Tech Talks LIVE Schedule – Presentation will begin shortly

tech talks

Wireless Connectivity Tech Talks

Thursday, July 15th	**Get to Know OpenThread Resources and Examples**
Thursday, August 26th	**Understand the Benefits of Wi-SUN for Long Range Industrial Applications**
Wednesday, September 29th	**Learn to use Machine Learning for Predicative Maintenance**

Recording and slides will be posted to:
www.silabs.com/training

We will begin in 3:00

Speaker

高山　毅 (Takeshi Takayama)

Staff FAE, Japan

SILICON LABS

tech talks

WELCOME

Understand the Benefits of Wi-SUN for Long Range Industrial Applications

Takeshi Takayama

Silicon Labs Confidential

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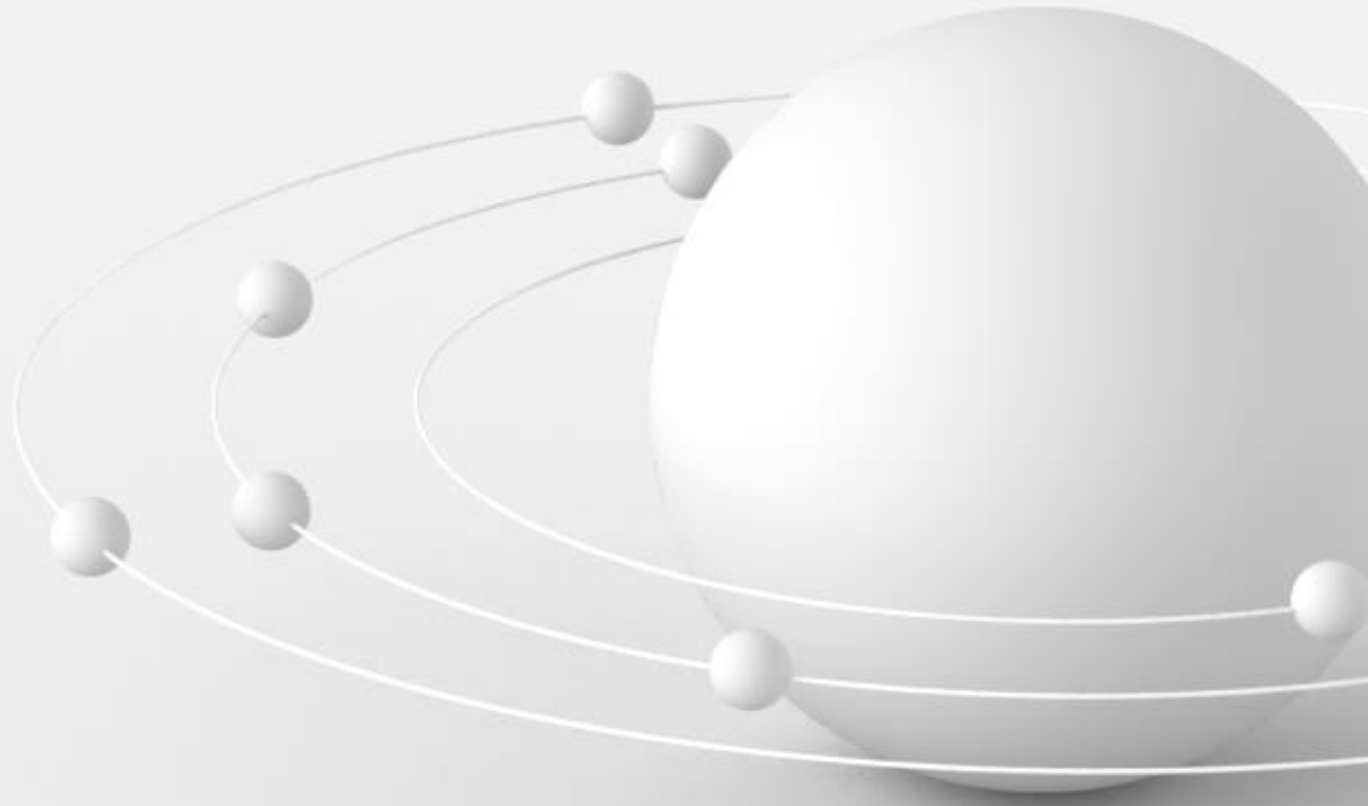
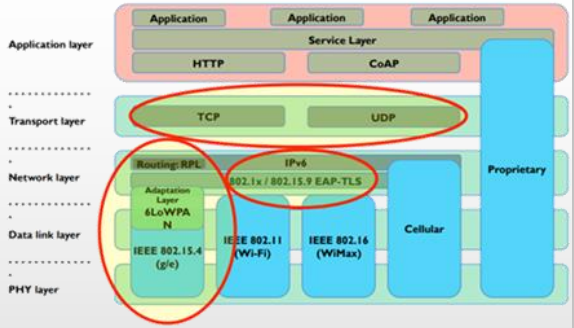
Wi-SUN



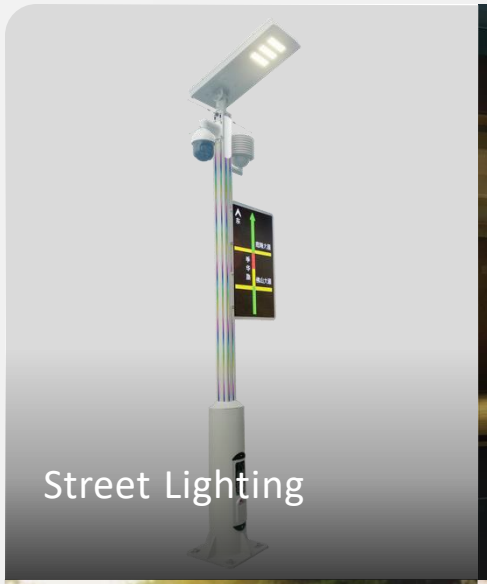
Presented by: Takeshi Takayama

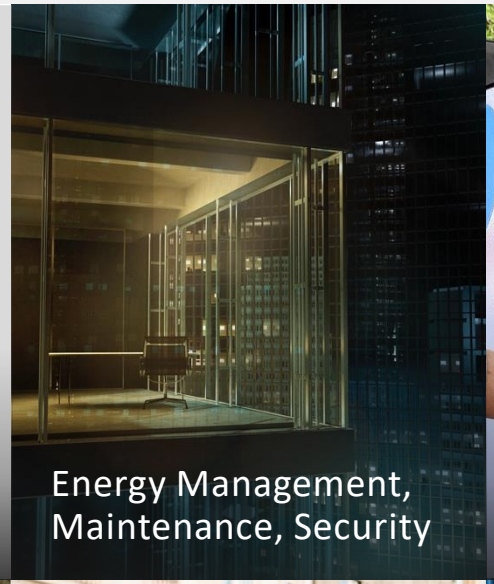
Wi-SUN, Wireless Smart Ubiquitous Network

SMART CITY MKT PROBLEM	SOLUTION : WI-SUN ALLIANCE	SOLUTION: WI-SUN	SOLUTION : CERTIFICATION
	Itron, OMRON, SILICON LABS, TOSHIBA, Trilliant, HEXING, RENESAS, NICT, arm, cisco, Landis+Gyr		Wi SUN Certified FAN
➢ Proprietary Protocols ➢ Lack Of Interoperability ➢ Non-IP Based ➢ Limited Security	➢ Global Organization ➢ Silicon Labs Promoter Member ➢ 46 Countries ➢ 300+ Members ➢ ~100 Million Devices	➢ OPEN Standards Based ➢ Interoperable ➢ IPv6/6LoWPAN ➢ Mandatory Security ➢ FSK, OFDM ➢ FAN 1.0 and FAN 1.1	➢ PHY Certification ➢ FAN Profile Certification ➢ 6 Independent Test Houses ➢ ~50 FAN Certified Products

WI-SUN : A GLOBAL STANDARD DELIVERING INTEROPERABLE CONNECTIVITY & SCALABILITY

Wi-SUN Field Area Network Applications

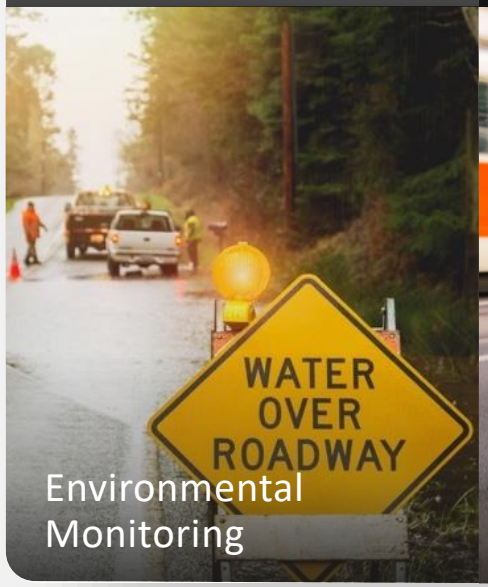

Street Lighting


Energy Management, Maintenance, Security

Traffic Control/Lights, Parking Meters

Oil/Gas Production

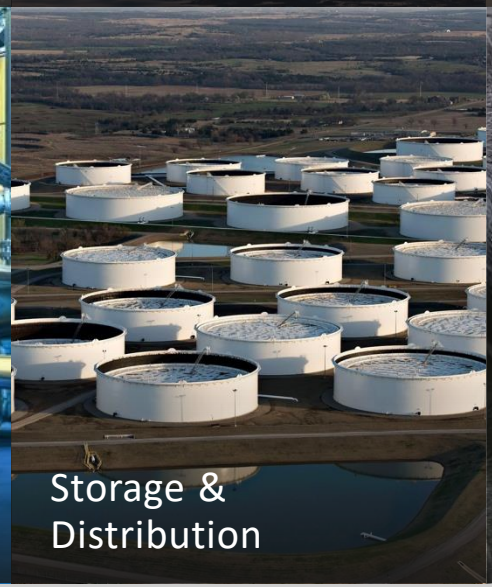
Utility Meters

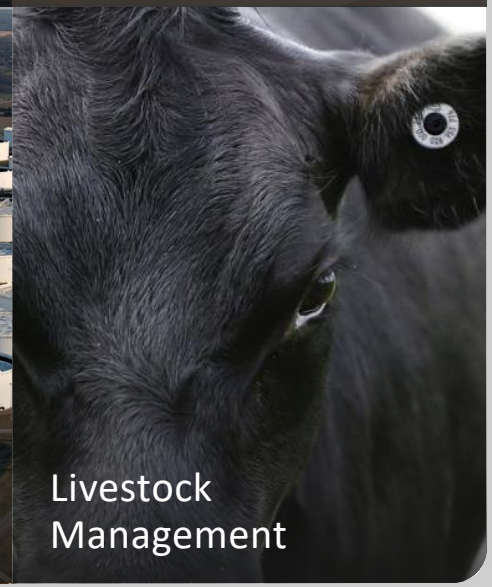


Environmental Monitoring

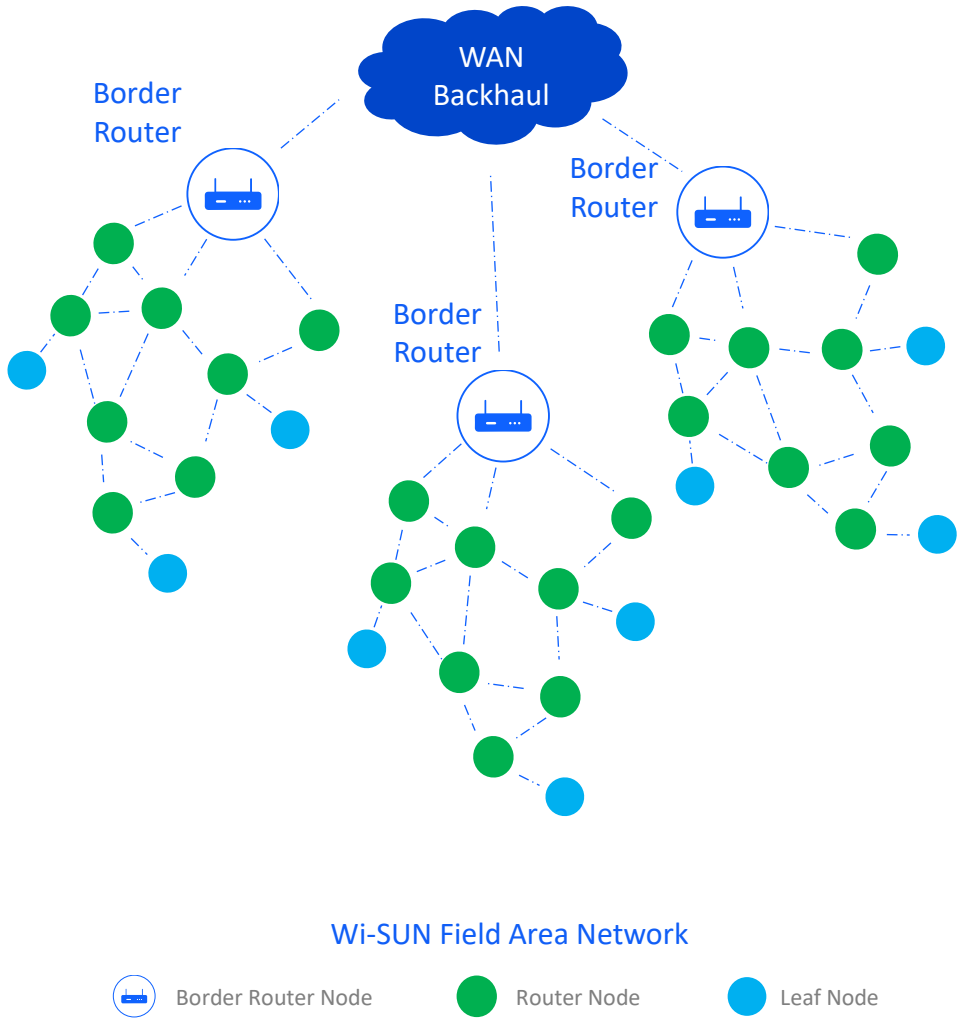
Waste Management

Consumption, Flow rate, Valve Control


Storage & Distribution


Livestock Management

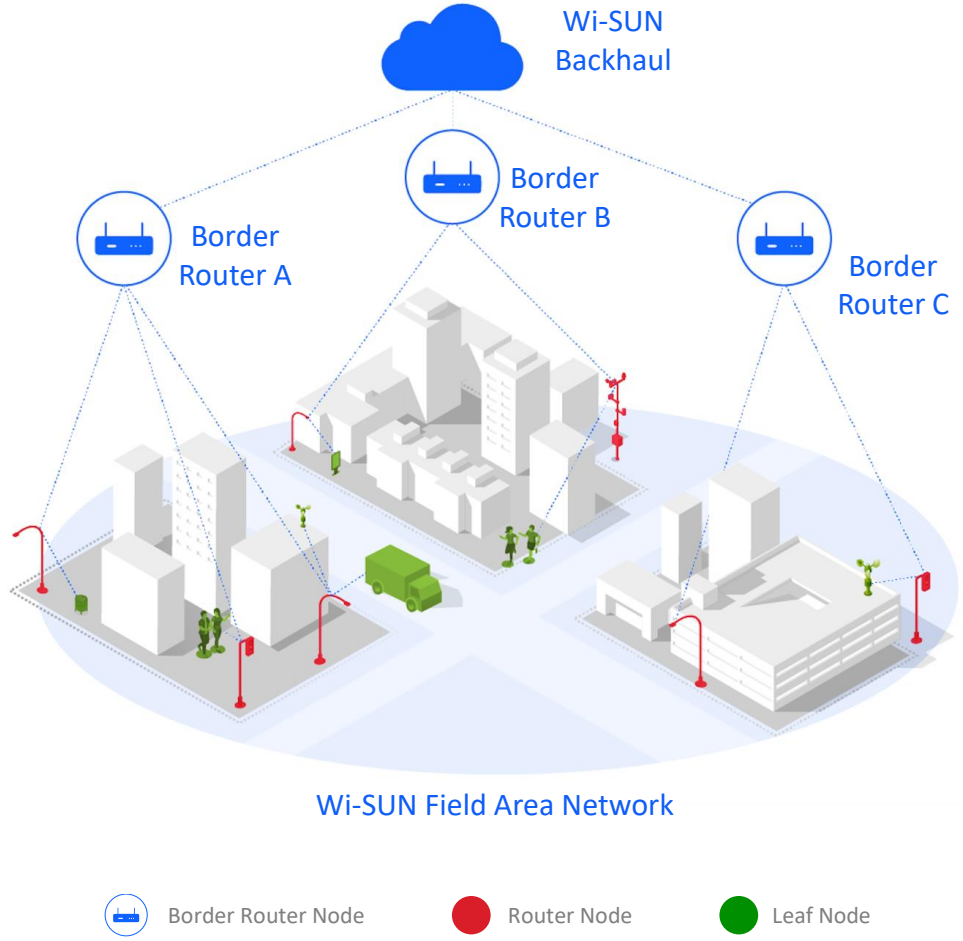
Wi-SUN Key Words



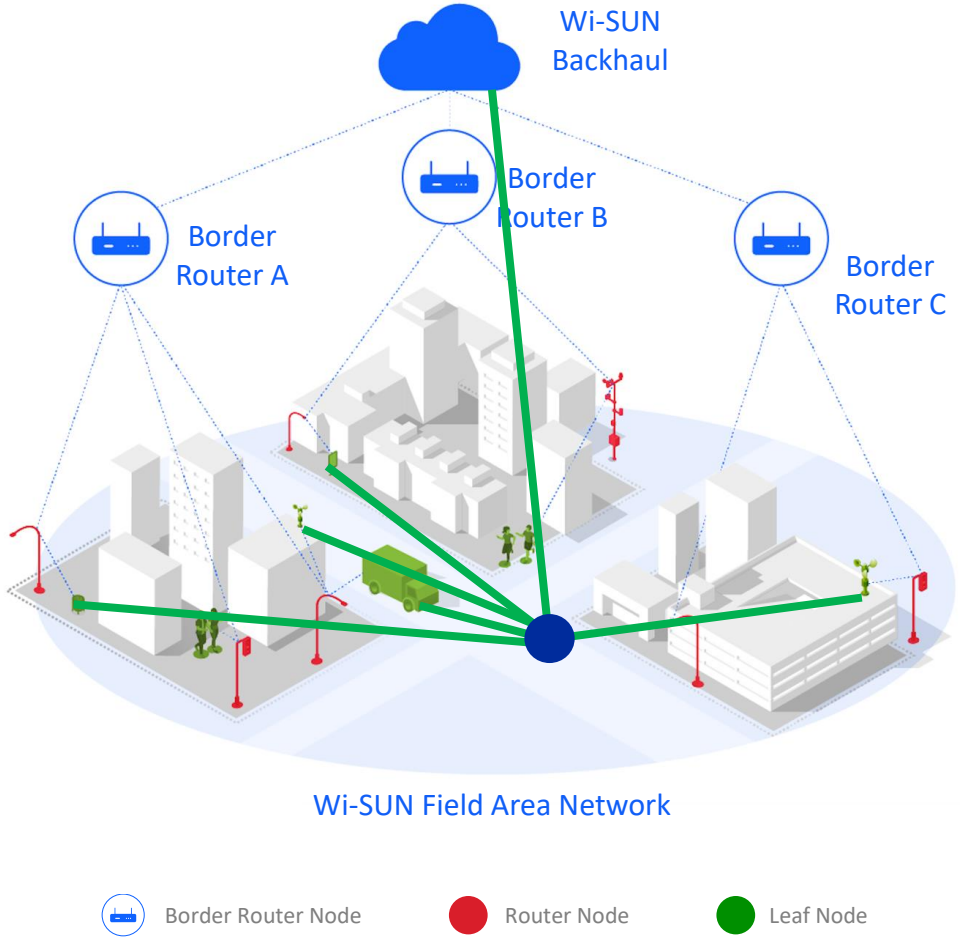
System Elements:

- Wi-SUN Network
- Border Router
- Router/Node
- Leaf Node
- IPV6/6LoWPAN

How Wi-SUN works….

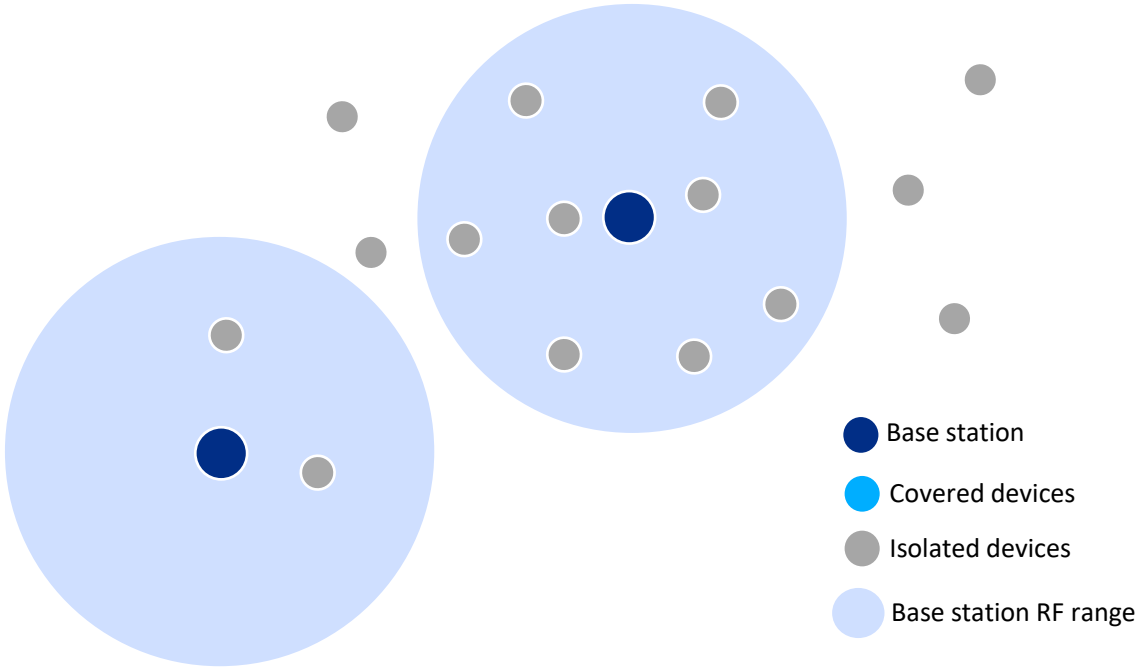


How Wi-SUN works….



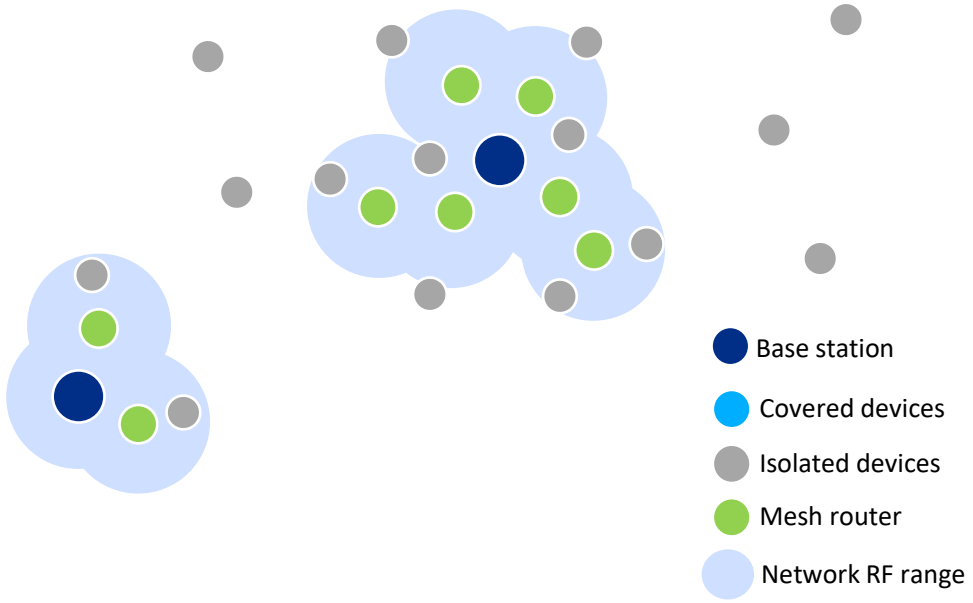
Mesh Network vs Long-Range IoT Protocols

NB-LPWA : Long-range IoT Protocol



- Star topology (LoRa, Sigfox, NB-IoT…)
- Base station able to cover several km² with a data rate which can go below 1 Kbps
- One isolated device requires a new base station implantation

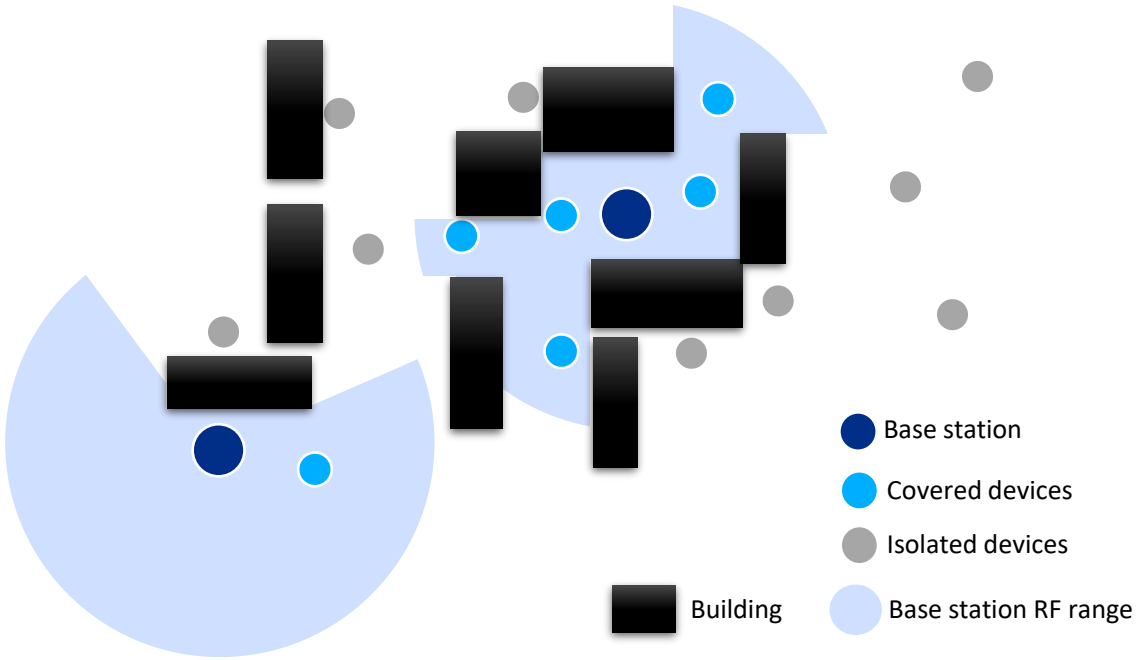
LPWA : Mesh Network Protocol



- Mesh topology (Wi-SUN/Thread/Bluetooth Mesh…)
- Device range is around 700-800m in the lowest data rate (50 Kbps FSK)
- Due the higher data rate used, the battery life of the devices is extended for similar use cases

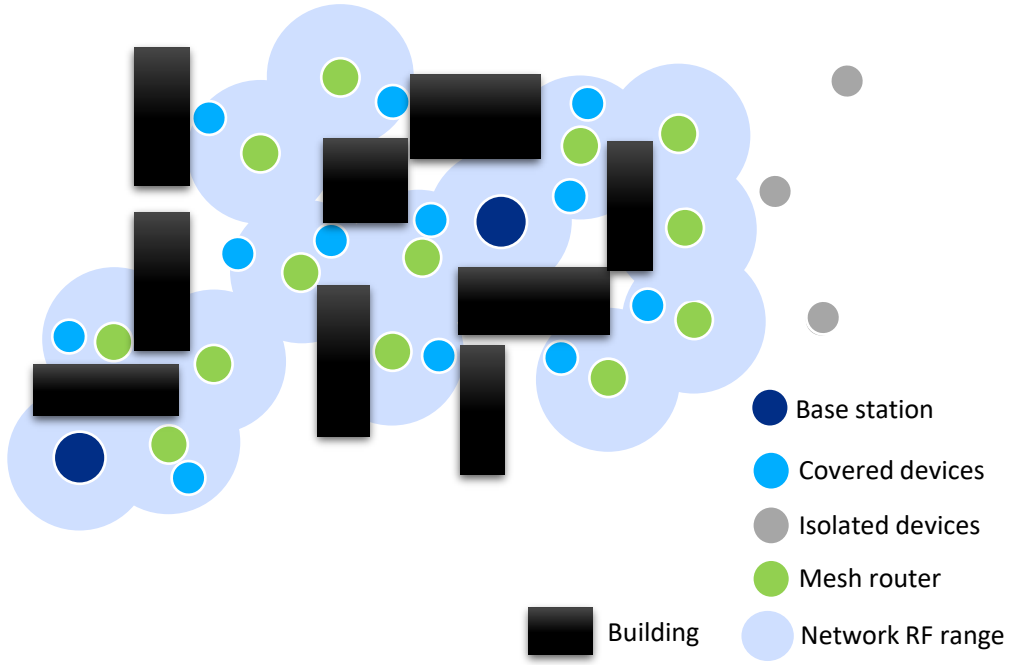
Mesh Network vs Long-Range IoT Protocols

Long-range IoT Protocol



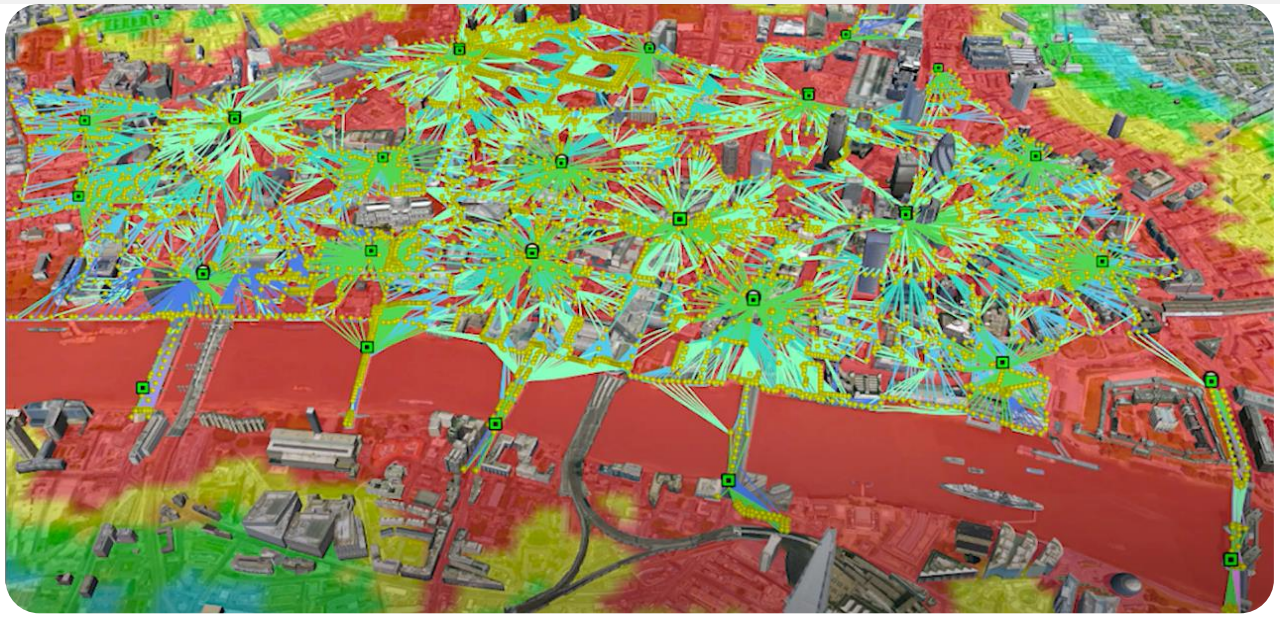
- Star topology includes expensive base stations
- In an urban environment or RF challenging layout, deploying enough base stations to cover the entirety of an area is tedious.

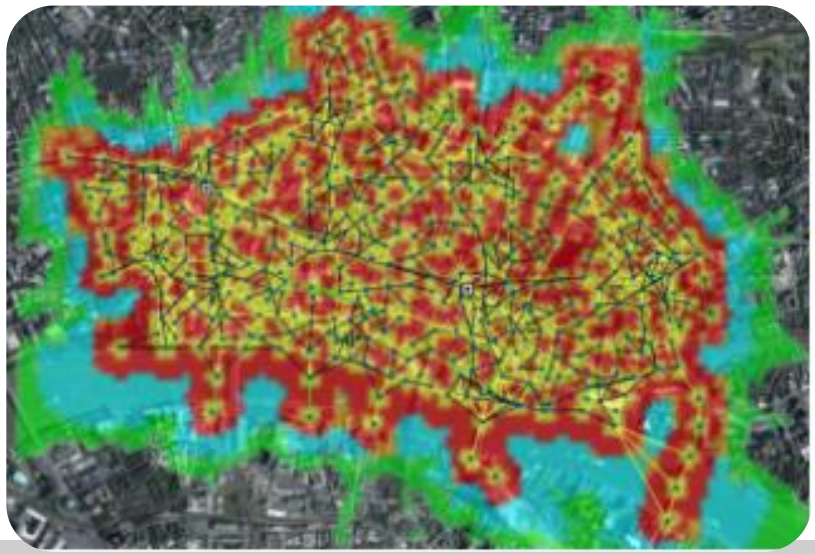
Mesh Network Protocol



- Mesh topology is more flexible
- Mesh routers can be deployed on grid powered devices (electric meters, streetlights…)
- Having a complete RF coverage of such an area becomes possible

Deployment Example: London



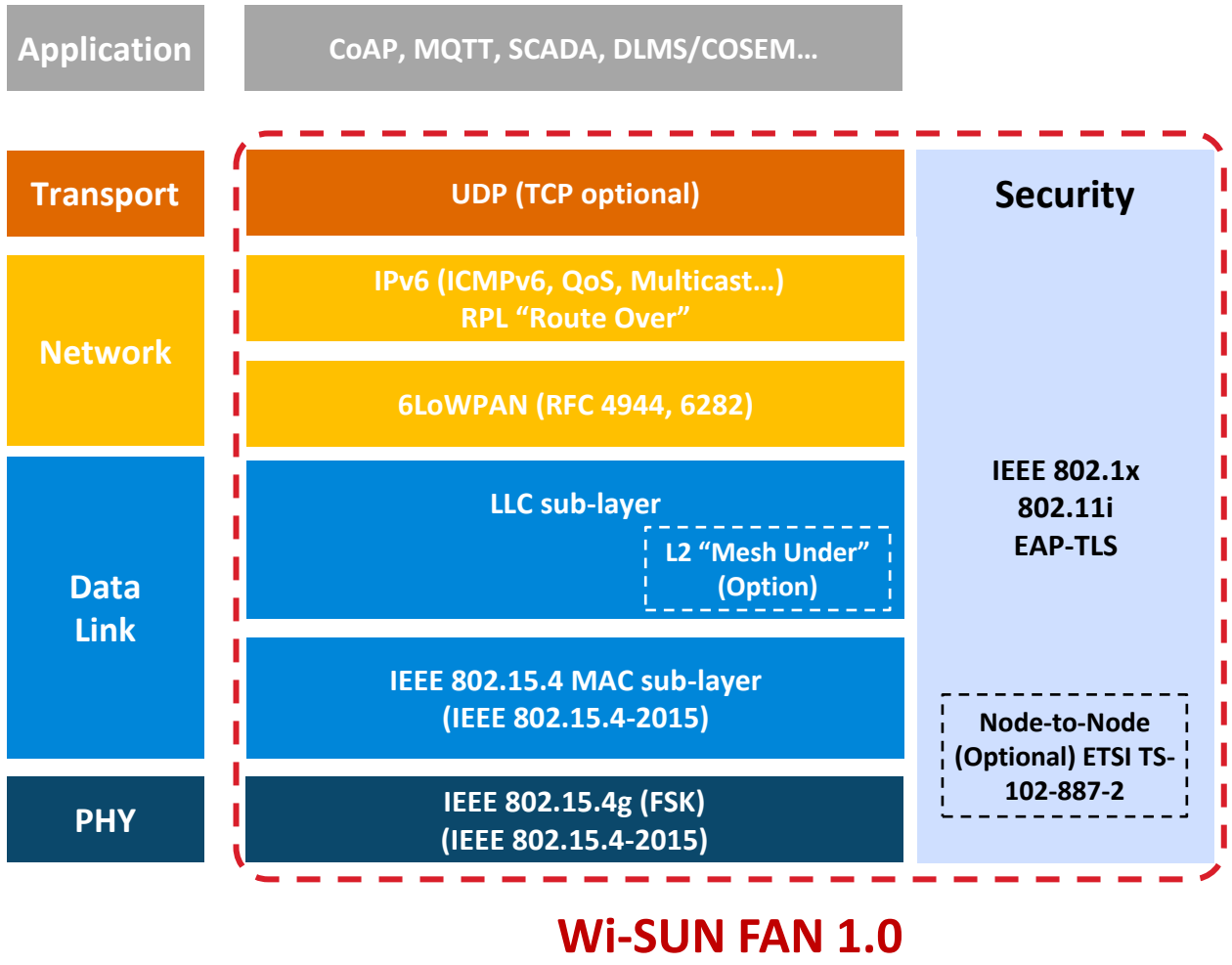


- **Control Management System (CMS)**
  - Street lighting
  - Utilities
  - Parking
- **15,000 connected Wi-SUN devices**
- **12 Wi-SUN border routers**
- **Major benefits**
  - Enables real-time remote management
  - Reduces electrical energy usage
  - Automatically generates maintenance service orders
  - Future proof system that can scale as the city converts old infrastructure to new

Additional information here:

https://wi-sun.org/latest-news/wi-sun-technology-provides-the-platform-for-city-of-london-smart-city-initiative/

Wi-SUN FAN, Field Area Network



IPv6 Protocol suite

- UDP (TCP only optional)
- 6LoWPAN Adaptation + Header Compression
- DHCPv6 for IP address management
- Routing using RPL
- ICMPv6
- Unicast and Multicast forwarding

Security

- 802.1X/EAP-TLS/PKI Authentication
- 802.11i Group Key Management
- Optional ETSI-TS-102-887-2 Node-to-Node Key Management

MAC based on IEEE802.15.4e + IE extensions

- Frequency hopping
- Discovery/Join
- Optional Mesh Under routing (L2 Mesh)

PHY based on 802.15.4g

- FSK modulations, various data rates and regions

Wi-SUN: Frequency Bands and Operating Modes

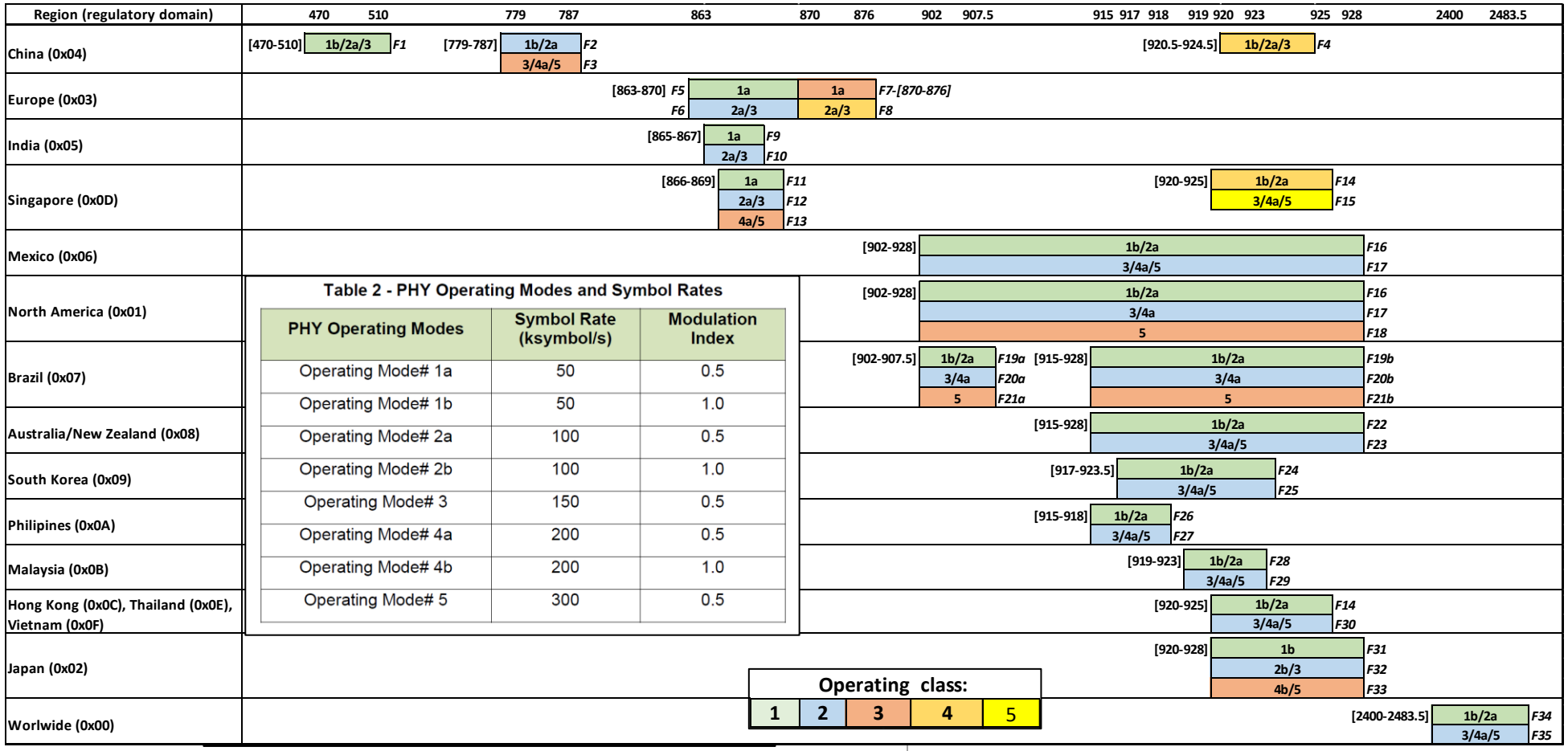
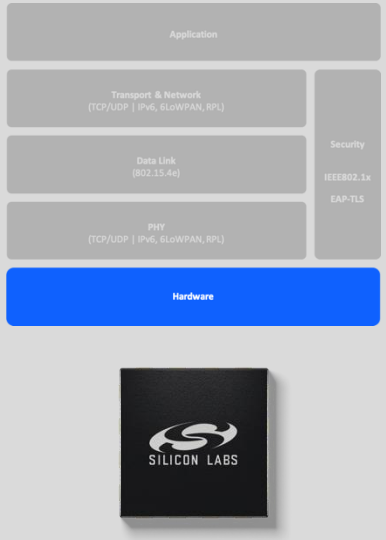


Table 2 - PHY Operating Modes and Symbol Rates

PHY Operating Modes	Symbol Rate (ksymbol/s)	Modulation Index
Operating Mode# 1a	50	0.5
Operating Mode# 1b	50	1.0
Operating Mode# 2a	100	0.5
Operating Mode# 2b	100	1.0
Operating Mode# 3	150	0.5
Operating Mode# 4a	200	0.5
Operating Mode# 4b	200	1.0
Operating Mode# 5	300	0.5

Regulatory domain, operating class and operating mode are provided by the stack, together with network name . The Operating Class (OC) field is an 8-bit unsigned integer which is used to achieve the desired data rate and channel plan within the Regulatory Domain

Silicon Labs Wi-SUN Solution

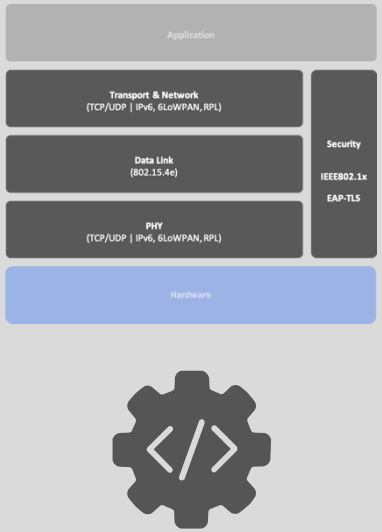


HARDWARE

Field Proven SoC xG12

Low-Power Silicon

Sub-GHz FSK PHYs

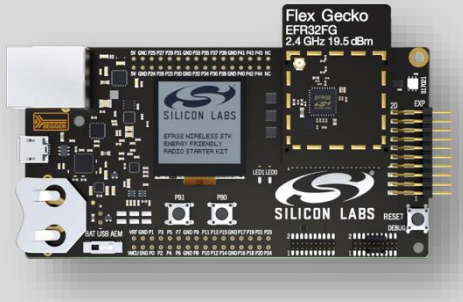


WI-SUN STACK & OS

IPv6/6LoWPAN

Runs w/ FreeRTOS and Micrium

Full featured Stack



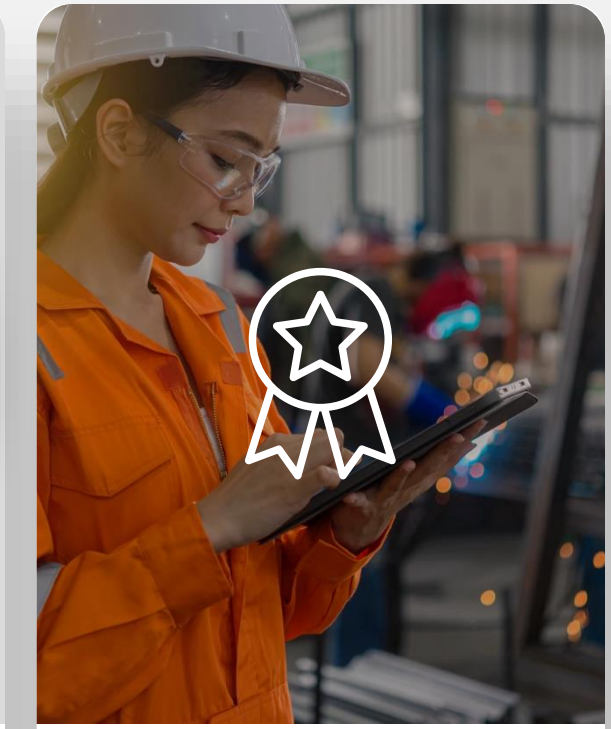
Simplicity Studio 5

TOOLS

Reference Applications

(Including Border Router Demo)

Command Line Interface support



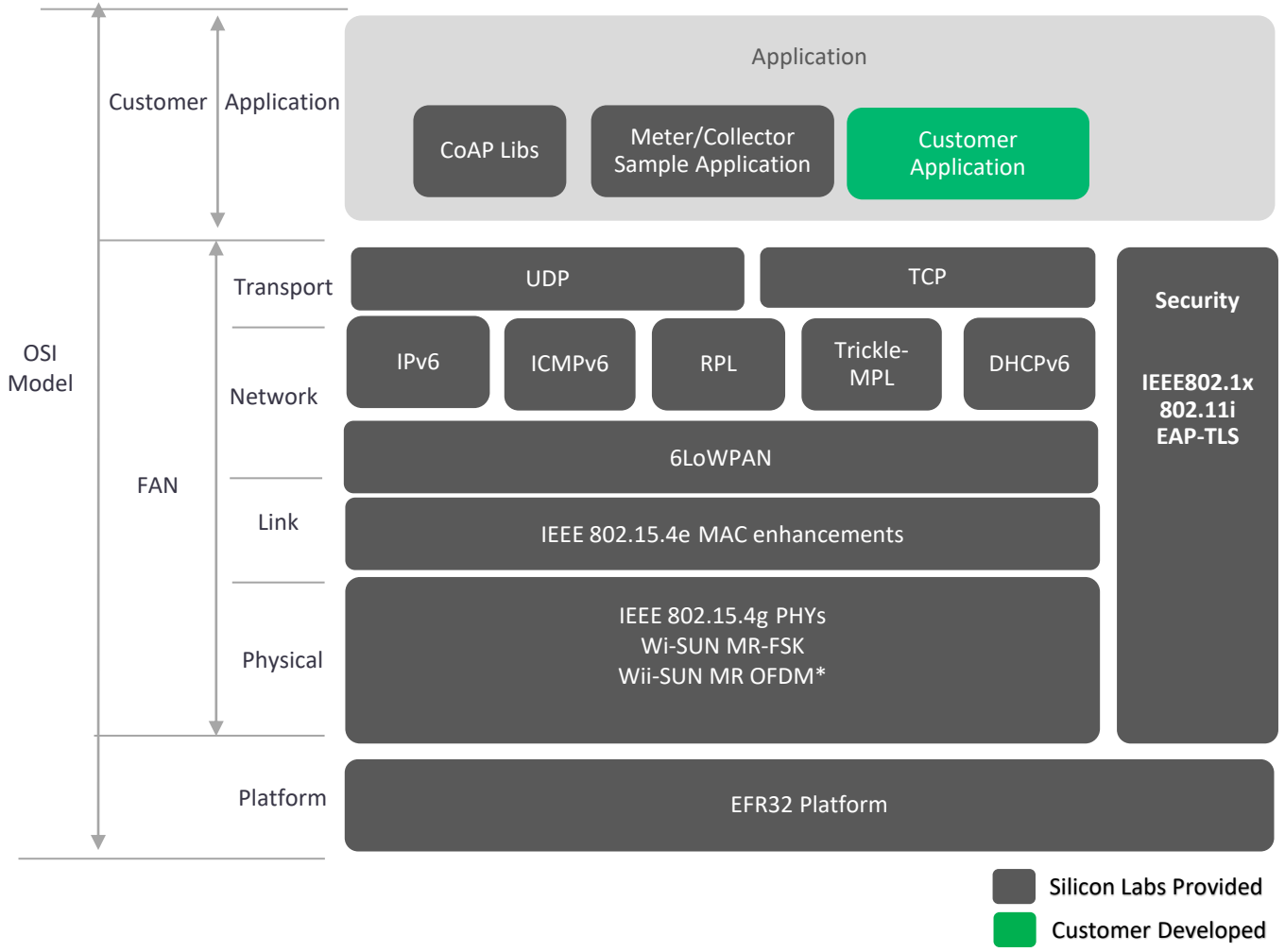
CERTIFICATION

Certified PHY

Certified FAN 1.0 stack

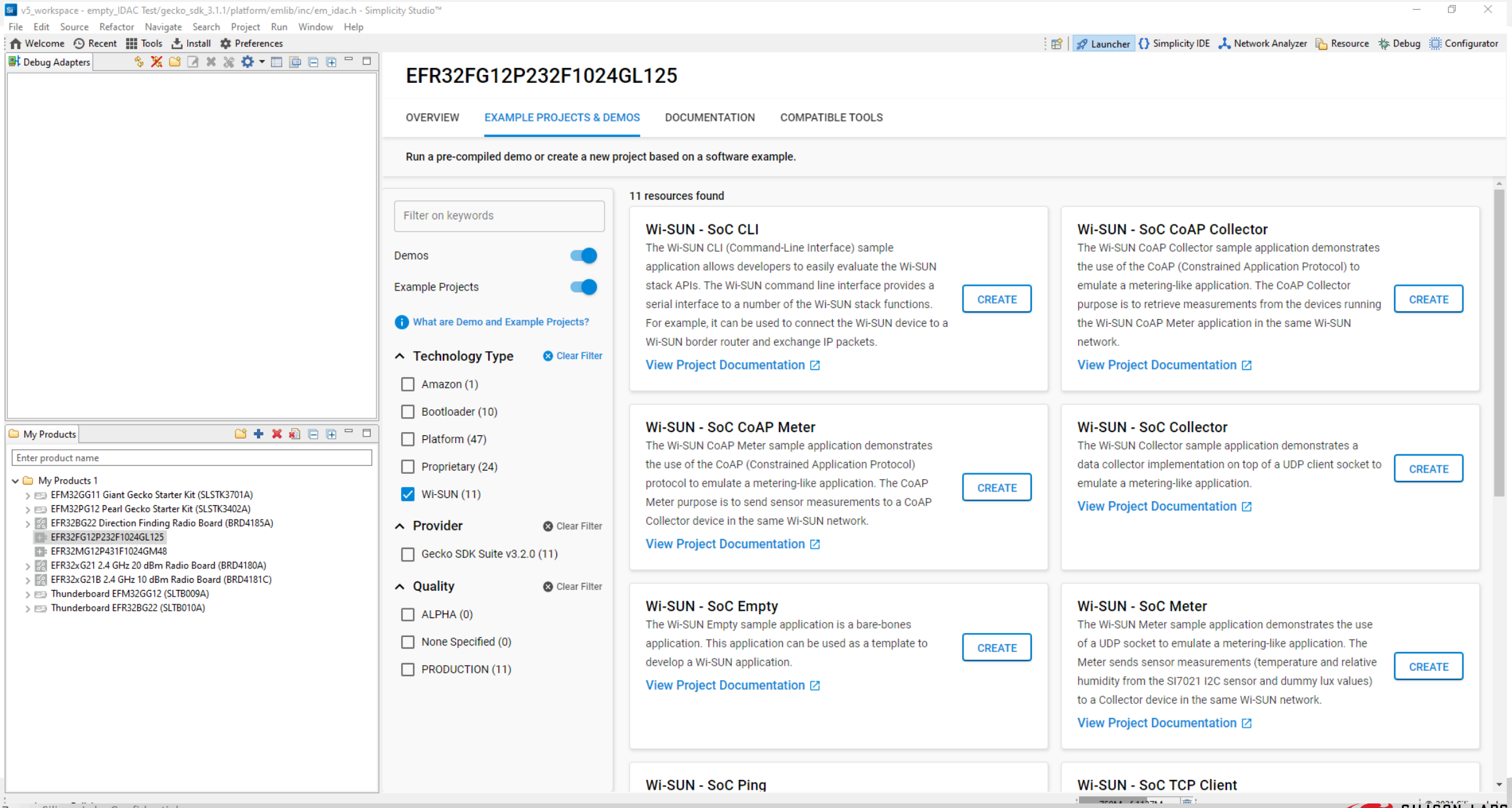
(FAN 1.1 when specification ratified)

Stack and Sample Apps



- **Wi-SUN Sample Apps**
  - SoC CLI
  - SoC CoAP Collector
  - SoC CoAP Meter
  - SoC Collector
  - SoC Empty
  - SoC Meter
  - SoC Ping
  - SoC TCP Client
  - SoC TCP Server
  - SoC UDP Client
  - SoC UDP Server
- **PHY (802.15.4g)**
  - FSK (xG12) modulations, data rates, and regions
  - *OFDM Support Coming Soon

Simplicity Studio 5 – Wi-SUN Application Examples



Silicon Labs Delivers the Wi-SUN Foundation

Applications & Device Management

Grid intelligence | Distribution automation | Municipal infrastructure | Cloud database management | Enterprise efficiency | … … …

SECURITY

Stack (L2-L4)

Wi SUN **FAN 1.0**

Line powered, FSK modulations

Wi SUN **FAN 1.1**

Battery powered, OFDM modulations

Wi SUN **FAN 2.0**

… … …

SECURITY

Hardware

EFR32xG Series 1

EFR32xG12
1 MB / 256 kB
2.4/sub-GHz

EFR32xG13
512 kB / 64 kB
2.4/sub-GHz

EFR32xG Series 2

EFR32xG21
1 MB / 96 kB
2.4GHz

EFR32xG22
512 kB / 32 kB
2.4GHz

Coming Soon
Sub-GHz

CUSTOMER FOCUSED ON CREATING AND MONETIZING VALUE ON THE APPLICATION LAYER

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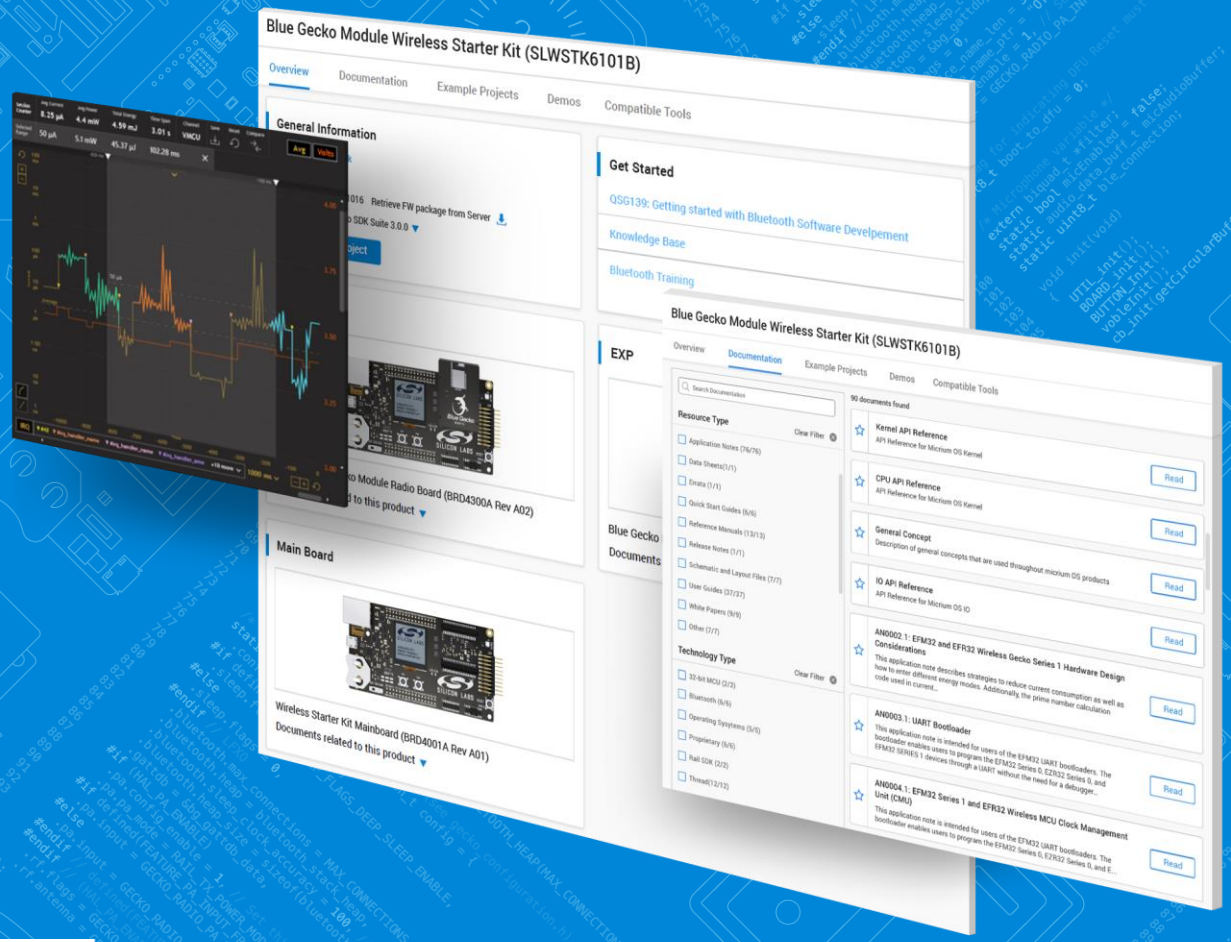
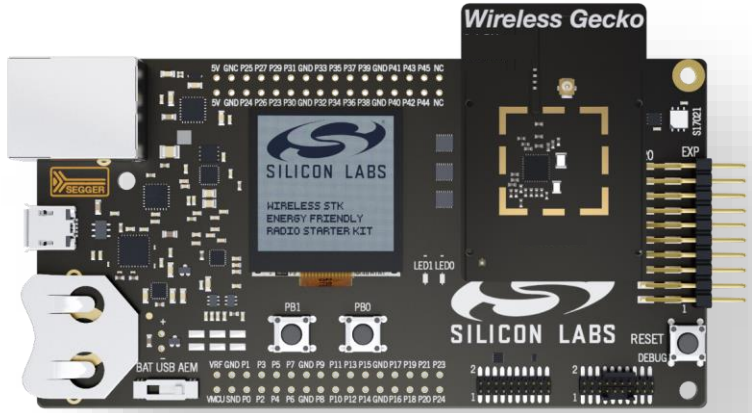


Simplicity Studio 5

Simplified Developer Experience

- **Simplicity Studio 5**
  - **Interface**
    - Fresh, new & simplified
    - Intuitive out-of-the-box experience
    - Fast access to developer resources
    - Linux, Mac & Windows
  - **Tools**
    - Configuration utilities
    - Compiler
    - Error & validation
    - IDE & command line support
    - Graphical hardware configurator
    - Energy Profiler – visual energy analysis
    - Network Analyzer – packet capture & decode

Getting Started with Wi-SUN and FG12 SoCs



Wi-SUN/MG12 SoC Starter Kit
SLWSTK6007A

- Build your Wi-SUN mesh with the Wi-SUN starter kit
- Border router demo available on Raspberry Pi (not included in the kit) or a Linux host machine

Content

SLWSTK6007A	3x BRD4001A WSTK main boards 3x BRD4170A 2400/868-915 MHz 19 dBm Radio Boards 1x debug adapter board + 1x flat cable SMA Antenna

Other supported radio boards

SLWRB4163A **SLWRB4254A**	2400/868 MHz 10 dBm Radio Boards
SLWRB4164A **SLWRB4253A**	2400/915 MHz 19 dBm Radio Boards
SLWRB4172A	2400/490 MHz 19 dBm Radio Boards

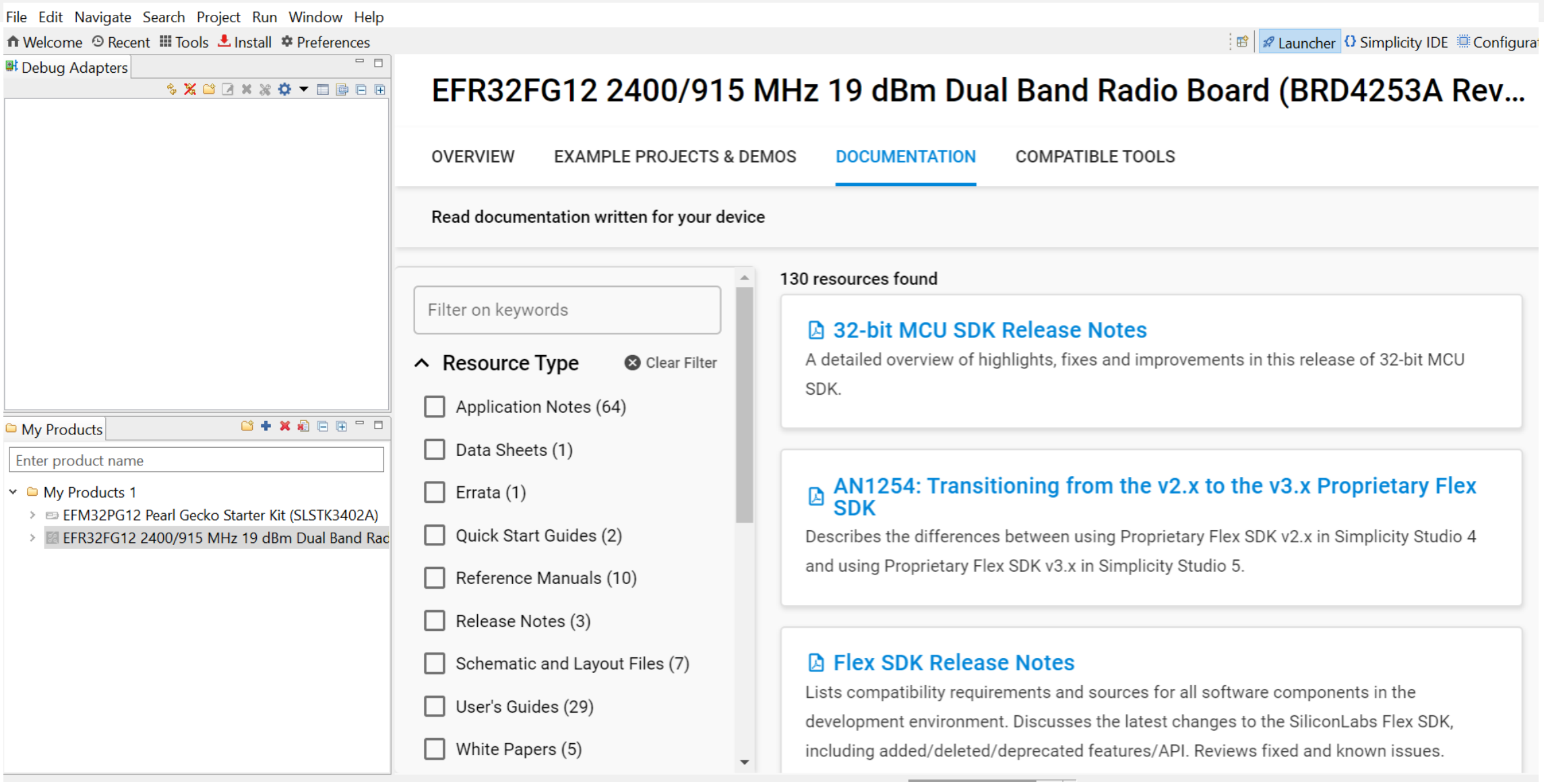
Going further with Wi-SUN

- **GSDK 3.2 release Wi-SUN sample applications**
- **Documentation (QSG, UG and ANs)**
- **Works With sessions**

- Wi-SUN FAN Technical Overview
- QSG181: Silicon Labs Wi-SUN SDK Quick-Start Guide
- UG495: Silicon Labs Wi-SUN Developer's Guide
- AN1330: Silicon Labs Wi-SUN Mesh Network Performance
- AN1332: Silicon Labs Wi-SUN Network Setup and Configuration
- docs.silabs.com
- Documentation inside of SS5
- Works With Wi-SUN sessions (September 2021)

Session ID	Session Name
WSN -101	Introduction to Wi-SUN, It's markets and the Alliance
SMC -102	Smart City Network Management in the Cloud Using Pelion
SMC -103	Why Wi-SUN is Ideal for Smart Street Lighting?
WSN - 300	Building Large Scale Smart City Networks with Wi-SUN

Obtaining Key Information Inside SS5



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VIRTUAL CONFERENCE

When	September 14–15th
Where	Accessible live and online from anywhere in the world
Who	Developer conference that brings together the biggest names in smart home technology
Why	Developer's will learn how to develop and deliver IoT devices directly from the engineers who are building the latest advances
What	Live. Free. All-online

Register Today

View Agenda

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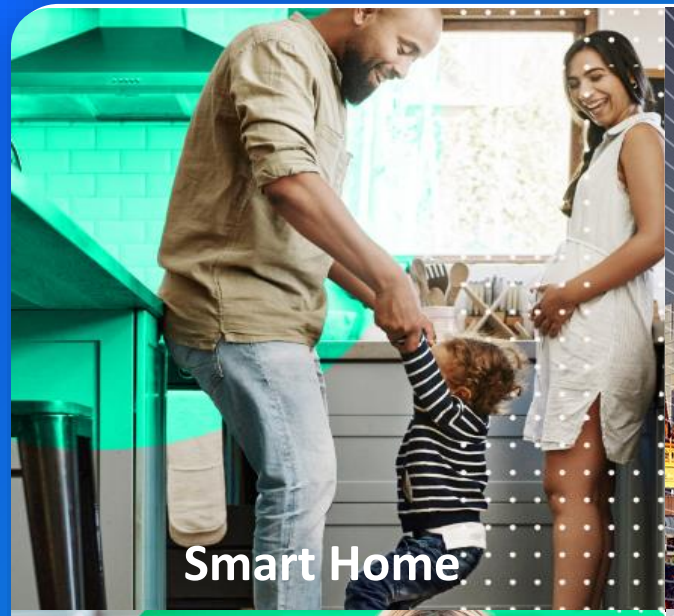

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VIRTUAL CONFERENCE

September 14–15, 2021 (CDT)

Works With 2021 Virtual Conference

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