CRUMPET

Tourism and Open Source for Small Devices

CRUMPET (IST-1999-20147) is the Creation of User-friendly Mobile services Personalised for Tourism. The overall aim of the project is to implement, validate and trial tourism related value added services for nomadic users across mobile and fixed networks using agent technology. The implementation is based on the FIPA-compliant open source agent framework FIPA-OS; **µFIPA-OS** is the first and only *open source* software for small footprint devices using FIPA interoperability; it is available for download from http://fipa-os.sourceforge.net/.

CRUMPET trials will include tourism services evaluated by several mobile service providers. The services will support intelligent, anytime, anyplace communication and adaptive nomadic services. Services will be nomadic across any suitable network (IP, WLAN, GSM, GPRS, UTMS) and any suitable mobile device (next generation mobile phones, PDAs, hybrid terminals). The CRUMPET consortium will influence and be influenced by international standards, notably FIPA, 3GPP (UMTS), W3C, and OpenGIS. Real content will be provided by tourism organisations in Heidelberg, Helsinki, and London.

The partners in the CRUMPET project are Emorphia, European Media Laboratory (EML), GMD, Nortel Networks, Portugal Telecom, Queen Mary College (University of London), Sonera, and the University of Helsinki. The project consists of five work packages including

user interaction, FIPA-OS small footprint agent services development, nomadic service network support development and validation and trials.

One of the most important features associated with the adaptation of tourist services to different nomadic computing and network environments, as well as varying network conditions, is the implementation of the FIPA Nomadic Application Support specification (FIPA specification FIPA00014 — refer to the Nomadic Application Support article this Issue). This will include implementing Monitor Agents (observe/measure/analyse both the message transport protocol QoS and the connection QoS) and Control Agents (control MTC/P).

There are several other issues that will also need to be considered, specifically the selection of message transport protocols and the connections to be used for agent communication, the selection of ACL representation and content languages and, finally, support for application agents to carry out adaptation of content (images, video, audio, etc.).

One scenario will be a tourist arriving at

Editorial

Welcome to the 4th issue of Inform! The theme is **'Agents in a Mobile World'** — but *not* mobile agents per se; 3G wireless (UMTS) in particular is featured. We have to be careful when we talk about *mobility* and *agents*; mobility can refer to the code itself, or to the nomadic user or device. Personally I have yet to see a convincing reason for agent code mobility other than for deployment purposes, but I am open to suggestions! Join the chat@fipa.org community mail list if you feel compelled to share your view on this or any other agent topics.

In addition, there are two updates on last issue's theme (FIPA Platform Implementations) and, as promised, some news on the Emorphia start-up, based in that little-known part of England known as 'Silicon Hollow'… Harlow to the uninitiated.

The format for the next issue of Inform! will change, we have had 4 issues now and it's time to reflect; there will be more on FIPA-specific topics and FIPA members (widening the spotlight beyond start-ups). Please send suggestions for Inform! content to image@fipa.org and the FIPA Secretariat (secretariat@fipa.org) will ensure they are considered.   *Rob Hadingham*

Agents *LEAP* onto lightweight PDAs

The Lightweight Extensible Agent Platform (LEAP) project (IST-1999-10211) reached its first milestone in December 2000. LEAP Version 1.0 is a FIPA-compliant agent platform that has been tested on a number of devices: and small device emulators, such as PALM Vx, PSION 5mx, Compaq iPaq;, and small device emulators: Symbian Quartz emulator, Siemens SL45 emulator, Compaq iPaq and SUN's MIDP emulator. To our knowledge LEAP Version 1.0 is the first FIPA-compliant agent platform capable of running on lightweight devices, such as PDAs, under J2ME.

LEAP is addressing the need for open infrastructures and services which support dynamic, mobile enterprises. It has three goals: to develop a light-weight FIPA-compliant agent platform; to develop innovative agent-based services that meet the requirements of a mobile enterprise workforce; and to run two Field Trials of the platform and services covering both customer service engineers maintaining telecommunications networks, and assistance services for emergency road-side incidents.

In addition LEAP paves the way for future m-commerce applications, where agents on PDA's and 'phones will provide intelligent, personal and proactive services to mobile users as well as to mobile teams.

The LEAP consortium partners are: Motorola (co-ordinator), ADAC, Broadcom, BT , TI LAB , U. Parma and Siemens. For additional information and contact details, please consult the LEAP website. http://leap.crm-paris.com/

The platform has been demonstrated at FIPA 20 in Phoenix and FIPA 21 in London. The next major demonstration will be at Autonomous Agents 2001 in Montreal.

The development process of LEAP created a new branch of JADE, and will be reintegrated back to replace the heart of JADE. This environment will also be integrated with the ZEUS toolkit, to provide a complete development environment reaching from design to deployment.

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Open Source Initiatives: TIIERA

TIIERA (Tactical, Intelligent Information Exploitation and Retrieval Agents), first mentioned in issue 2 of Inform!, is a completely object-oriented Java implementation of the FIPA 97 specifications. It provides a flexible architecture that facilitates extensions and agent development. TIIERA does not require any third-party extensions, simply the Java 2 Standard Edition SDK. TIIERA can work with either Java 1.2 or 1.3 (the RMI limitation in Java 1.2 has been resolved). TIIERA provides a simplified "make" style compilation mechanism, so it is easy to compile across various platforms. TIIERA has been shown to operate properly on Solaris (2.5.1, 6, 7, and 8), Linux (RedHat 6.0+ and LinuxPPC), and Mac OS X PB.

The TIIERA developer's manual (version 1.0) has been completed. It covers the mandatory FIPA 97 services in TIIERA, the class packaging scheme, agent development, agent (and Home Agent Platform) startup, agent messaging, and agent configuration.

Work has begun on a bridge agent that will support a limited form of interoperability between a TIIERA environment and a CoABS (Control of Agent Based Systems) grid. The bridge agent will function as a proxy for TIIERA agents and grid-based agents, providing a translation capability between TIIERA DF agent descriptions and CoABS DfAgentDescription entries.

In addition, agent messaging between the two platforms will be managed by the bridge agent. Note that the CoABS-based agent must be capable of generating a FIPA ACL message as there are no current plans to support any type of ACL translation.

Development of the next generation of TIIERA (currently underway) will comply with the latest FIPA 2000/2001 specifications. It will also provide support for protocol plug-ins in the new message transport system, and for JESS (Java Expert System Shell) and JAM. JAM is a BDI-theoretic (Belief-Desire-Intention) agent architecture based upon the Procedural Reasoning System (PRS) of Georgeff, Ingrand, Rao, Lansky, and others (primarily from SRI International and the Australian AI Institute).

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CRUMPET

a destination with no 'local knowledge'. The agent will adapt to the available network and contact local providers to arrange the desired services. Agents can also act proactively to suggest services to the user that the agent knows are of interest. The agent will adjust to possible c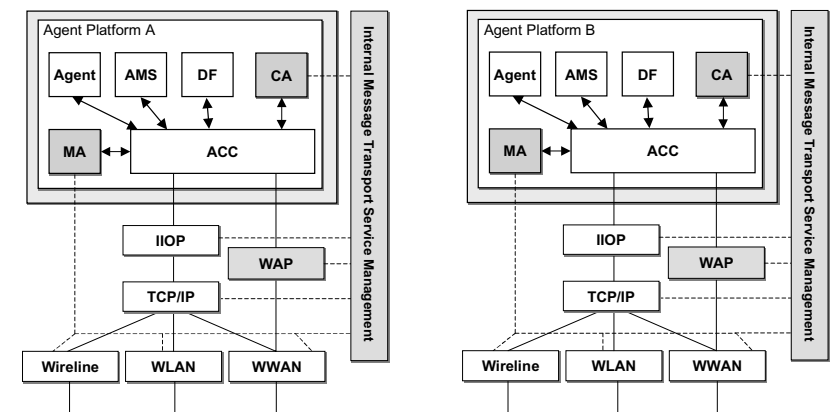hanges of network, network type (e.g. from WLAN to UMTS), and content adaptation (e.g. the video stream might lose the picture content, but keep the audio when a user moves from a high-speed connection to lower one).

Milla Makelainen

FIPA Nomadic Application Support

Today's information services in the Internet, for example the WWW, are designed for workstations in fixed wireline networks. Wireless data services such as GPRS and UMTS enrich the options for communications.

signed to be looked at on high resolution displays and as nomadic users will be charged based on the amount of data transmitted over the GPRS network, they will have to pay for bits that are totally useless to them.

1. Information about expected performance - provided by agents.
2. Intelligent agent controlling the transfer of operations.
3. A condition-based control policy.
4. The capability provided by intelligent agents to work in a disconnected mode.
5. Advanced error recovery methods.
6. Adaptability.

FIPA Nomadic Application Support has addressed these issues by specifying an agent-based framework comprising:
1. An agent middleware to monitor and control a FIPA Message Transport Protocol and the underlying Message Transport Connection.
2. An ontology for the QoS of the Message Transport Service in the context of nomadic application support.
3. Agent interaction protocols for nomadic application support.
4. Bit-efficient representation of ACL.

Reference architecture of agents performing adaptation.

Nomadic computing exploits the advanced technologies of wireless, the Internet, global positioning systems, portable and distributed computing to provide anytime, anywhere access. The communication variables adapt as the user's device moves: for example from a wired LAN via a wireless LAN to a GPRS/UMTS network. All of these factors create new demands for the adaptability of data services. For example, palmtop PCs cannot properly display the high quality images de-

The ability to automatically adjust to changes, mentioned above, in a transparent and integrated fashion is essential for nomadicity. Furthermore, to help reduce complexity, nomadic end-users need all the support that a FIPA agent-based distributed system can deliver.

Nomadic end-users would benefit from having the following functionalities provided by an infrastructure:

The specifications have reached experimental status and several instances have already been planned to implement them (refer to the CRUMPET article on page 1 for example).

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Mobile Middleware for M-Commerce:
The Grasshopper MicroEdition for UMTS Devices

Mobile middleware is considered as the basis for rapid and unified applications development within the emerging UMTS and M-Commerce markets as the killer application(s) have not yet been identified. According to the forecasts of the major market analysts, worldwide revenue in the mobile middleware industry will explode at a compound annual growth rate of 61%, from $137 million in 2000 to nearly $1.5 billion in 2005. Mobile middleware extends the capabilities of existing middleware and open service plat-

forms towards the mobile domain, taking particularly the capabilities of existing and emerging mobile devices into account.

With the evolution towards advanced end user terminals, i.e., the combinations of circuit and packet switched GSM/GPRS handsets and Personal Digital Assistants, it becomes possible to provide next generation services also within the end user domain, rather than solely on servers within

(Continued on page 4)

Provider System
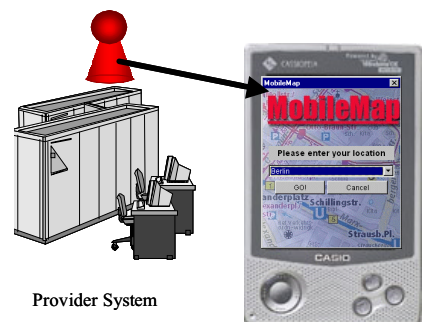
Grasshopper MicroEdition enables instant service deployment within emerging PJava-enabled UMTS end systems

Start-Up Corner: Emorphia in 'Silicon Hollow'

Emorphia is a new venture formed by the Nortel Networks' Agent Technology Group to commercialize this rapidly developing software paradigm.

Emorphia eases pain for application and service providers by supplying easy-to-use smart software components called *Morphs,* novel intelligent software agents that share the burden of labour-intensive tasks. Morphs are reusable and re-configurable; they can be given personalities, profiles, and missions – collectively adapting their behaviour to new circumstances as they try to attain their goals. Morphs conform to the FIPA standards for agent interoperability allowing them to 'plug and play', working towards providing unprecedented re-use and rapid time-to-market for new types of service and application.

Emorphia recently announced the availability of **FIPA-OS 2**, the open source FIPA implementation available for download from SourceForge (http://fipa-os.sourceforge.net). There are several reasons for the '2', but principally it is to mark a 'change in management'; Nortel Networks has

transferred management responsibility of *FIPA-OS* to Emorphia. All previous 'covered' code will continue under the Nortel Networks open source public license; however, new code will be part of the 'larger works' *FIPA-OS 2*, released under the Emorphia Public License (http://www.emorphia.com/EPL/), which can also be used or adapted by contributors.

emorphia

The spirit of royalty-free commercial and academic use continues with *FIPA-OS 2*; already many improvements and new features have been made to this release, not least **security provisions** and more recently, support for small footprint devices. *FIPA-OS* 2 is a component-based toolkit implemented in 100% pure Java, and supports the majority of the FIPA Experimental specifications enabling rapid development of FIPA compliant agents.

Emorphia are currently building a number of applications that exploit the

Morph technology, such as the UMTS resource balancing project SHUFFLE (IST-1999-11014) and the location-based services-for-tourism project CRUMPET (IST-1999-20147). Emorphia are also developing *Morph* technology for **electronic marketplaces**, the hub of which is being used for training at Queen Mary, University of London. The E-market hub will be released as open source in Q2 2001, allowing experimentation and research to be carried out on a large scale – in particular academic use will be supported. A small-footprint version of *FIPA-OS* (**µFIPA-OS**) is under development with the University of Helsinki, aimed at PDA's and smart mobile phones.

Emorphia is not owned by Nortel Networks, but is based near their UK Research Laboratory in Harlow (a 'silicon hollow' between Cambridge and London). For further details on Emorphia, visit www.emorphia.com and track it over the coming months.

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Mobile Middleware for M-Commerce

the provider domain. This is of fundamental importance in face of increasingly content-oriented UMTS services, such as music on demand or dynamic customised map provision, as end users want to have access to this type of information without the need of 'always-on' broadband wireless connectivity.

Consequently, the German **IKV++ GmbH** has developed a dedicated version of its well known Grasshopper Mobile Agent platform - the **Grasshopper MicroEdition.** Grasshopper ME enables the secure and dynamic provision of services from provider systems directly into PJava enabled mobile devices, such as PocketPC-based and Symbian-based mobile ter-

minals, and vice versa. Interested programmers can download from the Grasshopper Website (www.grasshopper.de) the new enhanced version of the Grasshopper MicroEdition together with a set of impressive demo applications illustrating the potentials of this M-Commerce enabling platform. These demos include a mobile map demo and a music on demand demo.

It should be stressed, that for the Grasshopper MicroEdition the FIPA Add-on is currently only available at the server-based agencies. However, it is planned to adopt the most recent FIPA specifications adressing mobile endsystems for the upcoming MicroEdition bringing FIPA directly into the PDAs.

Take a look at the IKV website (www.ikv.de) for more information about Grasshopper and its evolution towards a more comprehensive mobile portal framework called enaGo.
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