Cambium Networks

WHITE PAPER

RELIABILITY OR RISK

FOR MANY GROWTH-ORIENTED WIRELESS ISPs (WISPs), CUSTOMER SATISFACTION MAY BE AT RISK BY USING LOW COST EQUIPMENT.



Whether you're a regional WISP with thousands of customers or a local provider with dozens, you face many of the same business challenges. In pursuit of a sustainable business model, three factors have significant impact on your profitability: equipment cost, operating expense and churn. The cost of recruiting and replacing lost customers hinders investment and throttles growth. Whether you serve high-density urban or low-density rural areas, customer satisfaction is always crucial.

GIVING CUSTOMERS **WHAT THEY WANT**

Customer satisfaction is critical to any size service provider. Your customers want low-cost connectivity. They want high performance so they can use innovative new bandwidth-intensive applications on their powerful new devices. They want superior reliability so you need to eliminate outages and maximize uptime. The question is: How do you balance your need to enhance customer satisfaction with your need to keep costs down and profitability up?

The key is having the right equipment. No matter how large or small your business, equipment price and maintenance costs are going to constitute a large part of your expenses. All wireless broadband equipment is not created equal. Choose a solution that will work reliably from the start and will be well supported in the future.

Says Ben Strahan, director of operations at Agave Broadband, "Superior equipment is the way to provide superior customer satisfaction. We need equipment that performs under high user demand and extreme temperatures. Equipment failures and repair dispatches need to be minimized to control operations costs."

WIRELESS OPTIONS

Wireless point-to-multipoint (PMP) networks, like the Cambium PMP 430 series, have proven themselves to be successful around the world. But as providers strive to keep costs down, some are considering equipment that offers a lower entry cost. In certain circumstances, this equipment may be a viable solution. But lower priced equipment can also lead to compromises in service and reliability that may actually lead to lower satisfaction and increased churn as you grow the subscriber base.

ABOUT CAMBIUM NETWORKS

Cambium Networks, formerly part of Motorola Solutions, is an independent company providing world-class wireless broadband and microwave solutions for military, government, municipal and enterprise customers around the world. Cambium Networks currently has more than 3.2 million products deployed and provides reliable, secure, cost-effective connectivity in thousands of networks in over 150 countries.

COMPARING **TECHNOLOGIES**

For a great many WISPs, choice of equipment is one of the biggest factors in whether or not they achieve success and sustainability. So how do PMP networks differ from lower priced infrastructure equipment in how they help you build customer satisfaction and loyalty? In and of itself, the lower price may be enough to be considered by providers just starting out or looking to expand in a low-density area. The real issue is, will those initial savings be enough to compensate for lower performance, reduced reliability and customers who are consistently dissatisfied with your quality of service? In general, lower cost infrastructure cannot match Cambium PMP networks in a number of critical aspects.

THROUGHPUT PERFORMANCE

Regardless of the application, customers want throughput that will carry voice and video payload reliably both upstream and downstream. In terms of throughput, it's important to distinguish between theoretical and real-world figures. Cambium Networks develops excellent 802.11-based products. We have specific experience with this technology and also the unique needs of WISPs who are building long-range distribution and access networks for business and residential subscribers. When comparing to PMP solutions, other 802.11 vendors claim maximum throughputs based on 40 MHz channels and in ideal conditions that are not likely for a typical WISP. In fact, it is easier to find 10 MHz or 20 MHz of available spectrum. Service providers need to consider the amount of available spectrum, and provide the most throughput possible in that spectrum.

In addition, PMP systems normally do not have the interference issues of 802.11 technology, even when 40 MHz channels are available. Many 802.11-based networks have no external filtering, making them vulnerable to interference on adjacent channels and from out of band.

THROUGHPUT		
	Others	PMP
Published throughput rate is based on useable throughput for applications and does not count signaling "overhead" data	NO	YES

LOWER COST INFRASTRUCTURE CANNOT MATCH CAMBIUM PMP NETWORKS IN A NUMBER OF CRITICAL ASPECTS

SYNCHRONIZED PERFORMANCE

The difference in performance is partially based on the fact that most low cost 802.11-based networks are contention-based systems while PMP networks are synchronized with Global Positioning System (GPS) capabilities.

The PMP network's highly optimized scheduled TDD MAC layer supports GPS synchronization, minimizing self-interference and providing efficient frequency reuse. With consistent latency of just 5 to 7 milliseconds even in fully loaded conditions, PMP networks provide the experience your subscribers need and expect for optimal performance even for networks under high load. On the other hand, 802.11-based networks operate on a contention scheme and often have problems with providing consistent

low latency. Due to its scheduled MAC and implementation of Quality of Service (QoS) capabilities, the PMP 430 ensures that high priority, latency sensitive traffic is delivered consistently. Conversely, you can't rely on consistent latency performance from lower-cost, contention-based 802.11 systems — particularly in over-loaded conditions. Customers expect high performance at all times, not just in the middle of the night when no one else is using the network.

SYNCHRONIZATION SPECIFICS	Others	PMP
One GPS antenna is leveraged across all access points (APs) at one site	NO	YES
Synchronization across sites does not require network connectivity	NO	YES
Synchronization is an integral part of the Field-Programmable Gate Array (FPGA) hardware design	NO	YES
GPS antenna mount location is flexible to allow for simple installation	NO	YES
GPS antenna is securely mounted for operation in harsh environments	NO	YES

RF RELIABILITY BY DESIGN

Outdoor systems operate in a noisy environment that will become more congested. Unlike 802.11-based systems, PMP solutions optimize interference tolerance and offer improved performance in noisy environments. External filtering isolates the system from interference on adjacent channels and from out of band sources. Efficient filtering further minimizes self-interference and maximizes the useable channels in available frequency bands.

Other systems attempt to provide noise isolation by providing fewer channels and using the bandwidth to move away from noise. This restricts the number of channels available and constrains total system bandwidth.

In addition, PMP solutions are certified to use the 5.2 GHz and 5.4 GHz frequency bands that require government certified Dynamic Frequency Selection (DFS) capabilities. Not all manufacturers provide this capability. This technology, in effect, makes an additional 350 MHz of spectrum available for service providers to use.

PMP SOLUTIONS OPTIMIZE INTERFERENCE TOLERANCE AND OFFER IMPROVED PERFORMANCE IN NOISY ENVIRONMENTS

HARDWARE DESIGN SPECIFICS	Others	PMP
Mean Time Between Failures (MTBF) of 40 years proven in field use	NO	YES
Power supplies are rated for outdoor use	NO	YES
Designed for full outdoor temperature range (-40C to +55C)	NO	YES
Robust RF noise filtering	NO	YES

SOFTWARE DESIGN SPECIFICS	Others	PMP
Flexible cyclic prefix for fewer dropped packets in multi-path outdoor environment	NO	YES
Selectable broadcast repeat count for more reliable message delivery	NO	YES
Robust RF noise filtering	NO	YES
DFS implementation that minimizes false detections	NO	YES

NETWORK PERFORMANCE AND OPTIMIZATION

Integrating the technology into the network is an important phase of growth. By optimizing the equipment performance to support workflows and information processing, PMP solutions remove cost from operations.

NETWORK PERFORMANCE DESIGN SPECIFICS	Others	PMP
Network monitoring features include proactive trouble-shooting features: • Registered Subscriber Module (SM) count • Network Time Protocol (NTP) time update, etc.	NO	YES
Pre-configured "Quick Start" system settings for fast deployment	NO	YES

SECURITY

One bad security incident can ruin a service provider's reputation. Customers are likely to consider turning away from a service provider after a bad security experience. With the sensitive information being shared by businesses and residential users, they want to trust that the information that they share is protected from intruders. Cambium understands this and has designed its PMP equipment to protect you and your customers.

SECURITY DESIGN SPECIFICS	Others	PMP
SNMPv2 compliant for more secure transactions	NO	YES
SNMP v3 is committed for development	NO	YES
Three levels of user-access security for greater network control	NO	YES
Both proprietary and standards-based SM authentication safeguards to fully manage network access	NO	YES
"Color Code" software control prevents SM association with unintended APs	NO	YES
Greater control over network administration: • Two community strings • Multiple password features	NO	YES

ADVANCED FEATURES	Others	PMP
Advanced Virtual Local Area Networks (VLAN's) to manage private enterprise traffic	NO	YES
QoS settings prioritize voice traffic and minimize latency	NO	YES
Configuration parameters protect networks from rogue DHCP servers	NO	YES
Broadcast Downlink Committed Information Rate (CIR) to selectively prioritize broadcast traffic	NO	YES
Traffic is kept local at AP tower, reducing risk against server failure	NO	YES
Remote spectrum analyzer for fast deployment	NO	YES

BY OPTIMIZING EQUIPMENT PERFORMANCE TO SUPPORT WORKFLOWS AND INFORMATION PROCESSING, PMP SOLUTIONS REMOVE COST FROM OPERATIONS

SERVICE IMPACT

HIGHER QUALITY OF SERVICE

The days of customers tolerating slow downloads and too many outages are long gone. If the download icon is spinning, chances are users are thinking about finding a provider with faster service. To keep your customers loyal, you've got to give them quality of service that works with bandwidth-hungry applications. You need to give them high-speed connectivity, fast data services, streaming video, and more on a wide variety of devices. Business customers want all that and more including prioritized Voice over IP (VoIP) voice traffic, VLANs for private enterprise traffic, video surveillance, E1/T1 replacement, and redundancy. In PMP networks, each Customer Premise Equipment (CPE) can have multiple service flow connections with different QoS classes, and all data is centrally scheduled by the access point. The result is PMP networks consistently provide higher quality of service experiences than contention-based 802.11 systems.

RELIABILITY REDUCES OPEX

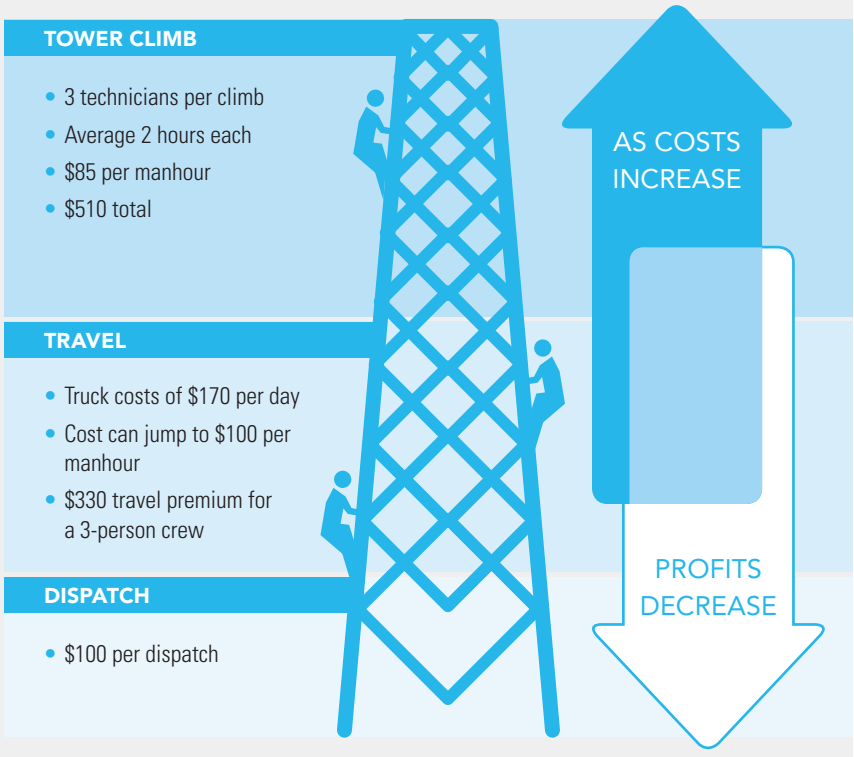
Once a network is deployed, reliability is crucial. Subscribers will not tolerate downtime. With more than three million modules deployed, PMP networks have proven to be exceptionally reliable performers worldwide. The Cambium Networks PMP 430 offers an MTBF rate of greater than 40 years. But low cost equipment networks can be considerably less reliable — both in hardware and in message delivery — reducing customer satisfaction while increasing operational costs.

THE TRUE COST OF AN OUTAGE

Outages happen. Preventable outages are the WISP's worst nightmare. A single outage can affect customer perception, and that can seriously affect business. When service is compromised, subscriber loyalty is tested, and as the cost of switching providers is also low, increased churn is a reality. Outages can also lead to unacceptably high maintenance and operations costs.

The cost of a typical installation — or swapping out — involving a tower climb can be significant. The Occupational Safety and Health Administration (OSHA) requires three technicians per climb. Consider that an average climb is about two hours each at approximately $85 per manhour, making the cost of a routine tower climb about $510 total. You can pay about $100 per dispatch for labor and a vehicle. That's over $2,400 for an eight-hour, four-person dispatch day, and that's significant. It all adds up.

Ultimately, a single outage can wipe out the savings from purchasing lower-priced equipment.

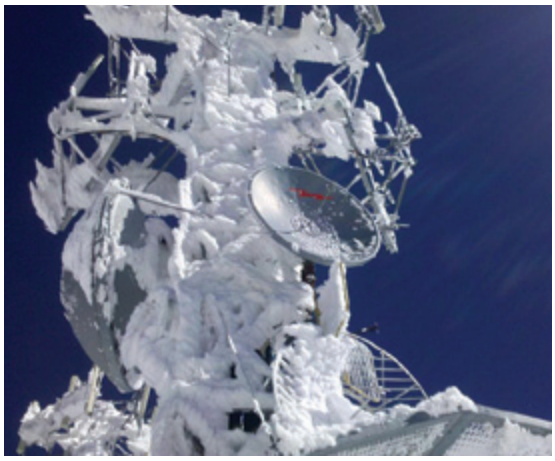


The inability of most low cost equipment to withstand the rigors of outdoor use leads inevitably to more outages, increases in trouble calls and dispatches. Reliable PMP equipment also leads to reductions in training costs and allows staff to concentrate on new installs and growing the network instead of fixing it.

Information on best practices for PMP networks is readily available, and assistance is easy to access. Cambium produces detailed technical documentation, provides telephone support, sponsors community forums, has full time technical specialists, and offers training courses. This information, supported by a supportive PMP user community with three million modules deployed and years of field experience, makes it easy to understand the technology and deploy it right the first time.

Reliable service increases customer satisfaction, helping to increase up-selling to higher levels of service, and driving positive word of mouth that is the provider's single most important marketing factor.

JAB Wireless, a service provider in the seven-state area of Utah, Colorado, Texas, Oklahoma, Wyoming, Idaho and Illinois, relies heavily on Cambium PMP 430 and other equipment. Says Dean Lundberg, JAB vice president of operations, "[PMP] technology allows us to achieve the kind of innovation and stability that lets us compete and succeed in the changing wireless environment. It helps us capture new customers and serve existing ones as their demands grow. We now have tens of thousands of subscribers to show for it." In addition, when you have a homogenous network across your entire subscriber base, there is less training cost and fewer SKUs to keep in stock for maintenance and repair.



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NEW LOW DENSITY PMP OPTIONS

Among the service providers most interested in lower cost network equipment are those with low-density networks in rural areas. If you want to provide local coverage to dozens or scores of subscribers rather than hundreds, you may at first see low cost equipment as your only option. Cambium's new AP 105 access point is making PMP performance and reliability more affordable for low-density and network edge applications. The AP 105 offers full data throughput of 14 Mbps, can serve up to 10 subscriber modules and offers a substantially lower price point than full capacity equipment — at about one-third of the price of a PMP 100 series access point. As you grow, it also offers the ability to upgrade to the full 200-subscriber module capacity through a simple software key… and with no cost penalty. This solution provides a low entry cost while providing the opportunity to have a consistent network as your service area grows.

UNIVERSAL GPS

You can add low-cost GPS synchronization for one or two AP modules with the new small site network-compatible Universal GPS (UGPS). These new units provide synchronization that enhances performance and decreases core network interference, and are compatible with all Cambium Networks PMP radios.

BUSINESS IMPACT

CUSTOMERS WANT RELIABILITY

Customers are sophisticated. They know they need bandwidth to use their advanced applications on their laptops and smartphones and tablets. They also want far-ranging coverage and 24/7 availability. Most customers understand wireless technology very well. When outages happen, they will very likely begin to think about changing service providers even if they are saving a few dollars each month.

TRUSTED PERFORMANCE

Equipment outages and failures can be an ongoing problem for networks with low cost equipment. The fact is, all 802.11-based equipment is built on a standard chipset that was developed for indoor networks, not outdoor use, making it difficult if not impossible to scale efficiently to serve thousands of subscribers. Actual throughputs are also typically well below published maximum published rates. From a hardware standpoint, 802.11-based equipment may not be built to withstand the rigors of outdoor installation, notably extreme temperatures and harsh weather conditions, which affects reliability. How significant are these issues? Today, it's not unusual to find providers tearing out equipment and replacing it with Cambium Networks' PMP family of solutions. The most frequent reason is performance issues that lead to low customer satisfaction, which can cause high maintenance and troubleshooting costs, churn rates and ultimately decreased profitability.

Boston-based Community WISP has been using Cambium point-to-multipoint solutions, including the PMP 430, for years now. "For us it's a matter of confidence," says Bob Zakarian, president. "We're a small ISP; we don't have the time or the dollars to fix equipment that continually fails or experiences outages. PMP equipment often carries a higher initial price tag than other equipment, but you get what you pay for. We've found the added reliability and performance we gain adds up to increased customer satisfaction. Word of mouth grows our business. That's what we care about."

MAXIMIZING NETWORK VALUE

No matter how large or small your network is, the key is always customer satisfaction. If you're able to provide your subscribers with the reliable, high-performance service they expect, they'll not only be loyal customers, they'll also actively spread the word about your network to their friends and colleagues. Successful service providers balance equipment purchase and maintenance costs with the need to deliver reliable service with the bandwidth that today's subscribers demand.

It's no surprise that some service providers, especially those with low-density rural service areas, are considering low cost equipment. It's also no surprise that a growing number of small and larger growth-oriented providers are ultimately deciding in favor of more powerful PMP networks that deliver both high performance and high reliability. By significantly reducing operating expenses, especially those involving installs, re-installs and maintenance, PMP networks are proving to be exceptionally cost-effective in creating and maintaining customer satisfaction and facilitating network growth and sustainability.

"FOR US IT'S A MATTER OF CONFIDENCE. WE'VE FOUND THE ADDED RELIABILITY AND PERFORMANCE WE GAIN ADDS UP TO INCREASED CUSTOMER SATISFACTION."

Bob Zakarian,
president,
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