

# Smart Industrial Control

- **HMI Solution**
- **Gateway Solution**
- **5G Data Center**

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# HMI Application Scenario

## Smart Home

COM-SEG LCD with Touch Key



## Smart Home Appliance

Small Size TFT-LCD with Capacitive Touch



## Smart Factory / Industrial Control HMI

Large Size TFT-LCD with Resistive Touch



# | The Graphics Acceleration for Advanced HMI

For better user experience in graphic HMI, Advanced HMI **integrates** high performance cores, display I/F, graphic engine, touch sensor I/F and communication I/F.



## High Performance and Real-time Processing

- Dual 64-bit Arm Cortex-A35 up to 1 GHz
- Stacking a large DDR up to 512 MB
- Integrates the 2D graphics engine and Codec
- Operating system: RTOS, Linux



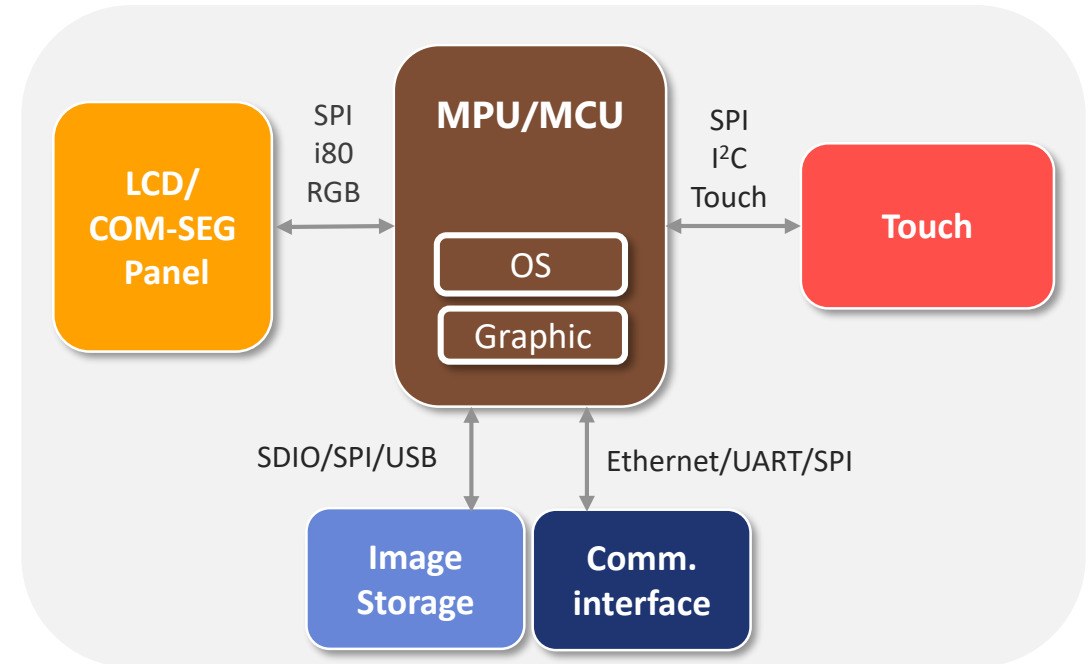
## Display/ Touch interface

- RGB, SPI, i80 Display interface
- Capacitive and Resistive Touch interface



## Connectivity & Storage

- Gigabit Ethernet, USB2.0 HS, SDIO, CAN FD, UART, SPI, I2C etc.



# NuMicro® M254/ M256/ M258 Series MCU

8x44 COM-SEG LCD, with 24 Touch Keys

## Power Consumption

138  $\mu$ A/MHz (Normal-Run)  
2.0  $\mu$ A (Power-down, RTC on)  
1.6  $\mu$ A (Deep-power-down, RTC off, LVR on)



## Segment LCD Driver

Drives up to 8 COM x 44 SEG  
Charge pump for battery device



## Capacitive Touch Sensing

Supports up to 24 channels  
with water proof and noise resistance features  
Only spend 10ms to complete 24 touch keys scanning



## USB 2.0 FS with BC 1.2

USB 2.0 Full speed crystal-less function  
Up to 12 endpoints equal to 3 VCOM ports  
Supports 5V 1.5 Amp battery charging efficiency



## 3-in-1 Low-Power Microcontroller (USB + LCD driver + Touch keys)

- Arm® Cortex®-M23 core
- Runs up to 48 MHz
- Operating voltage:  
1.75V to 5.5V  
(5V tolerance I/O)
- Operating temperature:  
-40°C to +105°C
- High immunity:  
EFT 4.4 kV, ESD HBM 7 kV



# NuMicro<sup>®</sup> M460 Series MCU

For Small Size TFT-LCD, < 480 x 272

## High Performance & Low Power

200 MHz Arm Cortex-M4 with DSP, FPU

134  $\mu$ A/MHz (Normal-Run)

140 nA (Deep-power-down)



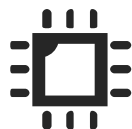
## Advanced Memory Structure

1024 KB Flash Memory with FOTA & XOM function

512 KB SRAM

**HyperBus** Interface to connect with HyperRAM

**SPI Master** plus 16 KB cache to extend code Flash



## Graphics Acceleration

SPI and i80 interface

2 sets of PDMA

Floating point unit (FPU)

Touch Key



## Advanced Connectivity

10/100 Mbps Ethernet

USB HS OTG with PHY

Up to 4 sets of CAN FD



Extended Flash and SRAM with security function  
Suitable for industrial applications

- **Arm<sup>®</sup> Cortex<sup>®</sup>-M4 core**
- **Runs up to 200 MHz**
- **Operating Voltage:**  
1.7V to 3.6V
- **Operating Temperature:**  
-40°C to +85°C/+105°C

### Sub Series:

- M467: Ethernet + Crypto + CAN FD + USB HS OTG + USB FS OTG
- M463: AES + CAN FD + USB HS OTG

# NuMicro<sup>®</sup> MA35D1 Series MCU

For Large Size TFT-LCD, < 1920 x 1080

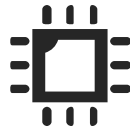
## High-Performance and Real-Time Ability

Dual cores 64-bit A35 processor up to 1 GHz  
One Cortex-M4 processor up to 180 MHz



## Stacking a large DDR up to 512 MB

Reducing the PCB layers, Size, and EMI interference  
Saving production cost



## Graphics Acceleration

A LCD display I/F, resolution up to 1080P  
2D graphics engine  
Integrates JPEG and H.264 decoder  
Supports 4/5-wire resistive touch without an external IC



## Rich Peripheral

High-speed connectivity Giga Ethernet. SDIO3.0, USB  
HS Host/Device, CAN-FD



## Cortex-A35 Offers more Efficiency over Cortex-A7



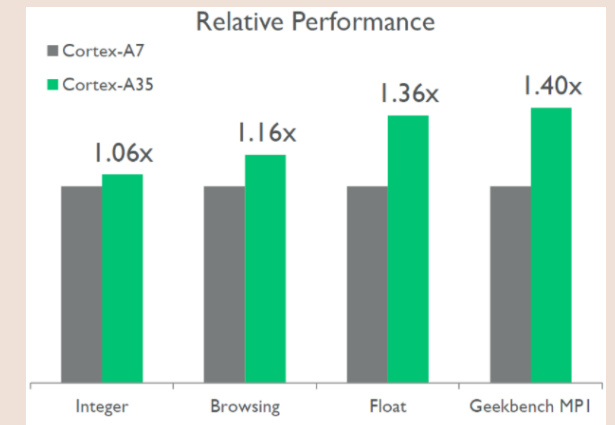
**10% low power**



**6% to 40% performance uplift**



**64b capable** with full backwards compatibility



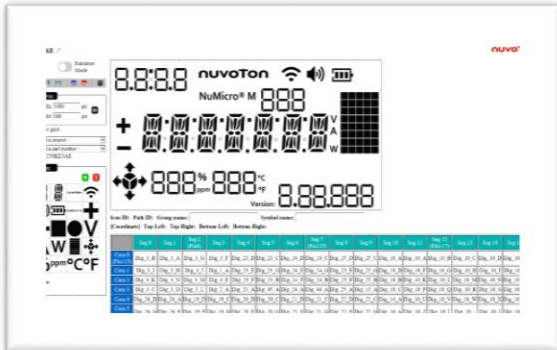
\*Comparisons assume same process technology and implementation for both processors  
\*Captured from Arm Community blogs

# NuMicro<sup>®</sup> HMI Platform – GUI Tools and Resource

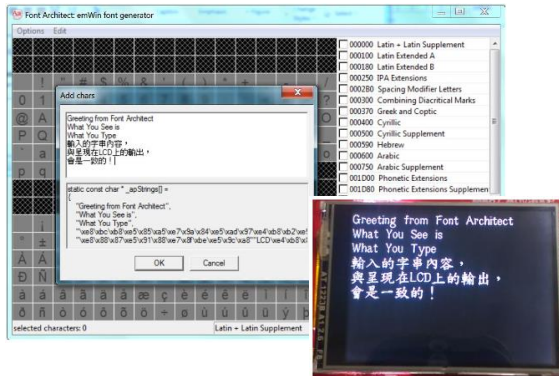
- Provides **GUI tools for HMI applications**, ease your development & save your time
- Provides **diverse graphics library**, such as **emWin**, **LVGL**, **Qt** for creating GUI easily
- **Nuvoton** is licensed with the **SEGGER emWin graphics library**; users can use it **for free** on the HMI platforms

## COM-SEG LCD

Nuvoton  
LCDView & LCD  
Touch Key



Nuvoton FontArchitect  
Supports multi-language display



## TFT-LCD

Graphics Library



# NuMicro<sup>®</sup> HMI Platform



COM-SEG LCD



COM-SEG LCD +  
Touch Key



Small Size TFT-LCD



Median Size TFT-LCD



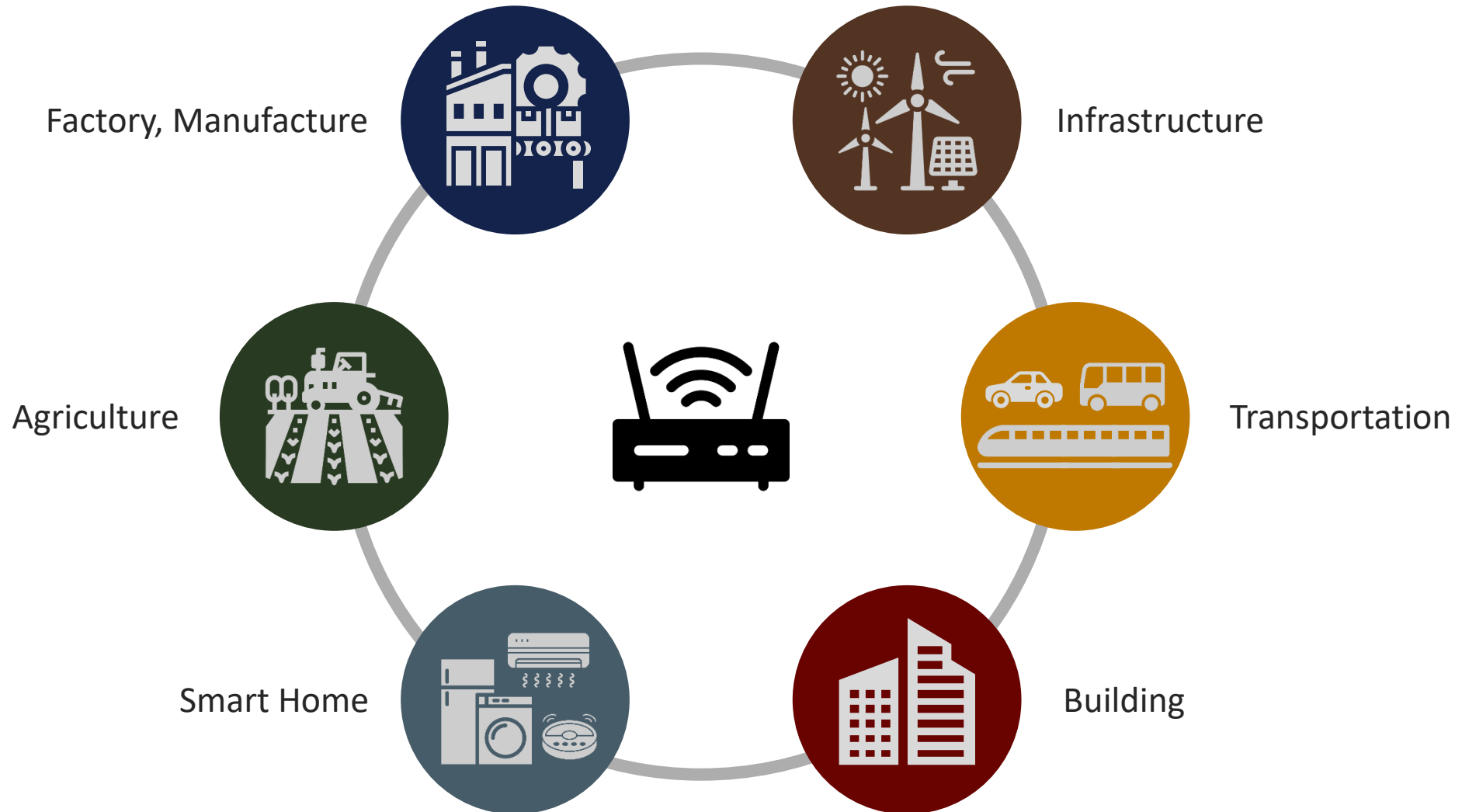
Large Size TFT-LCD

COM-SEG LCD		
Series	M254 ML54	M258 M256 ML56
COM-SEG LCD Driver	Up to 8x44	Up to 8x44
Touch Key	-	24 CH
OP Voltage (V)	1.8 ~ 5.5	1.8 ~ 5.5
CPU Core & Speed	Up to 48 MHz, M23	Up to 48 MHz, M23
Flash	256 KB	256 KB
RAM Size	32 KB	32 KB

TFT-LCD			
Series	M460 M480 M2354 M032	N9H20 N9H26 N9H30	MA35D1
LCD Resolution (Recommendation)	< 480 x 272	< 1024 x 768	1920 x 1080
LCD Interface	SPI / i80	SPI / i80 / RGB	SPI / i80 / RGB
CPU Speed	Up to 200 MHz, M4	Up to 300 MHz, Arm9	Up to 1 GHz, Dual Cores A35
Flash	1024 KB	External	External
RAM Size	512 KB	Up to 128 MB	Up to 512 MB
Video Codec		JPEG & H.264 Codec	JPEG & H.264 Decoder
2D GFx		●	●
OS	RTOS	Mbed, FreeRTOS, RT-Thread	FreeRTOS, RT-Thread
	Linux	●	●



# IIoT Gateway Everywhere



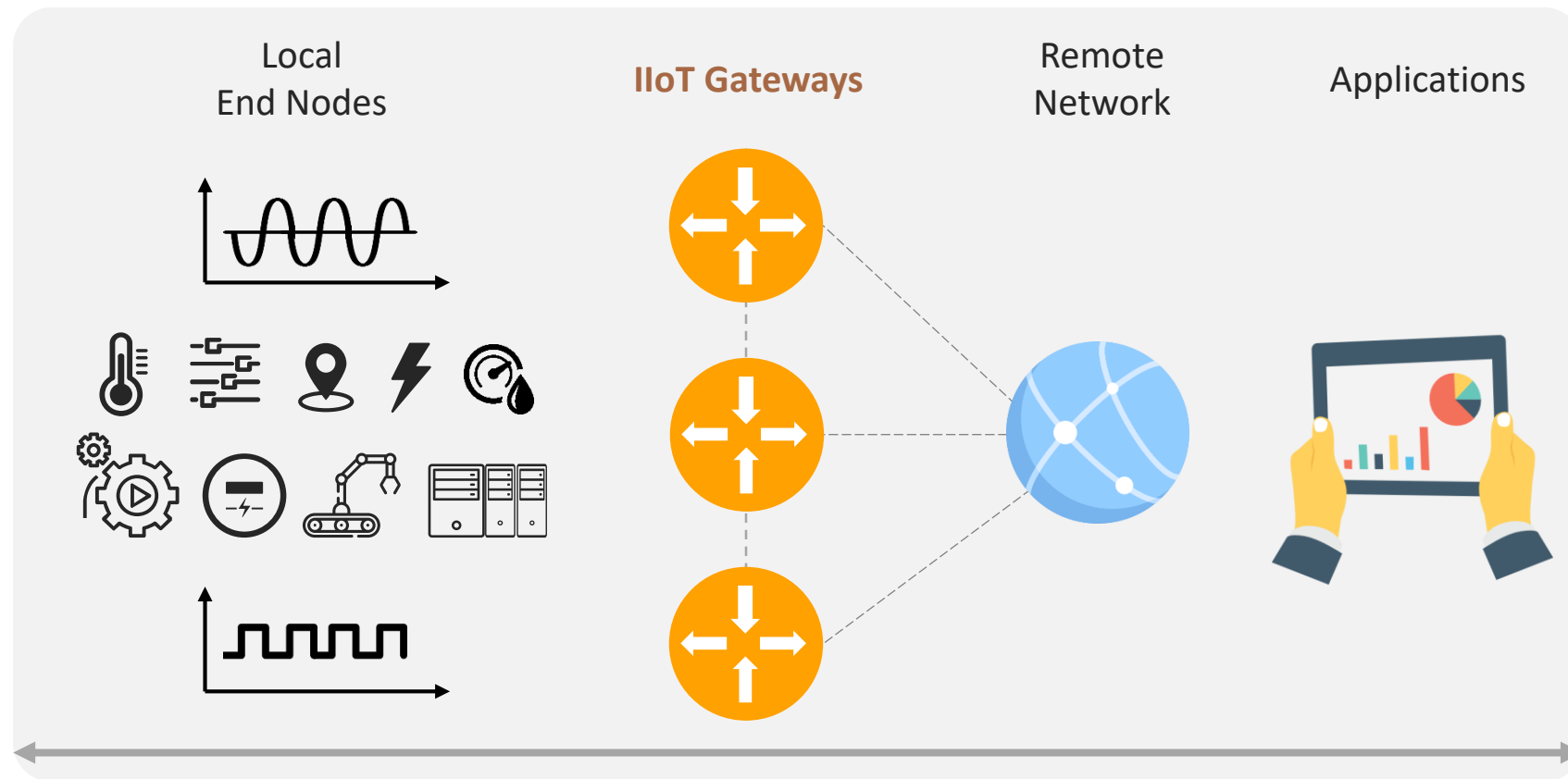
# IIoT Gateway Application Scenario

Key Features of Gateway:

Connectivity

Security

Software & Protocol



# High Performance and Advanced Security for Edge Gateway

For increased data processing and connection ability, we provide products equipped with advanced security, high performance cores, PDMA and high-speed connectivity.

## High Performance and Real-time Processing

- Dual 64-bit Arm Cortex-A35 up to 1 GHz
- Arm Cortex-M4 up to 200 MHz

## Advanced Security

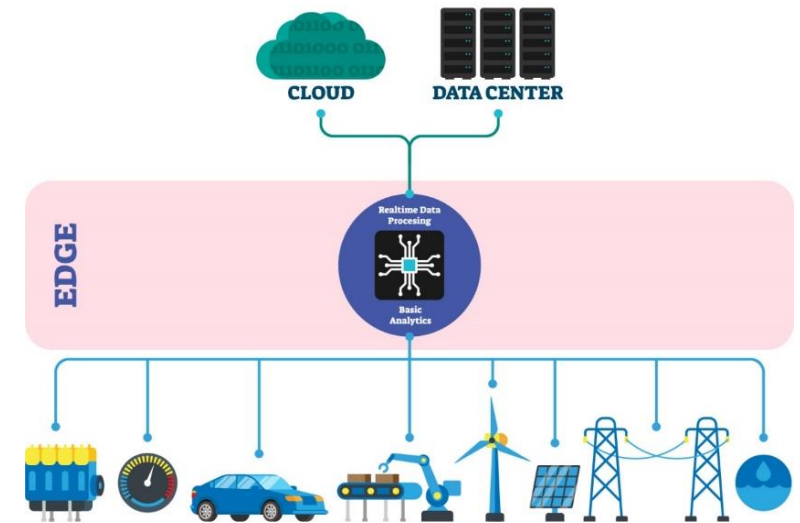
- TrustZone
- Nuvoton unique secure hardware - TSI
- Secure data transfer by TLS encryption

## Connectivity

- Gigabit Ethernet x2, USB2.0 HS x2, SDIO 3.0, CAN FD x4, UART x17 etc.
- Ethernet, Wi-Fi, 4G/5G, NB-IoT, LoRa, BLE, sub-1G, etc.

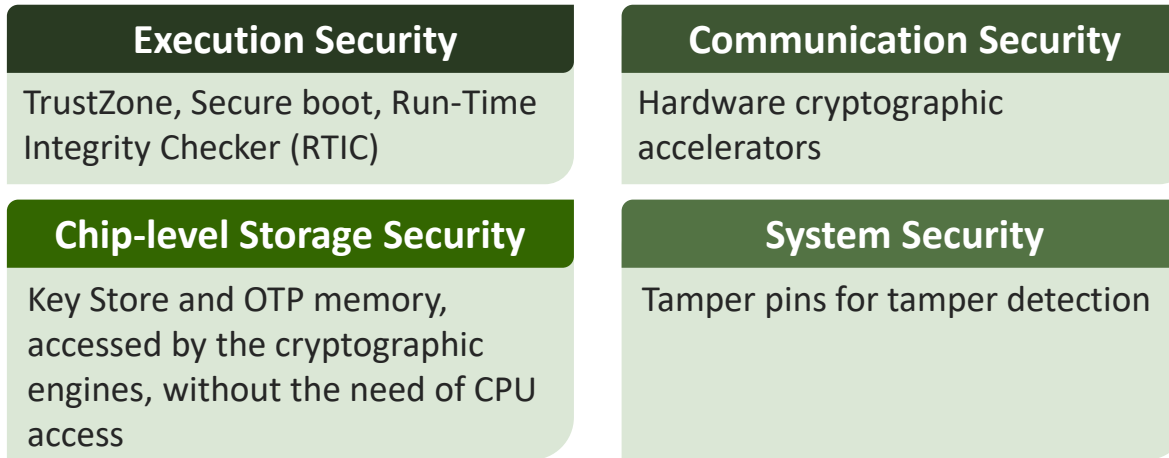
## Software & Protocol

- Network protocols -TCP, UDP, HTTP(S), MQTT, CoAP, etc.
- Public cloud client references to Azure, AWS, etc.

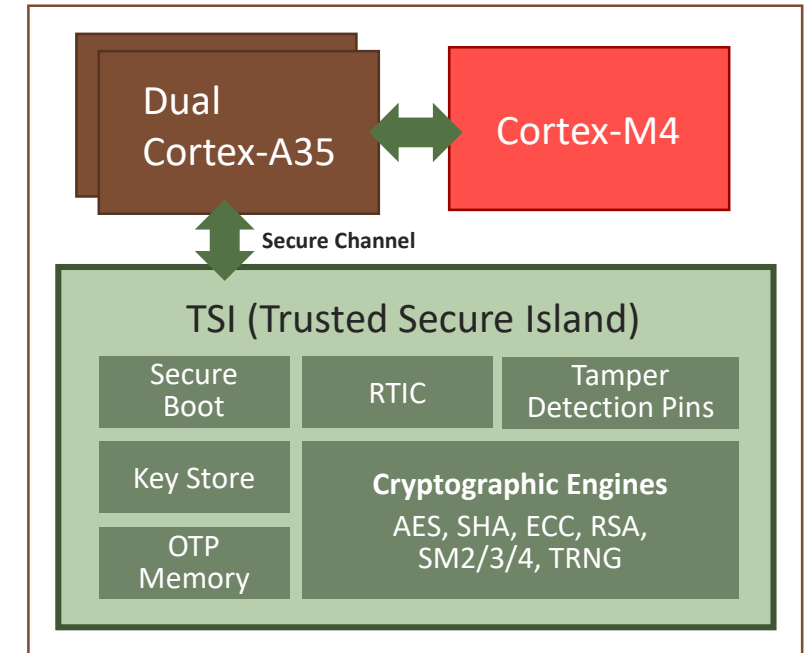


# Advanced Security Features for Cyber Security

- Easy to establish



- The secure environment and features realize the **Protection**, **Detection**, and **Recovery** for IoT products.
- The **Nuvoton Trusted Secure Island (TSI)** is an isolated secure hardware unit.
- Built-in cryptographic accelerators, Key Store, and OTP memory.
- Performs all the security operations, including secure boot and tamper pins detection.



The MA35D1 is a trusted system for IoT products' security requirements

# IIoT Gateway Segments

	Entry	Advanced	Superior
	M460	NUC980	MA35D1
Performance	Cortex-M4@200 MHz 512 KB SRAM	ARM9@300 MHz MCP 128 MB	Dual Cortex-A35 Up to 1 GHz + Cortex-M4 MCP 512 MB
Connectivity	10/100M Ethernet UART x10 CAN-FD x4 USB x2	10/100M Ethernet x2 UART x10 CAN x4 USB x2	1G Ethernet x2 UART x17 CAN-FD x4 USB x2
Security	Secure Boot, Crypto Engines, Secure MEM	Crypto Engines	Nuvoton TSI (Secure Boot, Crypto Engines, Secure MEM)
Software & Protocol	Mbed, RTOS Azure, AWS TCP, UDP, HTTP(S), MQTT, CoAP	Linux, OpenWRT and RTOS Azure, AWS TCP, UDP, HTTP(S), MQTT, CoAP	Linux and OpenWRT Azure, AWS TCP, UDP, HTTP(S), MQTT, CoAP



# NuMicro<sup>®</sup> M460 Platform

## Hardware Features

- Arm **Cortex-M4@200MHz**, DSP, FPU
- Flash and SRAM are **1 MB** and **512 KB**
- **HyperBus Interface** for external HyperRAM as data buffer

## Network Connectivity

- 10/100M **Ethernet**
- UART, I<sup>2</sup>C, SPI, PWM, GPIO, USB HS/FS, CAN FD, MicroSD
- Extended support 4G LTE, NB-IoT, BLE, LoRa, etc.

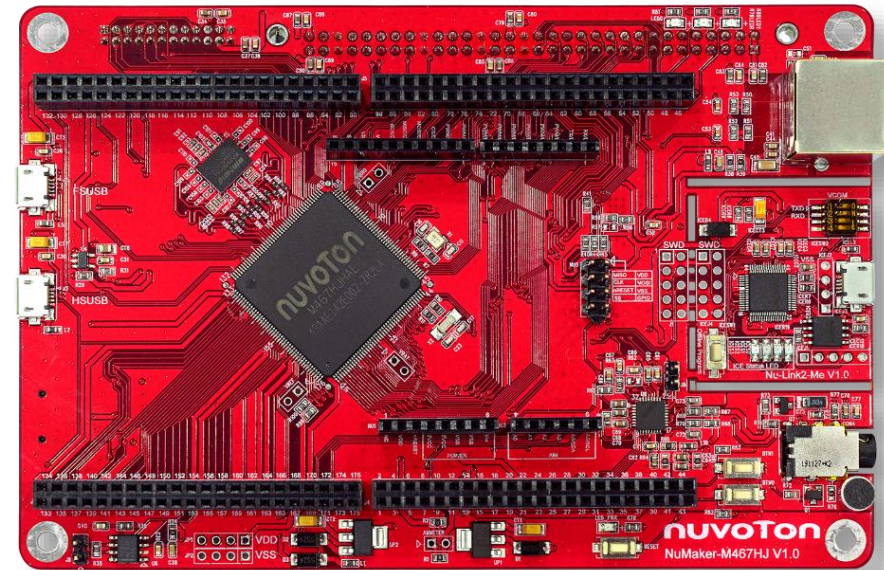
## Software & Protocols

- RTOS support **Mbed OS**, RT-Thread, etc.

## Security

- AES, ECC, RSA, and SHA Hardware Crypto engines
- TRNG, XOM, Key Store

NuMaker-M467HJ



# NuMicro<sup>®</sup> NUC980 Platform

## Hardware Features

- ARM926EJ-S@300 MHz, MCP 64 or 128 MB DDR

## Network Connectivity

- 10/100M **Ethernet** on board
- UART, I<sup>2</sup>C, SPI, PWM, GPIO, USB FS/HS, MicroSD
- Extended support Wi-Fi, 4G LTE, NB-IoT, LoRa, BLE, and sub-1G, etc.

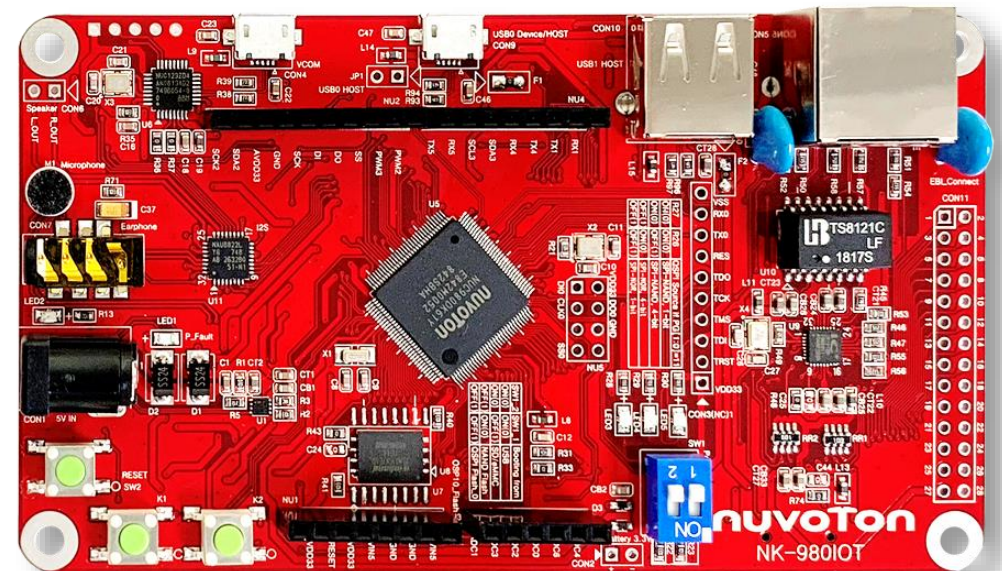
## Software & Protocols

- **Linux v4.4**, **OpenWRT**, u-boot and **RTOS** are ready for development
- **TLS 1.2** encryption for data encryption

## Security

- AES, ECC, RSA, and SHA Hardware Crypto engines

## NuMaker-IIoT-NUC980



# NuMicro<sup>®</sup> MA35D1 Platform

## Hardware Features

- **Dual Arm Cortex-A35@800 MHz + M4 + TSI**, MCP 512MB DDR
- NAND Flash 1 GB, QSPI-NAND Flash 512 MB

## Network Connectivity

- **Gigabit Ethernet, Megabit Ethernet**
- USB 2.0 HS, CAN FD, RS485, UART, Camera I/F, MicroSD slot
- Extended support Wi-Fi, 4G LTE, NB-IoT, LoRa, BLE, and sub-1G, etc.

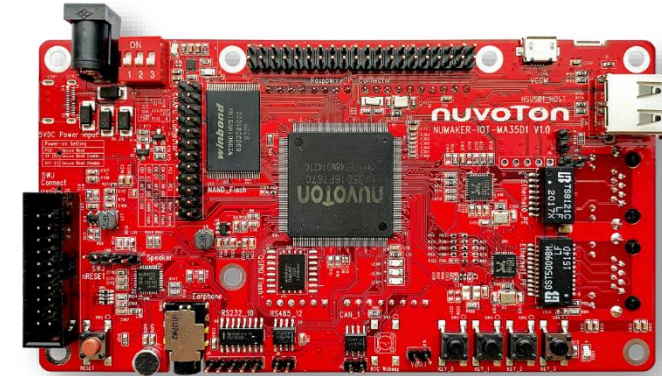
## Software & Protocols

- **Linux v5.4, OpenWRT**, and u-boot are ready for development
- **TLS 1.3** encryption for data encryption

## Security: Nuvoton Trusted Secure Island (TSI)

- TrustZone/ Secure Boot
- AES, ECC, RSA, SHA, SM2/3/4 Hardware Crypto engines
- RTIC, TRNG, Key Store, OPT memory, Tamper Detection Pin

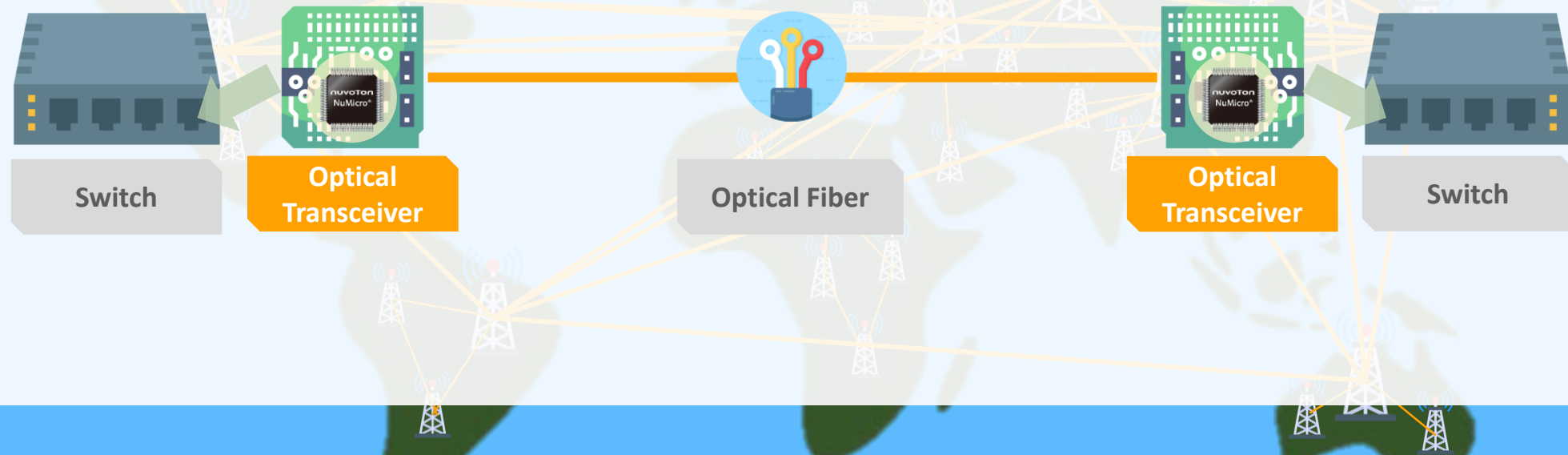
## NuMaker-IoT-MA35D1-A1





# NuMicro<sup>®</sup>

## M029G/M030G/M031G



# NuMicro<sup>®</sup> M029G/M030G/M031G for Optical Transceiver



## Accurate Temp. Sensor

Build-in Temp. Sensor  
 $\pm 2^{\circ}\text{C}$  ( $-40^{\circ}\text{C}\sim 105^{\circ}\text{C}$ )



## Small Package

QFN24 3x3 mm  
QFN33 4x4 mm



## Strong I<sup>2</sup>C

400K/1MHz Slave Mode  
Non-Stretch Mode  
I<sup>2</sup>C Bootloader



## Manchester Codec

Hardware Implement  
With CRC Support



## Premium DAC

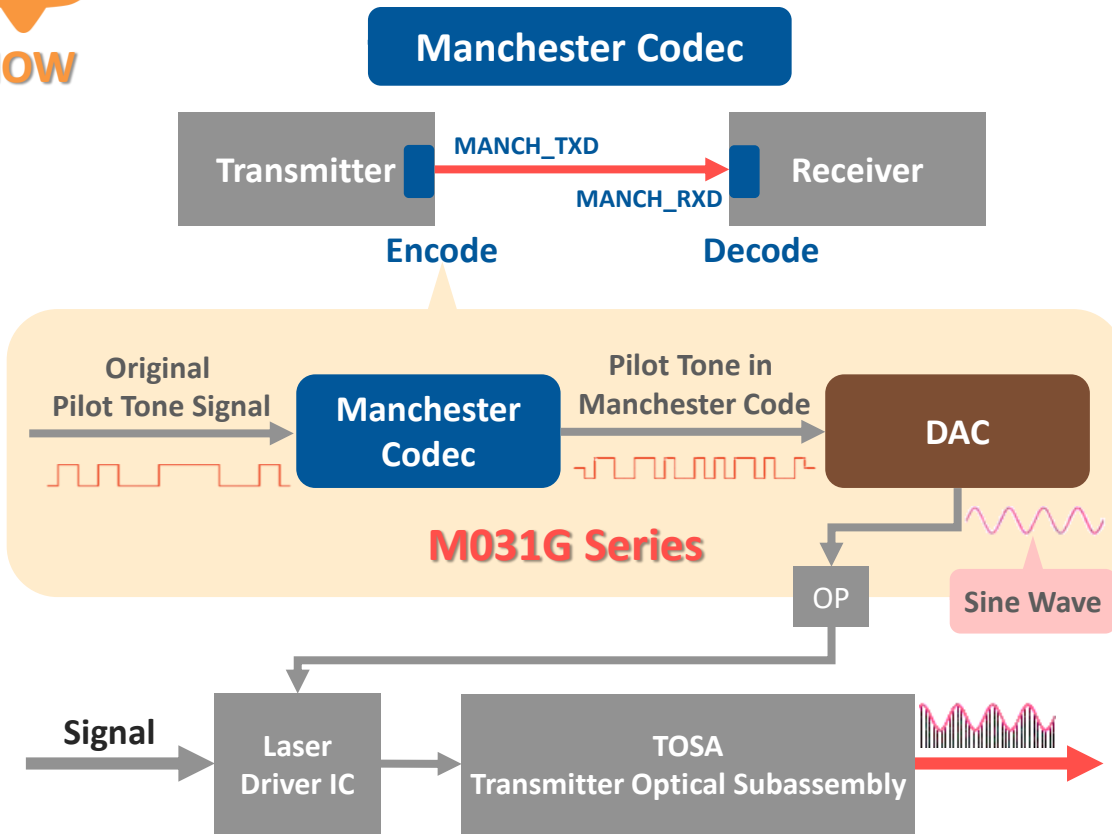
Auto Data Generation



**M029G/M030G** for General Optical Transceiver

**M031G** for Pilot Tone Optical Transceiver



# NuMicro<sup>®</sup> M029G/M030G/M031G for Optical Transceiver



 <b>Manchester Codec</b>	 <b>Premium DAC</b>
Hardware Implement With CRC Support	Auto Data Generation
<b>M031G for Pilot Tone Optical Transceiver</b>	

Joy of innovation  
**nuvoTon**

谢谢

謝謝

Děkuji

Bedankt

Thank you

Kiitos

Merci

Danke

Grazie

ありがとう

감사합니다

Dziękujemy

Obrigado

Спасибо

Gracias

Teşekkür ederim

Cảm ơn