[redacted]

http://verizon.public.brainbankinc.com/default

**1. Verizon Core Capabilities* (PICK the categories)**

i. Cloud Services
ii. Connected Device Services
iii. Mobility Services
iv. Security Services
v. Wireless Services x
vi. Wireline Services

**2. Provide a title for your Concept Submission.**

Personal Profile (PerPro) Content Delivery System

**3. Description:**

[redacted] proposes the PerPro Content Delivery System (CDS) project to improve the effective use of technology and increase academic performance of K-12 students in the rural communities of Allegany and Cattaraugus counties in New York State. This will be achieved by increasing access to Internet connectivity leveraged with the development and implementation of a novel, web-based content delivery system (CDS) to provide students with a customized learning plan from any Internet enabled device (i.e. computers, tablets and smartphones). The cross-platform CDS will also be accessible to teachers, administrators and parents. Currently, no single protocol or system exists to distribute multiple content types (i.e. video, audio, documents etc.) from a CDS to all types of Internet capable devices. The project will also benefit the community as a whole through improved communication and interaction with emergency personnel i.e. police, fire, EMS. This project will create the required applications needed for this true, seamless interconnectivity. This innovative approach has not previously been implemented on a large scale, multi-county service area.

[redacted] is partnering with ten (10) school districts in Allegany County and twelve (12) school districts in Cattaraugus County in southwestern New York State, adjacent to the Pennsylvania border in the Southern Tier West region of the state. The primary beneficiaries of the PerPro CDS project will be the **20,449** rural, underserved students in grades K-12 in upstate New York. Secondary beneficiaries will be the teachers and other educators as well as the community at large (**107,360** people) since all will benefit from an increase in in Internet connectivity through 4G cellular access and improved emergency response throughout the area.

The project concept is based on data from recent studies describing media and technology use in young people, as well as the results of a pilot project conducted by [redacted]. According to the Kaiser Family Foundation, the increase in media use and content is driven in large part by ready access to mobile devices like cell phones and iPods. Over the past five years,

there has been a huge increase in mobile device ownership among 8- to 18-year-olds: from 39% to 66% for cell phones, and from 18% to 76% for iPods and other MP3 players. During this period, cell phones and iPods have become true multi-media devices. Young people now spend more time listening to music, playing games, and watching TV on their cell phones (a total of: 49 daily) than they spend *talking* on them (: 33).[1] A study by Brand, J., & Kinash, S. (2010) demonstrated that devices such as iPads promote anytime, anywhere learning in schools where the student does not have to be sitting in front of a computer in a laboratory setting[2]. Tablets have unique capabilities, such as a multitouch screen and a wide variety of applications, that promote previously unseen possibilities for mobile learning. A study of an iPad initiative in a California algebra classroom showed that 78% of students who used the Houghton Mifflin Harcourt-funded algebra iPad app scored "proficient" or "advanced" on the California Standards Test, compared to 59% of students who used the textbook version[3].

The overarching **goal** of PerPro CDS is to improve the effective use of technology and increase academic performance of K-12 students in the rural communities served by CA BOCES. This goal will be achieved through two components: 1) the creation of a content delivery system (CDS) application that supplies each user (students, teachers, administrators and parents) a customized menu of services (learning plan) from any Internet enabled device (i.e. computers, tablets and smartphones); and 2) Enhancement of community Wi-Fi infrastructure and the Wi-Fi enablement of 22 School District bus fleets (breaking down the classroom walls) to increase reliable broadband Internet connectivity. PerPro CDS project will create a singular web access point for student learning opportunities and for communicating vital information to the school community. The specific **objectives** of the project are: 1) increase student, teacher, and parent access to and utilization of technology-based learning opportunities; 2) increase individual student performance by 5% in reading and math standardized tests; and, 3) increase parental engagement and school staff communication with parents to facilitate an environment and build relationships with families that supports learning. The project will work closely with an expert evaluator and use a quasi-experimental design with comparison groups. This will allow for continuous feedback so that timely course corrections can be made, as needed, to ensure the success of the project.

The first phase of the project will involve development of required infrastructure to distribute seamless, personalized content to any Internet enabled device that can access information via a web portal. The system will provide a single, secure, sign-on for users to access to their individual customized menu of learning and personal growth opportunities. Applications will be developed to correctly format websites and their pages for use on mobile devices. These applications will enable resources to be displayed in a web format that is accessible regardless of display size or type. The system will recognize user profiles rather than

[1] Kaiser Family Foundation, January 20, 2010, *Daily Media Use Among Children and Teens,* retrieved from http://www.kff.org/entmedia/entmedia012010nr.cfm.

[2] Brand, J., & Kinash, S. (2010). Pad-agogy: A quasiexperimental and ethnographic pilot test of the iPad in a blended mobile learning environment. Paper presented at the 27th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education (ASCILITE), Sydney, Australia. Retrieved January 5, 2012 from works.bepress.com/je.ff_brand/18

[3] Barseghian, Tina. Mind/Shift: How we will learn. January 23, 2012 retrieved April 20, 2013 from http://blogs.kqed.org/mindshift/2012/01/study-shows-algebra-ipad-app-improves-scores-in-one-school/

device profiles which will provide for a rich, personalized experience that is available any time, anywhere. For example, a student may have access to the system from one location through a web login and have one pane (section) of their display displaying a live stream, one pane with an interactive e-book, and a third pane with a distance learning course. The student could pause the course, logout and relocate to another location, perhaps a bus or home. The student could login from another device, and their resources are just as they left them at school. In the example of the "paused course", the student could simply hit play, and continue their distance learning course from where they had paused it. The key is that the profile follows the user, not the device. As long as there is some type of Internet connectivity, and an available device, the user's resources are accessible to them. The CDS and apps will be section 508 compliant, increasing accessibility and differentiation for all learners. Once the CDS is fully developed, educational content will be personalized, developed and/or enhanced via the school district's teachers and administrators.

The CDS will include a web-based portal available to the community at large. Kiosks, with media players, will be placed in school districts and community locations (libraries, community centers, town halls, etc.) to provide information to parents and members of the community. The kiosks can provide any content such as a live feed and pictures of district or community activities, an informational ticker at the bottom of the screen of activities and statuses, and daily informational bulletins. The CDS will also be used in conjunction with local city and county officials to deliver emergency messaging such as: weather, chemical spills, building intruders/lockdowns, and any other important and critical information. A login page will provided to county officials so they can immediately send any message to subscribers of the system based on defined groupings of subscribers. Emergency personnel, i.e., police, fire, EMS provider, city and county governments will also utilize the CDS to improve communications and response times.

The second component of the PerPro CDS project will involve enhancement and expansion of Wi-Fi service throughout the service area. Verizon is a vital partner in this project to build new towers as well as to add 4G capabilities to existing towers throughout Allegany and Cattaraugus County. The partnership with Verizon will improve: Wi-Fi for the schools and the community at large; emergency dispatch and communication; and, transportation fleets throughout the entire two county region. Increased access and 4G connectivity will allow students the opportunity to access the CDS in school, at home, and during their bus rides to and from school. Project PerPro CDS project will provide for Wi-Fi and cellular enabled school busses, which will allow students to maximize out of school learning time. Oftentimes students ride the bus 1.5 hours one-way, or 3 hours daily, to school and athletic events. Since students will have access to Wi-Fi and cellular networks, a mobile device to utilize the content delivery system will be provided in limited quantities for each district.

**4 a. Describe the problem YOU plan to solve, and how YOU intend to solve it.**

The **problem we plan to solve** is: 1) the inability for Internet enabled devices (i.e. computers, tablets and smartphones) to communicate regardless of operating platform; and 2)

[redacted]

the lack of Wi-Fi infrastructure and unreliable broadband Internet connectivity throughout the rural communities of Allegany and Cattaraugus counties. 3) the inability to provide true mobile learning to the students of our 22 School Districts.

Technology is at the core of virtually every aspect of our daily lives and work. Properly leveraged, the power of technology can be harnessed to provide engaging and powerful learning experiences and content, as well as resources and assessments that measure student achievement in more complete, authentic, and meaningful ways[4]. The National Education Technology Plan strongly encourages all school systems throughout the United States to reach students with learning opportunities anytime and anywhere. One of the barriers to optimizing the power of technology is the limited, inconsistent accessibility to broadband and Wi-Fi in rural America, which creates a digital divide between urban and rural students.

Although New York is the nation's third most populous state with a population density of 402 people per square mile, large areas of New York are both rural and sparsely populated. Internet access is limited in sparsely populated areas as the relative cost of service is higher than in more urban areas. This is even more pronounced in New York as cellular companies and broadband providers choose to invest in needed infrastructure in more densely populated areas because of the opportunities to reach such large populations. Due to the fact that Allegany and Cattaraugus counties are in the state's less populated areas, the students and citizens of these counties have less Internet access and therefore disparate access to services and educational programs.

Allegany and Cattaraugus counties are culturally and economically disadvantaged. There are 127,809 people residing in these two counties with 22% of that population being children under the age of 18. Nearly 17% of the population lives in poverty far above the state average of 14.5%[5] and 46.5% of students[6] receive free or reduced lunch. The area is extremely rural with Allegany County having 47.6 persons per square mile and Cattaraugus County with 61.4 persons per square mile as compared to the state with 411.2 per square mile. Children in Allegany and Cattaraugus counties score below state averages in most measures of student achievement. In grades 3-8, 46.5% of students are scoring below Level 3 (meets proficiency standards) in English Language Arts and 37% in math[7]. In secondary school, 18.5% score below Level 3 in English and 17.5% in Math with a graduation rate of only 76%, below the state average of 80%[8].

The future of EMS communications is through the development of interconnectivity that will allow all Internet enabled devise to communicate. To save time in life-threatening

[4] U.S. Department of Education Office of Educational Technology, *Transforming American Education: Learning Powered by Technology, National Education Technology Plan 2010,* Alexandria, VA: Education Publication Center, November 2010, p 7
[5] U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits, Consolidated Federal Funds Report
Last Revised: Monday, 11-Mar-2013
[6] The New York State District Report Card. Accountability and Overview Report, 2010-11. Web April 19, 2013. https://reportcards.nysed.gov
[7] ibid
[8] ibid

situations, it is essential to use technologies now available or in development to send data in addition to voice communications. Fast, robust data communications will enable EMS professionals to have a level of situational awareness (a real-time understanding of all events and resources impacting response, patient care, and transport) and a common operating picture (all responders and hospital staff involved in an EMS call share the same understanding and expectations for what is occurring) not possible today. In this way, life-threatened patients may be more quickly brought to the attention of the EMS system, and responders will be better informed and more quickly able to make decisions about appropriate emergency treatment and transportation. The aging VHF, UHF, and trunked systems used by EMS for the past 35 years will not support these data communications. [9]

With mobile devices developing into access points for web based content, [redacted] recognized a need to create an application that would seamlessly connect mobile devices with content from a central distribution point, the Content Delivery System (CDS). To test the hypothesis, or "proof of concept", for this type of delivery, [redacted] conducted a pilot for proof that an application could be built to decode any type of video content and format the content so that it could be delivered to any type of device regardless of make or model. This base concept was necessary to feed the multiple types of delivery needed for the CDS: streaming, live Internet feeds, recorded video conferencing playback "on demand", e-books, etc. The pilot was also a success in the fact that applications were developed that made different types of hardware appliances interact with one another to deliver a successful end product. The success of the pilot study demonstrated the feasibility of developing a broader scale application to connect students on mobile devices to a variety of online content on a web based learning management system and to personalize the delivery to reflect the individual's needs.

The **problem will be solved** by increasing access to Internet connectivity leveraged with the development and implementation of a web-based content delivery system (CDS) to provide students with a customized learning plan from any Internet enabled device (i.e. computers, tablets and smartphones). Although this project is focused on improving the academic performance of students, it will also have a profound impact on the community as well. The CDS will also be used to improve the effective use of technology throughout the counties fire and police departments, Emergency Medical Services (EMS) providers, county government and agencies. Providing Internet connectivity and a CDS will provide these agencies and emergency personnel with instant access to information that may be received via any Internet enabled device. The CDS will deliver emergency messaging such as: weather, chemical spills, building intruders/lockdowns, road closures, and any other important and critical information. Information/ knowledge is power and in the case of EMS providers, police and fire departments it can be the difference between life and death.

[9] National Association of State EMS Providers, Comments of the National Association of State Emergency Medical Services Officials. December 1, 2009.

[redacted]

**b. Describe how your innovation or product utilizes one or more of the Verizon Core Capabilities. [More details regarding Verizon Core Capabilities (e.g. Cloud Services, Connected Device Services, Mobility Services, Security Services, Wireless Services, Wireline Services) can be found at www.verizon.com.]**

The PrePro CDS project will utilize Verizon Wireless Services. Wireless services will provide an extended signal to our rural area, which in turn will provide students with access to the PerPro CDS so that they may continue their studies outside of the school. The project will Wi-Fi and cellular enable 200+ buses used to transport students in 22 School Districts. Each bus will have two high speed Internet routers to provide connectivity to students whether they are going to and from school, to extracurricular activities, to athletic events, etc. The 22 Districts will also be provided with Internet capable devices (iPads, Droids, laptops) so students without a device can use a "loaner", if necessary. The extended coverage Verizon intends to provide will not only make the bus routes better enabled for connectivity, but it also provides community members located along those same routes with Internet connectivity that they do not have today. In addition, county emergency personnel (police, fire, EMS) will also be better served by this expanded infrastructure. The PerPro CDS will enable all users to access their individualized content through the expanded delivery model that Verizon Wireless Services will provide.

**c. Discuss why and how you expect your innovation / product to create a significant social benefit.**

The significant social benefit will be improving community interactions, communications and knowledge via increased access to personalized information utilizing a content delivery system and Wi-Fi that will open up a world of opportunity to over 50% of the populations that have not had access to Wi-Fi. Through the CDS, students will have all their educational and personal enrichment resources at their fingertips. For the first time, students will have access to educational opportunities outside of their community. Through the CDS student can join educational forums, do homework on the bus or while traveling on a plane to visit their grandparents. The CDS connects students to their school community in a fun, yet educational way that will enhance academic performance.

Adding towers to areas that currently do not have access to Internet services and upgrading the existing towers to 4G will introduce the world this rural community. Teachers would love to unitize technology, but do not, because half of their class would be unable to participate in the lesson outside of school. Once Wi-Fi is available teacher can expand their lessons and curriculum to offer greater learning opportunities. For instance, while doing a project on India, the student can do a web search on India and instantly pull up information on the country, its people and culture. Students can view pictures and video to see the country. Teachers can assign a reading activity from an author from India utilizing eBooks. This type of instant access brings the county of India into the classroom.

The Internet has the ability to create global connections, which have previously not been available in rural communities. Advanced students can participate in an accelerated calculus class that is being offered at Harvard. A group of students wanting to study French,

calculus class that is being offered at Harvard. A group of students wanting to study French, can do so with a French teacher living in the next county. Teachers can now have "Skype pals" instead of "pen pals". While studying Mexico, students can connect in real time with students in Mexico studying America. The global connections and social benefits of the Internet are endless.

The Internet creates new ways for residents (and schools) to communicate, congregate, and share information (social and emergency). There is instant messenger, email, Skype, VoIP services, video conferencing, and social networking. Many of these are increasingly being connected to mobile devices as well to further increase the ease of communication. By having this access to technology, the schools can improve communication with parents and increase parental and community involvement via direct email, websites, eblasts, checking the CDS to view their child's homework assignment and/or their grades.

The delivery of emergency services (police, fire, rescue) will also be transformed through the CDS and expanded Internet coverage. Emergency personnel through the use of tablets can send real-time images back to a command center, providing a firsthand look at the incident. This can provide leadership in the emergency operations center a view on the scene they wouldn't normally have, providing the best information possible. Tablets can also be used to transmit real-time images and video of patients to doctors in hospitals who can make advanced preparations on care decisions before the patient arrives in the emergency department. The social benefit is the protecting the community and saving lives.

Everyday, the Internet expands by the social, educational, political, and economic activities of people all over the world. Through the Internet there are no geographical separation and there are no borders. The community can participate and contribute to the world drawing on their experiences and resources. In cyberspace actions and reactions are essentially instantaneous, and this is why the Internet is so gratifying and attractive. Bringing this to rural communities will literally be giving its residents the world.

**d. describe what makes your innovation or product different from solutions or technologies currently available in the market.**

The proposed project will provide significant contributions towards advancing the knowledge base on effective use of technology in rural school communities. The PerPro CDS project is **innovative from other technologies in the market** in the development and implementation of a content DELIVERY system, where others in the market are only doing pieces of what it take to put the whole system together, i.e. content management systems. The PerPro CDS will allow any Internet enabled device to receive individualized content with one sign in at any location.

The CDS provides a technology delivery system that supplies each user a customized suite of services and resources from any connection point. It is a singular hub for students, teachers, parents, administrators, and other community members to access school-related

information such as emergency alerts and other real-time notifications, building maps and directions, school calendars and class schedules, and student learning resources. The PerPro CDS is unique in that the application allows a home page for a singular log in to each user's electronic resources. Specifically for students, vast student curriculum will be available for individualized learning. This will allow the student to have one sign in to all of their electronic resources that is device agnostic. Delivery is not tied to the device, but rather to the user no matter where they are located.

Another unique concept is Wi-Fi enablement of the school buses, with security limited content, that will allow students connectivity during long bus rides to/from school or extracurricular events. Often times, students may ride the bus for up to 1.5 hours one-way to/from school and athletic events. The bus becomes available as another "location of content delivery".

Another innovative component is the impact that increased Internet accessibility has on rural student achievement. The project will provide a unique rural perspective on the development of a content delivery system that provides access to learning when and where students need it, i.e. school, home, school bus, library, while traveling, etc. Each stage of the project will involve detailed data collection and documentation so that products, processes, or strategies, as well as lessons learned, are available for broad dissemination.

**5. Describe who will buy this product or service, and discuss the potential market size. Provide an economic analysis of the solution.**

While the market potential for this project is wide spread, for the purposes of this discussion we have narrowed the focus to public schools. It does have potential use for universities, community colleges, private schools, alternative education sites, and EMS services nationwide. However; we do think it will be of particular interest to rural areas where accessibility via cellular networks (3G and/or 4G) may be more prominent that access via traditional Wi-Fi networks.

Assumptions:

We used local information to determine assumptions. In our area about 40% of the population does not currently have access to 3G or 4G connectivity. This percentage varies widely throughout the country, but we feel it is reasonable to assume that rural areas have similar levels of connectivity. The cost to install 4G antennas on existing communication towers is approximately $100,000 per tower. For our service area we would need four towers to provide reasonably full area coverage.

During the 2010-2011 school year there were 17,911[10] public school districts in the country serving 49.4 million students[11]. Rural districts accounted for 7,730 of all districts and

[10] (Patrick Keaton, National Center for Education Statistics, 2012)
[11] (Patrick Keaton, National Center for Education Statistics, 2012)
[12] (National Center for Education Statistics, 2012)
[13] (National Center for Education Statistics, 2012)

[redacted]

12.03 million of all students.[12],[13] With the heavy emphasis on reinventing education through technology to accurately assess student progress, make learning available anywhere and anytime, provide for learning differentiation, and create learning opportunities outside of the classroom, the PerPro CDS has significant potential for all districts. For this analysis however, we assumed that 60% of districts would adopt a similar technology in their communities if it were available.

While no current, equitable solution exists, we surveyed potential models available through Cisco and estimate that a non-customized solution purchase cost would approximately be $500,000 per district. For a district to fully develop their own solution, we estimate the cost in labor and software to be approximately $650,000 per district. This is dependent upon an individual district having this level of expertise in house however and being able to devote the staff to work on the project full-time for at least 3 year. Also, many districts may not have the internal IT infrastructure needed to provide Quality of Service (QOS) consistently. These districts would have to devote significant resources to upgrading equipment and expanding their network capacity. Areas with Board of Cooperative Education Services (BOCES) or Educational Service Centers (ESCs) would be more likely to adopt the technology as their BOCES or ESC could provide significant IT infrastructure and staff support. Areas without such agencies may form cooperatives or work with state universities to effectively provide the type of infrastructure needed and yet remain cost effective.

The National Telecommunications and Information Administration estimated that there are more than 1.9 million rural households with children under the age of 18 without high speed Internet access at home[14]. We assumed that 70% of these households would purchase a 3G or 4G family cellular access plan if they had a child in a district participating in the program. This represents a potential 803,880.00 household data plans and, assuming at least two devices per home, 1,607,760 data enabled devices. There is potential for this number to be higher as some households with high speed at home would also add a data plan if it meant they could have solid 3G and 4G access throughout their county. With more than 12 million students enrolled in rural public schools, a potential 7.2 million could be in districts implementing our solution. Discounting 2 million students who may be included in the households discussed above, we assume that 30% of the remaining rural students, or 2.8 million, would purchase a data plan. In total then we would expect more than 4.3 million devices to become data enabled.

The original development, testing, and deployment would take place over 3 year(s) at a cost of $1,955,976.00. This includes personnel costs for coding the system, installing routers on 200 buses (personnel and equipment cost of two routers per bus at $500 per router) in the test area, hardware infrastructure, yearly BOCES service fee for pilot districts, a monthly Verizon fee of $39.99 per bus, and staff time to test, refine, and create iterations of the code until it is market ready. It also includes creating documentation and user manuals needed for replication at other sites.

[14] (Office of Policy Analysis and Development, NTIA, 2012)

[redacted]

For the project to become effective of course, 3G and 4G coverage needs to be extended. In many areas existing telecommunications towers could have a Verizon antennae added at the cost of $100,000 per tower. To cover our service area we would need four antennae for a total of $400,000 dollars. This would be a one time cost but is being used as part of the overall software development cost to calculate a potential selling price of the software.

Based upon the above development cost, the high barriers to entry for competitive products or for schools to create themselves, and the upcoming need, we anticipate that 60% of the rural districts would be willing and able to purchase the product and that more than 4.3 million devices would be added. Based upon publicly available data, we assume the average household without current high speed access would adopt a plan of $70 per month while those with home access would adopt plans of $150 per month. Districts would assume monthly plans of $39.99 per bus with an average of 100 buses per district. Based on our assumptions 4,368 districts would participate.

Using the assumptions above we calculate that the total revenue from selling the system to rural school districts to be $9,276,000.00 with a total profit of $6,908,072.00 Verizon's potential data plan sales revenue, including sales to districts and families to be $5,875,547,544.00 annually after deployment of 4,368 systems. Assuming that two new antennae will be needed per district (some districts share a county and may need fewer while some cover disperse areas and may need more), there will be a first year profit of **5,001,947,544.00** with a five year net profit of **$22,628,590,176.00** This profit does not include potential other sales of service to businesses, families without children, individual households and community agencies who would benefit from expanded cellular coverage. It also does not consider sales from those switching from another carrier to take advantage of full area coverage.

Furthermore, it should be noted that the project has significant job creation potential, by creating opportunities within Verizon, potentially creating a software development company, creating tech support and custom modification opportunities and expanding the potential economic base in impacted communities by increasing the technology infrastructure.