

Proposal For Requirement that RS Transmit Preamble

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:

C80216j-06_057

Date Submitted:

2006-06-30

Source:

Jaroslav Sydir, Wendy C. Wong, Hyunjeong Lee, Kerstin Johnsson

Intel Corporation

2200 Mission College Blvd.

Santa Clara, CA 95025

Voice:

+1 408 765 2212

E-mail:

jerry.sydir@intel.com

Venue:

Session 44 San Diego

Purpose:

This contribution is submitted in response to the call for contributions for technical requirements. The purpose of this contribution is to present the arguments for requiring that RSs transmit preambles.

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://ieee802.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://ieee802.org/16/ipr/patents/notices>>.

Overview

- There have been contributions that propose the following scheme:
 - MMR-BS broadcasts preamble, FCH, DL-MAP, UL-MAP, UCD and DCD. (MS receives preamble from MMR-BS)
 - RS does not transmit preamble or broadcast data.
 - Unicast data is relayed by the RS (MS receives unicast data from RS)
- We have the following concerns regarding this scheme:
 - It is not strictly backwards compatible, i.e. it will not work with all 802.16e-2005 compliant MSs.
 - This usage will lead to decreased system capacity.

Backwards Compatibility

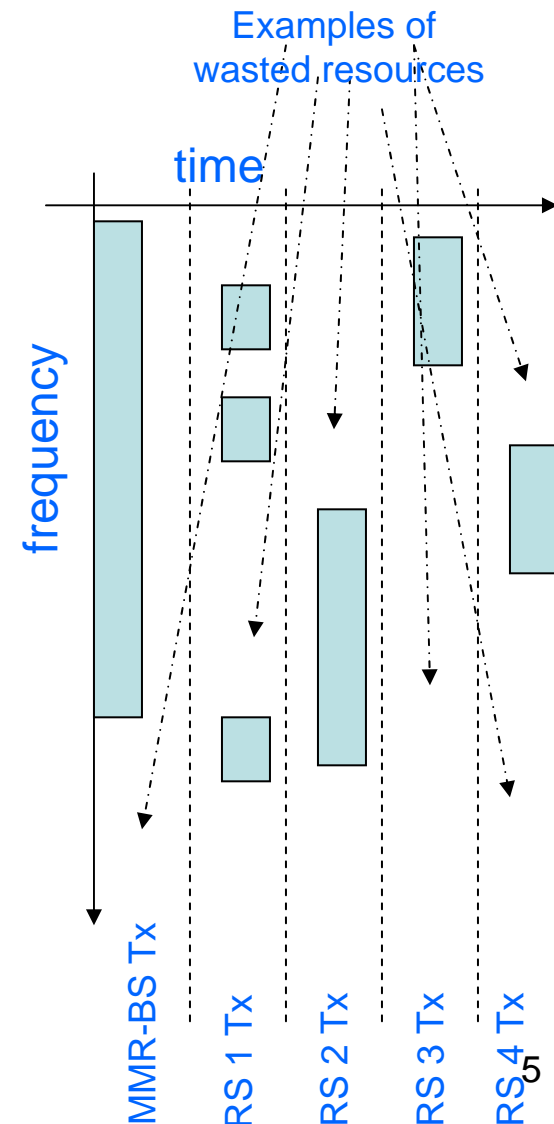
- The 802.16e-2005 spec does not specify that the preamble cannot be used for channel estimation.
- The 802.16e-2005 spec does not specify that MSs must support high speed mobility.
- Standards compliant implementations can use the preamble for:
 - Channel estimation mechanism;
 - Link adaptation mechanism;
- A standards compliant implementation that achieves a given level of performance in an 802.16e network (and uses the preamble for channel estimation) will perform significantly worse in an 802.16j network when the RS does not transmit a preamble.

System Capacity Limitations

- Pilot distribution in the downlink is not designed for multiple transmitters in a symbol.
- Larger cyclic prefix (CP) will need to be used to cover time synchronization errors.

Downlink Pilot distribution mechanism

- Downlink pilots are allocated before subchannels are allocated from remaining available subcarriers.
- No mechanism to separate pilots during simultaneous MMR-BS/RS transmissions so that
 - MMR-BS transmits some pilots;
 - RS transmits other pilots.
- No mechanism to associate pilots with subchannels.
- One option is to have all MMR-BSs and RSs transmit in complete symbols at different times in TDM fashion:
 - This is inefficient – system capacity will decrease
- Another option is to have multiple RSs transmit pilots simultaneously:
 - This will create interference depending how far apart the RSs are!
 - MS/SS cannot be changed and won't be able to distinguish one set of pilots from the other.



Cyclic Prefix Length

- In current systems CP is designed to cover maximum multi-path delay spread.
- When RS does not transmit preamble, the MS synchronizes with the MMR-BS and is unaware of the RS.
- Distance to the RS is different, so a timing error is introduced.
- This error is in addition to the multi-path delay spread, so the length of the CP will have to be increased to cover both delay spread and the additional timing error
- CP length of $1/8$ is commonly used. Going to $1/4$ results in a large drop in capacity.

Recommendation

- ❖ We recommend that the RS be required to transmit a preamble when it participates in downlink data transmissions.