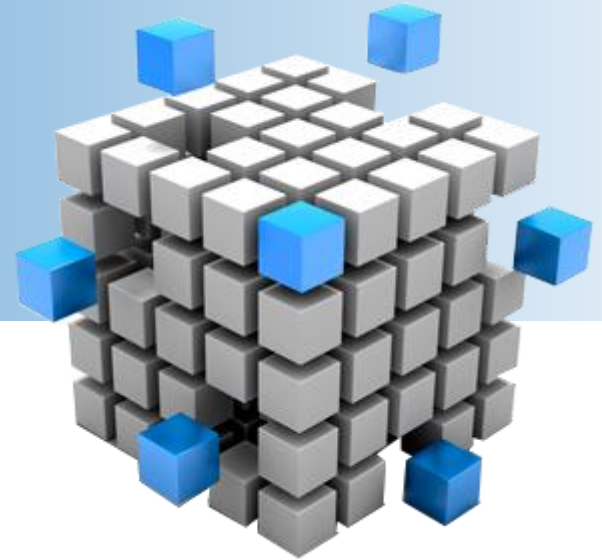


# Introducing IoT Framework

Complete Development Platform  
for Internet of Things Systems



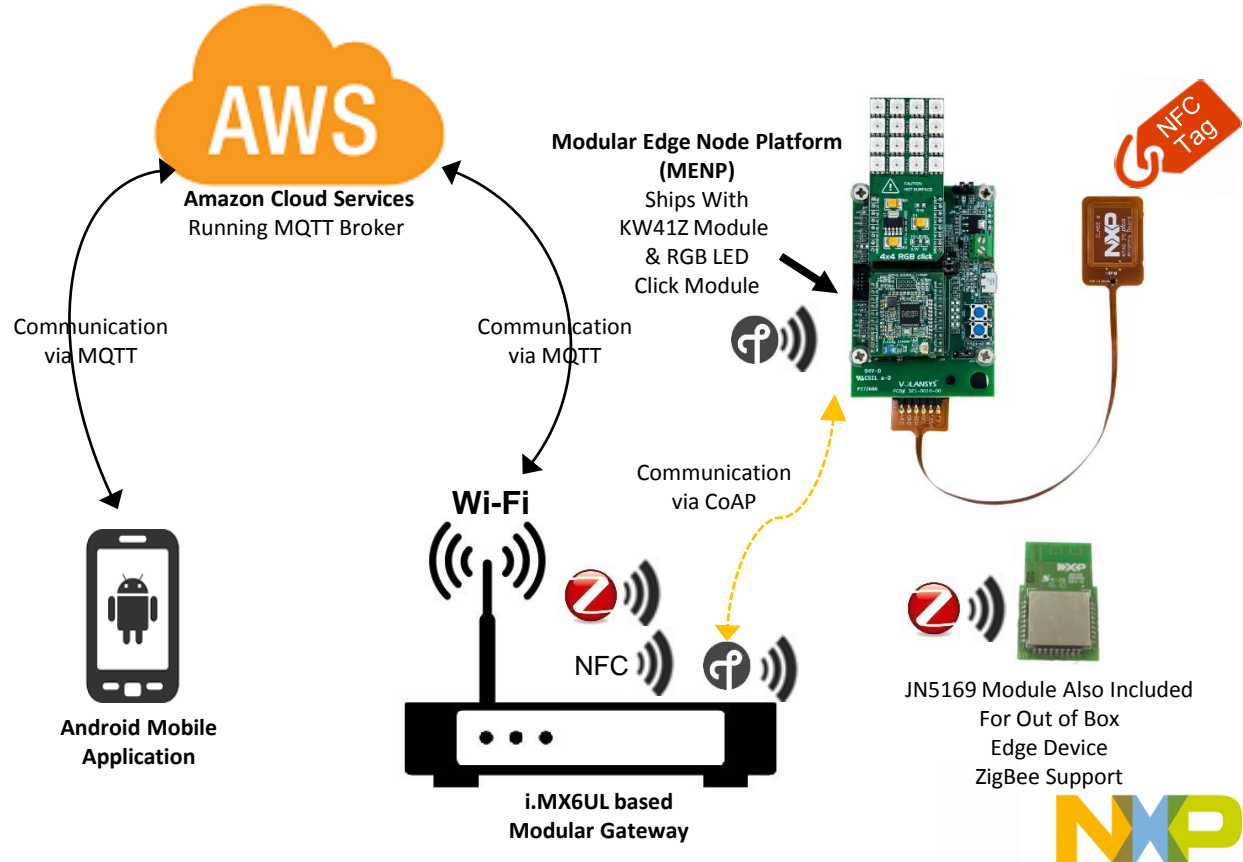
NXP  T FRAMEWORK

Internet of Things - modular, connected and secured

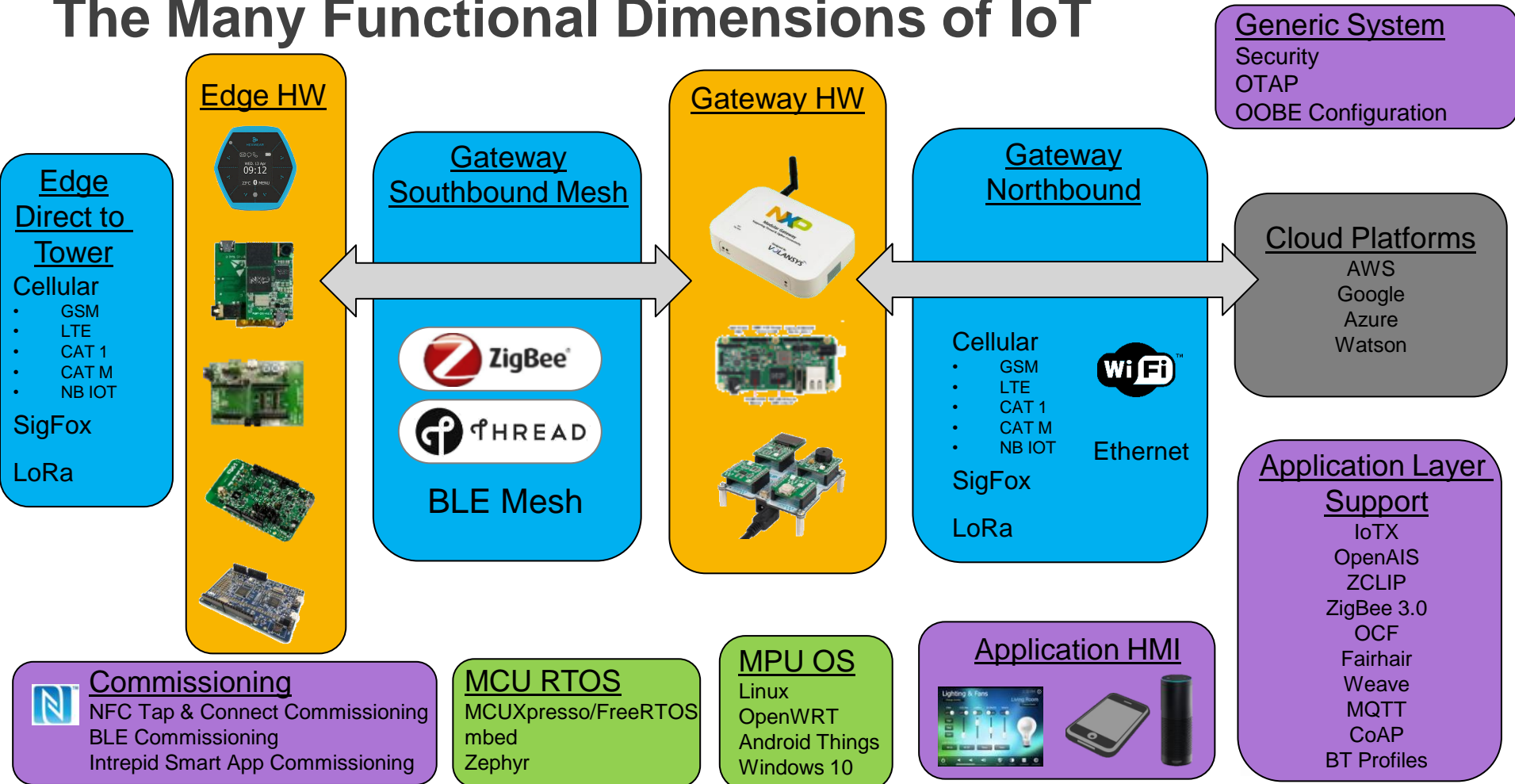


# NXP Modular IoT Framework V1.0 Integrated Development Experience

- Tap and connect via NFC commissioning
- Monitor & control ZigBee/ Thread devices via cloud using mobile application
- Gateway & cloud communication via MQTT protocol
- Gateway functions as Thread border router with Thread module (NXP KW41Z)
- Gateway functions as ZigBee coordinator with ZigBee module (NXP JN5169)
- MENP based edge device supports ZigBee and Thread connectivity



# The Many Functional Dimensions of IoT



# NXP MODULAR GATEWAY



# NXP Modular Gateway Solution Platform v1.0

## Value Proposition:

- Reduce time to market and development costs via modular design for Thread and ZigBee Gateway/Border Router customers
- Reduce project risk and uncertainty associated with wireless connectivity

## Key NXP Content:

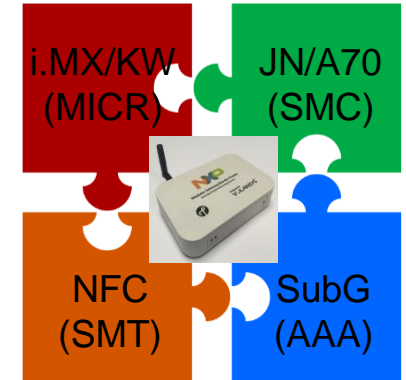
- Hardware, software & services, including all drivers, protocol stacks, and Linux BSP support
  - i.MX6UL SOM w/ PF3001 PMIC
  - Kinetis KW22D512/KW41Z Module, JN5169/JN5179 Module
  - PN7120 NFC, A70CM Sec Element
  - Professional Support and Services

## Target Segments/Applications:

- Commercial Building/Lighting
- Low Power WAN

**Availability:** EA Sep 2016 (Completed)

Launch November 2016 (Completed)



Cross-PL Core Of  
NXP IoT

## Key Features/Capabilities:

- Thread, ZigBee, WiFi, ENET
- Large Node Networks (>255 nodes)
- Over the Air Programming via Multicast
- Commissioning (NFC Demo, Smart App)
- WiFi and Ethernet to Cloud
- Smart Phone Apps
- FCC/CE/IC\*



# NXP Modular Gateway v1.0 Large Node Network Configurations

App Layer Support  
CoAP Per Thread Spec  
CoAP Observe Function  
ZigBee 3.0

Southbound:



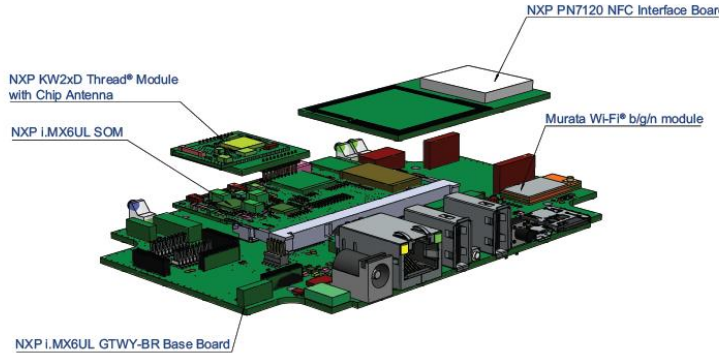
KW2xD



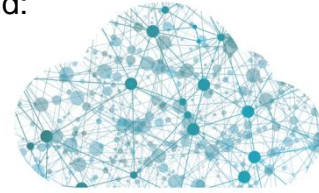
KW41Z



NXP JN5169



Northbound:



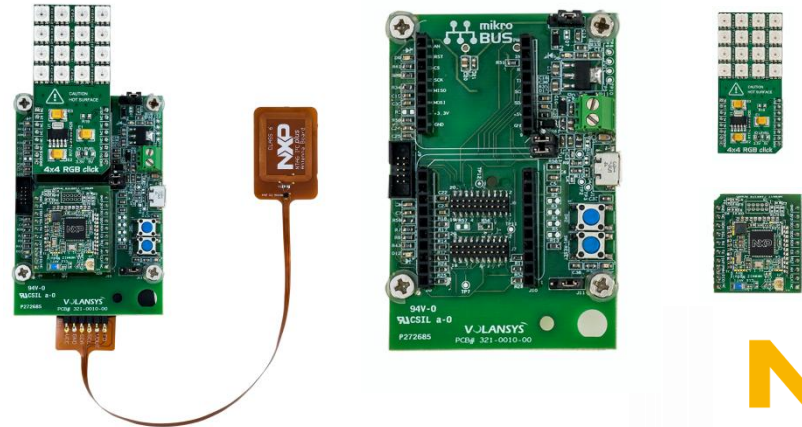
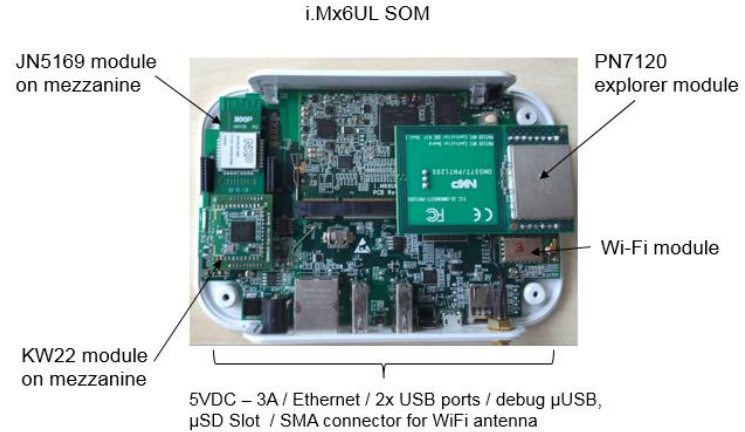
NFC Tap Commissioning Demo

Intrepid Smart App Commissioning



# Modular Gateway and Modular Edge Node Platform

- Same Modular Form Factor as Modular Gateway (MikroBus)
  - (Same modules can be used in either Gateway or Edge)
- Can connect KW41Z module using MikroBus
- Can connect JN5169/79 modules using 40 pin proprietary connector
- Can connect any click module in 2<sup>nd</sup> slot

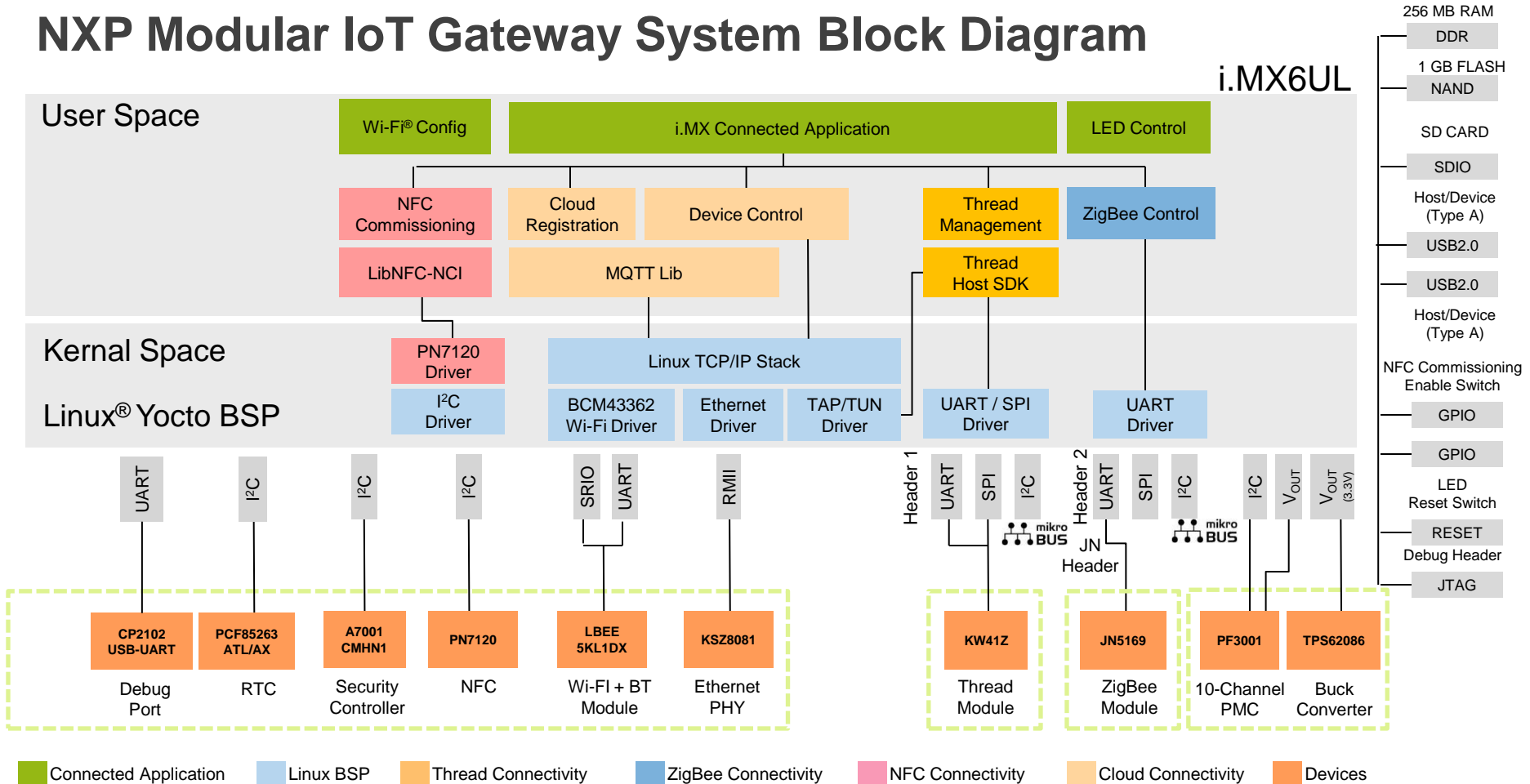


# MODULAR GATEWAY BLOCK DIAGRAMS



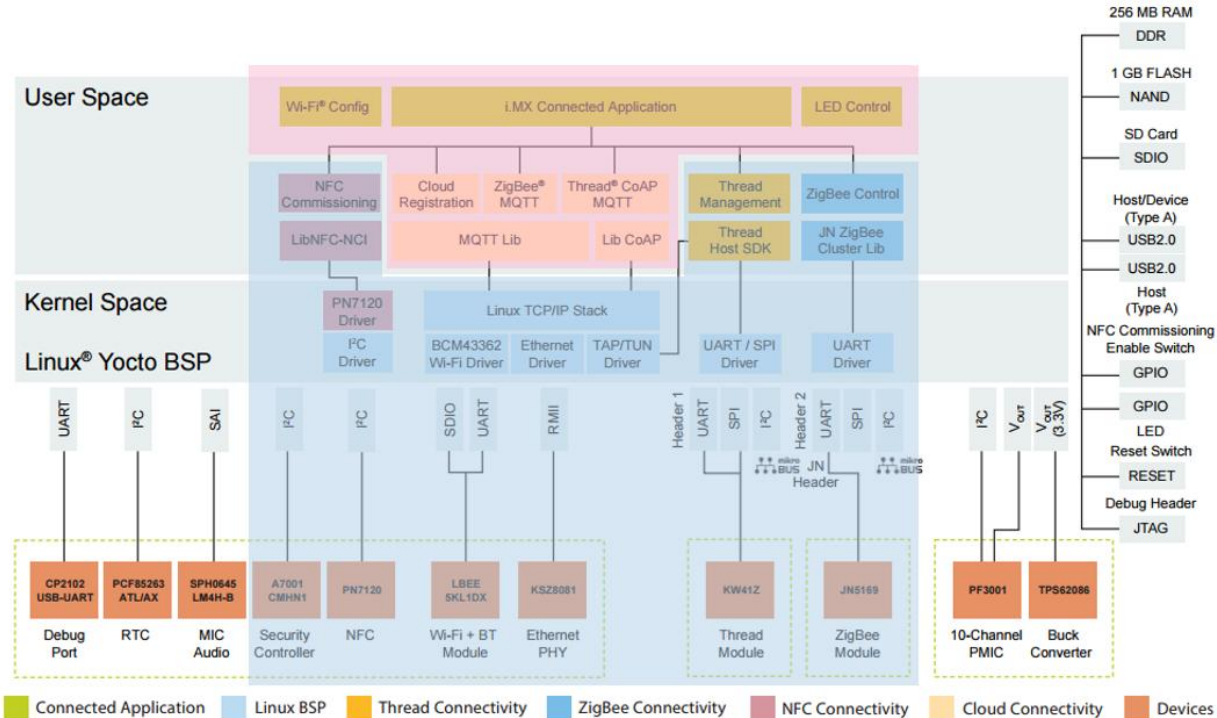


# NXP Modular IoT Gateway System Block Diagram



# NXP IoT Modular Framework - System Block Diagram Overview

NXP IoT Modular Framework includes two parts:  
The Connectivity Framework (U) and the Cloud and App (T)



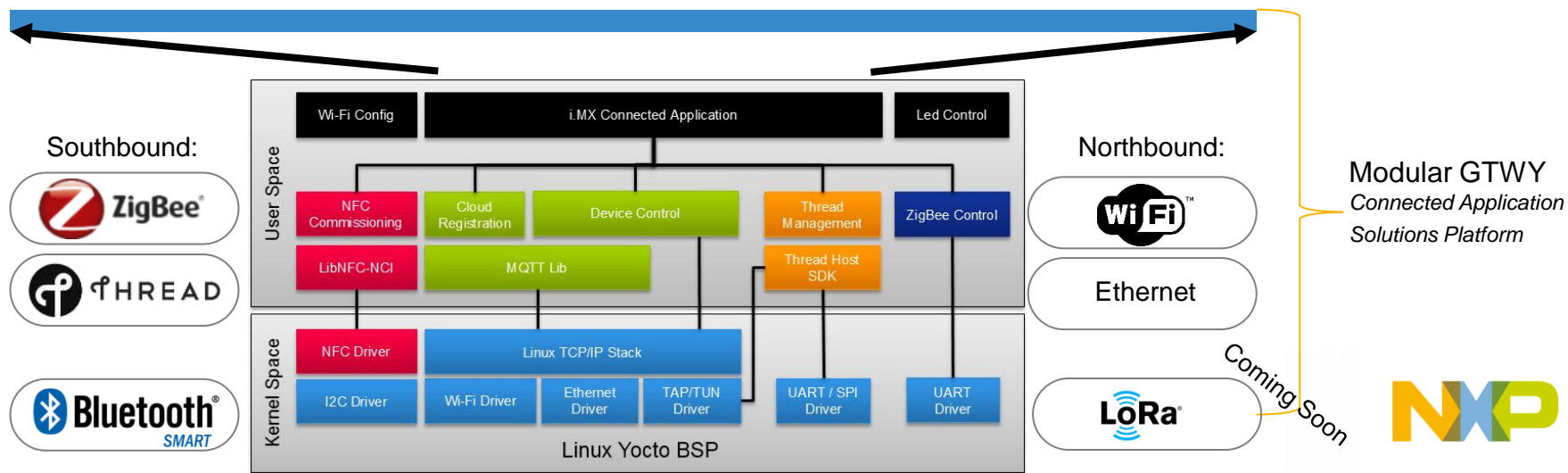
# Connected Application Solutions Platform Block Diagram

## • i.MX Connected Application Examples

- Headless Gateway/border Router
- Building Automation Panel
- Patient Room Management System
- Smart Home Control Node
- Agriculture Field Area Management Station
- Smart Grid Control Panel

## • i.MX Application Capability Examples

- Advanced Graphics and Video
- Network and Device Control/Management/Monitoring
- Speech Rec and Voice Control
- Machine Learning/Predictive Algorithms
- Local Data Analysis, Event Processing, Aggregation
- Active Security and Thread Management

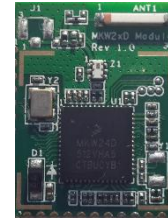
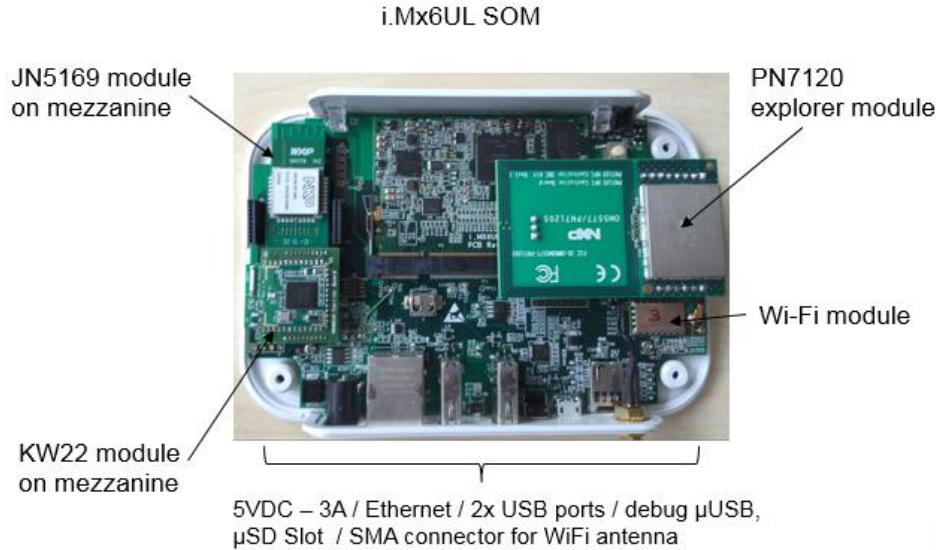


# MODULAR GATEWAY TECHNICAL DETAILS



# Modular Gateway Hardware Overview

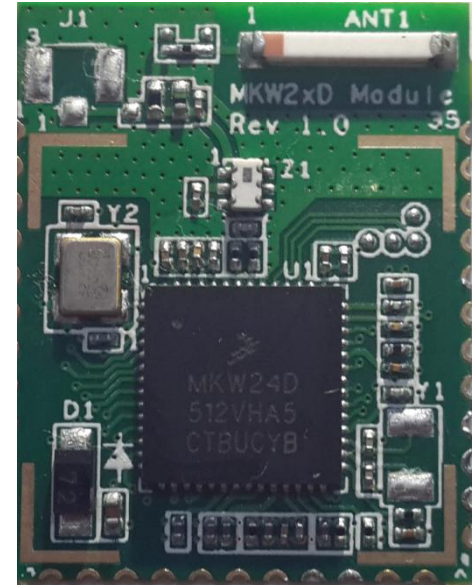
## Hardware Modules



# KW2XD Module

- Features

- Ultra Compact size of 24x19 mm
- 50 MHz 32-bit ARM Cortex M4 MCU with DSP capabilities
- 512 KB Flash & 64 KB SRAM
- Pads are side castellation for easy soldering & optical inspection
- MikroBus compatible connector
- Industry standard JTAG/SWD Programming and debug connectivity
- Antenna Options: Integrated Chip Antenna or U.F.L connector
- Thread Network Stack
- RoHS Compliant
- Fast integration opportunities and the shortest possible time to market for your product



# KW41Z Module

- Features
  - Ultra Compact size of 21x16 mm
  - 48 MHz ARM Cortex M0+ core
  - 512 KB Flash & 128 KB SRAM
  - AES 128 Hardware Accelerator
  - Pads are side castellation for easy soldering & optical inspection
  - MikroBus compatible connector
  - Industry standard SWD Programming connectivity
  - Antenna Options: Integrated Chip Antenna or U.F.L connector
  - RoHS Compliant: FCC and CE Certification (In plan)
  - Thread, Bluetooth Protocol Support



# i.MX6UL SOM

- Features
  - Ultra Compact size of 67.6x45.0x5.0 mm
  - i.MX6UL Power Efficient ARM Cortex-A7 Platform
  - Footprint Compatible to i.MX6ULL
  - P32PF3001 PMIC
  - Memory: DRAM, Flash, NAND, EEPROM
  - Display: 24-bit parallel LCD interface
  - Multiplexed Signals to support multiple peripherals
  - The Board supports mounting of eMMC & NAND Flash
  - Peripherals:  
I2C,SPI,USB,UART,SDIO,PWM,Smart Card
  - Audio: Up to 3-channel, Digital Audio
  - Networking: 10/100 Mbps Ethernet Ports(2x)





# MODULES: JN5179 RANGE - Launch 1<sup>st</sup> October 2016

- **All modules include JN5179 chip plus support components**

- Surface mountable on motherboards

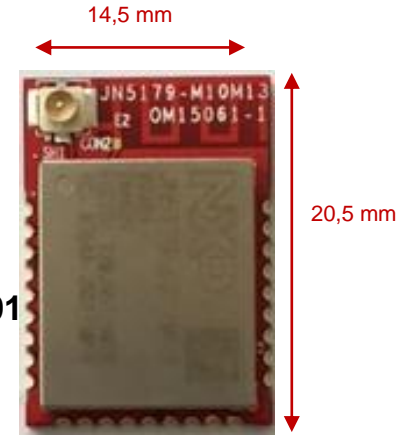
- **Standard power modules**

- Medium power module **14,5x20,5mm JN5179-001-M10**
  - Printed antenna
  - +10dBm
- Medium power module **14,5x20,5mm JN5179-001-M13**
  - uFL
  - +10dBm
- High power module **14,5x20,5mm JN5179-001**
  - Printed antenna and uFL connector
  - +22dBm
  - Antenna Diversity

- **Modules with JN5179 will be available by Q2'16**

- **Module value proposition**

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



JN5179-001-M1x

# GTWY Base Board – Technical Details

- Power Input: 5V DC through wall adapter
- Ethernet: RJ45 10/100 Mbps
- USB: 2x USB 2.0 Host Interface
- Micro SD Connector Interface
- 2x User Indication LEDs
- 1x User Input switch



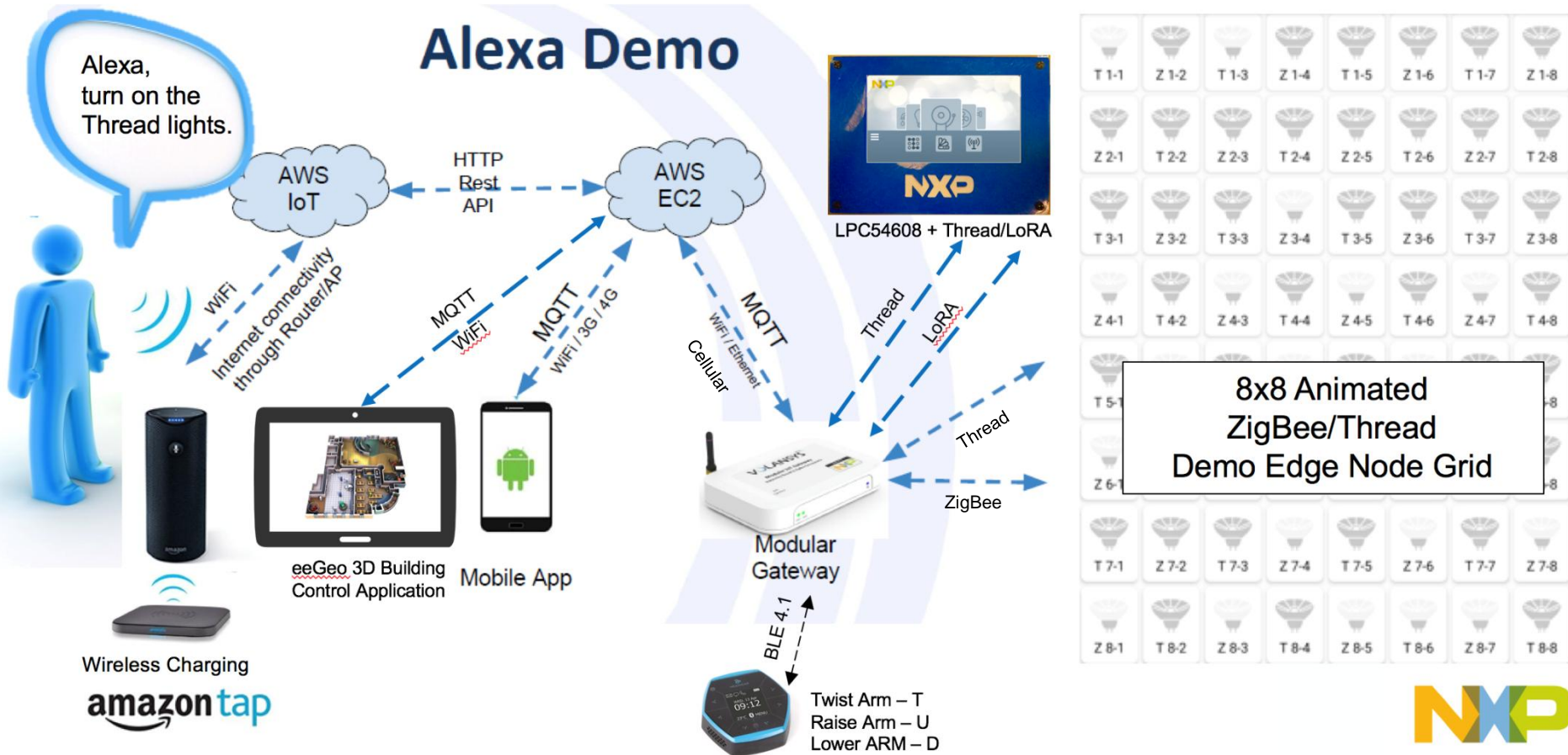
## RF Interfaces:

- Wi-Fi: 2.4GHz b/g/n support and BT 4.1 over Murata's 1DX module
- 802.15: Supports two RF Module Interface Headers (MikroBUS)
- NFC: Support through PN7120 NFC Controller

# EMBEDDED WORLD DEMO SNEAK PEEK



# EW2017 Smart Building Control Demo



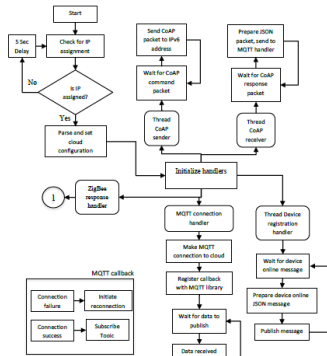
# RELEASE PACKAGE



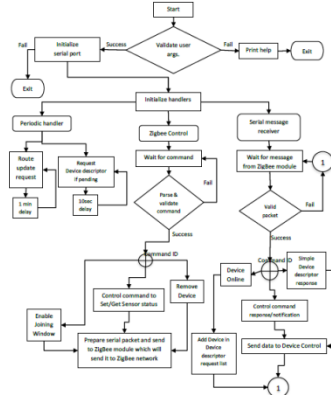
# NXP Modular Framework v1.0 IDEX (HW/SW/Docs Listing)



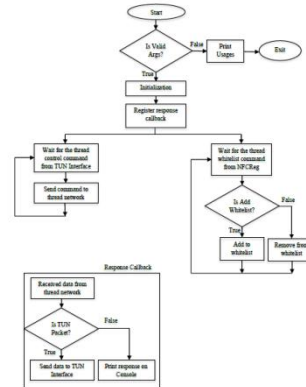
2.3 Device Control



2.4 Zigbee Control



2.5 Thread Control



Document Name	SW Module Description
i.MX6UL Modular Gateway Firmware Flashing Guide	MQTT Client Library
Modular Gateway Out of Box Demo Setup Guide	Thread Linux Host Software SDK
Modular Gateway Source Build Instruction Guide	Gateway & End device Registration with Cloud
Modular Gateway OOB demo software architecture details	Start up script for WiFi client service
JN5169 Module Firmware Build Guide	Control LED/LED2 behaviour
JN5169 Module Firmware Flashing Guide	Communication bridge between cloud and end device
KW2xD Module Firmware Flashing Guide	NFC Commissioning of Gateway & End devices
KW41Z Module Firmware Flashing Guide	Thread end device controller
FRDM-K64+MCR20 Firmware Build Guide	Config File to load WiFi Station firmware
FRDM-KW24D Firmware Build Guide	Zigbee end device controller
FRDM-KW41Z Firmware Build Guide	Indicates where process are connected with each other in Block Diagram
KW22D512 + MENP Module Firmware Build Guide	Libnfc-nci for NXP NFC chip
KW22D512 + MENP Module Firmware Flashing Guide	PN7120 Driver is provided as part of Linux BSP
KW41Z + MENP Module Firmware Build Guide	Self extracting Yocto i.MX6UL Linux BSP and Drivers binary image
KW41Z + MENP Module Firmware Flashing Guide	Jn5169 Module Gateway Radio Firmware
JN5169 + MENP Module Firmware Build Guide	KW22D Module Gateway Radio Host Firmware
JN5169 + MENP Module Firmware Flashing Guide	MKw41Z module gateway radio firmware
Modular Gateway Mobile application software architecture details	PN7120 Firmware comes pre-flashed from manufacturer

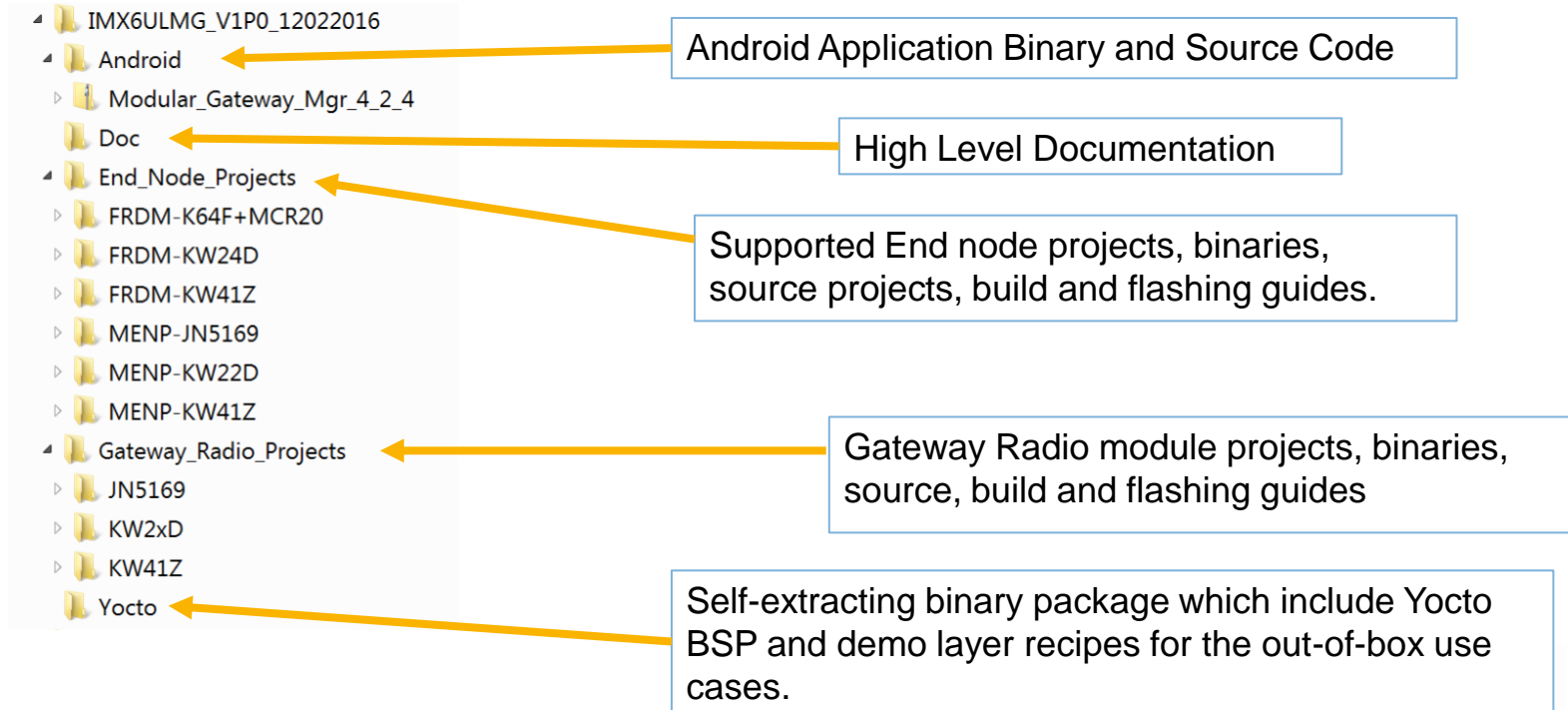
Android mobile app to control and commission Zigbee/Thread End device  
 Thread K64F+MCR20 End device application for use with GTWY OOB demo  
 Thread KW2x End device application for use with GTWY OOB demo  
 Thread KW41Z End device application for use with GTWY OOB demo  
 Thread KW41Z + MENP End device application for use with GTWY OOB demo  
 Thread KW22D + MENP End device application for use with GTWY OOB demo  
 Zigbee JN5169 + MENP End device application for use with GTWY OOB demo

Pre-built SD Card image for Gateway  
 Gateway NAND Manufacturing Tool



# Gateway Release Package

Download and extract the IMX6ULMG\_V1P0\_12022016.zip, and review the following:



# Package Documentation

Download and extract the IMX6ULMG\_V1P0\_12022016.zip, and review the following:

The screenshot displays a file explorer window with the following directory structure:

- IMX6ULMG\_V1P0\_12022016
  - Android
  - Modular\_Gateway\_Mgr\_4\_2\_4
  - Doc
    - End\_Node\_Projects
    - FRDM-K64F+MCR20
    - FRDM-KW24D
    - FRDM-KW41Z
    - MENP-JN5169
    - MENP-KW22D
    - MENP-KW41Z
    - Gateway\_Radio\_Projects
    - JN5169
    - KW2xD
    - KW41Z
    - Yocto

On the right, a list of PDF documents is shown:

- IMX6ULMGFFUG
- MGOOBDSUG
- MGSBIUG
- Modular\_Gateway\_OOB\_Software\_Architecture\_v1.0

Yellow arrows point from callout boxes to these documents:

- Modular Gateway Flashing Guide** points to IMX6ULMGFFUG.
- Start With this Document  
Modular Gateway Out-of-Box  
Demo Setup Guide** points to MGOOBDSUG.
- Modular Gateway Source Build User Guide** points to MGSBIUG.
- Modular Gateway Software Architecture Document** points to Modular\_Gateway\_OOB\_Software\_Architecture\_v1.0.



# SD Card vs NAND - FAQ

**[Question]** Should I be updating the NAND in the gateway or configuring the gateway for SD Card, which to me would seem to involve soldering resistors, which I would prefer not to do.

**[Answer]** – Our recommendation would be to use the SD card for development. You do not need to modify any resistors within the GTWY to do so. The NAND is only 1GB and our default Yocto builds do not fit within it as we include many additional build tools for ease of use. You can read about how to boot from the SD card within /Doc/IMX6ULMGFFUG.pdf -> Section 3.

**[Question]** Is there a Manufacturing Tool image/files to update the firmware in NAND?

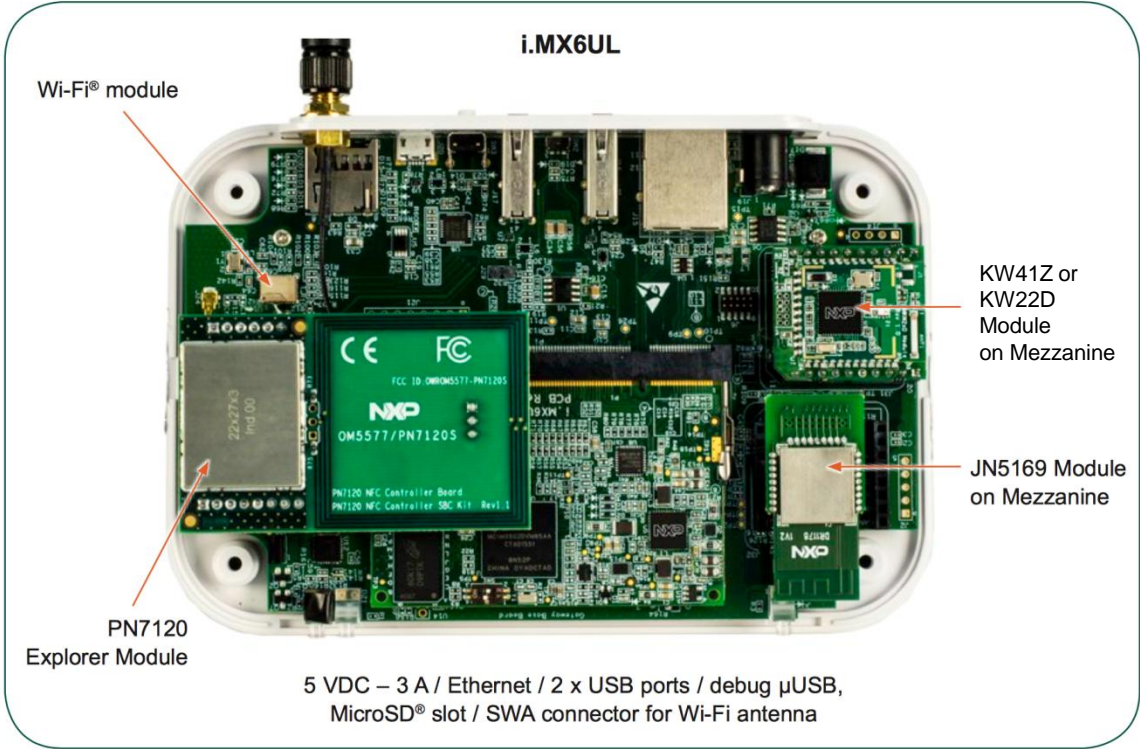
**[Answer]** – Yes, this tool can be found within the “Software” folder on the extranet website. However please keep in mind that our default OOB builds will not fit within the 1GB NAND. If you wish to create a “minimal” build that will fit within the NAND, and will need to use the “\$ bitbake volansys-image-gw-minimal” option as described within /Doc/MGSBIUG.pdf -> Section 6.



# ENABLEMENT

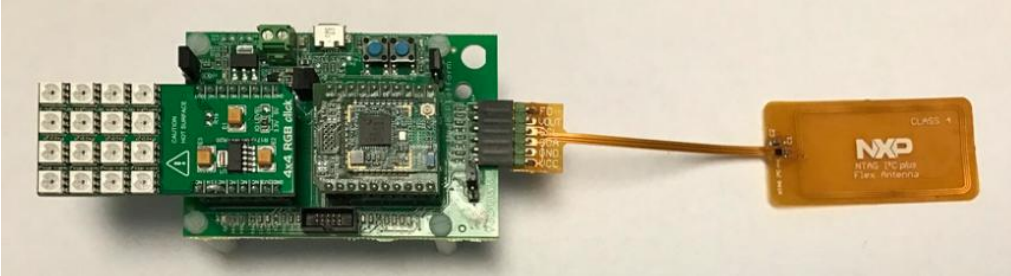


# Modular Gateway

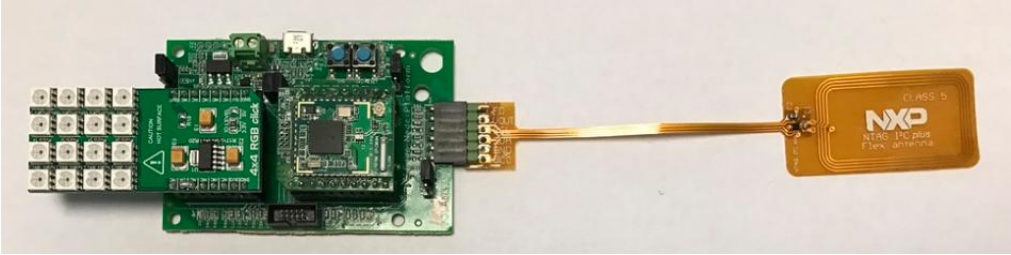


# Modular Edge Node Platforms

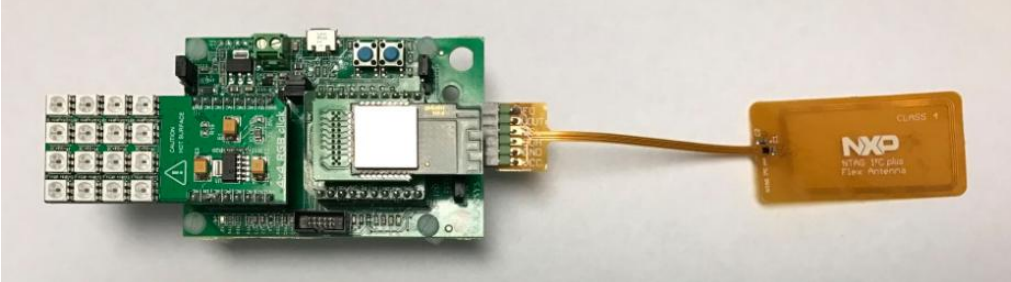
MENP-KW41Z



MENP-KW22D



MENP-JN5169



# Kinetis Wireless Freedom Boards

FRDM-KW41Z



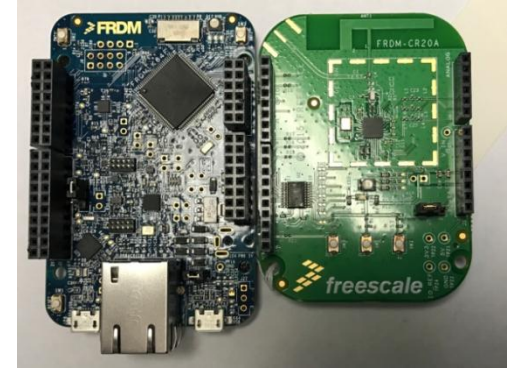
FRDM-KW2xD



FRDM-K64F+MCR20



=



# Additional Required and Recommended Hardware

- In order to fully leverage the development capabilities of this reference design we recommend you acquire the following debug hardware:
  1. **Android Phone (required)**
    - NFC enabled
    - Recommend Nexus 5 or greater – or – Samsung Galaxy S5 or greater
  2. **Segger J-Link BASE or higher (required)**
    - For flashing and debugging the KW41Z and KW22D based embedded applications
    - <https://www.segger.com/jlink-debug-probes.html>
  3. **FTDI TTL-232R-3V3 USB to UART Cable (required)**
    - For UART access and some flashing cases.
    - <http://www.digikey.com/product-detail/en/ftdi-future-technology-devices-international-ltd/TTL-232R-3V3/768-1015-ND/1836393>
  4. **Beyond Semiconductor Debug Key (recommended for heavy JN516x development)**
    - Will be required for single-step debugging of the JN5169 based embedded applications
    - <http://www.beyondsemi.com/purchase-beyond-debug-key/>
  5. **LPC-Link2 Debug Probe (recommended for heavy JN517x development)**
    - Will be needed for future version which will include the JN5179 based ZigBee radios
    - [http://www.nxp.com/products/reference-designs/lpc-link2:OM13054?&cof=0&am=0&tab=Buy\\_Parametric\\_Tab#OM13054](http://www.nxp.com/products/reference-designs/lpc-link2:OM13054?&cof=0&am=0&tab=Buy_Parametric_Tab#OM13054)



# Community Support Pages

We have setup 5 community pages pages which are linked together manually to form the basis of the Community we will start to use moving forward.

<https://community.nxp.com/groups/modular-framework>

<https://community.nxp.com/groups/nxp-iot-modular-framework-faqs>

<https://community.nxp.com/groups/nxp-iot-modular-framework-tips-tricks>

<https://community.nxp.com/groups/nxp-iot-modular-framework-patches>

<https://community.nxp.com/groups/nxp-iot-modular-framework-doc-updates>

