Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Legacy preamble sequence reuse methodology to achieve bandwidth scalability and avoid 802.16m preamble overhead**
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Re:	IEEE C802.16m-08/118r1(“Proposed 802.16m Frame Structure Baseline Content Suitable for Use in the 802.16m SDD ”) Target: Legacy preamble reusable frame structure
Abstract	This contribution suggests adopting legacy preamble sequence as 802.16m preamble sequence. Reusing legacy preamble sequence for 802.16m saves at least 0.5% radio resource for the co-existence of the legacy and 802.16m system. It also avoids extra 802.16m preamble sequence detection circuit. Concatenating legacy preamble sequences on frequency domain further supports bandwidth scalability. If no extra and significant benefit comes from new preamble sequence and no further system design conflicts occur, reusing legacy preamble sequence should be our first consideration.
Purpose	To be discussed and adopted for 802.16m frame structure baseline content
Notice	
Release	
Patent Policy	

Legacy preamble sequence reuse methodology to achieve bandwidth scalability and avoid 802.16m preamble overhead

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1. Introduction

This contribution proposes the methodology to reuse legacy preamble sequence for 802.16m preamble sequence. This method saves one OFDM symbol per radio frame, 0.5% radio resource, for IEEE 802.16m. Extra preamble sequence detection is avoided due the reusable legacy preamble sequence detection circuit. Concatenating preamble sequences on frequency domain further supports bandwidth scalability.

2. Frame structure comparison for both reuse and non-reuse cases

Figure 1 illustrates the offset frame structure which is cited from the contribution [1]. Extra preamble sequence results in the loss of radio resource and extra preamble sequence detection circuit is necessary. The frame structure necessitates two kinds of preamble sequences for both legacy system and 802.16m system. Because every super frame, composed of 4 radio frames, possesses one 16m sync signal and it wastes at least 0.5% radio resource in the legacy/16m coexisting system. Since the 16m sync signal is different to the legacy preamble sequence, it requires extra detection circuit and increases complexity.

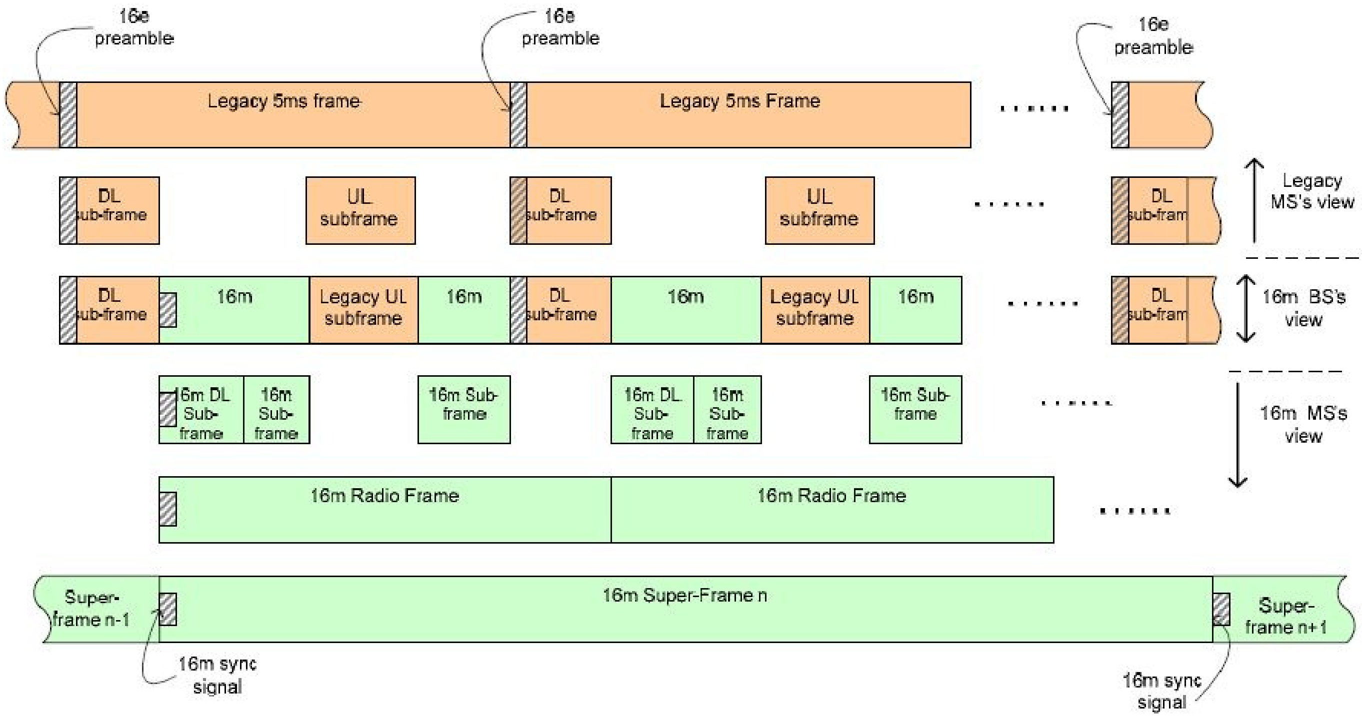

Figure 1: Legacy preamble non-reuse frame structure.

Additionally, less occurrence of preamble signal deteriorates pure 802.16m performance. The 16m sync signal occurs every 20ms. This induces longer synchronization time and deteriorates handover performance due to longer measurement periods. Furthermore, narrow band sync signal will lose frequency domain diversity gain and deteriorates preamble detection performance. This frame structure pays noticeable performance degradation.

Fig. 2 illustrates the reuse frame structure. The preamble sequence is applied for both the legacy system and 802.16m system. The 16m sync signal becomes optional and can be removed to gain one OFDM symbol, 0.5% radio resource. Since the preamble is reused, the measurement period for handover maintains the same for both legacy system and 802.16m system. Preamble detection circuit for the legacy system is reusable and no further implementation cost for the legacy and 16m coexistence system.

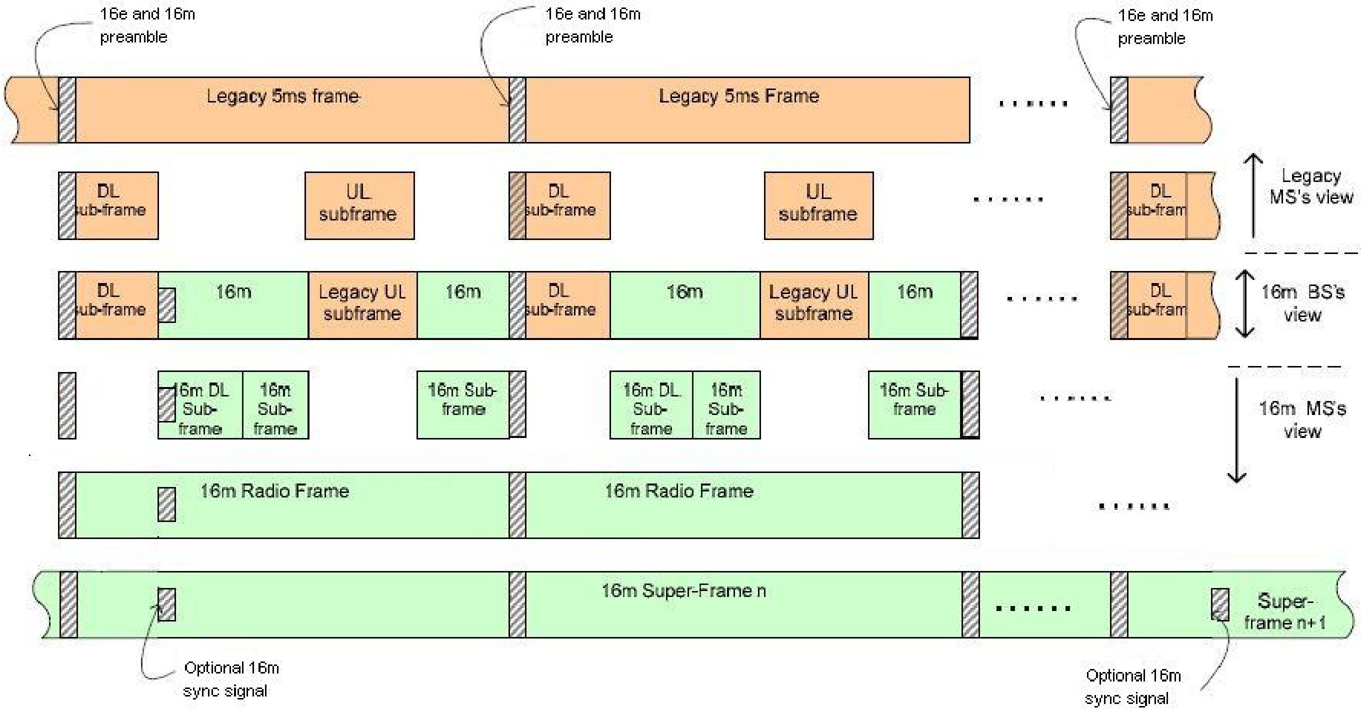

Figure 2: Legacy preamble reuse frame structure.

3. Preamble scalability

Preamble sequence can be constructed by the concatenation of multiple preamble sequences and legacy support is achieved. Figure 3 depicts an example of the concatenated frame structure with two 16e sectors. From the view of 16m base station, the preamble sequence is constructed of two legacy preamble sequences. Therefore, the preamble sequence can be constructed from the concatenation of multiple preamble sequence. The longer the preamble sequence necessary, the more preamble sequences concatenated. Even for 100MHz, one can concatenate 10 1024 preamble sequences to build a length 10240 preamble sequence. It provides the most flexibility in preamble construction and avoids the storage of preamble sequence for various bandwidths. The legacy user can access through any partial preamble sequence to enter the system.

4. Conclusions

This contribution provides preamble reuse methodology. This method provides legacy support and the legacy preamble detection circuit is reusable. Extra resource for 16m sync signal can be avoided and the system can save 0.5% radio resource for the legacy and 16m coexistence system. Preamble sequence scalability further gives the most system extension capability.

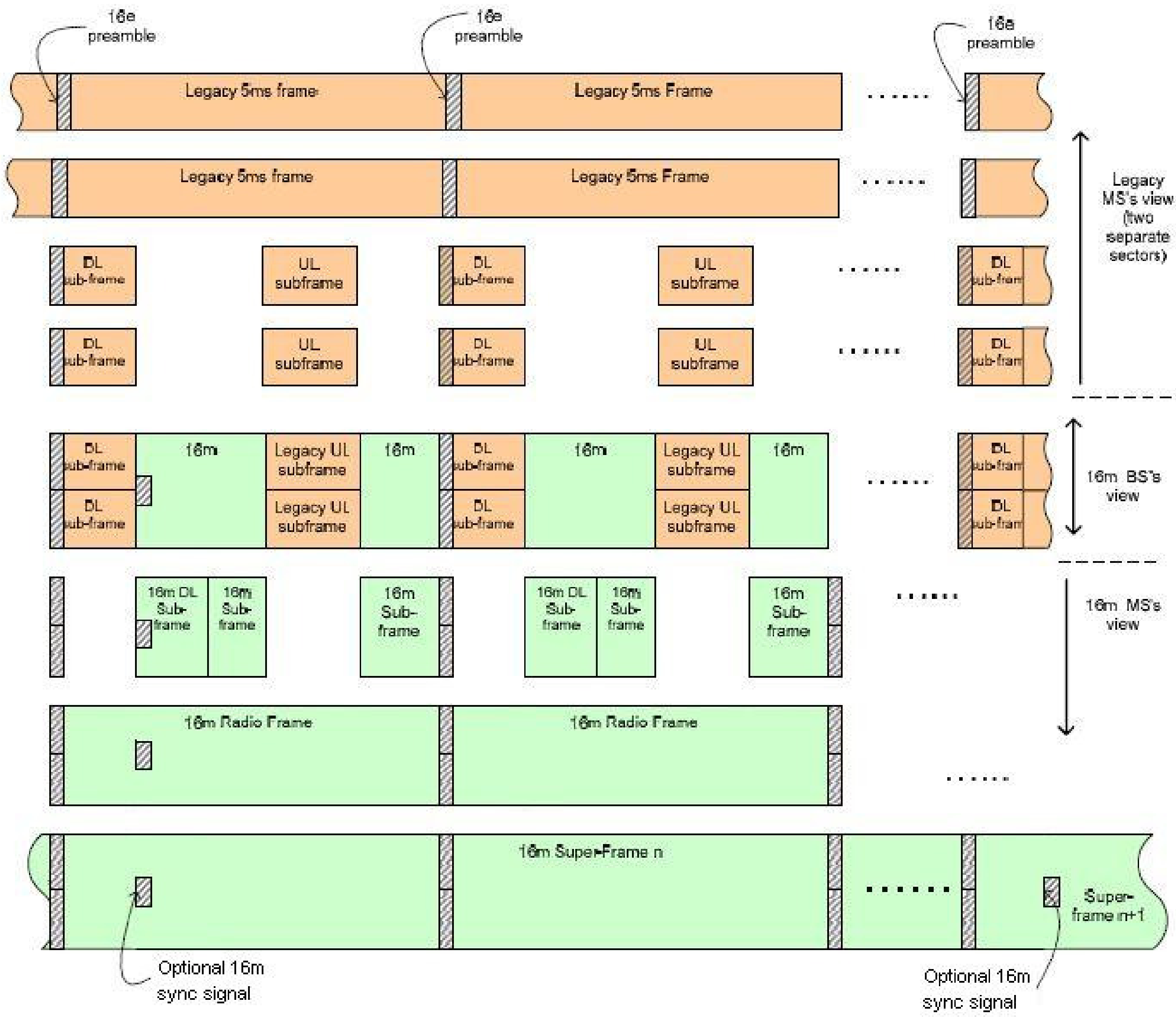

Figure 3: Concatenated frame structure.

References

[1] IEEE C802.16m-08/118r1, "Proposed 802.16m Frame Structure Baseline Content Suitable for Use in the 802.16m SDD," March, 2008.

========================Text Proposal=============================

11.4.2 Frame Structure Supporting Legacy Frames

When legacy support is enabled, the legacy frames and the 802.16m frames starts from the shared preamble symbol. The shared synchronization signal (16e and 16m preamble) maintains system performance such as measurement period for handoff or preamble detection probability. The frame structure allows accommodating new features such as broadcast channel and control channel. The legacy portion occupies the prior mini-frames of each 802.16m radio frame. As shown in Figure 11.4-3, the 802.16m frame structure supports the legacy frames by having the legacy portion and the 802.16m portion sharing the 802.16m air link in a time-division manner. Same preamble is shared for both the legacy and 802.16m frames. New functions, such as optional 16m sync signal, can be embedded from the start of the 16m service region. Such a legacy frame support scheme is applied to TDD, FDD, and H-FDD schemes, although Figure 11.4-3 illustrates the scheme in TDD.

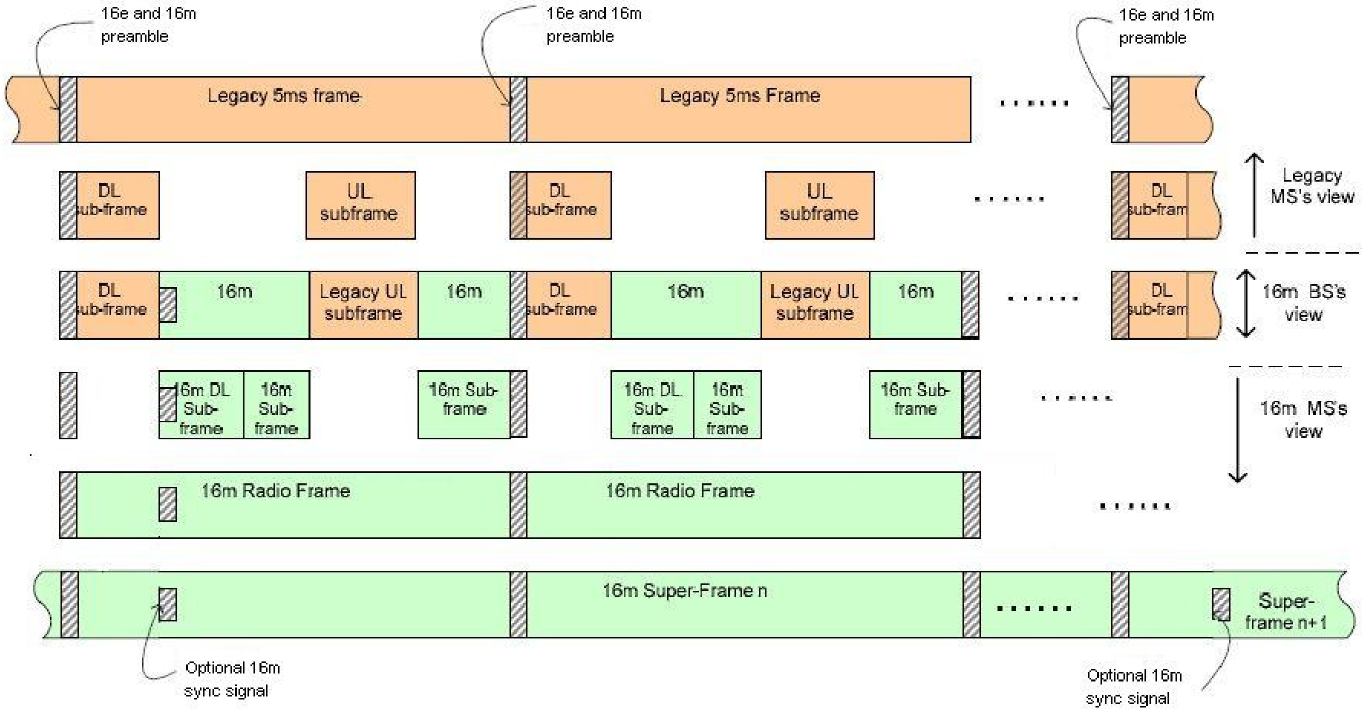

Figure 11.4-3: Example of Frame Structure Supporting Legacy Frames (TDD).

11.4.3 Frame Structure Supporting Legacy Frames with a Wider Channel for 802.16m

When legacy support is enabled and the 802.16m uses a wider contiguous channel that is twice the width of the legacy channel, two legacy channels are composed to form a wider 802.16m channel, as illustrated in Figure 11.4-4.

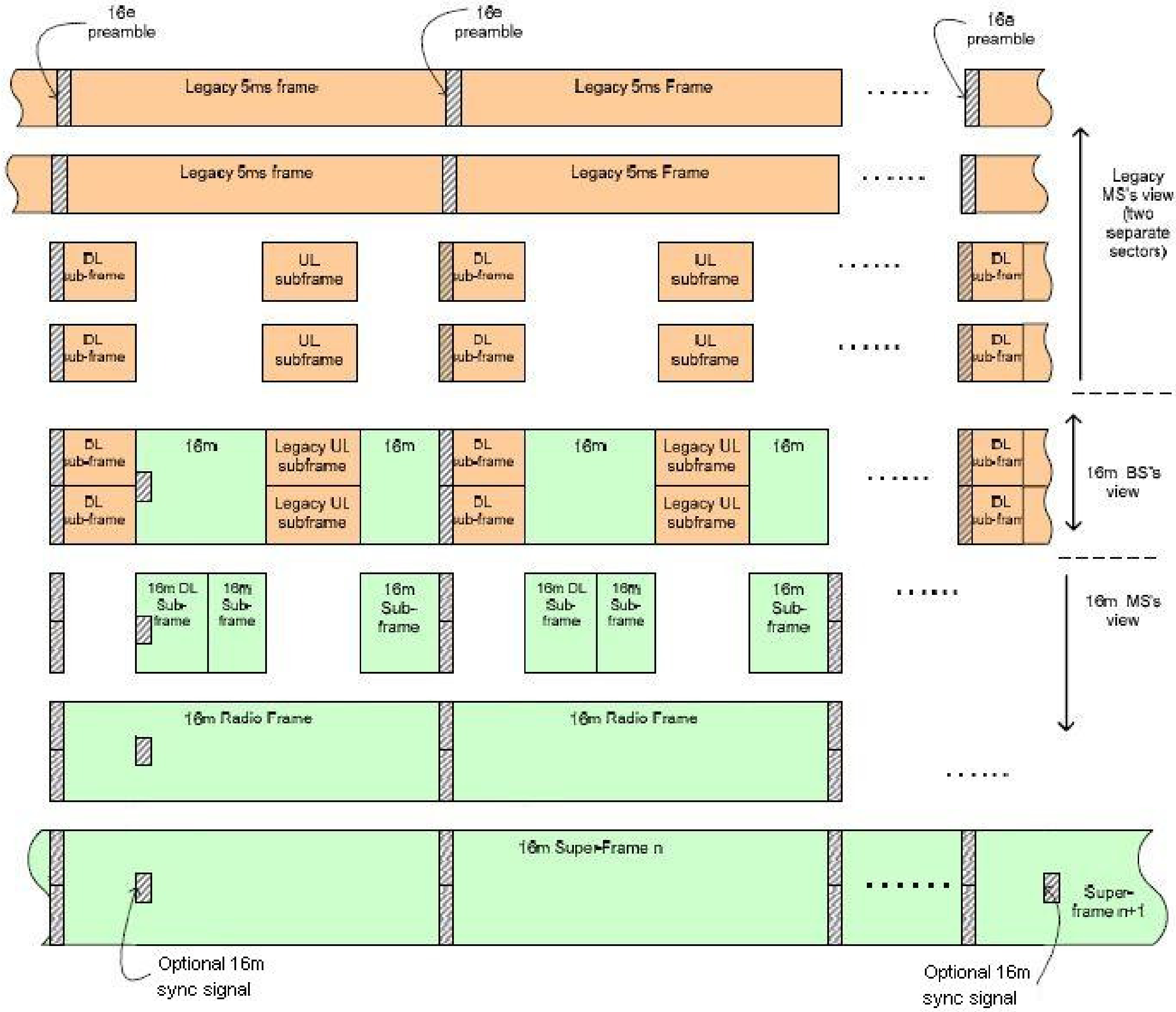

Figure 11.4-4: Frame Structure Supporting Legacy Frames with a wider channel for 16m.