

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of:

Connect America Fund	WC Docket No. 10-90
A National Broadband Plan for Our Future	GN Docket No. 09-51
Establishing Just and Reasonable Rates for Local Exchange Carriers	WC Docket No. 07-135
High-Cost Universal Service Support	WC Docket No. 05-337
Developing an Unified Intercarrier Compensation Regime	CC Docket No. 01-92
Federal-State Joint Board on Universal Service	CC Docket No. 96-45
Lifeline and Link-Up	WC Docket No. 03-109

REPLY COMMENTS OF JDS UNIPHASE CORPORATION

JDS Uniphase Corporation (“JDSU”) hereby submits its reply comments in response to the Commission’s Notice of Proposed Rule Making and Further Notice of Proposed Rulemaking (NPRM) to reform and modernize the Universal Service Fund (USF) and Intercarrier Competition (ICC).¹ As a telecommunications and technology company with decades of experience in addressing many of the telecommunications industry’s quality of service and reliability challenges, JDSU believes that it provides unique insights into service accuracy and accountability for video, data and voice broadband communications.

INTRODUCTION

JDSU, headquartered in Milpitas, California, is a leader in broadband network test and measurement solutions and optical components. JDSU’s deep experience in the industry includes working with all sizes of telecom service providers, cable operators, utilities, municipalities, and network equipment manufacturers. JDSU offers products and solutions in three distinct market segments:

¹ *In the Matter of Connect America Fund*, Notice of Proposed Rulemaking and Further Notice of Proposed Rulemaking (“NPRM”), WC Docket No. 10-90, FCC 11-13 (released February 9, 2011).

- **Communications Test and Measurement** offers equipment manufacturers and telecommunication service providers test and measurement instruments, solutions, and services to build, deploy, and manage next-generation communication networks.

- **Communications and Commercial Optical Products** provides optical communications products used by network operators and equipment manufacturers for telecommunications and enterprise data communications; lasers for a wide variety of OEM applications; and, photovoltaic components for the energy industry.

- **Advanced Optical Technologies** creates security technologies for brand protection and document authentication; optical thin-film coatings for light management in a variety of applications; and, custom color solutions for product and brand enhancement.

Of most relevance to this proceeding, JDSU's Communications Test and Measurement products and solutions have helped tens of millions of Americans fully enjoy the benefits of broadband communications technology. As broadband continues to expand to reach and serve all consumers, particularly in rural and remote areas of the country, it is critical that service providers ensure quality of service and provide consumers with complete information about the capabilities of their broadband connections. JDSU's test and measurement solutions enable broadband service providers to capture quality data and metrics that provide this critical consumer information.

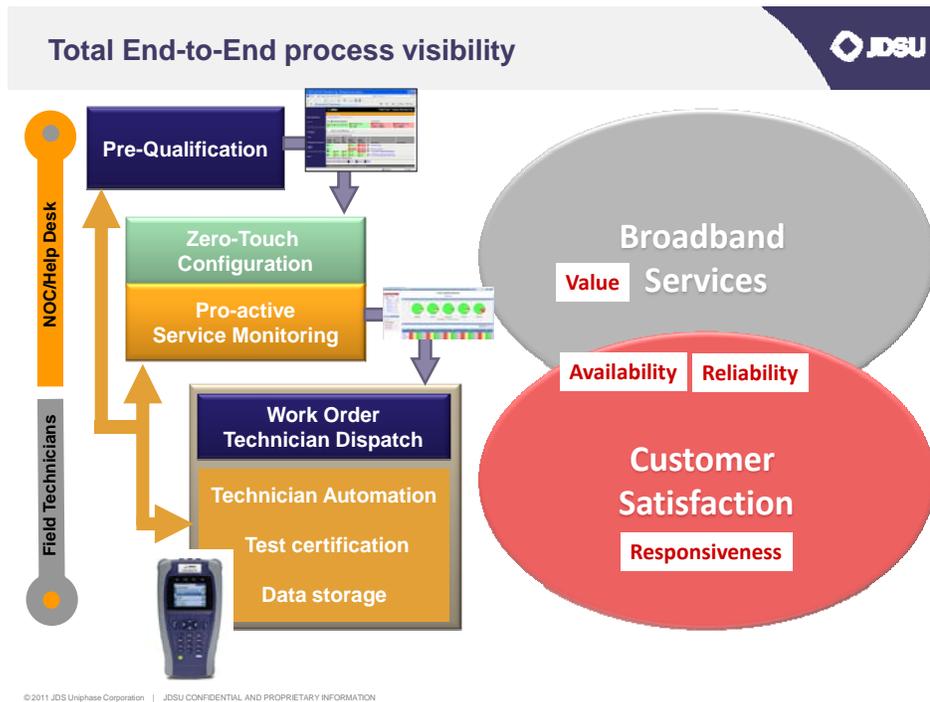
JDSU works with service providers to create and optimize operational procedures that enable the delivery and provision of high quality and reliable broadband services to customers. This includes emphasizing deployment methodologies that help service providers track and measure performance. Indeed, JDSU's test and measurement capabilities help providers develop a strategy that improves end-to-end quality of service throughout the network life cycle. These capabilities include:

- **Proactive Service Monitoring** encompasses test and measuring solutions for the full range of broadband services including video, voice and data, which provide reporting by geographic region, type of broadband service, network provider, or network technology. The real quality of customer experience is directly measured from the CPE devices via an Automatic Configuration Server ("ACS"). This is a probe-less solution that does not require any hardware or software being deployed on the customer premises. It is based on monitoring key statistics that are available from the Broadband Forum TR-069 standard and associated data models. JDSU test and measurement technologies allow service providers to non-intrusively measure and monitor WAN behavior (xDSL, FTTH), home LAN networks, and each broadband service.

- **Pre-qualification** provides service providers with tools to inspect and certify broadband service quality before service activation by enabling remote analysis of copper and fiber connections (at the

network and home access levels) to verify proper upstream and downstream transmission speeds, network stability, identify root causes of network problems, and service availability.

- **Zero-touch Configuration** enables service providers to deploy ACS to efficiently manage broadband services including automatic CPE device configuration, automatic CPE device firmware upgrades, and service activation and management.



USF / Broadband Expansion

JDSU applauds the Commission’s proposed changes to the USF to provide much needed funding to expand broadband access to rural and underserved communities across America.² JDUS agrees that for these communities, access to high-speed data, voice, and video services offers dramatic economic development benefits – e.g., job creation, on-line learning, enhanced business opportunities and growth.³ Individuals can grow web-based businesses, take advantage of telemedicine and distance learning applications, and enjoy more home entertainment options. As service providers play the critical role in accelerating broadband deployment for more American communities, JDSU can offer test and

² *NPRM* at para. 3 (“Ubiquitous broadband infrastructure has become crucial to our nation’s economic development and civic life.”)

³ *Id.* (“Businesses need broadband to start and grow; adults need broadband to find jobs; children need broadband to learn.”)

measurement solutions to allow verification and analysis of broadband service speed, quality and optimization.

This is a historic opportunity to bring the benefits of broadband to those Americans who currently do not have access. Whether a carrier is deploying fiber-to-the-home (FTTH), digital subscriber line (DSL), wireless, hybrid fiber-coaxial systems, or broadband over power lines, JDSU can provide the tools and expertise to install, test, troubleshoot and verify infrastructure and services efficiently and cost-effectively.

NPRM

In the *NPRM*, the Commission is proposing adoption of metrics for broadband using specific performance characteristics.⁴ In particular, the Commission is seeking comments on ways of measuring broadband services provided to consumers, such as throughput, latency, jitter, or packet loss, for purposes of establishing performance requirements for recipients of universal service funding.⁵ The Commission is also proposing that universal service fund recipients test their broadband networks for compliance with those metrics that are adopted and report this data to the fund administrator on a quarterly basis and further, asks whether the benefits of such proposal would outweigh the burdens of such a requirement.⁶

The Commission further notes that it has entered into a partnership with Sam Knows, a third party measurement company, to monitor broadband service speed and quality for a select group of users. JDSU agrees with Empirix's conclusion that while this service may provide important quality data to measure broadband service, the Sam Knows measurement system does not provide the full-range of dynamic testing necessary to provide a long-term quality service monitoring solution.⁷ Indeed, the Commission should require implementation of test and measurement metrics that provide more robust capabilities that verify functionality, performance, scalability, reliability and resiliency of broadband networks. Table 1, shows the tests that JDSU can proactively and continuously monitor metrics collected to fully qualify a network for the access and services that customers will use. This monitoring includes identifying critical problems that SamKnows may not be fully equipped to locate, such as:

1. Intermittent problems on the access network due to crosstalk, interference and bad cable shielding
2. Faulty Network Elements (e.g. DSLAM, MSAN, OLT...)
3. Poorly functioning home networks that are unable to deliver qualitative video service (e.g. poor WiFi connection, congestion due to files upload or download...)

⁴ *NPRM* at para. 103.

⁵ *Id.* at 105.

⁶ *Id.* at 116.

⁷ *Comments of Empirix, Inc, (NPRM)*, dated March, 2011 at page 7.

4. Unavailability of a network service delivery platform (e.g. VoD server)

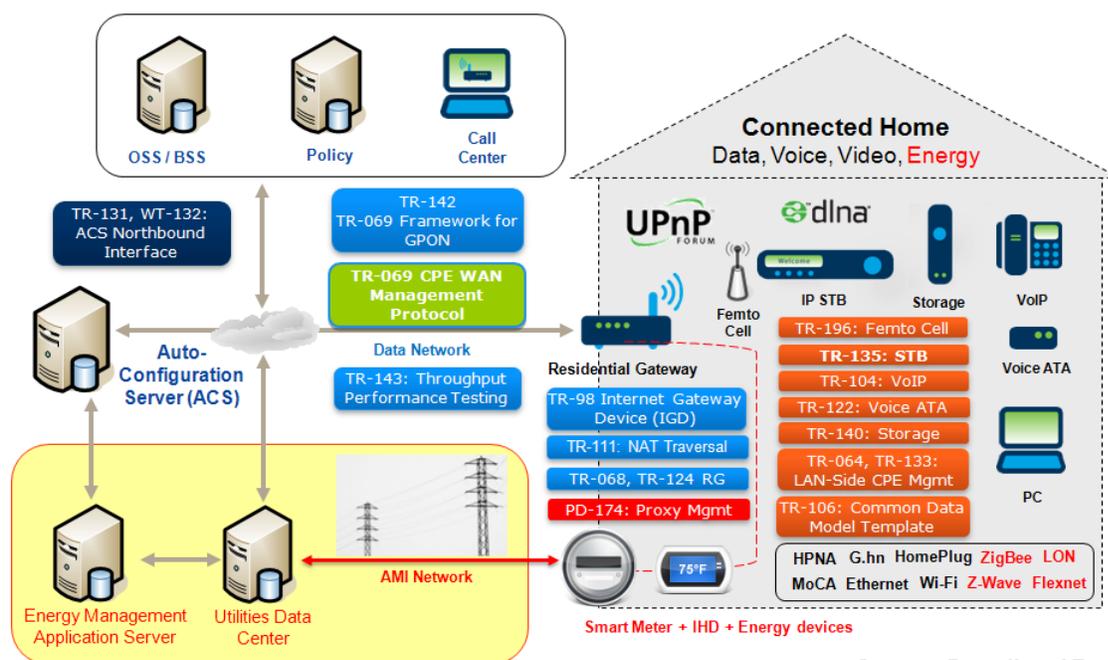
Table 1 - Test and Measurement Metrics - Each access method and service requires its own set of metrics for robust testing.

	Primary	Secondary	Tertiary
Access (DSL, FTTH, cable/HFC, wireless)	Line quality / reliability: - Connection Status - Upstream bit rate - Downstream bit Rate - Connection stability (e.g. link retrain in DSL)	Stability of connection Recovery time from errors	Errors (e.g. Upstream & Downstream CRC or HEC or FEC Errors for DSL)
Voice	VoIP Service availability (e.g. VoIP Server down time) - voice service status VoIP Packets lost, dropped, or with high error rates...), VoIP ATA Overruns & Under runs	VoIP Quality (VoIP Packets lost, dropped, or with high error rates...) Receive and Far-end Packet loss rate Receive and Far-end inter arrival jitter	Number of incoming calls failed / Dropped Number of Outgoing calls failed / Dropped Round Trip delay
Video	IPTV Service availability IPTV Portal information Retrieval time Video on demand Access Success If active: Number of MPEG2-TS discontinuity Errors, STB Overruns & Under runs	IPTV Quality (IPTV Packets lost, dropped, or Errored...)	Zapping time Video on demand response time
Data	IP Service availability IP throughput	Number of Packets Dropped and Errored	

Using a more robust set of metrics like those in Table 1 will provide two major benefits to consumers: better quality and lower cost. Today's measurement technology and network architecture allows for collecting these metrics and identifying problems early. Using measurements tied to specific applications (voice, video and data) ensures the delivery of those services with high Quality of Service. Additionally these measurements will allow rapid identification of specific problems so service can be restored quickly and with minimum effort reducing maintenance costs⁸.

⁸ In a large scale deployment (approximately 400,000 IPTV customers) one of JDSU's service provider customer experienced a 20% reduction in operating expenses by utilizing JDSU solutions that enabled comprehensive testing resulting in substantially fewer dispatches for service and set-top-box exchanges.

JDSU recommends that a common industry recognized set of standards be used to establish the measurement architecture.⁹ Figure 1 summarizes the key features of a test and management architecture that will provide measurement of the customer Quality of Service. The key is utilization of the Residential Gateway and the Set-top-boxes at the customer premise to interact with the Auto-Configuration Server (ACS) at the network provider. This will allow the network provider to non-intrusively collect the desired metrics to ensure consistent QoS and allow network diagnostics to maintain proper operation. These are an open set of technical requirements accepted by a broad range of industry equipment and service providers. This allows interoperability and consistent metric performance measurement. This technique does not need to deploy any additional pieces of hardware or software at any customer premises.



Source: Broadband Forum

Figure 1 Broadband Forum Test and Management Architecture and Technical Reports¹⁰

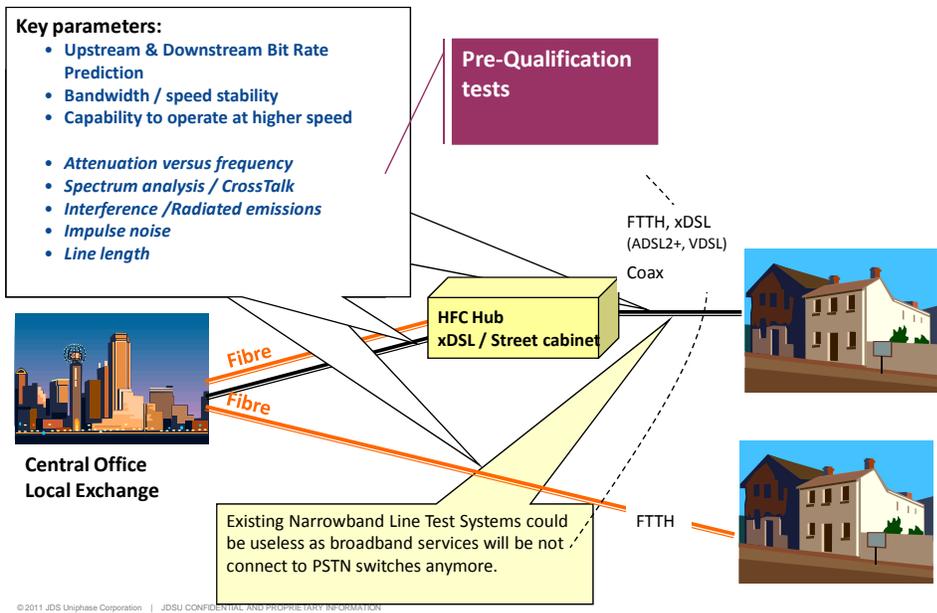
Pre-Qualification

⁹ The DSL Forum has promulgated an extensively developed set of requirements pertaining to quality of experience for triple-play services (TR-126).

¹⁰ Figure 1 depicts the network access points. For the consumer, the Residential Gateway and the Set Top Box (STB) are key elements. They interact with the Auto Configuration Server (ACS) to share performance data and allow monitoring of the health of the network. It provides a dynamic set of measurements that addresses the specific voice, video and data services, not just that the network is sending data. The complexity of these services requires a more nuanced set of measurements to ensure the network is performing properly.

Broadband providers should be required to meet minimum performance metrics in order to qualify for universal service funding. There are equipment and tools readily available to broadband providers in today's marketplace that can measure whether new customers are obtaining an acceptable quality and reliability of broadband services. These tools can confirm customer qualification even before the broadband service provider activates the customer on the network and therefore, provides an effective qualitative verification to validate the likelihood of effective services provisioning. As new customers are turned up, additional testing should be required to measure throughput, packet loss and latency. There are also tools available to enable remote Home Certification -- testing of home installation and/or customer premises equipment. These tests can be run through the transport network, over the access network and into the customer's home, to the premises equipment. The Commission should adopt specific rules that would mandate, for universal service fund recipients, such pre-qualification tests throughout the service provider's network. These rules would serve the public interest of verifying that public funding is paying for a qualitative and powerful signal necessary for robust broadband service.

Pre-Qualification: Make sure the access network is capable to transport the Broadband Services



© 2011 JDSU Uniphase Corporation | JDSU CONFIDENTIAL AND PROPRIETARY INFORMATION

Pre-Qualification – Critical points to check



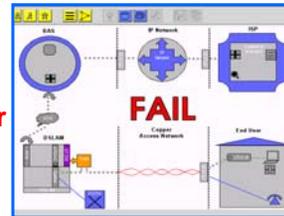
1. Perform remote Access network certification

- Make sure the access network can support and deliver the expected speed on both transmission ways (Upstream and Downstream) (e.g. Measure Loop Attenuation, Quiet Line Noise and Signal-to-Noise Ratio over xDSL band)
- Ensure the access network is stable (e.g. no DSL re-synchronization or link retrain, Adaptation to time varying line conditions)
- Identify potential intermittent disturbers that would impact the Customer experience
- Identify problems in access network quickly and accurately; **Avoid unnecessary truck rolls and false dispatches**
- *Most problems are caused because the network is not provisioned properly*
- *Copper problems are due to poor line pre-qualification*

2. Perform remote Home certification

- Ensure the Home LAN networks are stable and error-free (WiFi, Ethernet, HPNA, MoCA...)
- Check service availability (Internet, data, Voice/VoIP, Video)
- *Customer problems are due to modem interoperability and bad configuration*

✘ Without the right tools, Customer facing operation can rarely provide acceptable answer



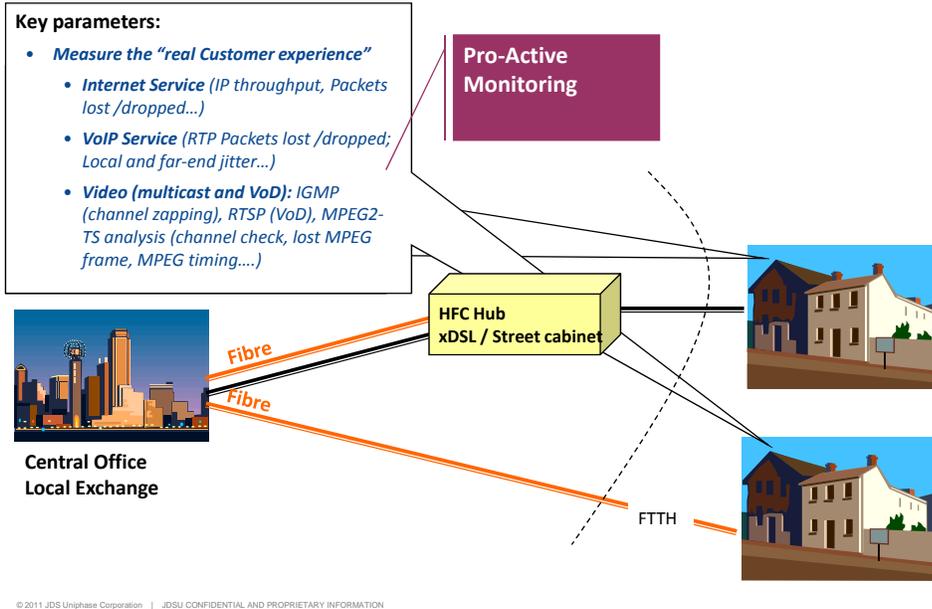
© 2011 JDS Uniphase Corporation | JDSU CONFIDENTIAL AND PROPRIETARY INFORMATION

Accurate Real-time testing and measuring of broadband performance metrics

To ensure the best quality of service for existing broadband customers served by providers receiving universal service funding, JDSU also recommends that the Commission adopt rules requiring quarterly verification testing to confirm that the broadband service provided to each customer in the funded service territory is operating in conformance with established FCC metrics. These tests should not only ensure that the minimum speed is available for every customer, but should also include measurements for availability, quality and reliability of service. These performance metrics should also relate to each type of broadband service: 1) for video -- IP / RTP / MPEG / IGMP / RTSP metrics; 2) for voice -- RTP, call quality, server down; and, 3) for Internet -- IP throughput.

The testing results can be consolidated by: 1) geographic area; 2) type of service; 3) service provider; and 4) access network technology.

Pro-active Service monitoring



Pro-active Service Monitoring



- Perform Proactive Testing of services such that failures are detected before the customer experiences a problem
- Get a real visibility of the service availability : *Measure the real customer experience*
 - *Tolerance to Video failure is seconds/minutes not hours (e.g. The TV is assumed to be a service which works 24 / 7 without any interruption or almost no image freeze . Subscriber does not accept a disconnection of service during a movie!).*
 - *Pro-active monitoring of the availability of the service is required*
 - *BUT Trouble shooting has to be efficient to pre-locate faults instantly*
- Provide evidence of changed condition: *Consolidate, Aggregate and correlate pro-active measurements to identify black spots in the network*
- Share test unified test resources between NOC, Field technician, provision and Service Provider(s).
- ✘ **Dispatch to fix (not to find) and enable on-site technician to perform the full job**

© 2011 JDS Uniphase Corporation | JDSU CONFIDENTIAL AND PROPRIETARY INFORMATION

As millions of Americans watch video over the web, download music and video, and send increasingly larger files, today's broadband networks have to meet increasingly stringent tests. Broadband service providers have to deliver high-quality service at an affordable price. Establishing metrics and specific testing requirement not only aides consumers, but provides the

Commission with the information to confirm that its limited universal service funds have been well-spent. In addition, established metrics and testing requirements will give broadband service providers the knowledge, tools, and solutions to build more resilient and reliable broadband access networks; understand where the network can fail and how to detect common problems; expedite network repair and reduce installation problems and, most importantly, ensure reliable service.

CONCLUSION

JDSU applauds the Commission for proposing the expansion of the Universal Service Fund to support the provision of broadband access to rural and underserved areas of America. JDSU believes that successful modernization of USF includes the adoption of more dynamic metrics for broadband that test characteristics including throughput, latency, jitter and packet loss on the full spectrum of service offerings. Measuring these network attributes will qualify and verify broadband service to help ensure initial and continuously performing broadband service is delivered to all domestic consumers. We look forward to continuing to provide test and measurement solutions to support ubiquitous broadband!

Respectfully submitted,

JDS UNIPHASE CORPORATION

/s/

Kevin Siebert

Senior Corporate Counsel

Phone: 240.404.1116

Email: kevin.siebert@jdsu.com

May 23, 2011