MedBiquitous Guidelines for Transmitting Binary Attachments

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MedBiquitous Guidelines for Transmitting Binary Attachments

1. Acknowledgement

These guidelines are based on work submitted by Joel Farrell of IBM, Chair of the MedBiquitous Technical Steering Committee. The following members of the MedBiquitous Technical Steering Committee also contributed to this document:

- James Fiore, American Board of Surgery
- Steve Kenney, American Osteopathic Association
- Dan Rehak, Learning Technologies Architect
- Andy Rabin, CECity
- Carl Singer, CECity
- Valerie Smothers, MedBiquitous

2. Scope

This document provides general guidelines for those wishing to transmit binary attachments to support XML documents. The document provides guidance for transmission via SOAP-based web services, via Representational State transfer (REST) services, and other types of transmission, including the transmission of zip files.

3. Status

This document is a technical guideline developed for the MedBiquitous community. It is currently a draft document; we welcome your comments. These guidelines are designed to complement the MedBiquitous Web Services Design Guidelines [MedBiq1] and the Knowing When to REST: Simple Object Access Protocol vs. Representational State Transfer [MedBiq2].

4. Introduction

There are many instances where it is necessary to transmit supporting documents as file attachments that accompany structured XML data. For example, some hospitals may wish to receive a copy of a physician's diploma when making decisions about whether or not to grant privileges to the physician. Because the need to transmit binary attachments comes up in multiple contexts within MedBiquitous, the MedBiquitous Technical Steering Committee has developed these guidelines and accompanying XML Schema to assist MedBiquitous working groups in developing a consistent approach to transmitting binary attachments in support of data using the MedBiquitous XML format.

This document assumes a general understanding of XML, Web services, and binary encoding.

5. Attachments of Any Size: Transmitting Binary Attachments Using SOAP Web Services

If your organization uses SOAP Web Services for transmitting data, use the MTOM approach to transmitting attachments. MTOM is the SOAP Message Transmission Optimization Mechanism [MTOM] specification for transmitting binary information. Implementations leveraging MTOM should use the board approved draft of WSI Basic Profile 1.2 [WSIBP1.2].

MTOM leverages the Multipurpose Internet Mail Extensions specification for multipart messages [MIME].

Two good links for examples of MTOM are:

http://ws.apache.org/axis2/1_0/mtom-guide.html
This shows how the Apache AXIS library is used to send SOAP messages with attachments using MTOM.

http://publib.boulder.ibm.com/infocenter/rsahelp/v8/index.jsp?topic=/com.ibm.webservice.wsfp.doc/topics/cmtom.html
This links to IBM documentation explaining MTOM and providing sample code.

A SOAP request using the Professional Profile would look something like this:

```
... other transport headers ...
Content-Type: multipart/related;
boundary=MIMEBoundaryurn_uuid_0FE43E4D025F0BF3DC11582467646812;
type="application/xop+xml";
start="<0.urn:uuid:0FE43E4D025F0BF3DC11582467646813@apache.org>";
start-info="text/xml"; charset=UTF-8

--MIMEBoundaryurn_uuid_0FE43E4D025F0BF3DC11582467646812
content-type: application/xop+xml; charset=UTF-8; type="text/xml";
content-transfer-encoding: binary
content-id:
   <0.urn:uuid:0FE43E4D025F0BF3DC11582467646813@apache.org>


         <soapenv:Envelope
xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
            <soapenv:Header/>
            <soapenv:Body>
               ...Professional Profile XML
                        <xop:Include
xmlns:xop="http://www.w3.org/2004/08/xop/include"
href="cid:1.urn:uuid:0FE43E4D025F0BF3DC11582467646811@apache.org"/>
               ...More Professional Profile XML
         </soapenv:Envelope>
--MIMEBoundaryurn_uuid_0FE43E4D025F0BF3DC11582467646812
content-type: text/plain
content-transfer-encoding: binary
content-id:
         <1.urn:uuid:0FE43E4D025F0BF3DC11582467646811@apache.org>

... binary data goes here ...
--MIMEBoundaryurn_uuid_0FE43E4D025F0BF3DC11582467646812--
```

Web services tools build this structure.

6. Small Attachments: Transmitting Binary Attachments using Foreign Coding

If you are transmitting a small file, you may wish to embed the encoding within the XML document. Whether an attachment is small or large is relative to your environment. There are several types of encoding schemes that may be used, including Base64 and UUENCODE. The recommended method of encoding is Base64 [Base64]. A good example of Base64 encoding may be found on Wikipedia at: http://en.wikipedia.org/wiki/Base64#Examples

MedBiquitous recommends limiting use of this method for performance and storage reasons. For large files, Base64 encoding will be extremely large.

Security Ramifications
Note that Base64 encoding does not provide security like encryption. If information is sensitive, it should be sent across an SSL or HTTPS connection.

7. Attachments of Any Size: Transmitting Binary Attachments Referencing a Shared Location

A flexible way to transmit attachments associated with XML data is to embed URL references within the XML document. This optimizes performance and provides flexible mechanisms for transmitting attachments, whether it be transmission of a zip file or allowing recipients to download files via HTTP or FTP. This mechanism can be used by RESTful services or sites that provide the document as a download. When the service caller retrieves the main document, the caller finds the referenced attachment and can make another REST call to retrieve the document. The reference approach can also be used by those wishing to transmit attachments by other mechanisms, including email.

MedBiquitous recommends using URL references as the preferred method of transmitting attachments.

If the document must be protected for security reasons, the URL should use HTTPS and some authorization, like HTTP Authentication Basic or Digest **[HTTP AUTH].**

8. Representing A Field for Attachments in XML Specifications and Standards

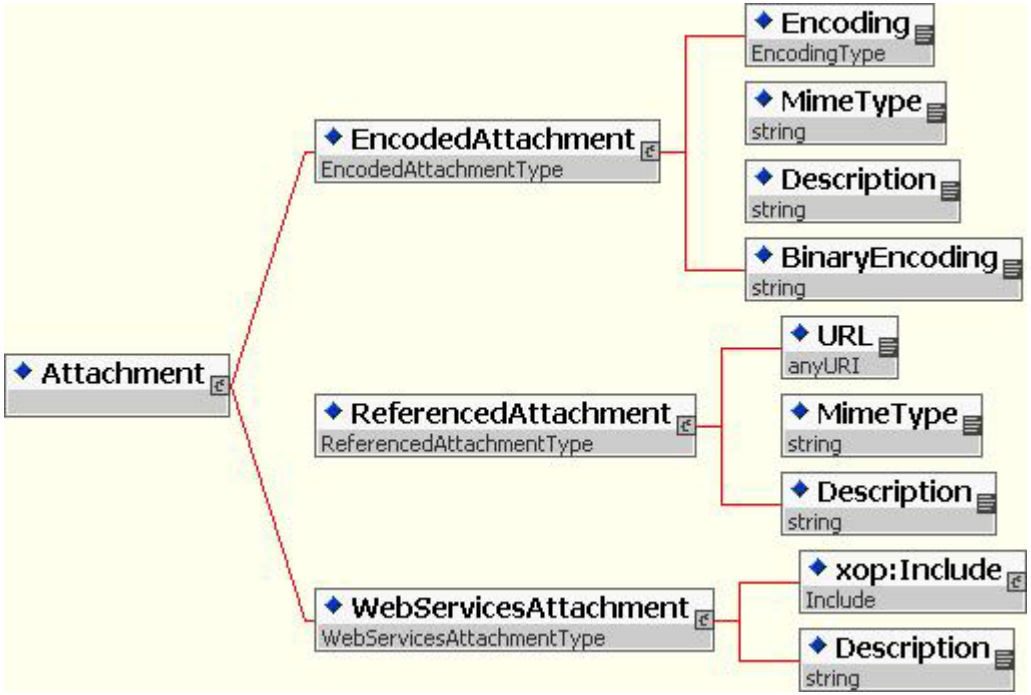
MedBiquitous Working Groups wishing to incorporate support for attachments in MedBiquitous specifications and standards should follow the guidelines below:

1. Determine which types of data may require binary files for supporting documentation. For example, within the Professional Profile specification, Education may require supporting files, such as scanned copies of diplomas.
2. Add the following Attachment element to the container element for that data. Attachment should be optional with 0 or more occurrences in most cases.

The attachment element is defined in the following XML schema:

http://ns.medbiq.org/common/v1/attachment.xsd

A description of the XML schema grammar follows.



Either EncodedAttachment or ReferencedAttachment must be included as a subelement of Attachment. The following table provides definitions for Attachments and its subelements.

Element	Description	Required	Multiplicity	Datatype
Attachment	The subelements of attachment reference or include an attachment supporting the accompanying data.	-	-	Container
EncodedAttachment	The subelements of EncodedAttachment provide encoded data and descriptive information regarding an encoded binary attachment.	Either EncodedAttachment ReferencedAttachment or WebServicesAttachment must be present.	0 or 1	Container

Element	Description	Required	Multiplicity	Datatype
ReferencedAttachement	The subelements of ReferencedAttachment provide a URI reference to a binary attachment and descriptive information regarding that attachment.	Either EncodedAttachment or ReferencedAttachment or WebServicesAttachment must be present.	0 or 1	Container
WebServicesAttachment	The subelements of WebServices Attachment provide a reference to a part of a multipart message and a description.	Either EncodedAttachment or ReferencedAttachment or WebServicesAttachment must be present.	0 or 1	Container
Encoding	For encoded attachments, the type of encoding used. Valid values are Base64 and Uuencoding.	Required for Encoded Attachments	1	Restricted
MimeType	The MIME Media type and optionally subtype of the attachment. For example, image/jpeg. See IANA for more details: http://www.iana.org/assignments/media-types/	Required	1	String
Description	A description of the attachment that clarifies its relation to the data with which it is associated.	Required	1	String
BinaryEncoding	For encoded attachments, the encoded data.	Required for Encoded Attachments	1	String
URL	For referenced attachments, the URL of the attachment.	Required for Referenced Attachments	1	URI
xop:Include	For web services SOAP attachments, xop:Include references the URN of a part in a multipart message.	Required for Web Services attachments using MTOM	1	See: http://www.w3.org/TR/xop10/

The following example shows how attachments might be included as a referenced attachment in the MedBiquitous Healthcare Professional Profile:

```
<Member>
. . .
   <EducationInfo>
      <Degree>M.D.</Degree>
      <InstitutionInfo>
         <InstitutionName>Johns Hopkins University School of Medicine</InstitutionName>
         <InstitutionID domain="AAMC">133</InstitutionID>
         <Address>
            <a:StreetAddressLine>720 Rutland Avenue</a:StreetAddressLine>
            <a:City>Baltimore</a:City>
            <a:StateOrProvince>MD</a:StateOrProvince>
            <a:PostalCode>21205</a:PostalCode>
            <a:Country>
               <a:CountryCode>US</a:CountryCode>
            </a:Country>
         </Address>
      </InstitutionInfo>
      <EducationStatus>Graduated</EducationStatus>
      <StartDate>1980-08-01</StartDate>
      <EndDate>1984-07-31</EndDate>
      <GraduationDate>1984-07-31</GraduationDate>
      <Attachment xmlns="http://ns.medbiq.org/common/v1/">
         <ReferencedAttachment>
            <URL>http://www.medbiq.org/files/diploma1234.jpg</URL>
            <MimeType>image/jpeg</MimeType>
            <Description>John Doe's diploma for medical school.</Description>
         </ReferencedAttachment>
      </Attachment>
   </EducationInfo>
   . . .
</Member>
```

The following example shows how attachments might be included using SOAP web services and MTOM.

```
         <soapenv:Envelope
xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
            <soapenv:Header/>
            <soapenv:Body>
               <Member>
               . . .
                  <EducationInfo>
                     <Degree>M.D.</Degree>
                     <EducationStatus>Graduated</EducationStatus>
                     <Attachment xmlns="http://ns.medbiq.org/common/v1/">
                        <WebServicesAttachment>
                           <xop:Include
xmlns:xop="http://www.w3.org/2004/08/xop/include"
href="cid:1.urn:uuid:0FE43E4D025F0BF3DC11582467646811@apache.org"/>
                           <Description>John Doe's diploma for medical school.</Description>
                        </WebServicesAttachment>
                     </Attachment>
                  </EducationInfo>
                  . . .
               </Member>
         </soapenv:Envelope>
--MIMEBoundaryurn_uuid_0FE43E4D025F0BF3DC11582467646812
content-type: text/plain
content-transfer-encoding: binary
content-id:
         <1.urn:uuid:0FE43E4D025F0BF3DC11582467646811@apache.org>

... binary data goes here ...
--MIMEBoundaryurn_uuid_0FE43E4D025F0BF3DC11582467646812--
```

9. References

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[HTTP AUTH]
HTTP Authentication: Basic and Digest Access Authentication, June 1999. http://tools.ietf.org/html/rfc2617

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Knowing When to REST: Simple Object Access protocol vs. Representational State Transfer, Accessed October 28, 2009. http://www.medbiq.org/std_specs/techguidelines/knowingwhentorest.pdf

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Multipart Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies, http://tools.ietf.org/html/rfc2045

[MTOM]
Message Transmission Optimization Mechanism, http://www.w3.org/TR/soap12-mtom/

[WSIBP1.2]
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