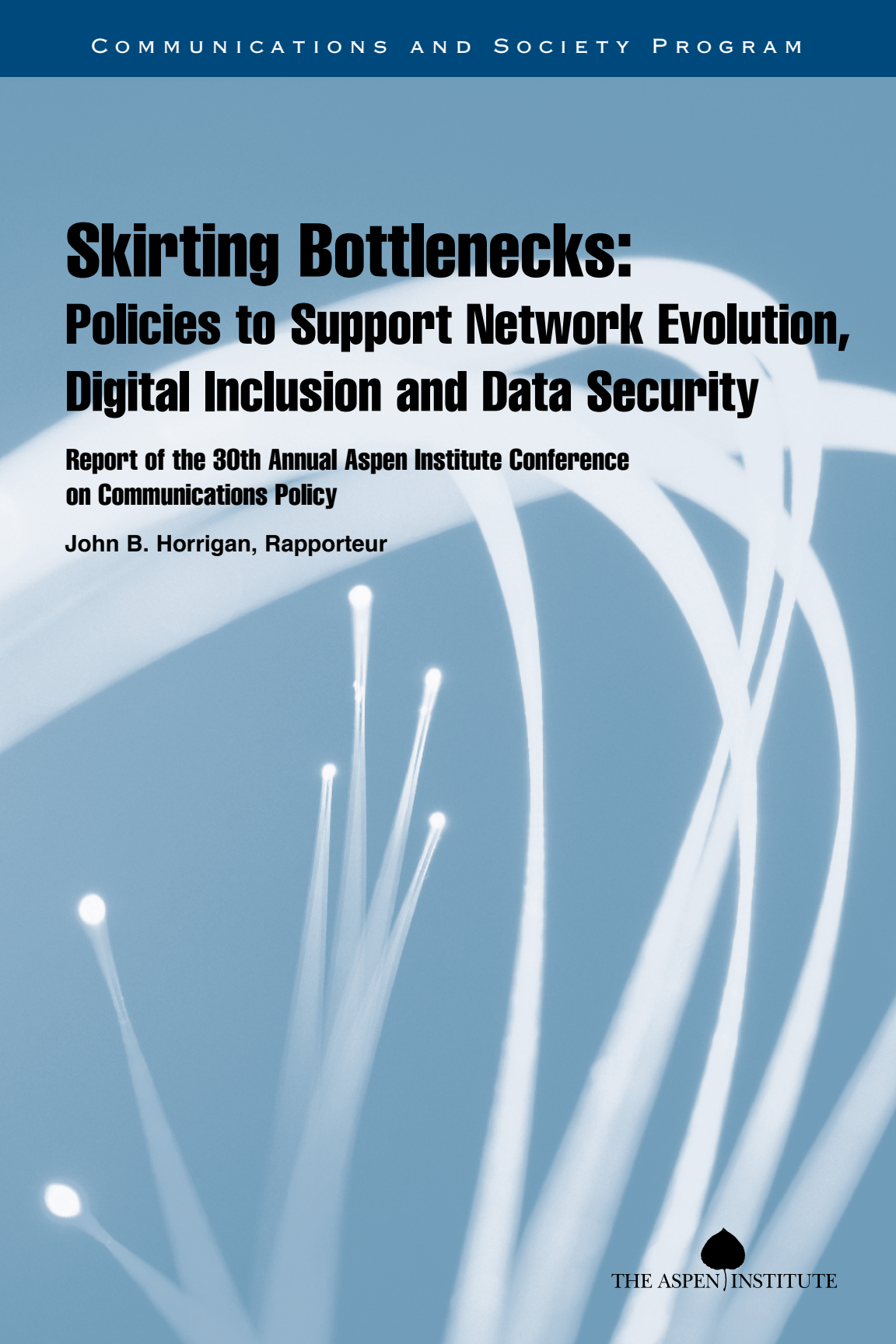
Skirting Bottlenecks:
Policies to Support Network Evolution, Digital Inclusion and Data Security

Report of the 30th Annual Aspen Institute Conference on Communications Policy

John B. Horrigan, Rapporteur



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Charles M. Firestone
Executive Director
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The Aspen Institute
Communications and Society Program
One Dupont Circle, NW
Suite 700
Washington, DC 20036
Phone: (202) 736-5818
Fax: (202) 467-0790

Charles M. Firestone
Executive Director

Patricia K. Kelly
Managing Director

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One Dupont Circle, NW
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Contents

This report is written from the perspective of an informed observer at the Aspen Institute Conference on Communications Policy. Unless attributed to a particular person, none of the comments or ideas contained in this report should be taken as embodying the views or carrying the endorsement of any specific participant at the Conference.

Foreword

Robust competition among communications providers has always been a crucial goal for policymakers, leading to robust, innovative and efficient delivery of services. It was an integral purpose of the 1996 Telecommunications Act and the FCC's National Broadband Plan. Today, with the delivery of over-the-top video, games, apps, big data and other content via broadband, the extensive use of cloud, and now fog computing, and the advent of next generation networks, the old definitions and visions of market may need significant revision. Broadband Internet has become a necessary service for all populations. Accordingly, policy-makers need to take steps to ensure that there is competitive pressure within the industry to avoid a stagnant marketplace, that the current digital divide does not widen and that there is sufficient security and privacy with personal data.

What does the competitive communications marketplace of the future look like?

On August 12-15, 2015 the Thirtieth Annual Aspen Institute Conference on Communications Policy met in Aspen, Colorado, to investigate policy goals that can ensure this robust, competitive marketplace. The 32 leading communications policy leaders and experts who gathered in Aspen considered how broadband markets can promise delivery of economic and social benefits that improve the quality of life in America for all. They came up with the five recommendations, found in this report, "Skirting Bottlenecks," written by rapporteur John B. Horrigan.

1. **Improve the investment climate for fiber networks**
2. **Ensure the availability of spectrum for 5G wireless networks**
3. **Develop "smart vouchers" to promote broadband adoption**
4. **Invest in training on the Internet and computers for eligible populations**
5. **Think expansively in promoting information security for consumers**

While these recommendations generally reflect the sense of the meeting, no votes were taken. Accordingly, participation in the dialogue should not be construed as agreement with any particular statement in the report by the participant or his or her employer.

Acknowledgments

I would like to acknowledge and thank the entities represented in this conference who have also contributed to and supported the Communications and Society Program. They are Microsoft Corporation, Google, Inc., AT&T Services, Inc., Cisco, Comcast NBCUniversal, Cablevision, Charter Communications, Dodge & Cox Funds, Intel Corporation, Netflix, Inc., New Street Research, Telefonica Internacional USA, Inc., Time Warner Cable and Emmis Communications.

I also want to acknowledge and thank John B. Horrigan, our rapporteur, for his extensive and informative account of the conference discussions; and our participants for their contributions to these complicated topics. Finally, I want to thank Ian Smalley, Senior Project Manager, for producing the conference and this report, along with the Communications and Society Program Managing Director Patricia Kelly, who oversaw its editing and publication.

Charles M. Firestone
Executive Director
Communications and Society Program
The Aspen Institute
Washington, D.C.
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Executive Summary

The communications policy environment carries great expectations for broadband's transformational potential, yet accompanying these hopes are potential risks on the horizon. Over the past two decades, the Internet has evolved from a hobbyist's technology into a bedrock infrastructure for communications, commerce, civic activity and social life. Society is at a point where those impacts will deepen further. The Internet transports more data faster than ever before and our ability to put that data to use promises huge changes in how we manage our personal health, households, education and work life.

Yet within the swirl of change and expectation come uncertainties. Technological innovation drives economic change, but it does not negate the possibility for market concentration in networked industries. Equity concerns—who has access to the latest gadgetry and who does not—is an abiding worry and may take on new consequence as digital tools become more pervasive in society. With data about people's behavior, health, learning habits and households driving new applications, new consumer protection issues arise around data privacy and security.

This context served as the backdrop for the 30th Annual Aspen Institute Conference on Communications Policy, entitled "The Future of Broadband Competition." The question that animated discussion was: How can broadband markets continue to deliver economic and social benefits that improve the quality of life in America? The answers fell into three categories:

1. **Breaking down bottlenecks in the marketplace.** For consumers, the ideal future broadband market will have at least two "gigabit plus" providers in addition to one or more 5G wireless providers. This should provide sufficient competitive pressure to avoid the pitfalls of a stagnant broadband marketplace, but this outcome is not inevitable. In many areas of the United States, multiple gigabit plus providers will be economically infeasible.
2. **Ensuring inclusion.** The level of home broadband subscriptions in the United States is not sufficient to ensure an equitable distribution of the benefits of digital applications. The evolving market

will help solve this problem, but the market by itself will not be sufficient to address the scale of the remaining digital divide.

3. **Enhancing information security.** The benefits of pervasive data notwithstanding, it has created a sense of vulnerability among consumers about the data they share with business and government. Action is needed so that the bad actions of a few in the data environment do not have wider repercussions for consumers and innovation.

To give substance to each of these topics, conference participants made the following recommendations:

1. Improve the investment climate for fiber networks

Wireline broadband networks are capital intensive, which creates the possibility that a given geography may only attract one provider of multi-gig connectivity. Without the possibility of an additional provider, such areas run the risk of having a stagnant monopoly as their sole broadband provider. Policy should work to prevent the stagnant monopoly case, while recognizing that no more than two wireline networks may be economically viable in a given region (and in some regions, even a single multi-gig network may not be economically viable). Even in that case, the resulting duopoly should have incentives to upgrade networks and compete for customers.

To realize the vibrant duopoly case, government and industry must develop a playbook to lower the cost of network deployment. This means compiling the necessary data to make network deployment cheaper; such data would, for example, facilitate permitting to access rights-of-way and represent an inventory of utility pole and conduit information. Municipalities should also have the legal authority to build their own fiber networks; while this may make economic sense in a limited number of cases, having that authority could establish a credible threat of entry that would drive network upgrades by incumbents. Places that prohibit municipal broadband should be ineligible for Connect America Fund network subsidies.

2. Ensure the availability of spectrum for 5G wireless networks

Although 5G wireless remains ill-defined, its potential to change the market is great. It holds the potential to change network architecture

and draw market entry in broadband from non-incumbents (i.e., adjacent market entry). This underscores the urgency of ongoing initiatives to increase the supply of spectrum for commercial and unlicensed use. These initiatives include the incentive auction for broadcast spectrum and methods to share government spectrum with the private sector.

3. Develop "smart vouchers" to promote broadband adoption

Current campaigns to promote broadband adoption do not address the scale of the problem. Public funding has dried up as Recovery Act dollars have expired and well-crafted private initiatives, such as Comcast's Internet Essentials, do not extend nationwide. At the same time, public and private programs have resulted in a "community of practice" that represent viable models for increasing broadband adoption.

The development of a Smart Voucher program would give low-income populations the financial assistance to subscribe to broadband. Developing the program would start first with a pilot project to determine the size of the voucher—though the likely level would be greater than the current $9.25 per month level for the FCC's Lifeline program for telephones. Given the size of the non-adopting population in the country, eligibility would extend beyond very low-income populations. The voucher would be good for purchasing service that supports key applications, such as two-way video and real-time voice, though supported service levels would not be the highest speeds offered in the market.

4. Invest in training on the Internet and computers for eligible populations

Smart vouchers should also be coupled with funds for training to assist eligible populations to acquire the digital skills to take advantage of the Internet. Voucher recipients could receive larger voucher amounts if they complete digital skills training. Funding for training programs should be channeled to community institutions through a new block grant program.

5. Think expansively in promoting information security for consumers

Urgency was the watchword to describe deliberations on the need to provide people the assurance that their personal data is secure enough so that they can embark on the emerging next generation of digital applications. Steps stakeholders should take to do this proved difficult

to specify. To better marshal forces at the federal level, a new entity—the Federal Information Security Council—is worthy of consideration. Yet, given the time to ramp up such an entity, it may make sense instead to give the Federal Trade Commission more resources to address information security. And whatever actions are taken at the federal level should not supplant state action on information security. An alternative mechanism—namely a less formal collaborative platform that serves as a forum for all stakeholders to respond to information security challenges—has promise. But this approach leaves open important details such as governance and enforcement.

Skirting Bottlenecks

Policies to Support Network Evolution, Digital Inclusion and Data Security

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Setting the Stage

Competition has been central to communications policy since the origins of the telephone. In 19th century Britain, where complaints about service were pervasive, it was seen as "axiomatic…that telephony must necessarily be a monopoly."[1] The earliest American telephone industry pioneers were quick to identify and seize network bottlenecks as a way to exert market power. In 1907, Theodore Vail declared that the "telephone man of the day wanted the exchange rights" to control interconnection of local calls to the long distance network.[2] At the same time, the battleground of interconnection also contributed to the build out of a "geographically ubiquitous telephone infrastructure" that gave the phrase "universal service" its early meaning.[3] Thus began a long-standing communications policy tension: successful firms, secure in their market power, might not have sufficient incentives to invest in network improvements.

This situation gives technology the role of double-edge sword in the drama of competition in the communications market. Those companies on the cutting edge can—and do—win dominant places in the markets they enter. This, however, comes with it the risk for complacency, as dominant incumbents see little reason to invest to stay ahead of the competition. Yet this dynamic is a risk, not a certainty. A concentrated market structure may not, under certain conditions, mean innovation takes a back seat. If a market is not competitive in the textbook sense, can it nonetheless call forth the investment necessary for future innovation?

The 2015 Aspen Institute Conference on Communications Policy addressed how these long-standing dynamics in communications markets are playing out in the 21st century. Since the beginning of the

21st century, broadband has rapidly become a crucial infrastructure for commerce, civic engagement and social life. High speed Internet connectivity ushered in changes to various dimensions of society at the same time the technology itself—and the uses people and business put to it—has evolved.

These deep and disparate impacts invite scrutiny from policymakers and stakeholders in the private sector and civil society. Are policies in place that support continued investment in broadband? Are equity issues—such as whether enough people have adopted broadband or whether enough places have access at sufficient speeds—receiving enough attention? And, not least, is the marketplace for broadband services vibrant enough to support bandwidth abundance, a term that captures the expectations of many stakeholders for the role the technology can play in economic and social development?

As participants met to consider the future of broadband competition, they recognized that the broadband ecosystem has seen significant progress in recent years. Private sector investment is strong, with steady advances in adoption of new services by consumers and significant network upgrades in many parts of the country. Against this progress, however, were worries that fell into three categories:

- **Competition:** Will markets for broadband service be stagnant monopolies or vibrant duopolies?

- **Adoption and Use:** Today's gaps in adoption of home broadband remain significant and existing mechanisms to close them may not scale to address the size of the problem.

- **Consumer Protection:** There is a sense of "data vulnerability" among consumers as well as worry about customer service—and these concerns may inhibit development and adoption of next generation technology tools.

After exploring these three issues, conference attendees presented proposals to address each of them:

- For competition, develop a playbook for states and localities to follow to take steps to lower the cost of deployment of new networks.

- To encourage greater adoption of broadband, create a voucher program by which eligible low-income consumers purchase service, with opportunities for consumers to receive training on the Internet.

- To address consumer protection, create a Federal Information Security Coordinator (FISC) as a means to mitigate consumers' "data vulnerability," though attendees did not reach a consensus on the merits of this idea.

Broadband Policy in the Obama Administration

The arrival of the Obama Administration added a new energy to U.S. broadband policy at a time of economic crisis. Broadband itself, with adoption approaching two-thirds of all households and network speeds improving, had arrived at a maturity that made it central to economic and social life. As a force in the economy, high-speed networks (both wireline and wireless) were widely seen as crucial to economic competitiveness. In social life, the Internet had established itself as a "new social operating system" that was central to many people, to personal interactions and community life.[4]

In this context, the Federal Communications Commission (FCC) embarked on the National Broadband Plan (NBP), which made a number of recommendations on how to expand deployment of broadband networks, expand the supply of spectrum (for both commercial and unlicensed uses) and increase the number of households with broadband subscriptions. Even though the recession made it difficult to put federal dollars behind many policy goals, overarching telecommunications policy themes in the Obama years have been to:

- Foster investment
- Stimulate competition
- Close the digital divide

There is progress on each of these fronts, including $260 billion in public and private investment in networks over the past several years, with the vast majority of it from the private sector. Fast fourth generation (4G) wireless networks now cover nearly all (98%) of the country.

The demand for spectrum is evident, as witnessed by the $41 billion in revenues generated in 2014 in the FCC's Auction 97, also known as the Advanced Wireless Service 3 (AWS-3) auction. The Congressional Budget Office projected that the auction would not raise any appreciable revenue, which proved to be far off the mark. Additionally, there are a number of developments on the network deployment front—from fiber to cable network upgrades—that suggest robust competitive activity, at least in some parts of the country. And the advent of smartphones, along with steady (if not spectacular) growth in home broadband adoption, shows progress in getting more people online.

Notwithstanding these positive developments, there is reason to be wary of what R. David Edelman, Special Assistant to the President for Economic & Technology Policy at the White House National Economic Council, called a "digital disconnect." First, the consumer experience is not always what it should be, as evidenced by how poorly Internet Service Providers (ISPs) rate in customer satisfaction surveys. The origin of this dissatisfaction is not always clear. Some of it may be as simple of some consumers finding response times from ISPs too slow in the face of service outages. Some discontent may pertain to price. The monthly fee for access may seem high for some households—and the perception that service is too costly may take hold where consumers do not have much choice among ISPs. The "digital disconnect" may even extend to some consumers' sense of insecurity about the personal data they share online.

…access is a matter of "digital dignity"….
– Nuala O'Connor

A second issue is the widespread sense that broadband connectivity to U.S. schools is too slow to support next generation educational needs. Although recent years has witnessed progress—77% of school districts met the 100 Mbps minimum speed goal in 2015, up from 30% two years earlier—more must be done on advancing network speed and affordability.[5] With this rationale the Obama Administration has launched the ConnectEd initiative to invest $10 billion over five years to improve broadband network speeds at schools.

Finally, home broadband adoption among the urban poor and in some urban areas lags behind national averages significantly, as Julia Johnson, President of Net Communications, said. To address this, the Administration is implementing its ConnectHome program to expand connectivity in public housing units, which could, in time, reach more than 200,000 households. Though this initiative may be a good start on the broadband adoption issue, the stakes on this issue are high. Nuala O'Connor, President and CEO of the Center for Democracy and Technology, stated that access is a matter of "digital dignity," and Opeymi Akanbi, Ph.D. student at the Annenberg School for Communication, University of Pennsylvania, noted that, with online access becoming more integrated into health care delivery, being disconnected can have deleterious consequences for people and health care providers.

However one judges progress in broadband in the Obama years—both scope and rate—a number of challenges remain. If competition is not unfolding robustly enough, what measures will spark it? Are there models that can close home broadband adoption gaps? If a "digital disconnect" abides in consumers' minds, what can ease worries about the security of personal information that flows through communications networks?

Aspirations have to be matched with policy proposals that can bring life to visionary goals.

To answer these questions requires equal measures of aspiration and pragmatism. If a future broadband marketplace is to be competitive, it is worth asking what such a market would look like—and what it would accomplish. If it does not accomplish the goals stakeholders articulate (for example, goals relating to digital inclusion), understanding market failures is crucial. And, not least, stakeholders must contemplate challenges that may fall outside the traditional bounds of competition policy. Aspirations have to be matched with policy proposals that can bring life to visionary goals.

Future Broadband Markets: Wireless Access and Abbreviated Bottlenecks

Economies of scale are a hallmark of network industries and the broadband market is no exception. The high fixed cost of building broadband networks to all (or most) households in a geographic area makes investment decisions challenging for the private sector. In the current environment, the debate over investment in infrastructure for very high speed home connectivity (typically a gigabit or more) vividly conveys the worry about the consequences of investment decisions. Although consumers in many places may have the choice of more than one ISP, the concern is that not enough will have a choice of more than one "gigabit plus" provider. (See the discussion below on the likely size of the share of households with just one gigabit provider.) The upshot would be large parts of the country where the gigabit provider has a monopoly for the provision of Internet service at next generation speeds. This, in turn, raises the potential for deleterious marketplace impacts that can accompany monopoly provision of a good or service.

Avoiding this result means marshaling the forces of technology. If the economics of broadband seem destined to have a connectivity market where a single provider holds the bottleneck, one possible solution is to engineer around the connectivity market. That is one possible future, offered Kevin Werbach, Associate Professor of Legal Studies and Business Ethics at the University of Pennsylvania's Wharton School, if wireless mesh networks have the capacity to provide access to the Internet for consumers. The notion of businesses or consumers subscribing to a service that gives them access to content or people using electronic devices may become obsolete. The pace of software-driven innovation is so rapid that the means to access communications infrastructure may migrate away from a carrier providing connectivity services. Rather, pervasive high-speed wireless networks, driven by software that allows access devices to find connectivity on demand, may become the norm for how people get online.

A future marketplace might then look as follows:

- Cognitive mesh wireless wins in the connectivity market.
- Almost everyone will have access to last mile networks at multi-gigabit speeds.

- Almost all traffic is video, virtual reality, games or driven by sensors.
- The average American has more devices that connect to the Internet than choice of providers.

If the future plays out in this way, sector-specific telecommunications regulation could become a thing of the past.

Although such an idealized vision may sound far-fetched, experience in the wireless market shows how quickly things can change. Former FCC Chairman and current CEO of the Coalition for Green Capital Reed Hundt noted how each generation in the wireless access market has had different dominant players. Blackberry dominated the beginning of the 3G era, with Nokia also having significant market share. The 4G era has seen Samsung and Apple battle for market share, with the Chinese company Xiaomi also in a strong position.

…the point of competition in network industries is to be in a position to control the bottleneck through which dollars flow.

Whether the transition to 5G will similarly disrupt the market and whether 5G will result in radical decentralization that eviscerates the market for connectivity remains to be seen. Hundt suggested that a 5G world would result in a new architecture for the network whereby cloud storage and smart devices result in fewer bottlenecks. Such a world will not put an end to the pursuit of bottlenecks, as the point of competition in network industries is to be in a position to control the bottleneck through which dollars flow. The goal of policy is not to prevent companies from pursuing and winning such market power, but instead to ensure that winning companies cannot determine how the market evolves in the future. The power of 5G technology promises to prevent winners in leveraging bottleneck power to shape the succeeding generation of technology and marketplace competition.

The market structure of the future, then, is likely to have wireless play a prominent role in how people access the Internet and other digital applications. As Eli Noam of the Columbia University Business

School said, consumers are likely to have the choice of two wireline providers—telecom and cable—and at least two 5G providers beyond the one offered by the incumbent wireline provider. Yet for wireless to be a viable substitute for wireline access in the broadband subscription market, sufficient spectrum capacity is vital. For the most part, conference participants did not see wireless in today's 4G environment as a substitute for wireline broadband access. Chris Libertelli, Vice President, Global Public Policy at Netflix said that a small fraction of Netflix users access content using a wireless device on a data plan; the presence of data caps limits behavior. However, Catherine Bohigian, Executive Vice President, Government Affairs at Charter Communications, noted that her company's investment decisions today treat wireless as a competitive threat to wireline broadband.

The goal of policy…is to ensure that winning companies cannot determine how the market evolves in the future.

Although wireless animates the vision of a future with no marketplace bottlenecks, wireline infrastructure is indispensable to realizing it. Better wireless requires capacious backhaul for data traffic, and that means extensive deployment of fiber optic networks. Since fiber networks are a necessary condition for robust wireless access, much of the policy discussion to follow centers on ways to encourage the construction of fiber optic networks. That said, today's efforts to increase the supply of spectrum, whether through incentive auctions for broadcast spectrum or better spectrum sharing by the federal government, remain important priorities.

Turning the Vision into Reality: Adjacent Market Entry

A future of wireless mesh networks and 5G access structuring consumers' access to the Internet is not inevitable. 5G itself is not well defined and much less well understood as to its use cases and the complementary investments needed to give it life. As Arun Palakurthy, Vice President and Shareholder of Dodge & Cox Funds said, if 5G is

to truly be the era of spectrum abundance, then standards bodies and government have work to do to ensure that 5G can support radical decentralization of the marketplace. Tim Wu, Columbia Law School's Isidor and Seville Sulzbacher Professor of Law, added that the role of unlicensed spectrum in a 5G world must also be defined, and has to be a part of future wireless ecosystem.

…if 5G is to truly be the era of spectrum abundance, then standards bodies and government have work to do to ensure that 5G can support radical decentralization of the market place. ***– Arun Palakurthy***

In the meantime, a sign of health in the broadband marketplace is the degree to which adjacent market entry is viable. Competition in broadband may not come from an established network provider seeking to build a new network where an incumbent currently resides. Verizon, for example, may not enter a market where Comcast holds a large share of the broadband service market because the chances may not be good that Verizon will gain enough of the market to justify the investment. That is why FiOS build out was eventually played out only in the markets Verizon initially announced—and in some cases not as extensively in those markets as promised. Jonathan Chaplin, Managing Partner of New Street Research, noted the difficulty Verizon had in turning a profit from FiOS, observing that Verizon sold off all its FiOS assets in three major markets (at very low prices) because they did not generate sufficient return on invested capital.

Rather than entry from an established player, market entry might come from a company who participates in a related market—in other words, an adjacent market. Some firms may see an opportunity to expand in a direction that departs from their core functions; this may constitute a threat to firms which it heretofore had not competed with. Policymakers cannot force adjacent market entry, but they can do things to make it more attractive for firms to go down the path of entering an adjacent market.

For broadband, the main means to encourage adjacent markets is to lower the cost of the inputs necessary to build a network, said Blair Levin, Nonresident Senior Fellow at the Brookings Institute, and Executive Director of Gig.U. Accessing public rights of way, conduit under streets or utility poles are indispensable for building new fiber networks. They are also costly—making up as much as 20% of the overall cost of network deployment.[6] Yet these are costs over which government has some control—and lowering these costs can spur new fiber builds. This was much of the rationale behind Gig.U and also has made Google Fiber deployments more economically attractive. Google Fiber represents a classic example of adjacent market entry, as it expands from search to the infrastructure that delivers search results to users.

…a sign of health in the broadband market place is the degree to which adjacent market entry is viable.

For wireless and 5G, the conditions for adjacent entry require that spectrum not be in short supply in the market. This requires ongoing work on initiatives that have been under discussion for the past several years. Incentive auctions must proceed to capture spectrum unused by broadcasters and re-auction it for commercial use, as well as continue to search for ways for government to better share its spectrum with the private sector. More provocatively, the Coalition for Green Capital's Reed Hundt raised the notion of "use it or lost it" for current spectrum rights-holders, which is to say that if a company that holds spectrum rights does not put it to commercial use after a certain time period, that company must return it to the public domain for reallocation. It includes developing 5G, which, as noted, means that standards bodies must make choices that allow the private sector to commercialize products. Most participants agreed that spectrum scarcity would not be a characteristic of the 5G era—and that indeed spectrum abundance is a necessary condition for the 5G era to flourish.

Whatever the uncertainties about 5G or future fiber deployments, there was consensus on the market structure for broadband in the medium term. Jonathan Chaplin of New Street Research noted that, as

of 2015, about 16% of households have access to a fiber broadband provider, with another 10% estimated to have access within the next few years, based on announced deployments. He envisions about half the country, over time and given existing market conditions, having access to a fiber option and one other (most likely a cable provider) for home Internet service at speed thresholds (i.e., 25 Mbps download) identified by the FCC. This leaves open the question of the other half of the country, which would likely have access to only one broadband provider.

However, the question of speed threshold for what qualifies for broadband, garnered much less consensus. In a 2014 speech, FCC Chairman Tom Wheeler declared that having access to 25 Mbps network speeds "is fast becoming 'table stakes' in 21st century communications" and said that 80% of American homes have access to networks whose speeds are 25 Mbps or better. The problem, argued Wheeler, is that too few households have more than one choice of home Internet service providers that offer those speeds. According to FCC data, 25% of households have access to two or more providers offering network speeds of 25 Mbps or greater, leaving "three quarters of American homes…with no competitive choice for the essential infrastructure of 21st century economics and democracy."[7]

Two objections arose pertaining to the FCC's 25 Mbps threshold. First, as Richard Clarke, Assistant Vice President of Economic and Regulatory Policy at AT&T said, consumers' speed preferences vary depending on the consumer. Wireless access at LTE speeds (typically no more than 12 Mbps) may be acceptable to some consumers, meaning such services constitute a competitive threat to broadband ISPs. He also reminded participants of the dynamic nature of the broadband landscape. When FCC Chairman Wheeler defined broadband as 25 Mbps in 2014, the AT&T's typical network speed to customers was 24 Mbps. By 2015, AT&T had upgraded its network speeds to 45 Mbps for 60% of its customer base. Second, Comcast (in comments in the proposed Time Warner Cable-Comcast merger) found "no basis" for the 25 Mbps threshold, saying that consumers "enjoy—and are using—a variety of DSL, wireless and other broadband services" to meet their needs.[8]

Whatever the merits of specific speed thresholds, there was consensus that households should have broadband at sufficient speeds to support video (whether that is for entertainment or other purposes). There

was also agreement that substantial portions of the country are unlikely to have the choice of more than one provider at very high speeds.

The Consumer: Inclusion and Data Protection

Skirting bottlenecks—or their gradual elimination over time—promises great marketplace benefits. But by itself, ending bottlenecks may not address all the challenges in the broadband ecosystem. The two main challenges to keep in mind are:

- Eliminating the digital divide, and;
- Devising ways to ensure consumer protection in a data-rich society.

Adoption gaps and solutions

As a way to frame equity issues in communications policy, the digital divide has been the main organizing principle for at least 20 years. In the Clinton Administration—at a time when less than one in five Americans used the Internet—it gained prominence as a way to think about the digital "haves" and "have nots." Now the nature of the gaps has flipped. Today, less than one in five Americans do not use the Internet, though anywhere between one-quarter and one-third do not have broadband at home.[9] Yet participants agreed that the broadband adoption gap in the United States is too large and warrants efforts to address it. Julia Johnson, President of Net Communications pointed out that home broadband adoption rates are particularly low in poverty-stricken parts of the country, which are also the places the need for jobs is acute—and that broadband has a role to play in promoting employment. Chris Lewis, Vice President, Government Affairs at Public Knowledge, echoed the severity of the problem, and added that broadband is increasingly a conduit to education and government services.

As a way to frame equity issues in communications policy, the digital divide has been the main organizing principle for at least 20 years.

Although the problem has a long history, solutions to the digital divide have evolved in recent years. The American Recovery and Reinvestment Act (ARRA) spent $450 million on sustainable broadband adoption and public computing centers in the Broadband Technology Opportunities Program (BTOP). The non-profit Everyone On, launched by former FCC Chairman Julius Genachowski, has sought to promote broadband adoption by promoting the relevance of connectivity to low-adopting populations. Comcast's Internet Essentials (IE), a voluntary merger condition in the Comcast-NBCUniversal merger, offers a discounted service plan to low-income households with children, access to computer and Internet training and the option to purchase a computer for $150.

Partnerships with trusted community institutions are important in reaching low-adopting populations to draw them to online use.

These programs have had impacts in the geographic areas they serve. BTOP connected nearly 740,000 households in the 43 projects it funded through 2013.[10] Since 2012, IE has attracted 500,000 customers in its service area.[11] BTOP and IE have fostered a community of practice on how successful broadband adoption programs are structured. Partnerships with trusted community institutions are important in reaching low-adopting populations to draw them to online use.[12] Training on how to use the Internet and computers is also important—and those new Internet users who have had training are more likely than those without training to use the Internet for job search and accessing government services.[13]

Whatever the exact impact of these initiatives—and they are on the order of 1.2 million households connected—they are not of sufficient scale to address a broadband adoption gap that amounts to approximately 30 million households. How to muster resources appropriate to the size of the problem is one of the key recommendations to come out of attendees' deliberations.

People, their data and their worries

Once people are online, the extent of their Internet use depends on a number of things. Familiar demographic factors—such as age or education—explain some portion of people's usage patterns, with older and less-educated people usually less active online. A label to capture consumers' predilection toward online use is "digital readiness"—a combination of skills and trust in the online environment that gives people the confidence to do important transactions online relating to health care or commerce.[14]

…"digital readiness" [is] a combination of skills and trust in the online environment.…

How much trust in the digital environment impacts behavior is not a settled question. Surveys register consumers' concern over whether their personal data is secure online, and about threats from bad actors online breaking into secure government or commercial data systems.[15] Yet these concerns do not always translate into consumers' online behavior. Data traffic seems to grow unabated by privacy (or other) concerns.[16] There is also the caution embedded in the "privacy panic cycle" by which new technologies bring on the worry—perhaps warranted, but perhaps not—that, notwithstanding their benefits, new technologies offer new threats to privacy.[17]

Nevertheless, with more of people's lives being mediated by digital tools—transacting with merchants, securing the household or managing personal health and fitness—the potential consequences of data breaches grows. This, in turn, contributes to a sense of vulnerability, which Jeff Smulyan, CEO and Chairman of the Board of Emmis Communications emphasized, that many people feel when thinking about using modern communications networks. Developing mechanisms to protect consumers' data and give them a greater sense of control over their personal data thus becomes more important than ever.

Charting a Path to the Future

The vision—broadband markets that are contested, networks whose capabilities constantly improve and more Americans securely using digital tools for personal improvement—requires a set of practical steps for it to be fulfilled. Here is what participants proposed in the areas of competition, digital inclusion and consumer protection.

Competition

Classic textbook competition, whereby many providers in a market sell to fully informed consumers, is not a realistic scenario for the broadband market. Markets are not likely to have more than two wireline providers and many, for the foreseeable future, may have only one. Given markets with few players, the challenge is how to encourage investment in networks so that capacity stays ahead of consumer needs. Policymakers must devise ways to discourage firms from becoming complacent in their investment plans. That is, policy must ensure that marketplace outcomes settle firmly on the side of a vibrant duopoly, where firms invest to ward off competitive threats, not stagnant monopoly, where firms have little reason to upgrade their networks.

In places where there currently are not plans to deploy fiber networks, looking for ways to encourage such deployment becomes an imperative. There are three possible ways to do that:

- *Municipal broadband:* There was not much enthusiasm for this as a strategy, but it nonetheless may make sense for municipalities to have the capability to do this. Such authority was seen, as Phil Weiser, Dean of the University of Colorado Law School reported out on behalf of the working group, as providing a credible threat that could encourage private-sector investment in fiber deployment.

- *Aggregate demand:* The approach fostered by Gig.U, which consists of city officials and other stakeholders coordinating on ways to lower costs of network deployment, thereby making the investment proposition more attractive.

- *Direct government investment:* This is a "last resort" option that is likely most relevant in rural areas where the size of the

market makes private investment unattractive. In such cases, government subsidies for fiber deployment may be justified.

A single "grand strategy" to foster fiber deployment may not be possible, given the variety of market conditions in different parts of the country. Rather than develop such a strategy deployment, the group set forth a set of ideas they labeled a "modest proposal" to pressure high-end wireline providers to invest in communities where they currently are not.

1. Develop a playbook to lower deployment costs and reward compliance with it. The playbook notion was borrowed, to varying degrees, from Google Fiber, Gig.U and NTIA, each of which have compiled ways in which localities can make it easier and cheaper to deploy fiber.
2. Prohibit states that ban municipal broadband networks from using any Connect America Funds (CAF).
3. Tax incentives to promote network investments, such as accelerated depreciation.
4. Increase broadband adoption. Expanding the market and revenue opportunities improves the investment proposition.

The centerpiece of the "modest proposal" is the notion of a playbook for governments to follow in order to lower the cost of building new fiber infrastructure. Google has set forth a number of steps to reduce deployment barriers. They include:

- Establish a national inventory of utility pole and conduit information.
- Reduce delays associated with pole attachment and conduit occupancy.
- Allow use of utility-approved contractors to perform all pole attachment and conduit make-ready work.
- Encourage adoption of local best practices.[18]

On the final recommendation, the "Google Fiber City Checklist" could serve as a guide to localities that would like to accelerate the

process of building a new fiber network.[19] Similarly, Gig.U's "The Next Generation Connectivity Handbook" offers, on the basis of the combined experience of Gig.U participants, a blueprint on not only the rationale for upgrading communications networks in a city, but also ways to lower the cost of network deployment.[20]

An idea, which Chris Lewis of Public Knowledge put forth, was regulation of wholesale access of a stagnant monopoly. The group rejected this approach: notwithstanding short-term benefits, over the long-term such regulation would dampen incentives for network upgrades.

Changing the MVPD model

A "less modest" proposal was promulgated to create incentives for the private sector to upgrade their broadband networks. Jonathan Chaplin, Managing Partner of New Street Research, proposed that broadband providers should get out of the pay TV business altogether and provide broadband service only. By upending the multichannel video programming distributor (MVPD) model, video would become a pass through service.

In the current model, out of a $120 bundled service for broadband and video, $80 covers video service and $40 covers broadband. Carriers should switch the model, argued Chaplin, so that $80 is revenue from broadband "stand alone" service with consumers purchasing video services at $40 per month. The additional revenue would create incentives for providers to upgrade to or invest in fiber. Chaplin noted that essentially all the value created in the consumer broadband market in the past 15 years has gone to video content providers. Notwithstanding dramatic growth in broadband's utility in the past 15 years, average revenue per user (ARPU) has remained constant at $45. It should be noted that the proposed change would affect only consumers who take video and Internet service in a bundle. While video-only consumers would presumably see price decreases, broadband-only consumers would likely face steep price increases.

And the latter concern is a stumbling block to this proposed change in the market. Chaplin said that providers believe that the FCC will not allow $80 per month broadband pricing and step into regulate the market. Title II, with its potential for rate regulation, thus becomes a roadblock to changing the pricing model for carriers.

Chaplin noted further that at least one MVPD, Cable One, has used this model. Cable One exited the video business a few years ago and, though it lost some customers, it increased cash flow by 23%. This made clear to customers that the cost of video content is high. And the hope is that, with consumers having to purchase video content outside the context of a bundle, competitive pressure will lower the cost of video content.

Julie Brill, Commissioner of the Federal Trade Commission, asked whether this plan should include a requirement that programming distributors unbundle program choices for consumers. Chaplin agreed that this should happen—and is already beginning to happen. Though unbundling may be attractive in theory, Johanna Shelton, Director of Public Policy and Government Relations at Google, noted that this may be difficult in practice. Many programming contracts are long-term and staggered, meaning instantaneous unbundling may be impossible. In other words, transactions costs in negotiating for content would not go away in this proposal and may present barriers to its feasibility. Additionally, added Chris Libertelli, Vice President of Global Public Policy at Netflix, the set-top box technologies of incumbent cable providers can make it hard for new entrants to the video market to deliver their programming to consumers.

Inclusion: Fixing policy mismatches

An important theme identified on the digital inclusion topic is how existing policy instruments do not map effectively to the nature and scope of the problem. Although the Obama Administration made investments in closing access gaps in the Recovery Act, that funding has expired. Private sector efforts, though effective, are not wide-ranging enough to tackle the scope of the problem. The FCC's program to promote connectivity—the Lifeline Program—has been aimed at telephone connectivity, although the Commission is in the process of allowing Lifeline subsidies for phone service to be used for broadband service.

The main goal of the group, therefore, was to bend the adoption curve by delivering the financial resources to the people in need in order to spur demand for broadband. The primary method the group proposes to do this is a "Smart Voucher." The vision for the program is to knit together three things needed to close broadband adoption gaps:

- **Digital skills:** Develop robust digital literacy and relevance training.
- **Connectivity:** Use a consumer subsidy, paid monthly, to support fixed or mobile broadband at minimum service levels.
- **Devices:** In partnership with the private sector, develop leasing or ownership programs that build a secondary market for devices that use vouchers for transactions.

From this vision came a detailed proposal to operationalize Smart Vouchers as a means to increase broadband adoption. Given the strong rate of smartphone adoption among the low-income population the program targets, the objective is for this population to have "an app for that," meaning eligible consumers could use an app to receive vouchers, transfer payments, learn about broadband service offerings and choose among broadband offers and attributes. The vouchers would work for wireless providers as well as wireline ISPs.

To maximize convenience for eligible consumers—both in signing up for and using the benefit—the vouchers would also be integrated into other government programs, i.e., broadband vouchers might be made available to people when they apply for Food Stamps. The vouchers might also be tethered to commercial offers of service, merchandise

coupons and ads. Finally, the group emphasized the need for feedback on effectiveness of the program and subsequent fine-tuning. Smart Vouchers would use data generated in program operations to improve program operations and thereby maximize the impact of vouchers.

The Smart Voucher program design therefore creates a policy instrument that reaches the target population in a way that has a strong potential to encourage eligible consumers to use the vouchers. That leaves two important ingredients to specify: who is eligible for the benefit and how it will be funded.

Eligibility: Given the size of the broadband adoption gap, participants proposed to expand eligibility for Smart Vouchers beyond the current criteria used for the FCC's Lifeline program. A household would be able to participate in the Smart Voucher program if its income was 185% of poverty level (adjusted for need and household size), compared to the 135% threshold currently used. This proposal would, potentially, have millions of households as beneficiaries—far more than currently take advantage of the Lifeline subsidy for telephone service. Today, some 40 million households are eligible for Lifeline (at the 135% of poverty income threshold), though only 12 million take advantage of the benefit. Determining eligibility and signing people up would be in the hands of the government, not broadband providers.

Funding: As to how to fund a program with expanded eligibility, the group proposed several options. First, funds could come from general revenues, either from congressional appropriations or from economic development programs. Additional funds might come from cost-savings that accrue from agencies using less costly online service delivery methods. The group said that this approach—relying on funds from general revenues—would be preferable to the existing reliance on user fees, though changing the program to one dependent on general revenues may not be politically feasible at the moment.

The second approach would be to build on the existing method, namely user-fees employed by the Universal Service Fund. To meet the needs of expanded eligibility, the base for USF contributions could expand to include other services (such as satellite or cable). The group left unresolved the issue of whether the program would be a budgeted appropriation (with a ceiling on expenditures) or an open-ended entitlement.

As to projected cost, the group presented a "back-of-the-envelope" figure of roughly $23 per recipient, per household, per month for the voucher amount. At the same time, that would be a provisional figure and the final one would be determined by a one-year pilot, with heavy emphasis on data collection on what increases adoption. The pilot would be important; the program cost may be $2 billion in early years but climb to $11 billion in time. This makes the pilot important in order to make sure program funds are directed in such a way to maximize impacts.

Training: Providing resources for Internet training programs to community institutions such as neighborhood non-profits or libraries can accelerate new users' paths to meaningful online use.[21] The voucher amount for eligible recipients might be increased—or even conditioned upon—completion of a training course on Internet use that could focus on how to use digital resources for job applications, workforce skills or education. A federal block grant program could serve as the funding mechanism for institutions providing training services.

Providing resources for Internet training programs…can accelerate new users' paths to meaningful online use.

Supported services: The final piece of the proposal had to do with what would qualify as a broadband service to be supported through the voucher program. There has to be a set standard of "good enough broadband" that enables users to carry out online tasks that justify policy intervention (e.g., education). Although such a standard may not be premium service, "good enough broadband" might result in users migrating to higher service tiers as they gain experience with home broadband connectivity.

To determine the standard, the FCC should define an eligible broadband service (EBS) which would have to support:

- Emergency communications (while the other listed services are being used)

- E-government services
- Job applications and training programs
- Homework and teacher interaction outside of school

Carriers would submit offerings that the Commission would certify as an EBS. Qualifying standards could display a seal that signifies that they meet the standard and are offering an EBS service for eligible consumers. If a consumer chose a non-EBS offering, carriers would have to reimburse the cost of the voucher to the government. The FCC would report where EBS offerings are available to consumers.

As to quality metrics for an EBS, they would have to evolve over time just as networks and uses do. At any given time, though, an EBS should be sufficient to support two high-quality video streams in addition to web browsing. This could be set at half of average fixed download speed in the United States, or roughly 10-12 Mbps today. A similar logic would apply for upload speeds and other metrics of network quality, such as latency (e.g., an EBS must support real-time voice and two-way video) and reliability. Finally, some data caps and usage charges might be permissible, given differences in fixed versus mobile technology and peak versus off-peak usage patterns.

Reimagining the Universal Service Policy

An enduring feature of communications policy is the uneasy relationship between competition and universal service. At several points during the conference, questions arose about whether the two policy goals can comfortably co-exist in the future. Coalition for Green Capital CEO Reed Hundt characterized the tension as a long-standing one that poses universal service against incentives for companies to upgrade their networks. R. David Edelman, Special Assistant to the President for Economic and Technology Policy at the White House's National Economic Council, wondered whether today's policy environment can accommodate promoting both competition and universal service.

A proposal, offered by Hundt, sought to essentially bypass the periodic debate about whether the Universal Service Fund (USF), as currently structured, makes sense. Annual spending on USF is approximately $11 billion, which includes support for network construction and subsidies for telephone service. Rather than spend that amount annually, the FCC should commit to spend $5 billion per year on universal service over the next 20 years, and then declare an end to the Universal Service Fund.

Using the $5 billion commitment over 20 years, the FCC should issue a bond which could yield on the order of $70 billion today. With those funds, the FCC could hold a series of regional auctions with rules designed to ensure build out of fiber networks to buildings that need them, along with service conditions designed to make service affordable to low-income people. The revenue stream would not (and would not need to) fund construction to all structures in the country, but should support running fiber to buildings in low-income areas. Those are the areas where, because revenue opportunities may not be great, one would expect the private sector to be reluctant to invest. Auction rules could also specify that monthly service fees for low-income customers would have to be set at affordable levels (e.g., $10 per month over a five year period). With network construction cost defrayed by the government, the lower revenue stream from serving customers in those areas would be less of a problem for ISPs.

This proposal was not intended to supplant the Smart Voucher proposal, but instead offer an alternative way of addressing, and perhaps settling, universal service policy disputes.

Consumer protection

Driven by a strong sense of consumer worry over data vulnerability, the group felt that promoting information security for Americans is a crucial priority, especially as the role of data in society deepens. This led to a "moonshot" proposal to create a new federal entity called the

Federal Information Security Coordinator (FISC). The FISC would own the various dimensions of information security for consumers, rather than have that responsibility diffused among several different agencies. A single coordinator, who would serve a seven year term, would not just have the broad view across all federal agencies, but would also interact with existing private-sector self-regulatory organizations (SROs). The FISC would have enforcement powers, but would not supplant those of the SROs.

More specifically, the mission of the FISC would be to:

- Analyze the current "information security" environment
- Set minimum standards for data protection and collection[22]
- Review the performance of SROs
- Make legislative recommendations.

The FISC would focus on actual harms consumers may experience in today's data environment as well as encourage companies to compete on privacy and security. With respect to harms, consumers could file complaints with either FISC or existing SROs. As to competition, the group was clear in its sense that companies can and will attract consumers if companies aggressively market how they promote information security.

The proposal to create a new federal coordinating body attracted criticism that fell into two categories. First, the harms-based approach (that is, the FISC investigates complaints consumers file with it) may not result in sufficient consumer protection. Second, a new locus of policy activity at the federal level may undermine strong data protections many states have enacted.

Khaliah Barnes, Associate Director and Director of the Student Privacy Project at the Electronic Privacy Information Center (EPIC) voiced concern about the harms-based approach in the proposal because it places so many burdens on consumers. The data environment is very complex and it is unrealistic to expect consumers to understand all the attributes of this environment, much less prove specific harm. An alternative to the harms-based approach, which FTC Commissioner Julie Brill raised, is an enforcement-driven regime whereby tech companies test specific practices and report results to the public. Oftentimes, a few companies are the source of problems, so enforcement should address those problems.

They may never be subject of complaints. The harms-based approach, she added, assumed a high level of consumer knowledge, but "consumers have no idea what's going on in this space."

The possible pre-emption of state laws on consumer data was the other issue raised. Brill noted that a number of states have developed very strong models for consumer data protection; although California is often invoked as the standard, other states have moved aggressively, too. The coordination challenge may not be across different federal agencies, but between the states and the federal government.

With the premise of creating the FISC under challenge, the issue arose of what to do about consumer information security in the meantime. The notion of strengthening the Federal Trade Commission quickly rose to the front. David Quinalty, Republican Policy Director for Communications and Technology of the Senate Committee on Commerce, Science and Transportation made an appeal for simplicity; there should be a strong FTC, clear rules, strict enforcement and liability against companies who violate the rules. Julie Brill agreed, saying that the FTC could easily quadruple its budget and still be busy addressing consumer protection in the digital age. The range of potential consumer harms is changing quickly and courts are starting to look outside financial harm in thinking about consumer protection. The risk climate is complex, too, as flaws in data-dependent medical devices and transportation systems have different consequences than in traditional e-commerce transactions. Immediate attention to these issues might make more sense than creating a new institution such as the FISC.

Stefaan Verhulst, Co-Founder and Chief Research and Development Officer of the Governance Laboratory (GovLab) at NYU raised a very different proposal contrary to the idea of creating a new institution such as the FISC. Creating a new institution may not only take time to realize benefits, it also fails to take advantage of contemporary innovations in ICTs that may enable networks of actors to quickly address information security problems. In advocating for a platform model to address consumer information security, Verhulst envisioned a collaborative network of the wide range of public and private sector actors that touch data. He acknowledged that this would be a complex undertaking, but done properly, it could be a much more responsive and flexible approach to addressing security issues that evolve rapidly.

This proposal elicited questions and criticisms. The platform model relies less on rules and more on norms than the FISC proposal. The platform model also has a stronger dose of self-regulation than the proposed FISC and would need to develop specifics on appropriate governance enforcement. Rob Atkinson, Founder and President of the Information Technology and Innovation Foundation (ITIF), noted one specific merit of the more flexible platform approach—many maintain that an environment in which there is a low level of trust in information security is one where some benefits of modern network connectivity go unrealized.

In the end, while there was consensus on the need to address what appears to be consumers' growing "data vulnerability," there was not agreement on a proposed mechanism to do something about it.

Conclusion

Participants in the 30th Annual Conference on Communications Policy sought ways that broadband markets could continue to deliver economic and social benefits that improve the quality of life in America. They saw that they needed to break bottlenecks down in the marketplace so as to provide sufficient competitive pressure; raise the level of home broadband subscriptions in the United States to ensure digital inclusion; and enhance information security so as to assuage the sense of data vulnerability among consumers.

Based on these three main principles, the participants made five recommendations, (although not all by consensus). First, there is a need to improve the investment climate for fiber networks to protect against a stagnant marketplace. Next, spectrum should be made available for 5G wireless networks, even though they are in a nascent state. Additionally, we need to develop a "smart voucher" system to promote broadband adoption. Those populations eligible for the smart vouchers should also receive digital and Internet training opportunities. Finally, they proposed, we must all think expansively in promoting information security for consumers, and consider a variety of different plans that would achieve the security goals.

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APPENDIX

The Future of Broadband Competition

August 12-15, 2015
Aspen, Colorado

Conference Participants

Opeyemi Akanbi
Ph.D. Student
Annenberg School for Communication
University of Pennsylvania

Rebecca Arbogast
Senior Vice President, Global Public Policy
Comcast NBCUniversal

Robert Atkinson
Founder and President
The Information Technology and Innovation Foundation

Khaliah Barnes
EPIC Associate Director
Director, EPIC Student Privacy Project
Electronic Privacy Information Center

Catherine Bohigian
Executive Vice President of Government Affairs
Charter Communications

John Branscome
Senior Democratic Communications Counsel
Senate Committee on Commerce, Science, and Transportation

Julie Brill
Commissioner
Federal Trade Commission

Laura Carter
Assistant General Counsel
Microsoft Corporation

Jonathan Chaplin
Managing Partner
New Street Research

Richard Clarke
Assistant Vice President
Economic and Regulatory Policy
AT&T Services, Inc.

R. David Edelman
Special Assistant to the President for Economic & Technology Policy
The White House, National Economic Council

Note: Titles and affiliations are as of the date of the conference.

Charles M. Firestone
Executive Director
Communications and Society Program
The Aspen Institute

John Horrigan (rapporteur)
Senior Researcher
Pew Research Center

Reed Hundt
Chief Executive Officer
Coalition for Green Capital

Julia Johnson
President
Net Communications, LLC

John Kincaide
Senior Security and Privacy Policy Attorney
Intel Corporation

Fernando Laguarda
Vice President, External Affairs and Policy Counselor
Time Warner Cable

Blair Levin
Nonresident Senior Fellow
Brookings Institute

Chris Lewis
Vice President, Government Affairs
Public Knowledge

Chris Libertelli
Vice President, Global Public Policy
Netflix, Inc.

Eli Noam
Professor of Economics and Finance
Garrett Professor of Public Policy and Business Responsibility
Director, Columbia Institute for Tele-Information
Columbia Business School
Columbia University

Nuala O'Connor
President and CEO
Center for Democracy & Technology

Emmett O'Keefe
Vice President, Federal Affairs
Cablevision Systems

Michael O'Rielly
Commissioner
Federal Communications Commission

Arun Palakurthy
Analyst
Dodge & Cox Funds

David Quinalty
Republican Policy Director for Communications and Telecom
Senate Committee on Commerce, Science, and Transportation

Johanna Shelton
Director, Public Policy & Government Relations
Google

Note: Titles and affiliations are as of the date of the conference.

Jeff Smulyan
CEO and Chairman of the Board
Emmis Communications

Alfredo Tímermans
CEO
Telefonica Internacional USA, Inc.

Stefaan Verhulst
Co-Founder and Chief Research and Development Officer
Governance Laboratory (GovLab) at NYU

Philip Weiser
Dean
University of Colorado Law School

Kevin Werbach
Associate Professor of Legal Studies and Business Ethics
Wharton School
University of Pennsylvania

Tim Wu
Isidor and Seville Sulzbacher Professor of Law
Columbia Law School

Staff:

Ian Smalley
Senior Project Manager
Communications and Society Program
The Aspen Institute

Note: Titles and affiliations are as of the date of the conference.

About the Author

John B. Horrigan is a Senior Researcher at the Pew Research Center where he focuses on libraries, communities, and technology. He rejoined the Pew Research Center in January 2015, having been with Pew before from 2000 to 2009. In 2009, he joined the leadership team at the Federal Communications Commission and he led development of the broadband adoption and usage portion of the National Broadband Plan. After that, he has served in senior positions at the Joint Center for Political & Economic Studies and TechNet.

As a consultant, Horrigan is author of landmark reports on Comcast's Internet Essentials program. The reports, "The Essentials of Connectivity" and "Deepening Ties" demonstrate the impact of online access for low-income families with children and make recommendations on how to accelerate broadband adoption and usage. He is also author of "Schools and Broadband Speeds" for the LEAD Commission and the Alliance for Excellent Education, which explores gaps in high-speed Internet at schools serving low-income and minority students.

Horrigan has a Ph.D. in public policy from the University of Texas at Austin and his undergraduate degree from the University of Virginia.

About the Communications and Society Program

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The Communications and Society Program is an active venue for framing policies and developing recommendations in the information and communications fields. We provide a multidisciplinary space where veteran and emerging decision-makers can develop new approaches and suggestions for communications policy. The Program enables global leaders and experts to explore new concepts, exchange insights, develop meaningful networks, and find personal growth, all for the betterment of society.

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Most conferences employ the signature Aspen Institute seminar format: approximately 25 leaders from diverse disciplines and perspectives engaged in a moderated roundtable dialogue, with the goal of driving the agenda to specific conclusions and recommendations. The program distributes our conference reports and other materials to key policymakers, opinion leaders, and the public in the United States and around the world. We also use the Internet and social media to inform and ignite broader conversations that foster greater participation in the democratic process.

The Program's Executive Director is Charles M. Firestone. He has served in this capacity since 1989 and also as Executive Vice President of the Aspen Institute. Prior to joining the Aspen Institute, Mr. Firestone was a communications attorney and law professor who has argued cases before the United States Supreme Court. He is a former director of the UCLA Communications Law Program, first president of the Los Angeles Board of Telecommunications Commissioners, and an appellate attorney for the U.S. Federal Communications Commission.

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Making Waves: Alternative Paths to Flexible Use Spectrum,
by Dorothy Robyn

The 2014 Aspen Institute Roundtable on Spectrum Policy (AIRS) gathered 26 of the top telecommunications policy experts at the Aspen Wye River Conference Center in Queenstown, MD. They investigated whether the U.S., in light of recent progress in alternative approaches to spectrum allocation, should make the more drastic move to a regime that has all spectrum, other than some carved out for specific public benefit, to be considered general use spectrum eligible for the highest and best use available. The report, written by Roundtable rapporteur, Dorothy Robyn, tackles the task of describing what general purpose spectrum actually is; discusses the practical, political and institutional limits and ways to overcome them; and details the necessary technical advances and regulatory actions to make general purpose spectrum a reality. 2015 68 pages, ISBN Paper: 0-89843-625-7, $12.00

The Atomic Age of Data: Policies for the Internet of Things,
by Ellen P Goodman

The Twenty-Ninth Annual Aspen Institute Conference on Communications Policy investigated the imminent proliferation of the Internet of Things. As the world becomes increasingly connected and more objects become embedded with sensors, the Internet of Things is poised to explode, with estimates of 25 billion connected devices by 2020. 35 knowledgeable participants gathered to examine how specifically should communications policies accommodate the new Internet of Everything? Written by rapporteur Ellen P. Goodman, the report explores the nascent promises and challenges of the IoT. In examining the interplay between the vast increase in data created on the Internet of Things (IoT), and the resultant strain on the networks that carry this information, and the group came to a realization. Data needs to be thought of as ""infrastructure." 2015, 72 pages, ISBN Paper: 0-89843-623-0, $12.00

Video Veritas: Building a 21st Century Video Platform for a High-Performance Society, by John B. Horrigan

The Twenty-Eighth Annual Aspen Institute Conference on Communications Policy focused on the future of video regulation. The resulting report, written by John B. Horrigan, looks at the changing landscape of video regulation and the fundamental shift in how video is being viewed. While cable and broadcast television continue to be the dominant modes of transmission, over the top delivery of content via the Internet provides new ways to distribute personalized and targeted programming directly to the viewer. This, and the proliferation of mobile devices and tablets can deliver video to the viewer anywhere, anytime. As a result, the advertising-based broadcast business model is undergoing significant challenge and change. This report examines the evolving video ecosystem and offers recommendations for policy that can accommodate the new video market. 2014, 54 pages, ISBN Paper: 0-89843-603-6, $12.00

Spectrum as a Resource for Enabling Innovation Policy, by William Webb

The 2012 Aspen Institute Roundtable on Spectrum Policy (AIRS) convened shortly after the presidential election to consider ways that spectrum policy could improve the economy through innovation. The 32 leading communications policy experts in attendance focused on how spectrum policies could help create an environment that makes it easier to use spectrum as a resource for innovative new goods and services. The participants first identified problems facing new entry and innovation today, and then recommended solutions, looking specifically at the interstices among licensed and unlicensed approaches, spectrum sharing and flexibility, and new institutional arrangements to manage these solutions. The report, written by British spectrum expert William Webb, sets forth 11 recommendations that he gleaned from the conference dialogue to guide future spectrum policy development with regard to facilitating innovation. 2013, 45 pages, ISBN Paper: 0-89843-584-6, $12.00

Rethinking Communications Regulation, by Richard Adler

As the Internet and other information and communications technologies grow exponentially, and as a new ecosystem is emerging that could conflate previously distinct methods of communication into a

single digital medium, questions arise as to whether the traditional silos of regulation are still appropriate. The report resulting from the 27th Annual Aspen Institute Communications Policy Conference addresses the overarching concern as to whether the Communications Act needs a radical revision. Written by rapporteur Richard Adler, the report considers the key goals of a new communications regime and offers regulatory and non-regulatory approaches for achieving these goals in a digitally connected world. 2013, 65 pages, ISBN Paper: 0-89843-583-8, $12.00

The Reallocation Imperative: A New Vision for Spectrum Policy, by Preston Marshall

The report resulting from the 2011 Aspen Institute Roundtable on Spectrum Policy addresses new ways of allocating, clearing, using and/or sharing spectrum controlled by private parties and government agencies. Written by rapporteur Preston Marshall, the report attempts to step back and establish a broad vision for reallocating spectrum in the United States in the public interest, discussing new approaches that will facilitate more effective and efficient spectrum use. A number of recommendations are laid forth to guide future spectrum policy development, Congressional actions, and technology explorations. 2012, 54 pages, ISBN Paper: 0-89843-570-6, $12.00

Updating Rules of the Digital Road: Privacy, Security, Intellectual Property, by Richard Adler

Given the current growth and importance of the Internet, the report of the 2011 Aspen Institute Conference on Communications Policy titled *Updating Rules of the Digital Road: Privacy, Security, Intellectual Property*, highlights the elements that will allow for greater use of broadband as the common medium: security, privacy and intellectual property regulation. Written by rapporteur Richard Adler, the report explores a range of threats that plague the use of today's communications media and provides a series of recommendations which aim to ensure that users' communications are secure, private and protected.

The report reflects the issues and ideas raised by business leaders, academics, and policy experts at the Twenty-Sixth Annual Aspen Institute Conference on Communications Policy. 2012, 70 pages, ISBN Paper: 0-89843-563-3, $12.00

Spectrum for the Next Generation of Wireless, by Mark MacCarthy

Spectrum for the Next Generation of Wireless explores possible sources of spectrum, looking specifically at incentives or other measures to assure that spectrum finds its highest and best use. It includes a number of recommendations, both private and federal, of where and how spectrum can be repurposed for wireless use. In November 2010, the Aspen Institute Communications and Society Program convened the Aspen Institute Roundtable on Spectrum Policy, where 31 experts and leaders addressed the consequences and solutions to the increasing demand for spectrum. Spectrum for the Next Generation of Wireless is the report resulting from the Roundtable discussions. 2011, 68 pages, ISBN Paper: 0-89843-551-X, $12.00

Rewriting Broadband Regulation, by David Bollier

The report of the 25th Annual Aspen Institute Conference on Communications Policy in Aspen, Colorado, considers how the United States should reform its broadband regulatory system. Participants looked at international models and examples and examined how data and communications should be protected in the international arena. The resulting report explores a range of policies for U.S. broadband regulation, many of them derivative of the National Broadband Plan adopted by the Federal Communications Commission only a few months before the conference.

Participants also ventured into new and interesting territory with the novel concept of "digital embassies." They saw this as a way of dealing with jurisdictional issues associated with the treatment and protection of data in the cloud, i.e., data that is provided in one country but stored or manipulated in another. The concept is that the data would be treated throughout as if it were in a kind of virtual embassy, where the citizenship of the data (i.e., legal treatment) goes along with the data. This policy seed has since been cultivated in various other regulatory environments. 2011, 37 Pages, ISBN Paper: 0-89843-548-X, $12.00

Scenarios for a National Broadband Policy, by David Bollier

The report of the 24th Annual Aspen Institute Conference on Communications Policy in Aspen, Colorado, captures the scenario

building process that participants used to map four imaginary scenarios of how the economy and society might evolve in the future, and the implications for broadband policy. It identifies how certain trends—economic, political, cultural, and technological—might require specific types of government policy intervention or action. 2010, 52 pages, ISBN Paper: 0-89843-517-X, $12.00

Rethinking Spectrum Policy: A Fiber Intensive Wireless Architecture, by Mark MacCarthy

Rethinking Spectrum Policy: A Fiber Intensive Wireless Architecture is the report resulting from the Aspen Institute Roundtable on Spectrum Policy, held at the Aspen Wye River Conference Center in November 2009. Written by rapporteur Mark MacCarthy, the report captures the insights of the participants, exploring innovative ways to respond to the projections of exponential growth in the demand for wireless services and additional spectrum. In addition to discussing spectrum reallocations, improved receivers, shared use and secondary markets as important components for meeting demand, the report also examines opportunities for changes in network architecture, such as shifting the mix between fiber and wireless. 2010, 58 pages, ISBN Paper: 0-89843-520-X, $12.00

ICT: The 21st Century Transitional Initiative, by Simon Wilkie

The report of the 23rd Annual Aspen Institute Conference on Communications Policy in Aspen, Colorado addresses how the United States can leverage information and communications technologies (ICT) to help stimulate the economy and establish long-term economic growth. The report, written by Roundtable rapporteur Simon Wilkie, details the Aspen Plan, as developed in the summer of 2008, prior to the economic meltdown beginning in September 2008 and prior to the election of Barack Obama as President. The Plan recommends how the Federal Government—through executive leadership, government services and investment—can leverage ICTs to serve the double bottom line of stimulating the economy and serving crucial social needs such as energy efficiency and environmental stewardship. 2009, 80 pages, ISBN Paper: 0-89843-500-5, $12.00

A Framework for a National Broadband Policy, by Philip J. Weiser

While the importance of broadband access to functioning modern society is now clear, millions of Americans remain unconnected, and Washington has not yet presented any clear plan for fixing the problem.

Condensing discussions from the 2008 Conference on Communications Policy and Aspen Institute Roundtable on Spectrum Policy (AIRS) into a single report, Professor Philip Weiser of the University of Colorado at Boulder offers a series of specific and concrete policy recommendations for expanding access, affordability, and adoption of broadband in the United States. 2008, 94 pages, ISBN Paper: 0-89843-484-X, $12.00

The Future of Video: New Approaches to Communications Regulation, by Philip J. Weiser

As the converged worlds of telecommunications and information are changing the way most Americans receive and relate to video entertainment and information, the regulatory regimes governing their delivery have not changed in tune with the times. These changes raise several crucial questions: Is there a comprehensive way to consider the next generation of video delivery? What needs to change to bring about a regulatory regime appropriate to the new world of video? The report of the 21st Annual Conference on Communications Policy in Aspen, Colorado, outlines a series of important issues related to the emergence of a new video marketplace based on the promise of Internet technology and offers recommendations for guiding it into the years ahead. 2006, 70 pages, ISBN Paper: 0-89843-458-0, $12.00

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