Before The
Federal Communications Commission
Washington DC 20554

In the Matter Of	)	
	)	
A National Broadband Plan for Our Future	)	GN Docket Nos. 09-47, 09-51, 09-137
	)	
Regarding Broadband Needs in Education,	)	CC Docket 02-6
	)	
Including Changes to E-Rate Program to Improve Broadband Deployment	)	WC Docket No. 05-195
	)	

COMMENTS OF QUALCOMM INCORPORATED IN RESPONSE TO NBP PUBLIC NOTICE #15 REGARDING BROADBAND NEEDS IN EDUCATION, INCLUDING CHANGES TO E-RATE PROGRAM TO IMPROVE BROADBAND DEPLOYMENT

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SUMMARY

Qualcomm is pleased to respond to NBP Public Notice #15, which seeks comment on various issues relating to broadband access and education. As the Commission states in the Public Notice, broadband and especially mobile broadband have "important roles to play in education, from digital learning resources to eTextbooks, professional development for teachers, remote instruction, and data records management." NBP Public Notice #15 at 1. As Secretary of Education Duncan said: "[b]roadband access and online learning. . . presents a huge opportunity that can be leveraged in rural communities and inner-city urban settings, particularly in subjects where there is a shortage of highly qualified teachers. At the same time, good teachers can utilize new technology to accelerate learning and provide extended learning opportunities for students." Id. at 1-2 (quoting U.S. Department of Education Press Release, June 26, 2009).

Qualcomm wholeheartedly believes that mobile broadband technologies, devices, and applications, in particular, can be used to achieve vast improvements in learning for all Americans. The capabilities of mobile broadband in this regard take an almost endless number of forms, including the Amazon Kindle and other e-book readers, which provide easy access to large numbers of books, magazines, newspapers, and other periodicals, wherever students are located; the burgeoning variety of smartphones, which can run all types of educational software based on many different operating systems; laptops and so-called smartbooks with embedded mobile broadband connectivity, which allows students to access the Internet wherever they may happen to be.

The ability of mobile broadband to bring huge improvements in education is based on much more than just intuition. As discussed herein, the pilot projects conducted to date,

including two sponsored by Qualcomm's Wireless Reach Initiative and another sponsored by Sprint, prove that student performance dramatically improves when mobile broadband technologies, devices, and applications have been used as part of school curricula. The findings of these pilot projects, which are discussed herein, are powerful proof that mobile broadband can substantially improve American education.

Improving education in America through this promising technology will not happen overnight, but it need not take years if there is a concerted effort in the public and private sectors to use mobile broadband technology to improve education to the fullest extent possible. Such an effort will require that all levels of government, the educational community, and the vast mobile broadband ecosystem work together in partnership to tap the tremendous potential of mobile broadband for education. Facilitating the use of broadband for education will stimulate greater broadband adoption in communities at large and will bring incalculable benefits to our nation.

For its part, the Commission can take at least four steps to facilitate far greater use of mobile broadband to improve education. First, as Qualcomm has consistently argued elsewhere, the Commission should set a central national goal in the National Broadband Plan: universal mobile broadband coverage. No American should be left without access to mobile broadband precisely because this technology has tremendous potential to improve education. Today, based on the most recently available FCC data, over 95.6% of all Americans live within the coverage of one mobile broadband network, as the FCC has defined mobile broadband, that is EV-DO or HSPA.[1] Within a few years or even less, this nation can achieve 100% mobile broadband coverage if we have a national commitment to do so, along with the targeted use of public funds

[1] See Bringing Broadband to Rural America, Report on a Rural Broadband Strategy, released May 22, 2009, at Pgs. 12-13.

for this purpose. Until all Americans have access to mobile broadband, its potential to improve education can never be realized.

Second, the E-rate program should be converted into a mobile broadband program. In the 21st Century, Americans use their mobile broadband devices wherever they happen to be. Accordingly, these mobile broadband devices can enable learning and collaboration outside the four walls of the classroom. The original E-rate program was geared toward the wiring of schools. The program has achieved that purpose with great success. But, for the 21st Century, learning can and should be wireless, not wired, and mobile, not fixed. Learning should take place anytime, anywhere. The E-rate program should not favor wired and/or fixed technologies and, in fact, should fund wireless and mobile devices, modems, services and applications. The E-rate program should become a mobile broadband program to subsidize mobile broadband devices, modems, applications, and services for students and teachers. These are the critical tools to bring dramatic improvements in education.

Third, the Commission should also convert the universal service program into a broadband program, and in particular, the Commission should establish a program to provide mobile broadband devices and service at subsidized rates under the Lifeline/LinkUp programs. This new program would ensure that low income Americans have access to mobile broadband devices and services. Such a program would go hand-in-hand with modernization of the E-rate program, which does not provide direct funds to consumers. Students of all income levels, and their parents, should get access to mobile broadband devices and services since these will be critical tools to improve education in the 21st Century.

Fourth, as Qualcomm has explained in other filings, the demand for mobile broadband is growing at exponential rates. As the Commission and many stakeholders from every aspect of

mobile broadband has maintained, there is a drastic need for additional licensed spectrum for mobile broadband. The increasing use of this technology for educational purposes is just one more factor which warrants the allocation and auction of more licensed spectrum for mobile broadband.

Qualcomm looks forward to working with the Commission and with all other public and private sector stakeholders to ensure that mobile broadband technologies, devices, services, and applications are all used to improve education in America as much as possible, as quickly as possible, and to the greatest extent possible.

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QUALCOMM Incorporated ("Qualcomm"), by its attorneys, hereby submits these Comments in response to the Commission's NBP Public Notice #15, DA 09-2376, released November 3, 2009, in which the Commission sought comment on broadband needs in education, including changes to the E-rate program to improve broadband deployment.

I. Introduction

Educational experts have recognized the vital role that broadband can play in improving education. The Public Notice quotes California State Superintendant of Instruction Jack O'Connell as follows: "today we live in a world that is increasingly technology oriented. . .I feel strongly that our K through 12 public education system must absolutely keep pace with these advances in order to more effectively prepare our children for the challenges of this new world. [Our students] are digital natives and are riding this wave with ease. Now educators and students must find ways to use technology to help students navigate this increasingly competitive world and better prepare for successful futures." Id. at 2.

Mobility adds significant dimensions to the power of broadband to improve education. The Amazon Kindle and other e-readers, such as the iREX, use mobile broadband to provide access to large libraries of books on a fully mobile basis so that students can obtain books wherever they may happen to be, without having to travel to a library which could be far away. These e-readers also make it possible for students to retain many more books than is possible given the limited borrowing privileges in libraries, and at vastly reduced costs than if the students purchased paper copies of the books.

Smartbooks, a new category of wireless devices with embedded mobile broadband connectivity in thin, lightweight form factor with all-day battery life, will provide students with high speed access to the Internet on a fully mobile basis-- at home, in school, and wherever else they go to facilitate learning before, during, and after school. Moreover, many full sized laptops are available today with embedded mobile broadband, and these devices can be used the same way as smartbooks. Likewise, smartphones with embedded mobile broadband are essentially hand-sized computers with constant high speed Internet access. These devices are able to run an ever expanding array of educational applications.

Qualcomm is committed to working with its many partners in the mobile broadband ecosystem to deliver mobile broadband technologies, devices, services, and applications to improve education at all levels. In these Comments, Qualcomm first describes mobile broadband technologies, devices, services, and applications. Qualcomm then explains a highly successful pilot project in which it participates to use mobile broadband to improve instruction in algebra. Finally, Qualcomm discusses four policy initiatives the Commission should undertake to facilitate greater use of mobile broadband for education.

II. Qualcomm's Pioneering Work on New Mobile Broadband Technologies, Applications, & Services Which Can Be Used to Improve Education

Qualcomm is a world leader in developing innovative digital wireless communications technologies and enabling products and services based on the digital wireless communications technologies that it develops. Qualcomm is the pioneer of code division multiple access ("CDMA") technology, which is utilized in the 3G CDMA family of wireless technologies. These technologies include CDMA2000 and HSPA/WCDMA, which are used in today's 3G wireless networks and devices to enable tens of millions of Americans, in rural, suburban, and urban areas alike, to enjoy advanced, high speed, and ubiquitous mobile broadband services.

In fiscal 2009 alone, Qualcomm spent $2.4 billion, or approximately 23% of its revenues on research and development. Since Qualcomm's inception in 1985, it has invested approximately $12.8 billion in R & D. These enormous expenditures enabled Qualcomm to invent many of the technologies that are fueling the mobile broadband boom. Today, Qualcomm holds or has applied for approximately 11,600 US patents (3,600 issued and 8,000 pending) and 54,100 foreign patents (18,500 issued and 35,600 pending). Every division and subsidiary of Qualcomm has multiple research and development teams working on projects which will hopefully lead to patentable inventions. This work occurs in many offices and labs around the US and the world. In addition, Qualcomm has a Corporate Research and Development group, which has its own Research Center in San Diego and other offices and labs in the US and abroad.

Qualcomm broadly licenses its technology to over 175 handset and infrastructure manufacturers around the world, who make infrastructure equipment, handsets and other consumer devices, and develop applications, all based on the CDMA2000 and/or HSPA air interfaces. Qualcomm also licenses its orthogonal frequency division multiple access

("OFDMA") technology, which will be used in wireless networks based on the so-called Long Term Evolution ("LTE") air interface.

Qualcomm CDMA Technologies ("QCT"), a division of Qualcomm, is the world's largest provider of wireless chipset technology. QCT's chipsets provide a high degree of integration and support all the major frequency bands, the full gamut of wide area cellular technologies, Assisted GPS, Bluetooth, Wi-Fi, and many different operating systems, including Android, Windows Mobile, Symbian, and Qualcomm's Brew Mobile Platform. Devices containing QCT chips can be used to access a wide variety of educational applications wherever a mobile broadband network provides service.

Moreover, QCT has helped lead the diversification of mobile broadband into many new types of mobile broadband-enabled devices, ranging from smartphones, mobile broadband PC cards and USB dongles, Mi-Fi devices which provide a 3G mobile broadband connection to up to five Wi-Fi enabled devices, mobile broadband-embedded laptops and netbooks, and a wide variety of pocketable computing devices with mobile broadband capability. All of these devices can be important tools for education. These mobile broadband devices are used today by millions of Americans, and they provide low-cost, mobile Internet access and broadband applications wherever a student or teacher may happen to be, thereby facilitiating learning before, during, and after school.

Qualcomm Internet Services offers software platforms which aim to bring any application to any device on any network in any location. These platforms began with BREW, a thin software layer which was the first platform which enabled the downloading of applications into wireless phones. More recently, Qualcomm Internet Services began offering Plaza Mobile Internet, a platform which allows mobile devices to access widgets, thereby bringing the features

and interactivity of Web 2.0 applications to mobile devices, and Plaza Retail, which provides support for multiple app stores, which give wireless subscribers a uniform and easy shopping experience on a wide variety of wireless devices.

These software platforms allow educational applications to be written for all types of mobile broadband devices, rather than limiting the application to any one particular device or requiring separate applications to be written for each type of device. Moreover, the same educational applications and any updates can be downloaded into many types of devices. Such platforms are critical for the rapid, cost-effective proliferation of educational applications on mobile broadband devices.

Qualcomm MEMS Technologies, Inc. has developed the world's first MEMS-based direct-view display for mobile devices. This technology, known as "mirasol," offers dramatically lower power consumption and enhanced viewing quality in a wide range of ambient lighting conditions, including bright sunlight. This display technology is well suited for a new generation of mobile broadband devices, which will have far longer battery lives than today's devices. A mirasol display uses one-tenth to one-one hundredth of the power, depending on the nature of the usage, of a traditional cell phone display, which equates to approximately 40 percent longer time in between battery charges.

E-readers with mirasol displays will be available beginning in 2010. This display technology will allow students and teachers to use their e-readers and other mobile devices for learning inside and outdoors, and for long periods of time before, during, and after school.

III. The Rapid Proliferation of Innovative Mobile Broadband Networks & Devices

In the United States, as the Commission itself has found in May of this year, 95.6% of the US population is covered by a mobile broadband network (defined as a network based on EV-DO or WCDMA/HSPA). In fact, 99% of the non-rural US population and 82.8% of the rural US population is so covered.[2] Worldwide, there are 578 wireless carriers in 157 countries that have deployed one of the 3G CDMA technologies. Of those 578 carriers around the world, 108 have deployed EV-DO, 70 of whom have deployed EV-DO Revision A. Another 274 of the 578 carriers have deployed HSDPA, 87 of whom have deployed HSUPA. These broad deployments create enormous demand for EV-DO Revision A and HSDPA equipment, thereby creating economies of scale which bring down prices for carriers and ultimately consumers.

Currently, approximately 830 million people around the world use a 3G device. By 2013, the number of 3G subscribers is projected to reach approximately 2.4 billion, and at that time, most 3G subscribers will be using an EV-DO or HSPA-based device.[3] This strong demand creates an ever-expanding market for 3G-based devices, including 3G phones, smartphones,

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[2] See Bringing Broadband to Rural America, Report on a Rural Broadband Strategy, released May 22, 2009, at Pgs. 12-13. In making that finding, the Commission defined networks based on EV-DO and WCDMA/HSPA as constituting mobile broadband. The Commission used the same definition of mobile broadband in its annual reports on the state of competition in the US wireless market in 2009, 2008, and 2007. See Thirteenth Report, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, WT Docket No. 08-27, DA 09-54, released January 16, 2009 at Pgs. 69, 73-74; Twelfth Report, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, WT Docket No, 07-71, released Feb. 4, 2008, at Pgs. 8, 68-69; Eleventh Report, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, WT Docket No, 06-17, released Sept. 29, 2006, at Pg. 54

[3] The source of the data on subscribers is Wireless Intelligence, a database which collects such information. Wireless Intelligence defines a subscriber (actually a "connections" as a "unique SIM, or where SIM cards do not exist, a unique telephone number, which has access to the network for any purpose (including data-only usage), but excluding telemetric applications."

PDAs, consumer electronics devices, and laptops. These devices include more than 646 EV-DO-based devices (118 of which incorporate EV-DO Revision A) and more than 1,910 HSDPA-based devices (305 of which incorporate HSUPA). The number and variety of these devices is increasing every day.

As noted above, Qualcomm licenses its technology to over 175 companies, who manufacture infrastructure and subscriber devices (including phones, smartphones, smartbooks, consumer electronic devices, and the like). These companies span the entire wireless industry. In particular, the number of companies manufacturing devices based on mobile broadband technologies, such as CDMA2000 and HSPA, continues to increase, along with the different types of devices themselves. At last count, 111 companies have manufactured at least one CDMA2000 device, and more than 169 companies have manufactured at least one WCDMA or HSPA device. These devices span all price points—from low end 3G phones to very high end smartphones and other consumer electronics devices.

In particular, eighteen laptop manufacturers now offer at least one laptop model with a form of embedded mobile broadband technology, and more than 400 such laptop models have been brought to market. It is becoming increasingly common for Americans, in urban, suburban, or rural areas and of all age groups, including both students and teachers, to access the Internet and a plethora of mobile broadband services through these mobile broadband-embedded laptops or by using a PC card or USB device with 3G mobile broadband connectivity.

There is fierce competition in the US among the wireless carriers in the provision of mobile broadband services, which has brought substantial benefits to consumers and has spurred the rapid deployment and expansion of these mobile broadband networks across the country. Indeed, American consumers in urban, suburban, and rural areas are enjoying mobile broadband

service at ever-increasing penetration rates and data speeds. Moreover, as the Commission found in its annual reports on the US wireless market, carriers have deployed competing mobile broadband technologies, which has only intensified the competition as the carriers seek to differentiate their networks by providing what each claims to be the best and most advanced high speed mobile broadband network and by offering the most robust and compelling mobile broadband services to consumers.[4]

Accordingly, Verizon Wireless, Sprint, US Cellular, Leap Wireless, and Cellular South, among other carriers, have deployed the CDMA2000 (EV-DO) mobile broadband technology, and their deployments are expanding every day. Overall, according to the Commission's latest report, EV-DO is available in over 1.5 million square miles across the country.[5]

On the other hand, AT&T has deployed the alternative WCDMA/HSDPA technology, and it is expanding the footprint of its WCDMA/HSDPA network at a very rapid rate. AT&T provides mobile broadband across much of the United States. Initially, AT&T deployed HSDPA, and subsequently, AT&T completed deploying HSUPA, thereby supporting higher speed uploads and downloads. For its part, T-Mobile USA has also launched HSPA on its AWS-1 spectrum in major markets around the country and now provides this mobile broadband service to an ever-increasing footprint. Thus, the mobile broadband networks based on HSPA/WCDMA technology are also expanding rapidly.

Mobile broadband networks based on these technologies are also operated by many smaller carriers. For example, Stelera Wireless provides mobile broadband service via HSPA to rural areas in Texas. Prior to Stelera's launch, these areas either had no broadband service of any kind or very limited service. Earlier this year, Cellular South announced a major expansion of its

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4 See Thirteenth Report at Pg. 66.

5 Id. at Pg. 73.

mobile broadband service, provided via EV-DO, in Mississippi to cover the Mississippi Delta region and as well as counties in Southwest and Eastern Mississippi. Mobile broadband deployment is especially critical in Mississippi, which has one of the lowest overall broadband penetration among the 50 states. [6]

All told, as of May 2009, the Commission found that approximately 272.55 million Americans live within a census block in which one carrier provides mobile broadband service as defined by the FCC to include EV-DO or WCDMA/HSPA. These numbers are increasing every day as the carriers constantly expand and enhance their mobile broadband networks. Thus, most American students and teachers have access to one or more mobile broadband networks where they live, where their school is located, and while they are in transit between school and home.

IV. The Upgraded 3G Technologies and the New LTE Technology

The ability of mobile broadband to improve education is not static because mobile broadband technology is constantly changing—delivering faster data, with lower latency and greater capacity. The improvements in mobile broadband technology will provide even greater capabilities to improve education.

As operators began deploying the first mobile broadband technologies, EV-DO and HSPA in their initial forms—EV-DO Release 0 and HSDPA—the ecosystem of vendors that develop and support these technologies were simultaneously working on upgrades to the technologies for deployment in existing spectrum, and the new LTE mobile broadband technology, which was designed for deployment in new spectrum and which was optimized for wider bandwidths than the 3G technologies.

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[6] See FCC Fifth Section 706 Report, FCC 08-88, released June 12, 2008 at Table 9.

Today, as noted supra and as the FCC recently found, Verizon Wireless, Sprint, Leap Wireless and others provide mobile broadband service to areas in which over 95% of Americans live via EV-DO Revision A, which supports peak data speeds of 3.1 Mbps on the downlink and 1.8 Mbps on the uplink. Likewise, AT&T is concluding its network upgrade to HSUPA, which will support peak data speeds of up to 1.8 Mbps to 5.6 Mbps on the uplink, and is already in the midst of upgrading its HSPA network to support peak speeds of 7.2 Mbps. Likewise, T-Mobile USA is moving forward rapidly with its HSPA deployment and will migrate to HSPA+ on its AWS-1 spectrum.

The EV-DO and HSPA technologies are not standing still. Both are being enhanced substantially, and these enhancements will all be backwards compatible. The next upgrades to EV-DO and HSPA will result in dramatically faster data rates. EV-DO Revision B enables the aggregation of three EV-DO carriers in one 5 MHz channel. In its Phase I, EV-DO Rev. B will support downloads at a peak rate of 9.3 Mbps and eventually, in Phase II, at 14.7 Mbps, while supporting uploads at up to 5.4 Mbps. This technology will undergo an additional upgrade, now known as EV-DO Advanced, which, if implemented with four carriers, will support downloads of up to 34.4 Mbps and uploads of 12.4 Mbps. These upgrades will not require any new infrastructure. The net result of these upgrades to CDMA2000 will be mobile broadband service with data rates that are ten times faster than even today's fastest EV-DO-based networks achieve.

Likewise, there are substantial upgrades for HSPA technology on its roadmap. The initial version of the technology known as HSPA + (also called HSPA Evolved—HSPA Release 7) will support peak downloads of 28 Mbps and uploads of 11 Mbps. Future releases of HSPA, Releases 8 and 9, will increase the peak downlink speeds, first to 42 Mbps and then to 84 Mbps.

Moreover, Qualcomm and many other vendors around the world are working on LTE, an OFDM-based technology. LTE achieves high data rates and is optimized for wider bandwidths— a minimum of 20 MHz of paired spectrum per operator and ideally 40 MHz of paired spectrum per operator for initial deployments.

V. New Categories of Mobile Broadband Devices

As noted supra, QCT is the world's largest provider of chipsets for mobile broadband devices. QCT constantly develops new chipsets incorporating more functionality and lower power to drive mobile broadband into an ever increasing variety of devices at all price points. In particular, QCT is in the midst of three important initiatives that are intended to expand the scope and use of mobile broadband devices by creating new categories of mobile broadband devices. These new categories of devices will offer important capabilities for students and teachers and should provide the basis for tremendous improvements in education.

QCT's first mobile broadband initiative is a platform by the name of Snapdragon. Snapdragon, which consists of a single chip with integrated wireless modem, applications processor, multimedia, GPS and other features, enables a new generation of mobile computing devices with embedded support for mobile broadband. These new mobile broadband computing devices, known as smartbooks, are much smaller, thinner, and less expensive than traditional notebook and mini-notebook PCs and with longer battery life that provides day-long availability.[7] Smartbooks feature always-on mobile broadband connections similar to mobile phones with everyday computing functionality in sub-compact, ultra-thin, and highly portable devices. (For more information on smartbooks, see www.hellosmartbook.com.) Smartbooks

[7] In the territory of the Federal Republic of Germany, the use of the term "smartbook" in connection with portable computers is reserved exclusively to Smartbook AG, Germany.

will combine the simplicity and connectivity of smartphones with the power and usability of laptops.

At present, 15 major manufacturers are developing more than 40 Snapdragon-based mobile broadband devices. The first Snapdragon-based mobile broadband smartphone was introduced in February 2009 by Toshiba, and other Snapdragon-based devices for mobile broadband computing have been introduced throughout this year. The first smartbook will be manufactured by Lenovo and will run on AT&T's mobile broadband network. Students will be able to use smartbooks before, during, and after school to complete schoolwork and homework, do research on the Internet, and interact with their teachers and fellow students.

A second QCT mobile broadband initiative consists of a global mobile broadband and GPS embedded solution for notebook computers and other wireless devices. This solution is called Gobi. Gobi-enabled notebooks can operate on mobile broadband networks in the United States and around the world. The original Gobi solution included a Qualcomm chipset, associated software and API, and a reference design for a data module supporting both the EV-DO Revision A and HSPA mobile broadband air interfaces as well as GPS. This solution allowed notebook manufacturers to deliver products that provide mobile broadband connectivity wherever the user may happen to be. Earlier this year, Qualcomm announced its second generation embedded Gobi module. This module, which will launch commercially this year, provides a wide range of enhancements, including support for additional frequencies, increased data speeds, enhanced GPS functionality, and additional operating systems, such as Windows 7 and Linux. Just today, Lenovo and Qualcomm announced that Lenovo will incorporate the second generation Gobi embedded module in upcoming ThinkPad laptops in the X, T, and W series beginning next year.

While Gobi was initially deployed in notebooks, it is now being embedded into other devices to provide worldwide mobile broadband connectivity. IREX Technologies ("IREX") announced a new Gobi-embedded touch-screen e-Reader, the IREX DR800SG. This innovative device will enable the wireless downloading of books, newspapers, and magazines around the world via the embedded 3G multi-mode capability provided by the Gobi module. This device, and others like it, such as the new Amazon Kindle which also comes with embedded worldwide connectivity, will give our nation's students access to an almost limitless library of books, newspapers, magazines, etc., all for instant downloading and easy access before, during, and after school.

QCT's third mobile initiative is a new category of low-cost, low power devices that use mobile broadband networks for wireless Internet access and support e-mail, social networking, e-commerce, and distance learning applications. Late last year, Qualcomm formally announced the introduction of an affordable wireless Internet access and voice device by the name of "Kayak." See www.qualcomm.com/news/releases/2008/081112_qct_kayak.html. Kayak consists of a reference design and recommended software specifications that device manufacturers are using to bring to market a variety of innovative wireless devices.

These Kayak-based devices use mobile broadband technology to fill the niche between desktop computers, which typically require wireline or cable connections for internet access that is often unavailable in rural areas, and Internet-capable mobile broadband-enabled smartphones. Kayak-based devices include embedded 3G voice and data capability, a full featured Web 2.0 browser, and access via the browser to Web 2.0 productivity and other broadband applications. In addition, Kayak supports both television sets and computer monitors for displays and/or built-

in displays. Kayak-based devices are compatible with a standard keyboard and a mouse for input and will include a music player and/or 3D gaming console functionality.

The Kayak reference design uses a Qualcomm Mobile Station Modem, which enables the user to access the Internet by using a standardized web browser running at desktop resolutions and mobile broadband networks which employ 3G wireless broadband technology, either EV-DO Revision A or HSPA. Thus, Kayak-based devices use built-in cellular connectivity and an inherently low-cost platform based on high-volume wireless chipsets. Kayak-based devices enable affordable mobile broadband Internet access and will be introduced commercially early next year.

VI. Pilot Projects Prove That Mobile Broadband Can Substantially Improve Education

Three pilot projects have proven that substantial improvements in education are possible through the use of mobile broadband in curricula. The facts are that students learn more and better when mobile broadband technology is integrated into the curricula for subjects including math and language arts. These pilot projects are the tip of the iceberg, but they demonstrate the vast potential that this technology has to improve education.

A. Project K-Nect: Using Smartphones for Instruction

The first pilot project showed that students learning algebra on educational software accessed on smartphones performed far better than their peers who learned algebra via traditional instruction from the very same teacher. Qualcomm's Wireless Reach Initiative, an initiative designed to promote the socially beneficial uses of mobile broadband technology in the United States and around the world, supports this project, which is known as Project K-Nect. The project is based in rural North Carolina and uses smartphones operating on a mobile broadband network to teach math to at-risk high school students. In the very first phase of the project, one

participating class scored 30 percent higher on their end of course exam than a class of their peers not participating in the project, but taught by the same teacher.

This project also demonstrated that a major contributor to the students' success was the e-classroom support structure made possible with mobile broadband connectivity. That connectivity allowed students to connect with their peers, tutors and teachers after school hours and outside the classroom walls to share solutions to math problems and to discuss classroom lessons. By using mobile broadband connectivity, students who otherwise lacked access to the Internet at home were able to get the benefit of accessing educational web sites, such as algebra.com, and to communicate with each other via blogs and instant messaging, which allowed them to assist each other with algebra problems. In a research report completed after Phase I of Project K-Nect, students reported they spent more time working on algebra outside of their class than they did before they received their smartphones.

The intended outcomes of Project K-Nect included: (1) increased mathematics achievement as measured by proficiency in state testing and improved classroom performance; (2) greater academic involvement of harder-to-engage students who had struggled with mathematics; and (3) a dramatic impact on decreasing the current digital gap between students with and without access to the Internet at home.

Phase II of Project K-Nect began in 2008. The number of students in the pilot was increased from 100 to 150, and the project was expanded to include Geometry, Biology and Algebra II classes. Students in Project K-Nect continued to show extraordinary results compared to those not in the program. For example, one Project K-Nect Algebra II class had a pass rate of 83 percent on the state exam, compared to pass rates of 71% and 33% for other Algebra II

classes in the same school with different teachers and which did not participate in Project K-Nect.

Most recently, Onslow County, North Carolina was recently awarded a $2.5 million grant by the Department of Defense Education Activity to expand Project K-Nect from 150 students to approximately 2,000 students. The expansion will give a large number of students from this rural county mobile broadband devices and technology as part of their algebra studies.

B. Sprint/GoKnow Project: Using Mobile Phones for English Language Arts & Math Instruction

In September 2009, Sprint and GoKnow, a provider of educational software, announced the results of a trial project conducted in the Inskster Public School District, a school district in Michigan. During the 2009 summer session, students were given Sprint handsets loaded with GoKnow software, which intgrated into the classroom lessons to enhance the learning environment for English Language Arts ("ELA") and math. Prior to using the handsets, the students were performing below Michigan state standards in these subjects. After using the handsets and software during the summer session, the students improved their test scores by an average of 25 percent.[8]

Some of the ways in which the cellphones were integrated into the ELA and math instruction included:

- Students completed and synchronized ELA assignments using their cellphones with the Sprint/GoKnow technology programs such as Pico map (creating family tree and characterization using graphic organizers), Sketchy (story telling using animation software), KWL chart (vocabulary skills and activating prior knowledge), camera, video,

[8] See "Sprint and GoKnow Trial Delivers Higher Achievement Scores in English Language Arts and Math," released September 22, 2009 and available at http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1334364.

and Windows Mobile (word processing) for lessons that went along with their online reading assignment of "Animal Farm" by George Orwell.

- Students learned how mathematics is integrated into everyday life through the district's Culinary Arts Program. Students completed and synchronized assignments using the Sprint/GoKnow technology programs: Pico map, Sketchy, KWL Charts, camera, note taking and PowerPoint presentations. The lessons were designed with an emphasis on conversions and algebraic solutions.
- Students took a field trip to Comerica Park Baseball Stadium that integrated math concepts by using the seating arrangements at the park to determine which section of seating generated the most income. The students used their cellphones to gather data using Windows Mobile (Excel). The students also used their cellphones to capture pictures of the park with the objective of creating a slideshow presentation of their experience.

C. Learning Without Walls Project: Using Mobile Broadband-Embedded Notebook Computers to Improve Learning

Another recently launched pilot project by the name of "Learning Without Walls," is a joint effort undertaken by the Alliance for Digital Equality, AT&T, HP, Smart Technologies, Saywire, and Qualcomm (through Qualcomm's Wireless Reach Initiative). In this project, students in the North Clayton Middle School in metropolitan Atlanta were given HP notebook computers loaded with educational tools and embedded with Qualcomm's Gobi solution to provide ubiquitous high speed Internet access over, in this case, the AT&T mobile broadband network.[9] As part of this pilot project, resources for technical support, teacher training, project management, equipment and access to AT&T's mobile broadband network have been donated by the project participants. The project is examining how 24/7 access to educational resources through mobile devices helps improve student engagement and academic achievement.

Although the students have only had the notebook computers for a short period of time, the initial results are very positive. One seventh grade class had a 50% pass rate on vocabulary tests before the project began. The same class had a 90% pass rate on the very first test given

[9] See "Alliance for Digital Equality, AT&T, and Qualcomm Launch 'Learning Without Walls," www.qualcomm.com/news/releases/2009/091001_Alliance_for_Digital_Equality.html.

after they began using the mobile broadband-embedded notebook computers. The teacher attributes the improved performance to the fact that the students are more motivated to go online and search the vocabulary words, instead of having to use pencil, paper, and a thick dictionary.

There is no question but that mobile broadband technology has the potential to improve education in countless ways as the extraordinary results of three projects demonstrate. To drive more widespread interest in this topic, Qualcomm's Wireless Reach Initiative, Project K-Nect, CTIA, the Software and Information Industry Association, and the Consortium for School Networking sponsored a conference in February 2009 on mobile learning.[10] The conference brought together experts from the public and private sectors, both the educational and technology communities, to share information on how mobile broadband can be used to improve education. A second mobile learning conference will occur in 2010. Rather than forbidding mobile devices from schools, many schools and educators around the country are embracing this technology with very positive results for students. The rapid proliferation of mobile broadband devices, services, and educational applications among students will vastly improve education in this country.

Qualcomm now turns to policies that the Commission could adopt to facilitate greater use of mobile broadband for education.

VII. The Central Goal of the National Broadband Plan Should Be to Ensure That Every American Has Access to Multiple Mobile Broadband Networks and to a Wide Variety of Mobile Broadband Devices, Services, & Applications

The Commission's own data on the US wireless industry establish that mobile broadband

[10] See http://www.mobilelearning09.org/speakers.html.

is growing at dramatic rates. Literally every day, mobile broadband networks are expanding; a wide variety of new mobile broadband devices come to market; and, many new mobile broadband services and applications are launched.

In May 2009, the Commission found that 95.6% of the US population is covered by a mobile broadband network, and that 99% of the non-rural US population and 82.8% of the rural US population is so covered.[11] The nation is clearly making rapid progress in achieving greater penetration of mobile broadband. Two years ago, the FCC found that 63% of all Americans are covered by a mobile broadband network, and last year, the figure in the FCC's annual report was 82%.[12] In January 2009, the FCC reported that the figure was 92%, and now, the FCC puts the figure at 95.6%.[13] Moreover, earlier this year, the Commission found that 72.5% of Americans are covered by two or more mobile broadband networks, and 50.7% of Americans are covered by three or more mobile broadband networks. Even during the sharp recession our nation has gone through, on the heels of a global economic crisis, the US mobile broadband market stands out for its tremendous growth rates and the ever-increasing popularity of the devices and services.

Qualcomm respectfully submits that in drafting the national broadband plan, the Commission should recognize the pivotal role that mobile broadband is playing in providing

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[11] See Bringing Broadband to Rural America, Report on a Rural Broadband Strategy, released May 22, 2009, at Pgs. 12-13.

[12] Twelfth Report, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, WT Docket No, 07-71, released Feb. 4, 2008, at Pgs. 8, 68-69; Eleventh Report, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, WT Docket No, 06-17, released Sept. 29, 2006, at Pg. 54.

[13] See Thirteenth Report, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, DA 09-54, released January 16, 2009 at Pg. 74; Bringing Broadband to Rural America at Pgs. 12-13.

ubiquitous high speed access to the Internet for millions of Americans every day and can play in the future for every American. In particular, as shown herein, mobile broadband, with ubiquitous high speed wireless connectivity, holds tremendous potential to improve education in a host of ways. For that reason and others set forth in Qualcomm's companion filings, Qualcomm believes that the central goal in the national broadband plan should be to ensure that every American has access to multiple mobile broadband networks and a wide variety of mobile broadband devices and services.

The nation is well on its way to achieving that goal. The Commission's most recent data shows that over 50% of Americans are covered today by three or more mobile broadband networks, a remarkable fact given that the first mobile broadband deployments in the US began just seven years ago. Nevertheless, Qualcomm respectfully submits that the Commission should set the clear national goal stated above to ensure universal mobile broadband coverage by multiple networks, and dedicate its resources to working with all affected stakeholders—carriers, vendors, and the public at large—to reach that goal.

VIII. The E-rate Program Should Be Converted Into a Mobile Broadband Program

The E-rate program should be modernized and converted into a mobile broadband program. Today, the E-rate program is more geared toward wired and fixed technology. As Qualcomm, Sprint, Verizon, and Verizon Wireless have all explained in prior filings with the Commission, the 2010 E-rate Eligible Services List does not clearly provide that wireless internet equipment, such as 3G (EV-DO and WCDMA/HSPA) connection cards, My-Fi devices and other 3G routers, and USB modems are eligible for E-rate support. See Docket 02-6, Comments of Sprint Nextel and Verizon and Verizon Wireless (filed June 19, 2009); Reply Comments of Qualcomm (filed June 30, 2009). There is no functional difference between a

wireless modem and a wired (cable or wireline) modem except that the wireless modem can be used wherever the student is physically located. Similarly, the Eligible Services List provides support for "routers" without unequivocally providing that wireless routers are covered. Wireless routers provide a broadband signal just like a wireline router except that the wireless router does not need a wireline connection and instead uses a mobile broadband connection for its backhaul. These wireless devices should all be covered by the E-rate program.

Likewise, as e-book readers, such as the Amazon Kindle and the IREX device, become more prevalent, they should also be eligible for federal subsidies. Students can use these devices to gain access to textbooks wherever they go. These devices will lower costs for schools and students, reduce adverse environmental impacts, and improve learning in a host of ways.[14] California has a statewide digital textbook initiative.[15] Three recently enacted California state statutes promote the use of digital textbooks.[16] Likewise, Texas recently enacted a law authorizing the use of electronic textbooks.[17]

There is no better use of federal funds than to subsidize e-readers and digital textbooks for use on the e-readers to make them available to all students. This funding should be made provided under the ARRA, various federal education programs, and/or a revamped E-rate program.

Moreover, the E-rate program should provide funding for wireless Internet applications and services. These applications may or may not be used on school property, and that is their

[14] For a thorough discussion of the benefits of e-readers in education, see Friedman, "A Kindle in Every Backpack: A Proposal for E-Textbooks in America's Schools," July 2009.

[15] See http://gov.ca.gov/press-release/12225.

[16] See http://gov.ca.gov/press-release/13561/

[17] See http://governor.state.tx.us/news/press-release/12647/.

virtue. Students can use mobile broadband technology to learn before, during, and after school. The E-rate program should fund these applications and services as much as possible precisely because they can help students learn before or after school, when their teachers may not be physically available to them.

In the past, the E-rate program has focused largely on wiring schools, and most schools in the nation are wired. The E-rate program should be refocused on mobile broadband devices, applications, and services, since students can benefit far more with mobile technology, which allows them to learn before, during, and after school. The E-rate program should be transformed so that it can bring all students the benefits of mobile learning.

IX. The Universal Service Program Should Provide Funding for Mobile Broadband

It is vitally important that the E-rate program be converted into a mobile broadband program, but by itself, that will not be sufficient for our nation to reap the full capability of broadband to improve education. Although the E-rate program could provide mobile broadband devices at reduced prices, the E-rate program does not provide direct funding to consumers. Low income Americans need direct subsidies in order to ensure that they are not left without the ability to purchase mobile broadband devices, services, and applications.

Reforming the universal service program is a gargantuan, but not impossible, task. In particular, one aspect of universal service reform could be put in place quickly. As Qualcomm and a host of other companies have argued, a pilot program could be put in place under Lifeline and LinkUp to provide subsidized mobile broadband devices and mobile broadband service initially to at least one million low income participants all over the nation. See Comments of Qualcomm Incorporated, Docket Nos. 01-92, 99-200, 99-68, 96-98, 96-45, 06-122, 05-337, 04-36, 03-109, 08-262 (filed Nov. 26, 2008). Such a pilot program should be fully funded and put

in place quickly, and if the pilot is successful, as it is expected to be, the program should become permanent. As the Commission itself found in the Order & Further Notice in the omnibus universal service proceeding, according to the Pew Internet & American Life Project, only 25 percent of households with incomes under $25,000 have broadband service. See Order on Remand and Further Notice of Proposed Rulemaking, FCC 08-262, released November 5, 2008, A-35, C-34. It is essential that this problem be cured quickly. The Lifeline and LinkUp programs are well suited to do so.

The Commission should convert the universal service program into a broadband program. That conversion will take time to complete. In the meantime, the Commission should authorize and fund a mobile broadband pilot program under the existing Lifeline and LinkUp programs.

X. The Commission Should Identify, Allocate, and Auction More Licensed Spectrum for Mobile Broadband

As Qualcomm has urged in other filings concerning the National Broadband Plan, and as Chairman Genachowski has himself stated, our nation needs more licensed spectrum for mobile broadband to meet the burgeoning demand for mobile broadband devices and the wide variety of services and applications. See Comments of Qualcomm filed on June 8, 2009 at 15-17, Reply Comments of Qualcomm filed on July 21, 2009 at 1-2; Comments of Qualcomm filed September 30, 2009 at 27-28; Comments of Qualcomm filed on October 23, 2009 at 23-25; Reply Comments of Qualcomm filed on November 13, 2009 at 2-5. The mobile devices, services, and applications that will be used to improve education will be an important component of the exponential growth in overall mobile broadband demand. More licensed spectrum is essential to meet this ever-growing demand.

Without belaboring the point, there is a substantial need for considerably more licensed spectrum for mobile broadband, hundreds of MHz, in order to meet the demand and, in

particular, to ensure that our nation's students are able to have access to the tremendous range of mobile broadband services and applications, which as shown herein, will improve education to a great extent.

XI. Conclusion

Wherefore, Qualcomm requests that the Commission act in accordance with these Comments.

Respectfully submitted,

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