MAT-101

Introduction to Matter: Why, What and How

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Agenda

01 ***Why*** was the Matter specification created?

02 ***What*** is Matter?

03 ***How*** is Silicon Lab Addressing Matter?

Why?

Smart Home Dilemma

Smart Home Dilemma

- Multiple Ecosystems available
- Devices often tie to one Ecosystem
- Requires different products, apps and hubs

Manufacturers

- Manufacturers are forced to pick ecosystem(s)
- Need to ship multiple SKUs for connectivity standards
- Need to learn different IoT technologies and ecosystems

Retailers

- Leads to duplicate products on the shelf
- Difficult to provide expert advice to consumer questions
- High return rates due to interoperability or incompatibility

Consumers

- Purchasing confusion
- Hard to mix and match the products they want
- Difficult to change Ecosystems

Matter’s Vision

Developers

- Reduce “Ecosystem specific” products
  - Lower development & operational cost
  - Develop once / deploy everywhere
- Community of support
- Allow more time for innovation

Retailers

- Reduces inventory complexity
  - Lowers inventory cost
  - Requires less shelf space
- Minimize returns

Consumers

- Simplify purchasing experience
- Simplify setup & control
  - Provide more consistent set up experience

Simplicity

Easy to purchase and use

Interoperability

Devices from multiple brands work natively together

Reliability

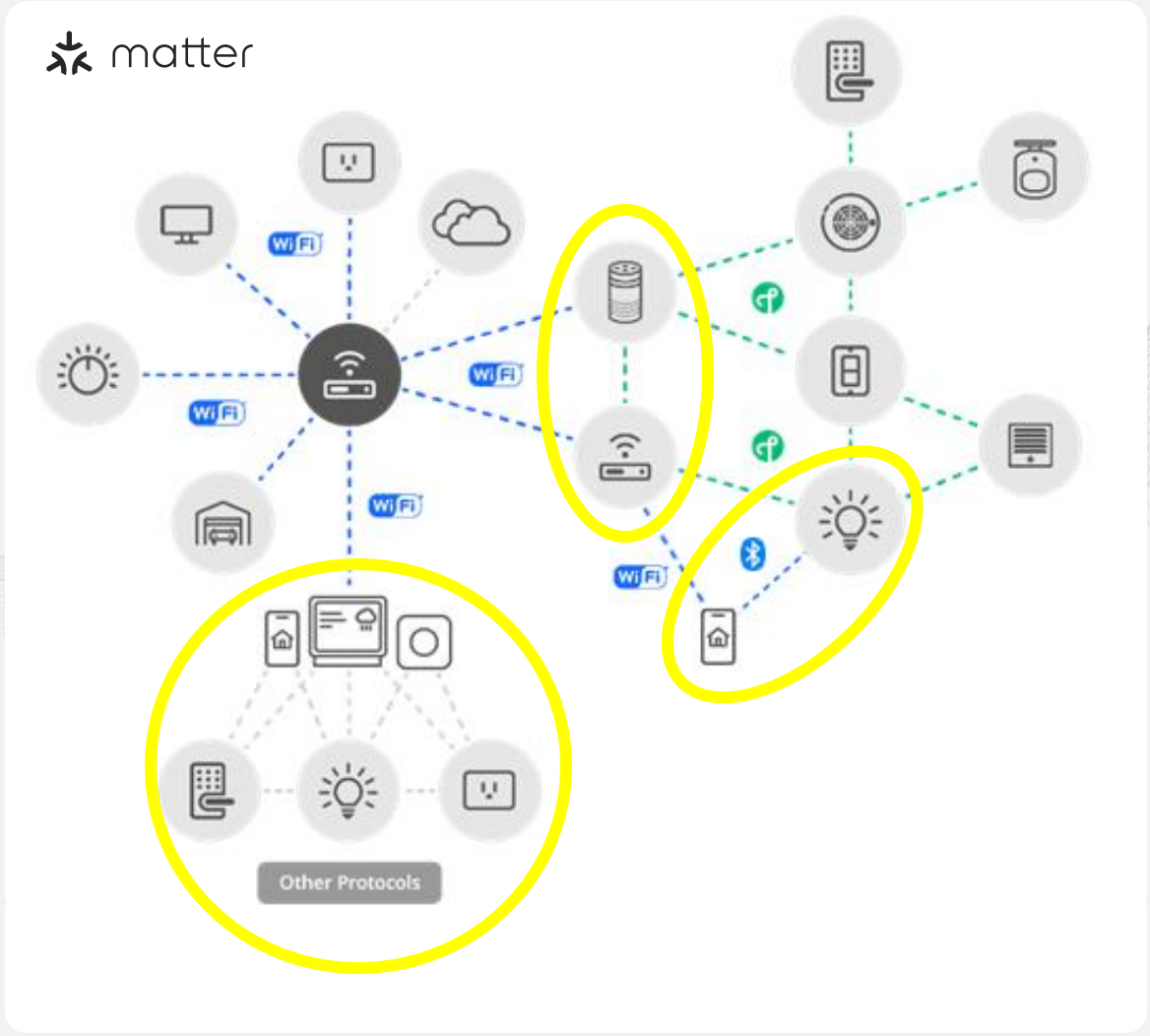
Consistent and responsive local connectivity

Security

Robust and streamlined for developers and users

What?

Network Protocol and Topology



Based on Internet Protocol v6

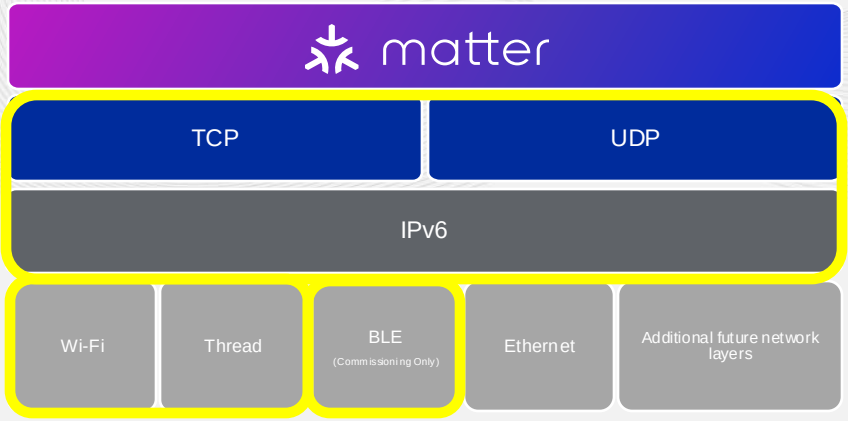
Native support for Wi-Fi and Thread

Thread devices require border routers

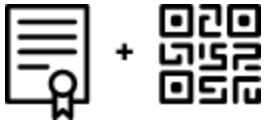
Devices use Bluetooth for commissioning

Bridges can link to other protocols

- Zigbee and Z-Wave



Matter Security – Security at its Core

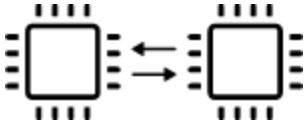


Manufacturing

Matter devices must be injected with a unique DAC certificate/ private key, Onboarding Payload (QR code delivered), Certification Declaration (CD), and other static/ dynamic data during manufacturing. **(Mandatory)**

Commissioning

DAC with VID/PID must be checked against the DCL and CD verified to ensure only authentic and certified Matter devices are commissioned. **(Mandatory)**



Device Communication

Communication between Matter devices must be secured and encrypted using cryptographic keys and PBKDF. **(Mandatory)**

Software Updates

Devices must support OTA firmware updates to allow vulnerabilities to be patched **(Mandatory)**

Other Security Specifications

- Authentication and encryption keys must be generated by a “Deterministic Random Bit Generator” Seeded by NIST 800-90B TRNG **(Mandatory)**
- Debug interfaces and access to secure boot trust anchors should be disabled to only allow authorized access (fusing) **(Recommended)**
- DACs and operational private key confidentiality should be protected from *remote* attacks **(Recommended)**
- Vendors should have a public policy & mechanism to identify and rectify security vulnerabilities in a timely manner **(Recommended)**
- The software should be encrypted *at rest* to prevent unauthorized access to core IP **(Optional)**
- Some devices should be protected against *physical* attacks to prevent tampering, side-channel, or debug glitching attacks. **(Optional)**

Secure Vault can support all Mandatory, Recommended and Optional requirements

Simple Commissioning via QR Code and Bluetooth

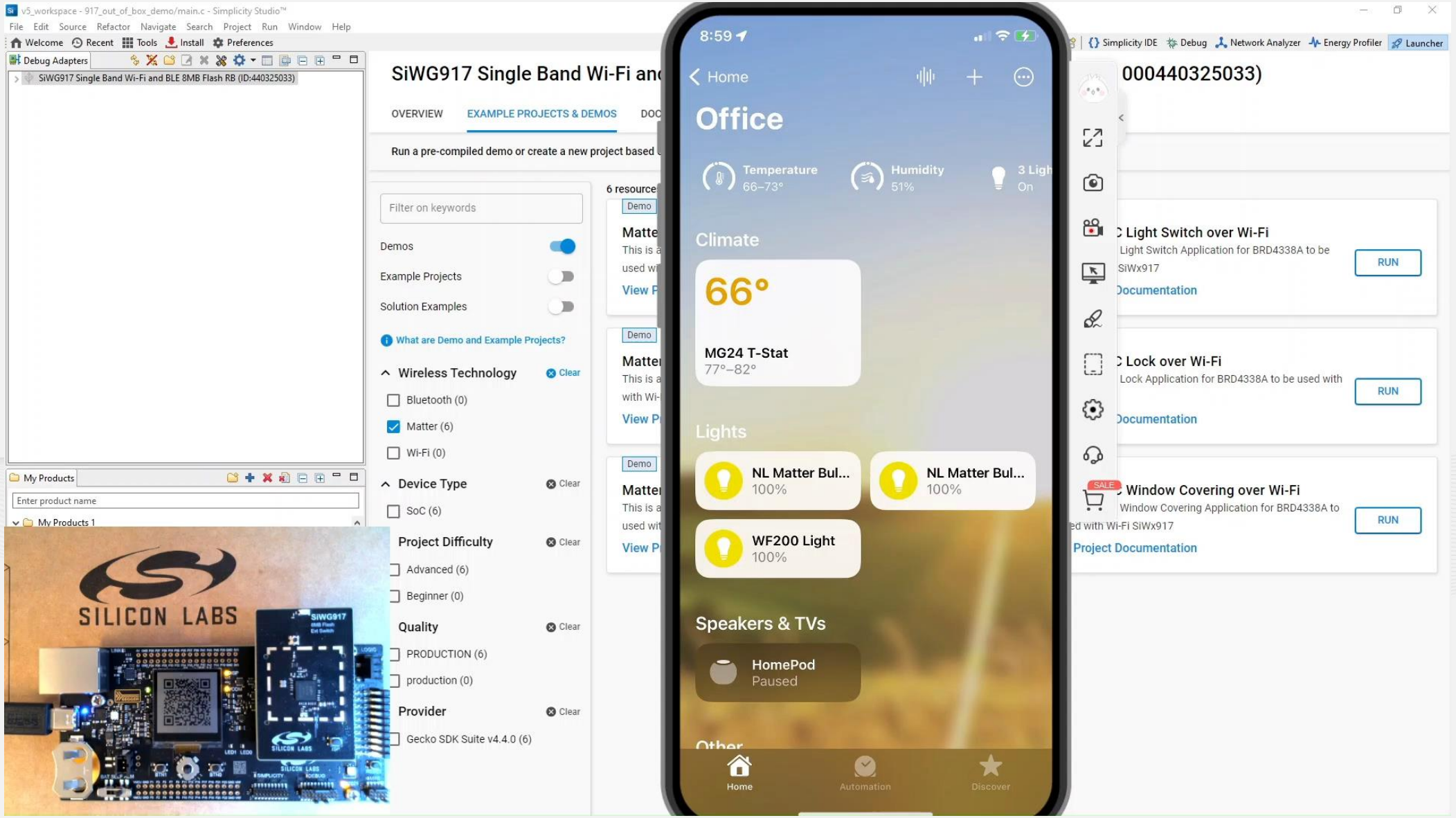
Uses Bluetooth for commissioning

- Typically done via phone or tablet
- Same flow regardless of network protocol (Thread or Wi-Fi)
- Does not require you to connect via Wi-Fi, provide SSID, etc.

Uses QR code to obtain device info, passkey, etc

- Uses phone or tablet to scan QR code
- User does not need to enter info manually
  - Can enter passkey manually if commissioner does not have camera
- Commissioner exchanges credentials, authenticates the device and exchanges keys
  - Verifies the device against the DCL to verify it is certified device

Demo Video



Matter Device Types

Devices Categories and Device Type (May 2024)

Controllers and Bridges

Home Routers and Access Points
New Devices in Development

Sensing
New Devices in Development

Switches

Closures

Lighting and Electrical

HVAC Controls

Robot Devices

Media Devices

Air Quality Control

Smoke and CO Detection

Safety and Security

Water Management

White Goods (Appliances)

Energy Management
New Devices in Development

Cameras
(In Development)

Matter Products available – The Verge

CSA Matter Future Release Cadence

Twice a year releases of new specs

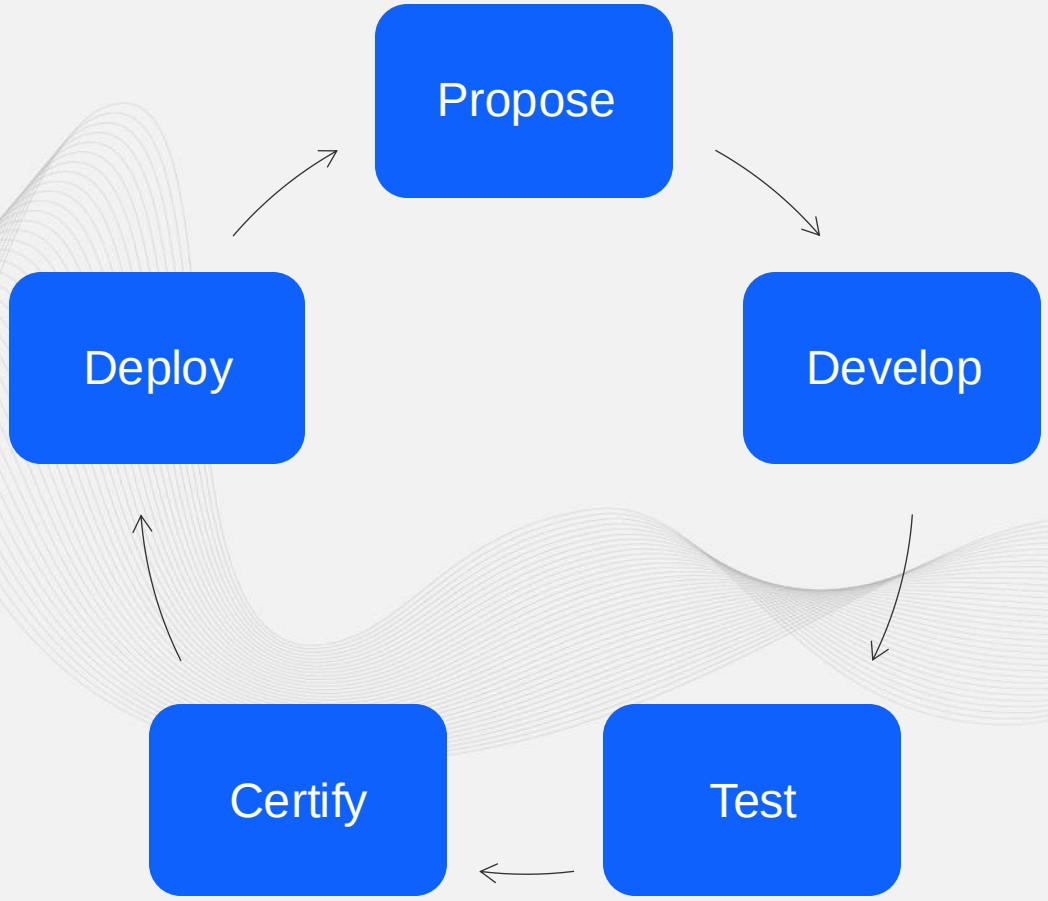
- Fall and Spring

CSA Schedule Targets

- Matter 1.4 – October 2024
- Matter 1.5 – April 2025

Regular cadence for updates to specification

- New and updated device types
- New and updated features, clusters, etc.
- Minor bug fixes



How?

Simplifying Matter Development, Testing and Manufacturing

Guided end-to-end Matter Developer Journey

- Steps developers through learning to deployment including guidance for popular Ecosystems

High-performance Low-power Wireless SoCs and Modules

- Wi-Fi and Thread solutions with Bluetooth Low Energy for commissioning

Wireless Matter solution for Simplicity Studio with Matter SDK

- Proven and pre-certified stacks for Matter over Wi-Fi and Matter over Thread and Bluetooth

Comprehensive Development Tools

- Development kits, tools, and sample applications for Matter use cases

Robust Matter-compliant Security

- The most advanced IoT security solution with full Matter-compliance

Connectivity Lab and Robust SQA

- Developed for testing our software release as well as products from the user's perspective

Silicon Labs Custom Product Manufacturing Services

- Secure Programming of your Matter certificates, security parameters, application, and bootloader

Silicon Labs' Product Portfolio Designed for Matter

matter

High performance RCP for gateways and hubs

- SoCs and Modules
- +20 dBm
- High Sensitivity
- Thread + BLE DMP
- 2.4 GHz co-existence
- Secure Vault

High Performance, low power SoC for end devices

- SoCs and Modules
- +19.5 dBm
- High Sensitivity
- Thread + BLE DMP
- Lowest Power
- Robust peripheral set
- AI/ML accelerator
- Secure Vault High

Most feature rich SoC for end devices

- SoCs and Modules (2025)
- +19.5 dBm
- High Sensitivity
- Largest Flash/RAM
- High GPIO count
- Thread + BLE DMP
- Thead+Zigbee CMP
- Low Power
- Robust peripheral set
- AI/ML accelerator
- Secure Vault High

Lowest power Wi-Fi 6 SoC for battery powered devices

- Wi-Fi 6 End Devices
- SoCs and Modules
- Large Flash/RAM
- Wi-Fi 6 + BLE
- Bluetooth LE co-existence
- Low power

High Performance Wi-Fi 6 for line powered devices

- Wi-Fi 6 End Devices
- SoCs and Modules
- Large Flash/RAM
- Wi-Fi 6 + BT/BLE
- Bluetooth LE co-existence

MG21 – Optimized for Matter over Thread Gateways and Hubs

Bluetooth® THREAD zigbee Multiprotocol

4x4 QFN32 (20 GPIO)

12.9 x 15.0 PCB Module

15.5 x 22.5 Lighting Module

DIFFERENTIATED FEATURES

+20 dBm output power

- Eliminates the need for an external power amplify

Secure Vault

- Protects data and device

Co-existence

- Improves RF performance in crowded 2.4 GHz environments

High Temp Rating up to +125 ºC

DEVICE SPECIFICATIONS

High Performance Radio

- Up to +20 dBm TX
- -97.5 dBm RX @ BLE 1 Mbps
- -105 dBm RX @ BLE 125 kbps
- -104.5 dBm RX @ 15.4

Efficient ARM® Cortex®-M33

- 80 MHz (FPU and DSP)
- 1024kB of Flash
- Up to 96kB of RAM

Low Power

- 9.9 mA TX @ 0 dBm
- 34.9 mA TX @ +10 dBm
- 8.8 mA RX (BLE 1 Mbps)
- 59.8 µA/MHz (CoreMark) @80 MHz

MG24 Optimized for Battery Powered IoT Mesh Devices

matter zigbee

THREAD

Bluetooth® Proprietary

5x5 QFN40 (26 GPIO)

6x6 QFN48 (28/32 GPIO)

DIFFERENTIATED FEATURES

Integrated Power Amplifier

- +19.5 dBm output power

AI/ML accelerator

- Accelerates inferencing while reducing power consumption

Secure Vault High

- Protects data and device from local and remote attacks

20-bit ADC

- 16-bit ENOB for advance sensing

Feature Rich peripherals

20-bit ADC, ACMP, VDAC, EUSART, USART, I2C

PLFRCO

Eliminates need for 32 KHz crystal

Co-existence
Improves RF performance in crowded 2.4 GHz environments

Antenna Diversity
Improves RF performance in multi-path environments

DEVICE SPECIFICATIONS

High Performance Radio

- -97.6 dBm RX @ BLE 1 Mbps
- -105.4 dBm RX @ 802.15.4

Efficient ARM® Cortex®-M33

- Operating Frequency: Up to 78 MHz

Memory

- Up to 256kB RAM
- Up to 1536kB Flash

Low Power

- 5.0 mA TX @ 0 dBm
- 19.1 mA TX @ +10 dBm
- 4.4 mA RX (BLE 1 Mbps)
- 5.1 mA RX (802.15.4)
- 33.4 µA/MHz
- 1.3 µA EM2 with 16 kB RAM

Wide Operating Range

- 1.71 to 3.8 volts
- +125ºC operating temperature

MG26: Addressing High-end, Low power IoT Mesh Devices

matter zigbee

THREAD

Bluetooth® Proprietary

6x6 QFN48 (28 GPIO)
6x6 QFN48 (32 GPIO)
8x8 QFN68 (49 GPIO)
7x7 BGA136 (64 GPIO + 4 AIN)

DIFFERENTIATED FEATURES

- **Large Flash and RAM**
  - Future proofs product
  - More application space
  - Eliminates external flash
- **High GPIO Count**
  - Up 64 GPIO & 4 analog in
  - More complex use cases
- **Integrated Power Amplifier**
  - +19.5 dBm output power
- **Integrated segment LCD**
  - Up to 288 segments
  - 4x40 or 8x36
- **Faster AI/ML inferencing**
  - 8x faster and 6x lower power
- **Drop-In Compatible xG24**
  - 6x6 QFN48
- **Advanced Sensing**
  - 20-bit ADC with 16-bit ENOB

DEVICE SPECIFICATIONS

- **High Performance Radio**
  - Up to +19.5 dBm TX
  - -97.6 dBm RX @ BLE 1 Mbps
  - -94.8 dBm RX @ 2Mbps GFSK
  - -105.7 dBm RX @ 125 kbps GFSK
- **Efficient ARM® Cortex®-M33**
  - 78 MHz
- **Memory**
  - 3200 kB Flash
  - 512 kB RAM
- **Low Power**
  - 6.0 mA TX @ 0 dBm
  - 6.2 mA RX (802.15.4)
  - 5.4 mA RX (BLE 1 Mbps)
  - 19.0 mA TX @ +10 dBm
  - 1.4 µA EM2 sleep
  - 56.6 µA/MHz (Coremark)

SiWx917: Ultra-Low-Power & High-Performance Wi-Fi 6 SoC

7x7 QFN84

DIFFERENTIATED FEATURES

- **Ultra Low Power**
  - Wi-Fi Standby Assoc current of 50uA @ 1 sec
  - Long Battery life
- **Multi- Protocol Co-existence**
  - Wi-Fi 6 + Bluetooth LE 5.4
- **High Performance 2.4 GHz Radio**
  - 802.11b/g/n/ax, 1x1, 20MHz
  - Up to +20dBm for Wi-Fi
  - Up to +19.5dBm for Bluetooth
- **Best-in-class Security**
  - High Security for the Device. , Protocol and Networking
- **Host-less single chip SoC**
  - Low RBOM count
  - Reduces cost and complexity

DEVICE SPECIFICATIONS

- **Integrated Application MCU**
  - ARM® Cortex®-M4 with FPU
- **Hosted operation**
  - RCP- OSD Linux Drivers
  - NCP- SPI, SDIO, UART
- **Memory**
  - Up to 672kB RAM
  - Up to 8MB Flash stacked (or ext flash)
  - Up to 8MB PSRAM stacked
  - Optional PSRAM support
- **Integrated Stacks**
  - Wi-Fi, Bluetooth, TCP/IP Networking Matter
- **Certifications**
  - FCC/IC/CE/MIC certified modules
  - BTSIG certification
  - Wi-Fi alliance certification

SiWx915: Low-power, High Performance Wi-Fi 6 IoT SoC

Wi Fi Bluetooth

matter

7x7 QFN84

DIFFERENTIATED FEATURES

- **Multi- Protocol Co-existence**
  - Wi-Fi 6 + Bluetooth LE 5.4
- **High Performance 2.4 GHz Radio**
  - 802.11b/g/n/ax, 1x1, 20MHz
  - Up to +20dBm for Wi-Fi
  - Up to +19.5dBm for Bluetooth
  - Ensures reliable communication
- **Best-in-class Security**
  - High Security for the Device. , Protocol and Networking
- **Host-less single chip SoC**
  - Low RBOM count
  - Reduces cost and complexity
- **Low Power**
  - Wi-Fi Standby Assoc current of 120uA @ 1 sec
  - Energy Efficient

DEVICE SPECIFICATIONS

- **Integrated Application MCU**
  - ARM® Cortex®-M4 with FPU
- **Hosted operation**
  - RCP- OSD Linux Drivers
  - NCP- SPI, SDIO, UART
- **Memory**
  - Up to 672kB RAM
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- **Integrated Stacks**
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Matter Software and Simplicity Studio

CSA GITHUB

Pure Matter is open-source software for developers and device makers that want to contribute to the community.

Who is it for?

- For experimenting & prototyping
- Organizations with sufficient resources and the ability to contribute to open-source development.

connectivity standards alliance

Open-source for Experimenting

SIMPLICITY STUDIO

Complete IDE that automatically tailors the Matter development experience for your HW. Easiest, smoothest, most integrated!

What Is Included?

- All wireless & Matter SDKs
- Advanced wireless developer toolkit, sample applications, network analyzer, test harness, certification capabilities, etc.
- VS Code extension – Full dev experience with the tools of your choice

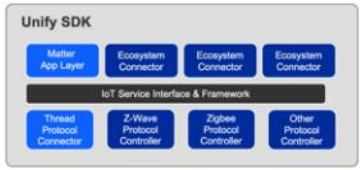
Easiest & Most Integrated!

UNIFY SDK

Simplified multiprotocol SW development for Matter Bridge and gateways.

Benefits of Unify Sdk

- Enables turnkey Zigbee to Matter and Z-Wave to matter bridging
- Reduce development costs and Time-to-Market
- Develop & maintain a single codebase – Unify SDK handles protocol-specific

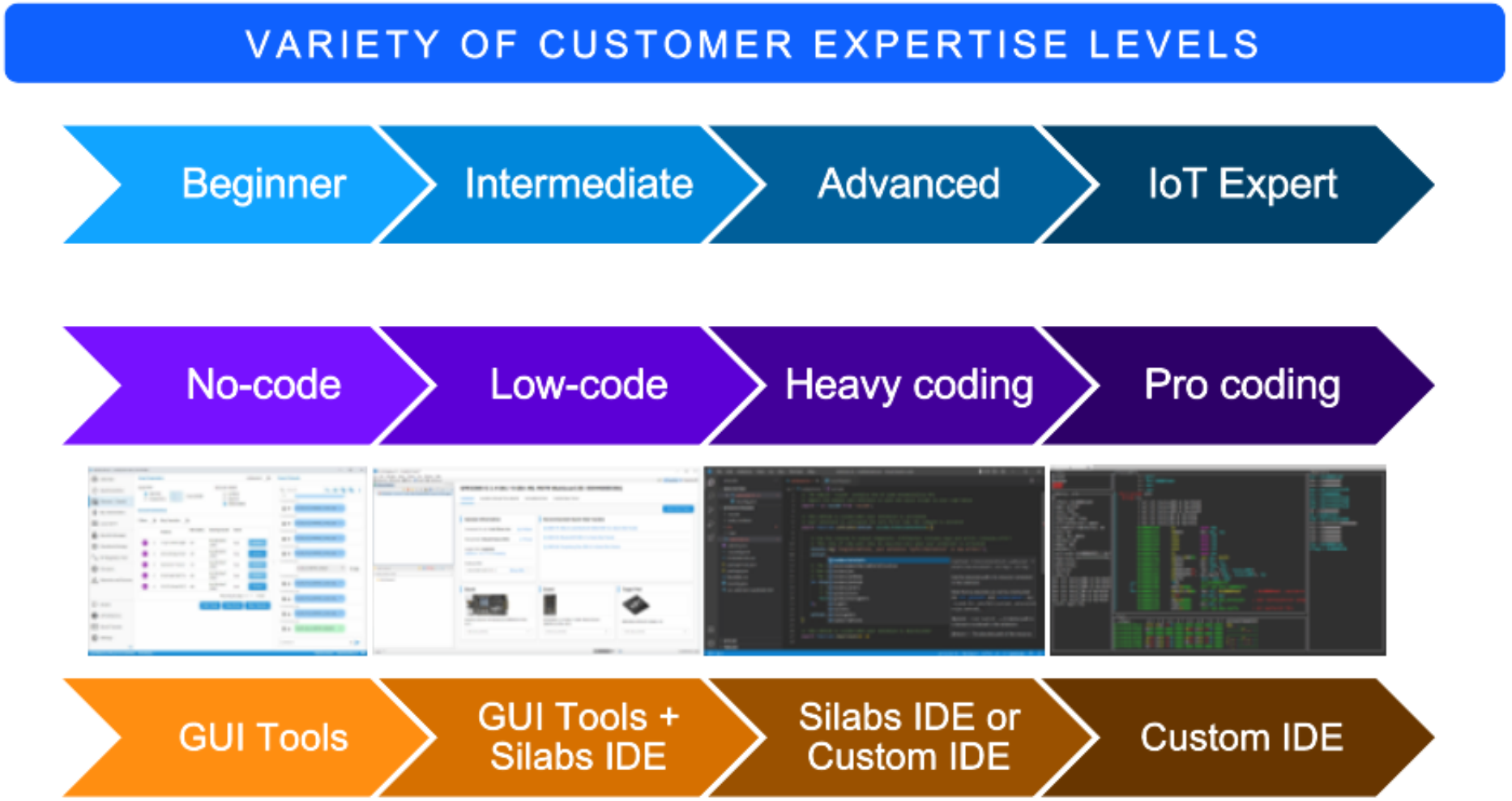


Matter Bridge & Gateways!

Comparing Matter Tools

	Item	Open-source Solution with Community Contribution GitHub	Silicon Labs Simplicity Studio and GSDK support Studio & GSDK Matter
Development	Thread Part Support	Yes	Yes
	Wi-Fi Part Support	Yes	Yes
	Developer Platforms	MacOS, Linux	Windows, MacOS Linux
	Studio Tools Support	No	Full
	Memory Optimizations	No	Full
	Core Protocol Stack	Source Code	Pre-built Compliant Library
QA	Production Testing	No	Yes
	Performance Testing	No	Yes
Certification	Thread Certified Libraries	Yes	Yes
	Matter Compliance Testing	No	Yes
Support	Application Engineering Support	Limited	Full

No Code vs Pro Code



Comprehensive Development Tools

Explorer Kit

- Lowest-cost wireless and MCU development platform
- Compact, scalable, and easy to use
- Minimal on-board features
- FW App Development
- 3rd party hardware support

Dev Kit

- Wireless SoC evaluation board with sensors
- On-board sensors
- Quick prototyping
- Out-of-the-box demos
- 3rd party hardware support

Pro Kit

- Full-featured wireless and MCU development platform
- Radio board + mainboard
- Modular design for radio boards
- Energy profiling
- Advanced debug & test
- RF measurements
- Network analysis

Radio Board

- Wireless SoC and module development
- Primary RF reference design
- Requires mainboard
- Modular design
- Scalable across portfolio

Expansion Board

- Wireless co-processor development platform
- Requires Host Platform (EFR or 3rd Party MCU/MPU)
- For NCP and RCP app development

Secure Vault™ - Robust Matter-compliant Security

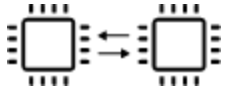
Mid	High	Feature
✓	✓	True Random Number Generator
✓	✓	Crypto Engine
✓	✓	Secure Application Boot
VSE / HSE	HSE	Secure Engine
✓	✓	Secure Boot with RTSL
✓	✓	Secure Debug with Lock/Unlock
✓ (HSE) Optional (VSE)	✓	DPA Countermeasures
—	✓	Anti-Tamper
—	✓	Secure Attestation
—	✓	Secure Key Management
—	✓	Advanced Crypto

MANUFACTURING

Matter devices must be injected with a unique DAC certificate/ private key, Onboarding Payload (QR code delivered), Certification Declaration (CD), and other static/ dynamic data during manufacturing

COMMISSIONING

DAC with VID/PID must be checked against the DCL and CD verified to ensure only authentic and certified Matter devices are commissioned.



DEVICE COMMUNICATION

Communication between Matter devices must be secured and encrypted using cryptographic keys and PBKDF.

AUTHENTICATION AND ENCRYPTION

Authentication and encryption keys must be generated by a “Deterministic Random Bit Generator” Seeded by NIST 800-90B TRNG

Connectivity Lab – Test Matter & Ecosystems

Why Connectivity Lab?

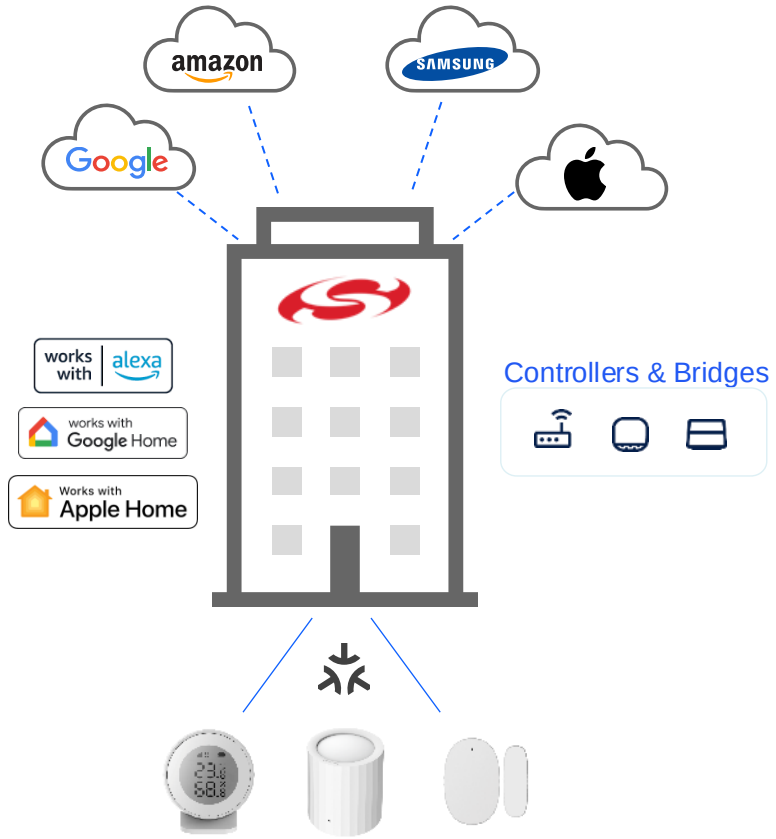
- Many ecosystems support Matter today. However, we are on the verge of exponential market growth
- The increasing popularity of Matter will make interoperability and unification more complex
- Connectivity Lab will provide a practical and simple way to improve many-to-many interoperability to tear down the boundaries between ecosystems

Purpose

- Simulate a real home to address the real issues users might experience when using smart home
- Test real-world multi-fabric use cases in Matter
- Find out solutions to improve interoperability between the ecosystems
- Test the theories to help the smart home industry to advance to a unified, commercially viable, global system

Availability

- Connectivity Lab build-up is happening now while it is already producing valuable ecosystem unification insights for Silicon Labs and its customers and partners



Connectivity Lab Complements Silicon Labs' Leadership as a One-stop Matter Solution Provider

Custom Part Manufacturing Service

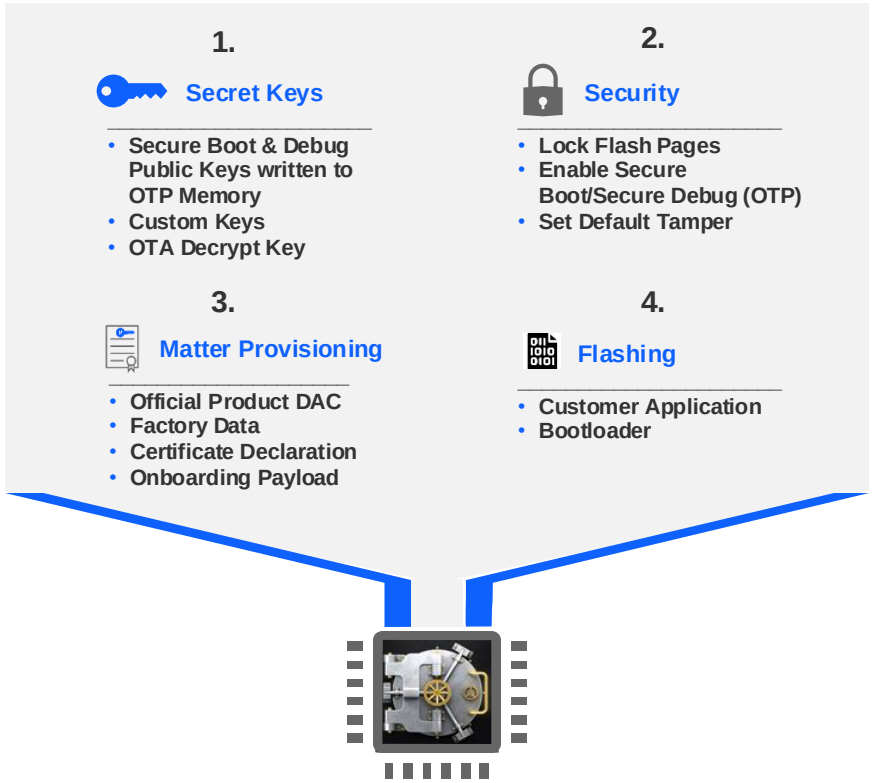
User customization of Silicon Labs devices

- Ensures secure supply chain and prevents counterfeiting
- Simplifies product manufacturing and test fixture cost
- Helps meet upcoming security regulations
- Self-service web portal

CPMS Options

- Unique Part Numbering
  - Track shipments to avoid overproduction and counterfeiting
- Custom Marking
  - Hide the technology used in your products
- Custom Programming - Application and Bootloader
  - Pre-flash your software securely and cost efficiently
- Secure Options
  - Debug Lock – Secure debug port to protect IP
  - Secure Boot – Ensures only authorized firmware is run
  - Key Injection – Safeguard products before production
  - Custom Identity – Ensure product authentication
  - Tamper Detection – Protect products from attacks
- Custom Marking
  - Hide the technology used in your products
- **Matter DAC Injection**
  - **Simplify Matter product manufacturing**

Secure Programming (CPMS)



Summary

Summary

Matter addresses the challenges faced by consumers, manufacturers, and retailers

- Reduce purchasing confusion and returns
- Improve interoperability and user experience

Matter aims to bring simplicity, interoperability, reliability, and security to smart home devices

- Enables devices from multiple brands to work natively together on multiple ecosystems

Silicon Labs' provides lowest power Matter over Thread and Matter over Wi-Fi solutions

- Designed to address a broad range of applications for Matter

Silicon Labs' end-to-end Matter developer journey

- Simplifies Matter development, testing, and manufacturing

Silicon Labs is committed to the success of Matter

- Strong portfolio of both Matter over Wi-Fi and Matter over Thread
- Continued development and support in CSA for new features and device types
- Largest Matter code contributor among Semiconductor companies

Q&A

Thank You