

## Grant County Public Utility District

**Grant County Public Utility District (PUD) is reaping rewards from its strategy to build an open-access metropolitan-area network with Gigabit Ethernet access to every customer using Cisco Systems solutions. With a phenomenal subscription rate of 43 percent of homes passed and rising, Grant County PUD is well ahead of its original business plan—and teaching others the secrets of its success.**

Several years ago, in response to the lack of private-sector service providers' investment in rural Washington State, Grant County PUD decided to build its own all-fiber metropolitan-area network. With an infrastructure in place, Grant County PUD would then invite service providers to lease capacity and offer services. It made the bold decision—still considered revolutionary today—to deploy Gigabit Ethernet drops to every home and business in the county, at rates most consumers can afford. (For more background, see the companion story, *Internet Utopia*.)

### Surpassing the Business Plan

Today, the network passes 8,400 homes, with an anticipated increase to 10,000 homes passed by December 2002, about 30 percent of the county's residential properties. The original business plan calls for a 10- to 15-percent subscription rate of homes passed, with an increase to 40 percent after 10 years. Yet after delivering service for only 18 months, the market penetration rate is 43 percent. "This is absolutely phenomenal—beyond our wildest imagination," says Jonathan Moore, Senior Telecommunications Engineer at Grant County PUD. "We take 30 to 50 applications per week.

Of those, 100 percent take Internet services, 35 percent take video services, and five percent take voice services."

Any service provider can lease capacity to deliver any combination of data, voice, and video services to Grant County customers. To date, 17 Internet service providers (ISPs) offer services over the network, along with two video entertainment providers and one telephone provider, each competing with the incumbent providers.

Says Moore, "I expect that the 17 ISPs will whittle down over time, but when we first started, we thought we would have only two or three providers, never dreaming that the marketplace would support so many. The providers see us as a means to augment their existing dial-access business."

Both video providers also offer Internet access as a bundled package. "We find that video providers have had to bundle Internet access along with video to compete with satellite service. The satellite providers have driven margins down. The video-Internet access bundle makes them competitive," says Moore.

The two video providers offer contrasting levels of service. One offers 283 channels, and the other offers 90 channels. All traffic is sent in MPEG-2 format. Local channels are



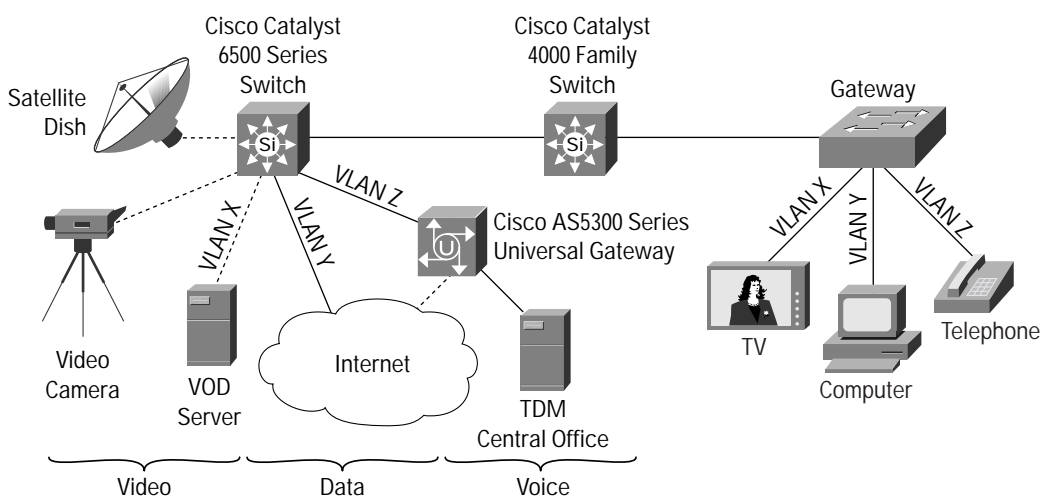
MPEG-2 encoded at 5 Mbps. Direct digital satellite signals are captured and encapsulated at an average 2.1 Mbps in “sliced-I” format. Subscribers have at least one set-top box on their premises, with an option for more boxes if they have more than one television and customers want to view more than one channel at a time.

The single voice provider is new to the network, and Moore suggests the reason for the low market penetration of five percent is that the provider is targeting their marketing at business customers in a predominantly residential environment. “Business customers typically require multiple phone lines and at present we only provide two. As the price of multi-line VoIP gateways comes down, we anticipate a greater interest in the business community,” Moore concludes.

### Cisco Network Makes it Happen

The network itself is built almost entirely with Cisco Systems solutions. Most content is delivered through an Ethernet-switched core comprised of Cisco Catalyst® 6509 switches and gigabit interface converter (GBIC) interfaces. Cisco ONS 15454 optical transport platforms provide dense wavelength division multiplexing (DWDM), long-haul optical, and time-division multiplexing (TDM) transport over fiber rings. The edge is comprised of Cisco Catalyst 4006 LAN switches with a few Cisco Catalyst 3550 Series switches and Cisco Catalyst 6500 Series switches at aggregation points. The “last mile” to each customer premises is built with Cisco Ethernet in the First Mile (EFM) technology (Figure 1) over single-mode fiber.

Figure 1  
Grant County PUD Metropolitan Access Network



Cisco IP multicast technologies enable a robust video deployment architecture. Digital television distribution has unique challenges, and Cisco Catalyst switches deliver the performance and functionality to meet them. Cisco multicast technologies enable highly-efficient core bandwidth utilization, because video providers can send a single video stream per channel, making digital television technically viable and scalable. Channels are replicated at the final “hop” into the EFM access network.

Grant County achieves video quality as good as any cable headend. Its secret? Hardware-based Internet Group Management Protocol (IGMP) in Cisco Catalyst switches. All video content is distributed using IP Multicast throughout the EFM network, and the Cisco products provide the performance and functionality required to meet the unique challenges inherent to



distributing digital TV. Says Moore, “It gives us sub-second channel change times and completely unburdens the switch CPU from doing any video. Video is no longer a task that has to be allocated. It frees us to market product versus engineering individual areas for capacity.”

#### Changing How Grant County Lives

The network and other Cisco solution-related projects have altered the culture of Grant County. “As a political organization, the network is very good for us,” says Moore. Property values jump with a Gigabit Ethernet connection in place. In fact, realtors advertise it as a key property feature. Some businesses have gone so far as to move their offices to buildings that include fiber access.

The network brings technological innovation and economic vigor to the rural county. Its tangible economic benefits encourage more young people to stay after graduating from high school, where just a few years ago they had to leave the area to find opportunities. Moore counts four new businesses that have moved to Grant County because of the network. The network has created 92 new jobs and represents an annual community benefit of over \$8 million.

The television production classes at Moses Lake High School use their Gigabit Ethernet connection to broadcast school events to the community. It televises football games and other sporting events, school concerts, and other activities such as city council meetings and the Grant County Fair. Other schools have collaborated to set up a separate network for Internet-based game applications. The County expects several of its schools to join Internet 2, a consortium being led by 200 U.S. universities working in partnership with industry and government to develop and deploy advanced network applications and technologies to accelerate the creation of the Internet.

A common virtual LAN (VLAN) connects all Cisco Systems Networking Academy™ Program campuses at high schools and community colleges to share resources and ideas, the first association of its kind in the country. Cisco Networking Academies provide a source of trained staff for Grant County PUD, which sponsors an internship program to spot the most promising students and hire them full time. “We grabbed the entire first graduating class of students with CCNA® certification for the PUD network operations center,” says Moore. “Training our own talent is a tremendous blessing.”

#### White House Summons

The venture is so successful that Moore received an invitation from the United States Office of Science and Technology Policy to present the business model, architecture, and results to the U.S. President's Council of Advisors on Science and Technology at the White House. “The Bush administration wants to create some national press, and ours is one of a dozen success stories from across the United States. It’s part of an initiative to encourage other public and municipal utilities to do similar things,” says Moore.

“I feel a responsibility toward Gigabit Ethernet and convergence of everything over IP, to show that there is an economic model that does make this work,” adds Moore. “The public sector—the municipal market, the utilities, the co-ops—we can be an example for them and have a responsibility toward them. I don’t dare let those down. There are many people out there who keep claiming that fiber to the home is well before its time. We may be on the first part of the adoption curve, but its time has come. Now is the time for everyone to get on the bandwagon and learn all they can about it.”

Moore asserts that his relationship with Cisco is the cornerstone to the phenomenal success of the Grant County network, because Cisco solutions make possible the combination of advanced features, reliable Gigabit Ethernet to users, optical technology, and scalability that Grant County needs. Its partnership with Cisco allows Grant County to deploy leadership solutions tailored to its business plan and technical requirements. “Gigabit Ethernet based fiber to the home has enabled

service competition, attracted new business, inspired our educational and medical institutions, and given us a scalable and reliable infrastructure to carry us into the next decade.”

#### Find Out More About Cisco Solutions

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#### Corporate Headquarters

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
[www.cisco.com](http://www.cisco.com)  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 526-4100

#### European Headquarters

Cisco Systems International BV  
Haarlerbergpark  
Haarlerbergweg 13-19  
1101 CH Amsterdam  
The Netherlands  
[www-europe.cisco.com](http://www-europe.cisco.com)  
Tel: 31 0 20 357 1000  
Fax: 31 0 20 357 1100

#### Americas Headquarters

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
[www.cisco.com](http://www.cisco.com)  
Tel: 408 526-7660  
Fax: 408 527-0883

#### Asia Pacific Headquarters

Cisco Systems, Inc.  
Capital Tower  
168 Robinson Road  
#22-01 to #29-01  
Singapore 068912  
[www.cisco.com](http://www.cisco.com)  
Tel: +65 317 7777  
Fax: +65 317 7799

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