Routing Behind the Mobile Station on an APN

The routing behind the Mobile Station (MS) feature enables the routing of packets to IPv4 addresses that do not belong to the PDN Session (the MS), but exist behind it. The network address of the destination can be different than the Mobile Station address.

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Feature Description

The Framed-Route attribute provides routing information to be configured for the user on the network access server (NAS). The Framed-Route information is returned to the RADIUS server in the Access-Accept message. Framed-Route can work at a context level or VRF level. VRFs can be per enterprise and each can have its own set of framed-routes. In such configuration, framed routes will be installed in VRF’s dedicated for respective enterprise. Association of Framed-Route with VRF will be done based on subscriber IP pool.

Mobile Router enables a router to create a PDN Session which the GGSN authorizes using RADIUS server. The RADIUS server authenticates this router and includes a Framed-Route attribute in the access-accept response packet. Framed-Route attribute also specifies the subnet routing information to be installed in the GGSN for the "mobile router." If the GGSN receives a packet with a destination address matching the Framed-Route, the packet is forwarded to the mobile router through the associated PDN session.

How It Works

Routing Behind the Mobile Station on an APN

The following rules apply:
• AAA interface of GGSN/P-GW supports receiving "Framed Route AVP" in Radius Access-Accept Message from the Radius Server.

• AAA interface of GGSN/P-GW supports maximum 16 "Framed Route AVP" in Radius Access-Accept Message

• GGSN/P-GW does not accept framed route with destination address as 0.0.0.0 and/or netmask as 0.0.0.0.

• GGSN/P-GW does not accept framed route where gateway address in the route is not matching with the address that would be assigned to Mobile station.

• GGSN/P-GW ignores duplicate framed routes.

• GGSN/P-GW supports controlling enabling/disabling of this feature through CLI in APN Configuration.

• GGSN/P-GW supports controlling number of framed-routes to be installed through this feature.

• GGSN/P-GW supports controlling number of hosts (addresses) supported behind the mobile station per route.

• The routing behind an MS is supported only for IPv4 PDP contexts.

• Packets routed behind the MS share the same 3GPP QoS settings of the MS.

Configuring Routing Behind the Mobile Station

The routing behind the MS feature enables the routing of packets to IPv4 addresses that do not belong to the PDN Session (the MS), but exist behind it. The network address of the destination can be different than the MS address.

Before enabling routing behind the MS, the following requirements must be met:

• The MS must use RADIUS for authentication and authorization.

• The Framed-Route (attribute 22) as defined in Internet Engineering Task Force (IETF) standard RFC 2865, must be configured in the profile of a user and contain at least one route, and up to 16 routes for each MS that is to use the routing behind the MS feature.

When configured, the Framed-Route attribute is automatically downloaded to the GGSN during the RADIUS authentication and authorization phase of the PDN Session creation. If routing behind the MS has not been enabled using the network-behind-mobile command in access-point configuration mode, the GGSN ignores the Framed-Route attribute.

When the MS session is no longer active, the routes are deleted.

• Static routes are not configured. The configuration of the routing behind the mobile station feature (Framed Route, attribute 22) and static routes at the same time is not supported.
Configuration Overview

To enable routing behind a Mobile Station perform the following steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Create an APN Profile. Refer to Creating an APN Profile, on page 3.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Enable or disable a Network behind Mobile Station for APN. Refer to Enabling Routing Behind the Mobile Station, on page 3.</td>
</tr>
</tbody>
</table>

Creating an APN Profile

Use the following example to create an APN profile on the P-GW/SAEGW/S-GW:

```plaintext
config
cntxt context_name
  apn apn_name
end
```

Notes:
- The apn name must be an alphanumeric string from 1 to 64 characters in length.
- Once you have created an APN profile, you will enter the Access Point Profile Configuration Mode.

Enabling Routing Behind the Mobile Station

To enable routing behind an MS, use the following steps command in access-point configuration mode:

```plaintext
config
  netw-behind-mobile { max-addresses-behind-mobile max_addr | max-subnets max_subnets }
  { default | no } network-behind-mobile
end
```

Notes:
- **default**
  Enables the default settings for this function. It enables NBMS with max-subnets as 10 and max-addresses-behind-mobile as 16,777,214 default values.
- **no**
  Disables the network behind mobile station functionality on the APN.
- **max-addresses-behind-mobile max_addr**
  Configures the maximum number of addresses that are allowed in a single Network/subnet Behind MS.
- **max-subnets max_subnets**
  Specifies the maximum number of subnets that can be enabled for a call in the APN.

  *max_subnets* must be an integer from 1 through 16.

  Default: 10
Verifying the Routing Behind the Mobile Station

To verify the routing behind the mobile station configuration, use the following show commands.
### Verifying the Routing Behind the Mobile Station

**1. Router show ip route vrf vpn_am2**

<table>
<thead>
<tr>
<th>Destination</th>
<th>Nexthop</th>
<th>Protocol</th>
<th>Prec</th>
<th>Cost</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>*17.18.19.20/32</td>
<td>10.7.104.2</td>
<td>bgp</td>
<td>20</td>
<td>0</td>
<td>bgp_neighbour</td>
</tr>
<tr>
<td>(nhlfe-ix:3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*17.18.19.21/32</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td>vpn_am2lb1</td>
</tr>
<tr>
<td>*40.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*41.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*42.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*43.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*44.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*45.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*46.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*47.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*48.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*49.40.41.0/24</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>*106.106.0.0/16</td>
<td>0.0.0.0</td>
<td>connected</td>
<td>0</td>
<td>0</td>
<td>pool pool_test_3</td>
</tr>
</tbody>
</table>

Total route count: 13
Unique route count: 13
Connected: 12 BGP: 1

**2. show subscribers pgw-only full all**

- **Username:** starent
- **Subscriber Type:** Visitor
- **Status:** Online/Active
- **State:** Connected
- **Connect Time:** Mon Oct 12 12:23:52 2015
- **Auto Delete:** No
- **Idle time:** 00h00m50s
- **MS TimeZone:** n/a
- **Daylight Saving Time:** n/a
- **Access Type:** gtp-pdn-type-ipv4
- **Network Type:** IP
- **Access Tech:** eUTRAN
- **Callid:** 0bd5d3a3
- **IMSI:** 123456789012345
- **Protocol:** pgw-service-name: PGW21
- **Protocol Username:** starent
- **MSISDN:** 9326737733
- **Interface Type:** SS8GTP
- **Low Access Priority:** N/A
- **Emergency Bearer Type:** N/A
- **IMS-media Bearer:** No
- **S6b Auth Status:** N/A
- **Access Peer Profile:** default
- **Acct-session-id (C1):** 141414650F55554B
- **ThreeGPP2-correlation-id (C2):** 17767C4D / 6SKDhW-2
- **Card/Cpu:** 12/0
- **Sessmgr Instance:** 47
- **Bearer Type:** Default
- **Bearer-Id:** 5
- **Bearer State:** Active
- **IP allocation type:** local pool
- **IPv6 allocation type:** N/A
- **IP address:** 106.106.0.5
- **Framed Routes:**
  - 40.40.41.0 255.255.255.0 106.106.0.5
  - 41.40.41.0 255.255.255.0 106.106.0.5
  - 43.40.41.0 255.255.255.0 106.106.0.5
  - 44.40.41.0 255.255.255.0 106.106.0.5
  - 45.40.41.0 255.255.255.0 106.106.0.5
  - 46.40.41.0 255.255.255.0 106.106.0.5
  - 47.40.41.0 255.255.255.0 106.106.0.5
  - 48.40.41.0 255.255.255.0 106.106.0.5
  - 49.40.41.0 255.255.255.0 106.106.0.5
  - 42.40.41.0 255.255.255.0 106.106.0.5

- **ULI:**
- **TAI-ID:**
- **MCC:** 214
- **MNC:** 365
- **TAC:** 0x6789
- **ECGI-ID:**
- **MCC:** 214
- **MNC:** 365
- **ECI:** 0x1234567
- **Accounting mode:** None
- **APN Selection Mode:** Sent by MS
- **MEI:** 1122334455676788
- **Serving Nw:** MCC=123, MNC=765
- **charging id:** 257250635
- **charging chars:** normal
- **Source context:** EPC2
- **Destination context:** ISP1
- **S5/S8/S2b/S2a-APN:** cisco.com
- **SG1-APN:** cisco.com
- **APN-OI:** n/a
- **Restoration priority level:** n/a
Traffic flow template: none
IMS Auth Service: IMSGx
active input IPv4 acl: IPV4ACL
active output IPv4 acl: IPV4ACL
active input IPv6 acl: IPV4ACL
active output IPv6 acl: IPV4ACL
ECS Rulebase: cisco
Bearer QoS:
QCI: 5
ARP: 0x04
PCI: 0 (Enabled)
PL: 1
FVI: 0 (Enabled)
MBR Uplink (bps): 0
GFR Uplink (bps): 0
PCRF Authorized Bearer QoS:
QCI: n/a
ARP: n/a
PCI: n/a
PL: n/a
FVI: n/a
MBR uplink (bps): n/a
GFR uplink (bps): n/a
Downlink APN AMBR: n/a
Uplink APN AMBR: n/a
Primary IPv6: n/a
Secondary IPv6: n/a
Tertiary IPv6: n/a
Primary IPv4: n/a
Secondary IPv4: n/a
Tertiary IPv4: n/a
Access Point MAC Address: N/A
pgw c-teid: [0x80000002f] 2147483695
pgw u-teid: [0x80000002f] 2147483695
sgw c-teid: [0x50010001] 1342242817
sgw u-teid: [0x50010001] 1610678273
ePDG c-teid: N/A
ePDG u-teid: N/A
cgw c-teid: N/A
cgw u-teid: N/A
pgw c-addr: 2002::2:101
ggw c-addr: 2002::2:61
ePDG c-addr: N/A
cgw c-addr: N/A
Downlink APN AMBR: 16534000bps
Uplink APN AMBR: 16534000bps
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Verifying the Routing Behind the Mobile Station
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Routing Behind the Mobile Station Show Command(s) and/or Outputs

```
show apn name <apn_name>
```

... proxy-mip: Disabled
proxy-mipv6: Disabled
proxy-mip null-username static home address: Disabled
Network Behind Mobile Station: Enabled
Maximum subnets behind Mobile station: 10
Maximum Addresses Behind Mobile Station: 16777214
L3-to-L2 tunnel address-policy no-alloc-validate
tunnel address-policy alloc-validate
NPU QoS Traffic Priority: Derive from packet DSCP