Flashing Modem Firmware on the Sierra 5G Modems with Linux Tools

Most likely you won't need to install modem drivers, as Linux distros tend to come with them installed along with modemmanager. If you do need to install them, request them from Sierra or from your Vendor. The Wireless Haven keeps a repository here:

https://thewirelesshaven.com/sierra-modem-linux-tools

USB drivers are best compiled on your local machine. The instructions are in the driver download file.

Download the MBPL_SDK_Rxx_ENGx-lite.bin.tar.gz file. (the x's is are a place keeper for whatever version is available, ie: ...R28_ENG5-...)

The tool we will be using is called 'lite-fw-download'

Extract it all to a local folder. Don't rename anything until after you are familiar with what you are doing.

For the firmware update tool setup you will need to follow the instructions in the readme file called "lite-fw-download-readme.txt" This file will also explain the tool a little. You will also want to pickup hints in the file called "fw_upgrade_notes.txt" Some of the items in these files do not pertain to 5G modems, but it is good to get familiar with these notes for better understanding of what you're doing. The folder that contains these readme files should be: /MBL_SDK_Rxx_ENGx-lite.bin/SampleApps/lite-fw-download/

Also download and read through the file:
Software_Integration_and_Development_Guide_for_Linux_USB_Platforms_Rxx.pdf

There is an important note on disabling modemmanager in there. Please don't miss that or the Gobi Drivers notes.

https://TheWirelessHaven.com

-Richard
Last Edit – 09/20/2022

Blacklisting and disabling both the Gobi drivers and modemmanager are key. Make sure you follow all the instructions as best you can understand. The scope of this document isn't how exactly to deal with Linux apps and drivers. You have to figure that out for your particular system. Ignore the PCI driver stuff unless you need it.

OK, so now you have the software and drivers setup.....

For my examples I am using the Sierra EM9191 modem.

Download the appropriate firmware files for your modem (https://source.sierrawireless.com/ or from your modem supplier).

You will want .nvu files and .cwe files, they must match and are always available together. IE: SWIX55C_03.09.11.00-001_GENERIC_030.044_000.nvu is the Generic Carrier profile file (PRI) that matches with firmware file version: SWIX55C_03.09.11.00-001.cwe. Notice the matching 03.09.11.00-001 in each file name. this means that the carrier profile file SWIX55C_03.09.11.00-001_GENERIC_030.044_000.nvu will only work with modem firmware file SWIX55C_03.09.11.00-001.cwe

Modem firmware file (FW): .cwe

Carrier Profile file (PRI): .nvu

When you swap carrier profiles with the command AT!IMPREF="GENERIC", the modem will look for the carrier profile "GENERIC" and then load/swap to the appropriate firmware image that that carrier profile is made to work with. If it does not exist, it will not work and likely just refuse the command with an error message.

I load all matching carrier PRI files into one folder named to match the firmware file version. Example:

I have a folder named: /03.09.06.00-001/
https://TheWirelessHaven.com

-Richard
Last Edit – 09/20/2022

Inside this folder I have:

SWIX55C_03.09.06.00-001.cwe

SWIX55C_03.09.06.00-001_GENERIC_030.038_000.nvu

SWIX55C_03.09.06.00-001_ATT_030.038_000.nvu

SWIX55C_03.09.06.00-001_TMO_030.035_000.nvu

SWIX55C_03.09.06.00-001_ROGERS_030.001_000.nvu

SWIX55C_03.09.06.00-001_BELL_030.000_000.nvu

This is one firmware file (fw file - .cwe) and 5 carrier profile files (PRI files - .nvu)

Now that we have that in place, we can get ready to flash them to the modem.

Plug your Sierra modem into your linux machine, via USB.

Open a command line and run the command: lsusb

This should list all USB devices currently loaded on your machine. You should see the Sierra modem, eventually, if you have the proper drivers for it.

Next run: ls /dev/ttyUSB*

This should load up a few entries IF the modems comm ports properly load. If you do not see a single /dev/ttyUSBx entry than your modem either isn't loading comm ports or hasn't yet. If you do not get a comm port, you need to stop and troubleshoot this first.

Next run: ls /dev/cdc-wdm*

https://TheWirelessHaven.com

-Richard
Last Edit – 09/20/2022

This should show you if the modem has loaded up as a modem device in your system. You will need the exact number for your modem below (usually it's cdc-wdm0)

Now it's time to load the firmware.

In the command line, navigate to your /MBL_SDK_Rxx_ENGx-lite.bin/SampleApps/lite-fw-download/bin/ folder and I would run the following command to install the above mentioned files that I have in my known firmware folder.

sudo ./fwdwl-litehostx86_64 -p /dev/cdc-wdm0 -t 1 -f /~folderpathtomyfirmwarefolder~/EM9191/03.09.06.00-001/ -w SWIX55C_03.09.06.00-001.cwe -n SWIX55C_03.09.06.00-001_GENERIC_030.038_000.nvu

** Make sure to choose the tool that matches your computer hardware/processor. Mine is an x86 based 64 bit system. (fwdwl-litehostx86_64)

** Make sure you use the /dev/cdc-wdmX that matches your system from the ls /dev/cdc-wdm* query command. (mine was cdc-wdm0)

** ~folderpathtomyfirmwarefolder~ should be obvious, but in case it isn't that is unique to your location of your firmware folder. Mine ended in ~/EM9191/03.09.06.00-001/ for this example.

This should run and look something like this:

10:22 AM (0 minutes ago)

to me

Application version: 1.0.2204.2

INFO: QDL Port :

INFO: Device Path: /dev/cdc-wdm0

https://TheWirelessHaven.com

-Richard
Last Edit – 09/20/2022

INFO: FW Path : /~folderpathtomyfirmwarefolder~/03.09.06.00-001/

Target image Info:

Carrier   :GENERIC

FW Version :03.09.06.00

Model ID   :SWIX55C

Package ID :000

PRI Version:030.038

SKU   :9999999

Switching device into download mode ...

Modem Needs FW

Modem Needs PRI

Waiting for modem to disconnect from the host ...

Modem disconnected from host.

Waiting for modem to come up in BOOT and HOLD mode ...

QDL port found: /dev/ttyUSB0

BOOT and HOLD Mode. Downloading firmware ...

Downloading: /~folderpathtomyfirmwarefolder~/03.09.06.00-001//SWIX55C_03.09.06.00-001_ROGERS_030.001_000.nvu

Downloading: /~folderpathtomyfirmwarefolder~/03.09.06.00-001//SWIX55C_03.09.06.00-001_GENERIC_030.038_000.nvu

Downloading: /~folderpathtomyfirmwarefolder~/03.09.06.00-001//SWIX55C_03.09.06.00-001_ATT_030.038_000.nvu

Downloading: /~folderpathtomyfirmwarefolder~/03.09.06.00-001//SWIX55C_03.09.06.00-001_TMO_030.035_000.nvu

Downloading: /~folderpathtomyfirmwarefolder~/03.09.06.00-001//SWIX55C_03.09.06.00-001.cwe

Downloading: /~folderpathtomyfirmwarefolder~/03.09.06.00-011//SWIX55C_03.09.06.00-001_BELL_030.000_000.nvu

FW download succeeded.

Waiting for modem to come up in ONLINE mode ...

https://TheWirelessHaven.com

-Richard
Last Edit – 09/20/2022

Modem is now in ONLINE mode ...

FW update status: Successful

FW info from modem:

Model ID   : EM9191

FW Version   : SWIX55C_03.09.06.00

Carrier Name   : GENERIC

Carrier PRI Revision: 030.038_000

Firmware Download Process completed

Exiting Application!!!

And you've done it!

If you have any firehose error messages, there could be many reasons for failure. The biggest one I have found is if your modem does not have at least firmware version 01.07.19.00 on it, you will need to update the modem to that version first, and then you can load newer firmware versions. I tend to use the Windows FTD2 tool to do this first, and then run the Linux tools for the rest.

Also, make certain that modemManager is not running at all. You don't have to remove it from your system, but ensure its processes are not running.

You will obviously want to install multiple base firmware files to support all the carrier profiles that you can. With this method, simply separate your firmware files into separated firmware version folders and run the tool for each. This method will not overwrite the firmware image slot previously installed, it will pick the next available slot (up to 3 on the Sierra 5G modems and usually 4 on the LTE modems) or it will overwrite the oldest installation.

Checkout our forum for talk about this and all topics related to wireless connectivity: https://wirelessjoint.com

If you need equipment, that's what we do: https://thewirelesshaven.com

Check us out on Youtube: https://thewirelesshaven.com/youtube

Facebook: https://www.facebook.com/TheWirelessHaven/

Facebook Group: https://www.facebook.com/groups/LTE.Hacks

https://TheWirelessHaven.com

-Richard
Last Edit – 09/20/2022