                            XML Media Types

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Abstract

   This document proposes two new media subtypes, text/xml and
   application/xml, for use in exchanging network entities which are
   conforming Extensible Markup Language (XML). XML entities are
   currently exchanged via the HyperText Transfer Protocol on the World
   Wide Web, are an integral part of the WebDAV protocol for remote web
   authoring, and are expected to have utility in many domains.

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1 Introduction

    The World Wide Web Consortium (W3C) has issued a Recommendation
    [REC-XML] which defines the Extensible Markup Language (XML), version
    1. To enable the exchange of XML network entities, this document
    proposes two new media types, text/xml and application/xml.

    XML entities are currently exchanged on the World Wide Web, and XML
    is also used for property values and parameter marshalling by the
    WebDAV protocol for remote web authoring. Thus, there is a need for a
    media type to properly label the exchange of XML network entities.
    (Note that, as sometimes happens between two communities, both MIME
    and XML have defined the term entity, with different meanings.)

    Although XML is a subset of the Standard Generalized Markup Language
    (SGML) [ISO-8897], and currently is assigned the media types
    text/sgml and application/sgml, there are several reasons why use of
    text/sgml or application/sgml to label XML is inappropriate. First,
    there exist many applications which can process XML, but which cannot
    process SGML, due to SGML's larger feature set. Second, SGML
    applications cannot always process XML entities, because XML uses
    features of recent technical corrigenda to SGML. Third, the
    definition of text/sgml and application/sgml [RFC-1874] includes
    parameters for SGML bit combination transformation format (SGML-
    bctf), and SGML boot attribute (SGML-boot). Since XML does not use
    these parameters, it would be ambiguous if such parameters were given
    for an XML entity. For these reasons, the best approach for labeling
    XML network entities is to provide new media types for XML.

    Since XML is an integral part of the WebDAV Distributed Authoring
    Protocol, and since World Wide Web Consortium Recommendations have
    conventionally been assigned IETF tree media types, and since similar
    media types (HTML, SGML) have been assigned IETF tree media types,
    the XML media types also belong in the IETF media types tree.

2 Notational Conventions

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
   document are to be interpreted as described in [RFC-2119].

3 XML Media Types

   This document introduces two new media types for XML entities,
   text/xml and application/xml. Registration information for these
   media types are described in the sections below.

   Every XML entity is suitable for use with the application/xml media
   type without modification. But this does not exploit the fact that
   XML can be treated as plain text in many cases. MIME user agents
   (and web user agents) that do not have explicit support for
   application/xml will treat it as application/octet-stream, for
   example, by offering to save it to a file.

   To indicate that an XML entity should be treated as plain text by
   default, use the text/xml media type. This restricts the encoding
   used in the XML entity to those that are compatible with the
   requirements for text media types as described in [RFC-2045] and
   [RFC-2046], e.g., UTF-8, but not UTF-16 (except for HTTP).

   XML provides a general framework for defining sequences of structured
   data. In some cases, it may be desirable to define new media types
   which use XML but define a specific application of XML, perhaps due
   to domain-specific security considerations or runtime information.
   This document does not prohibit future media types dedicated to such
   XML applications. However, developers of such media types are
   recommended to use this document as a basis. In particular, the
   charset parameter should be used in the same manner.

   Within the XML specification, XML entities can be classified into
   four types. In the XML terminology, they are called "document
   entities", "external DTD subsets", "external parsed entities", and
   "external parameter entities". The media types text/xml and
   application/xml can be used for any of these four types.

3.1 Text/xml Registration

   MIME media type name: text

   MIME subtype name: xml

   Mandatory parameters: none

Optional parameters: charset

   Although listed as an optional parameter, the use of the charset
   parameter is STRONGLY RECOMMENDED, since this information can be
   used by XML processors to determine authoritatively the character
   encoding of the XML entity. The charset parameter can also be used
   to provide protocol-specific operations, such as charset-based
   content negotiation in HTTP. "UTF-8" [RFC-2279] is the
   recommended value, representing the UTF-8 charset. UTF-8 is
   supported by all conforming XML processors [REC-XML].

   If the XML entity is transmitted via HTTP, which uses a MIME-like
   mechanism that is exempt from the restrictions on the text top-
   level type (see section 19.4.1 of HTTP 1.1 [RFC-2068]), "UTF-16"
   (Appendix C.3 of [UNICODE] and Amendment 1 of [ISO-10646]) is also
   recommended. UTF-16 is supported by all conforming XML processors
   [REC-XML]. Since the handling of CR, LF and NUL for text types in
   most MIME applications would cause undesired transformations of
   individual octets in UTF-16 multi-octet characters, gateways from
   HTTP to these MIME applications MUST transform the XML entity from
   a text/xml; charset="utf-16" to application/xml; charset="utf-16".

   Conformant with [RFC-2046], if a text/xml entity is received with
   the charset parameter omitted, MIME processors and XML processors
   MUST use the default charset value of "us-ascii". In cases where
   the XML entity is transmitted via HTTP, the default charset value
   is still "us-ascii".

   Since the charset parameter is authoritative, the charset is not
   always declared within an XML encoding declaration. Thus, special
   care is needed when the recipient strips the MIME header and
   provides persistent storage of the received XML entity (e.g., in a
   file system). Unless the charset is UTF-8 or UTF-16, the recipient
   SHOULD also persistently store information about the charset,
   perhaps by embedding a correct XML encoding declaration within the
   XML entity.

Encoding considerations:

   This media type MAY be encoded as appropriate for the charset and
   the capabilities of the underlying MIME transport. For 7-bit
   transports, data in both UTF-8 and UTF-16 is encoded in quoted-
   printable or base64. For 8-bit clean transport (e.g., ESMTP,
   8BITMIME, or NNTP), UTF-8 is not encoded, but UTF-16 is base64
   encoded. For binary clean transports (e.g., HTTP), no content-
   transfer-encoding is necessary.

Security considerations:

See section 4 below.

Interoperability considerations:

XML has proven to be interoperable across WebDAV clients and
servers, and for import and export from multiple XML authoring
tools.

Published specification: see [REC-XML]

Applications which use this media type:

XML is device-, platform-, and vendor-neutral and is supported by
a wide range of Web user agents, WebDAV clients and servers, as
well as XML authoring tools.

Additional information:

Magic number(s): none

Although no byte sequences can be counted on to always be present,
XML entities in ASCII-compatible charsets (including UTF-8) often
begin with hexadecimal 3C 3F 78 6D 6C ("<?xml"). For more
information, see Appendix F of [REC-XML].

File extension(s): .xml, .dtd
Macintosh File Type Code(s): "TEXT"

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Intended usage: COMMON

Author/Change controller:

The XML specification is a work product of the World Wide Web
Consortium's XML Working Group, and was edited by:

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The W3C, and the W3C XML working group, has change control over
the XML specification.

3.2 Application/xml Registration

   MIME media type name: application

   MIME subtype name: xml

   Mandatory parameters: none

   Optional parameters: charset

      Although listed as an optional parameter, the use of the charset
      parameter is STRONGLY RECOMMENDED, since this information can be
      used by XML processors to determine authoritatively the charset of
      the XML entity. The charset parameter can also be used to provide
      protocol-specific operations, such as charset-based content
      negotiation in HTTP.

      "UTF-8" [RFC-2279] and "UTF-16" (Appendix C.3 of [UNICODE] and
      Amendment 1 of [ISO-10646]) are the recommended values,
      representing the UTF-8 and UTF-16 charsets, respectively. These
      charsets are preferred since they are supported by all conforming
      XML processors [REC-XML].

      If an application/xml entity is received where the charset
      parameter is omitted, no information is being provided about the
      charset by the MIME Content-Type header. Conforming XML processors
      MUST follow the requirements in section 4.3.3 of [REC-XML] which
      directly address this contingency. However, MIME processors which
      are not XML processors should not assume a default charset if the
      charset parameter is omitted from an application/xml entity.

      Since the charset parameter is authoritative, the charset is not
      always declared within an XML encoding declaration. Thus, special
      care is needed when the recipient strips the MIME header and
      provides persistent storage of the received XML entity (e.g., in a
      file system). Unless the charset is UTF-8 or UTF-16, the
      recipient SHOULD also persistently store information about the
      charset, perhaps by embedding a correct XML encoding declaration
      within the XML entity.

Encoding considerations:

> This media type MAY be encoded as appropriate for the charset and
> the capabilities of the underlying MIME transport. For 7-bit
> transports, data in both UTF-8 and UTF-16 is encoded in quoted-
> printable or base64. For 8-bit clean transport (e.g., ESMTP,
> 8BITMIME, or NNTP), UTF-8 is not encoded, but UTF-16 is base64
> encoded. For binary clean transport (e.g., HTTP), no content-
> transfer-encoding is necessary.

Security considerations:

> See section 4 below.

Interoperability considerations:

> XML has proven to be interoperable for import and export from
> multiple XML authoring tools.

Published specification: see [REC-XML]

Applications which use this media type:

> XML is device-, platform-, and vendor-neutral and is supported by
> a wide range of Web user agents and XML authoring tools.

Additional information:

> Magic number(s): none

> Although no byte sequences can be counted on to always be present,
> XML entities in ASCII-compatible charsets (including UTF-8) often
> begin with hexadecimal 3C 3F 78 6D 6C ("<?xml"), and those in
> UTF-16 often begin with hexadecimal FE FF 00 3C 00 3F 00 78 00 6D
> or FF FE 3C 00 3F 00 78 00 6D 00 (the Byte Order Mark (BOM)
> followed by "<?xml"). For more information, see Annex F of [REC-
> XML].

> File extension(s): .xml, .dtd
> Macintosh File Type Code(s): "TEXT"

Person & email address for further information:

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   the XML specification.

4 Security Considerations

   XML, as a subset of SGML, has the same security considerations as
   specified in [RFC-1874].

   To paraphrase section 3 of [RFC-1874], XML entities contain
   information to be parsed and processed by the recipient's XML system.
   These entities may contain and such systems may permit explicit
   system level commands to be executed while processing the data. To
   the extent that an XML system will execute arbitrary command strings,
   recipients of XML entities may be at risk. In general, it may be
   possible to specify commands that perform unauthorized file
   operations or make changes to the display processor's environment
   that affect subsequent operations.

   Use of XML is expected to be varied, and widespread. XML is under
   scrutiny by a wide range of communities for use as a common syntax
   for community-specific metadata. For example, the Dublin Core group
   is using XML for document metadata, and a new effort has begun which
   is considering use of XML for medical information. Other groups view
   XML as a mechanism for marshalling parameters for remote procedure
   calls. More uses of XML will undoubtedly arise.

   Security considerations will vary by domain of use. For example, XML
   medical records will have much more stringent privacy and security
   considerations than XML library metadata. Similarly, use of XML as a
   parameter marshalling syntax necessitates a case by case security
   review.

   XML may also have some of the same security concerns as plain text.
   Like plain text, XML can contain escape sequences which, when
   displayed, have the potential to change the display processor
   environment in ways that adversely affect subsequent operations.
   Possible effects include, but are not limited to, locking the
   keyboard, changing display parameters so subsequent displayed text is
   unreadable, or even changing display parameters to deliberately

obscure or distort subsequent displayed material so that its meaning
is lost or altered. Display processors should either filter such
material from displayed text or else make sure to reset all important
settings after a given display operation is complete.

Some terminal devices have keys whose output, when pressed, can be
changed by sending the display processor a character sequence. If
this is possible the display of a text object containing such
character sequences could reprogram keys to perform some illicit or
dangerous action when the key is subsequently pressed by the user.
In some cases not only can keys be programmed, they can be triggered
remotely, making it possible for a text display operation to directly
perform some unwanted action. As such, the ability to program keys
should be blocked either by filtering or by disabling the ability to
program keys entirely.

Note that it is also possible to construct XML documents which make
use of what XML terms "entity references" (using the XML meaning of
the term "entity", which differs from the MIME definition of this
term), to construct repeated expansions of text. Recursive expansions
are prohibited [REC-XML] and XML processors are required to detect
them. However, even non-recursive expansions may cause problems with
the finite computing resources of computers, if they are performed
many times.

5   The Byte Order Mark (BOM) and Conversions to/from UTF-16

The XML Recommendation, in section 4.3.3, specifies that UTF-16 XML
entities must begin with a byte order mark (BOM), which is the ZERO
WIDTH NO-BREAK SPACE character, hexadecimal sequence 0xFEFF (or
0xFFFE, depending on endian). The XML Recommendation further states
that the BOM is an encoding signature, and is not part of either the
markup or the character data of the XML document.

Due to the BOM, applications which convert XML from the UTF-16
encoding to another encoding SHOULD strip the BOM before conversion.
Similarly, when converting from another encoding into UTF-16, the BOM
SHOULD be added after conversion is complete.

6   Examples

The examples below give the value of the Content-type MIME header and
the XML declaration (which includes the encoding declaration) inside
the XML entity. For UTF-16 examples, the Byte Order Mark character
is denoted as "{BOM}", and the XML declaration is assumed to come at
the beginning of the XML entity, immediately following the BOM. Note
that other MIME headers may be present, and the XML entity may

contain other data in addition to the XML declaration; the examples
focus on the Content-type header and the encoding declaration for
clarity.

6.1 text/xml with UTF-8 Charset

   Content-type: text/xml; charset="utf-8"

   <?xml version="1.0" encoding="utf-8"?>

   This is the recommended charset value for use with text/xml. Since
   the charset parameter is provided, MIME and XML processors must treat
   the enclosed entity as UTF-8 encoded.

   If sent using a 7-bit transport (e.g. SMTP), the XML entity must use
   a content-transfer-encoding of either quoted-printable or base64.
   For an 8-bit clean transport (e.g., ESMTP, 8BITMIME, or NNTP), or a
   binary clean transport (e.g., HTTP) no content-transfer-encoding is
   necessary.

6.2 text/xml with UTF-16 Charset

   Content-type: text/xml; charset="utf-16"

   {BOM}<?xml version='1.0' encoding='utf-16'?>

   This is possible only when the XML entity is transmitted via HTTP,
   which uses a MIME-like mechanism and is a binary-clean protocol,
   hence does not perform CR and LF transformations and allows NUL
   octets. This differs from typical text MIME type processing (see
   section 19.4.1 of HTTP 1.1 [RFC-2068] for details).

   Since HTTP is binary clean, no content-transfer-encoding is
   necessary.

6.3 text/xml with ISO-2022-KR Charset

   Content-type: text/xml; charset="iso-2022-kr"

   <?xml version="1.0" encoding='iso-2022-kr'?>

   This example shows text/xml with a Korean charset (e.g., Hangul)
   encoded following the specification in [RFC-1557]. Since the charset
   parameter is provided, MIME and XML processors must treat the
   enclosed entity as encoded per [RFC-1557].

   Since ISO-2022-KR has been defined to use only 7 bits of data, no
   content-transfer-encoding is necessary with any transport.

6.4 text/xml with Omitted Charset

    Content-type: text/xml

    {BOM}<?xml version="1.0" encoding="utf-16"?>

    This example shows text/xml with the charset parameter omitted. In
    this case, MIME and XML processors must assume the charset is "us-
    ascii", the default charset value for text media types specified in
    [RFC-2046]. The default of "us-ascii" holds even if the text/xml
    entity is transported using HTTP.

    Omitting the charset parameter is NOT RECOMMENDED for text/xml. For
    example, even if the contents of the XML entity are UTF-16 or UTF-8,
    or the XML entity has an explicit encoding declaration, XML and MIME
    processors must assume the charset is "us-ascii".

6.5 application/xml with UTF-16 Charset

    Content-type: application/xml; charset="utf-16"

    {BOM}<?xml version="1.0"?>

    This is a recommended charset value for use with application/xml.
    Since the charset parameter is provided, MIME and XML processors must
    treat the enclosed entity as UTF-16 encoded.

    If sent using a 7-bit transport (e.g., SMTP) or an 8-bit clean
    transport (e.g., ESMTP, 8BITMIME, or NNTP), the XML entity must be
    encoded in quoted-printable or base64. For a binary clean transport
    (e.g., HTTP), no content-transfer-encoding is necessary.

6.6 application/xml with ISO-2022-KR Charset

    Content-type: application/xml; charset="iso-2022-kr"

    <?xml version="1.0" encoding="iso-2022-kr"?>

    This example shows application/xml with a Korean charset (e.g.,
    Hangul) encoded following the specification in [RFC-1557]. Since the
    charset parameter is provided, MIME and XML processors must treat the
    enclosed entity as encoded per [RFC-1557], independent of whether the
    XML entity has an internal encoding declaration (this example does
    show such a declaration, which agrees with the charset parameter).

    Since ISO-2022-KR has been defined to use only 7 bits of data, no
    content-transfer-encoding is necessary with any transport.

6.7 application/xml with Omitted Charset and UTF-16 XML Entity

    Content-type: application/xml

    {BOM}<?xml version='1.0'?>

    For this example, the XML entity begins with a BOM. Since the
    charset has been omitted, a conforming XML processor follows the
    requirements of [REC-XML], section 4.3.3. Specifically, the XML
    processor reads the BOM, and thus knows deterministically that the
    charset encoding is UTF-16.

    An XML-unaware MIME processor should make no assumptions about the
    charset of the XML entity.

6.8 application/xml with Omitted Charset and UTF-8 Entity

    Content-type: application/xml

    <?xml version='1.0'?>

    In this example, the charset parameter has been omitted, and there is
    no BOM. Since there is no BOM, the XML processor follows the
    requirements in section 4.3.3, and optionally applies the mechanism
    described in appendix F (which is non-normative) of [REC-XML] to
    determine the charset encoding of UTF-8. The XML entity does not
    contain an encoding declaration, but since the encoding is UTF-8,
    this is still a conforming XML entity.

    An XML-unaware MIME processor should make no assumptions about the
    charset of the XML entity.

6.9 application/xml with Omitted Charset and Internal Encoding
     Declaration

    Content-type: application/xml

    <?xml version='1.0' encoding="ISO-10646-UCS-4"?>

    In this example, the charset parameter has been omitted, and there is
    no BOM. However, the XML entity does have an encoding declaration
    inside the XML entity which specifies the entity's charset. Following
    the requirements in section 4.3.3, and optionally applying the
    mechanism described in appendix F (non-normative) of [REC-XML], the
    XML processor determines the charset encoding of the XML entity (in
    this example, UCS-4).

An XML-unaware MIME processor should make no assumptions about the
charset of the XML entity.

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