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APN Content Level	BASIC	INTERMEDIATE	<input checked="" type="checkbox"/>	ADVANCED	Confidentiality	Public	<input checked="" type="checkbox"/>	Private	
Hardware Compatibility	Product Line	IoT Modules	Series	EM	MC				
				RC	WP				
Software Compatibility	Windows				Document Type	Application Note	<input checked="" type="checkbox"/>	Technical Note	

1 Version

This document may be updated over its lifetime. To ensure you design with the correct version, please check source.sierrawireless.com for the latest version. (Search for "2174314" (this document number.))

2 Introduction

This document is provided to Sierra Wireless customers to facilitate the upgrading of firmware and configuration files of Sierra Wireless embedded modules. To request a new application/technical note, contact your regional Sierra Wireless Product Marketing Manager.

3 Glossary

Term/Initials	Definition
.cwe	Firmware image file
.nvu	Carrier configuration file
.spk	Container file for multiple .cwe files
FDT	Firmware Download Tool
fdt2 / fdt2.exe	Version of FDT application (as of document publication date)
QDL	Qualcomm Download mode
Sahara	Packet processing protocol

4 Application Note Description

This document describes how to use Sierra Wireless' FDT (Firmware Download Tool) application to download firmware images from a Windows computer onto a connected embedded module (Sierra Wireless Qualcomm chipset-based – supported series are indicated in the Series list of the header on this page).

5 FDT Overview

FDT is a Windows® (Windows 10 and newer) console application that can be used to download firmware images to embedded modules over the USB interface.

This document describes the FDT command options typically used for factory firmware installation.

To download the latest version of FDT, refer to source.sierrawireless.com/resources/airprime/software/fdt. As of the publication date of this document, the latest version of the application is fdt2.exe, and command examples in this document refer to fdt2 (or fdt2.exe).

Note: Proper driver installation is required prior to using this tool. To download the latest Windows drivers for supported Sierra Wireless modules, go to the module's page on source.sierrawireless.com and click the Windows Drivers link.

6 Factory Firmware Installation Method

Sierra Wireless modules are shipped from a Sierra Wireless factory with a default firmware image. Customers can then use FDT to upgrade or change the firmware image on the module.

1. On a Windows system, download and install the latest version of FDT from source.sierrawireless.com/resources/airprime/software/fdt.
2. Use FDT to install appropriate images to the module.
For details, refer to:
 - Table 1 FDT Command Syntax
 - Table 2 FDT Firmware Installation Examples
 - Table 3 FDT Error Codes

6.1 Command Syntax

Because the FDT tool is used by Sierra Wireless to pre-provision modules, by customers to install stock or custom images, and by end-users to update modules when necessary, the tool provides some options that are specific to these different use cases.

The following table describes FDT command options and values that are typically used for factory provisioning of modules.

Note: For a full list of available FDT options and version information, use “`fdt2 -h`”.

Table 1 FDT Command Syntax

FDT Command Syntax – Factory Download		
<code>fdt2 -d [device_type] -fd [folder name] -f [image file name 1] ... [image file name x] -a -mi -impref [Pref 1] [Pref 2] -force -log</code>		
<i>Note:</i> If a value contains spaces, use double quote around the value. (e.g. “sample image.cwe”)		
Options	Values	Description
-d [device_type]	wpspk, g5k	Device type. <ul style="list-style-type: none"> • g5k Use to download firmware images and configuration files (customer and carrier PRIs) to the modem. • wpspk Use this option to update multiple module images using a single .spk file that includes multiple download files. <i>Note:</i> This option is not required if only a single file is being downloaded.
-fd [folder name]	Relative or absolute folder path	Pathname of folder containing image file to be downloaded to module. Absolute or relative pathname may be used. e.g. “C:\data\img_folder”, “img_folder”. <i>Default:</i> If option is not used, pathname defaults to the current folder.
-mi	-	Multiple image download <ul style="list-style-type: none"> • Image downloads start at slot 0 for the first image, slot 1 for the second image, etc. <i>Note:</i> -impref option must also be specified when -mi is used.

FDT Command Syntax – Factory Download		
-f [image file name 1] ... [image file name x]	File name(s) e.g. xxx.cwe, yyy.nvu, zzz.spk	Filename(s) of image file(s) to be downloaded. <ul style="list-style-type: none"> Downloads one or more image files. If -f option is not used, FDT searches for the first .cwe image file in the specified folder (if '-fd' is used) or in the current folder (if '-fd' is not used). Multiple files can be combined into one .spk file and downloaded with this format
-a	-	Automated mode —FDT will not prompt for user to press Enter when finished.
-impref [Pref 1] [Pref 2]	Image file names	Image preferences to take effect when module is reset or power-cycled after multiple image download (using -mi option) <hr/> <i>Note: -mi option must also be specified when -impref is used.</i>
-force	-	Force download of all specified images even if some may already be on device This ensures FDT always downloads the intended files. (For example, to make sure the device isn't using an incorrect/corrupt image.)
-log [folder]	Relative or absolute folder path	Folder where FDT logs will be written <hr/> <i>Default: If option not used: %programdata%\Sierra Wireless\logs</i>

7 Examples

The following table describes FDT command options to use for typical factory provisioning use cases.

Table 2 FDT Firmware Installation Examples

Action	Description
fdt2.exe	Install: <ul style="list-style-type: none"> File: First .cwe image in folder Folder: Current folder
fdt2.exe -f a.cwe	Install: <ul style="list-style-type: none"> File: a.cwe Folder: Current folder
fdt2.exe -fd C:\Data\Example -f a.cwe	Install: <ul style="list-style-type: none"> File: a.cwe Folder: C:\Data\Example
fdt2.exe -fd Example -f a.cwe	Install: <ul style="list-style-type: none"> File: a.cwe Folder: .\Example
fdt2.exe -fd "C:\SWI9X07Y_00.00.02.00\WP7603FlashUtil" -f example_fw_v1.cwe	Install: <ul style="list-style-type: none"> File: example_fw_v1.cwe Folder: C:\SWI9X07Y_00.00.02.00\WP7603FlashUtil
fdt2.exe -fd "C:\SWI9X07Y_00.00.02.00\WP7603FlashUtil" -f spkg.cwe	Install: <ul style="list-style-type: none"> File: spkg.cwe Folder: C:\SWI9X07Y_00.00.02.00\WP7603FlashUtil

Action	Description
<code>fdt2.exe -f a.cwe -a</code>	Install: <ul style="list-style-type: none"> • File: a.cwe • Folder: Current folder • FDT does not prompt for user input when finished
<code>fdt2.exe -log C:\Data\fdt2_logs</code>	Install: <ul style="list-style-type: none"> • File: First .cwe image in folder • Folder: Current folder • Log messages saved to C:\Data\fdt2_logs folder
<code>fdt2 -d g5k -f onefile.cwe anotherfile.nvu</code>	Install: <ul style="list-style-type: none"> • Files: onefile.cwe, anotherfile.nvu • Folder: Current folder • Purpose: Image switching using the specified files
<code>fdt2 -d wpspk -f sample.spk -force</code>	Install: <ul style="list-style-type: none"> • File: sample.spk (containing multiple download files) • Folder: Current folder • FDT downloads file even if already on the device • Updates multiple images
<code>fdt2 -d g5k -fd images_folder -f fw1.cwe fw2.cwe fw3.cwe pri1.nvu pri2.nvu pri3.nvu pri4.nvu pri5.nvu -mi -impref fw2.nvu pri3.nvu</code>	Install: <ul style="list-style-type: none"> • File: Three .cwe and five .nvu files • Folder: images_folder • Indicate that module should run fw2.nvu and pri3.nvu on next boot

8 Error codes

FDT returns a status code upon completion (Table 3).

Table 3 FDT Error Codes

Code	Error Type	Description
0	ERROR_SUCCESSFUL	Operation was successful.
Application Errors		
1	ERROR_APP_FILE_NOT_EXIST	File doesn't exist.
2	ERROR_APP_INVALID_PARAMETER	File name pointer invalid.
3	ERROR_APP_DEVICE_NOT_CONNECTED	Module is not connected.
4	ERROR_APP_DEVICE_REMOVED	Module removed.
5	ERROR_APP_NO_SERIAL_PORT_AVAILABLE	No serial port available to continue to ping the module.
6	ERROR_APP_ANOTHER_INSTANCE_RUNNING	Another FDT instance is running.
8	ERROR_APP_IMAGES_VERSION_MISMATCH	Possible causes: <ul style="list-style-type: none"> • Specified firmware and PRI versions do not match • Specified file is not found
9	ERROR_APP_JSON_FILE_OPEN_FAIL	JSON file could not be opened.
10	ERROR_APP_JSON_PARSE_FAIL	JSON file could not be parsed.
12	ERROR_APP_NO_DOWNLOAD_PORT_AVAILABLE	No download port available.
13	ERROR_APP_NO_DM_PORT_AVAILABLE	No DM port available.

Code	Error Type	Description
14	ERROR_APP_NO_ADAPTER_AVAILABLE	No adapter available.
Device Errors		
30	ERROR_DEV_IMAGE_TYPE_NOT_REQUIRED	Specified CWE image file is already on device. To load it anyway, include the '-force' option.
31	ERROR_DEV_NO_SAHARA_PORT_AVAILABLE	No Sahara port available.
32	ERROR_DEV_REMOVAL_FAIL	Device not removed properly.
33	ERROR_DEV_FW_UPDATE_FAIL	Device responded indicating the firmware update failed.
34	ERROR_DEV_NO_FIREHOSE_AVAILABLE	No Firehose available.
Errors from FwUpdateCore		
51	ERROR_FWMGMT_SWITCH_TO_BOOT_MODE_FAIL	Failed to switch mode to expose only QDL Serial port. Modem does not respond to the SWITCH_TO_BOOT&HOLD command.
53	ERROR_FWMGMT_OPEN_STATE_FAIL	Failed in Open stage.
54	ERROR_FWMGMT_WRITE_STATE_FAIL	Failed in Write stage.
55	ERROR_FWMGMT_DONE_STATE_FAIL	Failed in Done stage. Possible cause: <ul style="list-style-type: none"> • Boot loader does not match device type
56	ERROR_FWMGMT_DONE_FINAL_STATE_FAIL	Failed in Done All stage.
58	ERROR_FWMGMT_INTERNAL_WAIT_FAIL	Failure when waiting for download to finish, invalid event handle.
59	ERROR_FWMGMT_DEVICE_DISCONNECTED	Communication to the device is broken.
60	ERROR_FWMGMT_SEND_COMMAND_FAIL	Failed to send command to the device.
61	ERROR_FWMGMT_SEND_DATA_FAIL	Failed to send data to the device.
64	ERROR_FWMGMT_ALLOCATE_TRANSACTION_FAIL	Failed to get transaction resource.
65	ERROR_FWMGMT_WAITING_RESPONSE_TIMEOUT_FAIL	Timeout while receiving response.
66	ERROR_FWMGMT_COMPORT_INIT_FAIL	Failed to initialize COM port.
67	ERROR_FWMGMT_FIRMWARE_UPDATE_TIMEOUT	Timeout while updating the firmware.
68	ERROR_FWMGMT_INCORRECT_RESPONSE_FAIL	Incorrect response received.
69	ERROR_FWMGMT_DEVICE_NOT_SUPPORTED_FAIL	Device not supported. Currently, only QMI devices are supported.
70	ERROR_FWMGMT_EDL_FILE_NOT_EXIST	One of the emergency download files does not exist in the location specified.
71	ERROR_FWMGMT_ALLOCATE_MEMORY_FAIL	Failed to allocate memory.
72	ERROR_FWMGMT_READ_FILE_FAIL	Failed in read file.
73	ERROR_FWMGMT_DMSS_DL_NAK_RECEIVED	Received NAK in DMSS download protocol.
74	ERROR_FWMGMT_INVALID_PARTITION_FILE	Invalid partition file.
75	ERROR_FWMGMT_MODEM_INIT_FAIL	Failed to initialize the modem object.
76	ERROR_FWMGMT_SWITCH_TO_STREAMING_FAIL	Failed in switching the device to streaming download mode.
77	ERROR_FWMGMT_STREAMING_DL_FAIL	Failed in streaming download stage.
78	ERROR_FWMGMT_PREPARE_ED_FAIL	Failed in getting DMSS download parameters.
79	ERROR_FWMGMT_EDL_FAIL	Failed in downloading emergency download files.
80	ERROR_FWMGMT_LAUNCH_FLASH_PROGRAMMER_FAIL	Failed to launch the flash programmer.

Code	Error Type	Description
81	ERROR_FWMGMT_RESET_DEVICE_FAIL	Failed in resetting the device.
82	ERROR_FWMGMT_CHECK_MODE_FAIL	Failed in checking modem mode. Device not in expected state (e.g. not accepting correct commands in boot&hold mode, QMI not working properly after image switching, etc.) Possible causes: <ul style="list-style-type: none"> Device not resetting into boot&hold mode properly. Device adapter not enumerating properly after firmware download.
83	ERROR_FWMGMT_INIT_FAIL	Failed in FwUpdateCore initialization.
84	ERROR_FWMGMT_CHECK_FWUPDATE_STATUS_FAIL	Failed in checking firmware update status—FDT unable to confirm firmware update final status after firmware download. Possible causes: <ul style="list-style-type: none"> Mobile Broadband Network Interface is not available in Device Manager. (It must be available for the fwupdate check to complete successfully.) Device reported failed update status.
85	ERROR_FWMGMT_WAIT_COMMAND_TIMEOUT_FAIL	Timeout while waiting for command.
86	ERROR_FWMGMT_IMAGE_ID_MISMATCH_FAIL	Image ID mismatch in Sahara read data command.
87	ERROR_FWMGMT_INVALID_MODE_FAIL	Expected mode invalid.
88	ERROR_FWMGMT_IMAGE_TRANSFER_END	Image transfer in Sahara has completed.
89	ERROR_FWMGMT_SAHARA_IMAGE_TRANSFER_ERROR	Image transfer in Sahara failed.
90	ERRPR_FWMGMT_SAHARA_UNKNOWN_COMMAND_FAIL	Unknown Sahara command.
91	ERROR_FWMGMT_FIREHOSE_ERASE_FLASH_FAIL	Failed to erase flash in Firehose.
Host OS or system errors		
100	ERROR_SYS_OPEN_FILE_FAIL	CreateFile for CWE file failed.
101	ERROR_SYS_GET_FILE_SIZE	GetFileSize failed.
102	ERROR_SYS_GET_CURRENT_DIR_FAIL	GetCurrentDirectory failed.
103	ERROR_SYS_GET_CLASS_DEV_INFO_FAIL	SetupDiGetClassDevs failed.
104	ERROR_SYS_GET_DEVICE_INSTANCE_FAIL	SetupDiGetDeviceInstance failed.
105	ERROR_SYS_DESTROY_DEVICE_INFO_LIST_FAIL	SetupDiDestroyDeviceInfoList failed.
106	ERROR_SYS_GET_DEVICE_REG_PROPERTY_FAIL	SetupDiGetDeviceRegistryProperty failed.
110	ERROR_SYS_ALLOCATE_CWE_FILE_BUFFER_FAIL	Failed to allocate buffer for CWE file.
111	ERROR_SYS_READ_FILE_FAIL	ReadFile failed.
GobiApi Errors		
200	ERROR_API_QCWWANCONNECT_FAIL	QCWWANConnect API failed.
201	ERROR_API_SWITCH_TO_QDL_MODE_FAIL	Failed to switch to QDL mode.
202	ERROR_API_QCWWANDISCONNECT_FAIL	QCWWANDisconnect API failed.
203	ERROR_API_GET_API_WRAPPER_FAIL	Failed to get GobiApi Wrapper.
204	ERROR_API_API_WRAPPER_INIT_FAIL	Failed to initialize GobiApi Wrapper.
205	ERROR_API_UNSUPPORTED_COMMAND_FAIL	Unsupported QMI command.

Code	Error Type	Description
206	ERROR_API_INVALID_OPERATION	Invalid operation.
207	ERROR_API_CHECK_FWUPDATE_STATUS_FAIL	Error checking firmware update status.
208	ERROR_API_UNSUPPORTED_API_FAIL	API is not supported in GobiApi.
209	ERROR_API_INVALID_SPK_HEADER_STRING	Invalid image preference string in SPK header.

9 Package Deliverables

This application/technical note is delivered as a single .pdf file.

10 Software Compatibility Matrix

Firmware	Legato Application Framework	Library/Libraries

11 Support

For direct clients: contact your Sierra Wireless FAE

For distributor clients: contact your distributor FAE

For distributors: contact your Sierra Wireless FAE

12 Document History

Level	Date	History
1	June 22, 2021	Creation

13 Legal Notice

Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

Safety and Hazards

Do not operate the Sierra Wireless modem in areas where cellular modems are not advised without proper device certifications. These areas include environments where cellular radio can interfere such as explosive atmospheres, medical equipment, or any other equipment which may be susceptible to any form of radio interference. The Sierra Wireless modem can transmit signals that could interfere with this equipment. Do not operate the Sierra Wireless modem in any aircraft, whether the aircraft is on the ground or in flight. In aircraft, the Sierra Wireless modem **MUST BE POWERED OFF**. When operating, the Sierra Wireless modem can transmit signals that could interfere with various onboard systems.

Note: Note: Some airlines may permit the use of cellular phones while the aircraft is on the ground and the door is open. Sierra Wireless modems may be used at this time.

The driver or operator of any vehicle should not operate the Sierra Wireless modem while in control of a vehicle. Doing so will detract from the driver or operator's control and operation of that vehicle. In some states and provinces, operating such communications devices while in control of a vehicle is an offence.

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