Wi SUN Alliance

How Wi-SUN Technology Empowers

SMART CITY and IoT DEVELOPMENT

wi-sun.org

How Wi-SUN Technology Empowers Smart City and IoT Development

Contributing companies (in alphabetical order)

CISCO

HEXING

ITRON

LANDIS+GYR

OKI

RENESAS

SILICON LABS

TEXAS INSTRUMENTS

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Mission and Industry Impact

This eBook gathers relevant Wi-SUN Alliance information into one publication for convenient access. The book includes multiple sections.

Introduction

1.0 INTRODUCTION OF THE WI-SUN ALLIANCE EBOOK

By John Koon, Editor-in-Chief

For more information on Wi-SUN Alliance, go to https://wi-sun.org/

Together with cloud services and edge computing, the Internet of Things (IoT) has emerged as one of the fastest growing industries. Its real-time monitoring capability is giving us insights never before available. These insights are transforming a range of industries, bringing improved efficiency to manufacturing, transportation, supply chains, asset tracking, agriculture, power grid management, smart cities, and more.

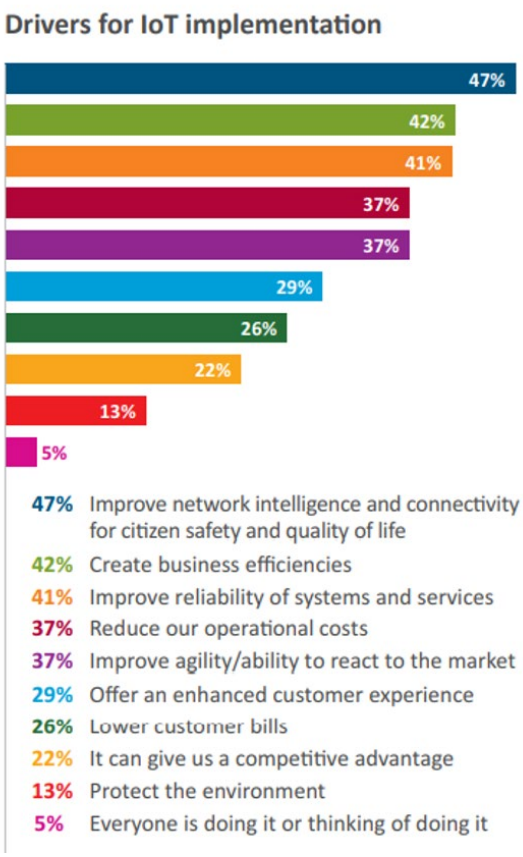
Every country is either investigating or already investing in smart city applications such as smart power grid/energy management, smart streetlights, smart parking (on streets and in parking lots and structures), environmental sensing for monitoring air quality and other environmental aspects, smart homes, smart buildings and facilities, smart waste management, flood management, smart healthcare, and water quality control.

The Wi-SUN Field Area Network (FAN) is a proven wireless technology which is robust, efficient, and secure. This technology has been adopted by many countries worldwide and is supported by technology heavyweights. Driving the development of the technology is the 300-member Wi-SUN Alliance in 46 countries.

Besides explaining how the technology works, this document features an interview with Wi-SUN Alliance President and CEO Phil Beecher. Additionally, eight leading Wi-SUN Alliance members share their vision with the response to three questions.

1. Where do you see Wi-SUN FAN applications in the next five years?
2. What new application opportunities do you see for Wi-SUN technology?
3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

2.0 How Wi-SUN FAN Technology Makes Cities and the IoT Smart



Source: Wi-SUN Alliance

1. INTRODUCTION

The global Internet of Things (IoT) market will grow from $250 billion in 2019 to $1,463 billion by 2027 at a compound annual growth rate (CAGR) of 25%, according to Fortune Business Insights. There are many reasons behind the growth. Heading the list are improvement of network intelligence, business efficiency, and reliability along with operational cost reduction.

The IoT's real-time monitoring capability has practically transformed many industries and almost every aspect of our daily lives. Improved efficiency for manufacturing, transportation, and supply chain logistics are to the IoT's credit. So are asset tracking, agriculture, power grid management, smart cities, smart homes, and the list goes on.

2. HOW DO CITIES BECOME SMART?

City management is a complex system consisting of many different functions that interact with each other on a daily basis. Creating a smart city means adding intelligence to these functions. Smart city applications include smart power grid/energy management, smart streetlights, smart parking, either on the street or inside a parking structure, and environmental sensing to gage air quality, for example. Applications also include smart buildings and facilities (which require communication, power management, and a secure and robust infrastructure), smart waste management, flood management, and water quality control.

The examples of what future smart cities will be able to do include connecting various city services. With such connections, traffic can be directed so as to avoid traffic jams. Also, during emergencies traffic could be routed so as to let ambulances reach hospitals in the shortest amount of time. Hospitals would be able to prepare for patients using precise information about ambulance arrivals. When a city experiences a tornado, extreme cold, or any weather or other event affecting power grids and disrupting power supply to households, a smart grid would automatically reroute power or obtain it from adjacent grids to avoid disruption.

3. WHAT IS WI-SUN FAN TECHNOLOGY?

The Wi-SUN Field Area Network (FAN) is a standards-based (IEEE 802.15.4 sub-GHz wireless), wireless mesh network. The IEEE 802.15.4g standard was first published in March 2012 and included in the 802.15.4 revision in 2015. The importance of open standards is that they provide stability and cooperation opportunities across countries worldwide. Additionally, the technology offers multi-service capabilities with IP-based, enterprise class security. It is a proven outdoor IoT network with over 100 million nodes around the globe.

With its robust and efficient architecture, the Wi-SUN FAN suits IoT and machine-to-machine (M2M) applications including smart cities and smart utilities. The City of London, City of Copenhagen, Tokyo Electric Power company (29 million meters) and the Florida Power & Light Company (U.S) which serves over five million customer accounts, now deploys Wi-SUN FAN compatible networks.

“Smart city needs including automatic meter reading (AMR) for gas and water, smart lighting, and smart parking offer many new opportunities for Wi-SUN technologies,” continued Dai Hui, IoT BU CEO of Hexing, “These types of applications are just getting started in most of Asia and countries in Africa.”

The Wi-SUN FAN features include:

- Backward compatible with millions of smart meters
- Multiple data rates with robust error detection and supports direct use of an IP network layer
- MAC layer based on IEEE 802.15.4e + IE extensions with frequency hopping
- PHY based on 802.15.4g with orthogonal frequency division multiplexing (OFDM) and frequency-shift keying (FSK) modulations, with multiple data rates, and global regional support
- Support for global and regional frequency bands (EMEA, The Americas and APAC), further extended by 802.15.4u, 802.15.4v, 802.15.4x and 802.15.4y

  902-907.5 & 915-928 MHz in Brazil

  902-928 MHz in U.S. and many other regions

  920-928 MHz Japan

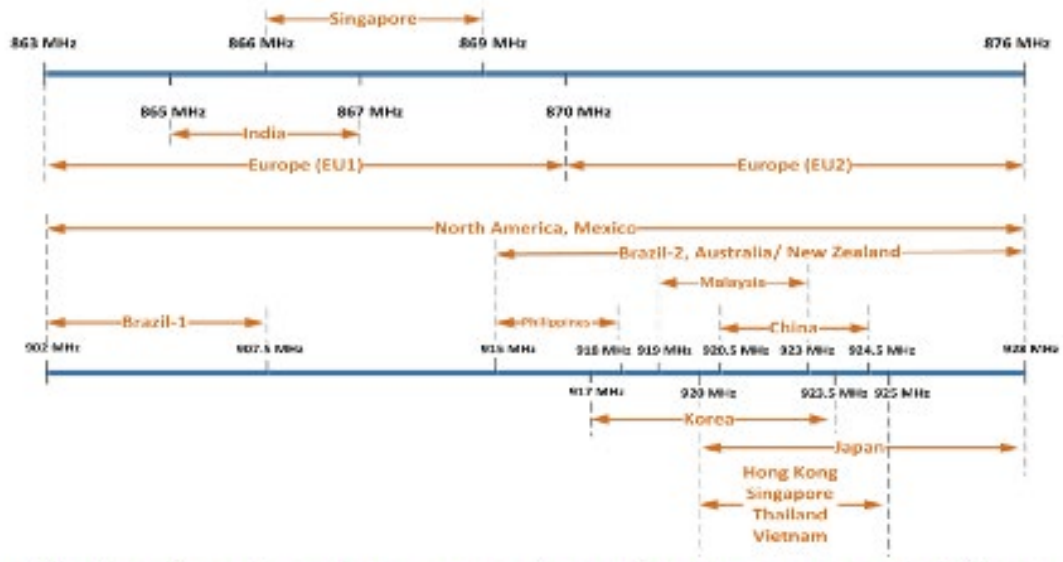
  868.3, 870 – 876 MHz Europe

  917-923.5 MHz Korea

  920-925 MHz APAC

  920.5-924.5 MHz China

Wi-SUN PHY Global Spectrum



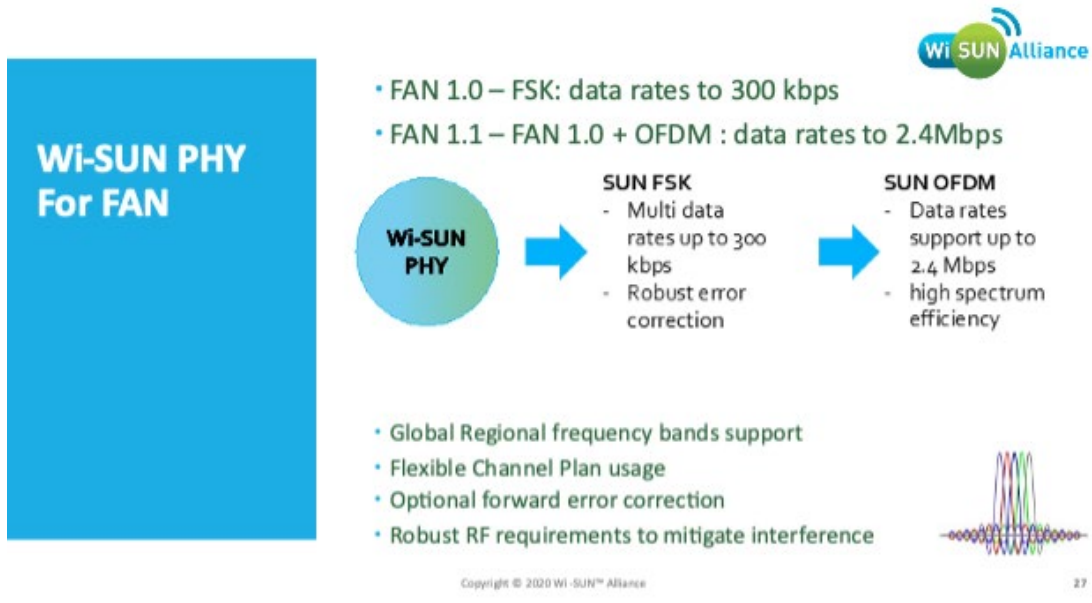
- Multi regional spectrum support provided by same radio/silicon
- Simplified PHY certification and interoperability

The Wi-SUN FAN architecture

The Wi-SUN FAN layer profiles are well defined. They include application, network /transport, media access control (MAC), and the physical radio (PHY) layers.

The Wi-SUN FAN specifications include FAN 1.0 and FAN 1.1. The FAN 1.0 supports data rates up to 300 kilobits per second and this has been enhanced with FAN 1.1 which supports up to 2.4 megabits per second (FAN 1.0 + OFDM). FAN 1.1 has brought many enhancements including:

- Longer battery life of up to 20 years vs typical LPWAN 10 to 15 year battery life
- Expanded global support including Japan, Brazil, and EU
- The 2.4 Mbps data rate increase to support more demanding applications including distributed automation
- New “gear shifting” technique provides modulation and data rate negotiation



4. THE WI-SUN ALLIANCE STANDS BEHIND THE TECHNOLOGY

A group of visionary leaders initiated the idea of interoperable smart utility networks in 2011 based on the 802.15.4g standard to form the Wi-SUN Alliance.

Today, the focus on energy conservation, along with automated monitoring and control of metering, has expanded to cover smart city, smart utility, smart home and IoT applications around the world. The Wi-SUN Alliance promoter members include Arm, Cisco, Itron, Hexing, Landis+Gyr, Omron, NICT, Renesas, Silicon Labs, Trilliant, and Toshiba. Today, it has 300 members worldwide.

Why Wi-SUN FAN is the best technology for smart city and smart infrastructure? It is a standards-based, low-power technology, incorporating data rate flexibility, and delivering reliable and secure communications.

"Historically the technologies used to service smart utilities, smart cities, and M2M use cases have been very fragmented. We think Wi-SUN FAN will be one of the technologies that brings all these applications together. These applications all need network infrastructure that provides, reliable, secure communications at scale—and Wi-SUN can provide all of that," commented Jeff Lund, Director, Product Management, Cisco IoT.

Compared with other low-power wide-area network (LPWAN), Wi-SUN FAN has the advantage of higher data rates and lower latency. Additionally, FAN 1.1 devices can achieve a battery life similar to or exceeding other LPWAN technologies, and data rates can reach as high as 2.4 megabits per second.

IoT Network	Data Rate	Latency
Wi-SUN FAN	Up to 2.4Mbps	0.02 – 1 second
LoRaWAN	300 bps to 62.5 Kbps, depending on spreading factor	1-16 seconds
NB-IoT	Up to 140 Kbps Uplink, Up to 80 Kps Downlink	2-10 seconds

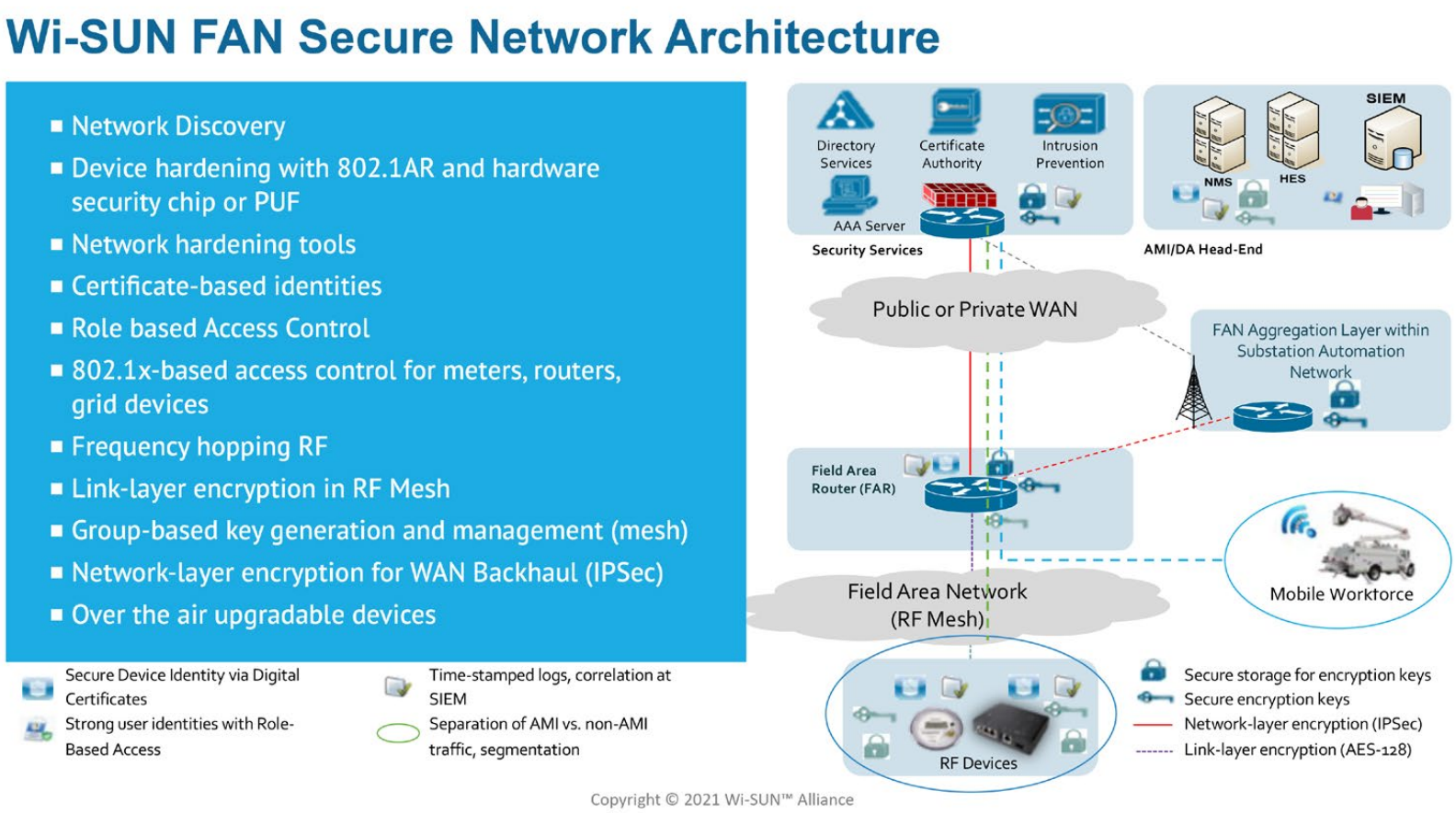
Silicon Labs, a leader in providing silicon for networks, echoes similar idea. "The technology's support for long-range, low throughput, and a high throughput OFDM PHYs at both sub-GHz and 2.4GHz with enterprise-level security is very significant," suggested Abhijit Grewal, Senior Marketing Manager, Industrial and Commercial IoT, Silicon Labs, "We see Wi-SUN technology as an all-encompassing solution for smart city and related applications."

5. HOW SECURE IS THE WI-SUN FAN TECHNOLOGY?

Cyber criminals come in all shapes and forms. Some go after hospitals, government agencies, or organizations using ransomware to demand money. Others purposely disrupt the operations of business organizations, government agencies, and power grids.

As technology develops, more and more cities will be connected and have intelligent network dependent operations such a smart homes and buildings, streetlights, parking, power grid, and traffic controls that rely on IoT systems. As cyber-attacks continue to increase, cybersecurity for the network is critical, given how devasting disrupting daily operation could be.

As IoT connections become more and more prevalent, it is, therefore, important to observe all the cybersecurity rules in designing a network to ensure reliable operations. These rules include end-to-end security, encryption, authentication, key management, and network isolation in the event of a security breach. Wi-SUN has a number of built-in security functions to ensure operational security.



6. WHO IS RESPONSIBLE FOR THE WI-SUN FAN CERTIFICATION PROCESS?

All Wi-SUN FAN CERTIFIED™ products are interoperable and will operate reliably within a network. Before they are certified, products have to go through a vigorous testing process conducted by independent authorized test laboratories. After all the requirements are satisfied, the product will be issued a Wi-SUN CERTIFIED logo.

The certification program has four major elements.

- Test method and specification. Wi-SUN Alliance members will develop the test methodology and specification collaboratively within the TCC (Test and Certification Committee).
- Test equipment. The Wi-SUN TCC works with equipment vendors to provide the required test harness to ensure test conformance.
- Test laboratory. TCC works with the Wi-SUN approved test labs to deliver third-party testing.
- Test bed units. TCC works with product vendors to develop the testbed units (TBU) to facilitate third-party testing.

Certification is available for a wide range of consumer, enterprise, and operator-specific products, including smart meter communications devices, networking infrastructure, domestic electronic products, and modules, all based on the Wi-SUN Alliance technical profiles. When deploying the technology, interoperability can be achieved with the implementation of devices that are certified.

INTERVIEW

Phil Beecher
Wi-SUN Alliance President

3.0 ONE-ON-ONE INTERVIEW WITH THE WI-SUN ALLIANCE PRESIDENT, PHIL BEECHER

By John Koon, Editor-in-Chief

Phil Beecher is the President of the Wi-SUN Alliance, a global ecosystem of member companies driving the proliferation of interoperable wireless solutions for use in smart cities and other IoT applications and which implements a rigorous testing and certification program to achieve its aims.

Phil has extensive experience in wireless communications protocols, standards and testing. He has held positions in IEEE, Wi-Fi Alliance, the US Smart Grid Interoperability Panel (SGIP), OpenSG, Telecom Industry Association and Bluetooth SIG. He has been an active contributor in the development of communications standards and the specification of test plans for a number of Smart Utility Network standards, including Advanced Metering Infrastructure and Home Energy Management Systems.

He is a graduate of the University of Sussex with a degree in Electronic Engineering and holds patents in communications and networking technology.

1. There are quite a few wide area networks (WANs) available on the market today; why do we need the Wi-SUN Field Area Network (FAN)?

Most low-power wide area networks (LPWANs) have been designed for low-speed applications with infrequent communication. The connection is typically “hub and spoke” where devices communicate directly with a base station receiver. The Wi-SUN Field Area Network (FAN), however, uses a mesh network architecture, which provides greater reliability and resilience, by enabling devices to have multiple connections between them.

For example, when conditions change, such as during a storm, when a physical obstruction causes a radio shadow, or data traffic increases, the network can automatically reroute and reconnect through neighbouring nodes to maintain full network connectivity.

The Wi-SUN FAN supports flexible topologies, with a peer-to-peer mesh topology with connection to a backhaul network through one or more border routers providing greater reliability and resilience.

Additionally, Wi-SUN FAN provides flexibility in data rates and energy consumption. These data rates far exceed other LPWANs providing much lower latency (typically allowing applications which require latencies less than one second).

An initial consideration for certain LPWAN technology was to provide long range connections using low transmit powers. This restricts the applications where this kind of technology can be used. In contrast, Wi-SUN FAN offers the flexibility to address smart city and other applications more broadly. Smart city applications place high demands on the underlying network infrastructure, requiring a high degree of security, reliable connections, resilience in the event of faults or changing conditions and much more. Wi-SUN FAN provides resilient, secure and cost-effective connectivity with ubiquitous coverage in a range of topographical environments, from dense urban neighborhoods to rural areas, with minimal additional infrastructure.

2. What is the mission of the Wi-SUN Alliance?

In today's environment, there is no such thing as "one size fits all." In a smart city, a public Wi-Fi network is very convenient for high-speed streaming. However, that Wi-Fi network does not address low-power devices such as environmental monitors or gas and water meters. To fully serve the requirements of a wide range of smart city applications, the Wi-SUN Alliance sees the need for an open, robust, and secure network for utilities and other smart city applications.

In the case of the City of London, towers with access points are available to provide Wi-Fi services.

Our mission is to advance seamless connectivity by promoting IEEE 802.15.4g standards-based interoperability for global regional markets with a robust testing and certification program.

3. Who is part of the Wi-SUN Alliance and what does the Alliance do?

The Wi-SUN Alliance® is a consortium of global corporations and world leaders in smart utility, smart city, and Internet of Things markets. The Wi-SUN Alliance, with 300 member companies in 46 countries, is seeing growing interest from organizations across Europe, Middle East and Africa, as well as new members from the Americas, APAC, South Asia and Japan.

Members offer a wide range of solutions including networking, utility products, energy management, and silicon. The cooperation among companies from different countries has created great synergy. Furthermore, Wi-SUN profiles are based on open standards, ensuring that RF silicon at a reasonable price is available from multiple manufacturers, and that the technology does not rely on just one single proprietary silicon. Additionally, the Wi-SUN product certification program ensures members' products are interoperable.

4. Smart cities are growing leaps and bounds globally, what technologies are needed for smart cities to be sustainable and successful?

Yes indeed, smart cities are growing everywhere. Each smart city is a complex system and has different requirements. There are a number of considerations for the communications infrastructure when developing a smart city:

a. The primary goal for a smart city is to provide its citizens with many benefits including power efficiency, safety, better air quality, convenience, and ultimately better services. This will require a smart infrastructure to support smart streetlights, traffic management, parking, waste management, air quality monitoring, to name a few.

b. The applications supported by this smart infrastructure need to be scalable. For example, managing hundreds of streetlights is one thing. It is another to be able to communicate and monitor tens of thousands of smart streetlights.

c. The network communication needs be secure, robust, and highly reliable. The network should be considered as "critical infrastructure" and protected from hackers and cyber-attack. A security breach that disrupts the operation and daily lives of a city is totally unacceptable.

Wi-SUN FAN provides an infrastructure with reliable and secure connectivity with sufficient capacity to support 100s of thousands of sensors and actuators.

5. Can you expand on how the Wi-SUN FAN will accelerate the development of smart cities?

Perhaps the best way to answer this question is by example. The City of London needed to upgrade its outdated street lighting system to reduce operating and maintenance costs with increased reliability. After an extensive evaluation of options, they decided to use Wi-SUN. As with many other smart cities, the implementation is taking place in stages. The first stage was deploying LED streetlights incorporating Wi-SUN communications technology. LEDs provide better energy efficiency and reliability. Additionally, including communications allows for lights to be controlled and monitored remotely, hence reducing running costs and maintenance.

The next phases of the project will include various sensors for monitoring traffic flow and air quality, to survey road use and benefits of pedestrian only areas. There are sensors for lifebelts provided along the River Thames. A canopy of communications devices installed in streetlights, provides connectivity across the city for a wide range of sensors.

Another application is that of smart waste management. Throughout a city, garbage bins should be available for citizens' convenience. The cost associated with manually checking if bins need emptying can be very high. However, if each bin incorporates a sensor that can detect when a bin is nearly full then garbage collection can be optimized.

6. Can you give us a sense of what smart cities will look like in five to ten years?

Smart city applications are in their infancy, and we are currently experiencing the introduction of new technologies promoted as solutions for these applications. There will be a mix of physical communications technology needed to support the diversity of applications, but much of this is already available and proven at scale. A common factor is the use of internet protocols and architecture. The "Internet of Things" can make use of the wide range of mature technology already well proven as part of the "Internet". Smart cities require more than just one element. The wide range of diverse applications have different needs in terms of latency, low power, number of devices in a given location. For example, they need a smart infrastructure with secure and reliable connectivity for the streetlights, buildings, parking, power grids, and other facilities in the city. Smart city management, including disaster warning and recovery, demands all of the above.

Government agencies and city planning authorities should be able to easily deploy applications that they need, without becoming too constrained by the underlying communications technology.

Cities already rely on many of these applications, such as the power grid, streetlights, highways and traffic management. Smart city technology should provide resilience against disruptions, such as weather events or earthquakes, or building fires or traffic accidents. Therefore, the communications infrastructure supporting these applications must be reliable and fault tolerant during unexpected events.

7. Can you briefly describe the benefits of Wi-SUN FAN certification?

The Wi-SUN Alliance provides a certification program to ensure Wi-SUN products are interoperable and will operate reliably within the network. The program covers both the field area network (FAN) and the home area network (HAN). To become Wi-SUN CERTIFIED, products have to pass rigorous testing conducted by one of our independent authorized test laboratories. When the stringent requirements are met, the product and the manufacturer will be issued a Wi-SUN FAN CERTIFIED™ logo. This ensures that a product complies with the communications standards, and interoperates with other Wi-SUN FAN CERITFIED devices. Certification is available for a wide range of enterprise and operator-specific products, including smart meter communications devices, networking infrastructure, and modules, all based on Wi-SUN Alliance technical profiles.

8. What is the Wi-SUN FAN technology road map?

The objective of Wi-SUN FAN technology is to provide a multi-vendor interoperable, reliable, and secure network for smart city and other smart IoT applications. Today we have 100 million Wi-SUN capable endpoints awarded. Wi-SUN has launched the next phase of its specification program with Wi-SUN FAN 1.1, confident that the demand for interoperable products will continue to grow this year as more IoT applications and services are rolled out across global markets, including North America and South America.

Wi-SUN FAN 1.1 will deliver higher data rates with lower latency, and support for battery-powered devices for applications like gas and water metering, environmental monitoring, traffic sensing, parking management and weather sensors. This next evolution of the program will help extend the range of applications suited to Wi-SUN products, including the integration of smart metering with renewables like solar and wind power where network stability and grid control is critical.

4.0 Members Sharing Their Visions on Wi-SUN

Jeff Lund, Director
Product Management, Cisco IoT

4.1 ACCELERATING WI-SUN FAN DEVELOPMENT WITH NETWORK SYSTEMS AND INFRASTRUCTURE

By Jeff Lund, Director, Product Management, Cisco IoT

Jeff Lund is Director, Product Management at Cisco leading the team responsible for industrial routers, gateways, and field networking products. Jeff has over 20 years of experience working with manufacturers and integrators to add intelligence and networking to devices for industrial, building automation, transportation system, and smart grid applications. Jeff has an MBA from the Wharton School of the University of Pennsylvania and a B.Sc. in Electrical and Computer Engineering from the University of California at Davis.

Cisco Systems, Inc.
Cisco (NASDAQ: CSCO) IoT helps organizations successfully connect the industrial assets they care about most — everything from manufacturing robots and utility substations to roadways and the buses that run on them.

These connected assets deliver outcomes and experiences that drive revenue, make customers loyal, and keep cities running safely. Cisco's IoT portfolio is purpose-built to simplify, secure, and scale industrial deployments and ensure project success. Its end-to-end architecture connects and manages devices, governing data access and movement to applications with scale, reliability, visibility, and security. The portfolio combines Cisco's market-leading cyber security and networking with industrial protocol interoperability and compliant, hardened technology to ensure high performance connectivity anywhere.

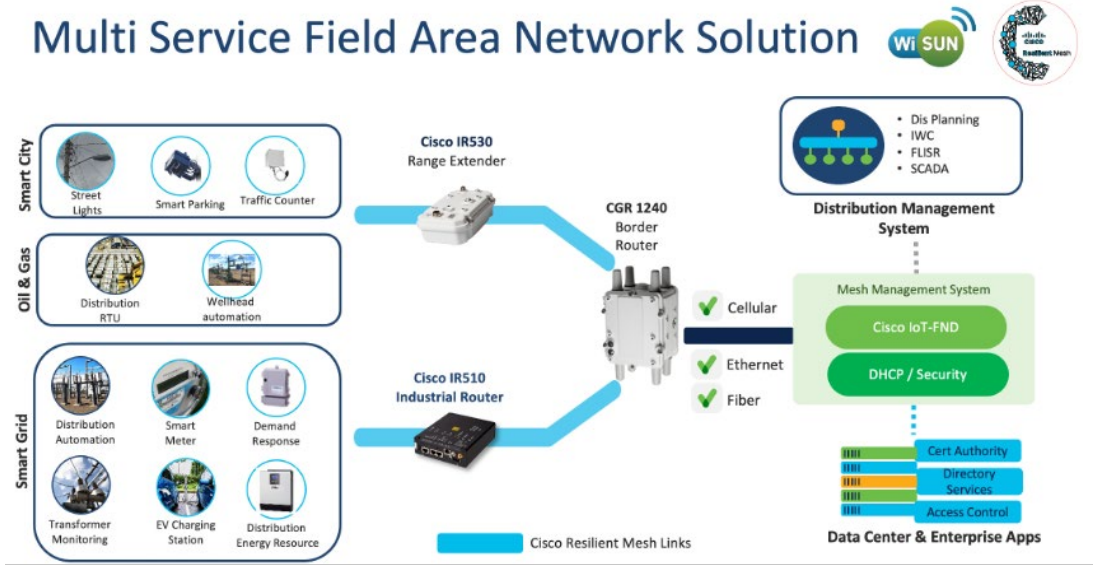
1. Where do you see Wi-SUN FAN applications in the next five years?

Wi-SUN's goal is to support Smart utilities, Smart cities, Smart home, and M2M. Even though there is already a lot of activity in all four of these areas, we are still only at the very early stages of the growth curve. Historically the technologies used to service these use cases have been very fragmented. We think Wi-SUN will be the one of the technologies that brings all these applications together. These applications all need network infrastructure that provides, reliable, secure communications at scale – and Wi-SUN can provide all of that.

In the next five years, we think the Wi-SUN FAN applications will be in smart metering, distribution automation, smart cities, including smart street lighting and other city sensors, and in use cases where customers require a robust

network to cover a large area for critical infrastructure.

Cisco is a network company, and we are a strong supporter of open-standard hardware and software including IP and IPv6. We provide the major components for the complete network including the backbone, routers, switches, hubs, and endpoint devices. Additionally, we provide management software to enable companies to deploy and manage scalable and secure network systems. For example, our Cisco IoT Field Network Director (FND), shown in the figure, enables the mesh endpoints from the Wi-SUN FAN to connect to other network infrastructure.



2. What new application opportunities do you see for Wi-SUN technology?

We believe that we live in a multi-access wireless world, where multiple wireless technologies will coexist and complement one another to solve customers' problems, just like our cell phones today contain multiple wireless technologies that complement each other to provide a richer set of functions. The key trend we see if a convergent from a large number of proprietary technologies and protocols to a smaller set of standards-based technologies built on IP.

Wi-SUN provides a unique set of services that make it very well suited for applications that require a very resilient network that can cover a large area, provide reasonable bandwidth and response times, and that provides all the advantages of IP to provide the quality of service, segmentation and security needed by critical infrastructure applications.

As Wi-SUN continues to evolve and adds new capabilities such as battery powered endpoints that can be intermixed with mains powered devices, we see a richer set of use cases that will evolve, particularly in utility and smart city applications but also in general SCADA use cases.

3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

As I mentioned earlier, as a networking company Cisco believes that customers have a diverse set of use cases that will require many technologies—both wireless and wired – to address their full set of use cases. IP is the common thread that ties all of these technologies together so that customers can build an integrated, secure connected enterprise. We believe 5G and Wi-SUN are complementary technologies that each have an important role to play.

Mr. Dai Hui
IoT BU CEO

4.2 HEXING BRINGS SECURE TWO-WAY COMMUNICATION TO METERING

By Mr. Dai Hui, IoT BU CEO

Mr. Dai Hui is in charge of the IoT business unit within HEXING Group, with headquarters in China. He has more than 10 years of experience in IoT solution development and applications. He led and supervised the development of the company's end-to-end Wi-SUN based advanced metering infrastructure (AMI) solution prior to its release and beginning of mass commercial use in Latin America.

Hexing

In recent years, Hexing has been committed to the research and development of new technologies in the IoT communication field.

Following the Wi-SUN Alliance announcement of the FAN certification program in October 2018, Hexing began rapidly advancing its Wi-SUN field area network solutions and successfully FAN-certified its first-generation smart gateway and related products.

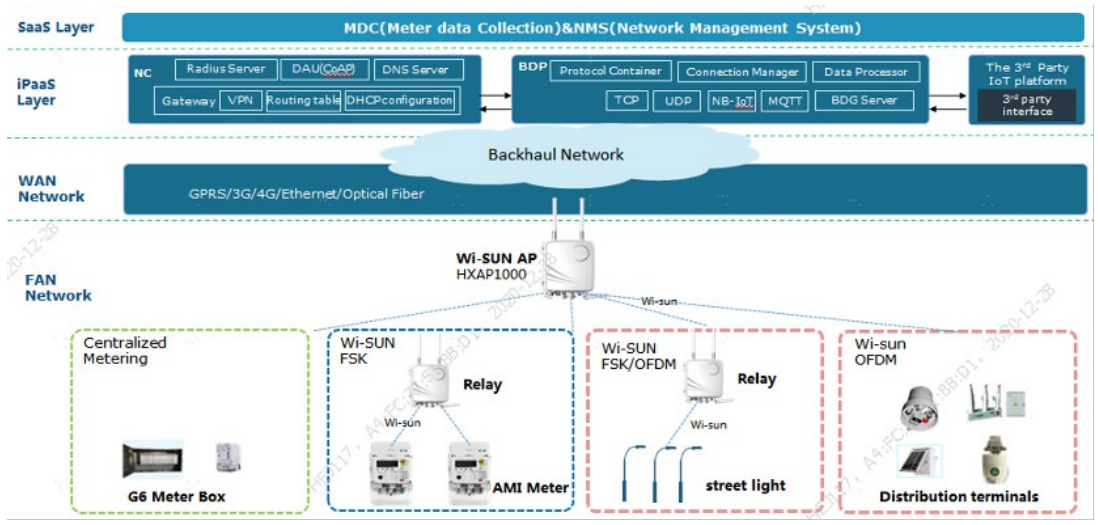
Subsequently, Hexing has become an effective promoter member within the Alliance by introducing new Wi-SUN products into different markets and has won several projects.

Hexing Wi-SUN solutions allow two-way communication of data between the electricity meters' network interface card (NIC) and the meter data collection (MDC) system with total security.

The radios that make up the RF Mesh communication infrastructure are the communication modules connected to the meters, routers, and data collectors. These components share the same communication network and support different applications, such as AMI and Distribution Automation, respecting the requirements of each system.

The following figure shows the technical architecture of the Wi-SUN solution used by Hexing in projects in Brazil and Latin America.

It consists of four parts:



HXAP1000 is a powerful, scalable, reliable outdoor HX-Edge series gateway, which be able to support edge computing and abundant communications via Wi-SUNFAN network. HXAP1000 can be used to setup a large scale IPv6 Wi-SUN compliant network. HXAP1000 is quite easy to add any new software APPs by HX-IoT edge computing controller system remotely.Wi-SUN provides a unique set of services that make it very well suited for applications that require a very resilient network that can cover a large area, provide reasonable bandwidth and response times, and that provides all the advantages of IP to provide the quality of service, segmentation and security needed by critical infrastructure applications.

- FAN Network Layer: Includes the Wi-SUN communication and smart terminal equipment (including gateway and communication relay products, centralized meter box products, AMI meter, and distribution terminals and smart streetlight products to be considered in the future).
- WAN Network Layer: The backhaul communication technology, including GPRS / 3G / 4G / Ethernet / Optical Fiber technology.
- iPaaS Layer: IoT devices access layer.
- SaaS Layer: Data collection and network monitoring application layer.

1. Where do you see Wi-SUN FAN applications in the next five years?

Smart cities and gas and water metering offer many opportunities for IoT technologies. While Wi-SUN technology will not be the only choice, it will be in demand for smart lighting and smart parking, for example. Automatic meter reading (AMR) for gas and water is just getting started in most of Asia and in countries in Africa. Low-power RF technology is expected to take an important role.

2. What new application opportunities do you see for Wi-SUN technology?

There are opportunities for Wi-SUN HAN network solutions to integrate with Bluetooth Low Energy (BLE) and offer more versatility for smart home applications than is possible with Wi-Fi and Zigbee. We have begun preliminary research and development on products that would employ a new version of Wi-SUN technology as the LPWANs and related sensors used in water and gas metering. Another area of interest is commercial office building lighting system control.

3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

We are already seeing its impact on energy metering in China, for example, where most gas and water metering communication technology is NB-IoT. However, NB-IoT cannot achieve low-latency. Also, Wi-SUN has a cost advantage over 5G and LTE Cat 1.

Therefore, for applications that require reliable and low-latency two-way communication, the arrival of 5G will have less influence. One role 5G technology could have, however, would be as an optional backhaul network in a Wi-SUN gateway.

Jeff Scheb
Director of Product Management, Connectivity & Smart Infrastructure

4.3 LANDIS+GYR BETS ON SMART INFRASTRUCTURE GROWTH

By Jeff Scheb, Director of Product Management, Connectivity & Smart Infrastructure

Jeff Scheb is responsible for leading the connectivity and smart infrastructure teams at Landis+Gyr. As a Director of Product Management, he has been with Landis+Gyr for more than 14 years also previously serving in other leadership positions including Solution Architecture, Technical Sales and Research & Development. Jeff holds an M.B.A. from the Georgia Institute of Technology, where he also completed a M.S. in Electrical & Computer Engineering and a B.S. in Electrical Engineering.

Landis+Gyr

Landis+Gyr
Landis+Gyr offers a full portfolio of products and services focused on helping utilities build a brighter energy future. Our Wi-SUN Field Area Network (FAN) solutions are designed to enable the benefits of a true multi-purpose and interoperable network, allowing utilities to support common and emerging use cases such as Advanced Metering Infrastructure (AMI), Distribution Automation (DA), Distributed Energy Resources (DER), and Adaptive Load Management (ALM). Benefits would encompass smart city applications, too, including smart streetlighting.

Landis+Gyr produces various Wi-SUN enabled sensors and devices, including electric meters (Residential and C&I), battery-powered gas communication modules, and radio modules which can be integrated into other third-party devices for grid monitoring and control. Additionally, Landis+Gyr provides a full range of Wi-SUN capable network infrastructure, including border routers and range extenders/repeaters.

1. Where do you see Wi-SUN FAN applications in the next five years?

As “AMI 2.0” takes hold over the next few years, Wi-SUN FAN technology will likely become a ubiquitous requirement in new smart grid deployments, supporting diverse applications such as DA, DER, Load Management, and Electric Vehicle (EV) charging in addition to traditional AMI.

Some of the initial drivers for interoperability will be around supply chain diversification and cost reduction, especially with respect to large smart metering / AMI deployments. However, over the longer term the value of

Wi-SUN FAN will be in easily integrating new sensors from multiple vendors and supporting other grid-focused applications. In this way Wi-SUN FAN becomes a platform that enables all kinds of new applications beyond what we are seeing today.

2. What new application opportunities do you see for Wi-SUN technology?

Many of the biggest opportunities for growth in new applications could be in smart cities / smart communities and other areas outside the traditional utility space. Today we are seeing some traction in smart street lighting systems, and in the future, this could expand to other kinds of smart infrastructure. Utilizing different sensors, such infrastructure can help with applications like public safety, traffic monitoring, noise detection, and pollution monitoring. Other areas for which Wi-SUN is well suited include integration of EVs and DER onto the Grid.

3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

5G is inherently a broadband technology, and while it enables many fascinating and perhaps life-altering applications, it is quite simply overkill for many of the same applications where Wi-SUN FAN will be well suited. Nor is 5G likely to be as cost-effective as mesh for supporting applications like AMI or streetlighting, which simply do not require large amounts of data or extremely low latency. Other cellular LPWAN technologies such as LTE-M and NB-IoT may overlap somewhat with Wi-SUN FAN capabilities. However, there are a number of differentiators and scenarios for which Wi-SUN's underlying RF mesh networking technology is better suited.

Near term, 5G technology is likely to complement Wi-SUN. For example, 5G makes a great high-speed backhaul option from the FAN border router back to the data center, similar to how fiber is used today. While some high-bandwidth grid sensing applications can benefit from a high-speed connection, in other cases a mesh network's inherent peer-to-peer capabilities offer advantages. Combined with concepts such as distributed intelligence and greater edge computing, mesh networks can support more localized decision-making without as much reliance on centralized headend systems. This layered intelligence approach, including edge-, community-, and system-level processing and decision making, is likely to win the day while also suiting Wi-SUN FAN architecture.

We are likely to see more and more hybrid solutions incorporating both Wi-SUN based mesh networking and 5G/cellular technologies in order to reap the best of both.

Ty Roberts
VP Product Marketing,
Networked Solutions

4.4 ITRON IS LEVERAGING THE POWER OF INTEROPERABLE IIoT TO BUILD CONNECTED COMMUNITIES

By Ty Roberts, VP Product Marketing, Networked Solutions

Ty Roberts has 20+ years' experience with the design, development, and delivery of advanced solutions for global utilities. He was a pioneer in the definition and realization of meter data management as a utility business function and has been involved with many of the largest global smart metering deployments over the last 10 years. At Itron, Ty is responsible for defining market strategy for Itron's networked solutions portfolio of smart utility, smart city, and grid management solutions.

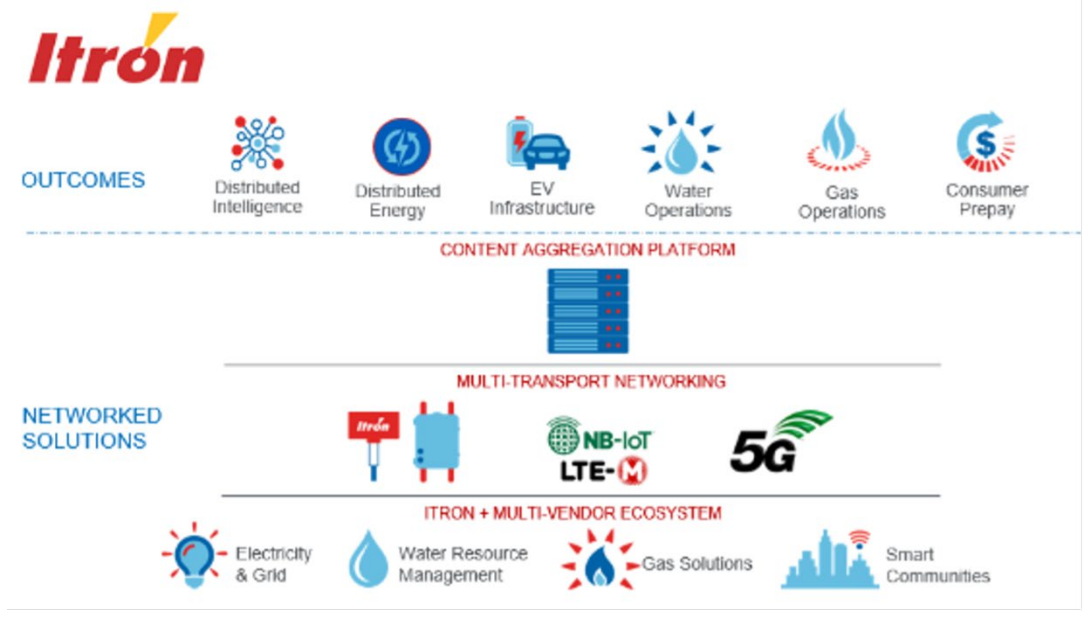
Itron

Itron is a wireless network provider that leverages Wi-SUN's open standard solution to enable communications for millions of devices across the globe. The standardized wireless mesh Field Area Network (FAN) enabled by Wi-SUN provides multi-vendor interoperability and greater choice for our utility and city customers. Itron's Bridge 5-WS became one of the first products to receive Wi-SUN FAN certification in early 2019, based on FAN communications profile compliance and proven ability to interoperate with other Wi-SUN FAN certified products. Itron's Access Point 5-WS was also certified in late 2019. Bringing about a standardized wireless mesh FAN marks a major milestone for Industrial IoT (IIoT) RF mesh technology. Now a solid foundation exists upon which to build feature-rich solutions. This foundation will allow interoperable networks to cover multiple use cases such as utility automation, AMI, distribution automation and more.

1. Where do you see Wi-SUN FAN applications in the next five years?

Communications and energy network modernization readiness is something that numerous cities and utilities are eager to reach. Yet only 28% of cities and utilities believe their existing communication networks are ready to support smart initiatives within the next five years. For many utilities and cities adopting Wi-SUN certified FAN applications, we see a continued focus on supporting and expanding functionality of core AMI applications such as smart metering, outage management, distribution automation and voltage monitoring. Utilities and cities will continue to expand on these foundational IoT network and smart device investments to support AMI 2.0 applications

and functionality such as Distributed Intelligence, distributed energy resource management systems (DERMs), Electric Vehicle Supply Equipment (EVSE), demand response, consumer engagement programs and more.



2. What new application opportunities do you see for Wi-SUN technology?

Wi-SUN-based mesh networks are aptly suited to support utility and IIoT applications. As new advancements in IIoT technology enable more real-time visibility and control, critical infrastructure providers will leverage improved data-driven decision making through capabilities like Distributed Intelligence – peer-to-peer collaboration among edge devices for highly integrated use cases like DERMs and EVs. We will also see FAN communications supporting more fine-tuned grid management solutions. For instance, IIoT-enabled voltage control, fault detection and isolation, grid sensing, load balancing, and active demand response.

3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

The Wi-SUN Alliance plays an important role in promoting standardized wireless mesh for outdoor FAN applications. Similarly, Wi-SUN has a role in broader multi-transport network strategies. Over the next decade, RF Mesh will remain a preferred communication technology to support core operational use cases. However, as cellular becomes more prevalent, cellular networks and Wi-Fi will become integral components of intelligently connected multi-purpose networks to support advanced use cases. Rather than taking a one-size-fits all connectivity approach, critical infrastructure providers should choose interoperable network technologies. Doing so creates the flexibility that makes supplementing networks with 5G and other technologies possible. Communication and application providers should continue to work together with Wi-SUN and other stakeholders to increase the growth and adoption of IIoT-based smart utility and smart city applications.

SILICON

Abhijit Grewal
Director of Marketing Smart Cities,
Industrial and Commercial IoT,
Silicon Labs

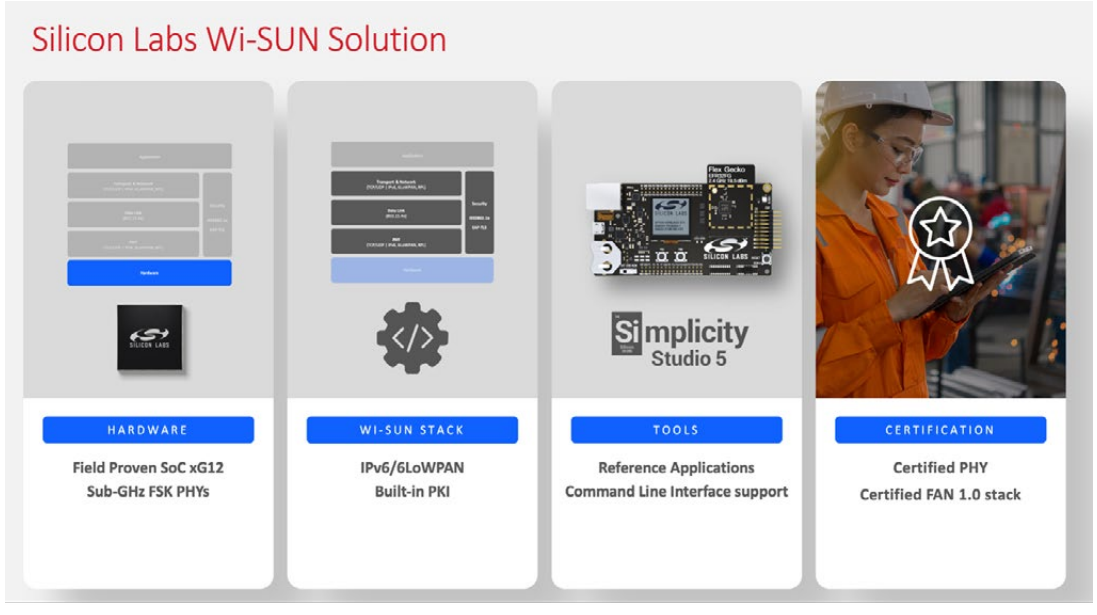
4.5 SILICON LABS IS YOUR COMMITTED WI-SUN PARTNER

By Abhijit Grewal, Director of Marketing Smart Cities, Industrial and Commercial IoT, Silicon Labs

Abhijit Grewal serves as Director of Marketing Smart Cities in Silicon Labs' Industrial and Commercial IoT Business Unit. Grewal leads the company's smart city business, which includes responsibility for the company's smart city product roadmap, technology direction, marketing strategy, and key customer engagements. He also serves on the Wi-SUN Alliance Board of Directors. Grewal joined Silicon Labs in 2008 and has served in various roles in multiple business units, including leading the consumer and automotive digital radio business. He holds an MSE in Electrical Engineering from Arizona State University and a BE in Electronics and Electrical Communications from Thapar Institute of Engineering and Technology Patiala, India.

Silicon Labs

Silicon Labs is a proven leader in IoT wireless silicon, software, and solutions. We joined the Wi-SUN board in 2020 because we strongly believe Wi-SUN is an ideal technology for myriad smart city applications. It supports both high-throughput applications for urban areas as well as long range sensor applications and last mile connectivity – critically important for smart city applications. Wi-SUN delivers multi-node support and provides a robust sub-GHz IPv6 mesh network.



Comprehensive full-featured Wi-SUN solution (hardware and royalty-free stack) from Silicon Labs

Silicon Labs' Wi-SUN offerings are targeted for a broad range of applications including smart meters (electric, water, and gas), smart street lighting, and a host of other smart city applications like solar, parking, asset monitoring, and more. They all provide the foundational hardware and software required to build large scale smart city networks. Silicon Labs has an extensive portfolio of sub-GHz radios. The radios support Wi-SUN PHYs, currently being used to design Wi-SUN capable solutions across all customer tiers. We are committed to bringing fully certified Wi-SUN applications to market and currently developing a Wi-SUN FAN networking stack slated for launch in summer of 2021, which will be supported and maintained in-house. Silicon Labs' first in a series of devices supporting our FAN stack is the EFR32xG12. This 32-bit Arm Cortex-M4 platform has up to 1MB of flash and 256Kb of RAM along with an integrated +20dBm PA for sub-GHz frequencies. Silicon Labs will be certifying the stack and radios to existing and future FAN specifications.

1. Where do you see Wi-SUN FAN applications in the next five years?

Wi-SUN FAN defines everything needed to create secure, reliable, and resilient networks for large-scale smart city and smart utility applications. In many cities worldwide, Wi-SUN has and continues to be implemented by cities to modernize utility and street lighting infrastructure.

We see Wi-SUN as an all-encompassing technology given its support for both full function devices (FFDs) and limited function devices (LFDs); ability to deliver enterprise-level security; support for long-range, low throughput, and high throughput OFDM PHYs; support for both sub-GHz and 2.4GHz deployments; and support for IPv6, making each node IP addressable and effectively simplifying back-end IT needs. Ultimately, Silicon Labs believes Wi-SUN will become the dominant smart city and industrial IoT technology because of its significant scalability and multi-vendor interoperability advantages versus other LPWAN standards.

Silicon Labs already sees significant Wi-SUN FAN traction among major electricity metering and street lighting vendors across North America and Japan today. Wi-SUN FAN is expected to become a global standard over the next five years. With the release of Wi-SUN's FAN 1.1 specification, Wi-SUN adds support for battery-powered water and gas meters, as well as a wide array of smart city sensors. FAN 1.1 enables utility providers responsible for both electric and gas to simplify to a single Wi-SUN network for all their metering needs.

Streetlights are a widespread legacy municipal asset ripe for digitization. These lights are increasingly evolving into canopies for digital infrastructure featuring sensors that add smart city functionality. Because street lighting is high above the ground, it is ideal for maximum network coverage and resiliency. Overhead street lighting and traffic signals are the ideal gateways to support a wide array of smart city sensors and applications. Street lighting poles can be leveraged to manage various functions that help protect, sustain, and improve urban sustainability and quality of life. Think of every street lighting pole as a repeater able to carry LPWAN signals, and so ideal for supporting municipal IoT infrastructure. That includes smart city sensors

governing parking, air quality, methane detection, energy efficiency, man-hole safety, and waste management.

With FAN 1.1's added support for battery-powered devices, customers can deploy a single technology to simultaneously address high-throughput streetlight mesh connectivity as well as low-throughput battery-operated sensor networks.

2. What new application opportunities do you see for Wi-SUN technology?

With the addition of battery-powered metering, low power and mix and match support in FAN 1.1, Silicon Labs sees enormous opportunities for Wi-SUN to successfully expand into LPWAN applications spanning industrial automation and energy renewables like large solar arrays and solar inverters, as well as agriculture, including farm automation, equipment, and herd management.

3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

Wi-SUN network technology has significant advantages over cellular IoT for smart utility, smart city, and industrial automation applications. The limited lifespans of cellular networks are a significant concern for utility and street lighting deployments, given that the average metering lifespan is at least 15-20 years, if not more. For example, the shutdown of 2G cellular networks in the U.S. has proven to be very painful for utility metering vendors, who are now being forced to invest significant time and resources to switch their cellular network to mesh.

In addition, cellular network operating costs are significantly higher than those for mesh networking, especially when factoring in M2M data charges. By contrast, Wi-SUN is an open standard operating within ISM bands, delivering a much lower cost of entry. Vendors relying on cellular networks also find themselves at the mercy of mobile network operators for management and maintenance. At the same time, Wi-SUN enables utility vendors to completely own and manage their own networks.

Utility vendors who have complete control over their network infrastructure can ensure that only certified, authorized, and authenticated devices connect to their network and can deploy repeaters as needed to reinforce the strength of the mesh network for 100% quality of service.

Cellular solutions also consume significantly more power, necessitating larger batteries for smart city sensors, when much smaller and longer lasting batteries can be used with mesh networking. Other areas where cellular networks are inferior to Wi-SUN mesh networking include coverage and tower failure. Mesh networking enables reliable coverage and data transfer. It can also self-form and self-heal should a tower failure occur.

Peter Knazko
Renesas Connectivity Solutions Leader, Americas, Renesas

4.6 RENESAS PROVIDES WI-SUN SOLUTIONS WITH CERTIFIED EMBEDDED REFERENCE DESIGNS

By Peter Knazko, Renesas Connectivity Solutions Leader, Americas, Renesas

Peter is based in Milpitas, California, at Renesas Electronics America's headquarters, and is responsible for expanding the possibilities of embedded computing and IoT connectivity for smart energy applications. Peter is originally an electronics engineer with a 30-year career in semiconductors and embedded solutions, including sales and business development positions at STMicroelectronics and Mitsubishi Semiconductor, and as solution sales director for GE Energy's smart grid business in Europe.

Renesas

Renesas is a global semiconductor company delivering embedded design solutions that enable billions of connected, intelligent devices to enhance the way people work and live. We are a founding member of the Wi-SUN Alliance and current Promoter Member. Our focus on innovative embedded systems allows us to differentiate our offering for Wi-SUN with a fully certified FAN stack running on our microcontroller and radio devices. Our FAN stack enables network system developers to design end-products for a complete Wi-SUN network that will interoperate with other vendors' certified Wi-SUN infrastructure. Renesas solutions comprise reference designs for both the border router and end-node with included certified firmware. The border router design is based on a 32-bit microcontroller and separate radio chip that can accommodate over 1,500 end nodes, and a single device for end-node applications that contains a microcontroller and radio in one integrated circuit. Renesas is a global partner with many companies who use our designs and can help connect embedded design companies with other companies to create exactly the right Wi-SUN solution.

RAA604S002 WI-SUN TRANSCEIVER CHIP ON A "PMOD" EVALUATION MODULE.

1. Where do you see Wi-SUN FAN applications in the next five years?

The Wi-SUN FAN will find more and more adoption especially in the electric utility space as the benefit of interoperability broadens the choice of vendors and helps to reduce costs due to competition. With Wi-SUN v1.1 and its inclusion of battery-operated functionality, this adoption should extend more into the water and gas side of the utility. Also, with v1.1 the addition of OFDM will add an order of magnitude increase in data rate that will allow Wi-SUN

to compete (and coexist) more effectively with LTE networks. In fact, we are beginning to see hybrid solutions where customers want the choice of OPEX and CAPEX on the same modules. And so, Wi-SUN and LTE are showing up together in the same equipment, allowing users to make the choice between the two after field deployment and eliminate the need for retrofitting. But overall, network security, robustness, and mesh capability, combined with the capability of the sub-GHz spectrum to overcome large utility networks' geographic barriers, will continue to be the biggest benefits for Wi-SUN adopters.

2. What new application opportunities do you see for Wi-SUN technology?

Apart from the traditional electricity metering application space, other areas such as municipal lighting and a wide variety of other fixed-asset monitoring applications across industrial and municipal environment will take advantage of Wi-SUN's capabilities. These IoT network applications demand predictable and reliable connectivity and interoperability among thousands of vendor access points. They will benefit from Wi-SUN in the same way that Wi-Fi has become essential for generic wireless connectivity to the internet. The same need exists in the sub-GHz industrial space to simply be able to connect and not have to worry about issues of security, compatibility, and data integrity.

3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

The emergence of 5G provides another operational expense (OPEX) option for utilities vs. the mainly capital expense (CAPEX) of Wi-SUN. Certainly, there is always interest among utility companies to reduce any expense, and 5G will be more and more attractive as its costs fall and reliability and flexibility continue to be addressed by service providers. But a bigger challenge for Wi-SUN will be the recent decision by the FCC in the U.S. to allow for private 5G services just below the 900MHz ISM unlicensed band. By taking the service provider out of the picture, this option becomes a direct CAPEX competitor to Wi-SUN. Utilities will now be allowed to build and maintain their own 5G networks for their power network protection and control operations and not have to co-exist within the crowded unlicensed segment a few megahertz above, where Wi-SUN lives. Private 5G may make sense for only the largest utilities who have the resources and the need to deploy this type of network. It remains to be seen if the complexity of 5G will be worth moving away from the option of Wi-SUN, which will probably remain a smaller capital expense for a while. Also, whether latency, security, and low-power operation will be equal or better than for Wi-SUN is still a challenge for 5G. But with this move by the FCC, the challenge for Wi-SUN as the most effective and best-suited sub-GHz wireless connectivity option for utilities will definitely increase.

SOLUTION PROVIDER

Takahiro Yamamoto
General Manager, Smart Communications System Department, IoT Platform Division, Solution Systems Business Group, OKI Electric Industry Co., Ltd.

OKI
Open up your dreams

4.7 OKI SUPPORTS DIGITAL TRANSFORMATION WITH IOT TECHNOLOGY

By Takahiro Yamamoto, General Manager, Smart Communications System Department, IoT Platform Division, Solution Systems Business Group, OKI Electric Industry Co., Ltd.

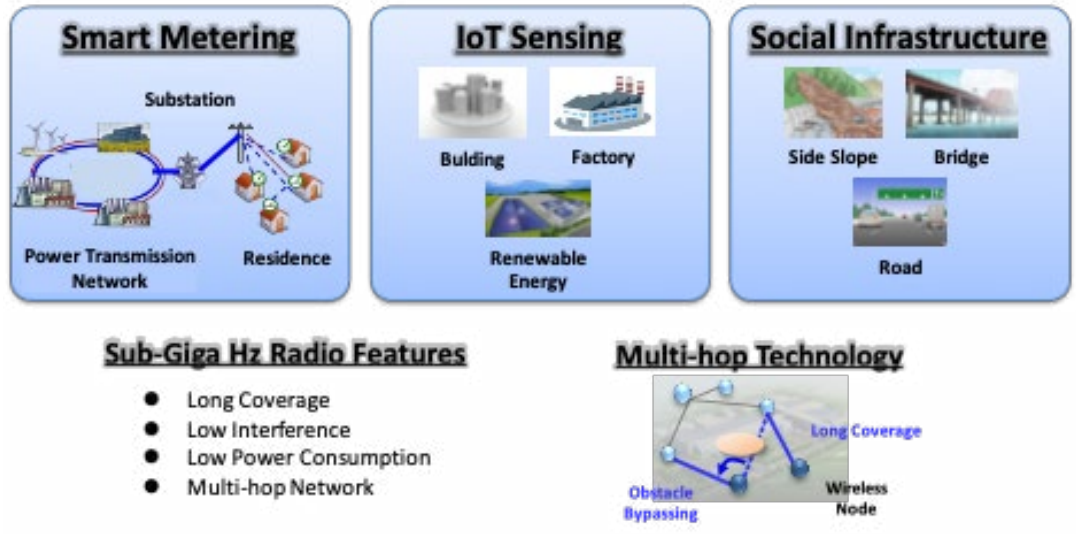
OKI

Wi-SUN is a wireless multi-hop communication technology that complies with the international IEEE 802.15.4 standard using the sub-giga frequency band, including Japanese 920MHz band regulatory support. Wi-SUN is expected to be a communication method suitable for IoT and smart cities.

One of the advantages of Wi-SUN compatible devices is the rigid product certification program the Wi-SUN Alliance provides, which maintains a high level of communication quality and interoperability worldwide. Based on this fact, we believe that Wi-SUN FAN will be widely applied in sectors supporting public social infrastructure.

In the United States, Wi-SUN FAN has been introduced for smart metering and smart cities. The next version of FAN will support higher communication rates and extend to more regions, including Japan, while adding new functionality. In the future, Wi-SUN FAN will be applied to various applications such as infrastructure management, transportation systems, energy utilities, and other fields that support our daily life.

OKI has been promoting sub-gigahertz multi-hop wireless networks in the industrial IoT space and will continue contributing to the development of a smart society utilizing Wi-SUN FAN.



OKI's 920MHz-band wireless application market

1. Where do you see Wi-SUN FAN applications in the next five years?

Infrastructure management, transportation systems, energy utilities, and other fields that support our daily life.

2. What new application opportunities do you see for Wi-SUN technology?

The opportunities are in systems and products that are subject to general procurement based on international standards. This is the case, for example, for businesses that support public social infrastructure. Among the opportunities are:

- Remote monitoring, deterioration diagnosis, and predictive maintenance as applied to public infrastructure, for instance, bridges, tunnels, steel towers, etc.
- Traffic condition monitoring and dangerous vehicle detection to protect the safety and security of pedestrians and construction workers.
- Remote monitoring/control, unmanned operation, and predictive maintenance in smart factories.
- Vital signs sensing for the management of workers physical conditions; heat stroke prevention, etc. for individuals working in specific areas/environments.

3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

5G technology is helping expand the smart city market with its high speed, low latency, and support for a large number of sensors. However, the enterprises that make up the industrial IoT typically require a self-deployed network for data management and business continuity. Also, IoT sensors must have low power consumption and a small form factor, with the ability to be installed in a wide range of locations, and with lower operating costs. Wi-SUN technology is well suited for these requirements and expected to evolve continuously and complement 5G services.

Peder Rand
Sub-1GHz Business Line Manager,
Texas Instruments

4.8 TEXAS INSTRUMENTS SIMPLIFIES DEVELOPMENT FOR WI-SUN APPLICATIONS WITH DURABLE DEVICES AND ROYALTY-FREE STACKS

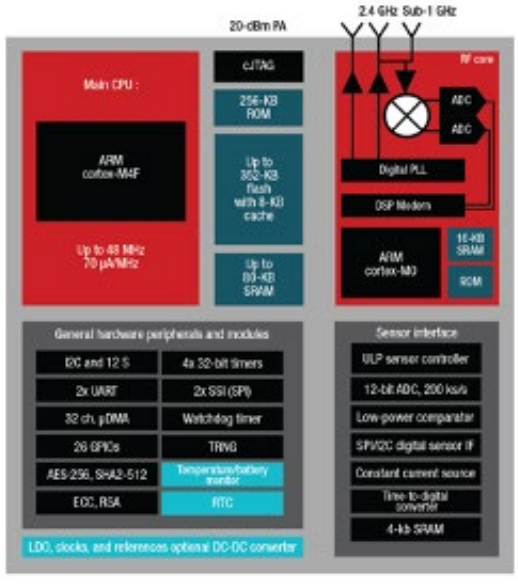
By Peder Rand, Sub-1GHz Business Line Manager, Texas Instruments

Peder Rand is the business line manager for sub-1GHz connectivity at Texas Instruments, where he focuses on developing innovative ways to make Sub-1GHz technology available globally, achieving greater distances, lower power, and lower cost.

Texas Instruments

Texas Instruments provides wireless MCUs, network processors, high-performance transceivers, and a full Wi-SUN FAN 1.0 stack for smart grid, smart city and industrial applications. These components were designed according to FCC, ETSI, and ARIB specifications. Reference designs for end notes, routers, and border routers, as well as the Wi-SUN stack, are free of charge and can be downloaded from www.ti.com/wisun.

Texas Instruments provides transceivers and network processors that support Wi-SUN FAN for long-range networks needing end-to-end security. For example, the low-power and high-performance CC1200 wireless transceiver supports a maximum transmission data rate of 1 Mbps and has a sensitivity of -122 dBm at 1.2 kbps, which translates to high speed and long range while meeting North American, European, and Japanese standards.



System block diagram of the TI CC1352P device

For developers looking for a wireless MCU, the CC1312R and CC1352P devices include a 48-MHz Arm® Cortex® M4F application MCU, with integrated flash memory (so you can update your firmware over the air) and a crypto accelerator to enable security. TI has a low memory footprint implementation of the Wi-SUN stack which enables more room for end user's application. In addition, TI minimizes network interference with an enhanced re-transmission feature. These devices are part of a growing family of wireless MCUs that maintain pin-to-pin and API compatibility for seamless scalability.

1. Where do you see Wi-SUN FAN applications in the next five years?

Wi-SUN has a very solid base in electricity metering, where it has a proven record of meeting the application needs. In addition to pure data collection and control, electricity metering networks require scalability, security, and longevity. These are aspects that when solved in a well architected and proven manner,

CC1352P Wi-SUN development board

form a solid base for use in other infrastructure applications as well. For that reason, I believe Wi-SUN FAN will be successful in wide-area infrastructure networks supporting applications beyond just metering.

2. What new application opportunities do you see for Wi-SUN technology?

There will in essence be two types of Wi-SUN applications going forward. The first type are applications that build the mesh infrastructure. Ideally these applications have nodes spread out evenly over the geographical area to be covered and consist of mains powered nodes. Examples today include electricity meters and streetlights. The second type are the battery-powered applications that leverage these mesh networks. With this second category is where I believe we will see a more significant surge in new and not previously considered applications. Anything from smart trash cans to environmental sensors to pet trackers.

3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

5G networks will form ideal backbones for the Wi-SUN routers to connect to the internet. For particularly critical infrastructure, the slicing functionality that is novel in 5G may be of interest to separate out traffic from the Wi-SUN routers in those networks to ensure the required priority and secure routing.

Summary

The Wi-SUN Field Area Network (FAN) is a standards-based (IEEE 802.15.4 sub-GHz wireless), mesh wireless network. It has been recognized by leading technology companies around the world as the technology of choice for smart cities, smart infrastructure, and related IoT applications. Its global ecosystem of providers includes those offering semiconductor, smart energy management, smart metering and infrastructure, software, and networking solutions.

The 300-member Wi-SUN Alliance, which is responsible for defining the FAN 1.0, 1.1, and future specifications, ensures member product interoperability with a well thought out, vigorous certification program. Built on a solid foundation, Wi-SUN FAN momentum is growing quickly.

Eight leading technology companies have shared their Wi-SUN visions by answering three questions. Their answers are summarized here:

1. Where do you see Wi-SUN FAN applications in the next five years?

The technologies available today for smart cities and smart utilities are very fragmented. Wi-SUN technology will potentially bring all these applications together because this open standards based technology has gained global support in America, Asia, Africa, Japan, and Europe. Strong momentum is building for the Wi-SUN FAN.

Wi-SUN FAN applications are very broad-based. In the next five years, many applications will be deployed including:

- Automatic meter reading (AMR) and smart metering for gas and water
- Distribution automation for energy utilities
- Smart streetlighting
- Smart city applications
- Smart energy and load management
- Smart grid and infrastructure
- Communications and energy network modernization
- Distributed Intelligence, distributed energy resource management systems (DERMs)
- Electric Vehicle Supply Equipment (EVSE)
- Infrastructure management

- Transportation systems

2. What new application opportunities do you see for Wi-SUN technology?

Wi-SUN FAN offers many benefits, including interoperability, long battery life up to 20 years, and a higher data rate than other low-power WANs. The members have collectively shared many new applications and opportunities.

- Smart home opportunities
- Oil and gas applications
- Smart buildings with security for hospitals, police stations, fire stations, city government offices, and university campuses
- Wi-SUN smart home area network (HAN) solutions to integrate with Bluetooth Low Energy (BLE)
- Additional applications for distributed intelligence, DERMs, and EVSE as the technology matures
- New opportunities in low power wide area network (LPWAN) applications including industrial automation, more renewable energy sources in solar arrays/inverters
- Agriculture, including farm automation, equipment, and herd management
- Predictive maintenance and remote monitoring of public infrastructure such as bridges, tunnels, power grids, and steel towers
- Monitoring traffic conditions and pedestrians to improve safety

3. How will the continued adoption of 5G impact Wi-SUN FAN developments and adoption?

The consensus is that the 5G network potentially provides a high-speed backhaul option for the Wi-SUN FAN gateway to connect back to the data center. Some high-bandwidth grid applications can benefit directly from 5G. However, for most low-speed connections the Wi-SUN FAN's mesh network's peer-to-peer capabilities offer sufficient advantages. Using 5G without the Wi-SUN FAN can achieve the same result but at a higher cost. Therefore, it is most likely 5G will complement the Wi-SUN FAN to form a hybrid network. The FCC is considering allowing private 5G services to operate below the 900MHz ISM unlicensed band, an action that could impact how the Wi-SUN FAN will coexist with this new spectrum in the future.

THE TAKEAWAYS:

Smart city, smart infrastructure, and Internet of Things are heading toward a new era. Wi-SUN FAN will be making a significant contribution in these applications and beyond. This ebook has covered the basic Wi-SUN FAN technologies and its architecture. In the one-on-one interview with Wi-SUN Alliance President and CEO, Phil Beecher has shared the future vision of the organization. Additionally, eight leading Wi-SUN members have shown their support and shared the reasoning behind why the technology will be a success globally.

For more information on Wi-SUN Alliance, go to https://wi-sun.org/

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wi-sun.org