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WiSUN use cases
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Abstract

This draft presents several use cases in which WiSUN technology can be applied, including Advanced Metering Infrastructure and Intelligent Street Lights. The draft can stand alone as an independent draft, but also represents a potential contribution to the "WiSUN overview" section of [I-D.ietf-lpwan-overview].

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1. Introduction

WiSUN [RFC2119] is an established suite of IoT technologies that is based on IEEE 802.15.4, TCP/IP, and related standard protocols. Important characteristics of WiSUN include the following:

Coverage
: Range measured in kilometers

Development Ecosystem
: WiSUN Alliance with task groups for targeted use cases and assured interoperability

High Bandwidth
: Up to 300 kbps

Low Latency
: 0.02 seconds

Mesh Routing
: Resilient and scalable

Power Efficiency
: less than 2 uA when resting; 8 mA when listening

Scalability
: Networks to 5,000 devices; 10 million endpoints worldwide

Security
: Public key certificates, AES, HMAC, dynamic key refresh, hardened crypto

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119]. Additionally, this document uses the following terms:

AMI
: Advanced Metering Infrastructure

B-LLN
: Building Automation LLN

CAN
: Campus or Corporate Area Network

I-LLN
: Industrial LLN

LLN
: Low-power, lossy network

U-LLN
: Urban LLN

WiSUN
: Wireless Smart Utility Network

3. Use Cases

3.1. Advanced Metering Infrastructure

Advanced metering infrastructure (AMI) is an integrated system of smart meters, communication networks and data management applications. The coverage of Wi-SUN signal is typically 2~3 km, matching the needs of neighborhood area networks, campus area networks, or corporate area networks (CAN). AMI can use Wi-SUN as the single technology to read various types of meters (electricity, gas, water) within one network.

Besides the daily or monthly meter reading for bill charging, customers also desire to have a more frequent meter reading to build detailed consumption reports. For such scenarios, the sampling rate of AMI can be once every 10 minutes or even more. Wi-SUN devices are designed for frequent communications (as often as every 10 seconds), satisfying AMI's requirement on sampling rate. Moreover, the MAC MTU of 2047 bytes of Wi-SUN supports the aggregation of locally cached samples into a single packet, which can then be uploaded far less

often (e.g. daily). A battery-powered Wi-SUN device can last for up to 10 years without needing battery replacement.

Wi-SUN's symmetric uplink/downlink capability and data rate (up to 300kbps) allow interactive communications between end devices and gateways. Customers are able to read their meters and get a timely response. When an outage occurs, the operator can interactively "ping" each meter to verify its status, so that the trouble spots can be diagnosed. For these two cases, the meters should respond in real-time.

3.2. Intelligent Street Lights

Enabling Intelligent Street Lights is an important use for urban IoT. Various end devices can be integrated in a single street light pole for the purposes of adaptive lighting, environment monitoring, utility management, advertising and so on.

Wi-SUN supports a high duty cycle enabling frequent data transmission -- as often as once every 10 seconds. With Wi-SUN, sensors such as temperature, humidity and air quality mounted on a light pole can maintain a high sampling rate. Wi-SUN's large MTU (2047 bytes) also allows data from different sensors to be packed within a single packet.

As an example for utility management, in the current trash collection, the sanitation workers have to pass by to check each trash can periodically. Since the workers cannot tell whether a can contains any trash, sometimes they come by only to find that the can is empty. If sensors are deployed in the cans, the workers will be informed before attempting collection. Given detailed information about the quantity and type of trash , the right type of vehicle can be sent for collection, and an efficient schedule and path can be planned. Such on-demand collection can reduce the operations cost of sanitation companies. The communication devices in the trash cans would be powered by battery, and their life time should be long enough to minimize the need for battery replacement. In order to save energy, the device is activated only when needed; otherwise it is in deep sleep mode. Battery powered Wi-SUN devices can last for years due to low power consumption. The range of Wi-SUN can be 2~3km in line of sight, so that a gateway mounted on a light pole would cover the end-devices in a district area. If a physical obstruction exists, the range can be extended by multi-hop connection between mains powered Wi-SUN gateways.

4. Security Considerations

Security is a core concern for many IoT/lpwan networks. Compromised devices can be used to mount attacks on other networks, resulting in disruption of essential services (as would be the case for critical IoT networks used for public safety) or costly technology replacements. Networks based on WiSUN can provide excellent security by offering a number of standardized and powerful features such as Public Key Infrastructure certificates, 802.11i, AES, HMAC, and others as described in [citation required].

5. References

5.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <http://www.rfc-editor.org/info/rfc2119>.

5.2. Informative References

[I-D.ietf-lpwan-overview] Farrell, S., "LPWAN Overview", draft-ietf-lpwan-overview-05 (work in progress), July 2017.

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