



Deploying Generation 3 Border Gateways

[January, 2025]

Deploying Generation 3 Border Gateways

Table of Contents

Scope	4
Overview	4
Prerequisites	4
Deployment location	4
Mounting	4
Supporting Hardware	5
Supporting Software	5
Tools	5
Deploying Border Gateways	5
Preparing the Border Gateway	7
Attach Border Gateways to poles	8
Attach Border Gateways to trees	12
Using tree nails to attach the bracket to a tree	12
Using garden wires to attach the bracket to the tree	14
Snapping the Border Gateway into the bracket	15
Finalizing the setup	15
Deploying Solar panels	16
Important facts to consider during the deployment	17
Attach solar panel to pole or tree	17
Attach the bracket to a pole	17
Attach the bracket to a tree	18
Attach the bracket to a tree using tree nails	18
Attach the bracket to the tree using garden wires	18
Snapping the solar panel into the bracket	18
Powering the Border Gateway using solar	19
Using PoE (Power over Ethernet)	20
Compliance	22
Antennas	22
EU Compliance	23
CE Radiation Exposure Statement	23
CE Operating Bands and Maximum Output Power	23
USA Compliance	24
FCC Statement	24
FCC antenna	25
FCC Radiation Exposure Statement	25
FCC Caution	25
FCC Company contact details	25
Canada Compliance	26

Scope

This document provides detailed instructions and guidelines for deploying the Silvanet Generation 3 Border Gateway. It covers the necessary steps to ensure that the gateway establishes reliable and efficient communication with the Silvanet Mesh Network and the Silvanet Cloud.

Overview

The Silvanet Mesh Network consists of a Border Gateway, Mesh Gateways, and Wildfire sensors. The Border Gateway receives messages from some of the Mesh Gateways and Wildfire sensors within its communication range, and finally forwards them to the Silvanet Cloud.

Prerequisites

The prerequisites are listed below and arranged into several groups.

Deployment location

- A location to deploy the Border Gateway, determined using the Dryad pre-planning tool.
- Check whether the selected location has sufficient sunlight throughout the day.
- Check whether the selected location can access the mains power supply.
- Check whether the selected location has internet access through a router.
- Check whether the selected location has cellular network coverage if internet access is unavailable.

Mounting

- A healthy tree or a metal/wooden pole mounted:
 - **If using a tree:** Make sure it is healthy and not expected to be cut down. Make sure that there is enough space on the selected tree, at least 3 m above the ground, to mount both the Border Gateway and solar panel(s).

- **If using a pole:** Verify that the pole can be grounded or securely attached to another surface, such as a wall or roof. The pole's diameter must not exceed 60 mm (2.3 inch). Make sure that there is enough space on the selected pole, at least 3 m above the ground, to mount both the Border Gateway and solar panel(s).

Supporting Hardware

- 2 x Solar panels with cables
- PoE adapter
- Cat 6 Ethernet cable
- (Optional) IoT SIM from any cellular service provider supports LTE-M and NB-IoT

Supporting Software

- Dryad Deployment App

Tools

- For Mounting:
 - 2 x U-clamps
 - 4 x M10 nuts
 - A 17 mm wrench
 - Spool of garden wires
- Ladder

Deploying Border Gateways

Before deploying the Border Gateways, review the following guidelines to better understand the product and prepare for its deployment.

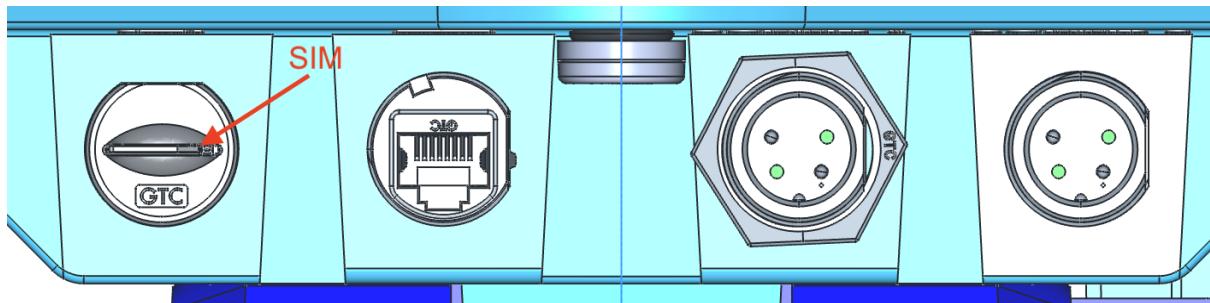
Guideline	Description
Range	The range of a Border Gateway to a Mesh Gateway is approximately 700 m - 3 km. This range may vary depending on various factors such as the environmental conditions, terrain, etc.
Location	Due to the power supply and Internet connectivity requirements of the Border Gateway, the location should be chosen carefully. Deploy the Border Gateway at the edge of a forest and near a power supply. To maximize range, install the Border Gateway on a hill, or at least a higher location to maximize range. If the Border Gateway is powered by solar, select a sunny location with direct sunlight. If it is installed on a tree, the solar panel should not be covered by branches.
Internal antennas	The Border Gateway has built-in internal antennas printed on the PCB for LoRa, Cellular, and Satellite connectivity. Therefore, no options are available to connect external antennas.
Power supply	As the primary power source, the Border Gateway can be powered via the mains supply using the provided PoE adapter. Alternatively, you can use the provided solar panels to power the Border Gateway. The Border Gateway has an option to connect up to 2 solar panels.
Internet	Use Ethernet for internet connectivity, as it is the recommended option. If Ethernet connectivity is not available, use cellular connectivity instead. The Border Gateway includes a built-in eSIM, which serves as a backup (worldwide) connectivity option even when

	<p>Ethernet is used as the primary internet connection. You can insert a second IoT SIM card (micro-SIM) which supports both NB-IoT and LTE-M access if you prefer to use cellular coverage from another provider. Once the second SIM is inserted, the eSIM is automatically disabled.</p> <p>Both 2G (GSM) and 4G (LTE) networks support NB-IoT and 4G networks support LTE-M.</p>
Deployment height	The recommended minimum height is 3 m above the ground, on trees or poles.
Obstructions	The Border Gateway requires a clear line of sight to communicate with wireless networks such as LoRaWAN and cellular, however, this is not essential in many cases..
Solar panel orientation	Install the solar panel facing the sun at 12:00 noon (northern or southern hemisphere). Use a compass to identify true South (in the northern hemisphere) or true North (in the southern hemisphere). This maximizes the amount of light that hits the solar panel. Also, select a location with direct sunlight (such as a hillside) and keep it free from branches that obscure direct sunlight.

Preparing the Border Gateway

- Place the Border Gateway on the planned location. With the Dryad Deployment App, tap the phone against the Border Gateway at the spot marked as NFC. This will register the Border Gateway with the Silvanet Cloud.

- (Optional) Insert the IoT SIM card which is a micro SIM into the SIM card slot. Unscrew the protective cap to open the port labeled "SIM," and insert the SIM card in the correct direction. Then, close the protective cap to secure the port from dust and water.

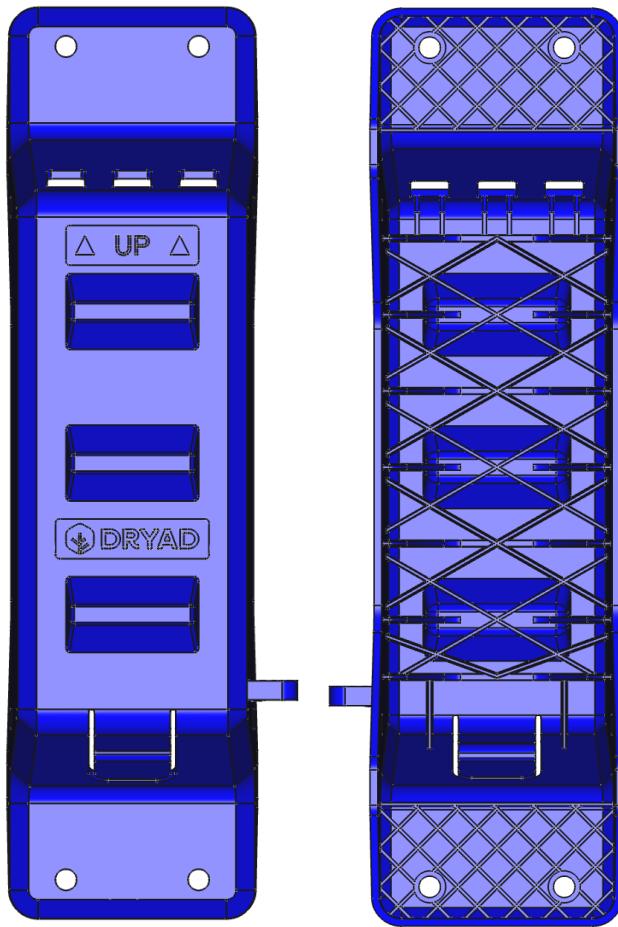


SIM card slot

Attach Border Gateways to poles

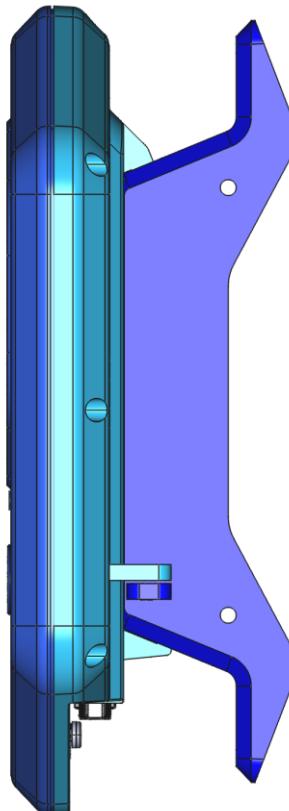
The following are the steps to install a Border Gateway to a pole.

1. Using the ladder, reach the desired height of the pole.
2. Place the back of the bracket on the pole at the desired position. Make sure that the "UP" side of the bracket faces the sky. The bracket has two pairs of mounting holes, top and bottom. Insert the two U-Clamps by inserting them around the pole and through the bracket's mounting holes.



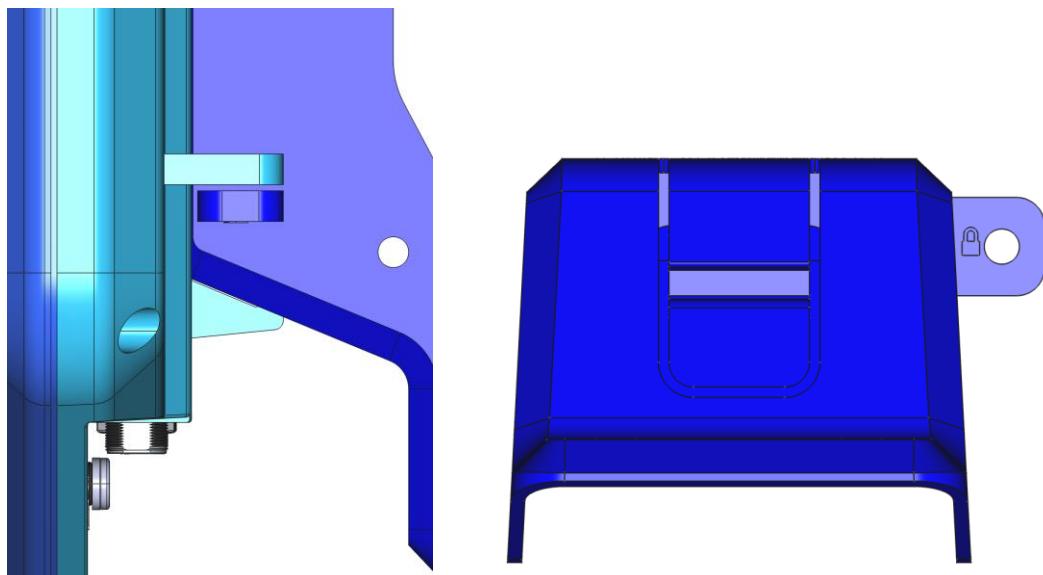
-Mounting bracket, front and back-

3. First, secure the nuts onto the U-Clamps by hand-tightening them. Then, use a 17 mm wrench to firmly tighten the nuts to hold the bracket in place. Avoid using excessive force to prevent damage to the bracket.
4. Place the Border Gateway upwards on the plastic bracket and firmly push it toward the bracket until you hear a clicking sound. This indicates that they are securely snapped together.



-Border Gateway and the bracket are fitted together-

5. To further secure the Border Gateway to prevent it from being removed from the bracket by unauthorized persons, add a padlock or wire/zip ties as shown in the image below. The lock is marked with the padlock symbol.



-lock-

6. If the Border Gateway requires solar power, mount the solar panel(s) on the pole above or opposite side of the Border Gateway. The Border Gateway supports up to two solar panels. (See "Deploying Solar Panels" for more information.)
7. Once mounted, the completed setup would similar to the picture shown below:



-Completed setup on a metal pole-

8. Perform the connectivity test to ensure the Border Gateway is connected to the Silvanet Cloud.

Attach Border Gateways to trees

If the Border Gateway is going to be attached to a tree, make sure the tree is stable and unlikely to be cut down.

Attaching the Border Gateway requires the plastic bracket to be attached to the tree first, then the Border Gateway can be snapped into the bracket. You can use either tree nails or garden wires to attach the plastic bracket to the tree.

Using tree nails to attach the bracket to a tree

Follow the steps below to attach the bracket to a tree:

Once you have selected a tree, use a safety strap to secure the ladder to the tree.

With an assistant holding the bottom of the ladder steady, find a suitable location on the tree, approximately 3 m above the forest floor, to mount the gateway.

Cut any branches and remove other obstructions at the deployment height to ensure the solar panel receives optimal sunlight for charging the device. Carefully use an axe or chisel to remove a small portion of the bark where the holes will be drilled. This helps the gateway hang vertically on the tree.



-Clear small area of bark-

With a distance between the holes at 70 mm, drill approximately 6-7 cm (2 $\frac{1}{2}$ inches) into the tree for the top holes of the bracket. Ensure you do not split the tree or drill on an angle. Use the 10mm drill bit. When drilling into a tree, first drill a pilot hole using a small drill bit ($\frac{1}{4}$ inch / 6 mm) then drill the final hole with the 10mm drill bit. Also, ensure you are using a drill bit for wood. This ensures the wood in the tree does not split.



-Drill two holes, 70 mm apart-

Carefully hammer the treenails through the top two holes of the plastic bracket into the drilled holes of the tree.

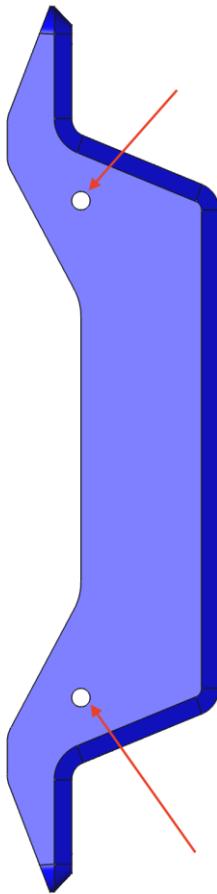
Carefully drill the bottom two holes into the tree through the bottom holes of the bracket. Be careful not to damage the bracket while doing so. Also, use a drill bit with a sufficient length to ensure the holes are at the correct depth.

Carefully hammer the treenails through the bottom holes of the bracket into the drilled holes of the tree.

Using garden wires to attach the bracket to the tree

The plastic bracket can also be attached to a tree using garden wires. The bracket has holes designed for this purpose. Two holes are located at the top left and top right sides, allowing

you to insert a garden wire through them to secure the top of the bracket to the tree. Similarly, two holes are located at the bottom left and bottom right sides for inserting another garden wire to secure the bottom of the bracket to the tree.



-Holes for inserting garden wires -

Snapping the Border Gateway into the bracket

Place the Border Gateway upwards on the plastic bracket and firmly push it toward the bracket until you hear a clicking sound. This indicates that they are securely snapped fitted together.

Finalizing the setup

1. Attach the solar panel to the tree above the Border Gateway. (See “Deploying solar panels” for more details)

2. If used, connect the Border Gateway to the internet enabled router through the provided PoE adapter.(See “Using PoE”)
3. The completed setup would similar to the picture shown below:



-Completed setup on a tree-

Perform the connectivity test to ensure the Border Gateway is connected to the Silvanet Cloud.

Deploying Solar panels

After attaching the Border Gateway to either a pole or a tree, the solar panel needs to be attached to the same location, preferably above the Border Gateway. Garden wire is used to secure the solar panel to the tree or pole.

The cable from the solar panel is 3 m long and has a plug at the end.

Important facts to consider during the deployment

- The pole or tree has adequate space to attach both the Border Gateway and the solar panel, or if you are planning to add two solar panels.
- Identify the deployment location where the sun is positioned at 12:00 noon. This ensures the solar panel receives maximum sunlight exposure throughout the day.
- Ensure to place the cable between the solar panel and the Border Gateway in such a way that it cannot be damaged by human or animal incidents.
- Ensure the solar panel is tightly connected to the tree or pole so that it cannot slip or turn during strong winds or other environmental actions.

Attach solar panel to pole or tree

The solar panel can be attached to a pole or tree using the plastic bracket. First, attach the bracket to the pole or tree:

Attach the bracket to a pole

Attach the plastic bracket to the pole using U-Clamps. Follow the instructions below:

1. Place the back of the bracket on the pole at the desired position. Make sure that the "UP" side of the bracket faces the sky. The bracket has two pairs of mounting holes,

top and bottom. Insert the two U-Clamps by inserting them around the pole and through the bracket's mounting holes.

2. First, secure the nuts onto the U-Clamps by hand-tightening them. Then, use a 17 mm wrench to firmly tighten the nuts to hold the bracket in place. Avoid using excessive force to prevent damage to the bracket.

Attach the bracket to a tree

Attach the plastic bracket to the tree using either tree nails or garden wires. Follow the instructions below:

Attach the bracket to a tree using tree nails

1. With a distance between the holes at 70 mm, drill approximately 6-7 cm (2 ½ inches) into the tree for the top holes of the bracket.
2. Carefully hammer the treenails through the top two holes of the plastic bracket into the drilled holes of the tree.
3. Carefully drill the bottom two holes into the tree through the bottom holes of the bracket. Be careful not to damage the bracket while doing so. Also, use a drill bit with a sufficient length to ensure the holes are at the correct depth.
4. Carefully hammer the treenails through the bottom holes of the bracket into the drilled holes of the tree.

Attach the bracket to the tree using garden wires

The bracket has holes designed for this purpose. Two holes are located at the top left and top right sides, allowing you to insert a garden wire through them to secure the top of the bracket to the tree. Similarly, two holes are located at the bottom left and bottom right sides for inserting another garden wire to secure the bottom of the bracket to the tree.

Snapping the solar panel into the bracket

After attaching the bracket to the pole or tree, position the solar panel facing upward. Align the socket on the back of the solar panel with the plastic bracket, then firmly push the panel onto the bracket until you hear a clicking sound. This confirms that they are securely snapped together.



Powering the Border Gateway using solar

The Border Gateway supports up to 2 solar panels.

1. Open either port labelled ‘SOLAR’ on the Border Gateway by unscrewing the protective plastic cap (counterclockwise).
2. Plug the cable from the solar panel into the connector on the Border Gateway.
3. Screw the protective cap (clockwise) onto the outer casing of the Border Gateway's SOLAR port to secure it.



-Solar power connector-

Using PoE (Power over Ethernet)

Power over Ethernet (PoE) delivers both internet connectivity and the power through the same Ethernet cable.

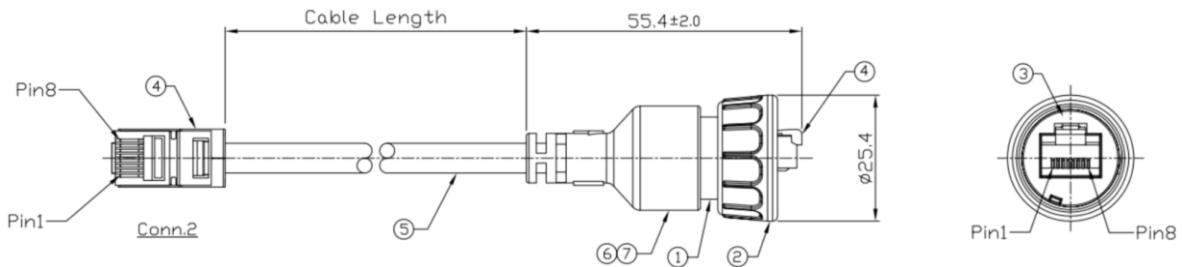
The PoE adapter provides internet access to the Border Gateway while ensuring a constant power supply via the PoE adapter, which is connected to the main power source.

The provided PoE adapter works with 100–240V AC, outputs 48V DC at 0.65A, and can deliver up to 30W.



-PoE adapter-

Use the provided Cat 6 Ethernet cable to connect between Border Gateway and the PoE adapter. This cable has pre-clipped connectors at both ends and has a protective plastic cap at one end that matches the outer housing of the POE port of the Border Gateway which ensures water tight connection.



-Cat 6 Ethernet cable with protective cap (left), PoE port on Gateway (right)-

The port for connecting the Ethernet cable is located at the bottom of the Border Gateway, labeled 'PoE'.

1. Open the POE port of the Border Gateway by unscrewing the protective plastic cap (counter clockwise).
2. Connect the end of the Ethernet cable with the protective cap to the PoE port of the Border Gateway.
3. Screw the protective cap (clockwise) onto the outer casing of the Border Gateway's PoE port to secure it.
4. Connect the other end of the Ethernet cable to the POE port of the PoE adapter.
5. Plug the PoE adapter to the mains power supply.

Compliance

Antennas

	Brand	Model Name	Antenna Type	Gain (dBi)
GPS	Dryad	GPS01Gen-3	PCB Antenna	-
LoRa (CE)	Dryad	LORA01Gen-3	PCB Antenna	0.8

LoRa (FCC / ISED / RCM)	Dryad	LORA01Gen-3	PCB Antenna	0.75
WWAN	Dryad	LTE01Gen-3	PCB Antenna	-
P-GSM 900				1.0
DCS 1800				3.7
LTE Band 1				3.3
LTE Band 3				3.7
LTE Band 8				1.1
LTE Band 20				1.3
LTE Band 28				-1.5

EU Compliance

CE Radiation Exposure Statement

This equipment should be installed and operated with a minimum distance of 27 cm between the radiator and your body.

CE Operating Bands and Maximum Output Power

Model Name	Description	
SBG-3X (Where X = "empty" or "S" that represents satellite variant)	SBG-3	without satellite
	SBG-3S	with satellite

Bands	Gain (dBi)	Power (dBm)	EIRP (dBm)
<u>LoRa</u>			
M (F1D)	0.8	14.72	15.52
N (F1D)	0.8	14.68	15.48
P (F1D)	0.8	21.62	22.42
<u>2G</u>			
2G (900;GXW)	1	35	36.00
2G (1800;GXW)	3.7	35	38.70
<u>LTE Cat-M1 (eMTC)</u>			
B1 (M1; G7D)	3.3	25.70	29.00
B3 (M1; G7D)	3.7	25.70	29.40
B8 (M1; G7D)	1.1	25.70	26.80
B20 (M1; G7D)	1.3	25.70	27.00
B28 (M1; G7D)	-1.5	25.70	24.20
<u>LTE Cat-NB1 (NB-IoT)</u>			
B1 (NB-IOT; G7D)	3.3	25.70	29.00
B3 (NB-IOT; G7D)	3.7	25.70	29.40
B8 (NB-IOT; G7D)	1.1	25.70	26.80
B20 (NB-IOT; G7D)	1.3	25.70	27.00
B28 (NB-IOT; G7D)	-1.5	25.70	24.20

Referred to Article 10(9), [CE simplified EU declaration of conformity](#)

Hereby, Dryad Networks GmbH declares that the radio equipment SBG-3X (Where X = “empty” or “S” that represents satellite variant) are in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following address:

<https://docs.dryad.app/dryad-documentation/resources/declaration-conformity>

USA Compliance

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC antenna

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance 70 cm between the radiator and your body.

FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

FCC Company contact details

Dryad Networks

Contact: +1 (855) 379 2387

Address: 7820B Wormans Mill Rd.

Suite 300

Frederick, MD 21701

Canada Compliance

This Class B digital apparatus complies with Canadian ICES-003

ISED Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada

RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

ISED Radiation Exposure Statement

This equipment complies with ISED RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance 52 cm between the radiator and your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 52 cm de distance entre la source de rayonnement et votre corps.

Antennas

The transmitter module may not be co-located with any other transmitter or antenna.

Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.