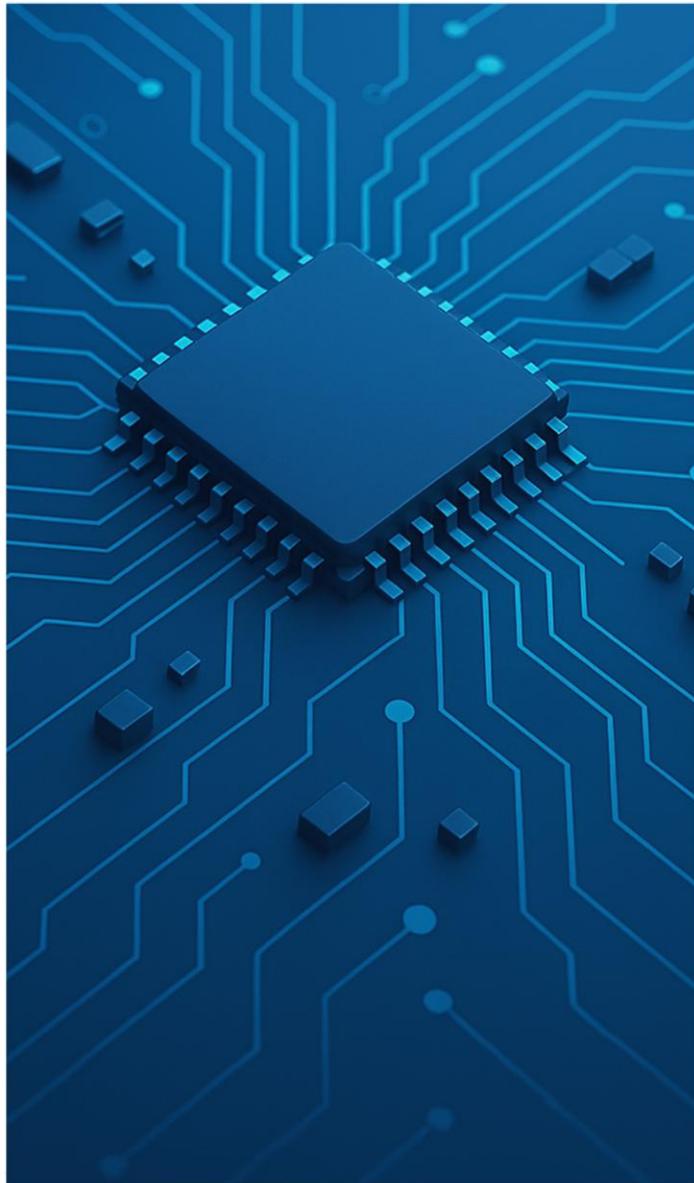# THE STM32 ADVANTAGE

Scalable, Reliable & Production-Ready Solutions by Inthings

OVERVIEW

STM32 MCU Families:

- F0, F3, F4 series

STM32 MPU Family:

- STM32MP1

Interfaces:

- UART
- SPI
- I2C
- ADC
- GPIO
- RS485
- CAN
- USB

RTOS & Firmware:

- Baremetal
- FreeRTOS
- HAL/LL drivers
- custom bootloaders
- OTA

Application Domains:

- Power electronics
- LoRa gateways
- Environmental IoT
- Multi-sensor systems
- Industrial automation

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CORE STM32 CAPABILITIES

Hardware Expertise

Schematic & PCB design (up to 8-layer HDI, FBGA layouts)

High-precision analog front-end design

RF, power management, and EMI/EMC-compliant design

Secure boot and hardware crypto module integration

Firmware Expertise

STM32 HAL/LL driver development

RTOS (FreeRTOS) integration

Interrupt-driven and DMA-based data acquisition

Custom bootloaders supporting UART/USB/OTA

Sensor interfacing (ADC, RS485, I2C, SPI)

Communication protocol stacks (LoRaWAN, MQTT, MODBUS, LTE AT-commands)

System Capabilities
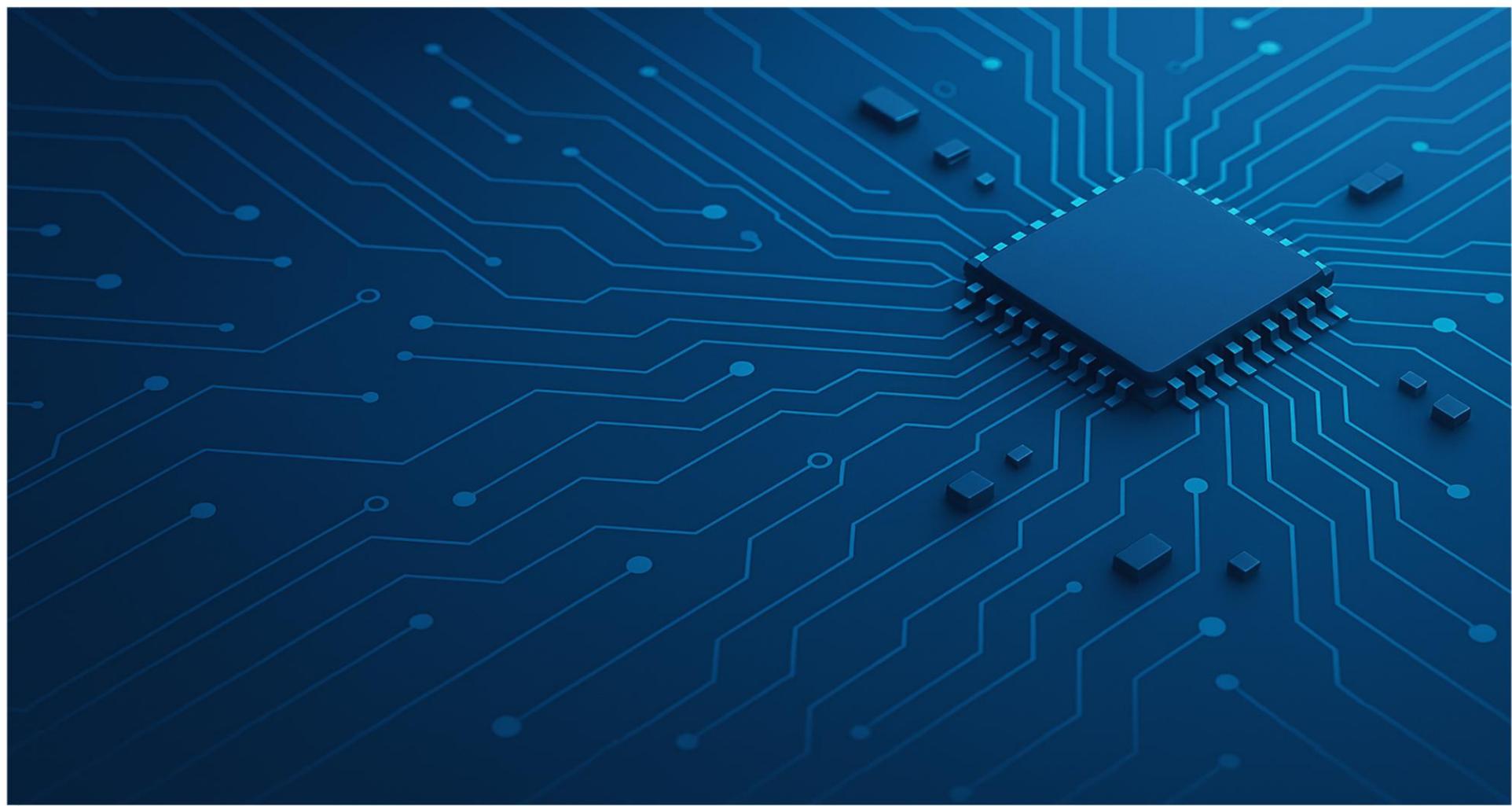
Real-time data acquisition

Multi-protocol communication

Cloud connectivity (Azure IoT)Edge processing & ML on Cortex-M4
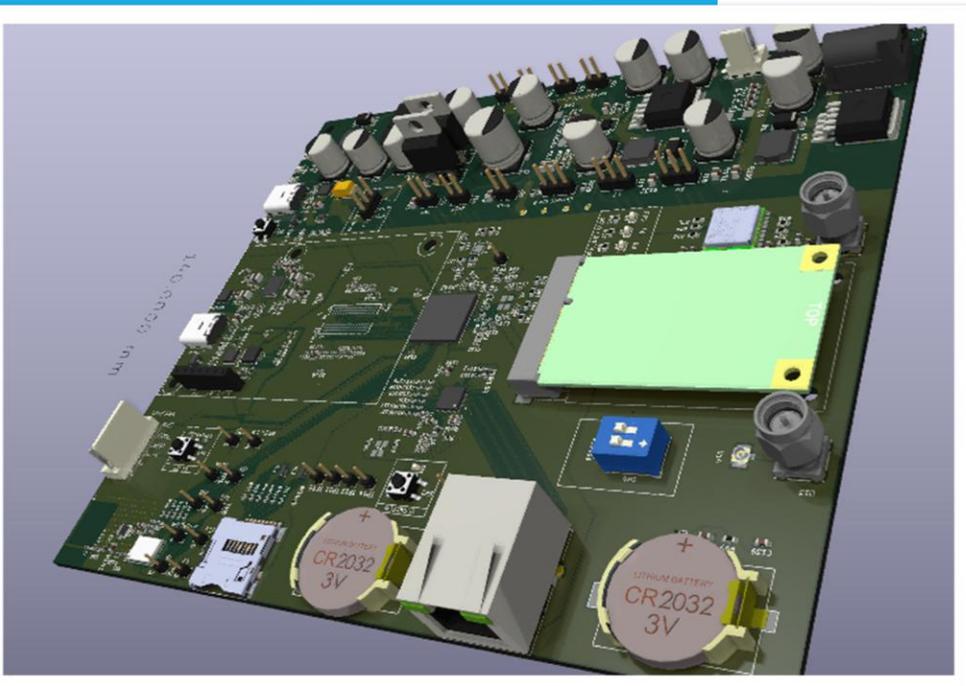
Power-efficient embedded designs

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PROJECT PORTFOLIO | Inthings

LORA GATEWAY: STM32MP1

Interfaced SX1303 LoRa concentrator via SPI

Developed Linux-based applications on A7 and RTOS firmware on M4 core

Implemented secure boot and hardware security module support

Enabled multi-interface connectivity:
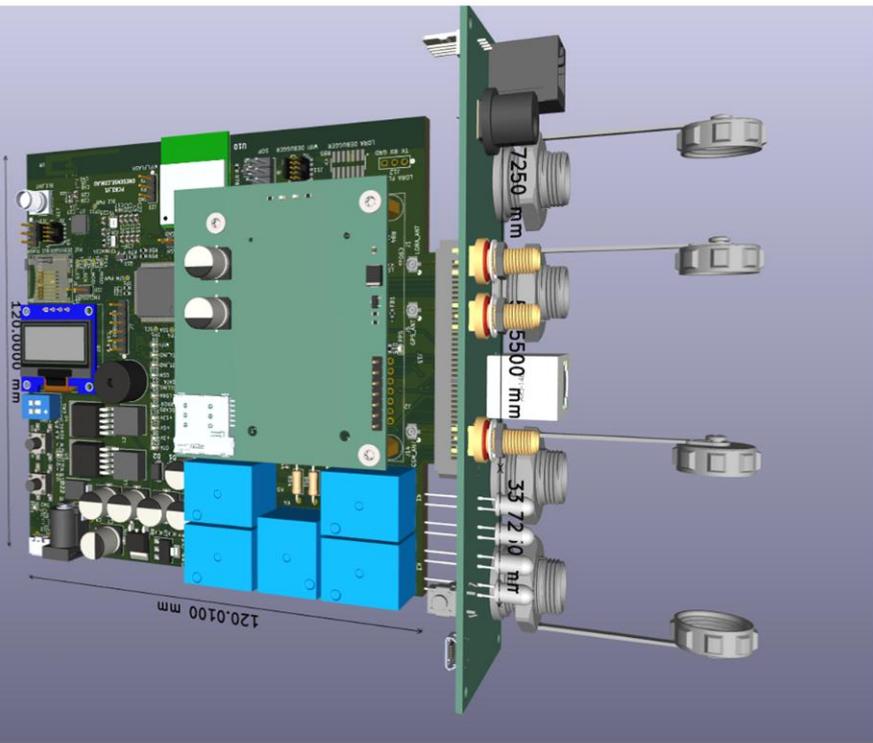- Ethernet
- Wi-Fi
- Bluetooth
- 4G/5G LTE

Real-time LoRa packet processing on M4 with cloud publishing via A7

Azure Edge Module

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IOT GATEWAY FOR INDUSTRIAL APPLICATION: STM32F407

- **High-precision ADC sampling for 5 analog channels**

- **2 x RS485 (MODBUS RTU)Channels for industrial interfacing**

- **SPI/UART wireless modules (4G/LTE, LoRa, Wi-Fi, BLE)**
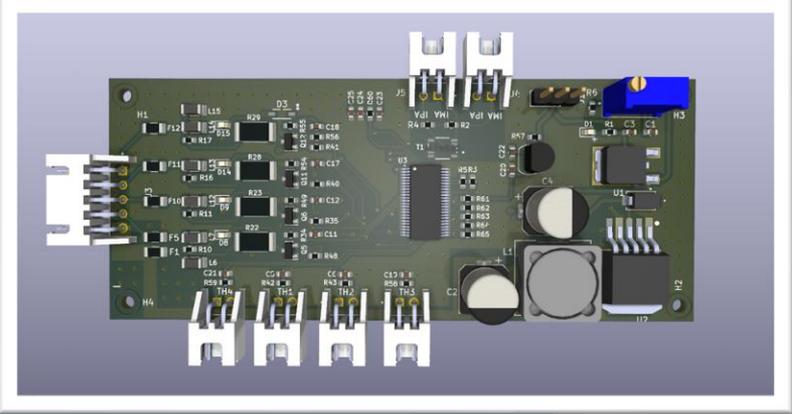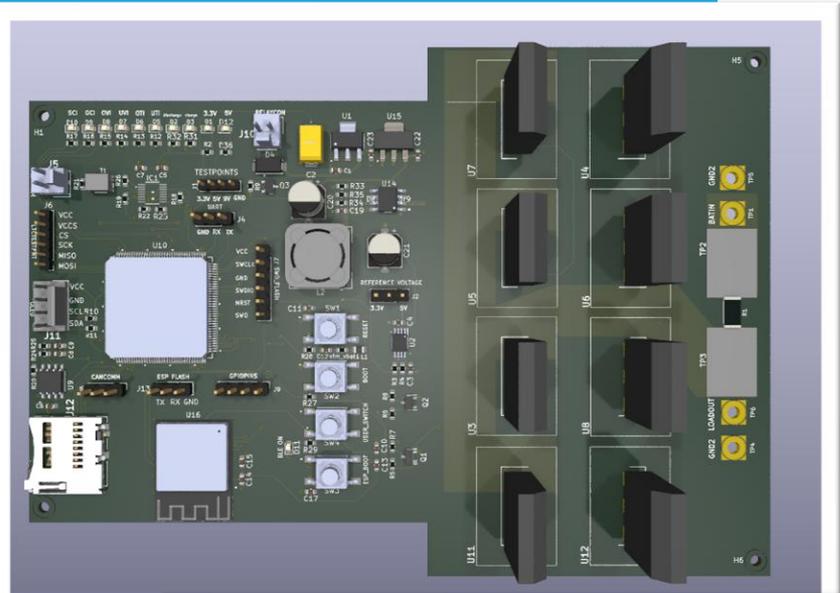
- **SD card logging + OLED display**

- **Relay automation outputs**

- **Designed for harsh-field environmental sensing**

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BATTERY MANAGEMENT SYSTEM: STM32F303

- Integrated LTC6811-2 AFE via ISO-SPI

- Passive balancing up to 60 per cell

- Voltage, current, and temperature safety monitoring

- LMP8481-based current sensing

- SOC and SOH calculation algorithms

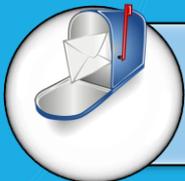- Used in 24-series Li-Ion packs

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