Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Handover - Data Forwarding and deferring IP re-establishment**
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Re:	Response to IEEE 802.16-04/19 (Recirculation Ballot #14a)
Abstract	Handover - Data Forwarding and deferring IP re-establishment
Purpose	Enhance the handover performance during handover
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Data Forwarding and deferring IP re-establishment

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1. Problem Statement

When handover is performed, the serving BS may either discard MAC SDUs associated with the MSS or forward MAC SDUs for service continuation. However in case of data forwarding, if the MSS re-establishes IP connectivity after handover, forwarded data are useless due to IP address change.

Therefore, it is required for MSS to defer IP re-establishment if there are forwarded data from the serving BS.

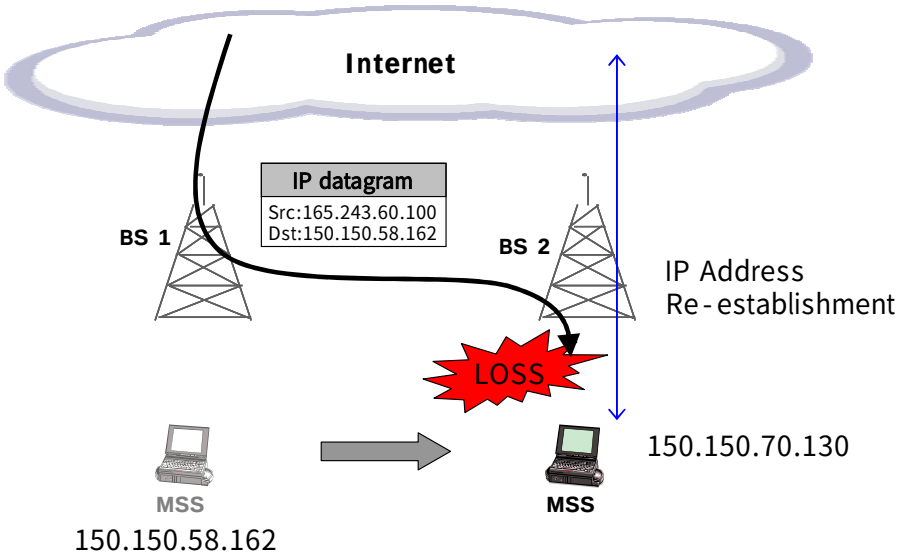

Figure 1. Data forwarding vs IP address re-establishment

In this contribution, we propose possible solutions for MSS to defer IP re-establishment if there are forwarded data from the serving BS after HO.

2. Overview of Proposed Solution

If the serving BS decides to forward data to the target BS for moving MSS's service continuation, the serving BS will forward data through backbone and the target BS will receive them. At this time, the target BS notices the MSS of data to receive after HO. The MSS will register with the target BS, and the target BS will notify the MSS of forwarded data existence in REG-RSP message. Now MSS can decide when IP re-establishment should be performed. The MSS may defer re-establishment of IP connectivity to receive data or may re-establish IP connectivity. During data is being forwarded to the target BS, if the MSS re-establishes IP connectivity then the target BS may send a backbone message (Stop-Data-Forwarding) to stop data forwarding to the serving BS. When the serving BS receives the Stop-Data-Forwarding, the BS may close all connections and discard state machines and MAC SDUs associated with the MSS.

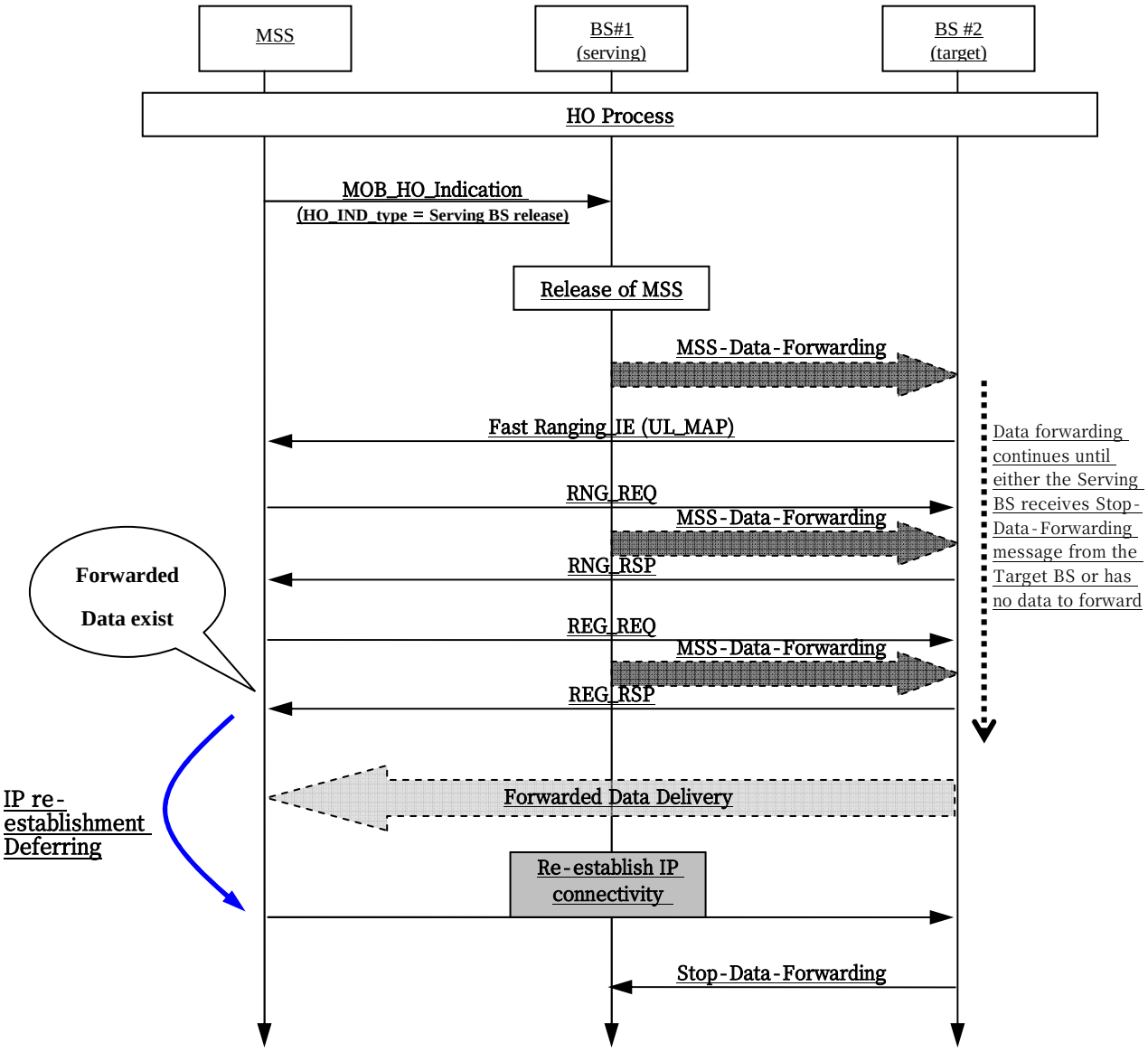

Figure 2. Data forwarding and deferring IP re-establishment

3. Proposed Changes in Document

Remedy:

Use one bit in *Method for allocating IP address* TLV of REG-RSP to indicate the MSS of forwarded data existence. Insert paragraph describing BS's and MSS's actions of data forwarding. Add backbone messages for data forwarding and stop data forwarding over a backbone.

Remedy 1:

[Insert a sentence to 6.3.20.2.5 in page 47as follows]

6.3.20.2.5 Termination with the Serving BS

After the hand-over request/response handshake has completed, the MSS may begin the actual HO. At some stage during the HO process, the MSS terminates service with the serving BS. This is accomplished by sending a MOB-HO-IND MAC Management message with the HO_IND_type value indicating serving BS release.

If the HO_IND_type field specifies Serving BS release, the BS may either close all connections and discard MAC state machines and MAC PDUs associated with the MSS, or it may retain the connections, MAC state machine and PDU associated with the MSS to be forwarded to the Target BS for service continuation, or to be discarded upon reception of a backbone message from the Target BS. After handover the MSS may defer IP connectivity re-establishment if there are data forwarded from the old BS. When MSS re-establishes IP connectivity during receiving forwarded data, BS may send a backbone message to request the old BS to stop forwarding data.

*[Modify the table in **11.3.2.12 Method for allocating IP address** in page 84, **11.7.9 Method for allocating IP address** in page 88]*

11.3.2.12 Method for allocating IP address

Type	Length	Value	Scope
5.23	1	bit #0: DHCP - default bit #1: Mobile IPv4 ~~bit #2-7: reserved; shall be set to zero~~ bit #2: Forwarded Data Exist bit #3-7: reserved; shall be set to zero	REG_REQ REG_RSP

*[Add new Inter-base station message **"D.2.XX MSS-Data-Forwarding Message";** appropriate allocation of numbering is required.]*

This message is sent from the Serving BS to the Target BS to forward the MSS's MAC SDUs during HO. This message is typically used when MSS requests the Serving BS to releases the Serving BS with data forwarding. This message's transmission shall be stopped on reception of Stop-Data-Forwarding Message.

Table DX– MSS-Data-Forwarding Message

Field	Size	Notes
Global Header	152-bit	
Length	8-bit	The length in bytes of the MAC SDU including the Global Header, MSS unique identifier, and Security field.
MSS unique identifier	48-bit	48-bit unique identifier used by MSS on initial network entry
MAC SDU	Variable	
Security field	TBD	A means to authenticate this message

*[Add new Inter-base station message **"D.2.XX Stop-Data-Forwarding Message";** appropriate allocation of numbering is required.]*

This message is sent from the Target BS to the Serving BS in order to make the Serving BS stop forwarding the MSS's MAC SDUs.

Table DX– Stop-Data-Forwarding Message

Field	Size	Notes
Global Header	152-bit	
MSS unique identifier	48-bit	48-bit unique identifier used by MSS on initial network entry
Action	TBD	TBD
Security field	TBD	A means to authenticate this message