Portland Broadband Strategic Plan

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Portland Broadband Strategic Plan

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Portland Broadband Strategic Plan

Introduction

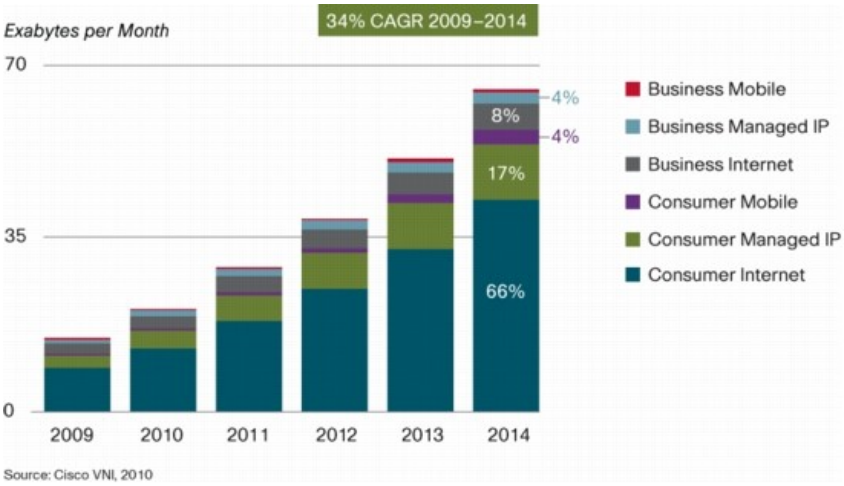
Broadband is the key to Portland's economic future and quality of life. We are at a critical juncture where Broadband policy done right will create more jobs for Portlanders, more opportunities for the region's companies, more safety for families, and better education for children. Broadband is about keeping Portland competitive so that our workforce can continually innovate locally and collaborate globally. This requires robust, affordable broadband infrastructure plus realistic adoption and utilization strategies. Broadband Networks (including the Internet, as well as infrastructure and devices) are producing cataclysmic change in global, national and local societies, markets and institutions around the world. These networks are so interconnected and pervasive in their reach, that they are most easily understood as simply "the Network." The Network allows change to happen so quickly that we are often surprised by the deep societal changes we see, and are unaware of great impacts that are just around the corner. Yet, the Network is transforming societies, threatening national and local boundaries, challenging markets, and impacting wealth, work, education, health and public safety. So it is important for us to learn what the Network is, how it impacts society, and set a strategic course for our economic and social development.

Like the introduction of electricity, Broadband Networks are fundamentally changing our environment and society in ways that were not anticipated. Much like electricity, which was invented to turn on the lights but powered the transformation to an industrial society, the Network is powering another transformational global shift. It was impossible to know in advance that electrification would provide the critical infrastructure to power computers, radio and television, financial markets, home appliances, manufacturing, electric vehicles and many more unforeseen innovations. Though we could not see the transformational impact of powering rural America, it changed the world. When the Rural Electrification Administration (REA) electricity was created in 1935, less than 11% of US farms had electricity. By 1942, nearly 50% of US farms had electricity, and by 1952 almost all US farms had electricity.

Broadband is Critical Infrastructure

Broadband refers to the high-capacity Internet connections which have rapidly become fundamental infrastructure. Just as electricity was the pivotal innovation in the last century, broadband networks are having rapid, widespread and dramatic impacts on our society in this century. The Network has become integral to both the working and personal lives of most households, families and businesses. The majority of job listings are online, education (K-12 and higher ed) has rapidly been moving online, economic development and jobs are demonstrably related to adequate broadband capacity to recruit and retain businesses in our community, critical health care functionality is rapidly moving online, e-commerce and home-based businesses need this critical access, and Portland's culture and policies promoting sustainability have a critical delivery element that has a strong correlation to adequate broadband infrastructure.

Broadband refers to the capacity of the networks to carry data traffic (the size of the access "lanes" on the Network). A broadband network has large capacity to transmit information globally, although the definition of Broadband is changing quickly too. The Federal Communications Commission (FCC) has proposed in the *National Broadband Plan* (NBP) (2010) that broadband should be defined as 50 Mbps "downstream" (to the consumer) and 20 Mbps "upstream" (from the consumer into the network) by 2015. This definition is extremely conservative, given the growth trends in network traffic. Cisco and other scientific companies talk about the network in terms of "terabytes" of capacity in the network center, or "core". Businesses today routinely require symmetrical gigabit service between their locations. Global Internet traffic grew 45 percent during 2009 alone. **Global network traffic will quadruple from 2009 to 2014**. The average monthly traffic in 2014 will be equivalent to 32 million people streaming Avatar in 3D, continuously for the entire month. Overall, Internet Protocol (IP) traffic will grow at a compound annual growth rate (CAGR) of 34 percent.



For the City's Broadband Strategic Plan, we view the NBP's capacity goals as a "floor". While these are higher than Portland's capacity today, they are much too conservative to define the capacity that is needed to

accomplish the goals set forth in this plan. As a policy imperative, we must ensure that the broadband networks available in Portland are as ubiquitous and affordable as any other utility or critical infrastructure (roads, electricity, water) and that we are able to meet and exceed demand. A shortage or deficit of broadband capacity will cause Portland to lose ground in its economic future. This plan does not suggest a specific broadband capacity for Portland in the future. This plan does, however recognize Broadband service as a **necessary service** (both wireless and wireline) to sustain economic growth, maintain quality educational and governance institutions, protect citizens and property and to create employment opportunity.

Fiber and Wireless Broadband: The Technological Future

Fiber and wireless are essential

The future of telecommunications technology is not wireless or fiber optics—it is a combination of both. These two essential technologies inherently complement each other and work together:

> ***Fiber offers high bandwidth***
> Fiber offers theoretically infinite capacity, which is essential for institutional and high bandwidth users. Wireless offers far lower speeds that, though impressive, cannot support some of the ultra-high speed applications made possible by fiber.
>
> ***Wireless offers mobility***
> The key advantage of wireless is that it offers mobility and connectivity during movement. Fiber cannot connect to an ambulance, a bus, or a resident's laptop in a public park. The emerging standard for wireless is 4G, or fourth-generation wireless; it is on the medium-term horizon for commercial deployment in Portland, and will also be an essential part of Portland's public safety wireless future.

Fiber is the international standard for broadband

Fiber to the premises (FTTP) is clearly the emerging standard internationally for wireline networks. It is not on the immediate horizon for Portland, given the known deployment plans of the private sector, but it is being deployed on a national basis in almost every developed Asian country, as well as in China, which currently has more FTTP connections than the United States. FTTP is also being deployed extensively in our competitor nations and cities across Europe.

Wireless is essential for mobility but requires fiber to function adequately

A robust wireless broadband network is inconceivable without an extensive fiber network for backhaul throughout the community. Indeed, it is the fiber portion of the wireless network that has the most longevity; most wireless equipment requires replacing in three to five years as technology changes and components age.

Fiber is an infinitely scalable, long-term asset

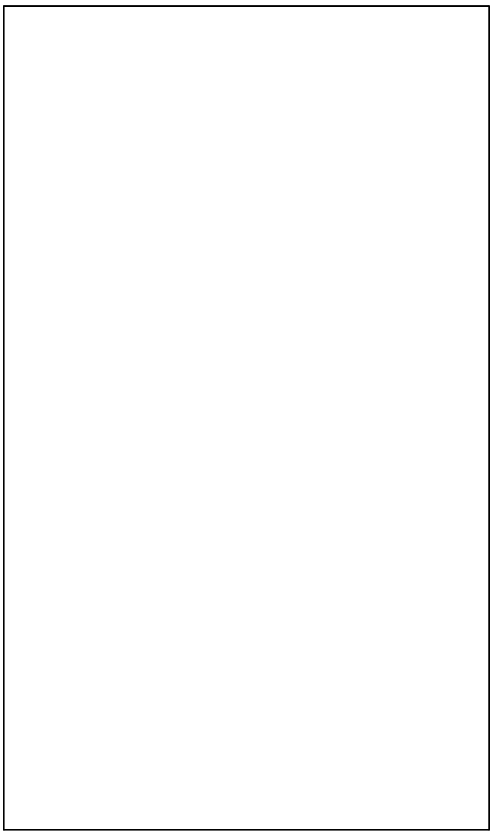
While fiber construction is costly, it is an infinitely scalable, long-term asset with a lifespan of decades (and, as a result, is very cost-effective in the long run). It is a communications medium that, much like the copper that was deployed in the late 19th century for telephone use, will efficiently scale to meet new needs—and is likely to be usable decades and generations from

now. It also enables robust, rich mobile communications. Because of the future-proof vision that fiber represents, it is universally acknowledged as the gold standard for supporting both wireline and mobile communications.

Scope of the Broadband Strategic Plan

The objectives of the planning effort are:

- To positively affect how broadband infrastructure and service is likely to develop in Portland over the next ten years.
- To plan for optimal broadband deployment for Portland.
- To identify key short (3-year), mid (7-year) and long-term (10-year) broadband policies and initiatives that the City can put in place that coordinate and guide the actions of City Bureaus, Offices and Committees toward a unified technology policy direction.
- To lead the way with the Portland Broadband Strategic Plan in order to positively impact the policies, actions and directions of other Oregon communities and of the state as a whole.



5 Goals of the Broadband Strategic Plan

Through the strategic planning process, the following five goals were identified for the Broadband Strategic Plan. These goals are consistent with the resolution of the City Council in late 2010. Later in this document these goals are augmented with key action strategies and recommendations from the workgroups for short, medium and long-term activities to accomplish them.

1. **Make strategic investments in broadband infrastructure to attract innovative broadband-intensive business and institutions that create knowledge jobs in Portland.**

2. **Eliminate broadband capacity, equity, access and affordability gaps so Portland achieves near universal adoption of broadband services**

for all residents, small businesses and community-based organizations.

3. **Consult with workforce development partners when investing in broadband infrastructure to ensure the development of highly technology-skilled and employable residents, students, small businesses and workforce.**

4. **Ensure that development and planning activities promote the use and wide-spread adoption of broadband technologies in government, energy conservation, transportation, health and public safety.**

5. **Create future-oriented broadband policy, modernize government organizations and institutionalize digital inclusion values throughout the region.**

Requirements for Success: Vision, Partnerships and Leadership

This Broadband Strategic Plan represents a milestone in urban planning for the City of Portland. For the first time, the City has taken steps to include Broadband as an essential, critical infrastructure in the planning fabric, along with transportation, telecommunications, parks, power, and water/sewer infrastructure. A robust broadband ecosystem of infrastructure, competitive providers, services and devices is necessary for economic growth, job creation, livability, sustainability, public safety and civic engagement. However, achieving the goals outlined in this plan cannot be accomplished by City policy and actions alone. The City must engage a host of regional and statewide players with its vision, and must create partnerships that can move together in a strategic direction. The partnerships required include both public sector and private sector entities.

Effective policy changes and transformation of the City government and its institutions requires strong and committed leadership. The Broadband Strategic Plan describes sweeping changes in government structures, relationships and technology. These cannot be implemented easily, and the steadfast commitment of the City's elected officials and top managers is necessary throughout the change process.

Economic Development

The City of Portland's economic goal is job creation, including providing access to a skilled workforce. The City of Portland recognizes four traded-sector industry clusters in the City's

Economic Development Strategy, including advanced manufacturing, athletic and outdoor, clean tech, and software, as well as a fifth, functional cluster focused on research and commercialization[1]. The City's Economic Development Strategy also recognizes the importance of vibrant communities and small neighborhood businesses to Portland's economy.[2] Wilf Pinfold, Director of Extreme Scale Projects at Intel said "if we really want to create an engine for job creation, Portland must have particular competence in Broadband. We need to look at standards and best practices." Sheldon Renan, a consultant in technology issues said "we have to address infrastructure. It doesn't have to be, and probably shouldn't be either publicly owned or privately controlled, but rather we should be setting up cooperative partnerships between the public and private sectors to improve infrastructure and access to broadband generally for businesses and the workforce." Business needs Broadband as its lifeblood. Local government has an enormous role to make sure that broadband resources get placed in our communities, by providing funding, support, and resources. Skip Newberry, of the Mayor's Office noted that the City "wants to help entrepreneurs, very small businesses (11-99 employees) and micro businesses (under 10 employees) because these businesses create most of the new jobs in Portland. Certain parts of the city, like the Central Eastside, have a concentration of start-ups and PDC is looking at ways to direct urban renewal and other resources to help these small businesses grow." The economic development workgroup wanted to find incentives for developers to include broadband in their buildings, and for providers to extend high bandwidth services in areas where business clusters. They discussed both regulatory and financial incentives to developers and providers. Rich Bader, CEO of EasyStreet On-Line Services suggested the need to "marry high tech businesses and anchor institutions, such as government, universities" to leverage their demand for very high bandwidth into "markets" for broadband providers. Wilf and Sheldon proposed that the City should actively work to attract research and development institutions, with very high bandwidth requirements to pump demand into the City and establish the City as a research-friendly high bandwidth ecosystem.

Broadband and the Transformation of Working and Employment

According to the Aspen Institute's Communications and Society Program's recent publication, "The Future of Work", (2011) "Work in the future will be organized in ways that are far more decentralized." Work is no longer confined to a specific time and place. Technology is blurring the lines between work and home and between work and personal life. Tens of millions of people now work at home offices, telecommute or participate in "virtual

1 These are described at http://pdxeconomicdevelopment.com/industries.h

2 See the Portland Development Commission's Neighborhood Economic I
athttp://www.pdc.us/bus_serv/ned.asp

companies" whose members are scattered across the country or the globe. Many others work for startup firms in improvised settings. Open platforms for the "crowdsourcing" of work mean that work is becoming an activity that can occur anywhere, and at any time. The implications of this transformation affect our urban architecture (who will occupy high-rise buildings?), tax structure (what is the correct structure for taxing business when its location is the Network, not the City) and our economic development strategies (how can we attract companies to locate in Portland, if they are in fact virtual rather than physical?) The Aspen Institute report predicts the transformation of corporations or "firms" into markets, where skills are outsourced and workers are much more likely to be contractors or affiliated with markets than specific firms. Particularly in scientific, cognitive and creative work, the knowledge worker may work for employers who are not located within the region at all. Conversely, employers located in Portland may hire workers from anywhere on the globe, depending on their skills rather than their ability to report to a specific location at a specific time.

Broadband and the Transformation of the Worker

Employees will be expected to be highly conversant with digital networking and virtual collaboration.

As cloud computing becomes more pervasive, Peter Jackson, Chief Scientist and Vice President of Corporate Research and Development at Thomson Reuters, envisions that "once the cloud becomes a reality and people have raw, undifferentiated computing power available to them *as a utility*, they will be able to stop worrying about infrastructure and platforms. Then they will be able to start thinking about intangibles: innovation and imagination – the things that build higher quality services. This will raise everybody's game." (Aspen, p.17) This is the new reality that Portland must develop a strategy to accomplish. Our city must be a location among the first and best in the Country to provide the computing power and platforms as a utility, to attract the innovation and imagination of the economic markets. Just as rust belt cities have been left behind in the end of the manufacturing era, Portland's economy cannot prosper without institutions that innovate, and infrastructure that allows global connectivity wherever those intuitions and their workers choose to locate. Legacy hierarchies and institutional structures are bottlenecks to developing the new economy. Portland must innovate in both, by establishing partnerships with industry, education, and other government bodies, and by reforming our government institutions and policies to root out silos of control and resistance to change.

The Aspen Report points out that in the networked environment, the mindset and disposition of workers will matter more than ever (p. 22) Workers must be prepared to embrace change. They must desire to be "on the edge" of breaking developments, and must have passion to probe a question or problem (a passion for inquiry). These mindsets and dispositions cannot be taught, but must be cultivated, according to John Seely Brown, of the Deloitte Center for the Edge. Work is becoming a lifestyle and identity, not just a paycheck (Aspen p.24)

Sustainability, Transportation and Urban Planning

The Network will have pervasive effects on our social networks and our physical habits, perhaps most notably our commutes. The increase in available capacity to do work and make social and political contacts on the network, combined with the increasing real and social costs of commuting means that more work will be performed without requiring commuting. Home offices, neighborhood "office-environments" (like the coffee shop, library or community center) will draw workers when commuting is inconvenient or impossible. Beyond convenience, knowledge workers who are based "on the net" will choose to live where they want, in social and physical environments that enhance their lifestyle and are affordable, since work can and does take place anywhere, and at all hours. Families will seek communities offering a lifestyle, knowing that their work is portable. Affordability will be critical, but also access to cultural activities, recreation, educational opportunities and community for children and adults, and the ability to shop, dine, and interact will attract knowledge workers.

Aging: Our society is also aging, and families will be concerned with the care of seniors as well as children. Telemedicine will advance to the household, offering health worker visual and auditory monitoring of seniors, medication inventories, vital sign monitoring, motion detection, and other types of in-home monitoring and assessment using the network. Today many seniors take most of their outings out of the home to physician appointments. Many of these check-ups will be performed via the network, allowing seniors to function for days and weeks and months without visiting a hospital or doctor's office for care. Seniors separated from their family members will be able to visit daily and check in with children and grandchildren as well as caregivers through the network.

Internet of Things: Household systems will be connected to the network, not just for communication, entertainment or work, but in an "Internet of Things". Devices will connect and communicate their status and health, monitoring and controlling energy consumption, making shopping lists of items running low in the fridge, and scheduling events, maintenance, and replacement of everything from tires to furnace filters without human intervention. The power grid itself will be a "smart-grid" managing demand according to available supplies in an automated effort to control power consumption.

Transportation: Urban travel will be most convenient and affordable on public transportation, but even private automobiles will be connected to a network. Their network will monitor their status and performance, notify drivers of hazards, delays and mechanical issues. Anti-collision

technology will brake and steer through road hazards, and prevent operation of vehicles by inebriated drivers.

Urban Planning: For Portland planners, understanding the power the network will have on urban form and function is critical. Neighborhoods will be designed around affordable and sustainable transportation options, and network access will be as important to the function, form and livability as power, roads and water. Tim McHugh, Chief Information Officer of TriMet notes that there will be three layers of communications infrastructure in the transit system; the equipment imbedded in vehicles, systems for vehicle tracking and real time information on conditions and location, and customer information access and applications. These three layers will also apply to buildings, homes and other structures. An "Internet of Things" will tie the systems within the structures together to monitor and control energy use, inventories, locks and security, temperature, etc. Control systems will be accessible through the network "cloud", which will aggregate information for trending and real-time energy-load, transportation and supply chain control. Consumers will access their systems real time, through mobile devices wherever they are to turn the lights on or off, defrost dinner, or say hello to their children when they put their key in the lock after school. Gary Odenthal, Senior Planner for the City noted that "everything is going mobile. The network has to go where people go." Brendan Finn, Chief of Staff for Councilman Dan Saltzman noted that "Infrastructure is driving where people are going to locate. It drives where companies are locating. High bandwidth nodes are just like freeway interchanges." Chris Smith of the Portland Planning Commission noted that Broadband networks could be "commons goods" or "private goods." Chris advocates for Broadband to be a commons good in Portland, something all have access to as a privilege of being here, and not something that is a luxury available only at a premium. Scott Robinson, CIO of Metro suggests that Broadband should be included in every regional planning effort from climate action to transportation to housing, community development and education. Alex Bejarano of the Portland Bureau of Transportation noted that "Broadband is essential to our quality of life and vision of the future. It's a utility, and so much more." Don Stastny, an architect from StastnyBrun Architects in Portland was very concerned about equity issues. "Broadband, if not ubiquitous will create further divides between the haves and have-nots. Broadband access is a matter of social equity and social policy, indivisible from modeling neighborhoods. We have to consider the impact on individual citizens."

Digital Inclusion and Civic Engagement

Don Stastny's concerns were echoed throughout the workshop sessions and in every workgroup in the Portland process. According to the Aspen Report, "New sorts of government leadership

are needed to address social inequality, education and training, and improvements in governments services…There is a keen imperative, in short, for serious institutional innovation."

The biggest dangers are greater inequalities of wealth and potentially destructive social polarization. These trends make it imperative that government, education and social institutions learn how to respond to the emerging networked environment.

Civic Engagement: Brian Hoop, of the Office of Neighborhood Involvement (ONI) shared ONI's goals for improving civic engagement: increasing and diversifying access to government, strengthening the capacity of community organizations, expanding public impact on government (improving transparency) and improving neighborhood livability and safety. Cece Hughley, Executive Director of Portland Community Media noted that a major part of their role is to promote digital literacy. She notes that it is a natural role for non-profits to help cities accomplish transparency. She also noted that video storytelling provides a powerful context when discussing policy. Without Broadband, individuals and communities have limitations on their ability to see and distribute video communications. Russell Senior of Personal Telco commented that the overarching goal is to facilitate everyone to be a producer of Internet content as well as a consumer.

Transparency: Julie Omelchuck, of the Portland Office of Cable Communications and Franchise Management noted that Broadband technologies are "the only way to make transparency affordable." She commented that all city government documents should be on-line for public access. However, Rick Nixon, Technology Manager for the City's Bureau of Technology Services suggests that that idea doesn't go far enough. Government documents need to be on-line but they need to be in a useful, standardized format, that is searchable, indexed, and where data can be lifted or exported to other programs and platforms for analyses and general use. Rick also noted that the City has outdated policies for maintaining the City's web site, and for access to technology. Julie and Rick emphasized that the City needs to provide more transactional opportunities for citizens to do all of their business with government over the Network. Public records laws, public meeting laws and other standing policies and regulations need to be reformed. Public meetings will not continue to be "physical in a given place and time" but will be conducted over a period of time over the network, to allow residents with all kinds of schedules to participate in dialog and decision-making." Portland could be a leader in instituting these improvements

Culture: Abdiasis Mohamed, Program Coordinator for IRCO spoke about trends in Portland's immigrant communities. He notes that there is a generational difference among these communities, where youth are

adapting mobile Internet and smart phone technologies very quickly, but older populations don't adapt to the Networked society. Access and affordability of broadband are key for these communities to be able to connect and engage with civic life, and to remain connected with their native cultures. Julie noted that it is important to focus on mobile applications, because mobile internet is being adopted faster and is more pervasive through smart phones than fixed internet.

There was extended discussion of the role of the City in ensuring affordable access to Broadband for residents of Portland. While many participants feel that Broadband access is becoming a right, not a luxury, and that access is an equity issue; not all supported the idea of forming a municipal utility to provide Broadband. There were many other proposals to find ways to subsidize needy and low income households to pay for broadband, requiring public buildings to offer free broadband service, and providing incentives to carriers to serve low income neighborhoods. Digital literacy continued to emerge as a necessary element to empower communities and individuals. Access to Broadband, while necessary, is not sufficient in itself.

Public Safety

Several public safety leaders in Portland participated in the Broadband and Public Safety work group. Mark Ellwood, IT Manager for the Portland Police Bureau noted that "everything" is moving to video for law enforcement, including camera-equipped police cars, video interrogation, traffic stops and speeding tickets, and live ambulance links to hospitals. Mark Greinke, Portland's Chief Technology Officer commented that the systems in use already are limited by the lack of Broadband wireless capacity. The group noted the benefits that sensor-nets can provide for situational awareness in fires, emergencies, car wrecks and other events, but that current networks and devices don't support the City's ability to activate even the sensors they already have. Chief Klum, the Portland Fire Chief points out that firefighters need building plans, maps and videos of locations to provide "a Google street view of a building, only from the inside." Firefighters should have access to private WiFi systems that exist in buildings when they respond. The 911 system cannot receive or process videos from citizens, even though as Carmen Merlo, Director of the Portland Office of Emergency Management (POEM) points out, "the public is our eyes and ears" in emergencies. Though mobile network costs are high, the cost of not having high availability of information is response time, mistakes and delay. Karl Larson of the Public Safety Regional Radio Project (PSSRP) points out that Broadband is "cheaper than gas." The participants discussed the specific needs and standards of the first responder community. "Our needs for reliability and ubiquitous coverage demand are higher standards that commercial networks have met in the past. Moreover, we require interoperability between networks, and priority access to networks. This group would like to see policies which develop seamless roaming and regional reliability, coverage and availability of networks with pre-

emption for public safety." The group notes that there are publicly owned assets that could be leveraged to help commercial providers build reliable networks with better coverage, such as City-owned towers, buildings, fiber plant and spectrum. They would like to find technology companies willing to launch pilot projects to develop better public safety networks.

Education and Health

Workers cannot expect to enjoy a "steady job" with a lifelong employer in the future. The concept of a single company giving an employee the skills they need as work changes is gone. Workers will need continuous training and mentorship, but new sources for their education and affiliations must develop. The Aspen report notes that new types of private/public partnerships to help address the need for education, training and lifelong learning must develop. It was also noted that it is an open question where and how education should happen, when "exceptional competencies occur where human knowledge is created, at the cutting edge, in a community of practice." Dr. Miles Ellenby of OHSU Pediatric Medicine notes that digital literacy and digital skills should be taught to young children as early as possible, and appropriate. Such education programs could focus on teaching independent problem solving and inquiry while also teaching about privacy and safety on-line. Sharon Blanton, Chief Information Officer of Portland State University noted that distance learning, or network centered learning is the future of higher education, providing students with the ability to integrate learning with work and lifestyle, without requiring commuting. As networking and computer power grow, the virtual classroom, including the engagement with other students will begin to be an experience much closer to being in the same room at the same time. Workforce training and education is moving toward an on-line virtual experience as well. In fact, Ms. Blanton, Nick Jwayad, CIO of Portland Public Schools and others in the Education and Health focus group note that like firms and corporations, educational institutions must adapt to the networked world, offering education when people can use it, rather than at a specific time and place, and making sure it is relevant culturally to the communities served. The group suggested that we need the "digital education equivalent of drivers ed" for all Portland students.

World Class Broadband: Experiences from Other Communities

Communities worldwide have demonstrated creative, innovative practices to develop world class broadband infrastructure. This range of successful initiatives can inform the City as to strategies to contemplate. Some are incremental and modest in scope, and can be immediately undertaken should the City decide to do so. Others are much more ambitious and broad—and thus may not

be feasible at the current time—but they remain important reference points as the City contemplates its broadband future. The following is a brief survey of some of those strategies.

Aggressively court the private sector to invest in broadband locally. This is a strategy that has been undertaken by many communities, but has been successful only in a few cases—mostly where the private sector has undertaken extremely ambitious investments. Fort Wayne, Indiana is one community that managed to emerge from the pack and successfully court private sector investment, despite the fact that it did not meet the obvious criteria for typical commercial carrier investment. Under the leadership of Mayor Graham Richard, Fort Wayne undertook an extremely ambitious campaign to lure Verizon to build fiber to the premises (Fios) to Fort Wayne. This was as aggressive an economic development effort as has ever been launched by an American community, and entailed significant cost and effort on the part of the city. Fort Wayne represents a somewhat anomalous investment for Verizon, given its demographics and location. Part of what helped Fort Wayne is that it had insight ahead of its time; if Fort Wayne had launched its efforts in the past few years it likely would not have been successful—but it did so early in the process when Verizon was first planning its Fios deployments and had not yet narrowed the range of communities where it would build.

Implement a "dig once" policy that cost-effectively enables gradual deployment of infrastructure. In this model, a community implements a policy mandating installation of conduit (or fiber) any time a trench or road is open in the public rights-of-way, thus enabling build-up of a critical mass of infrastructure at relatively low incremental cost. Ideally, the conduit and fiber are specified in advance and, of course, they must be impeccably mapped and recorded. Such a policy is most effective where there exists extensive planning and coordination among the various departments responsible for infrastructure and construction (public works, transportation, IT, permitting authorities, and utilities). It also helps to coordinate the construction timelines of various departments so as to facilitate cost-effective placement of conduit and fiber. This strategy enables deployment of infrastructure for backhaul and middle-mile fiber that can be leased to the private sector and stimulate offering of services. It can also enable placement of conduit directly to wireless facilities sites, thus facilitating not only deployment of next-generation wireless services but also reducing the cost for new competitors to enter the market.

A pioneer of this strategy, Mesa, Arizona, placed conduit opportunistically whenever trenches were open until it eventually completed a downtown ring. The city leases space in the conduit to the private sector, which only has to blow or push fiber through the existing conduit and thus saves significant construction costs. Among the many benefits to the city are the revenues, the reduced barriers to entry for the private sector, and the reduced damage to the roads and other public assets.

Another key pioneer in this area, the City of Santa Monica, built fiber wherever feasible and then connected local businesses over the fiber to competing providers. Santa Monica operates a 10

Gigabit per second network that connects the business community to 160 Internet Service Providers (ISPs) in Los Angeles data centers, thus enabling them to select among cost-effective competitors. Santa Monica built this fiber by extending its network during any city project, including roadwork, water and sewer main installations, and traffic signal system installation.

Build fiber to potential wireless tower sites. In this model, the community builds fiber to public sites that are promising for the siting of wireless facilities. The combination of fiber and high-value sites amounts to a desirable package for wireless providers, and thus both the fiber and the site could realize revenues in the form of lease payments from wireless service providers. The community-based non-profit, One Community, in northwest Ohio has very effectively partnered with wireless providers, and realized significant revenue by building fiber to logical tower locations—and has made this a centerpiece of not only the revenue flow of their network, but also their efforts to attract wireless providers to provide service to residents and businesses within their footprint.

Deploy a modest, scalable FTTH pilot as a platform for innovation and research. In this model, the community builds a small, inexpensive pilot area that can scale in size over time. This approach was pioneered by Case Western Reserve University in Cleveland, in partnership with local communities and non-profits (such as healthcare institutions and social service groups). The project has deployed one block of FTTH technology and provides free symmetrical gigabit service to all residences on the block. That single block has become an important test-bed for application providers to test and experiment and innovate in areas including energy/environment, health care, and education. As a result, this single block pilot is at the center of a number of initiatives headed by the Office of Science and Technology in the White House. For the cost of building out one block, the community has a platform for innovation, a platform for a variety of entities to test their applications, and a platform for research by local academic institutions.

Incrementally develop publicly-owned fiber using a variety of approaches. In this model, the community gradually, using a variety of mechanisms, builds a network that serves institutional needs and is publicly owned and controlled--such that there is no limitation on the services it can provide or the service providers it can support. This strategy enables the benefits of an I-Net such as ERNE, without the limitations imposed as a result of the cable franchise agreement. Over time, using the strategies suggested above, the District of Columbia has developed much of its own infrastructure to serve its own needs. As a result it has not only secured its network (i.e., no risk of losing the network to the private sector fiber owner), but has also dedicated capacity within the network to enable private sector competitors to enter markets at much lower cost—essentially lowering the barriers to entry.

Develop a public/private FTTH partnership. In this model, the community finds non-traditional partners to build and own fiber. For example, the City of Amsterdam wanted to see open access FTTH emerge, and had as its top priorities not only open access, but that it would

reach all residents—not just those that were commercially desirable. The city agreed to make a significant investment that attracted investment from local real estate owners and banks to build open access fiber. The city has been able over time to reduce its ownership percentage of the underlying fiber because the policy requirements of open access and universal deployment had been met. In this way, the city was able to meet its public policy goals by partially, rather than fully, investing in a network.

Build a public FTTH network with a risk-sharing element. In this model, the community initially funds the network and effectively sells it to local operators over time—thus reducing operator risk and increasing incentives to participate. The government of New Zealand is the prime example of this model. Crown Fibre Holdings, the government's designated entity, has selected local partners—both public utilities and private sector companies—that will be funded by the government to build open access FTTH throughout the country. Eventually the network will reach one million homes and businesses. The business model requires open access, and also requires that as providers activate portions of the network and bring customers onto the network (i.e., as they begin realizing revenues), they will reimburse the government in part for the capital costs. Ideally the network will be very successful nationally and the government will be reimbursed in large part for many of the capital costs. An open access FTTH network throughout the country would not have been conceivable if the government had not taken the capital risk. The business model enables local providers to build and operate the network in a competitive environment, while sharing the financial risk with the government; that risk would likely have precluded those providers from building the network absent the government investment. Thus, even if the government is not fully reimbursed, it has still met its public policy goals.

Strategic Planning Process

The City of Portland began its Strategic Planning for Broadband in late 2010, after the City Council passed a resolution recognizing "*high-speed*, *accessible and affordable broadband is now a mission-critical infrastructure* for job creation, education, health care, the enhancement of safe and connected communities, civic engagement, government transparency and responsiveness, reduced carbon emissions, and emergency preparedness".

The Portland City Council directed the Office of Cable Communications and Franchise Management to work closely with the Portland Development Commission, the Bureau of Technology Services, the Fire Bureau, the Police Bureau, the Public Safety Systems Revitalization Program, the Office of Planning and Sustainability, and Mayor and Council Offices to ensure that a comprehensive, informed and inclusive broadband planning effort was undertaken that emphasizes equitable provision of services, business vitality and job creation. The Office of Cable Communications and Franchise Management engaged a consultant, IBI Group and its affiliate Nancy Jesuale of NetCity Inc., to assist with the Plan. A leadership team

composed of staff from each City Council Office and the Bureau Directors of key City Bureaus was formed. Phase I of the work plan called for the formation of five sector workgroups (economic development, education and health, digital equity and inclusion, planning/transportation/sustainability and public safety) to participate in an eight-week facilitated planning process. This process was kicked- off with a session in City Hall in January 2011 that included presentations by Commissioner Dan Saltzman, Commissioner Amanda Fritz, City Officials, community representatives and telecommunications providers offering broadband services in Portland. The five sector workgroups included City Bureau Managers, Directors and executive employees, Council Office liaisons, members from other cities and counties, NGOs, small and large business, social activists, educators and health professionals. This report represents the outcomes of those meetings, engagement with the community, research and consultation with broadband experts on best practices.

Key Themes

The questions raised in the course of Portland's workgroup discussion process are more numerous than the answers. There are many interconnected issues, although clearly a profound transformation of local civic life, opportunity and work is underway, both here in Portland and globally. The challenge that faces us is to identify the ways the powerful forces unleashed by the new networked economy can be directed toward inclusion, equity, sustainability and prosperity through public policy and civic action. As the participants focused on action proposals, several key themes emerged:

- ***Portland and its partners must take bold actions to ensure the development of world-class network infrastructure in the City.***
- ***Affordability and ubiquitous availability are keys to adoption.***
- ***Adoption across all age groups, cultures, races and economic classes is crucial to relieve social and economic inequities***
- ***Economic and societal health depends on education, training and mentoring to create lifelong learners who can embrace rapid change and work and prosper in the new economy***
- ***Portland must become a technology-centered economy, attracting innovators, research and development centers and employers seeking a tech-savvy environment. To do so, Portland must improve its broadband infrastructure, and ensure both very high bandwidth and mobile solutions for industry.***

The conclusion of the Aspen report notes, “Government and public policy can play a tremendously helpful role in guiding the forces that are emerging. But historically, government and public policy have tended to be more reactive and short-term oriented, not pro-active and visionary… New sorts of government leadership are needed to address social inequality, education and training, and improvements in governments services… There is a keen imperative, in short, for serious institutional innovation.”

The imperative for leadership and institutional innovation is central to the goals and strategies included in the Portland Broadband Plan. We have also tried to focus both on the “low hanging fruit”, by identifying short-term, high-impact actions that the City can take to make a big difference in government transparency and broadband availability and affordability, as well as remain focused on long-term strategic change and vision.

Portland’s Strategic Broadband Goals and Key Strategies

On the next page is a summary table of Portland’s five Strategic Broadband Goals, and the fourteen key strategies which will accomplish these goals. Following the summary table, each goal is discussed along with the key strategies that will enable the goal to be met. Specific actions are recommended for the short-term, medium-term and long-term are provided for each goal.

Table 1: Broadband Strategic Goals and Key Strategies

Strategic Goal	Key Strategies
Make strategic investments in broadband infrastructure to attract innovative broadband-intensive business and institutions that create knowledge jobs in Portland.	**Prioritize "Big Pipe" Capacity:** Plan and incentivize very high bandwidth Broadband deployment through clustering and co-locating very large capacity users, and providing economic incentives to providers to serve these areas. **Attract R&D:** Work with institutional partners, including OHSU, PSU, PDC, the State and others to attract at least one major research and development facility whose work requires very high capacity broadband infrastructure and globally-based research **Standards and Best Practices:** Partner with Education, Industry and Research Organizations to encourage involvement in Standards development, open architecture and the evolution of work and markets
Eliminate broadband capacity, equity, access and affordability gaps so Portland achieves near universal adoption of broadband services for all residents, small businesses and community-based organizations.	**Establish Neighborhood Broadband Hubs:** Create high-capacity access points within neighborhood community centers **Expand City Capacity to Address Digital Equity:** through dedicated funding and staff resources and community partnerships. **Facilitate Marketplace Competition:** Advocate for and facilitate robust competition in Portland's Broadband marketplace.
Consult with workforce development partners when investing in broadband infrastructure to ensure the development of highly technology-literate and employable residents, students, small businesses and workforce.	**Create Broadband Centers of Excellence:** Create innovative alliances, partnerships and incentives to develop advanced services and applications locally. **Promote Technical Literacy and Skills:** Leverage existing and support new investment in life-long technology education and training. **Modernize and Adopt Telecommuting and Remote Work**

	Strategies and Policies
Ensure that Development and Planning activities promote the use of broadband technologies in government, energy conservation, transportation, health and public safety.	**Energize a Dynamic City Technology Culture:** Foster a change in the culture of City bureaus so that the use of technology and civic engagement is facilitated, embraced and cultivated. **Adopt Information Technology Standards**: to improve the efficiency and effectiveness of the buildings, streets, parks and health services in the City. **Adopt Regional Public Safety Standards for Wireless Networks**: that incorporate Public Safety's needs for reliability and ubiquitous coverage, interoperability and priority access.
Create future-oriented broadband policy, modernize government organizations and institutionalize digital inclusion values throughout the region	**Establish a Regional Task Force on Digital Inclusion Policy** **Advocate for legislation, regulation and adoption of open network platforms and open data standards**

Discussion of Broadband Key Strategies

Goal 1	Key Strategies

Make strategic investments in broadband infrastructure to attract innovative broadband-intensive business and institutions that create knowledge jobs in Portland.	**<u>Prioritize "Big Pipe" Capacity</u>:** Plan and incentivize very high bandwidth broadband deployment through clustering and co-locating very large capacity users, and providing economic incentives to providers to serve these areas. **<u>Attract R&D:</u>** Work with institutional partners, including OHSU, PSU, PDC and the State and others to attract at least one major research and development facility whose work requires very high capacity broadband infrastructure and globally-based research. **<u>Standards and Best Practices:</u>** Partner with Education, Industry and Research Organizations to encourage involvement in Standards development and the evolution of work and markets.

Broadband service has developed in Portland for most of the "Middle Market", defined as businesses located in the urban core, small businesses in most neighborhoods in Portland, where business needs for Internet service are for relatively moderate speeds, and middle-to-high-income residential users. However, Portland is still a "Tier 2" City, where broadband providers do not see a market for expansion of high-speed, high-capacity infrastructure equal to Tier 1 Cities.[3] To accomplish the goal of attracting innovation, new businesses and jobs to Portland that are based on the new networked economy, Portland must have a Tier 1 Infrastructure, including ubiquitous wireless coverage, and very high capacity broadband to industrial centers and clusters. Portland must also modernize its development standards to recognize that networking is an infrastructure equivalent to power, water and sewer when it comes to attracting tenants within developments.

These three key strategies address Portland's need to ensure that very high capacity Broadband infrastructure is developed in strategic corridors or "geographic clusters" that will anchor new industries and improve employment. The two prongs of this strategy are "pipes" and "tenants" (supply and demand).

3 For our purpose, Tier 1 Cities refer to those with fiber-to-the-home infrastructure and 4-G LTE mobile infrastructure. Tier 2 Cities have copper infrastructure to the home (which carries much less bandwidth) and 3-G mobile infrastructure.

Deploy High-Capacity "Pipes": Fiber connections are available for some high-capacity users in facilities within the urban core. However, the cost to extend fiber infrastructure to new locations is high. Fiber is necessary to achieve high-end service anticipated in the National Broadband Plan. PDC has noted that: "[D]rivers of the knowledge economy such as high tech and creative services, as well as more traditional manufacturing industries...require cutting edge communications technologies to enhance productivity and maintain competitiveness." To encourage the deployment of very high capacity broadband deeper into areas of the City where market forces have not attracted providers, the City should provide economic incentives including tax breaks, zoning and permit assistance, construction assistance, and conduit placement in rights-of-way. To the extent allowable by Federal law, the City should work with providers to subsidize, waive or reduce building entry fees to establish fiber connectivity, and should work with building developers and owners to participate in the industry cluster strategy.

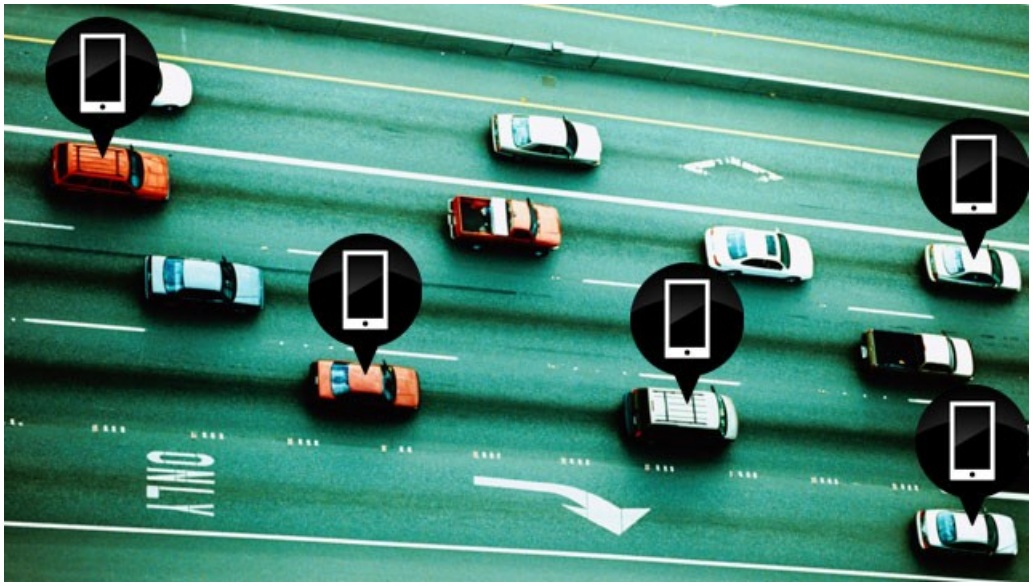
Attract Broadband Anchor Tenants: Locating one or more very large anchor tenant in strategic cluster areas will spur the development of broadband infrastructure by providing demonstrable demand for a higher level of speed and capacity. The City must attract research institutions, data centers, media companies or other entities that require broadband skilled workforces and high quality broadband services to create the anchor tenancy for a cluster area.

Standards and Best Practices: Standards and Best Practices for industrial buildings, commercial developments and neighborhood planning need to be updated to reflect the new necessities for accessibility that large businesses have and will have. Today, a business locating in a building is responsible for bringing any information technology it needs to the site. Tomorrow's standards will require that buildings are pre-wired for both mobile and fixed networking, with much higher standards of wiring and in-building coverage for wireless networking. The City should work with building owners and developers to ramp up connectivity in the City's urban infrastructure and commercial centers.

Action Recommendations

By 2013	Identify urban development areas for high capacity broadband infrastructure deployment. Establish a policy to drop conduit into all street trenching in identified areas.
By 2017	Create a program with Industry to identify economic incentives to encourage fiber core build-outs to cluster areas. Such a package might include low cost power, free or reduced cost access to City owned or financed assets (such as conduit, roof-tops, permits, etc.). Create an assistance program for very high capacity users to finance initial installation of fiber infrastructure, and to provide subsidies for high capacity bandwidth to spur job creation, and industry relocation to the clusters.
By 2020	Leverage the IRNE fiber assets, City streets, sewers and other rights of way to place publically owned infrastructure assets at the disposal of service providers who agree to deploy very high bandwidth services at lower than market cost to industry and employers.

Include Broadband infrastructure development in public works projects, such as streets, sewers, etc. to diffuse high capacity infrastructure throughout the City and region.
Work with PDC, Higher Education, the State and other potential partners to incentivize research partnerships that require large pipe broadband. Develop projects that will anchor a large pipe "campus" such as a genomic research project, Central Eastside URA for mid-to-small business cluster projects, other URAs such as North Macadam and Interstate.
Actively recruit "Network Centric" businesses and workers to Portland through an innovative program of incentives and marketing.



Goal 2	Key Strategies
Eliminate broadband capacity, equity, access and affordability gaps so Portland achieves near universal adoption of Broadband services for all residents, small businesses and community-based organizations.	**Establish Neighborhood Broadband Access Centers:** Create high-capacity access points within neighborhood community centers. **Expand City Capacity to Address Digital Equity:** through dedicated funding and staff resources and community partnerships. **Facilitate Marketplace Competition:** Advocate for and facilitate robust competition in Portland's broadband marketplace.

Until recently, not having affordable broadband was an inconvenience. Now, broadband is a prerequisite to economic opportunity for individuals, small businesses and communities. Those without broadband and the skills to use broadband-enabled technologies are becoming more isolated from the modern American economy. Broadband provides students and families access to global and local educational resources, immigrant and minority communities access to cultural connections, and small businesses achieve operational scale more quickly.

Neighborhood Access

The vision for neighborhood broadband access centers includes state of the art mobile and fixed broadband services, with training and affordable access close enough to residents and small business that they don't have to commute to it. These can be extended within existing centers, such as neighborhood libraries, community centers, shopping centers, parks or schools. Providing access to advanced services at the neighborhood level will help reduce pollution and energy consumption caused by travel.

The first key strategy adds high capacity broadband access to the Portland Plan's vision for "20-minute neighborhoods" where all services necessary for livability are within walking distance of home.

Broadband access centers provide tools to those who cannot afford, or do not have access to them in their household. It allows communities to "move information not people," connect

diverse communities, promote tele-medicine and telework, level inequities in civic participation and educational opportunities, and reduce geographic and economic challenges including commuting and other travel.

Digital Equity and Inclusion

The difference between those with no or very limited access to communications technology and those in the higher access categories is the "digital divide". Attempting to create an environment to counteract the divide is often known as "digital inclusion".

Portland should continue its critical role in working to overcome inequities in access to communications technology – Multiple communities in Multnomah County have indicated the need for local government to continue its current central role in providing public access to communications technology and the internet, such as through the Public Library and through public access organizations. Without increased access, many in the community will have even less opportunity to learn the skills necessary to work and participate in the networked society. Companion actions needed include dedicated funding and staff resources to assist non-profit organizations to provide digital content, access to technology and training to those with limited resources, and wireless broadband access.

Community groups and non-profits need to continue to work for digital inclusion, but need increased support from City government to fulfill that role – For example, representatives of immigrant and refugee organizations in Multnomah County talk about the value of public access at government locations like libraries and schools. These groups also need to have greater support to increase literacy skills, education, employment, civic engagement, cultural participation and healthcare.

The second key strategy establishes dedicated funding and City staff to support community groups and institutions that can work in partnership with the City to close the digital divide. This strategy will establish practices and policies to create equity for all communities to access broadband services.

Increased Competition

Competition provides consumers the benefits of choice, better service and lower prices. Building broadband networks—especially wireline—requires large sunk investments. Policies which help bring down the fixed cost of infrastructure and which spur greater demand may encourage new network expansion and new competitors.

The National Broadband Plan notes that broadband **competition is both fragile and insufficient** to keep pricing affordable, and to push advanced services into all markets and neighborhoods. The NBP also notes that current Federal policies may be ineffective at driving true competition in broadband, and that local public policy is a determinant of the level of competition locally.

The third key strategy addresses ways that the City of Portland can leverage its public assets (rights-of-way, IRNE, spectrum), fiscal and franchising policy, tax incentives and its substantial public sector market demand to encourage a robust broadband marketplace served by multiple, competitive providers.

The greatest deterrent to competitive broadband is the cost of deploying infrastructure. Broadband providers can expand high capacity infrastructure when access to land and property costs are reduced, bringing down the provider's fixed cost of plant. The City and its infrastructure partners (TriMet, ODOT) together own miles of fiber plant that is underutilized. These include conduit, building entries, fiber termination points and dark fiber that, to date, are reserved under several layers of local and Federal policy for the exclusive use of the public sector. The City should investigate ways to change these policies and leverage these assets to help enable the Private Sector to expand broadband services to the City's residents through public/private partnerships.

Broadband providers appear to invest more heavily in network upgrades in areas where they face competition. Providers generally offer faster speeds when competing. **Next generation wireless broadband networks**—for instance, Long Term Evolution Systems (LTE)—could offer speeds between 4 and 12 Mbps which can compete with mid-tier fixed broadband speeds and rates. The competition policy for Portland must include incentives to ensure that multiple wireless providers serve the entire City, and the metropolitan region.

Action Recommendations

By 2013	Work with non-profits and NGOs to increase access to broadband tools for underserved communities. Revise rules for local grants to allow support for training and access to broadband services. Convene a planning committee with the provider industry to identify and leverage incentives for broadband service expansion including complete neighborhood coverage for wireless. This could include access to public sector assets (rooftops, conduit, fiber etc), tax or franchise fee reductions, etc. Advocate at local, state and federal levels for robust competition in broadband markets. Study ways to lower the cost of infrastructure deployment including working with industry to pool or share core infrastructure builds (towers, conduit, spectrum, etc.) to move the model toward competition with collaboration. Conduct a study to demonstrate the impact of broadband availability on property values. Promote a subsidy or grant program for low income or distressed communities to allow them to obtain commercial service at affordable rates, to pull latent demand for service into the marketplace.
By 2017	Partner with non-profit community groups to provide technology grants to communities. Establish a fund for Broadband Equity. Develop a stable funding stream for access subsidies through a strategy such as a 1% universal service fee.

	Begin distributing City workforce from office buildings to neighborhoods, where they are connected digitally to City Hall. Provide free WIFI at public buildings in each neighborhood. Negotiate a service agreement for public safety levels of reliability, capacity and coverage with a provider. Identify and commit to policy and financial incentives such as franchise fee credits, shared trenching, City-provided conduit, grant programs, or other means to reach accessibility goals and objectives. Aggregate public sector demand among several institutions and entities (higher education, government, transit, K-12) to incentivize development of service providers in underserved areas.
By 2020	Work with the County, Higher Education and Portland's public schools to build telework centers and resources within community centers, K-12 schools or community college campuses that align with "20-minute neighborhoods." Become a "city without walls" where all city services, meetings and records are available to all residents and constituents on interactive digital platforms so that it is never necessary to travel to a city office to conduct business, provide testimony or participate in City business. Conduct all City public meetings, hearings, etc. via interactive video so that residents can participate from their neighborhood.

Goal 3	Key Strategies
Consult with workforce development partners when investing in broadband infrastructure to ensure the development of highly technology-skilled and employable residents, students, small businesses and workforce.	**Create Broadband Centers of Excellence:** Create innovative alliances, partnerships and incentives to develop advanced services and applications locally. **Promote Technical Literacy and Skills:** Leverage existing and support new investment in lifelong technology education and training. **Modernize and Adopt Telecommuting and remote work strategies and policies**

Four key emerging and evolving technologies are driving digital adoption and the Internet economy in the near and long term - These include expanded video use in all of its forms; in-home services accessed remotely; evolution and rapid growth of applications for portable mobile devices; and collaborative, real-time, high capacity applications. **Emerging technologies will positively impact several key network attributes –** This includes ease of use; highly scalable bandwidth; centralized data storage and network reliability and redundancy. The combination of evolving attributes will make network tools central to social interaction, employment, medicine and treatment options, transportation, and household management. While the network will free us from many unproductive and wasteful activities, it will also cause the obsolescence of a majority of policies and practices developed to support hierarchies of management of systems, people and institutions. These must be replaced with adaptive policies and systems which empower innovation and can flexibly support change.

Centers of Excellence

Portland cannot wait for innovations to trickle down to second-tier cities if it wishes to have the advantages of innovation. Oregon is a nationally recognized center for the open-source software movement, and software start-ups and mobile and cloud-based computing. Portland needs to leverage the skills of tech-savvy professionals it has “in residence” right away, to develop a digital services economy. A key to this strategy is the development of technology “Centers of Excellence” in Portland within Portland institutions, which will establish the area’s leadership in new economy innovations – in software, in management, standards, buildings, telecommuting

and education. Also key is investment in research and development in science and technology which require very high bandwidth connectivity.

The first key strategy will demonstrate Portland's ability to innovate and accelerate technology developments to accomplish desirable social outcomes. This strategy focuses on ways to propel innovation into Portland's structures, institutions and educational and social fabric.

Technology Literacy and Lifelong Learning

Broadband and Internet access are essential for student achievement and workforce development. The current workforce development system is fragmented and relies heavily on bricks-and-mortar facilities to deliver services. This physical infrastructure makes it difficult to adjust to changes in demand, resulting in inconsistent supply, quality and information distribution.

- Delivering services online through a scalable platform can expand the reach of One-Stops to everyone who has access to the Internet. Additionally, adopting content and service standards would ensure every participant receives consistent high-quality service.
- Broadband-enabled solutions address time, information and technology barriers faced by disadvantaged Americans seeking jobs and training.
- Research shows that unemployed workers who receive re-employment services land a job and exit unemployment insurance approximately one week sooner than those who do not receive such services.

Computer and Internet access alone do not produce greater student achievement. Access needs to be combined with appropriate online learning content, systems and teacher training and support. Some school districts are finding that online systems can help with high dropout rates. In addition to dropout prevention, online systems provide flexibility to students who cannot be in school for health, child-care, work or other reasons.

However, the Network has changed the way workers and students need to be educated and mentored. Sitting in a classroom, learning from dusty textbooks, and taking standardized tests will not support the economic future of students and workers. They must be trained in a new way, by institutions built on a foundation of global collaborative instruction and research, and flexible, on-demand instruction, tutoring and mentoring. Portland must work with every educational provider in the region to impress modernization and flexibility into their structures, student services and governance models.

The second key strategy establishes regional partnerships aimed at making sure that Portlanders are well trained and well educated at the earliest possible age to thrive in a digital economy. We need to focus on literacy, content and mentoring, not just technology to create a population that is ready for the new economy.

Telework

Telework and telecommuting can reduce congestion, pollution and energy consumption. Where travel can be eliminated from work, civic participation and meeting basic communication needs, carbon emissions and congestion can be eliminated. The knowledge "class" of workers and employers will not be focused on geographical proximity to the "office" or direct line-of-sight

control over workers. The future of professional work is that it will be done "anywhere" and lots of places, and will not require a fixed location. The corollary reality is that Portland must attract workers and employers who have the Network they need and the lifestyle and environmental attributes they desire in order to locate here.

The third key strategy modernizes our approach to work in order to foster and encourage remote work and telework, rather than to marginalize and "test" it. This strategy focuses on management issues as well as network issues to promote remote work styles and opportunities.

Action Recommendations

By 2013	Work with PDC, Higher Education, the State and other potential partners to incentivize research and development partnerships in software, applications and digital services. Establish a clearinghouse for digital information access and resources. Develop telework resources, including training, technical assistance and technology subsidies for small businesses and large employers. Work with Higher Education to create HR resources and advisors for employers who wish to promote telework. Provide tax incentives to employers who embrace telework solutions using broadband, decreasing commuting.
By 2017	Support K-12 and ongoing digital literacy programs in libraries, schools and other institutions. Develop small business training for owners and employees in the use of digital tools. With the medical community, establish a pilot project for aging-in-place that features affordable high-capacity Broadband for patient/physician connectivity and information exchange. Assist local educational institutions and school districts to modernize technology and teacher training in on-line instruction.
By 2020	Partner with Industry and Education to establish "Centers of Excellence" which promote innovation in Digital Communities and undertake research and development in advanced applications and economic and social change. Partner with state and local workforce development providers to create learning centers for small businesses and job seekers. Work with Portland's education institutions to have a fully developed distance learning platform in place which supports digital literacy and lifelong learning.

Goal 4	Key Strategies
Ensure that Development and Planning activities promote the use of broadband technologies in government, energy conservation, transportation, health and public safety.	**Energize a Dynamic City Technology Culture:** Foster a change in the culture of City bureaus so that the use of technology and civic engagement is facilitated, embraced and cultivated. **Adopt Information Technology Standards:** to improve the efficiency and effectiveness of the buildings, streets, parks and health services in the City. **Adopt Regional Public Safety Standards for Wireless Networks:** that incorporate Public Safety's needs for reliability and ubiquitous coverage, interoperability and priority access.

Broadband can facilitate a vast change in government and government's impact on urban planning. Once we understand that broadband is the lifeblood of advanced systems of all types, it is clear that broadband is essential in the design, monitoring, control of our entire infrastructure – including communications, water and sewer, roads, buildings, energy systems, manufacturing systems and payroll and inventory systems. Like private companies, government can make its services available 24 hours a day, seven days a week, 365 days a year across departments and across different levels of government. Moreover, communications technologies are the arbiters of transparency and inclusion. Recent social unrest across the globe has illuminated just how important it is for citizens to trust the transparency and equity of government. Elected officials and executive management must realize that there is no longer a delay between action and reaction in policy, politics and service. The network interjects a powerful new force in public policy and politics, and we don't yet employ it to gain its advantages. The longer the City waits to understand and employ technology, the further behind it will fall.

Energizing our Technology Culture

Portland's City Bureaus and Offices are not prepared to embrace innovation and rapid technology change for a variety of reasons, including the cost to change, current policies, current

management styles and structures, internal operating rules, etc. However, the City will continue falling behind the technology curve if it doesn't identify these constraints and remove them from our City culture and practices.

One of the most important ways the City can improve is in its use of networking technology for civic engagement. Currently, the City's use of web-enabled technologies is inefficient and ineffective, and could be improved. The City does not have an integrated web-enabled service delivery platform for citizens, and it does not conduct public business or provide public information effectively over the web.

The City also operates several data centers and many servers to maintain computer and network systems for its Bureaus. New technologies will replace these systems with more efficient generations of information and communications technology. A study by Booz Allen Hamilton estimates that an agency that migrates its infrastructure to a public or private cloud **can achieve savings of 50-67%.** Social media technologies provide the government another platform to spur innovation and collaboration. The private sector has come to recognize the efficiency gains and other benefits of social media within the workplace. Today, **out of the 36% of Americans involved in a civic or political group, more than half of them (56%) use digital tools to communicate** with other group members. Government must take advantage of these trends to encourage citizens to communicate with government officials more often and in richer ways. City managers and officials must encourage, not discourage the migration to digital platforms.

The first key strategy addresses the application of broadband tools to improve City operations and services, especially to improve public access to government services and public safety services. This strategy also addresses productivity improvements and cost reductions through the adoption of advanced broadband applications in City government.

Adopt Information Technology Standards

The infrastructure Bureaus of the City, including Environmental Services, Transportation, Planning, Facilities and the Portland Development Commission –all Bureaus that have an impact on the urban fabric, utilities, and development should be working toward understanding and adopting information technology standards to underpin the development of the City's infrastructure. Knowing with certainty that broadband infrastructure will be necessary in every structure and system built in the City is a clear mandate that standards and practices for integrating this technology in an efficient way into the urban fabric is essential.

The second strategy addresses the requirement for standards setting and cooperation and collaboration between the City, developers and manufacturers to ensure that new technology platforms which underpin our urban structure are efficient and ubiquitous.

Adopt Regional Public Safety Standards for Wireless Networks

The core function of City government is public safety. The City is responsible for firefighting, search and rescue, law enforcement, policing, 911 services and emergency planning. These functions represent nearly three quarters of the expenditures of the general fund. Yet our police and firefighters have less sophisticated wireless technology than most schoolchildren carry in their backpacks. The tools for first responders are dated, but even more distressing is their network access. Police and fire wireless networks and the 911 network, currently only carry voice calls, and very limited textual data. They cannot text or access the web from handheld devices. Callers to 911 cannot provide videos or text to call-takers. Though the City has access to a large amount of licensable wireless spectrum for broadband, it does not have the means to finance or plan a broadband network for public safety. Moreover, the public safety community as a whole has not provided standards or operational requirements for using wireless broadband. There is an immediate need for the City and its regional partners to develop wireless standards for interoperability, capacity and coverage requirements, and work with the carrier and equipment industries to develop next-generation wireless services that meet or exceed these requirements.

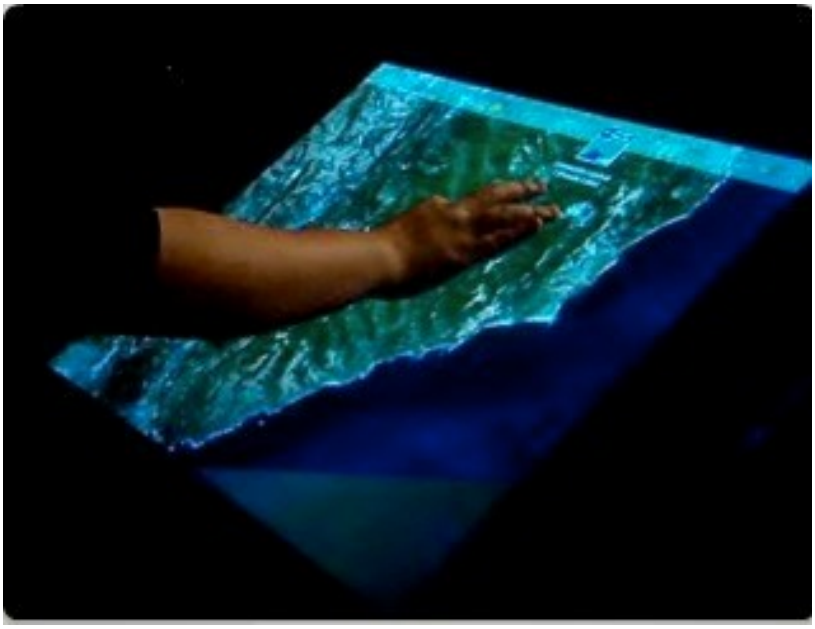
Sensors that can monitor chemical spills, water levels, heart and lung function, location and other essential data are available, but the wireless network to transmit the information from the sensors to response officials don't exist. Portland Fire reports that it has sensors in its equipment today, but they can't be used because there is no network to support them. Video cameras around the City, whether located at traffic lights or in apartment building corridors could provide essential situational awareness during accidents, emergencies, fires or crimes in progress, but their signal is not available in real-time to incident command. These systems can be improved through standards, procedures, partnerships and investment.

The third key strategy addresses the need for public safety broadband services to improve response time, lower costs and save lives.

Action Recommendations

By 2013	Lead a "culture change" within City government to promote full utilization of digital tools, especially to provide public access to civic engagement and city services. Begin a standards process with the public safety community on a regional level to develop public safety standards for commercial wireless use, so that public safety could become an anchor tenant on a 4-G wireless infrastructure. Create City policies, practices and funding mechanisms that to foster greater adoption and utilization of digital tools. Put wireless broadband accessible to the public in all public buildings. Investigate any health hazards, e-waste issues associated with broadband deployments and issue credible study results to inform the public and decision-makers. Improve use of social media to engage citizen involvement in local government.

By 2017	With the transit community, develop smart applications to assist in traffic management, traffic safety, commuter connections and fuel conservation. Emphasize the adoption of digital tools in City government through modernized equipment, software, data storage techniques and workforce education. Adopt best practices from emerging technology-rich business models and social media platforms. Seek funding or redirect existing funds to modernize the City's technology and software to support broadband utilization and workforce mobility, especially for public safety. Evolve video connectivity within buildings using smoke detector model. Incentivize in partnership with home insurance industry. Support wide adoption of "wired household or Smart Home" standards. Incentivize builders and homeowners through expedited review or financing through an energy conservation trust model. Develop strategic spectrum plan for spectrum licenses available to the City in the 700 MHz, 4.9 GHz bands that will serve public safety and promote Citywide broadband goals. Investigate and adopt "smart building" codes. Implement a fully-functional, Web 2.0 enabled "311" service online. Place all government information in standardized, usable, searchable, accessible formats on-line.
By 2020	Increase municipal telework-force and telework hours over time so that only mandatory commuting happens. Address and change city culture (personnel and management policies, workforce technology, incentives and rules) to reward higher levels of telework in Bureaus. Calculate and monitor direct and indirect savings and other benefits (such as reduced carbon emissions, longer "hours of operation", family and quality of life and other benefits) from telework. Adopt cloud computing platforms where prudent and feasible to replace data centers, equip public buildings with energy sensors to reduce energy use. Implement next-generation 911, including text and video call-taking.



Goal 5	Key Strategy
Create future-oriented broadband policy, modernize government organizations and institutionalize digital inclusion values throughout the region	**Establish a Regional Task Force on Digital Inclusion Policy:** Portland must innovate both by establishing partnerships with industry, education, and other government bodies, and by reforming our government institutions and policies to root out silos of control and resistance to change. **Advocate for legislation, regulation and adoption of open network platforms and open data standards.**

The conclusion of the Aspen report notes, "Government and public policy can play a tremendously helpful role in guiding the forces that are emerging. But historically, government and public policy have tended to be more reactive and short-term oriented, not pro-active and visionary…New sorts of government leadership are needed to address social inequality, education and training, and improvements in governments services…There is a keen imperative, in short, for serious institutional innovation."

The imperative for leadership and institutional innovation is central to the goals and strategies included in the Portland Broadband Plan.

The strategies proposed in this plan are based on expectations for radical changes in society, local and national government and economic opportunity. The pace of change is assumed to be rapid – much faster than our current government models, practices and structures can respond to. This plan is also visionary – attempting to forecast our social and political needs into the future on a landscape that we imagine is coming quickly. Though there are many short-term actions suggested in this plan, the preparation for longer-term change must also begin now.

The pervasive reality of the networked society breaks down traditional barriers and roles, and reassigns new ones. So the City must adapt with collaboration and advocacy. We need regional partners with a similar and harmonious vision of the future to work with us to accomplish the goals in this plan.

These two key strategies address the need for Portland to advocate as well as innovate. Public policies must be changed within the institutions around us (higher education, state and federal government, private industry) to allow the other goals of this plan to be realized.

Advocacy for changes in policy must produce evolution in everything from standards for open access and open data, copyright reforms and affordability of access to public records and public meeting laws. Leadership in changing government institutions across government levels to promote education and equity are essential. Also essential is the institutionalization of the value that broadband is critical infrastructure and that public access to it is a social goal.

Several participants in the Portland broadband planning workshops felt that the City should build a municipally-owned broadband services provider to offer high-capacity broadband service in an equitable and affordable manner to every household in Portland. The decision to do this or not would depend on several policy factors, economics, market conditions and the availability of alternatives. While we cannot say today whether this policy direction is the correct one to take, we must evaluate whether the infrastructure, policy framework and pricing options available in Portland will meet the other four strategic goals.

Action Recommendations

By 2013	Establish a task force on digital policy that includes representatives from local, regional and state government. Review and update the City's comprehensive approach to wireless facilities in the City including a database and mapping. Compile an action agenda for policy review of internal City policy that must evolve. Create a public/private working group on digital equity issues. Advocate for open access platforms.
By 2017	Introduce legislation at the State level to create digital equity standards statewide. Advocate at the Federal level for broadband standards in publicly-funded infrastructure.
By 2020	Re-structure local government institutions for the digital age.

Conclusion and Next Steps

The Portland Broadband Strategic Plan is among the first ever drafted by a municipality in the United States. It represents the vision of Portland's City Council, its Bureau Directors and executives, and most importantly the needs and desires of Portland's diverse communities for quality, inclusion and equity. The City plans to conduct targeted engagement on the Plan with under-represented groups, industry and technology user groups in the next eight weeks. Once the strategic plan is adopted, a work plan for 2011-2013 will be developed through the City's budget process. It is this first work plan which will launch the activities that stem from the goals and key strategies.

Success Metrics

As the City begins the implementation process, key measures of success will be developed for the plan.

This Plan will guide other plans – in development, transportation, permitting, changes in City code, government restructuring, the City's budget process and the overall Portland Plan. This Plan lays the foundation for understanding, embracing and adapting to the digital economy.

Attachments *(Placeholder)*

Workgroup Participants

Connecting Our Future: Portland's Broadband Strategic Plan Roundtable Participants

Economic Development/Business Vitality

NAME	ORGANIZATION
Skip Newberry	Mayor
Gerald Baugh	PDC
Sheldon Renan	Renan & Associates
Vince Porter	Governor's Film Office
Rich Bader	Easystreet OnLine Services
Wilf Pinfold	Intel Corporation
Matt Nees	Oregon Software Association
Andy Frazier	Frazier Hunnicutt Financial
Bernie Foster	The Skanner Newsgroup
Naomi Pierce	N PDX Multimedia Train Ctr

Education and Health

NAME	ORGANIZATION
Kali Ladd	Mayor Adams
Sherry Swackhamer	Multnomah County
Don Westlight	Network Engineering, OHSU
Nick Jwayad	Portland Public Schools
Sharon Blanton	Portland State University
Eileen Argentina	Parks
Christine Blouke	Parkrose School District
Miles Ellenby	OHSU
David Olson	City of Portland
Leslie Riester	PCC/Tech Solution Svcs

Digital Inclusion/Civic Engagement

NAME	ORGANIZATION
Tim Crail	Commissioner Fritz
Cece Hughley	Portland Community Media
Doretta Schrock	NPNS
Abdiasis Mohamed	IRCO
Kayse Jama	ICO
Julie Omelchuck	MHCRC
Rick Nixon	BTS

Dylan Amo	Citizen
Brian Hoop	ONI
Sonia Schmanski	Commissioner Fish
Russell Senior	Personal Telco

Planning/Transportation/Sustainability

NAME	ORGANIZATION
Brendan Finn	Commissioner Saltzman
Don Stastny	StastnyBrun Architects, Inc
Chris Smith	Portland Planning Comm
Gary Odenthal	Planning & Sustainability
Peter Koonce	PBOT
Alex Bejarano	PBOT
Mike Burnett	Hot Sky Consulting
Kate Miller	Kate Miller Studios
Michael Jung	Silver Spring Networks
Scott Robinson	Metro
Tim McHugh	TriMet

Public Safety and Emergency Response

NAME	ORGANIZATION
Aaron Johnson	Commissioner Leonard
Mark Greinke	BTS
Karl Larson	PSSRP
John Klum	Portland Fire & Rescue
Mark Elwood	Portland Police
Lisa Turley	BOEC
Carmen Merlo	POEM

Timeline

Phase I

1. Resolution at Council - September 22, 2010
2. Kick-Off Event - January 28, 2011
3. Roundtables – February & March 2011
   - Economic Development/Job Creation
   - Planning, Sustainability & Transportation
   - Public Safety
   - Education & Health
   - Digital Inclusion

Phase II

Targeted Engagement with Under-represented Groups - May & June 2011
Industry Forum – June 3, 2011
Presentations of draft BBSP – June 2011
Bureau Director Briefing – June 2
Planning & Sustainability Commission – June 14
OSBridge June 21-23
Lunch 2.0 June 29
Other potential presentations: Alliance of Portland Neighborhood Business Associations, Contact info: heather@apnba.org., SAO (Board), PBA, Hispanic Metro Chamber, OAME, SBAC, Pilipino American Chamber of Commerce (PACCO), African American Chamber of Commerce

Phase III

1. Council Work Session – July 19, 2011 @ 9:30 am
2. Council Adoption – September 14, 2011 @ 2:00 pm Time Certain (Recognition of Roundtable Participants)

*Roundtable Participants & interested citizens updated throughout via web and email

History of Broadband in Portland

State of Broadband in Portland Today

List of Broadband Providers in Portland

Telecoms in Portland Ranked by Number of Company Employee

Portland Business Journal, January 26, 2011

Rank	Company	Phone Website	No of Company Employees	No. of Metro Employees Headquarters	Geographic Area Co
1	**AT&T Inc** 208 S Akard St Dallas, TX 75202	210-821-4105 att.com	**282,720**	N/A Dallas, TX	World
2	**Comcast** 9605 SW Nimbus Ave Beaverton, OR 97008	503-605-6000 comcast.com	**107,000**	1900 Philadelphia	Kelso/Longview, Vanc Metro, Portland Metro Salem/McMinnville, C Lebanon/Eugene Met

		503-574-1707	**80,000**	500	Nationwide/Hawaii, p
3	**Verizon Wireless** 6600 SW 105th Ave, Ste 200 Beaverton, OR 97008	verizonwireless.com		New Jersey	Alaska. Also global v date service in more t countries.
4	**Sprint Nextel Corp.** 8405 SW Nimbus Ave Beaverton, OR 97008	800-829-0965 sprint.com	**40,000**	N/A Kansas	Nationwide
5	**CenturyLink-Qwest Communications Inc** 421 SW Oak St Portland, OR 97204		**30,138**	900 Monroe, LA	Statewide, nationwide
6	**Cricket Communications** 1750 NW Naito Parkway Portland, OR 97209	503-306-2527 mycricket.com	**4,331**	N/A Dallas, TX	Nationwide
7	**XO Communications** 9000 SW Nimbus Beaverton, OR 97008	503-277-1400 xo.com	**4,000**	N/A Herndon, VA	Nationwide
8	**tw telecom** 520 SW 6th Ave, Ste 400 Portland, OR 97229	503-416-8982 twtelecom.com	**2,950**	50 Littleton, CO	Serves 75 markets in states
9	**Integra Telecom** 1201 NE Lloyd Blvd Portland, OR 97232	503-453-8000 integratelecom.com	**2,200**	N/A Portland	Washington, Oregon, Minnesota, North Dak

National Broadband Plan Summary

Transcribed Highlights of Broadband Kick-Off