From:	Mark Berman
To:	BOCrfc2015
Cc:	Mark Berman
Subject:	Broadband Opportunity Council - RFC Response
Date:	Wednesday, June 10, 2015 4:52:52 PM
Attachments:	BroadbandOpportunityCouncil.pdf ATT00001.txt

Dear Madam or Sir,

Please find attached a response to the Broadband Opportunity Council's notice and Request for Comments, dated April 29. 2015.

Sincerely,
Mark Berman, GENI Project Office

Enhancing Broadband Access with Distributed Infrastructure

June 10, 2015

Comments in response to:
Broadband Opportunity Council Notice and Request for Comment
RIN 0660-XC019
April 29, 2015

Prepared by:
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Experience with technology deployments consistently shows that "if you build it, they will come" is not a good strategy for assuring adoption of and engagement with new technology concepts. Encouraging adoption of broadband requires not only building a broadband network, but also implementing additional measures to bring the benefits of this network to all.

We recommend the following two actions to increase availability and encourage adoption of broadband infrastructure across a wide demographic range.

1. Expand our notion of "the cloud" to include not only large, privately owned, data centers, but also local computing and networking resources.
2. Use federally funded physical infrastructure projects as an opportunity to inexpensively preposition corresponding cyberinfrastructure.

Each of these concepts is discussed briefly below.

1. Expand our notion of "the cloud" to include not only large, privately owned, data centers, but also local computing and networking resources.

   The vast majority of currently available broadband-enabled applications rely on server infrastructure that is centralized in a single location or a small number of data centers. Even interactions with "the cloud" are generally simply an opaque transaction with monolithic or nearly monolithic data center infrastructure. This centralized approach introduces inherent limitations upon the types of interaction that can be supported in broadband-enabled applications. While there are multiple limitations introduced, the most glaring is latency. Simply dealing with the delays introduced by speed-of-light signal propagation and multiple network devices prevents truly the low-latency interactions that broadband infrastructure would otherwise support.

   By introducing local computing and networking resources, whole new classes of applications will be achievable for broadband users. These applications cover a broad range, from remote healthcare to interactive gaming. The National Science Foundation (NSF) has pursued the development and exploitation of such infrastructure in multiple programs. The GENI (Global Environment for Network Innovations) project has partnered with multiple hardware vendors to develop "GENI racks," affordable and deployable kits of programmable computing, network, and storage resources that can be installed at local research institutions, community anchor institutions, or significant network locations. The White House Office of Science and Technology Policy and NSF launched the US Ignite initiative, which is exploiting GENI and other technology to encourage the development and adoption of advanced applications that make use of advanced broadband and programmable networks. These applications are

addressing key areas of societal importance, including education, public safety, transportation, and healthcare.

Deployments of GENI-developed technology at over fifty sites across the US have demonstrated the feasibility of a "distributed cloud" that incorporates local infrastructure. Through partnerships with broadband-enabled communities such as Chattanooga, TN, GENI and US Ignite have shown that advanced applications can be quickly developed and adopted to improve society. Federal agencies should aggressively pursue opportunities to expand deployment of local computing, networking, and storage resources that unlock the capabilities of broadband for local communities.

2. Use federally funded physical infrastructure projects as an opportunity to inexpensively preposition corresponding cyberinfrastructure.

   The cost of deployment of broadband infrastructure can be dramatically reduced if it coincides with the initial construction or significant renovation of the associated physical plant. Federal agencies that provide funding for infrastructure projects should establish policies that require or encourage such deployments. Specific examples include:

   a. Federally funded road and railroad construction and renovation projects should, whenever possible, simultaneously deploy conduit suitable for later installation of fiber for broadband networks.
   b. Federally funded housing construction and renovation projects should, whenever possible and cost-effective, install fiber to each unit.

   Whenever possible, in keeping with relevant laws and regulations, the prepositioned enabling broadband infrastructure should be publically owned and managed to encourage maximum competition from broadband network and service providers. Appropriate policies might include guaranteed access ("Any network provider may install fiber in the public conduit.") or avoiding single-party saturation of a resource ("No more than 25% of overall capacity may be allocated to a single provider."). The overriding goal should be to reduce the barriers to entry and encourage healthy competition to the end benefit of consumers.