



CYBER; Attribute Based Encryption for Attribute Based Access Control

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Cyber Security (CYBER).

Modal verbs terminology

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1 Scope

The present document specifies trust models, functions and protocols using attribute based encryption as a foundation of an attribute based access control scheme. It covers both the Ciphertext-Policy (CP-ABE) and Key-Policy (KP-ABE) variants of Attribute-Based Encryption.

The specifications address the following aspects:

- Identification of an ABE scheme covering both the Ciphertext-Policy and Key-Policy variants
- Definition of interactions between the data sources, the service providers and the authority releasing attributes and key material
- Mechanisms for keys, policies, and attributes distribution
- Mechanisms for secret key expiration and revocation
- Definition of semantics for a basic set of attributes to ensure interoperability
- Mapping to a standard Public Key Infrastructure X.509
- Mapping to a standard assertion protocol (SAML)
- Definition of a policy schema for data access control
- Identification of limitations compared to traditional ABAC features
- Translation rules to XACML
- Definition of new protocol bindings when existing bindings do not cover the deployment scenario (e.g. a CoAP binding for the IoT case)

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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2.2 Informative references

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

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3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

ABE authority: ABE entity that stores the master secret key and gives out secret keys

ABKEM universe: set of attributes in which the number of attributes can be a linear (small-universe) or exponential (large-universe) function of the system's security strength

ABKEM universe regeneration: procedure by which an entirely new ABKEM universe is generated, with redistribution of new public key, new master secret key, and new secret keys

app: "software application", typically running on a user's device platform

assertion: statement made by an authority about a property of an entity, typically for - but not restricted to - access control decisions

asymmetric encryption system: encryption system based on asymmetric cryptographic techniques whose public transformation is used for encryption and whose private transformation is used for decryption, see ISO/IEC 18033-1 [i.17]

attack: algorithm that performs computations and makes queries to the encryption algorithm for the encryption and/or for the decryption of adaptively chosen texts under a single secret key, with the purpose of recovering either the unknown plaintext for a given ciphertext, which may be adaptively chosen but for which a decryption query is not issued, or a secret key, see ISO/IEC 18033-1 [i.17]

attack cost: ratio of the average complexity of the attack algorithm measured in terms of the number of calls to the encryption algorithm made by the attack to the probability of success of the attack, see ISO/IEC 18033-1 [i.17]

attribute: characteristic or property of an entity that can be used to describe its state, appearance, or other aspects, see ISO/IEC 24760-1 [i.19]

Attribute-Based Encryption (ABE) system: asymmetric encryption system which is either a CP-ABE system, a KP-ABE system or a combination of both

attribute universe: set of attributes

cloud platform provider: cloud service provider providing identity management services and interfaces (e.g. API, marketplace, etc.) for third party applications using the platform services

cloud platform user: cloud service user consuming one or more platform services

cloud service customer: individual or organization consuming one or more cloud services provided by a cloud service provider

cloud service partner: individual or organization providing support to the provisioning of cloud services by the cloud service provider, or to the consumption of cloud service by the cloud service customer

cloud service provider: individual or organization providing cloud services to one or more cloud service customers

cloud service user: individual consuming one or more cloud services using a particular device

ciphertext: data which has been transformed to hide its information content, see ISO/IEC 18033-1 [i.17]

Ciphertext-Policy Attribute-Based Encryption (CP-ABE) system: asymmetric encryption system where secret keys are derived from a set of attributes and ciphertexts are derived from a policy on attributes

data consumer: natural or legal person, public authority, agency or any other body accessing data for a given purpose

data controller: natural or legal person, public authority, agency or any other body which alone or jointly with others determines the purposes and means of the processing of personal data