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STM32U5 Azure IoT Hands-on

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October 2022

Agenda

1. Download Material
2. Check Requirements
3. Hardware
4. Security
5. X-Cube-Azure Walkthrough
6. Board Distribution
7. Hands-On
8. Option Byte Reset

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Download Material

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Workshop Material

Please choose one of download options below

Option 1: Zip Download Link

- https://tinyurl.com/st-iot

Option 2: Clone GitHub Repo

- git clone https://github.com/AlnurElberier/ST_Azure_Workshop_2022.git

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Check Requirements

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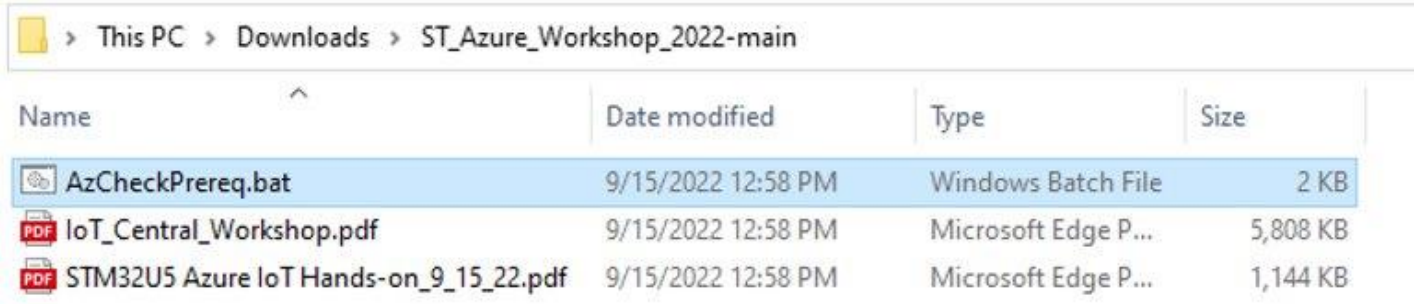
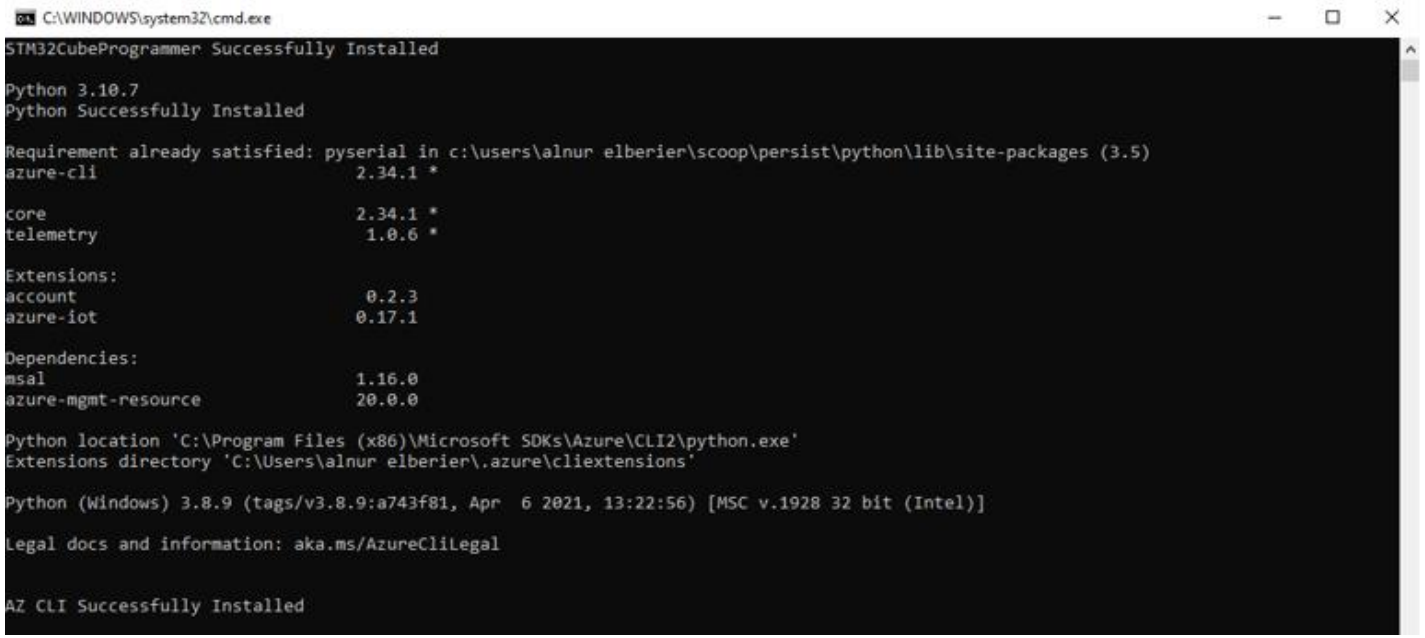
Workshop Requirements

- Windows
- Python3
  - Pyserial
- Azure CLI
- STM32CubeProgrammer
- Git Hub
- X-CUBE-AZURE

Pre-Requisite Check Script

- Navigate to the ST_Azure_Workshop folder you just downloaded
- Double click the AzCheckPrereq.bat script





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Hardware

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STM32U5 Microcontrollers

The new reference for secure and smart IoT applications

Higher Security
Certified PSA L3 and SESIP L3

Lower Power
58 ULPMark-CM

Richer applications
Cortex-M33 @160MHz, extended features set

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STM32U5 IoT Kit

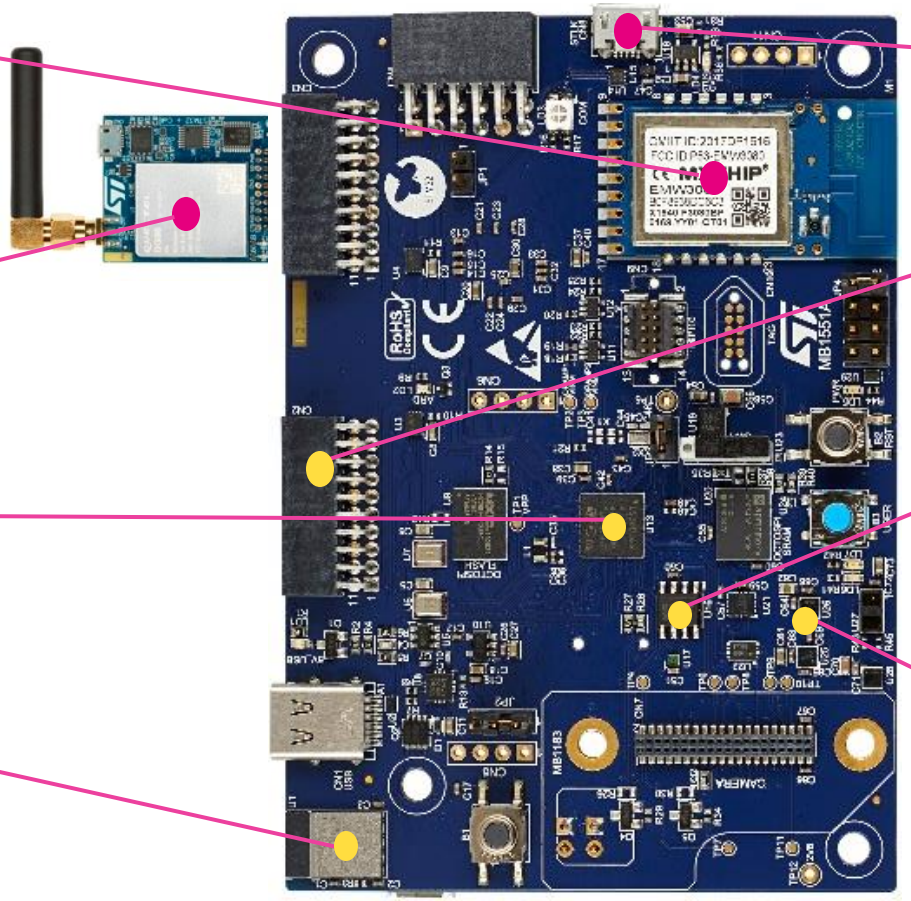
Your reference board for IoT Proof-of-Concept

Wi-Fi Module

Cellular extension

STM32U5 MCU

BLE module



Programming and Debug

Extension connectors
Arduino (backside), PMOD, STMOD+

STSAFE secure element

Sensors
Accel, Magnetometer, Pressure, Humidity, ToF, Temperature

B-U585I-IOT02A

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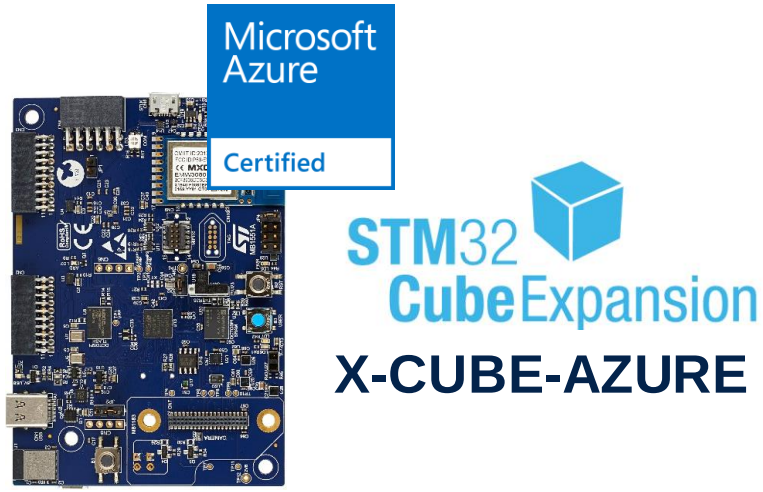
Azure IoT on STM32U5

X-CUBE-AZURE reference integration simplifying your development



- Certified for Microsoft Azure plug and play
- Leveraging ARM Trusted Firmware-M (TF-M)
- Based on AzureRTOS middleware
- Supporting WIFI and Cellular (Cat M1)
- using STSAFE for simpler provisioning and even higher security

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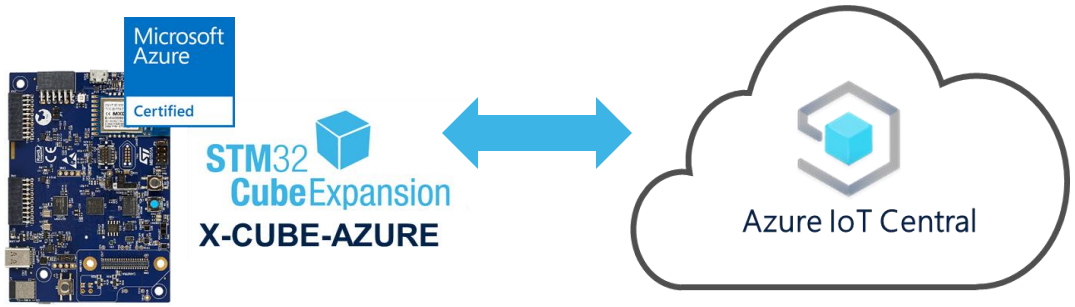
Microsoft Azure

Azure IoT on STM32U5

Reference implementation supporting Azure IoT and app Services



Azure IoT Central

Data visualization and analysis, device management and

Azure IoT Hub

device provisioning services

IoT plug and Play

Device update for IoT Hub (public preview)

Microsoft Defender for IoT

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Microsoft Azure

Azure IoT Central Quick Connect

Abstracts Firmware customization and registration process

- Allows Cloud IoT/Data architects to focus on developing power of the Cloud IoT platform proof of concepts.
- Connect to Microsoft Azure IoT Central and perform telemetry in minutes
- Solution Components:
  - *B-U585I-IOT02A Discovery Kit*
  - *Reference Binary*
  - *Quick connect scripts*
  - *Cloud visualization*

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Security

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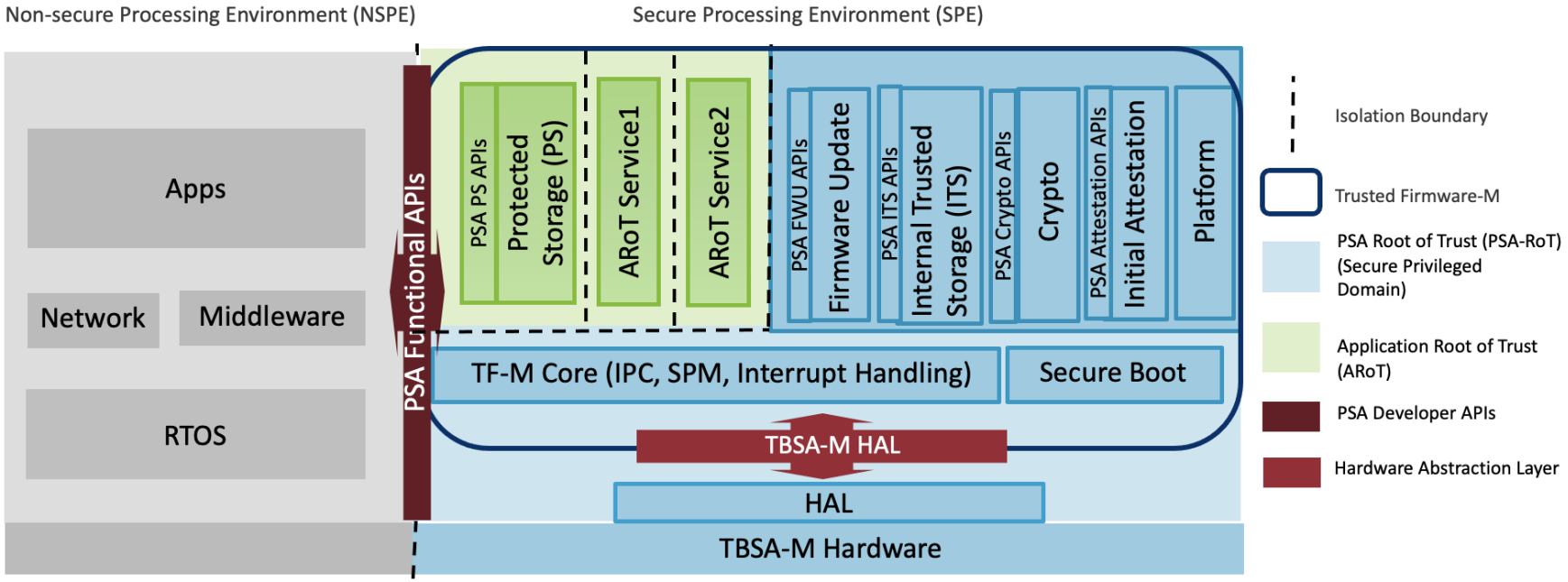
Microsoft Azure
STM32
Azure RTOS + ST U5 Security Overview
Using ST's Secure, Ultra Low Power, Sensor to Cloud Reference Hardware

Trusted Firmware-M (TF-M)

- Trusted Firmware for Cortex M (TF-M) implements the Secure Processing Environment (SPE) for Armv8-M, Armv8.1-M
- **Trusted Firmware-M consists of:**
  - Secure Boot , Control the isolation, communication and execution within SPE and with NSPE
  - Crypto, Internal Trusted Storage (ITS), Protected Storage (PS) and Attestation secure services



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Directory Walk-Through X-CUBE-AZURE

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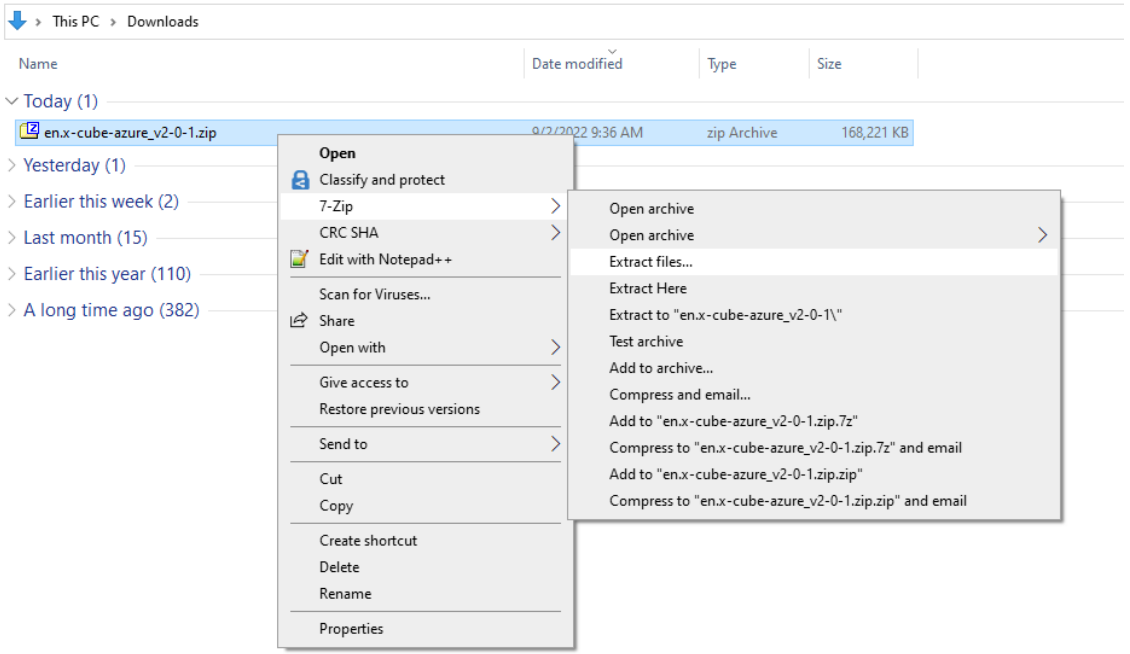
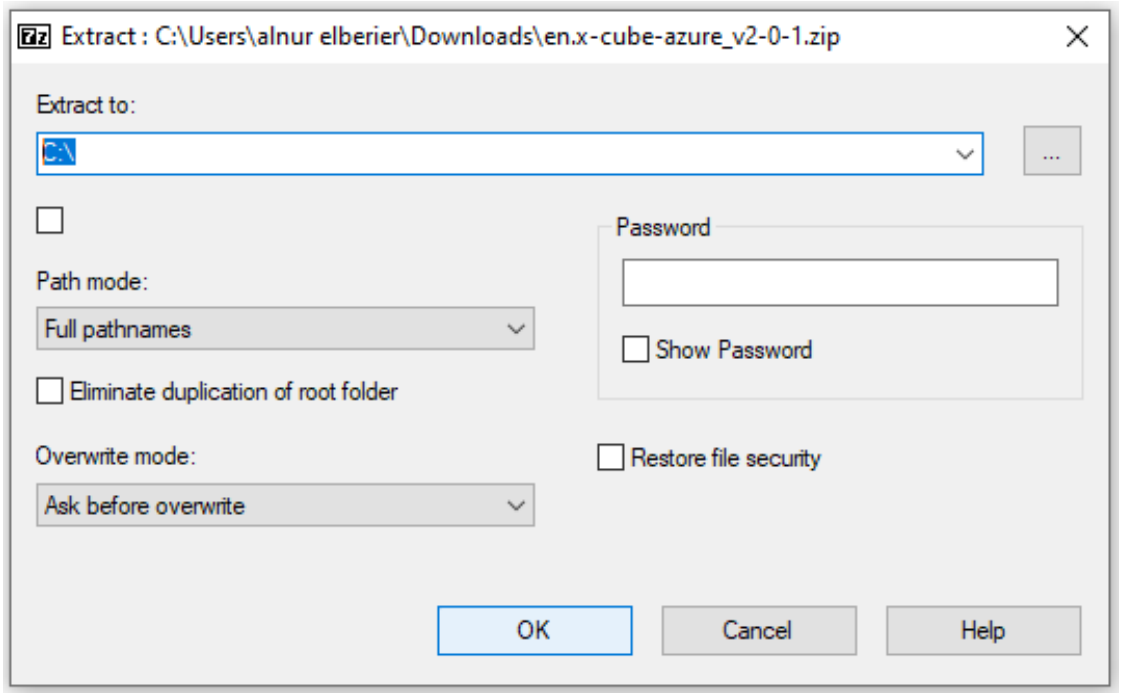
Download

- Download the X-CUBE-AZURE Software package and become familiar with the directory structure
- Download Link:
  - www.st.com/en/embedded-software/x-cube-azure

Extracting X-CUBE-AZURE to C Drive

- Navigate to download directory
- Select the **en.x-cube-azure_v2-0-1.zip** file you just downloaded
- Extract the file to your **C drive**





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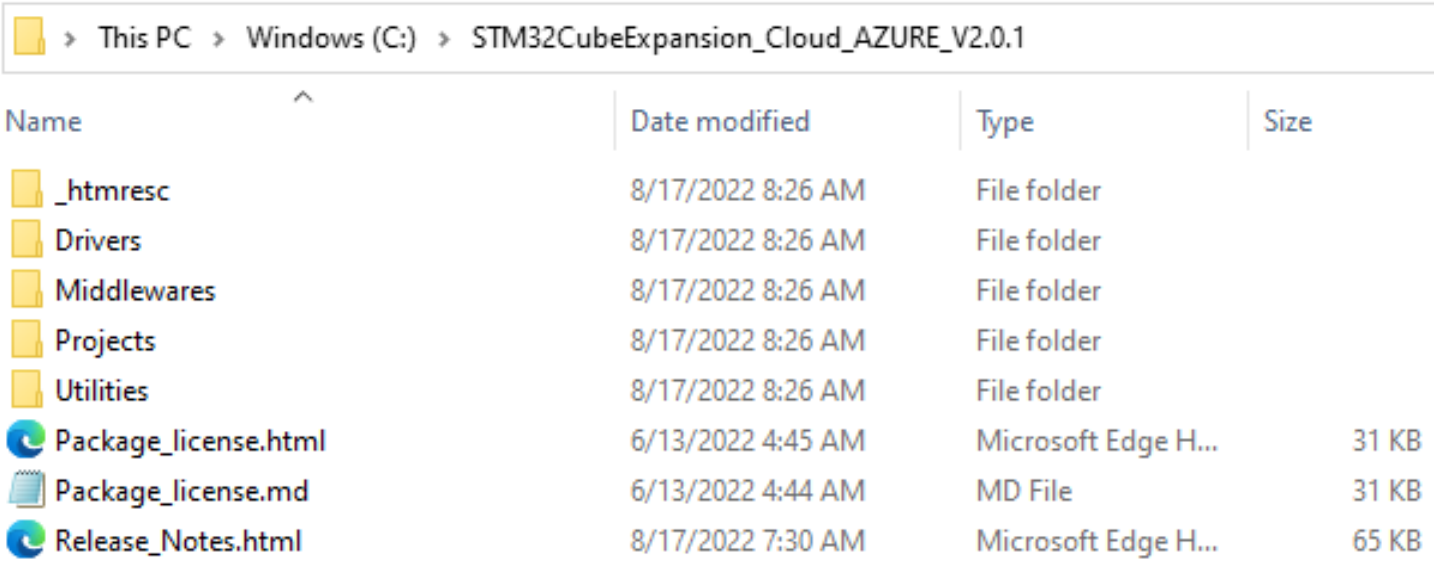
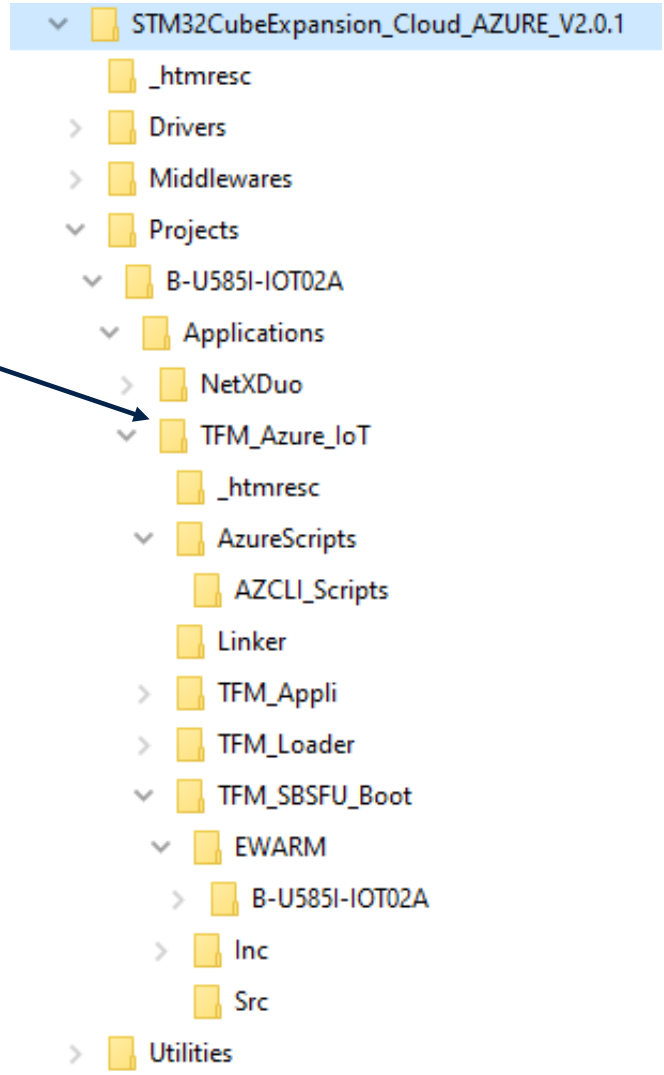
X-CUBE-AZURE Root Directory

- Drivers
  - BSP, CMSIS, and HAL Drivers
- Middlewares
  - Both ST and Third-Party Middleware
- Projects
  - Sample Projects and applications
- Utilities
  - Additional software and patches



X-CUBE-AZURE Directory Structure

- Project directory containing application code and documentation



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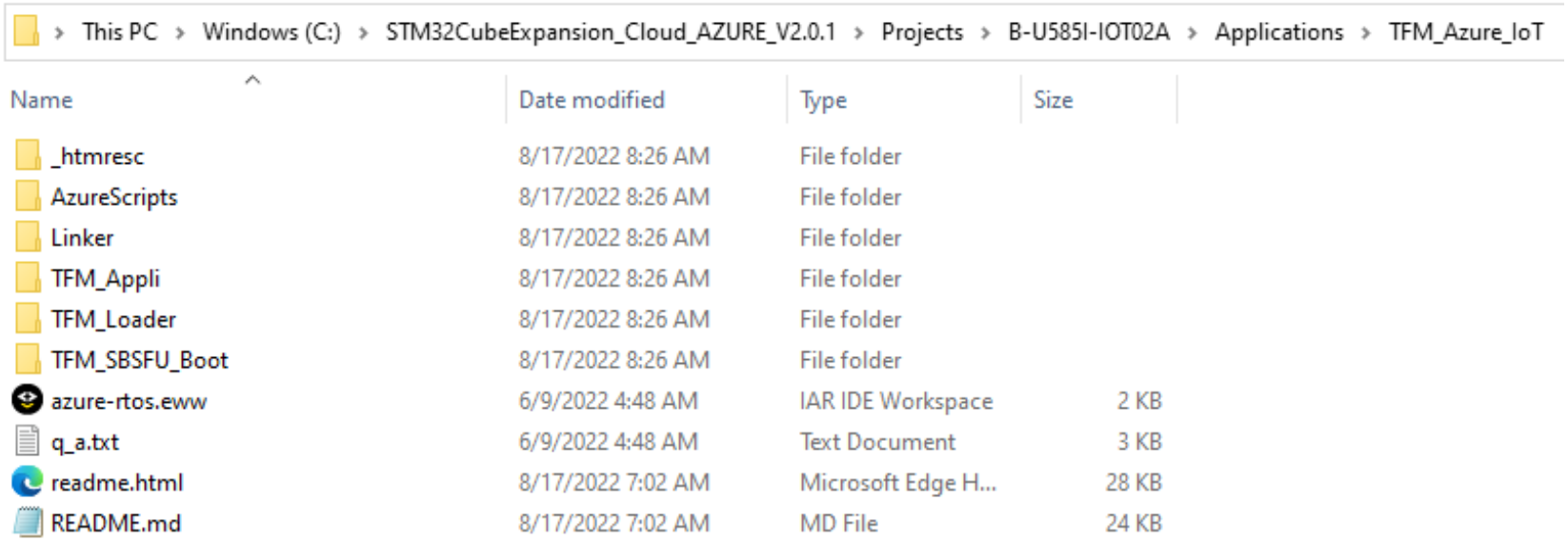
X-CUBE-AZURE TFM_Azure_IoT

- Azure Scripts
  - Supporting software
- Linker
- TFM_Appli
  - Main application
- TFM_Loader
- TFM_SBSFU_Boot
  - Boot firmware and scripts
- azure-rtos.eww
  - EWARM project shortcut



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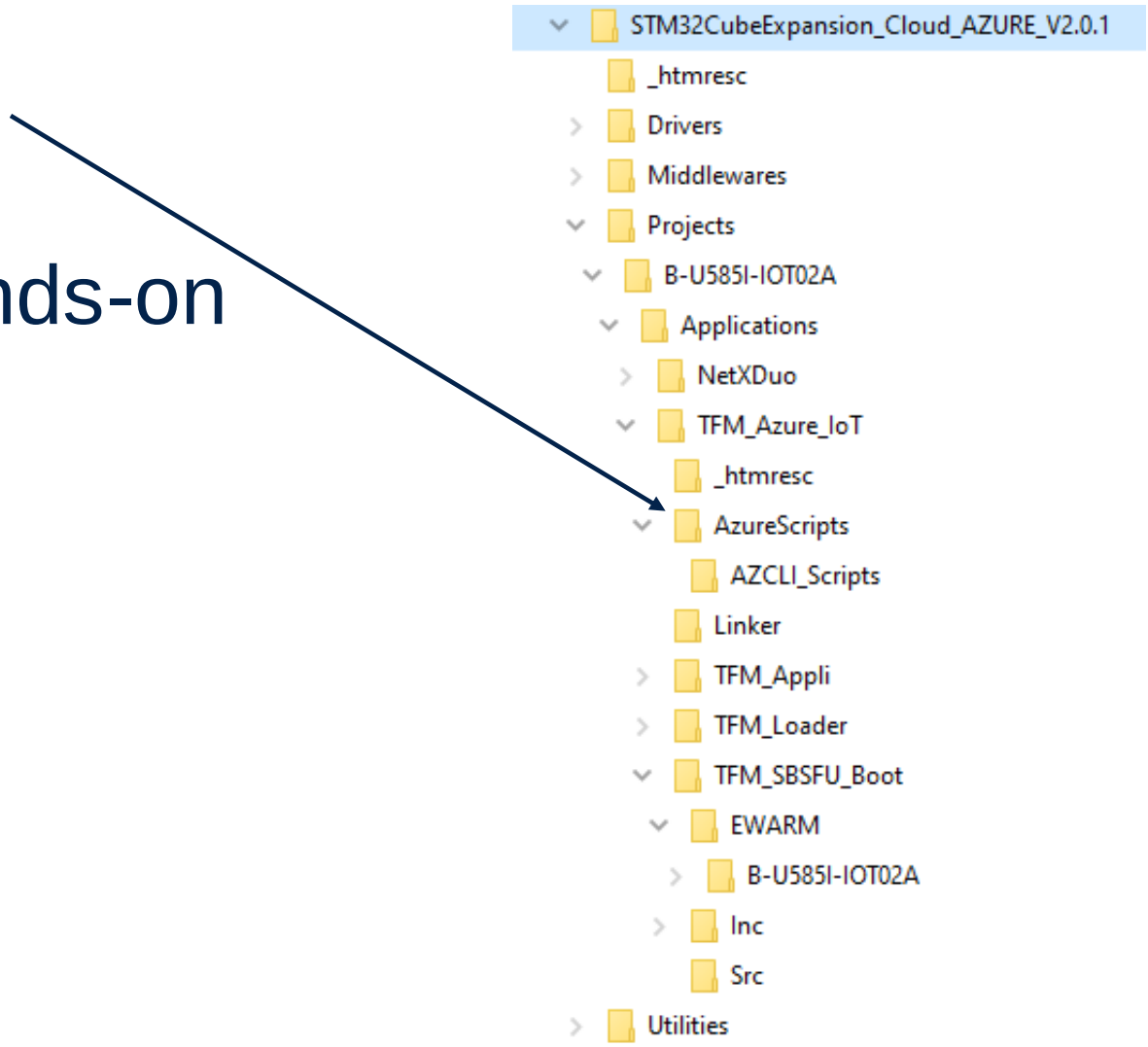
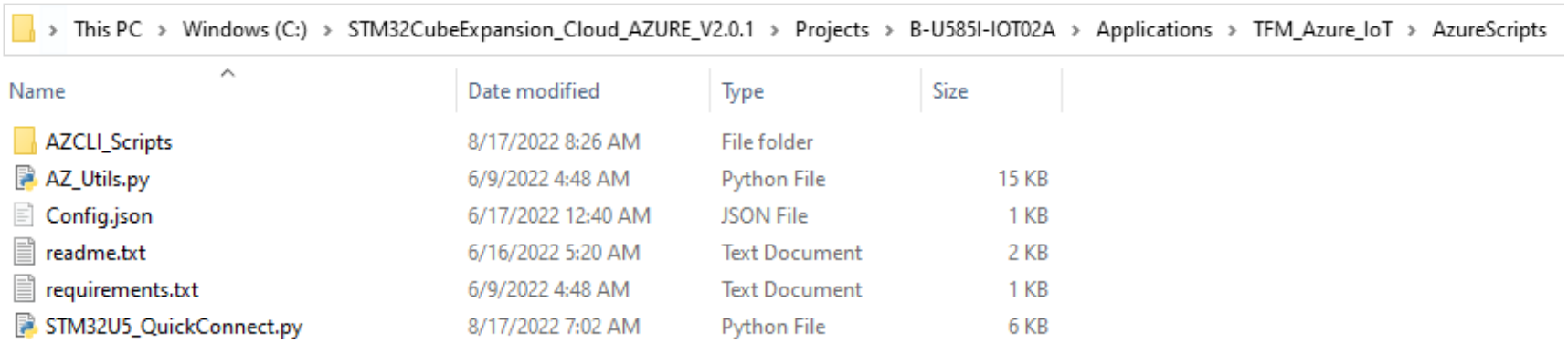
X-CUBE-AZURE Directory Structure

- Script directory that contains all the files pertaining to this hands-on



X-CUBE-AZURE TFM_Azure_IoT\AzureScripts\

- Config.json
  - Configuration file for Quick Connect Script
- Requirements.txt
  - Python library requirements
- STM32U5_QuickConnect.py
  - Quick connect script for connecting B-U585I-IOT02A to Azure IoT Central



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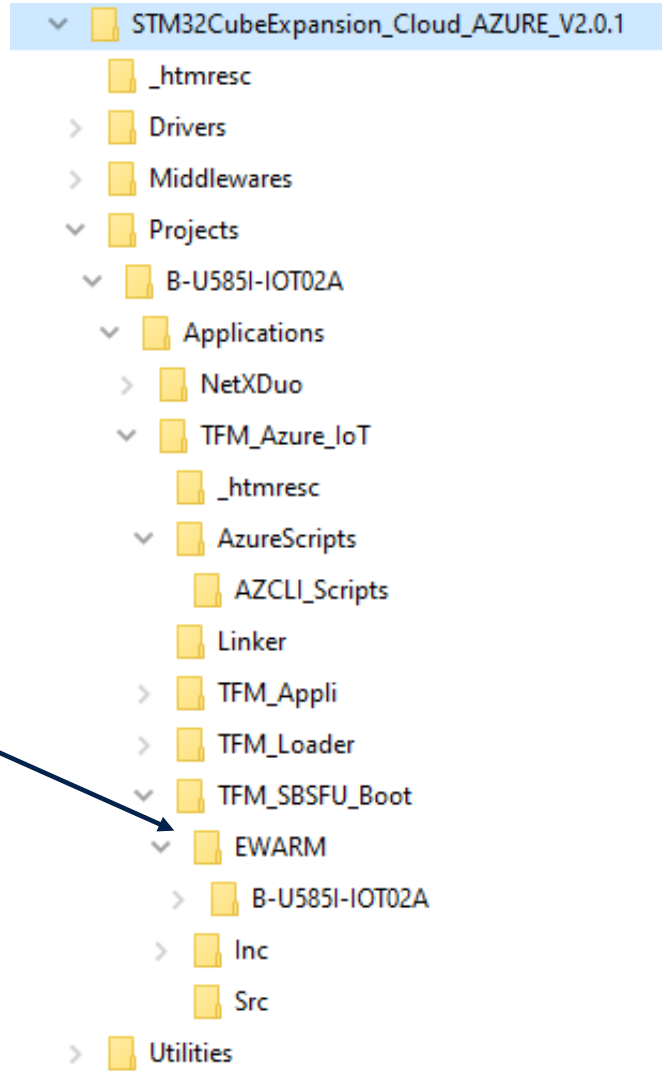
X-CUBE-AZURE Directory Structure

- Utility script directory used to set option bytes and flash firmware



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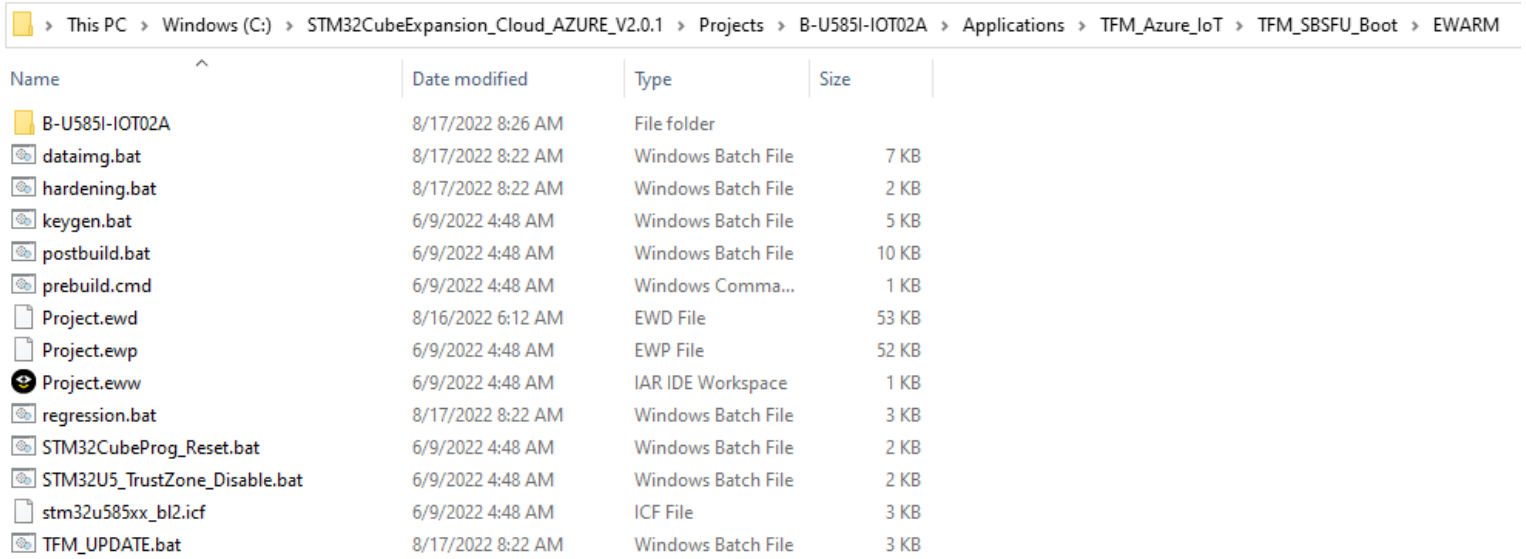
X-CUBE-AZURE TFM_Azure_IoT\TFM_SBSFU_Boot\EWARM

- regression.bat
  - Script to set option bytes on board
- TFM_UPDATE.bat
  - Flashing Script
- STM32CubeProg_Reset.bat
  - Script to reset board
- STM32U5_TrustZone_Disable.bat
  - Script to disable TZ option byte



Board Distribution

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Boards distribution

- Believe it or not, even at ST we have hard time to get boards. Unfortunately, we need to collect the board at the end of the workshop to use them in the next one.
- We'll disinfect the boards at the end of the workshop and before re-distribution.
- A voucher will be handed out at the end of hands-on

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Hands-On: Quick Connect

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Goal

- Create an Azure IoT Central application and connect the B-U585I-IOT02A - Discovery kit for IoT node for bi-directional communication

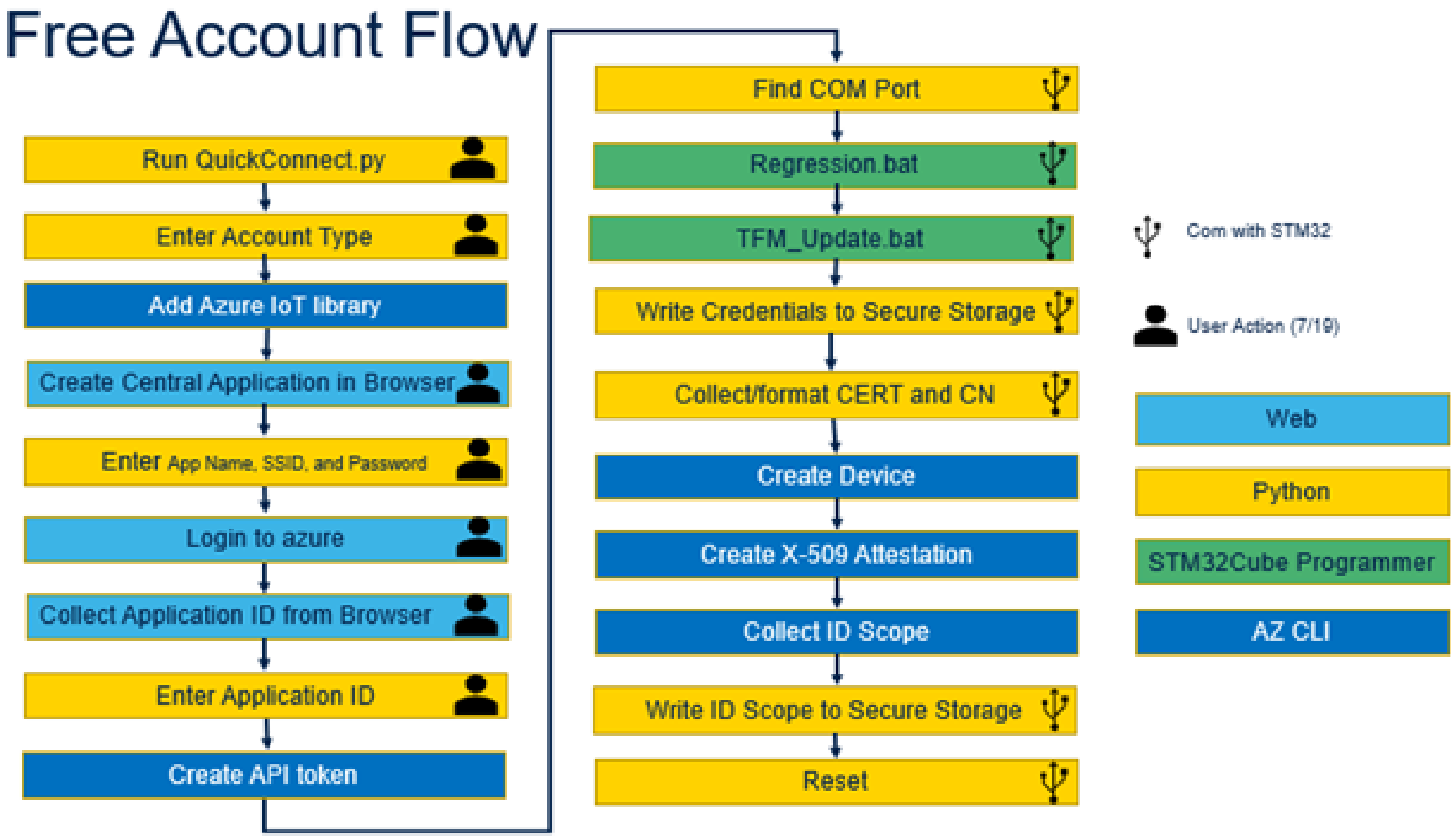
B-U585I-IOT02A

Telemetry Data

Commands

IoT Central Application

Quick Connect Flow



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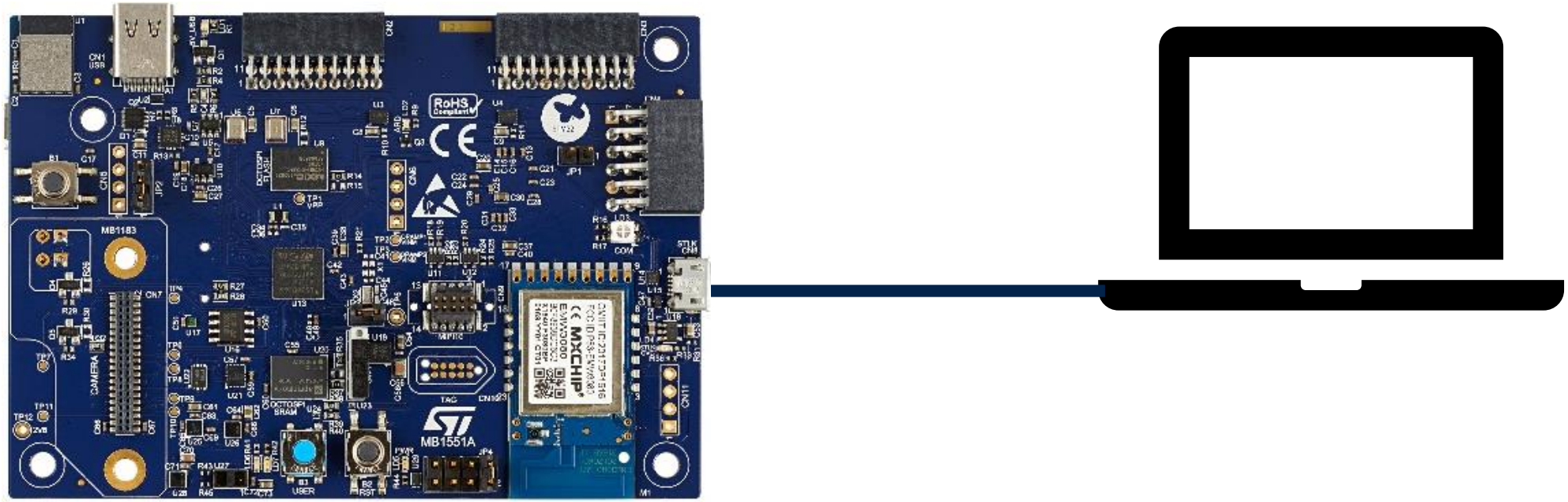
Connect your board

- Connect your board to the PC



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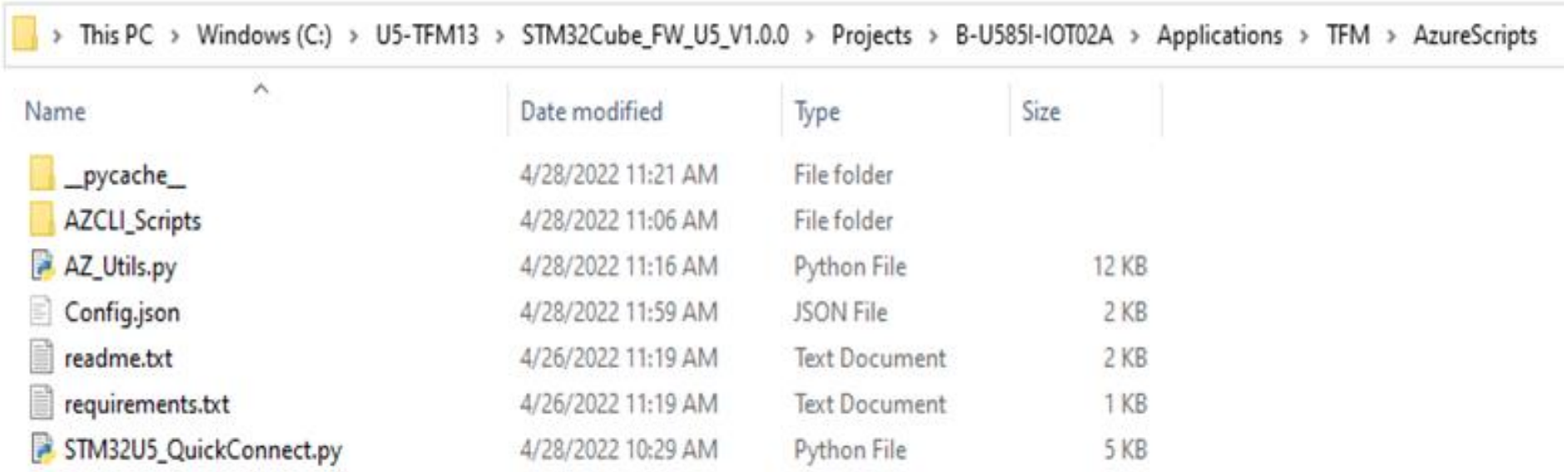
Step 1: Running Quick Connect Script

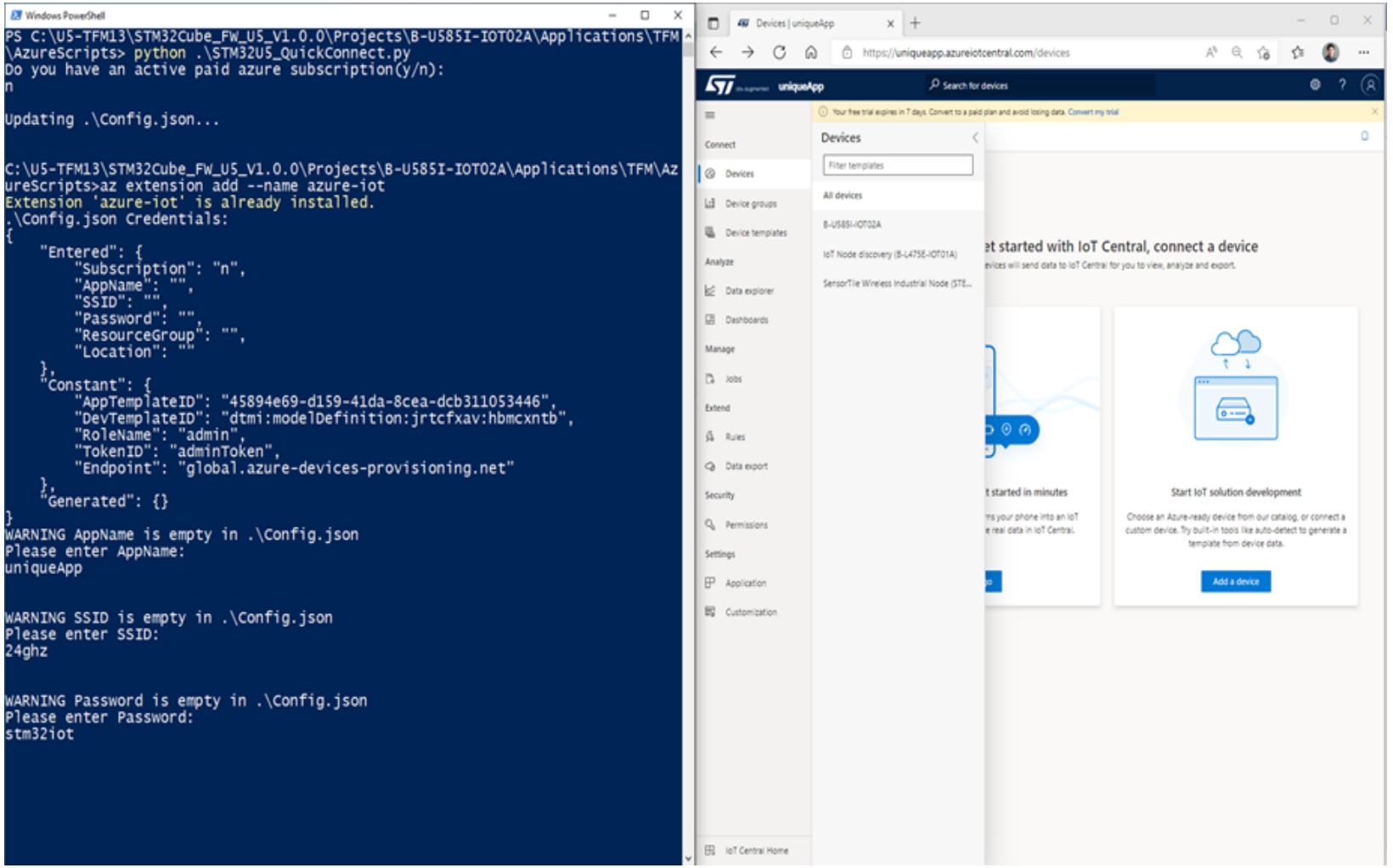
- Navigate to C:\U5-TFM\STM32Cube_FW_U5_V1.1.1\Projects\B-U585I-IOT02A\Applications\TFM\AzureScripts



Step 6: Enter Wi-Fi Credentials

SSID: **st_iot_demo**

PASSWORD: **stm32u585**



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Configuration File: Config.json

Config.json

C: > STM32CubeExpansion_Cloud_AZURE_V2.0.0_Modified > Projects > B-U585I-IOT02A > Applications > TFM_Azure_IoT > AzureScripts > {} Config.json > ...


```
{
    "Entered": {
        "Subscription": "n",
        "AppName": "custom-2g9uib7cdfe",
        "SSID": "st_iot_demo",
        "Password": "stm32u585",
        "ResourceGroup": "",
        "Location": ""
    },
    "Constant": {
        "AppTemplateID": "",
        "DevTemplateID": "",
        "RoleName": "admin",
        "TokenID": "adminToken",
        "Endpoint": "global.azure-devices-provisioning.net"
    },
    "Generated": {
        "AppID": "6d73bd89-3ff5-468c-84ad-e62d04c32ea2",
        "APIToken": "SharedAccessSignature sr=6d73bd89-3ff5-468c-84ad-e62d04c32ea2&sig=QEDIi5RAmx2DXTk9ZrYPSiJqGm
        "Cert": "MIIBmTCCAT+gAwIBAgILAgnwK0Fa1CrCATkwCgYIKoZIzj0EAwIwTzELMAkGA1UEBhMCTkwxHjAcBgNVBAoMFVNUTWljcm9l
        "RegistrationID": "eval3-0209F02B415AD42AC20139",
        "IDScope": "0ne0077AF13"
    }
}
```


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Web Based Terminal Emulator: https://googlechromelabs.github.io/serial-terminal/

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Welcome Microsoft for Cloud Hands-On

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Option Byte Reset

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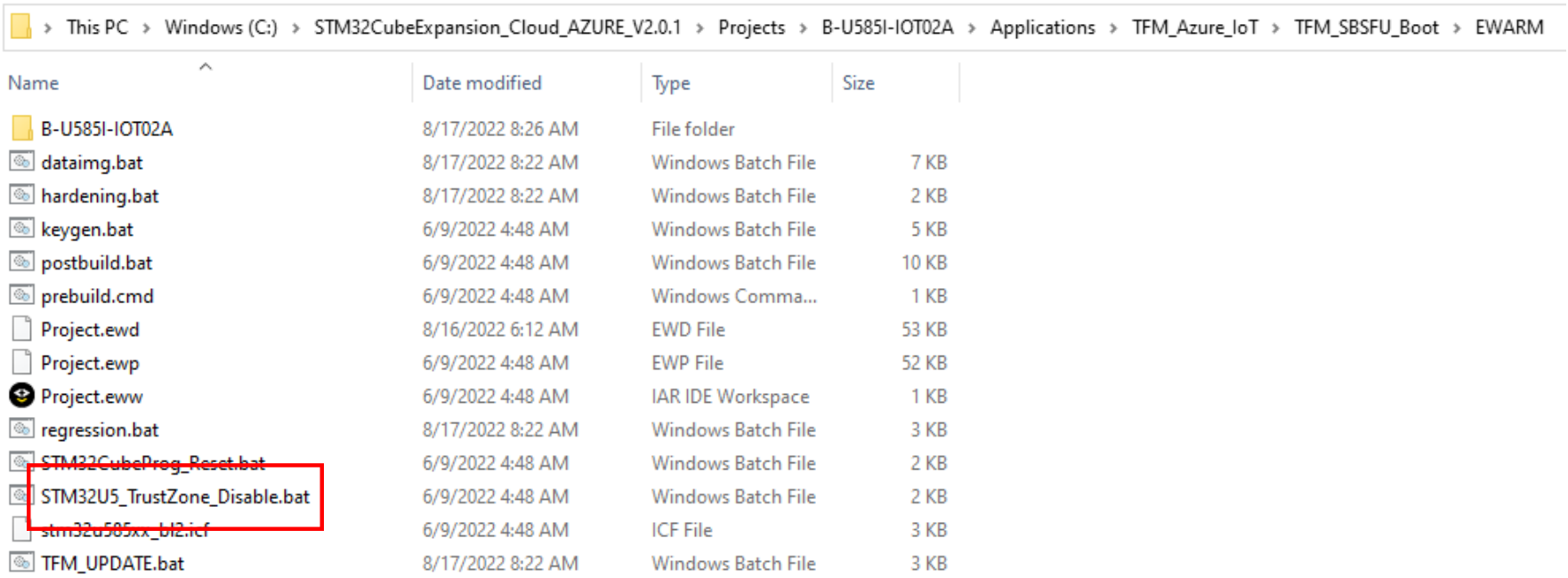
Disabling Trust Zone

- Navigate to TFM_Azure_IoT\TFM_SBSFU_Boot\EWARM
- Double Click: STM32U5_TrustZone_Disable.bat



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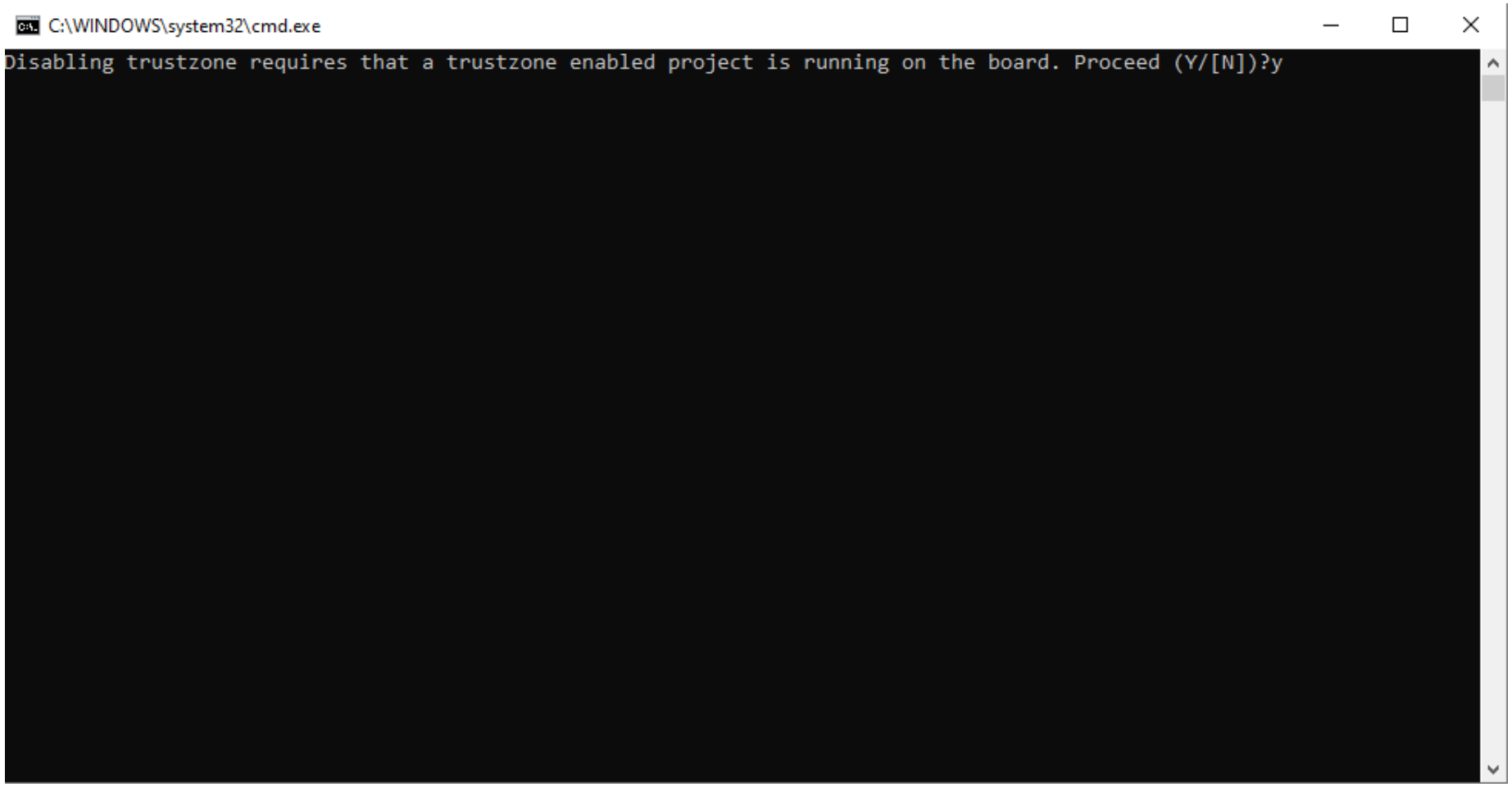
Disabling Trust Zone

- Enter 'y' in to CMD window prompt:



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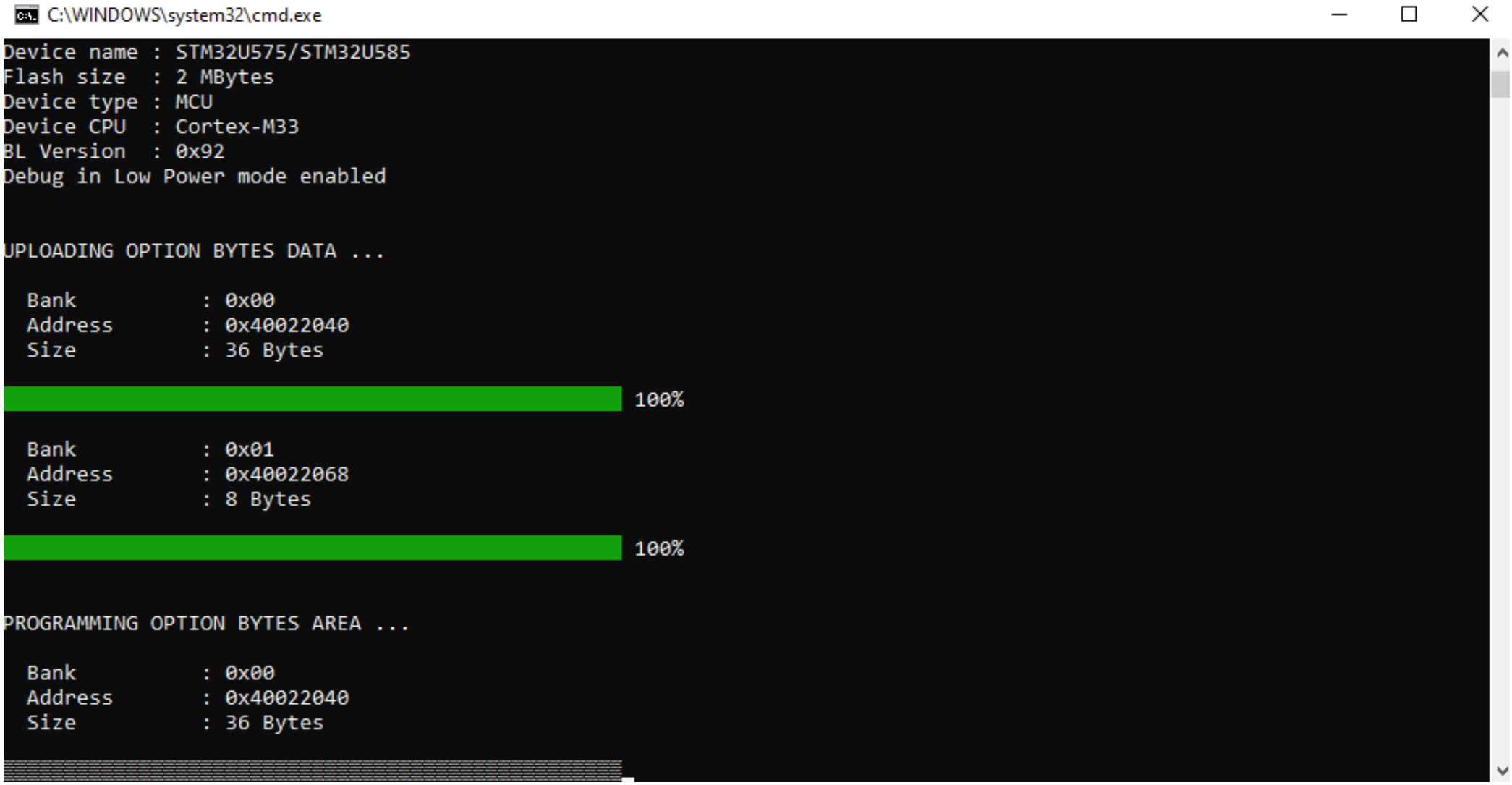
Disabling Trust Zone



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