

IEEE Standard for Interoperability of Internet Protocol Security (IPsec) Utilized within Utility Control Systems

IEEE Power and Energy Society

Developed by the
Power System Communications and Cybersecurity
Committee

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IEEE SA Standards Board

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Abstract: Specific configuration requirements within the relevant Internet Engineering Task Force (IETF) Request for Comments (RFC) for implementation of the Internet Protocol Security (IPsec) protocol suite within a utility control system are identified in this standard. It is not intended to be a comprehensive guide to implementing IPsec. Promoting interoperability between products developed by different vendors is the primary goal in developing this standard. Configuration parameters needed to support the establishment and sustained operation of an IPsec Virtual Private Network (VPN) tunnel between two devices which have implemented IPsec conforming to this standard are the focus of this standard. Minimizing configuration errors involving IPsec implementations within utility control systems is a secondary goal of this standard. Product agnosticism and applicability to any device (e.g., router, substation gateway, intelligent electronic device, etc.) is the intent of this standard, within the utility control system as the end user deems necessary for their unique system architecture.

Keywords: control systems, cyber security, encryption, ICS, IEEE 2030.102.1™, IPsec, IEDs, privacy, Virtual Private Network, VPN

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Introduction

This introduction is not part of IEEE Std 2030.102.1–2020, IEEE Standard for Interoperability of Internet Protocol Security (IPsec) Utilized within Utility Control Systems.

Interoperability is not a new concept in the context of cyber security. It is, however, a difficult and challenging concept that poses a significant barrier to establishing and maintaining a secure posture for control systems deployed within the electric utility sector. This standard represents a continuation of work that began under the Lemnos Interoperable Security Project, which was a multiyear effort under the DOE Office of Electricity Delivery and Energy Reliability's Cybersecurity for Energy Delivery Systems (CEDs) program in support of the Roadmap to Secure Energy Delivery Systems. The Lemnos Project established a process to address this challenge by selecting open standards, namely Internet Engineering Task Force (IETF) Request for Comments (RFCs), and then developing profiles that detail specific configuration requirements within the RFC. The intent of these profiles is to be product-agnostic and able to be applied modularly to any device (e.g., router, substation gateway, intelligent electronic device) within the utility control system as the end user deems necessary for their unique system architecture.

This standard identifies specific configuration requirements within the relevant Internet Engineering Task Force (IETF) Request for Comments (RFCs) for implementation of the Internet Protocol Security (IPsec) protocol suite as part of a utility control system. It has been developed relative to IEC 61850. It is not intended to be a comprehensive guide to implementing IPsec.

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1. Overview

1.1 Scope

This standard specifies requirements for interoperability of devices utilized within utility control systems, which implement the Internet Protocol Security (IPsec) protocol suite within an IPv4 environment.

1.2 Purpose

The purpose of this document is to define a specific configuration profile for the Internet Protocol Security (IPSec) protocol suite suitable for use within a utility control system. The primary goal in developing this standard is to promote interoperability between products developed by different vendors. It focuses on those configuration parameters needed to support the establishment and sustained operation of an IPSec Virtual Private Network (VPN) tunnel between two devices that have implemented IPSec conforming to this standard. A secondary goal of this standard is to help minimize configuration errors involving IPSec implementations within utility control systems.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).^{1,2}

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

¹The use of the word *must* is deprecated and cannot be used when stating mandatory requirements, *must* is used only to describe unavoidable situations.

²The use of *will* is deprecated and cannot be used when stating mandatory requirements, *will* is only used in statements of fact.