

FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS

FIPA ACL Message Structure Specification

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34 of specification may be found in the FIPA Document Policy [f-out-00000] and the FIPA Specifications Policy [f-out-
35 00003]. A complete overview of the FIPA specifications and their current status may be found on the FIPA Web site.

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37 represented many countries worldwide. Further information about FIPA as an organization, membership information,
38 FIPA specifications and upcoming meetings may be found on the FIPA Web site at <http://www.fipa.org/>.

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63 **1 Scope**

64 This document contains specifications for the FIPA ACL message parameters. The objectives of standardizing the form
65 of a FIPA-compliant ACL message are:

- 66
- 67 • To help ensure interoperability by providing a standard set of ACL message structure, and,
 - 68 • To provide a well-defined process for maintaining this set.
- 69
- 70

71 2 FIPA ACL Message Structure

72 A FIPA ACL message contains a set of one or more message parameters. Precisely which parameters are needed for
 73 effective agent communication will vary according to the situation; the only parameter that is mandatory in all ACL
 74 messages is the `performative`, although it is expected that most ACL messages will also contain `sender`,
 75 `receiver` and `content` parameters.

76
 77 If an agent does not recognize or is unable to process one or more of the parameters or parameter values, it can reply
 78 with the appropriate `not-understood` message.

79
 80 Specific implementations are free to include user-defined message parameters other than the FIPA ACL message
 81 parameters specified in *Table 1*. The semantics of these user-defined parameters is not defined by FIPA, and FIPA
 82 compliance does not require any particular interpretation of these parameters. The prefatory string “x-” must be used
 83 for the names of these non-FIPA standard additional parameters.

84
 85 Some parameters of the message might be omitted when their value can be deduced by the context of the
 86 conversation. However, FIPA does not specify any mechanism to handle such conditions, therefore those
 87 implementations that omit some message parameters are not guaranteed to interoperate with each other.

88
 89 The full set of FIPA ACL message parameters is shown in *Table 1* without regard to their specific encodings in an
 90 implementation. FIPA-approved encodings and parameter orderings for ACL messages are given in other
 91 specifications. Each ACL message representation specification contains precise syntax descriptions for ACL message
 92 encodings based on XML, text strings and several other schemes.

93
 94 A FIPA ACL message corresponds to the abstract parameter message payload identified in the [FIPA00001].
 95

Parameter	Category of Parameters
<code>performative</code>	Type of communicative acts
<code>sender</code>	Participant in communication
<code>receiver</code>	Participant in communication
<code>reply-to</code>	Participant in communication
<code>content</code>	Content of message
<code>language</code>	Description of Content
<code>encoding</code>	Description of Content
<code>ontology</code>	Description of Content
<code>protocol</code>	Control of conversation
<code>conversation-id</code>	Control of conversation
<code>reply-with</code>	Control of conversation
<code>in-reply-to</code>	Control of conversation
<code>reply-by</code>	Control of conversation

96
 97 **Table 1:** FIPA ACL Message Parameters
 98

99 The following terms are used to define the ontology and the abstract syntax of the FIPA ACL message structure:

- 100 • **Frame.** This is the mandatory name of this entity that must be used to represent each instance of this class.
- 101 • **Ontology.** This is the name of the ontology, whose domain of discourse includes their parameters described in the
 102 table.

- **Parameter.** This identifies each component within the frame. The type of the parameter is defined relative to a particular encoding. Encoding specifications for ACL messages are given in their respective specifications.
- **Description.** This is a natural language description of the semantics of each parameter. Notes are included to clarify typical usage.
- **Reserved Values.** This is a list of FIPA-defined constants associated with each parameter. This list is typically defined in the specification referenced.

All of the FIPA message parameters share the frame and ontology shown in *Table 2*.

Frame	fipa-acl-message
Ontology	fipa-acl

Table 2: FIPA ACL Message Frame and Ontology

2.1 Type of Communicative Act

2.1.1 Performative

Parameter	Description	Reserved Values
performative	Denotes the type of the communicative act of the ACL message.	See [FIPA00037]

Notes: The `performative` parameter is a required parameter of all ACL messages. Developers are encouraged to use the FIPA standard performatives (see [FIPA00037]) whenever possible.

2.2 Participants in Communication

2.2.1 Sender

Parameter	Description	Reserved Values
sender	Denotes the identity of the sender of the message, that is, the name of the agent of the communicative act.	

Notes: The `sender` parameter will be a parameter of most ACL messages. It is possible to omit the `sender` parameter if, for example, the agent sending the ACL message wishes to remain anonymous. The `sender` parameter refers to the agent which performs the communicative act giving rise to this ACL message.

2.2.2 Receiver

Parameter	Description	Reserved Values
receiver	Denotes the identity of the intended recipients of the message.	

Notes: Ordinarily, the `receiver` parameter will be a part of every ACL message. It is only permissible to omit the `receiver` parameter if the message recipient can be reliably inferred from context, or in special cases such as the embedded ACL message in `proxy` and `propagate`.

The `receiver` parameter may be a single agent name or a non-empty set of agent names. The latter corresponds to the situation where the message is multicast. Pragmatically, the semantics of this multicast is that the sender intends the message for each recipient of the CA encoded in the message. For example, if an agent performs an `inform` act with a set of three agents as receiver, it denotes that the sender intends each of these agents to come to believe the content of the message.

145 **2.2.3 Reply To**

Parameter	Description	Reserved Values
reply-to	This parameter indicates that subsequent messages in this conversation thread are to be directed to the agent named in the <code>reply-to</code> parameter, instead of to the agent named in the <code>sender</code> parameter.	

146

147 **2.3 Content of Message**148 **2.3.1 Content**

Parameter	Description	Reserved Values
content	Denotes the content of the message; equivalently denotes the object of the action. The meaning of the content of any ACL message is intended to be interpreted by the receiver of the message. This is particularly relevant for instance when referring to referential expressions, whose interpretation might be different for the sender and the receiver.	

149

150 **Notes:** Most ACL messages require a content expression. Certain ACL message types, such as `cancel`, have an
 151 implicit content, especially in cases of using the `conversation-id` or `in-reply-to` parameters.
 152

153 **2.4 Description of Content**154 **2.4.1 Language**

Parameter	Description	Reserved Values
language	Denotes the language in which the content parameter is expressed.	See [FIPA00007]

155

156 **Notes:** The ACL `content` parameter is expressed in a formal language. This field may be omitted if the agent
 157 receiving the message can be assumed to know the language of the content expression.
 158

159 **2.4.2 Encoding**

Parameter	Description	Reserved Values
encoding	Denotes the specific encoding of the content language expression.	See [FIPA00007]

160

161 **Notes:** The content expression might be encoded in several ways. The `encoding` parameter is optionally used to
 162 specify this encoding to the recipient agent. If the `encoding` parameter is not present, the encoding will be specified in
 163 the message envelope that encloses the ACL message.
 164

165 **2.4.3 Ontology**

Parameter	Description	Reserved Values
ontology	Denotes the ontology(s) used to give a meaning to the symbols in the content expression.	

166

167 **Notes:** The `ontology` parameter is used in conjunction with the `language` parameter to support the interpretation of
 168 the content expression by the receiving agent. In many situations, the `ontology` parameter will be commonly
 169 understood by the agent community and so this message parameter may be omitted.
 170

171 **2.5 Control of Conversation**172 **2.5.1 Protocol**

Parameter	Description	Reserved Values
<code>protocol</code>	Denotes the interaction protocol that the sending agent is employing with this ACL message.	See [FIPA00025]

173

174 **Notes:** The `protocol` parameter defines the interaction protocol in which the ACL message is generated. This
 175 parameter is optional¹.

176

177 Any ACL message that contains a non-null value for the `protocol` parameter is considered to belong to a
 178 conversation and it is required to respect the following rules:

179

- 180 • the initiator of the protocol must assign a non-null value to the `conversation-id` parameter,
- 181
- 182 • all responses to the message, within the scope of the same interaction protocol, should contain the same value for
 183 the `conversation-id` parameter, and,
- 184
- 185 • the timeout value in the `reply-by` parameter must denote the latest time by which the sending agent would like to
 186 have received the next message in the protocol flow (not be confused with the latest time by which the interaction
 187 protocol should terminate).
- 188

189 **2.5.2 Conversation Identifier**

Parameter	Description	Reserved Values
<code>conversation-id</code>	Introduces an expression which is used to identify the ongoing sequence of communicative acts that together form a conversation.	

190

191 **Notes:** An agent may tag ACL messages with a conversation identifier to manage its communication strategies and
 192 activities. Typically this will allow an agent to identify individual conversations with multiple agents. It will also allow
 193 agents to reason across historical records of conversations.

194

195 It is required the usage of globally unique values for the `conversation-id` parameter in order to allow the
 196 participants to distinguish between several concurrent conversations. A simple mechanism to ensure uniqueness is the
 197 concatenation of the globally unique identifier of the sender agent to an identifier (for example, a progressive number)
 198 that is unique within the scope of the sender agent itself.

199

200 **2.5.3 Reply With**

Parameter	Description	Reserved Values
<code>reply-with</code>	Introduces an expression that will be used by the responding agent to identify this message.	

201

202 **Notes:** The `reply-with` parameter is designed to be used to follow a conversation thread in a situation where multiple
 203 dialogues occur simultaneously. For example, if agent *i* sends to agent *j* a message which contains:

204

205 `reply-with <expr>`

206

207 Agent *j* will respond with a message containing:

208

¹ However, developers are advised that employing ACL without the framework of an interaction protocol (and thus directly using the ACL semantics to control the agent's generation and interpretation of ACL messages) is an extremely ambitious undertaking.

in-reply-to <expr>

209
210

211 2.5.4 In Reply To

Parameter	Description	Reserved Values
in-reply-to	Denotes an expression that references an earlier action to which this message is a reply.	

212
213
214

Notes: See notes for Section 2.5.3.

215 2.5.5 Reply By

Parameter	Description	Reserved Values
reply-by	Denotes a time and/or date expression which indicates the latest time by which the sending agent would like to receive a reply.	

216
217
218
219
220
221

Notes: The time will be expressed according to the sender's view of the time on the sender's platform. The reply message can be identified in several ways: as the next sequential message in an interaction protocol, through the use of the `reply-with` parameter, through the use of a `conversation-id` and so forth. The way that the reply message is identified is determined by the agent implementer.

222 **3 References**

223 [FIPA00001] FIPA Abstract Architecture Specification. Foundation for Intelligent Physical Agents, 2000.
224 <http://www.fipa.org/specs/fipa00001/>

225 [FIPA00007] FIPA Content Languages Library Specification. Foundation for Intelligent Physical Agents, 2000.
226 <http://www.fipa.org/specs/fipa00007/>

227 [FIPA00025] FIPA Interaction Protocol Library Specification. Foundation for Intelligent Physical Agents, 2000.
228 <http://www.fipa.org/specs/fipa00025/>

229 [FIPA00037] FIPA Communicative Act Library Specification. Foundation for Intelligent Physical Agents, 2000.
230 <http://www.fipa.org/specs/fipa00037/>
231

232 **4 Informative Annex A — ChangeLog**

233 **4.1 2002/11/01 - version F by TC X2S**

- 234 Page 1, line 64: Removed references to maintenance procedures and inclusion criteria
- 235 Page 2, line 83: Added requirement that additional parameters have the “x-“ prefix
- 236 Page 4, line 148: Specified that the content is intended to be interpreted by the receiver
- 237 **Page 5, line 178: Added requirements to control the conversations**
- 238 **Page 5, line 184: Added requirement that `conversation-id` parameter be a globally unique identifier**
- 239 Page 7, lines 222-260: Removed section 3 on maintenance of FIPA ACL
- 240