AgentLink II:

Continuation of a Network of Excellence for Agent-Based Computing

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Year Two Report

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Contents

1. SUMMARY

In August 2000, the European Commission began funding **AgentLink II**: *Continuation of a Network of Excellence for Agent-based Computing*, which followed on from the earlier **AgentLink** project from 1998 until 2000. (For convenience, we will sometimes refer to AgentLink II as AgentLink, but will always distinguish the first project as AgentLink I.) Agent technology is an important new area of information technology concerned with the construction of computer systems composed of one or more semi-autonomous computer systems known as agents. AgentLink II was funded for 36 months. This report summarises the activities of AgentLink II in its second year of activity. The key successes of AgentLink II in this second year may be summarised as follows.

- In terms of membership, AgentLink II enumerated 83 members in the first three months (at startup), largely comprising members of AgentLink I. At the end of the first year, membership stood at 131. In the second year, new membership applications have slowed, but the network continues to grow, amounting to 160 full members currently, with a growing number of "associate" members from both Europe and elsewhere.

- AgentLink II initially established five "Special Interest Groups", continuing activity from AgentLink I, which focus the activities of the network on strategically important sub-fields of agent technology. In the second year, a sixth inter-network SIG was established, and a planned inter-network SIG on agents and logic with CoLogNET is about to be established, making seven in total.

    - SIG01: Agent-mediated electronic commerce
    - SIG02: Methodologies and software engineering for agent systems
    - SIG03: Intelligent information agents
    - SIG04: Agent-based social simulation
    - SIG05: Special Interest Group on Intelligent and mobile agents for telecommunications and the Internet
    - SIG06: Agents that learn, adapt and discover
    - SIG07: Agents and Logic

    These SIGs meet regularly to discuss key issues. They provide the core of AgentLink's meetings and public activities, and have provided appropriate technical input to generate the network's technological roadmap.

- In the second year, AgentLink organised its fourth major international summer school on agent technology, co-located with the First International Joint Conference on Autonomous Agents and Multi-Agent Systems. The summer school offered 17 courses on agent technology to over 150 delegates from across the world. AgentLink II financially supported a number of students to attend this event, but in addition, the vast majority of delegates paid for themselves to attend. Students came from as far afield as South Africa, Singapore, USA and Taiwan.

- AgentLink supported a number of high-profile international conferences and more focussed workshops.

- AgentLink continued its publication of AgentLink News, and continued to seek to improve design and impact redesigned to appeal to a wider audience, to improve engagement with the commercial and industrial sectors in particular. The magazine is distributed in hardcopy form to a distribution list that is continually being updated and

expanded, and at conferences and workshops, as well as being freely available in electronic form via the WWW.

- AgentLink continued its monthly email-based "update", to keep members (and others) informed of the progress and activities of the network.

- The AgentLink management committee to guide the activities of the network, continues to meet at regular intervals**.**

2. AIMS AND OBJECTIVES OF AGENTLINK

2.1 Background: What is Agent Technology?

Agent-based systems are one of the most vibrant and important areas of research and development to have emerged in information technology in the 1990s. Put at its simplest, an agent is a computer system that is capable of flexible autonomous action in dynamic, unpredictable, typically multi-agent domains. Many observers believe that agents represent the most important new paradigm for software development since object-orientation. The concept of an intelligent agent has found currency in a diverse range of sub-disciplines of information technology, including computer networks, software engineering, object-oriented programming, artificial intelligence, human-computer interaction, distributed and concurrent systems, mobile systems, telematics, computer-supported cooperative work, control systems, and electronic commerce.

Because of the horizontal nature of agent technology, it is likely that the successful European adoption of agent technology in these areas will have a profound, long-term impact both on the competitiveness and viability of European IT industries, and also on the way in which future computer systems will be conceptualised and implemented.

2.2 Aims of AgentLink

The aims of AgentLink are:

- to gain competitive advantage for European industry by promoting and raising awareness of agent systems technology;

- to facilitate improvement in the quality, profile, and industrial relevance of European research in the area of agent-based computer systems;

- to promote excellence of teaching and training in the area of agent-based systems;

- to provide a widely known, high-quality European forum in which current issues, problems, and solutions in the research and development of agent-based computer systems may be debated, discussed, and resolved.

In order to achieve these goals, AgentLink II was formed to:

- actively promote awareness of agent research and development activities within European industry by means of an industrial awareness programme, drawing attention to the potential advantages of agent-based solutions and describing the scope of agent-systems technology;

- encourage technology transfer from academia to industry, by supporting industrial-academic meetings and pump-priming technology transfer collaborations, particularly with respect to the IST programme;

- promote the adoption of standards and the awareness of standardisation activities in the area of agent technology;

- provide support for innovative, high-quality conferences and workshops related to agent systems research, technology, and applications;

- create a pan-European infrastructure for teaching and training in the area of agent-based systems, disseminating curricula, reading lists, courses, and teaching materials;

- establish and maintain databases that map agent-based systems research and development skills to researchers and practitioners across Europe;

- establish high-quality channels of communication on research, technology, and application aspects of agent-based systems, including a dedicated World-Wide Web (WWW) site, email list, and printed newsletter.

3. ORGANISATION, MANAGEMENT AND MEMBERSHIP

3.1 The Organisation of AgentLink

The activities of AgentLink are organised into six workpackages, with each workpackage having a coordinator (or several coordinators for WP4: SIGs) to oversee activities.

- WP1 — Industrial action: focussing primarily on the transfer of agent technology from academia to industry, the transfer of user requirements from industry to academia, and promoting best practice in agent systems development. Coordinator: Jörg Müller, Siemens AG, Germany.

- WP2 — Research coordination: focussing primarily on the promotion of excellence in European agent research, and establishing new research communities in promising, valuable areas of research. Coordinator: Yves Demazeau, LIFIA/IMAG, France (to 31st May 2002); Monique Calisti, Whitestein Technologies, Switzerland (from 1st June 2002).

- WP3 — Education and training: focussing on building agent technology development and research skills in students and researchers, and providing an infrastructure for teaching and research in agent-based systems. Coordinator: Wiebe van der Hoek, Universiteit Amsterdam, The Netherlands.

- WP4 — Special Interest Groups: focussing on the development of communities around areas of strategic importance and providing input to the management committee from the SIG members, as well as developing the technological roadmap. Each SIG has its own coordinator.

- WP5 — information infrastructure: focussing primarily on the creation of a management and communication infrastructure through which the work of AgentLink can efficiently be carried out. Coordinator: Michael Luck, University of Southampton, UK.

In order to carry out the work of the workpackage, each workpackage coordinator convened a "work package committee".

3.2 AgentLink Management Structure

In order to manage AgentLink, a management/steering committee was established, made up of internationally recognised researchers and leading industrialists. This management committee meets at regular intervals to provide strategic guidance to the network's decision-making process. The management committee is made up as follows:

- The coordinators of the network

- The coordinators of each workpackage

- The coordinators of each special interest group (SIG)
- The members of each workpackage committee

This means that the management committee has a membership of 10-15 in total. The management committee met twice in the second year of the project:

- 5 December 2001- Amsterdam, The Netherlands
- 17 July 2002 – Bologna, Italy

Minutes were taken of each meeting and are attached as Appendix A of this document.

3.3 Membership

The desire to create an open network was always an important goal of AgentLink I, and AgentLink II has continued in attracting an extensive and broad membership. In the second year, AgentLink has increased in size by over 20%, from the 131 after 12 months, to 160. The immense interest in membership of AgentLink is one of the most powerful indicators that AgentLink is regarded as an important development by the agent R&D community. AgentLink has advertised its activities through various mailing lists and conferences, and any institution that satisfies the European Commission's rules for membership can apply for membership. Applicants must make a case for why they should be members of such a network, and in particular, academic nodes must demonstrate excellence in the area of agent technology. Applications are reviewed by the management committee to ensure quality control. Appendix B provides a complete list of current members.

AgentLink II is now two years old, and in the last year, the network has grown from 131 members to 160. The reach of AgentLink is shown in the following analysis of network members. The results provide limited information, but they do at least give an indication of who is doing agent R&D, and where this is happening.

The most obvious analysis we can do is to look at number of members of AgentLink by country – see Figure 1. The UK, and then Germany, France, Spain and Italy continue to have the strongest showing; the UK figure is particularly high. Perhaps the most encouraging single observation we can make is that Europe is now well covered by AgentLink – we have representation and activity throughout the region, including newly associated states such as the Czech Republic, Hungary, Poland, Romania, and Slovenia, as well as Russia. Perhaps more enlightening is to look at the number of AgentLink nodes per million of population.

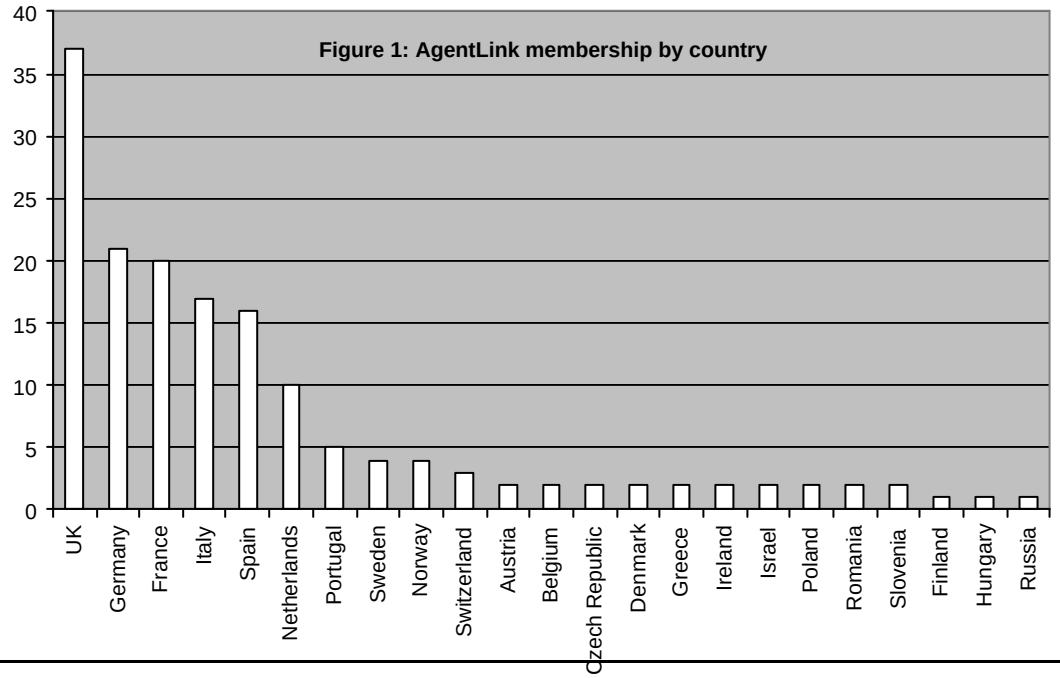
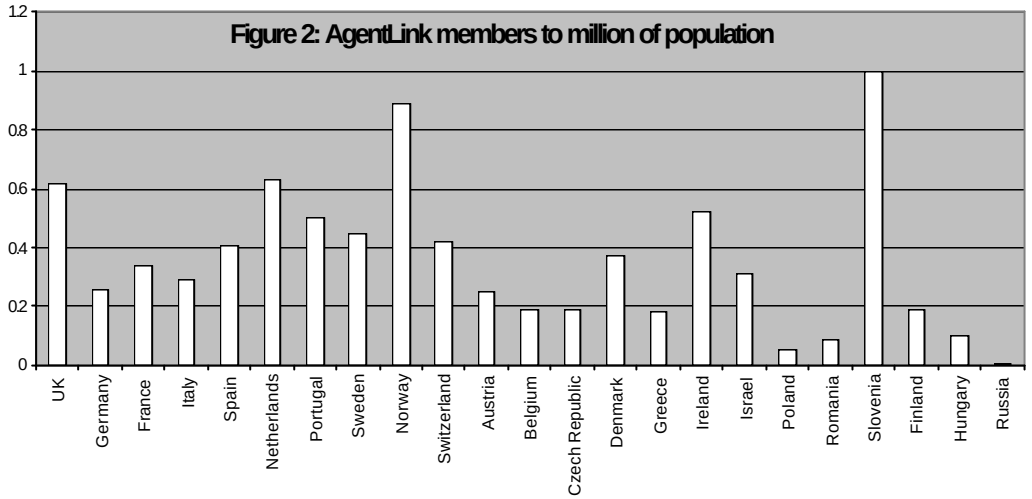


Figure 2 shows these values. Belgium, the Czech Republic, Poland, Romania, Finland, Greece and Hungary are all relatively weaker, while the UK, The Netherlands, Norway and Slovenia are all particularly strong. The deviations are not great, however; most countries seem to have a representation approximately on par with their population size, and newly associated states are coming into the field.



We also examined the membership of AgentLink by organisation type (university, industry, research institute, or public administration). The results are shown in Figure 3. In the second year, AgentLink university membership decreased from 67% to 61%. Industrial nodes have increased from 21% to 29%, and research institutes have stayed stable at around 11%. The clear trend here is in the dramatic improvement in representation of industrial nodes which have risen by 64%, while the universities continue to rise at a much slower rate (10%). In aiming to target industrial nodes, we need to continue to improve on these figures, with sustained efforts directed at the relevant communities.

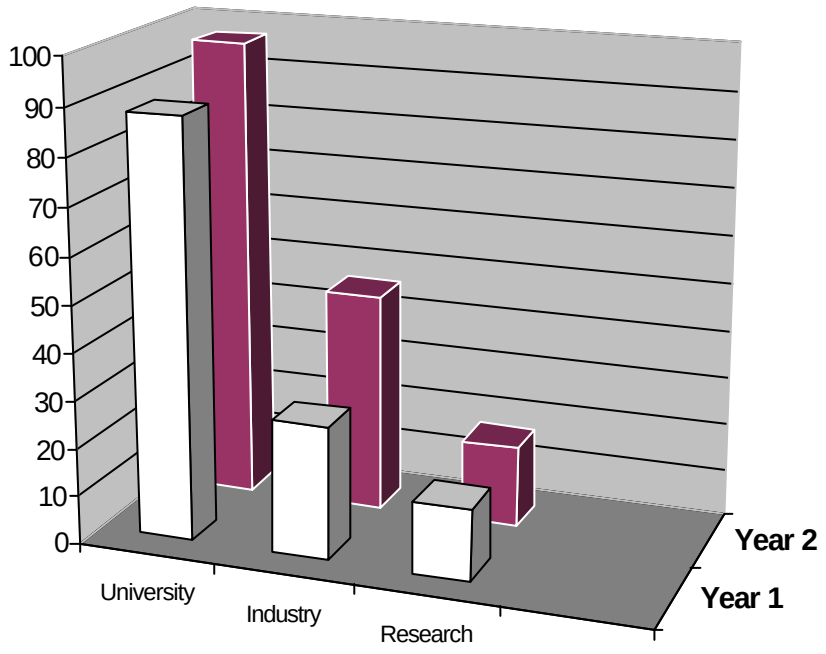
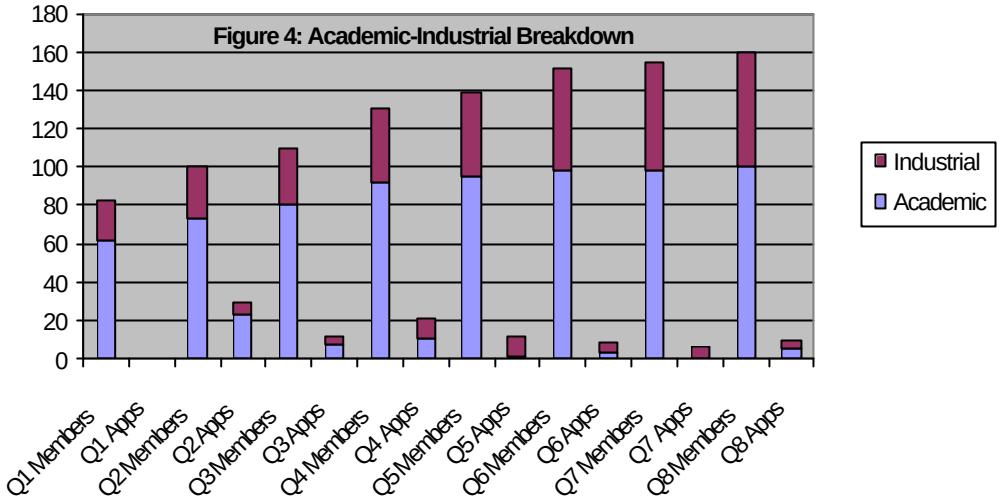


Figure 3: AgentLink membership by organisation type



The improvement in representation of industrial organizations can be traced to efforts to redevelop the AgentLink website and redesign the newsletter, as well as special events aimed at reaching an industrial and commercial audience. In particular, the Agent Technology Conference held in London in January 2002 was a very successful awareness raising event that generated a large amount of publicity and reaction from information technology companies. We aim to continue these efforts and improve on them in the final year of AgentLink II, trying to reach yet more commercial organizations and individuals. Indications from the breakdown of trends of academic and industrial membership and applications by quarter in Figure 4 show that the balance has clearly shifted, and that our efforts have borne fruit. Although we continue to improve, there is still more to be done in ensuring that the community at large really do understand how AgentLink can serve them.

4.COMMUNICATION AND INFRASTRUCTURE ACTIVITIES

4.1 The AgentLink WWW Site

It goes without saying that the World-Wide Web (WWW) forms a key component of the information infrastructure of a European-wide network of excellence. To this end, the Internet domain name AgentLink.org, which was registered by AgentLink I in May 1998, was transferred to AgentLink II, and a seamless transition effected between WWW servers. The information provided on the WWW site has continued to increase in the second year of AgentLink II, and now has substantially improved and enlarged repositories for agent software, publications, and member information that are becoming increasingly populated. The WWW server provides:

- information on all AgentLink activities;
- all publicly available AgentLink documents (including the newsletter);
- resources for the community:
    - an improved people finder;
    - a complete, up to date list of agent-related events;
    - a curricula database for agent courses;
    - a publications repository;
    - an enhanced agent projects database;
    - an agent software database;

- an *educational* software and demonstration database;
- a members map and individual member research profiles;
- Agent Standards;
- an Agent Jobfinder;
- IST Calls for proposals;
- an Inter-Network page;
- a Sixth Framework Programme information page

- information on how to apply for membership; and
- administrative information (e.g., how to claim back expenses for AgentLink events).

The website continues to undergo periodic redesigns, to improve usability, to enhance the attractiveness, and to enable advanced searching and indexing. Site statistics continue to show an overall increase in traffic to the site, which is increasingly being seen (and promoted) as '***The*** Agent Portal". The improved information resources now enable the site to be a major source of information for surveys of European agent activity, and it has been used to seed several such undertakings. For example, new database areas such as 'agent software' both commercial and educational are in the top ten ports of entry.

Web server statistics are shown in Figure 4, and illustrate visits each month. Note that the minor blips in the fifth quarter and the eighth quarter correspond to lack of data (due to technical server problems) for some days during those periods. *Visits* are not subject to change due to design modifications as are other measures, and clearly show a sustained monthly increase in traffic.

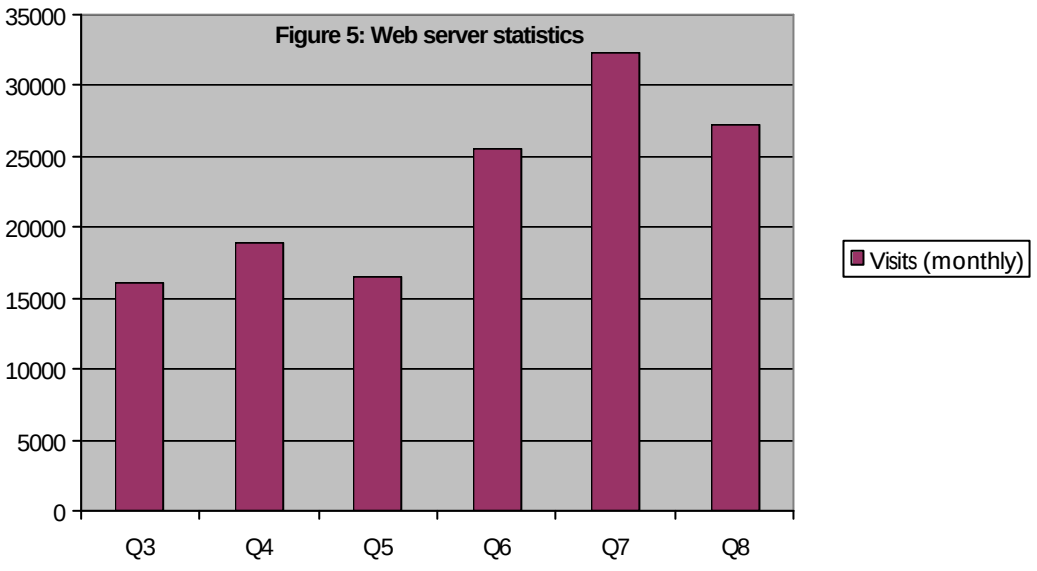


Figure 5: Web server statistics

4.2 The AgentLink Update Mailing List

The AgentLink WWW site provides a useful but essentially passive mechanism for keeping members up to date with AgentLink activities. In order to provide a more "pro-active" communications mechanism, a regular (monthly) email list was established. This email list is publicly available (anyone can subscribe, not just members), and currently has approximately

600 subscribers. In order to ensure a high signal to noise ratio, emails are sent in a "digest" form, with a number of short items in each monthly mail.

4.3 The Newsletter

The AgentLink newsletter was the first agent-related magazine. The newsletter aims to combine features on agent technology of general interest (informal summaries of important research results, book reviews, conference and workshop reports etc) together with news about the network and its activities. The newsletter is edited by Paul Davidsson, and designed and typeset by the AgentLink web and publications coordinator, Elizabeth Coulter-Smith. In the second year of the project, three issues of the newsletter were printed. The contents of these issues may be found in Appendix C of this document.

The aim of the newsletter is to engage with the broader IT community, who we see as its primary "market", as well as being of interest to academics. The newsletter continues to be improved in both content and appearance to give it a much punchier style, and to reach a wider audience. In particular, two issues in the second year have featured articles resulting from the Agent Technology Conference aimed at a commercial audience, the most recent including interviews with industry experts.

Copies of the newsletter are distributed in a variety of ways. Hard copies are sent to a distribution list that is approximately 350 strong and growing, across Europe (including Central and Eastern Europe) and the rest of the world. They are also distributed at academic and industrial conferences, as a means of disseminating reports on agent-related activity, and of soliciting membership enquiries. Electronic copies of the newsletter are also available from the AgentLink website. In the second year of AgentLink II, around 15000 copies of different newsletters have been distributed, including around 3500 printed copies.

5. MEETINGS AND WORKSHOPS

In its second year, AgentLink II supported several significant workshops and conferences:

CIA 2001, September 2001, Bologna, Italy

> The focus of the Fifth International Workshop on Cooperative Information Agents was information agent technology, which is one of the key technologies for the Internet and World Wide Web. Development of information agents requires expertise from different research disciplines such as Artificial Intelligence (AI), advanced databases and knowledge base systems, distributed information systems, adaptive information retrieval, and Human Computer Interaction (HCI), all of which were brought together in this workshop. AgentLink supported the event with 3000 Euros for 5 students.

CEEMAS'01, September 2001, Krakow, Poland

> The 2nd International Workshop of Central and East Europe on Multi-Agent Systems was the main forum for presentation of research results and discussion in the field of agent-based computing in Eastern Europe, and the conference aimed to consolidate and build the community across the different regions. AgentLink supported the event with 4000 Euros for an invited speaker (Nick Jennings), researcher travel support for 3 researchers, and organization support.

UKMAS'01, December 2001, Oxford, UK

> The Fourth Workshop of the UK Special Interest Group on Multi-Agent Systems provided an informal setting for discussion of research and application issues in the field, and extended beyond national boundaries. AgentLink supported the event with 1000 Euros to cover the costs of an invited speaker.

AAMAS-II, April 2002, London, UK

The goal of the AAMAS symposium on learning agents was to increase awareness and interest in adaptive agent research, encourage collaboration between machine learning experts and agent system experts, and give a representative overview of current research in the area of adaptive agents. The symposium served as an inclusive forum for the discussion on ongoing or completed work in both theoretical and practical issues. AgentLink supported the event with about 800 Euros for an invited speaker.

DEON'02, June 2002, London, UK

The biennial DEON workshops promote research and cooperation in a rapidly expanding interdisciplinary area, linking the formal-logical study of normative concepts and normative systems with computer science, artificial intelligence, organisation theory and law. In addition, there is currently a growing interest in this field from researchers in multi-agent systems and autonomous agents. AgentLink supported the event with 600 Euros for an invited speaker

AAMAS'02, July 2002, Bologna, Italy

The First International Joint Conference on Autonomous Agents and Multi-Agent Systems was the largest such event, and a combination of the three most significant agent conferences. AgentLink provided student travel grants to the total of about 4000 Euros for 7 students.

6. SPECIAL INTEREST GROUPS (SIGS)

One of the main activities of AgentLink is the organisation of a number of Special Interest Groups (SIGs). These SIGs take the form of a series of meetings of interested parties, which AgentLink provides financial support for (room bookings and travel), as well as administrative support. SIGs are intended:

- to facilitate the development of new consortia and partnerships;
- to facilitate technology transfer, by putting technology consumers in touch with technology providers;
- to articulate a long-term vision of where the sub-field is going, identify key technology gaps in that sub-field, and highlight possible routes of attach for these technology gaps;
- to develop the technological roadmap for AgentLink.

Six SIGs have been established as in AgentLink II, and a seventh is being initiated.

- SIG01: Agent-mediated electronic commerce
- SIG02: Methodologies and software engineering for agent systems
- SIG03: Intelligent information agents
- SIG04: Agent-based social simulation
- SIG05: Special Interest Group on Intelligent and Mobile Agents in Telecommunications and the Internet
- SIG06: Agents that learn, adapt and discover
- SIG07: Agents and logic

These SIGs, which were established by a process of reviewed applications, meet to discuss key issues.

SIG01: Agent-mediated electronic commerce

The Internet is spawning many new markets and Electronic Commerce is changing many market conventions. Old commercial practices are being adapted to the new conditions of immediacy brought forth by the global networks, and new products, services, as well as new practices, are beginning to appear. Agent-based technologies are crucial for these developments.

However many theoretical, technological, sociological and legal aspects will need to be addressed before such opportunities become a significant reality. This Special Interest Group serves as a platform to promote the interchange of ideas among specialists to stimulate and facilitate a significant European contribution to the field. This SIG aims to serve as a platform to permit the dialogue between academic partners and practitioners from industry. It will help in promoting the generation of strong consortia that participate in the programmes of the European Commission by focusing on those areas of Electronic Commerce that involve the development and use of agents and agent-mediated interactions including:

- Agent design for electronic auctions and electronic institutions,
- Electronic Market Places as agent societies,
- Negotiation strategies for agents,
- Agent-mediated retailing,
- Coalition formation,
- Trusted third parties,
- Agent standards,
- Agent-mediated interaction with public administrations.

Expected Results

The objective of this SIG is to establish a channel of communication between the researchers and developers interested in the area of agent-mediated electronic commerce in Europe. The channel of communication is twofold: physical and virtual.

The physical channel consists of 1 or 2 meetings per year, partly funded by AgentLink, in which a basic agenda is agreed upon and followed by all participants. Of special interest in these meetings will be the presentation of new products and the presentation of successful applications of agent-mediated electronic institutions, but theoretical contributions as well as the examination of legal and business practices should also be a constitutive part of the agenda.

The virtual channel is through web pages and mailing lists to facilitate the exchange of ideas and the collaboration among AgentLink members.

SIG01: Third meeting, Amsterdam, 4-6 December 2001

The SIG meeting was quite well attended with more than 30 participants including 11 from industry. We held a day and a half meeting organised around three topics: the relation between OntoWeb and Agent-mediated Electronic commerce, the industrial activities around AMEC and a group of research and development activity reports from members. Let us comment on each one of the activities.

OntoWeb and AMEC

Virginia Dignum introduced a Knowledge Management system being developed at Achmea, where agents are used as participants in a knowledge exchange market. The aims of the market is the efficient exchange of knowledge and information in a way that vindicates the interests of the users (both in the role of knowledge owner as well as knowledge seeker). Her talk ended with some questions to both the AMEC as the Semantic Web communities concerning the representation of knowledge pointers (description of knowledge sources) and the match of 'fuzzy' products that can be ambiguously represented such as knowledge sources.

Two people from the Free University of Amsterdam, Frank van Harmelen and Dieter Fensel, gave an overview of the developments in the area of the Semantic Web. They gave an introduction to the use of XML to mark-up Web pages and also indicated the limitations to the use of “semantic” mark-up. New developments to describe more semantic elements of unstructured information are the languages DAML and OIL, both of which contain more expressive power than XML and contain some logical operators that can facilitate searching and matching of items. One bottleneck is the annotation of all the web pages that already exist. In many cases, the automatic annotation of these pages does not give enough extra information to facilitate matching beyond the keyword matching that already exists.

The perspective taken at the University of Edinburgh on the Semantic Web was represented by Gunnar AAstrand Grimnes, who presented the work done in exploring the impact of semantic mark-up on machine learning techniques for personalisation. The experiments explored different ways of exploiting the structure and semantics of markup for outperforming standard statistical text analysis when categorising documents.

AMEC and Industry

Stuart Campbell, CTO of TIE gave a vision of ebXML to create a single global market, where enterprises of any size and in any geographical location can meet and conduct business with each other through the exchange of XML based messages. These requirements have been formalised as a technical architecture within TIE. EbXML is considered by his company as the answer to the Global Electronic Commerce challenges. EbXML will open electronic commerce to small and medium sized businesses allowing them to have the same access to global networks as big companies. One of the benefits of using ebXML is that the procedures followed by the participants in a transaction are themselves described in XML. It would be nice for AMEC if the agents could use these XML descriptions to determine their interactions. This would mean that agent systems could interface with other systems using ebXML.

The current developments within British Telecom on a number of tools and approaches to Agent Mediated Electronic Commerce were presented by Simon Thompson. His presentation focused on the DOME E-catalogue integration system which, is based around a description logic powered ontology server. In most applications the ontology used is still very simple. It is expected that for any real applications outside the boundary of a company more complex mechanisms will be needed. He also explained several applications of the Zeus agent toolkit, including agent-enhanced workflow.

Menno Jonkers from the company Tryllian argued on the relevance of (mobile) agent technology to the increasingly networked world. His point was that commercial success requires agent technology to prove added business value and to meet industry requirements like reliability, scalability, security and seamless integration with existing technologies and methodologies. In his presentation, he explained Tryllian's cumulated experience in the several years it has dedicated to commercialising mobile agent technology.

Activity reports

Ana García Serrano presented an advice-giving system for E-commerce being developed at the Universidad Politécnica de Madrid in the context of an EU-funded project (ADVICE IST 1999-11305). She made special mention on the agent-based design regarding (a) the inter-agent communication language, (b) the ontology for the semantic contents and (c) the

knowledge engineering techniques used to support a multimodal dialogue-based interaction with the user.

The activities of the agents@city agents group at City University were presented by Michael Schroeder and Eduardo Alonso. Their presentation focused on two main research topics, namely, "Agents and Learning" (mainly in the area of Inductive Logic Programming) and "ICE: Information Integration with Conflict Resolution and Exploration by Visualisation".

Juan Manuel Serrano from the Universidad Rey Juan Carlos I analysed the problem of specifying the communicative behaviour of a stock advisor. The proposed approach fosters reusability by abstracting away from the stock advisor more generic roles ("advisor" and "explainer"), which could be applicable in other electronic commerce Settings.

Toni Reyes from the company iSOCO presented iBundler as a decision support tool for highly constrained e-sourcing scenarios. As a combinatorial reverse auction solver, it extends current models by accommodating both operational constraints and multi-attribute, multi-item constraints. IBundler offers an XML language for expressing offers, constraints, and requirements and thus may be integrated within e-sourcing solutions. The XML specification is parsed into a MIP formulation and solved using available MIP solvers.

We also had the participation of Stanislaw Ambroszkiewicz, a researcher from the Polish Academy of Sciences, who talked about a new simple minimum language called Entish as a proposal for automatic web service integration. The integration is done by autonomous software agents. The new language is fully declarative, although it corresponds functionally to WSFL, XLANG, XAML, and DAML-S.

Finally, Carles Sierra explained a recent model on reputation developed at the IIIA-CSIC. The model takes a sociological perspective to integrate different sources of information to assess the reputation of an agent in the context of electronic commerce applications. Three dimensions of reputation were identified: individual (as the result of direct interactions), social (as the information gathered from the social context of the agent) and ontological (putting into relation the different concepts over which reputation values are defined).

Beyond Amsterdam

The main conclusions of the meeting in Amsterdam were that the techniques, languages and tools developed in the context of the semantic web can be very useful to describe ontologies in virtual markets. In particular, the use of XML, DAML, OIL, etc., may prove to be useful. However, it was noted that the usefulness will depend to a

large extent on how (accurately) the semantics are described. OntoWeb seems to be an adequate forum for this. Participants in the meeting argued that agent companies still have much trouble selling agent technology. The advantages can only be shown in large systems, while these companies can in most cases only show to their customers prototypes, which are usually small

SIG02: Methodologies and software engineering for agent systems (MSEAS)

The basic principles and lessons of software, knowledge, and distributed systems engineering, as well as the same scientific rigour pervading these research areas, have to be applied to the development and deployment of multi-agent systems.

At present, the majority of existing agent applications are developed in an ad hoc fashion: little or no rigorous design methodology, limited specification of the requirements, ad-hoc design of agents and of multi-agent system as a whole, and little attention to non-functional requirements such as mobility, scalability, performance issues, standards. This is indeed a limitation for the widespread appliance of any new software technology. And, of course, it can be a strong limitation for agent-based computing too.

Moreover, outside the agent community, there is still no widespread acceptance of agent-based computing as a new paradigm. Many people - both from academia and from industry - still think that agents are nothing but grown-up objects, re-newed with a nice, publication-appealing, name. Although the raising of some scepticism is intrinsic with the introduction of any new technology, we feel that this problem is actually exacerbated within the agent community by the lack of a clear and unambiguous terminology, of a clean set of abstractions, and, even more important, of a full understanding of the commonalties and differences between the agent paradigm and more traditional (i.e., object-based and component-based) paradigm for software development, and of the associated advantages and drawbacks.

Clarifying what makes agent-based approach to the development of complex software systems different from traditional component-based and object-based approaches, and developing a discipline of agent-oriented software development accordingly, are thus necessary goals to be achieved for making agents accepted outside the agent community.

Goals of the SIG

The Agentlink SIG on Methodologies and Software Engineering for Agent Systems (MSEAS) is meant to provide a European, multi-disciplinary forum for all researchers and practitioners who are interested in research and development of methodologies and software engineering for agent systems.

Any topic related to the engineering of agent systems and to the associated methodologies if of interests to the SIG. These include, among the others:

- identification of suitable abstractions and ontologies for agent systems;
- analysis, design, and testing techniques for agent systems;
- formal techniques for specification, design, and verification;
- methodologies for the development of agent systems;
- development tools and infrastructures;
- standardisation issues;
- non-functional requirements, e.g., performance, mobility, distribution, and reliability;
- analysis of relations with traditional software engineering approaches.

The SIG brings together a sub-community of AgentLink interested in the above topics, and, due to its intrinsic inter-disciplinarity, intends to promote strong interactions with all the other AgentLink SIGs. This can facilitate inter-SIG exchange of ideas and cooperation, as well as the development of co-ordinated research projects.

In addition, the SIG intends to put a strong emphasis on practical use in industry, by involving in its meetings researchers and practitioners from European industries. Last but not least, the SIG will try to maintain strict contacts with those consortia that are currently working in similar areas (e.g., OMG and FIPA), so as to promote cooperative standardisation actions.

It is expected that the SIG, during its activity, will be able to define a clear roadmap of both long-term and short-term research activities in the area, and it is hoped that the activities of the SIG will increase the European influence in the area.

SIG02: Second Meeting, Amsterdam, 4-6 December, 2001

Introduction

The interest of the European agent community in the themes of agent-based software engineering, testified by the success of the first meeting of the renewed MSEAS Agentlink SIG, was confirmed by the success of the second meeting. The meeting was held in

Amsterdam, December 5-6 2001, at the Vrije Universiteit, and was co-located with the meeting of other Agentlink SIGs and with the meeting of the OntoWeb Network of Excellence.

While the first meeting of the SIG was intended to be a sort of "start up", and required organizing it around a few invited talks of a broad nature – to help determine the specific interests of the participants – this second meeting was of a more working nature. The idea was to involve all participants in focused discussions on the future of agent-based computing and, consequently, on the role to be played by software engineering research. To this end, the meeting was organized into three half-day working sessions, each focused on a specific topic. Within each session, volunteer speakers gave short talks, aimed at briefly summarizing the current research of their groups and, mostly, at outlining the personal visions of the speaker on the future and possible impact of software engineering research. Between and at the end of the talks, ample time was devoted to discussion.

Specifically, the first session focused on agent-oriented software engineering methodologies, and it was organized by Federico Bergenti. The second session was devoted to the use of formal models in agent-based software engineering, and it has been organized by Giovanna di Marzo. The third session was co-organized with the C3 Working Group of the I2A SIG, coordinated by Paolo Petta, and focused on the relationship between software engineering research and research in the area of communication and coordination models.

The three sessions, on average, involved about 30 participants, a significant percentage (30%) of whom came from industry or from industrial research centres. For all the three sessions, very lively, and sometime very combative, discussions were spontaneously initiated by the participants (and moderated by the session organizers), and several key research points were identified. This is certainly the best evidence of the appropriateness of the AgentLink SIGs as fora for research discussions.

Session on Methodology

The SIG Working Group on Methodologies is meant as a forum for discussing the role of development methodologies in the realization of multi-agent systems. Methodologies are considered a cornerstone in the construction of real-world systems, and agent-oriented methodologies are necessary to lead multi-agent systems towards mainstream development. This session ideally continued the first session held in Prague and its focus was on highlighting the main concepts of agent-oriented software engineering to identify a common and accepted vocabulary. Such a vocabulary should ease the comparison of existing methodologies, and should provide a solid ground for defining new methodologies.

The first part of the session was devoted to introductory presentations. Federico Bergenti started the session by summarizing the principal outcomes of the Prague meeting and by remembering the aims of the series of sessions on Methodologies. Then, Paolo Marques (University of Coimbra, PT) provided an overview of the work on software engineering for mobile-agent systems. He introduced some concepts and ideas that are peculiar to the development of mobile-agent systems and showed his latest advances in this field. Finally, Gauthier Picard and Carole Bernon (University of Toulose III, FR) continued the critical analysis of the Adelfe methodology that started in Prague.

The second part of the session was primarily devoted to brainstorming and discussions on the underlying models that form the basis of well-known methodologies, e.g., Tropos, SOMA, and Gaia. Volunteer speakers presented such models in the attempt to draw a comparison between them. The result of this second part was a reasoned overview of the concepts that the discussed methodologies share. The session ended with attendees sharing the urge of finding an ontology for the basic concepts of agent-oriented software engineering and with representatives of some of the methodologies available in the literature committing to the identification of such an ontology for their own work.

Session on Formal Models

The scope of the session on Formal Models was to raise interest in formal techniques, by discussing the role of formal methods within development methodologies. The urge for a

session on these topics had been outlined since the first meeting, where a significant interest on formal models for specification and verification of agent systems was identified. The talks presented during this session showed how diverse specification languages are used for specifying agent concepts, and how formal models can be integrated into a development process.

Giovanna Di Marzo Serugendo introduced the session by remembering the fundamental goals of formal methods, which are to enhance quality, and ensure reliability in safety-critical and mission-critical systems. Gerd Wagner (Eindhoven University of Technology, NL) provided an overview of Agent-Object-Relationship (AOR) modeling, which extends UML by defining stereotypes for agents. AOR models enable to define agents both from an external view, for the analysis phase; and an internal view, for the design phase. Joris Hulstijn (Vrije Universiteit Amsterdam, NL) presented the work of his group on requirements engineering for knowledge-intensive compositional systems based on organization models. This work is driven by the fact that requirements can for a large part be dealt with by taking into account the components, their relations and their interactions. Mark d'Inverno (University of Westminster, London, UK) discussed the SMART Agent Framework. SMART provides formal definitions of concepts and terms related to agents, using the Z formal specification language, and enables subsequent development of increasingly more refined concepts. Finally, Paolo Giorgini (University of Trento, I) described the Tropos project, which proposes an agent-based software development methodology, adopting i* as a modeling framework. Actors, goals, and dependencies are identified during the analysis phase, while agents are identified during the design phase.

The session ended with a discussion on the need, the role, and the way to promote formal methods within agent-based software engineering. While almost all of the participants agreed on the need for formal methods to produce reliable and verifiable software, several participants were concerned with the difficulty of getting formal methods accepted from industry. A possible resolution of that conflict could be the use of formal languages for defining agent concepts, supported by common case studies for evaluating formal methods, and coupled with semi-formal methods for the use of non-skilled developers, a practice which is already common in mainstream software engineering.

Session on Coordination and Communication

The main goal of this joint session, co-organized with the “Communication, Collaboration, and Coordination” working group of the I2A SIG, was to investigate the impact of current trends in coordination models and languages on software engineering practices. The session was intended to ideally continue a similar successful joint session organized during the first meeting of the MSEAS SIG.

Rune Gustavsson (Blekinge Insitute of Technology, Sweden) started characterising the novel challenges and needs posed by the new type of net-centric applications. He stressed the need to re-assess the engineering views of systems and system methodologies and illustrated a possible solution in analogy to developments that occured in defence since the end of the cold war, according to which the currently predominant top-down approach in engineering ought to be replaced by a more comprehensive conceptualisation of the engineering task. This integrates a principled scientific analysis where empirical observation leads to the development of models capable of describing the domain in a consistent way allowing the characterisation of its properties. The talk of Sascha Ossowski concerned the role of context for the design of coordination mechanisms. First, it relates the design of an adequate context to the problem of engineering coordination mechanisms. Then, it outlines the mechanism of "structural cooperation" as an example of how individual, social and normative contexts influence behaviour at the macro and at the micro-level. Finally, some questions are put forward respecting how these ideas can be extended to more open environments. The talk of Enrico Blanzieri (IRST, Italy) introduced the concept of implicit culture as the relation between two groups of agents such that one group executes cultural actions with respect to the other. Enrico Blanzieri presented a result showing how this concept can be exploited in order to characterize a class of theories that hold true for a group. He concluded, pointing out the potential for application in agent-based software engineering.

The discussion following the talk was mainly focused on the fact that, despite the adoption of different terminology, most of the current research in coordination models are starting to adopt a bottom-up perspective and a sort of "context-centered" approach to interaction engineering. On the one hand, it is being recognized that the complexity of modern software systems and, thus, of agent-based systems, can no longer be addressed by adopting a top-down approach, in which the functionalities of the systems are achieved via decomposition in lower-level functionalities. Instead, a better approach is to engineer complex systems by starting from the low-level components, promoting coordination abstractions and driving the global behaviour of these components towards the achievement of the needed functionalities. On the other hand, it is being recognised that components and agents, for their interactions to be effectively engineered, cannot live in a "vacuum" space, but should be immersed in a context – whether an active environment, a cultural setting, or a world with specific physical laws – able to influence their interactions and, thus, the global behaviour of the system.

OUTCOMES AND PLANNED Activity

Overall, the topical discussions that took place during each of the three sessions made several general research issues emerge, as key points to be taken into account in agent-based software engineering research. In particular:

- *Standardisation*: it was agreed by all participants that agent-oriented methodologies must take seriously into account the existing standards in object-oriented software engineering, like UML. At the same time, specific agent-oriented features must be integrated into existing standards that, as they are at present, are still unsuitable for agent-oriented software development. For instance, there is a need for more efforts in the AUML area, to make it a truly usable tool matching the basic abstractions of agent-based computing.

- *Bottom-up Approach*: it appears that the only suitable way to model and engineer complex software systems, and specifically multi-agent systems, is via the adoption of a bottom-up approach. Instead of trying to achieve the needed functionalities in terms of decomposition of higher-level abstract components, the needed behaviour for a complex multi-agent systems should be engineered so as to emerge from interactions among low-level agents.

- *Environment*: Multi-agent systems will be immersed in highly-dynamic environments. Whatever the specific type of environment (e.g., physical or computational) and the specific abstractions used to model it (e.g., social, biological, or physical) the role and impact of the environment and of its dynamics in engineering the global behaviour of a multi-agent system must be seriously taken into account.

- *Inter-disciplinarity*: For the above goals to be achieved, the role of formal models will be of primary importance, and their coupling with semi-formal models can provide for a wider acceptance and use. Still, other than formalisms, it appears that the lessons of disciplines like biology, sociology, and thermodynamics may play a central role towards a scientifically-oriented approach to agent-based software engineering.

In addition to scientific conclusions, a number of correlated activities of the SIG, extending beyond the official meetings, have been planned, some of which have already started:

- The urge for concrete case studies with which to test the effectiveness of research proposals will be addressed by collecting a set of representative case studies in agent-oriented software development. Paolo Giorgini volunteered to collect such case studies from SIG members. In addition, he offered to promote a special session, devoted to discussing the impact of different software engineering methodologies in the case studies, during the "Agent-oriented Information Systems" workshop, co-located with AAMAS 2002. This special session has been already organized.

- Several of the researchers recognized that the problem of building a complex software system is more and more approaching the problem of building in a bottom-up way a complex society of individuals. For this reason, it has been planned to try to

organize, for the next meeting, a common session with the AgentLink SIG on social simulation, to understand how and to what extent research in the area of social simulation can be exploited by software engineers.

- To facilitate the activity of the SIG, we all agreed that it could be useful to set up an open-subscription mailing list, focused on the topics of methodologies and software engineering of agent systems. This list has already been opened by making use of Yahoo™ facilities. Named "Agent-Based Software Engineering (ABSE), it can be accessed at http://www.yahoogroups.com/groups/abse. Messages to the list can be addressed at abse@yahoogroups.com.

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SIG03: Intelligent information agents (I2A)

The research and application area of intelligent information agents is of rapidly increasing importance. Information agents are computational software systems that have access to multiple, heterogeneous and geographically distributed information sources as in the Internet or corporate Intranets. The main task of information agents is to perform active searches for relevant information in non-local domains on behalf of their users or other agents. This includes retrieving, analyzing, manipulating, and integrating information available from multiple autonomous information sources.

Intelligent information agents have to face up to the increasing complexity of modern information environments, ranging from relatively simple in-house information systems, through large-scale multidatabase systems, to the visionary Infosphere ('Cyberspace') in the Internet. Intelligent information agents may have different characteristics dependent on the concrete application domain; they may behave adaptive, self-interested rational, cooperative, or are even mobile. Thus, research on, and development of, fielded systems of information agents in the Internet is a challenging task, and is crucial for the development of next generation open information environments.

This Special Interest Group on Intelligent Information Agents will serve as a platform to promote the interchange of ideas among interested people, research groups, and projects to stimulate and facilitate a significant European contribution to the field. This concerns, in particular, researchers from the following areas:

- Database and Information Systems
- Information Retrieval
- Artificial Intelligence
- CSCW (Computer Supported Collaborative Work)

- HCI (Human Computer Interaction), HAI (Human Agent Interaction)

The SIG strongly encourages and supports activities and collaborations among academic and industrial partners. This includes, e.g., the dissemination of relevant information, regular SIG meetings, and support of related conferences.

SIG03: Third Meeting, Amsterdam, 4-6 December, 2001

The seventh meeting of the I2A SIG was held on December 5, 2001, at the Free University of Amsterdam, The Netherlands. It was co-located with the meeting of the EU-IST funded thematic network OntoWeb. The purpose of the I2A SIG meeting was three-fold.

1. Update of latest results of research and development of SIG members in the European I2A domain.

2. Synchronisation between activities of SIG members and agreement on new roadmaps of SIG's working groups.

3. Foster relationships to, and proceed with, joint work in collaboration with our partners in academia, industry and standardisation organisations.

All working groups (C3, ADK, and AIA) of the SIG attended the meeting with an average of 15 participants.

Presentations

The meeting started off with invited plenary talks given by members of each of the working groups. Ramon Sanguesa (UPC, Spain) gave insights on project-related work on the application of reputation methods in a multi-agent system for human management support. Simon Thompson (BT, UK) provided a survey of agent technologies deployed in the domain of workflow management. In his talk, he pointed out in particular the difficulties of integrating new technology into existing procedures and the danger of mismatch between specific over-sophistication of the technology provided (e.g. in terms of representational capabilities) and the actual needs of the real problem at hand. Using the history of technologies developed by BT, spanning from ADEPT in the mid-1990s to the current AgentCities initiative, he illustrated progress in tackling these extant issues. Michael Schroeder (City Uni, London, UK) traced the historical roots of Grid Computing, emphasising how, in his view, Grid Computing is "parallel distributed computing" under modern guise. He pointed out where, and which issues also discussed within the agent community surface in this context. The presentation of the underlying technologies was illustrated with some current biomedical application scenarios. Marie-Christine Rousset (Uni Paris-Sud, France) presented ongoing work on the information system Xyleme, in particular its promising, formal tree-based approach to intelligent information integration. Gerd Beuster (Uni Koblenz-Landau, Germany) gave an inspiring talk on the status of the MIA project on information agents for mobile, location-aware computing (http://www.uni-koblenz.de/~bthomas/MIA_HTML/).

The afternoon consisted of a sequence of plenary talks and discussions on each of the working group's activities and current joint research projects. In particular, in the context of the ADK working group, Davide Gazotti (Gruppo Formula Spa, Italy) outlined the ongoing and future work of the EU-funded WINK project on Web-linked integration of networked-based knowledge. This project is led by the University of Modena, Italy, as part of the recently started EUTIST-AMI cluster. The objective of the WINK project is to validate a combination of two promising software platforms which will perform automated, efficient data collection and project management in complex and smart organisations made up of physically and organisationally remote partners participating in large-scale projects. WINK will support project networks by integrating, adapting and implementing the technologies developed in the distinct WHALES and MIKS projects, focused respectively on project network management and intelligent agent middleware. The WINK project will allow the installation and testing of software in a real business setting, provided by the Italian space industry leader, Alenia Spazio. This will focus on procurement, co-design, and will apply a factual cost benefit

analysis on the system experiment. Then, WINK will be one step from becoming a commercial product.

In the C3 working group session, Andrea Omicini (University of Bologna, Italy) illustrated the multitude of possible perspectives on the relationship between the notions of context(s) as defined and treated and the domain of C3. A range of ensuing topics and issues was presented, culminating in the provocative question of whether context-oriented programming could be seen to be the agent-oriented counterpart to aspect oriented programming. It was proposed that the *(agent) context* can serve as a viable abstraction for an agent environment, and can lead to a start on discussing the main issues relating context to agent interaction, communication and coordination, such as situatedness, openness, security, topology, economy, embodiment and prescriptiveness.

Enrico Blanzieri (ITC-IRST, Italy) illustrated how communication, coordination and control can benefit from taking a multicontext perspective and using multi-context formalisms. He explained how multicontexts allow the modelling of the relativism of local/individual views, thereby picking up and continuing the thread followed by Andrea Omicini and Sascha Ossowski in their presentation on Objective vs. Subjective Coordination given at the previous session of the C3 WG at the AgentLink meeting in Prague in July 2001. Blanzieri noted how this approach is only partially new and presented a brief schema of the pros and cons. According to this approach, actions serve as primitives in the definition of communication as shared plans; coordination relates to sharing of semantics (including the special case of imitation as a basic means to attempt to import semantics into the individual point of view); and the notion of control relates to the capability of prescribing semantics, with "implicit culture" as a particular case where the coverage of the prescription is not (needs not) be located with any particular agent.

In the last session of this SIG meeting, Maarten van Someren (Uni Amsterdam, Netherlands) sketched ideas and approaches to solve selected problems in the domain of multi-agent version space learning by relevance sharing. Rushed Kanawati (LIPN Uni Paris 13, France) provided an interesting case-based reasoning approach for automatic Web site personalisation, which has been developed in the context of the system COBRA.

Finally, Matthias Klusch (DFKI) gave a brief summary on recent activities in the European research community that are relevant to the SIG, including the EU-funded projects Agentcities.RTD and Agentcities.NET, and the EUTIST-AMI cluster.

Organisational Issues and Next Actions

After some discussion it was agreed that the AIA working group should be newly formed and re-activated. The current group chair, Pete Edwards, will resign due to his assignment of co-ordinating the new inter-network SIG on adaptation and agents. This “spin-off” is already the second major contribution of the I2A SIG to the European scientific research community, which clearly underlines the significant impact of the activities of the SIG members.

The I2A SIG will also be promoted by a book project. The book “Intelligent Information Agents: An AgentLink Perspective” edited by Matthias Klusch (DFKI, Germany), Sonia Bergamaschi (University of Modena, Italy), Pete Edwards (University of Aberdeen, UK), and Paolo Petta (Austrian Reseach Institute for Artificial Intelligence) will be published by Springer Verlag in the LNCS State of the Art Survey series, probably in Fall 2002.

As mentioned above, there will be no funded SIG meetings in 2002. Thus we aim for individual working group meetings in co-location with highly frequented scientific events (conferences, workshops) on demand. Proposals to host such meetings are more than welcome! The same goes with any suggestion as to where to possibly co-locate some SIG or working group meetings. The date, venue, and topics of such meetings will then be announced immediately on the SIG’s activity web page (http://www.dfki.de/~klusch/i2aActiv.html) and via the SIG’s mailing list infoagents@gmd.de.

After more than three years, the SIG’s web pages hosted by DFKI, Germany, are currently under a complete redesign. The new SIG web pages are already relocated to, and will be

hosted by, the University of Modena, Italy. Availability of these pages is expected by the end of January.

For further information on the activities of the I2A SIG please contact the co-coordinators Matthias Klusch (klusch@dfki.de) and Sonia Bergamaschi (sonia.bergamaschi@unimo.it).

SIG04: Agent-based social simulation (ABSS)

Computer simulation has proved useful for modelling phenomena of traditionally social scientific interest, such as cooperation, coordination, organizational behaviour, social dynamics, group and coalition formation, and the evolution of conventions and norms. Multi-agent researchers soon came to realize how crucial these topics are within their field. In particular, the study of emergence of social phenomena such as organizational performance and optimisation, cultural norms, institutional forms has become a major direction of research in MAS. In turn, such social modelling rings into play a variety of normative concepts, such as conventions and obligations, and phenomena, such as commitment and responsibility, and draws attention to how these phenomena evolve among computational agents in interaction. These concerns have led social simulators to pay increasing attention to agent modelling. Dissatisfied with the model of the rational social actor, they have developed simulation models of evolutionary social phenomena incorporating representations of cognition derived other disciplines such as cognitive science and social psychology. However, the model of the agent used is essentially behavioural and frequently more rudimentary than those developed in some areas of AI.

The computational study of social organizations and institutions is a topic of growing interest in both the computer science and social science communities. In the formal/computational scientific communities, logical philosophy and social philosophy have a long tradition in studying institutions and obligations. Interest in such issues is rapidly growing. This is shown by several indicators, including (a) the number of workshops, etc.; (b) the diffusion of notions of obligation, convention, trust, commitment, reciprocity, right, permission, etc. in the research on intelligent agents; (c) the attention paid to norm-based phenomena in designing and implementing situated intelligent agents (consider the trade-off between robust performances and flexibility: formal and computational research on commitment essentially proceeds from the question of how to design intelligent, adaptive, flexible agents that exhibit robust performances; moreover, think of the research on conventions as solutions to problems of coordination among autonomously interacting agents).

Interestingly, the more the MAS researchers pay attention to evolutionary and dynamic organizations and institutions, the more they use computer simulation (for example, simulation-based studies on the evolution of conventions, commitment, altruism, in MAS, and the role of simulation in the study of organizations). Where the social sciences meet the physical and biological sciences as, for example, in the modelling of climate change, there is growing disenchantment with analytic equilibrium approaches to analysis of social and economic systems. Agent-based simulation methods are proving attractive to physical scientists seeking to take socio-economic factors into account in the analysis of such issues. Increasingly, we are seeing agent-based social simulation used to provide more realistic alternatives to analyses of the whole area of exchange with particular success in generating empirically more satisfactory models of financial markets.

Within the AgentLink framework, these various communities are given the opportunity to meet and discuss matters related to the theme proposed. The theme is transverse to several pure and applied research fields:

- electronic commerce, trading relationships
- intelligent information agents
- robotics
- organizational structure and change

- authorization
- delegation
- social and collective action
- commitment
- reciprocity and cooperation
- institutions, empowerment, and roles
- coordination and conventions
- autonomous social agents modelling

An issue exercising the social simulation community is that of emergence which has important implications for all of the above areas.

SIG04: Third Meeting, Amsterdam, 4-6 December, 2001

The meeting was divided into three sessions. The first session was dedicated to the working group on social policy and the second to the concept of *norms*. The meeting was concluded by a session on ABSS and business processes.

Session on Social Policy Analysis

The session was chaired by Nick Gotts from the Macaulay Land Use Research Institute in Aberdeen. The first half of the session consisted of four short presentations. First out were Anders Lundgren and Johan Esko from the Spatial Modelling Center (SMC) in Kiruna, Sweden. Anders described the database from Statistics Sweden used in the SMC's work. This includes "life trajectories" for all Swedish residents from 1985-1995, including information about residence, employment, marriage, etc. It is currently being extended to cover 1965-1999. Johan then described the "microsimulation engines" SVERIGE and EVSIM, and Anders returned to describe one application of EVSIM, a model of sports fishing in the Torne river, in which 5000-10000 fishers will be represented as agents. Finally, Johan discussed the generation of synthetic microdata, and the use of "smart agents" based on neural nets in microsimulation. The second speaker was Bengt Carlsson from Blekinge Institute of Technology, Sweden, who gave a very brief talk describing his thesis work on agent societies with similarities to natural ecosystems. This was followed by Jim Doran who briefly described the problem of integrated watershed management on the Fraser river, British Columbia, and suggested conceptualising environmental management scenarios as applying an intervention to a system composed of a MAS and an environment. He compared intervention to achieve co-operation in a human social system with initially conflicting stakeholders, and to achieve co-operation in an abstract MAS on a computer with initially conflicting agents; ABSS assumes that there are interaction strategies common to both. Finally, he proposed a research agenda aimed at discovering such strategies:

1. Formulate a suitable environment.
2. Generate a sample of MAS (say 100) connected to this environment.
3. Interpret the sample in both abstract and human terms.
4. Search the space of all possible interventions and find the most successful for MASs of each type.
5. Interpret the interventions found in both abstract and human/social terms.

The first half of the session was concluded by Scott Moss with a presentation entitled "What's so good about agents". Scott identified a key problem in both social and computer science as the extreme difficulty of finding models which are both verified (i.e. theoretically well-

grounded) and validated (i.e. empirically supported). ABSS models provide new scope for validation at both macro level (matching their output to the "statistical signatures" of real-world data) and micro level (assessing agents as descriptions of the behaviour and interactions of social agents in relation to the perceptions of particular stakeholders). Noting that different stakeholders will have different perceptions, Scott proposed that the micro-level of ABSS policy models should be validated by stakeholders, who should be involved in model design and development, and by independent domain experts. This leads to a research agenda very different from Jim Doran's, building models from empirical evidence and de-emphasising theory.

The second half of the session was given over to discussion. We initially split into two groups, one discussing: "Modelling conflict over resources and ways of achieving co-operation between agents with conflicting interests." This group concentrated on finding a modelling project or area, which could form a significant part of the future activities of the working group on social policy analysis. Toward the end of the period set aside, it was agreed that Jim Doran would make available, to all ABSS members interested, a document describing in detail pollution of a tributary of the Fraser river in British Columbia, and possible ways of ameliorating it. All ABSS SIG members interested could then work on the design of models illuminating aspects of the problem and possible solutions described, allowing comparisons of the range of approaches taken by different ABSS research groups, and leading in due course to one or more research papers detailing these comparisons.

The discussion of second group was wider-ranging but with a focus on the question of how to move ABSS models from the academic world into practical use by policy-makers and/or in participatory planning. One outcome was a list of common interests, which can be paraphrased as follows:

- Assessing the realism of assumptions used in ABSS work.
- Identifying the relevant industrial problems.
- The problem of formalisms failing to capture reality.
- The search for a shared terminology for ABSS.
- Reproducibility of ABSS systems.
- The possibility of creating a common modelling platform.
- Industrial-quality tools for large-scale simulations.

The second outcome was a proposal that those within the SIG with a particular interest in declarative modelling platforms for MAS should collaborate. This is an area in which Europe-based researchers have a marked lead over those based elsewhere, and it was felt this should be exploited. Such collaboration would involve users of SDML and DESIRE. It seems unlikely that a common platform will emerge, but identifying both common aspects and important differences would be very useful. More ambitiously, prospects for a common formalism (playing a role similar to UML in object-oriented programming) could be explored.

Session on Norms

Previous ABSS meetings resulted in repeated discussion on general concepts and displayed evidence of the lack of a shared terminology. One of the central concepts in social systems is norms, thus this was selected for the first thorough discussion of concepts. First out was Harko Verhagen from Stockholm University, who also chaired this session. He presented an overview of the use of the term norms (as well as systems resulting in norm compliance) in several scientific areas such as sociology, decision theory, legal theory, and multi-agent systems research. Some of these definitions and uses can be mapped onto each other but there is no shared general definition possible was his conclusion. After this, Leon van der Torre presented a short history of deontic logic and some of the formal systems developed in this area for reasoning about normative systems. He also mentioned the BOID system, which extends traditional BDI agents with Obligations. The final theory-oriented presentation was by

Bruce Edmonds. While discussing the difference between indicators and goals, he put norms in a central position by arguing that it is norms that enable agents to change their goals.

The applied part of the norms session was opened by David Hales. David has recently been working on simulation models using norms (in co-operation with the Conte/Castelfranchi group). In his view, although norms have an ontologically different position, they are to be treated internally in the system as beliefs. Finally, Andre Meyer updated us on the progress in the Media Shelf project (an extended version of the presentation can be found at

http://home.hccnet.nl/a.meyer/understandingemergenceinmedia/index.html). The current simulation model focuses on how a convergence between media present in an intelligent room and its users emerges. In the simulation, clusters emerge from selective interaction among active media items (media agents) and with user agents, the question was raised whether this was actually *social* simulation and how norms could contribute in controlling emergence. Andre also mentioned his idea to represent perspectives (viewpoints) explicitly in software systems to allow for reasoning about one's approach and alternatives and to enhance co-ordination. The view of norms being constraints was also expressed by one of the participants as being the way norms operate in policy use in distributed systems. However, in Verhagen's talk, this was presented as merely one view on the use of norms. Future plans include a co-operation between the speakers in this session (since they represented differing views on norms and their implementation and application). A conceptual framework that integrates these views and sheds light on the relation between norms and more generally accepted concepts such as goals, beliefs, desires and intentions seems within reach as some work on this has already been done by Verhagen. Such a co-operation may well result in a special issue in a suitable journal.

Session on Business Processes

Iqbal Adjali from Btexact, UK, chaired the business processes session and gave an introductory presentation highlighting the relevance of ABSS to the business world. Today's business environment is characterised by constant change, increasing complexity and a high degree of uncertainty about the future. Traditional business modelling techniques, which have limited power in dealing with complex, dynamic behaviour and uncertainty, have become inadequate in addressing a wide range of business problems of relevance to strategy formulation and economic analysis. Iqbal presented some BT applications of ABSS including customer behaviour modelling, industry structure modelling, auction dynamics and bandwidth markets. As an example, the agent-based modelling approach was used to develop a model of customer behaviour which is able to capture characteristics of individual customers and their interactions. This approach preserves the richness of the information at the individual level, unlike conventional averaging methods which throw away potentially useful information. The model developed provides insights into the likely effects of specific actions (advertising, segmentation, etc.) and allows key variables such as return on marketing investment to be quantified.

Wilfred Geerlings presented his work in the area of strategic human resource management. The focus of his work is on developing new concepts and simulation tools that provide insight into the effects of changing business strategy on the workforce requirements of the organisation. Wilfred used a case study based on the Royal Netherlands Navy to illustrate the limitations of current practices and the benefits of the new approach. Adrian Li Mow Ching gave a talk on user and server interaction dynamics in telecommunications. Understanding emergent behaviour from the growing complexity of telecommunication networks has become increasingly difficult. Managing complex networks effectively requires detailed understanding of user dynamics. Using agent based modelling, Adrian simulated the service system and investigated the characterisation of the model against different user dynamics. The final talk in the session, given by Lionel Sacks, explored the possible development of a modelling platform for ABSS on the GRID. The GRID is a telecommunications network designed as a virtual distributed environment where users can share data and computing resources. The business processes session was highly successful in raising awareness in industrial and business applications of ABSS. One of the immediate benefits of the session was to bring together a group of industrial and academic participants to develop a research proposal based on the topic of the last presentation.

SIG05: Special Interest Group on Intelligent and Mobile Agents in Telecommunications and the Internet (SIGMA)

The main purpose of SIGMA is to provide a forum for discussion and collaboration between researchers and industry on the topic of intelligent and mobile agents in telecommunications and the Internet.

The overall aim of SIGMA is to:

- Raise awareness within industry of the value of mobile agent technology and applications based thereof.
- Demonstrate the potential of this technology for solving industry and research problems.
- Facilitate the transfer of agent technology, skills, standards, and best practice from academia to industry.
- Provide feedback on industrial problems and requirements to agent researchers.
- Disseminate information on up-to-date research and development of agent technology.
- Engage in AgentLink's teaching and training activities on mobile agent related subjects.
- seed projects among SIG members

  SIGMA strives to establish cooperation between both researchers and and industry, arrange contacts, and focus dispersed research and development efforts. Interdisciplinary work is particularly welcomed.

  SIGMA collaborates with other AgentLink SIGs, and complements their work with a focus on mobile agents.

  The primary means of communication within the SIG are the SIG's mailing list and Web site, as well as SIG meetings (1-2 per year). Meetings are organized usually in concomitence with AgentLink meetings, Conferences, Workshops and other events that are strongly related to the SIG's working area.

SIG05: Second Meeting, Lund, 8-11 April, 2002

Introduction

Mobile agents are a fascinating paradigm for design and implementation of dynamic distributed systems. Mobile agents are programs capable of deciding on their migration to other hosts.

During migration the agent's state as well as its code must be transmitted. Their high degree of flexibility and adaptivity makes mobile agents a promising software pattern for the new generation of powerful mobile platforms by integrating their own capability for migration within a network with the platform's capability to accompany the end-user in daily life.

Recent years have seen the development of a number of mobile agent systems which present new challenges along with increased functionality compared to traditional distributed systems.

As in each and every field it is important to learn from the lessons taught by past work and projects; and to move from ad-hoc development and prototyping to the use of sound engineering practices in design and architecture for this class of systems as well as frameworks for quality of migration and interoperability between different systems. These

topics are highly relevant for the acceptance, dissemination, and use of mobile agent technology.

The Conference and Workshop

Towards the goals identified above, SIGMA organized a Conference Session and Workshop on Performance, Interoperability, and Applications of Mobile Agent Systems at the 9th Annual IEEE International Conference and Workshop on the Engineering of Computer-Based Systems (ECBS'02) Lund University, Lund (Sweden), April 8-11, 2002

ECBS'02 was the 9th IEEE sponsored meeting dedicated to formulating and advancing processes, models and tools for the engineering of computer-based systems. ECBS conferences promote a comprehensive systems perspective, targeting an engineering audience by fostering an interdisciplinary working environment for otherwise separated domains of computer science and other related disciplines. New technologies are evaluated with regard to their suitability to support complex systems engineering tasks and to advance the state of the art.

Therefore, the conference was well-suited and provided a suitable and interesting framework for the goals of the SIGMA meeting.

We were looking for research contributions and experience reports that address the performance, interoperability, and applications of mobile agent systems. We particularly solicited submissions covering but not limited to:

- Mobile agent system architecture design issues.
- "Components-off-the-shelf" for mobile agent systems.
- Quantitative and qualitative analysis and comparison of mobile agent systems.
- Benchmarks and performance analysis of mobile agent systems.
- Design Pattern to improve the performance of mobile agent systems.
- Performance of mobile agents vs. other approaches.
- Scalability of mobile agent systems.
- Resource control.
- Mobile agent applications.
- Design patterns and abstractions that promote interoperability of mobile agent systems.
- Work related to the interoperability and standardization of mobile agent systems.
- Experiences with mobile agent testbeds and publicly accessible servers.
- Agency and service discovery for mobile agents.
- Critical reviews of existing approaches.

We asked authors to back their results by experimental evidence wherever possible, and to evaluate their approaches against the existing systems, approaches, and literature. The papers presented at the conference session are published in the conference proceedings by IEEE Computer Society. Position papers were published on-line at URL http://swt.informatik.uni-jena.de/workshop.html and will appear on the SIGMA Web pages as well.

The Conference

We received twelve full paper submissions. Out of these, we the programme committee selected six papers for presentation at the conference session. The conference session was split on two days, and included the following presentations:

- Dag Johansen and Kare J. Lauvset and Keith Marzullo, An Extensible Software Architecture for Mobile Components
- Ulrich Pinsdorf and Volker Roth, Mobile Agent Interoperability Patterns and Practice
- Ryszard Kowalczyk and Peter Braun and Jan Eismann and Bogdan Franczyk and Wilhelm Rossak and Andreas Speck, Intermarket – Towards Intelligent Mobile Agent-based e-Marketplaces
- Kare J. Lauvset and Dag Johansen and Keith Marzullo, Factoring Mobile Agents
- Li Tang and Bernard Pagurek, A Comparative Evaluation of Mobile Agent Performance for Network Management
- Sea Ling and Seng Wai Loke, Advanced Petri Nets for Modelling Mobile Agent Enabled Interorganizational Workflows

The conference itself was dual-track. However, for organizational reasons, the track parallel to the SIGMA track was canceled and some of the attendants of the parallel track therefore attended the SIGMA track. The overall number of attendants was about 30 people. Several attendants were unfamiliar with the details of mobile agent technology, and thus Dag Johansen from the University of Tromso, who is a well-known and respected principal

researcher in the field of mobile agents, gave an introduction to the concepts of mobile agents. The conference session was well-received and spawned interesting questions and discussions.

The Workshop

Out of the submitted position papers, the programme committee selected five papers for presentation. Some authors of full paper submissions, whose papers where considered too premature for inclusion in the conference session, were asked to re-submit a short version as a position paper.

In addition to the presentation of position papers, the workshop also included the live presentation of software systems and demonstrations. The final schedule is given below:

- Cornelius Wille, Reiner R. Dumke, An Integrated Performance Measurement Approach for MAS based on Software Aglets
- Antonella DiStefano, Corrado Santoro, Diego Scardaci, Secure Data in Mobile Agent's State
- Christian Erfurth, Dynamic Domain Maps for Dynamic (Mobile) Agents
- Bohumil Horak, Application of Multi-agent Systems in Mobile Attendance Flight Means
- Uli Pinsdorf, Demonstration of the SeMoA mobile agent system
- Walter Binder, Agent Adaptation in J-Seal2 and Applications of Mobile Agents in Grid Computing and Mobile Commerce

On Wednesday, the workshop had about ten participants, and about seven on Thursday. Some attendants held the opinion that this was the best part of the conference. The workshop did not impose severe time limits and so there was ample opportunity for questions and

discussion. The participants made use of that. Practical demonstrations included the Secure Mobile Agents Project (SeMoA), as well as a demonstration of the technology behind mobile agent based autonomous stations for on-demand bus scheduling, which were deployed

in a real-world prototype test around Vienna, Austria. In particular the software demonstrations triggered interested detail questions and a rich discussion.

SIG06: Agents that Learn, Adapt and Discover (ALAD)

Learning and adaptation have become increasingly important in agent research and the creation of the ALAD SIG is a reflection of this development. Following the success of the first Adaptive Agents and Multi-Agent Systems (AAMAS-I) at York, March 2001, an enquiry to determine the necessity of such a group was proposed to the European agent community. The outcome did encourage the promoters (Eduardo Alonso, Peter Edwards, Dimitar Kazakov and Daniel Kudenko) to propose the creation of a new AgentLink II SIG.

The ALAD SIG was approved as an Inter-Net SIG, with the collaboration of AgentLink II itself, EUNITE and ILPNet2. A web-page was created (http://www.csd.abdn.ac.uk/~pedwards/alad/) and a mailing-list was set up.

The SIG is concerned with all aspects of learning, adaptation and discovery in the context of intelligent software agents - theoretical principles, novel algorithms, practical applications.

The SIG encompasses a variety of activities, including (but not restricted to):

- Adaptive Personal Information Agents
- Agent-Based Knowledge Discovery & Data-Mining
- Learning in Multi-Agent Systems
- Learning & Communication
- Evolutionary Agents & Emergent Behaviour
- Distributed Learning
- Learning Agents for E-Commerce
- Learning Robots

The SIG aims to promote interaction among researchers (academic and industrial) via the dissemination of relevant information, organisation of meetings and workshops, fostering research collaborations, and supporting various other activities related to learning agent research.

SIG06: First Meeting, Amsterdam, 4 December, 2001

The first ALAD (Agents that Learn, Adapt and Discover) SIG meeting was held in Amsterdam, December 2001. The meeting opened with an introduction by ALAD's co-ordinator, Pete Edwards from University of Aberdeen. He explained how the new SIG had been considered and approved by the AgentLInk II committee in Prague, Summer 2001.

This kick off meeting continued with the following presentations:

Learning Agents Research at the University of York
Daniel Kudenko, University of York

Abstract: This talk introduced various research activities in the area of learning agents and multi-agent systems in the York Artificial Intelligence research group. The research projects are in the areas of distributed learning, learning of coordination, evolution, information retrieval, and intelligent interface agents.

Hybrid Learning Mechanisms for E-commerce MAS
Eduardo Alonso, City University
Abstract: We will focus on a proposal to build and implement hybrid learning systems for e-commerce. Hybrid systems can learn either on-line (for example, using reinforcement learning techniques) or off-line (using domain knowledge and sets of examples to induce general hypothesis). The goal of the proposed research is to identify (business) scenarios where different learning strategies are successful.

ALAD - The EUNITE Perspective
Georgios Tselentis, MIT GmbH
Abstract: The talk described the organizational structure and goals of EUNITE, and possible overlaps with the interests of AgentLink and ILPNet in the areas of learning and adaptive agents.

The meeting finished with a planning discussion, where it was decided to organise the SIG in a centralised fashion, and leave the eventual creation of sub-groups for a later date. The SIG will act as a whole under Peter Edward's co-ordination.

The discussion also covered the question of industrial involvement, and it was noted that there is still a lot to be done to overcome the gap between academia and industry. A possible activity that would bring both interests together would be the definition of benchmark tasks that are based on real-world data from industry.

Georgios Tselentis mentioned that EUNITE would be keen to fund "novel" activities. While he deliberately didn't want to specify what kind of activities EUNITE is looking for, he excluded "standard" activities, such as workshops and specific research projects.

SIG06: Second Meeting, Bologna, 12 July, 2002

The joint AMEC/ALAD (Agent Mediated Electronic Commerce/ Agents that Learn, Adapt and Discover) SIGs joint session was held in July 2002, the 12th, in Bologna. With this joint session the following goals were achieved:

- **Increase awareness and interest in adaptive agents for e-commerce in the European AI community and encourage further research:** Even though Europe is the home to some of the strongest research groups in both AMEC and ALAD, research on adaptive agents for electronic commerce has only recently started to receive increased attention.
- **Encourage collaboration between AMEC and ALAD communities:** There are many agent researchers in Europe that have a strong learning background but only little or no knowledge of electronic commerce, and vice versa. The AMEC/ALAD meeting presented an ideal opportunity for these two groups to meet and discuss potential collaborations.
- **Give a representative overview of current research in the area of adaptive agents for electronic commerce in Europe.**

It is worth noting that the session was a truly international event, as researchers from France, Belgium, United Kingdom, The Netherlands, Spain, Portugal, Italy, Israel and USA participated. It was organised like an open discussion forum around different talks:

Ed Durfee, University of Michigan
Automated Agents That Learn Consumer Preferences in an Information Economy
Abstract: Current highly networked information technologies permit people and enterprises to access vast amounts of information, and allow producers of information to supply a continuously evolving population of consumers who want their information goods. Given that an information producer is unlikely to know exactly what consumers will want and how much

they want it, and that tracking such consumer preferences over time will require ongoing calculations, we have been investigating the use of computational agents to automate the producers' processes of adjusting contents and prices of information products. In this talk, I will summarize our experiences, ranging from how a monopolist producer can efficiently learn about a consumer population so as to maximize aggregate profit, to how a pair of producers can establish niches within a consumer population, to how a wider variety of markets for information goods can emerge in a larger population of producers and consumers.

Henrique Lopes Cardoso and Eugénio Oliveira
LIACC, Faculty of Engineering, University of Porto
Including Marketing Strategies in the Electronic Commerce Framework
Abstract: B2C electronic commerce is commonly viewed as a straightforward browsing and purchase process. Current search tools assisting shoppers limit the automatic comparison of products to the price of goods. Allowing merchants to successfully employ differentiation strategies online requires providing the web with semantic content that can represent merchants' offers and be automatically processed by user-delegated software agents. In this paper we explore what we believe would be a positive evolution of agent-based electronic commerce, justifying the need for "second generation bots" that enable the utilization of different seller-side marketing strategies. We take a dynamic posted offering approach as opposed to a single negotiation-based approach. We present our seller agent architecture in such a scenario, including market analysis skills for insightful offer generation, implementing marketing strategies according to its configurable degree of autonomy. Since normally it will operate on an imperfect information scenario, we also consider the application of online learning skills, based on the exploitation/exploration tradeoff, that enable the agent to acquire information about the market in order to generate more informed offers. We expose some of our research concerns with the purpose of making such a model feasible.

Jean-Pierre Georgé, Marie-Pierre Gleizes, Pierre Glize
IRIT (Institut de Recherche en Informatique de Toulouse)
A theory to handle Adaptive MAS – ABROSE, a case study in electronic commerce
Adaptive MAS represent the next generation of MAS because most future applications will need to take into account the dynamic and complex nature of their environment. Classically such a system is defined as a MAS that is able to change its behaviour to react to the evolution of its environment.
Our work focuses on the design of adaptive systems; therefore, we developed a theory based on emergence and MAS. The specificity of our AMAS theory lies in the fact that we do not code the global function of the system within an agent. Each agent composing the system is able to change its interactions with others. The global function is realized by the collective and if the collective is able to change its interactions, the global function is thus modified. Therefore, this capacity of self-organization enables the system to adapt itself. The global function is then emerging.
Electronic commerce is based on the exchange of products between producers and consumers and consists in brokerage and negotiation phases. It increases regularly due to the Internet facilities. The ABROSE system is a help for the brokerage phase by providing to a customer a list of relevant content providers, and in allowing a targeted publicity of the content providers' new offers. The architecture is composed of adaptive multi-agent systems. Each user is represented by a transaction agent. This agent has beliefs on itself and on others transaction agents. These beliefs are automatically up-dated after the user has done a transaction enabling ABROSE to be adaptive.

Rodrigo Agerri and Eduardo Alonso
City University, London
Learning to recover intentions in electronic commerce
When designing Multi-Agent Systems, the problem of communication must be addressed. We use a pragmatical view of communication in order to build artificial systems (agents) that communicate with one another. We consider that agents' speech acts are actions whose purpose is the achievement of a goal. This goal is identified as the speaker's *intention*, which is expressed by using a sentence. However, a sentence usually yields a set of different

interpretations according to the communicative sentence in which is used. Thus, 'understanding' would be the process of working out the *communicative meaning* of the utterance or, in other words, the process of recovering agents' intentions. Our research focuses on learning how to recover such intentions. In particular, we can use our background knowledge and previous communicative experience to induce hypothesis about what the speaker's intentions are. Electronic commerce is an ideal domain for the implementation of our proposal. Clearly, when negotiating it is essential to learn to recover the traders' intentions. In particular, in B2B scenarios where huge amounts of goods and resources are involved, understanding the "right" intention of our counterpart in terms of price, quantity, quality, warranty and delivery time becomes crucial. The ability to automatically recover the intentions involved in the negotiation process might help understand and enforce dubious contracts.

F.M.T. Brazier, B.J. Overeinder and N.J.E. Wijngaards
Vrije Universiteit Amsterdam
Automated Adaption of E-commerce Agents
Contact the authors at niek@cs.vu.nl for a copy of their presentation

SIG07: Agents and Logic

AgentLink/CoLogNET joint activity on "Agents and Logic"

Formally, this activity is one of the main areas within CoLogNET and is a special interest group within AgentLink. The activity is funded by both networks, showing their commitment to this important area.

Background

The link between agents and logic is important to both the Agents and Computational Logic communities: to the Agents community since logic-based approaches already have a strong profile, and are likely to grow in importance especially as verification becomes more necessary; to the Computational Logic community since agents represent a key relevant techniques. While CoLogNET on its own might contain a little about agent applications, and AgentLink contain a little about logic, this formalised activity aims to allow more expertise/ideas to flow between the networks, thus providing more chance of productive technology transfer.

Thus, in the future, this activity will contribute to the uptake of logic-based agent technology and logical methods for agent-based systems. This, in turn, may impact on forthcoming standards, for example where semantics/verification/compliance is an issue.

The objectives are to disseminate the state of the art in key areas concerning logic and agents throughout both communities, and industry, via dedicated symposia; where possible to disseminate key breakthroughs in this area to wider academic/industrial communities by developing publications examining these specific areas; to enhance collaboration between groups, networks, academia/industry, etc; to showcase successful applications concerning the verification and implementation of agents using logic-based approaches; and to identify key future research issues and key requirements for wider use of these techniques.

Activities

The work of this area/interest group is centred around two symposia, one on "logic-based agent verification", the other on "logic-based agent implementation", both of which provide very strong links between the networks. Each symposium will aim to consolidate expertise and stimulate research/collaboration in each area, and to provide input into both standards efforts and the development of technological roadmaps for the area. They will also endeavour to showcase successful applications and enhance the uptake of logic-based agent technology. Via industrial presentations/sessions, they will also attempt to elicit key problems

in industry that could be tackled with a logic-based approach, and to identify barriers to such technology transfer.

It is planned that each symposium be co-located with a general AgentLink or CoLogNET supported event. For each symposium, funds will be provided for one invited speaker from outside the EU and for the travel/accommodation support for a number of other participants.

Note that the aim of these symposia is not to compete with existing logic-agent research workshops, but to provide a forum whereby the state of the art within a particular topic concerning logic and agents can be reported, examined and transferred not only to both CoLogNET and AgentLink communities, but to industry and the wider academic community.

As part of this transfer activity, we plan to provide a (WWW-accessible) focal point for research, education and applications of "logic and agents", building up a set of working exemplars concerning the role of logic in agent-based systems. This will also provide wider access to tools for (and tutorials/explanations of) verification, logic-based programming, etc, of agent-based systems.

APPENDIX A:

MINUTES OF MANAGEMENT COMMITTEE MEETINGS

Minutes of the AgentLink II Management Committee

Amsterdam, Wednesday 5 December 2001

Present:

Michael Luck	[MML] Chair
Paul Davidsson	[PD]
Frank Dignum	[FD]
Matthias Klusch	[MK]
Scott Moss	[SM]
Joerg Mueller	[JM]
Carles Sierra	[CS]
Eileen Simon	[ESS]
Franco Zambonelli	[FZ]

Apologies Received:

Magnus Boman	[MB]
Yves Demazeau	[YD]
Nick Jennings	[NJ]
Chris Preist	[CP]
Volker Roth	[VR]
Wiebe van der Hoek	[WvdH]
Michael Wooldridge	[MW]

1. Welcome

MML welcomed everyone to the fourth management committee meeting of AGENTLINK II.

2. Status of AGENTLINK II

Membership
MML reported that AGENTLINK now has 148 members, with the network continuing to expand through both new applications and new membership agreements being received. It is both of particular importance and satisfaction that the last batch of 6 applications considered was entirely from industrial organisations. This seems to demonstrate that the efforts made to reach the industrial community are bearing fruit.

Finances
MML distributed a summary of the current financial state of AL2, which showed a substantial projected overspend in the travel category. This was a worst case position, caused in part by extra costs on review meetings and industrial events that were not originally budgeted for, but which have become required. Although this is cause for care to be taken with finances, MML explained that the projections were likely to be reduced substantially as expenses did not typically hit upper limits, and industrial event costs were likely not to use their allocated amounts. The situation would be monitored. SM requested that best case figures also be presented, to enable the range of projections to be understood by the committee.

MML also reminded the committee that since industrial representation was important, funds could sometimes be found for committee members to represent the network at industrially-oriented events.

3. Membership Applications

Applications and Decisions
MML distributed a breakdown of membership applications received and sub-committee decisions since the last meeting. As noted above, there is a very healthy proportion of industrial appplications and members joining.

Consideration of User Members and Naive Users
In relation to the Project Reviewers' encouragement of user members of the network, SM raised the issue of criteria to be used when assessing applications. He was concerned that the criteria as applied may deny memership to some relevant organisations (in government, industry and education). MML reminded the committee that the criteria for industrial organisations were intended to draw in as many as possible, and were relatively light, but that there needed to be some measure of excellence for academic institutions. After some discussion, the meeting agreed that while the criteria might not be perfect, they provided a sensible compromise between all needs.

4. Workshop Requests for support/sponsorship

CS reported on the deliberations of the research workpackage committee.

According to the criteria used for evaluation, it was agreed that 1000 Euros would be provided to support UKMAS'01, 500 Euros for HOLOMAS'02 (in year 3) and 800 Euros for AISB'02 (AAMAS workshop). It was further agreed that funding would be provided for CIA'02 but that the decision on amount would be defered to a later meeting since it was still somewhat early.

Despite recognising the value of EKAW'02, the committee agreed not to provide funding since it was not directly concerned with agents, and because the budget had been exhausted for the current year. It seems more appropriate for related initiatives more directly relevant to EKAW (such as Ontoweb) to provide funding instead.

5. Agentcities.NET

MK reported on the current status of Agentcities, and reminded the committee that the Agentcities take-up measure would soon be taking membership aplications. AgentLink has been liasing with the Agentcities management board.

6. Technological Roadmap

MML reported on the current status: a draft had been developed by Christine Guilfoyle and MML based on inputs from the SIGs provided by the coordinators. This had now been refined further and MML would be issuing the revised version to the committee for their approval before releasing it to the project reviewers. At the review meeting in September, the reviewers indicated their readiness to help support the roadmapping effort and to be involved early. They had cited the ITEA roadmap as a good example of a model to follow, and had requested a methodology for development of the roadmap be formalised and documented. MML reported on his research into the ITEA roadmap, on the style and substance, and on the effort that was involved in its development. Clearly, the ITEA roadmap had access to resources an order of magnitude greater than those available to AgentLink for its own effort, but MML was confident that AgentLink could make a valuable contribution.

MML had developed an AgentLink roadmap methodology and distributed it to the committee in advance of the meeting but was still awaiting comments.

ACTION: Committee to respond as early as possible.

One of the open questions was whether scenarios were an appropriate model to use in the roadmap. After some discussion, it was agreed that SIG coordinators would coordinate the development of scenarios to provide a context for the roadmap.

ACTION: SIG coordinators to develop scenarios.

In collaboration with Christine Guilfoyle, MML has developed a questionnaire designed to elicit specific responses to provide targetted inputs to the roadmap. The questionnaire was distributed to participants at the SIG meetings in Amsterdam, and MML reminded the committee of the importance of encouraging members to return them.

CS suggested that a recent call for roadmap development proposals might be an interesting area to explore. MML to investigate.

7. Summer School

MML reported that EASSS'02 in Bologna, organised by Paolo Ciancarini, Franco Zambonelli and Andrea Omicini, in addition to the AgentLink committee, was progressing well. The programme was nearly ready to be confirmed. FZ was concerned that the communication among the organising committee had not been working as well as it should. MML apologised for the lack of communication over the progress of the course selection process, but explained that no offence had been intended, and that the problems had now been corrected.

EASSS 2003
MML solicited suggestions for the venue of the final summer school of AgentLink II in 2003.

8. SIGs

In response to a query on finances from MK, MML explained that costs incurred in organising SIG meetings increase with late or incorrect information from SIG coordinators. ESS does an excellent job in trying to meet the requirements of SIGs, but when faced withpoor information from coordinators, her job is made extremely difficult. In particular, accurate and early information about numbers and requirements means that unnecessary costs are not incurred, and the optimal arrangements can be made.

Learning SIG
MML reported that a new inter-network SIG on Agents that Learn, Adapt and Discover had had its first discussions in Amsterdam, and was ready to proceed, coordinated by Pete Edwards. KDnet, EUNITE and ILPnet were all ready to participate in the inter-network activity. Pete Edwards would attend the next MCM.

Next Meetings

MML reviewed the agreed SIG schedule. It was recognised that the next SIG meetings were not scheduled for another year, and this would leave a large gap before then. Because funding was tight, it would not be possible to organise a funded meeting, but FZ suggested that unfunded meeting in Bologna at the time of EASSS and AAMAS would be possible, since many people would already be there. The committee agreed that this was a good idea, and to move towards that schedule and organisation.

9. AgentLink Review Meeting

Two main issues arose from the September Review: industrial representation and relevance, and the development of the roadmap. The latter was considered above. The former was being adressed through the industrial conference in London in January and other efforts to increase industial involvement. The trend towards industrial applications to join AL2 shows good progress here.

MML reminded the committee that the effort involved in preparing materials for review meetings was substantial and that the committee needed to engage more in this process, particularly WP and SIG coordinators. Reviews would take place at 6-month intervals until the end of the project, and could be anticipated well in advance. MML explained that the next review was scheduled for early February, requiring materials to be sent to the reviewers 2

weeks before that. In consequence, he requested materials from the committee by early January. The committee agreed to support MML in this.

ACTION: Committee to provide materials for the review meeting to MML by 14th January 2002.

MML explained that he recognised that some members of the committee were extermely busy and may not be able to contribute to AL2 as much as was now required because of other commitments. He reminded the committee that there was an implicit obligation to respond in a timely fashion. If other commitments prevented a member of the committee from contributing fully, a replacement should be considered. While there had been a fair amount of movement in and out of the committee, one question raised was whether there should be a more formal process of fixed tenure and replacement.

10. AgentLink Technology Conference

MML explained that the conference organisation was well under way, and all was progressing well. However, the success of the event depended on reaching the industrial community with invitations to attend. This would require effort from all in AL2, and the committee was requested to forward names to invite to MML and ESS, as well to advertise the conference as best they could.

ACTION: Committee to pass on industrial contacts to MML. Committee to raise awareness of the conference in their national communities.

11. Any other business

MML reminded the committee that the special issues of the Journal of AAMAS would be around 2002/3, requiring copy in the summer of 2002. The committee was requested to consider content now, and email suggestions to MML.

12. Date and location of next meeting

The next meeting could be held in February 2002 at the same time as the review meeting.

Minutes of the AgentLink II Management Committee

Bologna, Wednesday 17 July 2002

Present:

Michael Luck	[MML] Chair
Sonia Bergamaschi	[SB]
Monique Calisti	[MC]
Paul Davidsson	[PD]
Wiebe van der Hoek	[WvdH]
Nick Jennings	[NJ]
Matthias Klusch	[MK]
Joerg Mueller	[JM]
Chris Preist	[CP]
Michael Wooldridge	[MW]
Franco Zambonelli	[FZ]

Apologies Received:

Frank Dignum	[FD]
Volker Roth	[VR]
Carles Sierra	[CS]

1. Welcome [MML]

MML welcomed everyone to the fifth meeting of AGENTLINK II.

2. Status of AGENTLINK II

Membership
MML reported that AGENTLINK now has 160 members, with the network continuing to expand through both new applications and new membership agreements being received.

3. Industrial Action

MML reported that the very successful industrially-targetted Agent Technology Conference held in London in January 2002 attracted over 100 industrial participants. It was now time to consider a second such event. MML reported on discussion with the Agentcities Project Management Board to try to co-locate the next ATC in Barcelona in February 2003 at the same time as the AgentLink SIG meetings and the Agentcities Information Days. This would provide a strong context for an industrial event, and would benefit all parties. The committee agreed that this would provide an appropriate location.

In light of the impending review in September, MML reminded committee members that they should inform him of any industrial visits at which they represented AgentLink in order to report back.

4. Workshop Requests for support/sponsorship

The Research Coordination workpackage has been handed over from Yves Demazeau to Monique Calisti of Whitestein Technologies. MML began by reminding the committee of all the work that Yves has done for AgentLink since 1998 and thanking him (in absentia) for his efforts.

MC reported on the deliberations of the research workpackage committee. According to the criteria used for evaluation, it was agreed that 600 Euros would be provided to support

DEON'02, 1000 Euros for EKAW Ontologies Worjshop, 2000 Euros for CIA'02, and 2000 Euros for ESAW'02.

MML reminded the committee that there were two big events intended for Year 3 of AgentLink, CEEMAS in Prague and AAMAS in Melbourne, and he suggested planning with the aim of supporting these events. The committee agreed that permission should be requested from the Project Officer to support students to attend AAMAS as had been done previously with AA 2000 in Montreal, as it was such an important event.

5. Education and Training

MML reported on the success of the Fourth Agent Systems Summer School, which took place the previous week. The event was extremely successful, again attracting over 150 particpants. MML recorded his thanks to Paolo Ciancarini, Franco Zambonelli and Andrea Omicini for their efforts as local organisers and contacts, and especially Wiebe van der Hoek and Eileen Simon for ensuring that the summer school ran smoothly and effectively. WvdH reminded the committee that MML was also responsible for much of the effort in ensuring the school was successful.

Discussions were now taking place over the timing and location of the next summer school. MML explained that Eugenio Oliveira had kindly agreed to investigate the possibilities of locating in Porto in July, but there were several issues that still needed resolving which could prove problematic: some local arrangements; the timing of the summer school very close to AAMAS in Melbourne; the timing of the North American summer school to co-locate with IJCAI later in the summer.

Several alternatives were discussed, particularly in relation to the possibility of an event earlier in the year; MJW proposed holding the summer school in Barcelona at the same time as the SIG meetings and other events in February to avoid clashing with AAMAS and the North American school. The committee agreed to explore this as an alternative.

6. Special Interest Groups

MML reported on some changes to personnel. Scott Moss had stepped down as coordinator of ABSS, and Paul Davidsson had agreed to take over.

The next set of SIG meetings would take place in Barcelona in February 2003, co-locating with Agentcities Information Days.

Some difficulties with the ALAD SIG, possibly due to over-commitment of key personnel, were noted, and after some discussion of the best way to proceed, the committee agreed that a new coordinator might best help the situation in the absence of any immediate progress. MML would mail the current coordinator to discuss the situation, and then invite Daniel Kudenko and Eduardo Alonso (the original proposers of the SIG) to get involved in coordination.

7. Technological Roadmap

MML reported on the current status of the roadmap: MML, Peter McBurney and Chris Preist had formed a core roadmapping team that overhauled the previous version of the roadmap at a 3-day meeting, and developed a new draft over a period of a couple of months. This version was then sent to the Management Committee and to key experts in the field to review the draft and provide written responses on a consultancy basis. The process was well underway, with some responses already received and more expected. In general, the response has been extremely positive, and the roadmap has been very well received by the community. The core group would meet again to consider the responses and update the draft accordingly.

In the longer term, it was hoped that there would be a document to distribute at the February 2003 meeting, but that the document would continue to be revised through the lifetime of AgentLink II. The core group would seek to continue to consult widely.

8. Review in Madrid in September

MML reminded the committee about the upcoming review meeting in Madrid in February and requested that everyone ensured he had all relevant information in order to prepare the documentation needed.

9. The Sixth Framework

MML reported on the submission of the Expression of Interest for FP6 that was now available from the AgentLink web site. A full proposal for a third AgentLink project was intended to be developed in the Autumn. MML reminded the committee that assistance in the development of the proposal would be welcomed.

10. Any other business

Paul Davidsson, who was now coordinating the ABSS SIG, was also Newsletter editor, and was over-committed. In order to help Paul, a new editor had been identified as Andrew Byde of HP Labs. Andrew would work with Paul to take over editorial duties in the final year of AgentLink.

CP reminded the committee that the special issue of the Journal of AAMAS was only one year away, and that copy would be required by the end of the year. Off-line discussions would take place with MML and SIG coordinators to find the best ways to represent AgentLink and European activity in this archival journal

11. Date and location of next meeting

The next meeting could be held in September 2002 at the same time as the review meeting.

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APPENDIX C:

CONTENTS OF AGENTLINK NEWSLETTER ISSUES 8, 9,10

Issue 8 (November 2001)

Events Calendar

Issue 9 (April 2002)

Features

Agents for a Service Company: The Agent Team at BT
Simon Thompson

LEAP: When the e-society meets the m-workforce
Patricia Charlton and Nicolas Lhuillier

Agents in real-world Applications: Living markets
Christian Dannegger, Christoph Kluge and Rolf Katzengerger

Agents in dynamic supply chain management
Jim Stanfield

Trading Agent Competition 2001
Maria Fasli

Agents in a J2EE World
Stefan Brantschen &Thomas Haas

SIG Reports

Agent Mediated Electronic Commerce
Frank Dignum and Carles Sierra

Methodologies and Software Engineering for Agent Systems
Franco Zambonelli, Federico Bergenti and Giovanna Di Marzo

Issue 10 (July 2002)

Features

Prospects for Agent Technology: Interviews with Industry Experts

Java Agent Services
Dominic Greenwood

SAMOS-Software Agents for Mobile Services
Zakaria Maamar and Wathiq Mansoor

SIG Reports

Intelligent Information Agents
Matthias Klusch

Agent Based Social Simulation
Iqbal Adjali, Paul Davidsson, Nick Gotts, Scott Moss and Harko Verhagen

Events Calendar

APPENDIX D:

DOCUMENTS PRODUCED BY AGENTLINK II IN YEAR 2

2002

- 2002-029.txt
  AgentLink email update #45, July 04, 2002 (plain text version).

- 2002-028.txt
  AgentLink email update #44, May 24, 2002 (plain text version).

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- 2002-026.txt
  AgentLink email update #42, February 21, 2002 (plain text version).

- 2002-025.txt
  AgentLink email update #41, January 24, 2002 (plain text version).

2001

- 2001-024.pdf
  AgentLink roadmap questionnaire (pdf).

- 2001-024.doc
  AgentLink roadmap questionnaire (word document).

- 2001-023.txt
  AgentLink email update #40, November 23, 2001 (plain text version).

- 2001-022.pdf
  AgentLink News #8, November 2001 (pdf).

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  AgentLink email update #39, October 12, 2001 (plain text version).

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  AgentLink email update #38, September 12, 2001 (plain text version).

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- 2001-017.pdf
  AgentLink News #6, January 2002001-014.pdf:
  Minutes of Management Committee Meeting held in Prague on Monday 9 July 2001.

- 2001-016.pdf
  AgentLink News #5, May 2000.

- 2001-015.txt
  AgentLink email update #37, July 31 2001 (plain text version).

- 2001-014
  Minutes of Management Committee Meeting held in Prague on Monday 9 July 2001.2001-013.doc: