

PRODUCTION FIRMWARE LOADING PROCEDURE

Application Note

v1.0

INTRODUCTION

The goal of this document includes the following:

- Describe the process by which Laird loads firmware prior to shipment to the customer.
- Describe the behaviors on the first two boots after firmware update.

OVERVIEW

From the manufacturer, the WB radio modules have an initial firmware (consisting of multiple image files) loaded in the Flash memory and have an assigned Wi-Fi MAC address. The Ethernet MAC address is initially set to a random value. This allows the manufacturer to consistently test all WB modules before shipping to Laird.

Before shipment to the customer, Laird loads a specific *Firmware Release* into the WB module, assigns the Ethernet MAC address, and tests that the firmware is loaded properly. In addition, several data items are recorded from the WB module to a local Records File. This local Records File serves as a record of the final WB module configuration and contains details such as firmware version info, MAC addresses, and other desired data items.

This final production procedure supports updating a number of WB modules in parallel, using respective break-out boards that the WB modules mounts to. The example setup discussed in this document is for a *gang-of-four* boards.

Once the WB modules have completed this firmware update process, the resulting Records File can be accessed by scanning the MAC address label on the WB module.

SETUP

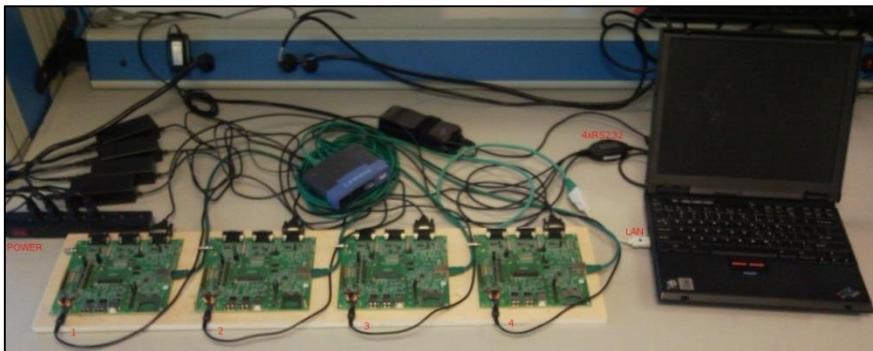


Figure 1: Procedure Setup

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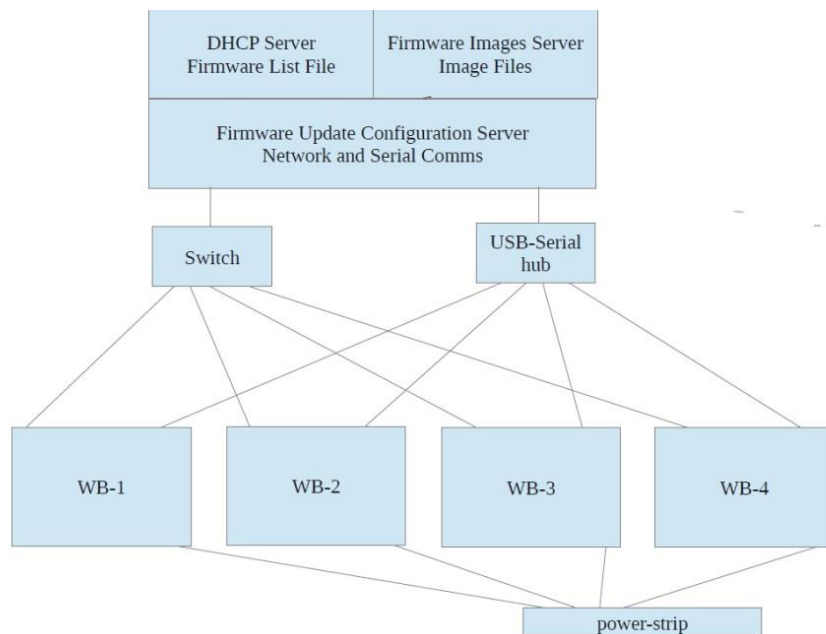


Figure 2: Setup diagram

As shown in [Figure 1](#) and [Figure 2](#), the servers may reside on the same computer or independently. In this setup, these services are on the same computer and are running Linux. The four WB-# boards are plugged into a common power strip to allow them to be switched on or off at the same time.

Note: The firmware updating via network is described in WB Firmware Update Utility Procedure and is used in this procedure.

Additionally, a *tk/tcl expect script* monitors the four WB modules and issues commands to the console of each.

A Production Configuration File, which is stored on the computer, contains settings to control the process. Settings include the following:

- Ethernet MAC Address pool range to use
- Number of boards (in this case, four)
- Name of records file to write
- Commands to run during post-update
 - Firmware version
 - eth0 -Ether address (Ethernet MAC address)
 - wlan0- Radio address (WiFi MAC Address)
 - Etc.

PROCEDURE

The following are procedure steps for firmware updating and configuration:

1. With the power off, plug the new WB modules into the breakout boards.
2. Turn on power to the breakout boards.
3. The following steps are taken programmatically:
 - a. Each WB module acquires a DHCP IP address and gets its firmware update list file.
 - b. Each WB module runs a local *fw_update* script and writes the new *Firmware Release* image files to Flash.
 - c. The Firmware Update Configuration server issues a unique Ethernet address to each WB module and decrements the available Ethernet addresses range.

- d. Each WB module reboots itself and enters post-update state upon reboot.
 - e. The *tk/tcl expect script* logs into each WB module's console and issues several commands to capture data from the WB module.
 - f. The resulting captured data is recorded to the local *Records File*.
 - g. The *Records File* information is compared to the Production Configuration File to determine if the WB module firmware was installed properly.
 - h. An LED on each breakout board indicates the final status. The LED is on during the testing and is turned off to indicate that the WB module has passed its test.
4. The power is turned off to the breakout boards.
 5. The WB modules are removed and placed them into the holding area.
 6. Repeat with Step 1.

PROCESS CONTROL

First Bootup

The following occurs upon the first bootup:

1. Updating the firmware via network is fully automatic and initially triggered by the random Ethernet MAC address.
2. When the new Firmware Release image files are written to Flash, the status is *update-pending*.
3. The configuration server receives a message from each WB module.
4. The response contains the to-be-assigned unique Ethernet MAC address.
5. The WB module stores the Ethernet MAC address in Flash and uses this value hereafter.
6. The WB module reboots.

Second Bootup

The following occurs upon the second bootup:

7. The serial COMs (via the *tk/tcl expect script*) catch several expected console messages and, at the proper point, perform an automatic login to facilitate direct actions for recording information to a local Records File.
8. The post-update process also checks for errors. The local Records File data is compared to the Production Configuration File data to determine if the WB module firmware was loaded successfully. When the data in both files match and the WB module successfully reboots, the firmware is determined to have successfully been updated.
9. When this post-update process is complete, an LED indicator shows the final status on the breakout board.
10. If the WB module firmware was successfully updated, the LED on the breakout board is turned off and the resulting status is *update-success*. If the WB module was not successfully updated, the LED on the breakout board will remain on and the resulting status is *update-failed*.
11. The WB module is issued a *poweroff* command.

NOTE

With the Firmware Update process, each WB module has gone thru two power cycles and their network and console serial COMs must have worked satisfactorily. A local Records File contains the firmware version and MAC address values for each WB module.

If there is an error at any stage of the process, it is noted in the local Records File and indicated via the LED on the respective breakout board as noted above.

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This Firmware Update process is fully automatic with exception of physically handling the WB modules. With the Production Configuration File containing proper settings, the operator should only need to load or unload the WB modules and switch the powerstrip at appropriate times as indicated.

There may be some fallout of WB modules that do not update on first bootup cycle. These failures will be detected and any problem WB modules will be set aside and corrective action taken later. Since it is feasible for a random Ethernet MAC address collision to occur, the WB modules that fail the first bootup cycle will be processed thru this procedure a second time. If the WB module fails first bootup a second time or if any WB module fails to successfully have its firmware updated, those WB modules will be isolated for failure determination.

REVISION HISTORY

Revision	Date	Description	Approved By
1.0	24 Oct 2014	Initial Release	John Imboden