Cypress Bluetooth MESH Solution
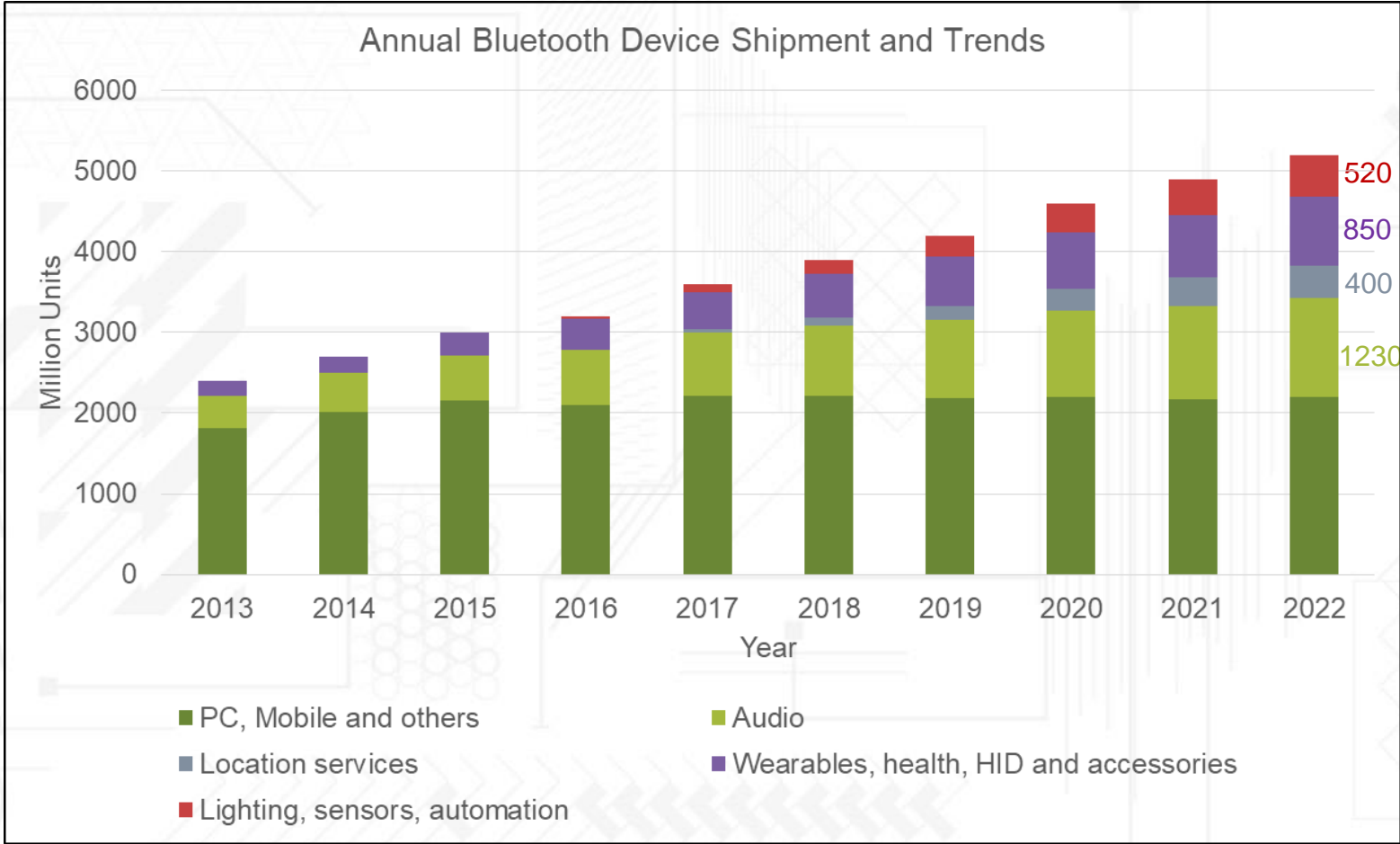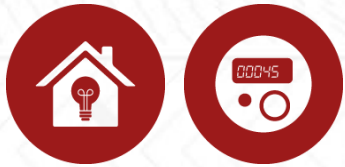
刘楠 John Liu

5/23/2019

Agenda

- Bluetooth market overview

- Bluetooth MESH and applications

- CYPRESS Bluetooth MESH solution

Bluetooth Shipments and Trends

Annual Bluetooth Device Shipment and Trends

Lighting and automation are the fastest growing emerging markets

HID, health and medical, and wearable market is expanding

Location service market emerged in 2016. Although small, it is growing fast

Audio market will maintain its size

Source: Bluetooth SIG-2018

Cypress is best positioned to address all growing Bluetooth markets – Now with Bluetooth Mesh also!

Market Vision

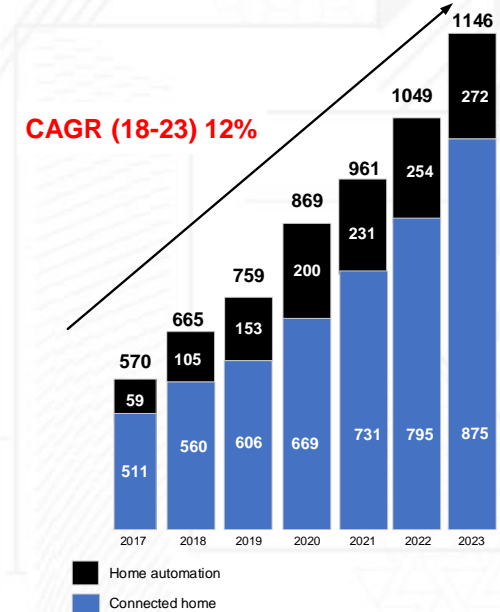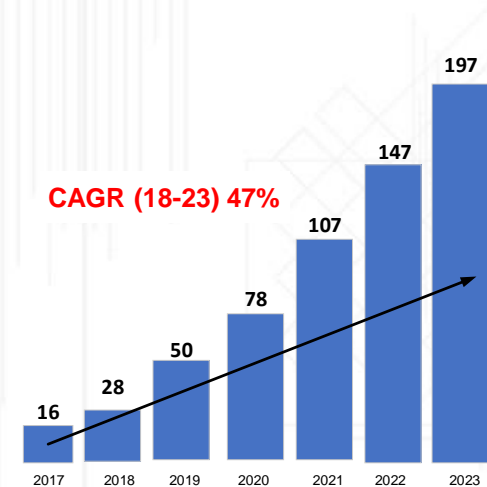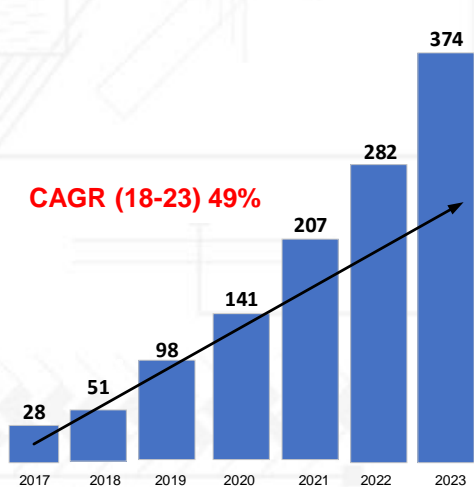# Emerging Applications Will Leverage Bluetooth Mesh
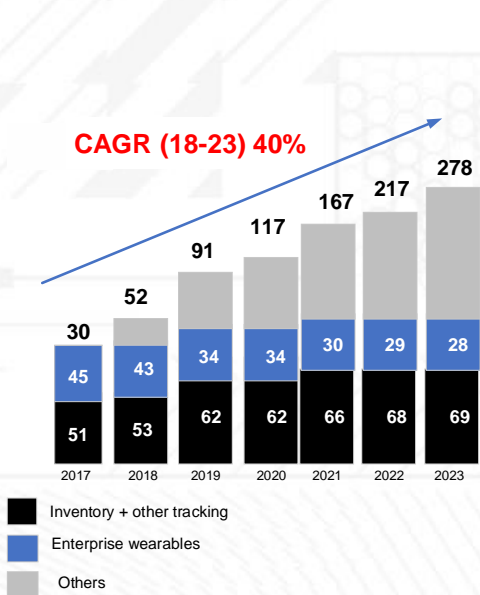
Smart Industry

Smart Building

Smart City

Smart Home

Device Shipment Forecast (Mu)

Smart Industry chart:

CAGR (18-23) 40%

Year	Inventory + other tracking	Enterprise wearables	Others	Total
2017	51	45		30
2018	53	43		52
2019	62	34		91
2020	62	34		117
2021	66	30		167
2022	68	29		217
2023	69	28		278

- ■ Inventory + other tracking
- ■ Enterprise wearables
- ■ Others

Smart Building chart:

CAGR (18-23) 49%

Year	Value
2017	28
2018	51
2019	98
2020	141
2021	207
2022	282
2023	374

Smart City chart:

CAGR (18-23) 47%

Year	Value
2017	16
2018	28
2019	50
2020	78
2021	107
2022	147
2023	197

Smart Home chart:

CAGR (18-23) 12%

Year	Connected home	Home automation	Total
2017	511	59	570
2018	560	105	665
2019	606	153	759
2020	669	200	869
2021	731	231	961
2022	795	254	1049
2023	875	272	1146

- ■ Home automation
- ■ Connected home

Source: Bluetooth SIG-2019

Market Vision

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Bluetooth Mesh Use Cases

Smart Industry
Asset Tracking

Smart Building
Location, sensors

Smart City
Beacons
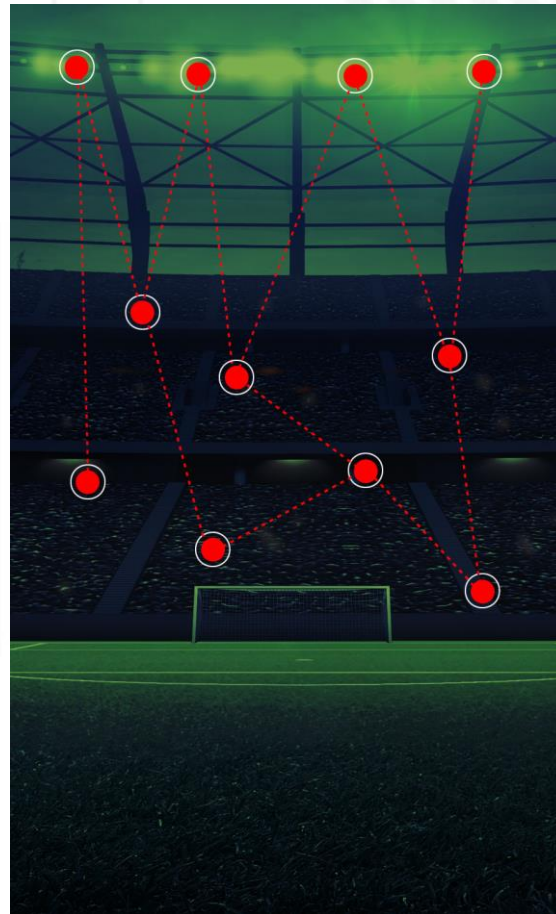
Smart Home
Lighting
Automation

Additional Detail

CYPRESS
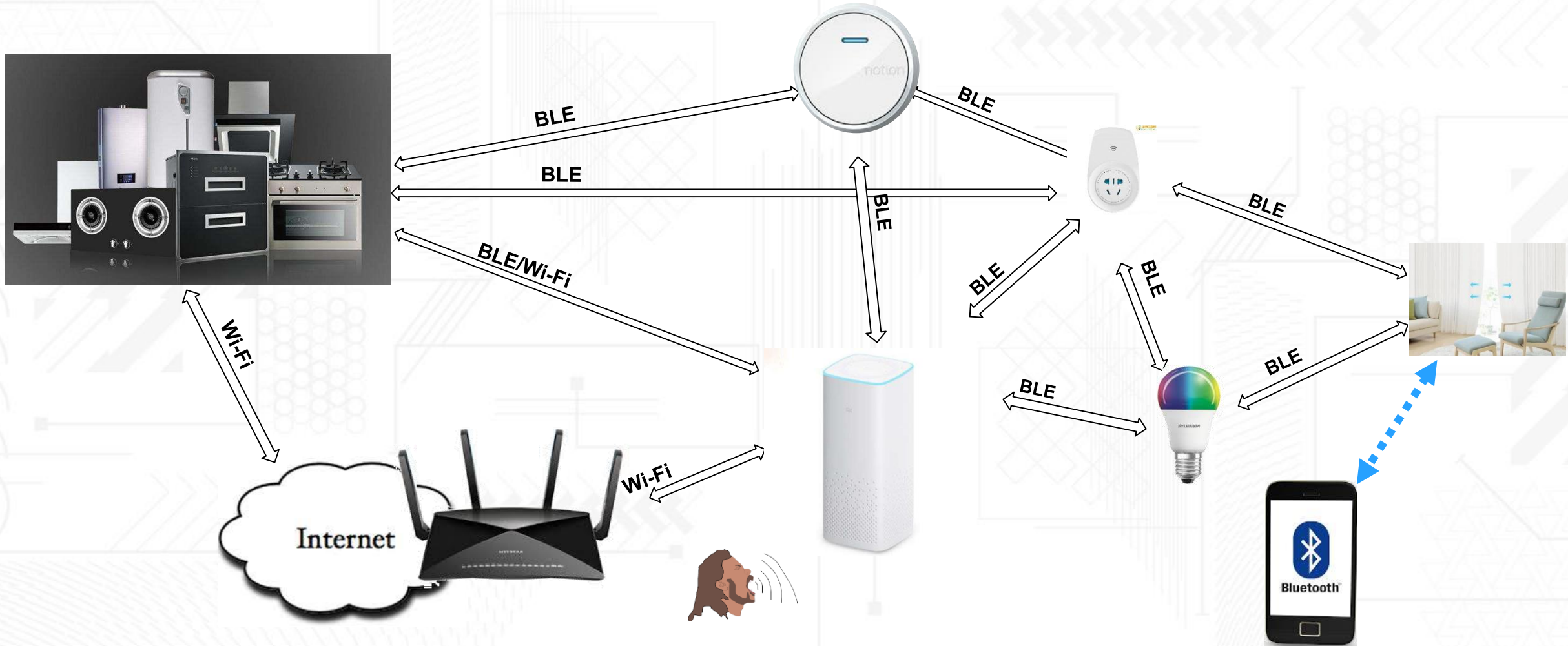EMBEDDED IN TOMORROW

Bluetooth Mesh Use Cases – Smart Home

- MESH Server and Client into Platforms: Linux, RTOS, Android, IOS etc.

Design Problems Engineers Face

- **Mesh nodes need low-power capabilities as well as extended range**
  - Battery-powered applications, such as sensors and door locks, need ultra-low-power mesh node operation
  - Depending on the application, mesh nodes may be far away from neighboring nodes

- **Bluetooth hardware design is complex with high certification costs**
  - Low volumes along with lack of RF experience make chip-on-board designs difficult
  - Regulatory certification of Bluetooth designs are costly and very time consuming

- **Proper implementation of mesh requires extensive resources for software, firmware, and mobile development**
  - Standard Bluetooth Mesh implementation is needed for interoperability
  - Mobile applications are a must for configuration and management of mesh nodes

Solution: Cypress' Bluetooth 5 MCUs Enabled with Bluetooth Mesh

- Full portfolio of Mesh-compliant silicon and pre-certified module solutions

- Low-power radio options available along with up to 10-dBm Tx power capabilities to reach longer distances

- Best-in-class Bluetooth Mesh implementation that is SIG Compliant, with example projects and reference mobile apps

Design Problems

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Cypress Bluetooth Mesh System-Level Solution

Cypress BT Mesh Solution
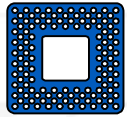
Hardware

- Broad silicon portfolio
- Fully certified modules
- Development kits

Software/Firmware

- Easy-to-use software
- Several code examples
- Full support of Mesh Profiles

Mobile Applications

- Reference application source code and mesh libraries for Windows, iOS, and Android

System Level Solution

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Cypress Bluetooth Mesh System-Level Solution

All Bluetooth MESH 1.0 mandatory & optional features

OTA-over-mesh (pre spec)

Remote provisioning (pre spec)

Mesh controller app including JSON provisioning database

Mesh libraries (Windows/Android/Linux)

Reference application for dimmable light, switch, dimmer, motion sensor, and temperature sensor

Reference iOS app

Reference Android app

Reference Linux mesh stack (BSA)

Additional Detail

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Cypress Bluetooth Mesh System-Level Solution

Cypress BT Mesh Solution

- **Proxy Feature/Node**
  - Allows smartphones to connect to the mesh over GATT bearer

- **Relay Feature/Node**
  - Provides the ability to Receive (RX) and Transmit (TX) Mesh messages over the advertising bearer

- **Friend Feature/Node**
  - Stores messages destined for an LPN device
  - Delivers messages to LPN nodes when polled by the LPN device

- **Low Power Feature/Node (LPN)**
  - Provides the ability to operate at a significantly reduced RX duty cycle
  - Works in conjunction with a node that supports the Friend feature
  - LPNs can operate for multiple years on a coin cell battery

WICED
MESH LIGHTING

Smartphone
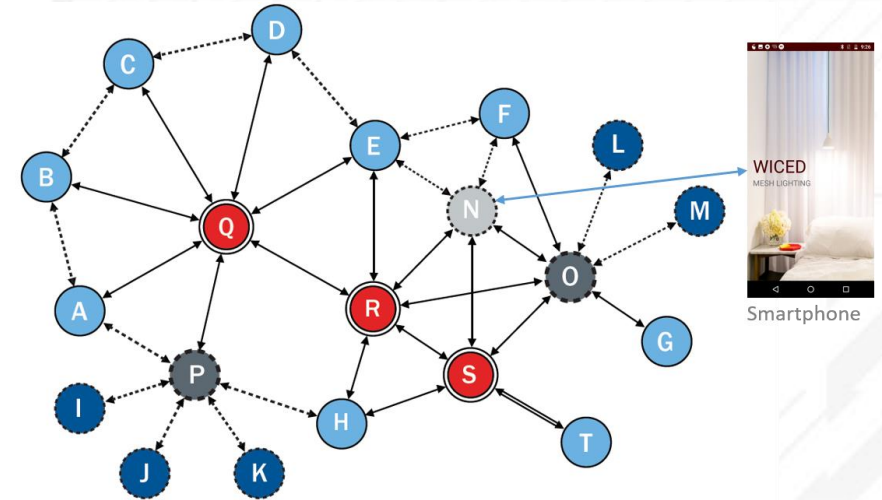
BLUETOOTH MESH NODE TYPES

| Relay Node | Low Power Node | Friend Node | Proxy Node |

Support all type of Nodes and Multiple features can co-exist on a single node/device!

System Level Solution

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SYLVANIA SMART+ Lighting Portfolio Adds World's First Bluetooth Mesh Qualified LED Products
LEDVANCE Breaks New Ground with Industry First Technological Achievement
January 6th, 2018

CYW20719 Inside

## Sylvania Announces World's First BLE Mesh Qualified LED Bulbs

Wilmington, Mass. – Lighting leader LEDVANCE, maker of SYLVANIA general lighting products in North America, has developed the **world's first LED lighting products that are Bluetooth® mesh qualified** … The new Bluetooth mesh networking technology allows a user to control devices, in another room because Bluetooth mesh qualified devices can speak to each other when within 300 meters and pass along command signals…The SYLVANIA SMART+ Bluetooth lighting products from LEDVANCE with **Cypress'** qualified interoperable Bluetooth mesh technology mark a significant step forward …

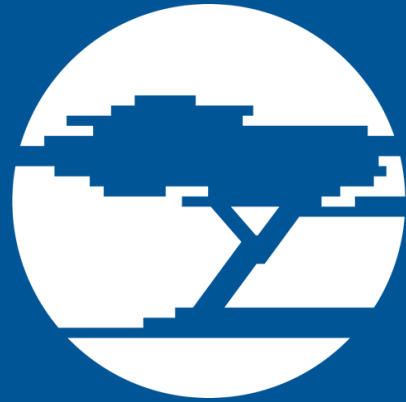## Industry's First Production BLE Mesh Solution!

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How To Get Started

1. **Purchase a Cypress Bluetooth Mesh Evaluation Kit (CYBT-213043-MESH)**

2. **Download the ModusToolbox IDE**

3. **Join the Cypress Developer Community (CDC)**

4. **Start your Bluetooth Mesh application using the Mesh Kit User Guide and resources to the right**
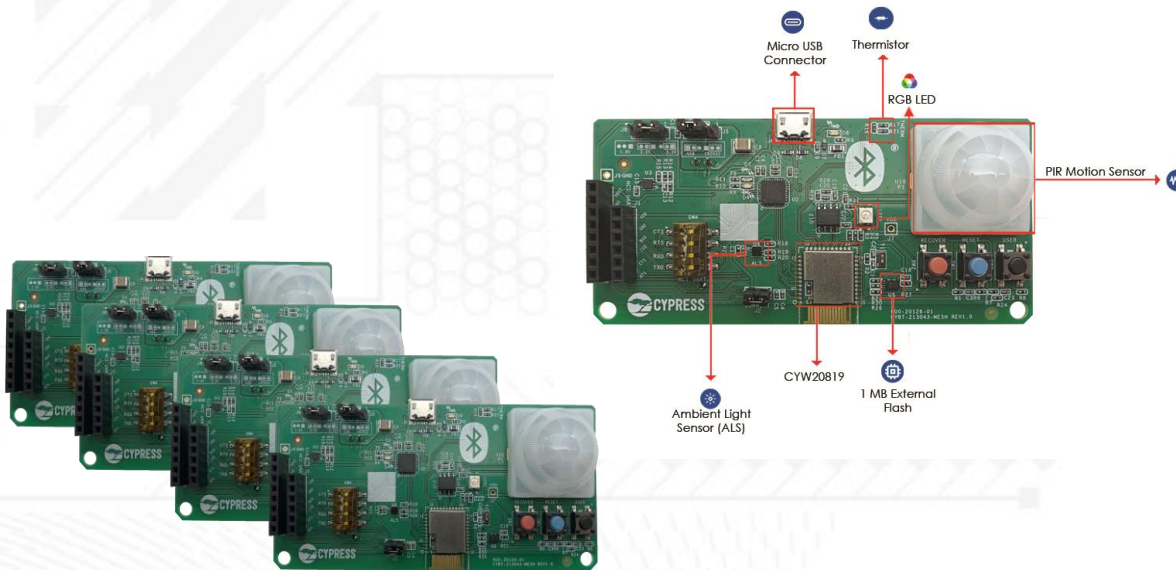
Resources

- **Product Pages**
  - Cypress Bluetooth Mesh Solutions
  - Cypress Bluetooth/BLE Solutions

- **Cypress Developer Community (CDC)**
  - ModusToolBox Bluetooth SDK

- **App Notes/Datasheets/Technical Docs**
  - Getting Started with Bluetooth Mesh Application Note
  - MeshClient and ClientControlMesh App User Guide
  - CYW20819 Ultra Low Power, BLE/BR/EDR BT 5.0 SoC Datasheet
  - CYBT-213043-02 EZ-BT Module Datasheet
  - CYW20819/20820 Hardware Design Guideline

How To Get Started & Resources

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