

Portland State University

PDXScholar

Master of Urban and Regional Planning
Workshop Projects

Nohad A. Toulan School of Urban Studies and
Planning

2003

A Road Map for Accessible, Affordable and Adaptable Broadband Telecommunications in Portland

Abdullah Al-Thabt

Portland State University

Jamison Cavallaro

Portland State University

David de la Rocha

Portland State University

Brendan C. Finn

Portland State University

Jonathan Konkol

Portland State University

Follow this and additional works at: https://pdxscholar.library.pdx.edu/usp_murp



Part of the [Urban Studies Commons](#), and the [Urban Studies and Planning Commons](#)

Let us know how access to this document benefits you.

Recommended Citation

Al-Thabt, Abdullah; Cavallaro, Jamison; de la Rocha, David; Finn, Brendan C.; and Konkol, Jonathan, "A Road Map for Accessible, Affordable and Adaptable Broadband Telecommunications in Portland" (2003). *Master of Urban and Regional Planning Workshop Projects*. 145.

https://pdxscholar.library.pdx.edu/usp_murp/145

This Report is brought to you for free and open access. It has been accepted for inclusion in Master of Urban and Regional Planning Workshop Projects by an authorized administrator of PDXScholar. Please contact us if we can make this document more accessible: pdxscholar@pdx.edu.

A Road Map for Accessible, Affordable and Adaptable Broadband Telecommunications in Portland



Portland State University

College of Urban and Public Affairs
School of Urban Studies and Planning
USP 558 Planning Workshop, Spring 2003

Prepared By:

Abdullah Al-Thabt
Jamison Cavallaro
David de la Rocha
Brendan C. Finn
Jonathan Konkol

Disclaimer

The following student-produced document does not necessarily represent the views of Portland State University, the College of Urban and Public Affairs, the School of Urban Studies and Planning, or the Master of Urban and Regional Planning Program

Table of Contents



Executive Summary	5
I. Introduction	7
II. Evaluation	10
III. Planning	21
IV. Implementation / Deployment Options	34
V. Conclusion	44
Glossary	46
Appendices	49

Executive Summary

Portland needs to plan for broadband development and take steps to ensure these plans are implemented. In order to implement Portland's land use and economic development goals, broadband must be accessible to all users. This means that any home or business must have access to the best available network technology to meet their needs. Currently, broadband service is not provided at uniform levels City-wide. It must be affordable, which requires real competition among providers. Portland's market presently offers too few choices outside the central business district to meet this criterion. In addition, broadband must be adaptable to future uses. Without investments in new network elements, Portland homes and businesses may not have access to the infrastructure necessary for tomorrow's broadband applications in a timely manner. Portland should proceed towards better broadband deployment in three phases: evaluation, planning and deployment.

This report recommends that Portland should establish a Broadband Taskforce composed of planners, economic development specialists, and telecommunications industry personnel to identify specific needs and evaluate best practices to meet these needs. The City will need to take inventory of all broadband networks in operation in the City and assess their ability to meet Portland's current and long-term needs.

Currently, the City of Portland's land use and economic development plans do not address broadband telecommunications needs. As a result, the City may be unable to ensure adequate levels of service for planned developments. The City's planning and economic development goals could be advanced by the coordinated deployment of broadband and the provision of wireless Internet services (WiFi) in town centers. Better broadband provisions can be achieved through a combination of demand side policies such as mandating minimum levels of service to all users, and supply side incentives to private telecommunications network owners. The City needs to incorporate broadband into its comprehensive plan as well as in its economic development strategy. Portland's zoning code should be updated to reflect these changes and should mandate minimum levels of service provisions for all land use and development types.

Public intervention in the form of public provision of retail broadband connectivity should be considered a last resort, in cases where private providers cannot meet the City's goals for broadband connectivity. The City would be served best by mandating minimum standards for broadband provision through the City Code and leaving private providers the option of determining the most cost effective means of delivery.

If planning efforts do not achieve results necessary to promote the City's land use and economic development goals, direct market intervention should be implemented in order to achieve universal broadband service that is accessible, affordable, and adaptable to future needs. Other Cities have addressed this issue by taking public intervention to its logical extension, creating publicly owned overbuild network. A network overbuild creates a parallel network, duplicating existing basic

networks, and competes with them since it is independently owned. Due to the cost and difficulty associated with a public overbuild, this option should only be considered if all other attempts to bring superior network services to Portland fail.

If Portland begins to treat broadband in the same manner as it treats traditional forms of infrastructure such as water and sewer service, it can ensure superior connectivity to all users. This report provides a roadmap and decision-making framework for the process of creating a better broadband network for the benefit of all Portlanders.

I. Introduction

Broadband telecommunications networks have proliferated to an unprecedented degree in the past decade. These networks carry vast amounts of data between cities, but the extension of broadband telecommunications networks *within* most cities, including Portland has not kept pace with the increasing demand for broadband connectivity. The growth of the Internet, doubling every 100 days¹, demonstrates the exponentially increasing demand for telecommunications facilities. While individuals were at one time comfortable accessing Web information over 14.4 kbps and 28.8 kbps modems, more and more users are upgrading to broadband access using Digital Subscriber Lines (DSL) and cable modems. This means that users who once expected only a small, slow flow from the Internet now demand vastly increased data transmission rates as well as reduced delays. New bandwidth-intensive applications such as video, voice, multimedia, and interactive gaming are driving the push toward higher capacity network systems.

Just as businesses have come to rely on Broadband applications to compete effectively in the marketplace, residential users are increasingly expecting Broadband access in their homes, and consider that access as an integral part of their quality of life. While this service is commonly regarded by the public as a basic service, it is not currently treated as such by Portland's City codes and policies. Because of this, Broadband service currently is not uniformly available throughout the City; it is costly; and no clear and consistent standards have been established by the City². Broadband needs to be universally *accessible, affordable and adaptable* to future needs in order to become a true basic service. These three criteria will be used to evaluate existing service provisions in Portland, evaluate deployments of Broadband service in other communities, and to establish a framework for Portland policy-makers and planners to begin to address important choices this City faces with regard to meeting Broadband needs. This framework will provide policy alternatives available to the City, recommend preferred solutions, and define steps to be taken in order to implement a successful Broadband deployment policy.

Portland currently has planning language and code sections dealing with every form of traditional infrastructure, from roads, to wiring, and from water to sewers. It lacks, however, an equivalent degree of planning for broadband telecommunications. Failure to address this type of infrastructure is a significant oversight. This report will demonstrate that broadband service is necessary for many of the land use and economic development targets, and that under present market conditions, it is unlikely that service will be extended to all target areas in the City in a timely and uniform manner. There is a compelling need to integrate any potential Broadband infrastructure build-out with Portland's land use planning policies in order to achieve a successful deployment. The City has invested considerable resources in the development of detailed land use and economic development plans and goals. The presence of a universally accessible, affordable and adaptable Broadband network could have a significant impact on the City's ability to realize those plans. The

¹ William E. Kennard, Federal Communications Commission (FCC) chairman, January 27, 2000 speech in Lisbon, Portugal

² *Technology Reshapes Office Building Specs* Daily Journal of Commerce, October 1, 2000

first step towards remedying this situation is for the City to establish uniform standards for access to broadband. This report will examine some of the ways in which existing plans would be advanced by coordinated Broadband connectivity, thus establishing a case for establishing broadband as a basic public service, much like water or electricity.

Bringing Supply and Demand Together for a More Wired Future

Portland's planning system requires a mechanism to bridge the gap between levels of service provided by its "incumbent local exchange carrier" (ILEC), Qwest and levels required by planned development. Often, the most intensive investments in new telecommunications networks take place in areas with large concentrations of existing commercial users. For this reason areas such as Downtown Portland, the Pearl District, and neighboring Washington County's "Silicon forest" are amply provided for by numerous private network providers, such as Qwest Communications. Areas which do not already have large concentrations of business users generally do not receive similar levels of network technology investments for the simple reason that it is too risky for a firm to place expensive infrastructure in an area with no guarantee that sufficient users will materialize to purchase service over the network.

This does not have to be the case, however, if Portland was to mandate uniform standards for broadband provision and establish a link between supply side policies which create incentives for network expansion, and demand side policies, which mandate minimum levels of access for developments. Creating a link of this nature, and incorporating it in planning practices could eliminate a large part of the uncertainty which prevents private providers from investing in underdeveloped areas. One of the advantages of the Oregon land use system is that the preparation of comprehensive plans guarantees a level of predictability absent in most other states. Despite the bureaucratic hurdles this system creates, the long-term predictability fostered by comprehensive planning makes Oregon cities attractive for development, since firms can safely assume that if a given development conforms to long range plans for an area, their investment is relatively secure. This means that government goals and policies will support the presence of that land use in the long term and ensure that service provision is adequate for its needs. Therefore, what is needed is to bring this degree of long term predictability and stability to the broadband provision market.

Bridging this divide will require greater coordination with private sector partners. With the right incentives these firms could be allies in the effort to provide competitive open access broadband to Portland homes and businesses. If telecommunications firms are made aware of plans for commercial development as a potential market for their services, they will have a compelling reason to invest. If providers can count on public sector efforts to drive a certain level of development, it will be far more justifiable for them to outlay capital on technology upgrades. By giving them a stake in the success of planning process, the City can work with Qwest and other firms to achieve its desired state of accessible, affordable and adaptable broadband.

If Portland acts immediately to establish a system of universal Broadband service provision, it could significantly enhance the City's reputation as a creative, technologically sophisticated community. This reputation, along with the value of the service itself, would position Portland as a global leader in municipal use of broadband technology, creating opportunities for economic growth and community development. It is becoming increasingly evident that firms choose to locate in particular areas not only because of cost and amenities, but also because of the quality and bandwidth available for network connectivity³. Because of this, broadband policies implemented today will have a direct effect on the City's competitiveness tomorrow. Planning efforts cannot ignore the very real possibility of a City purchase of Portland General Electric (PGE). If this attempt is successful, the City would be in an ideal position to utilize the utility's infrastructure to directly deploy a broadband network. This report provides information and case studies which the City should consider if it acquires PGE, as well as suggesting options for alternative contingencies.

Framework: Evaluation, Planning, and Implementation

This report provides decision-makers with a roadmap to the development of a comprehensive, systematic strategy for the deployment of broadband network resources City-wide. It outlines this process in three distinct phases. The first phase, *Evaluation*, assesses levels of service under present market conditions and highlights the need for increased public intervention in broadband provision. It catalogues the types of broadband service currently available in the City of Portland, identifies firms which provide these services and describes their service areas. This section also evaluates these services in terms of the three criteria of accessibility, affordability and adaptability.

The second phase, *Planning*, describes current plans and their failure to address broadband telecommunications. It identifies instances in which better broadband provision could help the City to meet its land use and economic development goals, and identifies several ways in which the City could incorporate broadband into its current land use planning system.

The final phase, *Implementation*, recommends measures the City can take to make sure standards are met. It recognizes that merely enacting planning requirements and supply-side incentives may not guarantee achievement of an ideal level of connectivity which meets every individual's and business's need for broadband speed for the long term at reasonable costs. This section proposes benchmarks for evaluating the success of planning initiatives and suggests several contingency plans, including public provision of basic broadband services, if the benchmarks are not being met. Ideally, market forces can be harnessed to bring about better service provision. The City should only consider public provision as an option of last resort, when private providers cannot be prevailed upon to provide the required infrastructure.

³ Stephanie Basalyga, *Technology reshapes office building specs*, DAILY JOURNAL OF COMMERCE, 1 August 2000

II. EVALUATION PHASE

Portland needs accessible, affordable, and adaptable broadband to meet planned targets for land use and economic development. Portland must negotiate several key challenges to accessibility, as well as several opportunities to accomplish broadband which is accessible to all potential users. The Federal government has defined accessible broadband as an issue of public interest: the Federal Telecommunications Act of 1996 stated that advanced telecommunications capability should be deployed to all Americans in a reasonable and timely fashion.

SEC. 706. ADVANCED TELECOMMUNICATIONS INCENTIVES:

- (a) IN GENERAL- The Commission and each State commission with regulatory jurisdiction over telecommunications services shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) by utilizing, in a manner consistent with the public interest, convenience, and necessity, price cap regulation, regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment.⁴

This means that any home or business should have access to the desired level of connectivity (generally described in terms bandwidth, which is measured in megabits per second, or Mbps⁵) on demand. Second, broadband must be affordable.

SEC. 254. UNIVERSAL SERVICE:

- (b) UNIVERSAL SERVICE PRINCIPLES- The Joint Board and the Commission shall base policies for the preservation and advancement of universal service on the following principles:
- (1) QUALITY AND RATES- Quality services should be available at just, reasonable, and affordable rates⁶.

This is a slightly more nebulous concept, but at its core, affordability must reflect a point of market equilibrium at which providers price services so that most users are willing to pay market rates. Case studies from other jurisdictions have shown this price level to be somewhere in the \$25-\$35/month range for a typical home user, (see Chapter IV) but there is no hard and fast measure of affordability since it is a relative term. Finally, broadband service must be adaptable, meaning that telecommunications delivery systems can meet not only the needs of today's users and applications, but are sufficiently upgradeable to handle projected increases in bandwidth demand for the foreseeable future. A coordinated effort to build networks which meet all three of these criteria will

⁴ Federal Communications Commission, 3 January 1996. Telecommunications Act of 1996.

⁵ SEC. 706. ADVANCED TELECOMMUNICATIONS INCENTIVES:

(c) DEFINITIONS- For purposes of this subsection:

(1) ADVANCED TELECOMMUNICATIONS CAPABILITY- The term `advanced telecommunications capability' is defined, without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology.

⁶ Federal Communications Commission, 3 January 1996. Telecommunications Act of 1996.

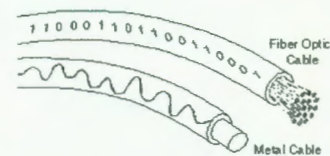
help to introduce stability into the market by providing assurances that infrastructure upgrades will keep pace with users' needs.

A. Portland and its Networks.

Existing Networks and Their Owners: part of the problem or part of the solution

Unlike other types of infrastructure, broadband services are provided by numerous private providers in the City of Portland. The largest of these providers is Qwest, a former "baby bell" created by the 1984 Supreme Court decision to break up AT&T. Such firms own the majority of the telecommunications infrastructure in almost all American cities, much like the natural monopolies which provide such services as water and electricity. These are known as Incumbent Local Exchange Carriers (ILECs). Qwest provides primary telephone service in Portland, as well as a variety of broadband services over its network. However it is far from alone in this field.

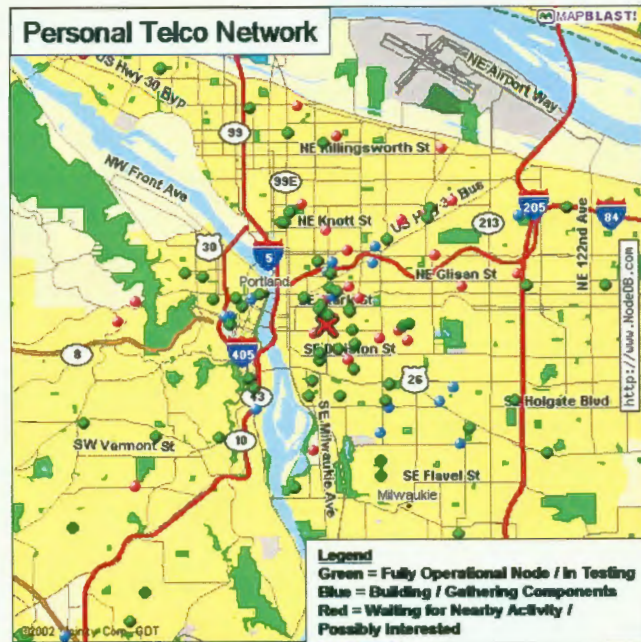
Portland is presently served by several major Broadband network types. These networks vary greatly in geographic coverage, available bandwidth and user costs. At the high end of the market are large commercial users in the downtown core and adjacent areas, which are served by fiber optic networks. Portland is relatively fiber rich, with large quantities of fiber optic conduit in place beneath central City streets. Fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages modulated onto beams of light. This type of network technology has the distinct advantage of transmitting data digitally (the natural form for computer data) rather than analogically as most networks do. Numerous private carriers offer this type of service in and around Portland's central City. Some of these providers are Electric Lightwave, XO Communications, AT&T and Portland General Broadband, a subsidiary of Portland General Electric. The following map identifies several of these networks and depicts their locations in the central core. See Appendix 1 for a map of some of the broadband networks which have been deployed in central Portland.



Other firms, such as Velocitus provide point-to-point fixed wireless communications. These systems send signals through line of sight transmission arrays to recipients. This can be done with microwaves or lasers. PGE in particular possesses an extensive microwave transmission network. Wireless Fidelity, or WiFi, is another form of wireless broadband that provides mobile access for users of laptops or hand-held devices. While fixed wireless typically connects a whole building's network with a wholesale provider's network WiFi, is typically used for connecting individual computers and other portable devices to the Internet. It has a 300-foot range and can be configured to exclude non-authorized users. This form of network is ideal for connecting individual users, such mobile users and homes to the Internet, but is less appropriate for serving businesses due to security concerns. The local universities and colleges provide this service to their communities, and T-Mobile has established a network of hotspots within Starbucks cafes around the City. Also, an ad-hoc group of local technology enthusiasts calling themselves the "Personal Telco Network" have established a

network of free open access hotspots around the City by sharing their personal WiFi access points with all users within the range of a WiFi antenna.

As noted above, Qwest has the most extensive network in the City of Portland. Users can connect to the Internet over Qwest's copper wire telephone network either by dial-up modem service, at 56 kilobytes per second (Kbps), or via a digital subscriber line, which uses complex signal modulation to provide service at rates over one Mbps for the typical home user. This technology can provide even faster connection speeds with certain network upgrades. The other significant regional network is operated over Coaxial cable, the type used to carry cable television. This network is owned by Comcast, the same company that provides cable television service to Portland. It offers speeds roughly equivalent to those available from DSL and is available to almost all homes and businesses in the City.



Missing Links: How Portland's Existing Networks Fall Short of Accessibility, Affordability and Adaptability.

Each of these networks has advantages, but with no coordinated planning, they do not, even in combination, presently provide universally accessible, affordable and adaptable broadband coverage City-wide. With few exceptions, private investments in telecommunications networks have responded only to market demand, with little or no regard for the City's long range plans. Without guidance from the public sector, market forces are unlikely to coincide with these plans.

Most of the high-end network types such as fixed wireless and fiber optic networks are not accessible to most users. Often, the most intensive investments in new telecommunications networks take place in areas with large concentrations of existing commercial users. For this reason, areas with existing clusters are amply provided for by numerous private network providers as well as the incumbent, Qwest. Areas which do not already have large concentrations of users are generally not targeted for investments of this kind for the simple reason that it is bad business to make costly investments which do not guarantee a return.

Simultaneously, the lack of up-to-date infrastructure in a given area sends a signal to the market that the area is not a wise choice to locate a business. As a result, such districts are less viable candidates for commercial development. This is a mutually reinforcing cycle, which leads to an

increasing concentration of investment in existing business cores, to the detriment of less prestigious areas of the City. This market dynamic is at odds with the goals of the City's Comprehensive Plan, which calls for City-wide revitalization and economic development in town and regional centers (Goal 5, Economic Development).

Much of the existing fiber network carries only interstate traffic, meaning that it travels through conduits which link major hubs in large cities, but provides no direct connectivity to end users. These long-haul fiber networks provide inter-City connectivity, but no intra-City access. Direct fiber connections are plentiful, but only within a highly circumscribed area in the downtown core, where most businesses have the option of connecting to more than one private fiber ring. This reflects both the high cost and the tendency of private providers to build only where existing users are located. Due to the high cost of fiber connections, which need sophisticated termination equipment, only large firms have the economies of scale needed for this level of access. Because these firms are primarily located in the central City core, private network builders have not built capacity for the rest of the City. Similar cost issues make fixed wireless and microwave connectivity beyond the reach of most small and medium sized businesses outside the downtown core.

Accessibility is a significant problem, since firms requiring large amounts of bandwidth must, for the most part, locate within the downtown core. For similar reasons, affordability of most broadband services is also problematic. As stated above, the most powerful network technologies require economies of scale that small and mid sized businesses are unable to achieve, and home users have even fewer options. Beyond downtown, most users receive Broadband service Qwest's copper wire and Comcast's coaxial cable.



The most basic type of telecommunications system is the copper wire telephone system, which is owned by Qwest. This network is subject to Federal "open access" laws under FCC regulations, requiring Qwest to make its network available to private third party Internet service providers (ISPs). Competition between ISPs ensures lower user costs. Users can connect to the Internet over this network either by dialup modem access, or with a digital subscriber line (DSL). The former is functionally obsolete, and the latter is available only within 18,000 linear feet of the nearest Qwest central office facility or digital subscriber line access multiplexer (DSLAM), which extends the range of the signal. Significant improvements may be on the horizon in the form of remote DSLAMs, which can theoretically extend this range indefinitely. Like any private firm, Qwest is risk averse, and may not make the needed upgrades in areas that do not promise much return on investment in the absence of incentives from the public sector. Qwest is also strongly motivated to protect its market share from the effects of competition. The result is that DSL is unavailable in many parts of the City and may continue to be so for years to come. Because of this, Portland's existing networks are neither universally nor sufficiently accessible. When consumers lack choice of providers, the result is frequently a service which is not affordable.

The case of cable broadband illustrates this principle. Comcast's cable network is costly to gain access to, and is subject to arbitrary price increases, such as Comcast recently enacted⁷. Moreover, this network is not subject to Federal open access provisions because the FCC does not consider cable networks to be "telecommunications networks." Since Comcast is an unregulated monopoly, it excludes other firms from providing service over its network. Comcast's prices are free from regulatory control. The result is that there is no way for the City to ensure that these fees will be affordable. The existing coaxial cable network is not adequate on these grounds.



The third major challenge for Portland's broadband providers is to provide service that is adaptable to future needs. This means that they will have to be able to accommodate the increased bandwidth capacity requirements of foreseeable applications and developments in the future. Not only must these networks provide connectivity to accommodate greater demand by existing users, they must also provide the basis for undeveloped or underdeveloped parcels to upgrade to higher users. Current market conditions have ensured that high capacity networks have only been built in existing commercial centers, bypassing less prestigious districts around the City. This problem will have to be rectified if Portland's broadband service is to adapt to meet the City's goals for land use and economic development. One of the most basic goals of planning is to "provide a timely, orderly and efficient arrangement of public facilities and services that support existing and planned land use patterns and densities" (City of Portland Comprehensive Plan, Goal 11, Public Facilities). Without a means to ensure that these networks will be extended to meet current and planned future needs, it is unclear how the City will be able to guarantee an adequate level of broadband service to implement its long range planning goals.

Unfortunately Portland's existing networks are inadequate with respect to the three basic criteria of accessibility, affordability and adaptability under current market conditions. This situation is unlikely to change without supply side intervention. Each of these networks alone achieves at least one of the criteria, but unless all users can connect to a network which is simultaneously accessible, affordable and adaptable, the level of service is inadequate under the terms of this analysis.

Portland's Broadband networks do not provide uniform service Citywide, and failing to plan for minimum levels of broadband service may impede the implementation of certain plans. The Bureau of Planning has developed plans for developments which require broadband services, but has failed to specify how those sites should receive that service. The South Waterfront plan alone calls for the creation of 10,000 jobs, with a heavy concentration on biotechnology sector jobs in conjunction with OHSU. The bioscience field requires access to vast databases and is generally very technologically intensive. Even more conventional aspects of medicine are increasingly dependant on broadband infrastructure for day to day operations. Table 1 demonstrates the minimal broadband capacity required for a variety of personal and business applications. Note that most commercial

⁷ Comcast's fee increase raises questions, USA Today, 1 April, 2003

applications require at least a T-1 Internet connection. The planned land uses for the South Waterfront district will most likely require even higher bandwidths. Such high bandwidth uses are likely to proliferate over the next decade. The Portland Development Commission's (PDC) most recent Business Plan report contains a section on the South Waterfront Urban Renewal Area, and cites the need for telecommunications infrastructure. However, the section does not specify how it can be provided or what level of service will be needed. The Planning Bureau's plans for the district do not mention this need at all.

Table 1: Connection Speeds, Applications and its Providers in Portland

Provider	Qwest/Comcast -- Available by both vendors as well as countless other ISPs	Qwest DSL - up to 1.3Mbps -- Comcast Cable ranges between 1.5Mbps and 3.4Mbps	36 separate providers -- Cost and availability is limited	Limited availability outside Central Business District (CBD) -- Highcosts	Currently used only near CBD -- Requires direct Fiber connection -- Very costly
Applications	E-mail				
	Music				
	Low-resolution video				
	Collaborating workgroup				
	Server - WWW personal				
	Medium-resolution video				
	Multimedia distance education				
	Storage area networking				
	High quality, real time imaging				
	Server - WWW commercial				
					Video broadcast
Data Rate	< 200 Kbps	200 Kbps - 1 Mbps	1 Mbps - 10 Mbps	10 Mbps - 100 Mbps	100 Mbps - 1 Gbps
Type of Connection	Dial-up ISDN Mobile	Cable modem T 1 DSL Fixed Wireless Satellite	T 1 T 3 VDSL Fiber Fixed Wireless Satellite	T 3 Fiber Fixed Wireless	Fiber

Source: Michigan Broadband Development Authority, and Portland Office of Franchise Management

Linking the development of network technology with planning and economic development goals is necessary to ensure that services will be adequate to meet those goals. The simplest and most effective mode of intervention would be for the City to establish standards for a desired state and leave it to the market to provide the most cost effective mechanism of bringing this about. This could be realized if the City first identifies its goal of specified levels of broadband service, then allows the market to determine the means to meet that goal. Under present conditions, confusion reigns in the broadband market because the City has no established vision for broadband service and no benchmarks by which to measure it.

B. Broadband in Land Use and Economic Development Plans

Authority to Plan for Broadband

According to Portland City Attorney Ben Walters, State-enabling language is *not* required for Portland to establish and implement a telecommunications plan because the Oregon State

Constitution establishes a system of strong home rule for municipalities⁸. Unlike practices in other states, Cities in Oregon are empowered to amend their charters to address a wide variety of regulation, including telecommunications, unless the State passes legislation specifically prohibiting them from doing so. Portland's charter allows the City to exercise a wide degree of latitude to plan for Broadband, from adding Broadband requirements in the zoning code and comprehensive plans to **creating a new broadband public utility**.

If planning efforts prove to be insufficient to encourage improvements in Broadband provision by private networks, the City's Charter has language which permits Portland to directly intervene by providing direct Broadband service in the same manner that it provides public utilities. The section is located in Chapter 10, Public Utilities and Franchising. The specific enabling language is as follows:

Section 10-102. General Provisions

The City of Portland shall have the power to construct, condemn, purchase, add to, acquire, maintain, operate and own all or any part of any public utility or any plant or enterprise, for the purpose of serving the City and the people thereof for uses public and private. Such power may be exercised in any lawful manner and shall include the power to purchase, condemn or otherwise acquire any franchise heretofore granted to operate a public utility

Section 10-103. Power of Construction and Acquisition

The City shall have the power to construct and acquire in any legal way and to maintain and operate works, plants and facilities for the purpose of doing any and all municipal work by direct employment of labor under the supervision of the City, and may use such works, plants and facilities, and the product thereof, for the purpose of doing municipal work of all kinds, and shall have the power to sell such product for use in the construction of municipal improvements of all kinds. It shall have power to provide payment for the whole or any part of local improvements constructed or done by the City directly under the provisions of this Section by assessment against the property benefited thereby.

Funds for the carrying out of this Section may be provided by issuing bonds as provided in Section 7-201 of this Charter or by the use of any moneys in the General Fund at the end of the fiscal year.

Lack of Broadband Language in Land Use and Economic Development Plans

Portland's Comprehensive and Economic Development Plans do not directly address Broadband telecommunications. This oversight is not uncommon, as municipalities across the nation have a similar problem. Portland's comprehensive plan contains language addressing services such as electricity, water and transportation. However, it presently lacks components dealing with Broadband, and makes only cursory remarks about telecommunications in general. The plan calls for the development of an internal telecommunications policy and recommends examining needs of homes and businesses. Beyond this suggestion, the comprehensive plan does not recommend any specific actions, nor does it describe a specific standard or goal for telecommunications service.

⁸ Interview with Portland City Attorney Ben Walters, who has a long history of dealing with telecommunication policies for the City of Portland, representing the City in various law suits with telecommunication entities as well as serving as counsel as the City established the Integrated Network Regional Enterprise (IRNE)

The City's economic development plans are equally deficient with regards to Broadband telecommunications. PDC's current business plan does not include a telecommunications component, nor does it mention a need for Broadband networks to serve the needs of businesses. According to PDC, the City has set targets for the creation of 152,000 jobs by 2014, requiring the construction or rehabilitation of 31,000,000sf of office space. It is highly unlikely that this could occur without substantial upgrades to the City's telecommunications infrastructure. Specific urban renewal area plans developed by PDC call for investment in telecommunications infrastructure, citing this as a prerequisite for development of key sites such as South Waterfront. But even these plans fail to provide details about how this service should be provided, or what constitutes a minimum level of acceptable service to meet plan goals. Such a piecemeal approach to incorporating Broadband in economic development plans is a serious liability. It has already resulted in missed opportunities.

Broadband Gap in Portland's Plans: Missed Opportunities

Portland's plans have failed to explicitly incorporate broadband, yet there are a number of examples which illustrate that a clear nexus exists between incorporation of broadband in land use and economic development plans and the City's ability to implement those plans successfully. Until this omission in planning and economic development goals is rectified, the City will continue to miss opportunities to utilize the power of broadband telecommunications to advance its goals and objectives. In the case of South Waterfront, Plans call for specific development patterns which are increasingly dependant on reliable, high speed broadband. The plans do not specify any way in which this infrastructure could be provided. Opportunities exist to advance land use and economic development goals through the incorporation of language addressing broadband. Portland's comprehensive plan contains several policies such as the redevelopment of obsolete industrial structures for different uses.

Certain high technology uses such as data centers are highly supportive of planned land use patterns for these types of development, but they cannot be established without a guarantee of broadband service. The City is in a position to advance many of the goals of public housing while providing opportunities for disadvantaged communities. For instance, the New Columbia (formerly Columbia Villa) redevelopment could include WiFi as a component of the site plan. Likewise, WiFi can stimulate activity in town centers, as Portland's independent Personal Telco group has demonstrated with its ad hoc network of free access hotspots around the City. The promise of greater connectivity has had a demonstrable effect in the two urban renewal areas where it has been deployed. According to PDC staff this infrastructure has been instrumental in redeveloping a number of sites in these areas and is a prerequisite for further economic growth.

Potential Missed Opportunity: North Macadam/South Waterfront

For the City of Portland to better realize their planning and economic goals by increasing the services and deployment of broadband services, it is necessary to examine what the broadband needs are for specific industries. For the purposes of this analysis, we will choose a planning effort being pursued by the City and outline how broadband applications apply.

North Macadam is an area just south of Portland's downtown core that offers a unique opportunity for redevelopment as it provides the largest block of vacant or underutilized land within the City's Central Business District. The area has approximately 140 acres of land and 6,500 linear feet of waterfront along the Willamette River. On August 11, 1999, Portland City Council formed the North Macadam Urban Renewal District and accepted the *North Macadam District Framework Plan* (Framework Plan) and directed PDC and the Bureau of Planning (BOP) to plan the area with the goal of providing approximately 10,000 jobs and 3,000 homes within the district by the year 2019.



BOP worked with teams from various City Bureaus to develop work products and provide analysis as part of the planning process. This work culminated into the product that was sent to City Council in late 2002, which meet the needs of the various stakeholders. On November 13, 2002, the Portland City Council voted unanimously to adopt the *South Waterfront Plan, Zoning Code for South Waterfront, South Waterfront Design Guidelines* and the *Greenway Design Guidelines for South Waterfront*. These went into effect in January 20, 2003.

The South Waterfront Plan is organized into sections that address vision, land use and urban form, greenway and parks, transportation, environmental design and district development. Many of these are loosely framed in terms of how to get 10,000 jobs into the district, although much of the language in the executive summary is quite specific about what type of jobs they hope to have in the district. In the executive summary of the plan, it is noted that "*South Waterfront is poised to play a critical role in the City's newly-christened Science and Technology Quarter*" and that BOP look to, "*investigate the potential for bio-science and other high technology fields to expand within the Central City*" with an "*increased interest on the part of OHSU and other science-based institutions in expanding functions and locating substantial facilities in North Macadam/South Waterfront.*"

In regard to how they were going to bring this plan to fruition, BOP relied on the planning methods that currently do not account for telecommunications infrastructure needs. There is an emphasis throughout the document on the provision of various forms of infrastructure, mostly revolving around transportation, water, sewer and parks. The Planning Commission report to Council calls for the City to "*Target public funding to stimulate a critical mass of private investment in the district*" and that "*Major infrastructure improvements would be phased to maximize the potential for private*

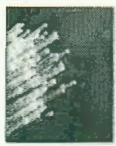
*investment in the district, beginning with development of an OHSU “satellite” campus and related uses in the center of the district.”*⁹

For these ambitious industry and job targets to become a functioning reality, the City’s planning efforts will need to adapt to the needs of broadband telecommunications infrastructure. As stated above, businesses, especially high-technology biosciences, will need greater provisions of broadband to function at all. To address this need of these desired business, PDC and BOP identified as one of the projects for the District Development Action Chart to “Develop the infrastructure needed to ensure South Waterfront is a competitive location for high technology jobs, such as bioscience businesses.”¹⁰ While this is an encouraging recognition of the need in the planned district, there is no analysis of how this might happen, unlike transportation, water, sewer and parks. Effective Broadband service in the South Waterfront District will require more coordinated planning, but no mechanism is yet in place for such coordination to ensure the success of the urban renewal area. Such coordination can assist planning and economic development goals throughout the City.

⁹ Executive summary, Planning Commission Recommended North Macadam Plan September 10, 2002

¹⁰ *ibid*

C. Broadband Taskforce



Broadband Taskforce

The creation of a Broadband Taskforce is a critical first step to realizing a superior broadband network. The purpose of the Taskforce is to plan for new telecommunications infrastructure that promises to enhance public services, quality of life, and business productivity. This infrastructure will be the mechanism to bring better service to customers, lower prices and universal connectivity by creating a truly free market for broadband services. These values must frame the work of the taskforce as it supervises the development of a plan for deployment and maps the path to implementation.

This Taskforce should comprise a team of broadband advisors from City bureaus responsible for planning and economic development in addition to bureaus such as Cable Communications and Franchise Management and ComNet. This taskforce should also include members with network technology experience from work in the telecommunications field. This kind of private sector experience is indispensable given the challenges of a market already dominated by powerful incumbents. The taskforce will require the participation of representatives from the business community, particularly the high technology industry. Region representation is highly valuable, since the City should take advantage of any possibilities for regional partnerships.

The recommended responsibilities of the taskforce might include but are not limited to¹¹:

- Articulate the City's vision for telecommunications and the goals for its use throughout the community.
- Study Federal and State law relating to the City's regulatory authority over telecommunications and the City's current regulatory structure.
- Update the City's regulatory structures relating to telecommunications, including regulation of rights-of-way.
- Review and update the City's organization and management of telecommunications, including the development of policies that will guide future decision-making related to telecommunications.
- Determine ways in which the City can enhance revenues and save costs associated with telecommunications.

¹¹ A similar effort has been spearheaded in Pittsburgh, Pennsylvania as the Telecommunications Working Group. Their efforts can be accessed at: <http://www.city.pittsburgh.pa.us/downloads/documents/tele/section1.pdf>

III. Planning Phase

A. The Case for Broadband Planning

If the City takes the aforementioned steps to incorporate broadband requirements into Portland's code and comprehensive plan, it would be in a much better position to negotiate infrastructure upgrades by private network owners. Moreover, it would be far easier for Portland to accomplish its existing land use and economic goals. The following are examples of goals and policies which would be direct beneficiaries of coordinated planning and standards for broadband provision, demonstrating a need for increased attention to this increasingly vital form of infrastructure in the City's policies and plans.

South Waterfront Revisited: Opportunity for Planning Coordination

If PDC and BOP had made an effort to assess *all* the infrastructure needs of the development types called for in their plans, there might have been recognition of a potential for parallel investment in developing the infrastructure needed for high technology jobs. Currently, the City of Portland's Bureau of Environmental Services is constructing a large sewer/storm-water pipe under the North Macadam/South Waterfront plan district, for the Southwest Parallel Interceptor project. This is part of the larger Combined Sewer Overflow Project (CSO) that will virtually eliminate sewer overflows to the Willamette with the construction of large pipes adjacent to the river.

In 2000, the City commissioned a feasibility study on how fiber optic lines can be deployed through Portland's sewer system. The report provided several scenarios where deployment would be possible and provided companies that offer the service. Because South Waterfront will be within the borders of the Central City Planned District, utilities will have to be sited underground. Taking advantage of the CSO project to deploy fiber optic infrastructure would help PDC and BOP move toward the goals of the plan to develop the infrastructure needed for high technology jobs.



The current status quo of broadband provisions will not be sufficient to meet these future needs. If this planned district and urban renewal area is expected to meet the goals set forth by the City and stakeholders, planning for enhanced broadband provisions is at least as necessary as the provisions articulated for transportation, parks/greenway, and environmental issues. The “*major infrastructure improvements*” that will leverage private investment, should be provision of fiber infrastructure. This is indispensable for the development in a planned district that continues to be vacant land.

Redevelopment of Obsolete Industrial Sites

3-D Space: Portland's industrial sanctuaries contain a large number of older, multistory industrial structures. These buildings are not suited to today's large-scale industrial operations, which generally demand large two-dimensional manufacturing spaces. Many of these spaces are under used and the buildings are in need of upgrades which uses such as warehousing cannot afford. Meanwhile, allowing more offices in these zones would undermine their viability as low cost industrial preserves.

Encouraging the development of data centers in these older 3-D industrial structures would encourage maintenance and upgrading of structures, since data centers could generally be relied upon to have sufficient revenue to be able to afford the cost. Moreover, the passive nature of these uses ensures that they will not be in conflict with any noise, smell, or other potentially obnoxious by-products of industrial uses.



Typical data center, housing Internet servers

Columbia Villa Redevelopment

The Housing Authority of Portland (HAP) is presently undertaking a complete overhaul of the Columbia Villa low-income housing project in Portsmouth neighborhood of North Portland. The planned reconstruction will take approximately 3 years and the only work HAP is presently contemplating is the physical redevelopment of the site. They do not have a plan to wire the property yet, but this might happen after the three year remodeling phase¹². The whole project, including reconstruction and relocation of residents will take about 5 years. There are 4 programs that provide Internet and computer technologies now. A proposal and feasibility study have been undertaken by staff from the Portland Parks and Recreation Department's University Park Community Center (<http://www.universitypark.org/hope/>).

This plan details the physical requirements for providing WiFi connectivity to residents and adjacent businesses on a \$35,000 initial budget. It also offers suggestions for how to supply low-income tenants with computers. For example, a local non-profit, Free Geek, offers reconstructed Pentium PCs for free to anyone who volunteers 24 hours of work to their organization. Meanwhile,

¹² Interview with Sheryl Butler, Housing Authority of Portland, 19 June, 2003

Portland Parks & Recreational Department is planning on using a \$280,000 grant from Intel to pay for training programs. Another program, through the Portsmouth Evolvement Program provides computers to homes for low-income residents. Such programs offer an excellent example of ways in which publicly sponsored network development can bridge the digital divide and increase the standard of living of low income Portlanders as well as local small businesses.

North/Northeast Urban Renewal Districts

Goals

The Portland Development Commission identified a lack of modern high-speed telecommunications infrastructure in North/Northeast as a serious barrier to business development in that area, and applied for SB 622 funding to leverage private investments in fiber optic resources for the Interstate Avenue urban renewal area.

PDC's vision for economic development in this area is heavily dependent on technology, and high bandwidth in particular. The construction of light rail on Interstate Avenue provided an impetus for creating higher densities and more intense activity centers in the area, and access to high-speed telecommunications infrastructure was deemed essential for this development to occur. PDC's goal was to attract so called 'primary jobs' to the area in the form of software development firms, media developers and other technology driven industries. PDC anticipates that these firms will bring sufficient new money into the community to support secondary businesses as well as retail and service sector jobs. Meanwhile, the Commission also envisioned other tech users such as call centers siting on fiber routes. These employers would provide more entry-level tech based jobs, which would pay a family wage. PDC's vision also involved strategies to generate more users for the new Qwest fiber investments in the form of business incubator facilities. It was anticipated that nonprofits and other community organizations would assist in bringing the advantages of this technology to the community.

In PDC program manager Colin Sears' opinion, a more wired, technologically sophisticated population is a very attractive proposition to firms considering locating in the Portland area. Giving residents access to high-speed Internet connections would thus create a collective advantage for Portland when it comes to attracting jobs to the community.

Early Results

One such incubator space has already opened on N. Interstate Avenue. The Gotham Building is a renovated historic office building. According to an article in the Business Journal, the building owners' goals for the project included "creating a great working space for below-market rents, using energy-efficient elements and recycling better than any previous construction project."¹³ Portland Community College, local community centers and non-profits such as OAME have been very active in the development of community access programs. All have set up training centers and

¹³ *Feral cats in the junk pile at Gotham Building*, Portland Business Journal May 24, 2002

access points open to community members in N/NE. According to Sears, there has been a high degree of interest and participation in such programs locally.



The Gotham Building, 2240 N. Interstate Ave.

Ongoing Issues

The fiber build out in N/NE to date is incomplete. The fiber backbones have been installed but are not yet lit up and operational. Moreover, the grant PDC received from OEDC provided only enough funds for the backbones, and not last mile connections. Some users are planning to tap into these lines at their own expense. Last mile connections require the construction of “fiber huts,” or small distribution nodes, along the primary backbone. Some businesses in the area have gone to the extent of setting up a satellite link as a makeshift solution to this ongoing digital divide.

Merely providing the fiber backbone is analogous to cleaning up a brownfield from an economic development standpoint. A site is rendered acceptable for a potential user to develop the site, but it is by no means ready for a tenant to simply move in and plug in. Last mile access provisions are still needed.

B. Incorporating Broadband into City Code and Infrastructure Policies

Once the City has established a vision for its desired future state with regards to broadband connectivity, it will have to provide a demand-side mechanism to ensure that users can expect basic levels of service appropriate to typical needs for established land use types. This type of mechanism could very easily take the form of incorporation of broadband components into the City Code, Development Code, and Comprehensive Plan Goals and Objectives. The City of Portland has codes governing the construction and maintenance of all traditional forms of infrastructure that serve its citizens, such as transportation, water, sewers and electricity. Developers must construct their buildings to meet minimum standards of service provision for these utilities. Broadband service is increasingly essential for businesses, and preferred by home users. A logical means of ensuring adequate provision of broadband could be to treat it in much the same way as Portland treats traditional infrastructure: through regulation.

If Portland pursues a strategy of mandating uniform standards for broadband provision and establishes a link between supply side and demand side policies it may be able to create much more favorable conditions for telecommunications firms to invest in better broadband connectivity. Creating links of this nature by incorporating broadband into planning practice could eliminate a large part of the uncertainty which prevents private providers from investing in undeserved areas. If telecommunications firms are informed of ongoing planning projects they can be enlisted to assist in the development of plans for broadband deployment. Creating a clearinghouse for long-term planning initiatives requiring private investments could be a powerful stimulus to the local telecommunications market while achieving public goals. If providers can count on public sector efforts to drive a certain level of development, it will be far more justifiable for them to outlay capital on technology upgrades. By giving them a stake in the success of the planning process, the City can work with incumbents to achieve its desired state of accessible, affordable and adaptable broadband.

A Starting Point: The American Planning Association Model Code

The American Planning Association (APA) has taken the position that planning for advanced telecommunications is a critical issue. APA has recommended the adoption of enabling legislation for cities to plan for telecommunications facilities in its model code (see Appendix 2). The APA goes on to describe some of the elements that should be in such a plan and cites several reasons for the creation of administrative rules regarding telecommunications. First, cities have an interest in guiding the placement of telecommunications facilities in a way which minimizes land use conflicts, visual impacts, establishes criteria for siting facilities in rights-of-way, and mandates coordination with other forms of infrastructure. According to the APA, telecommunications can be seen as an economic development tool, enhancing a City's competitiveness regionally as well as globally. The APA code acknowledges the economic development potential of advanced telecommunications infrastructure and recommends coordination with other public sector partners. APA recommends that planners "propose changes to local ordinances, regulations, and procedures affecting telecommunications in order to enhance investment in infrastructure, advance technological advancement, and provide universal service."

In the APA's model code telecommunications component, three sections are of outstanding relevance: Sections 2d, e, and f read,

- (d) define the role of the local government in encouraging competition within the marketplace;
- (e) encourage investment in the most advanced telecommunications technology while protecting the public health, safety, and general welfare, including aesthetics and community character;
- (f) ensure that investments in telecommunications infrastructure are provided in a timely, orderly, and efficient manner that will minimize public inconvenience and disruption to expansion and new construction of facilities

Portland's comprehensive plan currently carries similar language for services such as electricity, water and transportation. It is almost completely devoid of language regarding

telecommunications and does not address Broadband at all. The City's comprehensive plan section on Community Facilities does not recognize broadband as a utility and sets forth no standards for its provision. This error should be rectified as soon as possible in the form of language describing universally accessible, affordable and adaptable broadband as a planning goal. This should follow the pattern established by public facility goals for traditional infrastructure types such as sewer and water, setting clear goals which can be implemented by the City's zoning code.

Portland's economic development goals, like those for land use, are increasingly dependant on availability of Broadband for implementation, yet the City's economic development agency, the Portland Development Commission has no overarching plan to address this need.

An opportunity to address this deficiency is imminent. According to a press release from the Mayor's office, dated February 12, 2002, PDC is creating a new economic development strategy for the City, to replace 1994's outdated Prosperous Portland plan. A recently published report from the City of Portland Blue Ribbon Committee on Economic Development recommends the integration of Broadband in the City's forthcoming economic development strategy. The committee specifically recommended the development of a telecommunications component for the City's next economic development strategy: "Support, with investment if necessary, the continued expansion of state-of-the-art communications technology for Portland businesses. The City should continue to work with companies to enhance the connectivity and bandwidth for Portland businesses and residents."

The matrix on the following page suggests potential steps that could be undertaken by the City's various bureaus and agencies to move towards a unified City policy stance on broadband deployment. It outlines the short term and long term actions which each relevant bureau should take to ensure orderly and cost-effective extension of broadband services, as well as overarching policy issues which the bureaus will need to focus on.

	Actions (short term)	Actions (long term)	Issues
	Identify sections of existing comp plan language which would relate to the benefits of increased broadband provisions. Examine ways to add broadband to goal 11(Public facilities). Review current Plan Districts and designated Master Plans in an effort to identify the broadband needs that could be addressed at the sunseting of the plan.	Set benchmarks based on average home user demand and create categories of business use of broadband, keyed to zoning codes for each land use category/density. Adopt broadband standards as part of the development review process. Adjust the zoning code to address the demand of residences and businesses.	Regulation alone may be insufficient to ensure greater services. May run counter to the City's current "Regulation Reform" effort by making additional requirements on developers.
	Review the current employment goals of each of the 8 Urban Renewal Areas and identify those that are encouraging "high tech" industries	Use Tax Increment Financing as a funding mechanism for broadband infrastructure Pursue opportunities for regional partnership. Market Portland Aggressively for tech businesses, based on fiber assets.	Develop incentives based private deployment strategy (such as SB 622).
 Bureau of Environmental Services	Pursue pilot project on the West Side Combined Sewer Overflow Project, using the newly constructed sewer lines as fiber optic conduits	Develop plans to deploy fiber in sewers in the Central City Plan District, establish concurrency with new development.	Identifying the initial capital funding for deployment in sewers
 Cable Communications & Franchise Management	Provide inventory of fiber assets to other bureaus, brief them on statutory requirements of franchising infrastructure. Brief Metro on regional coordination options/Issues.	Identify where future fiber assets may be obtained through upcoming franchising agreements that require public fiber optic lines be provided as a condition of approval. Continue to defend the City's right to charge telecommunication companies for the use of the public rights-of-way and identify further strategies to encourage "openaccess." Investigate opportunities for in-kind exchanges in lieu of franchise fees.	Finding equitable agreements concerning collection of franchise fees.
 ComNet	Complete an inventory of all public telecommunication needs throughout the region, also identifying the needs of future applications such as enhanced Geographic Information Systems. Brief Metro on regional coordination options/Issues.	Continue to seek out additional regional public partners to take advantage of the cost savings and services available through IRNE. Where possible, renegotiate licenses that provide access for IRNE, so it can seek re-licensing as full CLEC.	Work with private providers to add much needed connectivity to target areas. May need to extend public provision to retail when private providers do not invest in target areas, while avoiding semblance of "poaching" private providers' customers.
	Using the Interstate Max fiber deployment as a model, coordinate with Tri-Met on future light rail projects	Identify major road and transportation improvements that will require the relocating of utilities.	Identifying who will pay for the fiber lines
 City Council	Appoint broadband taskforce. Pass enabling language to authorize broadband planning.	Establish intergovernmental agreements with neighboring jurisdictions and Metro, to guide regional broadband coordination.	Coordination with business community to ensure mutually beneficial deployment scenario.
 All	Review of all 5-year Capital Improvement Programs, identifying possible synergies to constructing broadband infrastructure.	Identify opportunities for concurrency on new development.	Bureaus need to communicate with each other to recognize/Identify opportunities. Need central coordinating function to make sure no projects/opportunities "slip through the cracks"

C. Potential Action Items For Portland's Bureaus and Agencies

Planning Bureau:



The Bureau of Planning for the City of Portland is responsible for establishing the Comprehensive Plan, which is intended to guide growth to reflect plans and guidelines approved by City Council. It also provides a guide for the major public investments required to implement the Plan. It is meant to be dynamic, open to amendments and refinements, which, according to the Bureau of Planning should respond to “changing conditions, special studies, new technology, and changes in state land use regulations.” This is carried out with changes to the Comprehensive Plan Map and a set of regulations for development in the Zoning Code.

The plan was established in 1980 and since its enactment has not responded to the changing conditions and new technologies related to Broadband telecommunications. Many goals and objectives do address the City’s responsibility for provision of various types of services but do not specifically address Broadband. Universal Broadband deployment is supportive of many established Comprehensive Plan goals and policies. These sections represent opportunities to insert language into the plan and zoning code, establishing minimum service requirements for Broadband. The following are selected illustrations of this relationship by examining the goals in the Comprehensive Plan:

Wiring the Portland Comprehensive Plan

Portland’s comprehensive plan does not contain a component dedicated to planning for Broadband deployment. Many goals and objectives do address the City’s responsibility for provision of various types of services but do not specifically address Broadband. Universal Broadband deployment is supportive of many established Comprehensive Plan goals and policies. These sections represent opportunities to insert language into the plan mandating minimum service requirements for Broadband. The following are selected illustrations of this relationship:

Goal 2: Urban Development

- Wireless Hot Spots encourage diversity of activity, support nodal development patterns
- Supports development in town centers; creates opportunities for businesses to locate there
- Broadband enables teleworking, living closer to work, thus reducing the need for commute-related vehicle trips.

Goal 4: Housing

- Housing objectives call for the development of efficient, mixed use, transit supportive housing options. Broadband, and WiFi in particular, has the potential to expand the functionality of established land use patterns by blending many functions within buildings.

Investment in this infrastructure would create potential for more individually tailored land uses in areas planned for mixed uses, and create added value and functionality to more building types, creating the potential for a more responsive and fine-grained mixture of uses.

Goal 5: Economic Development

- Calls for the City to “Encourage investment in the development, redevelopment, rehabilitation and adaptive reuse of urban land and buildings for employment and housing opportunities.”
- Broadband supports business development goal by providing valued service on competitive terms.
- Supports community economic development by making high-end technology available to community training centers and non-profits like the Oregon Association of Minority Entrepreneurs (OAME).
- Strengthens community planning by encouraging investment in town centers, opportunities for building social capital.
- Potential new users for obsolete industrial areas.
- Goals require City to provide critical infrastructure – accessible, affordable and adaptable. Broadband constitutes this type of infrastructure. Broadband should explicitly be incorporated into this category.

Goal 6: Transportation

- Objectives for this goal call for strategies to reduce auto travel by creating more opportunities for people to live and work in more efficient patterns. Broadband is necessary for teleworking, a plausible alternative to commuting. Providing Broadband to all buildings enables more fine-grained land use mixes since it enables living spaces to double as working spaces, as well as flexibility of the uses of urban spaces since any space can become an ad-hoc office or studio as needed.
- These phenomena support reduction of vehicle miles traveled (VMT) by potentially reducing the need for car trips.

Goal 11, Public Facilities

- Mandates timely, orderly and efficient arrangement of public facilities and services that support existing and planned land use patterns and densities.
- 11.B states: “City will provide, where feasible and as sufficient funds are available from public or private sources, energy and communication facilities and services at levels appropriate for all land use types.”
- The absence of language specifically addressing Broadband is a missed opportunity.

The Zoning Code: Incorporating Broadband in Development Standards

These goals assist in providing guidance in the future development of Community, Neighborhood and Area plans. For plans that have already been enacted, changes in the goals to address broadband will not be applied. The Zoning Code however, establishes development guidance

and guidelines for Base Zones, Additional Uses, Overlay Zones, Land Divisions and Planned Developments, which are adhered to in previously established Community, Area and Neighborhood Plans. The following are examples of how refinements to Title 33 in the Portland City Code (Zoning Code) could support greater broadband provisions to further planning goals. One example of this could be an addition to Section 600 of the Zoning Code, Land Divisions and Planned Developments, using the same template for other development requirements such as the following for Sanitary Sewer Disposal Service Standards:



Sections:

33.652.010 Purpose

33.652.020 Sanitary Sewer Disposal Service Standards

33.652.010 Purpose

The sanitary sewer disposal service standards protect the public health by providing for the safe and sanitary collection, treatment, and disposal of waste products from development in the land division. These standards will result in an efficient, flexible sewer system that can serve a variety of development configurations within reasonable overall development costs.

33.652.020 Sanitary Sewer Disposal Service Standards

Sanitary sewer disposal service must meet the standards of this section. Adjustments are prohibited.

A. Availability of sanitary sewer.

1. The Bureau of Environmental Services has verified that sewer facilities are available to serve the proposed development; or
2. BDS has approved the use of a private on-site sanitary sewage disposal system.

B. Public sanitary sewage disposal. Where public sewer facilities are available to serve the proposed development, the Bureau of Environmental Services has preliminarily approved the location, design, and capacity of the proposed sanitary sewage disposal system. The approval is based on the Sewer Design Manual; and

C. Private sanitary sewage disposal. Where private on-site sanitary sewage disposal is proposed, BDS and Environmental Services have preliminarily approved the location, design, and capacity of the proposed sanitary sewage disposal system.

Following this template, the following could be a potential addition to Section 600 of the Zoning Code, Land Divisions and Planned Developments creating 33.671.00 Broadband Telecommunications Service Standards:

Sections:

33.671.010 Purpose

33.671.020 Broadband Telecommunications Service Standards

33.652.010 Purpose

A. Enhanced broadband telecommunication infrastructure adds to the desirability of developed and undeveloped parcels in the City of Portland. The services that provide by this infrastructure will allow citizens and businesses to utilize advanced software and Internet applications. These Broadband Telecommunication Service Standards will result in an efficient, flexible telecommunications system that can serve a variety of development configurations within reasonable overall development costs. Enhanced broadband infrastructure has the potential to:

- Create greater connection speeds decreasing the amount of time it takes to conduct business
- Allow for telecommuting and video conferencing, lessening the demands on the City's transportation system
- Allow for citizens and business to have greater access to public information

B. **Minimum Broadband Standard.** To meet the current and future needs in commercial zones, new development must have access to a Hybrid Fiber/Coaxial system that has a minimum connection speed of 7 Mbps for dwellings and 10 Mbps for commercial uses pursuant to the architecture and deployment standards defined in Chapter 3.297.

The reference to chapter 3.297 would be an addition to the Development Regulations chapter (3.200s), which would define the specific technical requirements of deployment. This format could also be replicated for the Base Zones of Chapters 3.130 (commercial zones), residential chapters 3.10 (Single-Dwelling Residential) and 3.120 (Multi-Dwelling Residential), as well as 3.140 (Employment and Industrial Zones).

These new regulations should be applied to individual projects, but they could also be powerful tools for advancing the City's planning goals in whole districts. When the Planning Bureau develops an area plan or PDC crafts an area-based economic development strategy, the City should assess the level of projected broadband service requirements for the new uses, and determine whether or not existing infrastructure can meet those needs. If existing service is found to be inadequate to meet the needs of planned developments the City could draft a public Request For Proposal (RFP), inviting telecommunications firms to bid on installation of the needed infrastructure components. The most competitive bidder could then be given incentives to pursue the network build-out.

The Portland Development Commission (PDC)



As the economic development arm of the City of Portland, PDC has a vested interest in seeing planning and subsequent development with the goal *“to be a catalyst for positive change in the creation of a world-class 21st Century City.”*¹⁴ PDC's interface with planning takes place mostly in the creation of urban renewal plans of which PDC oversees. The Portland Development Commission (PDC) uses urban renewal as a tool to help specific areas of the City realize capital projects such as parks, streetscape improvements, community centers, and the like. This is accomplished by financing capital projects that would not otherwise be funded, through the use of Tax Increment Financing (TIF). Additionally, the City

¹⁴ <http://www.pdc.us/>

should explore land use based incentives such as floor area ratio (FAR) bonuses for developers who exceed basic requirements and provide additional broadband amenities, such as publicly accessible WiFi hotspots in their developments. FAR bonuses have been used successfully to promote green building practices, and could serve as a good model for promoting more “wired” development. These bonuses allow developers to construct larger developments than standard zoning would allow. Since large developments have a diminishing rate of marginal cost for additional floors, this allows the developer to make more profit in exchange for meeting the City’s voluntary program goals.

For PDC to meet some of the goals it has set in such Urban Renewal Areas (URAs) as South Waterfront, there will be a need for greater telecommunication infrastructure. Currently, PDC has not utilized TIF funds to finance the deployment of infrastructure related to the broadband needs within the URAs. PDC has however, taken advantage of Oregon Senate Bill 622 to increase the amount fiber optic infrastructure in the North/Northeast and Lents URAs. While there have been some affects for land use development, according to Colin Sears, (Senior Project Coordinator for Economic Development at PDC) it will not serve as a “catalyst.” The following are a few suggested policies PDC may wish research in order increase the development of broadband to meet URA goals.

- Leverage Tax Increment Financing (TIF) funds for investment in Broadband infrastructure in Urban Renewal Districts, putting a priority on deployment to encourage targeted uses such as high density residential and commercial.
- Examine all Bureaus planning projects and identify where the city’s Integrated Regional Network Enterprise (IRNE) could be used to meet the specific employment needs and further land use goals in URAs.
- Conduct a study that closely examines of the benefits of fiber deployment as a result of SB 622. Use results as a guide for future deployments.
- Develop a Request for Proposals for the deployment of Broadband infrastructure in Urban Renewal Districts that may have specific broadband needs such as South Waterfront.

City Council:



Utilizing the Commission form of government, the Portland City Council provides policy direction to the City’s bureaus as well as overseeing them administratively. While each Commissioner concentrates on policy formation of the bureaus within their respective portfolios, there are instances where the council as a whole provides policy direction. The following are a number of possible council actions that could result in increased broadband deployment.

The Comprehensive Plan’s “A Vision of Portland’s Future.”

- This vision is at the outset of the Comprehensive Plan and provides a roadmap of priorities for the future of development in Portland. It contains direction for meeting of future demands with development improvements in such areas as transportation, but

does not mention broadband telecommunications. Council could amend the following section of the vision to help better reflect the needs of the 21st Century:

Provisions are included which allow more efficient use of larger homes and vacant land, encourage apartment developments to be more compatible with other residential uses, promote energy conservation, strengthen and protect industrial areas, preserve and enhance environmental quality in the City and stabilize existing neighborhoods from uncontrolled development speculation and deterioration and plan for the future telecommunication needs for the citizen and businesses of Portland.

Other Council actions could take the following form:

- The City Council could also direct the Office of Government Relations to put a high priority on tracking and opposing state and Federal legislation by incumbent telecommunication providers that may hinder municipal efforts to enhance Broadband services.
- Council could pass a resolution (aimed at the Portland Planning Bureau and PDC) stating the importance of Broadband infrastructure for meeting planning and economic development goals.
- Direct the City's Government Relations Office to lobby for incentive based legislation, such as SB 622 to encourage greater deployment of broadband infrastructure and services.

IV. Implementation/Deployment Phase

Public Intervention: A Tool of Last Resort

Chapter one illustrated how Broadband is an essential service required by businesses, and also how Portland's land-use and economic development goals require adequate Broadband services City-wide in order to be fulfilled. Chapter two illustrated how Broadband service in the City of Portland currently does not adequately meet criteria for accessibility, affordability, and adaptability, thus threatening the success of those goals. Chapter three outlined how to enact demand-oriented changes to the market by means of the planning process, with the objective of effecting infrastructure improvements by existing providers at the lowest possible cost and effort. But what happens when planning alone does not adequately result in the desired improvements? It is then that the City must consider more direct intervention to ensure that Broadband is universal and effective.

The Broadband Taskforce, first described in Chapter one, will already have supervised a full inventory and evaluation of the Broadband market, as well as the implementation of changes to the Comprehensive Plan and planning codes. After a specified period of time (determined by the Taskforce), a subsequent evaluation must be made to determine if further intervention is necessary. If it is found to be so, the Taskforce must consider three possibilities for public intervention, each with varying degrees of cost and risk to the taxpayer. They include:

- Regulation of Private Networks to compel service levels and price points required to meet City goals
- Direct Public Provision – offer a direct public alternative, much like water and sewers are provided directly by the City
- Develop Public/Private Partnerships to share resources, risk and rewards with current and new providers

1. Private networks: municipal attempts at regulation have failed

The City of Portland recently has had an acrimonious relationship with the two major incumbent providers of broadband services in the City, having to argue two separate cases in Federal court to defend its right to regulate telecommunications. The 9th Circuit Court of Appeals ruled in favor of ATT/Comcast concerning Portland's attempt to require "open access" for competitive Internet Service Providers (ISPs) over AT&T/Comcast's coaxial Broadband network. The same Court is currently hearing an appeal of a lower court's ruling in favor of the City over Qwest's refusal to pay franchise fees for the use of the public Right-of-Way (ROW) for telecommunications infrastructure. In the former case, the City wanted to send the message that the Telecommunications Act of 1996 was not benefiting the citizens of Portland, who saw cable rates increase 67% in the

seven years since enactment¹⁵, while AT&T/Comcast's customers had no choice but the incumbent for an ISP. In the latter case, Qwest unsuccessfully argued that the City should not collect any more in franchise fees than the actual cost to provide access to the public ROW for infrastructure¹⁶.

Both cases illustrate the difficulty Portland, as well as any other municipality, has in using regulation as a tool to meet its goals. This is particularly true considering the court's interpretation of the 1996 Telecommunications Act, which reserves most regulation of such industries to the Federal government. A more pragmatic approach to meeting goals may be found by using the power of the market to exact public benefit, much like was done in the case of Senate Bill 622, which allowed Qwest to enter into unregulated market segments in exchange for a fund designed to help bridge the 'digital divide' suffered by rural and low-income communities.

Case Study: Senate Bill 622

Oregon's Senate Bill 622, passed in 1999, is illustrative of these synergies. SB 622 deregulated US West (now Qwest) rates¹⁷, in exchange for requiring US West to fund telecommunications infrastructure improvement projects in disadvantaged areas. Under this act, participating telecommunications carriers were required to establish a Telecommunications Infrastructure Account and commit 20 percent of their gross intrastate revenues to it. Approximately 40% of this account was to be deposited into a fund for the benefit of K-12, community colleges and higher education institutions, the Connecting Oregon Communities Fund. The remaining balance of the Telecommunications Infrastructure Account was earmarked for specific infrastructure upgrade plans. These plans were funded subsequent to review of a needs assessment by the state Economic and Community Development Commission. Subsequent implementation of funded projects was carried out by US West/Qwest. Implicit in this initiative is the fundamental link between affordable, reliable broadband access and the attainment of economic development goals.

The needs assessments were required to address the following topics:

- the type of telecommunications services and technology already deployed within communities and region;
- the type of telecommunications technology and services desired by communities within regions;
- the competitiveness of the local telecommunications market;
- the economic significance of desired telecommunications investments;
- community and regional priority lists for telecommunications infrastructure and service;
- the ability of qualified public and nonprofit users within the community or region to aggregate demand for telecommunications services and the benefits of such aggregation;

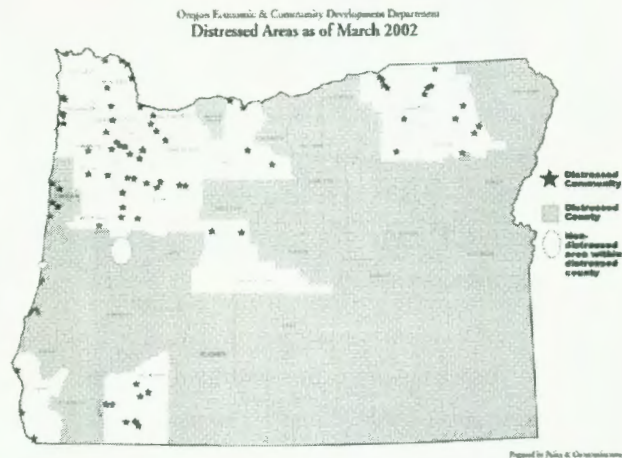
¹⁵ Open-access issue is closed, November 18, 2002, The Oregonian, Jeffrey Kosseff

¹⁶ States Limit Cities Street Fees, Wall Street Journal, April 9, 2002. Caffery, Andrew

¹⁷ The program, which is voluntary, would have applied to other carriers, had they opted to participate in exchange for deregulation.

- the estimated costs and implementation schedule of desired or proposed telecommunications investment;
- an analysis of state, Federal, nonprofit, and private sources of funding for the proposed improvements;
- the ability of the investment to be self-supporting;
- the ability of a community or region to make the investments necessary to connect to the Oregon Enterprise Network and the local and statewide benefits of such investments.

While SB 622 was primarily targeted at telecommunications infrastructure upgrades for rural Oregonians, the bill was written to allow all underserved and distressed communities to apply for funding. The following map illustrates regions and communities considered to be distressed for the purposes of SB 622. The Lents neighborhood met OECD's criteria, as did North Portland and portions of Northeast and Southeast. The Portland Development Commission applied for, and received funding for the construction of two fiber optics loops in north/northeast and a DSLAM (*digital subscriber line access multiplexer*) in Burlington.



2. Public Provision: Self-Imposed Limitations

The City of Portland has excellent Broadband service at the municipal level, with the Integrated Regional Network Enterprise (IRNE) providing a direct fiber connection to every level of local government. IRNE has considerable excess capacity, and would make an excellent backbone on which to build an alternative to the private Broadband networks in the City. But before Portland considers becoming a direct public provider of Broadband services, there must be a careful review of statutes and legal limitations. The City of Portland, as discussed in Section I, has the legal authority to provide direct telecommunications service to City customers. But the network by which such a service can be built, IRNE, is part of a municipal cooperative which has a charter limiting its role to that of a Competitive Local Exchange Carrier (CLEC) only for municipal customers. Any direct public provision based on IRNE architecture would also face legal opposition from incumbent carriers, as they deployed most of the fiber resources used in the network in lieu of franchise fees, and would object to the fruit of those 'fees' being brought to bear as direct competition for their services. A potential opportunity would be for the public sector to provide IRNE as a backbone for Wireless Fidelity (see Appendix 3) coverage in specific economic development zones which lack sufficient broadband resources.

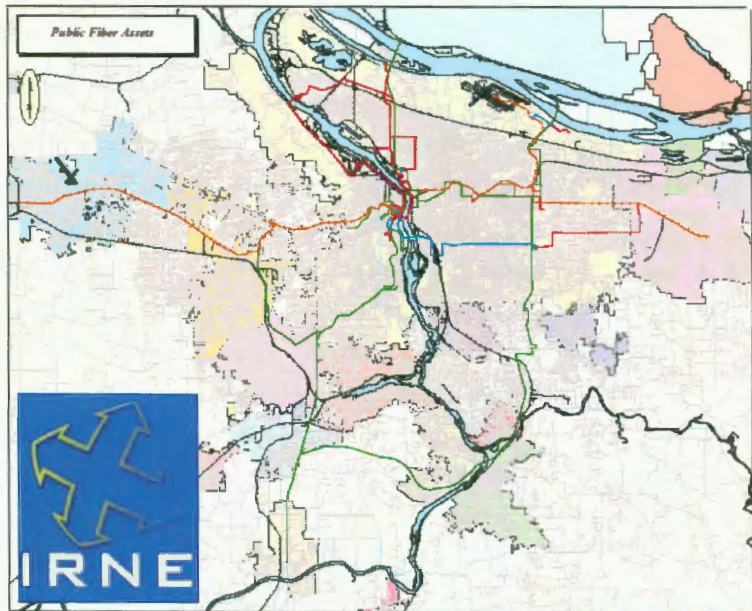
Case Study: IRNE (Integrated Regional Network Enterprise)

Due to the growing costs of private provisions of telecommunications and the need for high-capacity, high-reliability telecommunications network, the City of Portland created the Integrated Regional Network Enterprise (IRNE). INRE is a telecommunications network designed to carry all voice, video and data communications traffic for the city and its regional public partners. IRNE was formed because many of these services were not available through the conventional leasing practices with the local private providers. The INRE network was created by the blending of network assets to avoid the creation of expensive single application networks that would come from overbuilding each other¹⁸.

This network has taken a good deal of time to become established, with assets being accumulated as the private sector was building networks. Over the years of the ‘overbuilt’ mentioned previously, the City has been requiring any telecommunications carrier that wishes to put conduits in the ROW to build additional fiber optic conduit for the City as a condition of receiving a franchise and permit. During this time, the City began designing a fiber plant that would link the conduits creating the network¹⁹.

Working with the Portland Office of Transportation (PDOT), Oregon Department of Transportation (ODOT) and Tri-met, INRE has been able to leverage on their capital projects to lay fiber along transportation and transit corridors. Currently, INRE has the acquired nearly all the fiber optic infrastructure to connect the core sites of the IRNE partners. Over \$13 million of fiber assets are placed, in use, and cooperatively managed by the City and its regional partners.

INRE’s fiber assets, which are displayed on the right, show a backbone of the network. The architecture of the network starts with the Pittock Internet Hotel, where interstate and transcontinental fiber is linked to IRNE through the City’s switch. The fiber rings shown here display how the current network is deployed to City bureaus and IRNE partners. Depending on the needs of the partnering entity, IRNE can provide all voice, data and video services beyond those of



¹⁸ City of Portland, Bureau of General Services, ComNet (2000). Portland’s Integrated Regional Network Enterprise. Broadband Network Implementation Strategy. March, 2000

¹⁹ <http://www.irnenet.net/>

the private sector. This network could be built on to construct a 'build out' of the City, providing substantial cost savings.

INRE is registered with the FCC as a Competitive Local Exchange Carrier (CLEC)²⁰. This gives the City of Portland the legal ability to provide services to the public at large. To do this in a comprehensive manner to all reaches of the region would still require a good deal of infrastructure improvements to insure redundancy.

3. Public/Private Partnership: Recommended Scenario

Portland's decision makers will have to determine the most appropriate form of public intervention required to resolve the issues of inadequate service provision and lack of real competition in the local Broadband market. If the City is unable to achieve desired results from market incentives for private networks, or limited coverage through direct public provision, then a public/private partnership approach may be the most effective option. With the possible municipal takeover of Portland General Electric, such an option should be studied in earnest, as that company has considerable network resources which can be brought to bear in such a scenario. A typical public/private operation consists of private ISPs operating over publicly-owned infrastructure. The risk is shared between the two entities, and so are the rewards. Such an arrangement is considered a 'win-win' solution, for it does not exclude the private sector from services that they once provided exclusively, but it does offer more competition and lower prices. This method has proven successful in other jurisdictions, notably Tacoma and Ashland (see case studies below). In this scenario, the City would build and maintain control over the physical infrastructure. All services provided over this network, however, would be handled by private parties. As such they would represent direct transactions between individual users and private service providers. This type of public intervention has the added advantage of enabling the public sector to effectively disengage itself from the process once the network is established and competing firms have been licensed. From this point on, the market would take over and both bandwidth and consumer cost would tend toward equilibrium.

Case Studies: Tacoma and Ashland Hybrid/Fiber/Coax Deployments

Two examples of public/private partnerships to deploy HFC as an alternative to exiting Broadband networks provide excellent examples of overall service improvements when additional competition is added. Lessons learned from deployments in Tacoma, Washington and Ashland, Oregon can help guide Portland as the City seeks methods to address its own Broadband service deficiencies if additional public intervention is required beyond updating plans.

²⁰ <http://www.irnet.net/>

Tacoma's Click! Network

The City of Tacoma enjoys one of the most expansive fiber optic networks in the nation, with over 800 miles of fiber optic cables providing network connectivity via sonnet ring to the Central Business District and to neighborhoods by means of a hybrid/fiber/coax network. Connectivity is provided by Tacoma Power and Light (TPL), a City-owned electric utility. Internet and other telecommunications are provided on a competitive basis through local providers making use of the fiber network for data transmission.



Genesis

The origins of the click network began in 1992, when TPL began to plan for an expected Congressional deregulation of the electric industry. Steve Kline, the superintendent of TPL ordered the utility's planners to "study companies that are successful in the midst of deregulation." Three predominant themes came out of the study, they were that successful companies:

- developed marketing expertise and sold their product
- "right-sized" and reorganized to better serve their customers
- had access to *connectivity*

On the third point, the study found that local telecom providers, US West (now Qwest) and TCI (now Comcast), both used antiquated infrastructure and could not provide TPL with the connectivity it needed. In particular, both incumbent providers use copper and coaxial wires which are not permitted to be co-housed with high voltage transmission cables. TPL's ultimate goal was to improve data connectivity to provide real-time monitoring and management of its power distribution network. To achieve that goal, Broadband access would be required so that every electric transmission substation in TPL's 180 square mile service area could provide real-time data to company managers.

Addressing Telecom Problems

Tacoma Power and Light is run by a board, which is appointed by Tacoma's City Council. As TPL considered deploying an internal fiber optic network, the board and City council floated the idea of expanding the network's mission to cover a full spectrum of telecommunications. The reason for this was the poor state of telecom in Tacoma in 1997. At that time, a business requiring telephone service faced a 12-18 month wait for new service from US West. Entire neighborhoods were offered cell phone service from US West because the copper infrastructure was inadequate to meet demand for new service. Likewise, TCI's cable television service was rated so badly that the Council was looking for a way to lessen the level of complaints from angry constituents. Many of these problems were a result of Tacoma being identified as a Tier 3 City for telecom provision. For all practical purposes, that meant that neighboring jurisdictions like Seattle, Bellevue, and Olympia enjoyed far greater levels of investment in telecom infrastructure than Tacoma was receiving from these same telecom providers. The Telecom Act of 1996 convinced the City Council that the moment was ripe to address the shortcomings by authorizing *Click!* as a provider of high-speed Internet, Broadband, and Cable Television services under the auspices of TPL.

Funding

Click!'s capital costs were covered from \$150 million in accumulated capital at TPL. TPL's charter required the utility to regularly reinvest such reserves in the interest of the rate payers. Of the \$150 million, \$90, million was invested in *Click!*'s capital outlays. In the five years since the initial deployment, *Click!* is already operationally profitable.

Service Provision

Click! offers a full range of wholesale telecom services for businesses, and retail high-speed Internet and cable television services to individual households. Schools and other municipal entities have greatly benefited from *Click!* as they also receive the full range of telecom services, but on an at-cost basis. The effect is that schools and other public entities save at least 50% compared to retail costs for Broadband data transmission, high-speed Internet, cable television, and dialtone. By bundling such wholesale and retail applications, TPL has also been able to deploy, at a dramatically reduced operating cost, a new power management system which has improved electric delivery reliability and will ultimately lead to offering new services such as remote meter reading and peak load pricing for energy.

Results: Choice, Lower Cost

Diane Lachel, spokesperson for the *Click!* network sums up the company by saying "*Click!* is about choice." In most areas of telecommunications, there were natural monopolies that provided service and pricing independent of customer requirements. Since 1997, Click has achieved a 32% penetration of the cable television market in its service area with 22,000 customers. It has signed up 7,000 Internet customers, and does a brisk business in commercial Broadband provision. The effect has been fewer complaints because of improved service from both Qwest and Comcast, and overall prices that are 25-30% lower than those found in adjacent communities outside of *Click!*'s service area. Tacoma's Chamber of Commerce attributes this to the market forces of competition. Such competition is evinced by the improvement of response time for business service requests, where the 12-18 month wait for telecom services has been reduced to 2-3 weeks²¹.

Effect on Business Climate and Land Use

Paul Ellis and Gary Bracket of the Tacoma Chamber of Commerce point out that no one policy is responsible for Tacoma's business renaissance, but that the *Click!* network was a significant factor in securing new businesses and maintaining existing ones. Since 1997, over 100 businesses decided to relocate to Tacoma. Along with less expensive office rents, Ellis and Bracket claim that Broadband connectivity allowed Tacoma to effectively compete for business that were

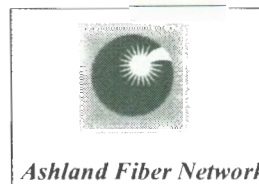


²¹ Interview with Diane Lachel, Government and Public Relations Manager for the *Click!* Network

clustered in Seattle and Bellevue. The result has been a great deal of investment in the Central Business District, with many formerly unused buildings now remodeled and housing office tenants. Especially transformative has been the arrival of new anchor tenants with major operations. The most significant of these is the University of Washington, which chose Tacoma as the headquarters for its technology school²².

Ashland Fiber Network (AFN)

The City of Ashland was the first in Oregon to deploy a municipal fiber optic system to serve retail customers. The 12-mile fiber ring serves 90% of the City's residents through a Hybrid-Fiber-Coax (HFC) network providing high-speed Internet, Broadband data, and cable television services.



Genesis

Like the Tacoma example, Ashland's municipal power company decided in 1996 to prepare for energy deregulation by studying ways it could improve its power management. In late 1997, the public leadership in Ashland, Oregon began to discuss how they also could bolster Broadband services for residents and businesses with a single deployment. They identified the demand that existed within their community and also determined that Broadband would attract businesses and complement planning goals. There had been a sentiment of disappointment among citizens, business and City officials as to what telecommunications provisions were being made by the incumbent providers, mainly AT&T (now Comcast). The City decided to take matters into its own hands and began to investigate the feasibility of establishing a municipal fiber network and subsequent Broadband service.

Financing

The City of Ashland followed a similar path as Tacoma when it financed AFN. In addition to \$5 million in cash reserves, the electric utility issued an additional \$10 million in bonds secured by the electricity replacement fund that had been previously established by City Council. The bonds are to be paid back through operational proceeds. Before City Officials decided to implement this proposal, they first consulted with members of the business community in an attempt to get buy-in. They were successful in convincing a number of business advocates to advocate for a municipal network. With financial and political backing in place, the network was successfully deployed.

Results: Comprehensive Service, Lower Cost

The result was a much more comprehensive service that was dramatically cheaper for both businesses and citizens. AFN provides high-speed cable Internet services for about \$30 dollars, almost half the cost of what was being offered by AT&T. They also received a choice in ISPs, with no filtration of content. AFN charges the ISP a cost for using the fiber network, but they do

²² Interview with Paul Ellis and Gary Bracket of the Tacoma Chamber of Commerce, Technology Division

not limit the amount of competition; the market is allowed to make that determination. As of January of 2003, *AFN* customers have a choice of 9 ISPs that are now a part of the local economy. *AFN* also has a strategy of deploying wireless Internet connection via WiFi. In cooperation with the City of Ashland and Starbucks, Open Door Networks Inc. has launched "Ashland Unwired," which will provide last mile wireless connectivity coupled with the existing high-speed fiber network throughout the City. Any business that has *AFN* access can offer Ashland Unwired. Project A and Open Door Networks, City-certified Internet Service Providers, will provide the *AFN* connection and consultation to help any business or organization wishing to provide Ashland Unwired to their customers.¹⁹

Analysis

The deployment of HFC networks by *Click!* and *AFN* provided both Tacoma and Ashland with Broadband services that meet our evaluation criteria:

- **Accessibility:** Tacoma now enjoys 100% Broadband coverage, with connectivity to every home and business. Ashland has coverage to 90% of homes and businesses, with a plan for serving the remaining 10% within five years.
- **Affordability:** Prices for Broadband service fell 25-30% in both markets, which enjoy superior service at lower costs than that found in immediately adjacent communities. Both providers employ open access for service delivery, using the power of the market to further reduce costs.
- **Adaptability:** Both networks planned for future bandwidth demands by developing a delivery architecture that is "fiber rich." Because of this, last-mile connectivity to direct fiber optics can be readily provided as demand develops for high-bandwidth applications.

Both Tacoma and Ashland were able to leverage public ownership of an electric utility to provide telecom services to ratepayers. This allowed for considerable cost savings through economies of scale. The utilities also were able to use unspent capital funds to deploy their systems at little added expense to ratepayers that do not subscribe to the new telecom services. The two cities, however, have had different experiences at the bottom line. Tacoma's market is ten times larger than Ashland, and has been able to achieve operating profits after only five years. In contrast, Ashland has been forced to adjust its business model to reflect higher capital costs and lower operating revenues, with the goal of reaching operating profitability by 2006. Portland, with just over 500,000 residents represents market that is 2½ times that of Tacoma, and thus has the potential for far greater economies of scale. If the City was able to gain control of Portland General Electric, the primary electric utility serving the City, it would be able to leverage that advantage to minimize marginal costs.

¹⁹ <http://www.opendoor.com/AshlandUnwired.html>

Comparison of Key Indicators for *Click!* and AFN

	Tacoma, WA	Ashland, OR
Population	194,500	19,770
Households	79,000	9,050
Cost to build	\$90million	\$15million
Capital cost/household	\$1,139	\$1,841
Cable penetration	32%	30%
Internet penetration	9%	45%
Type of System	HFC & SONET	HFC
Number of ISPs	3	9

Conclusion

If current City practices regarding the provision of broadband services to the businesses and residents of the City of Portland are not soon altered, it will be increasingly difficult for area residents and businesses to connect to broadband networks which are accessible, affordable and adaptable. This report has demonstrated that Portland's planning and economic development efforts have specific broadband telecommunication needs, and that while essential for many forms of development, City codes do not address provision of this increasingly vital service. Little planning has been done by the public sector to promote expansion of the provision of these services. These issues should be addressed through the establishment and of a Broadband Taskforce, which would be charged with articulating a vision for a more wired City as well as provide technical solutions and recommended best practices.

This analysis has focused on two primary means of public intervention to increase the realization of affordable, accessible and adaptable broadband in order to bring planning and economic development goals to fruition. Using a mixture of supply-side incentives and regulations to strengthen market demand. Applying these strategies to the creation of its recommendations, the Broadband Taskforce will need to rely upon a roadmap for decision-making. The Broadband Taskforce should examine in great detail each of the approaches on both the supply and demand sides. A cost/benefit analysis should be applied to all options before moving towards implementation. After due analysis of the options and weighing the opportunity costs, the taskforce will be able to move the City in a direction where broadband services are accessible, affordable and adaptable. In order to fully engage both supply and demand-side solutions, this analysis acknowledges an array of potential options spanning the spectrum from full public provision to subsidizing additional private network deployment.

These include, on the demand-side, identifying specific minimum levels of broadband provision appropriate for each land use type and mandating them in the building code. Additionally, provision of WiFi in town centers and high density planned developments such as New Columbia could provide affordable access to homes and versatile access to individuals needing to work 'on the go' outside the confines of a traditional office space. Both these measures would increase connectivity in areas outside the central City, thus advancing the City's goals for revitalization of neighborhoods and town centers.

Most demand side options would likely be of a regulatory nature, based on mandating minimum levels of deployment for new development and redevelopment of existing sites to bring broadband services up to a level commensurate with user demands. To do so, Portland's regulatory system will have to give a level of attention to broadband similar to that accorded to other utilities such as water, sewer and electricity. This could be accomplished by modifying and amending two of the City's primary planning documents, the comprehensive plan and the zoning code.

The supply side measures outlined comprise incentive-based approaches that provide financial or in-kind bonuses to developers and private sector providers in order to promote greater private market provision of broadband services. Continuation and expansion of financial incentives such as SB 622 is advisable, since even without the infrastructure being operational, it has positively affected planning and economic development goals for the Interstate Urban Renewal District. Programs such as SB 622 provide a model for public sector intervention tactics, which help to achieve goals in the public interest such as urban renewal and economic development while creating new markets for telecommunications firms.

Another supply side approach would involve the leveraging of public assets for greater private deployment. The City has a publicly run telecommunication system, IRNE, which has fiber and copper assets throughout the region. The City could open up these assets for the use of private providers, incumbents or otherwise, to bolster their systems. This could be invaluable to such planning efforts such as South Waterfront, where public fiber optic assets are present. Also, if Portland is successful in its bid to purchase Portland General Electric, it will acquire not only PGE's electric poles and other delivery infrastructure: it will also gain control of PGE's subsidiary Portland General Broadband, which owns a regional fiber optic network and the ability to use that network to provide service directly to consumers. This would make it much easier for the City to provide areas where private network owners are unable or unwilling to invest in additional network resources.

Ultimately, the most cost effective, and efficient strategies for the deployment of better broadband networks will be those, which require the least direct public involvement. What is needed for the orderly expansion of broadband resources is a simple guarantee to residents and businesses that they will have access to the best communications technologies available. At a minimum, Portland must explore ways to increase the level of communication between network owners and City planners. If Telecom firms are aware of public initiatives to fuel development in a given target area, they will most likely clamor to reach this new market before their competitors do.

A permanent broadband working group might be needed to bring together representatives from the telecommunications industry and City planners to coordinate broadband network deployment with planning. The City could conceivably outline connectivity standards for a given target area and offer an RFP for service provision. If no acceptable proposals are submitted, the City could then exercise the option of providing a public overbuild network solution.

Glossary

Analogue	Almost everything in the world can be described or represented in one of two forms: analog or digital. The principal feature of analog representations is that they are continuous. In contrast, digital representations consist of values measured at discrete intervals. Analogue data transmission is conducted by converting digital data to radio frequencies which are sent across a network to a device which reinterprets them back into digital data.
Backbone	The high-traffic-density connectivity portion of any communications network.
Bandwidth capacity	The relative range of frequencies that can be passed without distortion by a transmission medium. Greater bandwidths mean a higher information carrying capacity of the transmission circuit. Bandwidth, usually measured in Hertz, is assessed as the number of bits that can be transferred per second.
Broadband	Broadband is a descriptive term for evolving digital technologies offering consumers a single switched facility offering integrated access to voice, high-speed data services, video-demand services, and interactive information delivery services. Broadband commonly refers to any data transmission system with a bandwidth equal to or greater than 256Kbps.
Byte	The smallest unit of information that a computer system can locate within its data storage or memory. A byte consists of eight bits and represents an amount of information roughly equivalent to a single printed or typewritten character.
Cable television	A television distribution method in which signals from distant stations are received, amplified, and then transmitted by (coaxial or fiber) cable or microwave links to users. Cable is an assembly of one or more insulated conductors, or optical fibers, or a combination of both, within an enveloping jacket.
Coaxial cable	A type of cable commonly used in cable television systems, which is composed of two concentric conductors: an inner wire, and an outer braided sleeve.
Dial tone	A tone employed in a dial telephone system to indicate to the calling party that the equipment is ready to receive dial or tone pulses.
Dial-up	A service feature that allows a computer terminal to use telephone systems to initiate and effect communications with other computers.
Digital subscriber line (DSL)	In Integrated Services Digital Networks (ISDN), equipment that provides full-duplex service on a single twisted metallic pair at a rate sufficient to support ISDN basic access and additional framing, timing recovery, and operational functions. The physical termination of the DSL at the network end is the line termination; the physical termination at the customer end is the network termination

Digital subscriber line access multiplexer (DSLAM)	The multiplexer is a device that combines multiple inputs into an aggregate signal to be transported via a single transmission channel.
Fiber hut	Also known as “vaults” these are devices which house switching equipment for users to connect to a fiber network. They are usually constructed below grade, but can also be deployed on the surface. Qwest currently installs these in rights-of-way. They are not presently subject to any <i>specific</i> land use regulations.
Fiber optic	A method for the transmission of information (sound, video, data) in which light is modulated and transmitted over high-purity, hair-thin filaments of glass. The bandwidth capacity of fiber optic cable is much greater than that of copper wire.
Fixed wireless	Radio-communications service between specified fixed points.
Head-end facility	The electronic control center of a cable system. This is the site of the receiving antenna and the signal processing equipment essential to proper functioning of a cable system.
Hub	A device that accepts a signal from one point and redistributes it to one or more points.
Hybrid Fiber	An optical communications cable having two or more different types of optical fibers, e.g., single-mode and multimode fibers.
Hybrid fiber-coax (HFC)	A connector that contains contacts for more than one type of service. Those are that have contacts for both optical fibers and twisted pairs.
Incumbent Local Exchange Carrier (ILEC)	A local telephone company, i.e., a communications common carrier that provides ordinary local voice-grade telecommunications service under regulation within a specified service area. These firms, of which Qwest is one, are the former “Baby Bells” created by the breakup of AT&T.
Internet	A computer network stretching across the world that links the user to businesses, government agencies, universities, and individuals. The Internet provides computers with the ability to connect with other computers for communicating, disseminating and collecting information.
Laser	A device that produces a coherent beam of optical radiation by stimulating electronic, ionic, or molecular transitions to higher energy levels so that when they return to lower energy levels they emit energy.
Microwave	Those frequencies from about 1 gigahertz (GHz) upward that use microwave frequencies for point-to-point and point-to-multipoint communications, including common carriers, cable TV operators, broadcasters, and private operational fixed users.
Modem	An abbreviated term for “modulator-demodulator.” A modem converts digital signals into analog signals (and vice versa), enabling computers to send and receive data over the telephone networks.

Modulation

The process, or result of the process, of varying a characteristic of a carrier, in accordance with an information-bearing signal.

Point-to-point fixed wireless communications

Communications between two designated stations only; through radio.

Radio frequencies

Any frequency within the electromagnetic spectrum normally associated with radio wave propagation.

SONET

Synchronous Optical Network. An interface standard for synchronous 2.46-Gb/s optical-fiber transmission, applicable to the Physical Layer of the OSI Reference Model. It uses a basic data rate of 51.840 Mb/s, called OC1 (optical carrier 1). The SONET hierarchy is defined in multiples of OC1, up to and including OC48, for a maximum data rate of 2.48832 Gbps.

Note: SONET was developed by the Exchange Carriers Standards Association (ECSA).

T-1

The generic designator for any of several digitally multiplexed telecommunications carrier systems. *Note:* The designators for T-carrier in the North American digital hierarchy correspond to the designators for the digital signal (DS) level hierarchy. See the table for frequencies:

T-Carrier	North American
T-1	1.544 Mbps (DS1) (24 user channels)
T-2	6.312 Mbps (DS2) (96 Ch.)
T-3	44.736 Mbps (DS3) (672 Ch.)
T-4	274.176 Mbps (DS4) (4032 Ch.)
T-5	400.352 Mbps (5760 Ch.)

Telecommunication

Any transmission, emission or reception of signs, signals, writing, images, sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.

Transmission

The propagation of a signal, message, or other form of information by any means, such as by telegraph, telephone, radio, television, or facsimile via any medium, such as wire, coaxial cable, microwave, optical fiber, or radio frequency.

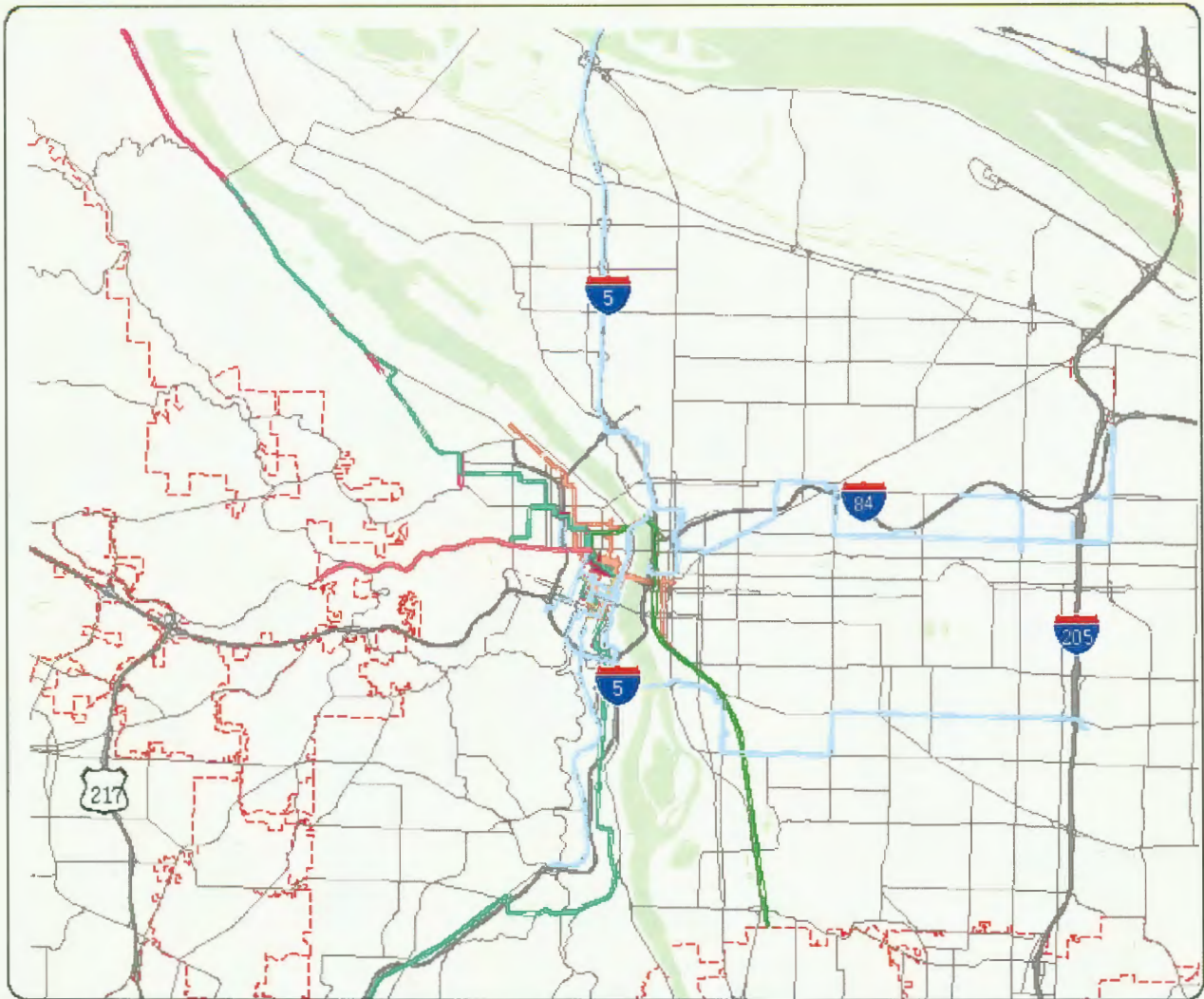
Wireless Fidelity, WiFi

Any broadcast or transmission, which can be received through microwave or radio frequencies without the use of a cable connection for reception. Devices are certified as WiFi compatible by the Institute of Electrical and Electronic Engineers (IEEE). This group establishes parameters for wireless devices. The two currently dominant forms of WiFi are IEEE 802.11a and 802.11b. The latter is more prevalent because despite its lower speed. 802.11b is more stable than 802.11a and can cover far greater distances, including passing through fixed objects.

Appendices

Appendix 1

Current Fiber Optic Networks in Portland



- Fiber routes
- ATT
 - ATTW
 - ELI
 - ENRON
 - FTV
 - GST
 - MCIMET
 - MFS
 - SPRINT
- Arterials
- Freeways
 - Major Streets
 - Water Body
 - City Boundary



Data Source: City of Portland Office of Cable Communications and Franchise Management

Appendix 2

APA Model Code

The American Planning Association has recommended the following local enabling and planning language as part of the model code they have developed. This could provide a useful guide to [crafting similar language for Portland's code](#).

7-206.1 Telecommunications Component

(1) A telecommunications component [may or shall] be included in the community facilities element of the local comprehensive plan. Two or more local governments may enter into an agreement to jointly prepare such a component pursuant to Section [7-202(11)] above.

(2) The purposes of the telecommunications component are to:

- (a) coordinate local telecommunications initiatives through the state telecommunications and information technology plan prepared pursuant to Section, if such a plan has been adopted, and other state programs;
- (b) assess short- and long-term telecommunications needs, especially regarding infrastructure and service technology, for the public and private sectors;
- (c) determine the location and capacity of existing telecommunications infrastructure and services within or potentially affecting the local government;
- (d) define the role of the local government in encouraging competition within the marketplace;
- (e) encourage investment in the most advanced telecommunications technology while protecting the public health, safety, and general welfare, including aesthetics and community character;
- (f) ensure that investments in telecommunications infrastructure are provided in a timely, orderly, and efficient manner that will minimize public inconvenience and disruption to expansion and new construction of facilities; and
- (g) establish a framework for providing reasonable access to public rights-of-way and public structures and ensuring that the local government receives fair and reasonable compensation for use of that access.

(3) In preparing the telecommunications component, the local planning agency shall undertake supporting studies. In undertaking these studies, the local planning agency may use studies conducted by others, such as those conducted in the preparation of the state telecommunications and information technology plan or any regional plan. The supporting studies may include, but shall not be limited to:

- (a) surveys and assessments of future telecommunications needs on a local and/or regional basis as they relate to businesses, local government (including the needs of individual departments of the local government), education, health services, and economic development;
- (b) an assessment of the existing private telecommunications system on a local and regional basis, including a determination of infrastructure location, rate structures, and provision of services;
- (c) an assessment of Federal telecommunications statutes and regulations to evaluate their impact on the local government;
- (d) an inventory of existing telecommunications facilities, public structures, co-location sites, and other areas that could serve as preferred locations for new telecommunications facilities, and a visual impact assessment of these sites and facilities should they be selected as preferred locations;
- (e) an assessment of the ordinances, regulations, and permitting procedures of the local government that affect private telecommunications firms and their effects on the cost of doing business as well as on investment in infrastructure, technological advancement, and the provision of universal service; and
- (f) an assessment of the ability of private telecommunication firms to cooperate with each other and with the local government to coordinate construction to ensure minimum public inconvenience or disruption.

(4) The telecommunications component shall consist of summaries of the relevant studies described by paragraph (3) above as well as a statement of goals, policies, and guidelines by which the local government may improve telecommunications infrastructure and services in order to address the purposes listed in paragraph (2) above. The component shall include a summary map drawn at the same scale as the future land-use plan map required by Section [7-204(6)(c)] above that shows existing telecommunications facilities, public rights-of-way, and public structures that may be used as locations for new telecommunications facilities, and other areas within the jurisdiction of the local government that represent preferred locations for such facilities.

(5) The telecommunications component shall contain actions to be incorporated into the long-range program of implementation as required by Section [7-211] below. These actions may include, but shall not be limited to, proposals for:

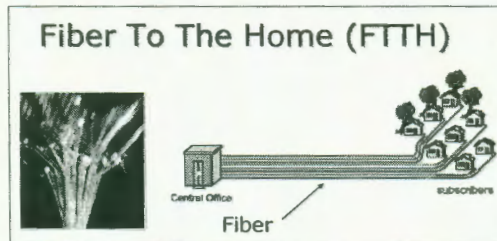
- (a) construction or installation of, or improvements to, the telecommunications facilities and computer networks of the local government;
- (b) changes to zoning ordinances to ensure an adequate number of sites for telecommunications facilities;
- (c) ordinances that establish fees, allow the use of public rights-of-way and public structures for telecommunications facilities, ensure the coordination of construction in such rights-of-way in order to minimize public inconvenience and disruption, and provide for removal of such facilities in the event of obsolescence or abandonment;
- (d) ordinances containing design criteria to promote public safety, maintain community character, and minimize the impact of telecommunications facilities on adjacent land uses;
- (e) public information programs to market the telecommunications potential of the local government and/or region for economic development purposes;
- (f) agreements between telecommunications firms and the local government for use of telecommunication facilities by police, fire, and/or emergency service personnel; and
- (g) changes to local ordinances, regulations, and procedures affecting telecommunications in order to enhance investment in infrastructure, technological advancement, and the provision of expanded access to all citizens.

Appendix 3

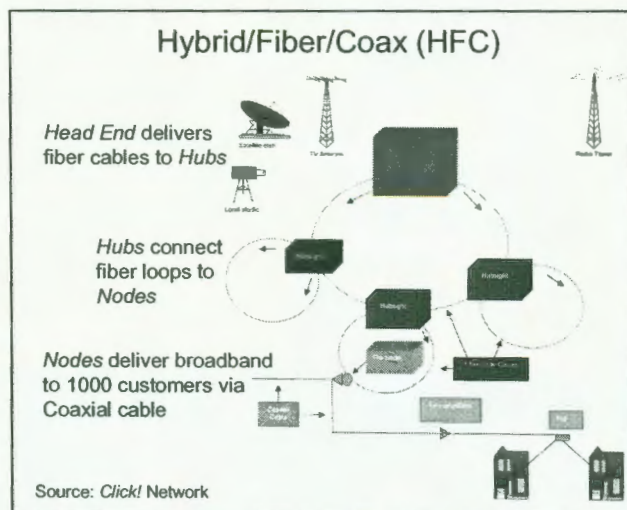
Network Architecture

Fiber-To-The-Home (FTTH)

Perhaps the most advanced form of Broadband network currently in use is Fiber to the home (FTTH). This type of network provides a direct fiber connection from network hubs to each home and business in the City. Not only is direct fiber much faster than cable or DSL – it offers speeds up to six orders of magnitude (or a million times) greater than analog dialup service²³. Under current telecommunications statutes, it can also serve as a backbone for third party Internet service providers (ISPs), enabling users to benefit from competition between service providers via fiber infrastructure²⁴. FTTH offers unparalleled accessibility and adaptability to future needs owing to its high capacity bandwidth and flexible deployment



possibilities. Fiber, unlike copper-based media, can be collocated with other utilities such as sewers and electric transmission conduits. This is because fiber does not interact with moisture, nor does it arc or distort signal when in the presence of high-voltage transmission lines²⁵. The only serious drawback to this system is that the equipment required for the “last mile” connection, from the curb to the home or business is very costly, and only larger firms currently are willing to make such an investment for improved bandwidth. For this reason, fiber optics networks generally serve only business districts where large buildings with many tenants can leverage the cost of making the connection. FTTH is widely regarded by technology analysts²⁶ as a necessity for the next generation of Internet applications. Cities should therefore monitor this technology and anticipate deployment when the need arises.



Hybrid Fiber Coax (HFC)

A lower cost alternative to FTTH that provides many of the same benefits is a hybrid fiber-coax (HFC) network. A typical HFC network consists of direct fiber connections from a head-end facility

²³ *Fiber-to-the-Home White Paper* Self-Published Report by Telecommunications Consultant Paul E. Green Jr. 2003 Fiber-to-the-Home White Paper

²⁴ City of Portland, Office of Cable Management

²⁵ Interview with Diane Lachel, Government and Community Relations Manager for the Click! Network, a division of Tacoma Power & Light

²⁶ Paul E. Green Jr. 2003 *Ibid.*

to neighborhood hubs. From these hubs, another fiber connection carries data to sub-district nodes. From these nodes, coaxial cable makes the “last mile” connection to individual homes and businesses. HFC can provide adequate bandwidth for home users and most small business needs. These networks have been deployed successfully in several US cities, and have proven to be highly accessible and affordable, as evidenced by successful deployments in Tacoma, WA, and Ashland, OR. These systems are much less costly to deploy, enabling network “overbuilders” to charge lower rates to customers. The fact that these networks compete directly with incumbent providers has also had the effect of driving down user costs in markets where they have been deployed. An additional advantage of HFC networks is that the last mile coaxial connections can be replaced very easily with direct fiber connections when Internet technology matures to a point at which this service is cost effective and market demand requires it²⁷. While inadequate for high end users such as large office buildings and other central City users, these networks can be complimented with direct fiber in districts where densities and intensity of bandwidth demand require it. Hybrid fiber coax network architecture thus meets *all* the basic criteria for accessibility, affordability and adaptability.

WiFi

Wireless Fidelity, or WiFi, is another promising network technology. This type of network requires minimal infrastructure and consequently has very low cost to implement (as described in the University Park WiFi proposal examined in Section III). WiFi uses radio frequencies to broadcast and receive signals similar to those used by cellular telephones. These systems are already in widespread use on college campuses and at most Starbucks coffee shops, where they provide users with flexibility because they can then connect to the Internet from any location within range of a transmitter at relatively high connection speeds (see Appendix E). WiFi systems are cheap and versatile, meeting the criteria for accessibility and affordability. The fact that these systems broadcast over wide areas makes them somewhat less stable than physical connections. This issue, as well as concerns about network security, means that WiFi is not adaptable to many business applications. WiFi alone does not meet all three criteria, but



the advantages it does offer make it a highly complimentary system to a fixed Broadband deployment. WiFi would be an ideal tool to advance City goals to increase activity and diversity of uses in town centers. The transmission range of most current WiFi systems could provide convenient connections over the entire area of designated town centers.

²⁷ Interview with Diane Lachel, Government and Community Relations Manager for the *Click!* Network, a division of Tacoma Power & Light