Broadband Stimulus for Health

National Broadband Plan
Health Workshop

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Rural Health Care Pilot Program
Symbology
Non-rural Facility
Rural Facility
National LambdaRail
Internet2 Network
Regional Networks
Planned Networks
National Capital
State Capital
City over 250,000
County
State / Territory
Alaska
Puerto Rico
Hawaii

Key Health Science Members

- **113 Academic Medical Colleges (AAMC) and their medical centers**
- **130 Health Science related colleges**
  - Public Health, Nursing, Dentistry, Pharmacy
- **Affiliate Members**
  - NIH, National Library of Medicine, VA, Dept. of State, NSF
  - Howard Hughes Medical Institute
- **Industry**
  - Cisco, IBM, Microsoft, Polycom, Lifesize
- Partnership with **Health Information Management Systems Society (HIMSS)**

Biotech Data's BIG BANG

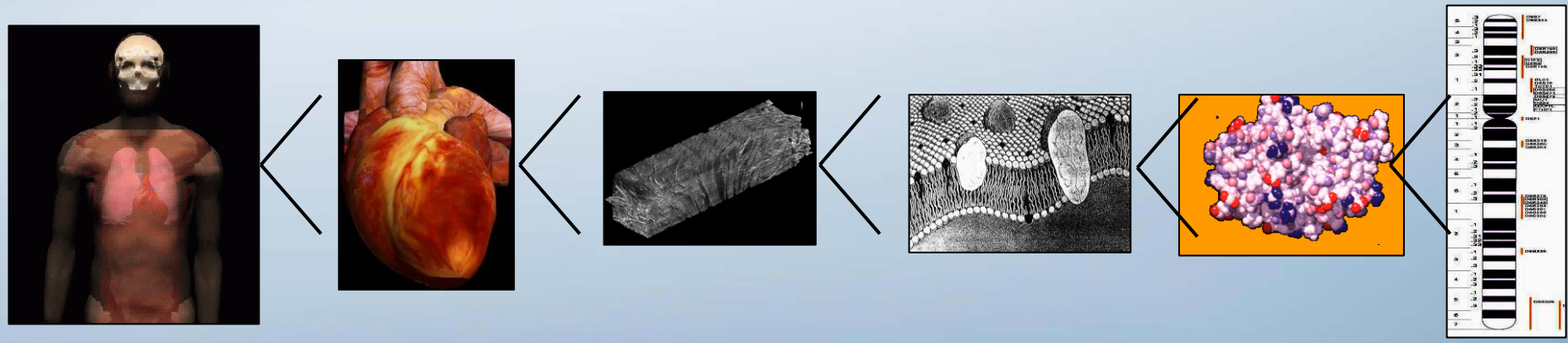
It's like Moore's Law on steroids:

The total volume of biological data worldwide, having doubled every 18 months in recent years, is now doubling every half a year to three months. And this isn't a momentary spike, but a long-term trend that may require new ways to measure, analyze and mine biological databases.

Chappell Brown

EE Times (04/25/2005)

Health Science's Grand Challenge



<Person-----Organ-----Tissue-----Cell-----Protein-----Atom>

(1m) (10^{-3}m) (10^{-6}m) (10^{-9}m) (10^{-12}m) (10^{-15}m)

Systems models **Continuum models (PDEs)** **ODEs** **Stochastic models** **Pathway models** **Gene networks**

Courtesy: Peter Hunter, University of Auckland

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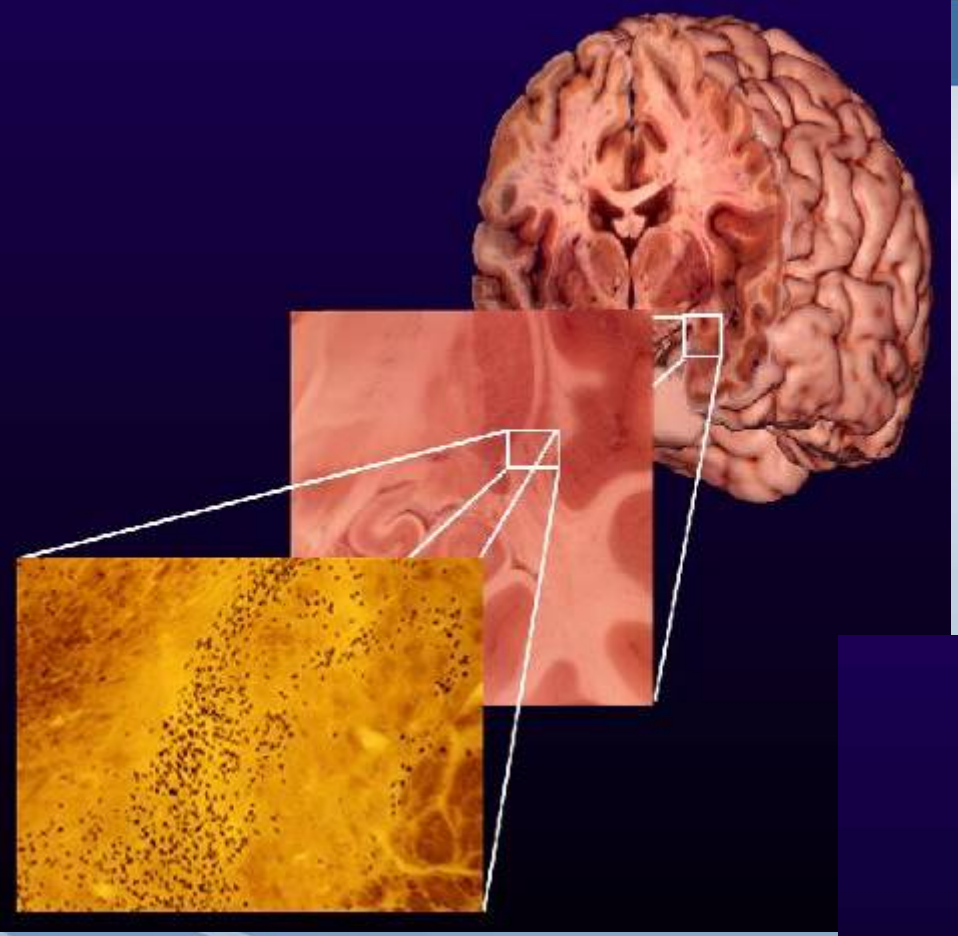

EACH BRAIN REPRESENTS A LOT OF DATA

Volume sizes by resolution - brain = 1500 cm^3

GB = Gigabyte = 10^9
TB = Terabyte = 10^{12}
PB = Petabyte = 10^{15}

Voxel size	B&W (1 B/p)	High res (2 B/p)	Color (3 B/p)
cm	1.5 KB	3 KB	4.5 KB
mm	1.5 MB	3 MB	4.5 MB
10 μm	1.5 TB	3 TB	4.5 TB
μm	1.5 PB	3 PB	4.5 PB

Comparisons must be made across several image sets

Slide courtesy of Arthur Toga (UCLA)

Theoretical Performance

	T1 (1.5Mb/sec)	1Gb/sec
Image Study (e.g., MRI, CT, PET) 500MB	1 Hour	5 Seconds

Realistic Performance of DICOM protocol coast-to-coast (RTT = 50ms)

	T1 (1.5Mb/sec)	1Gb/sec
Image Study (e.g., MRI, CT, PET) 500MB	10 Hours	50 Seconds

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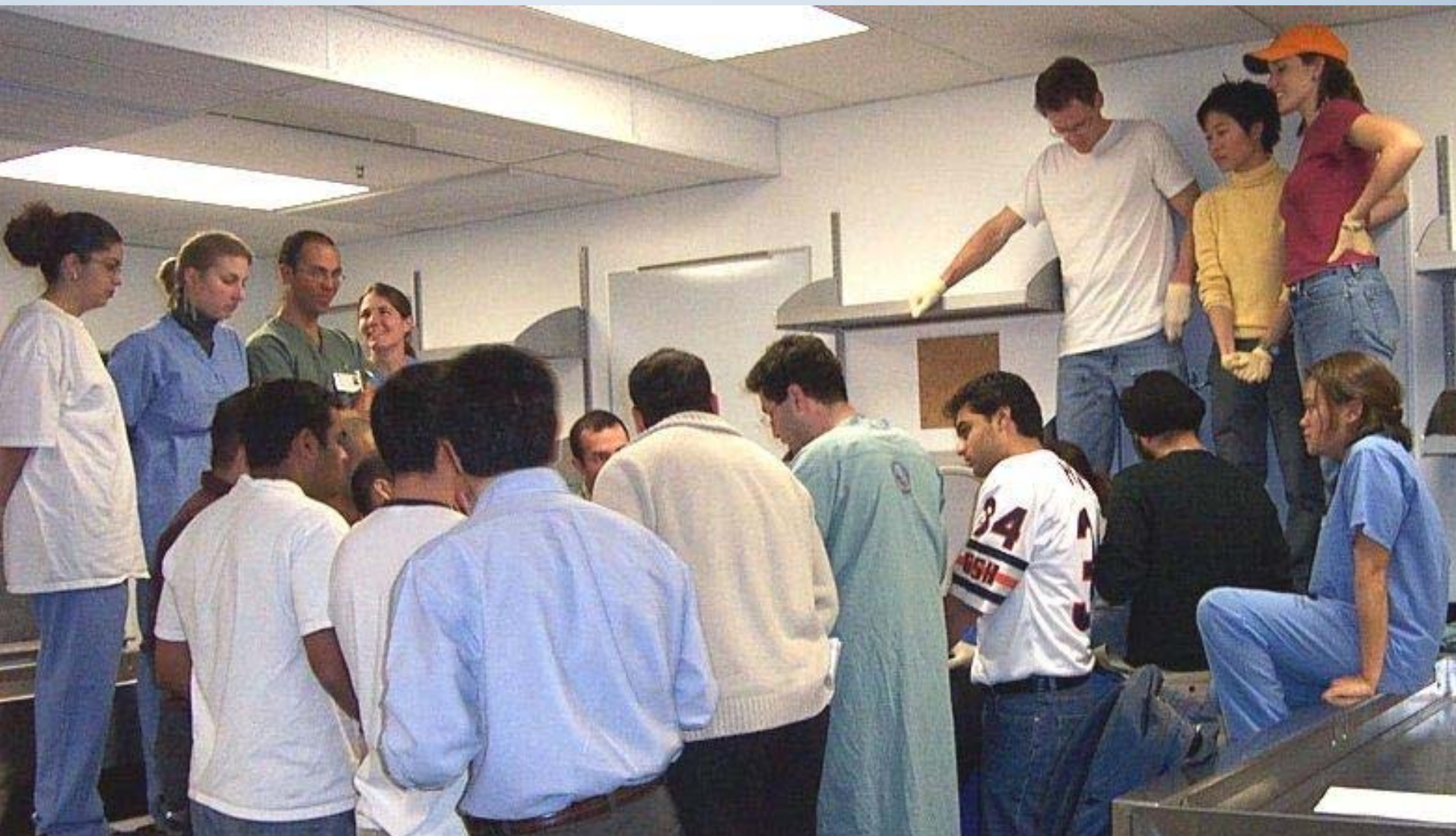
Traditional Medical Education



Telepresence Examples

Vendor	Bandwidth
Destiny	1.5-3.0 Mbps
MedPresence	4.5 Mbps
Cisco	6 Mbps per screen
Teliris	2 – 45 Mbps

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Nationwide Children's Hospital Nodes

	Bandwidth	Resolution	Frames/sec
Nationwide Children's Hospital	10Mb	720p	30
Adena Regional Medical Center	6Mb	720p	30
Genesis Health System	6Mb	720p	30
Mary Rutan Hospital	4Mb	720p	30

Our Vision:

- A nation-wide health network at first connecting
  - 6,170 hospitals
  - 3,781 rural clinics
  - 1,067 Federally qualified health centers
- Research, Medical Education & Clinical Care

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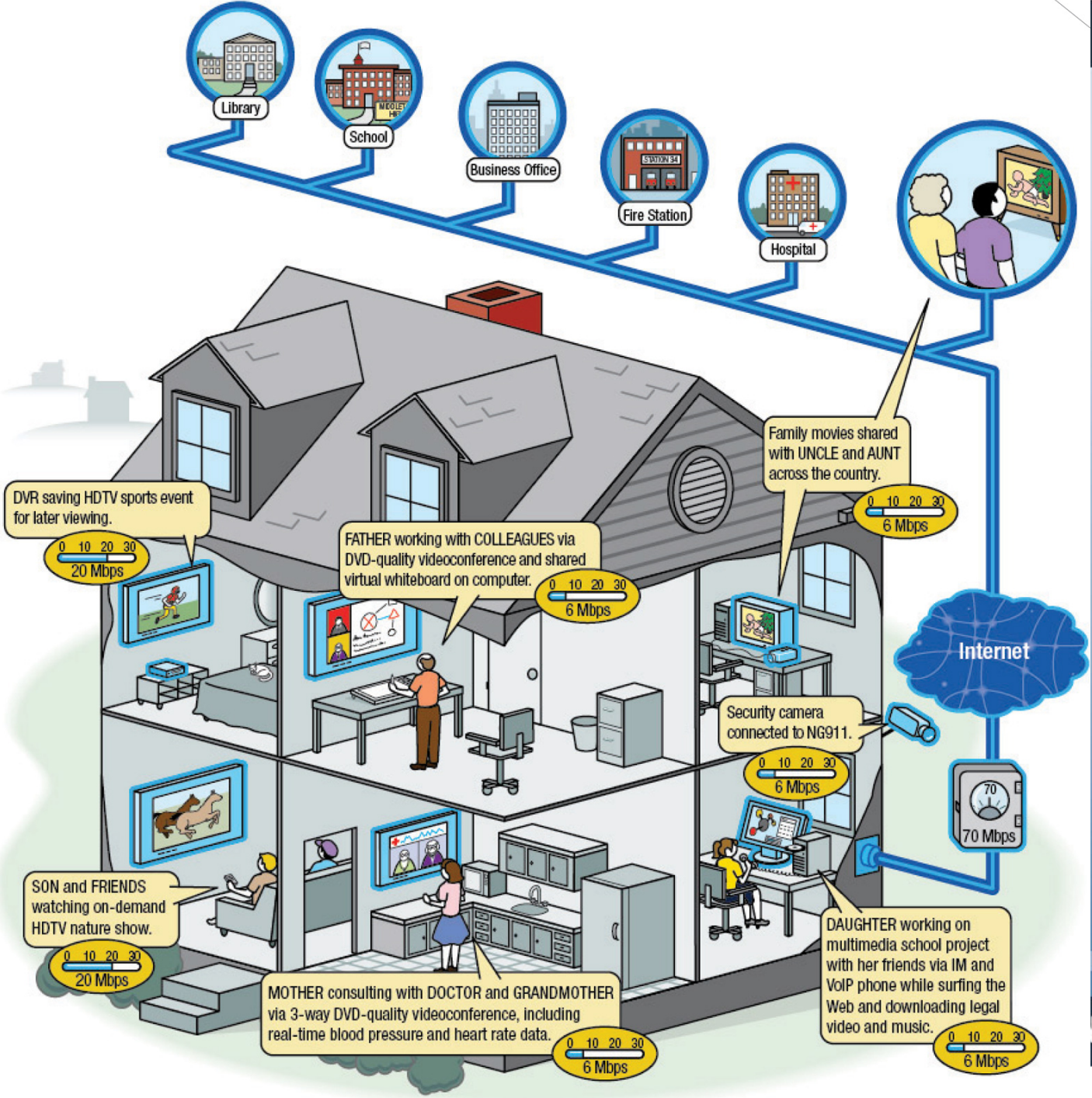
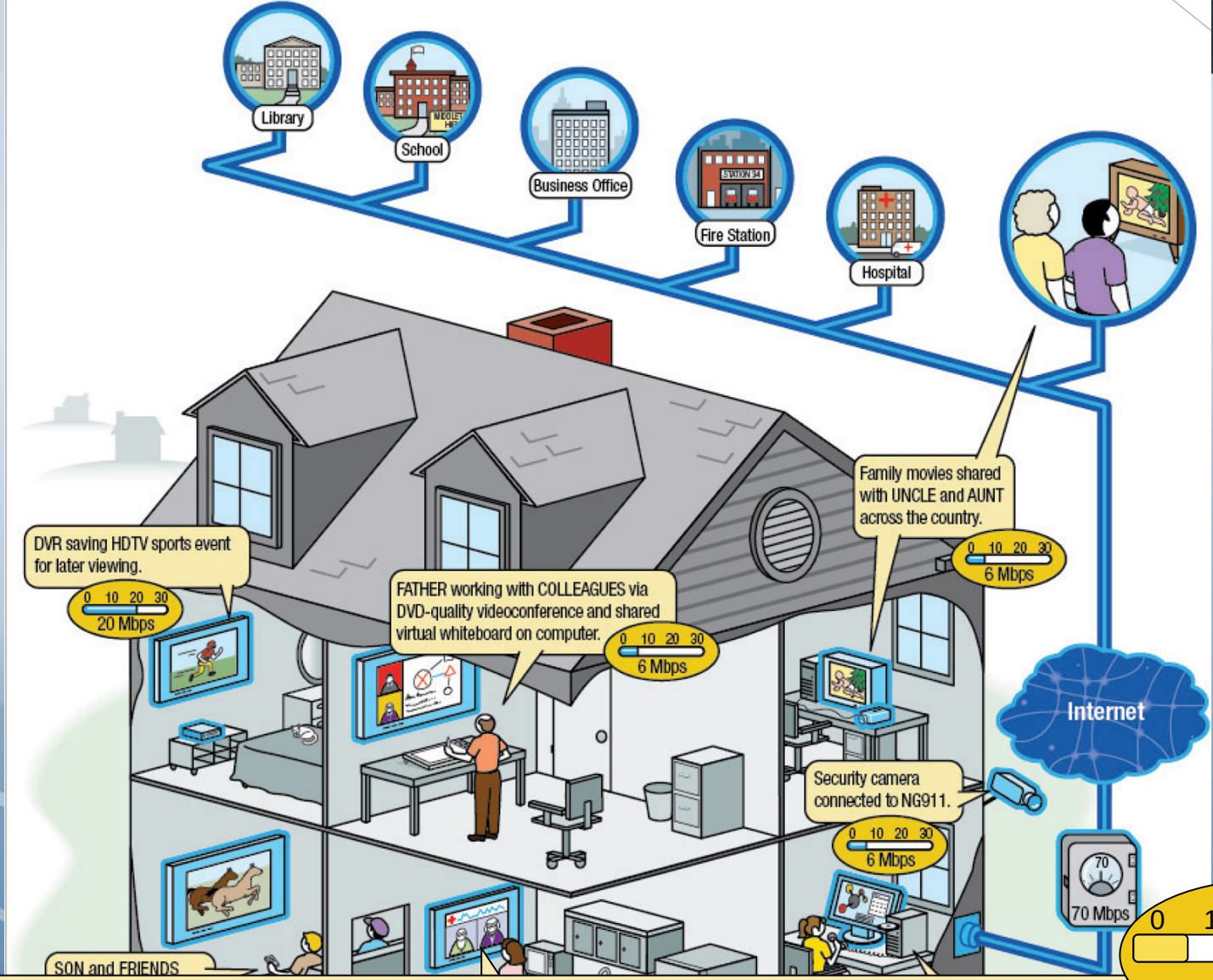

Library
School
Business Office
Fire Station
Hospital
Family movies shared with UNCLE and AUNT across the country.
0 10 20 30
6 Mbps
DVR saving HDTV sports event for later viewing.
0 10 20 30
20 Mbps
FATHER working with COLLEAGUES via DVD-quality videoconference and shared virtual whiteboard on computer.
0 10 20 30
6 Mbps
Internet
Security camera connected to NG911.
0 10 20 30
6 Mbps
70
70 Mbps
SON and FRIENDS watching on-demand HDTV nature show.
0 10 20 30
20 Mbps
MOTHER consulting with DOCTOR and GRANDMOTHER via 3-way DVD-quality videoconference, including real-time blood pressure and heart rate data.
0 10 20 30
6 Mbps
DAUGHTER working on multimedia school project with her friends via IM and VoIP phone while surfing the Web and downloading legal video and music.
0 10 20 30
6 Mbps



MOTHER consulting with DOCTOR and GRANDMOTHER via 3-way DVD-quality videoconferencing, Including real-time blood pressure and heart rate data

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