



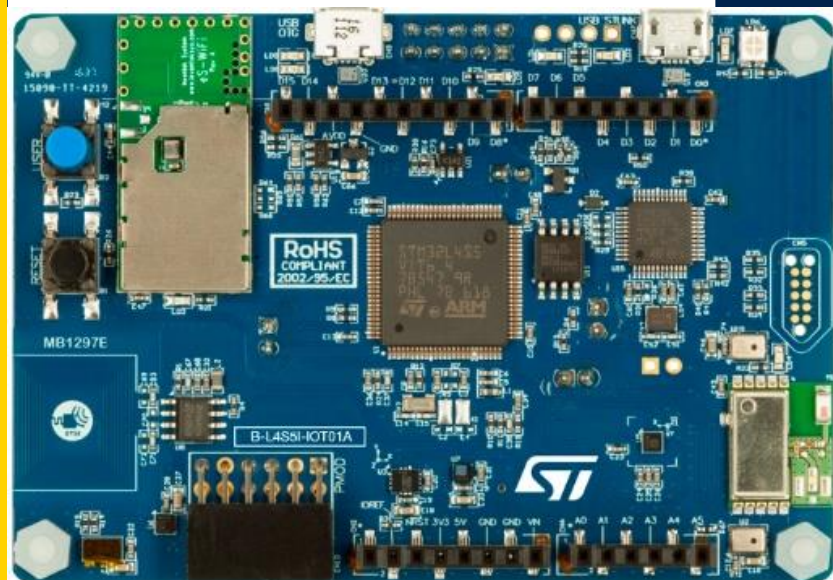
life.augmented



# Quick Start Guide

STM32Cube AWS Cloud function pack for STWIN and Discovery kit IoT node evaluation kits (FP-CLD-AWS1)

Version 3.0 (March 3, 2021)



# Agenda

1 Hardware and Software overview

2 Setup & Demo Examples

3 Documents & Related Resources

# 1- Hardware and Software overview

# STWIN development kit - STEVAL-STWINKT1B

## STWIN - SensorTile Wireless Industrial Node

## Hardware Overview

The STWIN (STEVAL-STWINKT1 or STEVAL-STWINKT1B) is a development kit and reference design that simplifies prototyping and testing of advanced industrial IoT applications such as condition monitoring and predictive maintenance. The kit supports BLE wireless connectivity through an on-board module and Wi-Fi connectivity through a special plugin expansion board (STEVAL-STWINWFV1).

### Key Features

- Multi-sensing wireless platform implementing vibration monitoring and ultrasound detection
- Updated version of STEVAL-STWINKT1, now including STSAFE-A110 populated, BlueNRG-M2S module and IMP23ABSU MEMS microphone
- Built around STWIN core system board with processing, sensing, connectivity and expansion capabilities
- Ultra-low-power ARM Cortex-M4 MCU at 120 MHz with FPU, 2048 kbytes Flash memory (STM32L4R9)
- Micro SD Card slot for standalone data logging applications
- On-board Bluetooth® low energy v5.0 wireless technology and Wi-Fi (with STEVAL-STWINWFV1 expansion board), and wired RS485 and USB OTG connectivity
- Option to implement Authentication and Brand protection secure solution with STSAFE-A110
- Wide range of industrial IoT sensors:
  - ultra-wide bandwidth (up to 6 kHz), low-noise, 3-axis digital vibration sensor (IIS3DWB)
  - 3D accelerometer + 3D Gyro iNEMO inertial measurement unit (ISM330DHCX) with machine learning core
  - ultra-low-power high performance MEMS motion sensor (IIS2DH)
  - ultra-low-power 3-axis magnetometer (IIS2MDC)
  - digital absolute pressure sensor (LPS22HH)
  - relative humidity and temperature sensor (HTS221)
  - low-voltage digital local temperature sensor (STTS751)
  - industrial grade digital MEMS microphone (IMP34DT05)
  - analog MEMS microphone with frequency response up to 80 kHz (IMP23ABSU)
- Modular architecture, expandable via on-board connectors:
  - STMOD+ and 40-pin flex general purpose expansions
  - 12-pin male plug for connectivity expansions
  - 12-pin female plug for sensing expansions
- Other kit components: Li-Po battery 480 mAh, STLINK-V3MINI debugger with programming cable, Plastic box



Latest info available at  
[www.st.com/stwin](http://www.st.com/stwin)

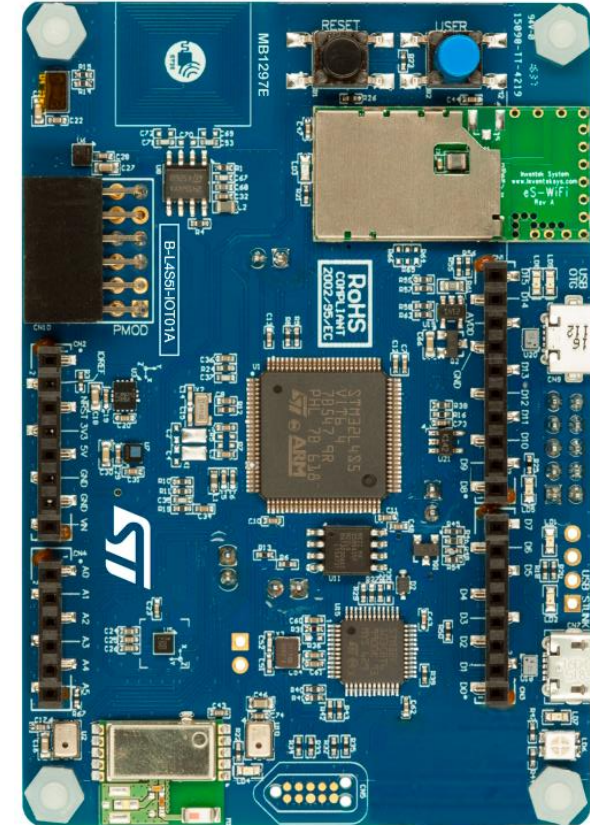
# STM32L4 Discovery Board for IoT node (B-L4S5I-IOT01A)

## Hardware Overview

The STM32L4+ Discovery kit for the IoT node (B-L4S5I-IOT01A) allows users to develop applications with direct connection to cloud servers. The STM32L4+ Discovery kit enables a wide diversity of applications by exploiting low-power multilink communication (BLE, Sub- GHz), multiway sensing (detection, environmental awareness) and ARM® Cortex®-M4 core-based STM32L4 Series features. Arduino™ Uno V3 and PMOD connectivity provide unlimited expansion capabilities with a large choice of specialized add-on boards.

### Key Product on board

- Ultra-low-power STM32L4 Series MCUs based on ARM® Cortex® -M4+ core with 2 Mbytes of Flash memory and 640 Kbytes of SRAM, in LQFP100 package
- Bluetooth® V4.1 module (SPBTLE-RF)
- Sub-GHz (868 or 915 MHz) low-power-programmable RF module (SPSGRF-868 or SPSGRF-915)
- Wi-Fi® module Inventek ISM43362-M3G-L44 (802.11 b/g/n compliant)
- Dynamic NFC tag based on M24SR with its printed NFC antenna
- 2 digital omnidirectional microphones (MP34DT01)
- Capacitive digital sensor for relative humidity and temperature (HTS221)
- High-performance 3-axis magnetometer (LIS3MDL), 3D accelerometer and 3D gyroscope (LSM6DSL), 260-1260 hPa absolute digital output barometer (LPS22HB), Time-of-Flight and gesture-detection sensor (VL53L0X)
- USB OTG FS with Micro-AB connector
- Expansion connectors: Arduino™ Uno V3, PMOD
- Flexible power-supply options: ST LINK USB VBUS or external sources
- On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, virtual COM port and debug port



Latest info available at  
[www.st.com/B-L4S5I-IOT01A](http://www.st.com/B-L4S5I-IOT01A)



# FP-CLD-AWS1

## Software Overview

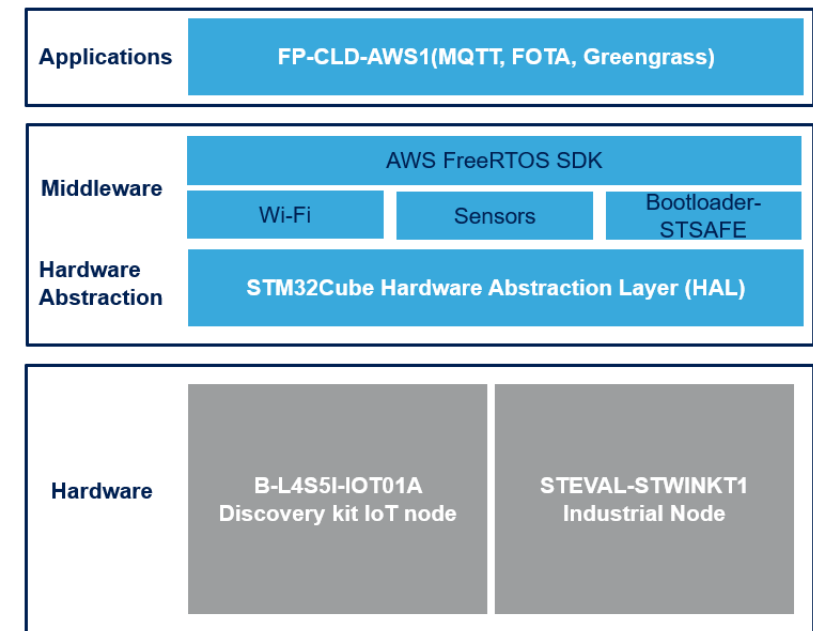
## Software Description

The FP-CLD-AWS1 is an STM32Cube Function Pack. Thanks to this package you can directly connect your IoT sensor node to Amazon AWS IoT, transmit sensors data and receive command from Cloud applications.

## Key features

- Three Key AWS Demo Application: MQTT, OTA and Greengrass Device Discovery.
- A Web Dashboard running on Amazon AWS services for Sensor data Telemetry Application.
- Integrated X-CUBE-SBSFU and the STSAFE-A110 to implement a Secure Boot and a Secure Firmware Update solution.
- Middleware libraries featuring the Amazon AWS FreeRTOS software development kit, Wi-Fi, and transport-level security (mbedTLS)
- Complete firmware to safely connect an IoT node with sensors to Amazon AWS IoT using Wi-Fi communication technology
- Ready-to-use binaries to connect the IoT node to the web dashboard
- Sample implementations available for STM32L4+ Discovery Kit for IoT node (B-L4S5I-IOT01A), and for STEVAL-STWINKT1B Industrial node.
- Easy portability across different MCU families, thanks to STM32Cube
- Based on STM32Cube software development environment for STM32 microcontrollers
- Free, user-friendly license terms

### Overall Software Architecture



## **2- Setup & Demo Examples: STEVAL-STWINKT1B & B-L4S5I-IOT01A**

# HW prerequisites for STEVAL-STWINKT1B

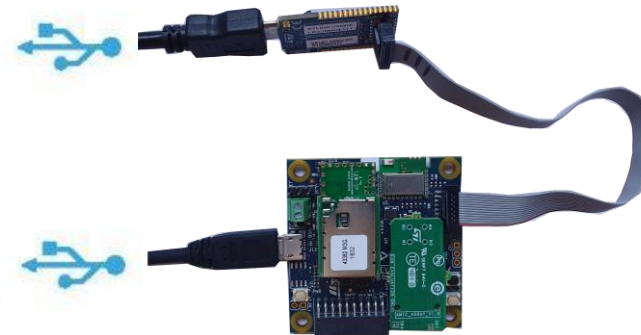
- 1x STEVAL-STWINKT1B development board
- Laptop/PC with Windows 7, 8 or 10
- 2x microUSB cables
- Wi-Fi Router or access to a Wi-Fi network



STEVAL-STWINKT1B



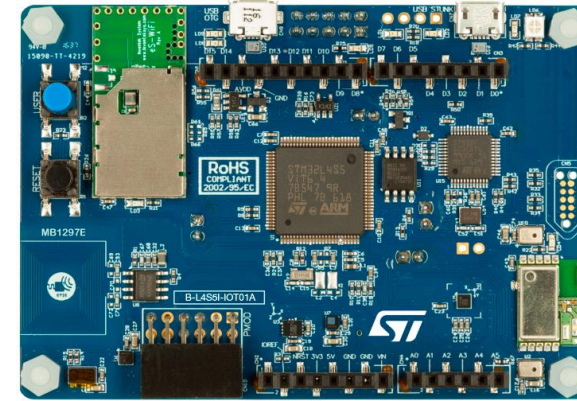
MicroUSB Cable





# HW prerequisites for B-L4S5I-IOT01A

- 1x B-L4S5I-IOT01A development board
- Laptop/PC with Windows 7, 8 or 10
- 1x microUSB cables
- Wi-Fi Router or access to a Wi-Fi network



B-L4S5I-IOT01A



MicroUSB Cable

# Software and other prerequisites

- **STM32CubeProgrammer Software**

- Download and install [STM32CubeProgrammer](#)

- **FP-CLD-AWS1**

- Download FP-CLD-AWS1 package from [www.st.com](http://www.st.com), copy the .zip file content into a folder on your PC. The package contains binaries and source code with project files (IAR, STM32CubeIDE) based on B-L4S5I-IOT01A and STEVAL-STWINKT1B

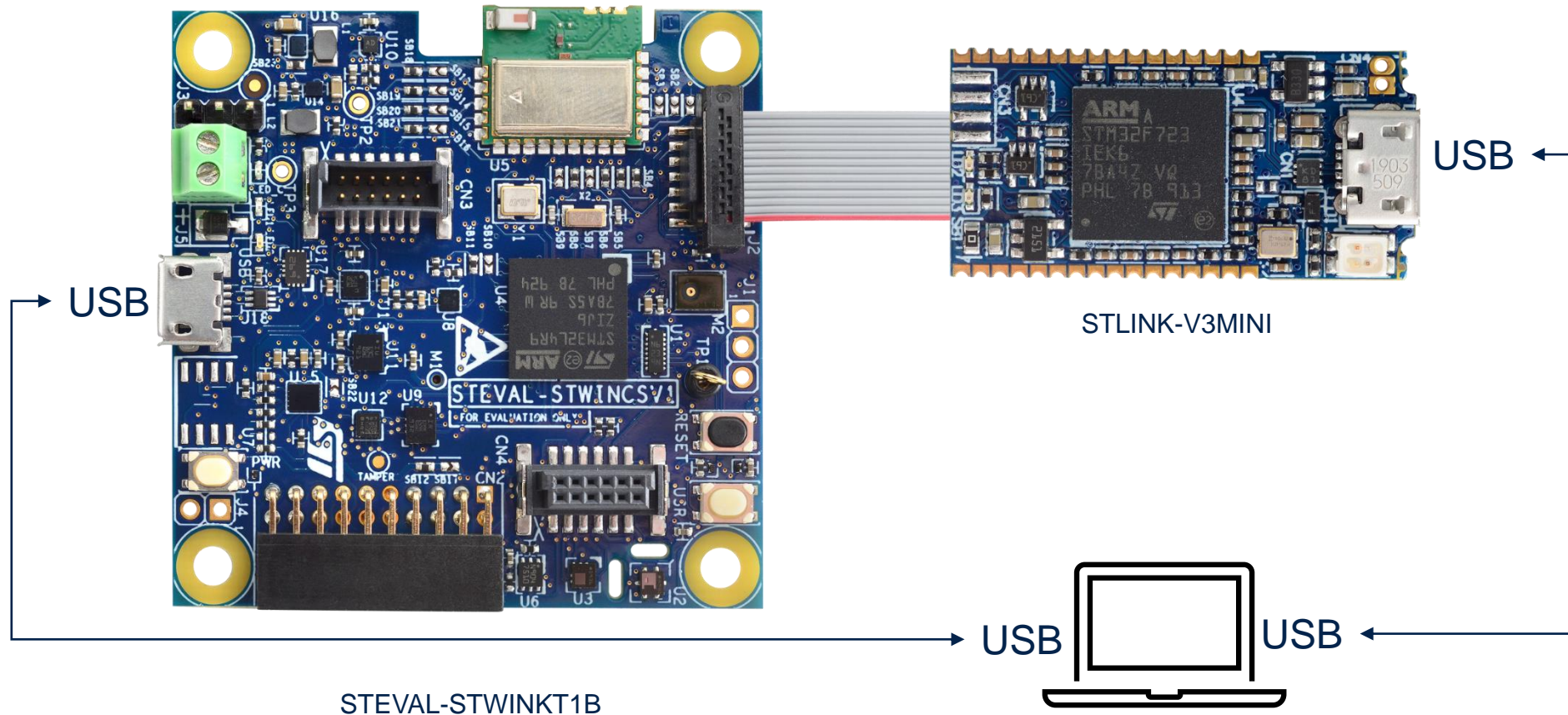
- **Serial line monitor, e.g. TeraTerm (<https://ttssh2.osdn.jp/>)**

- **Chrome web browser (<https://www.google.com/chrome/> ); tested with Chrome version v83.0.4103.61.**

## **2.1- Provision the Device STEVAL-STWINKT1B**

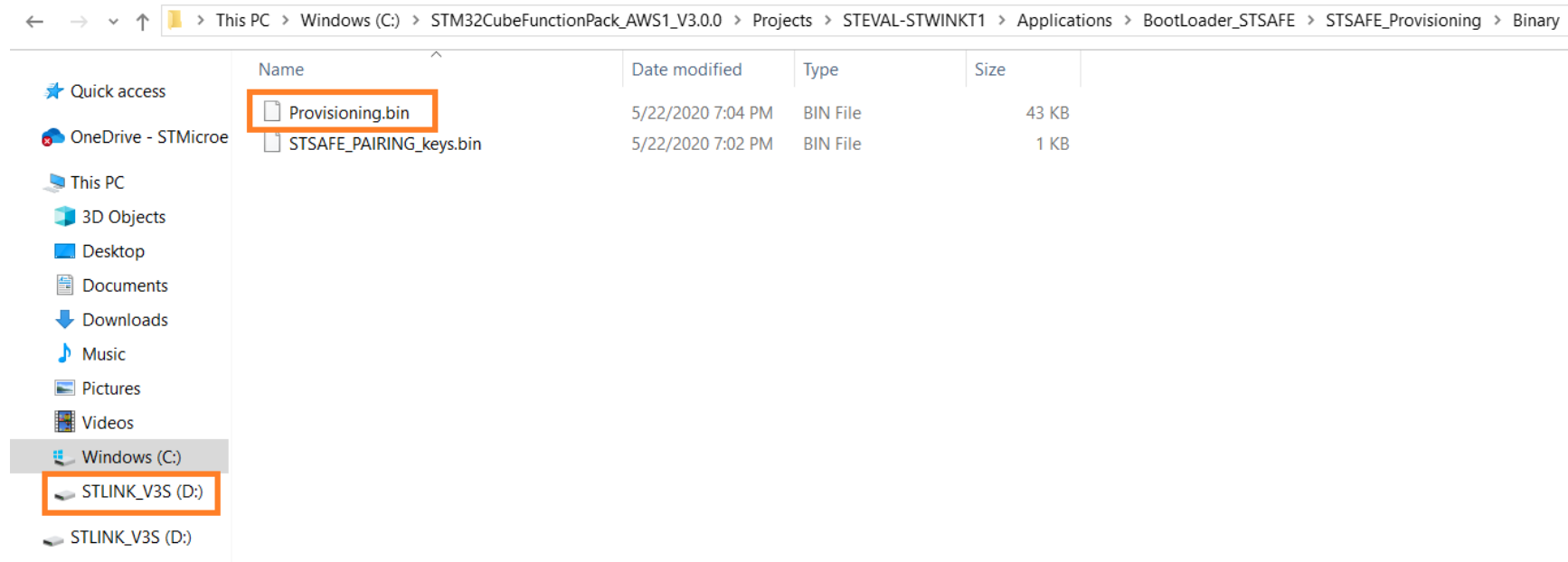
# Connect STEVAL-STWINKT1B To PC

- Connect STEVAL-STWINKT1B USB micro port to PC using USB micro cable
- Connect STEVAL-STWINKT1B J2 Connector (14 pin) to STLINK-V3MINI debug port and debugger USB to laptop USB.



# Flash the Provisioning FW

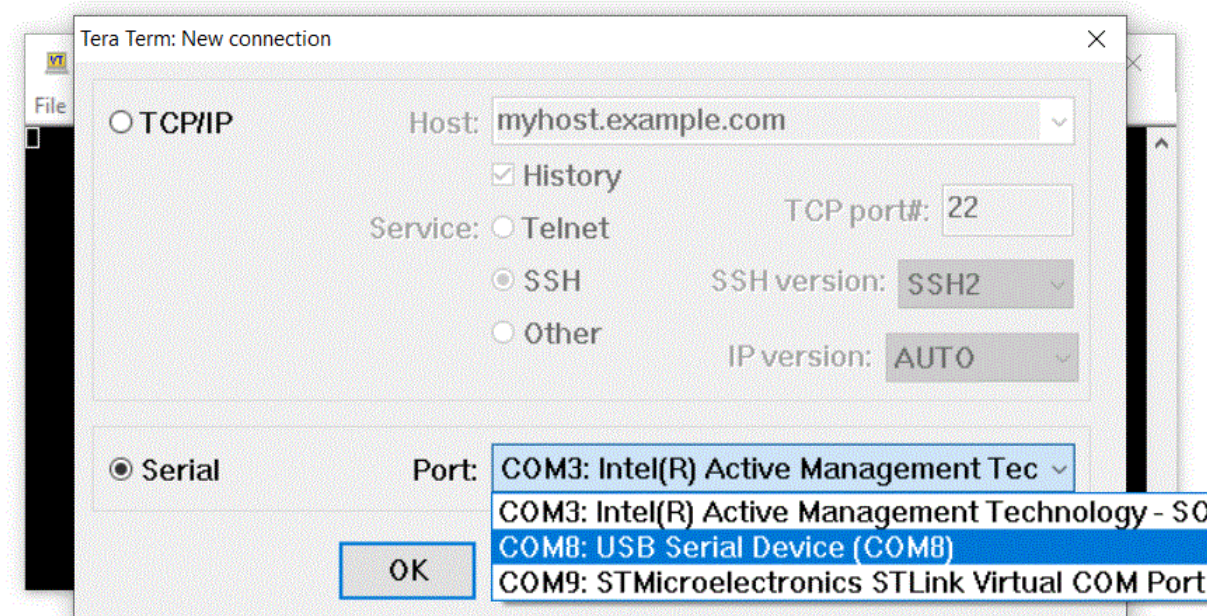
- Provisioning binary is provided in the folder:
  - Projects\STEVAL-STWINKT1\Applications\BootLoader\_STSAFE\STSAFE\_Provisioning\Binary\Provisioning.bin
- Program the FW to the board.
  - Use STM32CubeProgrammer to flash the Binary
  - Paste the binary to STLINK USB Drive (STLINK\_V3S) visible in Windows Explorer to flash the device





# Run FW and Connect a Terminal to STWIN

- Reset the board pressing Black Button and Run the FW.
- Open *Tera Term*, select *Serial*, select the *USB Serial Device* and click *OK*.
  - *Caution: Do NOT select STMicroelectronics STLink Virtual COM Port*
- Configure New-line (Rx:AUTO/Tx:CR+LF) and enable local echo in Terminal configuration (**Setup** → **Terminal** in TeraTerm).





# Complete the Provisioning

- Press user button (white) to start provisioning
- Get the Provisioning complete message on Screen

```
COM14 - Tera Term VT
File Edit Setup Control Window Help

-----
Start provisioning of STSAFE-A
Force STSAFE-A provisioning
Launching STSAFE-A provisioning
Check if Pairing Host keys available
Provisioning OK

Erase Data : OK

Now Store Certificate STM_POC_SBSFU_ROOT_TEST_CA_00 inside STSAFE
Certificate STM_POC_SBSFU_ROOT_TEST_CA_00 successfully written inside STSAFE
Now Store Data using HAL_Store_Data

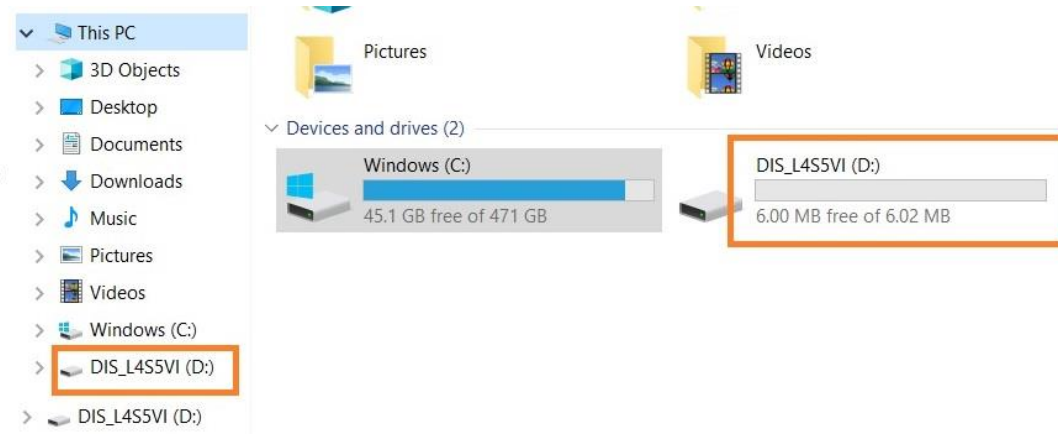
Now Store Certificate STM_POC_SBSFU_OEM_TEST_CA_00 inside STSAFE
Certificate STM_POC_SBSFU_OEM_TEST_CA_00 successfully written inside STSAFE

End provisioning of STSAFE
█
```

## **2.2- Provision the Device B-L4S5I-IOT01A**

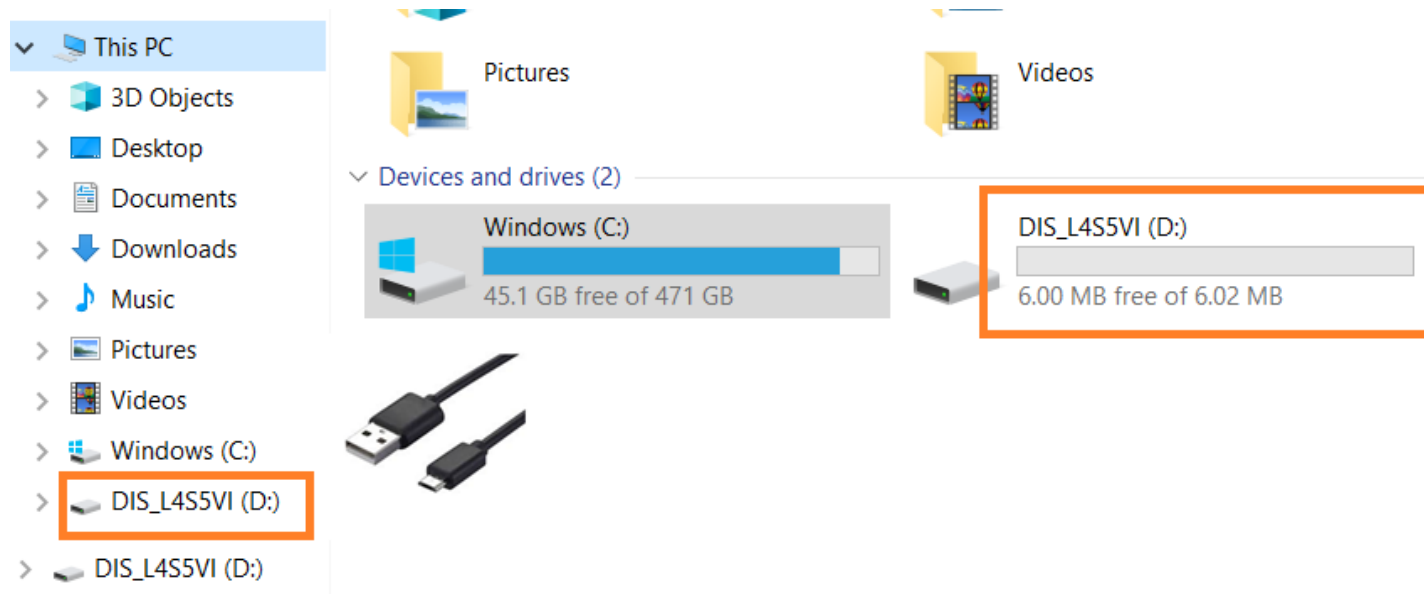
# Connect B-L4S5I-IOT01A To PC

- Connect the board (B-L4S5I-IOT01A) to your laptop using USB micro cable



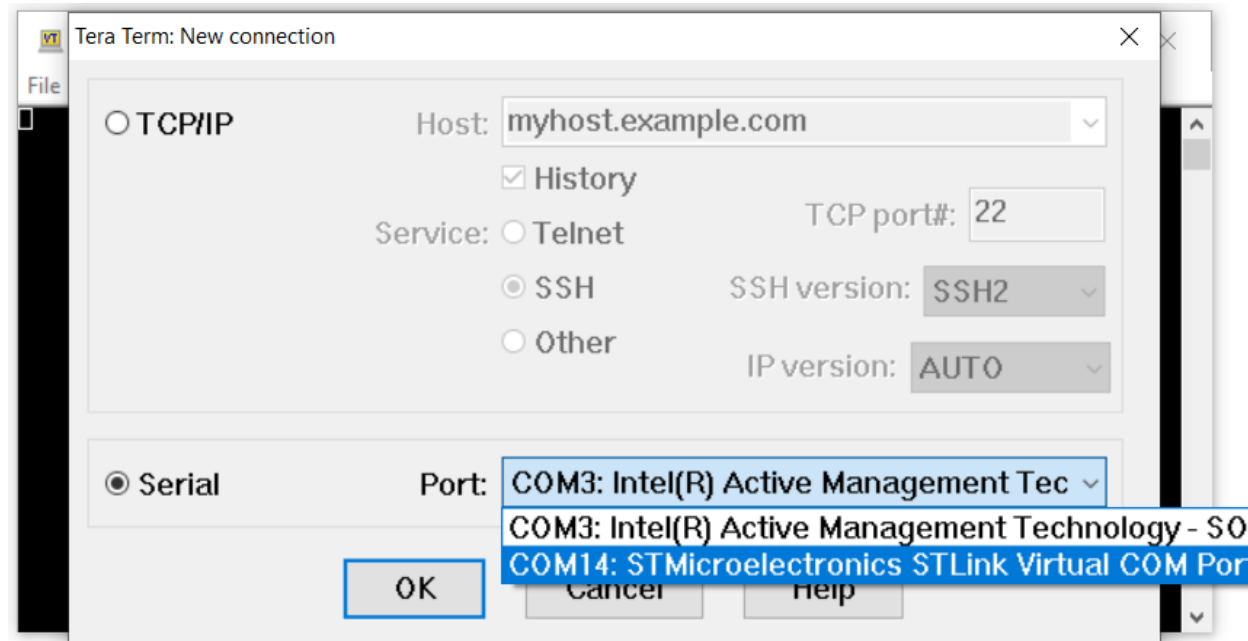
# Flash the Provisioning FW

- Provisioning binary is provided in the folder:
  - Projects\B-L4S5I-IOT01A\Applications\BootLoader\_STSAFE\STSAFE\_Provisioning\Binary\Provisioning.bin
- Program the FW to the board.
  - Use STM32CubeProgrammer to flash the Binary
  - Paste the binary to STLINK USB Drive (DIS\_L4S5VI) visible in Windows Explorer to flash the device



# Connect a Terminal to B-L4S5I-IOT01A and Run FW

- Open *Tera Term*, select *Serial*, select STMicroelectronics STLink Virtual COM Port
- Configure New-line (Rx:AUTO/Tx:CR+LF) and enable local echo in Terminal configuration (**Setup** → **Terminal** in TeraTerm).
- Reset the board pressing Black Button and Run the FW.



# Complete the Provisioning

- Get the Provisioning complete message on Screen

```
COM14 - Tera Term VT
File Edit Setup Control Window Help

-----
Start provisioning of STSAFE-A
Force STSAFE-A provisioning
Launching STSAFE-A provisioning
Check if Pairing Host keys available
Provisioning OK
Erase Data : OK

Now Store Certificate STM_POC_SBSFU_ROOT_TEST_CA_00 inside STSAFE
Certificate STM_POC_SBSFU_ROOT_TEST_CA_00 successfully written inside STSAFE
Now Store Data using HAL_Store_Data

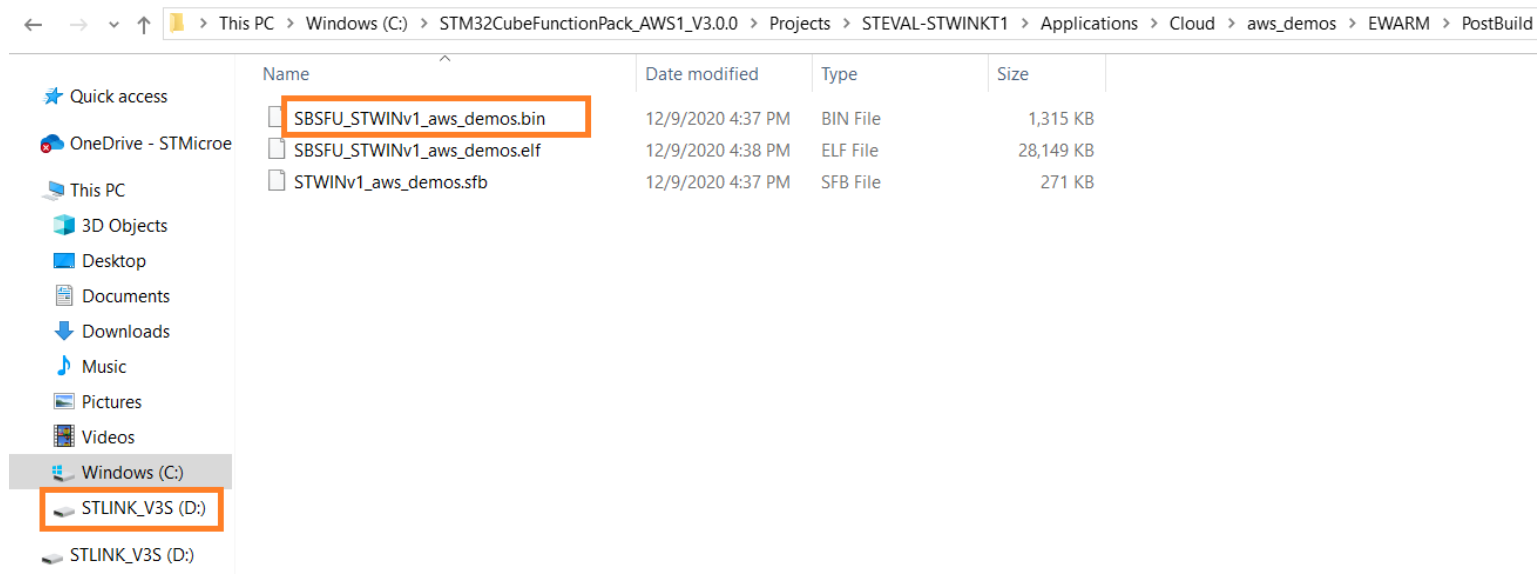
Now Store Certificate STM_POC_SBSFU_OEM_TEST_CA_00 inside STSAFE
Certificate STM_POC_SBSFU_OEM_TEST_CA_00 successfully written inside STSAFE
End provisioning of STSAFE
█
```



## **2.3- Register the Device to ST Dashboard**

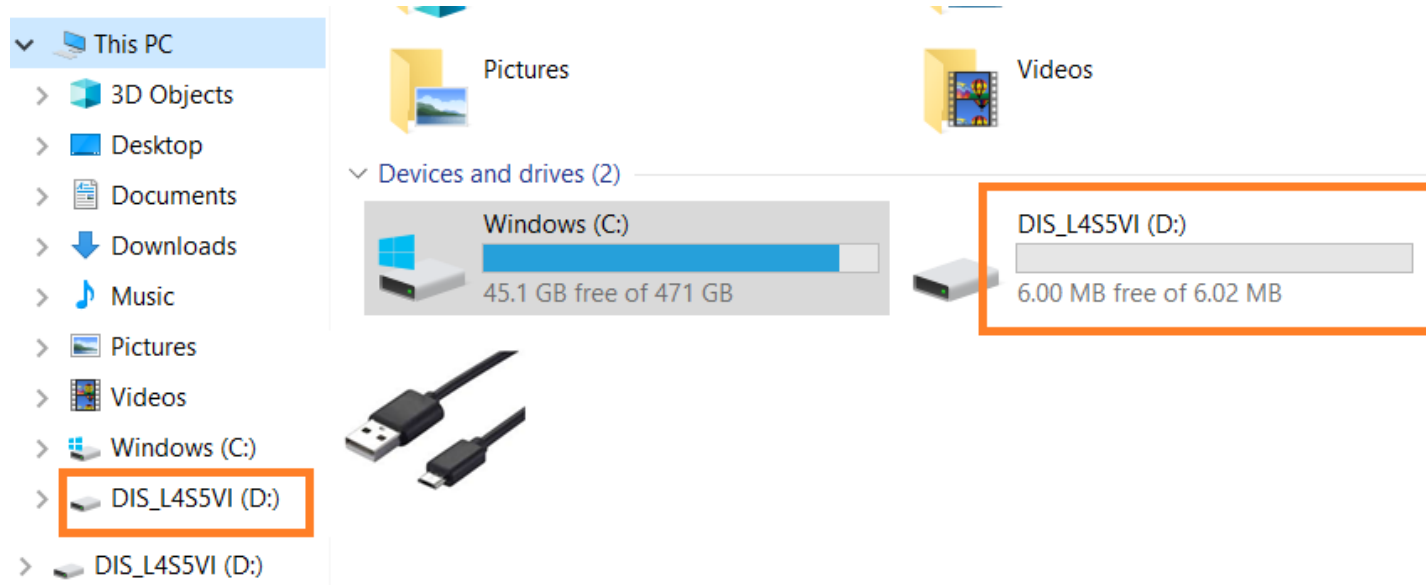
# Run AWS application on Device: STEVAL-STWINKT1B

- Keep the board (USB and Debug) connected to your PC and Tera Term open
- AWS Application Binary is provided in the folder:
  - Projects\STEVAL-STWINKT1\Applications\Cloud\aws\_demos\EWARM\PostBuild\SBSFU\_STWINv1\_aws\_demos.bin
- Program the FW to the board.
  - Use STM32CubeProgrammer to flash the Binary
  - Paste the binary to STLINK USB Drive (STLINK\_V3S) visible in Windows Explorer to flash the device

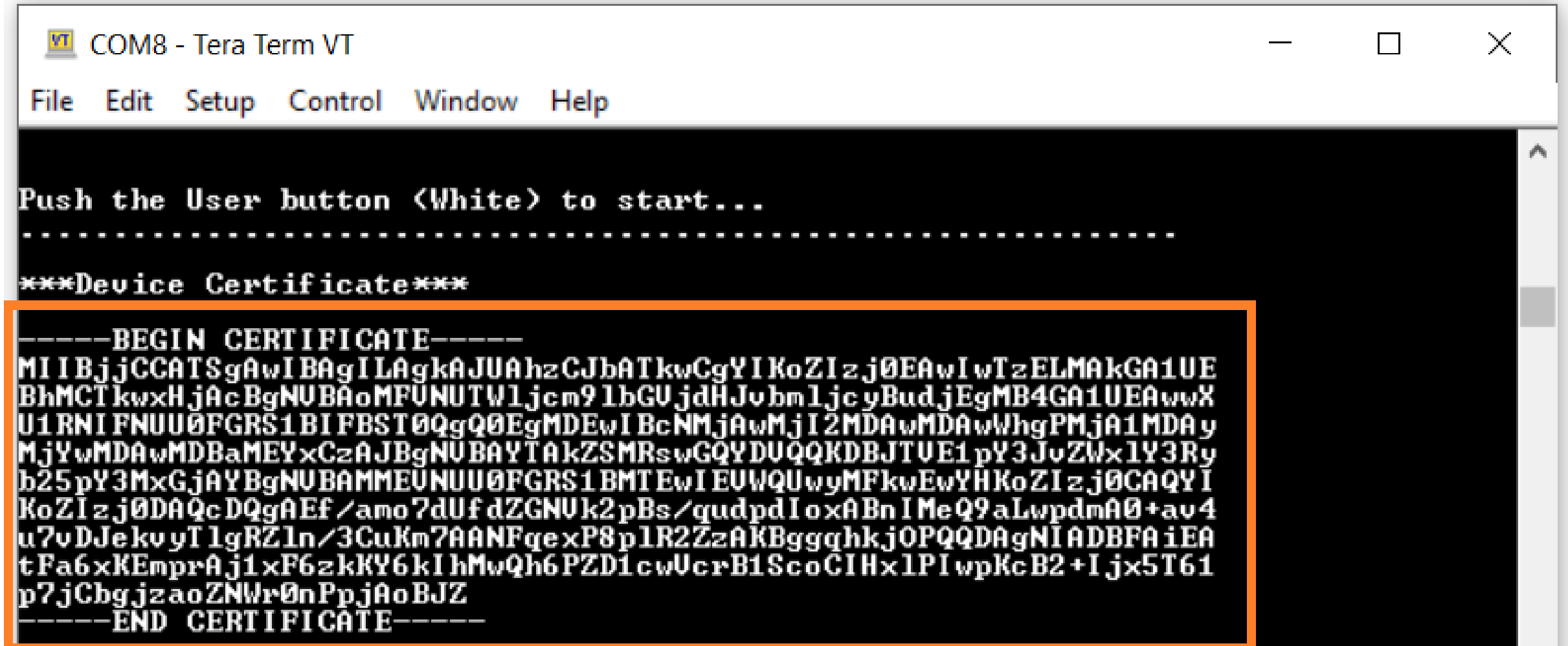


# Run AWS application on Device: B-L4S5I-IOT01A

- Keep the board (USB) connected to your PC and Tera Term open
- AWS Application Binary is provided in the folder:
  - Projects\B-L4S5I-IOT01A\Applications\Cloud\aws\_demos\EWARM\PostBuild\SBSFU\_B-L4S5I-IOT01\_aws\_demos.bin
- Program the FW to the board.
  - Use STM32CubeProgrammer to flash the Binary
  - Paste the binary to STLINK USB Drive (DIS\_L4S5VI) visible in Windows Explorer to flash the device



# Copy Device Cert from the terminal



The image shows a screenshot of a Tera Term VT terminal window. The title bar reads "COM8 - Tera Term VT". The menu bar includes "File", "Edit", "Setup", "Control", "Window", and "Help". The terminal output displays instructions to push a button and then shows a device certificate. The certificate text is highlighted with an orange border.

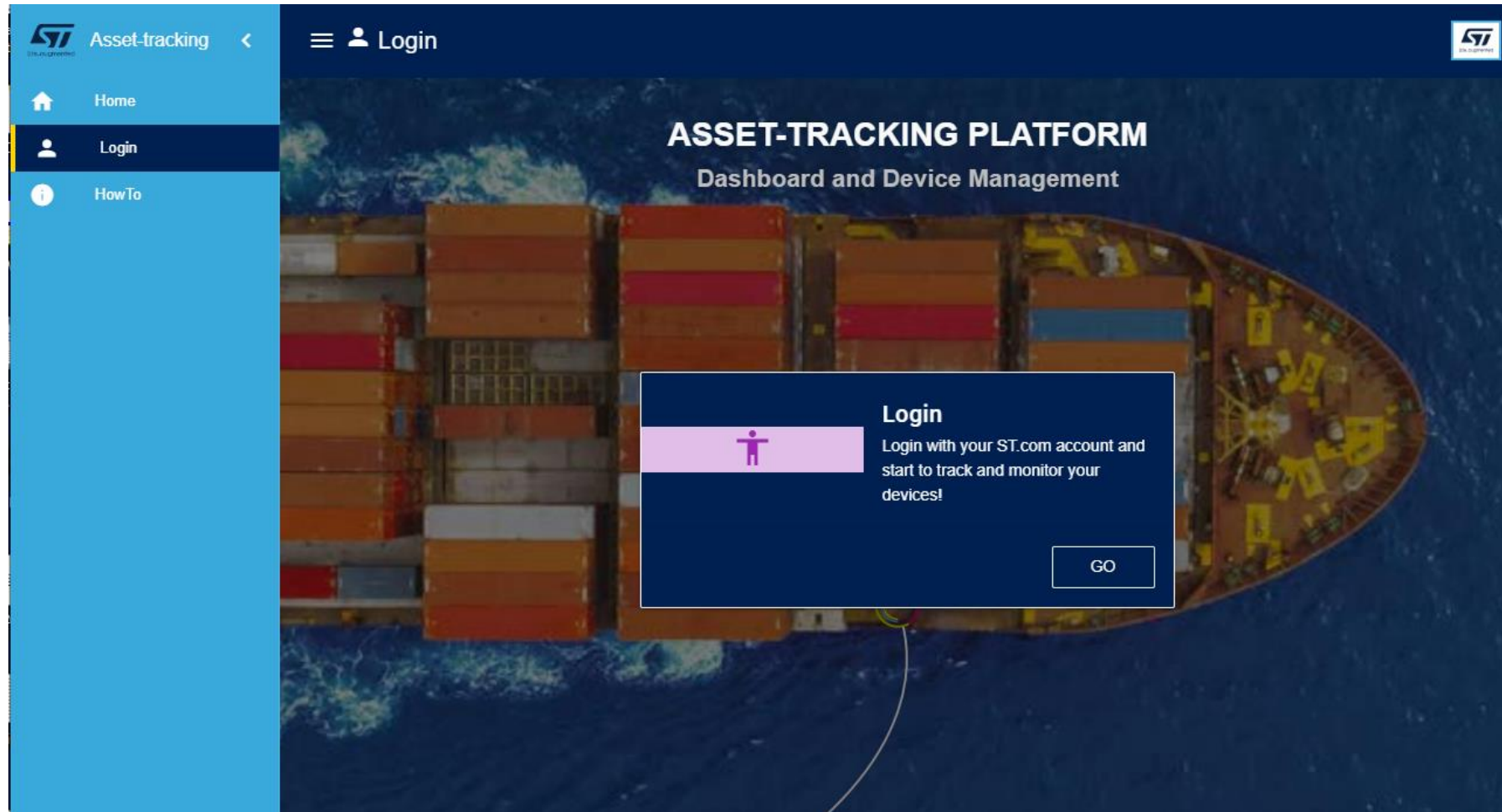
```
COM8 - Tera Term VT
File Edit Setup Control Window Help

Push the User button <White> to start...
.....

***Device Certificate***

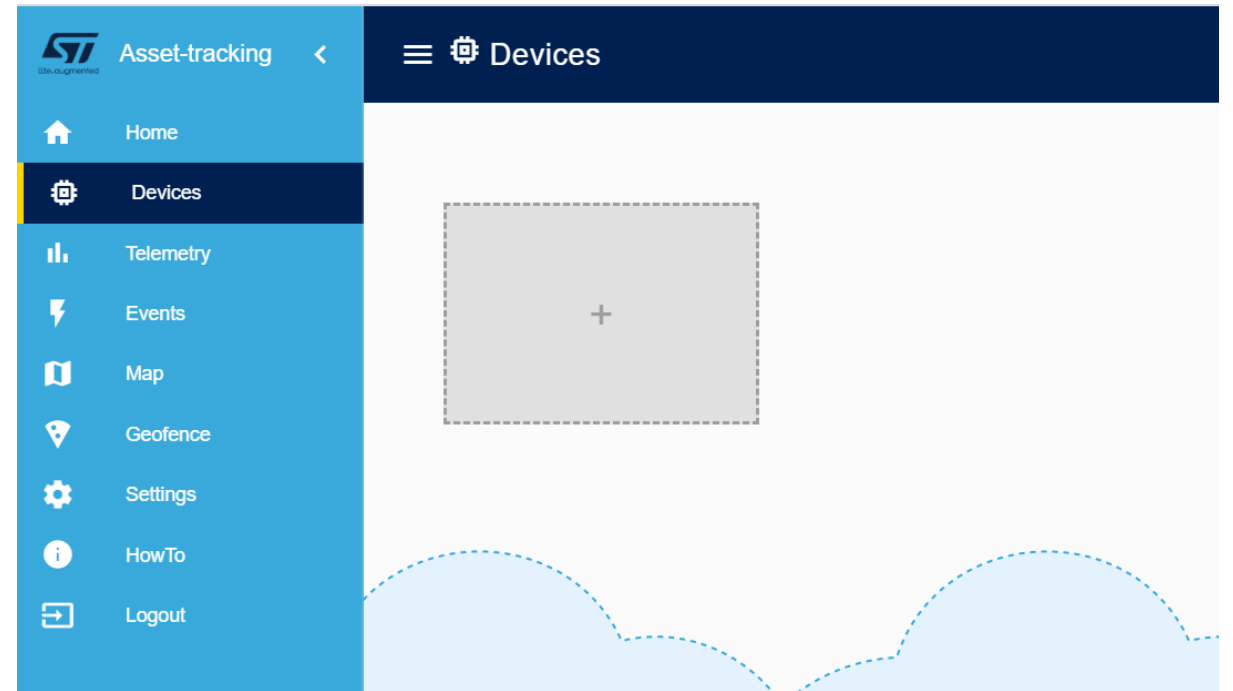
-----BEGIN CERTIFICATE-----
MIIBjjCCATSgAwIBAgILAgkAJUAhzCJbATkwCgYIKoZIzj0EAwIwIzELMAkGA1UE
BhMCTkwuHjAcBgNVBAoMFUNUTVljbcm91bGUjdHJvbm1jc3BudjEgMB4GA1UEAwwX
U1RNIENUNU0FGRS1BIFBST0QgQ0EgMDEwIENMjAwMjI2MDAwMDAwWhgPMjA1MDAy
MjYwMDAwMDEyMEYxMzA1BgNVBAYTAkZSMRswGQYDUQgKDBJTUE1pY3JuZWx1Y3Ry
b25pY3MxGjAyBgNVBAMMEUNUNU0FGRS1BMTUEwIENUNU0FGRS1BMTUEwIENUNU0FGRS1
KoZIzj0DAQcDQgAEf/amo7dUfdZGNUk2pBs/gudpdIoxABnImeQ9aLwpmA0+av4
u7vDJEkvyTlgRZln/3CuKm7AANFgexP8p1R2ZzAKBggqhkhjOPQQDAgNIADBFAiEA
tFa6xKEmprAj1xF6zkKY6kIhMwQh6PZD1cwUcrB1ScoCIHx1PIwpKcB2+Ijx5T61
p7jChgjzaoZNR0nPPjAoBJZ
-----END CERTIFICATE-----
```

# Signup and Signin to <https://dsh-assettracking.st.com>



# Enroll new device in Dashboard by clicking + sign

- Go to Devices in Left Panel, then on Right Panel click on “+” sign to enter data for new device.





# Enter New Device Parameters

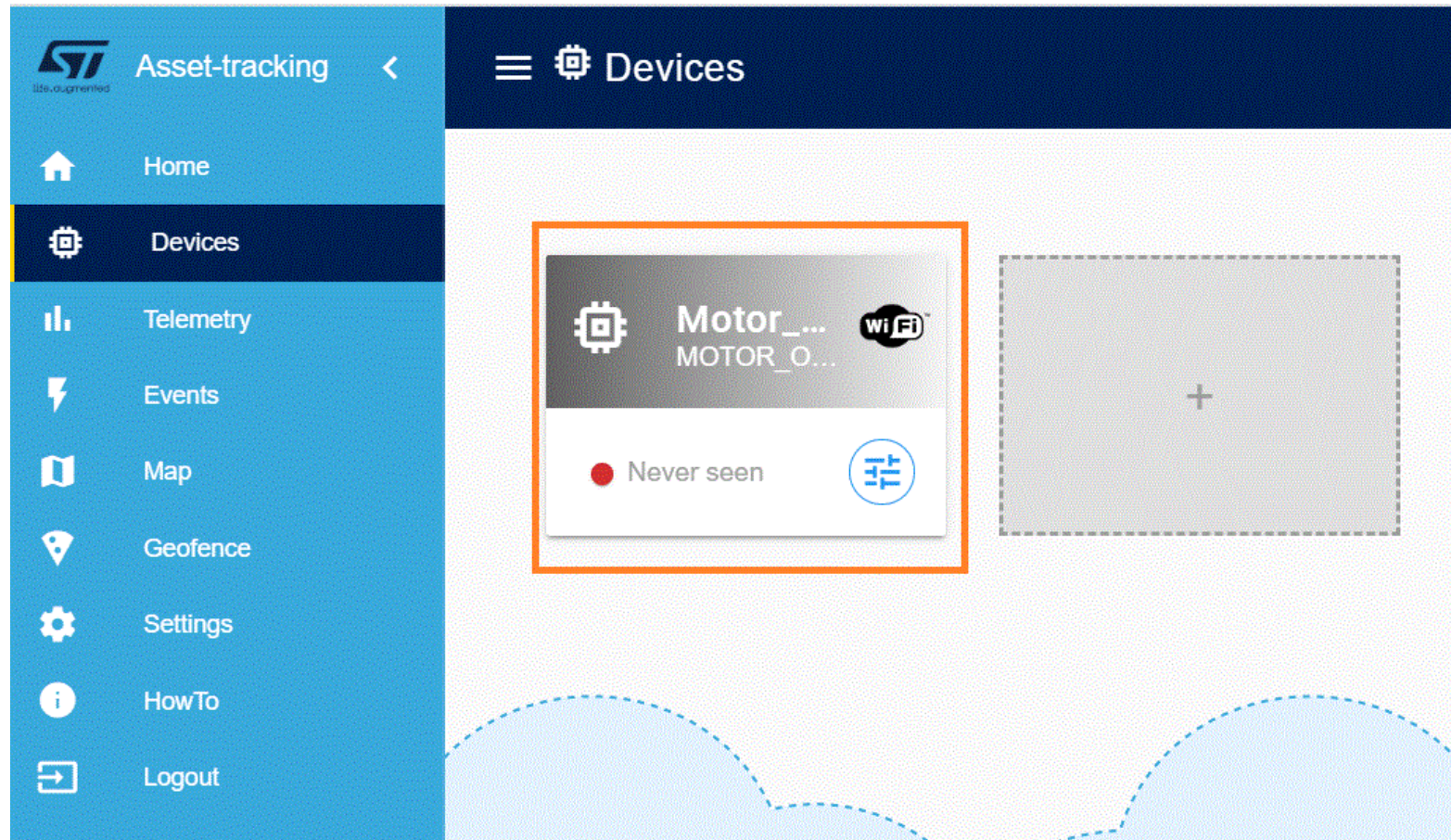
- Enroll the new device in Dashboard with
  - a descriptive name to your device as Custom name
  - A string as Device ID
  - Select Technology: Wi-Fi.
  - Select Multi-Account device registration and Paste the Device Certificate copied from Terminal into Certificate PEM string edit box.
  - Finally Click submit to create the thing in Dashboard

The screenshot shows a 'New device' form with the following fields and options:

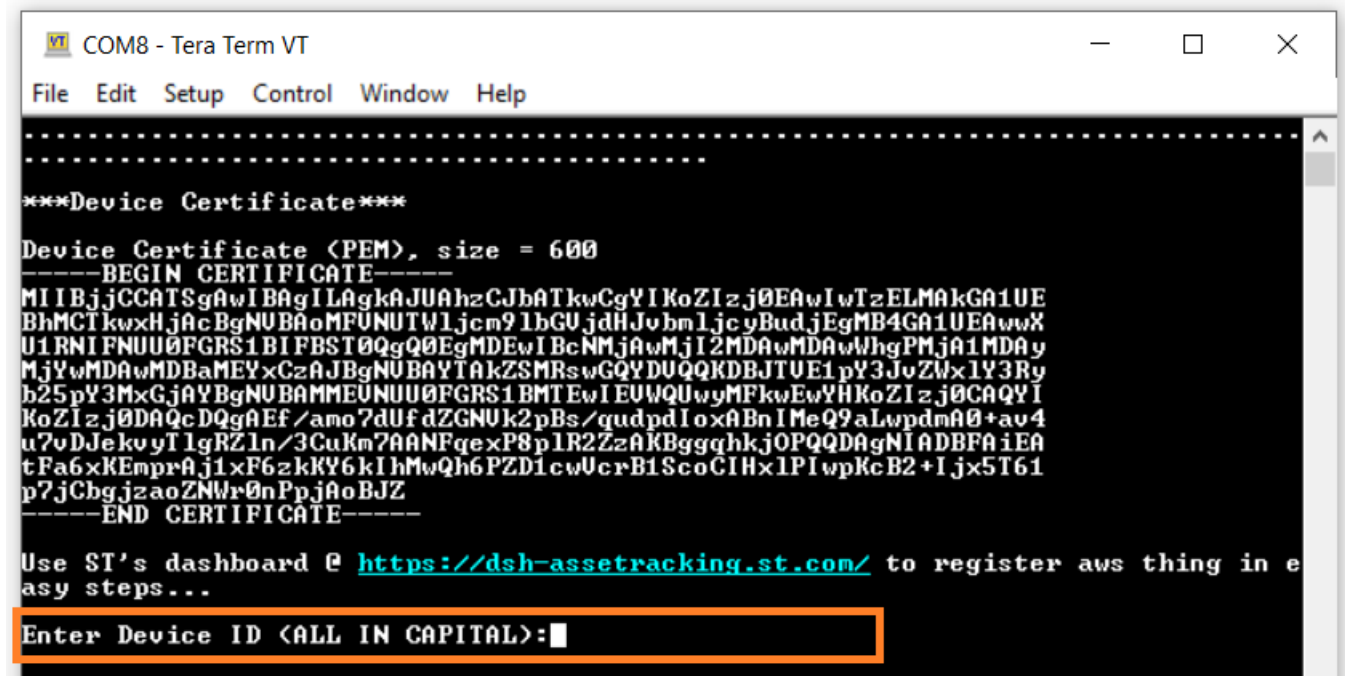
- Custom name:** A text input field with a character count of 0 / 16.
- Device ID:** A text input field with a character count of 0 / 19.
- It's a MAC address:** A toggle switch, currently turned off, highlighted with an orange box.
- Technology:** A list of radio button options: WiFi (selected and highlighted with an orange box), LTE - Cellular, LoRa (TTN), Sigfox, Bluetooth Low Energy, and NFC.
- Connection credentials:** Two radio button options: Create new device certificate and key, and Multi-account device registration (selected and highlighted with an orange box).
- Certificate PEM string:** A large text area for pasting the certificate, highlighted with an orange box.
- Buttons:** At the bottom right, there are three buttons: CLOSE, RESET, and SUBMIT (highlighted with an orange box).

# Device Enroll Success

After the board is registered, a new icon appears in device list



# Enter newly generated Device ID into terminal



```
COM8 - Tera Term VT
File Edit Setup Control Window Help
.....
***Device Certificate***
Device Certificate (PEM), size = 600
-----BEGIN CERTIFICATE-----
MIIBjJCCATSgAwIBAgILAgkAJUAhzCJbATkwCgYIKoZIzj0EAwIwTzELMAkGA1UE
BhMCTkwuHjAcBgNUBAoMFUNUTWljcm91bGUjdHJvbm1jc3YudjEgMB4GA1UEAwX
U1RNIENFUU0FGRS1BIFBSt0QgQ0EgMDEwIENMjAwMjI2MDAwMDAwWhgPMjA1MDAy
MjYwMDAwMDBaMEYxCzAJBgNUBAYTAkZSMRswGQYDUQAKDBJTUE1pY3JoZWx1Y3Ry
b25pY3MxGjAYBgNUBAMMEU0FGRS1BMTExwIENWQUwYMFkwEwYHKoZIzj0CAQYI
KoZIzj0DAQcDQgAEf/amo7dUfdZGNOk2pBs/qudpdIoXABnIMeQ9aLwpdmA0+av4
u7vDJEkvyTlgRZln/3CuKm7AANFqexP8pLR2ZzAKBggqhkJOPQQDAgNIADBFAIEA
tFa6xKEmpRaj1xF6zkKY6kIHmWqh6PZD1cwUcrB1ScoCIHx1PIwpKcB2+Ijx5T61
p7jCbgjzaoZNR0nPPjAoBJZ
-----END CERTIFICATE-----
Use ST's dashboard @ https://dsh-assettracking.st.com/ to register aws thing in e
asy steps...
Enter Device ID (ALL IN CAPITAL):
```

# Configure Wi-Fi parameters

Use ST's dashboard @ <https://dsh-assettracking.st.com/> to register aws thing in easy steps...

Enter Device ID <ALL IN CAPITAL>:STWIN120320

read: --->  
STWIN120320  
<---

Stored Device ID => STWIN120320

\*\*\* Wi-Fi Setup \*\*\*

Your WiFi parameters need to be entered to proceed.

Enter SSID:

\*\*\* Wi-Fi Setup \*\*\*

Your WiFi parameters need to be entered to proceed.

Enter SSID: NETGEAR65  
You have entered NETGEAR65 as the ssid.

Enter Security Mode <0 - Open, 1 - WEP, 2 - WPA, 3 - WPA2>:

\*\*\* Wi-Fi Setup \*\*\*

Your WiFi parameters need to be entered to proceed.

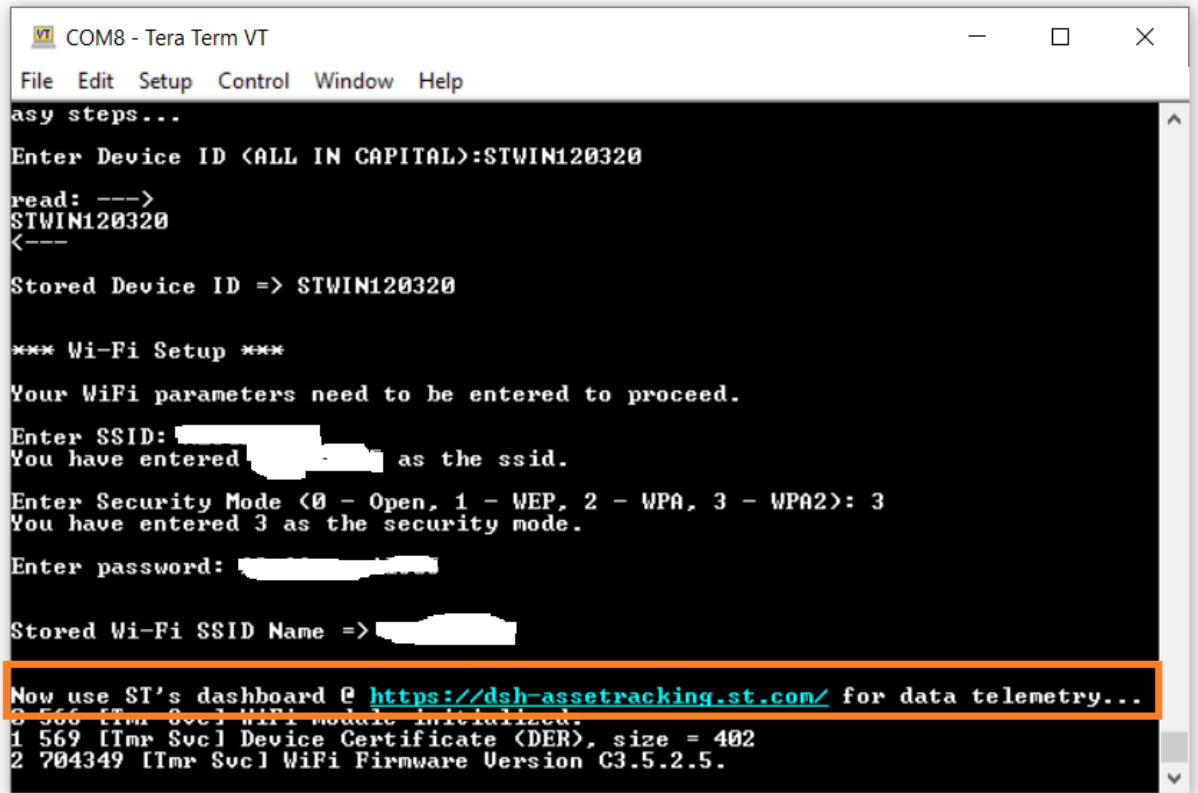
Enter SSID: NETGEAR65  
You have entered NETGEAR65 as the ssid.

Enter Security Mode <0 - Open, 1 - WEP, 2 - WPA, 3 - WPA2>: 3  
You have entered 3 as the security mode.

Enter password:

# Demonstration Application Starts

- Device Configuration is complete.
- Device will connect to network and publish data.
- Go to ST's Dashboard to see the published data



The screenshot shows a Tera Term VT window titled "COM8 - Tera Term VT". The window contains a series of text prompts and user inputs for configuring a device. The text is as follows:

```
easy steps...
Enter Device ID <ALL IN CAPITAL>:STWIN120320
read: ---->
STWIN120320
<----
Stored Device ID => STWIN120320

*** Wi-Fi Setup ***

Your WiFi parameters need to be entered to proceed.

Enter SSID: [redacted]
You have entered [redacted] as the ssid.

Enter Security Mode <0 - Open, 1 - WEP, 2 - WPA, 3 - WPA2>: 3
You have entered 3 as the security mode.

Enter password: [redacted]

Stored Wi-Fi SSID Name => [redacted]

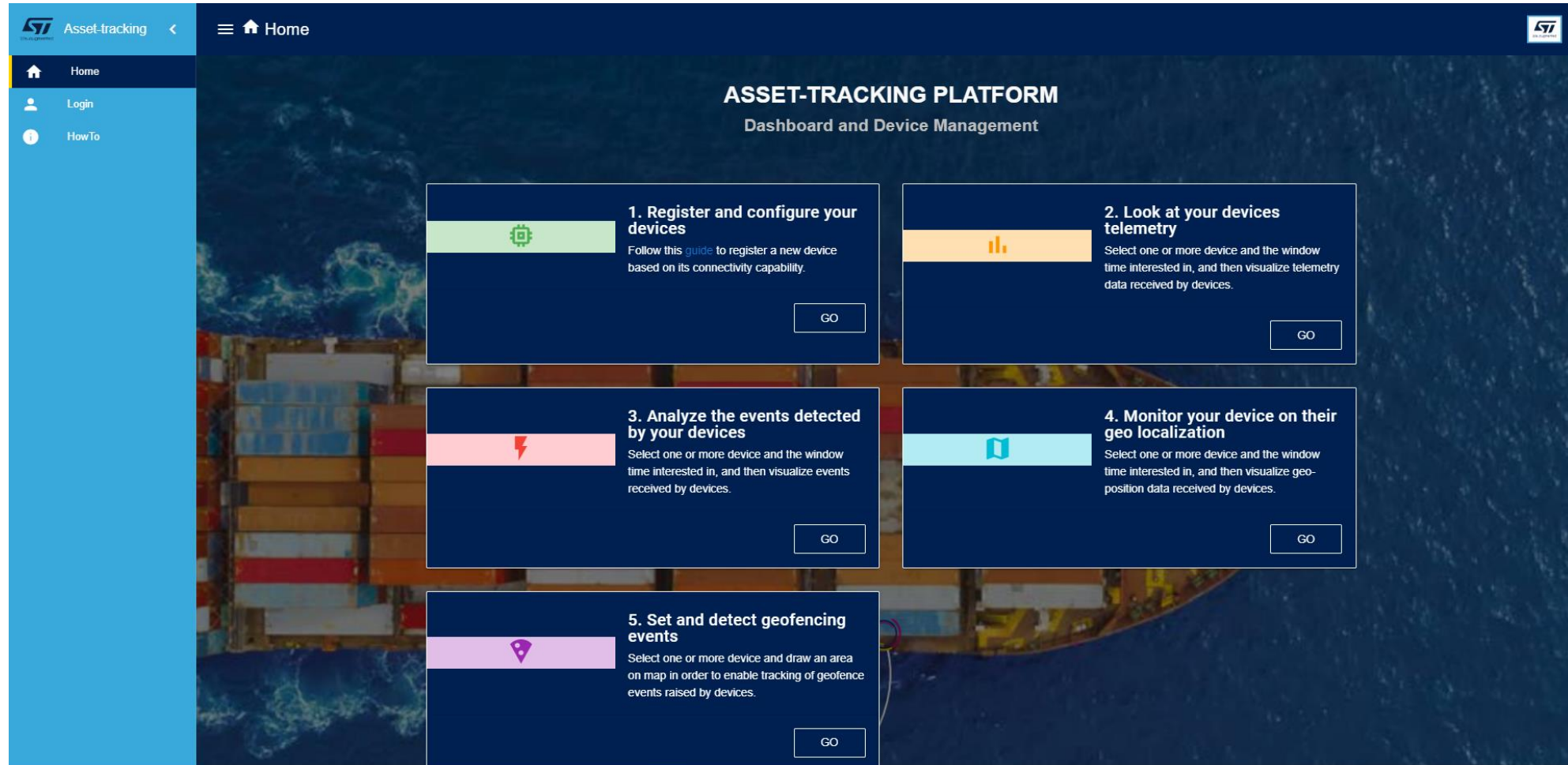
Now use ST's dashboard @ https://dsh-assettracking.st.com/ for data telemetry...
0 568 [Tmr Svc] WiFi module initialized.
1 569 [Tmr Svc] Device Certificate <DER>, size = 402
2 704349 [Tmr Svc] WiFi Firmware Version C3.5.2.5.
```

The line "Now use ST's dashboard @ <https://dsh-assettracking.st.com/> for data telemetry..." is highlighted with an orange border.

## **2.4- Stream Device data to ST Dashboard**



# Return to ST Dashboard to see Sensors Data

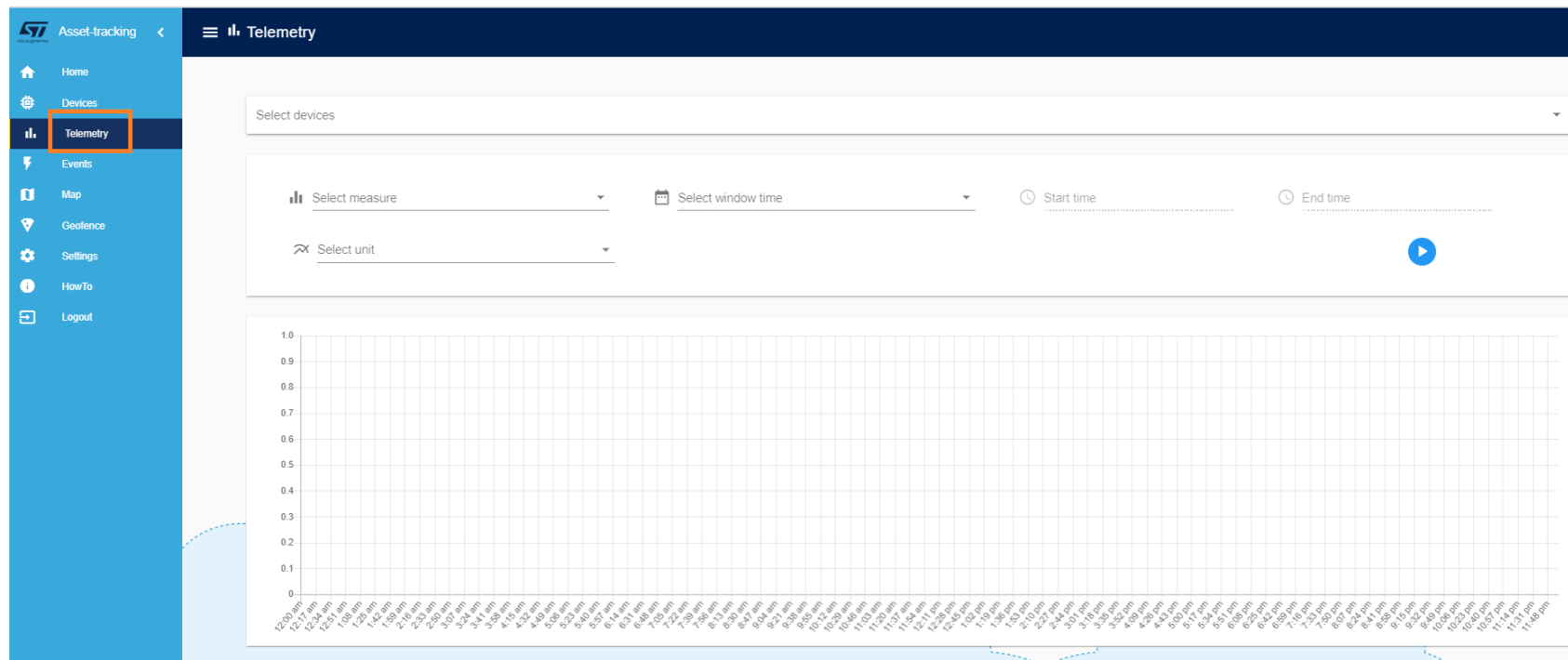


The screenshot displays the ST Asset-tracking dashboard. The top navigation bar includes the ST logo, 'Asset-tracking', and a home icon. A left sidebar contains links for Home, Login, and HowTo. The main content area is titled 'ASSET-TRACKING PLATFORM' and 'Dashboard and Device Management'. It features five numbered steps, each with an icon, a title, a description, and a 'GO' button:

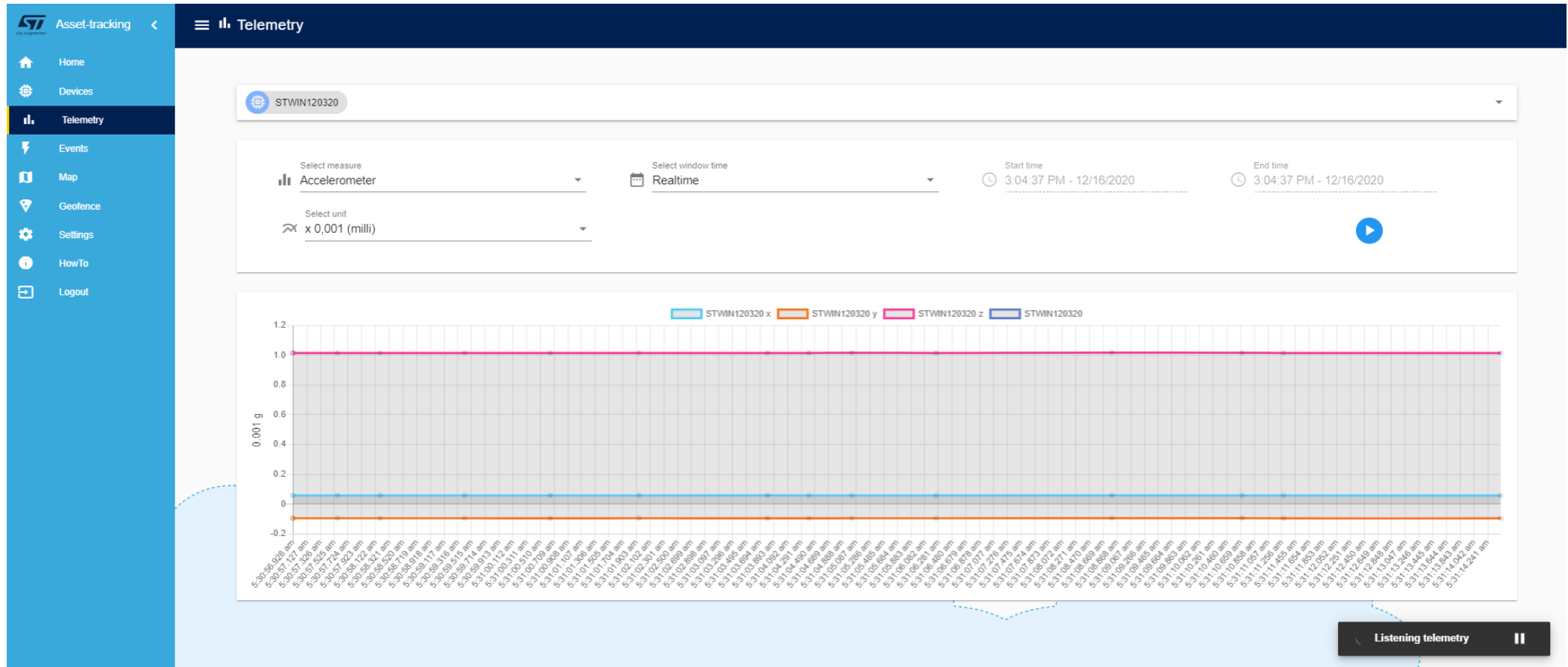
- 1. Register and configure your devices** (Green gear icon): Follow this [guide](#) to register a new device based on its connectivity capability.
- 2. Look at your devices telemetry** (Orange bar chart icon): Select one or more device and the window time interested in, and then visualize telemetry data received by devices.
- 3. Analyze the events detected by your devices** (Red lightning bolt icon): Select one or more device and the window time interested in, and then visualize events received by devices.
- 4. Monitor your device on their geo localization** (Light blue location pin icon): Select one or more device and the window time interested in, and then visualize geo-position data received by devices.
- 5. Set and detect geofencing events** (Purple location pin icon): Select one or more device and draw an area on map in order to enable tracking of geofence events raised by devices.

# Select a Device to see Sensors Data

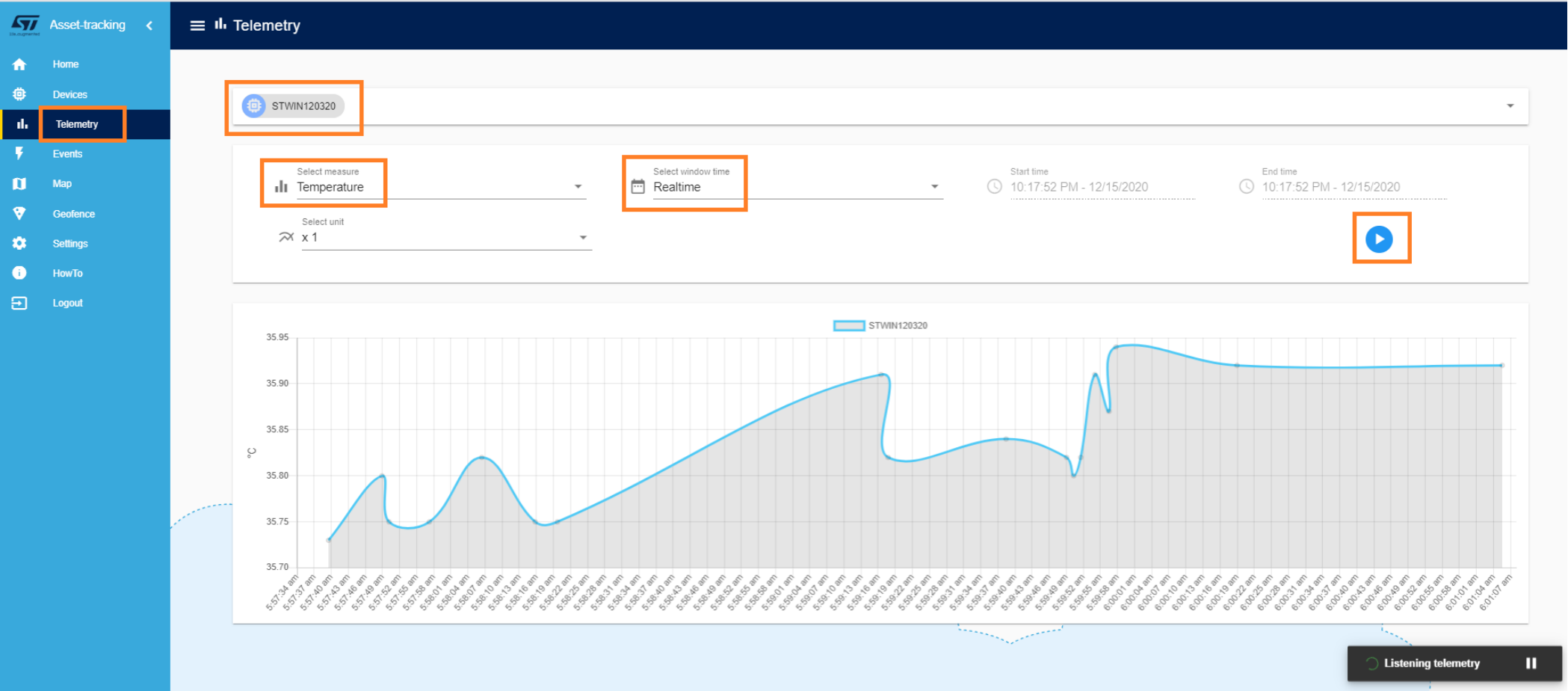
- Go to “Telemetry”
  - Select data sending Device from *Select Devices*
  - Select a Sensor from *Select Measure*
  - Select *Realtime* from *Select Window Time*
  - Click the Play button to see the data on Window



# Accelerometer Data



# Temperature Data



## **3- Documents & Related Resources**

# Documents & Related Resources

## FP-SNS-AWS1:

- **DB3232:** STM32Cube function pack for IoT node with Wi-Fi and sensors, connected to ST Dashboard on Cloud – [databrief](#)
- **UM2186:** Getting started with STM32Cube function pack for IoT node with Wi-Fi and sensors, connected to ST Dashboard on Cloud – [user manual](#)

## DSH-ASSETTRACKING:

- **DB4207:** Cloud Amazon-based web application for asset tracking 2.0 – [databrief](#)

## X-CUBE-AWS:

- **UM2178:** Getting started with X-CUBE-AWS STM32Cube Expansion Package for Amazon Web Services® IoT – [user manual](#)

## X-CUBE-SBSFU:

- **UM2262:** Getting started with the X-CUBE-SBSFU STM32Cube Expansion Package – [user manual](#)

# Documents & Related Resources

## STEVAL-STWINKT1B:

- [Gerber files, BOM, Schematic](#)
- **DB4345:** STWIN SensorTile Wireless Industrial Node development kit and reference design for industrial IoT applications – [databrief](#)

## STEVAL-STWINWFV1:

- [Gerber files, BOM, Schematic](#)
- **DB3971:** Wi-Fi expansion for the SensorTile Wireless Industrial Node (STWIN) kit – [databrief](#)

## B-L4S5I-IOT01A:

- [Gerber files, BOM, Schematic](#)
- **DB4184:** Discovery kit for IoT node, multi-channel communication with STM32L4+ Series 1.0 – [databrief](#)
- **UM2622:** Discovery kit for IoT node, multi-channel communication with STM32L4+ Series 1.0 – [user manual](#)

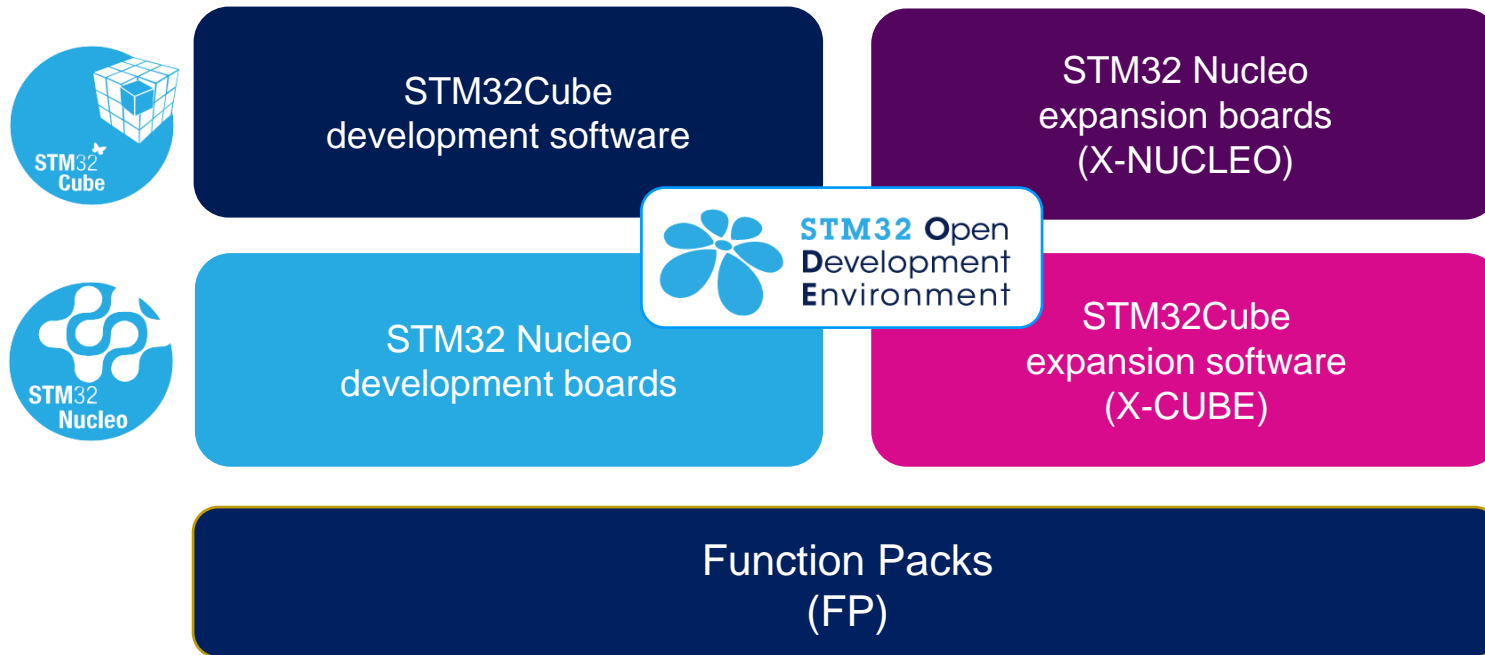


# 4- STM32 Open Development Environment: Overview

# 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](http://www.st.com/stm32ode)

# Thank you

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