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THE EVOLUTION OF WIRED COMMUNICATIONS NETWORKS

HEARING

BEFORE THE

SUBCOMMITTEE ON COMMUNICATIONS AND TECHNOLOGY

OF THE

COMMITTEE ON ENERGY AND COMMERCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRTEENTH CONGRESS

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THE EVOLUTION OF WIRED COMMUNICATIONS NETWORKS

WEDNESDAY, OCTOBER 23, 2013

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON COMMUNICATIONS AND TECHNOLOGY,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to notice, at 10:34 a.m., in room 2123, Rayburn House Office Building, Hon. Greg Walden (chairman of the subcommittee) presiding.

Members present: Representatives Walden, Latta, Shimkus, Terry, Blackburn, Scalise, Lance, Guthrie, Gardner, Pompeo, Kinzinger, Long, Ellmers, Barton, Upton (ex officio), Eshoo, Doyle, Matsui, Welch, Dingell, Pallone, DeGette, Butterfield, and Waxman (ex officio).

Staff present: Gary Andres, Staff Director; Ray Baum, Senior Policy Advisor/Director of Coalitions; Andy Duberstein, Deputy Press Secretary; Kelsey Guyselman, Counsel, Communications and Technology; Grace Koh, Counsel, Communications and Technology; David Redl, Chief Counsel, Communications and Technology; Charlotte Savercool, Legislative Coordinator; Jessica Wilkerson, Staff Assistant; Roger Sherman, Democratic Chief Counsel; Shawn Chang, Democratic Senior Counsel; Margaret McCarthy, Democratic Professional Staff Member; Kara van Stralen, Democratic Policy Analyst; and Patrick Donovan, Democratic FCC Detailee.

Mr. WALDEN. We will call the Subcommittee on Communications and Technology to order and begin our hearing on the evolution of wired communications networks.

OPENING STATEMENT OF HON. GREG WALDEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Wired communications networks have come a long way since the days of the telegraph or the rotary phone. It is getting harder and harder to remember a time when if you wanted to reach out and touch someone, Ma Bell's pair of twisted copper wires were the only option. Today's consumers have so many more options. Cable, wireless, satellite, and, yes, even the telephone companies are all offering Americans the connectivity to communicate with the world.

As all of the services consumers have grown to love as standalone networks, like voice and video, are increasingly just data applications, completion between network providers has never been more vigorous, and over-the-top providers like Skype, Apple, Apple's Facetime, Netflix, and Hulu are bringing a new facet to competition for consumers' communications dollars. But while their

competitors have gone through successive generations of technological improvements, wired communications networks have languished. This isn't because of a lack of innovation, but rather because of a declining user base. High costs and unique regulatory mandates have conspired to make the economics of upgrade untenable.

Today, however, we stand on the cusp of two transitions in the wires network: the IP transition and the upgrade of the networks to fiber. Now, these transitions are a natural evolution as technology advances, greater capabilities develop, prices drop, and competition forces the market to respond.

While some of the costs of upgrade have changed, and wire line providers are increasingly branching out beyond their voice service roots, the outdated regulations once enacted to break up a monopoly remain. Consumers have come to expect, as well as they should, competition among providers in the innovation—innovative offerings that result from that competition. The question we face today is this: What is the appropriate role for the Federal Government in this transition?

We should be looking not only on the theoretical impact of competition policies on the market as they exist today, but also to the practical impact of the rules in an uncertain future. ILECs looking to invest in future technologies should be able to do so without the specter of maintaining legacy networks. Those in the competitive community should be able to look to the future with the certainty that they have the opportunity to serve their customers. And consumers should be able to embrace this transition without an interruption in the services they already enjoy.

We must strike the appropriate balance between protecting consumers, promoting competition, and not slowing the pace of needed innovation. The Internet and wireless worlds have thrived without heavy regulation. The last thing we want do is stifle the unprecedented growth in innovation of the Internet by subjecting it to complicated, outdated, government-imposed rules of the plain, old telephone networks.

It is time to take a hard look at the role of regulation in the modern wired communications network marketplace, and our witnesses are here to help us do just that.

[The prepared statement of Mr. Walden follows:]

PREPARED STATEMENT OF HON. GREG WALDEN

Wired communications networks have come a long way since the days of the telegraph or the rotary phone. It's getting harder and harder to remember a time when if you wanted to "reach out and touch someone," Ma Bell's pair of twisted copper wires was the only option. Today's consumers have so many more options. Cable, wireless, satellite and, yes, even the telephone companies, are all offering Americans the connectivity to communicate with the world. As all of the services consumers have grown to love as stand alone networks—like voice and video—are increasingly just data applications, competition between network providers has never been more vigorous, and over-the-top providers, like Skype, Apple's FaceTime, Netflix and Hulu are bringing a new facet to competition for consumers' communications dollars.

But while their competitors have gone through successive generations of technological improvements, wired communications networks have languished. This isn't because of a lack of innovation, but rather because a declining user base, high costs, and unique regulatory mandates have conspired to make the economics of upgrade untenable. Today, however, we stand on the cusp of two transitions in the wires net-

work: the IP transition and the upgrade of networks to fiber. These transitions are a natural evolution as technology advances, greater capabilities develop, prices drop and competition forces the market to respond.

While some of the costs to upgrade have changed and wireline providers are increasingly branching out beyond their voice service roots, the outdated regulations once enacted to break up a monopoly remain. Consumers have come to expect, as well they should, competition among providers and the innovative offerings that result. The question we face today is this: what is the appropriate role for the Federal Government in this transition?

We should be looking not only on the theoretical impact of competition policies on the market as it exists today, but also to the practical impact of the rules in an uncertain future. ILECs looking to invest in future technologies should be able to do so without the specter of maintaining legacy networks; those in the competitive community should be able to look to the future with the certainty that they have the opportunity to serve their customers; and consumers should be able to embrace this transition without an interruption in the services they already enjoy. We must strike the appropriate balance between protecting consumers, promoting competition, and not slowing the pace of needed innovation.

The Internet and wireless worlds have thrived without heavy regulation. The last thing we want to do is stifle the unprecedented growth and innovation of the Internet by subjecting it to complicated, outdated, government-imposed rules of the plain old telephone network. It's time to take a hard look at the role of regulation in the modern wired communications network marketplace, and our witnesses are here to help us do just that.

Mr. WALDEN.I thank the witnesses for their testimony, and now I would yield to my colleague from Texas, Mr. Barton, for 1 minute.

OPENING STATEMENT OF HON. JOE BARTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS

Mr. BARTON. Thank you, Mr. Chairman. That is perfect timing; I just walked in.

I want to thank you for holding this hearing on the transition of the Internet Protocol. It is a topic that we have not discussed, but we need to discuss in this Congress.

I was actually serving on this subcommittee and the full committee back in 1996 and participated in many conversations, debates, hearings, and markups regarding that act. I remember discussing how we could make the marketplace more competitive. And at that time AT&T did basically have monopoly, and we believed that creating the incumbent local exchange, the ILECs, and then the competitive local exchange, was a good solution to spur competition.

That marketplace then and the marketplace today, Mr. Chairman, as you know, are not the same. I do question now whether we need the Title 2 protections of the CLECs that we put in place back in 1996, and I think this hearing is a good start to answering that question.

Mr. WALDEN. Thank you.

And I now recognize the gentleman from Ohio, Mr. Latta, for 42 seconds.

OPENING STATEMENT OF HON. ROBERT E. LATTA, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OHIO

Mr. LATTA. Thank you very much, Mr. Chairman. And thank you very much for holding this hearing today, and I appreciate our witnesses for being here today.

Within the last three decades, we have entered a digital age of communications and witnessed the emergence of multimodal com-

petition and a dynamic Internet ecosystem that is replacing the public switched telephone network and time-division multiplex technologies with Internet Protocol-based platforms.

As we continue to see the convergence and evolution of our telecommunications marketplace, the future of regulation is a topic that must be addressed so that it does not thwart future investment, innovation, or economic growth. We need to ensure that current laws and regulations reflect the technologies and competitive dynamics of today's marketplace, while protecting consumers' ability to access the communications services of their choice and safeguarding the reliability and security of those services.

I would also ask to submit this chart, Mr. Chairman, for the record, showing the declining share of U.S. households with ILEC switched landline service as their primary line service over the last 10 years.

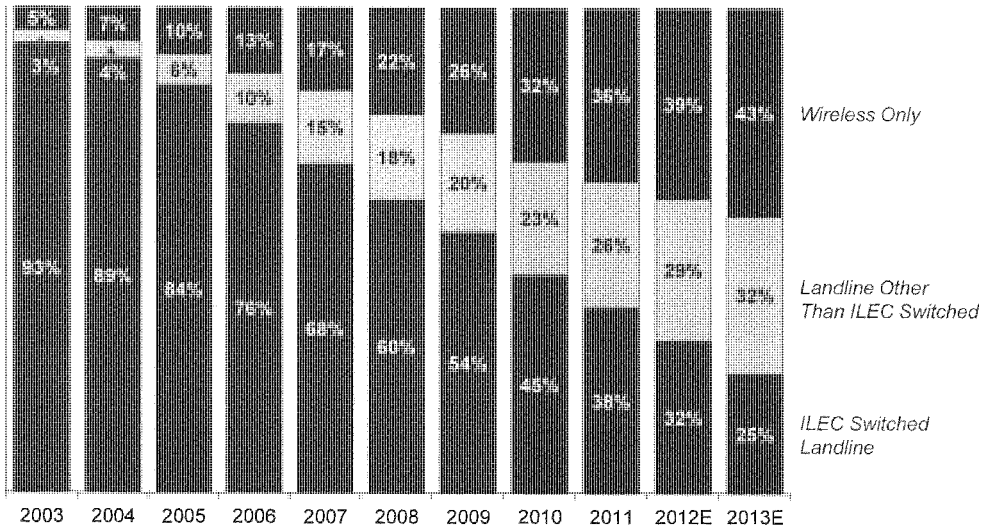
Look forward to hearing from our witnesses today, and I yield back.

Mr. WALDEN. And, without objection, the chart you reference will be submitted for the record.

[The chart follows:]

ILEC Switched Share of Households Is Declining Sharply

Share of U.S. Household Primary Line Service
(Percent of Telephone Households)



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

USTELECOM
THE BROADBAND ASSOCIATION

Mr. WALDEN. We now turn to my friend and colleague from California Ms. Eshoo for an opening statement.

OPENING STATEMENT OF HON. ANNA G. ESHOO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Ms. ESHOO. Thank you, Mr. Chairman. And welcome to all of the witnesses and packed hearing room.

Seventeen years ago, the 1996 act stated its intention, quote, "to promote competition and encourage the rapid development or deployment of new telecommunication technologies." In the years that have followed, hundreds of new entrants have emerged, and with their creativity and ingenuity, billions of dollars have been invested, and thousands of new jobs have been created. So there have been a lot of good things that have come from that.

As the title of today's hearing suggests, an evolution—and I underscore the word "evolution"—in wired communication networks is under way, creating new ways of delivering a familiar service, a phone call. For over a decade communications companies have been making the transition to IP. And so I think it is incumbent upon all of us here to decide why we would remove rules that have helped pave the way for greater competition and innovation in the marketplace, and it is a worthy examination.

Changes in technology and infrastructure do not alter the national goals that have always guided our communications policies. As Commissioner Rosenworcel and Public Knowledge have both articulated, our conversation should begin by laying out the core values or principles that will guide the transition to all IP voice networks.

Fundamentally the FCC must ensure universal service to all Americans and the rules of the road for competition, as well as strong consumer protections and access to 911. Consumers and businesses have to have confidence in the reliability and the functionality of these services, particularly during times of emergency. And I am sure it is an area that we are going to hear about and concentrate on today.

The reality is is that consumers don't consider whether a phone call is delivered through a traditional switched network or via IP. They just expect their phone call to connect as it always has.

We all support investments that enable companies to offer their consumers new and innovative services and do so more efficiently and reliably, but changes in technology don't automatically—don't automatically—make markets more competitive. I look forward to our witnesses' perspectives on how we can ensure that the IP transition results in more competitive choices.

And finally it is important that the investment in job creation—to remember that the investments in job creation do not come from just two or three companies, but rather an ecosystem, and we are blessed to have that in our country, that includes hundreds of communications companies both small, medium, and large. Earlier this year a study found that updated procompetition policies would stimulate the hiring of up to 650,000 new employees in the telecom sector over the next 5 years and $184 billion of private funds into U.S. telecommunications networks.

So, Mr. Chairman, the topic of today's hearing raises—first of all, it is an important topic. It also raises important questions that it is our responsibility to have thoroughly answered. As the migration to all-IP networks continues, the testimony of our witnesses—and we have a sterling panel here today—will help ensure that our laws and regulations promote new investment, competition and consumer choice.

And I would like to ask unanimous consent, Mr. Chairman, that this letter from the Competitive Carriers Association reiterating the importance of long-standing, tech-neutral interconnection requirements be submitted for the record.

Mr. WALDEN. Without objection.

[The letter follows:]

Competitive Carriers Association
805 15th Street NW, Suite 401
Washington, DC 20005
Office: (202) 449 -9866 • Fax: (866) 436 -1080

October 23, 2013

The Honorable Fred Upton
Chairman
Committee on Energy & Commerce
U.S. House of Representatives
Washington, DC 20515

The Honorable Henry Waxman
Ranking Member
Committee on Energy & Commerce
U.S. House of Representatives
Washington, DC 20515

The Honorable Greg Walden
Chairman
Subcommittee on Communications & Technology
U.S. House of Representatives
Washington, DC 20515

The Honorable Anna Eshoo
Ranking Member
Subcommittee on Communications & Technology
U.S. House of Representatives
Washington, DC 20515

Dear Chairmen Upton and Walden and Ranking Members Waxman and Eshoo:

Thank you for today's consideration of "The Evolution of Wired Communications Networks." On behalf of over 100 wireless carrier members, including providers of all sizes and serving nearly every geographic area in the country, CCA submits this letter to underscore the importance of the longstanding, technologically-neutral interconnection requirements that have been a cornerstone of U.S. telecommunications.

CCA supports efforts to facilitate the transition from time-division multiplexing (TDM) to Internet Protocol (IP) networks, but this transition to IP neither requires nor should contemplate the elimination of the important interconnection and arbitration safeguards enacted by Congress under Sections 251 and 252 of the Communications Act. As Congress and the Federal Communications Commission (FCC) consider the appropriate regulatory framework for an all IP world, it is imperative that policymakers reaffirm the vital interconnection and arbitration requirements of Sections 251 and 252 of the Act, which has been the fundamental underpinning of robust nationwide telecommunications capabilities, regardless of the technology used.

The FCC has recognized that "[b]asic interconnection regulations" have been "a central tenet of telecommunications regulatory policy for over a century," and that "[f]or competition to thrive, the principle of interconnection ... needs to be maintained." As Congress looks to the future of telecommunications and the appropriate role of regulation, a policy framework supporting technology-neutral interconnection as a core principle will allow companies of all sizes to invest and compete.

In addition to spectrum and devices, wireless carriers need access to networks and network connections to effectively compete. Some have incorrectly assumed, speculated, or inaccurately characterized that existing statutory provisions for interconnection requirements do not apply to carriers using IP technology. Policymakers should reaffirm the Communications Act's technology-neutral interconnection provisions to

provide all carriers with certainty that every carrier will have access to the required physical infrastructure to connect their networks and their customers. This certainty will provide wireless carriers with the confidence needed to invest in their networks, including bidding on spectrum in upcoming auctions and deploying infrastructure to meet consumers' insatiable demands for high-speed mobile broadband services.

We commend your efforts and focus on the important issues impacted by this ongoing network evolution, and look forward to our continued work with you to support competition throughout the industry. Please do not hesitate to contact me with any questions.

Respectfully Submitted,

Steven K. Berry
President & CEO, CCA

Ms. ESHOO. Thank you. And I yield back.

Mr. WALDEN. Gentlelady yields back the balance of her time. The chair now recognizes the vice chair of the full committee, the gentlelady from Tennessee, Mrs. Blackburn.

OPENING STATEMENT OF HON. MARSHA BLACKBURN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TENNESSEE

Mrs. BLACKBURN. Thank you, Mr. Chairman. And I want to thank you for holding this hearing. It is important. It is timely. And we want to welcome our witnesses. And thank you for being here.

As you have heard, each of us talk about competition and looking at how that has changed in the communications marketplace. And today we have that intermodal competition among the ILECs, the CLECs, VoIP, cable, satellite, others. But these competitive services are subject to different rules based on outdated assumptions. And I think that it is not easy for regulators in the Federal Government and here in DC to change how they think about the treatment toward communications in today's marketplace. And I do feel that it is our responsibility to look at how we create the appropriate environment, put some regulatory certainty in place, and then encourage that private capital and investment and focus on creating jobs.

There are three things that I want to drill down on a little bit on today with you all. Number one, is it fair to tell someone who wants to invest in tomorrow's technology that they need to slow down in order to maintain an old network that they don't want to invest in anymore? Number two, does it still make sense for the old rotary-dial regulatory model—and, yes, some of us do remember that model—to hold back the communications revolution that is before us now? And, number three, how can we make the transition to the Internet Protocol as seamless and dependable as possible? Those are questions worthy of discussion.

I thank you all for your time, and at this time I will yield to any other Member—I do not have anyone in the queue.

Mr. WALDEN. Anyone else on the Republican side want to make any comments? If not, the gentlelady yields back.

Now recognize my friend, the gentleman from California Mr. Waxman, for 5 minutes.

OPENING STATEMENT OF HON. HENRY A. WAXMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. WAXMAN. Thank you very much, Mr. Chairman.

Since the days of a black rotary phone, Americans have been able to count on the phone network to call friends and family, conduct business, and reach emergency services when needed. Today, thanks to innovation and competition, consumers can connect to the phone network in more ways than ever before, but when we pick up a wireless smartphone or dial a number over Voice over Internet Protocol service, few of us pause to consider the technology involved. We simply expect our phone calls to go through.

The ongoing transition from traditional circuit-switched networks, the Internet Protocol or IP-based networks is the technical backdrop for today's hearing, but our phone network is more than a system of wires, switches, and technical protocols. It is an essential part of the social and economic fabric of the United States. As we consider this next network evolution, we must continue to protect the core values that have guided our communications policy for nearly a century. Many of today's witnesses have articulated some version of these values, and there is widespread agreement on these principles.

Our commitment to universal service is a recognition that all of us benefit when everyone is connected. We protect competition because it is the most efficient way to generate new products and lower prices, with the added benefits of limiting regulation. We have rules for consumer protection, because the marketplace needs oversight to ensure that services like 911 are provided even if the market is not yet demanding them. This is a mandate Congress has entrusted to the FCC, and it does not change with new generation of technology.

I think we all recognize the transition to IP-based networks is already happening, and this is a good thing. The transition means more investment and opportunities for economic growth and new services that can improve everything from healthcare delivery to energy efficiency. The challenge we face is how to manage this transition in a way that does not disrupt businesses and consumers that rely on traditional services today.

I agree with Mr. Cicconi that we need the FCC as an expert agency to help guide the evolution to an all-IP network, but I caution against using the advent of IP-based services as a vehicle to try to undermine the FCC's authority to preserve competition and protect the public. Whether addressing complaints about rural call completion or ensuring network reliability during disasters, we need the FCC to address the impacts of the IP transition. A vibrant and vital FCC is critical to ensuring that the transition ultimately achieves the goal we all share, which is a world-class network that delivers greater benefits for consumers and our economy.

And I thank Chairman Walden for holding this important hearing and working with us to assemble a balanced panel.

Mr. Chairman, I would like to ask unanimous consent to enter into the record a paper by Professor Kevin Werbach titled "No Dialtone: The End of the Public Switched Telephone Network."

Mr. WALDEN. Without objection.

[The information follows:]

NO DIALTONE:

THE END OF THE PUBLIC SWITCHED TELEPHONE NETWORK

Kevin Werbach

The Wharton School, University of Pennsylvania
werbach@wharton.upenn.edu

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NO DIALTONE:

THE END OF THE PUBLIC SWITCHED TELEPHONE NETWORK

Kevin Werbach*

[21,263 words – including footnotes]

I. INTRODUCTION

All good things must come to an end. The Public Switched Telephone Network (PSTN) is the foundation for the modern global communications system, and the myriad benefits it delivers. Today, the era of the PSTN is swiftly coming to a close. The PSTN's technical, economic, and legal pillars have been undermined in the United States by three developments: the rise of the Internet; customers and providers abandoning wireline voice telephony; and the collapse of the regulatory theory for data services. This article provides a framework for moving beyond the PSTN, by distinguishing the aspects of the existing system that should be retained, reconstituted, and abandoned.

The transition from the PSTN to a broadband network of networks is the most important communications policy event in at least half a century.[1] It calls into question the viability of the Federal Communications Commission, the Communications Act, and the telecommunications industry as we know it. Yet the significance of the transition is not widely recognized. Attention has focused

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[1] *See generally* JONATHAN E. NUECHTERLEIN & PHILIP J. WEISER, DIGITAL CROSSROADS: AMERICAN TELECOMMUNICATIONS POLICY IN THE INTERNET AGE (2005) (describing the transformation of communications networks); Michael K. Powell, Comm'r, FCC, The Great Digital Broadband Migration, Remarks before the Progress and Freedom Foundation (Dec. 8, 2000), *available at* http://www.fcc.gov/Speeches/Powell/2000/spmkp003.html (arguing that all communications platforms were in the midst of a transformative "digital broadband migration").

on specific manifestations and consequences, such as the rise of "wireless-only" households and problems with rural call completion.

The time has come to address the situation squarely. The lesson from prior structural transitions in communications such as digital television, the AT&T divestiture, and the opening of local telephone competition is that, with good planning and the right policy decisions, they can proceed smoothly and open new vistas for competition and innovation. Without them, they are dangerous opportunities for chaos that can gravely harm the public interest.

There are two mainstream views about how to handle the PSTN transition. One is that it represents the completion of a deregulatory arc begun at the AT&T divestiture and accelerated by the Telecommunications Act of 1996. The other is that longstanding regulatory obligations need only to be extended to a new world. Both are wrong, because they treat the PSTN as a unitary thing. What we call the PSTN is actually six different concepts:

1) a technical architecture
2) a regulatory arrangement
3) a business and market structure
4) universal connectivity
5) strategic national infrastructure
6) a social contract

The elements earlier on the list are rooted in the particular historical, legal and technical circumstances that gave birth to the PSTN. They are anachronistic in the current environment. The later elements are public policy obligations that should be satisfied regardless of the historical circumstances. The question is how to do so in the most efficient and effective manner, given the changed circumstances.

The end of the PSTN involves two primary developments. First, customers are switching from the incumbent wireline telephone companies to alternatives using different networks or technologies, primarily wireless phones and voice over Internet protocol (VOIP). Second, those telephone companies themselves are migrating away from the technical underpinnings of the PSTN, seeking to move their own customers to wireless and VOIP-based alternatives.

The initial stage of the PSTN transition is occurring with surprising speed. The PSTN has been around for more than a century, and reached effective ubiquity in U.S. households in the middle of the last century.[2] It is deeply woven

[2] *See* MILTON MUELLER, UNIVERSAL SERVICE: COMPETITION, INTERCONNECTION AND MONOPOLY IN THE MAKING OF THE AMERICAN TELEPHONE SYSTEM (MIT Press 1997). Penetration numbers continued to creep up after that. Though some Americans in

into the fabric of daily life and business. It seems unthinkable that it could disappear in a generation, let alone a decade. Yet for all intents and purposes, the era of the PSTN as the country's dominant communications network is already over. The Federal Communications Commission's (FCC's) Technology Advisory Committee has predicted that by 2018, the PSTN market will reach only six percent of the U.S. population.[3]

The PSTN is rapidly becoming an afterthought. Its market share will continue to shrink even if the incumbent network operators do nothing. And they are doing significantly more than that. They are putting into motion plans to transition their PSTN customers to VOIP or wireless connections. A small number of Verizon customers have already been transitioned to a wireless service that doesn't provide the full functionality of the PSTN as their only option for phone service.[4] And AT&T has petitioned the FCC for authorization to switch entire communities over to IP-based technology on an experimental basis.[5] The endgame for both, and for virtually all PSTN providers, is to move to an all Internet Protocol (IP) network with no switched wireline voice connections.[6]

The death of the PSTN is a good thing. The reason all new entrants are using IP-based technologies, and all existing providers want to, is that they offer enhanced functionality and cost savings. Both customers and industry will benefit from the switchover. Yet there are two significant and related problems with the transition. The PSTN delivers highly important public interest benefits, not all of which will necessarily be preserved when moving away from traditional telephone service. These benefits range from consumer protections to national security considerations. Second, the U.S. regulatory regime for telecommunications is tightly connected to the PSTN. Partly as a result, the business arrangements of the telecommunications sector assume the PSTN as a

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extremely rural areas of with low incomes never obtained telephone service, their numbers are miniscule.

[3] FCC Technology Advisory Counsel, Critical Transition Working Group: PSTN, working draft last modified June 12, 2011.

[4] *See infra* Fire Island discussion.

[5] *See infra* AT&T petition.

[6] *See* Kevin Werbach, *Off the Hook*, 95 Cornell L. Rev. 101, 104 (2010); Susan P. Crawford, *Transporting Communications*, 89 B.U. L. REV. 871, 874 (2009); Jonathan Weinberg, *The Internet and "Telecommunications Services," Universal Service Mechanisms, Access Charges, and Other Flotsam of the Regulatory System*, 16 YALE J. ON REG. 211, 211–12 (1999) ("The communications world is changing, and packet-switched networks are taking over."); Philip J. Weiser, *Toward a Next Generation Regulatory Strategy*, 35 LOY. U. CHI. L.J. 41, 41 (2003) ("[T]he advent of digital, packet-switched broadband networks that carry all forms of communication will restructure traditional telecommunications markets ....").

backstop. If all regulatory obligations disappear with the transition, the consequences could be dire.

The transition process is complicated by past decade of telecommunications policy-making, which has left the legal regime for IP-based services a confusing mess. Fortunately, even without Congressional action, the FCC retains sufficient legal authority to address the critical issues. The best way to do so is through the transition process itself, because telecommunications carriers are required to apply for FCC approval whenever they terminate service.[7] The statutory process under Section 214 of the Communications Act offers a unique opportunity to facilitate the PSTN transition without being caught up in the detritus of other policy-making.

The remainder of this paper is organized as follows. Part II describes the PSTN and the IP transition now underway. Part III offers a framework that eliminates legacy requirements while ensuring public interest protections going forward. Part IV discusses specifics of the transition process.

II. THE TRANSITION

A. Goodbye to All That

1. The Public Switched Network

The telephone is among the most profound inventions of the last 150 years.[8] It is how we stay in touch with friends and family; perform business transactions; and obtain vital information. Without the telephone, modern cities, transportation networks, corporations, law enforcement, and many other attributes of the world we live in would not be possible. The ability to, in the words of a famous AT&T slogan, "reach out and touch someone," in real time, anywhere, has brought massive efficiencies to business and altered the fabric of social interaction.[9] Many decades of technological evolution have led from rotary phones making calls connected by human operators to today's feature-laden

[7] 47 U.S.C. § 214.

[8] *See generally* ITHIEL DE SOLA POOL (EDITOR), THE SOCIAL IMPACT OF THE TELEPHONE (MIT Press 1977) (offering various perspectives on the societal significance of telephone service delivered through the PSTN).

[9] *See generally* Kevin Werbach, *Sensors and Sensibilities*, 28 CARDOZO L.REV. 2321 (2007) (describing the impact of changing communications technologies on modes of social interaction).

digital devices, but the telephone as a universal communications tool has been a constant.

We take all this for granted. We assume we can call a doctor or summon public safety personnel in an emergency; obtain customer service from a business; or put children in touch with grandparents across the country. Like fish swimming in water, we have a hard time imagining a world in which reliable, universal telephone service could not be counted on. Yet today, that is a real possibility.

The telephones in our homes, businesses, pockets, and purses are not islands. They are the visible endpoints of a vast and unbelievably complex edifice built at massive expense over the course of a century. Phones "just work" every day for hundreds of millions of Americans -- and billions of people around the world -- through the cooperative efforts of many companies of varying sizes and configurations, often direct competitors. And the hidden infrastructure supporting those phones gave us many other things that piggybacked on the network, not least of which is the Internet. The system that enables all this and more is the PSTN.

Colloquially, the PSTN refers to the wired telephone network that reaches into virtually every American home. However, such a definition is misleading. The PSTN is not a particular set of physical components. The same copper wires that deliver telephone service to the home can also support non-PSTN services such as broadband Internet access and video programming.[10] At the same time, traditional telephone service can be delivered to the home over non-PSTN connections. A Comcast Digital Voice customer uses an ordinary telephone to dial ordinary telephone numbers to make and receive ordinary telephone calls, but technically that customer is using voice over Internet Protocol (VOIP) technology rather than the PSTN.[11]

A more precise definition is implicit in the term itself. The Code of Federal Regulations (CFR) defines the Public Switched Network as, "Any common carrier switched network, whether by wire or radio, including local exchange carriers, interexchange carriers, and mobile service providers, that use the North American Numbering Plan in connection with the provision of switched

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[10] For example, AT&T's U-verse service offers voice, broadband, and multichannel video over a new fiber-optic digital network infrastructure that still uses the existing copper wires for the final connection into the home.

[11] *See* See IP-Enabled Services; E911 Requirements for IP-Enabled Service Providers, WC Docket Nos. 04-36, 05-196, First Report and Order and Notice of Proposed Rulemaking, 20 FCC Rcd 10245, 10257-58, para. 24 (June 3, 2005) (VoIP 911 Order), aff'd, Nuvio Corp. v. FCC, 473 F.3d 302 (D.C. Cir. 2006); 47 C.F.R. §§ 9.3, 54.5 (defining "interconnected VoIP service").

services."[12] While this definition does not capture all the dimensions of the PSTN, it identifies its most basic elements.[13] As the CFR definition suggests, the PSTN is the interconnected network of communications networks that are:

- Public (available to all, which is implied by the CFR term "common carrier");
- Switched (routing calls within and between networks by creating a dedicated end-to-end communications path); and
- Telephone (implied by the reference to the North American Numbering Plan, which defines the familiar dialing system of a three-digit area code and seven-digit phone number).

The CFR definition includes wireless networks as part of the interconnected mesh of the PSTN. While this is accurate from a high-level perspective, the core of the PSTN in the legacy wireline infrastructure that was in place before the growth of mobile phones. That is the portion that functions as a bedrock reliable connection and is subject to special regulatory obligations.

2. The incredible shrinking network

For several decades, all but small percentage of Americans used a home telephone. Those wires are still there today. Yet in just over a decade, there has been a massive shift away from the PSTN.[14] Where previously virtually all

[12] 47 C.F.R. §20.3. "Public Switched Network" is not exactly the same phrase as "Public Switched Telephone Network," but the two are generally coterminous. It bears noting that this definition appears in the CFR, which collects rules issued by the FCC, and not in the FCC's authorizing statute, the Communications Act. Communications Act of 1934, Pub. L. No. 73-416, 48 Stat. 1064 (codified as amended at 47 U.S.C. §§ 151–615b (2000)). The Communications Act gives the FCC several grants of legal authority in the telecommunications space, but these are only indirectly tied to the concept of the PSTN. This creates significant problems in ascertaining the agency's authority to apply its public interest rules when network operators change from the PSTN to other network architectures. *See infra* Part II(B).

[13] This paper focuses on the PSTN transition in the United States. The PSTN is a global system, and similar developments are occurring in other parts of the world. The ultimate transition from the PSTN to an Internet Protocol environment will be worldwide phenomenon. The regulatory obligations on the network operators and other service providers involved in the PSTN, however, are specified at the national and sub-national level. Each country (or region, in the case of the European Union) has its own telecommunications laws, which are better or worse adjusted in their current form to the evolution of the network. Thus, while there will be similar questions as France Telecom or Japan's NTT go through the transition, the specific legal considerations will differ.

[14] *See generally* Richard Taylor, Issues in the Transition of the U.S. PSTN from TDM to IP (Paper presented at International Telecommunications Society 6th Africa-Asia-Australasia Regional Conference, Perth, Australia, 2013), *available at* http://psu-us.academia.edu/RichardTaylor (describing the transition away from the PSTN)

telephones were connected through the wired PSTN, today substantially less than half of American households use it for their primary telephone connection. Subscribers are choosing in droves to give up their conventional landline telephones and replace them with services using different technologies.

The pace of change has been breathtaking. The total number of residential switched access lines, the term used in FCC statistical reports for traditional local telephone service accounts, peaked at 194 million in 2000.[15] That number fell to 101 million in 2012,[16] a drop of 48% in a dozen years. As dramatic as those statistics are, they understate the trend. The U.S. population grew by over 30 million from 2000-2012, even as the number of switched access lines fell. In total, according to US Telecom, the trade association for the local telephone carriers, the percentage of U.S. households with traditional phone service fell from 93% in 2003 to 25% in 2013.[17]

Where are all those subscribers going? Virtually all of them still have telephone service.[18] They are simply obtaining it in different ways, primarily wireless and VOIP.

As of December 2012, there were 326.4 million wireless subscriber connections in the U.S., counting phones, tablets, and other devices.[19] Most

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[15] Federal Communications Commission Releases Latest Data on Local Telephone Competition, May 21, 2001, *available at* http://transition.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/lcom0501.pdf.

[16] FCC, Local Telephone Competition: Status as of June 30, 2012, *available at* http://transition.fcc.gov/wcb/iatd/comp.html.

[17] Patrick Brogan, Evidence of Voice Competition and ILEC Non-Dominance Mounts, US Telecom Research Brief, April 3, 2013, at 1. The report sourced data from several governmental sources including the FCC, Centers for Disease Control, and Census, as well as industry reports. *See also* Report and Order and Further Notice of Proposed Rulemaking, Connect America Fund et al, FCC 11-161, Reply Comments of AT&T at 21 (AT&T universal service reply comments) (reporting that as of December 2012, only 29% of customers in the states where AT&T provides service were using residential wireline phone service from the incumbent local exchange carriers).

[18] A portion of the fall-off in switched access lines is from households eliminating second phone lines that were purchased for fax machines or dial-up Internet access. With the shift to residential broadband since 2000, fewer households found a second line necessary, even if they kept their original wired phone connection. The drop in access lines to the current number is therefore exaggerated somewhat, because the high point exceeded the total number of households in the U.S. by a significant amount. However, the current level is well below the baseline prior to the second-line boom.

[19] CTIA: The Wireless Association, Wireless Quick Facts, *at* http://www.ctia.org/advocacy/research/index.cfm/aid/10323. Astute observers will note that this number exceeds the total U.S. population. The explanation is that some people have more than one wireless subscription, such as a personal mobile phone and one for work, or a mobile phone and a tablet with a cellular wireless data connection.

Americans who have a mobile phone also have a wired connection at home, but a growing percentage rely solely on their mobile device.[20] If a mobile phone can provide all the functionality of their traditional wired service, with the added benefits of mobility and smartphone features, many Americans have decided, why continue to pay a monthly fee for the landline as well? Such "cord cutting" is especially prominent among young people, who got used to mobile phones as their primary communications device before living on their own, but it has now spread more broadly. The Centers for Disease Control, which conducts annual health surveys of U.S. households, has for several years asked about phone service. In its most recent survey, with data from December 2012, it found that 35.8% of households reported using only wireless service at home.[21]

The second major category of non-PSTN phone service is wireline service using VOIP. With a small converter device at the customer premises, it is possible to carry telephone calls from ordinary phones transparently through a broadband Internet connection.[22] The experience is effectively unchanged for the subscriber, but the PSTN has been removed from the connection.

This can be done in two ways. First, an independent company can provide the VOIP service across the public Internet. Vonage, the largest such provider in the U.S., reported 2.3 million customers in the second quarter of 2013.[23] Vonage and other companies like it make voice into an application, similar to the way Netflix delivers video programming "over the top" of an Internet connection.

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[20] As noted above, the CFR definition includes "mobile service providers" in its definition of "public switched network." 47 C.F.R. §20.3. While it is true that today's mobile phone networks used the circuit-switching technology, mobile phones avoid the infrastructure of the landline PSTN. A home telephone subscriber who switches to a mobile phone as their primary connection is abandoning their existing connection for one that uses very different technology and has a somewhat different regulatory regime. *See* 47 U.S.C. §332 (defining regulatory obligations for commercial mobile radio service). Further, mobile networks are also evolving away from circuit-switching towards data-centric architectures. A technology called Voice Over Long Term Evolution (VoLTE) is now being deployed to handle wireless voice calls through VOIP. *See* MIIKKA POIKSELKÄ, ET AL, VOICE OVER LTE (VOLTE) (John Wiley & Sons 2012).

[21] Early Release of Estimates from the National Health Interview Survey, January – June 2012. National Center for Health Statistics, December 2012.

[22] This does not include services such as Skype that ride on top of a broadband connection and do not require dedicated hardware at the customer premises. While users employ these services to substitute for PSTN calls, especially for international connections, only a small percentage use them as their sole telecommunications link, due to inconsistent reliability. Moreover, to make calls on Skype-type VOIP services to or from an ordinary telephone requires translation to the PSTN for a portion of the call.

[23] Vonage Holdings Corp. Reports Second Quarter 2013 Results, *available at* http://pr.vonage.com/releasedetail.cfm?ReleaseID=781567.

Alternatively, an Internet access provider can provide VOIP as a standalone service, along with broadband data. In addition to the potential synergies in network operations and billing, the broadband providers can route the VOIP traffic over managed connections and voice peering links with other operators, resulting in improved performance and lower cost.[24] The largest cable VOIP provider, Comcast, now has over 10 million subscribers, making it the third largest local phone company after AT&T and Verizon.[25]

In all, the US Telecom report concluded that by the end of 2013, 43% of U.S. households would be wireless-only and 32% would use VOIP or other non-PSTN landline technologies.[26] Taking into account homes that subscribe to landline service but use a mobile phone for all or almost all calls, the percentage of American households using any form of wired telephone fell below half in the first half of 2011, and has continued dropping since.[27] All indications are that these trends will continue.[28]

Wireless phone service was introduced in the US at the end of the 1970s and was not a mainstream consumer service until the 1990s, while robust VOIP services only became available with the growth of broadband around the turn of the millennium. Yet in that short time period, these two alternatives have dethroned the mighty PSTN.

3. The carriers make their move

The major telephone companies that provide PSTN service are not ignorant of the massive shifts occurring around them. Even without changing their own operations, the incumbent local exchange carriers use the PSTN transition in their arguments to regulators. They claim that so many subscribers moving to other platforms means the market is sufficiently competitive to eliminate legacy

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[24] *See* Carol Wilson, VON: Cable close to national VoIP peering, Connected Planet, March 21, 2007, *at* http://connectedplanetonline.com/voip/technology/cable_voip_peering_032107/

[25] Comcast Reports 2nd Quarter 2013 Results, *available at* http://www.cmcsk.com/releasedetail.cfm?ReleaseID=781496.

[26] *See* Brogan, *supra* note 17.

[27] *See* Stacey Higginbotham, Over Half of American Homes Don't Have or Use Their Landline, GigaOm, Dec. 26, 2012, *at* http://gigaom.com/2012/12/26/over-half-of-american-homes-dont-have-or-use-their-landline/.

[28] *See generally* FCC Technology Advisory Council, Status of Recommendations, June 29, 2011, at 10, *available at* http://transition.fcc.gov/oet/tac/TACJune2011mtgfullpresentation.pdf (predicting continued migration away from the PSTN).

obligations on incumbents. However, they are not stopping there. They are moving to abandon the PSTN themselves.[29]

On November 7, 2012, AT&T filed a document with the FCC innocuously titled, "Petition to Launch a Proceeding Concerning the TDM-to-IP Transition."[30] AT&T asked the Commission to authorize a series of geographically-limited experiments by what it called "the 'telephone' industry[]", pointedly adding quotes to reinforce its message.[31] According to AT&T, these "geographically limited trial runs ... will help guide the Commission's nationwide efforts to facilitate the IP transition."[32] After listing what it claimed were outmoded regulatory obligations on telecommunications carriers, AT&T sought authorization to take three steps in specified wire centers:

- Remove legal requirements that carriers maintain legacy PSTN networks after IP-based alternatives are in place.
- Eliminate the carriers' obligation to interconnect with other TDM-based networks.
- Permit carriers to transition customers to alternative IP-based networks with notification, but without permission.[33]

AT&T did not reject the notion that some FCC and state regulation might remain in place for IP-based networks, but it urged the Commission to "keep IP services free of legacy regulation so that the trial may proceed without the distorting and investment-chilling effects of such regulation."[34] In essence, these trial areas would inhabit a largely regulatory-free zone.

Though couched in limited terms, AT&T's petition is a dagger to the heart of the telecommunications regulatory structure of the Communications Act. The clear implication is that, if the trials AT&T proposes were implemented and were deemed successful, the FCC should expand the same approach to the entire industry. Under AT&T's proposed framework, the post-transition

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[29] *See* Rob Frieden, *The Mixed Blessing of a Deregulatory Endpoint for the Public Switched Telephone Network*, 37 TELECOMM. POL'Y, 400 (May–June 2013).

[30] *See* AT&T Petition to Launch a Proceeding Concerning the TDM-to-IP Transition, GN Docket No. 12-353 (filed Nov. 7, 2012) (AT&T Petition). AT&T's petition was consolidated with a similar request filed by the National Telecommunications Cooperative Association (NTCA), which represents certain rural carriers. Petition of the National Telecommunications Cooperative Association for a Rulemaking to Promote and Sustain the Ongoing TDM-to-IP Evolution (filed Nov. 19, 2012).

[31] AT&T Petition, *supra* note 30, at 1.

[32] *Id* at *20*.

[33] *Id.* at 21-22.

[34] *Id.* at 22.

telecommunications network would start with a largely blank regulatory slate, rather than evolving from the regulatory obligations on TDM networks. Under AT&T's three conditions, carriers could make the transition without requiring authorization from regulators, other networks they interconnect with, or customers.

If the FCC implemented AT&T's proposed regime nationwide, it would be, in effect, formally abdicating its historic regulatory role. Whether the time has come to move in that direction is valid question, and AT&T's petition is a legitimate request. The point to emphasize is that the stakes are that high. AT&T acknowledged the magnitude of its request by proposing initially a set of trials limited in time and geographic scope. It framed these as opportunities for the FCC to gather data and evaluate the proper course forward, recognizing that a frontal assault on the agency would be less likely to succeed.[35] Of course, AT&T's petition didn't appear out of the blue. AT&T and other incumbent carriers have been pushing for the elimination of "outmoded" regulatory obligations for some time. The petition represents a new stage of the debate, obliging the FCC to respond formally.

The same day it filed its petition with the FCC for "all-IP" experiments, AT&T made a major public announcement. The carrier declared it would spend an additional $14 billion over a three-year period to upgrade 75% of its customers to its U-verse IP-based broadband wireline platform, and cover virtually all the remainder with high-speed wireless connections.[36] AT&T stated this investment was part of an overall effort to decommission its copper infrastructure. In effect, AT&T was staying that by the end of 2015, it anticipated being in position to transition completely away from the PSTN to an all-IP architecture. And in rural areas, where U-verse is un-economical to deploy, AT&T plans to replace landlines with wireless alternatives.[37]

AT&T's primary competitor, Verizon, has similar plans. In transcribed remarks at an investor conference in July 2012, Verizon CEO Lowell McAdam indicated the company planned to shut down its copper PSTN infrastructure.[38]

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[35] It is worth mentioning that the petition was filed the day after Barack Obama was re-elected. Had Republican Mitt Romney captured the White House, the environment for direct elimination of the FCC's primary regulatory functions would have been considerably more favorable.

[36] *See* Anton Troianovski, *AT&T Move Signals End of the Copper-Wire Era*, WALL ST. J., Nov. 7, 2012.

[37] *See* Joan Engebretson, Wireless Landline Replacement is Part of AT&T's Rural Plans, Telecompetitor, (Nov. 15, 2012), http://www.telecompetitor.com/wireless-landline-replacement-is-part-of-atts-rural-plans/

[38] *See* Phillip Dampier, Verizon CEO Ponders Killing Off Rural Phone/Broadband Service & Rake In Wireless Profits, Stop the Cap!, July 17, 2012, *at*

In rural areas, he said, "we are going to cut the copper off there. We are going to do it over wireless."[39] McAdam also expressed his intent to eliminate copper within the footprint of Verizon's fiber-optic FiOS service, which reaches about 18 million homes.[40] "[E]very place we have FiOS, we are going to kill the copper. We are going to just take it out of service and we are going to move those services onto FiOS."[41] In constrast to AT&T, Verizon has not announced an all-IP upgrade for the non-rural portions of its network that do not have FiOS, but such a plan cannot be far from announcement.[42]

4. Changing facts on the ground

Verizon has also developed a product called Voice Link to replace PSTN phone service with wireless.[43] Voice Link offers the major voice features of the PSTN, such as 911 access and caller ID. It also offers 36-hour battery backup power, because wireless networks, unlike the wireline PSTN, depend on the commercial power grid.[44] However, Voice Link currently only supports voice calling, meaning that it does not handle faxing, dial-up modems, burglar alarm monitoring, or other activities that many subscribers engage in over the PSTN.[45]

Verizon in 2011 began promoting Voice Link to subscribers who had required frequent customer service visits because of connection problems. A year of so later, it took a more significant step. Hurricane Sandy damaged or destroyed the

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http://stopthecap.com/2012/07/17/verizon-ceo-ponders-killing-off-rural-phonebroadband-service-rake-in-wireless-profits/.

[39] *Id.*

[40] *See* Jeff Baumgartner, Verizon FiOS Rolls Out 500-Meg Internet Tier Offers, Multichannel News, July 22, 2013, *at* http://www.multichannel.com/distribution/verizon-fios-rolls-out-500-meg-internet-tier/144521

[41] *Id.*

[42] Under pressure from Wall Street, Verizon has said it plans no further geographic expansion of FiOS. *See* Susan P. Crawford, *The Communications Crisis in America*, 5 HARV. L. & POL'Y REV. 245 (2011); Peter Svensson, *Verizon Winds Down Expensive FiOS Expansion*, USA TODAY, (Mar. 26, 2010). The company can be expected to fill in the donut hole between 4G wireless and FiOS with a hybrid fiber copper system along the lines of AT&T's U-verse.

[43] *See* Samantha Bookman, Verizon Goes on Offensive in Voice Link Deployment, FierceTelecom, May 23, 2013, *at* http://www.fiercetelecom.com/story/verizon-goes-offensive-voice-link-deployment/2013-05-23

[44] While this is not the same as the powered network of the wired PSTN, the battery power can be extended by the customer by replacing three ordinary AAA batteries. See FierceTelecom, *id.*

[45] Verizon says it will offer this functionality in the future. *See id.*

PSTN connections to a few thousand subscribers on Fire Island in New York and coastal communities in New Jersey. Rather than rebuild the copper infrastructure, Verizon unilaterally replaced those PSTN connections with Voice Link.[46]

The Fire Island situation was unusual, in that it resulted from a natural disaster that literally destroyed significant portions of Verizon's physical plant. By deploying Voice Link, Verizon was restoring at least some form of home phone service to those subscribers. It is not surprising, therefore, that the New York Public Service Commission gave interim approval to Verizon's actions.[47] The net result, however, was the same as if Verizon itself had removed existing copper PSTN connections and replaced them with Voice Link.

Verizon is still offering Voice Link to customers complaining about service quality problems in some other areas, allegedly on a purely voluntary basis. However, after consumers in the Catskills area of New York reported that Verizon customer service agents were insisting that Voice Link was their only alternative, the New York Attorney General's Office asked the state regulator to take action.[48] These scattered incidents, together with Fire Island, represent only a tiny percentage of Verizon's subscribers. There is no question, however, that Verizon, AT&T, and other major local exchange carriers are actively looking to transition away from their traditional PSTN connections.

5. FCC response

The FCC was established during the New Deal in 1934 as the federal regulator for the PSTN. For much of its history, its primary role in telecommunications consisted of overseeing AT&T, which was the government-sanctioned monopoly provider of telephone service to most Americans. In recent decades, it has it has shifted its efforts toward fostering and overseeing a competitive telecommunications marketplace. Throughout, however, its statutorily-defined mission has been to promote a "rapid, efficient, nationwide ... communications

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[46] Jon Brodkin, Verizon Would End "Century of Regulation" by Killing Wireline Phone, Says NY AG, Ars Technica, July 5 2013, *at* http://arstechnica.com/information-technology/2013/07/verizon-would-end-century-of-regulation-by-killing-wireline-phone-says-ny-ag/

[47] See Samantha Bookman, Verizon Voice Link for Fire Island Approved by NY Commission, Fierce Telecom (May 20, 2013), http://www.fiercetelecom.com/story/verizon-voice-link-plan-fire-island-approved-ny-commission/2013-05-20.

[48] Patrick McGeehan, *Fight With Verizon Over Ending Landline Service Has New Front: Catskills*, N.Y. TIMES, June 26, 2013.

service with adequate facilities at reasonable charges."[49] The FCC is responsible for promoting the benefits of the PSTN through universal service programs, consumer protection activities, interconnection and non-discrimination policies, network reliability coordination, disability access requirements, and many other initiatives.

The FCC has been monitoring the PSTN transition. It sought public comment on two petitions regarding copper loop retirement filed in 2007, but has not acted on them.[50] More recently, as part of the run-up to the release of America's National Broadband Plan,[51] the FCC issued a public notice in 2009 asking for input on the transition from the PSTN.[52] The FCC made no specific proposals at that time, but it highlighted the emerging issues. As the PSTN transition on the ground kicked into high gear, the FCC convened two experts' forums in 2011 and 2012.[53] More recently, the FCC's Technology Advisory Council (TAC), a group of outside experts who advise the agency, took on the sunset of the PSTN as one of its major projects.[54] Internally, the FCC formed a Technology Transitions Task Force in 2012, which has held its own public meetings to solicit input on various issues.[55]

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[49] 47 U.S.C. 151.

[50] In re Petition for Rulemaking and Clarification, BridgeCom International, Inc., et al., RM-11358 (filed Jan. 18, 2007); In re XO Communications, LLC, et al. Petition for a Rulemaking to Amend Certain Part 51 Rules Applicable to Incumbent LEC Retirement of Copper Loops and Copper Subloops, RM-11358 (filed Jan. 18, 2007). In February 2013, petitions were filed with the FCC to update and refresh the record in those proceedings. *See* Wireline Competition Bureau Seeks Comment on Request to Refresh Record and Amend the Commission's Copper Retirement Rules, GN Docket No. 12-353; RM-11358, FCC Public Notice, DA 13-147 at 1 (rel. Feb. 4, 2013).

[51] Federal Communications Commission, Connecting America: The National Broadband Plan (2010), *at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf.

[52] Comment Sought on Transition from Circuit-Switched Network to All-IP Network, NBP Public Notice #25, DA 09-2517 (rel. Dec. 1, 2009).

[53] FCC Workshops on the Public Switched Telephone Network in Transition, News Release, DA 11-1882, Nov. 10, 2011.

[54] *See* FCC Technology Advisory Committee Critical Legacy Transition Working Group, Sun Setting the PSTN, Sept, 27, 2011, *at* http://transition.fcc.gov/oet/tac/tacdocs/meeting92711/Sun-Setting_the_PSTN_Paper_V03.docx.

[55] FCC Chairman Julius Genachowski Announces Formation of "Technology Transitions Policy Task Force", News Release, Dec. 10, 2012, *at* http://www.fcc.gov/document/fcc-chairman-announces-technology-transitions-policy-task-force.

In response to AT&T's petition, the FCC took the standard set of soliciting public comment.[56] It then issued a request of its own in May 2013.[57] The FCC asked for comment on potential trials to evaluate three specific issues: interconnection between VOIP networks; the transition of the 911 public safety system to an IP environment; and the substitution of wireline voice services with wireless connections.[58] In its public notice, the Commission briefly sought additional comment on AT&T's proposed "geographic all-IP" trials, but took no petition on AT&T's petition.[59]

The May 2013 public notice is the fist time the FCC has put concrete proposals on the table. In all likelihood, AT&T's filing was designed to force the FCC's hand, after several years of inconclusive discussion. The Fire Island situation may have done so anyway. The end of the PSTN is no longer merely a theoretical possibility.

While it may seem that the PSTN transition is essentially a set of business decisions, the public policy implications are profound. The movement of subscribers and carriers away from wired PSTN connections has the potential to eviscerate the entire regulatory structure of telecommunications in America. Without careful management, the end of the PSTN may represent the end of much more. The attributes that made the PSTN such a beneficial force in society may be at risk.

B. What We Talk About When We Talk About the PSTN

1. Unpacking the concept

In order to determine which aspects of the communications regulatory regime should remain in place through the PSTN transition, we must examine not just what the PSTN is, but what it represents.

The definition of the PSTN as the network of networks that is public, switched, and designed for telephone service[60] fails to adequately capture its significance. The function of the PSTN is to provide ubiquitous, open, reliable communications connectivity for all Americans. Even when there are many

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[56] Pleading Cycle Established on AT&T and NTCA Petitions, Public Notice, DA 12-1999 (rel. Dec. 14, 2012) *at* http://www.fcc.gov/document/pleading-cycle-established-att-and-ntca-petitions

[57] Technology Transitions Policy Task Force Seeks Comment on Potential Trials, GN Docket 13-5, Public Notice, DA 13-1016, May 10, 2013.

[58] *See id.*

[59] *See id.*

[60] *See supra* TAN 13.

competing networks that provide different levels of functionality to different groups of customers, such baseline features remain vitally important. In fact, ensuring that the benefits of universal connectivity continue to be available becomes an even more critical role for regulation when there is no dominant backstop network.

The essential character of the PSTN can be understood in more than one way. In fact, there are six common explanations. Some describe attributes that are historically contingent. These were important for the PSTN in the past, but the can be abandoned now without harming the public interest. Others, however, remain relevant in the current converged digital competitive environment. The FCC's regulatory regime may need to be revamped substantially, but it should remain capacious and flexible enough to ensure these objectives are met.

In essence, the first three conceptions of the PSTN are essentially descriptive, while the other three are normative. What the PSTN *is* should be allowed, even encouraged, to change; what the PSTN *does* should be protected.

2. The legacy PSTN

The first three visions of the PSTN describe the network as it historically developed. Some of these attributes have already broken down, and the IP transition will accelerate those trends. Policy initiatives should not focus on preserving these aspects.

Technical Architecture

The PSTN was developed with engineering parameters geared to providing what is colloquially known as POTS: plain old telephone service. Technically this has evolved over time to mean a real-time voice channel; touchtone dialing through the familiar 10-digit area code and numbering structure to reach any other subscriber; a basket of basic features such as busy signals, toll-free calling, E911 emergency calling[61], and caller ID; and a high level of reliability. When providing "universal service" subsidies for phone service in high-cost areas, these are the essential functions the FCC requires carriers to offer.[62]

To make connections, the PSTN uses a technology called circuit switching. When you make a telephone call, a dedicated path is opened through the network

[61] *See* 911 Act (codified at 47 U.S.C. § 251(e)). E911 refers to 911 service that automatically identifies the location of the caller. *See* VOIP 911 Order, *supra* note 11, at para. 13.

[62] *See* Federal-State Joint Board on Universal Service, CC Docket No. 96-45, Report and Order, FCC 97-157, 12 FCC Rcd. 8776, 8809 para. 61 (1997) (defining features to be supported through universal service funding).

from endpoint to endpoint, and kept open for the duration of the call. Today's digital networks multiplex multiple calls onto the same lines for greater efficiency. The PSTN uses an approach called time-division multiplexing (TDM), which is sometimes used as a shorthand for circuit-switched PSTN connections. Even with multiplexing, every part of the call travels the same physical route.

Mainframe computers known as switches route the call across the country and onto other networks as needed. Since the 1980s, the PSTN has used parallel digital signaling channels, known as the signaling system 7 (SS7) network to manage calls and associated functions. The dedicated SS7 network speeds the process of setting up and tearing down call circuits, and also supports billing and features such as call waiting and call forwarding. In the PSTN architecture, therefore, call channels are reserved for voice and signaling channels are reserved for the special SS7 signals. The Internet architecture, by contrast, has only one channel, but it can carry kind of information.

Based on specifications developed by Bell Labs when it was part of the old AT&T, the PSTN uses 64 kilobit per second (kbps) communications channels and 8 kilohertz (kHz) sampling for analog-to-digital audio conversion. These provide for reliable and consistent voice quality, in contrast to mobile phones and some VOIP services where quality can vary based on congestion and other local conditions. On the other hand, the audio quality of a PSTN phone call will never be better than the specified encoding. Anyone who has used Skype or a business VOIP phone system from vendors such as Cisco and Polycom has experienced clarity and sound quality far exceeding what we've come to expect from a telephone call.

As noted, all these standards were devised to support voice phone service. Because other forms of communication such as alarm monitoring systems and dial-up modems can convert their signals into formats intelligible to the PSTN, the network is not limited to that offering. The PSTN is a universal network offering "dialtone," so it supports whatever communication meets its technical requirements. However, these requirements significantly limit the flexibility of the network. For example, the SS7 network is designed specifically to set up and tear down phone calls, not for carrying email or movies.

The PSTN is built on engineering trade-offs that made sense based on the state of technology at the time and the need to support voice calling. With massive advances in computing and networking, however, they no longer do.

The technical infrastructure of the legacy PSTN is fast reaching its end-of-life state. The switching fabric is based on room-filling, purpose-built mainframe computers. Most of these are now decades old, to the point at which parts are in

short supply.[63] The VOIP infrastructure that replaces circuit-switching, by contrast, uses "softswitches" based on general-purpose servers and easily-updated software. No greenfield network operator today would deploy a circuit-switching infrastructure. Instead, new entrants, even when providing telephone service, create networks based on the Internet Protocol and related technologies. The major telephone companies that continue to operate PSTN networks are, understandably, looking to make that same leap.

If the PSTN is defined solely as TDM and circuit switching, it should be allowed to die. IP-based networks can deliver the same basic telephone service more efficiently, at the same time as they enable an array of new broadband data services and applications.

Regulatory Arrangement

Many of the regulatory obligations associated with the PSTN predate the development of the telephone. The concept of common carriage – a set of requirements that operators treat customers equally and charge just and reasonable rates – was developed in the 19th century for other utilities.[64] The FCC, created in 1934, was in many ways modeled on the Interstate Commerce Commission that oversaw railroads.[65] The Communications Act of 1934 enshrined a set of requirements for common carriers, most notably that their charges be "just and reasonable"[66], that they avoid "unjust or unreasonable discrimination" in provision of service[67], and that they "establish physical connections with other carriers."[68]

Another set of requirements associated with the PSTN came not from administrative regulation but from antitrust. In 1913, AT&T and the U.S. Department of Justice entered into an agreement known as the Kingsbury

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[63] *See* Richard Shockey, Technical Challenges in the PSTN Transition from Plain Old Telephone Service (POTS) at 3. The leading manufacturers of current PSTN switches, Lucent (the former hardware arm of AT&T) and Nortel, both no longer exist in their prior form. Lucent was acquired by French equipment manufacturer Alcatel, and Nortel was dissolved in bankruptcy.

[64] BRUCE WYMAN, THE SPECIAL LAW GOVERNING PUBLIC SERVICE CORPORATIONS AND ALL OTHERS ENGAGED IN PUBLIC EMPLOYMENT (1911) at 115–16; Kevin Werbach, *Only Connect*, 22 BERKELEY TECH. L.J. 1233, 1246–50 (2008).

[65] *See* Werbach, Only Connect, *supra* note 64.

[66] U.S.C. § 201(b).

[67] 47 U.S.C. § 202(a).

[68] 47 U.S.C. § 201(a).

commitment,[69] in which AT&T agreed to interconnect with independent telephone companies. Later consent decrees in 1956 and 1983 further defined expectations about the PSTN. Although only binding on the old AT&T, which effectively disappeared after the post-1983 divestiture, the effects these agreements are still being felt today. For example, the 1956 consent decree, by precluding AT&T from offering non-common carrier services, created the independent data processing industry that ultimately involved into today's internet services marketplace.[70]

The most recent significant legal evolution was the Telecommunications Act of 1996 (1996 Act).[71] The primary thrust of the 1996 Act was to open up local telephone markets to competition, while in return allowing the local incumbents to offer long-distance and other services.[72] In addition to these specific requirements for network operators, the PSTN is subject to an overall regulatory structure of what agencies address various policy issues. For example, the Federal Trade Commission Act expressly excludes common carrier services from the consumer protection jurisdiction of the Federal Trade Commission (FTC).[73]

Like the technical attributes, the regulatory structure for the PSTN is deeply rooted in history. Even after the 1996 Act, communications services are divided into all-or-nothing silos, even as convergence and competition undermine those distinctions.[74] Regulation, like technology, is a means to an end. If there are more effective ways to achieve the goals that the current regulatory structure serves, legacy rules need not be preserved. However, the regulator needs a statutory mandate or the legal authority to replace those rules with a new framework. As discussed below, the PSTN transition has the potential to undermine the FCC's authority over the telecommunications market across the board. That would threaten not only the old rules, but the public policy objectives the rules were designed to achieve.

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[69] Letter from NC Kingsbury. AT&T to JC McReynolds, Attorney General, Justice Department (1913). *See generally* Mueller, *supra* note 2 (describing the antitrust case against AT&T).

[70] *See* Kevin Werbach, *The Network Utility*, 60 DUKE L.J. 1761 (2010).

[71] Telecommunications Act of 1996, Pub. L. No 104-104 § 3(a)(2), 110 Stat. 56.

[72] *See* Nuechterlein & Weiser, *supra* note 1, at 69-74; Charles B. Goldfarb, *Telecommunications Act: Competition, Innovation, and Reform*, in TELECOMMUNICATIONS ACT: COMPETITION, INNOVATION, AND REFORM 1, 8–10 (Charles B. Goldfarb ed., 2006).

[73] 15 USC § 45(a)(2).

[74] *See* Kevin Werbach, *A Layered Model for Internet Policy*, 1 J. ON TELECOMM. & HIGH-TECH L. 37 (2002).

Market Structure

The PSTN has traditionally implied a market structure with one or more regulated dominant providers. Even after the nationwide AT&T monopoly was broken up, there were seven "Baby Bells" with monopolies on local service in their territories. Those seven providers, and others, have since consolidated back to AT&T and Verizon, who are now also the largest wireless service providers. The prevalence of monopolistic and oligopolistic providers in telecommunications led to regulatory categories such as "incumbent local exchange carrier"[75] and "dominant" provider, which imposed special obligations to protect against abuse of market power.

The economics of the PSTN are driven by the fact that telephone networks involve huge fixed costs and relatively low variable costs, especially for the "last mile" connections into homes. It was received economic wisdom for many years that telephone service was a natural monopoly. Even after AT&T was broken up and competition brought to long-distance service, local phone companies retained their monopoly status for more than a decade. Only recently has it been feasible for cable and wireless providers to offer facilities-based last-mile alternatives at scale, which they were able to do selling customers services that initially supplemented, rather than replaced, conventional phone service.

The monopoly market structure that was historically associated with the PSTN has now given way in most of the country to oligopoly.[76] Virtually all Americans have alternatives for phone service, especially when VOIP and wireless options are included. However, high fixed costs and scale economies still mean that only a limited number of physical platforms provide direct connectivity to the home.[77] Those facilities-based providers, primarily the legacy telephone companies and cable television operators, are also now the dominant providers of Internet access.[78] Thus, while there is significant competition in many communications markets that previously were controlled by monopolies, substantial concentration remains, producing concerns about market power.

3. Enduring objectives

Despite everything changing in the telecommunications market, some things stay the same. The PSTN has provided huge economic and social benefits to

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[75] 47 U.S.C. 153(26)

[76] *See* Howard Shelanski, *Adjusting Regulation to Competition: Toward a New Model for U.S. Telecommunications Policy*, 24 YALE J. REG. 55 (2007).

[77] *See* Crawford, *supra* note 42.

[78] *See id.*

America. As the legacy technical, regulatory, and business elements of the PSTN change, those benefits should not be lost. These goals therefore provide guidance on the proper role for public policy in the post-PSTN era.

Universal Connectivity

The PSTN allows anyone to connect to anyone. There are many other networks that offer voice telephony or similar services on a private basis, for example connecting between offices of a company or between account-holders of a specific service such as Skype. A core element of the PSTN is the idea that access to the network allows direct calling to and from any other subscriber.[79]

In the early years of the 20th century, AT&T's refusal to interconnect its long-haul network to competing local exchange carriers, or to exchange local traffic with those carriers, was its primary tool to consolidate market domination after the expiration of Alexander Graham Bell's foundational patents. AT&T understood as a matter of business strategy what economists and network scientists have now demonstrated formally as network effects.[80] All other things being equal, the largest network has a structural advantage over smaller networks, because the value of a service like telephony increases with the ability to call and be called by more people.[81]

AT&T's refusal to interconnect was its most powerful competitive weapon. Appropriately, it was there that the federal government targeted its efforts to regulate the dominant telephone network. In the Kingsbury Commitment, AT&T agreed to interconnect its long-distance network with independent local exchange carriers.[82] This became the foundation of interconnection obligations in the 1934 Communications Act, and the further requirements in the 1996 Act. All this time, the concept of universal connectivity has been built into telephone service, and the other functions delivered through the PSTN.

Strategic infrastructure

Like the electricity grid, the PSTN has strategic national importance as a piece of critical infrastructure.[83] The PSTN is essential to the smooth functioning of the U.S. economy. For individuals, a PSTN connection is a lifeline to the world. A

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[79] *See* Thomas B. Nachbar, *The Public Network*, 17 COMMLAW CONSPECTUS 67 (2008).

[80] Mark A. Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 CAL. L. REV. 479 (1998).

[81] *See* Werbach, Only Connect, *supra* note 64.

[82] *See supra* note 69.

[83] *See* 42 U.S.C. § 5195c (defining "critical infrastructure).

serious outage of the PSTN, or a PSTN that doesn't provide service to some Americans, would be far more harmful than a similar outage of a television network or a major highway.

Strategic aspects of the PSTN include reliability, security, law enforcement access, and public safety. In each case, there are either public processes or legislative requirements to ensure these functions are achieved. For example, carriers, including "interconnected" VOIP providers, are required to report outages above a specified threshold to the FCC.[84] And they are required to make their networks accessible for law enforcement wiretaps, subject to search warrant requirements, under the Communications Assistance for Law Enforcement Act (CALEA).[85]

As an interconnected network of networks touching billions of endpoints, the global PSTN has been called "possibly the largest distributed system in existence."[86] The technical and operational challenges of providing robust connectivity with minimal downtime are immense, even under normal conditions, let alone during natural disasters or in the face of attempted intrusions. As FCC Chairman Julius Genachowski noted after Superstorm Sandy damaged communications networks on the East Coast, "Our nation's communications infrastructure is a vital part of our public safety and national security."[87] The FCC held field hearings after Sandy to identify ways to limit damage in future storms.[88]

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[84] *See* Proposed Extension of Part 4 of the Commission's Rules Regarding Outage Reporting to Interconnected Voice Over Internet Protocol Service Providers and Broadband Internet Service Providers, PS Docket No. 11-82, Report and Order, 27 FCC Rcd 2650 (2012).

[85] Pub. L. No. 103-414, 108 Stat. 4279 (1994) (codified as amended in sections of 18 U.S.C. and 47 U.S.C.). The FCC has extended CALEA obligations to interconnected VOIP providers, Communications Assistance for Law Enforcement Act and Broadband Access and Services, ET Docket No. 04-295, Second Report and Order and Memorandum Opinion and Order, RM-10865, May 12, 2006.

[86] D. Richard Kuhn, *Sources of Failure in the Public Switched Telephone Network*, COMPUTER, April 1997, at 31, 31.

[87] Statement Of FCC Chairman Julius Genachowski, Superstorm Sandy Field Hearing, Feb. 5, 2013, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-318754A1.pdf

[88] Chairman Genachowski Convenes First Post-Sandy Field Hearing, News Release, Feb. 5, 2013, *at* http://www.fcc.gov/document/chairman-genachowski-convenes-first-post-sandy-field-hearing.

The strategic importance of the PSTN makes telecommunications different than most other industries. The government has a strong interest in ensuring the PSTN's smooth functioning that does not depend on particular technologies or market conditions.

Social contract

The final defining aspect of the PSTN is the notion of a social contract. Historically, this involved government tolerance of AT&T as a private monopoly in return for its commitment to provide affordable service to all Americans.[89]

Even after the opening of all telecommunications markets to competition, incumbent service providers supporting the PSTN still receive a variety of benefits.[90] These include low-cost access to pole attachments and rights-of-way, receipt of universal service subsidies when serving high-cost areas, free spectrum for the initial offering of mobile phone service, and protection against antitrust liability on the grounds that the Communications Act comprehensively regulates the field.[91]

The notion of the social contract is that in return for these benefits, the traditional telecommunications providers took on certain obligations.[92] For example, PSTN service providers had to provide universal service, protect subscribers' privacy, interconnect on reasonable terms, and charge just and reasonable rates. Market changes that undermine either the benefits or the obligations side of the equation run the risk of destabilizing the arrangement.

Perhaps the clearest example of the social contract around the PSTN is universal service. Originally an AT&T marketing slogan, universal service came to be accepted as a national policy to provide ubiquitous phone service throughout the country.[93] For circuit-switched telephone service, the great challenges for universal service are density and geography. Because phone service requires a wire into every home and localized switching facilities, providing service in sparsely populated rural areas and difficult geographies is substantially more expensive than providing the same service in urban areas. Universal service policy embodied a commitment to providing comparable

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[89] *See* Mueller, *supra* note 69.

[90] *See* Frieden, *supra* note 29.

[91] Verizon Comms. v. Law Offices of Curtis V. Trinko, 540 U.S. 398 (2004).

[92] *See* Frieden, *supra* note 29; Jodie Griffin & Harold Feld, Five Fundamentals for the Phone Network Transition, PK Thinks white paper, July 2013, *available at* http://www.publicknowledge.org/files/PKThinks5Fundamentals.pdf.

[93] *See* Mueller, *supra* note 69.

service to any customer, regardless of the expense, and also to pricing that service comparable to denser areas.

Historically, universal service involved a combination of service mandates, complicated hidden cross subsidies, rate-averaging requirements, and other regulatory arrangements. Many of these mechanisms depended on the absence of competition, and thus had to be dramatically revamped after the 1996 Act. The PSTN transition puts further strain on the system.

C. The Regulatory Dead-End

1. All or nothing

The changeover from circuit-switched landline connections to VOIP and wireless may seem like a straightforward evolution. Subscribers are still getting something that feels like the PSTN phone service they always had, especially for those using interconnected wireline VOIP. The problem is that from a regulatory standpoint, the change is significantly more dramatic.

Over the past ten years, the FCC has interpreted the Communications Act, its authorizing statute, in a way that backed it into a corner. The things the FCC retains clear authority to regulate are increasingly not the things that network operators do. A growing share of communications – even voice or video communications that directly substitute for telephone calls – inhabit an area of uncertain regulatory status. And if they wanted to, the major regulated carriers could quickly reconfigure themselves into the same legal white space. That they have failed to do so yet seems purely a matter of strategic calculus. This seemingly odd result is an unintended consequence of years of well-meaning but short-sighted FCC decisions. As a consequence, unless the FCC intends to go out of business, it must take action.

Most of the rules governing the PSTN apply to providers of "telecommunications," which is defined as "the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received."[94] The statute contrasts these telecommunications services with "information services."[95] However, the 1996 Act, which inserted these two terms, gives the FCC no specific

[94] 47 U.S.C. § 153(43).

[95] Information service is defined as "the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications, and includes electronic publishing, but does not include any use of any such capability for the management, control, or operation of a telecommunications system or the management of a telecommunications service." 47 U.S.C. § 153(20).

direction on the treatment of information services. And this creates inherent confusion.[96] A circuit-switched wireline voice telephone connection is clearly a telecommunications service. A VOIP call, even one between two ordinary telephones, may not be. And if it is an information service, the FCC's ability to impose any obligations on the providers involved is contestable.

The FCC and others saw the 1996 Act's distinction as a continuation of prior FCC practice.[97] Before the Communications Act created a category for information services, the FCC had developed a parallel distinction between "basic" and "enhanced" services in its *Computer II* proceeding.[98] Enhanced services were unregulated, but there was a critical difference from the information service classification in the 1996 Act: local telephone carriers could only provide them subject to stringent restrictions.[99] The 1996 Act contained no restrictions on who could provide information services, and no distinctions between information service providers.

The FCC compounded this problem by holding that "telecommunications" and "information services" were mutually exclusive.[100] Something could be one or the other, but not both. This decision created a conundrum. Either something is "telecommunications" and thus subject to a wide variety of rules designed for traditional telephony, or it is an "information service" arguably subject to no rules at all. In other words, the FCC now faces the choice of regulating too much or not enough.

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[96] Werbach, Off the Hook, *supra* note 6.

[97] *See* Werbach, Network Utility, *supra* note 70; In re Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, 20 FCC Rcd. 14,853, 14,871 (2005) (report and order and notice of proposed rulemaking) ("[T]he Commission has previously determined that Congress intended the statutory categories [of information service and telecommunications service] to parallel the categories [of enhanced service and basic service that] the Commission established in the Computer Inquiry proceeding.")

[98] *See* Amendment of Section 64.702 of the Comm'n's Rules and Regulations (Second Computer Inquiry), 77 F.C.C.2d 384 (1980); Werbach, Network Utility, *supra* note 70; Robert Cannon, *The Legacy of the Federal Communications Commission's Computer Inquiries*, 55 FED. COMM. L.J. 167 (2003).

[99] Amendment of Sections 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry) (Computer III), 104 F.C.C.2d 958 (1986) (report and order).

[100] *See In re* Fed.-State Joint Bd. on Universal Serv., Report to Cong., 13 F.C.C.R. 11,501, 11,531–32 (1998), *available at* http://www.fcc.gov/Bureaus/Common_Carrier/Reports/fcc98067.pdf [VOIP Report to Congress]; *see also* Declaratory Ruling and Notice of Proposed Rulemaking, Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities, 17 FCC Rcd 4798, 4823-24 ¶ 41 (2002), *aff'd*, Nat'l Cable & Telecomms. Ass'n v. Brand X Internet Servs., 545 U.S. 967 (2005).

2. *The perseverance of unregulation*

The FCC's initial concern was to avoid over-regulating nascent Internet-based services.[101] It systematically avoided classifying Internet-based services as "telecommunications," out of concern that doing so might chill innovation and investment.[102] The FCC's hesitation to impose rules designed for legacy industries and market structures to the emerging Internet was a powerful spur to the subsequent flowering of Internet development.[103] However, the agency's actions also had a downside. By placing virtually all Internet-based services outside the statutory provisions where the FCC's authority is clear, the agency created the hole that the major telecommunications carriers are now attempting to run through.

Beginning in 2002, the FCC classified broadband Internet access as an information service.[104] Even though broadband involves both a pure transmission function and information processing, the FCC determined that it was impossible to split off the telecommunications functionality. This decision became problematic when the Commission later decided to impose network neutrality obligations to prevent those broadband providers from blocking or discriminating against unaffiliated content, applications, or devices.[105]

The FCC unambiguously has legal authority to adopt such rules for telecommunications services.[106] For information services, by contrast, the statute is silent about the scope of FCC authority. The FCC's attempt to justify its

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[101] *See* Werbach, Off the Hook, *supra* note 6, at 109; Rob Frieden, *The FCC's Name Game: How Shifting Regulatory Classifications Affect Competition*, 19 BERKELEY TECH. L.J. 1275, 1286–87 (2004); Jason Oxman, *The FCC and the Unregulation of the Internet* 11 n.27 (Fed. Commc'ns Comm'n Office of Plans & Policy, Working Paper No. 31, 1999), *available at* http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp31.pdf.

[102] *See* Kathleen Q. Abernathy, Commissioner, Fed. Commc'n. Comm'n, The Nascent Services Doctrine, 1-2 (July 11, 2002).

[103] *See* Werbach, Off the Hook, *supra* note 6. The FCC's "unregulation" of Internet-based services was only part of the equation. The Internet was about to develop and thrive because the FCC also took affirmative steps to prevent telephone network operators and other incumbents from stifling it. *See* Kevin Werbach, *The Federal Computer Commission*, 84 N.C. L. REV 1 (2005); Steve Bickerstaff, *Shackles on the Giant: How the Federal Government Created Microsoft, Personal Computers, and the Internet*, 78 TEX. L. REV. 1 (1999).

[104] *See* Werbach, Off the Hook, *supra* note 6 (discussing the FCC's broadband classification proceedings).

[105] *See id.*; In re Preserving the Open Internet; Broadband Industry Practices, Report and Order, Docket Nos. 09-191, 07-52, 25 F.C.C.R. 17905 (Dec 23, 2010), 76 Fed. Reg. 59192 (Sept. 23, 2011) (Open Internet Order).

[106] *See, e.g.*, 47 U.S.C. 201, 202.

network neutrality rules based on its "ancillary authority" under Title I of the Communication Act is currently under challenge in the D.C. Circuit Court of Appeals.[107] Even if the FCC prevails, its power under ancillary authority is circumscribed.

The FCC's treatment of VOIP has proven especially problematic. The FCC was understandably reluctant early in the history of VOIP to impose unnecessary rules on a nascent industry. It was also legitimately concerned that a blanket decision to regulate VOIP as a telecommunications service would sweep in many offerings, such as free end-user software, that were not appropriately treated as carriers. When pressured by Congress in 1998 to impose per-minute access charges on all VOIP providers, the FCC was right to demur.[108]

However, that was fifteen years ago. VOIP then was used by a relatively small number of hobbyists, typically communicating through software on their personal computers that allowed for private real-time voice connections. VOIP today is something quite different. Legitimate concerns remain about the potential for unnecessary obligations on some VOIP services, but exempting all forms of VOIP from all telecommunications regulation purely on the basis of the protocol used would be illogical and problematic. For example, a customer picking up their home telephone and dialing 911 in an emergency should be able to reach an emergency operator regardless of whether that phone happens to connect to a circuit-switched network.

Rather than confront these issues directly and consistently, the FCC addressed them in an ad hoc manner.[109] The Commission was willing to act in particular cases, but refused to adopt general principles. Thus, in 2004, it preempted a Minnesota decision that would have subjected Vonage's VOIP

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[107] *See* Cecilia Kang, *Verizon Sues FCC Over Net Neutrality Rules*, WashingtonPost.com, Sept. 30, 2011. The FCC's ancillary authority was first affirmed in U.S. v. Southwestern Cable Co., 392 U.S. 157 (1968). There, the FCC attempted to impose requirements on cable television service, which at the time it had no statutory grant of regulatory authority over. The Supreme Court concluded the FCC could take action "reasonably ancillary to the effective performance of the Commission's various responsibilities." *Id.* at 178. In *Southwestern Cable,* that meant the FCC's authority over television broadcasters, who were subject to competition from the new cable TV providers. For the Open Internet rules, the FCC identified several statutory bases for ancillary authority, most centrally the language in Section 706 of the Communications Act on advanced services. *See* Open Internet Order, *supra* note 105.

[108] *See* VOIP Report to Congress, *supra* note 100. The Commission carefully worded its statements to suggest that "phone to phone" VOIP might ultimately be classified as a telecommunications service, without formally reaching that conclusion.

[109] See Griffin & Feld, supra note 92, at 7 "[T]he result is an inconsistent hodge-podge that has segregated nearly all critical policy obligations to the 'copper safety net' of the traditional phone system."

service to traditional state telephone rules and taxes, but it refused to determine the status of VOIP under federal law.[110] That same year, when AT&T attempted to evade obligations to pay interstate "access charges" to local telephone companies by converting its existing traffic into VOIP form, the FCC rejected its argument, again limiting its decision to the facts at hand.[111]

Today, not only are VOIP solutions such as Skype significant businesses with hundreds of millions of users and hundreds of millions of dollars in annual revenue, but VOIP has become the core technology for all new telephone service offerings. Cable operators have built their telephony offerings, which they bundle on top of their broadband and television packages, using VOIP technology.[112] Comcast is now the third-largest telephone company in America, using VOIP for transmission.[113] To end-users the Comcast Digital Voice service works exactly like their traditional telephone service: it involves the same phones, telephone numbers, features, and other aspects. Overall, roughly a third of Americans get their home phone service through VOIP.[114] Yet the FCC has failed to squarely declare that such VOIP-based services fall under the same rules as other forms of telephony.

The FCC could take the step it has heretofore resisted, and declare some forms of VOIP as telecommunications services. However, such authority would be limited to retail VOIP service offerings. Within the network, VOIP traffic is just data. And the FCC has already concluded that broadband data transmission is an information service.

Regulations operating at the wholesale level, most notably interconnection obligations, would not automatically be extended to a VOIP world, even if the

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[110] Vonage Holdings Corp. v. Minn. Pub. Utils. Comm'n, 290 F. Supp. 2d 993, 999 (D. Minn. 2003); Vonage Holdings Corporation Petition for Declaratory Ruling Concerning an Order of the Minnesota Public Utilities Commission, WC Docket No. 03-211, Memorandum Opinion and Order, 19 FCC Rcd. 22,404 (2004); Sunny Lu, Cellco Partnership v. FCC & Vonage Holdings Corp. v. Minnesota Public Utilities Commission: *VoIP's Shifting Legal and Political Landscape*, 20 BERKELEY TECH. L.J. 859, 860 (2005).

[111] *See In re* Petition for Declaratory Ruling that AT&T's Phone-to-Phone IP Telephony Servs. Are Exempt from Access Charges, 19 F.C.C.R. 7457, 7465–68 (2004)

[112] *See* Werbach, Only Connect, *supra* note 64, at 1267; Crawford, *supra* note 42; SUSAN P. CRAWFORD, CAPTIVE AUDIENCE: THE TELECOM INDUSTRY AND MONOPOLY POWER IN THE NEW GILDED AGE (Yale University Press, 2013) (describing the growing power of cable operators offering "triple play" services including VOIP).

[113] Comcast Now the Third Largest Residential Phone Services Provider in the U.S., News Release, March 11, 2009, *at* http://corporate.comcast.com/news-information/news-feed/comcast-now-the-third-largest-residential-phone-services-provider-in-the-us.

[114] *See* Brogan, *supra* note 17.

FCC took action for retail VOIP services. Nor would such a step solve new problems that arise in a VOIP-centric world, such as numbering conversion and service continuity in emergencies. These issues turn out to be critically important to preserving the normative goals of the PSTN.

III. RECONCEIVING THE INTERNETWORK

A. What Falls Away

The switched telephone network, and its accompanying regulatory and business arrangements, deserve to die. Their era has passed. However, that does not mean the idea of a public network has no enduring relevance.[115] To the contrary, some aspects of the PSTN are not tied to the particular technical, legal, or economic conditions that prevailed in 1934 or 1996. There are good economic and public interest reasons to continue treating communications network operators differently than ordinary businesses. The task is therefore to define a regime for today's world that preserves the enduring aspects of the PSTN and jettisons those no longer applicable.

In effect, the Internet will become the new PSTN. In the process, however, the Internet has already changed, and will continue to do so. As it becomes the default communications infrastructure, the Internet can no longer depend, as it has to date, on access to physical infrastructure regulated as telecommunications. Moreover, public policy considerations such as universal access, interoperability, reliability, privacy, access for persons with disabilities, emergency services, and law enforcement access become questions for Internet-based services.[116] As noted above, the last two decades of communications policy have created largely

[115] In fact, the concept of a "public network" is at the heart of the common carriage regime that predates the Communications Act. *See* Nachbar, *supra* note 79. Nachbar locates the essential "publicness" of the network in term of rules barring user discrimination, as opposed to use discrimination. The concept described here is broader, referring to the network of interconnected networks rather than the carriage policies of a particular network operator.

[116] Public Knowledge, a public interest and advocacy group in Washington, DC, has proposed "five fundamentals" to guide FCC involvement after the PSTN transition. These include: service to all Americans, interconnection and competition, consumer protection, network reliability, and public safety. *See* Technological Transition of the Nation's Communications Infrastructure, GN Docket No. 12-353, Comments of Public Knowledge, Jan. 28, 2013, *available at* http://www.publicknowledge.org/files/PKPSTNComments.pdf.

incompatible regulatory domains for the Internet and the PSTN at the same time as market forces joined them together.

The FCC has taken some steps in this direction in its treatment of VOIP. In a series of proceedings, it extended telecommunications regulation to "interconnected" VOIP providers, that is, those offering the familiar experience of dialing a telephone number on an ordinary phone.[117] Interconnected VOIP providers must now: contribute to universal service funding,[118] offer access to E911 emergency service,[119] provide access to law enforcement subject to legitimate wiretaps[120], accommodate persons with disabilities,[121] adhere to privacy rules for the customer information they use to complete calls,[122] support the ability of existing subscribers to keep their existing telephone numbers when switching services[123] and report service outages to the Commission.[124]

One problem with the FCC's approach is that it imposed these obligations pursuant to its ancillary authority under Title I of the Communications Act.[125] It thus did not have to decide whether any component of the VOIP offerings was a telecommunications service subject to Title II. In most cases, the FCC justified its

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[117] *See* Frieden, supra note 29.

[118] *See* Universal Service Contribution Methodology, Report and Order and Notice of Proposed Rulemaking, 21 FCC Rcd. 7,518 (2006), aff'd in relevant part sub nom., Vonage Holdings Corp. v. FCC , 48900 F.3d 1232 (D.C. Cir. 2007) (imposing universal service contribution obligations interconnected VOIP providers).

[119] *See* VOIP 911 order, *supra* note 11.

[120] *See* Communications Assistance for Law Enforcement Act & Broadband Access & Services, First Report and Order and Further Notice of Proposed Rulemaking, 20 FCC Rcd. 14,989 (2005).

[121] *See* IP-Enabled Services, Report and Order, Order and Public Notice, 22 FCC Rcd. 11,275 (2007); In re IP-Enabled Services, 22 FCC Rcd. 18,319 (Oct. 9, 2007) (granting in part and denying in part waivers of the FCC order); *see also* Contributions to the Telecommunications Relay Services Fund, 26 FCC Rcd. 3285 (2011).

[122] *See* Telecommunications Carriers' Use of Customer Proprietary Network Information and Other Customer Information; IP-Enabled Services, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd. 6,927 ¶ 54 n.170 (2007), aff'd sub nom. Nat'l Cable & Telecom. Ass'n v. FCC, 555 F.3d 996 (D.C. Cir. 2009) (imposing customer privacy requirements on interconnected VOIP providers).

[123] *See* Telephone Number Requirements for IP-Enabled Services Providers, Report and Order, Declaratory Ruling, Order on Remand, and Notice of Proposed Rulemaking, 22 FCC Rcd. 19,531 (2007) (imposing local number portability requirements on interconnected VOIP providers).

[124] *See supra* note 84.

[125] *See* Werbach, Off the Hook, *supra* note 6, at 144; U.S. v. Southwestern Cable Co., 392 U.S. 157 (1968) (concluding the FCC could regulate cable television under its ancillary authority, even though it had no specific grant of authority over cable in the Communications Act).

actions on the grounds that even if VOIP was an information service, interconnected VOIP calls were likely to pass over the regulated telecommunications networks of the PSTN.[126] If and when those networks themselves move to VOIP, the legal rationale evaporates.

A second problem with the FCC's actions is they are ad hoc. The FCC has not adopted principles for what forms of regulation should remain in the shift from TDM to IP, and what may be abandoned. The six dimensions of the PSTN offer a framework for making such decisions.[127] Rules that are rooted in technology, regulatory arrangements, or market structure are likely to be anachronisms that can be abandoned. Those based around universal connectivity, strategic infrastructure, and a social contract retain their significance as the network evolves. The regulatory framework for the PSTN transition should be based on evolving regulatory policies to support these goals in a new environment.

Pulling apart and constituting the PSTN in this way clarifies that two kinds of regulatory initiatives should endure: those involving interconnection and coordination. The first involves rules to ensure the network of networks retains its universal character. The second reflects the persistence of the PSTN as critical and essential infrastructure. Together, they form the nucleus of a new social contract for the emerging IP-based communications environment.

B. Interconnection

1. *Importance of interconnection*

State troopers in western Montana found themselves in a bad situation in summer 2013.[128] The mobile phones they carried with them, and the laptop computers in their cruisers, had service provided by Verizon Wireless. Because Verizon's network coverage wasn't ubiquitous in the rural area, however, the troopers – and all other mobile phone subscribers in the area – were actually "roaming" on a network owned by AT&T.[129] When the roaming agreement between the two companies expired, things changed. Suddenly, areas that had good service provided no reception at all. The state troopers often had to drive

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[126] *See* VOIP 911 order, *supra* note 11.

[127] *See supra* Part II(B).

[128] *See* Phillip Dampier, AT&T/Verizon Roaming Agreement Ends in Montana; Rural Customers Left Without Service, Stop the Cap!, July 9, 2013, *at* http://stopthecap.com/2013/07/09/verizon-ends-at-rural-customers-left-without-service/.

[129] Such roaming arrangements are common, especially in more rural areas.

30 miles or more to get a usable signal. Public safety services were adversely affected for residents of that part of Montana.

This example illustrates the power of interconnection. Few communications networks, services, or applications can survive without linkages to other networks. The only route for success without interconnection is for operators sufficiently ubiquitous to reach a substantial portion of the market on their own – as in the case of pre-divestiture AT&T. For anyone else seeking to deliver a network-based service, reaching customers requires some path through networks controlled by others.

In telecommunications, interconnection is, in the word of Eli Noam, "the paramount tool of regulation."[130] This is true at every stage of competition. In an era of regulated monopoly, the government mandates interconnection to ensure ubiquitous service, and regulates interconnection charges to allocate costs across the network. In a period of market opening, such as prevailed in the U.S. in the 1980s and 1990s, interconnection rules are the means of breaking down monopolies. And as markets become competitive, interconnection prevents hold-outs and fosters efficient network integration.[131]

As Howard Shelanski observes, the rationale for interconnection obligations differs from that for most other telecommunications regulation.[132] It is not necessarily tied to the monopoly history of the U.S. telecommunications market, because interconnection remains important even when there are multiple competitors with significant market share. As Noam explains, interconnection is a kind of anti-fragmentation policy that reduces transaction costs.[133] Having more competing networks doesn't eliminate the need for interconnection; in fact, it accentuates it. An uneven interconnection environment produces situations like the one in Montana, which belie the universality of the PSTN.

In the traditional PSTN environment, interconnection obligations are clear. Section 201(a) of the Communications Act obligates all common carriers "to establish physical connections with other carriers."[134] Section 251, added by the

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[130] Eli Noam, Interconnection Practices," *in* HANDBOOK OF TELECOMMUNICATIONS ECONOMICS 385, 385 (2002). *See also* Werbach, Only Connect *supra* note 64 (describing the centrality of interconnection to communications regulation).

[131] *See* Griffin & Feld, *supra* note 92, at 11 ("As we saw more than 100 years ago, without mandatory interconnection the phone network will slide inevitably toward monopoly as the largest carriers can gain anticompetitive advantages by withholding access to their customers from competitors.").

[132] *See* Shelanski, *supra* note 76, at 68.

[133] ELI NOAM, ED., INTERCONNECTING THE NETWORK OF NETWORKS (MIT Press 2001).

[134] 47 U.S.C. 201.

Telecommunications Act of 1996, further states that, "Each telecommunications carrier has the duty ... to interconnect directly or indirectly with the facilities and equipment of other telecommunications carriers."[135] A network operator simply cannot refuse to offer interconnection to another network, although there is room for negotiation on some economic terms and the physical points of connection. Nor can carriers refuse to carry certain traffic across their interconnection links.

When carriers have failed to honor their connectivity obligations, the FCC has been willing to step in. When conference calling services began to offer free services by exploiting high terminating access charges in rural areas, some telephone companies responded by blocking calls to those numbers.[136] The FCC acknowledged the services were problematic, but ordered the carriers not to engage in "self help."[137] More recently, the FCC launched a proceeding to address problems of calls not being completed to some rural subscribers.[138] The problem appears to be the inadvertent results of a variety of technical decisions, but the FCC recognized that non-universal connectivity undermines the essential promise of the PSTN.

In some markets, pressure to interconnect is sufficiently great that competitors are able to negotiate reasonable commercial arrangements on a private basis.[139] The fact that private interconnection regimes sometimes develop, however, does not mean they always do, or that they necessarily produce a well-functioning market.[140] An interconnection dispute that cuts of service for some customers to other subscribers is a major public policy harm.[141] This is true regardless of the underlying technology involved.

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[135] 47 U.S.C 251(a).

[136] Establishing Just and Reasonable Rates for Local Exchange Carriers; Call Blocking by Carriers, WC Docket No. 07-135, 22 FCC Rcd 11629 (WCB 2007).

[137] *See id.*

[138] Rural Call Completion, WC Docket No. 13-39, Notice of Proposed Rulemaking, ¶ 1-3 (2013); Developing an Unified Intercarrier Compensation Regime, Establishing Just and Reasonable Rates for Local Exchange Carriers, CC Docket No. 01-92, WC Docket No. 07-135, Declaratory Ruling, ¶¶ 1-2 (W.C.B. 2012)

[139] RICHARD LEVINE & RANDOLPH MAY, INTERCONNECTION WITHOUT REGULATION: LESSONS FOR TELECOMMUNICATIONS REFORM FROM FOUR NETWORK INDUSTRIES (2005), *available at* http://www.pff.org/issues-pubs/communications/books/051018Interconnection.pdf.

[140] *See* Frieden, *supra* note 29 (describing examples of interconnection failures).

[141] *See* Griffin & Feld, *supra* note 92, at 12 ("If NBC and AT&T have a retransmission dispute and AT&T video subscribers temporarily lose NBC programs, it is annoying. But if Comcast and AT&T have a 'peering dispute' and millions of AT&T wireless customers can't call Comcast landlines, it is a communications disaster.").

The Montana situation illustrates the challenge in a post-PSTN world. On the wireline PSTN, it would be impermissible for AT&T to cut off Verizon customers. Because this was a roaming arrangement between two mobile phone networks, however, it was essentially an unregulated commercial arrangement. As mobile and VOIP connections become the new PSTN, this dichotomy becomes increasingly untenable.

2. *Internet interconnection disputes*

The Internet provides a glimpse of the post-PSTN future of interconnection. Interconnection is as important to the Internet as to the PSTN, but it has traditionally operated differently, both in technical and regulatory terms.[142] In recent years, however, the Internet's model of purely voluntary, private interconnection has begun to fray, as the Internet and legacy communications networks converge.

Internet service providers can choose whether to interconnect with one another.[143] Any provider offering transmission using the Internet protocol is technically free to interconnect and join the Internet, but companies must agree on the terms and location of interconnection. Unlike the PSTN, the Internet uses a packet-switching architecture, with traffic routed dynamically from router to router.[144] The same traffic can be routed between endpoints through multiple paths, with different financial terms and technical conditions.

Traditionally, interconnection between Internet networks used one of two arrangements: peering and transit.[145] Peering agreements were historically done on a settlement-free basis between the largest, so-called "Tier 1" networks.[146] The other distinctive feature of a peering arrangement is that it involves the agreement only to route traffic to customers of the terminating network.[147] A

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[142] *See* Werbach, Only Connect, *supra* note 64.

[143] *See* Michael Kende, *The Digital Handshake: Connecting Internet Backbones*, 11 COMMLAW CONSPECTUS 45, 52–70 (2003). The situation is similar in Europe. *See* Marcus, et al, The Future of IP interconnection: Technical, Economic, and Public Policy Aspects. WIKConsult, 2008, prepared for the European Commission (WIK 2008).

[144] *See* Kevin Werbach, Digital Tornado: The Internet and Telecommunications Policy 20 (FCC Office of Plans and Policy, Working Paper No. 29, 1997), *available at* http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp29pdf.html, at 17 (describing packet switching).

[145] *See* Kende, *supra* note 143.

[146] *See id.*

[147] David Clark, et al, Interconnection in the Internet: the Policy Challenge, Aug. 9, 2011, *available at* http://ssrn.com/abstract=1992641.

transit agreement, by contrast, involves a payment by one network to another network, which agrees to deliver traffic anywhere on the Internet.[148]

In recent years, more complex arrangements have developed, as companies constantly seek to optimize performance along both financial and engineering dimensions.[149] Some networks now pay for peering in order to guarantee performance on the terminating network. The rise of content delivery networks, which store content close to its destination using caching servers for improved performance, has also changed Internet interconnection dynamics.[150] The environment is considerably more complex today than in the days of "Tier 1" peering.

The FCC has declined to address backbone interconnection, finding it unnecessary because the market is sufficiently competitive.[151] Nonetheless, some authors have pointed out the similarity between Internet interconnection issues and those the FCC regulates.[152] And thanks to the growth of video streaming services such as Netflix and YouTube, Internet interconnection disputes have become more prominent. Because it uses such enormous bandwidth, video content now comprises the dominant share of Internet traffic.[153]

As the Internet becomes the medium for voice traffic and other essential communications services, the question of whether a totally unconstrained interconnection environment can function effectively becomes increasingly salient. Because Internet interconnection agreements are private, it is impossible to get a full picture of the marketplace. However, a number of recent disputes have flared up in public and highlighted potential concerns.[154]

In 2010, after Level 3 became a major delivery network for Netflix, an interconnection dispute erupted between Level 3 and Comcast.[155] Comcast

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[148] *See id.*

[149] *See* Peyman Faratin, et al, Complexity of Internet Interconnections: Technology, Incentives and Implications for Policy (2007), *at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2115242.

[150] *See id.*; Werbach, Only Connect, *supra* note 64, at 1254.

[151] *See* Kende, *supra* note 143.

[152] *See* James Speta, *A Common Carrier Approach To Internet Interconnection*, 54 FED COMM. L.J. 225 (2002); Werbach, Only Connect *supra* note 64.

[153] *See* Sandvine Global Internet Phenomena Report, 1H 2013, *at* http://www.sandvine.com/downloads/documents/Phenomena_1H_2013/Sandvine_Global_Internet_Phenomena_Report_1H_2013.pdf.

[154] *See* Werbach, Network Utility, *supra* note 70, at 1779.

[155] *See* Daniel L. Brenner & Winston Maxwell, *The Network Neutrality and the Netflix Dispute: Upcoming Challenges for Content Providers in Europe and the United States*, 23 INTELL. PROP. & TECH. L.J. 3, 5 (March 2011); Cecilia Kang, *Level 3*

previously had been paying Level 3 for transit, but Level 3 was now delivering huge volumes of Netflix video traffic to Comcast's network. Comcast therefore insisted that Level 3 pay it a termination fee. The disagreement threatened to disrupt the connection between the country's largest broadband access provider and the largest source of Internet traffic. The FCC, however, declined to intervene, even as it adopted open Internet rules prohibiting broadband providers such as Comcast from blocking content and services to their end-users.[156]

In July 2013, the two companies issued a terse press release stating that they had "resolved their prior interconnection dispute on mutually satisfactory terms."[157] Presumably, the companies had continued to exchange traffic the past three years under some interim arrangement, before agreeing to new terms. While this could be seen as evidence that the market can resolve backbone interconnection disputes without interference, the fact that it took three years (an eternity in Internet time) should give one pause. As with most Internet interconnection arrangements, the terms are private, so there is no way to evaluate the agreement. The fact that both parties agreed to a deal does not prove the deal was favorable to competition and innovation; only that the less-powerful party felt signing was better than walking away.

In June 2013, Cogent Communications, another major Internet backbone provider, complained that Verizon was allowing connection quality to degrade across its peering points with Cogent, by not upgrading equipment to handle the volume of traffic.[158] Verizon argued that, because Cogent was sending significantly more traffic than it was receiving from Verizon customers, it should instead use Verizon's paid peering option to deliver content closer to end users for better performance.[159] Of course, that would also impose additional costs on

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Communications Calls Comcast Fees for Netflix Feeds Unfair, WASH. POST, Nov. 29, 2010; *Peering Problems: Digging into the Comcast/Level 3 Grudgematch*, ARS TECHNICA (Dec. 9, 2010), *at* http://arstechnica.com/tech-policy/news/2010/12/comcastlevel3.ars; *Peer Pressure*, THE ECONOMIST: BABBAGE (Dec. 23, 2010), http://www.economist.com/blogs/babbage/2010/12/connecting_internets; Brian Stelter, *Netflix Partner Says Comcast 'Toll' Threatens Online Video Delivery*, N.Y. TIMES: MEDIA DECODER (Nov. 29, 2010), *at* http://mediadecoder.blogs.nytimes.com/2010/11/29/netflix-partner-says-comcast-toll-threatens-online-video-delivery/; Frieden, *supra* note 29.

[156] *See* Open Internet Order, *supra* note 105.

[157] Joan Engebretson, *Behind the Level 3-Comcast Peering Settlement*, Telecompetitor, July 17, 2013, *at* http://www.telecompetitor.com/behind-the-level-3-comcast-peering-settlement/.

[158] Joan Engebretson, *Verizon, Netflix Dispute Not Just Over Peering; Servers are New Battlefield*, Telecompetitor, June 24, 2103.

[159] *See id.*

Cogent compared to the current peering arrangement. The future of the Internet video market, and other markets dependent on significant broadband capacity, hinges on the terms spelled out in these interconnection agreements.

The major incumbent telephone companies argue that the competitive concerns that motivated interconnection obligations for the PSTN are unnecessary for IP services.[160] Competition, however, may not be a sufficient check. Even when there is widespread competition to provide IP transit, access providers still have market power in controlling the ability to reach their customers.[161] In other words, a network seeking to deliver video or voice content to an AT&T U-verse broadband access subscriber needs to terminate that traffic on AT&T's network. The fact that AT&T has many broadband competitors is irrelevant once the customer has chosen a particular one. In the telecommunications market, this is known as the terminating access monopoly.[162]

The difference between the PSTN and the Internet is that there can be multiple paths between two points.[163] A network seeking to reach AT&T's customers that finds AT&T's peering terms excessive can instead pay transit an intermediary network that has a peering arrangement with AT&T.[164] According to AT&T, "the multiplicity of alternative transit routes into a given ISP's network, combined with the interdependence of every IP network on every other, deprives any ISP of the ability to coerce inefficiently high payments from any other IP network."[165]

There are, however, reasons for skepticism that transit will provide a sufficient disciplining mechanism on broadband access providers. The use of an intermediary network makes it difficult to ensure end-to-end performance. The very reasons network providers have gone to paid peering and content delivery networks are the need for reliable performance and the efficiencies involved in caching content closer to its destination. Broadband access providers can make

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[160] *See, e.g.* Report and Order and Further Notice of Proposed Rulemaking, Connect America Fund et al, FCC 11-161, Comments of AT&T (AT&T Universal Service Comments) (arguing that IP interconnection obligations are unnecessary).

[161] Letter from Paul Kouroupas, Global Crossing, to Marlene Dortch, Secretary, FCC, GN Docket No. 09-191, at 2 (filed Feb. 4, 2011); Letter from John M. Ryan, Level 3, to Chairman Julius Genachowski, FCC, GN Docket No. 09-191, at 1-2 (filed Feb 16, 2011).

[162] *See* Patrick DeGraba, Bill and Keep at the Central Office as the Efficient Interconnection Regime (Federal Communications Commission Office of Plans and Policy Working Paper No. 33, Dec. 2000) at 25-26.

[163] *See* Werbach, Only Connect, *supra* note 64 (describing Internet interconnection as a means of "routing around" hold-ups).

[164] *See* Clark et al, *supra* note 147.

[165] *See* AT&T Universal Service Comments, *supra* note 160, at 2.

this problem worse by refusing to upgrade the port capacity on interconnection links, as Cogent alleged Verizon was doing. European antitrust authorities are examining similar complaints that failure to upgrade a congested Internet interconnection link constitutes anticompetitive conduct.[166]

The other development that could change the dynamics of Internet interconnection involves the end-user pricing. Broadband access providers have been exploring the use of data caps and usage based pricing, allegedly to deal with network congestion caused by the rise in high-bandwidth video traffic.[167] They have also begun to enter into agreements, such as a recent arrangement between Comcast and Microsoft for content delivered through Xbox 360 consoles in the home, which exempt certain traffic from those restrictions.[168]

As David Clark, Bill Lehr, and Steven Bauer explain in their analysis of Internet interconnection questions, such end-user policies allow broadband access providers to neutralize transit as a disciplining factor on peering practices.[169] Data caps or usage charges could make watching videos on the regular Internet connection less desirable or overly expensive. Content received by the broadband ISP through direct paid peering arrangements would still be available to subscribers without caps or additional charges. Such arrangements could force originators or distributors of content to pay the peering charges for riding on the "favored" connection.[170]

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[166] *See* James Kanter, *Antitrust Scrutiny of Telecoms in Europe*, N.Y. TIMES, July 11, 2013, at B5, *at* http://www.nytimes.com/2013/07/12/business/global/eu-investigates-telecom-firms-over-internet-access.html; Benoît Felten, There's No Economic Imperative to Reconsider an Open Internet (April 3, 2013), *available at* http://ssrn.com/abstract=2244335 (describing allegations in France that broadband providers Free is deliberately underprovisioning interconnection links).

[167] *See* Jacob Minne, *Data Caps: How ISPs are Stunting the Growth of Online Video Distributors and What Regulators Can Do About It*, 64 FED. COMMS. L.J. 233 (2013); Stacey Higginbotham, Which ISPs are Capping Your Broadband, and Why?, GigaOm, Oct. 1, 2012, *available at* http://gigaom.com/2012/10/01/datacaps-chart/; Roger Yu, *Cable Companies Cap Data Use for Revenue*, USA TODAY, *available at* http://www.usatoday.com/story/tech/2012/10/01/internet-datacap/1595683/.

[168] *See* Stacey Higginbotham, The Technical and Legal Realities of Comcast's Xbox Cap Spat, GigaOm, Mar. 27, 2012, *at* http://gigaom.com/2012/03/27/the-technical-and-legal-realities-of-comcasts-xbox-cap-spat/.

[169] *See* Clark et al, *supra* note 147.

[170] Pricing structures that advantage content through the broadband access provider's "fast lane" in this manner might run afoul of the FCC's Open Internet Rules. *See* Open Internet Order, *supra* note 105. However, those rules are currently under challenge in court. *See* Edward Wyatt, *Verizon-F.C.C. Court Fight Takes On Regulating Net*, N.Y. TIMES, Sept. 8, 2013, at B1. Even if upheld, it is not certain that the FCC's rules would cover these practices. Usage-based pricing and data caps are arguably neutral mechanisms that affect all content equally. The question is whether the arrangement to exempt traffic through certain peering arrangements from the cap changes the outcome.

3. VOIP interconnection

The end of the PSTN means that carriers will switch from TDM to IP-based transmission. During a transitional period, some networks will continue to interconnect through TDM connections, either because one party still operates a legacy network, or by converting from IP to TDM and back. Ultimately, though, the efficient interconnection of post-PSTN networks will involve direct IP links.[171]

VOIP-based service providers can voluntarily connect their networks, and indeed several cable operators reportedly have done so.[172] However, most interconnection for voice services, even when delivered through VOIP, today still involves conversion to TDM in the middle.[173] Telecommunications service providers are required to provide TDM interconnection by Section 251 of the Communications Act.[174] Because the FCC has never decided the legal status of VOIP, however, carriers currently do not have to offer IP interconnection, even where it is technically feasible and the networks involved use IP on both ends.

Even worse, because interconnection negotiations outside the Communications Act are private business transactions, most agreements are treated as confidential. A few disputes have become public when one party goes to the media or the FCC, but there is no reason to believe those are the only ones that have occurred. AT&T has suggested to the FCC that, prior to imposing any regulatory obligations, the FCC should "compile hard evidence of how IP-to-IP interconnection arrangements have played out in practice."[175] This comment is unintentionally ironic. It would be next to impossible to compile such information, because the agreements are confidential, and the FCC's ability to compel data collection is limited because the IP providers are not regulated as carriers.

In 2011, as part of the reform of its intercarrier compensation rules, the FCC sought comment on direct IP interconnection for VOIP.[176] While it reached no

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The FCC did not act to prohibit Comcast's partnership with Microsoft to offer such an exemption for the Xbox. *See* Higginbotham, *supra* note 168. The Open Internet rules allow for "managed services" to be treated differently than general Internet traffic.

[171] Report and Order and Further Notice of Proposed Rulemaking, Connect America Fund et al, FCC 11-161, WC Docket Nos. 10-90, 07-135, 05-337, 03-109, GN Docket No. 09-51, CC Docket Nos. 01-92, 96045, and WT Docket No. 10-208 (rel. Nov. 18, 2011) (VOIP Interconnection Notice).

[172] *See supra* note 24.

[173] *See* VOIP Interconnection Notice, *supra* note 171.

[174] 47 U.S.C. 251.

[175] *See* AT&T Universal Service Reply Comments, *supra* note 17, at 11.

[176] *See* VOIP Interconnection Notice, *supra* note 171.

tentative conclusions, the agency made an intriguing statement in the notice of proposed rulemaking:

> We recognize the importance of interconnection to competition and the associated consumer benefits. ... We also make clear that even while our FNPRM is pending, we expect all carriers to negotiate in good faith in response to requests for IP-to-IP interconnection for the exchange of voice traffic.[177]

Such a good faith requirement seems reasonable, but without FCC legal authority and rules obligating carriers to interconnect through IP, it is entirely hortatory.[178] Clearly, the FCC recognizes that as the PSTN migrates to IP technology, the need for interconnection to ensure universal connectivity does not evaporate.

AT&T and Verizon claim that the FCC has no authority to mandate interconnection when either the requesting or the interconnecting operator uses VOIP.[179] Carriers are also making this argument at the state level, where VOIP-based operators have been rebuffed when seeking direct IP interconnection.[180] At first glance, the FCC's determination that broadband Internet access is an integrated information service would seem to bar imposition of Title II interconnection obligations.[181] As I have elsewhere explained, however, the statutory scheme of the 1996 Act is more nuanced.[182]

While the old Section 201 applies to the narrower class of common carriers, Section 251 applies to "telecommunications carriers." That is defined as all providers of "telecommunications service,"[183] which is in turn defined as

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[177] *Id.* at 16 para. 42

[178] The "good faith" language parallels the FCC's mandate in another controversial area involving distribution arrangements between content producers and distributors: the retransmission consent process between television broadcasters and cable television providers (or their competitors). *See* Amendment of the Commission's Rules Related to Retransmission Consent, Notice of Proposed Rulemaking, MB Docket No. 10-71, FCC 11-31 (March 3, 2011).

[179] *See* AT&T Universal Service Comments, *supra* note 160.

[180] *See* Griffin & Feld, *supra* note 92, at 12; Petition for a Determination that Verizon IP-to-IP Interconnection Agreements Must Be Filed for Review and Approval and for Associated Relief, D.T.C. No. 13-2, Commonwealth of Massachusetts Department of Telecommunications and Energy (considering a request from competitors for IP interconnection with Verizon).

[181] The FCC theoretically could reverse itself, if it offered sufficient justification for a change in position, and reclassify some portion of Internet access as a telecommunications service. However, this is unlikely.

[182] *See* Werbach, Off the Hook, *supra* note 6.

[183] 47 USC 153(53).

provision of telecommunication to the public for a fee.[184] The interconnection obligation applies under Section 251(a) to any telecommunications carrier; it is not limited to interconnection for provision of telecommunications service.[185] Thus, any company that, in some capacity, provides "telecommunications" to the public for a fee must interconnect with other such providers. The "telecommunications service" definition in the statute expressly applies "regardless of the facilities used."[186] Congress understood that voice services would not always be delivered over the same technical platform.

Although it has not yet moved forward on IP interconnection for VOIP, the FCC has taken action to require interconnection between the data services offered by mobile phone providers on a roaming basis.[187] Roaming, the kind of arrangement that allows subscribers of one network to get service from a cellular tower on another network, subject to a charge, is common in the mobile phone world and particularly important to ensure service in rural areas where every carrier cannot economically build out a complete network. The FCC has existing roaming rules for voice service, but its recent decision extended those to mobile data connectivity.[188]

Data roaming provides a template for VOIP interconnection. The data roaming rule requires providers to "offer data roaming arrangements on commercially reasonable terms and conditions."[189] In contrast to common carriage, however, carriers may "negotiate the terms of their roaming arrangements on an individualized basis."[190] They may also decline data roaming interconnection if it is not technically feasible.[191] Where conflicts arise, there is a dispute resolution process.[192]

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[184] 47 U.S.C. 153(53).

[185] 47 U.S.C 251(a). *See also* Werbach, Off the Hook, *supra* note 6 (explaining the scope of interconnection obligations under the 1996 Act).

[186] 47 U.S.C. § 153(53).

[187] Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services, Second Report and Order, FCC 11-52 (Apr. 7, 2011) (data roaming order). The Montana example described above involved a roaming agreement that lapsed and was not renewed.

[188] *See id.* The FCC's data roaming requirements were upheld by the D.C. Circuit in December 2012. *See* Juliana Gruenwald, Appeals Court Upholds FCC's Data-Roaming Rule, NationalJournal.com, Dec. 4, 2012.

[189] Data Roaming Order, *supra* note 187, at 5432 ¶ 43

[190] Id.

[191] Id.at 5432 ¶ 43

[192] Id. at 5448 ¶ 74.

Limited rules of this sort would ensure that the universality of the PSTN endures in the new IP-based communications environment, without retaining the burdensome aspects of legacy telecommunications regulation.

C. Coordination

1. Role of Coordination

The PSTN, the Internet, and whatever comes of their union share a fundamental characteristic: they are networks of networks. No one entity serves every customer, partly because of the massive capital costs involved, and partly because providers can no longer monopolize the market. As a system, therefore the PSTN and its successors are modular in structure, with functionality divided among different entities.[193]

The challenge in any modular system is that those entities make independent decisions about investments, technologies, and business models. When each provider optimizes for its own needs, the overall result may not be optimal.[194] This is true even when all the participants would agree on certain system-wide goals. Unlike interconnection, therefore where every network has a private incentive to limit connectivity but a public incentive to expand it, coordination issues are fundamentally collective action problems.

Modular systems, by definition, lack a strong central control mechanism that controls the actions of all participants. Therefore, the only means of addressing areas of global concern that may be poorly served by local decisions is for government to impose system-wide mandates, or for the participants to communicate directly and make commitments through some coordination mechanism. The social policy aspects of the PSTN can be seen as examples of the former approach. Communications networks are unlikely to be fully accessible to those with disabilities, and the costs of building and managing E911 emergency service infrastructure are unlikely to be borne, for example, if the decisions rest solely in the hands of individual providers. Here, government serves the role of spreading a collective burden across all market participants.

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[193] CARLISS Y. BALDWIN & KIM B. CLARK, DESIGN RULES, VOLUME 1: THE POWER OF MODULARITY (2000); Joseph Farrell & Philip J. Weiser, *Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age*, 17 HARV. J.L. & TECH. 85 (2003).

[194] Christopher Yoo, Modularity Theory and Internet Policy, *at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2032221, at n. 169-180.; Henry W. Chesbrough & David J. Teece, When Is Virtual Virtuous?: Organizing for Innovation, HARV. BUS. REV., Jan.–Feb. 1996, at 65, 67-69.

In other areas, however, government mandates are less appropriate. When it comes to the management and operation of networks, the providers themselves are best-positioned to make the requisite technical decisions. Sometimes the most essential need is for all providers to come to the table to work out cooperative arrangements. And in some cases, the market failure is primarily informational: the industry participants need to give government and the public appropriate data to make decisions.

In recent years, scholars of administrative law have increasingly looked to cooperative "new governance" mechanisms instead of traditional direct mandates.[195] In Internet policy specifically, "co-regulation" and "multi-stakeholder processes" have generated significant interest as means of addressing thorny issues related to Internet governance, content regulation, and network neutrality.[196] With these mechanisms, government can set a policy goal, but allow industry and public interest representatives to define and commit to specific requirements. Alternatively, the multi-stakeholder process may narrow the scope of disagreement and identify safe harbors that are clearly permissible or impermissible.

When the PSTN was primarily operated by AT&T, coordination functions could be handled within that corporate entity, or through affiliates such as Bell Labs. In today's environment, where all providers are independent, there is a need for separate coordination mechanisms. The Communications Act recognizes this. Section 256, for example, directs the FCC to "establish procedures for Commission oversight of coordinated network planning by telecommunications carriers and other providers of telecommunications service...."[197]

Section 256 is limited on its face to providers of telecommunications service. The FCC would need to articulate a theory of legal authority to continue acting in this area following the PSTN transition. Under the FCC's current interpretation of telecommunications and information services, the easiest way to do so is under ancillary authority.[198] Coordination activities are not about promoting

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[195] *See* Richard Stewart, *Administrative Law in the Twenty-First Century*, 78 N.Y.U. L. REV. 437 (2003).

[196] Joe Waz & Phil Weiser, *Internet Governance: The Role of Multistakeholder Organizations*, 10 J. TELECOMM. & HIGH-TECH L. 2 (2013); CHRISTOPHER MARSDEN, INTERNET CO-REGULATION: EUROPEAN LAW, REGULATORY GOVERNANCE AND LEGITIMACY IN CYBERSPACE (Cambridge University Press, 2011).

[197] 47 U.S.C. 256(b)(1).

[198] *See* Werbach, Off the Hook, *supra* note 6.

competition or overcoming market power; they are about reducing transaction costs and ensuring public interest goals are met for the network as a whole.

The two most essential areas for coordination in the post-PSTN environment are numbering and network reliability.

2. Numbering

Any communications network requires a system of identifiers. The nodes on the network can only route information correctly if endpoints are uniquely identified in some consistent manner. Similarly, end users need some way to specify which users or systems they wish to contact. The end-user identifiers must be simple enough for people to remember and use. Coordination is essential so that two endpoints are not assigned the same identifier, and to ensure that connections are made smoothly to the desired destination across independent networks.

The system of identifiers for the telephone network was based on the numeric keypad of telephone handsets. The international technical standard for the familiar arrangement of country code, area code, and telephone number is called E.164. Local and regional authorities around the world handle the allocation and management of numbers within their territories.[199] Section 251(e)(1) of the Communications Act directs the FCC to "create or designate one or more impartial entities to administer telecommunications numbering and to make such numbers available on an equitable basis."[200] The FCC oversees processes such as adding new area codes when numbers are exhausted, and establishing special numbers such as 311 for non-emergency local services. The NANP administrator assigns blocks of numbers to carriers, who then assign them to end-users.

VOIP developed outside the numbering framework of the PSTN. Standalone VOIP services such as Skype could assign their own private identifiers, tied directly to usernames. Interconnected VOIP services such as Vonage and Comcast Digital Voice connect to ordinary telephones, and therefore must somehow interoperate with the E.164 numbering system. However, because these provides are not formally classified as telecommunications carriers, they cannot participate directly in the NANP.[201] Instead, they must buy blocks

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[199] For the United States, the overall structure is called the North American Numbering Plan. *See* 47 C.F.R. § 52.5(c).

[200] 47 U.S.C. 251(e)(1).

[201] *See* Numbering Policies for Modern Communications, Notice of Proposed Rulemaking, Order, and Notice of Inquiry, Docket No. 13-97 (Apr. 18, 2013) (VOIP Number Access NPRM).

numbers from carriers. The FCC has initiated a proceeding and begun trials designed to give interconnected VOIP providers direct access to numbers.[202]

The coordination issue around numbering primarily concerns the internal routing process in the network. VOIP systems use the routing structure of the Internet, based on IP numbers identifying devices, rather than the traditional PSTN mechanisms designed for circuit switches. When a VOIP subscriber makes a call with a PSTN user on the other end, the communication must be converted in the middle to TDM.

Moreover, there is no central database for converting between IP numbers and E.164 telephone numbers.[203] Thus, even when a call is made between two interconnected VOIP subscribers, it typically must be converted to TDM, passed through a legacy PSTN device called a tandem switch to look up the location of the terminating phone number, and then reconverted to IP. Some companies, most notably cable operators, have reached bilateral agreements for direct IP interconnection.[204] However, traditional telecommunications carriers generally require interconnection through TDM.

The precedents for coordination around E.164 to IP numbering are equal access and number portability. When AT&T agreed to divest its local affiliates and open the long-distance market to competition, one of the requirements of the consent decree was equal access: the ability for subscribers to use competitive long-distance carriers as easily as AT&T.[205] This meant the creation of a database system identifying the presubscribed interexchange carrier (PIC) for each subscriber, and mechanisms in the network to route long-distance calls to that carrier's network. Equal access was a requirement imposed on AT&T, but it set a precedent for later coordination mechanisms.

Number portability refers to the opportunity for a customer to take their assigned phone number to a new provider. This was not necessary at divestiture, because local service, where phone numbers were generally assigned, remained a monopoly. It first became an issue in the late 1980s with toll-free service, which was provided by long-distance companies. Customers who advertised toll-free numbers for their businesses, especially those with mnemonic numbers such as 1-800-FLOWERS, were unwilling to change providers if they had to obtain a new number. Eliminating this requirement, however, required the creation of a new

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[202] *See id.*

[203] AT&T Universal Service Comments, *supra* note 160, at 5, 22-23.

[204] *See supra* note 24.

[205] *See* GERALD M. BROCK, TELECOMMUNICATIONS POLICY FOR THE INFORMATION AGE (Harvard University Press 1994)

industry-wide toll-free number database.[206] Every call to a toll-free number then required a database lookup to identify the associated carrier.

The establishment of local competition after the 1996 Act necessitated a new form of portability.[207] Now it was not just toll-free numbers that required a database lookup to identify the associated carrier. Customers needed the ability to take a local phone number assigned by one carrier and "port" it to another. This meant the incumbent network operator providing the wire into their home would have to perform a database lookup before connecting every call. Despite the technical difficulty involved, such as system was in fact deployed and operated smoothly.

An IP-to-E.164 numbering database poses no major technical challenges beyond those that were successfully addressed for local number portability.[208] And the Internet technical community has for several years been developing a protocol called ENUM for mapping IP addresses to telephone numbers.[209] The issue is a collective action problem. An IP interconnection database would benefit everyone, but no individual company wants to build and pay for that infrastructure.

Moreover, any system of this type needs to meet reliability standards to ensure a seamless experience for customers. The FCC may need to play a facilitator role to ensure the creation of such a database. As a starting point, the Commission should bring together leading PSTN and VOIP providers to develop an outline of an IP interconnection database. Such a system could be operated by a neutral third party and funded through small minimal charges on each call, along the lines of the PSTN number portability mechanisms.

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[206] *See* Provision of Access for 800 Service, Report and Order, 4 FCC Rcd 2824 (1989).

[207] *See* First Report and Order and Further Notice of Proposed Rulemaking in the Matter of Telephone Number Portability, 11 FCC Rcd. 8351 (July 2, 1996).

[208] *See* Geoff Huston, *ENUM—Mapping the E.164 Number Space into the DNS*, INTERNET PROTOCOL J., Vol. 5, No. 2, *at* http://www.cisco.com/web/about/ac123/ac147/archived_issues/ipj_5-2/enum.html.

[209] *See* Craig McTaggart, *The ENUM Protocol, Telecommunications Numbering, and Internet Governance*, 12 CARDOZO J. INT'L & COMP. L. 507 (2004); Geoff Huston, *ENUM - Mapping the E.164 Number Space into the DNS*, 5 INTERNET PROTOCOL J. 13 (2002), *available at* http://www.cisco.com/warp/public/759/ipj-5-2/ipj-5-2-ENUM.html; Request for Comments 2916, E.164 number and DNS, from Patrik Faltstrom (September 2000), available at http://www.ietf.org/rfc/rfc2916.txt (defining the ENUM protocol).

3. Reliability

Reliability is essential for critical infrastructure such as the telecommunications network. No network is perfectly reliable, especially one as complex as the PSTN. Increasing reliability also imposes costs, and the most reliable network may not be worth it in terms of the added expense passed on to subscribers. Today, when most Americans have mobile phones in addition to (or instead of) their landline PSTN connections, as well as potentially other communications alternatives, the PSTN may not be the one essential network it once was. Nonetheless, some baseline level of service is necessary to ensure public safety and emergency connectivity. The FCC convened the Communications Security, Reliability and Interoperability Council's (CSRIC), a Federal advisory committee, to bring together major network operators to develop reports and recommendations on reliability-related matters.[210] The most recent CSRIC's charter expired in March 2013, and has not yet been extended. [211]

In recent years, weather-related events have caused significant disruptions of PSTN functionality. For example, in June 2012, an unusual wind storm called a Derecho disrupted communications networks in the area near Washington DC.[212] Subsequently, superstorm Sandy caused widespread devastation throughout the East Coast.[213] In both cases, the FCC investigated how networks fared and developed recommendations to ensure customers did not face unnecessary outages in times of significant need. Other possible causes of significant outages are surges in demand and the interconnection of the traditional TDM network infrastructure to new IP-based networks.

The FCC should ensure that the industry is able to articulate and adhere to appropriate reliability standards for the post-PSTN network. The Internet was traditionally a "best efforts" network, meaning that service quality levels were not guaranteed.[214] As the Internet has grown and become more of a foundation for

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[210] http://transition.fcc.gov/pshs/advisory/csric/.

[211] Communications Security, Reliability and Interoperability Council III, *at* http://www.fcc.gov/encyclopedia/communications-security-reliability-and-interoperability-council-iii/.

[212] Impact of the June 2012 Derecho on Communications Networks and Services: Report and Recommendations, Public Safety and Homeland Security Bureau, Federal Communications Commission (Jan. 2013), http://transition.fcc.gov/Daily_Releases/Daily_Business/2013/db0110/DOC-318331A1.pdf.

[213] Public Notice, FCC Announces Date and Locations for the First Post-Superstorm Sandy Field Hearing, DA 13-19 (Jan. 8, 2013), http://transition.fcc.gov/Daily_Releases/Daily_Business/2013/db0108/DA-13-19A1.pdf.

[214] *See* Werbach, Network Utility, *supra* note 70, at 1832.

commercial activity and real-time voice or video services, operators have engineered their networks to enhance reliability. However, when IP-based networks are used to provide critical services such as telephony, the stakes are raised.

The FCC has already required interconnected VOIP providers to report outages.[215] It should reconstitute an advisory committee on network reliability along the lines of the old NRIC, to identify emerging issues associated with the PSTN transition. An industry-based group may be able to address network reliability on a voluntary basis, but FCC initiative will be required for all major network operators to participate.

A related reliability issue concerns battery backup.[216] The copper wires used for the PSTN are self-powered. Telephone companies provide power for the telephone system directly over the lines. They operate their own backup generators that operate even when the public power grid goes down. This is important in natural disasters. VOIP systems are not self-powered. They rely on the commercial power grid to power devices at the customer premises.

Therefore, to keep a connection operating when the power goes out, these systems generally provide local battery backup. For example, Verizon's Voice Link product deployed on Fire Island promises battery backup for two hours of talk time and 36 hours of standby time.[217] Whether that level is sufficient is a public policy question. Leaving the decision of whether and how long to provide battery backup to each operator will not ensure that customers can count on their phone service in emergencies.

IV. TRANSITION MECHANISMS

Interconnection and coordination form the basis for a regulatory approach that meets the enduring policy needs of the post-PSTN communications environment. The practical challenge now facing the FCC is how to cross the rubicon from the current PSTN to that world. And orderly transition is essential to ensure that subscribers are not excessively harmed by the changeover from

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[215] *See supra* note 84.

[216] *See* David Gabel and Steven Burns, The Transition from the Legacy Public Switched Telephone Network to Modern Technologies, National Regulatory Research Institute, at 17-19 (Oct. 2012).

[217] Fire Island, New York, *at* http://www22.verizon.com/about/community/fireislandny.htm

TDM to IP. Two mechanisms can help: the Section 214 approval process and a date-certain deadline.

A. Section 214

1. The approval requirement

Section 214(a)(3) of the Communications Act states that, "No carrier shall discontinue, reduce, or impair service to a community, or part of a community, unless and until there shall first have been obtained from the Commission a certificate that neither the present nor future public convenience and necessity will be adversely affected thereby."[218] Under this provision, carriers cannot shut down their networks without authorization from the FCC. Doing so would violate the PSTN's social contract, by potentially leaving subscribers with no viable communications option.

Of course, network operators are not proposing to cease operations due to the PSTN transition; they are asking to shut down the legacy PSTN and transfer customers to new IP-based platforms. AT&T argues that it needs no Section 214 authorization to decommission PSTN equipment, because it will not "discontinue, reduce, or impair service" in the process.[219] Instead, it claims, it intends to replace inferior circuit-switching equipment with superior IP-based connections. AT&T supports its claim by pointing out that Section 214(a)(3) emphasizes that no authorization is required for changes "which will not impair the adequacy or quality of service provided."[220]

It bears noting that despite their claims that Section 214 does not apply, both AT&T (through its proposal for field trials) and Verizon (through its petition for approval of its actions on Fire Island) formally requested FCC approval. It remains to be seen whether the carriers would challenge a negative decision by the FCC in court, but neither company has yet been willing to test its legal claim.

Contrary to the network operators' assertions, IP-based networks are not inherently superior to the TDM-based infrastructure of the PSTN. The question is not the novelty of the underlying technology, but the nature of service offerings available to customers. IP may be a better technology than TDM, but that does not mean that every IP-base connection offers superior performance to every TDM connection. A change could be "impairment" subject to Section 214

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[218] 47 U.S.C. 214(a)(3).

[219] *See* AT&T Petition, *supra* note 30, at 13 ("AT&T believes this provision is simply inapplicable where a carrier transitions from legacy TDM-based services to superior IP-based ones....").

[220] 47 U.S.C. 214(a)(3).

authorization even if the replacement is more efficient and potentially more functional overall, so long as the service customers receive is inferior in some respects to what they had before.

Indeed, Verizon's Voice Link product deployed on Fire Island fails to support numerous services that could be used through the wired PSTN:[221]

- Medical alert home monitoring services
- Telecommunications relay service for the deaf and hard of hearing
- Digital Video Recorder (DVR) program guide downloads
- Credit card processing terminals for small businesses
- ATM machines for small businesses
- Home alarm monitoring
- Calling to 900-number (paid) services
- Collect calls
- Calling cards or other dial-around calls
- International dialing (without a supplemental plan)

In effect, Voice Link turns a home into a big mobile phone. This also means that it has the same capacity and reliability limits as a wireless device. Voice Link does not provide its own power for backup, relying instead on batteries which last 36 hours. And though it provides E911 emergency service, the terms of service for Voice Link expressly disclaim liability for E911 connection failures.

Verizon initially delayed filing a Section 214 application with the FCC for Fire Island, but it eventually did so.[222] As Verizon appears to be acknowledging filing a petition with the FCC, Voice Link is in many ways an impairment of the service its customers on Fire Island previously received.

This does not necessarily mean the switch should be prohibited. Verizon would have to invest significant capital to rebuild its wired infrastructure on Fire Island, a community with a small number of mostly-seasonal customers. With the potential exception of service guarantees for E911 connections, none of the limitations of Voice Link are elements of the minimal required functionality defined for universal service purposes.[223] The Communications Act does not direct the FCC to ensure that telecommunications service levels never decline; it

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[221] New Networks, Plain Old Telephone Service (POTS) vs. Verizon Voice Link Wireless, *available at* http://teletruth.org/POTSvsvoicelink.pdf.

[222] Section 63.71 Application of Verizon New York Inc. and Verizon New Jersey Inc. for Authority to Act Pursuant to Section 214 of the Communications Act of 1934, as Amended to Discontinue the Provision of Service (filed June 7, 2013).

[223] *See supra* note 62.

merely requires a showing that a significant change of this sort, on balance, serves the public interest.

2. Cutting the regulatory Gordian Knot

The FCC should clarify that Section 214 approval is required for any transition from the PSTN to IP or other forms of service that result in some functions or activities no longer being supported. Approval should also be required whenever a change no longer provides the same reliability or support such as backup power that customers previously enjoyed. Such a requirement will force carriers to be explicit about their plans and the implications for subscribers. Merely having a public process creates incentives, a record, and the opportunity for comment to protect important public policy interests in the inevitable transition from the PSTN.

Beyond that, the Section 214 process isn't just a mechanism to determine if changes meet the public interest test. It offers a way to cut through the Gordian Knot of legal uncertainty surrounding the FCC's authority over broadband. Section 214 is tied to the old network, so it requires no resort to ancillary authority or other fancy legal footwork to justify regulatory action. So long as the impairment test is met, approval is a clear statutory requirement for any carrier that currently offers PSTN service.

The FCC should declare that Section 214 approval for terminating PSTN service and replacing it with IP-based or wireless alternatives include a set of affirmative commitments related to interconnection, coordination, and social obligations. Specifically, operators should commit to:

1. Offer interconnection on commercially reasonable terms, subject to a backstop arbitration mechanism and a requirement to disclose terms of signed interconnection agreements.
2. Participate in coordination mechanisms for PSTN-to-IP numbering integration and network reliability.
3. Continue to meet social obligations previously mandated by the FCC for interconnected VOIP, such as E911 service, universal service contribution, and disability access.

The rationale for each of these obligations has been developed earlier in this article. Mandatory interconnection, using a loose standard analogous to the FCC's data roaming rules, ensures the universal connectivity at the heart of the PSTN is not abandoned in the IP transition. An arbitration process avoids the need for the FCC or other regulators to get bogged down in setting terms for specific interconnection agreements when parties are unable to reach agreement.

A mechanism such as the "baseball-style" process in which each party offers a best and final proposal, and the arbitrator chooses between them, creates strong incentives for both sides to deal in good faith[224] Making interconnection agreements public provides data for regulators to assess market performance and aids the development of best practices and customary terms.

These terms could be set as default or presumptive obligations that the FCC would consider as meeting the public interest test. Network operators could propose alternative mechanisms of achieving similar goals. Or, they could argue that the default requirements were infeasible or counterproductive under the specific circumstances of their application. It may be reasonable, for example, to make accommodations in rural areas.

There is precedent for such a mechanism. The FCC must approve all significant telecommunications mergers involving either common carriers or transfer of spectrum licenses.[225] Often, mergers raise a variety of complicated competitive issues. The FCC in recent years has often attached conditions to its approval of such mergers.[226] The FCC's expansive use of merger conditions has been criticized as an invitation for unconstrained regulatory and political meddling.[227] The primary objection, however, has been the use of conditions or concessions not directly tied to the competitive issues at hand.[228]

In the PSTN transition, the proposed requirements go directly to the public interest objectives underlying the Section 214 requirement. The reason carriers must petition for approval to impair or terminate service is so that customers are not left in the lurch. Interconnection and coordination requirements are narrowly tailored, as described above, to preserve the essential aspects of the PSTN while allowing the unnecessary legacy requirements to wither away.

B. Date Certain

In discussions about the PSTN transition, the FCC TAC has suggested a "date certain" at which point the FCC would formally decommission the old network,

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[224] *See* Mark Lemley & Carl Shapiro, A Simple Approach to Setting Reasonable Royalties for Standard-Essential Patents, 2013, *at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2243026 (explaining the benefits of baseball-style arbitration).

[225] *See* Thomas Koutsky & Lawrence Spiwak, *Separating Politics from Policy in FCC Merger Reviews: A Basic Legal Primer of the Public Interest Standard* 18 COMMLAW CONSPECTUS 329 (2009).

[226] *See id.*

[227] *See id.*

[228] *See id.*

typically set at 2018.[229] Network operators such as AT&T have endorsed a date certain for the PSTN transition.[230] The Commission itself has not taken up this suggestion.

A date certain would focus industry attention on the transition and potentially facilitate for an orderly transition schedule. It might allow network operators and others to make plans with certainty about the future environment. However, there is some vagueness on what exactly a date certain means. The concept evokes a strong analogy to the recent digital television transition.

In the transition to digital broadcast television (DTV), Congress adopted a date-certain mandate when it became clear broadcasters were unlikely to change over without it.[231] After some wrangling, Congress set a hard deadline of February 17, 2009, after which television broadcasters could no longer transmit on their original analog frequencies, which they were required to return to the FCC for re-auctioning.[232] The hard deadline for the transition was important to focus efforts and ensure the necessary investments as well as consumer education took place.

There are, however, significant differences between DTV and the PSTN. The DTV transition involved strong network effects. It only made sense for broadcasters to invest the resources to switch when enough customers owned digital televisions or converters, but those purchases only made sense for viewers when there was enough digital programming on the air. With the PSTN transition, customers can use their existing equipment. Moreover, broadcasters didn't foresee substantial additional revenue from the digital broadcasts, so their private incentives to make the necessary upgrade investments were limited. By contrast, telephone companies have strong incentives to switch to IP, even without the potential regulatory freedom it provides. Finally, the FCC played a

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[229] Om Malik, When Will the (Traditional) Telephone Hang Up?, GigaOm, July 7, 2011, *at* http://gigaom.com/2011/07/07/when-will-the-traditional-telephone-hang-up/; Bernie Arnason, Bye-Bye PSTN. It's Been Real, Telecompetitor, July 6, 2011, *at* http://www.telecompetitor.com/bye-bye-pstn-its-been-real/; FCC Technology Advisory Council, Status of Recommendations: June 29, 2011, *at* http://transition.fcc.gov/presentations/06292011/2010_06_29-presentation.pdf.

[230] *See* AT&T Universal Service Comments, *supra* note 160.

[231] Balanced Budget Act of 1997, Pub. L. No. 105-33, § 3003, 11 Stat. 251, 265 (1997).

[232] *See* Digital Television Transition and Public Safety Act of 2005 ("DTV Act").Pub. L. No. 109-171, §§3001-3013, 120 Stat. 4, 21-28 (2006). In the end, the deadline was pushed back to June 12, 2009 when last-minute concerns arose about readiness for the transition. *See* DTV Delay Act, Pub. L. No. 111-4, 123 Stat. 112 (2009) (extending the deadline).

necessary role in approving the technical standard for digital broadcasting, which was tied to broadcasters' FCC-granted spectrum licenses.[233]

The precise meaning of a date certain for the PSTN transition is unclear. In the DTV context, broadcasters were shutting down one form of transmission and turning on another. Network operators, however, can move from the PSTN to IP on the same physical facilities. More important, those operators do not lack incentives to make the changeover; rather, the public policy concerns involve the consequences for customers, competitors, and other providers when they do.

AT&T's proposal for a date certain PSTN transition is that, after a certain date, service providers could not longer request TDM interconnection.[234] In other words, Section 251 interconnection obligations would end at that time. Of course, in AT&T's view, the FCC has no authority to impose interconnection obligations on IP networks. To AT&T, therefore, the PSTN transition means the full deregulation of interconnection.

A better approach is to view the date certain not in terms of the rights of competitors, but in terms of the obligations of incumbents. At the sunset date of the PSTN, traditional telecommunications providers meeting the IP interconnection, coordination, and social contract obligations identified in connection with the Section 214 process above would be freed from obligations associated with the legacy PSTN. For the primarily rural carriers who are less eager to transition their networks voluntarily, the FCC could transition universal service funding support at that point to be available only to carriers who move to IP. Legacy TDM interconnection obligations could be removed so long as viable IP interconnection options were available as an alternative.

The exact details of the "zero day" for the PSTN transition could be worked out with significant input from a multi-stakeholder body. The date should be set far enough ahead so that all industry participants have a reasonable opportunity to work through issues and implement any needed changes to their systems. This may be particularly challenging in rural areas. On the other hand, it might be possible to allow early termination of the PSTN in areas where sufficient arrangements are in place, along the lines of AT&T's proposed "all-IP" trials.

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[233] *See* Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service, Fourth Report and Order, MM Docket 87-268, FCC 96-493 (rel. December 27, 1996) (ATS Fourth Report and Order) (adopting the DTV standard).

[234] *See* AT&T Universal Service Comments, *supra* note 160.

C. Conclusion

The PSTN is going away. This should be an opportunity to rejoice, but not to abandon the public policy objectives the PSTN has served for so long. A smooth transition from the PSTN to the all-IP future requires a conscious effort to identify those feature of the legacy regime that should be preserved, those that should be reformulated, and those that should be abandoned. The best way to do so is to examine closely what the PSTN offers, and then distinguish aspects that are historical accidents from those that should apply regardless of the prevailing technology or market conditions. How the FCC manages the PSTN transition is the most important task it faces for the future of wireline communications networks.

Mr. WAXMAN. And, Mr. Chairman, I wish at this time to yield the balance of my time to the gentleman from Vermont, Mr. Welch.

OPENING STATEMENT OF HON. PETER WELCH, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF VERMONT

Mr. WELCH. Thank you very much.

I have the privilege of introducing John Burke, a Vermonter from Castleton, Vermont, graduate of Dartmouth College, and 12-year member of the Public Service Board, which is our public utility commission. And John has served on the Committee on Telecommunications with the National Association of Rural Utility Commissioners, and one of the things that he is so good at is talking about the impact on rural areas of telecom policies. And Congressman Latta and I, as you know, started a Rural Caucus to try take a specific look at how the policies that we have to implement are going to be affecting rural areas, and there is no person with more experience and wiser counsel than the person that we are going to hear from, John Burke from the great town of Castleton, Vermont. Thank you, John.

Thank you, Mr. Chairman. I yield back.

Mr. WALDEN. The gentleman yields back his time, and the gentleman from California yields back the balance of his time. So now we are ready to move forward with our distinguished panel of witnesses.

We thank you all for your testimony. It is most enlightening, even if there is a little conflict here and there among you, which is why you are all here.

So with that, we will start off with Jim Cicconi, who is the senior executive vice president for external and legislative affairs for AT&T. Mr. Cicconi, thank you for being with us. And we look forward to hearing your comments.

STATEMENTS OF JAMES W. CICCONI, SENIOR EXECUTIVE VICE PRESIDENT, EXTERNAL AND LEGISLATIVE AFFAIRS, AT&T, INC.; MARK IANNUZZI, PRESIDENT, TELNET WORLDWIDE, INC.; HAROLD FELD, SENIOR VICE PRESIDENT, PUBLIC KNOWLEDGE; JOHN D. BURKE, COMMISSIONER, PUBLIC SERVICE BOARD, STATE OF VERMONT, ON BEHALF OF THE NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS; AND RANDOLPH J. MAY, PRESIDENT AND FOUNDER, FREE STATE FOUNDATION

STATEMENT OF JAMES W. CICCONI

Mr. CICCONI. Thank you, Chairman.

Mr. WALDEN. And we are still on an old wired copper network, so if you could turn on that microphone.

Mr. CICCONI. Boy, that is embarrassing.

Anyway, Chairman Walden, Ranking Member Eshoo, distinguished members of the subcommittee, thanks for the opportunity to testify with you today, and thank you for holding this hearing.

Four years ago, as you know, the FCC issued the National Broadband Plan, as directed by you. That plan concluded that bringing modern broadband services to all Americans is vital, and

that to do so we must have communications policies rooted in the future, not the past.

In my testimony today, I want to focus on four key points concerning this very important IP transformation. First, transition to all-IP networks is happening today, and I think the chart that you have up here demonstrates that. That is over a 10-year period, and the smallest part of that at the end of that is——

Ms. ESHOO. Is that chart for you to see or for us to see?

Mr. CICCONI. Well, I had hoped that the committee would have it, but——

Mr. WALDEN. We got it covered. Go ahead.

Mr. CICCONI. And this is based on government data. But it shows that by the end of this year, only about 25 percent of Americans will actually be taking advantage of the legacy wireline services. Three-quarters of Americans would have moved to alternatives. The National Broadband Plan, I think, recognizes that this IP transition is well under way. It is happening today. And I posit that all my fellow panelists recognize this as well.

Communications marketplace has changed dramatically, and so has my company in response to that. Today we provide broadband and communications services in robustly competitive markets where consumers have an almost overwhelming array of choices. And, believe me, they exercise those choices on a daily basis. They, consumers and businesses, are abandoning the old circuit-switched wireline network in droves and are moving to IP and mobile services offered by a host of different providers. In fact, it is estimated that what we lovingly call POTS, which is "plain old telephone services," as I mentioned earlier and the chart demonstrates, would be confined to only 25 percent of U.S. households. In fact, in Florida and Michigan, two States that are in our wireline footprint, only about 15 percent of homes are still connected to the legacy wireline network today.

Second point: This transition to an all-IP network is a good thing, and it should be embraced. This is a huge and crucial undertaking for our country. We are replacing the networks that served us well for 100 years with far more advanced and capable networks, networks he hope will serve us well for the next 100 years.

National Broadband Plan correctly concluded that these new smart networks are vital to our Nation's economic development and to maintaining our global competitiveness, but these networks don't happen by themselves. They have to be built, and to build them companies need the right incentives to invest. Most important, companies must be able to retire old infrastructure in order to make the investments in new infrastructure, just like any other business would do. To do otherwise makes little sense and would impede what the National Broadband Plan rightly has made a national imperative.

Third point: We have the time to do this right. This is not a flash cut. The transition to all-IP networks will take place over the course of this decade, but we have to use that timewisely. The FCC's Technical Advisory Committee suggested that the old legacy networks be retired by 2018, but the FCC should in any event set a date certain for their retirement. My company believes it will ac-

tually take us until 2020 to accomplish that, and even then it will require a maximum effort on our part.

In the meantime, we have asked the FCC to conduct industry-wide trials. In our case, we suggested converting two pilot wire centers out of some 4,700 wire centers in our footprint to all-IP. We feel trials are critical. As careful as our planning is, no one can anticipate every issue that may arise when we actually transition off the legacy wireline infrastructure. Trials will help us learn while we still have a safety net in place, and as we learn, all of us, industry, government, customers, and stakeholders, can then work together over the coming years to address any problems we find.

This leads to my final point, which is the importance of an overall framework of values and principles to guide us during this transition to all-IP networks. In that regard some of our friends in the public interest community, including one of my colleagues on the panel here today, have, I think, served us very well. They have stressed that this transition from the old to the new should consider things we have all come to see as fundamental: universal connectivity, consumer protection, reliability, public safety, interconnection.

We know that an all-IP world will not be a regulatory-free zone, nor are we seeking that, but we do feel that any regulation should be rooted in the problems of today, not the problems of a bygone era.

Regulations should also recognize and give deference to the choices of consumers in what are now highly competitive markets and treat all providers equally regardless of technology or their company's lineage.

This is not the first time the U.S. has helped plan for that communications transition. As noted by the National Broadband Plan, we will need wise government policies to ensure that legacy regulations do not impede the investments our country needs, and that the interests of consumers are protected as these new technologies are deployed.

Thank you again for holding this hearing today, and I will look forward to your questions.

[The prepared statement of Mr. Cicconi follows:]

STATEMENT OF JAMES W. CICCONI

SENIOR EXECUTIVE VICE PRESIDENT EXTERNAL AND LEGISLATIVE AFFAIRS

AT&T, INC.

HEARING: "THE EVOLUTION OF WIRED COMMUNICATIONS NETWORKS"

UNITED STATES HOUSE OF REPRESENTATIVES

ENERGY AND COMMERCE COMMITTEE
SUBCOMMITTEE ON COMMUNICATIONS AND TECHNOLOGY

OCTOBER 23, 2013

Chairman Walden, Ranking Member Eshoo, other distinguished Members of the Subcommittee, thank you for the opportunity to testify today.

Internet Protocol (IP) is the common language almost all forms of technology can understand that enables seamless communication of voice, data and Internet applications among various devices (TVs, phones, laptops, tablets, etc.). Modern IP networks are fundamentally different from, and more dynamic and cost-efficient than, last century's TDM-based voice telephone networks. They offer consumers and communities a world of boundless opportunity, by spurring technological innovation, job creation and economic growth through major capital investment. These smart networks are vital to our nation's economic development and will serve as a cornerstone for us to maintain our global competitiveness. But, with the explosion of IP innovation, today's communication landscape resembles nothing that has ever existed before. To make that last point clear, one need just focus on some recent statistics. Skype just celebrated its 10th birthday by announcing that it had reached a record 70 million people simultaneously using Skype online to communicate. That's out of a total of 500 million registered users. To put those numbers in perspective, in our 2nd Quarter SEC filings, AT&T stated that we had 13.9 million

POTS access lines, and Verizon said it had about 7.2 million POTS access lines in service. In other words, Skype had 3 times as many users simultaneously using its service last month as we and Verizon had total POTS access lines in service. 500 million registered users versus 21 million. In October 2012, Apple's CEO Tim Cook announced that Apple's iMessage platform had been used to deliver 300 billion text messages with an average rate of 28,000 per second. Last June, What'sApp, a very popular over-the-top text messaging application, sent or received 27 billion texts in one single day.

With regard to IP, when consumers speak clearly about what they want, we have to listen. And they're speaking now—loudly and daily. They want wireless, and they want IP. We're listening – over the past five years (2008-2012), AT&T invested nearly $98B into its wireless and wireline networks; investing more capital into the U.S. economy than any other public company. The investment in our wireless and wireline networks in 2013 is expected to be in the range of $21B, with increased spending in wireless. In a September 2013 report, the Progressive Policy Institute (PPI) again ranked AT&T No.1 on its list of U.S. "Investment Heroes."[1] In addition, through its Project Velocity IP (Project VIP), AT&T plans to invest billions of dollars over the next three years (2013-2015) to significantly expand and enhance our wireless and wireline IP broadband networks. Project VIP is a major commitment to invest in the 21st Century communications infrastructure for the United States and bring high-speed IP broadband – wireless and wireline – to millions more Americans. Through this investment we plan to: expand our 4G LTE network

[1] *U.S. Investment Heroes of 2013: The Companies Betting on America's Future*, September 2013, http://www.progressivepolicy.org/wp-content/uploads/2013/09/2013.09-Carew-Mandel_US-Investment-Heroes-of-2013.pdf. AT&T ranked No. 1 in the PPI list issued in July 2012. *Investment Heroes: Who's Betting on America's Future?*, July 2012, http://progressivepolicy.org/wp-content/uploads/2012/07/07.2012-Mandel_Carew_Investment-Heroes_Whos-Betting-on-Americas-Future.pdf.

to cover 300 million people by year-end 2014, more than 9 out of 10 Americans; expand our wired IP broadband network to approximately 75% of customer locations in our 22-state wireline service area by year-end 2015; deploy fiber to 1 million additional business customer locations in AT&T's wireline service area by year-end 2015; bring high-speed IP Internet access via IP wireline broadband and/or 4G LTE to 99% of all customer locations within our 22-state wireline service area by year-end 2015; and increase the density of our wireless network through the deployment of small cell technology (40,000+), macro cells (10,000+) and additional distributed antenna systems (1000+). This densification will further improve network quality and increase spectrum efficiency.

And while AT&T's planned investment is significant, it goes without saying that AT&T is no longer a monopoly telephone service provider. We provide broadband and communications services in a robustly competitive marketplace where consumers have many choices among various providers of networks, services and devices. Consumers and businesses have abandoned and will continue to abandon the POTS network in droves for broadband and mobile services offered by those alternative providers. In Florida and Michigan – two states in our wireline footprint – only about 15% of homes are still connected to the POTS network. This disappearing customer base means, not only that companies, like AT&T, which are no longer monopoly telephone service providers must be permitted – indeed encouraged – to retire their antiquated telephone networks and replace them with next-generation high-speed Internet networks. Indeed, public policy must create the right incentives to spur expanded investment, by *all* providers, in next-generation high-speed Internet networks. To be clear, the economics of maintaining the POTS network while simultaneously deploying broadband everywhere in those states just won't work. There simply aren't enough investment dollars to do both, even for a

company as large as ours. And, if our experience participating in the USF reform proceedings has taught us anything, it is that there are not enough dollars in universal service support to pay the cost of bringing broadband everywhere in this country where it's not present today. If we are going to get broadband everywhere in this country, we have to recognize that it makes no sense to mandate investment in antiquated architecture instead of modern architecture. Indeed, every dollar spent maintaining and supporting POTS and TDM service is an investment dollar that is almost immediately stranded.[2] And, more importantly, it represents a dollar not being spent on broadband– as the FCC's own National Broadband Plan points out.[3] Consequently, the mission of the FCC should be to do everything it can to maximize the amount of private investment in broadband infrastructure so it can minimize reliance on USF subsidies and target those subsidies to where they are most needed.

Last November, AT&T filed a petition with the FCC proposing a path forward to upgrade the nation's communications infrastructure and transition to an all IP network by 2020.[4] First and foremost, AT&T's petition encourages the Commission to evaluate issues related to the IP transition in a single, unified proceeding to determine what, if any, regulation may be appropriate in the emerging all-IP ecosystem, in which multiple service providers offer competing IP-based services over a variety of wireline and wireless broadband platforms. This IP transition, or

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[2] Regulations that "require certain carriers to maintain POTS – a requirement that is not sustainable – [would] lead to investments in assets that could be stranded." FCC, *Connecting America: The National Broadband Plan*, at 59 (2010) ("*National Broadband Plan*"), http://www.broadband.gov/.

[3] "[R]equiring an incumbent to maintain two networks . . . reduces the incentive for incumbents to deploy" next-generation facilities and "siphon[s] investments away from new networks and services." National Broadband Plan at 49, 59.

[4] *Petition to Launch a Proceeding Concerning the TDM-To-IP Transition*, In The Matter of AT&T Petition to Launch a Proceeding Concerning the TDM-To-IP Transition, GN Docket No. 12-353, November 7, 2012, http://www.att.com/Common/about_us/files/pdf/fcc_filing.pdf.

"Internet transformation," would effectively speed the development and deployment of high-speed, next-generation IP broadband networks to more American consumers, and, by doing so, provide important consumer benefits (including new choices, better products, services, devices and greater functionality) and help achieve national priorities in areas such as education, healthcare, energy and environmental sustainability.

The Internet transformation is about improving and expanding access to the latest networks and technological innovation, creating untold numbers of new jobs, fostering powerful economic growth, and spurring immense capital investment so that the United States can continue to lead the world. While IP broadband networks and information technology have already driven almost unimaginable economic growth, fully transitioning to all-IP networks will take the promise of this technology to the next level. These next-generation networks support everything from real-time videoconferencing, secure transfers of electronic medical records, e-learning, entertainment, online banking, e-commerce, citizen participation in government and virtually any other Internet application that our best minds can conceive. The innovation enabled by all-IP broadband networks will facilitate distance learning on Indian reservations and small Mississippi farms; it will extend a city doctor's reach to the most remote areas of Maine and Alaska; and it will give American entrepreneurs access to a worldwide market, whether they live in the Louisiana bayou or in the mountains of Montana:

- **Benefits to Consumers -** Consumers continue to demand more services and internet applications at faster speeds and greater service quality. Transitioning to high-speed IP-based networks will open new opportunities for consumers by expanding access to and use of telemedicine, mHealth patient monitoring devices, digital textbooks and online

distance learning tools, remote smart-grid technologies and capabilities to control energy usage in the home and much more.

- **Healthcare Benefits -** Healthcare is an area ripe for greater efficiency and improved outcomes. High-speed broadband can be the much-needed catalyst for change. For example, high speed broadband on IP-based networks can help improve rural health care. Today, fifty million Americans live in rural areas, where there are higher levels of certain chronic diseases but less than half the number of primary care physicians than those living in urban areas. IP-based networks can play a key role in remedying this problem by enabling access to telemedicine applications and devices that can revolutionize the provision of healthcare, increasing access to physicians and treatment centers, providing new tools to diagnose and monitor patients remotely, and improving data transmission for analysis by medical personnel. These benefits, of course, will be available to all Americans, wherever IP networks are deployed, but they are especially important to rural communities, where the healthcare infrastructure may be less developed.

- **Education Benefits -** IP also can transform education. "Blended learning" is education delivered through a combination of online resources and classroom teaching. Instead of traditional textbooks, students will use digital content delivered through broadband-connected devices. Online learning programs benefit students at every level from elementary school to university and adult education. They level the playing field in education and offer access to new educational opportunities to anyone with a broadband connection, no matter where they live. And online learning platforms can be modified to

reach students with a variety of different needs. Currently, more than 70 percent of school districts in the United States offer online courses and 30 states permit virtual charter schools, which enroll over 250,000 students. Many universities, including MIT, Stanford, and Northwestern, offer K-12 distance learning programs, which together enrolled over 2.5 million children in 2010-2011. In the workplace, 30 percent of employers already use e-learning for training.

- **Economic Benefits** - Building and expanding the IP infrastructure will generate hundreds of thousands of jobs at every stage of the process, from the physical installation of new network infrastructure, to network management, to the thousands of new businesses and jobs that will result from the burgeoning high-speed IP broadband economy. Access to IP-enabled networks also will assist those looking for employment by making it quicker to apply for work online at home or through job kiosks using broadband.

- **Infrastructure Benefits** - Improving and expanding broadband infrastructure also will bring many benefits to other aspects of the nation's physical infrastructure. For instance, IP-based networks and services will improve the ability of consumers to control their energy usage remotely and monitor their home's security. In transportation, everything from smart grid technologies to apps showing traffic congestion will be enabled to ensure a smoother, more energy efficient transportation system.

- **Citizen Benefits** - As more and more government services become available online, IP-based broadband will make citizens' interactions with government easier – everything

from renewing a driver's license to paying taxes. This will be particularly important for those living in rural areas and others who may find it difficult to go in person to a government office.

How can policymakers provide additional regulatory and business certainty to help speed the investment necessary to meet rising consumer demand for 21st Century broadband services? The FCC can take the first step, and act quickly on AT&T's request to begin the collaborative process with industry, public interest groups, and consumers to implement trials in a few local markets to create a "real-world" test of the transition away from the antiquated legacy telephone network and towards the deployment of networks capable of offering voice, video and high-speed internet services. AT&T has asked the FCC to allow geographically limited areas in which telephone companies and the agency would initiate beta-tests as the first step toward the FCC's goal of a nationwide transition to IP technology. The beta trials will help the FCC better understand the technological and policy dimensions of the IP transition, and in the process, identify regulatory reforms needed to promote consumer interests and preserve private incentives to upgrade America's broadband infrastructure for the 21st century. Companies that participate in these beta tests would: (i) identify the network modifications necessary to deploy IP technologies as quickly and completely as possible while transitioning away from the legacy TDM network; and (ii) develop a plan for the transition, including outlining the steps they will take to notify all customers (including both retail and wholesale customers) of these changes and all aspects of the transition including how they would migrate all customers to replacement services.

The trials would offer clear benefits with no costs. Many consumers have already made the transition from traditional telephone voice service, currently subject to legacy monopoly style regulation, to Voice over Internet Protocol (VoIP) service offered on the IP broadband networks of competitive providers. The trials will provide an opportunity for all stakeholders (including consumers, industry and policy makers) to identify and engage in an informed debate about any gaps in technology, services or policy, and to develop solutions that address parties' concerns. In some cases, the solution may entail changes to proposed replacement services to ensure that they will support essential features and functions following the transition. In others, stakeholders may conclude that particular features and functions no longer are necessary or make sense in an all-IP world, or that entities that historically relied on TDM technology and services will have to adapt their own products and services to be compatible with next generation wireless and IP-based services. The important thing is to commence those trials now so that we, as a nation, can begin to identify and resolve the issues (both known and unknown) that will arise as we complete the transition to next generation wireless and IP-based services while a TDM safety net is still in place so that an orderly transition can occur, along with the proper planning to make that happen.

This does not mean that a move to an all-IP world means moving into a regulation-free zone. We understand that there will be a set of core consumer protections that exist. While I might disagree with the FCC on particular matters, I would concede readily the FCC can play a strong role in protecting consumers, and it has demonstrated that in recent years. Public safety should fall within the FCC's consumer protection mandate as well. People must be able to reach help in emergencies. No one can disagree with that. But here is another area where the transition to IP can transform that mandate. If robust 911 service is a public policy imperative (and I think it is), then public policy should treat it as such, regardless of the underlying technology used to provide

the service. The obligations should be provided uniformly, both as a matter of competitive fairness and simplicity for consumers.

But while there clearly will continue to be a role for regulations in protecting consumers, it would be illogical and counterproductive to take regulations designed for a monopoly Bell System and try to apply them to modern, competitive Internet communications. To do so would discourage the very investment we need to move the country forward. This means we must discard the old-think philosophy, which relied upon distinctions based on technology or legacy status under the Communications Act. And in cases where the FCC's jurisdiction does not extend to all providers in a relevant market, we should not try to regulate only a subset of that market based on obsolete distinctions. Today, wireline communications are uniquely saddled with restrictions on innovation and the ability to upgrade or replace old technology with new technology. This has to change. While the transition to IP is inevitable, the right rules must be in place – and in some cases no rules at all – in order for the investment and innovation to continue.

In this regard, I have to compliment Harold Feld of Public Knowledge for identifying the key consumer protections needed for a successful IP transition.[5] We may end up differing on details, but their framework is sound. Clearly the fundamental principles of universal connectivity, interconnection, consumer protection, reliability and public safety are hallmarks of our Nation's commitment to communications and cannot be lost in this process. Yet it can't just be Public Knowledge embracing this challenge. The FCC also needs to embrace the challenge and lead the country through this in an orderly way. In my opinion, the FCC has no more important mission

[5] "*Five Fundamentals for the Phone Network Transformation*," PKThinks, July 25, 2013, http://publicknowledge.org/five-fundamentals-phone-network-transition.

in the coming years and must start working with the industry to ensure an orderly transition of technologies. These changes are already underway. Consumers are driving them with the choices they make every day. The pace is accelerating. A failure by the FCC to plan risks confusion, disruptions, a squandering of resources, and even a new sort of digital divide. This is an area where we need the FCC to act like the expert agency it is supposed to be. And it's an opportunity for incoming Chairman Wheeler to really distinguish himself and his agency by articulating a vision for a 21st Century FCC and a truly modernized approach to regulation.

I would be remiss if I did not mention one related and equally important issue: our support for FCC reform. Many Members of this Subcommittee, on both sides of the aisle, have expressed concerns that, in the modern broadband Internet era, the FCC still operates under a statute designed for the communications services and markets of the last century. This problem obviously impacts our discussion today, but it also impacts urgent issues like spectrum exhaust and universal service. We look forward to working with the Subcommittee to meaningfully review and reform the way the FCC analyzes markets, determines whether rules are necessary and appropriate, evaluates license transfers, and seeks public input before taking actions.

To conclude, I would like to thank the Subcommittee for allowing me to be here today and for your tireless efforts to promote innovation, job-creation and investment through pro-growth communications policies for the 21st Century. America's communications future is rooted in our ability to invest and innovate, to achieve the networks that go faster, reach further, and bring us closer to the future – a future that will generate economic growth, create jobs, and open new doors of opportunity for every American. Supported by a policy framework designed for an all IP-world, it's time to move forward faster so that America will grow and lead in the 21st Century.

Mr. WALDEN. Mr. Cicconi, thank you for your testimony. We appreciate your participation in the hearing.

We will now go to Mark Iannuzzi, who is president of TelNet Worldwide. We are thankful that you are here today to represent the industry and yourself. And please turn on that microphone, pull it up close, and we will—look forward to your comments as well, sir. Thank you for joining us.

STATEMENT OF MARK IANNUZZI

Mr. IANNUZZI. Chairman Walden, Chairman Upton, Ranking Member Eshoo, Ranking Member Waxman, and to each of the members of the committee, thank you very much for an opportunity to speak to you today. I am Mark Iannuzzi. I am president and founder of TelNet Worldwide. We are a competitive facilities-based carrier providing telecommunications and broadband services. We are headquartered in Troy, Michigan. We are also very privileged and proud to be the communications service provider to Chairman Upton's district offices in Kalamazoo and St. Joseph/Benton Harbor, Michigan.

TelNet offers the complete range of essential communications services for small to middle-size businesses, including classic voice, IP telephony, hosted IP applications, and advanced data and networking services. In this increasingly connected world, we help unify and simplify all the ways that businesses communicate and collaborate, providing them big-business solutions to small businesses at prices that they can afford.

Today I am pleased to appear on behalf of COMPTEL. It is the Competitive Communications Association. Nearly two-thirds of the COMPTEL members are small and middle-size businesses, a majority of which have $10 million or less in revenues and fewer than 100 employees. However, the DNA of these companies is about entrepreneurs serving entrepreneurs.

A little background about myself. I was born and raised in Detroit. I am an American engineer and entrepreneur. I built TelNet with my brothers 15 years ago from the dirt out of the basement of our home. To this day, though, however, since that time, we have invested upward of $100 million, employing now over 100 career associates in our company, and we also are very proud to have created the first network in the State of Michigan which integrates the vast majority of the State with a service area greater than AT&T and Frontier combined.

One of the things that is indelible upon me was a conversation I had with my father when I was about 5 years old when I had to do a book report on poverty. I asked my father, "What is poverty?" And my father paused, and he told me it is—"Poverty is about persons without choice." Now, at 10 years old, I didn't quite grasp what that meant because I thought it was all about not having a lot of money. But it was his pride of being an Italian immigrant, a U.S. citizen, to be a part of this great land of opportunity, that he had choice for himself and our family.

So with that as a backdrop, I want to make it clear that as we have these debates, I or the competitive community, we are not against AT&T, we are not against the ILECs. AT&T is a proud American company. We want all companies to do well. It is in our

interests. When they raise themselves, they raise the entire industry, and we have the ability to serve customers better. So it is not about what we are against; it is about what we are for.

We are for robust competition, for merit over might, for much as things change in this technological age, some things never change, one of which is the enduring truth of free-functioning, competitive markets to bring about the greatest good for the widest array of people the world has ever seen.

We are for the rule of law, which means trust. It means certainty in keeping our collective promises, including those to the capital markets which have invested theirselves in our endeavors.

And, finally, we are for ensuring that there are no artificial barriers to progress not only for those of us who are currently in the market today, but for all those who are yet to be born who will take up the mantle that we have set forth.

So let us begin from the—let us start at the beginning, the 1996 act. The 1996 act unleashed the greatest advancements in communication history since the history of history. Improvements to our capabilities today in terms of the capabilities, the competitive position and the productivity in this country are mind-boggling. And to that extent, I would like to extend my sincere salute to Chairman Upton, to Congressman Dingell and all the Members here who were participatory in that '96 act because your leadership was instrumental in forging a bipartisan team for this landmark legislation which has revolutionized the industry of communications.

At the very soul of that act, the very soul was designed specifically to open up competition, including the ability for the incumbent dominant companies to expand their service offerings, and they have done very well. They entered the LD market and ultimately the Baby Bells bought Ma Bell.

Now, there are some here that would say that there are technical limitations in the act. I say to them as I say to you, the act is not and cannot be about technological limitations. It is rather about technology inspiration through a simple framework for free-functioning, competitive markets to exist.

Why this matters. We understand small businesses, I believe, and that is why TelNet came into being. This is where we thrive. Small businesses seek to be relevant in what they do, not necessarily experts in technology. Small businesses cannot afford to go out and pay for the consultants to sort out the alphabet soup of technology. Rather, it is often where it is their next-door neighbor's nephew's cousin that comes in and tries to help them figure out some of the things going on here.

The competitive industry can touch these small businesses. We sit across the table, we examine their needs, we establish solutions tailored to those needs and help them go from crawl, walking, to run. You know, God bless them, but this is not the AT&T's forte. Our goal, in fact our promise, to our customer is to be the last service provider that they ever need, because we want them for life. We do—to do this, we must ensure that we can futureproof their investments and deliver ongoing value.

So let us get to the heart of the matter. There are three things that are key to what this conversation here about the next-generation networks. The last mile is the essential business building

block for function and competitive markets, regardless of technology. Our network is the best in the world, but it is only at good as its weakest link, and that is last mile.

It is—secondly, it is important that these networks are interconnected, that we can exchange traffic at just and reasonable rates and our terms and conditions regardless of technology.

And, third, we need to make sure that the business agreements and pricing between the dominant and competitive—pair are negotiated and adjudicated with the firewall backstop of our local public utilities commissions.

Mr. WALDEN. Mr. Iannuzzi, I am going to have you wrap up. You are about 2 ½ minutes over.

Mr. IANNUZZI. Thank you.

In conclusion, I came into this business 15 years ago with a driving desire to make things better, to make things less expensive through business process improvement and technology advancement. If I ever had any doubt that there was a—going to be a technological limitation in a tech business, that would have been a nonstarter.

The TelNets of the world may come and go, but should never—must never perish from this great Nation is that we do not erect barriers which impoverish, but we stay true to our competitive spirit as Americans for those ingredients that promote prosperity and well-being for all.

Thank you very much for the opportunity to testify today.

[The prepared statement of Mr. Iannuzzi follows:]

Written Statement Of

Mark Iannuzzi, President, TelNet Worldwide, Inc.

On Behalf of COMPTEL

United States House of Representatives

Committee on Energy and Commerce
Subcommittee on Communications and Technology

Hearing on

"The Evolution of Wired Communications Networks"

October 23, 2013

Chairman Walden, Chairman Upton, Ranking Member Eshoo, Ranking Member Waxman:

Thank you for the opportunity to appear before the Subcommittee today.

I am Mark Iannuzzi, founder and president of TelNet Worldwide, Inc., a competitive facilities-based telecommunications and broadband provider headquartered in Troy, Michigan, and proud to serve Chairman Upton's offices in Kalamazoo and St. Joseph/Benton Harbor. We offer a complete range of integrated communications services to the small and medium-sized business market, including voice and data services, such as enhanced Voice over Internet Protocol (VoIP) applications and hosted Internet Protocol (IP) solutions and applications. Today, I am appearing on behalf of COMPTEL, the competitive communications association.

COMPTEL started more than 30 years ago and today, the association has more than 200 members, including local competitors, broadband providers, wireless carriers, and cloud service providers, as well as suppliers and professional partners. COMPTEL's membership is diverse. Nearly two-thirds of COMPTEL's members are small and medium-sized businesses ("SMBs"), a majority of which have $10 million or less in revenue and fewer than 100 employees. We also have a number of large national companies with thousands of employees. COMPTEL member companies utilize private investment to drive technological innovation and create economic growth with their competitive broadband, voice, video, Internet, data and other advanced services.

Members of the competitive industry continue to be the entrepreneurial innovators. They were the first to deploy DSL in the mid-1990s. And, during the last decade, they have been the first to deploy next-generation, IP-based managed networks that utilize copper, fiber, and wireless technologies. Whether COMPTEL members are helping businesses meet their increasing bandwidth needs by providing Ethernet services, saving small businesses thousands of dollars each month in IT costs by offering cloud-based solutions, or enabling telemedicine by providing telecommunications services to rural health care facilities, they are the companies fostering innovation, investing in new facilities to reach their customers, and creating jobs across the United States.

COMPTEL members are largely running and growing their businesses with private investment and very little, if any, support from federal programs. But it is important to emphasize that the key element that allows COMPTEL members to offer these services is the wireline network. Wireline networks are, and will continue to be, an essential component of the communications marketplace for the foreseeable future. Wireline remains the communications medium of choice for small, medium, and large businesses, as well as a significant segment of the consumer market.

I would like to provide just a brief background on myself. I am a product of the Detroit Public School system and after earning an engineering degree at the University of Arizona, I returned to Michigan and teamed up with a handful of colleagues in a start-up company to develop revolutionary CAD/CAM software. During this endeavor I noticed that SMBs were not able to obtain the types of telecommunications services that were both affordable and enabled their businesses to grow. Understanding that a small business service provider is likely the best at knowing what small businesses need, I formed TelNet in 1998 with my brother to address this market need. TelNet had a humble beginning out of the basement of my home. Today TelNet has invested more than $100 million into Michigan, providing career oriented jobs to our 105 associates, helped usher in numerous business start-ups and sustained even more businesses. Among our accomplishments is that we built the first network to integrate the vast majority of the state of Michigan – more than AT&T-MI and Verizon-MI combined.

I am pleased to be able to sit before you today and discuss the building blocks for effective, facilities-based competition in the United States. The solid foundation that was built by this legislative body in the Telecommunications Act of 1996 must remain intact during the

transition to IP technologies to ensure that competition will continue to flourish and benefit consumers. I will spend my time focusing on several critical policies my company and COMPTEL's members believe must be addressed by the FCC. This testimony can be summarized into three key points:

- American businesses, particularly SMBs, benefit from the investment and innovation driven by competitive carriers in the business broadband market.
- Last-mile access and interconnection policies remain the crucial building blocks for a free, functioning competitive market, regardless of the technology.
- Businesses in the United States can continue to benefit from innovative, dedicated broadband services both during and after the IP transition, if the FCC updates its last-mile access and interconnection policies.

American Businesses are Enjoying the Benefits of the Investment and Innovation Driven by Competitive Carriers in the Business Broadband Market

I know firsthand what SMBs lacked before starting TelNet and what they continue to need to grow and to provide their goods and services. These businesses demand reliable, dedicated and high-quality broadband voice and data services. Services that are delivered over managed networks—not the Internet. Many of the customers we serve, such as retail chains, banks, hospitals and universities, have multiple locations and require innovative "end-to-end" solutions that fit their individual needs, as opposed to a generic, "one-size-fits-all" approach. For example, they need services to reliably and securely transfer large amounts of data between their multiple locations (*e.g.*, among their retail stores, their bank branches or their campuses). Importantly, "best efforts" Internet access services marketed to residential customers are not a substitute for the dedicated business broadband services demanded by business customers of all sizes today.

To meet this demand, competitive carriers, including COMPTEL's members, are serving businesses of all sizes, in all industries, all across America. They have made substantial investments in the telecom industry and in the provision of business broadband services in particular. Indeed, competitive carriers have invested billions of dollars in state-of-the-art network infrastructure and own millions of miles of fiber. In 2008, competitive carriers, along with cable companies, spent almost $17 billion—nearly 40 percent of the total wireline

investments in the United States. By 2012, these carriers increased their investments to 43 percent of total wireline expenditures.[1]

The services that American businesses need to compete in the today's economy have been and are being developed as a result of capital investment by competitive carriers. And through their investment, competitive carriers have driven innovation in the business broadband market. They were among the first to develop many of the innovative, "must have" services that businesses use today, including "VoIP" services, Ethernet services, and cloud services. Competitive carriers have been constructing their own fiber networks wherever possible, but they also have utilized available copper to provide innovative business broadband services. For instance, competitive carriers invested in their own network equipment to bring game-changing Ethernet-over-copper services to SMBs in the many areas of the country where fiber is not available. These high-capacity broadband services allow SMBs to cost-effectively realize many of the same efficiencies of Ethernet technology as larger enterprise customers using Ethernet services provisioned over fiber.

Moreover, businesses want a choice in providers. Competitive carriers offer that choice. They deliver to businesses an alternative to the products and pricing offered by dominant incumbent carriers, such as AT&T and Verizon. As I mentioned above, competitive carriers also provide solutions tailored to the needs of SMBs, a niche often neglected by incumbents. For example, competitive carriers provide cloud services that give SMBs access to virtual systems that can be easily upgraded and expanded, unlike conventional IT resources that are tied to specific hardware. Using cloud services, SMBs can free themselves from allocating time and resources to IT maintenance and focus on their core business strengths.

In addition, SMBs benefit from customer service provided by competitive carriers, which is designed to meet their unique needs. For example, TelNet and other competitive carriers provide SMBs with personalized sales consultations, 24/7 service monitoring and support, and education about how to leverage the efficiencies of IP and packetized technologies and lower their IT costs. These are among the reasons that competitive carriers are frequently recognized

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[1] *See* Susan M. Gately and Helen E. Golding, S.M. Gately Consulting LLC, *The Benefits of a Competitive Business Broadband Market*, at 16 (April 2013), *available at* http://thebroadbandcoalition.com/storage/benefits-of-broadband-competition.pdf ("*The Benefits of a Competitive Business Broadband Market*").

in the industry for their excellent customer service to SMBs in addition to larger enterprise customers.[2]

The investment, innovation, and competitive choice provided by competitive carriers has, in turn, spurred investment in broadband deployment by incumbent carriers, while increasing adoption of broadband by business customers. For example, following the introduction of Ethernet services provisioned over fiber and copper by competitive carriers to businesses of all sizes, incumbent carriers responded with their own Ethernet offerings.

This competition in the business broadband market has led to tremendous growth in the telecom industry. Economists have found that competition causes both competitive carriers and incumbents to increase investment, employ more workers and foster innovation in new technologies.[3] Importantly, this competition also benefits the economy as a whole. In particular, the services offered by competitive carriers enable American businesses—particularly the SMBs that are the growth engines of our economy—to boost productivity, reduce costs and focus on creating jobs.

Competition in the Business Broadband Market Has Been Made Possible by the Last-Mile Access and Interconnection Provisions of the Communications Act

The virtuous cycle of competition, investment and innovation in today's business broadband market has been made possible by several key provisions of the Communications Act and the bipartisan 1996 amendments to the Act.

First, the Act requires incumbents to provide competitive carriers with access to "last-mile" connections to homes and businesses on reasonable rates, terms and conditions.[4] This last-mile access requirement is critical to competitive choice in the business broadband market for several reasons. To begin with, by virtue of their historical monopoly, the large incumbents control the only physical connections to the vast majority of business customer locations in the country. In addition, while competitive carriers have invested billions of dollars in replicating

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[2] The Broadband Coalition, *Broadband Innovators: Driving Small Business Forward*, at 5, *available at* http://thebroadbandcoalition.com/storage/images/Driving-Small-Business-Forward.pdf.

[3] *See The Benefits of a Competitive Business Broadband Market* at iv.

[4] 47 U.S.C. §§ 251(c)(3), 201(b), 202(a).

these last-mile connections wherever possible,[5] it is frequently uneconomic to do so because of the steep costs associated with construction of last-mile connections.[6] Thus, in most cases, in order for a competitive carrier to offer broadband services to a business, the carrier must have access to the last-mile connection to that business or they will be left with only one provider (the large incumbent) to serve them.

Second, the Act requires incumbents to (1) connect their networks with the networks of other carriers at any technically feasible point for the purpose of exchanging voice calls; and (2) provide such interconnection on reasonable rates, terms, and conditions.[7] This interconnection requirement is also crucial to ensuring competition. In order to attract customers, a provider of voice services must be able to interconnect its network with those of other providers so that its customers can make calls to and receive calls from any other providers' customers. However, as the FCC has recognized, incumbent carriers have no economic incentive to voluntarily interconnect with competitive carriers.[8] Because incumbent carriers continue to have

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[5] Even though competitors have invested billions of dollars, the FCC, the Department of Justice ("DOJ"), and the Government Accountability Office ("GAO") have found that competitive carriers have constructed their own fiber last-mile connections to only a small percentage of commercial buildings in the United States. *See* Petition of Ad Hoc Telecommunications Users Committee, BT Americas, Cbeyond, Computer & Communications Industry Association, EarthLink, MegaPath, Sprint Nextel, and tw telecom to Reverse Forbearance from Dominant Carrier Regulation of Incumbent LECs' Non-TDM-based Special Access Services, WC Dkt. No. 05-25 & RM-10593, at 42-44 (filed Nov. 2, 2012) ("Competitive Carriers' Petition to Reverse Forbearance") (citing FCC, DOJ, and GAO findings).

[6] For example, the costs of obtaining rights-of way-and digging up streets often far exceed the revenues that can be earned from serving business customer locations using those connections.

[7] 47 U.S.C. § 251(c)(2).

[8] *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996; Interconnection Between Local Exchange Carriers and CMRS Providers*, First Report and Order, 11 FCC Rcd. 15499, ¶ 55 (1996). This is because of so-called "network effects." "Network effects arise when the value of a product increases with the number of customers who purchase it." *Connect America Fund et al.*, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd. 17663, ¶ 1336 (2011). For instance, the value of a subscriber's telephone service increases as the number of other people the subscriber can reach using that service increases. And, "[i]f the attractiveness of a [telephone or other communications] network increases as it enlarges, consumers will tend to choose the larger network, which in turn will make it even larger and even more attractive." *Network Effects in Telecommunications Mergers MCI WorldCom Merger: Protecting the Future of the Internet*, Address by Constance K.

substantially bigger voice subscriber bases than virtually any of their competitors—they do not need to interconnect with competitors nearly as much as competitors need to interconnect with them. It follows that the interconnection mandate is still needed to promote a competitive marketplace.

To Promote Continued Competition, Innovation and Investment in the Business Broadband Market, the FCC Must Promptly Update its Last-Mile Access and Interconnection Policies

Importantly, both the last-mile access and interconnection provisions of the Act are "technology neutral." That is, the terms of the statute make *no distinction* between legacy and new technologies. For example, this is why the FCC recognized back in 1998 that "the interconnection obligations set forth in Section 251(c)(2) of the Act apply to packet-switched services."[9] The FCC held that "[n]othing in the statute or legislative history indicates that [Section 251(c)] was intended to apply only to existing technology."[10] The agency further noted that "Congress was well aware of . . . packet-switched services in 1996, and the statutory terms do not include any exemption for those services."[11]

While the Act is technology neutral, competitive carriers will lose last-mile access and interconnection rights as companies transition from using legacy technology (known as "TDM-based" technology) to IP and packetized technologies in their networks. This is for two reasons. First, the FCC's last-mile policies are not technology neutral. The FCC only requires last-mile access for connections that use legacy, TDM-based technology. The FCC does not apply the pro-competitive last-mile access provisions of the Act to connections that use newer, more

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Robinson, Director of Operations and Merger Enforcement, DOJ Antitrust Division, before the Practicing Law Institute, at 2 (Aug. 23, 1999), *available at* http://www.justice.gov/atr/public/speeches/3889.pdf ("*DOJ Network Effects in Telecommunications Mergers Address*").

[9] *See Deployment of Wireline Services Offering Advanced Telecommunications Capability*, Order on Remand, 15 FCC Rcd. 385, ¶ 22 (1999), *remanded on other grounds, WorldCom v. FCC*, 246 F.3d 690 (D.C. Cir. 2001).

[10] *Deployment of Wireline Services Offering Advanced Telecommunications Capability*, Memorandum Opinion and Order and Notice of Proposed Rulemaking, 13 FCC Rcd. 24011, ¶ 49 (1998).

[11] *Id.*

efficient packetized technology, such as Ethernet technology. Accordingly, as incumbents replace their legacy TDM-based technology with IP technology, competitive carriers will lose access to the last-mile connections that have enabled them to push deployment of innovative business broadband services to American businesses.

In addition, the FCC has so far failed to offer clear guidance confirming that the interconnection requirement in Section 251(c)(2) of the Act applies to IP interconnection.[12] As incumbents transition their networks to packetized technology, competitors risk losing access to interconnection on reasonable rates, terms and conditions. This is because, as discussed further below, incumbents have interpreted the FCC's interconnection policies to apply only to the exchange of traditional TDM-based voice calls, not VoIP calls.

Thus, *absent FCC action, the last-mile access and interconnection policies that have made competition in the business broadband market possible will be in jeopardy.* The real-world consequences of such inaction in the face of the IP transition could be disastrous for customers and competition. Hundreds of thousands of American businesses could lose their business broadband provider, and in turn, lose the high-quality, competitively priced and innovative broadband solutions that they have come to rely on to compete in the global economy. In addition, there could be a resulting loss of as many as 300,000 existing jobs and a reduction of $30 billion in capital spending in the telecom industry.[13]

In order to prevent this outcome, the FCC should promote continued competition in the business broadband market by updating and enforcing its last-mile access and interconnection policies on a technology-neutral basis. Specifically, the FCC should take three steps.

First, the FCC should update its last-mile access policies to ensure that competitive carriers can obtain access to last-mile connections that use packetized technology on reasonable rates, terms and conditions.

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[12] This is despite the fact that the agency has had a full record on this issue for almost two years, and its own Technology Advisory Council has advised it to settle this issue in order to advance the IP transition in the United States. *See* Federal Communications Commission Technological Advisory Council, TAC Memo—VoIP Interconnection, at 2-3 (2012), *available at* http://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting92412/VoIP-Interconnection-TAC-Memo-9-24-12.pdf.

[13] *See The Benefits of a Competitive Business Broadband Market* at iv.

Second, until the FCC updates its last-mile access policies, the agency should adopt rules that preserve the copper infrastructure that is no longer being used by incumbents. Competitive carriers have been leveraging existing copper networks well beyond what was conceivable a decade ago to provide affordable and innovative broadband-over-copper services to businesses of all sizes. These cutting-edge broadband services include high-bandwidth, low-cost Ethernet services at speeds of up to 100 Mbps; services that would not likely be offered by the large incumbents.

Third, the FCC should affirm that the interconnection obligations in Section 251(c)(2) of the Act apply to interconnection for the exchange of voice calls, regardless of the technology (*e.g.*, VoIP technology) used to make and receive such calls.

There is no doubt that the FCC can take these actions. The agency has the authority to do so because, as discussed, the Act is designed to promote competition in the marketplace and is technology neutral. In addition, the FCC has received substantial input from interested parties and developed significant records in the relevant rulemaking proceedings on last-mile access and interconnection. Furthermore, the FCC has recently begun the process of gathering the data it believes are necessary to reform its last-mile access policies.

Last-Mile Access and Interconnection Policies are Still Needed to Ensure Competition in the Business Broadband Market Today

The largest incumbent carriers and their supporters have argued that the ongoing transition from TDM-based technology to IP and packetized technologies obviates the need for last-mile access and interconnection policies. As discussed below, this is simply not true.

First, despite changes in technology, last-mile access requirements are still needed to ensure competition in the business broadband market today because large incumbents maintain an extremely high share of the last-mile connections to businesses.[14] As discussed above, competitive carriers still face extensive economic and operational barriers to constructing their own last-mile connections. Indeed, the FCC found in 2010 that there is "nothing . . . to indicate that, in the years since the passage of the 1996 Act, these barriers have been lowered for

[14] *See* Competitive Carriers' Petition to Reverse Forbearance at 45-46 (citing analysis of data submitted by incumbent carriers and competitive carriers to the FCC in 2011).

competitive [carriers]."[15] And, importantly, *these barriers exist regardless of whether the services provided over the connections utilize legacy technologies or newer IP and packetized technologies.*

The FCC also has long held that control over "bottleneck facilities," such as last-mile connections, is *prima facie* evidence of market power[16] and incumbents have repeatedly exploited that market power. Just two weeks ago, AT&T notified its wholesale customers (*i.e.*, competitive carriers with whom AT&T competes in the downstream retail market for business broadband services) that it will effectively be increasing rates for so-called DS1 and DS3 last-mile inputs in November 2013.[17] AT&T and other incumbents may seek to impose such unilateral price increases on competitive carriers because competitive carriers have few, if any, alternative suppliers of last-mile connections.

Moreover, the continuing need for last-mile access requirements is not obviated by purportedly high levels of competition among incumbents, cable companies and wireless companies in the residential market for phone, video and Internet access services. The needs of business and residential customers are very different. In particular, businesses need much more robust, reliable and secure wireline connections than those that are generally delivered via "best efforts" services marketed to residential customers. And, there is little hope for meaningful competition in the provision of business broadband services without the presence of competitive carriers in the market. Cable companies originally built their networks to serve residential customers, and so far have not been major players in rolling out robust business broadband offerings. According to a recent JP Morgan Chase analyst report, in the fourth quarter of 2012, AT&T and Verizon together earned more than 11 times as many revenues from business services

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[15] *Petition of Qwest Corporation for Forbearance Pursuant to 47 U.S.C. § 160(c) in the Phoenix, Arizona Metropolitan Statistical Area*, 25 FCC Rcd. 8622, ¶ 84 (2010) ("*Phoenix Order*"); *see also id.* ¶ 90.

[16] *See Phoenix Order* ¶ 5 (citing *Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor,* First Report and Order, 85 FCC 2d 1, ¶ 58 (1980)).

[17] *See* AT&T Accessible Letter (dated Oct. 10, 2013), *available at* https://primeaccess.att.com/access_letters/view.cfm?CPSWorkplace/getContent?objectStoreName=Accessible.__.Letters&objectType=document&guestid=P8guest&id={179EF01D-73DF-4965-954F-25C822B68B9B}.

(*i.e.*, $13.5 billion) than the two largest cable companies, Comcast and Time Warner Cable (*i.e.*, $1.2 billion). Even if cable companies' business broadband offerings become more widespread, the best case scenario for American businesses in a market without competitive carriers is a duopoly. Businesses would have only two providers to choose from—the incumbent telephone carrier and the incumbent cable company in their area. As the FCC has found, prices are likely to be higher in such markets.

Second, notwithstanding changes in technology, interconnection requirements also remain necessary today. As discussed earlier, large incumbents still have no rational incentive to voluntarily interconnect their networks with those of competitors. Just as in 1996, the size of a carrier's subscriber base is still the most important determinant of its leverage in interconnection negotiations and its willingness to interconnect with other carriers.[18] The resulting market power over interconnection persists, regardless of whether a competitive carrier seeks to interconnect using legacy TDM-based technology or newer IP technology. This is evidenced by the incumbents' refusal to negotiate interconnection agreements with competitive carriers. For example, AT&T has not interconnected via IP with a single competitive carrier for the exchange of voice calls. And Verizon has only agreed to establish such interconnection with one incumbent cable provider (*i.e.*, Comcast), which has a very large subscriber base. By contrast,

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[18] Large incumbent carriers, such as AT&T and Verizon, still have far more voice subscribers than competitive carriers. This point can be illustrated by measuring the value of a large incumbent LEC's network relative to that of a competitor. Under one such measure (known as "Metcalfe's law"), the relative value of a network is proportional to the square of the number of subscribers served by the network. *See* Michael Kende, FCC Office of Plans and Policy, *The Digital Handshake: Connecting Internet Backbones*, OPP Working Paper No. 32, at 3 n.5 (Sept. 2000), *available at* http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp32.pdf ("*The Digital Handshake*"). For example, AT&T provides approximately 122.9 million total voice connections, while Sprint (itself one of the largest providers of voice services in the country) provides approximately 53.6 million total voice connections. *See* Sprint Corp., SEC Form 8-K, Exh. 99.1, 99.2 (filed July 30, 2013); *see also* AT&T Inc., SEC Form 8-K, Items 8.01, 9.01 (filed July 24, 2013). (This total includes 92.7 million wireless connections (excluding data-centric devices such as tablets), 26.8 million switched access lines, and 3.4 million U-Verse VoIP connections. *See id.*). Based on these totals, Metcalfe's law yields the conclusion that AT&T's voice network is more than five times more valuable than Sprint's voice network. Therefore, it is not surprising that while "Sprint currently has IP interconnection agreements with 12 major carriers," it "has yet to obtain IP-to-IP interconnection for voice traffic from any of the major ILECs," including AT&T. *See* Comments of Sprint, GN Dkt. No. 13-5, at 6-7 (filed July 8, 2013) ("Sprint July 8, 2013 Comments").

competitive carriers have established IP interconnection with each other. For instance, Sprint currently has IP interconnection agreements with 12 major non-incumbent carriers."[19] Similarly, tw telecom has entered into five IP interconnection agreements with non-incumbent carriers. But competitive carriers also need to establish these agreements with incumbent telephone carriers, and that outcome can only be assured if the requirements of Section 251(c)(2) apply to interconnection in IP.

While some incumbents claim that voluntary interconnection agreements for the exchange of VoIP traffic will develop through market forces in the same way that voluntary interconnection agreements for the exchange of "best efforts" Internet traffic have developed, there are several reasons why this prediction will not come true. To begin with, competitive conditions in the Internet backbone market are very different from those in the voice market. The providers in the Internet backbone market consistently have had rational incentives to voluntarily enter into interconnection agreements with each other. As the DOJ found, initially, "no single backbone provider reached a disproportionate amount of destinations on the Internet relative to other major players" and "[t]here was a rough equality, with each backbone provider depending on the other."[20] And today, the large volume and explosive growth of "best efforts" public Internet traffic has attracted the entry of many large competitors in the Internet backbone market. This has yielded fierce competition and the absence of market failure for interconnection—unlike in the voice market today, which is still dominated by the large incumbent carriers, such as AT&T and Verizon.

Moreover, the VoIP calls that are made by business broadband customers using reliable, higher quality "managed VoIP" service do not travel over the public Internet and cannot be exchanged over the many Internet backbone networks that are used to exchange lower quality "best efforts" public Internet traffic.[21] Accordingly, it will be harder for competitive carriers

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[19] *See* Sprint July 8, 2013 Comments at 6.

[20] *DOJ Network Effects in Telecommunications Mergers Address* at 12. For this reason, the DOJ took action in 1998 to prevent increased concentration in the Internet backbone market precisely because provider's incentives to interconnect would change. *See id.*

[21] Indeed, the VoIP services that AT&T and Verizon provide to their own customers are delivered over managed networks and do not travel over the public Internet (*i.e.*, they are not "over-the-top" VoIP services). Both carriers clearly make this point in their marketing materials. *See, e.g.*, Verizon, *FiOS Digital Voice: Here's How It Works*, June 3, 2010, *available at*

providing the managed VoIP services demanded by businesses today to avoid reliance on direct interconnection with the likes of AT&T and Verizon.[22]

Updating the FCC's Last-Mile Access and Interconnection Policies Will Yield Tremendous Benefits for the Telecom Sector and America's Businesses

Congress should urge the FCC to take the steps described above and update the agency's last-mile access and interconnection policies. And Congress should urge the FCC to take these actions as soon as possible. Economists have found that these and other actions that promote competition in the business broadband market will likely yield huge benefits in the form of increased investment and job creation. In fact, a recent study shows that updating the FCC's policies to promote competition during and after the IP transition will result in as many as 650,000 new jobs and an additional $184 billion in capital investment in the telecom industry over the next five years.[23] Moreover, increased competition in the business broadband market will have positive ripple effects throughout the economy. In particular, it will lead to lower prices, higher speeds, and accelerated innovation for America's businesses and consumers.

* * *

Thank you for allowing me the opportunity to discuss these issues with you. I look forward to your questions.

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http://newscenter2.verizon.com/press-releases/verizon/2010/fios-digital-voice-heres.html (explaining that Verizon's FiOS Digital Voice service uses "Verizon's private IP-based network" and "does not ever touch the public Internet").

[22] It is also worth pointing out that because managed VoIP traffic does not traverse the public Internet, there is absolutely no danger that IP interconnection requirements will lead to regulation of the Internet, as the largest incumbents have claimed.

[23] *The Benefits of a Competitive Business Broadband Market* at ii.

Mr. WALDEN. Mr. Iannuzzi, thank you for your comments, and we appreciate your testimony.

We will go now to Harold Feld, who is the senior vice president of Public Knowledge. We welcome you back before our subcommittee, and we look forward to your summary of your testimony as well. Mr. Feld, go ahead.

STATEMENT OF HAROLD FELD

Mr. FELD. Thank you. Chairman Walden, Ranking Member Eshoo, thank you for inviting me to testify today.

The transition of our wireline networks to Internet Protocol-based services is a tremendous opportunity for our Nation, but we must make sure the transition results in an actual upgrade in technology without a downgrade in the services upon which Americans depend.

For decades our country has used the reasonable rules based on fundamental principles to build a phone network that became the envy of the world. We are the country that brought a phone to every farm, the country that built a network you count on. We accomplished this by moving certain fundamental values with us as our networks evolved. As we now face the opportunities and challenges of implementing the next generation of communications technology, we must continue to leave no one behind.

Americans are so used to relying on the protections of the phone network, they often don't even notice them. We conduct our business and personal communications as if we can always trust the phone network will just work, because it has. During emergencies we can always call for help from police, firefighters and hospitals. When someone calls a friend on another phone network, that call will always go through, regardless of which carriers they subscribe to or where they live.

In the rare instance that any part of the system breaks down, government authorities at the local, State, and Federal levels move swiftly to act as if our lives depended on it, because they do.

Every one of these benefits is the result of deliberate policy choices that serve specific basic values. Our phone network became the envy of the world because our policymakers valued what Public Knowledge calls the five fundamental principles: One, service to all Americans; two, competition and interconnection; three, consumer protection; four, network reliability; and, five, public safety.

There are some who believe the IP transition should be a glidepath to eliminate FCC oversight, but as carriers begin the transition, we have concrete examples that many of the essential services we take for granted are at risk in rural and not so rural areas, for individuals and for small businesses. One of the worst problems is the continuing inability of rural residents to receive telephone calls reliably. As carriers switch to IP technology, they can route calls through least-cost router systems, creating latency, and sometimes trapping calls in perpetual loops. In a world where we simply allow the marketplace to work, this doesn't get fixed. As one carrier told the complaining subscriber, due to living in a rural area, you will experience service issues.

The FCC will address this at the open meeting next Monday, but in a world where the FCC could only regulate based on market

power or in response to unfair or deceptive practices, as some have urged, rural America would be out of luck.

Which brings me to my larger point: IP technology brings the potential for new services, but it also brings the potential for new ways to crash the system. IP doesn't work with a lot of legacy equipment or services. It brings in all of the cybersecurity issues, like malware and cyber attacks, without any of the existing defenses. I am not alone in worrying that things could go very wrong. The Department of Defense and the Federal Aviation Administration have both filed with the FCC to express concerns that the IP transition, if not handled properly, could interfere with vital government operations.

As with rural call completion, we may find we actually need the FCC to use its legacy authority to solve these problems. Rather than thinking of the FCC as an obstacle that stands in the way, we should think of it as our last defense against the total train wreck, because at the end of the day, the measure of success for the transition will not be how many regulations did you kill, but does the phone network still work for everyone.

For all these reasons, I am very glad to hear Jim Cicconi acknowledge the importance of doing this right, of avoiding any kind of flash cut that could cause major disruption, and for acknowledging this will not be a regulatory-free zone. To everyone's surprise, Public Knowledge and AT&T agree on a lot because we want the same thing: a competitive, modern network for all Americans. Unfortunately we still debate this as if we were for or against upgrading our phone system or even for or against AT&T.

This is absurd. We want AT&T and every other carrier to invest in its network. No one is seriously suggesting that AT&T or any other carrier should preserve copper to the end of time. While we will fiercely disagree on how to make this work, we all want to make this work, and we know that the stakes are high.

Most importantly, we need to stop thinking of this as AT&T's transition, where AT&T proposes something, and everyone else reacts. We need to plan out a transition that reflects our values. This is the transition of the phone system of the United States of America on which 300 million people depend every single day. We need to recognize we all have a shared benefit from making this network reach everyone, and therefore a shared responsibility to make it work for everyone.

Thank you.

[The prepared statement of Mr. Feld follows:]

Testimony of Harold Feld
Senior Vice President
Public Knowledge

Before the
U.S. House of Representatives
Committee on the Energy and Commerce
Subcommittee on Communications and Technology

Hearing On:
The Evolution of Wired Communications Networks

Washington, DC
October 23, 2013

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October 23, 2013

Chairman Walden, Ranking Member Eshoo, thank you for inviting me to testify today. My name is Harold Feld, and I am Senior Vice President for Public Knowledge, a nonprofit public interest organization that promotes the public's access to information and culture through open, competitive, and universally accessible and affordable communications networks.

Introduction

Our telephone network has long been the envy of the world. According to the Federal Communications Commission's (FCC) most recent report, more Americans have access to basic voice communication than ever – with a stunning penetration rate of nearly 96% of the population.[1] We rely on the telephone network every day for the most basic social, economic and public safety needs. Whether it's something as mundane as a call to order take out for dinner, as personal as a call to Grandma on Mother's day, or as vital as calling 9-1-1 in the middle of the night, Americans count on the phone system working the same way day in and day out.

Likewise, our economy rests on the same bedrock belief that that the phone network works reliably anywhere in the United States no matter what network or device we use for the call. A small business using a traditional copper line doesn't worry about reaching a potential customer on a cell phone or a supplier using an IP-based network. We count on our calls, our faxes and our text messages getting through to where we send them without a moment's thought.

We have enjoyed the benefits of a ubiquitous, reliable, affordable telephone network for so long that we take it for granted. We have forgotten that these things did not happen by accident. The telephone system we rely on today works the way it does because we made policy choices based on our fundamental values. The features of the phone system we depend on: service to all Americans, interconnection and competition, consumer protection, reliability and public safety could disappear tomorrow if we decide these values no longer matter.

Before we rush into decisions about what rules to throw away and what to keep, we need a framework based on values to tell us where we want to go.

[1] "FCC Releases New Telephone Subscribership Report," August 13, 2013. Available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-292758A1.doc

That can't happen if we deregulate first and ask questions later, as some have urged. Laws and rules are means to an end, not ends in themselves. It is our values that tell us what we need to keep, what to modify, what to add, and what to discard. For example, how does a principle that we "not apply old monopoly era rules" help us solve the rural call completion problem? Do we want to get rid of the requirement that law enforcement must secure a warrant to listen to our calls, or do we think consumers will be happier with the NSA listening to IP-based calls but only getting metadata from traditional phone calls? Will consumers be happier with caller I.D. spoofing, cramming, and other anti-consumer practices post-transition so that we should eliminate the ability of the FCC or state agencies to protect them?

The dialog so far has too often focused on wish lists and special interest pleadings. Even those claiming to support technical trials, while providing plenty of detail as to what rules they would like eliminate, have not provided any actual trial proposals or statements of what they would test. Similarly, those opposing trials have by and large made it clear that they oppose trials because of their possible impact on policy.

If this were a new vaccine, no one would seriously say "we've done vaccines for centuries, we don't need clinical trials!" Nor would a manufacturer argue that the best way to test a new vaccine would be to allow them to sell it, without a prescription requirement, in 5 random markets. Yet that is the state of debate around technical trials for the phone system on which we all rely.

We need a vaccination against "telecom lawyer disease" that sees this transition solely in terms of rules and laws. At this early stage, we need to focus on how to plan out a transition that reflects our fundamental values and works as an upgrade for everyone, not an upgrade for some and a downgrade for others. We need to recognize the phone system is a network, where we all have a shared benefit from it reaching everyone and therefore a shared responsibility to make it work for everyone.

To make this work, we need to keep the Federal Communications Commission as the central coordinator. We need to leave the FCC with sufficient authority to keep track of what's going on and to fix problems as they arise. While we should continue to expect that the transition will remain largely industry-driven, someone must make sure we don't accidentally drive off a cliff.

Other federal agencies must begin to seriously consider their own transition plans, as evidenced by filings from the Department of Defense[2] and the Federal Aviation Authority (FAA) communications contractor Harris Corporation.[3] Likewise the states and localities must remain engaged and begin their own planning. The Federal government, states and localities are

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[2] Comments of United States Department of Defense and All Other Executive Agencies, Docket No. 13-5, Filed July 8, 2013 ("DoD Comments") available at http://apps.fcc.gov/ecfs/document/view?id=7520928837.

[3] Comments of Harris Corporation, Docket No. 12-353, Filed January 28, 2013 ("Harris Comments") available at http://apps.fcc.gov/ecfs/document/view?id=7022113466.

consumers of telephone services and are equally dependent on a reliable, ubiquitous affordable telephone network to conduct their daily business and meet emergency needs.

Nor can anyone imagine that the FCC will "control" the transition. Something this vast cannot have a central choke point. But it does require a central coordinator. That role belongs to the Federal Communications Commission, and will continue to do so for the foreseeable future.

A History Of Values Stretching Back To The Founding of the Republic

The United States has consistently led the world in developing communications technologies because we begin with a fundamental value – all Americans should be able to communicate with each other. Article I Section 8 of the Constitution establishes the authority and the duty of Congress to "establish post offices and post roads," and George Washington appointed the first Postmaster General to his cabinet. From the beginning, we recognized that our future as a country depended on making sure all Americans could communicate with each other for purposes of culture and commerce.

As we moved from the mail to the telegraph to the telephone we have updated that fundamental value as we updated our technology. Almost exactly 100 years ago, we enshrined the principle in the Kingsbury Commitment which established that AT&T must give interconnection rights to rival rural providers, and accept certain other responsibilities in exchange for a monopoly to serve the country.

More than 40 years after we broke up the AT&T monopoly, Section 1 of the Communications Act still begins with this proud expression of our single most important value: "to make available, so far as possible, to ***all*** people of the United States" the benefits of our communications network.[4] And 40 years later, we still depend on the federal and state governments to give expression to this value and make this commitment a reality. As a result, more people than ever now enjoy access to basic voice service, with 96% of the country subscribing to some form of voice.

Why Voice Still Matters

It has become fashionable to look on voice communications as "just another application" in an IP network, unworthy of any special consideration and needing no additional protection than access to Facebook. This is, in a word, absurd.

As noted above, ***nearly 96% of the country subscribes to a basic voice service***. Yes, many people now also communicate with other technologies, using a plethora of devices. People like choices. But the delusion that the rise of these new technologies renders plain old voice communication obsolete is demonstrably false. How on Earth can any rational person dismiss a system to which 96% of the country still subscribe as anything other than fundamental to our daily lives? No other technology even comes close to this level of ubiquitous adoption.

[4] 47 U.S.C. §151 (emphasis added).

Even if we were to consider only traditional copper POTS (Plain Old Telephone Service), that still leaves ***100 million people***, as well as millions of small businesses, relying on the service. According to even the most enthusiastic industry cheerleaders of the IP Transition, five percent of the country continues to rely exclusively on POTS. That translates to 15 million people dependent on POTS alone. A remaining 85 million people keep their POTS line *despite also having a mobile phone*.

At a time when too many American families struggle to make ends meet, we can safely assume that the bulk of these POTS/mobile customers keep their POTS line because they feel they need it, not because they perversely enjoy writing two checks for voice service. Certainly consumers embrace choices, and find the right combination of technologies and services that works for them. But we are not talking about consumers selecting mobile or IP technologies as a choice in addition to, or in place off, traditional copper networks. We are talking about eliminating traditional phone service entirely.

We are dealing with the technology that remains the foundation on which many of the additional technologies rest. To approach this exercise with the cavalier attitude that "the market" has chosen and we can safely shut down a system on which 100 million people still directly depend courts disaster.

The Five Fundamentals Framework

Public Knowledge has identified Five Fundamental Values that have defined our communications network and created the communications network on which we all rely.

Service To All Americans. As discussed above, this principle has applied to the telephone network for 100 years, and to earlier technologies since the founding of the Republic. From a rational self-interest perspective, we all benefit from a network that reaches everyone. I might never call someone in rural Tennessee, but the fact that I could if I needed to has value to me as well as to the citizen of rural Tennessee who can reach the rest of the country.

Interconnection and Competition. We developed the principle of interconnection 100 years ago to ensure universal service. At its heart, interconnection means making sure calls from one network can terminate on any other network. This principle includes not only the narrow meaning of the term as defined by Sections 251 and 252, but the broader concept that traffic from one network must flow to another network and that the receiving network has an obligation to terminate these calls.[5]

[5] Even during the days of regulated monopoly, AT&T was required to offer interconnection to other telecommunications companies to ensure universal access and the smooth operation of the telephone network. In this regard, it is noteworthy that the oral argument on network neutrality last month spent considerable time focused on the question of whether a general "no blocking" rule that required Internet carriers to terminate each other's traffic, even without regulating terms, constituted common carrier interconnection.

As we have increasingly depended on competition among networks, we have increasingly depended on interconnection to ensure service from one network to another. In the absence of interconnection, competition puts vital services at risk. Even without anti-competitive intent, Congress found it necessary to order interconnection between IP-based providers and ILECs to ensure reliable 9-1-1 access.[6]

In addition, we have in the last 50 years adopted numerous regulations to promote competition in every aspect of the network. This includes everything from *Carterfone* and the right to attach devices to the network to the computer proceedings that allowed competing services such as alarm companies to exist, to local number portability that allows consumers to move seamlessly from cable to wireless to POTS at will. As we move forward, we must consider what competition we wish to see, and what rules, if any, we need to maintain it.

Consumer Protection. We have long recognized that basic voice service is not like buying a toaster or even subscribing to cable. We have long considered basic voice so essential to participation in society that we have developed significant protections above and beyond what consumers expect from routine services and goods. These range from the expectation that the government will not listen to our calls without a warrant to guarantees of voice quality to truth-in-billing rules.

Anyone who believes that consumers no longer value these protections need only look at the outrage generated by phenomena such as "bill shock." It would be rash indeed to assume that the willingness of some consumers to make tradeoffs they would rather not make to enjoy the benefits of new technologies means that they look forward to a world governed by *caveat emptor* – let the buyer beware.

As we move through the IP transition, we must consider how to keep consumers whole. The DTV transition provides a very useful model. As part of the transition, the government subsidized the purchase of converter boxes so that consumers would not have to buy expensive new televisions or subscribe to MVPD services if they wished to continue to rely on free over-the-air television.

As the IP transition renders fax machines, credit card readers, and other embedded equipment useless, we must consider how to keep consumers caught in the transition whole.

In addition to keeping consumers financially whole, we must preserve fundamental privacy protections that protect our confidential personal and business information. Consumers continue to use the telephone for communications that are too confidential for email or other means of electronic information. The outrage expressed by consumers over the NSA acquisition of their metadata, even without looking at the actual content of the call, demonstrates how highly consumers value this information. As discussed below in the context of unauthorized release of unlisted phone numbers, protection of consumer privacy on the phone network can literally be a matter of life and death.

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[6] See Next And Emerging Technologies 911 Improvement Act of 2008, Pub. L. 110-283.

Reliability. Above all else, we count on the phone system to work reliably. Enter 10 digits and you reach the same number every time. When we can't reach our loved ones, we worry. If we can't reach clients, we lose valuable business opportunities. And if we cannot reach 9-1-1 in a crisis, we may die.

There are certainly tradeoffs in the nature of reliability between IP based services and traditional copper POTS. This is not a question of better or worse, or more reliable or less reliable. It is a question of how to balance these tradeoffs. Perhaps most importantly, it is a question of recognizing what new vulnerabilities we may introduce as we transition our communications networks, and how we address these vulnerabilities both technologically and with American consumers.

Public Safety. The National 9-1-1 system is perhaps the most obvious public safety element of the traditional telephone network that we will want to migrate to the new IP-based networks. But it is not alone. As filings by the FAA's communications contractor Harris Corporation indicate, the FAA depends on existing POTS for critical functions.[7] The Department of Defense has likewise filed comments with the FCC to underscore how changes in the underlying technology of the phone system could, if not carefully managed, threaten operations essential to our nation's security and the operation of critical government services.[8]

False Choices and Real Dangers

Unfortunately, rather than seriously assess the challenges of the transition and the steps needed to make it a success, parties have portrayed this as a series of false choices.

First, to ask whether we "should" transition is absurd. We *are* transitioning. Already our communication system consists of a mix of technologies, and technological and economic factors are driving TDM Providers to gradually convert to IP-based systems. The only question is whether we will transition in a mindful way or if we will continue to ignore the potential pitfalls.

More importantly, to frame this transition as primarily about regulation obscures the most important concern of the transition: ***the phone system must keep working***. The blithe assumption that nothing can go wrong and therefore we should focus exclusively on how to rationalize our current patchwork of regulation with its artificial distinctions based on technology ignores the very real problems that confront us. Law and regulation are means to an end, not ends in themselves.

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[7] Harris Comments at 5-6. *See also* Letter of Patrick Sullivan, Government Affairs, Harris Corporation to Marlene H Dortch, Secretary, Federal Communications Commission, Docket No. 13-5 (filed September 20, 2013) available at http://apps.fcc.gov/ecfs/document/view?id=7520944815.

[8] DoD Comments at 4.

Similarly deregulation is not an end in itself. We have no evidence that existing regulations place any sort of barrier to the ongoing transition effort. To the contrary, as those seeking regulatory relief constantly point out, the pace of the conversion has proceeded steadily over the years. We do not need to "bribe" carriers with promises of regulatory relief to make the transition a reality.

On the other hand, as we have already seen, a market driven transition on its own will not protect the traditional values that have formed the fundamental basis for our relationship with our communications network. As discussed below, we are already seeing warning signs that a purely market-driven transition will be an upgrade for some, but a downgrade for others. We must now decide whether as a nation will abandon our more than 220 years of recognizing the role of government in protecting fundamental principles in our communications network, and how abandoning that tradition would make us weaker as a nation.

The Transition Has Already Brought Challenges That Underscore the Need For A Value-Based Framework.

As a nation, we have been building to this transition since the passage of the Telecommunication Act of 1996. Indeed, we should rightly regard our current landscape of new technologies and new choices as a testament to the 1996 Act's success. As Congress intended, pro-competitive regulation made possible new competitors and new technologies. A shift from rate-of-return regulation preserving a static market to interconnection requirements, local number portability and other changes enabling competitive entry has created whole new classes of competitors offering new services.

Unfortunately, the blessings of this new world do not fall evenly on everyone. In urban areas, those who can afford premium prices have their pick of services that would have seemed like science fiction when the 1996 Act passed. But it takes only a short drive from the urban center to less populated areas to see that many communities in America are moving backward, not forward. And even in urban areas, the new competition does not always bring lower prices or new services to vulnerable populations.

In recent years we have seen no shortage of industry reports and techno-enthusiasts celebrating the inevitable march to IP technologies as an upgrade for all, driven by the magic of the market. We see an endless recitation of statistics showing the decline of traditional copper lines and the embrace of IP-based and wireless alternatives. Certainly this market shift has made the transition from traditional Time Division Multiplexing (TDM) to newer, less expensive IP-based technologies inevitable. But has this technological upgrade addressed all our traditional social values that lie at the heart of our social contract with the phone system?

Even a cursory examination shows that while the technology changes, the needs remain the same. We must decide whether we no longer care about the traditional values that have formed the basis of our relationship with our phone system for the last 100 years, or whether we still need government to play an important role in making these fundamental values a reality.

The IP Transition Does Not Guarantee Affordable Service To All Americans

As noted above, the most fundamental principle that has served as the foundation of our relationship with our communication system for more than 220 years is the concept of affordable service to all Americans. The IP Transition holds tremendous promise to provide benefits for all. But we have already seen disturbing signs that without government oversight guided by a values-driven framework, the transition will not be the universal upgrade we hope for and expect. Rather, it could very easily become a downgrade for rural Americans and vulnerable populations.

Case study: Salem County & Stow Creek, NJ

We think the blessings of the IP transition reach everywhere but the most remote regions of the United States. But as the story of Salem County and Stow Creek demonstrates, you don't need to get too far off the main highway to miss out on the benefits of the last 15 years.

In May 2012, the New Jersey Board of Public Utilities (BPU) held a public hearing in response to complaints that Verizon had failed to provide any broadband access for the local population. A packed hearing room informed the BPU that basic telephone service had degenerated to the point of unreliability that put people's lives at risk. Customers talked about the inability to reach 9-1-1, 'humming' on the line, and lengthy response time for service calls.[9]

Why didn't the residents of Stow Creek switch to a better provider? Because no other provider offered a competitive alternative. They had no cable provider to offer competing service. Wireless providers did not deploy sufficient towers to make wireless service reliable. The wonders of the IP transition had utterly passed them by. Due to rational decisions on whether it made sense to invest in maintenance, even conventional POTS service continued to degrade.

Stow Creek sits approximately 50 miles south and east of Comcast's corporate headquarters in Philadelphia, and approximately100 miles from Verizon's corporate headquarters in Basking Ridge, New Jersey. The region has a population of 5,000 people. But it was still too "rural," and the population too small, to provide incentive for Verizon to upgrade to IP or even maintain basic traditional copper service without pressure from regulators.[10] Nor could they attract potential competitors such as Comcast to want to serve in the first place. Only

[9] Lauren T. Taniguichi, "Stow Creek, Greenwich, and Salem County Residents At Verizon Hearing: Can You Hear Us Now?" South Jersey Times (May 10, 2012) available at: http://www.nj.com/cumberland/index.ssf/2012/05/stow_creek_greenwich_salem_cou.html (last visited October 20, 2013).

[10] *See* Lauren T. Taniguichi, "Verizon Asserts Broadband Commitments Have Been Met Despite Complaints From Stow Creek, Greenwich," South Jersey Times (April 15, 2012) available at: http://www.nj.com/cumberland/index.ssf/2012/04/verizon_asserts_broadband_comm.html (last visited October 20, 2013).

when confronted by the possibility of a BPU Order did Verizon agree to upgrade Stow Creek to FIOS and provide new IP-based services.[11]

If "the market" will not serve Stow Creek, a short drive from the two largest and most sophisticated communications providers in the country, how can we count on "the market" to serve rural America? Alternatively, we can decide we no longer care about serving communities where providers see no business case. In which case, whether or not people in rural America can make phone calls does not trouble us for the IP transition.

Case Study: Prices For Basic Services Rise, Hurting The Most Vulnerable.

Even where competition thrives, the most vulnerable populations can still suffer. In 2006, California deregulated most of its basic telephone services. As price caps for basic service phased out, prices for basic phone services rose at double-digit rates.[12] Even granting that prices prior to deregulation were artificially too low for sustainability, one cannot deny that a sudden spike in prices for basic voice service falls most heavily on the most vulnerable.

If we believe that competition generated by the IP transition cures all ills, we must resign ourselves to the reality that even basic voice service may become too expensive for those who most need it. The problem becomes even more acute when we consider that many competitive providers, such as cable operators, provide competing voice service only as part of a bundle of other, higher priced services. Voice service that is cheaper only as part of a bundle you can't afford is not cheap voice service – at least not for those who need it most.

The IP Transition Does Not Always Provide Consumer Protection Or Ensure Emergency Services.

The example of Stow Creek shows that the blessings of the IP transition have been distributed rather unevenly and even places we would imagine as having a wealth of competitors can lose even basic service. The California example illustrates that even with competition, the transition can still drive up prices for the most vulnerable.

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[11] *See* Don E. Woods, "Verizon Promises Fiber Optic Network Will Come To Stow Creek," South Jersey Times (June 13, 2013) available at: http://www.nj.com/cumberland/index.ssf/2013/06/verizon_promises_fiber_optic_network_in_greenwich_and_stow_creek.html (last visited October 20, 2013)

[12] *See* James Temple, "AT&T Rates Skyrocket Since Deregulation," San Francisco Chronicle (January 18, 2013) available at: http://www.sfgate.com/technology/dotcommentary/article/AT-amp-T-rates-skyrocket-since-deregulation-4204388.php (last viewed October 20, 2013); David Lazarus, "Getting Hung Up On Basic Phone Rate Increases," Los Angeles Times, (January 27, 2010) available at: http://articles.latimes.com/2010/jan/27/business/la-fi-lazarus27-2010jan27 (last visited October 20, 2013).

Two more examples from California provide disturbing evidence that the availability of new technologies and competition do not guarantee consumer protection or even the basics of public safety on their own. Indeed, they indicate that relaxing regulatory oversight – even without entirely eliminating it – can raise serious problems that threaten people's lives.

Case Study: Decline of Wireless Location Accuracy

CalNena is a California non-profit organization that supports 9-1-1 service in the state of California. On August 13, 2013, CalNena released a report documenting significant decline in the accurate transmission of location information by wireless 9-1-1 calls since 2008.[13]

In other words, at the very time that reliance on wireless and other non-traditional voice services was going *up*, the reliability of 9-1-1 service was going *down*. But it is this very shift from traditional TDM service to wireless and IP alternatives that is supposed to justify eliminating regulatory oversight altogether because "the market has chosen."

I have not conducted any surveys, but I am fairly certain that consumers do not choose to have less reliable 9-1-1 service as a consequence of choosing an IP-based or wireless provider. To the contrary, consumers expect that when they switch from traditional TDM service to IP-based services or mobile services, 9-1-1 will remain reliably accessible. On the one recent occasion where a provider was required to inform customers that the shift from traditional copper service to wireless service could possibly result in less reliable access to 9-1-1, Verizon's recent effort to offer Voice Link as a substitute for wireline service on Fire Island, customers and first responders reacted negatively and vociferously.[14]

Case Study: Comcast Discloses 74,000 Unlisted Numbers Of Its California Residential Customers.

As documented in a recent Order by the California Public Utility Commission (CPUC), Comcast appears to have accidentally released to the public 74,000 unlisted numbers between 2009 and 2013. As explained by the CPUC, Comcast appeared slow to identify the problem, to

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[13] CalNena, "New Data Show More Than Half Of California's 9-1-1 Calls Are Delivered Without Caller Location Information," August 13, 2013. Available at: http://www.calnena.org/communications/To-FCC-08-12-2013/CALNENA-Press-Release-081213.pdf (last visited October 20, 2013).

[14] *See, e.g.*, Dan Bobkoff, "Residents Forced To Live Without Landlines," National Public Radio (July 22, 2013) available at: http://www.npr.org/2013/07/22/204501411/residents-forced-to-live-without-landlines (last visited October 20, 2013); Jodie Griffin, "As Consumer Complaints Keep Streaming In, FCC Should Not Automatically Approve Verizon's Voice Link," Public Knowledge (July 22, 2013) available at: http://publicknowledge.org/blog/consumer-complaints-keep-streaming-fcc-should (last visited October 20, 2013).

respond to customer complaints, or to alert the CPUC as to this violation of customer privacy.[15] When pressed by CPUC staff to cooperate with the investigation into possible rule violations, Comcast asserted that recently passed California law prohibiting regulation of IP-based services barred the CPUC from exercising authority.

No one would imagine for a moment that Comcast intended to release this information. Nevertheless, it is equally absurd to suppose that because customers embraced Comcast's IP-based voice service that they had "chosen" to have their unlisted numbers released. To judge by the customer complaints included in the CPUC staff report, Comcast customers reacted to this breach of privacy with considerable shock and concern. Many of the complaints involved significant threats to the safety of subscribers.[16]

The question facing us in the IP Transition is not whether Comcast should have done a better job (Comcast itself reports that it has taken remedial steps to prevent these sorts of disclosures in the future). The question is whether we are content to leave protection of this sort of information to market incentives alone, or whether information about phone numbers and other customer information remains sufficiently sensitive that – like financial and health information – we provide consumers with additional oversight and protection. If we intend to leave customers without the additional protections they have long enjoyed, we need to warn them that companies can accidentally release their private information to abusive former lovers, wanted felons, and others with no consequences other than the fear that customers will take their business to another provider – assuming they find out about the release at all.

New Networks, New Problems: The Rise Of Network Neuropathy

Every network has its own unique set of vulnerabilities. In the wake of Superstorm Sandy, we have debated whether IP networks or wireless networks are more or less reliable than traditional copper networks. Like the proverbial "how high is up," this question needs some kind of referent. Traditional copper POTS networks are self-powered, and, because we have regulated them with an eye to reliability, have state and federal obligations to report outages, effect repairs in a reasonable period of time, and provide some quality of service guarantees. Proponents of greater reliability for wireless and IP-based networks point to the resistance of these media to flooding and corrosion.

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[15] California Public Utility Commission (CPUC), *Order Instituting Investigation Into Unauthorized Disclosure of Unlisted Numbers By Comcast* (adopted October 8, 2013) available at http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=78432340 (last visited October 20, 2013); CPUC Staff Report, Safety Enforcement Division, *Investigation of Comcast Phone LLC and Related Entities Concerning the Unauthorized Disclosure and Publication of Unlisted Phone Numbers* (released September 25, 2013) ("CPUC Staff Report") available at http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=78432340 (last visited October 20, 2013).

[16] CPUC Staff Report at 13-20.

My purpose here is not to enter into a debate about back up power or other forms of reliability. I will simply note in passing that resolving what requirements we should have for new networks now that they have matured from new entrants to critical infrastructure is one of many questions we must resolve as part of the transition. Given the importance of communications infrastructure to our lives, particularly in an emergency, we will hopefully continue to maintain reliability as a core value and acknowledge that government at all levels have both a keen interest in the safety of their citizens and an important role in ensuring that safety.

Rather, I wish to highlight here that the rise of new IP-based networks creates a new set of security issues that threaten the overall reliability of the network. In addition, the transition itself has created additional instability as assumptions built into TDM networks no longer hold true.

I refer to the problems of stability emerging as we transition to IP-based networks as "network neuropathy." The word "neuropathy" is a medical term referring to the breakdown of the central nervous system due to certain disease, which causes effects first in the extremities. Victims of neuropathy experience feelings of "pins and needles" in their extremities similar to when a hand or foot falls asleep, or may experience a decline in sensitivity. But while the sufferer experiences these things as happening at the extremities, the real problem lies in the core of the central nervous system.

We are experiencing a similar problem with our telephone network and the symptoms are rural call completion, caller I.D. spoofing, and other problems associated with the rise of IP networks. If we ignore these problems because they seem minor and peripheral today, we will find them attacking us with crippling force in the future.

Case Study: Rural Call Completion

Rural call completion occurs when calls originate in IP networks and are routed to rural TDM-based systems.[17] Using IP enables providers to employ third party "least cost routers" to minimize the cost of transporting traffic. This normally useful function of minimizing cost creates problems with rural exchanges as providers employ multiple routes to arbitrage intercarrier compensation (ICC) rates. This extended routing introduces latency which the target rural TDM system interprets as "dead air." Incoming calls are dropped, or may never get completed.

Any system that regulates only on the basis of market power or consumer fraud cannot address rural call completion. There is no "bad guy" trying to use market power to force rural exchanges out of business or to pay some sort of monopoly rent to transmit the call. Nor is the

[17] *See* Harold Feld, "If the Phone Doesn't Ring, It's Rural America," Daily Yonder (March 28, 2013) available at: http://www.dailyyonder.com/if-phone-doesnt-ring/2013/03/22/5733 (last visited October 20, 2013); Harold Feld, "Rural Call Completion and Network Neuropathy," Public Knowledge Blog (April 3, 2013) available at http://publicknowledge.org/blog/rural-phone-calls-and-network-neuropathy (last visited October 20, 2013).

carrier from whom the call originates engaged in an unfair practice. The problem comes from the natural market dynamic of carriers using new technology to save money.

Nor do "incentives" fix the problem. Larger urban carriers do not lose customers due to rural call completion problems – at least not in sufficient numbers to make the additional expense of direct routing worthwhile. It is often said carriers have no incentive to give bad service. But the real question is whether carriers have adequate incentive to give good service.

Those unwilling to concede that the IP transition raises problems that only government oversight can solve are quick to point out that it is artificially high ICC rates that drive carriers to use least cost routing in the first place. This is true, but not terribly relevant. The FCC has already announced a plan to eliminate ICC altogether and shift to "bill and keep." That has not solved the rural call completion problem.

If we insist that the FCC has no role in the IP transition except ongoing elimination of its "legacy regulation," then we have two choices for dealing with rural call completion. We can immediately eliminate ICC, with the resultant disastrous impact on rural carriers from the sudden elimination of revenue. Or we can tell rural America to wait several years and hope the problem clears up.[18]

Alternatively, we can embrace the idea that the FCC still has a role to play in maintaining a stable phone system and that a rush to eliminate its power to ensure that calls originating on one network terminate on another are premature.

The other problem with the "ICC is the root of all evil" approach to rural call completion is that it assumes that no such problem could ever happen again. This seems wildly optimistic. No one anticipated rural call completion would become an issue in the transition. It seems very likely that other unanticipated problems will arise, and we will want the FCC to address them.

Case Study: Caller I.D. Spoofing, SWAT-ing, and DDOS.

The transition to IP brings not merely the efficiencies and capacities of IP networks, but also their vulnerabilities. This is not a case of "better" or "worse" than traditional POTS networks. But rather we need to recognize that the new world of IP networks lacks many of the safety features developed in traditional TDM networks and opens a new set of vulnerabilities. If voice is simply "another application" on the IP network, then we import into the phone network the same vulnerabilities that plague us on the cybersecurity side.[19]

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[18] A bipartisan coalition of U.S. Senators has urged the FCC to act expeditiously to resolve the rural call completion problem. S. Res. 157, 113th Congress. For some, at least, waiting for ICC to zero out does not seem the preferable option.

[19] *See* "Reply Comments of Shockey Consulting," Docket Nos. 07-243, 95-116, 01-92, 10-90, 99-200, 13-5 (filed July 19, 2013) available at: http://publicknowledge.org/files/FCC_Shockey_Consulting_Reply_Comments_Numbering.pdf; *See also* John Bergmayer, "What We Mean When We Say 'Things Should Work' After the

Like viruses attacking a host with no defenses, these cybersecurity threats can invade our phone system with greater ease and have far more devastating effect. For example, dedicated denial of service attacks (DDOS) against voice-over-IP routers can take down phone systems and prevent emergency communications. Because the phone system includes TDM elements and IP elements designed to work together, under an assumption of stability, an attack that takes down one segment of the network can have far-reaching impact.

Additionally, we now have vulnerabilities associated with the misuse of phone numbers that simply did not exist previously. In the old world, only certified carriers meeting state and federal standards had access to phone numbers. We could trace a phone number easily through a chain of allocations and know who was using the number.

That is simply not true today. Many states have eliminated any certification for IP based carriers. CLECs and ILECS swap numbers freely, and provide them to other entities with no oversight. Worse, the shift to digital makes it easier for unscrupulous hackers to trick the system into treating fake phone numbers as real. While these vulnerabilities existed to some degree in the POTS network (as those of us old enough to remember "phone phreaks" will recall), the shift to digital creates new opportunities for bad behavior, while the steady stream of deregulation at the state and federal level of IP-based services translates into less oversight and more opportunities for mischief.

Caller I.D. spoofing goes beyond camouflaging the origin of unwanted calls. Bad actors can use fake caller I.D. information to frustrate law enforcement. The public safety community even has a name for the problem of "SWATing," the use of fake caller I.D. information to 9-1-1 to send a SWAT team to someone's home.[20]

In the absence of an FCC or state commissions empowered to address these issues, we can expect the Department of Justice and DHS to take lead in addressing these concerns. With all due respect to the law enforcement agencies, the solutions these agencies typically seek in the first instance raise serious concerns as to cost and effectiveness. Quite often they raise civil liberties concerns as well.

There is a reason Congress made the FCC the ultimate decisionmaker in CALEA, rather than the Department of Justice. But if we eliminate any role for the FCC in the IP Transition, we can depend on DoJ and DHS asserting their own authority to address these emerging issues of cybersecurity in the voice network.

PSTN Transition," Public Knowledge Blog (October 4, 2013) available at http://www.publicknowledge.org/blog/things-should-still-work (last visited October 21, 13).

[20] *See* Neal Ungerleider, "SWATing, A Prank Where Police Storm Your House," Fast Company (March 18, 2013) available at http://www.fastcompany.com/3007161/code-war/swating-prank-where-police-storm-your-house (last visited October 21, 2013).

The "Market" v. Real People

If this list of issues does not dent the confidence of techno-utopians that nothing can go wrong with the IP transition and the only role for government is to get out of the way, consider the recent experience of Verizon on Fire Island.

Following Superstorm Sandy, Verizon faced a choice on Fire Island: rebuild its copper network, deploy FIOS, or deploy its fixed wireless product called Voice Link. Verizon made the rational business decision that deploying either a copper or fiber network for the Island's small permanent population was simply not cost effective. Instead, they announced they would deploy Voice Link – a technology that allows the phones in your house to use Verizon's wireless network.

Verizon justified its choice using exactly the same talking points for eliminating any government oversight in the IP transition: "The market has embraced wireless, and has been moving away from traditional copper." In addition to the usual observations that about 40% of phone subscribers have dropped any form of landline service, Verizon also noted that 80% of the voice traffic from Fire Island was already wireless and the Verizon's wireless network is the most popular wireless network in the country – routinely receiving accolades for its quality and reliability.[21] What could possibly go wrong?

As even Verizon eventually conceded, Fire Island customers did not agree. Customer complaints and negative news stories, combined with regulatory scrutiny from the New York Public Service Commission (NYPSC) and the FCC, ultimately forced Verizon to commit to deploying FIOS on Fire Island.[22] Verizon experienced a similar customer rejection of forced migration from POTS to Voice Link in Mantoloking, NJ. Of the 600 customers Verizon previously had in this small beach community, only 120 have subscribed to Voice Link. The rest opted to keep a landline and subscribed to Comcast voice service.[23]

Verizon's experience on Fire Island illustrates the importance difference between *the market* and *actual real life customers.* Consumers like choices, and make comparisons and tradeoffs among different products. They do not like having their lives and expectations upended by large corporations telling them that a new technology is what they really need and that "the market" has spoken.

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[21] *See, e.g.,* Tom Maguire, "Setting the Record Straight on Fire Island and Voice Link," Verizon Public Policy Blog, July 11, 2013. Available at http://publicpolicy.verizon.com/blog/entry/setting-the-record-straight-on-fire-island-and-voice-link (last visited October 21, 2013).

[22] *See, e.g.,* Tom Maguire, "A Fiber Optic Network For Fire Island," Verizon Public Policy Blog, September 11, 2013. Available at http://publicpolicy.verizon.com/blog/entry/a-fiber-optic-network-for-fire-island (last visited October 21, 2013).

[23] *See* Ed Wyatt, "On A New Jersey Islet, Twilight of the Landline," New York Times, October 14, 2013. Available at http://www.nytimes.com/2013/10/15/technology/on-a-new-jersey-islet-twilight-of-the-landline.html?_r=0 (last visited October 21, 2013).

In particular, consumers do not like suddenly discovering that technologies on which they rely will no longer work, or that services they are accustomed to receiving are no longer available. We in Washington D.C. may think faxes are an obsolete technology or that no one cares about their choice of long-distance provider or international calling plan. But many real people – especially the 100 million people who have elected to stay with traditional copper lines – do care.

If we want to repeat the failure of Fire Island, we should by all means trust 'the market' and ignore the actual people on the ground. If we would like better consumer acceptance, we need to focus on real community needs rather than aggregated national statistics. While we will undoubtedly need to phase out TDM over time, I can think of no surer recipe for disaster and consumer backlash than to simply convert wire centers to IP with the admonition to outraged customers that the conversion is what they really need because 'the market' has spoken.

We Are Vastly Under-Estimating The Impacts On Small Businesses and Government

So far, we have not considered the impacts of the IP transition on small businesses. Nor have we considered the impact on local, state and federal government agencies. But these two sectors are among the most dependent on the consistent and reliable operation of the telephone system. In addition, these sectors have significant amount of legacy equipment designed for traditional telephone service.

The Fire Island experience highlights the potential problems small businesses may face during the transition. Fire Island businesses experienced significant problems with loss of fax machine service. Credit card processing became unreliable. ATM transactions likewise became unreliable. Alarm systems dependent on existing copper lines also did not work. In addition, voice quality in some cases was so poor, and calls dropped so frequently, that businesses complained of an inability to conduct ordinary business.

While Fire Island was a wireline-to-wireless conversion, the same problems can occur with TDM-to-IP wireline conversions. Small businesses given insufficient warning of the conversion of their local wire center may find their business disrupted and may incur unanticipated expenses to buy new equipment or alarm services compatible with new technologies.

In the current market, small businesses converting from TDM-to-IP do so *voluntarily*, generally with the assistance of a sales agent eager to ensure that the transition goes smoothly. Even then, part of every business' decision to embrace or not embrace IP-based technology includes factoring in possible disruption from the transition and expenses associated with replacing legacy equipment and services.

Converting an entire wire center, and thus forcibly converting all small businesses that have elected to remain on copper-TDM, is an entirely different matter. To assume that the experience of forcibly migrating businesses will resemble the voluntary migration of businesses to date blinks at reality – especially if done without sufficient warning or outreach to the local community.

The same concerns apply to government agencies as well. Government at all levels requires thorough planning and budgeting for expenses. If, for example, HHS must replace all existing fax machines in its field offices and headquarters and replace them with new IP compatible models, it will need sufficient planning time (and additional appropriation of funds) to ensure that critical government services are not disrupted.

State and local governments are even less likely to be prepared for the transition than federal agencies. But no one has put forth any plans for coordinated outreach or education vital to a smooth and successful transition.

What We Need For A Successful Transition

The above list does not even begin to capture the scope and complexity of shifting one-third of our nation from traditional copper lines to IP-based services. While we have had technological transitions of the telephone network before, we have managed them in a far more controlled environment. While no one would want to return to the days of "Ma Bell" and regulated monopoly, we must acknowledge that the diversity of our current communications system creates far greater challenges of coordination and integration than previous telephone network upgrades.

Furthermore, previous upgrades involved years of planning and gradual phase in of technology in a stable regulatory environment. No one imagined that the phase out of party lines, or the upgrade to SS7, required the complete phase out of nearly all state and federal oversight of the telephone system. It seems reckless in the extreme to imagine that nothing could improve a horribly complex and critical technical transition like the sudden elimination of all established safeguards and practices, coupled with elimination of any authority to fix things if they go wrong. Yet that is precisely what an endless stream of reports and white papers appears to propose as the most "sensible" thing to "speed the transition."

The real work of planning the transition has been further hampered by the effort to cast this as being "for" or "against" the transition or – even worse – "for" or "against" AT&T. While we should expect healthy debate around specific proposals, efforts to make the transition about industry wish lists for deregulation or preservation of this or that specific regulation do more than miss the point, they actively interfere with what needs to happen to keep this transition running smoothly.

The Central Role of the FCC

Rural call completion provides the perfect example why eliminating FCC authority prematurely can sabotage the IP Transition. Any short term solution to the rural call completion problem requires invocation of FCC Title II authority over IP-based services. This is the heart of interconnection and the core of Title II, requiring that one network complete calls from another network. If we had followed the path of those who see this first and foremost as an opportunity for regulatory relief, we would now be helpless to resolve this issue.

Talk of massive restructuring of the FCC or limitations on its authority to address potential problems, is not merely premature – it is counterproductive. Such suggestions divert attention from critical work that remains. It causes parties to retreat to their respective bunkers and entrenched positions at precisely the time we should be cooperating with each other to ensure a smooth transition.

Let us be clear, the measure of success for this transition is not *how many regulations did you kill,* but *did you avoid crashing the phone system and/or enraging your customers?*

For the same reason, we should reject the efforts of parties like the 21st Century Privacy Coalition to rip the heart out of the FCC's consumer protection jurisdiction and transfer it to the Federal Trade Commission.[24] Even were we not in the middle of a complex transition, such a move would be profoundly anti-consumer and utterly unwarranted. Americans do not want their personal telephone calls to have the same lack of privacy protections as their Facebook status.

But from a practical perspective, I can think of no better way to cause chaos in this transition than to take a critical aspect of the FCC's consumer protection regulation and transfer it to another agency with no history or experience in regulating phone service. At best, coordination across two agencies on vital consumer protections would hinder the transition and create confusion among carriers and consumers as to their rights and responsibilities.

None of this is to suggest that the Federal Trade Commission does not play an important role in protecting consumers. Rather, since 1934, we have recognized that management of the critical infrastructure of our communications system requires a single agency. Other agencies, such as NTIA and NIST, will certainly play supporting roles in the PSTN Transition. But the FCC must serve as the central coordinating agency to ensure that the pieces of this transition work together, rather than work against each other.

Guidance For Natural Disasters

As a first step in the transition, the Commission should ensure that carriers and consumers know what to expect in the wake of natural disasters that destroy communications infrastructure. As we saw in the wake of Hurricane Sandy, carriers may face difficult choices as

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[24] *See* Cecilia Kang, "Here's How The Telecom Industry Plans To Defang Their Regulator," Washington Post (September 12, 2013) available at: http://www.washingtonpost.com/blogs/the-switch/wp/2013/09/12/heres-how-the-telecom-industry-plans-to-defang-their-regulators/ (last visited October 21, 2013).

to whether to replace damage networks with new technologies. At the same time, consumers rebuilding their lives in the wake of a natural disaster need certainty that they will have access to reliable phone service.

Public Knowledge, joined by 17 other public interest organizations, submitted a letter to Acting FCC Chairwoman Mignon Clyburn requesting the FCC commence a separate proceeding to provide guidance to carriers on their responsibilities when a disaster destroys their network and the carrier wants to replace the network with an IP-based or wireless technology. We hope that the FCC will move expeditiously on this request.

In times of crisis, the obligations and expectations of all parties must be clear. The FCC can take appropriate action, while reserving judgment on the final outcome for policy decisions following the transition.

We Need Real Trials and Real Planning, Not Industry Wish Lists

As Public Knowledge has repeatedly stated, we favor well-structured technical trials to inform the FCC on appropriate policy. We are therefore considerably disappointed at the game playing by AT&T on the one hand to politicize the test process. On the other hand, we are equally frustrated with the competitive carrier community for its stubborn insistence that we have no need of trials at all.[25]

First, AT&T has repeatedly criticized the FCC for failure to 'move forward' on its 'application.' This is, bluntly, utter nonsense. AT&T has not submitted a serious application. If this were an NSF Grant Proposal, AT&T's 'proposal' would boil down to "give me a billion dollars and I will do some cool stuff." When asked to elaborate, AT&T's reply boils down to "don't bother me with all that reporting stuff or safety precautions because you can't rush genius."

No one would accuse NSF of "hating science" or standing in the way of progress for treating such a proposal as nothing more than an attempt to get free money. AT&T's proposed "trials" deserve a similar rebuke. In Public Knowledge's reply comments to the FCC's public notice on possible trials, Public Knowledge identified numerous deficiencies that would need to be addressed before the FCC could even ***consider*** it a genuine proposal.[26] These deficiencies include:

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[25] *See generally* Harold Feld, "Our Bogus 'Debate' About PSTN Trials," Tales of the Sausage Factory (September 13, 2013) available at http://tales-of-the-sausage-factory.wetmachine.com/our-bogus-debate-about-pstn-trials/ (last visited October 21, 2013); Jodie Griffin, "What We Need To See In A Pilot Program," Public Knowledge Blog (August 26, 2013) available at http://publicknowledge.org/blog/what-we-need-see-pilot-program-proposal (last visited October 21, 2013).

[26] Reply Comments of Public Knowledge, Docket No. 13-5 (filed August 7, 2013) available at http://apps.fcc.gov/ecfs/document/view?id=7520936672 (last visited October 21, 2013).

- Failure by AT&T to describe adequate safety precautions – or any safety precautions whatsoever – in the event the trial jeopardizes 9-1-1 access, disrupts critical services, or otherwise places the well-being of subscribers at risk;

- Failure by AT&T to provide any metrics for the study, by which to gauge success or failure or provide any useful information to the general public;

- Failure by AT&T to provide any transparency or accountability mechanisms;

- Failure to specify any end point to the trial.

By contrast, AT&T had no difficulty specifying things it did want, largely preemption of any inconvenient rules, and the right to permanently transfer customers regardless of any failure of the new network or cost to the customer in the form of lost or degraded service or legacy equipment rendered inoperative.

Public Knowledge made its disappointment quite clear:

> "This is not just a case of recalcitrant customers who 'do not want change.' These are everyday Americans who have legitimate concerns that the network they count on to support services in what could be life-or-death situations will lose its reliability and functionality. Requiring the transition to be a true step forward, not a step backward, for everyone is not 'hold[ing] back progress,' it is *demanding* progress."[27]

It defies belief to accuse the FCC of some sort of dereliction of duty that it declined to grant AT&T's request to conduct live experiments with its customers with no safety precautions. To the contrary, the FCC would have been derelict in its duty to protect the public if it had ***granted*** this absurd request. How could the FCC possibly approve a request that could easily result in customers losing 9-1-1 access, potentially cause small businesses to lose access to their customers, and possibly leave state and federal government agencies in the trial area unable to provide critical services – with no oversight of any kind?

In January, AT&T accidentally shut off tens of thousands of U-Verse customers for several days.[28] In light of this, it does not seem unreasonable to demand that AT&T set out some kind of safeguards for what happens if things go wrong. Those who would scold the FCC for undue caution should ask themselves, "Would you like to participate in a forced migration similar to the experience on Fire Island, where you could lose access to 9-1-1 or critical services? Wouldn't you like some kind of oversight and back up plan, just in case?"

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[27] *Id.* at 5.

[28] Dara Kerr, "AT&T's U-Verse Blacks Out For Days in Several States," CNET (January 23, 2013) available at http://news.cnet.com/8301-1023_3-57565559-93/at-ts-u-verse-blacks-out-for-days-in-several-u.s-states/ (last visited October 21, 2013).

Finally, there is simply no justification for demanding that AT&T be permitted to migrate customers permanently as part of a "trial." The insistence on permanently migrating customers as part of a supposed "technical trial" fuels the stubborn resistance of nearly every other telecommunications provider to what would be – if properly structured and with suitable safety mechanisms – be a valuable contribution to the nation's IP Transition.

At the same time, the Fire Island experience demonstrates that we do not know nearly enough about what happens when we shut off the copper entirely. Our "transition" to date has all taken place in the context of customer conversions where the traditional copper safety net provides adequate protection for customers who discover that IP services do not meet their needs.

Instead of genuinely engaging with the effort to construct trials, competitive providers and cable operators have responded with their own wish list to counter AT&T's wish list. Not surprisingly, the greatest concern for CLECs and cable VOIP providers lies with interconnection. AT&T submits its wish list to be free of interconnection obligations entirely, while other providers submit their wish list to have interconnection obligations entirely resolved before we even begin testing.

This transition is too important to be managed by industry wish lists. To be clear, while we support technical trials, Public Knowledge does not support 'behavioral experiments' such as seeing if AT&T can negotiate an IP Interconnection agreement without regulatory compulsion because this is hardly indicative of the real world. But that is a side point. The more important point is that the time has come for both AT&T and the competitive provider community to stop making this a battle of dueling wish lists and step up to their responsibilities as providers of critical infrastructure.

This Is Not AT&T's Transition; This Is The Transition Of The Phone System of the United States On Which 300 Million People Depend, And All Providers Have A Shared Responsibility To Make It Work.

Which brings me to a final point. Although AT&T deserves credit for beginning the dialog on this transition in a comprehensive way, this is not "AT&T's transition." This is not a negotiation with AT&T, or with ILECs generally, or between ILECs and CLECs. This is the transition of the phone system of the United States, and responsibility for its success or failure lies with *all* of us.

Every single carrier benefits from having a national phone network that reliably reaches everyone, everywhere, every day. In addition to this general benefit, carriers receive many explicit benefits such as poll attachment rights and access to the international phone numbering system. In exchange, all carriers have a collective responsibility to make sure the system continues to work in accordance with our fundamental values.

It is time for all carriers to stop advocating around their own narrow interests and acknowledge this collective responsibility. It is time to stop telling regulators what you want, without also offering solutions to the challenges of the IP Transition.

Most importantly, it is time to stop insisting that we sideline the people of the United States by stripping federal and state agencies of their power to protect the public and the public interest.

Conclusion

As every member on this Committee knows, for all that constituents have embraced of new means of communicating like email and Twitter, many of them still count on reaching their elected official by phone. As noted above, 96% of Americans still subscribe to some form of basic voice service, despite the fact that many of them embrace other communications technologies as well. If we want to see how attached the public remains to basic voice service, by all means let ignore the warning signs we have already seen and bull ahead with no plan and no goal beyond "elimination of legacy regulation."

Alternatively, we can take the steps to ensure that the transition works for all Americans. Guided by a framework rooted in the fundamental values that made our phone system the envy of the world, we can develop transition plans that will protect these values and preserve for all Americans affordable access to a reliable and ubiquitous network for the 21st century.

But a successful transition requires real work and a shared commitment from all of us. If we continue to make this a debate about deregulation and "legacy rules," rather than focus on the very real challenges before us, we can be certain that failure will follow.

Mr. WALDEN. Thank you, Mr. Feld.

Maybe we can create a government Web site they could all work through. Never mind. Just kidding.

Mr. FELD. We all learn from our mistakes.

Mr. WALDEN. Yes, hopefully.

We go now to Mr. John Burke, who is back before our subcommittee. We appreciate your participation. He is a Board member and Public Service Board of the State of Vermont. Mr. Burke, we are delighted to have you here again, and thanks for your testimony. And please go ahead.

STATEMENT OF JOHN D. BURKE

Mr. BURKE. Thank you, Mr. Chairman, and Ranking Member Eshoo, and members of the subcommittee. Thank you for allowing me to testify on the topic of IP transition.

In recent months, under Acting Chairwoman Clyburn, the FCC has greatly increased its interaction with the States. We are particularly pleased with the outreach from the internal FCC task force to NARUC's own Federalism Task Force. Chairwoman Clyburn is to be applauded for her leadership and for her outreach.

In my home State of the Vermont, we face many challenges. Very little fiber is being deployed to the home, and there are many areas without broadband access. There is limited competition even in urban areas. Wireless coverage leaves much to be desired even where it exists. And yet, even in Vermont, transition to the IP-based voice network is occurring. In this latest evolution, which has been under way for quite a few years now, networks are migrating away from circuit-switched voice and data services to IP-based services.

During the transition, like the previous ones, it is crucial for policymakers to focus on the right issues. No regulator or legislator should intervene in the market to put a thumb on the scale in favor of one technology over another. The market should make those choices.

The reason public service commissions and agencies like the FCC were created and regulate remains the same. First, we regulate where competition is not vigorous enough to adequately protect consumers. Secondly, we intervene to impose public-interest obligations.

Regardless of the level of competition, some oversight will always be necessary to provide what the market will not, including consumer protection, local number portability, interconnection, prioritization of service restoration, 911 service, disabled access, and universal service.

The AT&T requests for the wire center trials raises some questions of why trials are needed now. The AT&T—AT&T and other providers have no significant problems rolling out IP-based service today. The transition is well under way, and major reason why issues remain is because the FCC has focused on the wrong issues.

The transition is not about regulation or deregulation. The FCC has ample tools in the 1996 act to eliminate unneeded regulation. Nor should the debate be technology-focused. Congress established a technology-neutral framework in the 1996 act and incorporated the core values of consumer protection, universal service, and com-

petition. The FCC should just follow this framework, but for over 10 years the agency has followed what Congress has set out, but not in exact terms. Instead the agency has been unable, under both Democratic and Republican Chairmen, to provide needed certainty by classifying VoIP services either as a telecommunications service or as an information service, which has undermined the communications market.

Leaving this question unresolved has created the regulatory arbitrage that undermined intercarrier compensation system and is at the reason and the very base for the call-completion problems Mr. Feld mentioned. It has also left some consumers who chose IP-based services with fewer protections than they might have had with the circuit-switched service, despite voice services being exactly the same from a consumer's point of view.

The States and industries stakeholders continue to waste significant resources at ultimate expense of taxpayers and ratepayers on proceedings that would be unnecessary if the FCC acted.

The FCC-blessed real-world VoIP interconnection trials will not necessarily help the Commission clarify the statutory basis for the incumbent LEC's duty to provide VoIP interconnection. The clarification begins and ends with an interpretation of the States—of the statute.

There is no question that the interconnection is technically feasible. AT&T and Verizon manage that on a daily basis on their own networks. Rather than inventing new legal theories with no statutory support specifically to avoid classifying VoIP telephony, as the FCC did in the November 2011 transformation order, the agency should just classify the service.

Oversight of VoIP services has absolutely nothing to do with either the Internet or peering arrangements. Verizon and AT&T assure their customers that their VoIP services are not Internet services on their Web sites daily.

If the FCC continues along to consider technology trials, Congress should encourage the agency to first seek the benefit of a fact-based recommendation from an adequately funded Federal-State-USF joint board. Any proposed trials can only benefit from the significant State involvement.

In conclusion, while technologies change, the expectations of our consumers do not. Consumers expect the same level of service and protections they have been accustomed to, and it is up to us all to ensure that those expectations continue to be met.

Thank you for your attention. I look forward to your questions.

[The prepared statement of Mr. Burke follows:]

Testimony on behalf of the

National Association of Regulatory Utility Commissioners (NARUC)

by

Commissioner John D. Burke, Chairman
NARUC COMMITTEE ON TELECOMMUNICATIONS

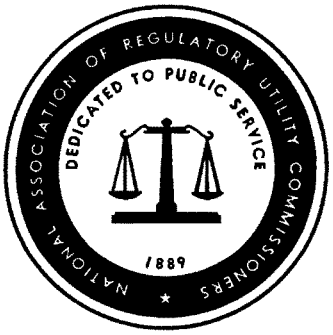
before the

United States House of Representatives
Energy and Commerce Committee
Subcommittee on Communications and Technology

hearing on

The Evolution of Wired Communications Network

October 23, 2013



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Summary: We are here today because technology is doing what it has always done – evolve. In this latest evolution, which has been underway for several years, networks are migrating from circuit-switched voice and data services to IP-based service. During times of transition it is crucial for Congress, as well as state and federal regulators, to focus on the right issues.

The reason for regulatory oversight *never changes* regardless of changes in technology used to provide a service - and there are only two. First, we regulate where competition is not vigorous enough to adequately protect consumers. Second, we intervene to impose public interest obligations. Regardless of the level of competition, some oversight is always necessary to provide things the market will not. This includes consumer protection, local number portability, interconnection, prioritization of restoration of services after disasters, 911 service, disabled access and universal service.

VoIP services are not new. AT&T and others began deploying VoIP in the early 2000's and already 30% of all U.S. voice traffic is IP based. Why then are "transition trials" needed now? The real reason is because the FCC has focused on the wrong issues. The 1996 Act, while far from perfect, focused on services and did not differentiate between services provided over different technology platforms – a technology neutral approach. For over 10 years, the FCC has been unable, under both Democratic and Republican Chairmen, to provide needed certainty by classifying VoIP services as either a "telecommunications service" or an "information service". The result has been regulatory arbitrage that undermined the intercarrier compensation system and is the *raison d'être* for the call completion problems that continue to plague rural areas. It also left some consumers of IP-based services with fewer protections than users of the older circuit-switched/copper network.

If the FCC is truly interested in facilitating rollout of IP services, and saving taxpayers/ratepayers money, the best thing it can do is provide legal certainty – not open-ended trials. Either VoIP is a "telecommunications service" or an "information service". Should the FCC move forward with trials and delay a decision on the vital IP-to-IP interconnection issue, Congress should encourage the agency to first seek the obvious benefits of a fact-based recommendation from an adequately funded Federal-State Joint Board. Thank you for the opportunity to provide NARUC's position on these crucial issues.

Testimony: Chairman Walden, Ranking Member Eshoo, and Members of the Subcommittee, thank you for the opportunity to testify today on the IP Transition.

Since 2001, I have been a Commissioner with the Vermont Public Service Board. I currently serve as the Chairman of NARUC's Committee on Telecommunications and as the Chair of the Federal-State Joint Board on Separations. Just last year, I completed a six-year term as a member of the Federal-State Joint Board on Universal Service.

NARUC is – like Congress – a bipartisan organization. NARUC's members include public utility commissions in all your States, the District of Columbia and U.S. territories with jurisdiction over telecommunications, electricity, natural gas, water and other utilities. NARUC member commissioners are the in-State experts on the impact of FCC programs in your State and on your constituents.

In my home State of Vermont we face many challenges. Little fiber is being deployed to the home. Our largest incumbent, Fairpoint, has not deployed fiber to the home and to my knowledge has no plans to do so. Comcast provides voice, video and broadband to about two-thirds of the population but speeds vary greatly depending on where you live and none by fiber to the home. Two companies are deploying fiber to the home. The first is a municipal network run by the City of Burlington and the other is small, rural VermontTel which received a federal grant from the ARRA. And while there is some competition, mainly from cable, it is mostly in the cities and population centers and the quality of that offering varies greatly. And yet, even in Vermont, the transition to IP-based voice communications has begun.

When Are Regulators Required? The Reasons for Regulatory Intervention

We are here today because technology is doing what it has always done – evolving. In this latest evolution, which has been underway for quite a few years now, networks are migrating away from circuit-switched voice and data services to IP-based service.

But during this transition, like the previous technology evolutions of the network, it is crucial for Congress, as well as state and federal regulators, to continue to focus on the right issues.

The reasons why regulatory oversight remains necessary *never changes* regardless of changes in technologies used to provide a service. That is why NARUC has for years consistently urged Congress (and federal regulators) to take a technology-neutral approach to regulation.[1]

No regulator or legislator should be intervening in the market to put a thumb on the scale to favor one technology over another. The market should make those choices. Sometimes a technology can engender new problems.[2] But the basic reasons why public service commissions and agencies like the FCC were created remains the same.

And there are only two.

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[1] *NARUC Legislative Task Force Report on Federalism and Telecom* (July 2005). See also, NARUC's February 2003, NARUC passed *Resolution Relating To Voice Over The Internet Telecommunications*, available online at: http://www.naruc.org/Resolutions/voice_over.pdf, that notes "a significant portion of the nation's total voice traffic could be transported on IP networks within a few years" and urged the FCC to "confirm its tentative decision that certain phone-to-phone calls over IP networks are *telecommunications services*." In November 2003, NARUC passed a *Resolution on "Information Services"*, at http://www.naruc.org/Resolutions/info_services.pdf, cautioning the FCC to consider the negative implications associated with a finding that IP-based services are subject to Title I jurisdiction, including the (i) uncertainty and reduced capital investment while the FCC's authority under Title I is tested; (ii) loss of consumer protections applicable to telecommunications services under Title II; (iii) disruption of traditional balance between federal and State jurisdictional cost separations; (iv) increased risk to public safety... content; (vi) loss of State and local authority over emergency dialing services..." Those warnings remain valid today. See also, NARUC's 2008 *Resolution Regarding the Interconnection of New Voice Telecommunications Services Networks,* online at: http://www.naruc.org/Resolutions/TC%20Interconnection.pdf ("NARUC applauds the numerous advances in technology . . . to enable the efficient transmission of voice telecommunications traffic and the continued successes in developing innovative means to deliver voice telecommunications services . . . it is in the public interest for telecommunications carriers to interconnect their networks to exchange traffic in a technologically neutral manner, as provided for under Sections 251 and 252.") See also, NARUC's February 2012 *Resolution on Mandatory Reporting of Service Outages by Interconnected Voice over Internet Protocol Service Providers*, asking the FCC to, *inter alia*, extend the mandatory service outage reporting requirements in 47 C.F.R. Part 4 to interconnected VoIP service providers.

[2] Some argue some technology specific rules may be needed to address the reduced resiliency of wireless and fiber networks. But there is no question that competing services should face similar rules. Both rely more on commercial power both at the network level and at the customer premise. The battery backup system installed with FiOS service is the responsibility of the consumer, after one year. There is a similar question, given the increasing number of wireless-only households, of backup power to cell towers. NARUC has raised concerns about the problem and will be having a panel on the interdependencies between the telecom and energy sectors at our conference in November.

First, we regulate where competition[3] is not vigorous enough to adequately protect consumers. Where competition is sufficient to protect consumers and insure market choice and innovation, then there is little need for regulatory oversight.

Second, we intervene to impose public interest obligations. Regardless of the level of competition, some oversight is always necessary to provide things the market will not. This includes consumer protection mechanisms, local number portability,[4] interconnection between competing carriers, prioritization of restoration of services after disasters, 911 service, disabled access and universal service.

By definition, competition is unlikely to either yield "comparable services at comparable rates" between urban and rural high-cost areas or provide appropriate interconnection between carriers with widely divergent market power. One need only compare the services in Vermont to the high-speed fiber-based offerings in more lucrative markets to understand this reality. And Vermont is not alone. The status of competition and high-speed services in my State is similar to many other parts of the country.

Why are we having this hearing? FCC Inaction on Crucial Classification Questions.

Packet-based services have been a feature of the network for decades. The migration from the dedicated pathways characteristic of the circuit-switched network to router-based communications, while more recent, has also been with us since at least the early 2000's if not before. This "evolution" to all-IP-based communications has been underway for several years. Already "[t]he Commission's own 477 data indicates that perhaps as high as 30% of all U.S. Voice traffic is being switched using IP-based SIP/IMS systems now, often over highly managed IP networks in order to maintain effective Quality of Service and Quality of Experience guarantees."[5] One of the requests that has sparked greater scrutiny of so-

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[3] Experts will always argue about how to define a competitive marketplace or what level of competition is needed to eliminate market power concerns but that is a different question and debate, but that is a broader question than the one facing policy makers under the current law. Here the question is, does the 1996 Act allow the FCC to treat functionally equivalent services differently under an ad hoc (FCC-created) regulatory regime.

[4] Number portability, which unquestionably facilitates competition, had to be forced on the wireless industry at a time when many considered that sector to be the poster child for a competitive market.

[5] See, the July 19, 2013 *Reply Comments of Shockey Consulting*, in FCC WC Docket No. 13-97 et al., at 4, available online at: http://apps.fcc.gov/ecfs/document/view?id=7520931878.

called "transition issues" associated with the wireline transition that is the subject of this hearing was AT&T's relatively recent request for "wire center deregulation" trials. Presumably that's one reason why Mr. Cicconi was invited to testify. AT&T, however, began rolling out its U-verse services, which utilize existing copper facilities for last-mile access, in 2006. According to "Wikipedia", it added U-verse Voice almost six years ago in January of 2008. It *already* has at least 2.7 million VoIP customers utilizing the service.[6] It also announced in 2012 plans to expand and enhance its wireline IP network to 75% of all customer locations by the end of 2015.

The AT&T request, on its face, raises the question of why trials are needed now? And why are policy makers still talking about this technology almost 6 years after VoIP service was rolled out to almost 3 million AT&T customers – and at least 30 percent of traffic on the network is already IP-based?

Apparently, AT&T has had no significant problems rolling out the service to date. Indeed, the company alleged in its February 25, 2012 Reply Comments (GN Docket No. 12-353, at 21) that only 21 percent of residential housing units in States where AT&T is an ILEC will still subscribe to ILEC POTS services *by the end of this year*. Similarly, Verizon began deploying its fiber-based FiOS service to homes and businesses about seven years ago.[7]

Obviously, the transition is well underway, and the major reason why issues remain is that policy makers – predominately at the FCC – have focused on the wrong issues. Congress established the framework in the 1996 Act. Values incorporated in that legislation include consumer protection, universal service and competition. Without new legislation, the FCC is not free to abandon these goals. And yet, that appears to be exactly what the agency is doing by singling out one technology – VoIP – for special treatment rather than focusing on the service provided to consumers.

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[6] See, AT&T U-Verse (from Wikipedia, the free encyclopedia): http://en.wikipedia.org/wiki/U-verse (Last Accessed on August 2, 2013).

[7] Krause, Reihhardt, "Will Verizon Go Wireless-Only and Spinoff FiOS?" *Investor's Business Daily* (9/26/13): http://news.investors.com/technology/092613-672670-speculation-verizon-restructures-to-go-all-wireless.htm?ven=rss&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed:%20InternetTechnologyRss%20%28Technology%20RSS%29.

The transition is not about regulation or deregulation. The FCC has ample tools in the 1996 legislation to eliminate unneeded regulation.[8]

Nor should the debate be technology-focused.

Instead, FCC Policy makers should, as Congress required, adopt a *functional approach* to defined services.

The 1996 Act is far from a model of perfection. But in key areas, it does properly focus on services – not the technologies used to provide those services. The FCC should do the same.

What Congress intended is obvious on the face of the 1996 legislation. It expected States and the FCC to work together to facilitate competition, broadband deployment, and universal service.[9] It is no accident that the definition of "telecommunications services" is technologically neutral.[10]

Laudably, Congress did not expect either federal or State regulators to intervene in the market to protect competitors based on the technology they use to provide service. But that is the result of the FCC's inaction. Rather than inventing new legal theories with no statutory support specifically to avoid classifying "VoIP Telephony," as the FCC did in the November 2011 *USF/ICC Transformational Order*, the agency should just classify the service.[11]

For over 10 years, the agency's inability, under both Democratic and Republican Chairmen, to provide needed certainty by classifying VoIP services as either a "telecommunications service" or an

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[8] See, e.g., 47 U.S.C. § 160(c) ("Any telecommunications carrier, or class of telecommunications carriers, may submit a petition to the Commission requesting that the Commission exercise the authority granted under this section with respect to that carrier or those carriers, or any service offered by that carrier or carriers."). See also, 47 U.S.C. § 253.

[9] See, e.g., 47 U.S.C. §§251-2, 254 (1996).

[10] According to Congress,"[t]he term "telecommunications service" means the offering of telecommunications for a fee directly to the public...regardless of the facilities used."47 U.S.C. §153 (46). {emphasis added} "The term "telecommunications" means the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received." 47 U.S.C. §153 (43).

[11] See, e.g., *Connect America Fund,* Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663 (2011), at ¶¶ 76-77.

"information service" has continued to undermine the telecommunications market and spawn a plethora of unnecessary agency and court proceedings.

It has left this question unresolved for over 10 years creating the regulatory arbitrage that undermined the intercarrier compensation system and is the *raison d'être* for the call completion problems that continue to plague rural businesses and homeowners in each of your states. It has also left some consumers who choose IP-based services with fewer protections than users of the older circuit-switched/copper network have, even though, from the consumer perspective, the voice service offered is exactly the same.

NARUC, the States, and industry stakeholders continue to waste significant resources, all at the ultimate expense of the taxpayer and ratepayers, on proceedings that would be unnecessary if the FCC acted.

An FCC-blessed "real-world VoIP interconnection trial" will not help the Commission clarify the statutory basis for incumbent LECs' duty to provide VoIP interconnection. That clarification begins and ends with an interpretation of the statute.

Similarly, the outstanding FCC separate rulemaking to determine if 251 and 252 safeguards apply to VoIP interconnection is a waste of time if the service is properly classified. There is no question such interconnection is technically feasible – AT&T and Verizon manage that on their own networks.[12]

And of course the FCC's inaction has had a ripple impact on a range of State proceedings (and policies) too, even in Vermont,[13] requiring us to grapple with classification issues that should have been resolved 10 years ago.

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[12] The only evidence available strongly suggests that the biggest obstacle to establishing VoIP interconnection agreements is incumbent LECs' unwillingness to do so—*not* any technical issues related to VoIP interconnection. See July 8, 2013 *Comments of Comptel*, filed in the FCC's GN Docket No. 13-5, at 9, available online at: http://apps.fcc.gov/ecfs/document/view?id=7520928883 ("The RBOCs, such as AT&T and Verizon, nevertheless, continue to refuse to enter into VoIP interconnection agreements that would comply with the simple competitive protections of those statutory provisions, such as public disclosure, opt-in rights and arbitration (should negotiations fail).")

[13] See, e.g., *In re: Investigation into Regulation of Voice over Internet Protocol Services*, 2012-109, 2013 VT 23 (Filed 29-Mar-2013) Vt. Supreme Court, online at: http://info.libraries.vermont.gov/supct/current/op2012-109.html

NARUC is on record pointing out the obvious.[14]

The definition of "telecommunications services" in the Act is functional and the voice services provided by all the major carriers, e.g., AT&T, Verizon, Comcast, Cox, etc. meet that definition. Significantly, oversight of VoIP services provided by these carriers has absolutely nothing to do with either the internet or peering arrangements. Indeed, both Verizon and AT&T assure their customers that their VoIP services are not Internet services. See, http://newscenter.verizon.com/press-releases/verizon/2010/fios-digital-voice-heres.html ["To understand the features and quality of FiOS Digital Voice, you first need to know that the service is not the same as the services you get with a little Internet adapter for your modem and phone, *and it does not ever touch the public Internet.*"]; (emphasis added); See also, www.att.com/esupport/article.jsp?sid=KB401031#fbid=L8RYx19uzva ["AT&T U-

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[14] See, May 28, 2005 *Comments of the National Association of Regulatory Utility Commissioners* filed *In the Matter of IP-Enabled Services,* WC Docket 04-36, at http://apps.fcc.gov/ecfs/document/view?id=6516199621, at page 6:

> In § 153(46), Congress made clear that distinctions in technology deployed to transmit voice communication are not relevant in classifying a service as a "telecommunications service." 47 U.S.C. §153(46). Congress' definition of "advanced telecommunications capability" in § 706 likewise makes clear that such capability is "without regard to any transmission media or technology" and "enables users to originate and receive high-quality voice ...telecommunications using any technology." 47 U.S.C. §157 (reproduced in note thereto). The fact that any service uses IP technology rather than some other technology to deliver its voice telecommunications service is immaterial to a proper classification of the service. By mandating technology neutral determinations, Congress intended that functionally similar services, like basic telecommunications services, be classified similarly. Indeed, the FCC has affirmed elsewhere that telecommunications services are not limited to those employing circuit-switched technology.[14] [Footnote 14 - *In re Deployment of Wireline Services Offering Advanced Telecommunications Capability*, 13 FCC Rcd 24011, 24032, ¶ 41 (1998). ("Nothing in the statutory language or legislative history limits these terms to the provision of voice, or conventional circuit-switched service. . .The plain language of the statute thus refutes any attempt to tie these statutory definitions to a particular technology").] Moreover, a focus on the functional nature of particular VoIP services *from the end user's standpoint* is consistent with the *1998 Universal Service Report,* where the FCC correctly observed, "Congress' direct[ed] that the classification of a provider should not depend on the type of facilities used ... Its classification depends rather on the nature of the service being offered to customers." They also noted: ". . a telecommunications service is a telecommunications service regardless of whether it is provided using wireline, wireless, cable satellite, or some other infrastructure." *Universal Service Report* at ¶ 59.[] The nature of the service in turn "depends on the functional nature of the end-user offering." Id. at ¶86.

verse Voice service is provided over AT&T's world-class managed network and *not the public Internet*."] (emphasis added).[15] As Comptel noted in a recent pleading:

> [I]n their advocacy, AT&T and Verizon . . . repeatedly confuse the IP Interconnection at issue here with Internet peering and transit arrangements that are irrelevant in the managed VoIP environment that exists today. Perhaps one day AT&T and Verizon will forgo its managed voice services (including its existing VoIP products such as UVerse and FiOS which they clearly market to consumers as not being provided over the Internet) and offer only OTT [over the top] voice products to which all its customers - even enterprise customers - will subscribe and for which the Internet peering and transport arrangements might suffice. But that day is not today and not likely anytime in the near future due to the security and quality of service expected by most consumers for voice.[16]

Congress has already established the framework for negotiating interconnection agreements. As Commissioner Rosenworcel (D) recently testified: "Congress, in laying out the definitions at the front of the Communications Act, speaks to telecommunication services *regardless of the technology used*."[17] Commissioner Pai (R) agrees:

> "Section 251 of the Communications Act specifies, among other things, that telecommunications carriers have "the duty to interconnect directly or indirectly with the facilities and equipment of other telecommunications carriers.'' When discussing interconnection, this provision neither mentions any particular technology that may be used by a telecommunications carrier nor distinguishes between telecommunications carriers using different technologies."[18]

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[15] Nor is regulating a utility service provider, like Vonage, and the few others that actually do use the internet to provide "over-the-top" voice services, "regulating the internet" anymore that regulating financial services, gambling, banks, drug companies, or insurance businesses that, like Vonage, do not own or control any part of the public internet, but do provide services only ***through*** the internet, is "regulating the internet." Do policy makers care if people die because they expect 911 services to work properly and they do not? The FCC has said yes – after several people did die – and imposed 911 services on nomadic VOIP providers like Vonage. Should Vonage and other over-the-top providers be subject to CALEA (law enforcement) requirements? What about contributing to the universal service program – an obligation that only falls on "telecommunications service" providers in the 1996 Act? Again, the FCC, under the last Administration, has said yes and yes. The reasons for imposing these obligations have nothing to do with the technology used to provide the service and everything to do with the characteristics of the offering – which fits squarely within Congress' definition of "telecommunications services." Vonage is positioned exactly like other resellers – other than the service quality of their offering has the reputation of being not quite as high as resellers that use the PSTN or managed VoIP services.

[16] See July 8, 2013 *Comments of Comptel*, filed in the FCC's GN Docket No. 13-5, at 4, available online at: http://apps.fcc.gov/ecfs/document/view?id=7520928883

[17] Transcript, July 10, 2012 House Committee on Energy and Commerce, Subcommittee on Communications and Technology, Hearing on FCC Oversight.

[18] S. Hrg. 112-480 - Nominations of Jessica Rosenworcel and Ajit Pai to the Federal Communications Commission, at 78 available at http://www.gpo.gov/fdsys/pkg/CHRG-112shrg75046/content-detail.html.

A change in the technology to provide the very same "functionally equivalent" service cannot allow carriers to escape State and federal universal service, disabled access, disaster recovery, law enforcement access, service quality and interconnection obligations. If the FCC is truly interested in facilitating rollout of IP services, and saving taxpayers/ratepayers money, the best thing it can do is provide legal certainty – not open-ended trials.

Where do we go from here? Partnership, not preemption.

If the FCC, as seems likely, continues to delay the IP-to-IP interconnection docket and remains intent on instigating trials, Congress should encourage the agency to first seek the obvious benefits of a fact-based recommendation from an adequately funded Federal-State Joint Board. Indeed, once it became clear that the FCC was moving forward with a "trials" based approach, NARUC passed a resolution, a few months ago at our summer meetings.[19] The selection and details of any proposed trials can only benefit with significant state involvement. That resolution points out specifically that the current:

> Federal-State Joint Board on Universal Service has the unique experience and collaborative and technical capabilities to advise the FCC on behalf of the States regarding the design, geographic application, selection of applicants and evaluation of telecommunications technology trials and any subsequent policy recommendations necessary to maintain and advance the statutorily protected universal service concept which entails the fundamental entitlement of end-user consumers to have affordable and reliable access to advanced voice telecommunications and broadband services.[20]

This is the most logical way to proceed.

Congress has already recognized, in many ways, the reservoir of useful experience and information residing at the State level. For example, in the 1996 Act, Congress specified that States, which have both the experience and the resources, should handle interconnection negotiations.[21] Indeed, in the single most preemptive provision in the 1996 legislation, Congress specifically reserved State

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[19] See, *Resolution Concerning Numbering and Technology Transition Trials for Voice over Internet Protocol and Other IP-Enabled Services (July 24, 2013), which is available online at: http://www.naruc.org/Resolutions/Resolution%20Concerning%20Numbering%20and%20Technology%20Transition%20Trials%20for.pdf*

[20] Id.

[21] See, 47 U.S.C. §251-2 (1996).

authority over both universal service and service quality.[22] Moreover, in 1996, Congress enhanced the Joint Board provision - requiring a specific type of Joint Board to address universal service issues. Congress recognized the FCC's limited resources along with State commissions proximity and long experience in oversight.[23] Even the FCC has, in several contexts, "recognize[d] . . . that [S]tates play a vital role in protecting end users from fraud, enforcing fair business practices, and responding to consumer inquiries and complaints."[24] In the last few years, the State laboratories of democracy have been busy, with over 20 States legislatures adopting laws scaling back oversight of IP-based services to varying degrees. The States remain at the bleeding edge of telecommunications policy.

State deregulation experiments can inform policy makers at all levels. Competition does not sprout up uniformly. Market by market analysis will be required and this is where States as the "boots on

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[22] 47 U.S.C. Section 253, which is unquestionably the broadest grant of preemptive authority provided to the FCC in the entire statute – allowing the FCC to preempt ANY state or local law that has the effect of prohibiting ANY telecommunications service provider from entering a market - still explicitly reserves State authority over *inter alia,* service quality and universal service. ("Nothing in this section shall affect the ability of a State to impose on a competitively neutral basis and consistent with Section 254...requirements necessary to preserve and advanced universal service, protect the public safety and welfare, ensure the continued quality of telecommunications services and safeguard the rights of consumers.")

[23] See, e.g., the Draft *NARUC Federalism Task Force Report: Cooperative Federalism and Telecom in the 21st Century*, online at: http://www.naruc.org/Publications/Draft%20Federalism%20Task%20Force%20Report.pdf. Important note – this draft has not yet been adopted by NARUC. Action is expected on the draft at NARUC's upcoming meetings next month. However, the June 2013 draft, at 4, accurately describes the federal state collaboration expected by Congress:

> The idea of the States and the FCC working jointly to identify and resolve end user and carrier issues and ensure competition is a central part of TA96. The Act envisions collaboration between the FCC and the States in determining end-user needs, promoting on-going competition between providers and technologies, providing universal service, ensuring public safety and privacy, and protecting consumers from illegal and unfair practices. The Act shares regulatory jurisdiction over communications between the States and the federal government. It divides responsibilities along the traditional lines of inter and intrastate communications but looks to the States to provide insight into the needs of their residents, to ensure that comparable service is available to all users regardless of location, and to encourage competition and the universal availability of service by ensuring that providers interconnect their networks, regardless of the technology those networks use. The Act also recognizes that the States have specific expertise in many areas, particularly those requiring investigation and adjudication. The Act also creates specific mandates for the States and the FCC to work together through . . . Joint Boards to evaluate issues and recommend solutions to problems.

[24] *In the Matter of Preserving the Open Internet Broadband Industry Practices*, GN Docket No. 09-191, WC Docket No. 07-52, FCC 10-201 Report and Order, (rel December 23, 2010) mimeo at 66, note 274 available online at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-201A1.pdf.

the ground" are valuable partners. A one size fits all approach cannot work. It is only logical that that partnership forms the foundation for oversight going forward. For the same reasons, the FCC should utilize the Joint Board process before proceeding with any additional "transition" trials.

In November 2012, NARUC President Philip Jones chartered a task force on Federalism to review NARUC's 2005 policies and paper and to determine any changes to those policies required by the changing communications landscape. The final draft of the resulting whitepaper has been publicly circulated and will be considered and likely passed at the NARUC Annual Meeting in November. At its foundation are core principles in line with that of the 1996 Act: consumer protection; network reliability and public safety; competition; interconnection; universal service; and regulatory diversity.

The FCC's Sean Lev and Rebekah Goodheart, who are chairing the internal FCC task force on the transition, have had several exchanges with the NARUC's Task Force on transition issues. As those exchanges recognize, we in the States are well positioned to work with our FCC counterparts as communications networks evolve.

While technologies change the expectations of consumer do not. Consumers expect the same level of service and protections they are accustomed to.

The FCC should continue to work with States to assure that policymakers at all levels have the information and data needed to fully evaluate impacts of the network evolution and the regulatory gaps. Thank you for your time and I look forward to any questions you may have.

Mr. WALDEN. Thank you very much, Mr. Burke. We appreciate your counsel today.

We will go now to our final witness on this panel, Mr. Randolph May, who is president and founder of Free State Foundation. Mr. May, it is good to have you back, and we look forward to your comments as well.

STATEMENT OF RANDOLPH J. MAY

Mr. MAY. Chairman Walden, Ranking Member Eshoo, and distinguished members of the committee, thank you for inviting me to testify. I am president of Free State Foundation, a nonpartisan, free-market-oriented think tank that focuses its work primarily in the communications policy area. I have been involved for 35 years in communications policy in various capacities, including having served as Associate General Counsel at the FCC.

I appreciated the opportunity to testify in July before this committee regarding FCC process reform. That hearing was very important, but, frankly, the topic at this hearing may be even more important. As the transition away from narrowband communications services to digital broadband services continues, the fundamental question confronting policymakers is this: Will the existing public-utility-style framework that still largely governs communication service providers be replaced by a free-market-oriented paradigm that accelerates the ongoing broadband digital transition; or, instead, will the regulatory framework be an impediment to progress?

The answer has important implications for the Nation's economic and social well-being because there is widespread agreement that the transition to IP services, which indisputably is leading to dramatic marketplace changes, will be completed at some point. And there is also widespread agreement that completion of the transition is a positive good, because IP-based services provide consumers with more functionalities in less costly ways than do copper-based TDM services.

There is no doubt that the digital revolution has enabled increasing competition among broadband providers for the provision of voice, high-speed data, and video services, whether these providers offer their services over wireline, cable, wireless, satellite, fiber, or whatever technology. The relevant point is not that all of the services offered by all of the competitors are perfectly substitutable, or that they meet every consumer's desire at all times. The relevant point for policymakers is that for an increasingly large number of consumers, these various competitors provide a choice of service providers offering a choice of attractive service options.

Note that I said above the IP transition almost certainly will be completed at some point in time, but the FCC's actions, and possibly Congress's, too, will affect the timing of the transition's completion and whether the regulatory regime that emerges is a proper one going forward.

My testimony explains why, in order to benefit consumers and in order to promote investment in new networks and innovation, the legacy regulatory framework, which is based on assumptions of a monopolistic marketplace that no longer exists, should be replaced in a timely fashion by a free-market-oriented model. Requiring

telecom companies to continue to maintain their TDM networks past when they are economically viable drains investment dollars from deployment for new IP networks, and economists agree that burdening any service provider, regardless of the platform used, with unnecessary costly regulation does deter investment and innovation. So in the IP world, the FCC's regulatory intervention should be tied closely to findings of market failure and consumer harm.

The FCC may well possess the authority under the Communications Act to implement most of the regulatory changes necessary to facilitate completion of the digital transition, while at the same time safeguarding certain basic public safety and universal service interests, which I recognize are important interests to be safeguarded, but to the extent such authority either is lacking, or the FCC fails to properly exercise such authority in a timely fashion, then Congress should be ready to step in.

For example, Congressman Latta's recently introduced bill, H.R. 2649, which requires the FCC to presume forbearance relief should be granted absent clear and convincing evidence to the contrary, would be a useful tool in enabling the agency to act more quickly, especially if forbearance relief is made available for all entities subject to the Commission's jurisdiction, as I think it should be.

In any event, aside from any near-term legislation that may be desirable to ensure the benefits resulting from the digital revolution are fully realized, ultimately Congress should adopt a comprehensive overhaul of the current Communications Act along the lines of the Digital Age Communications Act model that I have long advocated, and which I describe in my testimony.

Finally, Mr. Chairman, I mentioned I served as Associate General Counsel at the FCC. That was in the late 1970s and early 1980s under the Carter administration. At that time traditional economic regulation of the various transportation markets was largely eliminated, and this deregulation initiated by President Carter's administration was accomplished on a mostly bipartisan basis, and the Congress and the agencies cooperated productively. The agencies generally initiated deregulatory changes through the administrative process, while Congress engaged in oversight. And Congress eventually legislated to put in place deregulatory regimes that relied for the most part on marketplace competition rather than regulation to protect consumers. I believe that a similar opportunity for positive change now exists.

Again, thank you for inviting me to testify today, and I will be pleased to answer your questions.

[The prepared statement of Mr. May follows:]

Testimony of Randolph J. May

President, The Free State Foundation

Hearing on "Evolution of Wired Communications Networks"

before the

Subcommittee on Communications and Technology

Committee on Energy and Commerce

U.S. House of Representatives

October 23, 2013

Summary of the Testimony of Randolph J. May
President, The Free State Foundation

As the transition away from analog narrowband communications services to digital broadband Internet Protocol ("IP") services continues, the fundamental question confronting Congress and the Federal Communications Commission is this: Will the existing public utility-style regulatory framework be replaced by a new free market-oriented paradigm that accommodates and accelerates the ongoing broadband IP transition by taking into account the dramatic marketplace and technological changes that are continuing to occur at a rapid pace? Or, instead, will the regulatory framework be an impediment to progress? The answer to this question has very important implications for the nation's economic and social well-being because there is widespread agreement that IP services, overall, provide consumers with more features and functionalities in less costly, more efficient ways than do copper-based time-division multiplexed ("TDM") services.

My testimony explains *why*, in order to enhance overall consumer welfare, the existing legacy regulatory framework, essentially a public utility-style common carrier model devised based on assumptions of a monopolistic market, should be replaced in a timely fashion by a free market-oriented model. And I will explain *how*, in this new paradigm, the FCC's future regulatory activity should be tied closely to findings of demonstrable market failure and actual consumer harm. In my view, the FCC presently may well possess the authority under the Communications Act to implement most of the regulatory changes necessary to facilitate completion of the digital transition, while, at the same time, safeguarding certain basic public safety and universal service interests. But to the extent such authority either is lacking, or the FCC fails properly to exercise such authority in a timely fashion, then, of course, Congress should be ready to act. And, in any event, aside from any near-term legislation that may be necessary or desirable, to ensure that the benefits resulting from the new marketplace realities that characterize the IP world are preserved without any backsliding, Congress ultimately should adopt a new "Digital Age Communications Act" along the lines I have long advocated.

In the late 1970s and early 1980s, traditional economic regulation of the airline, rail, bus, and trucking markets was largely eliminated, and this deregulation, initiated by President Carter's administration, was accomplished on a mostly bipartisan basis and in a symbiotic process in which Congress and the agencies (the Civil Aeronautics Board and the Interstate Commerce Commission) cooperated productively. The agencies generally initiated deregulatory changes through the administrative process while Congress engaged in oversight. And Congress eventually legislated to put in place consumer-enhancing deregulatory regimes that took account of the marketplace competition. A similar opportunity for positive change now exists.

Finally, I want to emphasize this: The FCC and Congress should not look at the inevitable IP-transition just as an *opportunity* to implement a new free market-oriented regime fit for the digital age. Given the stakes, implementing such a new paradigm should be viewed as a *necessity*.

Testimony of Randolph J. May

President, The Free State Foundation

Mr. Chairman, Ranking Member Eshoo, and Members of the Committee, thank you for inviting me to testify. I am President of The Free State Foundation, a non-profit, nonpartisan research and educational foundation located in Rockville, Maryland. The Free State Foundation is a free market-oriented think tank that, among other things, focuses its research in the communications law and policy and administrative law and regulatory practice areas. I have been involved for thirty-five years in communications law and policy in various capacities, including having served as Associate General Counsel at the Federal Communications Commission. While I am not speaking on behalf of these organizations, by way of background I wish to note that I am a past Section Chair of the American Bar Association's Section of Administrative Law and Regulatory Practice and its representative in the ABA House of Delegates. I am currently a Public Member of the Administrative Conference of the United States and a Fellow at the National Academy of Public Administration. And, in addition to having published over 150 scholarly law review and other articles and commentaries, I am the author, editor, or co-editor of five books on communications law and policy, including, most recently, *Communications Law and Policy in the Digital Age: The Next Five Years*.

I mention the last book I edited not to sell books, but because its title puts me in mind of what this hearing really, in its essence, is all about. As the transition away from analog narrowband communications services to digital broadband Internet Protocol ("IP") services continues, the fundamental question confronting Congress and the Federal Communications Commission is this: Will the existing public utility-style regulatory

framework be replaced by a new free market-oriented paradigm that accommodates and accelerates the ongoing broadband IP transition by taking into account the dramatic marketplace and technological changes that already have occurred and are continuing to occur at a rapid pace? Or, instead, will the regulatory framework be an impediment to progress? The answer to this question has very important implications for the nation's economic and social well-being because there is widespread agreement that IP services, overall, provide consumers with more features and functionalities in less costly, more efficient ways than do copper-based time-division multiplexed ("TDM") services.

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Finally, I want to emphasize this: The FCC and Congress should not look at the inevitable IP-transition just as an *opportunity* to implement a new free market-oriented regime fit for the digital age. Given the stakes, implementing such a new paradigm should be viewed as a *necessity*.

I. The IP Transition Is Well Underway But Not Complete

It is important to understand that the transition away from analog narrowband services to digital broadband services has been underway for well over a decade. Indeed, in the year 2000, then FCC Commissioner (later Chairman) Michael Powell spoke of the "Great Digital Broadband Migration" as already underway, and as already having a "profound effect on the communications industry and on our society as a whole." Here is how Mr. Powell described then the implications of the digital migration that he saw occurring:

> It is not a movement of people, though it will change how people live. Rather, it is a fundamental shift of technology—the arrival of "disrupting technologies" (in the words of Clayton Christensen, the author of *Innovator's Dilemma*). And it is the

> unleashing of the power of "creative destruction," the phrase coined by the late great economist Joseph A. Schumpeter, who is celebrated more and more as the father-figure of the New Economy. Schumpeter saw that technological change "incessantly revolutionizes the economic structure from within." Rather than talk of "reform," a relatively pedestrian, incremental notion, we need to consider the Schumpeterian effect on policy and regulation. That is, what are the implications of "creative destruction" economics on economic-regulatory policy.[1]

Of course, since the turn of the century, the migration to digital communications platforms has steadily progressed, so that the transition process perhaps is even far beyond what then-Commissioner Powell could foresee. I am not going to use this testimony to introduce all the available facts and figures which are not really in dispute that indicate the current state of the marketplace transition, but rather I am going to simply refer to a few of the figures contained in the recently released comprehensive report, "Telecommunications Competition: The Infrastructure Investment Race," by Anna-Maria Kovacs, a Visiting Senior Policy Scholar at Georgetown University's Center for Business and Public Policy.

Ms. Kovacs reports that as of 2012 only 5% of U.S. households still rely only on circuit-switched POTS (Plain Old Telephone Service) lines for their voice communications service, while 38% of U.S. households are wireless only. At the end of 2012, only 34% of U.S. households even subscribed to legacy POTS service. Over 90% of households subscribed to wireless service, increasingly delivered over 4G/LTE broadband platforms. The number of cable and other non-ILEC interconnected VoIP subscribers has increased significantly and steadily as POTS subscriptions have declined. In sum, according to Ms. Kovacs' estimates, circuit-switched traffic amounts to less than 1% of IP traffic today. The FCC itself, in the context of a workshop on the digital

[1] Remarks of Commissioner Michael Powell, "The Great Digital Broadband Migration," Communications Deregulation and FCC Reform: Finishing the Job, p. 12 (Eisenach and May: Kluwer Academic Publishers, 2001).

transition, previously recognized that "broadband technologies...are fast becoming substitutes for communications services provided by older, legacy communications technologies."[2]

Of course, this migration to digital services, including digital voice services, affects, in a substantial way, the use of service providers' existing legacy networks. And, importantly, it impacts the funds available to service providers to invest in new broadband facilities and services. The impact on the use of legacy networks is dramatic. As but one measure, since 1999, the number of circuit-switched local exchange carrier telephone lines in use has decreased by two-thirds, from approximately 140 million lines to approximately 50 million lines.

It is possible that others might provide a slightly different set of figures for the same indicators. But I am confident that any such figures would not cast doubt on the clear direction of the ongoing IP migration or, indeed, the extent to which such migration already has occurred. So, the real questions involve the public policy implications of the transition and the implications of those public policies on American consumers. And

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[2] Public Notice: "FCC Workshops on the Public Switched Telephone Network in Transition" at ¶ 2 (2011), available at: http://transition.fcc.gov/Daily_Releases/Daily_Business/2011/db1110/DA-11-1882A1.pdf. It is important to understand that new companies and technologies continually enter the market to give consumers greater choice in access to broadband services. For example, in its latest "Measuring Broadband America" report, the FCC recognized that the satellite broadband market has been on the "verge of a major transition" and now provides services offering performance "as much as 100 times superior to the previous generation." Report: "Measuring Broadband America" at 4 (2013), available at: http://transition.fcc.gov/cgb/measuringbroadbandreport/2013/Measuring-Broadband-America-feb-2013.pdf. Satellite operators are offering speeds 40% higher than advertised, and they have reported a more than 25% increase in broadband satellite subscribers. Report: "ViaSat 2013: Taking Center Stage" at 8 (2013), available at: http://files.shareholder.com/downloads/VSAT/2745172919x0x682046/7B22F640-4449-4B9F-AD49-ABD19DB2E0DF/Viasat_AR_2013_web.pdf; *see also* Max Engel, "FCC Report Marks Key Breakthrough for Satellite Broadband," Satellite Today, available at http://www.satellitetoday.com/publications/2013/04/01/fcc-report-marks-key-breakthrough-for-satellite-broadband/.

whether the FCC and Congress will rise to the challenges presented by IP marketplace revolution. This is the subject to which I now turn.

II. The Dramatic Marketplace and Technological Changes Driving the IP-Migration Require Near-Term FCC Actions As Well As Congressional Oversight

In this section, I want to address what the FCC should do in the near term to facilitate completion of the IP migration, at a time when Congress continues to engage in active oversight. But before doing that, it is useful as a preface to set forth briefly some fundamental guiding principles.

A. General Applicable Regulatory Principles: Turn Away from Public Utility-Style Regulation Toward Free Market Competition

When a market undergoes dramatic, competition-enhancing disruptive change – as the voice services and advanced telecommunications market surely has during the past decade – the fundamental regulatory approach to that market should reflect such change. Otherwise, consumer welfare likely will suffer on account of unnecessary legacy regulations that have the effect of dampening new investment and restraining innovative new services or that result in higher prices being charged by service providers. When markets move from a monopolistic to a competitive environment – as is certainly the case when it comes to communications in the last decade or more – regulatory policy should no longer be premised on outdated monopolistic assumptions. This is especially so when markets become competitive due to changes largely brought about by the introduction of innovative technologies and business models – precisely what has transpired as a result of the digital revolution.

Specifically, competitive markets should be subject to a much less onerous regulatory approach than the legacy public utility/common carrier model that historically

has been applied to communications service providers. In today's dynamic environment, taking into account certain regulatory measures to ensure public safety and basic universal service obligations are met, marketplace competition should serve as the primary means for incentivizing and disciplining providers to ensure availability of superior service and price options for consumers. Any remaining regulatory requirements should provide the least intrusive means available to serve statutory objectives, and the benefits of any remaining regulations should outweigh the costs.

B. What the FCC Needs to Do in the Near-Term

As I have said above, in reality, the transition from analog to digital facilities and services, or from TDM to IP if you prefer, has been underway for well over a decade. And, while there has been some recent regulatory back-sliding,[3] the FCC deserves some credit for getting us to this point by virtue of adopting, in the early 2000s, a generally "light touch" regulatory approach for broadband Internet access services. It did this by classifying Internet access services as unregulated information services rather than telecommunications services subject to common carrier regulation.[4] So it is wrong to think in any sense of the FCC now needing to *initiate* the transition. But the agency does need to act to expedite *completion* of the transition. In doing so, it can address legitimate public safety and universal service concerns in the most efficient, cost-effective manner possible. And the FCC needs to act without the delay that so often has characterized its *modus operandi* – which is why I have emphasized "*near term*" when referring to needed

[3] The FCC took a step backwards in 2010 when it adopted net neutrality mandates applicable to Internet service providers in its *Open Internet* order. *Preserving the Open Internet*, Report and Order, 25 FCC Rcd. 17905 (2010).This order is currently on appeal in the United States Court of Appeals for the D.C. Circuit.

[4] *See, e.g.,* Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, 67 Fed. Reg. 9232 (2002).

FCC actions.

It is been a year since AT&T filed its petition asking the FCC to initiate a proceeding "to facilitate the 'telephone' industry's continued transition from legacy transmission platforms and services to new services based fully on the Internet Protocol ('IP')."[5] Focusing on the retirement of TDM facilities and their replacement with IP-based alternatives, AT&T asked the Commission to conduct a limited number of trials in selected locations to help the agency "understand the technological and policy dimensions of the TDM-to-IP transition and, in the process identify the regulatory reforms needed to promote consumer interests and preserve private incentives to upgrade America's broadband infrastructure."[6] Since then, while the Commission has opened a proceeding, solicited comments, and held a workshop or two, it has not acted with sufficient dispatch, or shown a commitment to do so. Perhaps this hearing, and further congressional oversight, will provide a spur for faster Commission action.

The central reason why near-term action is necessary is essentially grounded in economics, but it does not take a Harvard-trained economist to understand. Indeed, the reasoning was set forth clearly for the Commission in 2010 in the National Broadband Plan ("NBP"), which stated that "requiring an incumbent to maintain two networks…reduces the incentive for incumbents to deploy" new IP facilities.[7] Continuing to maintain the TDM-based network "[s]iphons investments from new networks and services."[8] Three years ago the NBP warned the Commission that maintaining two networks was "not sustainable" and would likely lead to stranded investments as the

[5] AT&T Petition to Launch a Proceeding Concerning the TDM-to-IP Transition, GEN Docket No. 12-353, filed November 7, 2012.
[6] Id., at 1.
[7] Connecting America: The National Broadband Plan, FCC, at 49.
[8] Id., at 59.

traffic which the legacy network carries declines precipitously. Because ILEC investment resources are limited, this is axiomatic, and indeed, no responsible policymakers or advocates seriously argue that it makes sense to operate and maintain the TDM network facilities indefinitely. The real questions involve timing and getting in place a proper free market-oriented replacement regime, one that safeguards public safety and provides a certain basic level of universal access in the most efficient manner, but that otherwise abandons the existing legacy model that is based on public utility-style common carrier regulatory requirements.

As for timing, it is important for the Commission, or Congress if need be, to set a firm deadline for completing the transition, that is, retiring the legacy TDM network. As explained above, until the TDM network facilities are retired, the funds required to operate and maintain such facilities are not freed up for investment in new or upgraded IP facilities. Just as with the DTV transition, a firm deadline is needed so that the Commission, service providers and facilities suppliers, consumers, and other interested parties can focus on the tasks that need to be accomplished by the deadline date. From the outset, it should be made clear that the date will not be delayed absent a showing, by clear and convincing evidence, of good cause.

Regrettably, the Commission has been slow to initiate the trials requested by AT&T, or any form of trials. Trials in selected locations likely would prove useful in providing information concerning matters such as consumer reactions to transition notices and cut-overs, adjustments to new IP offerings, and the like, as well as service provider implementation of basic public safety and universal service backstops. But the failure to initiate trials, and if ever initiated to complete them, should not be allowed to

delay unreasonably Commission decision-making and deadline setting. In other words, at some point the costs of undue delay in completing the transition will outweigh the benefits of whatever knowledge is anticipated to be gained from trials in a few markets. This is not to say that trials should not be initiated quickly. But it is to say it is easy to see that, absent a firm commitment by the Commission to oversee their timely completion, those who have an interest in delay may use the trials as delaying mechanisms. So it may become advisable for the Commission to move forward with necessary regulatory actions and regulatory relief absent completion of trials.

In comments submitted to the FCC, the Free State Foundation discussed at some length tools the Commission has available to facilitate the trials, and, as importantly, to facilitate the actual implementation of the transition to completion.[9] These tools include exercise of the Commission's authority under Section 10 of the Communications Act[10] to forbear from applying any law or regulation upon certain statutory showings. The Commission historically has underutilized its forbearance authority since this unique regulatory relief provision was added to the Communications Act in 1996. But certainly the exercise of forbearance authority is a tailor-made tool for facilitating completion of the transition by avoiding claims that the application of existing regulatory provisions stand in the way.

In addition to forbearance, the Commission has available other tools such as its waiver authority to get the transition completed. For instance, forbearance or waiver grants can be used to clear delays or other obstacles that could result from service

[9] Comments of the Free State Foundation, AT&T and NCTA Petitions on Transition from Legacy Transmission Platforms to Services Based on Internet Protocol, GN Docket 12-353, January 28, 2013.
[10] 47 U.S.C. §160.

discontinuance requirements,[11] notice-of-network change regulations,[12] or state carrier-of-last-resort obligations that are unnecessary or that would hinder the transition to IP-based services.

In some instances, the use of declaratory rulings might prove useful for providing clarification of requirements in an expeditions manner. For example, the Commission should be ready to issue declarations that preempt state or local regulations that stand as roadblocks to completion of the IP transition. The Commission should also consider promptly issuing a declaratory ruling clarifying the inherently interstate status of IP-enabled services, such as VoIP. In prior orders, the Commission has recognized the benefits that result from ensuring that a truly national market exists for such services, free from layers of burdensome regulations.[13] Unlike the old analog networks, it is more costly and less practical, if not technically infeasible, to track the jurisdictional status of IP calls for regulatory purposes. Maintenance of dual regulatory regimes, especially if the states seek to impose any form of traditional public utility regulation on IP providers, is likely to thwart the federal policy of completing the IP transition in a timely fashion. Thus, the Commission's preemption authority may be an important tool.

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[11] *See* 47 U.S.C. § 214(a).

[12] *See* 47 C.F.R. §§ 51.325(a), 51.333.

[13] *See, e.g., In re:* Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities, 17 FCC Rcd 4798 (2002) (classifying cable modem service as "information services" and thereby exempt from potential common-carrier regulation under Title II of the Communications Act), *affirmed, NCTA v. Brand X*, 545 U.S. 967 (2005); *In re:* Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, 20 FCC Rcd 14853 (2005) (classifying wireline broadband services as "information services" exempt from regulation under Title II), *affirmed, Time Warner Telecom v. FCC*, 507 F.3d 205 (3d Cir. 2007); *In re:* Appropriate Regulatory Treatment for Broadband Access to the Internet Over Wireless Networks, 22 FCC Rcd 5901 (2007) (classifying wireless broadband services as "information services" exempt from regulation under Title II). *See also, e.g., In re*: Vonage Holdings Corporation Petition for Declaratory Ruling Concerning an Order of the Minnesota Public Utilities Commission, 19 FCC 22404 (2004) (preempting state regulation of Vonage's DigitalVoice VoIP service), *aff'd Minnesota Pub. Utils. Comm'n v. FCC*, 483 F.3d 570 (8th Cir. 2007).

As I have said, a key aspect of the IP transition is replacement of the existing public utility-style regime – with its rate regulation, non-discrimination mandates, and the vague public interest standard at its core – with a free market-oriented model characterized by regulatory intervention only in instances when demonstrable market failure and consumer harm has been shown. Under the new market-oriented model that should govern the IP world, instances of regulatory intervention (other than to implement certain public safety and universal service requirements) should be rare.

It is possible that in rare instances disputes concerning interconnection between two IP service providers might be a cause for some "last resort" form of regulatory backstop, but this is by no means evident now. Presently, Sections 201 and 251 in Title II of the Communications Act, in general, impose an interconnection duty, upon request by one telecommunications carrier to another, at reasonable rates and on nondiscriminatory terms. Without going into details here, suffice it to say that this general interconnection duty is enforced, ultimately, by the FCC's authority, in administrative proceedings long characterized by the trappings of common carrier regulation, to set the rates for interconnection and to define nondiscrimination obligations.[14]

Up to now, the FCC historically has not intervened in interconnection disputes between Internet providers, and it is questionable, in light of the fact that such providers are not common carriers or telecommunications carriers but rather information service providers, whether the agency possesses the legal authority to intervene even if it wished to do so. But it should not wish to do so because, thus far in the IP world, marketplace negotiations have led to agreements to interconnect among the service providers.

[14] Of course, the Telecommunications Act of 1996 uses the term "telecommunications carrier," for example in Section 251, in place of "common carrier." They are essentially the same.

Although there have been a few instances when interconnection disputes have been brought to the Commission's attention (for example, the dispute between Level 3 and Comcast), to the best of my knowledge these disputes ultimately have been resolved by the parties through voluntary negotiations. The existence of many different IP networks facilitates various transit routing arrangements around a particular direct peering point in the event of stalemated negotiations. Indeed, the existence of many alternative IP networks and routing arrangements almost certainly is the reason why, thus far, IP-to-IP interconnection arrangements have been negotiated so routinely on a voluntary basis without regulatory intervention.

Therefore, the Commission should not decide prematurely to establish any regime for intervening in, or otherwise regulating, the private voluntary negotiations that presently are employed to establish connections between Internet providers. The Commission should determine that, while it intends to monitor the situation, it presumes that IP-to-IP interconnection agreements will continue to be negotiated in the marketplace on a voluntary basis and that, absent clear and evidence of demonstrable market failure and consumer harm, it does not intend to intervene. It is very unlikely that there will be any need to intervene. But in the unlikely event there ever is, the Commission certainly should not revert to a public utility-style common carrier regulatory model. Instead, at most, the agency should devise some form of dispute resolution procedure, perhaps requiring mediation first, and if that fails, some form of third-party baseball-style "last best offer" arbitration.

I have said that the Commission should retain authority to facilitate the provision of a basic level of communications service on a universal basis. It is important to keep in

mind that, in the IP world, cable operators, telephone companies, wireless providers of different kinds, fiber providers, satellite operators, and more, are all, more or less, competing against each other to provide broadband services. For the most part, this competitive marketplace environment, in conjunction with, and made possible by, the existence of the various alternative delivery platforms, means that an acceptable basic level of communications service will be available to most Americans on a ubiquitous basis without the need for regulatory intervention or provision of subsidies. But in those limited instances where this may not be true – in locations unserved by any provider meeting certain basic standards and for low-income persons – there is a role for the Commission to play in ensuring universal service.

Of course, the Commission's USF/ICC reform proceedings have addressed, and are continuing to address, the establishment of a proper universal service regime. The Free State Foundation has filed numerous comments in these proceedings[15] and I will not repeat the points made in those comments here. The design of the proper universal service backstop in an IP-world, which in large part is what the Commission should be aiming to do in the USF/ICC reform proceedings, is a whole subject in and of itself. For now, I will just say that, in the context of those proceedings, I have advocated capping the high-cost fund, gradually reducing the available subsidies, and establishing a sunset

[15] See, e.g., Randolph J. May and Seth L. Cooper, "Comments of the Free State Foundation: Universal Service – Intercarrier Compensation Transformation Proceeding," (August 24, 2011), available at: http://freestatefoundation.org/images/Further_Inquiry_-_USF ICC_Comments_082411.pdf; Randolph J. May and Seth L. Cooper, "Reply Comments of the Free State Foundation: Connect America Fund, A National Broadband Plan for Our Future, Establishing Just and Reasonable Rates for Local Exchange Carriers, High-Cost Universal Service Support, Developing an Unified Intercarrier Compensation Regime," (May 23, 2011), available at: http://freestatefoundation.org/images/USF_Comments_05.23.11.pdf; Randolph J. May and Seth L. Cooper, "Comments of the Free State Foundation: Connect America Fund, Compensation Regime," (April 18, 2011).

period, say, of ten years for ending the high-cost fund subsidies. And I have advocated maintaining a targeted Lifeline program to provide subsidized service to those low-income persons demonstrated to be truly needy. It is obvious, of course, that the existing Lifeline program is in need of further meaningful reforms to prevent waste, fraud, and abuse, and continued support will be jeopardized if the FCC doesn't quickly take steps to implement safeguards.

III. Ultimately, Congress Needs to Replace the Current Communications Act with a New Digital Age Communications Act

As I have said, in the near-term, and without delay, it is the FCC's job to proceed with facilitating completion of the IP transition in the manner I have suggested thus far, and I believe it mostly has the authority to do so. To the extent particular issues regarding the agency's authority arise, it could become advisable for Congress to adopt certain responsive legislation that is consistent with the principles I have discussed.

Nevertheless, because of the extent of the dramatic marketplace changes wrought by the IP transition that already have been described, it seems to me that Congress ultimately needs to comprehensively overhaul the Communications Act by adopting a new free market-oriented model that breaks thoroughly with the past. And I want to add here, without addressing the matter in any detail, that it is possible, depending on the time-frame in which Congress ultimately acts, that consideration should be given to whether authority for overseeing competition and consumer protection issues relating to broadband Internet service provider practices should be transferred to the Federal Trade Commission. The FTC has expertise in these areas, and such a transfer might bring a degree of uniformity of treatment to various providers in the Internet ecosystem, some of

which are subject to the FTC's general jurisdiction over all companies in commerce and some of which are subject to the FCC's specialized jurisdiction.

But putting aside the question of any potential jurisdictional shift for now, and I am not advocating such a transfer now, here are some the key points regarding a new legislative Digital Age Communications Act framework. We do not need a replacement regime based on a newer (but nevertheless soon to-be-outdated too) set of techno-functional constructs like the ones that now characterize the Communications Act's current "stovepipe" model.[16] The new model, unlike the current stovepipe one in which the indeterminate "public interest" standard plays such a prominent role, should tie the FCC's permissible regulatory activity closely to a competition-based standard that necessarily requires the agency to base its decision-making on a mode akin to an antitrust-like analysis.

By virtue of adoption of a competition standard grounded in antitrust-like jurisprudence,[17] the FCC would be required, much more than it is today, to engage in rigorous economic analysis that focuses whether there is a demonstrated market failure causing actual consumer harm. As part of such analysis, the agency would need to take

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[16] See Randolph J. May, *Why Stovepipe Regulation No Longer Works: An Essay on the Need for a New Market-Oriented Communications Policy,* 58 FED. COMM. L. J. 103 (2006). For an early discussion relevant to how what I have called the Communications Act's techno-functional constructs are outdated in the IP world, see my essay, Randolph J. May, *The Metaphysics of VoIP*, CNET, January 5, 2004 http://news.cnet.com/2010-7352_3-5134896.html. The issues we are discussing today concerning the need to implement a new regulatory model were evident to me then. Also, I should add that the legislative model that I set forth here is akin to the "Digital Age Communications Act" model which was developed in 2005 in a project which I led at the Progress and Freedom Foundation. The project involved many notable academics and think tank law and economics experts, who made significant contributions.

[17] Note that I am not suggesting the agency would be required to adhere in any strict sense to antitrust law or its precedents. Rather I am suggesting that following a competition-based standard rather than a public interest standard likely would require the agency, if its decisions are to be sustained on judicial review, to engage in a rigorous economic analysis regarding allegations of market failure and consumer harm.

into account the dynamic technological environment that characterizes the digital marketplace. Further, unlike the way the agency mostly now operates, under the new model, the FCC generally would be required to favor narrowly-tailored *ex post* remedial orders over broad *ex ante* proscriptions developed in rulemakings. This would be accomplished by requiring the Commission to determine whether service providers subject to individualized complaints possess demonstrable market power that should be constrained in some appropriately targeted way. So, rather than the FCC embarking on generic rulemaking proceedings that frequently end with the adoption of overly broad proscriptions designed to anticipate harms that may never materialize, regulatory relief most often would be accorded through focused adjudicatory proceedings.

This new competition-based, market-oriented model would force the FCC to focus its attention on market failures and overall consumer welfare, not on outdated regulatory classifications grounded in particular technology platforms or functional characteristics that may happen to favor one competitor over another without any good reason. And the Commission no longer would be able to invoke the highly elastic public interest standard to devise new regulations that have little or nothing to do with existing marketplace realities.

Only with substantial deregulatory changes in communications law and policy will the United States be able to realize fully the benefits that enhanced competition and advanced digital broadband technologies in the communications marketplace can bring to our nation's consumers and to our economic and social well-being. As I said earlier in this testimony, in the late 1970s and early 1980s the airline, rail, bus, and trucking transportation markets were largely deregulated, and this change in regulatory paradigm

was accomplished on a bipartisan basis, with the relevant agencies and Congress engaged in a productive symbiotic relationship. The change in regulatory paradigm that I recommend in this testimony for the dynamic IP world should be accomplished on a similar basis.

Thank you for giving me the opportunity to testify today. I will be pleased to answer any questions.

Mr. WALDEN. Mr. May, thank you. And thanks for your in-depth testimony, which we all have.

I am going to start off with questions. And, Mr. Iannuzzi, in your testimony you said, and I quote, the prepared testimony, "As incumbents replace their legacy TDM-based technology with IP technology, competitive carriers will lose access to the last-mile connections that have enabled them to push deployment of innovative business broadband services to American businesses." That is kind of the crux of the argument you represent today, correct, that if they abandon—if AT&T or other companies abandon their copper networks, then you are not going to have the ability to get to that last mile, correct?

Mr. IANNUZZI. Correct.

Mr. WALDEN. Now, Mr. Cicconi, from your perspective, what does that mean in terms of—is that accurate? Will you—will AT&T and other companies still make last-mile connection available? And then I want to go to Mr. May on this as well.

And again, hit that microphone button, if you would.

Mr. CICCONI. Short answer is of course we would make them available, and there is nothing we have proposed that would take that away.

Mr. WALDEN. Under the same interconnection, reasonable rates, terms and conditions?

Mr. CICCONI. I think if we are talking about copper loops, you know, there is nothing in our proposal that would change the treatment of that as a "uni."

Mr. WALDEN. But in terms of an advanced network, fiber?

Mr. CICCONI. I think when you are talking about, you know, Ethernet, for example, the FCC has concluded the Ethernet is a competitive service. So I think if we are rolling out Ethernet services in replacement for TDM facilities—you know, and to give you the sense of that, a TDM facility is not classed as a broadband-level facility by the FCC currently. So for placing TDM with a broadband facility, for example, and backhaul to a cell tower, you know, I think the FCC has concluded Ethernet is, in fact, very competitive.

And I think, you know—in fact, I think Sprint CTO just stated recently that for the same price he pays for a T–1 to a cell tower, he can get 20 times the capacity by running Ethernet to the same cell tower. And so, obviously, if it is a competitive market, we wouldn't feel that regulation, per se, is needed in that area in order to provide an alternative capacity.

Mr. WALDEN. All right. Mr. Burke, what is your reaction to all of that?

Mr. BURKE. Well, I think that one of the things you look at when you look at the potential for interconnection is that there are supposed to be agreements. The idea is that they are supposed to agree. That doesn't necessarily mean that all the players have an equal bargaining power. It doesn't always work that way. If that is the case, it may well be necessary for somebody to take a look at those agreements. And the 1996 act clearly said, and wisely so, in my estimation, the States can look at that and arbitrate that. And it also defined the service to include advanced services.

So 1996 actually had—in my estimation, had it right and gave a methodology so you would be able to handle arbitration of these issues if, in fact, Mr. Cicconi and Mark couldn't agree. And I think that is another point that exists in the States' position here and what they would have to do in this brave new world moving forward.

Mr. WALDEN. All right. Mr. May, from your perspective?

Mr. MAY. Thank you, Mr. Chairman.

I think part of the premise of your question was based on the continuation of offering of copper-based loops from Mr. Iannuzzi.

Mr. WALDEN. Well, and just the ability, regardless of the underlying infrastructure, to have a competitive marketplace for these alternative competitors.

Mr. MAY. Right. You know, there is a transition going on, which is why you called the hearing.

Mr. WALDEN. Right.

Mr. MAY. You know, from my perspective, over time, as I said in my oral testimony, it is important that we not require the maintenance by regulatory fiat of older technologies that are less efficient and more costly. So eventually—I am not in favor of requiring AT&T or anyone else to maintain in existence a technology in a competitive environment that we are moving to that is not efficient.

But I want to say one other thing, if I could. In Mr. Iannuzzi's testimony, he is talking both about the ability to access facilities of others and to use those last-mile facilities, and he is also talking about interconnection of facilities. And as we talk about this today, those are really—they are actually two different things. In 251 and 252, without getting too technical, they involve both of those things. And, from my perspective, in terms of where public policy wants to go, I am much—I am more receptive to arguments that have some regulatory backstop for interconnection, saying, you know, I have to interconnect my network with Mr. Burke's network or Mr. Cicconi's, than I am about regulation which continues to require that if I build a facility, that I have to provide access under regulated terms and prices, you know, ad infinitum for someone else to use those facilities.

And the simple reason, and this is important, I think, to understand, is when you require that type of sharing of facilities and access that he talks about, and he does say he has some facilities of his own, but——

Mr. WALDEN. Right.

Mr. MAY [continuing]. When you do that, it discourages either him from building his own facilities, or it discourages me, if I am the one that has to provide access, from actually investing more to build more facilities.

Mr. WALDEN. All right. My time has expired. And I now turn to the gentlelady from California Ms. Eshoo for 5 minutes.

Ms. ESHOO. Thank you, Mr. Chairman. And thank you to all the witnesses.

We will start over here with the Italian part of the table, who don't agree with each other despite their shared background ethnically.

Mr. Cicconi, you stated in your testimony that modern IP networks are both more dynamic and cost-efficient than the TDM-

based voice telephone networks that we have depended on over the last century.

How does a new network technology change the state of competition? Because I think that that really goes to the heart of a lot of what we are talking about here and some of the testimony that we have heard from others.

In your view, shouldn't the—the rules to preserve and promote competition be technology neutral? I mean, I have always favored technology being neutral in whatever legislation we do. It has always been something that I thought was like a hot stove; don't go and touch it. It should be neutral.

Mr. CICCONI. Well, first of all, I don't think the Telecom Act itself makes the rules technology neutral. It put most of those rules in Title 2, which is entitled common carriage, and it doesn't apply to our wireless service. In fact, you have an expressed provision in Title 3 that it can't be applied to wireless service. It doesn't apply to cable. It applies uniquely to the wireline TDM services provided by a legacy wireline carrier.

So they are not technology neutral in that sense. They are uniquely imposed on this part of the business. And as you saw from the chart earlier, it is a declining part of the business. At the current time AT&T has fewer than 14 million customers using traditional wireline services. By contrast, the number four wireless carrier has double that.

So I would argue that today these services are competitive, Congresswoman, and that you all when you wrote the act—or rewrote the act—in 1996 I think did something fairly unique. I think you recognized in there that there were major transformations that were underway and that I think augured well for competition, and you gave the FCC some fairly unique powers there——

Ms. ESHOO. So are you agreeing that the rules going forward should promote competition, but you don't agree they should be technology neutral?

Mr. CICCONI. I certainly would argue that it is an appropriate mission for the FCC to continue doing, but I would disagree that all the rules that were needed in 1996 and 1934——

Ms. ESHOO. We are not in my office. I have to get to Mr. Iannuzzi, OK? Thank you.

Mr. Iannuzzi, you gave great testimony. I loved what you said. And it is uncommon for people to come here and speak about what their father said, how that remained with you, what you do, what you are for. It is not what you are against, but where you want to go and why. And I just think you gave terrific testimony.

Without a regulatory backstop, what incentive do you think that the largest incumbent providers have to reach a commercial interconnection agreement with you?

Mr. IANNUZZI. Thank you very much, Congresswoman, for your kind remarks.

Ms. ESHOO. Turn the microphone on so everybody can hear you say, thank you for your kind words, Congresswoman.

Mr. IANNUZZI. When I got my CLEC license they asked me three questions. One was do you have the technical acumen, do you have the financial wherewithal, do you have the business know-how. I would have flunked that test if I was going to go into a business

to compete against an 800-pound gorilla without some type of firewall, some type of framework that allowed a competitive marketplace to exist. Because our ability to go and negotiate a commercial agreement, the incentives, just economics 101 concepts here, the economic incentives of the incumbent provider, they control the connectivity to the customer. It is in their interest not to provide connectivity to other people because they would like to keep that customer. So without that firewall there to make sure that we did have fair and equitable access to the customer, the business case would fall. It would just not be there.

Ms. ESHOO. Thank you very much. I think I am out of time. Thank you.

I will submit the rest of my questions for the record. I do have them for Mr. Feld and other witnesses. Thank you.

Mr. WALDEN. We will now go to Mr. Barton for 5 minutes.

Mr. BARTON. Thank you, Mr. Chairman.

Last weekend I finally got to go home to Texas after the government shutdown. And I hadn't been there. It is the first time in the 29 years I have been in the Congress that I had spent two consecutive weekends in Washington, DC. So obviously I was glad to get home. And when I got home I walked into my house and decided to make a phone call and I didn't have a dial tone. And the phone was provided by AT&T, a legacy carrier.

So I got the phonebook out and I went through the protocol on page 9, you know, dial 1–800 and we will be happy to help you, and said, now, if the problem is on your phone in the house, it is 99 bucks. If it is not, we will come out and fix it for free.

So, anyway, I went through that and I finally self-reported a problem and I did all the things you are supposed to do, and they called back and said we will be out tomorrow by 8 p.m. Well, the next day by 8 p.m. they weren't out. So I picked up my cell phone, which was provided by Verizon, and called and hit OOO and I finally got a sweet lady in Houston, Texas, and I said my phone is not working in my home and I still haven't got the serviceman, and she agreed with me and she said, we will be here tomorrow. And, by golly, they were, and they fixed it. Boom. And the guy could not have been nicer. Could not have been nicer. But the moral of that story is I had to use a wireless provider to get my hard line phone fixed.

In 1996 CLECs, they were competitive, and we wanted the CLECs to compete with the ILECs, the incumbents. Now, since 1996 my congressional district has changed four times, but we are still operating under rules that we put in place for an old system. And it is time, just like our congressional districts change every 10 years—in the case of Texas we changed 2 times in addition to those 10-year changes—we really need to relook at this. And I love AT&T and I love Verizon and I love the CLECs and all the independents out there, but what I really love is consumer choice and market efficiency and competition that works.

So my question to Mr. Cicconi, who I have known since way back when, even before I was a Congressman I knew Jim, would the group that you represent guarantee access if we did away with some of the regulatory protections under Title 2?

Mr. CICCONI. Well, first, Congressman, I am sorry for your service problems.

Mr. BARTON. Well, we have had rain problems.

Mr. CICCONI. But I think you made an important point, and that is there are alternatives out there and wireless has become an alternative for wireline phone service, and there are many, many competitive carriers offering wireless services. Cable offers phone service today, I am not sure in your area or not. But there are an array of choices out there. And so I think that consumers have those choices today.

Now, is it a legitimate function of government to ensure that everybody is connected and has the ability to communicate? Absolutely. Our company has always stood behind the principle of universal service, and I think that is an important function of the government, to ensure that the choices are there and that they are available to all Americans.

Mr. BARTON. Well, to the average consumer, a consumer doesn't care whether they are serviced by an ILEC or a CLEC. What they want is service. What they want is something that works, that is efficient, and that is cost competitive. So our job on the committee is not to protect an existing market segment. Our job is to do the very best we can to give our consumers choices.

And I want the CLECs to stay in business. I am not anti-CLEC. What we passed in 1996, it might have worked for 1996, but that world doesn't exist today, so let's figure out what exists today and in the future and go that way.

And with that, Mr. Chairman, thank you for the hearing and I yield back.

Mr. WALDEN. The gentleman yields back.

We turn now to the gentleman from California, Mr. Waxman.

Mr. WAXMAN. Thank you, Mr. Chairman.

Based on some of the testimony we heard today, one might think that we are evaluating a new network being built across the country, an IP network that runs on fiber lines and wireless airwaves. Others suggest that this is no new network, but that new electronics that have been added to the copper and fiber infrastructure that has been transporting voice and data throughout the country for years.

Why are these distinctions important? If what we really care about are basic values like protecting consumers and competition, universal service and public safety, why does it matter what kind of infrastructure communications runs over?

Mr. Feld, it is my understanding that Google is currently planning to offer extremely fast Internet access over new fiber networks being deployed in three communities. Although consumers can sign up for video service to complement their Internet access service, Google is not offering a voice product. Google has not been shy about stating that it is not offering voice at least in part due to the complex rules associated with providing telephone service.

What do you think of Google's argument that a company like Google be saddled with regulations if it decided to add voice to its video and broadband offering?

Mr. FELD. I think that there are a couple of points that need to be very clear. First is that when Google talks about the regulations

that they found too burdensome, they are not talking about the 251/252 kind of regulations that have been the focus of the debate here. They are talking about the things that we all agree ought to stay in system, like 911, like consumer protection and privacy protections, all of these things that we have said, yes, that is very important.

Mr. WAXMAN. Well, what are they talking about? Give me examples of what they are concerned about?

Mr. FELD. Well, it is expensive to maintain the 911 system. It is expensive to contribute to the Universal Service Fund system to ensure that all Americans are connected.

Now, we believe that it is very important to maintain these things. We believe that it is very important. Google likes to collect the information of the people who use its services. They aggregate it. They have one level of privacy protection for that. Their business model is based on a couple of different things.

In the phone world we treat this very differently and you cannot treat phone call information the same way that you would treat a Facebook status update, that people hold that very closely. And I understand for Google to say we don't want to get into that business. But if we were to say, well, OK, we want to encourage Google to get into this business so we want to eliminate these kind of vital consumer protections, I think that would be a very grave mistake.

Mr. WAXMAN. So even if they choose not to offer telephone service, that doesn't lead you to the conclusion that we ought to eliminate the rules for all telephone services.

Mr. FELD. Oh, not at all. And, in fact, I would point out any business looking to enter a market figures out what the tradeoff is and what their business model is. We have a thing that is very valuable in a network that goes everywhere and uses telephone numbers. And I will point out that when we have companies that are VoIP providers, pure VoIP providers that want to use those telephone numbers, we impose certain obligations on them already, and businesses make the evaluation of whether the benefits of getting into that business are worth the expense.

Mr. WAXMAN. That is their decision for themselves.

Mr. FELD. Yes.

Mr. WAXMAN. Now, for the rest of public policy and for everybody else, given the importance and complexity of transitioning voice services to an all-IP network, wouldn't it make sense to have a trial overseen by the FCC to help collect data based on real world experience and challenges? This past May the FCC issued a public notice seeking comment on trials related to the IP transition. Then Chairman Julius Genachowski stated at the time, quote, "Trials are a smart approach that the FCC has deployed before."

In the public notice the FCC invited carriers interested in pursuing a geographic trial, like AT&T, and they proposed to submit a more detailed, comprehensive plan, including the design of the trial, that data that would be collected, the rules that would need to be waived, and the role of the States and the tribes. It seems to me that the FCC is approaching this issue methodically and thoughtfully.

So let me ask in the short time I have left to anybody on the panel that wants to jump in on this, do you believe that the FCC

is moving ahead in a diligent and responsible manner in exploring potential trials on the IP transition? And if you don't, what would you do differently?

Mr. FELD. I would say that, yes, I think the FCC is behaving exactly appropriately. They have invited further comment. I think that we cannot treat conversion of an entire wire center as something——

Mr. WAXMAN. Let me hear if there is somebody with a contrary position? Mr. Cicconi?

Mr. CICCONI. I don't think I would be directly contrary. But I think there are a couple fundamental points here. I think, first of all, when the FCC put out its additional questions, I think we all recognized that the FCC was going through the leadership change from the former chairman to a chairman not yet confirmed by the Senate, and I don't think, honestly, Chairman Waxman, they were prepared yet to answer the question.

But I don't think they should be leaving open the question of whether we should have trials. I think when we filed the petition almost a year ago we asked them to actually set up the trials. This isn't an AT&T project. As somebody said earlier, it involves government, it involves the entire industry, and it involves consumers and stakeholders, and it shouldn't be up to AT&T to come up with the plan. We actually proposed industry-wide trials to the FCC that the FCC would actually help put together in a collaborative way working with everybody.

And so I think they have at least to this point punted on that decision. I don't think not having trials is an acceptable answer because I think it would in essence be the government saying, we are not going to plan for this. And when you did the DTV transition——

Mr. WAXMAN. Your point is the trials are not methodical and they are not fully thought through?

Mr. CICCONI. Right. The FCC actually planned the DTV transition, conducted the trials, learned from them, and it went fairly smoothly, and I think that is what needs to happen here and that is what I still am very hopeful will happen.

Mr. WAXMAN. Thank you.

My time has expired. It is up to the chairman if you want to let anybody else respond.

Mr. IANNUZZI. May I comment please?

Mr. WALDEN. Mr. Iannuzzi, real quick.

Mr. IANNUZZI. With all due respect, the concept of a trial, in my opinion, is a boondoggle. The reason behind it is that we do IP all over the place today in interior of networks and how we connect with other cooperative parties. We have got smart people. We know how to do this stuff right now. We are losing ground in terms—do you want to try to make the revolution of IP even more profound? Then let's get going with it.

Are there things that we have to attend to, to tweak stuff? Sure. But in terms of the mechanics of it, it is making it sound like water is hard, if you want to make it seem complicated. You could take anything and make it sound more difficult. It is done today all over the place.

Mr. WALDEN. All right. We are going to have to move on. We go now to Mr. Latta for 5 minutes.

Mr. LATTA. Thank you, Mr. Chairman. Again, thanks very much for holding the hearing today.

And thanks to everyone who is testifying today. We really appreciate hearing your testimony.

If I could start with Mr. Cicconi, if I may. As the gentleman from Vermont mentioned, he and I have worked on different issues, especially concerning rural call completion. It is big for both of us. And I have a very unique district. I go from urban to suburban to very rural. And one of the things that—I have met with a lot of my rural telecoms out there, is that they have had problems with dropped calls. This is a serious issue for folks out there, because again if you have family members that are elderly and you are trying to call them and all of a sudden they are not picking up that phone, then your next recourse is you call the local law enforcement or the fire department, hey, can you go out and check on a family member.

In the same way it really hits small businesses or any businesses out in these areas, because again I have a lot of businesses that are located way out and all of a sudden if all of their calls are getting dropped, if somebody can't make that call they lose business and pretty soon they are out of business. So as we are looking at what is happening out there, as the networks, especially the rural providers, transition to IP, how do you think this will affect the call completions in the future?

Mr. CICCONI. Well, notwithstanding Mr. Barton's earlier service problems, I am not aware that AT&T itself has a rural call completion problem, but I am very aware that there is a problem there. The FCC has a proceeding underway right now to try to deal with it and to deal with it in a way that applies across all technologies and across all providers, and that is the way it should be. And I think it is an example of what an appropriate role of government should be.

Mr. LATTA. But do you think as we go forward with the IP, especially the rural providers, do you think it will help them to make sure that they don't have the dropped calls in the future?

Mr. CICCONI. I would be hopeful. But, again, I think that is one of the reasons you have trials, to test these things, make sure they work properly, make sure the replacement technologies are just as reliable as the others.

And just in response to what Mr. Iannuzzi said a minute ago, too, we can't go out and convert a wire center today from TDM to IP without permission from the FCC. So while a lot of IP investment is going on, we can't do the fundamental investment. There are 20,000 wire centers in the country that have to be converted to IP and not a single one of them can be converted without permission from the FCC today.

So that is why we need the trials, to take two of those wire centers, it is all we have proposed out of 20,000 nationally, conduct the trials and see if we can accomplish this without the kind of problems that you have experienced in the rural areas and ensure, frankly, that the replacement services and technologies are actually better and don't have those issues.

Mr. LATTA. Thank you.

Mr. May, in reviewing your testimony, in your section number three it says, "Ultimately, Congress needs to replace the current Communications Act with a New Digital Age Communications Act," and you state that "because of the extent of the dramatic marketplace changes wrought by the IP transition that has already been described, it seems to me that Congress ultimately needs to comprehensively overhaul the Communications Act by adopting a new free market-oriented model that breaks thoroughly with the past."

Could you elaborate on that, please?

Mr. MAY. Yes. Thank you, Congressman Latta.

One of the reasons why ultimately Congress should pass a new act, it really goes to a lot of the discussion we have had today back and forth talking about technology, whether policies are technology neutral or not and how that relates to competition.

The reality is the current act is not technology neutral really at its core. We talk so much, those who are in this area talk about the smokestack or stovepipe regime, because in essence the act establishes different types of regulation based on different types of technical or functional constructs, and that is not the most efficient or most sound way for regulation to go forward.

So what should happen really in the future is competition is obviously important, as Mrs. Eshoo has talked about. We all want competition. But what we want to have really is an environment, and in fact the digital revolution is enabling more competition. That is why we have these, that we have cable and wireless and fiber and all of these things are part of the digital revolution.

But ultimately in a new act what we would like to have in my view would be a standard that ties the regulatory activity of the agency closely to an analysis of the competitive marketplace, and then only if there is a market failure or consumer harm, and I recognize if there is consumer harm there is a place for regulation.

I am not, like Mr. Cicconi, I am not advocating no regulation. But we need in a new act to tie regulatory activity much more closely to an analysis of the marketplace. And that really gets away from all this discussion about this technology and that technology and that type of thing. But the fact that technology is changing and it enables competition, that is a reason for policy changes. It is not a reason to do nothing.

Mr. LATTA. Thank you.

Mr. Chairman, my time has expired and I yield back.

Mr. WALDEN. The gentleman yields back.

We turn now to the gentleman from Pennsylvania, Mr. Doyle, for 5 minutes.

Mr. DOYLE. Thank you, Mr. Chairman.

Mr. Chairman, this morning I read in the newspaper that AT&T recently notified many of its special access customers that it will eliminate certain long-term discount price plans, effectively increasing rates by as much as 24 percent. Competitive carriers argue that they have no alternatives to gain last mile access to business customers and must simply accept the higher prices.

Mr. Chairman, I would like to ask unanimous consent to place a copy of that article that appeared in the Wall Street Journal this

morning and a copy of the ex parte filing that several companies made to the FCC in regard to those rate hikes.

Mr. WALDEN. Without objection.

[The information follows:]

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TECHNOLOGY

Rivals Protest AT&T Rate Shift

By RYAN KNUTSON

Oct. 22, 2013 8:01 p.m. ET

AT&T Inc. has moved to effectively raise the price on some of its dedicated data and voice lines for businesses, prompting complaints from groups representing cellphone carriers to ATM owners which say the market is uncompetitive.

The telecom giant notified customers earlier this month that it would no longer offer extended contracts—and the discounts that come with them—to companies using these high-capacity connections, known as "special access lines."

Sprint Corp. and other telecommunications companies that buy the connections claimed the move was anticompetitive, and complained to the Federal Communications Commission. Once the FCC receives official notice of the change from AT&T, the agency will have 15 days to respond or the changes will automatically take effect. The agency can still suspend the changes after they have taken effect.

Rising prices of high capacity connections could impact a broad array of businesses from financial institutions, manufacturers and retailers that use these lines to connect ATMs, gas pumps and warehouse inventories.

Last year, the FCC said it would begin collecting data on prices charged in the special access market, which it estimates to be between $12 billion to $18 billion annually, to assess whether there is adequate competition.

AT&T and Verizon Communications Inc. control 80% of the special access market, Sprint and other rivals say.

"The very fact that AT&T can unilaterally impose a substantial price increase on its customer base is a sign of its continuing market power," a group of telecommunication companies, including Sprint and EarthLink Inc., wrote in a letter to the FCC on Friday.

AT&T said that as of Nov. 9, it will stop offering contracts longer than 36 months for older types of connections, known as TDM, because it plans to phase out the technology by 2020. Last year, AT&T said it would invest $14 billion over three years to expand wireless networks and transition its network from TDM to more efficient Internet protocol-based technology. AT&T still needs FCC approval before it can stop offering TDM systems.

AT&T said this is an effort to wean customers off TDM-based services. AT&T offers deeper discounts for longer term plans, but because this service will be terminated in 2020, longer-contracts aren't available, said spokesman Michael Balmoris.

"These steps are necessary to accomplish a smooth and non-disruptive modernization of our network and services," said Mr. Balmoris in an email.

The company is still selling IP-based special access lines on five-year contracts. But those connections are more expensive than the older, TDM-based connections, which are subject to rate regulation by the FCC.

Colleen Boothby, a lawyer who represents about 20 companies including banks, insurers and auto makers, said the proposed changes could affect prices paid by consumers for a range of services. "The concern is this will raise prices across the market," Ms. Boothby said.

Many businesses have the option to buy special access connections directly from AT&T or from smaller competitors, such as EarthLink or TW Telecom Inc., Ms. Boothby said. But because these rivals often resell AT&T special access lines, it affects those firms' ability to compete."It's weakening competitors who you're counting on to keep downward pressure across the whole market," Ms. Boothby said. who you're counting on to keep downward pressure across the whole market

Sprint uses the special access lines to connect its cell towers to the broader network, known as "backhaul." All wireless carriers need backhaul to connect their network of cell towers, and Sprint says about 30% of its operating expenses at each cell site go to backhaul. Sprint estimates the changes will increase its backhaul prices in some areas by 24%.

"It puts the rest of the wireless industry at a competitive disadvantage," said John Taylor, Sprint spokesman. Mr. Taylor said the company won't pass along the price increase to its customers.

Verizon Wireless and T-Mobile US, Inc. could also be affected in areas where they have to buy backhaul from AT&T. T-Mobile could feel less pain from the price increase because it has deliberately tried to purchase backhaul from a broad range of providers, according to a person familiar with the carrier's network. Verizon declined to comment.

Verizon also sells special access connections, and in 2012 it faced opposition from the same companies when it proposed increasing rates by 6% for similar services. The company later withdrew the increase.

Write to Ryan Knutson at ryan.knutson@wsj.com

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October 18, 2013

Via Electronic Filing

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Re: ***Ex Parte Communication***
Special Access Rates for Price Cap Local Exchange Carriers, WC Docket No. 05-25, RM-10593; Technology Transitions Policy Task Force, GN Docket No. 13-5; Petitions to Launch a Proceeding Concerning the TDM-to-IP Transition, GN Docket No. 12-353; Connect America Fund, WC Docket No. 10-90

Dear Ms. Dortch:

On October 10, 2013, AT&T sent letters to many of its special access customers, informing them that, effective November 9, 2013, AT&T will no longer offer new term plans longer than 36 months for tariffed TDM services.[1] These letters, which were distributed during the recent government shutdown, eliminate the five- and seven- year term plans that many customers have come to rely on when obtaining special access services. By unilaterally forcing these customers onto shorter term plans, AT&T is effectively raising its rates by eliminating the additional discounts it has issued when customers commit to longer term plans.[2] These lost discounts will result in substantial

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[1] AT&T "Accessible Letter" No. ACCESS13-063, *AT&T 13-STATE – Announces the Elimination of Term Plans Exceeding 3 Years for Multiple Digital Services* (Oct. 10, 2013), attached as Exhibit A; AT&T "Accessible Letter" No. CLECSE13-082, *AT&T Southeast Region – Announces Elimination of Term Plans Exceeding 3 Years for Multiple Digital Services* (Oct. 10, 2013), attached as Exhibit B; *see also* AT&T "Accessible Letter" No. ACCESS13-064, *AT&T 13-STATE – Announces Expiration Dates on Term Plans for Specific Optical Services* (Oct. 10, 2013), attached as Exhibit C (establishing fixed termination dates for future term commitments for OCn point-to-point services, dedicated SONET Ring Service, OC-192 SONET Ring Service, OPT-E-MAN and CSME Service).

[2] Customers have long been forced to enter into anticompetitive volume and term agreements in order to receive the accompanying discounts and avoid the even more egregious month-to-month rates that would otherwise apply. *See, e.g.*, Declaration of Stanley M. Besen and Bridger M. Mitchell, *Anticompetitive Provisions of ILEC Special Access Arrangements*, attached as Appendix A to Comments of BT Americas, *et al.*, WC Docket No. 05-25, at 32 ¶ 55 (Feb. 11, 2013) (Redacted Version). AT&T's most recent

price increases for special access customers. Sprint, for example, estimates that AT&T's proposed action will increase special access prices by as much as 24 percent.[3]

AT&T's rate hike will cost carriers, and the customers they serve, tens of millions of dollars and will have a sweeping effect on a wide range of services and activities. For example, carriers depend on DS1 and DS3 special access services to connect to the public safety answering points ("PSAPs") they need to reach to provide 9-1-1 services. In addition, in most instances, competitive carriers have been forced to use TDM-based circuits to interconnect with AT&T for the exchange of voice traffic, since AT&T refuses to interconnect via IP-based circuits.[4] Thus, AT&T is using its market power both to require TDM-based interconnection and to raise the costs of the circuits required to accomplish that interconnection.

Moreover, businesses and mass market consumers will be hurt by AT&T's rate hike because special access is a pervasive component of nearly every communications service they use, from residential Internet access to corporate intranets to cellular service. AT&T's price increases will raise the costs of these retail services because they are provided via special access services that service providers obtain from AT&T and its subsidiaries. Ultimately, then, AT&T's actions will harm American businesses and consumers that depend on special access services to accomplish a wide array of day-to-

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action extends that abuse of market power by reducing even further the options for purchasing these necessary inputs.

[3] This estimate is based on an analysis of AT&T's tariffs and reflects the difference in the costs of a ten-mile DS3 circuit with two channel terminations under currently-available five or seven year plans versus the prices for the same circuit under a three-year plan. Sprint's analysis also shows that the price of a similar DS1 circuit would increase by as much as 14 percent if customers are forced to move to a three-year term plan.

[4] *See, e.g.,* Reply Comments of Sprint Nextel Corporation, GN Docket No. 12-353, at 2 (Feb. 25, 2013) ("Sprint has no voice IP interconnection agreements with the AT&T or Verizon incumbent LECs, and AT&T has continued to assert that it has no obligation under the Act to interconnect with Sprint on an IP basis."); Comments of Cablevision Systems Corporation, GN Docket No. 12-353, at 3 (Jan. 28, 2013) ("Large ILECs may have little incentive to upgrade their interconnection facilities to IP, as they derive revenues from transporting TDM traffic and raise their IP-based competitors' costs by requiring them to convert traffic to TDM."); Comments of Cbeyond Communications, LLC, *et al.*, GN Docket No. 12-353, at 12-13 (Jan. 28, 2013) (noting that AT&T has refused requests for SIP interconnection for the exchange of local voice traffic); Comments of Sprint Nextel Corporation, WC Docket No. 10-90, at 12 (Feb. 24, 2012) ("Last year, AT&T was unable to identify a single IP interconnection agreement that its ILEC affiliates had executed . . ."); *see also* Comments of XO Communications, LLC, GN Docket No. 13-5, at 12-13 (July 8, 2013).

day activities, such as processing credit card transactions, sending emails, tracking inventory, managing manufacturing facilities, surfing the Web, using an automated teller machine ("ATM"), calling customer service, or reaching emergency services.

At bottom, AT&T's letters regarding the changes to its term plans are little more than an effort to exploit its market power before the Commission has had a chance to conclude its pending proceedings on special access prices and the transition from TDM to IP based networks.[5] The very fact that AT&T can unilaterally impose a substantial price increase on its customer base is a sign of its continuing market power over a broad range of special access services.[6] The question of whether AT&T retains market power in the special access marketplace is at the heart of many of the Commission's ongoing proceedings, including in the special access proceeding.[7] Indeed, the Commission's proposed data request is designed to help it gather the information it needs to resolve

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[5] AT&T's market power derives, in large part, from the fact that it is the only carrier with last-mile facilities-based connections to a majority of commercial buildings within its in-region footprint. *See, e.g.*, Reply Comments of XO Communications, Inc., WC Docket No. 05-25, at 12 (March 12, 2013) (noting AT&T's "pervasive reach to commercial buildings within its territory").

[6] It is well-established that an entity has market power when it can profitably raise prices. *See Agnew v. NCAA*, 683 F.3d 328, 335 (7th Cir. 2012) (determining market power includes a showing of "the ability to raise prices significantly without going out of business"); *Petition of Qwest Corporation for Forbearance Pursuant to 47 U.S.C. § 160(c) in the Omaha Metropolitan Statistical Area*, Memorandum Opinion and Order, 20 FCC Rcd 19415, ¶ 18 n.54 (2005) ("Market power is defined as the 'ability to raise prices by restricting output,' or 'to raise and maintain price above the competitive level without driving away so many customers as to make the increase unprofitable.'") (citation omitted). *See also, e.g.*, *NCAA v. Board of Regents*, 468 U.S. 85, 109 n.38 (1984).

[7] *See, e.g., Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, Report and Order and Further Notice of Proposed Rulemaking, 27 FCC Rcd 16318, ¶ 67 (2012). The extent of the BOCs' market power is also the crux of the petition to reverse forbearance that is currently pending in this docket. Petition of Ad Hoc Telecommunications Users Committee, *et al.* to Reverse Forbearance from Dominant Carrier Regulation of Incumbent LECs' Non-TDM-Based Special Access Services, WC Docket No. 05-25 (Nov. 2, 2012); *see also* Petition of tw telecom inc., *et al.* to Establish Regulatory Parity in the Provision of Non-TDM-Based Broadband Transmission Services, WC Docket No. 11-188 (Oct. 4, 2011).

disputes over the extent of the former Bell Operating Companies' ("BOCs'") market power.[8]

AT&T's letters also have implications for the ongoing proceedings regarding the transition from TDM to IP.[9] AT&T appears to be trying to dictate the terms of that transition by making its TDM-based services more expensive. This will allow AT&T to leverage its market power in TDM special access to increase the price it charges for its IP-based alternatives to TDM special access.

Accordingly, and for all the reasons explained above, the Commission should prohibit AT&T from effectuating its proposed price increases until the FCC has resolved its ongoing proceedings examining AT&T's market power over special access services – including Ethernet services[10] – and the appropriate transition to IP-based networks. In the meantime, the Commission should not permit rate increases, such as those proposed

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[8] *Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket No. 05-25; RM-10593, Report and Order, DA 13-1909, ¶ 2 (rel. Sept. 18, 2013). AT&T's ability to impose unilaterally unjust and unreasonable rate increases in areas where it has been granted pricing flexibility is a central issue in the pending special access proceeding. It is worth noting, moreover, that in areas that are subject to price caps, AT&T's proposed changes to its term discount offerings may well raise its actual price index ("API") above its price cap index ("PCI"). *See Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, Report and Order, 27 FCC Rcd 10557, ¶ 10 n.23 (2012) ("*Pricing Flexibility Suspension Order*") (explaining that a price cap LEC's rates are in compliance with the Commission's rules if the API is less than or equal to the PCI); *see also* 47 C.F.R. § 61.49(d) (explaining the showings a price cap carrier must make if it proposes rates that will result in an API that exceeds the applicable PCI).

[9] *See, e.g., Technology Transitions Policy Task Force,* GN Docket No. 13-5; *Petitions to Launch a Proceeding Concerning the TDM-to-IP Transition,* GN Docket No. 12-353.

[10] Prices and regulations for TDM and non-TDM-based special access services are interrelated, at least to the extent that the Commission has relied on the availability of price-regulated TDM-based services to justify forbearance from dominant carrier regulation of AT&T's non-TDM services. *See Petition of AT&T Inc. for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Its Broadband Services; Petition of BellSouth Corporation for Forbearance Under Section 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Its Broadband Services*, Memorandum Opinion and Order, 22 FCC Rcd 18705, ¶¶ 25, 60 (2007).

by AT&T, to take effect.[11] Refusing to allow AT&T to effectuate its price increase while the Commission evaluates issues related to AT&T's market power would be consistent with the Commission's decision to suspend its rules governing grants of pricing flexibility, while it works to conclude the special access proceeding.[12]

Respectfully submitted,

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[11] Some of AT&T's proposed changes will require it to file tariff revisions, and the undersigned parties plan to file petitions asking the Commission to reject or suspend and investigate those tariff revisions. *See* 47 C.F.R. § 1.773.

[12] *See Pricing Flexibility Suspension Order.*

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Exhibit A

Accessible

AT&T 13-STATE - Announces the elimination of Term Plans Exceeding 3 Years for Multiple Digital Services

Date: October 10, 2013

Number: **ACCESS13-063**

Category: Special Access

Issuing ILECS: AT&T Illinois, AT&T Indiana, AT&T Ohio, AT&T Michigan, AT&T Wisconsin, AT&T California, AT&T Nevada, AT&T Arkansas, AT&T Kansas, AT&T Missouri, AT&T Oklahoma, AT&T Texas and AT&T Connecticut (collectively referred to for purposes of this Accessible Letter as "AT&T 13-State")

Contact: Account Manager

Subject to any delays resulting from the federal government shutdown, effective November 9, 2013, AT&T 13-State no longer will offer new term plans longer than 36 months for tariffed TDM services. Existing services under term plans that are longer than 36 months and already in place as of November 9, 2013 will remain subject to the terms and conditions of those plans until their terms expire, at which time customers may either select from the term plans for which they are eligible under the expiring plan, or continue receiving service under month-to-month or monthly extension rates.

AT&T 13-State is modifying its ordering systems to reflect these tariff changes. Upon completion of those modifications, if a customer submits an order for a term plan longer than 36 months, the order will be rejected automatically.

System modifications may not be fully implemented immediately. Until those modifications are complete, if a customer submits an order for a term plan longer than 36 months, AT&T's ordering systems may automatically return a firm order confirmation ("FOC") that incorrectly confirms such order, contrary to the terms of AT&T's tariff. In that case, AT&T will notify the customer that the term plan ordered is not available. The notice will be provided by email (to the address identified by the customer), as soon as possible after submission of the order. That notice will supersede any confirmation, via FOC or otherwise, of the term plan originally chosen by the customer. AT&T's email notice will inform the customer of its intent to revise the term (and associated rate) applicable to the customer's order to reflect a 36-month term plan (*i.e.*, the maximum term offered pursuant to AT&T's tariff), unless the customer modifies or cancels the order prior to the service due date (in which case no order modification or cancellation charges will apply).

Notice of the revision also will be reflected in the customer's first bill. When a customer receives such a notice, the customer may decline the charges by issuing a disconnect order (without early termination charges) if the customer does not wish to accept service under a 36-month term plan. If the customer does not issue a disconnect order prior to the due date of the first bill for the service, the customer will be deemed to have acknowledged and approved the order for the 36-month term plan.

AT&T reserves the right to modify or to cancel the information in this Accessible Letter. In the event of such modification or cancellation, AT&T will notify carriers in a subsequent Accessible Letter. AT&T will incur no liability if the information in this Accessible Letter is modified or cancelled.

The changes apply to the following special access service types:

- Analog Private Line and DS0 Services
- DS1 and DS3 Services

A detailed list of AT&T 13-state Tariff sections impacted is provided in Exhibit 1:

Exhibit 1 - 13-State Tariff Term Plan Elimir

If you have questions related to these changes, please contact your AT&T Account Manager.

AT&T reserves the right to modify or to cancel the information in this Accessible Letter. In the event of such modification or cancellation, AT&T will notify carriers in a subsequent Accessible Letter. AT&T will incur no liability if the information in this Accessible Letter is modified or cancelled.

Exhibit B

Accessible

Date: **October 10, 2013** Number: **CLECSE13-082**

Effective Date: **November 9, 2013** Category: **Special Access**

Subject: **(BUSINESS PROCESSES) AT&T Southeast Region - Announces Elimination of Term Plans Exceeding 3 Years for Multiple Digital Services**

Related Letters: **NA** Attachment: **Yes**

States Affected: **Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee**

Issuing ILECS: **AT&T Alabama, AT&T Florida, AT&T Georgia, AT&T Kentucky, AT&T Louisiana, AT&T Mississippi, AT&T North Carolina, AT&T South Carolina and AT&T Tennessee (collectively referred to for purposes of this Accessible Letter as "AT&T Southeast Region")**

Response Deadline: **NA** Contact: **Account Manager**

Conference Call/Meeting: **NA**

Subject to any delays resulting from the federal government shutdown, effective November 9, 2013, AT&T no longer will offer new term plans longer than 36 months for tariffed TDM services. Existing services under term plans that are longer than 36 months and already in place as of November 9, 2013 will remain subject to the terms and conditions of those plans until their terms expire, at which time customers may either select from the term plans for which they are eligible under the expiring plan, or continue receiving service under month-to-month or monthly extension rates.

AT&T is modifying its ordering systems to reflect these tariff changes. Upon completion of those modifications, if a customer submits an order for a term plan longer than 36 months, the order will be rejected automatically.

System modifications may not be fully implemented immediately. Until those modifications are complete, if a customer submits an order for a term plan longer than 36 months, AT&T's ordering systems may automatically return a firm order confirmation ("FOC") that incorrectly confirms such order, contrary to the terms of AT&T's tariff. In that case, AT&T will notify the customer that the term plan ordered is not available. The notice will be provided by email (to the address identified by the customer), as soon as possible after submission of the order. That notice will supersede any confirmation, via FOC or otherwise, of the term plan originally chosen by the customer. AT&T's email notice will inform the customer of its intent to revise the term (and associated rate) applicable to the customer's order to reflect a 36-month term plan (*i.e.*, the maximum term offered pursuant to AT&T's tariff), unless the customer modifies or cancels the order prior to the service due date (in which case no order modification or cancellation charges will apply).

Notice of the revision also will be reflected in the customer's first bill. When a customer receives such a notice, the customer may decline the charges by issuing a disconnect order (without early termination charges) if the customer does not wish to accept service under a 36-month term plan. If the customer does not issue a disconnect order prior to the due date of the first bill for the service, the customer will be deemed to have acknowledged and approved the order for the 36-month term plan.

AT&T reserves the right to modify or to cancel the information in this Accessible Letter. In the event of such modification or cancellation, AT&T will notify carriers in a subsequent Accessible Letter. AT&T will incur no liability if the information in this Accessible Letter is modified or cancelled.

The changes apply to the following special access service types:

- Analog Private Line and DS0 Services
- DS1 and DS3 Services

A detailed list of AT&T Southeast Tariff sections impacted is provided in Exhibit 1:

Exhibit 1 - Southeast Tariff Term Plan Elimir

If you have questions related to these changes, please contact your AT&T Account Manager.

AT&T reserves the right to modify or to cancel the information in this Accessible Letter. In the event of such modification or cancellation, AT&T will notify carriers in a subsequent Accessible Letter. AT&T will incur no liability if the information in this Accessible Letter is modified or cancelled.

Exhibit C

at&t

Accessible

AT&T 13-STATE - Announces Expiration Dates on Term Plans for Specific Optical Services

Date: October 10, 2013

Number: **ACCESS13-064**

Category: Special Access

Issuing ILECS: AT&T Illinois, AT&T Indiana, AT&T Ohio, AT&T Michigan, AT&T Wisconsin, AT&T California, AT&T Nevada, AT&T Arkansas, AT&T Kansas, AT&T Missouri, AT&T Oklahoma, AT&T Texas and AT&T Connecticut (collectively referred to for purposes of this Accessible Letter as "AT&T 13-State")

Contact: Account Manager

Effective November 9, 2013, AT&T 13-State will grandfather certain term plans associated with the following access services:

- Optical Carrier Network (OCN) Point-to-Point Service
- Dedicated SONET Ring Service and OC-192 Dedicated SONET Ring Service
- OPT-E-MAN® and CSME Service

Grandfathering will be implemented by establishing fixed termination dates for future term commitments under the grandfathered term plans, which will apply regardless of the nominal lengths of those term plans. In other words, once the fixed expiration dates become effective, affected term plans will expire on those dates, regardless of when they would otherwise expire. Interstate Access Guidebook changes implementing the fixed termination dates are being made sufficiently in advance of the fixed termination dates and existing term commitments will not be affected.

The expiration dates for new term plans vary by service. All term plans which are established, or those that are renewed or extended, after November 9, 2013, with term lengths that otherwise would expire at any time after the fixed term plan expiration dates, will instead expire on the fixed term plan expiration dates. Following the expiration of the term plans, services will be provided on a month-to-month basis at the applicable month-to-month rates.

A list of AT&T 13-State Guidebook sections, services impacted, and term plan expiration dates is attached as Exhibit 1:

Exhibit 1 - 13-State Guidebook Term Plan

If you have questions related to these changes, please contact your AT&T Account Manager.

AT&T reserves the right to modify or to cancel the information in this Accessible Letter. In the event of such modification or cancellation, AT&T will notify carriers in a subsequent Accessible Letter. AT&T will incur no liability if the information in this Accessible Letter is modified or cancelled.

Mr. DOYLE. Thank you.

Let me ask Mr. Feld and Mr. Iannuzzi, how can AT&T institute up to 24 percent price increases if these markets are competitive? And do you find fault in claims by some that competition today eliminates the need for a regulatory backstop, particularly in light of AT&T's action to effectively raise special access prices?

Mr. IANNUZZI. Sure. Only a dominant market player can go and raise prices ad hoc and to that level of magnitude. It was quite shocking to see that take place where those network elements are very vital to run the connectivity within our network. So if there was true ability to shop and pick, then they would be foreclosing those sales and those revenue streams. And AT&T is in the business to make profit, and to then just raise prices, if the market was working and there is an equal service, you would go pick the next lowest provider, provided they had equivalent capabilities.

Mr. FELD. I would add that we often have a confusion between the underlying infrastructure and the things that ride on top of the underlying infrastructure. And we look at the number of wireless carriers, the number of carriers that offer service through that underlying infrastructure, and looking at just the surface of that we say, wow, there is a lot of competition. But when you actually get below the surface to the infrastructure on which all of that competition rides, you have still the same kind of network problems, still the same kind of infrastructure monopolies that you have to worry about.

So I think that what we have seen in special access—and this is not a new problem, this has been going on for many years—is that there was a lot of hope and anticipation when we set up criteria about how we were going to tell whether there was competition. Some of that did not happen, but also the criteria were, frankly, too optimistic and did not take into account the difference between people offering retail service or people offering different kinds of commercial service and the critical infrastructure that you have to get to in order to reach the customers to offer that.

Mr. DOYLE. Thank you.

Mr. Cicconi, would you like to respond?

Mr. CICCONI. Yes, sir.

First of all, let's be clear. When we are talking about the special access facilities mentioned here, we are not talking about services that are broadband. The FCC has not classed these services as broadband.

I think one of the reasons, Mr. Doyle, that you read the Wall Street Journal article that we are not offering service contracts out 5 and 7 years is because we plan as part of the IP transition, the reason we are here today, to be replacing these old facilities with modern broadband fiber-based facilities, including ethernets. So naturally we don't want to be offering long-term contracts on a facility if we are going to be replacing it with an alternative facility.

There is a proceeding underway on special access currently at the FCC that is designed to gather facts on what alternative facilities are available for other providers like TelNet to use. We think that the data the FCC collects from all providers, including cable, is going to show that there are ample alternative facilities there.

And one of the alternatives, by the way, is for a CLEC to build its own facilities. We right now have a project underway, and hopefully within 2 years we will have run fiber to 1 million businesses in our 22–State footprint. And I think any other carrier out there is free to do the same thing.

Mr. DOYLE. Mr. Cicconi, listen, I understand that you are transitioning and that it probably makes sense that you are not going to do 7-year contracts. I think the concern is not so much that you are discontinuing the long-term contracts, but that you are raising the rates, you are not passing down the discounts. And if this were truly a competitive market, I don't know how you could get away with doing that.

Mr. CICCONI. Mr. Doyle, I have to go back and check on the rates. But I don't think we have raised prices. I think we have eliminated some rate plans. But I don't think prices have gone up.

Mr. DOYLE. I would like to see that.

Let me just—well, Mr. Chairman, I see my time has expired. I will just wait for another time. Thank you.

Mr. LATTA [presiding]. The gentleman yields back.

And at this time the chair would recognize the gentlelady from Tennessee, the vice chair of the full committee, Mrs. Blackburn.

Mrs. BLACKBURN. Thank you, Mr. Chairman.

And I want to go back to Mr. Waxman's question, talking about the peering agreements. Mr. May, let me come to you, and then, Mr. Feld, I am going to want to hear from you. Do you think the FCC should do a pilot project and test some of the IP networks to figure out how to make the transition easier for consumers, for businesses? Where are you on a pilot project?

Mr. MAY. I am in favor of one, but I have to say I probably don't need to be as delicate as Mr. Cicconi may need to be. I think the FCC has been a little slow, I would say, in getting these trials off the ground, so I would like to see them move quickly. And I think they would yield useful information. But I don't want to see them used—over a long time of watching the FCC, sometimes I know when you start things like this they can be used in ways that delay ultimately the ultimate decision making. That shouldn't be allowed to happen with these projects.

You started out by mentioning the interconnection, I think, in the IP transition. And I just want to say, and I said this in my testimony with regard to IP-to-IP interconnection, I don't think that—and I am just assuming we will have the trial or not—but ultimately I don't think the FCC should presume that it is going to regulate these interconnection agreements in the same way that it did in the TDM world. It is likely that there won't be many interconnection problems. That hasn't been the case with pure IP-to-IP connection. Thus far they have been very rare that there have been disputes. They have ultimately have been worked out really in a voluntary marketplace way.

So my counsel would be for the FCC to just presume that it is not going to intervene, that we watch the situation. If it does turn out that there is a real problem with interconnection, I said in my testimony that there could be a regulatory backstop. But it shouldn't look anything like the current 251/252 process that basically really resembles more of a public utility style regulatory re-

gime. It should be a dispute resolution process that ultimately depends on mediation, and perhaps ultimately baseball-style arbitration or something like that.

Mrs. BLACKBURN. OK. Mr. Feld, anything?

Mr. FELD. First, we support having well-constructed trials. I do think that the FCC has been behaving responsibly, however. What AT&T has put in so far is much more akin to a phase-in or a beta test, which you get to at the end, rather than time-delineated trials with suitable safeguards, which are really where we are now. We saw what happened when you tried to flip a wire center on Fire Island this summer, and I am very glad to hear AT&T say we don't want to do a flash cut like that.

The issue here is, as the FCC properly said in its proper notice, is that while the trial is voluntary for the carrier, it is not voluntary for the customers. And the other point I would make is that in a network if something goes really wrong and the wire center starts to go down, it can take down other portions of the network with it.

So we believe in being cautious, but we think that, as with any other kind of trial, there needs to be appropriate safeties in place and that those need to be described and settled before we initiate any trials rather than after we get into it.

Mrs. BLACKBURN. All right. Thanks.

I am going to yield my time back, Mr. Chairman.

Mr. LATTA. The gentlelady yields back. And at this time the Chair recognizes the chairman emeritus of the full committee, Mr. Dingell, 5 minutes.

Mr. DINGELL. Mr. Chairman, I thank you for your courtesy and I commend you for this hearing. I also wish to express my thanks to Mr. Welch for his courtesy to me. Thank you.

I would like to begin by welcoming a fellow citizen of Michigan, Mr. Mark Iannuzzi, this morning. His company, TelNet Worldwide, offers valuable services to the businesses of Michigan.

At issue this morning is the transition to IP-based communications networks. As some of our witnesses have noticed, this transition is already underway and has the potential to confer significant economic and technological benefits on our people. But we need to learn more about what that transition means for the future of communications in this industry and particularly as to how it will affect the consumers.

Incumbent carriers make the very valid point that they are required to maintain TDM networks at great cost despite the fact that only 30 percent of all Americans used ILEC switched networks in 2012. It is my view that the billions spent to maintain legacy networks can be more efficiently based and invested in IP-based networks that will be the backbone of the 21st century telecommunications. This part will help advance the goals of the 2010 National Broadband Plan.

With that said, I understand that AT&T has petitioned the Federal Communications Commission for forbearance from certain regulations in order to establish two geographically limited IP-based test projects. I think there is real value in this approach. It will provide an invaluable case study to consumers, businesses, policymakers, and to the government about what the transition to IP-

based networks will entail. I encourage the Commission to work with AT&T to set these projects in motion, making certain that there are mechanisms in place for monitoring and effectively resolving consumer complaints.

In addition to the lessons that we can learn from AT&T's potential trial projects, I suggest that policymakers also keep in mind several fundamental principles when considering the role of government vis-a-vis IP-based communications. As Public Knowledge has wisely suggested, our focus should be on ensuring universal connectivity, interconnection and competition, consumer protection, network reliability, and public safety. Those are very important principles to be kept in mind as we go forward.

I firmly believe that there still exists a need for certain ex-ante obligations because the Communications Act's purpose is to make available insofar as possible to all—and I emphasize all people of the United States—the benefits of our communications system. That presumption and that comment is as valid today as it was 79 years ago.

Mr. Chairman, I thank you for your courtesy. I am yielding back a minute and 24 seconds. And I thank Mr. Welch, and I will be happy to yield to the gentlelady.

Ms. ESHOO. I appreciate it, Mr. Dingell.

Can I just pursue this issue of the trial? It seems to me that there is kind of a chicken-and-egg thing going on between the FCC—maybe it is because we don't have a full Commission yet—but it seems to me the following. And I could be wrong, so, Jim, you just jump in and tell me if you think I am wrong. You will do that anyway.

But anyway, you want the trials, you want the FCC to approve, give you the green light to go ahead with a trial. It seems to me that the FCC is saying we will do a trial but we want the following things in it, and there is not an agreement. Does that look anything like how you see reality? Because time is going on.

Mr. CICCONI. Right.

Ms. ESHOO. And I think what Mr. Dingell said is it is just on the mark. We need to get going.

Mr. CICCONI. I honestly think it may just be a function of our timing on this, as one chairman is on his way out and another chairman isn't yet in there. The questions actually issued were fairly recent, I mean, and they waited until 6 months after we filed the petition to actually ask the questions. And, frankly, I mean, like a lot of you, I have been around the town a while and I took the questions as a way of the FCC saying we are not ready to answer this yet.

But I do take comfort in the fact that we have Democratic and Republican Commissioners both on the FCC who have said, yes, we should have trials. Mr. Pai said that, Commissioner Rosenworcel has said that, categorically go forward. The principal author of the National Broadband Plan, Blair Levin, has said, absolutely, he would have said yes to the trials on day one.

I think the key, Congresswoman, is this isn't about us exclusively, it is industry-wide and it is nationwide. And I for one have been reluctant to put in the FCC a, quote/unquote, AT&T plan for conducting the trials. I think it is really the job of the FCC to work

with all of industry and all stakeholders and, frankly, State-level government as well to design those trials, much like was done during the DTV, and I am pretty confident that once Chairman Wheeler gets there that that is what will happen.

Ms. ESHOO. Great. Thank you.

Thank you, Mr. Dingell.

Mr. LATTA. The gentlelady yields back her time to the gentleman whose time has expired.

And the Chair now recognizes the gentleman from Illinois, Mr. Shimkus, for 5 minutes.

Mr. SHIMKUS. Thank you, Mr. Chairman. Great hearing. I have learned a lot. And I love trying to stay as long as I can because you really do hear the point-counterpoint. But you never miss the opportunity to hear a member bring up a personal story. So, Mr. Cicconi, I am sure your staff prepared you for that personal story, and if they didn't then you might need to look for other staff members.

Mr. CICCONI. I wish, Mr. Shimkus.

Mr. SHIMKUS. But let me address, and I always get concerned when I start agreeing with Mr. Waxman every now and then. I have to check the data file on that. But I do agree we need to move on a test. We just need to move forward.

And to his comments on Google, they are probably out here or they are listening, I would encourage them to come in, because my guess it is 251/252, is why they are not into voice. That is what my guess is.

Now, if you have talked to them, Mr. Feld, and they have given you that data. But I think there is interconnection issues. It is very informative that they are not doing that, and I think that is a lesson we should learn and find out.

So having said that, just a blanket statement, and I know the FCC is looking into this, these dropped calls in rural areas are an issue. And that talks about a backstop. I mean, that also reinforces an issue of having some type of backstop. So I want to raise that.

But to Mr. Feld and Mr. Cicconi, public safety is a big issue for all of us here. Anna and I work very closely on this. In this move, how do you envision public safety being positively, or maybe—hopefully not negative—we won't accept a negative, obviously, response on public safety. So how do we deal with that? Why don't we start with Mr. Cicconi and then we will go to Mr. Feld.

Mr. CICCONI. I mean, I hate, Mr. Shimkus, to sound like it is circular reasoning here, but I think this is one of the reasons we need to have the trials out there. We are fairly confident that we can design these systems in a way that takes account of public safety. Moreover, we fully accept that they have to work well for public safety. You simply can't have a new technology deployed where 911 doesn't work or other public safety features don't work. So I think we all recognize this is imperative, and I think we need to stress test it to ensure that it does work and that we can transition it accordingly. But I think we all accept the obligation has to be there and we simply can't replace the old technology with new technology unless 911 works.

Mr. SHIMKUS. Thank you.

Mr. Feld.

Mr. FELD. Two things. One, planning precedes trials rather than trials preceding planning. And the thing that has been troubling to me is I get that we will need to have some information that we will gather in the trials, that is the point of doing trials, but before we say let's throw a switch and see what happens to public safety on this stuff, I want to know what the recovery mechanisms are, I want them to have limited tests first before you move on to full tests.

The other important factor is we need to start thinking of how we make a more robust public safety system in our competitive and differently enabled technology universe. There is virtue in redundancy. So maybe we don't have to put everything on every network the same way if we have ways in which the networks will work together that are for public safety.

We have seen some things coming out the Hurricane Sandy hearings that the FCC has been conducting where we have seen how different technologies have different strengths and weaknesses and have responded in a different way. And I think that one of the exciting advantages of the IP transition is that it allows us to start thinking about how to take advantage of the structures of the Internet which rely on redundancy and flexibility for stability rather than requiring 59 liability from every single network that is participating.

The last thing I will just mention is we do have to be wary of new issues that are coming up. I mentioned in my testimony the problem of swatting, which is caller ID spoofing, which allows people as a joke to send SWAT teams to other people's houses. That is not a particularly funny joke. And while obviously these are challenges that need to be resolved, we need to be accumulating this checklist of what needs to work as we move forward.

Mr. SHIMKUS. Yes, and let me finish on this. I have been really involved with trying to raise this issue with the FCC with the convergence of technology and I have given up. I don't think we will ever change the FCC and the bureaus that it has.

The last thing, the question is, Mr. Iannuzzi, have you seen in the business sector the cutting of the cord from landline to cell for the business community as we have seen in residential services?

Mr. IANNUZZI. Mr. Congressman, an excellent question. In the business community it is a distinctly landline-oriented business. While mobile phones are part of the workforce for the common employee, the way that businesses communicate and collaborate is inherently a landline type of function. It is because there is group capabilities going on. You are continually interacting with a wide variety of locations perhaps, and so forth, which is not conducive to how cellular technology has been deployed, which is more about the individual and how that connects together.

If I may on your very important item here about security and public safety, the competitive energies already have migrated for the most part to IP-based 911 service. It is a far superior solution than currently the legacy TDM one. Why? Because when we are trying to get our customers' calls to an emergency authority, the IP network allows us to make sure that if there is any bottleneck to get to the public safety point, we have alternate routes to alternate

safety points to get to them or answer it even through our own operators to make sure that we connect the dots.

Furthermore, we have added in cool technology where if somebody picks up the phone and they dial 911, we not only send the call to the public safety organization, but we can then send it to the building supervisor, the provost of the university, or if you are a residential user you could go to—you are out at the show and somebody calls 911 from your home, we will sent it to your cell phone so that you know that 911 call was made from your home. So we have already made that move.

And this thing about the IP-to-IP interconnection, yes, do you have to do things in a measured fashion? Certainly. But when it comes to network center connecting and peering at the IP basis, that is different than how you are talking to the end user, and that IP-to-IP interconnection goes on right now.

Mr. LATTA. Thank you very much. The gentleman's time has expired.

And the chair now recognizes the gentleman from Vermont, Mr. Welch, for 5 minutes.

Mr. WELCH. Thank you very much, Mr. Chairman.

Mr. Burke, thank you for being here. Your testimony mentions a few carriers in Vermont are investing in fiber, and my question is what policy decisions would change carrier incentives to invest in rural areas and are there regulations that are imposing unnecessary costs that are hindering any of that investment?

Mr. BURKE. Thank you for the question, Congressman. I think that it is a very tricky question when you get to how do we move out into a better business plan in more rural areas. I mean, dollars are dollars. And I guess to call on a predecessor of my own, I will go back to my grandfather. He was a dairy farmer, and I can remember when I was little he said, you know why this stool has three legs, Johnny? And I said, no, sir, I don't. He said, because if it had two it would just fall over.

And I think that is actually what we may be dealing with here. I think we actually have a potential as we move forward into an IP world, and we are moving there, to be able to do it in a better and more focused way if in fact we use a stool with three legs; the Federal leg that obviously is your responsibility and the FCC's; industry's leg and how we get out there to make ubiquity part of the process here, because if it is not ubiquitous it doesn't really work the way we want it to work; and last but not least is the States' responsibility and the States' ability, be it with their own USF funds to help manage to get this stuff out there, or be it their policies to help make the move-out for industry itself more seamless, easier, and more attractive to their business plan. The States are a vital part of this. And without three legs to that stool, I am not so sure that it has got any chance of succeeding.

Mr. WELCH. Thank you.

For Mr. Cicconi and Mr. Iannuzzi, just quickly, what actions are required by the FCC in order to ensure that competition will continue and actually thrive in an all-IP world? I would appreciate it if it was quick and ABC, because I don't have that much time. I will start with you, Mr. Cicconi.

Mr. CICCONI. Well, I think you have competition today, Mr. Welch, and I think as the FCC moves forward with the IP transition it certainly ought to take a look at what regulations are needed going forward to help preserve the competition that is there today. I would certainly grant that. But I would also suggest that on a going-forward basis that it would be a mistake to assume that the problems of the present and the future are necessarily the same as they were in 1996 or 1934.

So I think the notion of taking legacy rules and applying them to new technology is something the National Broadband Plan actually spoke to, and it talked about how applying legacy rules could actually retard the investments that were necessary and could have unintended consequences of siphoning investments away from the new technologies that were needed. So I think that would be our main concern, is that we not overcorrect here and assume there are problems until we actually know what those problems are.

Mr. WELCH. Thank you.

Mr. Iannuzzi?

Mr. IANNUZZI. It is very simple. In terms of the FCC, we just need the clarity that removes, that if there is any technological implication in the way the act works, it is technically neutral. Communication systems are by their design technical, so if there is not technical advancements, then what were we trying to do in terms of trying to get where we are at, if we weren't trying to make things better, faster, cheaper, smarter.

So my point here is that the key thing to ensure competition is to eviscerate. Take out the eraser on the spot that we have the technology underpinning to the act, because it was about creating competition. It was a framework to correct a market-based structure so that we could compete.

Mr. WELCH. Thank you very much.

Back to Mr. Burke, we have got a real epidemic of rural call completion, and as far as my constituents and the people you serve as well, our concern, fixing that problem, can't come fast enough. How can IP transition help to address the issue of incomplete calls, particularly in rural areas?

Mr. BURKE. Well, I think that obviously you have to take a look as you move forward here with where the problems lie. And if you take a look at what we will see I think in call completion, the order comes out next Monday, I believe, is the date that the FCC is actually going to issue it. The fact of the matter is that call completion is probably a methodology that grew from terminating access charges, and as least-cost routers sensed heavy terminating access charges, they decided that they would not complete the call. Least-cost routers are innovation, too, and we can't get carried away with innovation. Certainly it has given us a lot of good things, but I suspect the idle innovator like the idle hands can be the devil's work thing, too, when it wants to be, and in fact that may have been the case here.

How we go forward is to try to make sure that there is a regulatory touch as well that keeps an eye on moving forward in this transition. Mr. Cicconi hasn't said that that isn't the right idea. I would point out, too, that with call completion, that began, and the answer to that began through the States.

When the problems occurred, I know that you got them, Congressman. You said that you did, and I believe that you did. But the fact of the matter is most of the time your public service commission or your AG's office probably got them first as people became unhappy with what they were getting and what they weren't getting in rural America. And hopefully keeping those regulations in place will allow for consumers to get the kind of protection that they have learned to expect in their old network as we move through to a new one.

Mr. WELCH. My time has expired. I yield back. Thank you.

Mr. LATTA. Thank you very much. The gentleman yields back.

And the chair now recognizes the gentleman from Louisiana, Mr. Scalise, for 5 minutes.

Mr. SCALISE. Thank you, Mr. Chairman. I appreciate your having this hearing.

And I want to thank all of the witnesses for coming and testifying and giving your perspective on the changes in technology. I am excited by it, when you see the things that people are able to do now as we have this transition to Internet protocol. You also have coupled with that the upgrades that are being made from copper to fiber optics. And, of course, that brings billions of dollars of investment. It gives consumers a lot more options to do things with voice and video and sending larger packets of data.

Of course, the investments that go with it, I know, Mr. Cicconi, your company and other incumbents are investing billions of dollars to help build out these new networks, to use this new technology in better ways even with the current regulatory environment. I want to ask your take, because some would say that the fact you are investing these billions of dollars proves that there is no need to change the regulatory structure. How would you answer that?

Mr. CICCONI. Well, I think that the first thing I would do is kind of refer back to the chart, Congressman, that opened the hearing here that talks about the way the market is set up today, where by the end of this year we will have three-quarters of Americans using either wireless only or VoIP providers as opposed to the circuit-switched provider. As I said earlier, we have fewer than 14 million circuit-switched telephone customers at AT&T at the present time, which is a small fraction of the numbers that any other provider has out there in these competitive markets. So I think that would be the first point that I would make.

The second point is that the investment that has occurred over the last few years in wireless and IP technologies is, of course, I think it is related to the fact that these are the least regulated areas of technology. It is not accurate that the 1996 act is technology neutral. In fact, it penalizes wireline technologies uniquely by imposing a lot of extra requirements on them. And I think that is one of the reasons that Google has decided not to offer VoIP service in a city like Kansas City.

Mr. SCALISE. And that is a good point. I want to ask you about that, because the 1996 Telecommunications Act does impose some ILEC-specific rules. How does that actually affect your investment decisions?

Mr. CICCONI. Well, I think on a going-forward basis with IP, I think we hear what Google hears, which is some companies advocating that we simply take the common carriage model in Title 2 and apply it as if nothing has changed to modern competitive IP services. And I certainly think that is not what the act envisioned. I also think it would be a big mistake. But it creates regulatory overhang for a company like Google or a company like AT&T in deciding to make a wireline investment decision.

Now, to the final point, we have gone ahead anyway here recently and decided to invest in this area. And, quite honestly, it was a difficult decision for us, running fiber to these buildings and expanding our user services to millions more Americans, including in a lot of rural areas. But I think it is a leap of faith on AT&T's part in terms of the regulatory environment. We have read the National Broadband Plan. We take comfort in the fact that it speaks to these issues, it has been endorsed by the President, it has been endorsed by the Congress on a bipartisan basis, and I think it gives us confidence going forward that these regulatory issues and uncertainties will get settled in the proper manner. And, of course, I think one the reasons we filed for the trials is to kind of spur that along.

Mr. SCALISE. I appreciate that.

I want to ask Mr. May, because I am running out of time, you have been advocating for an updated Telecommunications Act to reflect the digital age. If you can share with me some of the principles that you would envision. And I left my brick telephone at home because I didn't want to get into that here, but since I have got you here, you might even want to mention something about the 1992 Cable Act, which is probably also very outdated and needs to be updated.

Mr. MAY. Thank you, Congressman. That is outdated, for sure, the 1992 act. And, frankly, the 1996 act is as well, although at the time it was adopted it, you know, was a transitional piece of legislation that was good.

You know, here are the basic fundamental principles going forward. And you have to think about it really in the larger sense, because, obviously, I have talked about some regulatory backstops and safeguarding universal service and so forth. But in a large sense a new act should get rid of the silos that are in the present act, the stovepipes. And they are not technology neutral, they are based on technology constructs, the different titles. And it should replace the public interest standard that now is in the act in 110 different places, delegates authority to the FCC just to act in the public interest, that indeterminate standard, with a competition-based standard that is antitrust-like. I am not suggesting that you are going to import all of antitrust jurisprudence. But it is going to focus on the competitive marketplace and regulation; therefore, shouldn't be adopted unless there is a market failure or proof of consumer harm.

Then, finally, what a new act should do is circumscribe somewhat the FCC's general rulemaking authority, which now, as you know, operates in what we would call an ex-ante, anticipatory fashion. When you engage in that process what you do by definition is

conjecture harms that may occur in the future because you are trying to conceive of all potential harms.

What happens is generally those types of rulemakings are overly broad, broader than they need to be. So you want to get the FCC to act more in a post hoc capacity, acting on individual complaints that say there is a specific problem. You know, Mr. Iannuzzi says with this carrier in this place there is a market failure for some reason, I have got an interconnection problem. You take it into an adjudicatory context and you try and address that specific problem rather than proscribing a lot of conduct that otherwise might be beneficial to the country otherwise.

Mr. SCALISE. I appreciate the answers. And I yield back.

Mr. LATTA. Thank you very much. The gentleman's time has expired.

And the chair now recognizes the gentleman from New Jersey, Mr. Pallone, for 5 minutes.

Mr. PALLONE. Thank you, Mr. Chairman.

I think we can all agree that the IP transition already underway is good for American consumers, the economy, and the country as a whole. So I welcome this conversation.

However, we must work with industry, public interest groups, and consumers to ensure that as it progresses these technological advances do not come at the expense of consumer choice and access, public safety, or competition.

I think some of you know that nearly a year ago, October 29th is next week, my district and the State of New Jersey were hit hard by Hurricane Sandy, and one of the many impacts of that devastation was the loss of communication services. Power outages and floods disrupted many types of communications, including wireless, television, telephone, and Internet services. In fact, yesterday, I was with Congressman Leonard Lance and Yvette Clarke and Congressman Holt and Congressman Payne in Newark, and we were talking about this, you know, on a bipartisan, regional basis.

So I wanted to ask, I know some of this has been touched upon. I am going to try not to be repetitive. But I understand that traditional copper networks operate even when power lines go down. So my question of Mr. Cicconi is, because AT&T has a large legacy copper communications network and significant plans to deploy new fiber infrastructure, how will the new fiber networks handle natural disasters like hurricanes? We know that the copper continued to operate. But what happens now with the new fiber networks and, you know, dealing with that issue? How you going to deal with it?

Mr. CICCONI. There is, unfortunately, no IP technology, Congressman, that allows you to power the line. You know, you cannot put power over a fiber connection. Fiber has many other advantages in addition, though, to its Internet capacity and one of them that I think is relevant in a hurricane or a flooding zone or in a Sandy-type situation is that seawater will destroy copper and make it unrepairable. Fiber is very resilient in that type of situation, and, frankly, so are our wireless networks. They are very resilient. We get them back up and running very quickly after these storms.

And I say that, knock on wood, because we are still in hurricane season.

Mr. PALLONE. Now, again, I think that we all agree that these communities should not lose services they rely on simply because they are unlucky enough to be in the path of a storm. So if there are, you know, different consequences from these replacement services with fiber, you know, why—again, I guess this goes back to the trial, but what else can we do? Is there anything else we can do? And what are you going to do with these real world trials so we can—how do they relate to the problem that I just discussed?

Mr. CICCONI. Well, sir, I mean, I don't want to second-guess, you know, a decision made by other carriers, but I think that what trials and proper planning for the IP transition would allow is for us to test the capabilities of these services, not have people surprised if you deploy a service and a fax machine doesn't work the same way, things of that nature.

I do think it is iterative, though. I think the technology will evolve. And, frankly, we can help it evolve if we know what we are trying to do. For example, in our wireless home phone service, we have actually asked the manufacturers to add a data capability. That came online this summer. So we actually have that in our wireless home phone product.

But I think as we go forward over the years I would expect that the wireless capabilities will evolve and change to meet those needs so that, frankly, it could be more robust and more reliable and provide all of the same services and more that our copper line facilities do.

Mr. PALLONE. Do you have your hand up? Go ahead.

Mr. FELD. Yes, thank you. One of the things that we have asked the FCC to do, and to put priority on this, is to initiate a separate proceeding for disaster guidance. We have, as you know, a situation in Mantoloking, New Jersey, also Fire Island, where Verizon did not know what they were supposed to do. They didn't want to rebuild their copper network, but they also needed, had no guidance for what they should be doing instead.

We think that the FCC, in order to address this problem of public safety, needs to get out there and start a proceeding right now, first thing, as we are doing this transition. And we know that carriers are going to want to put in new infrastructure as they rebuild after storms like Sandy. What are their responsibilities? What are they supposed to do and what can the people in those communities rely on in order to be able to rebuild their lives?

We have asked that. We have had 17 other public interest organizations join us in asking the FCC to begin a proceeding on this, and hopefully we will see action on that as soon as Chairman Wheeler is confirmed.

Mr. PALLONE. Go ahead. With the chairman's approval, go ahead.

Mr. IANNUZZI. May I comment?

Mr. LATTA. Just briefly.

Mr. IANNUZZI. I would like to point out one key thing here, is that make sure we embrace the small, middle-size business market. A lot of conversation here focuses on residential, and it is certainly important. The charts that I see on the side here talk about a degradation in copper-based usage at the residential level. That

is not the case at the business level. That is typically the only connection into there, is copper facility. That copper facility can handle the power line backup requirement you need. So we often deploy where they are working in parallel; we have the next-generation IP technology taking care of all those ones and then we have the copper-based lit services, which are taking care of all those other critical functions and allowing that to work its place out as time goes on.

Mr. LATTA. Thank you.

Mr. PALLONE. Thank you, Mr. Chairman.

Mr. LATTA. The gentleman's time has expired.

And the chair now recognizes the gentleman from Missouri, Mr. Long, for 5 minutes.

Mr. LONG. Thank you, Mr. Chairman.

And thank you all for being here today. And given your testimony, I am kind of the cleanup hitter here. Well, they should have started with me. We would have been done a long time ago.

But, Mr. Cicconi, you made mention earlier in the questioning portion of this hearing that you have read the FCC's National Broadband Plan. And being that you have read that, I will remind you that they came to a conclusion, the FCC's National Broadband Plan, to, quote, "Regulations require certain carriers to maintain plain old telephone service." And they highlight a requirement that is not sustainable and lead to investments in assets that could be stranded.

So if FCC believes that maintaining legacy telephone service is not sustainable, and that investments are at risk of being stranded, shouldn't the FCC change its policies that have caused this problem?

Mr. CICCONI. Well, Mr. Long, I do think it is appropriate for the FCC to move forward. It put together an excellent plan at your direction, at the Congress' direction. It has been widely endorsed. It anticipated this very issue, the words you quoted. And, you know, and unfortunately, we are 4 years along here, and I don't think we have seen the implementation of some of the things that they recommended. But I remain very hopeful that once the Commission is back up to full strength that they will do so. And, again, our petition last year for the IP trials was designed in part to spur along the very process you just highlighted, sir.

Mr. LONG. OK. Again, when you are the last guy at bat, some of this you have touched on before. But let me ask you to elaborate, if you will, on the types of services that would be available through these Internet protocols that are unavailable on the copper networks.

Mr. CICCONI. Well, I think the IP transition—and I am at risk of oversimplifying, I am a liberal arts major, not an engineer—but it by and large is about voice becoming simply another application riding on an Internet pipeline. OK? So as we build out fiber, we are building out Internet capability and voice then becomes just another application.

And so I think what that provides, obviously, is competitive opportunities for a lot of people. But it also provides much more accessibility. It allows people to design and innovate based on IP. And so you may bring to voice services through this IP transition

some of the same innovations you are seeing, you know, in every other form of Internet service. And, you know, if you pull out an iPhone and you go through the app store, I think you can get a sense of the innovation that is available. And I think as we transition these networks toward IP, I think we will see the same types of innovation there. And I think it is obviously important for the country from every standpoint of economic activity, but also I think from a consumer standpoint too.

Mr. LONG. OK. I represent Missouri 7, which is Springfield, Joplin, Branson area, down southwest corner of the State. And I think that we can all agree, out of the 435 Congressional districts, that I have the best one in the United States. And in that area, there are 11 counties, part of 11 counties, 10 full counties, part of an 11th county. So I have a lot of rural areas along with Springfield, Joplin, Branson. And a lot of my constituents don't have ready access to the latest medical technology, and even the number of doctors that you would find in urban areas. And that is another topic. But can you elaborate on the types of telemedicine and mobile health applications that would be available to my constituents in the best congressional district in the United States if they did have the IP services?

Mr. CICCONI. Well, sir, I think, again, I think if we are able to get the broadband connections into those areas, and they are fulsome and they are both wired and wireless, I think you have an infinite variety of services that are available that are being actually put together by innovators today. I think our entire healthcare system, notwithstanding the current difficulties, is actually innovating quite well in terms of making records available and things of this nature.

Mr. LONG. Can you give me any more specifics or anything on telemedicine?

Mr. CICCONI. We can certainly pull together something for you, Mr. Long, and get it to you. I don't have anything specific I could lay out in the hearing here today, though.

Mr. LONG. OK. I have zero seconds. So with that, if I had any time I would yield it back.

Mr. LATTA. The gentleman yields back, and his time has expired.

Seeing no other members wishing to ask questions this afternoon, I want to thank you for this excellent panel. And I am sure that the chairman would also want me to extend his heartfelt thanks for you all being here today.

And without anything else coming before the committee today, we will stand adjourned.

[Whereupon, at 12:43 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

Opening Statement of the Honorable Fred Upton
Subcommittee on Communications and Technology
Hearing on "The Evolution of Wired Communications Networks"
October 23, 2013

(As Prepared for Delivery)

If there is one thing that nearly everyone can agree on, it's the remarkable pace of technological innovation in our country. The march of technology waits for no one, and this is most vividly seen in how we communicate. Broadcasting brought the town square into our homes, the Internet brought the world of information to us, and wireless services made them all mobile. In such a rapidly evolving and converging marketplace, it's critical that our laws foster these changes and reflect our national focus on innovation.

Today's hearing will look specifically at wired communications networks, the technology that has enabled them, and what the future holds for their continued evolution. Wired networks are in the midst of a transition to Internet protocol and increasing use of fiber. These transitions are both inevitable and welcome and we should embrace them, and the benefits to jobs and the economy are unmistakable. Consumers stand to gain through new and improved services, as well as through the competition that these networks bring to other IP and data service providers.

In our modern communications marketplace, consumers have an unprecedented level of competition to serve the many ways we communicate. But our laws were written piecemeal to reflect the prevailing conditions of their time. Whether it was to break up a monopoly or in an attempt to legislate competition in existence, we should be taking a hard look at where technology is going and ensure that these strictures of the past do not hinder our future.

Thank you to all of our witnesses for your testimony today. I'd like to especially thank Mark Iannuzzi, CEO of TelNet, a Michigan-based company providing voice and data service to businesses across the state, including my district in southwest Michigan. We appreciate your input and insight into this important topic.

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FRED UPTON, MICHIGAN
CHAIRMAN

HENRY A. WAXMAN, CALIFORNIA
RANKING MEMBER

ONE HUNDRED THIRTEENTH CONGRESS

Congress of the United States

House of Representatives

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December 20, 2013

Mr. Jim Cicconi
Senior Executive Vice President – External and Legislative Affairs
AT&T
1120 20th Street, N.W., Suite 1000
Washington, D.C. 20036

Dear Mr. Cicconi:

Thank you for appearing before the Subcommittee on Communications and Technology on October 23, 2013, to testify at the hearing entitled "The Evolution of Wired Communications Networks."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions by the close of business on January 14, 2014. Your responses should be e-mailed to the Legislative Clerk in Word format at Charlotte.savercool@mail.house.gov and mailed to Charlotte Savercool, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Greg Walden

Greg Walden
Chairman
Subcommittee on Communications and Technology

cc: Anna Eshoo, Ranking Member, Subcommittee on Communications and Technology

Attachment

Keith K. Krom
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January 16, 2014

Ms. Charlotte Savercool
Legislative Clerk
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, DC 20515

Re: Questions for the Record – "The Evolution of Wired Communications Networks" – October 23, 2013

Dear Ms. Savercool:

Pursuant to the December 20, 2013 letter from Chairman Walden, enclosed please find the responses of James Cicconi to the Questions for the Record.

Thank you in advance for your attention to this matter. Please do not hesitate to contact me with any questions or concerns.

Sincerely,

Attachment

EAST #1097650

RESPONSES TO QUESTIONS FROM THE HONORABLE BILLY LONG

Q. Can you elaborate on the types of telemedicine and mobile health applications that would be available to my constituents in the best congressional district in the United States if they did have the IP services?

A. As you noted during the hearing, residents in rural areas may have limited access to the latest medical technologies and limited numbers of available health-care providers. In several different respects, mobile-health and telehealth technologies hold great promise for extending quality, affordable healthcare into remote and previously underserved areas. The healthcare opportunities presented by the IP transition fall into several different categories.

The first enables a patient to consult, in real time and over a secure video link, with doctors in a major medical center in Missouri or even across the country. AT&T's telehealth solution, known as AT&T Virtual Care, combines our most sophisticated, high-resolution, IP-based video-conferencing service with numerous medical peripherals to enable face-to-face medical consultations over AT&T's highly secure network. AT&T Virtual Care also provides two-way connectivity for doctor-patient consultations that is cost-effective and easily portable. In addition to the real-time, secure video link, these solutions allow the measurement, transmission and display of various vital signs and biometric information; they also include a separate, hand-held, high-resolution camera, permitting close-up examination of skin conditions and the like. These solutions offer individuals in remote regions access to the nation's best medical specialists, over an IP network, without leaving their home-town clinic or community health center.

Mobile health solutions also hold great promise for rural and underserved populations. An almost endless variety of mobile health applications is now available for smart and data-enabled phones, allowing people to track numerous indicators, from daily exercise and calorie intake to blood glucose levels for diabetics. These applications run on today's ubiquitous mobile, hand-held devices and give users the ability to conveniently and regularly track the health information that matters most to them, and to receive coaching and support along the way. In addition to the coaching and support available through these applications, the IP network allows these technologies to feed a regular stream of health-status information into a patient's electronic medical record. This enables doctors to regularly monitor their chronic disease patients and prioritize additional outreach to those experiencing the most difficulty in managing their conditions.

Remote patient monitoring technologies, which will increasingly depend on a ubiquitous, all-IP network, facilitate monitoring of all patients, urban and rural alike, for serious medical conditions in the comfort of their own home, instead of requiring a costly and inconvenient, extended hospital stay. Small, body-worn wireless sensors and other wireless-enabled, in-home devices monitor indicators associated with a wide range of medical conditions, including chronic heart failure and chronic obstructive pulmonary disorder. These monitors transmit information to a hub device in the patient's home,

from where it travels securely over the IP network to a healthcare provider for analysis. AT&T's remote patient monitoring solution includes a locked-down tablet, with embedded secure video-on-demand, pre-paired with medical peripherals that allow clinicians to continuously track their patients' health status after discharge from the hospital. These technologies allow patients to receive at home the monitoring and follow-up care that would previously have required a longer hospital stay and cumbersome, wired sensors and avoiding the high cost of additional hospital time and the inconvenience and isolation of extended separation from family.

Finally, electronic medical records (EMRs) and health information exchanges also rely on IP technology and hold the potential for better, more cost-effective medical care for all citizens, regardless of where they live. EMRs, already adopted by many physicians, are replacing paper files with digital health-care records, much as numerous other segments of our economy long ago moved to digital records. As noted above, EMRs can receive health and biometric data from mobile-health applications and remote patient monitoring devices and display it in an accessible, user-friendly manner for a patient's health-care practitioner. The greater promise of these digital records, however, comes when they are woven together through a health information exchange, so any doctor treating a patient has convenient, immediate and secure access to the records, observations and recommended treatments from all of the other practitioners who have seen that patient, as well as prescription records and radiological images. As with the other exciting capabilities discussed above, this too can only be effectively accomplished over an all-IP network.

RESPONSES TO QUESTIONS FROM THE HONORABLE ANNA ESHOO

Q. I understand that AT&T ultimately proposes moving some of its customers away from both wired voice and broadband service. My concern is that consumers could incur steep charges for applications like streaming video and music if your substitute wireless service is subject to similar usage-based pricing to what we see today with 4G LTE. How do you respond to this concern?

A. At this point, the precise details of the services to which TDM customers would likely be migrated and the projected cost for those services have not yet been established. AT&T has sought FCC approval for narrowly limited, geographic trials for a transition away from the legacy, TDM network. We are optimistic that, in the relatively near future, the FCC will take the first step toward such approval, accepting providers' IP-transition plans for filing. When AT&T files its plan with the agency, it will contain more detail about replacement products that will be available to customers. Currently, all I can say is that pricing is continually under review, with the intent to satisfy customers' needs in a competitive environment.

Q. AT&T has frequently cited the findings of a CDC survey showing that the number of customers who have cut the cord is large and increasing. But that survey asks only about voice service. Do you have evidence to suggest that those cutting the cord for voice service are also moving away from a wired broadband connection?

A. Several Commentators and analysts have noted the growing trend of wireless broadband substitution (in place of fixed broadband services). For example, the 2013 Pew Institute Smartphone Usage and Adoption Study found that 8% of Americans access broadband via a Smartphone and have no home broadband connection whatsoever. Other commentators and analysts have noted this same trend and concluded that the growth of 4G LTE technologies will spur those numbers even higher. See, *Growth In Wireless-Only Subscribers Heralds Changes for Internet Access* By Mari Sibley, SmartPlanet, March 13, 2013 (http://www.smartplanet.com/blog/the-report/growth-in-wireless-only-subscribers-heralds-changes-for-internet-access); LTE Is Going To Accelerate Fixed to Mobile Broadband Substitution, Gary Kim, Mobility Techzone (November 26, 2012) (http://www.mobilitytechzone.com/topics/4g-wirelessevolution/articles/2012/11/26/317066-lte-going-accelerate-fixed-mobile-broadband-substitution).

AT&T, however, references the CDC survey to demonstrate a trend that highlights the fact that more and more customers are moving away from *time-division multiplex (TDM) service* – the old style of switched telephone service that relies on a continuous circuit between the two end-points of a call. This is the 20th-century technology that the market is increasingly rejecting in favor of other, more efficient network technologies. (And it is the old technology that it is becoming increasingly difficult and expensive for companies like AT&T to maintain because the parts and qualified personnel simply are not available. To paraphrase one of our senior executives, no one graduates from Stanford or MIT planning to become a TDM engineer these days.) In some cases, the new technology will be the wireless phone that seems to have become the sole communication device for everyone under 30. In some cases, the replacement service will be an over-the-top internet service like Skype. In other cases, it will be a voice-over-internet-protocol (VOIP) service that runs over the same wires (whether telephone or cable) that have served homes in the past. This is the voice service that typically serves AT&T's U-Verse customers and Verizon's FIOS customers. It is also typically the service that serves cable customers who have opted for their provider's triple play (voice, data and video) package. Our market research has shown that, in many cases, customers may not even realize that they no longer have the plain old telephone service (POTS) that was so common during the last century. In the IP transition we do not necessarily aim to take customers off of our wired broadband network. Quite the contrary. We just want to move them off of last century's technology and onto the IP-enabled voice service of the 21st century.

RESPONSES TO QUESTIONS FROM THE HONORABLE HENRY WAXMAN

Q. **At the hearing you stated that the rules of the Telecom Act are not technology neutral, and cited the different titles of the Act that apply to wireline, wireless and cable service. Do you believe that within Title II of the Act, there is a distinction between TDM voice services or IP delivered voice or are the rules for voice service technology neutral?**

A. Title II of the Act does not distinguish between wireline telecommunications services (such as traditional, circuit switched voice services) based on a technology. But, whether and how a service (including a voice service) is regulated under Title II depends on how that service is classified. The Act distinguishes between telecommunications services and information services (which are mutually exclusive categories in that a service is one or the other, but not both), and, for the most part, limits regulation under Title II to telecommunications services. Under the Act, telecommunications services are defined as the offering of "telecommunications" for a fee directly to the public. 47 U.S.C. § 153(46). In turn, telecommunications is defined as "the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received." *Id.* at § 153(43). Traditional, circuit-switched voice services are classified as "telecommunications services" because they are limited to transmitting information (*i.e.*, voice traffic) with no net change in the form or content of that information as sent and received. In contrast, most, if not all, VoIP services are properly classified as information services because the voice component of those services is tightly integrated with other functionalities that allow end users to "generat[e], acquir[e], stor[e], transform[], process[], receiv[e], utilize[e], or mak[e] available information via telecommunications," 47 U.S.C. § 153(24), and also because they involve a net protocol conversion.

Q. **During the hearing, you referenced a chart showing a decline in ILEC Switched Landline service as a share of U.S. household primary line service. Mr. Iannuzzi pointed to slower adoption of wireless and IP voice alternatives by business. How would you characterize the differences between residential and business customer's reliance on TDM voice services? How should policy makers consider these differences in the context of the IP transition?**

A. Although many business customers already have made the transition to IP-based services, their adoption of such services has been somewhat slower than residential customers. It appears that is so for several reasons. First, the largest facilities-based providers of VoIP

services are cable operators, which originally focused on marketing to residential customers, and did not focus on business customers and services until several years later. Now that cable operators have begun to focus on business customers and expanded their business service offerings, it seems likely that the number of business customers switching to IP-based services offered by cable will rapidly increase, replicating cable's experience in the residential market. Likewise, telephone companies initially focused their VoIP marketing and service offerings on residential customers, and only recently have begun to focus on business customers and services. Thus, any differences between residential and business customers' adoption of IP voice alternatives to TDM voice services is likely to diminish rapidly in the near future. Second, business customers are more likely than residential customers to sign up for long term service contracts, and to utilize more expensive customer premises equipment (CPE). As a consequence, business customers may delay adoption of IP voice alternatives until their existing TDM service contracts expire, or their CPE becomes obsolete or fully-depreciated. Third, many residential customers have switched to over-the-top VoIP services, which may not provide the same quality of service and service guarantees as those provided by facilities-based VoIP service providers. Thus, it should come as no surprise that business customers (which generally have greater demand for reliable, high quality services than residential customers) have adopted VoIP alternatives at a slower rate than residential customers.

These differences between residential and business customers should not alter policy makers' analysis in the context of the IP transition. In both cases, policy makers should consider whether wireless and IP-based voice services are a reasonable alternative to traditional, circuit-switched voice services. Specifically, they should determine, *inter alia*, whether such alternatives support essential features and functions, and offer adequate service quality and reliability. That does not mean that IP-based alternatives will necessarily replicate every feature and function offered by existing TDM voice services, nor should it. But, as the IP transition progresses, all affected parties (consumers, industry and policy makers) will have the opportunity to engage in an open, frank, and informed dialogue concerning any potential gap in technology, services and policy, and whether, how, and by whom such gap should be filled. In some cases, providers may need to modify or upgrade their IP-based services to provide essential features and functions. In others, policymakers and other stakeholders may conclude that particular features and functions no longer are necessary or make sense in an all-IP world. Or they may find that entities that historically relied on TDM technology and services will have to adapt their own products and services to be compatible with next generation wireless and IP-based services. But, regardless of which solution is adopted, policymakers should ensure that all parties affected by the transition receive adequate notice of the need to adapt, and have the time and opportunity to do so.

FRED UPTON, MICHIGAN
CHAIRMAN

HENRY A. WAXMAN, CALIFORNIA
RANKING MEMBER

ONE HUNDRED THIRTEENTH CONGRESS

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December 20, 2013

Mr. Harold Feld
Senior Vice President
Public Knowledge
1818 N Street, N.W., Suite 410
Washington, D.C. 20036

Dear Mr. Feld:

Thank you for appearing before the Subcommittee on Communications and Technology on October 23, 2013, to testify at the hearing entitled "The Evolution of Wired Communications Networks."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions by the close of business on January 14, 2014. Your responses should be e-mailed to the Legislative Clerk in Word format at Charlotte.savercool@mail.house.gov and mailed to Charlotte Savercool, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Greg Walden

Greg Walden
Chairman
Subcommittee on Communications and Technology

cc: Anna Eshoo, Ranking Member, Subcommittee on Communications and Technology

Attachment

The Honorable Anna Eshoo, Ranking Member, Subcommittee on Communications and Technology

In Mr. Cicconi's testimony, he states that the trials AT&T has proposed "would offer clear benefits with no costs." Do you agree with this assertion? If not, what steps should the FCC take to mitigate any potential for consumer harm?

Witness: Harold Feld, Senior Vice President at Public Knowledge

We support conducting trials for the purposes of the phone transition but we believe the trials must be structured properly in order to ensure that consumers aren't harmed during the experiments. In order for the trials to be successful they must be voluntary and reversible. It would be incredibly disruptive and potentially harmful to involuntarily transition users who depend on traditional phone technology to support their devices such as health monitoring systems. The example of Verizon's Voice Link rollout on Fire Island, NY in the aftermath of Hurricane Sandy is a clear case of what can happen when consumers are involuntarily transferred from a traditional technology to a new, untested technology. In the Fire Island scenario, business owners were without use of credit card readers and fax machines, and some residents were even unable to access their medical devices from within their own municipal area.

The purposes of trials are to gather information and ensure that the next technology can just as adequately serve consumers' needs as previous technologies. Until the FCC is certain of the capabilities and limitations of new technologies when compared to traditional technologies, we must not forcibly transfer users from their current, reliable communications service. This is why the trials must also be reversible. Any trial that cannot be undone is not a trial at all but a forced migration. This means that carriers must not remove, destroy, or disable existing equipment and infrastructure for the duration of the trials and should retain the capacity to bring it back online.

Public Knowledge has submitted to the FCC a technical analysis prepared by CTC Technology and Energy, an engineering and business consultancy firm, on PK's behalf. Neither CTC nor Public Knowledge has a financial stake in the outcome of the IP transition. CTC has identified ten attributes that require particular testing during the trials:

1. Network capacity
2. Call quality
3. Device interoperability
4. Service for the deaf and disabled
5. System Availability
6. PSAP and 9-1-1 access
7. Cybersecurity
8. Call persistence
9. Call functionality, and
10. Wireline coverage

In addition to the general recommendations listed above, we believe the FCC should examine each of these areas during the trials to ensure that it obtains the most useful data possible before making any decisions that would impact the future of the network.

ctc technology & energy

engineering & business consulting

A Brief Assessment of Engineering Issues Related to Trial Testing for IP Transition

January 13, 2014

Prepared for Public Knowledge by CTC Technology & Energy

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Engineering issues related to trial testing for IP transition
January 13, 2014

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Engineering issues related to trial testing for IP transition
January 13, 2014

1. Introduction

This report considers, from an engineering standpoint, some of the tests necessary to determine the likely impact of transitioning the telephone service delivered by particular wire centers from circuit-switched analog technology to packet-switched Internet Protocol (IP) technology—what FCC Chairman Tom Wheeler has called the "Fourth Network Revolution."[1]

Specifically, this report identifies the core technical features of the public switched telephone network (PSTN); enumerates some of the IP network attributes that require testing; and identifies some of the parties that should be involved in any testing regime. This analysis was prepared by the engineers of CTC Technology & Energy to provide a starting point for planning tests. In other words, the elements we recommend here are, in our judgment, a floor for adequate trials—not a ceiling or an exhaustive list of considerations.

The basic core functionality of the PSTN holds critical importance to American citizens, businesses, and institutions. As a result, the transition to IP technology—which is an upgrade to the PSTN, not a replacement—requires verification that the new IP environment delivers the same capabilities, reliability, and other critical aspects of the old technologies upon which Americans have long relied.

New IP technologies offer myriad benefits but IP technology has never had to replace the core functionality of the circuit-switched network. Regardless of individual consumer choices to purchase IP service, the circuit-switched network has remained an option for all Americans.

Given that IP technologies will become the nation's primary telephone wire center technology as a result of this transition, these technologies must demonstrably meet the threshold of capabilities delivered by circuit-switched wire centers in order for Americans to rely on the new system for the core functionalities upon which they have always relied.

As Chairman Wheeler has said in regard to the transition, "The way forward is to encourage technological change while preserving the attributes of network services that customers have come to expect – that set of values we have begun to call the Network Compact."[2]

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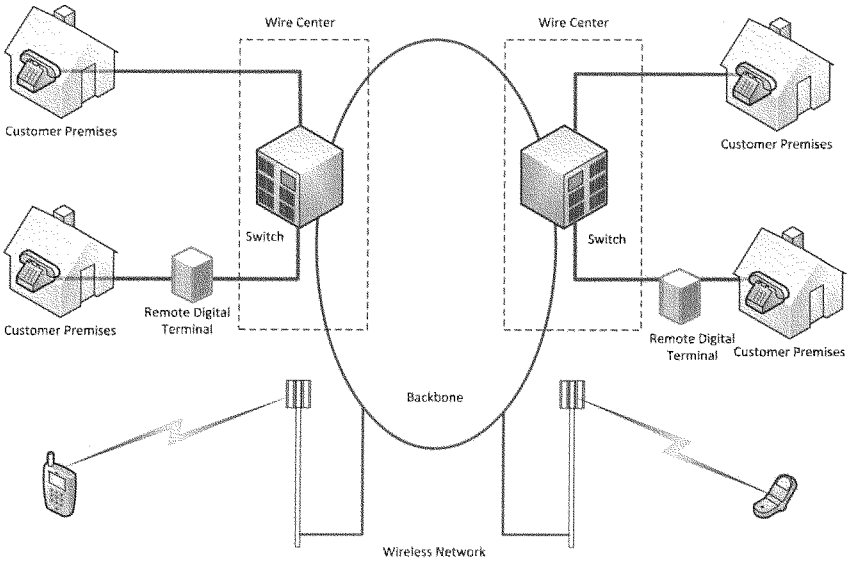
[1] Tom Wheeler, "The IP Transition: Starting Now," Official FCC Blog, November 19, 2013. http://www.fcc.gov/blog/ip-transition-starting-now
[2] Ibid.

2. Selected Core Features of the Public Switched Telephone Network and IP Networks

The public switched telephone network (PSTN) provides a reliable voice connection to almost all Americans. Subscribers hear a dial tone virtually every time they pick up their phone, and their calls—including to 9-1-1 during emergencies—are completed almost every time.

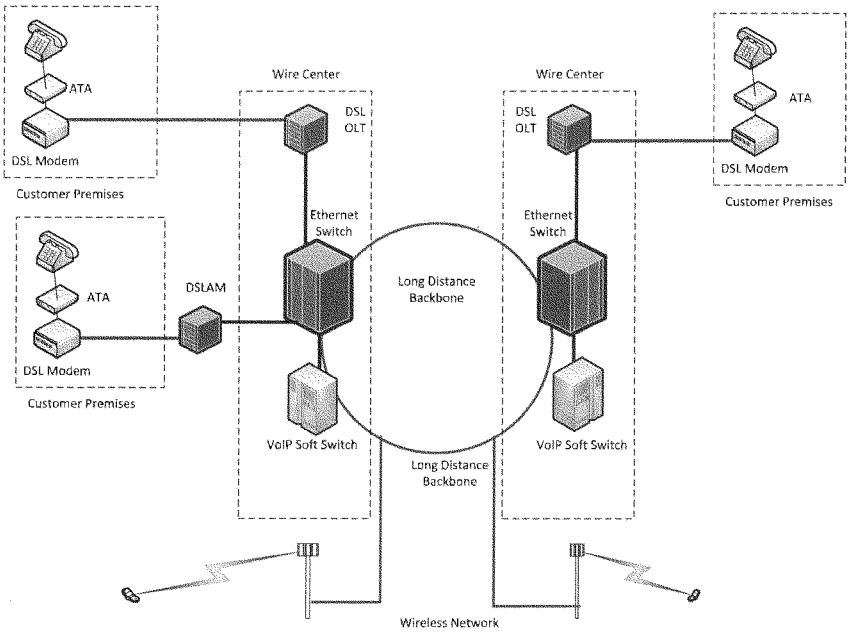
The current PSTN has a set number of lines in and out of each wire center. Some lines have a dedicated switch port at the central office and others are terminated at a remote digital terminal (RDT) (Figure 1). The switch provides the dial tone signal. The current PSTN has trunk circuits to the long distance and backbone networks. The phone company sizes its trunk circuits to provide sufficient lines for normal peak conditions. Although the network has physical limits and will eventually give a customer a busy signal or non-completion message if overloaded, the network works in a predictable way up to known limits.

Figure 1 – Typical Telephone Network



In contrast, in an IP environment, calls are converted to IP data packets at the user premises by an IP analog telephone adapter (ATA). The packets are transported over a DSL, cable modem, wireless, or fiber connection to the wire center, where they are aggregated by a high-speed Ethernet switch. VoIP call servers or "soft switches" (the IP equivalent of traditional telephone switches) connected to the Ethernet IP network set up connections between phones by communicating both with the ATAs placing and receiving the call and the switches and routers creating the connection through the IP network (Figure 2). The call quality, call completion, and other performance parameters depend on the ATA, the type of compression/encoding algorithm, the VoIP servers, the IP network, the Ethernet switches, and the multiple interfaces between them. Call quality can potentially vary greatly from provider to provider and from installation to installation. Additionally, call completion depends on mapping of the phone numbers to addresses in the IP network.

Figure 2 – Telephone in an IP Environment



3. IP Network Attributes that Require Testing

An effective testing regime will prioritize key attributes of circuit-switched wire centers, and will demonstrate that IP-based technologies can deliver comparable functionality and reliability across an appropriate range of scenarios and environments.

It is impossible to generalize about how any one sector or community is currently using traditional telephone services, or how a sector will be able to make the transition. In other words, we cannot understand the impact in a generalized way. Part of the reason for testing, then, is that the process will identify variations between communities. Robust testing will determine the real-life impact of IP migration and how much variation there is likely to be from community to community.

Testing regime must explore these 10 key network attributes:

1. Network capacity
2. Call quality
3. Device interoperability
4. Service for the deaf and disabled
5. System availability
6. PSAP and 9-1-1
7. Cybersecurity
8. Call persistence
9. Call functionality
10. Wireline coverage

In this section, we propose 10 attributes of IP telephone service delivery that should be tested—starting in a lab setting and progressing to a wire center environment and to field tests.

As a starting point, we believe that the FCC should conduct an architecture review—an examination of the current nationwide implementation by voice providers of "plain old telephone service" (POTS), IP-transitioned telephony, and transitian stages between the two. The architecture review is critical for determining the number of central offices, phone lines, and other systems that should be tested, and verifying the estimates in this report. The review would ascertain the current state of the voice network—how many customers have POTS, how many phone companies and wire centers provide it, if and where communications services have already transitioned to digital and IP format in backbone network segments, and how many have been transitioned to an IP access technology (e.g., VoIP over DSL, Verizon Voice Link). The review would examine the extent to which calls are already converted to IP at the wire center or tandem switch; the use of IP "soft switches" (also known as Session Initiation Protocol (SIP) switches) versus traditional time division multiplexing (TDM) switches; and the use of IP network connections versus TDM connections.

This architecture review is also essential because much of the IP conversion in the backbone has already happened. Many voice calls may be in IP or other digital format in the backbone or elsewhere. It is necessary to understand what is being proposed relative to the current environment, and to what extent risk will increase.

3.1 Network Capacity Stress Test

Stress testing of the access network (i.e., the portion of the network that connects from the home or business back to the wire center or central office), switching, aggregation system, and connections between wire centers should be performed to quantify available network capacity and analyze the behavior of the system when it is heavily used.

These tests should identify the system's real-world "breaking point." To that end, testing must simulate worst-case traffic through all significant system components to determine the limits of those components. The traffic types and other environmental conditions should be as close to a real-life wire center service area as possible. And the results of these tests should be comparable to the standards of the PSTN in its current state. (We recommend that the stress test not be performed on a live production network; it should instead be conducted on a VoIP and IP network that is under test, before voice lines are connected, to avoid disruption to customer telephone services.)

These tests should demonstrate that the components of an IP-transitioned telephone network will work reliably even when large numbers of calls take place simultaneously, and when large numbers of calls are made in and out of the wire center. This means that:

1) Calls are routed to the correct location
2) Calls are completed
3) Call quality does not deteriorate under stress
4) Call setup does not exhibit noticeable latency

The level of stress on the network may affect the quality and reliability of the phone system, because large numbers of packets and many simultaneous requests for a call may overburden many different parts of the system. Because the IP system is complex, the problems may not be predictable. Therefore live testing is necessary in several diverse wire centers representing a wide range of environments.

Specifically, network capacity stress tests should follow certain minimum requirements:

1) Testing should be conducted at a minimum of 100 separate wire centers across the U.S. (together representing approximately 1 percent of the phone lines in the U.S.). Wire

centers under test should collectively represent urban and rural environments, large and small service areas, a range of telephone companies, and the range of equipment types and configurations that the telephone company plans to use. *If the architecture review (Section 3) indicates that the telephone system is so diverse that 1 percent cannot represent the range of environments in a statistically viable way, then a larger number should be tested.*

At each wire center, the testing should generate simulated simultaneous traffic from at least 25 percent of the lines in the wire center,[3] in advance of a cutover to IP service in the wire center area. Test traffic calls should be placed to lines internally within the wire center area; from the wire center area to several other wire centers, cellular carriers, and other carriers; and from external wire centers back to the lines in the wire center.

2) Testing should be performed while the underlying DSL, Ethernet, wireless, or fiber data network is fully utilized.

3) Testing should include the failover to alternate paths between wire centers, to verify that calls are not affected when primary routes between wire centers fail.

Carriers and enterprises commonly conduct stress tests before accepting a new network or an upgrade, so there are many established technical approaches and platforms for stress testing of IP networks, and VoIP in particular. Numerical measurements can include loss or delay of voice packets or jitter in the voice calls, call setup time, and call answer delay.[4]

In contrast to the other tests recommended here, we do not recommend that the stress testing called for in this section be conducted from customer premises; that would be logistically complex for so many simultaneous calls. Rather, because this test is less dependent on the line to the customer premises, we recommend that calls be placed at the aggregation points entering the network—such as the DSL optical line terminal (OLT) at the wire center or the remote DSL access module (DSLAM). The calls can be simulated by test equipment specifically designed for this purpose; this equipment can generate large numbers of VoIP calls and large

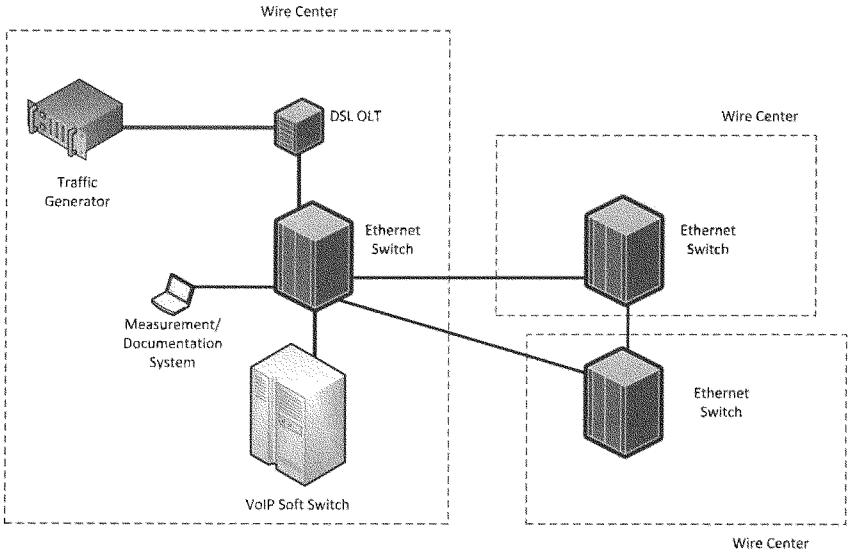
---

[3] Remote terminals often serve 96 lines out of a T1 trunk with 24 wire center ports, so 4:1 is a common aggregation ratio in a phone network.

[4] See, for example, the IP voice stress test technology in the enterprise environment described in "Performance and Stress Testing of SIP Servers, Clients and IP Networks," StarTrinity. http://startrinity.com/VoIP/TestingSipPbxSoftswitchServer.aspx#tests, accessed December 7, 2013.

amounts of data traffic through an Ethernet port on the OLT or DSLAM, and can place calls to test equipment at the remote end, which simulates the phones receiving the calls (Figure 3).

Figure 3 – Stress Test Configuration



3.2 Call Quality

Testing the quality of calls relative to standards applicable to current POTS calls will require both quantitative and qualitative measurements. While quantitative scores are necessary for any rigorous analysis, many aspects of call quality are best measured by a human test, so the qualitative score (as assessed by a test team) will be a check on the quantitative methodology.

Qualitative criteria should include a Delivered Audio Quality (DAQ)[5] score. A suitable passing minimum score should be selected, such as 4.5 out of 5, corresponding to clear speech with

[5] Delivered Audio Quality (DAQ) is defined in TSB-88, a Telecommunications Industry Association standard for wireless systems performance. *See:* "A REPORT ON TECHNOLOGY INDEPENDENT METHODOLOGY FOR THE

only infrequent noise or distortion. A standard practice in land-mobile radio testing, which would also be applicable here, is for an odd number of individuals to evaluate the quality, with the majority determining whether the call passes or fails.[6]

Quantitative tests should measure frequency response, signal levels, distortion, and other criteria—which will be selected so that any audible problem or weakness in quality will be a failing score.

Testing must also verify that a range of standard modem types will work with access connections loaded to their full capacity. This will verify the line quality and also determine the ability of diverse non-voice devices to continue using the network (see Section 3.3.2 for more details).

Tests should be performed in two ways: Using test equipment connected to the analog telephone adapter (ATA) that dials the test equipment at the remote end (Figure 4**Error! Reference source not found.**), and with individual testers dialing a team member at the remote end (Figure 5). Other tests proposed here (e.g., device interoperability, 9-1-1, TTY/TDD) can be performed in series with this test, during the same visit, to minimize the time and customer service impact.

MODELING, SIMULATION AND EMPIRICAL VERIFICATION OF WIRELESS COMMUNICATIONS SYSTEM PERFORMANCE IN NOISE AND INTERFERENCE LIMITED SYSTEMS OPERATING ON FREQUENCIES BETWEEN 30 AND 1500 MHz," Table 1 at 80. TIA, May 20, 1997. http://www.antd.nist.gov/wctg/manet/docs/TIAWG88_20.pdf, accessed December 6, 2013.

[6] One approach can include three individuals—one from the phone company, an independent technical person and an independent layperson—a similar acceptance test approach is recommended in Jacobsmeyer, J., and Reardon, K., "Acceptance Testing in Land Mobile Radio Systems," presented at International Wireless Communications Expo 2010, http://www.pericle.com/papers/W07_ATP_for_LMR%20Slides_V2.pdf, and by Teddy Kavaleri, Chief Information Officer, District of Columbia Office of Unified Communications (discussion, December 4, 2013).

Figure 4 – Field Test from Test Transmitter at Customer Premises

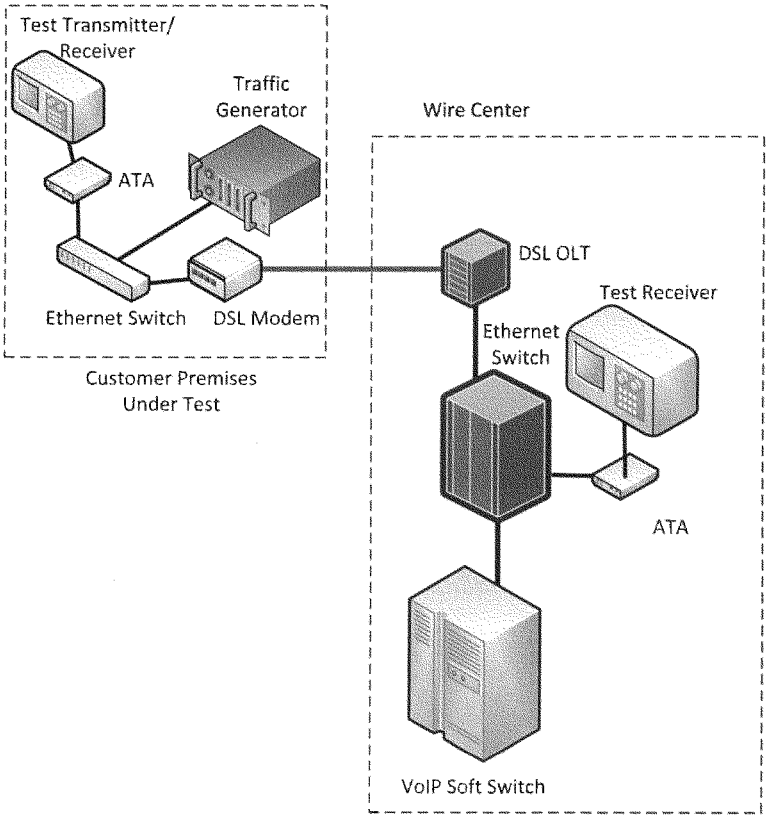
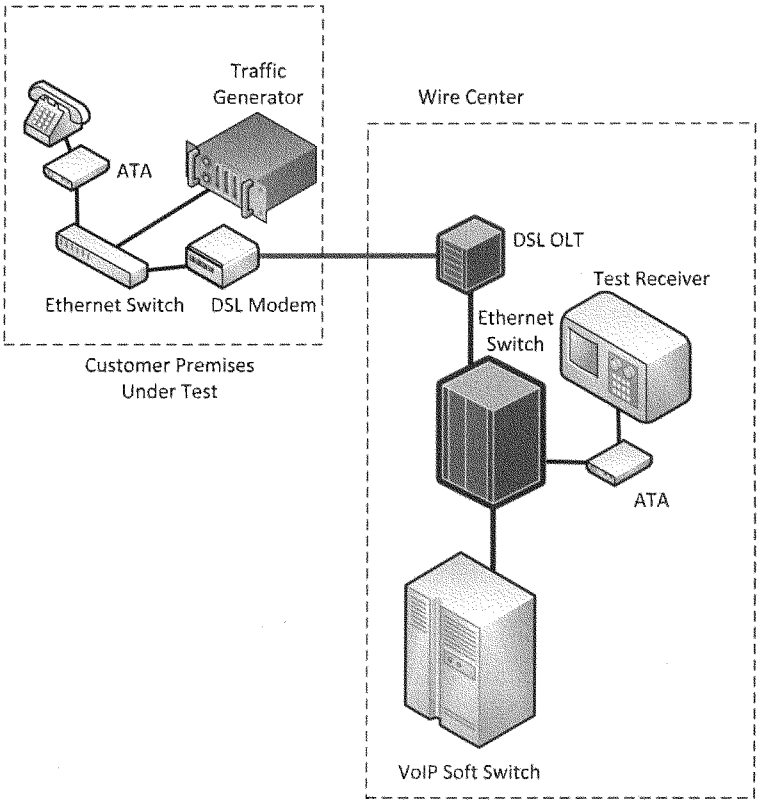


Figure 5 – Field Test from Telephone at Customer Premises



Both quantitative and qualitative tests may fail for a range of reasons. The phone company should be required to determine the root cause of the problem (e.g., ATA, copper line, DSL network, wireless network) and the means of correcting the problem. If there are systematic problems (e.g., failures in all long lines, failures in using particular types of network equipment, failures using particular types of phones or modems), these must be understood and addressed, and noted as important outcomes of the test.

Finally, the test practices and criteria should be leveraged as ongoing standards for system performance. They should be used in regular proof-of-performance tests, and as standards for

customer satisfaction—such as for determining when to send a service technician, and when to provide credits or refunds to a customer. Cable TV performance standards provide an example of commonly accepted minimum technical standards for initial and ongoing testing, and criteria under which a regulatory authority can force the operator to act.[7]

Large-scale technology transitions such as the IP transition have, as a matter of course, significant acceptance testing involving many lines and user addresses. During the E-911 upgrade of the 9-1-1 system, for example, some states required testing of 40 percent of the lines.[8] The acceptance testing of the Washington, D.C. public safety radio network upgrade, serving only a 70-square-mile area, required the work of 60 individuals over a two-week period.[9] And in the 1990s, AT&T's testing and implementation of its TrueVoice upgrade of the long distance voice system, which sought to improve call quality by boosting the levels of certain voice frequencies, required three years.[10]

Before any national implementation of the IP transition, there should be testing at a large enough number of wire center service areas to obtain a representative sample of the national network. As with the network capacity stress tests, the call quality tests should be performed in the test ensemble of at least 100 wire centers.

In each wire center, at least 10 percent of lines should be tested—and the lines should be representative of all geographic areas in the wire center service area, all types of customer (residential, business), overhead and underground service, and single dwelling and multi-dwelling units. At least one-third of the tests should have loop length in the top 25 percent of the loop lengths in that service area (as measured from the beginning of the copper loop from the DSLAM or wire center) in order to take into account the most challenging lines.[11] Tests should be performed with calls originating and terminating within the wire center, as well as with calls originating from one wire center and terminating in another.

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[7] Code of Federal Regulations, Title 47 Subpart K, 76.601 and 76.605, http://www.gpo.gov/fdsys/pkg/CFR-2010-title47-vol4/pdf/CFR-2010-title47-vol4-sec76-601.pdf, accessed December 9, 2013.

[8] Illinois Administrative Code, PART 725 STANDARDS OF SERVICE APPLICABLE TO 9-1-1 EMERGENCY SYSTEMS SECTION 725.500 TESTING PROCEDURES, http://www.ilga.gov/commission/jcar/admincode/083/083007250E05000R.html, accessed December 5, 2013.

[9] Discussion with Teddy Kavaleri, December 4, 2013.

[10] Discussions with David Isenberg and Chuck Gritton, members of the AT&T TrueVoice team, on November 26, 2013, and an article by Waring, Christine, *AT&T Bell Labs News*, August 2, 1993, accessed at http://repo-nt.tcc.virginia.edu/classes/tcc315/resources/alm/telephone/truevoice.html, 2013.

[11] This is comparable to the requirement in the cable TV proof of performance tests that one-third of cable test points be in the extremities of the cable system.

Testing 10 percent of the lines, if a representative sample is chosen, will create an acceptably sized database to understand the performance of the system, highlight trends, and identify the transitioned network's strengths and weaknesses. This level of testing will reliably identify problems in the hardware and software, call routing, installation, line quality, training, and maintenance.

3.3 Device Interoperability

Testing should verify that voice and non-voice equipment that works on the current PSTN will work consistently on an IP-transitioned phone line—and, in the process, should identify types of devices that do not work in all circumstances on an IP-transitioned phone line, or that work only in a limited way.

3.3.1 Voice Devices

Analog telephone adapter (ATA) terminal equipment should be tested to determine its ability to work with telephones designed to provide voice service and interface through a standard RJ-11 jack. Testing should include all proposed ATAs and should include verifying the ringer equivalence number (REN), which determines the maximum number of phones of various types that can be connected to the ATA. Testing should also include the ATA device's ability to transport Dual-Tone Multi-Frequency (DTMF) tones, both in-band (to dial a number) and out of band (to dial within a phone tree or to dial an extension).

Tests should be performed in the lab or in a test wire center. Any phone should have similar characteristics, but testing should include phones representative of the full range of typical consumer voice devices, such as a high-REN and a low-REN device, and a corded and a cordless phone.

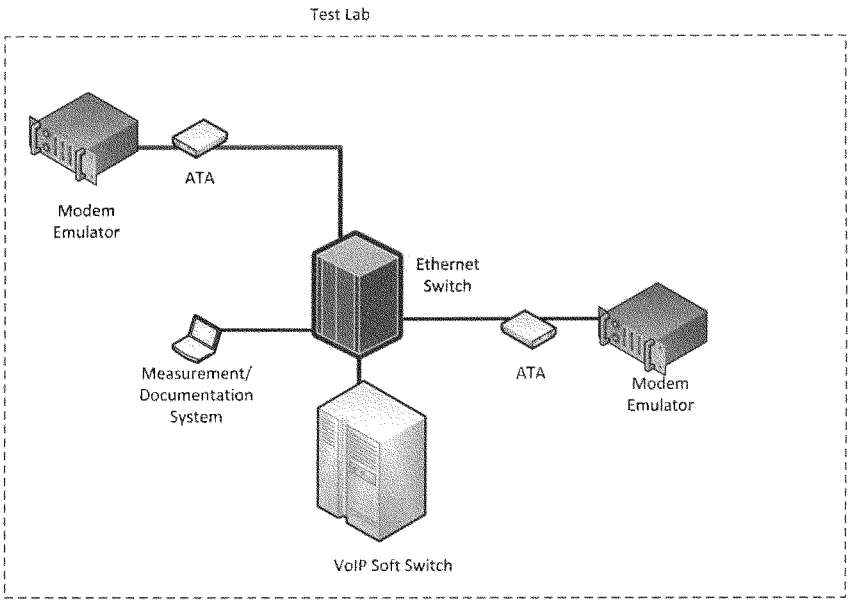
3.3.2 Non-Voice Devices

A rich variety of non-telephone devices successfully use the telephone network and have become important parts of our infrastructure. These include fax machines, credit card/point-of-sale terminals, ATMs, voting machines, medical monitoring or alert systems, burglar alarms, elevator phones, ringdown lines at fire stations, and intercoms for building access.

Despite this diversity, the majority of non-voice devices conform to a standard modem technology, such as v.32, v. 34, v.42bis, v.44, v.90, and v.92. Even where a truly proprietary device is used, the signaling and communications protocol is similar enough to a standard modem that a test of a range of standards should be close enough to determine whether many devices will work on an IP-transitioned line.

These tests should first be performed in a lab setting, to determine what types of devices (if any) are excluded by the ATAs or another part of the IP-transitioned system. The tests should be performed with the full range of standard modem protocols, and under a range of simulated operating environments (Figure 6). For example, if the ATA switches to a different type of CODEC (i.e., hardware or software in the ATA that converts the voice to a digital signal) or operating mode under conditions of congestion or low bandwidth, then the ideal and the congested/low-bandwidth modes should all be tested.

Figure 6 – Interoperability Test Setup



Systematic problems should be noted, and test results should include a checklist of modem protocols, the degree of compliance, and the performance in the range of operating modes.

This testing is necessary because the history of technological transitions and the history of phone communications include many examples of users being left behind or encountering unexpected problems. Users of older phones, users of phones with unusual features, and users

in poorly connected areas may be sufficiently outside the design use cases that they will experience more problems after the IP transition.

Unlike with phones, there may be non-voice devices that either 1) never work on the IP-transitioned network or 2) work under some conditions, but fail under certain circumstances (e.g., poor quality line, congestion, power failure).

The formerly ubiquitous dial-up modem and fax machines still exist in many business, governmental, and institutional settings; common recent versions are accommodated by many VoIP devices in most operational situations. However, unusual or older devices may not work. There is a range of possible reasons, including that some VoIP devices compress the telephone audio signal in a manner that prevents the receiving modem or fax machine from decoding the signal. This compression is generally optimized for voice audio signals, and does not reproduce the digitally encoded data in the modulated audio signal from a modem or fax machine. Technology complying with the ITU T.38 standard can mitigate this issue by allowing the VoIP ATA to decode or "read" the fax or modem signal, transmit the contents to the VoIP device at the far end as IP packets, and re-encode it for the fax or modem at the receiving location.

In circumstances where a CODEC that does not compress the audio is used, the VoIP device accurately carries the fax or modem signal, and the system appears to work perfectly even without specialized fax and modem support. However, in unusual situations such as network congestion or during a "reboot" of the network following a power failure or outage, the device may revert to a low-bandwidth mode with a different CODEC. In this circumstance, the VoIP system may again cause the modem to fail. It is this "unusual" situation that can be the most dangerous—because it could cause a critical device such as a burglar alarm or a medical alert device to fail, potentially at the same time as a major power disruption or other problem.

This is one reason that some providers of IP voice services, such as Cablevision, recommend that alarm devices not be used on their networks, even though they may appear to work properly. Cablevision states, "Cablevision does not guarantee that Optimum Voice will function as the connection between home security or emergency medical alert systems and central monitoring services, and will neither connect to such services nor provide technical support for the connection."[12] Vonage and Comcast both state that their services are not compatible with

[12] "Optimum Voice: Emergency Medical Alert Systems (ID 733)," Cablevision Optimum website, http://optimum.custhelp.com/app/answers/detail/a_id/733, accessed December 6, 2013.

all alarm systems, and recommend consulting first with the alarm company to verify compatibility.[13]

Device and protocol compatibility are a significant part of any technology transition. Extensive effort is needed to identify "marginal" uses of the phone network, and these uses also need to be included in the test. As an example, during its TrueVoice implementation, AT&T worked to identify and test the technology of diverse users, including banks, institutions, and people with disabilities. As part of the process, AT&T also replaced terminal equipment used by the AP and UPI wire agencies with equipment that was compatible with TrueVoice.[14] Through this process, AT&T was able to test the equipment in a range of environments, including over longer, low-quality lines. The testing was an important means of identifying user equipment that did not work and equipment that failed under certain ranges of conditions, as well as equipment that could be relied upon to work.

3.4 Service to the Deaf and Other Support for People with Disabilities

Tests must be performed to determine how IP migration will affect the full range of devices and services that accommodate people with disabilities in using the phone network. These include Text Telephones (TTY), Telecommunications Devices for the Deaf (TDD), and "711" Telecommunications Relay Services (TRS).

The TTY/TDD system is a telemetry-based system that enables deaf and hard-of-hearing individuals to communicate via text over the phone network. The system consists of a text terminal connected to a modem, which communicates with a similar device at the other end. The system is centered around the ITU V.18 set of standards, which incorporate a range of modem technologies.[15]

The TRS system uses a text-based system to enable a deaf individual to type a message to an operator. The operator then calls the intended recipient of the message and verbally conveys the message.

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[13] Vonage website, https://support.vonage.com/app/answers/detail/a_id/1075/kw/alarm%20system, accessed December 6, 2013; Comcast website, http://customer.comcast.com/help-and-support/phone/home-alarm-systems-phone/, accessed December 6, 2013.

[14] Discussion with David Isenberg, former AT&T engineer and TrueVoice team member, November 26, 2013.

[15] V.18 operational and interworking requirements for DCEs operating in the text telephone mode, International Telecommunications Union, http://www.itu.int/rec/T-REC-V.18-200011-I/en, accessed December 6, 2013.

Both of these technologies are well established and an important part of the lives of many deaf individuals. New technologies and applications offer similar functionality, often through a smart phone or computer, but many of those depend on the availability of a minimum quality of wireless service, which may not be available in all areas and may not be affordable to all users.

A transition to IP technology may reduce the reliability of the TTY/TDD service, because the service uses analog telephone modem technology (which, as discussed in Section 3.3.2, may be affected by the conversion to IP). The technology may become less reliable under conditions of stress or saturation of the IP network. Because the TTY/TDD system, combined with an IP conversion, is complex, the areas of potential failure need to be examined.

To the extent that the network may diminish the reliability of the system, it may compromise one of the means that many people have to communicate, with particular burden placed on individuals who for financial or other reasons have not adopted newly emerging technologies for the deaf.

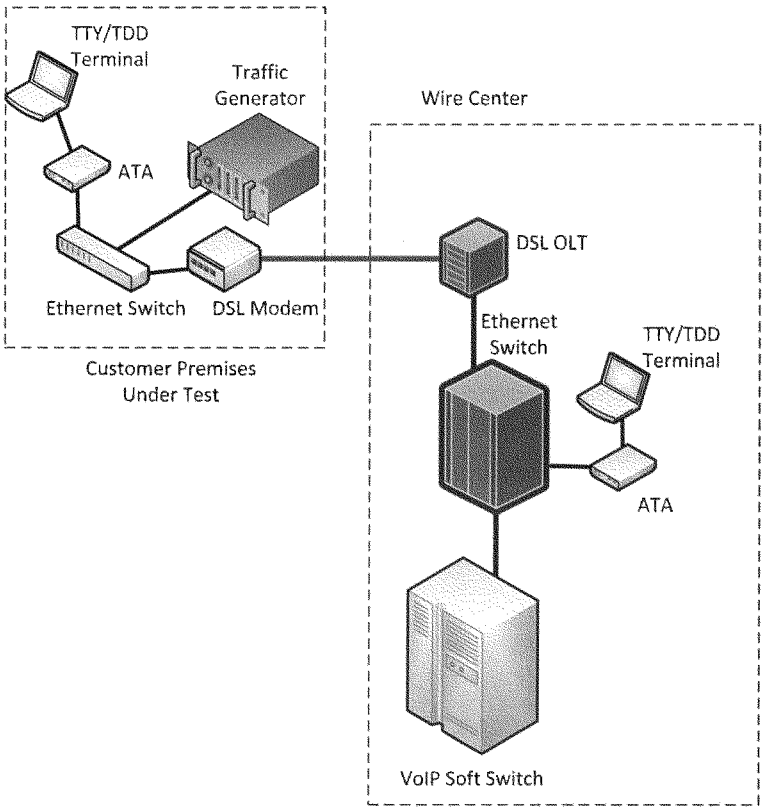
3.4.1 TTY/TDD

TTY/TDD testing should use all ATA devices under consideration, and a range of TTY/TDD devices representing the majority of devices in use (not necessarily the ones currently for sale). As with the non-voice testing in Section 3.3.2, testing should include ATA devices operating in all possible CODECs and operational modes, during a system reboot, and other possible situations. It should occur when the underlying data network is saturated, and should determine the levels of latency, jitter, and packet loss that can be tolerated by the system. Testing should include the ability to connect, place calls, deliver a message, as well as to receive a message.

As with the voice calls, there should be qualitative as well as quantitative tests, with deaf test team members evaluating the quality of the overall experience.

Testing of the TTY/TDD hardware should first be performed in a lab setting. Once it is determined which areas pose the greatest challenges, elements of the tests should be included in the wire center tests in Section 3.1. This will likely mean ensuring that the modem protocols used by the TTY/TDD hardware are tested as part of the non-voice tests performed at the 10 percent of customer locations.

Figure 7 – TTY/TDD Test Setup



3.4.2 TRS

Testing of the Telecommunications Relay Services (TRS) system should include deaf test team members, the system hardware, and the companies (including the operators) that provide the service.

As with the TTY/TDD systems, there should be extensive lab testing that, in addition to verifying the performance of the physical system under the full range of configurations, should also verify that operators receive messages accurately and reliably, and are able to call and relay the messages. To the extent that any problems are observed by operators or the TRS providers

during the lab testing, it may be necessary to include a call to the TRS as part of the procedure during the field tests.

3.4.3 Other Communications Systems

To adequately test other devices used by individuals with disabilities, such as wireless peripherals for paraplegic or mobility-impaired individuals, communications providers should be required to reach out to organizations representing these individuals (e.g., disabled veterans, AARP) as well as industry groups developing and manufacturing assistive technologies. The goals of this outreach should be to identify use cases that use the phone network, and to ensure either that assistive technologies can migrate to the IP-transitioned network or that individuals who need these devices can have the telephone company replace them with another technology that suits their needs.

3.5 System Availability

A system availability test should be conducted to ensure that an IP-transitioned telephone network maintains the level of availability that has been expected of the PSTN. Availability refers to the ability of the technology to be usable when needed, through a wide range of circumstances and network conditions.

Although not perfect, the current PSTN has demonstrated a high level of availability compared to other telecommunications technologies:

- It is designed to continue operating when power fails, even if it fails for an extended period.
- It is designed with sufficient capacity to provide dial tone and connectivity even when demand for the network is at its peak.
- It is designed so that callers can count on reaching or being reached by any other connected caller, even if that caller is distant or in an isolated part of the network.

The telephone industry is one of the best known instances of using "nines" to illustrate the percentage of time that a service is available, and the end-to-end network availability objective

for the telephone local loop is more three nines—meaning more than 99.9 percent availability, or less than nine hours per year of unavailability.[16]

In order to measure the actual availability of an IP-transitioned phone service, it is necessary to observe a sufficiently large and representative sample of phone customers to measure the availability of the service. Moreover, it is necessary to be sure that the test measures actual availability—the ability of a caller to receive a dial tone (or equivalent) and successfully complete a call with the system providing the specified level of quality and functionality.

One of the advantages of IP technology is that the status of ATA devices can be monitored by the operator in a non-intrusive way. We recommend that in the trial area of at least 100 wire centers, with hundreds of thousands of customers, all customer locations be monitored for system availability.

The operator should be required to poll the ATA devices hourly to determine status and to assess whether there is a fault condition. The operator should document all instances of the ATA device being unavailable or in a fault mode, and should document the fault.

Alternatively, if the system has another equivalent status monitoring functionality, such as an alarm mode when an ATA or DSL router experiences a fault or disappears from the network, the operator may be allowed to use that functionality.

During the trial period, the operator should be required to document the causes of all outages or faults. The operator should be required to notify the customer if a chronic problem appears to exist. If the phone is only intermittently operable, the operator should call the customer to assess whether the customer is experiencing problems and to identify a solution. If the phone is out, and the customer has not called to complain, the operator should be required to contact the customer in writing or by e-mail to assess whether the customer is experiencing problems and to identify a solution.

During the system availability test, the operator should also note any known commercial power failures, storms, Internet outages, or periods of high utilization, in order to determine how these stresses influence the network, the degree of impact they have, and how best to help the network recover.

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[16] "BOC Notes on the LEC Network," *Bellcore*, SR-TSV-002275, Issue 2, April 1994, p. 4-46, http://efile.mpsc.state.mi.us/efile/docs/13796/0442.pdf, accessed December 9, 2013.

Taken together, the documented report of hour-by-hour outages, faults, and corrective actions will be a rich resource to illustrate the capabilities and limitations of the IP-transitioned network. It will identify how many "nines" this network truly has, relative to the current network. It will identify the frequency and types of problem the new technology causes. It will create opportunities for fine-tuning the network after service has begun. It will identify potential gaps in the solution, potentially relating to power or the underlying IP network. And it will assist regulators in developing suitable approaches to protect customers.

3.6 9-1-1 and Public Safety Answering Points (PSAP)

The IP-transitioned phone network must be tested to verify that users have the same access to 9-1-1 as do users of the current public switched telephone network, and that all calls to the public safety answering point (PSAP) accurately deliver the callers' fixed locations.

The 9-1-1 system is obviously one of the most critical parts of the phone system. One of the main reasons that individuals keep a landline phone is to have a reliable 9-1-1 service in their home or business. An unreliable 9-1-1 service on wireline phones would potentially force people to depend entirely on cell phones during emergency situations. This is problematic because cell phone service is not available in isolated or very rural areas, or in areas such as basements and elevators where service is obstructed. Even ideal cell phone service only provides a position within 100 meters for an indoor 9-1-1 call where GPS signals are not available—while a properly working landline phone service will always provide an address.

Testing in the lab will identify problems that are related to the hardware and the system as a whole. Testing in the field will verify that the correct identifying information is consistently provided with each call in the correct format for the PSAP. It will also verify if any issues relating to the transport network interfere with 9-1-1, or if the qualitative sound of the system creates problems. Testing at a large number of wire center areas will confirm that a diverse set of PSAPs are tested, and that a sufficiently large ensemble of calls is tested to find unusual problems. Testing alongside other procedures will minimize the time and resources required for the test, relative to standalone 9-1-1 tests.

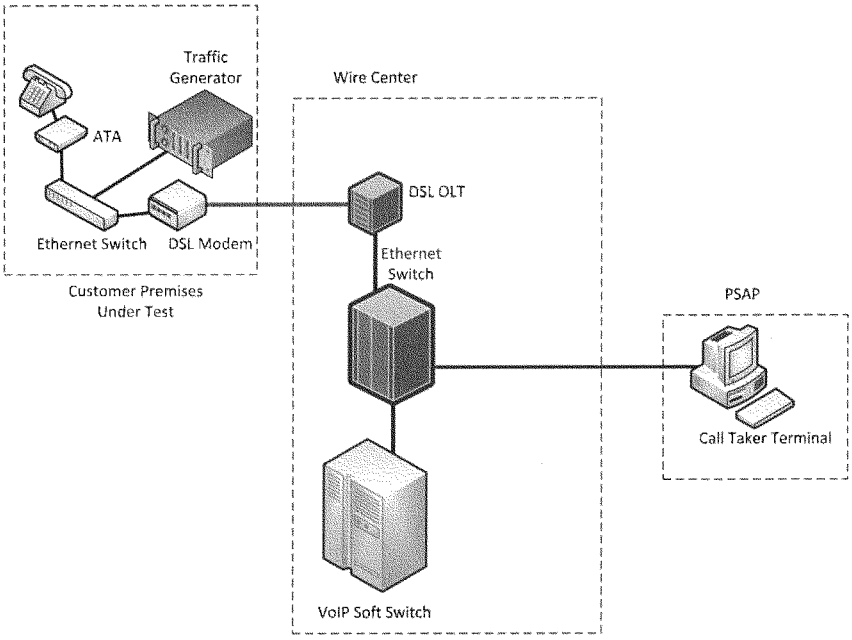
3.6.1 9-1-1

In order to test access to 9-1-1, it is necessary to 1) verify that the customers will reach the system and the correct PSAP, and 2) verify that the 9-1-1 dispatchers can provide the same quality of response to an IP-transitioned caller as a caller on the current phone network.

As in the other tests described here, this test will have both a lab and a field test component. In the lab setting, the test will need to verify that callers using all offered ATA types can reach the PSAP, and that the PSAP receives the caller's location and other identifying information.

The field component will test both the IP phone components and the phone company's customer database (Figure 8). Testing will be performed at all the locations where the tests are performed in Section 3.1. The number of wire centers should be widely representative of the U.S., a minimum of 100. Test areas should also represent a representative cross-section of PSAPs, including urban, suburban, and rural; large and small (two-person); public and private.

Figure 8 – 9-1-1 Test Configuration



As part of each field test, the test team member will alert the PSAP through a non-emergency line, then dial 9-1-1 from the test location. At the PSAP, the call will be routed to an individual

assigned to manage the test call, who will verify that the number and location information is correct, and will qualitatively verify the call.

We recommend that no more than one call at a time go to the PSAP, and that the test be suspended if the PSAP manager believes the center is too busy or there are any other issues that may interfere with 9-1-1.

We also recommended that the individual performing the test at the PSAP have training and experience as a 9-1-1 call taker. An experienced 9-1-1 call taker will be better able to verify that the call quality and experience are sufficient and to evaluate any other issues with the system. For example, some IP phone systems have been criticized by 9-1-1 operators for problems that interfere with the call—such as noise-suppression features that eliminate background noises that may be critical to managing a 9-1-1 call (e.g., sound of struggle, falling). This type of problem needs to be identified and addressed in the test stage.

The 9-1-1 testing needs to be comprehensive without interfering with 9-1-1 and without overburdening the 9-1-1 staff. We recommend that the phone company offer its own staff for the calls (including 9-1-1 trained individuals at the PSAP) and give the PSAP manager the option to use phone company staff or its own staff.

The 9-1-1 results, tabulating all passes and failures and describing in detail any problems, should be reported to the FCC and made available for review by first responder entities, such as the Association of Public Safety Communications Officers (APCO) and the National Emergency Number Association (NENA), in order that the challenges in managing emergency calls in the transitioned network be understood by the community.

3.6.2 Reverse 9-1-1

Reverse 9-1-1 is an automated system used by many local governments to quickly notify residents and businesses of an immediate public safety problem such as active shooters or gas leaks. An emergency manager selects a geographic area and calls the phones in the area to deliver a recorded message.

A typical urban reverse 9-1-1 system can make 5,000 30-second calls in less than 10 minutes. In each of the wire center service areas, each public safety entity operating a reverse 9-1-1 system should test the system to a representative area, according to its own test procedures.

The public safety entity should record the number of calls answered, as well as any anomalous behavior such as delays in completing the call and any problems reported by the public.

3.7 Cybersecurity

Another important test should assess the vulnerability of the IP-transitioned phone network to cyber attack. VoIP denial-of-service attacks have already taken place on 9-1-1 PSAPs, with large numbers of bogus calls generated overseas overloading the incoming capacity, and untraceable callers threatening 9-1-1 operators.[17]

Tests should be performed by the phone companies and independently verified by external security experts to assess the degree to which the network is vulnerable to being shut down or damaged by an attack, the presence of points of failure, the ability to impersonate other users, the ability to maliciously disconnect other devices, and the ability to generate individual or mass numbers of spoofed calls.

The phone companies should be required to describe the steps they have taken to address these and other security issues, and the testing they have conducted. These plans and steps should be reviewed for completeness and adherence to industry best practices by independent experts.

Independent security experts should then prepare interrogatories to clarify any questions and obtain more detail. If determined by the FCC, this process can be done in a manner to protect proprietary information or information that may be used to compromise the network.

Once the responses are reviewed, independent "white hat" external tests may be warranted, to determine the level of risk and strategies for remediation. As with the 9-1-1 tests, the "white hat" tests must not damage the network or compromise the service or personal information of network users.

This test is significant because IP migration of the phone network, by definition, merges the phone network with the data and Internet traffic. Prior to IP migration, the phone switches operated in a physically separate space from the data network and the communications traffic of users who are not part of the telephone company. In an IP-migrated network, the phone

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[17] Kahn, David, "The Growing Threat to PSAPs from Telephony Denial of Service (TDoS) Attacks," *9-1-1 Magazine*, July 3, 2013, http://www.9-1-1magazine.com/Kahn-Threat-of-TDoS-Attacks, accessed December 10, 2013, with additional information from a briefing to first responder entities from Department of Homeland Security at time of attacks.

switch is physically connected to the IP data network, which also supports outside Internet traffic.

Best practices can help to secure the network. These include setting up separate "tunnels" for voice communications and for system management. However, managing security is complex, and individual devices, such as ATAs and switches, may have security weaknesses in their hardware or software. Moreover, internal security is also important—for example, to secure the network against rogue or careless employees or the existence of lax password practices.

Practices should be aligned, where appropriate, with the Cybersecurity Framework developed as part of *Executive Order 13636, Improving Critical Infrastructure Cybersecurity.* In the language of this Framework, the service provider would describe its current situation in various cybersecurity categories as a Current Profile, compare that Profile to a Target Profile describing industry standards and best practices, identify the gaps between that Profile and its Current Profile, and create a plan to address those gaps.[18] The risk is substantial; each ATA is essentially a computer, so each one can theoretically be spoofed or hijacked. Moreover, a single computer can pretend to be thousands of ATAs—with implications for violating customers' privacy, crashing the network, corrupting the billing, eavesdropping on calls, or generating the equivalent of voice spam.

3.8 Call Persistence

Users of the wireline phone network expect never to be "dropped" by the network—indeed, this is one of the distinguishing attributes of the wireline network, relative to wireless. Some users of the phone network also *require* persistent connectivity, such as for monitoring applications.

One way of measuring how often a caller is dropped is to see how long a call persists under a range of circumstances. Tests should be conducted both in the lab and in the field to verify that a call placed on the IP-migrated phone system stays connected indefinitely. Multiple tests of call persistence are also a means of measuring the stability of the phone network.

The test calls should stay connected for at least one week. The lab calls should be performed using the full range of ATAs on a fully utilized IP network. Calls that are dropped should be

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[18] *Improving Critical Infrastructure Cybersecurity, Executive Order 13636, Preliminary Cybersecurity Framework,* http://www.nist.gov/itl/upload/preliminary-cybersecurity-framework.pdf, p. 14-5, accessed December 18, 2013.

analyzed for the root cause, and network modifications should be made accordingly, until calls stay connected in all cases.

Call persistence should be verified in a subset of the home and business field tests to verify one-week connectivity. Tests should be done at a representative 10 percent of the tested field locations[19] to other locations both within the wire office service area and to other wire centers and service providers. Again, calls that are dropped should be analyzed for root causes, and modifications made on the network, until calls stay connected in all cases.

Another benefit of call persistence testing is to identify unexpected features of the IP-transitioned network and their impact on users. Digital and computerized technologies often have new features that are not always desired. It is possible that software or hardware contains commands to disconnect calls after a period of time; these features need to be understood and, if necessary, disabled for users who need a persistent call.

3.9 Call Functionality

The local phone network has many functions that are taken for granted by its users—including that the local phone network is a network with access to any other phone network.

There is no technological reason why a user should lose basic functionality simply because of IP migration. Furthermore, there is no technological reason that the common carrier nature of the local phone network should change to a proprietary closed system in which the phone company can assert greater control over whom an individual calls or how.

For example, the Verizon Voice Link service has sharply limited callers' ability to reach outside networks. Its terms of service preclude callers from access to outside carriers, such as long distance and international phone providers and calling card numbers.[20]

Accordingly, the IP transition testing should include a test of the range of call functions that are now available to all PSTN users. These functions include transport of caller-ID information, and transport of DTMF tones (i.e., touch tones) both in-band and out of band.

These functions also include the ability to reach outside carriers—such as long distance and international phone providers, calling card, and dial-around (10-10-XXXX)—and to have full

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[19] Ten percent of the ten percent of lines tested—so approximately 1% of the lines in each wire center service area.
[20] Verizon Voice Link Terms of Service, http://www.publicknowledge.org/files/VZ%20Voice%20Link%20TOS.pdf, accessed November 26, 2013.

access to any phone number desired by the caller, as well as to receive collect calls or third-number billed calls.

Tests should be performed in the lab, and in each wire center area. Tests should be performed using each ATA device. The wire center area tests can be performed at any location in the wire center service area. They should be performed once with each ATA device in each wire center area; because they are independent of the specifics of the local loop connection, they do not need to be done at many separate field locations.

3.10 Wireline Coverage

Notably after Superstorm Sandy, in Fire Island, NY and Mantoloking, NJ, but also in other locations reported by the media, telephone companies have attempted to migrate copper phone customers to wireless service, often with fewer features and lower reliability than the copper lines. In some cases, too, maintenance practices have been changed from permanent repairs to temporary patching.[21]

Testing should thus be performed to verify that, after the IP transition, service will continue to be available at all locations currently served by the phone network. Service may continue to be analog POTS or can be a migrated IP service—but where wireline service existed before the migration, wireline service should continue to be available.

Physical verification should be performed at 10 percent of addresses in the 100 wire center test areas, randomly selected from among the addresses reported served by wireline telephone service as of five years before the beginning of the trial period. Verification should include testing that analog dial tone exists, or that migrated IP service exists.

These locations may overlap with the locations in the other field tests. One scenario may be to perform the other field tests at the randomly chosen locations where service has been migrated to IP.

Each address tested should be documented as "migrated IP service," "analog POTS," or "service not available." Locations where service is not available should be further investigated to

[21] Shapiro, Carolyn, "With aging infrastructure, Verizon has trouble on the line," PilotOnline.com, http://hamptonroads.com/2011/10/aging-infrastructure-verizon-has-trouble-line, accessed December 11, 2013.

determine if the line is capable of receiving service within 24 hours (i.e., servable but disconnected by the subscriber), which would then be verified by having the phone company connect the line and perform the IP field tests (or verify POTS dial tone). If the physical plant is not capable of service within 24 hours of request, the location will be noted as service not available.

Testing of wireline coverage will also determine the extent to which copper infrastructure is being neglected or may be in the process of being abandoned by the phone company.

4 Parties that Need to Be Involved in Testing Regime

Best practices dictate that testing should be performed by independent entities, not by the companies that seek authorization for the IP Transition or by their contractors. Rather, those companies should, as has been done in the past, cooperate in and support the testing of their networks, and support the independent testing to be conducted by third parties.

Beyond the independence of the testing entities, the tests must include the involvement of three broad sets of stakeholders: Public safety, public health, and state and local governments.

Parties that must be involved in testing:

1. *Public safety*
2. *Public health*
3. *State and local government*

4.1 Public Safety

The interests of the public safety community are obviously significant—if not paramount—in the IP conversion process. This is true both in terms of their own communications and the devices upon which they rely, as well as from the standpoint of their communications with members of the public through 9-1-1 and calls placed directly to police departments, fire departments, and other first responder agencies. The local entities that represent public safety where the tests are occurring should be engaged and have the opportunity to verify the results.

4.2 Public Health

State and local public health departments will be of particular importance, much like public safety, because they are able to understand the impact of circuit-switched services on a critical sector. Implications will vary by community, because different communities use technologies in different relevant quantities. There is consistency, however, in that there is impact everywhere. Each community that is tested needs to be able to evaluate the local impact on public health, including in the delivery of emergency medical services.

4.3 State and Local Government

The IP conversion presents huge potential consequences at the local level in a variety of ways—including public safety and public health, but also in the full range of governmental operations, such as providing education, day-to-day governmental services, and regulatory functions. There are also important potential economic impacts for citizens and businesses that rely on circuit-switched technologies such as point-of-sale devices (e.g., gas stations, restaurants, retail stores).

Another way in which state and local governments have a huge stake in the outcome of the IP conversion is the quality and capabilities of government communications services in general. State and local governments constitute the largest collective user of traditional circuit-switched services in many communities, so they have standing as a major consumer group.

The possibility that thousands of devices and services will cease functioning in the event of an ineffective wire center transition means that it is essential that the state and locality where the test takes place are informed of the test, are able to plan ahead, and are able to evaluate the impact of the test.

5 Threshold for Stopping Tests

It is possible that unforeseen problems in the technological migration will be sufficiently severe that tests will need to pause or end in order to address the problems. Depending on the nature of the problem, its severity, and the individuals affected, it may be necessary to reconnect the affected members of the public to the analog "plain old telephone service" (POTS) network or end the tests altogether and return the central office area to POTS.

Therefore, it is critical that the switches, multiplexers, management system, cables, powering, and all other POTS infrastructure operate in parallel with the IP-migrated infrastructure, enabling the operator to rapidly migrate some or all of the lines and their numbers back to POTS if necessary.

We understand that no technological migration will be perfectly smooth and that there will be brief outages, variations in quality and consistency, and delays. We do not advocate halting the migration if a problem is not severe or is clearly able to be promptly solved.

However, in the event of failures affecting highly critical systems or the identification of major problems with the transitions, we believe the operator should be required to at least temporarily revert to POTS and, if no solution can be found, to potentially migrate neither the service area nor the affected users. Furthermore, if the testing demonstrates that the overall migration will be measurably detrimental to the public, the tests should be stopped altogether and the service area returned to the pre-migration configuration.

Examples of highly critical connections include systems affecting the safety or health of many people. Failures in these areas might include malfunctions in critical alarm systems at large institutions, failures of health care devices or monitoring systems, failure affecting the utilities systems, difficulties in accessing 9-1-1, reduced functionality of the 9-1-1 system for call takers (such as not properly identifying callers' locations or providing insufficient sound quality), failures of reverse 9-1-1 systems, and reduced functionality of fire station ring-down lines. *If these systems fail or lose functionality, they should be migrated back to the original system until a solution is found.* If the source of the problem extends beyond that system's direct connection to the phone network (for example, a 9-1-1 problem caused by the 9-1-1 trunks AND the customer phone connections) the entire migration should be stopped and restored to the original configuration until a solution is found.

Examples of major problems include loss or deterioration of a significant system for more than one week. As compared to "highly critical" systems, these are systems that are extremely important to individuals and businesses but do not create an imminent hazard to life or

property if they fail. These systems include credit card readers, ATMs, individual home and business alarms, TTY/TDD systems, significant cybersecurity vulnerabilities, modems, and fax machines. *If these systems fail or lose functionality for more than one week, they should be migrated back to the original system until a solution is found.*

Finally, if many of the tests fail—that is, if more than 10 percent of the tests performed consistently fail to achieve the expected results and service cannot be readily repaired or restored with minor adjustment—the operator should be required to stop the migration and restore POTS until it develops a better plan. If the IP transition creates significant deterioration within the test area that cannot be improved within one month—such as reduced call completion, call dropping, reduced access to dial tone, or deterioration of call quality (e.g., noise, echo, distortion)—the migration should be stopped and the system restored to POTS.

January 13, 2014

Tom Wheeler
Chairman
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: GN Docket No. 12-353, Comment Sought on the Technological Transition of the Nation's Communications Infrastructure; GN Docket No. 13-5, Technology Transitions Policy Task Force

Dear Chairman Wheeler:

Public Knowledge (PK) believes that technical trials are important to ensure that the transition of the PSTN from circuit-switched to packet-switched IP technology goes smoothly for all users. Without proper management, fundamental alterations to the fundamental architecture of our national phone system could have serious and disruptive consequences. To employ a medical analogy, the difference between upgrading a single customer to IP and converting a wire center to IP is like the difference between setting a broken arm and open-heart surgery.

Accordingly, PK has from the beginning supported well-designed trials, grounded in experience with numerous other technological transitions and based on sound engineering principles, to ensure that this transition proves no more disruptive than necessary. We have therefore been dismayed to see no one – not even AT&T, the company that proposed the trials – provide in any specific detail what specific tests would be conducted and what safeguards would protect the public during this transition.

Worse, a chorus of Silicon Valley techno-enthusiasts and consultants have continued to urge a path of recklessness, insisting that the FCC should permit an immediate conversion of the guts of our national telecommunications network with no pre-planning or precautions. One noted tech writer has gone so far as to accuse those voicing any need for caution as "using consumers as human shields" against change.[1] At the opposite extreme, some have objected to the very idea of transitioning from the existing copper network, let alone conducting trials to facilitate such a transition.

[1] See, e.g., Larry Downes, "The End Of The Wired Network Is Coming . . . But Not Soon Enough," Forbes October 30, 2013 (available at: http://www.forbes.com/sites/larrydownes/2013/10/30/the-end-of-the-wired-telephone-network-is-coming-but-not-soon-enough/)

Reviewing What Can Go Wrong.

In light of this, it is worth pausing a moment to consider the very real concerns brought to light by the current state of deployment. It is the height of recklessness to insist that nothing can go wrong when things have *already* gone wrong. Even without alteration of the guts of the network at the wire centers, the Commission has already seen unanticipated problems emerge, such as rural call completion.

Further, as demonstrated by the recent events on Fire Island, technologies do not always scale. The Fire Island deployment of voice link disrupted credit processing and ATM withdrawals, as well as raised significant public safety concerns. There is a very real danger that a poorly constructed trial could impose unforeseen and significant costs on local businesses, as well as place the health and safety of residents at risk.

The risk is amplified because AT&T proposes to implement changes at the wire center, not merely for individual subscribers. A failure of the trial in the wire center may have wide-ranging consequences. A trial that shuts down a wire center would potentially shut down access to the PSAPs or otherwise shut down the 9-1-1 system, and may impact local cellular providers and cable operators. A malfunction in the wire center could shut down ***all*** communication in the region, not merely that of remaining POTs subscribers, for some unknown period of time.

In addition, the impact would radiate far beyond that particular wire center. People would not be able to call into the impacted area, and it is not foreseeable what broader impact a network failure might have on other wire centers. It is the nature of a network that it is interconnected, and an unanticipated technology failure in one wire center may have ripple effects in other wire centers.

These are not, of course, arguments against trials. To the contrary, ***it is precisely to identify such potential hazards that trials are necessary***. But since such failures are possible, trials must proceed with responsible safety measures and controls. While the possibility of a wide-scale disaster may seem remote, the fact that system failures with broad geographic impact have already occurred in more limited environments (such as the AT&T U-Verse outage last year[2] and the failure of Voice Link on Fire Island[3]) means that such catastrophic scenarios must be considered as possible outcomes and planned for.

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[2] Doug Gross, *U-verse back up after outage hits thousands*, CNN (Jan. 24, 2013), http://www.cnn.com/2013/01/24/tech/web/uverse-outage-att/.

[3] Candice Ruud, *Verizon offers alternative to Voice Link on Fire Island*, Long Island Newsday (Sept. 10, 2013), http://www.newsday.com/long-island/towns/verizon-offers-alternative-to-voice-link-on-fire-island-1.6046505.

Striking the Right Balance Between Recklessness and Paralysis.

The Commission has managed numerous technological upgrades of the phone system, as well as several upgrades of the CMRS system and the DTV Transition. In every transition the FCC faces enthusiasts eager to deploy new technologies and its detractors who wish to retain the existing systems that they know and understand. The Commission has the responsibility to strike the right balance between moving the technology forward while protecting vital communications infrastructure on which our lives and our economy depend.

To that end, PK is pleased to submit an analysis prepared by CTC Technology & Energy, an engineering and business consultancy firm, on PK's behalf.

CTC prepared this report for PK on a pro bono basis, and like PK, CTC does not have a financial stake in the outcome of the PSTN transition. As CTC says on its website, "We are not affiliated with equipment manufacturers, communications carriers, cable operators, or construction contractors."[4] Rather, CTC is interested in ensuring that the PSTN transition serves the needs of the public and the communications industry as a whole, and has applied its considerable engineering expertise toward that end in offering recommendations for the goals and methodology of PSTN technology trials. In particular, CTC has identified ten attributes that require particular testing during the trials: (1) Network capacity, (2) Call quality, (3) Device interoperability, (4) Service for the deaf and disabled, (5) System availability, (6) PSAP and 9-1-1 service, (7) Cybersecurity, (8) Call persistence, (9) Call functionality, and (10) Wireline coverage.

Furthermore, providers offering trials must not disconnect the old network or render it impossible to restore service until the final results of the trials are in and the FCC and other appropriate regulatory agencies grant permission. Problems may not appear right away, or may only occur (as they did with rural call completion) when deployment reaches a certain scale. If something goes wrong, and providers cannot restore the old service, the results could be disastrous for those stuck in a failed trial.

Trials in Their Proper Context

Mr. Chairman, you wrote that the trials should be designed to "best obtain accurate and useful information about the technology transition from multiple resources."[5] We agree. The trials cannot and should not answer policy questions—rather, the purpose of these trials is to

[4] CTC Technology & Energy, *What We Do*, http://www.ctcnet.us/what-we-do.html.
[5] Tom Wheeler, FCC Chairman, *The IP Transition: Starting Now*, FCC Blog (Nov. 19, 2013), http://www.fcc.gov/blog/ip-transition-starting-now.

ensure that new technologies can continue to support our values.[6] The trials do not determine what those values are, and the trials will not answer looming questions regarding the proper capacities or availability of the PSTN nor tell us how best to regulate carrier behavior to protect end-users.

Finally, these are trials, and should be conducted as such, and not as a *fait accompli*. Running permanent "trials" would place subscribers at risk and pre-judge the outcome of the pilot programs with regard to the adequacy of the technologies tested. They must be reversible, and it must be possible for carriers to restore service to its previous level until they have received actual authority under Section 214(a).[7] Specifically, this means that carriers must not remove, destroy, or disable existing equipment and infrastructure and should retain the capacity to bring it back online. Otherwise, the trials will not be real trials at all, but rather the first steps toward a technology transition whose agenda is driven by the needs of incumbent carriers and not the needs of the public and of PSTN end-users.

Voluntary, Not Mandatory Trials

Public Knowledge has repeatedly urged that no one should be used as guinea pigs against their will to determine whether these new technologies will function as predicted.[8] This is, after all, a *trial*. If we knew what would happen, we wouldn't need trials. We do not doubt that AT&T and other companies wish to behave responsibly, and intend to act in the best interests of their customers. But the fact remains that the self-interest of companies that will benefit from the transition may interfere with their judgment. The Commission, the public safety community, and state and local governments must provide the "adult supervision" necessary to protect the public should trials start to go wrong.

Contrary to the objections of those who view this more as a Beta Test for a ready to release product, rather than a significant effort to gather information and avoid future roll out disasters, voluntary trials would be as effective as all-in trials with regard to the broader

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[6] Reply Comments of Public Knowledge, *Technology Transitions Policy Task Force Public Notice Regarding Potential Trials*, GN Docket No. 13-5, at 4-5 (Aug. 7, 2013), *available at* http://publicknowledge.org/pk-reply-pilot-program-public-notice.

[7] Reply Comments of Public Knowledge, *Technology Transitions Policy Task Force Public Notice Regarding Potential Trials*, GN Docket No. 13-5, at 3-4 (Aug. 7, 2013), *available at* http://publicknowledge.org/pk-reply-pilot-program-public-notice; Comments of Public Knowledge, *Technology Transitions Policy Task Force Public Notice Regarding Potential Trials*, GN Docket No. 13-5, at 10, 14-15 (July 8, 2013), *available at* http://publicknowledge.org/pk-comments-pilot-programs-phone-network-transitio. *See also* 47 U.S.C. § 214(a).

[8] Reply Comments of Public Knowledge, *Technology Transitions Policy Task Force Public Notice Regarding Potential Trials*, GN Docket No. 13-5, at 8-11 (Aug. 7, 2013), *available at* http://publicknowledge.org/pk-reply-pilot-program-public-notice; Comments of Public Knowledge, *Technology Transitions Policy Task Force Public Notice Regarding Potential Trials*, GN Docket No. 13-5, at 6-7 (July 8, 2013), *available at* http://publicknowledge.org/pk-comments-pilot-programs-phone-network-transitio.

technological questions. AT&T or other providers can induce participation the same way drug and medical device manufacturers do, by offering free or discounted service for the pendency of the trial.

Voluntary trials would have the added benefit that businesses, residential users, and government agencies that rely on the PSTN for their day-to-day functioning would not be adversely affected. As was demonstrated in Fire Island, when put in real-world contexts next-generation technologies may fail to support or be insufficiently reliable for features for routine business needs like credit card processing or ATM transactions. In addition, many small and midsize businesses (such as pharmacies, real estate agents, and banks) as well as government agencies rely on fax machines and other legacy technologies that do not work with IP-based or wireless equipment.

Also, individual users may have particular needs that rely more heavily on certain aspects of the traditional network than the general population. A customer that uses the copper network for heart monitoring, for example, could justifiably refuse to switch over to a network that does not support her medical equipment or does not have the same reliability as the existing network. Once we have found solutions to those legitimate concerns, then carriers can begin the process of switching those customers over to new networks. The purpose of the trial is not to see whether users can adapt to a new network technology with diminished capability; rather, it is to ensure that new technologies continue to provide the capabilities that users need.

Eventually, of course, these issues must be addressed and resolved. Ultimately the conversion will be mandatory for many who continue to find existing services adequate. But certainly at this initial stage, when a poorly conducted trial could create significant public backlash for the IP Transition as a whole, the Commission should use voluntary rather than mandatory trials.

Conclusion

Especially at this early stage, it is critical that the trials be conducted responsibly. If trial procedures are insensitive to the real and legitimate needs of consumers and other end-users, they could undermine public confidence in the transition as a whole. By contrast, well conducted trials will both inform policy and promote . PK and CTC hope that the attached report will be a valuable contribution to this endeavor.

Respectfully submitted,

/s/ Harold Feld
/s/ Jodie Griffin
/s/ John Bergmayer

PUBLIC KNOWLEDGE

FRED UPTON, MICHIGAN
CHAIRMAN

HENRY A. WAXMAN, CALIFORNIA
RANKING MEMBER

ONE HUNDRED THIRTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE
2125 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6115
Majority (202) 225–2927
Minority (202) 225–3641

December 20, 2013

Mr. John D. Burke
Board Member, Public Service Board
State of Vermont
2112 State Street, 4th Floor
Montpelier, VT 05620-2701

Dear Mr. Burke:

Thank you for appearing before the Subcommittee on Communications and Technology on October 23, 2013, to testify at the hearing entitled "The Evolution of Wired Communications Networks."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions by the close of business on January 14, 2014. Your responses should be e-mailed to the Legislative Clerk in Word format at Charlotte.savercool@mail.house.gov and mailed to Charlotte Savercool, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Greg Walden
Chairman
Subcommittee on Communications and Technology

cc: Anna Eshoo, Ranking Member, Subcommittee on Communications and Technology

Attachment

N A R U C
National Association of Regulatory Utility Commissioners

January 10, 2014

The Honorable Fred Upton
Chairman
Committee on Energy and Commerce
2125 Rayburn HOB
Washington, D.C. 20515

The Honorable Henry Waxman
Ranking Member
Committee on Energy and Commerce
2322A Rayburn HOB
Washington, D.C. 20515

The Honorable Greg Walden
Chairman
Subcommittee on Communications,
Technology & the Internet
2125 Rayburn HOB
Washington, D.C. 20515

The Honorable Anna Eshoo
Ranking Member
Subcommittee on Communications,
Technology & the Internet
2322A Rayburn HOB
Washington, D.C. 20515

Re: Evolution of Wired Communications Networks Hearing Questions for the Record

Dear Chairmen Upton, Walden and Ranking Members Waxman, Eshoo:

Thank you for the opportunity to testify before the subcommittee on Communications and Technology on October 23rd and I appreciate this additional opportunity to elaborate on my testimony.

Additional Questions for the Record - The Honorable Anna Eshoo:

You indicated in your testimony that "regardless of the level of competition, some oversight is always necessary to provide things the market will not." Do you agree that interconnection between competing carriers is an area where oversight is needed? If so, what role should state public utility commissions play?

Answer:

Thank you for your question.

Yes, interconnection between competing carriers is an area where history indicates some level of oversight is necessary. Interconnection of telecommunications carriers' networks for the exchange of voice traffic is essential to ensure your constituents continue to enjoy the benefits of robust competition and receive voice services that are universally connected, reliable, and secure.

As carriers enter the market, oversight of vital carrier-to-carrier interconnection is more important than ever. The backstop authority to arbitrate disputes where the market fails outlined at 47 U.S.C. §§ 251-2 of the federal Telecommunications Act of 1996 is crucial. Proper interconnection can

level the competitive playing field and benefit consumers. The converse is also true. Without access to such backstop authority, competition can be stymied in crucial market segments.

Recognizing the importance of a technology-neutral approach to interconnection policy, in July 2008 NARUC adopted a resolution calling for the preservation of State authority as well as carriers' interconnection rights and traffic exchange obligations under Sections 251 and 252. Regardless of the technology used to provide a voice service, State commissions should continue to act under those sections to ensure consumers enjoy the full and unconstrained benefits of local competition.[1]

Section 251 requires all telecommunications carriers to interconnect with the facilities and equipment of other telecommunications carriers. On the issue of interconnection, the Act is technologically neutral. It does not distinguish between circuit switched facilities and other network facilities or protocols that may be used to provide fee-based point-to-point real time voice services. As cited in my testimony, FCC Commissioners Rosenworcel and Pai have both made similar statements.

The clear duties outlined in those sections and the arbitration provisions provided by Congress should have resolved all interconnection issues on a rolling basis. But that's not what has happened. States (and the FCC) continue to receive complaints from carriers that incumbents and large facilities-based providers are denying them IP interconnection outright. Experience shows commercial agreements between parties of unequal bargaining power often are hard to reach.

In December of last year, the Michigan Public Service Commission (MPSC) ruled in favor of Sprint in an IP interconnection dispute with AT&T Michigan. In that case, AT&T argued that it was unable to provide Sprint with IP interconnection because the applicable (IP) equipment is owned by a separate, but affiliated, out-of-state company and specifically alleged that Section 251(c)(2) does not extend to IP-to-IP interconnection.[2] This case is indicative of the type of ongoing interconnection problems in the market that confront States regularly. These disputes are a direct result of the FCC's failure to classify VoIP services as either an "information service" or a "telecommunications service" under the Act.

Section 252 provides State commissions with the primary responsibility to mediate, arbitrate and approve interconnection agreements between incumbent local exchange carriers and other telecommunications carriers. State commissions have always been at the forefront of implementing and enforcing the open market requirements of the Act. Absent this State PUC arbitrated interconnection back stop, there would surely be less competition (and competitors) today. Should this important State role be eliminated or even curtailed, competition and consumers would suffer.

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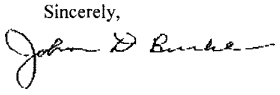
[1] NARUC Resolution Regarding the Interconnection of New Voice Telecommunications Services Networks, Adopted July 23, 2008. Available at: http://www.naruc.org/Resolutions/TC%20Interconnection.pdf.

[2] In the matter of the petition of SPRINT SPECTRUM, L.P. for arbitration pursuant to Section 252(b) of the Telecommunications Act of 1996 to establish Interconnection Agreements with MICHIGAN BELL TELEPHONE COMPANY d/b/a AT&T MICHIGAN, Case No. 17349. Available at: http://efile.mpsc.state.mi.us/efile/docs/17349/0027.pdf.

Carriers should not be allowed to avoid obligations to interconnect just because they have migrated from one packet-based technology (TDM) to another (IP). Competition alone will not solve all problems. As the Michigan example above illustrates, oversight of interconnection remains necessary for consumers to receive the benefits of competition. Congress was clear in the 1996 Act that State commissions have a crucial backstop arbitration authority where competing carriers cannot negotiate an interconnection agreement. This role should continue.

If you have questions about NARUC's positions or would like to discuss it further, please contact NARUC Legislative Director Brian O'Hara at (202)898-2205, bohara@naruc.org, NARUC General Counsel Brad Ramsay at (202)898-2207, jramsay@naruc.org or John Burke at (802)828-2358.

Sincerely,



John Burke
Commissioner, Vermont Public Service Commission
Immediate Past Chair, NARUC Committee on Telecommunications

cc: Members of the Committee on Energy and Commerce