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# IEEE Standard for Wireless Smart Utility Network Field Area Network (FAN)

Developed by the
IEEE SA Board of Governors Corporate Advisory Group (CAG)

**IEEE Std 2857™-2021**

IEEE

# IEEE Standard for Wireless Smart Utility Network Field Area Network (FAN)

Developed by the

**Corporate Advisory Group (CAG)**
of the
**IEEE SA Board of Governors**

Approved 16 June 2021

**IEEE SA Standards Board**

**Abstract:** This document describes a complete communications specification, encompassing layers 1 to 4 of the Open Systems Integration (OSI) network model, for a secure, wireless mesh communications network, using open standards communications and cybersecurity standards from standards organizations including Institute of Electrical and Electronics Engineers (IEEE) and Internet Engineering Task Force (IETF). The specification describes the functionality of the physical (PHY layer), medium access control (MAC layer), the network layer, transport layer and security parameters including certificate format for a highly scaleable and secure wireless mesh network for critical infrastructure ipv6 wireless communications networks.

**Keywords:** adoption, FAN, field area network, IEEE 2857, Internet of Things, IoT, OSI, smart city, smart utility network, Wi-SUN, wireless mesh

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**Gary Stuebing**, *Chair*
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**Philip E. Beecher**, *Editor*
**Thomas Herbst**, *Secretary*

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## Introduction

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This specification has been provided "as-is" to the IEEE as a proposed adoption standard. This specification has been fully implemented by a number of industry entities and is being used commercially by more than 96 million devices, The Wi-SUN Field Area Network (FAN) specification has been adopted by certain governmental agencies, regulatory authorities, cities and large utility companies. The specification is based on several IEEE 802® standards including IEEE Std 802.15.4™, IEEE Std 802.1™, and IEEE Std 802.11™. The Wi-SUN Board of Directors has offered this specification to the IEEE as a standard offering "as-is" given that the time to market for mesh wireless solutions in the Utility, Smart City, and Internet of Things (IoT) environments is critical. As such, the initial offering is provided without change to the IEEE.

Users should be aware that within the adopted specification, a statement of "must" shall be interpreted as "shall."


## Field Area Network Working Group (FANWG)

# Technical Profile Specification
# Field Area Network

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## Version Released for IEEE Std 2857

(Date of Release: November 26, 2020)

# Field Area Network Working Group
# Field Area Network Technical Profile Specification

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# 1 Introduction

## 1.1 Scope

This document defines the technical implementation and behavior of a Wi-SUN Field Area Network which fulfills the marketing requirements specified in [MRD]. With the details presented in this document, an implementer is enabled to construct an interoperable and certifiable implementation of the Wi-SUN FAN.

## 1.2 Requirements Language

Requirements are specified using the terminology and conventions as described in [RFC2119]. Requirements key words described in [RFC2119] must be capitalized.

## 1.3 Structure of This Document

The FAN Technical Profile Specification is developed in an iterative process as described in [FWGDP]. A brief overview of each TPS section is provided below. Unless noted otherwise, all sections are informative.

1. Introduction. Self-explanatory.
2. References. Self-explanatory.
3. Definitions and Acronyms. Self-explanatory.
4. Technical Requirements (normative). This section defines the requirements which must be met by the Specification section. It defines what functionality must be provided by the TPS. It does not define the technical specifics of how the Technical Requirements are met, nor test cases required to verify that functionality.
5. Architecture. Overview of the design and operation of the FAN.
6. Specification (normative). The technical specifics of how the mechanisms of the FAN are to be implemented. Normative clauses within this section require corresponding test case coverage be incorporated into the Wi-SUN FAN Compliance and Interoperability Test Plans.
7. Appendix A. (normative). Description of the TR51 Channel Function.
8. Appendix B. Unicast Frame Exchange examples.
9. Appendix C. (normative). Description of the Direct Hash Channel Function.
10. Appendix D. Guidance for FAN IPv6 Addressing Architecture.
11. Appendix E. Unicast / Broadcast / Discovery Example.
12. Appendix F. Description of IPv6 Neighbor Discovery Optimizations.
13. Appendix G. Description of Frame Counter, Frame Sequence Number, and MPX-IE Transaction ID interaction.
14. Appendix H. Unicast Timing Calculation Example.
15. Appendix J. FAN Node Bootstrap Messaging Flow.
16. Appendix K. EAPOL Target Selection.
17. Appendix L. Key Reinstallation Attack.