

IEEE FOUNDATION FOR INTELLIGENT PHYSICAL AGENTS STANDARDS COMMITTEE (FIPA SC)

AGENTS AND WEB SERVICES INTEROPERABILITY WORKING GROUP

Charter Proposal

1 Problem Statement:

The current set of FIPA specifications lack interoperability with Web Services (WS) standards and technologies. For instance, although FIPA has a concrete XML representation of ACL messages and envelopes, it has still not ventured outside the realm of agent-to-agent communication using a few (HTTP, IIOP, and WAP) transport protocols. This is unfortunate, since:

1. Web services are seeing tremendous growth in terms of popularity, industry backing, and adoption, whereas agents and agent technology have had less successful results. Emerging WS standards such as WS-CDL (Choreography) are clear evidence that the WS community is inexorably moving toward eventual 'agent-like' models, largely independent of the traditional software agent community.
2. Web services are still not a significant improvement over traditional distributed computing concepts. Web services technology is gaining popularity for its well-defined infrastructure and interoperability whereas agent technology aims at providing intelligent and social capability (trust, reputation, engagement, etc) for applications. Integrating these two technologies would create an environment where web services and agents can employ and compliment each other's strengths.
3. The W3C Web Services Architecture Working Group Note (02/2004) clearly states: "*Agents are programs that engage in actions on behalf of someone or something else. For our purposes, agents realize and request Web services. In effect, software agents are the running programs that drive Web services — both to implement them and to access them.*" However, WS standards that exist do not make explicit use of any agent concepts as understood by the agent community.
4. The emergence of Semantic Web Services is an ideal opportunity for software agents to demonstrate their viability when applied to orchestration, choreography, administration, etc., of services intrinsically expressed with semantic annotations.

Although both W3C and FIPA have specifications addressing the core issues of registration, discovery, and communication, these specifications use different technologies and there is no principled correlation between them. As a result, FIPA agents cannot currently participate in web service applications as an integral part of the system and vice versa.

2 Objectives:

- 2.1 **Agent interoperation with WS:** The primary objective of the proposed working group (WG), the IEEE FIPA Agent and Web Services Interoperability (AWSI) WG, is to *fill the communication gap between agents and web services*. Agents should be able to locate, negotiate and interact with web services seamlessly and vice versa.
- 2.2 **FIPA compatibility:** *Maintain backward compatibility with previous FIPA specifications as much as possible*. However, the working group might need to propose minimal but sufficient modifications to or extensions for existing FIPA specifications to achieve the primary objective.
- 2.3 **Value addition to WS:** *Add value to WS by introducing concepts novel to agents* such as dialogues, communication semantics, and agent interaction protocols to WS. In this regard, the work of the AWSI WG is not merely an exercise in translating FIPA standards and syntax into WS compliant ones.
- 2.4 **Non-interference with WS standards:** Do not modify existing web services standards and reference implementations. Use web application- or domain-specific extensions allowed by the web services standards where necessary.
- 2.5 **Utilize semantic web technologies:** The AWSI WG will utilize semantic web technologies and standards (such as RDF markup) to introduce agent concepts into WS.
- 2.6 The following are approximate mappings from FIPA standards to WS standards that the AWSI WG will work to realize by means of the documents it will produce (In the spirit of objectives 2.2 and 2.4): Section 6 gives more detail.

Area Standards (documents)	FIPA	Web Services	Semantic Web/Other
Service Description (3.2.3)	Agent Description Ontologies	Web Services Description Language (WSDL)	WSDL Service Ontology (WSDL-S) OWL for Services (OWL-S), Web Services Modeling Ontology (WSMO)
Registration (3.2.1)	Directory Facilitator (DF)	Universal Description Discovery and Integration (UDDI)	
Communication Protocol (3.2.3.1, 3.2.3.2)	Agent Communication Language (ACL)	Simple Object Access Protocol (SOAP)	
Semantic Language (3.2.3.1)	FIPA-SL		Web Ontology Language (OWL) WSMO
Interaction Schemes (3.2.3.3)	FIPA Agent Interaction Protocols	Business Process Execution Language for Web Services (WS-BPEL), Web Services Choreography Description Language (WS-CDL)	OWL-S Process Model, Semantic Web Services Language (SWSL) model for service composition.

Additional consideration must be given to other existing and emerging WS related specifications that may have an impact on the work of this group. These include:

- [Web Service Choreography Interface](#) (WSCI)
- WS-Addressing
- WS-AtomicTransaction
- WS-BusinessActivity
- WS-Coordination
- WS-Discovery
- WS-Eventing
- WS-Federation
- WS-Management
- WS-MetadataExchange
- WS-Policy
- WS-ReliableMessaging
- WS-Security
- WS-Trust

3 Documents Generated:

The AWSI WG will produce the following (hierarchically organized) documents

- 3.1 FIPA AWSI Requirements statement
- 3.2 FIPA AWSI Specification Overview
 - 3.2.1 FIPA AWSI Description Specification
 - 3.2.2 FIPA AWSI Registration and Discovery Specification
 - 3.2.3 FIPA AWSI Engagement Specification Overview
 - 3.2.3.1 FIPA AWSI Communication Language Specification
 - 3.2.3.2 FIPA AWSI Messaging Specification
 - 3.2.3.3 FIPA AWSI Interaction Specification

4 Technology:

The following existing technologies may be used, modified or built upon by the AWSI WG. The WG participants and contributors are chief researchers/active contributors in all of these technologies except 4.9

- 4.1 AgentWeb Gateway (NIIT/Comtec)
- 4.2 OWL-P: OWL for Protocols and Processes (North Carolina State University)
 - Framework for specifying and enacting *flexible* agent interaction protocols; a formal basis for composing protocols.
 - Potential: Help introduce a generic process model for WS interaction.
- 4.3 Deutsches Forschungszentrum fuer Kuenstliche Intelligenz (DFKI), Germany
- 4.4 JBees workflow management system (University of Otago)
- 4.5 WS2JADE (Swinburne University)
 - Toolkit which allows Jade agents to discover and access Web services at runtime.
- 4.6 ACLs for WS communication (Universitat Politecnica de Catalunya)
 - An encoding of FIPA ACLs using semantic web standards for WS Communication.
 - Potential: Map semantically rich agent communications to WS interactions
- 4.7 JADE WSIG – Web Service Integration Gateway (Whitestein Technologies)
 - Bi-directional Gateway allowing FIPA compliant agents to discover and invoke WSDL/SOAP/UDDI Web services and vice-versa.
 - Makes use of standard technology and libraries for Web service management
 - 100% FIPA compliant and available as add-on the JADE Agent Platform.
- 4.8 Web Service Agent Framework (Michael Maximilien, IBM Research Almaden)
 - Trust-based service selection using agents as proxies. Concepts of history-based and community-based trust.
 - Potential: Help introduce patterns for service selection decisions.
- 4.9 Semantic Web Services Language (SWSL + SWSO), OWL for Services (OWL-S), and the Web Services Modeling Ontology (WSMO).
 - Describe conceptual and operational aspects of semantic markup of WS for automated service composition.
 - Potential: Semantic markup to introduce high-level “agent” concepts for WS
- 4.10 Open Cybele Agent Platform (Intelligent Automation, Inc.)
 - Agent development environment and platform which also offers a gateway

5 Plan for Work and Milestones:

The AWSI WG will collaborate and communicate based primarily on email and other freely available Internet-based collaborative technologies such as blogs, protected message boards, instant messaging services, and Internet-based telephony. Details and logistics for setting up phone conferences and face-to-face meetings have not been worked out yet.

- 5.1 September 2005 Establishment of WG
- 5.2 November 2005 Requirements Statement
- 5.3 December 2005 Approval of work plan
- 5.4 March 2006 Alpha version of the standards
- 5.5 May 2006 Reference implementation for Alpha version
- 5.6 June 2006 Beta version of the standards
- 5.7 August 2006 Reference implementation for Beta version
- 5.8 September 2006 Release of the standards

6 Dependencies:

- 6.1 FIPA Agent Management Specification (SC00023K)
 - Describes agent management services, ontology, and platform message transport.
- 6.2 FIPA Agent Message Transport Service Specification (SC00067F)
 - Will be expanded to include WS Messaging standards (SOAP)
- 6.3 FIPA Interaction Protocols Specifications (SC00026—SC00030, XC00031, XC00032, SC00033—SC00036) and FIPA Communicative Acts Specifications (SC00037)
 - Will be used to develop new WS interaction styles using agents, potentially create new agent

- interaction protocol styles using interactions unique to WS.
- 6.4 OASIS Business process execution language for Web Services specification (BPEL4WS)
 - An executable service based workflow/process specification language; specifies only local views of interactions; the AWSI WG Interaction Specification will draw from this.
 - 6.5 W3C Web Service Choreography Description Language (WS-CDL)
 - A non-executable W3C standard for a global specification of a WS interaction process; the AWSI WG Interaction Specification will draw from this
 - 6.6 W3C Web Services Description Language (WSDL 1.1 and 2.0)
 - Describes XML format for describing Web service endpoints and messages containing either document-oriented or procedure-oriented information.
 - 6.7 W3C Simple Object Access Protocol (SOAP 1.2)
 - Describes SOAP messages and protocol for exchanging XML structured information in a decentralized environment.
 - 6.8 OASIS Universal Description, Discovery, and Integration (UDDI 3.0.2)
 - Describes web service directory usage and management
 - OASIS UDDI specifications technical committee best practices describes UDDI usage with WSDL; the AWSI WG can analogously describe UDDI usage with FIPA agents.

7 Participants:

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