Broadband over Power Line:
U.S. Innovation Driving Economic Growth

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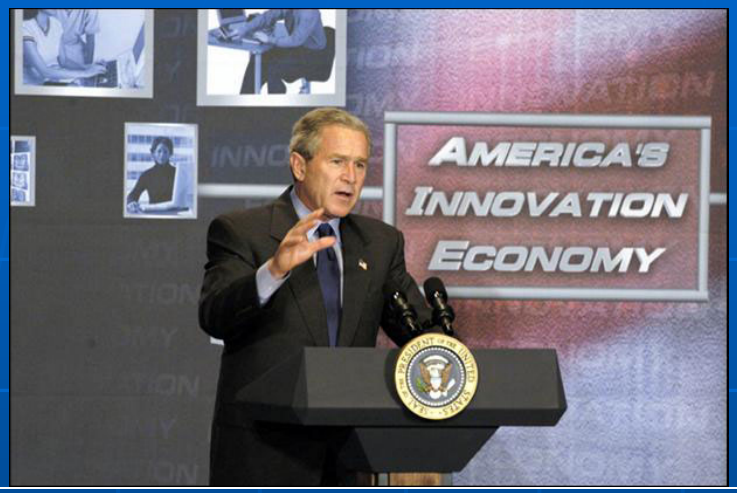
The President's Broadband Vision



President Bush speaking at the U.S. Department of Commerce on June 24, 2004.

"This country needs a national goal for broadband technology . . . universal, affordable access for broadband technology by 2007."

– President George W. Bush, Albuquerque, NM, March 26, 2004

Government's Role

"The role of government is not to create wealth; the role of our government is to create an environment in which the entrepreneur can flourish, in which minds can expand, in which technologies can reach new frontiers."

– President George W. Bush, Technology Agenda, November, 2002

Overarching Goal:
Promoting Economic Growth

Thanks to the President's policies, America's economy is strong:

- GDP grew 3.3% in 2Q05 and 3.6% during the past 4 quarters, above the averages of the past 3 decades. During the past 4 quarters, EU25 GDP grew 1.3% and euro-zone GDP grew 1.2%.
- The economy has shown job growth for 27 straight months and added nearly 4.2 million new jobs since May 2003 – more than Canada, France, Germany, Great Britain, and Japan combined.
- Over the past four years, productivity grew at its fastest 4-year rate in over 50 years.
- 169,000 new jobs added in August – the U.S. unemployment rate is 4.9%, while the EU25 unemployment rate is 8.8%.
- Manufacturing activity (ISM index) has been growing for 27 straight months – the longest period of growth in 16 years.
- National homeownership is 68.8%, near its record high of 69.2% in 4Q04.

Benefits of Broadband

"[B]roadband will not only help industry, it'll help the quality of life of our citizens."

— President George W. Bush, US Department of Commerce, June 24, 2004

- Tele-Medicine
- Distance Learning
- Tele-Work
- National Security
- Jobs and Economic Growth

Creating Economic Conditions For Broadband Deployment

Tax relief has given businesses powerful incentives to invest in broadband technology:

- Accelerated depreciation for capital-intensive equipment.
- Extension of the Internet tax moratorium until Oct. 31, 2007; support making it permanent.
- An 18-month extension of the research and experimentation tax credit; support making it permanent.
- President's FY 2006 budget requests a record $132 billion for research and development.

"We ought not to tax access to broadband. If you want something to flourish, don't tax it."

- President George W. Bush in Baltimore, Maryland on April 27, 2004.

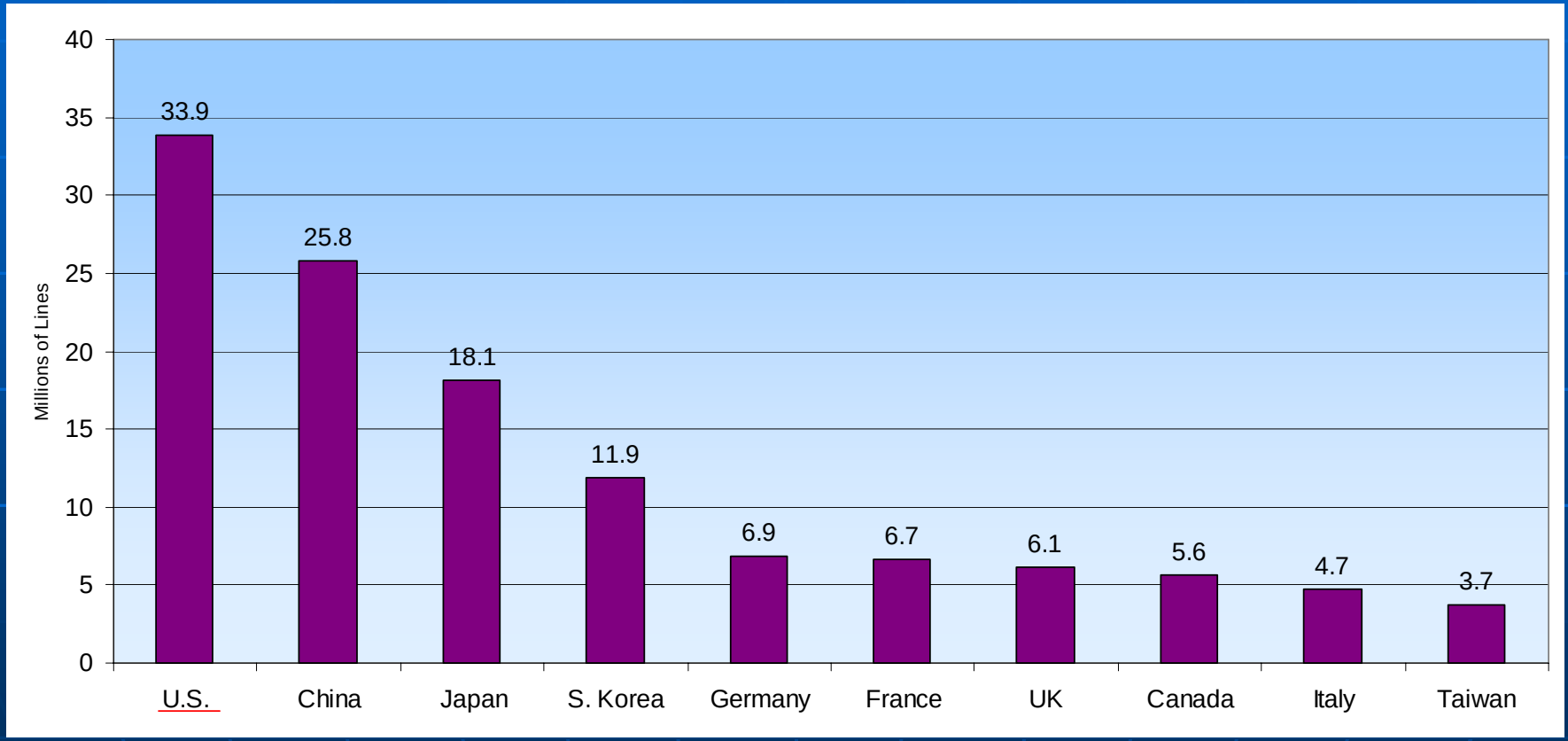
Creating Economic Conditions For Broadband Deployment (cont'd)

Reducing legacy regulation of broadband services:

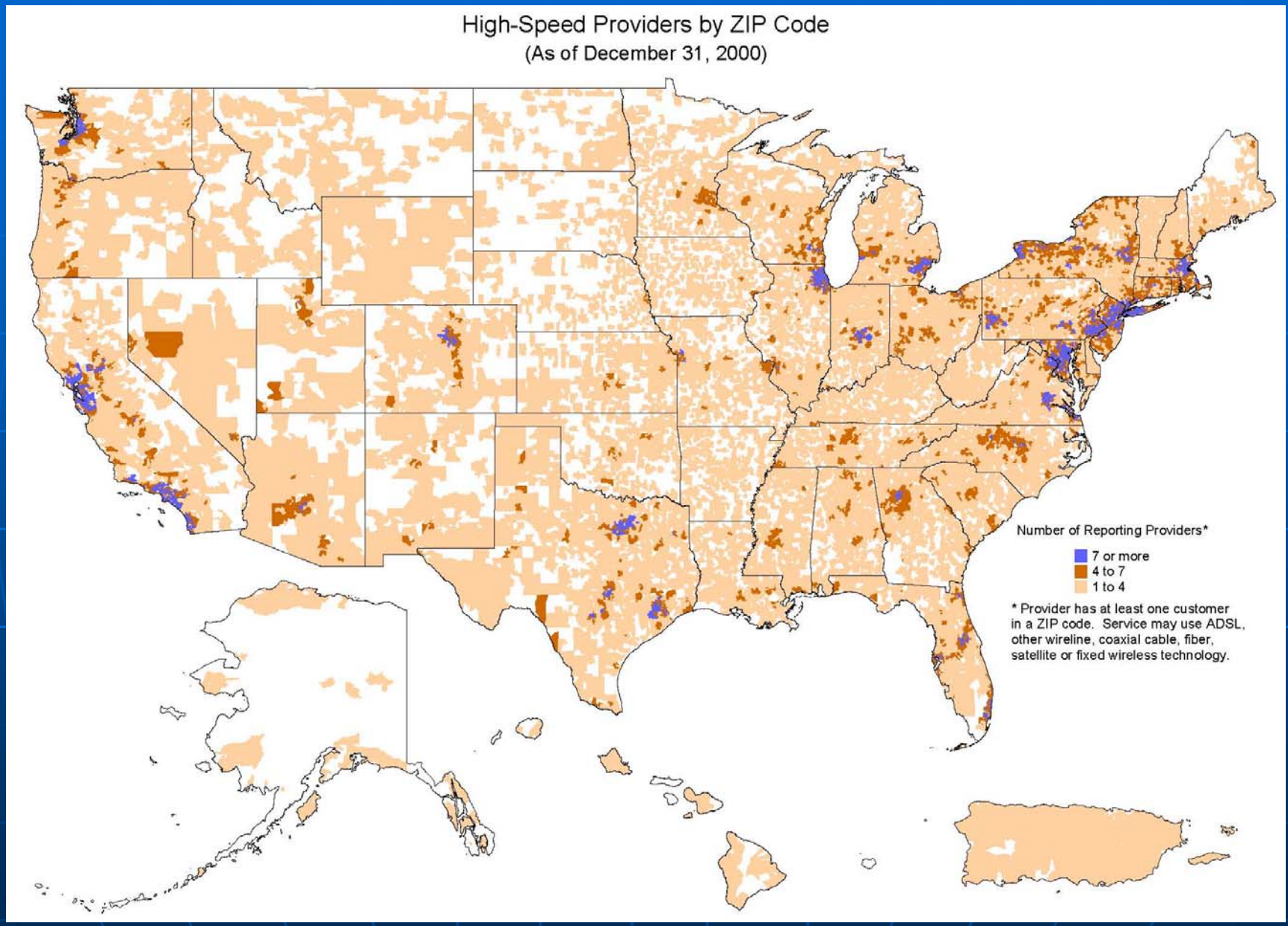
- The Administration supports the FCC's order freeing newly deployed broadband infrastructure from legacy regulation.
- The Administration also supported policies that will ensure that VoIP is free from unnecessary economic regulation, while mindful of the importance of law enforcement and emergency services.
- Spurred by the President's Executive Memorandum, the Administration instituted reforms in April 2004 in rights-of-way management across federal lands, including standardizing applications, speeding decisions, and setting reasonable fees.

Largest Broadband Markets in the World

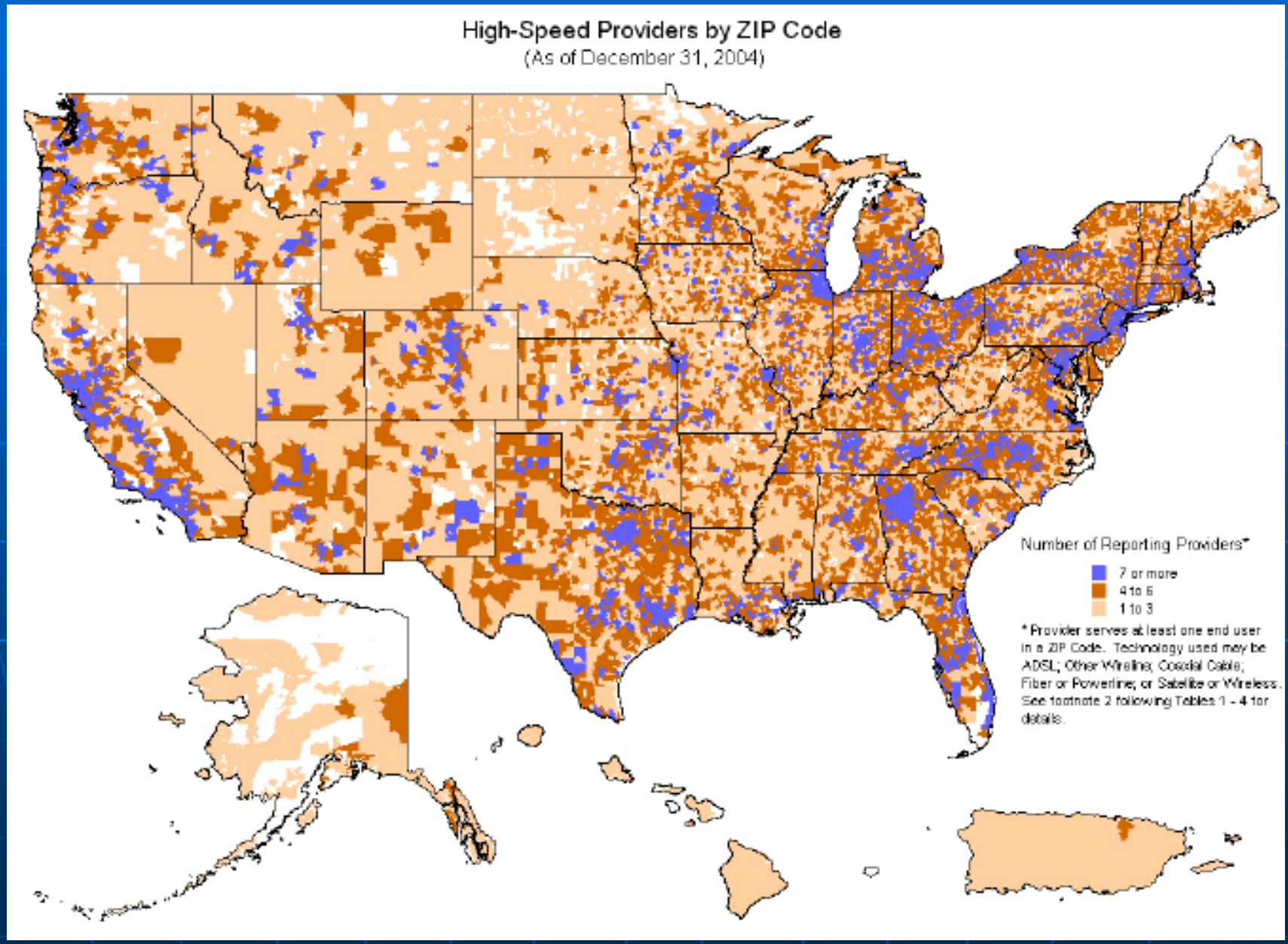
Top Ten by Number of Broadband Lines



Source: Point Topic, June 30, 2004 – December 31, 2004

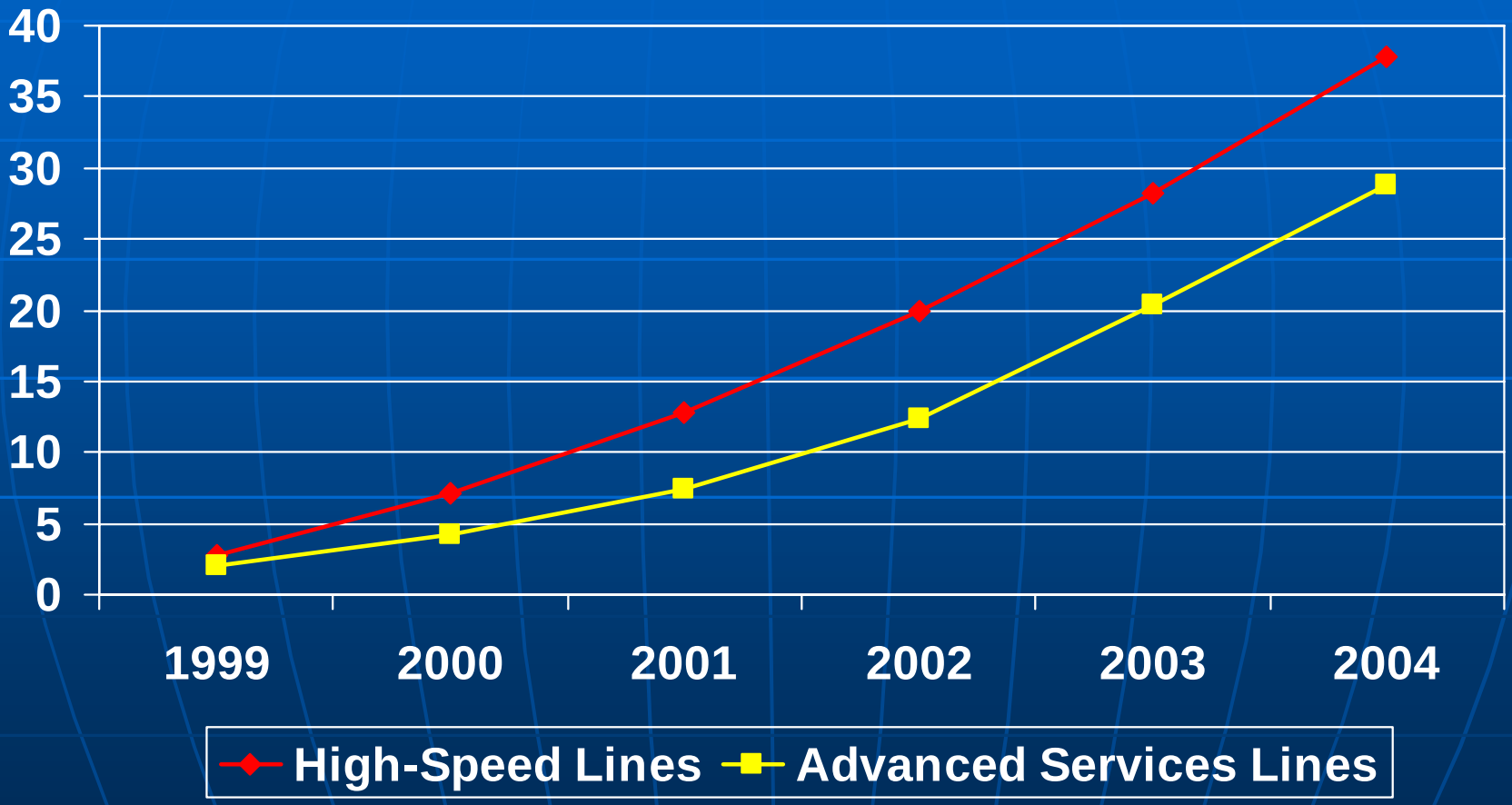

High-Speed Providers by ZIP Code
(As of December 31, 2000)
Number of Reporting Providers*
7 or more
4 to 7
1 to 4
* Provider has at least one customer in a ZIP code. Service may use ADSL, other wireline, coaxial cable, fiber, satellite or fixed wireless technology.

Source: FCC

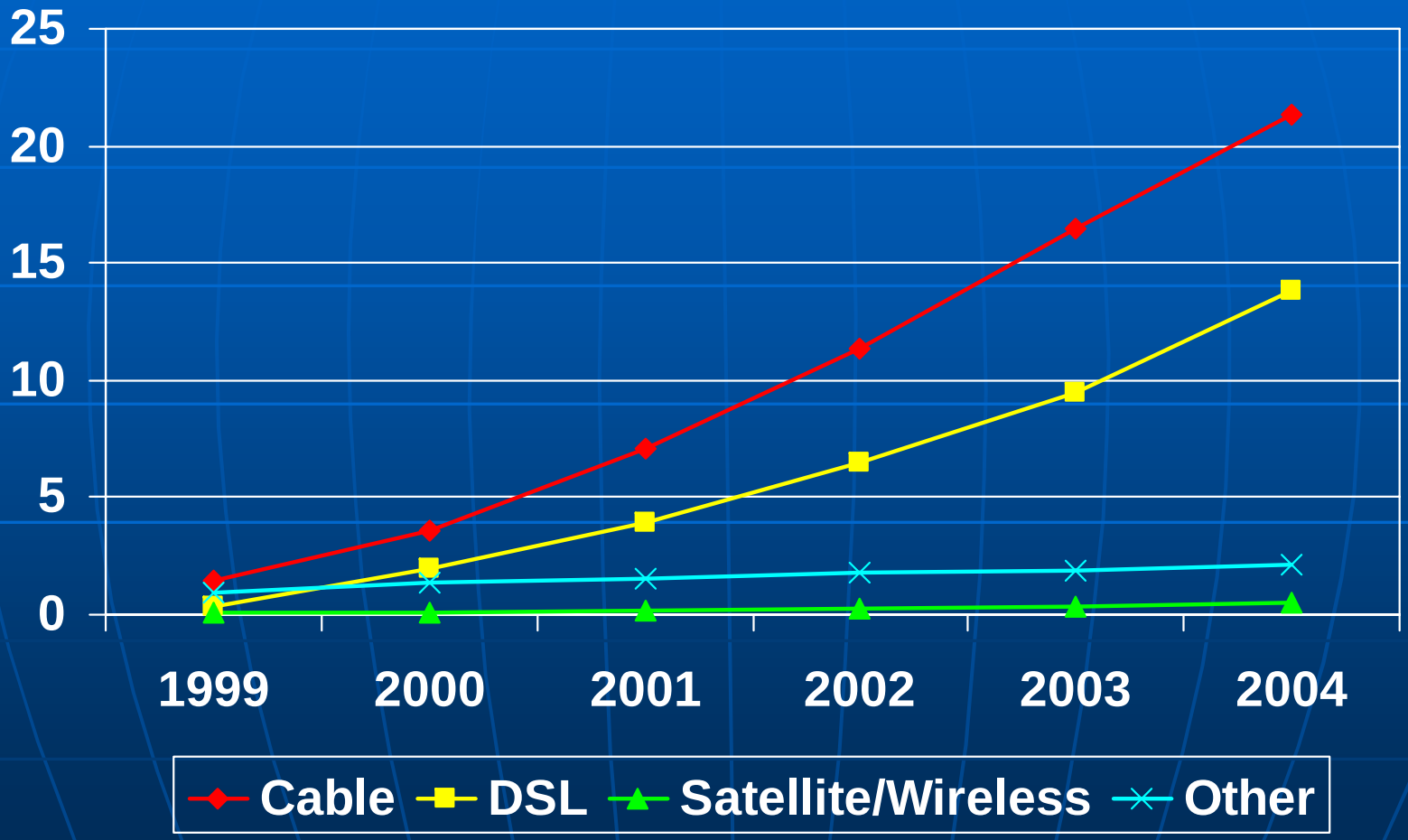

High-Speed Providers by ZIP Code
(As of December 31, 2004)
Number of Reporting Providers*
7 or more
4 to 6
1 to 3
* Provider serves at least one end user in a ZIP Code. Technology used may be ADSL; Other Wireline; Coaxial Cable; Fiber or Powerline; or Satellite or Wireless. See footnote 2 following Tables 1 - 4 for details.

Source: FCC

Growth in Broadband Lines 1999-2004



Types of Broadband Lines 1999-2004



Broadband Over Power Lines:
Enabling the Third Wire

"We need to get broadband to more Americans . . . one great opportunity is to spread broadband throughout America via our power lines."

— President George W. Bush, US Department of Commerce, June 24, 2004

- The FCC began a BPL rulemaking on February 12, 2004.
- Principal concern was the risk that BPL systems might interfere with licensed radio communications.
- BPL system deployment allowed under the Commission's existing Part 15 rules
- Asked what frequencies are preferred for BPL
- Sought comments on potential interference from BPL systems to radio communications
- Requested comments on compliance measurement procedures

HomePlug Modem can turn an electrical outlet into an Internet connection.

Broadband Over Power Lines:
Enabling the Third Wire

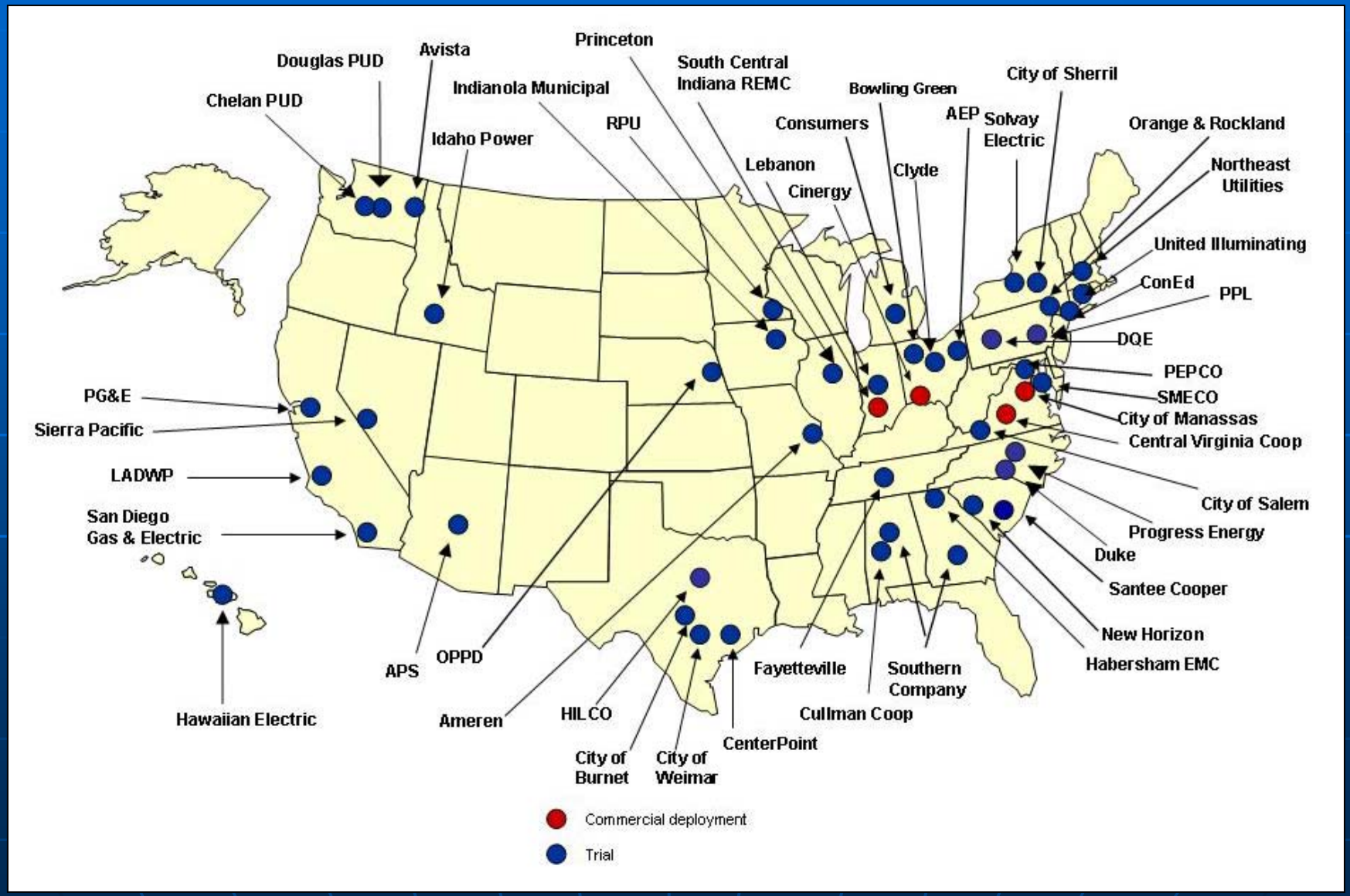
- NTIA submitted to the FCC a Phase 1 study that defined interference risks and potential mitigations (April 2004).
- Based on additional analyses, NTIA recommended several supplements to the FCC proposed BPL rules to reduce risk of BPL interference (June 2004).
- The FCC adopted rules incorporating most NTIA recommendations on October 14, 2004.
- NTIA Phase 2 study evaluating effectiveness of newly adopted rules in reducing the risk of BPL interference is nearing completion.
- Today, many utilities, hotel operators and others are deploying experimental and operational BPL systems.

NTIA Radio Spectrum Measurement System

Rules Adopted by the FCC Protect Federal and Non-Federal Spectrum Users

- BPL industry to establish database with information needed for interference identification and resolution.
- BPL providers are required to employ adaptive interference mitigation techniques (e.g., frequency avoidance).
- BPL systems:
  - Must incorporate capabilities to modify their operations to “notch out” any specific frequency. Minimum depth of frequency notches: 20 dB below 30 MHz and 10 dB above 30 MHz.
  - Are required to avoid operating in 74.8-75.2 MHz aeronautical frequencies.
  - Must have remote shutdown capability.
  - Are authorized under the FCC’s certification procedures.
- Aeronautical receive station consultation areas have been established.
- Procedures established for advanced consultation and notification for safety-of-life and public safety operations.
- Radio astronomy and U.S. Coast Guard maritime public coast receive station exclusion zones have been established.
- Certification measurement procedures enhanced to accurately characterize emissions from BPL systems.

Broadband Over Power Lines:
Current Deployments



Source: UPLC, Sept. 2005

Broadband Over Power Lines:
Current Deployments

Deployment	Location	Details
Arizona Public Service – Mitsubishi	Cottonwood, AZ	technical trial
Ameren - Main.net	Cape Girardeau, MO	500 homes passed/70 end users
AEP – Amperion	Dublin, OH	132 homes passed/2 end users
CenterPoint Energy – Mitsubishi/Amperion	Houston, TX	BPL pilot + technology center for utility apps.
Central Virginia Electric Cooperative – IBEC	Nelson County, VA	4000 homes
Cinergy – Current Technologies	Cincinnati, OH	commercial deployment to 50,000 homes passed
City of Manassas – Main.net	Mannassas, VA	City-wide deployment to reach 20,000 end users
City of Solvay, NY – New Visions	Solvay, NY	Commercial deployment; government funding from State of NY
ConEdison – Ambient	Briarcliffe Manor, NY	1st trial in US
Consumers Energy – Shpigler Group	Grand Ledge, MI	commercial deployment to 1000 homes passed
Cullman Electric Cooperative – IBEC	Cullman, AL	rural trial
Duke – Main.net	Charlotte, NC	ramping up to 15,000 users
Duquesne – Amperion	Pittsburg, PA	newest BPL deployment
HECO --Current Technologies	Honolulu, HI	100 home trial
Hilco Elec. Coop – Amperion	Glen Heights, TX	100 home development
IdaComm – Amperion	Boise, ID	25 end users
City of Salem, VA -- Amperion	Salem, VA	10 subs, 100 homes passed
PEPCO – Current Technologies	Potomac, MD	115 subs
PPL – Main.net/Amperion	Allentown, PA	17,000 homes passed
San Diego Gas & Electric – Ambient	San Diego, CA	recently announced
South Central Indiana REMC	Martinsville, IN	to reach 33,000 customers
Southern Company – Main.net/Amperion	Birmingham, AL	technical trial

Source: UPLC, Sept. 2005

Broadband Over Power Lines:
Market Achievements & Challenges

- Technology Development
  - HomePlug and other power line chipsets developed to operate in the “noisy” power line environment, with 2nd generation products on the way.
  - Various means to “bypass” the electric step-down transformer to connect customers on each low voltage line to BPL signals on the medium voltage distribution line.
- Access to Capital
  - Growing interest in BPL from strategic investors:
    - Goldman Sachs, Hearst and Google recently invested in CURRENT Communications.
    - Motorola and Mitsubishi are developing their own BPL solutions.
    - IBM entering the BPL market as a system integrator.
    - Intel and Cisco recently invested in HomePlug BPL chip maker Intellon.

Source: CURRENT Communications, LLC, Sept. 2005

Broadband Over Power Lines:
Market Achievements & Challenges

- Utility Interest
  - Although utilities tend to be conservative when adopting new technologies, a number of them have shown an interest in being the first in their regions with BPL.
  - Other encouraging factors are utility interest in enhanced utility applications such as:
    - BPL-enabled electricity meters that enable time-of-day and real-time pricing through automated meter reading.
    - Load control devices that allow for enhanced load management functions.
    - Automated outage and restoration detection.
    - Preventative maintenance by monitoring the distribution network for problem signs before they result in power outages.
  - Enhanced utility applications are seen as the key driver for utilities to consider BPL deployment.

Source: CURRENT Communications, LLC, Sept. 2005

Broadband Over Power Lines:
Market Achievements & Challenges

- Regulatory Uncertainty is Dissipating
  - The FCC released its Report and Order on Access BPL in October 2004.
  - The NARUC BPL Task Force Report in February 2005 recommended a "light-handed" regulatory approach to BPL.
  - Texas legislation encourages utilities to deploy (or permit 3rd parties to deploy) BPL, and similar proceeding are underway in other states such as California, Indiana and Illinois.
  - Energy Policy Act of 2005 encourages utilities to employ advanced technologies for distribution network maintenance and operability.
- Market Growth
  - Telecom Trends International estimates BPL market to grow from $57.1 million in 2004 to $4.4 billion in 2011.
  - Research and Markets Inc. estimates that BPL subscribers will grow at a CAGR (compound annual growth rate) of 106% between 2006 and 2012, and that 1/3 of new US broadband customers and 13% of existing broadband customers will choose BPL by 2012.

Sources: "BPL's Growing Pains", Rural Telecommunications, July 1, 2005, and CURRENT Communications, LLC, Sept. 2005.

Broadband over Power Lines:
The Six Things You Need to do to Comply

Access BPL systems must be designed and operated in a manner that avoids harmful interference to licensed radio operations.

- Before initiation of service:
  1. Use equipment authorized by the Commission for this application.
  2. Supply all required information to the Access BPL Database manager, and to the State Public Utility Commission(s).
  3. Consult with local public safety users, and with federal users in areas designated as consultation areas.
  4. Be aware of and avoid operating at frequencies in use within areas designated as exclusion zones.
- During operation:
  5. Address cases of suspected interference in a timely manner.
  6. Cease operations immediately at the location where interference to public safety services is suspected.

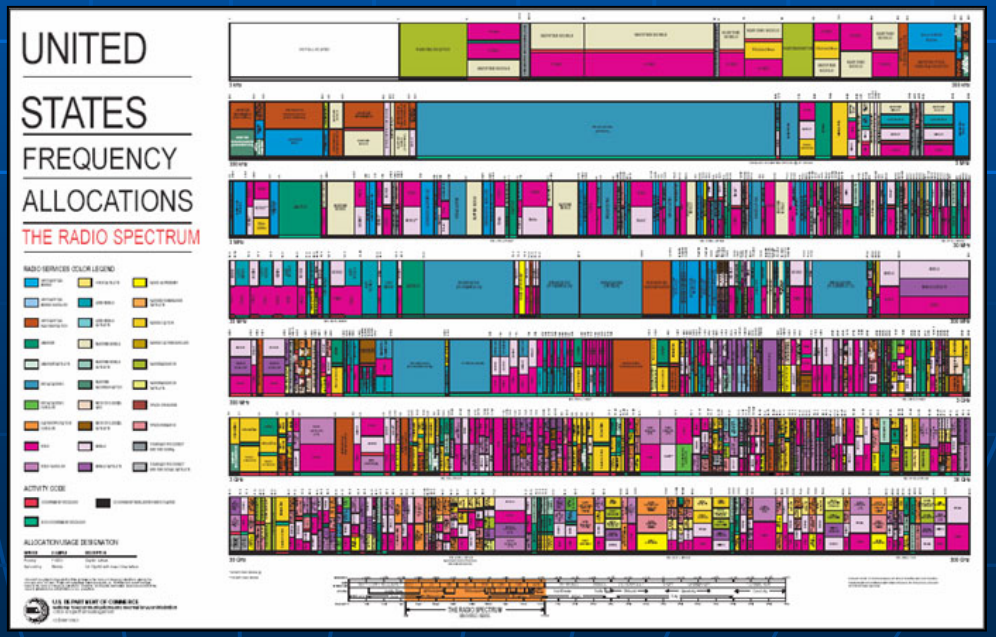
Expanding Competition:
Wireless Broadband and New Technologies

"The other promising new broadband technology is wireless. The spectrum that allows for wireless technology is a limited resource . . . [a]nd a wise use of that spectrum is to help our economy grow, and help with the quality of life of our people."

-- President George W. Bush, June 24, 2004

The Administration has made more radio spectrum available for wireless broadband technologies:

- Advanced Wireless Services ("3G")
- Ultra-wideband
- 5 GHz Spectrum

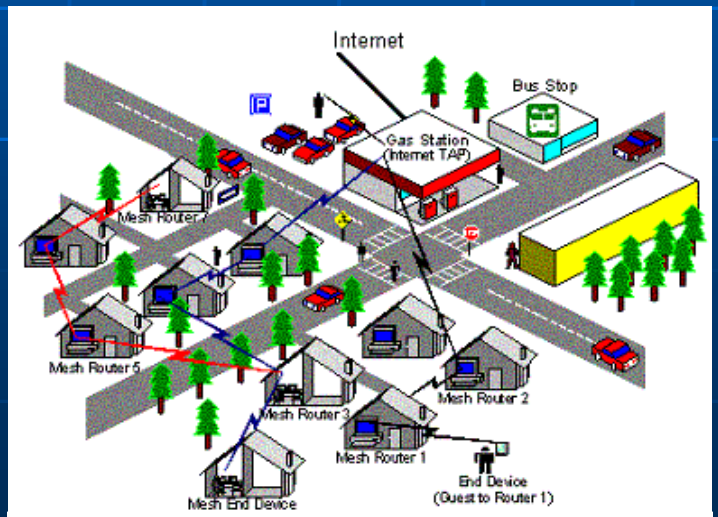


Moore Meets Marconi:
Wireless Applications

- **Wi-Fi:** Until recently, the utility of Wi-Fi phones was limited to businesses and colleges. Companies such as Nokia, Flarion, IDT, Motorola, Cisco, and SpectraLink are beginning to develop hardware and software to facilitate Wi-Fi telephony.

- **WiMax:** Intel plans to build WiMax into its Centrino chip platforms, which power 80% of all PCs, by 2006. InStat/MDR estimates that a company could reach 97.2% of the U.S. population with a $3.7 billion investment in WiMAX.

- **Unlicensed Mesh Networks:** By linking nodes on an ad hoc basis, mesh technology promises to deliver high bandwidth wireless coverage to areas that lack wired infra-structure, and can link diverse devices or networks. Champaign-Urbana Community Wireless Network (CUWin) in Illinois has offered free 1.5 Mbps Internet access on a mesh network since 2002.



Self-Organizing Neighborhood Wireless Mesh Networks (Source: Microsoft Research)

Conclusion

- Achieving the President's broadband vision will improve the lives of our citizens and promote economic growth.
- BPL is emerging as a viable third broadband wire into the home.
- Utilities see enhanced utilities applications as the key driver to deployment of BPL.
- Careful design and operation of BPL systems are essential to successful co-existence with nearby radio communications.