



Overo™ Conduit Setup Guide

Bring-up guide for Gumstix® Overo LoRaWAN gateway board with thethingsnetwork.org

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1 Introduction



Figure 1: Overo Conduit LoRa gateway board

The Overo™ Conduit gateway development board from Gumstix® is an Ethernet-connected expansion board for the Gumstix® COM. This board, combined with an Overo EarthSTORM™ or AirSTORM™, and a RisingHF RHF0M301 LoRaWAN gateway/concentrator module, and sub-GHz antenna, acts as a Wide Area Network(WAN) hub for IoT devices.

The LoRaWAN topology allows for low-powered or battery-operated IoT devices to communicate with online applications by way of Internet-connected gateways and concentrator modules, as shown in the figure below.

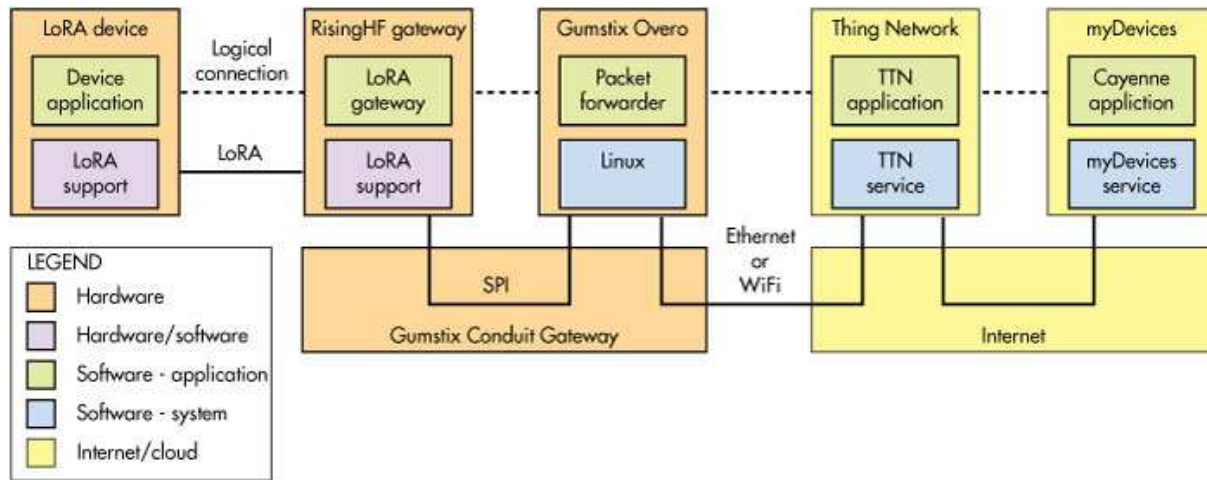


Figure 2: Lora network topology. (src: William Wong, Electronic Design)

The following guide will assist in the initial setup and configuration of the COM, board and software in order to operate the gateway on thethingsnetwork.org. It provides links, images and step by step instructions for configuring the device.



2 Material



Figure 3: Required materials

In order to connect and configure the Overo Conduit gateway you will require the following:

- Overo Conduit gateway board (store.gumstix.com/overo-lora.html)
- RisingHF RHF0M301 gateway/concentrator module (www.risinghf.com/product/rhf0m301/)
- Overo COM (store.gumstix.com/coms/overo-coms.html)
- 5V 3A DC pwer supply (store.gumstix.com/accessories/wall-adapters/5v35a-us-power-adapter.html)
- >4GB MicroSD card
- Ethernet cable
- An antenna for a frequency suitable for your region
 - North America: 915MHz



- Europe: 868MHz, 434MHz

Gumstix provides various kits for the Overo Conduit and Gumstix Pi Conduit gateways that include many of the required components at store.gumstix.com/kits.html for North American and European regions.

In addition to the hardware listed above, you will also require an account on TheThingsNetwork (TTN) and a gateway configured in your TTN console.

3 Setup

3.1 Hardware

Assemble the equipment as shown:

1. Snap the Overo COM onto the board.
Take care to align the COM with the outline on the board. This has the COM's microSD slot facing outward.



Figure 4: COM placement and orientation

2. Connect the RHF0M301 module to the 24-pin connector on the board's backside.
Use risers to keep the module's pins from bending during use.

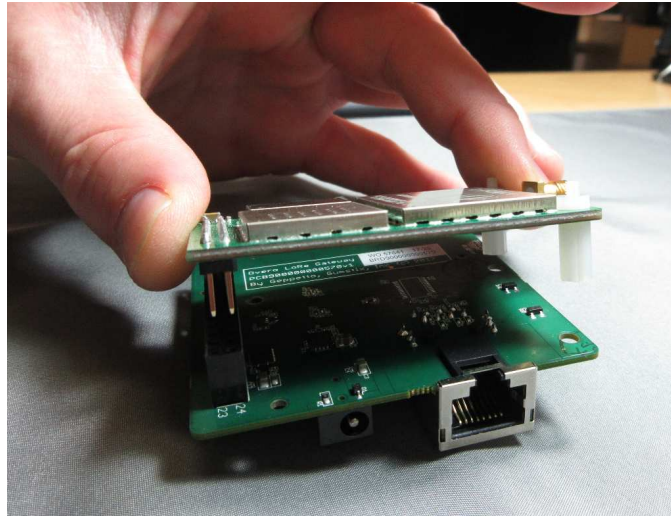


Figure 5: Connecting LoRa gateway module

3. Connect the Ethernet cable, power adapter, and antenna(s)



Figure 6: All components connected

3.2 Disk Image

A custom disk image is available for the Overo Conduit board at:

<https://drive.google.com/open?id=0B81rAesohgnc1Y5TzFVS3NkSW8>



Decompress it and create a new Overo SD card with the following command, replacing `sdx` with the location of your SD card within the `/dev/` folder:

```
$ dd if=overo-conduit-yocto.img of=/dev/sdx bs=4M
```

3.3 Packet Forwarder

The disk image provided above includes the TTN packet forwarder in root's home folder so there is no need to build it.

If you would like to build it from scratch, follow the directions for compiling the TTN packet forwarder located at https://github.com/TheThingsNetwork/packet_forwarder and copy the program to `/media/rootfs/home/root`.

To set your gateway up on thethingsnetwork.org, create a YAML file called `pkt-fwd.yml` in the same directory with 2 fields:

- **id**: This is the name given to your gateway in the TTN console
- **key**: This is the key, starting with `ttn-account-`, that is provided in the TTN console

The application is written for the Raspberry Pi[®] and a script is therefore required to adapt it to the Overo system. Create a file called `start-packet-forwarder.sh` and paste in the following script:

```
#!/bin/sh

# Toggle reset GPIO
echo "21" > /sys/class/gpio/export
echo "out" > /sys/class/gpio/gpio21/direction
echo "0" > /sys/class/gpio/gpio21/value
sleep 1
echo "1" > /sys/class/gpio/gpio21/value
sleep 1
echo "0" > /sys/class/gpio/gpio21/value

# Create symlink to spidev1@0
if [ -c "/dev/spidev0.0" ]
then
    echo "spidev0.0 already exists"
else
    ln -s /dev/spidev1.0 /dev/spidev0.0
fi
# start the packet-forwarder
./packet-forwarder -config pkt-fwd.yml -ignore-crc
```

Copy the script into `\home\root\` on the SD card, insert it into the slot on the Overo COM and plug in the device. SSH into it and run the script. The gateway should now be sending and receiving packets from the TTN API.



Appendices

A start_packet_forwarder.sh

```
#!/bin/sh

# Toggle reset GPIO
echo "21" > /sys/class/gpio/export
echo "out" > /sys/class/gpio/gpio21/direction
echo "0" > /sys/class/gpio/gpio21/value
sleep 1
echo "1" > /sys/class/gpio/gpio21/value
sleep 1
echo "0" > /sys/class/gpio/gpio21/value

# Create symlink to spidev1@0
if [ -c "/dev/spidev0.0" ]
then
    echo "spidev0.0 already exists"
else
    ln -s /dev/spidev1.0 /dev/spidev0.0
fi

# start the packet-forwarder
./packet-forwarder --config pkt-fwd.yml --ignore-crc
```



External Links

<https://drive.google.com/open?id=0B81rAesohhgnc1Y5TzFVS3NkSW8>, 5
https://github.com/TheThingsNetwork/packet_forwarder, 6
store.gumstix.com/accessories/wall-adapters/5v35a-us-power-adapter.html, 3
store.gumstix.com/coms/overo-coms.html, 3
store.gumstix.com/kits.html, 4
store.gumstix.com/overo-lora.html, 3
thethingsnetwork.org, 2, 6
www.risinghf.com/product/rhf0m301/, 3