Verizon Wireless Dynamic Mobile Network Routing LTE - Cisco Integrated Services Router (ISR) and Connected Grid Router

Mobile Private Network Planning Guide

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Overview

Verizon Wireless offers four 3G/4G data services to connect remote sites to enterprise private networks:

- Machine-to-Machine (M2M) price plan with Internet access and dynamic IP: This service enables a router to connect users or devices to the Internet or an enterprise network (through a customer premises equipment (CPE)-based VPN such as IP Security [IPsec], generic routing encapsulation [GRE], Dynamic Multipoint VPN [DMVPN], etc.).

- M2M price plan with Internet access with static IP: This service offers the same services as the previous one, except the 3G/4G interface of each router receives a consistent predetermined 3G or 4G IP address.

- Mobile Private Network (MPN): This service enables a router to connect to an enterprise network. It requires a customer premises-based VPN or Network Address Translation (NAT) for users behind the remote router to access the network.

- Mobile Private Network (MPN) with Dynamic Mobile Network Routing (DMNR): This service enables a router to connect users to an enterprise private network without the need for customer premises-based VPN. Traffic does not traverse the Internet. Dynamic routing allows changing of local and remote IP addresses without coordination with Verizon. It can be used with any Cisco VPN option, including Group Encrypted Transport VPN.

This planning guide outlines the process and timelines to order and plan for MPN services. Relevant documents are also referenced.

1. Determine what type of pilot or test will be done, and order the appropriate service.
   a. If testing or deploying MPN, DMNR is required (unless you plan a premises-based overlay tunnel VPN). MPN with DMNR is always recommended. There are two scenarios for private networks:
      i. You already have a Verizon MPN:
         1. If your Mobile Private Network is enabled for Long Term Evolution (LTE) and DMNR with LTE, proceed to step ii.
         2. If your Mobile Private Network does not support LTE or DMNR with LTE, then a Verizon Wireless representative must submit a Verizon Home Agent Portal (VHAP) request to have the Mobile Private Network upgraded for LTE and DMNR on LTE. The time between the private network work order and customer turn-up is normally at least 3 weeks. A Verizon Wireless representative should be consulted for the specifics. Once MPN is set up, new lines can be added in a few days.
      ii. Your organization does not yet have a Verizon Mobile Private Network:
         1. The Verizon Wireless representative submits a request for Implementation of a Mobile Private Network (with 4G and DMNR options); the process is found within InfoManager (internal Verizon system). The time between the private network work order and customer turn-up is normally at least 3 weeks. A Verizon Wireless representative should be consulted for the specifics.

2. Ensure the router is a Cisco Integrated Services Router Generation 2 or 4000 series, so it supports the LTE enhanced high-speed WAN interface card (eHWIC, for 1900, 2900, 3900 series), the LTE Network Interface Module (NIM, for Cisco 4000 series), the LTE GRWIC (CGR-2010), or an 8x9 series with embedded LTE. There are multiple sources for these:
   a. Use an existing ISR.
   b. Acquire a new ISR.
   c. Borrow an ISR G2 from the Verizon Vienna Demo Depot pool (an internal link is available to the Verizon field team): http://infomanagerdoc.ddc.vzwcorp.com/OST/OSTDisplay/IM/section/780/72400.

Borrow an ISR from the Cisco eStar Demo Depot pool; an internal link is available to the Cisco field team: http://tools.cisco.com/GPSS/dlp/jsp/dlphome.jsp.

   d. For Verizon DMNR service, ISR modular models requires a Data License or Appx license (optional software feature on 1900/2900/3900/4000 ISRs, included with 8x9 series). There is a method of generating an instant temporary 60-day license from the ISR itself (for example, Cisco IOS® Software config mode: "**license boot module c1900 technology-package datak9**" on ISR G2, "**license boot level appxk9**" on ISR 4K). The 8x9 series includes a data license by default.

3. Obtain an LTE eHWIC (or GRWIC, or NIM) for the test and implementation. It can be obtained in one of the following ways:

   a. Place an order for the LTE NIM/eHWIC/GRWIC (through an authorized Cisco partner).

   b. If an organization wants to evaluate LTE prior to purchasing, an evaluation unit may be available through either Verizon (through the Vienna demo pool) or Cisco (through the Demo Depot program).

4. Ensure you have a subscriber identity module (SIM/USIM/Mini-SIM, Verizon SKU "DIRECTSIM4G-D") for the LTE NIM/eHWIC/GRWIC/8x9. Your Verizon account manager is the appropriate contact for obtaining a SIM.

   a. The SIM must be provisioned and associated with your organization's Mobile Private Network.

   b. The SIM must be provisioned and associated with international mobility equipment identity (IMEI) of the LTE eHWIC/GRWIC/819 modem before activation on an approved plan.

   c. The Mobile Private Network must also have 4G and DMNR support enabled. This support can be verified by your Verizon Wireless representative.

   d. If the ISR and SIM are from the Verizon Vienna demo pool, MPN cannot be tested without replacing the SIM. You must have a separate capable Mobile Private Network and an associated/activated SIM because SIMs provided by Vienna demo pool are for Internet access only.

5. Insert the SIM using the instructions found at:

www.cisco.com/c/en/us/td/docs/routers/access/interfaces/NIM/hardware/installation/guide/4GLTENIM_HIG.html#pgfId-1201912

www.cisco.com/en/US/docs/routers/access/interfaces/ic/hardware/installation/guide/EHWIC-4G-LTEHW.html#wp1147248

www.cisco.com/c/en/us/td/docs/routers/access/800/hardware/installation/guide/800HIG/installing.html#39557

6. Install the eHWIC into the ISR.

   a. The instructions to physically install the LTE NIM or eHWIC into the ISR are available at:
www.cisco.com/c/en/us/td/docs/routers/access/interfaces/NIM/hardware/installation/guide/4GLTENIM_HIG.html#pgfId-1209630
www.cisco.com/en/US/docs/routers/access/interfaces/ic/hardware/installation/guide/inst_ic.html#wp1037332
The CGR-2010 is similar. The C819G-4G-V has the LTE already integrated.

   b. Install the LTE eHWIC (or GRWIC) into the right-most eHWIC slot (looking at the rear of the ISR, slot 0/0) (Figure 1).

Figure 1. LTE eHWIC

7. Install the antenna cables to the LTE eHWIC (or GRWIC, or C819G-4G-V) and the antennas onto the extension cables. Instructions are in the section "Additional Information".

8. Power up the ISR, and ensure that the antennas are positioned appropriately.

   a. With terminal or console access to the ISR G2 (logging the terminal console is recommended):

      i. Power up the ISR. Hit Enter, and at the console prompt type "enable". No ID or password should be set. If there is, follow the instructions to reset the password at: http://www.cisco.com/en/US/products/ps5855/products_password_recovery09186a0080b3911d.shtml.

      ii. Position antennas for best RSSI signal > -80 dBm, with the **show cell 0/0/0 radio** command (or **show cell 0 radio** for 819).

      iii. Type "sh cell 0/x/0 hardware (cell 0 for 819) and "show version", and ensure that the recommended Cisco IOS® Software version is running. The generally recommended Cisco IOS software release depends on the LTE modem firmware level (seen via "show cell 0/x/0|0 hardware" command).

ISR LTE SKU	LTE Modem	Recommended firmware	Recommended IOS Release
EHWIC-4G-LTE-V	MC7750	3.5.10.6	15.5.3M4
EHWIC-4G-LTE-VZ	MC7350	5.5.58.01	15.5.3M4
C819G-4G-V-K9	MC7750	3.5.10.6	15.5.3M4
C819HG-4G-V-K9	MC7750	3.5.10.6	15.5.3M4
C819G-4G-VZ-K9	MC7350	5.5.58.01	15.5.3M4
C899G-LTE-VZ-K9	MC7350	5.5.58.01	15.5.3M4
NIM-4G-LTE-VZ	MC7350	5.5.58.01	XE 3.16.4
C819G-LTE-MNA-K9	MC7354	5.5.58.01	15.6.1T
C819GW-LTE-MNA-K9	MC7354	5.5.58.01	15.5.3M4

      iv. Type "show run" to see if the configuration matches the configuration guide on the following pages.

      If the configuration does not match the provided configuration, add or change the appropriate lines through the command-line interface (CLI) **config t**, etc. **Note:** Even with an IP address specifically defined per ISR via MPN, the cell interface remains defined as "address negotiated".

   c. If a new SIM is installed, it may take up to 10 minutes after ISR power-up before the LTE interface becomes active because the SIM must connect to the network and start a process that may reconfigure the LTE modem. The ISR should not be powered down for at least 10 minutes after initial power-up (with antennas attached). This process provisions the appropriate data APN. If the network-based process (SIM-Over-the-Air/Over-the-Air Device Management [SIM-OTA/OTA-DM]) does not change the APN as expected, either the SIM is not properly activated or provisioned (Call Verizon Wireless Customer Care), or the SIM was installed in the LTE eHWIC without this network process completed and the ISR powered down. If the latter, there are two ways to address the problem:

   1) Power down the ISR, remove the SIM, put the SIM into another LTE device Novatel Mifi hotspot, LTE eHWIC, etc.). When that device connects, reinsert the SIM into the LTE eHWIC, connect the antennas, power up, and wait 10 minutes. 2) Use the 1-line IOS enable mode command (shown below). The Cisco IOS Software command **show cellular 0/x/0 profile** displays the APN (**show cellular 0 profile** for the 819). The Cisco IOS Software command "**show cellular 0/x/0 profile**" shows the APN (**show cellular 0 profile** for the 819).

   For IOS 15.3(3)M2 and later M releases, additional APNs have been exposed (IMS, admin), so the profile number has been changed from 1 to 3. Below is an example:

cellular 0/0/0 lte profile create 3 ne01.VZWSTATIC (Note that the Data APN is profile 3)

9. Check and if needed, configure the ISR G2.

   a. Type "show run" to see if the configuration matches the appropriate configuration guidelines

   b. If the configuration does not match, add or change the appropriate lines with the command-line interface (CLI) **config t**, etc. **Note:** With Verizon Wireless Mobile Private Network service where a static IP address is defined per ISR, the cell interface remains defined as "address negotiated".

   c. Configuration guides for various MPN DMNR deployments can be found at:

      www.cisco.com/en/US/products/ps5949/products_installation_and_configuration_guides_list.html

   d. Review the current planning document at any of the above sites to update the NIM/eHWIC/GRWIC/8x9 firmware if needed.

Additional Information

- Cisco LTE Portal: http://www.cisco.com/go/4g.

- Cisco antenna installation guide (also includes connection troubleshooting guidance):

  www.cisco.com/c/dam/en/us/td/docs/routers/access/interfaces/software/deployment/guide/guide_100413.pdf

- Verizon planning/configuration documents:

  www.cisco.com/en/US/products/ps5949/products_installation_and_configuration_guides_list.html

- LTE NIM and eHWIC hardware overview, SIM install, antenna connection, and module install:

  www.cisco.com/en/US/docs/routers/access/interfaces/ic/hardware/installation/guide/EHWIC-4G-LTEHW.html

  www.cisco.com/c/en/us/td/docs/routers/access/interfaces/NIM/hardware/installation/guide/4GLTENIM_HIG.html

- LTE NIM and Cisco IOS Software configuration (use Verizon Wireless MPN config guides), monitoring, and troubleshooting: www.cisco.com/en/US/docs/routers/access/interfaces/software/feature/guide/EHWIC-4G-LTESW.html

  www.cisco.com/c/en/us/td/docs/routers/access/interfaces/NIM/software/configuration/guide/4GLTENIM_SW.html

- LTE eHWIC dipole antenna instructions:

  www.cisco.com/en/US/docs/routers/access/wireless/hardware/notes/4G3G_ant.html.

- LTE eHWIC dipole antenna stand instructions:

  www.cisco.com/en/US/docs/routers/access/wireless/hardware/notes/4Gantex15-10r.html.

- LTE eHWIC antenna lightning arrestor instructions:

  www.cisco.com/en/US/docs/routers/access/wireless/hardware/notes/4Glar.html

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