

Distinct OFDMA-based Ranging Code Sets for Relay Station and Mobile Station

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:

IEEE S802.16j-06/206

Date Submitted: 2006-11-07

Source:

Kanchei (Ken) Loa, Yung-Ting Lee, Yi-Hsueh Tsai,
Chih-Chiang Hsieh, Heng-Iang Hsu, Shiann-Tsong Sheu
Institute for Information Industry
8F., No. 218, Sec. 2, Dunhua S. Rd.,
Taipei City, Taiwan

Voice: 886-2-2739-9616
Fax: 886-2-2378-2328
E-mail: loa@nmi.iii.org.tw

Hang Zhang, Mark Naden, Wen Tong, Peiying Zhu,
Derek Yu David Steer, Gamini Senarath, G.Q. Wang
Nortel
3500 Carling Avenue
Ottawa, Ontario K2H 8E9

Voice: +1 613 7631315
E-mail: WenTong@nortel.com

Venue:

IEEE 802.16 Session #46, Dallas, US

Base Document:

IEEE C802.16j-06/206 http://dot16.org/CSUpload//upload/Relay_db/C80216j-06_206.pdf

Purpose:

Propose the text regarding distinct ranging code for RS and MS

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.

IEEE 802.16 Patent Policy:

The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <<http://iee802.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://iee802.org/16/ipr/patents/notices>>.

Problems for RS & MS Using Same Ranging Code

Based on current ranging code,

1. RS and MS cannot be differentiated by MR-BS

- *Until capability negotiation phase for network entry & handover*
- *Overhead (radio parameters adjustment, CID allocation) will be introduced when a RS joins an MR network by trial and error approach*

2. RS cannot avoid collisions with MS

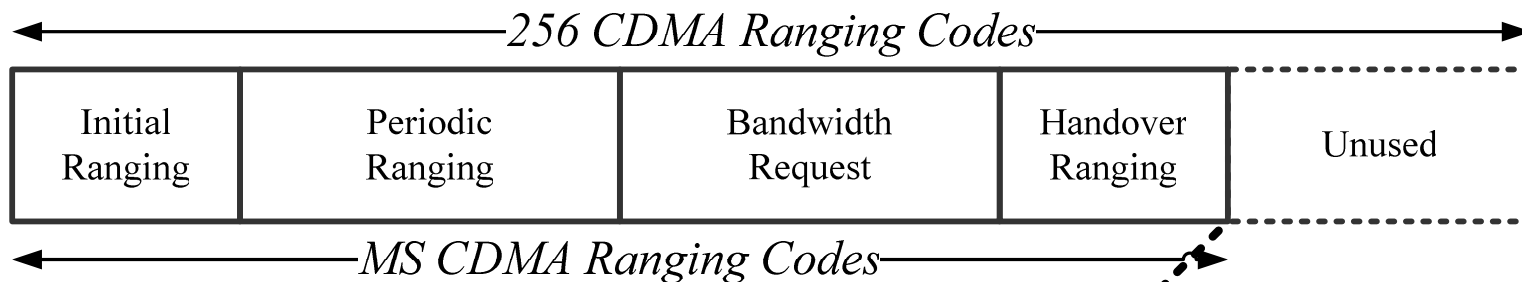
- *Number of RS \ll Number of MS*
- *RS should play more important operating role than MS especially for initial ranging, periodic ranging, handover ranging, and bandwidth request*

Requirements for RS Ranging Code

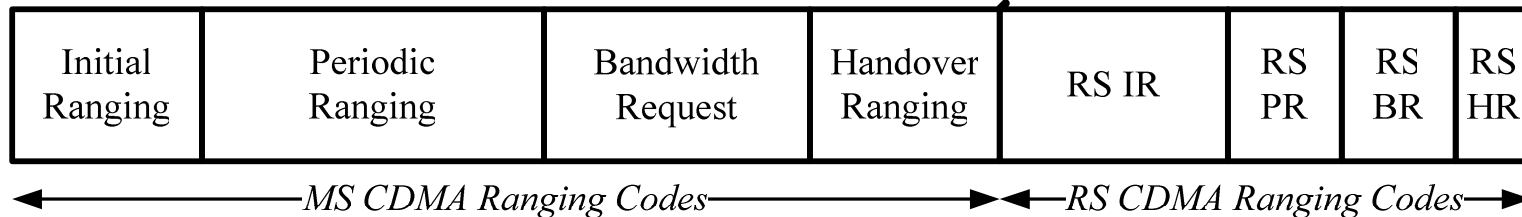
1. Ranging codes shall be defined for RS initial/periodic/handover ranging and bandwidth request functionalities
2. MR-BS should be able to differentiate RS and MS by ranging codes
3. Collisions between RS and MS should be avoided

Proposed Ranging Code Sets

Original Ranging Code Sets



Proposed Ranging Code Sets



- 4 new ranging code sets, namely **RS IR (Initial Ranging)**; **RS PR (Periodic Ranging)**; **RS BR (Bandwidth Request)**; **RS HR (Handover Ranging)** are defined for RS
- The allocation of the 8 ranging code sets is determined by MR-BS

Key Points & Benefits

- We propose to define *distinct code sets* for RS and MS, respectively
 - *The MS code sets are used in the access links*
 - *The RS code sets are used in the relay links*
- By using distinct code sets for RS and MS, the MR-BS can apply *different policies* at the *earliest stage* regarding network entry, handover, and bandwidth request

Backup

Background

- In IEEE 802.16 specifications, there are 256 CDMA ranging codes defined, which are partitioned into 4 code sets for *initial ranging*, *periodic ranging*, *bandwidth request*, and *handover ranging*, respectively.
- A BS broadcasts the information of used codes in the UCD message. Among the used codes, an MS, in general, randomly selects one ranging code for ranging or bandwidth request.

Design Alternatives

- Use dedicated ranging region
 - *Inefficient radio resource utilization due to it has to allocate dedicated resources*
- Use distinct CDMA ranging code sets for RS and MS
 - *Better radio resource utilization with minimized overheads*

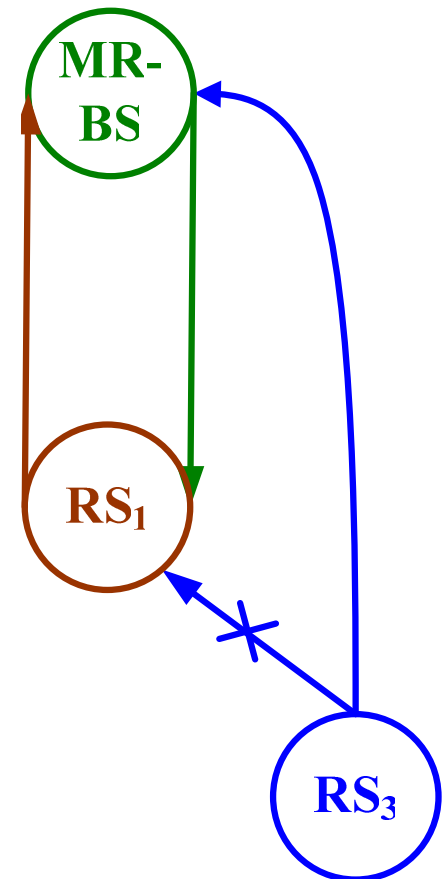
Advantages of Using RS Initial Ranging Code Sets

- MR-BS can differentiate RS from MS in the initial ranging phase of network entry
- MR network topology establishment can be achieved before using routing protocol when RS uses distinct ranging code set from the MS
 - *MR-BS could configure one RS to be the endpoint of a relay path by setting the RS to ignore any request with RS initial ranging code*
 - *MR-BS could apply alternative topology control policy to RS initial ranging code*
- RS IR could be almost collision-free for fixed & nomadic RS

Advantages of Using RS Initial Ranging Code Sets

(Example: RS cannot join a 2-hop MR network via RS)

- RS3 cannot join the MR network via RS1 due to policy restrictions (hot count limit, RS limited capability, ... etc)
- There are two possible ways for RS3 joining the MR network
 - *RS3 could ramp up its transmission power of initial ranging (IR) until MR-BS can decode the initial ranging message correctly, and alternatively*
 - *RS1 could forward the IR message to MR-BS and MR-BS tells RS3 how to adjust radio parameters so that the RS3 can do initial ranging with MR-BS directly.*



Advantages of Using Distinct RS Ranging Code Sets

- **Using RS Handover Ranging Code Sets**
 - *Similar to the advantages of using RS initial ranging code sets*
 - *MR-BS could apply different policies for RS handover and MS handover*
- **Using RS Periodic Ranging Code Sets**
 - *MR-BS could apply different response policies to RS periodic ranging and MS periodic ranging*
- **Using RS Bandwidth Request Ranging Code Sets**
 - *MR-BS could apply different response policies to RS bandwidth request and MS bandwidth request*