

# FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS

## FIPA Iterated Contract Net Interaction Protocol Specification

<b>Document title</b>	FIPA Iterated Contract Net Interaction Protocol Specification		
<b>Document number</b>	XC00030G	<b>Document source</b>	FIPA TC C
<b>Document status</b>	Experimental	<b>Date of this status</b>	2002/ <del>10/18</del> <u>07/25</u>
<b>Supersedes</b>	None		
<b>Contact</b>	fab@fipa.org		
<b>Change history</b>	See <i>Informative Annex A — ChangeLog</i>		

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37 be found ~~in the FIPA List of Specifications. A list of terms and abbreviations used in the FIPA specifications may be~~  
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41 FIPA specifications and upcoming meetings may be found [on the FIPA Web site](#) at <http://www.fipa.org/>.

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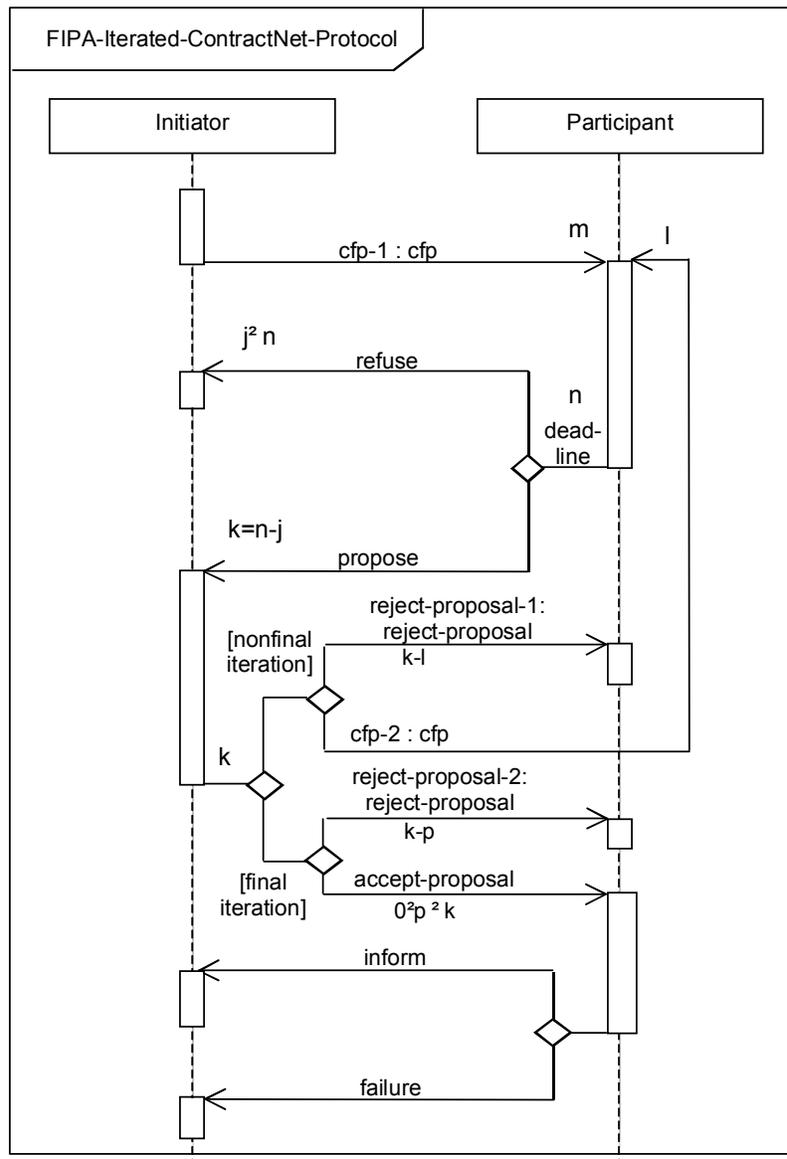
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54 **1 FIPA Iterated Contract Net Interaction Protocol**

55 The FIPA Iterated Contract Net Interaction Protocol (IP) is an extension of the basic FIPA Contract Net IP (see  
 56 [FIPA00029]), but it differs by allowing multi-round iterative bidding. ~~As with the FIPA Contract Net IP, the manager~~  
 57 ~~issues the initial call for proposals with the cfp act (see [FIPA00037]). The contractors then answer with their bids as~~  
 58 ~~propose acts (see [FIPA00037]) and the manager may then accept one or more of the bids, rejecting the others, or~~  
 59 ~~may iterate the process by issuing a revised cfp. The intent is that the manager seeks to get better bids from the~~  
 60 ~~contractors by modifying the call and requesting new (equivalently, revised) bids. The process terminates when the~~  
 61 ~~manager refuses all proposals and does not issue a new cfp, accepts one or more of the bids or the contractors all~~  
 62 ~~refuse to bid.~~

63  
 64 The representation of this IP is given in *Figure 1* which is based on extensions to UML1.x. [Odell2001] This protocol is  
 65 identified by the token *fipa-iterated-contract-net* as the value of the protocol parameter of the ACL message.  
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67  
 68 **Figure 1: FIPA Iterated Contract Net Interaction Protocol**  
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 70

## 71 **1.1 Explanation of the Protocol Flow**

72 As with the FIPA Contract Net IP, the Initiator issues  $m$  initial call for proposals with the `cfp` act (see [FIPA00037]). Of  
 73 the  $n$  Participants that respond,  $k$  are `propose` messages (see [FIPA00037]) from Participants that are willing and able  
 74 to do the task under the proposed conditions, and the remaining  $j$  are from Participants that `refuse`. Of the  $k$   
 75 proposals, the Initiator may decide this is the final iteration and accept  $p$  of the bids ( $0 \leq p \leq k$ ), and reject the others.  
 76 Alternatively the Initiator may decide to iterate the process by issuing a revised `cfp` to  $l$  of the Participants and  
 77 rejecting the remaining  $k-l$  Participants. The intent is that the Initiator seeks to get better bids from the Participants by  
 78 modifying the call and requesting new (equivalently, revised) bids. The process terminates when either the Initiator  
 79 refuses all proposals and does not issue a new `cfp`, the Initiator accepts one or more of the bids, or the Participants  
 80 all refuse to bid.

81 Any interaction using this interaction protocol is identified by a globally unique, non-null `conversation-id`, assigned  
 82 by the Initiator. The agents involved in the interaction must tag all of its ACL messages with this conversation identifier.  
 83 This enables each agent to manage its communication strategies and activities, e.g. it allows an agent to identify  
 84 individual conversations and to reason across historical records of conversations. In the case of 1:N interaction  
 85 protocols or sub-protocols the Initiator is free to decide if the same `conversation-id` should be used or a new one  
 86 should be issued. Additionally, the messages may specify other interaction-related information such as a timeout in the  
 87 `reply-by` slot that denotes the latest time by which the sending agent would like to have received the next message  
 88 in the protocol flow.

### 90 **4.11.2 Exceptions to Interaction Protocol Flow**

91 At any point in the IP, the receiver of a communication can inform the sender that it did not understand what was  
 92 communicated. This is accomplished by returning a `not-understood` communication. As such, the figure above  
 93 does not depict a `not-understood` communication as it can occur after any communication. The communication of a  
 94 `not-understood` within an interaction protocol may terminate the entire IP. Termination of the interaction may imply  
 95 that any commitments made during the interaction are null and void. However, since this IP broadcasts to more than  
 96 one Participant, multiple responses are also possible. Each response, then, must be evaluated separately — and  
 97 some of these responses might be `not-understood`. However, terminating the entire IP in this case might not be  
 98 appropriate, as other Participants may be continuing with their sub-protocols.

100 At any point in the IP, the initiator of the IP may cancel the interaction protocol by initiating the meta-protocol shown in  
 101 Figure 2. The `conversation-id` of the cancel interaction is identical to the `conversation-id` of the interaction that the  
 102 Initiator intends to cancel. The semantics of the cancel should roughly be interpreted as meaning that the initiator is no  
 103 longer interested in continuing the interaction, and that it should be terminated in a manner acceptable to both the  
 104 Initiator and the Participant. The Participant either informs the Initiator that the interaction is done using an `inform-`  
 105 `done`, or indicates the failure of the cancellation using a `failure`.

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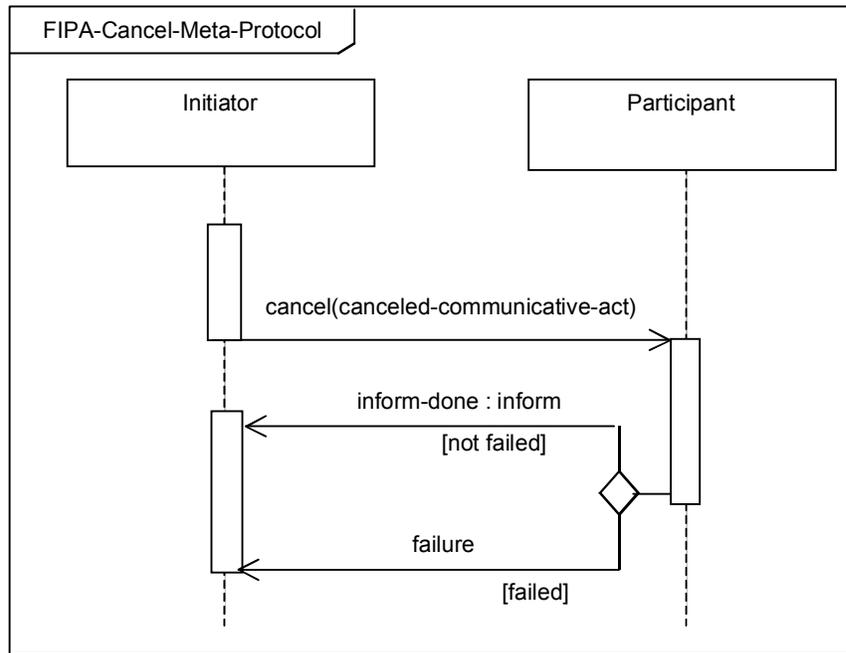


Figure 2: FIPA cancel meta-protocol

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This IP is a pattern for a simple interaction type. Elaboration on this pattern will almost certainly be necessary in order to specify all cases that might occur in an actual agent interaction. Real world issues such as the effects of cancelling actions, asynchrony, abnormal or unexpected IP termination, nested IPs, and the like, are explicitly not addressed here.

This IP is a pattern for a simple interaction type. Elaboration on this pattern will almost certainly be necessary in order to specify all cases that might occur in an actual agent interaction. Real world issues of cancelling actions, asynchrony, abnormal or unexpected IP termination, nested IPs, and the like, are explicitly not addressed here.

117 **2 References**

118 [FIPA00029] FIPA Contract Net Interaction Protocol Specification. Foundation for Intelligent Physical Agents, 2000.  
119 <http://www.fipa.org/specs/fipa00029/>

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

122 [Odell2001] Odell, James, H. Van Dyke Parunak, and Bernhard Bauer, "Representing Agent Interaction Protocols  
123 in UML," *Agent-Oriented Software Engineering*, Paolo Ciancarini and Michael Wooldridge ed.,  
124 Springer, Berlin, 2001, pp. 121-140. [http://www.fipa.org/docs/input/f-in-00077.](http://www.fipa.org/docs/input/f-in-00077)  
125

125 **3 Informative Annex A — ChangeLog**

126 **3.1 2002/05/10 - version G by FIPA Architecture Board**

- 127 Page 1, figure 1 :        The not-understood communication was removed.
- 128 Page 1, Figure 1 :        To conform to UML 2, the protocol name was placed in a boundary, « x » is removed from
- 129 the diamonds (xor is now the default), and the template box was removed.
- 130 Page 1, line 50 :        Moved a portion of the section introduction to the new section 1.1 and enhanced it.
- 131 Page 1, line 57 :        Added a new section 1.1, entitled « Explanation of the Protocol Flow ».
- 132 Page 1, line 57 :        Renumbered old section 1.1 to section 1.2. Added a paragraph explaining the not-
- 133 understood communication and its relationship with the IP.
- 134 Page x, line y:        <blah>
- 135