FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS

FIPA ACL Message Structure Specification

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Foreword

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Contents

1 Scope

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

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

2 FIPA ACL Message Structure

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

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

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

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

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

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

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

Table 1: FIPA ACL Message Parameters

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

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

146 #### 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 reply-to parameter, instead of to the agent named in the sender parameter.	

147

148 ## 2.3 Content of Message

149 #### 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.	

150
151 **Notes:** Most ACL messages require a content expression. Certain ACL message types, such as cancel, have an
152 implicit content, especially in cases of using the conversation-id or in-reply-to parameters.
153

154 ## 2.4 Description of Content

155 #### 2.4.1 Language

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

156
157 **Notes:** The ACL content parameter is expressed in a formal language. This field may be omitted if the agent
158 receiving the message can be assumed to know the language of the content expression.
159

160 #### 2.4.2 Encoding

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

161
162 **Notes:** The content expression might be encoded in several ways. The encoding parameter is optionally used to
163 specify this encoding to the recipient agent. If the encoding parameter is not present, the encoding will be specified in
164 the message envelope that encloses the ACL message.
165

166 #### 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.	

167
168 **Notes:** The ontology parameter is used in conjunction with the language parameter to support the interpretation of
169 the content expression by the receiving agent. In many situations, the ontology parameter will be commonly
170 understood by the agent community and so this message parameter may be omitted.
171

2.5 Control of Conversation

2.5.1 Protocol

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

Notes: The protocol parameter defines the interaction protocol in which the ACL message is generated. This parameter is optional; 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.

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

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

2.5.2 Conversation Identifier

Parameter	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.	

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

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

2.5.3 Reply With

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

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

```
reply-with <expr>
```

Agent *j* will respond with a message containing:

```
in-reply-to <expr>
```

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.	

Notes: See notes for Section 2.5.3.

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.	

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.

3 References

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

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

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

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

4 Informative Annex A — ChangeLog

4.1 2002/10/01 - version F by TC X2S

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

4.2 2002/12/03 - version G by FIPA Architecture Board

Entire document: Promoted to Standard status