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# IEEE Standard for Cryptographic Protection of Data on Block-Oriented Storage Devices

IEEE Computer Society

Sponsored by the
Cybersecurity and Privacy Standards Committee

IEEE
3 Park Avenue
New York, NY 10016-5997
USA

**IEEE Std 1619™-2018**
(Revision of IEEE Std 1619-2007)

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# IEEE Standard for Cryptographic Protection of Data on Block-Oriented Storage Devices

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**Abstract:** Cryptographic transform for protection of data in sector-level storage devices is specified in this standard.

**Keywords:** data-at-rest security, encryption, IEEE 1619™, security, storage, XTS

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| James Hatfield | Mohsin Awan | Glen Jaquette |
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The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

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| John Geldman | Quist-Aphetsi Kester | Oren Yuen |
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| Dong Liu | Annette D. Reilly | Jingyi Zhou |

*Member Emeritus

## Introduction

This introduction is not part of IEEE Std 1619-2018, IEEE Standard for Cryptographic Protection of Data on Block-Oriented Storage Devices.

The purpose of this standard is to describe a method of encryption for data stored in sector-based devices where the threat model includes possible access to stored data by the adversary. The standard specifies the encryption transform. Encryption of data in transit is not covered by this standard.

This standard defines the XTS-AES tweakable block cipher and its use for encryption of sector-based storage. XTS-AES is a tweakable block cipher that acts on data units of 128 b or more and uses the AES block cipher as a subroutine. The key material for XTS-AES consists of a data encryption key (used by the AES block cipher) as well as a "tweak key" that is used to incorporate the logical position of the data block into the encryption. XTS-AES is a concrete instantiation of the class of tweakable block ciphers described in Rogaway [IEEE3][1]. The XTS-AES addresses threats such as copy-and-paste attack, while allowing parallelization and pipelining in cipher implementations.

[1]The numbers in brackets correspond to those of the bibliography in Annex A.

## Contents

# IEEE Standard for Cryptographic Protection of Data on Block-Oriented Storage Devices

## 1. Overview

### 1.1 Scope

This standard specifies the XTS cryptographic mode of operation for the Advanced Encryption Standard modes (AES) block cipher for block-oriented storage devices.

### 1.2 Purpose

The purpose of this standard is to define the XTS cryptographic mode while maintaining backward compatibility with existing implementations that are compliant with IEEE Std 1619™-2007 [B5].[2]

## 2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

NIST FIPS-197, Federal Information Processing Standard (FIPS) for the Advanced Encryption Standard (AES).[3]

## 3. Definitions, acronyms, and abbreviations

### 3.1 Definitions

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.[4]

[2]The numbers in brackets correspond to those of the bibliography in Annex A.
[3]FIPS publications are available from the National Technical Information Service, U. S. Department of Commerce (http://www.ntis.org/).
[4]*IEEE Standards Dictionary Online* is available at: http://dictionary.ieee.org.