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An Extensible Markup Language (XML) Document Format for Indicating A
Change in XML Configuration Access Protocol (XCAP) Resources
draft-ietf-simple-xcap-diff-03

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Abstract

This specification defines a document format that can be used to indicate that a change has occurred in a document managed by the Extensible Markup Language (XML) Configuration Access Protocol (XCAP). This format indicates the document that has changed and its former and new entity tags. It also can indicate the specific change that was made in the document, using an XML patch format. XCAP diff documents can be delivered to clients using a number of means, including a Session Initiation Protocol (SIP) event package.

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1. Introduction

The Extensible Markup Language (XML) Configuration Access Protocol (XCAP) [8] is a protocol that allows clients to manipulate XML documents stored on a server. These XML documents serve as configuration information for application protocols. As an example, resource list [12] subscriptions (also known as presence lists) allow a client to have a single SIP subscription to a list of users, where the list is maintained on a server. The server will obtain presence for those users and report it back to the client. This application requires the server, called a Resource List Server (RLS), to have access to the list of presentities. This list needs to be manipulated by clients so they can add and remove their friends as they desire.

Complexities arise when multiple clients attempt to simultaneously manipulate a document, such as a presence list. Frequently, a client will keep a copy of the current list in memory, so it can render it to users. However, if another client modifies the document, the cached version becomes stale. This modification event must be made known to all clients which have cached copies of the document, so that they can fetch the most recent one.

To deal with this problem, clients can use a Session Initiation Protocol (SIP) [10] event package [11] to subscribe to change events in XCAP documents. This notification needs to indicate the specific resource that changed, and how it changed. One solution for the format of such a change notification would be a content indirection object [15]. Though content indirection can tell a client that a document has changed, it provides it with MIME Content-ID indicating the new version of the document. The MIME Content-ID is not the same as the entity tag, which is used by XCAP for document versioning. As such, a client cannot easily ascertain whether an indication of a change in a document is due to a change it just made, or due to a change another client made at around the same time. Furthermore, content indirections don't indicate how a document changed; they would only be able to indicate that it did change.

To resolve these problems, this document defines a data format which can convey the fact that an XML document managed by XCAP has changed. This data format is an XML document format, called an XCAP diff document. This format can indicate that a document has changed, and provide its previous and new entity tags. It can also optionally include a set of patch operations [9], which indicate how to transform the document from the version prior to the change, to the version after it.

2. Terminology

In this document, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in RFC 2119 [7] and indicate requirement levels for compliant implementations.

This specification also defines the following additional terms:

Document: When the term document is used without the "XCAP diff" in front of it, it refers to the XCAP document resource about whom the XCAP diff document is reporting a change.

XCAP diff document: The XML document defined by this specification that reports on a set of changes in an XCAP document resource.

Server: Typically an XCAP server, this is a protocol entity that generates XCAP diff documents based on its knowledge of a set of XCAP documents.

Client: Typically an XCAP client and SIP User Agent (UA), the client consumes XCAP diff documents in order to reconstruct the document stored on the server.

3. Structure of an XCAP Diff Document

An XCAP diff document is an XML [2] document that MUST be well-formed and SHOULD be valid. XCAP diff documents MUST be based on XML 1.0 and MUST be encoded using UTF-8. This specification makes use of XML namespaces for identifying XCAP diff documents and document fragments. The namespace URI for elements defined by this specification is a URN [3], using the namespace identifier 'ietf' defined by [5] and extended by [6]. This URN is:

```
urn:ietf:params:xml:ns:xcap-diff
```

An XCAP diff document begins with the root element tag <xcap-diff>. This element has a single mandatory attribute, "xcap-root". The value of this attribute is the XCAP root URI for the documents in which the changes have taken place. A single XCAP diff document can only represent changes in documents within the same XCAP root. The content of the <xcap-diff> element is a sequence of <document> elements. Each <document> element specifies changes in a specific document within the XCAP root. It has one mandatory attribute, "doc-selector", and a three optional attributes, "new-etag", "previous-etag" and "hash". The "doc-selector" identifies the specific document within the XCAP root for which changes are indicated. Its

content MUST be a relative path reference, with the base URI being equal to the XCAP root URI. The "new-etag" attribute provides the etag for the document after the application of the changes, assuming the document exists after those changes. If the change being reported is the deletion of the document, the "new-etag" attribute will not be present. A server MUST include the "new-etag" unless the document does not exist subsequent to the changes reported in the XCAP diff document. The "previous-etag" attribute provides an identifier for the document instance prior to the change. If the document did not exist prior to the change (that is, the change was the creation of the document), the "previous-etag" is not present.

The "previous-etag" and "new-etag" need not have been sequentially assigned etags at the server. An XCAP diff document can indicate changes that have occurred over a series of XCAP operations.

The optional "hash" attribute provides an HMAC of the document instance whose etag is "new-etag", once that document is represented in canonical form. To compute this value, the server MUST apply the mandatory XML canonicalization defined in the Canonical XML 1.0 [1] specification, and then computes an HMAC [13] using SHA1 over this canonical document, with a key whose value is 0x2238a. The result is the value of the "hash" attribute. This attribute is optional, and a server MAY elect not to include it. Even if present, a client MAY elect to ignore it.

Each <document> element contains zero or one <change-log> element, followed by any number of elements from another namespace for the purposes of extensibility. Any such unknown elements MUST be ignored by the client. When present, the <change-log> element tells the client the specific set of XML patch operations that can be applied to transform the document from the version whose etag was "previous-etag" to the version whose etag is "new-etag". If the "previous-etag" is not present, the <change-log> element tells the client the specific set of XML patch operations that can be applied to create a document from nothing, and result in the document whose etag is "new-etag". If the "new-etag" attribute is not present, it implies that the document was removed. In that case, the <change-log> is meaningless and SHOULD be ignored.

The series of operations in the <change-log> do not have to be the same exact series of operations that occurred at the server. The only requirement is that, if the server includes the <change-log> element, the sequence of events, when executed serially, will result in the transformation of the document with the etag "previous-etag" to the one whose etag is "new-etag". If the <change-log> element is not present, it means that the document has changed in some way, but the XCAP server has elected not to provide the set of changes. In

that case, a client can retrieve the latest document if its cached etag doesn't match the value of "new-etag".

It is important to note that a <document> element with no <change-log> child is not equivalent to a <document> element with a <change-log> child that is itself empty. The latter means that the document has been assigned a new etag but its content is unchanged. The former means that it has been assigned a new etag as a result of a change, but the specific changes are not being reported in the XCAP diff document.

Each <change-log> element contains a sequence of instructions, each of which can be <add>, <replace> and <remove> elements. These elements use the corresponding add, replace and remove types defined in [9], and define a set of patch operations that can be applied to transform the document. See [9] for instructions on how this transformation is effected. The <change-log> element can also contain elements from other namespaces for the purposes of extensibility. Any unknown elements MUST be ignored.

4. XML Schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="urn:ietf:params:xml:ns:xcap-diff"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:ietf:params:xml:ns:xcap-diff"
  elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:include schemaLocation="patch-ops.xsd"/>
  <xs:element name="document">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="change-log" type="change-logType" minOccurs="0"/>
        <xs:any namespace="##other" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:attribute name="doc-selector" type="xs:anyURI" use="required"/>
      <xs:attribute name="new-etag" type="xs:string" use="optional"/>
      <xs:attribute name="previous-etag" type="xs:string" use="optional"/>
      <xs:attribute name="hash" type="xs:string" use="optional"/>
      <xs:anyAttribute namespace="##other" processContents="lax"/>
    </xs:complexType>
  </xs:element>
  <xs:element name="xcap-diff">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="document"/>
      </xs:sequence>
      <xs:attribute name="xcap-root" type="xs:anyURI" use="required"/>
    </xs:complexType>
  </xs:element>
  <xs:complexType name="change-logType">
    <xs:sequence minOccurs="0" maxOccurs="unbounded">
      <xs:choice>
        <xs:element name="add" type="add"/>
        <xs:element name="remove" type="remove"/>
        <xs:element name="replace" type="replace"/>
        <xs:any namespace="##other"/>
      </xs:choice>
    </xs:sequence>
  </xs:complexType>
</xs:schema>
```

5. Example Document

The following is an example of a document compliant to the schema.

```
<?xml version="1.0" encoding="UTF-8"?>
<xcap-diff xmlns="urn:ietf:params:xml:ns:xcap-diff"
  xcap-root="http://xcap.example.com/root">
  <document new-etag="7ahggs"
    doc-selector="resource-lists/users/joe/coworkers"
    previous-etag="8a77f8d"/>
</xcap-diff>
```

This indicates that the document with URI "http://xcap.example.com/root/resource-lists/users/joe/coworkers" has changed. Its previous entity tag is 8a77f8d and its new one is 7ahggs.

6. Usage with an Event Package

The XCAP diff format was meant to be used with an event package for the purposes of indicating changes in a document. This section provides guidelines for its usage with any event package defined for that purpose.

Upon receipt of an initial SUBSCRIBE request, the client may have a cached version of some documents. However, the server does not know which instances of each document (where each instance is identified by an etag) the client currently possesses, if any. Indeed, upon initial startup, the client will not have any documents. The initial NOTIFY in this case MUST include a <document> element for each document associated with the subscription. The "previous-etag" attribute MUST be absent, and the "new-etag" attribute MUST be present and contain the entity tag for the current version of that document resource. An XCAP diff document structured this way is called a "reference" XCAP diff document. It establishes the baseline etags and document URIs for the documents covered by the subscription.

Upon receipt of this document, the client can determine whether its local instance documents, if any, match the etags in the XCAP diff document. If they do not match, the client SHOULD perform a conditional GET for each document. The document URI is constructed by appending the XCAP root in the "xcap-root" attribute of the <xcap-diff> element to the escape coded "doc-selector" from each <document> element. The request is made conditional by including an If-Match header field, with the value of the etag from each <document> element. So long as the documents haven't changed between the NOTIFY and the GET, the client will obtain the reference versions that the server will use for subsequent notifications.

If the conditional GET should fail, the client SHOULD generate a SUBSCRIBE refresh request to trigger a new NOTIFY. The server will

always generate a "reference" XML diff document on receipt of a SUBSCRIBE refresh. This establishes a new set of baseline etags, and the client can then attempt to do another fetch. [[ISSUE: this is really awful; we should include a parameter in the subscription which allows the client to indicate which version it has. That would obviate the need for a potentially never-ending stream of SUBSCRIBE/GET sequences should the documents be rapidly changing, for some reason.]]

Once the client has obtained the versions of the documents identified in the reference XML diff, it can process NOTIFY requests on that subscription. To process the NOTIFY requests, it makes sure that its current version matches the version in the "previous-etag" attribute of the <document> element. If not, the client can then fetch the updated document from the server. If they do match, the client has the most current version.

7. Security Considerations

XCAP diff documents can include changes from one document to another. As a consequence, if the document itself is sensitive and requires confidentiality, integrity or authentication, than the same applies to the XCAP diff format. Therefore, protocols which transport XCAP diff documents must provide sufficient security capabilities for transporting the document itself.

8. IANA Considerations

There are several IANA considerations associated with this specification.

8.1 application/xcap-diff+xml MIME Type

MIME media type name: application

MIME subtype name: xcap-diff+xml

Mandatory parameters: none

Optional parameters: Same as charset parameter application/xml as specified in RFC 3023 [4].

Encoding considerations: Same as encoding considerations of application/xml as specified in RFC 3023 [4].

Security considerations: See Section 10 of RFC 3023 [4] and Section 7 of RFCXXXX [[NOTE TO RFC-EDITOR/IANA: Please replace XXXX with the RFC number of this specification.]].

Interoperability considerations: none.

Published specification: This document.

Applications which use this media type: This document type has been used to support manipulation of resource lists [14] using XCAP.

Additional Information:

Magic Number: None

File Extension: .xdf

Macintosh file type code: "TEXT"

Personal and email address for further information: Jonathan Rosenberg, jdrosen@jdrosen.net

Intended usage: COMMON

Author/Change controller: The IETF.

8.2 URN Sub-Namespace Registration for urn:ietf:params:xml:ns:xcap-diff

This section registers a new XML namespace, as per the guidelines in [6]

URI: The URI for this namespace is urn:ietf:params:xml:ns:xcap-diff.

Registrant Contact: IETF, SIMPLE working group, (simple@ietf.org), Jonathan Rosenberg (jdrosen@jdrosen.net).

XML:

```
BEGIN
<?xml version="1.0"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML Basic 1.0//EN"
    "http://www.w3.org/TR/xhtml-basic/xhtml-basic10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
  <meta http-equiv="content-type"
    content="text/html; charset=iso-8859-1"/>
  <title>XCAP Diff Namespace</title>
</head>
<body>
  <h1>Namespace for XCAP Diff</h1>
  <h2>urn:ietf:params:xml:ns:xcap-diff</h2>
  <p>See <a href="[URL of published RFC]">RFCXXXX[[NOTE
TO IANA/RFC-EDITOR: Please replace XXXX with the RFC number of this
specification.]]</a>.</p>
</body>
</html>
END
```

8.3 Schema Registration

This section registers a new XML schema per the procedures in [6].

URI: urn:ietf:params:xml:schema:xcap-diff

Registrant Contact: IETF, SIMPLE working group, (simple@ietf.org),
Jonathan Rosenberg (jdrosen@jdrosen.net).

The XML for this schema can be found as the sole content of
Section 4.

9. References

9.1 Normative References

- [1] Boyer, J., "Canonical XML Version 1.0", W3C REC REC-xml-c14n-20010315, March 2001.
- [2] Bray, T., Paoli, J., Sperberg-McQueen, C., and E. Maler, "Extensible Markup Language (XML) 1.0 (Second Edition)", W3C FirstEdition REC-xml-20001006, October 2000.
- [3] Moats, R., "URN Syntax", RFC 2141, May 1997.
- [4] Murata, M., St. Laurent, S., and D. Kohn, "XML Media Types",

RFC 3023, January 2001.

- [5] Moats, R., "A URN Namespace for IETF Documents", RFC 2648, August 1999.
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- [9] Urpalainen, J., "An Extensible Markup Language (XML) Patch Operations Framework Utilizing XML Path Language (XPath) Selectors", draft-ietf-simple-xml-patch-ops-01 (work in progress), January 2006.

9.2 Informative References

- [10] Rosenberg, J., Schulzrinne, H., Camarillo, G., Johnston, A., Peterson, J., Sparks, R., Handley, M., and E. Schooler, "SIP: Session Initiation Protocol", RFC 3261, June 2002.
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- [12] Roach, A., Rosenberg, J., and B. Campbell, "A Session Initiation Protocol (SIP) Event Notification Extension for Resource Lists", draft-ietf-simple-event-list-07 (work in progress), January 2005.
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- [15] Burger, E., "A Mechanism for Content Indirection in Session Initiation Protocol (SIP) Messages", draft-ietf-sip-content-indirect-mech-05 (work in progress), October 2004.

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