

Discovery Institute Technology Forum Series

“Moore Meets Marconi: Spectrum Policy for the 21st Century”

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The National Telecommunications and Information Administration (NTIA)

- NTIA, under the leadership of Commerce Secretary Don Evans, serves as the President's principal adviser on telecommunications and information policy matters, but is not the regulator of telecommunications, which is the job of the Federal Communications Commission (FCC).
- Our second major function is to be the manager of the nation's airwaves, or radio spectrum, by federal government agencies, including the military. We have joint jurisdiction with the FCC over spectrum allocation and use.
- NTIA's goal is to enhance the public interest by promoting quality service, competition, consumer welfare, and economic and social opportunities for all.



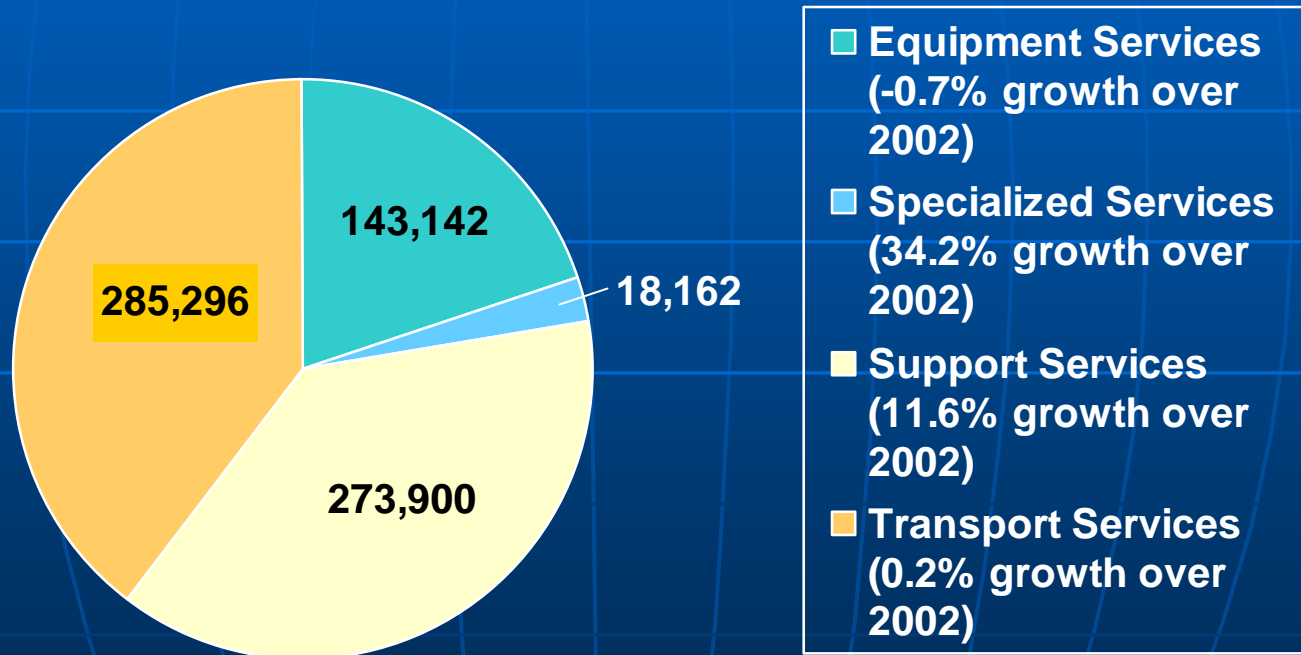
Overarching Goal: Promoting Economic Growth

- Thanks to the President's policies, America's economy is strong:
 - U.S. economy grew at a real Gross Domestic Product rate of 3.9% in the first quarter of 2004; economic growth in second half of 2003 was the fastest in nearly 20 years.
 - Payroll employment increased by 112,000 in June, with ten straight months of job growth and 1.5 million jobs created since August 2003.
 - Jobless claims have fallen to their lowest levels since October 2000.
 - There has been a sharp pickup in business spending on capital equipment.
 - Homeownership is presently at its highest level ever – 68.6 % in the first quarter of 2004.
 - Advance estimates of U.S. retail and food services sales for May 2004 were \$336 billion, an increase of 1.2% from the previous month and up 8.9% from May 2003.

U.S. Telecom Market Continues to Grow...

(\$ Millions)

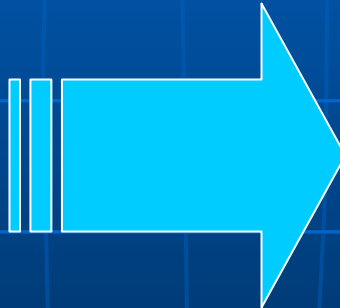
Total: \$720,500 (4.7% growth over 2002)



Since the Enactment of the Telecom Act in 1996 America Has Embraced the Future

Then...

Wireless Revenues \$23.6 billion
Wireless Subscribers 44 million
Wireline Households 101 million
E-Commerce Revenue \$5.4 billion (4Q99)



Now

Wireless Revenues \$87.6 billion
Wireless Subscribers 165.6 million
Wireline Households 113 million
E-Commerce Revenue \$15.5 billion (1Q04)

The President's Broadband Vision

Goal

“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

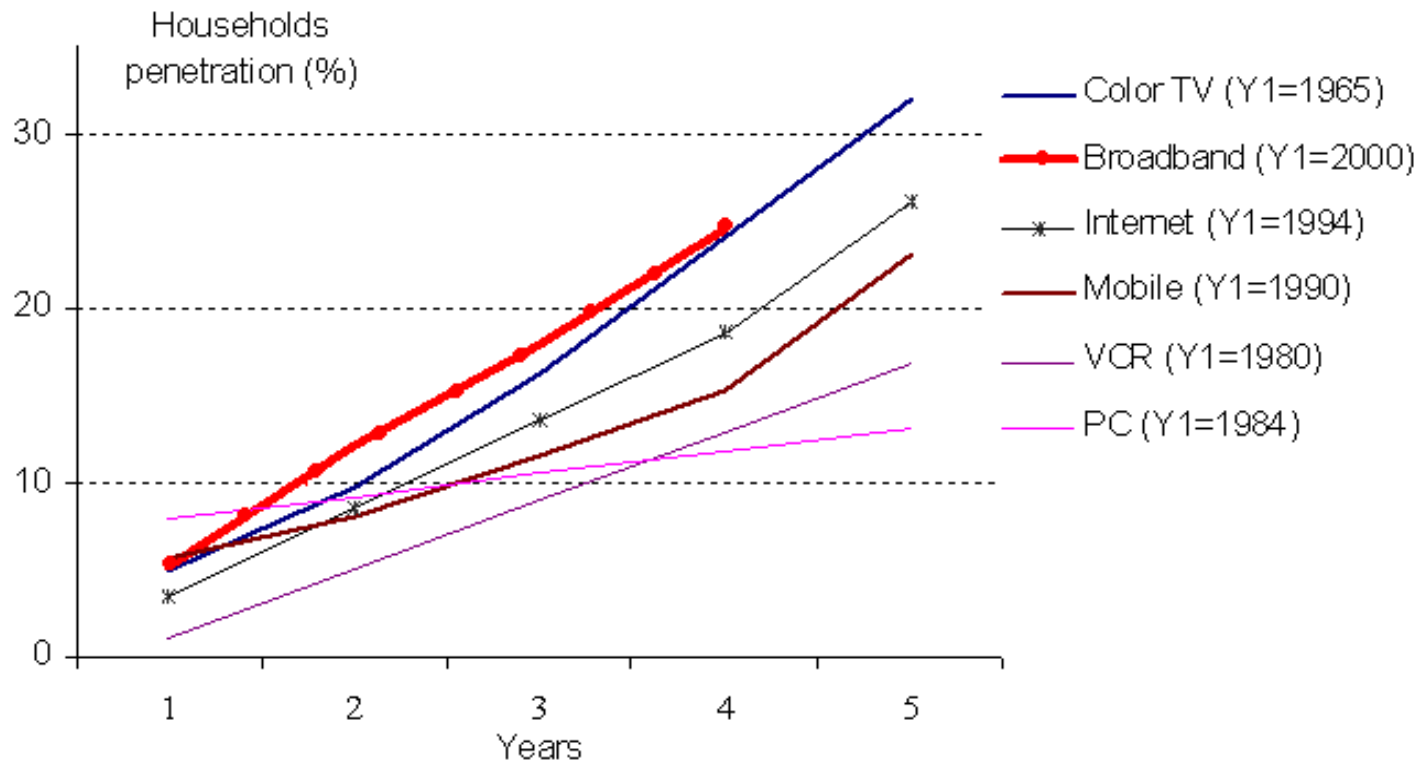
“The role of government is not to create wealth; the role of our government is to create an environment in which the entrepreneur can flourish, in which minds can expand, in which technologies can reach new frontiers.”

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

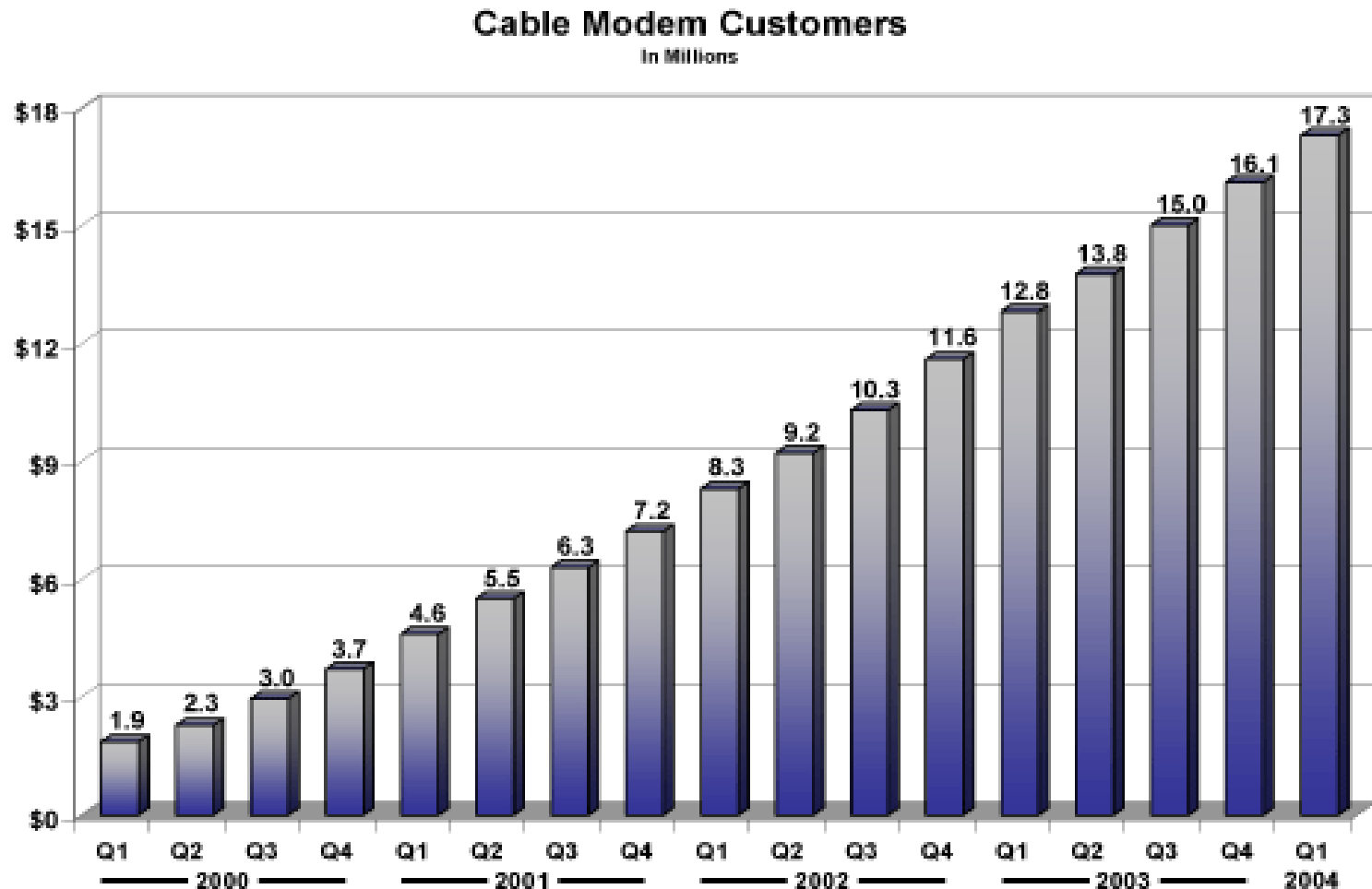
“If you want something to be used more, you don't tax it.”

— President George W. Bush, Waco, TX August 3, 2002

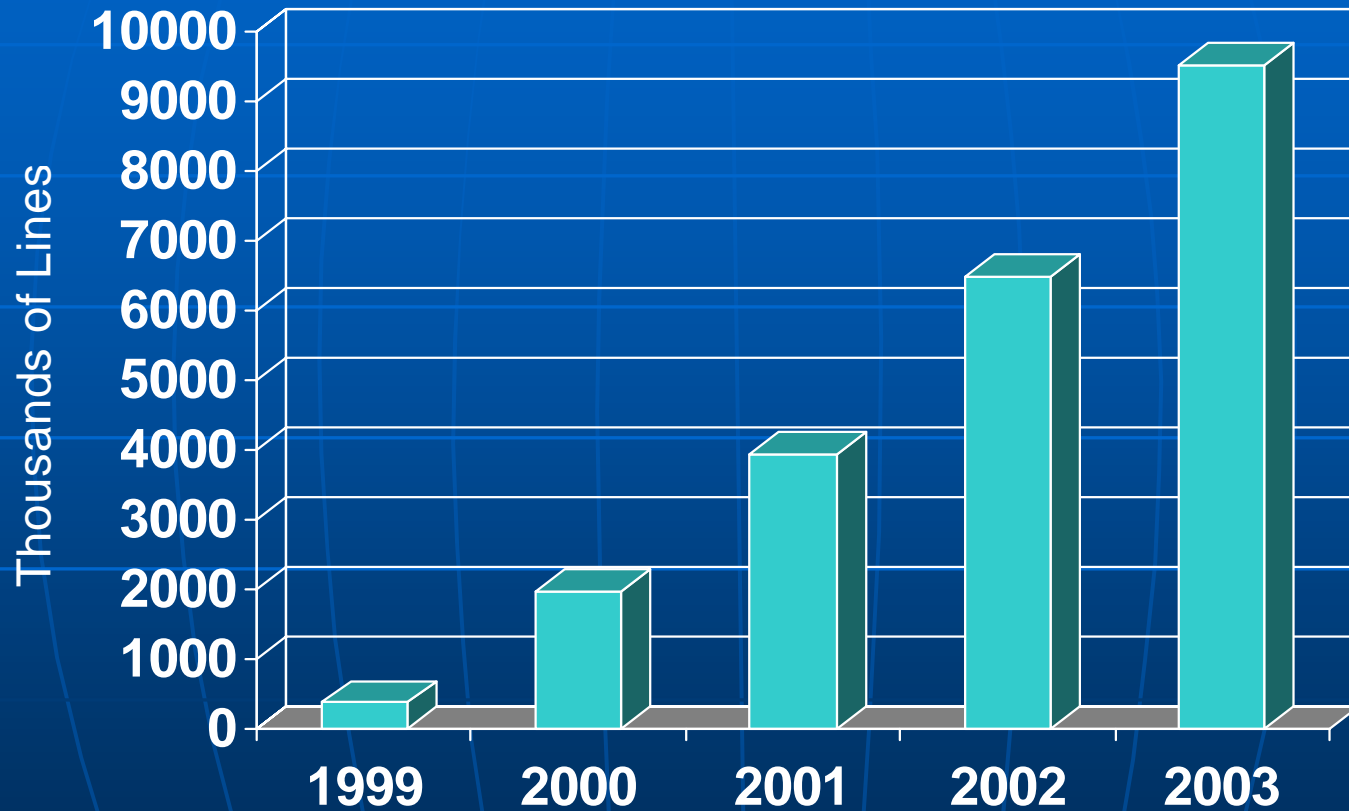
United States: Diffusion of consumer goods and communications services (5 % onwards)



Cable Modem Subscriptions Have also Experienced Significant Growth



DSL Lines Have Continued to Grow



Source: FCC

Broadband Over Power Lines: 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, June 24, 2004

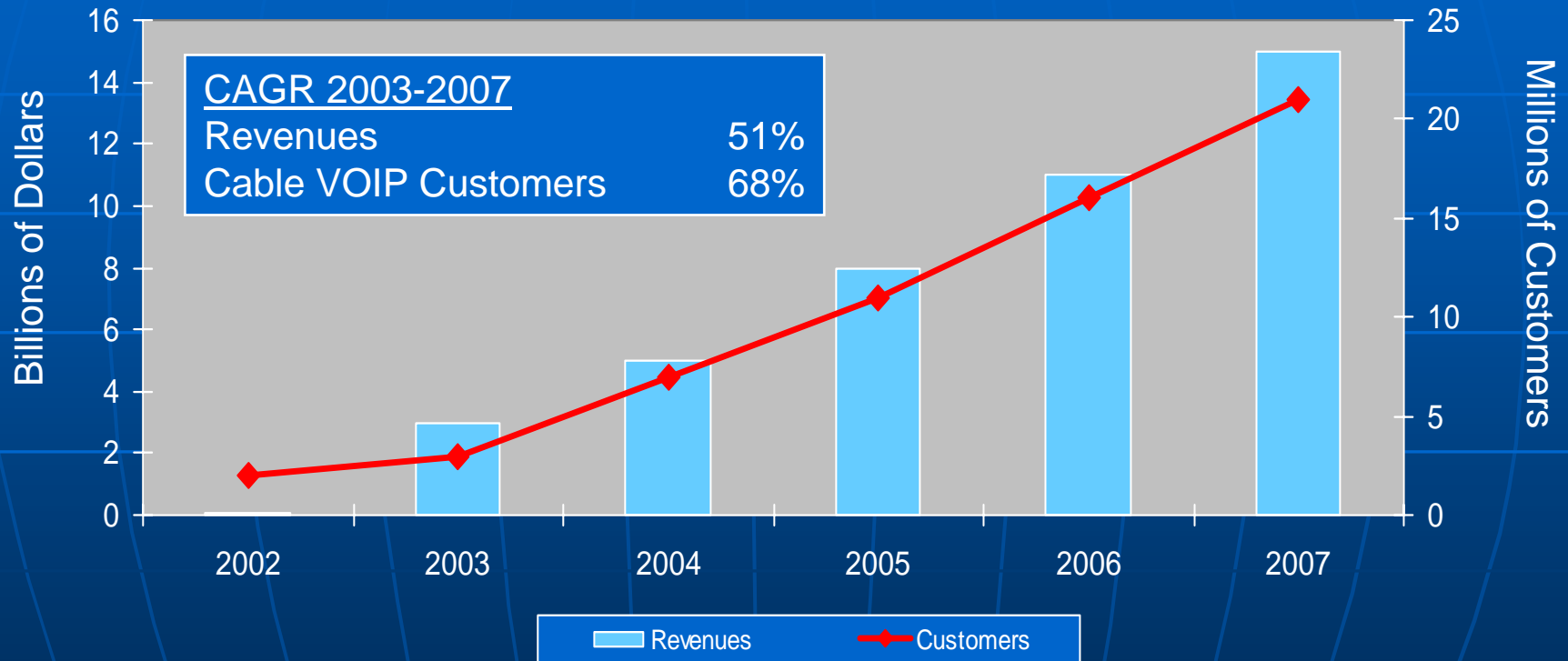
- Principal concern is the risk that BPL systems might interfere with federal government radio communications or other state and private radio operators.
- FCC began BPL rulemaking on February 12, 2004.
- On April 27, 2004, NTIA submitted to the FCC a Phase 1 interference report, which suggested interference mitigation techniques to protect critical government radio systems.
- On June 4, 2004, based on additional analyses, NTIA recommended several supplements to the FCC proposed BPL rules to reduce further any risk of harmful BPL interference.



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

VoIP and Other IP Applications Will Continue to Change the Market

Cable VoIP Market



Source: Kaufman Brothers, "A General Flavor of Mild Decay," July 14, 2003

ENUM and IPv6 Will Enable New IP Capabilities

- ENUM promises true convergence by facilitating the integration of telephone numbers and IP addresses, providing a foundation for development and deployment of new Internet-based communications devices and applications
- IPv6 developed during 1990's as replacement for existing Internet Protocol version 4 (IPv4)
- Enhanced capabilities of IPv6 as compared to IPv4 would:
 - Exponentially increase the number of available Internet addresses
 - Enable the proliferation of enhanced mobile services/applications
 - Increase security

The Spectrum Challenge

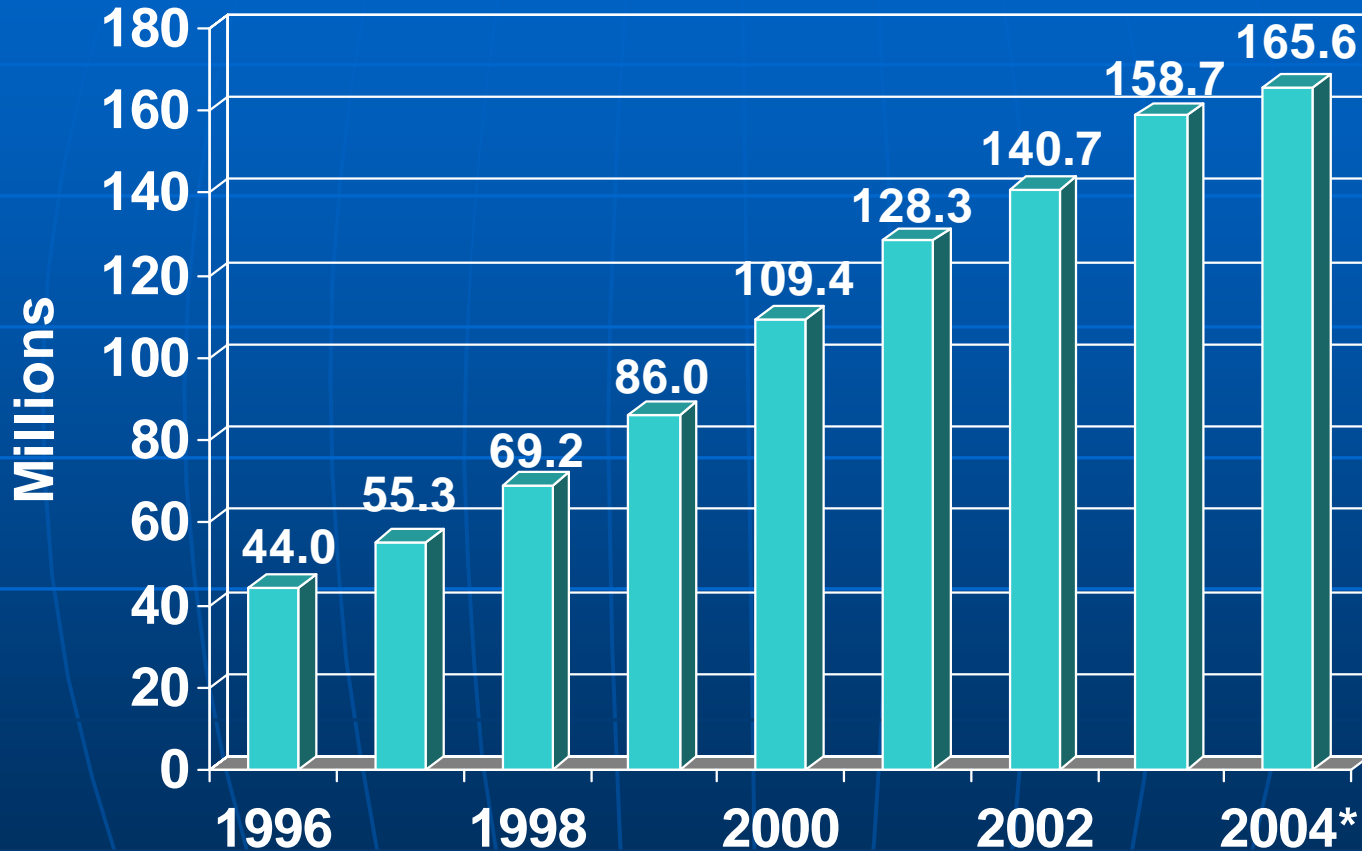
A Presidential Policy Board examining spectrum management summed up the urgent issues in stating:

"The development of so valuable a resource as the radio spectrum is a matter of paramount importance. Despite technical and operational improvements the demand for frequencies has steadily crowded the supply within the usable spectrum. The use of this resource should have the most careful planning and administration within the United States and in cooperation with other countries. Unfortunately, guidance and administration have often been inadequate."

The Spectrum Challenge (cont'd)

- The statement on the previous slide sums up today's situation pretty well... except it was written in 1951 by President TRUMAN'S policy board.
- A Johnson Administration report in late 1968 observed the "remarkable" growth in spectrum use and resulting problems and inefficiencies caused by an inflexible block allocation system among other things. It called for greater use of economic factors, and, echoing a Commerce Department advisory board report called "The Silent Crisis," cautiously raised the idea of a market system and possibly license fees related to the amount of spectrum used.
- The General Accounting Office has visited spectrum issues more than once, including a report in 1974 that discussed the views of economists that advocated the use of market forces for spectrum management.
- In 1991, NTIA released its own comprehensive review of spectrum management, which among other things called for greater use of market forces.

Wireless Service Has Grown Dramatically



*June 2004

Source: CTIA

Moore Meets Marconi: 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 for unlicensed devices
- 70/80/90 GHz

Advanced Wireless Services (“3G”)

- Third generation (3G) is an ITU specification for high-speed wireless communications. This worldwide wireless connection is compatible with GSM, TDMA, and CDMA. Carriers worldwide are now in the process of deploying 3G network infrastructure across urban, suburban and highly trafficked rural areas.
- Next-generation 3G cellular services will create broad-range coverage of data across wide geographic areas, providing the greatest mobility for voice communications and Internet connectivity. The 3G service will enable highly mobile users with laptops and other wireless data device to bridge the gap between higher bandwidth WiMax hot zones and Wi-Fi hot spots.
- New devices optimized for 3G communications are beginning to reach the marketplace. Such devices include cell phones that can also provide interactive video conferencing, as well as PDAs that can provide full-playback DVD services.

Ultra-Wideband (UWB)

- The primary standard involving UWB is the high data rate wireless Personal Area Network (PAN) or IEEE 802.15.3 that could reach data rates of 480 Mbps at 1 meter, or 110 Mbps at up to 10 meters.
- Proposals for the 802.15.3 Physical and Media Access Control standards have been made by Motorola and the Multiband OFDM Alliance (MBOA) which includes 120 companies such as Intel and Texas Instruments.
- Freescale Semiconductor (Motorola Inc.) has detailed the current and next generation UWB product family roadmap at the Wireless Connectivity (WiCon) World Expo in Amsterdam on June 7, 2004. Over the next year, Freescale plans to deliver three advanced UWB product families, including the industry's first 1 Gbps UWB solution.
- The WiMedia Alliance has announced its endorsement of the MBOA UWB standards for use with the WiMedia Convergence Platform.
- There is a wide range of perspectives on the future market size and growth potential of UWB technology. Some see 274 million chipsets by 2007, while others see only 24 million by this time. A recent report by Parks Associates predicts that there will be 150 million UWB devices by 2008.

Wi-Fi

- IEEE 802.11 or Wi-Fi operates in the 2.4 GHz or 5 GHz frequency range and offers a maximum data throughput of 108 Mbps with ranges that vary from 50 meters for low-gain antennas up to 8 kilometers for high-gain antennas.
- Currently the Wi-Fi Alliance has over 200 member companies from around the world, and has over 1250 products have received Wi-Fi certification since certification began in March of 2000.
- Wi-Fi packages sold 12 million units in 2003 and are on pace to double this year. An estimated 99 million people will have Wi-Fi enabled technology by 2006.
- Developing strong Fee-for-Service model (Airports, Hotels, etc.).
- The spectrum made available for Wi-Fi usage at 5 GHz is a model for sharing between industry and government.

Wi-Fi: Hot Spots to “Hot Zones”

- There are over 20,000 hot spots in the United States:
(Source, Intel’s Hotspot Finder)
- City-wide hot spots:
 - Spokane, WA
 - Cerritos, CA
 - Chaska, MN
 - Athens, GA
- Some communities are developing major free hot zones:
 - Long Beach, CA
 - San Jose, CA
 - Washington, DC
 - New York, NY
 - Austin, TX

WiMax

- WiMax or 802.16 is designed to provide wireless broadband access in a Metropolitan Area Network (MAN), operating at speeds up to 75 Mbps over a 30 mile radius.
- WiMax connectivity is fast enough to support more than 60 businesses with T1-level connections and hundreds of homes with DSL-rate connectivity using only 20 MHz of channel bandwidth.
- Intel plans to build WiMax into its Centrino chip platforms, which power 80% of all PCs, by 2006. Motorola plans to commercially offer integrated radio access networks that can handle 3G, Wi-Fi, WiMax and other future wireless innovations. AT&T, Siemens, and Alcatel are also backing WiMax technology.
- Industry analysts predict six fold growth in WiMax sales over the next three years.

Software Defined Radio (SDR)

- SDR can potentially solve problems facing the commercial wireless communication industry by easing the transition to new technologies
- Example – SDR-enabled devices can be dynamically programmed in software to reconfigure the device's characteristics for better performance, richer feature sets, advanced new services that provide choices to the end users and new revenue streams for the service provider
- SDR has the potential to alleviate interoperability problems facing federal, state, and local public safety organizations, and spectrum access and deployment problems faced by the military
- Current projects involved in the development of SDR include Department of Defense's Joint Tactical Radio System (JTRS)
- Security issues need to be resolved before SDR technology can be fully accepted for commercial and public safety applications

Cognitive Radio

- Cognitive radio technology is a particular extension of SDR that employs model based reasoning based upon its assessment of the radio environment.
- NTIA is addressing the following issues raised in the FCC's Notice of Proposed Rulemaking on SDR and CR:
 - Ways CR can facilitate opportunistic use of the spectrum by unlicensed devices while protecting incumbent licensed spectrum users;
 - Rules for CRs permitting additional flexibility for unlicensed devices operating in rural and underserved areas;
 - How CR can enhance interoperability between different public safety entities;
 - Changes to the FCC's equipment authorization processes to better accommodate SDR and CR systems.

Smart Antenna Technology

- Smart antenna systems provide numerous benefits in wireless communications environments:
 - Reduce multipath fading
 - Increase system capacity
 - Extending battery life of terminals
 - Extending the range of base stations
 - Interference reduction
- Systems employing advanced antenna designs such as sectorized and phased array adaptive antennas are now being used as part of wide area network systems.
- Sectorized and phased array antennas are used to create dynamic communication links with associated mobile and fixed devices in any direction around an antenna structure.
- The FCC has issued a rulemaking (et docket no. 03-201) to address compliance measurement issues related to sectorized and phased array antenna systems.

President Bush's Spectrum Policy Initiative

- On May 29, 2003 President Bush signed an Executive Memorandum to develop and implement a comprehensive United States Spectrum Policy for the 21st Century.
- The Initiative was designed to foster economic growth, ensure national and homeland security, maintain U.S. global leadership in communications technology development and satisfy other vital U.S. needs such as public safety, scientific research, federal transportation infrastructure and law enforcement.

Spectrum Policy for the 21st Century

- On June 24, 2004, the Department of Commerce released two spectrum reports with recommendations to develop a U.S. spectrum policy for the 21st century:
 - Report 1: Recommendations of the Federal Government Spectrum Task Force
 - Report 2: Recommendations for Spectrum Use by State and Local Governments and the Private Sector

NOTE: Reports can be downloaded at www.ntia.doc.gov
- Highlights of the Recommendations in the two reports:
 - Encourage Innovation and New Technologies
 - Modernize the Spectrum Management System
 - Establish Economic and Efficiency Incentives
 - Ensure the Protection of Critical Government Spectrum Users and Services

Summary

- Communications are the backbone of our economic and national security.
- Spectrum is the rocket fuel for the next wave of technological innovation and job creation.
- This Administration and FCC have met the call of innovative spectrum policy and have made significant real achievements.
- We have laid the groundwork for the next 5-10 years of spectrum policy, and will continue to encourage innovation and the development of new wireless technologies.