Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Minimizing IP Connectivity Establishment Procedure**
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Source(s)	Yong-Ho Kim Voice: 82-31-450-4387 LG Electronics,Inc. Fax: 82-31-450-7912 533,Hogye-1dong,Dongan-gu, mailto: ronnykim@lge.com Anyang-shi,Kyongki-do,Korea
Re:	Response to IEEE 802.16-04/19 (Recirculation Ballot #14a)
Abstract	IP connectivity establishment procedure can be minimized by BS's information when MSS tries to handover to the new BS.
Purpose	Discuss and adopt the advanced feature for IP connectivity establishment decision.

Minimization IP connectivity Establishment Procedure

Yong-Ho Kim

LG Electronics

1. Introduction

IEEE 802.16e uses DHCP, and Mobile IP in order to allocate IP addresses to MSSs and after MSS handover to the target BS re-establishment of IP connectivity is required. However in case the same subnet is used in the target BS, re-establishment of IP connectivity procedure can be skipped and MSS can use the same IP address. Therefore it is required that BS provide some information for MSS to decide the subnet change.

Current IEEE 802.16e doesn't provide MSS with information for IP re-establishment decision. In this document, we propose a possible solution for MSS to make decision whether it needs to re-establish IP connectivity.

2. Overview of Proposed Solutions

Currently after MSS's handover, new IP allocation procedure is required regardless of subnet change. However, if network subnet is not changed in the new BS, MSS can use old IP address which was used in the previous BS. MSS needs some information to decide whether subnet is different from the previous BS. Information for subnet change decision is different depending on the method for allocating IP address. Currently, two IP address allocating methods are defined. One is using DHCP, and the other is using Mobile IPv4. BS monitors DHCP messages and Mobile IPv4 flowing on the Secondary Management Connections and can store information which can help MSS make decision whether new IP address allocation procedure is required or not. This information is delivered when an MSS moves from another BS and tries to register and establish service flow.

How subnet change can be decided for DHCP case and Mobile IP case is described below.
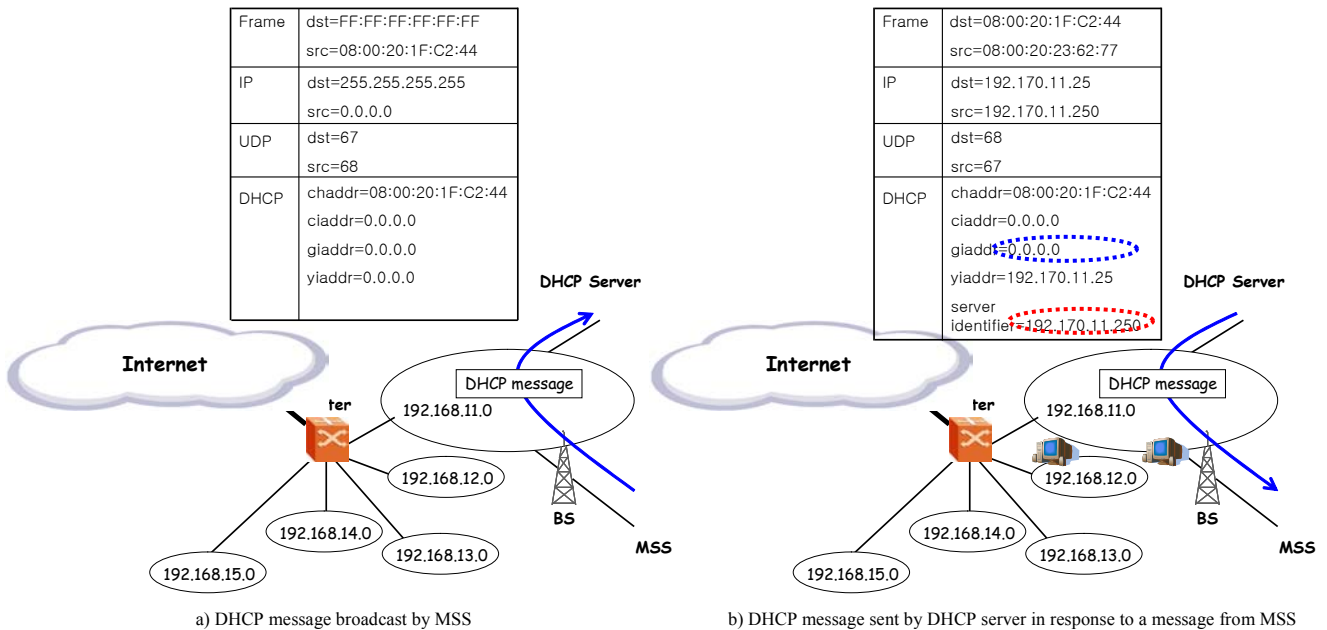
    1.   DHCP case

a) DHCP message broadcast by MSS   b) DHCP message sent by DHCP server in response to a message from MSS

Figure 1. When DHCP server exists on the same network with MSS

Frame	dst=08:00:20:23:62:77
	src=08:00:20:A3:99:4C
IP	dst=192.170.11.250
	src=192.170.11.254
UDP	dst=67
	src=68
DHCP	chaddr=08:00:20:1F:C2:44
	ciaddr=0.0.0.0
	giaddr=192.170.12.254
	yiaddr=0.0.0.0

Frame	dst=08:00:20:A3:99:4C
	src=08:00:20:23:62:77
IP	dst=192.170.11.254
	src=192.170.11.250
UDP	dst=68
	src=67
DHCP	chaddr=08:00:20:1F:C2:44
	ciaddr=0.0.0.0
	giaddr=192.170.12.254
	yiaddr=192.170.12.25
	server identifier=192.170.11.250

a) DHCP message forwarded from MSS to DHCP Server by Relay Agent in router   b) Response from DHCP Server forwarded by Relay Agent in router to MSS
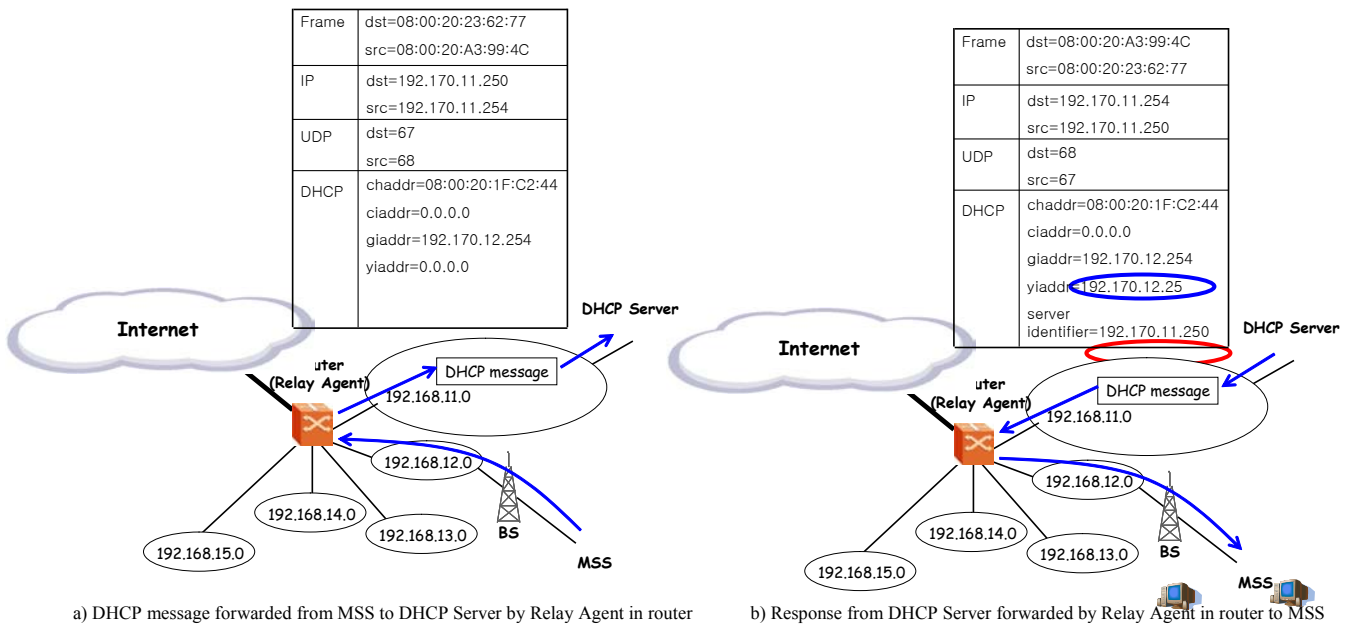
Figure 2. When DHCP server exists on a different network with MSS

Relay agent IP address and server identifier in DHCP response from server can be hints to decide whether subnet is changed.

giaddr: relay agent IP address
server identifier: used to identify a DHCP server in a DHCP message and as a destination address from clients to servers

2. Mobile IPv4 case
    Mobile nodes determine their movement by following two ways in Mobile IPv4.
    A. Move detection using lifetime field within ICMP Router Advertisement [IETF RFC 1256] portion of an Agent Advertisement [IETF RFC 3220].
    B. Move detection using Network-Prefixes [IETF RFC 3220]

IP Header Fields			IP Header
Type = 9	Code	Checksum	
Num Addrs	Addr Entry Size	Advertisement Lifetime	ICMP Router Advertisement
Router Address [1]			
Preference Level [1]			
...			
Type = 16	Length	Sequence Number	
Max Registration Lifetime	R B H F M G V	reserved	Mobility Agent Advertisement Extension
Care-of-address [1]			
...			
Type = 19	Length	Prefix-Length[1] Prefix-Length[2]	Prefix-Length Extension (Optional)
...	...		

Figure 3. Agent Advertisement Message

Router Address with prefix-length extension can identify network-prefix. However prefix-length is an optional parameter, when prefix-length is not present, this information should not be used to decide the network-prefixes.
MSS can listen to periodic or solicit Agent Advertisement message, but if BS provides a moving MSS with router address and prefix-length information, MSS can expedite handover procedure by reducing waiting time of Agent Advertisement from FA.

In DHCP case, BS listens to the DHCP offer message from the DHCP server to the MSSs on the

secondary management connection and stores giaddr and server identifier. In mobile IP case, BS listens to periodic Agent Advertisement from the Foreign Agent and stores Router Addresses in ICMP Router Advertisement portion and prefix-length extension in Prefix-Length Extension of an Agent Advertisement.

By providing information for IP re-establishment decision in REG-RSP message when MSS moves to a new BS, handover delay due to IP re-establishment can be reduced.

2. Proposed Changes in Document

Remedy:

Add mechanism for BS to monitor DHCP related and mobile IP related information. Add TLVs in REG-RSP which are used for MSS to decide whether IP address establishment is necessary.

Remedy1:

[Add sentences to the paragraphs of 6.3.20.4 in page 52 as follows]

For a managed MSS, there is the possibility that entry at the new BS necessitates layer 3 protocol exchanges in order to retain IP connectivity. Such an MSS should take appropriate steps to detect and respond to the change of BS (eg. By performing Mobile IPv4 move detection and re-registration [RFC 3344], or Mobile IPv6 Binding Update [draft-ietf-mobileip-ipv6-24.txt]). In order for MSS to facilitate an IP connectivity retainment, BS may provide MSS with information of IP connectivity which is stored by monitoring other MSS's IP connectivity establishment using DHCP and listening to Agent Advertisement from FA on the secondary management connection.

Remedy2:

*[Add new TLV **"IP address establishment information";** appropriate allocation of Type numbering is required.]*

11.7.10 IP address establishment information

This field provides an IP connectivity establishment related information that allows an MSS to facilitate IP re-establishment decision so that it may continue use the previous IP address after a hand-over to a new serving BS .

Name	Type	Length	Value	Scope
IP address establishment Information	??	Variable	Compound	REG-RSP

The following TLV values may appear in a IP address establishment information TLV.

Name	Type	Length	Value	Scope
DHCP IP address establishment information	??.?	8	Relay agent's IP address in giaddr and the DHCP server IP address in the server identifier option in DHCP message.	REG-RSP

The following TLV values may appear in a IP address establishment information TLV.

Name	Type	Length	Value	Scope
Mobile IP FA address information	??.?	variable	Router Addresses in ICMP Router Advertisement portion and prefix-length extension in Prefix-Length Extension of an Agent Advertisement	REG-RSP