

# R-Idge

## 6LoWPAN USB router



User Guide  
Revision 1.1

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# I. INTRODUCTION

R-Idge is a 6LoWPAN USB Router. It aggregates 6LoWPAN mesh networks and interconnects them to the enterprise local and wide-area IPv6 networks. R-Idge eliminates need to dedicated high-cost 6LoWPAN router and offers a seamless scalability.

This document explains how to run R-Idge on Linux (2.6 and above).

## 2. INSTALLING R-IDGE ON LINUX

When plugging R-Idge to an available USB connector, it will automatically:

- create a serial device `/dev/ttyACM0`.
- configure an IPV6 link-local address `fe80::xxxx:xxxx:xxxx:xxxx/64`,  
`xxxx:xxxx:xxxx:xxxx` being the router MAC address.

You can check this with the following commands:

```
ls /dev/ttyACM0
ifconfig usb0
```

If you have other serial device which might already use `/dev/ttyACM0` or a network device which might already use `usb0`, you can perform the following process:

- unplug R-Idge
- run the two commands

```
ls /dev/ttyACM*
ifconfig
```
- plug R-Idge to the computer
- run again the two commands

```
ls /dev/ttyACM*
ifconfig
```

R-Idge corresponds to the added `ttYACMx` and `usbx` device.

For the remaining of the document, we assume that R-Idge creates `/dev/ttyACM0` and `usb0`.

## 3.CONFIGURING R-IDGE ON LINUX

### 3.1.Configurable parameters

R-Idge is shipped with the following factory default parameters:

- RF channel: 26
- RF output: 37 (-18dBm)
- RF 802.15.4 PAN ID: 0xABCD
- LOWPAN\_IPHC shared context: none

#### 3.1.1.RF channel

R-Idge is a IEEE 802.15.4 device working in the ISM 2.4 GHz frequency band. This frequency band is divided into 16 channels: the lowest channel number is 11, the highest channel number is 26.

All the devices should use the same channel in order to be able to communicate.

RF channel can be chosen between these 16 channels.

#### 3.1.2. RF output power

The RF output parameter controls the power of the RF transmission.

The value of RF output can be chosen between 5 and 255.

The following table shows typical output power settings.

RF output	Typical output power (dBm)	Typical current consumption (mA)
5	-22	23
37	-18	24
117	-8	25
149	-4	26
181	-1.5	27
197	-0.5	28
213	1	29
229	2.5	31
245	4.5	34

### 3.1.3. RF 802.15.4 PANID

The PANID identifies the 802.15.4 network. It is 2-byte length and must be unique. All the devices in the same network should have the same PANID.

### 3.1.4. IPv6 Header Compression Shared Context

R-Iedge can be configured to use the LOWPAN\_IPHC encoding format (as specified in RFC 6282). The LOWPAN\_IPHC encoding format relies on shared context to allow compression of arbitrary prefixes.

Up to five (5) shared contexts can be configured on the router. By default, there is no shared context defined.

## 3.2. Configuring R-Iedge

If necessary, these factory default parameters can be changed. The configuration program “`cfgtool`” is provided for this purpose.

### 3.2.1. Set up the Configuration program

The Configuration program is available in deb package, rpm package and source code.

It can be downloaded at the following url <http://www.rosand-tech.com/downloads>.

See the instructions detailed in the document “Firmware Configuration Manual” if you need to compile the source code.

### 3.2.2. Prepare your user account

In order to be able to change the R-Iedge configurable parameters, your account must belong to the group “dialout”.

Run the command:

```
grep dialout /etc/group
```

If your account is not listed, add it to the “dialout” group

```
sudo useradd -G dialout <account>
```

Log out and login again to activate the account.

### 3.2.3. Change the configurable parameters

Let's assume that your network uses channel 21 and PANID 1001.

Run the command:

```
cfgtool -c serial -p ridge -U channel:w:21: -U panid:w:1001:
```

You can run `man cfgtool` to know about all the options of `cfgtool`.

The document “Firmware Configuration Manual” gives more detailed information. It can be downloaded at the url <http://www.rosand-tech.com/products/r-idge/doc.html>.

## 3.3. Setting up the network

### 3.3.1. Activate IPv6 routing

Edit the file “/etc/sysctl.conf” by setting to 1 ipv6 forwarding:

```
net.ipv6.conf.all.forwarding=1
```

Run the command:

```
sudo echo 1 > /proc/sys/net/ipv6/conf/all/forwarding
```

### 3.3.2. Configure the network

Configure the IPV6 address on `usb0`:

```
ip -6 address add 2001:db8:1::1/64 dev usb0
```

## 3.4. Routing configuration

R-Iedge can work with different routing protocols. In this section, we will show how to configure two routing protocols:

- Neighbor Discovery (RA/RS)
- RPL

Choose the most suited routing protocol for your Wireless Sensor Network.

### 3.4.1. Configure Neighbor Discovery (RA/RS)

`radvd` is the Linux IPv6 Router Advertisement daemon.

Install the `radvd` daemon.

In order to run `radvd` on the interface `usb0` and to advertise the prefix `2001:db8:1::/64` for address autoconfiguration, add the following section to the `radvd` configuration file (usually `/etc/radvd.conf`):

```
Interface usb0
{
  IgnoreIfMissing on;
  AdvSendAdvert on;
  AdvLinkMTU 1280;
  AdvCurHopLimit 128;
  AdvReachableTime 360000;
  MinRtrAdvInterval 100;
  MaxRtrAdvInterval 150;
  AdvDefaultLifetime 200;
  prefix 2001:db8:1::/64
  {
    AdvOnLink on;
    AdvAutonomous on;
  };
};
```

Activate radvd

```
sudo service radvd start
or
sudo /etc/init.d/radvd start
```

### 3.4.2. Configuring RPL

If you want to use the RPL protocol within your WSN, a Linux RPL Edge Router daemon is provided. The rpld daemon is available in deb package, rpm package and source code.

It can be downloaded at the following url <http://www.rosand-tech.com/downloads>.

In order to activate rpl on usb0 in daemon mode (background), run the following command:

```
rpld -i usb0 -D
```

You can run `man rpld` to know about all the options of rpld.



## 4. INSTALLING NEW FIRMWARE

The firmware loaded in the R-Idge router is modifiable. New firmware can be uploaded to the router through the USB interface.

### 4.1. Set up the Installation program

The Installation program is available in deb package, rpm package and source code.

It can be downloaded at the following url <http://www.rosand-tech.com/downloads>.

See the instructions detailed in the document “Firmware Installation Manual” if you need to compile the source code.

### 4.2. Prepare the new firmware

Download the new firmware from <http://www.rosand-tech.com/products/r-idge/doc.html>

Uncompress the downloaded file

```
unzip <filename>.zip
```

It will produce an Intel HEX file:<filename>-<version>.hex

### 4.3. Put the router in bootloader mode

Before uploading the firmware, the router must be in bootloader mode.

Please follow the below instructions:

- Press the reset button, the led RED will switch on.
- Maintain the reset button pressed until the led RED is off.
- The led GREEN will blink.



The router is now in bootloader mode.

### 4.4. Upload the new firmware

Run the command

```
blttool -c swra327 -p CC2531F128 -P /dev/ttyACM0 -U flash:w:<filename>-<version>.hex
```

You can run `man blttool` to know about all the options of `blttool`.

The document “Firmware Installation Manual” gives more detailed information. It can be downloaded at the url <http://www.rosand-tech.com/products/r-idge/doc.html>.

## Revision History

Revision number	Date	Description
1.0	15/04/2012	Initial version
1.1	01/08/2012	Add: - Configuring RPL - Installing new firmware