European Cooperation in the field of Scientific and Technical Research - COST -

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Secretariat

Brussels, 2 July 2008

COST 234/08

MEMORANDUM OF UNDERSTANDING

Subject :   Memorandum of Understanding for the implementation of a European Concerted Research Action designated as COST Action IC0801: Agreement Technologies

Delegations will find attached the Memorandum of Understanding for COST Action IC0801 as approved by the COST Committee of Senior Officials (CSO) at its 171st meeting on 18-19 June 2008.

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MEMORANDUM OF UNDERSTANDING

For the implementation of a European Concerted Research Action designated as

COST Action IC0801

AGREEMENT TECHNOLOGIES

The Parties to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 270/07 "Rules and Procedures for Implementing COST Actions", or in any new document amending or replacing it, the contents of which the Parties are fully aware of.

2. The main objective of the Action is to support and promote the harmonization of nationally-funded high-quality research towards a new paradigm for next-generation distributed systems based on the notion of agreement between computational agents, fostering research excellence and sowing the seeds for technology transfer to industry.

3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 20 million in 2007 prices.

4. The Memorandum of Understanding will take effect on being accepted by at least five Parties.

5. The Memorandum of Understanding will remain in force for a period of 4 years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter V of the document referred to in Point 1 above.

A. ABSTRACT AND KEYWORDS

Agreement Technologies refer to computer systems in which autonomous software agents negotiate with one another, typically on behalf of humans, in order to come to mutually acceptable agreements. This Action aims at coordinating national efforts on a new paradigm for next generation distributed systems, based on the concept of agreement between computational agents. An entity may choose whether to fulfill an agreement or not, and it should fulfill it when there is an obligation to do so derived from the standing agreements. Autonomy, interaction, mobility and openness are the characteristics that the paradigm will cover from a theoretical and practical perspective. Semantic alignment, negotiation, argumentation, virtual organisations, learning, real time, and several other technologies will be in the sandbox to define, specify and verify such systems. Both functional and non-functional properties are to be studied. Security on execution will be based on trust and reputation measures. These measures will help agents to determine with whom to interact and what terms and conditions to accept.

Keywords: Agreement, Multiagent Systems, Semantics

B. BACKGROUND

B.1 General background

Currently, most transactions and interactions at business level, but also at leisure level, are mediated by computers and computer networks. From email and social networks, to virtual worlds, the way people work and enjoy their free time has changed dramatically in less than a generation's time. This change has shifted the focus of IT research and development towards fields like new Human-Computer Interfaces or enhanced routing and network management tools. However, the biggest impact has been on the way applications are thought and developed. These applications require components to which more and more complex tasks can be delegated, components that show higher levels of intelligence, components that are capable of sophisticated ways of interacting, as they are massively distributed, sometimes embedded in all sorts of appliances and sensors. To stress their capability of representing human interests, of being autonomous and socially-aware, these components are usually termed "agents". In order to allow for effective interactions in such systems

that lead to efficient and mutually acceptable outcomes, the notion of "agreement" between computational agents is central.

Until recently, the concept of agreement was a domain of study mainly for philosophers and sociologists and it was applied exclusively to human societies. In recent years, the growth of disciplines such as social psychology, socio-biology, social neuroscience, together with the spectacular emergence of the information society technologies, have changed this situation. Presently, agreement and all the processes and mechanisms related with reaching agreements between different kinds of agents are a subject of research and analysis also from technology-oriented perspectives. A good example of this is the German DFG "Main-focus-programme" on Socionics: this programme promoted interdisciplinary research among different subfields of Sociology and Computer Sciences and developed intelligent computer technologies by picking up paradigms of the social world (e.g. virtual organisations and societies) and, in turn, it used computer technology in order to verify and develop sociological models of societies and organisations.

In Computer Science, semantic technologies are crucial to achieve agreement among computational entities, as they provide the basic means for reaching a common understanding of the space of possible courses of action - a prerequisite for any kind of joint decision. A central notion underlying the fields of Semantic Web and Semantic Web Services (SWS), for instance, is that of interoperability between services within open environments, where no a-priori assumptions can be made about interface, vocabulary, protocol, or service agreement. However, despite the achievements in the area of SWS, it appears that particularly solutions and proposals for how agreements can be achieved beyond pure semantic aspects (for instance with respect to mutual trust or policies) are still missing.

Multiagent systems have their roots in the field of (Distributed) Artificial Intelligence. A major challenge here is how to induce cooperation among computational agents with a significant degree of autonomy - despite partially conflicting individual goals - and based on a local view of the (open) environment that they are embedded in. Notions such as organisation, argumentation, and trust are crucial to this respect.

Several research efforts are currently underway in the aforementioned fields that address problems related to computer-mediated agreement in one way or another. The overall mission of this Action is to coordinate and support the harmonization of nationally funded high quality research that can contribute to the establishment of a new paradigm for next-generation distributed systems, based on the concept of agreement between computational agents. Autonomy, interaction, mobility and openness are the key challenges that Agreement Technologies need to address from theoretical and practical perspectives.

Given the huge potential of Computer-mediated transactions in a plethora of emerging applications, it is not surprising that the interest in the aforementioned research topics is steadily growing and, as it often occurs in such a context, the competition between European and US-based players is becoming stronger day by day. Hence, the time has come to fund the networking of European research activities in the field under the umbrella of the Agreement Technologies paradigm, creating the appropriate synergies and mobilising competencies spread all over Europe. Thus, the Action aims at fostering European leadership in next-generation open distributed software systems and their applications.

However, research on the different aspects of agreement among computational agents is very much dispersed among micro-communities, and interdisciplinary work in cooperation with Social Sciences colleagues is still an exception. Given the novelty of the paradigm and the lack of a common focus among the relevant research initiatives in Europe, few researchers would claim to be working on Agreement Technologies. Therefore, it is difficult to identify "natural leaders" in this emerging field. This fact discourages the use of networking instruments within the "Cooperation" programme of FP7. A Network of Excellence as conceived within FP7 would of course require a maturity of the field which has not yet been reached. Coordination and Support Actions are closer to the aims and scope of this COST Action, but the Commission does not seem to grant them high priority within FP7 and, furthermore, it is unclear how Agreement Technologies would fit into the current priorities of FP7 calls for CSAs. Similarly, it appears obvious that, despite its potential in the medium and/or long term, the paradigm is not yet ripe for implementation by means of market-oriented R&D networks such as EUREKA.

A COST Action therefore, appears to be most appropriate instrument to implement a coordination framework for Agreement Technologies due to its high degree of flexibility. As the process of community and capacity building progresses, new relevant partners can be identified and integrated, independently of the number of countries that are already participating; participants and their laboratories that have shown leadership in a particular topic can step forward and take on further responsibilities; etc. All this will be possible while the Action is already in progress and without significant administrative overhead.

B.2 Current state of knowledge

The recent trends towards open distributed software systems have motivated a number of research initiatives in Europe and USA in recent years. One of the most related to the Action's goals was the Global Computing initiative (GCI), launched in 2001 as part of the FP6 IST FET Programme. The vision of the call, also contained in the Global Computing II (GCII) initiative, was to focus research on large-scale open distributed systems: a timely vision given the exponential growth of the Internet and the turmoil generated in the media and scientific fora by some international initiatives, such as the Semantic Web, or the peak of Napster usage in 2001 with more than 25 million users. Most projects had a highly interdisciplinary nature, and a large number of groups from theoretical computer science, agents, networks and databases worked together fruitfully.

GCI focused on three main topics: analysis of systems and security; languages and programming environments and foundations of networks and large distributed systems. Along these lines, GCI projects dealt with formal techniques, mobility, distribution, security, trust, algorithms, and dynamics. The focus was ambitious and foundational, with an abstract view of computation at global level, having as particular examples the Grid of computers or the telephone network. Both functional and non-functional (e.g. Quality of Service) properties had to be studied. The focus on GCII shifted towards issues that would help in the actual deployment of such big applications, namely security, resource management, scalability and distribution transparency.

Other initiatives for large distributed systems (although with a limited degree of openness) include P2P systems - where nodes in a graph act as clients and servers and share a common ontology that permit easy bootstrapping and scalability - or Grid applications - where the nodes in a graph share and interchange resources for the completion of a complex task. The Semantic Web proposal that

has received large funding in the EU and the USA is generating standards for ontology definition and tools for automatic annotation of Web resources with meta-data. The size of the Semantic Web is growing at a high pace (10 million documents with meta-data by the end of 2006). Finally, the availability of applications as Web services has permitted an approach to solving complex systems by combining already available Web services. The annotation of those through standards like WSDL or BPEL permits the automatic orchestration of solutions for complex tasks. Combinations of Semantic Web and Web services standards are currently underway (SA-WSDL, SEE TC) within standardization bodies such as the W3C and OASIS. Finally, a strong social approach to develop new Web applications is at the heart of the Web 2.0 initiative (Wiki, Flickr, Blogs).

Although many efforts have been devoted in the above mentioned projects and initiatives, there still is a large number of unresolved questions that require a significant research effort and, in some cases, a completely new and disruptive vision. This Action will promote such a vision under the umbrella of Agreement Technologies. It will pool research towards a new programming paradigm for open distributed systems that is currently being carried out by a plethora of national research initiatives across Europe. This includes fundamental research on a large number of functional and non-functional aspects: Semantics, Resource management, Dynamicity, Adaptability, Workflow, Scalability, Security, and Usability. Besides the scientific benefits from the aforementioned lines of fundamental research, there is a need for the development of new formal methods, like algorithms for negotiation, persuasion, argumentation; compilers between norm representation formalisms, semantic aligners or agreement planners. From a technological perspective, work towards a methodology for developing software that follows the new programming paradigm of norm/agreement/call-by-agreement is needed. In addition, the design of open distributed systems will require a number of different tools that the engineer will use to specify, verify and test the applications. Finally, the question of a common infrastructure to run those applications, meaning the overlay global computer, is a major research challenge.

B.3 Reasons for the Action

From a scientific and technological point of view, COST countries show an increasing interest in the notion of open software systems based on runtime agreements among computational entities. This fact is corroborated by a significant number of recent nationally funded research initiatives in the field, such as:

- Advanced Argumentation Services for Trust Management. Funded for 3 years by the University of Luxembourg with 69.000 EUR;

- Agreement Technologies. Funded for 5 years by the Spanish MEC with 5 MEUR approx.;

- Dynamic Formation of Collaborative Agent Organizations. Funded for 5 years by the Greek Ministry of National Education and Religious Affairs with 120.000 EUR;

- Electronic Institutions providing Automatic Contracting for Virtual Organizations. Funded for 3 years by the Portuguese FCT with 40.000 EUR;

- Interdisciplinary Research Initiative on Security. Funded for 2 years by the University of Hanover with 2 MEUR approx.;

- Knowledge dynamics in the information society. Funded for 2 years by the Italian MIUR with 94.000 EUR;

- Lion Towards a social semantic information space. Funded for 5 years by the Science Foundation Ireland with 10 MEUR approx.;

- Logic and Artificial Intelligence for Multi-Agent Systems. Funded for 5 years by the Czech Academy of Sciences with 13 MCZK approx.;

- Market-based Control. Funded for 4 years the British EPSRC with 680.000 GBP;

- Social trust analysis and formalization (ForTrust). Funded for 5 years by the French ANR with 300.000 EUR.

The need for connecting national research, as well as the growing relevance of interdisciplinary actions, is underlined by the increasing number of recent, relatively small events that tackle topics related to Agreement Technologies:

- Interdisciplinary Workshop on Science and Technology of Agreement. ESF funded workshop to be held in Barcelona from June19-20, 2008;

- Conference of the European Social Simulation Association (since 2003);

- International Workshop series on Service Matchmaking and Resource Retrieval in the Semantic Web (since 2007);

- International series of Semantic Web Policy Workshops (since 2005);

- International Workshop series on Normative Multiagent Systems (since 2005);

- International Workshop series on Coordination, Organisation, Institutions and Norms in Multiagent Systems (since 2005);

- Conference on Computational Models of Arguments (COMMA) (since 2006);

- Models of Trust for the Web Workshop (MTW). Held in conjunction with the 15th International World Wide Web Conference, Edinburgh, UK, 2006.

However - although there are significant advances in fields such as trust mechanisms, argumentation and negotiation models, norm-based systems, semantic alignment, etc. - the research conducted rarely crosses the border of its micro-community - and if it does, its significance and potential impact is often not fully understood by colleagues working on different aspects of computational agreement. There is an urgent need to raise awareness about the existence of a joint research challenge, and to build up a stable research community centred on the notion of agreement among computational entities. To this respect, there is still a lack of:

- a general conceptual framework, based on a pragmatic but robust notion of agreement that is acceptable across disciplines, within which the different contributions can be consistently understood and related;
- an effective Europe-wide framework where the emerging community could cooperate;
- an efficient training scheme (including alignment of course programmes, topic specific summer schools, etc.) capable to attract young researchers to the field so as to foster the sustainability of the community over time.

A COST Action on Agreement Technologies will address these scientific/technological needs, thereby increasing the impact of nationally-funded research by pooling efforts, avoiding duplication of research, and coordinating dissemination strategies.

The Action will help addressing economic/societal needs as well. As argued previously, computer-mediation of interactions both at business and at leisure level are becoming increasingly important for companies, workers and citizens in general. Advances in the field of Agreement Technologies will enable and speed up the practical development of applications that allow people to delegate part of their missions to software agents whose interactions are adequately regulated by the infrastructure, providing added value to all parties involved.

There is a wide variety of areas where the findings of this Action will apply: Advanced Healthcare, Adaptive Transportation Management or Computer-mediated Commerce, to mention just a few. For example, people on the move, travelling in foreign countries for business or holidays, may face

situations where they need medical assistance because of an emergency. It would be an important step forward if, once the person presses an emergency button on his/her PDA/mobile phone, the services offered by different institutions, such as hospitals, ambulances, insurance companies, etc, regarding emergency transportation, medical treatment, second opinions, potential home transportation etc. could be organised on the-fly. One implication of these complex requirements is the need for flexible on-demand service discovery, for a dynamic creation of service invocation agreements, and for a coordinated execution of a huge number of services offered by a variety of different organisations. Of course, this can only be achieved through trusted computer-mediation. Another example is adaptive intersection management: intelligent vehicles with short-range communication facilities could "pay" for the permission to be the first to cross an intersection in order to minimise their travel time; or negotiate the conditions under which they exchange their default time/space-slice (assigned, for instance, by the an intersection manager) with the reservations of other vehicles, to mutual benefit. Moreover, coalitions of vehicles and/or intersections may be formed. Security, real-time, negotiation, and learning are essential to make this scenario a reality. Finally, consider the vision of the extended enterprise - the dynamic network of interconnected organisations, from suppliers to customers, which work collaboratively to bring value to the marketplace. Norms, trust, argumentation and negotiation are essential here for shaping on-the-fly agreements that allow for an efficient on-demand formation and adaptation of supply chains in eBusiness to the benefit of all involved actors.

It should be noted that several nationally funded projects (partially) address the aforementioned scenarios by their software demonstrators.

B.4 Complementarity with other research programmes

To the best of our knowledge, none of the European research frameworks, such as ESF, ESA, EUREKA! or the EU Framework Programme, is currently carrying out a research project that is targeting the emerging paradigm of Agreement Technologies.

C. OBJECTIVES AND BENEFITS

C.1 Main/primary objectives

The overall mission of the Action is to support and promote the harmonisation of nationally-funded high-quality research towards a new paradigm for next-generation distributed systems based on the notion of agreement between computational agents, fostering research excellence and sowing the seeds for technology transfer to industry. This mission translates into the following two primary Action objectives:

- Objective O1. European research excellence - to facilitate harmonization and improvement in the quality, profile, and industrial relevance of European research in the emerging field of Agreement Technologies, drawing on relevant prior work from related areas and disciplines;

- Objective O2. Technology transfer - to gain competitive advantage for the European ICT industry in open distributed software systems.

C.2 Secondary objectives

In support of achieving the primary objective O1, the Action aims at the following secondary (mid-term) goals:

- O1.1. Joint Research: to promote innovative and pragmatic joint research across the community fractions related to Agreement Technologies in different COST member states, and worldwide;

- O1.2. Interdisciplinary Research: to promote interdisciplinary research in the field of Agreement Technologies aimed at a robust understanding of the notion of agreement among computational entities;

- O1.3. Early integration of young researchers: to promote a rapid integration and sustained involvement of early-stage researchers in the community building process;

- O1.4. Capacity Building: to promote high-quality teaching in all aspects related to the Agreement Technology paradigm.

In support of achieving the primary objective O2, the Action aims at the following secondary (mid-term) goals:

- O2.1. Awareness: to raise awareness of the emerging field of Agreement Technologies technology among the target groups of the Action; and
- O2.2. Early Adoption: to encourage the early adoption of Agreement Technologies and applications in industry.

In addition, it should be noted that the promotion of gender balance, though not directly related to the primary objectives outlined above, is also a significant mid-term aim of the Action.

C.3 How will the objectives be achieved?

The following means will be applied to address the mid-term objectives, so as to achieve the Action's primary goals in the long run:

- Activity A1: Working Group Workshops
  - Description: this activity shall ensure regular workshops of the different Working Groups active in the Action. They are the most important means for coordinating research activities in areas that are crucial for the evolution of Agreement Technologies.
  - Targeted Objectives: O.1.1, O.1.2
  - COST resources needed: €3.000 to partially cover organisation costs. Up to €1.000 of travel and accommodation costs per participating researcher.
- Activity A2: Interdisciplinary Seminars
  - Description: this activity supports informal meetings called seminars among researchers possibly involved in different Working Groups and with diverse scientific and technologic backgrounds. Topics will be defined ad hoc in accordance with needs and questions coming up at the WGs. It will also take advantage of the activities related to coordination visits programme for senior researchers.
  - Targeted Objectives: O.1.2, O1.1
  - COST resources needed: 1.000 to partially cover organisation costs. Up to €1.000 of travel and accommodation costs per participating researcher.
- Activity A3: Coordination visits programme for senior researchers
  - Description: this activity shall organise visits of up to one month for senior researchers at institutions involved in the Action. These activities may target joint research on emerging topics identified by the Action; the coordination of national research initiatives that the

researchers are crucially involved in; or the preparation of new proposals for bilateral or multilateral research projects.

- o Targeted Objectives: O.1.1, O.1.2
- o COST resources needed: travel costs of up to €1.500 per visit (the sending organisation is supposed to continue salary payment).

- Activity A4: Short-term scientific missions for early-stage researchers
  - o Description: this activity shall organise visits of one to three months of PhD students and young researchers at research groups and institutions involved in the Action. This activity may lead to PhD Theses with a European label, as well as jointly supervised research work. The activity may also support topical research visits of students from relevant academic institutions to work at business sites.
  - o Targeted Objectives: O.1.4., O.2.2
  - o COST resources needed: monthly flat rate grants of up to €1.000 per young researcher if s/he is a student visiting a research institution, to partially cover subsistence costs. In addition, a maximum of €500 per exchange shall be granted at cost for travel expenses.

- Activity A5: Early-stage-researchers meeting
  - o Description: this activity shall raise awareness of the necessities of the "young" members of the Action, and particularly PhD students, regarding tutoring, mobility, exchanges, etc. It will put special attention to alert of and/or discuss of job opportunities in industry so as to foster knowledge transfer towards the industrial sector.
  - o Targeted Objectives: O.1.3, O.2.1
  - o COST resources needed: Up to €1.000 of travel and accommodation costs per participating researcher.

- Activity A6: European Summer School in Agreement Technologies
  - o Description: this activity shall organise and/or support relevant training events, and in particular Summer Schools in Agreement Technologies, open to both, participants from academia and from industry. This includes the development of calls, invitation and selection of lecturers, local organisation, execution, and the evaluation of the training events. Coordination with related training events across Europe (EASSS, SSSW, etc) will be sought.
  - o Targeted Objectives: O.1.4, O.2.2, O.1.3

- o Resources needed: €10.000 per training event, to partially cover the cost of room rentals, printing, education materials, social programme, travel grants for students, as well as travel and accommodation cost of invited lecturers.
- Activity A7: Agreement Technology Industrial Days
  - o Description: this activity shall launch a joint forum aimed at raising awareness of the potentials of Agreement Technologies for the software and services industry. Industry partners from national projects will be invited so that Action members acquire a full picture of their needs on the one hand, and to project the prospective benefits of the use of Agreement Technologies to them on the other hand. Coordination with other European events dedicated to technology transfer will be sought, so as to maximise the impact of the activity.
  - o Targeted Objectives: O.2.1, O.2.2, O.1.1.,O.1.2
  - o COST resources needed: €10.000 to partially cover the cost of room rentals, printing, education materials, social programme, as well as travel and accommodation cost of invited speakers.
- Activity A8: Agreement Technologies Handbook
  - o Description: this activity will produce a book, to be published by a major international editorial, summarising the state of the art in Agreement Technologies, its applications, and its industrial potential, towards the end of the Action.
  - o Targeted Objectives: O.2.1, O.2.2
  - o COST resources needed: €5.000 to cover the costs of coordination and publication.
- Activity A9: Dissemination and Exploitation
  - o Description: this activity refers to dedicated classic dissemination means including a central Action Web site. It will also exploit intermediate results of the Action's networking activities by promoting bilateral and multilateral research funding proposals among members.
  - o Targeted Objectives: all.
  - o COST resources needed: €5.000 per year to partially cover the costs of the different dissemination and exploitation activities.

These activities will be carried out during 48 months primarily by researchers of the countries participating in the COST Action. However, to this respect, the advantage of an open membership

beyond the borders of COST countries should not be underestimated, as many international associated partners outside Europe have already expressed their strong interest in participating and networking with the Action with relevant world-wide initiatives, even without direct funding.

Care will be taken so that the aforementioned activities of the Action, and more precisely those related to meetings, workshops, and conferences, receive support from other funding institutions on a national and European level.

C.4 Benefits of the Action

The benefits of the Actions are tightly linked to its mission and primary objectives outlined in Section C.1 and are expected to unfold along three major lines.

The Action will produce a strategic benefit for COST countries through targeted capacity-building and multilateral networking of research efforts in the field of Agreement Technologies. This will provide them with significant competitive advantages in the mid/long term and promote European leadership in the emerging field of Agreement Technologies.

The Action will produce economic/societal benefits by pooling computational mechanisms and software demonstrators developed unilaterally or multilaterally by different COST countries. The demonstrators address important real-world economic and/or societal problems (see section B.3), thus illustrating the potential impact of the target technology of this Action for companies and citizens. These example applications, in line with the promotion of the early adoption of Agreement Technologies by the services industry that this Action will carry out, will trigger work towards the development of advanced industrial-strength applications with significant socio-economic impact in the mid-term.

The Action will generate the scientific/technological benefit of the coordination of national research efforts in the field of Agreement Technologies that will be visible in the short-term. To this respect, the following concrete results will be produced:

- an Agreement Technologies Handbook that summarises the state of the art in Agreement Technologies, its applications, and its industrial potential;

- an extensive up-to-date Website that serves as reference for the location and distribution of information related to the field of Agreement Technologies;
- a set of scientific reports, publicly available through the Action Website, addressing
  - the concept of agreement and all the processes and mechanisms involved in reaching agreements, so as to lay the ground for a generic ontological framework for the field;
  - computational models, mechanisms and methodologies for problems such as Resource management, Dynamicity, Adaptability, Workflow, Scalability, Security, and Usability from the standpoint of Semantics, Norms, Organizations, Argumentation, and Trust;
- a repository, accessible through the Website by researches and practitioners, consisting of:
  - pieces of software targeting different common problems tackled by Agreement Technologies (e.g. algorithms for negotiation, persuasion, argumentation, compilers between norm representation formalisms, semantic aligners, or agreement planners);
  - a tool suite used to build intelligent agents and organisations, including different kinds of simulators for rapid prototyping, as well as an effective calibration and evaluation of the different mechanisms in specific contexts;
  - a directory of applications compiling the results of the different case studies carried out by the national efforts, including use cases, requirements, as well as demonstrators and other software applications.

C.5 Target groups/end users

The audience of the activities to be performed by this Action can be classified into four major target groups.

Firstly, regarding the scientific community, this Action will bridge the gap between the research carried out in the field of Computer Science, Artificial Intelligence, and Social Sciences, targeting - in one way or another - the problem of reaching agreement among different kinds of agents. The Action will align nationally-funded high-quality research that can contribute to the establishment of a new paradigm for next-generation distributed systems, based on the concept of agreement in virtual organizations and societies. A main target is the establishment of a stable scientific community involving a significant number of researchers working on Agreement Technologies in the COST member states.

Secondly, as the need for large-scale, open software applications continues to grow, the software industry is likely to become interested in the potential of the novel way of developing distributed systems that this Action puts forward, based on self-contained components with a significant degree of autonomy, which are coordinated dynamically based on call-by-agreement mechanisms. This interest on the part of the software industry may include methods and methodologies for software development, as well as software repositories addressing different common problems attacked by Agreement Technologies.

Thirdly, the services industry and consulting companies will show interest in some of the simulators and tools that address different aspects of the process of constructing solid and durable agreements. Finally, the citizens as end users for the different applications in fields of Computer-mediated Commerce, Advanced Healthcare, Adaptive Transportation Management, etc. are, of course, the ultimate target group of this Action.

D. SCIENTIFIC PROGRAMME

D.1 Scientific focus

This Action will coordinate research anticipating solutions for the needs of next-generation computing systems where autonomy, interaction and mobility will be the key issues. It will support the development of technologies to cope with the (high) dynamicity of the system topology and with semantic mismatches in the interaction, both natural consequences of the distributed and autonomous nature of the components. Also, the research tasks coordinated by the Action will focus on security issues in these systems and in particular trust measures that complement the classical cryptographic methods. These measures are essential in open environments where interactions have to be made under uncertainty on the environment state. Most importantly, the Action will back the design of techniques that enable software components to reach agreements on the mutual performance of services. Negotiation, argumentation, decision making, knowledge modelling, virtual organisations and learning will be the sandbox techniques to build this next-generation of software systems. The overall vision of the Action is a new programming paradigm that incorporates, among others, two key concepts: (1) a normative context, that determines the rules of the game, i.e. how the interactions between agents are going to happen, and (2) a call-by-agreement interaction method that is based on a two-step process: first the establishment of an action

agreement between the agents that respects the normative context and, second, the actual program call for the enactment of the Action.

To achieve the ambitious goals of this Action, the coordination of research activities will be structured along three major strands of innovation:

- Interdisciplinary foundations strand: The Action will promote the dialogue and knowledge transfer among Social Sciences (and in particular social psychology), Artificial Intelligence and Computer Science, so as to reach a more robust understanding of the notion of agreement and all the processes and mechanisms involved in reaching agreements between different kinds of agents. Furthermore, the wide range of social theories available to date offers many different solutions to problems found in complex (computer) systems, so deciding which theories to apply, how and when, becomes a major challenge. A second objective of this strand is to clarify how these terms and mechanisms can find their way into computational models for negotiation, reputation, trust, interaction, contracts, organisation, cohesion, social order, or collaboration.

- Research strand: The Action conceives the key research topics in the field of Agreement Technologies in a natural tower structure, where each level provides functionality to the levels above. In some case, research outcomes will also produce helpful feedback that can be exploited at lower levels in the shape of additional functional and non-functional requirements.

  o Level 1: Semantic technologies constitute the bottom layer, as semantic problems pervade all the others. Solutions to semantic mismatches and alignment of ontologies are needed to have common understanding of norms or of deals, just to give two examples. The semantics and resource management aspects of the research will be explored here.

  o Level 2: The next level is concerned with the definition of norms determining constraints that the agreements, and the processes to reach them, have to satisfy. The adaptability of software components to changing normative systems will be studied here.

  o Level 3: Organisational structures further restrict the way agreements are reached by fixing the social structure of the agents: the capabilities of their roles and the relationships among them (e.g. power, authority). The workflow and composition aspects will be also a concern at this level.

- o Level 4: Argumentation and negotiation methods will be studied, so as to reach agreements that respect the constraints that norms and organisations impose over the agents. Adaptability and learning are major concerns here.

- o Level 5: Finally, the trust layer will study how to summarise the history of agreements and subsequent agreement executions in order to build long-term relationships between the agents. Trust is the technology that complements traditional security mechanisms by relying on social mechanisms that interpret the behaviour of agents.

- Development and applications strand: The algorithms and methods developed by national efforts within the research strand will constitute the kernel of a repository of software and know-how related to Agreement Technologies. This repository will also include a tool suite for building intelligent agents and organisations, comprising different simulators that support rapid prototyping, or the calibration and evaluation of agreement mechanisms in different scenarios. Finally, the Action will keep stock of different case studies and applications that have been developed by the national efforts, including information about use cases and requirements for different domains, as well as the corresponding software demonstrators and the results of their trials. This will not only constitute a testimony of the benefits of the technology, but will also allow for the evaluation of nationally developed frameworks in a much bigger variety of application fields than what would be feasible separately on national bases.

The innovation cycle supported by the Action is stemming out from the results of interdisciplinary research in the field of Semantics, Norms, Organisation, Argumentation and Trust. The Action will keep track of the results of the implementation of these methods and algorithms and their application to certain domains and scenarios. This, in turn, will provide valuable feedback to the research strand and, in some cases, the interdisciplinary strand. The temporal dimension of the innovation cycle will, of course, depend on the work plans and progress of the national research initiatives.

D.2 Scientific work plan – methods and means

The Action's coordination activities will be structured around Working Groups (WGs). These WGs promote the interaction among researchers and groups already funded by other national or international initiatives, so as to:

- allow for an effective knowledge transfer among the national research initiatives;

- facilitate the dynamic development of sub-communities around specific areas of strategic importance;

- provide the management bodies of the Action with bottom-up input to its decision-making process, and hence ensure that its strategic direction is reactive to the needs of its members.

The coordination activities of WGs will target all three strands of innovation outlined previously, focusing on key topics so as to give solid foundations to the paradigm. Therefore, they will be structured in accordance with the five levels of the natural tower structure introduced previously. The focus of WGs may evolve along the lifetime of the Action, so as to address new problems, insights, or challenges.

WG1: Semantics

This WG shall explore novel ways of semantic alignment of ontologies taking into account the current interaction state that agents are involved in. It shall study the logical relations between ontologies, knowledge-bases, sets of non-monotonic rules (or any integrated combination of these) that are relevant for aligning and merging theories in meaning-preserving ways. In particular, the WG shall look into how far policies and measures of trust can be used to decide which alignments and mappings between heterogeneous formats to apply, assuming that data, alignments, as well as trust-relevant meta-data is published and reusable by agents on the Web. Such published alignments shall allow combinations of knowledge bases based on static mapping rules, dynamic service calls and allow partial revocations of data published by other agents. The WG will examine mathematical theories of information and information flow to describe the alignment of agent terminologies, as well as reasoning techniques to reuse and adapt previous alignments to new interactions. The WG shall explore semantic-alignment protocols and algorithms interweaving alignment and negotiation in cooperation with WGs 4 and 5 so as to analyse and design basic resource management mechanisms for locating adequate services in open, large-scale, decentralized systems. In the spirit of the Semantic Web and Semantic Web Services initiatives, the WG will, to this end, further investigate how existing standardization efforts can be enhanced to cater for agreement relevant

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information. Particularly, this WG will address the following challenges around semantic alignment for agreement technologies:

- Integration of ontologies and nonmonotonic rules: Nonmonotonicity seems inevitable for ontological agreement between agents in order to deal with consistent, but closed subsets of ontologies in open environments which would otherwise involve logically inconsistent superfluous ontological information.

- Querying over distributed ontologies involving mapping rules and alignments: Queries for data, grounded in distributedly published ontologies and mapping/alignment rules, impose new challenges. The WG will carefully explore the right tradeoffs between expressivity and efficiency for ontology, mapping and query languages.

- Alignment with existing Semantic Web standards: The WG will investigate how existing standardization efforts in the area such as RDF, RIF, SPARQL and SA-WSDL can be enhanced to cater for agreement relevant information such as trust, provenance and policies and how this additions can be exploited for open, distributed access to heterogeneous data and service. For instance, the enhancement of current standards for Digital Rights Management (DRM) and Software Licensing by semantic annotations which enable automatic agreement on license terms falls in this category.

WG2: Norms

The WG shall tackle the problem of how to specify normative systems so that they may be properly implemented and one may reason about them for different purposes, including advanced applications such as contract generation, automated documentation, virtual organisations and agent-supported cooperative work. Reasoning about the system is necessary for the designer of the system to assure that the system has adequate properties and for (the designer of) those agents whose interactions will be regulated to assure that they conform to the rules. Reasoning about the normative system may also be necessary at run-time because complex multiagent systems usually need dynamic regulations. The problem is interesting, from an individual agents perspective, because norm adoption and compliance involve complex decision-making, and is also conceptually significant because currently available formalisms tend to be heavy and consequently there are few practical implementations. The problem is also of significant practical interest for open systems and

P2P architectures where adoption and compliance need to be properly addressed at design and at run time. Major issues that will be addressed by this WG include:

- Normative reasoning and negotiated flexibility. A serious challenge is the fact that norms need to be interpreted and instantiated in specific situations; second, that norms (especially when applied to a specific case) can be in conflict; third, that it is possible that to work well, to fulfill the assigned mission of the role, and to be loyal with the organisation, agents may need to violate a given rule or procedure. Any organisation has such a problem (and it is one of the internal reasons for its adaptation and evolution). So, agents must not only be norm-sensitive; they also need to be able to interpret and compare norms, and to negotiate and reach agreements about norm interpretation, application, and violation. Moreover, modelling normative reasoning is important because one might model different kinds of normative agents and mentalities; for example, agents that adhere to norms just on the basis of possible sanctions (probability and value), thus for an economic evaluation; others more really normative that have some sense of duty and respect of the authority and do not decide on the basis of selfish evaluations; obedient but able to distinguish between a normative imperative and a personal request; and so on.

- Usability of norms. The adoption of formal, non-ambiguous, and machine understandable norms should not prevent end users from understanding thoroughly the norms and their effects, therefore suitable interfaces are needed in order to enhance user understanding and awareness of the current norms. Also, advanced norm explanation techniques are needed to enhance user awareness of (and control on) the norms enforced by the systems that the user is interacting with. The greater generality of the norms considered by this WG will require improvements to the techniques developed for more specialized cases.

WG3: Organisations

This WG shall explore techniques of virtual organisations to specify how to solve a complex task/problem by a number of agents in a declarative way. The agents participating in an organisation can work together and form teams for the solution of a particular task within the scope of the organisational objectives. The particular organisation of the group of agents will thus be the answer to the complexity of the problem. For instance, in a hierarchical organisation when not

enough agents are found at a certain level to solve a problem, a reorganisation of the hierarchy is to be made that flattens the structure. Methods to support organisational change will play a critical role to this respect. As systems grow to include hundreds or thousands of agents, it is necessary to move from an agent-centric view of coordination and control to an organisation-centric one. New planning methods to distribute tasks and to determine the optimal organisation structure are to be investigated as the decisions on the restructuring are distributed and the information that each node in the organisation has will be partial and uncertain. Social structures can be explicitly expressed and shaped through organisational concepts, and can be exploited by the agents to cope with the difficulties of solving complex tasks in a coherent and efficient manner. Challenges addressed by WG3 include:

- Organisational teamwork: The processes of team formation, coordination and dissolution are all based upon dynamic agreements that are forged and maintained within the limits imposed by organisational structures. The WG will examine models of deliberative social choice to target the problems of team formation and dissolution. It will also look into mechanisms for agreement planning that create joint plans to carry out a set of tasks by means of a collaborative process among agents, deciding which agreement each agent is committed to. In this type of planning, the "assignments" of tasks or parts of a plan are not fully specified and need to be further developed by the agent. This creates interesting problems of trust regarding plan sharing and the assembly sub-plans.

- Organisational change: In open environments, organisational structures must continuously evolve so as to efficiently promote effective teamwork. The WG will borrow from planning, case-based reasoning and learning models to detect and implement these changes. In particular, it will deepen the concept of Electronic Institution to permit the reflective modification of the rules of the game, and to empower the agents with new conventional actions with their special effect, that are valid only in force of the institution and of the institutional role (e.g. prohibiting or signing), and in force of the acknowledgment (agreement) of the others.

Design methodologies and tools: To sow the seeds for industrial take-up of Agreement Technologies, effective guidelines for the design of organisational structures with regard to certain types of problems need to be investigated. These guidelines need to be supported by tools that help programmers in the development of agents and organisations.

WG4: Argumentation and negotiation

This WG shall investigate decision-making processes useful to develop a variety of agreement management methods to try and reach satisfactory agreements, good enough with respect to the needs and requirements of agents. Classical works in the field of negotiation methods, based on purely economic/game theoretical grounds, have proven to be limited in modelling real life exchanges. However, some formal guarantees are indeed required, especially in the realm of sensitive data, privacy preservation, and security which calls for convergence of different approaches currently pursued in different areas. The WG will look into frameworks that integrate argumentation in negotiation, so as to supply the negotiating parties with additional information and help them convince each other by adequate arguments. The basic idea behind an argumentation-based approach is that by exchanging arguments, the theories of agents (i.e. their mental states) may evolve, and consequently, the status of offers may change. However, state-of-the-art argumentation frameworks do not explain when arguments can be used within a negotiation, and how they should be dealt with by the agent that receives them, i.e. a protocol for handling arguments is missing. Another limitation of current frameworks is that key notions such as concession are not modelled, and that the status of dialogue outcomes is not clear. The same goes for the way an agent chooses the offer to propose at a given step of the dialogue. Key topics addressed by the WG include:

- Argumentation in negotiation: the WG will explore how formal properties of argumentation frameworks can be identified, interpreted and exploited in a negotiation context. More precisely, it will study how they are related to the agent epistemic knowledge, the definition of the negotiation object, the acceptance or rejection of an offer, the nature of the negotiation outcomes. The WG will also explore the relation of these outcomes with the different types of solutions concepts proposed in game theoretic negotiation. It will look into generic protocols capable of capturing different models of negotiation (e.g. auctions, bilateral negotiations, multilateral negotiations, etc.) while allowing the verification of the formal properties. In this context, a rigorous notion of concession is of foremost importance.

- Strategies for bounded interactions: Negotiation, argumentation and contracting need practical bounds to fit practical requirements arising for example from the heavy load of many of the Web services of our interest and from computational limitations of pervasive

computing scenarios. Proper mechanisms need to be studied to meet these bounds and simultaneously preserve good properties (e.g. related to negotiation success, information disclosure minimization and the like) overcoming horizon effects that are not tackled by the existing approaches.

WG5: Trust

Trust is a critical prerequisite of any agreement process. When there is uncertainty about the behaviour of the signatories of an agreement trust is essential. Trust helps to reduce the complexity of decisions that have to be taken in the presence of many risks. This WG will depart from traditional approaches for security management in several ways, as trust can be built based on a range of different kinds of evidence, each having different strength and reliability. First, inspired by social theories and information theory, this WG intends to deepen in the most advanced models of trust and reputation that will permit to model social security, e.g., a probabilistic security model that agents can use for decision making by fixing thresholds of trust for the acceptance of agreements. In an open world, complete security is by definition impossible, thus a probabilistic model linked to objective-cost-risk analysis that permits the tuning of the security level is needed. Norms, as the a priori restrictions for agreement acceptance (studied by WG2), and trust, as the a posteriori analysis of behaviour, seem the right tandem to complement the well known cryptographic methods and provide the maximum achievable trust levels in open systems. Second, trust enhancement by means of iterative negotiations of information will be applied to those domains where different parties need different kinds of evidence to trust a peer. In such scenarios, negotiations are needed to exchange each party's requirements and guarantees in the form of contracts that in general may span beyond the current transaction. The following challenges are particularly relevant to the WG:

- Scalability: When trust is based on other agents opinions its computation does not scale on large societies. The use of social network analysis techniques would permit the clustering of agents into organisations and thus allow for scalable solutions. The members of the Action that are experts on sociology will help in this interdisciplinary work.

- Semantics: The quest for a common global ontology seems abandoned as an impossible job. Local ontologies are abundant and any trust model will need to take into account how to deal with erroneous behaviour that may be caused by misunderstandings. Semantic

alignment and matching techniques will need to be factored into the trust models in order to permit agreements in an open world.

- Similarity: The scarcity of exact past experiences for an agreement under discussion requires that agents use similar cases from the past in order to assess whether trust can be put on a new agreement. Case-based reasoning techniques and similarity functions are central in trust models.

- Balance between norms and trust: Norms and trust can somehow be seen as two extremes in a continuum. The more norms that can be enforced the less risk in the opponents' behaviour and thus the less need to rely on trust measures. However, norm enforcement has an associated cost that is otherwise negligible when decisions are based on trust. Techniques of Nash equilibrium and optimization could help in finding the right point in the continuum, that is, how normative has to be the interaction among a given set of agents.

E. ORGANISATION

E.1 Coordination and organisation

The management structure of this Action has been designed with the intention to engage as many potential members of the emerging Agreement Technologies community as reasonably possible, and not simply serve the interests of an 'elite'. This requires (a) to be flexible and responsive to the needs of the emerging community that the Action intends to align and serve; and (b) to involve as many countries and research groups as possible in carrying out the activities of the Action.

The management strategy of the Action incorporates the basic Rules and Procedures for implementing COST Actions. It aims at guaranteeing a smooth and successful execution of the Action by ensuring that the goals are clearly defined and understood, that responsibilities are clearly assigned and workload equally distributed, and that measures for risk management and quality insurance are fast and effective. The full potential of existing telecommunication and information technology (e.g., email, teleconferences) will be exploited, in order to optimise the level of resources needed to manage the Action.

The management structure is subdivided into two levels. The technical coordination of the Action's activities is mainly performed at Workgroup Level. Workgroups enjoy a broad freedom regarding their internal organisation. As a general rule, membership to workgroups must be open to all participants (see Section E.2 for details). The Action level refers to the management and supervision of the Action as well as the alignment of workgroup activities. The following management structures exist at Action level:

- Management Committee (MC). The Management Committee will be setup in accordance with the general regulations for COST Actions. Its responsibilities are those described in Section VII.9 of the "Rules and Procedures for implementing COST Actions". For the performance of the corresponding tasks, it is assisted by a Core Group and an Advisory Board. The MC will meet at least once a year at the Action's annual meeting.

- Core Group (CG). Governance of the network will be guaranteed by a Core Group assisting the Action Chair. The CG will be elected at the kick-off meeting and subsequently confirmed at all annual meetings. Replacements will occur at annual meetings. The CG will comprise, at least, the Action Chair, the Action Co-Chair, the Action Manager, and the Working Groups Chairs. The CG has both administrative and executive responsibilities:

  - o to ensure timely preparation of annual reports;

  - o to ensure accurate consolidated records of costs, resources, and time-scales;

  - o to communicate with other projects and to coordinate presentations;

  - o to measure and report the progress of the Action.

  - o to ensure that the Action maintains its objectives and relevance;

  - o to resolve any urgent technical, administrative, or contractual issues.

- The CG shall meet at least every six months in order to check and supervise the progress of the Action. These meetings will usually be co-located with the Action's annual meeting and with a WG meeting. To further minimise travel costs, any interim meetings will make use of group audio and video conferencing facilities whenever practicable, and will be used mainly for reporting/reviewing/decision making.

- Advisory Board (AB). To maintain a more general view of the scientific, technological, and socio-economic impact of the Action, a scientific Advisory Board will be recruited. Its role is to take stock of the Action's achievements and assess its progress in a broader context. The AB will provide constructive criticism of the activities and results obtained, and may issue recommendations to the CG regarding future targets and strategies. The AB is appointed by the MC of the Action at the kick-off general meeting.

The main roles in the Action and their associated responsibilities in relation to the management structure are as follows:

- Action Chair (AC). The AC is in overall charge of the Action, takes responsibility of the overall coordination, including financial, administrative and day-to-day issues, and convenes and chairs the Core Group. The AC convenes (but does not chair) the Advisory Board.

- Action Co-Chair. The Action Co-Chair assists the AC with the scientific coordination of the Action. This may include, but is not limited to, any of the following tasks:

    o to take stock of WG activities (liaisons, dissemination, research, project proposals, etc);

    o to guarantee a fair distribution of STSMs among WGs, taking into account the Action's strategic objectives (promoting early stage researchers, interdisciplinary visits, and gender balance);

    o to compose the annual report based on inputs from the WGs;

    o to coordinate the preparation of annual meetings (including early stage researchers meeting), training events, Industrial Days and Agreement Technologies handbook;

    o to ensure a swift construction and timely updates of the Action Website.

- Action Manager. The Action Manager assists the AC with the administrative coordination of the Action. This includes all financial and contractual issues.

The progress of the Action's activities and the degree of achievement of its milestones will be reviewed regularly at CG meetings. In addition, each WG member, and in particular the WG

Chairs, are responsible to report immediately to the AC any additional risk situations that may conflict with the Action objectives or their successful completion. Depending on the gravity and/or urgency of the problem, decisions regarding additional support or counter measures are taken by the AC, the CG, or the MC. Quality assurance of the Actions activities is based on peer review. In particular, the documents produced by the Action will be reviewed by the WG Chairs and the Action Chair or Co-Chair prior to publication on the Action Website or delivery at annual meetings.

E.2 Working Groups

The management structure of each Working Group will be decided by itself at their own meetings (co-located with the WG workshops) and remains essentially free. The only constraints will be the existence of a WG Chair and the use of the same Advisory Board of the whole Action. This should allow a better scientific appreciation of the WG activities. Participation remains open all over the duration of the Action and will be handled by open calls to be issued on a regular basis (before the workshops). The activities of WGs include:

- to provide an open forum for discussion on the topics covered by the WG, and in particular to organise WG workshops;

- to organise and/or contribute to interdisciplinary seminars;

- to propose coordination visits for senior researchers and training visits programme for early-stage researchers to the AC;

- to perform mentoring for PhD students and encourage participation to early stage researchers meetings;

- to perform and report on liaisons with related initiatives at a national, European, and world-wide level;

- to encourage contributions to the Action's software, tool, and application repository;

- to foster the dissemination of results to the large public, including contributions to the Industrial Days and Agreement Technologies handbook.

Working Group Chairs are responsible for the efficient execution of the WG activities. They convene and chair the WG meetings, and are to produce WG reports on time and to the specified quality.

E.3 Liaison and interaction with other research programmes

The Action will take the appropriate measures to ensure an effective cooperation with other COST Actions where appropriate. Initially, three candidates for such a liaison have been identified:

- COST Action IC0602: Algorithmic Decision Theory (running until 02/05/2011)

  o Description: Action IC0602 aims at bringing together researchers coming from Decision Theory, Discrete Mathematics, and Computer Science, so as to improve decision support in the presence of massive data bases, combinatorial structures, partial and/or uncertain information and distributed, possible interoperating decision makers. This Action can benefit from IC0602 essentially in its WG4, where its pragmatic argumentation models may be complemented by classical negotiation methods from Decision Theory. On the other hand, a knowledge and/or result transfer from this Action to IC0602 is likely to occur in the field of multiagent architectures and software that facilitate agreement among human decision-makers.

  o Liaison Action: The Action will designate an officer in charge of managing the liaison activity. This may, but need not, be the Chair of WG4. The possibility of coordinated or joint activities will be explored (seminars, visits, etc)

- COST Action IC0702: Combining Soft Computing Techniques and Statistical Methods to Improve Data Analysis Solutions (running until 30/06/2012)

  o Description: The main objective of Action IC0702 is to strengthen the dialogue between the statistics and soft computing research communities in order to enhance the robustness and generalisability of data analysis methods, while preserving their flexibility and practical applicability. This Action can benefit from IC0702 in several of its Working Groups, where data mining and other soft computing techniques will be relevant. A knowledge and/or result transfer from this Action to IC0702 will mainly refer to the application and demonstration fields.

- o Liaison Action: The Action will designate an officer in charge of managing the liaison activity. The possibility of coordinated or joint activities will be explored (seminars, visits, etc)

- COST Action IC0701: Formal Verification of Object-Oriented Software (running until 30/06/2012)

  - o Description: Action IC0701 aims to further the efficient development of correct and reliable software by coordinating the development of verification technology, to achieve reach and power needed to assure reliability of object-oriented programs on industrial scale. Verification techniques will undoubtedly be relevant to this Action aiming at a novel paradigm for distributed computing, so there appears to be a potential for cross-fertilization.

  - o Liaison Action: The Action will designate an officer in charge of exploring the potential benefits of a liaison who, if appropriate, will establish and implement the liaison activity.

As outlined in Section B4, none of the currently active European research projects are clearly overlapping with the Action. During its entire lifetime, the Action will see to it that the duplication of research efforts is avoided. The Action will keep a close eye on current and future initiatives in Europe and worldwide so as to identity emerging synergies. If appropriate, its dissemination strategy will be adapted accordingly.

E.4 Gender balance and involvement of early-stage researchers

This COST Action will respect an appropriate gender balance in all its activities and the Management Committee will place this as a standard item on all its MC agendas. The Action will also be committed to considerably involve early-stage researchers. This item will also be placed as a standard item on all MC agendas.

Although an increasing number of young women is attracted by scientific research in the areas covered by this Action, the real problem concerns the professional future of these young colleagues, as careers for young male researchers tend to be easier and faster than their female counterparts'. Therefore, the efforts undertaken in this Action to support early-stage researchers will not only

increase the possibilities to continue their research career after their PhD or PostDoc, but will also contribute to promote gender balance among future senior researchers. This general calculus is supported by a series of concrete additional measures. The Action will see to it that female speakers play a prominent part in seminars, workshops, and other events. It will also encourage officers (Action Chair and Co-Chair, as well as Working Group Chairs) to promote female participation and make gender balance visible in their respective areas of responsibility. The Action's success (or lack thereof) in this effort will be tracked as part of its normal reviewing and reporting activities.

F. TIMETABLE

The following timescale provides an overview of the sequence of activities for the whole 4-year-duration of the Action, as well as the expected months of their implementation.

During the Action's kick-off meeting at month M1 the Core Group and the Advisory Board shall be elected. Furthermore, Working Groups shall be established, a Chair for each of them elected, and the overall schedule of the Action refined and approved. Within 6 months from M1 a fully operational Web-site shall be available, containing essential information about the Action and its Working Groups. A call for participation will also be distributed through relevant mailing lists at month M1. These calls will be updated and reissued yearly, both through mailing lists as well as through the Web site.

At months M6, M18, M30 and M42, workshops of the Working Groups will be organised. WGs are generally free to organise and schedule their activities, but this is a minimum requirement. At each workshop, there will be a special session dedicated to internal WG organisational issues. WG Chairs will strive to hold their groups' workshops at the same time and place, so as to reduce travel and organisation costs, and to enable cross-WG sessions.

At months M12, M24, and M36 general meetings of the whole Action will take place. These will include a general assembly, including MC, CG, and possibly AB meetings, dealing with all questions related to the management of the Action as well as the coordination of its activities. An early-stage-researchers meeting will be co-located with the general meeting, so as to make explicit

the needs of young members of the Action (tutoring, mobility, exchanges, job opportunities etc.) and bring them to the attention of its governing bodies. Additional WG meetings may, but need not, be organised at the general meeting. An annual report shall be published before the meeting that summarises the achievements of the Action during the respective period.

Two Training Events will be organised around months M18 and M30. These shall not only address the capacity building of early-stage researchers involved in the Action, but shall also attract further young participants from research institutions and possibly, from industry. WG Chairs will see to it that the topics of their WG are adequately covered in the programme of the Training Events. Their final schedule will depend, however, on possible co-location with events and/or agreements with liaised projects or organisations.

Towards the end of the Action, around month M42, the Agreement Technologies Industrial Days shall take place, aimed at fostering the awareness of the Action's results among its target groups, and especially among actors from the software and services industry as well as the general public. It will be particularly concerned with an adequate promotion of the challenges, findings and application opportunities of the Action. The final schedule of the Industrial Days is subject to coordination with other major events targeting industrial knowledge transfer.

The results of the Action shall also be published by a major editorial around month M48.
The closing meeting, shortly after month M48, shall summarise the outcomes of the Action in the shape of a final report, and enact adequate measures to ensure the sustainability of its results.

Major Milestones are listed below (subject to available funding):

MS1. The followings activities and results have been achieved after month M12

- At least one Early-stage Researchers Meetings

- More than 5 Working Group Workshops

- More than 3 Interdisciplinary Seminars

- More than 5 STSMs realised (early-stage and senior researchers)

- Fully-functional Website with repository online

MS2. The followings activities and results have been achieved after month M24

- At least one Early-stage Researchers Meetings

- At least one Training Event organised (e.g. "Summer School")

- More than 5 Working Group Workshops

- More than 5 Interdisciplinary Seminars

- More than 10 STSMs realised (early-stage and senior researchers)

- More than 2 multilateral research funding proposals

- More than 2 PhD Thesis jointly supervised or with European Label

- More than 1000 visits to the Website and more than 50 downloads from the repository

MS3. The followings activities and results have been achieved after month M36

- At least one Early-stage Researchers Meetings

- At least one Training Event organised (e.g. "Summer School")

- More than 5 Working Group Workshops

- More than 8 Interdisciplinary Seminars organised

- More than 15 STSMs realised (early-stage and senior researchers)

- More than 3 multilateral research funding proposals

- More than 5 PhD Thesis jointly supervised or with European Label

- More than 2000 visits to the Website and more than 100 downloads from the repository

MS4. The followings activities and results have been achieved after month M48

- At least one Early-stage Researchers Meetings

- At least one Dissemination Event ("Industrial Days")

- At least one Book ("Agreement Technologies handbook")

- More than 5 Working Group Workshops

- More than 10 Interdisciplinary Seminars

- More than 15 STSMs realised (early-stage and senior researchers)

- More than 4 multilateral research funding proposals

- More than 10 PhD Thesis jointly supervised or with European Label

- More than 3000 visits to the Website and more than 200 downloads from the repository

M1	M6	M12	M18	M24	M30	M36	M42	M48
Kick-off meeting	WG workshops	General meeting	WG workshops	General meeting	WG workshops	General meeting	WG workshops	Closing Meeting
Call for participation	Action Web-site online	Call for participation	Training School	Calls for participation	Training School	Call for participation	Dissemination Conference	Book publication
Establishment of WGs		Annual Progress Report		Annual Progress Report		Annual Progress Report		Final report
Web-site construction		Early-stage researchers meeting		Early-stage researchers meeting		Early-stage researchers meeting		
Training visits programme for early-stage researchers								
Coordination visits programme for senior researchers								
Interdisciplinary Seminars								

G. ECONOMIC DIMENSION

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest: AT, CY, CZ, FR, DE, GR, HU, IE, IL, IT, LU, NL, PL, PT, ES, SE, CH, UK. On the basis of national estimates, the economic dimension of the activities to be carried out under the Action has been estimated at EUR 20 million for the total duration of the Action. This estimate is valid under the assumption that only the countries mentioned above will participate in the Action. Any departure from this will change the total cost accordingly.

39 research teams from the 18 aforementioned countries have already expressed their interest to contribute to the Action. The estimation of the overall manpower assumes an average dedication of 5 person-years per team (including the efforts of both senior and early stage researchers). 3 person-years for coordination and management are added on top of this for a grand total of 198 person-years, resulting in estimated costs of EUR 19,8 million. The sum of EUR 200.000 for computing and networking equipment needs to be added, leading to a total cost of EUR 20 million. This does

not include the costs incurred by any of the teams from non-COST countries that have expressed their interest to participate in the Action (Argentina, Australia, Brazil, Mexico, UAE, USA).

H. DISSEMINATION PLAN

H.1 Who?

All researchers involved in the Action - particularly CG and MC members - will play a proactive role in the dissemination of information about the Action and its activities and results. The findings and recommendations of this COST Action will be disseminated to the following target audiences:

- A1. Academia, and in particular researchers and institutions working in the fields of Computer Science (Semantic Technologies), Artificial Intelligence (Multiagent Systems), and Social Sciences;

- A2. Industry, and in particular practitioners and companies dedicated to software development, services, and consulting;

- A3a. European policy makers, and in particular bodies in charge of relevant research funding authorities (European Commission, ESF, etc);

- A3b. National policy makers, and in particular bodies in charge of relevant research funding authorities, and multinational cooperation;

- A4. European Citizens.

H.2 What?

Dissemination methods aimed at spreading the impact of the Action will include the following (the target audience is given in parentheses):

- Organisation of COST events centred on Agreement Technologies, such as workshops (A1), training schools (A1, A2), or Industrial Days (A2,A3)

- A set of Action presentations describing the COST Action, to be tailored to different kinds events and audiences (networks, workshops, fairs, info-days, "open door" events) (A1-A4)

- Publications produced by the Action proper including:

  o Scientific reports (A1) that describe the progress of the research activities coordinated by the Action in any of the five key technological areas for Agreement Technologies that have been identified, and from the standpoint of any of the three strands of innovation (see Section D.1);

  o Progress reports (A1) that portray the evolution of the Action's community and capacity building activities;

  o An Agreement Technology handbook that summarises the state of the art in the field and its potential applications, providing recommendations for a successful adoption of technology (A1, A2, A3);

  o Course material (A1, A2) resulting from the Action's training events.

- Press releases, possibly centred on application examples and breakthrough results from the coordinated research activities (A4, A2, A3)

- Scientific publications of Action members at high-level international conferences (A1). This may include

  o International Joint Conference on Artificial Intelligence (IJCAI)

  o International Semantic Web Conference (ISWC)

  o International World Wide Web Conference (WWW)

  o Int. Conference on Autonomous Agents and Multiagent Systems (AAMAS)

  o European Semantic Web Conference (ESWC)

  o European Conference on Artificial Intelligence (ECAI)

- Scientific publications of Action members in peer-reviewed international journals (A1). This may include

  o Artificial Intelligence Journal (AIJ)

  o Journal of Web Semantics

- o Int. Journal on Autonomous Agents and Multiagent Systems (IJAAMAS)

  - o Journal of Artificial Societies and Social Simulation (JASSS)

- Publications of Action members in professional journals or magazines (A2, A3).

H.3 How?

The public Action Website will be one of the main tools for disseminating information about the COST Action. It will contain comprehensive information about the Action, its aims and scope (including a list of national research initiatives coordinated by the Action), duration, countries participating in the Action, key scientists and research centres, a summary of the work plan, etc. Dissemination material produced by the Action, such as scientific reports, presentations, course material, press releases, etc. will be directly downloadable from the public Website. It will also include a list of publications produced by Action members, as well as pointers to bilateral and multilateral research projects of Action members. In addition, selected items from the Action's repository of software, tools, and applications will be accessible publicly. The amount of information available on the Website will of course increase with the progress of the Action's activities.

In addition, an internal Website will be maintained with information provided by the WGs, CG, AB, and MC. It will contain official documentation (e.g. MoU), the detailed work plan, the working documents and reports, and any useful information for the participants in the Action, such as an agenda with internal and relevant external events or information about potential STSMs and open positions for early stage researchers in partner institutions. The Action's repository of software, tools, and demonstrators, will be accessible to Action members (password protected) through the Web. The creation of Web-based discussion fora for early-stage researchers and other members of the Action will be possible. The CG members will see to it that both public and internal Websites are regularly updated.

Two mailing-lists will be available, one for communication between Action participants and one for individuals or organisations that want to be informed on specific progress of the Action without being directly involved in it. The second list will be open to anyone who wishes to join it via an electronic application form available on the Action Website, as well as via expressions of interest

gathered by Action members. Selected dissemination material will also be distributed through this mailing list.

Working Groups will encourage the active participation of its members in top-level international conferences in fields related to the Action and its associated workshops. Proactive Action presentations will not only occur at scientific events. Action members will also see to it that their assistance to meetings related to project liaisons, to fairs and industrial fora, as well as to policy or funding related events, be exploited for Action presentations.

Dissemination activities will be constantly monitored by the CG, and will be assessed in the annual reports of the Action. For this purpose, a dissemination plan will be generated that not only describes foreseen dissemination actions, but also keeps stock of which dissemination activities have been performed and with what results. This plan is a living document that will be updated regularly throughout the lifetime of the Action.

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