

Proposed Harmonization on IEEE 802.16m Frame Structure for Legacy Support

Document Number: IEEE C802.16m-08/251

Date Submitted: 2008-03-17

Source:

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Re: Call for Comments on C802.16m-08/118r1: 'Proposed 802.16m Frame Structure Baseline Content Suitable for Use in the 802.16m SDD'

Abstract: This contribution proposes the flexible hybrid superframe structure as a possible harmonized solution for a few different proposals as submitted to the January meeting, and summarized in C802.16m-08/118r1.pdf.

Purpose: To be discussed and adopted into the next revision of C802.16m-08/118r2, and the frame structure section of 802.16m SDD.

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March 17, 2008

Background

- Various proposals on frame structures have been summarized by the Frame Structure Rapporteur Chairs in C802.16m-08/118r1
- For legacy support frame structure, two alternatives are proposed for UL partition between legacy and 16m:
 - Time-Division Multiplexing (TDM)
 - Merits: New design of channelization and resource controls for 16m possible
 - Drawbacks: Reduced transmission time may result in reduced uplink coverage for legacy mobiles (MS)
 - Frequency-Division Multiplexing (FDM)
 - Merits: Similar uplink coverage can be maintained for legacy users
 - Drawbacks: Impose constraints on channelization and resource controls for 16m
- Some of the proposals support multiple switching points between downlink and uplink subframes per frame
 - Possible reduction of latency in re-transmission
 - Issues: may not be necessary due to the receiver processing delay in the practical implementation as of today

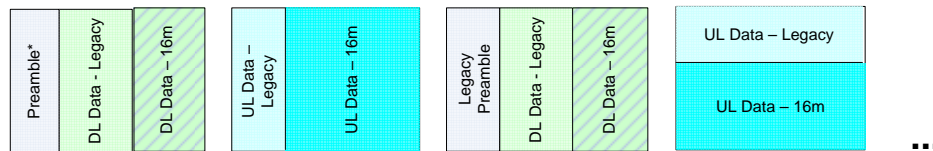
Flexible Hybrid Superframe Structure

- The superframe consists of a concatenation of frames which may not have the same structure. The type and number of frames in the concatenation is configurable on a per superframe basis.
- To accommodate the alternatives for UL subframe, a superframe can consist of a concatenation of frames for these alternatives, e.g.:
 - TDM between legacy & 16m system
 - FDM between legacy & 16m system
- Frame structures Type 1 and 2 are considered as possible candidates for 802.16m, for backward compatibility with the legacy 802.16 system
 - Type 1 has the same frame duration as the legacy
 - Type 2 has a shorter frame duration as compared to the legacy
 - Case of an additional switching point to reduce re-transmission latency
- A superframe can consist of a concatenation of frames with different configurations.

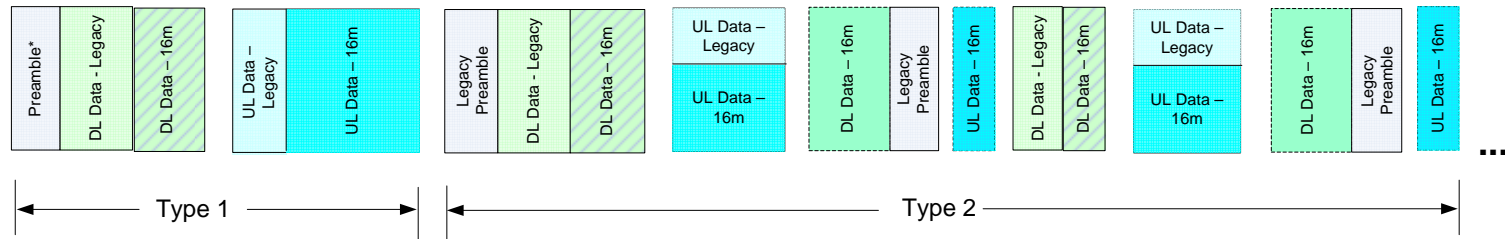
Superframe with concatenation of frames with legacy/16m TDM & FDM UL subframes

Superframe Structure with the concatenation of frames with UL TDM partition and FDM partition

1 Superframe = Concatenation of X' Frames of "Type 1-UL TDM partition" with Y' Frames of "Type 1-UL FDM partition":



1 Superframe = Concatenation of X'' Frames of "Type 1-UL TDM partition" with Y'' Frames of "Type 2-UL FDM partition" (Scenario 1):



*Note: Preamble may consists of a Superframe header, legacy preamble sequence, legacy frame configuration and resource control information

Notes:

- (1) X', Y', X'', Y'', partition ratio between legacy and 16m are configurable parameters carried by the broadcast control channels in the 16m Superframe header;
- (2) Legacy preamble subframe includes the legacy preamble sequence, FCH, MAP frame control information etc.
- (3) The first preamble of a Superframe is the Superframe header, which may consists of the legacy preamble sequence, broadcast control channel, legacy frame configurations and resource control information

Configurations

- Configurations of each superframe is specified in the Superframe Header through the Broadcast Control Channel, e.g.,
 - No. of Type 1/Type 2 frames
 - UL TDM or FDM partition
 - Legacy to 16m partition ratio
 - No. of DL/UL switching points per frame
 - Typically 2, can support 4
- CP length is also specified through the Broadcast Control Channel in the Superframe Header, e.g.,
 - Support of 2 or more CP lengths

Conclusion

- Proposed Flexible Hybrid Superframe allows a path for evolution of legacy 802.16e to an advanced 802.16m mobile system
 - As the number of legacy users in the system varies depending on the deployment, the frame structure configuration can be changed easily
- Depending on the number of legacy users with poor geometry in a cell site, the UL partition between legacy and 16m can be set to TDM or FDM to optimize the system performance
- Processing delay of smaller packets at the receiver could be much lower than that of large packets, thus the support of multiple DL/UL switching points enables a lower re-transmission delay
 - Improve throughput performance
 - Improve Quality of Service, i.e., reduced latency
 - Support of Service class for smaller packets at low latency
- Harmonized solution for various proposals on Frame Structure with legacy support, each of which has their own merits

SDD Text Propoal

11.4.x Hybrid Superframe structure

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[Include diagrams from Slides 5 and 6]