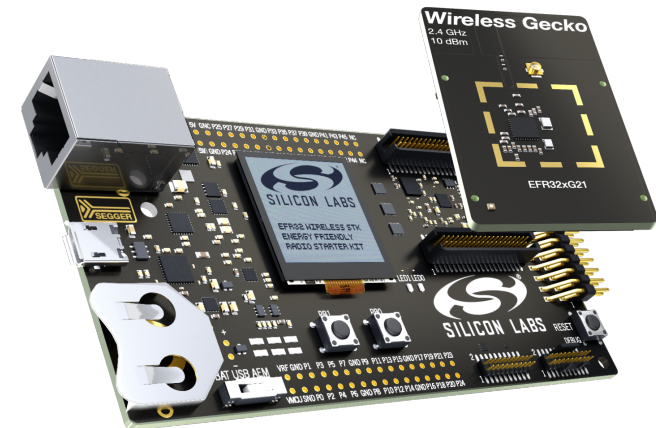


# Tech Talks LIVE Schedule – Presentation will begin shortly

Silicon Labs LIVE:

## Wireless Connectivity Tech Talks

Topic	Date
Overview of Silicon Labs Wi-Fi Solutions (Redpine Signals Wi-Fi Solutions)	Thursday, May 28
Optimize a Battery Supply Using the Energy Friendly PMIC	Tuesday, June 2
Zigbee Software Structure: Learn about Plugins and Callbacks	Thursday, June 4
<b>Multiprotocol Wireless: Real Application of Dynamic Multiprotocol</b>	<b>Tuesday, June 9</b>
Wireless Coexistence	Thursday, June 11
Bluetooth Software Structure: Learn the APIs and State Machines	Tuesday, June 16
Add a Peripheral to a Project in No Time: With 32-bit Peripheral Github Library	Thursday, June 18
OpenThread Software Structure: Learn about Resources and Examples	Tuesday, June 23



Find Past Recorded Sessions at:

<https://www.silabs.com/support/training>



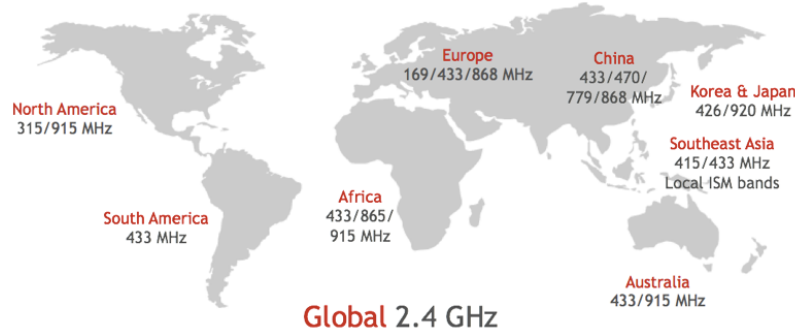


# Dynamic Multiprotocol

JUNE 2020



# Wireless Gecko Series 2 Platform



- Optimized for IoT Protocols
  - Zigbee, Thread, Bluetooth, Z-Wave and Wi-Fi
  - Multiband and **multiprotocol portfolio**
- High performance and integration
  - Arm Cortex-M33 processor core
  - Up to 125 dBm link budget with fully integrated PA/LNA
- Ultra-low power
  - Very low active current (27  $\mu$ A/MHz)
  - Low sleep current (1.4  $\mu$ A)
- Dedicated security core
  - Hardware crypto
  - Secure Boot
  - Secure Debug Access
  - True random number generator (TRNG)

Application Optimized for the IoT

# Silicon Labs Multiprotocol Wireless Stacks



	Bluetooth®		THREAD	zigbee	Proprietary	
Application	Customer Application		Customer Application	Customer Application	Customer Application	
	GATT (profiles/services)	Mesh Models (e.g. lighting)	Application Layer (e.g. dotdot, CoAP)	Application Profile (e.g. HA1.2, ZLL, dotdot)		
Network/ Transport	Bluetooth LE Core	Bluetooth Mesh Core	UDP	Zigbee Core Stack	Connect Stack	Customer Proprietary Stack
			IPv6, Mesh Routing			
			6LoWPAN			
Link	Bluetooth Link Layer		IEEE 802.15.4 MAC	IEEE 802.15.4 MAC	IEEE 802.15.4 like MAC	
Physical	Bluetooth PHY (2.4 GHz)		IEEE 802.15.4 PHY (2.4 GHz)	IEEE 802.15.4 PHY (2.4 GHz)	Proprietary PHY (2.4 GHz or Sub-GHz)	
Platform	RAIL		RAIL	RAIL	RAIL	
	Common Bootloader		Common Bootloader	Common Bootloader	Common Bootloader	

5

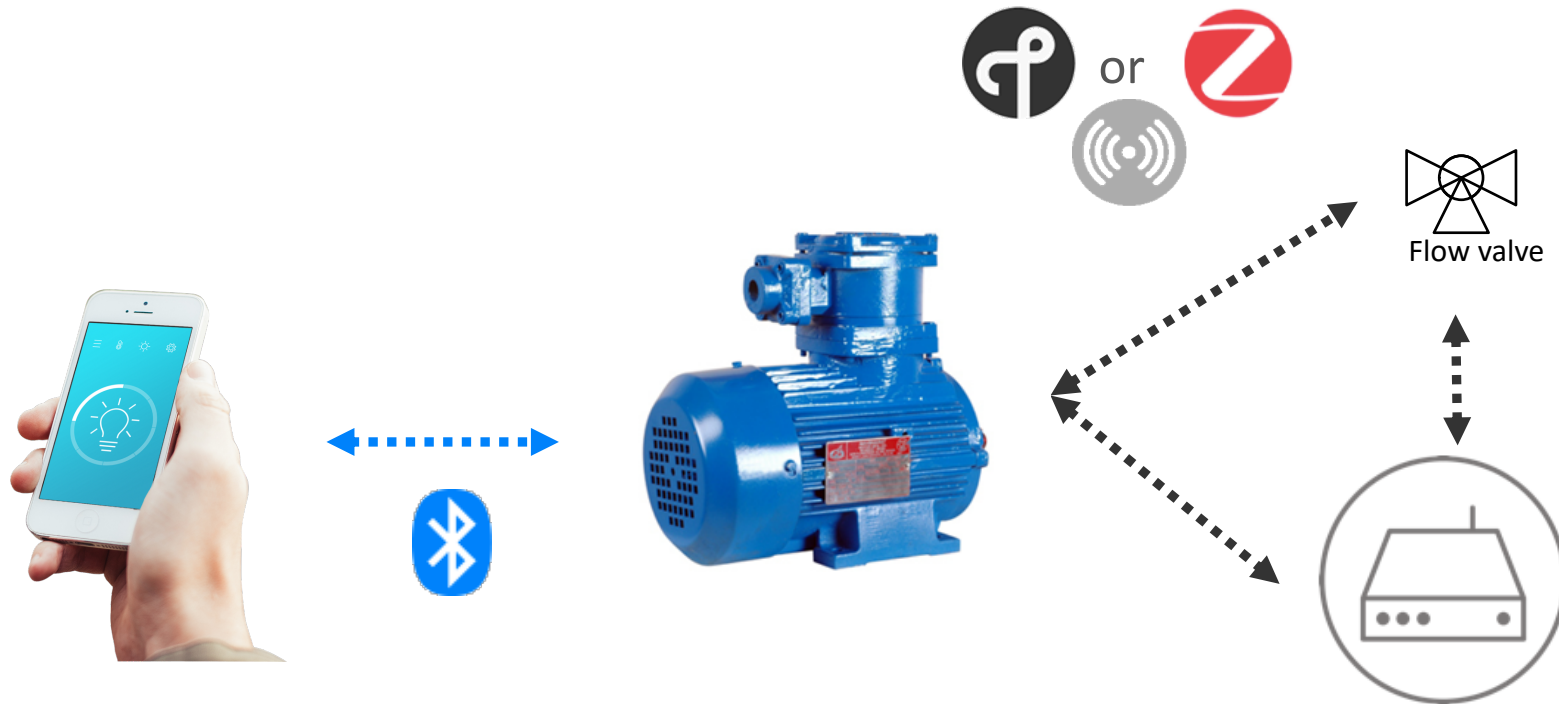
- Developed & maintained in-house
- Tested extensively, deployed at scale
- Dynamic multiprotocol
- Inter-stack power manager
- Common syntax

# Multiprotocol Definitions

Multiprotocol Type	Definition
<b>Programmable</b>	Device programmed with either <b>Protocol A</b> or <b>Protocol B</b> in manufacturing
<b>Switched</b>	Application switches between <b>Protocol A</b> and <b>Protocol B</b> via bootloader
<b>Dynamic</b>	Application runs simultaneously (time-sliced) <b>Protocol A</b> and <b>Protocol B</b>
<b>Concurrent</b>	Application runs both <b>Protocol A</b> and <b>Protocol B</b> in a single radio ( <b>on same RF channel</b> )
<b>Multiradio</b>	Application runs multiple protocols with multiple radios at the same time (no time-slicing)

# Use Case: Dynamic Multiprotocol

- Time-sliced operation between 2 stacks



# Key Terms for Dynamic Multiprotocol

- Radio Task
- Radio Config
- Radio Scheduler Operations
  - Background Receive
  - Scheduled Receive
  - Scheduled Transmit
  - Yield
- Priorities
  1. Bluetooth LE scheduled transmit
  2. Bluetooth LE scheduled receive
  3. Zigbee scheduled transmit
  4. Zigbee background receive
- Slip Time





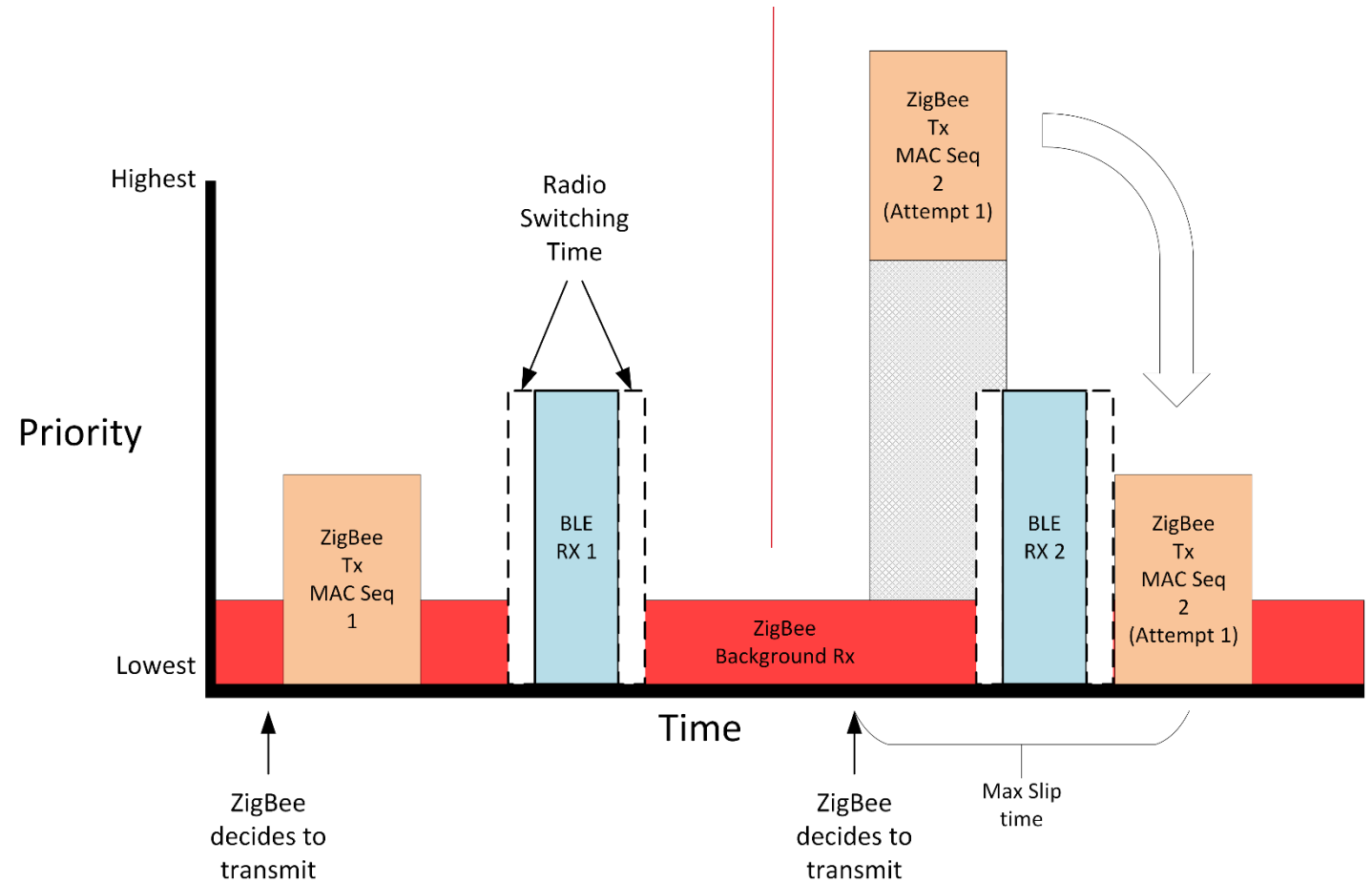
# Example of Priority Scheduling

Zigbee TX 1:

- Zigbee TX event with scheduled BLE RX1 event – no conflict

Zigbee TX 2:

- Scheduler determines there is not enough time to complete before BLE RX2
- Scheduler determines that Zigbee TX2 can wait until after BLE RX2 due to allowed slip time (indicated by Zigbee stack)



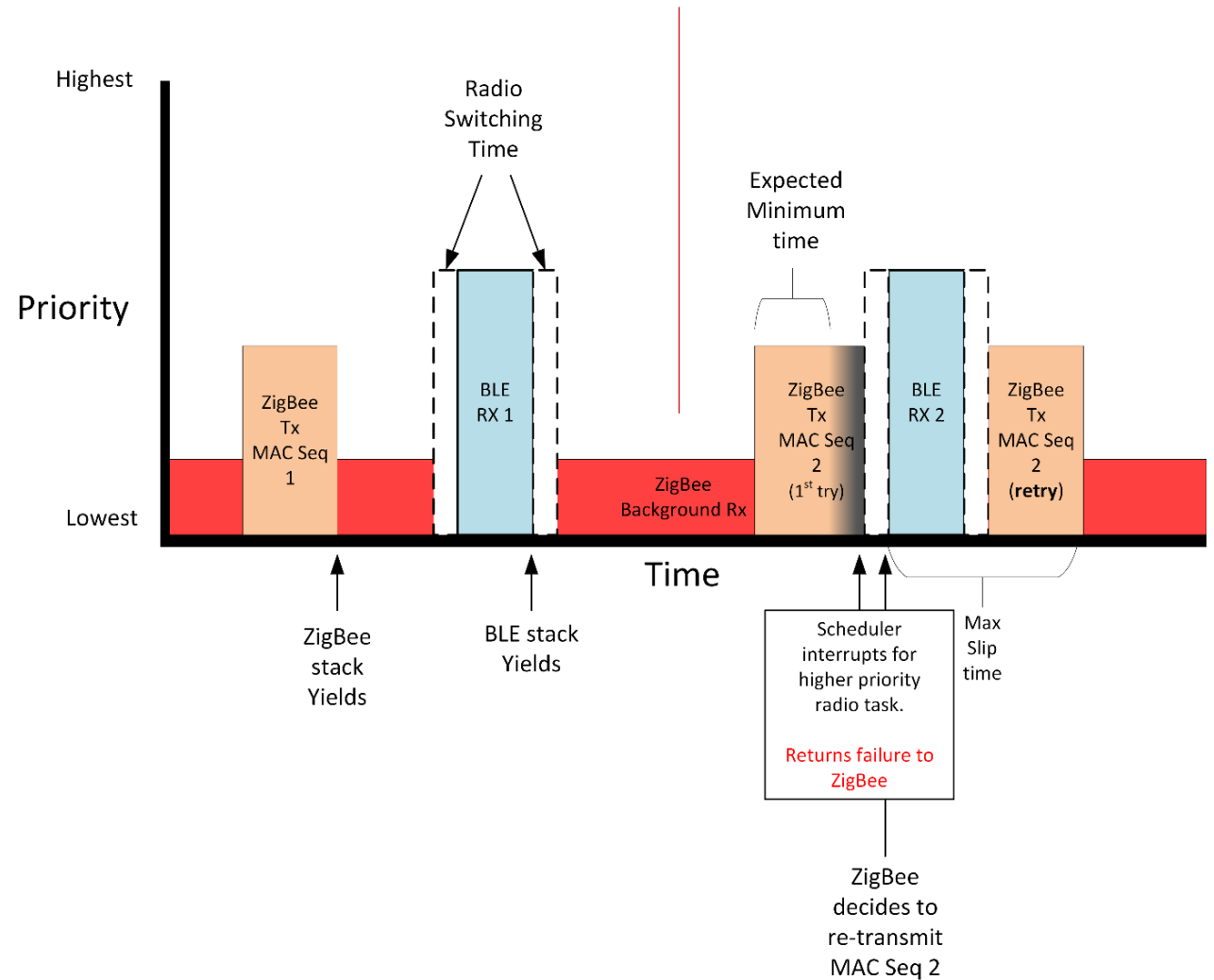
# Example of Priority Interruption

Zigbee TX 1:

- Zigbee TX event with scheduled BLE RX1 event – no conflict

ZigBee TX 2:

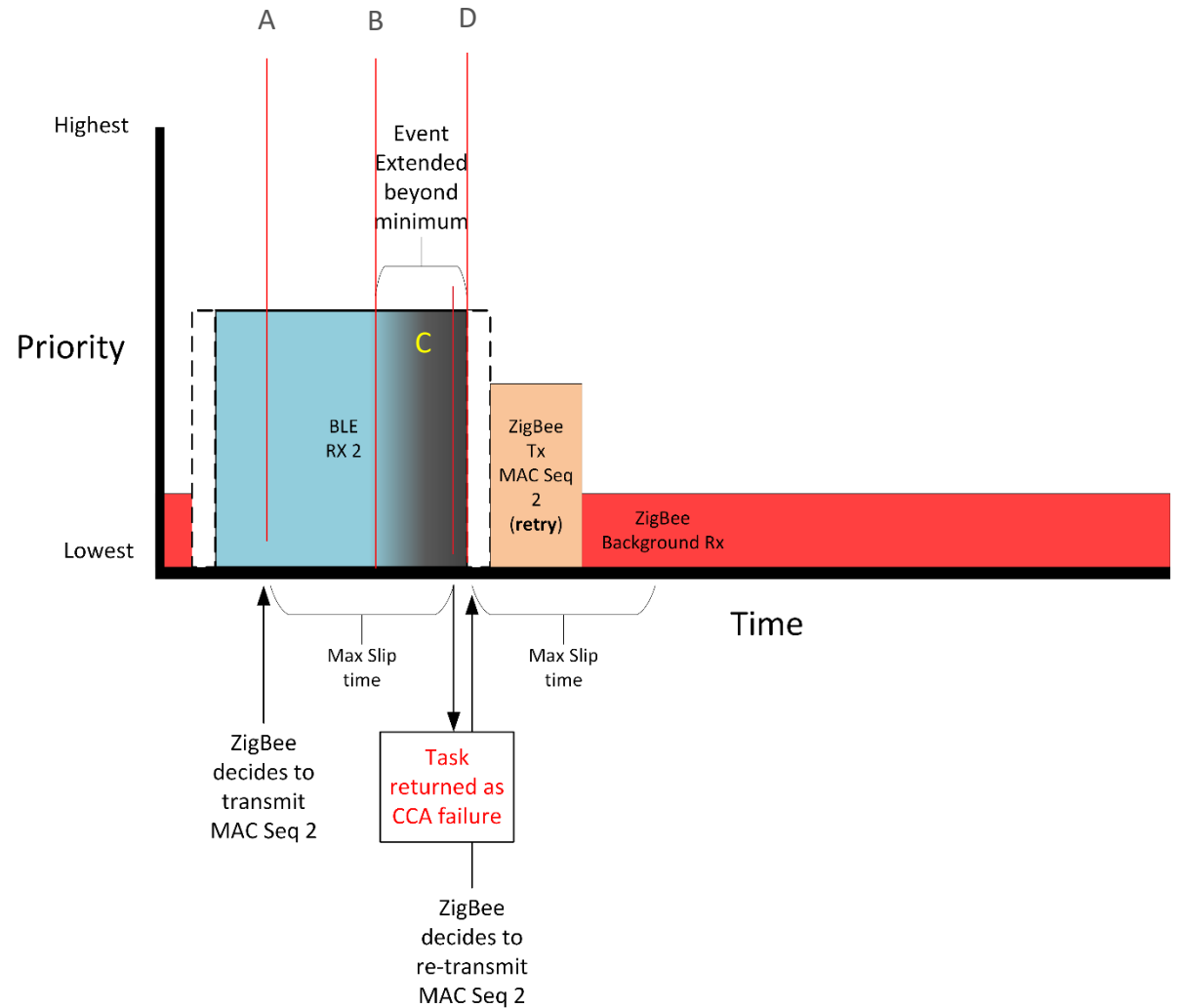
- Scheduler thinks there is time for ZigBee TX
- Zigbee TX2 event takes longer (e.g. long random backoff, does not yield in time)
- Collision
- Radio scheduler interrupts Zigbee event, returns failure to Zigbee stack
- BLE RX2 event occurs
- Zigbee stack retries TX2



# Higher Priority Task Extended

Higher priority task (BLE RX2) takes longer than expected

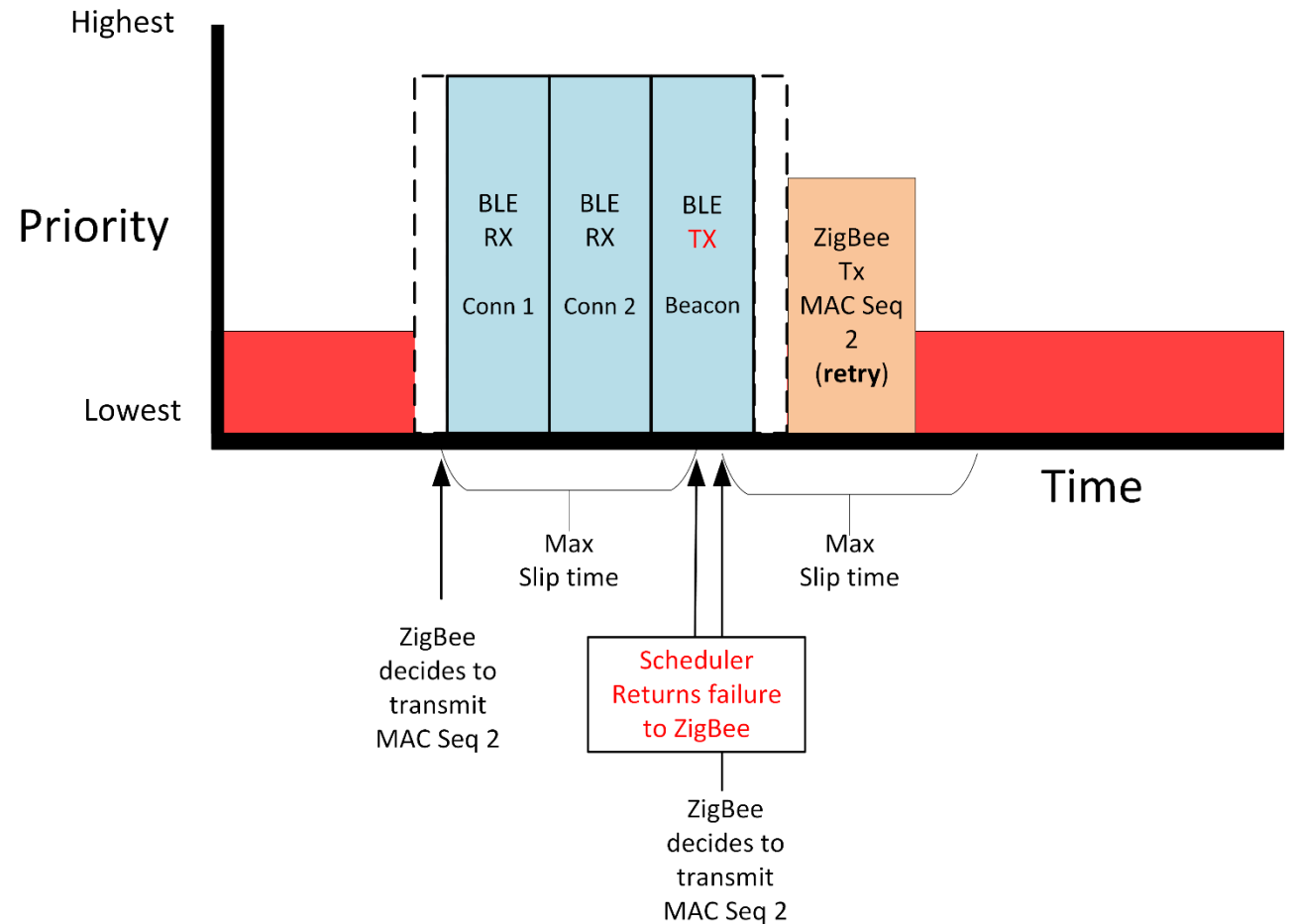
- Zigbee decides to send packet
- Radio scheduler accepts send request, assumes BLE RX2 will complete before end of Zigbee TX2 event slip time
- BLE RX2 takes longer than expected
- It exceeds the slip time of the Zigbee TX2 request
- Error is returned to the Zigbee stack
- Zigbee stack decides to retransmit the packet



# Higher Priority Task without Interruption

Multiple Bluetooth connections and a beacon

- Creates period where Zigbee cannot transmit or receive, even with slip time
- Zigbee asks scheduler to schedule TX2 task
- Scheduler accepts event, even though it will fail
  - Circumstances may change
  - Stack retry would happen too quickly after failure
- TX2 event queued, fails after slip time expires
- Zigbee stack retries, better likelihood of success with new slip time



# Choosing an MG Device

Increasing Features



## MG12 / MG21

Highest integration  
Large memory for **dual-protocol** and OTA  
Variants with highest security

## MG13

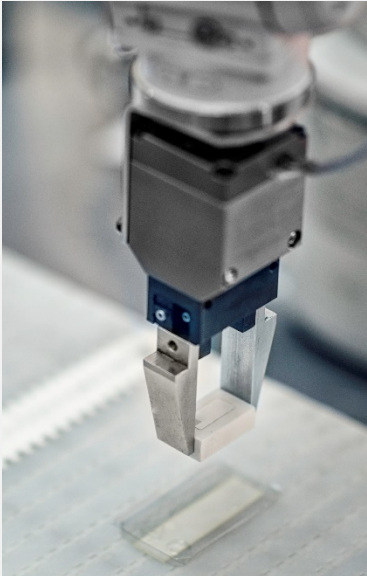
Balance of features, size, power, cost  
Supports dual-protocol

## MG22

Focused on simple low cost  
Zigbee node applications

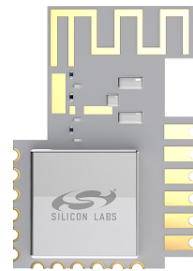
- Optimized for simple end nodes
- Lowest power
- Lowest cost
- New Security Features

# Don't forget the Series 2 MGM210x Wireless Modules



**MGM210P**

Optimized for a wide range of applications

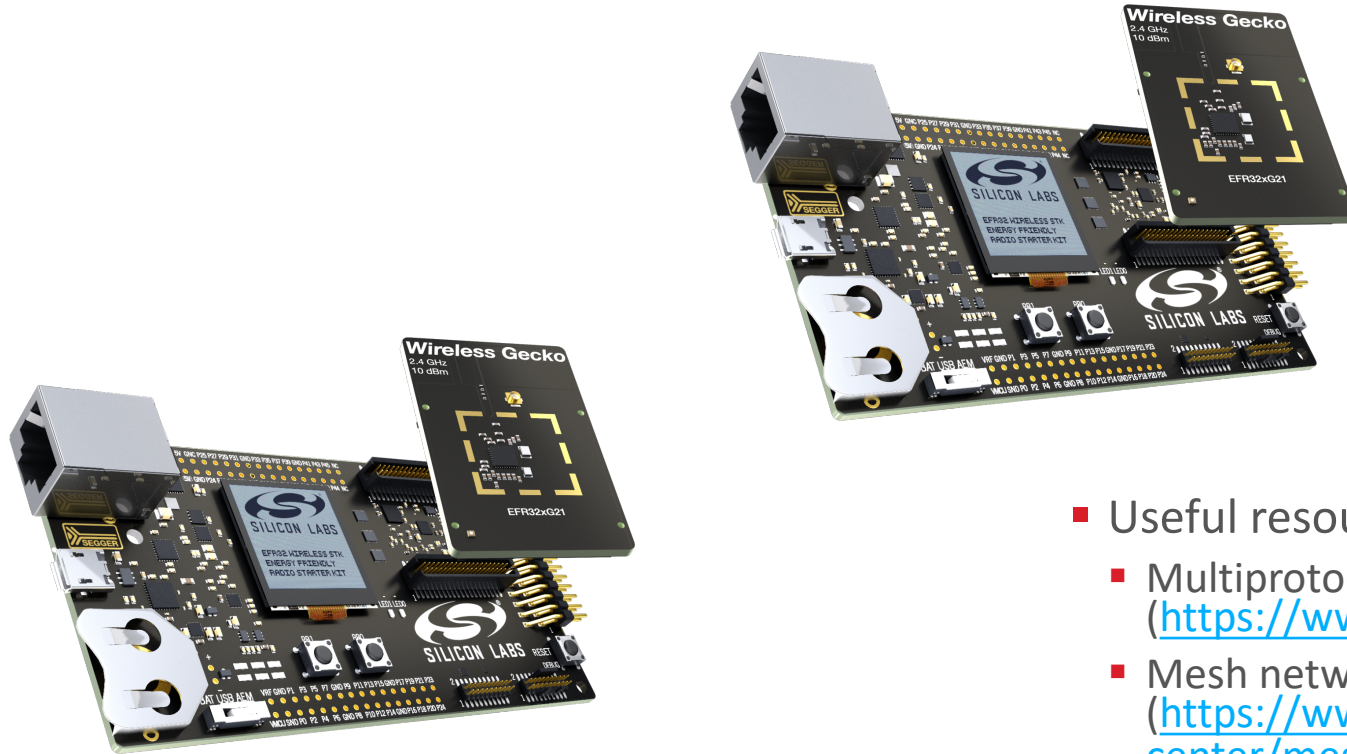


**MGM210L**

Optimized for Smart LED bulbs

- Worldwide certifications
  - Reduce certification costs
  - Mitigate risk
  - Accelerate time-to-market
- Best-in-class security
- High temperature rating up to 125 °C
- Software & support enables easy migration from modules to SoCs
- Field upgradeability ensures product longevity
- Protocols supported:
  - Zigbee
  - Thread
  - Bluetooth LE & mesh
  - **Dynamic multiprotocol**

# Get Started with Development



- Useful resources:
  - Multiprotocol website page (<https://www.silabs.com/wireless/multiprotocol>)
  - Mesh networks performance website page (<https://www.silabs.com/products/wireless/learning-center/mesh-performance>)
  - AN724 - Designing for Multiple Networks on a Single Zigbee Chip (<https://www.silabs.com/documents/public/application-notes/an724-multi-network.pdf>)

# BG22 Virtual Workshop



Learn how to develop and deploy more powerful, efficient, and secure IoT products with your own BG22 Thunderboard – free for all registrants!

New Sessions Open for June

10:00AM –11:30 AM CST - T, W, Th

(Other sessions available for Asia Pacific and Europe)

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# Join Us for a Smart Home Webinar



**SILICON LABS**

WEBINAR

## Smart Home: Work With Any Ecosystem

Wednesday, June 10<sup>th</sup> | 11AM CDT

Register Now

HOME SECURE

DEVICE CONNECTED

SPEAKERS ON

Register at <https://www.silabs.com/applications/smart-home>

# Q & A Session



Thank you

[silabs.com](http://silabs.com)

