

Intra-RAT Mobility Support 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

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Outline

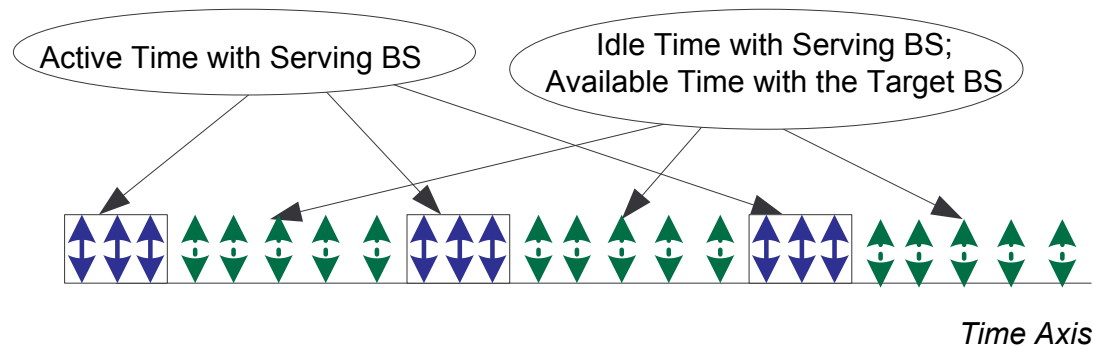
- Intra .16m mobility
- Mobility between .16m and .16e
- Mobility between Femto and Macro BS

Intra .16m Mobility

Intra .16m Mobility

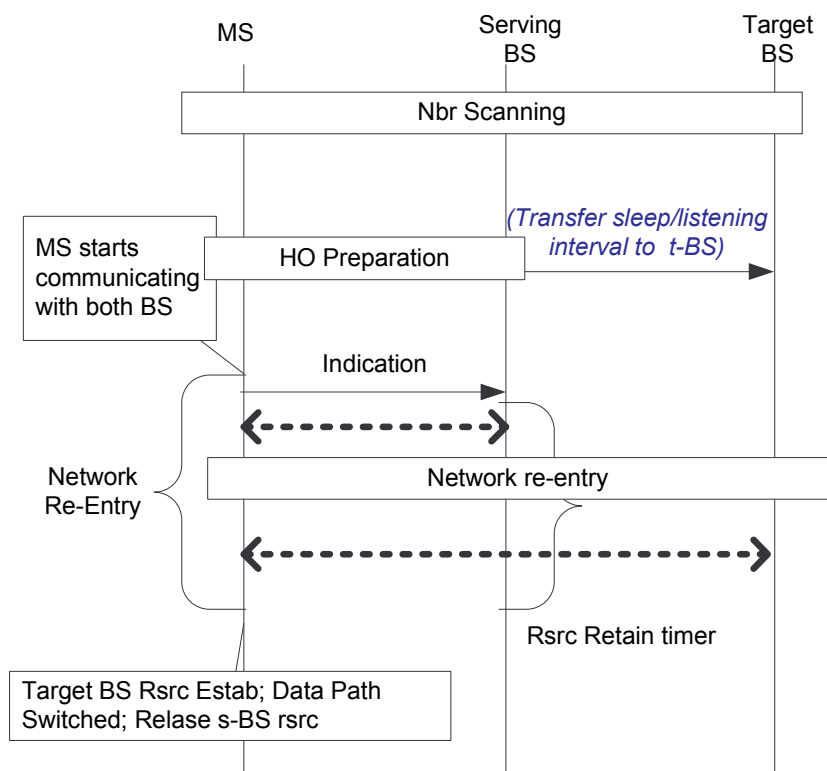
- For intra 16m mobility, we should optimize hard handover and reduce latency according to SRD section 6.2.3
- Latency is any possible break in communication, when an MS switches from one BS to another

Proposed Solution



- Utilize periodic listening/sleep window (sleep mode) with the serving BS
- If sleep mode is not activated yet, then activate it during HO preparation procedure
- Provide MS sleep time schedule with the serving BS to the target BS
- The MS continues exchanging data frames with the serving BS during the listening time
- The MS and the target BS exchange network re-entry signaling during the MS sleep time with the serving BS

Example Signaling Flows and Benefit



- The handoff latency reduction solutions in legacy system are proposed for the best scenario of HO Process Optimization
- This proposal reduces latency in the worst scenario where there is no HO Process Optimization

Proposed SDD Text

Section 10.x: Intra-.16m Mobility

Section 10.x.1: Intra-.16m Handover

An MS utilizes periodic listening/sleep window (sleep mode) with the serving BS during HO. During sleep window, the MS and the target BS exchange network re-entry signaling. During listening window, the MS and the serving BS continue to exchange data frames.

Mobility between .16m and legacy system

Handover Scenarios

- Legacy MS handover from legacy BS to 16m BS
 - Legacy MS handover to legacy zone of 16m BS and follows legacy handover protocol
- Legacy MS handover from 16m BS to legacy BS
 - Legacy MS handover from legacy zone of 16m BS to legacy BS and follows legacy handover protocol
- 16m MS handover from 16m BS to legacy BS
 - 16m BS and MS supports legacy handover protocol with legacy BS
 - 16m BS performs context mapping and protocol interworking from 16m to legacy system
- 16m MS handover from legacy BS to 16m BS

Proposed SDD Text

Section 10.x: Inter legacy and 16m Mobility

Section 10.x.1: Inter legacy and 16m Handover

Section 10.x.1.1: Handover from legacy BS to 16m BS

Section 10.x.1.2: Handover from 16m BS to legacy BS

Mobility between .16m Femto and Macro BS

Motivation

- There could be different types of BSs in the network e.g. Macro BS, Pico BS and Femto BS
- Femto BS can be deployed by the end user at home or small office to provide closed access to one or few users.
- There could be tens/hundreds of femto BSs deployed under the macro BS coverage area.
- The following slides propose efficient and seamless handover solution between macro BS and femto BS.

Issues to be Considered

- Considering large number of femto BSs in macro coverage area, it is not feasible to list all the femto BSs as neighbors of Macro BS.
 - Also not advisable because any way MSs will not have access to all the femto BSs except home femto BS.
- How MS detects valid femto BS (e.g. Home Femto BS) which can provide access?
 - Continuous searching for home Femto BS could drain MS battery.
 - It is desirable that when MS is in coverage area of its Home Femto BS, it should connect to Home femto BS.
- How to identify Femto BS?

Proposed Solution (1)

- When Femto BS is installed and configured under a macro BS. The femto BS identity is associated with the macro BS identity
 - Femto BS includes overlay Macro BS as its neighbor in order to support seamless HO from Femto to Macro BS.
 - In order for femto to identify whether a BS is a macro BS or another nearby femto BS, one of the following approach can be applied:
 - Femto BS could be deployed under different network ID (e.g. operator ID).
 - BS type indication (e.g, macro, femto)
 - Could check EIRP of BS
- When MS is configured to have access to femto BS, network sends signaling messages and provide the mapping of its own femto-BS and corresponding overlay macro BS(s).
- MS stores the mapping of home femto BS and overlay macro-BS

Proposed Solution (2)

- When MS detects that it is in overlay macro BS coverage area, then MS adds femto BS identity in its neighbor list and start scanning for home femto BS.
 - Because at this point MS knows that it is nearby his home femto BS.
- How MS detect its home femto BS?
 - **Option 1:**
 - Overlay Macro BS may transmit the preamble list used by femto BS or MS can exchange the signaling with network to find the preamble used by its own femto BS.
 - When MS enters into the coverage area of macro BS, receive the “preamble list of femto BS” and start scanning for home femto BS.
 - **Option 2:**
 - MS may store carrier frequency and preamble information of its home femto BS.
- When MS detects that it is outside of overlay macro BS coverage area, then MS removes the femto BS identity from its neighbor list and stop scanning for home femto BS.
- When MS detects good signal strength from its home femto BS, it triggers HO procedure. It provides the femto BS identity as target BS to macro BS.
- After that normal 802.16m HO signaling exchange takes place.

Benefit and Proposed SDD Text

- Benefit
 - Proposed simple and efficient seamless handover solution between macro BS and femto BS
 - Proposed solution conserves MS battery life

- Proposed SDD Text

10.x Mobility between Macro BS and Femto BS

10.x.1 Handover between Macro and Femto BS

Network provide femto BS and corresponding overlay macro BS mapping to MS for supporting handover between macro BS and femto BS.