Mobility - Network Entry in 802.16m

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Venue:

IEEE 802.16m-08/024, “Call for Comments and Contributions on Project 802.16m System Description Document (SDD)”.
Target topic: “Upper MAC concepts and methods - mobility”.

Base Contribution:

This is the base contribution.

Purpose:

To be discussed and adopted by TGm for the 802.16m SDD

Outline

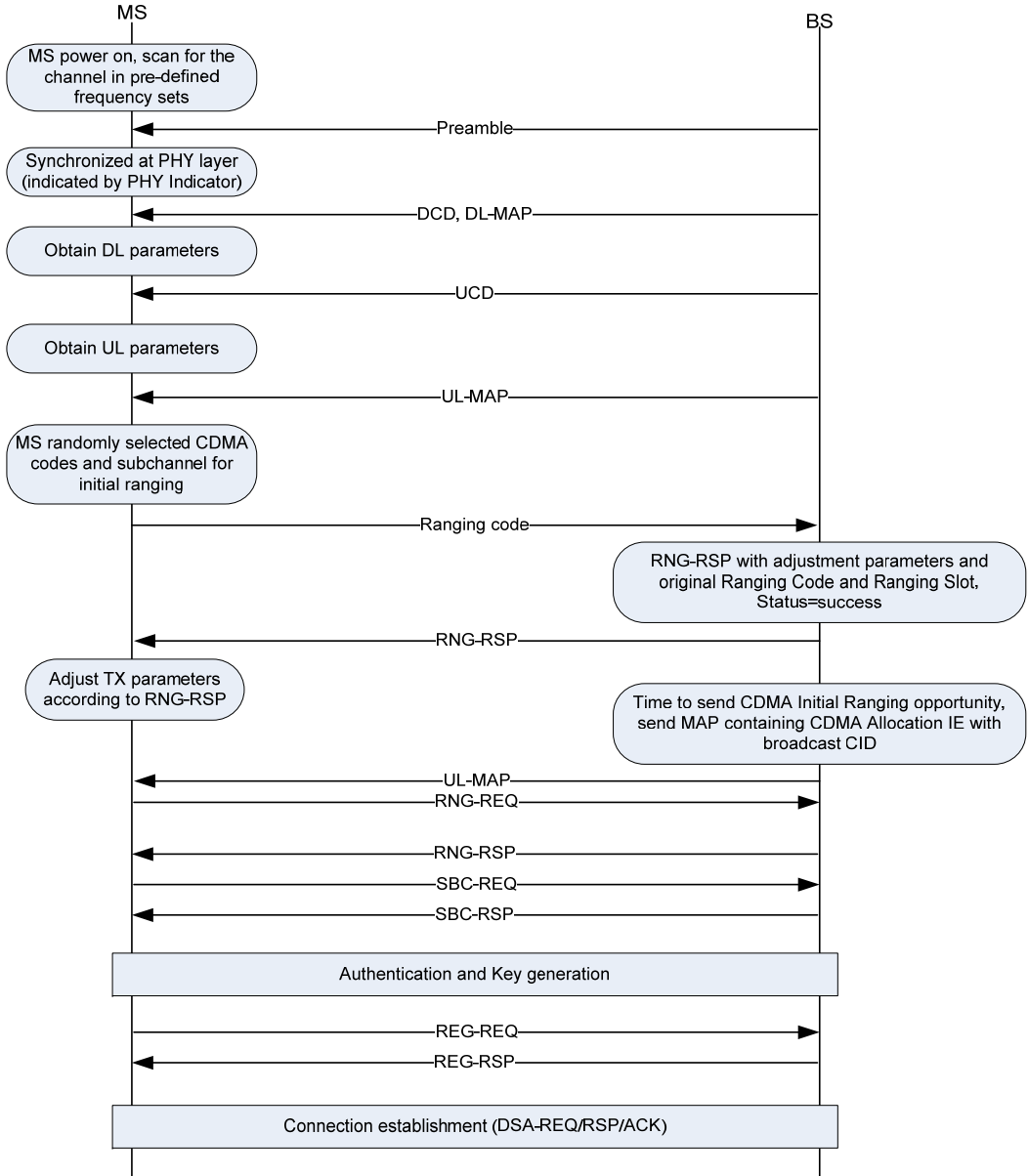
- 16e initial network entry overview
- 16m initial network entry and re-entry
  - Handover
  - Idle mode exit
  - Un-controlled HO

Background and motivation

- According to SRD, latency should be further reduced as compared to the WirelessMAN-OFDMA Reference System for all aspects of the system including the air link, state transition delay, **access delay**, and handover.
- In 16e (as shown in the next slide), MS has to detect both MAP and DCD/UCD messages in order to enter the network successfully. Since DCD/UCD are not transmitted in every radio frame, significant latency can not be avoided if the transmission interval of DCD/UCD is larger.
- In 16m, in order to speed up the system access, different new schemes have been proposed in DL Control (section 11.6 of SDD) such as
  - Classifying the system configuration information and separating information related to network entry
  - Define broadcast channel (including both PBCH and SBCH) to carry necessary information for network entry/re-entry.
- Based on the latest approved SDD text, network entry procedure should be discussed in TGm.

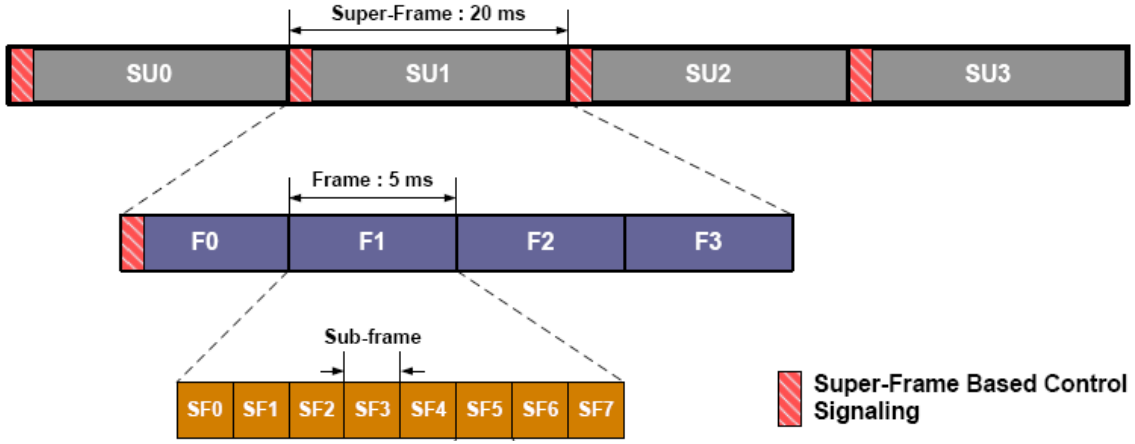
Summarized 16e Initial Network Entry Procedure

- PHY synchronization
- MAC synchronization (including getting DCD/UCD, DL-MAP/UL-MAP)
- Ranging process
- Basic capability exchange
- Authentication and key generation
- Registration
- Connection setup



16m Frame Structure and DL Control Structure

- Example of basic frame structure



- Essential system parameters mapping (SDD, section 11.6.3)

Information		Channel	Location
Synchronization information		Synchronization Channel (SCH)	FFS
Essential system parameters and system configuration information	Deployment-wide common information	Primary Broadcast Channel (PBCH)	Inside of SFH
	Downlink sector-specific information	Secondary Broadcast Channel (SBCH)	Inside of SFH
	Uplink sector-specific information		

Example information necessary for initial network entry

- UL Frequency
- Frequency lists
- Cell type
- Superframe number
- Subframe configuration information
- BS ID (incl. NAP ID)
- NSP ID
- BS EIRP
- EIRxP_IR, max
- TTG/RTG
- MAC version support
- Available DL/UL resource
- UL PHY mode ID
- MS transmit power limitation level
- Initial ranging codes/region, backoff_start/end
- BW request codes/region, backoff_start/end

Network entry for 16m MS

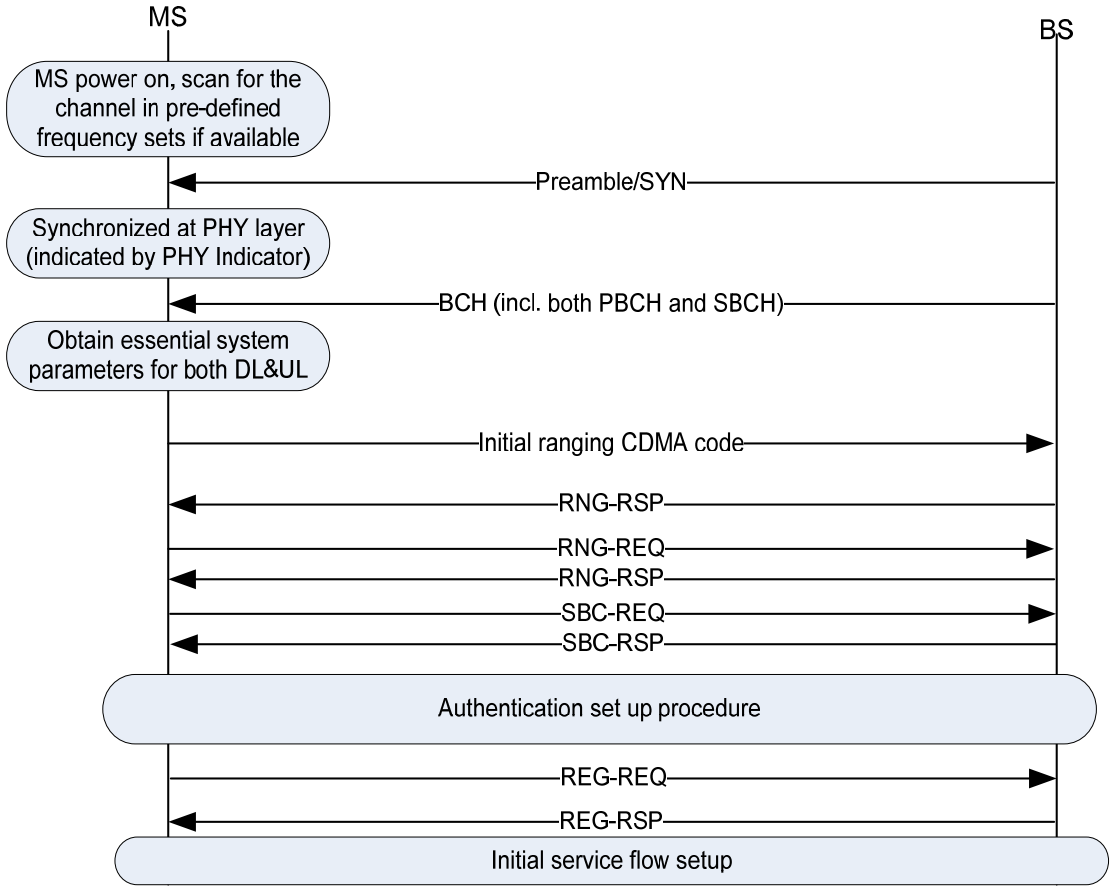
- How 16m MS can find 16m subframes in the mixed case?
- Scenario-1: If new SYN channel is defined
  - First 16m MS needs to get synchronized with SYN channel which might appear in every superframe or every frame (depending on the output of Preamble RG)
  - If there is fixed location relationship between the SYN channel and the superframe header which includes BCH, all the necessary information for initial NE, after PHY synchronization MS can get the content of BCH within superframe header.
  - the MS can start ranging process
  - Authentication
  - Service flow set up
- Scenario-2: If new SYN channel is not defined
- depending on configuration or 16e FCH which includes pointers to 16m region.
  - First 16m MS needs to get synchronized with legacy preamble.
  - Since the location information of 16m control channel is indicated via reserved bits in 16e messages e.g. FCH, 16m MS needs to decode the message and find out the high level control channel of 16m.
  - By reading 16m control channel, 16m MS can find out the random access region of 16m and start the random access procedure.

Network entry for 16m MS

- How 16m MS to find out 16m subframes in the Greenfield case?
  - First 16m MS needs to get synchronized with SYN channel which might appear in every superframe or every frame
  - Reading DL control channels and obtain all the necessary system configuration information and parameters for network entry
  - Start ranging process
  - Authentication and key exchange
  - Service flow setting up

Example of 16m initial network entry procedure

- PHY synchronization
- MAC synchronization (getting BCH)
- Ranging process
- Capability negotiation
- Authentication
- Registration
- Service flow set up



Network re-entry

- Network re-entry from different scenarios
  - Idle mode
  - Handover
  - Un-controlled HO due to signaling loss
- Network re-entry of 16m MS will follow the procedure of initial network entry except the latency can be further reduced by optimizing the procedures
  - MS context already known by the network
  - Many steps can be completed during preparation phase which does not affect service interruption time
  - Ranging sequences defined per user class, per service class, and per sector.

Proposed SDD Text

- 10.x Network entry

  Network entry is the procedure by which an MS finds and establishes a connection with the network. MS synchronizes with the BS via synchronization channel. MS can obtain the necessary information e.g. BS ID, NSP ID, from broadcast channel (BCH) and perform network selection. MS then establish connection with network after random access. Neighbour BSs search is based on the same downlink signals as initial network search except some information can be provided by serving BS. Network re-entry from such procedures as handover, idle mode exit and so on, is based on initial network entry procedure with some optimization procedures.

- 11.x.2.4 Ranging Channel

  The ranging sequence can be defined per user class, per service class and per sector.