# Quick Start Guide

STM32Cube function pack for GNSS and cellular connectivity enabling Assisted-GNSS applications

(FP-SNS-AGNSS1)

Version 1.0 (Feb 5, 2020)

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FP-SNS-AGNSS1: STM32Cube function pack for GNSS and cellular connectivity enabling Assisted-GNSS applications

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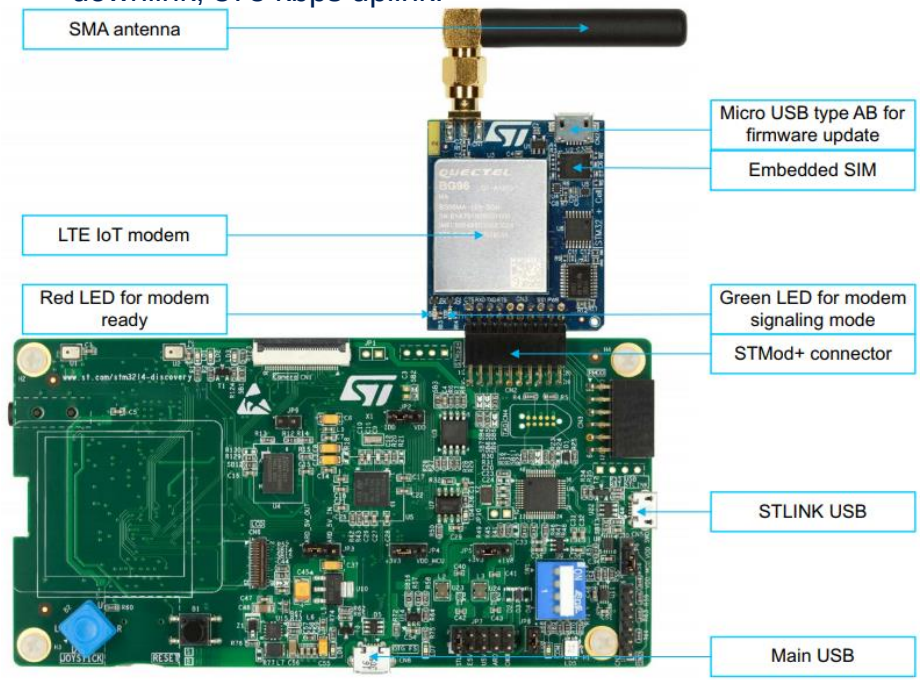
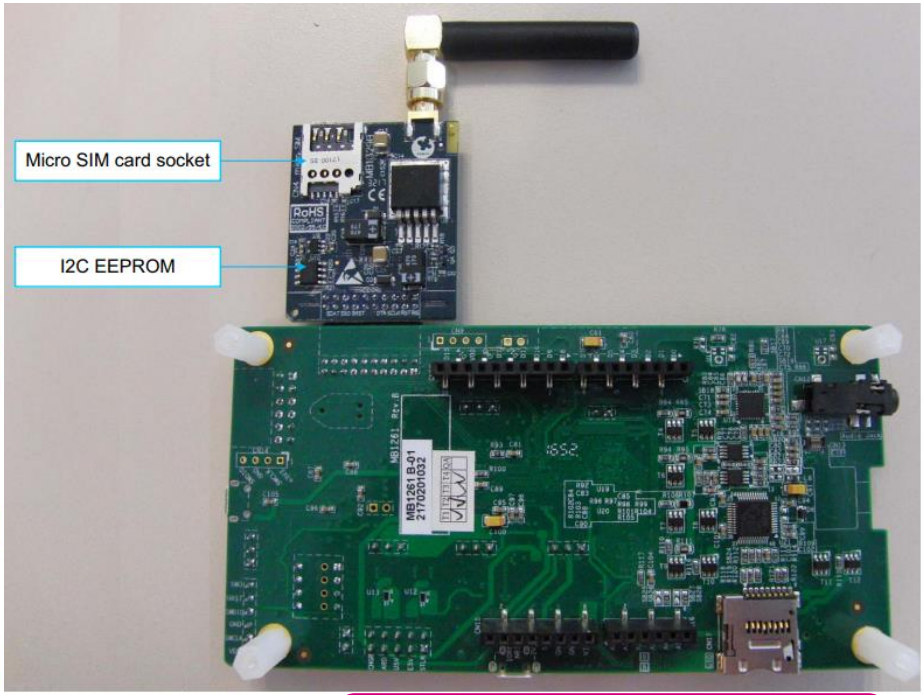
# P-L496G-CELL02
# Hardware Overview

## P-L496G-CELL02 Hardware Description

- The P-L496G-CELL02 STM32 discovery pack for LTE IoT cellular to cloud (STM32-C2C/LTE IoT) is a turnkey development platform for cellular and cloud technology based solutions.
- The pack is composed of an STM32L496AGI6-based low-power discovery mother board with preloaded firmware, and an STMod+ cellular expansion board with antenna.
- It features STM32L496AGI6 Arm®-based microcontroller featuring 1 Mbyte of Flash memory and 320 Kbytes of RAM in a UFBGA169 package
- Board expansion features Quectel BG96 worldwide cellular modem LTE Cat M1/Cat NB1/EGPRS module, 300 kbps downlink, 375 kbps uplink.




Top view




Bottom view

Latest info available at www.st.com
**P-L496G-CELL02**

# GNSS expansion board
# Hardware Overview



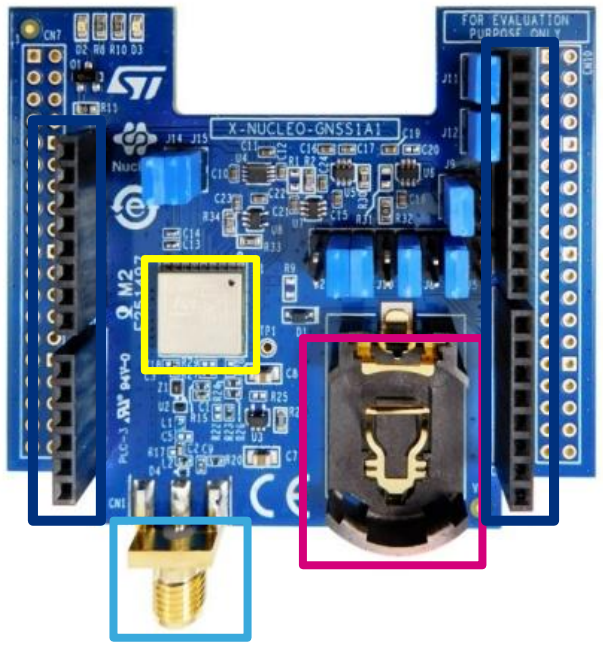
## X-NUCLEO-GNSS1A1 Hardware Description

- The X-NUCLEO-GNSS1A1 expansion board is based on the Teseo-LIV3F tiny GNSS module.
- It represents an affordable, easy-to-use, global navigation satellite system (GNSS) module, embedding a Teseo III single die standalone positioning receiver IC, usable in different configurations in your STM32 Nucleo project.
- The Teseo-LIV3F is a compact (9.7x10.1 mm) module that provides superior accuracy thanks to the on-board 26 MHz temperature compensated crystal oscillator (TCXO) and a reduced time-to-first fix (TTFF) with its dedicated 32 KHz real-time clock (RTC) oscillator.
- The Teseo-LIV3F module runs complete GNSS firmware (X-CUBE-GNSS1) to perform all GNSS operations including acquisition, tracking, navigation and data output without external memory support.
- The X-NUCLEO-GNSS1A1 expansion board is compatible with the Arduino™ UNO R3 connector and the ST morpho connector, so it can be plugged to the STM32 Nucleo development board and stacked with additional STM32 Nucleo expansion boards.

### Key Products on board

**Teseo-LIV3F**: Single die standalone positioning receiver IC working on multiple constellations, 10x10mm compact size.

26MHz Temperature Compensated Crystal Oscillator (TCXO) and reduced Time To First Fix (TTFF) relying to a 32KHz Real Time Clock (RTC) oscillator for superior accuracy.

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**X-NUCLEO-GNSS1A1**

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# FP-SNS-AGNSS1
# Software overview



## Software description

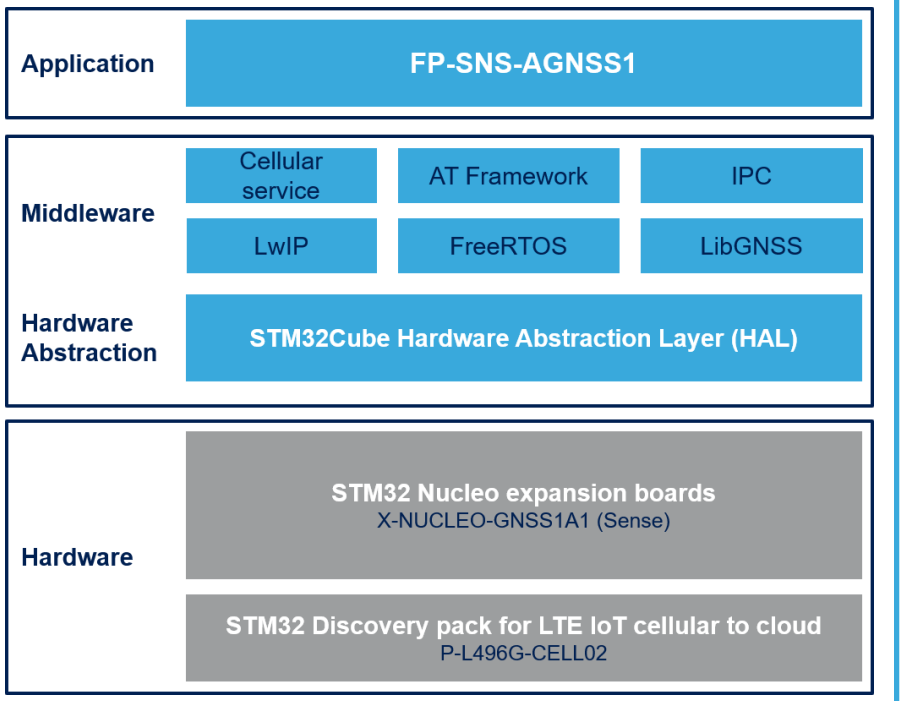
FP-SNS-AGNSS1 is an STM32Cube function pack which lets you connect your IoT node to a cellular network and enable Assisted-GNSS applications. Assisted-GNSS is a mechanism to provide ephemeris assistance from external source, thus considerably reducing the time to get a FIX especially in critical environments when the ephemeris download time could be very long. Ephemeris assistance is provided by RxNetworks online service.

The software is provided for STM32L496AG MCUs and it is easily portable across different MCU families thanks to STM32Cube.

## Key features

- Complete firmware to connect an IoT node with GNSS module to a LTE IoT cellular network Support for Assisted-GNSS through RxNetworks online services
- Middleware libraries with support for FreeRTOS, GNSS, NMEA and JSON parsing functionalities
- Sample implementation available for X-NUCLEO-GNSS1A1 connected to a P-L496G-CELL02 STM32 discovery pack for LTE IoT cellular connectivity
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms

## Overall Software Architecture

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**FP-SNS-AGNSS1**

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# HW prerequisites with L496G-DISCOVERY



- 1x STM32 Nucleo expansion board with Teseo-LIV3F GNSS (**X-NUCLEO-GNSS1A1**) with GPS antenna
- 1x **P-L496G-CELL02** discovery pack for cellular to cloud, which contains:
  - 1x expansion board with Quectel BG96 LTE IoT modem, compatible with STMod+ connector
  - 1x STM32 Discovery development board **32L496GDISCOVERY**
  - LTE antenna
- Laptop/PC with Windows 7, 8 or 10
- 1x micro USB cable
- Cellular network access point

Micro USB

X-NUCLEO-GNSS1A1

P-L496G-CELL02

# SW prerequisites



- **STSW-LINK009**: ST-LINK/V2-1 USB driver
- **STSW-LINK007**: ST-LINK/V2-1 firmware upgrade
- **FP-SNS-AGNSS1**
  - Download FP-SNS-AGNSS1 package from www.st.com
  - Copy the .zip file content into a folder on your PC
  - The package contains the source code example (Keil, IAR EWARM, STM32CubeIDE) and binary for **P-L496G-CELL02**
- **Serial line monitor** – e.g., Tera Term
- Before flashing the FP-SNS-AGNSS1 firmware it is necessary to register the embedded SIM card in the P-L496G-CELL02 as described in document UM2322, STM32 Discovery pack for LTE IoT cellular to cloud.

# FP-SNS-AGNSS1
# STM32 Function Pack



1

Go to www.st.com/stm32ode-fp

2

Select
FP-SNS-AGNSS1

3

Download and unpack

FP-SNS-AGNSS1

- _htmresc
- Documentation ← Docs
- Drivers ← BSP, HAL and drivers
- Middlewares ← GNSS, NMEA, FreeRTOS, Cellular Libs
- Projects ← Sample application; pre-built binary
- Utilities
- readme.txt
- Release_Notes.html
- Release_Notes.md

.\Projects\STM32L496G_Discovery\Applications\AGNSS1

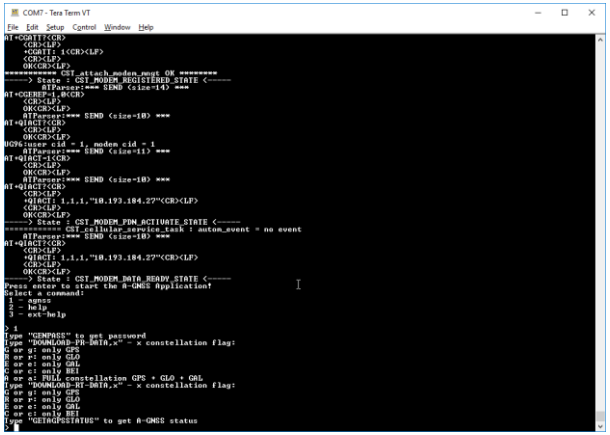
4

5

Build/Flash and Run the proje

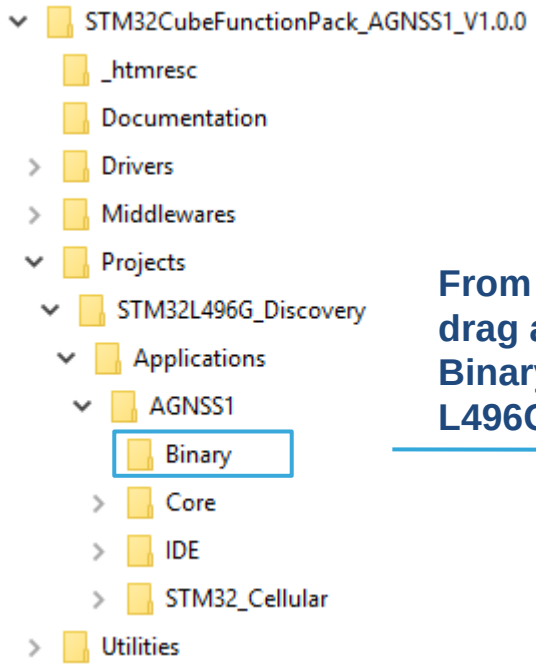
6

Display results on serial terminal

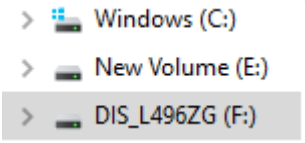


# FP-SNS-AGNSS1
## Installation procedure

- Connect the P-L496G-CELL02 and the X-NUCLEO-GNSS1A1 expansion board
- Connect the P-L496G-CELL02 board to your PC

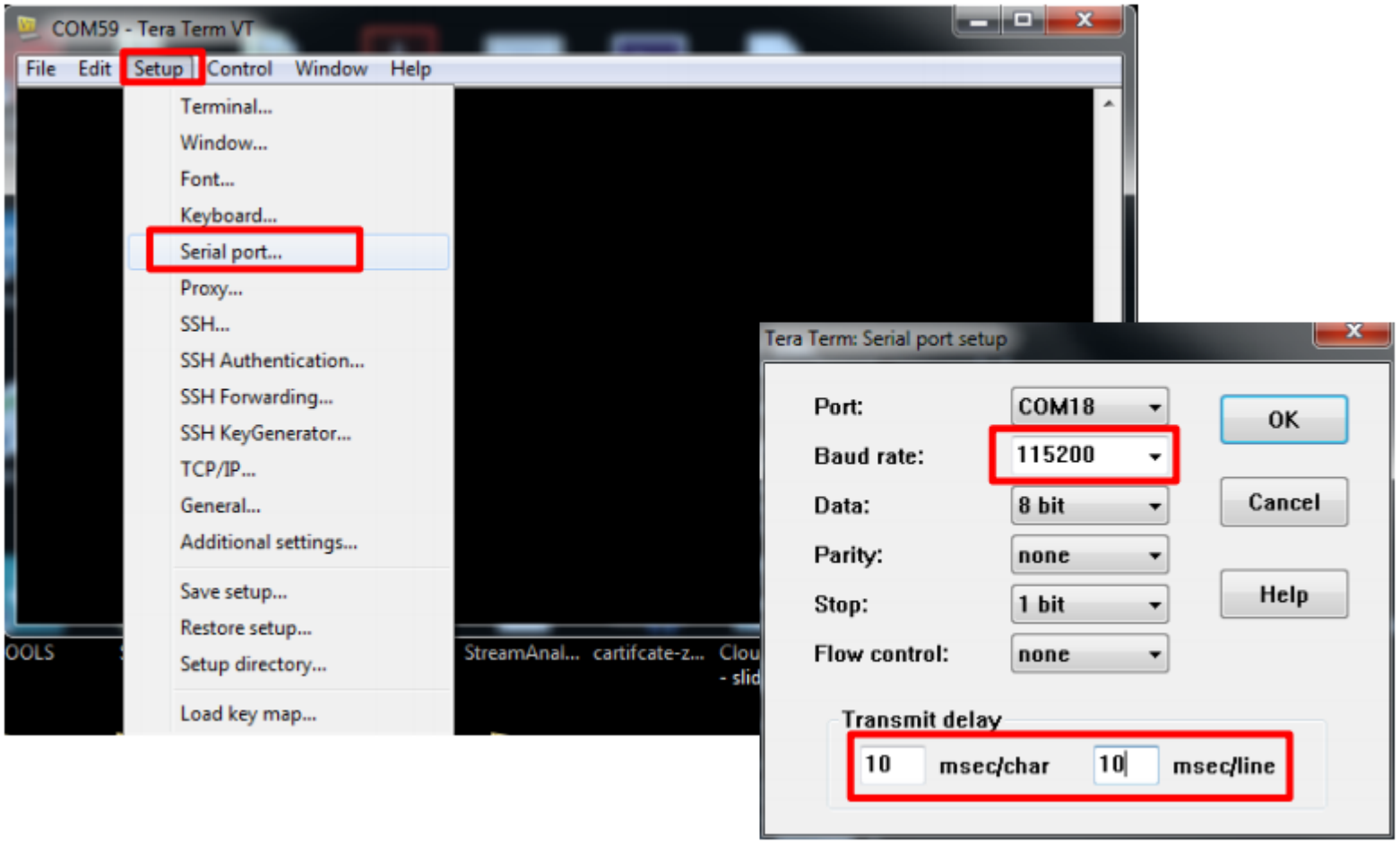



**From the software package drag and drop the *.bin (in Binary folder) on L496GDiscovery drive**




# FP-SNS-AGNSS1
# Configure Serial Terminal

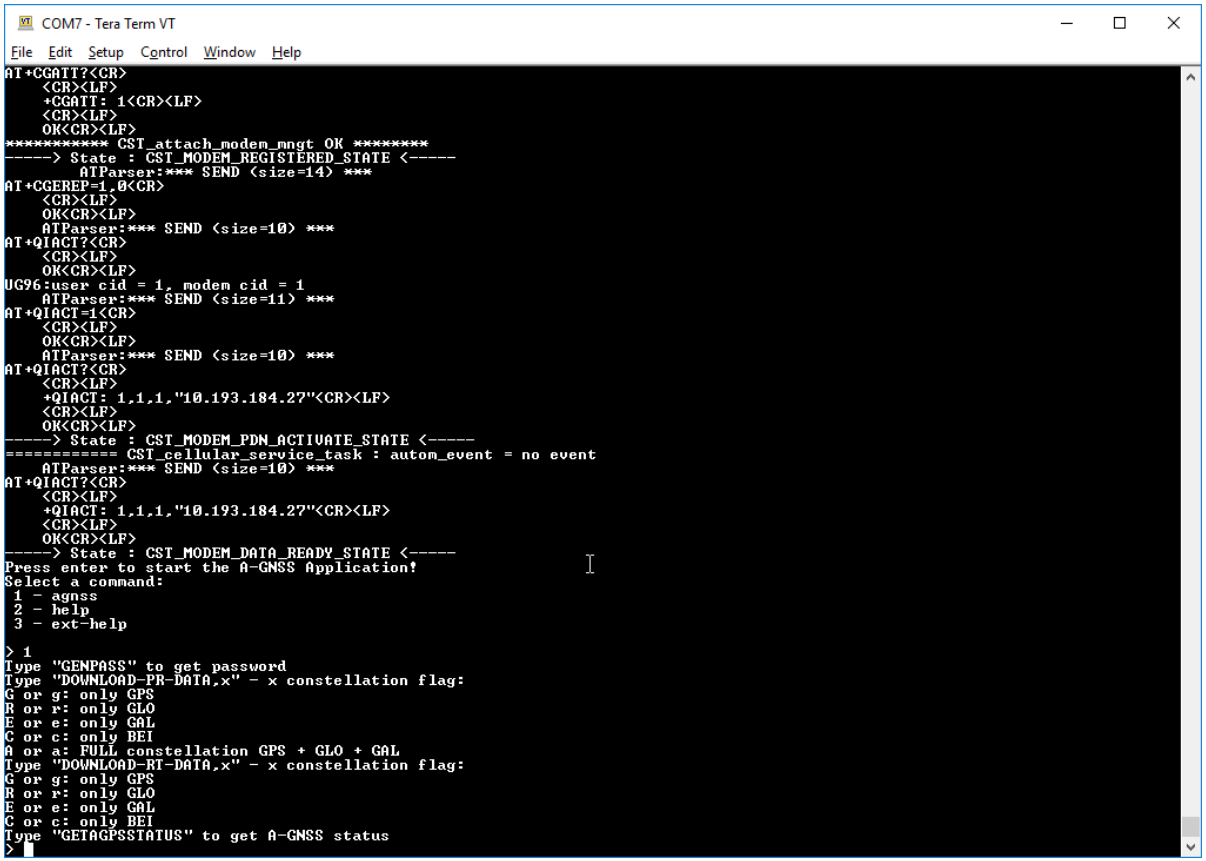
- Open serial terminal then configure baud rate speed to 115200 (Setup → Serial port in TeraTerm).
- Set transmit delays to a value bigger than zero, like 10.



# FP-SNS-AGNSS1
# Application initialized

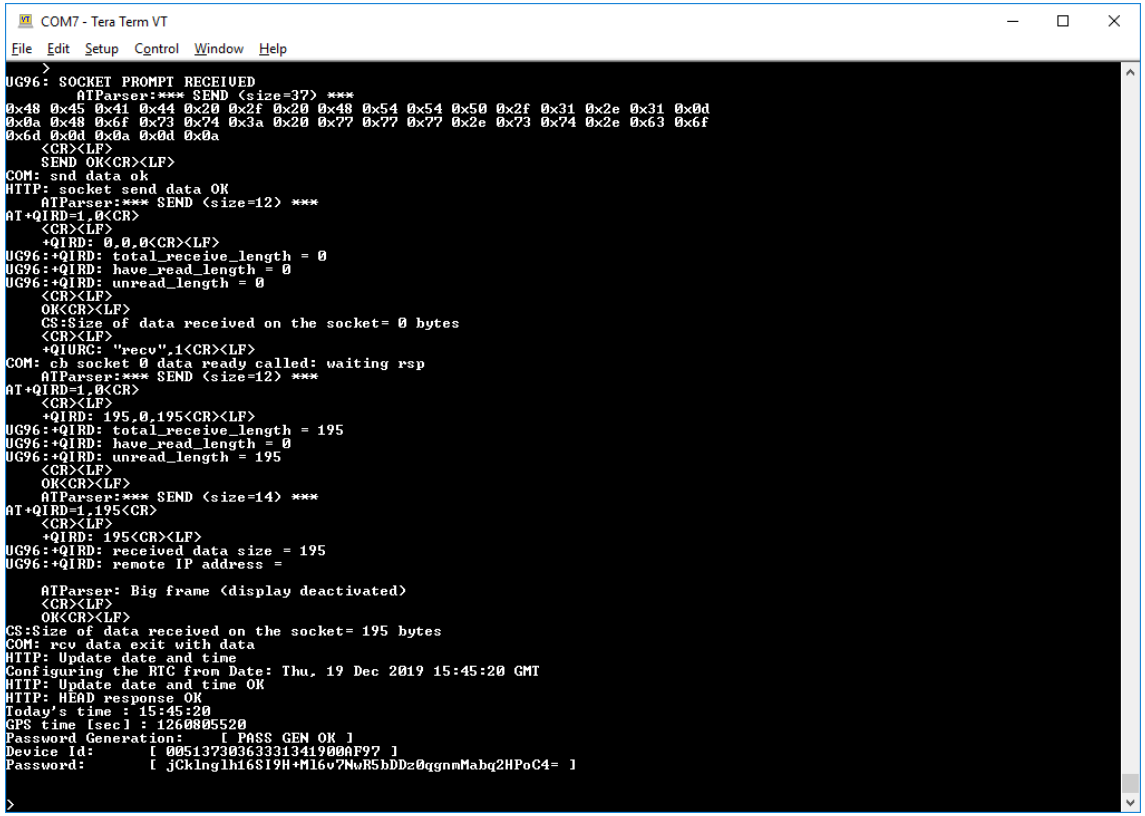
- Once the modem has been successfully initialized and is in the activate state, a message will notify to the user that A-GNSS task is ready: ‘Press enter to start the A-GNSS Application!’
- At this point, the main menu for the A-GNSS application will be displayed.

It may happen that the modem fails initializing. In that case, a manual reset is needed just pushing the reset button on the discovery board.



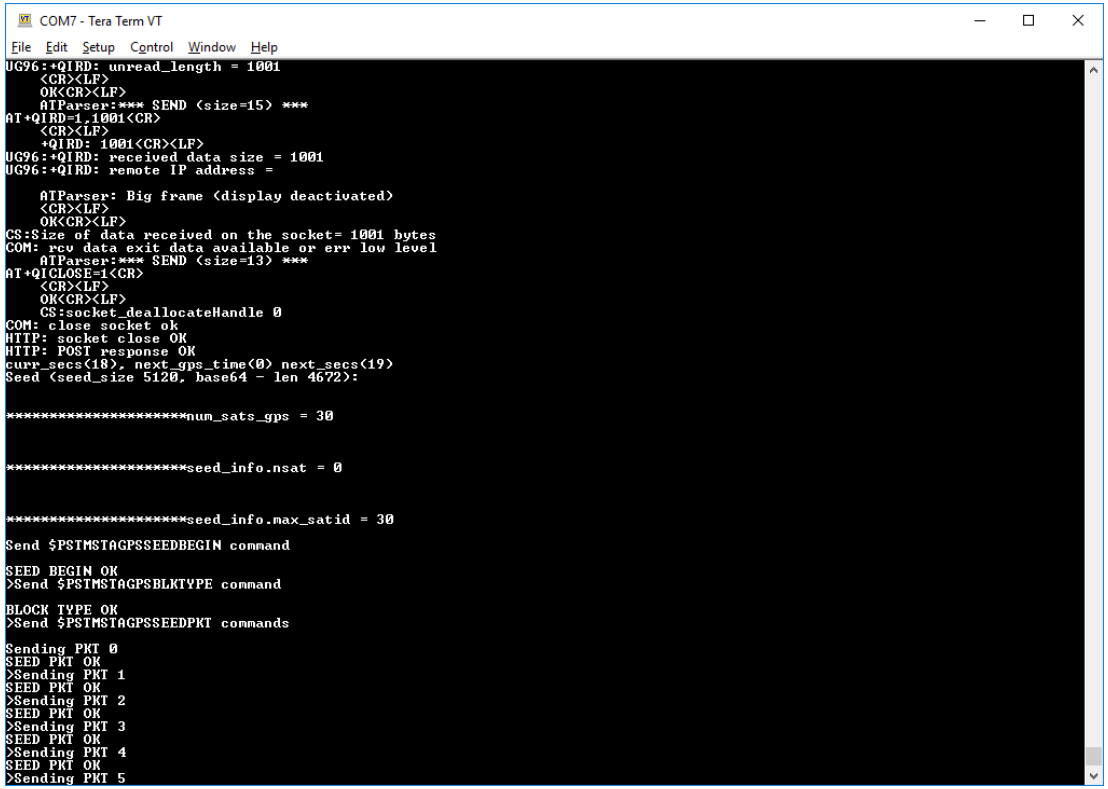
# FP-SNS-AGNSS1
# Password generation

- In order to access the RxNetworks servers, the user has to provide a set of parameters which are used for generating the HTTP request. Predictive A-GNSS and RealTime A-GNSS use the same password generator and the same NMEA commands.
- **GENPASS**: is the command through which the user asks the Teseo-LIV3F to generate a password in order to access the RxNetworks server



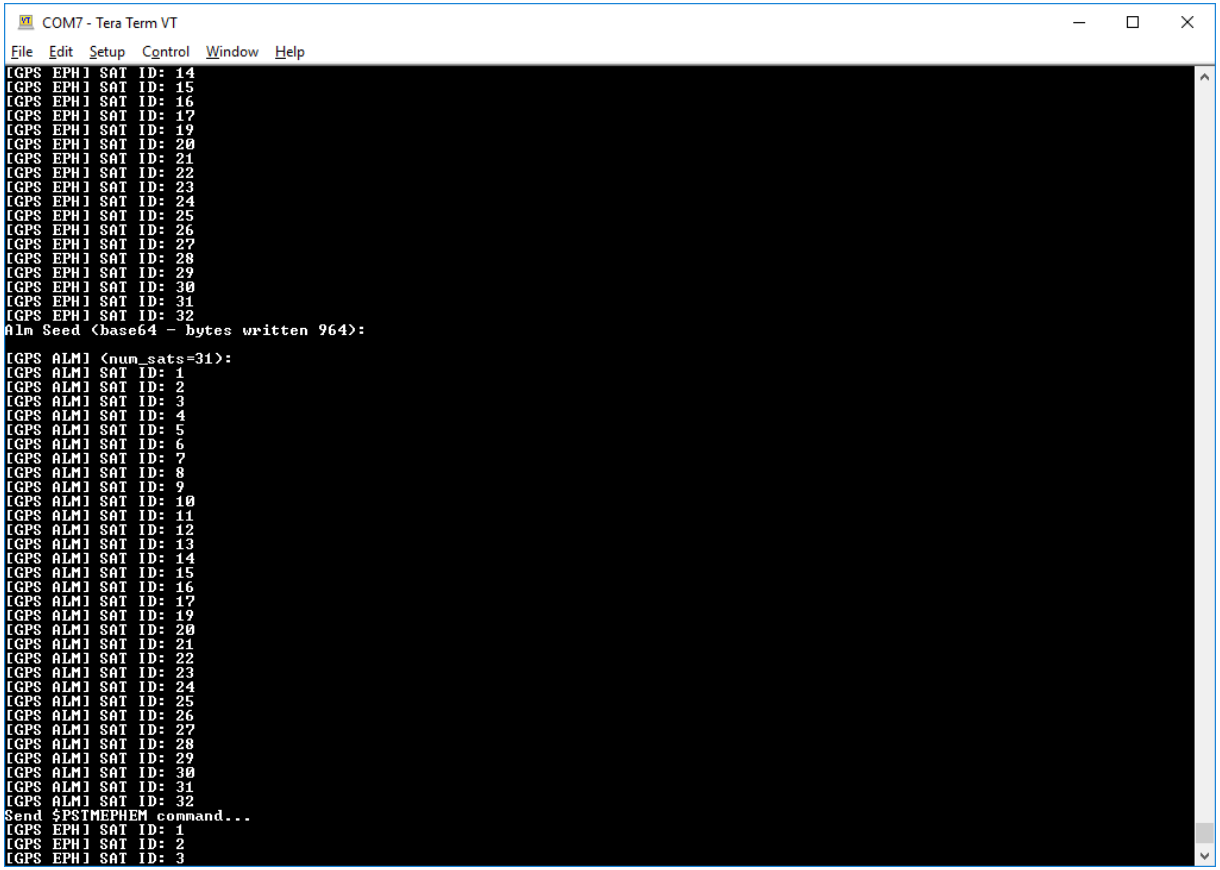
# Predictive A-GNSS seed transmission

- In order to download the assistance data called “seed” for the Predictive A-GNSS mechanism, the user has to invoke the command **DOWNLOAD-PR-DATA,x** where x is the flag for one of the following constellation:
  - GPS
  - Glonass
  - Galileo
  - BeiDou



# RealTime A-GNSS seed transmission

- In order to download the assistance data called “seed” for the RealTime AGNSS mechanism, the user has to invoke the command **DOWNLOAD-RT-DATA,x** where x is the flag for one of the following constellation:
  - GPS
  - Glonass
  - Galileo
  - BeiDou



# Documents & related resources



**All documents are available in the DESIGN tab of the related products webpage**

P-L496G-CELL01:

- Gerber files, BOM, and schematics
- **DB3530:** STM32 discovery pack for LTE IoT cellular to cloud – **Data brief**
- **UM2052:** Getting started with STM32 MCU Discovery Kits software development tools – **User Manual**
- **UM2365:** STM32 Discovery pack for LTE IoT cellular to cloud – **User Manual**

X-NUCLEO-GNSS1A1:

- Gerber files, BOM, and schematics
- **DB3444**: Global navigation satellite system software expansion for STM32Cube – **Data brief**
- **UM2334**: Getting started with the X-CUBE-GNSS1 Global Navigation Satellite System software expansion for STM32Cube **– User Manual**

FP-SNS-AGNSS1:

- **DB4108**: STM32Cube function pack for GNSS and cellular connectivity enabling Assisted-GNSS applications – **Data brief**
- **UM2675**: Getting started with the STM32Cube function pack for GNSS and cellular connectivity enabling Assisted-GNSS applications **– User Manual**
- **Software setup file**

Consult www.st.com for the complete list

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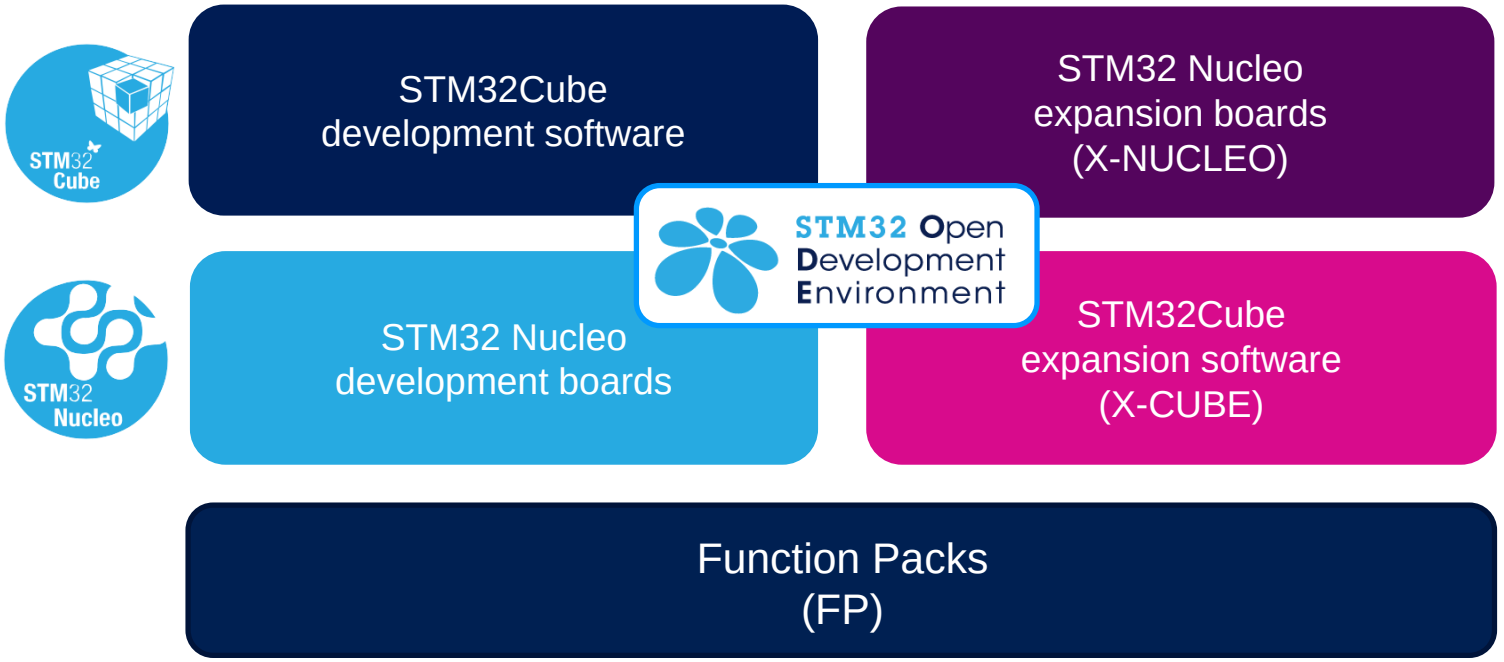
# STM32 Open Development Environment
## Fast, affordable Prototyping and Development



- The STM32 Open Development Environment (STM32 ODE) is an open, flexible, easy and affordable way to develop innovative devices and applications based on the STM32 32-bit microcontroller family combined with other state-of-the-art ST components connected via expansion boards. It enables fast prototyping with leading-edge components that can quickly be transformed into final designs.




For further information, please visit www.st.com/stm32ode