

FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS

FIPA Agent Message Transport Protocol for HTTP Specification

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1 Scope

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

- The transportation of messages between agents using the Hypertext Transfer Protocol (HTTP - see [RFC2616]).

2 Message Transport Protocol for HTTP

This MTP is based on the transfer of data representing the entire agent message including the message envelope in a HTTP request. The HTTP data transfer is a two-step process: the sender makes a HTTP request and after receiving the data the receiver sends a HTTP response.

Once the request has been completed and the HTTP response sent, the received data is extracted, the receiver parses the message envelope and the message is handled according to the instructions and information given in the message envelope.

2.1 Component Name

The name assigned to this component is:

```
fipa.mts.mtp.http.std
```

2.2 Interface Definition

2.2.1 Request

An HTTP request comprises:

- **Request Line**
 - The request method type that must be `POST`.
 - The request resource identification that must be a full URI (see [RFC1630]).
 - The request version that must be `HTTP/1.1`.
- **Request Headers**
 - The mandatory parameter `Content-Type`: that must be "multipart/mixed" and must have a `boundary` parameter enclosed by double quotes. It should be anticipated that the `boundary` parameter may be linear white space encoded (LWS) as described in [RFC2616] – hence parsers must be able to handle this type of encoding.
 - The mandatory parameter `Host`: that must be in the form `hostname` or `hostname:portnumber`.
 - The mandatory parameter `Cache-Control`: that must have the value `no-cache`.
 - The mandatory parameter `MIME-Version`: that must have the value `1.0`.
 - The optional parameter `Content-Length`: that contains the size of the request body¹.
- **Request Body**

The request body contains the agent message. The agent message has two components (separated as defined in [RFC2046] for multipart/mixed MIME content): a FIPA Message Envelope and a FIPA Message Body (the payload).

The encoded body MUST therefore contain at least two parts, the first part containing the FIPA Message Envelope, the second part containing the FIPA Message being sent. Each of the two parts must specify an encoding-level `ContentType` field which may be any MIME type (Implementations must assume that some parts of the multipart encoded content may contain raw binary data). Each of the two parts may contain some other headers such as for example `Content-Transfer-Encoding` but the processing of those fields is not mandatory.

¹ See [RFC2616] which strongly recommends that this parameter is used.

The `charset` used in headers and the boundary delimiter of the multipart encoding **MUST** be plain ASCII.

Where applicable the `charset` encoding of the FIPA Message must be specified as a `charset` parameter of the `ContentType` header. This `charset` parameter value must have the same value as the value of the envelope `payload-encoding` field.

The parts encoded in the multipart message body are enclosed between boundary delimiters. The boundary delimiter is specified as parameter for the `ContentType` header. The boundary delimiter must be a sequence of maximum 70 ASCII chars preceded by the "--" sequence (two ASCII minus characters). Each part is to be considered enclosed between two occurrences of the sequence "CRLF boundary delimiter". The last boundary delimiter must be a boundary ending line and is formed from the usual boundary delimiter followed by the sequence "--" (basically: "CRLF boundary delimiter --").

The envelope body encoding must therefore have the following structure:

- MIME headers (at least a MIME-Version header and a `ContentType` header with a boundary parameter).
- An empty line delimiting the MIME headers from the MIME body.
- A boundary line with a leading "--" which delimits the beginning of the envelope part.
- A `ContentType` header line which must have the value appropriate for the envelope representation (given in each envelope specification).
- An empty line (CRLF CRLF).
- The FIPA Message Envelope.
- A boundary line with a leading CRLF new line which delimits the FIPA Envelope from the FIPA Message.
- A `ContentType` header line which must have the value appropriate for the FIPA Message representation .
- A boundary line with a leading CRLF new line which defines the end of the FIPA Message. This boundary line may be a boundary ending line.

2.2.2 Response

A HTTP response comprises:

- **Response Line**
 - The response version must be `HTTP/1.1`,

The response status code must either be the success code or a suitable error code as defined in [RFC2616]. The success code only means that the receiving agent has succeeded in extracting the message content from the HTTP request. More detailed information about non-HTTP related issues such as envelope parsing and message handling should be sent back to the sender agent as a separate message. If a sending MTP receives an error code then the expected behaviour would be to try sending the message using another combination of target resource address and content type or give up. The reason phrase in any error response may be any string and is used only for informational purposes.

- **Response Headers**
 - The mandatory parameter `Content-Type`: can be any MIME type (see [RFC2045]),
 - The mandatory parameter `Cache-Control`: must have the value `no-cache`, and,

- The optional parameter `Content-Length`: specifies the size of the response body².

- **Response Body**

The response body may contain a message reply and depending on the content type can be text, binary or multipart. The sender is not obliged to read or make use of such content (i.e. it should not be relied upon for message transfer).

2.2.3 Notes

The default connection behaviour on HTTP version 1.1 is to have persistent connections which means that after a request-response cycle, the connection is kept open and other requests can be made. However, because this would require a more complex implementation, connection persistence is not mandatory. In the case of a simple MTP implementation that would not support persistence, the `Connection`: parameter with the value `close` must be sent in the request headers if the MTP is acting as a sender or in the response headers if the MTP is acting as a receiver.

It should be anticipated that some of the header field values (especially the boundary parameter of the `Content-Type` request field) are linear white space (LWS) encoded. So parsers must be able to handle this type of encoding.

Compliance to the MTP described in this document does not require HTTP 1.1 features that are not explicitly mentioned here.

2.3 Envelope Syntax

The syntax to used for the representation of the FIPA Message Envelope is that defined in [FIPA00085].

2.4 Notes for Developers

1. The boundary field is usually represented as a LWS encoded field so the underlying system should be able to handle LWS encoded MIME headers and values.
2. In the MIME body before the boundary delimiter there must be a new line separator that is considered to be part of the boundary delimiter. So sections are delimited by the sequence "CRLF boundary" (where CRLF are ASCII characters 10 13 and boundary is the sequence specified in the `ContentType` value as parameter).
3. Good implementations will generate random boundary delimiters and will check that none of the encoded parts contains the boundary delimiter sequence.

² See [RFC2616] which strongly recommends that this parameter is used.

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/>
- [FIPA00085] FIPA Agent Message Transport Envelope Representation in XML. Foundation for Intelligent Physical Agents, 2000.
<http://www.fipa.org/specs/fipa00085/>
- [RFC1630] Universal Resource Identifiers in WWW: A Unifying Syntax for the Expression of Names and Addresses of Objects on the Network as used in the World Wide Web. Request for Comments, 1994.
<http://www.ietf.org/rfc/rfc1630.txt>
- [RFC2045] Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies. Request for Comments, 1996.
<http://www.ietf.org/rfc/rfc2045.txt>
- [RFC2046] Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types. Request for Comments, 1996.
<http://www.rfc-editor.org/rfc/rfc2046.txt>
- [RFC2616] Hypertext Transfer Protocol - HTTP/1.1. Request for Comments, 1999.
<http://www.ietf.org/rfc/rfc2616.txt>

4 Informative Annex A - Example

The agent `sender@bar.com` sends a message to the agent `receiver@foo.com` which is resident on an AP that has an ACC with an external HTTP interface. Both agents are simple implementations that do not use connection persistence and the message encoding (see [FIPA00085]) that they use is text.

1. `sender@bar.com` sends a message to `receiver@foo.com`:

```
POST http://foo.com:80/acc HTTP/1.1
Cache-Control: no-cache
Host: foo.com:80
Mime-Version: 1.0
Content-Type: multipart-mixed ;
    boundary="-----251D738450A171593A1583EB"
Content-Length: 1518
Connection: close3
```

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.xml.std</acl-representation>
```

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

```
  <date>20000508T042651481</date>
```

```
  <encrypted>no encryption</encrypted>
```

```
  <received >
```

³ Followed by an empty line.

```

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

</params>

</envelope>4

-----251D738450A171593A1583EB
Content-Type: application/text; charset=US-ASCII

(inform
  :sender
    (agent-identifier
      :name sender@bar.com
      :addresses (sequence http://bar.com:80/acc))
  :receiver
    (agent-identifier
      :name receiver@foo.com
      :addresses (sequence http://foo.com:80/acc )) )
  :content-length 12
  :reply-with task1-003
  :language sl0
  :ontology planning-ontology-1
  :content
    (done task1)))
-----251D738450A171593A1583EB--

```

2. The ACC responds with a successful notification:

```

HTTP/1.1 200 OK
Content-Type: text/plain
Cache-Control: no-cache
Connection: close5

```

⁴ CRLF at the end of the XML Envelope

⁵ Followed by an empty line.