

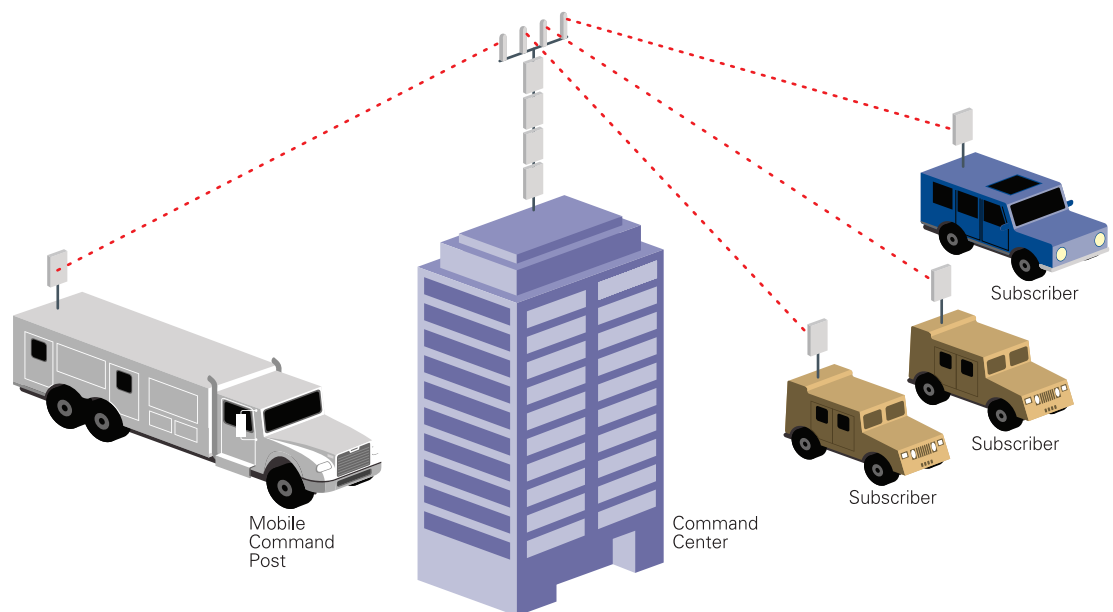

MOTOROLA WIRELESS BROADBAND

PTP 600 Wireless Ethernet Bridges

Multiple-Point-to-Point (M-PTP) Group Access: Rapid Deployment Connectivity

Typical M-PTP Application:

High-speed, point-to-point communications from a limited number of subscribers to a fixed command center and mobile command post, enabling rapidly-deployed emergency links as nomadic subscribers move from one site to another within the M-PTP network

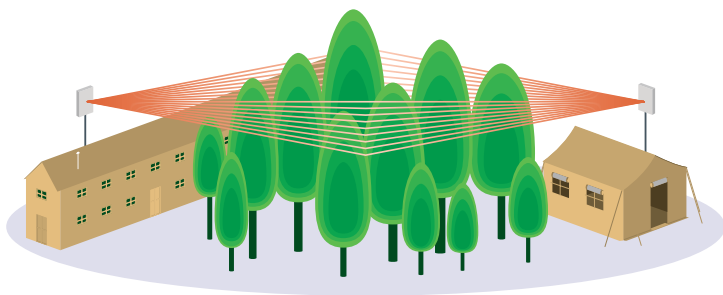


Delivering the right information to the right parties at the right time is absolutely essential to the success of any government, military, public safety or business initiative. What may seem to be a mundane task for today's technology is not as simple as it first appears. Content is always changing and growing. It's frequently in more than one repository, and multimedia (voice and video) accounts for an ever-increasing percentage of the content mix. The ongoing growth and change present challenges for the timely and efficient dissemination of information, especially when the people who need the information are on the move.

Barriers to Information Flow

Getting vital information to and from mobile workforces such as military personnel, police officers, fire fighters, public safety officials and field technicians is crucial to situational awareness, astute decision-making and prompt task completion. In certain cases, the need for broadband access may be driven by an impromptu event where connectivity is required for a short duration in a location where no fixed infrastructure exists. In other cases, personnel may be deployed in areas that present major connectivity challenges, including manmade and natural obstructions, water, desert terrain, long distances, radio-frequency interference and weather extremes. While point-to-point (PTP), point-to-multipoint (PMP) and mesh technologies all can enable communications to support mobile workforces, environmental challenges significantly reduce the number of solutions that can perform reliably in such conditions.

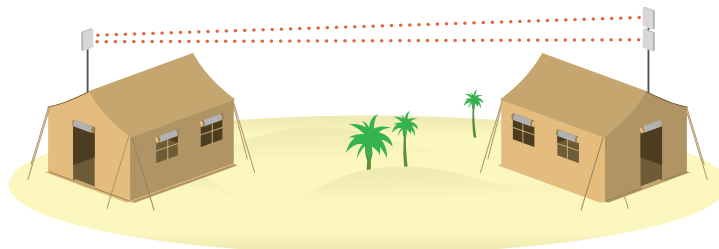
Through Trees



Around Buildings



Over Desert or Water



Hub-and-Spoke Applications

Many hub-and-spoke applications demand maximum flexibility in coverage, extended range and data throughput for both line-of-sight (LOS) and non-line-of-sight (NLOS) paths, while requiring minimal effort to deploy and connect remote sites to the hub. These requirements are typical of tactical broadband networks where hub sites must support nomadic “subscribers” who may be located anywhere within a 360° footprint. In such situations, personnel are typically using vehicles to move from one location to another as they perform various tasks.

There is a specific need for systems that can support nomadic teams where network topologies are typically hub-and-spoke and where some combination of high-throughput, long range and NLOS performance and carrier-class reliability is essential to deliver the right content, at the right time.

Typical applications:

- Nomadic communications
- On-scene access to vital information
- Disaster recovery and special events
- Persistent awareness
- Border security
- Tactical communications for military operations

Right Solution, Better Results

PTP systems offer major performance advantages for deployments in challenging radio frequency (RF) conditions. By design, directional antennas used with PTP systems provide maximum channel (transmit and receive) antenna gain as compared with wider-beam antennas. Moreover, PTP radios direct their full data-rate capacity to only one target radio. In contrast, a PMP hub radio must share its aggregate data rate across all of its subscribers.

Motorola’s PTP 600 Series Point-to-Point Wireless Ethernet Bridges are optimized for best-in-class performance. The PTP 600 radio’s highly sensitive receivers, together with high-gain transmitters, deliver a system gain that is at least 10 dB greater than other commercial-off-the-shelf (COTS) radios. This strong system gain is uniquely combined with Adaptive Modulation, 1024-point Orthogonal Frequency Division Multiplexing (OFDM) and Multiple-Input Multiple-Output (MIMO) technology to outpace comparable COTS radios in both line-of-sight (LOS) and non-line-of-sight (NLOS) applications.

Introducing Multiple-Point-to-Point (M-PTP)

PTP 600 Series solutions can be deployed in a hub-and-spoke configuration and meet the range, throughput, LOS and NLOS, reliability and rapid deployment requirements to support real-time information sharing. To specifically address the needs of nomadic applications, Motorola has taken the PTP 600 one step further by providing a PTP 600 Series Multiple-PTP Group Access solution which leverages the performance and capacity of discrete Motorola PTP links with the ease of deployment typical of traditional point-to-multipoint solutions.

M-PTP: Power with Simplicity

In its most basic configuration, a single PTP master hub radio is deployed with an omni-directional antenna and automatically associates with an authorized subscriber radio within range on any azimuth. Once the master and subscriber radios are associated, the link performs as a dedicated PTP link without having to establish and align the master radio.

Currently, three systems within the PTP 600 family of solutions offer M-PTP capabilities: PTP 45600, PTP 48600 and PTP 49600.

There can be up to four physically dedicated PTP links in an M-PTP configuration. Each physical PTP link is comprised of a PTP 600 Connectorized radio and omni-directional antenna at the hub site and, at the subscriber end, a PTP 600 radio with either an Integrated antenna or a Connectorized radio paired with a directional antenna. With Motorola's M-PTP solutions, the association between subscriber and available hub site is automatic. Field technicians need only apply power and orient the subscriber radio toward the hub site to make a connection. While deployment is greatly simplified, the PTP 600 M-PTP link will provide highly reliable, high-capacity performance even in challenging environments and severe weather conditions.

M-PTP: Group Access Enabled

Classically deployed, discrete PTP links require that master and subscriber radios are pre-matched via software configuration. *Group Access* is a new PTP 600 software-enabled feature which allows the operator to associate any subscriber radio in a defined group to any master radio in the group. This Group Access feature is particularly useful in nomadic hub-and-spoke applications as deployment tasks are reduced to powering and orienting the subscribers at the collective hub. As each hub and subscriber associate, they establish a traditional PTP 600 link, delivering traditional PTP performance.

Importance of System Gain

High system gain is a major advantage because it allows communications to go farther and faster. While M-PTP systems simplify hub deployment through the use of an omni-directional antenna with each hub radio, an omni-directional antenna will offer lower gain when compared to a directional antenna. As an example, 9 dBi is typical for a 4 GHz omni-directional antenna. This is 12 dBi less than the 21 dBi delivered by the PTP 45600's Integrated directional antenna. With an intrinsic radio system gain that is at least 10 dBi greater than other COTS radios in the 4.4 GHz band, the PTP 45600 uniquely delivers sufficient radio gain for a M-PTP configuration, making up for the 12 dBi lost by utilizing an omni-directional antenna.




Importance of TDD Synchronization

Depending on the number of subscribers that must be supported, interference between adjacent radios at the hub site is likely because multiple radios may be deployed on a single tower or rooftop. The PTP 600's TDD synchronization capability times and synchronizes all the hub radios to eliminate or greatly reduce interference between hub radios. An M-PTP hub site can support up to four simultaneous subscriber associations. If more than four subscriber associations are required in a fixed deployment, then a PMP solution may be more appropriate.

M-PTP: Expected Performance

The following table shows the range and data throughput of a PTP 45600 solution in an M-PTP configuration as compared to a PTP 45600 in a standard PTP configuration. From the subscriber's 282 Mbps data rate at one kilometer (0.62 mi), 193 Mbps at 10 kilometers (6.2 mi) or even 88 Mbps at 30 kilometers (18.6 mi), performance is unmatched by any known PMP solution in which the aggregate data rate is shared across all of the subscribers.

Motorola PTP 45600: M-PTP Throughput Compared With PTP Configuration

	Range	Fade Margin	Mean Aggregate Throughput Per Subscriber (Mbps)							
	Kilometers (miles)	For 99.9% Avail (dB)	30 MHz Channel		15 MHz Channel		10 MHz Channel		5 MHz Channel	
			M-PTP	PTP	M-PTP	PTP	M-PTP	PTP	M-PTP	PTP
PTP utilizes Integrated 21 dBi antennas at both the master and subscriber sites. M-PTP utilizes a 9 dBi omni-directional antenna at the hub and a 3-foot 30 dBi dish at the subscriber site. Link Availability:  99.999%  99.990%  99.900%	1 (0.62)	3.6	282	282	123	123	82	82	39	39
	3 (1.8)	3.6	262	282	123	123	82	82	39	39
	10 (6.2)	4.5	193	275	107	123	79	82	39	39
	30 (18.6)	5.8	88	182	63	99	48	74	29	37
	60 (37.3)	10	28	115	22	75	24	58	16	28
	90 (55.9)	14	10	55	11	49	10	39	7	21



PTP 45600, 48600, 49600:

- NATO band IV (4.4 to 5.0 GHz)
- Up to 300 Mbps
- 5, 10, 15, 20 or 30 MHz channels
- Up to 124 miles (200 km)
- High system gain
- Multiple-Input Multiple-Output (MIMO)
- 1024-pt. OFDM
- LOS and NLOS performance
- M-PTP Group Access
- TDD synchronization
- FIPS 140-2 ready
- PTP 45600 - J/F-12 approved
- PTP 45600/48600 – NTIA approved

M-PTP: Making the Right Choice

First and foremost, the PTP 600 M-PTP solution is designed to support up to four simultaneous subscribers in a network where links must be deployed rapidly and redeployed frequently. Nomadic hub-and-spoke applications that require high data rates, extended ranges and NLOS performance with the least amount of configuration and alignment efforts are a natural fit for a PTP 45600, 48600 or 49600 M-PTP system. With high system gain, high throughput, TDD synchronization and group association capability, even in challenging environments, the PTP 600's M-PTP functionality offers an excellent wireless broadband solution to enable mission-critical communications to and from personnel as they move from one operational site to another.

Link Planning

Motorola's PTP LINKPlanner allows operators to evaluate M-PTP performance for the planned coverage area based on local variables such as geography, distance, antenna height and potential hub-and-subscriber locations. While not always possible, nor required, doing so provides the operator with a general understanding of anticipated performance in the geographic area and allows them to proactively plan for appropriate antennas and operational scenarios.

Motorola Wireless Broadband

PTP 600 Series solutions are included in Motorola's comprehensive portfolio of reliable and cost-effective wireless broadband solutions that, 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, Wi-Fi 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.



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