

# FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS

## FIPA Nomadic Application Support Ontology Specification

|                        |   |                            |                                  |
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## 60 **1 Scope**

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

64  
65       Ontological descriptions.

66

## 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<br>FIPA-Nomadic-Application<br>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 data segment to be transmitted  | 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].

|                         |  |          |                   |   |
|-------------------------|--|----------|-------------------|---|
|                         | 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<br>Disconnected<br>Connecting |

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92 **2.1.2 Rate Value**

93 This type of object represents a data transfer value.

94

|                         |  |                 |             |   |
|-------------------------|--|-----------------|-------------|---|
| <b>Frame Ontologies</b> | rate-value<br>FIPA-Nomadic-Application<br>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<br>Outbound                     |
| unit                    | The unit in which the value is represented.            | Mandatory       | Word        | GBits/s<br>MBits/s<br>KBits/s<br>Bits/s |
| value                   | The rate value.  | Mandatory       | Number      |   |

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---

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

### 2.1.3 Time Value

This type of object represents a time value.

|                         |  |                       |             |                        |
|-------------------------|--|-----------------------|-------------|------------------------|
| <b>Frame Ontologies</b> | time-value<br>FIPA-Nomadic-Application<br>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<br>Outbound    |
| unit                    | The unit in which the value is represented.            | Mandatory             | Word        | h<br>m<br>s<br>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<br>FIPA-Nomadic-Application<br>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<br>Outbound    |
| value                   | The probability value which obeys the following axiom:<br>$0 \bullet \text{value} \bullet 1$ | 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<br>FIPA-Nomadic-Application<br>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<br>FIPA-Nomadic-Application<br>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<br>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<br>FIPA-Nomadic-Application<br>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<br>FIPA-Nomadic-Application<br>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             |                 |
| options          | A list of optional parameters for the transport protocol.   | Optional  | Set of property |                 |

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



### 2.1.9 Transport Protocol Selection

This type of object represents a selection of transport protocol.

|                         |   |                 |                                |                        |
|-------------------------|---|-----------------|--------------------------------|------------------------|
| <b>Frame Ontologies</b> | transports<br>FIPA-Nomadic-Application<br>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<br>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<br>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<br>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.

| Frame Ontologies | msg-representation<br>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.

| Frame Ontologies | msg-rep-selection<br>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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- [FIPA00062] FIPA Nomadic Application Support Monitor Agent Specification. Foundation for Intelligent Physical Agents, 2000. <http://www.fipa.org/specs/fipa00062/>
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