

# FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS

## FIPA ACL Message Structure Specification

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*Geneva, Switzerland*

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33 specification can be either Preliminary, Experimental, Standard, Deprecated or Obsolete. More detail about the  
34 process of specification may be found in the FIPA [Document Policy \[f-out-00000\]](#) and the FIPA [Specifications Policy \[f-  
35 out-00003\]Procedures for Technical Work](#). A complete overview of the FIPA specifications and their current status may  
36 be found ~~in the FIPA List of Specifications. A list of terms and abbreviations used in the FIPA specifications may be~~  
37 ~~found in the FIPA Glossary~~[on the FIPA Web site](#).

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39 represented ~~many~~[47](#) countries worldwide. Further information about FIPA as an organization, membership information,  
40 FIPA specifications and upcoming meetings may be found [on the FIPA Web site](#) at <http://www.fipa.org/>.

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## 66 **1 Scope**

67 This document contains specifications for the FIPA ACL message elements ~~including: the list of current FIPA ACL~~  
68 ~~message elements, procedures for maintenance of this list, and criteria for adopting new elements in the list.~~

69  
70 The objectives of standardizing the form of a FIPA compliant ACL message are:

- 71
- 72 • To help ensure interoperability by providing a standard set of ACL message structure, and,
- 73
- 74 • To provide a well-defined process for maintaining this set.
- 75

## 75 2 FIPA ACL Message Structure

76 A FIPA ACL message contains a set of one or more message elements. Precisely which elements are needed for  
 77 effective agent communication will vary according to the situation; the only element that is mandatory in all ACL  
 78 messages is the `performative`, although it is expected that most ACL messages will also contain `sender`,  
 79 `receiver` and `content` elements.

80  
 81 If an agent does not recognize or is unable to process one or more of the elements or element values, it can reply with  
 82 the appropriate `not-understood` message.

83  
 84 Specific implementations are free to include user-defined message elements other than the FIPA ACL message  
 85 elements specified in *Table 1*. The semantics of these user-defined elements is not defined by FIPA, and FIPA  
 86 compliance does not require any particular interpretation of these elements. The prefatory string "X-" must be used for  
 87 the names of these non-FIPA standard additional parameters.

88  
 89 Some elements of the message might be omitted when their value can be deduced by the context of the conversation.  
 90 However, FIPA does not specify any mechanism to handle such conditions, therefore those implementations that omit  
 91 some message elements are not guaranteed to interoperate with each other.

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

97  
 98 A FIPA ACL message corresponds to the abstract element message payload identified in the [FIPA00001].  
 99

Element	Category of Elements
<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

100  
 101 **Table 1:** FIPA ACL Message Elements  
 102

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

- 104 • **Frame.** This is the mandatory name of this entity, that must be used to represent each instance of this class.
- 105 • **Ontology.** This is the name of the ontology, whose domain of discourse includes their elements described in the  
 106 table.  
 107  
 108  
 109

- **Element.** This identifies each component within the frame. The type of the element 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 element. Notes are included to clarify typical usage.
- **Reserved Values.** This is a list of FIPA-defined constants associated with each element. This list is typically defined in the specification referenced.

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

<b>Frame</b>	FIPA-ACL-Message
<b>Ontology</b>	FIPA-ACL

**Table 2:** FIPA ACL Message Frame and Ontology

## 2.1 Type of Communicative Act

### 2.1.1 Performative

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

**Notes:** The performatives is a required element 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

Element	Description	Reserved Values
sender	Denotes the identity of the sender of the message, i.e. the name of the agent of the communicative act.	

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

### 2.2.2 Receiver

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

**Notes:** Ordinarily, the receiver will be a part of every ACL message. It is only permissible to omit the receiver 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 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.

149 **2.2.3 Reply To**

Element	Description	Reserved Values
reply-to	This element indicates that subsequent messages in this conversation thread are to be directed to the agent named in the reply-to element, instead of to the agent named in the sender element.	

150

151 **2.3 Content of Message**152 **2.3.1 Content**

Element	Description	Reserved Values
content	Denotes the content of the message; equivalently denotes the object of the action. <u>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.</u>	

153

154 Notes: Most ACL messages require a content expression. Certain ACL message types, such as cancel, have an  
155 implicit content, especially in cases of using conversation-id or in-reply-to.  
156

157 **2.4 Description of Content**158 **2.4.1 Language**

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

159

160 **Notes:** The ACL content element is expressed in a formal language. This field may be omitted if the agents receiving  
161 the message can be assumed to know the language of the content expression.  
162

163 **2.4.2 Encoding**

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

164

165 **Notes:** The content expression might be encoded in several ways. The encoding element is optionally used to specify  
166 this encoding to the recipient agent. If the encoding element is not present, the encoding will be specified in the  
167 message envelope that encloses the ACL message.  
168

169 **2.4.3 Ontology**

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

170

171 **Notes:** The ontology(s) is/are used in conjunction with the language element to support the interpretation of the  
172 content expression by the receiving agent. In many situations, the ontology(s) will be commonly understood by the  
173 agent community, and so this message element may be omitted.  
174  
175



175 **2.5 Control of Conversation**

176 **2.5.1 Protocol**

Element	Description	Reserved Values
protocol	Denotes the interaction protocol that the sending agent is employing with this ACL message.	See [FIPA00025]

177  
 178 **Notes:** The protocol message element defines the interaction protocol in which the ACL message is generated. This  
 179 element is optional; however, developers are advised that employing ACL without the framework of an interaction  
 180 protocol (and thus directly using the ACL semantics to control the agent’s generation and interpretation of ACL  
 181 messages) is an extremely ambitious undertaking.

182  
 183 **Notes:** Any ACL message that contains a non-null value for this protocol message element is considered to belong to  
 184 a conversation and it is required to respect the following rules:

- 185 • the initiator of the protocol must assign it ~~should have a non-null value to~~ the conversation-id element
- 186 • all responses to the message, within the scope of the same interaction protocol, should contain the same  
 187 value for the conversation-id element
- 188 • the timeout value in the reply-by slot must denote the latest time by which the sending agent would like to have  
 189 received the next message in the protocol flow (not be confused with the latest time by which the interaction  
 190 protocol should terminate).

192 **2.5.2 Conversation Identifier**

Element	Description	Reserved Values
conversation-id	Introduces an expression (a conversation identifier) which is used to identify the ongoing sequence of communicative acts that together form a conversation.	

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

197  
 198 **Notes:** It is recommended, but not strictly required, the usage of globally unique values for the conversation-id  
 199 element in order to allow the participants to distinguish between several concurrent conversations. A simple  
 200 mechanism to ensure uniqueness is the concatenation of the globally unique identifier of the sender agent to an  
 201 identifier (e.g. a progressive number) that is unique within the scope of the sender agent itself

203 **2.5.3 Reply With**

Element	Description	Reserved Values
reply-with	Introduces an expression that will be used by the responding agent to identify this message.	

204  
 205 **Notes:** This message element is designed to be used to follow a conversation thread in a situation where multiple  
 206 dialogues occur simultaneously. For example, if agent i sends to agent j a message which contains:

207  
 208 reply-with <expr>

209  
 210 Agent j will respond with a message containing:

211  
 212 in-reply-to <expr>

213

214 **2.5.4 In Reply To**

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

215

216 **Notes:** See notes for *Section 2.5.3, Reply With*.

217

218 **2.5.5 Reply By**

Element	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 have received a reply.	

219

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

224

225

### ~~3 Maintenance of the FIPA ACL Message Elements List~~

~~The most effective way of maintaining the FIPA ACL message element list is through the use of the elements themselves by different agent developers. This is the most direct way of discovering possible bugs, errors, inconsistencies, weaknesses, possible improvements, as well as capabilities, strengths, efficiency etc.~~

~~In order to collect feedback on the FIPA ACL message elements in this document and to promote further research, FIPA encourages coordination among designers, agent developers, and FIPA members. FIPA will make an annual report on the use of the ACL element in this document.~~

~~FIPA will designate a Technical Committee (TC) to maintain the FIPA ACL message elements. This TC will manage the FIPA ACL message elements and will be responsible for the following items:~~

- ~~•Collecting feedback and the comments about the FIPA ACL elements. Depending on interest, the TC may organize more specific Working Groups. These groups would be responsible for maintaining public lists referring projects and people that are currently using ACL elements of interest.~~
- ~~•Inviting contributions in various forms: e-mail comments, written reports, papers, technical documents, and so forth. The current email address of the TC is: comm@fipa.org~~
- ~~•All TC members will be notified about contributions, comments or proposed changes and should be able to access them.~~
- ~~•The proposed updates to the FIPA ACL elements must be discussed and approved during an official FIPA meeting, in order that the FIPA community may be involved with and informed of all of the FIPA approved FIPA ACL elements in this document library.~~

#### ~~3.1.1 Inclusion Criteria~~

~~To populate the FIPA ACL element list, it is necessary to set some basic guidelines for the selection of specific FIPA ACL elements. The minimal criteria that must be satisfied for a FIPA ACL element to be FIPA compliant are:~~

- ~~•Substantial and clear documentation must be provided;~~
- ~~•The message element must not duplicate an existing element, and;~~
- ~~•The usefulness of a new ACL element should be made clear.~~

#### ~~3.1.2 Comments and Questions~~

~~The latest version of this document may be found on the FIPA web site (<http://www.fipa.org>). Comments and questions regarding this document and the specification therein should be addressed to agent\_comm@fipa.org.~~

264 **43** **References**

- 265 [FIPA00001] FIPA Abstract Architecture Specification. Foundation for Intelligent Physical Agents, 2000.  
266 <http://www.fipa.org/specs/fipa00001/>
- 267 [FIPA00007] FIPA Content Languages Library Specification. Foundation for Intelligent Physical Agents, 2000.  
268 <http://www.fipa.org/specs/fipa00007/>
- 269 [FIPA00025] FIPA Interaction Protocol Library Specification. Foundation for Intelligent Physical Agents, 2000.  
270 <http://www.fipa.org/specs/fipa00025/>
- 271 [FIPA00037] FIPA Communicative Act Library Specification. Foundation for Intelligent Physical Agents, 2000.  
272 <http://www.fipa.org/specs/fipa00037/>

273 **54 Informative Annex A — ChangeLog**

274 **5.14.1 2002/05/10 - version F by FIPA Architecture Board**

275 Page 1x, line 64-65y: <del>blah removed reference to maintenance procedures and inclusion criteria

276 Page 2, line 83-84 : added requirement that additional parameters have the "X-" prefix

277 Page 4, line 149 : specified that the content is intended to be interpreted by the receiver

278 Page 5, line 180-187,191 :added requirements to control the conversations

279 Page 5, line 195-198 : added requirement that conversation-id be a globally unique identifier

280 Page 7, line 222-260 : Removed section 3

281

282

283