Deploying Generation 3 Mesh Gateways

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Scope

This document provides instructions for deploying Mesh Gateways in forests to establish reliable communication within the Silvanet Mesh Network. It outlines the necessary steps to ensure successful deployment and achieve optimal results.

Overview

The Silvanet Mesh Network consists of a Border Gateway, Mesh Gateways, and Wildfire sensors. The Mesh Gateways extend the range of a typical LoRaWAN network by providing multi-hop communication, allowing sensors to send messages (including fire alerts) over very long distances. Each Mesh Gateway relays a message until it reaches the Border Gateway, which finally forwards it to the Silvanet Cloud.

Prerequisites

The prerequisites are listed below and arranged into several groups.

Deployment location

- A location to deploy the **Mesh Gateway**, determined using the Dryad Planning Tool.
- A **Border Gateway** deployed on a location as per the deployment plan made by the Dryad Planning Tool and the Border Gateway being connected to the Silvanet Cloud.
- Check whether the selected location has a clear line of sight (if possible) to the Border Gateway.
- Check whether the selected location has sufficient sunlight throughout the day.

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 Mesh Gateway. The Mesh Gateway has a

built-in large solar panel that provides adequate power and charges the internal supercapacitors (there is no mains power supply for the Mesh Gateways) However, the solar panel needs an unobstructed area to obtain sufficient sunlight to charge the device. You may need to clear some branches away from the solar panel.

- **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 Mesh Gateway.

Supporting Software

- Mobile phone running Dryad Deployment App, NFC enabled

Tools

- For Mounting:
  - 2 x U-clamps
  - 4 x M10 nuts
  - 4 x Treenails
  - A 17 mm wrench
  - Codeless drill with drill bits
  - Hammer
  - Spool of garden wires
  - Wire cutter
- Ladder, safety stripe
- Safety gears for climbing the ladder

Guidelines

The following guidelines can be followed when deploying the Mesh Gateways.

Item	Guideline
Range	The communication range between Mesh Gateways and between a Mesh Gateway and the Border Gateway is approximately 700 m - 3 km and varies depending on environmental conditions and terrain. The placement location of the Mesh Gateway can be pre-determined using the Dryad Planning Tool.
Distance to sensors	Place the Mesh Gateways in locations that allow them to cover nearby sensors within a radius of approximately 1 km.
Location	If possible, install Mesh Gateways on a hillside or in a sunny location. If installed on a tree, it should not be covered by branches. The tree should be healthy and not planned for cutting down in the future.
Deployment height	Install Mesh Gateways at least 3 m above the ground. This will protect the Mesh Gateway from human or animal interference and provide a better line of sight to other gateways, as well as improved signal propagation between other gateways and wildfire sensors.
Obstructions	Ensure the tree does not have branches that obstruct a clear line of sight to other Mesh Gateways/the Border Gateway (this only applicable for its next hop gateways) as much as possible. Try to

	minimize cutting branches; if possible, choose another nearby tree instead..
Orientation	Mesh Gateways should be installed as vertically as possible on trees. Otherwise, their communication distance may be reduced due to a change in the orientation of the internal antenna. The Mesh Gateway should be installed facing the sun at 12:00 noon (in either the northern or southern hemisphere) or true north (in the southern hemisphere). This ensures the maximum amount of sunlight reaches the solar panel on the Mesh Gateway.
Attaching to trees	When attaching to trees, always use treenails or garden wires. Avoid using screws or bolts to secure the bracket to the tree, as they can sometimes harm the tree and may be corrosive.

Preparing the Mesh Gateway

With the Dryad Deployment App open on your phone and NFC enabled, tap the phone in the area where the NFC logo is marked on the Mesh Gateway. This will register the Mesh Gateway with Silvanet Cloud.

Attach Mesh Gateways to poles

A Mesh Gateway can be attached to a metal or wooden pole using the plastic bracket included in the package. The recommended diameter of the pole is 60 mm (2.3 inches). The plastic bracket can be secured to the pole using the two U-Clamps provided. Follow the instructions below to correctly attach Mesh Gateways to poles.

- Place the plastic bracket upright on the pole, typically about 3 m above the ground, with the front side facing you and the side marked 'UP' facing toward the sky.
- The plastic bracket has a pair of mounting holes at the top and bottom for inserting U-Clamps. Loosely attach the U-Clamps to the plastic bracket around the pole. Once inserted, the threaded ends of the U-Bolts should be visible through the mounting holes.
- Hand-tighten the nuts on the U-Clamps, then use a 17mm wrench to tighten them. Do not use excessive force to prevent damage to the plastic bracket. Ensure the plastic bracket is securely attached to the pole and cannot move.

- The Mesh Gateway has a matching socket on its back designed to snap into the plastic bracket. Place the Mesh Gateway on the bracket with its top side facing the sky. The solar panel of the Mesh Gateway should face your side. You can identify the top side of the Mesh Gateway by looking for the Dryad logo.
- Push the Mesh Gateway firmly onto the plastic bracket to snap them together. You will hear a click sound once they are securely attached.
- Check to ensure the Mesh Gateway is securely connected to the tree and does not move.
- Run a connectivity test to ensure the Mesh Gateway is connected to the Silvanet Cloud.

Now you have successfully attached a Mesh Gateway to a pole. Repeat the same process for all other Mesh Gateways at the deployment positions you have predetermined using the Dryad Planning Tool.

Attach Mesh Gateways to trees

A Mesh Gateway can be attached to a tree using the plastic bracket included in the package. First, attach the plastic bracket to the tree, then snap the Mesh Gateway into the bracket.

Attaching the plastic bracket to a tree

There are two options for attaching the plastic bracket to the tree. You can use either treenails or garden wires.

1. Once a suitable tree has been selected, use a safety strap to secure the ladder to the tree. Then, with an assistant stabilizing the ladder at the bottom, find a suitable position on the tree that is approximately 3 m above the ground and facing the sun (at 12:00 noon).

2. Remove any branches that might physically interfere with the Mesh Gateway or block sunlight.

Using treenails

1. If required, carefully remove a small portion of the bark with an axe where the holes for the treenails will be drilled. This allows the plastic bracket, together with the Mesh Gateway, to hang vertically on the tree.
2. Drill the top holes using a 10 mm drill bit to a depth of approximately 6-7 cm into the tree. The distance between the two holes should be 70 mm.
3. When drilling into hardwood trees, start with a smaller drill bit, then enlarge the hole to the final size with the 10 mm drill bit. Also, ensure you are using a drill bit designed for wood, not for steel or concrete.
4. Place the back of the plastic bracket over the drilled holes to align with its top mounting holes with the front side facing you and the side marked 'UP' facing toward the sky.
5. (Optional) If you plan to drill the bottom holes before attaching the plastic bracket to the tree, you can use the bracket as a template to locate the positions for the holes.
6. Hammer the treenails through the top loops of the Mesh Gateway into the drilled holes. Be careful not to damage the bracket while doing so. You may need an assistant to support the bracket while hammering the treenails into the tree.
7. With the bracket attached to the tree at the top, drill the bottom mounting holes of the bracket to a depth of approximately 6-7 cm into the tree.
8. Carefully hammer the treenails through the bottom mounting holes of the bracket. Make sure not to damage the bracket while doing so.

Using garden wires

1. Cut down two equal lengths of provided garden wires, each being twice the circumference of the location where you planned to attach the bracket on the selected tree.
2. The bracket has two pairs of holes on its top and bottom sides for inserting garden wires. Insert the garden wires through both sides..
3. Place the plastic bracket upright on the tree, typically about 3 m above the ground, with the front side facing you and the side marked 'UP' facing toward the sky.
4. While steadily holding the bracket by pushing it toward the tree, wrap the wires around the tree and twist the ends of the wires together.

Snapping the Mesh Gateway onto the bracket

- The Mesh Gateway has a matching socket on its back designed to snap into the plastic bracket. Place the Mesh Gateway on the bracket with its top side facing the sky. The solar panel of the Mesh Gateway should face your side. You can identify the top side of the Mesh Gateway by looking for the Dryad logo.
- Push the Mesh Gateway firmly onto the plastic bracket to snap them together. You will hear a clicking sound once they are securely attached.
- Check to ensure the Mesh Gateway is securely connected to the tree and does not move.
- Optionally, the snapped unit can be secured further using a padlock or zip tie by inserting it through the '**locking tab**' marked with a lock symbol.
- Run a connectivity test to ensure the Mesh Gateway is connected to the Silvanet Cloud.

Now you have successfully attached a Mesh Gateway to a tree. Repeat the same process for all other Mesh Gateways at the deployment positions you have predetermined using the Dryad Planning Tool.

Compliance

Antennas

	Brand	Model Name	Antenna Type	Gain (dBi)
GPS	Dryad	GPS01Gen-3	PCB Antenna	-
LoRA (CE)	Dryad	LORA01Gen-3	PCB Antenna	0.4
LoRA (FCC / ISED / RCM)	Dryad	LORA01Gen-3	PCB Antenna	-0.4

EU Compliance

CE Radiation Exposure Statement

This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

CE Operating Bands and Maximum Output Power

Model Name		Description
SMG-3X (Where X = “empty” or “S” that represents satellite variant)	SMG-3	with satellite
	SMG-3S	with satellite

Bands	Gain (dBi)	Power (dBm)	EIRP (dBm)
LoRa			
M (F1D)	0.4	15.26	13.51
N (F1D)	0.4	15.20	13.45

P (F1D)	0.4	20.81	19.06

Referred to Article 10(9), **CE simplified EU declaration of conformity**

Hereby, Dryad Networks GmbH declares that the radio equipment SMG-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 20 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

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

ISED Statement

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

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

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

with a minimum distance 23 cm between the radiator and your body.

un minimum de 23 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.