Scenarios for a National Broadband Policy

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Foreword

As part of the American Recovery and Reinvestment Act of February 2009, Congress tasked the Federal Communications Commission with developing a National Broadband Plan. The mandate for the Plan was to outline policies and goals to achieve universal access and adoption of affordable, high-speed broadband capabilities. This Broadband Plan has the potential to transform access to a range of resources and services that constitute the new broadband ecology, including telemedicine, the energy grid, education, e-government, public safety and homeland security, among many others.

But with changing financial markets and new technological advances, the long-term outlook of new broadband policies is uncertain. What are the indicators that might suggest policies need to change? What are the long-term implications for consumers and the industry?

To answer some of these questions, in August 2009, the Aspen Institute Communications and Society Program, a non-partisan, non-ideological, non-profit organization, convened 31 experts and leaders in communications policy from government, business, academia, and the non-profit sector in Aspen, Colorado for the twenty-fourth annual Aspen Institute Communications Policy Conference. The purpose of the Conference was to explore current broadband policy by using the scenario building process. We sought to understand signposts of trends that might alert policy-makers when their policies are going in a particular direction, and to suggest how to avoid certain adverse effects.

Many of the recommendations included in the National Broadband Plan would be based on current or past data. So we determined that the scenario building process could be a useful tool for thinking about longer-term impacts. Accordingly, participants mapped a series of imaginary scenarios of how the economy and society might evolve in the future, with informed speculation about the implications for broadband policy.

The four broadband scenarios developed by participants during the conference were set on axes of broadband supply and broadband demand. Thus they foresee how we might get to each of the possibilities (high demand/high supply; low demand/high supply, etc.), and suggest policy

considerations to contend with issues that rise within each scenario. Listed below, each scenario was given the name of a popular film that suggests the essence of the situation.

1. High demand coupled with low supply, or *Oliver!* This scenario describes a situation in which there is inadequate private investment in broadband despite a significant demand for it. While that seems unlikely, the group describes how that could come about and what to look for as it might be happening. Telecommunications policy could be a potentially important tool to increase the low supply through measures to improve "last mile" and "middle mile" connections to people's homes, and by helping broadband move to wireless, mobile devices.

2. High demand coupled with high supply, or *The Big Easy.* In this highly desirable world of plentiful broadband and robust consumer demand, problems could arise in managing the pace of growth, short-term disruptions and long-term stability. The signposts of this scenario are stable and thriving markets, a diverse array of innovative, high-quality content and applications, robust technological and business innovation, citizen participation and thriving capital markets.

3. Low demand coupled with low supply, or *Batman Returns.* The most dystopian of the visions, in this scenario insufficient broadband demand creates a vicious cycle of poor broadband supply. Under financial pressure, major network operators spin off unattractive assets, leaving many geographic areas with inadequate service. Other portions of the country are served by low-quality, economically weak providers, and major operators face increasing competition for a shrinking pool of high-revenue customers.

4. Low demand coupled with high supply, or *Final Fantasy.* This scenario suggests that the over-abundant broadband supply was caused by irrational exuberance in the market, leading to short-term market inefficiencies and bubbles. The government may also have over-stimulated investment by providing too many incentives, or there may have been exogenous shocks to the broadband market. The group proposes a variety of solutions to the excessive supply problem—including the need to develop better measurement systems to monitor actual demand.

At the end of the report, our rapporteur, journalist and author David Bollier, summarizes some of the common threads running through each of the scenarios. These include attention to digital inclusion

issues; the need to stimulate demand, possibly through e-governance; and the need to develop reliable metrics. The Report also sets forth six questions that participants believe the Omnibus Broadband Initiative should address and a number of policies for consideration by the National Telecommunications and Information Administration to stimulate broadband demand.

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Introduction

There is wide consensus that broadband technologies are likely to play a critical role in the future of the American economy, government services, social life, education, medicine and democracy. Already, a burgeoning array of software applications, computing functions and mobile devices are exploiting the high-speed, high-volume "pipes." Diverse sectors of the economy and society are likely to become highly dependent on broadband services.

Congress has appropriated more than $7 billion in the federal economic stimulus program for broadband development, leading many people to wonder how exactly this money will be spent. Some critics charge that policymakers are in "ready, fire, aim" mode, instead of developing a clear definition of broadband or a coherent strategy for deploying it in the years ahead.

To help sort through the complexities of these issues, and to think about them with a fresh perspective, the Aspen Institute Communications and Society Program convened thirty-one leading experts on broadband policy in Aspen, Colorado, from August 12 to 15, 2009. The gathering was the 24th annual Aspen Institute Conference on Communications Policy. Participants included representatives from cable system operators, telecommunications companies, software and computer companies, government agencies, policy think tanks, academia, consumer advocacy organizations and foundations.

The key question that the conference sought to address:

> *How can we develop a broadband world that grows the economy, provides opportunity and enhances the quality of life for everyone, improves the environment, and fosters democracy?*

The conference began with two general overviews about the state of broadband deployment and usage today. But the heart of the conference

was the development of four imaginary scenarios of how the economy and society might evolve in the future, and the implications for broadband policy.

Participants divided into four working groups, each of which explored the "signposts" of trends that might alert policymakers that a given scenario was in fact materializing. The groups also identified how certain trends—economic, political, cultural, and technological—might require specific types of government policy intervention or action.

A group as diverse as this one obviously could not come to a full consensus about the best public policies to achieve these goals. Yet the four scenarios, and the spirited dialogue within each and amongst the full group, elicited many penetrating insights. They also yielded a general agreement that certain government actions will be necessary: programs to foster universal service, better government use of broadband for its own services and procurement, effective policies to stimulate broadband demand, and better training in the use of computers and digital devices.

Charles M. Firestone, Executive Director of the Aspen Institute Communications and Society Program, moderated the three-day gathering. Rapporteur David Bollier prepared the following interpretive summary of the conference to convey the salient themes, conclusions and recommendations.

I. An Overview of the Telecom and Broadband Ecosystem

Eli Noam, Director of the Columbia Institute for Tele-Information at the Columbia Business School, introduced the state of broadband infrastructure today by explaining that it is best understood as an *ecosystem.* Although the term has certain ambiguities and is used in some quarters as a buzzword, broadband qualifies as an ecosystem in the sense that many disparate elements are interconnected; as in nature, a change in one will affect many other elements of the ecosystem.

In the broadband ecosystem, some of the key elements include: the distribution apparatus, content, digital devices, the transactions that occur on the system, the finance system for broadband equipment, government laws and regulations, and people, both as users and providers of content.

In the United States, there are approximately 560 million telecommunications lines in service, using an expansive definition of the term, including cable connections. According to the Federal Communications Commission (FCC), 125 million of these are incumbent local exchange carriers (ILECs) fixed; another 30 million of them are competitive local exchange carriers (CLECs) fixed. There are 255 million mobile "lines."

Despite the numbers of telecom lines, said Professor Noam, "vertical integration of local and long-distance carriers has been significant, which totally reverses the principles of the AT&T divestiture case [in 1984]. Intra-modal competition hasn't worked," he said. "Now, one can subscribe to various conspiracy theories on why this happened. But in order to be persuasive one would have to explain the same conspiracies all around the globe."

> **…broadband infrastructure today…is best understood as an *ecosystem.***
>
> **Eli Noam**

"In the European Union, according to Mme Viviane Redding, the EU czarina for the information society," said Noam, "incumbents account for 86.5 percent of all wire lines, and in many major countries, more. So there are some fundamental forces at work here, such as economies of scale."

That said there is competition with platforms, cable companies and especially the wireless companies, many of which are non-ILEC. Consumers typically have five infrastructure options for voice, said Noam: one local exchange carrier, one cable operator and three out-of-area local wireless.

As for broadband, connectivity stood at about 150 million lines in June 2008, according to the FCC. Nearly 47 percent of these connections are cable lines; about 34 percent are DSL lines. Some 16 percent are satellite, fixed wireless, mobile or power lines. Less than 3 percent are fiber wires. Noam characterized this range of choices as "two-and-a-half infrastructures—two major legs and a collection of little ones limping along."

From an international perspective, the United States has a moderate level of broadband adoption. Its number of subscribers per 100 inhabitants ranks 15th in the world, according to the Organization for Economic Cooperation and Development (OECD). Netherlands, Denmark and

Norway lead, and the United Kingdom and Belgium immediately precede U.S. broadband connectivity as 13th and 14th ranked.

Noam regards the U.S. ranking as only one part of the equation. The other is market structure, "There is some competition, but not too much…. If there were too much competition it would drive down prices towards the marginal cost," forcing companies out of business, as happened in long distance telephony. "We had great competition there, but now we don't have any competitors left," Noam said.

At the national level, broadband penetration now stands at about 60 percent. That means that 40 percent of Americans do not use broadband to connect to the Internet. Among the reasons, reports the Pew Internet & American Life Project: 33 percent of non-users say they are not interested in getting online; 13 percent say they cannot get access; 9 percent find it difficult and frustrating; 7 percent say it is too expensive.

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Noam contrasted such numbers with cell phone usage: "If you think about it, nobody had to persuade people to get cell phones. They sold themselves, because they had obvious usages." One lesson from this survey result, he said, is that "a supply-oriented or price-oriented policy will help with 20 percent of the non-adopters, but for 60 percent of them, it will not do the job of moving them to adopt, if that's the objective."

Yet there are societal benefits from increasing broadband penetration. According to a Brookings Institute report cited approvingly by FCC Chairman Julius Genachowski, employment will increase by 300,000 for each increase of 1 percent in broadband penetration. That means the U.S. would have seen a growth of 5 million new jobs in 2008, said Noam, which clearly did not happen. Quite the opposite.

While demand for broadband is "decent and steady" said Noam, "it is by no means explosive, despite the hype." Some observers may be astonished at the growth of Skype, for example, which now boasts 50 million users worldwide. But Skype's number of actual users on a daily basis is much less, approximately 5 million. Similarly, e-commerce is growing, but not explosively. As a percentage of retail sales, e-commerce has grown from about 0.6 percent in 2000 to 3.4 percent in 2008, accord-

ing to the U.S. Census Bureau. "A decent growth rate, but not evidence of taking over," said Noam. Government use of broadband to improve government services, education and medicine is similarly modest.

"So where is the big push for broadband demand going to come from?" asked Noam. He believes entertainment will be the most powerful driver. However, it will not be "the same old television, just distributed differently. It will be a new style of television that is user-generated, user-interactive, and immersive" with such novelties as three-dimensional images, virtual realities, interactive games and participation in immersive environments. "To me, that's where broadband, fiber-based, high-speed Internet will go on the content side," he said.

In terms of the supply side, that's "easy," said Noam: "We know how to do it, we're organized to do it, and we are doing it now as part of the stimulus policy. It's got political support which will not go away after the economic emergency goes away. It's really a universal service policy masquerading as a stimulus policy."

Much more important, Noam continued, "is the other side of the ecosystem—how to help the private sector generate applications and content that will capture the hearts, minds and pocketbooks of the world. That's much harder, yet it is hardly getting discussed on the policy level. But when we look at the whole ecosystem, we really ought to focus here."

Private-sector apps and content could benefit from appropriate tax policies and angel and venture capital, he said. He also cited the need for real competition: "One of the myths of the Internet is that it's incredibly competitive. But once you look at sub-markets, it's actually not. It's highly concentrated. And while it might start out competitive, it soon shakes out—and then the large-market-share players dominate." Charles Firestone added that this should not be surprising since, in most ecosystems, "there is a major species that controls."

Ranking Broadband Quality

Robert Pepper, Vice President of Global Technology Policy for Cisco Systems, took issue with the premise that all forms of broadband are essentially equivalent. "When we're talking about broadband," he said, "what are we talking about? We rarely define it, but there are many

dimensions of broadband. We tend to talk about speed, but in fact there is 'latency,' there's 'jitter,' there's 'symmetry,' there's 'burstiness,' and other things."

Why does this matter? Because not all bits are created equal, said Pepper. They do not have to show up at the same time. "E-mail doesn't care about latency, right? But voice-over IP dies with latency. So you have the same speed for very different applications, which has implications for quality of service."

One way to get a better grasp of the quality of broadband, said Pepper, is to "plot different kinds of applications and begin to understand what kinds of network characteristics, throughput and quality of service you need in order to meet the needs of various applications. That's really important."

Pepper cited a 2008 report by the Oxford Said School of Business and the University of Oviedo as a rigorous attempt to do this. The Cisco-sponsored report studied the ability of broadband in 42 nations to support next-generation video and Web services. The Oxford-Oviedo study developed a score for each country that attempts to combine a variety of different broadband capacities, weight them and then generate a single score to represent broadband quality in that nation.

"The Broadband Quality Score or BQS, is based on the normalized values of upload, download and latency," said Pepper. The model posits a baseline of 55 percent download, 23 percent upload and 22 percent latency, and assumes that today's applications require a BQS of 32. Projected applications in five years would require a BQS of 75. The study authors came up with a set of "standard applications that people are using" to figure out what quality of broadband would be needed.

Many participants took issue with the methodological premises behind the BQS Index, however. Michael Katz, Sarin Chair in Strategy and Leadership, and Director of the Institute of Management, Innovation and Organization at the Haas School of Business at UC Berkeley, questioned whether the same mix of applications would accurately describe usage in Germany, Greece and Estonia. He also cited differences among households from one nation to another: "The U.S. has bigger households and tends to have more users per connection in a household."

Yochai Benkler, the Jack N. and Lillian R. Berkman Professor for Entrepreneurial Legal Studies at Harvard Law School, and Co-Director

of the Berkman Center for Internet and Society at Harvard University, questioned whether the Oxford-Oviedo study differentiated the types of broadband providers, or whether it bundled institutional providers with residential providers. "If the United States has a higher share of users on institutional networks, like students and businesses," said Benkler, "then these data would overstate the availability of speed and low latency in the U.S., and understate the degree to which the U.S. is behind [other nations]."

Katz added that the size of mobile devices using broadband could also skew the BQS Index. "An awful lot of mobile is aimed at [small] screens, which puts an inherent limit on the data rates that you need—versus the 62-inch screen that sits in someone's house. So if you're really going to figure these numbers, we need to further subdivide [the user base]."

Eli Noam of Columbia Business School pointed out that there are a number of other indices for broadband quality: "Len Waverman of the London Business School has one, and so does the World Economic Forum. Various countries create comparative rankings tables. They always tend to show that their own countries are doing well. So one needs to be wary. But what difference does it make? The question still is, do we want to have to argue that we are not really behind Slovenia?"

In defense of the BQS Index, Pepper said that national scores are based on the number of households that are actually connected to broadband. Pepper also noted that the methodological assumptions behind the BQS are available to be studied. "The data is out there, and anyone can re-do it," he said.

He also mentioned that Cisco has been doing forecasting of broadband demand on networks extending five years into the future, to 2013. The Visual Networking Index sees a major shift to video, and a shift from peer-to-peer file sharing to streaming and flash video.

"A lot of this is going to be entertainment, and the implications for networks and network architecture are going to be dramatic," said Pepper. Mobile networks will not be able to handle such video traffic, he warned. Another worrisome forecast for broadband supply, said Pepper, is that "the peak-hour traffic is increasing faster than the overall network traffic. That means that investment in networks for peak periods, which is being driven by video, is going to be critical."

Forces Affecting Broadband Supply

Conference participants cited a number of factors that could dramatically affect the adequacy of broadband capacity in the future. Ben Scott, Policy Director of Free Press, warned that "the 'middle mile' [of connectivity] could be the most important supply question on the table."

"If wireless is going to become a true competitor," Scott said, "it's going to require a serious backhaul network to get that traffic back to the Internet. The more efficiently we manage to use spectrum, the more bits we will be pushing down the wireless lines, and so the more impressive the backhaul network that we will need. Yet backhaul networks are not uniform across the country, and the costs of backhauling traffic vary wildly."

Alan Davidson, Director of Public Policy for Google, warned that applications can have a big impact on broadband needs, but that it is inherently difficult to predict the breakthrough applications: "If we were making predications five years ago, we would have missed Twitter and Facebook and YouTube—which didn't exist at the time."

For example, what is the future of 3D video, asked Paula Boyd, Regulatory Counsel for Legal and Corporate Affairs at Microsoft. Such technologies may get a start in entertainment and then morph into other sectors such as education and healthcare, she said. The U.S. military could find 3D video or other applications quite useful, which could place new demands on broadband supply. Boyd said, "We need to think about what those kinds of applications will mean for broadband capacity."

In light of such speculative, difficult-to-predict futures, Steven Teplitz, Senior Vice President for Government Relations at Time Warner Cable, suggested that "we're just going to have to live in the ambiguity of things…. It would be really convenient and easy if we could just pick a number and say, 'This is broadband,' but it really doesn't work that way."

Broadband supply is implicated in the so-called "Wintel" cycle, said Teplitz. The growing size of the Windows operating system generates greater demand for more capacious Intel computer chips, which in turn spurs greater usage of Windows and other large applications, and so on. "It seems that whatever broadband is—and it continues to evolve based on what investments are made and what applications are out there—it is part of a virtuous cycle where the applications come, and the net-

works improve a little bit, and then new applications come. Whether that's fast enough is a policy question," said Teplitz.

The fugue that occurs between applications and broadband matters a great deal, said Lara Warner, Director of Research at Credit Suisse. "Application development is, and probably always has been, impacted by the pace at which broadband in its multi-dimensional state is available and rolling out. From my perspective, the most important thing is that today the economic burden [of greater broadband deployment] is borne disproportionately by a limited number of people…. If you allow broadband to proceed as it has, don't underestimate the economic penalty that these companies [cable and telecom companies] pay to deploy a service that applications can then ride on top of. That's where the incremental value [of broadband deployment] gets reduced."

It is important to overcome such hurdles, suggested Michael Gallagher, President and Chief Executive Officer of the Entertainment Software Association, because so many benefits can flow from plentiful broadband: "It's one of the places where quantum leaps forward in technology can deliver order-of-magnitude improvements in our economic well-being."

Another speculative factor in determining broadband needs is the future of online on-demand video viewing as opposed to simultaneous viewing of cable network programs. Kevin Kahn, Intel Senior Fellow and Director, Communications Architecture at Intel Labs, asked, "Will people continue to like viewing a lot of their content over a shared channel, where the show comes on at such-and-such a time? Or will we move to an environment where individuals take individual feeds when they want them? This issue is going to have more of a dramatic impact on network needs than almost anything else I can think of."

Joe Waz, Senior Vice President for External Affairs and Public Policy Counsel at Comcast Corporation, suggested there may be a middle ground on this issue. Usage levels for on-demand cable viewing continue to escalate every year, he said. Comcast is actively monitoring this question.

There are outer limits to what the existing infrastructure can support, Professor Eli Noam pointed out. "If you had a quarter of the population of Manhattan watching a video over their handset, it would take approximately 100,000 cell sites, or a huge amount of additional spectrum. People always talk about DSL, XDSL and VDSL [as ways to

upgrade networks], but there is no long-term future to these. This is the infrastructure of copper. You can feed a mule vitamins, or get a truck. Ultimately you have to invest in new infrastructure. That's the expensive part."

Ben Scott of Free Press pointed out another factor that should be included in supply-side deliberations: "To the extent that we're talking about 'last mile' problems, we shouldn't just be talking about 'edge to core' [transmissions] and back again. We should be talking about 'edge networks.' People are going to be communicating point-to-point around 'edges,' so we should consider what those mesh network-type systems will look like."

Responding to the preceding discussion, in which so many imponderables about supply were laid on the table, Professor Yochai Benkler stressed that broadband supply questions "are complicated and need to be explored in depth. I am puzzled by the view that we know everything we need to know about the supply side; we just have to look at the demand side." He stressed that supply questions should not be "taken off the table as if they are a solved problem."

Broadband Demand Questions

If broadband operates as an ecosystem, then the other factors affecting its development include distribution, content, transactions, and devices.

From his experience assessing broadband development in countries around the world, Robert Pepper of Cisco Systems proposed that broadband's evolution be seen as a four-stage drama. The first stage is a supply issue: Is it available? The second stage is adoption: Are people subscribing to the service? The third stage is speed and speed-for-price: How many megabits of broadband transmission can one buy per dollar (or euro or yen)? And finally, the fourth stage is about quality: What applications can one use, with what benefits?

"The real national debate in the United States is about the fourth stage," said Pepper. "It's about the quality of broadband and how people are using it. What are the benefits for consumer welfare, for social welfare, and so on? That's a much more satisfying debate [than debates about broadband rankings], but it is also a more complicated and difficult discussion."

Participants offered a number of important insights about the current state of broadband demand.

Ben Scott of Free Press noted, "It's absolutely accurate to say that we have more of an adoption problem than an availability problem." He wondered aloud whether this is less of a price issue than an "education and social problem"—i.e., people do not know how to use computers and the Internet, or do not appreciate the benefits that they may hold. (This issue is revisited in the scenarios described below.)

> **"…we have more of an adoption problem than an availability problem."**
>
> *Ben Scott*

Julia Johnson, President of Net Communications, agreed, but said, "Right now the problem is more about adoption than availability, but I submit that we've got to burn the candle at both ends because we have populations that are poised to jump on board so quickly—once they understand what broadband does—that it could turn the industry upside-down."

Broadband adoption will not expand, warned Joe Waz of Comcast, if we do not also address fears and uncertainties about the Internet, what he called "the dark side." He cited the need to protect people's privacy and protect them against fraud. He also cited cyber-security issues, child pornography and content piracy. "A lot of what we're talking about [in broadband adoption] is not going to pay off if we don't have secure networks and if people are not confident about using them. We won't get the full value out of the networks if we don't build this confidence."

Preston Padden, Executive Vice President of Government Relations for The Walt Disney Company, agreed with Waz, adding that the prevalence of piracy is a special concern. "We need to be talking about whether broadband is going to be a lawful or lawless environment. To date, we haven't brought the broader concept of the rights and freedoms of others into our consideration of behavioral norms online. Consumers want a safe and comfortable environment."

Waz also said that pro-active uses of broadband for education, healthcare and the environment will be disappointing if we do not address policy rules that interfere with such uses. For example, said Waz, "We're effectively precluding the optimal use of broadband in education because of curricular restrictions among the states. The

Department of Education can't even look at breaking down curricular restrictions for online learning. Broadband use in healthcare cannot expand because of rules that govern online healthcare records, reimbursement policies and remote diagnosis."

Robert Jarrin, Director of Government Affairs for Qualcomm added, "Powerful mobile wireless technologies are the backbone of high-speed ubiquitous data networks that enable connectivity for many things including medical devices, sensors and services. But unfortunately, not everyone in the U.S. has access to high-speed mobile broadband. According to the FCC, 95 percent of the U.S. population is covered by a mobile broadband network and only 82 percent of the rural U.S. population is covered. This is wrong and we should strive to cover 100 percent of the U.S. population. Thus, access to broadband plays a formidable obstacle in the adoption of innovative healthcare delivery."

II. Four Scenarios for the Future of Broadband

Because broadband technology is part of a larger ecosystem—technological, economic, social and creative—it is misleading to focus on broadband in isolation; there are many interrelated factors at play. The deployment and usage of broadband is related to the number of market competitors, the economics of providing the service, quality differences, the types of content offered, the devices connected to broadband, and software platforms and their interfaces, not to mention a host of macro-economic and social factors.

When so many complicated and dynamically interrelated factors are present, scenario building can be a useful tool for understanding broadband in a more holistic, contextual way. Accordingly, the rest of the conference was devoted to participants developing four different scenarios for the future of broadband.

In a background reading for this conference, Kees van der Heijden, an expert in scenario-building for strategic management, described the value of "scenario analysis" in helping people understand situations "that appear to be unstructured and threatening. Scenario analysis forces us to consider the horizon, to extend our mental models, to consider cause and effect, and to identify levers that we can use to establish a degree of control over a situation."[1]

Scenario analysis is particularly valuable in helping make forecasts even though there are many interconnected, unpredictable variables, and in providing a succinct, comprehensible narrative. Besides stretching rigid mental models that people may bring to a problem, scenario analysis can enhance the perception of certain factors or trends that might otherwise be discounted. It can also give managers and policy-makers a shared mental template for organizing their work.

To help structure the scenario-building process, Roundtable participants sketched out the categories in a graph (below) with two axes. To best flesh out the policy possibilities, the group decided that the x-axis would represent *supply for broadband* and the y-axis would represent *broadband demand*. Participants then divided into four working groups, with each group responsible for developing a scenario to describe one quadrant of the graph.

Under this framework, participants developed four scenarios for the future of broadband. Each working group gave their scenario the name of a popular film to describe its essential characteristics. The four scenarios were:

I. **Oliver!** High demand coupled with low supply.

II. **The Big Easy.** High demand coupled with high supply.

III. **Batman Returns.** Low demand coupled with low supply.

IV. **Final Fantasy.** Low demand coupled with high supply.

demand

Oliver!	**The Big Easy**
Batman Returns	**Final Fantasy**

supply

The rest of this section distills the salient features of each scenario. The scenarios are followed, in Part III, with a review of cross-cutting themes found in all of the scenarios, and by recommendations to the National Telecommunications and Information Administration (NTIA) as it considers how to spur demand for broadband.

Scenario 1: High Demand, Low Supply (Oliver!)

Members of Scenario I—high demand but low supply—named their scenario *Oliver!* after the film version of Charles Dickens' tale about Oliver Twist, an orphan who escapes from a London workhouse and joins a gang of pickpockets. Oliver famously asks, "Please sir, may I have some more?"—which encapsulates the key challenge facing people in this scenario: high demand for broadband, but low supply.[2]

How might this scenario occur? The group speculated that it could be a result of uneven development, with urban areas having greater broadband access than rural areas. Or the supply/demand mismatch could occur if government and business were to move their transactions online (such as welfare, unemployment insurance, driver's licenses, etc.) before there was adequate infrastructure. Or perhaps a new software application becomes popular and chews up huge amounts of broadband capacity. Or there could be a "supply shock" in which a credit crunch or other exogenous factors inhibit the ability to build out adequate broadband supply.

The chief cause of a supply shortfall, according to the *Oliver!* working group, would be a lack of private investment coupled with a lack of government support for it. There could also be a standards process that has broken down or seized up. Or there could be a lack of skilled people to implement and support the system. Whatever the cause, the group agreed that "there is remarkably poor information out there about actual investment levels, and that different companies report their investments in different ways."

Policy Elements. Telecommunications policy could be a potentially important tool to increase the low supply, the group concluded. Special attention would have to be paid to "last mile" connections to people's homes as well as to the "middle mile" wires. Dale Hatfield, an electrical engineer who is Executive Director of the Silicon Flatirons Center

in Boulder, Colorado, cited the hypothetical case of Meeker, Colorado, a small, remote community that could fairly readily solve its "last mile" problem, but which could still be 80 miles away from any Internet backbone wires. That could require several hops via microwave towers, the construction of towers on federal lands, and other expenses and legal complications.

Professor Yochai Benkler suggested that a lack of supply could be due to "the lack of a transition from widely available, high-capacity fixed broadband to wireless, mobile devices." If there is no ubiquitous capacity for mobile devices, then all the problems that afflict fixed broadband could be replicated in the wireless universe, he said.

Competition policy could play an important role in increasing supply, the *Oliver!* group noted. Competition policies could potentially block mergers that might decrease competition and thus supply. They could also encourage new infrastructure investment.

There was some concern that forcing broadband providers to unbundle their services, or to make wholesale capacity available to competitors, could discourage broadband investment. "On the one hand," said Professor Michael Katz of the Haas School of Business, "the intention of the policy, and quite possibly the effect, is to stimulate complementary investments because it can now use these other inputs to produce valuable services. But it could also take away the incentives to invest as well, because a carrier's investments would be subject to sharing."

Immigration policy could be important in terms of having enough skilled people to develop and maintain networks, and to continue technological innovation. Government economic policy more generally could be important to helping lower the costs of capital and thereby encourage investment in greater broadband supply.

The *Oliver!* scenario identified other possible causes of lagging broadband supply. There could be local obstacles to building out the infrastructure, such as rights-of-way and zoning laws. On the wireless side, there could be tower-siting complications.

Besides such legal obstacles, liability fears could deter carriers from investing in new broadband capacity. As Gigi Sohn, President of Public Knowledge, explained, "If you require carriers to filter and block all copyrighted material, at the risk of huge statutory damages for not doing so, they're not going to want to build out their networks." She cited

similar disincentives that liability for privacy and cyber-security viola-
tions might pose. Liability issues would need to be effectively managed
in this scenario in order to avoid low investment, declining terms of
service and massive shifts of businesses and users to private networks.

In looking at improving the demand side, the *Oliver!* group focused
on groups such as small businesses, local governments, low-income
people, minorities, the elderly and the disabled. Other low-demand
groups of people include rural residents; people who may need more
information to subscribe to broadband; and people who may have the
money and computer skills to go online, but simply do not have the
desire to do so. For these demographic categories, the lack of special-
ized software applications may be one reason that they are not going
online. The *Oliver!* group said that for rural residents, it was not
entirely clear that there were special demand barriers, but this deserves
greater research.

"Demand in our scenario is outstripping supply, but supply is not
keeping up. For some reason, the virtuous cycle of demand and supply
feeding each other is not working," said Professor Katz.

One potential problem is inter-carrier compensation policy, which
can be an important factor in the revenues received by rural carriers.
"Such a large percentage of their revenues can come from that," said
Professor Katz. "It's really a first-order issue for them in a way that it is
not for the big carriers in urban and suburban areas."

Another reason for high demand but low supply could be the "DMV
effect," in which the Department of Motor Vehicles and other govern-
ment agencies move more of their services online, and then shut down
their bricks-and-mortar offices or let offline services degrade. This
problem could give rise to third-party intermediaries that, for a fee,
transact business for citizens online, and then take a percentage cut
of the transaction. So, for example, Aid to Families with Dependent
Children recipients could get their AFDC payments online, but they
would have to pay a company that assisted in the transaction, on a
"check cashing" model.

The obvious solution to this problem would be for government not
to migrate its services online too quickly, and/or to help broadband
investment keep pace with expanding government services.

The *Oliver!* group agreed that the Universal Service Fund might be used effectively to help various unserved and under-served groups gain access. Two ideas were a "broadband version of Lifeline and Linkup," and means-tested subsidies to people.

Robert Pepper of Cisco Systems suggested that we talk about "digital inclusion" rather than the "digital divide," and recommended breaking that challenge into three categories: *reach, adoption,* and *use and benefit.*

The problem of *reach* is about people who do not have access to broadband. The problem of *adoption* is about people who have access but are not connected for any number of reasons (affordability, a perceived lack of benefit, no interest in going online, etc.). And the problem of *use and benefit* is about people who may have access and be connected, but they do not really know how to use and benefit from broadband. They need education and training to help them. Breaking the problem of digital inclusion down in this fashion is helpful because it points to more tailored solutions for different problems.

Signposts. What are the signposts that Scenario I may be nigh? On the demand side, a warning sign would be if government and business were moving online more rapidly than individuals were, and the consequent rise of business intermediaries to deal with the problems.

On the supply side, a signpost would be too little broadband investment and too little government support of investment. However, it could be difficult to ascertain this phenomenon without more reliable, timely data on actual broadband investment nationwide. Another worrisome signpost would be a wave of industry restructuring, in which low-density networks of lines leads to high debt loads, and then financial troubles.

Scenario II: High Demand, High Supply (The Big Easy)

Members of Scenario II working group—high demand and high supply—named their broadband story *The Big Easy*. In this world of plentiful broadband and robust consumer demand, the problems have more to do with managing the pace of growth, short-term disruptions and long-term stability than any fundamental mismatches of supply and demand.[3]

Signposts. The signposts of this scenario are stable and thriving markets, a diverse array of innovative, high-quality content and applications, robust technological and business innovation, citizen participation and thriving capital markets. Prices are either stable or possibly declining, but there are no shortages or excessive oversupply (which would cause prices to plummet). There is growth in e-commerce transactions and social networking; and there is consumer trust in online transactions and services.

The following conditions prevail in this scenario of rapid technological innovation and flexible systems:

- High-speed broadband is available to consumers irrespective of where they live and what they earn;

- Disruptive technologies foster new product development and service enhancements;

- Investments in R&D are rising to support innovation;

- Open and closed networks co-exist within the same universe (i.e., closed networks are not causing a Balkanization of the Internet);

- Copyright-based systems are better protected;

- The interoperability of devices is refined in order to support user convenience and flexibility;

- Online applications are created and/or enhanced to be more entertaining and culturally sensitive;

- The velocity of products to market is accelerated to accommodate increasing demand.

Policy Elements. In this near-utopian world, the contentiousness over intellectual property rules has abated, reflecting a stable social consensus among both users and producers about what levels of protection are appropriate. Technological innovation is healthy, as reflected in strong research and development, a functioning international trade system, fluid capital and labor markets, global stability and a steady stream

of new patents, products and services. Indeed, the velocity of innovation is so great that new disruptive technologies keep emerging.

Economic policy is as critical to the success of this scenario as communications policy. There must be high levels of international cooperation and security for intellectual property. There may be pockets of instability, but nothing that disrupts a generally favorable trajectory. The system is robust and open enough to give rise to new business models that offer flexible pricing and financing options. Companies are likely to expand their outsourcing to increase the speed at which they can bring new products and services to market.

The Big Easy is made possible by open platforms that encourage strong network effects. Systems are interoperable and people are able to manage their own content. The group mentioned the importance of spectrum policy. Particularly, capturing as much spectrum as possible and providing for flexibility and experimentation in the use of that spectrum. The scenario is also fueled by a widespread familiarity with computing technology and a cultural ease of use.

Culturally, *The Big Easy* world has much greater heterogeneity of creative expression. There would be a number of transnational communities of creativity collaborating and sharing their works. At the same time, the proliferation of so many cultures would fragment people's attention. In attempts to capture scarce attention in a crowded cultural milieu, more people would resort to sensationalism, fads and coarse expression to try to reach audiences.

One counter-balancing effect could be the rise of new intermediaries to curate cultural works and help users determine what they may wish to connect with. Counterintuitively, this could create greater opportunities for premium content created by large companies who wish to stand out from the mass of undifferentiated user-generated content.

In sum, creativity and culture are likely to take many different forms, but collaborative virtual communities would be able to co-exist with more traditional, high-capital-driven content.

The Big Easy envisions a more inclusive and culturally accepted Internet. Racial groups, ethnic minorities, immigrants, seniors and the disabled could all use broadband to engage with online content that speaks to their needs and interests. This might include multilingual content, for example, or "geri-apps" for the elderly.

The increased use of broadband by lower-income populations could be stimulated by flexible pricing plans and/or government incentives for broadband and device access. "Digitally disconnected" populations could get online through new technical training programs that support digital literacy.

Challenges Posed by *The Big Easy*. The main policy questions posed by *The Big Easy* are how to deal with the dark side of success: too much growth, the risk of bubbles and the risk of greater consumer fraud and security problems.

Certainly one risk is that robust economic growth would escalate into a financial or supply bubble, or cause recurrent boom-and-bust cycles. A certain price deflation for tech products would be likely, but it could zoom out of hand if market optimism resulted in excessive supplies of certain products followed by market collapses. However, the working group for *The Big Easy* believed that it would be possible for the market to constantly correct itself and become a "boom-bust-growth" cycle.

One question that the group did not fully resolve was the likelihood that the wealth would be unequally distributed between technology innovators and production workers. Would workers earn more money (from a soaring market) and thereby improve their livelihoods or would they suffer from lower wages (due to price deflation, cutthroat competition and greater outsourcing)? One interpretation of this trend saw unionization becoming more of a factor in the economy; another interpretation saw people enjoying "adequate disposable income."

In an environment of affordable and plentiful broadband supply, a residual problem is how to get non-adopters and the "bottom third" (in terms of income) to go online. The digital divide is not entirely eradicated even in this optimistic scenario.

A number of approaches were suggested for "digital inclusion." Government could encourage people to go online by putting more of its services online (driver's licenses, child support payments, etc.). The government could also provide "safety net" programs to help people become computer literate, or train them for jobs that may require computers.

The universal service program could be restructured to include broadband. Lifeline program funds could be redirected from the telephone Lifeline program, for example, to broadband, using the same

eligibility criteria. (Someone joked that this program could be called "Cash for Luddites.")

It would also be important for different government agencies to coordinate their rules and to develop new government-wide standards so that broadband usage is not stymied by needless barriers. For example, the Education Department's wisdom on job training should be coordinated with any FCC rules for a broadband Lifeline, and any Medicare rules for reimbursement should take account of the benefits of tele-medicine.

The Big Easy group speculated that the robust growth of its scenario would not take place if people did not have confidence in online transactions and vendors. Increased consumer demand and price deflation could spur companies to degrade their products or cut corners on privacy protection and cyber-security. Therefore, maintaining this growth would likely require heightened oversight by offline regulatory bodies to ensure adequate levels of consumer protection, broadband service quality, individual privacy, copyright protection and cyber-security. For example, said Robert Jarrin, Director of Government Affairs for Qualcomm, the integration of wireless communications products into medical devices is posing new consumer protection challenges.

Internet users would also want to feel confident that their freedom of expression was protected and that the free flow of information on the Internet was ensured. There was some concern that social or political groups might pressure companies to impose filters that limit the creation or exchange of objectionable user-generated content. Besides First Amendment protection, *The Big Easy* scenario would require a high degree of interoperability not just for the network, but for devices.

Scenario III: Low Demand, Low Supply (Batman Returns)

Scenario III—low demand and low supply—was clearly the most dystopian vision of the broadband future. In this scenario, insufficient broadband demand creates a vicious cycle of poor broadband supply. Under pressure from Wall Street, major network operators spin off unattractive assets, leaving many geographic areas with inadequate service. Other portions of the country are served by low-quality, economically weak providers. Major operators face intensifying competition for a shrinking pool of high-revenue customers.[4]

As Kevin Werbach, Assistant Professor of Legal Studies and Business Ethics at the Wharton School, University of Pennsylvania, put it, this broadband scenario "is where the dark side actually becomes too dark." The group chose the film *Batman Returns* to describe its scenario because "crime is rampant in this Gotham City, everyone is living in fear, and there is a small group of well-to-do, Bruce Wayne-type rich people, but they're locked away, cowering in their estates, and not that satisfied or happy."

How did this scenario evolve? Because a "vicious cycle" took hold that led to "Fairpointization" and ruinous competition.

"Fairpointization" refers to Verizon's sale of its local access wireline operations in three north New England states to a company called Fairpoint. Believing that it was not economically attractive enough to serve such a large, low-density rural region, Verizon wanted to shed its broadband assets there. But the company that bought the broadband network, Fairpoint, promptly experienced serious economic troubles, leading to declines in service for people in those regions and, subsequent to this conference, a filing for bankruptcy.

In the *Batman Returns* scenario, "Fairpointization" becomes a widespread phenomenon. The group speculated that some exogenous shock occurs that disrupts normal usage patterns, so that demand for broadband goes flat or declines. It could be a severe macroeconomic shock of the sort that occurred in October 2008. This would substantially depress consumer demand and also limit a company's ability to raise capital and build networks.

But the exogenous shock might also be a serious privacy violation or act of terrorism or cyber-security breach. The point is that people could become much less trusting of the Internet as a secure environment. Or perhaps there could be a shift in the political winds and there would be a clamp-down on content such as pornography or political expression. There might be, instead, an excessive or poorly executed act of structural regulation that breaks up entire industries, and basically erodes the economic value of using broadband networks.

Yet another potential exogenous shock is an unexpected fragmentation of the Internet. China might decide to retreat from the global Internet and develop its own national protocols. Or perhaps ICANN, the Internet Corporation for Assigned Names and Numbers, which

manages Internet domains, messes up in some way that ruins the net-work effects that make broadband attractive.

Instead of an exogenous shock—or in addition to it—the *Batman Returns* group speculated that there could be a massive decline in anticipated demand for broadband. Among the possible reasons:

- People shift more of their lives to mobile computing devices, which requires less bandwidth. Mobile could increasingly substitute for wireline and other kinds of services, becoming a low-demand platform.

- Broadband networks could become too closed, which would reduce the innovation in new applications. Or the open plat-form of the Internet could be supplanted by appliance-type networks that are not as innovative or demand-generating.

- Private, self-contained "non-broadband" networks for tele-health, education, public safety and other narrow-gauged uses could proliferate, reducing demand for open broadband plat-forms and fragmenting the public network.

- Video demand may not take off as currently anticipated, either because companies with high-quality content refuse to put their video on broadband for fear of copyright infringement, or because Internet users share high-quality content so widely that no one can make money from it any more. In either instance, broadband demand would decline.

Stung by either an exogenous shock or by unanticipated declines in broadband demand, or both, the *Batman Returns* scenario sees broad-band providers driven to the "Fairpointization" option. The average revenue per user, or ARPU, number may become so low that it no lon-ger makes economic sense for a company to provide service to a given region. The incentive becomes strong for a company to simply shed its assets in low-density, low-income service areas, reap the tax benefits, and move on.

Policy Elements. Of course, this poses a new set of quandaries that have no clear or easy resolution. What happens if a broadband

carrier goes bankrupt—and not just a reorganization of its finances, but a Chapter 7 scenario? Would the government have to step into the confusion and chaos, and provide an expensive capital bailout and transition management?

This scenario could be particularly troublesome for government if broadband had become a piece of critical infrastructure in people's lives. If utilities relied upon broadband for the smart grid for electricity management; if the U.S. Postal Service had moved more of its services to broadband; if broad swaths of government services, business-to-business and retail consumer transactions depended upon broadband, then a Fairpointization scenario could be disastrous. "Government would have to think about universal service in a whole new context," said Professor Werbach. "How should government think about this going forward?"

The alternative to the dystopia of Fairpointization would be ruinous competition. This is a scenario in which there would be intense competition for a very small number of "good" customers. Margins would get crushed and operators would not be able to fund networks. And even people in the so-called "good areas" would have inadequate, poor-quality service.

It is theoretically possible that an alternative economic model might materialize to help out the troubled broadband carrier. Perhaps the market moves to mesh networks with user devices, rather than to fixed broadband lines. But this was so speculative that the *Batman Returns* group did not seriously consider this possibility.

The essence of the *Batman Returns* scenario is a vicious cycle where broadband demand does not increase or even stay at existing levels, but instead declines. This sets off a chain of events that undermine broadband supply, with no other business models arising to replace the previous one.

Signposts. The signposts for recognizing the arrival of a *Batman Returns* scenario includes these developments:

- An economic or other exogenous shock to broadband demand;

- More carrier bankruptcies;

- More carrier spinoffs of rural assets;

- Continued absence of "big broadband" (fiber, DOCSIS 3) in rural and other underserved areas, as capabilities increase elsewhere;

- Private, specialized networks being used as substitutes for Internet broadband networks;

- Failure of broadband-enabled services such as tele-health and smart grids in under-served areas (because of a lack of network capacity);

- Precipitous drops in carrier ARPU (average revenue per user) when counting the entire voice/video/data basket;

- Average daily minutes of online use drops;

- Broadband churn rates increase, reversing currently low price elasticity of broadband.

Policy Responses. The *Batman Returns* group drew three general policy lessons from their scenario. One is that the best policy approach for avoiding the low demand/low supply vicious cycle is to treat broadband as critical infrastructure. This means supporting the viability of both the supply and demand sides.

A second lesson is that when broadband is the foundation for crucial services such as healthcare, smart-grid networks and e-government, the costs of an economic failure in broadband networks are magnified. As Ben Scott of Free Press said, "In a low demand/ low supply world, losing broadband service makes a crisis a lot more urgent because you're not just losing broadband, you're losing all the services that are increasingly tied to it."

> **…the best policy approach for avoiding the low demand/low supply vicious cycle is to treat broadband as critical infrastructure.**

Scott believes that the American Recovery and Reinvestment Act represents a shift of policy assumptions about broadband. The law does not regard broadband simply as a commercial service, but as critical

infrastructure. "We're no longer talking about whether or not people have access to the Internet," said Scott. "We're talking about whether they have access to all of the different services that are layered on top of broadband. And that changes your perspective." Perhaps there should be some sort of index to measure the degree to which broadband serves as critical infrastructure, he suggested.

…when broadband is the foundation for crucial services such as healthcare, smart-grid networks and e-government, the costs of an economic failure in broadband networks are magnified.

A final general policy lesson from *Batman Returns* is the need for government to keep better tabs on the state of broadband infrastructure. The policy process needs better economic data and analysis to assess risks and opportunities.

Policy Recommendations in the Low Demand, Low Supply Scenario. The *Batman Returns* group also had a number of specific recommendations. They included:

1. Elevate discussion of the digital divide as an *economic* concern, not just a social equity concern.

2. Do contingency planning for such calamities as a carrier bankruptcy or a pandemic that could cause massive temporary usage spikes.

3. Consider a return to a regulated utility model for some providers (while recognizing the significant complexities and risks in doing so).

4. Eliminate the U.S. Postal Service, move most mail transactions online and use the savings to subsidize ubiquitous broadband.

5. Use universal service to subsidize high-end broadband in rural areas (despite the costs and inefficiencies).

6. Promote (or restore) trust in broadband networks and applications with respect to privacy and security threats. Use the

Network Reliability and Interoperability Council (NRIC) and the National Security Telecommunications Advisory Committee (NSTAC) for industry coordination, and perhaps use "Good Housekeeping Seal" approaches.

The *Batman Returns* group also had several suggestions for addressing the digital divide in broadband access:

1. Review asset spinoffs carefully (but regulators will have few good options when the alternative is to starve the networks).

2. Engage in financial analysis to identify threatened carriers before it is too late (especially mid-tier operators such as Frontier and Embarq).

3. Open up significant rural spectrum capacity.

4. Support upgrades of rural cable operators (while considering whether economics can support two broadband lines into the home).

To stimulate broadband demand generally (and not just to rural areas), the *Batman Returns* group recommended promoting alternative venues for broadband use, such as schools and government centers for service delivery, which would then stimulate home demand. It also suggested training programs, including free personal computers, to make broadband "sticky."

Finally, an in act of supererogation, the *Batman Returns* group identified six analytic questions that it believes the FCC should answer as part of the National Broadband Plan process:

1. Prepare a five-year analysis of the financial performance of major carriers under various scenarios.

2. Assemble an inventory of baseline critical services (e-government, smart grid, etc.) that broadband is expected to support, and what network capacities they will require.

3. Identify the low-ARPU lines subject to potential spinoff by major carriers.

4. Evaluate the economics of middle-mile service: Are high back-haul prices in rural areas really the key bottleneck?

5. Assess how Universal Service Fund subsidy numbers might change if RLEC (rural local exchange carrier) "triple play" revenues and costs were counted (voice, video, data), and not just voice revenues alone.

6. Identify the amount of unoccupied broadcast spectrum in rural areas.

Scenario IV: Low Demand, High Supply (Final Fantasy)

Scenario IV—low demand and high supply—was named for the film *Final Fantasy*, which is a science-fiction story about the Earth in the year 2065, when it is a barren wilderness managed by a race of aliens. The last remnants of civilization are to be found in dome-enclosed "barrier cities." The group gave a tagline to their scenario: "Turn on, tune in, check out."[5]

How might this scenario have come to pass? In terms of high supply, two culprits were identified—industry and government. The group suggested that the over-abundant broadband supply was caused by irrational exuberance in the market, leading to short-term market inefficiencies and bubbles. The seemingly irrational levels of private sector investment may have been fueled by cheap money.

The government may also have over-stimulated investment by providing too many incentives. Or, as the Australian government did, it may have financed and built the broadband infrastructure itself on the mistaken assumption that "build it and people will come."

And how did demand become so low in this scenario? The *Final Fantasy* group proposed that an exogenous shock to the broadband market interrupted a virtuous cycle of rising supply and growing demand. The shock could have taken many forms: an economic downturn, a major security or privacy breach, or rampant piracy of copyrighted content.

However it arose, under this scenario, low demand for broadband has persisted and has been aggravated by digital illiteracy among con-

sumers. In addition, not enough culturally appealing Internet content has materialized and broadband prices are too high relative to users' sagging incomes. Other possible sources of low demand: consumer interface devices are not easy to use, and the unexpected discovery that certain popular electronic devices may cause cancer.

Broadband demand may also be low because no "killer apps" are materializing. Also, the "free" Internet content and applications business model that was expected to drive new demand—give something away in order to stimulate revenue from other sources—is not working over the long term. There may also be conflicts and complications in apps developers and network providers being able to collaborate to ensure that networks support applications, and that applications are "network-friendly."

Demand may be curtailed, finally, because of government over-regulation of new business models and excessive taxation. There could be antiquated federal, state and local laws that hinder digital adoption. Or perhaps large numbers of people simply do not want to use the Internet as intensively as previously, and are finding other, more interesting things to do with their time.

When investing in supply, government should also be sure to support demand concurrently.

Signposts.   So how does one know that we may have entered the realm of *Final Fantasy*? The signposts are plentiful availability of broadband and affordability, but persistent low demand. The bandwidth, latency and other relevant performance metrics are more than sufficient for future applications and content mixes—and even includes sufficient "headroom" for future innovation.

Yet people still choose not to subscribe, or they subscribe at lower capacity levels than are available. Low demand may be due to growing disparities in people's incomes. So another signpost would be variations in adoption rates among different racial and economic groups.

How might policy respond? The obvious solution to the excessive supply problem is for government to be careful not to overbuild or over-stimulate investment. When investing in supply, government should also be sure to support demand concurrently. As for the private

sector's role in over-building, the group recommended competition policy to allow consolidation.

In terms of bolstering demand, the *Final Fantasy* group recommended first that government develop better measurement systems to monitor actual demand. Government could help incentivize demand by putting more government services online or by addressing digital literacy problems with education and training. It could also encourage diverse populations to enter relevant professions such as software engineering.

A less obvious but potentially enormous barrier to broadband use is conflicts among state laws and inter-agency regulations. It was suggested, therefore, that the federal government could establish some form of inter-agency coordination as a way to harmonize laws and regulations that might affect broadband-related services.

For example, the Mayo Clinic may wish to use tele-medicine techniques, but Minnesota law does not permit a doctor to treat a patient in Florida. "There are an enormous range of things that are not under the control of the FCC or NTIA that can act as barriers to broadband use," said Anna-Maria Kovacs, Founder and President of Regulatory Source Associates. "We need to do an inventory of things such as state licenses, the lack of uniform standards, and so on, that either impede broadband or could be improved."

Robert Pepper of Cisco Systems suggested that if government could document the "business case" for government moving to electronic delivery—because of the cost savings that would result—it might even allow those savings to subsidize an increase in broadband connections. For example, if the Aid to Families with Dependent Children (AFDC) program, food stamp distribution or certain types of health care services could be moved online and thus produce new efficiencies and cost savings, then perhaps some or all of that money could be plowed into subsidizing broadband connections for low-income beneficiaries. Besides saving money, government processes themselves could be transformed, with many beneficial effects.

Conference participants conceded the political challenges in negotiating such inter-agency finances and service-delivery. And there would also be formidable challenges to government computer mainframes to provide user-friendly information and services. In addition, it may be difficult for many government executives and employees to accommo-

date the cultural mindset of such a shift in service delivery. Participants pointed out, for example, that the government's computer databases for copyrights, patents and trademarks are egregiously backward and not user-friendly.

The group speculated that copyright law could be contributing to low demand. But there were questions whether the problem is too much copyright protection or too little protection. Some thought that piracy of copyrighted works could be discouraging companies from investing in new applications and content, thus depressing demand; others suggested that insufficient freedom to create and share cultural materials was more responsible for low demand. Fair use reform was one suggested remedy to reduce the risk to

> **"…it is time to come up with an entirely different regime to support critical infrastructure that provides essential services."**
>
> *Julia Johnson*

users who wish to make transformative uses of existing works while creating new ones. Others suggested an overall rebalancing of copyright interests between freedom of use and security of ownership.

Improving security and privacy protection could help bolster demand. This suggestion echoed the concern expressed by Gigi Sohn of Public Knowledge in the *Oliver!* scenario that carriers may fear excessive liability for copyright, privacy or security violations, and earlier comments by Joe Waz of Comcast regarding the need for public confidence in the safety and security of the Internet.

Government subsidies for devices could help stimulate demand, although the group hastened to add that rigorous performance measures would need to be built into any such program. The *Final Fantasy* group also mentioned a Lifeline program for broadband, which would be directed to users, not networks, and would be drawn from general revenues, not user assessments.

Finally, noted Julia Johnson of Net Communications, "Since we know the universal service system is not sustainable, it is time to come up with an entirely different regime to support critical infrastructure that provides essential services. This is the time to start thinking outside of the box, particularly on the demand side."

III. Some Lessons from the Broadband Scenarios

The conference concluded by considering the cross-cutting themes from each of the scenarios, and making recommendations to the National Telecommunications and Information Administration on policies for stimulating demand and usage of broadband.

Themes Common to All Four Scenarios

While each of the scenarios sketched very different visions of the future for broadband, there were a number of recurrent themes that each group identified. No matter the scenario, it is likely that government will need to address the following issues:

Digital inclusion. Even in the rosy scenario, *The Big Easy*, government is needed to help people gain access to broadband, especially as more critical services migrate to broadband and as entire sectors of the economy and regions become dependent upon it. However, it is not self-evident how existing programs such as the Universal Service Fund and Lifeline programs should be modified or expanded to address disparities in broadband access.

E-government. There is a growing movement to develop "Government 2.0"—innovations that draw upon those of Web 2.0 and reap more of the performance improvements, cost savings and organizational transformations that could be achieved. However, moving to new forms of e-government entails massive challenges of scale, legal complexity, inter-agency coordination, transition costs and organizational culture. Despite the enormous potential, it is difficult for government to take a holistic view of its cost structures, coordinate its many endeavors and reorganize itself.

Stimulating broadband demand. Each group offered a number of suggestions for how government could stimulate demand. But there was no clear consensus for what the trigger points are for government action, and to what extent government should assume this challenge. There was a clear call for effectively measuring programs to stimulate demand before using federal support to bring them to scale.

Digital literacy. As broadband becomes the platform for new services, the need for education and training of people who are unfamiliar with

computers, or more specialized applications, becomes more urgent. Teaching people how to use online resources is not just a matter of stimulating broadband demand; it would help the economy, education, workforce preparedness and the government provision of services.

Copyright protection. Each group found intellectual property to be a potential influence in broadband supply and demand, and hoped for greater "clarity" and "adequate protections" in this area. However, there were divisions among conference participants about what is the more serious problem—piracy of copyrighted works or excessive restrictions on fair use, sharing and collaboration. How to achieve a stable new consensus on future intellectual property standards remains elusive.

Trust and liability. Every scenario saw that violations of privacy, computer security and personal trust could have serious implications for broadband supply and demand. People may avoid using broadband if it becomes a place of rampant fraud, identity theft, offensive content and security risks.

Reliable metrics. A recurring theme was the need for rigorous, trustworthy empirical data on the state of broadband investment, availability and usage.

Overcoming cultural barriers. Many people resist moving to broadband because of entrenched personal habits and cultural aversions and ignorance. This constitutes a serious, underappreciated barrier to broadband adoption.

Recommendations for the National Telecommunications and Information Administration

Lawrence Strickling, Assistant Secretary for Communications and Information at the U.S. Department of Commerce, invited conference participants to identify the most important options that the U.S. Government might take to stimulate broadband demand. What follows is a list of suggestions in no particular order of preference or ranking.

Redirect the Universal Service Fund (USF) to support devices, using vouchers. Gigi Sohn of Public Knowledge urged this change in the USF program because devices are becoming a part and parcel of the network.

Also, because computers are more expensive and complicated than smart phones, the latter may provide a more accessible platform for getting people online. Sohn recommended vouchers; Strickling stressed that there would need to be some ways to ensure that people indeed got connected and used the devices over time. Steps would have to be taken to protect against the rise of a secondary market for devices acquired with vouchers, so that people did not just use the program to make money.

Revamp Lifelife for broadband. A revamped Lifeline program would be a "an effective way to drive eligible low-income families online," said Nicol Turner-Lee, Vice President and Director of the Media and Technology Institute at the Joint Center for Political and Economic Studies. But it is unclear what standards or oversight may be needed to ensure that people actually use broadband and stay online. If government made broadband usage indispensable for accessing certain services, it would need to redefine the eligibility standards for the program. The government may also need to establish mandatory baseline criteria for what constitutes minimally acceptable Internet access.

Develop reliable government metrics.   Joe Waz of Comcast Corporation urged strong metrics for any government program, especially with longitudinal studies, so that the government can know what is actually working. While there are a number of worthwhile private studies that have been done, some participants pointed out that the government should be supporting much larger and more serious surveys than existing private ones.

Address digital literacy. There were suggestions for establishing digital literacy education programs for K-12 students and establishing national standards for workforce development. These programs might be coordinated with state and local governments. They could also draw upon volunteers from local communities so that minimal local resources would be needed to implement any program. One model that might be worth emulating is the "Geek Corps," which provides computer education in Africa under the auspices of USAID.

Use government purchasing power. Government could help develop certain markets, and thereby encourage broadband utilization, by promulgating design standards for products purchased through its own procurement or by making certain large purchases that kick-start a

market (the way that the General Services Administration's stipulation of air bags for the government car fleet prodded broader industry adoption of air bags).

Put more government services online for disadvantaged populations. Government could make it easier and cheaper for citizens to access government services online, and provide economic incentives for doing so.

Encourage the President to use his "bully pulpit." A presidential statement or appearance could be helpful in moving any number of broadband-related efforts forward. It could dramatize the need for computer training and education, for example, and the need for school children to improve their digital literacy.

Conclusion

This conference opened with a broad, ambitious question: "How can we develop a broadband world that grows the economy, provides opportunity and enhances the quality of life for everyone, improves the environment, and fosters democracy?"

There are clearly many imponderables in forging appropriate policies to stimulate broadband use and anticipate adverse developments. However, the scenario-building process helped stretch people's thinking, beyond their usual policy or political predilections, and helped develop more holistic understandings of the broadband ecosystem.

Scenario-building identified key signposts that may suggest our entrance into one or another of the four scenarios outlined. The process developed textured, interconnected portraits of the broadband future and the dynamic factors that may drive it. And the scenario-building process identified specific government policies and interventions that may be needed under various circumstances.

Interestingly, each of the four scenarios gravitated toward common concerns: the need to promote universal access and digital inclusion; the need for government to become more pro-active in using broadband to improve its own services; the value of popular education and training about digital technologies; the importance of social trust in the broadband environment; the need for more reliable metrics for understanding the scope of broadband investment, availability and usage; and the cultural barriers that often inhibit broadband usage.

The four scenarios, while imaginary, are likely to have considerable practical value to policymakers as they contemplate how to integrate the broadband infrastructure into more aspects of American society.

Notes

1. Kees van der Heijden, "Scenario Thinking About the Future," in *Changing Maps: Governing in a World of Rapid Change* (Ottawa: Carleton University Press, 1995), pp. 147-162. See also Lawrence Wilkinson, "How to Build Scenarios," *Wired.com*, 2009, at http://www.wired.com/wired/scenariois/build.html.

2. Participants in the *Oliver!* working group included Michael Katz (chair), Paula Boyd, Richard Green, Dale Hatfield, Robert Pepper, Jessica Rosenworcel and Gigi Sohn.

3. Participants in *The Big Easy* working group included Eli Noam (chair), Catherine Bohigian, David Bollier, Robert Jarrin, Cameron Kerry, Preston Padden, Jenny Toomey and Nicol Turner-Lee.

4. Participants in the *Batman Returns* working group included Kevin Werbach (chair), Dorothy Attwood, Meredith Baker, Kevin Kahn, Ben Scott, Steven Teplitz and Lara Warner.

5. Participants in the *Final Fantasy* working group included Julia Johnson (chair), Yochai Benkler, Alan Davidson, Michael Gallagher, Kathy Grillo, Anna-Maria Kovacs, Lawrence Strickling and Joe Waz.

APPENDIX

Scenarios for a National Broadband Policy

Aspen, Colorado
August 12-15, 2009

Conference Participants

Dorothy Attwood
Senior Vice President,
  Public Policy and
  Chief Privacy Officer
AT&T Services, Inc.

Meredith Baker
Commissioner
Federal Communications
  Commission

Yochai Benkler
Jack N. and Lillian R. Berkman
  Professor for Entrepreneurial
  Legal Studies
Harvard Law School, and
Co-Director
Berkman Center for Internet
  and Society
Harvard University

Catherine Bohigian
Vice President Federal Affairs
Cablevision Systems Corporation

David Bollier
Independent Journalist
  and Consultant
Onthecommons.org

Paula Boyd
Regulatory Counsel
Legal and Corporate Affairs
Microsoft

Alan Davidson
Director, Public Policy
Google

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

Michael Gallagher
President and Chief Executive
  Officer
Entertainment Software
  Association

Richard R. Green
Former President and Chief
  Executive Officer
CableLabs

Kathy Grillo
Senior Vice President
Federal Regulatory Affairs
Verizon Communications

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

Dale Hatfield
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Silicon Flatirons Center
  and
Adjunct Professor
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Robert Jarrin
Director, Government Affairs
Qualcomm Incorporated

Julia Johnson
President
Net Communications

Kevin Kahn
Intel Senior Fellow, and
Director, Communications
  Architecture
Intel Labs
Intel Corporation

Michael Katz
Sarin Chair in Strategy and
  Leadership, and
Director, Institute of
  Management, Innnovation
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University of California—
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Cameron Kerry
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Anna-Maria Kovacs
Founder and President
Regulatory Source Associates,
  LLC

Eli Noam
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  Tele-Information, and
Professor of Finance and
  Economics
Columbia Business School
Columbia University

Preston Padden
Executive Vice President
Government Relations
The Walt Disney Company

Robert Pepper
Vice President Global
  Technology Policy
Cisco Systems

Jessica Rosenworcel
Senior Communications Counsel
Senate Committee on Commerce,
  Science and Transportation

Ben Scott
Policy Director
Free Press

Gigi B. Sohn
President
Public Knowledge

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

Lawrence Strickling
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  Communications and
  Information
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  and Information Administration
U.S. Department of Commerce

Steven Teplitz
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Government Relations
Time Warner Cable

Jenny Toomey
Progam Officer
Media Rights & Access
Ford Foundation

Nicol Turner-Lee
Vice President and Director
Media and Technology Institute
Joint Center for Political and
  Economic Studies

Lara Warner
Director of Research
Credit Suisse

Joe Waz
Senior Vice President
External Affairs and Public
  Policy Counsel
Comcast Corporation

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

Staff:

Sarah Snodgress
Project Manager
Communications and Society
  Program
The Aspen Institute

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

About the Author

David Bollier (www.bollier.org) is an author, activist, blogger and consultant who has served as rapporteur for Aspen Institute Communications and Society conferences for more than 20 years.

Much of Bollier's work over the past ten years has been devoted to exploring the commons as a new paradigm of economics, politics and culture. He has pursued this work as an editor of Onthecommons.org, a leading website about commons-based policy and politics and in collaboration with various international and domestic partners.

Bollier's first book on the commons, *Silent Theft: The Private Plunder of Our Commons Wealth*, is a far-ranging survey of market enclosures of shared resources, from public lands and the airwaves to creativity and knowledge. *Brand Name Bullies: The Quest to Own and Control Culture* documents the vast expansion of copyright and trademark law over the past generation. Bollier's latest book, *Viral Spiral: How the Commoners Built a Digital Republic of Their Own*, describes the rise of free software, free culture, and the movements behind open business models, open science, open educational resources and new modes of Internet-enabled citizenship.

Since 1984, Bollier has worked with American television writer/producer Norman Lear and served as Senior Fellow at the Norman Lear Center at the USC Annenberg School for Communication. Bollier is also co-founder and board member of Public Knowledge, a Washington policy advocacy organization dedicated to protecting the information commons. Bollier lives in Amherst, Massachusetts.

Select Publications from the Aspen Institute Communications and Society Program

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

Clearing the Air: Convergence and the Safety Enterprise, by Philip J. Weiser

The report describes the communications problems facing the safety enterprise community and their potential solutions. The report offers several steps toward a solution, focusing on integrating communications across the safety sector on an Internet-Protocol-based backbone network, which could include existing radio systems and thus make systems more dependable during emergencies and reduce costs by taking advantage of economies of scale. The conference participants stressed that the greatest barriers to these advances were not due to lagging technology but to cultural reluctance in adopting recent advances. Writes Weiser, "The public safety community should migrate away from its traditional reliance on specialized equipment and embrace an integrated broadband infrastructure that will leverage technological innovations routinely being used in commercial sectors and the military." 2006, 55 pages, ISBN Paper: 0-89843-4, $12.00

Reforming Telecommunications Regulation,
by Robert M. Entman

The report of the 19th Annual Aspen Institute Conference on Telecommunications Policy describes how the telecommunications regulatory regime in the United States will need to change as a result

of technological advances and competition among broadband digital subscriber line (DSL), cable modems, and other players such as wireless broadband providers. The report proposes major revisions of the Communications Act and FCC regulations and suggests an interim transitional scheme toward ultimate deregulation of basic telecommunications, revising the current method for universal service subsidies, and changing the way regulators look at rural communications. 2005, 47 pages, ISBN Paper: 0-89843-428-9, $12.00

Challenging the Theology of Spectrum: Policy Reformation Ahead,
by Robert M. Entman

This report examines the theology of spectrum—that is, the assumptions and mythology surrounding its management and use. The report looks at how new technologies affecting spectrum, such as software-defined radio, can challenge the conventional wisdom about how spectrum should be managed. Such innovations allow for access to unused frequency space or time on frequencies that are otherwise licensed to an exclusive user. 2004, 43 pages, ISBN Paper: 0-89843-420-3, $12.00

Spectrum and Network Policy for Next Generation Telecommunications,
by Robert M. Entman

The report of the 18th Annual Aspen Institute Conference on Telecommunications Policy offers policy alternatives in both spectrum and network policy to achieve new gains for the telecommunications field. The first essay suggests new management approaches to encourage more efficient uses of spectrum while preserving the commitment to reliability of service and public safety values. The second essay debates the competitive structure of the telecommunications industry and its implications for building next-generation networks (NGN) and identifies three areas to encourage optimal development of the NGN: operate the NGN on a price-deregulated basis and begin to address access regulation issues, secure the intellectual property rights of content suppliers, and adjust the system of subsidized pricing to bring about competitively neutral pricing. 2004, 92 pages, ISBN Paper: 0-89843-394-0, $12.00

Balancing Policy Options in a Turbulent Telecommunications Market,
by Robert M. Entman

This report assesses the future of communications regulatory paradigms in light of desirable changes in spectrum policy, telecommunications market environments, and regulatory goals. It suggests four models of regulation, including government allocation, private spectrum rights, unlicensed commons, and a hybrid system of dynamic spectrum access. It also addresses how changes in spectrum and other telecommunications policies, as well as new business realities, might affect current regulatory regimes for the telecommunications industries. The report includes an essay on spectrum management, "The Current Status of Spectrum Management," by Dale Hatfield. 2003, 79 pages, ISBN Paper: 0-89843-370-3, $12.00

Telecommunications Competition in a Consolidating Marketplace,
by Robert M. Entman

In the telecommunications world, what would a fully competitive environment look like? What communications initiatives should policymakers develop—considering the ultimate welfare of the consumer—to implement change in the regulatory climate? This report explores ways to reshape the current regulatory environment into a new competitive space. It addresses competition not only within but across separate platforms of communications such as cable, wireline telephony, wireless, satellite, and broadcast. The report also includes an essay on an innovative approach to wireless regulation, "Opening the Walled Airwave," by Eli Noam. 2002, 64 pages, ISBN Paper: 0-89843-330-4, $12.00

Transition to an IP Environment, by Robert M. Entman

This report examines a "layered approach" to regulation. By viewing telecommunications in four separate layers—content, application, network, and data link—policy discussions can address concerns in one layer without negatively affecting useful existing policy in other layers. Also presented are beliefs that the growth of broadband should prompt a new discussion about universal service reform. The report also includes "Thoughts on the Implications of Technological Change for Telecommunications Policy," by Michael L. Katz. 2001, 78 pages, ISBN Paper: 0-89843-309-6, $12.00

Six Degrees of Competition: Correlating Regulation with the Telecommunications Marketplace, by Robert M. Entman

This report addresses basic conceptual questions about what the nature of regulation should be in a competitive, broadband future. It also examines how fundamental policy issues such as interconnection, mergers, spectrum allocation, jurisdiction, universal service, and consumer protection should be handled in the interim. The report also includes "Regulation: The Next 1000 Years," by Michael L. Katz. 2000, 65 pages, ISBN Paper: 0-89843-279-0, $12.00

Residential Access to Bandwidth: Exploring New Paradigms, by Robert M. Entman

This report explores policy initiatives that would encourage widespread deployment of residential broadband services throughout the United States. It identifies the regulatory system as one of the chief obstacles to achieving ubiquitous broadband deployment and offers a new regulatory model to overcome these barriers. 1999, 35 pages, ISBN Paper: 0-89843-256-1, $12.00

Reports can be ordered online at *www.aspeninstitute.org/publications* or by sending an email request to *publications@aspeninstitute.org.*

About the
Communications and Society Program

www.aspeninstitute.org/c&s

The Communications and Society Program is an active venue for global leaders and experts from a variety of disciplines and backgrounds to exchange and gain new knowledge and insights on the societal impact of advances in digital technology and network communications. The Program also creates a multi-disciplinary space in the communications policy-making world where veteran and emerging decision-makers can explore new concepts, find personal growth and insight, and develop new networks for the betterment of the policy-making process and society.

The Program's projects fall into one or more of three categories: communications and media policy, digital technologies and democratic values, and network technology and social change. Ongoing activities of the Communications and Society Program include annual roundtables on journalism and society (e.g., journalism and national security), communications policy in a converged world (e.g., the future of video regulation), the impact of advances in information technology (e.g., "when push comes to pull"), advances in the mailing medium, and diversity and the media. The Program also convenes the Aspen Institute Forum on Communications and Society, in which chief executive-level leaders of business, government and the non-profit sector examine issues relating to the changing media and technology environment.

Most conferences utilize the signature Aspen Institute seminar format: approximately 25 leaders from a variety of disciplines and perspectives engaged in roundtable dialogue, moderated with the objective of driving the agenda to specific conclusions and recommendations.

Conference reports and other materials are distributed to key policymakers and opinion leaders within the United States and around the world. They are also available to the public at large through the World Wide Web, *www.aspeninstitute.org/c&s*.

The Program's Executive Director is Charles M. Firestone, who has served in that capacity since 1989, and has also served as Executive

Vice President of the Aspen Institute for three years. He is a communications attorney and law professor, formerly 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.