

Cellular Background

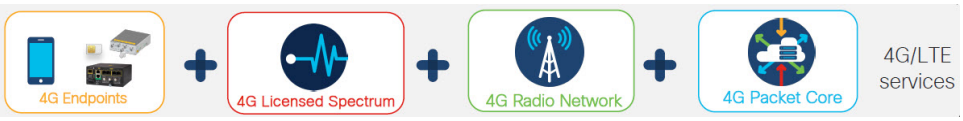
This chapter contains the following sections:

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What Is Cellular?

Cellular refers to different generation of cell-based wireless network technologies that connects end devices, for example, mobile phone, routers, and tablets to the Internet as specified in 3GPP architecture (https://www.3gpp.org) summarized in the following figure:

Figure 1: 4G/LTE Services



This section differentiates the types of cellular service that Cisco routers might use.

- Public Cellular Service — Public carrier service in countries, with frequency bands allocated to the carrier in country, and a service subscription done by customer who obtain SIM card from the mobile carrier.
- Private Cellular Network — Infrastructure and frequency band dedicated to a customer in a given location, with private SIM card managed by the owner of the network.
- Private APN — A public mobile network service where the APN is dedicated to an organization, for example, a Utility
- Public Safety Service — Dedicated to some customers, using specific bands and SIM subscription with products that may need to be certified for the services, for example, Firstnet on band 14.

Cisco Cellular Overview

Cisco Cellular Pluggable Interface Modules operate over 5G Sub-6 GHz, Fourth-Generation Long-Term Evolution (4G LTE) cellular networks and Third-Generation (3G) cellular networks.

The Cisco Cellular PIMs may support one or more of the below cellular technologies, dependent of the PIM mode:

5G Sub-6 GHz

Fifth generation of cellular technology. It uses new technologies and methods end to end—from new transmission frequencies to cloud-based radio network access and edge solutions—to achieve better speed, latency, capacity, resiliency, and coverage.

5G is available with dual network modes. NSA (Non-Standalone Access) and SA (Standalone Access) are the two 5G network modes.

- NSA relies on the 4G network facilities to provide more speed and higher data bandwidth.
- SA is the true 5G network, where the 5G network has its dedicated 5G facilities to provide enormous speed improvements and minimal network latency (delay). The 5G SA network is independent of the 4G network.

4G LTE

4G LTE mobile specification provides multi-megabit bandwidth, more efficient radio network, latency reduction, and improved mobility. LTE solutions target new cellular networks. There are different LTE categories that are described in the following table:

Table 1: LTE Categories

UE Category	3GPP Release	Uplink/Downlink Data Rate (Mbs)
NB1	13	HD: DL: 27kbs, UL:62kbs
M1	13	HD: DL: 300kbs, UL: 375kbs FD: DL/UL: 1
1	8	DL: 10, UL: 5
3	8	DL: 100, UL: 50
4	8	DL: 150, UL: 50
6	10	DL: 300, UL: 50
18	14	DL: 1200, UL: 150 (cat 13)

Note Categories specified over releases of 3GPP as LTE, LTE Advanced and LTE Advanced Pro. This led to the Cisco PIM names LTEA, LTEAP.

LTE 450MHz Category 4

The P-LTE-450 is a 450MHz Category-4 LTE PIM, which addresses LTE use cases primarily targeting Utility, public safety and critical infrastructure maintained by public organizations in Europe and other world regions.

The module supports only Band 31 and 72 for LTE 450MHz networks. Support for the module is available with Cisco IOS XE release 17.10.1.

The P-LTE-450 is configured differently from the rest of the Cisco Cellular Pluggable Interface Modules. Complete details can be found in the 450MHz Category-4 LTE PIM chapter.

3G Evolution High-Speed Packet Access (HSPA/HSPA+)

HSPA is a UMTS-based 3G network. It supports High-Speed Downlink Packet Access (HSDPA) and High-Speed Uplink Packet Access (HSUPA) data for improved download and upload speeds. Evolution High-Speed Packet Access (HSPA+) supports Multiple Input/Multiple Output (MIMO) antenna capability.

3G Evolution-Data Optimized (EVDO or DOrA) Mode

EVDO is a 3G telecommunications standard for the wireless transmission of data through radio signals, typically for broadband Internet access. DOrA refers to EVDO Rev-A. EVDO uses multiplexing techniques including Code Division Multiple Access (CDMA), as well as Time Division Multiple Access (TDMA), to maximize both individual users' throughput and the overall system throughput.

2G

This was the first generation of 3GPP specifications adding Data support on cellular networks. Today, it is still used for M2M communications in several countries, but the technology sunset is now scheduled. See the following note:

Important Information about 2G and 3G Sunset



Important Please read this information about 2G and 3G networks!



Important This configuration guide supports multiple products and is written as generically as possible. Throughout this document, the controller will be referred to as the generic term *slot*. The *slot* will take the form of *x/x/x* in this guide. When configuring the controller on your particular router/pluggable, use the information available in your product documentation, or the tables below.