

BUILDING THE INTERNET FOREST
Proposal submitted on behalf of the
Oregon Telecommunications Coordinating Council
for the Oregon Business Plan 5th Annual Leadership Summit
October 30, 2006

Broadband is Critical for Our Oregon Economy!

Telecommunications infrastructure is vital to Oregon’s economic future in urban and rural areas. While Oregon enjoys a quality infrastructure in most parts of the state, there are opportunities for improvement.

The fiber optic, coaxial cable, wireless, and copper wireline networks in Oregon that constitute our telecommunications infrastructure give Oregon a major economic development advantage over other states. This asset is a key advantage for companies and individuals doing business in Oregon. However, we can’t stand still without getting left behind. Infrastructure is always a work in progress. Many opportunities and challenges remain to address our infrastructure needs to enable and support commerce, education, healthcare, access to government, personal access to knowledge, and public safety applications.

The introduction of broadband technologies has enabled new forms of communication to become a reality throughout the world. A fact that cuts across every region of the state is that broadband technologies enable applications that provide enormous benefits to citizens and communities.

Broadband telecommunications capability is an accelerator of economic development.¹ There are significant economic benefits to using broadband technologies for business. With broadband access, worker productivity increases, jobs are created, and wages grow. Broadband creates opportunities for bundling services together and enables operators to offer more services to consumers at lower prices, creating added efficiencies in both time and money. In addition, new or offshoot industries are created as a result of broadband. As broadband penetration rates grow, there will be an increasing demand for state of the art information technologies, computer and networking equipment for the home and office, as well as wireless devices and other equipment that facilitates broadband use.

The economic benefits of broadband can be attributed to factors including increased e-commerce, reductions in commuting through telework, increased consumption of entertainment, Internet telephony (Voice over Internet Protocol or VoIP), and savings in healthcare costs through telehealth and telemedicine applications. For the entertainment sector, the economic benefits result from efficiencies in the distribution of goods, services, and information. The economic benefits of broadband arise from both direct and indirect sources.

¹ “Measuring Broadband’s Economic Impact,” William H. Lehr, Carlos A. Osorio, Sharon E. Gillett, Massachusetts Institute of Technology, Marvin A. Sirbu, Carnegie Mellon University, Presented at the Thirty-third Research Conference on Communication, Information, and Internet Policy (TPRC), September 23-25, 2005 Arlington, VA, http://cfp.mit.edu/groups/broadband/docs/2005/MeasuringBB_EconImpact.pdf, Revised as of January 17, 2006, retrieved February 2006

The Oregon Internet Forest

Oregon has made significant strides in building its telecommunications infrastructure over the past six years thanks to the forward-looking actions of both its public and private sectors. The next telecommunications challenge for Oregon is to adapt quickly to changes in the global competitive environment and the ever-growing importance of the Internet. The Oregon Telecommunications Coordinating Council (ORTCC) recommends that Oregon pursue an “Internet Forest” initiative. The concept is to build on the economic gains that the state’s Silicon Forest strategy successfully brought to Oregon and continue this proactive approach to adapting to the changing global economic environment.

Going forward, the greatest telecommunications challenge for Oregon is not our physical infrastructure but rather, how Internet Protocol (IP) traffic is routed within Oregon and between Oregon and the rest of the world. Conventional wisdom used to dictate that on the Internet, it does not matter where you are, provided you have reliable broadband access. While that tends to be true for consumers, physical location relative to the Internet backbone is becoming increasingly important for businesses with Internet based strategies and high volumes of data traffic.

Today, most of Oregon’s Internet traffic is sent to Seattle, the San Francisco Bay Area or other out-of-state locations for routing to its ultimate destination, even when that destination is back in Oregon, or to travel over the transpacific cables that come ashore in Oregon. Large businesses with a strong Internet presence increasingly prefer to have their web sites located on facilities that are close to major Internet routing centers. Nike, for example, has its web sites hosted out of state. Oregon, with its Open Source Laboratory in Corvallis, is at the heart of the global open source software movement that is spawning many new companies. The new software companies being formed in Oregon may relocate elsewhere if we fail to improve Oregon’s position relative to the Internet.

The ORTCC Internet Forest recommendations are about improving Oregon’s connections to the data networks we call the Internet so that we can recruit, grow and retain the 21st century traded sector businesses that will depend on high capacity telecommunications and the Internet for their success.

The Vision

Oregon has been steadily shifting from a natural resource based economy that depends heavily on fisheries and forests to an economy that increasingly depends on high technology and the businesses of the “*Silicon Forest.*” The next potential wave of economic development following high tech companies like Intel and Hewlett Packard will be Internet businesses like Google and Yahoo, open-source technology businesses, and the wide spread adoption of e-commerce and other Internet-dependent strategies by Oregon businesses. Oregon already has the nucleus of what can be a strong cluster of Internet businesses.

Oregon has an opportunity to build upon the success of the Silicon Forest and actively recruit and create the Internet businesses that will be the engine for the next wave of economic growth. Oregon is an ideal location for these businesses and has the potential to become a preferred Internet gateway to the Pacific Rim, to become the “*Internet Forest.*”

The Internet

The Internet is the major transportation network for the global information-intensive economy of the 21st century and is increasingly recognized as essential for business, yet it is still in its infancy as the key infrastructure underlying the global economy. The first major commercial browser permitting easy access to the “World Wide Web,” Netscape, was introduced in 1995, about a decade ago. Already, World Wide Web access has flattened the world (as Thomas Friedman’s book, *The World Is Flat*, describes it) to permit highly competitive global commerce. In that same time period we have seen the global transition from narrow-band dial-up access to widespread use of broadband access. We have seen the rapid expansion of the Internet and its applications despite the dotcom bust. The Internet will be just as disruptive over the next ten years with applications that continue to transform the way business is conducted and computer applications that will produce dramatic changes in education, health care and government. The businesses, institutions, and communities that leverage the Internet will thrive, and those that do not will falter.

The Opportunity

Oregon has the opportunity to become the “*Internet Forest.*” The Internet is not a single network under anyone’s control, but rather a network of interconnected networks operated by many different parties. Ultimately, future changes in the Internet infrastructure in Oregon and elsewhere will result from the decisions of private sector businesses and will be driven by end-user demand. The most effective way to stimulate continued investment in an advanced competitive telecommunications infrastructure in Oregon is to increase demand in Oregon. Organizing a community of interest among large private sector users and combining it with the aggregated purchasing power of state government, local government, education and health care networks could be used to leverage an improved Internet infrastructure in Oregon. Public-private partnerships or other government incentives could provide additional stimulus for investment in Oregon’s Internet infrastructure and industry clusters that will use it.

There are two other assets that may be used by Oregon to improve its future position on the Internet. Those two assets are Oregon’s undersea cable landings and its high quality telecommunications infrastructure.

Asset 1: Undersea Cable Landings

Eleven undersea cables currently come ashore in Oregon. Oregon has a competitive advantage over Washington and California in attracting future west coast cable landings due to established “fast track” permitting policies and a mature cooperative relationship between the undersea cable industry, the fishing industry and the state. Currently, most of those undersea cables pass through Oregon on their way to major out-of-state connection points. Oregon has the choice of being passive and becoming a poor neighborhood living “under the freeway” without an on-ramp to this economic opportunity as these highways of the future pass through without leaving much local benefit. Oregon also has the choice of being proactive and arranging its Internet connections so that Oregon becomes a preferred geographic location for organizations doing business in the Pacific Rim.

Asset 2: Oregon’s Telecommunications Infrastructure

Oregon has a telecommunications infrastructure extending throughout the state that is world class. Fiber optic backbone networks with diverse routing together with extensive broadband access provide excellent network reliability and connectivity throughout the state for both voice and data transmission.

Oregon should continue to build on these strengths and work to improve the Internet infrastructure that will be the key to the state’s future economic development. Oregon’s physical location on main communication routes has great value. Currently, the Internet includes “backbone” Internet providers that interconnect with each other bi-laterally or at a number of “peering locations” for the exchange of traffic. Most local Internet Service Providers (ISPs) connect via secondary networks that are like minor streams flowing toward the major rivers of fast-flowing data on the Internet backbone. These local ISPs do not “peer” with the Internet backbone providers. Instead they purchase Internet “transit” services from these providers. There are currently three major peering locations for Internet backbone providers on the west coast of the United States where these mighty rivers of data interconnect. They are in the Seattle area, the San Francisco Bay Area and southern California. Consequently, much of Oregon’s Internet traffic, even when both ends of the connection are in Oregon, travels out of state to one or more of the major Internet connection locations in Seattle, San Francisco, Denver, Chicago or Dallas before getting to its destination back in Oregon. Oregon has relatively poor intrastate and interstate Internet connectivity compared to other states. This affects the quality and cost of connectivity for large-scale applications. If unchanged, this situation will place Oregon at a competitive disadvantage.

The fewer the number of router hops between sender and receiver, the higher the quality of service. Locations with direct access to major Internet backbone nodes are preferable to locations at the end of long “tail circuits” or spur lines. They provide higher quality and lower cost. Unfortunately, Oregon is currently on Internet spur lines. As individuals and organizations become more dependent on the Internet and as Internet traffic incorporates more time sensitive applications such as videoconferencing and Voice over Internet Protocol (VoIP), network performance will be increasingly sensitive to routing delays. Major Internet-dependent businesses will prefer to locate their “servers” (data processing and storage facilities) near major Internet connecting locations because close proximity to the Internet backbone shortens the route to their customers and improves the reliability and quality of their service.

Oregon has an opportunity to improve its position on the Internet and should begin to do so by establishing specific goals and strategies.

Goals for Oregon’s Internet Infrastructure

The following goals are suggested for the Internet in Oregon to meet the needs of an “Internet Forest” economy.

Goal 1

Organize a statewide community of interest to improve network connectivity, capacity, quality and the consequent competitive advantage for every Internet user in Oregon.

Goal 2

Make Oregon a preferred location for the hosting of primary and mirrored sites for open technology development.

Goal 3

Make Oregon a preferred location for any business or organization needing high bandwidth connectivity between North America and locations on the Pacific Rim.

Goal 4

Internet Protocol (IP) traffic that both originates and terminates in Oregon should be interconnected in Oregon without having to go through out-of-state interconnection points.

Goal 5

IP traffic between North America and Asia transported on transpacific fiber optic cables landing in Oregon should find an efficient, reliable and cost-effective route (including the path with least congestion and fewest router hops) by interconnecting in Oregon.

Transition Strategy

Though most of the changes in Internet infrastructure in Oregon will result from the decisions of private sector carriers, Oregon may influence these decisions by planning, organizing and taking action.

Recommended Strategies

- Promote and organize a community of interest among large public and private sector users to improve the Internet infrastructure in Oregon for mutual benefit.
- Recognize, aggregate and use the purchasing power of all branches of state and local government, tribes, educational institutions and health care institutions, to influence service provider decisions and Oregon’s Internet infrastructure.
- Expand demand by supporting Oregon’s emerging Open Technology Cluster and the hosting of primary and mirrored sites for open technology development.
- Support the expansion and interconnection of Oregon’s Internet exchanges: Northwest Access Exchange (www.nwax.net) and the Oregon Internet Exchange (www.oregon-ix.net), and determine the viability of developing additional Oregon Internet exchanges, e.g., east of the Cascades and in southern Oregon, to develop an Internet infrastructure that will keep Oregon Internet traffic within Oregon and aggregate a sufficiently large volume of Internet transit traffic at the interconnected exchanges to make it economically attractive for Internet backbone providers to interconnect with their customers through the exchanges.
- Engage network carriers and service providers in a discussion of Oregon’s Internet Forest vision and identify industry issues and obstacles.
- Provide incentives to encourage the necessary private sector investments and to bridge financing gaps when the private sector’s return-on-investment is

- insufficient to justify desired capital expenditures (the objective is not to build a new public sector network, but to encourage private sector investment in a network infrastructure that will be available for use by all).
- Support innovation and the research and development environment in Oregon by establishing a regional optical network for research and education, and an Internet2/Lambda Rail network point of presence (PoP) in Oregon.
 - Support Internet research, development and technology transfer in Oregon.
 - Make broadband Internet access available to all areas of the state and to all Oregon businesses.

Funding

Once a critical mass of Internet traffic has been aggregated in Oregon, the interconnection infrastructure and its on-going operation should be economically self-sustaining. The key will be combining enough private sector and public sector participation in the initial stages to get the necessary funding and infrastructure in place and the volume of traffic up to the point of self-sustainability. Federal funding may be available for some parts of the project. Because of the potential to find solutions to some of the major technical problems of the Internet, National Science Foundation funding may be available. US Department of Agriculture Rural Utility Service funds may be available for infrastructure serving rural Oregon. Aggregating Oregon public sector network traffic would leverage the government funds used for the purchase network services to influence vendor investments. The state government’s network purchasing power could be a major factor in reaching self-sufficiency. Oregon’s cities, counties, and tribes may be included in the community of interest. Private sector participants may see a sufficient opportunity for adequate return on investment to make much of the initial investment themselves.

Recommendations to further enhance Oregon’s Internet capabilities

The following are legislative and policy concepts developed by the ORTCC for the 2007 legislative session.

Proposed Internet Forest Joint Resolution

Whereas the Legislative Assembly has declared that it is the immediate economic strategy of the state to focus on strategies and investments that maximize the economic benefit to the state of the global shift to an information, science and technology driven economy and on industries and companies that make significant use of the high-capacity telecommunications, science and technology-related manufacturing processes or knowledge transfer typical of these emerging economic sectors; and

Whereas the Legislative Assembly has declared that it is the goal of this state to promote access to broadband services for all Oregonians in order to improve the economy in Oregon; and

Whereas the Legislative Assembly has found that the improvement, expansion and new construction of the state’s telecommunications infrastructure provides the basic framework for continuing and expanding economic activity in this state, thereby providing jobs and economic opportunity for the people of Oregon; and

Whereas the Internet and Internet Protocol (IP) networks and technologies are emerging as an infrastructure necessary for the conduct of commerce and communication and necessary to establish and maintain Oregon’s global competitiveness; now, therefore,

Be It Resolved by the Legislative Assembly of the State of Oregon:

That it is the policy of the State of Oregon to promote, facilitate, and encourage activities, projects, and businesses that improve Oregon’s Internet Protocol (IP) network infrastructure, performance, and connectivity to the Internet backbone network and “World Wide Web” for the benefit of Oregon’s commercial, educational, governmental, and individual users.

Proposed legislation to establish an “Internet Forest” grant program

Whereas the Legislative Assembly has declared that it is the immediate economic strategy of the state to focus on strategies and investments that maximize the economic benefit to the state of the global shift to an information, science and technology driven economy and on industries and companies that make significant use of the high-capacity telecommunications, science and technology-related manufacturing processes or knowledge transfer typical of these emerging economic sectors; and

Whereas the Legislative Assembly has declared that it is the goal of this state to promote access to broadband services for all Oregonians in order to improve the economy in Oregon; and

Whereas the Legislative Assembly has found that the improvement, expansion and new construction of the state’s telecommunications infrastructure provides the basic framework for continuing and expanding economic activity in this state, thereby providing jobs and economic opportunity for the people of Oregon; and

Whereas the Internet and Internet Protocol (IP) networks and technologies are emerging as an infrastructure necessary for the conduct of commerce and communication and necessary to establish and maintain Oregon’s global competitiveness; and

Whereas the network performance and quality of Internet data transmissions, especially for time sensitive applications such as voice and video, will be enhanced by the improved routing Oregon Internet traffic; and

Whereas Oregon currently has only two Internet exchanges, located in Portland and in Eugene; and

Whereas improved Internet connectivity within Oregon’s different geographic regions will expand the potential for Internet-intensive businesses to locate in different parts of Oregon; now, therefore,

A grant program is established with the following goals:

- Expand and extend self-sustaining Internet exchanges to all geographic areas of the state.
- Improve Oregon Internet exchange accessibility.
- Improve Oregon Internet exchange capacity.
- Improve Oregon Internet connectivity.

- Improve Oregon Internet network performance.
- Increase the volume of Internet traffic originating and terminating in Oregon.

The grant program has two components:

- Grants to improve the capacity and accessibility of Oregon’s Internet exchanges, and
- Grants to improve the capacity and accessibility of Internet web-hosting facilities located in the state.

The Oregon Economic and Community Development Department is directed to administer the program and develop administrative rules to

1. Govern the submission and process of applications, and
2. Establish the process for evaluating and approving applications for grant awards to meet stated goals, and
3. Establish a process for tracking and reporting the effectiveness of the grant awards in meeting stated goals.

Eligibility

Any for-profit, non-profit or governmental entity, including educational institutions, is eligible to apply for an Internet Forest grant.

Appropriation of Funds

A total of one million dollars (\$1,000,000) of lottery funds is made available for this program.

Proposed legislation to establish an Oregon Special Public Works Matching Funds Bill

Create a new provision in the law governing the Special Public Works Fund (SPWF) to include the use of this fund as a local match for federal funds available from United States Department of Agriculture Rural Development Programs for telecommunications infrastructure projects.

The value and intent of this proposal is to assist rural and underserved communities to gain infrastructure that they do not have today, in particular the intent is to assist communities in obtaining broadband infrastructure where projects would otherwise not occur.

The proposed legislation would create a new provision in the law governing the Special Public Works Fund (SPWF) to include the use of this fund as a local match for federal funds available from United States Department of Agriculture Rural Development Programs (USDA RUS) for telecommunications infrastructure projects. It makes use of an existing fund and program that already supports telecommunications infrastructure projects to leverage the federal program and bring more USDA Rural Development telecom program dollars to Oregon.

The SPWF program is and would remain only available to municipalities, specifically cities, counties, county service districts (organized under ORS Chapter 451), Tribal Councils of Indian tribes, ports, districts as defined in ORS 198.010 and airport districts (ORS 838). SPWF

funding of telecommunications projects is and would continue to be limited. In order to qualify, the governing body of the municipality must adopt a resolution, after a public hearing, finding that the proposed telecommunications system project is necessary and would not otherwise be provided by a for-profit entity within a reasonable time and for a reasonable cost.

Internet Forest Action Plan

Support and strengthen the Northwest Access Exchange (NWAX) and the Oregon Internet Exchange (OIX). The goal should be to make them very low cost (or free) peering exchanges that also permit connections with other parties for competitive services, including Internet transit, web hosting and other Internet services. The more traffic we can peer in Oregon, the better the quality of Internet service in Oregon, because of fewer router hops and less transit delay, fewer dropped packets and less jitter. Making the cost as low as possible and making other services accessible at the same location should provide incentives for Oregon Internet Service Providers (ISPs) to peer their Oregon traffic in Oregon.

Implementation steps:

- (a) Ask the managers of the two exchanges what additional capital and operating budgets would be needed to strengthen the capabilities of the two and allow them to offer connections free or at very low cost.
 - (b) Discuss with Oregon Department of Administrative Services (DAS) management what it would take to interconnect all state government Internet traffic at the two Oregon exchanges for peering, Internet transit and access to the state government data center.
 - (c) Contact Oregon ISPs, including telephone companies, cable companies, competitive local exchange carriers (CLECs) and independent ISPs, to determine what additional incentives, if any, would be needed for them to exchange local traffic at one or more Oregon exchanges and to buy or sell Internet transit at an Oregon exchange.
 - (d) Contact organizations with significant Internet data centers in Oregon, including open source, educational, government and commercial server facilities, to determine what additional incentives, if any, would be needed for them to host exchange points at their locations and connect to the Oregon Internet exchanges.
2. Work with Internet and telecommunications service providers to offer services customers can use to access peers at multiple exchange points. One possible method would be for ISPs to buy Internet transit from networks that will facilitate local data exchange at the desired exchange points. This may not be a good option for all customers, however, so it would be desirable to develop additional service alternatives.

Implementation steps:

- (a) Discuss with DAS and Oregon higher education network management and the management of the two exchanges ideas for interconnecting the exchanges and key data centers.

- (b) Discuss with commercial Internet and telecommunications service providers what would be required to interconnect Oregon Internet exchanges for peering and Internet transit traffic.
3. Establish a Southern Oregon Internet exchange with a connection into OIX so that they too can hand off Oregon traffic through their own or one of the other Oregon exchanges.

Implementation steps:

- (a) Explore strategies to establish a full peering exchange with access to Internet transit services and connections to the other Oregon exchanges in Southern Oregon.
 - (b) Discuss with OIX, and NWAX and potential network and exchange providers what network facilities or services could be used to make an exchange interconnection available for all Internet traffic reaching one of the exchanges and seeking connections to the other exchange for either peering or Internet transit.
4. Establish a fourth exchange in central Oregon and connect it to the other Oregon exchanges for traffic hand-off. With this fourth exchange added and diverse routing (ring or cross-connect) among the four exchanges we will have created a robust Internet Protocol (IP) network in Oregon with multiple point connectivity and failure protection. Additional exchanges, perhaps on the Oregon coast and in eastern Oregon, could be added later.

Implementation steps:

- (a) Discuss with NWAX, OIX and potential providers their ideas for possible implementation of an Oregon east of the Cascades Internet exchange and other exchanges.
 - (b) Discuss with commercial Internet and telecommunications providers possibilities for interconnecting all Oregon exchanges.
5. Support an Internet research and development (R&D) program in Oregon that will address the issues of how to further improve Internet quality in Oregon, including, but not limited to, investigation of possible transition strategies to implement Internet quality and service improvements. This should be done in partnership with for-profit members of the Oregon Internet exchanges to be sure all the real-world technical and economic issues are addressed and to facilitate the transition from R&D to commercial network implementation.

Implementation steps:

- (a) Discuss with Internet researchers at Oregon Health and Sciences University (OHSU), Portland State University (PSU), Oregon State University (OSU) and University of Oregon (UO) what Internet research and development will be most useful to help reach the goal of highly improved Internet quality in Oregon.
- (b) Assist willing and interested researchers to get federal, state or private foundation research funds to conduct the desired research.

A Request for Action

“Building the Internet Forest” holds tremendous potential for Oregon’s economic development if it can be validated, supported, and translated into action. The Oregon Telecommunications Coordinating Council submits this concept and strategy to the Oregon Business Plan for consideration as a new initiative in the January 2007 Leadership Summit.

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