Complete Development Platforms for Secure IoT Systems

NXP IoT & SECURITY SOLUTIONS

JUNE 2017

SECURE CONNECTIONS
FOR A SMARTER WORLD

PUBLIC

AGENDA

- IoT System Challenges
- NXP Modular IoT Framework
- NXP Integrated Development Experience
- Walk through our IoT System kit

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

Pain Points at the System Level

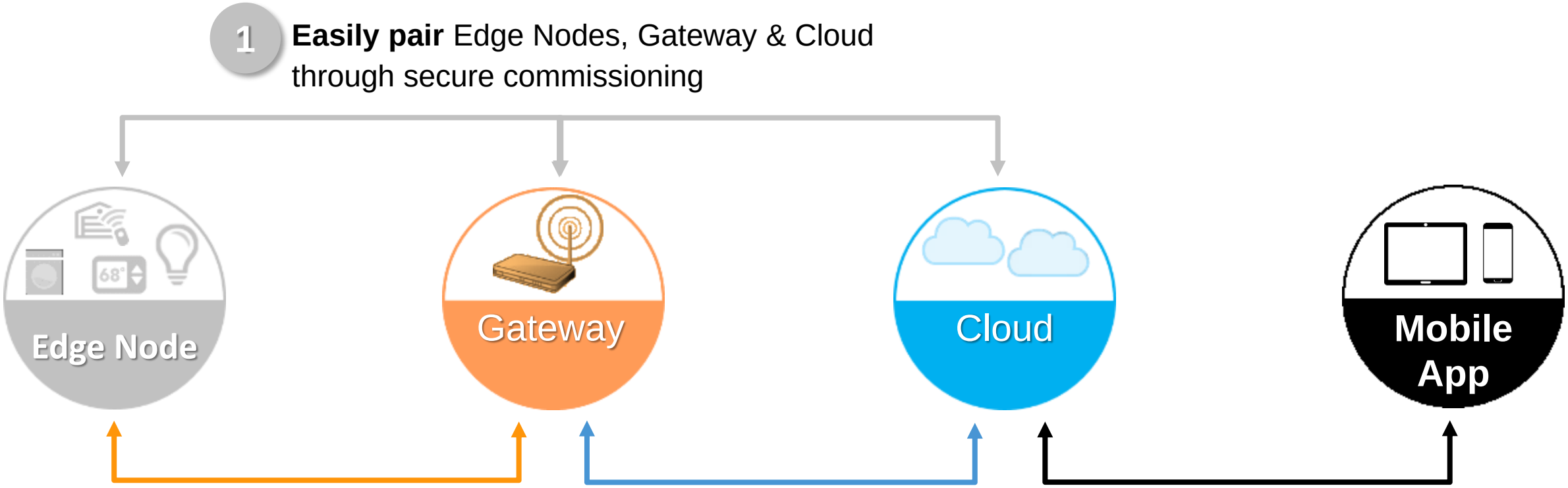
Complexity of IoT System Development

EDGE DIRECT TO TOWER	EDGE NODES	CONNECTIVITY	GATEWAY / ROUTING	COMMUNICATIONS TO THE CLOUD	CLOUD PLATFORMS
Cellular • GSM • LTE • CAT 1 • CAT M • NB IoT **SigFox** **LoRa**		Wi Fi Integration / Interfaces / Glue ZigBee THREAD Bluetooth		**Ethernet** Wi Fi Integration / Interfaces / Glue **Cellular** • GSM • LTE • CAT 1 • CAT M • NB IoT **SigFox** **LoRa**	• Cloud Services • Google • Azure • IBM Watson

SOFTWARE SERVICES
MCU OS and BSP: FreeRTOS, mbed OS, Zephyr OS
MPU OS and BSP: Linux, OpenWRT, Android Things, Windows10
Generic System: Security, Over-the-Air-Programming (OTAP), OOBE Configuration
Application Layer Support: BT Profiles, CoAP, Fairhair, IoTX, MQTT, OCF, OpenAIS, Weave, ZCLIP, ZigBee 3.0
NFC Commissioning: Tap and Connect, BLE Commissioning, Intrepid Smart App Commissioning
Application HMI: Computer GUI interface, iOS/Android Phone App, Voice Control

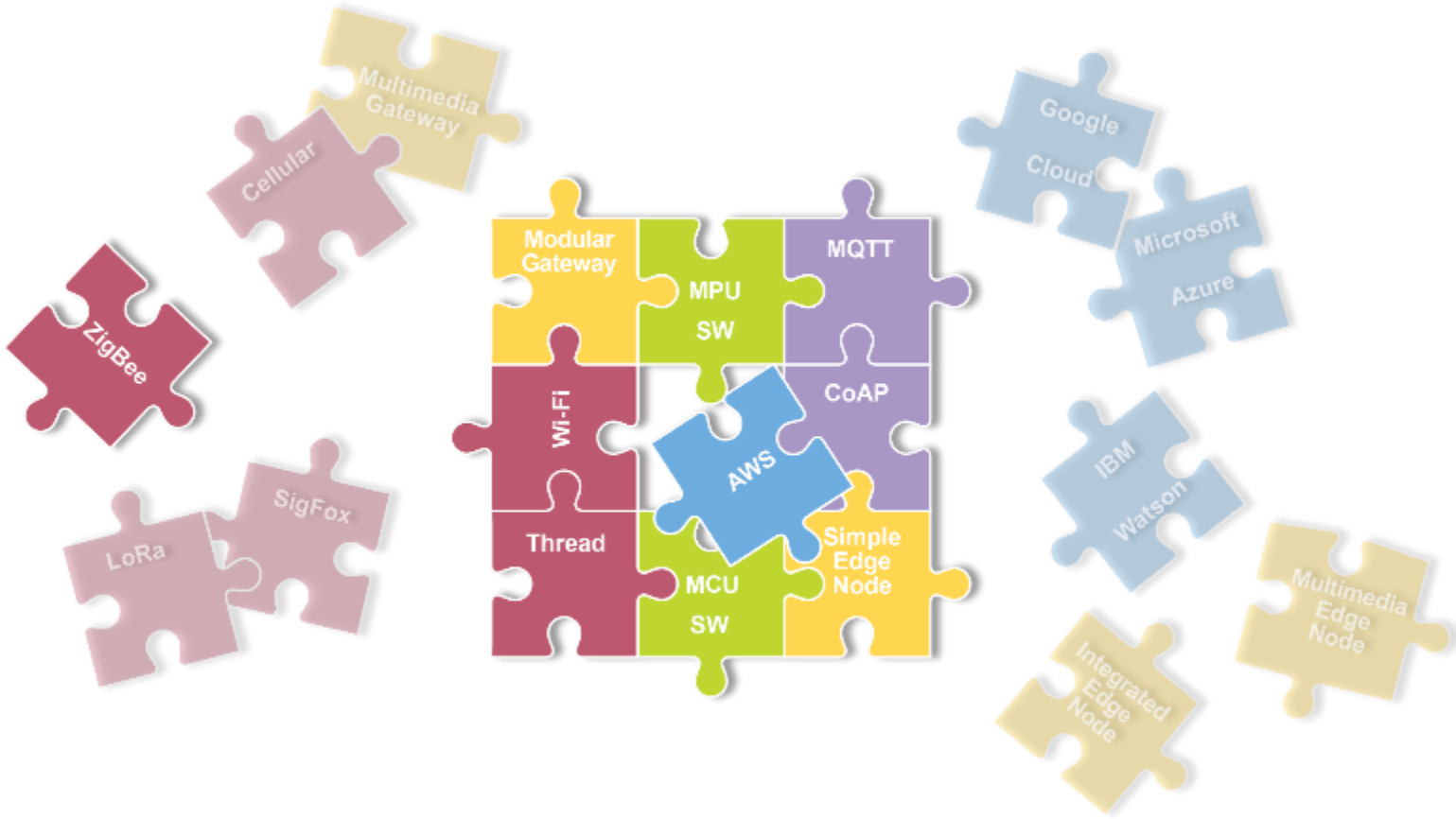
Fragmented market with thousands of use case combinations

IoT System Functionality Requirements



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

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 software and hardware**
  - Decreases amount of work and lowers risk for development teams
  - Fills skill gaps in wireless mesh connectivity and security
- **Cloud reference design examples with source code**

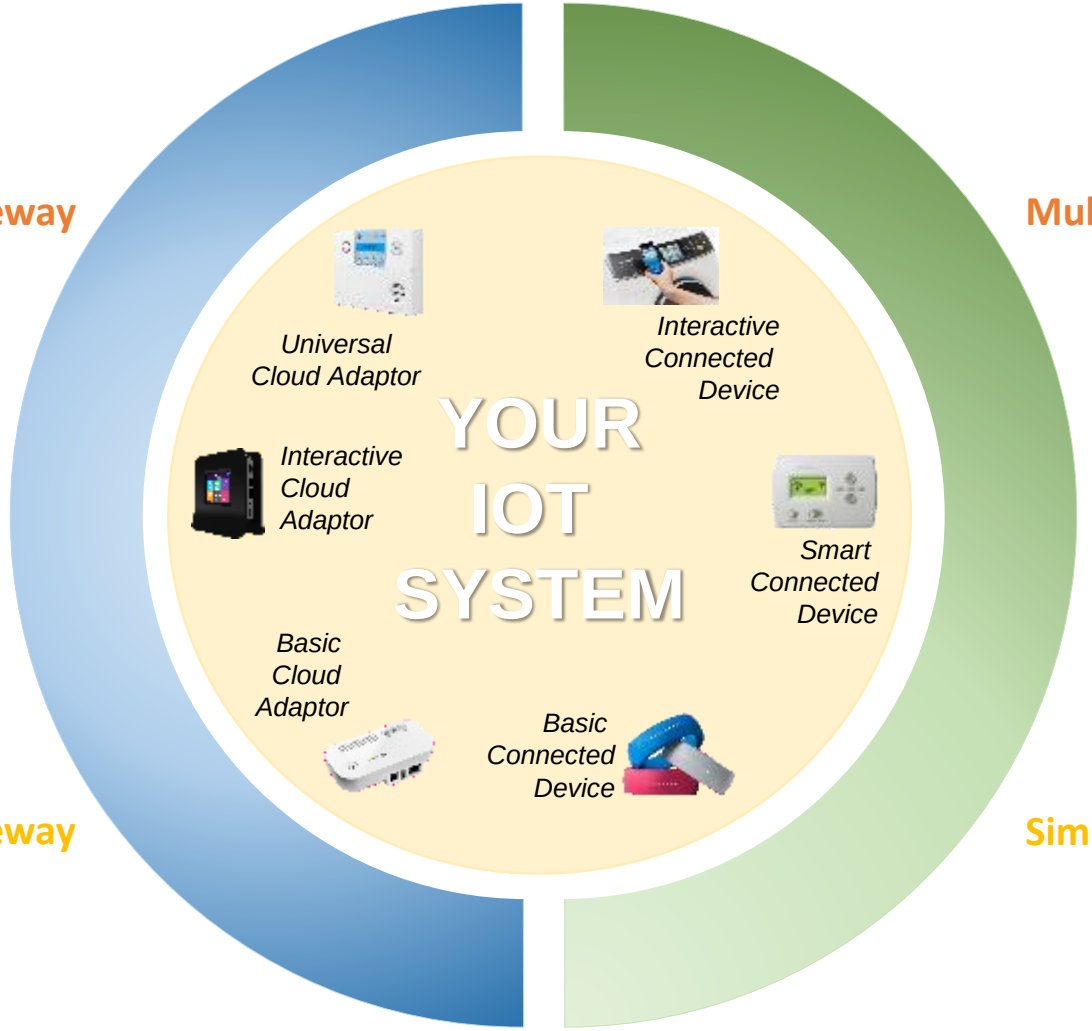
ALL IDEx Kit components are TESTED and VERIFIED to work together

Modular IoT Framework: *Hardware Platforms*

Modular IoT Gateway

Multimedia IoT Gateway

Low-cost IoT Gateway



Multimedia Edge-Node

Integrated Edge-Node

Simple Edge-Node

MPU based

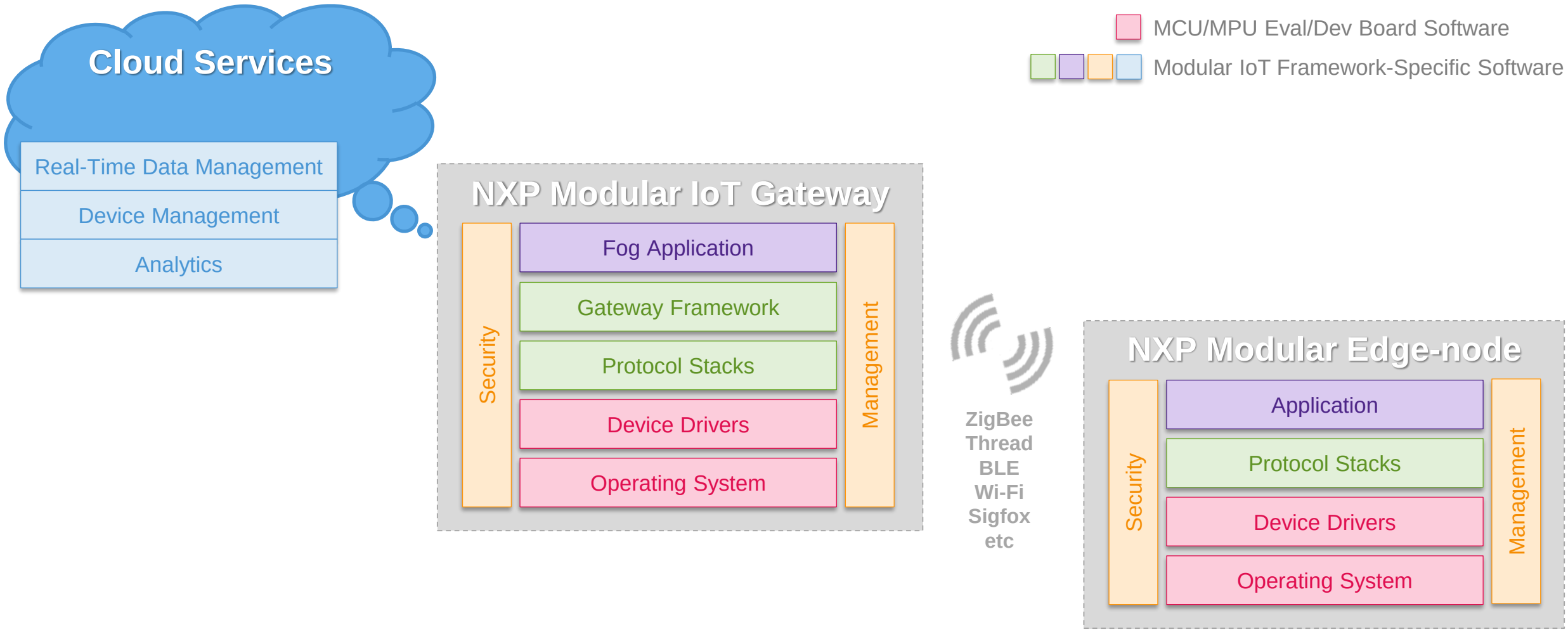
MCU based

Gateway

Edge-Node

Rich selection of hardware platforms that enable faster development of IoT Systems

Modular IoT Framework: *Software Architecture*

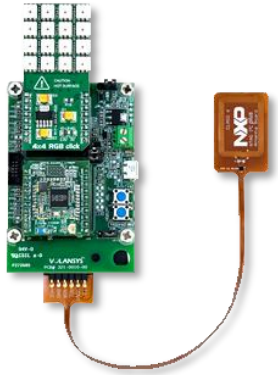


Complete Security, Connectivity, Management, Cloud and Application Software with compatibility and interoperability between IoT Gateway and Edge-nodes

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

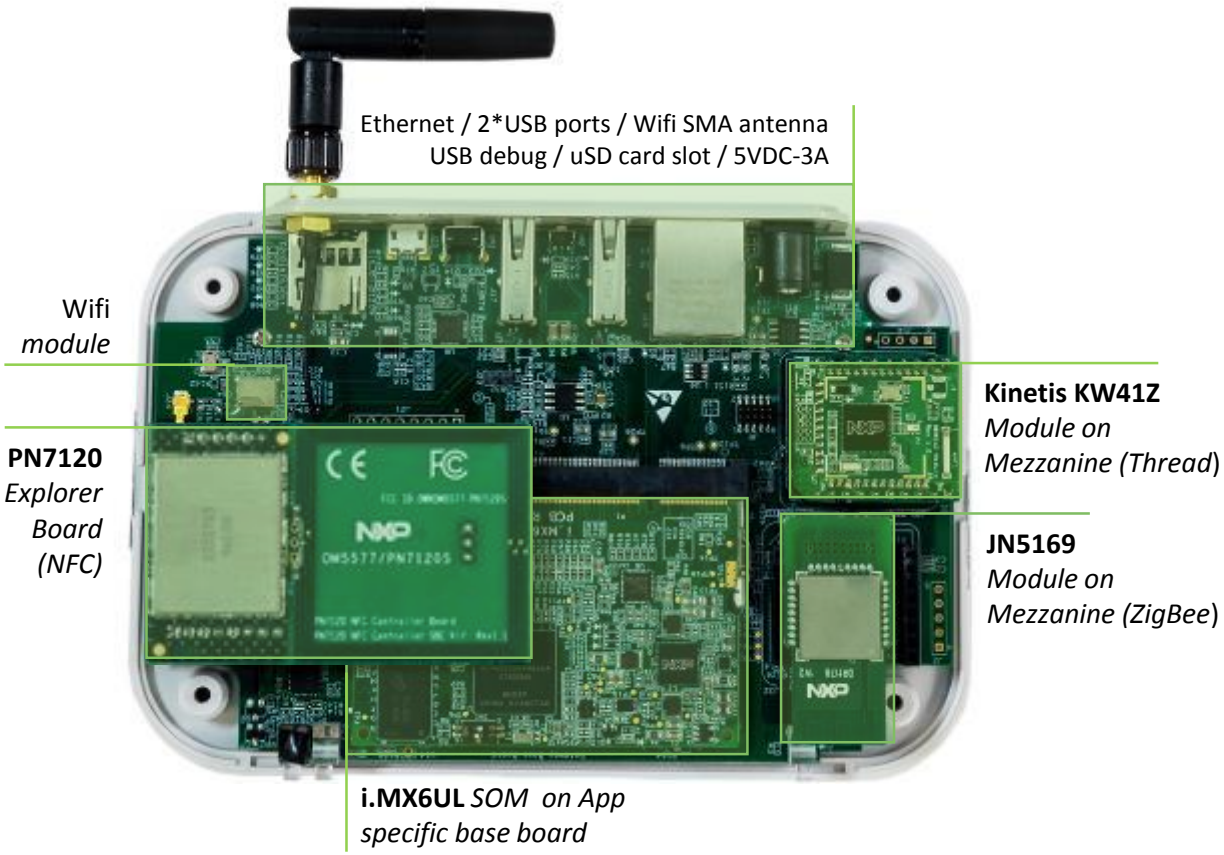
- Includes Connectivity and Security Software

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

Modular IoT Gateway: *Summary*

Fastest Time to Market
Modular solution reduces development time for Thread and ZigBee Gateway/Border Router applications

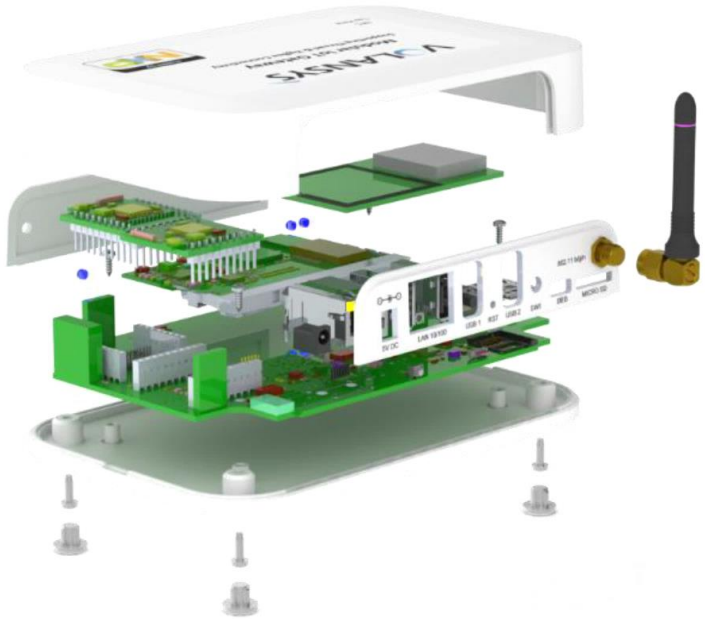
Path to Manufacturing
BOM, design files and software source code limit risks with wireless connectivity

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 & Services
Drivers, protocol stacks, Linux BSP support

Target Segments/Applications
- Commercial Building/Lighting
- Smart Home
- Low Power WAN



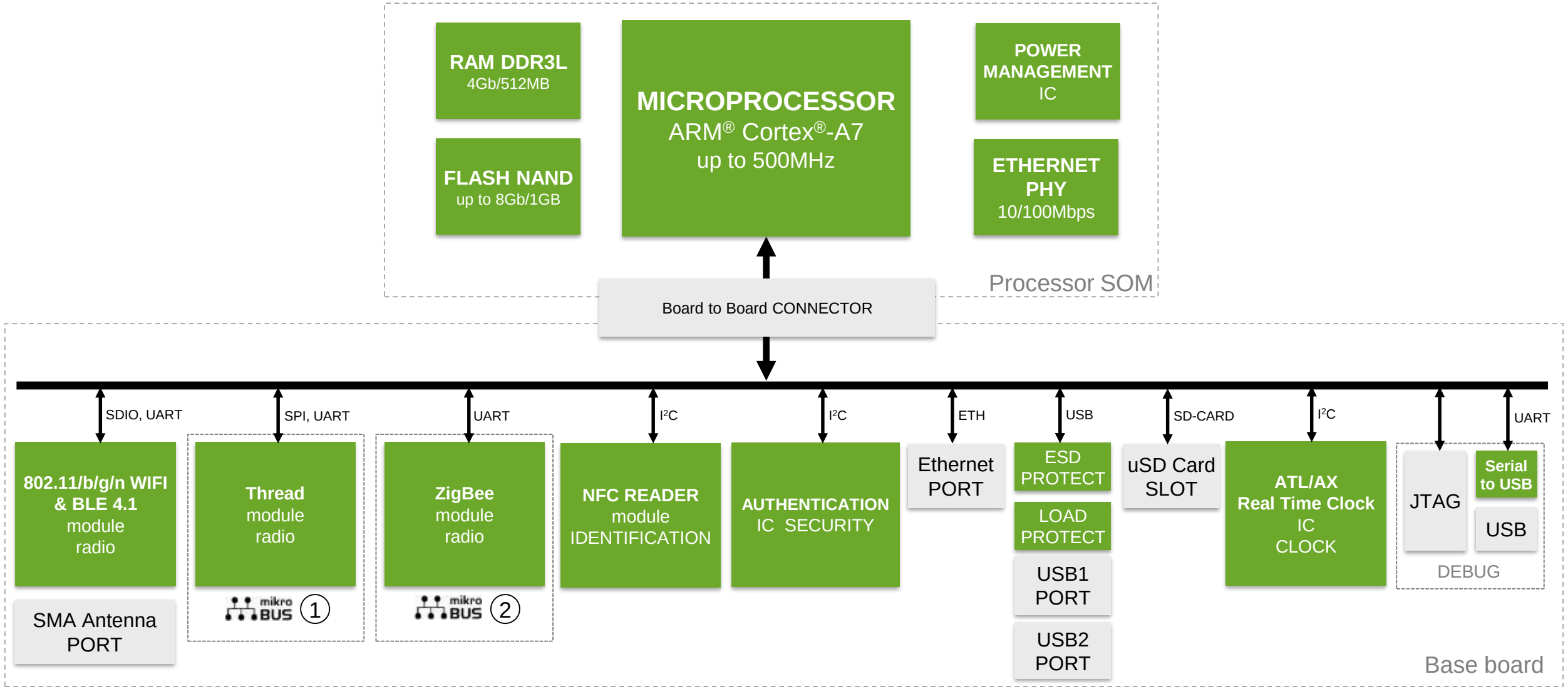
Key Features
Performance: **ARM Cortex®-A7 @ 696MHz**
Local Connectivity in Large Networks 255+ nodes: **ZigBee, Thread**
Cloud Connectivity: **Wi-Fi and Ethernet**
Authentification: **Secure Element**
Set up: **NFC Commissioning w/Smart App**
Update: **Over the Air Programming via Multicast**
Certifications: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

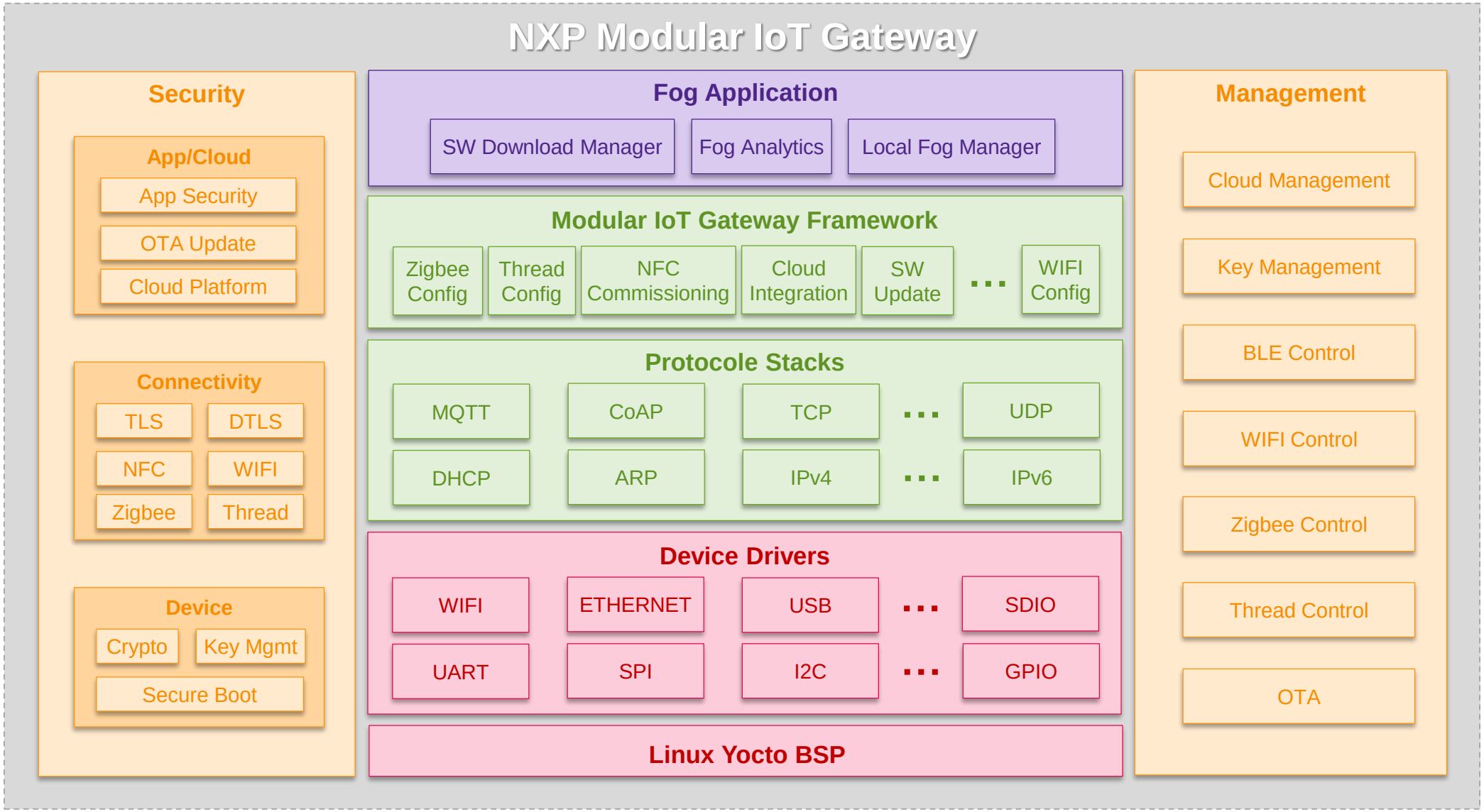
Software Enablement
(Open source and free)

UBOOT, Linux BSP
Board Component Drivers
Protocol Stack

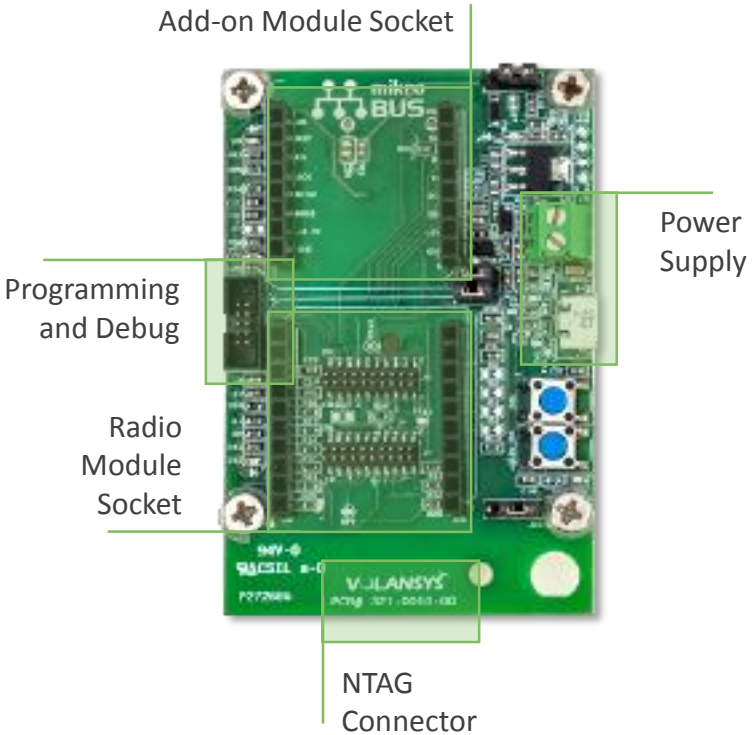
Modular IoT Gateway: *Hardware Block Diagram*

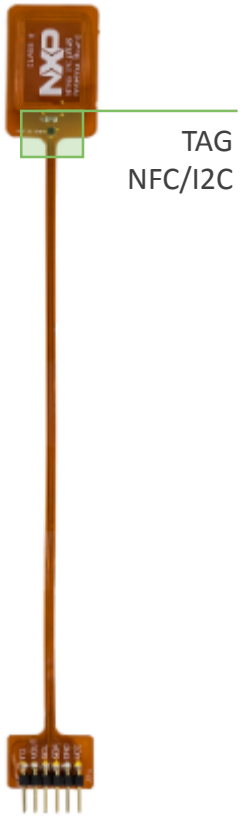


Modular IoT Gateway: *Software Architecture*



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

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 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

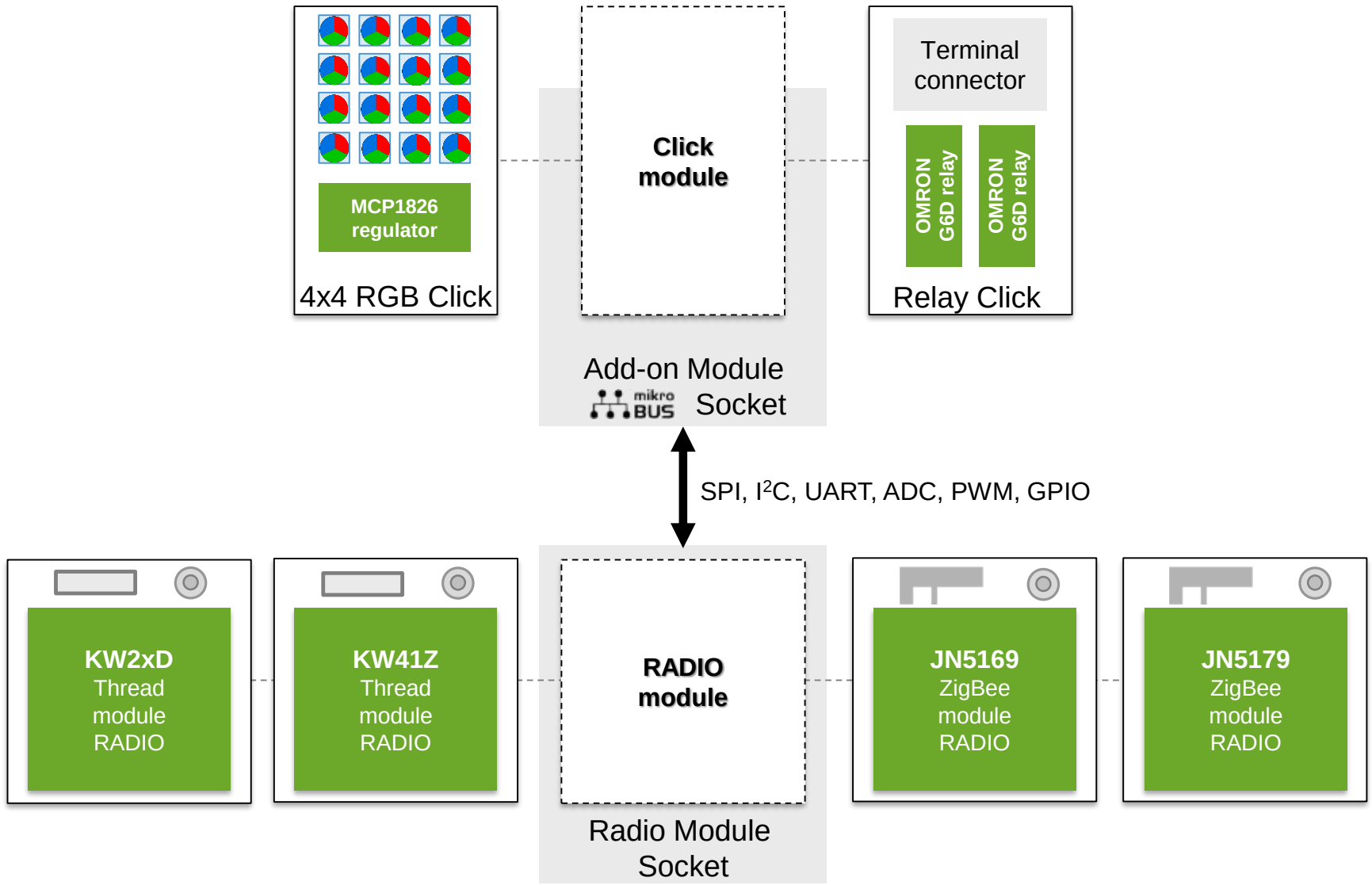
Key Features:
Performance: **Wireless System On Chip** (MCU with memory and radio)
Local Connectivity for Large Networks over 255 nodes: **Zigbee, Thread**
Setup: **NFC Tag for Commissioning**
Update: **Over the Air Programming via SPI Flash**
Power: **5V USB and DC input**
Extension: **compatible with 200+ Click™ modules**

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

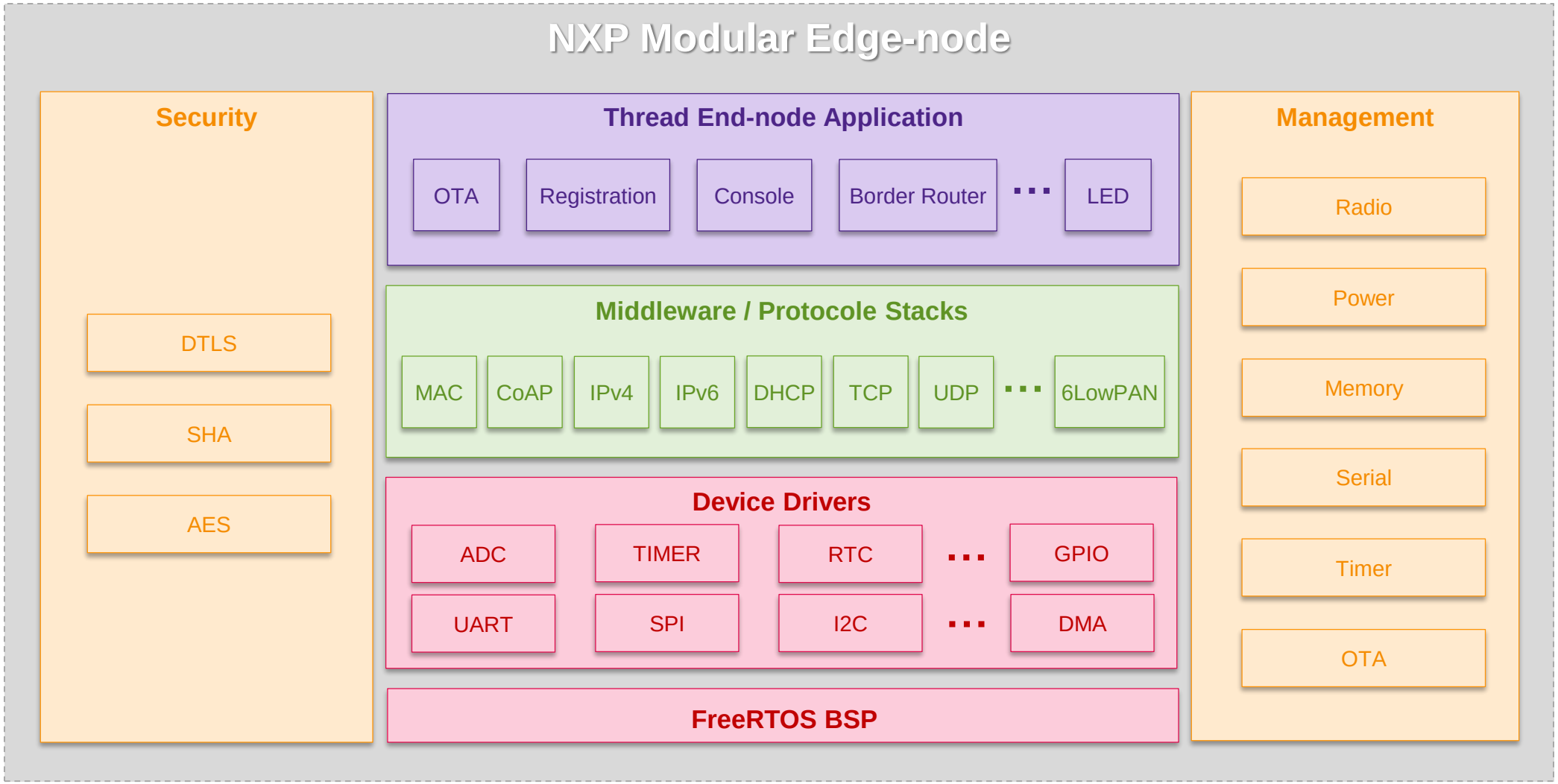
Software Enablement
(Open-source and free)
Kinetis Design Studio
Kinetis SDK
FreeRTOS
Protocol Stack

Target Segments / Applications
- Home Automation
- Healthcare / Wellness
- Utilities and Energy

Modular Edge Node: *Hardware Block Diagram*



Modular Edge Node: *Software Architecture*



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: *JN5169 Modules*

Key Features

JN5169 Modules are Hardware compatible with JN5168 Modules

All modules include JN5169 chip plus support components

- ✓ **Surface mountable** on motherboards

Standard power modules

- ✓ JN5169-001-M00-2: **Medium power** module (16 x 30mm)
  - ❖ **Printed antenna**
  - ❖ +10dBm
- ✓ JN5169-001-M03-2: **Medium power** module (16 x 21mm)
  - ❖ **uFL antenna connector**
  - ❖ +10dBm
- ✓ JN5169-001-M06-2: **High power** module (16 x 30mm)
  - ❖ **uFL antenna connector**
  - ❖ **+22dBm**

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

JN5169-001-M00-2

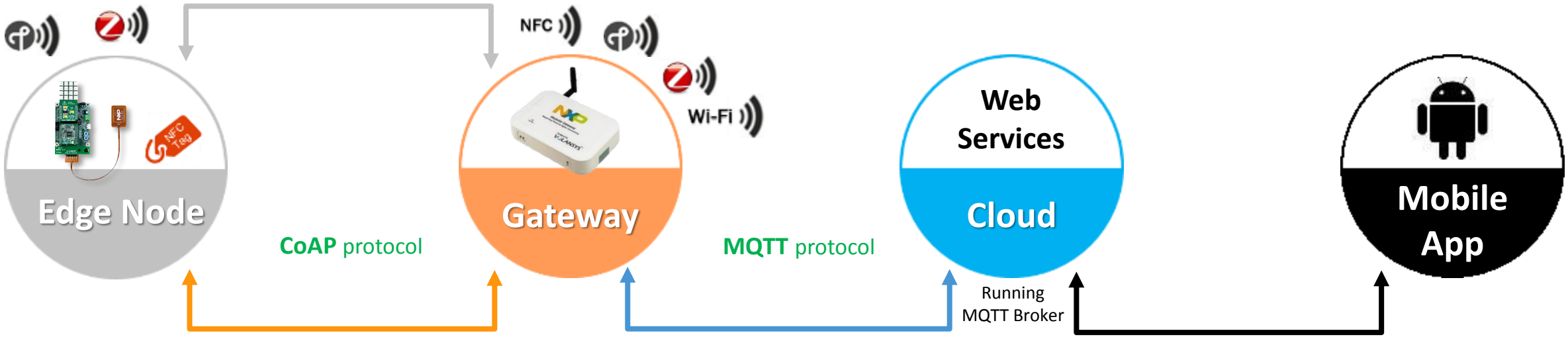
JN5169-001-M03-2

JN5169-001-M06-2

IDEx for General Purpose IoT Systems: *Functional Specifications*

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

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

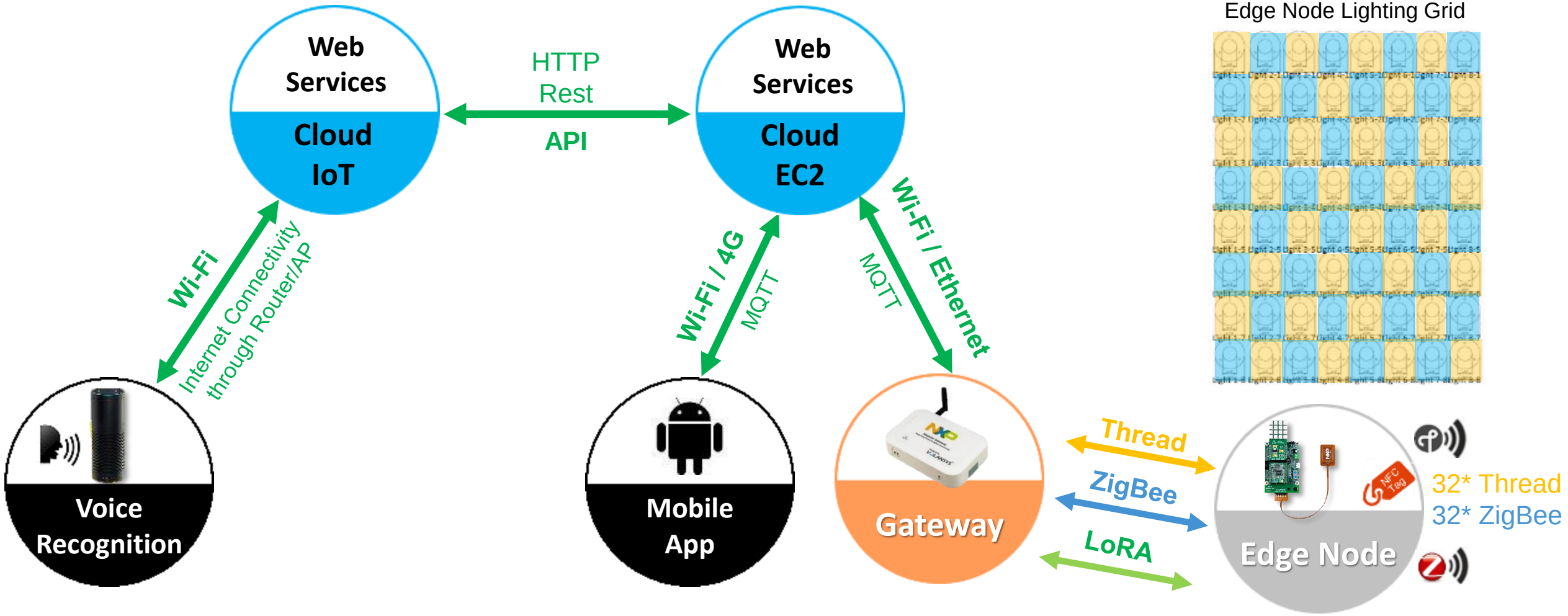


2 **Exchange data via MENP** ZigBee/Thread connectivity

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

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

IDEx for General Purpose IoT System Use Case: *Lighting Control*



Summary

NXP's Modular IoT Framework & IoT Use Case Specific IDEx Kits:

- Reduce the complexity of building IoT Systems with an optimized platform for quick evaluation, rapid prototyping, demonstration, iteration and IoT field trial deployments.
- Eliminate the need for in-house expertise with built-in wireless connectivity and security capabilities.
- Complete, use case specific, out-of-the-box IoT solution, significantly reduces development time up to 12 months.

The widespread adoption of the Internet of Things will take time, but the time line is advancing thanks to improvements in underlying technologies..”
-McKinsey & Company

All you need to get your IoT system to market faster!

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