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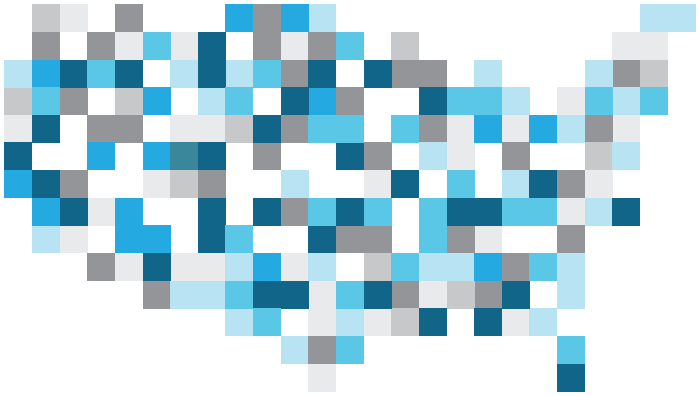
TECHNET'S 2012
STATE BROADBAND INDEX



Where States Rank as They Look to High Speed Connectivity to Grow Strong Economies and Vibrant Communities

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EXECUTIVE SUMMARY

States are actively pursuing ways to use broadband to promote economic development, build strong communities, improve delivery of government services, and upgrade educational systems. The ingredients for meeting those goals are fast and ubiquitous broadband networks, a population of online users, and an economic structure that helps drive broadband innovation and investment in new broadband uses. Not all states have these ingredients in equal measure. In this report, the TechNet State Broadband Index rates the states on indicators of broadband adoption, network quality, and economic structure as a way of taking stock of where states stand. The ratings show that the top fifteen states are:

RANK	STATE
1	Washington
2	Massachusetts
3	Delaware
4	Maryland
5	California
6	New Jersey
7	Vermont
8	Virginia
9	Utah
10	New York
11	Rhode Island
12	Pennsylvania
13	Oregon
14	New Hampshire
15	Texas

States employ a range of approaches to improving the broadband climate. Promising approaches to fostering an environment where broadband can contribute to states' development include:

- Executive and Legislative Leadership: Governors who show an interest in developing broadband are a spur to building the coalitions and institutions that can enhance broadband infrastructure deployment and adoption in a state. Legislative leadership is also critical to ensuring that regulatory barriers are minimized, that rights of way access is expanded and that other policies needed to promote deployment and adoption are developed.

- State Funding: Closely associated with executive and legislative leadership is funding for infrastructure (often done in a way to leverage private funding or incentivize private investment), and initiatives to promote broadband adoption among citizens. Although tight state budgets make new expenditures difficult to incur, states who find the resources lay the groundwork for future social and economic growth.

- Cooperation: Bringing stakeholders together in the public, private, and non-profit sector is often easier said than done. That is why the leadership of a governor and legislators matters, but other stakeholders have to demonstrate engagement as well. Effective cooperation can lower the cost of deploying infrastructure and boost broadband adoption rates. Conversely, frictions in such efforts may make it harder to compete for funding that may be available from the federal government or make a state less attractive for businesses that need fast broadband to thrive.

- Planning: Many states engage in planning activities to explore gaps in broadband infrastructure in the state, understand broadband adoption in the state, and identify how state agencies and community anchor institutions

(e.g., schools and libraries) can use broadband to carry out their missions better. Institutionalizing these planning efforts can give broadband advocates a stronger voice in debates about infrastructure in the state, while providing a long-term perspective on how policy choices impact broadband outcomes.

States that rank highly on the broadband index stand better chances of reaping the benefits associated with high quality networks and robust adoption rates. The links between broadband and specific outcomes—rates of economic growth, higher test scores for children, higher rates of civic engagement, or better government performance—are difficult to estimate with precision. Yet, if as the National Broadband Plan says, "Broadband is *the* great infrastructure challenge of the early 21st century," states' efforts to meet that challenges will have payoffs for the entire country. By comparing where states stand, the State Broadband Index offers stakeholders a roadmap for accelerating progress—and laying the foundation for stronger communities and a more innovative economy.

BROADBAND AND THE STATES

Broadband has become an important part of state policymaking in the past several years. With a tepid business climate, high unemployment, and an economy undergoing rapid transformation, state leaders are looking to build the base for productive and growing economies. Any number of elements goes into that. Schools must be strengthened in order to develop a workforce that can compete in climate of international competition and rapid product cycles. More efficient tax regimes can attract investment while generating the revenue to sustain vital public services. Local initiatives, whether they are business incubators or innovation hubs, can spur creativity and innovation that can lead to more vibrant local economies.

Infrastructure is also part of the equation. This means not just roads, bridges, water systems, and the electric grid, but also broadband. Increasingly, businesses and local economic development agencies recognize how fast and reliable broadband networks are critical inputs to productivity. State and local governments understand that broadband can help them deliver services more cheaply to citizens—and often more effectively. Individuals rely on broadband-enabled Internet access for a range of things—whether that is communicating with family and friends, shopping for deals, or finding information for education or health care.

As states try to get the most out of broadband they will be, in the familiar phrase, laboratories for democracy. Different states employ different approaches to encourage the development of broadband networks and their uses. Some states may bring considerable advantages to this effort; they may have a core of businesses in the tech sector that demand high quality broadband networks and adoption. Others may lack those assets but are actively engaged in promoting broadband adoption and deployment of high-speed networks. Still others may be behind the curve in many ways but searching for a path forward.

This report ranks states on where they stand in broadband by developing an index that brings together different elements of what might give states advantages in using broadband for economic and social development. This quantitative approach to understanding states and broadband is supplemented by a series of case studies to highlight how selected states encourage broadband deployment and adoption. There is no single recipe for success. By examining where states stand and how some are endeavoring to improve their broadband environment, this report seeks to spur a conversation among stakeholders on how to accelerate progress.

TechNet last examined states and broadband in 2003, when it released "The State Broadband Index: An Assessment of Policies Impacting Broadband Deployment and Demand."[1] That report was done at a very different broadband era in the United States. For instance, just 15% of homes had broadband subscriptions then, while 68% do today. No one knew what an "app" was and policymakers were only beginning to understand how broadband might help regional economies or improve educational outcomes. For those reasons, the 2012 TechNet State Broadband Index does not replicate the 2003 report, meaning it is not possible to compare 2003 state rankings to those reported here for 2012.

INDEX INPUTS

In developing a ranking of states on broadband, it is necessary to have data on the state level that illuminates the broadband landscape. The TechNet State Broadband Index used data that falls into the following three categories to develop state rankings.

- Adoption: The National Telecommunications and Information Administration (NTIA), an agency within the U.S. Department of Commerce, does large scale national surveys to determine the number of households that subscribe to broadband. The surveys are large enough to determine household broadband adoption rates in each of the 50 states across the U.S. Trend data on state broadband adoption also offers a look at growth rates in the past several years.

- Network speeds: There were two inputs to rate where states stand on network quality. The first, courtesy of Akamai, was on network speeds within the state (both average and peak). The second, courtesy of the Fiber to the Home Council, was the percent of households passed by fiber optic broadband infrastructure.

- Economic Structure: Two data sources characterize the extent to which a state's economy has an orientation toward broadband. First is a measure of the percentage of jobs in a state that can be counted as information and communication technology (ICT) industries (e.g., broadband service providers, electronic equipment manufacturers) and ICT centric industries (i.e., computer programmers or network administrators). The second uses research from Michael Mandel and Judith Scherer of South Mountain Economics (conducted for CTIA—The Wireless Association) who have developed a state-by-state estimate of jobs in apps development, to include "apps intensity." The rational for including the economic data is that a state economy more oriented to broadband/ICT may drive investment in or policy initiatives regarding broadband.

To elaborate on the data and how they were used, let's first look at adoption. The NTIA uses the services of the Census Bureau to conduct surveys of more than 100,000 households. These surveys were conducted in 2001, 2003, 2007, 2009, and 2010 to determine how many American households have broadband at home. The appendix includes state-by-state data for 2007, 2009, and 2010.

For this report, NTIA data from 2007, 2009, and 2010 were the inputs for ranking state broadband adoption. The index uses the level of broadband adoption in the state in 2010 and also the growth rate in broadband adoption from 2007 to 2009 and from 2009 to 2010. Each of those three elements is ranked equally. In this way, a state with a high broadband adoption rate in 2010 will receive appropriate credit for that in the rankings. However, states that may rank relatively low in 2010 have an opportunity to have a positive adoption score *if* they have exhibited strong growth rates in broadband adoption in recent years.

With respect to network quality, two measures from Akamai capture network speed in the state and a third, from the Fiber to the Home Council (FTTHC), shows the percentage of households passed by fiber optic broadband infrastructure. Data on network speed comes from Akamai, which is a content delivery network company. Akamai's clients provide content to end users, and Akamai facilitates delivery of this content by "mirroring" a client's content on Akamai servers, which are placed at a number of points in the network. When a user wants content, Akamai is able to route the request to a nearby

server, which results in the completion of a user's content request faster than otherwise possible. The extensive placement of servers in the broadband network enables Akamai to measure network speeds at various points and develop speed measurements for states. Akamai provided peak speeds for a state and average speeds for a state. The final element, from FTTHC, provides data as of the Spring of 2012, on the share of homes passed with fiber, which FTTHC develops through consumer and provider surveys. A table with figures for percent of homes passed by fiber is in the appendix. These three data elements—peak network speed, average network speed, and percentage of home passed by fiber—receive equal weight to develop a measure of network quality in a state.

In some respects, the measure of homes passed by fiber reflects investment choices that Verizon made in rolling out its FiOS fiber to the home product. FiOS provides very fast Internet connections to the home, but cable modem service does as well, especially with DOCSIS 3 upgrades. Places with a high share of homes passed by fiber have the reality of very fast home connection speeds and the potential for even higher speeds. The same is true for cable, even though the future upper bound for cable speeds is not likely to match fiber. In the index, places with high rates of fiber penetration certainly have an advantage, though it is worth emphasizing that fiber penetration makes up just one-third of the overall network measure. Those places with low rates of homes passed by fiber may compensate for that if their measured network speeds (average or peak) are high—perhaps due to upgrades in cable plant that enables fast home online connections.

The final set of inputs pertains to economic structure. The first is a measure of how many jobs in a state are related to broadband, that is, those that are likely to rely on broadband to carry out tasks or are involved in the production of goods or services in the internet economy. A full list of the occupations is in the appendix, and the list is adapted from an approach used by the trade association US Telecom when it developed a nationwide estimate of broadband jobs—over 10 million. This report used the US Telecom list of broadband-related jobs to create an estimate of broadband jobs in each state.

The other economic input is more forward looking and examines how states rate with the "sunrise" tech occupation of "apps development."In February of 2012, TechNet released a report that estimated that there were 466,000 jobs that either directly or indirectly depended on apps, that is, the creation of applications for mobile devices such as smartphones or tablet computers.[2] An updated version of that work examines apps jobs on a state-by-state basis and develops an estimate of "apps intensity," that is, the share of apps job in a state as a percentage of all jobs in the state.[3] This approach takes into account that California, with its size and large tech sector, is bound to have the most apps jobs. Smaller states will have fewer apps jobs, but perhaps are "apps intensive" in employment because they have a lot of apps jobs as a share of overall employment.

The index uses a state's "apps intensity" as a measure of its broadband environment. States with high "apps intensity" may be beneficiary of past investments in broadband and also an indicator that future investment (public or private) may be forthcoming to support an emerging sector of the economy. However, because the sector is small as a share of all employment and the methods to track apps employment are nascent, "apps intensity" receives a modest weight in the economic structure portion of the index. It is only one-fifth of the economic structure measure, with the overall ICT employment measure (by state) taking the balance.

HOW STATES RANK

The state of Washington tops the TechNet State Broadband Index (Table 1), driven by an economy that has a strong orientation toward ICTs and apps development. In picking apart the three main inputs to the index (adoption, network quality, and economic structure), Washington leads on the strength of its ratings on economic structure. With the presence of Microsoft and Amazon, as well as companies like F5 Networks and T-Mobile, and others, Washington has an economy which demands high speed connectivity. Washington State also rates very highly in apps intensity; companies like Point Inside are devoted to developing mobile applications and many workers within larger tech companies spend their days developing, or supporting the development of, apps.

TABLE 1

TechNet State Broadband Index

RANK	STATE	INDEX VALUE (100=AVG)
1	Washington	152
2	Massachusetts	146
3	Delaware	141
4	Maryland	140
5	California	132
6	New Jersey	131
7	Vermont	128
8	Virginia	126
9	Utah	119
10	New York	119
11	Rhode Island	117
12	Pennsylvania	116
13	Oregon	115
14	New Hampshire	108
15	Texas	105
16	Georgia	102
17	Connecticut	102
18	North Dakota	100
19	Minnesota	100
20	Florida	99
21	North Carolina	99
22	Colorado	99
23	Arizona	99
24	Illinois	98
25	Kansas	97
26	South Dakota	94
27	Tennessee	93
28	Indiana	93
29	Wisconsin	93
30	South Carolina	92
31	Michigan	91
32	Missouri	91
33	Nebraska	90
34	Iowa	89
35	West Virginia	89
36	Nevada	89
37	Oklahoma	89
38	Alabama	88
39	Ohio	88
40	Maine	88
41	Idaho	86
42	Mississippi	84
43	Montana	80
44	Wyoming	78
45	Kentucky	76
46	New Mexico	76
47	Louisiana	72
48	Hawaii	70
49	Alaska	66
50	Arkansas	64

The Commonwealth of Massachusetts follows, with the cluster of universities and tech companies in the Boston area driving high ratings for apps intensity and overall economic structure oriented to broadband. The density of the university-industry complex in the Boston area likely also contributes to high ratings on network speed. Delaware's third position in the rankings has a lot to do with network quality; Delaware comes in first in this indicator. The state's concentration of corporate headquarters, which are reliant on broadband connectivity, is likely the reason behind its above-average rating on economic structure. Maryland, like Delaware, is a small state geographically with dense urban clusters; this undoubtedly helps it have high measures of average and peak network speeds. Maryland is also part of the DC-area tech cluster, and its tech-oriented economic sector is enhanced by the health care and hospital industries in the Baltimore area. One commonality among Massachusetts, Delaware, and Maryland is a high rate of homes passed by fiber. Other top ten states with the same pattern of broadband oriented economic structure and fast network speeds are Virginia, New York, and California. Each of those states also has a higher-than-average share of homes passed by fiber.

It is notable that all of these states are average (or below average) on broadband adoption. States above average on home broadband adoption—Massachusetts, California, and New Jersey—have not had fast growth rates in recent years. New York and Delaware are at about the national average in home broadband adoption, but also have tepid growth rates in recent years. In the top ten, only Vermont and Utah are above the average for home broadband adoption. Utah has the highest rate of home broadband adoption of any state at 80%, while Vermont is just above average at 70%, but has seen fast growth rates in recent years. Table 2 displays results for all states on each of the three general index inputs.

TABLE 2

TechNet State Broadband Index—Breakout of Inputs

RANK	STATE	ADOPT TOTAL	NETWORK TOTAL	ECON TOTAL
1	Washington	101	105	260
2	Massachusetts	90	181	173
3	Delaware	88	224	116
4	Maryland	98	185	140
5	California	99	115	189
6	New Jersey	85	167	145
7	Vermont	121	177	84
8	Virginia	95	121	166
9	Utah	111	125	123
10	New York	87	139	132
11	Rhode Island	79	174	102
12	Pennsylvania	104	146	99
13	Oregon	98	109	140
14	New Hampshire	94	118	113
15	Texas	110	102	102
16	Georgia	93	83	134
17	Connecticut	92	99	116
18	North Dakota	119	104	73
19	Minnesota	94	81	125
20	Florida	92	112	95
21	North Carolina	104	93	100
22	Colorado	85	76	140
23	Arizona	112	72	112
24	Illinois	101	83	112
25	Kansas	112	82	95
26	South Dakota	102	110	70
27	Tennessee	98	108	70
28	Indiana	89	115	74
29	Wisconsin	94	86	98
30	South Carolina	113	93	66
31	Michigan	102	84	87
32	Missouri	112	58	101
33	Nebraska	94	80	98
34	Iowa	106	77	83
35	West Virginia	134	67	62
36	Nevada	108	85	71
37	Oklahoma	120	74	69
38	Alabama	114	74	74
39	Ohio	86	75	103
40	Maine	107	83	70
41	Idaho	117	57	81
42	Mississippi	132	67	47
43	Montana	101	71	66
44	Wyoming	115	73	42
45	Kentucky	95	63	69
46	New Mexico	83	71	71
47	Loulsiana	95	70	49
48	Hawaii	70	77	63
49	Alaska	75	62	61
50	Arkansas	77	47	68

STATES THAT ARE OVERACHIEVERS

Looking at the states that rank in the ranking's upper reaches invites the question of whether history or purposeful action (either by public or private sector) explains the results. California and Massachusetts, for instance, have been centers of the technology industry for generations, which has been cause and consequence of investments in higher education in those places. It would be surprising if these two states *did not* do well in the rankings. A strong broadband environment may flow naturally from structural forces and perhaps less from initiatives undertaken by stakeholders in the public, private, or non-profit sectors.

One way to explore that question is to ask whether some states are overachieving or underachieving, that is, whether they perform better than expectations or not. Overachievers can manifest themselves in two ways. First, overachievers could be states without inherent advantages in broadband—they have low population density, a population with, on average, or low socio-economic indicators. These states may have low or middling rankings, but those rankings might be *even lower* if these states had not made good choices to help the broadband environment. Such states are overachievers that do better than they should because of planning and investment efforts that have paid off. Second, overachievers could be states with a lot of advantages to begin with (e.g., a vibrant tech sector and well-educated population), which they build upon through smart initiatives undertaken by the public or private sectors. Underachievers could unfold in two ways as well—states with inherent advantages in broadband that do not rate as well as they should or states lacking advantages in broadband and rate lower that they should.

Determining which states are overachievers means asking whether the "non broadband" factors that are likely to influence the rankings explain where states fall in the rankings. Does a state's population density, household income levels, number of senior citizens, and levels of educational attainment explain variations in the rankings? Regression analysis is the way to tackle that question and it is used in the following way. First, a simple regression model explored how well the factors just identified—state population density, household income levels, percent of senior citizens, and the percent of a state's population with a college degree—predicted the actual index scores that form the rankings. It turns out these factors do a reasonably good job at predicting index scores; they explain about half the variation across states. Second, the equation generated by the model was used to compare the model's prediction of states' scores to actual scores.

The predicted scores of some states exceed their actual scores, meaning these states are overperforming relative to expectations, that is, they are overachievers. Other states have scores below what the model predicted, meaning they underperform. Many states' scores are fairly close to what the model predicts. Table 3 shows the results of this exercise for the thirteen states that are overachievers. Because estimates generate the results, the

table shows the states in alphabetical order and without data showing the degree to which states are overachievers.

TABLE 3
Overachievers

STATE
California
Delaware
Indiana
Nevada
North Dakota
Oklahoma
Oregon
Pennsylvania
South Dakota
Texas
Utah
Washington
West Virginia

Several high ranking states—Washington, Delaware, California, and Utah—are there in part because they perform better than expected. Others, such as Pennsylvania, Oregon, Texas, and North Dakota exceed expectations and place in the top twenty. Some states that did well in the overall rankings, such as Maryland, Massachusetts, Virginia, and New York, performed at about expectations in this analysis.

The states that do not rank highly in the index, but are overachievers include West Virginia, Indiana, Nevada, and Oklahoma. These states have inherent disadvantages relevant to some of the indicators—difficult terrain, open rural spaces, or economies that are less reliant on technology than many others. But several (West Virginia, Nevada, and Oklahoma) have been making strides in home broadband adoption in recent years. Indiana rates well in network quality, in part due to FiOS fiber-to-the-home deployments by Verizon in parts of the state.

This discussion shows that states with inherent advantages can build on them, while some without those advantages are able to do better than expected. What actions lead to these outcomes? The following case studies on six states offer illustrative examples on how a few states have tried to improve broadband. The states are California, Missouri, Ohio, Maine, Massachusetts, and Utah.

CASE STUDIES

CALIFORNIA

California has made important progress in broadband statewide by developing a coordinated plan to promote deployment, expanding support for new infrastructure, and taking steps to expedite rights of way access. In 2006, then-Governor Arnold Schwarzenegger issued an executive order to reduce regulatory roadblocks, install conduit in new road construction and establish the California Broadband Task Force, a public-private partnership to identify additional administrative actions to promote broadband access and usage within the state.

The task force report, called "The State of Connectivity: Building Innovation Through Broadband" was published in January 2008 and represented one of the earliest efforts by any state to benchmark broadband. The task force made a number of recommendations to enhance broadband deployment and access in California, such as:

- Building out high-speed broadband infrastructure to all Californians;
- Developing model permitting standards and encouraging collaboration among providers;
- Increasing the use and adoption of broadband and computer technology;
- Engaging and rewarding broadband innovation and research;
- Creating a statewide tele-health network; and
- Leveraging educational opportunities to increase broadband use.

One of the most significant and impactful recommendations from the 2008 report, creation of the California Advanced Services Fund (CASF) to fund broadband network construction in unserved and underserved areas, quickly became reality. In 2008, California Senator Alex Padilla won enactment of legislation, supported by TechNet, to authorize the CASF at a level of $100 million. In 2011, Governor Brown signed legislation, also authored by Padilla, to expand the Advanced Services Fund to $225 million through 2018. The CASF is funded through a small assessment on telephone and VoIP services.

Other 2008 task force recommendations that have been enacted include:

- SB 1437 (Padilla), establishing the California Virtual Campus and allowing community colleges to qualify for the Teleconnect Fund, and;
- SB 1191 (Elaine Alquist), authorizing community service districts to offer broadband services if they are not available from private sector providers.

California has been a leader in promoting broadband use, for example, adopting a policy of regulatory restraint with respect to IP-enabled communications services—an important demand driver for broadband; investing in development of an extensive tele-health network and removing regulatory barriers to online learning by enabling schools

to receive funding regardless of whether a student is physically in the classroom.

California has also benefitted from the California Public Utilities Commission's creation of the California Emerging Technology Fund (CETF), whose mission is to boost broadband adoption. The CETF came about because of the 2005 AT&T/SBC merger with Verizon/MCI. As part of the conditions attached to the merger's approval, the California Public Utilities Commission required the companies to contribute $60 million over five years. The CETF has undertaken a number of initiatives to reach its goals of 98% broadband deployment in California and 80% adoption, up from the state's 2010 73% home broadband adoption rate.

MAINE

Maine ranks 40th in the index, driven by mixed performance on all of the indicators used in the construction of the broadband index. Maine's level of broadband adoption is below average and has, until recently, grown at a pace below the national average. At the same time, Maine is in the middle of the pack when it comes to overall network health, even though the state's economy is not heavily oriented toward technology. The data seem to indicate that despite relatively early organization and leadership on the issue of broadband, the state has been unable to capitalize completely on broadband as a platform for innovation in its economy and society.

Like California, Maine was an early mover in terms of developing a statewide broadband initiative. In 2005, then-Governor John Baldacci created the state's Broadband Access Infrastructure Board (BAIB) in 2005 by executive order. The order set a goal that 95–98% of Maine communities would have access to broadband by 2010.[4]

The BAIB produced a report in 2005, recommending several actions—most directed at increasing the availability of broadband and improving broadband adoption in unserved or underserved areas. These recommendations included, among others, providing incentives and funding for broadband infrastructure, regulatory changes to rights of way policies, granting funds for technology demonstration projects and creating a Citizens' Advisory Board to lead technology demonstration efforts. In addition, the report recommended creating an entity with rulemaking authority and a professional staff to monitor broadband deployment and maintain information on availability, demand and potential funding. Thus, in 2006, Maine created the ConnectME Authority.[5] ConnectME has statutory authority to collect an annual fee (not to exceed 0.25% of revenue) from every communications provider for all services provided in the state. The Authority has provided 18 grants to providers to bring broadband to unserved areas across the state in the more than two years since it was formed, with the potential to reach 27,000 households.[6]

The state also took advantage of the 2009 stimulus bill. Maine received a $25 Million BTOP grant for a public-private partnership to expand its middle-mile infrastructure called the Three Ring Binder project, the first part of which was completed in October 2010. In addition, like other states, Maine received funding to expand the planning activities of ConnectME: in June 2011, the ConnectME Authority published a statewide needs assessment and followed that in April 2012 with a strategic broadband plan for Maine.

Apart from the stimulus funds, the state has also made other steps to integrate broadband into key sectors. For example, Maine is a member of the FCC Rural Health Care Pilot funded New England Telehealth Consortium, which links regional health care providers with urban public practices, research institutions, academic institutions and medical specialists.[7] But according to the state's strategic plan, the broadband speeds necessary for most healthcare entities are not available without a cost-prohibitive dedicated line subscription.[8] Also,

there is currently low uptake of applications that might boost broadband demand—Electronic Health Records and Health Information Technologies—amongst healthcare providers in the state. The strategic plan makes recommendations to boost adoption and use with federal help.[9]

Similarly, from primary schools through higher education, Maine has made progress integrating broadband and technology into education. Every Maine school and library has broadband service and 44 percent have fiber optic connections.[10] The Maine Learning Technology Initiative—which provides all seventh and eighth grade students and teachers in Maine with a laptop—is a national example of a successful education technology initiative.[11] And the University of Maine is working towards bringing next generation connectivity and speeds to the state as a founding member of the NorthEast Cyberinfrastructure Consortium, a charter member of the Gig.U Project and a participant in the NorthEast Research and Education Network.

However, the state has not excelled in developing its knowledge economy. Maine's ICT industry has lagged the national average as well as its New England neighbors, when measured as a share of overall GDP and employment.[12] With the state's efforts to improve network quality and broadband use in sectors such as health care and education, one would expect to see payoffs to the economy and quality of life in Maine in the coming years.

UTAH

Ranking 9th on the State Broadband Index, Utah's boasts a healthy technology economy supported by robust broadband infrastructure. Though many Utah communities are relatively rural and remote, the state has become a regional technology hub capable of attracting high technology businesses and supporting broadband adoption and use in various sectors like healthcare and education, and over 5 percent of the state's jobs are ICT-related occupations. In 2010, Utah had the highest broadband adoption rate in the country and continues to outpace the national average in adoption growth between 2009 and 2010. And the state ranks far above the national average on number of residences with fiber to the home as well as the peak and average speeds available to its residents.

Utah has led the country in publicly-supported broadband deployment projects, hosting one of the first—and largest—open access fiber deployments in the United States, the Utah Telecommunications Open Infrastructure Agency (UTOPIA) and its sister project, the iProvo network. UTOPIA is a consortium of now 16 cities that joined together to deploy an all fiber network to homes and businesses funded through municipal bonds. During the planning phases of these networks, the state legislature imposed a number of requirements that effectively barred the networks from providing retail services to homes and businesses but allowed municipal providers to exist as wholesale networks. These deployments faced considerable legal and legislative challenges, as well as problems in planning and management.[13] The iProvo network was sold to private provider Broadweave Networks in 2008 but was transferred back to the city earlier this year. UTOPIA, under new management since 2008, has continued to operate as a public open access network.

Disagreements remain about the success of Utah's fiber network experiments, and the issue has become a political dividing line in many communities. But these experiments, as well as private investment and sector-based broadband networks, have resulted in a sophisticated and healthy broadband infrastructure that the state's public and private institutions have readily used.

Public private partnerships between the Utah Education Network (UEN) and private broadband providers have connected over one thousand schools, supporting interactive video conferencing and distance education programs throughout the state.[14] Connections to schools are fully covered by the UEN, which receives support from state appropriations as well as federal universal service funds through the E-rate program and other federal grants. The network serves as the "anchor tenant" for many independent telecom providers throughout the state and is set to expand using BTOP funds to connect 149 more community anchor institutions. Similarly, the state's Department of Transportation has enabled the deployment of broadband throughout Utah through its policy, which originated with major road construction projects for the 2002 Winter Olympics, of facilitating cooperative fiber and conduit trades with broadband service providers as well as laying fiber conduit during road construction projects where it makes sense. The agency uses this backbone to provide "smart roads" to help eliminate traffic congestion.[15] And, the Utah Telehealth Network (UTN) connects urban and rural providers throughout the state with facilities and patients, enabling telemedicine, home monitoring for elderly and chronic patients, as well as public health and health administration projects.[16]

MASSACHUSETTS

Massachusetts ranks second on the index, driven by high marks in every category—broadband adoption, network health and economic structure. Demographics and geography put Massachusetts in a relatively advantageous position relative to other states—with a high median income, population density and level of education amongst residents, private and public stakeholders have taken an aggressive stance with regard to maintaining and improving the state's digital health. On display in Massachusetts is a holistic approach to broadband deployment, adoption and use that has yielded positive results.

Massachusetts communities were relatively early broadband adopters, with the state showing a nine percent broadband adoption rate in 2000—the highest in the country.[17] State and regional leadership appear to have helped the Commonwealth get a head start, with regional coalitions banding together to promote demand aggregation amongst anchor tenants, businesses and residents in rural western Massachusetts.[18] These efforts were led through The Massachusetts Technology Collaborative (MTC), the state's economic development agency for the "innovation economy and renewable energy," as directed by the legislature. The MTC became the home for other projects aimed at using technology to innovate in the economy and specific sectors like healthcare.[19] In 2008, the Massachusetts Broadband Institute (MBI) was created and assigned to the purview of the MTC. The authorizing legislation gave the MBI the ability to invest up to $40 million of state bond funds in necessary infrastructure assets like conduits, fiber-optics and wireless towers. MBI has used these funds as leverage to attract funding from the federal government's Broadband Technology Opportunities Program, as well as from the private sector. MBI's state resources helped attract investment from Axia NGN to serve as network operator for the Massachusetts 123 and OpenCape infrastructure projects.

The history of broadband policy in Massachusetts is full of partnerships—with the federal government, with private entities, amongst state agencies and interested nonprofits. For example, an MBI project along I-91 came from a collaboration between the state transportation agency, who was installing conduit for a traffic-management system and MBI who took the opportunity to install some of its own fiber at the same time.[20] The MBI has since developed a dig once policy and has a similar agreement with the Department of Conservation to use the state's fire towers as attachment points for wireless equipment.[21] The state, as already noted, has received federal stimulus grants to expand existing projects as well as work with private providers to build new infrastructure like the MassBroadband 123, which will connect over 120 communities in western and north central Massachusetts.[22] Such partnerships can fuel community action. In the western Massachusetts town of Leverett, the town has invested $3.6 million for a fiber-to-the-home project, which will use the MassBroadband 123 infrastructure as its on-ramp to the Internet backbone.

While deploying broadband and working to support its adoption in residences and businesses, stakeholders have also invested in the capacity of the overall digital ecosystem in the state. The John Adams Innovation Institute, another division of the MTC, has worked to develop and support research universities, hospitals and laboratories, the concentration of venture capitalists and angel investors as a framework for the innovation economy in Massachusetts. The Institute conducts investment support studies for private entities and the public sector and leads efforts like the development of the State Regional Economic Development Strategy.[23]

MISSOURI

Missouri, hit hard by the most recent economic downturn, sees broadband as a part of a broader economic recovery strategy. While the state is hampered by broadband network availability and capacity, recent high broadband adoption growth rates and a demonstrated embrace of the digital economy earns the state a rank of 32 on the broadband capacity index. The state possesses a host of necessary components to drive broadband-based economic growth and seems poised to address its broadband infrastructure challenges.

Rural residents in Missouri are less likely to have broadband at home than non-rural residents (63 percent compared to 82 percent).[24] State leaders have taken notice, establishing a Rural High-Speed Internet Access Task Force tasked with providing recommendations for policy changes to increase the availability of broadband in the state as well as applying for federal broadband stimulus funds for broadband infrastructure expansion.[25] These awards are intended to add capacity to the state's middle mile broadband infrastructure, lowering the costs to deliver service to homes and businesses for service providers and potentially lowering costs for consumers by improving competition amongst those service providers. Like other broadband stimulus funded projects, these infrastructure improvements are required to be substantially built out in two years. At the same time, localities are limited in the amount they can do to support broadband expansion as existing legislation bars municipalities and municipal electric utilities from selling or leasing certain telecommunications services to the public and sales of telecommunications services to other providers are also subject to various restrictions.[26]

In light of these challenges, elected officials, local stakeholders and representatives from private industry have demonstrated a commitment to planning for broadband and integrating the infrastructure into a broader, long-term strategy for development. In 2009, the Governor established MoBroadbandNow, a public-private initiative to expand broadband accessibility and facilitate the integration of broadband and information technology into state and local economies, including directing the state's stimulus funding and projects. The initiative's main objective is to deliver broadband to 95% of residents by the end of 2014.[27] In pursuing these objectives, the initiative has established regional teams to develop grassroots-level strategic broadband plans and holds an annual broadband summit. The initiative also collects broadband data to produce semi-annual interactive mapping information and reports on the status of other broadband infrastructure projects—joining all things broadband under one umbrella. The 19 regional planning councils recently completed local needs assessments and strategic planning efforts, all of which will be brought together in a state strategic plan.

In addition to the state's MoBroadbandNow efforts, Missouri is home to several existing networks that support the state's established and growing information technology sector. MORENet, a statewide research and education network, was established in 1991 at the University of Missouri Columbia and has connected schools, public libraries, academic institutions and state agencies to an advanced,

high-speed network as well as staff training, technical support and electronic resources.[28] The Missouri Telehealth Network (MTN) is a public-private partnership operating a semi-private network to deliver telehealth and general telecommunications services to hospitals, health care centers, and universities throughout the state.

In an effort to recover from the recent economic downturn, Missouri has aggressively pursued building economic diversity and a growing broadband-based economy. A report issued earlier this year details the importance of broadband for the state's agriculture economy and outlines ways to help farmers take advantage of the technology. Further, the state has sought to encourage the use of information technology in agriculture and heavy manufacturing, while encouraging entrepreneurship and the growth of new and emerging high-tech companies. The state supports emerging businesses through public-private partnerships like the Missouri Technology Corporation and non-profit and public-supported efforts like the IT Entrepreneur Network and university-housed Innovation Centers. Finally, using tax credit incentives, the state has attracted several high-technology companies to the region including IBM, Capgemini and Unysis.

There are some bright spots on the horizon for Missouri: The Google Fiber project, in Kansas City, will add a considerable boost to the speeds available to a portion of the state's residents, while making the area a potential hub for network-based innovations. Furthermore, the state's highly skilled workforce—the number of skilled employees in the state exceeds the population of 19 other states—and ability to attract ICT-based occupations even absent the robust networks of other regions should only improve with faster, more available broadband service.

OHIO

Currently, Ohio ranks below the national average in broadband adoption and indicators of network health like average and peak speeds, leaving the state unable to take full advantage of these networks. Though Ohio currently ranks 39th on the state index, strong stakeholder leadership and investment have the state poised to improve its standing on all indicators—broadband adoption, network deployment and strength of digital economy.

Ohio has a history of leading the country in its policies to support broadband deployment and usage, modeling programs for other states. In the past, the state has sought "alternative" regulatory arrangements to encourage providers to offer more broadband in exchange for its approval of mergers of telecommunications companies.[29] The state also led federal policy with several other states, when, in December 2007, then Governor Ted Strickland launched Connect Ohio, a public-private partnership to address broadband availability in the state. Ohio made an investment to establish this program to map broadband availability, research broadband use and adoption, work to stimulate and aggregate demand, and engage communities in the development of local and regional technology plans and expanded this program with funding from NTIA when it became available in 2009.[30] Also in 2007, the Governor created the Ohio Broadband Council to coordinate efforts to extend access to the states Broadband Ohio Network to every county in Ohio. In addition to developing a plan for statewide broadband deployment, the Ohio Broadband Council was charged with coordinating all state-funded broadband initiatives, pursuing additional federal investments in broadband, promoting public and private broadband initiatives and addressing the digital divide in Ohio's rural and urban areas. The council expired in 2010 with the end of Governor Strickland's term.

With changes in state leadership came changes in approach to the state's broadband efforts, with Governor John Kasich announcing plans to have the state spend $8.1 million to upgrade Ohio's existing fiber optic network, connecting schools, governments, and other anchor institutions. The plan calls for a ten-fold increase in download speeds, expanding the network's capacity to 100 Gbps.

In addition to these state initiatives, Ohio has a long history of non-profit groups promoting and expanding the use of broadband by its citizens. The internationally-recognized, Cleveland-based OneCommunity has been working in the state's northeast region since 2003 to support technological innovation and broadband-based economic development through technology adoption programs and on its non-profit high-speed network. OneCommunity—with private companies Horizon Telcom and Com Net, Inc—joined with the state's OARnet to form the public-private Ohio Middle Mile Consortium which was awarded $141.3 million to combine with private funds to build 3,600 new miles of broadband fiber throughout Ohio.[31] Leaders in rural, Southeastern Ohio.

Finally, Ohio's leaders—both elected and not—are promoting the use of technology to support entrepreneurship and innovation. In Cleveland,

an initiative called JumpStart pairs experience entrepreneurs with up and coming business leaders, especially women and minorities.[32] In addition, numerous angel funds have newly emerged and are now well underway to making investments, led by a matching program that's a small part of the State's Third Frontier Program, a $700 million investment in research, innovation and economic development.

The state's educational institutions have made substantial investments in the region's digital economy as well. The Case Connection Zone is a research project with the goal of bringing 1 Gbps Internet connectivity to the neighborhoods surrounding Case Western Reserve University. The current beta block comprises 100 separate residences, and the University has sought to expand this coverage as part of the national Gig.U initiative. The initiative has already spawned two startups in the neighborhood while serving as a model for university communities around the country. And, the Ohio State University Office of the CIO and OARnet are helping underserved communities achieve broadband Internet connectivity through wireless technologies, with major funding from the American Distance Education Consortium (ADEC), the Governor's Office of Appalachia and the Ohio Community Computing Network (OCCN).[33]

The state will soon begin to see dividends from these investments—in networks and digital capital to take advantage of those networks. It is likely the state's ranking will rise noticeably.

SUMMARY

The preceding discussion is obviously not a comprehensive view of what states are doing to encourage broadband. A number of states not mentioned here have initiatives to spur broadband adoption and deployment. In Illinois (ranked 24th), Governor Pat Quinn has created a $6 million Gigabit Communities Challenge fund that will award grants in the form of prizes to public or private sector projects that expand broadband infrastructure and link the build out to economic development, job creation, or improvements in education and health care. Illinois also has the Broadband Innovation Fund, a $500,000 grant program to organizations seeking to expand broadband adoption. Officials in Illinois were surprised to receive 113 applications for this grant program for 14 awards that the state made. In Hawaii (ranked 48th), Governor Neil Abercrombie has announced that the state will build a gigabit network statewide by 2018.

The diversity of state approaches is undoubtedly a virtue, as states search for models on how to encourage broadband in a fairly new arena for them. At the same time, building the capacity to learn lessons *across* states is crucially important. The National Broadband Plan recommended the creation of a clearinghouse for best practices for state and local broadband projects. The range of state performance in broadband demonstrated in this report suggests that the creation of such a clearinghouse would have clear payoffs.

ENDNOTES

1 See "The State Broadband Index", available online at: http://illinoisbroadbanddeployment.pbworks.com/f/State_Broadband_Index.pdf

2 Michael Mandel, "Where the Jobs Are: The App Economy." February 2012. Available online at: http://www.technet.org/wp-content/uploads/2012/02/TechNet-App-Economy-Jobs-Study.pdf

3 Michael Mandel and Judith Scherer of South Mountain Economics LLC, "The Geography of the App Economy," CTIA—The Wireless Association, September 20, 2012. Available online at: http://files.ctia.org/pdf/The_Geography_of_the_App_Economy.pdf

4 Maine Executive Order 41 FY 04/05 (dated May 6, 2005)

5 http://www.maine.gov/connectme/

6 ConnectME's Annual Report on the Activities of the ConnectME Authority: Report to the Maine State Legislature Joint Standing Committee on Utilities and Energy (January 14, 2010http://www.maine.gov/connectme/documents/Connectme-annrpt_2010Finalattach.pdf.

7 http://www.maine.gov/tools/whatsnew/index.php?topic=Portal+News&id=48046&v=Article-2006

8 http://www.maine.gov/connectme/ntiagrants/docs/ConnectMEStrategicPlanFinalDraft.pdf, p18

9 http://www.maine.gov/connectme/ntiagrants/docs/ConnectMEStrategicPlanFinalDraft.pdf , p17-18

10 http://www.sewall.com/files/connectme_plan.pdf, p7

11 http://maine.gov/mlte/index.htm

12 http://www.mainepolicy.org/wp-content/uploads/The-Maine-View-Broadband-111511.pdf

13 Utah Code Ann. § 10-18-201 et seq.

14 http://utahbroadband.files.wordpress.com/2012/06/utah-broadband-advisory-council-report3.pdf, pp3-5 http://utahbroadband.files.wordpress.com/2012/06/utah-broadband-advisory-council-report3.pdf, pp3-5

15 http://utahvalleybusinessnews.com/tag/utah-broadband-advisory-council

16 http://www.utahtelehealth.net/

17 FCC Form 477 data reported in "Measuring the Economic Impact of Broadband Deployment," Gillett, et al

18 See "Berkshire Connect History," available at: http://www.bconnect.org/page.php?PageID=2198&PageName=History

19 http://www.masstech.org/AgencyOverview/history11-05.pdf

20 http://www.iberkshires.com/story.php?story_id=31735

21 Pew State Broadband Report, p. 25; http://www.massbroadband.org/Network/tower.html

22 http://www.massbroadband.org/Network/mbi123.html

23 http://www.masstech.org/institute2009/special.html

24 MoBroadbandNow, "Dissecting Missouri's Digital Divide," June 2012

25 http://www.heartlandconnection.com/news/story.aspx?id=749638#.UFZVFqRSSwE; Missouri received $256 Million from NTIA and RUS for 18 separate infrastructure projects throughout the state.

26 Mo. Rev. Stat. § 392.410(7)

27 http://mobroadbandnow.com/

28 http://www.more.net

29 www.puco. ohio.gov/PuCo/Consumer/information.cfm?id=4078

30 http://connectohio.org/

31 www.ohiomiddlemile.org

32 Federal Communications Commission, Connecting America: The National Broadband Plan, 270. See also "About JumpStart" (JumpStart, Inc.); http://www.jumpstartinc.org/about/

33 http://cro.osc.edu.

APPENDIX

This appendix provides background on the inputs and date sources used for the index. Below is a table that lists the occupations used to develop the measure of the share of a state's jobs reliant on broadband. As noted, it is adapted from an approach used by US Telecom in estimating the number of jobs nationally that are "broadband-related." This report took this approach and replicated it state by state. More on the US Telecom method can be found on line here.

- Computer Programming and Software
  - Computer Programmers
  - Software Developers, Applications
  - Software Developers, Systems Software
  - Computer Specialists, Support, Operators, Users
  - Computer Hardware Engineers
  - Computer Operators
  - Computer Support Specialists
  - Data Entry Keyers
  - Database Administrators
  - Word Processors and Typists
  - Computer Occupations, All Other
  - Computer and Information Research Scientists
- Content/Information Production and Management
  - Archivists
  - Broadcast News Analysts
  - Broadcast Technicians
  - Camera Operators, Television, Video, and Motion Picture
  - Desktop Publishers
  - Film and Video Editors
  - Graphic Designers
  - Librarians
  - Library Assistants, Clerical
  - Library Technicians
  - Motion Picture Projectionists
  - Radio and Television Announcers
  - Sound Engineering Technicians
  - Printing Press Operators
  - Print Binding and Finishing Workers
  - Audio-Visual and Multimedia Collections Specialists

- Equipment, Repair, and Installation
    - Audio and Video Equipment Technicians
    - Camera and Photographic Equipment Repairers
    - Computer, Automated Teller, and Office Machine Repairers
    - Electronic Equipment Installers and Repairers, Motor Vehicles
    - Electronic Home Entertainment Equipment Installers and Repairers
    - Media and Communication Equipment Workers, All Other
    - Radio Operators
    - Security and Fire Alarm Systems Installers
    - Telecommunications Equipment Installers and Repairers, Except Line Installers
    - Telecommunications Line Installers and Repairers
    - Radio, Cellular, and Tower Equipment Installers and Repairs
- Manufacturing
    - Electrical and Electronic Equipment Assemblers
    - Semiconductor Processors
- Marketing, Advertising, and Sales
    - Advertising and Promotions Managers
    - Advertising Sales Agents
    - Telemarketers
- Network/I.T. Administrators, Operators, and Analysts
    - Communications Equipment Operators, All Other
    - Computer and Information Systems Managers
    - Computer Systems Analysts
    - Switchboard Operators, Including Answering Service
    - Telephone Operators
    - Network and Computer Systems Administrators
    - Information Security Analysts, Web Developers, and Computer Network Architects
- Other
    - Media and Communication Workers, All Other
- Teaching and Research
    - Communications Teachers, Postsecondary
    - Computer Science Teachers, Postsecondary
    - Library Science Teachers, Postsecondary

The National Telecommunications and Information Administration (NTIA), an agency in the U.S. Department of Commerce, periodically has conducted large scale national surveys to determine the number of Americans online and how many have broadband service at home. These surveys interview in excess of 50,000 households, a large enough sample size to estimate broadband adoption at the state level. Detail about the NTIA surveys can be found online here. The table at right shows state-by-state figures for 2007, 2009, and 2010.

BROADBAND ADOPTION BY STATE (NTIA SURVEYS)

STATE	2007	2009	2010
Alabama	37%	48%	56%
Alaska	63%	73%	73%
Arizona	54%	67%	74%
Arkansas	38%	51%	52%
California	56%	68%	73%
Colorado	58%	69%	72%
Connecticut	60%	71%	75%
Delaware	50%	67%	68%
Florida	53%	67%	70%
Georgia	54%	64%	69%
Hawaii	58%	70%	69%
Idaho	46%	67%	72%
Illinois	52%	63%	69%
Indiana	42%	56%	59%
Iowa	47%	62%	67%
Kansas	55%	67%	75%
Kentucky	40%	54%	58%
Louisiana	42%	57%	61%
Maine	48%	61%	67%
Maryland	56%	70%	74%
Massachusetts	61%	73%	76%
Michigan	46%	62%	66%
Minnesota	53%	67%	71%
Mississippi	33%	42%	52%
Missouri	45%	57%	64%
Montana	40%	58%	61%
Nebraska	54%	64%	69%
Nevada	54%	68%	74%
New Hampshire	65%	73%	78%
New Jersey	57%	72%	73%
New Mexico	43%	55%	58%
New York	54%	66%	69%
North Carolina	47%	59%	65%
North Dakota	49%	63%	71%
Ohio	49%	61%	64%
Oklahoma	39%	56%	63%
Oregon	58%	70%	75%
Pennsylvania	48%	62%	67%
Rhode Island	59%	69%	71%
South Carolina	39%	53%	60%
South Dakota	48%	60%	66%
Tennessee	42%	55%	60%
Texas	48%	60%	67%
Utah	59%	73%	80%
Vermont	47%	61%	69%
Virginia	53%	65%	70%
Washington	58%	72%	77%
West Virgina	33%	52%	59%
Wisconsin	53%	67%	71%
Wyoming	50%	66%	73%
All of United States	51%	64%	68%

For assessing the share of homes passed by fiber optic infrastructure, the Fiber to the Home Council contacts with RVA LLC, which develops North American FTTH Homes, passed and connected numbers using two different primary research studies and public information. Annually, RVA conducts interviews with approximately 350 FTTH providers and gathers detailed information about their respective deployments. Public Information from large public companies on FTTH deployment is also gathered.

RVA also conducts a random online consumer study of approximately 1250 FTTH consumer users each year. This study is based on a pre-screening of a far larger sample nationwide. While the consumer study is primarily used to determine the use and perceived value of FTTH, it also helps validate deployment information from providers, and helps determine the state-by-state distribution of FTTH from large multi-state providers. The table at right shows the results state-by-state.

SHARE OF HOMES PASSED BY FIBER (FIBER TO THE HOME COUNCIL)

STATE	2012
Alabama	2.6%
Alaska	1.0%
Arizona	0.6%
Arkansas	0.8%
California	20.1%
Colorado	0.7%
Connecticut	2.1%
Delaware	74.8%
Florida	22.1%
Georgia	3.6%
Hawaii	1.2%
Idaho	1.5%
Illinois	0.7%
Indiana	16.7%
Iowa	10.3%
Kansas	13.9%
Kentucky	4.5%
Louisiana	9.9%
Maine	2.8%
Maryland	67.9%
Massachusetts	62.8%
Michigan	1.1%
Minnesota	5.9%
Mississippi	2.3%
Missouri	5.0%
Montana	6.4%
Nebraska	5.1%
Nevada	1.6%
New Hampshire	9.1%
New Jersey	54.6%
New Mexico	5.4%
New York	35.0%
North Carolina	5.3%
North Dakota	18.6%
Ohio	1.7%
Oklahoma	1.7%
Oregon	20.5%
Pennsylvania	43.5%
Rhode Island	55.2%
South Carolina	7.1%
South Dakota	20.7%
Tennessee	18.2%
Texas	20.2%
Utah	20.9%
Vermont	53.0%
Virginia	18.2%
Washington	8.4%
West Virgina	0.7%
Wisconsin	3.7%
Wyoming	3.4%
All of United States	15.4%