# Proposal for IEEE 802.16m Preamble

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*<http://standards.ieee.org/faqs/affiliationFAQ.html>

Re: IEEE 802.16m-08/016r1 – Call for Contributions on Project 802.16m System Description Document (SDD), on the topic of "Preambles"

Purpose: Adopt the proposal into the IEEE 802.16m System Description Document

# Scope

- This contribution presents a preamble structure for IEEE 802.16m
  - 16m primary synchronization channel
  - 16m uses legacy preamble as secondary synchronization channel

# Introduction

- We consider a 16m specific preamble (or primary sync channel) as well as reuse of legacy preamble (as secondary sync channel)
- The advantages and disadvantages on using the legacy preamble as part of the 16m synchronization channel are summarized in the table below.

| | **Advantages** | **Disadvantages** |
|---|---|---|
| 16m mobiles use 16m preamble; ignore legacy | • one synchronization channel present in non-legacy mode<br>• Does not need information about legacy synchronization channel | • Does not make use of legacy synchronization channel in legacy mode<br>• may run out of sector IDs<br>• 16m synchronization channel may interfere with data in adjacent legacy sectors |
| 16m mobiles use 16m preamble as primary synchronization channel, and legacy preamble as secondary synchronization channel | • primary sync channel allows for reduced complexity during initial synchronization<br>•More total sequences / sector IDs (possibility to transmit additional information)<br>•16m and legacy preambles can be aligned across sectors | • Two preambles present in non-legacy mode<br>• Requires search for secondary/legacy synchronization channel subframe in TDD system |

# 16m Preamble: Primary and Secondary Synchronization

- A IEEE 802.16m MS uses both legacy preamble and 16m preamble for synchronization and system access.
- The legacy preamble can be reused as a secondary synchronization channel in 16m to make use of existing overhead in legacy mode.
- The 16m primary synchronization channel consist of 16m-specific preamble and is used for the following:
  - Synchronization
  - Carry control information, e.g. indication of whether legacy support is enabled in the IEEE 802.16m system.
  - Include additional sequences of sector identification
- The 16m secondary synchronization channel consists of the legacy preamble structure and is used for the following:
  - Contains cell specific sequence for cell search and best sector(s) selection
  - Fine synchronization
- The complete Cell/sector ID is a signaled by the combination of the primary and secondary synchronization sequences. The number of possible sequences are large enough so that they are not repeated in nearby sectors.

# 16m Preamble: Primary and Secondary Synchronization

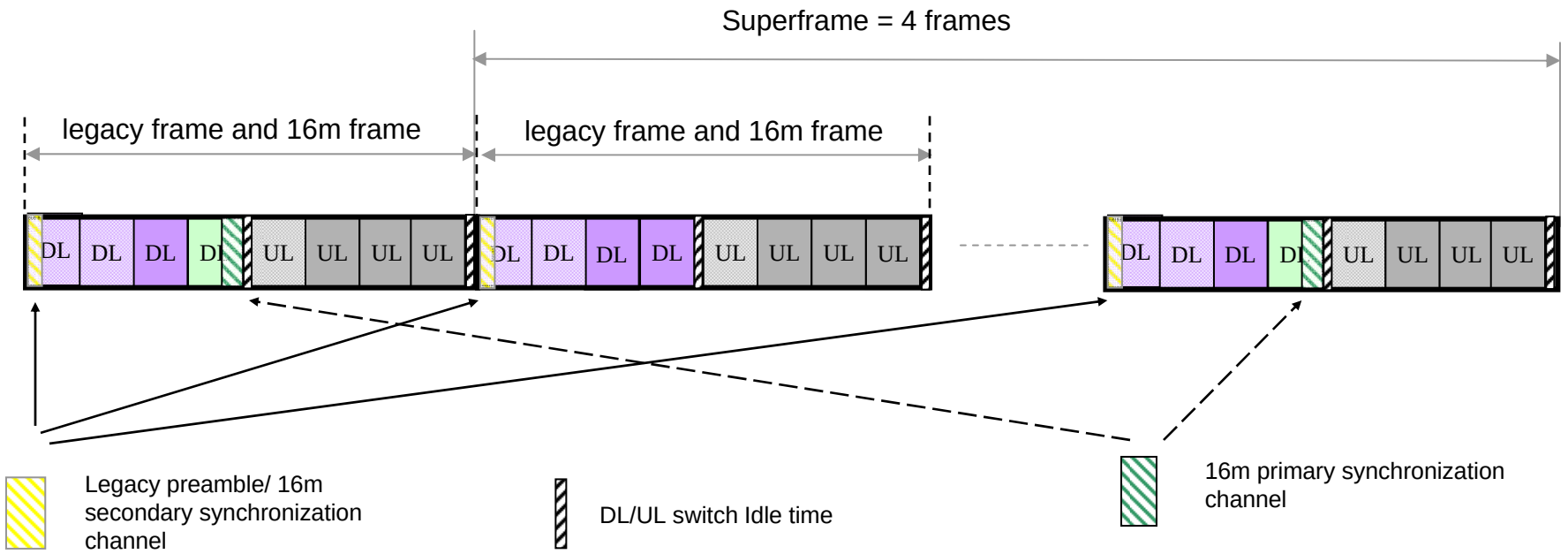
- In both legacy and non-legacy modes:
  - The secondary synchronization channel, constructed the same way as the legacy preamble, is present.
  - The primary and secondary synchronization channels remain aligned across sectors
  - The same synchronization procedure is used by the MS during network entry in legacy and non-legacy modes
- The MS first synchronizes with the primary sync channel. With this coarse synchronization, the MS can attempt to find the secondary sync channel (legacy preamble) at the start of subsequent subframes.

# Superframe, Frame and Subframe for Legacy Mode

- A legacy 5ms frame is divided into 8 subframe, each containing 6 symbols.
- The 16m superframe header is sent on the last DL subframe of the 16m superframe.
- The 16m primary synchronization channel is sent on the superframe header and occurs every 20ms

# Superframe, Frame and Subframe for Legacy Mode for TDD

16m TDD ratio shown here is 2:3




16m DL subframe:

16m superframe header: contain 16m primary synchronization channel, and 16m broadcast channel

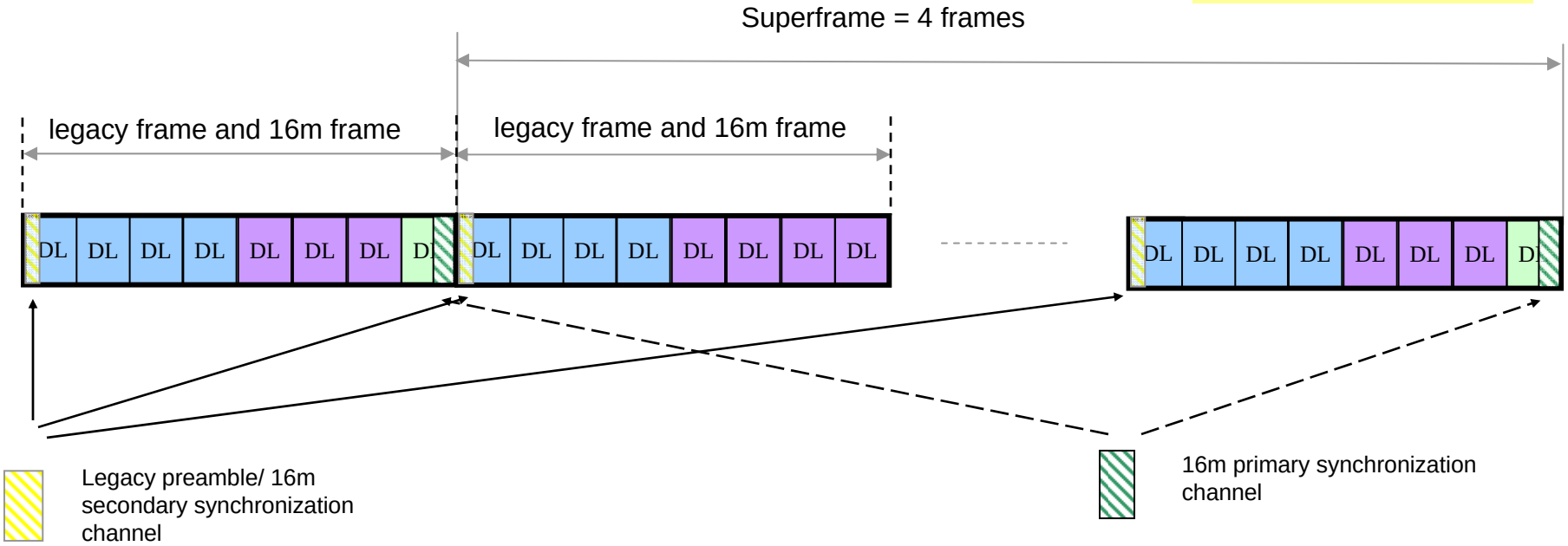
legacy UL subframe:

legacy DL subframe:

16m UL subframe:

# Superframe, Frame and Subframe for Legacy Mode for FDD

16m DL FDD shown here




16m DL subframe: contain 16m control and data

legacy DL subframe: contains legacy DL data

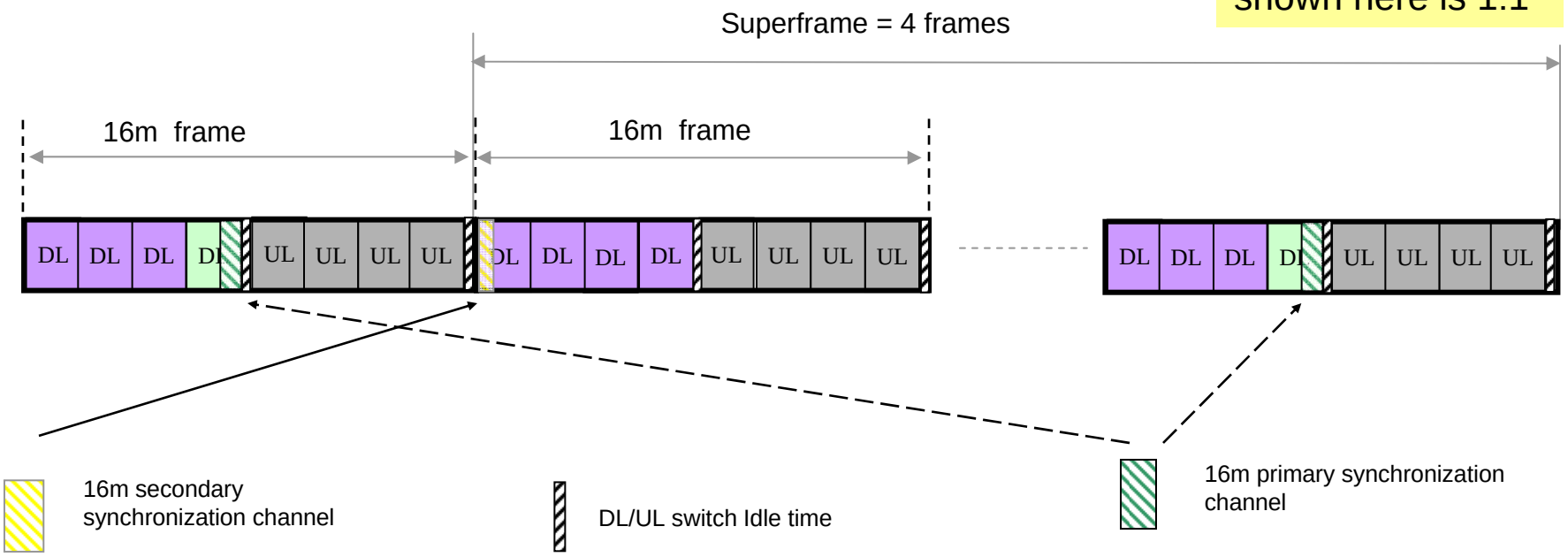
16m superframe header subframe: contain 16m primary synchronization channel, and 16m superframe broadcast control header

# Superframe, Frame and Subframe for Non-Legacy Mode

- The relative timing of the superframe header, primary and secondary synchronization channels is the same as in the legacy mode
- The 16m superframe header is sent on the last DL subframe of a 16m superframe.
- The 16m primary synchronization channel is sent on the superframe header and occurs every 20ms
- The 16m secondary synchronization channel is sent in the first DL sub-frame of a superframe and occurs every 20ms

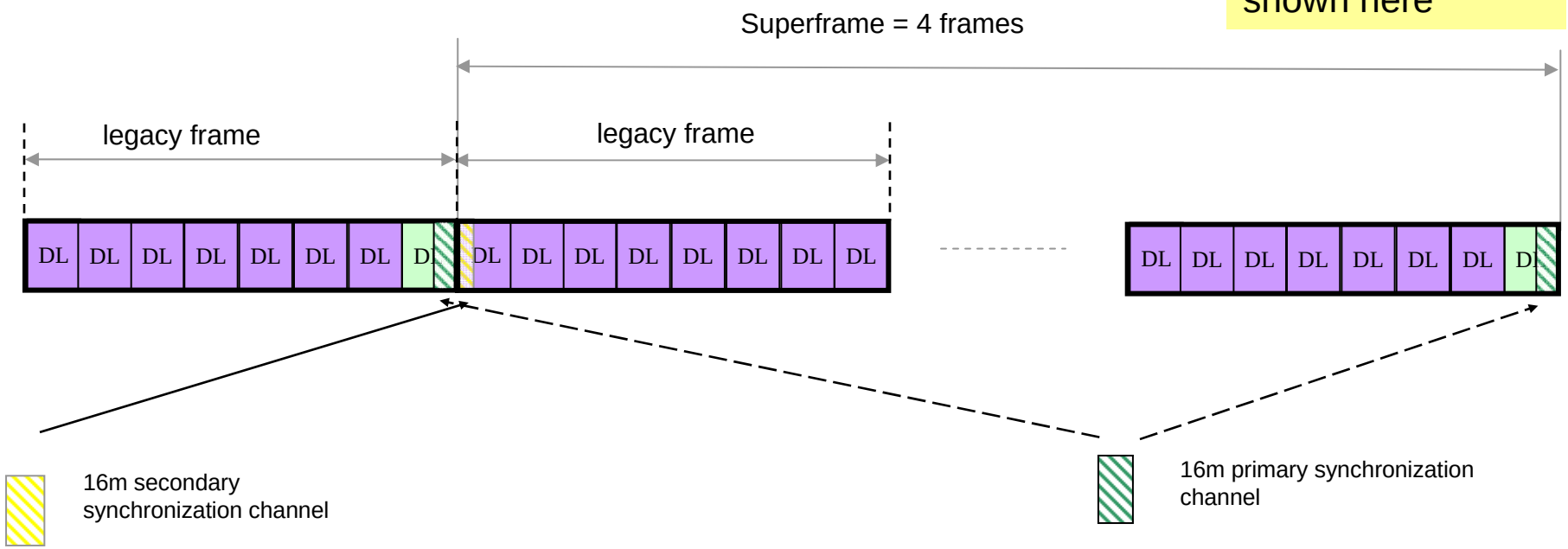
# Superframe, Frame and Subframe for Non-Legacy Mode for TDD

16m TDD ratio shown here is 1:1



# Superframe, Frame and Subframe for Non-Legacy Mode for FDD

16m DL FDD shown here



# Summary

- This contribution propose to use both legacy preamble and 16m preamble for 16m MS synchronization and system access.
- The same synchronization procedure is used in legacy and non-legacy modes
- 16m and legacy preambles remain aligned across sectors
- This configurations results in a larger number of possible Cell/sector ID's through combinations of the primary and secondary synchronization sequences
  - Useful for higher base station densities and relay stations identification