FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS

FIPA Content Language Library Specification

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Foreword

The Foundation for Intelligent Physical Agents (FIPA) is an international organization that is dedicated to promoting the industry of intelligent agents by openly developing specifications supporting interoperability among agents and agent-based applications. This occurs through open collaboration among its member organizations, which are companies and universities that are active in the field of agents. FIPA makes the results of its activities available to all interested parties and intends to contribute its results to the appropriate formal standards bodies.

The members of FIPA are individually and collectively committed to open competition in the development of agent-based applications, services and equipment. Membership in FIPA is open to any corporation and individual firm, partnership, governmental body or international organization without restriction. In particular, members are not bound to implement or use specific agent-based standards, recommendations and FIPA specifications by virtue of their participation in FIPA.

The FIPA specifications are developed through direct involvement of the FIPA membership. The status of a specification can be either Preliminary, Experimental, Standard, Deprecated or Obsolete. More detail about the process of specification may be found in the FIPA Procedures for Technical Work. A complete overview of the FIPA specifications and their current status may be found in the FIPA List of Specifications. A list of terms and abbreviations used in the FIPA specifications may be found in the FIPA Glossary.

FIPA is a non-profit association registered in Geneva, Switzerland. As of January 2000, the 56 members of FIPA represented 17 countries worldwide. Further information about FIPA as an organization, membership information, FIPA specifications and upcoming meetings may be found at http://www.fipa.org/.

Contents

1 Scope

This document contains specifications for structuring the FIPA Content Language Library (CLL) including: status of a FIPA compliant content language, maintenance of the library and inclusion criteria. This specification also maintains an updated list of FIPA content languages providing the information required to identify those languages and recover their relative specifications.

The first part of this document is primarily concerned with defining the structure of the FIPA CLL and the requirements for a content language to be included in the library. The elements of the library are listed in the FIPA CLL Registry table (see *Section 3.4, Registry*). The content languages listed in the FIPA CLL Registry table are compliant to the FIPA CLL requirements. FIPA is responsible for updating this list, but agent developers should be aware of possible changes to the FIPA CLL components. We recommend to all readers to consult the latest version of the FIPA Content Language Registry table for the latest specifications.

2 Overview

This specification focuses on the organization, structure, and status of the FIPA CLL and discusses the main requirements that a content language must satisfy in order to be FIPA compliant. The FIPA Content Library Registry document lists the current members of the library.

The objectives of standardizing and defining a library of FIPA compliant content languages are:

- To allow more flexibility and efficiency for many applications (for example, web based, real-time, nomadic), and,

- To increase interoperability between agents developed in different contexts, by facilitating the reuse of content languages. This would enable for instance the use of RDF schemas emerging on the Web, or the capability of expressing choices in an agent content language, etc.

In the following sections, we present the basic principles of the FIPA CLL. These principles help to guarantee that the CLL is stable, that there are public rules for the inclusion and maintenance of the CLL and that the CLL can be used by agent developers seeking a public content language.

3   FIPA Content Language Library

3.1   Status

The definition of a content language belonging to the FIPA CLL is normative. That is, if a given agent advertises that it accepts one of the languages in the FIPA CLL, then it must implement a parser or interpreter for the language as it is defined in the FIPA CLL. However, FIPA-compliant agents are not required to implement any of the FIPA CLL languages, except those required for agent management.

By collecting content language definitions in a single, publicly accessible registry, the FIPA Content Language Library facilitates the use of standardized content languages by agents developed in different contexts. It also provides a greater incentive to developers to make their content languages generally applicable.

The name assigned to the content language must uniquely identify which content language is used within a FIPA ACL message. The name must be prefixed by the string "FIPA-" and ended by a suffix of five digits (for example, FIPA-SL-00008, FIPA-CCL-00009, FIPA-KIF-00010, FIPA-RDF-00011). The suffix consists of the five digits that identify the FIPA document containing the specification of the content language.

FIPA is responsible for maintaining a consistent list of content language names and to make it publicly available to FIPA members and non-members. This list is located in the FIPA Content Language Library Registry.

Furthermore, every FIPA-compliant content language must specify at least one canonical encoding scheme that can be used for this language within a FIPA ACL message. Most of the languages included in the FIPA CLL include a "string-based" encoding scheme, but other encoding formats are allowed so that ACL messages can more efficiently represent the content of application specific data formats. The encoding schemes that a FIPA content language can support must be supplied as part of the language specification in the FIPA CLL, along with a name identifying each encoding. If several encoding schemes are supplied, the specific encoding scheme that is used in a particular FIPA ACL message must be specified in the `:language-encoding` parameter of the message. In addition, one of the encoding schemes shall be designated as the default encoding, to be used if the `:language-encoding` parameter is not specified.

In addition to the list of encoding schemes, each content language in the FIPA CLL may specify additional information, such as stability information, versioning, contact information, different support levels, etc.

3.2   Maintenance

The most effective way of maintaining the FIPA CLL is through the use of the languages 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 content languages in the library and to promote further research, FIPA encourages coordination between language designers, agent developers, and FIPA members. FIPA will make an annual report on the use of the content languages in the library.

FIPA will designate a Technical Committee (TC) to maintain the FIPA CLL. The FIPA CLL will be managed by this TC, which will be responsible for the following items:

- Collecting feedback and the comments about languages in the FIPA CLL. Depending on interest, the technical committee may organize more specific Working Groups. These groups would be responsible for maintaining public lists referring projects and people that are currently using such languages.

- Inviting contributions in various forms: email comments, written reports, papers, technical documents and so forth. The current email address of the TC maintaining the FIPA CLL 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 CLL 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 content languages in the library.

- In the future, FIPA intends to supply templates (publicly accessible from the FIPA web site) in order to facilitate submission of languages to the CLL and to ensure that language developers meet the requirements for the submission of a language to the FIPA CLL.

3.3   Inclusion Criteria

In order to populate the FIPA CLL, it is necessary to set some fundamental guidelines for the selection of specific content languages.

The minimal criteria that must be satisfied for a content language to be FIPA-compliant are:

- A good level of syntactical development is required. A "good" level means that, for example, the syntax of the language should allow the implementation of an effective parser. Content languages can express one or more actions, objects and propositions. If not all expressions are supported then all communicative acts may not be allowable. These not allowed communicative acts should be declared explicitly.

- A clear and intuitive (although not necessarily formal) semantics that fits with the use of FIPA-ACL must be specified. In particular, the composite semantics of ACL messages containing a communicative act which supervenes on a content expression must be specified.

- Examples of the usage of such a language (a parallel with SL for instance for a better understanding of what objects, actions and propositions are, etc.) are recommended.

- Substantial and clear documentation must be provided. This means that the proposal must be already well structured. FIPA members are in no way responsible for translating submitted content languages into an acceptable form.

- The utility of such a new language should be made clear. Either the language should include functionality which is useful across a wide range of agent activities (introducing extensions or improvements on existing languages) or it should directly support a single but very common agent activity (for example, travel assistance).

FIPA does not enforce the use of any particular content language, except for the case of `FIPA-Agent-Management`, for which `FIPA-SL0` is mandatory (see [FIPA00008] and [FIPA00023]).

3.4   Registry

Table 1 contains the name of the FIPA content languages that are currently part of FIPA CLL and the name of the FIPA specifications containing the current specification of those content languages.

Content Language	FIPA Specification	Date	Status
FIPA-SL-00008	[FIPA00008]	2000/07/21	Experimental
FIPA-CCL-00009	[FIPA00009]	2000/07/21	Experimental
FIPA-KIF-00010	[FIPA00010]	2000/07/21	Experimental
FIPA-RDF-00011	[FIPA00011]	2000/07/21	Experimental

Table 1: FIPA Content Language Library Registry

4   Conclusion

In this document a specific model for a FIPA CLL has been defined. This will allow more efficient usage and maintenance of the library itself.

Summarizing, the main features of such a model are:

- Every content language belonging to the FIPA CLL has a normative definition, but is optional in use.

- FIPA and its designated TC are responsible for the coordination and the maintenance of such a library.

- A content language proposed to belong to the FIPA CLL must satisfy the fundamental inclusion criteria listed in this document, see *Section 3.3, Inclusion Criteria*. At least a defined syntax and a clear intuitive semantics, which fits with the use of FIPA ACL, are required.

The second part of the document contains the FIPA CLL Registry. This table lists the content languages currently included in the FIPA CLL and maintains the references to the FIPA specification containing the relative language descriptions.

5   References

[FIPA00008]   FIPA SL Content Language Specification. Foundation for Intelligent Physical Agents, 2000.
                `http://www.fipa.org/specs/fipa00008/`
[FIPA00009]   FIPA CCL Content Language Specification. Foundation for Intelligent Physical Agents, 2000.
                `http://www.fipa.org/specs/fipa00009/`
[FIPA00010]   FIPA KIF Content Language Specification. Foundation for Intelligent Physical Agents, 2000.
                `http://www.fipa.org/specs/fipa00010/`
[FIPA00011]   FIPA RDF Content Language Specification. Foundation for Intelligent Physical Agents, 2000.
                `http://www.fipa.org/specs/fipa00011/`
[FIPA00023]   FIPA Agent Management Specification. Foundation for Intelligent Physical Agents, 2000.
                `http://www.fipa.org/specs/fipa00023/`