X2000 Gateway – Standard

Instruction Manual

These instructions must be read thoroughly before installation or operation.
This instruction manual was accurate at the time of printing.

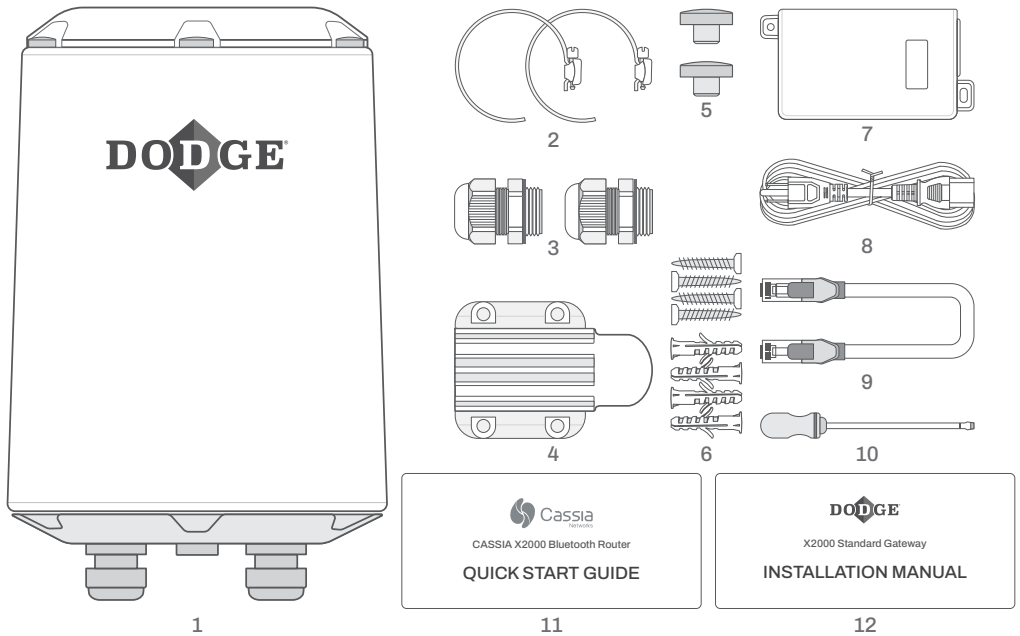
TABLE OF CONTENTS

1 GENERAL

The X2000 Gateway (part number 749972) is used to automatically upload Dodge® sensor data to the OPTIFY platform. For the gateway to communicate with OPTIFY, it needs to be configured for internet access. The following internet connections are supported:

- Local Area Network (LAN)/EtherNet network together with a Power over Ethernet (PoE) injector
- 2.4 GHz/5 GHz Wi-Fi network
- 4G mobile network with a specific USB dongle

The package includes:



1.X2000 Router (1)
2.Pole Mounting Straps (2)
3.Cable Glands (2)
4.Mounting Bracket (1)
5.Extra Top Screw Covers (2)
6.Anchors with Screws (2*4)
7.PoE Injector (1)
8.Power Cord (1)
9.Ethernet Cable (1)
10.Slotted Screwdriver (1)
11.Quick Start Guide (1)
12.Installation Manual (1)

Figure 1 - Package contents

For more information about these components, refer to the quick start guide (see Figure 1). For general information about the gateway, please refer to the user manual at cassianetworks.com/download/docs/Cassia_User_Manual.pdf

2 INSTALLATION

2.1 Prerequisites for installation

Internet connection

- The default DNS server address is the Google DNS server for global customers (8.8.8.8)
- If a firewall is used, the following ports need to be opened:

URL	Port type	Port number	Gateway communication partner	Service details
gw.dodgeoptify.com	TCP	8883	Access Controller (AC)	MQTT for Cassia Access Controller
gw.dodgeoptify.com	TCP	9999	Access Controller (AC)	SSH port to provide troubleshooting services for gateways
gw.dodgeoptify.com	TCP/ HTTP	80	Access Controller (AC)	HTTP service for gateway software and firmware updates
gw.dodgeoptify.com	TCP/ HTTPS	443	Access Controller (AC)	HTTPS service for gateway software and firmware updates
global.azure-devices-provisioning.net	TCP	8883	Azure IoT Device Provisioning Service	MQTT for gateway provisioning application
dodge.azure-devices.net	TCP	8883	Azure IoT Hub	MQTT communication between AC and router
api.dodgeoptify.com	TCP/ HTTPS	443	OPTIFY Platform	HTTPS for OPTIFY API
dodge-provisioning. azure-devices-provisioning.net	TCP	8883	Azure IoT Device Provisioning Service	MQTT for gateway provisioning application
Customer DNS URL	TCP/ UDP	53	DNS Server	DNS lookup for AC address (optional if specified in gateway network configuration)

NOTE: The above table is from the gateway's perspective. All communication is out of the gateway to the communication partner.

NOTE: Check to confirm there are no TLS splitting solutions on the way (certificate switching) or TLS blocking for the gateway.

NOTE: OPTIFY is hosted in the United States (east coast) via Microsoft Azure Cloud Service.

- Access controller (global)
  - gw.dodgeoptify.com
- OPTIFY platform (global)
  - dodgeoptify.com
- The mobile network needs to have adequate signal strength. In demanding locations, a USB extension cable or external antenna might be needed for the USB modem/dongle.
- OPTIFY Azure IoT Services (global)
  - dodge.azure-devices.net
  - global.azure-devices-provisioning.net
  - dodge-provisioning.azure-devices-provisioning.net

Power supply

- In case the PoE network is not available, a PoE injector is needed for the power supply
- PoE is 802.3af/at compliant
- The gateway can also be powered with a 12 V 2 A DC power supply

Ethernet cable

- The following table outlines the number of Ethernet cables required in different X2000 configurations

Power source	Connection method	Required Ethernet cables
PoE network	PoE network	1
PoE injector	LAN/Ethernet network	2
PoE injector	Wi-Fi	1
PoE injector	Cellular modem	1
12 V 2 A DC adapter	LAN/Ethernet network	1
12 V 2 A DC adapter	Wi-Fi	0
12 V 2 A DC adapter	Cellular modem	0

Computer

- Computer with a Wi-Fi adapter is needed to configure the gateway. A tablet or mobile phone can also be used.
- Google Chrome is the recommended web browser to use

USB cellular modem/dongle

- The gateway has bult-in drivers for several USB dongles. For the list of supported dongles, please check the USB mobile dongle connection section.
- A SIM card with an internet data plan
- The gateway also supports the use of any USB-powered Wi-Fi modem

Mounting

- A flat-head screwdriver can be used for pole mounting
- A Phillips-head screwdriver and a drill (optional if needed) can be used for wall mounting
- Mounting the gateway is not mandatory but is recommended to secure the unit in its intended location

2.2 Recommended location

Height

- The recommended mounting height for the gateway is 10 ft (3 m)—100 ft (30 m) from ground level. Mounting at a lower height is possible but may reduce the connection range.

Orientation

- The gateway has the best reception in the direction where the Dodge logo is located on the side of its case. If the gateway has trouble connecting to a specific sensor, it is recommended to rotate the gateway to point in that direction.

Grounding

- If installing the gateway outdoors, be sure to install a grounding cable to the bottom of the gateway as shown Figure 2.

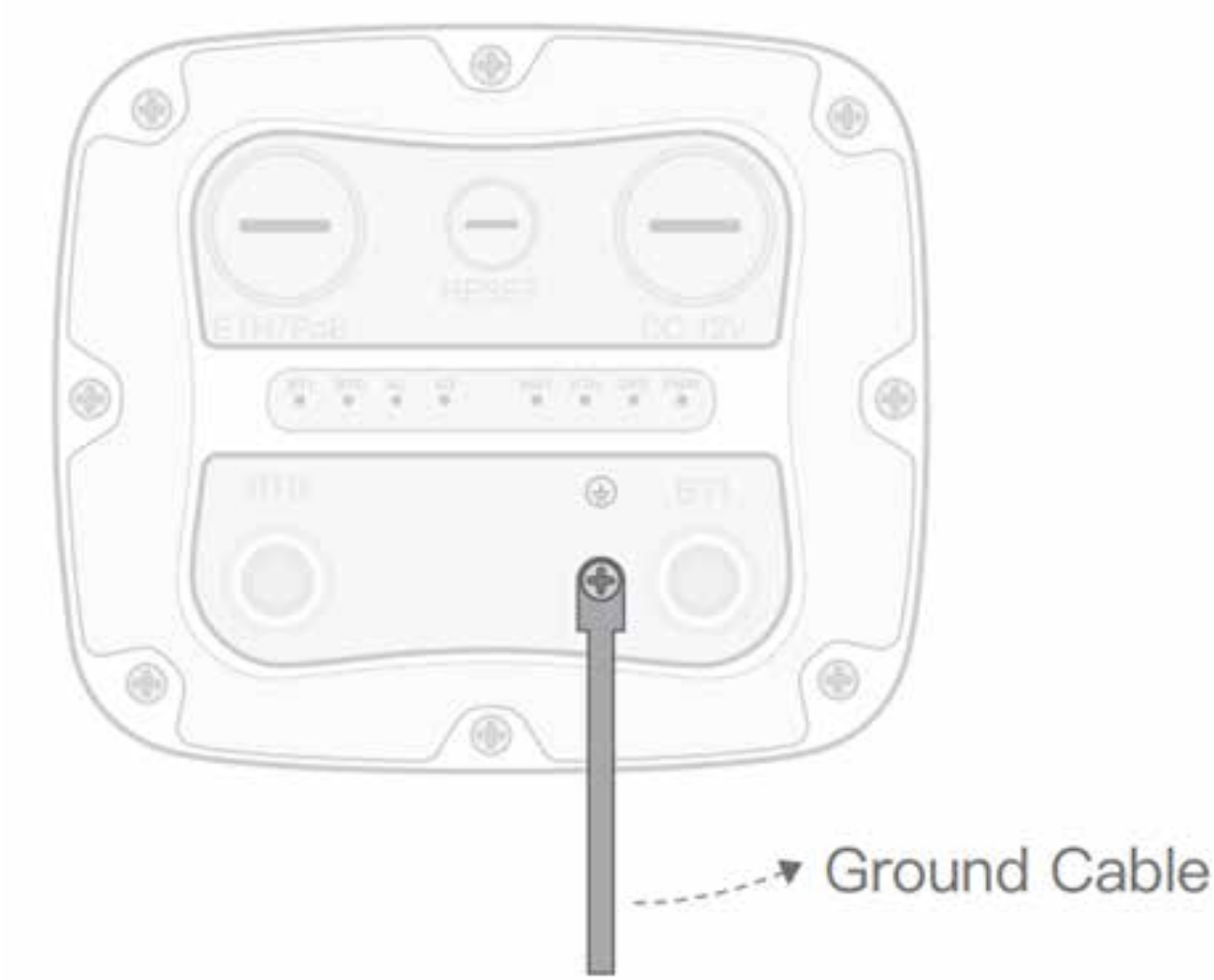


Figure 2 - Grounding cable location

2.3 Gateway configuration

When the gateway is powered on, the power LED at the bottom of the gateway will turn green. The bootup takes about 30—60 seconds.

After bootup, the gateway will turn on its Wi-Fi hotspot configuration. Connect to the Wi-Fi hotspot with the device used for configuration (e.g., computer, mobile phone, or tablet).

The Wi-Fi connection's SSID, or name, will be "cassia-XXXXXX" where the last 6 digits will match the last 6 digits of the gateway's MAC address. The MAC address can be found on the bottom of the gateway. The password for the Wi-Fi connection will be the same as the SSID.

Once your device is connected to the gateway's Wi-Fi hotspot, open an internet browser. Type 192.168.40.1 in the address field, then press enter. The Cassia configuration page will open.

The default password will need to be changed after the first login. When prompted, create a new password. The default credentials are:

- Username: admin
- Password: admin

NOTE: The new password should include a combination of numbers, letters, and special characters and must be between 8—20 characters in length. Take note of password for future use.

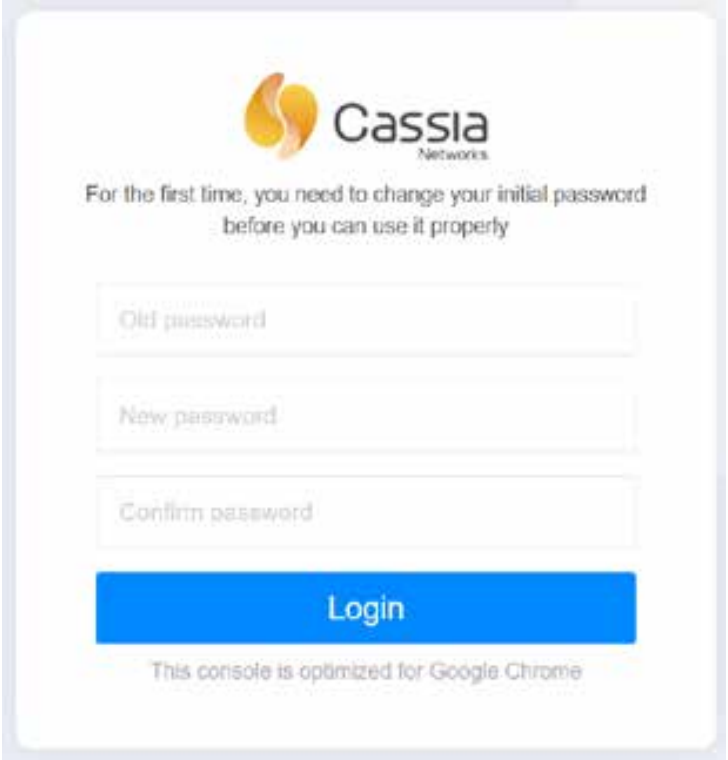


Figure 3 - Cassia login page

Once logged in, the status page is shown to display the current operation mode and connection status of the gateway. The AC Online Time shows how long the gateway has been connected to the AC server. If no time is shown, it means the gateway does not have a connection to the AC server. Connection to the AC server is required for the transfer of sensor data.

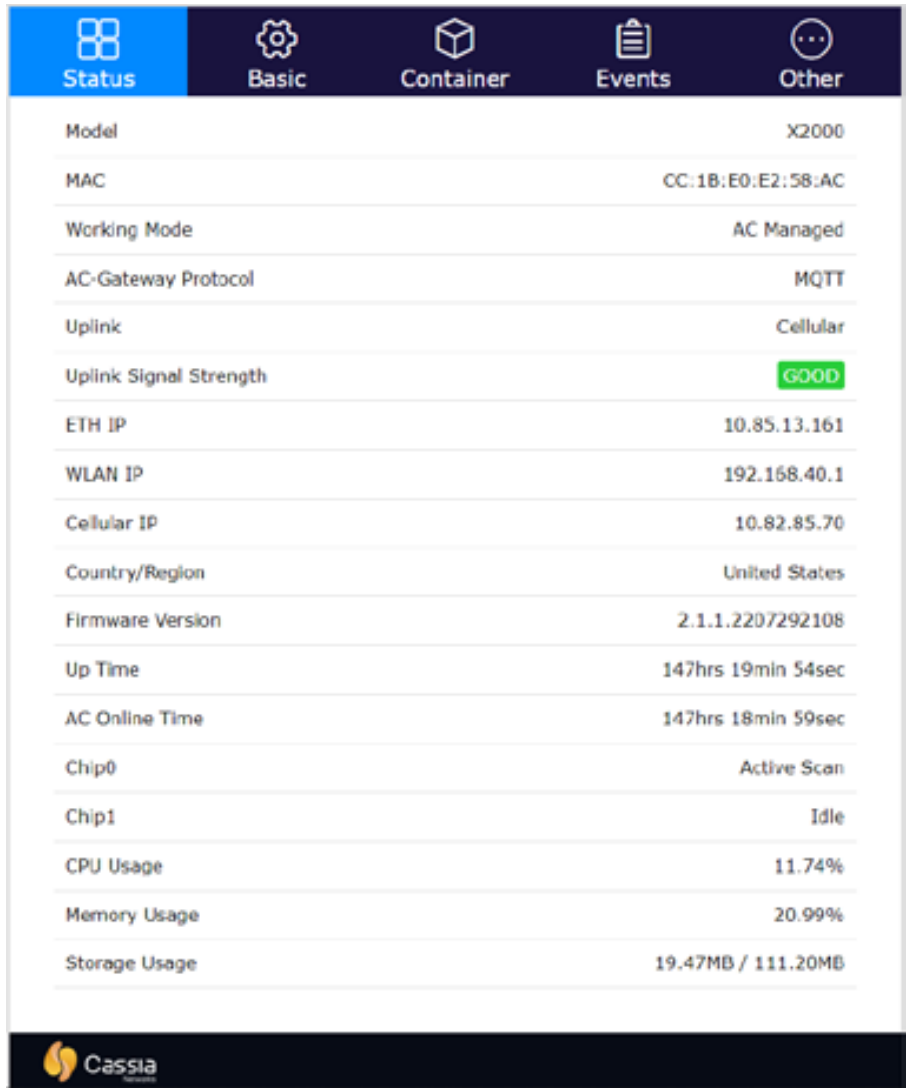


Figure 4 - Status page

The Basic page is where the configuration is managed. The following values are common for all network configurations (PoE, LAN, Wi-Fi, and Mobile):

- Gateway name: Not required but recommended
- Gateway mode: AC Managed Gateway
- Tx power: 19

- External antenna: None
- Statistics report interval: 5 minutes
- AC server address: gw.dodgeoptify.com
- AC-Gateway protocol priority: MQTT
- Connection priority: See below
- Enable OAuth2 Token for Local API: Off
- Remote assistance: On

Connection priority is where a prioritized connection method is selected in case there are several in use. Select the priority according to the connection in use:

- Wired for PoE and LAN connections
- Wireless for a Wi-Fi connection
- 3G/4G for a mobile USB dongle connection

For security reasons, we recommend that you change the gateway Wi-Fi password for wired or 3G/4G connections. This can be done under the Wi-Fi section. Please make note of the new password.

You can also change the SSID (name of the Wi-Fi hotspot of the gateway) if desired.

Figure 5 - Changing the Wi-Fi hotspot password

Figure 6 - Basic page

2.4 PoE connection

If a PoE network is available, the gateway can be configured for use without any additional power supply.

Figure 7 - PoE network configuration

NOTE: For more information about the figure components, please refer to the quick start guide.

From the Basic page, select:

- Connection Priority: wired
- IP Allocation: DHCP or static (in case the IP allocation is given)

Press “Apply” at the bottom of the screen.

2.5 LAN/Ethernet cable connection

If a LAN/Ethernet network is available, the gateway can be configured for use with a PoE injector as the power supply. Alternatively, a 12 V—2 A adapter can be used to power the gateway.

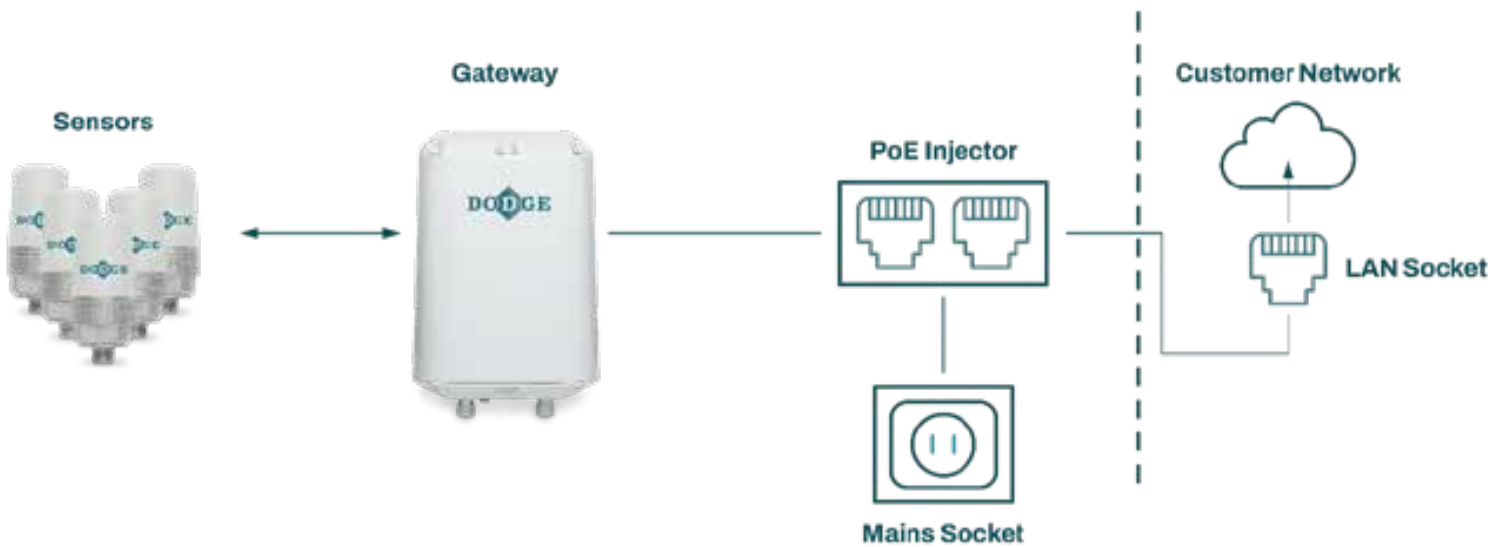


Figure 8 - LAN network configuration

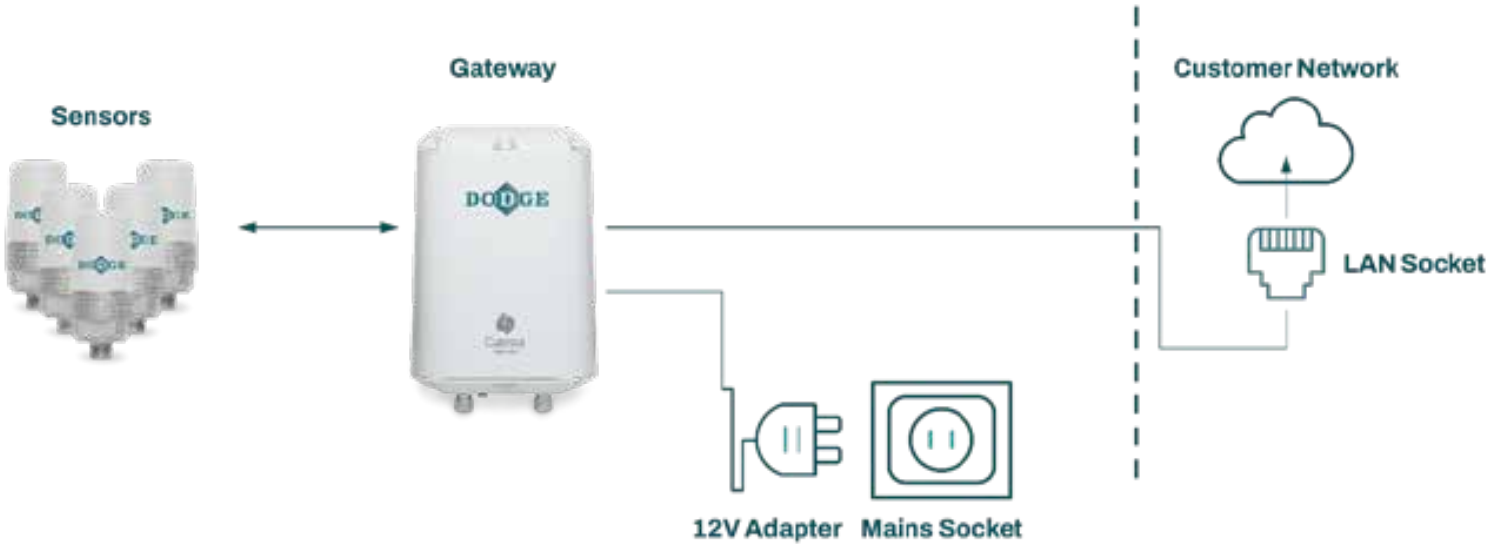


Figure 9 - 12 V LAN network configuration

NOTE: For more information about the figure components, please refer to the quick start guide.

From the Basic page, select:

- Connection Priority: wired
- IP Allocation: DHCP or static (in case the IP allocation is given)

Press “Apply” at the bottom of the screen.

2.6 Wi-Fi connection

The gateway can be configured to use an existing Wi-Fi network with a PoE injector as the power supply. If using a PoE injector, make sure the Ethernet cable is connected to the PoE port of the injector. Alternatively, a 12 V—2 A adapter can be used to power the gateway.

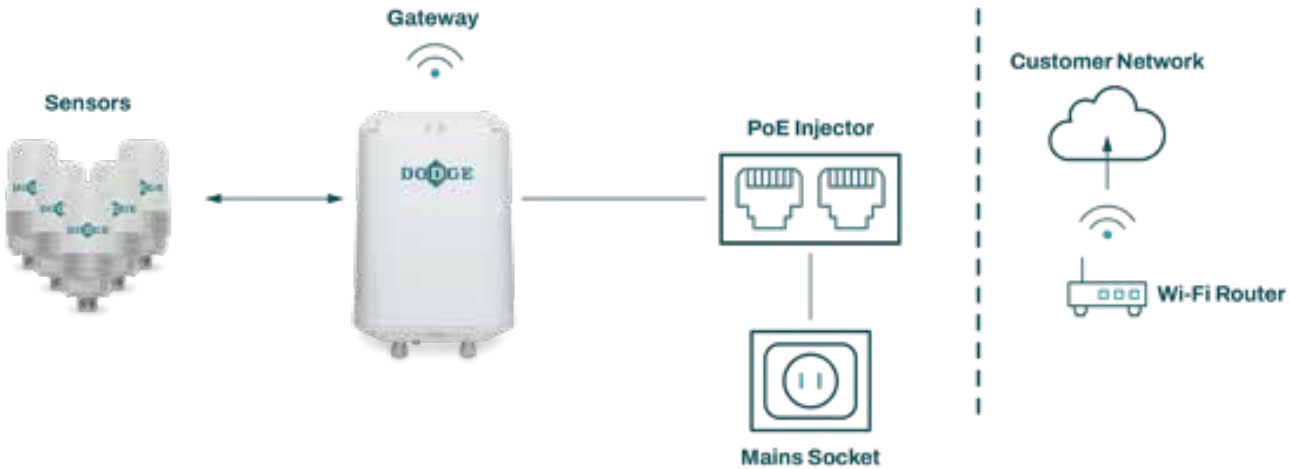


Figure 10 - Wi-Fi network configuration

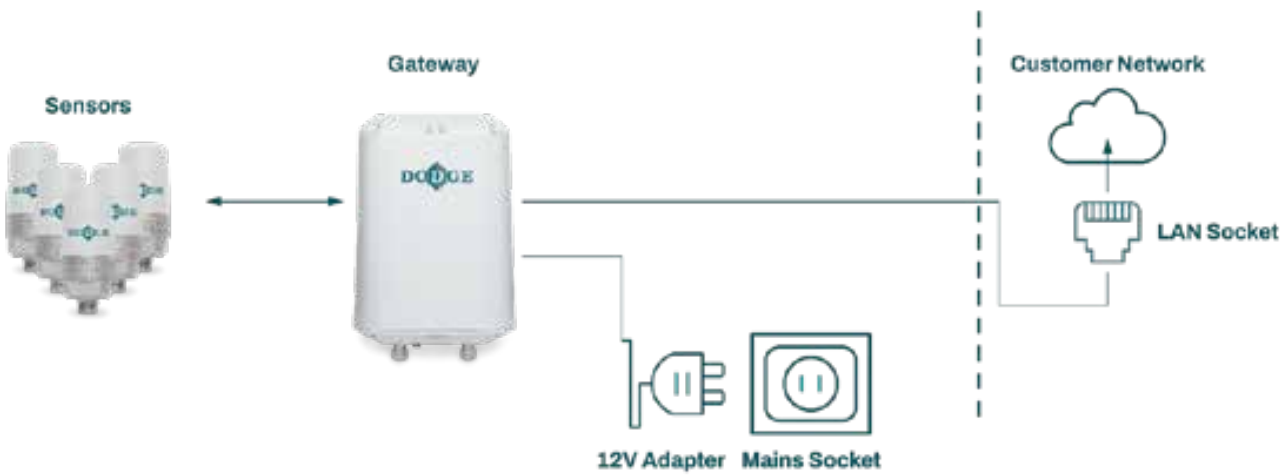


Figure 11 - Wi-Fi network configuration with 12 V adapter

From the Basic page, select:

- Connection Priority: Wireless
- Enter the Wi-Fi network SSID (name)
- Enter the Wi-Fi network password
- Under Wi-Fi, change Operating Mode from “Hotspot” to “Client”
- IP Allocation: DHCP or Static (in case the IP allocation is given)

Press apply at the bottom of the screen.

NOTE: Once the apply button is pressed, the gateway Wi-Fi adapter stops sharing the Wi-Fi hotspot and changes the connection to the configured Wi-Fi network. In case the DHCP is used, the gateway now has a new IP address. The new IP address is needed to reconnect to the gateway (e.g., to check the Status page or scan the devices within the gateway’s range). Your local IT department can find the gateway’s IP address by accessing the Wi-Fi router device list or by performing a network scan for IP addresses. In the case of a static IP being used, the address is known.

NOTE: Connect your computer, tablet, or mobile phone to the same Wi-Fi network the gateway is connected to. Open your web browser and type the new IP address into the address field, then press enter. Access to the gateway configuration pages is established again.

NOTE: If there was an error in the SSID, password, or IP address configurations, you cannot access the gateway anymore. In this case, the gateway isn't shown in the Wi-Fi router device list or a network scan. To resolve, press and hold the reset button on the bottom of the gateway for 10—15 seconds to reset the gateway back to factory default values.

2.7 USB mobile dongle connection

A mobile network can be used with a specific USB dongle. In addition, a PoE injector (power supply), a supported USB dongle, and a SIM card are needed. Alternatively, a 12 V—2 A adapter can be used to power the gateway.

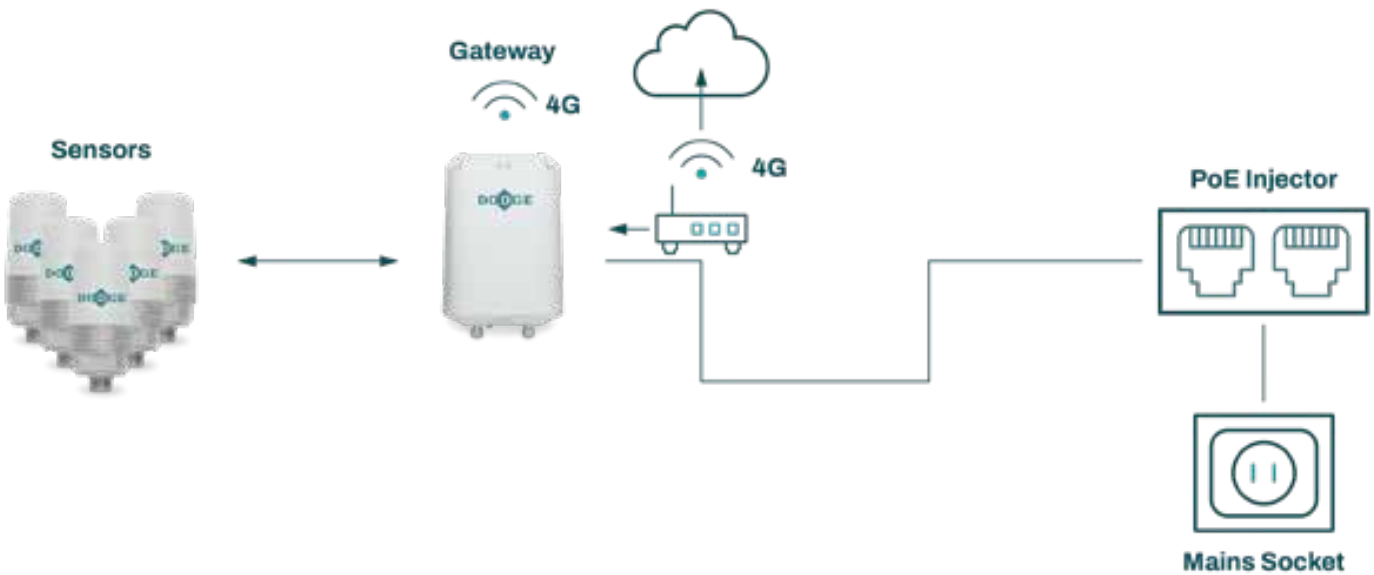


Figure 12 - Mobile network configuration

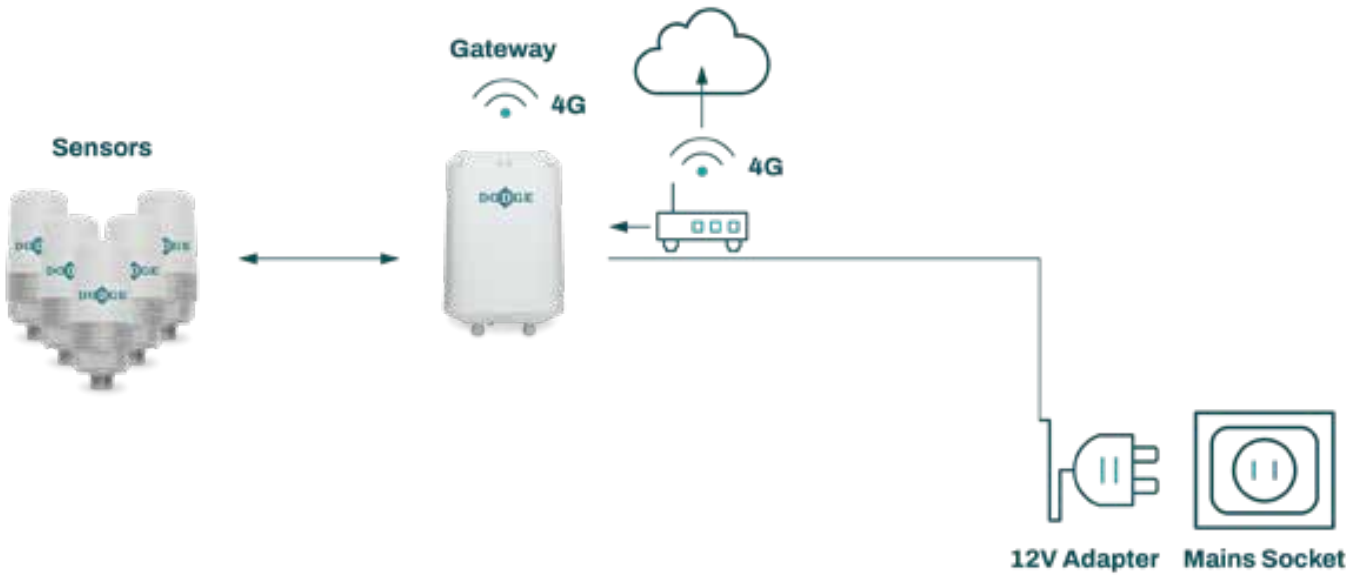


Figure 13 - Mobile network connection with 12 V adapter

Insert the USB dongle with the SIM card into the USB port at the top of the gateway. The PIN query needs to be disabled from the SIM card.

From the Basic page, select:

- Connection Priority: Cellular
- USB dongle type: Select the correct dongle type being used
- Type the access point name (APN) the SIM card's carrier is using
- Type the username and password for the APN if needed

Press apply at the bottom of the screen, then reboot the gateway by removing the power supply for a few seconds and reconnecting it.

NOTE: With a USB dongle, the gateway needs to be in a location with good network coverage. If the signal strength is weak, a USB extension cable or additional external antenna for the USB dongle might be needed.

NOTE: If a Wi-Fi modem is used, connect the modem to the USB port on the top of the gateway, then follow the instructions under section 2.6 Wi-Fi connection.

NOTE: For supported USB dongle modems, please consult Cassia's user manual. Please note that some countries might have regulations that forbid the use of certain types of hardware providers (i.e., check if Huawei can be used in the United States).

2.8 Firewall configuration

If there is a firewall in the network the gateway is using, specific ports needed to be opened.

Figure 14 - Firewall configuration

NOTE: The firewall should allow communication between the gateway and the access controller as well as the gateway and the OPTIFY platform respectively. If needed, refer to the required ports in section 2.1

2.9 Verifying the configuration

Once the configuration is done, it can be verified from the Status page. When the connection is established to the access controller, the AC Online Time will show.

Figure 15 - Gateway connected to gw.dodgeoptify.com

If the AC Online Time is not shown within a few minutes:

- Check the configuration and internet connection
- Reboot the gateway by powering it off, then on

3 TROUBLESHOOTING

If you forget your login credentials or make a mistake while configuring the Wi-Fi networks's SSID or password:

- Press and hold the reset button on the bottom of the gateway for 10—15 seconds to reset the gateway back to factory default values. This button is located under a cap labeled "reset".
- This will require reconfiguring the gateway to communicate with the access controller

If the gateway does not generate the Wi-Fi hotspot for setup:

- Check the power supply and verify the green LED on the bottom of the gateway is on
- If the gateway is configured to use a Wi-Fi network, it does not generate a Wi-Fi hotspot
- Press and hold the reset button on the bottom of the gateway for 10—15 seconds to reset the gateway back to factory default values

If the gateway does not connect to the AC server:

- Check access to the internet
- If a USB dongle is used, check if the model is supported by the gateway and that the dongle has established a connection to a mobile network
- Check the firewall settings for the network being used to ensure the necessary ports for outbound communication are open (refer to the Prerequisites for installation section)
- Check to confirm there are no TLS splitting solutions on the way (certificate switching) or TLS blocking for the gateway

Connection to access controller can also be verified with debug tools on the other page:

- Under debug tools, select “NetCat”
- For Address type “gw.dodgeoptify.com”
- For Protocol select “TCP”
- For Timeout select “5s”
- For Port enter “8883”
- Press start
- A success message will appear if the entered port is open for communication

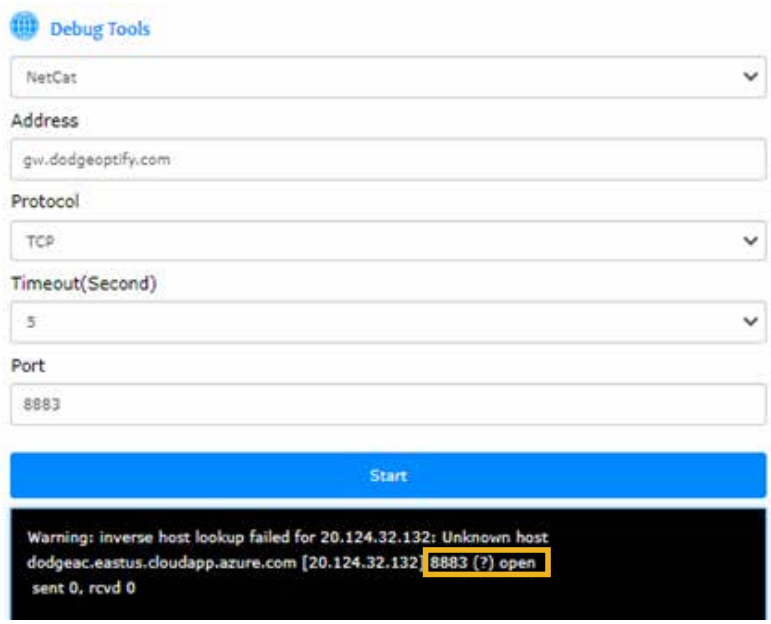


Figure 16 - Gateway debug tools on the other page

NOTE: NetCat can also be used to check ports 9999, 80, and 443.

NOTE: The inverse host lookup will fail, this is not an indication of whether the port is open.

Scanning for Bluetooth devices:

The correct gateway placement can be checked by scanning for Bluetooth devices within the gateway's range. The gateway's location or orientation might need to be changed if all desired sensors are not visible for the gateway or if the sensors are showing weak signal levels.

To enable scanning, the router's mode on the Basic page needs to be changed from "AC Managed Gateway" to "Standalone Gateway". Once changed, the gateway will automatically reboot and will be operational again in 30—60 seconds.

In addition, you must type an asterisk (*) in the "Allow Origin" field under Gateway Web Security on the Other page. Click "Apply" to save this change.

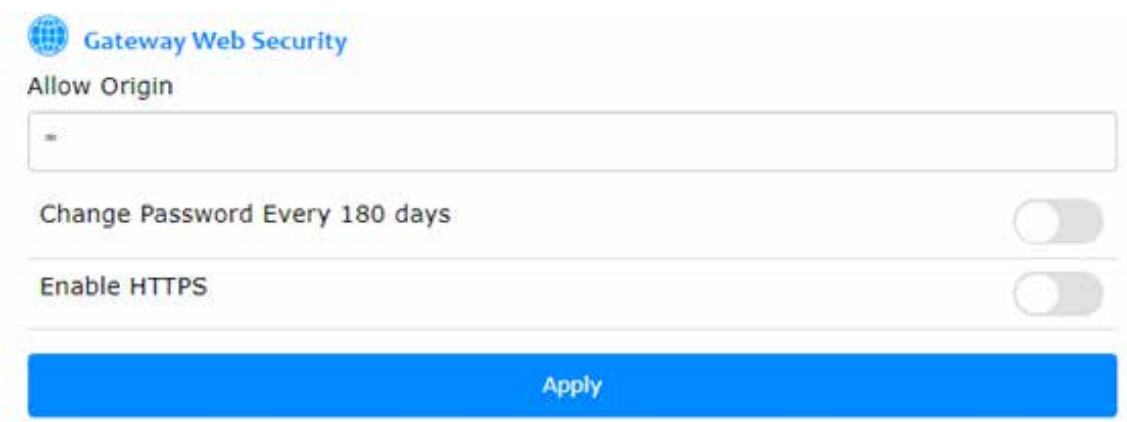


Figure 17 - Gateway web security section on the other page

Open the following web page on a Wi-Fi enabled computer using Google Chrome: bluetooth.tech/debugger/

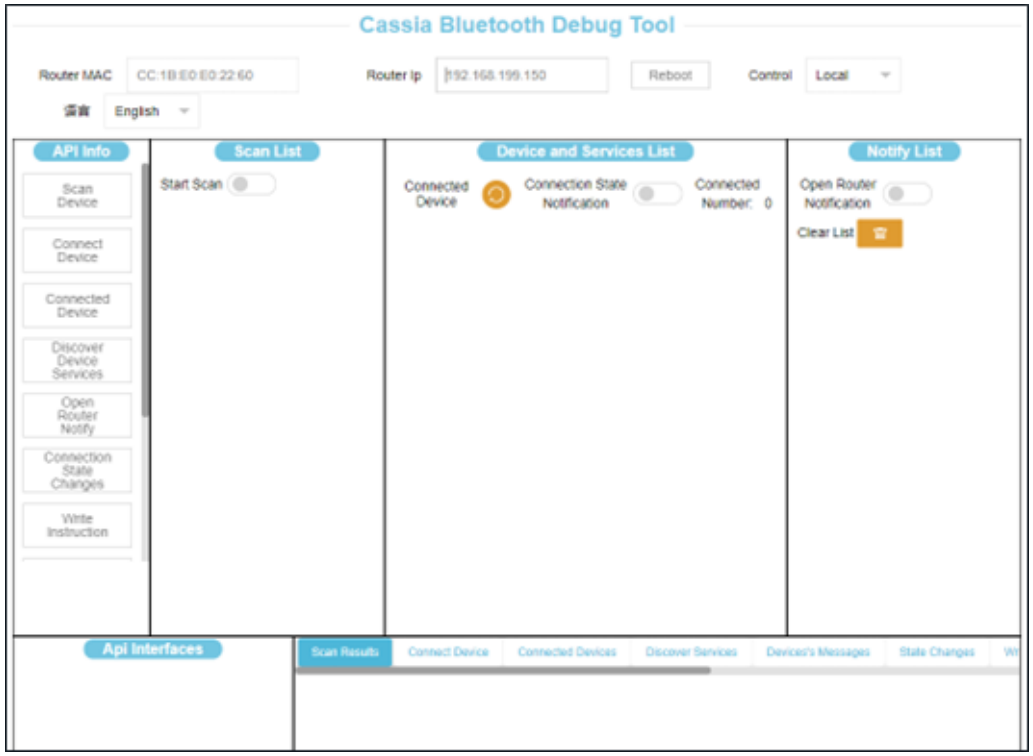


Figure 18 - Gateway Bluetooth debug tool

Once the debug tool is loaded, connect your computer to the Wi-Fi network generated by the gateway.

NOTE: For gateways configured to a Wi-Fi network, connect your computer to the same Wi-Fi network as the gateway.

Type in the gateway's MAC address into the Router MAC field and the IP address (192.168.40.1) into the Router IP field.

NOTE: For gateways configured to a Wi-Fi network, type the new IP address into the field. For more information, refer to the Wi-Fi connection section in the manual.

Press "start scan".

The debug tool will start to list all Bluetooth devices within range. For all scanned devices, the tool shows the MAC address and the RSSI value. Sometimes the name is not available, but it is listed if known.

If the debugger is not displaying any Bluetooth devices after starting the scan, please refer to the debugger troubleshooting guide available here: bluetooth.tech/debugger2/dist/Debugger2-Troubleshooting.pdf

RSSI values can be generally categorized into the following groups:

- RSSI value between 0 and -70: good
- RSSI value between -70 and -80: weak (the sensor data might be read periodically)
- RSSI value -80 or less: poor (most of the time the sensor cannot be read)

If the desired sensors are showing RSSI values of -70 or less, adjusting the gateway's location or orientation is recommended.

NOTE: Remember to change the gateway mode back to AC Managed Gateway. If this mode is not changed, the gateway will not establish the connection to the AC server and the sensor data is not being read.

4 SECURITY CONSIDERATIONS

4.1 Enable HTTPS access

Cassia gateways allow users to configure an SSL certificate (HTTPS) for accessing the gateway through an encrypted channel.

The SSL certificate and key will be delivered in the privacy enhanced mail (PEM) format, or a certificate signed by an internal public key infrastructure (PKI) can be used. An example of how to create and import a self-signed certificate is outlined below.

Certificate generation

A certificate can be created with the OpenSSL tool and the example shows creating the certificate with Ubuntu 22.01.2 WSL system using the built-in tool.

The tool uses command line interface (CLI) with appropriate arguments. Use the following command to generate a certificate:

- openssl -req -new -newkey rsa:4096 -x509 -sha256 -days 365 -nodes -out gateway.crt -keyout private.key

The command generates two files:

- gateway.crt (public certificate with a public key)
- gateway.key (private key for the certificate)

The following arguments are specified:

- Cryptographic algorithm: rsa
- Key length: 4096
- Type of certificate: x509
- Type of certificate signature: sha256
- Validity period: 365 days

You will also be prompted to provide additional data such as country name, location, and other information. The data will be included in your certificate but only the Common Name is required. The Common Name may be the IP address or DNS name if the DNS name is used to resolve and assign an appropriate name for the gateway.

Example data

- Country Name (2 letter code) [AU]: PL
- State of Province Name (full name) [Some-State]: Masovian
- Locality Name (eg, city) []: Warsaw
- Organization Name (eg, company) [Internet Widgits Pty Ltd]: Dodge OPTIFY Security
- Organizational Unit Name (eg, section) []: OPTIFY Platform
- Common Name (e.g. server FQDN or YOUR name) []: 192.168.192.53
- Email Address []: security@dodgeoptify.com

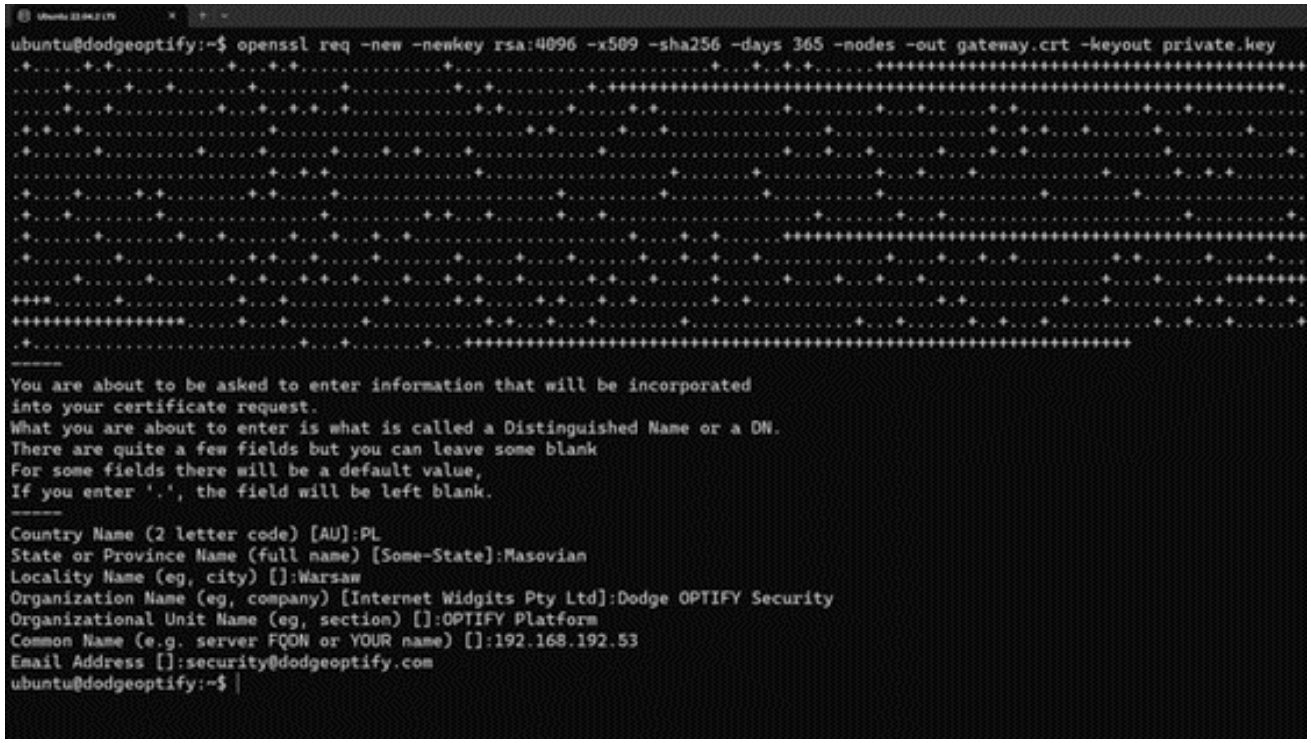


Figure 19 - Additional information for HTTPS security certificate

Figure 20 - Generated files for https security certificate

The generated files can be uploaded on the other page:

- Under the Gateway Web Security section, turn on Enable HTTPS and two new buttons should appear
- Upload the certificate and key files to the appropriate areas
- Click “Apply”

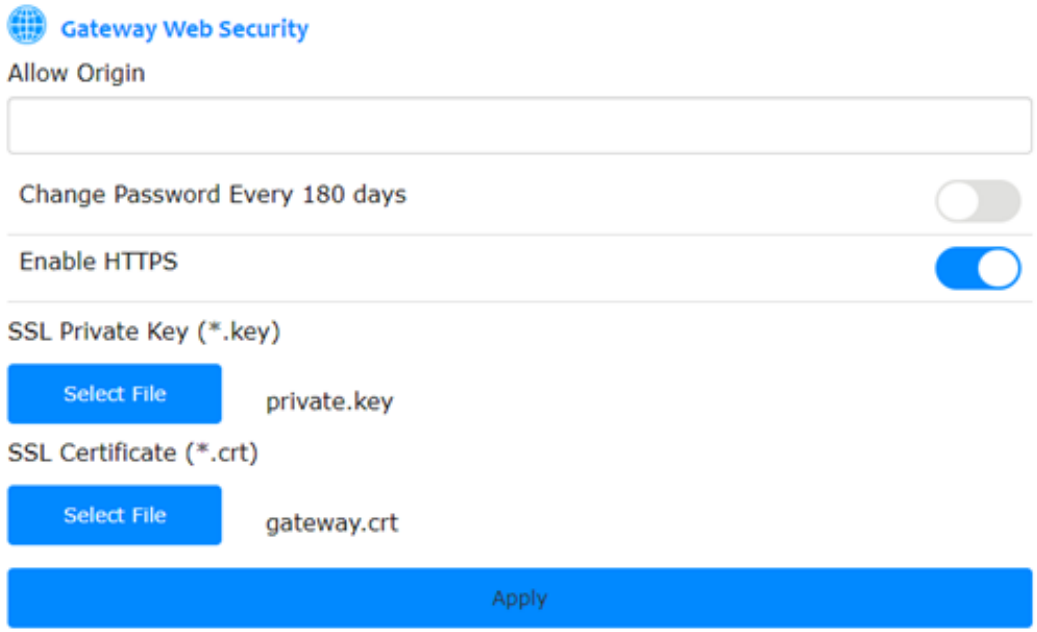


Figure 21 - Gateway web security section to enable HTTPS

You will be reconnected to a secure connection (HTTPS).

NOTE: If a self-signed certificate is used, your browser will display a message stating the connection is not private or trusted but this is not an issue.

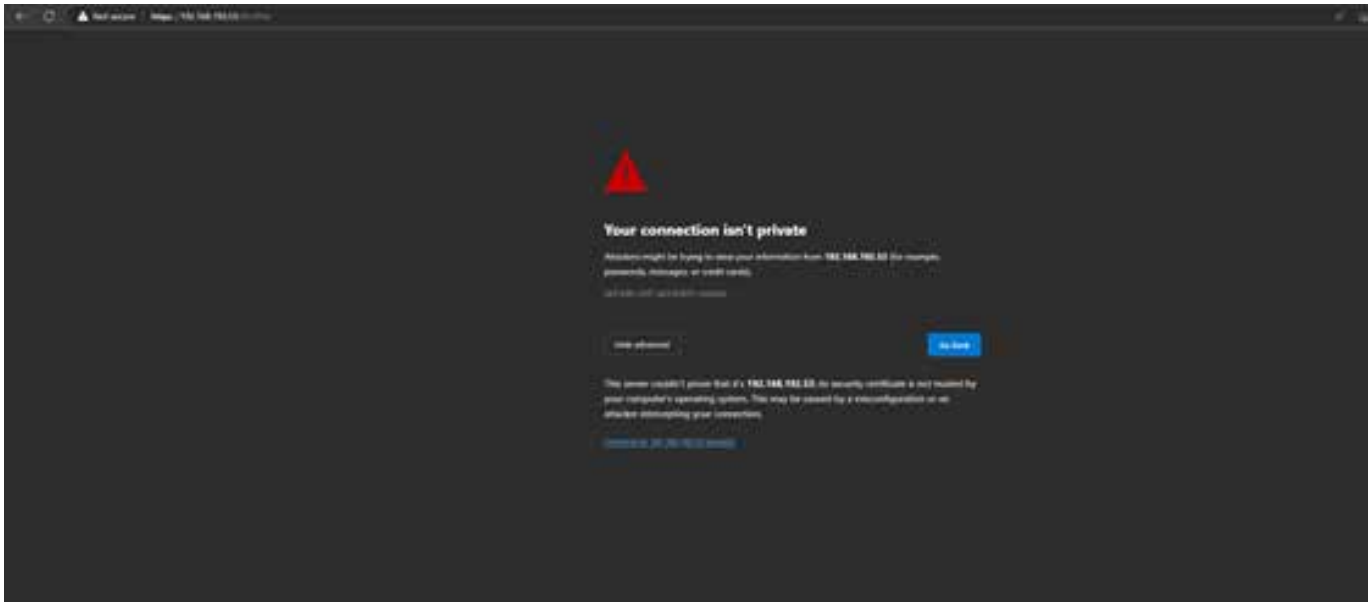


Figure 22 - Verifying the certificate

To verify your self-signed certificate, click on “Not secure” in the browser address bar and confirm the certificate.

NOTE: The process of approving a self-signed certificate may depend on the specific browser used.

The data presented should match your certificate data. Advanced users can also verify the fingerprint as needed for their security requirements.

Figure 23 - Certificate data

After completing SSL (HTTPS) setup, you must use the address, https://<gateway address>, when connecting to the gateway as an address leading with “http” will not work.

4.2 Enable administrator password update requirements

If needed, you can require the administrator password for the management panel to be updated every 180 days. To enable this feature, go to the Other page:

- In the Gateway Web Security section, toggle the button for “change password every 180 days”

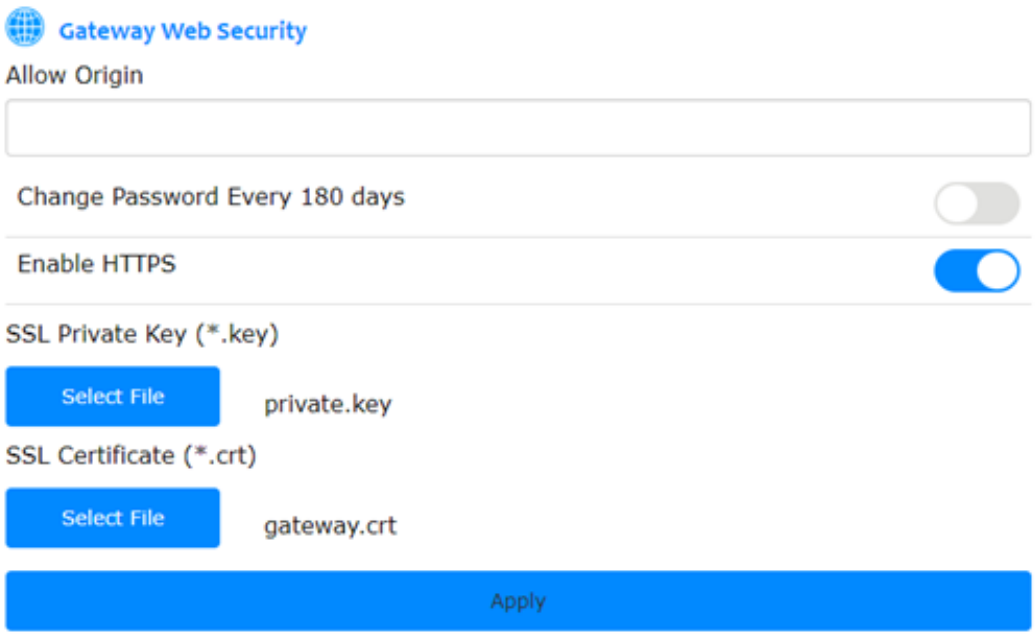


Figure 24 - Gateway web security section to enable password change requirements

4.3 SSH access and redirect

The gateway can allow SSH access locally and from the cloud. This access is only to be used by Dodge employees for troubleshooting reasons and you should not enable this feature.

5 OPTIFY

After a gateway is configured and online, it will need to be commissioned in the OPTIFY platform to read data from sensors. Once a gateway is commissioned, sensors must be assigned to it within OPTIFY as a gateway will only read data from assigned sensors.

Commissioning a gateway in OPTIFY can be done using the OPTIFY web portal or mobile app. The web portal is available at dodgeoptify.com. The mobile app is available on the App Store for iOS devices and the Google Play Store for Android devices.

To learn how to commission a gateway and assign sensors in OPTIFY through the web portal or mobile app, follow the appropriate QR code below to the instructions.

Commission a gateway

Manually assign a sensor

Automatically assign a sensor

6 SUPPORT

For additional support, please contact the Dodge IIoT Technologies team:

- Email: engineering@support.dodgeindustrial.com
- Phone: +1 864 284 5700 ext. 6
- Availability: Monday—Friday, 8 am—5 pm EST

Scan for the latest digital instructions:

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