Europe’s Network of Excellence for Agent-Based Computing

Year One Report
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1. SUMMARY

In May 1998, the European Commission began funding AgentLink, an ESPRIT Network of Excellence for Agent-based Computing. 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 was initially funded for 18 months. This report summarises the activities of AgentLink in its first year of activity. The key successes of AgentLink in this first year may be summarised as follows:

- In terms of membership, AgentLink has grown from 37 members at startup to 120 full members currently, with a growing number of “associate” members from both Europe and elsewhere

- AgentLink has established six “Special Interest Groups”, which focus the activities of the network on strategically important sub-fields of agent technology
  - SIG01: Agent-mediated electronic commerce
  - SIG02: Methodologies and software engineering for agent systems
  - SIG03: Intelligent information agents
  - SIG04: Agent-based social simulation
  - SIG05: Multi-Agent Coordination and Control
  - SIG06: Intelligent agents for telecommunications applications and telematics

These SIGs, which were established by a process of reviewed applications, meet regularly to discuss key issues. They provide the core of AgentLink’s meetings and public activities, and will provide the necessary technical input to generate the network's technological roadmap

- AgentLink organised the first major international summer school on agent technology, which offered 18 courses on agent technology to 160 delegates from across the world. AgentLink financially supported a number of students to attend this event, but in addition, 120 other delegates paid for themselves to attend — the event was “sold out” two months in advance. The event attracted US$16,000 sponsorship from the National Science Foundation in the USA, and drew students from as far afield as Australia and Taiwan

- AgentLink established and supported a number of “reactive” workshops, designed to respond in a timely fashion to topical issues in agent technology

- AgentLink supported a number of high-profile international conferences and workshops in the area of agent technology

- AgentLink established the first magazine on agent technology, now distributed both in hardcopy form to a distribution list of 300, and in electronic form freely via the WWW

- AgentLink established a monthly email-based “update”, to keep members (and others) informed of the progress and activities of the network

- AgentLink established a management/steering committee made up of international experts to guide the activities of the network, which meets at regular intervals
2. AIMS AND OBJECTIVES OF AGENTLINK

2.1 Background: What is Agent Technology?

Put at its simplest, agents are software components that can operate in an autonomous or semi-autonomous manner in order to achieve their design objectives. This simple definition belies the enormous importance currently attached to agent technology by the international IT community. Like object-oriented development, agents are a horizontal technology, applicable to a broad spectrum of application areas. Currently agents are seen as an important technology for such application areas as telecommunications, information management and the Internet, electronic commerce, and simulation.

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 raising awareness of agent technology, promoting technology transfer from research to industry, focussing research activities on industrially-relevant issues, and bringing together and focussing European industrial consortia on promising new areas of development;

- promote excellence in European agent systems research, by bringing together researchers in areas of common interest, promoting cross-fertilisation of research skills, promoting research collaboration on promising areas of European strength, and raising awareness of European agent research activities;

- promote the excellence and relevance of teaching and training in agent-based systems across Europe by organising summer schools to present courses on a range of agent-related issues, and disseminating curricula, courses, and teaching materials; and finally,

- provide a pan-European infrastructure for communicating the results of the network and debating relevant issues.

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

- actively promote awareness of agent research and development activities within European industry through a program of meetings with industry, describing the scope of agent-systems technology and drawing attention to the potential advantages of agent-based solutions;

- encourage technology transfer from academia to industry, by supporting industrial-academic visits and pump-priming technology transfer collaborations, particularly with respect to the Fifth Work Programme;

- promote adoption and 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 system research and development skills to researchers and practitioners across Europe;

• establish regular, respected channels of communication on research, technology, and application aspects of agent-based systems, including a dedicated WWW site, email list, and regular newsletter.

3. ORGANISATION, MANAGEMENT AND MEMBERSHIP

3.1 The Organisation of AgentLink

The activities of AgentLink are organised into four workpackages, with each workpackage having a coordinator 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: Donald Steiner, Siemens AG, Germany.

• WP2 — Research coordination: focussing primarily on promoting excellence in European agent research, and establishing new research communities in promising, valuable areas of research. Coordinator: Yves Demazeau, LIFIA/IMAG, France.

• 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: Gerhard Weiss, Technical University of Munich, Germany.

• WP4 — 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 Wooldridge, University of London, 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 coordinator of the network

• The coordinators of each workpackages

• The coordinators of each special interest group (SIG)
• The members of each work package committee
• A representative of the European Commission (the project officer)

This means that the management committee has a membership of about 15 in total. The management committee met three times in the first year of the project:

• 30 April 1998 - Brussels, Belgium
• 8 July 1998 - Paris, France
• 25 September 1998 - Brussels, Belgium
• 19 April 1999 - London, UK

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, and the network has succeeded beyond all expectations in creating such a network. In just a year, AgentLink has tripled in size, from the original 37 start up members to nearly 120. 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 has 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.

![Figure 1: AgentLink membership by country](image-url)
AgentLink is now a year old, and in that year, the network has grown from 37 members to over 100. Given that we have now passed the magic 100, it seemed appropriate to ask ourselves exactly who our members are and where they come from. The results should be taken with a pinch of salt – 100 members hardly makes for a statistically significant survey. 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 Germany clearly 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. Perhaps more enlightening is to look at the number of AgentLink nodes per million of population. It turns out that, on average, there are 0.26 AgentLink nodes per million of population throughout Europe. Figure 2 shows the normalised value. Germany represents almost exactly the average; France, Italy, Spain, Greece, Austria, and Denmark are all below average, while the UK, Portugal, Norway, and Finland all have above average representation. The deviations are not great, however; most countries seem to have a representation approximately on par with their population size.

We also examined the membership of AgentLink by organisation type (university, industry, research institute, or public administration). The results are shown in Figure 3. Perhaps surprisingly, AgentLink has only 55% university membership. Industrial and public administration together account for about 30%, with another 20% from research institutes. Our goal was to aim for no more than 60% academic membership, with 40% industrial membership, so these figures are encouraging.

Finally, we analysed industrial members by their industry area. (We took the information from registration forms completed by members when they joined the network.) The results are shown in Figure 4. Not surprisingly, software has a strong showing, but the two telecoms categories are together almost as strong. What is most perhaps most interesting is the spread of members, across industrial sectors. It is encouraging to see pharmaceutical companies expressing an interest in agent technology, for example.
The next phase of AgentLink recruitment will focus primarily on industrial members. There are still many potential industrial participants who either do not know about AgentLink, or else do not know about agent technology. Accordingly, a major thrust of the industrial action component of AgentLink over the coming months will involve raising awareness with such potential members. Although we have made a strong start (nearly tripling membership in one year is excellent), there is still a long way to go in ensuring that the community at large really do understand how AgentLink can serve them.
4. COMMUNICATION AND INFRASTRUCTURE ACTIVITIES

4.1 The AgentLink Domain name and WWW Site

It goes without saying that the World-Wide Web (WWW) will form a key component of the information infrastructure of a European-wide network of excellence. To this end, the Internet domain name AgentLink.org was registered by AgentLink in May 1998, and a WWW server was established at www.AgentLink.org shortly thereafter. This WWW server provides:

- information on all AgentLink activities;
- all publically available AgentLink documents (including the newsletter);
- resources for the community (e.g., a “people finder”, and a complete, up to date list of agent related conferences and other events);
- information on how to apply for membership;
- administrative information (e.g., how to claim back expenses for AgentLink events).

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 publically available (anyone can subscribe, not just members), and currently has approximately 300 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 is 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 is typeset by the AgentLink administrator, Hugo Brailsford. In the first year of the project, two issues of the newsletter were published, in October 1998 and February 1999. The contents of these issues may be found in Appendix C of this document.

5. MEETINGS AND WORKSHOPS

In its first year, AgentLink established a number of successful workshops, and similarly, has supported several significant conferences:

PAAM 98, London, UK, April 1998
PAAM is the International Conference on Practical Applications of Agents and Multi-Agent Systems. This is a key event for those in industry with an interest in agent technology. Although it was not possible for AgentLink to financially support this event (due to contract timing), the network supported this event by advertising it with AgentLink
members. The PAAM organisers responded by giving AgentLink a slot in the programme to present AgentLink, and by giving a stall at the event. The conference was attended by about 150 delegates.

**Agents World 98, Paris, France, July 1998**
Agents World was a major international forum for agent research, including the Third International Conference on Multi-Agent Systems, as well as a number of other workshops. AgentLink supported the event financially to a total of about 12,000 Euros. The event was attended by 540 delegates.

**UKMAS 99, Manchester, UK, December 1998**
The workshop of the UK Special Interest Group in Multi-Agent Systems, held annually. AgentLink supported the event to with about 750 Euros, which was used to fund an invited speaker (Moshe Tennenholtz from Israel). The event was attended by about 50 delegates.

**Logic and Agents, London, UK, March 1999**
A workshop organised jointly with COMPULOG-NET, the ESPRIT Network of Excellence for agent-based computing. This event was attended by about 60 people, of which only 12 were funded by AgentLink.

**PAAM 99, London, UK, April 1999**
AgentLink arranged 50 registrations to the PAAM 99 conference, costing the network about 15000 Euros. In addition, AgentLink was able to take a stall at the event, have advertising materials inserted into conference packs, and organise a panel on “barriers to the industrial takeup of agent technology”. The event attracted about 160 delegates.

### 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 in total:

- SIG01: Agent-mediated electronic commerce
- SIG02: Methodologies and software engineering for agent systems
- SIG03: Intelligent information agents
These SIGs, which were established by a process of reviewed applications, meet regularly 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 will serve as a platform to promote the interchange of ideas among specialists to stimulate and facilitate a significant European contribution to the field. This SIG intends 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 fifth work program of the European Comission 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 intends to be twofold: physical and virtual.

The physical channel will consist 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 will be initially a passive one, that is, web pages to facilitate the exchange of ideas and the collaboration among the AgentLink members. The transformation of this passive mechanism into an active one will be studied during the first year of functioning of the SIG.
As for concrete expected results for the first year, we would stress:

- The generation of a diagnostic of the European position on agent-mediated Electronic Commerce and the identification of opportunities for both academic and industrial partners. This document intends to serve to a better foccusing of our research and development efforts. This diagnostic study would be commissioned by this SIG, in coordination with the AgentLink Management Committee.

- The edition of a book containing the results of the first year meetings.

- The promotion of project proposals to be presented to the fifth framework program at the beginning of 1999.

- A plan to make the virtual space active by the introduction of agents associated to researchers in the SIG. These agents would contain the user profile and would proactively help in simple tasks like finding partners for projects or prioritizing the messages received from other members of this SIG. This “electronic virtual space” would serve as an example of what the SIG intends to bring to reality.

**SIG01: First report, Brussels, 24 - 25 September 1998**

Electronic commerce is one of the application areas where there is a clear growing interest by the research community on agents and multi-agent systems. This interest is clearly explained by the intuitive metaphor that a market represents in terms of a society of interacting agents. In a market, agents are buyers, sellers, brokers and possibly market staff, that engage in dialogues and interact in specific ways. These electronic counterparts of real trading agents (human beings) may free them from tracking the market, they can help in satisfying the rules of the market and book keeping the commitments associated to the interaction within the market.

Agents may also perform different useful tasks in more open environments, like finding products satisfying a set of users’ requirements (product brokering), or negotiating particular conditions for a commercial transaction on the users’ behalf.

The design of such agents is not an easy task. In the case of electronic markets, the agents’ ‘world’ is constrained, or structured, by a set of strict rules of behaviour. But even in that case, and for sure in the more open settings, there are many factors that are unknown and hence force researchers and developers to find appropriate agent architectures to model these factors. What mental concepts are needed to build agents for electronic commerce was a common concern.

**The First Meeting**

The number of research lines of the participants was very wide, being the most massive one that of negotiation - 6 groups showed interest on this topic. The need for specification environments was a worry and an interest of several groups. Also, the modelling of basic concepts for electronic commerce, such as trust, norms, authentication and preference modelling was pursued by different groups. Generic application domains like auctions was of interest to some of the participants. Research interests were split into ‘agent architectures’ and ‘multi-agent system architectures’. Areas like evolutionary computing, fair protocol design, coalition formation or security were used in the research on multi-agent systems and areas like preference modelling or BDI on the research on agents architectures. There were many positions on what type of agent architectures were suitable for electronic commerce. In the next point I summarise the most prominent ones.

**Agent architectures** The different groups in the meeting pointed out several components in an agent architecture that seemed necessary to model agents participating in electronic commerce:
• **Profile matching** The modelling of user preferences is essential if an agent is to be instructed to perform an automated mediation task. The agent will be faced to different choices and it must be able to establish preferences among them. Different techniques to model profiles, like for instance rough sets, were presented.

• **Deliberative** Different groups are following a deliberative approach to agent design, like modelling using BDI, goals, plans, persuasion. Different approaches to agent architectures were presented, for instance using case-based reasoning or fuzzy rules.

• **Models of personality** The use of psychological personalities can give good means to model strategies for agents in order to behave in a complex market setting. Emotional computing can be effective in modelling the relation between humans and their assistant agents.

• **Mobile agents** The need of giving mobility to agents was acknowledged. The research efforts concentrate on how to guarantee termination, security or exactly-once protocols. To protect agents against malicious hosts agents should contain time-limit validity, and electronic money with expiration date, a part from the need for third parties to give security to transactions.

**Application domains** The attendants of this first meeting showed a variety of interests in what concerns application domains. Market places, Electricity management and retailing were the most common. Other applications were on banking, telecommunications, finance, marketing and shopping assistants. Most applications were at a very initial stage of development. In some cases, researchers just showed their intention to start working in one of the previously listed application domains.

**Products** There were few products presented in the discussion. This shows the early stage of transference from theoretical ideas into realisations that Europe is facing. The presence of many industrials in the meeting, and their presentations, gives a hint, however, that several products are going to appear soon. There were two products presented:

• **Mole 3.0** A mobile agent system written in Java. Its functionalities have been tailored to support electronic commerce. The platform offers reliable execution of agents against failures of the underlying network system. Guarantees exactly-once execution and gives different security mechanisms to avoid malicious attacks to the mobile agents. Contact: Markus Schwehm (Markus.Schwehm@informatik.uni-stuttgart.de).

• **FM 96.5** A platform for the creation of auction houses. Current protocol is Dutch. Tools for monitoring are provided. The creation of agents is supported by program patterns in CommonLisp, C and Java. Free distribution (http://www.iiia.csic.es/Projects/fishmarket).

The company Living Systems presented their product at the SIG on Intelligent Information Agents and Cambridge consultants expressed their intention to extend their current products on electronic commerce (EasyChoice and NewsVenturer) with agents’ technology.

**Analysis of the First Meeting**

The meeting showed a good balance between Academy and Industry (7 industrial group presentations and 8 research group presentations). There was a high level of coincidence in the needs and the challenges for the future. The number of products presented was very short. This is something that will probably change in the near future as long as there is already a dozen projects funded by the Commission involving the development of such products, and the development plans that several industries presented at the meeting. The fifth framework program will probably influence in a quicker product development.

Most of the 26 attendants presented interdisciplinary work, and pointed out lacks in their research that would profit from more interdisciplinarity, economics and social sciences should
be the target communities for this. The two panels, on theory and practice, showed some
sintony between the participants.

The use of agents in electronic commerce has been justified by several authors by the fact that
they can free traders from trading details, can explore more possibilities and are more efficient
that human traders. In order to reach this functionality, the panel on theoretical challenges
focussed on a series of issues that the community has to face.

It was a quite common thought that economic models should be useful in order to build strategies
for agents. However, most of the theoretical models coming from economics are not valid for
multiple encounters, which is a more than probable scenario for agent-mediated electronic
commerce. Inspiration should come from other fields, like social sciences. Also, a more clear
connection between logic and game theory, and models for electronic commerce are missing.
For instance, in the connection between the modelling of obligations, which has been undertaken
in logic, and electronic commerce, where obligations are of vital importance -as for modelling
contracts. The importance of producing standards and specification environments as an outcome
of the research was stressed during the discussion. FIPA was considered, given its more that
50 members from over the world, a good framework for the management of standards.

The panel on practical challenges brought into discussion some of the key issues for the
practical development of agent-mediated electronic commerce. Given the open environment
that electronic markets will represent, agents necessarily will have to be adaptive. Also, mobility
is, in the long term, an essential issue. The modelling of trust, the creation of virtual enterprises
and the enormous variety of legal issues that the community has to face were also discussed
by the members of the panel.

Future Work
As an outcome of the first meeting of the SIG on Agent Mediated Electronic Commerce a
series of actions were agreed by the participants:

1) The co-ordinator will do actions in order to involve in the SIG activities those groups belonging
to consortia already funded by the commission. Probably the short time in preparing and
distributing the information about the kick-off meeting made it difficult to have a more massive
presence of such groups.

2) The web pages are going to be kept alive, and pointers to the slides of the presentations are
going to be provided to the co-ordinator by each of the speakers, to increase the mutual
knowledge of the participants and their research interests.

3) The green paper, whose elaboration is one of the objectives of the SIG, will start by the
generation of a questionnaire to be distributed between the members of the SIG and other
researchers and developers involved in the area.

4) Finally, it is planned to organise the next meeting around working groups. The four working
groups that appear to be of most interest are: i) Negotiation, ii) Market and protocol

Next meeting will take place in London during PAAM, 21-22 April. There will be common activities
with other SIGs that will be announced shortly.

Carles Sierra

SIG01: Second report, London 21 - 22 April 1999

After the kick-off meeting in Brussels last year this meeting was aimed at focussing on those
particular topics that appeared to be of maximum interest to the research and development
groups of the SIG. These topics both structured the meeting and proved to impact on the
practical outcome of the meeting as explained below.
The meeting’s overall objective was to discuss an initial assessment of a technological roadmap for the area of interest. This technological roadmap will become, as a result of the discussions of this meeting and the necessary post editing by all participants, the practical outcome of the meeting. This paper will cover one of the initial objectives of the SIG: to come out with a ‘green paper’ of the area. Hence, all participants had in mind the three key questions to answer during the meeting: where is Agent mediated Electronic Commerce going to be in the near future?, Where is agent mediated electronic commerce now?, and how are we going to make the way through?.

We organised the meeting around four working groups that attempted both to put on the table techniques that the European groups are working on and to answer the questions that would structure the technological roadmap. This report describes, in a cursory fashion, the discussions that took place and the topics that were addressed. The detailed paper, containing the concluding results, will be made available through the web page of the SIG by the end of summer.

The four topics found most relevant during the kick-off meeting were: negotiation, market and protocol specification, preference modelling and security. Before the meeting all participants showed their interest in one or several topics. As preference modelling and security showed a lower interest but had some arguable relation, we ended up with three different working groups. During the last afternoon a joint panel between the AmEC and the I2A SIGs took place.

Negotiation

The working group on negotiation started by an introductory lecture given by Nick Jennings. He argued that the second generation of e-commerce systems will be based on a much richer interaction than the current systems. This interaction would be based on argumentation and flexible protocols. A series of short presentations by Eugenio Oliveira, Carles Sierra, Nir Vulkan and Shamina Paurobally focussed next on different relevant aspects of the research on negotiation. The need for adaptive agents, special architectures for argumentative negotiation, and formal models for negotiation were the main topics addressed by these talks. Basically the agreement was reached that we need much more flexible forms of negotiation to overcome the currently very simple forms (such as auctions). Also, in order to be able to do negotiation on goods of high value, more efforts must be spent on better forms of trust modelling.

Finally, a panel chaired by Frank Dignum and with the participation of Nick Jennings, Ana Paula Rocha and Nir Vulkan discussed about the characterisation of negotiation problems, about which domains were more adapted for the application of negotiation techniques and about the series of problems to overcome. The discussions were very lively among the participants. It was clear that negotiation is probably the highest topic of interest to the SIG participants.

Market and Protocol Specification

This working group started with a detailed presentation on ‘Markets and protocols’ given by Frank Dignum. He covered many different aspects such as the impact of electronic markets on the supply chain or the role of organisational perspectives (institutions) in the design of markets. He extensively discussed the different types of auctions and argued that one of the hot topics of future research will be the design of electronic institutions. Then some short presentations by Maria João Viamonte, Fredrik Ygge and Carles Sierra focussed on mechanism design, electronic institutions specifications and on models for electronic market places.

Finally, another panel, chaired this time by Chris Preist, focussed on the possible alternative designs for markets. (Elements like reputation agencies and strongly institutionalised systems enforcing behaviour appeared as near yardsticks in the design of markets.) Travel agencies and retailing were identified as the domains where the next wave of applications will appear. As important factors to take into account when designing markets, efficiency and trust were highlighted. It was suggested that a good application area to focus was that of high liquidity markets. The panelists expressed their opinion that in order to design market more research is needed at the frontier with marketing, psychology and social simulation.
Preference modelling and security
Vania Conan talked about the problem of preference modelling within the context of the European funded project AIMEDIA. He argued about the importance that personalization has in the context of electronic commerce and proposed that machine learning techniques are needed for personalization to be more effective. In particular, data mining techniques seem very appropriate to determine users’ profiles. The other two big research areas identified by him were negotiation and context perception. Mehdi Dastani and Gerd Voelksen gave short presentations about the important issues in preference modelling, i.e. representation, learning and roles.

A panel, chaired by Markus Schwehm, focused on different questions about preference and security. The participants in the panel were Gerd Voelksen Mehdi Dastani and Vania Conan. The business scenarios detected as the most promising for the near future were business-to-business and retailing. Panelists argued that preferences should be modelled as a dynamic component, hence the need for learning and case-based reasoning techniques. Also, fuzzy logic and data mining where considered as interesting general approaches for profiling. The open research issues mentioned included standards for security and the automatisation of user profiling.

Joint panel AmEC-I2A
In the afternoon of the second day a joint panel between the I2A and AmEC SIGs took place. Walter van de Velde was the chair and the participants were Markus Schwehm, Eugenio da Costa, Vania Conan, Fredrik Ygge, Mihai Matskin and Matthias Klusch. The discussion was centred on the intersection that can be found between the integration of physical and immaterial spaces, the technology, and the user. Many of the arguments that appeared during the previous discussions reappeared here, namely negotiation and adaptability. A paper containing the detailed discussions will be edited by Walter van de Velde. Check the web pages of the SIG to keep track of the status of the paper.

Analysis
The atmosphere of the discussions in this meeting was very good. I think that we made quite a progress in detecting which are the relevant points for the research in the upcoming period. Thus, my assessment is that we are in a position where a clear roadmap can be prepared among the participants. I’ll take the responsibility of editing the paper from the input received from the participants in the meeting.

We also agreed that the next meeting will take place in Barcelona during the week 20-23 of September. I’ll take care of the arrangements for this meeting. The focus will be around the final discussions on the draft of the roadmap and the presentation of papers to be included in the book that we will prepare as a general outcome after the first year of work of this SIG. The book will be organised around the main topics detected in the roadmap.

More information on this SIG can be found at:
http:///www.iiia.csic.es/AMEC

Carles Sierra

SIG02: Methodologies and software engineering for agent systems

It is crucial that the basic principles and lessons of software and knowledge engineering are 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 - following little or no rigorous design methodology and with limited specification of the requirements or design of the agents or of a multi-agent system as a whole. To develop methods with which both the requirements on such systems and the systems themselves can be modelled and specified at a conceptually
acceptable level of detail, characteristics of real-world multi-agent applications need to be identified, in relation to specific domains. Such specifications describe the semantics of systems without concern for implementation details, providing a basis for verification, validation and testing of the functionality of the systems in the light of the specified requirements. The purpose of this SIG is to focus on these issues. As such, the SIG will bring together a strong sub-community of AgentLink in an area of particular European strength generally.

Specific topics to be addressed within this SIG are:

- requirements engineering for agent systems;
- analysis and design techniques for agent systems;
- formal techniques for specification, design, and verification of agent systems;
- specific ontologies for agent requirements and agent models;
- reuse of agents and agent components;
- libraries of generic models of specific types of agents and agent components;
- validation and testing techniques;
- tools to support the agent and multi-agent system development process.

SIG02: First report, Brussels, 24 - 25 September 1998

It is crucial that the basic principles and lessons of software and knowledge engineering are 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 - following little or no rigorous design methodology and with limited specification of the requirements or design of the agents or of a multi-agent system as a whole. To develop methods with which both the requirements on such systems and the systems themselves can be modelled and specified at a conceptually acceptable level of detail, characteristics of real-world multi-agent applications need to be identified, in relation to specific domains. Such specifications describe the semantics of systems without concern for implementation details, providing a basis for verification, validation and testing of the functionality of the systems in the light of the specified requirements. The purpose of this SIG is to focus on these issues. As such, the SIG will bring together a strong sub-community of AgentLink in an area of particular European strength generally.

The main purpose of this SIG is 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. This concerns, in particular, people addressing the following topics in their research or practice:

- requirements engineering for agent systems
- analysis and design techniques for agent systems
- formal techniques for specification, design, and verification of agent systems
- specific ontologies for agent requirements and agent models
- reuse of agents and agent components
- libraries of generic models of specific types of agents and agent components
• validation and testing techniques
• tools to support the agent and multi-agent system development process

This SIG aims at exploiting synergy from the interaction between the software and knowledge engineering communities and the agent community, and has a strong emphasis on practical use in industry.

The first meeting
The aim of this kick-off meeting was to establish a detailed agenda for the SIG, mapping out the key issues that need to be addressed in order to make agent-based software development a reality, and the key interests and problems of participants. To participate, attendants sent a position statement, stating the key issues to be addressed in order to realise the vision of agent-based software engineering, and summarising own work addressing these issues.

The meeting was structured in sessions with presenters around five perspectives: industrial, component-based, interactional/organisational, programming languages & foundations, and knowledge engineering perspective. To obtain a form of unification of the outcome of the meeting, in each of the sessions the following points of attention were addressed:

1. Design description. Methods and techniques to obtain a design description of an agent system; i.e., conceptual modelling/specification languages used to describe a system design.

2. Properties and analysis. Methods and techniques to specify and establish (required) properties of an agent system and relations between these properties; e.g., as needed in requirements engineering and formal analysis or verification.

3. Implementation. Methods and techniques for implementation in the context of prototyping or of achieving an operational system.

4. Reusability. Methods and techniques to specify and maintain reusable models and reusable software for multi-agent systems, agents and agent components.

5. Tool support. For example, requirements engineering tools, design tools, prototyping tools and implementation environments, verification tools.

6. Other. For each of these points, identification of existing potential: what was already achieved, and issues to be addressed: what has still to be done.

Design description In recent years various conceptual and logical modelling languages for agent systems in informal, semi-formal or formal graphical, textual, or logical form have been developed. Examples are:

• AALAADIN (University of Montpellier, interaction/organisational perspective)
• ACL, agent communication language (FIPA)
• Concurrent METATEM (Manchester Metropolitan University, temporal logic perspective)
• DESIRE (Free University Amsterdam, component-based/knowledge engineering perspective)
• MAGMA (University of Grenoble, interaction/organisational perspective)
• MAS-CommonKADS (University of Valladolid, knowledge engineering perspective)
• KSM (University of Madrid, knowledge engineering perspective)
• 3APL (Utrecht University, programming semantics/dynamic logic perspective)
A number of aspects have still to be addressed, and also a need for some form of unification of the various approaches is felt:

• UAML: a Unified Agent Modelling Language
• Substantiated extension of OO to agent-oriented SE; extending/modifying UML
• Documentation/design rationale
• Reference architectures for classes of agent system applications
• Extending logical approaches beyond simple examples, to more complex models
• Logical foundation for languages addressing more complex applications
• Extending existing languages with, e.g., ACL and dynamic agent creation
• Real-time aspects
• Languages for modelling mobility, with concepts to express, e.g., places/locations, migrations of agents

Properties and analysis A number of approaches to specify and relate properties of agent systems in informal, semi-formal or formal form have been developed. For example:

• ALBERT II, a temporal logic specification language to formalise requirements for real-time agent systems (University of Namur)
• Compositional verification of temporal properties by mathematical proof (Free University Amsterdam)
• Automated verification of temporal logic specifications for simple models by logical proof (Manchester Metropolitan University)
• KARO, a multi-modal framework for formalisation of agent attitudes (Utrecht University)

A number of issues still have to be addressed:

• Requirements engineering methods for agent systems
• Ontologies and patterns for requirements
• Making formalisation more computational; achieving groundedness of formal approaches: most formalisations have no systematic and well-defined relation to descriptions of actual agent systems
• Standard relation between formalised properties and design description
• Emergence as dynamic compositionality
• Formal verification methods for more complex models
• Compositional verification based on logical proof
• Systematic testing methods
• Extension of single-agent attitude frameworks to multi-agent systems
• Proof methods for combinations of temporal logic and logics representing mental state (e.g. belief, knowledge)
• Substantiation of properties such as mobility, security, co-ordination, heterogeneity, and interoperability
• Translations of easy-to-use, e.g. graphical, formalisms into formalisms such as temporal logic

**Implementation** A large number of agent implementation environments have been developed. For example:

• Many variants of agent software; e.g., in Java
• Environments for automated executable prototype generation from a formal conceptual design description (execution environments included in the software environments of ConcurrentMETATEM and DESIRE; interpreters of 3APL)
• Concurrent logic programming based toolkit: APRIL (Imperial College)

Needed is:

• A well-defined link between conceptual modelling languages and different existing implementation environments; agent oriented programming languages (graphical, textual,...) for implementing agent oriented design specifications
• Higher-level implementation languages providing agent concepts (e.g. goals)
• Compilers for interpreted conceptual or logical languages (such as 3APL)
• Implementation of ACL
• Interface software to existing robots

**Reusability** The following is already achieved:

• Notion of generic model (developed within the knowledge engineering community)
• A number of generic agent models
• Various generic models of tasks (developed within the knowledge engineering community)
• Generic requirements patterns (e.g., within ALBERT II)
• Reusable agents and agent components: models and software
• Library of reusable agent and agent component software (e.g., JIAC, University of Potsdam)
• Reusable verification proofs and generic proof patterns
• Reusable organisation structures (e.g., AALAADIN)
• A philosophy of constructing generic agents
Needed:

- Library of reusable agents and agent components: models and software
- Library of reusable agent capabilities
- Library of reusable organisation structures
- Library of reusable verification proof patterns
- Compositional semantics of combined approaches
- Development of compositional proof methods to support modularity
- Library of reusable knowledge about successful applications of certain agent technologies.

**Tool support** Achieved:

- Graphical conceptual design tools for some approaches
- Tools for automated generation of executable prototypes from formal conceptual design specifications
- Execution environments
- Verification tools for temporal logic specifications of simple models

Needed:

- Software environment to support requirements engineering for agent systems
- Software environment for verification of more complex models
- Compilers for agent oriented programming languages
- Agent development environments, incorporating full range of activities from requirements to verification and implementation.
- A debugger, in particular for distributed mobile agent systems

**Other** Achieved:

- Standardisation efforts (e.g., MAF/MASIF, FIPA, and UAA)

Needed:

- Support for the development process (e.g., life cycle)
- Pragmatics of the development process: guidelines
- Methods tuned to specific application areas (manufacturing, information management, electronic commerce)
- Evolution of agent systems
- Explicitation of the difference with other Software Engineering
When should Agent Technology be used for a specific application; explicitation of the benefits of certain agent technologies for certain application areas

Future work
For the short term, medium term, and long term future a number of agenda items were identified.

Short term (< 2000)
- Explication of why existing approaches such as UML are not sufficient, and of how development of agent systems is different
- What are crucial issues for development of a UAML
- What can agent technologies contribute today to today’s mainstream software engineering approaches and languages such as UML, CORBA, and Java

Medium term (< 2002)
- Filling gaps in the technology
- Spectrum of methods tuned to different application domains
- Pilot studies and assessments

Long term (= 2002)
- Developing a UAML
- Grounded foundational approaches: well-defined relations between formalisations and descriptions of actual agent systems
- Practical implementations / realised agent application systems
- Influence on standardisation efforts and platform developers

Jan Treur

SIG02: Second report, London, 21 - 22 April 1999
This SIG meeting was organised in the form of four half-a-day working groups. Themes addressed in the different Working Groups were:

- Design and Specification; Unified Agent Modelling Language
- Logical Foundations
- Requirements Engineering and Verification
- Relation to Existing SE Methodologies

Although the working groups in principle were independent, the participants in the working groups had a large overlap, with an exception of the logical foundations working group, which had a substantially lower number of participants.

In each of the working groups a research agenda for the theme was discussed (in continuation of the first SIG meeting), for the short term (1999), mid term (2000 - 2001), and long term (> 2001).
Design and Specification and UAML
The chairman of this Working Group was Jean-Pierre Müller. Presentations were performed by: Marie-Pierre Gervais, Bernhard Bauer, Rune Gustavsson, Olivier Gutknecht and Jean-Pierre Müller. The discussion focused mainly on the development of a Unified Agent Modelling Language (UAML).

The following short term aims were discussed:

- Define requirements for UAML (e.g., precise semantics, verification and validation, automatic code generation, include primitive agent concepts; which
- Identify what is already achieved by UML, and what are shortcomings (e.g., complex behaviour requirements, knowledge-intensive functionality)
- Define a first extension of UML
- Test this extension in projects
- Submit a proposal to FIPA2000

Identified mid term aims are:

- Develop graphical language and modelling tools
- Develop formal semantics
- Develop code generation tools
- Develop execution, test, debug tools
- Integrate both emergentist design and agent-based design methods
- Develop precise relations between global (organisational) specifications, local external agent specifications, and local internal agent specifications
- Identify and characterise classes of applications (e.g., distributed manufacturing systems, information agents, Electronic Commerce, ...)
- Develop dedicated modelling elements for a given class of applications
- Develop libraries of reusable models/patterns for: organisations, interactions, reusable agent models, agent components, tasks/problem solving methods, ontologies, knowledge bases
- For a given implementation platform, develop guidelines/automated support for implementation of a model

Long Term aims:

- Further maintenance and development of the modelling language
- Supporting tools (A-CASE tools)
- Development of formal semantics

Logical Foundations
The Working Group on Logical Foundations was chaired by Michael Fisher. Presentations were performed by him and John-Jules Meyer. It was felt that the use of logical foundations in practice is problematic, and it is not clear how this can be changed. A number of difficult questions were identified:

- What use are logical foundations in practice? (of no use in today’s practice, should become of more use (verification), but how?)
- How can we get more people to use formal approaches? (visualisation & graphical tools?)
- Will a logical semantics of UAML be possible?
- Is a grand unified (logical) theory possible? (is far away)

**Requirements Engineering & Verification**

Chairman of the The Working Group on Requirements Engineering and Verification was Jan Treur. Presentations were performed by Michael Petit, Jan Treur, and Paul Kearney.

As a short term aims it was identified:

- Development of a software environment for verification based on theorem proving

Mid term aims identified were:

- Development of a software environment for verification based on model checking
- Informal, semi-formal and formal representations of requirements and scenarios and relations between them (graphical form, library of requirement templates/patterns)

Long Term aims identified are:

- Two way relation between global phenomena and properties of agents
- Development of a software environment for requirements engineering for agent systems

**Relation to Existing SE Methodologies**

The Working Group on Existing SE Methodologies was chaired by Carlos Iglesias. Presentations were performed by him and Alexander Lauert.

Short term aims identified are:

- Determine demands specific for agent development methodology
- Compare these demands to offers from existing SE approaches

Mid and long term aims:

- Better exchange and integration with other communities (e.g., SE/OO, KE, RE, PE, DCS, logic-based)

**General issues**

Some general issues put forward are not restricted to one of the Working Groups, but of a more general type:

- Determine the different models that are needed (e.g., organisational specification, requirements at different process abstraction levels, system design specification)
Relations between different forms of specification
Create glossary of agent concepts
Characterise what makes agent systems different from other systems
Relations between formal and informal
Reusable ontologies (in XML ?)

On the basis of the identified issues a road map for the area of this SIG will be designed this year. A draft version of this road map will be discussed at the third SIG meeting in September in Barcelona.

Jan Treur

SIG03: Intelligent information agents

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.
The research and application area of Intelligent Information Agents (I2A) is of rapidly increasing importance. Information agents are computational software systems that have access to multiple, heterogeneous, and geographically distributed information sources. A common task of such agents is to perform, on behalf of their users or other agents, active searches for relevant information over both local and remote domains. These complex searches will require that agents have the ability to retrieve, filter, analyse, manipulate, and integrate the information discovered.

Information agents have to cope with the increasing complexity of modern information environments, ranging from relatively simple in-house information systems, through large-scale multi-database systems, to the much-vaunted cyberspace over the Internet. To cope with such information environments agents will have to deal with uncertain, vague or even incomplete information. Indeed, the effective handling of uncertainty is critical in designing, understanding, and evaluating computational systems tasked with making intelligent decisions.

As described in its original statement of Purpose & Goals, the main aim of this SIG is to provide a European interdisciplinary forum for industrial and academic parties involved in the research and development of intelligent information agents – and in particular, intelligent information agents in open, distributed information environments.

The SIG is interested in understanding the extent to which techniques and methods from areas such as Artificial Intelligence, Database Systems and Information Retrieval can be applied to the problem of information discovery by single or groups of information agents in the Internet or World Wide Web (WWW). Methods which have already born fruit and so are of particular interest here include: means for promoting interoperability among heterogeneous systems and sources, techniques from machine learning and evolutionary computing for adaptive filtering and user profiling, as well as a variety of symbolic and numerical approaches for reasoning about uncertainty.

A number of long-term goals have been established for the SIG. These include:

- Understanding the benefits, constraints and limitations of applying agent technology to database, multi-database and other information systems and environments.
- Investigating the impact of information agents on the everyday life of users in cyberspace. This could range from assessing the usage of today’s relatively simple ShopBots or SearchBots, to investigating the impact of more sophisticated rational, utility-based, or adaptive agents in the real-world electronic marketplace of the Internet.
- Investigating the various issues involved in modelling the interactions between humans and agents, as well as between agents and agents. Techniques of particular interest are those for providing cost- and time-effective navigating and searching over large, unstructured multimedia information spaces.
- Identifying methodologies for the specification, analysis, design and implementation of different types of information agents (and systems of information agents).
- Establishing benchmarks for measuring the performance and efficiency of information agents (and systems of information agents) in dynamic, open information system environments;
- The development and prototypical implementation of novel types of information agents for the Internet or WWW.

The I2A SIG is intended to promote synergetic efforts on applying software agent technology to databases and information systems in open environments such as in the Internet and large
corporate intranets. It is expected that the SIG will help to solidify existing and establish new cooperative ventures among I2A research groups; in addition, it should help focus scattered efforts in I2A and related fields.

The First Meeting

The purpose of the SIG kick-off meeting, then, was to provide an initial gathering in which I2A researchers and practitioners could exchange information, share research findings, and discuss potential collaborations and partnerships in intelligent information agents. Researchers and developers from a number of areas of activity were targeted, including Artificial Intelligence, Database and Information Systems, Information Retrieval and Information Sciences, Distributed Computing, Computer Support Cooperative Work, Formal Methods, and Human-Computer and Human-Agent Interaction.

The meeting was divided into two half-day sessions. The morning session started off with some general remarks from the chair and SIG co-coordinator Innes Ferguson, followed by a panel session on communication, co-operation and knowledge management in open environments. The panel session consisted of eight brief presentations, followed by a fairly lengthy and open discussion on issues arising from the scheduled talks. Stefano Antoniazzi (Italtel, Italy) addressed the impact of modern-day interactive multimedia appliances (such as set-top boxes) on user interface design and described work on a Java-based Web browser for home appliances. Chihab Hanachi (CERISS University of Toulouse I, France) described his group's work on active databases and the application of petri-nets to cooperative objects. Misbah Deen and Chris Johnson (University of Keele, DAKE Centre, UK) described their group's work on cooperating knowledge-based systems and their application to manufacturing, diagnostics and fault repair. Aldo Dragoni (University of Ancona, Italy) presented his group's work on evaluating the reliability of information sources and the modelling of various characteristics of these sources such as reliability, truthfulness, competence, efficiency, and relevancy. Pascal van Eck (Vrije University of Amsterdam, The Netherlands), standing in for his colleague Catholijn Jonker, described their work on information brokering agents and the role played by metadata and ontologies in helping to mediate between users and information providers. Klaus Fischer (DFKI, Germany) gave an account of the application-oriented MAS research taking place in his lab, which has already generated several applications in such areas as loading dock automation, transportation scheduling, traffic telematics, and virtual enterprises. Anna Ciampolini (University of Bologna, Italy) discussed her work on designing agent architectures and the integration of abductive logic for operating in open, multi-agent worlds. To end the presentations section of the panel, Mihail Matskin (Norwegian University of Science and Technology, Norway) described his group's work on agent architectures and their application to supporting cooperative work and electronic commerce.

The morning session was completed with demonstrations of two information brokering systems: OntoBroker by Stefan Decker from the University of Karlsruhe, and a multi-agent system for information brokering by Pascal van Eck from the Vrije University of Amsterdam.

The afternoon block started off with an invited talk titled “Economics, Markets and Rational Information Agents” by Scott Moss of the Manchester Metropolitan University. In addition to providing a theory describing the conditions under which one would want to use information brokers (rather than obtaining the information oneself), Scott addressed the question of why economics is increasingly being regarded as important to I2A, and compared the relative virtues of social versus economic modelling.

The invited talk was followed by a panel/discussion period on adaptive information agents and virtual information spaces. Wolfgang Pohl (GMD FIT-HCI Research Dept., Germany) described his group’s work on information brokering, user modelling, and user-tailored information environments. Vadim Ermoyalev (Zaporozhye State University, Ukraine) presented work on a CORBA-like architecture that addresses the semantic gap between users and systems designers. Daniel Ballin (University of Salford, UK) gave an overview of his group’s work on
the development of avatars and synthetic information agents and their application in intelligent virtual environments. Paolo Petta (Vienna University of Technology, Austria) gave an account of his work on providing intelligent support for exploration in open-world information domains. And David Merceron (EURIWARE, France) described his group’s work on applying machine learning and interface devices such as avatars to facilitate the interaction between human and software agents.

Following the panel session, two system demonstrations were given: one on electronic auctions by Kurt Kammerer from Living Systems AG and another on collaborative information gathering by Keiichi Nakata from the FIT-CSCW group at GMD. The day was completed with a group-wide roadmap/planning session.

The first I2A SIG meeting was widely regarded as a success by its 27 participants. Although an incredibly large number of topics and areas of study were represented - to be expected, perhaps, given the highly multi-disciplinary nature of the SIG - there was also much overlap in both purpose and interests. The top five among these essentially common interests included:

- Information (modelling such dimensions as its relevancy, quality, or currency; and performing actions over it such as search, discovery, and personalization);
- Agent architectures;
- Ontologies and metadata extraction and representation;
- Brokering, mediation, and interoperation (including issues pertaining to human-agent, agent-agent, and agent-legacy interfaces); and
- Databases (active, cooperative, federated).

Future Work

Most, if not all, participants expressed an interest in forming collaborations and to co-operate in one form or another. Moreover, concrete statements of interest were given to jointly propose specific projects for future EU funding (e.g. the upcoming Fifth Framework). A number of specific action items were also raised, several of which have already been accomplished or are actively being worked on. Among those already accomplished are the creation of a majordomo mailing list (infoagents@gmd.de), which interested parties are invited to submit contributions to; and the deployment of a BSCW shared workspace for the exchange and sharing of research publications, software, and SIG documents. (Contact Keiichi.Nakata@gmd.de or klusch@cs.cmu.edu if you’re interested in using this facility.) Ongoing action items include promoting the SIG to related communities - in particular, HCI, CSCW, Distributed Computing, and Database Technology - and actively “recruiting” more industry-based practitioners, to balance the predominantly academic make-up of the present-day SIG.

The next scheduled I2A SIG meeting will be at the PAAM-99 conference in London, UK (April 21-22, 1999), which will be held in conjunction with AgentLink’s other SIG meetings. For up-to-date information about the I2A SIG and its upcoming activities, and to obtain more detailed research reports from the participants cited above, check out the SIG’s homepage at:

http://www.informatik.tu-chemnitz.de/~klusch/i2a-SIG.html.

Matthias Klusch

SIG03: Second report, London, 21 - 22 April 1999

The purpose of the second meeting was threefold: Firstly, to report on the proceedings of collaborations which have been initiated and set up among SIG participants since the first meeting, secondly, to present new advanced work of R&D groups active in the I2A area, and finally, to discuss potential working groups within the SIG focussing on few main topics and significantly relevant issues of research and development of information agents. Accordingly,
the agenda of the two-day meeting comprised two sessions for selected presentations of projects and groups, one session for software demonstration, a keynote talk, one common session with the AgentLink SIG on Agent-Mediated Electronic Commerce (AMEC), and four panel sessions for working groups.

After a brief welcome and some general remarks from the SIG coordinator Matthias Klusch, the morning session of the first day started off with a keynote talk of Norman Sadeh from the European Commission, DGXIII, about the pro-active initiative Universal Information Ecosystem (UIE) in the European research program IST (Information Society Technologies). He emphasised the intent of the UIE initiative to encourage in particular all kinds of ‘revolutionary’ projects towards R&D of new technologies used by highly dynamic population of infohabitants of emerging, adaptive, scalable and open information ‘ecosystems’ including future cyberspace (http://www.cordis.lu/ist/fetuie.htm). This talk attracted much interest and stimulated intense discussion on project ideas of attendees partially even late night the same day. The session continued with a block of four selected presentations on industrial and research collaborations as well as perspectives and concrete proposals for joint projects among SIG participants.

Vadim Ermolayev (Uni Zaporozhye, Ukraine) presented motives, perspectives and potential of R&D on intelligent agents for organisational management and teaching in eastern Europe, especially the Ukraine. Dieter Fensel (Uni Karlsruhe, Germany) contributed a short description of the ESPRIT project called IBROW3 on Internet-based brokering services for knowledge reuse including, for example, the development of ontology-mediated facilities to bridge heterogeneous information systems, an ontology editor, and a fairly plain graphical user interface of OntoBroker system. Chihab Hanachi (Uni Toulouse, France) reported on first steps towards a joint project with another SIG participant, the DAKES Center of the University of Keele, UK, on collaborative agent systems facilitating cross-organisational workflow among different companies/corporations. To end the presentation session, Klaus Fischer (DFKI GmbH) gave an outline of the so-called CASIMA project which deals with research and development of an agent-based pan-European intelligent information and trading network infrastructure for agriculture industry; the project is a collaborative effort of six AgentLink members.

In the afternoon, two panel sessions on the key topics of two working groups on agent-based mediation among information systems, data and knowledge management, and communication, coordination and collaboration (C3) among information agents were held and chaired by Dieter Fensel and Paolo Petta (Austrian AI Institute, Austria), respectively. The first panel started off with an overview from Sonia Bergamaschi (Uni Modena, Italy) about past and current R&D activities towards utilisation of coupled AI/Database techniques for integration of heterogeneous information sources including known approaches and systems like TSIMMIS, InfoSleuth, InfoMaster and MOMIS. Leon Sterling (Uni Melbourne, Australia) gave an account to XML-based integration of ontologies and sketched some of the work of his group on single, adaptive information agents for information retrieval in the Internet, like SportsFinder. Hans-Juergen Mueller (Deutsche Telekom AG, Germany) presented his group’s work on composition and configuration platforms for Internet-based applications, in particular how to support effective knowledge management based on the concept of a so-called ‘knowledge factory’. Hans Weigand (Uni Tilburg, Netherlands) shortly described the most prominent R&D projects carried out by his lab, like TREVI, MEMO and DECOMATE/CIA, in the areas of basic language ontology, electronic commerce, and use of description logic for intelligent integration of information, respectively. Finally, Richard Benjamin (Uni Amsterdam, Netherlands) briefly presented an approach for intelligent web page annotation and information search which was very lively debated. Due to the discussion and comments on given presentations the following three key topics and issues were identified for upcoming joint effort by SIG participants in that working area:

1. Methods and standards for interoperability among heterogeneous, distributed information sources of different corporations,
Intelligent information brokering and matchmaking; this includes, for example, agent capability description languages and tools, (re-)use of common, minimal or domain-specific ontologies and meta-data tools, and

Agent-based support of (semi-automated) knowledge management in different enterprises and corporate virtual private networks or Intranets.

The second panel session was devoted to the working area of communication, coordination and collaboration (C3) among information agents. The panelists were Paolo Petta, Franco Zambonelli (Uni Modena, Italy), Luigi Serafini (IRST Trento, Italy) and Monica Divitini (Uni Trondheim, Norway). Coordination was seen as the sum of conventions and commitments in a multi-agent environment, means as the process to ensure coherency (unity) of multi-agent systems. The presentations given by the panelists comprised, for example, the relation of C3 to CSCW in real-world context, the analytical distinction among basic C3 capabilities of an agent, the role of artefacts and possible approaches for metrics of C3 as well as the increasing need of learning and dynamic management of coordination in steadily changing collaborations of information agents. In general, the discussion mainly suffered from the fear of potential overlap with the objectives of the AgentLink SIG on Multiagent coordination and control. At the end several key topics and issues to be addressed by joint efforts uniquely in the I2A SIG have been worked out; the main topics are:

- Communication methods and standards, like intelligent, agent-based CORBA compliant service facilities for coordination and collaboration, basic shared ontology for C3, and advanced interfaces for standardised agent communication language (FIPA ACL),
- Formal coordination models and reference scenarios for collaborative information agents,
- Learning and metrics of quality of C3 in the context of cooperative information agents and systems.

The second day of the meeting started off with a short classification of intelligent information agents by the SIG coordinator who even briefly sketched some project proposals as one already accomplished goal of this meeting after the first day. The morning session was divided into one presentation from Martin Schneider (Siemens AG, Germany) describing the work of his group on a client/server-based agent broker for project matching, and two software demonstrations. The first demonstration was given by Pascal van Eck (Vrije Uni Amsterdam, Netherlands), standing in for his colleague Catholijn Jonker, on an intelligent Website architecture for information agents. Even interesting was the second live demonstration which addressed collaborative user profiling performed by the CASMIR agent system which has been developed at Uni Salford, UK.

The afternoon was devoted to the discussion of two more working groups, the third one focussing on the areas of Human-Agent interaction (HAI) and interfaces for information agents, the fourth one dealing with the relation of information agents and electronic commerce. The panel session on the third working group was chaired by Jeremy Pitt (Imperial College, UK), the panelists were Daniela D’Aloisi (FUB Rome, Italy), Mathias Bauer (DFKI GmbH, Germany), Vadim Ermolayev and Ian Dickinson (Hewlett-Packard Bristol, UK). After each panelist briefly presented the work of his group and even some ideas on the topics to be addressed by the working group, the following main issues and problems have been worked out in a discussion:

- Convenient inspection of agents by user, more transparency of agents’ activity, clear impact of user feedback given in more native language, gestures or media input
- Standard of interface design for different kinds of information agents
- Need-driven not technology-lead products for agents in interfaces (which are not equal to complex agent architectures) and to cope with the danger of raised expectations of anthromorphisation.
• Shared context between user and intelligent interface agent including a common ontology for meaningful understanding in both directions, in particular to avoid that any single agent deployed on the Web will be just an individual curiosity to the user.

Since the last panel session intended to discuss one obvious key topic of the AgentLink SIG on agent-mediated electronic commerce, it was mutually agreed to hold a common session of both SIGs. This common session was chaired by Walter van de Velde (Starlab Ltd., Belgium), the panelists were Markus Schwehm (Uni Stuttgart, Germany), Eugenio da Costa (Uni Porto, Portugal), Mikail Matskin (Uni Trondheim, Norway), Ygge (Uni Karlskrona/Ronneby, Sweden) and Klusch (DFKI GmbH, Germany). The discussion attracted much interest for several different reasons and was sometimes even a bit emotional concerning the evaluation of future vision and current state of the art of personalised agents doing everyday business on the Web including homebanking and online shopping for the average user. Some main questions and issues discussed by the panelists were, for example, how to increase the awareness of users regarding the potential of agent-based computing not only in business-to-customer electronic commerce, the mutual impact of electronic and material commerce, profit maximisation by online retailers vs. users’ cravings for fun and social events, e.g., collaborative shopping (adaptive ShopBots for WebTV, etc.), notions of rationality not only in traditional terms of micro-economic based decision-making behaviour of trading agents. More detailed information on the outcome of this panel discussion will be available in a separate contribution by the panel chair. The status of a joint working group among AMEC and I2A SIG remains to be clarified. At the plenary meeting on April 23 the preliminary results of the meeting of every SIG and some additional news and administrative issues related to AgentLink as a whole have been reported.

Outcome of the Meeting
The second I2A SIG meeting had 43 registered participants, means a significant increase of interest since the kick-off meeting. Though, again twice as much attendees came from universities than from industry. But the large number of participants even showed the problem of satisfying different needs of active and passive attendees at the same time during a packed two-days meeting. However, the meeting was widely regarded as a successful event. In fact, much productive efforts towards collaboration and joint projects to propose for the recently started European IST research program have been put together, especially by fostering and establishing new inter-disciplinary contacts among attendees of this meeting in London.

The core activities of the two-day meeting were strongly determined by the panel sessions on the working groups intended to focus the work of the I2A SIG on a few important topics and to produce significant results theoretically and in practice in reasonable time. Actually, three important sub-areas of information agent technology have been discussed for future joint efforts among SIG participants, thereby forming kind of domain-specific working groups, at the meeting. Those groups focus on:

• Agent-Based mediation among information systems, data and knowledge management (WG-1)
• Communication, coordination and collaboration among information agents (WG-2)
• Human-Agent interaction and interfaces for information agents (WG-3)

In mid-term it is expected that each of these working groups will participate in national and European research programs, especially by joint projects among SIG participants in the respective working areas. First steps were taken already to accomplish this objective.

Future work
To further improve the productivity of upcoming I2A SIG meetings it is intended, for example, to restrict the number of participants to a much lesser amount, and to try to ‘recruit’ more industrial attendees. Besides, discussion on current or potential joint projects within the SIG working groups, means collaborative work and efforts among SIG participants in the mentioned
working areas, will be the dominant factor of the next meeting. The next I2A SIG meeting will be held in Barcelona, Spain, in late September this year (probably September 20 - 22, 1999).

The technological roadmap of the I2A SIG for the forthcoming period including that of each of its three working groups will be available as a kind of comprehensive green paper in late summer. In addition, it is intended to publish the preliminary results from substantial efforts within the I2A SIG as a journal article or book at the end of this year.

To facilitate convenient communication among SIG participants an open public majordomo mailing list infoagents@gmd.de, which anyone interested in is invited to submit contributions, as well as a (protected) shared working space (http://bscw.gmd.de/bscw) for exchange of more sensitive documents, like pre-proposals on joint projects among SIG participants, have been created and maintained. Several contacts to related research communities, like that for database and information systems, and information retrieval have been established.

Matthias Klusch

SIG04: Agent-based social simulation

Computer simulation has proved useful for modelling phenomena of traditionally social scientific interest, such as cooperation, coordination, organizational behavior, 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 optimization, 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 socioeconomic 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: First report, London, 21 - 22 April 1999**

The social simulation research community has developed rapidly in recent years, attracting sociologists, computer scientists, logicians and economists (and this list is not exhaustive) who believe that simulation methods can support the analysis of social issues while maintaining the relevance of sociology and the rigour of economics. The result is a happy research community in which participants from different discipline backgrounds use each others’ techniques and approaches to develop new methods and methodologies. We have seen the use of formal logics to represent such concerns of sociologists as trust, belief and helpfulness. Results and representations from cognitive science are regularly used to specify agents in computational organisation theory and a new approach to economic issues unfettered by old, conventional approaches.

This SIG is intended to reinforce the development of a strong European presence in social simulation and also to demonstrate that the disciplines on which the social simulation community draws can themselves benefit from the results obtained by members of that community. Perhaps because of its relative youth or because it encompasses an exceptionally diverse set of academic backgrounds, the social simulation community remains open to new ideas and to new applications. This is a strength on which the SIG is intended to build. The SIG is not intended to be another home for conventional economics. Applications of equilibrium representations of markets and game theoretic approaches to, for example, electronic commerce are already widespread. Where information markets and electronic commerce are applications of social simulation, a bottom-up modelling approach will be encouraged. There is already at least one such project arising from the activities of AgentLink and others are to be encouraged.
The overall aim of the activities of the Agent-Based Social Simulation (ABSS) SIG is to support and initiate joint projects and collaborations among active SIG participants towards research on and development of social simulation for the support of social analysis and to inform developments in software engineering. The SIG supports these aims by

- putting groups with related interests in touch with one another
- providing a discussion forum via regular SIG meetings.
- disseminating information about developments in the field of social simulation
- organising meetings around existing events with topics strongly related to agents and social simulation, such as interdisciplinary workshops, conferences, and symposia.

The First Meeting

The first meeting was characterised by a multi- and inter-disciplinary audience (over 40 participants), including among others Multi-Agent Systems and cognitive scientists, environmental scientists, logical philosophers and philosophers of law, sociologists, economists, physicists, operational research scientists, psychologists.

The meeting was inspired to the principle of promoting a general discussion around research projects and innovative ideas. Presentations and discussions were divided in paper sessions and one panel discussion session. Short presentations have been selected to stimulate discussion in the following main domains:

- **Agent Technology**: existing platforms and architectures in the field of agent systems, which are or can be used for agent-based(social) simulation platform. In this session, some projects for addressing issues of both social scientific and MAS interest were presented and the possibility to implement simulation models with agent architectures rather more complex than those usually employed in the social simulation community were discussed (for example, agents endowed with beliefs, desires, and intentions).

- **Agent Modelling**: the level of complexity of the agent model has been addressed. Some speakers argued that autonomous intelligent agents ought to be implemented in order for simulation models to deal with such social and institutional phenomena as the violation of norms, the solution of normative conflicts, the acknowledgement of norms and institutions, the formation of new ones, etc.

- **Modelling social institutions and group formation**: in some contributions, a radically simplified notion of agency was applied to the study of the emergence of institutions within the framework of complex dynamic systems. On the other side, contributions from the logical philosophical field showed the necessity to integrate a formal/theoretical approach in producing a consistent and heuristic institutional ontology -what is a norm, how to distinguish and therefore acknowledge rights and permissions, etc.? These questions were found preliminary to the modelling of social systems. Finally, the role of social emotions in group performance was also addressed.

- **Infrastructures and Tools**: several different systems and languages have been presented (DESIRE, SDML, MASSIF, CORMAS, etc.). Although not necessarily a disadvantage, this state-of-the-art dissemination requires a common investigation of similarities and specificities of existing tools.

- **Applications**: this range from agent-based simulation of MAS for purposes of evaluation, to participatory policy-making both at the level of development and at the level of verification of the candidate policies. In areas such as resource management, where physical and socio-economic factors are strictly intertwined (Integrated Assessment Modelling), the agent-based approach to social simulation was found especially useful.
During the panel discussion session, the impact of the field on (social) theory building, testing, and its application was emphasised. The issue of how to validate simulation findings, and the necessity for confrontation with adjacent fields (e.g., cultural evolution and neural nets) were identified as possible foci for future meetings.

One fundamental feature of social phenomena was generally acknowledged to consist of feedback loops (for example, between agents to institutions and from institutions back to agents). At the application level, this assumption has a direct impact on the role attributed to agent modelling and implementation in the field of participatory policy-making. Another largely shared assumption concerns the insufficiency of the model of economic rationality as a model of agency for social simulation.

**Future work**
A number of open questions were identified:

- At the theoretical-conceptual level, the issue of emergence was re-examined since its definitory and operational criteria are not clear yet (the relation between emergence and evolution, the direction of emergence - whether from lower to higher level of description or both-, etc.).

- At the epistemological level, two different principles have been debated at some length: the so called “KISS” principle (Keep the model Simple, Stupid) Vs the “KICS” principle (put Conflicts and concurrence into it) Vs the “KIN” principle (model Natural phenomena). The necessity to refer to real and natural phenomena Vs artificial but plausible ones was also discussed.

- At the methodological level, the question of validation is an issue of major concern for social simulators. What kind of data are simulation data?

- At the application level, the utility to design modular tools, which can be implemented one on top of another, Vs concurrent ones and the respective advantages of either option was also discussed.

More information on this SIG can be found at:
http://www.cpm.mmu.ac.uk/abss/

Rosaria Conte

**SIG05: Multi-Agent Coordination and Control**

Multi-agent concepts and methodologies are finding increasing application in controlling complex, unpredictable systems in real time. Agent-like approaches routinely accept uncertainty and distribution, leading to control schemes where decision-making and responsibility are distributed much more widely than in conventional engineering practice. The successes that they have begun to produce are likely to lead to their heavier use, including use in applications that have time-critical aspects. In order for them to succeed in such situations, however, they will need development that addresses real-time and time-critical properties explicitly. This is the motivation for our SIG.

The subdivisions following the one immediately below are labelled in terms of applications, because at present we consider it desirable to drive the selection of basic-research topics by reference to concrete problems that are turning up in specific applications. This SIG will bring together researchers from a number of areas fitting into the paradigm, including:

- Adaptive real-time systems with knowledge-based components
- Manufacturing systems
Robotics including multiple robot systems and robot football.

Adaptive real-time systems with knowledge based components includes traffic engineering applications. Multiple robot systems could include collections of robots which cooperate to perform some form of useful activity such as assembly operations or playing football or other games. The area of intelligent manufacturing systems aims to use multi-agent systems both as a modelling tool and a control software system.

The challenge for the SIG is to identify and focus on the general issues of coordination and control which are important for such applications, and to use the applications to stimulate and test advances in research on the issues, for example:

- How and where to represent information about the systems and the agent groups that operate on them
- Mechanisms (e.g. varieties of caching) for delivery of adequate responses to time-critical demands
- Coordination methods that are computationally economical enough for real-time use
- Decentralised management of limited common resources
- Adaptation of results from machine learning to collective learning in multi-agent systems
- New schemes of decentralised control to take account of the "real time" dimension

The "coordination and control" emphasis in this SIG is because the development of adequate methods for coordination and for control are crucial for the successful operation of multi-agent systems when a real-time discipline is imposed. Progress in other multi-agent topics is desirable too for real-time applications, but it will not be particularly helpful unless the problems of coordination and control are resolved adequately.

**SIG05: First report, London, 21 - 22 April 1999**

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The first meeting
About 20 members and associated members attended the first SIG meeting held at Imperial College, London in April, and set themselves the task of trying to extract a framework for coordination and control by studying the various application areas which were represented. A second task of creating a technological roadmap for the network was also addressed. Participants were roughly equally divided between robot football, multiple robot systems, intelligent manufacturing systems and traffic engineering. In addition, there were a few participants from the world of software engineering to help with the process of distilling a framework for applications in which spatio-temporal coordination was an important issue.

Each group had chosen a “spokesman” who presented the coordination issues from their respective domains. Bo Jorgensen provided an overview of coordination seen from a software engineering point of view. An important, common, coordination mechanism seemed to be the need to satisfy constraints imposed by the application, such as requiring that robots don’t simultaneously occupy the same physical space. The general feeling was that considerable progress towards the first goal had been made. It was proposed to construct a set of questions to be considered by participants for the next meeting, to be held in Barcelona during 5-7 July, immediately after MAAMAW, which will take place in Valencia. This early date was chosen because we felt that we had achieved a certain amount of momentum and synergy.

We also spent some time discussing the roadmap, which should provide answers to the following questions:

- Where do we want to be (i.e. what is our vision)?
- Where are we now?
- How do we get from here to there?

The vision which emerged was of how the next phase of the IT revolution, in which intelligence will be built into mechatronic components, could benefit from multi-agent concepts. We
foresaw this leading to a customized society in which people, software and machines would all be first-class citizens. Developments such as the modular Mindstorm components being produced by the toy manufacturer Lego, represented at the SIG by the LEGOlab from the University of Aarhus, were seen to be significant. Such distributed hardware systems as these, robot football teams, autonomous vehicle control systems and distributed manufacturing systems, were also seen as important testbeds for researching the nature of agency in systems with an important spatio-temporal element.

The PowerPoint slides of the coordinator's plenary presentation can either be obtained by requesting them from him or from the SIG home page.

It was also felt that it is difficult to partition the field of MAS into independent SIG's, so it is hoped that any other AgentLink members who feel that they belong with us should contact the coordinator.

More information on this SIG can be found at:
http://www.AgentLink.org/activities/sigs/sig5.html

John Perram

**SIG06: Intelligent agents for telecommunications applications and telematics**

The main purpose of this SIG is to provide a forum for discussion and collaboration between telecommunications service and network providers, universities and other research institutions as well as European research projects (ACTS, EURESCOM, ...), on the topic of intelligent agents for telecommunications applications and telematics services (IATA).

The overall aim of the IATA SIG is to support the rapid and timely of new telecommunications applications and telematics services in the telco industry based on agent technology, and the long-term establishment of agent technology in the telco industry. The IATA SIG promotes synergetic efforts on applying agent technology to telecommunications. It is expected to establish new cooperation between both researchers and telcos in the area mentioned above, but also to tighten contacts and focus dispersed research and development efforts. Agent technology is to be investigated as to how it can be usefully applied to the area of telecommunications applications and telematics services. Specifically, the following goals are to be pursued:

- identification and analysis of the telecommunications requirements for an open, scalable agent platform;
- identification and analysis of telecommunications applications and telematics services where agent technology can add substantial value as opposed to other, more conventional technologies

These applications and services include:

- service and network management;
- mobility supporting services;
- electronic commerce.
- identification and analysis of requirements for an infrastructure for agent-based applications and services;
- analysis of a methodology for agent-oriented software development for telecommunications applications and telematics services.
APPENDIX A:

MINUTES OF MANAGEMENT COMMITTEE MEETINGS

Minutes of the AgentLink General Management Committee

Brussels, Thursday 30 April 1998

Present:

(CHAIR) Michael Wooldridge (coordinator & general chair)
Donald Steiner (WP1 coordinator)
Yves Demazeau (WP2 coordinator)
Gerhard Weiss (WP3 coordinator)
Norman Sadeh (ESPRIT project officer)

1. Welcome [MJW + NS]

MJW formally welcomed the members of the management committee to the first official AL meeting. NS congratulated the management committee on coming this far, and stressed several points that he felt were vital to the future success of the network, the most important of which being the need to keep the network open and ensure that the community felt that this was a network in which they played a part. He also stressed that networks of excellence can play an important role in shaping the future of EC funding in areas such as agents.

2. Summary of state of play [MJW]

At the time of the meeting, the contract had been signed by QMW and returned to the commission. [It has since been signed and returned by the commission.] The official start date for the project is 30 April 1998. Funding is 400 KECU, for 18 months initially.

3. WP1: Industrial action [DS]

DS reported on the following:

Task 1.1 (industrial meetings). DS proposed visits to the following meetings:

- FIPA meeting, July 1998 in Dublin, Ireland. This was felt by all to be a good opportunity of killing 2 birds with 1 stone, viz raising awareness of AgentLink amongst the (significant) industrial membership of FIPA, and also of supporting standardisation activities (an important AL task). DS requested funding for this meeting of between 4 and 6 KECU, which was agreed in principle. DS to come back with a concrete proposal on the allocation of this funding.

- Agents World, July 1998 in Paris, France. Some concern was expressed that this might not have a strong industrial focus, but YD assured the committee this was not the case. YD agreed that a stall at Agents World would be provided for AgentLink. (See also the requests for conference support, below.)

- ECAI-98, August 1998 in Brighton, UK. MJW will be attending this, and will represent the network there. An exhibition stall costs GBP 450 (approx 720 ECU). MJW agreed to investigate the possibility of sharing a stall with another network.
Task 1.2 (database of products etc). DS proposed that a questionnaire should be distributed to all members to solicit such information. MJW added that an online registration for such information might be helpful. DS to prepare a questionnaire. NS recommended that the experience of other NoEs should be taken into account, appropriate contacts will be provided.

T1.3 (SIGs). No SIGs proposals were received specifically directed at industry component. However, 2 e-commerce-based SIG proposals were received from Carles Sierra and Aldo Dragnoni, but these were sent to the research coordinator. It was felt that these should be more in industry area. It was strongly felt by all present that an e-commerce SIG was a good idea. NS stressed importance of coordinating such a SIG with other EC e-commerce activities, in particular with Paul Timmers, who is responsible for such activities at the EC. In addition, the committee strongly felt that a methodologies/software engineering SIG would be a good thing. MJW reported that Jan Treur (Vrije University Amsterdam) had expressed an interest in managing such a SIG, but had not generated a proposal. DS to chase this up. DS stated goal of getting e-commerce and methodology SIGs established by end of June 1998, with 1st meetings targetted for July if possible.

T1.4 (inter-node visits). It was generally felt that the amount of money available for these made them scarcely worthwhile -- NS suggested strongly that the money woud be better spent on another SIG, and after some lengthy discussion, it was agreed to reallocate the money to potential SIGs.

T1.5 (standardisation activities). It was noted that AL would be directly supporting such activities (T1.1, above). MJW pointed out that an important role of AL was to keep the community informed of current activities, and that organisations such as FIPA might therefore want to submit regular reports to the newsletter on their activities. DS agreed this would be a good idea and will contact FIPA correspondingly. Also other standardisation activities should be taken into consideration (e.g., W3C, OMG, etc).

4. WP2: Research Coordination

YD noted that a detailed set of milestones for this WP had been generated and sent to MJW.

T2.1 (research database). Following from the suggestion of DS, YD proposed a questionnaire to find out the research expertise of each site. MJW again pointed out that this could be done online, via the WWW site. YD proposed that AL could act as a kind of "matchmaker" between sites working in closely related areas.

T2.2 (SIGs). There was some discussion on the criteria to be used for supporting SIGs. After some discussion, it was decided to adopt the following:

i/ Not too narrow focus -- of broad general interest.

ii/ Has real potential for generating new collaborations and projects that have a realistic chance of ultimately being funded.

iii/ Should have at least as much industrial relevance as a typical ESPRIT LTR proposal.

Some discussion took place on the proposals received. The most promising of these were felt to be the e-commerce SIGs, but that these were better dealt with under the industry SIG. YD to get back in touch with other proposers of SIGs and inform them of the guidelines for accepting SIGs. As with WP1, the goal is to establish SIGs by end June 1998.

T2.3 (database of research materials). YD to put ICMAS abstracts at disposal of AL, and also to ensure that any SIG publications were put online. It was suggested that further steps would be useful to ensure that a true research database was established. YD to investigate.

T2.4 (support for conferences). Some discussion on the criteria to be used for supporting
conferences. In the end, it was decided that a proposal for support should include:

i/ A statement on how support would be used.

ii/ A draft call for papers for the conference.

iii/ A statement on the organisation of the conference.

iv/ A draft budget.

v/ A statement on how AL will be presented at the conference (e.g., a stall?)

The following criteria were suggested as useful for deciding whether to support the event:

i/ Would support give real "added value" to the event? It is not AL's purpose to support events that do not need it. If the event could be self-financing, then it is not clear why AL should support it!

ii/ Only events taking place in the EU could be supported.

iii/ Is at least 50% of the event of relevance to AL?

iv/ Would AL be satisfactorily acknowledged?

v/ Could any profits be used to recover AL costs?

YD then presented a request for 15KECU funding from the "Agents World" event to be held in Paris. It was generally felt that this was a very large sum of money, but that "Agents World" would clearly be the largest agent-related event to be held in Europe during the first 18 months of the network. After some discussion, it was therefore agreed to support "Agents World" in this way, but that no further funds would be made available. YD noted that the break-even point for the conference was 300 delegates, and that any "profits" made over and above this would be returned to AL, up to the 15KECU value of support.

5. WP3: Teaching and training.

GW noted that WP3 is the smallest (in financial terms) of the work packages, and that the major event in this WP (the summer school) was some way off. However, the need to start thinking about this event was readily apparent. NS suggested that co-locating the summer school with IJCAI-99 would make it easier to attract first-rate non-EU speakers, who might otherwise not travel to Europe. GW to investigate. Another possibility is to send out a call for hosting the summer school, and give the opportunity for AgentLink members to bid.

Criteria to support courses, etc, were regarded as similar to those for support of conferences & workshops (WP2).

A questionnaire is under development by GW for teaching & training materials.

6. WP4: Management & Infrastructure

MJW noted that the AgentLink.org domain name had been registered, and a provisional WWW site already established. The WWW site plans to "go live" on 1st July 1998 (although a provisional site is already present). Work was underway to establish mailing lists for each of the WPs, as
well as a general mailing list for all members. MJW noted that he would prepare the first newsletter, but would like to hand-off to someone else after this. Delivery date for 1st issue of newsletter is July 1st. NS suggested that the newsletter be produced and shipped from a country with low production and shipping costs.

7. Consideration of membership requests [MJW]

More than 70 requests for membership were received prior to the meeting; it was impossible to consider them at the meeting. Some discussion therefore took place on the criteria to be used for allowing membership, so that MJW could make decisions back in London. In general, it was stressed that members should be "active", and not merely dormant observers. MJW noted that several organisations explicitly wanted to be merely observers. NS suggested an "associate member" status for such organisations, so that they could, e.g., receive the newsletter, but would not take any more active role in the network. MJW to work on the proposals offline, and get back to the management committee. The requests were distributed to the management committee offline, comments welcomed.

8. Finances [MJW]

QMW have already started to generate spreadsheets for handling finances. MJW to generate concrete instructions for claiming back expenses. NS advised MJW to ensure that an ECU account was created to handle the AL account, and MJW agreed to do this.

9. Review of action items [MJW]

DS:

- get concrete proposal for FIPA meeting support
- get list of other possible industrial meetings to attend
- contact Carles/Aldo with respect to organising e-commerce SIG
- generate questionaire for products/services/etc
- get in touch with OMG/XML/W3C organisations to let them know about AL, and request reports on activities
- generate list of milestones & dates for WP1

YD:

- generate questionaire for research expertise database
- report on progress for T2.1

MJW:

- give DS email address for Thomas Magedanz, re OMG standards
- questionaire to AL members, to find out what activities they want to see
- establish ECU account for AL at QMW
- email NS with ICMAS request for support

10. Date & location of next meeting [MJW]

It was agreed to hold the next management committee meeting the day after the "Agents World" event in Paris, i.e., Wednesday 8 July 1998. The meeting will be held in Paris. It was also decided to hold a general meeting of "AgentLink" at the same time.
Minutes of the AgentLink General Management Committee Meeting
IBIS La Vilette Hotel, Paris, Wednesday 8 July 1998

Present:
- Michael Wooldridge (MJW: chair - general coordinator)
- Donald Steiner (DS: WP1 coordinator)
- Yves Demazeau (YD: WP2 coordinator)
- Gerhard Weiss (GW: WP3 coordinator)
- Norman Sadeh (NS: European Commission representative)
- Hyacinth Nwana (HN: WP1 committee)
- John Perram (JP: WP1 committee)
- Nick Jennings (NRJ: WP2 committee)
- Magnus Boman (MB: WP2 committee)
- Wiebe van der Hoek (WvdH: WP3 committee)
- Janet Bruten (JB: WP4 committee)
- Carles Sierra (CS: WP2/e-commerce SIG)
- Jan Treur (JT: methodologies SIG)
- Matthias Klusch (MK: intel info agents SIG)

Apologies received from:
- Bernard Burg (WP1 committee)
- Rosaria Conte (WP4 committee)

[Last updated 22 July 1998, to include some corrections from DS.]

AGENDA ITEMS

1. Welcome. [MJW]

MJW welcomed in particular members of the management committee that had not previously attended AL meetings, and explained that the primary purpose of their attending the meeting was to bring everyone with a managerial role in AL together, so that understanding of role and function of the network could be coordinated. MJW also pointed out that it was important to have a clear understanding of what could and could not be done with the financial resources of the network, and how the finances worked. Finally, MJW stressed the goals of the network, and how the success or otherwise of the network was to be evaluated (primarily in terms of new collaborations, projects, and so on).

NS stressed that the network should be focussed on "added value" activities: the primary questions to consider whenever AL was contemplating an activity should be "does this add value?" NS also stressed that AL should be "open" with respect to the different views of agents in the community, and also that AL should not be dogmatic about what comes under the banner of agent work, and that AL should be directed as much as possible by the views of its members, and not be led in a top-down fashion by a small number of sites. He also stressed the importance of "roadmap" activities for the network - generating strategic plans for what the network should do.

2. WP1 Report: Industrial action [DS]

DS reported that a questionnaire for finding out about agent-products had been generated, and had been forwarded to MJW. MJW agreed to post this to the members of the network.
A number of suggestions were made as to possible industrial events to visit. An obvious candidate was the IST-98 conference, (formerly the ESPRIT conference) to be held in Vienna in December. NS stressed that the conference emphasises "visionary" stands. MJW will be attending, and will at least take some fliers. JT will be attending the IFIP conference in Vienna, and agreed to investigate taking a stand there. HN agreed to investigate telecoms conferences. JB suggested the simulation of adaptive behaviour conference, to be held in August 1998, and agreed to take along fliers.

With respect to standards, it was reported that there had been no interest in financial support to attend the FIPA Dublin meeting in July 1998, and a discussion ensued with respect to other activities to support standards. It was in principle agreed to provide support for a FIPA agent server (e.g., an NT workstation), so that the many FIPA projects out there could start to inter-work and evaluate the FIPA standard set. It was suggested that this server could also provide a repository for FIPA software. (Apparently, providing such services is not the function of FIPA itself.) DS to come back to MJW with proposal for such.

The need to get OMG/mobile agent input on standards was agreed. MJW to put DS in touch with Thomas Magedanz at GMD FOKUS, who is very active in this area.

3. WP2 Report: Research Coordination [YD]

MB discussed possible strategies for generating the research skills database for the AL WWW site. Ultimately, it was resolved that MB should provide MJW with this database in a WWW-ready format no later than 21 September.

NRJ discussed possible ways of generating the repository of agent-related papers. NRJ proposed two guiding principles:

i/ That some form of quality control was necessary - simply allowing people to add links to their own work, without quality control, was likely to lead to a low-value repository. It was accepted that a simple way to ensure quality control was to limit membership of the repository to papers published in quality conferences and workshops.

ii/ lists of references, without any further information about content, were not likely to be very useful - it was necessary to add value to the repository, by (for example) indexing the papers using AL's classification scheme.

These desires were mediated by the obvious practical limitations of what was realistically possible in the time available.

Following a discussion, NRJ proposed to "seed" the online repository with as many high-quality papers as possible, (with added information where realistically possible), and then to have a mediated on-line registration mechanism for new materials. It was resolved that NRJ should provide MJW with the database in a WWW-ready format by 21 September. In order that it could be kept up-to-date, it was agreed to update the database at regularly published intervals (e.g., every 4 months).

YD reported that he had received no further requests for conference/workshop support. It was resolved that as a general model for support, workshops and conferences would be expected to reimburse AL out of profits, as the "Agents World" conference has proposed to do. With respect to AW in particular, YD reported that despite the very high level of attendance (of the order of 525 participants), the financial situation was not yet clear. YD to provide AL with a definite, final financial statement as regards Agents World no later than 15 September.

A general discussion ensued about financial support for national workshops and conferences. Some participants felt that providing support for such events (in particular, non-English speaking events) not sufficiently European in nature, while others argued that they provided a useful
route for developing agent skills across Europe, and there are other official European languages other than English! Ultimately, it was agreed that no such workshop would be "excluded" from funding, provided that participation in the event was not limited by nationality etc. Of course, the criteria for support of events as agreed at the prior management committee meeting would apply.

4. WP3: Teaching and Training. [GW]

GW reported that he had been in touch with the IJCAI organising committee, who had agreed to allow the summer school to co-locate with IJCAI-99 if necessary. It was resolved to hold the summer school in or near Stockholm in the week prior to IJCAI, assuming that an appropriate (cheap!) venue could be found with sufficient local, cheap accommodation. MB to coordinate with GW on finding locations in and around Stockholm. It was agreed that a broad range of courses would be developed, that would appeal to industry as well as academia. In particular, it was agreed to allow industrial participation in the event for an appropriate fee. It was resolved to have a first call for participation, including names of lecturers, etc, no later than 21 September: GW to produce this call. GW to distribute an initial proposal detailing structure of the event and possible courses to the management committee ASAP.

5. WP4: Management & Infrastructure [MJW]

MJW reported that the "full" WWW site was live at www.AgentLink.org. In addition, exhibition boards for AL had been developed, as well as a logo. Some inter-network activities had taken place -- a NoE coordinator meeting is to be set up in November. Leaflets advertising AL had been produced, and placed in the conference pack of every participant of "Agents World". MJW reported that such leaflets were available for all participants to use for any conferences and workshops required. A number of enquiries about direct mailshots had been issued, and MJW proposed taking one of these up. MJW reported that some content had been obtained for the 1st issue of the newsletter, but production had been postponed until after "Agents World" so that reports could be included on the events that took place. Finally, MJW reported that the administrator post was about to be approved by QMW [it has subsequently been approved] and encouraged anyone who had a possible candidate for the post to apply.

MJW agreed to set up a moderated, members-only mailing list for the network, e.g., using majordomo.

MJW also pointed out that the network should actively attempt to play a more central role in shaping/guiding EC policy with respect to agent technology. MJW to come up with a proposal for this.

6. Status of Special Interest Groups [DS, YD]

A discussion took place as to exactly what "membership" of a SIG meant. It was stressed that the goal of a SIG was "not" to create a "project within a project", and as such, SIGs should have no formal membership, mailing lists, etc. SIG activities will be open to all AL members, and membership would be defined by those actively participating in them. The main purpose of SIG funding was to "pump-prime" new collaborations, projects, etc. The success (or otherwise!) of SIGs would be evaluated using the number of new collaborations as a major indicator.

As a guiding principle, it was agreed that funds would only ever be provided to SIG participants who actively took part in meetings (e.g., by presenting a paper or chairing a session). Additionally, MJW emphasised the very finite nature of AL's resources, and indicated that for each SIG meeting, funds would be available to support only up to about 10-15 participants. Support would only be possible for 6-8 SIGs. Other participants (including, if desired, participants from outside Europe) would be welcome to attend, but would not receive direct or indirect support from AL.
While it seemed appropriate for SIGs to maintain their own WWW site, it was emphasised that the "front door" to this site should be through the main AL WWW site. In addition, it was resolved that all official documentation relating to SIGs should be located on the central AL WWW site.

It was resolved to support the following SIGs:

- Agents for e-commerce (coordinator: Carles Sierra)
- Cooperative information systems (coordinator: Matthias Klusch when he returns from the USA, Innes Ferguson until then)
- Methodologies/software engineering (coordinator: Jan Treur)

All of these SIGs still need some work on finalising their goals, etc. Coordinators to work on this with DS/YD respectively. Coordinators to supply MJW with WWW forms ASAP.

CS and MJW reported on a meeting with Paul Timmers, ESPRIT project officer in the area of electronic commerce, as well as a number of ESPRIT projects in the area of e-commerce. It was reported that the main conclusion of this meeting was that these ESPRIT projects could usefully benefit from the AgentLink activities.

It was reported that the proposal for a SIG on norms had been withdrawn. Additionally, various members of the meeting reported informal discussions on several different possible SIGs. The most concrete proposals appeared to be in the area of logic & agency, telecoms, simulating societies, and some kind of RoboCup SIG. It was felt that while obviously no decision could be made on such SIGs without seeing a concrete proposal, there all of there areas were potentially interesting for AL. The proposers had been encouraged to develop their SIGs further. A discussion ensued about an informal proposal for a SIG in the area of human factors/HCI for agents - it was pointed out that this strayed very much into the territory of the i3net (intelligent information interfaces network) area, and as such, might not be appropriate for AL. NS emphasised the importance of coordinating such SIGs with other EC activities, (e.g., a logic SIG with COMPULOG).

It was agreed to hold kick off meetings of all the SIGs in the same location on 24 September 1998. It was agreed that the purpose of these kick-off meetings would be to find out the "lay of the land" -- establish main issues and a set of goals/agenda for the SIGs. A suggested model was short position papers and discussion/panel sessions. It was emphasised that such meetings should be as open as reasonably possible, and should not be run as if they were refereed workshops or conferences. Each coordinator to generate a call for participation to be sent to MJW for distribution ASAP.

7. The AgentLink Calendar, July 1998-July 1999 [MJW]

MJW stressed the need to establish a calendar for AL activities over the next year. In particular, it was proposed that before the end of the first year of AL, it should have a "general" meeting, including as many members of the network as possible. The goals of the meeting would be to bring the members of the network up to speed on its activities, foster a sense of community, and, perhaps most importantly, to get feedback from members on useful directions for the network to go in. It was felt that if possible, such an event should be co-located with an existing conference or workshop, and in addition, with SIG meetings. The primary advantages of such co-location would be to maximise the opportunities for new collaborative activities to take place, to reduce costs by "reusing" funds for multiple activities, and also to gain from the synergy of multiple closely related activities. (This was very much the experience of the extremely successful "Agents World" event held in Paris immediately before the meeting, on 3-7 July 1998, which co-located a number of events and gained enormously from the synergy generated.)
After some discussion, it was felt that the likeliest candidate for such an event was the PAAM conference, to be held in London in April. Concern was expressed, however, about the high cost of this event. It was resolved that MJW would investigate possible co-location models with the organisers of PAAM; if no reasonable model could be found, then it was resolved to organise the event in some other cheap and accessible location.

To summarise, the main events agreed were:

1998

24 September 98: kick off meeting for SIGs. Location: Brussels, exact location to be decided

25 September 98: AM - SIGs reporting back on kick off mtg to mgmt committee. PM - next AL management committee meeting. Location: Brussels, exact location to be decided between Dec 98 - Jan 99: next meetings of SIGs, each to fix their own location

1999

April 1999: SIG meetings, plus general meeting of AL, to be co-located with a conference (PAAM?)

26-30 July 1999: summer school in or near Stockholm

8. Consideration of membership requests [MJW]

MJW reported major difficulties in processing requests for membership, due to the sheer number received (> 100). MJW proposed that until requests for membership tailed off, it might be more useful for MJW to receive applications and make a suggestion for accepting/rejecting them offline. Management committee members would be given a short interval in which to register any objections, and if no comments were received, then the matter would be regarded as agreed. This proposal was agreed by the meeting to be a sensible one, and MJW proposed to move quickly on the large backlog of applications.

9. Summary of Financial Situation [MJW]

MJW reported that the financial situation is currently healthy, and that if anything the network is under-spending.

10. Date & location of next meeting [MJW]

The next meeting would be held in the day following the kick off meeting for SIGs. Precisely:

9.00am - 5.00pm, 25 September 1998
Room N105 1/92
Avenue des Nerviens 105
1040 Brussels

11. Any other business [MJW]

MJW thanked the participants for a helpful day, and a meeting that finished on time!
Minutes of the AgentLink Management Committee Meeting
Brussels, 25th September 1998

Present

- Michael Wooldridge (MJW - Chair, general coordinator)
- Donald Steiner (DS - WP1 coordinator)
- Yves Demazeau (YD - WP2 coordinator)
- Gerhard Weiss (GW - WP3 coordinator)
- Carles Sierra (CS - WP2/e-commerce SIG)
- Nick Jennings (NJ - WP2 committee)
- Janet Treur (JT - meth/soft eng SIG)
- Innes Ferguson (IF - i2a SIG)
- Paul Davidsson (PD - WP4 committee/editor of newsletter)
- Bernard Burg (BB - WP1 committee)
- John Perram (JP - WP1 committee)
- Magnus Boman (MB - WP2 committee)
- Rosaria Conte (RC - WP4 committee)
- Hugo Brailsford (HB - admin coordinator for network)

Apologies

- Thomas Magedanz (WP1 committee)
- Norman Sadeh (NS - European Commission representative)
- Wiebe van der Hoek (WP3 committee)

1. Welcome

The committee welcomed HB, joining AL as administrative co-ordinator, and also RC, IF, PD and BB, attending the meeting for the first time. MJW noted that the absence of NS meant that all decisions of the committee would need ratification before they could be made public. (Comments attributed to NS in the minutes were made after the meeting itself.)

2. Discussion of financial situation

A financial summary was distributed by MJW, indicating that about 165000 ECU in total was available to SIGs and related networking activities. Based on this information, six different models of SIG resource allocation were proposed by MJW. Each presented alternative options for distributing the 165000 ECU in terms of differing proportions of travel and subsistence expenses and other miscellaneous costs. MJW asserted that a model needed to be decided upon before any new requests for SIG funding were evaluated - for this reason, this agenda item was discussed immediately after opening remarks. It was agreed that the following model would be used as the basis on which to fund the SIGs:

SIG kick off meetings, Sep 24 1998
- 3 x meetings plus rooms 35000 ECU

Second SIG meetings
- 6 SIGs, 10 participants each at 750 ECU per participant 45000 ECU

Third SIG meetings
- 6 SIGs, 10 participants at each at 750 ECU per participant 45000 ECU

Plenary @ PAAM-99 costs for 50 registrations 15000 ECU
Other networking activities subtotal 25000 ECU

MJW reminded the group that in the future, SIG funding for meeting attendance would very likely need to be rationed (with likely many more applications for funding to be received), and that hard decisions would have to be made about the allocation of such funds. The group also agreed to favour the co-location of SIG meetings when possible.

There was some discussion about what possible things might be funded under “other networking activities”. It was suggested that money be used to help fund the travel and attendance of female speakers to conferences and workshops. While it was agreed that the low level of female participation in agent conferences and workshops was a general area of concern, there was some doubt about the practicality and appropriateness of such a fund from AgentLink. MJW agreed to work with RC to consider other possible measures that may be taken to address this problem.

In order to ensure that accurate and up-to-date financial information was available to the network at all times, it was agreed that claims for expenses would have to be submitted with two months of AL event attendance, and would otherwise be rejected.

It was emphasised that AL could not fund outside of ESPRIT guidelines, and that in all events, AgentLink must put its primary objective - of facilitating pan-European agent R&D - ahead of any other concerns.

3. Feedback/discussion on SIG kick off

MJW commented that the SIGs had had a very encouraging start, with a high level of interest shown in their activities, and congratulated the SIG organisers on their efforts. It was fortunate that the travel and living expenses of all attendees for the SIG meetings of the 24th September would be able to be paid for by AL, but highly unlikely that this would be the case at future meetings, considering the increasing membership of and level of interest in the SIGs.

There was considerable discussion on the issue of the interdisciplinary nature of SIGs. Many felt that it would be desirable to encourage the participation of parties (such as social scientists and those from the legal professions) in SIG meetings by paying for travel expenses to meetings. MJW reminded the group that special approval is needed to pay for the travel costs of those outside of the network, and that offers to pay for the travel costs of such should only be extended on a very limited basis. It would be preferable instead to suggest that such parties submit to join the AL network where possible.

Reports from SIGs on the working group meetings of the 24th September to be submitted by 13th November 1998, and will be included (perhaps in an edited form) for the second issue of the newsletter.


DS reported that Thomas Magedanz is to take over responsibility for the recently vacated management committee position of Hyacinth Nwana.

Task 1.1: Industrial meetings: AgentLink has been advertised in one industrial meeting to date. NS suggested holding a press event for the e-commerce SIG and AL at the IST conference in Vienna in December 1998, and MJW and CS agreed to follow this up.

Task 1.2: Agent systems and technology database: Only one submission of software for the software/products database has so far been received, although DS was confident of more to come. It was agreed that a call for more submissions would be included in the next AL update email. There was agreement also that classified lists of existing software should be added to the database. The arrival of the online version of this database is imminent, and should encourage submissions by acting as a focus for this activity.
Task 1.3: Application area special interest groups: A proposal for a SIG on Intelligent Agents in Telecommunications from Sahin Albayrak was considered. It was felt that the only issue standing in the way of approving this SIG proposal was that it should clearly reflect the interests of the entire agents in telecoms community, in particular the CLIMATE collection of ACTS projects, being co-ordinated by Thomas Magedanz. The proposal was therefore approved, subject to the SIG meeting these requirements.

It was agreed that SIG-specific subscription-based mail groups would be allowed, so long as all calls for participation and forthcoming events were made entirely open, and mailed to the main AL mailing list.

Task 1.5: Standardisation initiatives: A proposal was received from DS, BB and Jeremy Pitt from Imperial College to host an agent name server to promote investigation of interoperability amongst agents from different sources. NJ expressed concern that we have no firm commitments from people to contribute materials to the server for agent platforms. MJW suggested and it was agreed that there should be regular reports to management committee meetings on usage/uptake, and also an article for the newsletter explaining the purpose of the server and how to go about using it. It was felt that the quotes for hardware costs prepared by Imperial College were very high, and it was agreed that they should resubmit revised quotes on hardware costs to DS. Subject to these issues being resolved to the satisfaction of the management committee, approval was granted for this expense.

5. Workpackage 2 Report: Research Coordination (YD)

Task 2.1: Research database: Materials from this database soon to be made available online through the AL site.

Task 2.2: Research area SIGs: Three proposals were submitted for consideration as AL SIGs:

- Agent-based simulation. Modelling organizations and normative agents. There were concerns that this SIG had not enough industrial relevance, being too research oriented, and that the subtitle made the focus of the SIG too narrow: agent-based simulation was felt to be a broader field than the proposal itself might indicate. It was decided that this SIG should be approved, subject to appropriate revisions being made to the proposal. NS stressed the importance of the industrial component of all SIGs, and suggested that one possible way to ensure representation of industry would be to have an industrial co-co-ordinator of the SIG.

- An Agent-Link SIG about Robocup. It was suggested that the proposer develop this for possible consideration in a forthcoming real-time systems SIG proposal, it having no declared AL interest or AL node membership.

- Situated Agents SIG. This proposal was felt to be at an early stage of development, and was not approved by the committee.

Since the committee had agreed to support only 6 SIGs in total, the approval of 5 to date meant that there was only funds to support one more. It was therefore decided that, in the interests of fairness, this fact should be announced in the next AL update, and that proposals for this final SIG should be submitted no later than 1st December 1998.

Task 2.3: Clearinghouse for agent-related materials. Work is underway to develop this.

Task 2.4: Support for agent workshops and conferences. The committee resolved to support the following activities:

- CEEMAS-99. It was agreed to support this event to the requested total of 2250 ECU.

- UK-MAS 98. It was agreed to support this event to the total of 1000 ECU.
• MAAMAW-99. It was agreed that financial support be made available for all those in the network with full papers accepted to the MAAMAW-99 conference, to a maximum of 15000 ECU. Details of the arrangement to be worked out by MJW and MAAMAW organisers.

6. Workpackage 3 Report: Training/Awareness (GW)

It has yet to be decided where the 1999 summer school is to take place. A venue other than Stockholm may need to be found. JP agreed to investigate accommodation in Copenhagen as an alternative. The importance of agreeing a location and issuing an announcement in the very near future was agreed by all, and it was resolved that if no suitable location could be found in Sweden, then possible locations further afield would be sought.

7. Workpackage 4 Report: Infrastructure/Management (MJW)

Membership of AL has doubled from to 90, with more applications being received. The first issue of the AL newsletter is now at the printers. HB now employed as AL administrative co-ordinator.

8. The AgentLink calendar, September 1998-July 1999

Dates for the next SIG meetings need to be decided soon.

9. Strategic planning (MJW)

The absence of NS precluded any substantive discussion in this respect. It was decided that the 1st December 1998 should be the deadline for an outline of the AL strategic plan, and that 15th January 1999 should be a deadline for generating the continuation proposal for AL. It was suggested that the management committee should take into account the socio-economic slant of the ESPRIT 5th framework when suggesting ideas for the plan.

10. Date and location of next meeting

There are resources for only one more full-size management committee meeting. MJW suggested that there should be a smaller meeting, with workpackage leaders only attending to consider the continuation proposal - this would probably be held in January 1999. Otherwise, the next full management committee meeting would be at PAAM, in April 1999.
Minutes of the AgentLink Management Committee Meeting
London, 19th April 1999

Present

- Michael Wooldridge (MJW - Chair, general coordinator)
- Donald Steiner (DS - WP1 coordinator)
- Leonardo Flores (LF - European Commission representative)
- Carles Sierra (CS - WP2/e-commerce SIG)
- Nick Jennings (NJ - WP2 committee)
- Wiebe van der Hoek (WP3 committee)
- Matthias Klusch (I2A SIG)
- Paul Davidsson (PD - WP4 committee/editor of newsletter)
- John Perram (JP - WP1 committee)
- Bernard Burg (BB - WP1 committee)
- Magnus Boman (MB - WP2 committee)
- Rosaria Conte (RC - WP4 committee)
- Hugo Brailsford (HB - admin coordinator for network)

Apologies

- Janet Bruten (JB - WP4 committee)
- Thomas Magedanz (WP1 committee)
- Gerhard Weiss (GW - WP3 coordinator)
- Jan Treur (JT - meth/soft eng SIG)
- Yves Demazeau (YD - WP2 coordinator)
- Sahin Albayrak (IATA SIG)

Note

YD submitted comments for the MCM by email which unfortunately arrived too late to be read by committee members and used in the meeting. However, where possible, note was taken of the emails, and such comments appear below.

1. Welcome

MJW thanked Norman Sadeh, AgentLink’s previous European Commission project officer, for his efforts in helping to establish AgentLink and his guidance during the network's first year, and welcomed Leonardo Flores as the new project officer.

MJW briefly discussed AgentLink's membership status. The network has around 110 member nodes in total and all but one EC member states are represented in its membership. However, MJW felt that efforts should be made to secure a higher proportion of industrial member nodes, with industrial nodes currently making up around 30 percent of the total membership. DS suggested that one way of increasing industrial membership would be to check FIPA and OMG membership lists for industrial members who aren't AL members, encouraging them to join the network, and sending suitable AL publicity materials. He also noted that more AL presence at industrial meetings would improve the network's visibility. MJW noted that personal contacts are also a very important source of potential industrial membership. LF suggested that electrical/power transmission companies would be a good source of suitable industrial membership, and LF and several committee members agreed to follow up on potential contacts in these fields. DS suggested advertising in suitable premium magazines (such as The Economist), and agreed to follow up on costings in this respect.
2. Continuation proposal, strategic plan/technological roadmap

LF reported on the state of play in the EC 5th Framework programme. In his opinion there would be little point AL submitting a continuation proposal in the early summer because i) the EC is not yet administratively ready to accept proposals from Accompanying Measures (such as NoEs) and ii) because AL would not at that point have fully achieved all of its primary goals, and would have to be evaluated on these terms, to its disadvantage. As an alternative, AL should conduct an “informal” evaluation/review of achievements and activities, both to assess achievements to date and to inform future decision making and focus planning for the forthcoming continuation proposal. LF should not coordinate this review, but would happily participate in it. LF noted that a continuation proposal should address future directions for the network and not be wholly derivative of the research focus and strategies set in the first project term.

It was also noted that AL needs to request a no-cost project extension, in order to maintain administrative functions and presence and secure the services of HB if (as seems likely) continuation proposal processing runs on past October (the end of AL’s first funded term). It was stressed that the purpose of this extension is solely to ensure that we are able to carry on employing the AgentLink administrator throughout the interregnum; it would not be possible to fund any events during this period.

MJW solicited comments on future workpackage activities and funding allocation for the continuation proposal, suggesting that one area of change might be WP1, inter-node Visits, where the sum allocated in the first proposal was too small to be useful. It was agreed that at the forthcoming April ’99 SIG meetings SIG coordinators would ballot participants for general expressions of interest in inter-node visiting, so as to assess the case for allocating a much greater sum for this activity in the continuation proposal. Also in WP1, it was agreed that funding for work on Standardisation Initiatives should be requested, but that AL should not commit itself to an involved approach in the formulation of standards. MJW also noted that the WP4 budget for External & Inter-network Coordination should be increased in the proposal.

A proposal by RC for a ‘special fund’ (of travel support to agent-related events for disadvantaged groups) to be included in the continuation proposal was discussed at length (see Agenda, Appendix 1). Because of concerns that were voiced about this proposal (amongst others, that this funding would exclude the majority of AL members), a vote on a motion that RC should work out criteria for allocation of such funding was proposed, and the motion was passed. MJW noted that it was of utmost importance that i) RC provide reasoned, accurate figures, regarding the number of participants to be funded in this way per year, ii) that established EC definitions of less-advantaged areas be used as one of the criteria for allocation, iii) that such funding would not be used to support travel to events on the disciplinary margins of agent-related research, iv) that individual applications to such a fund would be evaluated in depth, to ensure that this money was actually reaching the target groups, and v) that the definition of unambiguous, transparent, fair criteria for determining whether or not to grant support would need to be developed in order to make the special fund viable. RC to develop appropriate criteria.

MJW introduced the committee to the concept of the ‘technological roadmap’, and stressed that the AL SIGs would have a crucial role to play in developing AL roadmap, which needs to be prepared in conjunction with the continuation proposal. The roadmap will be one of the key ways in which the success or otherwise of the network will be assessed. Broadly speaking, the technological roadmap will set out:

- what the long-term vision of agents is,
- what the state of the art is,
- what technology gaps exist between this long-term vision and the state of the art, and
- what short, medium, and long term research and development issues needed to be
addressed in order to close these gaps.

MJW asked SIG coordinators to provide concrete documents on future technological/research mapping in their SIG areas.

3. Discussion of financial situation

A financial summary was distributed, showing that to January 1999, AL was spending well within its pre-planned limits. Discussion with EC representatives in February 1999 re-emphasised the need for AgentLink funds to be spent as budgeted by the end of the October 1999 (and by the time that the continuation proposal will be submitted). MJW clarified the rules on spending for funded AL event participation, especially the rules covering the funding of non-EC participants. Such funding can be activated only extremely rarely, and requires special permission from LF.

4. Status of SIGs

The SIG coordinators felt that administration of SIG activities was not overly bureaucratic, and that existing procedures for organising SIGs would be adequate. CS and MK reported no serious problems in organising their SIGs. RC and JP reported that their meetings were about to be held for the first time.

MJW voiced serious concerns over the lack of contact from the IATA SIG coordinator with AL. DS agreed to contact the IATA SIG coordinator regarding this matter.

As a result of a number of non-approved and incomplete claims for funding following previous meetings, MJW ran through the rules for funding SIG participation. Funded participation is non-transferable and must be set in advance; original receipts for both travel and subsistence expenses are required; taxi costs must be met with subsistence costs, (which are regulated by a maximum daily allowance); and claims must be submitted two months after the meeting date at the latest. It is the responsibility of the SIG chairs to ensure that these rules are adhered to and communicated to SIG participants.

5. External relations

Efforts to strengthen contact with the CLIMATE group have been extensive, with articles on CLIMATE published in AgentLink news, and the CLIMATE coordinator, Thomas Magedanz having been invited to participate in the past three AL committee meetings. Despite earlier indications regarding a possible AL/CLIMATE joint application to the 5th Framework programme, CLIMATE have decided to pursue a separate application for "concertation activities". Efforts will be made to reduce overlap in forthcoming proposals, however.

A joint AL/COMPULOG workshop in March 1999 was a great success and COMPULOG are keen to repeat this event next year, possibly forming a joint SIG. The committee wholeheartedly supported this proposal.

A joint AL/I3net meeting, proposed by Jeremy Pitt to be co-located at MAAMAW was discussed, and it was agreed that that funds be made available to support the attendance of approx 5/6 AL members.

A proposal for a joint AL/ERUDIT/MLNET/I3net/COMPULOG 'network of networks' under the Universal Information Ecosystems initiative was outlined. AL resources will be used to publicise this initiative.
6. Summer school

MJW noted that Gerhard Weiss, the summer school coordinator has been doing an exceptionally good job of arranging EASSS'99. A high level of interest in the summer school has already been shown, and many registrations already accepted.

It was decided that a cap of 4 places per institution for AL-funded summer school attendance should be put in place, as out of 40 applications already received 8 were from the same institution. MJW and GW to contact the relevant institution and ask them to nominate no more than 4 students.

The possibility of a second call for AL-funded participation was discussed, and will be issued subject to funds being available. Any second call would give preference to institutes that did not participate in the first call. MJW and GW to manage.

7. Journal proposal from Nick Jennings

A proposal to fund all AL nodes a subscription to the newly-established Journal of Autonomous Agents and Multi-Agent Systems (at a cost of 50 US$ per node) was put forward by NJ (see Agenda, Appendix 2). It was agreed to support this measure, provided that if such an arrangement were to be put in place, it should be approached as an opportunity to publicise AgentLink, and that aside from AL receiving advertising space and the opportunity to take up a special issue of the journal, the journal should be distributed to AL nodes "by" AL, along with other AL material (such as AgentLink News). It was also suggested that information be included in the journal advertising materials explaining that AL members received issues for free.

8. Reports from workpackages

WP4

The AL web site has grown significantly and improved in appearance, and now contains several CGI programmes that allow visitors to submit information to various databases, add addresses to the AL update mailing list and handle applications to EASSS'99. A search engine has been installed on the WWW site, and will go online shortly. The deadline for submissions to AgentLink News issue 3 has been put back, to allow for feature interviews to take place in April/May 1999.

WP2

1. A request for funding from MK of 20EUR per AL member attending the CIA workshop was agreed on.

2. A proposal from Ruth Aylett for funding of 1000 EUR for UK-VR was apparently send by YD, but only 1 member of the meeting had had sight of it. For this reason, the meeting was unable to discuss this issue. WP2 to discuss offline this week.

3. A proposal from YD for funding of 1500 EUR for MAAMAW was apparently send by YD, but no members of the meeting had had prior sight of it. For this reason, the meeting was unable to discuss this issue. WP2 to discuss offline this week.

WP1

DS reported that WP1 had decided to rewrite the questionnaire for the industrial applications database due to a low level of submissions to date. Progress is still to be made on plans to set up a computer at Imperial College to handle standars interoperation work, although several pieces of software intended to run on this machine are now ready. DS agreed to provide revised quotes on the cost of this computer as soon as possible.
9. Any other business

MJW noted that those responsible for points of action arising from this meeting need to act on their responsibilities at the earliest opportunity, and at the very latest within a month of the meeting.

10. Date and location of next meeting

MJW suggested that the next meeting be co-located with the next set of SIG meetings, although it was very likely that an additional meeting would need to be called in the interim in order to discuss the continuation proposal and/or strategic review. MJW would be in contact with possible dates in the near future.
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FM: A Test-bed for Auction Markets
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The AgentLink FAQ
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Site Reports:

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Societies of Computation
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Project Reports:

MASCADA1: Manufacturing Control Systems Capable of Managing Production Change and Disturbances
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ZEUS: A Toolkit for building Distributed Multi-Agent Systems
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ADE: An Architecture type-based Development Environment for Agent Application Systems
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Methodologies and Software Engineering for Agent Systems
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APPENDIX D:

DOCUMENTS PRODUCED BY AGENTLINK IN YEAR ONE

All publically-available AgentLink documents are given a document number and are made freely available via the AgentLink WWW site. Documents produced in the first year of the project are as follows:

1999

- 1999-007.txt: AgentLink email update # 15, April 30 1999 (plain text version)
- 1999-006.txt: Agenda for the AgentLink management committee meeting, 19 April 1999 (plain text version)
- 1999-005.txt: AgentLink email update # 14, February 28 1999 (plain text version)
- 1999-004.txt: AgentLink email update # 13, February 11 1999 (plain text version)
- 1999-003.txt: AgentLink: What’s Happening. An advertising document, describing AgentLink’s main activities. Sent to a number of email lists. (plain text version)
- 1999-001.txt: AgentLink email update # 12, January 11 1999 (plain text version)

1998

- 1998-025.txt: AgentLink email update # 11, 11 December 1998 (plain text version)
- 1998-024.txt: AgentLink email update # 10, November 10 1998 (plain text version)
- 1998-022.txt: Minutes of AgentLink management committee meeting, Brussels, 25 September 1998 (plain text version) Also in PDF and MS Word 6/95
- 1998-021.txt: Request for data — agent teaching & training in Europe (plain text version)
• 1998-020.txt:
  AgentLink email update # 9 (plain text version)

• 1998-019.txt:
  Agenda for the AgentLink management committee meeting, 25 September 1998
  (plain text version)

• 1998-018.txt:
  AgentLink email update # 8 (plain text version)

• 1998-017.txt:
  AgentLink email update # 7 (plain text version)

• 1998-016.txt:
  AgentLink email update # 6 (plain text version)

• 1998-015.txt:
  AgentLink email update # 5 (plain text version)

• 1998-014.tif:
  AgentLink logo. (Also available in GIF format as 1998-014.gif.)

• 1998-013.txt:
  AgentLink email update # 4 (plain text format)

• 1998-012.txt:
  Minutes of the AgentLink mgmt committee meeting agenda, 8 July 1998 (plain text
  version)

• 1998-011.pdf:
  Expenses claim form (PDF version)

• 1998-011.pdf:
  Expenses claim form (MS Word 95 version)

• 1998-010.txt:
  AgentLink email update # 3 (plain text version)

• 1998-009.txt:
  AgentLink mgmt committee meeting agenda, 8 July 1998 (plain text version)

• 1998-008.txt:
  AgentLink email update #1 (plain text version) (plain text format)

• 1998-007.txt:
  AgentLink management committee meeting minutes, 30 April 1998 (plain text format)

• 1998-006.txt:
  Agenda for AgentLink management committee meeting minutes, 30 April 1998 (plain
  text format)

• 1998-005.txt:
  Email advert announcing AgentLink (plain text format)

• 1998-004.txt:
  Application form for sites wishing to join AgentLink (plain text version)
• 1998-003.txt:
  Instructions on how to apply for a special interest group (SIG) (plain text format)

• 1998-002.ppt:
  AgentLink presentation (MS Powerpoint 95 format) - amended April 1999

• 1998-001.pdf:
  AgentLink network program/technical annex (Adobe PDF format)