



# ASR 5000 Access Service Gateway Administration Guide Release 12.0 Documentation Addenda

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4/30/11

This addendum provides new and/or expanded information for the documentation pertaining to functionality delivered as part of the ASN GW 12.0 release. Specifically, this document pertains to PMIP Proxy Mobile IP-based WiMAX devices, in compliance with RFC 4332.

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## Affected Document(s)

Documentation updates provided in this addendum pertain to the documents listed in the following table corresponding to the stated release date:

Document	Part Number	Release Date
Cisco ASR 5000 Series Access Services Network Gateway Administration Guide	OL-24877-01	04-30-2011

## Description of Feature

Customers have experienced an issue on a subset of PMIP-based (Proxy Mobile IP) WiMAX devices. The issue causes the affected devices to be unable to communicate over the WiMAX network. The issue occurs when the device receives a DHCP offer that contains an IP address and IP gateway address that do not fall within the same IP network based on the subnet mask.

The Home Agent currently assigns only the IP address through Mobile IP. The ASN-GW fabricates an IP gateway and mask to include in its DHCP Offer to the mobile device. In some cases, the result is the inclusion of invalid parameters that result in the problem described above.

This document outlines a mechanism by which all three values will be explicitly assigned at the Home Agent via MIP, as well as how this functionality is employed to request and communicate the information between elements in the WiMAX PMIP network.

## Changes to Home Agent Processing MIP RRQ

This feature implements support for a new vendor-specific MIP RRQ extension at the Home Agent called the Host Configuration Request Extension.

When the Clearwire network sends a MIP registration request (RRQ) message to the network, this new extension is included in the message for processing by the home agent. The purpose of the extension is to indicate to the home agent that the client needs Ip gateway and mask information relevant to the assigned HoA. The extension is included for all MIP RRQs associated with the session.

## Host Configuration Request Extension

This extension includes the IP address for the default gateway to be inserted into the DHCP offer in option 3:

type	length	reserved	vendor/org-id	nvse-type	sub-type	selector
0x86	0x0C	0x0000	0x00000009	0x000E	0x0000	0x00000000

- **Type:** 134 is the defined normal vendor-specific value
- **Length:** Size of extension (in bytes) excluding type and length fields
- **Reserved:** All 0s
- **Vendor/Org-ID:** 9 is Cisco's NVSE ID
- **NVSE-Type:** 14 indicates a host configuration extension
- **Sub-type:** 0 indicates type is default gateway extension
- **Selector:** All 0s for Request

## Modifications to MIP RRQ

This feature implements support for two new vendor-specific MIP RRP extensions:

- Default Gateway Extension
- Home Network Length Prefix Extension.

## Default Gateway Extension

This extension includes the IP address for the default gateway to be inserted into the DHCP offer in option 3:

type	length	reserved	vendor/org-id	nvse-type	sub-type	default gw
0x86	0x0E	0x0000	0x00000009	0x000E	0x0005	0x00000000

- **Type:** 134 is the defined normal vendor-specific value
- **Length:** Size of extension (in bytes) excluding type and length fields
- **Reserved:** All 0s
- **Vendor/Org-ID:** 9 is Cisco's NVSE ID
- **NVSE-Type:** 14 indicates a host configuration extension
- **Sub-type:** 5 indicates type is default gateway extension
- **Default Gateway:** 32-bit IP address of the gateway

## Home Network Length Prefix Extension

This extension includes subnet mask to be inserted into the DHCP offer in option 1:

type	length	reserved	vendor/org-id	nvse-type	sub-type	prefix-length
0x86	0x0C	0x0000	0x00000009	0x000E	0x0001	0x0000

- **Type:** 134 is the defined normal vendor-specific value
- **Length:** Size of extension (in bytes) excluding type and length fields
- **Reserved:** All 0s
- **Vendor/Org-ID:** 9 is Cisco's NVSE ID
- **NVSE-Type:** 14 indicates a host configuration extension
- **Sub-type:** 1 indicates type is home network length prefix extension
- **Default Gateway:** 0-255 indicates the length of the mask

## Selection of IP, Gateway, and Mask by the Home Agent

When the home agent receives a MIP RRQ that includes the Host Configuration Request Extension, the home agent generates a gateway and mask.

The home agent also returns the generated values encoded in the Default Gateway extension and Home Network Length Prefix Extension appended to the RIP RRP.

To support this feature, configure the optional parameter as outlined in the sample CLI below:

```
ip pool <name> <network> <mask> [...] [subscriber-gw-address
<gateway>]
```

Make sure the configuration of the optional [subscriber-gw-address <gateway>] command adheres to the following guidelines:

- Enable the optional configuration parameter only for pool commands that utilize the network/mask mechanism, as opposed to a range of IP addresses.
- The specified <gateway> MUST be a unicast IPv4 address.
- The <gateway> address must fall within the valid range of unicast addresses based on the <network> <mask> portion of the command.

The successful configuration of the [subscriber-gw-address <gateway>] optional configuration to the end of an ip pool statement MUST have the following effect:

- The <gateway> address MUST be excluded from assignment as an HoA by the home agent.
- The pool of addresses MUST be made available for assignment as HoA for MIP RRQs NOT containing the Host Configuration Request Extension.

Only IP pools that have the [subscriber-gw-address <gateway>} optional parameter configured are considered as candidates for assigning HoA for MIP RRQs received with the Host Configuration Request Extension.

## Home Agent Operation

The following sections describe home agent processing depending on whether the MIP RRQ contains a zero or non-zero value HoA.

### Handling MIP RRQ with Zero Value HoA

The receipt of an MIP RRQ, including the Host Configuration Request Extension with an HoA value of 0.0.0.0, triggers the home agent to locate an IP pool. If the gateway is configured, it returns the netmask and gateway address as described above.

The home agent locates and assigns a valid IP from the selected IP pool. The home agent also retrieves the gateway and mask of the pool.

The home agent creates an MIP RRP, inserting the IP address into the MIP HoA field and adding the gateway to the Default Gateway Extension as defined above.

### Handling the MIP RRQ with Non-Zero Value HoA

If the requested HoA is within a valid IP pool, the receipt of an MIP RRQ, including the Host Configuration Request Extension with a non-zero value in the HoA field triggers the home agent to locate the appropriate IP pool, based on the received HoA.

The home agent obtains the Ip gateway and subnet mask of that pool.

The home agent creates an MIP RRQ, adding the gateway to the Default Gateway Extension and the mask to the Home Network Length Prefix Extension, as described above.

It is possible for an MIP RRQ with a Host Configuration Request Extension and a non-zero HoA field, to contain an HoA address that is part of an IP pool that is NOT configured with the [subscriber-gw-address <gateway>] command.

In this case, the HA has no way to populate a valid Default Gateway Extension and Home Network Length Prefix Extension to include in the MIP RRP.

The HA MUST send an MIP RRP with both of the extensions with zero values.

## Home Agent Configuration Example

The following is an example configuration of IP pools on a home agent and an outline of the home agent's expected behavior to each of the pools.

```
ip pool pool1 1.0.0.0 255.0.0.0 subscriber-gw-address 1.0.0.1
ip pool pool2 2.0.0.0 255.0.0.0
ip pool pool3 3.0.0.10 3.255.255.10
```

**Table 1** Home Agent IP Pool Configuration Example

Pool	Use
pool1	Available for assigning HoA for all MIP RRQs not containing a Host Configuration Request Extension.
	Available for assigning HoA for all MIP RRQs containing a Host Configuration Request Extension.
pool2	Available for assigning HoA for all MIP RRQs not containing a Host Configuration Request Extension.
	Available for assigning HoA for all MIP RRQs containing a Host Configuration Request Extension, but return netmask and gateway as zeros.
	Supports addition of the [gateway <gateway>] optional parameter.
pool3	Available for assigning HoA for all MIP RRQs not containing a Host Configuration Request Extension.
	Available for assigning HoA for all MIP RRQs containing a Configuration Request Extension, but return netmask and gateway as zeros.
	Does not support the addition of the [subscriber-gw-address <gateway>] optional

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