



Wireless Broadband Solutions

Wireless Broadband: A Versatile and Reliable Network Alternative





In a Challenging Environment, Wireless Solutions Prove their Value and Affordability

Motorola fixed wireless broadband solutions are a smart investment when balancing business needs with network performance and budget reality.

CIOs and network operators face a number of challenges. The most notable of these include developing network migration strategies that contribute to competitive advantages and addressing the ongoing—and often immediate—necessity for upgrades to current networks. Despite tighter budgets, shortened timetables and evolving technologies, astute, cost-effective investments in network infrastructure that deliver continuous connectivity and collaboration are essential.

Bottom Line Investment

Citing its own recent IT leadership survey, IDG Research Services notes that “Economic constraints call for more conscientious decision-making... improving efficiencies and reducing costs is the most important advantage survey respondents believe their companies could or will gain from continuing to deploy technology in slow economic times.” In addition, the survey reports, “A large percentage of the respondent base is investing in initiatives that impact the bottom line and promise hard returns to the business.”



Meeting the Challenge

During difficult economic cycles, the business of governments, municipalities and commercial enterprises doesn't stop; it just gets harder. Competition doesn't quit; it just gets tougher. In technology terms, networks need to deliver higher performance so people can be more productive. To positively affect the bottom line, organizations can no longer rely on the status quo. They need more efficient processes and powerful new applications. All of this requires reliable networks that deliver diversity, scalability and more bandwidth at a time when more bandwidth costs more money and budgets may be shrinking. It becomes a question of balancing the need for more network power and performance with limited resources. It becomes a matter of tapping into the power and reliability of wireless broadband.

The Versatility of Wireless Broadband

CIOs and network operators must continually optimize network performance, increase value, and extend network services to additional users while containing cost. Motorola's versatile fixed wireless broadband solutions offer a wide range of ways to cost effectively and strategically plan for the future and enable the delivery of measurable bottom line benefits. Applications include:

- Using wireless to eliminate recurring telecom leased line costs
- Extending fiber networks with wireless extensions
- Deploying a wireless backup network to ensure business continuity
- Replacing wireline with wireless, or integrating wireless into hybrid networks
- Augmenting 6 GHz microwave networks with wireless underbuild solutions



Eliminate Leased Line Cost and Inconvenience

CASE STUDY



THE ROYAL INTERNATIONAL AIR TATTOO (RIAT) MILITARY AIR SHOW

The RIAT, the world's largest military air show, faced serious communications problems at the 2008 site in Gloucestershire, UK. Communications needed to span the entire airfield, but the facility's outdated copper network did not reach across the site. Because the site was a U.S. Air Force facility, the show was unable to use the existing USAF network for security reasons, and could not install any permanent equipment. The solution? Motorola Point-to-Point and Point-to-Multipoint wireless broadband solutions. The result? Lyn Sherburne of the Royal Air Force Charitable Trust, the event sponsor, said, "The system worked brilliantly and carried an amazing amount of communications traffic while remaining unbelievably reliable."

Many organizations that rely on T1/E1 leased lines for high-speed connectivity are disenchanted with paying expensive lease charges every month. As bandwidth requirements continue to grow, many enterprises are seeing their monthly costs rise as their leased lines proliferate. T3 lines can provide bigger network pipes, but they also have limitations on how high they can scale before additional circuits are required. While these high recurring costs are one major problem with leased lines, they're not the only issue.

Other Leased Line Problems

For example, leased lines essentially lessen control by making organizations dependent on an outside third party for important business functionality. The reliability of leased lines is also often not what it should be, especially in rural and remote areas. In addition, when a natural disaster such as an earthquake, wildfire or hurricane hits, telephone lines are especially vulnerable to service interruption at a time when communications are especially critical. Finally, deployment of new services or upgrades in a leased line environment is usually both expensive and slow. In addition, the cost and manpower required to manage and monitor contracts and service level agreements—including frequent billing errors—can be significant. In the final analysis, the leasing of T1/E1 lines is fast becoming an expense not worth paying and a risk not worth taking.

Wireless Broadband — A Proven Replacement

What's the alternative? A growing number of enterprises are discovering the benefits of replacing leased T1/E1 lines with Motorola fixed wireless broadband solutions. Advantages can be substantial.

To begin with, overall network performance is upgraded, which is especially important for supporting today's in-demand real-time applications. In many networks, the most problematic point of network congestion is local access. In its 2007 report on T1/E1 upgrades and alternatives, the Gartner Group notes, "Ethernet services...will provide a stable, performance-based platform for voice over IP (VoIP) and other real-time applications by easing bottlenecks at the local access." Wireless broadband enables agile and flexible bandwidth provisioning that can be easily and quickly scaled up or down to match dynamic network traffic patterns.

Reliability is increased as well. Motorola's wireless broadband technology is able to connect remote, hard to reach locations while offering exceptional quality of service. PTP links can be easily engineered to achieve five nines reliability.

Real-Time Deployment

Other significant advantages are scalability and faster deployment. Organizations are able to deploy a fixed wireless broadband network that supports the convergent requirements of voice, video and data in a fraction of the time it would take to order and provision new leased line services. And adding new services or upgrades can often be accomplished the same day.

Cost-Efficiency and ROI

Perhaps most important of all, wireless broadband solutions can virtually eliminate expensive monthly lease costs, resulting in substantial savings. Bottom line, most organizations and operators choosing wireless broadband to replace leased line connectivity will often see ROI in less than one year.



Beyond Leased Line Replacement: When Fiber is Not an Option

CASE STUDY



SCHOOL DISTRICT SAVES \$1.7 MILLION

Thompson School District, the sixth largest in Colorado, needed to provide enhanced bandwidth and access to more than 15,000 students and teachers in 33 locations that posed significant line-of-sight challenges. With a network that used 27 Motorola 400 and 600 Series PTP Ethernet bridges, the district was able to provide more bandwidth than planned—data rates of 10 to 30 Mbps—while saving \$1.7 million over the installation of a comparable fiber network. Deployment was a full year ahead of schedule, and the district expects ROI within two years.

Extensions without Trenching

Enterprises or municipalities with fiber networks face two major challenges when expanding network capacity or extending service to additional locations. The first is financial. Expansion or extension of a wired network to add capacity or new locations is a major undertaking that carries a significant price tag because it involves trenching to accommodate

new wire lines. How expensive? Motorola estimates costs that range from about \$30,000 to \$40,000 per mile. The second issue is time. Fiber network extensions that involve major trenching efforts do not happen quickly, usually taking a number of months, and in some cases, even years.

CASE STUDY



UPGRADED CITYWIDE T1 NETWORK

The City of Santa Barbara, California, wanted to upgrade its T1 network for a number of reasons: to provide VoIP applications, to overcome significant interference, to enhance connectivity with city facilities around hilly terrain and tall buildings and to provide business continuity in the event of a natural disaster. The city deployed eight 5.8 GHz Motorola PTP 400 Ethernet bridges which upgraded performance to 22 Mbps throughput in six fire stations and 45 Mbps at the airport and other facilities. The city estimates annual savings of over \$100,000.

Beyond Leased Line Replacement: Networks on Demand

No enterprise or municipality can afford to have connectivity and access interrupted by a network failure. Yet wired networks are especially susceptible to service interruptions in times of calamity. When a natural disaster strikes, wire lines are generally among the first casualties, causing service interruption at times when connectivity is crucial. Furthermore, it can take hours or even days for wired networks to be repaired. For institutions such as healthcare organizations and schools and universities that are vital to the community, as well as for municipalities dependent on uninterrupted public safety communications, interruptions of even a few minutes are unacceptable.

Such interruptions are also often avoidable. Motorola fixed wireless broadband solutions offer organizations the ability to plan and deploy redundant networks in a matter of days... and at a cost that's a fraction of a wired backup. If a disaster hits, the organization simply performs a hot switchover, and its connectivity is restored virtually instantly. For an enterprise, business connectivity is restored and monetary loss is minimized. For a government, crucial public safety communications are restored and lives are saved. For everyone, the significant cost and unwanted consequences of downtime are eliminated or mitigated.

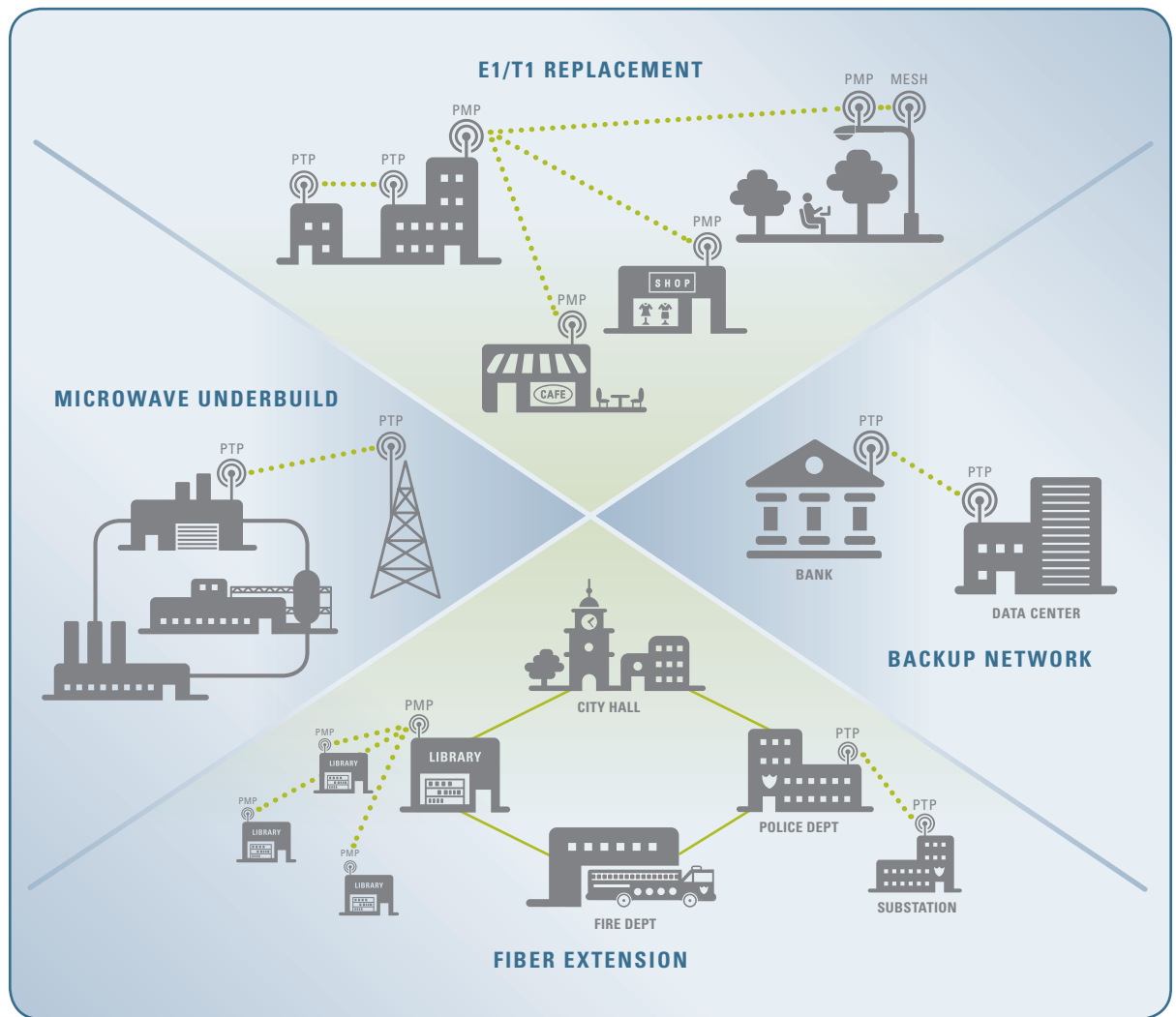
Motorola fixed wireless broadband networks offer significantly more cost-effective and faster-to-deploy solutions with comparable or, in many instances, improved performance and reliability. Motorola wireless broadband solutions can be planned and deployed in a matter of days or weeks, rather than months or years. Equally important, cost of expansion is significantly reduced: a PTP wireless Ethernet bridge for example, can normally expand capacity and extend service for under \$6,000.

CASE STUDY



6 GHz UNDERBUILD SOLUTION UPGRADES PERFORMANCE

Kansas City Power and Light needed to upgrade performance in its 6 GHz licensed microwave network to provide new functionalities at an affordable cost. The utility deployed an underbuild network utilizing 33 Motorola PTP unlicensed 5.8 GHz hops providing highly reliable service over a 200-mile network that now delivers VoIP service, video surveillance capabilities and redundancy for the utility's existing fiber and licensed microwave network. The Motorola fixed PTP wireless solutions are uniquely engineered to make a risk-free step-by-step approach possible with equipment capabilities that suit the needs of 6 GHz operators.



Motorola High Speed Wireless Broadband—A Reliable, Cost Effective Solution

A real-world example of this application was clearly evident in New Orleans, LA when Hurricane Katrina knocked out the city's wired communications network. A wireless broadband connection was quickly established to the city's temporary headquarters and, through the use of VoIP technology, supported some of the first phone calls the mayor made following the hurricane.

Affordable 6 GHz Licensed Network Expansion

Many enterprises—from transportation companies to utilities and more—rely on licensed microwave networks now in need of digital upgrades and incremental capacity to meet increasing demand for services and higher performance. These organizations face one daunting issue: cost. In most cases, the networks consist of numerous links that must

be replaced at costs of up to \$50,000 each. To make matters worse, these analog-to-digital upgrades are also both time-consuming and risky, and involve considerable network downtime. There is, however, an exceptionally cost-effective alternative.

Motorola Fixed Point-to-Point wireless broadband solutions provide an efficient and cost-effective unlicensed alternative to expensive 6 GHz link replacement. Motorola 5.4 and 5.8 GHz PTP radios can be installed in parallel with the existing microwave radios. They can be placed on the same towers and use the same antennas and cabling, providing additional capacity using existing infrastructure. Performance is upgraded substantially with little or no downtime to interrupt service, and at substantial savings.



Innovative Wireless Broadband Solutions for Today and Tomorrow

CASE STUDY



A WIRELESS ALTERNATIVE FOR AMR AND SCADA

Wisconsin Public Service is an electric and natural gas utility serving parts of Wisconsin and Michigan. To upgrade its Automated Meter Reading (AMR) and SCADA systems, the company realized it would have to pay exceptionally high costs—for example, more than \$100,000 a year in Green Bay alone—to continue leasing high-speed phone lines. The utility decided to deploy an unlicensed frequency point-to-multipoint wireless broadband solution from Motorola. The result is a more efficient and cost-effective communications network that delivers much greater bandwidth than leased lines, with interference-resistance and security that match licensed networks.

An increasing number of organizations around the world—from enterprises to municipalities—are turning to Motorola's fixed wireless broadband solutions to enhance or supplement existing satellite and cellular-based networks while controlling costs. A global leader and innovator in wireless technology, Motorola delivers wireless broadband solutions that bridge the gap between high-performance and low cost of ownership. Benefits include:

- Rapid deployment in days, not week
- Elimination of the recurring expense of leased lines
- Deployment of converged networks that support voice, video and data
- Support of organizational requirements for bandwidth-intensive applications
- Simplified co-existence with existing networks
- Provision of reliable infrastructure that enables stronger service-level agreements

Motorola is the industry's premier provider of streamlined, seamless indoor/outdoor wireless connectivity. Our products and solutions are designed to meet the requirements and challenges of organizations striving to upgrade connectivity, coverage and capacity while dealing with reduced budgets and the need for accelerated ROI.

The Motorola Wireless Broadband Portfolio

Motorola Point-to-Point Wireless Ethernet Bridges
Motorola point-to-point solutions provide maximum reliability and performance in a wide range of environments in which other technologies often experience difficulties. The PTP solutions operate in the 2.4, 2.5, 4.5, 5.2, 5.4 and 5.8 GHz frequency bands, and are proven to deliver fully digital communications with availability up to 99.999 percent. Motorola PTP solutions deliver data rates of up to 300 Mbps in high-interference, long-distance line of sight (LOS) and non-line-of-sight (NLOS) applications.

Motorola Point-to-Multipoint

Motorola point-to-multipoint solutions deliver scalable, interference-resistant, high-speed connectivity

to multiple business, institutional or municipal locations. Using frequencies in the 900 MHz, 2.4, 3.5 and 5 GHz bands, point-to-multipoint solutions provide exceptionally reliable performance as well as high power, range and bandwidth, increasing user satisfaction and optimizing ROI.

MOTOMESH™ Mesh Solutions

Bringing unprecedented mobility, Motorola's MOTOMESH wireless broadband network solutions further extend fixed wireless networks. The MOTOMESH portfolio includes MOTOMESH Duo, a solution offering 802.11 b/g connectivity plus an additional 5.8, 5.4 or 4.9 GHz radio; while MOTOMESH Solo is a single radio solution operating in the 2.4 GHz frequency band and offers Motorola's breakthrough Mobility Enabled Access (MEA) technology. Finally, MOTOMESH Quattro is a four-radio solution containing two standards-compliant WiFi radios and two of Motorola's MEA radios. One set of WiFi and MEA radios operates in the unlicensed 2.4 GHz band and the other set operates in the licensed 4.9 GHz public safety band.

Enterprise Wireless LAN

In addition to outdoor wireless broadband solutions, Motorola offers a comprehensive portfolio of wireless LAN (WLAN) infrastructure solutions designed to enable the truly wireless enterprise, including the latest 802.11n technology and meshing access points that eliminate the need for cables. The Gartner Group named Motorola as one of the three top leaders in its latest WLAN Magic Quadrant report and ABI Research named Motorola as the "Greenest WiFi Equipment Vendor."

One Point Wireless Suite

The Motorola One Point Wireless Suite is designed to speed and simplify what used to be ponderous and complex, taking the guesswork out of designing networks for optimal coverage, capacity and performance. The suite includes six powerful elements—PTP LINKPlanner, MeshPlanner, LANPlanner, Wireless Manager, RF Management System and the AirDefense Wireless Intrusion Protection System—that allow for the streamlined design, deployment and management of Motorola wireless networks from their inception through ongoing operations.

Performance Characteristics: Motorola Point-to-Point Solutions



MOTOROLA'S SUPPORT FOR GREEN IT

Motorola is active in the burgeoning Green IT movement. We provide a wide range of solutions that are environmentally friendly, ranging from lower power consumption to providing virtual network resources such as servers and storage, to consolidating network elements to our growing usage of recyclable materials in all aspects of our business. We are proactive supporters of global organizations such as The Green Grid, and are taking steps to significantly reduce our corporate carbon footprint.

FEATURES	PTP 100	PTP 200	PTP 300	PTP 500	PTP 600
Radio frequencies	2.4, 5.2, 5.4, 5.8 GHz	5.4 GHz	5.4, 5.8 GHz	5.4, 5.8 GHz	2.5, 4.5, 4.8, 4.9 5.4, 5.8, 5.9 GHz
Ethernet throughput* (maximum)	14 Mbps	21 Mbps	25 Mbps 50 Mbps < 6 mi (10 km)	105 Mbps	300 Mbps 4.9 – 125 Mbps
Latency (average round trip)	2.5 ms	5-7 ms	< 6 ms	< 6 ms	5.4 < 1 ms 5.8 < 1 ms 2.5 2-4 ms 4.5 2-4 ms 4.9 4-10 ms
LOS range (maximum with external antennas)	35 mi (56 km)	Integrated - 5 mi (8 km)	155 mi (250 km)	155 mi (250 km)	124 mi (200 km)
nLOS range (maximum with external antennas)	n/a	Integrated - 5 mi (8 km)	25 mi (40 km)	25 mi (40 km)	20 mi (32 km)
NLOS range (maximum with external antennas)	n/a	n/a	6 mi (10 km)	6 mi (10 km)	5 mi (8 km)
Channel Width	20 MHz	10 MHz	Selectable 5, 10, 15 MHz	Selectable 5, 10, 15 MHz	Selectable 5, 10, 15, 30 MHz 4.9 – Selectable 5, 10, 20 MHz
System gain (maximum with integrated antennas)	30 dB		123 dB	167 dB	5.4 – 162 dB 5.8 – 162 dB 2.5 – 154 dB 4.5 – 165.9 dB 4.9 – 165 dB
Security	56-bit DES 128-bit AES	56-bit DES 128-bit AES	Scrambling & optional 128-bit AES 256-bit AES	Scrambling & optional 128-bit AES 256-bit AES	Scrambling & optional 128-bit AES 256-bit AES
DFS	✓	✓	<i>i</i> -DFS	<i>i</i> -DFS	<i>i</i> -DFS
OFDM		✓	<i>i</i> -OFDM	<i>i</i> -OFDM	<i>i</i> -OFDM

* Data rates are dynamically variable with modulation. Due to the power restrictions imposed by U.S., Canadian and EU authorities on systems operating in the 5.4 GHz band, lower ranges will be realized with systems operating in the 5.4 GHz band within power-restricted regions. Use the Motorola PTP LINKPlanner to provide accurate link performance estimates for all systems.

Performance Characteristics: Motorola Point-to-Multipoint Solutions



MOTOROLA INNOVATION

Motorola's comprehensive portfolio of reliable and cost-effective wireless broadband solutions together with our WLAN solutions provide and extend coverage both indoors and outdoors. The Motorola Wireless Broadband portfolio offers high-speed Point-to-Point, Point-to-Multipoint, Mesh, WiFi and WiMAX networks that support data, voice and video communications, enabling a broad range of fixed and mobile applications for public and private systems. With Motorola's innovative software solutions, customers can design, deploy and manage a broadband network, maximizing uptime and reliability while lowering installation costs.

FEATURES	PMP 100	PMP 200 900 MHz	PMP 200	PMP 400	PMP 500
Radio frequencies	2.4, 5.1, 5.2, 5.4, 5.7, 5.9 GHz	900 MHz	2.4, 5.1, 5.2, 5.4, 5.7, 5.9 GHz	5.4 GHz	3.5 GHz
Signal Rate	10 Mbps	6 Mbps	20 Mbps	35 Mbps	35 Mbps
Total Aggregate Throughput*	7 Mbps	4 Mbps	14 Mbps	21 Mbps	13.5 Mbps
Latency (average round trip)	15 ms	< 15ms	5-7 ms	< 5-7 ms	<15 ms
LOS range	2.4 GHz: 5 mi (8 km) 5 GHz: 2 mi (3 km) Can be extended w/ LENS module and passive reflectors	40 mi (64 km)	2.4 GHz: 5 mi (8 km) 5 GHz: 2 mi (3 km) Can be extended w/ LENS module and passive reflectors	7 Mbps to 5 mi (8 km) 14 Mbps to 3 mi (5 km) 21 Mbps to 1.5 mi (2 km)	4.5 Mbps 40 to 100 km 9.0 Mbps 10 to 25 km 13.5 Mbps 4 to 10 km
nLOS range	n/a	3 – 4 Miles (4 – 6 km)	n/a	Range dependant on geography and conditions	Range dependant on geography and conditions
NLOS range	n/a	3 – 4 Miles (4 – 6 km)	n/a	Range dependant on geography and conditions	Range dependant on geography and conditions
Channel Width	20 MHz	8 MHz	20 MHz	10 MHz	7 MHz
Security	56-bit DES & optional 128-bit AES	56-bit DES & optional 128-bit AES	56-bit DES & optional 128-bit AES	56-bit DES & optional 128-bit AES	56-bit DES
DFS	✓	✓	✓	✓	✓
OFDM	n/a	n/a	n/a	✓	✓
MIMO	n/a	n/a	n/a	n/a	n/a
Number of SMs per AP	200	200	200	200	200
AP coverage Sector size	60°	60°	60°	90°	90°

* Data rates are dynamically variable with modulation. Due to the power restrictions imposed by U.S., Canadian and EU authorities on systems operating in the 5.4 GHz band, lower ranges will be realized with systems operating in the 5.4 GHz band within power-restricted regions.



MOTOROLA

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