

# FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS

## FIPA Nomadic Application Support Ontology Specification

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## 1 Scope

This document is part of the FIPA specifications and deals with agent middleware to support applications in nomadic environment. This specification also forms part of the FIPA Nomadic Application Support Specification [FIPA00066] and contains specifications for:

- Ontological descriptions.

## 2 Nomadic Application Support Ontology

### 2.1 Object Descriptions

This section describes a set of frames, that represent the classes of objects in the domain of discourse within the framework of the `FIPA-Nomadic-Application` and `FIPA-MTS-QoS` ontologies.

The following terms are used to describe the objects of the domain:

- **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 the parameters described in the table.
- **Parameter.** This is the mandatory name of a parameter of this frame.
- **Description.** This is a natural language description of the semantics of each parameter.
- **Presence.** This indicates whether each parameter is mandatory or optional.
- **Type.** This is the type of the values of the parameter: Integer, Word, String, URL, Term, Set or Sequence.
- **Reserved Values.** This is a list of FIPA-defined constants that can assume values for this parameter.

#### 2.1.1 Quality of Service Description

This type of object represents the quality of service of the transport protocol.

Frame Ontologies	qos FIPA-Nomadic-Application FIPA-MTS-QoS	Parameter	Description	Presence	Type	Reserved Values
		line-rate	The bandwidth in one direction over the link.	Optional <sup>1</sup>	rate-value	
		throughput	The number of user data bits successfully transferred in one direction across the link <sup>2</sup> . Successful transfer means that no user data bits are lost, added or inverted in transfer.	Optional	rate-value	
		throughput-std-dev	The current standard deviation of the throughput within a time unit.	Optional	rate-value	
		rtt	The round trip time which is the time required for a data segment to be transmitted to a peer entity and a corresponding acknowledgement sent back to the originating entity.	Optional	time-value	
		rtt-std-dev	The standard deviation of the round-trip time within a time unit.	Optional	time-value	
		delay	The (nominal) time required for a	Optional	time-value	

<sup>1</sup> While all of the parameters for this object are optional, a valid `qos` object will contain at least one parameter.

<sup>2</sup> See [ITUX135].

	data segment to be transmitted to a peer entity.			
delay-std-dev	The standard deviation of the delay time within a time unit.	Optional	time-value	
mean-up-time	The expected uptime of an established link.	Optional	time-value	
omission-rate	The probability that a data segment is not transmitted correctly over a link.	Optional	probability-value	
ber	The ratio of the number of bit errors to the total number of bits transmitted in a given time interval <sup>3</sup> .	Optional	probability-value	
frame-error-rate	The probability that a data segment is not transmitted correctly over a link.	Optional	probability-value	
conn-setup-delay	The (sampled) delay to establish a connection between communicating entities.	Optional	time-value	
conn-setup-failure-prob	The ratio of total call attempts that result in call setup failure to the total call attempts in a population of interest.	Optional	probability-value	
status	The connectivity status of the link.	Optional	Word	Connected Disconnected Connecting

### 2.1.2 Rate Value

This type of object represents a data transfer value.

<b>Frame Ontologies</b>	rate-value FIPA-Nomadic-Application FIPA-MTS-QoS			
<b>Parameter</b>	<b>Description</b>	<b>Presence</b>	<b>Type</b>	<b>Reserved Values</b>
direction	The direction in which this value is measured.	Mandatory	Word	Inbound Outbound
unit	The unit in which the value is represented.	Mandatory	Word	GBits/s MBits/s KBits/s Bits/s
value	The rate value.	Mandatory	Number	

<sup>3</sup> See [ITUE00].

### 2.1.3 Time Value

This type of object represents a time value.

<b>Frame Ontologies</b>	time-value FIPA-Nomadic-Application FIPA-MTS-QoS			
<b>Parameter</b>	<b>Description</b>	<b>Presence</b>	<b>Type</b>	<b>Reserved Values</b>
direction	The direction in which this value is measured.	Optional <sup>4</sup>	Word	Inbound Outbound
unit	The unit in which the value is represented.	Mandatory	Word	h m s ms
value	The time value.	Mandatory	Number	

### 2.1.4 Probability Value

This type of object represents a probability value.

<b>Frame Ontologies</b>	probability-value FIPA-Nomadic-Application FIPA-MTS-QoS			
<b>Parameter</b>	<b>Description</b>	<b>Presence</b>	<b>Type</b>	<b>Reserved Values</b>
direction	The direction in which this value is measured.	Optional	Word	Inbound Outbound
value	The probability value which obeys the following axiom: $0 \leq \text{value} \leq 1$	Mandatory	Number	

### 2.1.5 Change Constraint

This type of object represents constraints that limit quality of service notifications (see [FIPA00062]).

<b>Frame Ontologies</b>	change-constraint FIPA-Nomadic-Application FIPA-MTS-QoS			
<b>Parameter</b>	<b>Description</b>	<b>Presence</b>	<b>Type</b>	<b>Reserved Values</b>
value	The description of the constraints.	Mandatory	Expression	

<sup>4</sup> This parameter is mandatory for those quality of service values that have a different value depending upon the direction.

### 2.1.6 Time Constraint

This type of object represents constraints that limit quality of service notifications.

Frame Ontologies	time-constraint FIPA-Nomadic-Application FIPA-MTS-QoS			
Parameter	Description	Presence	Type	Reserved Values
type	The type of the constraint. If the type Every is used, then the expression becomes true after value and thereafter at intervals of value. If the type After is used, then the expression becomes true only after value.	Mandatory	Word	Every After
value	The time value.	Mandatory	time-value	

### 2.1.7 Communication Channel Description

This type of object represents a communication channel.

Frame Ontologies	comm-channel FIPA-Nomadic-Application FIPA-Communication-Management				
Parameter	Description	Presence	Type	Reserved Values	
name	The logical name of the communication channel.	Optional <sup>5</sup>	Word		
target-addr	The target transport address of the communication channel. This may also be the address of a gateway ACC.	Optional	URL		
options	A list of optional parameters for the communication channel.	Optional	Set of property (see [FIPA00023])		

### 2.1.8 Transport Protocol Description

This type of object represents a transport protocol.

Frame Ontologies	transport-protocol FIPA-Nomadic-Application FIPA-Communication-Management			
Parameter	Description	Presence	Type	Reserved Values
name	The logical name of the transport protocol.	Mandatory	Word	See [FIPA00074]
gw-addr	The transport address of the gateway ACC.	Optional	URL	
dest-addr	The transport address of the ultimate destination. If this address is present, but gw-addr is not, then the Control Agent may select the most appropriate gateway transport address to use.	Optional	URL	

<sup>5</sup> Either the `:name` parameter or the `:target-addr` parameter must be present in this object.



options	A list of optional parameters for the transport protocol.	Optional	Set of property	
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### 2.1.9 Transport Protocol Selection

This type of object represents a selection of transport protocol.

<b>Frame Ontologies</b>	transports FIPA-Nomadic-Application FIPA-Communication-Management			
<b>Parameter</b>	<b>Description</b>	<b>Presence</b>	<b>Type</b>	<b>Reserved Values</b>
send	A list of transport protocols supported for sending messages.	Mandatory	Sequence of transport-protocol	
recv	A list of transport protocols supported for receiving messages.	Mandatory	Sequence of transport-protocol	

## 2.2 Exceptions

The exceptions for the FIPA-Nomadic-Application ontology follow the same form and rules as specified in [FIPA00023].

### 2.2.1 Not Understood Exception Propositions

<b>Communicative Act Ontology</b>	not-understood FIPA-Nomadic-Application	
<b>Predicate Symbol</b>	<b>Arguments</b>	<b>Description</b>
unsupported-act	String	The receiving agent does not support the specific communicative act; the string identifies the unsupported communicative act.
unexpected-act	String	The receiving agent supports the specified communicative act, but it is out of context; the string identifies the unexpected communicative act.
unsupported-value	String	The receiving agent does not support the value of a message parameter; the string identifies the message parameter name.
unrecognised-value	String	The receiving agent cannot recognise the value of a message parameter; the string identifies the message parameter name.

### 2.2.2 Refusal Exception Propositions

<b>Communicative Act Ontology</b>	refuse FIPA-Nomadic-Application	
<b>Predicate symbol</b>	<b>Arguments</b>	<b>Description</b>
unauthorised		The sending agent is not authorised to perform the function.
unsupported-function	String	The receiving agent does not support the function; the string identifies the unsupported function name.

missing-argument	String	A mandatory function argument is missing; the string identifies the missing function argument name.
unexpected-argument	String	A mandatory function argument is present which is not required; the string identifies the unrequired function argument.
unexpected-argument-count		The number of function arguments is incorrect.
missing-parameter	String String	A mandatory parameter is missing; the first string represents the object name and the second string identifies the missing parameter name.
unexpected-parameter	String String	The receiving agent does not support the parameter; the first string represents the function name and the second string identifies the unsupported parameter name.
unrecognised-parameter-value	String String	The receiving agent cannot recognise the value of a parameter; the first string represents the object name and the second string identifies the parameter name of the unrecognised parameter value.
already-open	String	The specified communication channel is already open; the string identifies the communication channel.
not-open	String	The specified communication channel is not open; the string identifies the communication channel.
already-activated	String	The specified transport protocol is already activated; the string identifies the transport protocol.
not-active	String	The specified transport protocol is not active; the string identifies the transport protocol.
unrecognised-comm-channel	String	The specified communication channel is not recognised; the string identifies the communication channel.
unsupported-protocol	String	The specified transport protocol is not supported; the string identifies the transport protocol.

### 2.2.3 Failure Exception Propositions

<b>Communicative Act Ontology</b>	failure FIPA-Agent-Management	
<b>Predicate symbol</b>	<b>Arguments</b>	<b>Description</b>
internal-error	String	An internal error occurred; the string identifies the internal error.
open-failed	String	The opening of a communication channel failed; the string identifies the failure reason.
transient-failed	String	The opening/closing of a communication channel or the activation/deactivation of a transport protocol failed; the string identifies the failure reason.
close-failed	String	The closing of a communication channel failed; the string identifies the failure reason.

activation-failed	String	The activation of a transport protocol failed; the string identifies the failure reason.
deactivation-failed	String	The deactivation of a transport protocol failed; the string identifies the failure reason.

### 3 Message Representation Ontology

#### 3.1 Object Descriptions

This section describes a set of frames, that represent the classes of objects in the domain of discourse within the framework of the `FIPA-Message-Representation` ontology.

##### 3.1.1 Message Representation Description

This type of object represents an ACL message representation.

<b>Frame Ontologies</b>	msg-representation FIPA-Message-Representation			
Parameter	Description	Presence	Type	Reserved Values
name	The name of the message representation.	Mandatory	Word	See [FIPA00068]
options	A list of parameters for the message representation.	Optional	Set of property	

##### 3.1.2 Message Representation Selection

This type of object represents a selection of message representations.

<b>Frame Ontologies</b>	msg-rep-selection FIPA-Message-Representation			
Parameter	Description	Presence	Type	Reserved Values
send	A list of message representations supported for sending messages.	Mandatory	Sequence of msg-representation	
recv	A list of message representations supported for receiving messages.	Mandatory	Sequence of msg-representation	

## 4 References

- [FIPA00023] FIPA Agent Management Specification. Foundation for Intelligent Physical Agents, 2000.  
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