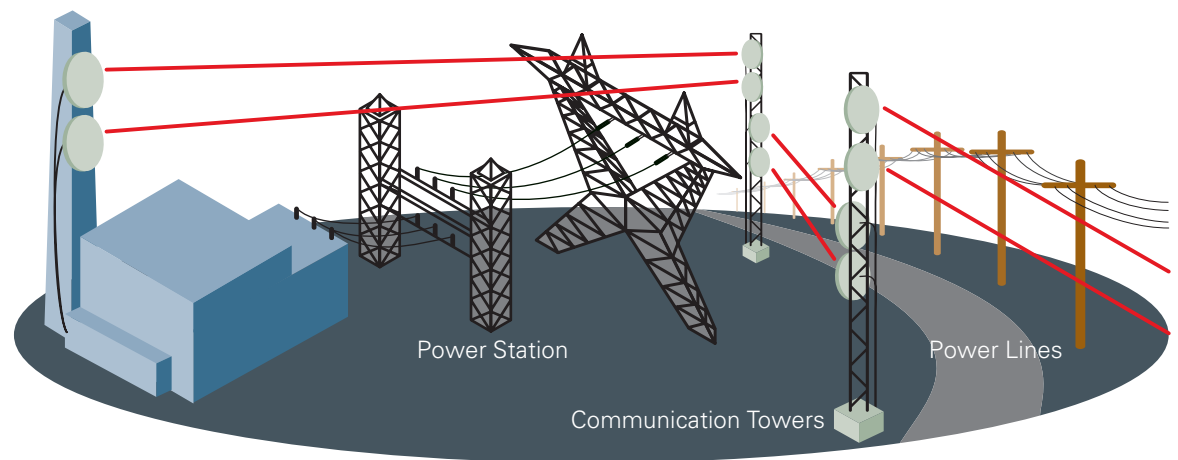




Unlicensed Broadband Wireless: A Low-Cost, Controlled Underbuild for Licensed 6 GHz

Typical Implementation



Situation: High-Risk, High-Cost Upgrades

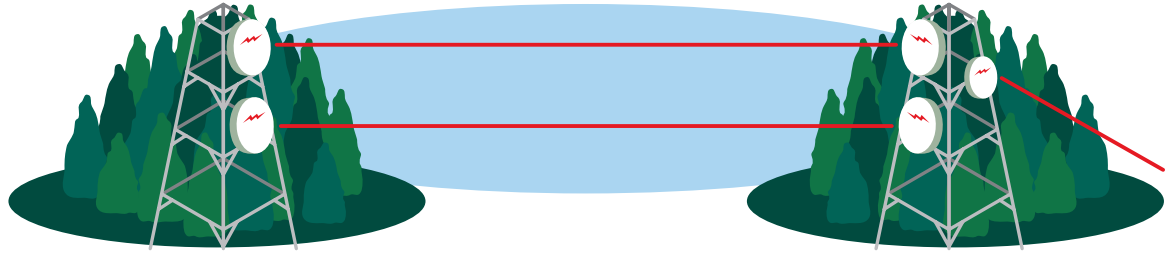
Today many transportation and utilities companies as well as large enterprises need to add digital or incremental capacity to their aging, licensed analog 6 GHz wireless networks to help them meet the increasing demand for services and maintain their huge infrastructures. These analog-to-digital upgrades are expensive, time-consuming and risky, especially when the communications carried on the network are critical to public safety and business operations.

One digital link can cost as much as US \$50,000, and each network relies on hundreds of links carrying mission-critical data along thousands of miles. The process can entail extended downtime and complex frequency coordination. Plus, the migration cannot be performed link-by-link as budgets allow, because bridging a new digital link to an old analog one is risky.

Now there is an extremely cost-effective unlicensed alternative for adding capacity and redundancy to your 6 GHz network – a 5.8 GHz point-to-point wireless Ethernet underbuild solution. Deploying a 5.8 GHz system that runs parallel to – and works with – your existing 6 GHz network can save you money, time and downtime. You can deploy the links step-by-step, as the budget permits, and test data transmission “offline” on the new network before the total switchover.

Spatial Diversity

Spatial diversity is a method of transmission or reception, or both, in which the effects of fading are minimized by the simultaneous use of two or more physically separated antennas – ideally, separated by one or more wave lengths.



Challenge: Safe, Cost-Effective Migration

The 5.8 GHz system must meet several crucial requirements to ensure a successful deployment. Because it carries data across so many miles, it should support spatial diversity to reduce fading, maximize signal strength in each direction and overcome environmental challenges – high noise levels, multipath interference and ducting over water and open terrain. It should deliver carrier-grade availability to minimize the risk of data loss and have sufficient power to carry transmissions between towers that may be great distances apart – often 40 miles (64 km) or more. Plus, it must fit within your budget and provide adequate bandwidth to support streaming video.

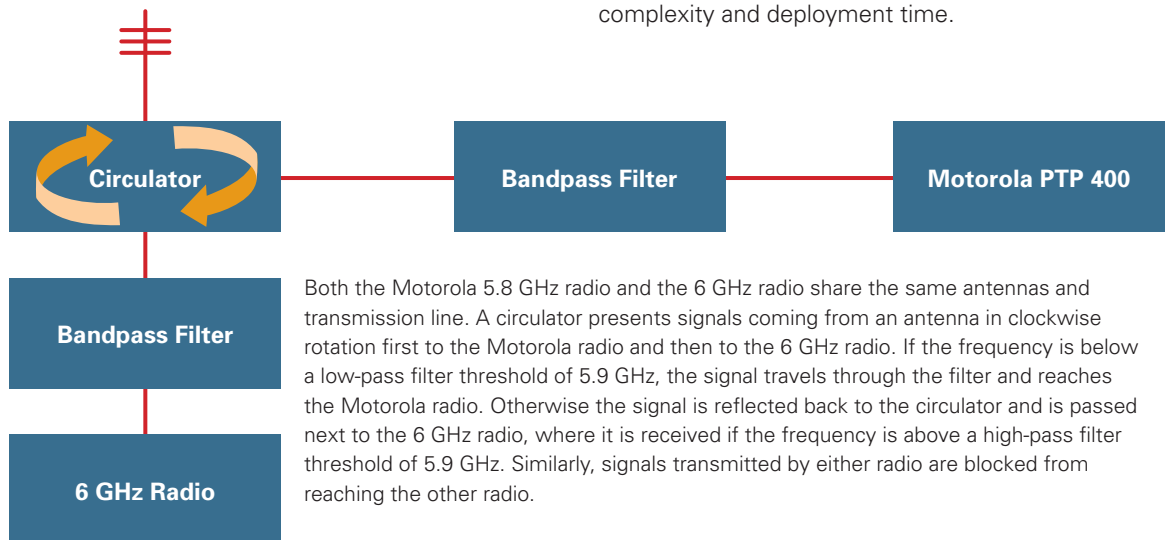
Solution: Reliability Plus Dual Transceivers

Motorola's wi4 Fixed Point-to-Point (PTP) Wireless Ethernet Bridges – PTP 400 and PTP 600 Series – offer cost-effective, fully digital communications at carrier-class reliability – up to 99.999%. The all-digital, all-IP traffic that the Motorola PTP systems support can be easily managed and dedicated to multiple users and applications to provide a seamless end-to-end network, including tunneled circuit-switched voice and data. In fact, the systems can reliably deliver all the traffic currently flowing on the 6 GHz side.

Particularly important, Motorola's PTP 400 and PTP 600 Series radios are the only solutions to offer inherent spatial diversity and dual transceivers that can "drop" easily into two-antenna deployments. Onboard software makes deployment quick and fine-tuning easy (including remote adjustments from the LAN), and built-in security features protect sensitive transmissions. In addition, Motorola PTP solutions outperform the competition, regardless of environmental requirements:

- Long-distance connectivity – traversing large expanses of open terrain and water without signal loss
- Non-line-of-sight (NLoS) or near-line-of-sight (nLoS) environments – making connections regardless of path obstructions
- Crowded hub sites – small spectral footprint for clustering more radios without increasing interference

Logistically, the Motorola PTP links can coexist on the same towers and antennas as the 6 GHz radios, and your engineers can operate them in parallel, running test data over the unlicensed portion of the network until they are satisfied it is fully production-ready. Because the Motorola PTP equipment already supports spatial diversity and has built-in connections for two antennas, only one unit is needed at each end of a link (rather than two as with the 6 GHz units). This further reduces cost, implementation complexity and deployment time.



Both the Motorola 5.8 GHz radio and the 6 GHz radio share the same antennas and transmission line. A circulator presents signals coming from an antenna in clockwise rotation first to the Motorola radio and then to the 6 GHz radio. If the frequency is below a low-pass filter threshold of 5.9 GHz, the signal travels through the filter and reaches the Motorola radio. Otherwise the signal is reflected back to the circulator and is passed next to the 6 GHz radio, where it is received if the frequency is above a high-pass filter threshold of 5.9 GHz. Similarly, signals transmitted by either radio are blocked from reaching the other radio.

Uniquely Engineered for 6 GHz Operators

With throughput rates up to 300 Mbps and latency rates as low as 0.6 ms, the Motorola wi4 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, including:

- Support for Spatial Diversity – reduces fading and maximizes signal strength
- Dual Transceiver Design – significantly increases the probability that data will get through
- *Intelligent* Dynamic Frequency Selection – continuously monitors the channel, automatically detects interference and switches to the clearest channel
- 1024-Tone OFDM Transmitters – provide greater immunity to multipath and fading
- Adaptive Modulation and Power Control – ensure maximum throughput, even as path characteristics change
- Sophisticated Web/SNMP-based network management – easily integrates into your overall network

With a Motorola PTP system to support the analog-to-digital conversion process, 6 GHz operators can utilize the licensed solutions and replace 6 GHz links over time while the Motorola PTP digital bridges operate in parallel to the 6 GHz analog network. Once the conversion is completed, the Motorola PTP solution can continue to serve as a reliable system for backup and overflow.

As the legacy microwave links on which licensed 6 GHz operators depend begin to age, the demand for manageable, affordable, and low-risk migration strategies is rising dramatically. Motorola's robust, high-performance and easily managed unlicensed digital links are the answer – especially when they fit so easily into the existing 6 GHz network infrastructure.

The Bottom Line

Organizations can see a fast return on investment – typically less than one year – due to:

- Significantly less cost to purchase and deploy equipment
- Efficient use of existing towers and antennas
- No additional cost for time or bandwidth usage
- Reduced maintenance fees by deploying 5.8 GHz links as backups
- Ability to handle all-IP voice, video and data communications

MOTOwi4™

The Motorola wi4 Fixed Point-to-Point Wireless Ethernet Bridges – PTP 400 and PTP 600 Series – are part of Motorola's MOTOwi4 portfolio of innovative wireless broadband solutions that create, complement and complete IP networks. Delivering IP coverage to virtually all spaces, the MOTOwi4 portfolio includes Fixed Broadband, WiMAX, Mesh and Broadband-over-Powerline solutions for private and public networks.

About Motorola

Motorola is known around the world for innovation and leadership in wireless and broadband communications. Inspired by our vision of seamless mobility, the people of Motorola are committed to helping you connect simply and seamlessly to the people, information, and entertainment that you want and need. We do this by designing and delivering "must have" products, "must do" experiences and powerful networks – along with a full complement of support services. A Fortune 100 company with global presence and impact, Motorola had sales of US \$42.9 billion in 2006. For more information about our company, our people and our innovations, please visit <http://www.motorola.com>.



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