

Editorial

Welcome back to the second exciting issue of Inform! This time we have another medley of articles for members and non-members alike. The first issue has now been disseminated widely through mail lists and at the major agent conferences, including AA2000, PAAM, and ICMAS. Paper copies are available on request for other suitable events. We start this issue with an article from the winner of the FIPA Competition, CSELT's Fabio Bellifemine. Other articles include a summary of the last meeting at ADETTI in Lisbon, a summary of FIPA business, and a number of special interest stories. There is also a handy glossary on the back. Read *inform!* and find out what the FIPA community is up to, or leave it on the coffee table and impress your friends!

ROB HADINGHAM

Audio-visual Entertainment and Broadcasting

Traditional manual selection of TV programmes (i.e. 'zapping' or 'channel hopping') amongst all those on offer, is quickly becoming anachronistic and impractical: some commercial systems already today consist of about 300 channels and have planned to offer 200 more! The Workpackage A1 of the European project FACTS

(<http://www.labs.bt.com/profsoc/facts>)

has realized a demonstrator that shows the usage of agent technology in the TV entertainment application domain. The target goal, at the application level, is to provide *intelligent* and *collaborative* capabilities for the set top box, to help people finding programmes that suit and are tailored to personal preferences, and to make interaction with the system as simple and intuitive as possible.

The user accesses a multi-agent system that is able to capture, model, and refine over-time his profile through the collaboration of agents with different capabilities. The user profile is then used by the system in order to restrict the scope of user requests or to autonomously retrieve, from the available service providers, information considered relevant for the user. The

personalization exploits several sources of information in order to tailor the programme guide to each specific user: knowledge about the services available, about the user and the characteristics of his terminal, about similarities within virtual communities of users, and about typical stereotypes of users.



Bayesian Belief Networks are exploited to learn over time the user preferences (i.e. the categories of TV programmes the user prefers to watch, possibly contextualized by the day of the week and the viewing time), pattern matching and case-based reasoning to classify users via a similarity function that does nearest matching and fuzzy matching. A community of collaborative interface agents helps the user to use the system; it is personified as an animated human-like character and overall provides multi-modal interaction. The user can interact via traditional GUI, or via a bi-directional natural language interface integrated with a commercial speech recognizer, or can also engage in the use of an embodied affective character, that integrates both synthetic body movements, voice, and affective traits.

JADE

(<http://sharon.csel.it/projects/jade>)

provides all the middle-ware necessary to manage the agents, distribute them on several machines, implement the communication and the agent interaction protocols. The full system is packaged as an intermediary service, eventually on the Web, that acts as a broker between the users and the service providers and provides horizontal bundling of resources, personalization of the TV guide and multi-modal human

interaction. Customization to different application domains can easily be carried out. All the software is available under the EU Standard Terms and Conditions of the ACTS programme, the contact point for any request is CSELT.

Partners: CSELT, Imperial College, ITC, NHK.

FABIO BELLIFEMINE

AgentCities

AgentCities is a new initiative designed to help realise the commercial and research potential of FIPA agent applications. Its aim is to build a publicly accessible, continually available, network of FIPA platforms. Each platform will support services modelled for a single real world city or place. Services deployed in the testbed will initially centre on information and transaction services for real world objects such as bars, restaurants, hotels, travel infrastructure, theatres etc. [presumably 'virtual' cities that do not have a direct physical analogue will also be permitted - Ed] Agent based applications will be able to access these services worldwide using federated directory services (DFs) and FIPA communication services. The set of services deployed in the network can then be used as building blocks to construct new agent services. Complex compound services such as planning a weekend away (organising flights and opera tickets, selecting restaurants, locating and booking a hotel and proposing an art exhibition to visit) would then be a real possibility for the first time.

The AgentCities 'testbed' will act as:

- A resource for agent application developers to enable their agents to interact with service agents developed by others, worldwide.
- Test applications in a realistic, distributed, open environment
- Provide examples of service models, ontologies and usage of FIPA standards
- A publicly visible and accessible deployment of FIPA technology
- An implementation experiment generating feedback on FIPA standards
- A benchmark environment for

compliance testing
The testbed will be built by contributing organisations each hosting their own “city” - a publicly available FIPA agent platform and accompanying agent services for a selected city or place. Several organisations have ‘signed-up’ to contribute to AgentCities, including EPFL, Fujitsu Labs USA, Imperial College, Motorola, and Nortel Networks.

The core effort of AgentCities is devoted to interoperability at the service level, in particular the development of ontologies, and service descriptions and the practical usage of FIPA protocols, ACL and



content languages

A workplan to coordinate AgentCities activity inside of FIPA is currently at the draft stage and being discussed on the FIPA chat reflector (chat@fipa.org). For more information and copies of related documents please contact Steve Willmott (willmott@lia.di.epfl.ch), monitor discussion on the FIPA chat reflector or check the web site (<http://www.agentcities.org>)

STEVE WILLMOTT, BERNARD BURG

FIPA: Agents Working Together

In recent months FIPA has undergone significant changes; we have completely revamped the way that specifications documents are produced and accounted for, we have also changed the way that technical work is started, and last but not least we have refocused on our core mission. This article is an introduction to some of these changes and how they may affect you as a FIPA member. The reworded FIPA mission is:

The promotion of technologies and interoperability specifications that facilitate the end-to-end interworking of intelligent agent systems in modern commercial and industrial settings.

With this we are reminded that the core focus of FIPA’s work is helping agent systems to work together.

FIPA’s most precious asset is and always has been the ACL. The ACL itself is less important than the idea: to use semantically meaningful messages to communicate between agents.

FIPA plans to focus more on the semantic level of agent interactions and less on the

‘plumbing’ needed to make it happen. The reason for this shift is that there are many mechanisms for sending strings between applications, but very few proposals for semantic standards for messages. For example, FIPA is considering standards for how policies can be described in ways that are accessible to intelligent agents; a policy contains constraints on the behaviour of agents and/or services. FIPA may also look at establishing agreements and contracts between agents. All this is building on richer and better-constructed interaction protocols.

In addition to the shift in emphasis, FIPA has a new document structure, new methods for doing work and a new technical authority, the FIPA Architecture Board (FAB). The function of the FAB is to oversee the technical work of FIPA, ensuring that our output meets high quality standards as well as being in line with FIPA’s goals.

The work process itself is driven by the FIPA membership. Groups of members get together and propose a workplan. A useful forum for pre-workplan discussions is the mail list chat@fipa.org. Put simply, the function of a workplan is to identify the problem, scope the work involved, and identify at least some of the members who are committed to getting the job done. The FAB is the authority for workplan approval.

The specifications themselves have had a makeover. Instead of FIPA 97, FIPA 98 and so on, there is a new numbering system independent of years. There are several categories of specification, depending on how far along the process the specification has progressed; and the kind of specification it is. PC0001 means that it is Preliminary (as opposed to eXperimental, Standard, Deprecated or Obsolete) and that it is a Component (as opposed to a Profile). The number means simply this is the 1st document registered by the FAB.

A component specification is a self-consistent part of the overall FIPA specifications; a profile document is a coherent subset of the specifications, showing how various components are combined to meet particular objectives. Preliminary specs can be released by technical committees, eXperimental specifications must be released by the FAB and Standard specifications are released by the FAB after a vote of the entire FIPA membership. Most of the previously released FIPA specifications will soon be at the ‘eXperimental’ stage; after demonstration of their interoperability and stability, they will become official

FIPA ‘Standard’ specifications.

Overall there has been a significant shift in the way that FIPA does business. We now have an exciting new direction and sound processes in place to make it happen. The transition to this new model is not yet complete but ‘getting there’; FIPA knows where it is going - join us!

FRANK MCCABE

FIPA-NET

The Internet is becoming a vast universal information space in which knowledge from heterogeneous media and on different computers is inter-linked. This “First Generation Web” focussed on human-to-human communication but this has become an obstacle; the sheer size of the Web and the volume of information available has dramatically increased the load on a user’s ability to filter and process the information. The next generation Web, the “Semantic Web”, aims to solve this problem by introducing universal technology within the Web to support machine reasoning.

One potentially useful technology here is software agents. These can act autonomously on the user’s behalf, and interoperate semantically with many other kinds of agents such as service providers, personal assistants, and infrastructure adapters. In order for agents to ‘scale up’ and become ubiquitous in the Internet, a scalable infrastructure to support agents and agent communication is required.

The FIPA-Net

(<http://casbah.ee.ic.ac.uk/fipanet>)

initiative, originating from the Intelligent and Interactive System group at Imperial College, is developing a testbed to provide such an infrastructure. Firstly, it provides an operational FIPA Multi-Agent (MA) system together with information and tools to support interoperability between FIPA MA systems distributed across the Internet. Secondly it offers a portal to link to services in other FIPA systems.

Currently, there are two MA systems linked together: one based at Imperial College and the other based at Nortel Networks, with others set to follow. Any other interested parties who wish to join the network can subscribe via the FIPA-NET home page. Several simple services are available on FIPA-Net including a directory service, an echo or ‘ping’ service and a date service. Support for authentication, encryption and auditing is also under development. FIPA-NET is contributing to the AgentCities initiative by providing part of the MA infrastructure.

STEFAN POSLAD

FTP@Lisbon

The 17th FIPA meeting was held in Lisbon in April 2000, kindly hosted by ADETTI. The Board of Directors revised the FIPA's mission statement [see *FIPA: Working Together* in this issue - Ed] and decided to strengthen FIPA's marketing activities. A marketing plan was developed and the design of a new website started, it will include FIPA activities as well as a larger vision on related projects, software developments, open source, and applications. The FIPA Architecture Board (FAB) finalised all procedures, reviewed and commented the workplans and invited resubmissions one month before the Baltimore meeting. All Technical Committees intend to propose their specifications to reach the "preliminary" stage during the Baltimore meeting in July and will resubmit their workplans. A new initiative named AgentCities was enthusiastically received by the FIPA members [see the *AgentCities* article - Ed]. FIPA also noted that a Java Community Process (JCP) on a Java reification of the FIPA abstract architecture is under discussion with leadership from Fujitsu. Another announcement from Fujitsu stated that APRIL, DIALOG, and APRILWEBS have been turned into open source projects, available on SourceForge. The highlights of the week included a traditional 'song and dance' from our hosts (surprise entertainment for the



troops) and the FIPA 2000 Competition - more on this later.

FIPA invites its membership and contributors to the 18th meeting, July 17-21 in Baltimore, Maryland, USA to be hosted by the University of Maryland, Baltimore County, and 19th meeting, Oct 16-20 in Sydney, Australia, to be hosted by Motorola Labs.

BERNARD BURG

TIIERA

The U.S. Office of Naval Research is sponsoring a project in agent technology that is implementing the FIPA standards. The software deliverable is called TIIERA (Tactical, Intelligent

Information Exploitation and Retrieval Agents). The software is being developed in San Diego, CA at the Space and Naval Warfare Systems Center. TIIERA is compliant with FIPA 97 version 2, and with portions of the Agent Management specification in FIPA 98. The architecture includes not only those mandated agents that constitute the FIPA reference model, but also agents for planning tasks and for monitoring the execution of tasks.

Current project plans include extending and documenting core capabilities, and continuing development of a suite of TIIERA agents, both general-purpose and application-specific. The general-purpose agents that currently exist in TIIERA are primarily of two sorts: wrappers of third-party applications that operate on text sources, and low-level agents for operating on web resources. Results of the following efforts will be reflected in the next major version of TIIERA:

Ontology service - Incorporate the FIPA-compliant ontology service provided by Comtec.

Data qualities - Incorporate qualitative criteria for planning agent sequences into TIIERA Plan agent and into user interfaces, to augment the existing syntax-based approach.

Weather services - Complete initial development of agents to exploit forecast weather data from U.S. Navy sources for general-purpose and specialized use.

Documentation - Prepare TIIERA developer manual.

The software requires Java 2. For further information on TIIERA, contact Robert Luna: luna@spawar.navy.mil.

ROBERT LUNA

Grasshopper 2

After initial releases of Grasshopper in 1998 and 1999, IKV++ GmbH, the pioneering agent technologies company from Berlin, Germany (www.ikv.de) has released in April 2000 the next generation of its agent platform. Grasshopper is an open 100% Java-based mobile intelligent agent platform, which is compliant to the both available international agent standards, namely the OMG MASIF and FIPA specifications. Grasshopper runs on all operating systems featuring a Java Virtual Machine. Worth mentioning is the availability of an adapted **Grasshopper Windows CE version** in order to enable rapid prototyping of potential pre-UMTS applications.

Besides a variety of technical enhancements, such as improved performance, reliability, scalability, and

extensibility, full Java 2 support, etc., the major news is that Grasshopper 2 is distributed free of charge and features the standard conformant platform parts as open source modules! Grasshopper includes two optional open source extensions providing the OMG MASIF and FIPA standard interfaces for agent/platform interoperability. Further extensions, currently under development at IKV++ include a servlet to provide access and control to remote Grasshopper agents and systems from any web browser via the internet. Another upcoming extension aiming also for enhanced user interactions, the Grasshopper-Media Framework, provides media converters and telecommunication service interfaces for accessing and delivering Grasshopper agents, enabling the delivering of their contents via phone (Voice), email, fax, SMS and WAP. An additional management system providing an SNMP interface will be made available in the course of the year, which makes the administration of Grasshopper and Grasshopper-based applications within corporate networks easier..

Potential customers can obtain Grasshopper 2 and/or join the Grasshopper community at www.grasshopper.de.

THOMAS MAGEDANZ

LEAP: Look First!

Project LEAP (Lightweight Extensible Agent Platform) is addressing the need for open infrastructures and services which support dynamic, mobile enterprises. It will develop innovative agent-based services supporting three requirements of a mobile enterprise workforce: knowledge management (anticipating individual knowledge requirements), decentralised work co-ordination (empowering individuals, co-ordinating and trading jobs), and travel management (planning and co-ordinating individual travel needs). Central to these agent-based services is the need for a standardised Agent Platform. Project LEAP will develop an agent platform that is - lightweight, executable on small devices such as PDAs and phones; extensible, in size and functionality; operating system agnostic; mobile team management enabling, WAP and TCP/IP supporting; and FIPA compliant. One of the goals of the consortium is to disseminate the Agent Platform in open source at the end of the project.

LEAP, a European IST project, consists of: Motorola (co-ordinator), ADAC, Broadcom, BT, CSELT, U.Parma and Siemens. The project started in January

2000 and has a duration of 30 months. The major milestones are the production of a first version of the LEAP platform including Lab trials and proof of feasibility, in January 2001. Next step is to provide LEAP Version 2.0 which will physically run on small devices such as PDA's and phones, in September 2001. An initial version of the agent services supporting the mobile workforce is scheduled for October 2001 with field trials planned for June 2002. These field trials will cover two domains, supporting telecom customer service engineers in maintaining telecom networks, and helping mechanics during emergency road-side assistance.

For additional information and contact please consult the LEAP website.
<http://leap.crm-paris.com/>

BERNARD BURG

FIPA-OS now with Added Intelligence!

FIPA-OS is royalty-free and available as open source code. It is easy to install and now includes features to enable improved reasoning abilities within the agents. The following is a feature summary for the new version (1.2.0):

- Additional Agent "Shell" that provides hooks to JESS (Java Expert System Shell <http://herzberg.ca.sandia.gov/jess/>).
- Support for the FIPA-CCL content language (Choice Constraint Language <http://liawww.epfl.ch/CCL/>).
- 'Agent Loader' script utility to enable automatic instantiation of multiple agents in a single VM.
- Agent Management GUI to control agents executing on a FIPA-OS platform.
- Support for the Task Manager to simplify the construction of domain specific agents. (see ftp://fipa-os.sourceforge.net/pub/FIPA-OS/docs/FIPA-OS_Agent_Tasks.pdf for more details).
- Two further example agents and tutorials
- Numerous bug fixes and feature enhancements

We are also pleased to announce that FIPA-OS has been made into an official SourceForge project (see <http://sourceforge.net/projects/FIPA-OS> for details). Further information can be found at <http://www.nortelnetworks.com/fipa-os>, and the email list is hosted at <http://fipaos.Listbot.com>. FIPA-OS is being used in a growing list of projects, including SHUFFLE (<http://www.ist-shuffle.org/>) and FIPA-NET. These projects are already feeding

back code changes that have been incorporated in this release of FIPA-OS. We would also like to encourage new developers to join us in this open source (royalty free) initiative, and help ensure that FIPA-OS supports the features required by all of the agent developers using the toolkit. If you have ideas for the future of FIPA-OS then please propose them on the list - take advantage of the FIPA-OS community.

PHIL BUCKLE

UKMAS-2000 - Call for Papers

The Third Workshop of the UK Special Interest Group on Multi-Agent Systems will be held at Oxford University on the 14-15th December 2000.

The aim of this workshop is to encourage and support activity in the research and development of multi-agent systems, in both academia and industry.

Topics of interest include, but are not limited to: agent communication, negotiation and argumentation, logical models, economic models, agent programming, agent methodologies, applications, deployed systems, agent theories, agent architectures, software tools, agent coordination, social relationships, cooperation and competition. Interested parties should visit or email m.dInverno@wmin.ac.uk or visit:

www.wmin.ac.uk/~dinverno/ukmas2000.html

MARK DINVERNO

Win \$10,000! - The Results

The winners are:

1. **New-generation TV entertainment system (FACTS-A1), presented by Fabio Bellifemine, CSELT.**
2. **Dynamic and Competitive Service Provisioning (FACTS), Phil Buckle & Danny Jacxsens, Nortel Networks & Alcatel.**
3. **Cybs: The Intelligent Agents Community Platform based on FIPA Communication Technology, Tianning Zhang & Stefan Covaci, PopNet AgentScape AG.**

The other entries (not placed) were: FATE – FIPA Agent Templates, Frank Noe, Institut fuer neue Medien Agent Mobility in FIPA-OS, Milla Makelainen, Nottingham Trent University Personalised eCommerce Service (MAPPA), Jeremy Pitt & Phil Buckle, Imperial College & Nortel Networks MONITORix, a video based traffic surveillance multi-agent system (MODEST), Prof. Maria Jose Trigueiros, Prof. Luis Botelho, ADETTI. Congratulations to FACTS-A1 and many thanks to all the competitors for making this an interesting and informative event.

Glossary

Agent (or Autonomous Agent) - an autonomous component that combines one or more service capabilities into an integrated execution entity. An agent can communicate with other agents, software, and humans. In particular FIPA agents communicate declaratively.

Agent Communication Language (ACL) - a language with precisely defined syntax, semantics and pragmatics that is the basis of communication between independently designed and developed software agents.

Bot - a popular term for intelligent Internet agents.
Communicative Act (CA) - a special class of actions that correspond to the basic building blocks of dialogue between agents (e.g. Inform, Request, Propose, Refuse, Subscribe, etc.).

Content Language - The content of an agent message refers to whatever the communicative act applies. If, in general terms, the communicative act is considered as a sentence, then the content is the grammatical object of the sentence.

Conversation - An ongoing sequence of communicative acts exchanged between two (or more) agents relating to some ongoing topic of discourse.

Extensible Mark-up Language (XML) - the universal format for structured documents and data on the web, used as an alternative syntax for FIPA ACL and content expressions.

Intelligent Agent - one which exhibits some degree of artificial intelligence.

Message - an individual unit of communication between two or more agents.

Mobile agent - one whose execution is not restricted to the Agent Platform where it was created; it can migrate to another agent platform. Mobility is not a mandatory agent attribute and discussions about agents should not assume that they are so equipped.

Ontology - An ontology is an explicit specification of the structure of a certain domain (for example, e-commerce, sport, manufacturing, etc.). An ontology includes a vocabulary for referring to a subject area, and a set of logical statements defining the constraints restricting the interpretation of the vocabulary.

Ontology sharing problem - The problem of ensuring that two agents that wish to converse do, in fact, share a common ontology for the domain of discourse.

Personalization - An agent's ability to take individual preferences and characteristics of users into account and adapt its behavior to suit these factors.

Protocol - A common pattern of conversations used to perform some generally useful task.

Resource Description Framework (RDF) - provides the necessary foundation to support the description and management of data, used as the basis for the FIPA-RDF content language.

Speech Act Theory - derived from the linguistic analysis of human communication and is used as the basis for Agent Communication Languages.

Stationary agent - A stationary agent is one that executes only upon the agent platform where it was created; it influences remote actions by communicating its requests and needs to other software, agents, and people.

User agent - A user agent is one that interacts with a human user.

Wrapper agent - A wrapper agent is one that provides an interface to a non-agent or legacy system.

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