Voice over Internet Protocol

Technology and Policy

December 10, 2013 | John Stephenson, Director, Task Force on Communications and Technology | State Capitol, Bismarck, ND

ALEC American Legislative Exchange Council

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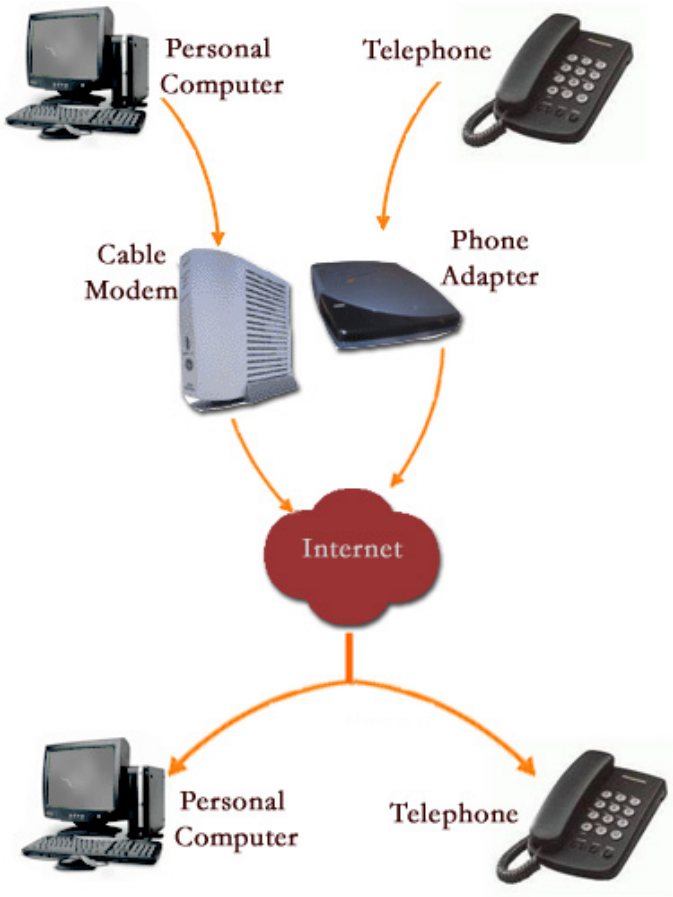
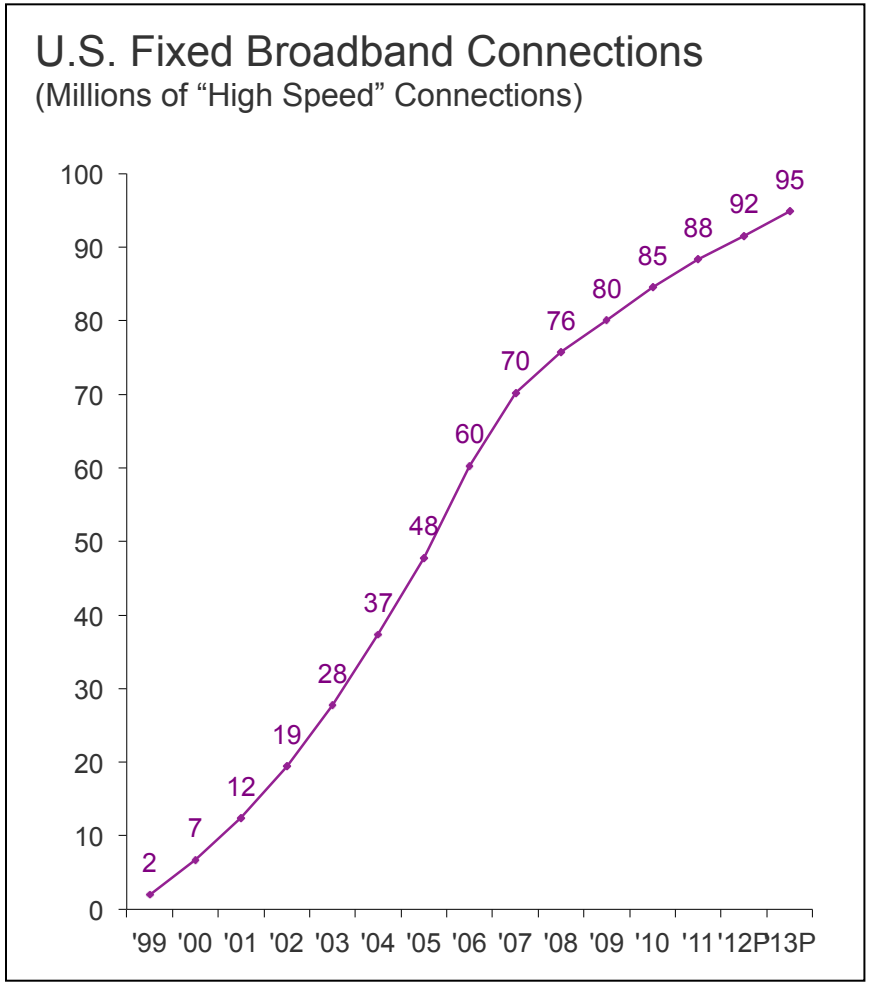
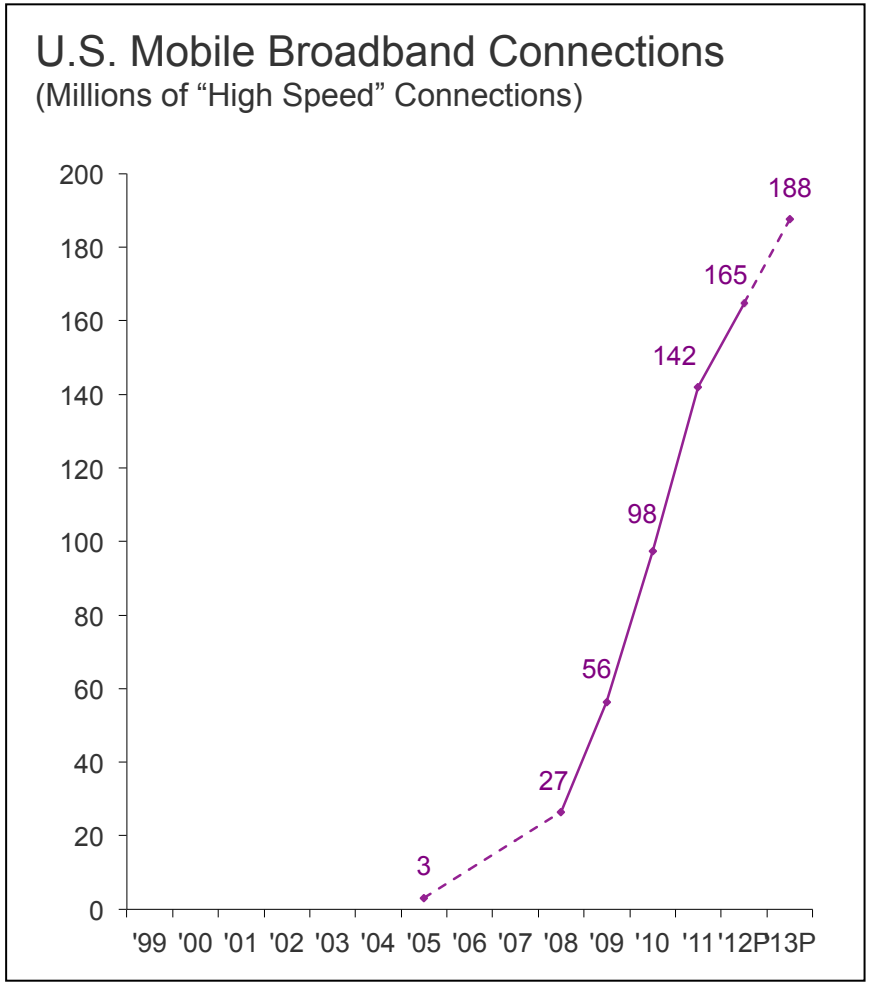
How VoIP works



Source: Federal Communications Commission

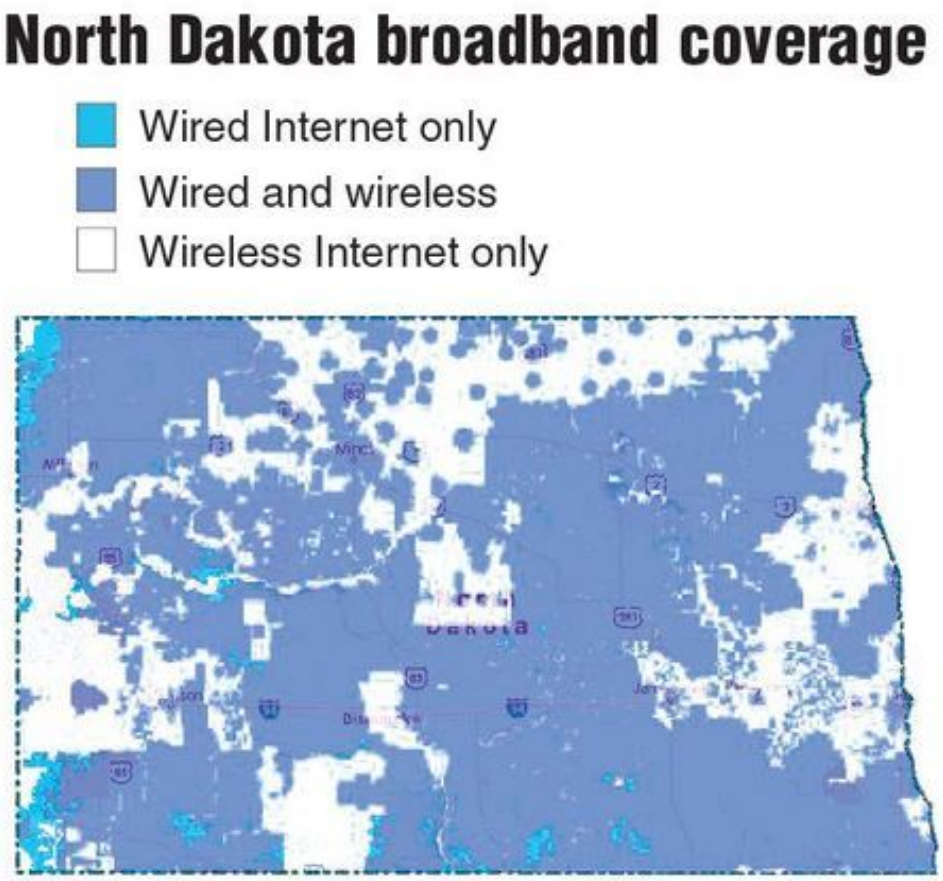
Broadband Internet Protocol (IP) Networks Widely Adopted





Source: FCC. Most recent data are for June 30, 2012. Projections based on most recent 6-month run rates. Based on FCC's most comprehensive definition of broadband, i.e., "high-speed services" > 200 kbps downstream. FCC changed its definition of mobile broadband in 2008; therefore, data for 2006 and 2007 are not included.

Broadband coverage in North Dakota is good and improving

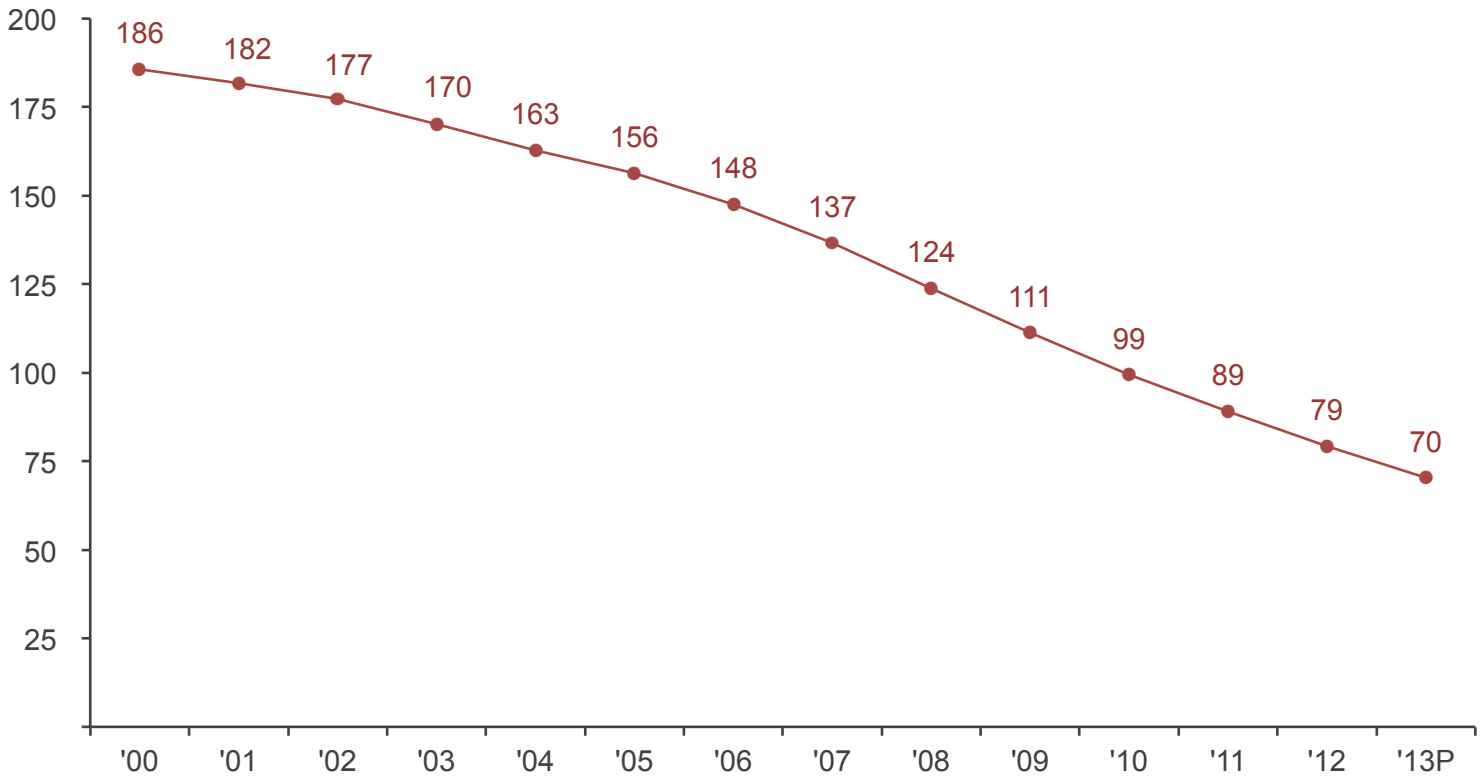


Source: Prairie Business Journal

VoIP Improves Scalability, Mobility, and Productivity

Competition Changing Communications Landscape

- Change in ILEC Switched Access Lines 2000-13 (millions)

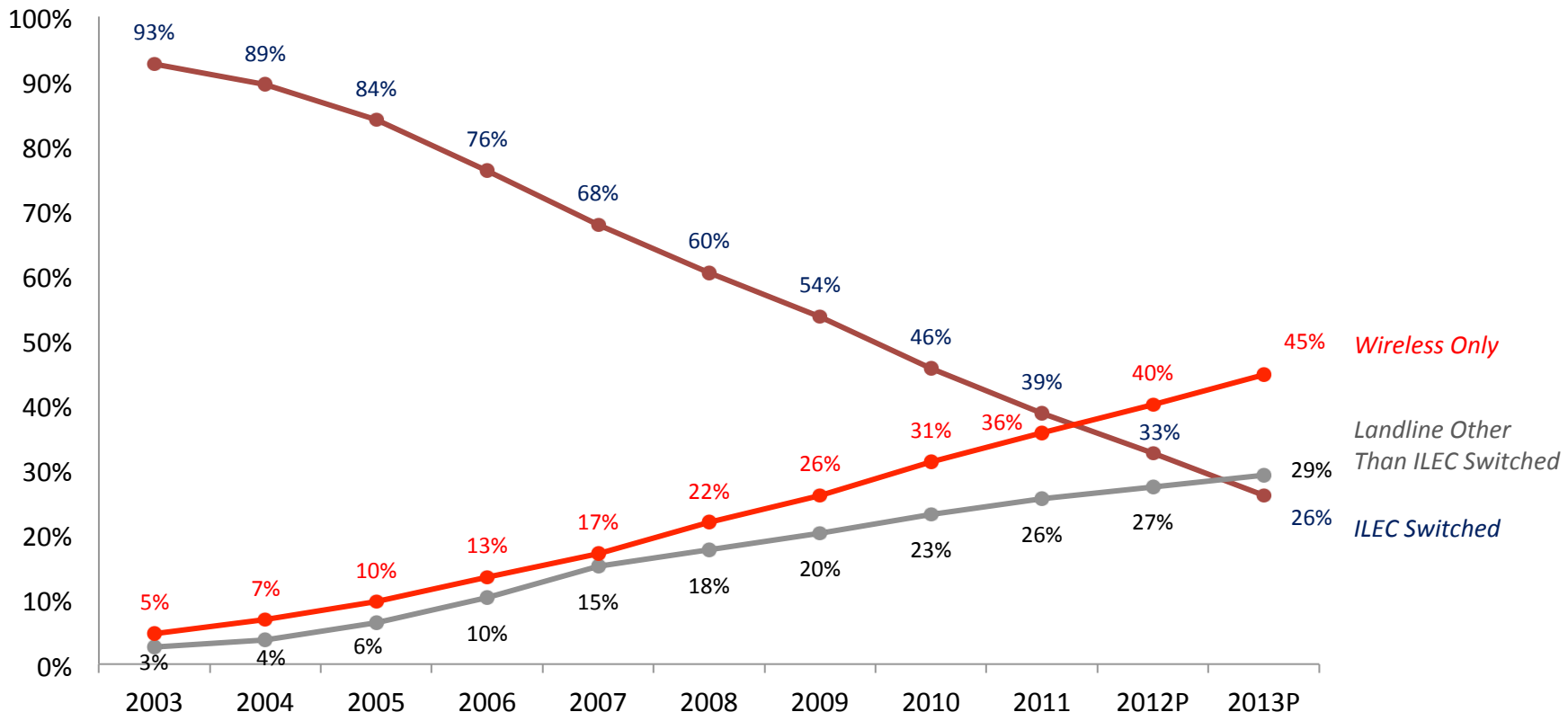


Sources: Federal Communications Commission, US Telecommunications Association

Household Usage of Traditional Phone Lines Declining Rapidly

U.S. Household Primary Line Service Penetration and Straight-Line Projections

(Percent of Telephone Households)



Sources: FCC, CDC, Census, USTelecom Analysis (2008-13P); and FCC, CDC, NCTA, Financial Reports, USTelecom Analysis (2003-7)

IP Networks Enable New Modes of Communications Competition

Switched Voice Declines as New Apps, Devices, and Networks Grow

Data are for 2011. Trend Continues to 2013.

Application Mode	Devices: Home Phone	Devices: Cell Phone	Devices: Smartphone	Devices: Any Computer	Devices: --Laptop	Devices: --Tablet	Networks: PSTN	Networks: Mobile 2G +	Networks: Mobile BB	Networks: Fixed BB	Applications: % HH Adoption 2000 or other year	Applications: % HH Adoption 2011 or most recent
% HH Adoption	64	88	55	90	69	22	40	88	n/a	71		
Switched Voice	✓						✓				95 ('00)	**40** ('11)
Interconnected VoIP	✓									✓	0 ('00)	24 ('11)
Wireless Voice *36% "cut cord" 2011*		✓	✓					✓	✓		50 ('00)	88 ('11)
Text Message		✓	✓	✓	✓	✓		✓	✓	✓	13 ('01)	66 ('11)
Email			✓	✓	✓	✓			✓	✓	40 ('00)	69 ('11)
Instant Message			✓	✓	✓	✓			✓	✓	19 ('00)	34 ('10)
Internet Voice Communication			✓	✓	✓	✓			✓	✓	4 ('00)	20 ('11)
Internet Video Communication			✓	✓	✓	✓			✓	✓	8 ('09)	17 ('10)
Social Network			✓	✓	✓	✓			✓	✓	4 ('05)	43 ('11)

Sources: USTelecom analysis , FCC, CEA, CDC, Pew, CTIA, NTIA. ✓ Indicates availability of application over devices or networks. HH = Household.

Testimony of John Stephenson
American Legislative Exchange Council
Before the North Dakota Information Technology Committee
Regarding its Study of Voice over Internet Protocol
December 10, 2013

I. Introduction

Chairman Weisz, Vice Chairman Schaible, and Members of the Committee, my name is John Stephenson. Currently, I am the Director of the Task Force on Communications and Technology at the American Legislative Exchange Council (ALEC). I am honored to appear before you today to present these remarks regarding your study of Voice over Internet Protocol (VoIP).

II. What is ALEC?

ALEC is a 501(c)(3) non-profit organization. We are a think-tank for state-based public policy issues, providing a constructive forum for state legislators and private sector leaders to discuss and exchange practical, state-level public policy solutions. The potential solutions discussed at ALEC focus on free markets, limited government, and the constitutional division of powers between the federal and state governments. We are a non-partisan resource for our members, which include approximately 2,000 Republican and Democratic state legislators. ALEC publishes research and writing on issues that are of importance to our members, and we hold meetings where people from the public and private sectors share their views.

The Task Force on Communications and Technology believes that constant, dynamic innovation in communications and technology presents numerous complexities that defy traditional public policy prescriptions. To help policymakers understand the changes underway in the 21st century economy, the Task Force brings together state legislators, private industry, and experts to research and develop public policies that will promote economic growth, freedom of technology, and innovation in the states.

III. What is VoIP?

VoIP is a relatively new but very promising communications technology. In less than a decade, what was once wishful thinking by computer engineers is now a popular multimedia communications service.

As its name suggests, VoIP uses Internet Protocol (IP) technology to transmit information as data packets over broadband networks, including the global Internet. VoIP converts a voice signal into a digital signal for transmission. VoIP connections or "calls" can be made from a computer, a special VoIP phone, a smartphone, or a traditional telephone with an adapter. If you use VoIP to call a non-VoIP telephone, the IP signal is

converted into a Time Disivion Multiplexing voice signal by special software before it reaches the destination telephone. VoIP connections are possible anywhere there is a broadband Internet connection. In addition, wireless "hot spots" in locations such as airports, libraries, parks, and cafes allow you to use VoIP applications wirelessly.

IV. VoIP and Broadband

VoIP is available wherever broadband is available, including here in North Dakota. The National Telecommunications and Information Administration (NTIA), an agency of the U.S. Department of Commerce that compiles communications data, reports that 98 percent of Americans have access to basic broadband service. Further, NTIA reports that at least 91 percent of Americans in rural areas have access to broadband.[1] NTIA defines basic broadband service as advertised speeds of 3 Megabits per second (Mbps) download and 768 kilobits per second (kbps) upload.

Not only is broadband widespread, but it is increasingly of better quality. Across the country, broadband availability at higher speed levels has increased significantly since 2010. Moreover, availability and speed of wireless broadband service has increased dramatically from 2010 to 2012. Specifically, NTIA has found:

- Between June 2010 and June 2012, national broadband availability increased at all advertised speed levels. During both years, the greatest rates of change occurred in the higher speed tiers, beginning with the 25 Mbps or greater tier. The percentage of Americans with access to broadband with speeds of 25 Mbps or greater has grown from nearly 50 percent in 2010 to more than 78 percent in 2012.
- Cable is the primary technology that providers use to offer services of at least 25 Mbps or greater but less than 1 Gigabit per second (Gbps). At basic speeds, 87 percent of the population has access to broadband via cable, 74 percent get this type of broadband from Digital Subscriber Line (DSL) providers and 20 percent get this broadband from fiber deployments.
- Almost 100 percent of urban residents have access to download speeds of at least 6 Mbps, while 82 percent of rural communities can access these speeds.
- In almost 59 percent of U.S. counties, at least 95 percent of the population has access to basic broadband; and in just under 10 percent of counties, at least 95 percent of the population has access at 25 Mbps.[2]

But even with advances in broadband speeds, VoIP is not a bandwidth hog. Thanks to advances in data compression and decompression technologies, more information can be transmitted using less bandwidth in the broadband pipeline. These advances have been integrated into VoIP software. For example, Skype recommends an upload and download speed of only 500 kbps for a high quality IP video call.[3]

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[1] http://www.ntia.doc.gov/report/2013/us-broadband-availability-june-2010-june-2012
[2] Ibid.
[3] https://support.skype.com/en/faq/FA1417/how-much-bandwidth-does-skype-need

V. VoIP Capabilities and Availability

By using Internet Protocol technology, VoIP does more than traditional telephone service such as carrying voice, data and video signals. An IP-enabled phone can call a traditional telephone or a computer and vice versa. IP technology also allows consumers to conduct video calls with other consumers anywhere in the world.

VoIP enables consumers to enjoy many features including caller ID, text messaging, call forwarding, conference calling, and voicemail. But with VoIP consumers can also access many of these features remotely using a laptop computer at school, a desktop computer at work, or a smartphone on the road. New VoIP features include voice to text conversion and group video conferencing. For example, with Google Hangouts consumers can enjoy live video calls with up to 10 other users while sharing files like documents, pictures, and live text chats. Additionally, VoIP's integration of voice, data and video opens a new accessibility options for disabled Americans.

Broadband providers like cable television, Internet, and even phone companies now offer VoIP as part of their broadband services to residential customers and businesses in North Dakota. Additionally, over-the-top VoIP services like Skype and Vonage are available separately. Many VoIP applications offer free voice and video calling if used to connect with other users of those services, even international users. Some VoIP providers charge for a long distance call to a number outside your calling area, similar to existing, traditional telephone services. Other VoIP providers permit you to call anywhere at a flat rate for a fixed number of minutes. Typically, per minute rates for VoIP are substantially less than those for traditional telephone services. In 2011, Consumer Reports calculated that consumers could save an average of $20 per month by replacing traditional telephone service with lower-cost VoIP services.[4]

Thanks to enhanced features, lower costs and improvements in VoIP quality and reliability, the number of VoIP subscribers has grown substantially as a result. Nationally, there were approximately 42 million VoIP connections in 2012, a 17% increase from the previous year according to the Federal Communications Commission (FCC).[5] In contrast, during the same period, wireline retail lines decreased by almost six percent from 101 million to 96 million lines. According to the FCC, there were more than 41,000 interconnected VoIP subscriber lines in North Dakota, receiving service from 44 VoIP providers, at the end of 2012.

Small and medium-sized businesses also benefit from lower costs and increased functionalities, including more control over communications, rapid scaling, increased productivity, enhanced mobility, more employee collaboration, and meaningful customer interactions, thereby giving businesses utilizing VoIP technology a competitive advantage. VoIP also promotes telework, enabling more opportunities for employment among rural Americans, families with children, adult caregivers, and the disabled. Some

[4] http://www.consumerreports.org/cro/magazine-archive/2011/may/electronics/cut-your-telecom-bills/phone-service-overview/index.htm
[5] https://www.fcc.gov/document/fcc-releases-new-data-local-telephone-competition-4

famous examples of VoIP technology in the workplace include Microsoft's software developers who video conference with colleagues around the world from their campus in Fargo, JetBlue's reservations agents who work from their homes in the Salt Lake City area, and the Butterball Turkey Talk Line that provides seasonal customer support nationwide.

The benefits of VoIP are substantial. VoIP enables more meaningful communications between people regardless of the distance, whether it is between business colleagues or loved ones. VoIP also contributes to innovation in products and services, which fosters progress and economic growth. Additionally, VoIP enables healthy competition in communication services, which keeps prices in check.

VI. Similarities and Differences Between Traditional Telephones and VoIP

Although there are some similarities, VoIP differs from traditional telephone service in significant and fundamental ways. Traditional telephone service has always relied on circuit switching technology. Basically, circuit switching is the idea that when a call is made between two parties, the connection is maintained for the entire call. Because two points are connected in both directions, the connection is called a circuit. This basic concept has underpinned telephone networks for more than a century and is the foundation of the Public Switched Telephone Network.

Suppose you lived in Fargo and wished to place a call to a relative who lived in Los Angeles. Let's say you wanted to talk to that person for 10 minutes. During that call, the circuit is continuously open between the two phones. Until the 1960s, every call had a dedicated copper wire from one end of the call to the other for the duration of the call.[6] So the switches between Fargo and Los Angeles would connect the pieces of copper wire you used for the call all the way across the United States. You would use all those pieces of wire just for your call for the full 10 minutes. Therefore, the cost of your telephone call would be high because you basically rented a 1,780-mile-long copper wire from the telephone company for a 10-minute conversation.

By contrast, data networks do not use circuit-switching technology. Instead, data networks use a concept known as packet-switching, which means they simply send and retrieve data as needed, and route the data through a network along thousands of possible paths. While circuit switching keeps the connection open and constant, packet switching opens a brief connection -- just long enough to send a small chunk of data, called a packet, from one system to another. While you're talking, the other party is listening, which means that only half of the connection is in use at any given time. A packet-switched network like what is used in VoIP services is the alternative to circuit switching.

Conversations over today's traditional phone network are somewhat more efficient and they cost less. Your voice is digitized**,** and your voice along with thousands of others can be combined onto a single fiber optic cable for much of the journey, but there's still a dedicated piece of copper wire going into your house. However, if you look

[6] http://computer.howstuffworks.com/ip-telephony.htm

at a typical phone conversation, much of this transmitted data is wasted.[7] Moreover, traditional phone service has limited functionality beyond voice calls due to physical limits. The copper wire simply cannot carry the larger amount of data at speeds necessary for high definition sound and video, and for other applications.

In the 1990s, when VoIP services first became available, VoIP was criticized for several flaws in its technology that lead some commentators to suggest the service is unreliable and unsuitable to serve as a replacement for traditional phone service.[8] Traditional telephones used phantom power delivered over the copper wire from the central office, which meant that they were always on even in the event of a power loss.[9] VoIP service, however, depended on wall power. VoIP was also criticized for its inability to integrate into home security systems, cybersecurity issues, emergency number access, and number availability.

However, technological advances and federal requirements resolved many of these issues. Over the last decade, the Internet has grown more widespread and reliable, as providers have upgraded their networks to handle more traffic and create redundancies. Additionally, there has been substantial growth in the number of mobile broadband connections, decreasing the need for wires considerably. Software developers have also written VoIP programs that use less processing power. Hardware manufacturers have also developed computers, tablets, and mobile devices that use less power, and have longer-lasting batteries. Additionally, VoIP-to-VoIP connections on services like Skype and Google Hangouts are now protected behind very powerful, industry-standard encryption and anti-virus features to protect users from hackers.

Federal regulators have also stepped in to impose public safety and consumer protection-related obligations on VoIP services. In June 2005, the FCC imposed 911 obligations on providers of "interconnected" VoIP services – VoIP services that allow users generally to make calls to and receive calls from the regular telephone network. In addition, the FCC requires interconnected VoIP providers to comply with the Communications Assistance for Law Enforcement Act of 1994 (CALEA) and to contribute to the Universal Service Fund, which supports communications services in high-cost areas and for income-eligible telephone subscribers.[10]

VII. How the States and Federal Government Treat VoIP

Some argue that exempting VoIP from regulation puts consumers at risk. Others argue that VoIP is no different from traditional telephone service and that it is no longer in its infancy.

Among the states, only Vermont regulates VoIP as a utility, but that policy is being challenged in court. As of December 2013, 29 states including California, Texas,

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[7] Ibid.
[8] Ibid
[9] http://transition.fcc.gov/voip/
[10] Ibid.

and Utah have exempted VoIP from public utility laws. Moreover, after public service commissions in Missouri and Wisconsin attempted to apply utility laws to VoIP, the legislature clarified VoIP is exempt from such requirements. None of these states have reversed their decisions to exempt VoIP from state regulation while recognizing the FCC's jurisdiction to regulate VoIP.

VoIP is also subject to several Communications Act and FCC rules requiring data privacy, emergency number access, contributions to the Universal Service Fund, and more. In fact, in 2004 the FCC prohibited states from applying the same common carrier obligations governing telephone service to VoIP and since that time has applied only a light regulatory approach towards the new technology. Moreover, VoIP providers are currently subject to many state consumer protection, business, and tax laws.

In 2007, ALEC members grew concerned about the treatment of VoIP and sought to develop policy to protect the technology from antiquated public utility regulation so it could thrive. At the same time, our members sought to preserve the appropriate federal and state balance of responsibilities towards consumers. Therefore, ALEC adopted as our policy towards VoIP elements from laws enacted in states like Florida and Indiana. Our model *Advanced Voice Services Availability Act* exempts interconnected VoIP service from state utility regulation, but also preserves several rights and responsibilities for states and providers, and recognizes the FCC's jurisdiction. Our model policy also preserves state authority for resolving interconnection disputes as guaranteed under Sections 251 and 252 of the Communications Act.

If each state applied its own utility laws to VoIP, which include requirements such as PUC authority to provide the services, carrier of last resort obligations and tariffs with pre-approval for service changes, the increased costs on providers and ultimately consumers would be substantial. Adding to the regulatory burden reduces the incentive for providers to invest in their networks. According to a report in the Kansas City Business Journal, Google Fiber considered offering VoIP through its new Gigabit broadband network in Kansas City, but opted not to once it learned about the costs of complying with telephone regulations.[11]

The majority of states have recognized that continued investment in communications technology and services is at risk if VoIP faces an uncertain regulatory future. Currently VoIP exists in a competitive marketplace with low barriers to entry and low switching costs for consumers. If states imposed retail regulations on VoIP, there is potential for less economic growth and less innovation to deliver new and better services to consumers. Instead legislatures across the country have made clear that they believe the competitive marketplace, not legacy telephone regulations, are capable of ensuring service availability, quality, and reliability for consumers into the future.

VIII. Conclusion

[11] http://www.bizjournals.com/kansascity/blog/2012/12/google-considers-drops-phone-service.html

Thanks to VoIP, North Dakotans now have access to low-cost, feature-rich communications services using advanced Internet Protocol technology. By following the hands-off approach to regulation, North Dakota maintains the regulatory environment that has encouraged broadband investment and delivers VoIP and other cutting-edge communications services that bring investment and economic growth to North Dakota. Moreover, this approach is the same one followed by 29 other states and the FCC, which maintains certainty in the communications market. I appreciate the opportunity to present this information and I look forward to your questions. Thank you.