



# Western Maryland's revolutionary WAN

Marconi adds Quality of Service to a wireless broadband network



Faced with a bandwidth shortage that could decelerate economic growth, community leaders in Western Maryland are working toward a common goal: expanding a successful wireless network for county government into a “local loop” infrastructure that will deliver broadband services to virtually all of the area’s businesses and residences. Their innovative plan, featuring Marconi multiservice technology, has many rural communities talking.

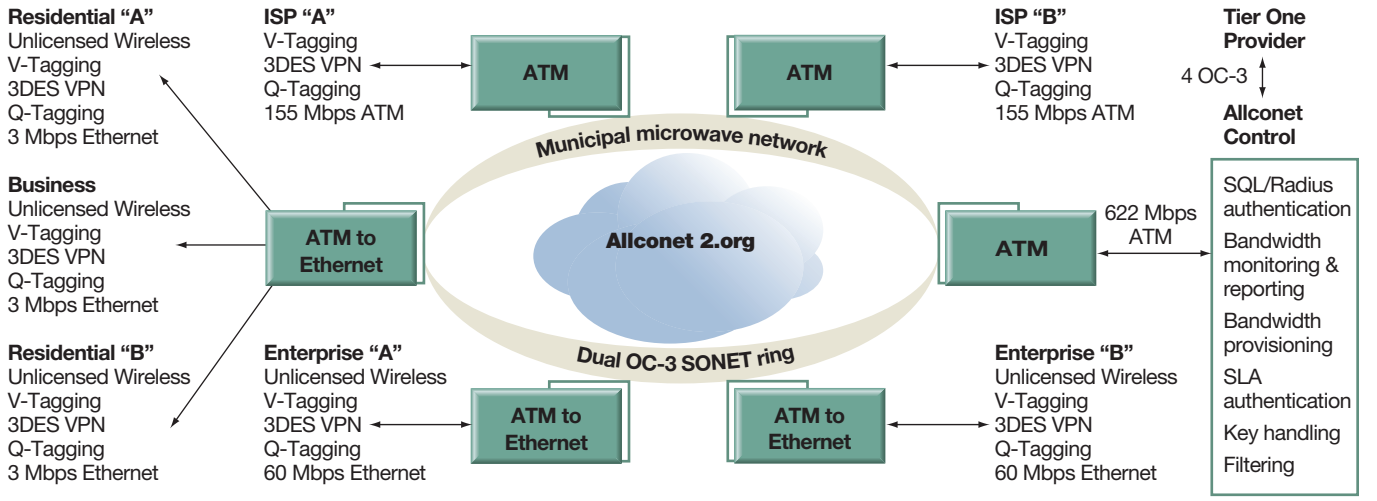
## **Evolving from smokestacks to data centers**

For 25 years, the residents of Allegany County, Maryland, and the neighboring counties of Garrett, Washington, Bedford (Pennsylvania) and Mineral (West Virginia) balanced a satisfying quality of life — good schools, a low crime rate, reasonable housing prices and picture postcard scenery — with fewer opportunities for economic advancement.

By the mid 1990s, smokestack industries (steel, glass, tire and textiles manufacturing) had gradually disappeared. Opportunities to participate in the new, technology driven economy were limited by something that urban areas in the US already had — the availability of a robust broadband telecommunications infrastructure.

“This area lacked what other rural communities lacked, and that was a reasonable telecom infrastructure, and reasonable access to the outside world,” said Jeff Blank, Supervisor of Microcomputers and Networking for the Allegany County Board of Education.

## Extending ATM Quality of Service over Wireless Ethernet



### Allconet: the original

Recognizing the need to bridge this digital divide, Allegany County government formed a partnership with the public library system, board of education and the city of Cumberland (the largest city in the county and the county seat) to bring schools, libraries, and government buildings online in the fastest, most economical way possible — which was not necessarily with traditional wireline networks. “We learned that leased microwave equipment was the best, most cost effective means of providing high-bandwidth network access in our area,” Blank said.

In 1994, the partnership launched “Allconet,” one of the industry’s earliest applications of wireless (unlicensed spectrum) Ethernet technology. A public sector initiative, Allconet is an IP-based, high-speed private network, connecting 85 county facilities and 4,000 workstations in a tree configuration to microwave tower sites throughout the region.

The wireless network provides reliable access to a wide range of telecommunications services — including a virtually unlimited IP space and numerous Internet services — to its subscribers, which now include agencies in counties adjacent to Allegany.

Proven successful as a business case, Allconet saves subscribers approximately \$67,000 each month in carrier leased line services. “We don’t have any leased lines in our network,” Blank explained. “Our monthly telephone bill is basically zero, as far as the county is concerned. Without the wireless solution, it would be very difficult to afford Internet access in all of our schools.”

### The base case for a carrier-class network

Recognizing that the digital divide also impacted the private sector, community leaders approached Allegany County about expanding Allconet to serve both businesses and residences. “By 2000, we found that our economic development folks were having a problem with bandwidth,” Blank said. “Several companies wrote to us that they couldn’t move to the area because of a lack of a telecommunications infrastructure.”

In particular, high tech and biotech firms, the types of new economy businesses that the area wanted to attract, are prodigious consumers of bandwidth. Internet access, data center connectivity, virtual private network (VPN) capabilities, streaming media, multiparty video conferences and other services used by today’s enterprise networks require a robust, carrier-class public network infrastructure.

The county examined its existing network, available bandwidth, and available services, and realized that a totally Ethernet-based network in a tree structure lacked carrier-class attributes. As Jeff Blank began to retool the original Allconet to create the next-generation Allconet 2, he talked to industry-leading vendors, including Marconi’s Broadband Routing & Switching group, about the community’s ambitious project.

### Five keys to Allconet 2

By combining the impressive coverage ability of microwave transmission with a robust backbone technology, Blank designed Allconet 2 to extend the value proposition of the original Allconet: the idea that entire geographic regions can be “wired” for broadband services with minimal financial resources, and rapid deployment schedules. Following are the five key elements of Allconet 2’s design:

#### 1. “Wireless fiber” SONET backbone

Allconet 2 is an FCC-licensed microwave radio tower\* backbone in a SONET configuration. SONET technology was implemented to take advantage of a quick (25 millisecond) ring reversal in the event of link failure.

Blank explained that recent technology cost reductions and ease of use mean that licensed microwave backbones are now feasible options for network operators. “Single radio units with distances of up to 11 miles and speeds of 311 Mbps cost as little as \$25,000 per end,” he said.

Licensed microwave radios of this caliber are known as “wireless fiber” units because they are indistinguishable from fiber at the add-drop multiplexer equipment level. “At \$50,000 per link, they’re much less expensive to install than 11 miles of fiber optics,” Blank said.

Standard add-drop multiplexers (ADMs), the same equipment used in traditional fiber networks, are deployed at each node on the wireless SONET ring. Implementing ADMs at this layer of the network allows the deployment of traditional, point-to-point time division multiplexed applications, such as private branch exchange (PBX) services, or interconnects with Telcos.

## 2. Quality of Service at the ATM layer

An asynchronous transfer mode (ATM) layer was added to the network to provide multi-Internet service provider (ISP) interoperability and ATM Quality of Service, or QoS.

Quality of Service is defined as the ability of a network to measure, prioritize and guarantee the transmission of voice, video and data services. Marconi ASX®-1000 and 200BX multiservice ATM switches provide QoS by prioritizing the queuing of voice, video and data traffic to the backbone.

The switches also provide a hierarchical permanent virtual circuit (PVC) system, allowing multiple ISPs to participate on the infrastructure while Blank maintains overall network security.

"We want to be the broadband provider for our community, but not the ISP. So we're partnering with local ISPs to provide Internet access through our network," Blank explained.

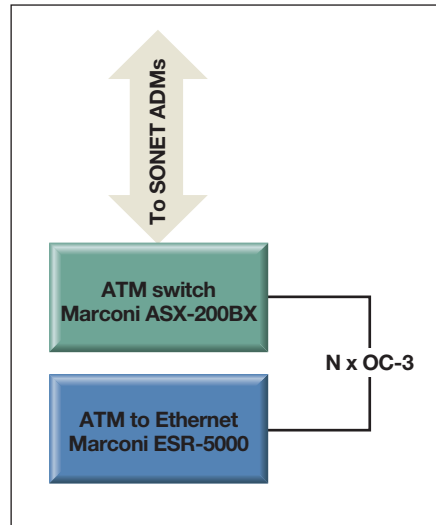
"The advantages of ATM in the multi-ISP market cannot be underestimated," he added. "Circuit switching technology for voice over IP and video applications is the only way to maintain QoS across the backbone."

## 3. Wireless Ethernet

"The key to making this local loop work is gaining access to the customer's premises," Blank said. Unlicensed wireless Ethernet "points of access" for residences and small businesses are comprised of four 2.4 GHz multipoint microwave transceivers on each tower.

High bandwidth access for large businesses, enterprise networks or ISPs is implemented by placing six 5.7 GHz multipoint transceivers on each tower. Access speeds can be scaled from 20 to 60 Mbps.

Marconi ESR™ series switch routers link the unlicensed wireless Ethernet point of access towers to the SONET network backbone. This allows Blank to seamlessly integrate the original, unlicensed wireless Allconet network into the new SONET infrastructure. "We still want to use Ethernet-based unlicensed microwave equipment, but we want to be able to get QoS out of it — network security and good provisioning. So we use Marconi's ESR-5000 to aggregate Ethernet traffic to ATM."



## 4. Customer premises equipment

The final hardware component links the point of access to the customer's premises. As easy to install as a television satellite "dish," customer premises radios cost as little as \$700 for a residential network.

"It's a cost that can easily be folded into the ISP's monthly charge," Blank said.

Equipment costs for high-bandwidth customers range from \$4,500 to \$8,000. However the customers are not required to purchase other routing equipment, channel service units, or data service units. Network interfaces are standard 10/100 Ethernet connections.

## 5. Network management

The network is easily managed through a Web-based management platform. Management and provisioning is performed from the master permanent virtual circuit at the ATM layer, allowing for central provisioning and monitoring while maintaining ISP interoperability.

Blank anticipates that network management of Allconet 2 will be as straightforward as the original Allconet has proven to be. To date, the Allconet program operates without a full-time staff. Blank, who is a Board of Education staffer, and other information technology personnel manage and monitor the network in tandem with their full-time jobs.

"Allconet has been a very reliable network," Blank added. "Our main problems have resulted from power outages, so for Allconet 2, we're adding propane-powered generators and 48-volt battery back-ups for power redundancy. It's absolutely built to carrier-class quality," he said.

## Allconet 2 as an economic engine

As Allconet 2 moves into a build-out stage, government, community, academic, and business leaders have identified the new network as a critical next step in the transformation of Western Maryland's economy.

"We've been advocating for the project and really getting behind it, bringing the issue to the public's mind, as well as to the politician's minds, and trying to make sure that we follow up on a number of things, like grant requests and letters of support," said Anna Custer, Executive Director of The Greater Cumberland Committee.

A business-funded non-profit organization with business presidents and CEOs on its board, the Greater Cumberland Committee represents companies that employ more than 12,000 people in Allegany, Garrett, Bedford, and Mineral Counties.

The Committee is a forum for corporate and civic leadership to develop solutions to the problems that affect the region's competitiveness and viability. It is one of several public and private sector groups that work closely together to improve the area's business climate. "There is a lot of collaboration happening right now that wasn't happening ten years ago," Custer said.

"Now we're on an upswing," she added, "and we want to continue to move forward."

"We're doing that by collaborating, and bringing lots of voices to the table. We are able to focus on a goal, and achieve it, and focus on the next goal, and achieve it. We haven't always had such a unified vision of what the future is going to look like."

The future includes the construction of Allconet 2-connected business parks. Among them, Barton Business Park will house technology businesses, and "ABC @ FSU," the Allegany Business Center at Frostburg State University, is an on-campus technology park that will also act as an incubator for start-up businesses.

"We're hoping to use the brainpower and the manpower of FSU students," Custer said. ABC @ FSU is a place where they can develop their technical expertise and entrepreneurial ideas."

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\* Tower rights and FCC licenses are required for this equipment. Jeff Blank considers these administrative issues to be "trivial" compared to negotiating right-of-way for fiber-optic cable.

Western Maryland is also emphasizing tourism as part of its business plan. The natural beauty and historical significance of the area (French and Indian, Revolutionary and Civil War battles were fought there) are promoted on [www.mdmountainside.com](http://www.mdmountainside.com), the area's new tourism web site.

Allconet 2 will also help the area exploit its obvious geographic advantages. A two-and-a-half-hour drive from Washington, D.C., Allegany County is a reasonable commute for Federal government employees who have a ten-hour-a-day/four-day workweek. "With Allconet 2, Western Maryland will have the technological assets that make commuting or telecommuting easier," Custer said.

Beyond being the ultimate bedroom community for big-city workers, Western Maryland is also an attractive location for the Capitol's back-office operations. "There are certainly avenues to explore with Federal agencies that require back-up facilities, or research centers," Custer said.

### **All eyes on Allconet**

The Allconet program attracts a lot of attention from civic leaders across the country. They want to know how a program with little or no administrative staff has the potential to make such a big difference in the community.

Anna Custer attributes the program's success to a shared vision that takes what's great about the area — and makes it better. "We still face the challenges that Appalachia faces," she said. "But we have a vision of where the community can go, and with an infrastructure like Allconet 2, combined with low crime, affordable housing, good schools, and a nice, natural environment in which to live, we've got the package."

Jeff Blank spends more and more time on the road, speaking to groups at Rural Broadband Conferences across the country, as well as to the Maryland Association of Counties, and to the Rural Telecommunications Congress in Washington, D.C. He promotes the solution that he believes could be "the future of WANs for years to come."

Part of his pitch is the absolute necessity to bring stakeholders in the community on board. "One of the most interesting things about this project is that it has unanimous support," Blank said. "We have state and federal senators on our side. We have the entire local delegation — the county commissioners, the mayor and city council, and all of the business groups — on our side. It has absolutely been unanimous support."

### **For more information**

[www.allconet.org](http://www.allconet.org)  
[www.allconet.org/allconet2](http://www.allconet.org/allconet2)  
[www.marconi.com/slg](http://www.marconi.com/slg)



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