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LR-103

The Evolving Landscape of RF Mesh: Enabling Smart Metering with In-Meter Gateway and HAN

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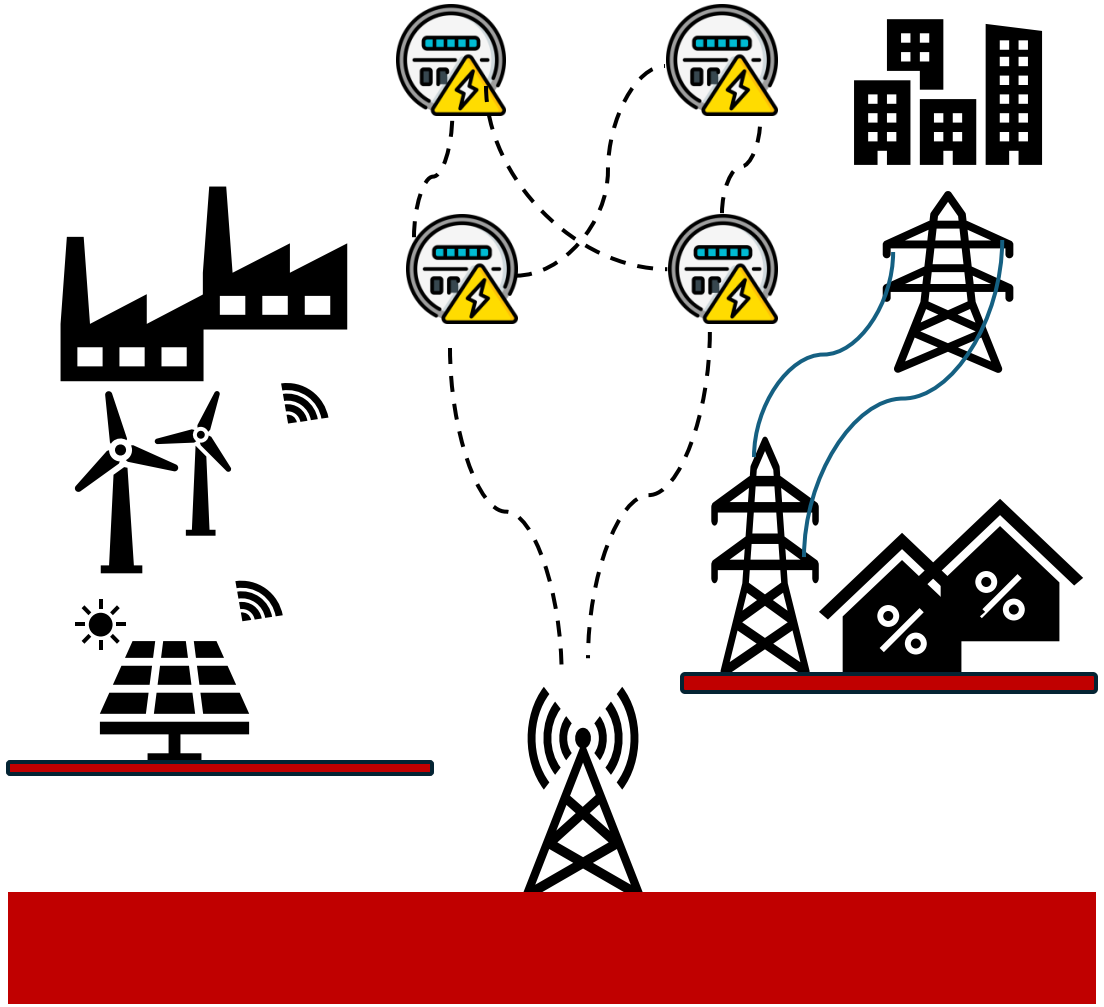
Introduction

What We'll Explore Today:

- **Why the Grid Needs to Evolve**
  Learn about the digital transformation from centralized generation to distributed, intelligent systems
- **The Role of RF Mesh in Modern Grid Networks**
  Discover how RF Mesh enables scalable, secure, and reliable connectivity for smart energy applications
- **Applications Across the Grid**
  See how RF Mesh powers microgrids, solar infrastructure, smart metering, and in-meter gateways
- **Inside the Smart Home**
  Understand the growing importance of Home Area Networks and Matter over Wi-Fi in grid-aware homes
- **Silicon Labs' Technology Advantage**
  Explore our end-to-end SoC solutions built for grid automation and energy efficiency
- **End-to-End Vision for Grid Intelligence**
  Wrap up with how it all ties together from silicon to cloud for a smarter, cleaner energy future

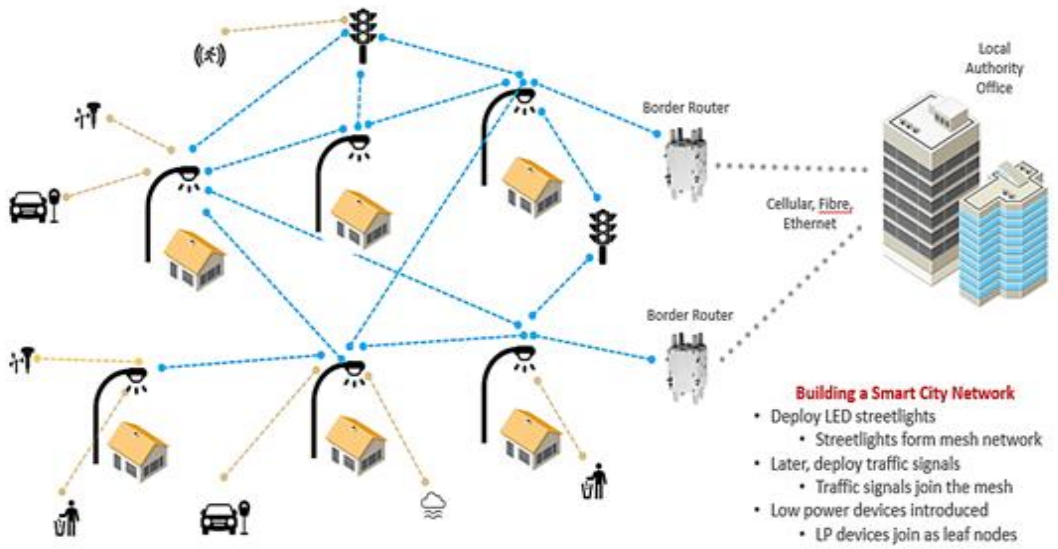
Automating the Grid - Generation to Distribution

- **The Grid is Evolving**
  - Transitioning from a centralized, one-way system to a decentralized, real-time energy platform
  - Driven by the rise of Distributed Energy Resources (DERs)
- **Smarter Energy Generation**
  - Dynamic control of solar, wind, and microturbines
  - Local optimization of production based on real-time demand and availability
- **Edge Intelligence Enables Autonomy**
  - Edge devices make autonomous decisions without relying on central/cloud systems
  - Enables self-healing grids, real-time fault detection, and fast recovery
- **From Monitoring to Action**
  - Real-time sensors and SCADA systems enhance observability
  - Use of synchro phasors and AI/ML drives predictive, high-resolution control
- **Silicon Labs Powers the Intelligent Grid**
  - Ultra-low-power wireless SoCs for edge nodes
  - Built-in security, resilience, and low-latency mesh connectivity
  - RF Mesh ensures secure, reliable communication across all grid layers



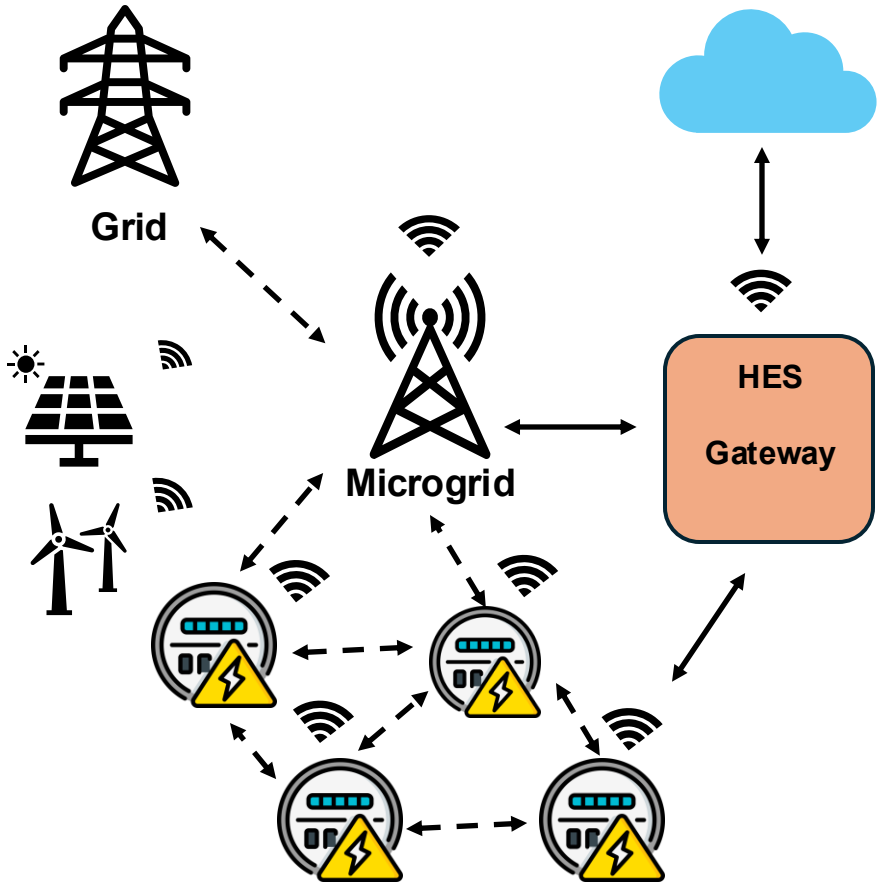
Introduction to RF Mesh Networks

- **Why RF Mesh is Transforming Utility Infrastructure**
  - Decentralized, self-healing communication over Sub-GHz ISM bands ensures uptime in harsh environments
  - Every node is intelligent: smart meters, inverters, and controllers relay, receive, and forward data boosting reach and redundancy
  - Dynamic rerouting around interference or failures provides unmatched field reliability
- **Designed to Scale with Your Grid**
  - RF Mesh grows stronger as more nodes are added improving coverage, path diversity, and network resilience
  - Enables secure, two-way communication for firmware updates, DER control, and real-time billing
  - Perfect for both urban density and rural distance — where uptime and flexibility are non-negotiable
- **Silicon Labs: Enabling RF Mesh Success**
  - Full-stack support for proprietary solutions like Wirepas Sub-GHz Mesh
  - Certified Wi-SUN FAN 1.1 solutions with Silicon Labs SoCs for interoperable, standards-based deployments
  - Ensures security, vendor flexibility, and a future-proof path to grid modernization
- **Bottom Line**
  - RF Mesh empowers smart utility networks with unmatched reliability, flexibility, and scalability and Silicon Labs provides the tools to build them.



RF Mesh in Microgrids

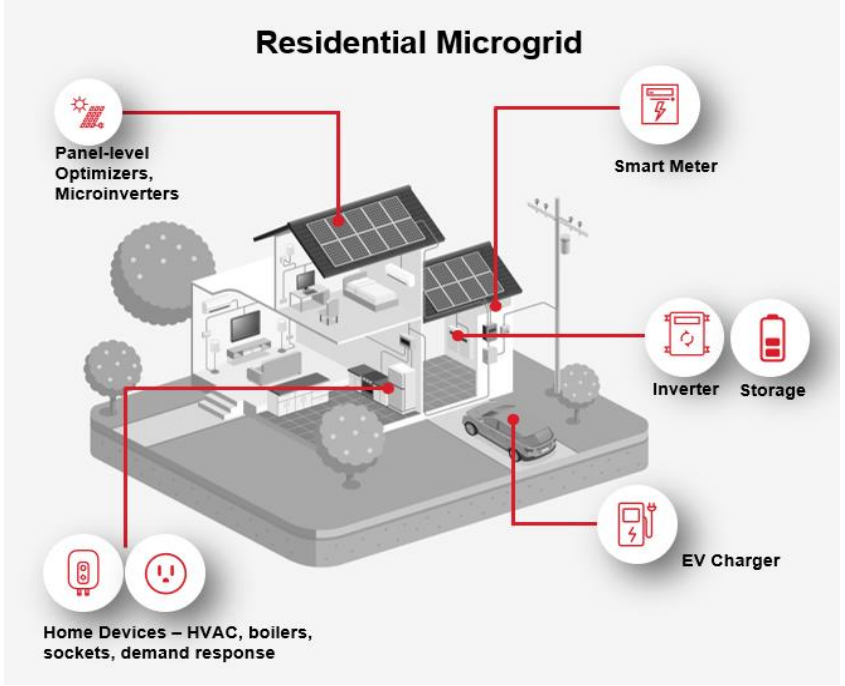
- **What is Microgrid & Why RF Mesh is Essential in Microgrids**
  - A microgrid is a localized energy system with its own generation (e.g., solar, wind), storage, and control, capable of operating independently
  - RF Mesh provides fast, reliable, and scalable communication between DERs, batteries, smart inverters, and controllers
  - Maintains operational reliability even when disconnected from the main utility grid
- **Security Threats in Grid Automation**
  - Cyber Intrusions - Includes device impersonation, MITM attacks, DoS floods, and over-the-air spoofing targeting grid communications
  - Physical vulnerability of Field Devices - Smart meters and RTUs deployed in unsecured locations are susceptible to tampering and credential theft
  - Weak Cryptographic Protection - Unsecured key storage and lack of secure boot mechanisms enable attackers to extract credentials or install malicious firmware.
- **How Silicon Labs Secure Vault™ Mitigates These Risks**
  - Built-in Device Trust - Hardware Root of Trust and factory-installed Secure Device Identity (SDID) ensure only genuine, untampered devices operate on the grid.
  - Verified and Secure Firmware Execution - Secure Boot with Anti-Rollback blocks unauthorized or outdated firmware, protecting against injection of malicious code
  - Cryptographic Security - Secure key storage, hardware cryptographic acceleration, and tamper detection provide layered protection against both digital and physical threats.
  - Secure Vault™ meets PSA Certified Level 3, the highest level of IoT device security certification, ensuring resistance to both software and physical attacks



Empowering Solar Infrastructure with RF Mesh Networks

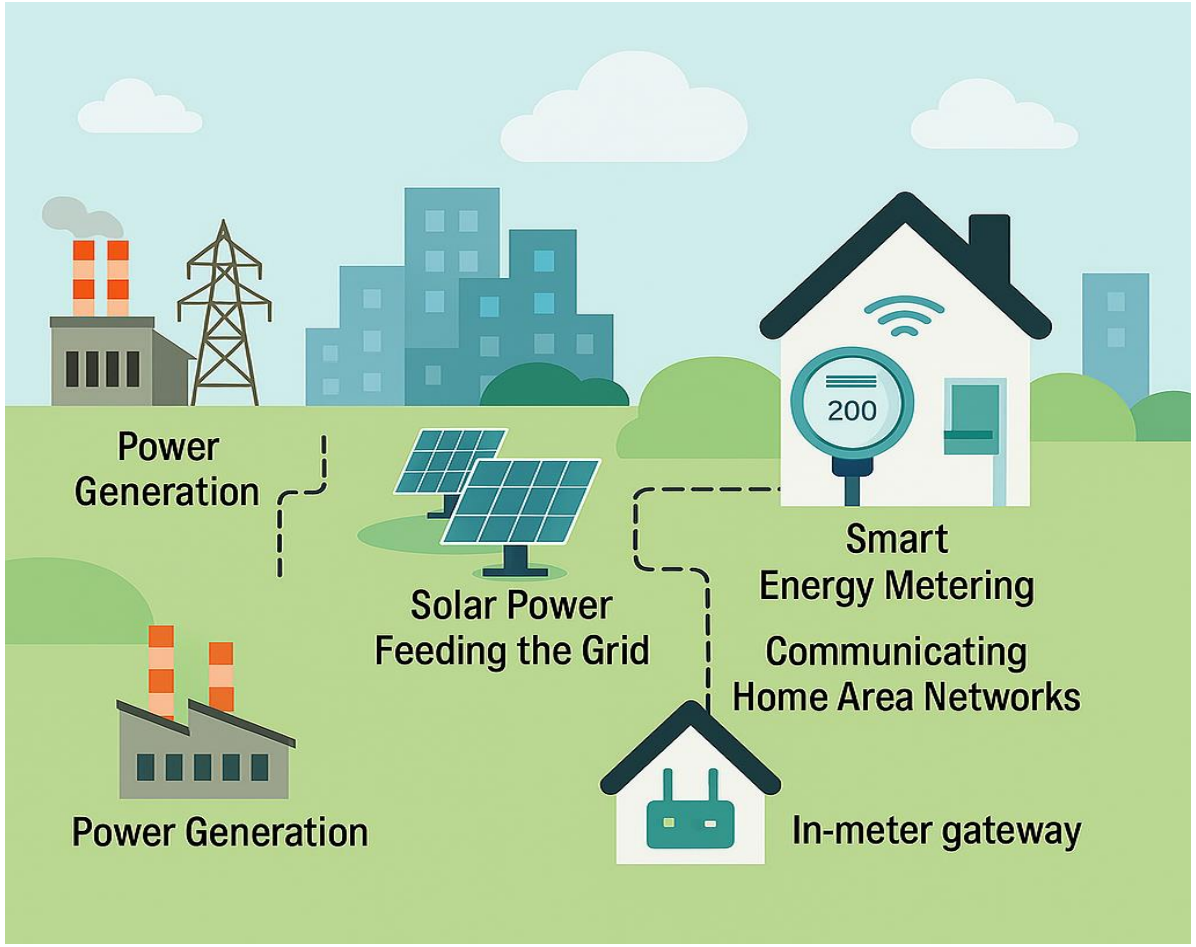
- **RF Mesh: Powering Scalable & Resilient Solar Networks**
  - Utility to Residential Scale: Supports both vast solar farms and distributed setups with inverters, controllers, and EV nodes
  - Wireless Advantage: Outperforms wired systems in scalability, cost, and installation no trenching or rigid cabling needed
  - Self-Healing & Maintainable: Mesh reroutes around failures and supports OTA updates for real-time diagnostics and low OPEX
- **Mesh in Industrial-Scale Solar Deployments**
  - Coordinated Infrastructure: Enables low-latency communication between inverters, MPPTs, tracking motors, and sensors across acres
  - Edge Autonomy: Localized decision-making ensures continued operation even during central connectivity disruptions
  - Terrain-Friendly Deployment: Avoids grid and fiber limitations; ideal for remote or rugged solar installations
- **RF Mesh in Residential Solar + EV Integration**
  - Home Energy Synergy: Manages solar inverters, battery charge levels, and EV charging in a coordinated wireless ecosystem
  - Why Mesh Still Matters: Delivers strong coverage (Sub-GHz), avoids single points of failure, and supports demand-response
  - Neighborhood Intelligence: Forms the foundation for virtual power plants and energy coordination at the community level

Industrial-Scale Solar Deployments



Smart Energy Metering & Dual Communication NIC

- **Smart Meters: Foundation of Grid Modernization**
  - Advanced Capabilities: Enable two-way communication, outage detection, and remote updates
  - Global Adoption: Key to AMI rollouts for real-time billing and demand-side management
  - India's Example: 250M+ meters targeted under RDSS, with RF Mesh leading in dense deployments
- **Dual Communication NIC: Solving Connectivity Gaps**
  - Hybrid Architecture: Dual NIC meters combine RF Mesh and Cellular (FG23 + Wirepas)
  - High Coverage, Low Cost: 20 - 30% cellular coverage achieves 100%-meter connectivity via mesh
  - Resilient Design: Ensures fallback paths and reduces reliance on cellular infrastructure
- **Bridging WAN to HAN: Extending Smart Meter Roles**
  - Inside-the-Home Integration: Connects meters to HAN devices via Wi-Fi
  - Grid Edge Intelligence: Enables demand-response and load forecasting at device level
  - Silicon Labs Solutions: Combines FG25 for Mesh and SiWx917 for Wi-Fi in secure, efficient gateways



Home Area Network (HAN) - Matter over Wi-Fi

- **Role of HAN in Smart Energy Homes**
  - Device Connectivity: Links EV chargers, thermostats, and appliances for energy monitoring and control
  - Wi-Fi as Backbone: Offers fast, familiar, cost-effective connectivity across household devices
  - Matter Protocol: Enables seamless, vendor-neutral interoperability over Wi-Fi for unified device control
- **Grid-Connected HAN via In-Meter Gateways**
  - Real-Time Visibility: Devices share energy usage data directly with utilities
  - Demand Response Ready: Responds to grid signals for load shifting and optimization
  - Granular Control: Supports targeted energy management (e.g., HVAC, EV charging) through the meter
- **Silicon Labs: Enabling Matter-Ready Smart Homes**
  - Matter Over Wi-Fi & Thread: Ultra-low-power SoCs enable flexible, IP-based HAN integration
  - Thread Leadership: Key contributor to Thread protocol and certified SoC provider for smart homes
  - Driving Standards: Founding member of CSA and top code contributor to Matter; SoCs support secure, future-ready deployments

Protocol for IP-Based Smart Home Cannectivity

Matter creates a unified language for seamless communication between devices over Wi-Fi

Ensures Interoperability Across Smart Home Brands

Devices from different manufacturers can operate together within the same network

Built-In Security Using Existing Wi-Fi Infrastructure

Supports encryption, authentication, and secure onboarding of devices

Silicon Labs' offerings in grid automation

- **End-to-End Leadership in Grid Automation**
  - Beyond Chips: Powering secure, intelligent, and connected grid infrastructure from cloud to endpoint
  - From FAN to HAN: Extending smart metering leadership to full grid automation, covering all layers
  - Future-Proof & Scalable: Building a seamless, standards-based foundation for utility modernization
- **Field Area Network (FAN) – Resilient RF Mesh with FG2x**
  - RF Mesh Expertise: Industry leader in Proprietary and Wi-SUN®-based Sub-GHz mesh solutions
  - FG2x SoCs: Deliver high link budgets, dual-band support, and BLE-based provisioning for flexible deployment
  - Edge Intelligence + Security: TinyML support for endpoint analytics; Secure Vault™ defends against HW/SW attacks
- **Home Area Network (HAN) – Smart Energy Inside the Home**
  - Matter Leadership: Founding member of CSA; shaping interoperable HAN ecosystems with major partners
  - Diverse HAN SoC Portfolio:
  - SiWx917: Wi-Fi 6 + BLE + Matter for energy gateways and appliances
  - MG24: Thread + BLE for ultra-low-power HAN devices
  - BG2x: Bluetooth Mesh Networking
  - Unified Vision: Bridging FAN to HAN with secure, intelligent, and interoperable devices that scale with the grid

- Single / Dual Band (Sub G & 2.4 G)
- High Performance RF
- OFDM
- Secure Vault
- AI/ML
- Metering

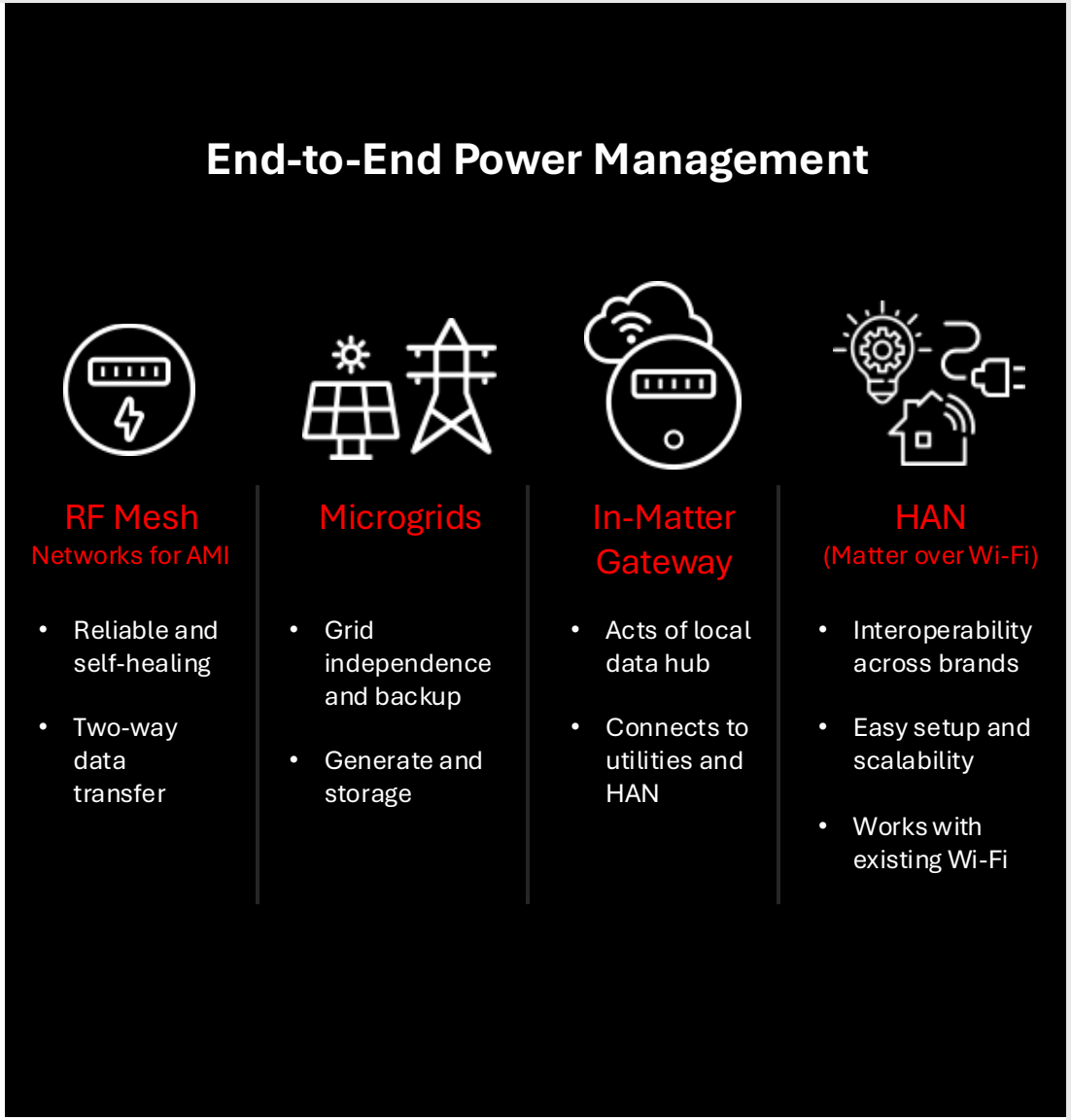
- Wi-Fi 6 & Bluetooth
- Ultra Low Power IoT
- Matter Certified
- Solar PV / In-meter GW
- HAN

- Bluetooth 6.0
- Long Range
- Secure Vault - PSA L3
- Metering / Asset tracking
- Channel Sounding

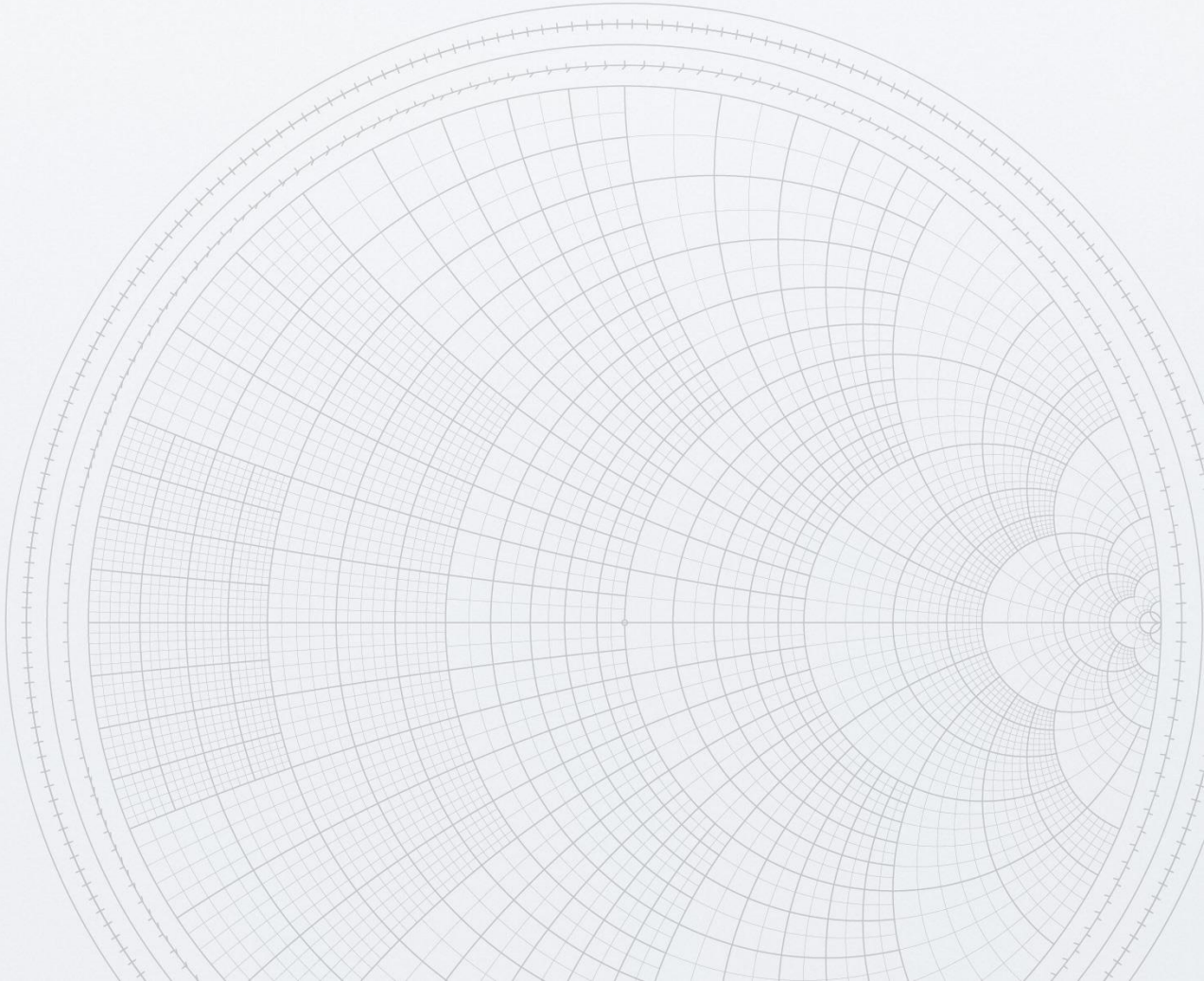
- Multiprotocol - 2.4G
- Thread + BLE
- High Performance RF
- Secure Vault
- AI/ML
- Metering

Conclusion: End-to-End Power Management

- **RF Mesh: The Digital Backbone of Smart Grids**
  - Provides robust, scalable, and low-power communication across grid devices
  - Enables two-way data transfer, remote monitoring, and real-time updates
  - Forms the foundation for reliable AMI, microgrids, and in-meter connectivity
- **Integrated, Intelligent, and Resilient Power Delivery**
  - Supports demand-response, outage detection, and autonomous fault recovery
  - Empowers grid-aware devices like smart thermostats, EV chargers, and appliances
  - Enhances visibility and control from generation through to in-home consumption
- **Toward a Sustainable, Future-Ready Grid**
  - Bridges Field and Home networks via Matter over Wi-Fi and in-meter gateways
  - Facilitates renewable integration, energy automation, and load optimization
  - Enables scalable, secure, and interoperable energy ecosystems with Silicon Labs SoCs



Q&A



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