

# NXP IOT SOLUTIONS COMPLETE DEVELOPMENT PLATFORMS FOR SECURE IOT SYSTEMS

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SECURE CONNECTIONS  
FOR A SMARTER WORLD

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# AGENDA

- Industry Problem Statement
- NXP Modular IoT Framework
- General Purpose IDEX available today
- Value proposition to your IOT team
- Practical Demonstration



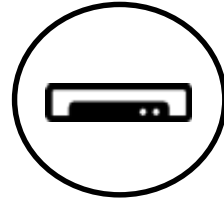


# 01.

## Industry Problem Statement

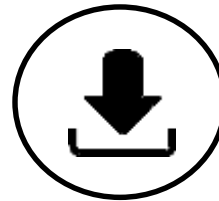


# IoT Systems Challenges Today



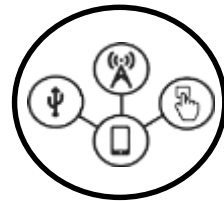
## **Stand alone IoT components do not function as full IoT systems**

*IoT application prototyping involves connecting multiple components/modules, that don't always work together*



## **Complex software integration**

*Substantial effort required to integrate connectivity and security software for each board*

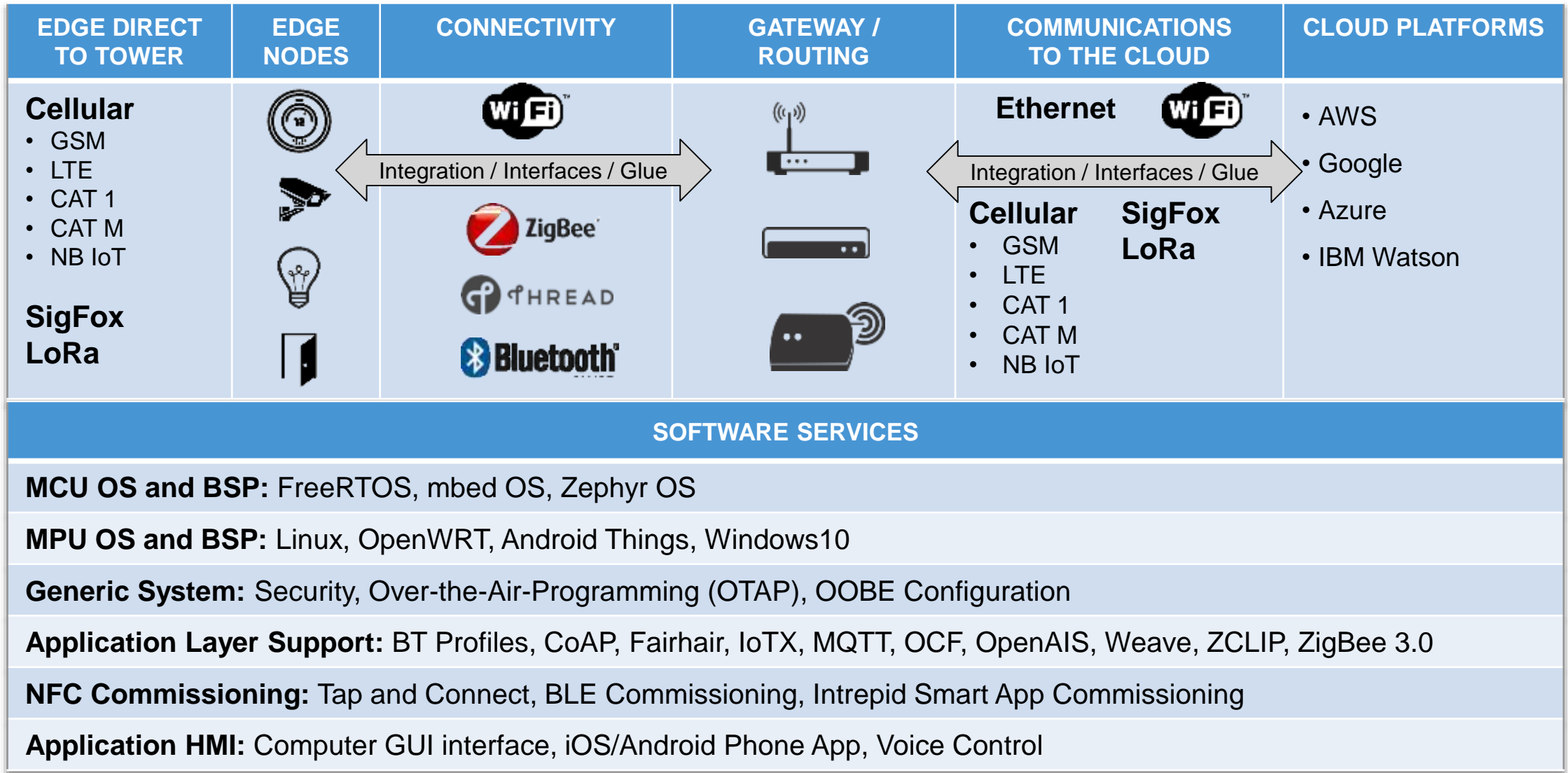


## **Interoperability not guaranteed across individual components**

*Hardware, Software, Connectivity, Security, Web/Cloud infrastructure must be carefully selected*

**Customer Pain Points  
at the System Level**

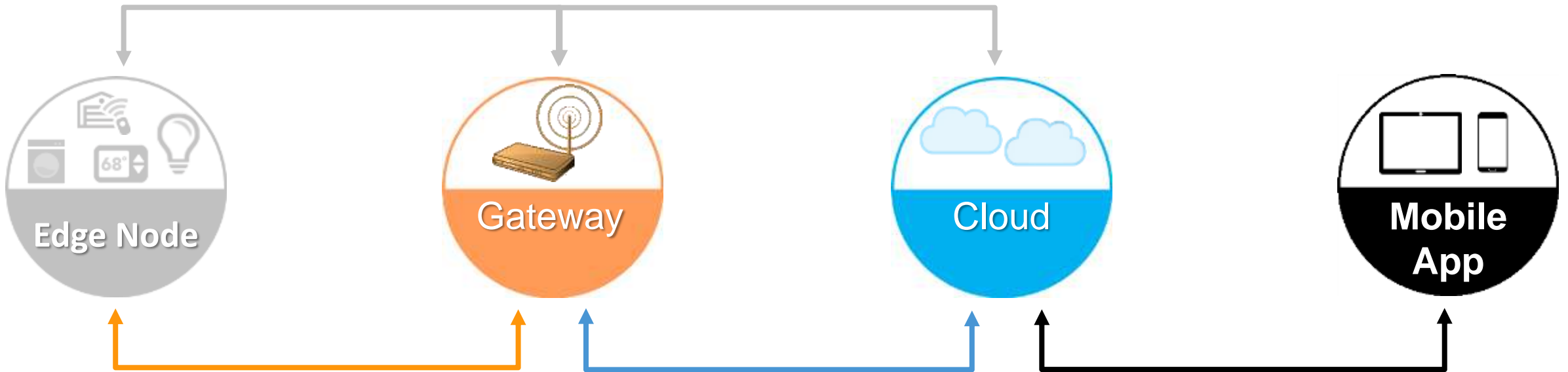
# Complexity of IoT System Development



**Fragmented market with thousands of use case combinations**

# IoT System Functionality Requirements

**1** Easily pair Edge Nodes, Gateway & Cloud through secure commissioning



**2** Exchange data between Edge Nodes and Gateway via secured connectivity

**3** Exchange data between Gateway and Cloud with secure protocols

**4** Monitor and Control Edge Nodes via Cloud using Application HMI

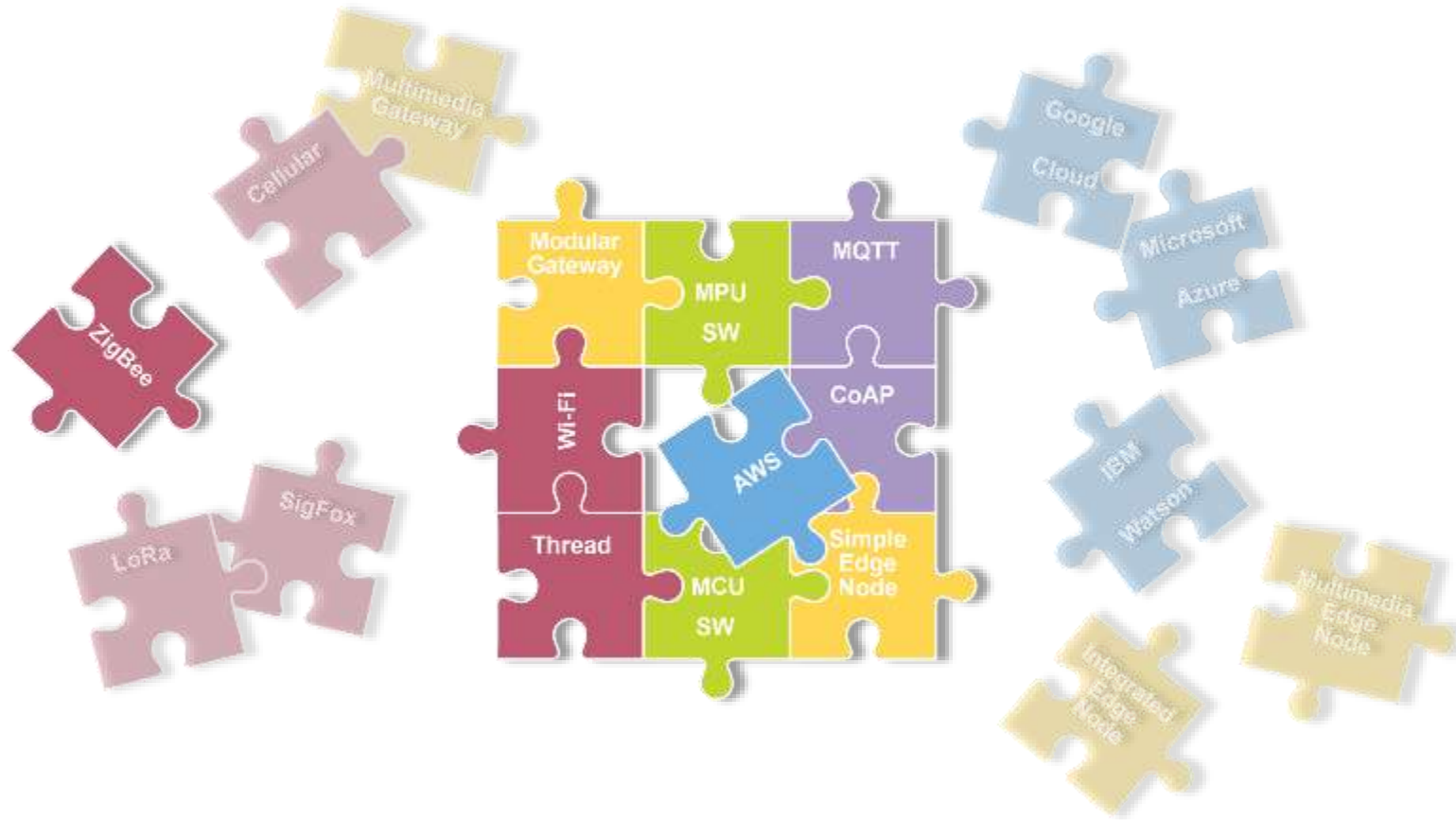


# 02.

## NXP Modular IoT Framework

# Introducing the NXP Modular IoT Framework

- Provides a selection of secure connectivity capabilities along with IoT edge services and a defined set of interfaces for building IoT Systems.
- Hardware and software components leverage the Framework to ensure system level compatibility and interoperability.
- Enables efficient development of IoT systems with pre-integrated security, wireless connectivity, and cloud services.



**The First Complete Development Platform for Secure IoT Systems**





# 03.

General Purpose IDEx available  
Today SLN-IOT-GPI

# Modular IoT Framework: *Integrated Development Experience Kits*

Based on the Modular IoT Framework, NXP provides optimized, Integrated Development Experience (IDEx) Kits to accelerate system development for specific IoT use cases, out-of-the-box.

- **Each kit is pre-integrated, comprehensive and fully documented**
- **Optimized for quick evaluation, rapid prototyping, demonstration, iteration and IoT field trial deployments**
- **Kits include production-ready connectivity HDW and SFW IP**
  - Decreases amount of work and lowers risk for development teams
  - Fills skill gaps in wireless mesh connectivity and security
  - Includes HW IP and SW source code
- **Cloud reference design examples with source code**



**ALL IDEx Kit components are TESTED and VERIFIED to work together**  
**GP-IDEx is the first of several**

# Modular IoT Framework: *Software Architecture*

## Cloud Services

*AWS, Azure, Watson, Enterprise, etc*

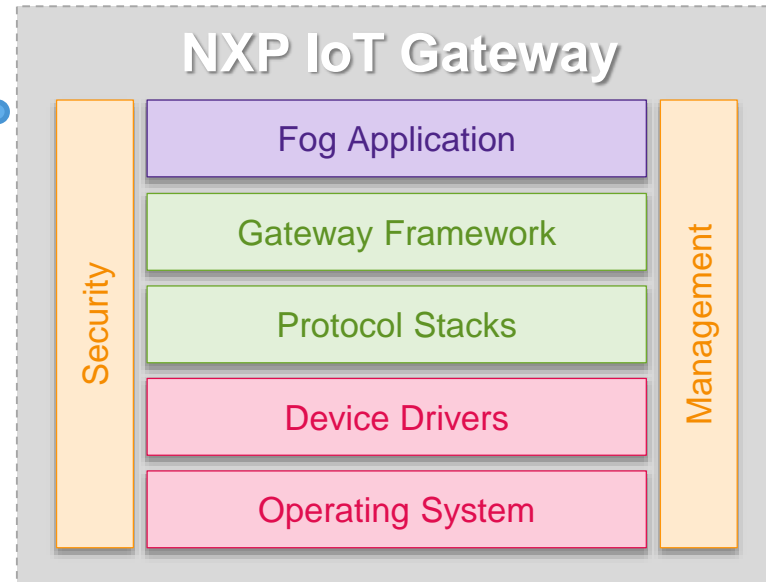
Real-Time Data Management

Device Management

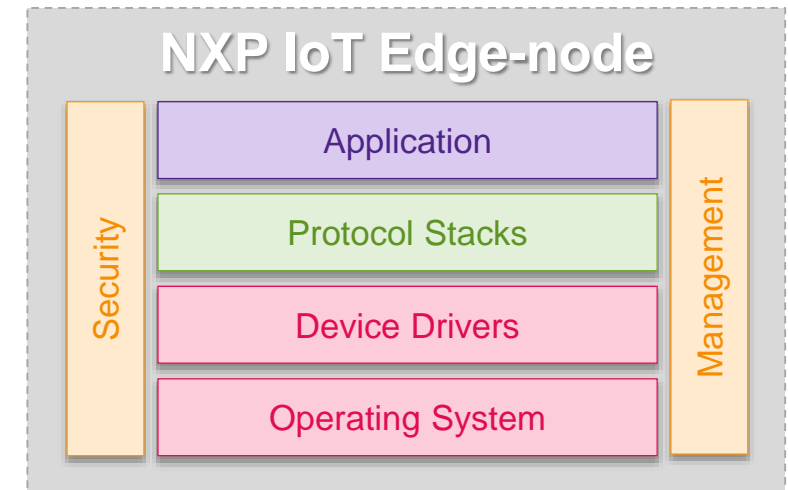
Analytics

MCU/MPU Eval/Dev Board Software

Modular IoT Framework specific Software



Zigbee  
Thread  
BLE  
WIFI  
Sigfox  
etc

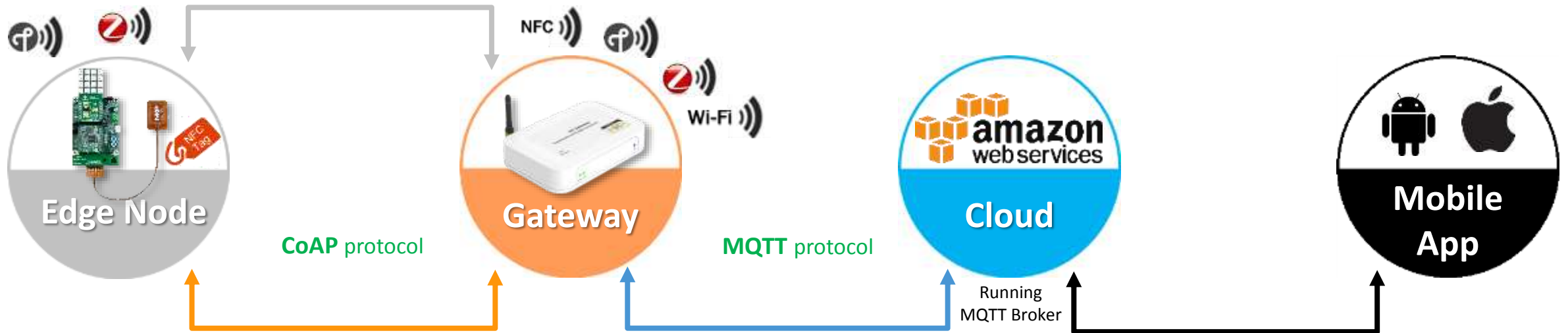


**Complete Security, Connectivity, Management, Cloud and Application Software to create compatible IoT Gateway and Edge-nodes**

# IDEx for General Purpose IoT Systems: *Functional Specifications*

- 1 **Tap and Connect with Modular Edge Node Platform (MENP) using NFC commissioning**

NXP Part-Number: **SLN-IOT-GPI**



- 2 **Exchange data via MENP ZigBee/Thread connectivity**

- 3 **Communicate data with secure Cloud protocols via MQTT**

- 4 **Monitor and Control ZigBee/Thread Edge Nodes via Cloud with mobile application**

# Integrated Development Experience (IDEx) for General Purpose IoT Systems

- Includes Pre-Configured Modular IoT Gateway and Modular Edge Node Platform



## Modular IoT Gateway

- Modular IoT Gateway Base board
- i.MX6UL SOM
- Wi-Fi/BT/BLE 4.1
- Thread/BLE Radio
- ZigBee Radio
- NFC Reader
- A7x Secure Element



## Modular Edge Node Platform (MENP)

- Simple Edge Node Base board
- ZigBee Radio
- Thread/BLE Radio
- NFC Tag
- RGB Click Module

- Includes Connectivity and Security Software

## Modular IoT Gateway

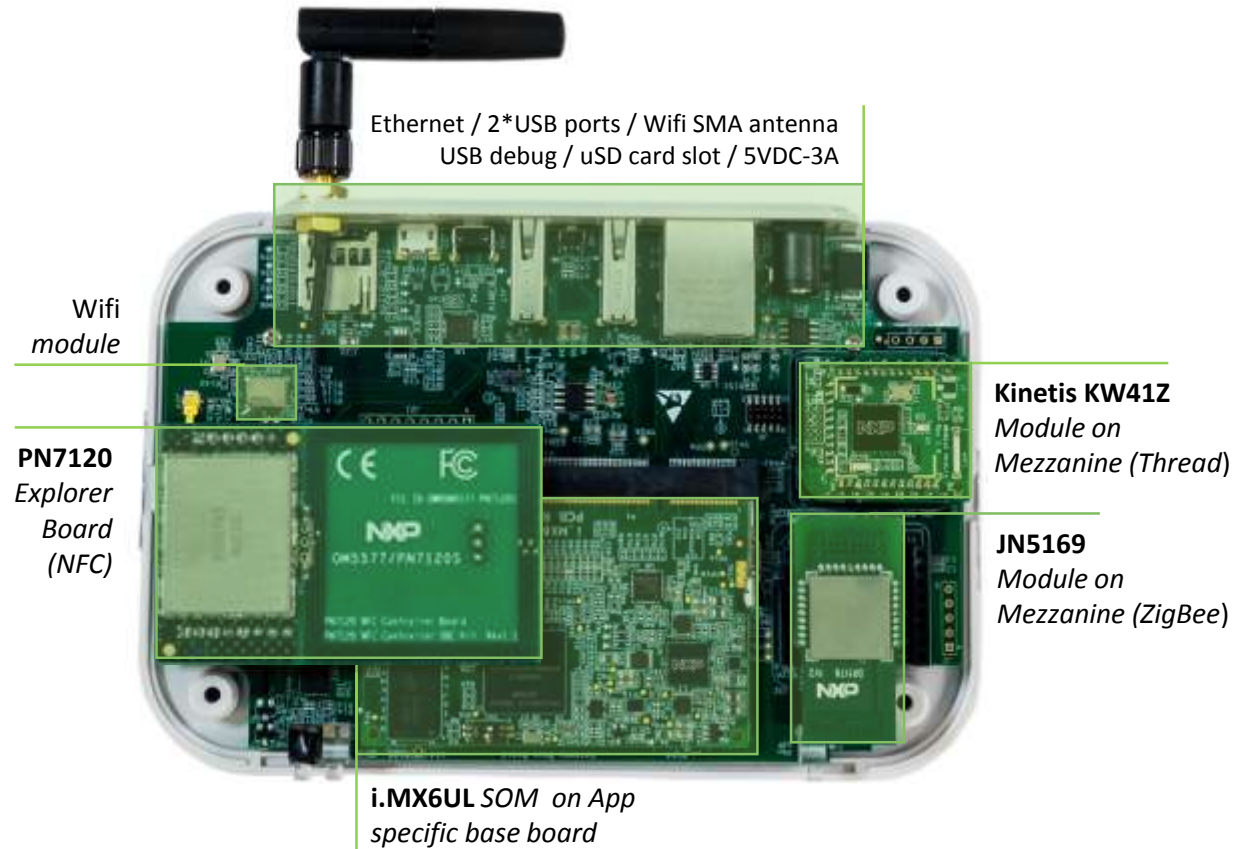
- Linux OS and component drivers (BSP)
- Connectivity and Cloud Protocols
- NFC Connectivity and Cloud commissioning
- Secure Over-The-Air Programming
- Application software

## Modular Edge Node Platform (MENP)

- FreeRTOS with SDK peripheral drivers
- Connectivity Stacks (ZigBee, Thread)
- NFC Connectivity commissioning

Shipping **TODAY** as NXP Part-Number: **SLN-IOT-GPI**

# Modular IoT Gateway: Overview



## Hardware Modules

### Radio Modules



KW2xD  
♠ Thread



KW41Z  
♠ ♣ Thread



JN5169  
♠ ♣ Zigbee



JN5179-001-M1x  
♠ ♣ Zigbee

### Processor Module



♠ ♣ i.MX6UL SOM

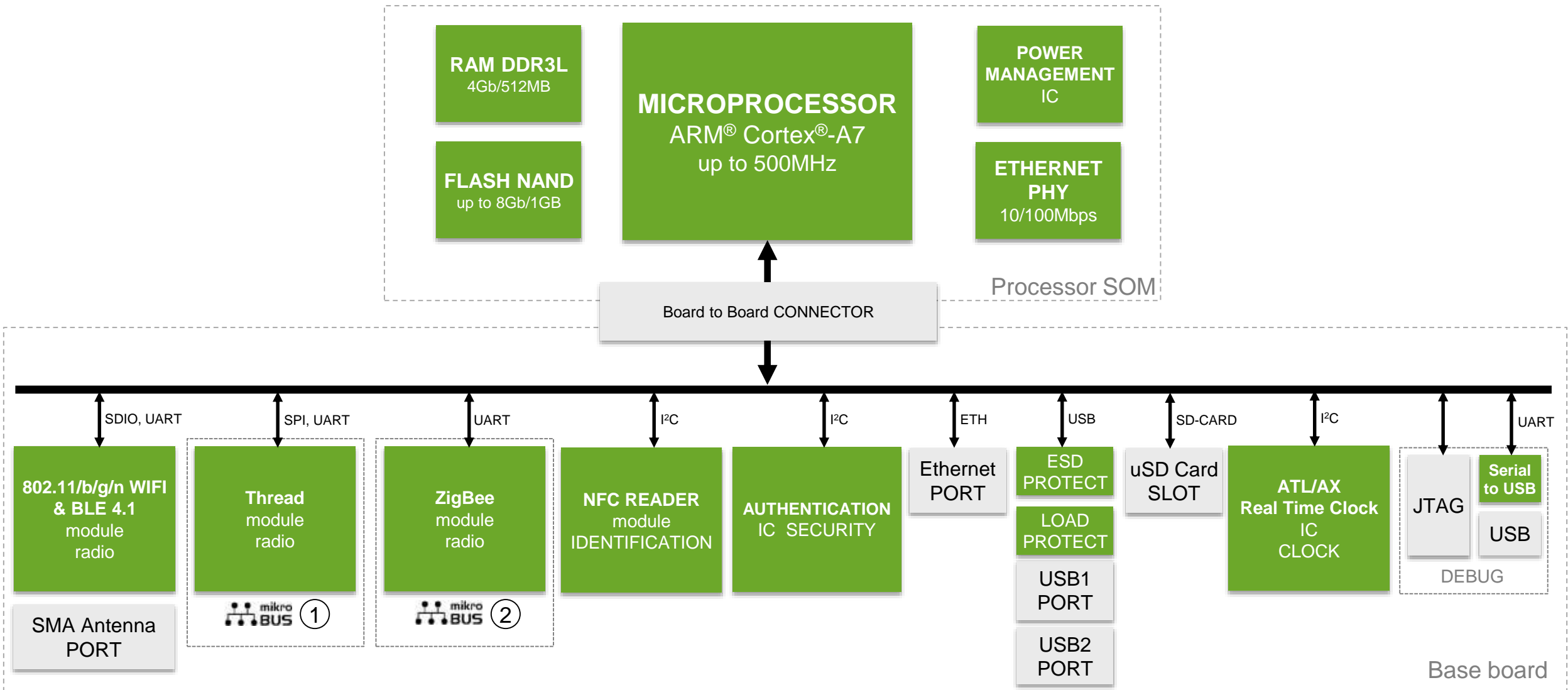
### NFC Module



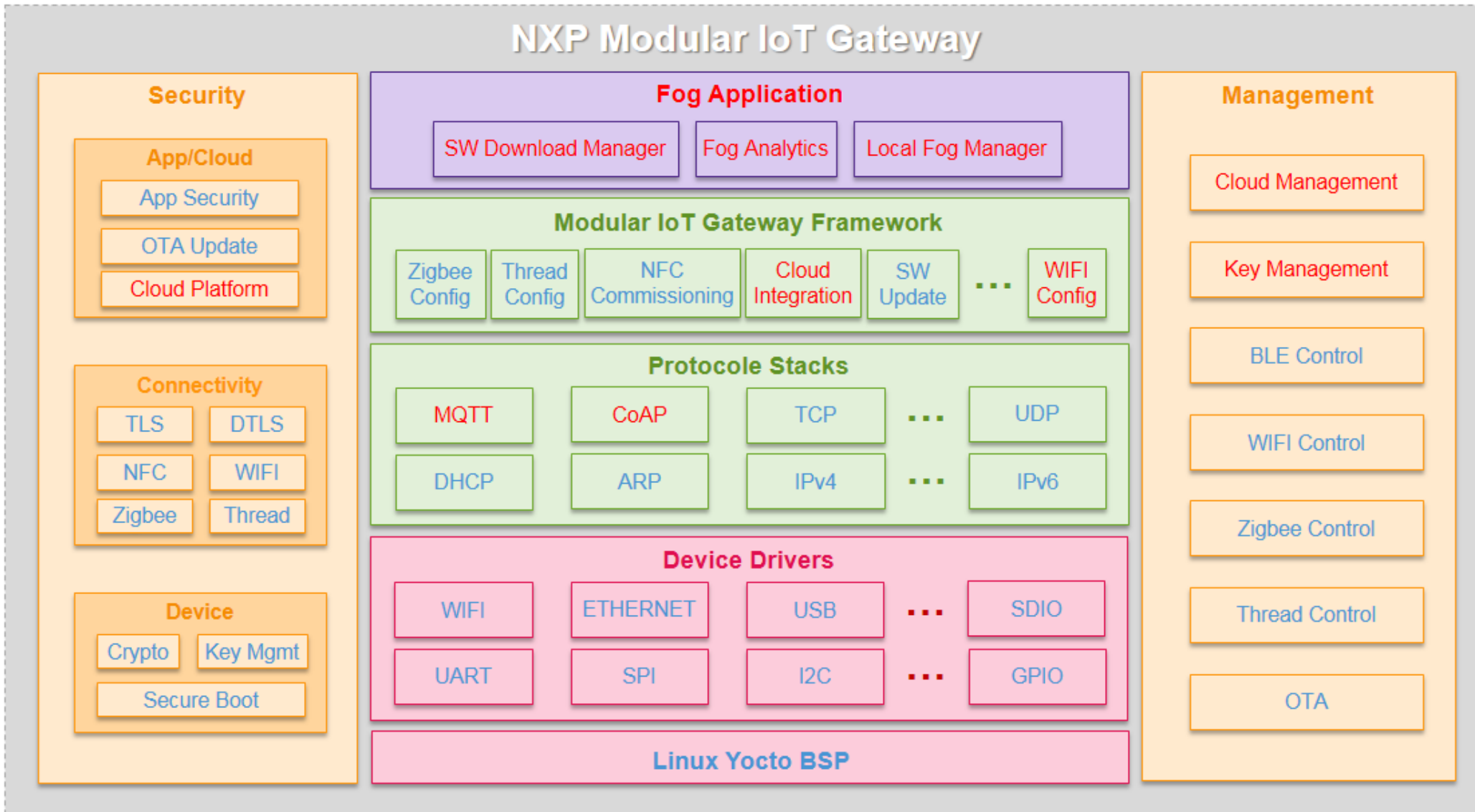
♠ ♣ PN7120

- ♠ Production ready HW IP and SW available at \$0
- ♣ RF Certification artifacts available at \$0

# Modular IoT Gateway: *Hardware Block Diagram*



# Modular IoT Gateway: Software Architecture



Connectivity Framework  
Production Ready

Cloud and App provided as Reference



# Modular IoT Gateway: *Summary*

## Fastest Time to Market

Modular solution reduces development time for Thread and ZigBee Gateway/Border Router applications

## Path to Manufacturing

BOM, design files and software source code limit risks with wireless connectivity

## Optimized Hardware Design

Includes best practices for IoT Gateway application design

## Robust Software

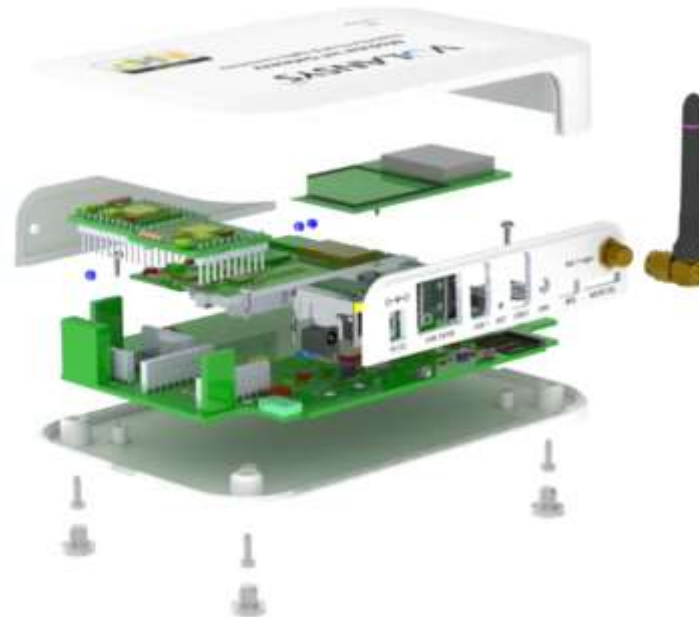
Includes everything from embedded drivers to cloud connectivity - optimized and easy to use

## NXP Hardware, Software & Support

Drivers, protocol stacks, Linux BSP support

## Target Segments/Applications

- Commercial Building/Lighting
- Smart Home
- Low Power WAN



## Key Features

Performance: **ARM Cortex®-A7 @ 696MHz**  
Local Connectivity in Large Networks 255+ nodes: **ZigBee, Thread**  
Cloud Connectivity: **Wi-Fi and Ethernet**  
Authentication: **Secure Element**  
Set up: **NFC Commissioning w/Smart App**  
Update: **Over the Air Programming via Multicast**  
Certifications: **FCC/CE/IC**

## Design Resources

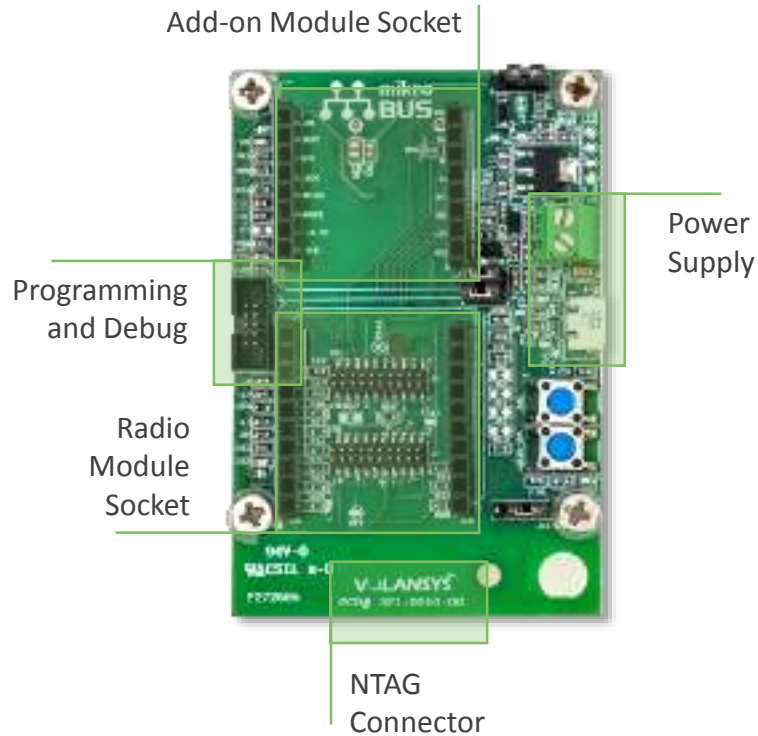
**Design files:** Schematic, Layout, Bill of Material  
**Application program** (Image + Source code)  
**Android Application** (App + Source code)  
**Professional Support and Services**

## Software Enablement

*(Open source and free)*

UBOOT, Linux BSP  
Board Component Drivers  
Protocol Stack

# Modular Edge Node Platform and Modules: Overview



## Hardware Modules

### Radio Modules



KW2xD  
♠ Thread



KW41Z  
♠ ♣ Thread

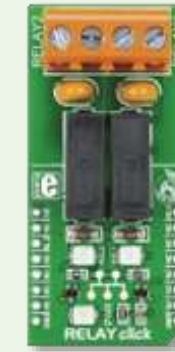


JN5169  
♠ ♣ Zigbee



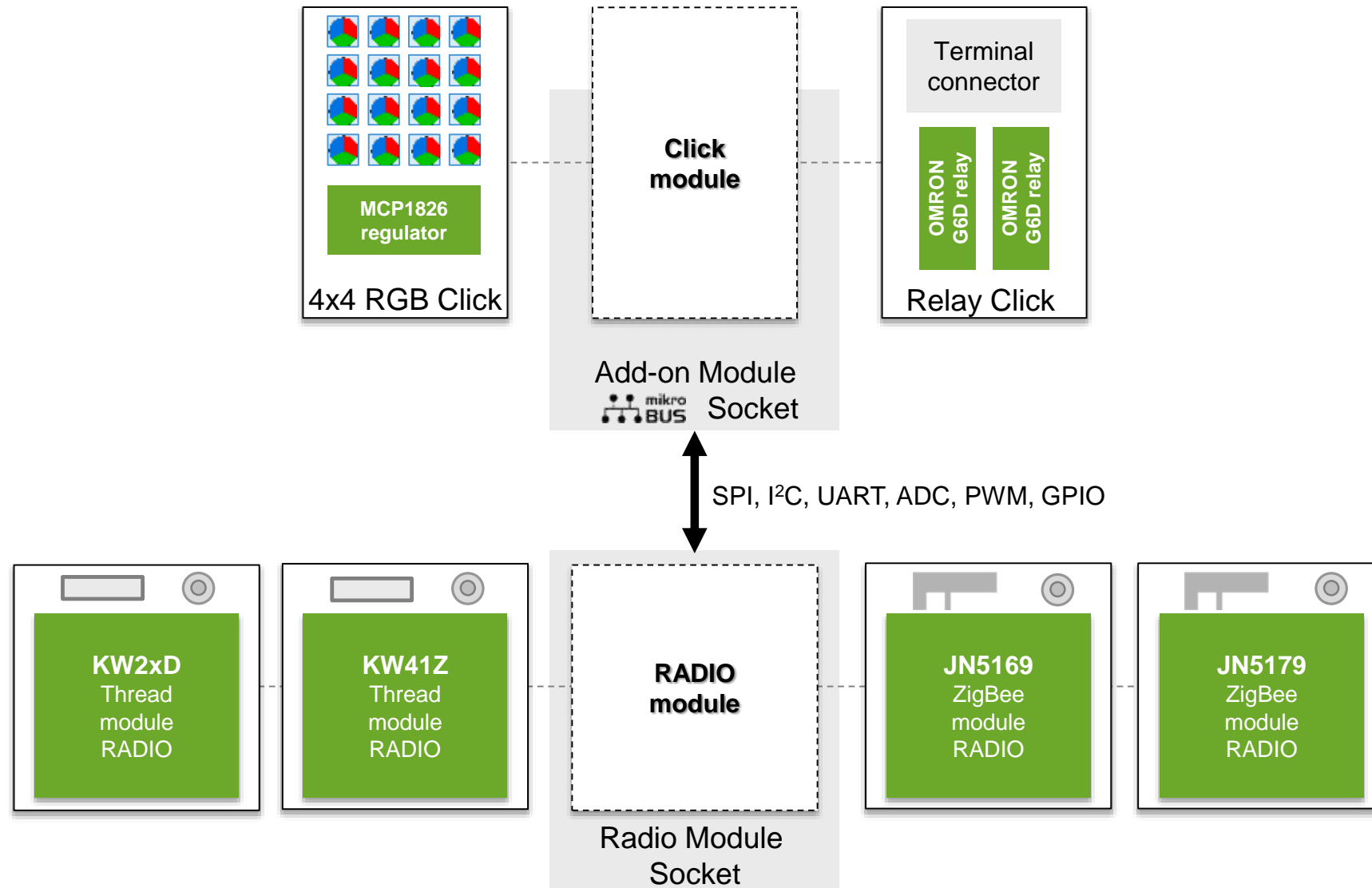
JN5179-001-M1x  
♠ ♣ Zigbee

### Sensor/Actuator Add-on Modules

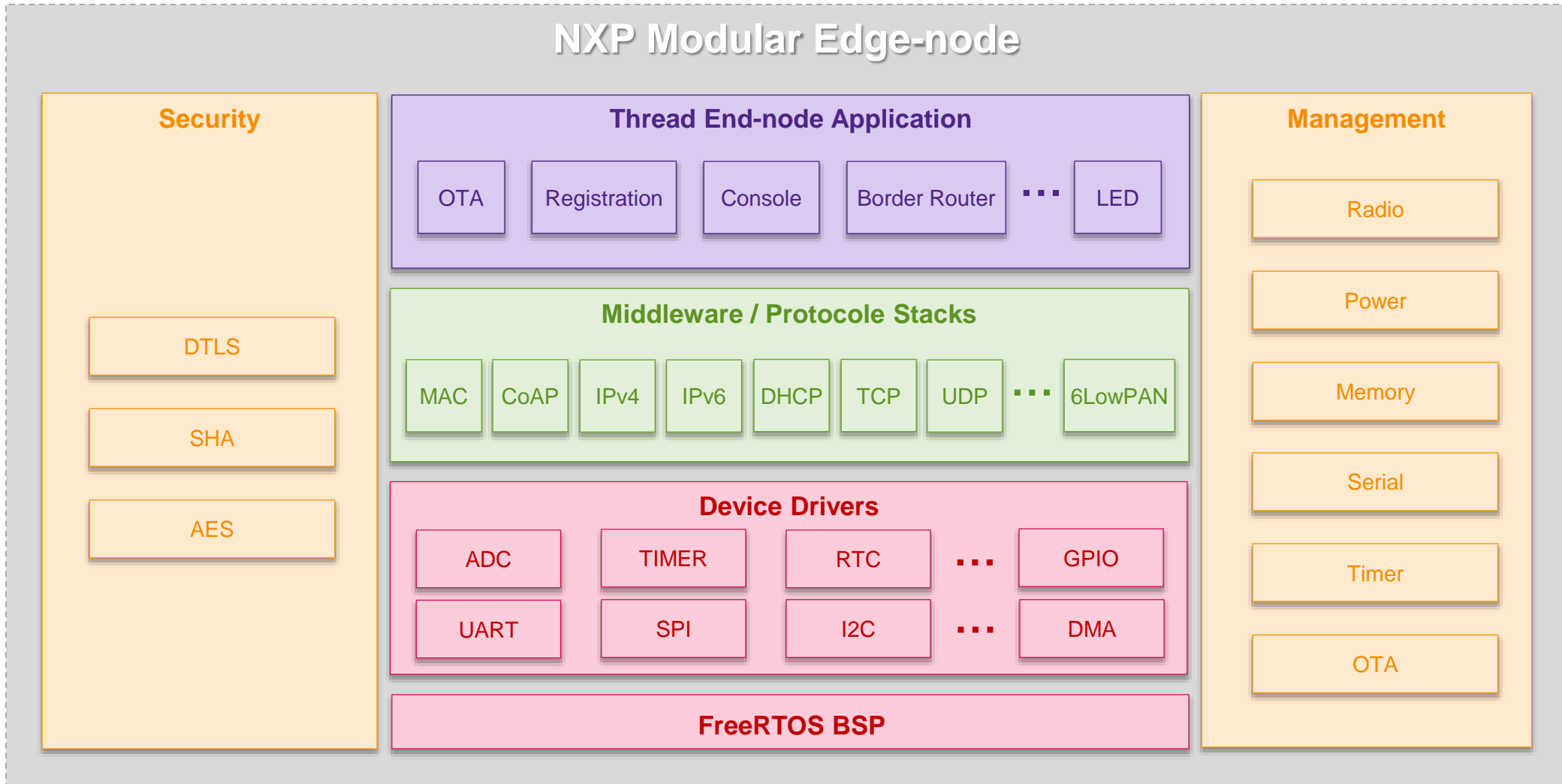


- ♠ Production ready HW IP and SW available at \$0
- ♣ RF Certification artifacts available at \$0

# Modular Edge Node: *Hardware Block Diagram*



# Modular Edge Node: *Software Architecture*



# Modular Edge Node Platform: *Summary*

## Fastest Time to Market

Modular solution reduces development time for Thread and ZigBee Edge Node applications

## Path to Manufacturing

BOM, design files, software source code – all accessible to limit risks of wireless connectivity

## Optimized Hardware Design

Optimized hardware design with best practices for designing Edge Node IoT applications

## Robust Software

Includes everything from embedded drivers to connectivity stacks - all optimized & easy to use

## NXP Hardware, Software, Services

Includes drivers, connectivity stacks & support

## Target Segments / Applications

- Home Automation
- Healthcare / Wellness
- Utilities and Energy



## Key Features:

Performance: **Wireless System On Chip** (MCU with memory and radio)

Local Connectivity for Large Networks over 255 nodes: **Zigbee, Thread**

Setup: **NFC Tag for Commissioning**

Update: **Over the Air Programming via SPI Flash**

Power: **5V USB and DC input**

Extension: **compatible with 200+ Click™ modules**

## Design Resources

**Design files:** Schematic, Layout, Bill of Material

**Application program** (Image and Source code)

**Professional Support and Services**

## Software Enablement

*(Open-source and free)*

Kinetis Design Studio

Kinetis SDK

FreeRTOS

Protocol Stack

# IoT Framework Radio: *Kinetis KW41Z Module*

## Key Features

- 32-bit **ARM Cortex®-M0+** MCU core @ 48MHz
- 512KB Flash and **128KB SRAM** memory
- SPI Flash to support **Over-The-Air Programming (OTAP)**
- **AES 128** hardware accelerator
- **Thread** and **Bluetooth** Network Stack
- **Integrated chip antenna** and uFL antenna connector
- Easy integration to reduce time to market
- Industry standard **SWD programming** and debug connectivity
- Pads are side castellation for easy soldering & optical inspection
- RoHS Compliant
- **FCC and CE certification**
- **MikroBUS™ compatible** connector
- Ultra compact size: **21 x 16 mm**



# IoT Framework Radio: JN5179 Modules

- **Key Features**

- ✓ All modules include JN5179 chip plus support components
  - **Surface mountable** on motherboards

- Standard power modules

- ✓ JN5179-001-M10: **Medium power** module (14,5 x 20,5mm)

- **Printed antenna**
- +10dBm

- ✓ JN5179-001-M13: **Medium power** module (14,5 x 20,5mm)

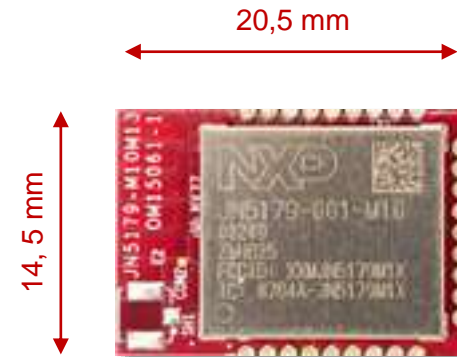
- **uFL antenna connector**
- +10dBm

- ✓ JN5179-001-M16: **High power** module (14,5 x 20,5mm)

- **Printed antenna and uFL connector**
- **+22dBm**
- **Antenna diversity**

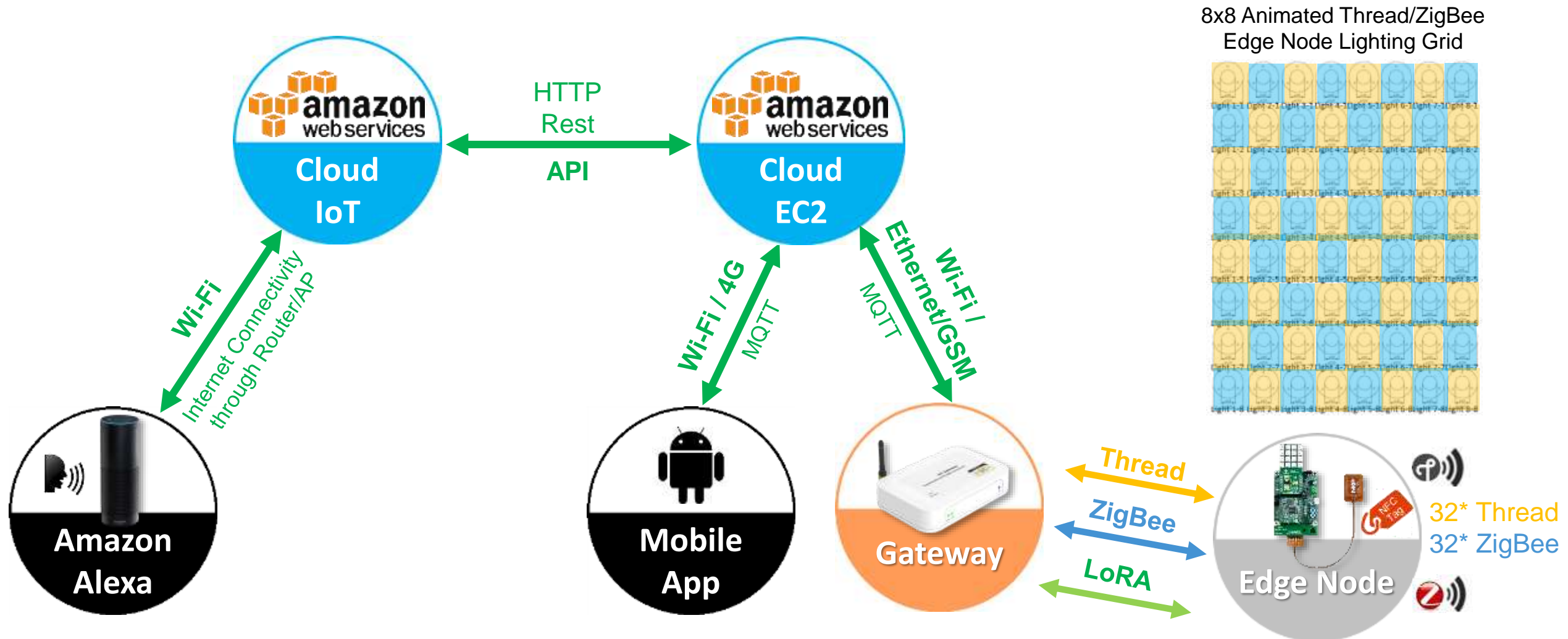
- Module value proposition

- Fast time to market
- Reduced support burden
- **Meets FCC and EU regulations**
- No need for RF design resource for board and test design



**JN5179-001-M10**

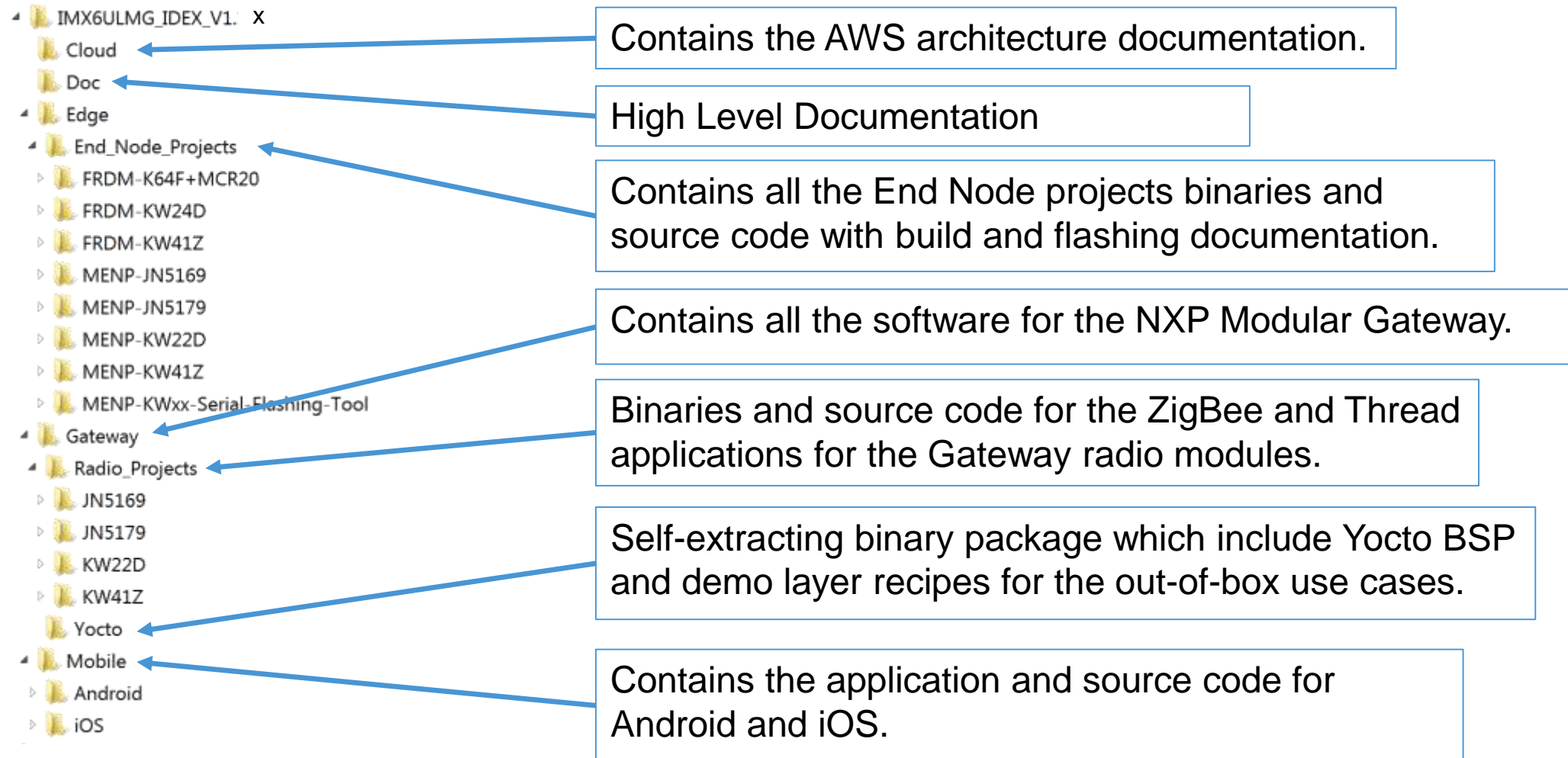
# IDEx for General Purpose IoT System Demo: *Lighting Control*





# General-Purpose IDEX v1.2: *Release Package Structure*

- Download and extract the IMX6ULMG\_IDEX\_V1.2.x.zip, and review the following:



# Community Forums

For support on the Integrated Development Experience, use the following links:

1. Main landing page for the Modular Framework community page.  
<https://community.nxp.com/groups/modular-framework>
2. Tips on developing further on the Modular Framework.  
<https://community.nxp.com/groups/nxp-iot-modular-framework-tips-tricks>
3. Answers to frequently asked questions.  
<https://community.nxp.com/groups/nxp-iot-modular-framework-faqs>
4. Known issues to documents or functionality. This can help the community as a whole.  
<https://community.nxp.com/groups/nxp-iot-modular-framework-doc-updates>
5. Patches to bugs or additional functionality between general releases.  
<https://community.nxp.com/groups/nxp-iot-modular-framework-patches>

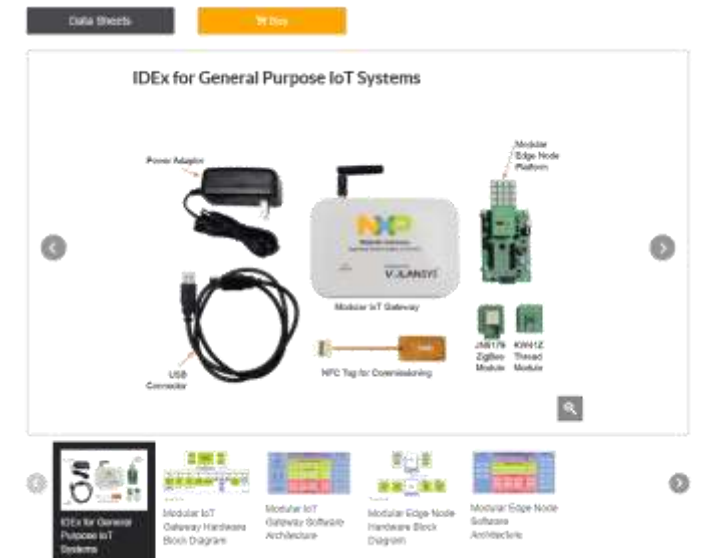
# GP IDEX v1.2 Summary: *Development of Production Grade IoT*

- Comprehensive development platform providing production ready HW and SW
  - Schematics, BOMs, layouts, source code (driver, BSP, integration), RF certification artifacts
  - Security, commissioning, IoT services, and scalable northbound/southbound connectivity
    - Wi-Fi, Ethernet, ZigBee, Thread
  - Out-of-the-box working reference edge nodes, cloud connectivity, and smart phone app
    - MQTT, CoAP, AWS, Android, iOS
- Pre-integrated starting point for differentiated IoT development

## Can Leverage as Much or Little as Desired

1. IP available for \$0
2. IDEX HW available for purchase

## To Reduce IoT Development Time, Costs and Risks





# 04.

## Value Proposition to Your IoT Team

# Opportunity to Start with Kit plus rich set of IDEX IP at \$0

## BOMs

U1	MP2120E-1-RT891	IC:REG:DO:1.8V:0.15A:30T2S
U2	NXP2501-EV0020	IC:FRONT:EMBED:2000:47:2018
U3	MT7161-200M1-GT-	IC:DOE3:SDRAM:200IT:800V:2:FDG6
U4	MT7161-200M1-GT-	IC:DOE3:SDRAM:200IT:800V:2:FDG6
U5	SA6_PPGA_2002	IC:MPU:1:MEM:ULTRALITE:2000GA
U6	W32P1500LATER	EMIC:48:511:QFN:EP
U7	N7704G4000AM	IC:CPU:5:3V:Embedded:MVC:155:7m
U8	MT20P02000000	IC:MPU:1:MEM:ULTRALITE:2000GA
U9	MT20P02000000	IC:MPU:1:MEM:ULTRALITE:2000GA
U10	MT20P02000000	IC:MPU:1:MEM:ULTRALITE:2000GA
U11	MT20P02000000	IC:MPU:1:MEM:ULTRALITE:2000GA
U12	MT20P02000000	IC:MPU:1:MEM:ULTRALITE:2000GA
U13	MT20P02000000	IC:MPU:1:MEM:ULTRALITE:2000GA
U14	MT20P02000000	IC:MPU:1:MEM:ULTRALITE:2000GA

## Software Source

- IMX6ULMG\_IDEX\_V1.1.1
  - Cloud
  - Doc
- Edge
  - End\_Node\_Projects
    - FRDM-K64F+MCR20
    - FRDM-KW24D
    - FRDM-KW41Z
    - MENP-JN5169
    - MENP-JN5179
    - MENP-KW22D
    - MENP-KW41Z
    - MENP-KWxx-Serial-Flashing-Tool
  - Gateway
    - Radio\_Projects
      - JN5169
      - JN5179
      - KW22D
      - KW41Z
    - Yocto
  - Mobile
    - Android
    - iOS

## OOB HW/SW



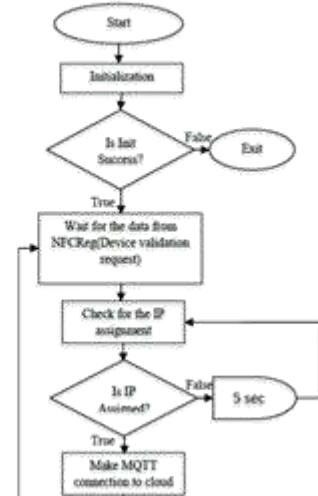
## Documentation

**4.4 Gateway Commission (Registration)**  
 The user needs to register gateway using the mobile application to use the gateway to control and monitor and devices. To register gateway, follow below steps:  
 The gateway can be commissioned by hardware. (Not using BLE operation and other is fast commission. Only for Wi-Fi commission).

**4.4.1 Gateway Registration**  
 1. Scan the mobile application and login to. User can set below screen to install application if some of the gateway found is registered previously with same user ID (distribution ID).

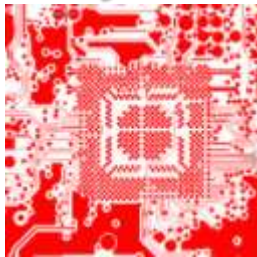


## Design Flows



## Schematics

## Layouts



## Training Videos



## Marketing Collateral



**SLN-IOT-GPI: Integrated Development Experience for IoT Systems**

The SLN-IOT-GPI is a complete development platform for building secure IoT systems. It offers a pre-integrated configuration for hardware, software, connectivity, security, cloud services and MQTT. Commissioning the popular IoT use cases. This solution platform speeds time-to-market, reduces risk associated with wireless commissioning and offers development tools to determine correct installation of large-scale networks (SLN).

## RF Artifacts



## NXP IoT Solutions Provide

- Coherency
- Pre-Integration
- Testing
- Production Readiness

# Your Choice to leverage as Little or Much IDEX IP as Needed...

- For you to meet your customers' needs and maximize your business!

1

## Start with NXP IDEX IP



2

## Add Your Value Add

- Productize
- New Capabilities
- Cost Optimize
- Localized Support
- Vertical Integration
- Etc.

3

## To Build, Market and Sell

- Gateways
  - End Points
  - Or Full Systems
- To Your Markets as You See Fit



4

## Move Forward with NXP!

- Tracks Industry Trends
- Maintains Gold SW Master
- Creates New IDEXs
- Deepens Security
- Adds New Cloud Options





# 05.

## Practical Demonstration





SECURE CONNECTIONS  
FOR A SMARTER WORLD