Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Clarification of Interoperability of the Secondary Management Connection.**
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Re:	IEEE 802.16g-04/04 Call for Comments on Project 802.16g Baseline Task Group Document IEEE 802.16g-04/03
Abstract	Support for the SMC (Secondary Management Connection) is mandated on BS by the packet profile in table 401. In order for use of the SMC to be interoperable, choices must be made about how this is used. Inferred requirements on the BS seem to include: • BS modems that are not routers MUST provide proxy ARP service for all managed SSs. • MUST provide IP forwarding service for all managed SSs. (No broadcast or multicast.) • Either provide DHCP service directly, or act as DHCP relay agent for all managed SSs. Since the stated purpose of the SMC is to support management (via IP), it seems that this is in scope for the 802.16g effort. In addition, it must be addressed if the 802.16f MIB is to be used by an SNMP agent.
Purpose	Need for clarification of an interoperable interpretation of how a secondary management connection should be used.
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Clarification on Interoperability of Secondary Management Connection

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Abstract

Support for the SMC (Secondary Management Connection) is mandated on BS by the packet profile in table 401. In order for the SMC to be interoperable, choices must be made about how this is used. Inferred requirements on the BS seem to include:

- BS modems that are not routers MUST provide proxy ARP service for all managed SSs.
- MUST provide IP forwarding service for all managed SSs. (No broadcast or multicast.)
- Either provide a DHCP service directly, or act as DHCP relay agent for all managed SSs.

Since the stated purpose of the SMC is to support management (via IP), it seems that this is in scope for the 802.16g effort. In addition, it must be addressed if the 802.16f MIB is to be used by an SNMP agent.

Introduction

Support for the SMC (Secondary Management Connection) is mandated by the packet profile in table 401. There is considerable ambiguity as to how a Secondary Management Connection could be implemented in a way that is interoperable.

Background

The IEEE Std. 802.16-2004 subclause 6.3.1.1 defines the SMC for managed SSs as follows:

> [T]he Secondary Management Connection is used by the BS and SS to transfer delay tolerant, standards-based [Dynamic Host Configuration Protocol (DHCP), Trivial File Transfer Protocol (TFTP), SNMP, etc.] messages. These messages are carried in IP datagrams, as specified in 5.2.6. Messages carried on the Secondary Management Connection may be packed and/or fragmented. For the SCa, OFDM, and OFDMA PHY layers, management messages shall have CRC. Use of the secondary management connection is required only for managed SS.

The Secondary Management CID (SMCID) is allocated by the BS and returned to the managed SS in the REG-RSP. As with the Basic CID (BCID) and Primary Management CID (PMCID), the SMCID identifies a pair of unidirectional connections: an uplink SMC (UL-SMC) and a downlink SMC (DL-SMC). Like transport connections, the UL-SMC and DL-SMC are used to transport CS PDUs encapsulated in the MAC SDU format. Unlike transport connections, the UL-SMC and DL-SMC are created via registration rather than DSx transaction. Therefore, the UL-SMC and DL-SMC have no explicitly configured service flow parameters apart from the optional ARQ parameters (cf. subclause 11.7.1), which may be included in REG-REQ/RSP messages to configure ARQ on the SMC.

Some of the SMC service flow parameters can be inferred. For example, the CS Specification (cf. subclause 11.13.19.1) is implied by the negotiated IP Version (cf. subclause 11.7.4) returned by the BS in the REG-RSP. If the IP Version bit #0 (IPv4) is set, then the CS Specification value must be 1 (Packet, IPv4). If the IP Version bit #1 (IPv6) is set, then the CS Specification value must be 2 (Packet, IPv6).

Other SMC service flow parameters are precisely defined by the standard. For example, we can infer from subclause 6.3.1.1 (quoted above) that the Request/Transmission Policy (cf. subclause 11.13.12) bits #3 (No Fragmentation), #4 (No Packing) and #6 (No CRC) must be clear.

Still other SMC service flow parameters are unfortunately ambiguous. For example, should we infer from the lack of PHS Rules for the SMC that the Request/Transmission Policy (cf. subclause 11.13.12) bit #4 (No PHS) must be set, and the PHSI field in the MAC SDU is therefore omitted? Or will PHS be enabled for the SMC, but the

MAC SDU always contain a zero PHSI value? The former seems the more reasonable assumption, but the standard is not clear.

Problem Statement

It should also be noted that the standard makes no provision for a broadcast DL-SMC (e.g., via well-known CID) that the BS could use to deliver secondary management messages (e.g., IP broadcast or multicast) to all managed SSs. The SMC is thus effectively a point-to-point link between BS and SS, and the following BS requirements may therefore be inferred:

1. Unless it is a router for the managed network, the BS shall provide a proxy ARP service for all managed SSs, so that the external router for the managed network can forward IP datagrams to the managed SSs.
2. Even if it is an 802.1D MAC bridge or 802.1Q VLAN bridge for user traffic, the BS shall provide an IP forwarding service for all managed SSs.
3. The BS shall either provide a DHCP service directly or else act as a DHCP relay agent for all managed SSs. (One or the other is mandatory, since DHCP requests are usually addressed to the limited broadcast IP destination address of 255.255.255.255, for which IP forwarding is disallowed. Since the SMC link is point-to-point, the BS is therefore the only possible destination for a limited broadcast from a managed SS.)

It is unclear to me whether the IEEE 802.16 WG intended the SMC to be a point-to-point link, for none of these derived requirements are mentioned in the standard. This needs clarification.

Corrigendum Change

Interestingly, the latest corrigendum draft (dated 2004-12-21) to the IEEE Std. 802.16-2004 amends subclause 6.3.1.1 as follows:

> [T]he Secondary Management Connection is used by the BS and SS to transfer delay tolerant, standards-based [Dynamic Host Configuration Protocol (DHCP), Trivial File Transfer Protocol (TFTP), SNMP, etc.] messages. These messages are carried using Ethernet convergence sublayer, as specified in 5.2.4. Messages carried on the Secondary Management Connection may be packed and/or fragmented. For the SCa, OFDM, and OFDMA PHY layers, management messages shall have CRC. Use of the secondary management connection is required only for managed SS.

Notice that the corrigendum has changed the CS Specification for the SMC from an IP Packet CS to an IP-over-802.3/Ethernet Packet CS. If this is correct, then an 802.16 MAC SDU on the SMC -- rather than encapsulating an IP datagram directly, as previously specified -- will instead encapsulate an IEEE 802.3/Ethernet PDU that in turn encapsulates an IP datagram. Of course, the 802.16 corrigendum fails to specify whether the IP datagram encapsulation shall follow the Ethernet or the 802.3/LLC/SNAP format.

It is hard to see what was gained by the added encapsulation of IP-over-802.3/Ethernet for the SMC. The SMC remains a point-to-point link between BS and managed SS, so Ethernet PDUs with a broadcast or multicast DA still cannot be forwarded to all managed SSs. The DL-SMC can be inferred from the destination IP address for unicast datagrams, so it is of no added value to include the managed SS's MAC address in the Ethernet PDU header. Also, since the SMC is not a multi-protocol link -- each SMC bears either IPv4 or IPv6 datagrams, but never both -- there is no need for a network-layer protocol discriminator like the Ethertype.

Outstanding Issues

In summary, the issues regarding the SMC are as follows:

- Should the 802.16 MAC SDU on the SMC include or exclude the PHSI field, since its value must always be zero?

- Did the IEEE 802.16 WG intend for the SMC to be a point-to-point link between BS and managed SS -- thereby placing certain added (though unstated) requirements upon the BS -- or is the absence of a broadcast DL-SMC for secondary management messages an oversight?
- What is the justification for changing the SMC's CS Specification from IP to IP-over-802.3/Ethernet, since the additional packet overhead -- namely the Ethernet PDU header -- seems to have no added benefit?

Scope

Since the stated purpose of the SMC is to support management (via IP), it seems that this is in scope for the 802.16g effort. Further, resolving these issues would be a requirement if the 802.16f MIB is to be implemented by an SNMP agent.

Conclusion

The following can be inferred as requirements and should be stated explicitly.

- BS modems that are not routers must provide a proxy ARP service for all managed SSs, so that the external router for the managed network can forward IP datagrams to the managed SSs.
- The BS must provide an IP forwarding service for all managed SSs.
- The BS shall either provide a DHCP service directly, or act as a DHCP relay agent for all managed SSs.

If it was not the intent for these to be hidden requirements (to support the secondary management connection) we would entertain suggestions as to how this should be fixed.