



Overview

The Cisco LoRaWAN Gateway is a module from Cisco Internet of Things (IoT) extension module series. It can be connected to the Cisco 809 and 829 Industrial Integrated Services Routers (IR800 series) or be deployed as standalone for low-power wide-area (LPWA) access and is positioned as a carrier-grade gateway for indoor and outdoor deployment, including harsh environments. It adds a ruggedized remote LoRaWAN radio modem interface to create a gateway between the Cisco Field Network Director and a partner's LoRa network server.

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Overview

The following models are covered by this document:

- IXM-LPWA-800-16-K9
- IXM-LPWA-900-16-K9

There are two LoRaWAN gateway modes as below:

- Virtual interface mode – IR800 series including the LoRaWAN module as a virtual interface
- Standalone mode – The LoRaWAN module working alone as an Ethernet backhaul gateway or attached to a cellular router through Ethernet

You can configure the LoRaWAN IXM running on virtual interface mode or standalone mode through CLI or Cisco IoT Field Network Director (IoT FND).

This guide will provide the configuration steps for standalone mode and guide you to swap between these two modes.

For detailed information of configuring virtual interface mode, see the “Configuring Virtual-LPWA” chapter of the Cisco IR800 Integrated Services Router Software Configuration Guide at:

<http://www.cisco.com/c/en/us/td/docs/routers/access/800/829/software/configuration/guide/IR800config/VLPWA.html>

For the information of software installation procedure, see the release notes of Cisco LoRaWAN Gateway at:

<http://www.cisco.com/c/en/us/support/routers/interface-module-lorawan/products-release-notes-list.html>

For more information of IoT-FND, see <https://www.cisco.com/c/en/us/support/cloud-systems-management/iot-field-network-director/tsd-products-support-series-home.html>.

Switching to Virtual Mode

You can use the **switchover** EXEC command to switch to the virtual mode.



Note Once the IXM is switched over to virtual mode, you need to have an IR829/IR809 to bring it back to standalone mode.

Use this command, if you are fully aware of your environment and confident of switching over and managing it via IR8x9.

```
Gateway#switchover
```

GPS Channel Plans

GPS check for verification of channel plans is included.



Note This table is derived from the LoRaWAN Regional Parameters document, version RP2-1.0.2.



Note The CPF feature is intended to operate only when a GPS fix is actively available or has been stored from an earlier fix. The location derived from the GPS fix must be in one of the countries listed in the table below. If not, the radio will not turn on. This does not apply to Actility LRR since the channel plan is configured on the network server.

Countries supported by this GPS check include:

Code	Name	Channel plan
AL	Albania	EU868
AD	Andorra	EU868
AM	Armenia	EU868
AR	Argentina	AU915-928
AT	Austria	EU868
AU	Australia	AU915 (default) AS923
AZ	Azerbaijan	EU868
BY	Belarus	EU868

Code	Name	Channel plan
BE	Belgium	EU868
BA	Bosnia	EU868
BN	Brunei	EU868
BG	Bulgaria	EU868
KH	Cambodia	EU868
CA	Canada	US915 (default) AU915
CN	China	AS923
HR	Croatia	EU868
CY	Cyprus	EU868
CZ	Czech Republic	EU868
DK	Denmark	EU868
EE	Estonia	EU868
FI	Finland	EU868
FR	France	EU868
DE	Germany	EU868
GR	Greece	EU868
HK	Hongkong	EU868
HU	Hungary	EU868
IS	Iceland	EU868
IE	Ireland	EU868
IN	India	IN865
IT	Italy	EU868
JP	Japan	AS923
LA	Laos	EU868
LV	Latvia	EU868
LI	Liechtenstein	EU868
LT	Lithuania	EU868
LU	Luxembourg	EU868

Code	Name	Channel plan
MK	Macedonia	EU868
MY	Malaysia	EU868
MX	Mexico	US915
MD	Moldova	EU868
ME	Montenegro	EU868
NL	Netherlands	EU868
NZ	New Zealand	AS923 AU915
NO	Norway	EU868
PL	Poland	EU868
PT	Portugal	EU868
PR	Puerto Rico	US915
RO	Romania	EU868
RS	Serbia	EU868
SG	Singapore	EU868
SK	Slovakia	EU868
SI	Slovenia	EU868
ZA	South Africa	EU868
ES	Spain	EU868
SE	Sweden	EU868
CH	Switzerland	EU868
TH	Thailand	EU868
TR	Turkey	EU868
GB	United Kingdom	EU868
UA	Ukraine	EU868
US	United States	US915 (default) AU915
VA	Vatican City	EU868
VN	Vietnam	EU868



Note Refer to the [LoRa Alliance Technical Specifications](#) for more information.

Displaying System Information

Use the show commands to display system information.

Displaying Version Information

Use the **show version** command to display system version information.

```
Gateway#show version
Corsica Software, Version 2.0.10.K5, RELEASE SOFTWARE
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2012-2014, 2017 by Cisco Systems, Inc.
Compiled 12-Jun-2017.19:06:44UTC-04:00 by Corsica Team

ROM: Bootstrap program is Corsica boot loader
Firmware Version : 2.0.10.K5, RELEASE SOFTWARE
Bootloader Version: 20160830_cisco

Hostname:ipsecrsa uptime is 15 hours, 44 minutes
Using secondary system image

This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.

cisco model: IXM-LPWA-800-16-K9
Processor : ARMv7 Processor rev 1 (v7l) with 1026764K bytes of memory.
Last reset from power-on

Base ethernet MAC Address : 00:50:43:14:32:45
Model revision number: : B0
System serial number: : FOC20394ANP
```

Displaying Platform Status

Use the **show platform status** command to display the platform status:

```
Gateway#show platform status
Load Average : 1min:0.23 5min:0.22 15min:0.23
Memory Usage : 0.38
```

```
Flash Usage : sys:0.06 app:0.06
CPU Temperature : 39.0 C
Board Temperature: 39.5 C
Door Status : DoorClose
```

Displaying AES Key

The LoRaWAN Chip ID is used to obtain the AES key. On the Thingpark Network Server, the AES key is stored in the **custom.ini** file. The AES key can be displayed from CLI.



Note On other 3rd party network servers, the AES key may be stored in a different location.

Obtaining the AES key requires LoRaWAN geolocation. The AES key is used to decrypt the fine - timestamps required for LoRa Geo-location calculation. The AES keys are licensed via a partner.



Note The false AES key will report incorrect geo-localization information.

Use the **show aes key** command to display AES key.

- The following example shows an existing AES key:

```
Gateway#show aes key
AES KEY: 595EB592055421C06895E4D4CE0FE63D
```

- The following example shows an unknown key:

```
Gateway#show aes key
AES KEY: Unknown
```

Displaying GPS Information

The GPS antenna must be properly installed on the LoRaWAN interface for both LoRaWAN Class B endpoints and geolocation support.

GPS information can be displayed from Cisco IOS or from the LoRaWAN interface Linux shell.

- When there is no GPS antenna attached, the **show gps log** command will have an output like the following example:

```
Gateway#show gps log
Unknown
```

- When there is a GPS antenna attached, the **show gps log** command and the **show gps status** command will have an output like the following example:

```
Gateway#show gps log
$GNRMC,231503.00,A,3725.12517,N,12155.20795,W,0.353,241.48,040517,,A*65
$GNVTG,241.48,T,M,0.353,N,0.653,K,A*2D
```

```
$GNGGA,231503.00,3725.12517,N,12155.20795,W,1,04,5.85,72.2,M,-29.8,M,,*4B
$GNGSA,A,3,24,15,12,13,,,,,,,,,9.40,5.85,7.35*1B
$GNGSA,A,3,,,,,,,,,,,,,9.40,5.85,7.35*18
$GPGSV,3,1,10,02,22,184,,06,49,142,,12,24,297,27,13,16,212,26*75
$GPGSV,3,2,10,15,17,248,31,17,51,041,,19,74,024,16,24,44,305,35*7C
$GPGSV,3,3,10,28,25,087,,30,05,146,*7F
$GGLSV,1,1,00*65
$GNGLL,3725.12517,N,12155.20795,W,231503.00,A,A*6B
$GNZDA,231503.00,04,05,2017,00,00*7B
```

```
Gateway#show gps status
INFO: SPI speed set to 2000000 Hz
reading GPS data...
total data length: 0
reading GPS data...
total data length: 246
$GNRMC,,V,,,,,,,,,N*4D
$GNVTG,
##PASS: GPS I2C interface check OK
```

- To display the GPS history information, use the following command:

```
Gateway#show gps history
Info: 23:31:50 3725.13869N 12155.17038W
GPS Satellites in View: 12
GPS Satellites in Use: 10
```

Displaying FPGA Information

Use the **show fpga** command to display the FPGA information, and the **show fpga version** command to display the FPGA version.



Note FPGA version may require specific LoRaWAN forwarder version from the LoRaWAN Network Server partner.

```
#show fpga
INFO: SPI speed set to 2000000 Hz
checking FPGA version...
FPGA version: 48
HAL version: 3.5.0
SX1301 #0 version: 103
SX1301 #0 chip ID: 1
SX1301 #1 version: 103
SX1301 #1 chip ID: 1
##PASS: FPGA version check OK
```

```
#show fpga version
FGPA version: 58
```

Displaying Inventory Information

The **show inventory** command displays the general Cisco LoRaWAN Gateway information.



Note After a firmware upgrade, the FPGAStatus may show it is under upgrade. Wait for "Ready" status before performing any other operation.

```
Gateway#show inventory
Name       : Gateway
ImageVer   : 20170427144502_DEV
BootloaderVer : 20160830_cisco_DEV
SerialNumber : FOC20133FNF
PID        : IXM-LORA-900-H-V2
UTCTime    : 02:40:53.464 UTC Sat Aug 12 2023
IPv4Address : 192.168.3.5
IPv6Address : None
FPGAVersion : 58
FPGAStatus : Ready
ChipID     : LSB = 0x2866ff0b MSB = 0x00f14184
TimeZone   : UTC
LocalTime  : Sat Aug 12 02:40:53 UTC 2023
ACT2 Authentication: PASS
```

Displaying Radio Information

The **show radio** command displays the radio information.

```
Gateway#show radio
LORA_SN: FOC20195V3C
LORA_PN: 95.1602T00
LORA_SKU: 868
LORA_CALC:
<115,106,100,95,89,86,83,80,72,63,55,46,38,33,29,25-126,114,106,97,89,85,81,77,69,60,52,43,35,30,26,22>
CAL_TEMP_CELSIUS: 29
CAL_TEMP_CODE_AD9361: 91
RSSI_OFFSET: -203.46,-203.75
LORA_REVISION_NUM:
RSSI_OFFSET_AUS:

radio status:
off
```



Note The radio status is off by default. Please turn on radio before working with the packet forwarder. Use the following commands to turn on radio:

```
Gateway#configure terminal
Gateway(config)#no radio off
```



Note The LORA_CALC value is the Calibration table from manufacturing, which cannot be changed, but can be used for hardware troubleshooting.

Displaying Certificate Information

The `show sudi certificate` command displays the certificate information.

```
Gateway#show sudi certificate
Calculating... please wait for seconds...
Certificate:
  X509v3 Key Usage: critical
  Issuer: O=Cisco, CN=ACT2 SUDI CA
  Subject: serialNumber=PID:IXM-LPWA-900-16-K9 SN:FOC21182U6D, O=Cisco, OU=ACT-2 Lite SUDI,
  CN=IXM-LPWA-900-16-K9
  Signature Algorithm: sha256WithRSAEncryption, Digital Signature, Non Repudiation, Key
  Encipherment
  Validity
    Not Before: May 16 19:21:43 2017 GMT
    Not After : May 16 19:21:43 2027 GMT
```

