

## Infinera Case Study: BVU



### Bristol Virginia Utilities Deploys Broadband Network with Infinera

*Bristol Virginia Utilities (BVU) is a pioneer in the provision of broadband to small city and rural America. A municipally-owned electric, water, and sewer utility in the small city of Bristol, Virginia (pop: 17,000) right on the border with Tennessee, BVU operates an FTTU (fiber to the user) network in the city and the surrounding rural areas of southwestern Virginia.*

"We first had a vision of fiber to the premises and what it could do back in the 1999 to 2001 timeframe, when it was almost unheard of," recalls Wes Rosenbalm, BVU's Chief Executive Officer. BVU management was very conscious of the fact that the southwestern Virginia area was suffering from the decline of the local coalmining industry, rural poverty, and depopulation. They saw FTTU as a technology that could turn the region around and attract people and new industries.

Their first challenges were raising the money to lay the fiber network and fighting off legal challenges from private cable and telephone companies who argued BVU was not legally entitled to provide commercial Internet services. They achieved the former with help from the Virginia Tobacco Commission and the latter with support from Virginia's State Legislature. By 2003, BVU had implemented a PON (passive optical network)-based fiber network in the city of Bristol. Over the next four years, in partnership with the Cumberland Plateau Commission, it rolled out a regional optical network to provide broadband access to significant government, commercial, industrial, educational, and other sites in the rural areas north and west of Bristol.

In 2007, the Bristol area scored its largest economic breakthrough, when Northrop Grumman decided to locate a large data center in Lebanon,

Virginia. A key reason for NG's decision was the availability of affordable, redundant broadband connections to the global Internet. But the arrival of Northrop Grumman created a new challenge for BVU, the need for a larger optical network. NG required two 1 Gigabit/second (Gb/s) connections, and BVU's network only had a transport capacity of 2.5G.



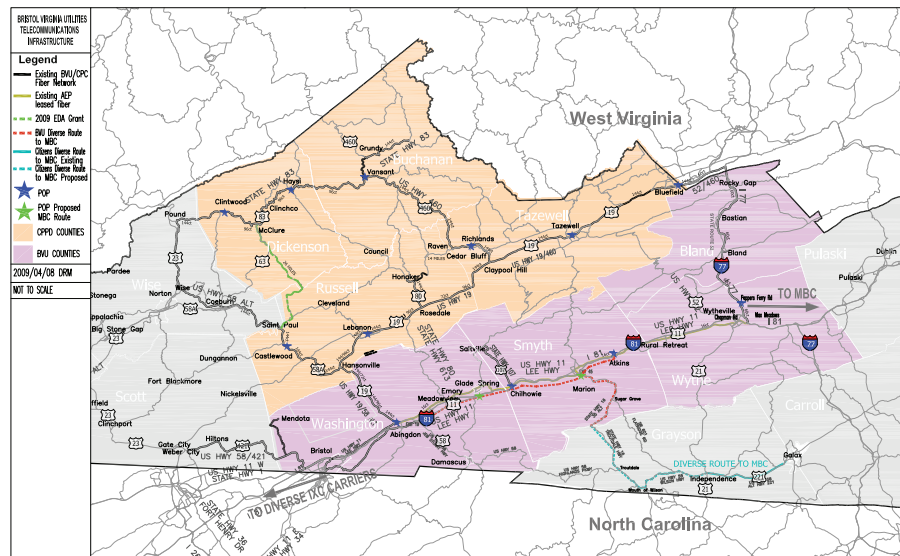
*"We found Infinera to be the leader in transport, offering technology, capacity, and scalability at a price per Gig that we could not find anywhere else" says BVU Chief Technology Officer Mark Lane.*

BVU began the search for a new optical network. After months of study, they decided to deploy the Infinera DTN. Based on Infinera's own photonic integrated circuits (PICs) which integrate more than 50 optical components and 100 Gb/s of optical capacity onto a single optical chip less than 5mm wide, the Infinera DTN is designed to offer a highly scalable optical system at industry-leading density. "We found Infinera to be the leader in transport, offering technology, capacity, and scalability at a price per Gig that we could not find anywhere else," says BVU Chief Technology Officer Mark Lane.

Lane's team deployed a 14-node regional network across an area covering six counties. He found that the Infinera network was easy to deploy and operate. Designed from the ground up for simplicity, the Infinera DTN includes an innovative GMPLS-based network operating system that automates many of the processes involved in commissioning, managing, and adding capacity to an optical network. Infinera's IQ™ operating system automatically recognizes all assets on the network and maintains a real-time database of those assets, as well as the routes and services deployed on the network. Power-balancing software automatically balances the power of wavelengths added to the network, eliminating what can otherwise be a laborious, time-consuming process involving optical specialist engineers at multiple locations. The



# Infinera Case Study: BVU



The BVU Network extends for 800 miles in Bristol and southwestern Virginia

GUI-based is designed interface of the management system is designed to makes it quick and easy to add new services to the network. "We deployed close to 100 Gigs of transport capacity," Lane comments. "And we did all that without adding any staff. I think that would be impossible with any other platform."

## Protection and Restoration

Infinera's Digital Optical Networks™ architecture is engineered to combine transport and switching into the DTN platform, delivering powerful additional functionality in a single platform. The switching capability at the

services, like those provided to Northrop Grumman, BVU uses Infinera's Gigabit Ethernet Tributary Adapter Modules (TAMs). The quick and easy interchangeability of Infinera's TAMs simplifies the addition of new services to the network.

BVU has also been pleased with the reliability of Infinera systems. A recent software upgrade throughout the network was achieved with just one engineer in two nights. "Previously, we did a software upgrade on another platform and it was a multi-week deal, and then we had to look for faults. This was a breeze by comparison."

***"Infinera is the way to go. It future-proofs your network. You put it in place, and it just works. With Infinera that is what you get."***

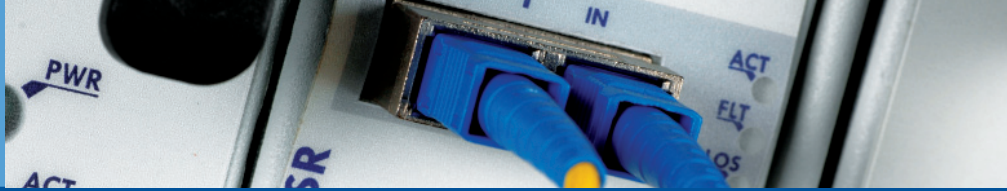
—BVU Chief Technology Officer Mark Lane.

ODU1 level, combined with the GMPLS-powered operating system, enables the network to offer protection and restoration services at the optical layer. This significantly increases the resiliency and reliability of the network. Because traffic is converted from the optical to the electrical domain at every node, the optical engineering is greatly simplified.

Today, BVU operates two interconnected Infinera rings that provide connectivity to access POPs using GPON to deliver FTTH triple-play services. For business

Today, BVU offers consumers residential broadband services starting at 2 Megabits per second (mbps) downstream for just \$27 per month. It's probably one of the best deals available anywhere in the US. BVU has about 10,000 customers, for a penetration rate above 60%. Lane points out that the private cable companies in Bristol offer similar packages in order to keep competitive, so BVU's aggressiveness on price and bandwidth has been good for all local consumers. Today, Lane is studying a plan to offer consumers 50 mbps downstream and 20 mbps upstream. This small city in the Appalachian





Mountains, 375 miles southwest of Washington DC, has better broadband offers than many consumers can find in Washington, New York or San Francisco.

Infinera plays a critical role in enabling BVU to offer these world-class broadband services. "If you have a business case based on rapid growth of broadband services," says Mark Lane, "Infinera is the way to go. It future-proofs your network. You

put it in place, and it just works. With Infinera that is what you get."

### *From Coalminer's Daughter to Broadband Role Model*

## How Technology is Changing Southwestern Virginia

In 2009, Bristol, Virginia was named one of the top 7 most "Intelligent Communities" in the world by the Intelligent Community Forum (ICF), an international think tank dedicated to supporting new technologies and economic development. It was the only American city in the list. The ICF honored Bristol for the contributions broadband has made to economic development in Bristol, and because it saw, according to the ICF statement, that technology had produced in Bristol "a deeper cultural change...which will ensure that the hard work and innovation of its current generation of leaders pays dividends far into the future."

The ICF award joins many other honors Bristol and BVU have won, including awards from "Last Mile" magazine, from the National Association of Telecom Officers and Advisors (NATOA), and others. All the awards recognize the world-class leadership role Bristol and BVU have played in deploying FTTH in the city and an advanced optical backbone throughout the region, and the positive economic effects of that leading-edge technology.

Bristol is a city with a history. Just east of the tree-covered mountains where Virginia, Kentucky, and Tennessee meet, Bristol is at the edge of the Appalachian coalmining region. Loretta Lynn was born 100 miles north of here, and Bristol claims to be the city where country music was invented, in 1927, when a record company executive recorded the Carter Family's songs and released them on 78 rpm records. But with the

endemic problems of the coal industry, Bristol and the surrounding region have also been plagued for decades by high unemployment, rural poverty, and a host of other social problems. The visionary policies of BVU are creating a real change in this corner of Appalachia.

The most visible symbols of change are the decisions by two large technology companies,

the two technology centers have brought 1200 jobs to southwestern Virginia.

Wes Rosenbalm, the CEO of BVU, says the presence of big broadband pipes, bandwidth at prices competitive with those in any major metropolitan area, and diverse connections back into the global Internet were critical factors in winning the investment by both of those companies. The region already had highly competitive costs for power, land, and labor. Broadband provided the missing piece of the puzzle. Diverse routes back into the global network are also critical, and right now BVU, in partnership with Mid-Atlantic Broadband Cooperative (also an Infinera customer) is building a second fiber route linking Bristol to the main Atlanta-Washington fiber highway.

"We set out on this course to change Bristol and southwestern Virginia from a coal and tobacco-producing area into a region that can offer the jobs and the technology of the 21st century," says

Rosenbalm. The economic benefit of the new employers, he says, can be measured in their pay rates. The average annual salary at the new data centers is around \$50,000, compared with average per-capita income in the region of \$20,000 (roughly half the US average).

"That's what this network is doing. It's allowing us to have these opportunities for the people in our region," he says.

The benefits are broader than jobs. Beth Rhinehart represents Wellmont Health System



Bristol Virginia Utilities CEO Wes Rosenbalm

Northrop Grumman and CGI, to locate data centers in Lebanon, Virginia. Northrop Grumman's center manages a large number of activities and processes for the state of Virginia. CGI, a \$3.6 billion IT and systems integration company with 26,000 employees, opened a Technology Center in Lebanon in December 2007. At the opening ceremony, CGI CEO Michael Roach praised the Lebanon center as CGI's first in "rural America" and a key part of CGI's strategy to keep its major business centers "onshore" in the US instead of sending them to low-wage countries. Together



on the local Community Broadband Integration Group. Wellmont recently completed the implementation of a cardiac tele-health system, which allows patients at any of its eight centers to send x-rays or other test results via the network, and get the benefits of a video consultation with the cardiac experts at its Tennessee medical center without the need to travel there. That eliminates the need for hours of travel, often over poor

The broadband revolution has also had an impact on education. With support from the new data centers and the state of Virginia, the University of Virginia at Wise, in the heart of the coalfields, recently became the first U.Va. campus to offer an undergraduate degree in software engineering. "To work in the coal mines, you didn't need a college degree. But the world has changed," says Rhinehart.

belong to the new industries of the 21st century. With the eloquence that has characterized Virginians since the days of Patrick Henry, he describes how faster, better, and cheaper broadband will be key to the future of southwestern Virginia.

"When you become a disciple of what broadband means to a community, and to the US, and

### ***"Broadband has allowed our region to become much more competitive than it ever was in the past."***

mountainous roads. "It extends expertise out to areas that do not have that expertise, while at the same time it saves us money and time," says Rhinehart.

Equally important, the presence of broadband helps improve the quality of life, which is important when recruiting staff for the Health System. "In today's health care market, recruitment can make or break health systems," Rhinehart says. "We're competing with the Mayo Clinic and New York City for physicians." Bristol cannot offer a Metropolitan Opera or Fifth Avenue shopping, but leading-edge broadband brings many other opportunities, including cultural, shopping and entertainment activities, into the home.

The success of the region's economic development policies was confirmed at a recent meeting in Richmond, the state capital, when the Virginia Coalfield Economic Development Authority (VCEDA) announced that the seven-county coal region finished 2009 with a regional unemployment rate of 8%, better than the surrounding regions and two points below the US national average.

"This used to be a region of double-digit unemployment and today the trend has totally reversed itself," says Jonathan Belcher, VCEDA Executive Director. "Broadband has allowed our region to become much more competitive than it ever was in the past." Rosenbalm says that the future of the region will

you see what it can do, you realize that the need is infinite. We are building something in this region that our children and grandchildren will enjoy and benefit from."



Beth Rhinehart of Wellmont Health System. Networked tele-health extends Wellmont's advanced medical services to the coal region.



#### **Infinera Global Headquarters**

169 Java Drive  
Sunnyvale, CA 94089  
USA  
Tel: +1.408.572.5200  
Fax: +1.408.572.5454  
www.infinera.com

#### **Sales Contacts:**

Americas  
sales-am@infinera.com

#### **Asia and Pacific Rim**

Infinera Asia Limited  
391B Orchard Road  
#23-01 Ngee Ann City Tower B  
Singapore 238874  
Tel: +65.6832.8099  
sales-apac@infinera.com

#### **Europe, Middle East, and Africa**

CityPoint  
1 Ropemaker Street  
London, EC2Y 9HT  
UK  
Tel: +44.207.153.1086  
sales-emea@infinera.com

#### **Customer Service and Technical Support**

Within North America  
Tel: 1.877.INF.5288  
Outside North America  
Tel: +1.408.572.5288  
techsupport@infinera.com

© Copyright 2010 Infinera Corporation. All rights reserved. 02/10 CS-INFN-01-018-0210-01

Infinera, Infinera Digital Optical Network, I-PIC, IQ, DTN, and logos that contain Infinera are trademarks or registered trademarks of Infinera Corporation in the United States and other countries. All other trademarks are the property of their respective owners. Infinera specifications, offered customer services, and operating features are subject to change without notice.