Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Network entry procedure for non-transparent relay station**
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Re:	Call for technical proposals 802.16j-06/027
Abstract	This contribution provides a technical proposal for the RS network entry procedure for the case of a non-transparent RS. It is based on reusing many of the stages executed in the SS network entry procedure with the only major change being the introduction of new SBC and REG TLV values to enable exchange of information about PHY & MAC features supported by the RS. It also defines how the RS switches from using the access link to using the relay link following successful registration with the MR-BS.
Purpose	For discussion and approval of inclusion of the proposed text into the P802.16j baseline document.
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Network entry procedure for non-transparent RS

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Introduction

This contribution provides a technical proposal for the network entry procedure to be followed by the MR-BS or RS and a non-transparent RS [1] to enable the non-transparent RS to enter the MR enabled network. It is basically an extension of the proposal in [2] for the case of a transparent RS. Nevertheless, the contribution is provided as a standalone proposal that can be easily merged with [2].

The proposed procedure is based on reusing as much of the procedure currently defined in the IEEE Std. 802.16 for the purpose of SS network entry.

The current IEEE Std. 802.16 SS network entry procedure is illustrated in Figure 1 for reference.

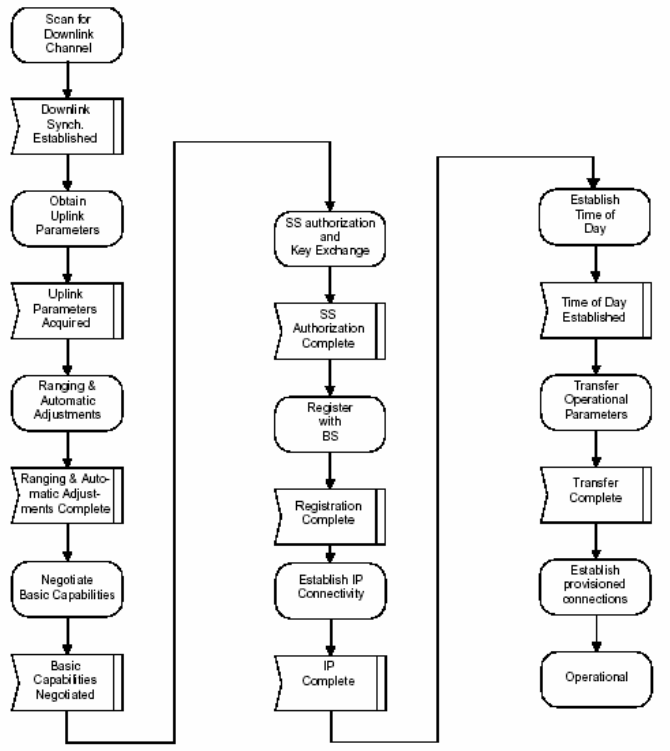

Figure 1. IEEE Std. 802.16 SS network entry procedure.

Overview of proposed procedure

It is assumed that the network could consist of some IEEE Std. 802.16 BS and some MR-BS. It is also assumed that a MR-BS may be operating in a legacy mode until it receives a request from an RS for it to enter the network. The reason the BS may operate in such a mode would be to preserve transmission resources by not

having to multicast relay specific information on the RS multicast management connection [3] when there are no relays benefiting from the transmission.

However, it is assumed that the MR-BS will at least broadcast the MAC version support TLV [4] indicating its capability to support the IEEE 802.16j MAC in the DCD message. The RS will then be able to identify that the BS is in fact an MR-BS at an early stage in the network entry procedure and decide whether to continue once it learns whether it is attempting to connect to a BS or MR-BS.

The RNG process will be unchanged from the used for SS network entry, the only change being that the RS will indicate support of IEEE 802.16j through the MAC version support TLV [4]. The MR-BS will respond indicating that it can support IEEE 802.16j.

Similarly in the SBC process, a new RS capability TLV are defined to indicate basic capabilities of the RS to the BS. This TLV will identify the type of relay (i.e. transparent, non-transparent, and whether Relay Midamble [5] is required) and also any other MR-BS or RS related features required to support the RS. This TLV is defined in this proposal. By placing it in SBC in allows the RS to abort connection if it finds that fundamental basic parameters are not supported.

In this proposal whether RS performs authorization is left FFS.

The next step where there is some modification is in the REG stage. In this case new TLVs may be signaled [6] and it is proposed that the secondary management connection is not created to the RS.

Once registered the RS network entry is essentially completed and in the case of a non-transparent RS the BS shall allocate the R-Link interval. The MR-BS will then include the MR_DL_Allocation_IE and MR_UL_Allocation_IE in the DL/UL-MAP on the access link for the RS to receive to tell it about the location of the R-Link, if not already being transmitted. The RS will then receive the DL/UL-MAP message in the same frame on the R-Link interval. After reception, of the information in the R-Link interval, the RS shall stop receiving the access link interval in subsequent frames, and when it is ready to start supporting SS connections, will transmitting its own preamble, FCH and broadcast MAC messages (as applicable) on the access link. The SS can then enter the network through the RS using the SS network entry procedure described in [7].

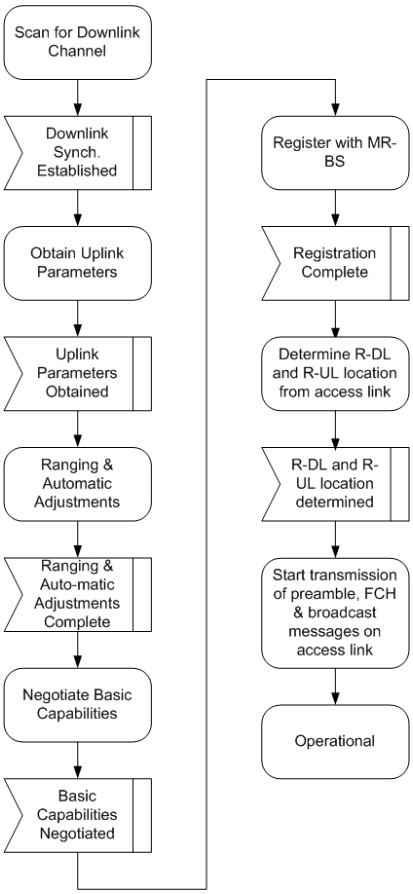

Figure 2. RS network entry procedure.

Proposed text changes

6.3.2.3.23 SS and RS Basic Capability Request (SBC-REQ) message

[Change the text in the first paragraph as indicated:]
The SS SBC-REQ shall be transmitted by the SS or RS during initialization. An SS or RS shall generate SBC-REQ messages in the form shown in Table 51.

[Insert the following text at the end of 6.3.2.3.23:]
An RS shall generate SBC-REQs including the following parameter:

> **Basic CID** *(in the MAC Header)*
> The CID in the MAC Header is the Basic CID for this RS, as assigned in the RNG-RSP message.

All other parameters are coded as TLV tuples.

Basic Capability Requests contain those RS Capabilities Encodings (11.8) that are necessary for effective communication with the RS during the remainder of the initialization protocols. Only the following parameters shall be included in the Basic Capabilities Request:

Physical Parameters Supported (see 11.8.3)
Bandwidth Allocation Support (see 11.8.1)

6.3.2.3.24 SS or RS Basic Capability Response (SBC-RSP) message

[Insert the following text before the last sentence:]

An MR-BS shall generate SBC-RSPs in the form shown in Table 52, including both of the following parameters:

CID *(in the MAC Header)*
The CID in the MAC Header is the Basic CID for this RS, as appears in the RNG-REQ message.

The following parameters shall be included in the SBC-RSP if found in the SS SBC-REQ:

Physical Parameters Supported (see 11.8.3)
Bandwidth Allocation Support (see 11.8.1)
The MR-BS response to the subset of RS capabilities present in the SBC-REQ message. The MR-BS responds to the RS capabilities to indicate whether they may be used. If the MR-BS does not recognize an RS capability, it may return this as "off" in the SBC-RSP.

Only capabilities set to "on" in the SBC-REQ may be set "on" in the SBC-RSP, as this is the handshake indicating that they have been successfully negotiated.

6.3.9 Network entry and initialization

[Change the first paragraph as indicated:]

Systems shall support the applicable procedures for entering and registering a new SS or RS or a new node to the network. All network entry procedures described hereunder through and including 6.3.9.13 apply only to PMP operation and PMP operation with MR support. The network entry procedure for Mesh operation is described in 6.3.9.14.

[Insert the following text after the second paragraph:]

The procedure for initialization of an RS shall be as shown in Figure 55. For the RS the stages e), g), h), i) and j) are not required, for all other stages the RS shall behave in the same manner as an SS during network entry unless otherwise specified in the subclauses of 6.3.9. The more detailed finite state machine representations of the individual sections (including error paths) and the timeout values shall be the same as those provided for the SS, unless otherwise specified.

In the case of a non-transparent RS, once the registration stage is complete, the MR-BS shall inform the RS of the location of the R-DL and R-UL through the MAP messages on the access link, if it is not already transmitting this information. Once the RS receives this information, within the same frame it will also receive the MAP information on the R-DL. In the next frame the RS shall stop receiving information on the access link from the MR-BS and use the R-Link interval for communications with the MR-BS. When the RS is ready to start supporting SS connections, it shall start transmitting the preamble, FCH and necessary broadcast MAC messages to enable an SS to perform network entry through the RS.

[Insert new subclause 11.8.3.8:]

11.8.3.8 MR specific parameters

[Insert new subclause 11.8.3.7.20:]

11.8.3.7.20 MR PHY feature support

[Insert the following text:]

This TLV indicates the MR PHY features supported by the RS and MR-BS.

Type	Length	Value	Scope
TBA	1	Bit #0: Transparent relaying Bit #1: Non-transparent relaying Bit #2: RM required Bit #3: Centralized scheduling Bit #4: Distributed scheduling Bits 5-7: *Reserved*	SBC-REQ SBC-RSP

[Insert new subclause 11.8.3.7.22:]

11.8.3.7.22 RS processing delay

[Insert the following text:]

This TLV indicates the DL and UL processing delay at the RS.

Type	Length	Value	Scope
TBA	1	Bit #0-3: DL processing delay (frames) Bit #4-7: UL processing delay (frames)	SBC-REQ

References

[1] Okuda, M., “Relaying methods proposal for 802.16j”, IEEE C802.16j-06/132, IEEE 802.16 meeting #46, Dallas, November 2006.
[2] Hart, M. et al., “Network entry procedure for a transparent RS”, IEEE C802.16j-06/142, IEEE 802.16 meeting #46, Dallas, November 2006.
[3] Hart, M., et al., “RS multicast management connection ID”, IEEE C802.16j-06/289, IEEE 802.16 meeting #46, Dallas, November 2006.
[4] Hart, M., “MAC version encoding TLV for .16j”, IEEE C802.16j-06/139, IEEE 802.16 meeting #46, Dallas, November 2006.
[5] Hart, M., “Relay midamble”, IEEE C802.16j-06/144, IEEE 802.16 meeting #46, Dallas, November 2006.

[6] Oleszczuk, A., “Registration messages for centralized-scheduler relay station”, IEEE C802.16j-06/152, IEEE 802.16 meeting #46, Dallas, November 2006.
[7] Okuda, M., “MS network entry for non-transparent Relay Station”, IEEE C802.16j-06/133, IEEE 802.16 meeting #46, Dallas, November 2006.