Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Editorial revision of subclauses 4.1 through 4.3**
Date Submitted	**2003-01-10**
Source(s)	Nico van Waes Nokia Wireless Routers
Re:	Sponsor ballot P802.16.2a/D3
Abstract	
Purpose	Adoption
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.

Editorial revision of subclauses 4.1 through 4.3

Nico van WAes
Nokia Wireless Routers

4.1 System architecture

Fixed BWA systems often employ multipoint architectures. The term multipoint includes PMP and MP-MP. The IEEE 802.16 Working Group on Broadband Wireless Access (see Clause 2) has developed a standard containing a fully specified air interface for PMP (2-66 GHz) and MP-MP (2-11 GHz) systems. Similar standards have been developed within the HIPERACCESS and HIPERMAN working groups of ETSI Project BRAN. In addition, a number of proprietary fixed BWA systems exist for which the air interface is not standardized.

Fixed broadband wireless access systems typically include base stations (BS), subscriber stations (SS), subscriber terminal equipment, core network equipment, intercell links, repeaters, and possibly other equipment. A reference fixed BWA system diagram is provided in Figure 1. This diagram indicates the relationship between various components of a BWA system. BWA systems may be much simpler and contain only some elements of the network shown in Figure 1.[1] A fixed BWA system contains at least one BS and a number of SS units. In the figure, the wireless links are shown as zigzag lines connecting system elements.

Intercell links may use wireless, fiber, or copper facilities to interconnect two or more BS units. Intercell links may, in some cases, use in-band point to point (PTP) radios that provide a wireless backhaul capability between base stations at rates ranging from DS-3 to OC-3. Such PTP links may operate under the auspices of the PMP license.

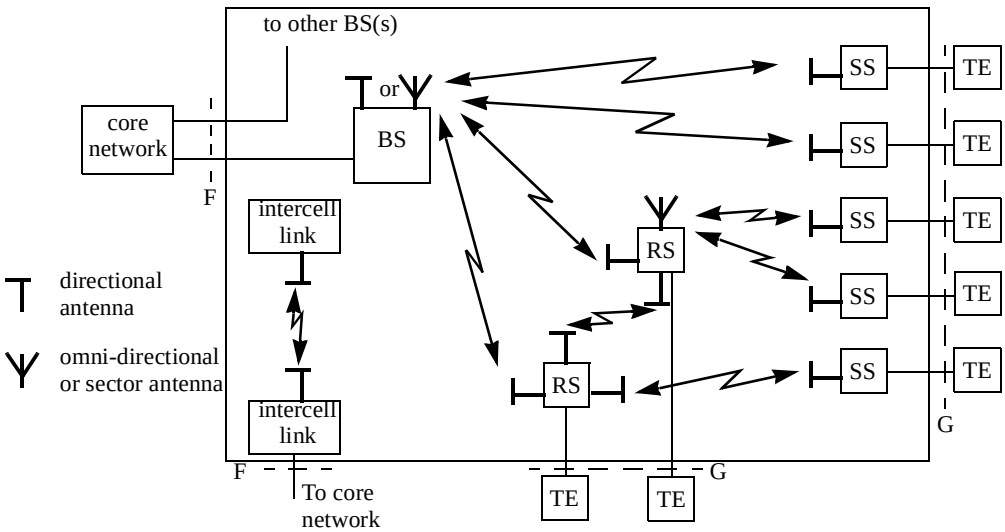

Figure 1—Reference Diagram for Fixed BWA Systems

Some systems deploy repeaters. In a PMP system, repeaters are generally used to improve coverage to locations where the BS(s) have no line of sight within their normal coverage area(s), or alternatively to extend coverage of a particular BS beyond its normal transmission range. A repeater relays information from a BS to one or a group of SSs. It may also provide a connection for a local subscriber station. A repeater may operate on the same downlink frequencies as those frequencies that it uses, facing the BS, or it may use dif-

[1]© Further use, modification, redistribution is strictly prohibited. ETSI standards are available by email to publication@etsi.fr or from http://www.etsi.org/eds/.

ferent frequencies (i.e., demodulate and remodulate the traffic on different channels). In MP-MP systems, most stations are repeaters that also provide connections for local subscribers.

The boundary of the fixed BWA network is at the interface points F and G of Figure 1. The F interfaces are points of connection to core networks and are generally standardized. The G interfaces, between subscriber stations and terminal equipment, may be either standardized or proprietary.

4.1.1 PMP systems

PMP systems comprise base stations, subscriber stations and, in some cases, repeaters. Base stations use relatively wide-beam antennas, divided into one or several sectors providing up to 360-degrees coverage with one or more antennas. To achieve complete coverage of an area, more than one base station may be required. The connection between BSs is not part of the fixed BWA network itself, being achieved by use of radio links, fiber optic cable, or equivalent means.

Links between BSs may sometimes use part of the same frequency allocation as the fixed BWA itself. Routing to the appropriate BS is a function of the core network. Subscriber stations use directional antennas, facing a BS and sharing use of the radio channel. This may be achieved by various access methods, including (orthogonal) frequency division, time division, or code division.

4.1.2 MP systems (Mesh)

Multipoint-to-multipoint (MP-MP) systems have the same functionality as PMP systems. Base stations provide connections to core networks on one side and radio connection to other stations on the other. A subscriber station may be a radio terminal or (more typically) a repeater with local traffic access. Traffic may pass via one or more repeaters to reach a subscriber.

4.1.3 Antenna subsystems

The antenna subsystems employed generally depend on the frequency band in use and the system type.

For microwave PMP SSs, the antenna subsystem is generally very highly directive, as LOS is typically required. Microwave MP-MP SSs typically employ multiple antennas of this type and employ a means for remote alignment.

For millimeter wave BSs, adaptive antenna systems may be employed to improve performance. For millimeter wave PMP SSs, the antenna subsystem is generally highly directive, though typically less so than for microwave PMP SSs as to enable near-LOS and/or NLOS operation to some extent. Millimeter wave MP-MP SSs typically use omni directional antennas.