Cambium Networks™

RELIABLE, COST-SAVING, LEASED-LINE ALTERNATIVES

for Field Area Networks

TO DELIVER ESSENTIAL SERVICES, YOU NEED RELIABLE, SECURE COMMUNICATIONS that deliver greater diversity, scalability, and capacity even as budgets tighten. Cambium Networks' fixed wireless broadband solutions provide an attractive ROI for electric utilities when replacing leased-lines for:

- Redundant backbone IP network rings
- Smart meter and distribution automation aggregation transport
- Transport for substation and distribution SCADA data
- Remote office connectivity
- Mobile WiFi connectivity in substations and operation centers

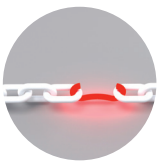
By owning and operating a wireless broadband communications infrastructure, a utility can significantly reduce business communications OPEX while tailoring the network to meet the exact needs of the business. Without the time and cost of interacting with a communications service provider, a business communications infrastructure can be deployed faster and provide higher reliability, throughput, and security.

Leased-Line Challenges

- **Escalating Costs as Bandwidth Needs Expand:** Fees for leased-line services can cost from a few hundred dollars per month for a single T1/E1 connections to thousands of dollars per month for gigabit service. As a result, many organizations that have relied on leased-lines are paying expensive lease d line charges every month with multi-year contractual commitments.

- **End of Life for 4-Wire Analog Circuits:** Telecom utilities are preparing for the end of the public switched telephone network. Service providers are dramatically raising the prices of 4-wire analog circuits that are often used to provide SCADA communications to relay tele-protection services for electric utilities. The replacement options being offered for these circuits are very expensive with high installation and ongoing service fees. Utilities have the opportunity to replace these analog circuits while they are still supported.

- **Loss of Control:** Leased-lines essentially diminish internal control by making organizations dependent on an outside party for important business functions. Many IT organizations prefer to maintain local control over their network operations. In that way, problems can be quickly diagnosed and resolved, and upgrades can be performed without having to wait for an outside party to respond.



- **Reduced Reliability:** In many instances, the reliability of leased-lines is not what it should be, especially in rural and remote areas. When a natural disaster such as an earthquake, flood, or storm hits, telephone lines are particularly vulnerable to service interruption at a time when communications are most critical.
- **High TCO:** Typically, deployment of new services or upgrades in a leased-line environment is both expensive and slow. The cost and manpower required to manage and monitor contracts and service-level agreements, including verifying billing records, can be significant.

In many cases, leased-lines are an expense not worth paying and a risk not worth taking.

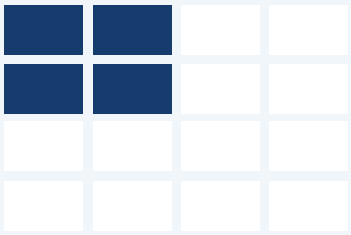
Cambium Networks Wireless Broadband – A Proven Alternative

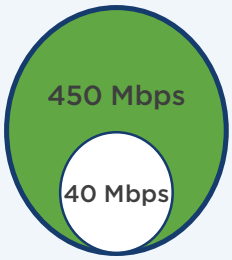
A growing number of utilities are discovering the benefits of strategically replacing leased-lines with wireless broadband communications. Point-to-Point (PTP) and Point-to-Multipoint (PMP) wireless broadband solutions from Cambium Networks are proven to deliver substantial advantages.

1. Utilities can eliminate or significantly reduce monthly lease fees.
2. Overall network performance can be upgraded for the core infrastructure ring, smart meter aggregation backhaul, and transport for substation and distribution SCADA data.
3. There is now a viable means to connect remote offices with voice, video surveillance, and data connectivity.
4. Network reliability and security is improved and under positive control.

In many networks, local-access is the most problematic point of network congestion. Wireless broadband can provide a stable, high-performance platform to ease local-access bottlenecks. Wireless also enables agile and flexible bandwidth provisioning that can be easily and quickly scaled up or down to match dynamic traffic patterns. Cambium's unique wireless technology is able to increase reliability and connect remote, hard-to-reach locations while offering exceptional quality of service.

PTP 650 WIRELESS BROADBAND TRANSPORT LINK COMPARISON





4 Month ROI | **Higher Throughput** | **Annual Savings of $7,200**

EXAMPLES OF LEASED-LINE CHARGES			
Type	Throughput (Mbps)	Typical Monthly Cost (USD)	Typical 2yr Contractual Commitment (USD)
T1 / E1 Leased-Line	1.544/2.048	$100 - $200	$2.4K-$4.8K
10 Mbps x 10 Mbps Symmetrical	100 x 100	$200 - $300	$4.8K - $7.2K
100 Mbs x 100 Mbs Symmetrical	100 x 100	$800 - $1K	$19.2K - $24K

Leased-Line Replacement ROI Model

ROI #1 - PTP LEASED-LINE REPLACEMENT*		
ROI Factor	10 Mbps x 10 Mbps Symmetrical Service	PTP 650
Max Throughput	100 x 100	Up to 450 (Mbps)
Estimated Monthly Fee	$600	$0
Installation/ Equipment Fees	$1,000	$5,000
First Year Total Cost	$8,200	$5,000
Ongoing Annual Fees	$12,000	0
4 TO 6 MONTH ROI + ANNUAL SAVINGS OF $7,200 + HIGHER THROUGHPUT		

ROI #2 - PMP 450 LEASED-LINE REPLACEMENT* (Using 1 AP and 3 SMs to replace 3 T1/E1 Lines)		
ROI Factor	3 T1 Leased-Lines	PMP 450
Max Throughput	1.5 per T1 (full duplex)	125 Mbps
Estimated Monthly Fee	$600 (3 at $200 each)	$0
Installation/ Equipment Fees	$1,050 (3 at $350 each)	$4,500
First Year Total Cost	$8,250	$4,500
Ongoing Annual Fees	$7,200	0
6 MONTH ROI + ANNUAL SAVINGS OF $7,200 + HIGHER THROUGHPUT		

**All values are in USD. Actual costs and savings may vary based on individual usage, application, environmental, and network requirements.*

Always-On Networks

No utility can afford to have communications interrupted by a network failure when a natural disaster strikes. It can take hours or even days for wired networks to be repaired. Fixed wireless broadband solutions offer the ability to plan and deploy redundant networks in a matter of days—at a cost that is a fraction of a wired backup.

Licensed and Unlicensed Spectrum

Leverage the investment in licensed spectrum where needed in populated areas, while gaining the best use of the unlicensed spectrum in rural and remote locations, to minimize total spectrum cost.

Security

Maintain system availability and minimize cyber threats with a rich set of features to encrypt the traffic, secure the management, and audit the changes in the communications network.

Rapid Deployment

A fixed wireless network can be deployed in a fraction of the time it would take to order and provision new leased-line services. And adding new services and upgrades can normally be accomplished in a day or less.

Total Cost of Ownership

Minimize the total cost of network ownership with one IP-based wireless network comprised of licensed and unlicensed backhaul and access components that can be rapidly deployed and perform reliably with minimum maintenance cost.

Wireless Broadband Solutions for Utilities:

PTP 820 Licensed Microwave Point-to-Point Link

- Up to 1.66 Gbps throughput
- All-outdoor, split-mount, or indoor solutions

PTP 650 Unlicensed Backhaul Point-to-Point Link

- Up to 450 Mbps throughput
- Up to 155 miles (250 km) range
- IP 66/67 rated

PTP 450i Licensed or Unlicensed Backhaul Point-to-Point Link

- Up to 130 Mbps throughput
- Up to 128 miles (200 km) range

PMP 450i Licensed or Unlicensed Point-to-Multipoint Access Network

- Up to 125 Mbps total throughput serving up to 200 end point locations
- Up to 25 miles (40 km) range

Cambium Networks™

Cambium Networks is a leading global provider of wireless broadband solutions that connect the unconnected. Through its extensive portfolio of reliable, scalable, and secure wireless broadband communications transport solutions managed by cloud-based software, Cambium Networks makes it possible for electric utilities to build powerful communications networks that scale to support grid communications now and into the future.

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