SILICON LABS
CONNECTED INTELLIGENCE

LPWAN Landscape

Standards vs. Proprietary Solutions

Who are we?

SILICON LABS RENNES

- Pure R&D site
- ~50 engineers
- Design, Software and support
- Wi-Fi, Z-Wave, Wi-SUN, Bluetooth, Sidewalk

THIBAUT COLIN

- 9 years at Silicon Labs
- R&D Manager
- Working on Wi-SUN
- Member of the SubGig and Proprietary Organization

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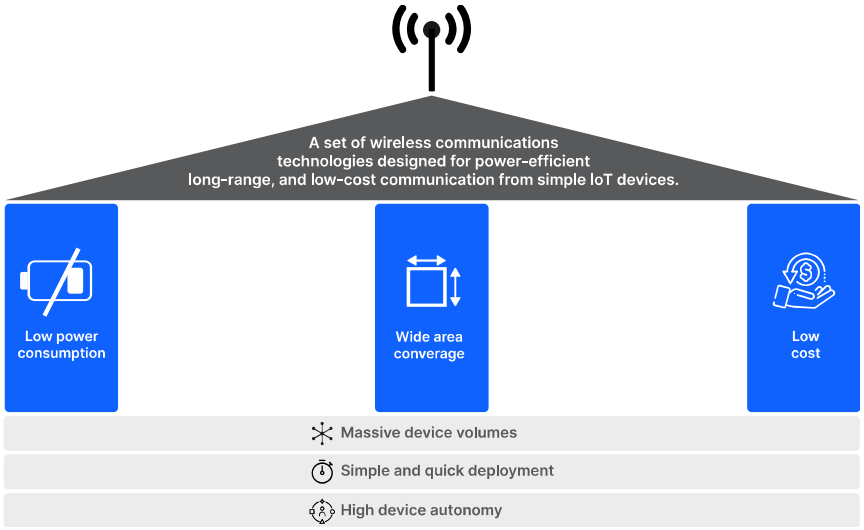
LPWAN Overview



Definition

Low-power wide-area networks (LPWAN) are a set of wireless communication technologies designed for:

- Power-efficient
- Long-range
- Low-cost communication from simple IoT devices

LPWAN Applications

IoT applications that are often cost-sensitive and characterized by infrequent transmissions of small bursts of data, many devices often spread over wide areas, and the need for devices to operate autonomously for many years.

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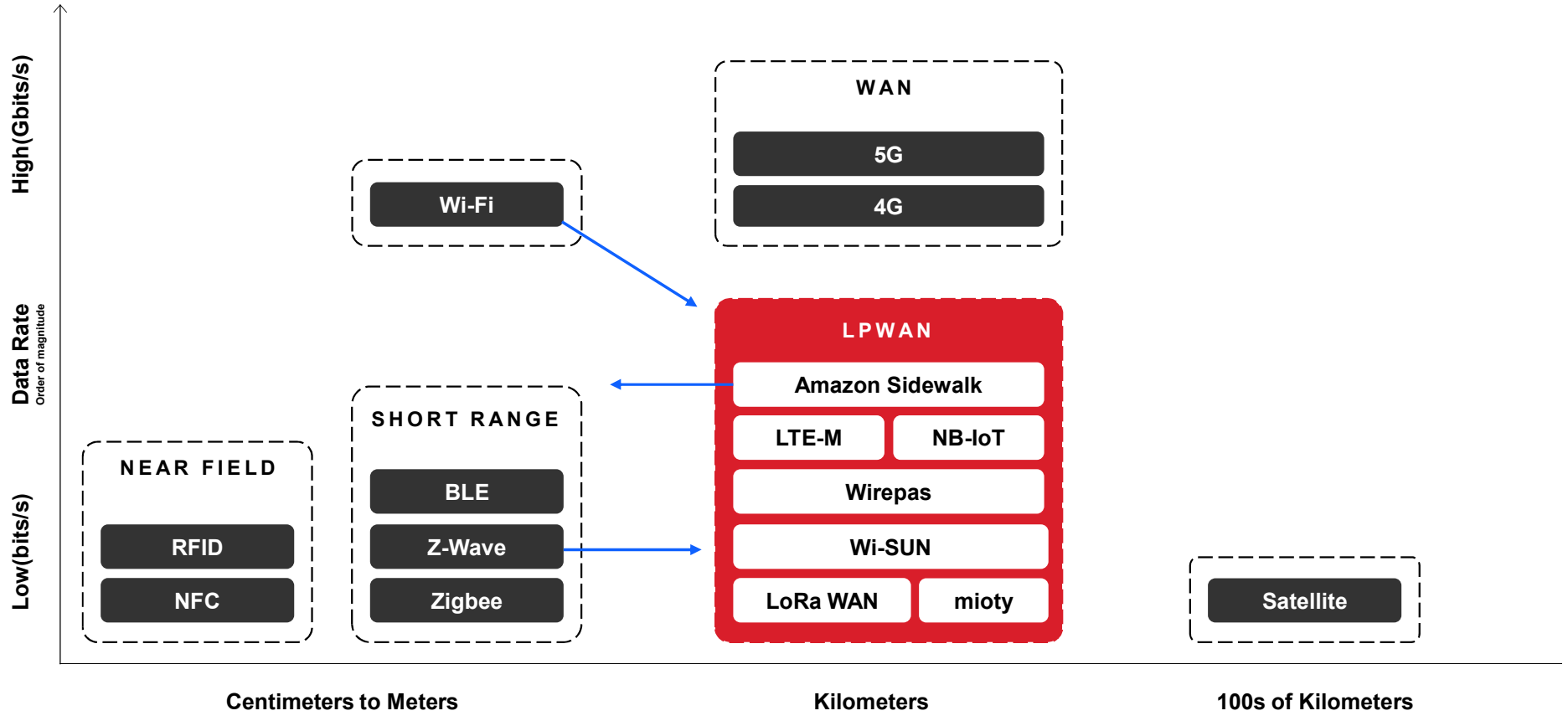
LPWAN Positioning



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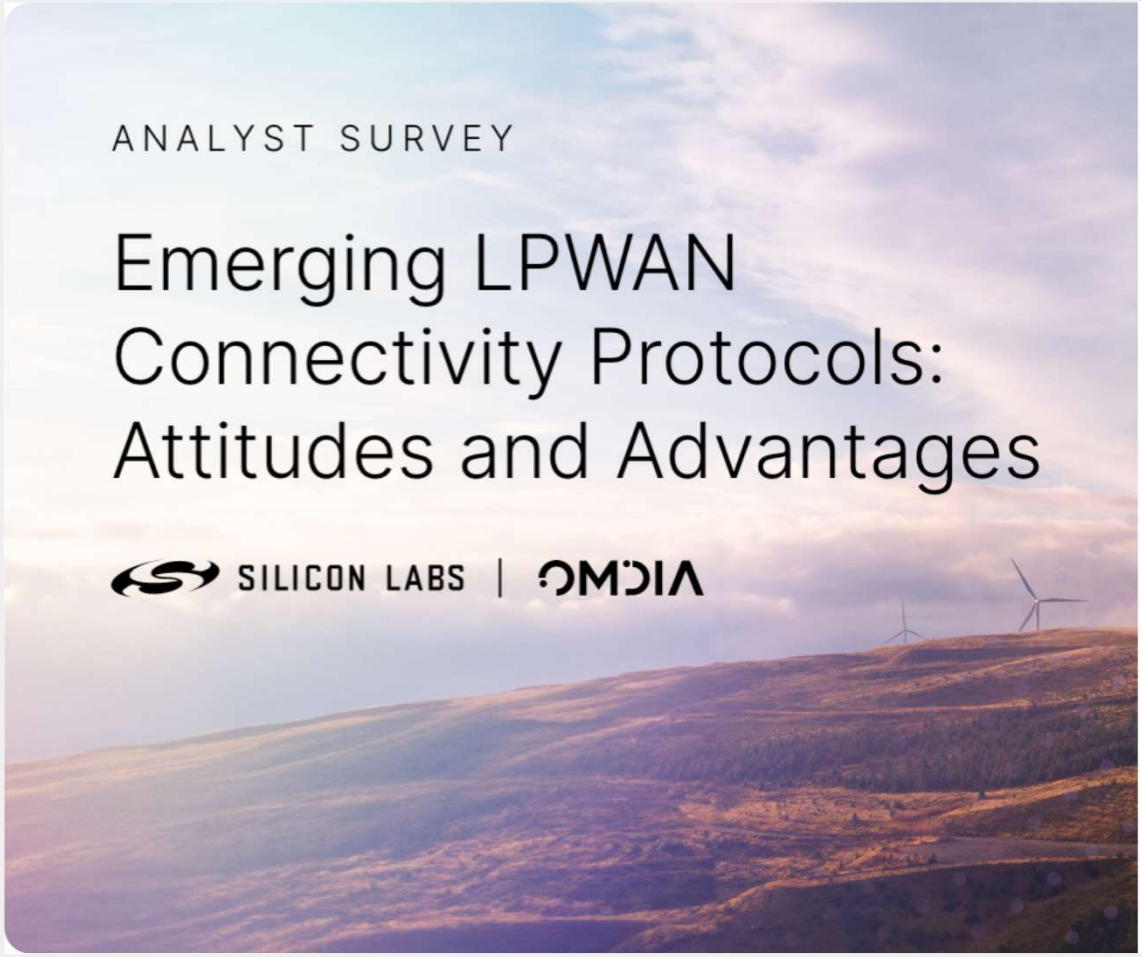
Omdia LPWAN Research



Silicon Labs coordinated with Omdia in 2023 for an LPWAN research report

- Globally focused with samples taken across multiple application areas

Focused on topics that are critical to LPWAN selection

- Networks being used
- Roadblocks in deployment
- Key considerations

Three main take aways:

- Picking right network is biggest concern of developers
- Security continues to be a concern across region and application
- Developer support and support model are key consideration when selecting protocol and platform

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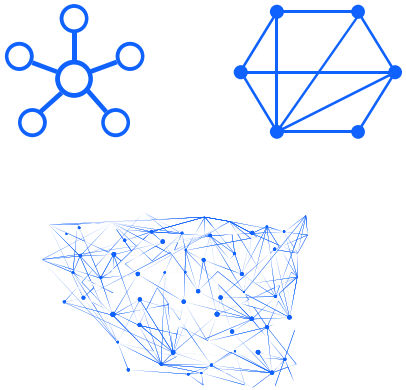
How do you select the right LPWAN?

WHICH ECOSYSTEM YOU WANT TO PARTICIPATE?

WHAT ARE YOUR APPLICATION REQUIREMENTS?



WHAT ARE YOUR NETWORK REQUIREMENTS?

There is no silver bullet. Selection comes down to ecosystem, application, network and several other factors

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Standards Based vs Proprietary

Standards-Based LPWAN Solutions

- **Examples: Wi-SUN, mioty**
- **Typically governed by alliances or member groups**
  - Interest in the growth of the solution and ensuring needs of key applications or markets are met
- **Ensure multi-vendor interoperability**
  - Typically done through certification programs
- **Great for large scale networks that need to serve many different applications**
  - Establish connectivity backbone and provide platform for expansion
- **In many cases, interoperability is only ensured up to the transport layer.**
- **Not always optimized for all applications**
  - Compromises need to be made for interoperability or other overriding concerns

Proprietary LPWAN Solutions

- **Example: Wirepas, Amazon Sidewalk**
- **Usually managed and supported by a single entity**
  - May require licensing fee to get support and deploy
  - Strong dependency on a single provider
- **PHY to Cloud**
  - Typically optimized for a smaller set of use-cases
  - May have different stacks to support different applications
- **Interoperability limited depending on owner / developer of the protocol**
  - Can decide to keep things completely private or to open network to approved third parties
- **Homegrown Standard**
  - Does not necessarily aim to be open to anyone

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Growing needs for interoperability

Higher cost equipment is building out backbone of municipal LPWAN networks

- Streetlights, electric meters, and other line powered devices make up majority of existing LPWAN use cases

Allows for faster ROI for entities responsible for deployment of networks

- Looking to expand use cases and allow other devices on formerly private networks

Multi-vendor interoperability is critical to this growth

- Network accessibility and reliability are now being added at SLA level to guarantee performance

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Interoperability Models

Standards-Based LPWAN Solutions

- Open interoperability
- Interoperability is greatly simplified
  - Standard compliance ensures network level interoperability
- Certification process typically defines standard level of interoperability
- Can be changed as applications and standard evolves
  - Gatekeeper of the backward compatibility
- Examples:
  - Wi-SUN
    - Has standard certification process including certified test bed units for checks of stack and application
    - Ensures backward compatibility across versions of standard

Proprietary LPWAN Solutions

- Controlled interoperability
- Interoperability can be limited depending on proprietary solution
  - Some take “walled garden” approach only allowing single manufacturer networks while others work to ensure multi-vendor compatibility
- Certification can be network dependent
  - Networks like Amazon Sidewalk have very strict certification process while others may not have any
- Examples:
  - Wirepas
    - Stack ownership by Wirepas ensures compatibility between devices
  - Amazon Sidewalk
    - Has very strict interoperability and certification program in place to ensure network “just works”
  - Homegrown Standard
    - Can limit interoperability by design and be optimized for very specific applications or use models
    - Interoperability dependent on inclusion of partners into ecosystem

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Security

Emergence of multi-vendor and mission critical applications is increasing visibility in LPWAN security

- Expansion of networks and inclusion of third parties raises potential security risks

Sub-GHz spectrum has some security advantages

- Network exploitation tools are not as readily available as they are for more prevalent technologies

Different network solutions take different approaches to solve the security issue

- Wi-SUN
  - Inclusion of standard IEEE 802.15.4 security along with certificate-based authentication
- Amazon Sidewalk
  - Very robust security built into network with public / private encryption used from device transmission to decryption at end destination
- Wirepas
  - Security at the heart of stack with the inclusion of secure device provisioning, network level security, and secure OTA
- Proprietary
  - Truly proprietary networks can have security advantages due to private nature

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My R&D engineer vision

Standards-Based LPWAN Solutions

- **Ecosystem**
  - Open and flexible
  - Collaborative, favor interoperability
- **Innovation**
  - Distributed across multiple participants
- **Inertia**
  - High: it often takes time to drive changes
  - Guarantees a certain stability
- **Efficiency**
  - Based on compromises: depending on the network, it can be either an advantage or a drawback

Proprietary LPWAN Solutions

- **Ecosystem**
  - Integration is seamless across the vendor's products.
  - Ease of use and time to market
  - Closed
- **Innovation**
  - Controlled and centralized
  - Can be more versatile
  - Harder for the end user to influence decisions
- **Inertia**
  - Low or high: Depends on the customer / provider relationship
- **Efficiency**
  - Vertical optimization: Can be tailored to the targeted applications

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What matters is to be aware the two
models exist and to make a choice in conscience

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Supported Protocols and Modulations

		xG22	xG23	FG25	xG28
Supported Protocols	Amazon Sidewalk		✓ (FSK Only)		✓ (Bluetooth LE and FSK)
	Wi-SUN		✓ (RCP Only)	✓	✓ (FSK Only)
	Proprietary	✓	✓	✓	✓
	Wireless M-BUS		✓	✓	✓
	Bluetooth	✓			✓
	Wirepas		✓		
	Mioty		✓		✓
	Z-Wave		✓		✓
Supported Modulations	MR-OFDM			✓	
	(DSSS)-OQPSK	✓	✓		✓
	(G)MSK	✓	✓	✓	✓
	2/4(G)FSK	✓	✓	✓	✓
	OOK/ASK		✓		✓
	MR-OQPSK			✓	

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Proprietary SoC Overview

- **Low Power Consumption**
  - 10+ year battery life on a coin cell
- **Robust Link Budget**
  - Adjustable output power and high receiver sensitivity for long range applications
- **World-wide Frequency Support**
  - Support for multiple frequency bands within a single part allows for simplified hardware and firmware design across platform of products
- **Highly Integrated RF Design**
  - Reduces design complexity and lowers power consumption
- **Flexible Radio Architecture**
  - Support for multiple modulations and data rates allows for network choice that best meets application requirements
- **Broad Temperature Range**
  - Support for up to 125ºC allows for use in wide range of applications

FG22

Target Applications

- Electronic Shelf Labels
- Home and Building Automation and Security
- Industrial Automation
- Commercial and Retail Lighting and Sensing

FG23

Target Applications

- Metering
- Home and Building Automation and Security
- Industrial Automation
- Street Lighting

FG25

Target Applications

- Smart Electric Metering
- Street Lighting
- Distribution automation
- Industrial applications
- Municipal infrastructure
- Agriculture Automation

FG28

Target Applications

- Industrial, Home and Building Automation and Security
- Metering
- Electronic Shelf Labels
- Commercial and Retail Lighting and Sensing

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