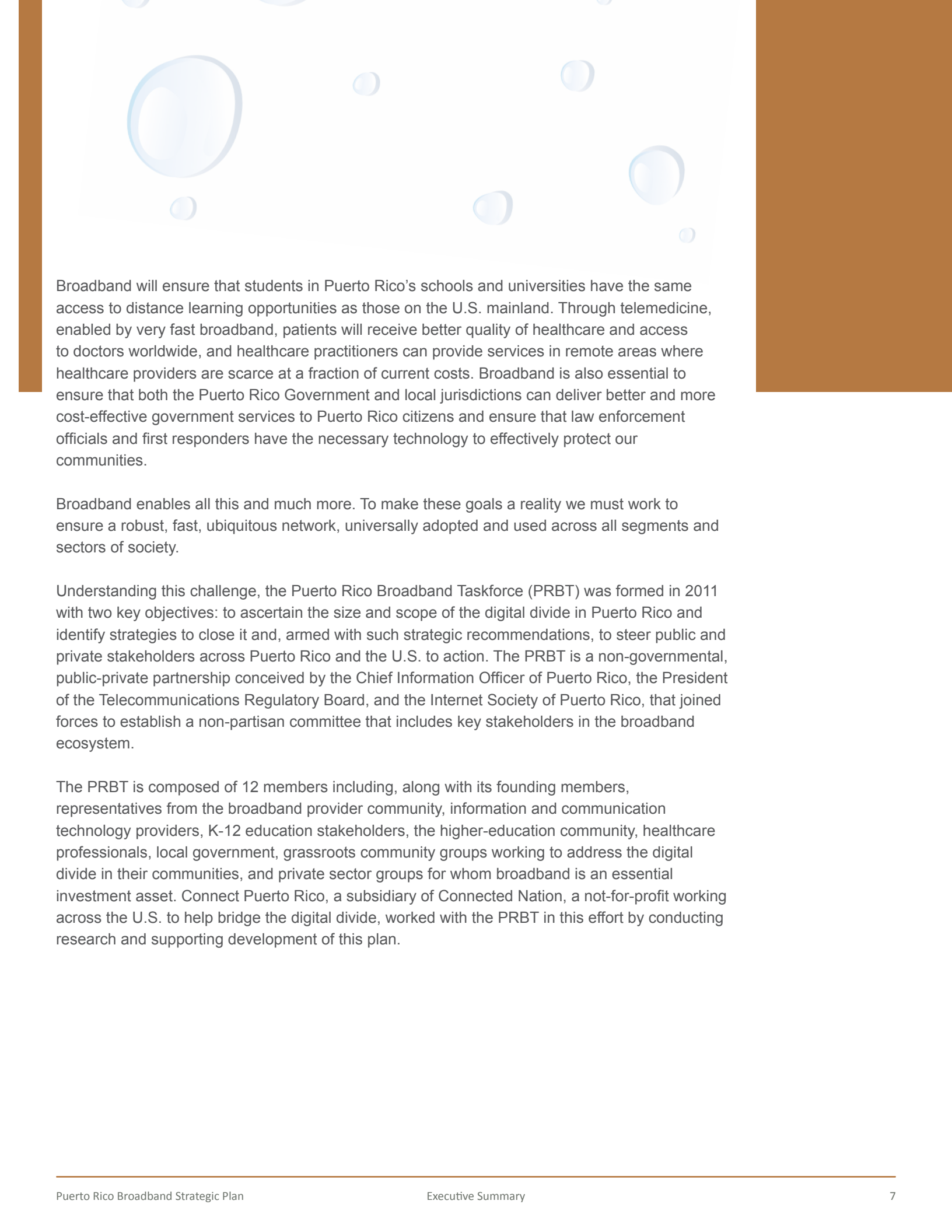




# Executive Summary

In today's global economy, broadband, or high-speed Internet, is an essential infrastructure asset for social inclusion, economic competitiveness, and sustainability. Policy makers around the world have recognized this and are working to close the digital divide by promoting access to high-speed broadband infrastructure, universal adoption of the technology across all segments of society, and increased utilization across key strategic sectors, such as education, healthcare, and the provision of government services. Broadband is the great infrastructure challenge of our time, and ensuring universal access, adoption, and utilization is essential to maintain a vibrant and competitive economy and society.

The impact of broadband technology is perhaps nowhere more acute than in an island economy such as Puerto Rico. As Puerto Rico makes gradual recovery from the current economic downturn, a robust, ubiquitous, fast broadband infrastructure is essential to attract foreign direct investment that will generate the jobs and opportunities needed to sustain Puerto Rico's competitiveness; it is essential for companies to efficiently interact with their business peers and reach existing customers and new markets; it is essential to ensure that professionals have access to remote jobs and training opportunities previously beyond their reach; and it is essential to ensure that students can access educational resources beyond the confines of their schools, universities, or neighborhoods.



Broadband will ensure that students in Puerto Rico's schools and universities have the same access to distance learning opportunities as those on the U.S. mainland. Through telemedicine, enabled by very fast broadband, patients will receive better quality of healthcare and access to doctors worldwide, and healthcare practitioners can provide services in remote areas where healthcare providers are scarce at a fraction of current costs. Broadband is also essential to ensure that both the Puerto Rico Government and local jurisdictions can deliver better and more cost-effective government services to Puerto Rico citizens and ensure that law enforcement officials and first responders have the necessary technology to effectively protect our communities.

Broadband enables all this and much more. To make these goals a reality we must work to ensure a robust, fast, ubiquitous network, universally adopted and used across all segments and sectors of society.

Understanding this challenge, the Puerto Rico Broadband Taskforce (PRBT) was formed in 2011 with two key objectives: to ascertain the size and scope of the digital divide in Puerto Rico and identify strategies to close it and, armed with such strategic recommendations, to steer public and private stakeholders across Puerto Rico and the U.S. to action. The PRBT is a non-governmental, public-private partnership conceived by the Chief Information Officer of Puerto Rico, the President of the Telecommunications Regulatory Board, and the Internet Society of Puerto Rico, that joined forces to establish a non-partisan committee that includes key stakeholders in the broadband ecosystem.

The PRBT is composed of 12 members including, along with its founding members, representatives from the broadband provider community, information and communication technology providers, K-12 education stakeholders, the higher-education community, healthcare professionals, local government, grassroots community groups working to address the digital divide in their communities, and private sector groups for whom broadband is an essential investment asset. Connect Puerto Rico, a subsidiary of Connected Nation, a not-for-profit working across the U.S. to help bridge the digital divide, worked with the PRBT in this effort by conducting research and supporting development of this plan.

The first goal of the PRBT was the completion of a Broadband Strategic Plan. The PRBT adopted a holistic approach in this Strategic Plan, addressing both demand- and supply-side challenges with three inter-related policy goals:

- **Access** - Ensuring subsequent waves of investment in infrastructure deployment to meet the increasing demand for broadband capacity by all citizens, businesses, government, and community anchor institutions.
- **Adoption** – Ensuring universal adoption and penetration of broadband services – either mobile or fixed - by all citizens, and businesses.
- **Utilization** – Ensuring that all communities – particularly community anchor institutions such as schools, hospitals, and clinics – are increasingly using broadband technology to pursue economic opportunity and sustainability, improve government services, and leverage educational and e-Health resources.

The Strategic Plan adopts a series of goals for each of these areas and recommendations for actionable strategies designed to achieve them. A comprehensive list of these goals and recommendations can be found following this Executive Summary.

The first step in this process was a thorough assessment of the size and scope of the digital divide across Puerto Rico. To accomplish this, the Office of the CIO of Puerto Rico, armed with American Recovery and Reinvestment Act funding obtained through the Department of Commerce for this purpose, commissioned an ongoing mapping initiative to develop an inventory of available broadband infrastructure across the island, as well as research to survey and analyze adoption and usage trends across the residential and business sectors in Puerto Rico. By focusing on both the supply, or infrastructure gap, and demand, or adoption and usage gap, this research has revealed the scope and nature of the digital divide across Puerto Rico.



## ACCESS

According to Connect Puerto Rico's broadband inventory, by June 2011, 86% of households across Puerto Rico had access to broadband from at least one fixed broadband provider at speeds of at least 768 Kbps download (DL)/200 Kbps upload (UL). This implies that approximately 14% of households, typically located in more rural parts of the island, remain without any form of fixed broadband service. In contrast, the Department of Commerce's National Broadband Map indicates that, in total, 95% of U.S. households are served by broadband at these speeds. This dire lag of broadband infrastructure investment remains a critical barrier to advancing Puerto Rico's economic competitiveness.

The broadband gap in Puerto Rico at higher capacity speeds is even more acute. By June 2011, only 57% of Puerto Rico households had access to broadband at speeds of 3 Mbps DL/768 Kbps UL, and only 32% of households had access to broadband at speeds of 10 Mbps DL/768 Kbps UL. Such speeds and more are necessary to sustain many services increasingly demanded by business and residential customers, such as two-way video conferencing. This capacity lag is an acute danger for the economic and social future of Puerto Rico. This investment lag is driven by lagging demand for the service, resulting in lower expected revenues, high cost of build-out, and high cost of operation maintenance. All of these factors affect business plans and slow investment. To help overcome this gap, this Strategic Plan set a series of infrastructure and capacity goals across both urban and rural areas of Puerto Rico. At the most basic level, the Strategic Plan sets a goal of 98% of all households served by broadband at actual speeds of at least 4 Mbps DL/1 Mbps UL by 2015. A comprehensive list of all capacity goals follows this Executive Summary.

For these capacity goals to be reached, we must promote competition and continued investment in infrastructure. Thus, this Strategic Plan also assesses the key barriers to investment and recommends a series of strategies to improve profitability and encourage build-out. Recommendations fall into three categories: i) stimulate lagging demand to improve the business case for broadband deployment; ii) lower unnecessarily high costs associated with broadband build-out and maintenance, including streamlining construction permitting or pole attachment processes; iii) streamline the regulatory process and continue promoting fair competition and market entry. The Strategic Plan also assesses the role of Federal programs impacting the Puerto Rico broadband market and recommends close collaboration of Puerto Rico stakeholders with the Federal Communications Commission to jointly work to address the acute digital divide on the island.



## ADOPTION

Residential survey research conducted by Connect Puerto Rico reveals an acute lag in broadband adoption across the island. Although 86% of Puerto Rican households have access to broadband, in 2010, only 31% subscribed, implying an adoption gap in Puerto Rico of 55%; in other words, more than one-half of Puerto Ricans have basic broadband service available but are choosing not to subscribe. In comparison, data collected in 2010 by the National Telecommunications and Information Administration indicated that 68% of U.S. households subscribed to broadband service. The mobile broadband adoption gap is also acute, as only 27% of Puerto Rico residents reported accessing mobile broadband service in 2010; which is significantly lower than the 59% U.S. average.

Across Puerto Rico, broadband non-adopters are generally people of low-income, senior citizens, and/or people with less education. These trends mirror demographic patterns across the U.S., however, the adoption gap in Puerto Rico for each of these groups is more acute. While across Puerto Rico broadband adoption is 31%, the broadband adoption rate is 5% among adults 65 and older; 7% among residents without a high school diploma; and 15% among households with annual incomes below \$15,000. The top barriers to broadband adoption in Puerto Rico include: relevance of the online experience to non-adopters (a lack of value proposition); affordability of the broadband service and access technology; and lack of computer ownership and digital literacy (or knowledge of how to use the technology).

The PRBT believes that it is imperative to address barriers to broadband adoption. Failure to do so would increase the gap between the haves and have-nots across Puerto Rico, creating an Internet underclass at risk of being left behind, resulting in a longstanding, significant, and detrimental social impact. Furthermore, for our collective economy, a broadband adoption gap would limit Puerto Rico's ability to develop sustainable economic models that fully leverage our unique position as an insular bridge between the U.S. and the Caribbean and Latin America and beyond. Moreover, because of the economies of scale and density of broadband networks, particularly high-capacity fiber optic networks, low levels of broadband adoption and use increases the cost per-subscriber for providers, weakening the business case for continued deployment in broadband capacity and infrastructure.



This Strategic Plan sets aggressive goals for rapid expansion of broadband adoption across Puerto Rico, including residential home broadband adoption of at least 50% by 2013 and at least 70% by 2015. To meet this challenge, a series of recommendations are proposed including: aggressive expansion of digital literacy programs targeted to vulnerable communities, particularly those of lower income; such efforts should be conducted in partnership with existing non-profit institutions already working to bridge the digital divide and leverage the K-12 system; promotion of mobile broadband as a lower cost and technically easier to use technology that can serve as an effective point of entry into the online, digital world by non-users; aggressive expansion of public computing centers across the island and expansion of digital literacy programs in these centers; a public-private partnership to develop targeted awareness campaigns regarding the benefits of the online interaction for both personal use and small business enterprises; and strategies to address the affordability challenge and to expand computer or other end-user device and subscription penetration across Puerto Rico.

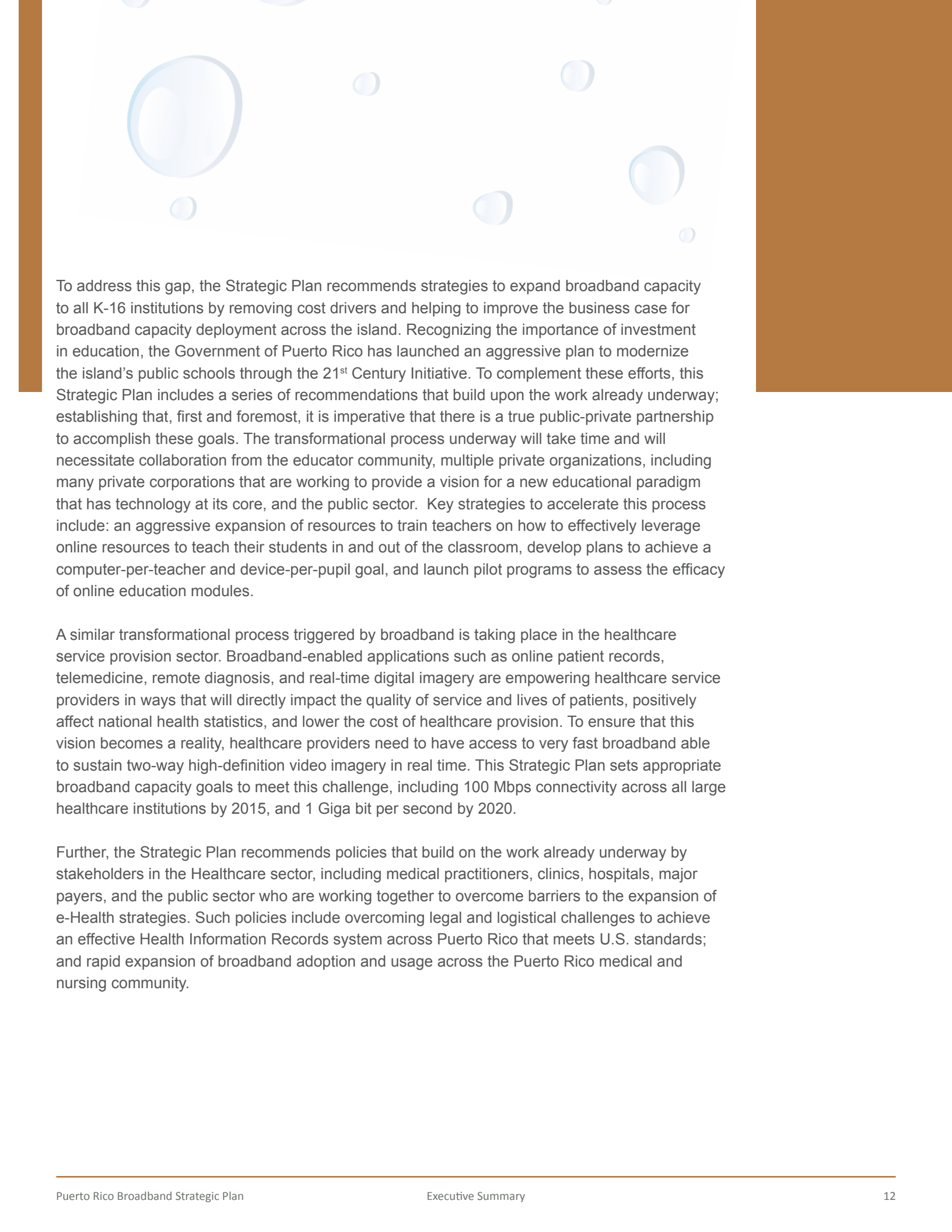
## UTILIZATION – EDUCATION AND e-HEALTH

Promoting access and adoption of broadband service is a key objective of the Strategic Plan. The job would be incomplete, however, if we failed to address the utilization challenge. An effective broadband strategy needs to ensure the growth of broadband-enabled technology and solutions across key business sectors, in particular, the Education and Healthcare sectors.

Online educational resources for teachers and students are already transforming the way children learn and teachers teach, empowering schools with a plethora of resources previously unattainable. However, this transformation needs proper steering and coordination to ensure that students and teachers have appropriate online educational content, appropriate content standards and means to protect students from online risks, and new curricula adapted to these new resources. Furthermore, teachers need to be trained to ensure that they not only know how to use a computer and can access this new wealth of information, but also understand how to leverage those resources to effectively steer their pupils along their educational development. Importantly, to enable all this, educational institutions need to have extremely fast (hundreds of megabits per second or more) broadband available to accommodate simultaneous use of online resources by teachers, administrators, and their students.

This Strategic Plan sets ambitious goals for broadband capacity and use across the K-16 system in Puerto Rico, including capacity of at least 100 Mbps by 2015 and 1 Giga bit per second by 2020. Data from the Puerto Rico Department of Education reveals a maximum contracted capacity across Puerto Rico public schools of 1.5 Mbps in 2011, indicating a vast gap to meet the established education capacity goals by the due dates.

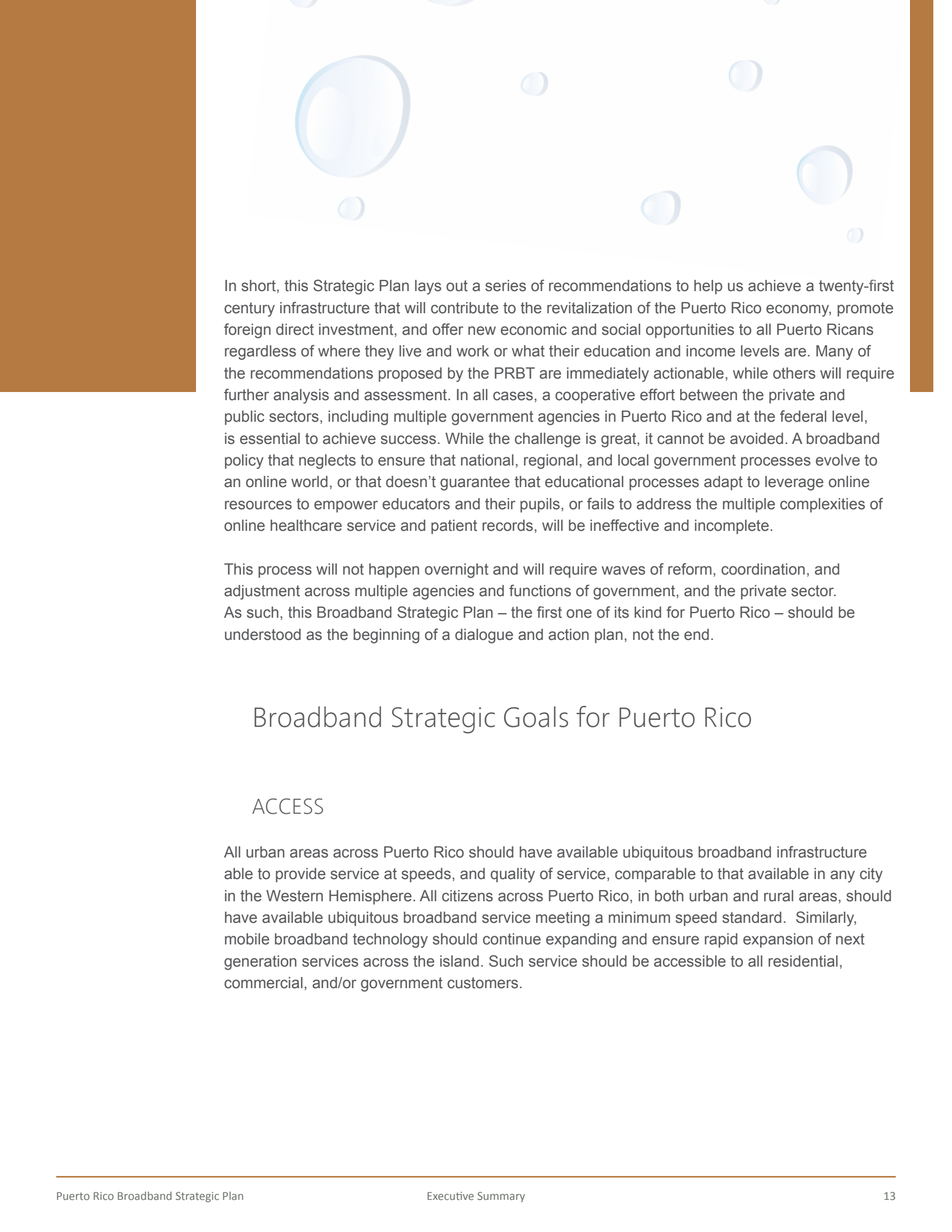




To address this gap, the Strategic Plan recommends strategies to expand broadband capacity to all K-16 institutions by removing cost drivers and helping to improve the business case for broadband capacity deployment across the island. Recognizing the importance of investment in education, the Government of Puerto Rico has launched an aggressive plan to modernize the island's public schools through the 21<sup>st</sup> Century Initiative. To complement these efforts, this Strategic Plan includes a series of recommendations that build upon the work already underway; establishing that, first and foremost, it is imperative that there is a true public-private partnership to accomplish these goals. The transformational process underway will take time and will necessitate collaboration from the educator community, multiple private organizations, including many private corporations that are working to provide a vision for a new educational paradigm that has technology at its core, and the public sector. Key strategies to accelerate this process include: an aggressive expansion of resources to train teachers on how to effectively leverage online resources to teach their students in and out of the classroom, develop plans to achieve a computer-per-teacher and device-per-pupil goal, and launch pilot programs to assess the efficacy of online education modules.

A similar transformational process triggered by broadband is taking place in the healthcare service provision sector. Broadband-enabled applications such as online patient records, telemedicine, remote diagnosis, and real-time digital imagery are empowering healthcare service providers in ways that will directly impact the quality of service and lives of patients, positively affect national health statistics, and lower the cost of healthcare provision. To ensure that this vision becomes a reality, healthcare providers need to have access to very fast broadband able to sustain two-way high-definition video imagery in real time. This Strategic Plan sets appropriate broadband capacity goals to meet this challenge, including 100 Mbps connectivity across all large healthcare institutions by 2015, and 1 Giga bit per second by 2020.

Further, the Strategic Plan recommends policies that build on the work already underway by stakeholders in the Healthcare sector, including medical practitioners, clinics, hospitals, major payers, and the public sector who are working together to overcome barriers to the expansion of e-Health strategies. Such policies include overcoming legal and logistical challenges to achieve an effective Health Information Records system across Puerto Rico that meets U.S. standards; and rapid expansion of broadband adoption and usage across the Puerto Rico medical and nursing community.



In short, this Strategic Plan lays out a series of recommendations to help us achieve a twenty-first century infrastructure that will contribute to the revitalization of the Puerto Rico economy, promote foreign direct investment, and offer new economic and social opportunities to all Puerto Ricans regardless of where they live and work or what their education and income levels are. Many of the recommendations proposed by the PRBT are immediately actionable, while others will require further analysis and assessment. In all cases, a cooperative effort between the private and public sectors, including multiple government agencies in Puerto Rico and at the federal level, is essential to achieve success. While the challenge is great, it cannot be avoided. A broadband policy that neglects to ensure that national, regional, and local government processes evolve to an online world, or that doesn't guarantee that educational processes adapt to leverage online resources to empower educators and their pupils, or fails to address the multiple complexities of online healthcare service and patient records, will be ineffective and incomplete.

This process will not happen overnight and will require waves of reform, coordination, and adjustment across multiple agencies and functions of government, and the private sector. As such, this Broadband Strategic Plan – the first one of its kind for Puerto Rico – should be understood as the beginning of a dialogue and action plan, not the end.

## Broadband Strategic Goals for Puerto Rico

### ACCESS

All urban areas across Puerto Rico should have available ubiquitous broadband infrastructure able to provide service at speeds, and quality of service, comparable to that available in any city in the Western Hemisphere. All citizens across Puerto Rico, in both urban and rural areas, should have available ubiquitous broadband service meeting a minimum speed standard. Similarly, mobile broadband technology should continue expanding and ensure rapid expansion of next generation services across the island. Such service should be accessible to all residential, commercial, and/or government customers.



### **Fixed Broadband Capacity Goals:**

- By 2015, 98% of all households should have broadband available at actual minimum speeds of 4 Mbps download (DL)/1 Mbps upload (UL) at affordable prices to allow for at-home web 2.0 service offerings such as one-way video streaming applications and two-way video conference and collaboration applications.
- By 2015, all urban locations and 50% of all rural and remote areas should have access to broadband actual speeds of at least 10 Mbps DL/3 Mbps UL at affordable prices; 70% of urban locations should have access to at least 25 Mbps DL/10 Mbps UL, and 50% of urban locations should have access to at least 50 Mbps DL/10 Mbps UL.
- By 2015, across the island the average capacity available across all fixed broadband service offerings, provided through wireline or fixed-wireless networks, should be no less than 6 Mbps download speeds.
- By 2020, at least 85% of all customers should have access to at least 100 Mbps DL/50 Mbps UL.
- By 2015, average latency for IP traffic which originates and terminates in Puerto Rico should be no greater than 20 milliseconds; average latency for IP traffic which originates in Puerto Rico and terminates in the southeast coast of the U.S. mainland should be no greater than 90 milliseconds.

### **Mobile Broadband Capacity Goals:**

- Mobile broadband offerings at next generation speeds will be available across at least 98% of the island's geography where the population resides by 2015. Expansion of smart phone penetration and tablet end-user devices will be promoted.

### **Connectivity Across Community Anchor Institutions:**

- By 2015, higher education, K-12 schools, and healthcare institutions across all urban and rural areas should have access to 100 Mbps DL/25 Mbps UL speeds to sustain virtual community learning and telemedicine.
- By 2020, higher education, K-12 schools, and healthcare institutions across all urban and rural areas should have access to 1 Gbps speeds to sustain virtual community learning and telemedicine.



### **Broadband Submarine and Backhaul Network Security:**

- Puerto Rico broadband providers and local and national government officials will work together to derive a plan to improve the security, robustness, and redundancy of the backhaul broadband infrastructure across the island. Particular emphasis will focus on the security standards of alternative submarine cables, and strategies to encourage the underground construction of backhaul infrastructure across the island.
- A more robust backhaul and underwater cable infrastructure will support the expansion of Puerto Rico as a telecommunications and data hub for the Hemisphere.

### **Competition across the Broadband Service Market:**

- By 2015, 98% of Puerto Ricans will have at least three competitive broadband offerings available.

## ADOPTION

All Puerto Ricans, regardless of income, race, gender, age or location, should have access and the willingness to partake and benefit from the online opportunities available through broadband.

- By 2013, residential home broadband adoption across Puerto Rico should be at least 50% and by 2015 at least 70%.
- By 2015, adoption of broadband by all business with more than 4 employees.
- By 2015, 90% of the Puerto Rico population should have access to a broadband enabled computer or other mobile devices, either at home, work or via personal connection.

## EDUCATION

- All K-16 institutions will have sufficient broadband capacity available to sustain always-on learning opportunities in every school, teacher's and administrator's office, classroom, and on each student's desk and backpack.
  - To enable this vision, every K-16 institution should have access to 100 Mbps speed by 2015 and 1 Gbps speed by 2020.
- All students will have the means to access always-on online learning opportunities in and outside of the classroom. To enable this vision, all students will need to have wireless devices that are fast, robust, and safe and that can support the student's learning experience beyond the classroom.
- A technology curriculum will be developed for every stage of the K-16 learning experience that is adjusted to the changing technology environment and ensures students are developing the necessary IT-literacy skills to fully leverage online resources in a safe environment.
- Continued development of a teaching work force that has the necessary skills to fully leverage broadband and IT technology in and outside of the classroom.

## e-HEALTH

All Puerto Rican healthcare providers and patients should have access to broadband that meets the capacity, latency, and quality of service specifications necessary to utilize healthcare information technology and provide telemedicine services effectively.

- By 2015, create a nationwide e-care network that will ensure interconnectivity between all stakeholders, including patients, healthcare providers, and payers – public and private.
- By 2015, ensure broadband network capacity available to healthcare providers:
  - 4 Mbps to all healthcare providers
  - 10 Mbps to nursing homes and rural healthcare providers
  - 25 Mbps to clinics and large physician practices (5-25 physicians)
  - 100 Mbps to hospitals
- By 2020, ensure 1 Gbps to academic and large medical centers



## STRATEGIC RECOMMENDATIONS TO EXPAND BROADBAND ACROSS PUERTO RICO

### ACCESS

- Puerto Rico should continue to collect and analyze data on broadband infrastructure availability, capacity, and competition over the next decade to assess progress in meeting the Strategic Plan's goals.
- Puerto Rico's public and private broadband stakeholders should work collaboratively with the FCC to ensure fair and effective allocation of subsidies to unserved areas in Puerto Rico. In particular, models determining the size of subsidies needed to achieve sustainable broadband business plans across Puerto Rico should be based on the economic realities of Puerto Rico, including levels of broadband demand half those expected elsewhere across the U.S.
- All broadband providers should collaborate with Connect Puerto Rico to ensure that broadband inventory data collected under the SBI grant program and used by the FCC to determine the Connect America Fund transition is comprehensive and accurate.
- Public and private broadband stakeholders in Puerto Rico should work collaboratively to reform the Puerto Rico Service Fund (PRUSF) to support the deployment of broadband in unserved areas and ensure that the PRUSF complements the FCC's new Connect America Fund program.
- To encourage sustainable investment in network build-out, Puerto Rico must aggressively implement strategies to promote broadband adoption across vulnerable populations, whether residing in rural or urban areas.
- Streamline the regulatory process to promote network investment and increase competition in the broadband sector.
- The legislative and executive branches, as well as the Junta Reglamentadora de Telecomunicaciones, should work to ensure that government assets critical to the broadband market are effectively contributing to the expansion of the market in a fair and competitively neutral way. The Government and regulatory agency should be vigilant of anti-competitive activity blocking market expansion and increased capital investment in broadband capacity across Puerto Rico.
- Promote island-wide and municipal planning and coordination of construction projects.
- Continue streamlining the construction permit process and Right of Way (RoW) approvals process in order to ensure lower costs of infrastructure build-out and processing timeframes.
- Institute legislation that will encourage "Dig Once" policies for all future transportation and civil engineering construction projects.

- Institute legislation that ensures competitively neutral access to colocation infrastructure in public buildings.
- Reduce uncertainty of future costs by encouraging implementation of tax and fee policies by state and municipal government aimed to attract investment and encourage broadband network build-out.
- Establish low and uniform pole attachment rental rates and efficient processes.
- To achieve this goal, establish the formation of a taskforce to evaluate pole attachment costs across the island and work to improve efficiency of pole attachment processes.
- Promote local network interconnection and peering to lower the cost of backhaul traffic in Puerto Rico.
- Create minimum service level requirements for broadband providers serving local government agencies and entities.
- Institute Legislation to amend Act No. 73 of May 28, 2008, to include companies which operate and deploy broadband networks in Puerto Rico.
- Institute legislation for the establishment of public-private partnerships (PPP) for the exclusive purpose of designing, building, and operating a fully-passive fiber optic network to the premise in currently unserved areas for wholesale use by any *bona fide* telecommunications or broadband provider.
- Continue implementing policies aimed to stabilize the price of energy across the island.
- Improve law enforcement efforts to reduce the theft of broadband network infrastructure and reduce service theft.
- Incentivize deployment of fiber networks, thereby reducing reliance on copper networks targeted by thieves.
- Improve the enforcement of existing excavation laws to reduce damages to infrastructure assets and end-user service interruptions.

## ADOPTION

- Expand public computing capacity, digital literacy, and workforce development programs leveraging existing community resources, support from national non-profit organizations, and public institutions such as the University of Puerto Rico campuses.
- Aggressively promote mobile broadband usage, especially among low income and vulnerable populations, as an effective lower-cost and easier to access introduction to online resources.
- Leverage existing online digital literacy curricula.
- Launch targeted public-private awareness campaign promoting the benefits of online resources across vulnerable populations.
- Promote telework across Puerto Rico by revising labor laws and policies hindering its growth, and setting in motion plans to expand teleworking practices through the Puerto Rico government.

- Leverage the presence and value of eGovernment services.
- Accelerate ICT access and use in the K-12 classroom.
- The private sector in partnership with public agencies including the Public Housing Authority, the Special Communities Administration, the Department of Labor, Economic Development and the Department of Family Affairs should work to establish programs offering basic entry broadband service at discounted prices to the most vulnerable citizens in Puerto Rico.
- Work collaboratively with federal agencies to promote broadband adoption among low income populations.

## EDUCATION

- Promote a collaborative effort across government agencies and private stakeholders.
- Leverage the demand for broadband across education institutions to promote competition and investment in broadband services.
- Develop plans to achieve a computer-per-teacher and device-per-pupil goal.
- Ensure K-16 institutions have appropriate legal and procedural frameworks to perform effective network management.
- Expand resources to train the teacher to ensure they are able to fully leverage ICT solutions in the classroom.
- Launch pilot programs to assess the efficacy of online education modules.

## e-HEALTH

- Continue to promote build-out of very high-speed Internet to all healthcare institutions and practitioner's offices.
- Continue ongoing efforts to document information regarding broadband service capacity used by healthcare providers across Puerto Rico.
- Reinforce public-private partnerships to overcome governmental barriers to Health IT expansion