Project	**IEEE 802.16 Mobile Multihop Relay Study Group**
Title	**Definition of terminology used in Mobile Multihop Relay**
Date Submitted	**2006-01-06**

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Re:	IEEE P802.16 MMR SG
Abstract	This contribution proposes definitions of terminologies to be used in the Mobile Multi-hop Relay project.
Purpose	Discussion
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Definition of terminology used in Mobile Multihop Relay

1 Introduction

This contribution proposes definitions that could be used to clarify discussions within the IEEE 802.16mmr Task Group. These definitions were originally proposed in [1] which was presented at IEEE 802.16 Session 40 in November 2005. The following definitions are modified slightly from those presented in [1].

2 Proposed Definitions

The following definitions are recommended for use in all Mobile Multi-hop Relay discussions and documents:

Station: Any transceiver and associated control hardware and software designed as a component of an IEEE 802.16 WirelessMAN system.

Relay Station (RS): A station whose function is to relay information between a Subscriber or Mobile station and a Base Station or between other Relay Stations or between a Relay Station and a Base Station.

Fixed Relay Station (FRS): An RS that is permanently installed station at a fixed location. An FRS is usually owned and maintained by a service provider and is most often installed by that service provider. An FRS may, however, be installed by a subscriber within that subscriber's place of business with the approval of a service provider. A connection to a power source is assumed. A backup power source may be provided. An FRS and all other relay stations are controlled by a centralized MMR controller. An FRS does not generate information of its own except for control information associated with the relay function.

Nomadic Relay Station (NRS): An RS that is not permanently installed and which therefore may be relocated from time to time. An NRS is assumed to be at a single location for periods of time at least as long as a typical subscriber session. An NRS may be owned and maintained by a service provider or by a subscriber. An NRS is typically installed by a subscriber in the subscriber's place of business or home with approval of a service provider. NRS antennas are mounted with the NRS itself (i.e. not on a separate structure). An NRS does not generate information of its own except for control information associated with the relay function. An NRS is controlled by a centralized MMR controller.

Mobile Relay Station (MRS): A fully mobile RS. An MRS is typically owned and maintained by a service provider. An MRS may be installed, for example, in a bus or train for use by subscribers in these vehicles. An MRS does not generate information of its own except for control information associated with the relay function. An MRS is controlled by a centralized MMR controller. An MRS is powered by the vehicle in which it is installed.

MMR-Subscriber or MMR-Mobile Station (MMR-SS or MMR-MS): A Subscriber or Mobile Station that has been enhanced to enable it to function as a relay. The MMR-SS or MMR-MS may be one element in a relay path between another Station and a Base Station. The entire relay path may include other MMR-SS, MMR-MS, and/or RS. The MMR-SS is owned by a subscriber and is controlled cooperatively by the subscriber and the service provider. The MMR-SS or MMR-MS is a source and sink of information in addition to functioning as a relay for other subscriber's information.

MMR-Base Station (MMR-BS): An IEEE 802.16e-2005 Base Station that has been enhanced to support Mobile Multihop Relay. An MMR-Base Station shall be fully compliant with IEEE 802.16e-2005. The MMR-BS, in addition to having all legacy IEEE 802.16e-2005 functionality, controls all relay functions in RS, MMR-SS, and MMR-MS.

Coverage Reliability: Coverage reliability for a system is the probability that a randomly located SS, MS, MMR-SS, or MMR-MS is able to achieve a specified level of service (QoS and data rate) when the system load is at a specified level. Coverage Reliability may be used as a metric for the comparison of different relay strategies.

Throughput: The rate at which user application information is transferred from source to destination. For the purpose of the MMR Task Group, throughput is the ratio of the total number of information bits in

the payload portions of a sequence of Medium Access Control Packet Data Units (MAC-PDU) to the total average time required to transfer these bits. Throughput accounts for the resources required to transmit all control, preamble, and other overhead data but does not count this information in the number of subscriber information bits transferred. Throughput may be calculated for a single link (i.e. one hop) or may be calculated for a relayed path between a SS, MS, MMR-SS, or MMR-MS and a Base Station. Throughput is measured or calculated with adaptive modulation and coding functions operational. Throughput does not account for time in transmission queues; however throughput does account for resources used for hybrid ARQ retransmissions. Therefore, throughput should be measured or calculated for a lightly loaded system. [Note that alternate definitions of throughput are possible that could take queuing delays and total latency into account.] The measure of throughput is bits per second per unit bandwidth.

System Data Capacity: The system data capacity is the maximum total average system information transfer rate that a Base Station can support while providing a specified Quality of Service to specified fraction of randomly placed users. Counted information includes only the payload portions of MAC-PDUs. Capacity accounts for the resources required to transmit all control, preamble, and other overhead data but does not count this information in the number of subscriber information bits transferred. Capacity is measured or calculated with adaptive modulation and coding functions operational. Transmissions from (or to) all user Stations directly or indirectly via RS are counted. Capacity is dependent upon the specific physical environment (e.g. buildings, foliage, terrain, and so on). The measure of capacity is bits per second per unit bandwidth per Base Station.

MMR Delay: Delay is the average time between the events of receiving one MAC-SDU at layer 2 of the transmitter and successfully receiving that MAC-SDU at the receiver. The time required to communicate ARQ acknowledgments to the transmitter is not counted. This definition includes the waiting times in the per-flow queues encountered by data prior to MAC-SDU transmission and takes into account delays associated with the ARQ process and scheduling.

Relay Enhanced SS/MS: An IEEE 802.16-2004 Subscriber Station or IEEE 802.16e-2005 Mobile Station that has been modified to function within a MMR enhanced IEEE 802.16 system. A Relay Enhanced SS/MS differs from a MMR-SS/MS in that it does not have the capability of functioning as a relay for data from other users.

Multihop Backhaul: A system architecture that is composed of one Base Station connected to wired infrastructure and multiple Base Stations without connections to the wired infrastructure. The Base Stations without wired infrastructure connections have wireless relay functionality to communicate with the Base Station that is connected to wired infrastructure. The wireless backhaul may use any viable spectrum possibly including the same spectrum used for BS to RS/MS communications.

3 References

[1] M. Asa, R. Peterson, S. Ramanchandran, D. T. Chen, N. Natarajan, ”Recommendations for the Scope and Purpose of the Mobile Multihop Relay Study Group”, document IEEE C802.16mmr-05/032, 11 November 2005.Revision History

4 Revision History

Version No.	Date	Remarks		Author
1.0	2006.01.06	Initial submission for MMR Study Group in Session 41 of IEEE 802.16		all authors