

Hearing on “State of Wireline Communications”

**Before the Subcommittee on Communications, Technology and the Internet
Committee on Commerce, Science and Transportation**

U.S. Senate

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July 25, 2013

Chairman Pryor, Ranking Member Wicker and members of the Subcommittee, thank you for this opportunity to testify on the state of wireline communications.

My name is Larry Downes. Based in Silicon Valley, I am an Internet industry analyst and the author of several books on the information economy, innovation, and the impact of regulation. I have also written extensively on the effect of communications regulation on the dynamic broadband ecosystem, and in particular the role played by the FCC and local regulators.

Summary

Wireline communication is in the midst of its most profound technological transformation in over a century of evolution. The old public-switched telephone network (PSTN) is joining other obsolete networking technologies in converting to the packet-switched network protocols of the Internet (IP). Analog equipment is being replaced with digital; copper is being replaced or supplemented with fiber optic cable. Voice, video and data are converging onto a single standard, and moving over a single global network infrastructure.

The emerging communications ecosystem, which includes broadband networks using fiber, cable, satellite and mobile technologies, is exponentially more efficient, extendable, and powerful than the separate, aging networks it is replacing. It offers new services that were unimaginable just a few years ago, and promises to accelerate its offerings in the coming

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decade. It is generating profound economic growth and new competitive advantage for American businesses that are leading the revolution.

The nature of wireline communications has changed utterly, and will continue to evolve as our technology industries complete their conversion to Internet standards. Wireline network operators, as the FCC acknowledges, increasingly compete not only with each other but with providers of mobile and other broadband networks, as well as cloud hosting and digital commerce services, content providers, consumer electronics device manufacturers, and operating system and other software developers.² Already, American consumers are enjoying the benefits of highly competitive, integrated markets for all manner of communication and information services.

While phone companies once dismissed the Internet as an inferior communications protocol for voice, carriers large and small have now embraced it. As switched network technology matured, IP has zoomed ahead, supporting exploding demands from consumers, small businesses, cloud-based services, and the coming deluge of machine-to-machine communications known as “the Internet of Things.” This new ecosystem is emerging organically from the deployment of robust, global broadband IP networks, a dividend from over \$1 trillion in private funding invested in IP-based technologies in the first decade of the commercial Internet.³

Not surprisingly, the communications industry itself is being affected more profoundly than any other by disruptive technologies. But the transition to an all-IP network follows a pattern in disruptive technological innovation I have been studying for most of my career. In our recent *Harvard Business Review* article, “Big Bang Disruption,” my co-author Paul F. Nunes and I reported on research into a new model of technology-based innovation, one that is dramatically remaking every sector of the global economy, and in record time.⁴

This accelerating pace of industry change, I believe, has profound implications for the regulatory process, particularly for agencies operating at the center of what Joseph Schumpeter once called “the perennial gale of creative destruction.”⁵

² Larry Downes, *FCC Refuses to State the Obvious: Mobile Market is Competitive*, CNET NEWS.COM, April 3, 2013, available at http://news.cnet.com/8301-1035_3-57577630-94/fcc-refuses-to-state-the-obvious-mobile-market-is-competitive/.

³ See Reed Hundt & Blair Levin, *THE POLITICS OF ABUNDANCE: HOW TECHNOLOGY CAN FIX THE BUDGET, REVIVE THE AMERICAN DREAM, AND ESTABLISH OBAMA'S LEGACY* 9 (2012).

⁴ Larry Downes & Paul F. Nunes, *Big Bang Disruption*, HARVARD BUSINESS REVIEW, March, 2013, at 44, available at <http://hbr.org/2013/03/big-bang-disruption/ar/1>.

⁵ Joseph A. Schumpeter, *CAPITALISM, SOCIALISM, AND DEMOCRACY* (Harper 3d ed. 2008) (1942).

Dynamic, technology-driven markets, for example, increasingly remedy their own harms more quickly and far more efficiently than regulators can. As change accelerates, on the other hand, the deliberative pace of regulation increasingly means that by the time laws are passed and rules are made, consumers, markets, and providers have long since moved on.

Under laws that date back nearly a century, regulatory agencies such as the FCC continue to tinker with 21st century problems using a 19th century toolkit. They are encouraged to do so by the siren song of competitors who prefer to lobby than to evolve, and by state and local regulators who fear they will play a far smaller role in the broadband future.

But it is simply impossible even for those of us in Silicon Valley and other technology hubs to anticipate how future technology improvements will evolve and the kinds of markets they will both create and destroy. Government must admit to its institutional hubris. Today's laws and regulatory rules reflect a profoundly dangerous belief that, despite being disconnected from the messy realities of rapid technology change, regulations can nonetheless predict the future and head off consumer harms that haven't yet occurred.

But regulators cannot imagine what is to come, even in the short term. No one can. Instead Silicon Valley investors have refined the art of making small bets on a range of experiments, watching closely to see which ones consumers embrace.

Increasingly, the risks of government getting it wrong outweigh the benefits, if any, of intervention.

I urge this Committee, in its analysis of communications and technology markets and industries, to consider adding a healthy dose of technological humility—of adopting a “watchful waiting” principle for disruptive technologies, and Hippocratic-like oath to “first do no harm.” Legislate only when it's clear that there is demonstrable harm to consumers, a remedy that isn't so broad as to cause unintended negative side effects, and no reasonable hope that the next generation of technology will moot the problem before new rules can be crafted.⁶

⁶ Larry Downes, *Toward a Technology 'Watchful Waiting' Principle*, TECHNOLOGY LIBERATION FRONT, Jan. 17, 2013, available at <http://techliberation.com/2013/01/17/toward-a-technology-watchful-waiting-principle/>. See also Geoffrey A. Manne & Joshua D. Wright, *Innovation and the Limits of Antitrust*, George Mason Law & Economics Research Paper No. 09-54 (Oct. 27, 2012) (“It is because of these dynamic and often largely unanticipated consequences of novel technological innovation that both the likelihood and social cost of erroneous interventions against innovation are increased.”), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1490849.

My testimony addresses the most significant regulatory challenge facing the wireline industry today: the transition to all-IP networks and the accelerated retirement of the obsolete PSTN. I will describe what I see as the most productive role for Congress and the FCC in supporting that transition, and the benefits of universal broadband adoption and economic growth that will result from getting it right. I will also discuss the particular issue of IP-to-IP interconnection, and lessons learned from the flawed but ultimately successful transition, last decade, from analog to digital television.

Accelerating the IP Transition⁷

The IP-based ecosystem reduces economic friction to dramatic effect. In information industries more than anywhere else, entrepreneurs now develop new products and services in real-time. Indeed, early users are increasingly co-developers, participating in product design, financing (through services such as Kickstarter), marketing and even customer service. The result is a new kind of technology disruptor, the “big bang disruptor”: one that enters the market as a cheaper, higher-quality, and more customizable substitute for existing products offered by incumbent providers.

In response to the sudden abandonment of older products and services by consumers with easy access to new big bang disruptions, many incumbents fail to adapt, unable to accept the death of the generation of core technologies on which their companies were built.

Challenging much of the conventional wisdom of strategy and competition, my co-author and I argue that incumbents, if they are to survive, must learn to see disruption coming much sooner and react decisively and quickly. Incumbents trained by a generation of strategic planning theory to wait for new markets to mature before beginning the transformation of their core business have waited too long. Many don’t survive the transition.

Big Bang Disruption is nowhere more visible than it is in the communications industry itself. It is hard to overestimate the magnitude of the shift taking place in our technology infrastructure. Like many of the industries in our study, the transformation is following a familiar pattern. As

⁷ Some of the comments that follow are derived from Comments filed with the FCC that I filed jointly with TechFreedom and the International Center for Law & Economics. See *How the FCC Can Lead the Way to Internet Everywhere by Enabling the IP Transition*, Reply Comments of Geoffrey A. Manne, Matthew Starr, Berin Szoka and Larry Downes, IN THE MATTER OF THE TECHNOLOGICAL TRANSITION OF THE NATION’S COMMUNICATION’S INFRASTRUCTURE, GN Docket No 12-353, (Filed on Feb. 25, 2013), available at <http://apps.fcc.gov/ecfs/document/view?id=7022125022>.

disruptive technologies become both better and cheaper, customers abandon older products and services gradually, and then suddenly.

This is especially true for legacy PSTN providers still operating under Title II of the Communications Act.⁸ For legacy PSTN providers, pricing, quality, and access to infrastructure by competitors are all regulated on the slower clock speed of government agencies. As their customers migrate to better and cheaper alternatives that are free of such regulations, the added gravitational pressure on the incumbents, who must continue to operate as common carriers, becomes unbearable.

PSTN providers can't beat better and cheaper with worse and more expensive, especially when worse and more expensive has to stay that way as a matter of law.

They must move faster. Customers are abandoning wired telephone service in favor of fiber and cable-based Voice over IP (VoIP) and mobile broadband at a remarkable rate. At its peak, the PSTN network connected nearly every American. By the end of 2011, less than half of all American homes still had a wired connection. That number could fall to as little as 25% by 2015.⁹

The disruptor here, of course, is networking technology that operates natively using the packet-switching protocols of the Internet. IP networks, crucially, don't care if the packets contain voice, data, or video content. While phone companies once dismissed IP as unsuitable for voice communications, carriers large and small have now embraced IP as the only option to satisfy exploding demand of consumers, cloud-based services, and the coming data deluge of machine-to-machine communications known as "the Internet of Things."

That superior design has created an enormous black hole for PSTN network operators. As fewer customers subscribe to wireline services, the cost of maintaining aging copper and analog switches is increasing dramatically, both in absolute terms and on a per-customer basis. As much as 50% of current wireline expenditures go toward maintenance. By comparison, the operating expenses of native IP networks can be as much as 90 percent less than for PSTN.¹⁰

⁸ Communications Act of 1934, 47 USC § 151 et. seq. (1934).

⁹ Larry Downes, Larry Downes, *Telcos Race Toward an all-IP Future*, CNET NEWS.COM, Jan 8, 2013, available at http://ces.cnet.com/8301-34435_1-57562644/telcos-race-toward-an-all-ip-future/.

¹⁰ Id. See also Larry Downes, *AT&T Moves Dramatically Towards 'Internet Everywhere'*, FORBES, Nov. 8, 2012, available at <http://www.forbes.com/sites/larrydownes/2012/11/08/att-moves-dramatically-towards-internet-everywhere/>.

To their credit, the incumbent providers are trying to retire and replace what had been, until recently, their most valuable assets. Both Verizon and AT&T have spent billions accelerating the replacement of copper with fiber, and circuit-switched with packet-switched equipment.

But turning off the old network isn't as simple as it sounds. By law, carriers cannot retire the switched network without federal and perhaps state regulatory approval, even if superior alternatives are in place. And the FCC and state regulators have balked at giving permission for the switchover, calling for more study on proposed trials for PSTN to IP switchovers in test markets.¹¹

The longer the carriers are required to spend money maintaining the obsolete networks, however, the less capital budget is available to accelerate the replacement of aging and obsolete equipment with better and cheaper IP technologies, including fiber optics, digital switches, and upgrades to straining cellular networks.

In the end, the real victims of the regulatory logjam are the remaining wireline customers who are also, not surprisingly, the ones least likely to be benefiting from Internet services. The customer segments that are farthest behind in broadband adoption, according to FCC data, are those most likely to be relying on switched telephone networks as their only form of communication access.¹² These include rural users, seniors, and low-income customers.

Getting these communities onto IP networks sooner rather than later eliminates the need for expensive duplication of the obsolete switched infrastructure. It will also make it easier and less expensive for them to connect to other broadband services including video and Internet access.

In that sense, allowing the carriers to accelerate the transition to IP would overcome many of the obstacles that keep 20 percent of American adults from joining the Internet. According to the Pew Internet Project, almost half of that group cite as their primary reason not to connect a lack of relevance to their needs, rather than cost.¹³ With IP-based telephony in place, however, the relevance for employment, education, health care, family life, entertainment and commerce would be far easier to communicate.

¹¹ Larry Downes, *FCC Again Balks on Telephone Network Shutdown*, CNET NEWS.COM, May 14, 2013, available at http://news.cnet.com/8301-1023_3-57584306-93/fcc-again-balks-on-telephone-network-shutdown/.

¹² FCC, *Eighth Broadband Progress Report*, GN Docket 11-121 (Aug 21, 2012), ¶ 122 at p. 54, available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-12-90A1.pdf.

¹³ Pew Internet and American Life Project, *Digital Differences*, April 13, 2012, available at <http://pewinternet.org/Reports/2012/Digital-differences/Main-Report/Internet-adoption-over-time.aspx>.

For Congress and the FCC, this is the moment of truth. The IP Transition is gaining speed, and its ultimate completion is inevitable. But even inevitable advances in technological progress can be delayed significantly by over-regulation, denying some consumers the full benefits of the Internet ecosystem.

The FCC has an unavoidable role to play in the process. As communications markets are being simultaneously destroyed and recreated, regulations designed to dull the sharper edges of once-static and siloed technologies are now, as the agency recognizes, posing the very real danger of unintentionally holding back the progress of innovation. The agency must unravel itself from its complicated relationships with the affected industries, and quickly.

To begin with, the FCC should expeditiously grant pending petitions for trials to switchover PSTN networks to native IP. And, while the trials are underway, the FCC should use begin planning a pro-transition agenda that can be enacted swiftly upon successful completion of the trials—or modified as necessary to adjust for any lessons learned.

Specifically, Congress and the FCC should:

1. Clearly define the IP Transition as a central Federal policy objective and make clear its intentions that VoIP be left unregulated.
2. The FCC should preempt state regulators' efforts to preserve PSTN networks beyond their useful lives to the long-term detriment of ratepayers.
3. Plan and set a date certain for PSTN retirement, based on lessons learned in the successful transition from analog to digital television.
4. Retire legacy federal regulations that are unintentionally slowing the transition to all-IP infrastructure and retarding the adoption of broadband, especially among rural and low-income populations.
5. Make clear that Title II regulations will never apply to IP networks.
6. Refrain from asserting Title I ancillary authority to impose mandated interconnection requirements on IP networks, and instead leave interconnection in the hands of the private parties exchanging the traffic.

There has been some progress in achieving these objectives, albeit slow. The National Broadband Plan, in particular, showed vision in urging the Commission to move immediately to accelerate the transition away from circuit-switched networks to native IP.¹⁴ As the Plan noted, “[r]egulations require certain carriers to maintain [legacy TDM networks]—a requirement that is not sustainable—and lead to investments in assets that could be stranded.”¹⁵

In creating the Technology Transitions Policy Task Force, the FCC likewise took an important step to encourage the rapid transition “from special purpose to general purpose, from circuit-switched to packet-switched, and from copper to fiber and wireless-based networks.”¹⁶ Then-Chairman Genachowski noted at the time:

Technological transitions don’t change the basic mission of the FCC. But technology changes can drive changes in markets and competition. And many of the Commission’s existing rules draw technology-based distinctions. So the ongoing changes in our nation’s communications networks require a hard look at many rules that were written for a different technological and market landscape.¹⁷

The point of these farsighted statements is both clear and accurate: Regulators should not pick winners and losers in the broadband ecosystem. But that truism does not mean the Commission should not take action to advance new technologies that are clearly superior.¹⁸ IP networks, in design and implementation, are in every relevant measure exponentially better than PSTN. Lawmakers and regulators should continue to hasten their adoption, focus on making the transition as smooth as possible for all consumers and refrain from placing regulatory impediments in the way of their success.

Some critics of proposed IP transition trials have argued for the continued application of existing regulations (particularly interconnection mandates under Sections 251 and 252 of the

¹⁴ See *Connecting America: The National Broadband Plan*, § 4.5 at p. 59 (2010) (“National Broadband Plan”), available at <http://download.broadband.gov/plan/national-broadband-plan.pdf>.

¹⁵ *Id.*

¹⁶ FCC, *FCC Chairman Announces Formation of “Technology Transitions Policy Task Force”*, (Dec. 10, 2012), <http://www.fcc.gov/document/fcc-chairman-announces-technology-transitions-policy-task-force>.

¹⁷ *Id.*

¹⁸ In nearly every government provision of spectrum in the last hundred years, Congress has clearly picked what it felt were “better” technologies and used policy levers to promote their adoption. Similarly, by excluding broadband Internet access from Title II regulations in the 1996 Communications Act, Congress affirmatively and wisely promoted an unregulated market for IP-based services, and mandated the FCC to do the same. See, e.g., Communications Act of 1996, 47 U.S.C. §§ 153(24), 230, 706 (1996). See also *NCTA v. Brand X Internet Services*, 545 U.S. 967 (2005).

Communications Act), arguing that these provisions should apply in a “technology neutral” fashion.¹⁹

According to these critics, “the policy justifications for requiring ILECs to provide interconnection and to submit to arbitration—namely, the ubiquity of ILECs’ telecommunications networks and market power that these pervasive networks confer—arise regardless of the technology used by those networks to transmit and exchange telecommunications traffic.”²⁰

Not only are these complaints irrelevant to the proposed trials (which are small steps aimed at determining precisely *whether* constraints such as Sections 251 and 252 are appropriate), but their alleged policy justification is not, in fact, “technology neutral.” Instead, it is a call to apply barnacled rules, crafted over decades specifically for the technology and business realities of the PSTN, to a new ecosystem that shares few, if any, of the same characteristics.

Technology neutrality does not mean blindly enforcing design principles suited for tree houses as buildings codes for steel skyscrapers. Modern structures are clearly better. They require entirely different rules, and different kinds of enforcement. Applying PSTN rules to IP networks is bad business and bad public policy. There are no regulated monopolies in the IP ecosystem, and no need for the kind of regulations aimed at controlling them.

An all-IP-infrastructure is clearly better for everyone. The sooner we can complete the transition, the sooner we will reap the full dividends of continuing private and public investments in this new infrastructure. Getting the transition right will not only save the legacy PSTN operators from irrelevance. It will likely bolster the U.S. economy, accelerate the technological empowerment of Americans as both citizens and consumers, and sustain global competitiveness for U.S. technology companies.

As the National Broadband Plan put it,

[B]roadband is a foundation for economic growth, job creation, global competitiveness and a better way of life. It is enabling entire new industries and unlocking vast new possibilities for existing ones. It is changing how we educate children, deliver health care, manage energy,

¹⁹ See, e.g., Comments of Competitive Carriers Association, *In re AT&T Petition*, GN Docket No. 12-353 (Filed Jan. 28, 2013), available at <http://apps.fcc.gov/ecfs/document/view?id=7022113646>.

²⁰ Id. at 3.

ensure public safety, engage government, and access, organize, and disseminate knowledge.²¹

In *The Politics of Abundance*, former FCC Chairman Reed Hundt and his one-time chief of staff Blair Levin make a persuasive case that the shift to “connected computing”—broadband Internet, cloud-based services, and widespread mobile devices—is essential to jumpstart the U.S. economy. Hundt and Levin urge all levels of government to take immediate steps to support what they call the “knowledge platform”—ultra high-speed broadband with high reliability and low latency, able to support high-bandwidth, video-intensive applications and cloud-based services.

As Hundt and Levin write, “[t]o increase growth, job creation, productivity gains, and exports at a faster rate, government should double down on what is already doubling in the Internet sector.”²² They point, for example, to the fact that Internet transit prices have improved as much as 50% each year. (See Figure 1)

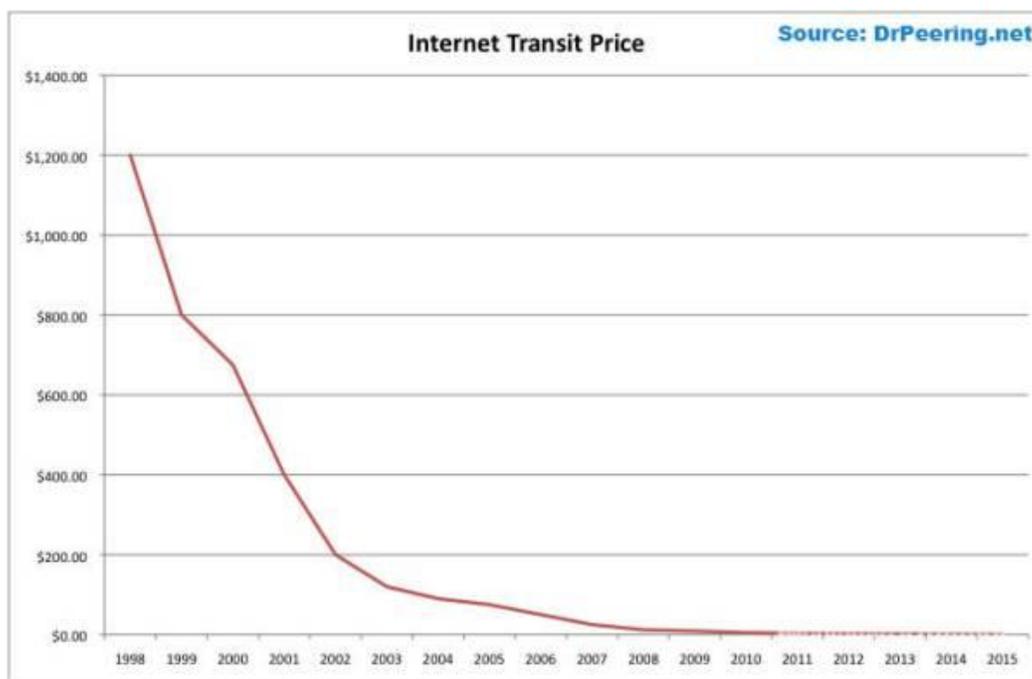


Figure 1 – Internet Transit Price per 1 Mbps, 1998-2015

²¹ National Broadband Plan, *supra* note 14, at xi. See also chapters 10-16. And see Robert E. Litan and Hal Singer, THE NEED FOR SPEED: A NEW FRAMEWORK FOR TELECOMMUNICATIONS POLICY IN THE 21ST CENTURY (Brookings Institution Press 2013).

²² Reed Hundt & Blair Levin, THE POLITICS OF ABUNDANCE: HOW TECHNOLOGY CAN FIX THE BUDGET, REVIVE THE AMERICAN DREAM, AND ESTABLISH OBAMA'S LEGACY 9 (2012), 16-17.

Source: Hundt & Levin, supra note 22, Figure 2.1, p. 105

The kind of high-speed, widely accessible and affordable broadband Hundt and Levin describe also provides the tools that innovators need to launch more Big Bang Disruptions. All-IP networks will vastly expand the possibilities of the next generation of cloud services like Google, Facebook, Twitter and Salesforce. These services and others that will follow will be superior in ways both easily imaginable (instant, more reliable interaction with richer media like video, streaming presentations, and more robust tools) but also in ways that we cannot yet imagine.

Preserving Peer-Based Interconnection

The IP Transition will accelerate the ongoing transformation of our digital experiences in ways that could be as revolutionary as the introduction of the Internet itself. It is imperative that government, private sector companies, and consumers work together to get it done as quickly as possible.

Government, in particular, should work to undo much of the regulatory mess that unnecessarily constrains legacy PSTN providers as they transition to IP. For example, Congress and the FCC should reject self-serving calls to impose outdated regulations mandated network interconnection, devised for an era of monopoly voice carriage, on the well-functioning market for private Internet peering agreements, which already ably provides for voice as well as video and data traffic management.

Private peering arrangements have long provided an efficient mechanism for interconnection on packet-switched networks, regardless of whether the packets contain data, video, and voice applications. The shutdown of PSTN networks and the migration of additional voice traffic to the Internet do not change the dynamics of that system. As Michael Kende, former Director of Internet Policy Analysis at the FCC has recently written:

[T]he competitive concerns that historically drove interconnection regulations for PSTN-based voice service are no longer valid due to the rapid take-up of many different types of alternative communications services to traditional voice, such as cable telephony, software-based voice over IP (VoIP), and other IP-based forms of communications. Therefore, as voice migrates to the Internet there is no need for any regulation of IP voice traffic which mirrors the regulation of the

PSTN on competition grounds, because the current IP interconnection arrangements show how traffic will flow end-to-end without a regulatory mandate.²³

Today, marketplace and reputational incentives drive interconnection and consumer protections. These incentives are buttressed by various multistakeholder processes that continue to evolve to supplement direct company-to-company dispute resolution.²⁴ At the same time, the FCC retains authority under Title I of the Communications Act to regulate for public safety, and antitrust and consumer protection laws govern IP services precisely because they are not regulated as common carriers (which are excluded from the FTC's general jurisdiction over the economy).²⁵

If significant issues do arise in the IP transition that escape these multiple layers of regulatory and governance constraints, Congress can of course enact legislation appropriately targeted to address clear consumer harms. But narrowly tailored legislation from Congress after the IP transition has evolved of its own accord is the proper mechanism for addressing such issues— not by bringing the dead weight of old regulatory baggage to new markets.

Not surprisingly, several parties in the FCC's on-going IP transition proceedings have urged the agency to transplant legacy interconnection requirements on IP networks as part of the retirement of the PSTN. PSTN interconnection requirements, however, were formulated when the Bell System was a true, regulated monopoly. They were a necessary evil to control monopolistic risks, and they have imposed considerable waste, fraud and unnecessary cost in exchange for that benefit. Consider, for example, recent FCC reforms of intercarrier

²³ Michael Kende, *Voice Traffic Exchange in an IP World*, Analyses Mason, April 12, 2013, at 2.

²⁴ Most notable among these is the Broadband Internet Technical Advisory Group (BITAG), “a technical advisory group to discuss and opine on technical issues pertaining to the operation of the Internet, as a means of bringing transparency and clarity to network management processes as well as the interaction among networks, applications, devices and content.” BITAG History, http://www.bitag.org/bitag_organization.php?action=history (last visited February 25, 2013).

²⁵ See Federal Trade Commission, *Broadband Connectivity Competition Policy*, 3 (2007), available at <http://www.ftc.gov/reports/broadband/v070000report.pdf> (“[FTC] jurisdiction [over broadband Internet access services] had once been regarded as limited to the extent that the FTC’s general enforcement authority under the FTC Act did not extend to entities that were ‘common carriers’ under the Communications Act. The regulatory and judicial decisions at issue, however, confirmed that the larger categories of broadband Internet access services, as information services, are not exempt from FTC enforcement of the FTC Act.”).

compensation aimed at reducing such interconnection arbitrage as traffic pumping, phantom traffic and other abuses.²⁶

In the IP world, by contrast, network operators worldwide negotiate all manner of peering agreements absent any regulation. Indeed, peering within the IP network is so easily achieved, as the OECD has pointed out, that “the terms and conditions of the Internet interconnection model are so generally agreed upon that 99.5% of interconnection agreements are concluded without a written contract.”²⁷ Simply put, there is no evidence that anything is broken in the IP network ecosystem.

Those asking regulators to invent an IP interconnection regulatory scheme for voice (or perhaps for all Internet traffic) invoke public interest concerns, but the real motivation is simple rent-seeking. Smaller carriers prefer below-market rates for backhaul, and CLECs are eager to protect their subsidized business model in new ecosystems that are already highly competitive. But these desires have nothing to do with consumer harms, let alone the public interest. In any case, the FCC should avoid “prophylactic” regulations for interconnection problems that, as even those asking for them admit, are speculative.

That Internet peering works so well absent regulation is no surprise. Major ISPs have strong business incentives to interconnect. For example, ISP customers increasingly demand access to streaming video content from services such as Netflix and Amazon, and ISPs know that streaming video is the primary reason that customers are willing to pay for high-speed broadband connections at home.

Where disputes have arisen (often around the distinction between settlement-free transit vendors and paid-peering content delivery networks (CDN), for example²⁸), they have taken the form of contract disputes between large commercial players over *the specific terms* of interconnection, not *whether* it will be available.

²⁶ Report and Order and Further Notice of Proposed Rulemaking, *In re* Developing a Unified Inter-carrier Compensation Regime, CC Docket No. 01-92 (November 18, 2011), available at <http://www.fcc.gov/document/fcc-releases-connect-america-fund-order-reforms-usficc-broadband>.

²⁷ OECD, Committee for Information, Computer and Information Policy, Internet Traffic Exchange: Market Developments and Policy Changes, 3 (June, 2011), available at [http://search.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/CISP\(2011\)2/FINAL&docLanguage=En](http://search.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/CISP(2011)2/FINAL&docLanguage=En).

²⁸ See, e.g., Marguerite Reardon, *Understanding the Level 3-Comcast spat (FAQ)*, C-Net (November 30, 2010), available at http://news.cnet.com/8301-30686_3-20024197-266.html.

Moreover, demand for streaming video has become so strong that Netflix, having established its own CDN, can now sidestep such disputes and pressure ISPs to accede to its peering demands by threatening to withhold new content or services. It has now *content providers*, in other words, and not ISPs, who threaten to withhold traffic.²⁹ The newfound market power of content providers—as well as increasing intermodal competition from mobile broadband—upends the weathered assumption that ISPs hold all of the bargaining power in interconnection negotiations.

Lessons from the Digital Television Transition

In encouraging the rapid transition of wireline providers to all-IP networks, Congress should heed the lessons of the earlier transition from analog to digital television (DTV). The DTV experience underscores the importance of accelerating deregulation of obsolete networks before consumers abandon them, of setting and sticking to a date certain, and to avoiding the temptation to prophylactically regulate for consumers harms that have yet to appear.

At its height in the 1970's, 93% of all American homes relied on antennas. But analog broadcast couldn't compete with the quality or the quantity of cable channels. As digital technology expanded the scope and efficiency of cable and later fiber-based programming, it became clear that over-the-air broadcasters would likewise need to convert to digital signals to compete.

Shutting down analog broadcast, however, required government coordination. In 1996, Congress mandated the conversion from analog to digital broadcast in 1996, setting a deadline of 2006 and authorizing the FCC to coordinate the transition.

The coordinated switch to DTV was intended to make the highly-regulated broadcasters more competitive with the relatively unregulated cable industry.

How? Digital TV lowered costs and created new opportunities for broadcasters. As part of the transition, for example, broadcasters traded their analog radio spectrum allocations in the 700

²⁹ See, e.g., Betsy Isaacson, *Netflix Says 3D and 'Super-HD' Movies Are Just Around The Corner--But Only For Some Customers*, Huffington Post (January 9, 2013), available at http://www.huffingtonpost.com/2013/01/09/netflix-3d-movies_n_2441394.html; Fred Campbell, *Netflix Blocking Internet Access to HD Movies*, The Technology Liberation Front (January 17, 2013), available at <http://techliberation.com/2013/01/17/netflix-blocking-internet-access-to-hd-movies/>; Fred Campbell, *What Does Netflix's Decision to Block Internet Content Tell Us About Internet Policy?*, The Technology Liberation Front (January 23, 2013), available at <http://techliberation.com/2013/01/23/what-does-netflixs-decision-to-block-internet-content-tell-us-about-internet-policy/>.

MHz band for a new 6 MHz block in the 600 MHz band. Because digital signals are more compressed, each 6 MHz block could be split and used for multiple channels, all of them capable of high-definition broadcast, as well as new mobile business opportunities for the broadcasters.

So far, however, few station operators have been able to make use of that capacity to offer extra channels or to repurpose underutilized spectrum for mobile or other premium services. That's largely because, in the end, the DTV transition was delayed until 2009. By then, over-the-air television had already entered an unrecoverable dive in viewership and revenue.³⁰ According to research from the Consumer Electronics Association, the decline in over-the-air audience became irreversible between 2005, when the transition should have happened, and 2009, when it finally did.³¹

Delays in the DTV transition were largely the result of unfounded and exaggerated fears that some consumers would not be ready in time. A 2006 article in *Fortune*, for example, warned breathlessly that the DTV transition would "render about 70 million TV sets obsolete," and that "for consumers with one of those 70 million sets -- many of whom are likely to be poor, elderly or uneducated, being forcibly switched from one technology to another will be a nightmare."³²

The reality, of course, was very different. Consumers who weren't already cable or satellite subscribers and whose energy-inefficient tube television sets were too old to receive digital signals were barely inconvenienced, let alone "forcibly switched."

Many had already moved to cable or satellite by the time the DTV transition occurred. For the rest, all they had to do was to buy and attach small digital converter boxes to their old TVs. Under a plan implemented by the Department of Commerce, consumers could even apply for up to two \$40 coupons with which to purchase the converters, funded by proceeds from the 700 MHz spectrum auctions.

On the fateful day, June 12, 2009, according to Nielsen, almost no one was left without television service. As Figure 2 shows, nearly all "unready homes" had successfully made the

³⁰ See Sam Schechner and Rebecca Dana, *Local TV Stations Facing a Fuzzy Future*, THE WALL STREET JOURNAL, Feb. 10, 2009, available at <http://online.wsj.com/article/SB123422910357065971.html>.

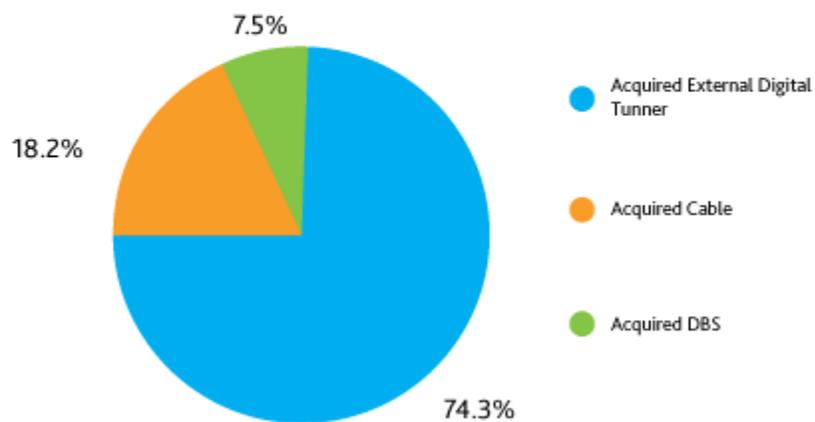
³¹ CEA Study: *Consumers are Tuning Out Over-the-Air TV*, May 31, 2011, available at <http://www.ce.org/News/News-Releases/Press-Releases/2011-Press-Releases/20110531-CEA-Study-Consumers-Are-Tuning-Out-Over-t.aspx>.

³² Marc Gunther, *Digital TV: Leaving Viewers in Limbo*, FORTUNE, Jan. 19, 2006, available at http://money.cnn.com/2006/01/04/technology/pluggedin_digitaltv/index.htm.

transition by using the converter box, or by switching to digital cable or satellite. No television was rendered “obsolete,” let alone 70 million.³³

The Transitioned Television Set Route to Readiness – Total U.S.

Percent of Converters June 21, 2009



Source: The Nielsen Company

Figure 2 – Consumers Adapted to the DTV Conversion

Delaying the transition by three years, however, blunted the potential of a coordinated and timely switchover in crucial ways. Consumers had more time to switch to cable or satellite to avoid dealing with the transition at all, imposing real damage on broadcasters. That loss of viewers makes it harder to this day for the broadcasters to offer new and competing products using their new spectrum and digital technology upgrades.

Ultimately, that translates to a loss to consumer of more competition in the video marketplace. Delays that were intended to protect consumers, in the end, did just the opposite.

³³ Nielsen, *The Switch from Analog to Digital TV*, Nov. 2, 2009, available at <http://www.nielsen.com/us/en/newswire/2009/the-switch-from-analog-to-digital-tv.html>.

The IP transition should be easier. Unlike digital television, consumers will not need to replace equipment already in their homes, nor will they need to install adapters for existing telephones. In some cases, fiber optic cable will replace copper wiring in the heart of the network; in other cases, fiber will be run directly to the home. But inside wiring will not be affected, and existing telephones (far cheaper to replace, in any case, than old analog televisions) will continue to operate, just as they do now in homes that have already switched to Internet voice services.

It is true that some rural users may need to switch from landline to mobile service, especially in remote areas where the cost of installing wired IP networks is prohibitive. But the FCC can subsidize the cost of that switch—as indeed it already does through the recently-reformed Universal Service Fund.³⁴

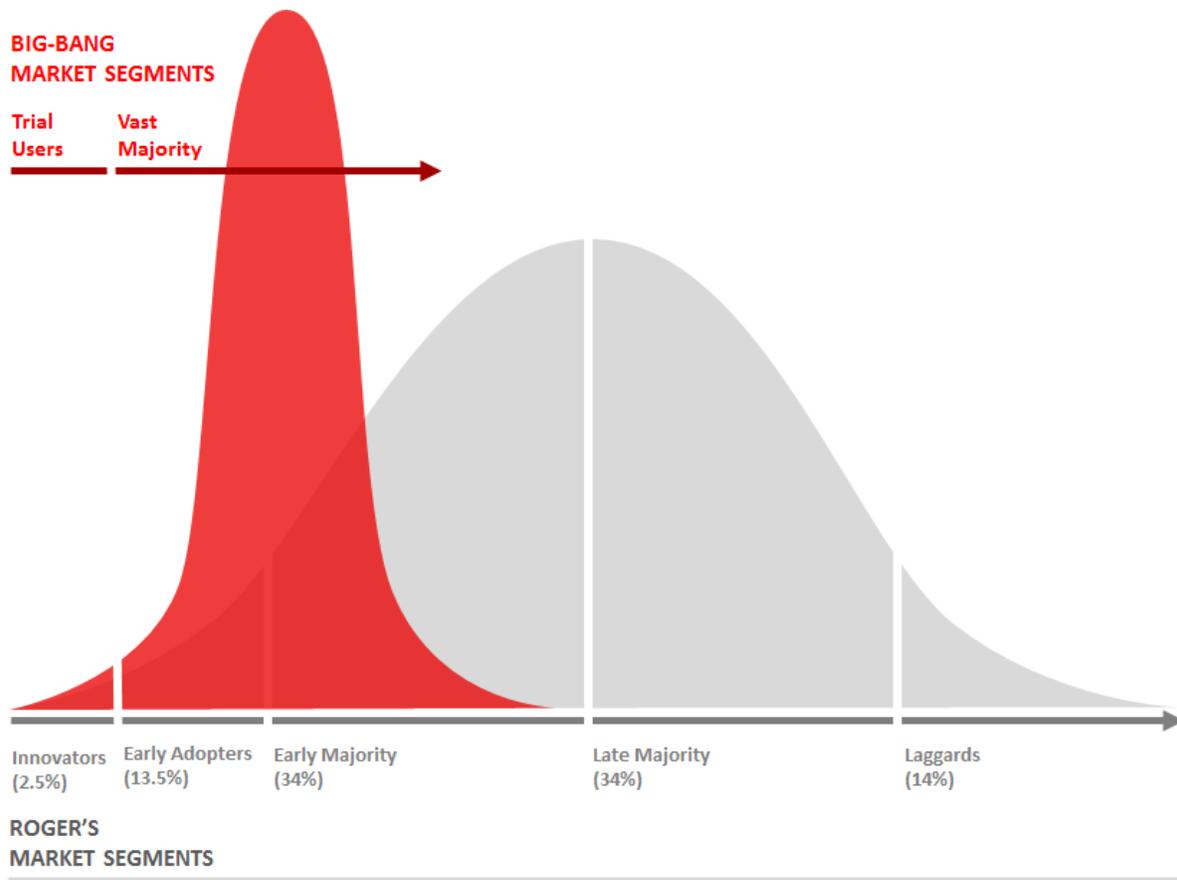
As with DTV transition, however, ungrounded fears of what could go wrong could continue to delay the IP transition, with dangerous and unintended consequences for consumers—particularly those for whom advocates most claim to be looking out.

Conclusion

Consumers naturally resist change, even when being offered new products and services that are better and cheaper. But where the introduction of new technologies once required careful planning by providers and different marketing delivered to different groups of users, research on Big Bang Disruptions reveals that the process has changed dramatically. The old bell curve model of technology adoption first described by Everett Rogers is gone, replaced by a much steeper curve in which adoption is nearly universal and immediate. The Internet revolution has compressed the old categories to just two: early users, and everyone else.³⁵ (See Figure 3.)

³⁴ See Marguerite Reardon, *FCC Reforms Phone Subsidy Program for the Poor*, CNET NEWS.COM, Jan. 31, 2013, available at http://news.cnet.com/8301-30686_3-57369007-266/fcc-reforms-phone-subsidy-program-for-the-poor/.

³⁵ See Downes and Nunes, *Big Bang Disruption*, *supra* note 4, at 47.



(Source: *Downes and Nunes*, supra note 4, at 47)

Figure 3 – The New Model of Technology Adoption

The adoption of IP-based voice services is following the new model, and its impact on wireline competition has already been devastating. Congress and the FCC must act to preserve the residual value of the PSTN and ease the transition for those Americans who have yet to make the leap.

Some consumers will no doubt encounter problems in the final transition from PSTN networks. Some of these issues will be addressed by more technology or, where truly necessary, by regulatory intervention. But as with the DTV transition, the real problems will likely turn out to be far less imposing, and visited on far fewer consumers, than pre-transition anxiety suggests. That of course is the reason to conduct trials in the first place: to unearth and resolve as many potential issues as possible, and to make clear where problems do not in fact exist.

In the DTV transition, broadcasters set free too late to make use of their new competitive technologies are now limping into extinction.

If we don't get the IP transition right, the same fate could be unnecessarily visited on incumbent PSTN network operators. But in the end, as before, it will be consumers who pay the price for that failure.