



Cross-Enterprise Security and Privacy Authorization (XSPA) Profile of XACML v2.0 for Healthcare

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Abstract:

A profile of XACML used to support cross-enterprise security and privacy authorization.

Status:

This document was last revised or approved by the WS-XACML TC on the above date. The level of approval is also listed above. Check the current location noted above for possible later revisions of this document.

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1 Introduction

Enterprises, including the healthcare enterprise, need a mechanism to exchange security and privacy policies, evaluate consent directives and determine authorizations in an interoperable manner. This document provides a cross-enterprise security and privacy profile that describes how to use eXtensible Access Control Markup Language (XACML) to provide these functions in an interoperable manner.

The Cross-Enterprise Security and Privacy Authorization (XSPA) profile of XACML describes several mechanisms to authenticate, administer, and enforce authorization policies controlling access to protected information residing within or across enterprise boundaries. The policies being administered and enforced relate to security, privacy, and consent directives. This profile MAY be used in coordination with additional standards including Web Services Trust Language (WS-Trust) and Security Assertion Markup Language (SAML).

This profile specifies the use of XACML 2.0 to promote interoperability within the healthcare community by providing common semantics and vocabularies for interoperable policy request/response, policy lifecycle, and policy enforcement.

1.1 Terminology

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” are to be interpreted as described in [RFC2119].

The following definitions establish additional terminology and usage in this profile:

Access Control Service (ACS) – The Access Control Service is the enterprise security service that supports and implements user-side and service-side access control capabilities. The service would be utilized by the Service and/or Service User.

Entity – An entity may also be known as a principal and/or subject, which represents an application, a machine, or any other type of entity that may act as a requester in a transaction.

Object – An *object* is an entity that contains or receives information. The *objects* can represent information containers (e.g., files or directories in an operating system, and/or columns, rows, tables, and views within a database management system) or *objects* can represent exhaustible system resources, such as printers, disk space, and central processing unit (CPU) cycles. ANSI RBAC (American National Standards Institute Role Based Access Control)

Operation - An *operation* is an executable image of a program, which upon invocation executes some function for the user. Within a file system, *operations* might include read, write, and execute. Within a database management system, *operations* might include insert, delete, append, and update. An *operation* is also known as an action or privilege. ANSI RBAC

Permission - An approval to perform an operation on one or more RBAC protected objects. ANSI RBAC

Policy Administration Point (PAP) – Manages and makes available policies that may be stored in and retrieved from the Policy Repository.

Policy Decision Point (PDP) – Takes information from an Authorization Decision Request and returns an access control decision based on evaluation of XACML policy.

Policy Enforcement Point (PEP) – The system entity that performs access control by making decision requests and enforcing authorization decisions. It facilitates passing XACML authorization request attributes and enforcing XACML response decisions and obligations. This module MAY be used for obtaining attributes required for authorization from a Policy Information Point (PIP) by an application. Typical attributes collected at this level include Health Level Seven (HL7) Provider Permissions, HL7 Resource Permission, and HL7 Patient Privacy Constraints.

Policy Information Point (PIP) – Repository of attribute data that is made available to support authorization decisions.

Structural Role - A job function within the context of an organization whose permissions are defined by operations on workflow objects. ASTM (American Society for Testing and Materials) [E2595-2007]

Service Provider (SP) - The service provider represents the system providing a protected resource and relies on the provided security service.

Service User – The service user represents any individual entity [such as on an Electronic Health Record (EHR)/personal health record (PHR) system] that needs to make a service request of a Service Provider.

1.2 Normative References

[RFC2119] - S. Bradner, Key words for use in RFCs to Indicate Requirement Levels, <http://www.ietf.org/rfc/rfc2119.txt>, IETF RFC 2119, March 1997.

[XACML CORE] - T. Moses, XACML 2.0 Core: eXtensible Access Control Markup Language (XACML) Version 2.0, http://docs.oasis-open.org/xacml/2.0/access_control-xacml-2.0-core-spec-os.pdf, OASIS Standard, 01 February 2005.

[SAML-XACML20] - A. Anderson, H. Lockhart, SAML 2.0 profile of XACML 2.0 Errata, <http://www.oasis-open.org/committees/download.php/15447/xacml-2.0-saml-errata-wd.zip>, Working Draft 01, 17 November 2005.

[SX20-ASSN-SCH] - access_control-xacml-2.0-saml-assertion-schema-os.xsd, http://www.oasis-open.org/committees/download.php/11474/access_control-xacml-2.0-saml-assertion-schema-os.xsd

[SX20-PROT-SCH] - access_control-xacml-2.0-saml-protocol-schema-os.xsd, http://www.oasis-open.org/committees/download.php/11475/access_control-xacml-2.0-saml-protocol-schema-os.xsd

[HL7-PERM] - HL7 Security Technical Committee, HL7 Version 3 Standard: Role-based Access Control Healthcare Permission Catalog, (Available through <http://www.hl7.org/library/standards.cfm>), Release 1, Designation: ANSI/HL7 V3 RBAC, R1-2008, Approval Date 2/20/2008.

[HL7-CONSENT] - HL7 Consent Related Vocabulary Confidentiality Codes Recommendation, <http://lists.oasis-open.org/archives/xacml-demo-tech/200712/doc00003.doc>, from project submission: <http://lists.oasis-open.org/archives/xacml-demo-tech/200712/msg00015.html>

1.3 Non-Normative References

[SAML-XACML20V2] - A. Anderson, H. Lockhart, SAML 2.0 profile of XACML Version 2, <http://www.oasis-open.org/committees/download.php/24681/xacml-profile-saml2.0-v2-spec-wd-5-en.pdf>, Working Draft 05, 19 July 2007 (current working draft covers all versions of XACML).

[XACML-RBAC] - A. Anderson, Core and hierarchical role based access control (RBAC) profile of XACML v2.0, http://docs.oasis-open.org/xacml/2.0/access_control-xacml-2.0-rbac-profile1-spec-os.pdf, OASIS Standard, 1 February 2005.

[HITSP] - Healthcare Information Technology Standards Panel (HITSP) at www.hitsp.org.

[XSPA-XACML-INTRO] - Draft Cross-Enterprise Security and Privacy Authorization (XSPA) Introduction to Profile of XACML for Healthcare.

[XSPA-XACML-EXAMPLES] - DRAFT Cross-Enterprise Security and Privacy Authorization (XSPA) Profile of XACML Examples.

[SNOMED CT]- SNOMED CT User Guide (July 2008) <http://www.ihtsdo.org/snomed-ct/snomed-ct-publications/>

2 XSPA profile of XACML

2.1 Interactions between Parties

Figure 1 displays an overview of interactions between parties in the exchange of healthcare information. Elements described in the figure are explained in the subsections below.

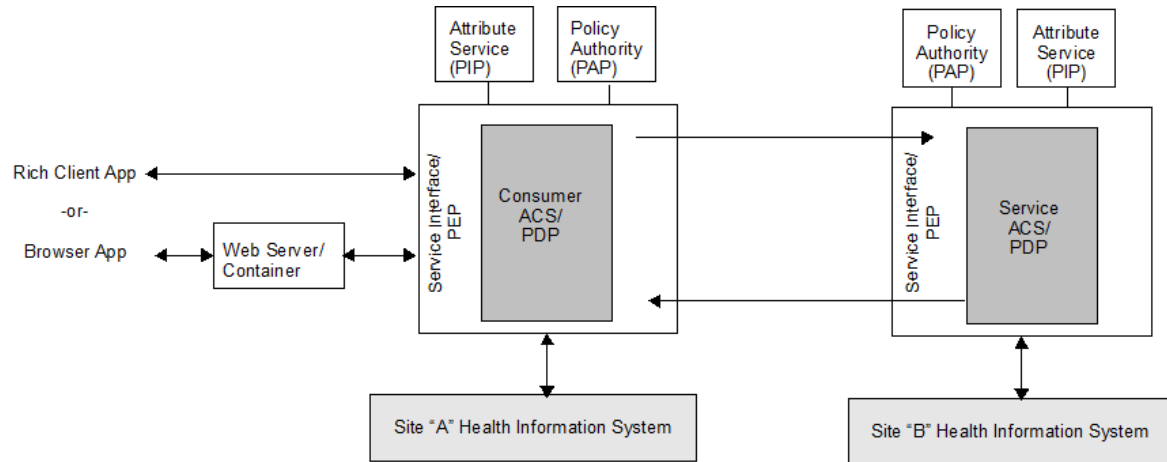


Figure 1: Interaction between Parties

2.1.1 Service Interface

XAMCL functions of the Policy Enforcement Point (PEP) are carried out by the Service Interface.

The PEP interacts with the Policy Information Point (PIP) of the Attribute Service and the Policy Decision Point (PDP) functionality of the Access Control Service (ACS), in enforcing authorization decisions.

2.1.2 Access Control Service (Service Consumer)

The XSPA profile of XACML supports sending all Service User requests through an ACS. XACML functions of the PDP are carried out by the ACS.

Attributes necessary to make a local access control decision are determined and HL7 Permission **[HL7-PERM]** are granted to the Service User based on their role, purpose of use (POU), the service endpoint of the external resource, and any site specific operational attributes.

2.1.3 Attribute Service

XACML functions of the Policy Information Point (PIP) are carried out by the Attribute Service.

The Attribute Service has access to attribute information (e.g., location, purpose of use), object preferences, consent directives and other privacy conditions (object masking, object filtering, user, role, purpose, etc.) that constrain enforcement.

2.1.4 Policy Authority

XACML functions of the Policy Administration Point (PAP) are carried out by the Policy Authority.

The Policy Authority has access to security policies that include rules regarding authorizations required to access a protected resource and additional security conditions (location, time of day, cardinality, separation of duty purpose, etc.) that constrain enforcement.

2.1.5 Access Control Service (Service Provider)

The Service ACS is responsible for the parsing of assertions, evaluating the assertions against the security and privacy policy, and making and enforcing a decision on behalf of the Service Provider.

2.2 Transmission Integrity

The XSPA profile of XACML recommends the use of reliable transmission protocols. Where transmission integrity is required, this profile makes no specific recommendations regarding mechanism or assurance level.

2.3 Transmission Confidentiality

The XSPA profile of XACML recommends the use of secure transmission protocols. Where transmission confidentiality is required, this profile makes no specific recommendations regarding mechanisms.

2.4 Error States

This profile adheres to error states described in [[XACML-CORE](#)].

2.5 Security Considerations

The following security considerations are established for the XSPA profile of XACML:

- Entities must be members of defined information domains under the authorization control of a defined set of policies,
- Entities must have been identified and provisioned (credentials issued, privileges granted, etc.) in accordance with policy,
- Privacy policies must have been identified and provisioned (consents, user preferences, etc.) in accordance with policy,
- Pre-existing security and privacy policies must have been provisioned to Access Control Services,
- The capabilities and location of requested information/document repository services must be known,
- Secure channels must be established as required by policy,
- Audit services must be operational and initialized, and
- Entities have pre-asserted membership in an information domain by successful and unique authentication.

2.6 Confirmation Identifiers

The manner used by the relying party to confirm that the requester message came from a system entity that is associated with the subject of the assertion will depend upon the context and

sensitivity of the data. For confirmations requiring a specific level of assurance, this profile specifies the use of National Institute of Standards and Technology (NIST) Special Publication 800-63 Electronic Authentication Guideline. In addition, this profile specifies the Liberty Identity Access Framework (LIAF) criteria for evaluating and approving credential service providers.

2.7 Metadata Definitions

A XACML extension is used to enable the SAML protocol layer. This is described in the [\[SAML-XACML-20\]](#) specification and in the [\[SX20-PROT-SCH\]](#) schema.

2.8 Naming Syntax, Restrictions and Acceptable Values

This profile will support the namespace requirements described in [\[XACML-CORE\]](#).

2.9 Namespace Requirements

This profile will support the namespace requirements described in [\[XACML-CORE\]](#).

2.10 Attribute Rules of Equality

This profile will support the attribute evaluation requirements as described in [\[XACML-CORE\]](#).

2.11 Attribute Naming Syntax, Restrictions and Acceptable Values

Table 1: Standard Attributes (Normative)

Attribute ID*	Namespace	Type	Valid Values
subject:subject-id	urn:oasis:names:tc:xacml:2.0:subject:subject-id	String	Unique identifier of subject defined by and controlled at the consuming organization.
subject:locality	urn:oasis:names:tc:xacml:2.0:subject:locality	String	Unique identifier of the consuming organization and/or facility.
subject:hl7:permission	urn:oasis:names:tc:xspa:1.0:subject:hl7:permission	String	Refer to [HL7-PERM]
subject:role	urn:oasis:names:tc:xacml:2.0:subject:role	String	Functional role agreed upon by participating organizations.
subject:purpose	urn:oasis:names:tc:xacml:2.0:subject:purpose	String	Healthcare Treatment, Emergency Treatment, System Administration, Operations, Payment, Research, Marketing, Public Health
resource:resource-id	urn:oasis:names:tc:xacml:2.0:resource:resource-id	String	Unique identifier of the resource defined by and controlled by the service organization.
resource:hl7:type	urn:oasis:names:tc:xspa:1.0:resource:hl7:type	String	For minimum interoperability set of objects and supporting actions refer to [HL7-PERM]
resource:hl7:permission	urn:oasis:names:tc:xspa:1.0:resource:hl7:permission	String	Refer to [HL7-PERM]
resource:hl7:confidentiality-code	urn:oasis:names:tc:xspa:1.0:resource:hl7:confidentiality-code	String	Refer to [HL7-CONSENT]
resource:hl7:dissenting-subject-id	urn:oasis:names:tc:xspa:1.0:resource:hl7:dissenting-subject-id	String	Unique identifier of the subject defined and controlled by the consuming organization.
resource:hl7:dissenting-role	urn:oasis:names:tc:xspa:1.0:resource:hl7:dissenting-role	String	Listing of functional roles whose values are agreed upon by participating organizations.

Attribute ID*	Namespace	Type	Valid Values
environment:locality	urn:oasis:names:tc:xspa:1.0:environment:locality	String	Unique identifier of the service organization.

*Note: Attribute-ID is provided for mapping to pseudo-code in the **[XSPA-XACML Example]** document.

HL7 RBAC Permission Catalog [HL7-PERM] represents a conformant minimum interoperability set for object/action pairings.

Table 2: Standard Attributes (Non-Normative)

Attribute ID*	Namespace	Type	Valid Values
subject:npi	urn:oasis:names:tc:xspa:2.0:subject:npi	String	National Provider ID provided by U.S. Government for all active providers.
resource:snomedct:type	urn:oasis:names:tc:xspa:2.0:resource:snomedct:type	String	For full implementation information on healthcare objects refer to [SNOMED CT].

*Note: Attribute-ID is provided for mapping to pseudo-code in the **[XSPA-XACML Example]** document.

Systematized Nomenclature of Medicine--Clinical Terms **[SNOMED CT]** provides the core general terminology for the electronic health record (EHR). As used in this profile, SNOMED CT is used to designate clinically relevant protected information objects.

2.12 Standard Rules (Normative)

At this time no Standard Rule requirements have been defined for this profile.

2.13 Standard Rules (Non-normative)

At this time no optional Rules have been defined for this profile.

2.14 Obligations (Normative)

This profile describes the use of <Obligation> element as optional.

2.15 Obligations (Non-normative)

The <Obligation> element will be used in the XACML response to notify requestor that additional processing requirements are needed. This profile focuses on the use of obligations to enforce patient privacy election. The XACML response may contains one or more obligations. Processing of an obligation is application specific. An <Obligation> may contain the object(resource) action pairing information. If multiple vocabularies are used for resource definitions the origin of the vocabulary must be identified.

The obligation should conform to following structure:

urn:oasis:names:tc:xspa:1.0:obligation:<action>:privacy:constraint:<object vocabulary>:object

The following is an example response obligation segment.

```
<xacml:Obligations
xmlns:xacml="urn:oasis:names:tc:xacml:2.0:policy:schema:os" >
  <xacml:Obligation
  ObligationId="urn:oasis:names:tc:xspa:1.0::obligation:ma:privacy:constraint:hl7:radiology"
  FulfillOn="Permit">
    </xacml:Obligation>
  </xacml:Obligations>
```

2.16 Examples of Use

The following section of this profile provides examples of XACML request and response messages. The examples are intended to provide additional guidance to implementers of this profile.

All XACML request and response attributes are identified by a Uniform Resource Name (URN) from the vocabulary. This enables seamless mapping of data values between the client interface and policy services.

It is recommended that the SAML 2.0 profile of XACML v2.0 [[SAML-XACML20](#)] be used for PEP-PDP communications. (Note: make sure to use [[SX20-ASSN-SCH](#)] and [[SX20-PROT-SCH](#)] schema files and specification in 17-Nov-05 Errata version.)

Following are the expected SOAP-wrapped request and response messages. Further analysis needs to be done here to confirm these formats and determine if they can be used by the participating vendors.

Sample SOAP SAML XACML Request wrapper:

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <soapenv:Body>
    <xacml-sampl:XACMLAuthzDecisionQuery
      xmlns:xacml-sampl="urn:oasis:xacml:2.0:saml:protocol:schema:os"
      ID="_e064bd912f83c1544fea110307000acf"
      IssueInstant="2007-05-21T22:00:36Z"
      Version="2.0">
      <xacml-context:Request
        xmlns:xacml-context="urn:oasis:names:tc:xacml:2.0:context:schema:os">
        <!-- See [XACML-Request-01] for sample content of this element -->
        </xacml-context:Request>
      </xacml-sampl:XACMLAuthzDecisionQuery>
    </soapenv:Body>
  </soapenv:Envelope>
```

The request message above contains three protocol layers:

- **soapenv:** is the SOAP layer. A SOAP Envelope contains a SOAP Body.
- **xacml-sampl:** is the SAML protocol layer, which is enabled by the XACML extension to the SAML protocol, which is described in [\[SAML-XACML-20\]](#) specification and in the [\[SX20-PROT-SCH\]](#) schema. Note that the usual sampl: is not declared here because xacml-sampl: extends sampl: and will transparently include the sampl: base declarations.
- **xacml-context:** is the XACML request/response layer which is described in [\[XACML-CORE\]](#).

Sample SOAP SAML XACML response wrapper:

```
<soapenv:Envelope
  xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <soapenv:Body>
    <sampl:Response
      xmlns:sampl="urn:oasis:names:tc:SAML:2.0:protocol"
      ID="A12345602"
      Version="2.0"
      IssueInstant="2007-05-09T00:00:01Z">
      <sampl:Status>
        <sampl:StatusCode
          Value="urn:oasis:names:tc:SAML:2.0:status:Success"/>
      </sampl:Status>
      <saml:Assertion
        xmlns:saml="urn:oasis:names:tc:SAML:2.0:assertion"
        Version="2.0"
        ID="A12345603"
        IssueInstant="2007-05-09T00:00:01Z">
        <saml:Issuer>xacml.interop.com</saml:Issuer>
        <saml:Statement
          xmlns:xacml-saml="urn:oasis:xacml:2.0:saml:assertion:schema:os"
          xsi:type="xacml-saml:XACMLAuthzDecisionStatementType">
```

```
<xacml-context:Response
  xmlns:xacml-
context="urn:oasis:names:tc:xacml:2.0:context:schema:os">
  <!-- See [XACML-Response-01] for sample content of this element -->
  </xacml-context:Response>
  </saml:Statement>
  </saml:Assertion>
  </samlp:Response>
</soapenv:Body>
</soapenv:Envelope>
```

The response message above contains three protocol layers:

- **soapenv:** is the SOAP layer. A SOAP Envelope contains a SOAP Body.
- **samlp:** is the SAML Protocol layer, which is explicitly declared this time because in the response case the xacml extension is lower in the samlp: protocol. In particular, samlp: requires a saml:Assertion, which in turn includes a saml:Statement. It is within the saml:Statement that the xacml extension occurs and is referred to as xacml-saml: because it extends the saml:Assertion/saml:Statement with the XACMLAuthzDecisionStatementType. The details are described in the [[SAML-XACML-20](#)] specification and the [[SX20-ASSN-SCH](#)] schema.
- **xacml-context:** is the XACML request/response layer which is described in [[XACML-CORE](#)].

3 Appendix A - Revision History

Document ID	Date	Committer	Comment
xspa-xacml-profile-01	09/29/2008	Brett Burley	Initial draft v1.0
xspa-xacml-profile-01	09/29/2008	Craig Winter	QA review / revision v1.1
xspa-xacml-profile-01	10/03/2008	Duane DeCouteau	Obligation, rules, and Snomed CT. v,1,2
xspa-xacml-profile-cd01	10/10/2008	Brett Burley	Formatting as Committee Draft