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

Brussels, 11 July 2006

COST 268/06

MEMORANDUM OF UNDERSTANDING

Subject :	Memorandum of Understanding (MoU) for the implementation of a European Concerted Research Action designated as COST Action 2100 'Pervasive Mobile & Ambient Wireless Communications'

Delegations will find attached the Memorandum of Understanding for COST Action 2100 as approved by the COST Committee of Senior Officials (CSO) at its 165th meeting on 27/28 June 2006.

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MEMORANDUM OF UNDERSTANDING
FOR THE IMPLEMENTATION OF A EUROPEAN CONCERTED RESEARCH ACTION DESIGNATED AS

COST Action 2100

'Pervasive Mobile & Ambient Wireless Communications'

The Signatories 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 400/01 'Rules and Procedures for Implementing COST Actions', or in any new document amending or replacing it, the contents of which the Signatories are fully aware of.

2. The main objective of the Action is to increase knowledge of mobile and wireless network technologies by exploring and developing new methods, models, techniques, strategies and tools that will facilitate the implementation of next generation mobile radio communication systems and that will foster the development of the paradigms of pervasive and ambient wireless communications.

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 20 million EUR in 2006 prices.

4. The Memorandum of Understanding will take effect on being signed by at least five Signatories.

5. The Memorandum of Understanding will remain in force for a period of four 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 6 of the document referred to in Point 1 above.

COST ACTION 2100

Pervasive Mobile & Ambient Wireless Communications

A. ABSTRACT

This Action aims at targeting the new topics that are currently emerging in the area of mobile and wireless communications, while offering an open framework that will be capable of evolving according to the most challenging research trends of the next four years.

The main objective of the Action is to increase knowledge of mobile and wireless network technologies by exploring and developing new methods, models, techniques, strategies and tools that will facilitate the implementation of next generation mobile radio communication systems and that will foster the development of the paradigms of pervasive and ambient wireless communications.

The main issues that will be dealt with refer to propagation and antennas, transmission techniques and signal processing, and radio networks. A multidisciplinary approach will be pursued, bridging the various expertises through the creation of special interest groups dealing with specific cross-layer oriented issues, while, on the other hand, more traditional working groups will create the disciplinary background to increase the knowledge of the various techniques. The current technology trend towards the integration of wireless systems operating under different paradigms will be investigated. The Action will actively contribute to standardisation bodies and aims at maintaining, and even increasing, the industrial competitiveness of European industry in the mobile and wireless communications area.

Keywords: wireless techniques, radio networks, propagation, mobile and ambient communications, pervasive computing.

B. BACKGROUND

Mobile and wireless communications play an instrumental role in the current ongoing societal changes, as enabling technologies for the spreading of information to all citizens, for making interhuman relations and interactions between people and the environment easier and more efficient.

In this context, Europe should continue to play a leading role, as was the case with GSM. UMTS is also a key technology for European industries. R&D continues to be an important factor, and the issues relating to the next generation of mobile radio systems, involving **high data rate communications** and **heterogeneous networks** (with many different radio access technologies simultaneously available to the end user, often through a single device), are already being addressed by a large number of researchers in the European R&D community. For many years now it has also been recognised that better and faster results are achieved by joint efforts at the European level, rather than by countries conducting their national programmes separately.

This Action basically addresses the various layers of mobile and wireless communications, namely:

- **radio channel** (single and multiple dimensional, propagation mainly for channel modelling, antennas mainly from a system point of view),
- **signal processing** (including coding, modulation, access techniques and enhanced MAC schemes),
- **radio network aspects** (cellular planning tools, radio resource management, protocols and traffic modelling).

In this context, mobile radio cellular systems, Wireless Local and Personal Area Networks (WLANs and WPANs) have been the main areas considered during the past few years, as the systems under development or deployment worldwide were GSM, UMTS, HIPERLAN and IEEE802.11, and short-range air interfaces such as Bluetooth. The current scientific trend is toward integration of these often fragmented research topics, leading to **cross-layer approaches** for the design of communication systems, and deeply exploring both cognitive radio and cognitive networks concepts. It requires **multidisciplinary** activities grouping together experts from the various areas mentioned above (from electromagnetic characterisation to signal processing, protocol design and traffic modelling).
Also, the wireless world is at present witnessing a clear technology trend: **integration among wireless technologies** initially intended for separate fields and applications is taking place. Some examples of this trend are as follows:

- **mobile radio systems need to interoperate with hot spot technologies**, the former covering large areas and providing multimedia services to high- or low-mobility users, the latter offering larger bandwidths in small areas to stationary users;
- **pervasive communications** are based on the concept of ubiquitous computing, where technology recedes into the background of our lives (and becomes pervasive) to make **human–computer interactions** much easier; they require efficient, multimedia and power-aware technologies linking together many heterogeneous devices distributed over small or large spaces, and peer-to-peer and ad hoc paradigms;
- **interaction between the environment and humans** will become stronger and stronger, and this can be enabled by integration between the technology of wireless sensor networks and mobile and personal radio systems, merging into a generation of **ambient wireless networks**;
- digital terrestrial distribution systems (such as DVB-T, Digital Video Broadcasting – Terrestrial) are merging with mobile radio systems (see for example, the development of the concept of DVB-H, where the H stands for Handheld) to facilitate the **diffusion of multimedia content** to the end user.

Another current trend is towards the vision of **Gigabit wireless**, i.e. to achieve usable bandwidths of 1 Gbit/s for stationary (nomadic) users, and hundreds of Mbit/s for mobile users. This provides many technical challenges, also requiring an interdisciplinary approach.

The high-mobility environment certainly presents the greatest technical challenges for the development of these trends, and hence mobile radio systems are the main focus of the Action. However, all scientific aspects related to the technology trends discussed above are a natural extension of the interests of researchers involved in this COST Action: many research issues such as MIMO, signal processing in general, or connectivity between nodes in ad hoc networks, are transgressing the boundaries of formerly separate applications and types of wireless systems.

The Action will establish and foster relationships both internal (i.e. among participating institutions) and external (i.e. towards other bodies such as ETSI and 3GPP, ITU-R, EU-IST STREPs, IPs and NoEs, etc.), not only at the European but also at the international level. These relations with other

bodies will be pursued, having in mind potential **contributions to standardisation**. The internal integration will generate coordinated actions. Other currently ongoing COST Actions have been examined in order to avoid any potential overlap and to possibly increase any synergetic aspects. Again, the links and collaboration of the previous Actions in the mobile area with others working in related areas will be continued.

The technical issues previously identified for this project require long-term and multidisciplinary (cross-layer) efforts. As clearly demonstrated in the past, COST is the best framework to carry out this type of project, thanks to its bottom-up à la carte approach. This facilitates a remarkable harmonisation and the integration of national research activities, providing the best environment to pursue long-term and multidisciplinary research with respect to the other EU instruments.

C. OBJECTIVES AND BENEFITS

The main objective of the Action is to increase knowledge of mobile and wireless network technologies by exploring and developing new methods, models, techniques, strategies and tools that will facilitate the implementation of next generation mobile radio communication systems and that will foster the development of the paradigms of pervasive and ambient wireless communications.

As a secondary objective, the Action will continue to play a supporting role to European industry, similar to the one played by the previous Actions in the mobile and wireless communications area. That is, besides giving inputs to the development of B3G systems, it is also expected that it will contribute to the deployment of systems that are very close to completion of their standardisation phase.

These goals agree with the more general European targets for the next four to five years in the mobile and wireless communications area, hence encompassing the four-year schedule of the Action and giving a justification for its length. The activity carried out in the Action brings benefits not only at a national but at the European level:

- it helps to maintain, and even increase, the industrial competitiveness of European industry in the mobile and wireless communications area, because of the work in this area on future systems and the assistance in the deployment of existing ones;
- it helps the SMEs involved in the Action to increase their knowledge of cutting-edge technologies;
- it includes research work that ranges from the fundamentals of the systems to more applied aspects, and it addresses the full scope of mobile and wireless systems, therefore, creating conditions for multidisciplinary work;
- it brings direct benefits to the Signatories involved, since this pan-European activity within the Action enables the exchange of information at a level that would not be possible for the individual researchers just by attending conferences or conducting bilateral exchanges;
- it contributes to improving the quality and to speeding up the results of the R&D work performed at the European level in the very competitive area of mobile and wireless communications, compared with that carried out in North America and in the Asia-Pacific region, by permanent collaboration and exchange of information;

- last but not least, the grouping of such a large community of researchers contributing to standardisation provides further stimulation to the growth of the mobile and wireless communications market, with a subsequent impact on the quality of life of the citizens of the Signatory countries as well as on their economies.

D. SCIENTIFIC PROGRAMME

This COST Action is organized around three Working Groups (WGs), dealing respectively with propagation and antenna issues, physical layer (i.e. mainly modulation and signal processing) aspects, and radio network aspects, as follows.

- WG1 – Transmission Techniques and Signal Processing
- WG2 – Radio Channel
- WG3 – Radio Network Aspects.

These WGs will be permanent, in principle, during the four years of the Action.

However, current technology and research trends clearly require a deeper integration of skills among the various disciplines involved in the design and development of mobile and wireless communication systems: signal processing issues are indissolubly related to propagation and antenna issues, and radio network aspects require investigation of the strong interactions between the various layers of the protocol stack. It is clear that cross-layer approaches can provide significant improvements to protocol performance. The recognition of this technology and research trend require that the scientific programme will be focused on both (1) the study of the separate disciplines (e.g. advanced modulation techniques) to attain the objective of the increasing knowledge of basic principles, and (2) the investigation of research areas which require cross-layer approaches, leading to a proper integration between expertise at different layers of the protocol stack. Therefore, **Special Interest Groups (SIGs) will be created, addressing specific topics that require expertises taken from the three separate WGs** (e.g. MIMO, Ultra Wide Band Communications, and cognitive radio). These SIGs will be created à la carte, according to a bottom-up approach and could be permanent or temporary depending on the researchers and on technical development trends. The Management Committee (MC) meetings will be organised in a way to solicit participation in SIGs, where a very large and fruitful exchange of knowledge is expected to take place.

Also, as SIGs will gather expertise from the different fields of mobile and wireless communications, participation of researchers with expertise in the field of cross-layer design, routing in ad hoc networks, computer science, etc. will be solicited. Actions to be undertaken may include:

- invitations to researchers from other areas to join the Action and the SIGs (for instance, from NEWCOM, the Network of Excellence in Wireless Communications);
- the first workshop of this Action will be devoted to cross-layer issues;
- at each MC meeting, speakers will be invited to present technical papers on the most innovative issues not covered sufficiently by the expertise already present in the Action.

The main scientific issues that will be dealt with are the following, reported on a WG basis.

Working Group 1 – Transmission Techniques and Signal Processing

This WG deals with transmission and signal processing techniques for air-interface technologies, mainly related to the physical layer of systems.

The main topics include:

- **Air-interface techniques** for gigabit wireless transmission;
- **Access technologies** for pervasive systems;
  - **Reduced complexity detection techniques**, including equalisation and channel estimation for broadband high mobility channels;
  - **Multicarrier-based techniques**, including OFDM/MC-CDMA and frequency domain equalisation with cyclic prefix;
  - **Interference management and suppression** techniques, including interference cancellation and MUD for interference cancellation;
  - **Modulation and FEC coding schemes**, including variable rate and adaptive techniques, multilevel modulation, efficient channel coding techniques such as turbo-codes, LDPC codes and other iteratively-decodable codes;
  - Adaptive air-interface techniques for use in **cognitive radio** systems, and **cognitive radio** issues related to the physical layer;
  - Receivers for wireless non-stationary and/or non-Gaussian channels, and evaluation of performance.

Turbo-processing (i.e. iterative) techniques will play an important role. They will be applied to joint detection, equalisation, estimation and synchronisation, and in addition they will be used for interference estimation, suppression and cancellation. The use of iteration across layers will be investigated.

In conjunction with WG3, the application of FEC coding at the network layer – sometimes known as **network coding** – may also be studied in the framework of network information theory. Its application for robust transmission in networks with time-varying topology and unreliable links, such as are likely to occur in pervasive wireless systems, will be of particular interest, as will MIMO-equipped mesh networks.

Some aspects of topics which are also likely to be covered by SIGs will be included in WG1 where the issues are more specific to the expertise of WG1, rather than cross-layer. For example, issues such as receiver implementation in UWB radio technology, and such as low complexity space-time coding in MIMO systems.

Working Group 2 – Radio Channel

This WG will follow a dual approach in order to contribute to the progress of radio communication systems in the area of propagation, channels and antennas.

The first is a traditional approach where basic work will be continued in order to improve the understanding and the modelling of **radio propagation** and of **single and multiple antenna systems**. Given the high complexity of the polarisation and spatial-dependent multipath propagation and of antenna interactions within themselves and with their environment, the anticipated outputs of this work will be the definition of simplified but accurate models, intended for radio systems simulation and standardisation.

The second approach is more proactive and will address the new requirements put on the assessment of radio channel properties for the successful development of novel wireless communication systems. This implies the need to identify the specific scenarios, parameters, and system configurations which have an effect on the radio channel, and to specify accordingly the

investigations to be carried out. For this purpose the second approach will build suitable links with the other WGs, particularly through the SIGs.

- *Physical propagation mechanisms*, at specific bands of the radio spectrum in the micro- and millimetre-wave bands,
- *Radio propagation modelling techniques*, for faster simulations or greater accuracy,
- *Measurements and advanced analysis* of the polarised, double directional radio channels, for meaningful parameter extraction,
- *MIMO channel sounding and modelling*, including small and electromagnetically coupled antenna arrays representative of terminals,
- *UWB channel sounding and model extraction*, taking into account the specificities of the major physical layer schemes making use of these models,
- *Identification of the propagation specificities* of multihop and relay networks, and of sensor networks,
- *Frequency dependence of the propagation*, and consequences on radio channels for multistandard and cognitive radio systems,
- *Mobile-to-mobile and point-to-multipoint* propagation channels,
- *Interactions between antennas and humans*, and the influence on the radio channel particularly for close sensors,
- *Advanced assessment of antenna handset characteristics,*
- *Statistical antenna models and UWB antenna models*, taking into account antenna dispersions and antenna environment variability.

Working Group 3 – Radio Network Aspects

This WG deals with radio networks aspects, oriented to single or hybrid (heterogeneous) networks.

These can be grouped into four categories, namely:

- advanced radio network planning,
- network optimisation techniques and radio resource management,
- system and service modelling, and
- design of protocols and algorithms to obtain efficient networks.

The WG will contribute strongly in the generation of new conceptual studies, as well as in the design of new algorithms, software platforms, tests and testbeds oriented to improve research in these four categories.

The detailed aspects considered in WG3 are listed below. It is important to remark that although cross-layer algorithms are crucial for network optimisation (even in the case of not being a heterogeneous network), the term ‘cross-layer’ does not appear in the list, because it would be included at too many points (cross-layer algorithms for power consumption reduction, cross-layer algorithms for interference reduction, for spectrum optimisation, for MAC, etc.).

- *Advanced planning*:
  - advanced planning using operational information;
  - convergence between planned (cellular) and infrastructure-less networks;
  - IEEE802.xx (e.g. WiMax and WiFi) networks: coverage analysis, effect of mobility on performance;
  - Hybrid Networks: radio network architecture and automatic planning methods, for GSM/UMTS, UMTS/802.11, WiFi and WiMax systems, DVB-H;

    - intelligent networks through mobile multi-agent technology, providing key features such as ubiquity, network awareness, interactivity, intelligence, reactivity, autonomy, goal oriented, temporally continuous, self learning, flexible and de-centralised;
    - cell site positioning with emphasis on heterogeneous multimedia services;
    - issues related to planning tools (generation/adaptation/improving of existing tools);
- *Radio Access Optimisation techniques and Radio Resource Management*:
    - dynamic radio resource allocation and efficient sharing of resources,
    - improved radio resource management strategies, including power control, admission and congestion control, spectrum management, interference reduction, cross-layer optimisation;
    - new mobility management solutions, including handover (considered as a transversal service provided by the network where different protocols from different layers can participate in a coordinated way).
    - algorithms for Joint/Common Radio Resource Management;
    - negotiation techniques between networks;
    - load balancing between nodes and networks;
    - cognitive radio and the consequent reconfiguration management of software and equipment.
- *System and Service Modelling*:
    - definition and analysis of network quality concepts (including QoS, user-oriented QoS and end-to-end QoS), and enhancements by using adaptive antennas;
    - capacity and interference modelling of B3G air-interfaces and its effects on network performance;
    - accurate traffic modelling and prediction, packet data for multimedia services (including integration of mobile networks with IP), speed and mobility, terminal location for enhanced capacity and value-added services;
- *Protocol Design applied to*:
    - Automatic Dynamic Network Reconfigurability;
    - intelligent networks through mobile multi-agent technology, providing key features such as ubiquity, network awareness, interactivity, intelligence, reactivity, autonomy, goal oriented, temporally continuous, self learning, flexible and de-centralised;
    - other cognitive algorithms (genetic algorithms, game theory, reinforcement learning) applied to optimise the network in a decentralised manner by offering end-to-end QoS;
    - totally decentralised or autonomous networks strategies and comparison with mixed networks (with centralised distribution of some relevant network information);
    - IEEE802.xx (e.g. WiMax and WiFi) networks;
    - ad hoc networks: coexistence with mobile radio systems in operation, routing protocols to handle interworking with infrastructure mobile networks, signalling cooperation between nodes, relay assisted transmission including MIMO, MAC analysis and design, network coding;
    - Hybrid Networks based on the simultaneous use of different network paradigms;
    - Wireless Sensor Networks: energy efficient routing and MAC protocols.

A few SIGs that will be created are also described below. However, as SIGs will be created according to the needs of evolving research trends, and the interest of participating institutions, other SIGs might be generated on topics such as cognitive radio, or hybrid networks.

Special Interest Group A – Mobile Radio Access Network Reference Scenarios (MORANS)
This SIG deals with the creation and maintenance of reference scenarios, collecting inputs from all WGs, aiming at providing scenarios to be used by researchers as a common reference, to allow simplified comparison between the results obtained by different research groups, using separate

tools. Reference scenarios will be established in the beginning of the Action and then adopted by all researchers for their models and algorithms assessment, hence enabling a better and more efficient comparison of performance. These scenarios have to be defined cooperatively among PHY layer, propagation, and networking experts.

Special Interest Group B – Ultra Wide Band
Ultra Wide Band (UWB) communications are strongly innovative because they provide considerable flexibility in system capabilities (very high data rates/low data rates, fixed sensor networks/mobile sensors, without/with localisation capability, simple or sophisticated interference mitigation), which in turn bring new requirements and new technological and architectural approaches. The **interplay between physical, link and network layers** is a consequence of both this large bandwidth (high time resolution, location capability, versatility in signalling schemes) and of the need to make them cooperate efficiently. In this context, the UWB SIG will attempt to identify the interdependencies between the various layers and the various functional elements, and construct a reference model for UWB systems. Such a model will cover the major physical layer schemes, the major application scenarios of interest, and the major MAC layer approaches. It will lend itself to simulator implementation for investigation of UWB system performance with a great versatility, and the possibility to make unbiased comparisons between alternative building blocks. The SIG is strongly connected to all three WGs, e.g. for the provision of UWB channel and antenna models, for the selection of the most relevant signal processing schemes, and for the model specification towards upper layer protocols. A particular focus is put on coexistence with other radio systems and on interference mitigation techniques. This will be important for Europe, where political pressure will enforce stricter coexistence rules than in other parts of the world. Although this might, on first sight, be seen as a constraint, improved compatibility specification of European products could turn out as a good sales argument. Such a reference model will be helpful for the design and the performance evaluation of UWB systems, and it will provide a technical framework for the regulation and standardisation of UWB radio communications.

Special Interest Group C – MIMO Communications
Multiple Input, Multiple Output (MIMO) wireless systems, involving multi-element antennas at both ends of the wireless link, have become a very active research area in the past few years, because of the greatly increased capacity they promise. This trend will continue in the next several years, as demand for bandwidth in wireless systems continues to increase and MIMO is viewed as *the* enabling technology for data rates around 1 Gbit/s, given that radio spectrum allocations are unlikely to increase sufficiently. Initially, research in MIMO systems was concentrated on the physical layer; more recently there has been significant work on channel modelling to replace the unrealistic models used by early physical layer research. However there has still been little work on the implications of MIMO for wireless networks on the system level, taking into account higher layers and the effect of interference. MIMO systems will deliver their promise only if the intricacies of the propagation channel in the deployment environment are precisely known, and both the physical layer procedures (e.g. transmit/receive algorithms) and the radio resource management and the network layer protocols are devised in such a way as to take full advantage of the actual channel. Therefore, the MIMO SIG will bring together research on channel modelling, physical layer techniques and system-level analysis to answer such questions as how much MIMO can increase overall network capacity and which is the best MIMO configuration in each environment.

E. ORGANISATION

E.1. Organisation, management and responsibilities

The Management Committee (MC) will elect a chairperson and a vice-chairperson, and will be responsible for the interactions with other European or international bodies, and for the mutual

transfer of information and exchange of relevant documentation (or any available material, on specific request). The Action will establish and foster close liaisons with the other projects, institutions and organisations, namely within the European COST and IST frameworks, as well as in 3GPP and ITU (with the intention of contributing to standardisation). The chairperson will report, annually, to the Domain Committee in the field of Information and Communication Technologies on the status of the Action, on the progress of the work and on the short-term work-plan.

Each WG will elect a chairperson, to coordinate the work within the group, and to ensure the exchange of information with the other WGs and with the MC. Sub-Working Groups (SWGs) will be organised on specific topics, depending on the evolution of the work, to enable a better and faster achievement of results within the time scale of the Action. Also, Special Interest Groups (SIGs) will be created on specific issues which are more interdisciplinary. Every SWG and every SIG will elect a chairperson. SWG chairpersons will interact with the WG chairperson, while SIG chairpersons will refer to the MC chairperson. Figure 1 shows the relation between these different groups and the MC.

Delegates representing Signatories in the MC are expected to: attend and actively contribute to meetings of the MC according to the objectives and milestones of the Action; take responsibility for specific items of the Action, when required; act as liaison/rapporteurs with the national research groups in their own country; achieve working liaisons between the Action and other related COST Telecommunication and Information Technologies Actions. Besides the Delegates, it is expected that Experts from each Signatory will attend the WG meetings, to present technical documents, and to participate in the technical discussions of the work.

The secretariat will be responsible for taking care of the administrative matters of the Action, for supporting the MC and the chairperson in its activities, and for taking charge of documentation flow within the Action. For this purpose, e-mail reflectors will be established, thus favouring the exchange of documents in electronic format. A web site will also be set up by the secretariat, not only as a support for the exchange of documents within the Action, but also to promote worldwide dissemination of results.

E.2. Technical visits and workshops, short term scientific missions

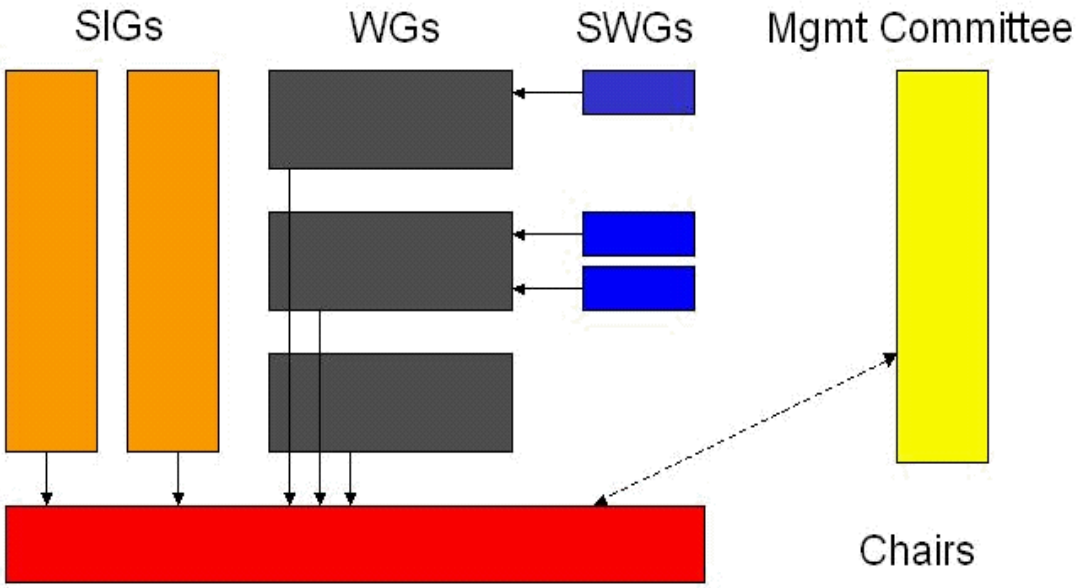
The Management Committee will hold three meetings per year, together with meetings of the WGs. In each one, technical visits to the laboratories of the host institutions will be organised, if possible, so that a better exchange of research methods is obtained. Besides these, short term scientific missions will be performed, to encourage the exchange of researchers between institutions, leading to an improved comparison of methods and models, to an increased flow of information within the Action, and to the promotion of joint activities among researchers from Signatories.

Moreover, to increase the level of interaction between the Action and industries, each MC meeting will include, when available, a keynote speech given by industrial representatives (either manufacturer, or operator), invited by the hosting institution.

As in the previously mentioned Actions, annual workshops co-organised with other running Actions or projects (STREPs, NoEs, IPs, etc.) that have points of contact with this one will be organised at the end of each year, for which speakers working in the various fields of interest to the Action will be invited. These workshops not only increase the visibility of the Action but also make it possible to bring knowledge from outside experts into the Action. Co-organisation with other Actions

enables a better exchange of information within the COST framework, and fosters stronger links with researchers in areas adjacent to the ones of the Action.

Also, to foster inter-WG interactions, each year an internal workshop will be organised in conjunction with one of the MC meetings, focused on exchanges between WGs and SIGs and on reporting of the achieved results together with next year's perspectives.



Figur

e 1. Organisation

F. TIMETABLE

The duration of this Action will be four years.

The activities associated with each WG, and the possible sub-WGs and SIGs that will emerge as the need arises, can be grouped into the following packages, in each case considering the models, techniques, algorithms, etc appropriate to that WG, sub-WG or SIG:

- development of common reference scenarios to allow better comparability of results, also taking advantage of previous activities carried out in former Actions, and their maintenance according to the feedback received by package two and the first phase of package three (duration: 18 months),
- identification and selection of the most promising techniques to be investigated and evaluated in detail (duration: one year);
- development of models, algorithms, methods for the areas under consideration, and realisation of simulations and measurements (duration: two and a half years);
- assessment of models, algorithms, and methods by comparing their results with the ones from simulations and/or measurements, possibly under common reference scenarios (duration: two years);
- writing of the Final Report (duration: one year).

A chart showing the time scale of the various activities outlined before is shown in Table 1.

The Final Report, which will be delivered at the end of the fourth year, will be prepared according to a continuous process of identification, during the four years of activities, of the most relevant results obtained. However, the most significant effort for its preparation will be carried out in the last year. Annual Reports will be also published at the end of each year, and a detailed schedule for the preparation of these reports will be decided upon in the kick-off meeting of the Action.

Table 1. Timetable for the Action

Year	I			II			III			IV			END
Pack	*********1*********												
	******2*********												
				********************3**********									
							***********4**********						
										**********5****			
MCMs	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
Workshops				#1			#2			#3			#4
Annual Reps				#1			#2			#3			#4
Final Report									(1)		(2)		(3)

(1) Definition of contents and of chapter editors

(2) First draft available

(3) Final version available

G. ECONOMIC DIMENSION

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Norway, Poland, Portugal, Serbia and Montenegro, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom.

On the basis of national estimates provided by the representatives of these countries, the economic dimension of the activities to be carried out under the Action has been estimated, in 2006 prices, at approximately Euro 20 million.

This estimate is valid on the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly**.**

H. Dissemination plan

H.1. Final Report

Researchers from universities, operators, manufacturers and research laboratories will work in close cooperation and ensure mutual and continuous exchange of information. As a result, it is expected that temporary documents containing the progress in the work being done throughout the project will be presented at the WG and SIG meetings, coming not only from this mutual cooperation but also from individual contributions. Some of these documents will be consolidated into contributions to standardisation. At the end of each year, a summary of the work will be presented in the Annual Workshop, from which Proceedings will be published. By the end of the Action, the publication of the technical Final Report (besides the administrative one) will be organised, containing the main results achieved in the Action. It will be structured as a book, by topical chapters, thus creating conditions for it to be a reference for further work by researchers, as in the case of the previous Actions.

H.2. Workshops, conference sessions, web site

The results from this Action will be of interest to a large number and range of entities. Since the area of Mobile/Wireless Communications continues to be of great importance in the telecommunications industry, and has large impact on society, one can expect that the outcome from this Action will be of particular interest to the former and of general interest to the latter. As in the previous Actions in the area of mobile communications, the participating entities will include universities, manufacturers, operators, research laboratories and regulatory agencies. Hence, the target audience for this Action constitutes the same type of entities that is proposing it, but on a wider geographic scale, i.e. not only in Europe, but also in Asia-Pacific and North America, as well as other regions in the world. The proof of this is the fact that the Final Reports of the previous Actions have also been very widely distributed.

Dissemination of results is a key aspect in R&D today, as was the case in preceding Actions. Active participation in international seminars and conferences will be organised (with technical sessions devoted to present the work developed within the Action). This will increase the extent of external interaction with the ideas, suggestions and proposals originated within the Action, as well as achieving wider dissemination of results and an increased visibility of the Action. Besides this, as mentioned above, workshops will be organised on a yearly basis, jointly with other Actions or other EU-originated initiatives (such as NoEs, IPs etc.), and which will also be an important instrument for dissemination.

Last, but definitely not least, and also continuing the practice of previous Actions, a web site will be set up where all the information concerning the Action will be available (with the exception only of the internal temporary documents). This enables an ‘instantaneous’ dissemination of the information on the largest scale possible. The web site will be also linked to the web sites of other EU-originated initiatives, to strengthen dissemination of information. With this approach, the goal of dissemination of results will be fully achieved.