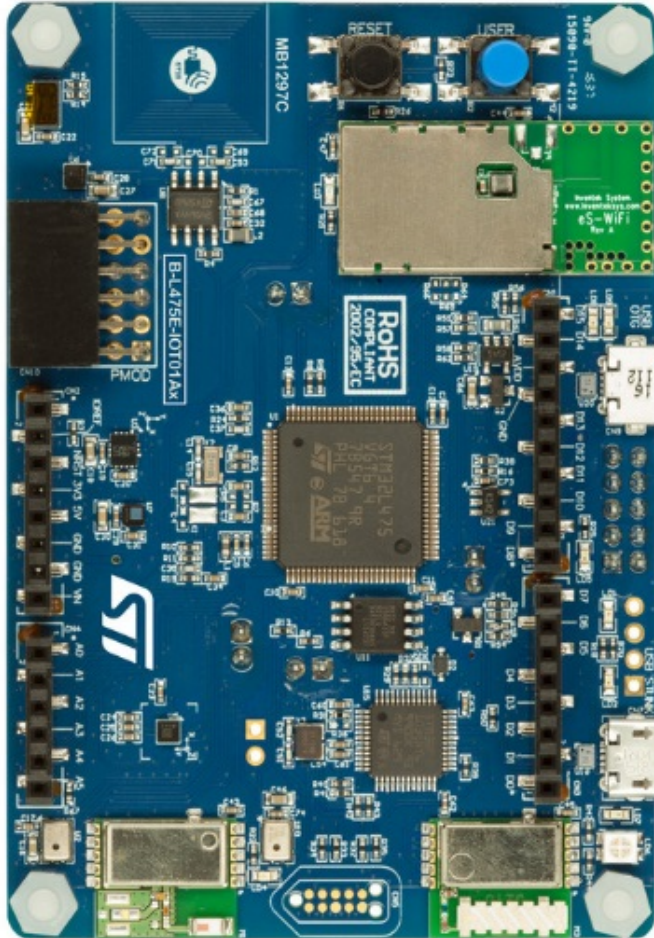


Secure Solutions for IoT Nodes



Cloud Connectivity Out-of-the-Box

Why should you add a Secure Element?

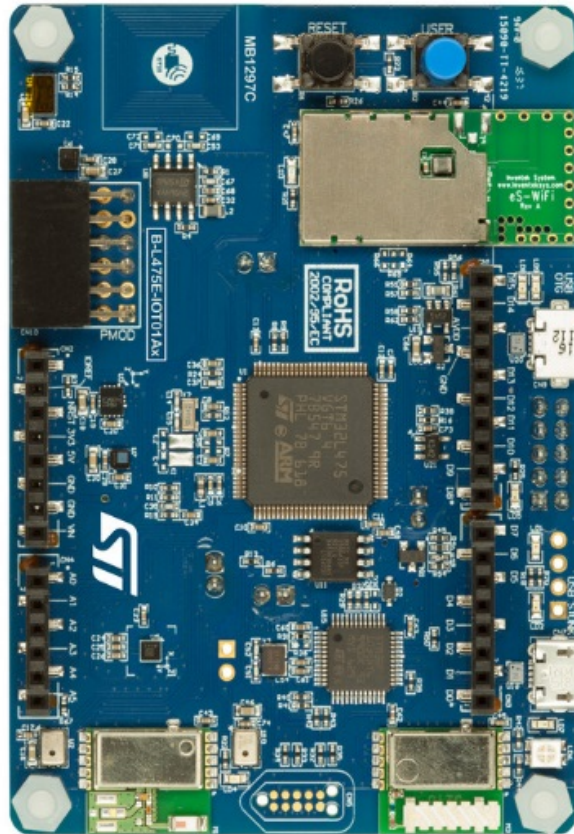
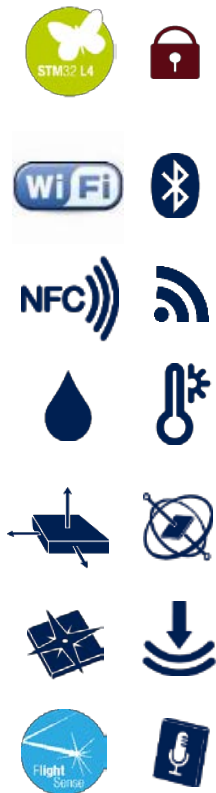
Secure Platform

Prototyping with STSAFE

STM32L475 Discovery Kit IoT Node

B-L475E-IOT01A

Cloud Connectivity Out-of-the-Box



- Ultra-low-power STM32L475 Arm® Cortex®-M4, 1 Mbyte Flash memory, 128 Kbytes of SRAM
- Firmware example for IoT end node connected with Wi-Fi®
 - 802.11 b/g/n compliant Wi-Fi® module
- Low Power Communications
 - Bluetooth 4.1, Sub-GHz, Dynamic NFC Tag
- Multiway Sensing
 - 3D Accelerometer, 3D Gyroscope, 3D Magnetometer, Temperature/Humidity, Pressure, Time of Flight, Microphones

Search | AWS Partner Dev x

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AWS Partner Device Catalog

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Filter by: Clear all Q stmicroelectronics X

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- ☐ AWS IoT Core
- ☐ AWS IoT Greengrass
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Device Type

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- ☐ Cellular Modem
- ☐ Development Kit
- ☐ Edge Server
- ☐ Gateway / Router
- ☐ Industrial PC
- ☐ PLC
- ☐ RF Module
- ☐ SBC
- ☐ Sensor
- ☐ SOM / COM
- ☐ Starter Kit
- ☐ Other

Industry

Application

Region

Hardware Architecture

Silicon Vendor

Operating System

Connectivity

Industrial Connectivity

Programming Language

I/O Interfaces


Security

Storage

Environmental

Lens Type

VERIZON




ThingSpace Cloud Connector Development Kit

The development kit is powered by a board set, combining an LTE Cat M1 / NB-IoT modem with an...

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The B-L475E-IOT01A Discovery kit IoT node allows users to develop applications with direct connection...

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32F769IDISCOVERY

The 32F769IDISCOVERY allows users to develop applications with direct connection to cloud servers.

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Discovery Kit with STM32F413ZH MCU

The 32F413HDISCOVERY kit allows users to develop embedded applications with direct connection...

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- **X-CUBE-AWS**
 - Cloud Connector: set of libraries and application examples, MCU acting as end devices.
- **FP-CLD-AWS1**
 - Based on X-CUBE-AWS provides a companion AWS-based web dashboard for an easy sensor data visualization and device control.
- **Amazon FreeRTOS**
 - STM32's port of the operating system for microcontrollers that makes small, low-power edge devices easy to program, deploy, secure, connect, and manage.



Microsoft Azure IoT Device Catalog

https://catalog.azureiotsolutions.com/alldevices?q=stm32

Device catalog Partner Dashboard

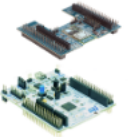
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IoT Wi-Fi node based on STM32 NUCLEOF401RE

By: STMicroelectronics

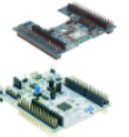
The STM32 Open Development Environment (STM32-ODE) is an open, flexible, easy and affordable way to develop i...



STM32 IoT Discovery Kit Node

By: STMicroelectronics

The B-L475E-IOT01A Discovery kit for IoT node allows users to develop applications with direct connection to M...



IoT Wi-Fi node based on STM32 NUCLEOL476RG

By: STMicroelectronics

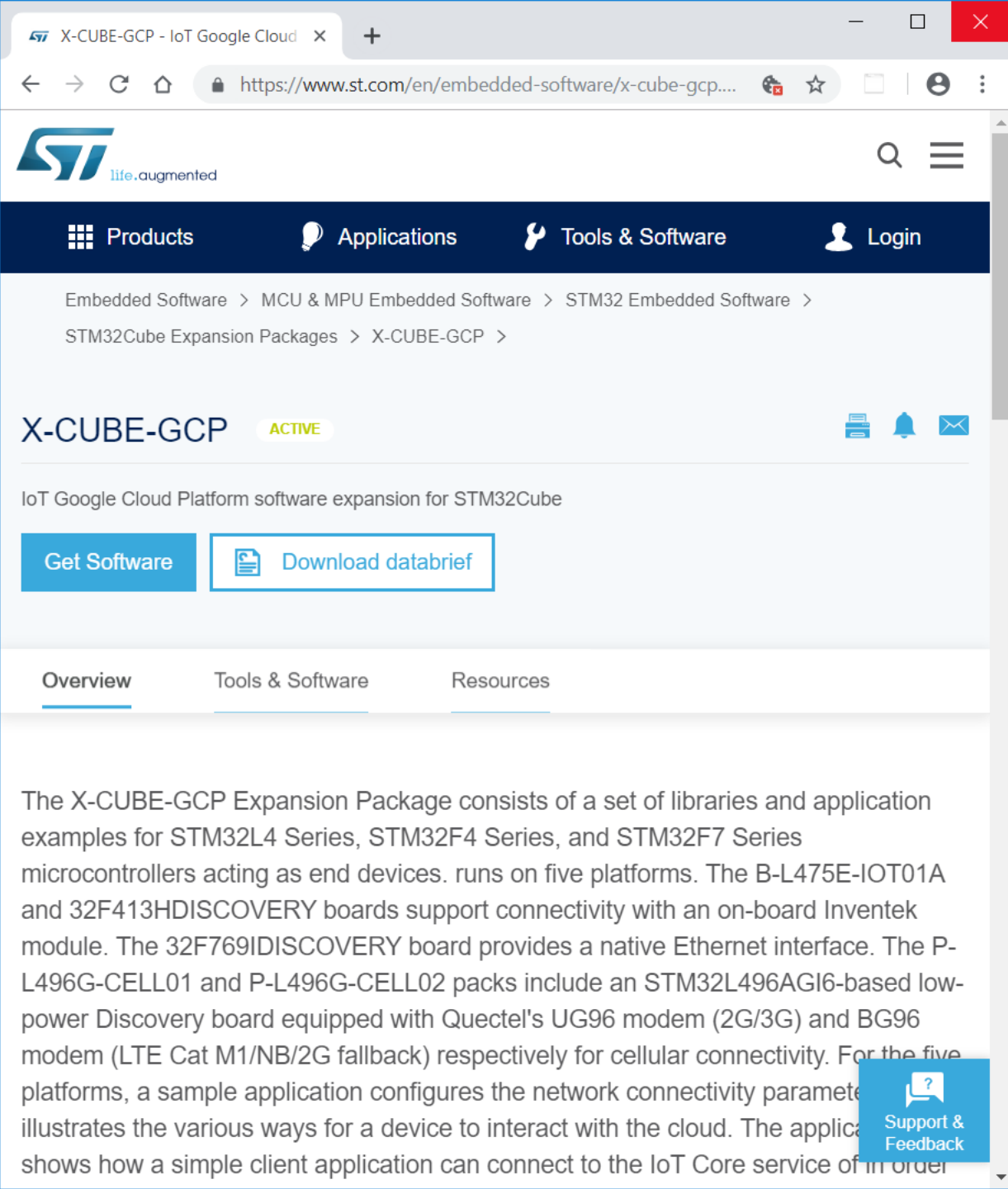
The STM32 Open Development Environment (STM32-ODE) is an open, flexible, easy and affordable way to develop in...

Feedback



- **X-CUBE-AZURE**
 - Cloud Connector: set of libraries and application examples, MCU acting as end devices.
- **FP-CLD-AZURE1**
 - Based on X-CUBE-AZURE provides a Web Dashboard with full support for Azure device management primitives and sample implementation for firmware update over the air (FOTA).





The screenshot shows a web browser window with the URL <https://www.st.com/en/embedded-software/x-cube-gcp...>. The page features the ST logo and the tagline "life.augmented". A navigation bar includes links for Products, Applications, Tools & Software, and Login. The breadcrumb trail indicates the path: Embedded Software > MCU & MPU Embedded Software > STM32 Embedded Software > STM32Cube Expansion Packages > X-CUBE-GCP >. The main heading is "X-CUBE-GCP" with an "ACTIVE" status indicator. Below this, there are two buttons: "Get Software" and "Download databrief". A tabbed interface shows "Overview", "Tools & Software", and "Resources". The "Overview" tab is selected, displaying a paragraph about the X-CUBE-GCP Expansion Package, which includes libraries and application examples for STM32L4, STM32F4, and STM32F7 Series microcontrollers. A "Support & Feedback" button is visible in the bottom right corner of the page content.

ST life.augmented

Products Applications Tools & Software Login

Embedded Software > MCU & MPU Embedded Software > STM32 Embedded Software > STM32Cube Expansion Packages > X-CUBE-GCP >

X-CUBE-GCP ACTIVE

IoT Google Cloud Platform software expansion for STM32Cube

[Get Software](#) [Download databrief](#)

Overview Tools & Software Resources

The X-CUBE-GCP Expansion Package consists of a set of libraries and application examples for STM32L4 Series, STM32F4 Series, and STM32F7 Series microcontrollers acting as end devices. runs on five platforms. The B-L475E-IOT01A and 32F413HDISCOVERY boards support connectivity with an on-board Inventek module. The 32F769IDISCOVERY board provides a native Ethernet interface. The P-L496G-CELL01 and P-L496G-CELL02 packs include an STM32L496AGI6-based low-power Discovery board equipped with Quectel's UG96 modem (2G/3G) and BG96 modem (LTE Cat M1/NB/2G fallback) respectively for cellular connectivity. For the five platforms, a sample application configures the network connectivity parameters. The application illustrates the various ways for a device to interact with the cloud. The application shows how a simple client application can connect to the IoT Core service of in order

Support & Feedback



- X-CUBE-GCP
 - Cloud Connector: set of libraries and application examples, MCU acting as end devices.
 - Web Dashboard: telemetry functionality with data plotting and commands from the cloud.



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- Security
- Web development



Connect ST SensorTile to IBM Watson IoT Platform

Created on Jul 19, 2017

STMicroelectronics ☆1 0 2824

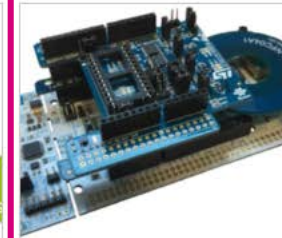


Connect an STM32L4 Discovery Kit IoT Node to IBM Watson IOT

Created on Aug 06, 2018

Publish sensor data (humidity, temperature, atmospheric pressure, 3-axis magnetometer, ...)




STMicroelectronics ☆0 1 830



STM32 modular sensors node for vibration analysis connected with IBM Watson

Created on May 23, 2017

STMicroelectronics ☆0 8 2534



• X-CUBE-WATSON

- Cloud Connector: set of libraries and application examples, MCU acting as end devices.
- IBM Quickstart and Registered Mode support.

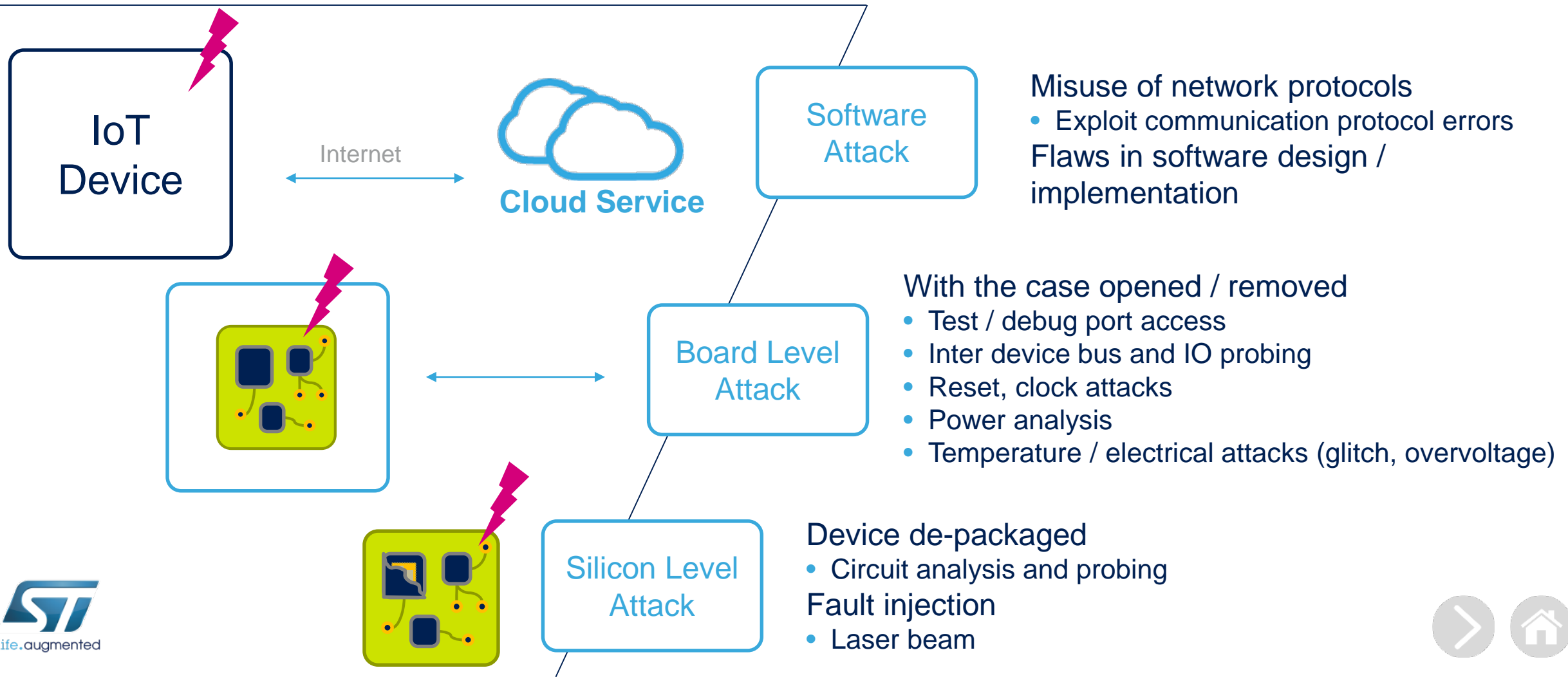
• FP-CLD-WATSON1

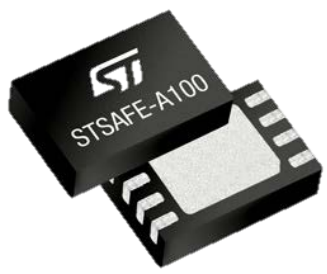
- Includes pre-integrated FFT algorithms for the processing of accelerometer data which can be used to detect vibration from devices such as motors, fans and pumps.
- Maximum frequencies and tear/wear conditions of the device under test are reported together with raw sensor data to IBM Watson IoT thus enabling solutions for industrial condition monitoring and predictive maintenance.



Classes of Attacks

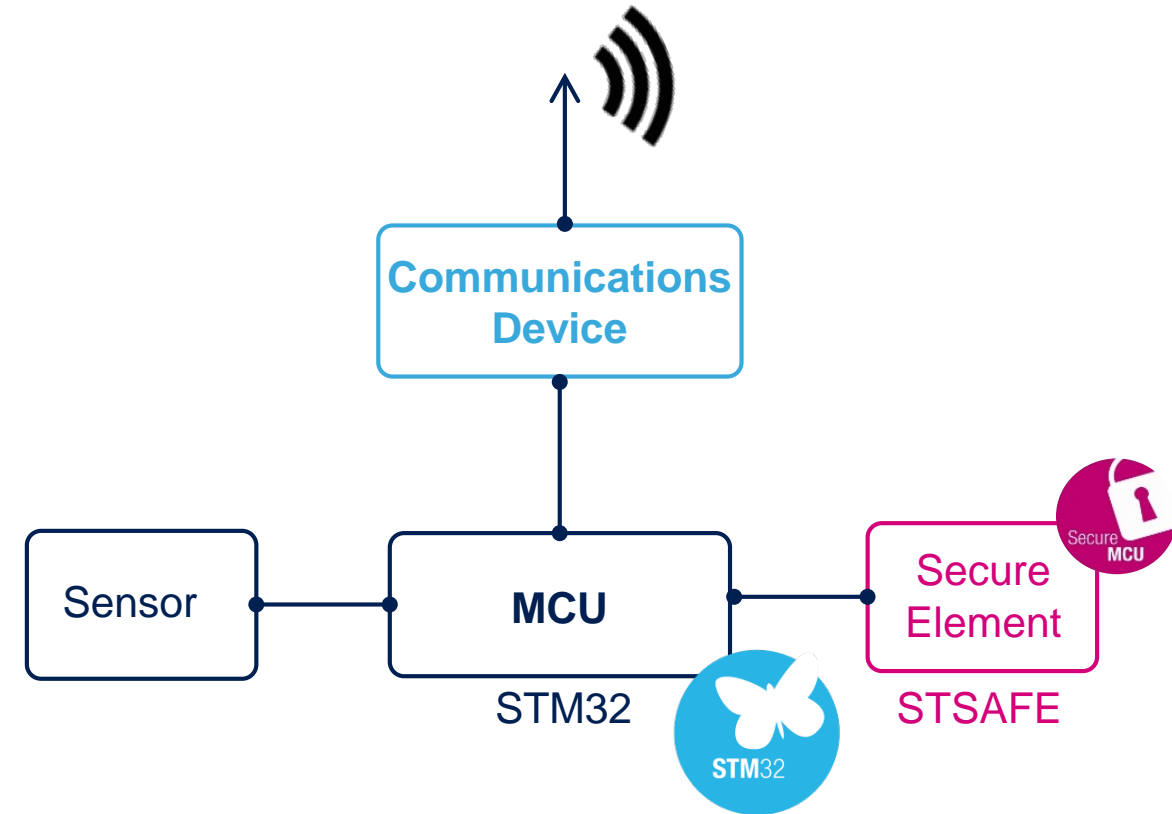
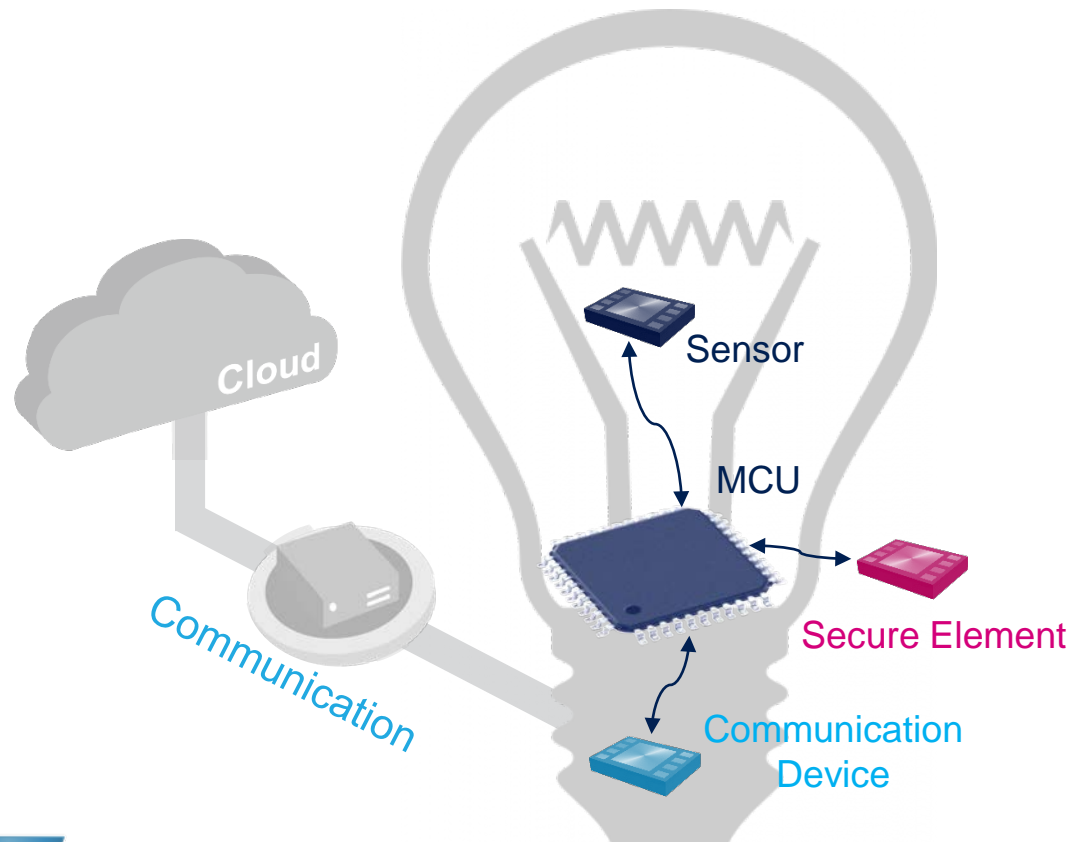
How would you defend from these?





Secure Platform

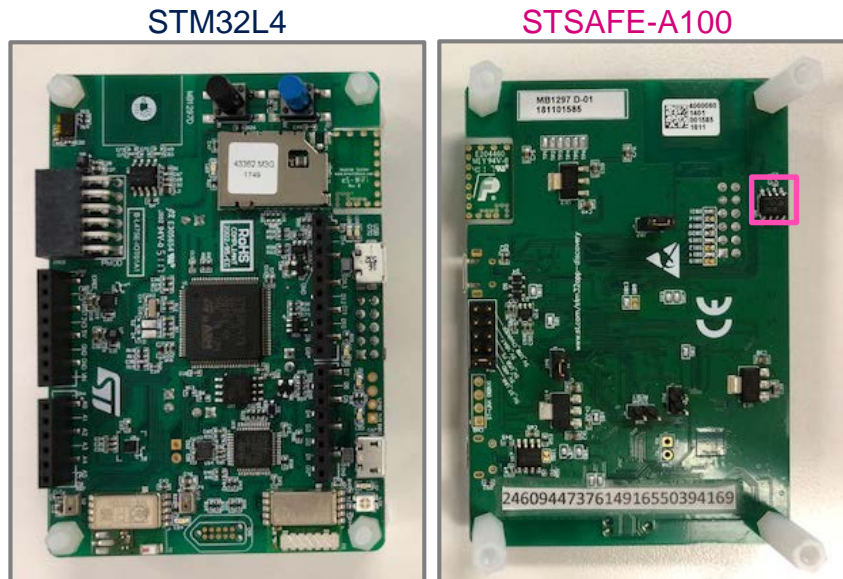
STSAFE enhances the tamper-resistance of an IoT Device throughout its lifecycle





Secure Platform

STSAFE supporting secure boot, firmware updates and communications



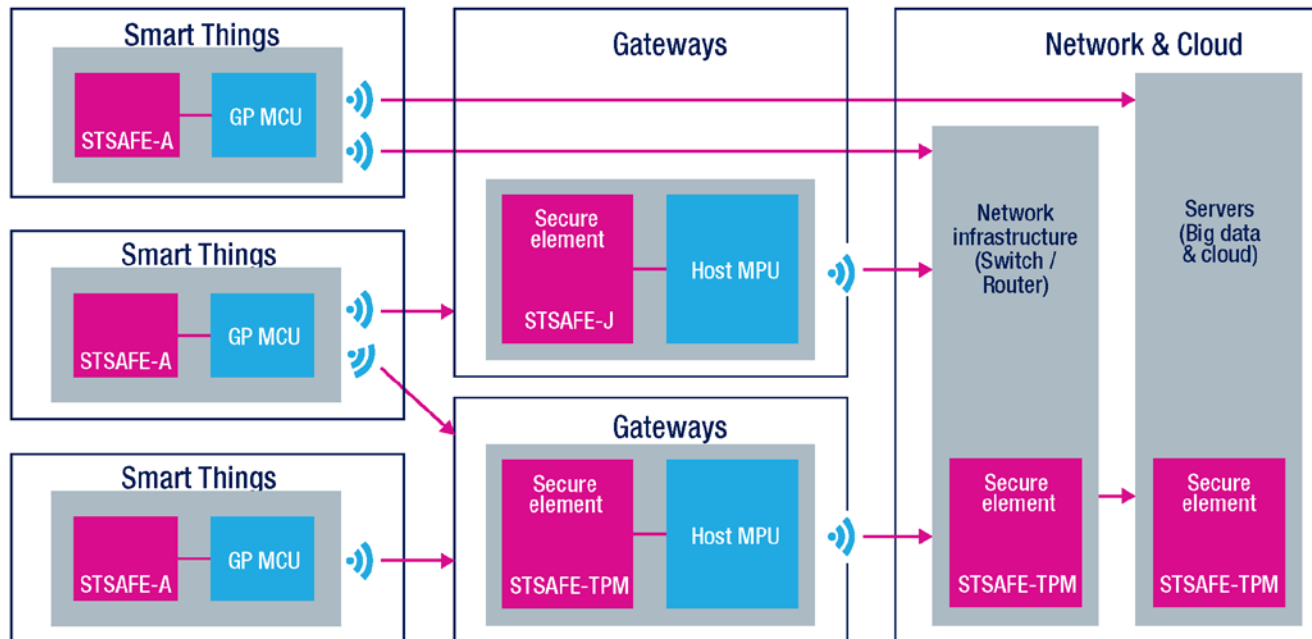
- A Secure Element is designed to thwart silicon invasive attacks
- Independently assessed, achieving very high standards like EAL5+ Common Criteria Certified chip
- Protects keys and performs cryptographic functions (ECDH, ECDSA, AES)
 - For Secure Communications, Secure Boot and Secure Firmware Updates
- Provides up to 6K bytes of Secure Data Store
- Devices shipped with secure keys and certificates which are provisioned during ST's manufacturing process reduces production cost and complexity
 - Trusted device identities don't require hardware security modules (HSM) in the supply chain, and their presence cannot be bypassed
- STSAFE may be combined with STM32, or other semi-vendors devices





Secure Solutions

STSAFE enables end-to-end security



- **STSAFE-A Optimized** authentication solution

- Authentication
- Secure communications, Secure data storage
- Secure key provision service
- EAL5+ Common criteria certified chip



- **STSAFE-J Flexible** Java based solution

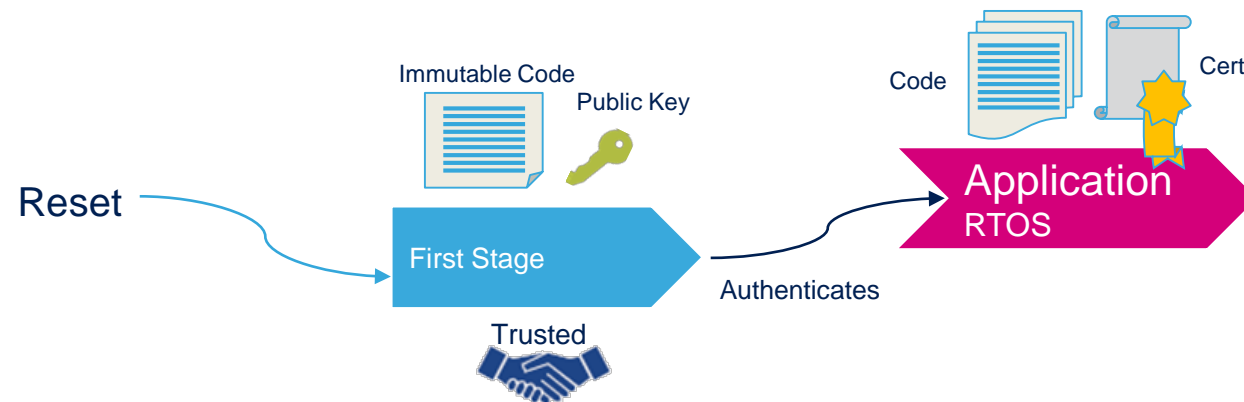
- Trusted network access with Authentication
- Secure Data storage, Secure communication
- Personalization services
- Common criteria and BSI certification

- **STSAFE-TPM Standardized** solution

- Platform integrity , Authentication
- Secure Boot, Secure Firmware upgrade
- Secure data storage and Secure communication
- Solution CC EAL4+ and TCG 1.2 / 2.0 certified

Secure Boot

Chain of Trust




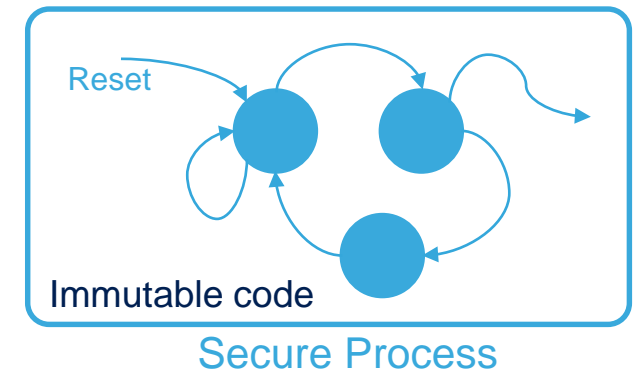
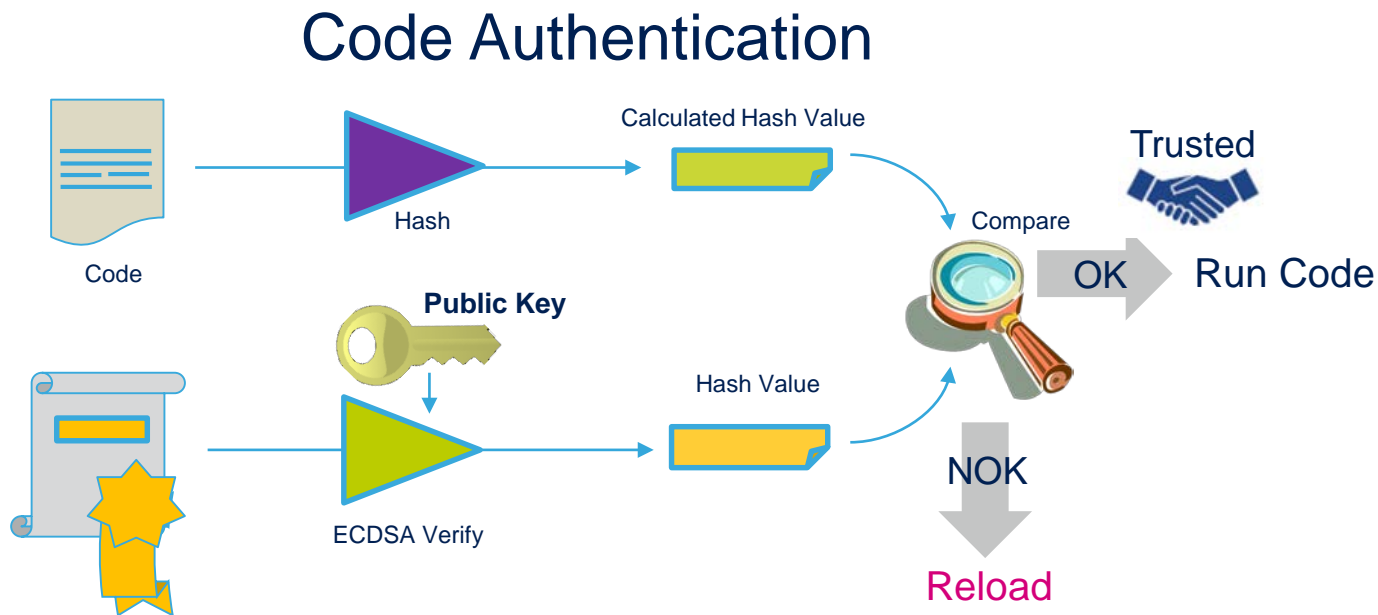
- Secure Boot uses cryptographic functions to confirm the authenticity of firmware before allowing it to run
- A multi-stage boot process is where each stage authenticates the next

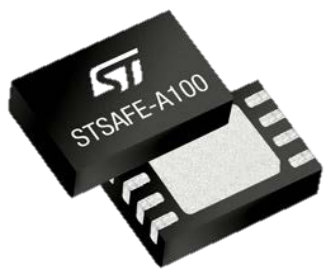


Secure Boot

Utilizing STM32L4's security features and STSAFE

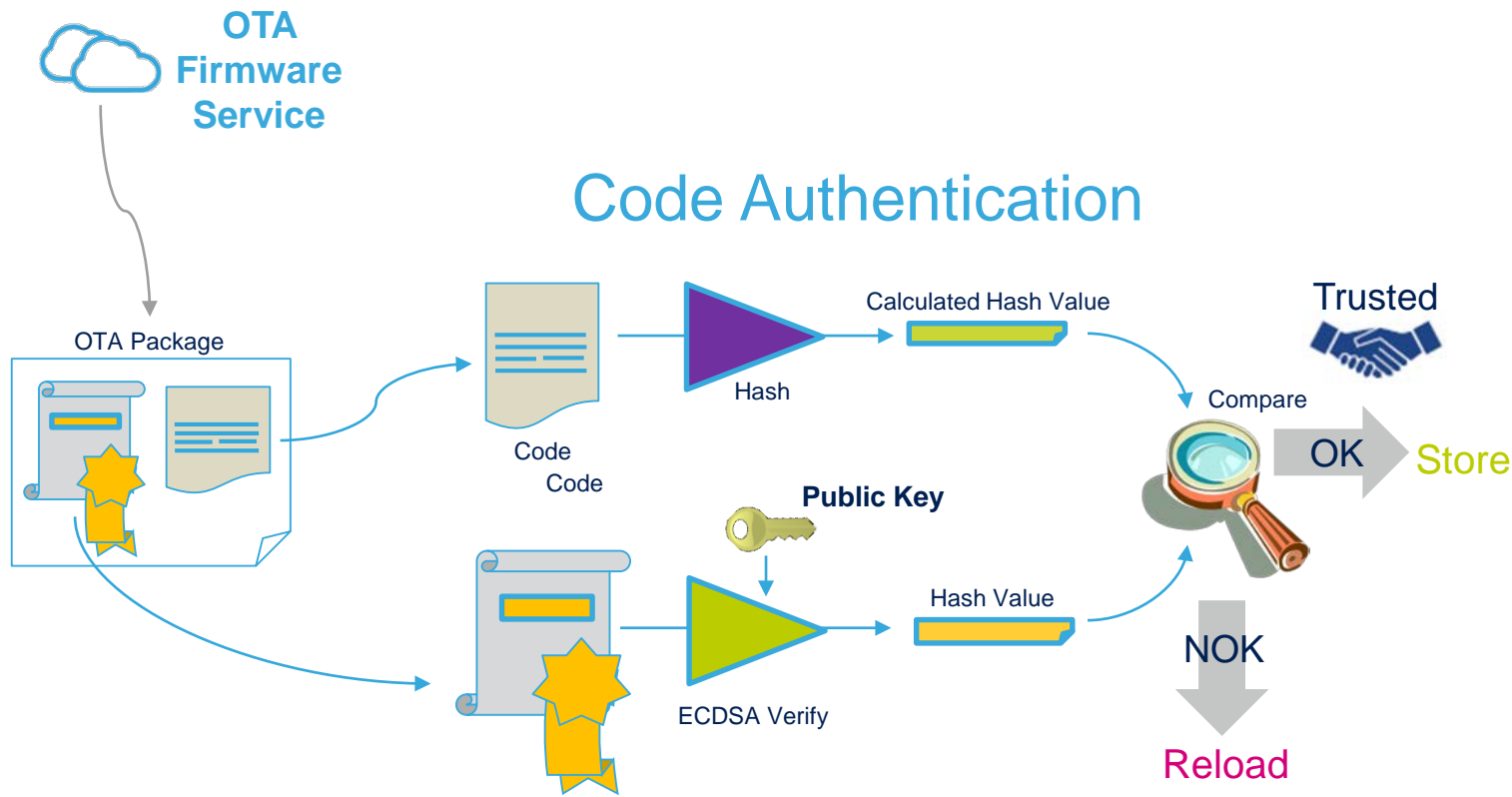
- Performed after a RESET, using a Public Key  stored in the device
- It is a stateful process for predictable behavior





Secure Firmware Update

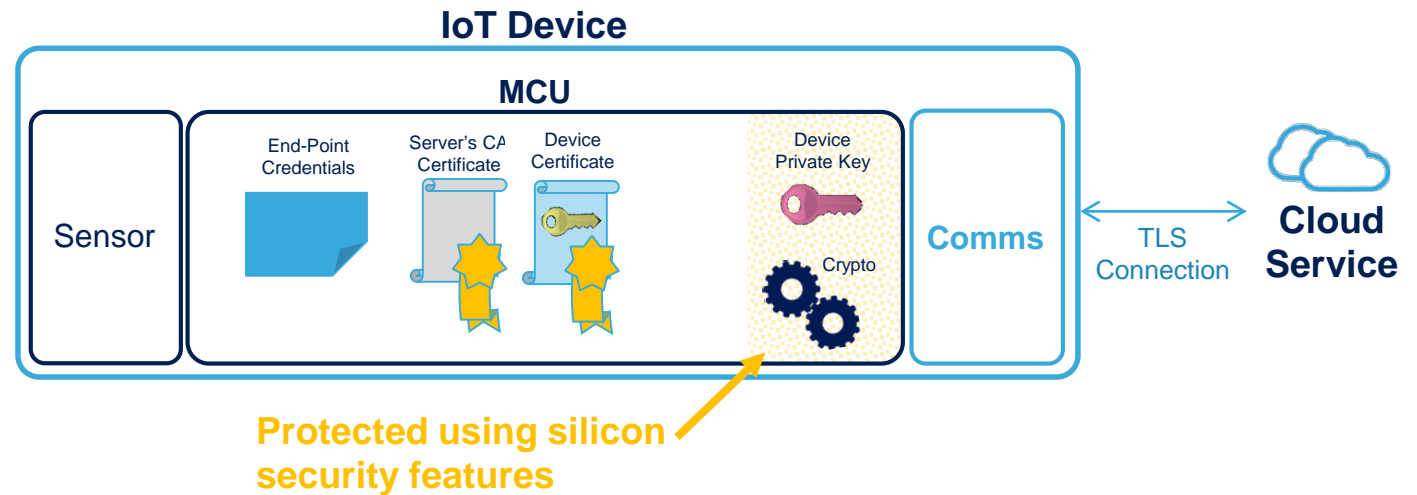
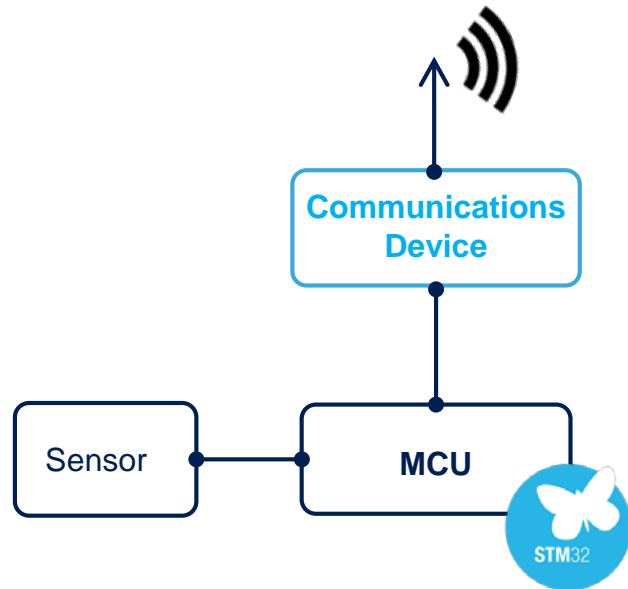
The ECDSA verify process off-loaded onto the STSAFE



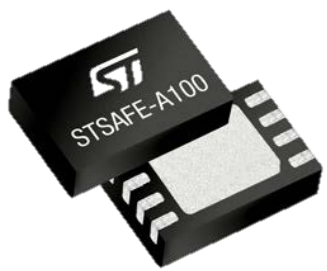
- This is a stateful process for predictable behavior
- A file is down-loaded containing the new firmware image and corresponding certificate
- The code image is then authenticated using a Public stored in the device
- If successful, the new firmware image is stored, ready for use

Connecting to the Cloud

Recommendations for handling TLS assets

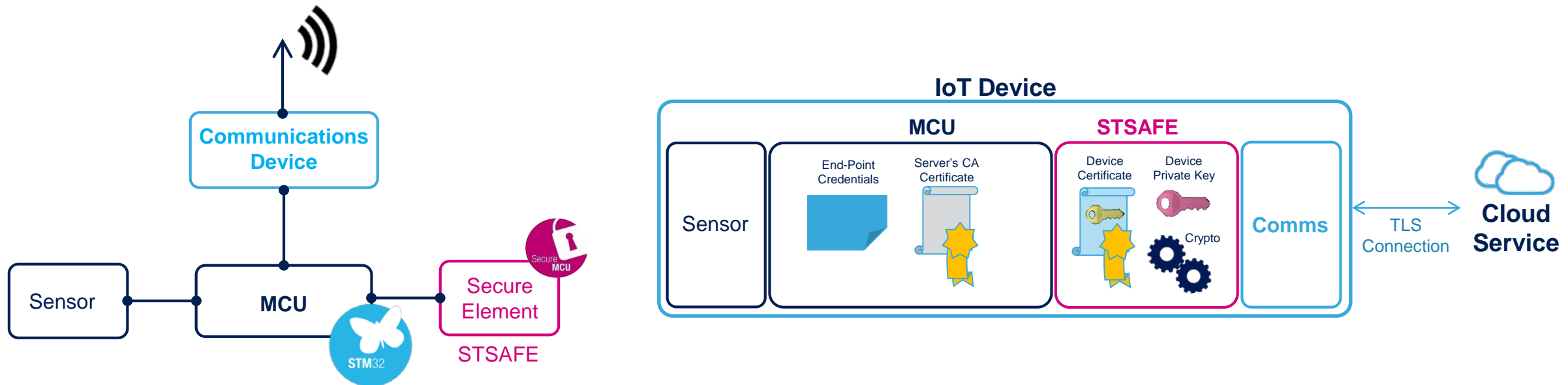


- Make use of the security mechanisms provided by the MCU to protect code, cryptographic functions and protect the keys (especially the Private Key 🗝)
- Store certificates and credentials in such a manner they cannot be easily replaced



Handling TLS Assets

TLS assets handled by a tamper-resistance Secure Element



- The Elliptic Curve cryptography is off-loaded to the STSAFE from the MCU
 - Reducing the amount of SRAM needed by the MCU
- The IoT Devices Private Key is stored securely in STSAFE tamper-resistant memory

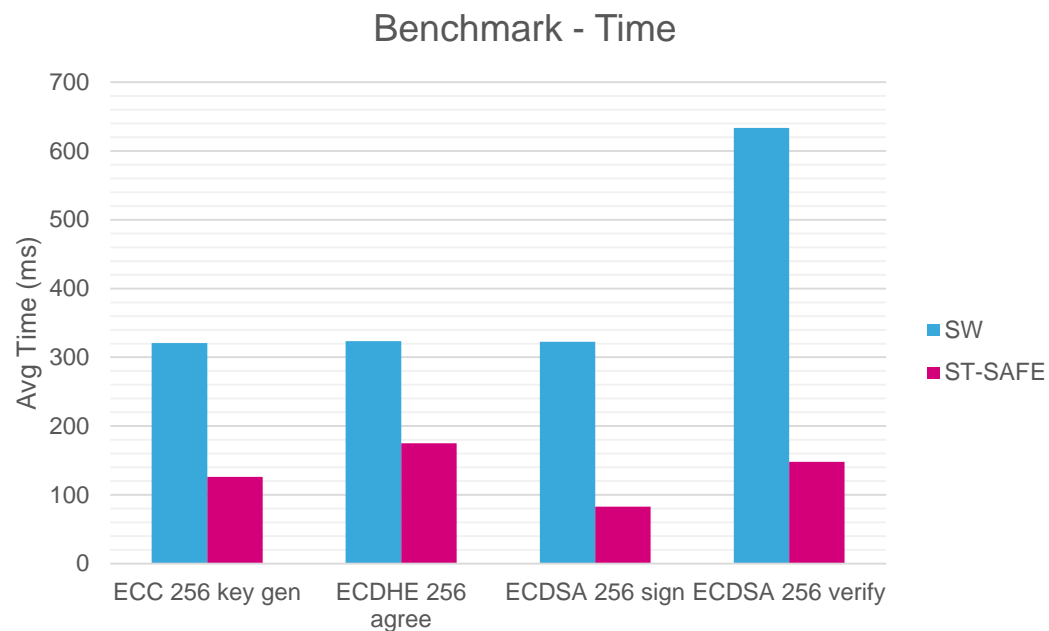


Performance Benchmarking

STSAFE-A100 improves TLS performance



STSAFE integrated with WolfSSL



Faster is better !





STSAFE-A100 For AWS IoT

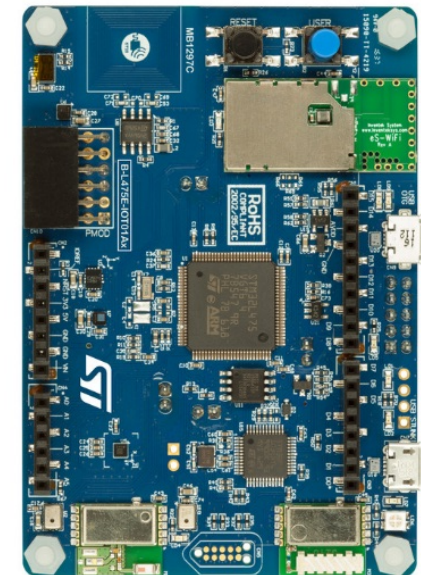
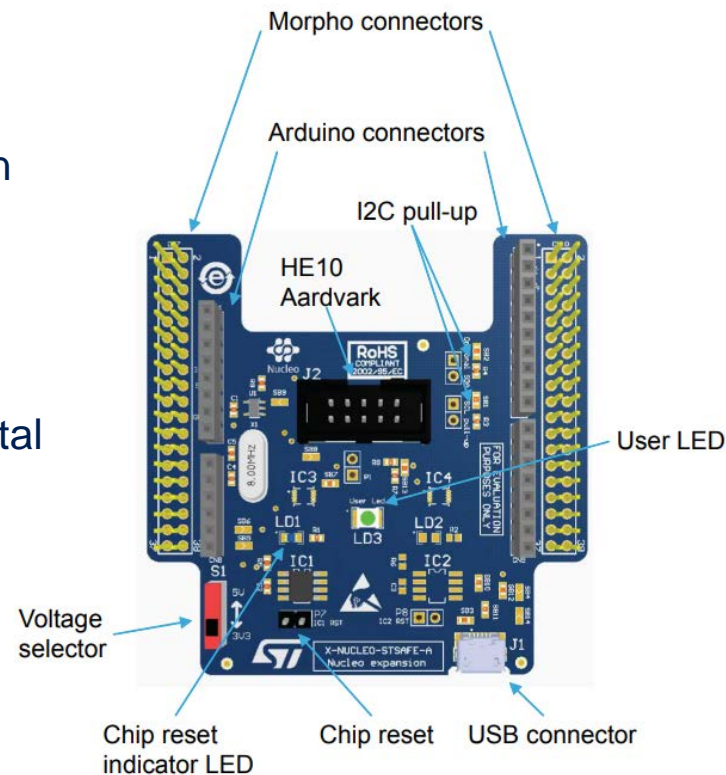
STSAFE-A100 tamper proof IoT Device identity without production HSMs

- Has been verified to protect the ECC private key used as the basis for TLS to common criteria EAL5+; your device using STSAFE-A100 is infeasible to clone
- An OEM specific CA is registered with AWS to allow devices to be authenticated on first connection, using the JITR process
- ST provides STSAFE devices pre-loaded with certificates signed by this CA
- When connecting to AWS IoT devices presenting these certificates will be accepted and automatically associated with the OEM's account
- MoQ

Quick Prototyping with STSAFE-A100

STM32 Discovery Kit IoT Node + X-NUCLEO-STSA100

- Ready-to-use printed circuit board STSAFE-A100 secure element.
- STSAFE-A100 pre-personalized with an evaluation configuration
- ARDUINO® connectors for connection to ARDUINO®-compatible microcontroller boards
- HE10 Aardvark™ connector for connection to a Total Phase Aardvark™ adaptor.
- Voltage selector to select the 3.3 V or 5 V power supply
- Chip reset jumper to force the chip reset stage
- User LED for use in applications



B-L475-IOT01A