

Broadband

- Broadband is high speed internet connectivity
- Broadband defined by the FCC:
 - 4 Mb down
 - 1 Mb up
- FCC National Broadband Plan
 - 100 million homes with 100 Mb

Bandwidth

- **1 Mb** (Megabit) = 1024 Kb (Kilobits)
- **T1 Circuit** = 1.5 Mb
- **100 Mb** = typical Local Area Network (LAN)
- **OC3** (Optical Carrier level 3) = 84 T1's or 155.52 Mb
- **1 Gb** (Gigabit) = 1,000 Mb
 - (Also called GigE for Gigabit Ethernet)
- **10 Gb** = OC192 or ~ 10,000Mb

How fast is fast?

- A regular feature length movie in Standard Definition format is 1 to 1.5 Gb.
- Downloading (Not streaming) 1 Gb takes:



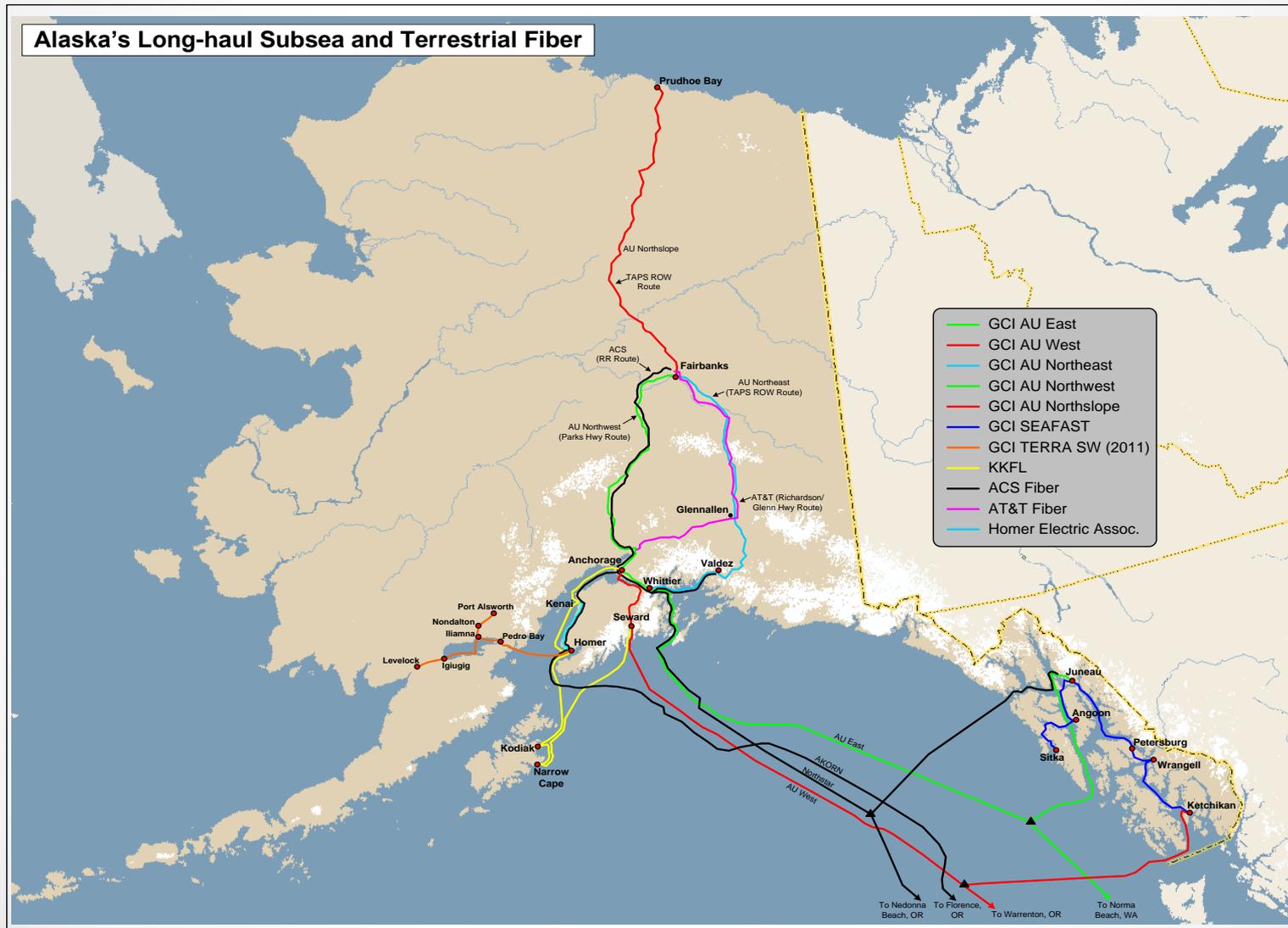
56Kb	41 hours
1 Mb	2.2 hours
T1	1.5 hours
4 Mb	33 minutes
10 Mb	13 minutes
100 Mb	1.37 minutes
OC3	52 seconds
OC192	0.8 seconds

Three Modes of Connectivity



- **Terrestrial Cable**
 - Primarily fiber optic
- **Terrestrial Wireless**
 - Microwave
 - WiMAX/WiFi/cellular
- **Satellite**
 - Transport by carrier
 - Direct to the doorstep

Alaska Fiber Cables



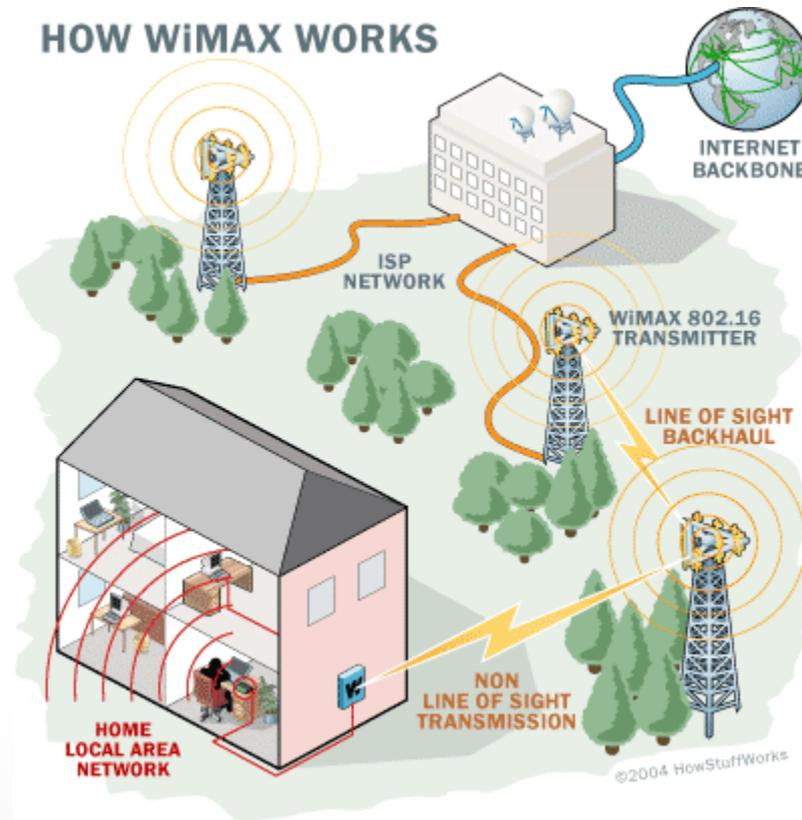
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WiMAX

(Worldwide Interoperability for Microwave Access)



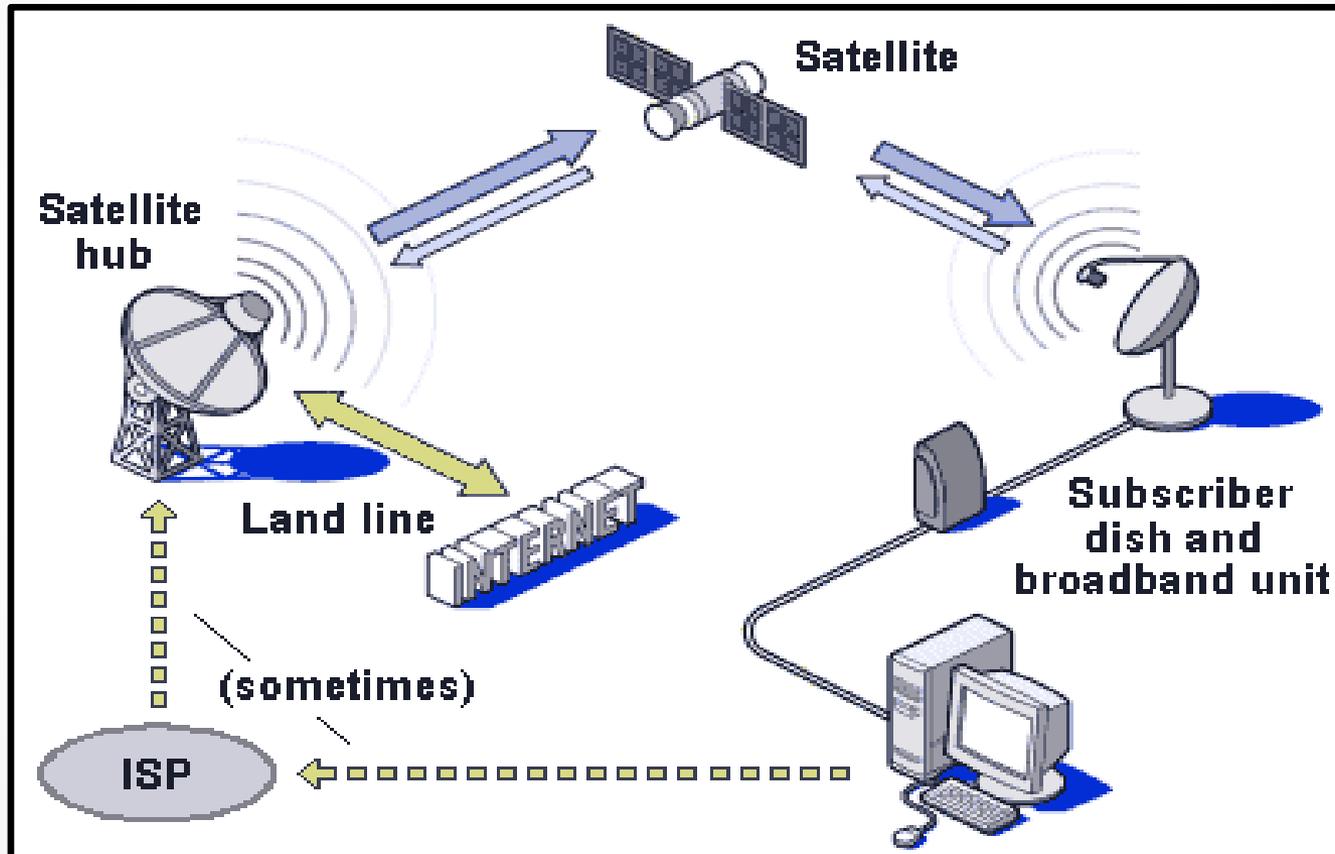
Three Modes of Connectivity



Chicken, Alaska

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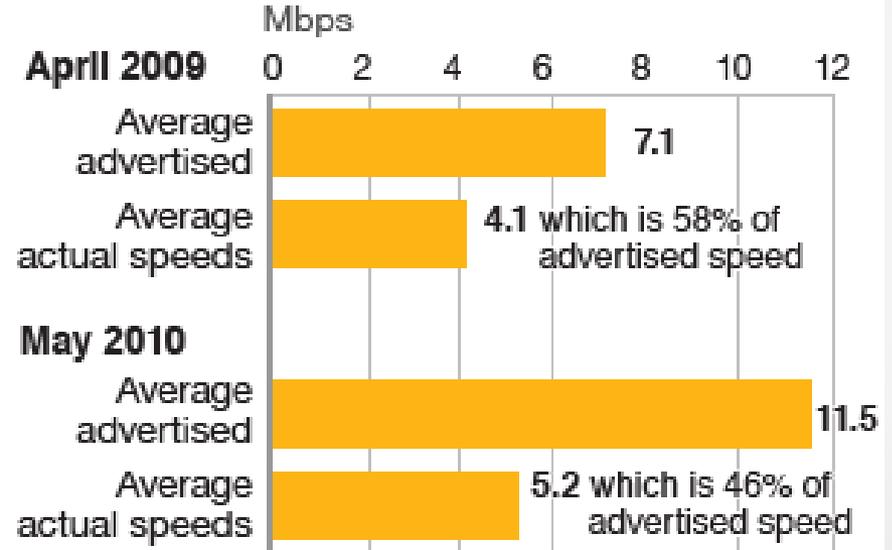
Satellite Internet



Advertised vs. Actual Speed

- Latency
- Shared Bandwidth
- Network Congestion
- Slowest Link
- Quality of Service

Increasing gap between advertised and actual speeds

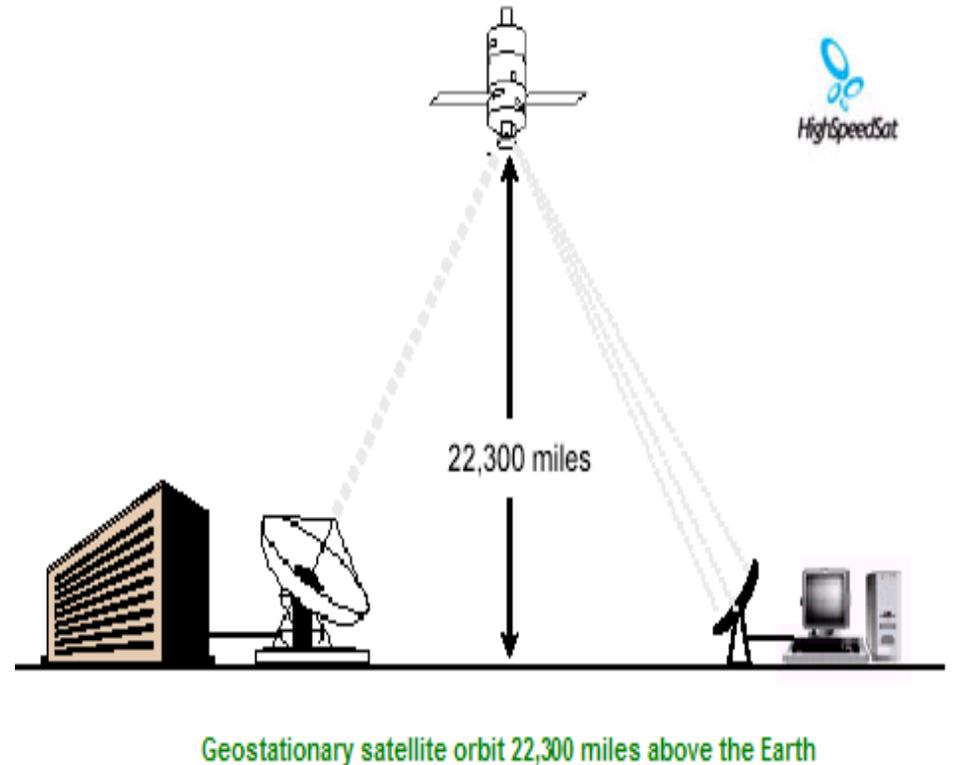


Source: Ofcom

Latency

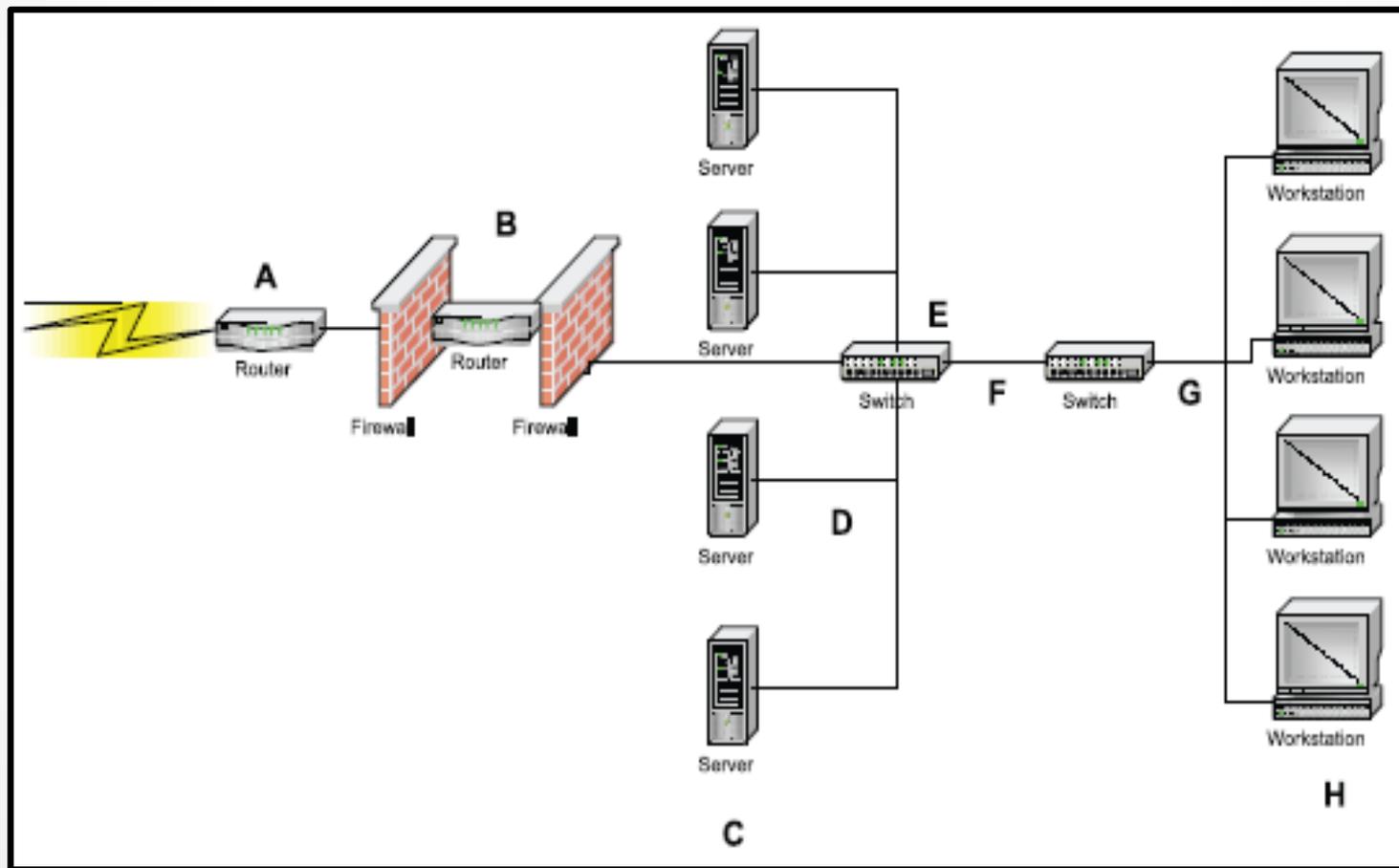
A measure of time delay

- How long to travel between two points?
- Measured in Milliseconds for networks
- Higher Latency: Slower Response
- Greater impact on synchronous use like video conferencing

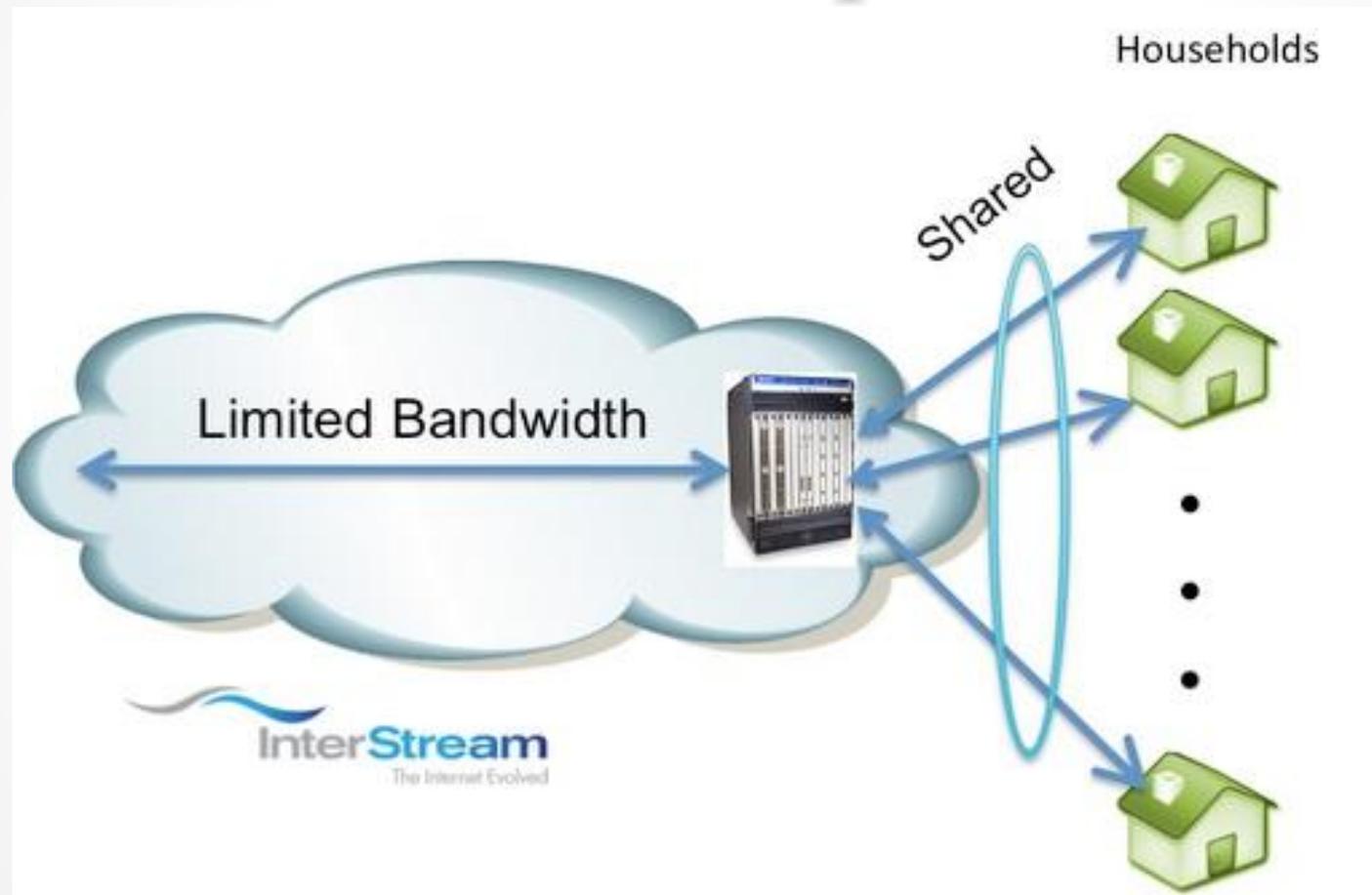


Latency: Many Sources

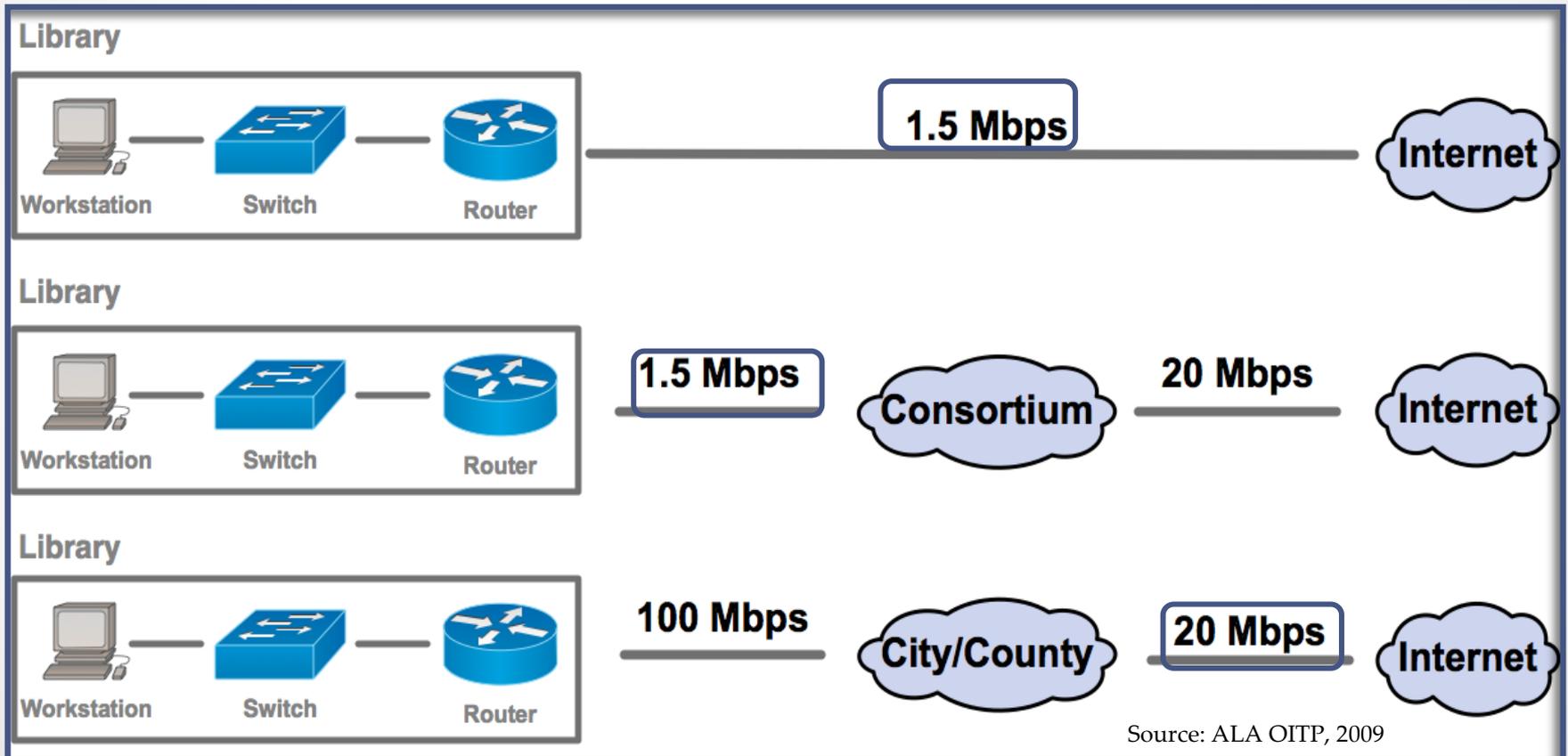
A to H : All sources of latency



Shared Bandwidth Impacts Actual Speed



Smallest Connection Dictates Maximum Bandwidth Available



Challenges to Broadband in Alaska

High capital and operation costs for rural Alaska

Low population density

Confusing regulatory environment

No sustainable business case

Satellite dominant for large areas of the state

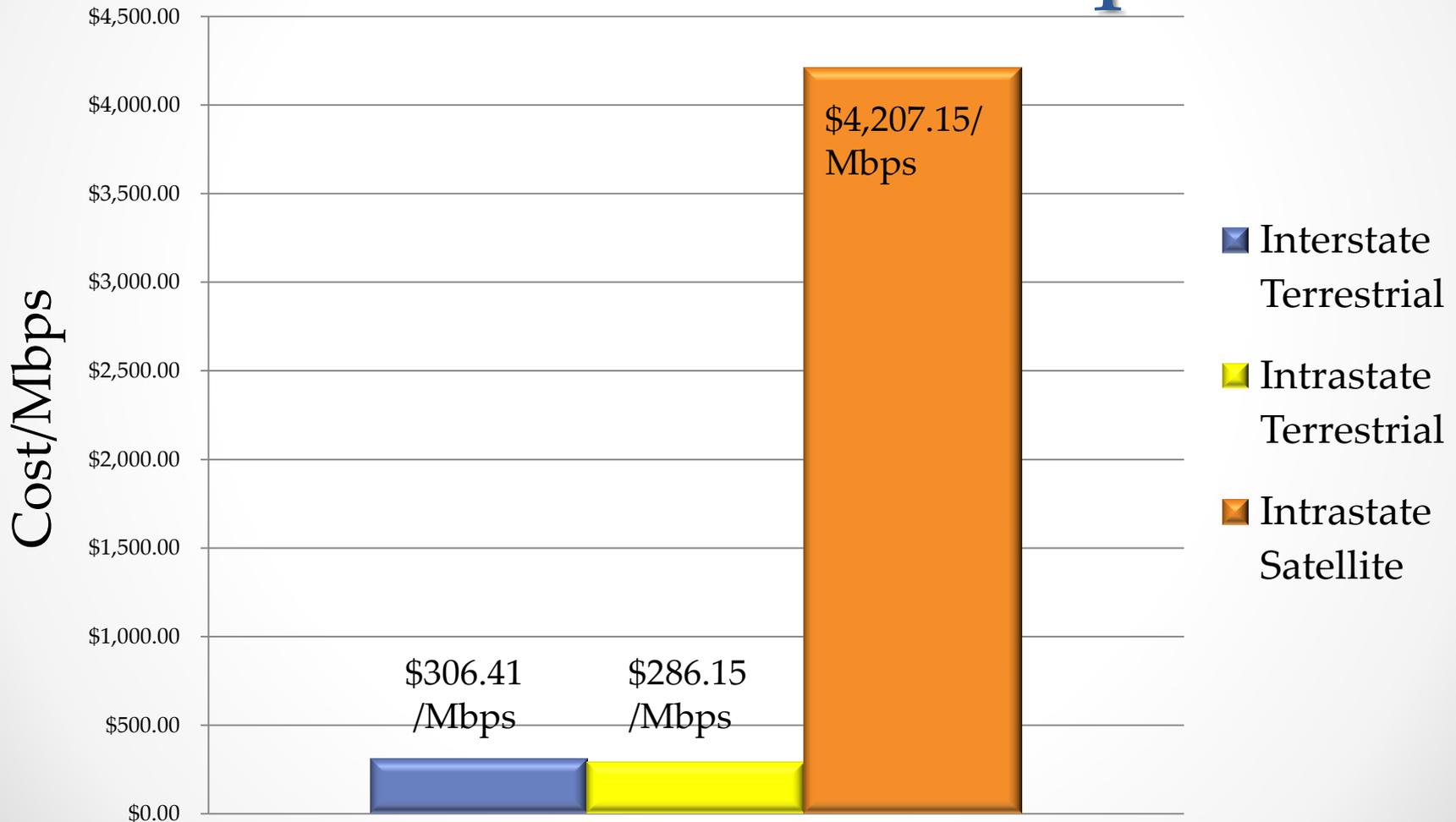
Median Residential Cost (Mbps) of Internet in Alaska

- Alaska Cost : \$ 16.77 (51 of 51)
- Average USA Cost: \$ 6.13

Data from Ookla, October, 2010

Mbps = Mb per second

UA Network Cost/Month/Mbps



The Future Is Here



Chattanooga's Fiber Network is America's:

FASTEST

delivering **150 megabits** continuous and symmetrical as a **standard consumer option** with 1 gigabit speeds coming before year end.

MOST COMPREHENSIVE

reaching all 170,000 homes and businesses in a 600 square mile area that includes a diverse population of 300,000 people.

SMARTEST SMART GRID

providing unprecedented amounts of real-time usage data, 1,500 smart switches to reduce outages and smart meters on every home, business and school.