

NATIONWIDE HIGH-SPEED BROADBAND DATA SERVICES

*Adopted by the IEEE-USA
Board of Directors, 15 January 2009*

IEEE-USA urges the U.S. government and the U.S. communications industry to work together to provide nationwide and ubiquitous access to affordable high-speed broadband data services and to facilitate use of new and demanding Internet applications. Such access will stimulate innovation, spur economic activity, increase national security and contribute to increased productivity for the nation.

Universal access to high-speed broadband data services is as imperative to our nation's economic prosperity in the 21st century as universal access to electric power and telephone services was in the 20th century. Broadband services enable telecommuting, distance learning, improved medical care, gateways to vast sources of information, and a host of other economic and quality-of-life opportunities. Burgeoning entrepreneurial applications, user-generated content, video networking, and entertainment traffic are driving demand for higher data rates. As with electricity and telephone service before it, new Internet applications generate economic and social gains that far exceed the investment in the enabling infrastructure.

Although the United States can legitimately take credit for developing the Internet, we cannot claim that our nation leads in providing access to it. Many countries have recognized the benefits of high-speed broadband data services and have dramatically expanded both the availability and speed of their national networks. Such investments provide competitive advantages that must not be ignored.

We must meet these challenges with new cooperative initiatives between the U.S. government and the U.S. communications industry. These efforts will require strong national leadership focused on development of new policy, and regulatory frameworks to stimulate investment in the enabling infrastructure for extending national access to the Internet; its widespread use; and competition in its facilities, service provision, and content. IEEE-USA urges the U.S. government to take these actions:

- **Designate universal and affordable access to high-speed broadband networks as a national priority and establish a series of bandwidth goals and target dates for deployment.** The most important short-term goal is broadening ubiquitous availability. Data rates should be sufficient to provide the equivalent of several channels of bidirectional, high-resolution video, achievable by expanding the capabilities of current technologies. This will enable or enhance the most important Internet services available today, as well as generate extra benefits that materialize as more and more people are connected.

The important long-term goal is scalability to data rates that will accommodate the most advanced applications in sight today, as well as the new ones that will emerge as capabilities increase.

- **Provide economic incentives for broadband investments and uses that qualify as furthering our national objectives.** As a minimum, many of the tools used to foster ubiquitous access to electricity and telephone services can and should be applied to increase access to the Internet through broadband.
- **Foster further competition in facilities, service provision and content through legislation and regulation.** When two or three broadband service providers compete in an area, the availability of higher data rates improves and the price of service declines.

This statement was developed by the IEEE-USA Committee on Communications Policy and represents the considered judgment of a group of U.S. IEEE members with expertise in the subject field. IEEE-USA advances the public good and promotes the careers and public policy interests of the 215,000 engineers, scientists and allied professionals who are U.S. members of the IEEE. The positions taken by IEEE-USA do not necessarily reflect the views of IEEE or its other organizational units.

BACKGROUND:

The United States faces two challenges for its broadband infrastructure: mushrooming domestic demand and lagging international performance.

- *Current levels of speed and access fall short of evolving demand:* The Federal Communications Commission’s (FCC) prior definition of broadband speed was 200 kilobits per second (kb/s). Recently the FCC replaced this definition with seven broadband tiers starting at 768 kb/s, and extending to speeds greater than 100 megabits per second (Mb/s). Six technologies, three wireline and three wireless, currently predominate in the provisioning of broadband services:

<p><u>Wireline:</u></p> <ul style="list-style-type: none"> ○ Digital Subscriber Line ○ Cable modem ○ Optical fiber 	<p><u>Wireless:</u></p> <ul style="list-style-type: none"> ○ Cellular telephony ○ Wireless Fidelity (Wi-Fi) networks ○ Satellite
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Availability and data rates vary widely within each of these technologies, so that tabulation of their capabilities here would necessarily be incomplete and subject to change. However, typical data rates currently increase from about 0.5 Mb/s for the newer cellular telephony systems, progressing to 20 Mb/s for optical fiber to the home. Optical

fiber so far is available only in limited service areas in the United States, compared with Japan, South Korea and France.

As microprocessor and broadband capabilities expand, new computing applications emerge. This is the story of technological progress in all fields. Many studies cite examples, just a few of which follow:

- Convergence of voice, data and video into bit streams carried on digital networks
- Social networking and “blogging,” with images and video uploaded by mass participants
- Emergence of Internet-based applications for desktop uses (commonly called “cloud computing,” which needs rapid communication between the user and the application source)
- Widespread bidirectional video conferencing
- High resolution medical images and electronic medical records transferred for diagnosis and consultation
- Next-generation, ultra-high definition television (requiring about 150 Mb/s per channel) delivered over the future Internet, eventually on subscriber demand.

These new applications can be used on the Internet now, but can experience delays in delivery where the Internet is not robust enough to handle the additional traffic they induce, as well as impact the user experience of any others sharing the same portion of the Internet.

- *U.S. competitiveness will require broadband comparability with those of other countries:*. Studies establish that current policies have let U.S. network penetration, speeds, and prices lag other developed countries by a significant degree. For example, using OECD data, Atkinson, et.al. (2008, p.6) report household penetration (fraction of households that subscribe) in South Korea, France, and the United States as 0.93, 0.54, and 0.57 respectively. They report average download speed (Mb/s) in those countries as 50, 18, and 5 respectively. They further report lowest monthly price per megabit per second (U.S. dollars) as 0.37, 0.33, and 2.83 respectively. (Note that these figures come from European studies. The United States doesn’t even have its own method for measuring broadband usage.)

If this gap continues, or indeed widens as other countries continue their progress, we shall suffer growing disadvantage as to jobs, technology and commerce, all of which depend on widespread and rapid connectivity. Examples are high-quality video that greatly enhances teleconferencing, telecommuting, interactive education, and eventually, medicine -- all leading to increased productivity.

The market is advancing U.S. broadband deployment, but at a pace limited by each individual provider's perceived return on investment. The result is twofold: we face inadequate provision for coming demand and we lack parity among world-class networks. Moreover, as networks connect more people, disproportionately positive economic and social benefits predictably accrue to society. To encourage faster progress, initiatives beyond ordinary market forces are needed.

Government has options for constructive action.

- *Designate deployment of high-speed broadband networks as a national priority, and establish a series of bandwidth goals and target dates for deployment.*
 - The President and Congress have a chance to provide vision and leadership by giving priority status to high-speed broadband deployment and access. Such leadership will close the widely publicized gap in penetration, speed and price between the United States and countries like Japan, South Korea and those in Europe.
 - Initially, we advocate the achievement of at least 20 Mb/s bidirectional speed with 90 percent availability throughout the nation within five years. The wide penetration of such speeds will achieve most of the expected benefits and accommodate numerous simultaneous applications per household or small business. Of course, greater speeds can be had by those with greater needs.
 - We further advocate the achievement of at least 100 Mb/s bidirectional speed with availability to all businesses and households within 10 years. The technology necessary to meet this goal is scalable to almost any future need at inexpensive upgrade costs.
 - Pursue the national annual census of broadband availability and usage to monitor progress toward the goals, identify competitive opportunities, and reveal underserved areas (Public Law 110-385).
- *Provide economic and other incentives for broadband investment and uses that qualify as furthering our national objectives.*
 - The government should reaffirm and extend tax incentives to private sector broadband investment. These include expensing of certain investments, accelerated depreciation, R&D tax credit, matching grants, and guaranteed loans for broadband deployment in underserved areas, including use of the Universal Service Fund.
 - Other incentives would include deductions for certain broadband subscriber expenses that further education and health care.
 - Additionally, to stimulate use and demand, provide programs to increase digital literacy.

- *Foster further competition in facilities, service provision, and content through legislation and regulation.* Competition among providers and technologies can be relied on to provide wider deployment, higher speeds and lower prices (NTIA, 2007, p. 35), just as it has in other countries. The following actions will foster such competition:
 - Rescind legislative and regulatory restrictions on deployment of end-user owned wired and wireless networks by municipalities and other communities, wherever these provide capability in the absence of adequate, cost-effective, or timely commercial services.
 - Encourage negotiation between service providers and facilities providers for access to the physical infrastructure, so as to realize the benefits of innovation, content diversity, end-user choice and competition.
 - Recommend network benchmark tests for broadband performance, and continually redefine them as usage and technology evolve. Different broadband technologies have more than raw speed differences. For the competitive marketplace to work in selecting broadband alternatives, there must be information on the alternatives. Users can select the performance best for their particular needs.

- *Additional initiatives will also encourage broadband investment and use.*
 - The FCC should designate ample licensed and unlicensed spectrum bands, including unused portions of television bands, for high-speed wireless networks, ultimately aiming at access for all. This action will expand mobile and nomadic services and augment access to the wired infrastructure.
 - Appropriate government agencies should step up their network acquisitions to stimulate demand.
 - The National Science Foundation, other funding agencies, and industry should assure research levels for hardware, software, applications and standards that are sufficient to spur continuing technological development, as Japan and the European Union are doing.

Priority action will return rewarding results both domestically and internationally.

There are two overarching goals for nationwide high-speed broadband networks: widespread availability and high performance. Together these form a critical infrastructure that couples to all aspects of national life.

- National security can be enhanced by a fast and universal Internet. It will supplement other methods of warning our population of emergencies. The wired and wireless Internet's inherent robust design provides redundancy and survivability in case of failures from both man-made and natural disasters such as the recent hurricanes. Local law enforcement officers, firefighters, and paramedics benefit by instantaneous and complete reporting of violations and emergencies. Using encryption, a fast public Internet allows quick and secure dissemination to local authorities of homeland security information about suspects and threats.

- Economically, broadband networks have been shown to spur growth through productivity, new and augmented markets, expanded work force, innovative products and services, and research (Atkinson, 2007, pp. 153 ff.; Baller Herbst Law Group; 2008, pp. 13 ff.; National Research Council, 2002, pp. 82 ff.). This occurs by speeding the diffusion of ideas and procedures throughout individuals and organizations, so that the direct benefits diffuse throughout the society as a whole.

In rural areas, facilities ownership by enterprises and communities is providing expanded capability in sparsely populated markets, thus enhancing local economic opportunity and richness of life (Atkinson et al., 2008, pp. 29 ff.; Windhausen, 2008, pp. 15 ff.).

The broadband infrastructure can enable energy efficiency as well as substitute for other resources, such as use of the transportation infrastructure, medical examination and advice, and paper-based records.

High-speed broadband access to homes and businesses will be important enabling infrastructure for advanced applications in the Smart Grid (Title XIII of the “Energy Independence and Security Act of 2007”), established in national policy as critical for our energy future.

Faster and more available wireless access can expand mobile commerce and create new multimedia applications, such as mobile video telephony.

- Socially, such networks have been shown to enhance all levels of education, to support health care delivery, to enrich living, and to diminish the disparity in access between rich and poor, urban and rural, and ethnic groups.

More extensive federal government use of broadband facilities and services could provide superior services to its citizens.

With networks of ample capacity, facilities providers can both increase their revenues and encourage open and competitive content by offering to carry any service or information content at reasonable compensation. Current practice tends to restrict third-party use of scarce facilities, limiting competition, diversity and choice.

- Globally, high-performance networks will enable the United States to match or exceed services and applications available to the citizens or trading partners of other nations, with consequent competitive advantages.

The above considerations support the following conclusions:

- The capabilities and benefits of widespread, advanced broadband networks are achievable by visionary national policies and leadership, enabling cooperative government and industry initiatives.
- Such networks are necessary for attaining and sustaining U.S. technological and competitive advantage in the global economy.
- Once in place, such networks reduce bandwidth constraints, thus opening a new era of innovation for knowledge-based goods and services.

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