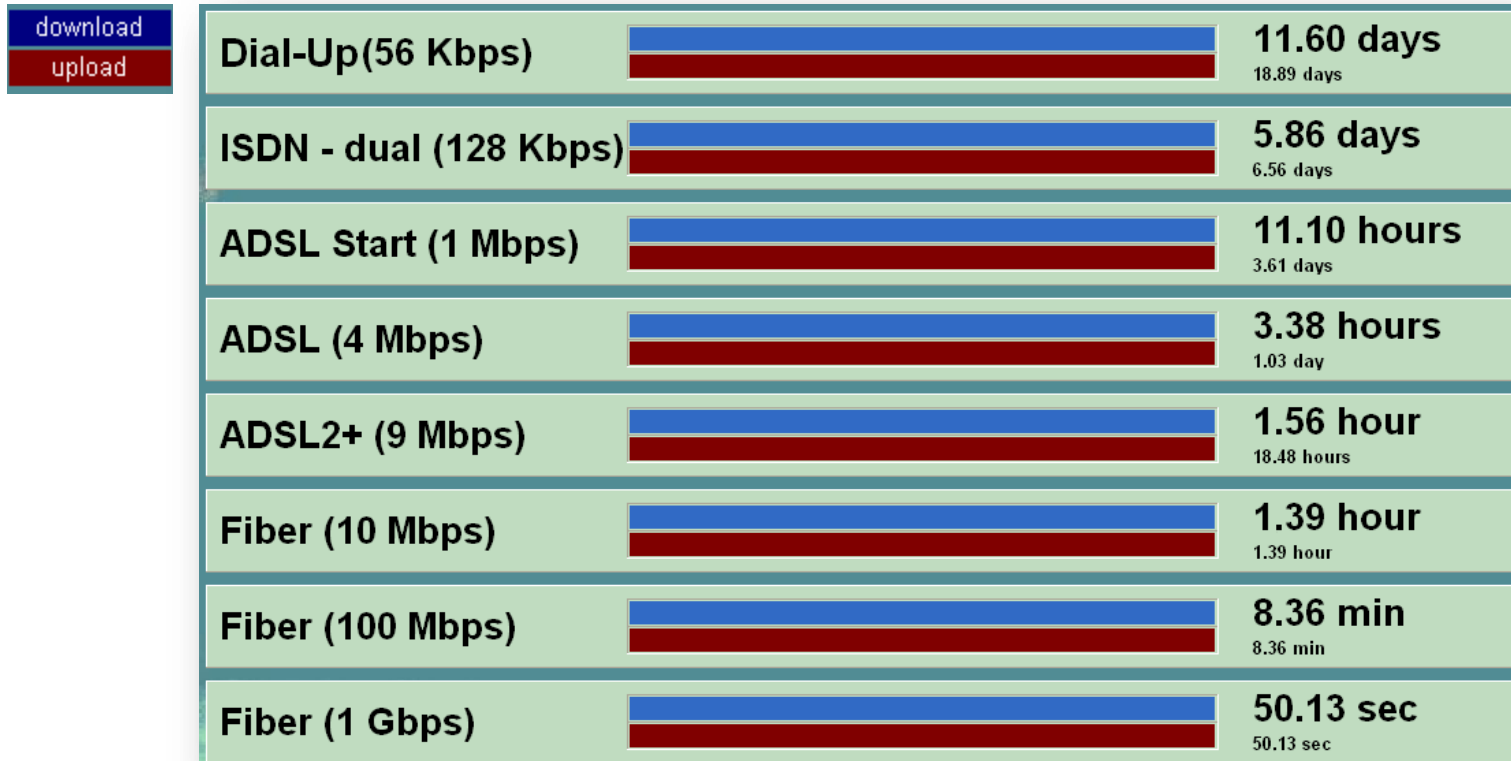


Need and Speed

Bandwidth	Illustrative Application	Technology
56 Kbps	Low quality streamlined audio	Dial-Up
200 Kbps	Former FCC definition of “high speed”	DSL Lite (256 Kbps)
1 Mbps	Streaming Video	Satellite, DSL, Cable
2.5 Mbps	High resolution neurological testing	DSL, Cable
4 Mbps	Standard TV	DSL, Cable
6 Mbps	Video Conferencing	DSL, Cable
20 Mbps	High Def TV	ADSL, Cable
100 Mbps	Most	Fiber

Need and Speed

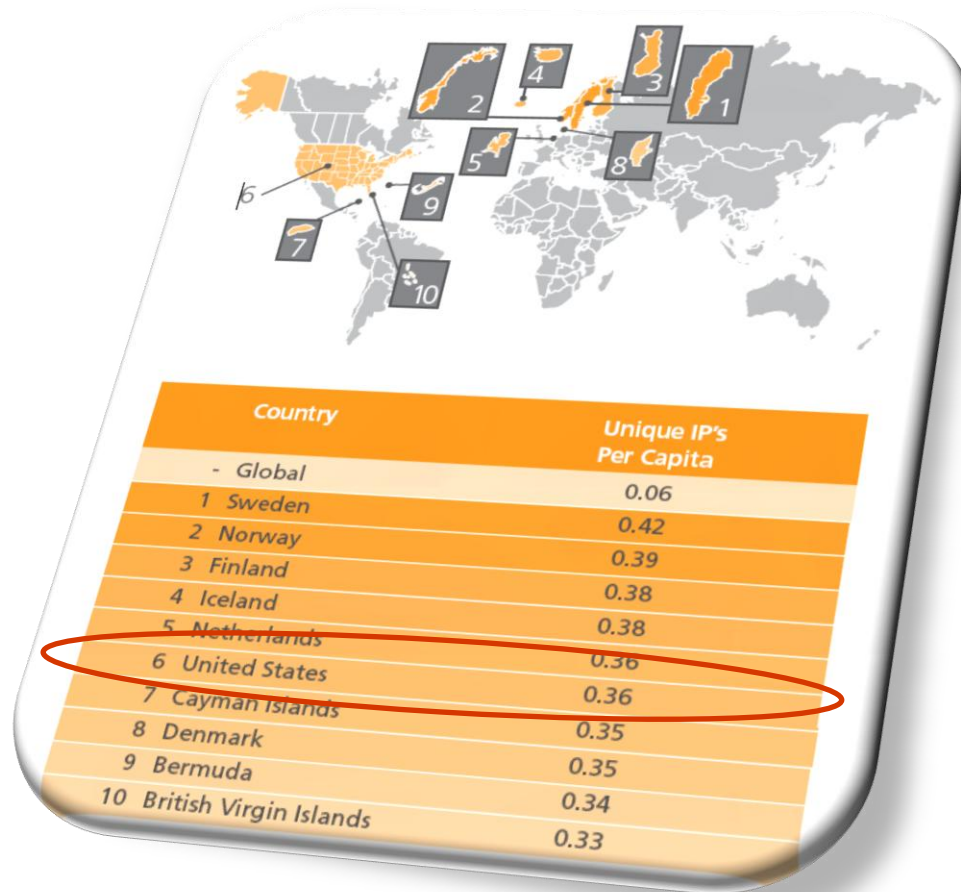
Downloading/Uploading 4.7GB DVD Movie



(US Mail – 1 to 4 Days)

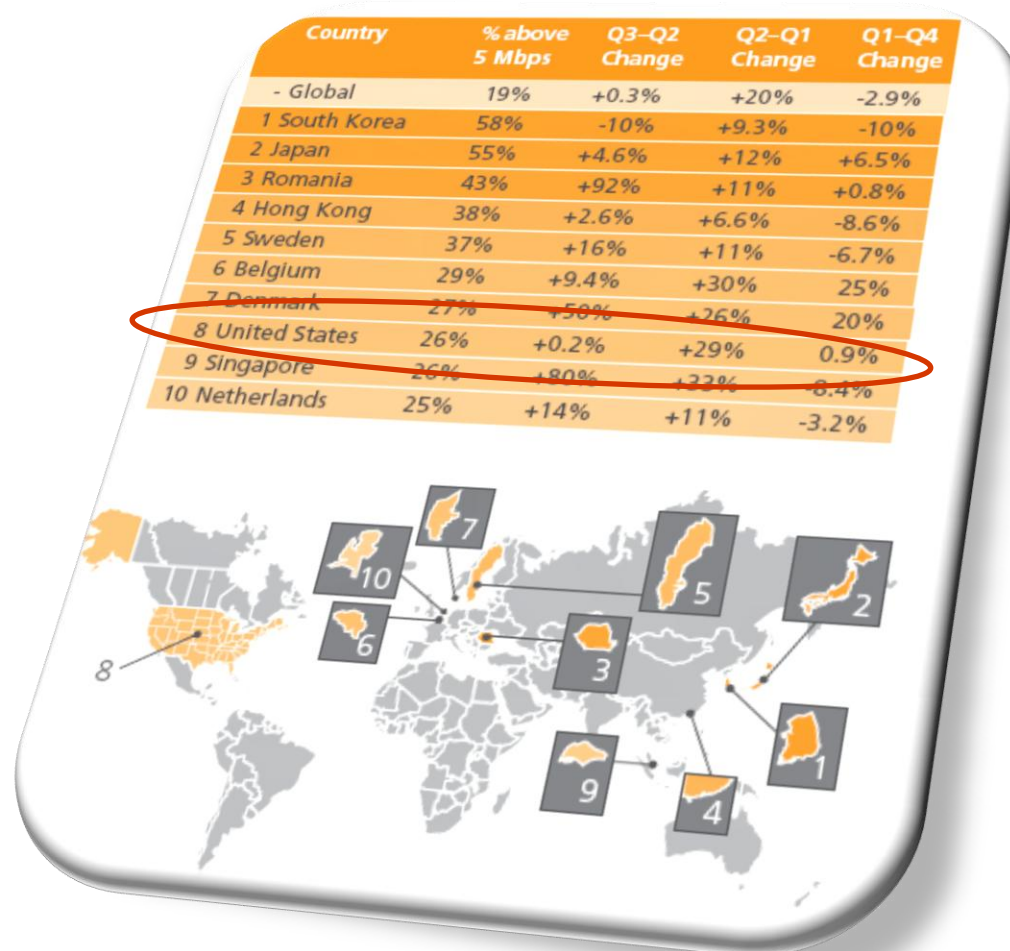
Rankings Around the World

Global Internet Penetration Ranking*



Rankings Around the World

Fastest International Countries*



Rankings Around the World

State Ranking in the US, 2008*

State	Median Download Speed (kbps)	Median Upload Speed (kbps)	Download Speed Ranking
Rhode Island	6,769	1,624	1
Delaware	6,685	1,483	2
New Jersey	5,825	1,149	3
Mississippi	1,567	340	43
Minnesota	1,566	512	44
Iowa	1,455	488	45
Alaska	814	246	51

Economic Impact

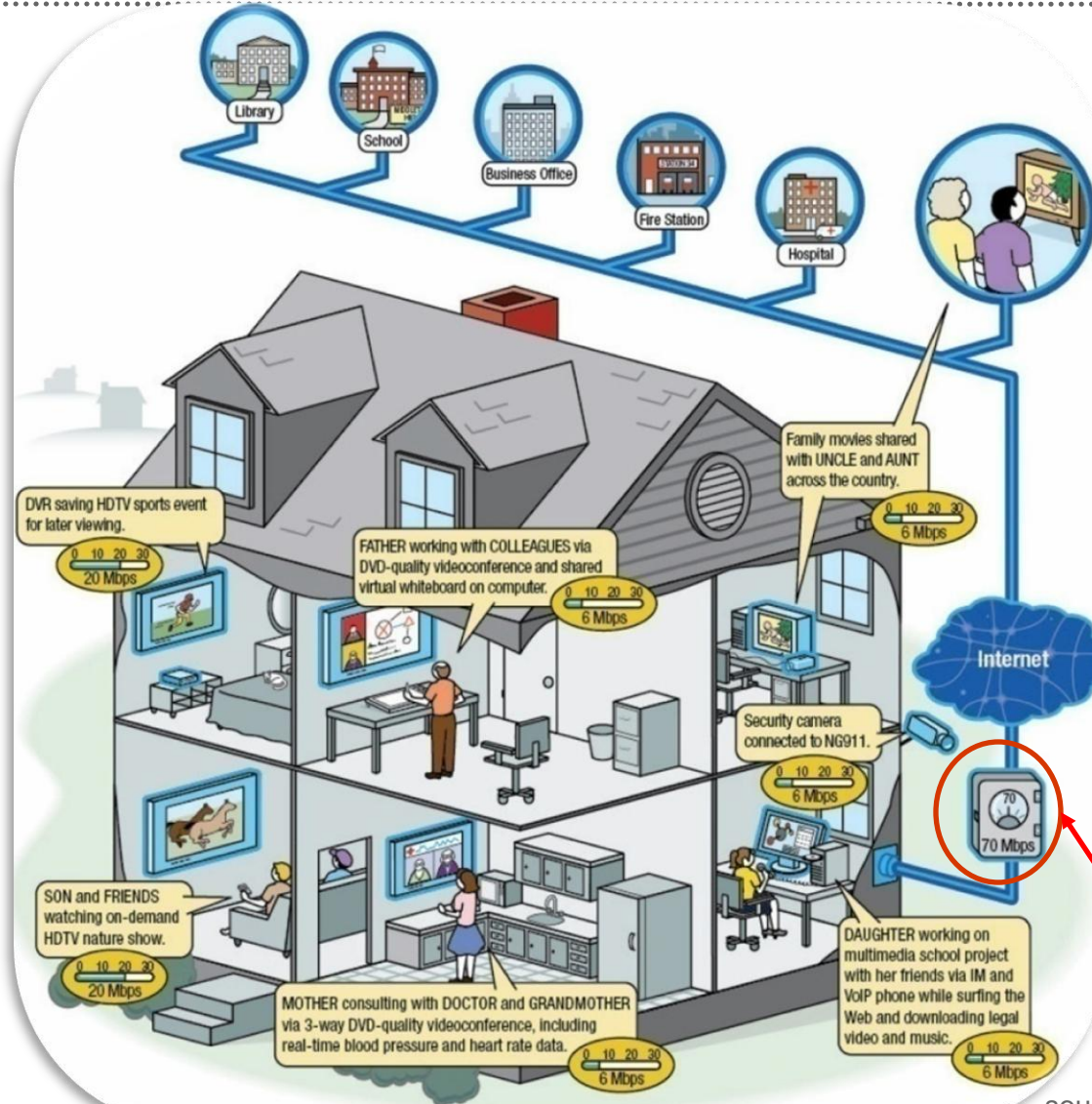
Economic Indicator	Technology
Employment (Jobs)	Broadband added about 1-1.4% to growth rate, 1998-2002.
Business Establishments (Proxy for Number of Firms)	Broadband added about 0.5 – 1.2% to growth rate, 1998-2002
Housing Rents (Proxy for property values)	More than 6% higher in 2000 in zip codes where broadband available by 1999
Industry Mix	<p>Broadband added about 0.3-0.6% to share of establishments in IT-intensive sectors, 1998-2002.</p> <p>Broadband reduced share of small (<10 employees) establishments by about 1.3-1.6% , 1998-2002.</p>

Current and Future Broadband Applications

- Education, Culture, & Entertainment
- Telecommuting
- Tele-health & Telemedicine
 - Remote specialized surgery
 - Remote house calls in rural areas
 - Tele-psychiatry: Sit on your own couch
- E-Government & Civic Participation
- Public Safety and Homeland Security
- Services for People with Disabilities
 - Telecommunications relay services
 - Video relay services



Current and Future Broadband Applications



70Mbps required
(avg. today: 2.3Mbps)

Broadband Task Force

- Established April 16, 2008
- Make recommendations to the governor and legislature
 - Creation of a state ultra high-speed broadband goal
 - A plan to implement the goal
 - Due **November 1, 2009**
- The report must include:
 - Level of broadband service, including speeds
 - Policies and actions necessary to achieve the goal
 - Opportunities for public/private sector cooperation
 - An evaluation of strategies, financing methods, and financial incentives
- Monthly meetings
 - Broadband related presentations
 - Panel discussions – Telco, healthcare, library, mapping, municipal & county
- Web site available – www.ultra-high-speed-org

