

Unique Randomizer Initialization for Interference Management in 802.16 OFDM PHY

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Purpose:

In an interference scenario, a user can misinterpret someone else's data as his data. To prevent this misinterpretation, the randomizer is initialized properly with the base station identifier.

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Problem Statement

- In a low reuse 802.16 network:
 - SS can see signals from multiple BSs (using the same frequency band) even though SS is in communication with only one of the BSs
 - SS should be capable of deciding if the decoded bits are from the desired BS or from an interfering BS
 - Same is true in the uplink where a BS can hear signals from SSs in different cells
 - Current standard does not have the support to distinguish desired signal from interfering signal

Proposed Solution

- Introduce the ability to distinguish signals by properly initializing the seed of the randomizer
- Desired properties of the output from the randomizer:
 - Unique to a BS
 - Unique to a connection (BS-SS)
 - Uncorrelated from frame to frame

Randomizer Initialization

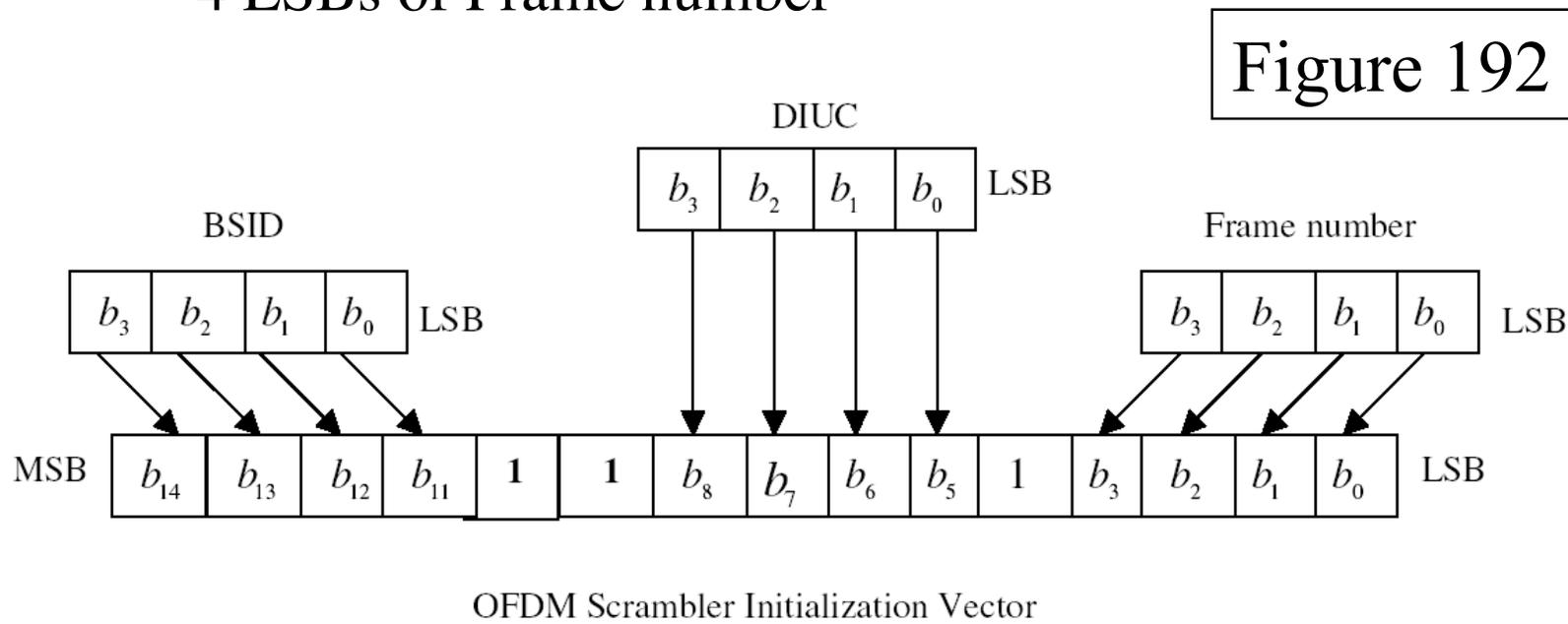
- BS unique identifier:
 - BSID is 48 bits long (upper 24 bits for operator ID and lower 24 bits unique to a BS)
 - Propose to use the lowest 4 bits of BSID to seed the randomizer
 - Provides a virtual cluster of 16 BSs

Randomizer Initialization

- Connection identifier:
 - CID is the ideal choice, but in the multicast mode, a burst can carry multiple CIDs. CID is not an option in the downlink
 - Propose to use DIUC/UIUC to seed the randomizer
- De-correlation in time:
 - Propose to include 4 bits of frame number in the seed

Downlink Randomization

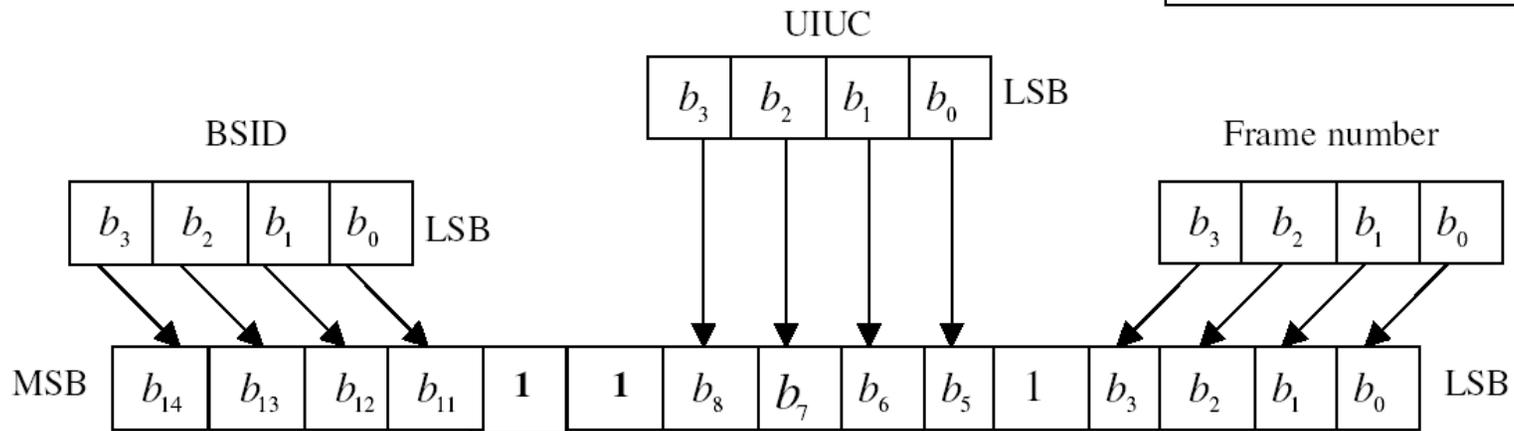
- Downlink randomizer is initialized with:
 - 4 LSBs of BSID
 - 4 bits of DIUC
 - 4 LSBs of Frame number



Uplink Randomization

- Uplink randomizer is initialized with:
 - 4 LSBs of BSID
 - 4 bits of UIUC
 - 4 LSBs of Frame number

Figure 193



OFDM Scrambler Initialization Vector

Proposed Text Changes

- 1) The paragraph immediately above Figure 192 is changed to read:

“On the downlink, the randomizer shall be re-initialized at the start of each frame with the vector: 1 0 0 1 0 1 0 1 0 0 0 0 0 0 0. The randomizer shall not be reset at the start of burst #1. At the start of subsequent bursts, the vector shown in Figure 192 shall be used to initialize the randomizer. The OFDM symbol number (i.e. the number of the first OFDM symbol of the data burst) shall be counted from the start of the DL-subframe, the first symbol being counted as symbol #0.”

Proposed Text Changes (contd.)

2) The paragraph immediately above Figure 193 is changed to read:

“On the uplink, the randomizer is initialized with the vector shown in Figure 193. **The OFDM symbol number (i.e. the number of the first OFDM symbol of the allocation) shall be counted from the time instant pointed by Allocation Start Time field of the UL-MAP, the first symbol being counted as symbol #0.**”