FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS

FIPA Agent Message Transport Envelope Representation in XML Specification

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Foreword

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Contents

1 Scope

This document deals with message transportation between inter-operating agents and also forms part of the FIPA Agent Management Specification [FIPA00023]. It contains specifications for:

- Syntactic representations of a message envelope in XML form (see [W3Cxml]).

2 XML Envelope Representation

This section gives the concrete syntax for the message envelope specification that must be used to transport messages over a Message Transport Protocol (MTP - see [FIPA00067]). This concrete syntax is designed to complement [FIPA00071] and [FIPA00084].

2.1 Component Name

The name assigned to this component is:

```
fipa.mts.env.rep.xml.std
```

2.2 Mime Type

Where required, the MIME type (see [RFC2046]) of items generated according to this specification is taken to be `application/xml`. The `charset` encoding used in this section must conform to [W3Cxml].

2.3 Syntax

The following DTD specifies the encoding of the abstract FIPA specification as an XML message:

```
<!--
Document Type: XML DTD
Document Purpose: Encoding of FIPA ACL message envelopes (as in [FIPA0067]).
See http://www.fipa.org
Last Revised: 2000-08-16
-->

<!ELEMENT     envelope               ( params+ )>

<!ELEMENT     params                 ( to?,
                                       from?,
                                       comments?,
                                       acl-representation?,
                                       payload-length?,
                                       payload-encoding?,
                                       date?,
                                       encrypted?,
                                       intended-receiver?,
                                       received?,
                                       user-defined* )>

<!ATTLIST     params                  index CDATA #REQUIRED>

<!ELEMENT     to                     ( agent-identifier+ )>

<!ELEMENT     from                   ( agent-identifier )>

<!ELEMENT     acl-representation     ( #PCDATA )>

<!ELEMENT     comments               ( #PCDATA )>

<!ELEMENT     payload-length         ( #PCDATA )>

<!ELEMENT     payload-encoding       ( #PCDATA )>

<!ELEMENT     date                   ( #PCDATA )>

<!ELEMENT     intended-receiver      ( agent-identifier+ )>
```

```
<!ELEMENT     agent-identifier       ( name,
                                       addresses?,
                                       resolvers?,
                                       user-defined* )>

<!ELEMENT     name                   ( #PCDATA )>

<!ELEMENT     addresses              ( url+ )>

<!ELEMENT     url                    ( #PCDATA )>

<!ELEMENT     resolvers              ( agent-identifier+ )>

<!ELEMENT     received               ( received-by,
                                       received-from?,
                                       received-date,
                                       received-id?,
                                       received-via?,
                                       user-defined* )>

<!ELEMENT     received-by            ( url )>

<!ELEMENT     received-from          ( url )>

<!ELEMENT     received-date           EMPTY>
<!ATTLIST     received-date           value CDATA #IMPLIED>

<!ELEMENT     received-id             EMPTY>
<!ATTLIST     received-id             value CDATA #IMPLIED>

<!ELEMENT     received-via            EMPTY>
<!ATTLIST     received-via            value CDATA #IMPLIED>

<!ELEMENT     user-defined           ( #PCDATA )>
<!ATTLIST     user-defined             href CDATA #IMPLIED>
```

2.4 Additional Syntax Rules

The following additional rules not specified in the DTD also apply:

1. [FIPA00067] requires that all changes made to a message envelope by one message processing step (for example, handling of the message by a single ACC) be attributable to the message processor that made the changes. This is achieved in the XML envelope by grouping all changes made by one message processor (ACC) at one point in time into a single `PARAMS` element.

2. There is no need to add envelope parameter values to a new `PARAMS` element if the values of these parameters is not being updated. Only parameters whose value is being changed need be included. The meaning of a `PARAMS` statement containing two elements defining new values for the same envelope parameter is undefined.

3. This specification permits multiple occurrences of unique message envelope-level parameters (`to`, `from`, `intended-receiver`, `date`, `acl-representation`, `payload-length`, `received` `transport-behaviour`, etc.) in order to handle field value overwriting as specified in [FIPA00067]. To help obtain the latest (and currently valid) value of any parameter, the `INDEX` attribute of the `PARAMS` element is used to establish an order of the different occurrences of elements (and hence envelope parameters). The first and oldest occurrence of the element will have an `INDEX` value of 1, the next value of the field will have `INDEX` value of 2 and so on.

4. When adding a new `PARAMS` element, the `INDEX` attribute will have a value with 1 higher than the largest existing `INDEX` of any `PARAMS` element currently in the envelope. The first `PARAMS` element will have the `INDEX` value of 1.

5. The current value of any envelope-level field will be given by the value of the field as it appears in the newest `PARAMS` element that contains that field.

6. The following pseudo code algorithm may be used to obtain the latest values for each of the envelope parameters:

```
EnvelopeWithAllFields := new empty Envelope;

while ((EnvelopeWithAllFields does not contain values for all its fields)
        OR (all PARAMS elements in the sequence have been processed)) {
 // the processor gets the next envelope in the sequence starting with the one
 // with the highest index
 tempEnvelope = getNextEnvelope;

 foreach field in an envelope {
   if ((this field has no value in envelopeWithAllFields)
       AND (this field has a value in tempEnvelope))
   then copy the value of this field from tempEnvelope to envelopeWithAllFields;
 }
}
```

`EnvelopeWithAllFields` contains now the latest values for all its fields set in the envelope.

7. User-defined fields in the `params`, `agent-identifier` and `received` parameters must be prefixed with "`X-`".

2.5 Representation of Time

Time tokens are based on [ISO8601], with extension for relative time and millisecond durations. Time expressions may be absolute, or relative. Relative times are distinguished by the sign character `+` or `-` appearing as the first character in the token. If no type designator is given, the local time zone is then used. The type designator for UTC is the character `Z`; UTC is preferred to prevent time zone ambiguities. Note that years must be encoded in four digits. As an example, 8:30 am on 15th April, 1996 local time would be encoded as:

```
19960415T083000000
```

The same time in UTC would be:

```
19960415T083000000Z
```

while one hour, 15 minutes and 35 milliseconds from now would be:

```
+00000000T011500035
```

3 References

[FIPA00023] FIPA Agent Management Specification. Foundation for Intelligent Physical Agents, 2000. http://www.fipa.org/specs/fipa00023/

[FIPA00067] FIPA Agent Message Transport Service Specification. Foundation for Intelligent Physical Agents, 2000. http://www.fipa.org/specs/fipa00067/

[FIPA00069] FIPA ACL Message Representation in Bit-Efficient Encoding Specification. Foundation for Intelligent Physical Agents, 2000. http://www.fipa.org/specs/fipa00069/

[FIPA00070] FIPA ACL Message Representation in String Specification. Foundation for Intelligent Physical Agents, 2000. http://www.fipa.org/specs/fipa00070/

[FIPA00071] FIPA ACL Message Representation in XML Specification. Foundation for Intelligent Physical Agents, 2000. http://www.fipa.org/specs/fipa00071/

[FIPA00075] Agent Message Transport Protocol for IIOP. Foundation for Intelligent Physical Agents, 2000. http://www.fipa.org/specs/fipa00075/

[FIPA00084] FIPA Agent Message Transport Protocol for HTTP Specification. Foundation for Intelligent Physical Agents, 2000. http://www.fipa.org/specs/fipa00084/

[ISO8601] Date Elements and Interchange Formats, Information Interchange-Representation of Dates and Times. International Standards Organisation, 1998. http://www.iso.ch/cate/d15903.html

[RFC2046] Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types, Freed and Borenstein, November 1996. http://www.rfc-editor.org/rfc/rfc2046.txt

[W3Cxml] Extensible Mark-up Language (XML) 1.0 Specification (Recommendation). World Wide Web Consortium, 1998. http://www.w3c.org/TR/REC-xml/

4 Informative Annex A — Examples

1. Here is a simple example of an envelope conforming to the DTD described in Section 2.3:

```
<?xml version="1.0"?>
<envelope>
  <params index="1">
    <to>
      <agent-identifier>
        <name>receiver@foo.com</name>
        <addresses>
          <url>http://foo.com/acc</url>
        </addresses>
      </agent-identifier>
    </to>
    <from>
      <agent-identifier>
        <name>sender@bar.com</name>
        <addresses>
          <url>http://bar.com/acc</url>
        </addresses>
      </agent-identifier>
    </from>

    <acl-representation>fipa.acl.rep.xml.std</acl-representation>

    <date>20000508T042651481</date>

    <received >
      <received-by value="http://foo.com/acc" />
      <received-date value="20000508T042651481" />
      <received-id value="123456789" />
    </received>
  </params>
</envelope>
```

2. Here is an example which covers all the aspects described in Section 2.3:

```
<?xml version="1.0"?>
<envelope>
  <params index="1">
  <to>
    <agent-identifier>
      <name>receiver@foo.com</name>
      <addresses>
        <url>http://foo.com/acc</url>
      </addresses>
      <resolvers>
        <agent-identifier>
          <name>resolver@bar.com</name>
          <addresses>
            <url>http://bar.com/acc1</url>
            <url>http://://bar.com/acc2</url>
            <url>http://bar.com/acc3</url>
          </addresses>
        </agent-identifier>
      </resolvers>
    </agent-identifier>
  </to>

  <from>
    <agent-identifier>
```

```
          <name>sender@bar.com</name>
          <addresses>
            <url>http://bar.com/acc</url>
          </addresses>
          <resolvers>
            <agent-identifier>
              <name>resolver@foobar.com</name>
              <addresses>
                <url>http://foobar.com/acc1</url>
                <url>http://foobar.com/acc2</url>
                <url>http://foobar.com/acc3</url>
              </addresses>
            </agent-identifier>
          </resolvers>
        </agent-identifier>
      </from>

      <comments>No comments!</comments>

      <acl-representation>fipa.acl.rep.xml.std</acl-representation>

      <payload-encoding>US-ASCII</payload-encoding>

      <date>20000508T042651481</date>

      <intended-receiver>
        <agent-identifier>
          <name>intendedreceiver@foobar.com</name>
          <addresses>
            <url>http://foobar.com/acc1</url>
            <url>http://foobar.com/acc2</url>
            <url>http://foobar.com/acc3</url>
          </addresses>
          <resolvers>
            <agent-identifier>
              <name>resolver@foobar.com</name>
              <addresses>
                <url>http://foobar.com/acc1</url>
                <url>http://foobar.com/acc2</url>
                <url>http://foobar.com/acc3</url>
              </addresses>
              <resolvers>
                <agent-identifier>
                  <name>resolver@foobar.com</name>
                  <addresses>
                    <url>http://foobar.com/acc1</url>
                    <url>http://foobar.com/acc2</url>
                    <url>http://foobar.com/acc3</url>
                  </addresses>
                </agent-identifier>
              </resolvers>
            </agent-identifier>
          </resolvers>
        </agent-identifier>
      </intended-receiver>

      <received>
        <received-by value="http://foo.com/acc" />
        <received-from value="http://foobar.com/acc" />
        <received-date value="20000508T042651481" />
        <received-id value="123456789" />
        <received-via value="http://bar.com/acc" />
      </received>
      </params>
```

```
</envelope>
```

3. Here is an example which also includes the MIME multipart encapsulation which might be used over HTTP (see [FIPA00084])*:*

```
MIME-Version: 1.0
Content-Type: multipart-mixed ;
      boundary="--251D738450A171593A1583EB"

This is not part of the MIME multipart encoded  message.
--251D738450A171593A1583EB
Content-Type: application/xml

<?xml version="1.0"?>
<envelope>
  <params index="1">
    <to>
      <agent-identifier>
        <name>receiver@foo.com</name>
        <addresses>
          <url>http://foo.com/acc</url>
        </addresses>
      </agent-identifier>
    </to>
    <from>
      <agent-identifier>
        <name>sender@bar.com</name>
        <addresses>
          <url>http://bar.com/acc</url>
        </addresses>
      </agent-identifier>
    </from>

    <acl-representation>fipa.acl.rep.string.std</acl-representation>

    <payload-encoding>US-ASCII</payload-encoding>

    <date>20000508T042651481</date>

    <received >
      <received-by value="http://foo.com/acc" />
      <received-date value="20000508T042651481" />
      <received-id value="123456789" />
    </received>
  </params>
</envelope>[1]
[2]
--251D738450A171593A1583EB
Content-Type: application/text; charset=US-ASCII

(inform
  :sender
    (agent-identifier
      :name sender@bar.com
      :addresses (sequence http://bar.com:80/acc))
  :receiver
    (set (agent-identifier
      :name receiver@foo.com
      :addresses (sequence http://foo.com:80/acc ))))
  :content-length 12
```

[1] CRLF at the end of the XML Envelope.
[2] CRLF included in the boundary delimiter at the beginning.

```
      :reply-with task1-003
      :language fipa-sl0
      :ontology planning-ontology-1
      :content "
        (done task1)")
    --251D738450A171593A1583EB—
```

5 Informative Annex B — Notes

1. Referencing
   There is no specific reference in the FIPA XML envelope reference to the DTD specified in the in Section 2.3. This is due to the fact that tests have shown that there is no consistent behaviour of most common parser in handling a DOCTYPE specification. The most inconvenient fact is that even in the case of non-validation the parsers are trying to download the DTD from the specified URI.

6 Informative Annex C — ChangeLog

6.1 2002/11/01 - version I by TC X2S

Entire document: Removed all : from parameter names
Entire document: Corrected examples
Entire document: Removed all references to the encrypted parameter
Page 2, line 90: Extended `params` definition to allow user-defined fields
Page 3, line 115: Extended `agent-identifier` definition to allow user-defined fields
Page 3, line 130: Extended `received` definition to allow user-defined fields
Page 3, lines 132-133: Changed type of `received-by` to `url`
Page 3, lines 135-136: Changed type of `received-from` to `url`
Page 4, line 190: Added a rule for prefix string for user-defined fields
Page 4, line 191: Fixed the definition of relative time