Introducing IoT Framework
Complete Development Platform for Internet of Things Systems

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

Amazon Cloud Services
Running MQTT Broker

Wi-Fi

Communication via MQTT

Android Mobile Application

Modular Edge Node Platform (MENP)
Ships With KW41Z Module & RGB LED Click Module

JN5169 Module Also Included For Out of Box Edge Device ZigBee Support

Communication via CoAP

NFC

i.MX6UL based Modular Gateway
The Many Functional Dimensions of IoT

**Commissioning**
- NFC Tap & Connect Commissioning
- BLE Commissioning
- Intrepid Smart App Commissioning

**MCU RTOS**
- MCUXpresso/FreeRTOS
- mbed
- Zephyr

**MPU OS**
- Linux
- OpenWRT
- Android Things
- Windows 10

**Application HMI**

**Edge HW**

**Gateway HW**

**Gateway Southbound Mesh**

**Gateway Northbound**

**Cloud Platforms**
- AWS
- Google
- Azure
- Watson

**Generic System**
- Security
- OTAP
- OOBE Configuration

**Application Layer Support**
- IoT
- OpenAIS
- ZCLIP
- OCF
- Fairhair
- Weave
- MQTT
- CoAP
- BT Profiles

**Ethernet**

**Cellular**
- GSM
- LTE
- CAT M
- NB IOT
- SigFox
- LoRa

**Edge Direct to Tower**

**Cellular**
- • GSM
- • LTE
- • CAT M
- • NB IOT
- SigFox
- LoRa
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)

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:

Northbound:

NFC Tap Commissioning Demo
Intrepid Smart App Commissioning

Ethernet

ZigBee

Northbound:

NFC Tap Commissioning Demo
Intrepid Smart App Commissioning

Southbound:
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 2nd slot
MODULAR GATEWAY BLOCK DIAGRAMS
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**
- **KW41Z**
- **NXP JN5169**
- **NXP PN7120**

**i.MX6UL SOM**

- JN5169 module on mezzanine
- PW22 module on mezzanine

Wi-Fi module

5VDC – 3A / Ethernet / 2x USB ports / debug μUSB, μSD Slot / SMA connector for WiFi antenna

14.5 mm

20.5 mm
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)
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-M16
    • 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
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
Alexa, turn on the Thread lights.

AWS IoT

HTTP REST API

AWS EC2

LPC54608 + Thread/LoRA

Thread

LoRA

Thread

ZigBee

8x8 Animated ZigBee/Thread Demo Edge Node Grid

Wireless Charging

amazon tap

eeGeo 3D Building Control Application

Mobile App

Modular Gateway

BLE 4.1

Twist Arm – T
Raise Arm – U
Lower ARM – D
NXP Modular Framework v1.0 IDEx (HW/SW/Docs Listing)
Gateway Release Package

Download and extract the IMX6ULMG_V1P0_12022016.zip, and review the following:

- **Android Application Binary and Source Code**
- **High Level Documentation**
- **Supported End node projects, binaries, source projects, build and flashing guides.**
- **Gateway Radio module projects, binaries, source, build and flashing guides**
- **Self-extracting binary package which include Yocto BSP and demo layer recipes for the out-of-box use cases.**
Download and extract the IMX6ULMG_V1P0_12022016.zip, and review the following:

- Modular Gateway Flashing Guide
- Modular Gateway Out-of-Box Demo Setup Guide
- Modular Gateway Source Build User Guide
- Modular Gateway Software Architecture Document
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

- Wi-Fi® module
- KW41Z or KW22D Module on Mezzanine
- PN7120 Explorer Module
- JN5169 Module on Mezzanine

5 VDC – 3 A / Ethernet / 2 x USB ports / debug μUSB, MicroSD® slot / SWA connector for Wi-Fi antenna
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](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.

4. **Beyond Semiconductor Debug Key (recommended for heavy JN516x development)**
   - Will be required for single-step debugging of the JN5169 based embedded applications

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?&coi=0&am=0&tab=Buy_Parametric_Tab#OM13054](http://www.nxp.com/products/reference-designs/lpc-link2:OM13054?&coi=0&am=0&tab=Buy_Parametric_Tab#OM13054)
Community Support Pages

We have setup 5 community 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