Broadband *in Washington*

2013
Annual Report

Washington State Broadband Office

Washington State
Department of Commerce
Brian Bonlender, Director

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Washington State
Broadband
Office

January 14, 2014

This is the fourth and final legislative report of the Broadband Office under the State Broadband Initiative of the American Recovery and Reinvestment Act (ARRA). As envisioned by the Legislature, the program has successfully mapped the availability of broadband across the state with the strong and consistent support of the National Telecommunications and Information Administration (NTIA), the U.S. Department of Agriculture's Rural Development, the state's diverse community of providers, local governments and community groups across the state, the Utilities and Transportation Commission, and the Office of the Chief Information Officer.

In addition to mapping, we have launched and will soon complete significant initiatives that have created local technology planning teams in nine areas of the state, launched the first public-sector apps contest in Washington, brought apps-oriented STEM options to students and teachers across the state, and developed capacity in state agencies to understand and promote broadband as an element of economic development.

The Federal Communications Commission has agreed to continue the mapping of broadband across the country using methodology developed by the states and NTIA at no expense to the states. Civic apps and STEM-oriented software efforts begun through which program have found support among the state's urban tech communities and also are likely to continue.

During its tenure the Broadband Office also has built strong partnerships with nonprofits, businesses, city and county governments, other state agencies, and across multiple divisions and programs at the Department of Commerce. Those partnerships have contributed to extraordinary changes in the broadband ecosystem in Washington as outlined in this report. As a state intimately connected with the digital economy, Washington will need to continue to strive for better access in communities that are most difficult to serve; and for better use of the networks available to deliver meaningful value through education, engagement and innovation.

The know-how and relationships of the Broadband Office will be passed on to other Department of Commerce programs and to the tech sector through the new Information and Communications Technology sector lead position at Commerce. It has been an honor for all of us in the Washington State Broadband Office to be part of this historic effort.

Respectfully,

Wilford Saunders
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Executive Summary

For the broadband ecosystem of Washington State, 2013 was a year of getting up to speed. Most of the major infrastructure projects funded through the American Recovery and Reinvestment Act were completed during the year. The largest of these projects was construction of more than 1,300 miles of "middle mile" fiber optic cable. Middle mile infrastructure usually connects communities at several key spots and the connection to a residence or business is considered "last mile" (for an explanation of broadband terms and technology please see Guide to Terminology and Technology on page 29).

Private investment continued throughout 2013 as well. Large wireline providers Frontier and CenturyLink spent millions on upgrades to existing service and expansion as did the smaller providers who are members of the Washington Independent Telecommunications Association. And the nation's wireless giants Verizon and AT&T expanded their 4G service areas, particularly in Northeastern Washington (see speed comparison maps on page 32 of this report).

Washington's tribal communities also went to work improving access to broadband on tribal lands. In some cases the tribes leveraged their own income sources to set up wireless or fiber networks to connect traditionally unserved or underserved communities to the Internet. The Confederated Tribes of the Colville Reservation used United States Department of Agriculture (USDA) Community Connect funds to install more fiber and will improve the network's redundancy as well as add a public computing center before the project is complete.

The resulting improvement of broadband access across the state is impressive. The National Broadband Map[1] compiles data from all 56 states and territories and includes tools for analysis and ranking of broadband access across the nation. Washington is ranked 22nd in the nation for access at download 3 Mbps or better download (98.9 percent of our state's population has access at this speed tier). However at higher speed tiers we shine, for instance 94 percent of Washingtonians have access to 100 Mbps or better. At that tier we are fourth in the nation, only two slots behind Massachusetts and well ahead of California.

And Washington's own map[2] data analysis shows that more than 450 of Washington's 629 census places (which include incorporated and unincorporated communities) saw an increase in broadband access, broadband speed or both between June of 2012 and June of 2013. For many of these communities it was the second upgrade in speed or coverage in two years as 500 census places saw increases last year.

Ultimately improved broadband service does not by itself create jobs or improve a community's quality of life. The key to improving those statistics lies in adoption or use of broadband's full potential. During 2013, the Washington State Broadband Office continued its work to encourage the realization of broadband's potential, in part through two key initiatives.

- The second year of funding of more than $300,000 in Local Technology Planning Team grants went to six community organizations representing multiple towns, counties and more than a dozen tribal communities. They are engaged in a variety of broadband activities from basic community surveys to hands-on education with iPads.
- The Broadband Office in partnership with the Technology Alliance expanded the scope of its apps contest with activities that engage our education community, including a K-12 Algebra Challenge, the ADA Academy that develops programming skills of adult women, and the first U.S. trial of the Apps for Good program from the United Kingdom.

These efforts help the state head in the right direction. And they build on the momentum of a tech industry sector that is already robust. But they do not ensure a prosperous technology powered future. There are however, policy choices that can help Washington create its own future of innovation.

Encourage and support innovation. Depending on the study you read, Washington ranks fourth or sixth in the nation for venture capital activity – the resources that help fuel start-ups in our state. But our venture capital community is dwarfed by that of California and Massachusetts. State lawmakers have already put some incentives in place to continue the growth of private investment in technology, mostly in the form of tax credits. While state and local governments can't directly invest in private businesses, they can encourage formation of startups through support of hackathons and apps contests such as the Evergreen Apps Challenge, and continued expansion of eGovernment initiatives already in place in large and small jurisdictions across the state.

Workforce of the future. Policy makers can also take a longer view on this most dynamic of industry sectors. Some experts are already warning that thousands of technology jobs are going unfilled and our current educational system is not preparing students with the kinds of science, technology, engineering and math (STEM) skills they will need for the future. Investment in K-12 STEM initiatives, community and vocational college programs, and our state's research institutions might be the most lasting way to ensure our state's continued success in a future of not only technology but also the innovation it enables.

This is the Broadband Office's fourth annual report. Our annual reports are required by legislative mandate to include at least the following information:

- The geographic areas of greatest priority for the deployment of advanced telecommunications infrastructure in the state.
- A detailed explanation of how any amount of funding received from the federal government for the purposes of broadband mapping, deployment, and adoption will be or has been used.
- A determination of how non-federal sources may be utilized to achieve the purposes of broadband mapping, deployment, and adoption activities in the state.

This report also captures a snapshot of our state's broadband ecosystem based on data collected from a number of sources, including the state broadband map, other publicly available data, and studies and analysis conducted within and outside of the Department of Commerce. This report and the Broadband Office itself are a direct result of earlier work done on behalf of the state and the governor. That work includes:

- The report published by the High-Speed Internet Working Group in 2008.
- The report published by the Governor's Broadband Advisory Council in 2009.
- Annual reports of the Broadband Office published in 2010, 2011 and 2012.

Introduction

The story of broadband in 2012 was largely about building. Private and public providers and wholesalers were adding middle and last mile wireline service at a rapid clip and the nation's largest wireless companies were expanding their 4G networks in a contest for fastest network in the state. Broadband in 2013, however, might be more about getting up to speed. Major infrastructure builds were heading to completion and that new robust network made it possible for private providers to offer more bandwidth than ever to their customers. In some cases, such as in Glenwood, 2013 was the year communities went from no providers at all to choosing between as many as three competing companies.

The State of the State's Broadband

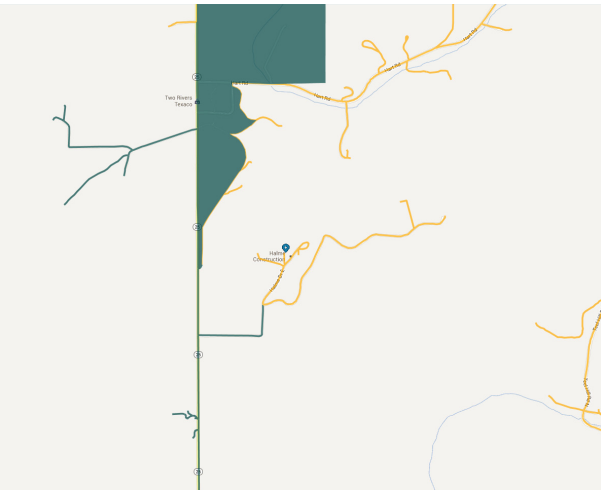
2013: A Year of Getting Up to Speed

Halme Construction, like a lot of Washington's employers, is an Internet-dependent company. Located outside of Davenport in rural Lincoln County, this family-owned business is a second generation construction company. They don't build sheds, they build infrastructure such as water and sewer systems for cities. The company regularly bids on and wins municipal contracts all over Eastern Washington.

But they're increasingly doing so at a disadvantage. The company headquarters are in a large building on the family farm about nine miles out of town. The move consolidated their office space and their maintenance shop.

"One of the biggest issues of our location is technology limitations," said Kevin Halme, chief financial officer for the company. "We are now getting two T-1 lines from a reseller in Seattle."

Wireline Download Speeds



768 Kbps - 3 Mbps 10 - 25 Mbps

And the backup broadband for that technology is Halme's Verizon Wireless 4G coverage (for an explanation of broadband terms and technology please see page 32) which he said is unreliable from their location nine miles north of State Highway 2.

"That's not a business solution," Halme said.

And he is looking for one. The company currently employs about 36 people. Not all of his employees live in Lincoln County but most of them live nearby. And most of them make construction wages between $40,000 and $50,000 a year. Halme would like to keep his business where it is, but he must remain competitive with the other construction companies located in urban areas where they have the benefit of high speed Internet and a broad employment base.

Even with Halme 's limited access, he already uses broadband to respond to requests for proposals that lead to more work. Responses to these requests require lots of documentation and it's not uncommon to send equally data-rich documents, such as blueprints to workers in the field once Halme gets the job. And he anticipates his bandwidth needs will only grow. He would love to have a 100 Mbps connection now if he could get it at a reasonable price. He is looking for a better broadband solution for his business by next spring or they may have to move business closer to Spokane – a loss of 37 jobs in a town of 1,700 people.

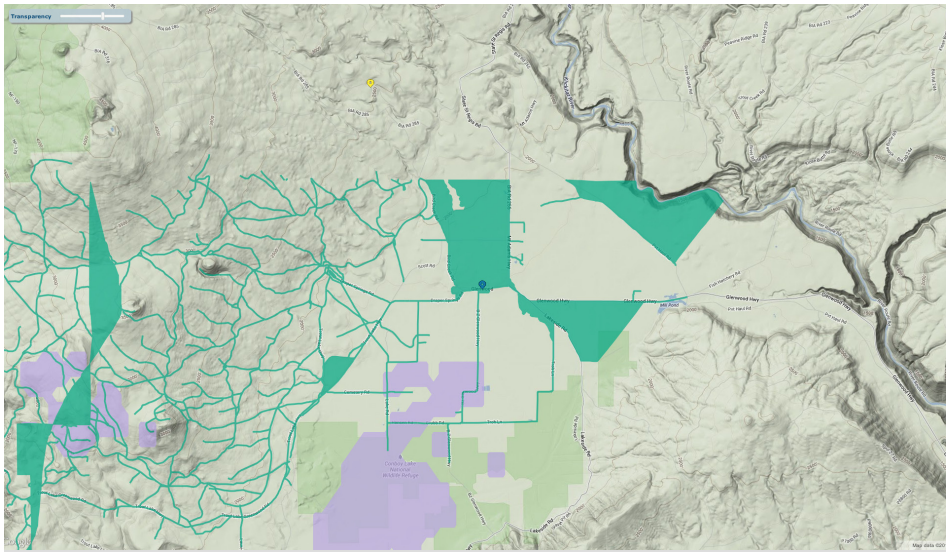
"Halme Construction is one of the largest employers in Lincoln County and the loss of this business, its jobs and the families connected to it would have a devastating impact on the Davenport community," said Margie Hall, director of the Lincoln County Economic Development Council.

Halme Construction's situation is an example of the two challenges still facing the broadband ecosystem in Washington State. Nearly everyone in the state has access to broadband at some level, but growing companies, meaningful distance education, and high-end remote health care will require more bandwidth in many communities in rural Washington. Halme's Spokane competitors' situation is also common: they will face competitors with lower costs who win an edge through efficient digital business tools. In some industries, the competition can use broadband tools to reach the Washington market from the other side of the globe.

Multiple Sources Tell Us We've Improved

In 2013, broadband access across the state continued to improve. In some instances that meant the introduction of broadband where there was none. For instance, Glenwood in southwest Washington celebrated the arrival of broadband after years of serving as a case study for rural areas of the state on the wrong side of the digital divide. Residents, county officials, providers and visiting dignitaries from Australia celebrated the arrival of broadband at a luncheon held at the local grange hall – an appropriate venue for this largely farming community.

Glenwood Download Speeds of 3 Mbps or More



But Glenwood is just one of many areas that showed improved access[3] through analysis of data from the Washington State Broadband Map. The number of households in Washington with no broadband available in their community shrank from 0.38 percent in 2012 to 0.30 percent in 2013. Comparing wireline broadband data, the number of underserved areas (one or two providers and download speeds greater than or equal to 768 kbps, or three or more providers and speeds less than 3 Mbps) also got smaller. In 2012, just over 35 percent of all Washington households qualified as underserved by wireline providers, in 2013 just over 31 percent of the state's households met that definition. This report outlines many of the publicly and privately funded broadband infrastructure build-outs that contribute to these impressive statistics. Even as communities celebrate connectivity, it is important to note that areas of the state are still unserved or underserved with dial-up access when metropolitan communities are asking for 100 Mbps or better service. Experts across the broadband industry predict that demand for bandwidth will only continue to increase with multiple connected devices in the home, the explosion in mobile technology and more data-rich applications in use every day. That means that without continued local, regional, state and national support, these unserved and underserved communities, mostly in areas of difficult topography or with low-density populations, are at serious risk of being left out of the state's digital future.

Federally Funded Projects Near Completion

Some of the improvements to broadband access were the result of projects funded under the Broadband Technology Opportunity Program (BTOP). These federal grants were part of the American Reinvestment and Recovery Act (ARRA) and were administered by the National Telecommunications and Information Agency. All told, Washington recipients received more than $165 million to install broadband middle and last mile infrastructure (mostly fiber optic cable) around the state. The last of the BTOP projects were completed in 2013 and include:

- $140 million to the Northwest Open Access Network (NoaNet), a nonprofit, open-access broadband network formed by several Washington public utility districts. NoaNet's broadband project connected 600 anchor institutions. In 2011, NoaNet broke ground on the construction project with more than 1,300 approved miles of fiber, and completed the project in August of 2013.
- $27.2 million to Pend Oreille Public Utility District for a broadband infrastructure project spanning 740 miles and providing wholesale broadband access to approximately 5,000 households, 360 businesses, and 24 community anchor institutions. The project, like many ARRA projects, was granted an extension until September 30, 2013. The project was substantially complete at the end of September with over 300 customers receiving service.

BTOP wasn't the only ARRA money spent in Washington. The Broadband Initiatives Program (BIP) of the United States Department of Agriculture also awarded grant money for broadband infrastructure.

- McDaniel Telephone Company[4] in Lewis County reported in June of 2013 that it was more than 50 percent completed with its broadband infrastructure project and had expended $1.1 million of its $1.2 million BIP grant. The company has completed the outside plant construction, which included burying about nine miles of fiber. They also finished connecting the central office facilities in Salkum, Mossyrock and Onalaska, and expected to start conversion of subscribers to the new network equipment in November. Once the project is complete, about 600 customers should have access to broadband at much higher speeds.
- Hood Canal Telephone[5] was awarded a $2.7 million grant, and by June 2013 the company was more than 50 percent complete on the project and had spent $2.4 million of the award.
- Public Utility District #1 of Okanogan County[6] was awarded $5.5 million to provide broadband to the underserved areas of Brewster, Twisp, Conconully, Tonasket and Oroville. As of June 2013, the PUD had spent $3.5 million of the award and the project was more than 50 percent completed.
- Ecliptixnet Broadband[7] was awarded $14.3 million and had spent $3.9 million as of June 30, 2013. They reported that the project was less than 50 percent complete at that time.

NoaNet Build-Out Map

Private Investment Continues

The nation's wireless giants continued their investment in 4G networks in Washington State. Both Verizon and AT&T expanded their service areas for this higher speed service. Private investment also included work by locally owned and operated independent telephone companies and fixed wireless internet service providers (WISPs). Though both phone companies and WISPs might well use the recently completed and federally funded "middle mile" networks they still had to invest in equipment that connected that network to the business or residential customer.

Private Broadband Investment in Washington

Company	Amount Invested	Time Period	Reason
AT&T	$1.5 billion	2009 to 2011	Investment in wireless coverage and speed
CenturyLink	$115 million	2011 through 2012	Exceeded $80 million agreement made as part of merger with Qwest in 2011
Comcast	$4 billion	1996 through 2011	Infrastructure additions and upgrades
Frontier Communications	$240 million	Since July 2010	Agreement as part of merger ($27 million in 2012) with Verizon Northwest in 2012 and infrastructure additions and upgrades
Verizon Wireless	$208 million	2010 to 2011	Infrastructure additions and upgrades
Wave Broadband LLC	$57.2 million	January 2012 through September 2013	Investment in broadband, upgrading former Broadstripe Cable communities purchased by Wave in January 2012, the purchase of Blackrock Cable and the purchase of Spectrum Networks
Wireless Internet Service Providers	$21 million	Between 2009 and 2013	Upgrades to equipment and expansion of service.
Members of Washington Independent Telecommunication Association	$55 million	Between 2009 and 2013	Expansion and/or upgrades in broadband service

Tribes

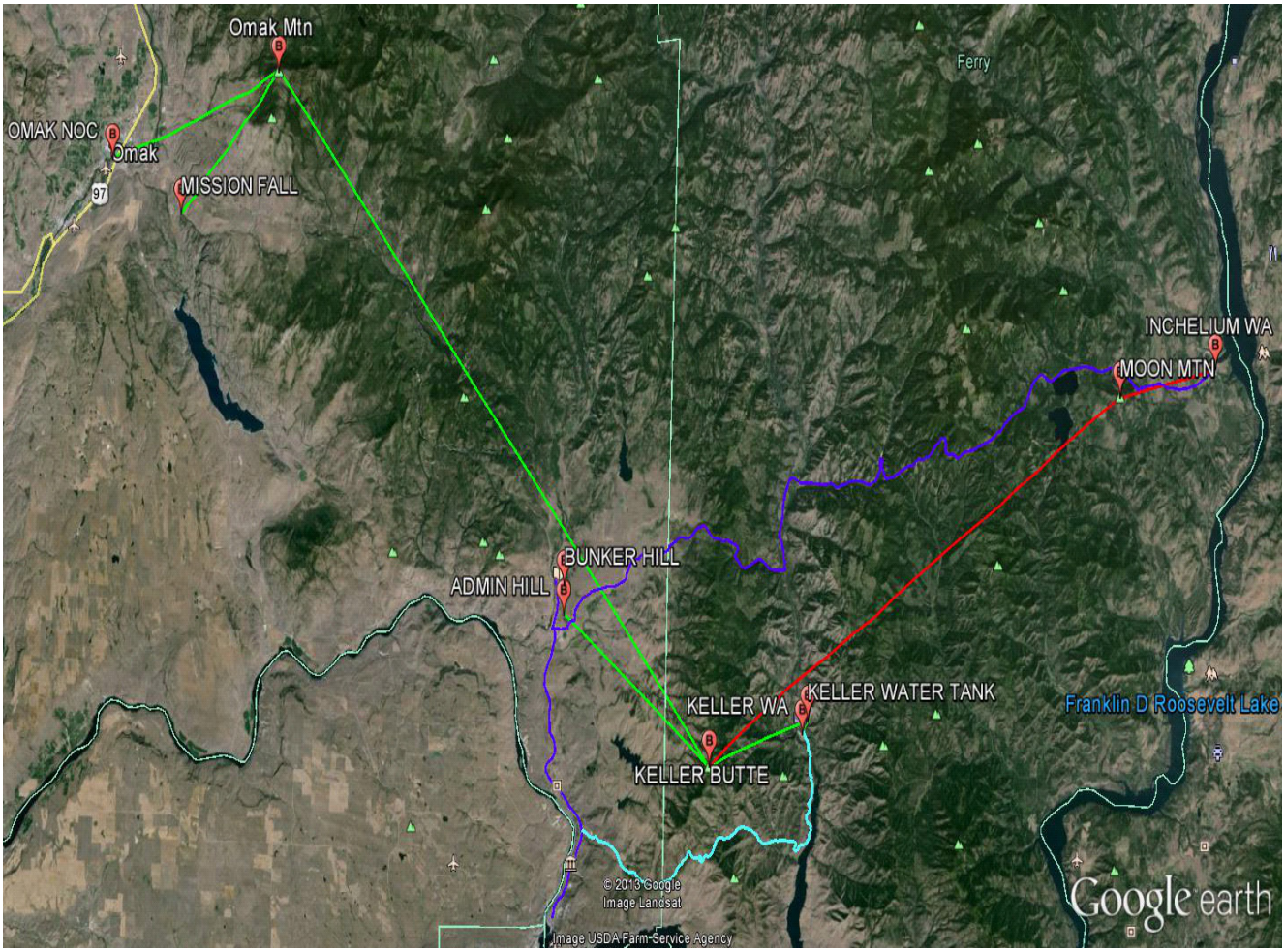
Tribes in Washington also began or expanded broadband infrastructure projects in 2013. Some used federal grant and/or loans for part of the work. For instance, in October 2012 the Confederated Tribes of the Colville Indian Reservation was awarded a $1.3 million Community Connect grant from USDA. They planned to use the funds for broadband services in the rural community of Keller through an optical fiber-fed wireless access network. On September 23, 2013[8] the tribe broke ground on the project and by mid-October was installing fiber from the Keller Community Center down Highway 21 to Manila Creek Road. They planned to have begun running fiber up Manila Creek road to the Peter Dan/Highway 155 cutoff by micro-trenching. They will resume the project in the spring.

They also successfully installed clean energy sources in the form of solar, wind and/or propane on key Mountain Top Services sites to improve continuity and redundancy of power.

The network is robust as a result of the newly generated redundant power to run the network's backhaul. And the tribal microwave backhaul has been extended into the town of Keller and into the Omak Lake area.

The tribe also is planning a technology center at the Keller Community Center and began the process of contracting that project in the fall of 2013. Once the project is complete, the center will be equipped to provide free access to computing equipment, training, and broadband services to residents for at least two years.

Colville Tribes Broadband Network



Construction Plan for Colville Network

- fiber being installed
- fiber projects upcoming
- upcoming microwave towers
- existing microwave towers

The Yakama Nation working with Yakama Power, a tribal enterprise, and NoaNet also added to the tribe's broadband access.[9] Although the power company had installed fiber as early as 2001, it primarily served tribal government offices. As NoaNet continued to build out its BTOP-funded network they contracted with Yakama Power to install fiber through reservation land, and the tribe also added a Point of Presence (POP)[10] that gives them connectivity to the rest of NoaNet's fiber network and adds value to the project. The resulting expanded network services[11] are offered through Yakama Nation Land Enterprises and is expected to include broadband service in the tribal community of White Swan, which historically had very poor access.

The project not only gave the tribe better broadband access, it also provided important training and work experience opportunities for tribal members. As a result, members of the Yakama Nation could potentially train members of other tribes for work in the telecommunications field.

Other tribes funded broadband access without outside funding. For example, after the Nisqually Tribe of Indians decided not to apply for a government grant, the tribe paid for and launched a WiMax[12] wireless broadband network in January 2012 for residents on tribal land. Households received one of two kinds of modems[13] based on their location with respect to water towers that carried the signal for the network. Before the project, some tribal members had no access to broadband and others paid for the service through a private provider. Now all but a small section of the tribe's residential areas have broadband access at 5Mbps download and 2 Mbps upload at no cost to the individual or family.

Other tribes in Washington are exploring other options for improving broadband access on tribal lands through state and federal grants and subsidies, as well as tribal and other private funding sources.

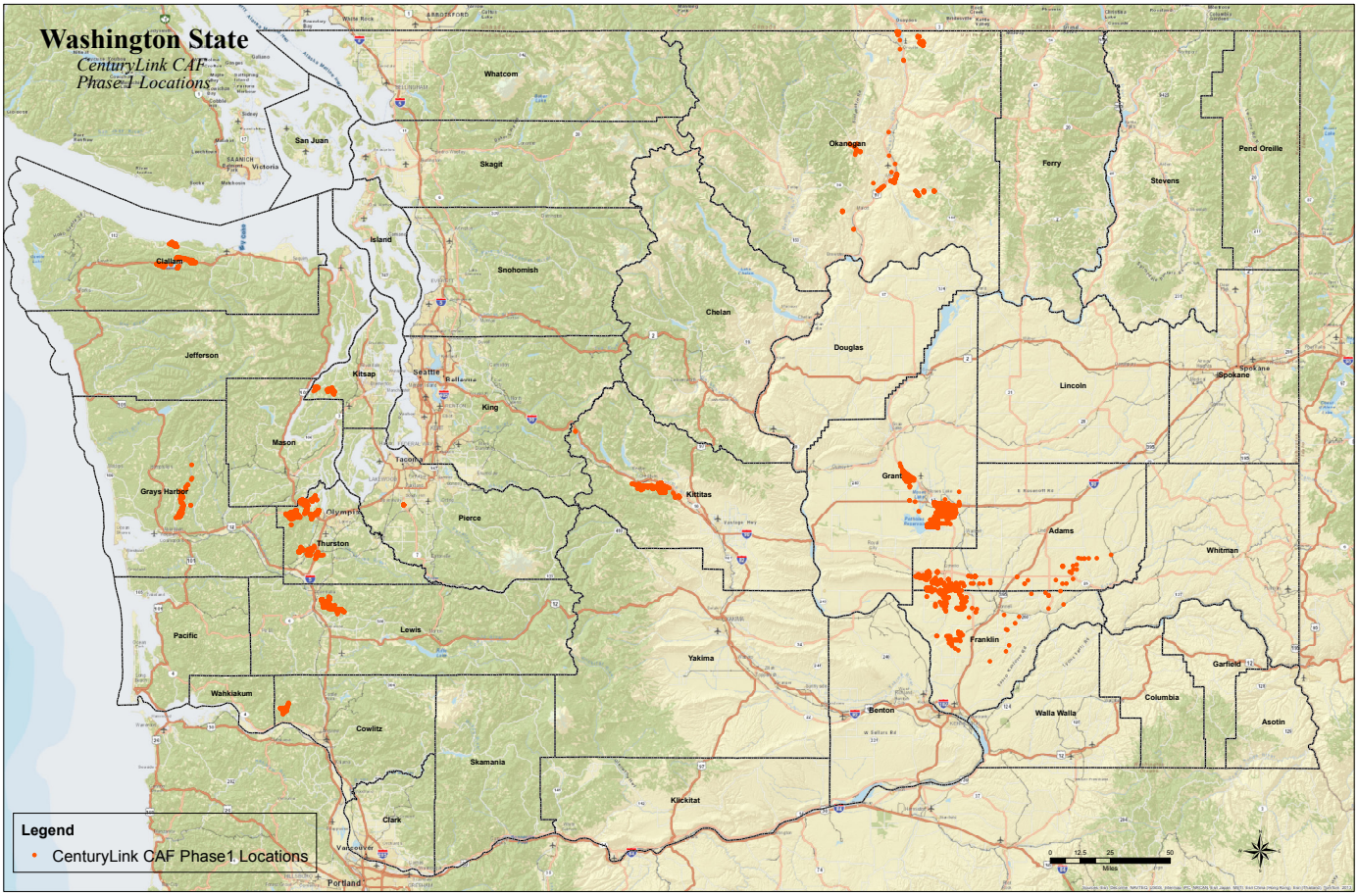
Connect America Fund Money

In 2013 the Federal Communications Commission (FCC) continued its work on a comprehensive reform of its Universal Service Fund and intercarrier compensation systems. Part of the reform created the Connect America Fund (CAF) with an annual budget of no more than $4.5 billion, which is intended to extend broadband infrastructure to millions of Americans who currently have no access. The FCC estimated that over a period of six years, CAF would expand broadband access to more than seven million residents of rural areas who are currently unserved, and will put the country on the path to universal broadband within a decade. FCC also created a map[14] of areas across the countries that were eligible for the funding.

The CAF Phase 1 was awarded in two rounds with the first round being more restrictive than the second round. CenturyLink accepted $54 million in Phase 1/Round 2 funding for broadband deployment in 33 states[15] where the company operates, $2.8 million will be spent in Washington State.

Frontier Communications accepted $72 million in Round 2 funds for the service areas it covers across the nation.[16] Frontier invested some of that money in the Lake Cavanaugh area of Skagit County by expanding fiber optic lines to a community that had no broadband at all. Once the project[17] was completed, Frontier expected to have residential service of up to 24 Mbps download for 432 homes in the area. CenturyLink filed documents with Washington Utilities and Transportation Commission that indicated it intended to use the funds for broadband service near Lake Crescent on the Olympic Peninsula, service areas near Othello and Connell, and parts of Cowlitz County among other locations.

CenturyLink CAF Phase 1 Round 1 Locations

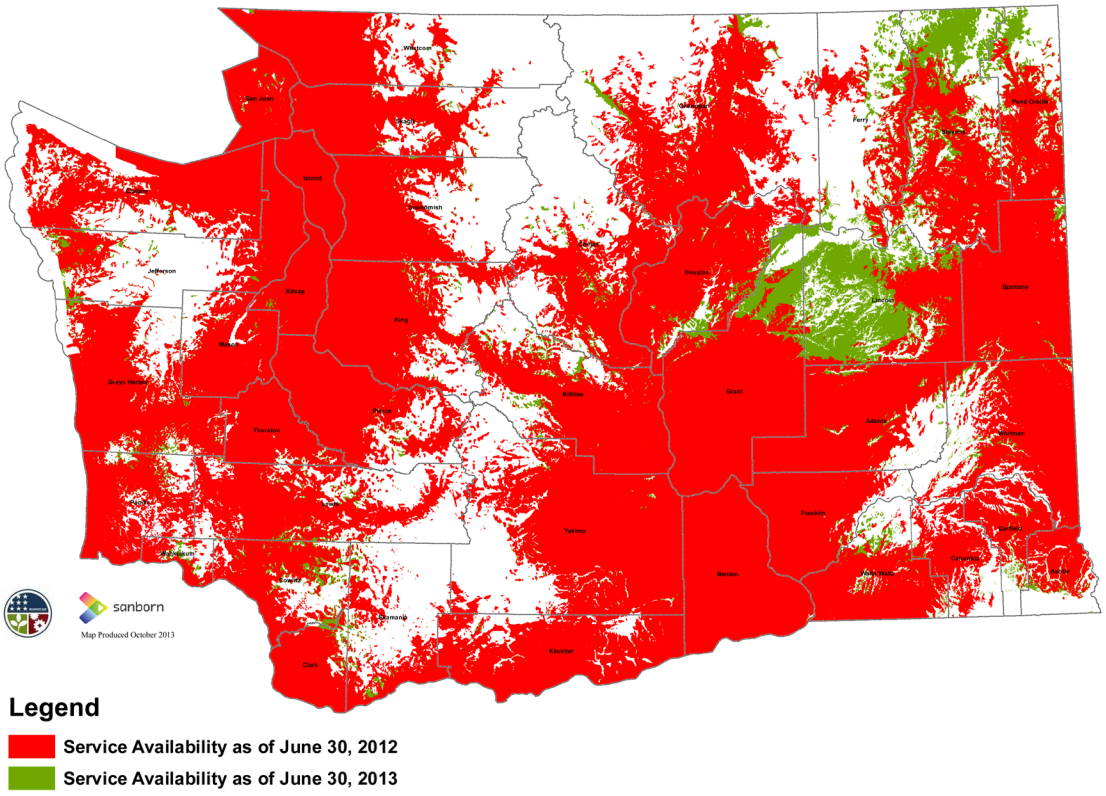


Mobile Wireless Broadband Footprint Continues to Expand

In addition to the increased mobile access that comes through the Connect America Fund, two of the nation's largest providers, Verizon and AT&T, also increased their coverage in northeastern Washington. In Lincoln County, wireless providers AT&T, Verizon, Inland Cellular and StarTouch reported coverage in most of the county in June of 2013 more than doubling wireless coverage there. And the northernmost portions of Stevens and Pend Oreille counties saw expanded wireless coverage from AT&T and Verizon. Both providers also increased the speed tiers for their service in those counties. As service expands, the experience of consumers may vary and they can document their experience on state's interactive broadband map.[19]

Washington State Mobile Wireless Expansion

From June 30, 2012 to June 30, 2013



The Network is Robust, But Only Valuable if it's Used

The results of considerable public and private investments in broadband through June 2013 are reflected on the state's interactive broadband map on the Washington State Broadband website.[19]

The 2012 State New Economy Index[20] (the most recent report available) recognized these investments and improvements in broadband access, and ranks Washington eighth in the nation, up from 15th in 2010.

56% people own a smartphone

70% people have Internet at home

85% men use the Internet

84% women use the Internet

30% adults use tablets

The National Broadband Map[21] compiles data from all 56 states and territories and includes tools for analysis and ranking of broadband access across the nation. Washington is ranked 22nd in the nation for access at 3 Mbps or better download (98.9 percent of our state's population has access at this speed tier). However at higher speed tiers we shine, for instance 94 percent of Washingtonians have access to 100 Mbps or better. At that tier we are fourth in the nation, only two slots behind Massachusetts and well ahead of California.

Access alone won't unleash the full potential of broadband. Economic, educational, and quality of life benefits only come with adoption. That means subscription to broadband and use of the service at home, at work, or on the go. And for the state to realize broadband's full economic development potential, the work towards adoption cannot stop at its most basic level with just email and Web surfing.

Nationally, about 70 percent of all adults have an Internet connection at home.[22] However, looking at state level data produces some mixed results.

For example, subscriber data gathered by the Federal Communications Commission as of June 30, 2012 (the most recent published report), showed a subscriber ratio (broadband in the home) of 61 percent[23] with connections of at least 3 Mbps download and 768 Kbps upload. That subscriber ratio made Washington eighth in the nation for subscribers at that broadband speed and ahead of all but three of our competitor states. Competitor states Massachusetts, Maryland, Virginia, and Colorado came in second, fourth, fifth, and ninth respectively. But an analysis by Governing Magazine in July of 2013[24] shows Washington is third in the nation for percentage of households with internet access in the home (83.6 percent) behind New Hampshire and Utah.

Just because the household has access doesn't mean it is being used by everyone in the home. Sometimes family members may lack the necessary language or digital literacy skills to use the computer or broadband services. However, in Washington that is not so often the case. In fact, according to Governing magazine, Washington also had the second highest percentage of individuals accessing the Internet at home (73.8 percent), trailing only New Hampshire.[25] And in its most recent report, the 2012 New State Economy Index ranked Washington as third in the nation for percentage of the population using broadband (presumably at any location) at 88.4 percent, up from 86 percent in 2010. The only competitor state with a higher percentage online was Utah. By comparison, the May 2013 the *Pew Internet & American Life Project* showed 85 percent of adults nationwide using the Internet.[26]

Though these adoption rates are encouraging, there are still populations that need more assistance to become confident broadband users, and take full advantage of this important tool's potential. For instance, elderly Americans have only a 56 percent adoption rate, according to the Pew Project[27]. Just 59 percent of residents with less than a high school diploma and only 76 percent of households with incomes below $30,000 use the Internet. Nationally, rural residents have adoption rates 6 percent lower than their urban/suburban counterpart.

Americans who do use broadband have come to expect access on multiple devices as well. By early 2013, smart phone ownership had grown to 56 percent among adults and 31 percent owned a tablet.[28] Device ownership may account part for the high number of Washington residents that access the Internet from places outside the home. According to the U.S. Census Bureau, just over 45 percent of state residents over the age of 3 accessed the Internet outside their home in 2010. Only six other states had higher rates of Internet use outside the home.[29]

Adoption Makes a Difference – Especially in Rural Areas

Tracking adoption in Washington is about more than keeping score. In 2012, the National Agricultural and Rural Development Policy Center released *Rural Broadband Availability and Adoption: Evidence, Policy Challenges, and Options*.[30] Researchers meshed broadband access and adoption data from several federal sources to draw some conclusions about broadband's effect on the economic health of rural communities:

- Using U.S. Census Current Population Survey household-level data, the broadband adoption gap between metro and non-metro areas remained at 13 percentage points in both 2003 and 2010; however, this gap increased among low income, low-education, and elderly populations.
- Using FCC county-level data, the most rural (non-core) counties experienced significant improvements in broadband adoption between 2008 and 2011.
- Traditional factors – income, education, age, race, and non-metro location – played a role in broadband adoption for both 2003 and 2010; low levels of providers had a negative impact on adoption while higher levels of broadband availability had a positive impact.
- In addition to traditional factors, employment in specific industries (real estate and information sectors) and broadband speed had an impact on non-metro county-level adoption rates.
- Analyses of areas participating in the Connected Nation[31] program found that it had increased the number of providers in the most rural counties, but did not fare well in terms of increasing broadband adoption in those counties.

Broadband and economic health are linked in rural areas:

- Low levels of adoption, providers, and broadband availability were associated with lower median household income, higher levels of poverty, and decreased numbers of firms and total employment in 2011.
- Increases in broadband adoption between 2008 and 2010 resulted in higher levels of median household income and total employment for non-metro counties.
- Broadband adoption thresholds have more impact on changes in economic health indicators between 2001 and 2010 than do broadband availability thresholds in non-metro counties.

Adoption Efforts in Washington State

Community technology organizations in Washington know that adoption is what makes a difference in people's lives. As early as 2008, the Washington State Legislature funded Community Technology Opportunity Program[32] and Washington State University was charged with management of the program. The university also had oversight for 10 grants to organizations doing a variety of projects involving digital literacy.

As a result of this nine-month program, 8,572 clients were served. More than 2,000 clients used employment-related services, such as training and completing online applications. Nearly 200 of those clients got internships, apprenticeships or jobs as a result. More than 3,900 used education-related services that ran the spectrum from basic literacy skills to completion of an educational program.

The Community Technology Opportunity Program ended in 2009, but adoption work continued in the state under the federally funded Broadband Technology Opportunity Program (BTOP). Among the grant recipients was EdLab Group[33] which was awarded just over $4.1 million for public computing sand sustainable adoption work. EdLab Group in turn granted funds to 22 community technology centers.

Over the two-year term of the grant, the centers made significant improvements to the community technology services at their organizations.

Grantees purchased and installed new computer equipment, made connectivity upgrades, developed and refined curriculum, offered new classes, improved websites, purchased new technical equipment, and hired staff. With these upgrades to their centers, these organizations were able to significantly increase access to community technology across Washington State.

- Operating hours per week for all locations increased by 326 during the BTOP grant.
- The total number of public work stations increased overall by 299, with the BTOP grants supporting the replacement of 240 of these.
- Volunteer hours increased by 4,734 hours, or approximately 215 hours per center.
- The average number of client visits per week increased by 4,533, an average of 206 additional visits per center.

As a result of these activities, clients using Community Technology Center resources were able to engage in important online activities, receive training, and experience significant improvements in their lives.

- 614 new classes were offered during the BTOP grant, with a total of 126,100 training hours provided to clients across the state.
- 5,500 clients used the centers to search for employment; 88 reported having found a new job.
- 22,000 clients used the centers for educational purposes, with 167 receiving a General Educational Development diploma as a result.
- 1,800 clients used the centers to access legal and law related services, including 660 who actually attended court proceedings by video conferencing.

EdLab Group received two years of funding and that funding has been spent. Other communities however, have taken on some adoption work as part of their partnership with the Washington State Broadband Office.

Broadband Office Adds Value

As part of the national effort to increase broadband access, and use a portion of American Recovery and Reinvestment Act money was set aside to help states coordinate the work of broadband build-outs and broadband adoption. The State Broadband Initiative funding was awarded to all 50 state and the U.S. territories to establish one agency or organization tasked with this work. In Washington that entity is the Washington State Broadband Office, which is part of the state Department of Commerce.

The Broadband Office was founded in 2010 and has been responsible for launching and maintaining an interactive map of broadband availability in the state and publishing annual reports on the state of the state's broadband network. Two important initiatives of the Broadband Office, designed to increase broadband access and adoption, continued through 2013.

In October of 2014, federal funding for the program's five-year grant is $7.3 million will end. The grant is administered by the National Telecommunications and Information Administration (NTIA) through the State Broadband Initiative program (SBI).

Technology Teams Address Community Challenges

As early as 2008 thought leaders in Washington's broadband eco-system believed that community groups engaged in local planning would be critical to increasing broadband access and use. They said so in a report produced by the High-Speed Internet Working Group.[34] That belief was reaffirmed in the recommendations of the Governor's Broadband Advisory Council[35] in 2009. The council report suggested that local governments or coalitions of local governments determine the best method of broadband deployment for their region and attempt to fund those solutions. The Broadband Office has advocated a similar approach and actively asked that broadband be a part of community planning at workshops, planner's forums, and within The Department of Commerce.

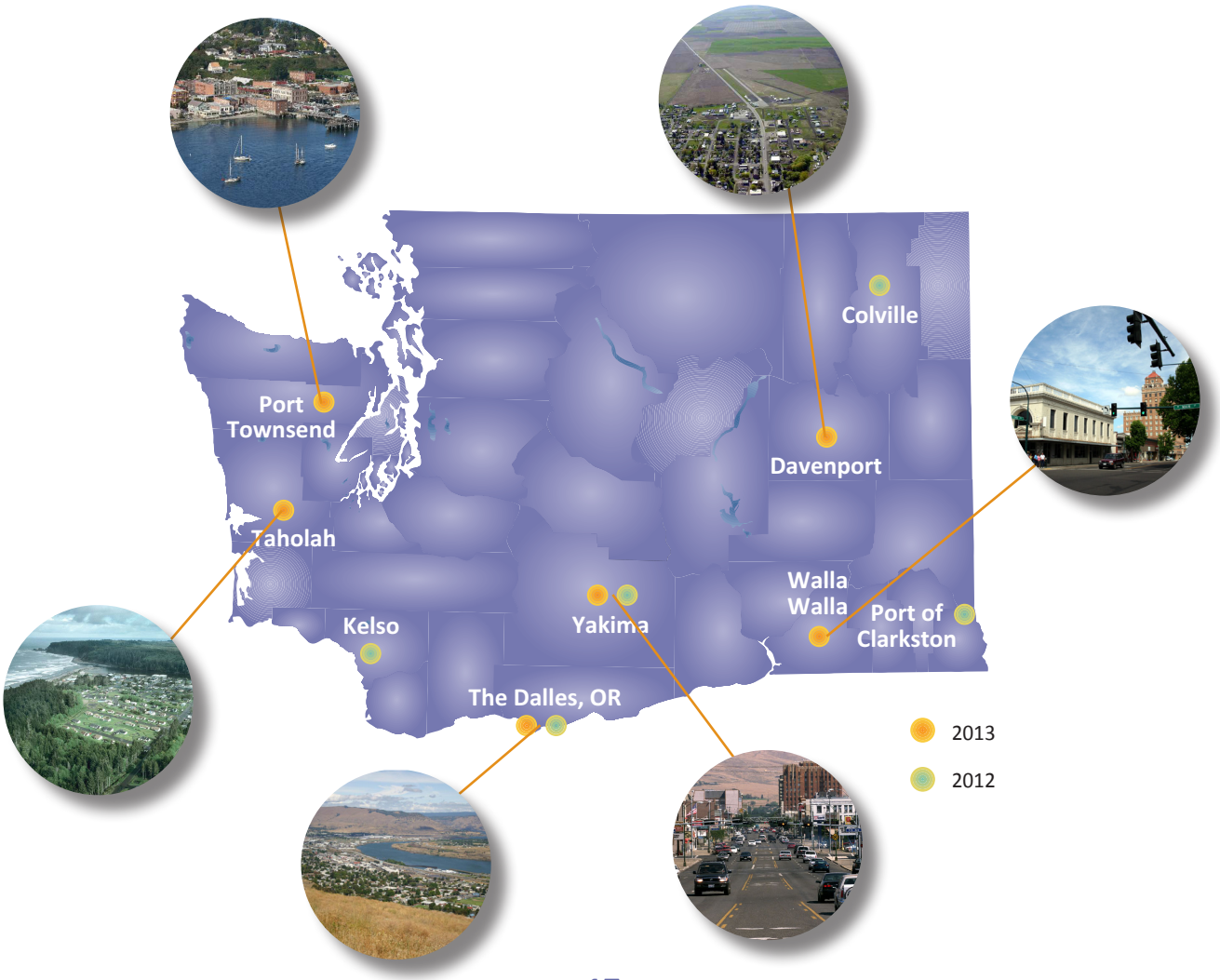
In 2012, the Broadband Office conducted the first of two annual cycles of grant funding, awarding nearly $300,000 to five local technology planning teams. The teams were chosen from a field of 16 applicants representing 17 counties and three tribes, with requests totaling more than $900,000. The first round of grantees concluded their work in 2013, demonstrating both the effectiveness of community organizing work at a local level and the importance of identifying their specific needs rather than applying a "one size fits all" approach. They also completed their work with these notable accomplishments:

- **La Casa Hogar** was awarded $63,920 for a project that included a broadband-adoption needs assessment for licensed child care businesses in Yakima County. The assessment resulted in a plan to use technology to help their limited-English clientele prepare for General Educational Development testing.
- **Cowlitz-Wahkiakum Council of Governments**, which was awarded $72,000, conducted community needs assessments and other work that prepared them for infrastructure grant applications.
- **The Mid-Columbia Economic Development District**, which was awarded $69,600, conducted a community and business needs assessment, and determine if individuals and businesses wanted more training opportunities. The classes are now offered in the community. The team serving Klickitat and Skamania counties also held community meetings that raised awareness of its benefits and helped collect responses to online and paper surveys. As a result of this work, several communities were identified for more work in a second round of grants.
- **The Tri-County Economic Development District**, which was awarded $48,224, determined from its community surveys that more people needed to know the value of broadband and conducted a Tech Expo that included local providers and a "gadget garage" so attendees could try out wireless equipment. The Tech Expo also helped community members connect with local providers, sign up for service and learn about services at the local library.
- **The Port of Clarkston** was awarded $46,232 to develop a telecommunications plan for Asotin County that included broadband education and application development strategies, and "last mile" connectivity solutions. The port is using those materials to apply for infrastructure funding, and was awarded a small grant and a low-interest loan to install broadband fiber in its new industrial park.

In 2013, the second and final round of local technology planning grants, totaling $300,000, was awarded. Six recipients planned to use the awards as follows:

- **Washington State University** was awarded $56,000 to leverage broadband needs assessment activities already begun in Jefferson and Clallam counties.
- **Lincoln County** was awarded $26,880 to address educational challenges and economic development opportunities in Lincoln County by increasing broadband access and use.
- **Affiliated Tribes of Northwest Indians Tribal Technology Team** was awarded $94,000 to provide broadband and communications planning to Washington tribes, including needs assessment, infrastructure/services inventory and gap analysis.
- **Walla Walla Valley Chamber of Commerce** was awarded $64,000 to partner with the Intelligent Community Forum, a think tank that focuses on broadband-centric economic and social development strategies, and to leverage their expertise through its Community Accelerator Program.
- **Klickitat-Skamania Local Technology Planning Team** was awarded $60,000 to provide community identified broadband training and address gaps in infrastructure through partnerships with regional governments, providers, communities and businesses, and increasing access to broadband via public hotspots.
- **La Casa Hogar** received $16,500 to continue its work using technology to help limited-English speaking child care providers pass the General Educational Development test.

Locations of Local Technology Planning Teams



Apps Contest Moves Beyond the Basics

In 2013, the Broadband Office built on the success of its Evergreen Apps Contest in 2012. Even as contest winners continued their work – and in one case sold their application to Yahoo – the next logical step was to involve the education community. Encouraging teachers and students to become more comfortable with coding and with science, technology, engineering and math (STEM) subjects will help create the next generation of innovators.

In partnership with the Technology Alliance, the Broadband Office supported projects that tackled that daunting educational challenge. Among the activities in 2013 was the statewide Algebra Challenge[36] during the final weeks of the 2012-2013 school year. Public and private school students in elementary, middle and high schools hoped to solve 250,000 algebra equations through a computer program modified by the University of Washington's Center for Game Science. The students blew through that goal and have solved more than 429,053 equations to date.

Select Washington educators spent part of 2013 piloting the first United States use of the U.K.'s Apps for Good program.[37] The program is aimed 11 to 18 year olds and starts with training for teachers who in turn teach the apps course. The coursework covers idea generation, feasibility and deciding on prototyping as well as prototyping and marketing. Students also get advice from professionals in the field via videoconference. This fall teachers from Cascade Middle School (Highline School District), Garfield High School (Seattle), Walla Walla High School and Battle Ground's River Homelink School are working their way through the curriculum and have already found it needed some tweaking to bring it in line with American English. The pilot applications this first cohort develops were expected to be virtually presented during the national Computer Science Week beginning Dec. 9, 2013. Additional schools will be recruited in 2014 and the U.S. Apps for Good contest will take place June of 2014.

Ada Academy

Sixteen women will be pioneers in a new, year-long program designed to combat the high-skilled labor shortage in Washington State's IT sector. Estimates of unfilled jobs for this sector run as high as 25,000. Add to that a gender imbalance in the computer programming field (85 percent male), and the model of a thriving and diverse high-tech workforce is at risk.

That's why the Washington State Broadband Office is proud to help support the Ada Developers Academy. This exciting new initiative – a project of the Technology Alliance – received applications from 108 women interested in gaining the skills required to launch a career in programming. A committee of Ada leaders and instructors interviewed 33 applicants and recently selected the Academy's very first class of 16 students.

Classes started in October for the successful applicants, who were required to submit a resume, pass logic and competency tests, and produce a five-minute video on why they should be selected for this unique opportunity. The resulting inaugural class delighted Susannah Malarkey, executive director of Technology Alliance.

"They are a very diverse group," she said. "Seventy-five percent of the students are from Washington, but we were open to applicants from other regions. The class even includes a recent immigrant from Kazakhstan."

Most of the women, but not all, have Bachelor's Degrees in subjects other than computer science but are interested in making a career change. The women will spend six months in a classroom setting learning computer programming and working with a mentor from one of Washington's many technology companies. At the end of six months, each student begins a six-month internship and is promised a job interview at the conclusion of the program. Malarkey hopes that the success of this inaugural class will lead to more opportunities for women interested in IT careers and potential expansion of the Ada model to serve women in other regions of the state. The Broadband Office is joined by a handful of Washington technology companies and individual donors in supporting the program, which offers students a stipend for the duration of their participation.

Broadband Developments for 2014

The largest of Washington's publicly funded infrastructure projects came to a close in 2013. But the year ahead also promises to see some dramatic developments in the state's broadband ecosystem. As policymakers and broadband stakeholders look to the future, there are a couple of developments worth watching.

City of Seattle Names Gigabit Neighborhoods

In 2012, Seattle signed an agreement with broadband developer Gigabit Squared to connect 14 neighborhoods in the city to a high-speed fiber network riding on the city's unused fiber infrastructure. In 2013 they announced the 14 neighborhoods they would serve in a swath that includes the University of Washington West Campus District, First Hill, Capitol Hill and the Central Area.[38] These neighborhoods will get fiber-to-the-home and fiber-to-the-business in early 2014 according to the company. The Gigabit Squared Seattle project also will include a wireless neighborhood cloud in its wired neighborhoods, providing Gigabit Squared Seattle's customers with mobile access. The fiber network, the wireless network, and wireless neighborhood cloud will work together and provide citywide broadband wired and wireless network and Internet services.

Gigabit Seattle plans to offer residential customers 5Mbps download and 1 Mbps upload free for 60 months.[39] Customers can get symmetrical broadband of 100 Mbps for $45 per month and 1 Gbps for $80 per month.

Update: As of January 2014, financial problems at Gigabit Squared have ended the project. Seattle's new mayor, Ed Murray, has said the plan is not dead, but has just hit a speed bump. For more information see http://murray.seattle.gov/an-update-on-the-status-of-a-fiber-to-home-network-in-seattle/#

FirstNet: a Broadband Network for Public Safety

In 2010, the National Broadband Plan[40] recommended deployment of a "nationwide, interoperable public safety mobile broadband network, with funding of up to $6.5 billion in capital expenditures over 10 years, which could be reduced through cost efficiency measures and other programs."

The network was envisioned as way to overcome some of the communication challenges that resulted in first responder fatalities in the terrorist attacks of Sept. 11, 2001.

In February 2012, Congress created a new authority within the National Telecommunications and Information Agency – the First Responder Network Authority or FirstNet – to build, deploy, and operate a nationwide interoperable network for public safety.[38] Also in the act were provisions for $7 billion in funding towards deployment of this network, as well as $135 million for a new State and Local Implementation Grant Program administered by the agency. Grants were awarded to each state and U.S. territory in 2013, including $2.6 million for Washington State.[41]

The state's work will be coordinated through the Office of the Chief Information Officer and will include updates to the state's interoperability plan as well as formation of a stakeholder subcommittee to implement the plan. Other grant components include statewide education and outreach as well as an advisory role in the decision to participate in a national network. The grant requires a state match of just over $660,000 and the work is expected to take three years to complete.

Broadband and Job Creation

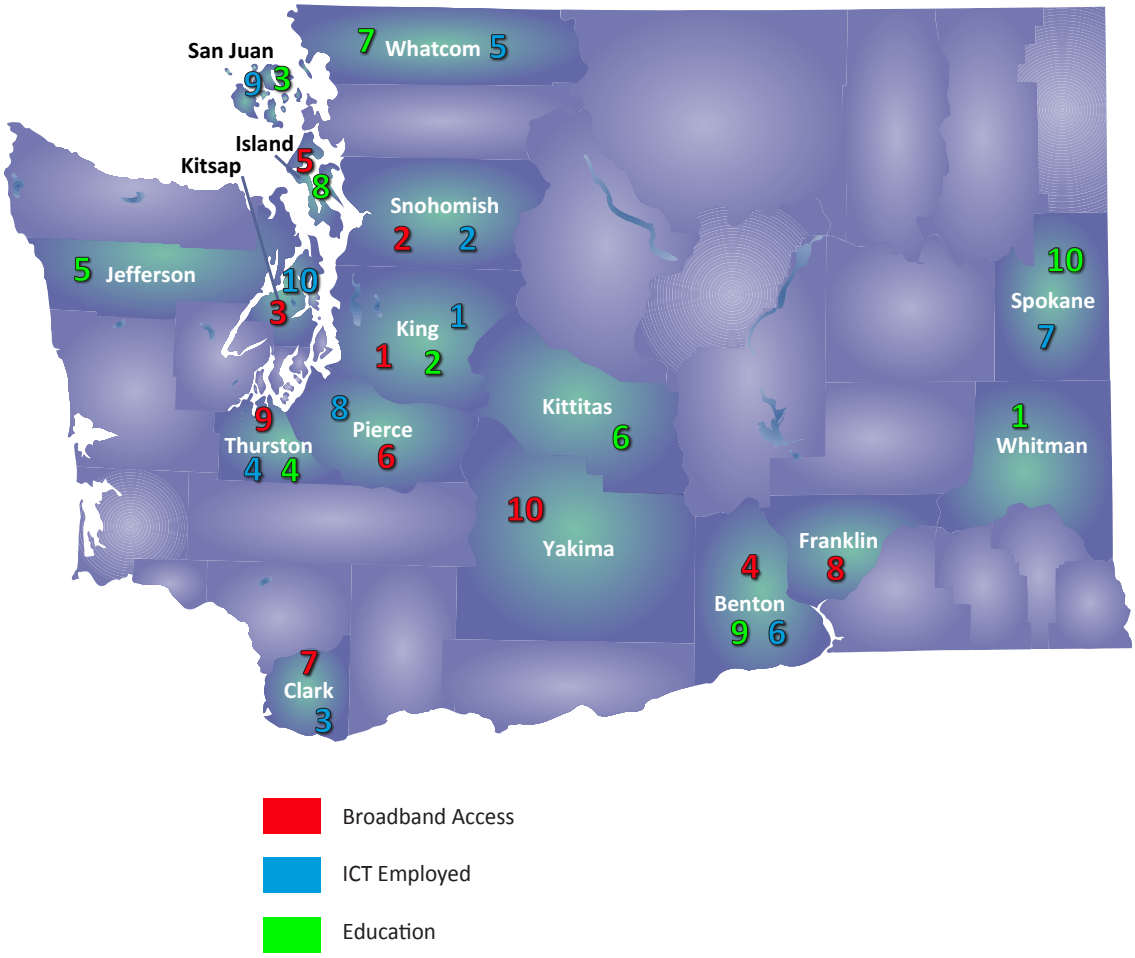
While broadband can enable improvements in the field of public safety, education and health care, its biggest benefit to the people of Washington State may be the role it plays in job creation. Broadband is part of the state's larger information and communications technology (ICT) sector which is already a powerful economic driver. For purposes of this report, ICT jobs are those included in a set of North American Industry Classification codes adopted in our 2010 Broadband Report.[42] According to the 2012 Cyberstates Report,[43] the tech industry already employed nearly 191,000 people in Washington, and in October 2013 Amazon and Microsoft were in the process of adding more than 54,000 people to their payrolls.[44] While all of those positions would not be in Washington, many of them could be at the company's headquarters here.

All told, the tech firms employ 8.2 percent of all the state's private sector workers and have an annual payroll of $21.1 billion. Even as other sectors in the state are still recovering from the recession, tech firms added 2,100 jobs and on average pay the third highest tech wages ($110,200) in the nation.

Not surprisingly employment in ICT is heavily concentrated in the west-side urban counties of Clark, King, Kitsap, Pierce, Snohomish, and Thurston. These counties accounted for almost 90 percent of ICT employment, but just under two-thirds of the population. Urban eastern counties, Spokane and the Tri-cities accounted for 5 percent of ICT employment, rural west-side 3.5 percent, and rural east-side 2.1 percent.

As the table below shows, broadband access tends to also be concentrated in similar patterns to ICT employment, higher education levels, and higher incomes. Broadband access in the graphic below is ranked by the percent of the population with access to high-speed broadband, wired providers, and wireless providers. Note that King county ranked first among Washington counties in access, ICT employment. Generally these four factors move together with some exceptions. Counties with a strong university presence like Whitman and Kittitas are highly educated, but relatively low in broadband access and ICT employment.

2012 Washington Counties Ranked by Broadband Access, Education, and ICT Employment



How Do We Compete in a Competitive Information and Communications Technology Industry?

The Washington State Department of Commerce regularly compares our economic strength against competitor states – those states are usually California, Colorado, Idaho, Maryland, Massachusetts, North Carolina, Oregon, Texas, and Virginia. These states either share borders or economic characteristics with Washington. Tech America's *Cyberstates Report* ranks all 50 states on a number of technology measures, and Washington consistently ranks in the top 10 cyberstates. In the Cyberstates 2013 report, Washington ranked fifth in the nation for the concentration of tech workers.

How Washington Compares

Washington

- 1st in software publishers by 2012 employment
- 2nd in total state-level payroll coming from tech industry with 18.4 percent
- 2nd in high-tech average annual wage vs. private sector annual wage at 124.7 percent
- 3rd in average annual wages of $110,240.
- 5th in high-tech workers per 1,000 private sector workers with 82
- 10th in total high-tech by 2012 employment with 190,953
- 13th in Internet and telecommunications services by 2012 employment with 34,889
- 10th in tech employment numeric Change from 2011 to 2012 (+2,099)
- 11th in high-tech annual payroll numeric change 2011 to 2012 ($299)

Idaho

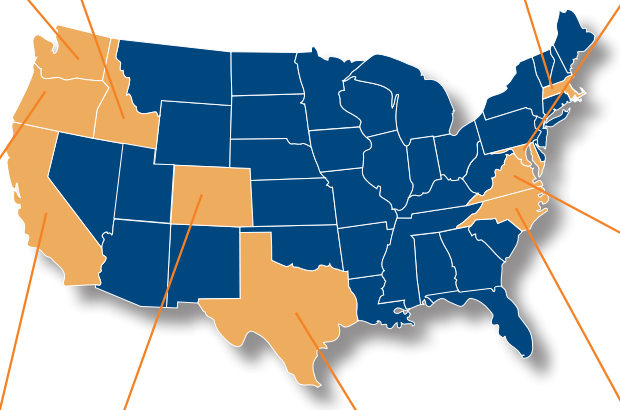
- 13th in high-tech workers per 1,000 private-sector with 60
- 3rd in high-tech average annual wage vs. private sector annual wage at 124.4 percent
- 24th in average annual wages of $76,536
- 36th in total high-tech by 2012 employment with 29,713
- 44th in Internet and telecommunications services by 2012 employment with 3,948

Massachusetts

- 2nd in high-tech workers per 1,000 private-sector with 91
- 11th in high-tech average annual wage vs. private sector annual wage at 95.4 percent
- 2nd in average annual wages of $116,006
- 6th in total high-tech by 2012 employment with 254,044
- 14th in Internet and telecommunications services by 2012 employment with 32,974

Maryland

- 4th in high-tech workers per 1,000 private-sector with 86
- 13th in high-tech average annual wage vs. private sector annual wage at 93.5 percent
- 9th in average annual wages of $96,540
- 11th in total high-tech by 2012 employment with 171,521
- 18th in Internet and telecommunications services by 2012 employment with 21,129



Virginia

- 1st in high-tech workers per 1,000 private-sector with 98
- 6th in high-tech average annual wage vs. private sector annual wage at 105.7 percent
- 5th in average annual wages of $101,990
- 4th in total high-tech by 2012 employment with 285,354
- 8th in Internet and telecommunications services by 2012 employment with 41,397

Oregon

- 12th in high-tech workers per 1,000 private-sector with 61
- 4th in high-tech average annual wage vs. private sector annual wage at 122.5 percent
- 11th in average annual wages of $94,152
- 21st in total high-tech by 2012 employment with 81,632
- 33rd in Internet and telecommunications services by 2012 employment with 11,013

California

- 7th in high-tech workers per 1,000 private-sector with 78
- 1st in high-tech average annual wage vs. private sector annual wage at 131 percent
- 1st in average annual wages of $123,900
- 1st in total high-tech by 2012 employment with 968,792
- 1st in Internet and telecommunications services by 2012 employment with 152,524

Colorado

- 3rd in high-tech workers per 1,000 private-sector with 87
- 9th in high-tech average annual wage vs. private sector annual wage at 98.4 percent
- 7th in average annual wages of $97,100
- 15th in total high-tech by 2012 employment with 162,648
- 11th in Internet and telecommunications services by 2012 employment with 37,314

Texas

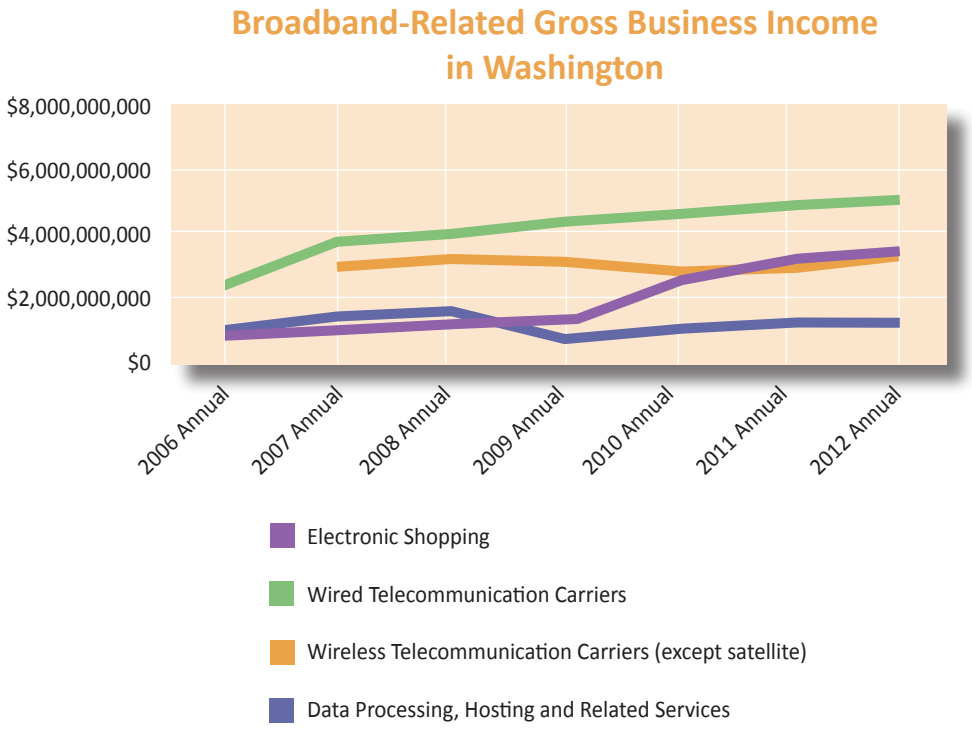
- 17th in high-tech workers per 1,000 private-sector with 55
- 22nd in high-tech average annual wage vs. private sector annual wage at 85 percent
- 12th in average annual wages of $92,242
- 2nd in total high-tech by 2012 employment with 485,636
- 2nd in Internet and telecommunications services by 2012 employment with 118,721

North Carolina

- 22nd in high-tech workers per 1,000 private-sector with 50
- 8th high-tech average annual wage vs. private sector annual wage at 101.9 percent
- 20th in average annual wages of $84,309
- 16th in total high-tech by 2012 employment with 162,070
- 10th in Internet and telecommunications services by 2012 employment with 39,191

Source: Cyberstates Report

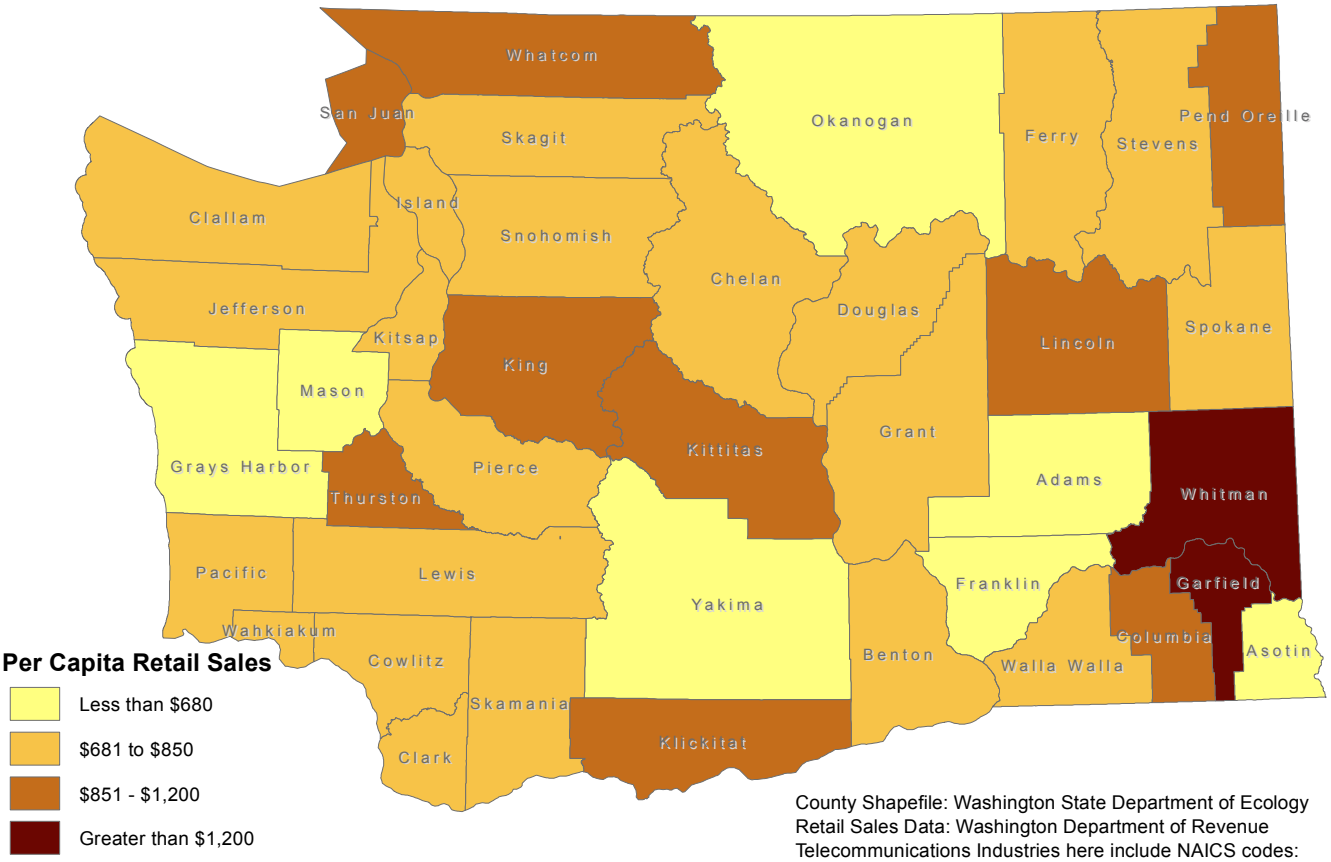
Traditional high-tech jobs, such as software or app development, don't tell the whole story of broadband's contribution to our economy. Washington's online retail economy is robust, and continues to be led by online retailing giant Amazon. And the sector continued to flourish even through the recent recession. Gross business income from electronic shopping topped $2.6 billion in 2010, topped $3.1 billion in 2011 and was more than $3.5 billion in 2012 according to the Washington State Department of Revenue.



Source: Washington State Department of Revenue

Online shopping has become the norm for all kinds of products from traditional quilt fabric to trendy electronics. Incorporated in that total for Gross Business Income are sales of broadband-related goods and services. In fact, the per capita retail sales for telecommunication related industries topped more than $850 in 11 Washington counties. King, Pierce, and Snohomish are the most populated and tech-heavy counties in the state, but Whitman, Garfield, Lincoln, and Pend Oreille counties generated hefty communications-related retail sales numbers, in part because of the BTOP infrastructure build-outs in those regions.

2012 Per Capita Retail Sales by County for Selected Telecommunications Industries



County Shapefile: Washington State Department of Ecology
Retail Sales Data: Washington Department of Revenue
Telecommunications Industries here include NAICS codes: 237130, 454111, 454112, 515210, 517110, 517210, 517410, 517911, 518210, 519130

Conclusion – Encourage and Support Innovation

Broadband access and adoption in Washington are ranked among the highest in the nation, and broadband-enabled industries already flourish here. The Department of Commerce estimates that there are nearly 267,500 high-tech workers (including some jobs not included as part of ICT) in the state generating $25 billion in revenue annually. But the real value of this kind of access to high-tech talent and high-speed broadband is the creation of the perfect environment for innovation.

Washington has already put in place incentives in the form of tax exemptions to encourage further technology development. The Washington Research Council documented those incentives in its report *Washington's Prosperity Depends on a Vibrant Tech Sector*.[45]

To continue building on the region's history of innovation however other investments should also be considered.

Washington Technology Incentives

Incentive	Date Implemented	Eligibility
High Technology B&O Tax Credit (of up to $2 million annually)	1/1/1995; expires 1/1/2015	Businesses conducting R&D in advanced computing, advanced materials, biotechnology, electronic device technology, or environmental technology
High Technology Sales & Use Tax Deferral/Waiver	1/1/1995; expires 1/1/2015	Businesses conducting R&D and pilot scale manufacturing in advanced computing, advanced materials, biotechnology, electronic device technology, or environmental technology
Biotechnology & Medical Device Manufacturing Sales & Use Tax Deferral/Waiver	7/1/2006; expires 1/1/2017	Biotechnology and medical device manufacturers, within certain construction and equipment purchases
B&O Credit for New Employees in Manufacturing and R&D in Rural Counties ($2,000 or $4,000 per job)	4/1/1986	Manufacturers, R&D labs, and commercial testing facilities located in rural counties or a community empowerment zone
Purchases of Server Equipment and Power Infrastructure for use in Eligible Data Centers – Sales/ Use Tax Exemption	For data centers constructed between 4/1/2010 and July 1, 2011, the exemption expires 4/1/2018. For those constructed between 4/1/2012 and 7/1/2015, the exemption expires 4/1/2020.	Data centers with at least 100,000 square feet in a rural county

Source: Washington Research Council

Recommendation: Invest in Research and Development

According to the Washington Roundtable, Washington is already a national leader in patents.[46] The Roundtable, a non-profit, public policy organization of major private sector employers throughout the state, has developed a set of benchmarks it believes will keep Washington in the top 10 states for quality of life and innovation. Its research indicates that inventors in Washington received 5,390 utility patents in 2012, making the state fifth in the nation for patents granted. Those patents are most likely the result of private and/or public investment in research. Washington has improved its standing in the national rankings of R&D spending in recent years, according May 2013 report[47] by Washington's Technology Alliance.

The report went on to say "Washington companies and institutions performed a total of more than $16.4 billion in R&D in 2010, the most recent year for which data are available."

That total puts the state at third in the nation to for R&D, but it also doesn't tell the whole story. Research in this state is heavily dependent on our two largest public universities, University of Washington and Washington State University. Both institutions have faced declining state support in recent years and put Washington at 21st in the nation for state and local government support of research, according to the report. This trend is troubling because our competitor states such as Massachusetts have multiple public and private research institutions with strong support.

The report goes on to recommend protecting the state's commitment to the Life Sciences Discovery Fund (which recently had its funds diverted to other purposes) to advance promising academic and non-profit research.

Recommendation: Increase Access to Venture Capital

For a company to move its idea from a great idea to a marketable product requires access to venture capital. The *2012 State New Economy Index*[48] report produced by The Information Technology and Innovation Foundation, analyzed each state's venture capital investment as a percentage of worker earnings. Overall, Washington ranked first in the New State Economy Index, which evaluated several metrics, not just venture capital activity. However, a few states recognizable for high-ICT investment rose to the top: California and Massachusetts, more than quadrupling most states, achieved rates of 0.89 percent and 0.86 percent respectively. The next closest was Colorado at 0.28 percent.

According to the report, "In 2011, 60 percent of venture capital activity was located in California and Massachusetts. Each receives nearly four times more venture capital as a share of worker earnings than the average state. Both states not only have a robust venture capital industry, but also strong university engineering and science programs and an existing base of high-tech companies, both of which can be the source of entrepreneurial startups or spinoffs that receive venture capital funding."

Washington ranked sixth in the nation, with a venture capital score of 0.18 percent, as a percentage of worker earning, placing the state in the 25th percentile nationwide.

Washington possesses a saturated ICT market, while solidly holding ground among the head of the pack in terms of venture capital activity. As a state that is home to leading ICT firms and a growing economy, Washington's net company creation and ICT growth and performance indicators tend to be positive year over year. However, the growth is not as exceptional as that experienced by the likes of North Dakota, which has relatively little previous market saturation by comparison, or California, whose culture and availability of venture capital support far outpace almost all states in the nation. In summary, Washington is among the leaders in nationwide venture capital activity overall and in particular in support of ICT startups, with consistent, albeit conservative, growth trends in new firm creation and job growth.

Technology Alliance's report[49] ranks Washington as fourth in venture capital activity with half of the $932 million going to software and information and technology services in 2012, and another 18 percent directed to biotechnology and medical devices.

While Washington state and local governments may not be able to invest in private businesses, they can encourage formation of startups through support of hackathons and apps contest such as the Evergreen Apps Challenge[50] in 2012 and the SpoCode hackathon[51] in the fall of 2013. Other jurisdictions support innovative applications as part of their own move to eGovernment.

Thirty-three jurisdictions in Washington State are currently using some kind of civic app. More than a dozen cities, police departments and sheriff's offices use civic apps as a way for residents to report crime. The state's largest city, Seattle, uses civic apps to track citizen requests, and share event information and transit schedules. Sunnyside in Eastern Washington also uses apps to share information about community facilities and resources, and track citizen requests.

The Technology Alliance in its May 2013 report recommends that the state makes a continued effort to nurture the growth of innovative young companies and high-impact jobs by continuously striving to make it easy to start and expand new businesses in Washington State.

Recommendation: Create a Workforce of the Future

As the state's ICT ecosystem and broadband infrastructure continue to improve today, experts in technology and economic development are already cautioning Washington to look to the future.

For instance Matthew Kazmierczak, Vice President of the TechAmerica Foundation and the author of *Cyberstates* 2013,[52] said "(The report) shows that Washington's tech industry is vibrant and growing, adding 2,100 jobs in 2012. Washington's tech industry benefits from its strong tech cluster in software services. In fact, Washington has the most software publisher employees in the nation with 51,700 workers. Overall, tech workers in Washington are well compensated for their specialized skills and knowledge. To continue supporting these types of jobs, the next generation of tech workers needs to be equipped with strong backgrounds in the math and sciences, starting in the K-12 system and enhanced by world class colleges and universities."

Washington's Technology Alliance couldn't agree more. In fact, the Alliance made the following recommendations regarding education in our state in its recent report *Drivers for a Successful Innovation Economy: Benchmarking Washington's Performance*[53]:

- Expand access to early learning opportunities for our pre-school aged children.
- Promote STEM literacy for all of our K-12 students through a combination of high-quality instruction, rigorous curriculum, and college and career-ready graduation requirements.
- Cultivate a college-going culture in our public K-12 education system and among our citizenry.
- Substantially increase capacity and enrollment in high-demand, high-impact fields at our public higher education institutions, at both the undergraduate and graduate levels.
- Make the attraction and retention of preeminent faculty a core strategy in our capacity-building at Washington's public research universities in order to strengthen our competitiveness in academic research and increase graduate degree production in fields that fuel our innovation economy.

Those recommendations are based on some rather dismal showings in the national rankings. Washington was 31st in the nation for high school graduation rate at 77 percent in 2010 and 46th in the nation for percentage of students continuing on to college right out of high school (just over 48 percent). And the statistics aren't much better once the student enrolls in college.

According to the report, "Our relative position in bachelor's degree production has worsened over time: we ranked 37th in total bachelor's and 32nd in natural sciences and engineering bachelor's production in 2009, compared to 32nd and 31st, respectively, in 1998.

"Our performance declines at the graduate level. Washington ranked last among our peers in both total master's degree production and science and engineering master's degree production in 2011. Our PhD production in science and engineering fields placed us 11th out of 12 peers and 35th in the nation – one place lower compared to a decade earlier."

There are opportunities to earn degrees in ICT broadband technology in Washington. There are roughly 11 colleges and universities in the state of Washington that have programs related to cyber security training according to research on EducationPortal.[54] The website includes an overview of some of the largest schools' programs and tuition information.

Students are availing themselves of some of those opportunities. The State Board of Community and Technical Colleges[55] reported that 2,153 students graduated from Washington's two-year and technical colleges with degrees or certificates in information technology during the 2010-2011 academic year.

But the Washington Roundtable recommends we improve the math and science skills of students long before college. Among the benchmarks in its *Benchmarks for a Better Washington*[56] are student achievements in math and science in the 8th grade where Washington ranks 12th and 18th respectively. The Roundtable also recommends more and faster progress towards improving our education system. And it also suggests in its report, *Great Jobs Within Our Reach,*[57] that Washington's investment in those changes now would result in significant economic impacts in the future. The report found:

- There are 25,000 "acute" unfilled jobs in Washington today – jobs that have been unfilled for three months or more due to a lack of qualified candidates. Eighty percent of these jobs are in high-demand health care and high-skill STEM disciplines, such as computer science and engineering.
- The gap is projected to grow by another 5,000 jobs per year, reaching 50,000 jobs by 2017. Ninety percent of those openings will be in health care and STEM roles.
- Due to multiplier effect, the Roundtable estimates that fulling the job skills gap could result in as many as an additional 110,000 jobs across many sectors by 2017, for a total of 160,000, and reduce the unemployment rate by up to two percentage points.
- Filling the job skills gap would generate $720 million in annual state tax revenues and $80 million in local tax revenues by 2017.

Washington has been the recipient of an extraordinary build-out of broadband capacity across multiple kinds of technology through public and private investment of billions of dollars in recent years. We are poised to leverage that technology, our culture of innovation and growing venture capital activity to continue the state's economic growth and job creation. Rather than struggling to ensure that everyone in the state has access to broadband, the challenge of the next decade maybe ensuring that all of Washington's residents have the necessary skills to take full advantage of the opportunities this network presents.

Guide to Terminology and Technology

Broadband Terminology

BIP
Broadband Initiatives Program disperses American Recovery and Reinvestment Act (ARRA) broadband funding from the U.S. Department of Agriculture Rural Utilities Service. BIP supports last-mile networks.

BTOP
Broadband Technologies Opportunity Program is the program that disburses from the American Recovery and Reinvestment Act (ARRA) broadband funding National Telecommunications and Information Agency (NTIA). BTOP supported middle-mile infrastructures and sustainable adoption programs. Sustainable adoption and infrastructure projects were completed in 2013.

Cable Modem
Cable modem service enables cable operators to provide broadband using the same coaxial cables that deliver pictures and sound to your TV set.

CCN
Communities Connect Network is a consortium of community technology experts from the nonprofit and public sector in Washington State.

CTOP
Community Technology Opportunity Program is an adoption program administered by the Washington State University from 2008 to 2009.

DSL
DSL or digital subscriber line is a wireline transmission technology that transmits data faster over traditional copper telephone lines already installed. DSL can either be asymmetrical with different download and upload speeds or symmetrical with equal downstream and upstream speeds.

Fiber
Fiber-optic technology converts electrical signals carrying data to light, and sends the light through transparent glass fibers about the diameter of a human hair. Fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even thousands of Mbps.

kbps
Data transfer speed over the networks (including the Internet) is calculated in terms of bits per second (kbps). The higher the kbps, the more bits transferred per second:

1 kbps (kilo bits per second) = 1000 bits per second
1 Mbps (mega bits per second) = 1000 kilo bits per second
1 Gbps (giga bits per second) = 1,000 mega bits per second

Last Mile
The connection between a home, wireless device or business and a broadband service provider.

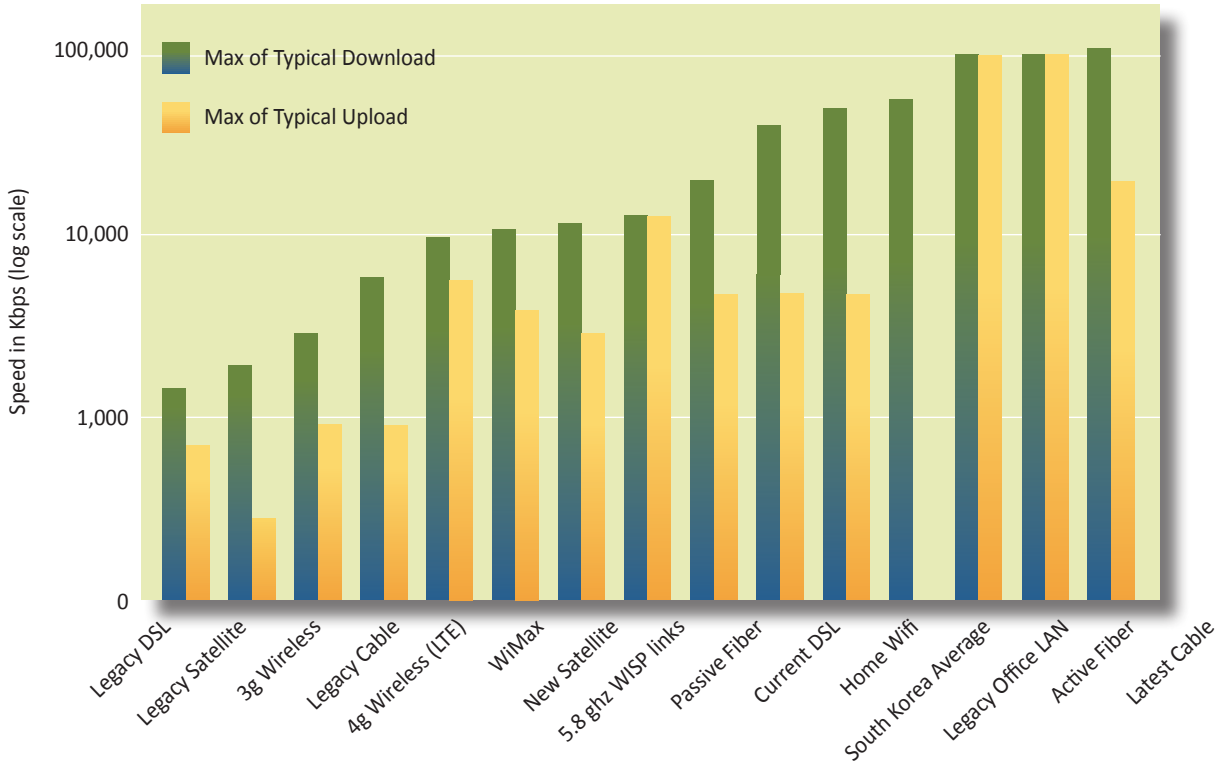
Mbps
Megabits-per-second is a unit of network speed. Every page, image and video on the Web comes to a device as small pieces of data, or packets. How fast these packets move on the network is measured in Megabits per second, abbreviated as Mbps.

Middle Mile
The connections between a broadband service provider and the Internet.

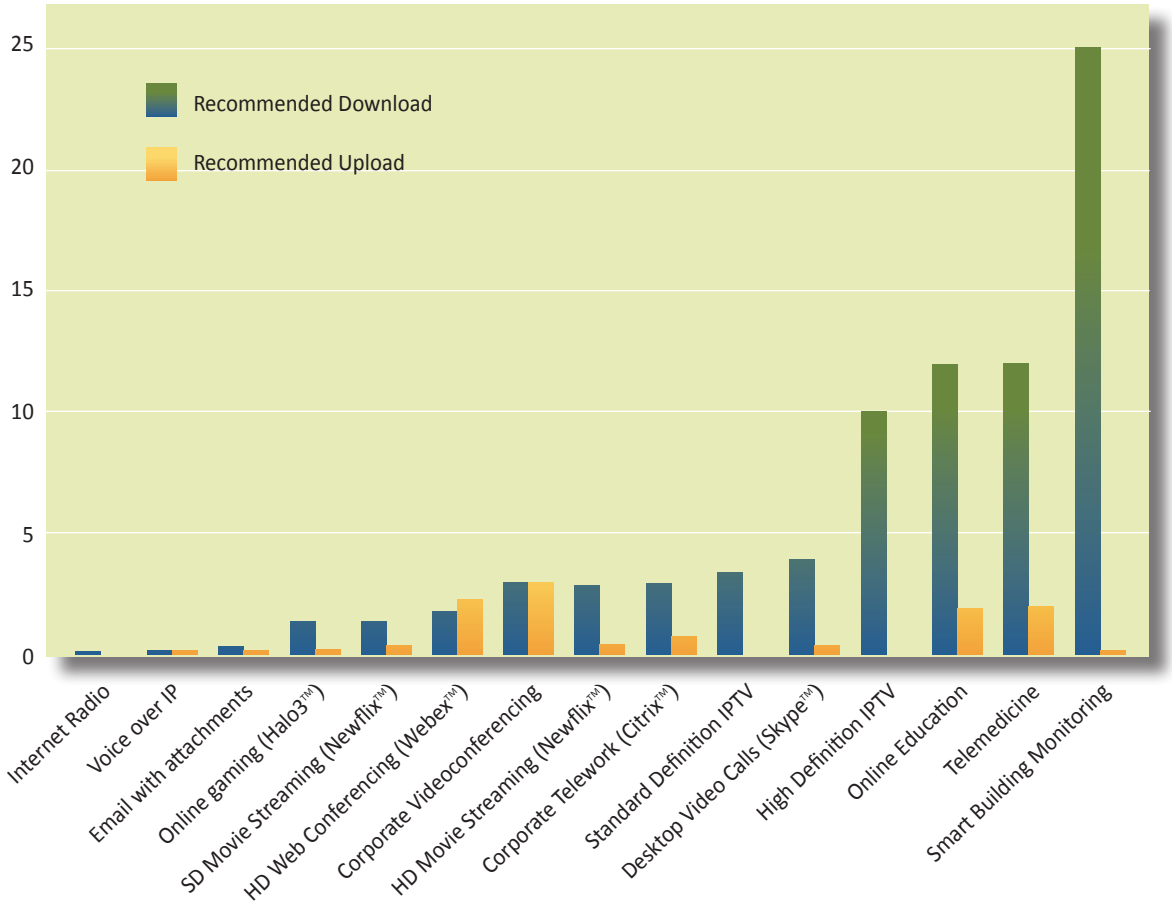
Satellite
Just as satellites orbiting the earth provide necessary links for telephone and television service, they can also provide links for broadband services. Satellite broadband is another form of wireless broadband.

Wireless
Wireless broadband in Washington can be mobile or fixed. Mobile wireless services such as “3G” and “4G” offerings from major providers use nationally licensed radio frequencies to offer broadband speeds for mobile devices; fixed wireless services use a combination of licensed and unlicensed radio frequencies to deliver broadband to homes, businesses and other fixed locations.

Estimated Network Speeds by Technology

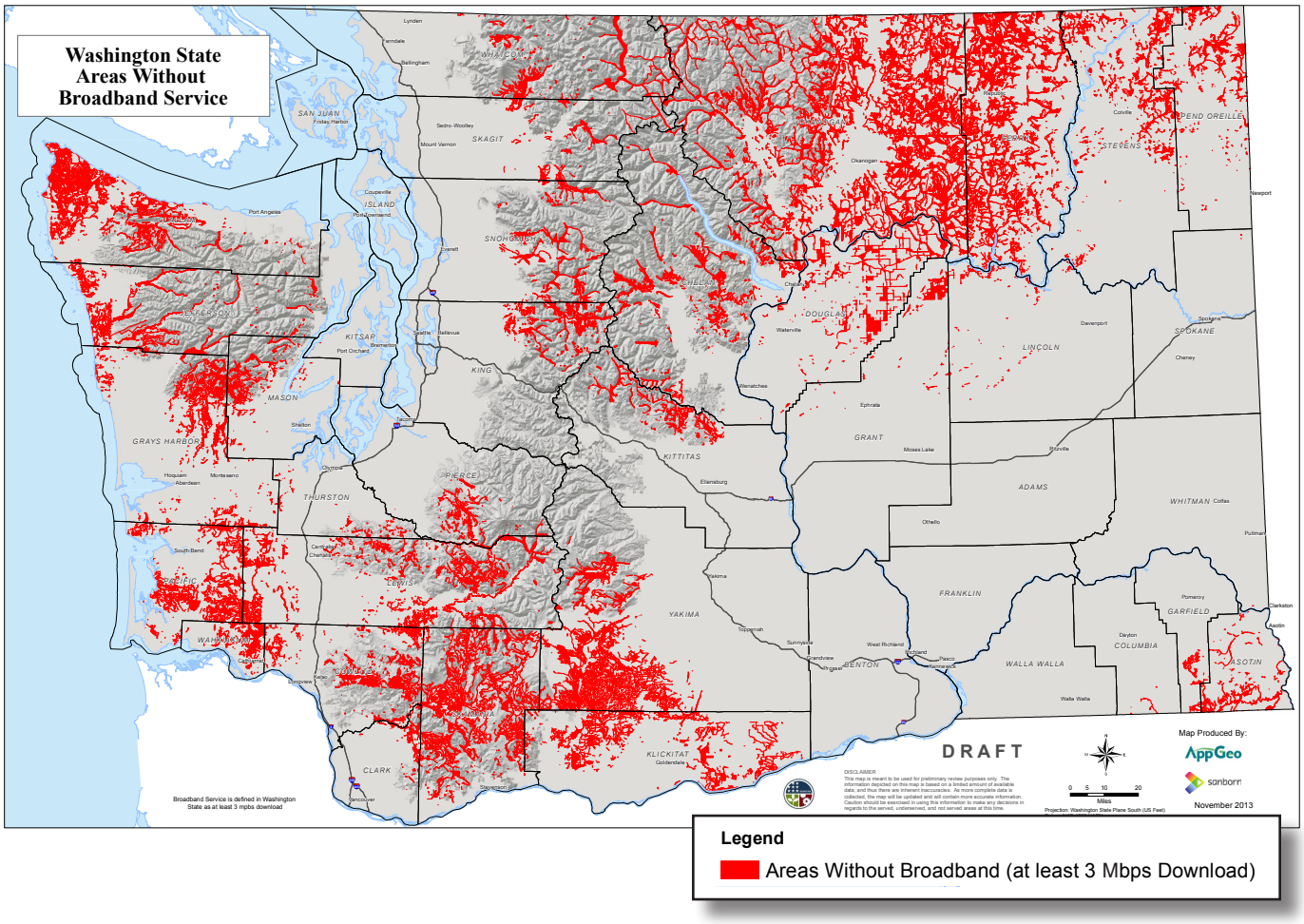


Minimum Speeds for Common Applications

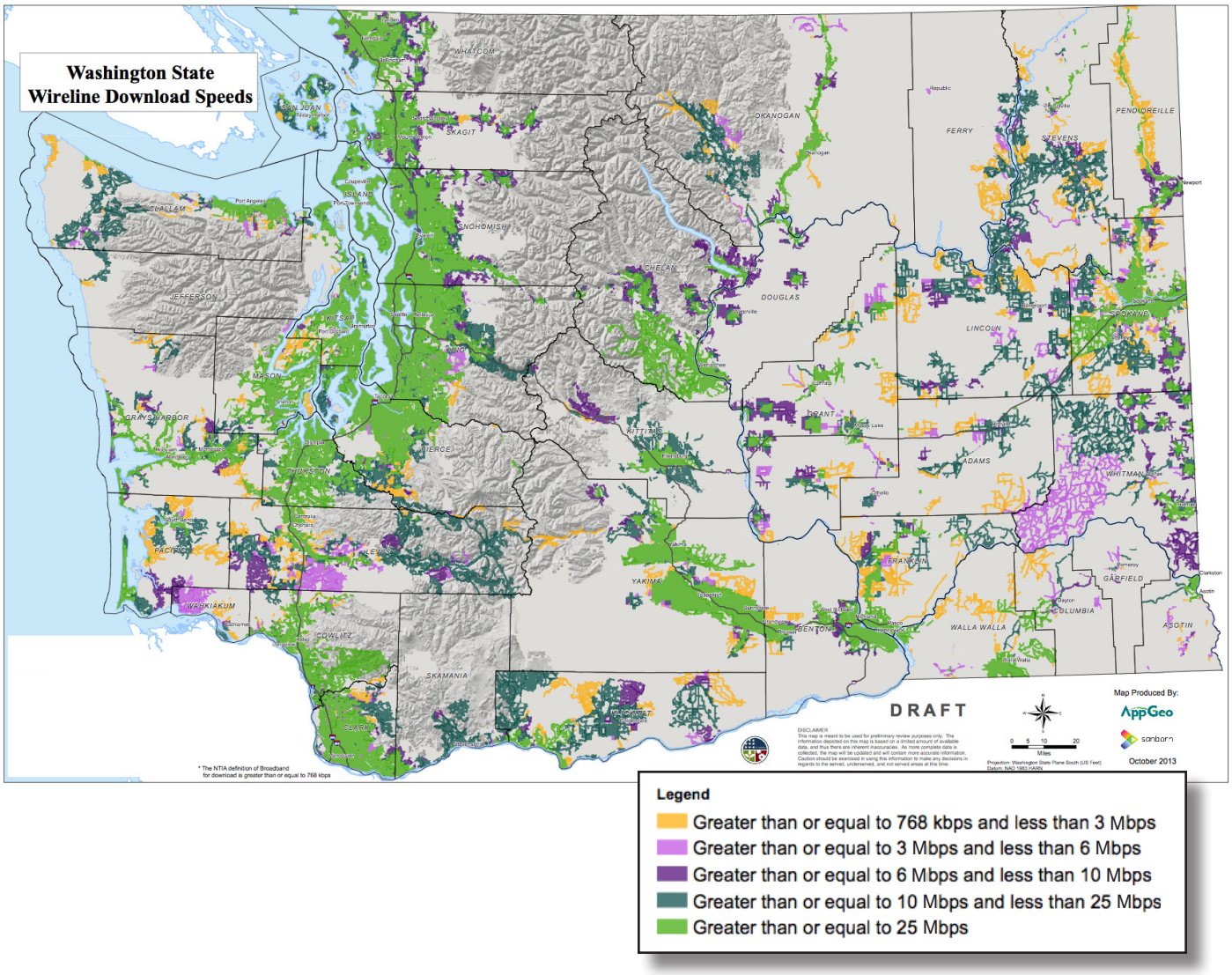


Appendix A

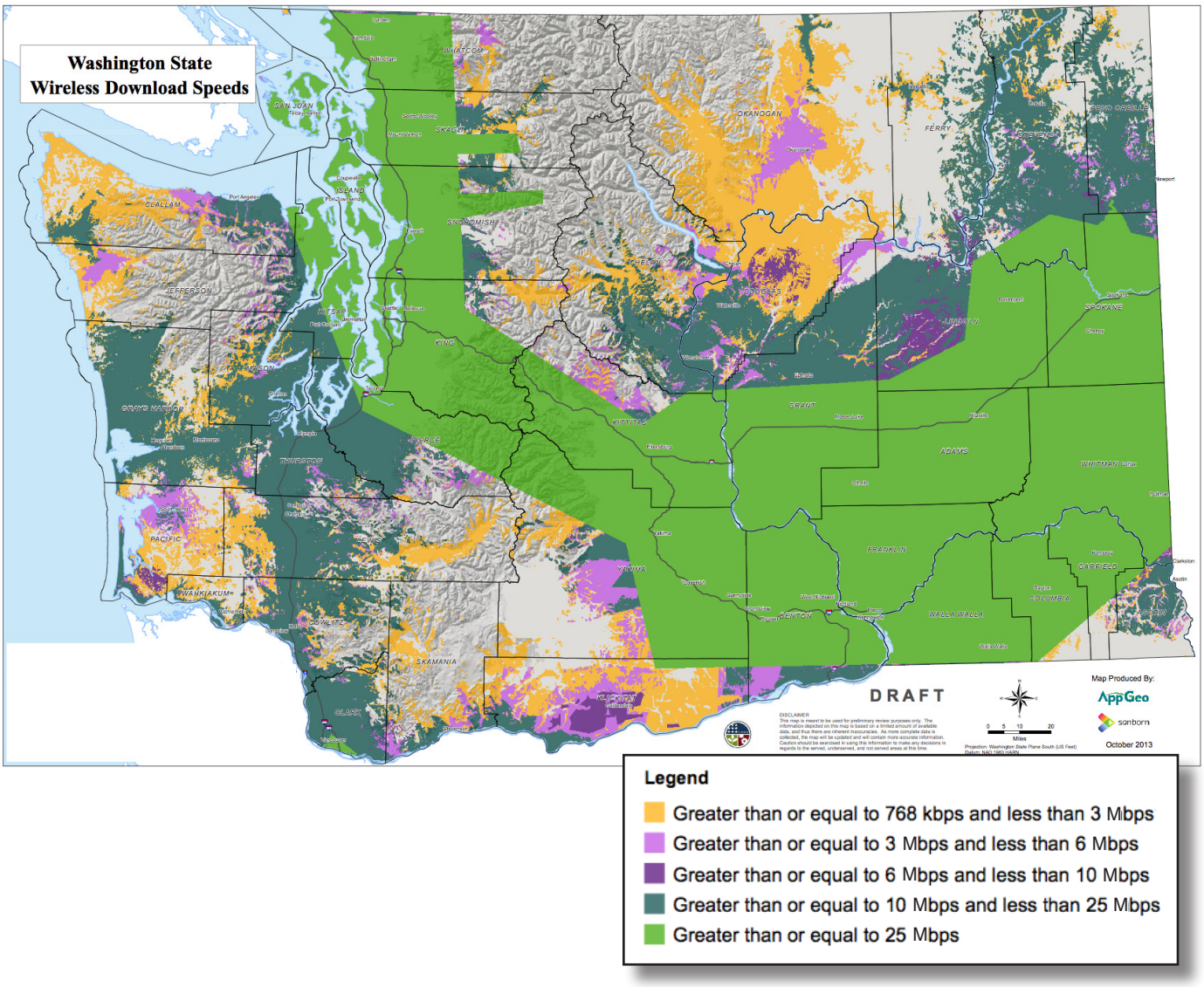
Areas With No Broadband Providers Offering at Least 3 Mbps



Wireline Download Speeds

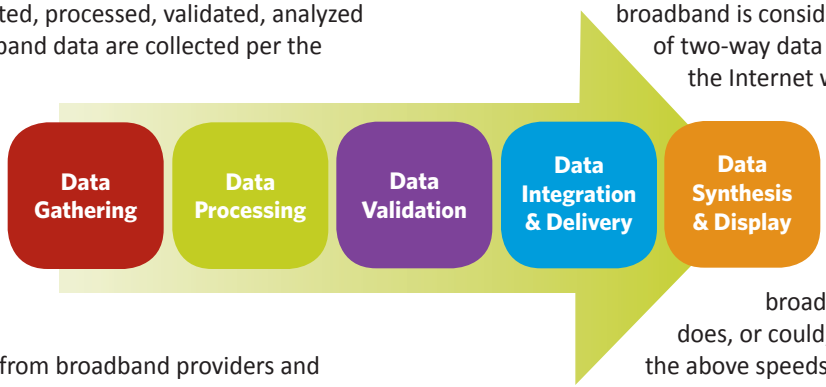


Wireless Download Speeds



Appendix B

This appendix discusses the State of Washington's broadband mapping efforts under the National Telecommunications and Information Administration's (NTIA) State Broadband Initiative (SBI) program. Under this program, funded through ARRA funds, for each state and territory in the United States, broadband data are collected, processed, validated, analyzed and displayed. The broadband data are collected per the requirements of the program and its Notice of Funds Availability (NOFA) and formal and informal clarifications to it (http://www2.ntia.doc.gov/SBDD).

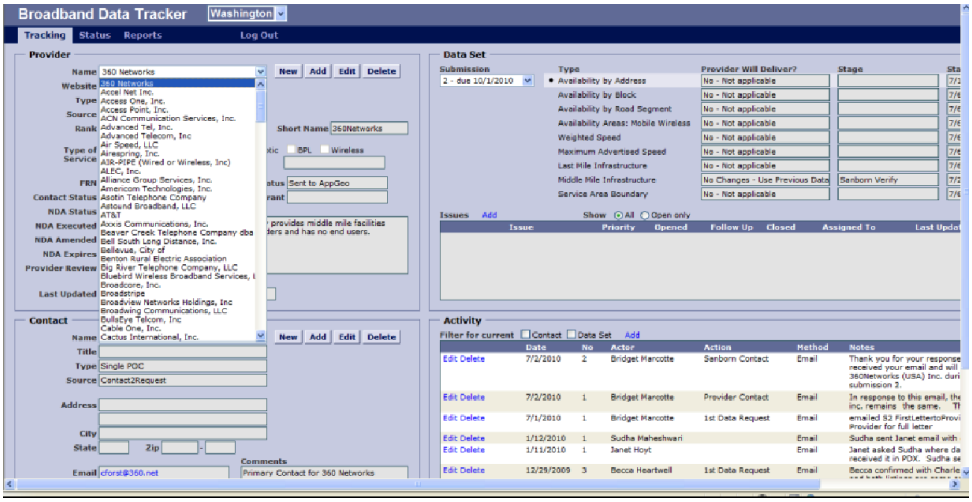


Specifically, it includes broadband data collected from broadband providers and community anchor institutions compiled from various sources for the state. The mapping program was launched nationwide in 2009 and involves semi-annual updates (data current as of June 30th and Dec 31st each year) for five years ending in 2014. Washington retained a mapping contractor, the Sanborn Map Company, to perform the work related to broadband mapping for this project.

For broadband availability information, providers of broadband are asked to provide information about themselves including their service area, technologies they use to provide service (e.g., DSL, cable, copper, fiber, wireless, satellite, etc.) and maximum advertised downstream and upstream speeds they can provide to consumers. Speeds are required in speed tiers (such as speed tier of 1 is less than or equal to 200 Mbps) rather than an actual number. For the purposes of this mapping, broadband is considered to be the provision of two-way data transmission to and from the Internet with advertised speeds of at least 768 kbps downstream and at least 200 kbps upstream to the end user. Broadband is considered available to an end user if a broadband service provider does, or could, provide broadband at the above speeds within a typical service interval (7 to 10 business days) without an extraordinary commitment of resources. Providers are also asked to provide infrastructure data in the form of last mile and middle mile locations but not the actual linear backbone.

In order to update data every six months, Sanborn contacts providers in early January and July of the year with submission deadlines and any changes in the data model or requirements from previous submissions. All interactions and information exchange is tracked in a tool built for this program, called the Broadband Data Tracker (below).

Broadband Data Tracker

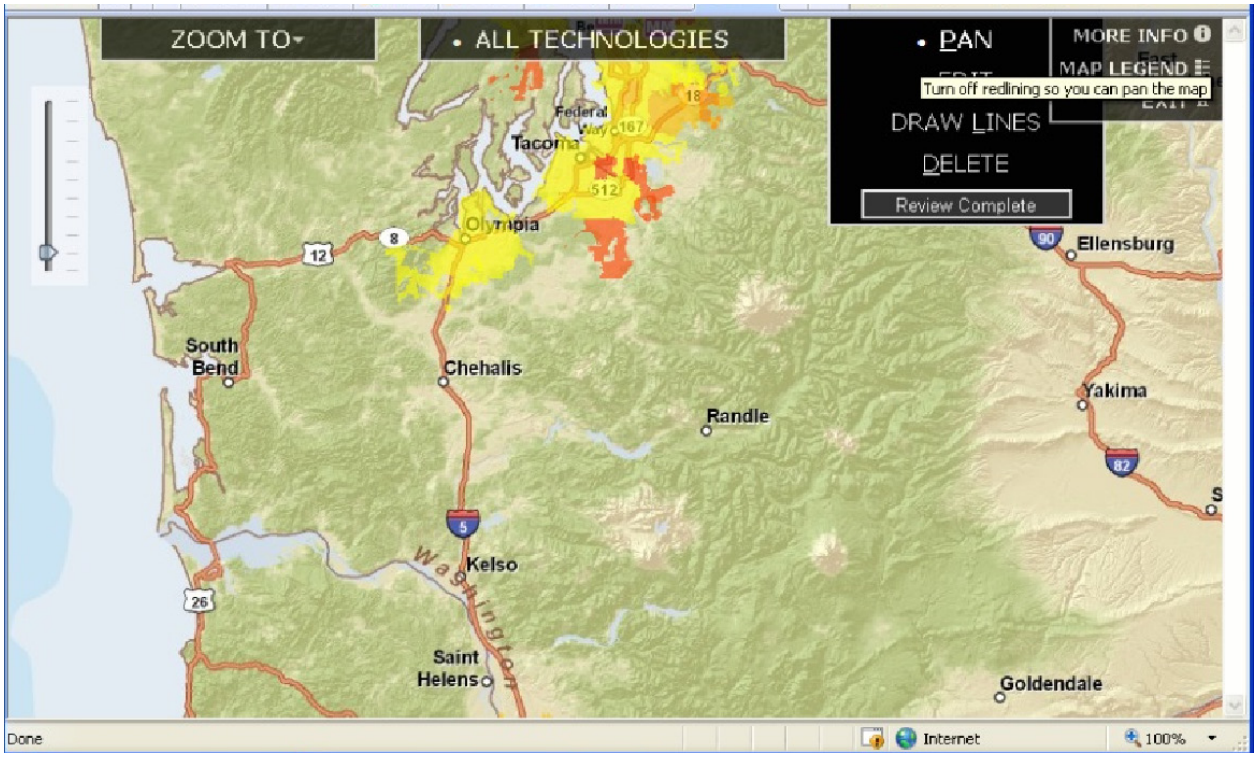


For broadband providers that are already participating in this program, processed data from previous submissions is uploaded on a provider portal where the provider can make changes directly to their previous data submission. The portal also is a tool to provide feedback to providers on their data based on validation efforts or other information that is collected from various sources.

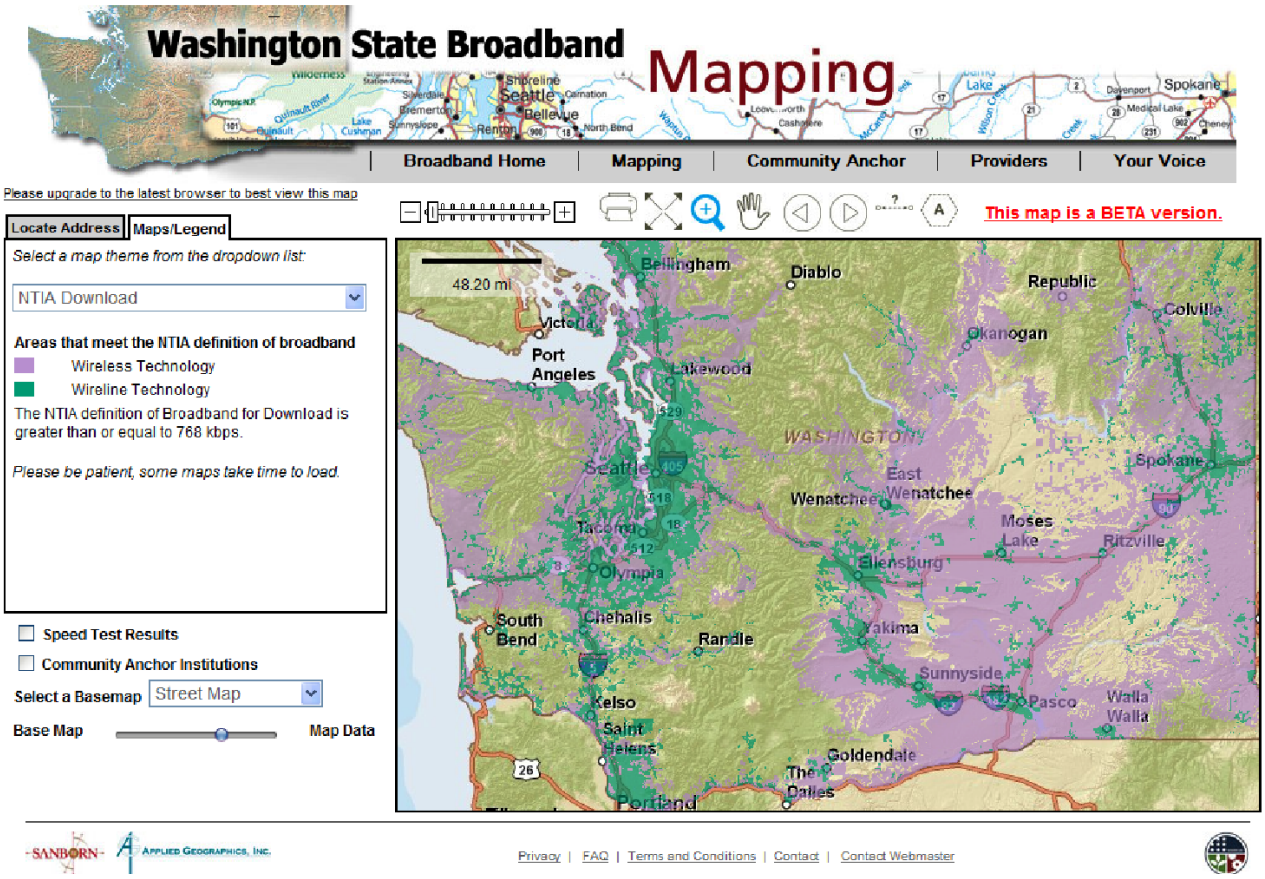
In addition to using the portal, providers give data to Sanborn in various ways and various formats – email attachments, FTP sites and in formats such as text files, spreadsheets, geographic data (e.g., KML files and shapefiles), or just a description. The data are standardized into NTIA formats through various data processing tools and softwares developed for this project.

Processed data is checked for quality and also checked against other datasets and sources of information to ensure their validity. Examples of such checks include: checking against Exchange Boundary dataset (i.e., The Washington Utilities and Transportation Commission regulated boundary of each wireline provider); MediaPrints data for cable providers; speed test data collected through our Interactive Map (http://wabroadbandmapping.org/) or through speedtest.net data purchased for this program; and feedback points collected from the above interactive map or through local interactions and knowledge. Providers see the processed data and all feedback from the above sources to review and correct the data before final submission to NTIA.

Sample Map of Washington State



Example of Washington's Broadband Map



Finally, all data are integrated into one data repository and submitted to NTIA. Other products such as maps of served/unserved, etc. are also created. Data are then uploaded on to the state's interactive map for public consumption. Through this site, consumers can search by address for providers who provide service at that address, review maps by speeds, technology, number of providers, and integrate this information with socio-economic and demographic maps. They can also provide feedback about the maps, about specific providers or take a speed test.

In addition to the above data, information about community anchor institutions (schools, colleges, libraries, hospitals, governmental and non-governmental facilities, etc.) also is compiled and the institution's access to broadband is collected through a crowd-sourcing tool developed for this project.

By October of 2013, Sanborn had collected data and updated it twice a year for four years (total of eight datasets). In the last data submission, Sanborn contacted a total of 314 providers in Washington of which 12 providers were contacted for the first time. A total of 123 potential providers have been identified, of which 97 are participating in this map to date and 26 have refused to participate. In addition, 13 providers have not responded to efforts to contact them (it is not clear whether any of these companies are actual broadband providers). Resellers are not part of this data collection.

End Notes

[1]http://www.broadbandmap.gov/

[2]http://wabroadbandmapping.org/

[3]http://wabroadbandmapping.org/InteractiveMap/

[4]http://www.recovery.gov/Transparency/RecoveryData/Pages/Recipient.aspx?duns=002799617

[5]http://www.recovery.gov/Transparency/RecoveryData/Pages/RecipientProjectSummary508.aspx?AwardIdSur=113546

[6]http://www.recovery.gov/Transparency/RecoveryData/pages/RecipientProjectSummary508.aspx?AwardIdSur=112723&AwardType=Grant

[75]http://www.recovery.gov/Transparency/RecoveryData/pages/RecipientProjectSummary508.aspx?AwardIdSur=116093&AwardType=Grant

[8]http://www.wita-tel.org/members1/

[9]http://www.colvilletribes.com/media/files/General%20Membership%2010-12-2013.pptx

[10]http://tribalbroadband.org/wp-content/uploads/2013/09/yakama_power_ttpt_kickoff.pdf

[11]http://www.broadband.gov/plan/appendices.html#s18-3

[12]http://www.ynnetworks.net/index.html

[13]http://keenwire.com/2013/01/23/nisqually-tribe-launches-wimax-broadband-network-free-to-members/

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[15]http://www.fcc.gov/maps/connect-america-fund-phase-i-round-two

[16]http://news.centurylink.com/index.php?s=43&item=3071

[17]http://broadbandbreakfast.com/2013/09/using-a-map-of-communities-receiving-connect-ame

[18]http://www.goskagit.com/news/local_news/frontier-pushes-fiber-optic-lines-to-lake-cavanaugh/article_40

[19]http://wabroadbandmapping.org/InteractiveMap/

[20]http://www2.itif.org/2012-state-new-economy-index.pdf

[21]http://www.broadbandmap.gov/

[22]http://www.pewinternet.org/Commentary/2012/May/Pew-Internet-Broadband.aspx

[23]http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-321076A1.pdf

[24]http://www.governing.com/blogs/by-the-numbers/gov-internet-adoption-by-state-data.html

[25]http://www.governing.com/blogs/by-the-numbers/gov-internet-adoption-by-state-data.html

[26]http://www.pewinternet.org/Trend-Data-(Adults)/Internet-Adoption.aspx

[27]http://www.pewinternet.org/Static-Pages/Trend-Data-(Adults)/Whos-Online.aspx

[28]http://www.pewinternet.org/Trend-Data-(Adults)/Device-Ownership.aspx

[29]http://www.census.gov/hhes/computer/publications/2010.html

[30]http://www.nardep.info/uploads/BroadbandExecutiveSummary.pdf

[31]http://www.connectednation.org/

[32]http://dgss.wsu.edu/CTOP/CTOP_Phase_1_Final_Report.pdf

[33]http://www2.ntia.doc.gov/grantee/edlab-group-foundation-formerly-known-as-the-puget-sound-center-foundation-for-teaching-lear

[34]http://www.commerce.wa.gov/Documents/Broadband-High-Speed-Internet-SWG-1Dec08.pdf

[35]http://www.commerce.wa.gov/Documents/Broadband-Report-FINAL-07-17-09.pdf

[36]http://algebrachallenge.org/

[37]http://www.appsforgood.org/

[38]http://gigabitseattle.com/areas/

[39]http://gigabitseattle.com/pricing-2/#sthash.DJr7OGwN.dpuf

[40]http://www.broadband.gov/plan/16-public-safety/#r16

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[41]http://www.ntia.doc.gov/sligp/washington

[42]http://www.commerce.wa.gov/Documents/Broadband-WA-Office-Report-2010.pdf

[43]http://www.techamericafoundation.org/washington-tech-industry-employs-191000-in-2012

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[45]http://researchcouncil.files.wordpress.com/2013/08/vibranttechsectorfinal.pdf

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[47]http://www.technology-alliance.com/documents/Benchmarking_2013%20brochure_hires.pdf

[48]http://www2.itif.org/2012-state-new-economy-index.pdf

[49]http://www.technology-alliance.com/documents/Benchmarking_2013%20brochure_hires.pdf

[50]http://www.evergreenapps.org/

[51]http://www.spocode.org/

[52]http://www.techamericafoundation.org/washington-tech-industry-employs-191000-in-2012

[53]http://www.technology-alliance.com/documents/Benchmarking_2013%20brochure_lores.pdf

[54]http://education-portal.com/

[55]http://www.sbctc.edu/college/studentsvcs/0entire_report-ayr_2.8.2012.pdf

[56]http://www.waroundtable.com/benchmarks/benchmarks

[57]http://waroundtable.com/pdf/resources/BCG_WRT_Great_Jobs_Within_Our_State_March_2013_report.pdf