

Ensuring Effective Broadband Stimulus

*An analysis of the broadband-related provisions of the
American Recovery and Reinvestment Act of 2009*

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January 22, 2009

Executive Summary: The American Recovery and Investment Act of 2009¹ contains provisions which purport to stimulate the deployment of high speed Internet access to currently unserved locations. Unfortunately, these provisions are drafted in such a way as to make it difficult or even impossible for many broadband providers to respond to the stimulus, especially in rural and sparsely populated areas of the United States. Some of the problematic provisions include a technically infeasible requirement for “open access;” a requirement for adherence to a vague and untested set of “broadband principles” adopted without expert consultation or opportunity for public comment; and vague performance requirements unsupported by the availability of wireless spectrum to implement them or reasonably priced Internet backbone access required to achieve them. The draft bill also requires that much of the stimulus be administered via the USDA’s Rural Utilities Service program, which provides grants, loans, and loan guarantees to corporations but not to small businesses which are sole proprietorships or partnerships. This would unduly limit participation to larger entities, and would prevent American small businesses from coming forward to serve their communities when large corporations will not.

To achieve the desired stimulus, the bill should be modified so that carriers can use innovative approaches to reach unserved areas with attractively and reasonably priced service. In particular, the “open access” requirement and “broadband principles” should be dropped in favor of simple rules prohibiting anticompetitive practices; ready and economical access to the Internet backbone (sometimes called “special access”) should be guaranteed, especially in rural areas; and the AWS-3 spectrum – currently in limbo at the FCC – should be dedicated to use by broadband providers under a non-exclusive licensing scheme with a mandatory spectrum etiquette (to allow the spectrum to be shared among competing providers). Finally, to ensure that small business can step up to the plate to fill the “broadband gap,” the program should be administered so as to allow (and in fact encourage) small businesses, including sole proprietorships and partnerships, to participate. These recommendations are explained in greater detail in the sections that follow.

“Open Access” Requirements Counterproductive

Among the prerequisites for receiving broadband grants, loans, or loan guarantees, as specified in the bill,

¹ United States House of Representatives Appropriations Committee, “American Recovery and Reinvestment Act of 2009,” unnumbered committee print dated January 15, 2009, retrieved from <http://appropriations.house.gov/pdf/RecoveryBill01-15-09.pdf> on January 22, 2009.

is a requirement for wireless “open access.”² While many definitions of the term have been bandied about, it appears that in this context “open access” is intended to embody the general notion that users should be able to bring the equipment of their choosing and use it to connect to a wireless network.

Unfortunately, such requirements are technologically infeasible in current and future high speed wireless broadband networks. For example, many terrestrial fixed wireless broadband providers use equipment that conforms to the popular IEEE 802.11g standard. This technology is able to deliver data to users at raw data rates as high as 54 Mbps (million bits per second). However, if a user who supplied his own equipment were to connect a radio conforming to the older 802.11b standard, the entire network would slow down to accommodate it. This would reduce the capacity of the entire network to no more than 10 Mbps and possibly as little as 1 Mbps.³ ⁴ Similar slowdowns will occur if a user attempts to connect a radio with inadequate power output, installs an antenna that does not have sufficient “gain” (a measure of the antenna’s ability to focus radio waves), aims or connects the antenna improperly, does not configure the equipment so as to comply with highly technical FCC regulations, or is too far away from the access point to make a good connection. An improperly configured radio, or one which is not fully compatible, can further disrupt the operation of the network by failing to participate in protocols which require the radios to “take turns” when transmitting and maintain order on the network. This can cause “collisions” (which occur when two radios attempt to transmit at the same time) and dramatically slow network access for all users.

What’s more, different brands of equipment often do not work together and may disrupt one another’s operation. For example, many wireless products produced by chip maker Intel (including the Centrino chips included in many laptops) will not interoperate with equipment containing chips produced by rivals Intersil and Conexant, even though Intel claims its products to be fully compatible with industry standards.

Highly experienced wireless network engineers (whom the author estimates to number perhaps 6,000 in the United States) understand these potential pitfalls and can specify and configure equipment to achieve optimal results. But even sophisticated users do not have this hard won knowledge and experience. For this reason, it is to users’ advantage if the wireless broadband provider retains the right to design the link, choose the best equipment, and install and configure the equipment in conformance with industry standards, Federal regulations, and the safety requirements of the National Electrical Code.

Wireless ISPs (WISPs), including the author’s own company, have the skills necessary to provide users with service that’s as good as, or better than, that provided via cable modems or DSL. It would be counterproductive and harmful if Congress were to enact legislation which precluded these engineers from doing the work which they are uniquely qualified to perform for the benefit of broadband users.

It is also worth noting that an “open access” requirement has never proven to be necessary to users’ ability

² Ibid., p. 38, line 17; p. 53, line 12 and 14; p. 58, line 12 and 16.

³ See, for example, UIUC Campus Information Technologies and Educational Services, “Wireless Networking Speed: Ideals and Experiences,” retrieved from <http://www.cites.illinois.edu/wireless/speed.html> on January 22, 2009.

⁴ Brewin, Bob, “Final 802.11g draft standard throttles data rates down,” *ComputerWorld*, May 22, 2003, retrieved from <http://www.computerworld.com/mobiletopics/mobile/story/0,10801,81450,00.html> on January 22, 2009.

to access wireless broadband networks. This author cannot find a single case – in the literature or in an exhaustive search of the World Wide Web – of a user who was prevented from obtaining wireless broadband for lack of such a requirement. Rather, “open access” regulation would impede access by reducing the speed and geographic reach of wireless broadband networks, prevent the development and deployment of new and innovative wireless technologies, and impose an unnecessary regulatory burden which would discourage investment.

Finally, the bill fails to provide a definition of “open access,” thrusting the responsibility to craft one upon the FCC (which must do so within 45 days of passage). This presents several problems. Because this key term is left completely undefined in the legislation, legislators who vote for the bill would not know exactly what they were voting for. Instead, Congress would be allowing law to be made by an FCC which was declared, in a recent report drafted by the House Energy and Commerce Committee, to be “dysfunctional” and rife with “deception and distrust.”⁵ While the FCC will soon be under new leadership, the Commission – in turmoil due to a change of administrations, missing two members, plagued by the structural and administrative problems mentioned in the report, and without a confirmed Chairman as of this writing – will need time to reform. It would not, at this time, be a suitable entity to implement a definition which would be a “make or break” proposition for economic stimulus. The 45 day deadline would prevent the FCC from conducting a thorough proceeding with appropriate public comment and expert testimony. And even a 45 day delay is inappropriate in a stimulus program which, for the best possible effect, should be implemented immediately.

For all of these reasons, the “open access” requirement should simply be deleted from the legislation.

Adoption of FCC “Principles” Would Allow Disruption of Networks and Impede Broadband Deployment

The draft legislation further requires the NTIA to ensure that all broadband providers adhere to the “principles” contained in a “policy statement” adopted by the Federal Communications Commission on August 5, 2005.^{6, 7} This provision would enshrine in the legislation a set of principles which originated in the same FCC which was labeled as “dysfunctional” in the abovementioned report.

These principles are problematic in several respects. Firstly, because they impose stringent regulation upon Internet service providers, they are in direct conflict with the policy statement set into statute by Congress at 47 USC § 230(b), which states that it is the policy of the United States “to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation.”

Secondly, the FCC’s principles have never been subjected to public comment or expert review. Rather, the

⁵ United States House of Representatives Committee on Energy and Commerce, “Deception and Distrust: The Federal Communications Commission under Chairman Kevin J. Martin,” majority staff report dated December 9, 2008, retrieved from http://energycommerce.house.gov/images/stories/Documents/PDF/Newsroom/fcc_majority_staff_report_081209.pdf on January 22, 2009.

⁶ United States House of Representatives Appropriations Committee, Op. Cit., p. 53, line 15.

⁷ Federal Communications Commission, “Policy Statement,” FCC 05-141, retrieved from http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-05-151A1.pdf on January 22, 2009.

FCC, in an egregious violation of due process, recently attempted to give these principles – which were explicitly stated by the FCC not to be rules when they were published^{8 9} – the full force of FCC rules, bypassing its own formal rule making and public comment process.

None of the above is meant to imply that the FCC’s principles are entirely harmful or without merit. However, two of them are problematic in several respects. Due to the absence of the public scrutiny that would have been part of the normal rule making procedure, these two principles are fraught with unintended consequences which would seriously impede the deployment of broadband to unserved areas were providers required to adhere to them. They are thus unsuitable for incorporation into vital economic stimulus legislation.

The first of these states that users must be allowed to “run applications... of their choice” on computers which they connect to the Internet, regardless of what those applications do.

To understand why this is problematic, one must understand the implications of the language. The word “application” is a term of art for any computer program which is not an operating system. An application program encodes and embodies behavior – any behavior at all that the author wants. And anyone – from a smart 5th grader to an experienced hacker – can write one.

Thus, the consequence of adoption of this principle as the law of the land would be that anyone could program his or her computer to behave any way at all — no matter how destructively — on the network, and the ISP would not be allowed to intervene to maintain order. The provider could not have an enforceable Acceptable Use Policy or Terms of Service which prevented users – or their computing devices – from doing things which were harmful to one another or to others on the Internet at large. For example, an ISP could not prevent users from running “port scanners,” whose purpose is to detect vulnerabilities which can be used to break into computer systems.¹⁰

This is a recipe for disaster. Any user who engages in destructive behavior, degrades other users’ service, or even takes down the entire network could simply say, “I was just running an application... and I have the right to run any application I want, so you can’t stop me.”

Now, imagine yourself as the administrator of a broadband network. Someone is doing something disruptive. Users are complaining; quality of service has deteriorated. People are unable to access the content of their choice on the Internet. But if you act, and especially if you focus on the destructive behavior by detecting the rogue application and attempting to block it and not others, you would be in violation of the FCC’s principles and could lose your funding. While it was likely not the intent of the

⁸ Ibid. See Footnote 15.

⁹ Federal Communications Commission, “FCC Adopts Policy Statement,” FCC press release dated August 5, 2005, retrieved from http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-260435A1.pdf on January 22, 2009.

¹⁰ Port scanning programs are not illegal in and of themselves; in fact, diligent network administrators routinely use them within their own networks to detect security vulnerabilities. But because the use of these intrusive programs on the public Internet (as opposed to within one’s own private network) is virtually always a prelude to an attack, it is appropriate for ISPs to prohibit users from running them against machines belonging to other users of the network or against computers on the Internet at large.

author of the draft stimulus legislation to create such conundrums, it would be a very real consequence if the FCC's principles were adopted.

The FCC has also interpreted its principles as prohibiting many forms of network management, including mitigation of the network congestion and cost shifting caused by "P2P" software. (Such software is most often used for illegal purposes, such as piracy of music and movies or the distribution of child pornography. It is also used to shift costs and bandwidth burdens from content providers to ISPs without permission or compensation, harming network performance and raising the cost of providing broadband service.)¹¹ Such a prohibition would prevent Internet providers from effectively managing consumption of Internet backbone bandwidth, which is particularly scarce and expensive in rural and sparsely populated areas, and thus make it difficult for them to provide high quality, affordable service. Because adherence to these "principles" as interpreted by the FCC would subject the provider to recurring costs far exceeding the amount of one-time stimulus funding it would receive, incorporating them in the law would negate the economic incentive which the legislation is intended to create.

Another of the "principles," which requires that the provider allow the user to connect to the network any device which has not been explicitly outlawed, raises similar concerns. This clause does allow the provider to prohibit devices which "harm the network," and therefore does not raise the issues inherent in the "open access" requirement which were described earlier in this document. However, it prevents the provider from prohibiting devices such as the "Slingbox," which by transmitting high bandwidth video over the Internet 24 hours a day can cost the ISP hundreds of dollars per month for Internet bandwidth – far more than the subscriber pays for his or her connection. It also could force the provider to allow the connection of devices which shift potentially unbounded costs to the ISP via P2P.¹² Several of either type of device, connected to a network, could cost the provider far more than was received in stimulus funding and/or exhaust the spectrum available to a wireless ISP. Thus, a requirement which forced ISPs to allow unrestricted use of such devices would create a disincentive rather than an incentive for any provider to participate in the stimulus program.

Of equal concern are the essential consumer protections which are *omitted* from the FCC's list of principles. The principles contain no requirement compelling disclosure of terms of service, of network management practices, or of what application software acquired from third parties does. There is no prohibition of anticompetitive conduct. And there is no requirement that users refrain from behavior which degrades the service of other users.

For all of these reasons, the FCC's list of principles is "not ready for prime time" and not appropriate to include – either directly or by reference – in legislation intended to stimulate the rollout of broadband. The author's document, "Seven Network Neutrality Principles and Guidelines for Appropriate Regulation"¹³ is intended to provide a foundation for better alternatives. However, because any list of regulatory requirements should be subjected to expert critique and public review and comment before they become binding, it is best, for the nonce, not to include any such regulation in this round of economic stimulus.

¹¹ For a full explanation of these concerns, see the author's April 2008 testimony before the FCC at <http://www.brettglass.com/FCC/remarks.html>.

¹² Ibid.

¹³ Glass, Brett, "Seven Network Neutrality Principles and Guidelines for Appropriate Regulation," Version 1.1, dated March 11, 2008, retrieved from <http://www.brettglass.com/principles.pdf> on January 22, 2009

Disbursing Funds As Specified in the Draft Legislation Would Disqualify Small Businesses and Advantage Large Incumbents

The draft also appropriates funds for loans and loan guarantees to be distributed via the USDA's Rural Utilities Service program.¹⁴ Unfortunately, the USDA currently requires that the recipients be corporations; sole proprietorships and partnerships need not apply.¹⁵ This requirement, at 7 CFR § 1738.16 (a)(1), precludes small businesses in rural areas from stepping up to the plate to serve their communities, even though they are often the best and most motivated entities to deliver rural broadband service. The legislation should therefore specifically include a preference for small entities and require that sole proprietorships and partnerships be eligible. The draft bill further discourages new entrants – and, hence, competition – by requiring that prior recipients of RUS loans or loan guarantees shall be given priority. All of these provisions hinder competition and consumer choice and should therefore be deleted.

The draft further instructs the NTIA to award grants for wireless service “to end users,”¹⁶ but in subsequent paragraphs states that the grants shall be awarded “to eligible entities” – an obvious inconsistency which must be corrected. Of these two methodologies, the former would be far superior because it would allow consumers themselves to ensure that they were able to benefit from the deployment of service. Rather than a program where money is disbursed directly to companies (which might well use it for infrastructure which they had already planned to build), it would be preferable to institute a program which provided unserved citizens with vouchers that would be given to providers who initiated service to their areas. Consumers would thus be able to choose the provider whose service and deployment offering best met their needs, and a distant government agency would not be burdened with the task of attempting to choose the provider which it thought might serve users best. However, whichever approach is chosen, the legislation should ensure – again – that sole proprietorships and partnerships are eligible and that preferences are provided for small and local businesses.

Broadband Inventory Map Could Enable Anticompetitive Practices

The draft legislation requires the NTIA to develop and maintain a “broadband inventory map” of the United States. While a general coverage map is a good idea, such an effort has the potential to enable anticompetitive practices. If the map data can be used by incumbent providers to precisely target “loss leaders” and discounts that could force competitors – especially smaller ones – out of business, it will fail to stimulate economic development or benefit consumers. Detailed coverage data for each provider can also reveal that provider's proprietary marketing strategies. Therefore, unless some confidentiality is offered, providers – especially those who specialize in serving the rural areas where coverage is most desired – would have a strong and well justified motivation not to submit detailed data, as is true today with the FCC's Form 477.¹⁷ The bill should therefore require that proprietary data supplied by individual providers

¹⁴ House Appropriations Committee, Op. Cit., p. 38, line 5 *passim*.

¹⁵ Congressional Research Service, “Broadband Loan and Grant Programs in the USDA's Rural Utilities Service, p. 7, retrieved from <http://www.nationalaglawcenter.org/assets/crs/RL33816.pdf> on January 22, 2009.

¹⁶ House Appropriations Committee, Op. Cit., p. 52, line 1.

¹⁷ Federal Communications Commission, “Statement of Material Facts for Which there is No Genuine Issue,” filed in Civil Action No. 06-1644 (RMC) (Lawsuit by Center for Public Integrity to enforce FOIA request for FCC Form 477 data), retrieved from <http://projects.publicintegrity.org/docs/telecom/telecomfoia/09.1 Statement>

remain confidential and not be available via FOIA requests. It should also require that only aggregated data be published, so as to prevent targeted anticompetitive practices.

Definitions of “Advanced” and “Basic” Tiers of Broadband Service Problematic

The draft bill attempts to create “tiers” of broadband and wireless broadband service, including “advanced broadband service,” “advanced wireless broadband service,” and “basic broadband service.”¹⁸ Unfortunately, the definition is vague because it refers to “speed” without stating which of the many measures of network speed should be used. (Possible measures range from the “raw” data rate over the physical medium to total TCP throughput to an individual user’s share of that throughput.)

In addition, the bill fragments the funding between the tiers, potentially preventing providers from making sound and economical implementation choices and depriving the NTIA of flexibility in its allocation of funds. For example, a provider might reach an unserved area via microwave radios which are sold at a lower price if they are limited to a certain maximum data rate (but can be accelerated to a higher throughput, when the number of users increases, via the purchase of an upgrade license). Fiber optic cables can likewise be operated at a lower throughput initially and later upgraded to higher capacity if the equipment at the ends is replaced with more expensive gear.

Providers should not be forced into a lower tier, and potentially denied funding, because they opt to make the best use of funds – and cover the largest possible area – by taking this sensible incremental approach. Therefore, the author recommends that the service tiers in the document be eliminated and that a single bar be set for broadband service to be subsidized by this round of stimulus funds – for example, a raw data rate of 3 Mbps or greater. (Verification of conformance to this requirement could easily be checked by perusing the manufacturer’s data sheet, which virtually always quotes this figure.) This change would also have the advantage of simplifying administration of the program.

Connecting to the Backbone

One problem which the draft stimulus legislation neglects to address is the problem of obtaining the Internet bandwidth which is necessary to serve sparsely populated and rural areas of the United States. Currently, wholesale access to the Internet backbone costs as little as \$4 per megabit per second (Mbps) per month in “NFL cities,” but can cost \$300 per Mbps per month in rural areas such as central Nebraska and western Massachusetts. Even if a fiber “superhighway” traverses the area in question, the operators of these fiber backbones routinely refuse to create “on-ramps” and “off-ramps” to serve rural America. The result is that even if a carrier is willing to build a network that connects every home in town to a central hub, getting bandwidth to that hub can be so expensive that even a connection which offers a guaranteed, full time throughput of 1 Mbps costs more than most consumers will pay.

For this reason, Congress should also act on the issue known as “special access.” The term is a misnomer, because in fact there is nothing “special” about such access; it is simply the necessary wholesale access that allows a “last mile” Internet provider to connect to the Internet backbone. To ensure that providers can readily respond to the stimulus package, Congress must provide requirements and monetary incentives for the opening of fiber backbones to local providers at wholesale prices no more than 5 times those which are

[of Facts.pdf](#) on January 22, 2009

¹⁸ House Appropriations Committee, Op. Cit., p. 56, line 15 *passim*.

available in urban areas. Failure to implement such a policy would preclude affordable access even in the presence of subsidies and incentives for rollout of broadband to homes and businesses.

Wireless Spectrum: More Important than Dollars

Deployment of wireless service to many unserved and underserved areas has been hindered by a lack of available wireless spectrum. Currently, most wireless Internet providers operate on unlicensed spectrum governed by Part 15 of the FCC's rules. However, because consumer devices also operate on these bands, the geographic reach and speed of such services are limited by interference. And a neighbor's purchase of a device such as a cordless phone or baby monitor can suddenly create interference that slows or blocks the service. Thus, providers who are incited to deploy broadband by the economic stimulus legislation may be hindered from doing so by a lack of clear wireless spectrum on which to do it.

Because wireless is by far the most cost-effective way of reaching rural areas (a 10 mile wireless link can cost as little as \$500 to provision, while 10 miles of rural fiber can cost \$160,000 or more), one of the most effective forms of broadband stimulus would be to provide carriers not just with subsidies but with the spectrum that nearly all of them have been unable to obtain via the FCC's auction process.

Fortuitously, at this time there exists a block of spectrum which the FCC had – controversially – proposed to auction off subject to very specific constraints on the winner's business model and service. The AWS-3 band consists of 25 MHz of wireless spectrum which, because of its proximity to the existing unlicensed bands, can easily be used by existing, economical wireless broadband equipment that is retuned to that frequency range. This spectrum is free of consumer devices and therefore can be reserved for the provision of wireless broadband – a purpose for which, astonishingly, no spectrum has been reserved in the past. What's more, because a new standard – IEEE 802.11y¹⁹ – has been developed to allow providers to share the spectrum, this block can be nonexclusively licensed, enabling competition as well as coverage of unserved areas. The author therefore recommends that Congress rename the AWS-3 band the “Broadband Stimulus Band,” and instruct the FCC to license it to broadband providers, for use as a set of five non-overlapping 5 MHz channels, under a nonexclusive licensing regime with the IEEE's 802.11y standard to be employed as a mandatory spectrum sharing etiquette. Because this spectrum could be used by thousands of providers across the country and even re-used by multiple providers within the same local area, the stimulus provided by this action alone could well be greater than that provided by the \$6 billion in funding proposed by the draft legislation. And because the spectrum is already under the government's control and can be licensed at will, Congress would not need to appropriate a penny to implement this vital broadband stimulus.

Conclusion

The House Appropriations Committee's draft economic stimulus bill is a good start toward a bill which will incent the rollout of broadband to unserved areas. However, for the stimulus to be effective, it must ensure that providers will not just benefit from subsidization of their non-recurring costs, but will also be able to come out ahead – or at least break even – in the long term. The abovementioned refinements to the bill would help it to provide an effective and fast-acting stimulus, which could then be followed by additional legislation based on the initial experience.

¹⁹ See <http://en.wikipedia.org/wiki/802.11y> for an overview of the 802.11y protocol.

About the Author: Brett Glass founded LARIAT, the world's first wireless broadband Internet service provider, in Laramie, Wyoming in 1992. An electrical engineer (MSEE Stanford 1985), inventor, chip designer, author, musician, and small business owner, Brett has penned more than 2,000 articles and columns for computer industry publications including BYTE, InfoWorld, PC World, and PC Magazine. Brett's personal mission, and that of his company, is to use innovative high speed wireless technology to extend the reach of first class broadband access to as many unserved areas of Wyoming, and of the United States, as possible. He can be reached by telephone at (307)761-2895 or via e-mail as brett (at) lariat.net.