Getting started with X-LINUX-GNSS1 package for developing GNSS Applications on Linux OS

Introduction

The X-LINUX-GNSS1 is a software package for STM32MP157F-DK2 Board. The software runs on STM32MP1 MPU and includes user space application, device tree for the Teseo-LIV3F global navigation satellite system (GNSS) device, library for the NMEA (National Marine Electronics Association,) protocol support and POSIX Thread for task scheduling to ensure better asynchronous message parsing.

The software comes with sample implementations of user space applications running on the STM32MP1 board with X-NUCLEO-GNSS1A1 connected to the Arduino Connector on UART and I2C. NMEA library is used to parse the GPS NMEA data that provide several GPS parameters like – latitude, longitude, elevation, speed etc. It contains platform specific Device Tree Modification for STM32MP1 as well.

The source code is designed for portability across a wide range of processing units running Linux .

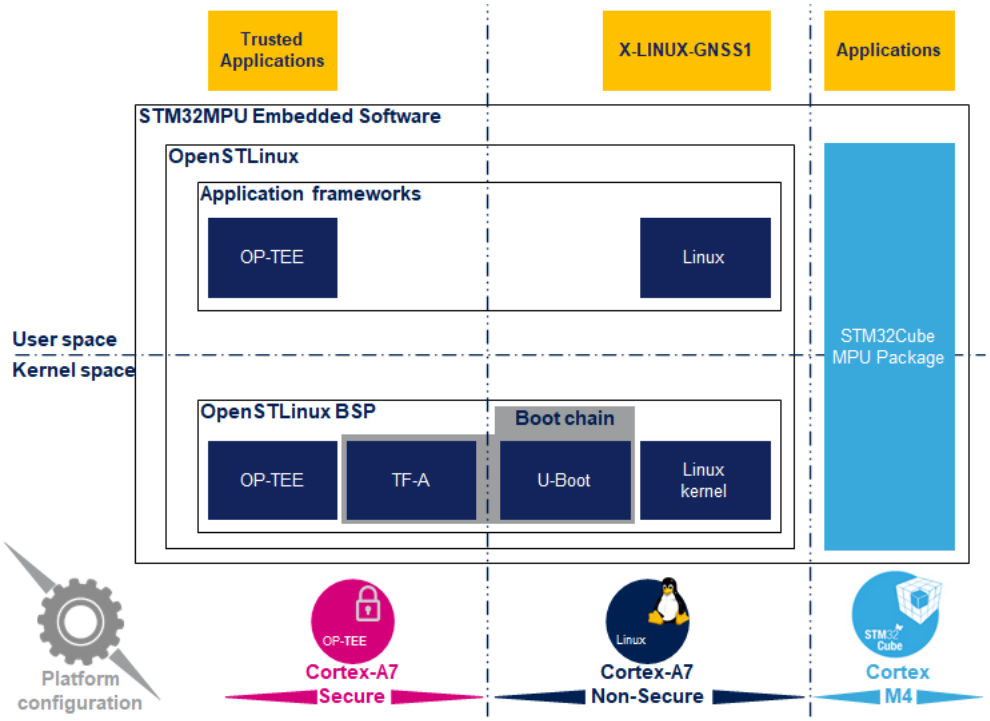


Figure 1 X-LINUX Software Architecture Diagram

1. X-LINUX-GNSS1 overview

The X-LINUX-GNSS1 software provides user space application running on STM32MP157F-DK2 for X-NUCLEO-GNSS1A1 expansion board based on the Teseo-LIV3F tiny Global Navigation Satellite System (GNSS) module. The software package has 3 modules :

1 . gnss_app (x-linux-gnss)

2. C utility(gnss_uart and gnss_i2c)

3. A python utility (gnss_pynmea2.py)

Each software module can be run independently to fetch the GNSS NMEA data from the X-NUCLEO-GNSS1A1 over UART and I2C.

The device tree for STM32MP157F-DK2 board has been modified to configure the UART7 and I2C5 on the Arduino Connector. For UART, underlying dev/ttySTM2 is enabled while for I2C, /dev/i2c-1 is enabled. The X-LINUX-GNSS1 software interacts with the lower layer peripheral drivers (I2C and UART) using user space application. It uses termios for UART and file descriptor reading for I2C peripheral.

It uses POSIX Thread to run two parallel tasks – Consumer Task and Console Task. Consumer Task fetches the NMEA data, parse it and populates the NMEA data structure. Console Task reads the input from the user and provides the information from the populated NMEA Data structure like position, speed, elevation, wakeup status, etc. based on the provided inputs.

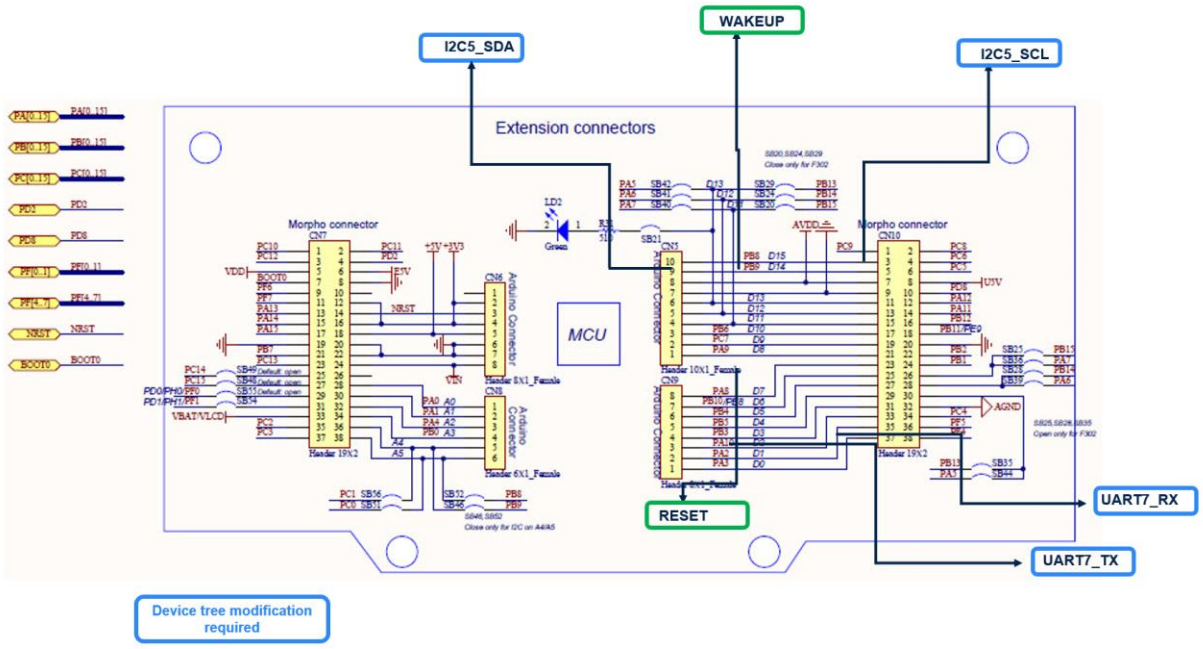


Figure 2 Hardware Connections

1.1 Features

Below are the main features of the X-LINUX-GNSS1

- Standalone applications to read the NMEA data over UART and I2C. (gnss_uart and gnss_i2c)
- Complete software to build applications using Teseo-LIV3F GNSS device on Linux.
- Middleware for the NMEA protocol
- POSIX Thread task scheduling to ensure better asynchronous message parsing.
- Easy portability across different Linux Platforms

- Sample application example to retrieve and parse GNSS data and send to ST Asset Tracking Dashboard for live tracking.
- Python Example(gnss_pynmea2.py)
- Free, user-friendly license terms

1.2 Architecture

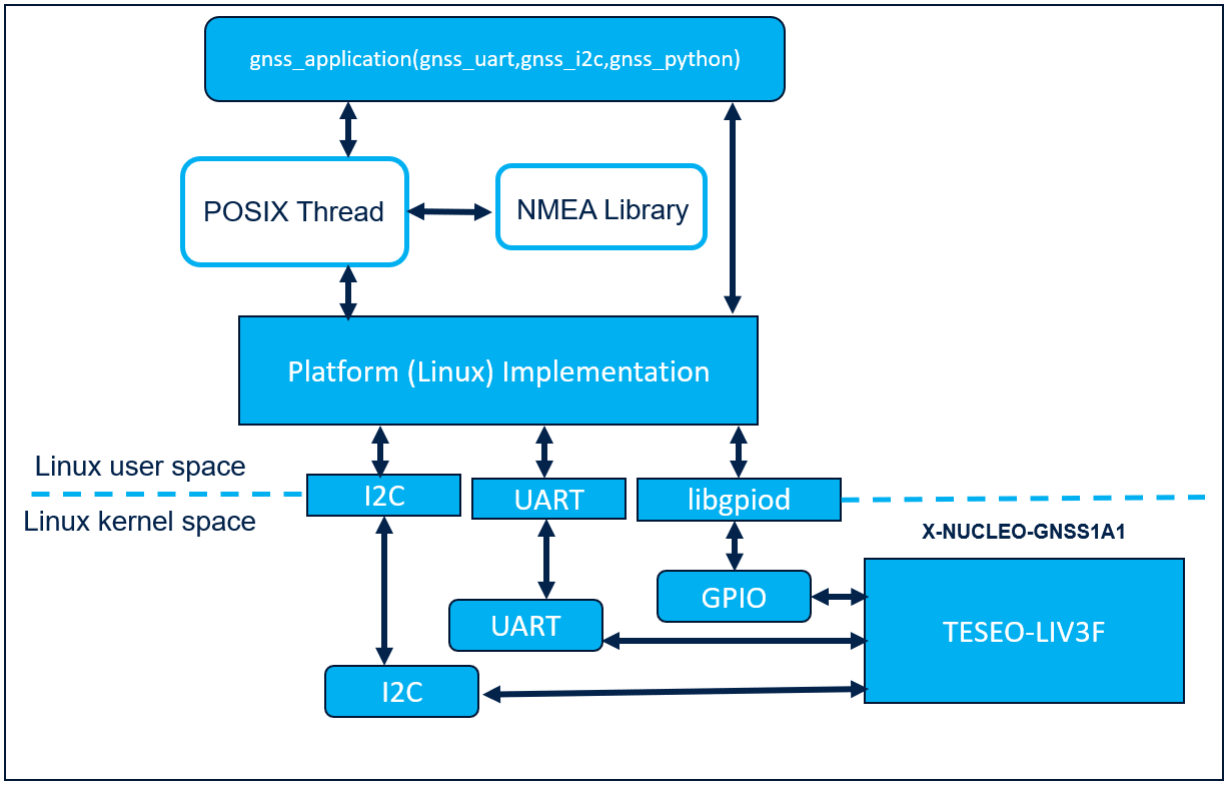


Figure 3 Application Architecture

1.3 Software Package Structure

Below is the folder structure of the release package. The release package has Linux user application C examples, python example, device tree and Yocto layer recipe. User can run any of the application independently inside the Application folder to retrieve the GNSS NMEA data.

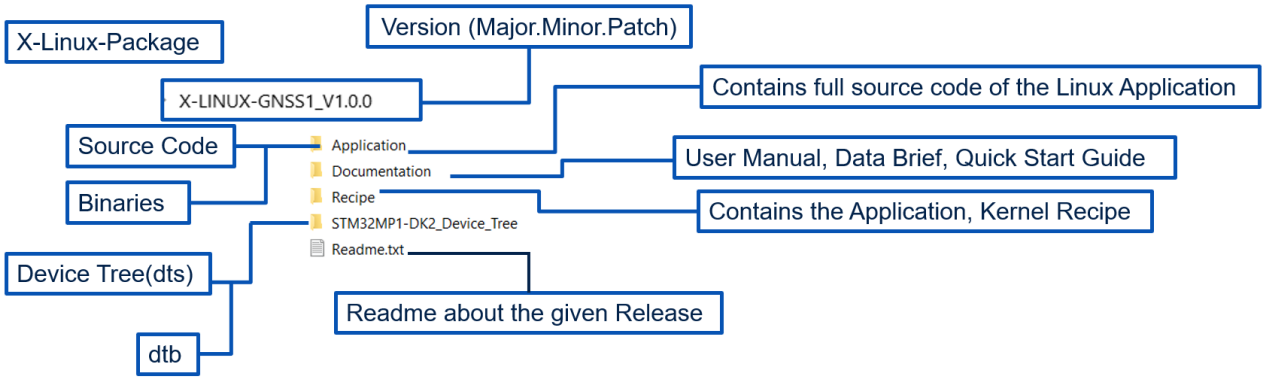


Figure 4 Release Package Structure Top Level

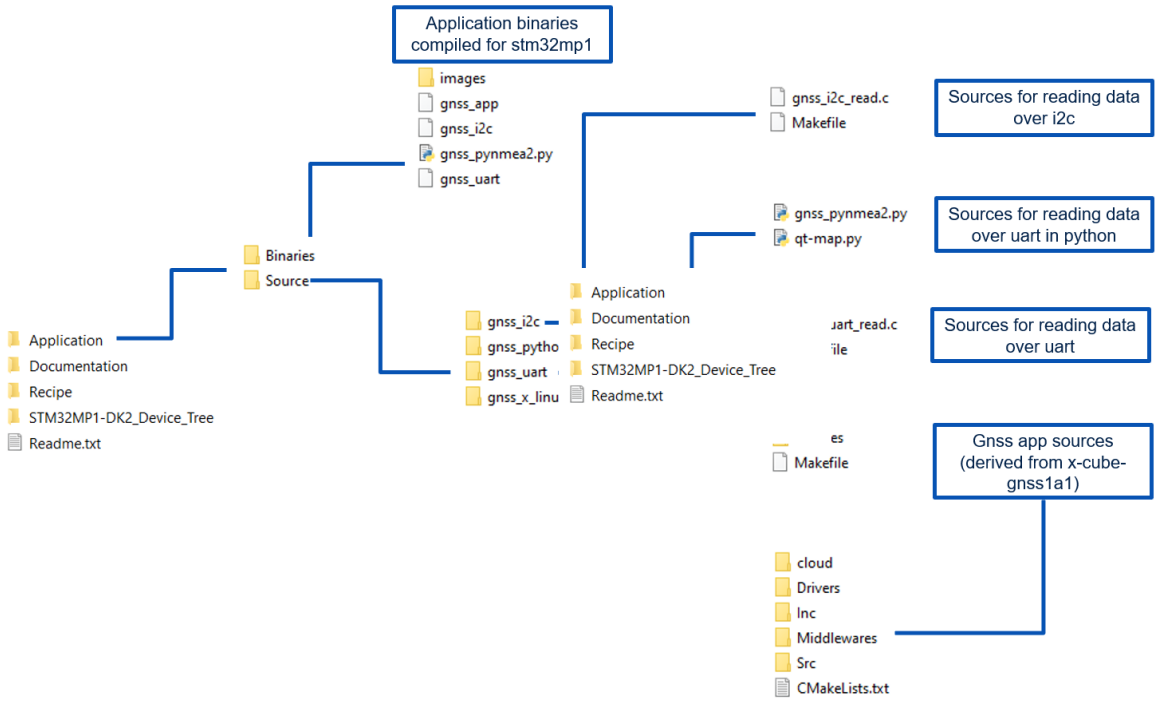


Figure 5 Application Folder Overview

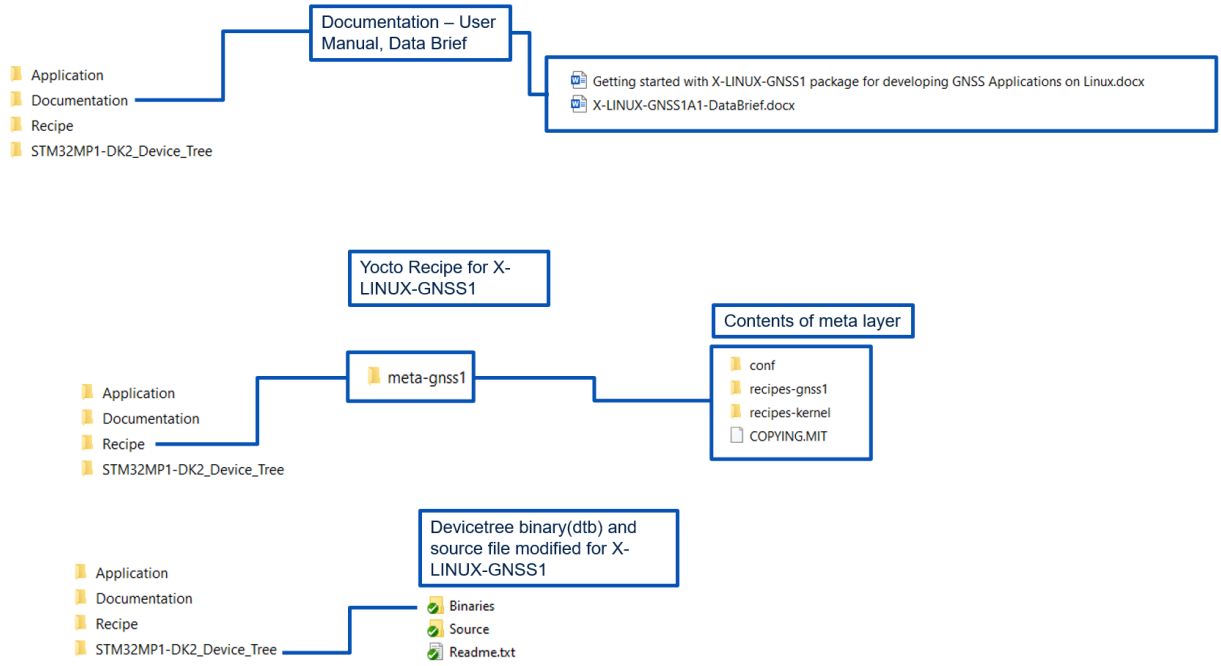


Figure 6 GNSS Other Folder Structures

1.3.1 GNSS_APP

This Application accesses the GPS data over UART (/dev/ttySTM2) and I2C(/dev/i2c-1) interface. The settings for enabling the UART and I2C is provided separately in the device tree file folder. It has also provision to upload the data to the cloud (ST Asset Tracking Dashboard)

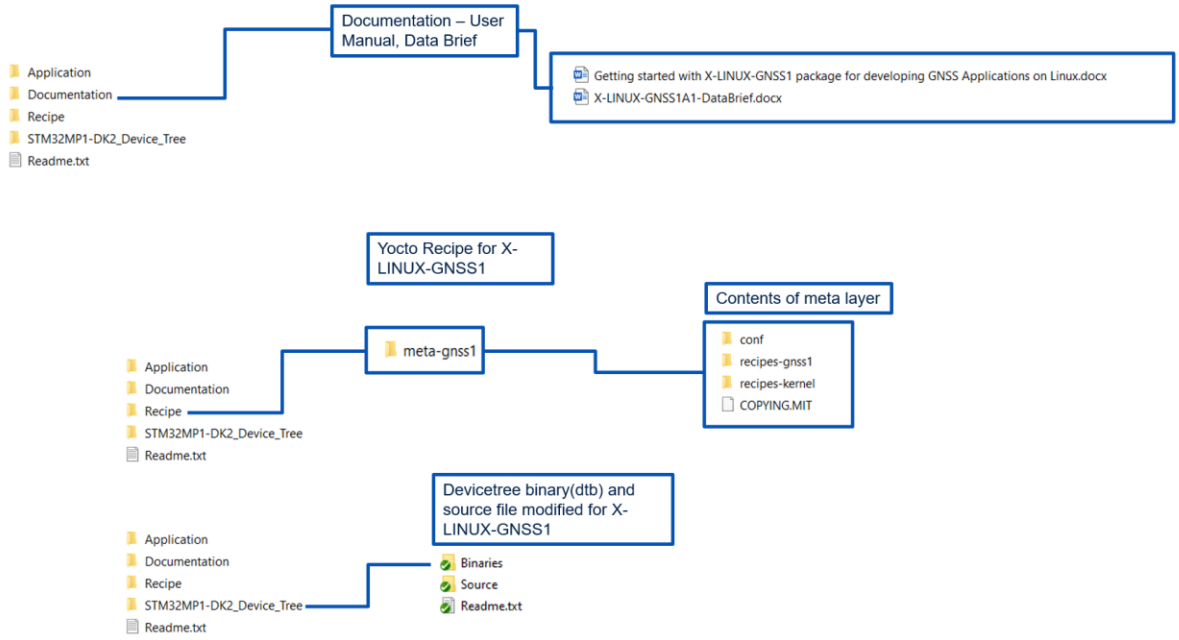


Figure 7 gnss_app

1.3.2 C Utility

This Application is Linux user space C application to read the data from the UART (/dev/ttySTM2) and I2C (/dev/i2c-1) interface.

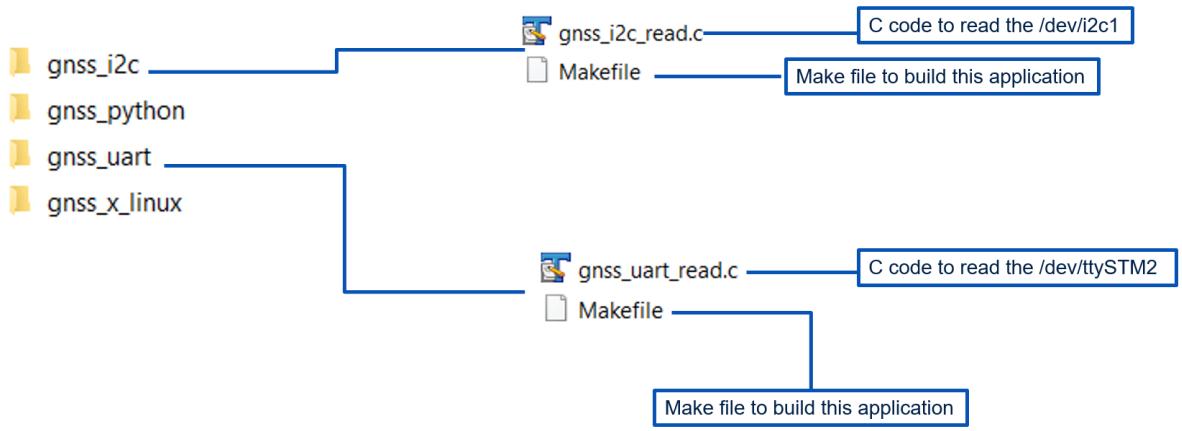


Figure 8 C utility – gnss-uart and gnss-i2c

1.3.3 Python Code

This Application is a basic python code to read the data from UART. It uses pyserial and pynmea2 library. You need to have these two dependencies installed before using this application.

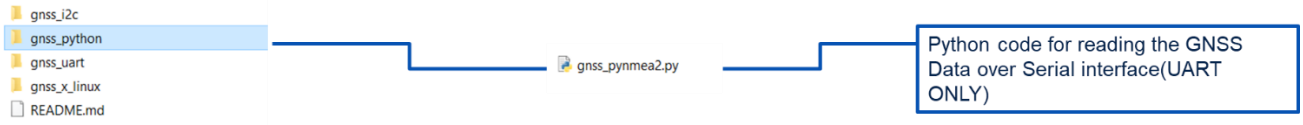


Figure 9 Python Code

2.Hardware Setup

The Software is compatible with X-NUCLEO-GNSS1A1 board which can be directly plugged on the Arduino connector. Keep the jumper settings as shown below in the figure 10 and plug it on Arduino connectors of the STM32MP157F-DK2 board.

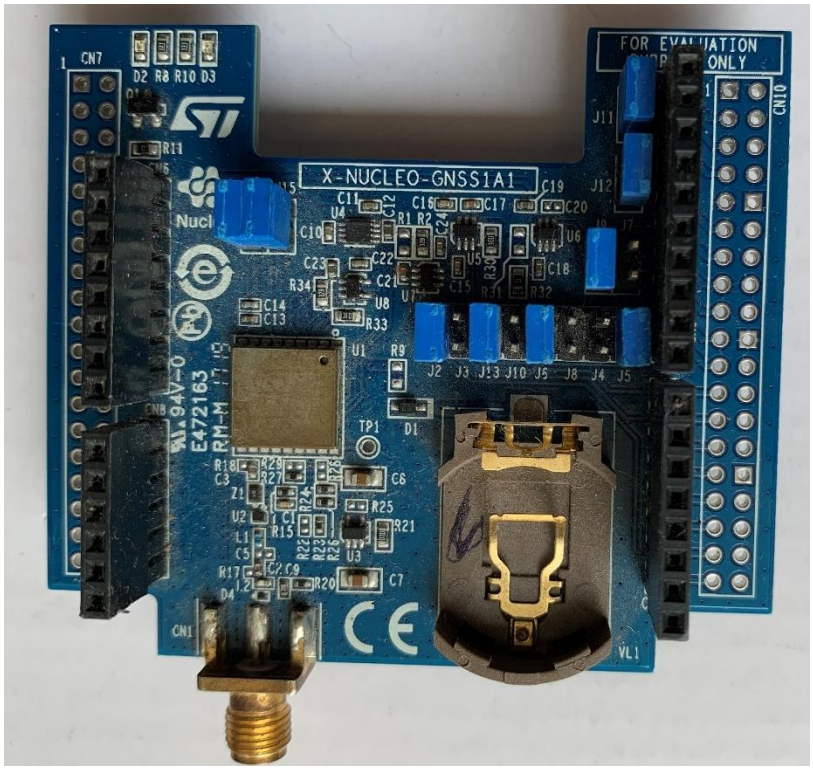


Figure 10 Hardware Setup – Jumper Settings

Signal	Arduino	Nucleo 64	Jumper	Configuration
I2C-SCL	D15	PB8	J11	Closed
I2C-SDA	D14	PB9	J12	Closed
Wakeup	D13	PA5	J9	Closed
Wakeup	D4	PB5	J7	Open
Reset	D9	PC7	J10	Open
Reset	D7	PA8	J13	Closed
PPS	D6	PB10	J6	Closed
PPS	D2	PA10	J8	Open
UART-RX	D8	PA9	J3	Open
UART-TX	D2	PA10	J4	Open
UART-RX	D1	PA2	J2	Closed
UART-TX	D0	PA3	J5	Open

Table 1 Jumper Settings

Connect the GPS/GLONASS/Beidou antenna provided with X-NUCLEO-GNSS1A1. Keep the antenna outdoor for better reception. The board will receive power from the STM32MP157F-DK2 board from USB type C cable.

3. Software Setup

The section describes the software setup, which is required for building, flashing, transferring, and running the GNSS application.

3.1 Recommended PC prerequisites

A Linux® PC running under Ubuntu® 18.04 or 20.04 is to be used. The developer can follow the below link.

https://wiki.st.com/stm32mpu/wiki/PC_prerequisites

3.2 Installing the SDK

This is required to build the application package. The package contains the binaries which you can transfer using scp command. In case customization is needed in the Application, installing SDK will help in building it. The developer can follow the below link.

https://wiki.st.com/stm32mpu/wiki/Getting_started/STM32MP1_boards/STM32MP157x-DK2/Develop_on_Arm%C2%AE_Cortex%C2%AE-A7/Install_the_SDK

3.3 Downloading the kernel Sources (Developer Package)

This is required to build the device tree. The package already contains the binaries(dtb) which can be transferred using scp command. The developer can follow the below link.

https://wiki.st.com/stm32mpu/wiki/Getting_started/STM32MP1_boards/STM32MP157x-DK2/Develop_on_Arm%C2%AE_Cortex%C2%AE-A7/Modify,_rebuild_and_reload_the_Linux%C2%AE_kernel

#KERNEL SOURCE PATH = ~/STM32MPU_workspace/STM32MP15-Ecosystem-v3.0.0/Developer-Package/stm32mp1-openstlinux-5.10-dunfell-mp1-21-03-31/sources/arm-ostl-linux-gnueabi/linux-stm32mp-5.10.10-r0/linux-5.10.10$

3.4 Downloading the Distribution Package

This is required to build the recipes and creating STM32MP1 images which has GNSS application and device tree settings embedded.

The developer can follow the below link to download the distribution package.

https://wiki.st.com/stm32mpu/wiki/STM32MP1_Distribution_Package

3.5 Connecting to the Board.

This is required to transfer the built binaries (application, device trees) to the STM32MP157F-DK2 board from the development PC. The developer can transfer the binaries either by Hotspot method (https://wiki.st.com/stm32mpu/wiki/How_to_configure_a_wlan_interface_on_hotspot_mode) or using the Wi-Fi connectivity (https://wiki.st.com/stm32mpu/wiki/How_to_setup_wifi_connection)

4.Building and Running the example

This section explains the method to build and run the software package. The code can be built using simple Makefile utility for Starter Package or using bitbake for Distribution package. For python, no building/compiling is required but it is dependent on pyserial and pynmea2 package which needs to be installed.

Below conventions are used below:

#Descriptive comments	Comment describing steps
$command	Development or Host PC/machine command prompt. Text after $ is command
$command	STM32MP1 command prompt. Text after $ is command
STM32MP1	STM32MP157F-DK2 Board

4.1 Using Makefile (For Starter Package)

Download the X-LINUX-GNSS1 package as a first step. Create a directory by name “gnss”

$mkdir gnss

$cd gnss

Download or clone the package (X-LINUX-GNSS_V1.0.0.tar.xz) from www.st.com and extract it

$tar xvf X-LINUX-GNSS_V1.0.0.tar.xz

You will get X-LINUX-GNSS1_V1.0.0 folder.

```
saurabhr7@vmi613801:~/gnss$ ls
x-linux-gnssa1
saurabhr7@vmi613801:~/gnss$ cd x-linux-gnssa1/
saurabhr7@vmi613801:~/gnss/x-linux-gnssa1$ ls
README.md  X-LINUX-GNSS1_V1.0.0
saurabhr7@vmi613801:~/gnss/x-linux-gnssa1$ ls -l
total 8
-rw-rw-r-- 1 saurabhr7 saurabhr7 1115 Jun 26 22:57 README.md
drwxrwxr-x 6 saurabhr7 saurabhr7 4096 Jun 26 22:57 X-LINUX-GNSS1_V1.0.0
saurabhr7@vmi613801:~/gnss/x-linux-gnssa1$
```

Figure 11 Cloning the Package

4.1.1 gnss_app

For running the gnss_app, the below steps are to be followed.

1. Modify the device tree or copy it from the folder provided (see below where?)
2. Build the device tree and transfer it to STM32MP157F-DK2
3. Build the gnss_app
4. Transfer the gnss_app executable over Wi-Fi or hotspot to STM32MP157F-DK2 board

Modify the device tree or copy it from the folder provided (see below)

#Copy the dts file in the directory: X-LINUX-GNSS1_V1.0.0/ STM32MP1-DK2_Device_Tree/Source to the kernel source directory at <KERNEL SOURCE PATH>/ arch/arm/boot/dts/

Download the Kernel Sources as described in section 3.1.2.

$cd path-to/X-LINUX-GNSS1_V1.0.0/Application/Source/gnss_x_linux/Sources

$cp stm32mp157f-dk2.dts <KERNEL SOURCE PATH>/ arch/arm/boot/dts

#Source the path of the SDK . You have already downloaded and Installed the SDK in steps above. – 3.1 .Source <SDK PATH>/SDK/environment-setup-cortexa7t2hf-neon-vfpv4-ostl-linux-gnueabi

$ source <SDK PATH>/SDK/environment-setup-cortexa7t2hf-neon-vfpv4-ostl-linux-gnueabi

#Build the device tree

$cd <KERNEL SOURCE PATH>

$make ARCH=arm CROSS_COMPILE=arm-linux-gnueabihf- menuconfig

$make arch=ARM menuconfig

$make ARCH=arm uImage vmlinux dtbs LOADADDR=0xC2000040 (Optional)

$make ARCH=arm modules (Optional)

#Once the dtbs are built, copy them to the STM32MP1-DK2 board. Make sure to connect to it using hotspot mode or over WIFI.

$scp <KERNEL SOURCE PATH>/arch/arm/boot/dts/stm32mp157f_dk2.dtb root@192.168.72.1:/boot

#Build the gnss_app

$cd gnss

#build the gnss_app. cd to the gnss_x_linux location and do make

$cd path to/X-LINUX-GNSS1_V1.0.0/Application/Source/gnss_x_linux

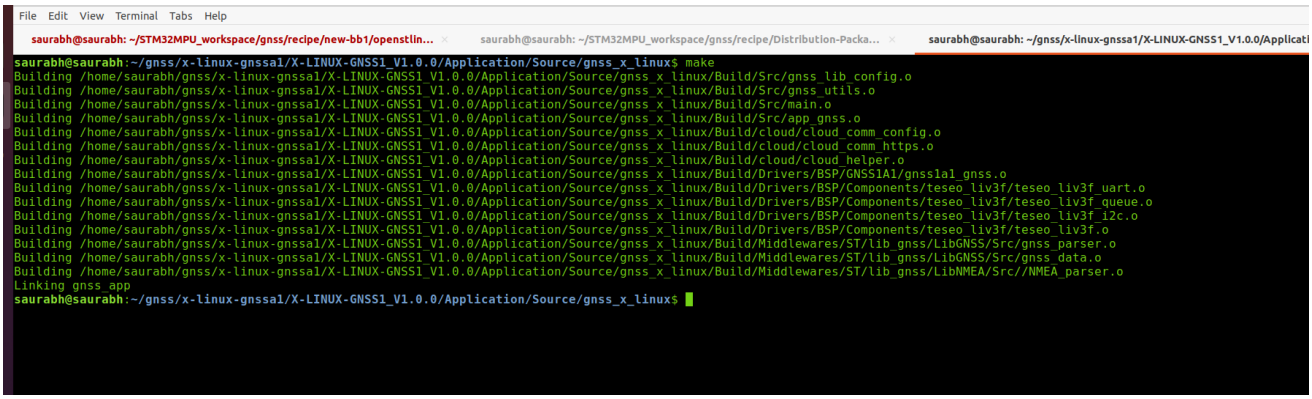
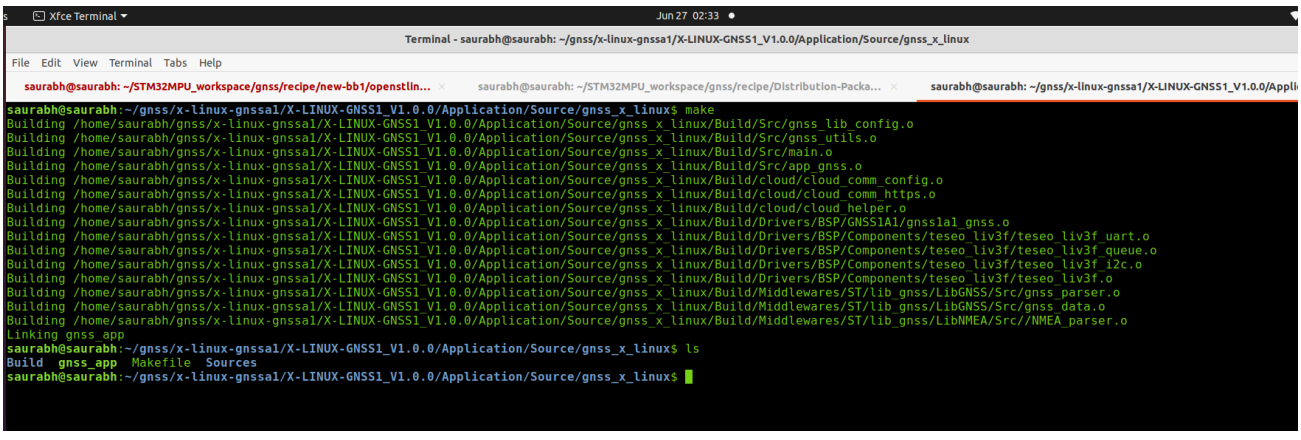


Figure 12 STM32MPU - Build Application

The executable (gnss_app) will be formed in the same location where Makefile is present.



#Transfer the application to STM32MP1

scp gnss_app root@192.168.72.1:/

#On STM32MP1 board sync and reboot

$sync

$reboot
#Running the Application

$cd /
$./gnss_app

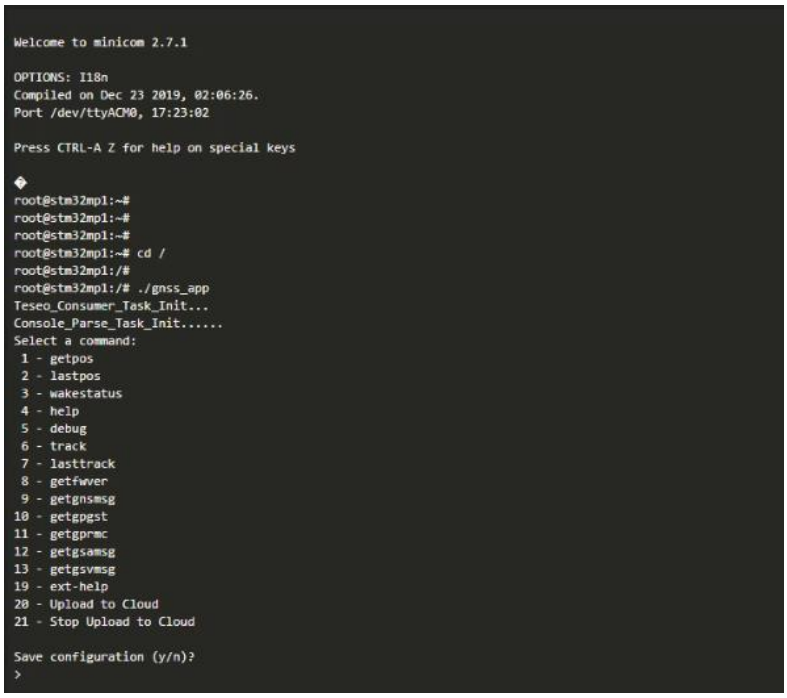


Figure 13 STM32MPU - Run Application

```
Save configuration (y/n)?
> 11
getgprmc =11

UTC:                          [ 08:19:17 ]
Status:                       [ V ]          -- Warning (reported in NO FIX conditions)
Latitude:                     [ 28' 32'' N ]
Longitude:                    [ 77' 21'' E ]
Speed over ground (knots):    [ 0.0 ]
Trackgood:                    [ 0.0 ]
Date (ddmmyy):                [ 110621 ]
Magnetic Variation:           [ 0.0 ]
Magnetic Var. Direction:      [ - ]


>Select a command:
 1 - getpos
 2 - lastpos
 3 - wakestatus
 4 - help
 5 - debug
 6 - track
 7 - lasttrack
 8 - getfwver
 9 - getgnsmsg
10 - getgpgst
11 - getgprmc
12 - getgsamsg
13 - getgsvmsg
19 - ext-help
20 - Upload to Cloud
21 - Stop Upload to Cloud
```

Figure 14 gnss_app Selecting the options - Select 11 to get the GPS Co-ordinates

4.1.2 C Utility

The steps are same as building gnss_app

Enter the <Path to > /X-LINUX-GNSS1_V1.0.0\Application\Source\gnss_uart and do make.

gnss_uart will be created in the same directory where Makefile is present. Transfer it to STM32MP1-DK2 using scp .

```
$cd /
$./gnss_app
```

```
Read 61:$GPGSV,3,2,09,24,33,250,,28,32,128,,17,19,070,,14,12,133,*7E

Read 1:

Read 40:$GPGSV,3,3,09,05,11,187,,,,,,,,,,,,*4B

Read 1:

Read 63:$GLGSV,2,1,08,76,72,261,30,86,45,001,,77,29,326,,71,13,106,*6D

Read 1:

Read 64:$GLGSV,2,2,08,85,12,042,,70,10,058,,75,00,000,45,87,00,000,25*65
Read 1:

Read 1:

Read 52:$GPGLL,2832.48525,N,07720.68458,E,074459.000,V,N*4A

Read 1:

Read 24:$PSTMCPU,36.35,-1,49*4C

Read 1:

Read 69:$GPRMC,074500.000,V,2832.48525,N,07720.68458,E,0.0,0.0,250521,,,N*71

Read 1:

Read 75:$GPGGA,074500.000,2832.48525,N,07720.68458,E,0,02,99.0,260.83,M,0.0,M,,*66
```

Figure 15 running gnss_uart

$./ gnss_i2c

```
$GPRMC,074246.000,V,2832.48525,N,07720.68458,E,0.0,0.0,250521,,,N*74
$GPGGA,074246.000,2832.48525,N,07720.68458,E,0,01,99.0,260.83,M,0.0,M,,*60
$GPVTG,0.0,T,,M,0.0,N,0.0,K,N*02
$GNGSA,A,1,,,,,,,,,,,,,99.0,99.0,99.0*1E
$GNGSA,A,1,76,,,,,,,,,,,,99.0,99.0,99.0*1F
$GPGSV,3,1,09,02,74,280,,06,60,026,,12,39,323,,19,36,051,*7F
$GPGSV,3,2,09,24,33,252,,28,32,127,,17,20,069,,14,13,133,*70
$GPGSV,3,3,09,05,10,187,,,,,,,,,,,,*4A
$GLGSV,2,1,08,76,73,264,31,86,46,000,,77,28,327,,71,12,107,*6A
$GLGSV,2,2,08,85,12,041,,70,10,059,,75,00,000,44,87,00,000,33*61
$GPGLL,2832.48525,N,07720.68458,E,074246.000,V,N*42
$PSTMCPU,30.80,-1,49*44
$GPRMC,074247.000,V,2832.48525,N,07720.68458,E,0.0,0.0,250521,,,N*75
$GPGGA,074247.000,2832.48525,N,07720.68458,E,0,01,99.0,260.83,M,0.0,M,,*61
$GPVTG,0.0,T,,M,0.0,N,0.0,K,N*02
$GNGSA,A,1,,,,,,,,,,,,,99.0,99.0,99.0*1E
$GNGSA,A,1,76,,,,,,,,,,,,99.0,99.0,99.0*1F
$GPGSV,3,1,09,02,74,280,,06,60,026,,12,39,323,,19,36,051,*7F
$GPGSV,3,2,09,24,33,252,,28,32,127,,17,20,069,,14,13,133,*70
$GPGSV,3,3,09,05,10,187,,,,,,,,,,,,*4A
$GLGSV,2,1,08,76,73,264,31,86,46,000,,77,28,327,,71,12,107,*6A
$GLGSV,2,2,08,85,12,041,,70,10,059,,75,00,000,44,87,00,000,32*60
$GPGLL,2832.48525,N,07720.68458,E,074247.000,V,N*43
$PSTMCPU,31.81,-1,49*44
$GPRMC,074248.000,V,2832.48525,N,07720.68458,E,0.0,0.0,250521,,,N*7A
$GPGGA,074248.000,2832.48525,N,07720.68458,E,0,01,99.0,260.83,M,0.0,M,,*6E
$GPVTG,0.0,T,,M,0.0,N,0.0,K,N*02
$GNGSA,A,1,,,,,,,,,,,,,99.0,99.0,99.0*1E
$GNGSA,A,1,76,,,,,,,,,,,,99.0,99.0,99.0*1F
$GPGSV,3,1,09,02,74,280,,06,60,026,,12,39,323,,19,36,051,*7F
$GPGSV,3,2,09,24,33,252,,28,32,127,,17,20,069,,14,13,133,*70
$GPGSV,3,3,09,05,10,187,,,,,,,,,,,,*4A
$GLGSV,2,1,08,76,73,264,31,86,46,000,,77,28,327,,71,12,107,*6A
```

Figure 16 running gnss_i2c

4.1.3 Python Code

Installing the dependencies on STM32MPU

You need to install the pyserial and pynmea2 for this.

#Installing pyserial

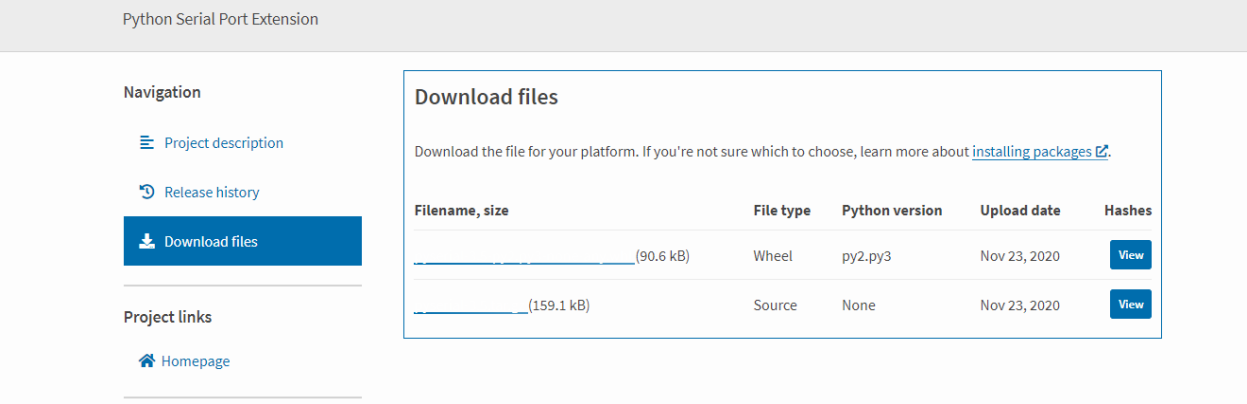


Figure 17 Installing Python Dependencies - Pyserial

$wget https://files.pythonhosted.org/packages/1e/7d/ae3f0a63f41e4d2f6cb66a5b57197850f919f59e558159a4dd3a818f5082/pyserial-3.5.tar.gz

$tar xvf pyserial-3.5.tar.gz

$cd pyserial-3.5

$python setup.py install or python3 setup.py install

#installing pynmea2

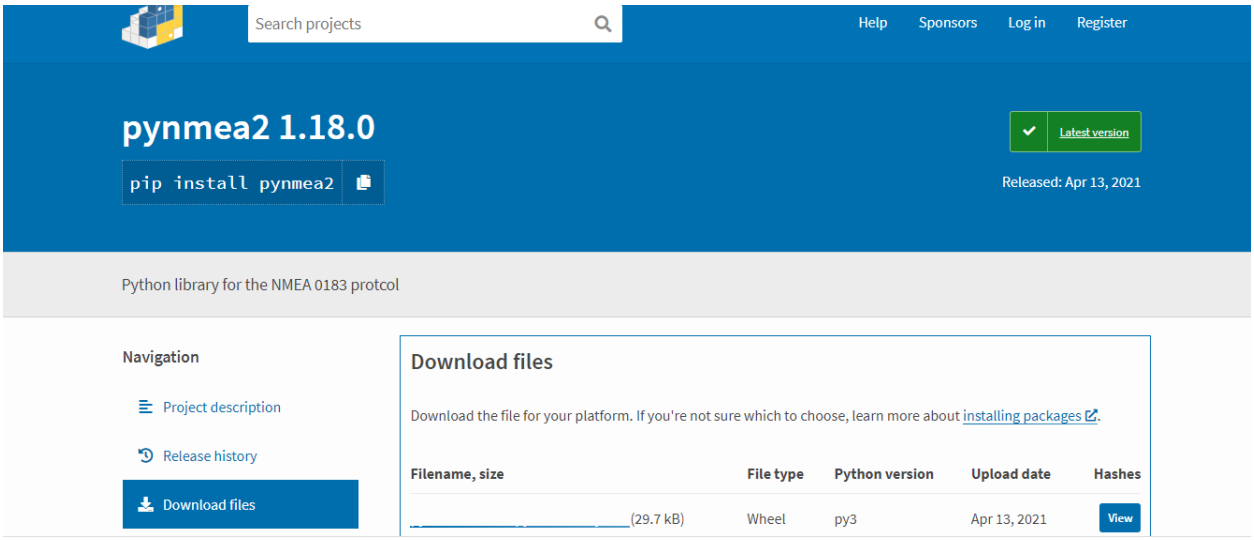


Figure 18 Installing Python Dependencies – Pynmea2

$wget https://files.pythonhosted.org/packages/88/b9/a0fed4563f5c73eb8f4d7bb115a455863c5327ae824ac1772e2a4b1b95ee/pynmea2-1.18.0.tar.gz

$tar xvf pynmea2-1.18.0.tar.gz

$cd pynmea2-1.18.0

$python setup.py install or python3 setup.py install

#Enter the python folder, copy the readmap.py file to stm32mp1

$Python3 readmap.py

#Running the python code

```
root@raspberrypi:/home/pi/Desktop/Maps# python3 readmap.py
Latitude=28.546475166666667and Longitude=77.35323316666667
Latitude=28.546476833333333and Longitude=77.35323233333334
Latitude=28.54647883333333and Longitude=77.35322833333333
Latitude=28.54647883333333and Longitude=77.35322833333333
Latitude=28.54647883333333and Longitude=77.35322833333333
Latitude=28.54647883333333and Longitude=77.35322833333333
Latitude=28.54647883333333and Longitude=77.35322833333333
Latitude=28.54647883333333and Longitude=77.35322833333333
Latitude=28.54647883333333and Longitude=77.35322833333333
Latitude=28.54647883333333and Longitude=77.35322833333333
```

Figure 19 Python example running

4.1.4 Maps and Asset Tracking

X-LINUX-GNSS1 provides an example to send GNSS data to the cloud over http. ST Asset Tracking Dashboard is used to display the live GNSS data . Below are the steps to getting started with sending GNSS data to cloud

#Create a login at ST Asset Tracking Dashboard: https://dsh-assetracking.st.com/ , its free

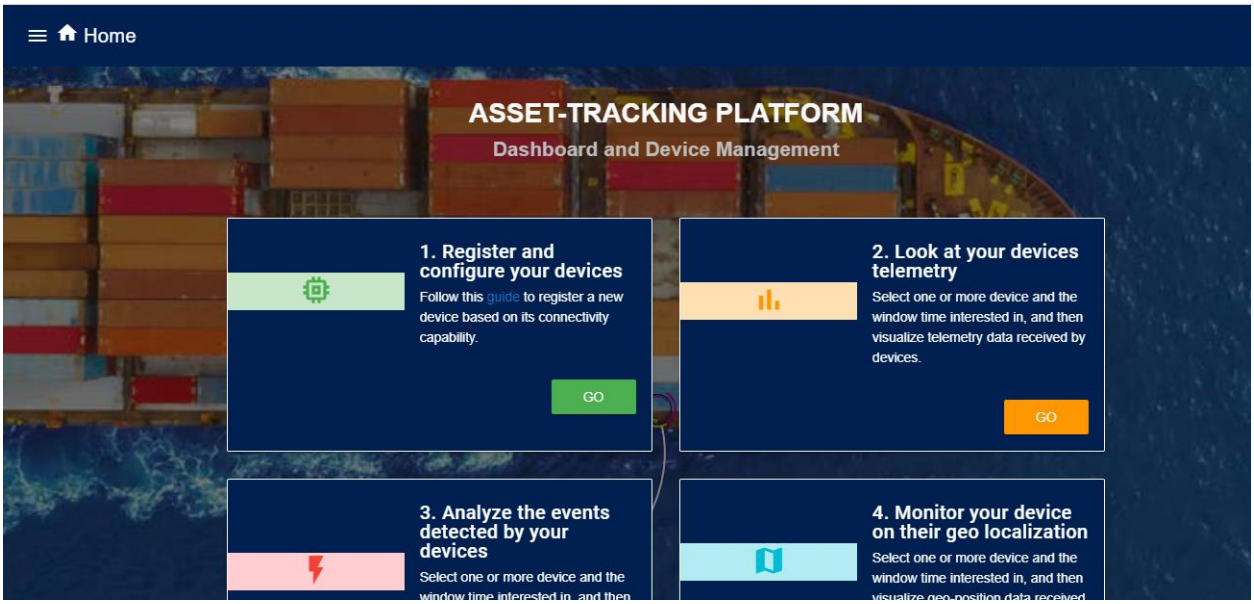


Figure 20 ST Asset Tracking Dashboard

Login or create an account at https://dsh-assetracking.st.com/#/login

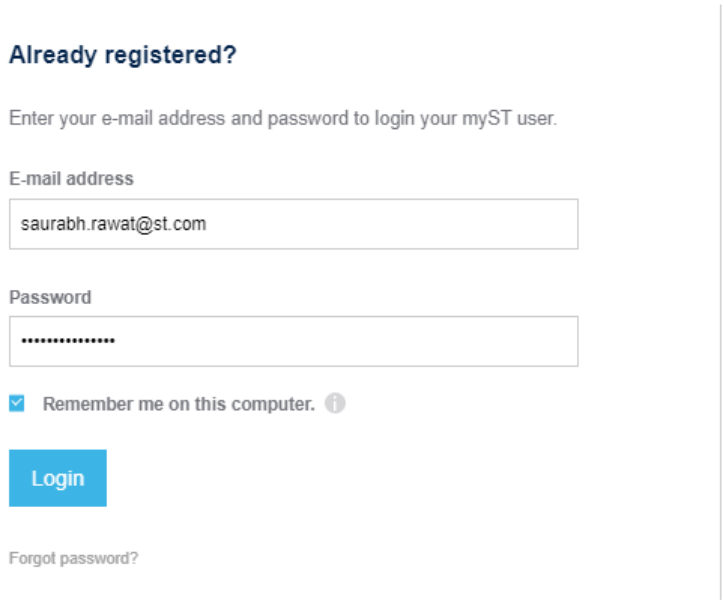


Figure 21 ST Asset Tracking Login

Once logged in , create a device (device name and device id) from the Devices Tab

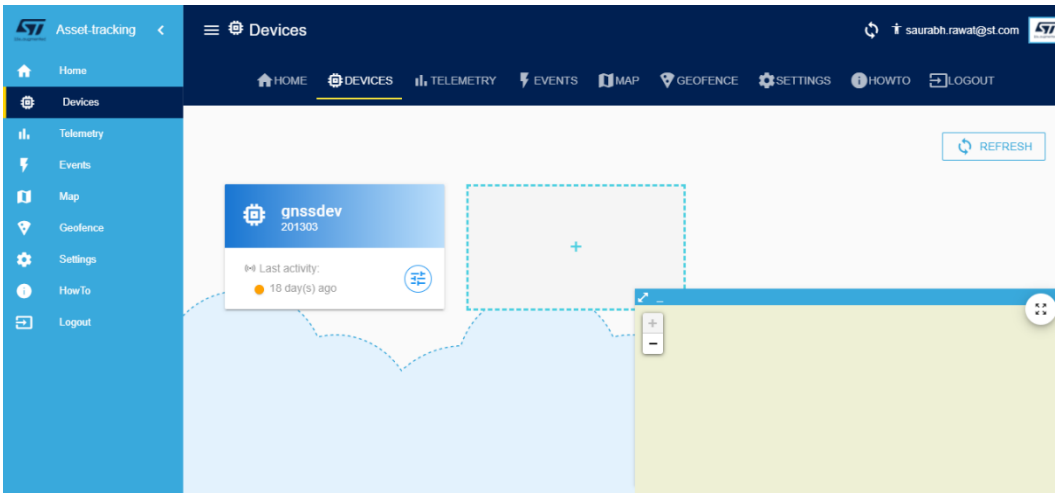


Figure 22 ST Asset Tracking Dashboard Home

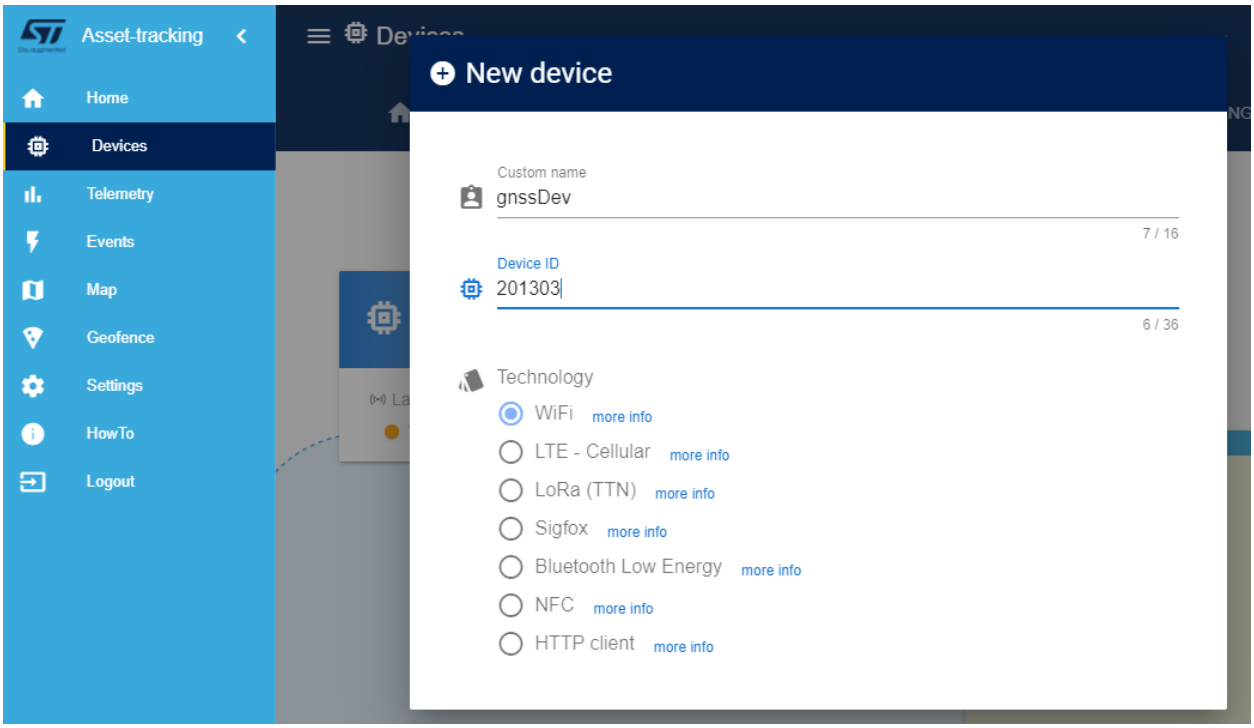


Figure 23 ST Asset Tracking Dashobard Creating a device ID and device Name

#Create API Key which will be used to send data to this Asse Tracking Dashboard

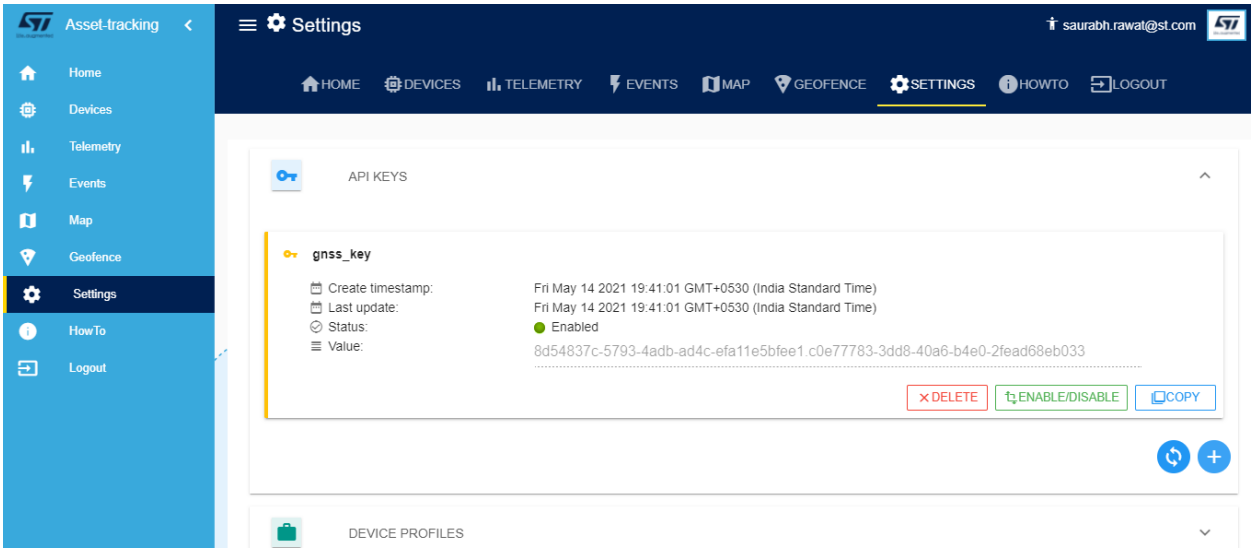


Figure 24 ST Asset Tracking Generating new API Key

Location of endpoint:

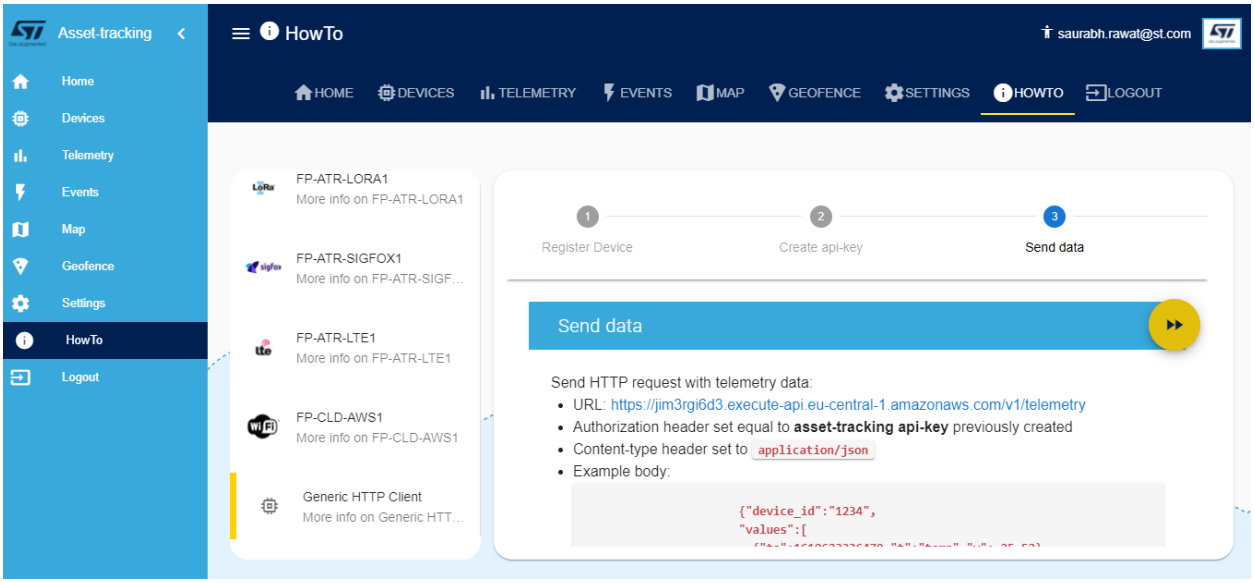


Figure 25 ST Asset Tracking - Note down the endpoint

#Modify the data in the creds.conf file as per the endpoint, device Id and the API Key

$cd /path-to/X-LINUX-GNSS1_V1.0.0/Application/Source/gnss_x_linux/Sources/cloud

$vi creds.conf

```
saurabhr7@vmi613801:~/gnss/x-linux-gnssal/X-LINUX-GNSS1_V1.0.0/Application/Source/gnss_x_linux/Sources/cloud$ ls -l
total 44
-rw-rw-r-- 1 saurabhr7 saurabhr7  280 Jun 26 22:57 cloud_comm_common.h
-rw-rw-r-- 1 saurabhr7 saurabhr7 4222 Jun 26 22:57 cloud_comm_config.c
-rw-rw-r-- 1 saurabhr7 saurabhr7  625 Jun 26 22:57 cloud_comm_config.h
-rw-rw-r-- 1 saurabhr7 saurabhr7 4340 Jun 26 22:57 cloud_comm_https.c
-rw-rw-r-- 1 saurabhr7 saurabhr7  428 Jun 26 22:57 cloud_comm_https.h
-rw-rw-r-- 1 saurabhr7 saurabhr7 1168 Jun 26 22:57 cloud_helper.c
-rw-rw-r-- 1 saurabhr7 saurabhr7  192 Jun 26 22:57 creds.conf
-rw-rw-r-- 1 saurabhr7 saurabhr7 1336 Jun 26 22:57 gps_parser.h
-rw-rw-r-- 1 saurabhr7 saurabhr7 1292 Jun 26 22:57 README.md
saurabhr7@vmi613801:~/gnss/x-linux-gnssal/X-LINUX-GNSS1_V1.0.0/Application/Source/gnss_x_linux/Sources/cloud$
```

#modify creds.conf file device_id,api_key and endpoint and Transfer it to STM32MP1-DK2 at the same place where gnss_app was transferred

http_endpoint = https://jim3rgi6d3.execute-api.eu-central-1.amazonaws.com/v1/telemetry

api_key = 8d54837c-5793-4adb-ad4c-efa11e5bfee1.c0e77783-3dd8-40a6-b4e0-2fead68eb033

device_id = 201303

```
http_endpoint = https://jim3rgi6d3.execute-api.eu-central-1.amazonaws.com/v1/telemetry

api_key = 8d54837c-5793-4adb-ad4c-efa11e5bfee1.c0e77783-3dd8-40a6-b4e0-2fead68eb033

device id = 201303
```

$scp /path-to/X-LINUX-GNSS1_V1.0.0/Application/Source/gnss_x_linux/Sources/cloud/creds.conf root@192.168.72.1:/

The steps are same as for building and deploying the gnss_app

Enter option “20” to upload the data to cloud. Make sure your STM32MP1-DK2 board is connected to internet

```
Save configuration (y/n)?
> 11
getgprmc =11

UTC:                          [ 08:19:17 ]
Status:                       [ V ]          -- Warning (reported in NO FIX conditions)
Latitude:                     [ 28° 32'' N ]
Longitude:                    [ 77° 21'' E ]
Speed over ground (knots):    [ 0.0 ]
Trackgood:                    [ 0.0 ]
Date (ddmmyy):                [ 110621 ]
Magnetic Variation:           [ 0.0 ]
Magnetic Var. Direction:      [ - ]


>Select a command:
 1 - getpos
 2 - lastpos
 3 - wakestatus
 4 - help
 5 - debug
 6 - track
 7 - lasttrack
 8 - getfwver
 9 - getgnsmsg
10 - getgpgst
11 - getgprmc
12 - getgsamsg
13 - getgsvmsg
19 - ext-help
20 - Upload to Cloud
21 - Stop Upload to Cloud
```

Figure 26 Running gnss app and enabling cloud upload option (“20”)

And then you will get the below logs and the live tracking on the Asset Tracking Dashboard.

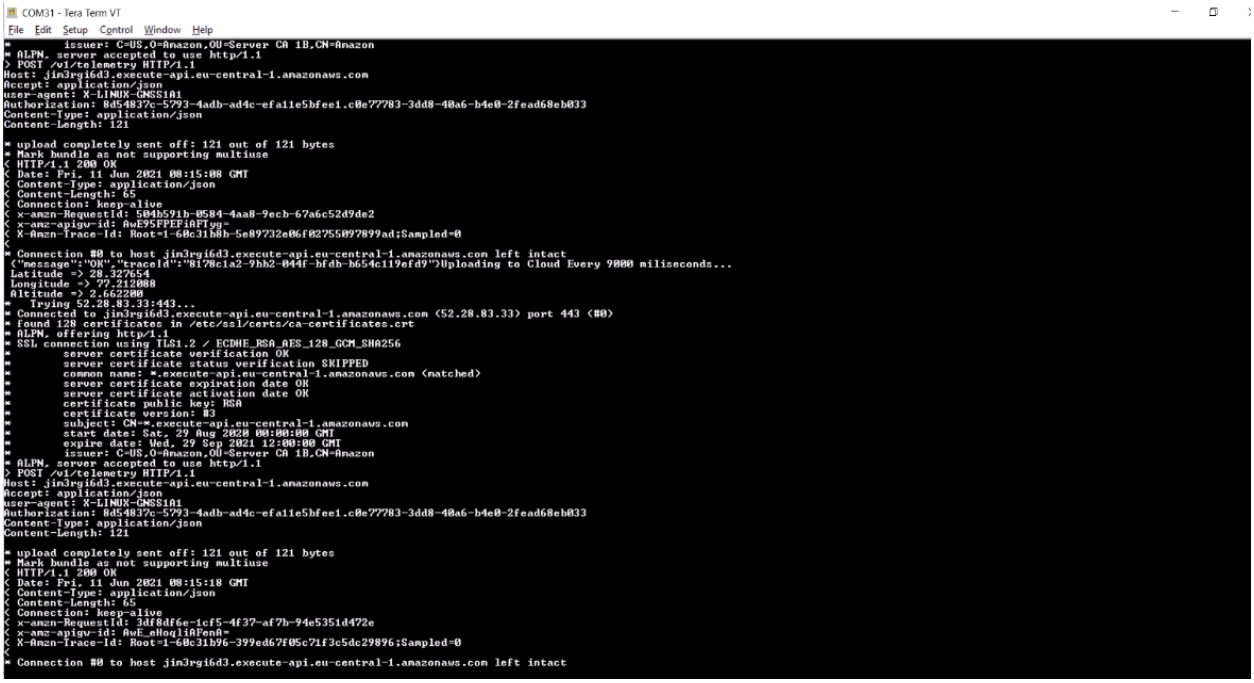


Figure 27 Gnss app sending data to ST Asset Tracking Dashboard over HTTP

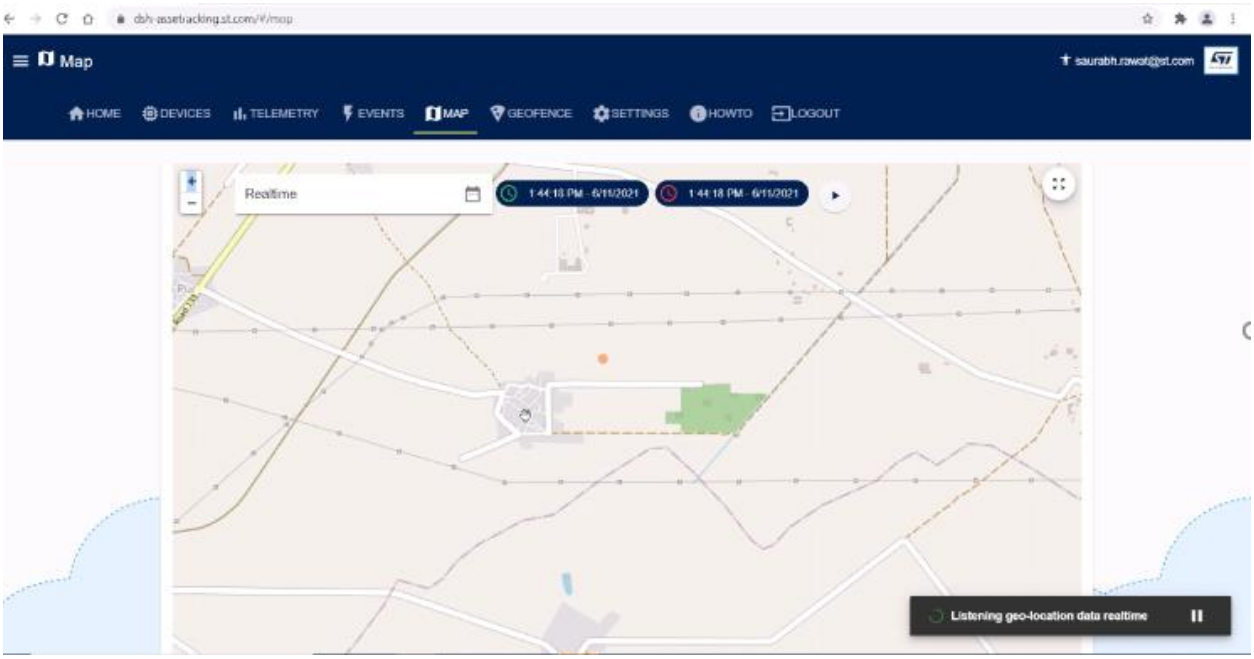
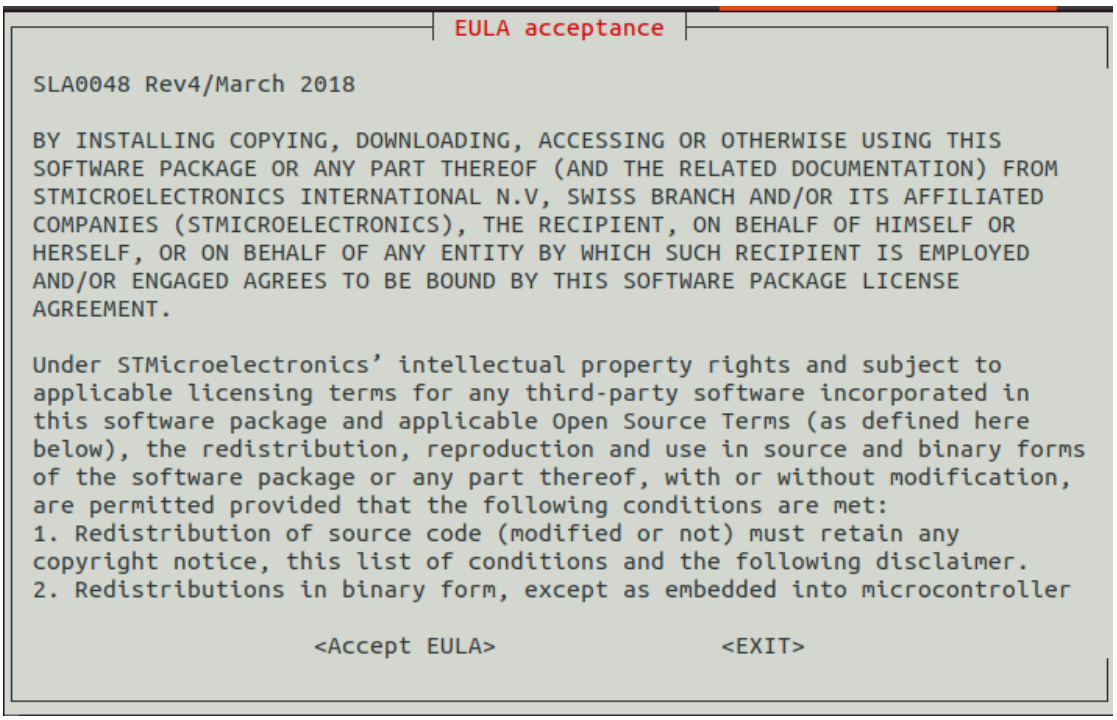


Figure 28 Gnss app live data

4.2 Using BitBake (For Distribution Package)

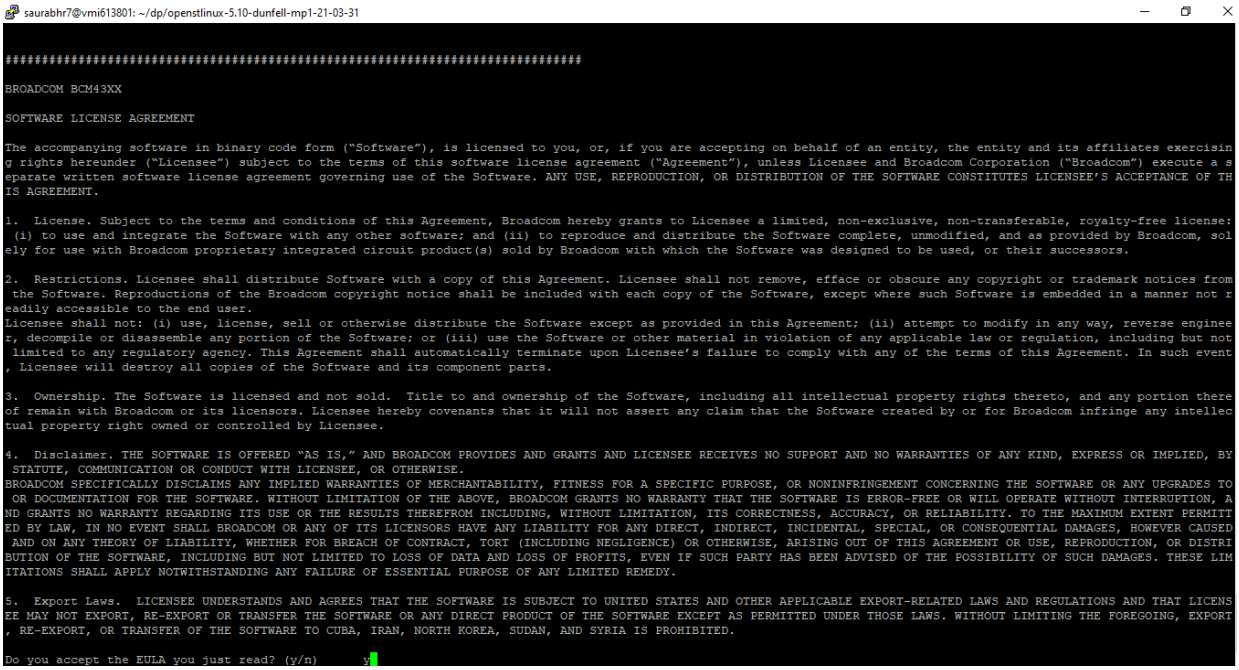
Below is an example to add the gnss_app as meta layer. Same procedure can be used to add C Utility as meta layer.

#Download the Distribution Package and do bitbake. Doing bitbake for the best time will show the EULA accept prompt, Accept it (type “y” and press enter)



$DISTRO=openstlinux-weston MACHINE=stm32mp1 source layers/meta-st/scripts/envsetup.sh

$bitbake st_image_weston



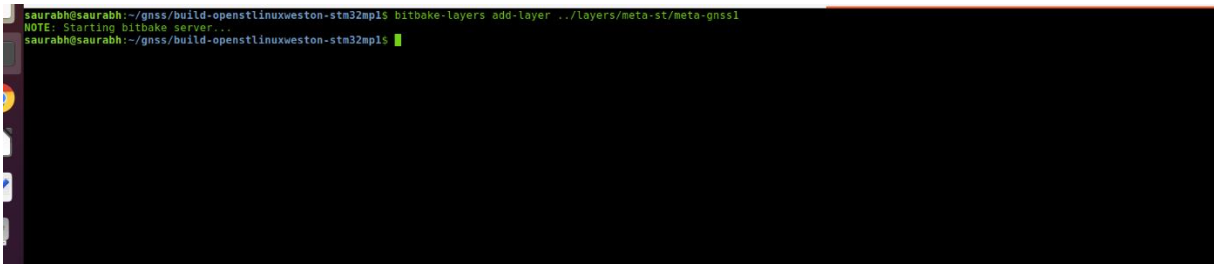
#You will be inside the build directory. Once bitbake is done, download the gnss package from www.st.com inside the build directory as shown in figure below.

#Create a layer : meta-gnss1

$bitbake-layers create-layer --priority 7 ../layers/meta-st/meta-gnss1

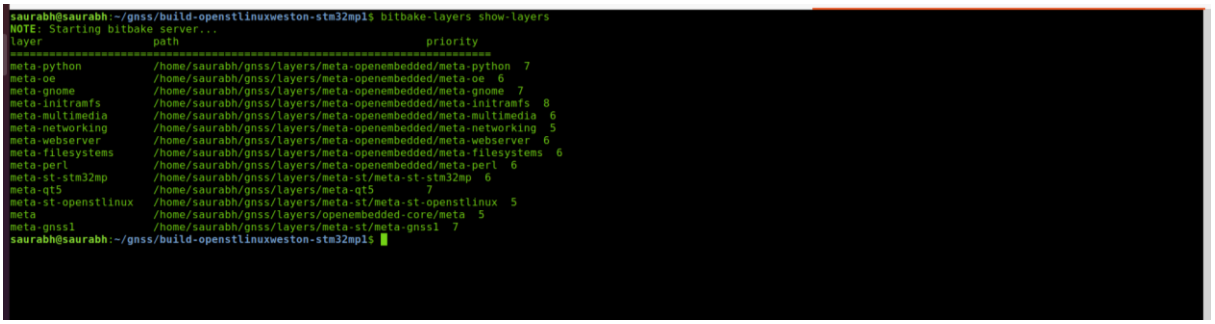
#Add a layer a layer : recipes-gnss1

$ bitbake-layers add-layer ../layers/meta-st/meta-gnss1



#See the added layer layer : meta-gnss1

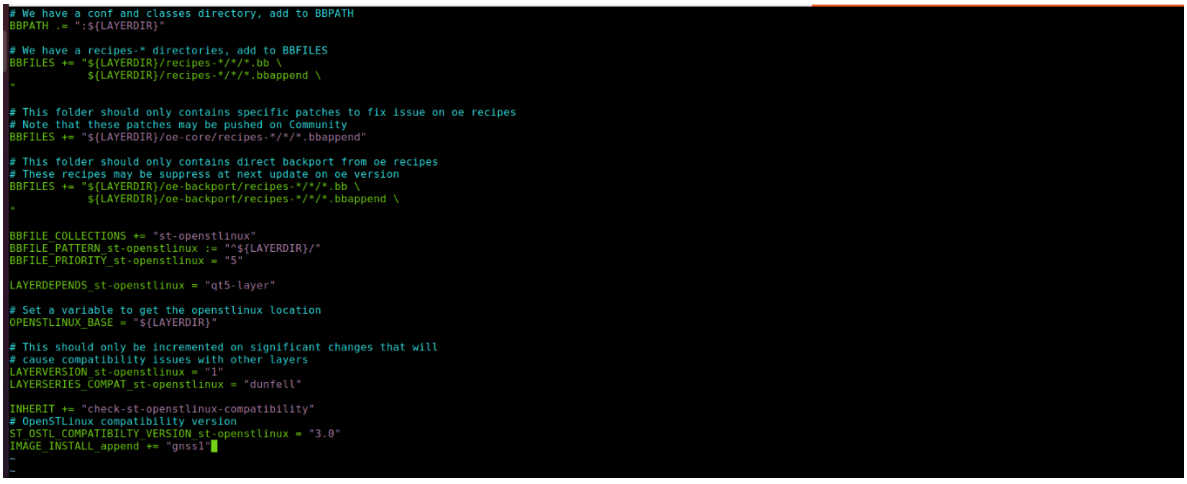
$bitbake-layers show-layers



#Add the IMAGE_INSTALL_append line as shown below in the layer.conf at the end

$vi ../layers/meta-st/meta-st-openstlinux/conf/layer.conf

IMAGE_INSTALL_append += "gnss1"



#Delete Completely meta-gnss1 that is created by the tool and we copy the meta-gnss1 downloaded from github / www.st.com

$ rm -rf ../layers/meta-st/meta-gnss1/

```
saurabh@saurabh:~/gnss/build-openstlinuxweston-stm32mp1$ rm -rf ../layers/meta-st/meta-gnss1/
saurabh@saurabh:~/gnss/build-openstlinuxweston-stm32mp1$
```

#And copy the layer provided from the X-Linux package

$ cp -rf X-LINUX-GNSS1_V1.0.0/Recipe/meta-gnss1/ ../layers/meta-st/.

```
saurabh@saurabh:~/gnss/build-openstlinuxweston-stm32mp1$ cp -rf X-LINUX-GNSS1_V1.0.0/Recipe/meta-gnss1/ ../layers/meta-st/
saurabh@saurabh:~/gnss/build-openstlinuxweston-stm32mp1$
```

#Add the Sources path(Location where CMakeLists.txt is present) inside gnss1_0.1.bbappend as shown below. (by default in the package what path will be?) If no path is present the user need

“/path-to/openstlinux-5.10-dunfell-mp1-21-03-31/build-openstlinuxweston-stm32mp1/x-linux-gnss/X-LINUX-GNSS1_V1.0.0/Application/Source/gnss_x_linux/Sources”

inside layers/meta-st/meta-gnss1/recipes-gnss1/gnss1/gnss1_0.1.bbappend

$vi ../layers/meta-st/meta-gnss1/recipes-gnss1/gnss1/gnss1_0.1.bbappend

```
saurabh@saurabh:~/gnss/build-openstlinuxweston-stm32mp1$ vi ../layers/meta-st/meta-gnss1/recipes-gnss1/gnss1/gnss1_0.1.bbappend
```

```
inherit externalsrc
EXTERNALSRC="/home/saurabh/gnss/build-openstlinuxweston-stm32mp1/X-LINUX-GNSS1_V1.0.0/Application/Source/gnss_x_linux/Sources"
~
~
~
~
~
~
~
~
~
```

#Build the ST image

$ bitbake st-image-weston

```
saurabh@saurabh:~/gnss/build-openstlinuxweston-stm32mp1$ bitbake st-image-weston
NOTE: Started PRServer with DBfile: /home/saurabh/gnss/build-openstlinuxweston-stm32mp1/cache/prserv.sqlite3, IP: 127.0.0.1, PORT: 46665, PID: 1690786
Parsing recipes:   4% |#######                                                                                  | ETA:  0:04:44
```

#New Images will be formed in the tmp-glibc/deploy/images/stm32mp1/ directory

$cd tmp-glibc/deploy/images/stm32mp1/

#FlashLayout_sdcard_stm32mp157f-dk2-trusted.tsv and FlashLayout_sdcard_stm32mp157f-dk2-trusted will be created besides other images

Follow below link (https://wiki.st.com/stm32mpu/wiki/STM32MP15_Discovery_kits_-_Starter_Package#Image_flashing) to flash the binary.

#check if below file is present on discovery kit

$ ls -l /dev/ttySTM2

#Run the application

$ /usr/bin/gnss_app or directly gnss_app

5.0 Revision History

Table 2 Revision History

Date	Version	Changes
6th June 2021	1.0	Initial Release

Contents

List of Figures

List of Tables