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Title	**Relay-Assisted MS Network Entry**
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Re:	This is in response to the call for proposals 80216j-06_034.pdf
Abstract	This document describes relay-assisted MS network entry procedures.
Purpose	This contribution is provided as input for the IEEE 802.16j baseline document.
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Relay-Assisted MS Network Entry

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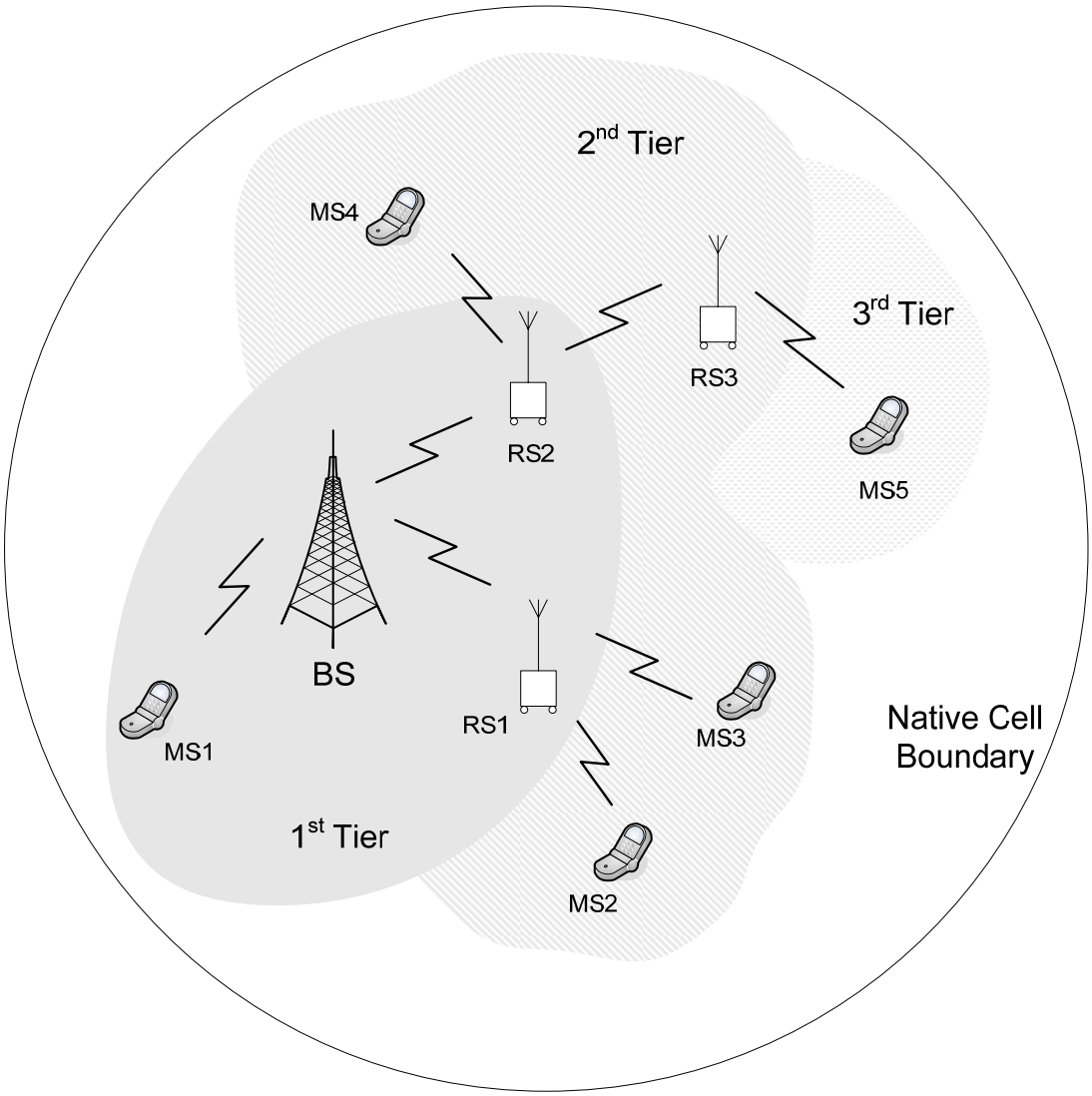
1 Introduction

Relay-enhanced 802.16 systems will allow legacy MSs to initiate network entry with the RS or BS. This scenario does not exist in the legacy standard, and hence requires modification of the MS network entry procedure. However, MS operation for the network entry procedure cannot change from the legacy standard [1] [2], according to the backward compatibility requirement [3].

This contribution proposes a method for the MS network entry procedure for 802.16 with MMR.

2 Assumptions

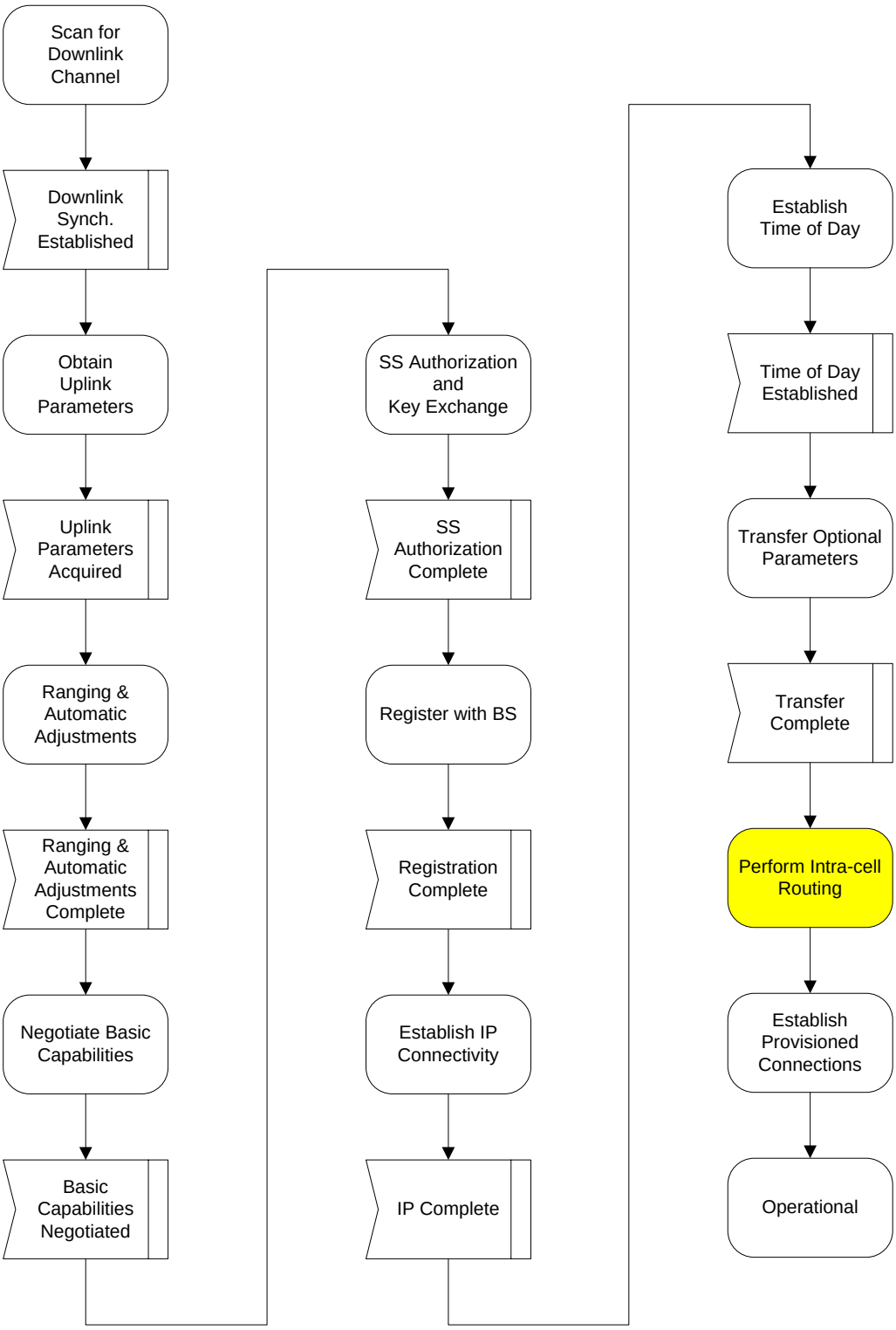


In this setup, we consider a relay setup where all relay stations (RS) and mobile stations (MS) receive control information such as preamble, FCH and MAP directly from the base station (BS). The RS may assist the BS in

transmitting data; however, the MS is not aware of this operation. In other words, the MS is not aware of the presence of relays and continues to receive or transmit packets as if they are from the BS.

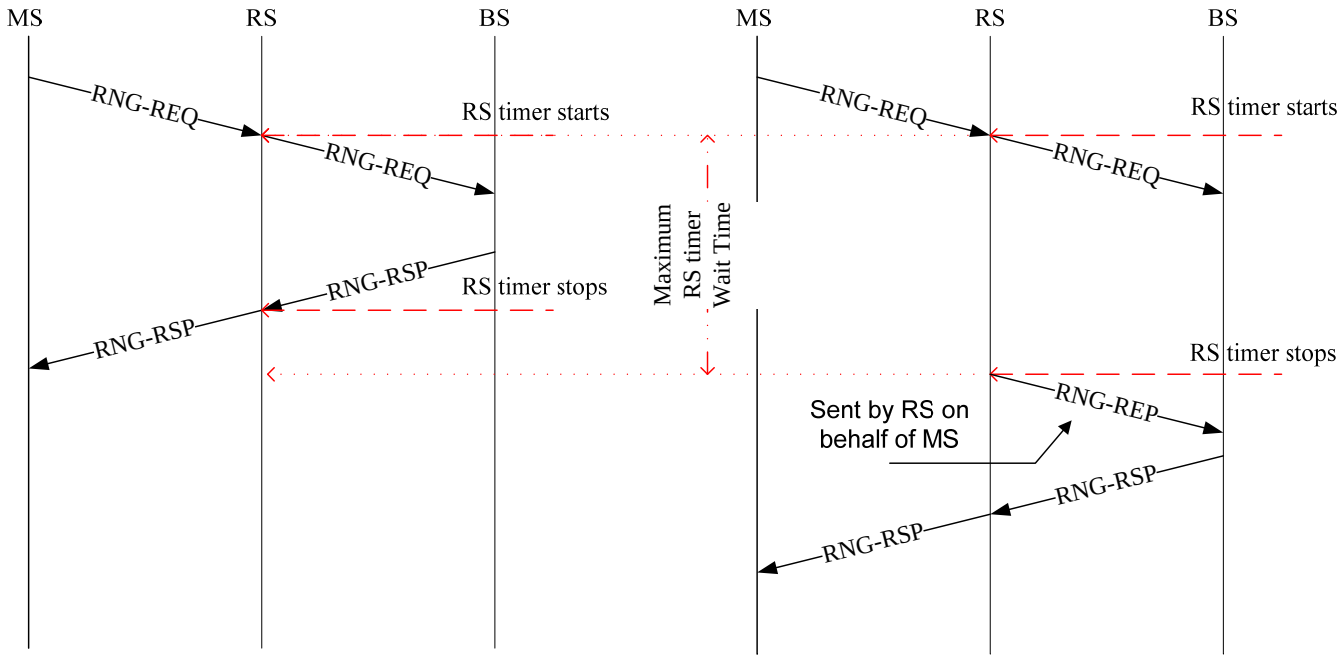
3 MS Network Entry

Given the assumption, a MS can communicate with the BS directly. Hence, it is not necessary for the RS to intervene during MS network entry, and a MS can associate itself directly to the BS in the manner specified by the legacy standard. Before the initialization procedure is complete, the BS will perform intra-cell routing in order to determine the best routing path before assigning data connections. This exact routing algorithm and distribution of route information is beyond the scope of this document.



As mentioned before, we consider the case where the RS is deployed in a BS-controlled system. Each MS starts initial ranging by sending a CDMA code on the initial ranging channel defined by the BS. The BS resorts to the characteristic of CDMA codes to perform contention resolution. After successfully resolving an initial ranging request from a SS/MS, the BS allocates an uplink bandwidth allocation for further network entry procedure. However, when the MS tries to enter the network at a disadvantageous location, e.g., being located in a coverage hole, its request can hardly be heard by the BS.

In this proposal each RS is allowed to perform contention resolution on what it receives on the initial ranging channel to the same way as the BS does. Then, the RS listens for the response from the BS. It remains silent if the request from the MS has been successfully processed. Otherwise, it relays the missing information to the BS.



a) Timer stopped by a BS response message

b) RS is triggered to relay RNG-REQ by timer overflows

Figure 1 depicts the possible time charts between BS, SS and RS. Figure 1a) illustrates the case when the timer is stopped since the BS sends the RNG-RSP; Figure 1b) illustrates the case when the RS is triggered to relay the RNG-REQ by timer overflows.

4 Proposed Text

6.3.2.3 MAC management messages

Change table 14 as indicated:

Table 14—MAC Management messages

Type	Message name	Message description	Connection
8	—RNG-REP	~~*Reserved*~~Ranging Repeat	—Initial Ranging

Insert new subclause 6.3.2.3.62:

6.3.2.3.62 Ranging repeat (RNG-REP) message

An RNG-REP shall be transmitted by the RS after the timer Txy expires (according to xxx.yyy.zzz) to assist the transmission of RNG_REQ from the MS. The format of the RNG-REP message is shown in Table 109z.

Table 109z—RNG-MSR message format

Syntax	Size	Notes
RNG-MSR_Message_Format() {		
Management Message Type=8	8 bits	
Frame Number	24 bits	
CDMA Code Index	8 bits	
Timing Adjust	32 bits	
Offset Frequency Adjust	32 bits	
Power Level Adjust	8 bits	
}		

5 References

[1] IEEE 802.16-2004, “Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems”.

[2] IEEE 802.16e-2005, “Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems, Amendment 2: Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands *and* Corrigendum 1”.

[3] IEEE C802.16j-06/050r4, “Proposed Technical Requirements for IEEE 802.16 TGj”.