

Application Note

Ranger Private Cloud OTA Firmware Update Process

OVERVIEW

When a Ranger is connected to a private MQTT broker and host system it is up to the network operator to manage and push any necessary firmware updates to the Rangers. The Ranger has two separate pieces of firmware that can be updated, the application and the modem. The application is the portion provided by SignalFire which controls all the Ranger functionality. The modem firmware is provided by the modem manufacturer and is certified by the network operators for compatibility with their cellular networks.

APPLICATION FIRMWARE UPDATE

The application firmware can be updated in several ways:

- 1) over the USB port using the Ranger ToolKit which will automatically prompt users that there is an update available.
- 2) Over the air (OTA) by issuing a MQTT publish to the Ranger.
- 3) Through the Signal Fire Cloud Platform

Application Firmware Versions

Currently there is a specific firmware variant that must be loaded to correspond with an installed daughter card. For example, if the Modbus card is installed the Modbus firmware variant must be loaded to enable Modbus functionality.

Rangers shipped prior to January 2021 used an older memory map and must be loaded with firmware containing a -A suffix. Additionally, the “-A” Rangers cannot be field updated to support the HART or SDI-12 daughter cards.

Rangers shipped after 1/27/2022 have a “V2” board version, and V2 firmware versions must be used for these Rangers.

Determining Firmware Revision to Load

Before an OTA firmware update can be initiated, it is first necessary to determine which revision is currently running on the Ranger by reading the “Properties/SW Rev” metric. The current version will dictate which revision to update to. To determine the latest application firmware revisions hosted on our webserver you can visit <http://downloads.signal-fire.com/S2C/>.

Existing Revision v0.1.8 and before

This is an older revision that requires an extra step to determine the correct revision to load. Since this revision was a combined version that included both the default Ranger and the Modbus Ranger, the user must determine which version is currently running, this can be found by reading the “Properties/HW Config” metric. If the result is “DCDC” or “DCDC-A2D1” the most recent -A firmware variant should be used. If this returns “DCDC-Modbus”, then the most recent -A-modbus revision should be used.

For example, if the Ranger running v0.1.8 has a HW Config of DCDC the correct firmware to update to is v0.1.X-v1-A, where X is the most recent revision.

Existing Revision v0.1.9 and after

Revisions starting at v0.1.9 are will already be separated to include the daughter card variant and if the -A variant is needed or not, making determining the correct firmware to load a simple matter of matching the existing string and replacing the revision number with the latest.

For example, if the Ranger reports it is running v0.1.13-A-3v, we need to replace the “13” with the latest revision and add the v1. For example, v0.1.X-v1-A-3V where X is the most recent revision.

Existing Revision v0.1.20 and after

If you are running a “V2” version board (firmware contains “v2”), you must upgrade to the V2 version of firmware. Otherwise, utilize the V1 variant.

Starting the OTA Application firmware update

To initiate an OTA firmware update to a remote Ranger, the string containing the URL of the firmware revision to apply should be published to the “Properties/SW Rev” tag. SignalFire host Ranger firmware files at the location <http://downloads.signal-fire.com/S2C/>. When the Ranger receives this publish it will initiate an HTTP file download from that URL. When the file download is complete, the Ranger will verify the file and, if it is valid, update itself to this version and re-connect to the MQTT broker.

For example, for a Ranger that is currently running v0.1.11-A, writing “http://downloads.signal-fire.com/S2C/v0.1.22-v1-A” to the “Properties/SW Rev” tag will cause the Ranger to download and apply the update to version 0.1.22

Note that if the incorrect version update version update is initiated (using a -A on a non -A Ranger for example), the update will fail, but the Ranger will continue running the existing firmware revision.

Also note that if your Ranger is connected to the Signal Fire Cloud Platform, the platform will automatically identify the correct firmware version to upgrade to and perform the upgrade for you.

MODEM FIRMWARE UPDATE

The Modem firmware can only be updated OTA but can be initiated over the USB port or via a MQTT publish to the Ranger.

Modem Firmware versions

There are currently four versions of modem firmware supported by the Ranger:

`mfw_nrf9160_1.1.1`, `mfw_nrf9160_1.1.3`, `mfw_nrf9160_1.1.4`, and `mfw_1.3.4`.

It is recommended that all V1 hardware Rangers are updated to the 1.1.4 release and all V2 hardware Rangers updated to the 1.3.4 release.

OTA Modem Firmware Update Process (V1 hardware)

First the current modem firmware revision should be checked by reading the “Modem/Rev” MQTT metric. This should return something like `mfw_nrf9160_1.1.1`.

Updating from `mfw_nrf9160_1.1.1`

Upgrading from this modem firmware revision requires a 2-step process, first the modem must be updated to `mfw_nrf9160_1.1.3`, then it can be updated to the latest `mfw_nrf9160_1.1.4`.

Modem firmware updates are again initiated by publishing to the “Properties/SW Rev” metric.

To update from 1.1.1 to 1.1.3, publish `mfw/mfw_111_113`

The Ranger will download and apply the Modem update and reconnect.

To update from 1.1.3 to 1.1.4, publish `mfw/mfw_113_114`

To confirm that either update was complete, read the “Modem/Rev” to determine the active version.

OTA Full Modem Firmware Update Process (V2 hardware)

Rangers with Hardware Revision 2 (PCB Rev 2.1) will be running V2 application firmware and can perform a full modem firmware update to a different minor revision (i.e. `mfw_nrf9160_1.1.4` to `mfw_nrf9160_1.3.4`).

Updating from `mfw_nrf9160_1.1.4` to `mfw_nrf9160_1.3.4`

Full modem firmware updates are initiated by publishing to the “Modem/Rev” metric. The string published to this metric must contain the full URL of the modem firmware .cbor file (Example: http://downloads.signal-fire.com/S2C/mfw/fmfw_134.cbor)

To update from 1.1.4 to 1.3.4, publish `http://downloads.signal-fire.com/S2C/mfw/fmfw_134.cbor`

To confirm that the update was complete, read the “Modem/Rev” to determine the active version.