# Ieee802.16 Revision

## Overview

1. The last two amendments in ieee802.16t included MAC and PHY layer channels needed to support narrower bandwidth channels:
   1. Ieee802.16s – channel bandwidth between 100 kHz and 1.25 MHz
   2. Ieee802.16t – channel bandwidth down to 5 KHz.
2. The highlights of these amendments are:
   1. Reduced PHY and MAC layer overhead for good frequency utilization in narrow channels.
   2. PAPR reduction when multipath is not a concern.
   3. The ability to aggregate non-adjacent channels for easy migration in legacy networks. This requires reliance on digital filtering alone for good ACR and ACLR performance.
   4. The addition of a connectionless Direct Peer to Peer (DPP) mode of operation.
3. Here are couple of topics which should be addressed in a revision to the standard:
   1. Various aspects of the baseline ieee802.16 standard were assumed to be applicable to ieee802.16s/t but this was not thoroughly verified. One example is support for mobility and seamless handover.
   2. As new applications are emerging for the new standard, the need for adjustments or new mode of operations emerges. For example, very short payloads application results in very poor frequency utilization and relatively high latency.
   3. Support of non- adjacent channels aggregation requires effective filtering technique meeting the ACLR requirements on transmit and good ACR performance in receive in each individual active channel. While such techniques are available, new techniques offering better performance will make deployment easier.

## Adjustment of certain procedures of the legacy ieee802.16

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## Mobility & Seamless Hanover

1. Legacy Ieee802.16 defines a procedure and messages for seamless handover of a remote from one BS to another. The procedure involves the establishment of a second connection to a new BS before the remote is disconnected from the previous BS.
2. The bandwidth available in a narrow channel may not be sufficient to support the legacy handover procedure in a timely manner in a high-speed mobility scenario.
3. The ieee802.16t DPP mode is connectionless and as such, mobility should be addressed using a different procedure than the connection-oriented ieee802.16t PtMP mode.
4. Note that the full solution for mobility requires the addition of a central mobility management server which is not specified by ieee802.16 (such an entity referred to as ASN-GW, was specified by the WiMAX forum).

## MIMO, Beam Forming, and other Smart Antenna Technologies

1. Ieee802.16 legacy smart antenna procedures, may consume more bandwidth than can be afforded in narrow channels.

## Application for ieee802.16s & t

1. Here is a list of candidate applications for ieee802.16t:
   1. Low throughput short message applications. The total throughput may still be high relative to the channel bandwidth because of the number of devices/applications running concurrently on the same channel. Due to the length of the message, the ieee802.16 MAC overhead becomes significant, and the frequency utilization becomes low. Concatenation of multiple payloads in one frame may not be allowed if the application is time-critical.
   2. Like the above but used with DPP.
   3. PTT voice application:
      1. Low rate compressed digital voice, e.g., AMBE+2 at rate 2,450 bps with 20 ms voice packets, 49 voice bits per packet.
      2. Multiple multicast groups. In each group, only one participant can transmit at one time while all the rest are in listening mode.
      3. A participant can only transmit in a multicast group if the group is idle. Switch of the PTT button triggers the activation of the multicast group.
      4. Functional equivalent PTT and Squelch signals are used to control the operation of the multicast group.
   4. Improved fading mitigation with frequency diversity needs to be studied.
   5. Relay security aspects need to be studied.
   6. Further study of a high order of repetition and impact on the preamble length.