

HUGHES
NETWORK SYSTEMS



PMP Applications - GSM, CDMA, 3G, WiFi Hotspot, and WiMax Base Station Connectivity; Basic and Broadband Services

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1.0 Executive Summary

Point to multipoint (PMP) is a broadband wireless access technology that an operator can use for a number of applications including connection of GSM, CDMA, and 3G cells, Basic Telephone services, broadband services, and even connecting WiFi or WiMax base stations. In a PMP system, there is a single point (the base station) from which multiple points (the remote terminals) access the broadband wireless capacity of the PMP base station. The ability to share a platform across so many applications ensures that invested capital is used to maximize revenues. In fact, investment in a PMP platform can generate revenue for the operator as leased lines or high-speed IP services are offered to enterprise customers.

1.1 What is the architecture of PMP?

PMP architecture takes advantage of a central base station from which one or more sectors provide broadband wireless service.

- The PMP architecture can be deployed and used much more effectively than PTP technologies. For example, there are block licenses for PMP that cover the whole city or whole country with a one-time fee, compared with link by link licensing and fees for PTP systems.
- PMP is a flexible platform that can support TDM, ATM, and IP traffic on a variety of CPE and network interfaces. Rather than building separate application-specific access networks, a single PMP platform serves multiple applications, thereby reducing the total cost of the access network.
- PMP technology can be easily redeployed to other areas as the market requirements dictate.

1.2 Why use PMP technology?

Unlike PTP systems, which are application specific (connecting sites together sequentially without regard to the type of use) PMP is not constrained in its ability to support different applications. Because PMP is a *platform for services*, the operator can actually earn *revenue* from the network:

- *Quick time to market:* Being wireless, PMP installations can occur without the need for complex preplanning or having to guess where the demand will come from or how the demand will evolve over time.
- *Convergence - One platform, many uses:* GSM, CDMA, and 3G cell sites can all use the PMP platform to connect to their respective switching centers. Multiple applications on one platform means consolidation of different access technologies and hence lower overall cost for the operator.
- *WiFi and WiMax applications:* Wireless LANs are popping up everywhere, while WiMax sites will start appearing in the near future; PMP can also carry traffic from these base stations.
- *Basic services applications:* PMP can be used to offer basic voice and Internet services.

- *Broadband services:* PMP is a broadband wireless access technology that enhances the fiber footprint of the operator. Installed in the access portion of the fiber network, strategically located PMP base stations extend the fiber footprint 3 - 5 km to either side of the fiber path, taking in many more buildings which can be served with broadband services. The operator can extend the fiber capacity to the larger coverage area to offer DSL, ISP, fractional E1, and multiple E1 services.

2.0 PMP Terms and Applications

- Access network = The portion of an Operator's network that carries the mobile, telephony, internet, and data traffic from the point of origination into the backbone (sometimes called backhaul) network for distribution and processing. PMP is the access network portion of an overall telecommunications network.
- PTP = Point to Point. When two points need to be connected, microwave transmission equipment is installed at both ends, creating a "microwave hop or link." One set of equipment is installed at each point so that two sets of equipment are needed for each hop. Two sets of licensing, site rental, and installations are required for each PTP link.
- PMP = Point to Multipoint. PMP architecture is such that a central base station or "hub" is used to communicate with multiple points. A single set of equipment is installed at the base station, which is then shared by many other points (thus the name PMP). The PMP advantage is that for n locations, only $n + 1$ sets of equipment are needed, where PTP requires $2 \times n$ sets of equipment. See **Figure 2-1**.

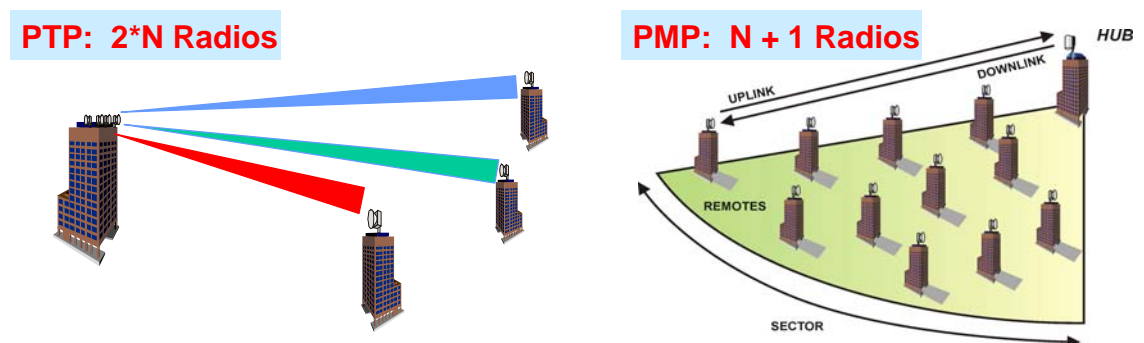


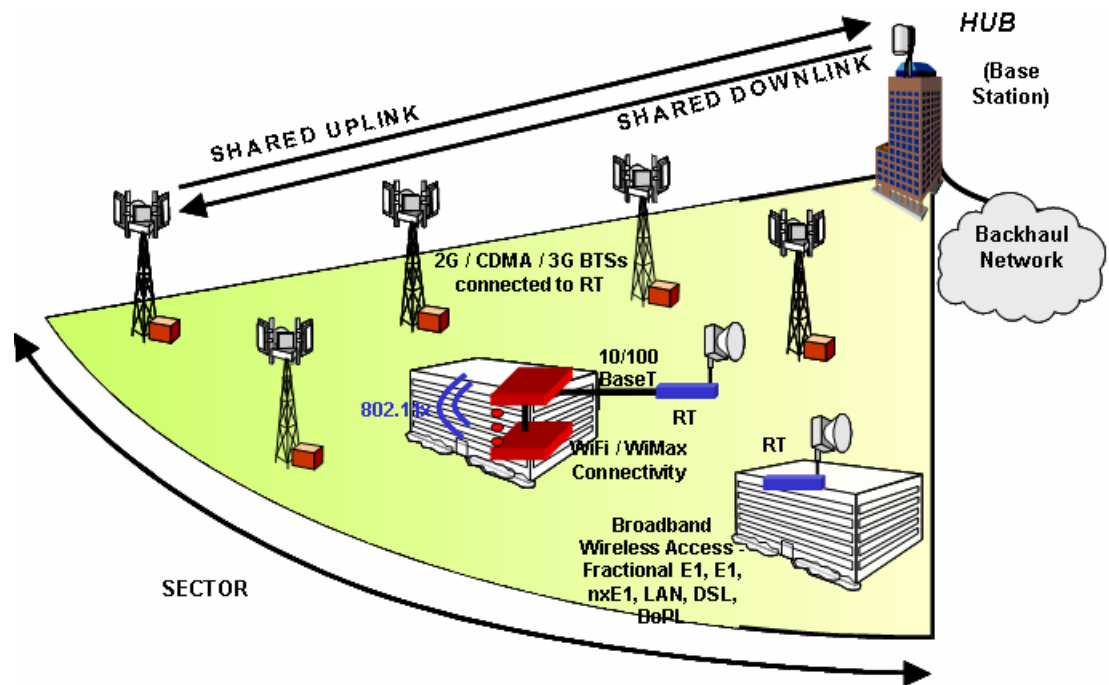
Figure 2-1. Comparing PTP and PMP Architectures

- PMP is wireless platform from which multiple services can be provided, for example: connection of GSM, CDMA, 3G cell site; connection of WiFi (high speed wireless LAN) sites; connection of WiMax base stations; basic services such as telephone, fax, and ISP; broadband services such as ATM, IP, DSL, fractional E1 and multiple E1. A PMP network consists of one or more base stations and associated Remote Terminals (RTs). The base station may have 1-, 2-, 4- or more sectors, depending on the coverage requirements. The RTs are installed at traffic originating places.
- 3G = Shorthand for the third-generation of mobile wireless equipment, it is the term applied to the new systems that unify voice and data in mobile networks. These systems offer new features including many that depend upon high-speed data transport using HSDPA (high speed downlink packet access) and HSUPA (high speed uplink packet

access). Data is the fuel driving 3G's growth. 3G technology provides a much higher capacity for moving high bandwidth traffic than its predecessors could. A fundamental feature of 3G is that the transport between the Radio Nodes (RN) and the Radio Node Controllers (RNC) is defined as packetized transport using either ATM or IP. Packetized transport offers many efficiency and cost benefits for the transport network, especially when the transport network is based on PMP wireless technology.

2.1 Convergence

Today, operators are offering mobility, mobility, ISP, basic, and broadband services. Different networks are being built to cater to different requirements and services. Now, more and more operators are offering one-stop-shop fixed-mobile services. Their networks will need to be flexible while simultaneously reducing capital investment. Operators must select and install networks that will adapt over time compared to one-of-a-kind investments that serve very limited functions. PMP technology allows operators to offer a variety of services all on the same platform. For example, an operator might use PMP to connect GSM and 3G cell sites today, he might also install and offer WiFi services; later, the operator might decide to offer WiMax, or basic and broadband services on the same PMP platform. See **Figure 2-2**.



An operator deploying PMP is ensuring that the network will be able to handle varying types of applications and services hence maximizing the use of the capital invested. Because the aforementioned services generate *revenue*, PMP becomes a *revenue source* for the operator rather than a cost element of the access network.

2.2 Broadband Networking

Operators are feverishly deploying metropolitan fiber networks to link up high traffic areas. It is unlikely that fiber will reach all the buildings in a given service area because of the cost of

digging, trenching, installation, time to deploy, etc. Hence, the footprint of a fiber network is often limited. However, PMP system that piggybacks onto a fiber network expands the fiber footprint to encompass a 3 - 5 km swath to the left and right of the fiber path. Whereas fiber reaches specific buildings along its path, PMP creates a 6 - 10 km wide swath of high-speed highway along the fiber route! See **Figure 2-3**. The enhanced footprint provided by PMP allows an operator to offer broadband services to many more buildings. And being able to offer services to more buildings means more revenue for the operator.

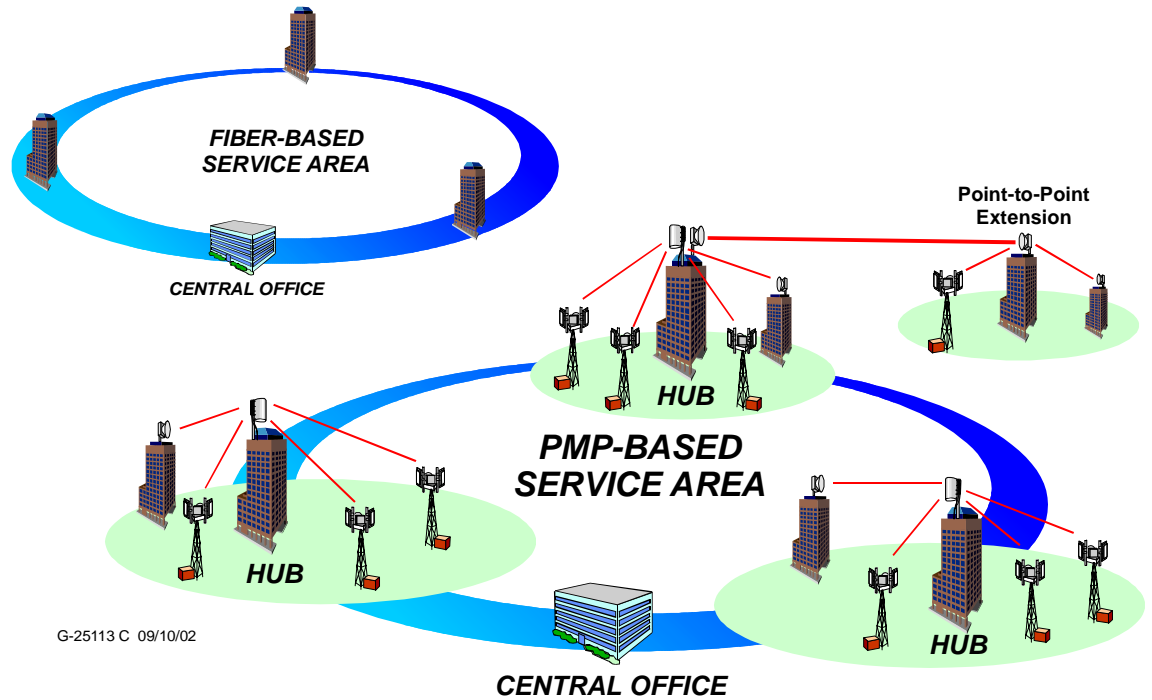


Figure 2-3 PMP Architecture Expands the Fiber Footprint

2.3 Cell Site Connectivity Using PMP

Figure 2-4 shows PMP being used to connect GSM, CDMA, and 3G cell sites. The PMP system has the appropriate interfaces to connect with each type of system. Notice that all the cell sites share the base station or “hub.” The mobile traffic comes into the base station and from there, it is sent to the Mobile Telephone Switch using high-capacity circuits.

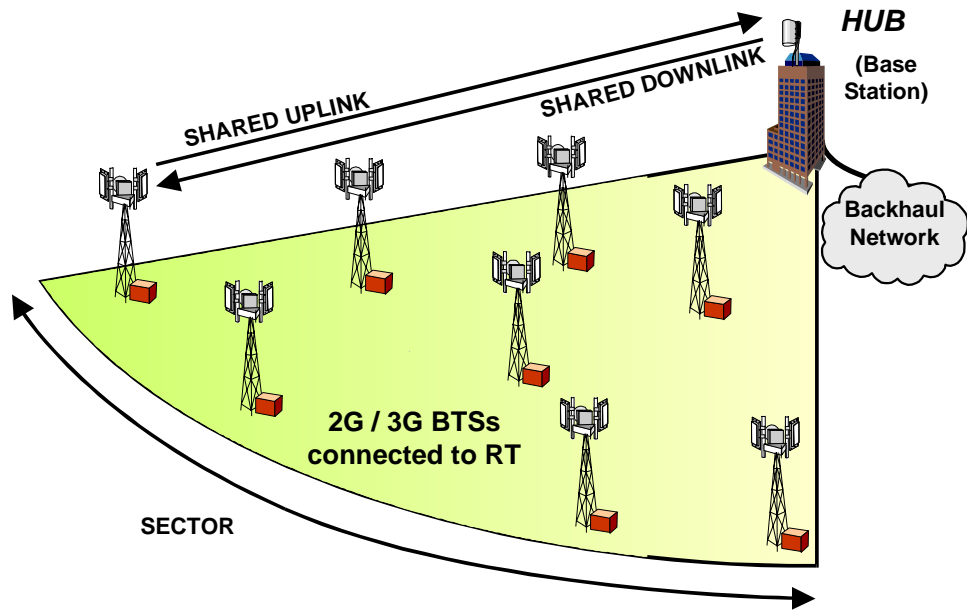


Figure 2-4. Using PMP for Cell Site Connectivity

2.4 WiFi Hotspot / WiMax Connectivity Using PMP

WiFi is the name given to broadband LAN (802.11a/b) specification that provides for high-speed Internet access. The WiFi technology enables private and public users to set up their own high-speed access points, coverage areas where access to high-speed (>10 Mbps) Internet service is made available (typically for a fee). Cafes, restaurants, hotels, airports, airplanes, lounges, convention centers, etc., all have installed such hotspots. Customers can bring their own PC with a WiFi card and can have immediate high-speed access to their corporate networks or Websites.

Recently WiMax base stations have also started to be deployed. Together, WiFi and WiMax base stations are being deployed in public locations where users tend to congregate and wish to have a high-speed connection back to their home offices or to the Internet. Such locations will be difficult to predict ahead of time; by using PMP technology, the operator can provide immediate backhaul of these base stations. **Figure 2-5** illustrates how PMP can connect wireless LAN “hotspots” and WiMax base stations into the Internet, while at the same time backhaul traditional 2G and 3G cell sites. The PMP equipment has the required LAN interface as well as the capacity to carry the IP traffic from the high-speed service areas back into the network.

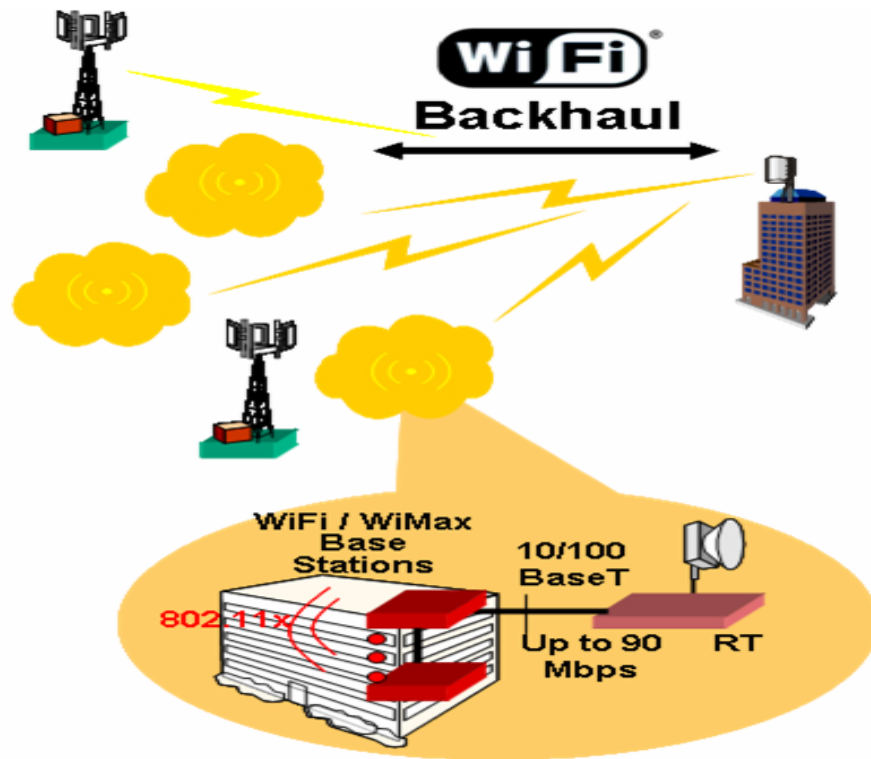


Figure 2-5. Connection of WiFi and WiMax Base Stations Using PMP

2.5 Basic and Broadband Services Using PMP

Because the PMP platform has plenty of traffic capacity and can carry various telecommunication services (E1, fractional E1, IP, ATM) another revenue earning application is to use the platform to provide basic telephone services. The operator may directly provide such services (retailer business model) or it may provide such services to an existing operator (wholesale business model).

Figure 2-6 illustrates how PMP can be used to provide Basic and Broadband Services. PMP equipment can be used to build “concentration clusters” whereby traffic from telephones, internet users, broadband users, etc., is concentrated by a multiplexer and sent over to the switching network via the PMP system. In addition to voice services, the multiplex can break out an E1 into fractional E1, which can then be allocated to business clients who may need various data capacity for Internet, DSL subscribers, private data networks, or PBX (Private Branch Exchange) use.

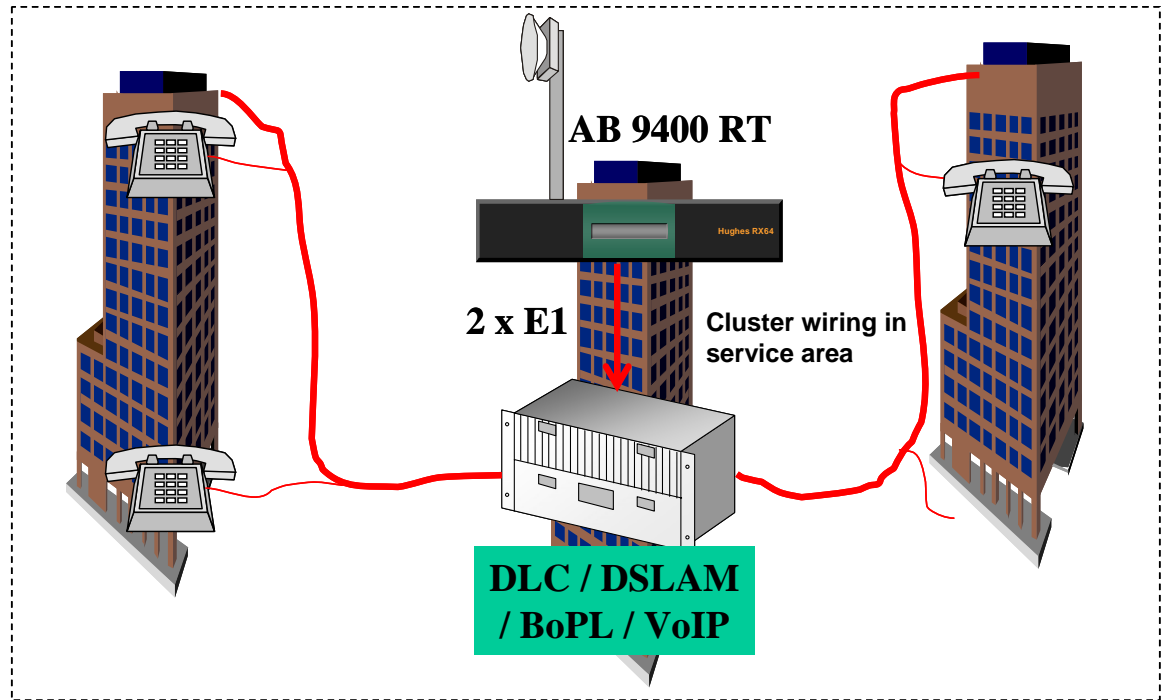


Figure 2-6. Provision of Basic and Broadband Services Using PMP

3.0 Summary

As can be seen from the examples presented here, the PMP platform is only a starting point. GSM, CDMA, and 3G mobile networks are growing at a phenomenal pace, and all those cell sites need to be connected to the Mobile Switching Center (MSC). PMP is an ideal platform to do that. WiFi hotspots and WiMax base stations are also being deployed and the numbers will continue to grow. Literally thousands of new base stations will be installed in a typical city. Most of these base station locations will not have existing infrastructure to connect the site to the Internet, presenting a lucrative opportunity for the operator. Basic and broadband services are another source of income. All of these applications and revenue making opportunities are enabled by PMP.

The bottom line is that the PMP is not a passive investment; rather, it can be a source of revenue.

Appendix - AB9000 PMP Technical Description

Figure A-1 depicts the PMP architecture. A single 90 degree sector is shown along with several RTs carrying different types of traffic: cell site connectivity, WiFi hotspot connectivity, WiMax base station backhaul, Basic services, and Broadband services. The AB9000 PMP system carries all of these applications on the same platform.

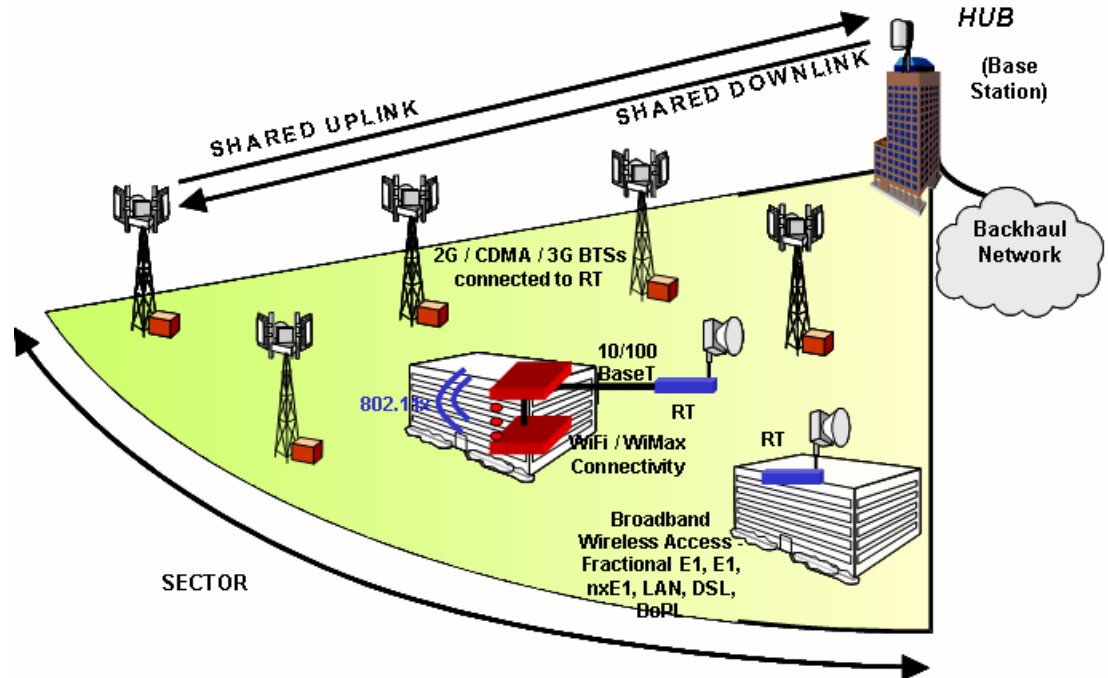


Figure A-1 AB9000 PMP Architecture and Applications

The AB9000 family of products includes the AB94000 system (which operates on QPSK and 16-QAM modulations, and uses 14 MHz RF channels) and the AB9800 system (which will use QPSK, 16-QAM, and 64-QAM modulations, and use up to 28 MHz RF channels). The AB9000 PMP system is compliant with the following specifications.

RF related:

- Frequency of operation: ETSI 26 and 28 GHz, China 26 GHz
- RF channel bandwidth: 14 MHz or 28 MHz (AB9800 product)
- Access: FDD / TDMA / TDMA
- Multi-modulation on the same RF channel using QPSK and 16-QAM on the AB9400; QPSK, 16-QAM, and 64-QAM on the AB9800
- Capacity: 14.592 Mbps (QPSK), 29.184 Mbps (16-QAM), and 92.2 Mbps (64-QAM)
- Standard 90 degree sector, with options for 180, and 360 degree sector
- PMP base station can be used with a remote antenna to make a PTP link
- Dynamic Adaptive Modulation
- Dynamic Bandwidth Allocation

Hub Interfaces:

- nxE1 (ATM and TDM)
- E3 (ATM)
- STM-1 optical (ATM)
- Up to 3x10/100BaseT
- ACU-HT (ATM concentration unit with HT) for concentration of ATM traffic from multiple sectors

RT Interfaces:

- nxE1 (ATM and TDM)
- STM-1 optical (ATM)
- Up to 3x10/100BaseT

System Services:

- End to end TDM
- Native ATM CBR
- Native ATM IMA
- Structured / unstructured CES
- Bridged LAN
- QoS for ATM and Ethernet services

Comprehensive Network Management:

- GUI based EMS running on a UNIX platform
- Provisioning and configuration management
- Fault management
- Performance management
- Security management
- Administration