

Out of Band Management Through USB Modem

Effective Cisco IOS XE Release 3.15.0S, the Cisco ASR 920 Series Router provides out-of-band connectivity to manage remotely-deployed cell site routers using the 3G or 4G cellular network through the USB modem (also called the dongle). This OOB connectivity gives the service providers the ability to securely manage their remote cell site routers at anytime from anywhere. This feature also eliminates the need for the onsite or remote IT staff to handle outages.

Out of Band Management feature is not supported in Cisco IOS XE Everest 16.5.1.

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Prerequisites for the OOB Management Through USB Modem

- The Local Mobility Anchor (LMA) must be a Cisco ASR 1000 Series Router.
- The Mobile Access Gateway (MAG) must be the Cisco ASR 920 Series Router (ASR-920-12CZ-A/D, ASR-920-4SZ-A/D, ASR 920-10SZ-PD, or ASR-920-8S4Z-PD).
- The dongle can be inserted only in the USB Memory port of the Cisco ASR 920 Series Router.

Restrictions for the OOB Management Through USB Modem

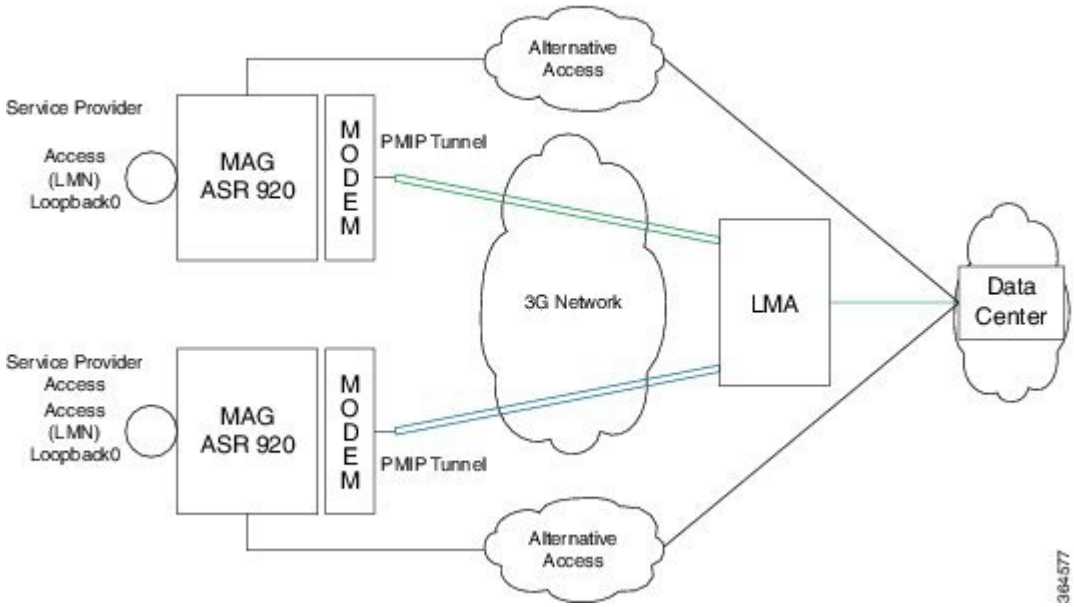
For Cisco IOS-XE Release 3.15.0S:

- Multi-VRF is not supported on the Cisco ASR 1000 Series Router.
- Only UDP PMIPv6 tunnels are supported between the LMA and MAG.
- Only the following dongle are supported:
  - Reliance (ZTE: model- AC2739)
  - Airtel 4G (Huawei: model-E3272)
  - TATA DoCoMo (ZTE: model-MF190)

- OOB Management using USB Modem works only when the advancemetroipaccess license is enabled.
- Starting from Cisco IOS-XE 3.15.0S release, you cannot configure or remove an virtual interface, virtualPPP-4001, manually.

Information About the OOB Management Through USB Modem

Figure 1: Sample Topology for OOB Management



Note By default, the management interface remains in administratively down state until the dongle in inserted and the feature is enabled.

In the above topology, the LMA assigns an IP address to the LMN. The USB modem receives its IP address from the Service Provider. A UDP tunnel is established between the LMA and MAG through the proxy mobile IPv6 (PMIPv6) protocol.

- Proxy Mobile IPv6 technology—Provides network-based IP mobility management to a mobile node without requiring the participation of the mobile node in any mobility-related signaling. The network is responsible for managing IP mobility on behalf of the host.
- MAG—Manages mobility-related signaling for a mobile node attached to its access link. It is the first layer 3 attachment node for the mobile clients.

The major functions of MAG are:

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  - Assigning an IP address to the loopback address given by the LMA (when LMA assigns an IP address dynamically)
  - Assigning an IP address to the loopback address and sending an update to LMA (in case of static IP address)
  - Tunneling the traffic to the corresponding LMA.

- LMA—is the topological anchor point for the MAG

The LMA is responsible for assigning addresses to MAG and managing it.

In Cisco IOS-XE 3.15.0S, LMA is hosted on the Cisco ASR1000 Series Router.

Configuring the Management Interface on the MAG

Procedure

	Command or Action	Purpose
Step 1	**platform usb modem** *username password*	Enables the dongle on the MAG. The *username* and *password* are the mobile numbers of the dongle (without the zero prefix).
Step 2	**interface loopback** *loopback-id*	Creates an interface loopback.
Step 3	**ip route** *prefix mask* {*ip-address*} **virtualPPP-4001**	Creates a route to reach the LMA through the dongle interface (virtual pp interface).
Step 4	**exit**	Exits the interface.
Step 5	ipv6 unicast-routing	Enables IPv6 routing.
Step 6	**ipv6 mobile pmipv6-domain** *domain-name*	Configures common parameters valid across the domain—a logical grouping of the MAG and LMA. Creates a PMIPv6 domain and configures it by using the configuration from the LMA
Step 7	**encap udptunnel**	Configures the UDP tunnel encapsulation between the Mobile Access Gateway (MAG) and the Local Mobility Anchor (LMA).
Step 8	**lma** *lma-id*	Configures an LMA within the PMIPv6 domain and enters PMIPv6 domain LMA configuration mode.
Step 9	**ipv4-address** *ip-address*	Configures an IPv4 address for the LMA within the PMIPv6 domain.
Step 10	**exit**	Exits the interface
Step 11	**nai** *user@realm*	Configures a network access identifier (NAI) for the mobile node (MN) within the PMIPv6 domain and enters PMIPv6 domain mobile node configuration mode.
Step 12	**lma** *lma-id*	Configures an LMA for the MN.

	Command or Action	Purpose
Step 13	**ipv6 mobile pmipv6-mag** *mag-id* **domain** *domain-name*	Enables the MAG service on the dongle, configures the PMIPv6 domain for the MAG, and enters MAG configuration mode.
Step 14	address {ipv4 ipv4-address | ipv6 ipv6-address | dynamic}	Configures an IPv4, an IPv6, or dynamic address for a MAG or to configure an IPv4 or an IPv6 address on an LMA.
Step 15	**roaming interface** *type number* **priority** *priority-value* **egress-att** *access-tech-type* **label** *egress-label*	Specifies an interface as a roaming interface for a Mobile Access Gateway (MAG) and set its parameters
Step 16	**interface loopback** *loopback-id*	Creates an interface loopback.
Step 17	**interface GigabitEthernet** *slot/subslot*	The local routing ACL's are not populated, which affects the locally generated/destined data packets. This command ensures the issue does not arise.
Step 18	**lma** *lma-id domain-name*	Configures the LMA for the MAG and enters MAG-LMA configuration mode.
Step 19	ipv4-address *ipv4-address*	Configures the IPv4 address for the LMA within MAG, for the MAG with LMA, or for the LMA or MAG within the Proxy Mobile IPv6 (PMIPv6) domain.
Step 20	**auth-option spi** {*spi-hex-value* | **decimal** *spi-decimal-value*} **key** {**ascii** *ascii-string* | **hex** *hex-string*}	Configures authentication for the PMIPv6 domain. **Note** This authentication should match that at the LMA side, otherwise the UDP tunnel will not be established.
Step 21	**logical-mn** *network-access-identifier*	Enables the mobile router functionality in MAG.
Step 22	**address** {**ipv4** *ipv4-address* | **ipv6** *ipv6-address* | **dynamic**}	Configures an IPv4, an IPv6, or dynamic address for a MAG or LMA.
Step 23	**home interface** *type*	Enables the MAG service on the specified interface.

Configuration Example: MAG Configuration with Dynamic IP Address on Logical MN Interface

```
Router(config)# platform usb modem 1234567890
 1234567890
Router(config)# interface loopback 1
```

```
Router(config-if)# exit
Router(config)# ipv6 unicast-routing
Router(config)# ip route 0.0.0.0 0.0.0.0 Virtual-PPP4001
Router(config)# ipv6 mobile pmipv6-domain D1
Router(config-ipv6-pmipv6-domain)# encap udptunnel
Router(config-ipv6-pmipv6-domain)# lma LMA1
Router(config-ipv6-pmipv6-domain-lma)# ipv4-address 173.39.88.101
Router(config-ipv6-pmipv6-domain-lma)# exit
Router(config-ipv6-pmipv6-domain)# nai MN5@cisco.com
Router(config-ipv6-pmipv6-domain-mn)# lma LMA1
Router(config-ipv6-pmipv6-domain-mn)# exit
Router(config-ipv6-pmipv6-domain)# ipv6 mobile pmipv6-mag M1 domain D1
Router(config-ipv6-pmipv6-mag)# address dynamic
Router(config-ipv6-pmipv6mag-addr-dyn)# roaming interface Virtual-PPP4001 priority 1
egress-att 3g label etyr
Router(config-ipv6-pmipv6mag-addr-dyn)# interface loopback1
Router(config-ipv6-pmipv6mag-intf)# interface GigabitEthernet0/0/1
Router(config-ipv6-pmipv6mag-intf)# lma LMA1 D1
Router(config-ipv6-pmipv6mag-lma)# ipv4-address 173.39.88.101
Router(config-ipv6-pmipv6mag-lma)# auth-option spi 67 key ascii key1
Router(config-ipv6-pmipv6mag-lma)# logical-mn MN5@cisco.com
Router(config-ipv6-pmipv6mag-logicalmn)# address dynamic
Router(config-ipv6-pmipv6mag-logicalmn)# home interface loopback1
```

Configuration Example: MAG Configuration with Static IP Address on Logical MN Interface

```
Router(config)# platform usb modem 1234567890
 1234567890
Router(config)# interface loopback 1
Router(config-if)# ip address 10.10.10.1 255.255.255.0
Router(config-if)# exit
Router(config)# ipv6 unicast-routing
Router(config)# ip route 0.0.0.0 0.0.0.0 Virtual-PPP4001
Router(config)# ipv6 mobile pmipv6-domain D1
Router(config-ipv6-pmipv6-domain)# encap udptunnel
Router(config-ipv6-pmipv6-domain)# lma LMA1
Router(config-ipv6-pmipv6-domain-lma)# ipv4-address 173.39.88.101
Router(config-ipv6-pmipv6-domain-lma)# exit
Router(config-ipv6-pmipv6-domain)# nai MN5@cisco.com
Router(config-ipv6-pmipv6-domain-mn)# lma LMA1
Router(config-ipv6-pmipv6-domain-mn)# exit
Router(config-ipv6-pmipv6-domain)# ipv6 mobile pmipv6-mag M1 domain D1
Router(config-ipv6-pmipv6-mag)# address dynamic
Router(config-ipv6-pmipv6mag-addr-dyn)# roaming interface Virtual-PPP4001 priority 1
egress-att 3g label etyr
Router(config-ipv6-pmipv6mag-addr-dyn)# interface loopback1
Router(config-ipv6-pmipv6mag-intf)# interface GigabitEthernet0/0/1
Router(config-ipv6-pmipv6mag-intf)# lma LMA1 D1
Router(config-ipv6-pmipv6mag-lma)# ipv4-address 173.39.88.101
Router(config-ipv6-pmipv6mag-lma)# auth-option spi 67 key ascii key1
Router(config-ipv6-pmipv6mag-lma)# logical-mn MN5@cisco.com
Router(config-ipv6-pmipv6-mag-logicalmn)# home interface loopback1
```

Configuring the LMA

Procedure

	Command or Action	Purpose
Step 1	**ip local pool** *pool-name low-ip-address high-ip-address*	Configures a pool of IP addresses from which the LMA assigns an IP address to the MAG.
Step 2	**ipv6 mobile pmipv6-domain** *domain-name*	Creates a PMIPv6 domain.
Step 3	**auth-option spi** {*spi-hex-value* | **decimal** *spi-decimal-value*} **key** {**ascii** *ascii-string* | **hex** *hex-string*}	Configures authentication for the PMIPv6 domain. **Note** This authentication should match that at the MAG side, otherwise the UDP tunnel will not be established.
Step 4	**encap udptunne**l	Configures the UDP tunnel encapsulation between the Mobile Access Gateway (MAG) and the Local Mobility Anchor (LMA).
Step 5	**nai** *user@realm*	Configures a network access identifier (NAI) for the mobile node (MN) within the PMIPv6 domain and enters PMIPv6 domain mobile node configuration mode. **Note** Multiple MAGs can be added in the LMA.
Step 6	**network** *network-name*	Associates a network, to which an IPv4 or IPv6 pool can be configured, with an LMA.
Step 7	**ipv6 mobile pmipv6-lma** *lma-id* **domain** *domain-name* [**force**]	Enables the LM) service on the router and configures the Proxy Mobile IPv6 (PMIPv6) domain for the LMA.
Step 8	**address ipv4** *ipv4-address* | **ipv6** *ipv6-address* | **dynamic**}	Configures an IPv4, an IPv6, or dynamic address for a MAG or LMA.
Step 9	**dynamic mag learning**	Enables the LMA to accept PMIPv6 signaling messages from any MAG that is not locally configured.
Step 10	**network** *network-name*	Associates a network, to which an IPv4 or IPv6 pool can be configured, with an LMA.
Step 11	**pool ipv4** *name* **pfxlen** *length*	Specifies the name of the IPv4 address pool, from which a home address is allocated to a mobile node (MN), in the LMA.

	Command or Action	Purpose
Step 12	**ip route** *prefix mask interface-name*	Creates a route to reach the MAG through the dongle interface.
Step 13	**exit**	Exits the interface.

Configuration Example

```
ip local pool v4pool 10.10.10.0 10.10.10.254
!
ipv6 mobile pmipv6-domain D1
 auth-option spi 64 key ascii 100
 encap udptunnel
 nai MN5@cisco.com
  network net1
ipv6 mobile pmipv6-lma LMA1 domain D1
 address ipv4 173.39.88.101
 dynamic mag learning
 network net1
  pool ipv4 v4pool pfxlen 24
!
ip route 0.0.0.0 0.0.0.0 GigabitEthernet0/0/2
exit
```

Verifying the Configuration

MAG Call Setup

On the MAG:

```
ASR920-MAG# show ipv6 mobile pmipv6 mag binding
Total number of bindings: 1
----------------------------------------
[Binding][MN]: Domain: D1, Nai: MN5@cisco.com
        [Binding][MN]: State: ACTIVE
        [Binding][MN]: Interface: Loopback1
        [Binding][MN]: Hoa: 10.10.10.1, Att: 4, llid: MN5@cisco.com
        [Binding][MN]: HNP: 0
        [Binding][MN][LMA]: Id: LMA1
        [Binding][MN][LMA]: Lifetime: 3600
        [Binding][MN]: Yes
        [Binding][MN][PATH]: interface: Virtual-PPP4001, Label: etyr
                State: PATH_ACTIVE
                Tunnel: Tunnel0
                Refresh time: 300(sec), Refresh time Remaining: 272(sec)
----------------------------------------
```

On the LMA:

```
ASR1000-LMA# show ipv6 mobile pmipv6 lma binding
Total number of bindings: 1
----------------------------------------
[Binding][MN]: State: BCE_ACTIVE
```

```
[Binding][MN]: Domain: D1, NAI: MN5@cisco.com
[Binding][MN]: HOA: 10.10.10.1, Prefix: 24
[Binding][MN]: HNP: 0
[Binding][MN][PEER]: Default Router: 10.10.10.0
        [Binding][MN]: ATT: WLAN (4)
                [Binding][MN][PEER1]:LLID: MN5@cisco.com
                [Binding][MN][PEER1]: Id: dynamic_mag165
                [Binding][MN][PEER1]: Lifetime: 3600(sec)
                [Binding][MN][PEER1]: Lifetime Remaining: 3538(sec)
                [Binding][MN][PEER1]: Tunnel: Tunnel0
                [Binding][MN][GREKEY]: Upstream: 1, Downstream: 0
---------------------------------------
```

Note If the LMA has bindings to multiple MAGs, use the following command to view a specific MAG:**show ipv6 mobile pmipv6 LMA binding nai MN5@cisco.com**.

MAG Data Path

- To verify the dynamic tunnel created between the MAG and the LMA:

show interface tunnel *tunnel-number*

- To verify dongle interface status (virtual ppp interface) and tunnel status:

show ip interface brief

```
ASR920-MAG# show ip int brief | i Virtual-PPP4001
Virtual-PPP4001        106.216.155.17  YES unset  up                    up
ASR920-MAG# show ip int brief | i Tunnel
Tunnel0                    106.216.155.17  YES unset   up                    up
```

Note Addresses assigned to the MN should be from the local pool configured in the LMA.

- To verify dynamic route map created in MAG:

show route-map dynamic

Debug Commands

The following debugs can be used to debug the call flow information and events.

- **debug ipv6 mobile mag events**
- **debug ipv6 mobile mag info**
- **debug ipv6 mobile mag api**

To view the packet level information messages, use

- **debug ipv6 mobile packets**

To clear the PMIPv6 bindings and statistics:

- **clear ipv6 mobile pmipv6 mag binding all**
- **clear ipv6 mobile pmipv6 mag binding nai** *MN-nai*

Related Documents

For more information on mobility commands, see the *Cisco IOS IP Mobility Command Reference*.