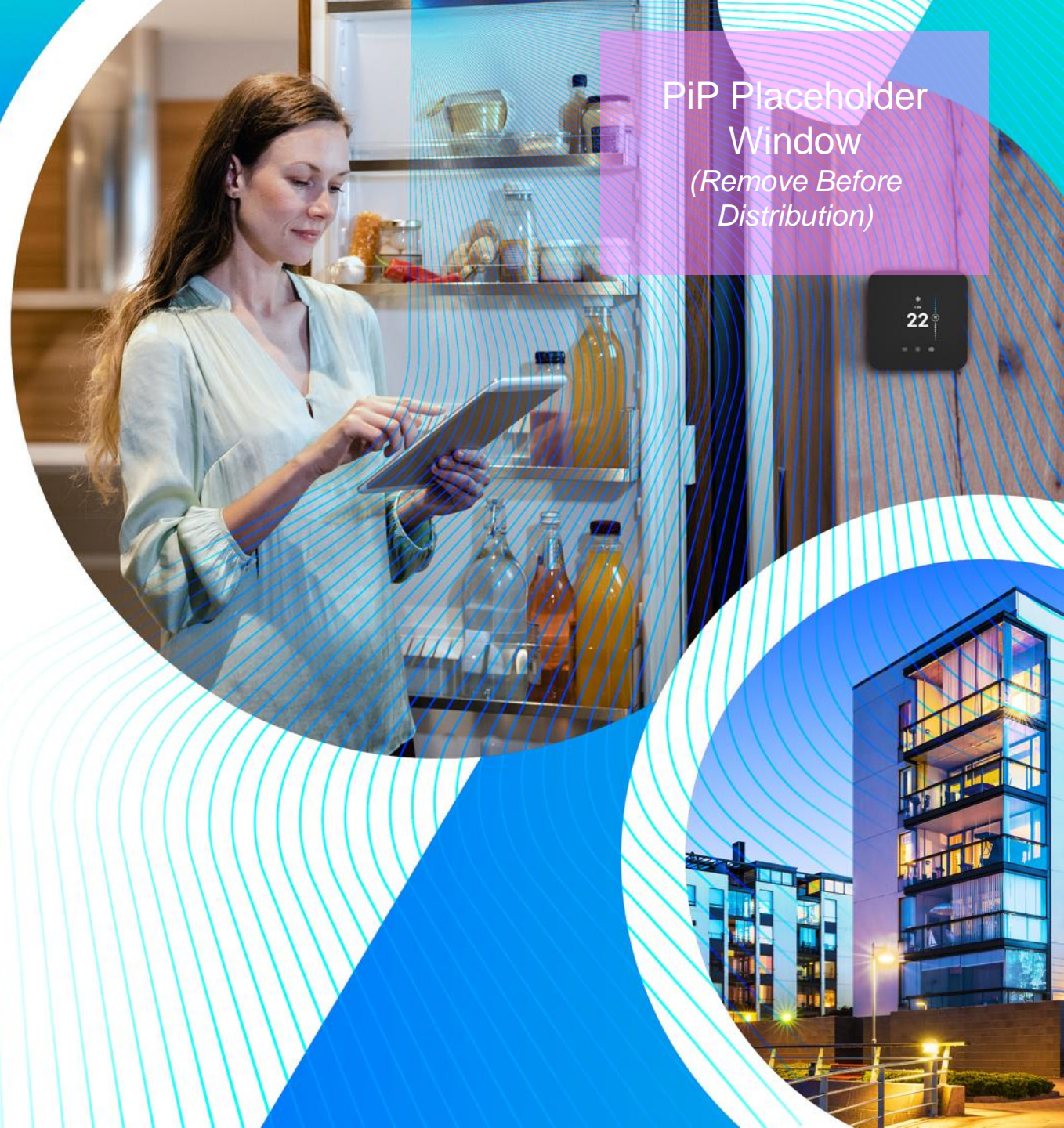


What Options Do I Have for LPWAN Applications?

Abitzen Xavier & Desmond Chan

September 2021



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Why Low Power Wide Area Network [LPWAN] ?


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Street Lighting




Energy
Management,
Maintenance,
Security



Traffic
Control/Lights,
Parking Meters



Oil/Gas
Production



Utility Meters



Scalability

1000s of nodes



Coverage

Several Miles



Low Power

Battery or Line



Low Data Rate

bps-kbps



Reliability & Security




Environmental
Monitoring




Waste
Management



Consumption, Flow
rate, Valve Control



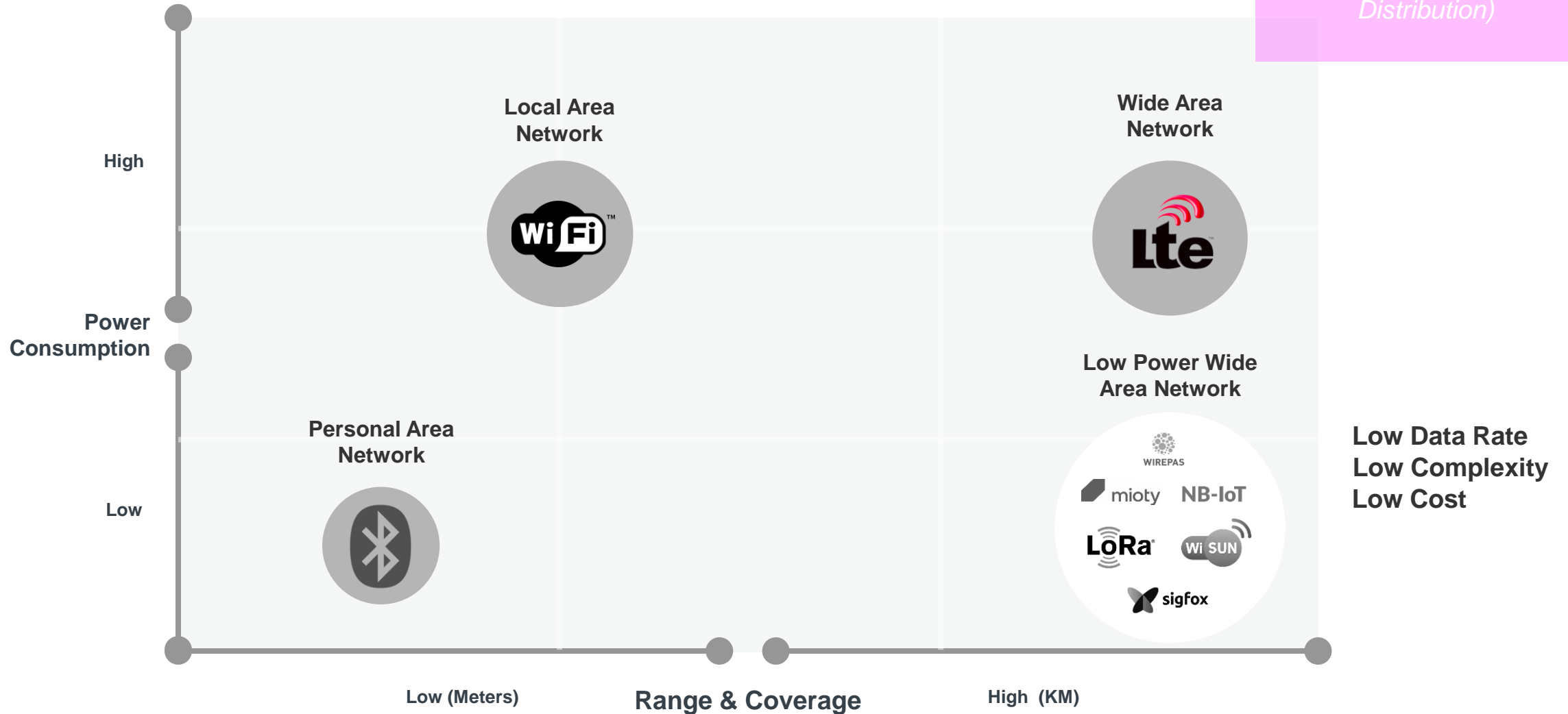
Storage &
Distribution



Livestock
Management

What is LPWAN ? – Low Power Wide Area Network

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What is NB-IoT and LTE-M



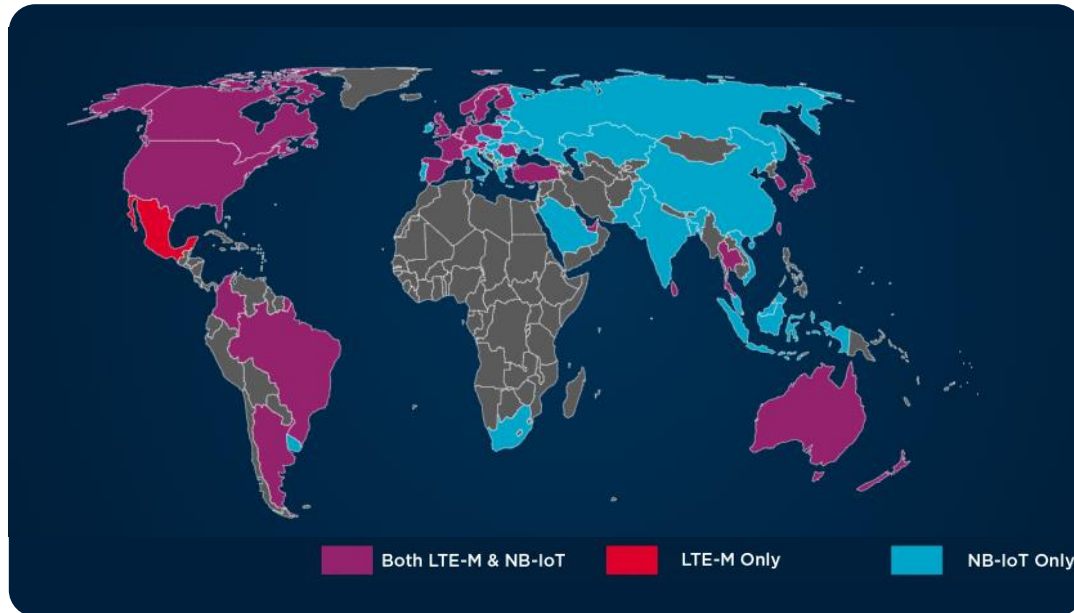
3GPP
Developer

GSMA
Alliance

159
Mobile IoT
Networks

106
NB-IOT

53
LTE-M
Networks



Source: <https://www.gsma.com/iot/deployment-map/> | July 2021

Voice & Mobility

Lte-m : Yes
Nb-iot : No



Global Coverage

LTE-M : Americas
Nb-iot : Europe & Asia

Peak Data Rate

Lte-m : 370 Kbps
Nb-iot : 60 Kbps

Power Consumption

LTE-M : Low
NB-IOT : Lower

Latency

Lte-m : ~100 Ms
Nb-iot : 1 S

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NB-IoT and LTE-M Technology

- Cellular technology using licensed spectrum
- Channel BW
 - LTE-M : 1.4 MHz, NB-IOT : 180 KHz
- Multiple Access and Modulation
 - LTE-M : OFDMA (DL)/SC-FDMA (UL) /16QAM
 - NB-IoT : OFDMA (DL)/SC-FDMA (UL) /QPSK
- Frequency deployment
 - LTE-M : LTE in-band, NB-IoT : Flexible
- End to End IP

Model

- Network connectivity is provided by operators
- Subscription based

What is LoRa and LoRaWAN

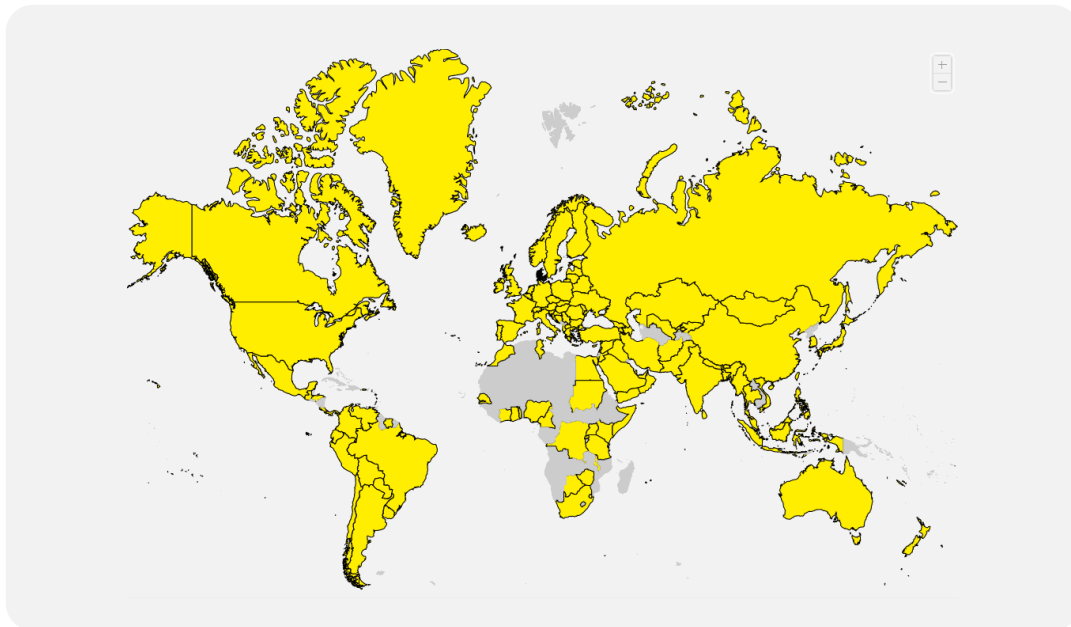


156+
Network
Operators

171+
Countries

LoRa
Developed by
Semtech

LoRaWAN
LoRA Alliance



Source: <https://lora-alliance.org/> | July 2021

Topology
STAR



Global Coverage

LoRa Max Data Rate
12 kbps(UL)
21 kbps (DL)

Long Range
Link Budget 150+ dB

Native IP Support
NO

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Distribution)*

LoRa Technology

- Frequency Bands - License free ISM Bands
- Bandwidth – 125/500 KHz
- Modulation - Chirp Spread Spectrum (CSS)
- Max Payload – 242 Bytes

Model

- Customers can deploy their own private network
- No subscription needed

What is sigfox

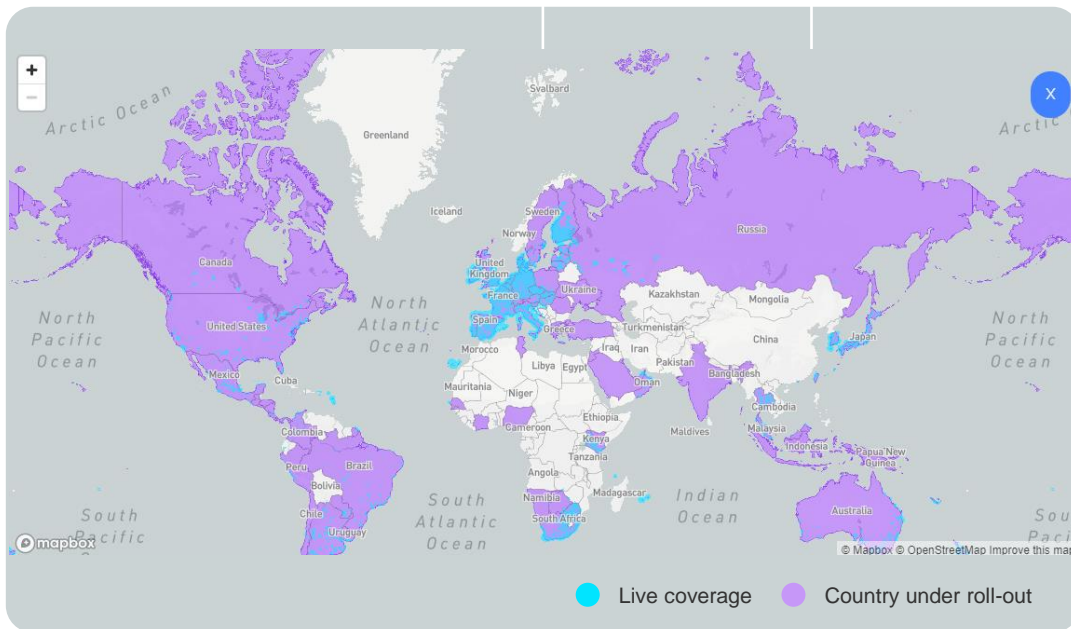


70 +
Network
Operators

72+
Countries

sigfox
Developed

sigfox
operators (SO)



Source: <https://www.sigfox.com/en/coverage> | July 2021

Topology
Star


Proprietary
Technology

Data Rate
100/600 bps

Range
Link Budget ~150 dB

IP to the end node
NO

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Sigfox Technology

- Frequency Bands - License free ISM Bands
- Bandwidth - 192 KHz
- Modulation
 - Ultra Narrow Band (UNB) – 100 Hz
 - D-BPSK (UL) & GFSK (DL)
- Random Access – Time and frequency diversity
- Max Payload - 12 bytes UL, 8 bytes DL
- Max messages/day - 140 (UL) and 4 (DL)

Model

- Network connectivity is provided by Sigfox operator
- Subscription based

What is sigfox



300+
Members

46
Countries

100+
Million Devices

Wi-SUN
Alliance



Source: <https://wi-sun.org/> | July 2021

Topology
MESH

Global Coverage

Data Rate
50 kbps – 2.4 Mbps

Link Budget
?

IP to the end node
YES

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Wi-SUN Technology

- IEEE 802.15.4g PHYs
 - FSK & OFDM Modulations, Multiple Data Rates
- IEEE 80215.4e MAC
 - Frequency Hopping & Mode Switching
- IPv6, UDP and TCP
 - 6LoWPAN and RPL Routing
- Mandatory Security
 - Public Key Infrastructure (PKI), AES, Certificates

Model

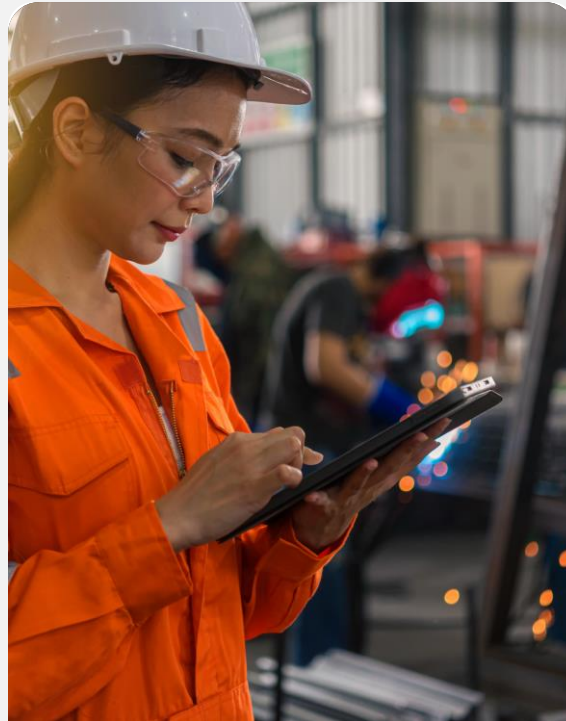
- Customers can deploy their own private network
- No subscription needed

How do you select the right LPWAN ?



ECOSYSTEM

Wi-SUN
LoRa WAN
Sigfox
Cellular



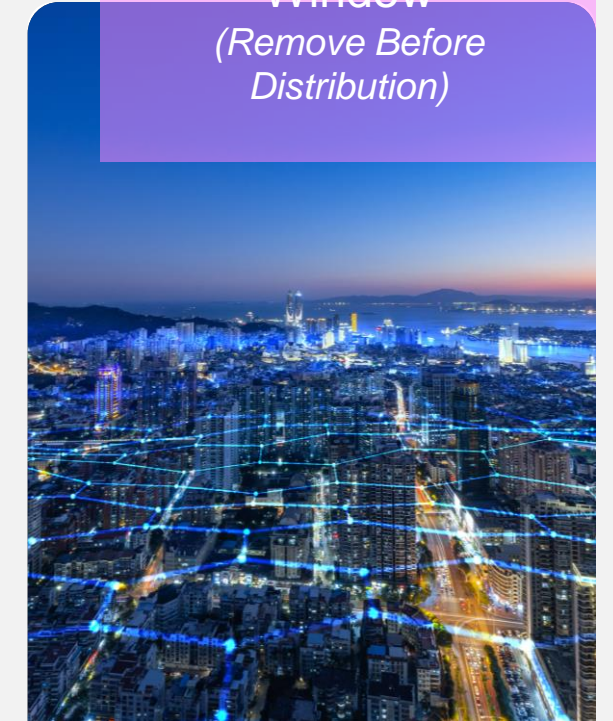
APPLICATION REQUIREMENTS

Data rate
Range
Battery Life
IP/Non-IP



MODEL

Proprietary Technology
Standard Based
Subscription Based
No subscription







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NETWORK

Scalability
Robustness
Topology
Frequency Band

High Level Comparison of LPWAN

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Native IP Support	Yes	No	No	Yes
Standard Based	Yes	LoRa – No LoRa WAN - Yes	No	Yes
Frequency Band	Sub-GHz & 2.4 GHz License Free ISM	Sub-GHz License Free ISM	Sub-GHz License Free ISM	Licensed
Application Layer	User Defined	User Defined	User Defined	User Defined
Network Topology	MESH	STAR	STAR	STAR

Silicon Labs LPWAN Offerings

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	Hardware	Stack/API	Partnership
Wi-SUN	Yes	Stack & DMS	Pelion/ARM
WM-BUS	Yes	Stack	Stackforce
MIOTY	Yes	No	MIOTY/Fraunhofer
Proprietary	Yes	RAIL API Long Range PHYs	-

Silicon Labs offers a very comprehensive portfolio of LPWAN solutions

To learn more please visit - <https://www.silabs.com/solutions/smart-cities>



works with
BY SILICON LABS
VIRTUAL CONFERENCE

Related Sessions

September 14–15, 2021
<https://workswith.silabs.com/>

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Session ID

Session Name

MSH-101	Which Mesh is the Right Mesh
LPW-201	How to Develop IoT Application with Proprietary Wireless
SMC -102	Smart City Network Management in the Cloud Using Pelion
SMC-103	Why Wi-SUN is Ideal for Smart Street Lighting?
WSN-101	Introduction to Wi-SUN, It's markets and the Alliance
WSN-300	Building Large Scale Smart City Networks with Wi-SUN



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Thank You

