

IoT HOME AUTOMATION BASED ON i.MX 6 APPLICATIONS PROCESSORS

APF-HMB-T2468

JIM LIN
NOVEMBER 2016



PUBLIC



SECURE CONNECTIONS
FOR A SMARTER WORLD

Agenda

- WaRP7
- i.MX6D IoT Gateway
- i.MX6UL IoT Gateway -- Volansys
- i.MX6UL IoT Gateway -- OpenWRT
- i.MX 7 IoT Gateway -- PHYTEC
- i.MX 6 & Proximity Cloud i.MX 7 Audio
- Streaming -- StreamUnlimited



WARP7

WaRP7 -- IoT and Wearable Development Platform



- Order/Support of **WaRP7** on:
- <https://www.element14.com/community/docs/DOC-79058>

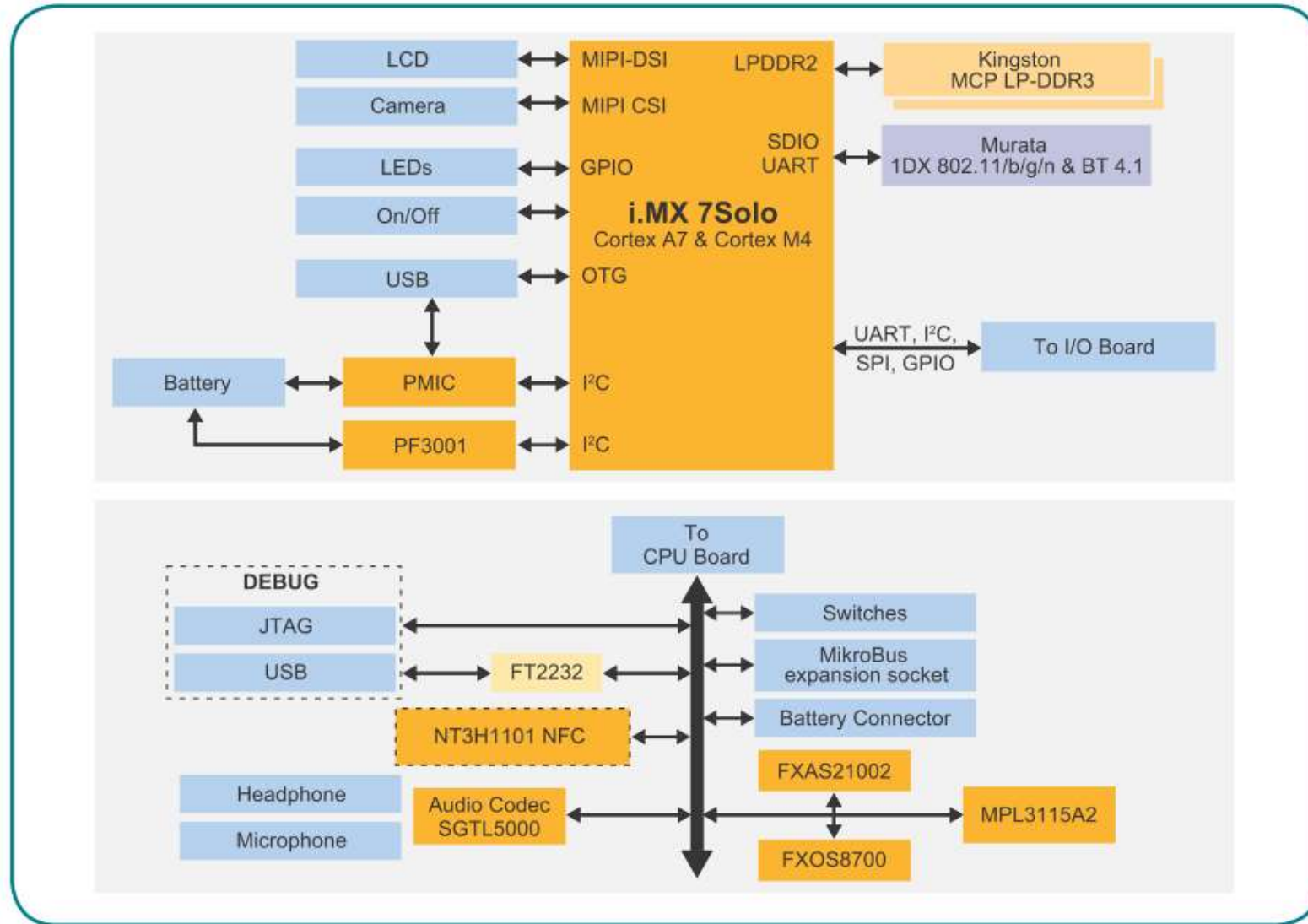
WaRP7 -- IoT and Wearable Development Platform(cont.)

- CPU: i.MX 7Solo applications processor (Cortex-A7/Cortex –M4)
- Memory: 8GB eMMC 5.0 and 4Gb LPDDR3
- Connectivity: WiFi, Bluetooth, BLE, USB-OTG, NFC
- Multimedia: I/F Camera, MIPI Display, Audio
- Sensors: Accelerometer, Barometer, Gyroscope
- Power: PMIC(PF3001), Battery charger

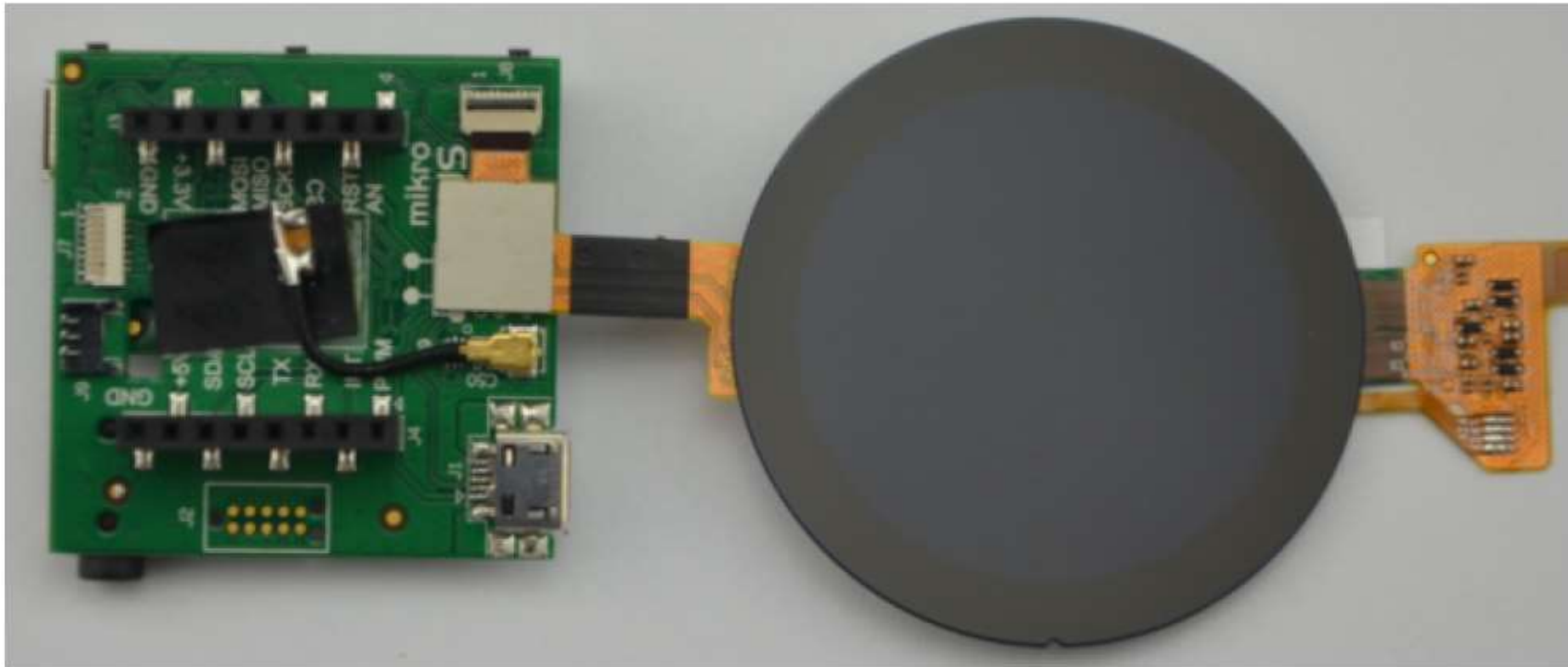
WaRP7 -- IoT and Wearable Development Platform(cont.)

- Hardware platform available for order, **\$92 per unit on Element14.**
- **Linux L4.1.x** BSP available(Yocto)
- **Android** BSP under development.(according to Element14 discussion forum)
- **FreeRTOS** BSP available for Cortex-M4 in i.MX7S.
- Unit test scripts for Wi-Fi/Sensor/Gyro/NFC/Accelerometer....etc. on Element14 Github.

WaRP7 -- IoT and Wearable Development Platform(cont.)



WaRP7 -- IoT and Wearable Development Platform(cont.)



Manufacturer: Element14
Mfg Part No: WARP7
Price: \$92.00
Availability: 32 ship now

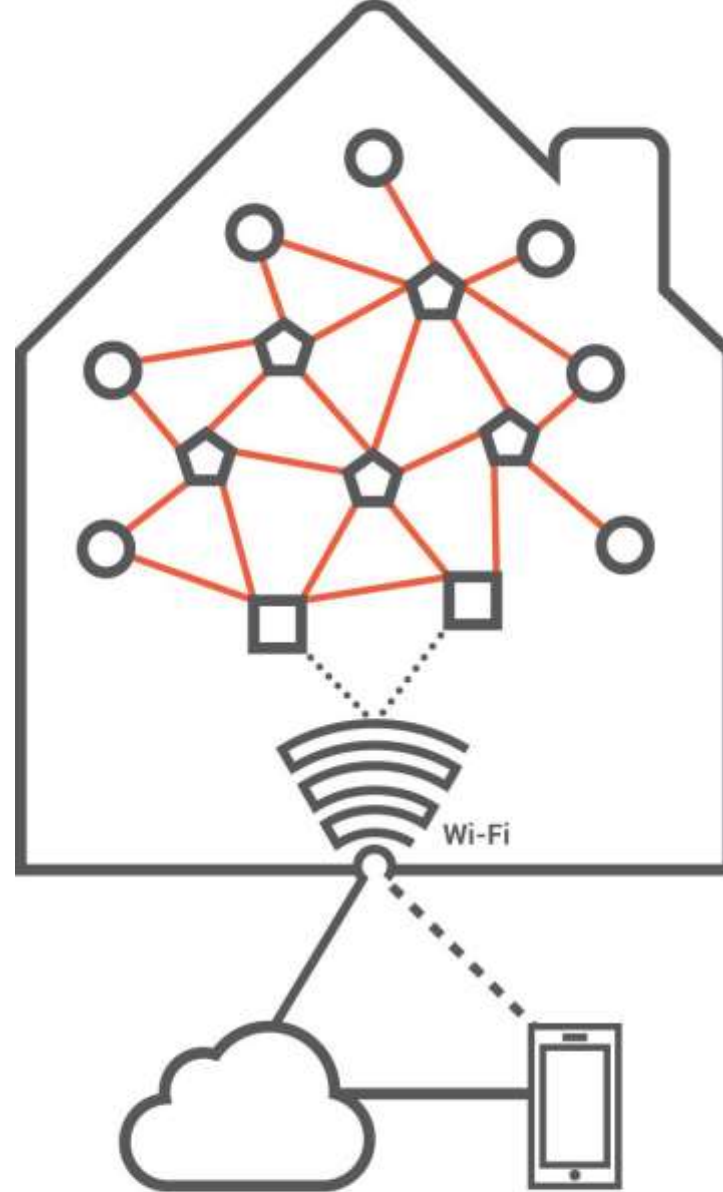
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i.MX IOT GATEWAY



Thread IoT Diagram

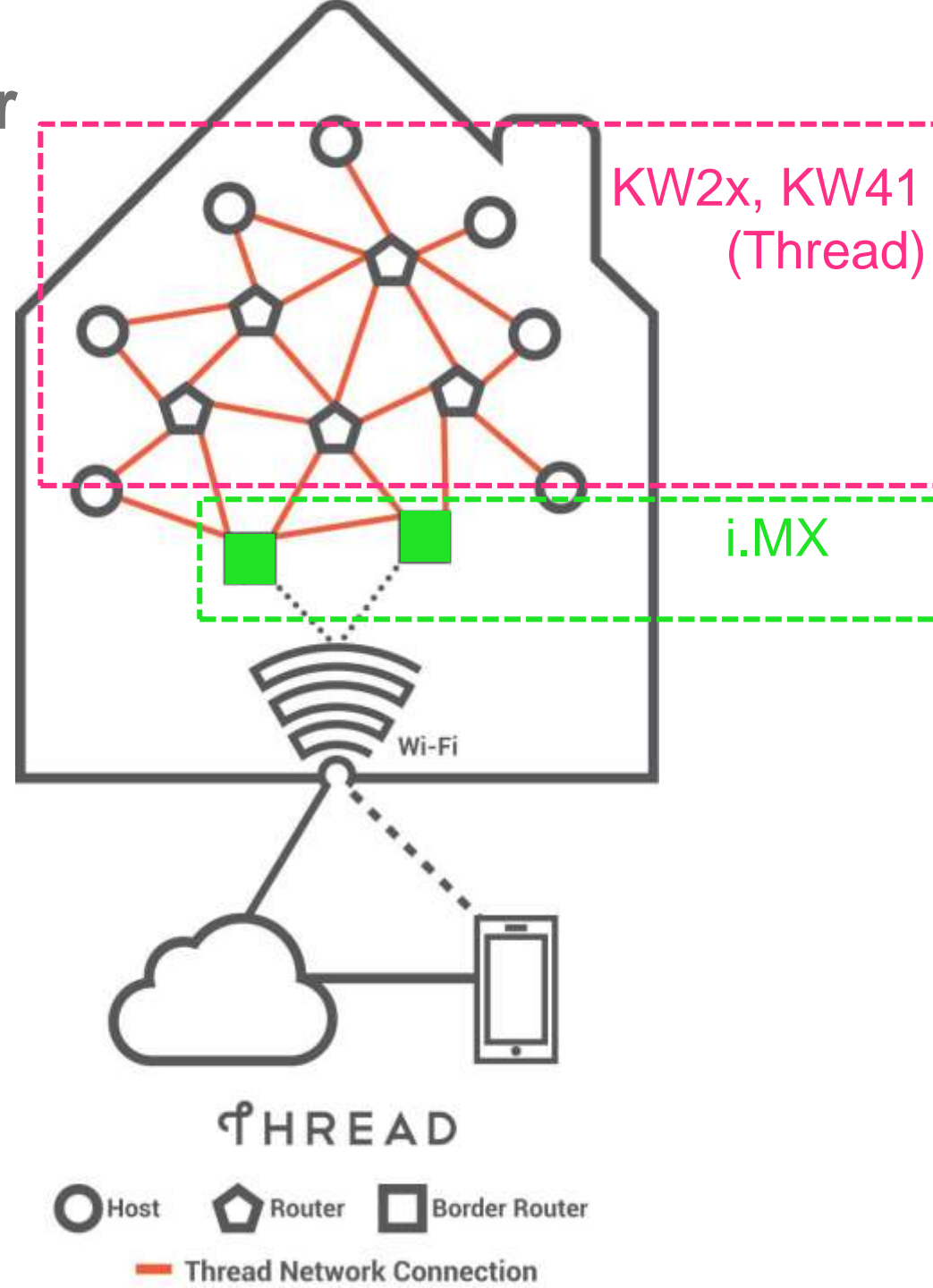


THREAD

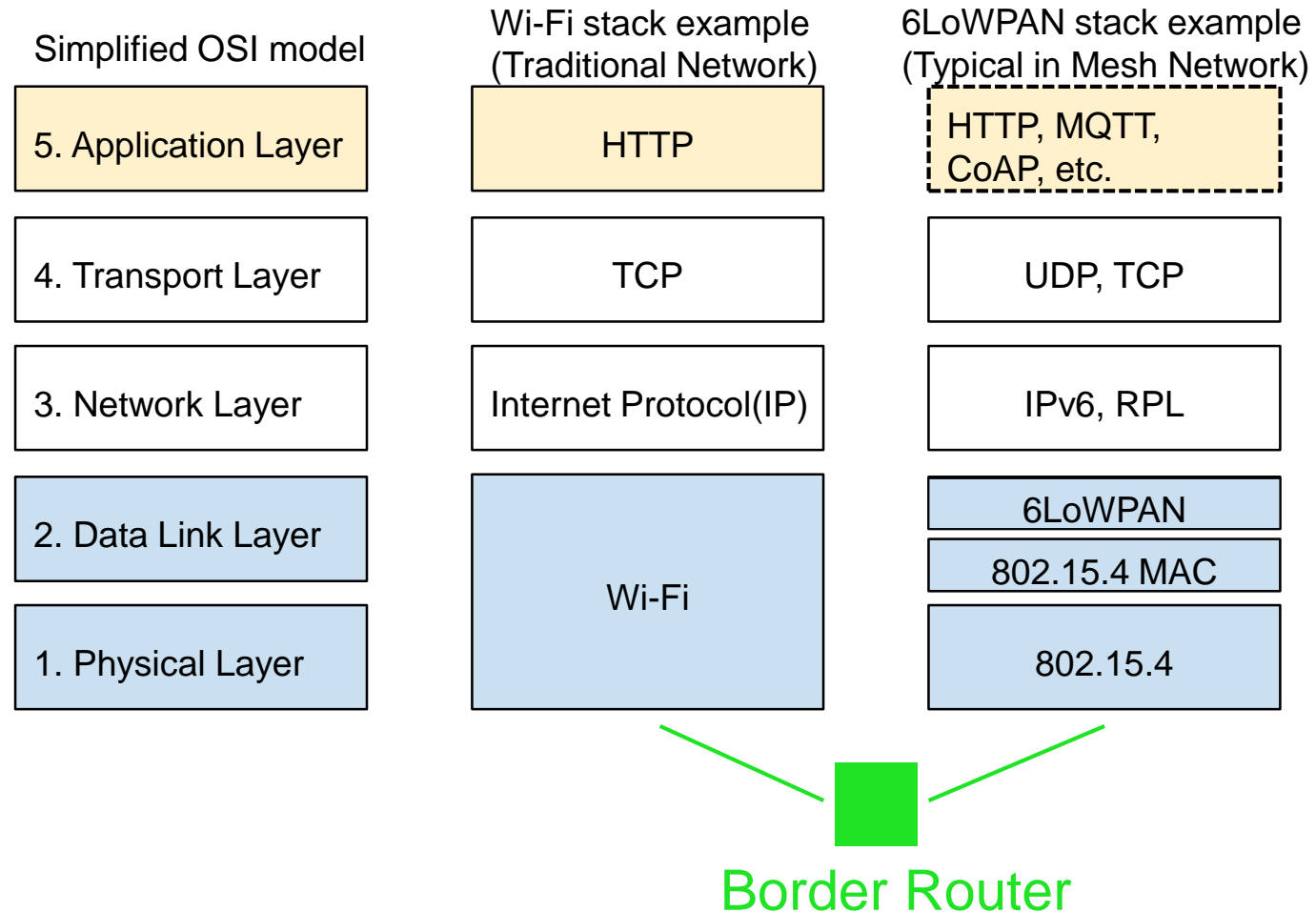
○ Host ⬠ Router □ Border Router

— Thread Network Connection

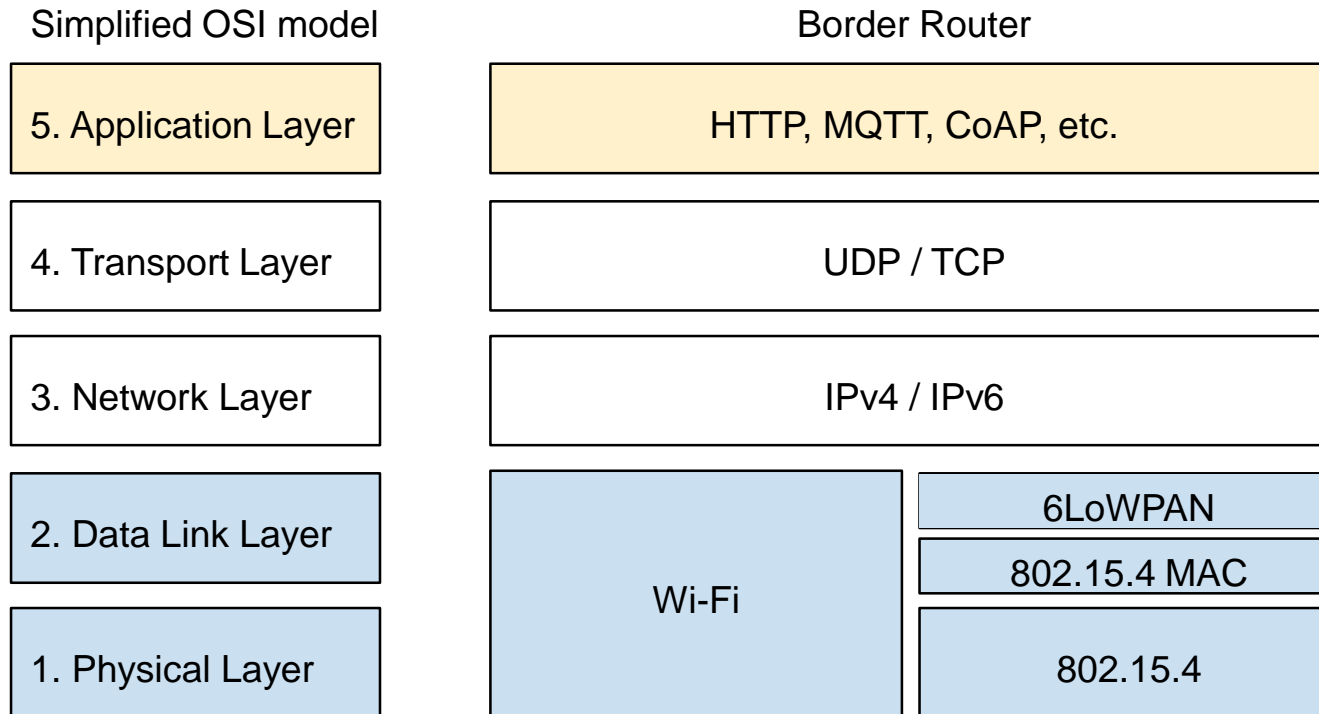
i.MX IoT Border Router



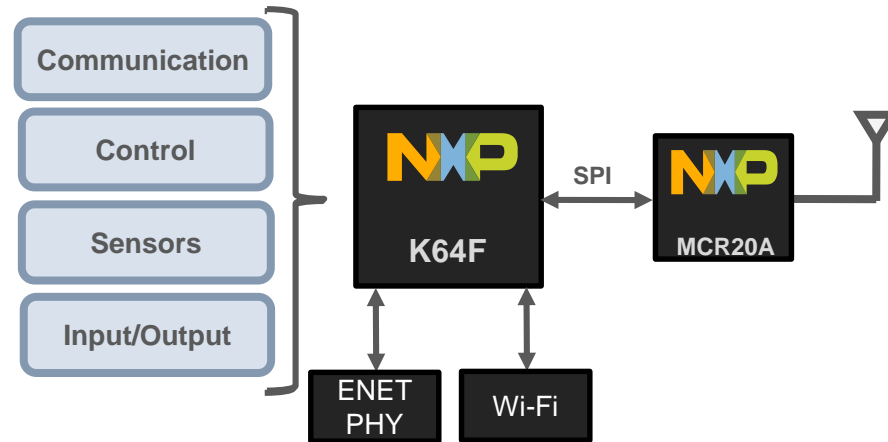
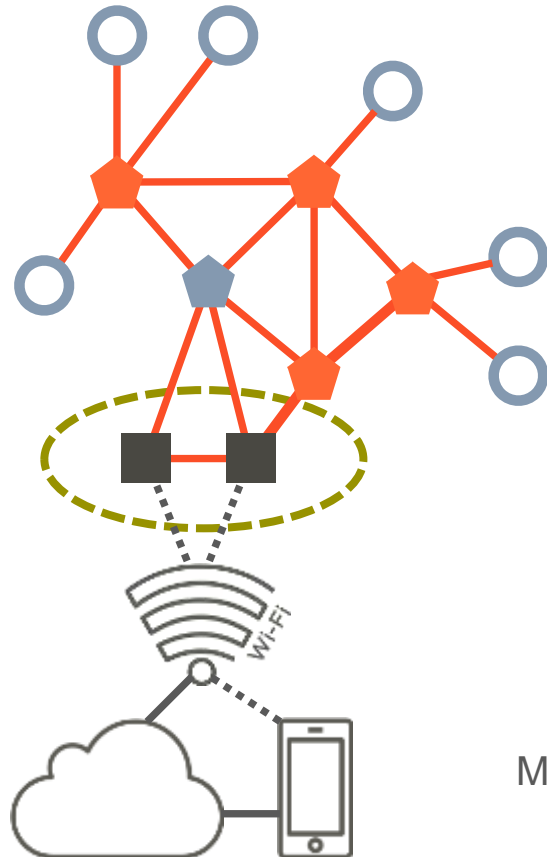
Overview of Simplified Network stacks



Network Stacks in IoT Border Router



Thread MCU (RTOS) Border Router



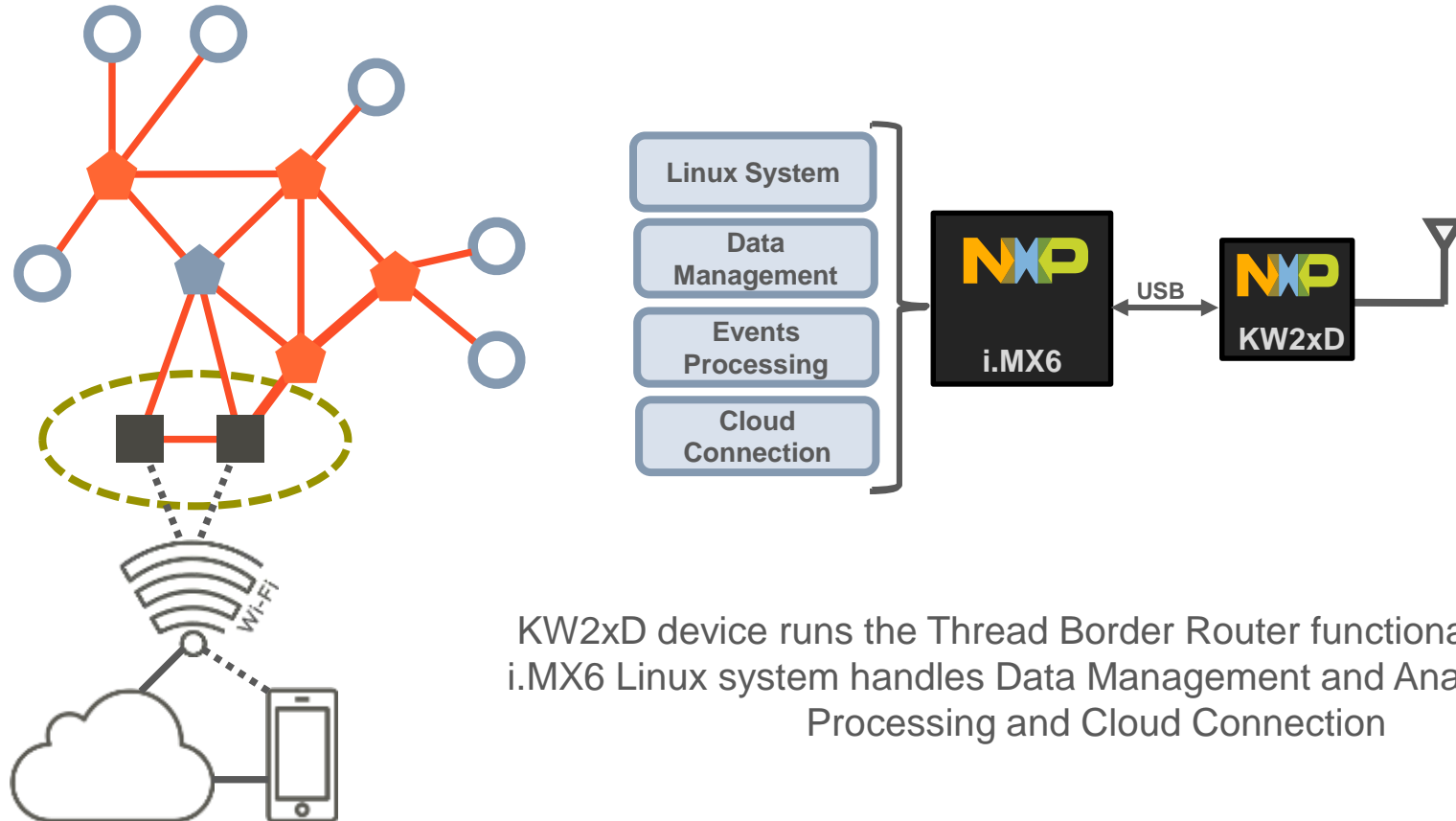
K64 is a standalone MCU with up to 1MB Flash, up to 256kB RAM and embedded Ethernet

Memory configuration can support Thread stack, Ethernet stack and Application

MCR20A is a 2.4GHz 802.15.4 transceiver

Wi-Fi (Qualcomm Atheros QCA400x) support in late Q2.

Thread MPU (OS) Border Router



i.MX6D IoT GATEWAY

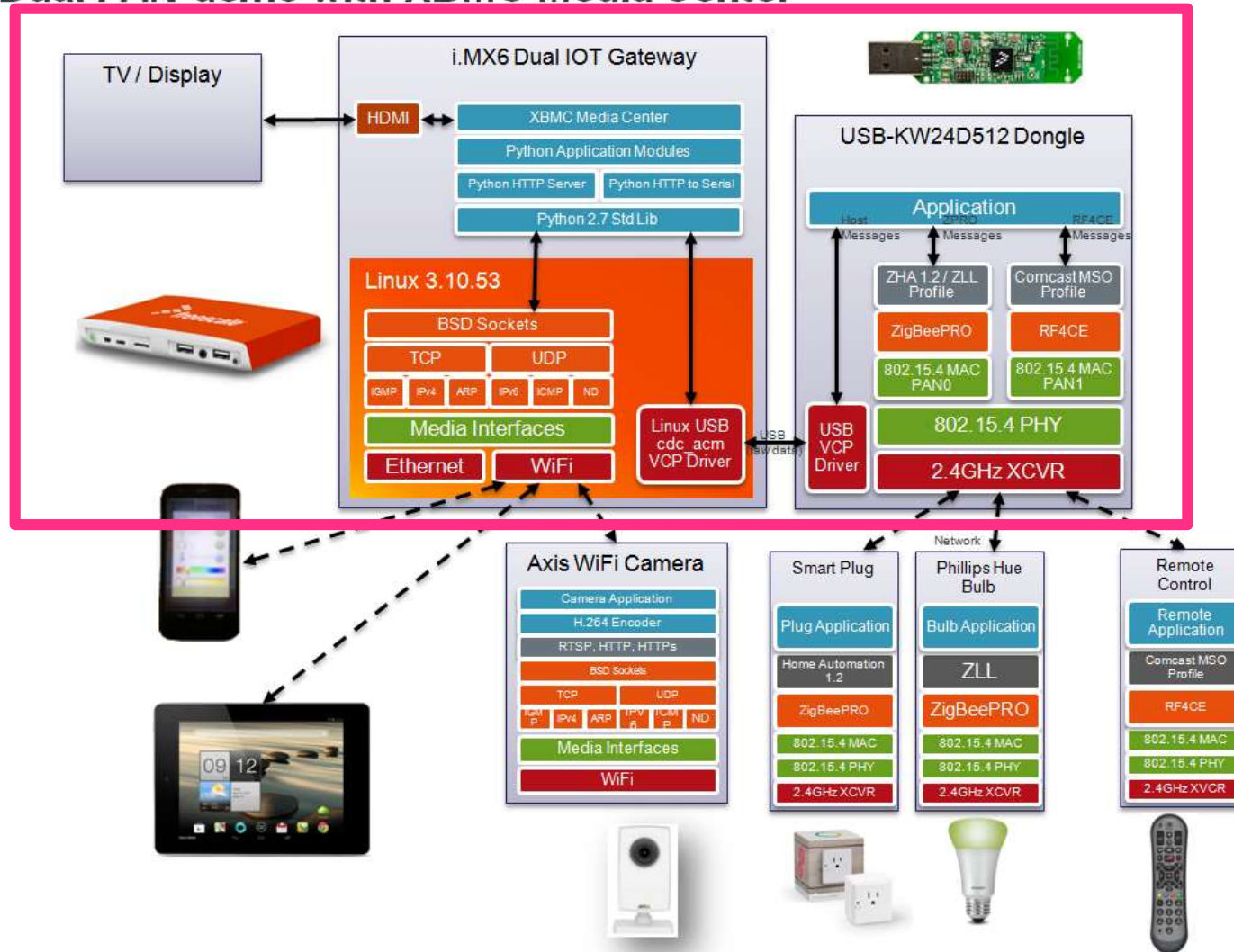


i.MX6D IoT Gateway



i.MX6D IoT Gateway(cont.)

IoT Gateway Suitcase Demo 105 Dual PAN demo with XBMC Media Center



i.MX6D IoT Gateway(cont.)

Gateways

- SOC's: **i.MX6 Dual Processor**
- Boards/Modules: Utilite Standard Box
- Software:
 - **Utilite IoT Gateway Linux BSP**
 - Kodi (XBMC) Open Source Media Player Component

Edge Devices

- End User Products: Multiple devices using WiFi, ZigBee PRO HA.12, and ZigBee RF4CE (See below for list)

Connectivity

- SOC's: KW24D512
- Modules: USB-KWD512
- Software:
 - 802.15.4 dual PAN MAC/PHY Firmware
 - ZigBee PRO with ZHA/ZLL profile Firmware
 - ZigBee RF4CE with Comcast MSO profile Firmware

i.MX6D IoT Gateway(cont.)



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About CompuLab

CompuLab is a leading manufacturer of industrial miniature computers and computer-on-modules. The company was established in 1992 and has been manufacturing computer-on-modules of its own design since 1997.

Product design, hardware design, software development, electronics manufacturing and testing – all take place under the same roof at CompuLab's facilities in Haifa, Israel.
CompuLab is an ISO9001:2008 certified company.

For CompuLab miniature PCs check [other products](#)
To learn more about CompuLab's embedded products, visit www.compulab.co.il



<http://www.compulab.co.il/utilite-computer/web/utilite-models>



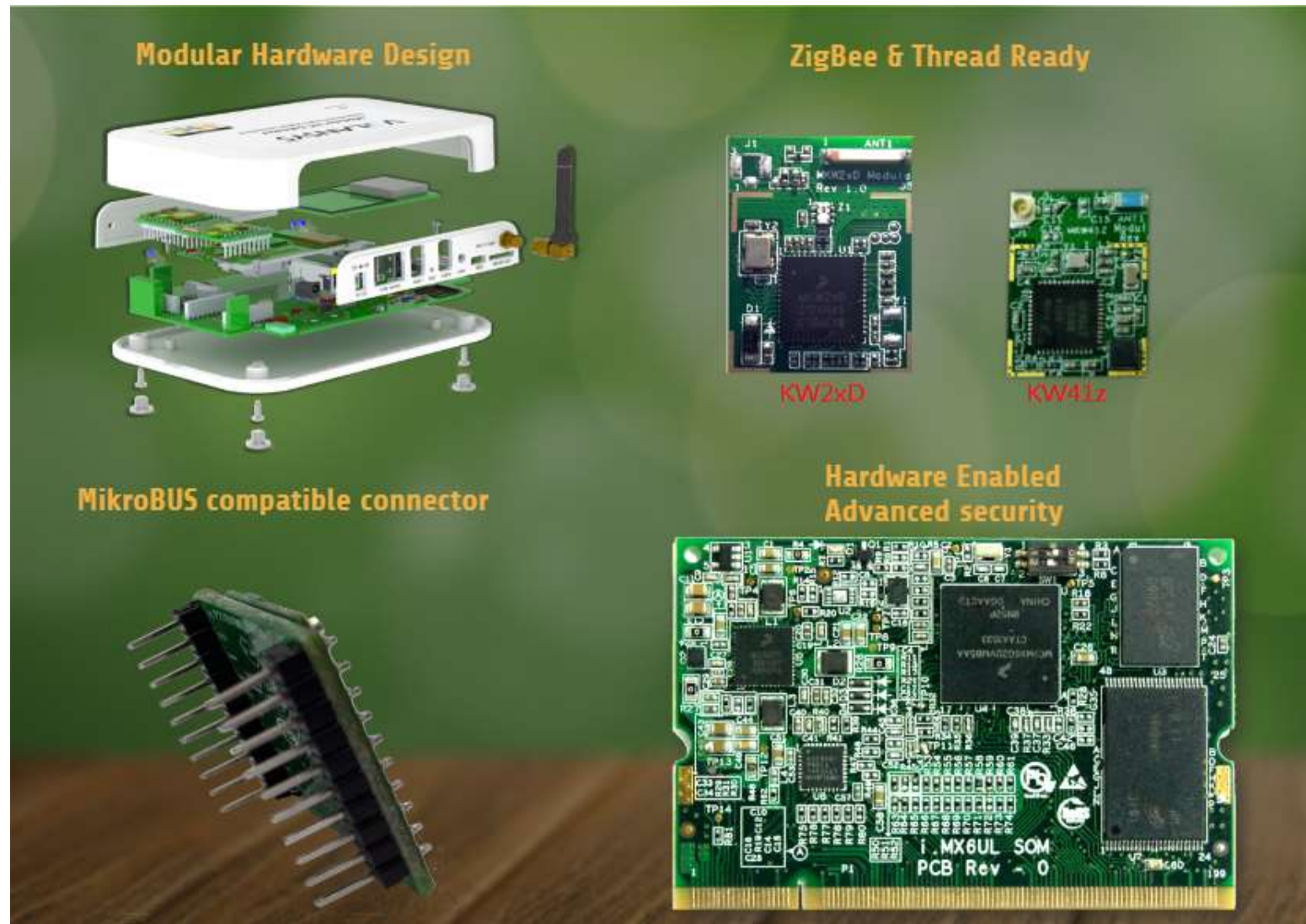
i.MX6UL IoT GATEWAY VOLANSYS



i.MX6UL IoT Gateway



i.MX6UL IoT Gateway(cont.)



i.MX6UL IoT Gateway(cont.)

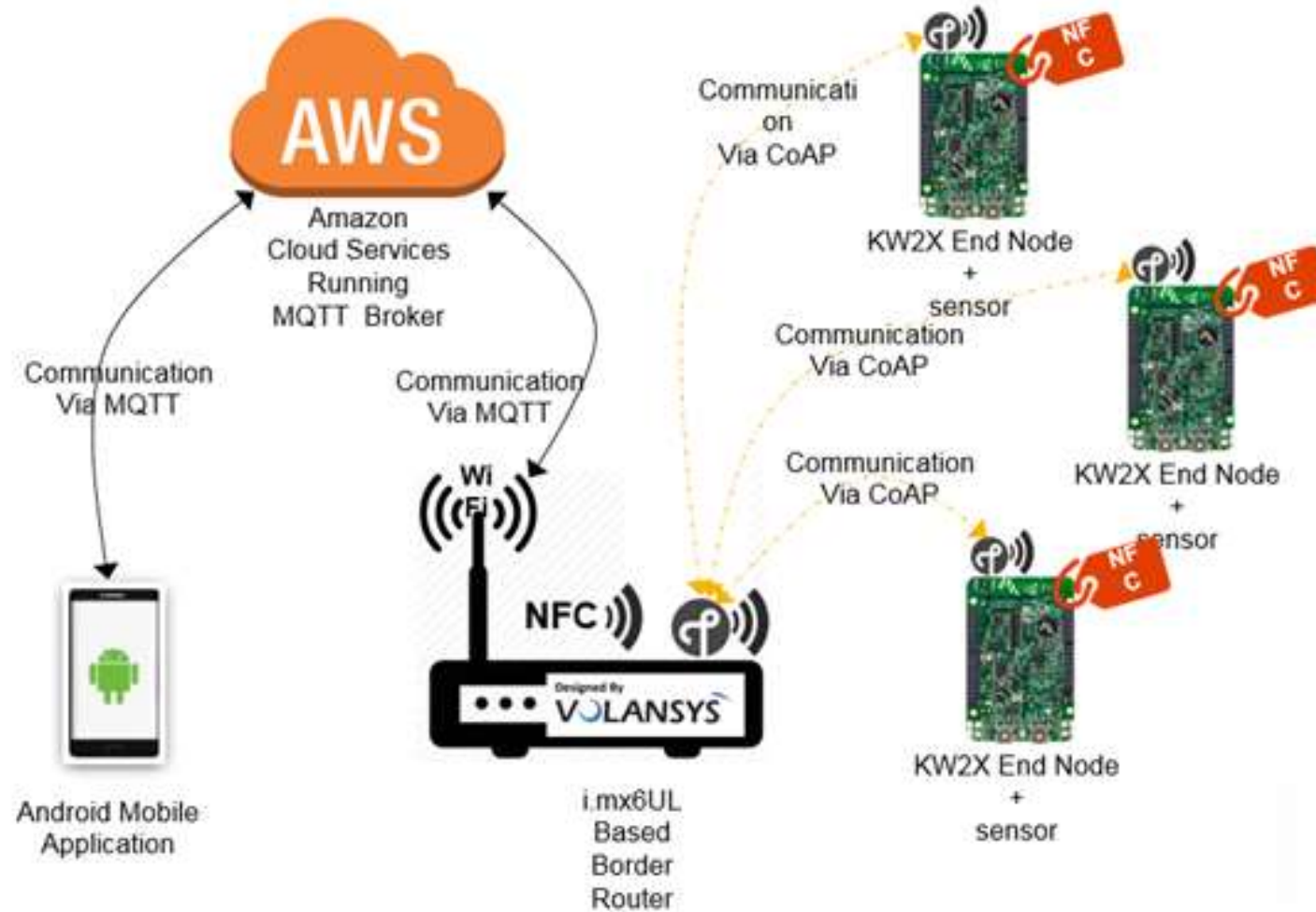
Product Features

- Thread Border Router functionality
- Ethernet or Wi-Fi support to AWS Cloud via MQTT
- Support for NFC commissioning
- Android mobile smart phone app

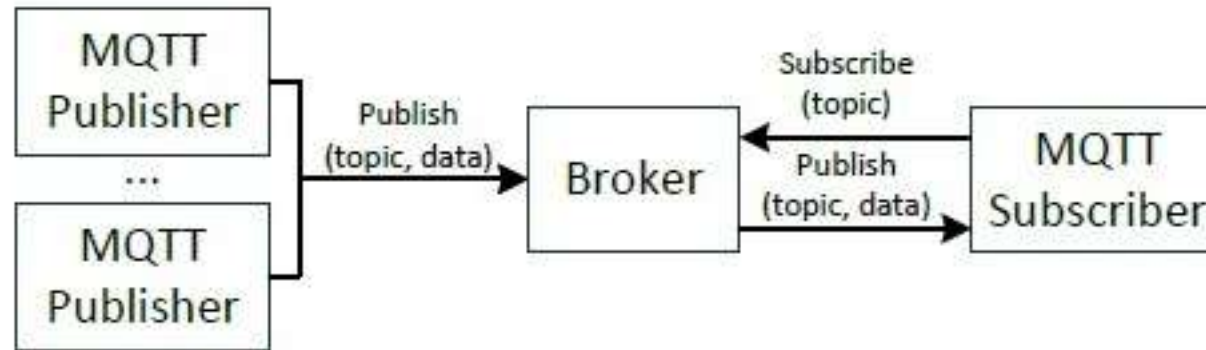
- Volansys has designed and developed the NXP **Modular Gateway/Border Router** - Running the Thread networking protocol. This product uses NXP's **i.MX6UL SOM** (ARM Cortex-A7) and NXP's **Kinetis KW2xD** Thread/802.15.4 Module. This modular gateway has capability to plug in multiple 802.15.4 modules supporting Thread and/or ZigBee.
- **JN5169-001-M00-2** ZigBee/802.15.4 Module support also available

i.MX6UL IoT Gateway(cont.)

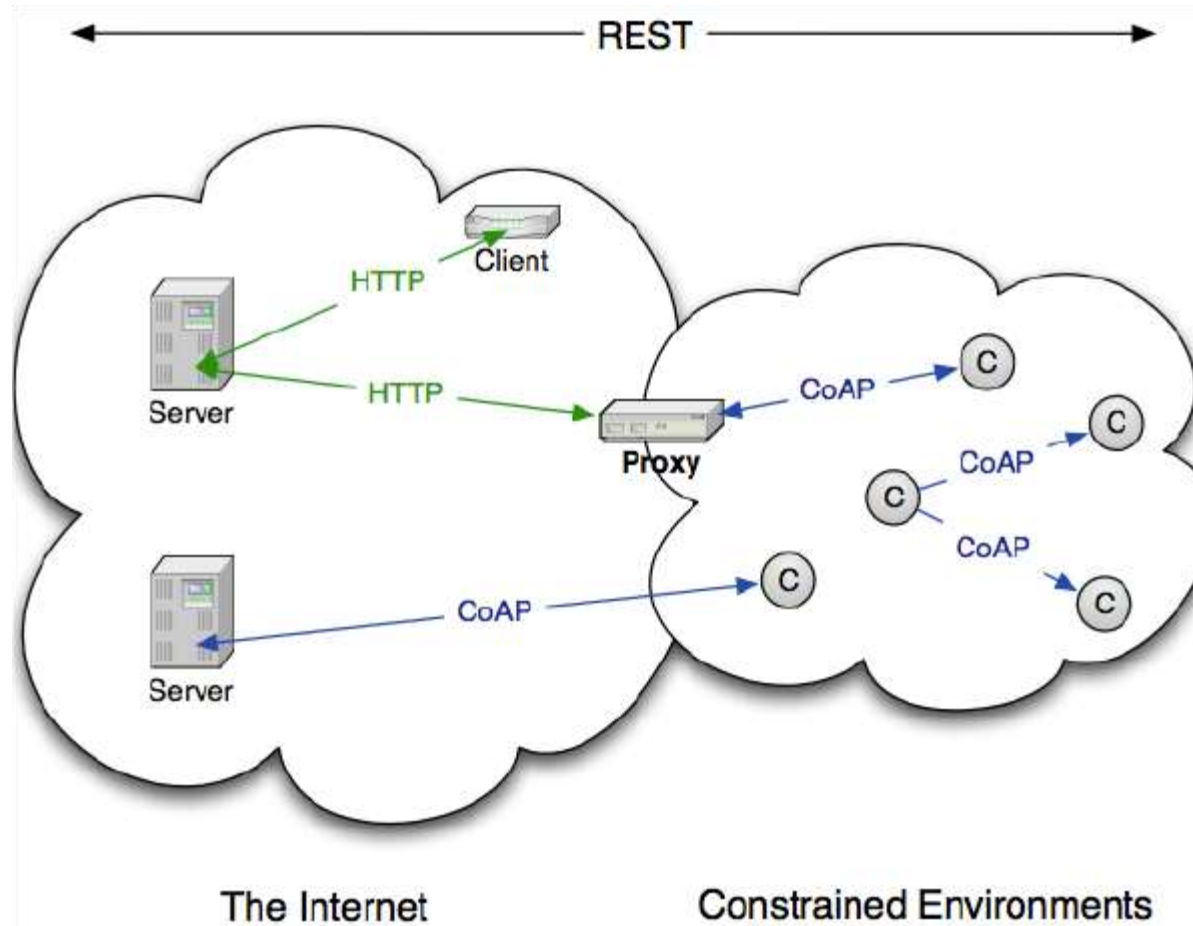
End to End Scenario For FTF Modular GTWY Demonstration



IoT Application Layer Protocols – MQTT



IoT Application Layer Protocols – CoAP



IoT Application Layer Protocols – MQTT & CoAP

	CoAP	MQTT
<i>Communications Model</i>	Request-Response, or Publish-Subscribe	Publish-Subscribe
<i>RESTful</i>	Yes	No
<i>Transport Layer Protocol</i>	UDP (TCP can be used)	TCP (UDP can be used; MQTT-SN)
<i>Header</i>	4 bytes	2 bytes
<i>Number of Message Types</i>	4	16
<i>Messaging</i>	Asynchronous & Synchronous	Asynchronous
<i>Scalability</i>	Complex	Simple
<i>Security</i>	DTLS	SSL/TLS
<i>QoS options</i>	Yes (Confirmable/Non confirmable messages)	Yes (3 levels)
<i>Encoding</i>	Binary	Binary
<i>Dynamic discovery</i>	Yes	No

i.MX6UL IoT GATEWAY OPENWRT



i.MX6UL IoT Gateway



What is OpenWrt?

- **OpenWrt** is described as **a Linux distribution for embedded devices**.
- Instead of trying to create a single, static firmware, **OpenWrt provides a fully writable filesystem with package management**. This frees you from the application selection and configuration provided by the vendor and allows you to customize the device through the use of packages to suit any application. For developer, OpenWrt is the framework to build an application without having to build a complete firmware around it; for users this means the ability for full customization, to use the device in ways never envisioned.

Part of “Table of Hardware”

148	Asus	WL-500g			10.03.1	wl500g	View/Edit data
149	Asus	RT-N10+D1	1		10.03.1	rt-n10plus.d1	View/Edit data
150	Asus	WL-320gE			10.03.1	wl320g	View/Edit data
151	Asus	RT-AC51U					View/Edit data
166	Belkin	F5D8230-4v2	v1000		-	f5d8230-4v2	View/Edit data
167	Belkin	F5D8230-4v2	v2000		-	f5d8230-4v2	View/Edit data
168	Belkin	F7C027			DD trunk	f7c027	View/Edit data
169	Belkin	F9K1115 v2 (AC 1750 DB)	v2		15.05	f9k1115v2	View/Edit data
170	Belkin	Play (F7D4302)	1				View/Edit data
171	Belkin	Play Max (F7D4301)	1			f7d4301	View/Edit data
172	Belkin	Share (F7D3302)	1		¿	f7d3302	View/Edit data
173	Belkin	Surf N300 (F7D6301)	1				View/Edit data
174	Belkin	F5D8235-4	v2		12.09	f5d8235-4	View/Edit data
175	Belkin	F7C030			¿	f7c030	View/Edit data
176	Belkin	N600DB (F9J1102)	v1		¿		View/Edit data
177	Belkin	Share Max (F7D3301)	1				View/Edit data
178	Belkin	Play (F7D4401)	1			f7d4401	View/Edit data
179	Belkin	F5L049	1				View/Edit data
180	Belkin	F5D8235-4	v1		15.05	f5d8235-4	View/Edit data
181	Belkin	F7C027			DD trunk	f7c027	toh:hwdata:belkin:belkin_f7c027, View/Edit data
182	Blueendless	U25AWF	HSEN-KI-300M-HDD-V3.0				View/Edit data
189	Buffalo	WHR-G300N	v1			whr-g300n	View/Edit data
190	Buffalo	WHR-G300N	v2		12.09	whr-g300nv2	View/Edit data
191	Buffalo	WHR-HP-GN	v1		15.05	whr-hp-g300n	View/Edit data
192	Buffalo	WLAE-AG300N	v1		15.05		View/Edit data
193	Buffalo	WLI-H4-D1300				wzr-d1800h	View/Edit data
194	Buffalo	WLI-TX4-AG300N	v1		15.05	wli-tx4-ag300n	View/Edit data
195	Buffalo	WZR-HP-AG300H	v1		15.05	wzr-hp-ag300h	View/Edit data
196	Buffalo	WZR-HP-G300NH	v1		15.05	wzr-hp-g300h	View/Edit data
197	Buffalo	WZR-RS-G54					View/Edit data
198	Buffalo	WZR-450HP2			¿	wzr-450hp2	View/Edit data
203	Buffalo	WSR-1166DHP			¿	wsr-1166dhp	View/Edit data
204	Buffalo	WZR-600DHP2			15.05.1	wzr-600dhp2	View/Edit data
205	Buffalo	WZR-600DHP			15.05	wzr-600dhp	View/Edit data
206	Buffalo	WHR-G301N	v1		15.05		View/Edit data
207	Buffalo	WBMR-G54			12.09	wbmr-g54	View/Edit data



Part of “Table of Hardware” – i.MX6 SBC by Gateworks

448	Gateworks	Ventana GW5100		external image		View/Edit data
449	Gateworks	Ventana GW5200		external image		View/Edit data
450	Gateworks	Ventana GW5220		external image		View/Edit data
451	Gateworks	Ventana GW5300		external image		View/Edit data
452	Gateworks	Ventana GW5310		external image		View/Edit data
453	Gateworks	Ventana GW5400		external image		View/Edit data
454	Gateworks	Ventana GW5410		external image		View/Edit data
455	Gateworks	Ventana GW5510		external image		View/Edit data
456	Gateworks	Ventana GW5520		external image		View/Edit data



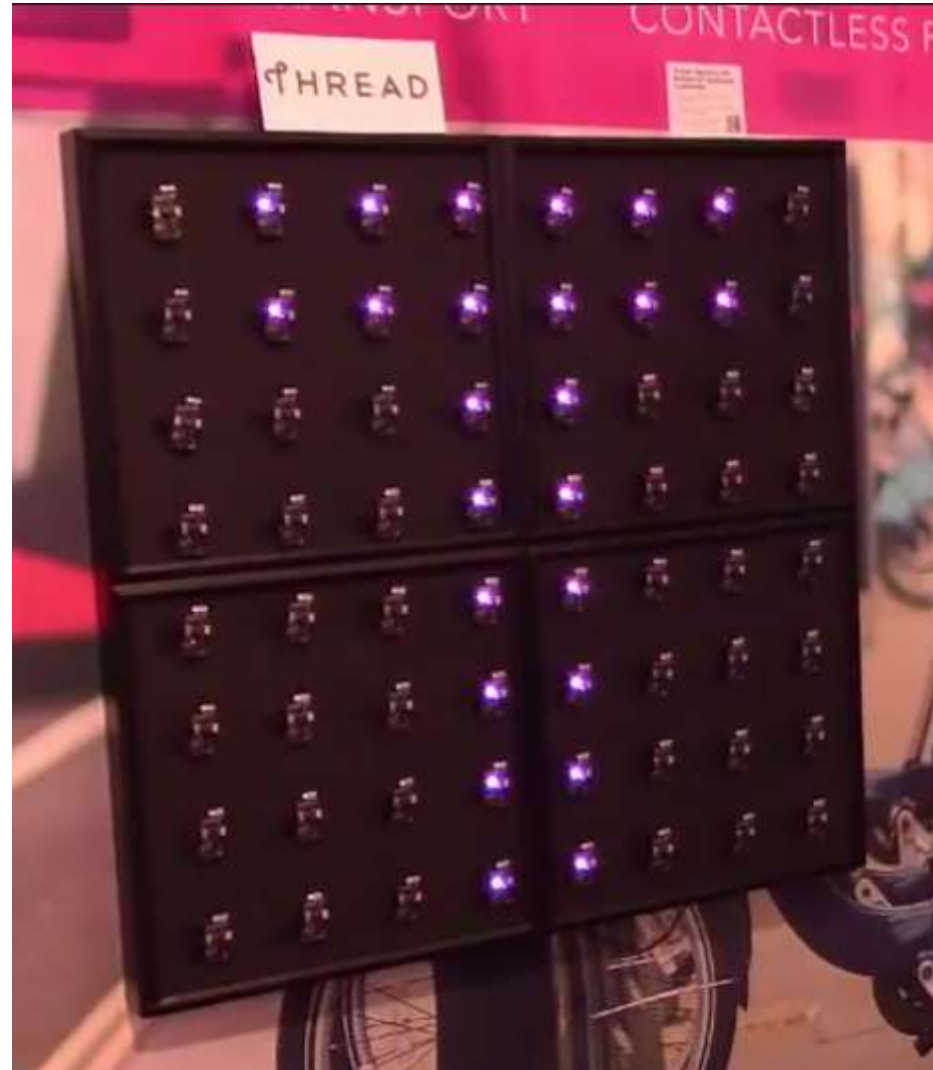
i.MX6UL IoT Gateway(cont.)

Features

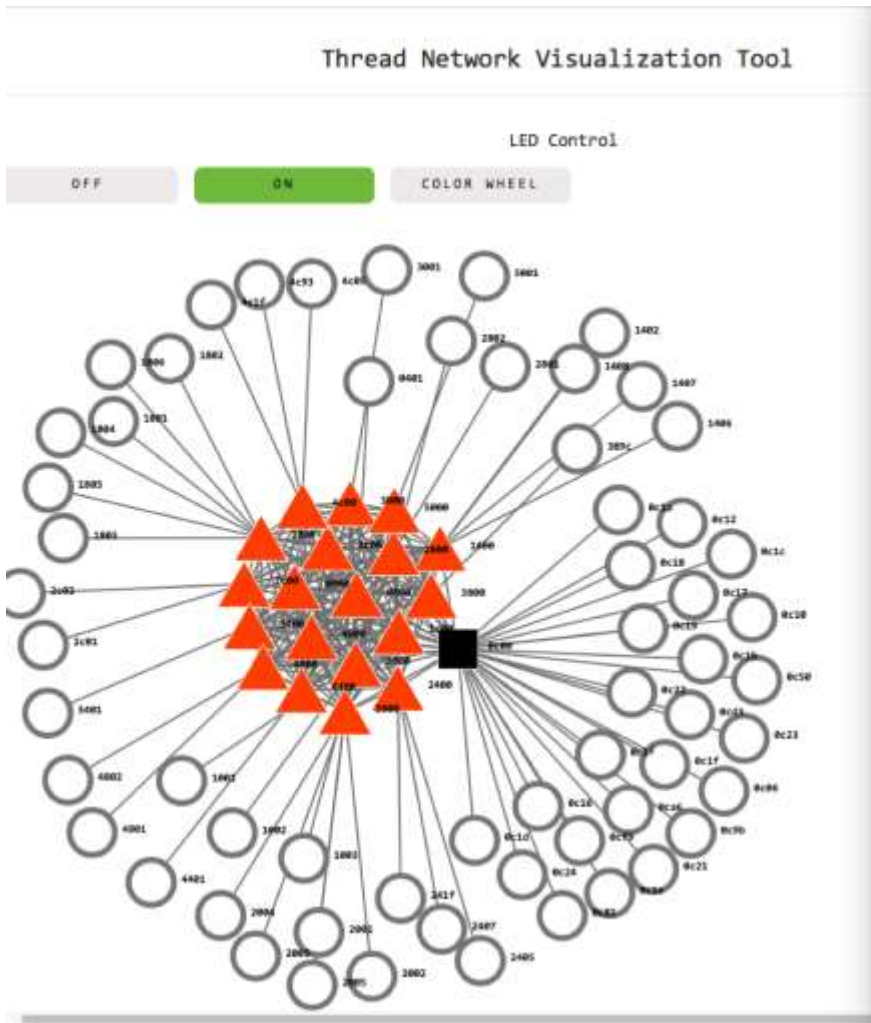
- Application layer communication based on **generic CoAP framework**
- CoAP messaging aligned with current ZigBee or OIC frameworks
- **Kinetis KW2xD and Kinetis KW41** ARM Cortex-M4/M0+ MCUs with large on-board memory (up to 512KB flash/128 KB RAM) enable multiple applications to run on a common Thread IP network fabric.
- One **i.MX6UL** ARM Cortex-A7 with **Kinetis KW2xD** Linux Border Router used for interfacing with network management GUI
- Network management and interoperable Thread diagnostics framework used to monitor node state
- Nodes are enabled for OTA Updates

- For details and OpenWrt source:
<https://community.nxp.com/docs/DOC-331175>

i.MX6UL IoT Gateway(cont.)



i.MX6UL IoT Gateway(cont.)



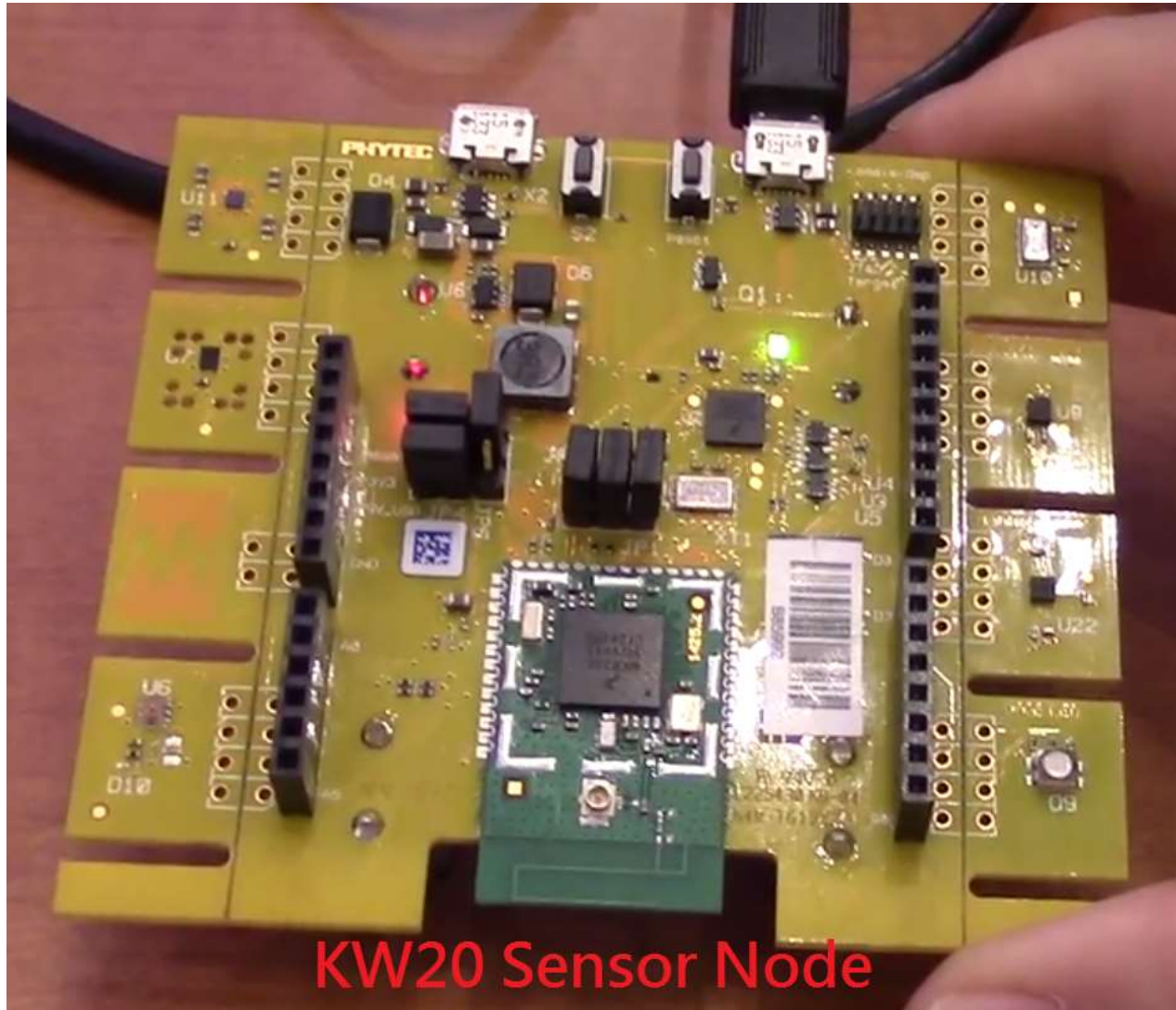
i.MX 7 IoT GATEWAY



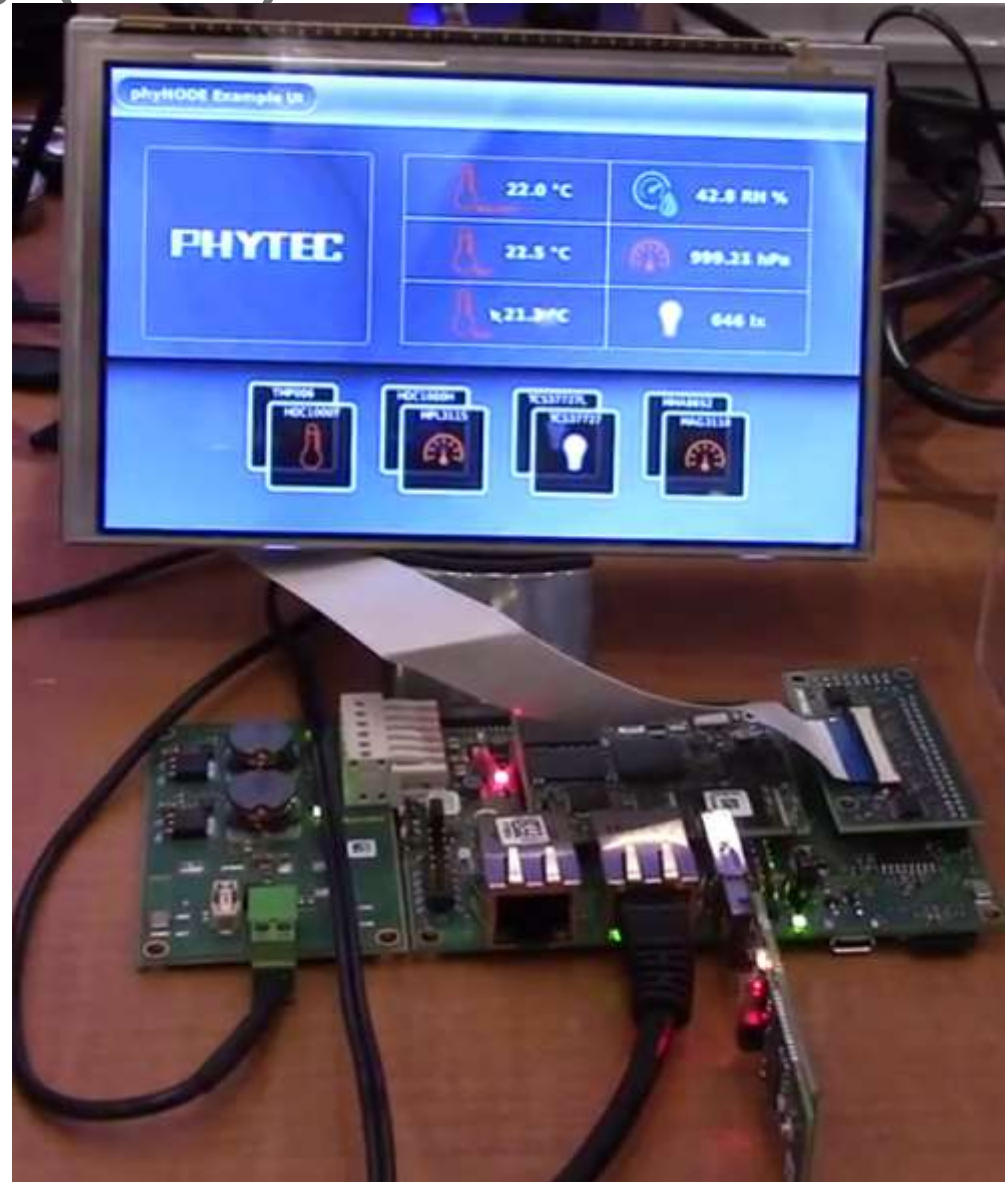
i.MX 7 IoT Gateway -- PHYTEC



i.MX 7 IoT Gateway (cont.)



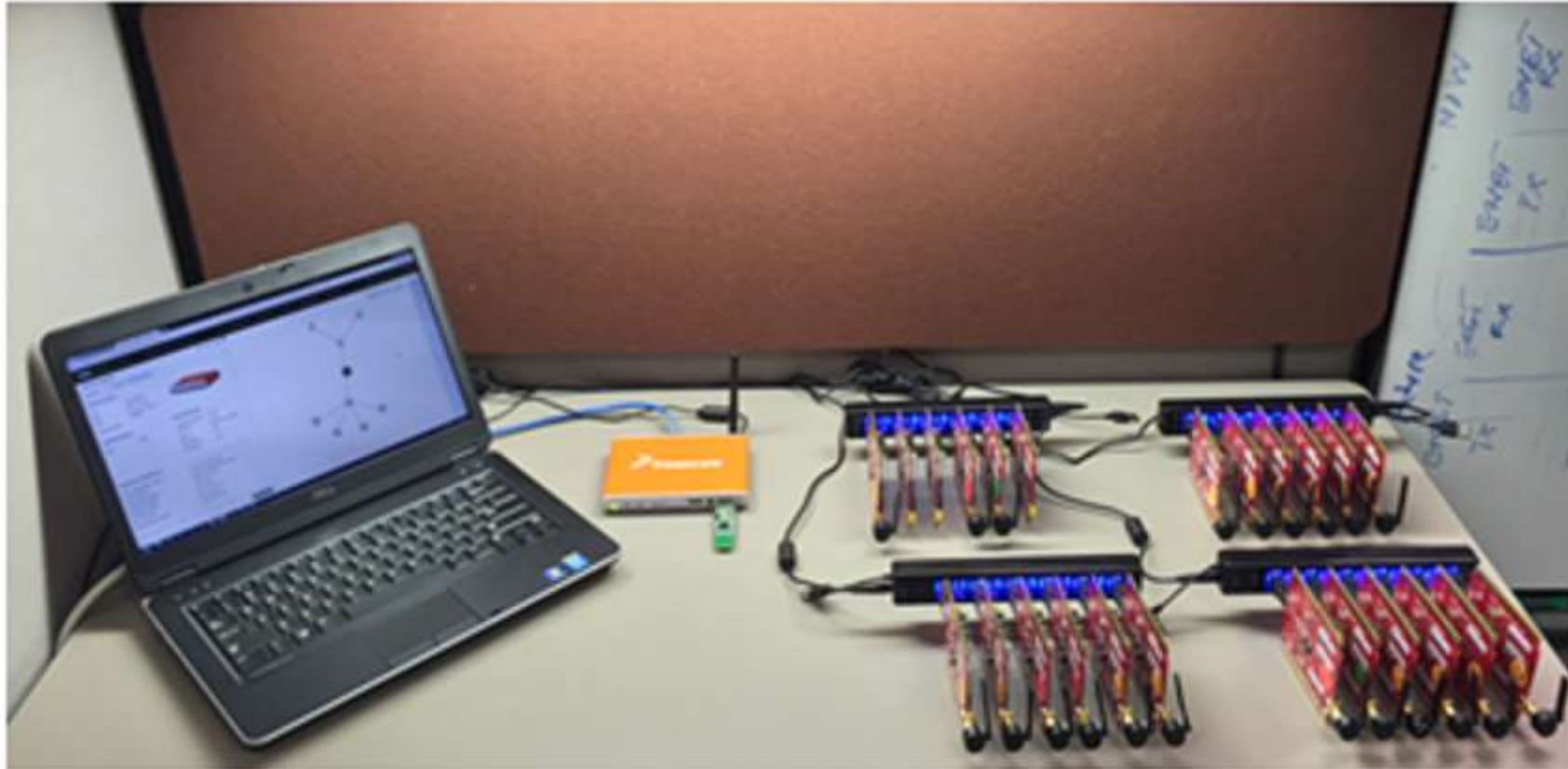
i.MX 7 IoT Gateway (cont.)



CLOUD -- PROXIMETRY

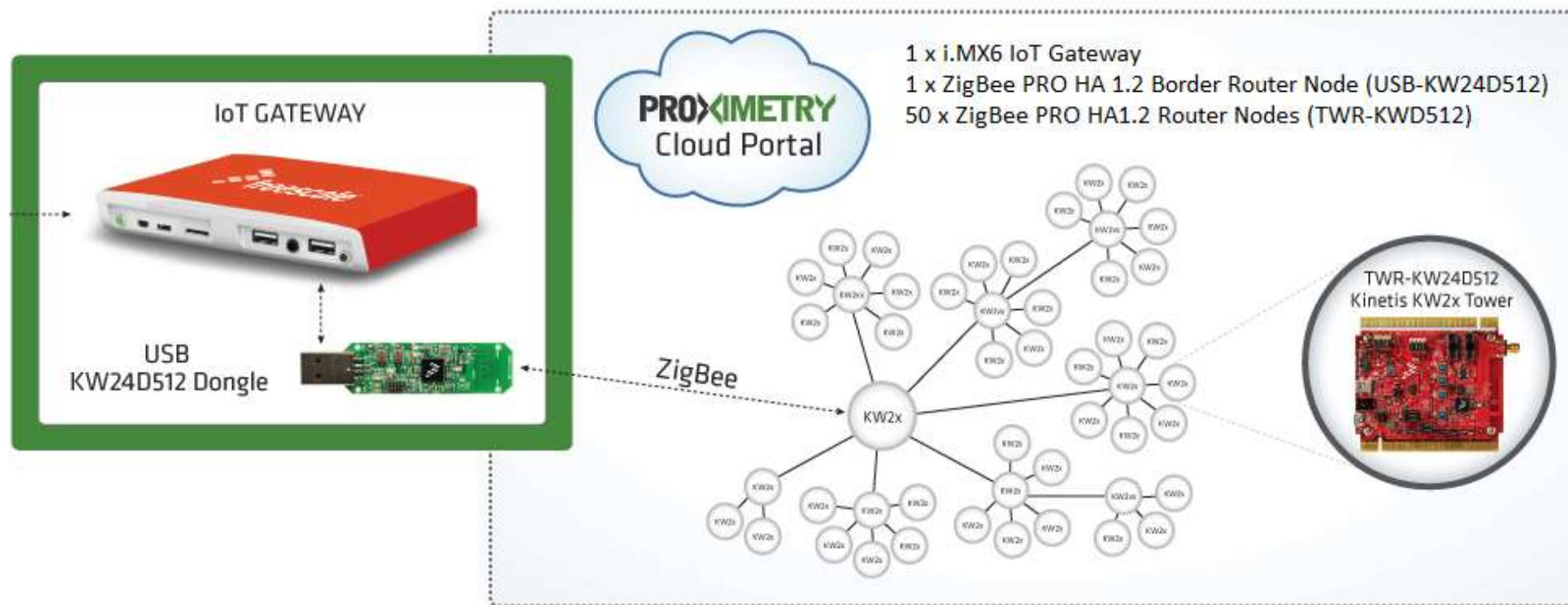


i.MX 6 IoT Gateway & Proximity Cloud

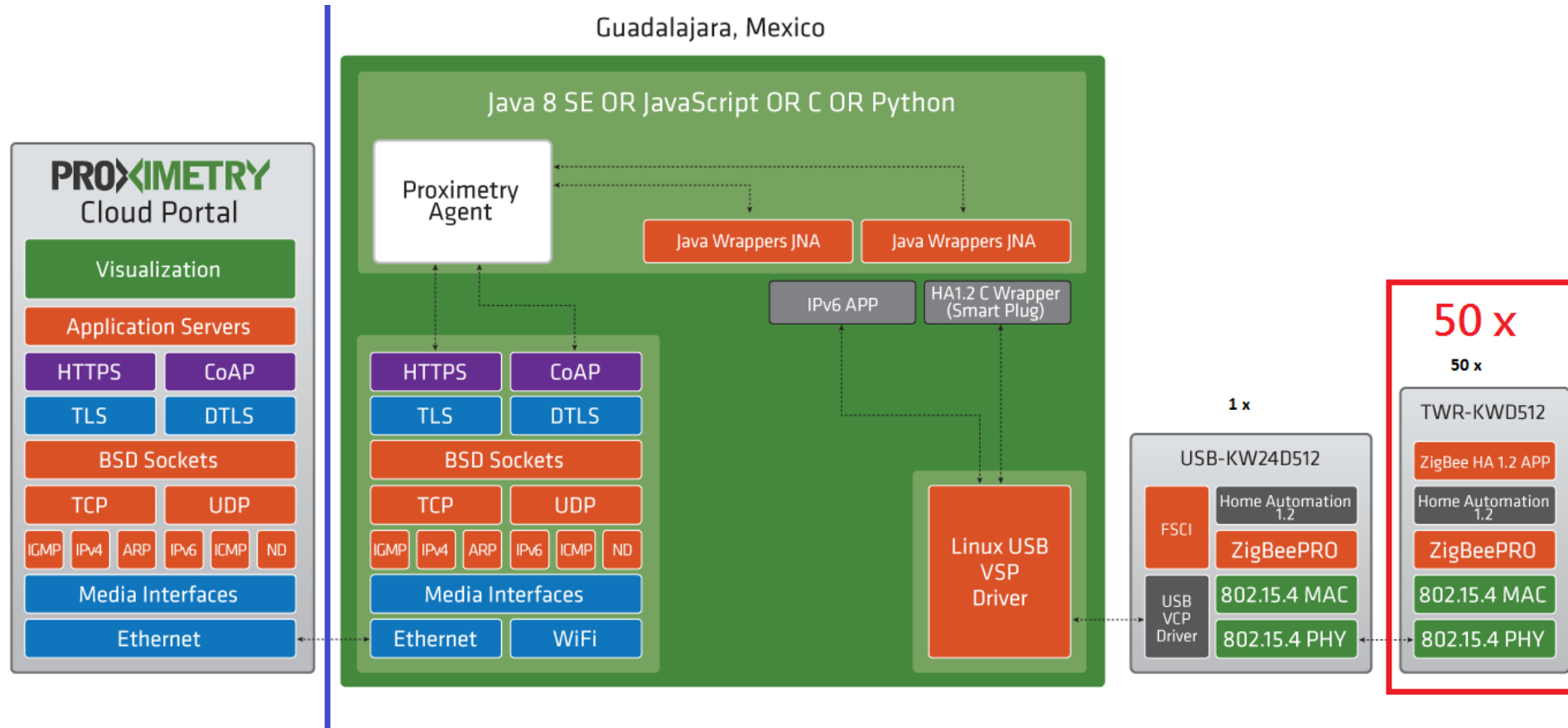


i.MX 6 IoT Gateway & Proximity Cloud (cont.)

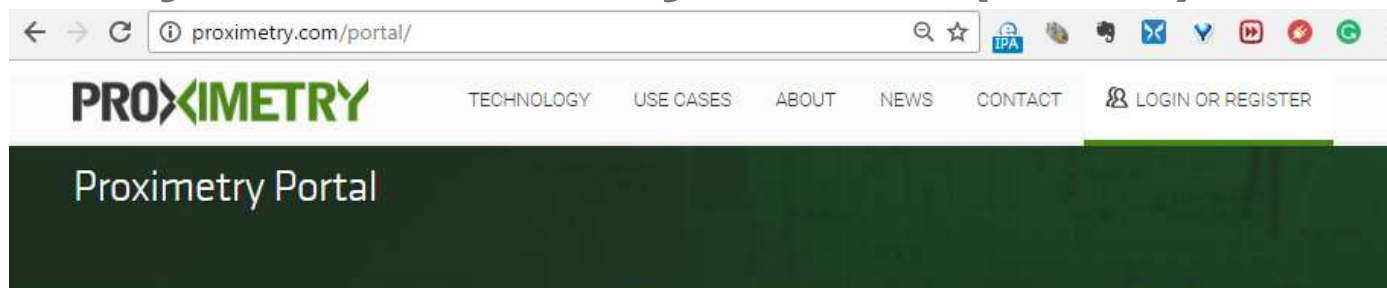
Guadalajara, Mexico



i.MX 6 IoT Gateway & Proximity Cloud (cont.)



i.MX 6 IoT Gateway & Proximity Cloud (cont.)



Proximity Portal fast tracks time to market for IoT developers.

Proximity Portal is a powerful resource available to IoT solution vendors for initial deployment and testing of their applications and devices. Proximity Portal provides developers with a comprehensive suite of device, network and data management services tailored for a wider variety of embedded device configurations. IoT solution developers can access Proximity Portal via the cloud in order to quickly deploy these powerful device, network and data management services.



3 Simple Steps to Manage All Your Devices

1 START

Create your account here:
<https://iot.proximity.com/>

2 DISCOVER

Discover and register your devices in any of the 3 ways:

- Configure devices to use your unique device activation code
- Import devices from an XLS file

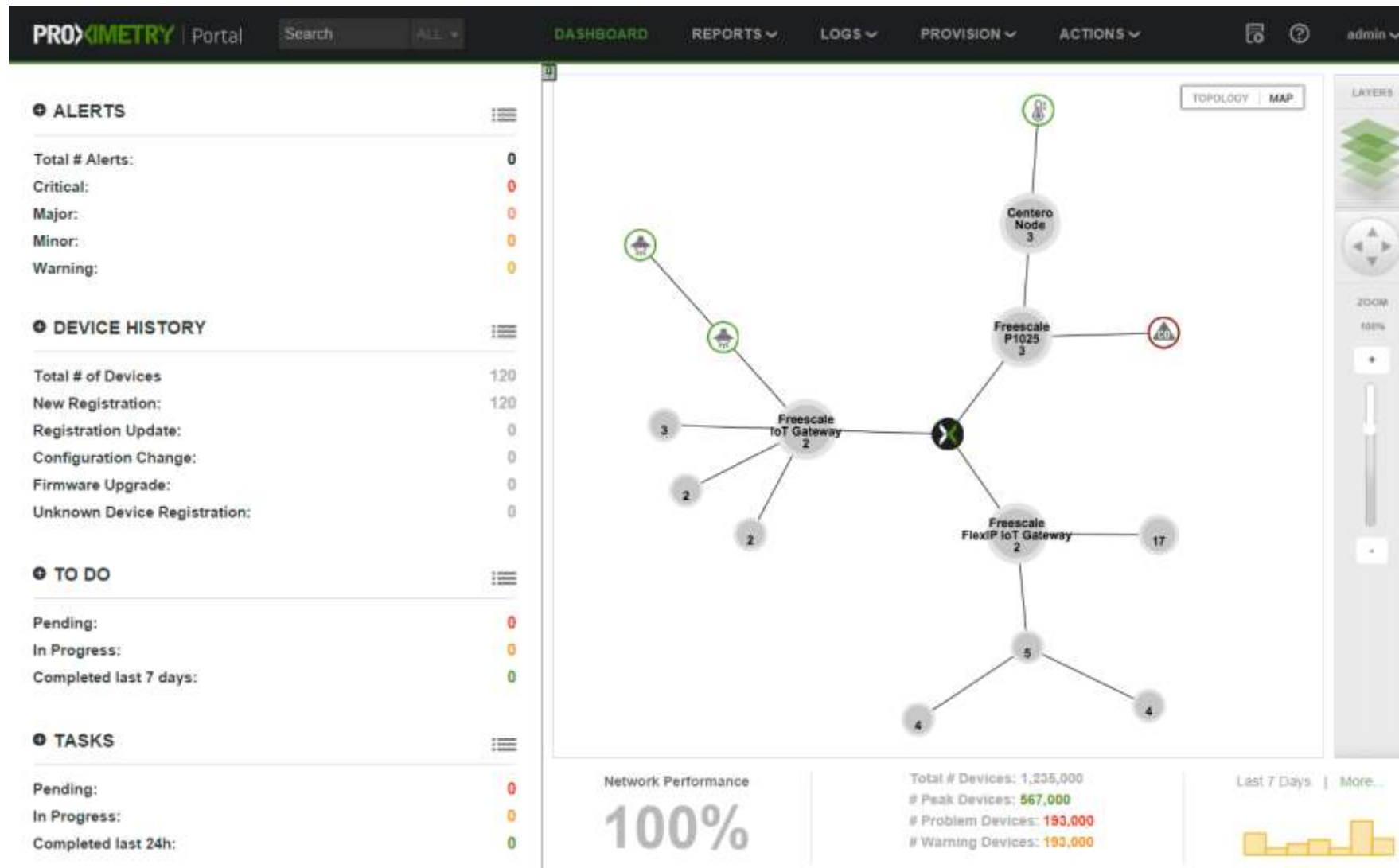
3 MANAGE

Once your devices are up and running Proximity provides comprehensive, real-time information about the devices.

You will be able to configure



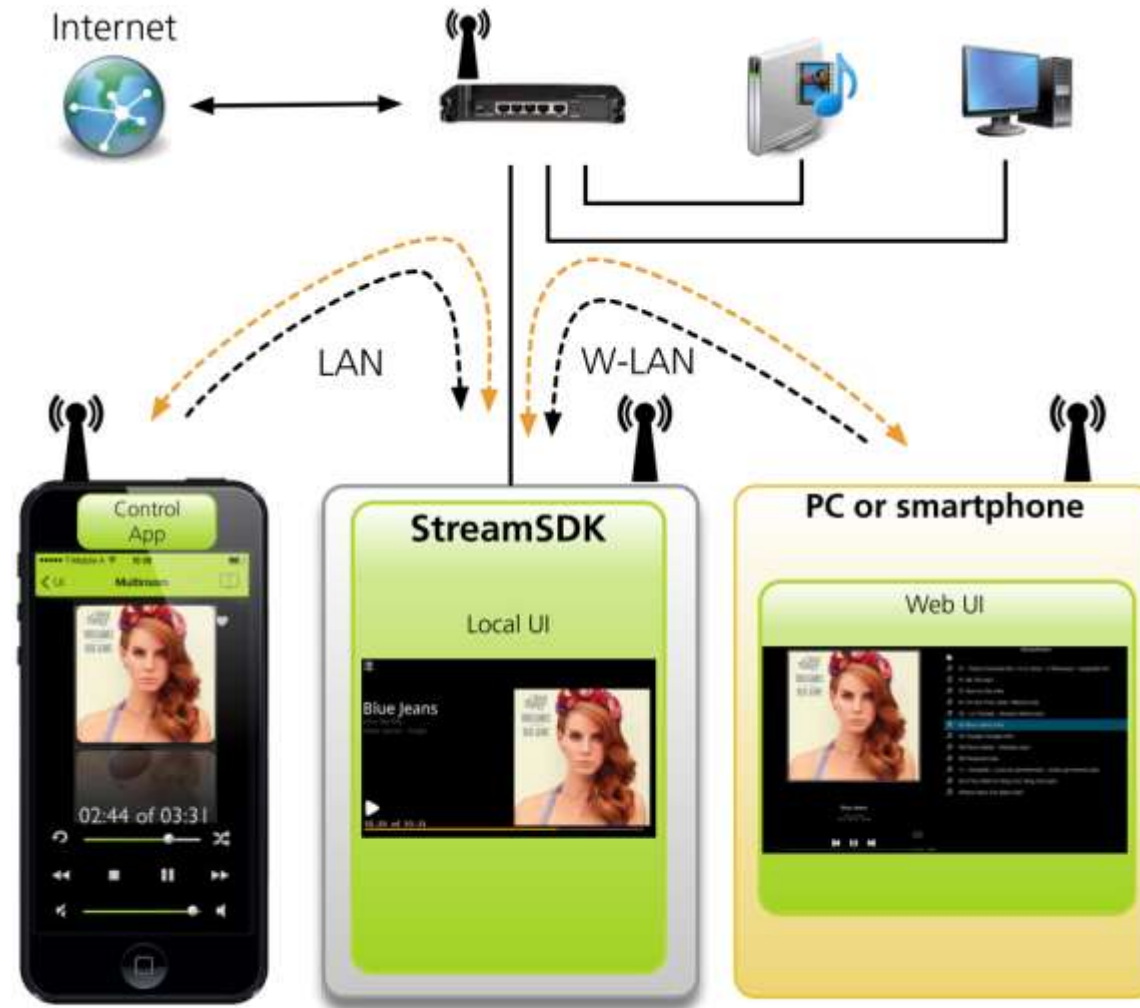
i.MX 6 IoT Gateway & Proximetry Cloud (cont.)



i.MX 7 AUDIO STREAMING



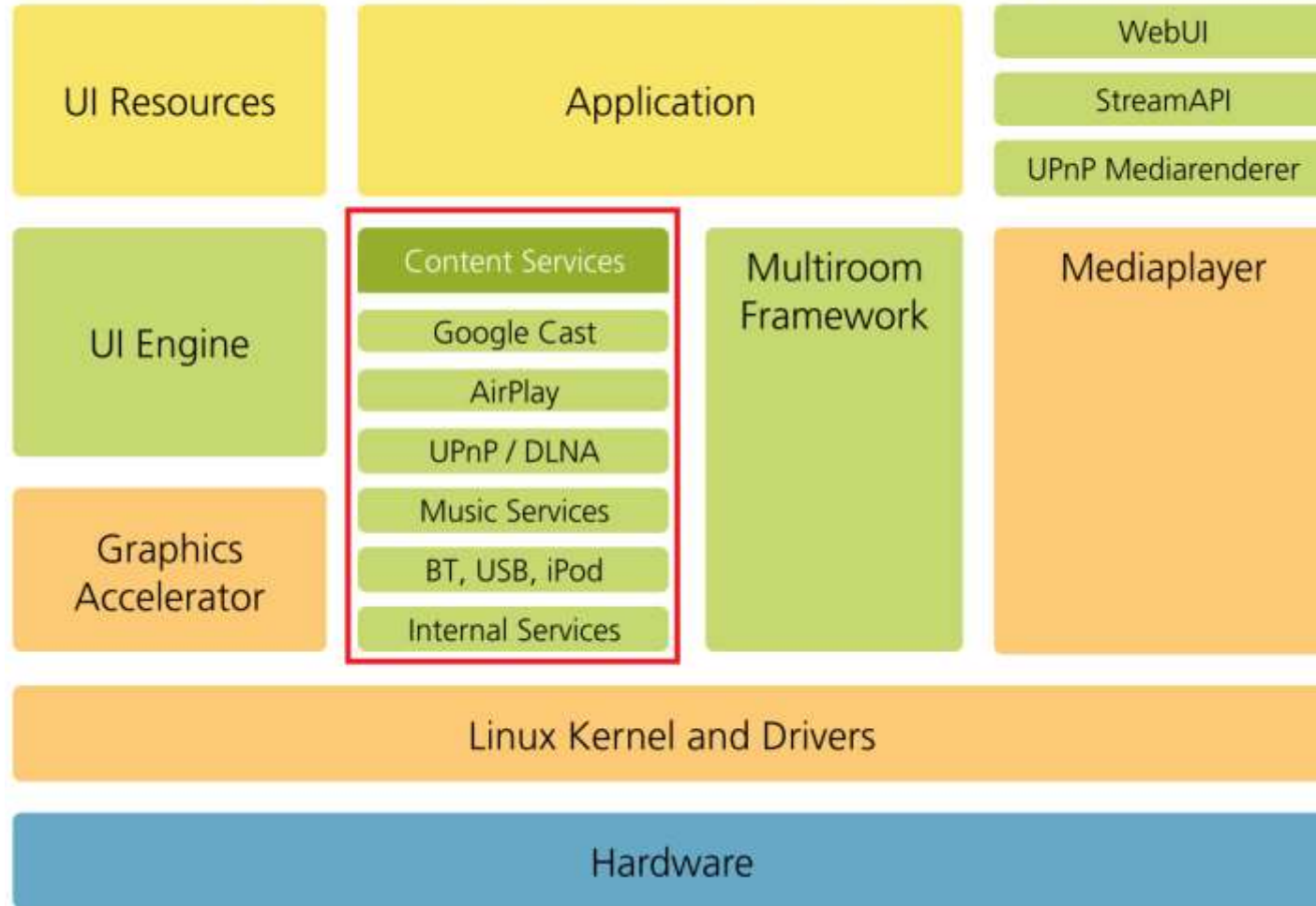
i.MX 7 Audio Streaming -- StreamUnlimited



- - - Playback control, meta data display (received from StreamSDK)
- Control of customer specific electronics (volume, source selection)

i.MX 7 Audio Streaming -- StreamUnlimited

StreamSDK from StreamUnlimited



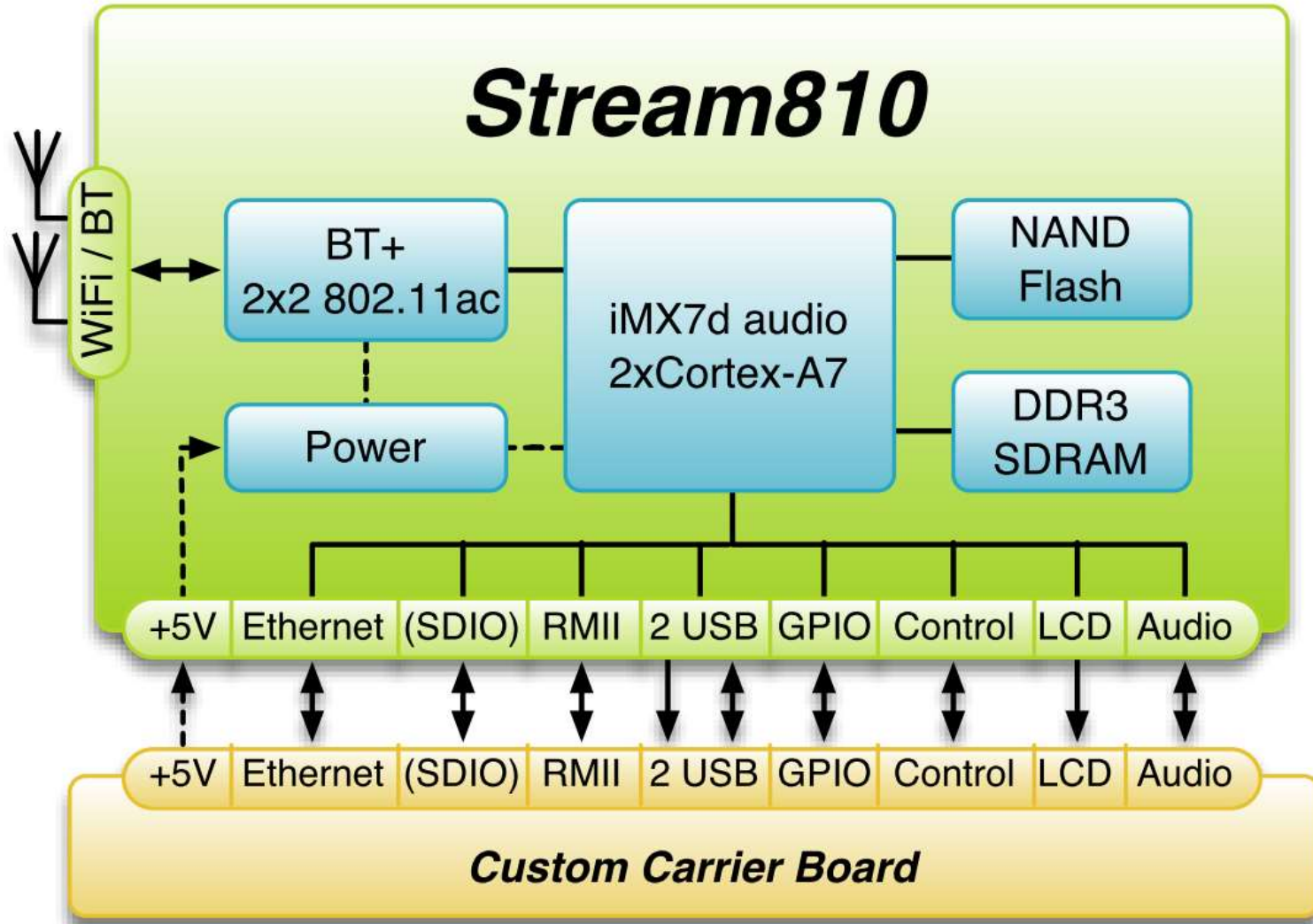
i.MX 7 Audio Streaming -- StreamUnlimited

- **About StreamSDK;**

StreamSDK from **StreamUnlimited** is a software solution that transports any streaming audio functionality to multiple various consumer electronics devices including Internet radio and music services, **UPnP/DLNA**, **Google Cast**, USB, high resolution audio, BT, **AirPlay**, wireless and Ethernet, graphical user interface, Android and Apple iOS.

- <http://www.streamunlimited.com/about/news/streamunlimited-launches.html>

i.MX 7 Audio Streaming -- StreamUnlimited



THANK YOU



References:

1. Resource constrained protocols for IoT: 6LoWPAN, MQTT & CoAP

- <https://www.linkedin.com/pulse/resource-constrained-protocols-iot-6lowpan-mqtt-coap-kontopoulos>

2. Thread Group

- <http://threadgroup.org/ourresources#Presentations>

3. OpenWRT Group

- <https://openwrt.org/>



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