Radiocrafts Sensor to Cloud (STC) Demonstration Kit User Manual

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Product Description

The Sensor to Cloud demonstration Kit is used to show principles and capabilities of the RC1180-MBUS3-IEB (Radiocrafts IoT Expansion Board). It demonstrates data acquisition and transfer from an external utility meter (**UM**) all the way to data presentation on the web. The document uses the Sierra Wireless FX30 modem as an example, but is also applicable to general MangOH based modems.
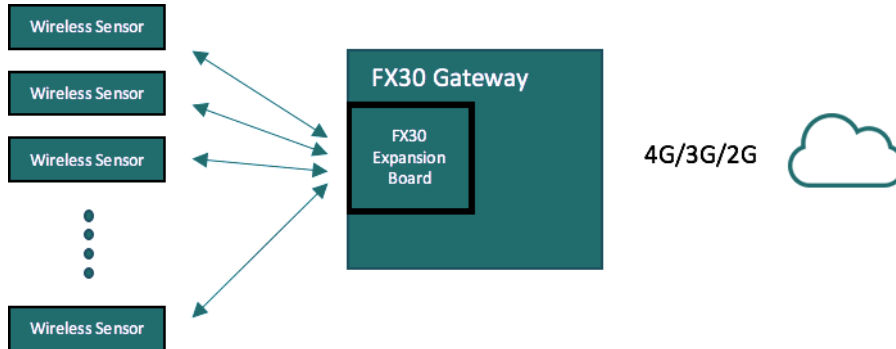
Hardware needed for the demonstration are:
- One MangOH based modem. E.g the MangOH Red or Sierra Wireless FX30
- One Radiocrafts IoT Expansion Board inserted in the IoT Card slot of the modem
- One SIM card with valid subscription inserted into the modem, or….
- …alternatively connect to the internet via an Ethernet cable if supported by the modem.
- The utility meter (UM) is emulated by a RC1180-MPC1-DB Demo Board

Software needed for the demonstration are:
- Demonstration software installed as an app on the modem. (Pre-loaded by Radiocrafts in the pre-built demonstration kit)
- Radiocrafts IoT Expansion Board with MBUS3 firmware. (Standard software included on module)
- An application server running backend and frontend application. This is already implemented in Amazon Web Services by Radiocrafts for the pre-built demonstration kit.

Everything except a SIM card with a valid subscription is provided in the pre-built demonstration kit.

Radiocrafts
Embedded Wireless Solutions

Setup
Sierra Wireless FX30:
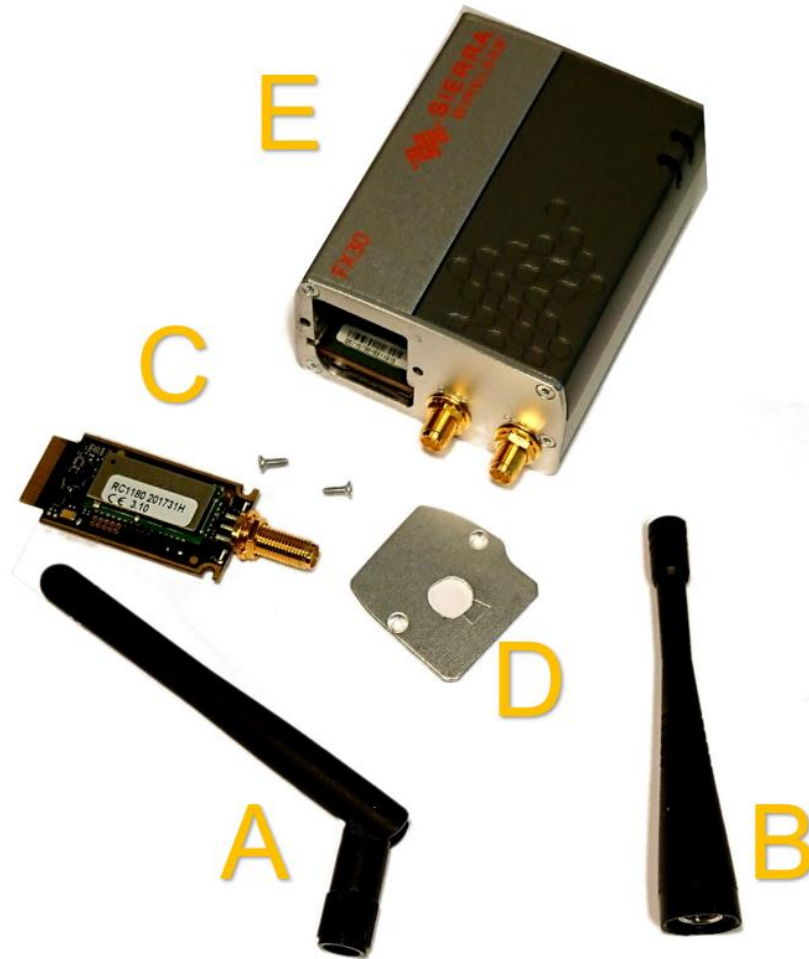
1. Remove the protective cover (D)
2. Connect the antenna (B) to the Radiocrafts FX30 Expansion Board (C)
3. Insert Radiocrafts FX30 Expansion Board (C) into the IoT slot of the FX30 (E)
4. Connect the GSM antenna (A) to the FX30 (E). Antenna should be 90 degrees bent to avoid coupling with antenna B.
5. Connect the FX30 (E) to external power and power on the device
6. Wait for 1-2 minutes for the device to power up and boot

MangOH Red:

The MangOH Red card can be set up as shown in the following picture. Pay special attention to the SW401 switches.
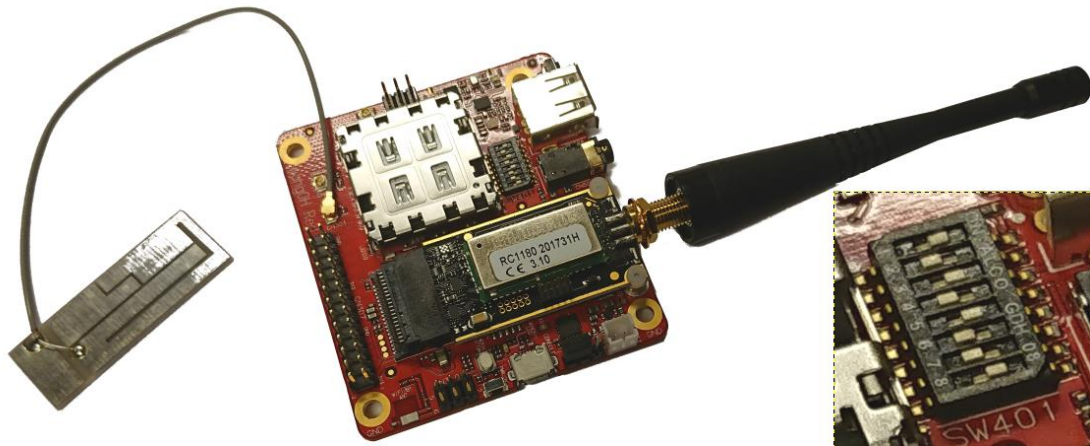
Utility Meter emulated by a Demo Board

1. Connect the antenna to the UM
2. Connect the UM wired external power supply or battery
3. The UM is live within a couple of seconds.

Web browser

      Using a web browser on a PC, tablet, phone or any other device, follow the link located at https://radiocrafts.com/products/IoT-expansion-board/ to the demo cloud implementation.

Usage

When everything is powered up, the UM is used to emulate two separate water meters connected to the modem using MPC1 – M-Bus Pulse Counter.

Water usage is incremented by 1 cubic meter every time button A (water meter 1) or button B (water meter 2) is pressed. If RESET button is pressed, the UM is reset, along with the counter values. Button C is not used.

The web page displays the current status of the water meters along with technical details about the Wireless M-Bus packets received. To get the latest updates and values, a refresh of the web page is needed. Therefore, after pressing one of the buttons, you will need to refresh the page to see the changes. The typical delay from button press to web update is less than 10 seconds. Link to the demo page can be found at the Radiocrafts web at https://radiocrafts.com/products/IoT-expansion-board/ .
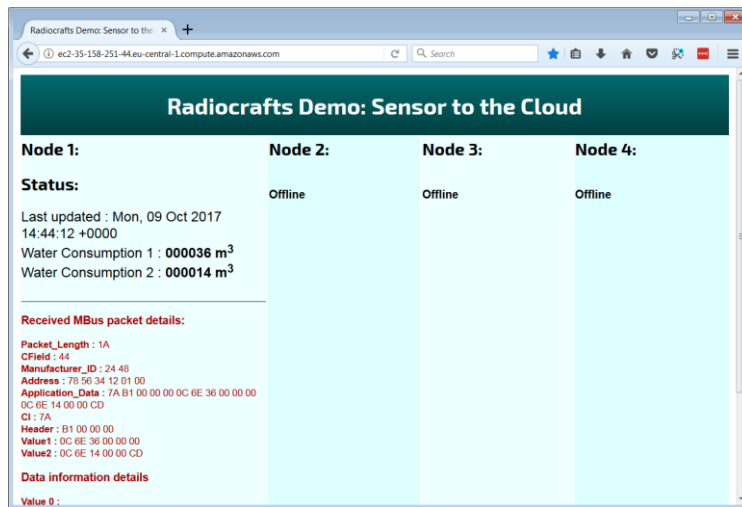
Terminal access to the modem

To access the modem, an SSH connection is needed. The modem runs the Legato system.
To access the modem, do the following:

1. Make sure the modem is powered up
2. Connect a USB cable from the host PC to the modem
3. Wait until drivers are installed
4. Open an SSH connection to 192.168.2.2. Any SSH client can be used
5. Login is **root** and password is nothing

Setup cellular data connection

Note: This step is only needed if you are using a cellular connection.

Before a cellular connection can be made, the user must insert a SIM card and configure the network to work with the provider. This requires you to have access to the modem via SSH. The following will only need to be done once, as settings are remembered between power cycles:

- An *UNLOCKED* SIM is inserted into the modem
- If the SIM is locked, you may unlock it by issuing the command "cm sim unlock" followed by your existing pin.
- You will also need to configure your network providers APN. This is information that you get from your provider. The APN is set by issuing the command "cm data apn" followed by the APN.
- The modem will need a reboot after the settings are set.

APPENDIX: Technical Setup and Troubleshooting
The following technical descriptions are for setting up the modem for the first time. The setup should be similar, independently of if you use a clean MangOH modem or e.g. the Sierra Wireless FX30. These instructions are provided as an overview guide for professionals. This setup is already done on versions received from Radiocrafts.

MangOH firmware
Ensure that the gateway has the correct firmware. This can be downloaded from Sierra Wireless / Legato / MangOH webpage.

UART setup
The UART must be set up as "Customer Linux Application". This is done through the AT command interface using the command **AT!MAPUART** .
For FX30: Use UART2
For MangOH Red: Use UART1

Setup firewall
The firewall on the modem must be set up correctly to enable data to be transferred between the modem and the outside world. IPTables are used for this, and the following setup is used:

```
# Generated by iptables-save v1.4.21 on Mon Nov 13 07:13:04 2017
*filter
:INPUT ACCEPT [5:1376]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [67:11910]
-A INPUT -i rmnet0 -p icmp -m icmp --icmp-type 0 -m state --state ESTABLISHED -j
ACCEPT
-A INPUT -i rmnet0 -p tcp -m tcp --sport 53 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -i rmnet0 -p udp -m udp --sport 53 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -i rmnet0 -p tcp -m tcp --sport 8443 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -i rmnet0 -p udp -m udp --sport 8443 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -i rmnet0 -p tcp -m tcp --sport 80 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT
-A INPUT -i rmnet0 -j DROP
-A INPUT -i eth0 -p icmp -j ACCEPT
-A INPUT -i eth0 -p tcp -m tcp --sport 53 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -i eth0 -p udp -m udp --sport 53 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -i eth0 -p tcp -m tcp --sport 8443 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -i eth0 -p udp -m udp --sport 8443 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -i eth0 -p tcp -m tcp --sport 80 -m state --state ESTABLISHED -j ACCEPT
-A INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT
-A INPUT -i eth0 -j DROP
COMMIT
# Completed on Mon Nov 13 07:13:04 2018
```

Web connection
The modem application connects to an Amazon Web Services instance. The application uses RESTful web services to transfer data from the modem. All certificates and keys are handled by the application, but port 80 and 8443 must be accessible for the modem

Installing/upgrading the app running on the modem
Installing and upgrading the app is done via the tool **update** provided by Legato.
Example: **update RC_IoTCard_Demo.wp85.update 192.168.2.2**
To request the pre-built binary file, please contact support@radiocrafts.com .

UM setup

The UM must be configured correctly for the demo to work as intended (see documentation for RC1180-MPC1-DB for details). The default configuration is used, except the following:

- MPC Pullup (address 0x0B) must be 0x03
- The pulse weights (address 0x2A and 0x2B) must be 0x05.
- The meter address must be
  - A-field ID2-4 (address 0x1C-0x1E) shall all be 0xFF
  - A-field ID1 can be any number

Document Revision History

Document Revision	Changes
1.00	First Release
1.01	Added note for binary file request and updating application
1.10	Generalized document to support general MangOH-based modems. Updated web links.

Disclaimer

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RC232™ is a trademark of Radiocrafts AS. The RC232™ Embedded RF Protocol is used in a range of products from Radiocrafts. The protocol handles host communication, data buffering, error check, addressing and broadcasting. It supports point-to-point, point-to-multipoint and peer-to-peer network topologies.

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This Radiocrafts product is not designed for use in life support appliances, devices, or other systems where malfunction can reasonably be expected to result in significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness. Radiocrafts AS customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Radiocrafts AS for any damages resulting from any improper use or sale.

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