MOBILEMAN

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Mobile Metropolitan Ad hoc Networks

MOBILEMAN

Dissemination and Use Plan

Deliverable D3

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MOBILEMAN Deliverable D3

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1. INTRODUCTION

Through research and industrial efforts, Europe has established world-renowned leadership in infrastructure-based mobile communications. Next generation mobile systems are recognized as a priority of the EU research to maintain and re-enforce the European leadership in the mobile market. Self-organizing ad hoc networking has an important role in next generation mobile and wireless systems. Currently, USA drive research in this area, mainly in the context of defence-related projects. On the other hand, in Europe, research is mainly performed by small research groups operating at the national level. MOBILEMAN is aimed to explore the technical, social, and market effectiveness of the ad hoc networking paradigm at the European level by bringing together complementary expertise, and heterogeneous users' requirements. Thus, the project contributes to overcome the barriers that could negatively affect the significance of results obtained at the national level, and to produce a common European approach toward self-organized networks that can balance the current USA leadership in this area.

The MOBILEMAN consortium consists of partners whose role and competence fill the complete chain of scientific, technological, and industrial skills required to realize a metropolitan area, self-organizing, and totally wireless network that we call *Mobile Metropolitan Ad hoc Network* (MobileMAN). Specifically, the main technical outputs of this project can be summarized as follows: (i) design, validation, implementation and testing of the architecture, and related protocols, for configuring and managing a MobileMAN; (ii) physical implementation of this architecture for lowers layers (i.e., wireless technologies); and (iii) integration of applications on top of our self-organized network.

MOBILEMAN addresses research issues that in the ISTAG time-framework are scheduled for 2007, and beyond. Therefore, the results of MOBILEMAN will represent the basis for the future EU R&D activities on Ambient Intelligence. In addition, the project

will also contribute (through the training of Master and Ph.D students) to build knowledge and research skills related to the mobile and wireless technologies.

MOBILEMAN will contribute to social objectives of EU long-term research: IST services should promote an ubiquitous, and user-friendly vision of the information society. MOBILEMAN can play a key role in advancing the *user-centric* approach to the information society. MOBILEMAN objective is to exploit the self-organizing networking paradigm to provide an infrastructure-less multimedia network that provides a flexible, inexpensive networking solution built around co-operative interactions among users, supporting free and seamless information sharing. In addition, MOBILEMAN project will test the social effectiveness of self-organizing networking by measuring users' satisfaction of the ad hoc networking paradigm. These measures will be done by empirical research based on forms to be filled, and through measurements with a group of users.

Finally, MOBILEMAN is aimed to study the economic value of the self-organizing paradigm, and to promote the market-value of its solutions. Specifically, MOBILEMAN will address how to realize a *secondary wireless market* (with respect to the cellular market) based also on the ad hoc paradigm. For infrastructure-based wireless networking, wireless operators are best placed to assume the role of kingmaker because they control the wireless networks and own the subscriber relationships. In the infrastructure-less approach, this position is challenged, and the economic and social model changes. Moreover, the deployment of new developments does not require involvement from major infrastructure players, significantly reducing the cost-barriers of creating services on a temporary, or experimental basis.

To summarize, the MOBILEMAN project aims at developing novel methods, tools, algorithms, and protocols supporting the construction and provisioning of self-organizing systems and applications. Alongside this, there will be tools, methods, and techniques specifically tailored for evaluating the economic and social impact of technology. In order to ensure that the project benefits are realized, we need to foster their deployment. This

will be achieved in two distinct ways, namely dissemination and exploitation. The consortium approach is to use dissemination to create awareness around the solutions provided by MOBILEMAN, and to define and execute an exploitation plan. During the project execution, a specific work-package (WP5) has been planned to face with this important aspect. In the next sections we discuss in detail the MOBILEMAN strategies for dissemination and exploitation.

2. DISSEMINATION

By dissemination, we mean making the results of this project visible to a wide audience. Dissemination is the previous activity to exploitation, and could be considered as the market strategy to create awareness around MOBILEMAN. For this reason, different dissemination channels have been identified as potentially important: (i) publishing and presenting results within the scientific community; (ii) presenting/testing the MOBILEMAN solutions with/to users' communities; (iii) influencing the relevant standardization bodies, and (iv) training of students. These points are discussed below.

• **Publications in leading peer-reviewed research conferences and journals**. The research results will be presented at the leading international conferences, and in the leading scientific journals to generate a level of awareness and constructive feedback from the scientific community and the industrial-research community. This is the primary way in which we intend to disseminate the project results. Considering the project targets, the more relevant areas of interest for this activity are the conferences and journal dealing with: Wireless and Mobile Technologies, Communication Networks, Personal Communication, and Socio-economic Aspects of Network Technologies.

• **Participation in program committees and editorial boards**. This is important for team members who can, in this way, play a role in setting the agenda (e.g., defining special conference sessions), and defining key areas of interest for the research community. Examples of such committees and boards are: IEEE INFOCOM and Globecom, Networking (IFIP), Personal Wireless Communications (IFIP), ACM Mobicom and MobiHoc, IEEE Communication Magazine, Cluster Computing, Internet Architecture Board (IAB), Kluver Grid computing. A first and relevant initiative in this direction is currently ongoing with the organization of "The Eighth International Conference on Personal Wireless Communications" (Venice, Italy, September 2003, http://www.iit.cnr.it/pwc2003) organized by CNR with the sponsorship of the IFIP WG 6.8 (Mobile and Wireless Communications). All the academic partners of the

MOBILEMAN project are represented in the executive and technical program committees of PWC2003.

• **Participation in strong industrially orientated events**. While offering fewer opportunities for scientific dissemination, they are very important in terms of technological evangelism, contacts, and lobbying. Examples of such events are: WCNC, ICC and Emerging Technologies conferences.

• **Organization of Magazines and Journal special issues, and books**. The members of the consortium have been, and are very active, in organizing journal special issues related to the MOBILEMAN research areas. These constitute very important forums for presenting the achieved results to the scientific and industrial communities. Relevant examples of this are: the special issue of the *IEEE Communication Magazine* on "Advances In Mobile Ad Hoc Networking" (editor: S. Giordano), 2001; the *Cluster Computing Journal* special issue on "Mobile Ad-hoc Networking" (editors: M. Conti and S. Giordano), 2002; and the special issue of *ACM/Kluwer Mobile Networks and Applications (MONET) Journal* on "Mobile ad-hoc Networks (editors: A. T. Campbell, M. Conti and S. Giordano), 2003. M. Conti and S. Giordano are also editor of the book "Ad hoc Networking", IEEE Press, to appear in 2003.

• **Organization of small, highly directed workshops**. These, focusing on MOBILEMAN and related work, provide an excellent way to disseminate results and receive feedbacks. A first and relevant initiative in this direction was already organized at the beginning of the project. The Workshop "*Is Mobile Ad hoc Networking part of the future of mobile networking in Europe?*" (Monterosso al Mare, La Spezia (Italy), 10-12 October 2002), organized with the sponsorship of the *European Science Foundation,* brought together the major researchers on this field in Europe. In the workshop the basic ideas and research directions of the MOBILEMAN project were discussed with the European community. The workshop thus contributed to a preliminary dissemination of the MOBILEMAN ideas, and

to the investigation of the technical issues, potentialities, and market perspective of the Mobile Ad hoc NETwork" paradigm, see http://www.esf.org/pesc/workshops/02.

• **Distribution of free (open source) software prototypes**. Because software distribution plays an integral role in disseminating the project results, active participation in the free software community (e.g. Usenix-Freenix, Linux, BSD-Con, ...) are also perceived as important by the projects partners.

• **Participation in international standardization bodies**. The project results, especially the experiences in performance measurement, will provide valuable input to standards organisations, in particular the MANET and ZEROCONF Working Groups of the IETF, and the newly born IRTF group on “Ad hoc Network Scaling Research”. Another area of great interest are the IEEE standardization committees for the new wireless technologies; this since the project will address the known limitations of the 802.11a and 802.11b in the mobile-ad-hoc networks and propose a more suited solution. If successful, the project results could even lead to the proposition of a new IEEE 802.11x standard (PHY and MAC levels) for MOBILEMAN.

• **Dissemination trough training and personal mobility**. MOBILEMAN will increase the number of students trained in the field. Within the consortium, there are already a number of Ph.D. students working on topics in mobile ad hoc networking. We expect that the MOBILEMAN project will attract even more good students, increasing the number of European specialists in this area. Students who will perform M.Sc. or Ph.D. thesis work in the context of the MOBILEMAN project will carry its ideas into their future workplaces and academic institutions**.**

• **Advance all citizens**. Finally, as MOBILEMAN is taking specific actions for a global and real involvement of users, behind the technological related fields of interest, we want to open some possibilities to all citizens (potential users) to access MOBILEMAN paradigm. This, as recommended by the Education, Outreach and Training Partnership for Advanced Computational Infrastructure (EOT-PACI), aims at ensuring that citizens may make

productive use of emerging computing technologies to advance their ability to understand and solve problems in education, science, business, government, and society. As a first specific activity for societal inclusion (as part of a more global socio-economic direction of the project), we started to create a bridge between the system designers, and the system users. This is pursued by 'translating' the MOBILEMAN project documents into semantically understandable, graphically appealing, and user-friendly documents. Specifically, we are trying to produce some material about MOBILEMAN accessible in its style and language to non-specialised audiences by keeping into consideration the various categories of stakeholders constituting MOBILEMAN's target group.

• **Co-operation with other mobile ad hoc projects.** For examples: INRIA HIPERCOM Project (http://hipercom.inria.fr/), HUT Mobile Ad Hoc Routing Testbed - MART (http://www.cs.hut.fi/~mart/), EPFL Terminode project (http://www.terminode.org/), University of Mannheim Fleetnet Project (http://www.informatik.uni-mannheim.de/). An extensive list of MOBILEMAN related projects can be found in the MOBILEMAN Deliverable D2 "Project Plans".

• **Web**. The project web-site will constitute a key communication and dissemination mechanism both for consortium members and non-members. It will contain general project information as well as information about project results, news, consortium members, software distributions, etc. In addition, as soon as preliminary MOBILEMAN results are available, we plan to activate on the web-site a public page devoted to the interested people and potential users, with information on past and current activities.

3. EXPLOITATION

Given both the consortium nature and composition (research institutes mainly affiliated to universities), and the project goals (functional terminal prototype), the economic promotion and development of the project results will be mainly performed through the indirect way of dissemination, and as feedback of the social analysis. In fact, we expect that the users' responses collected by the participatory design approach can offer us some indications about the Business Model of MOBILEMAN paradigm (mainly in terms of the usability and friendness of the technology and the applications) that can be used as a starting point for the exploitation.

In addition to the general dissemination activities outlined above, we have many exploitation routes for MOBILEMAN results through our on going research projects, existing industries' collaborations, and interactions with the Industrial Advisory Board (IAB). We begin by describing the role of the Board; then we describe the academic partners existing collaborations that constitute a good route for exploiting the knowledge produced in MOBILEMAN.

3.1 Industrial Advisory Board

The project has formed an Industrial Advisory Board whose membership represents a cross-section of technology and service providers; regular meetings with the Board will help us in revising, where necessary, the objectives of the project.

The role of the Industrial Advisory Board will be to assist the Executive Board:

- with evaluating the direction and progress of the Project;
- with evaluation of the lessons learnt from our planned case studies, and assessment of their likely validity in other environments;
- with the development of exploitation plans.

The first meeting with the IAB will take place in Cambridge (UK) beginning of July 2003. In the following subsections the members of the MOBILEMAN IAB are presented, and their role in the project is introduced.

3.1.1 BTexact Technologies

BTexact Technologies provides research, development, and consulting services for BT. BT is one of Europe's leading providers of telecommunications services (http://www.bt.com). Its principal activities include local, national and international telecommunications services, higher-value broadband and internet products and services, and IT solutions. BT is an active participant in European collaborative R&D through its participation in EU Framework Programmes. BT has participated in all the EU Framework Programmes, mainly in the IST area.

BTexact Technologies, headquartered at Adastral Park (Martlesham Heath) in Suffolk, UK, is home to 3,500 of BT's top scientists, working at the forefront of standards development and new technologies in areas such as multimedia, IP and data networks, mobile communications, network design and management, and business applications.

BT sees the future of its communications business to be primarily in added value services complementing its underlying network infrastructure. The Internet model for communications services has most of the intelligence, and hence most of the added value, located in the end systems concerned. BT's research seeks to understand where the added value can best be placed in the wide range of services it offers. Therefore, BTexact Technologies role in MOBILEMAN is mainly related to the middleware solutions with a special attention to the peer-to-peer (p2p) computing paradigm.

The BT representatives in the MOBILEMAN IAB are Ben Strulo, and Bob Briscoe.

3.1.2 Nokia

Nokia corporation has some research activities on the area of Ad Hoc networks. Nevertheless, this area requires having a clear use case from product perspective. Nokia,

could provide the required expertise, and point of view, for integrating Ad Hoc networks as part of existing services on the market. Therefore, an interesting project outcome for Nokia is the mechanism that the Ad Hoc network would provide in order to be integrated into existing infrastructures. Specifically, the routing and service discovery mechanism schemes, developed for Ad Hoc networks, are relevant in order to extend and create the links with existing networks for operators benefit.

The Nokia delegate that will participate in the IAB is Pertti Suomela which is a Nokia Senior Research Manager.

3.1.3 ST Microelectronics

Today, ST is one of the major silicon providers to the Mobile Phone market and has developed significant expertise in this area. Wireless networking is the natural evolution of, or convergence, with existing ST wireless business. There are significant challenges in this area of connectivity especially if you assume that a large percentage of these devices will be mobile. ST's interest and contribution to MOBILEMAN is mainly concentrated on MOBILEMAN MAC and link layers. Virtually, any decision involved with these layers directly affect the products ST will build in the future. As one of the leading semiconductor suppliers, ST will contribute MOBILEMAN with its expertise and advice on what semiconductor technologies can best be applied to the problems, as well as advice on integration strategies and technology evolution. On the other hand, ST will exploit MOBILEMAN results. The complexity of this type of technology, and time to market pressures, requires ST to take advantage of all opportunities of this type.

ST representative for MOBILEMAN IAB is Jeff Owen which is Design Center Director of AST Lugano.

3.1.4 Siemens

Siemens is one of the world's largest electrical engineering and electronics companies. Innovation is a top priority at Siemens. In 2002, the company invested EUR 5.8 billion (ca.

7 % of its sales) in research and development. Last year, Siemens researchers and developers turned out more than 7,000 inventions and filed more than 4,500 patent applications. Siemens boasts an impressive international presence, focusing on the core business areas of Information and Communications, Automation and Control, Power, Transportation, Medical, and Lighting.

One of the many research areas of Siemens Corporate Technology are Mobile Ad hoc Networks. The goal is to investigate their capabilities, and to improve mobile multi-hop ad hoc networking for Siemens networking and mobile products. The focus is on all networking layers, especially on mobile ad hoc routing. Consequently, Siemens interest as IAB member of the MOBILEMAN project is on the technical networking solutions, but also on the business and social impact of Mobile Metropolitan Ad hoc Networks, including applications.

Siemens representative for MOBILEMAN IAB is Michael Bahr, Siemens AG (München, Germany).

3.2 Project Partners

3.2.1 CNR

The research group at the Institute of Informatics and Telematics (IIT) of the Italian National Research Council (CNR) planned to exploit the results of MOBILEMAN in the following ways:

- Technology transfer initiatives towards the industry.
- Provision of consulting services to external companies (including education and training).
- Dissemination (mainly publications and courses).
- Master and PhD students training. Currently, the CNR group participating to the MOBILEMAN project includes 6 PhD students and several Master students.

To this end, we will use existing cooperation and collaboration channels with national and international industries, such as Telecom Italia and Marconi. In addition, as IIT is leading the Italian Registration Authority, it cooperates with all the Italian Internet Service Providers.

The CNR-IIT research group will also exploit MOBILEMAN results through the existing collaborations with the main national and European universities and research institutes. CNR-IIT is a member of the Create-Net association that involves (in addition to CNR) leading academic institutions at the European level such as: Politecnico di Torino and University of Trento in Italy, the Technical University of Berlin (Germany), Technion (Israel), and the Technical University of Budapest (Hungary). At the national level, CNR-IIT research group is leading the networking research of a 12 MEuro project funded by the Italian Ministry of the University and Scientific and Technological Research entitled "Virtual Immersive Communications". This project that will be carried out in collaboration with several Italian Universities. The project is aimed to provide solutions for supporting Ambient Intelligence, and will greatly benefit from the results of the MOBILEMAN project. Finally, CNR is involved in some 4G proposals that will be submitted to the VI framework programme. These projects, if funded, will constitute a natural framework for the exploitation of the MOBILEMAN results.

3.2.2 University of Cambridge

The Computer Laboratory in the University of Cambridge, and the University in a wider context, is well placed in several ways to exploit the output of the MOBILEMAN project.

- We are involved in the IETF (Internet Standards), and work in relevant working groups contributing drafts and RFCs.
- We are involved in the WiOPT conference (chairing and organizing the 2003 and 2004 editions, respectively).

- We have projects with Vodafone (Cambridge Open Mobile), BT (802.11 hotspot access) and Consume.net (London based multi-hop user providers 802.11 coordinator).

In addition, we have links with the Radiocommunications Agency that regulates spectrum, and advises the UK government on policy for spectrum use. We are proposing to work with them, BT, and MIT on a project to look at more open spectrum trading (the topic of a paper we published from the MOBILEMAN project), and also on the modified Media Access Control for modified WiFi. We are in discussions with Intel on possible commodity implementation of this latter area.

3.2.3 Eurécom

Even though Eurécom has no plans for any commercial exploitation, its involvement in MOBILEMAN will help develop potential prospects in terms of :

- French R&D actions as part of Réseau National de la Recherche en Télécomunications (RNRT) program. Eurécom already is a partner of a dozen projects and several committees of RNRT.
- Fundamental research actions as part of the ACI Sécurité program of Centre National de la Recherche Scientifique (CNRS). Eurécom is involved in the special interest group (RTP) on security. A project proposal on the theme of wireless ad hoc network security is being prepared jointly with INRIA for the current call for proposals.
- Collaborative research and integration on the topic of mobile security within the ENORICS proposal for a Network of Excellence in Security.
- Bilateral R&D collaborations with the industrial partners of Eurécom's consortium including Swisscom, Ascom AG, Thalès, CEGETEL, France Telecom, HITACHI Europe, Texas Instruments, ST Microelectronics, Bouygues Telecom.

In addition, Eurécom will contribute to the dissemination of the know-how generated in MOBILEMAN as part of its graduate teaching in telecommunications.

3.2.4 Helsinki University of Technology

The networking laboratory of HUT is in close relationship with industry (Nokia), operators (Sonera), and military departments. Thus, it would be feasible to establish a workshop where the results of the project could be presented to all the interested parties. The networking laboratory has common projects with the computer science department where is going on a similar development on IP mobility (IPv6) and Ad Hoc networking. Furthermore, the networking laboratory could re-enforce some of the existing links on the Ad Hoc area with other departments within the Helsinki University of Technology (HUT). In addition, the results of the Ad Hoc testbed that networking laboratory is implementing inside MOBILEMAN (i) would contribute to the free software consortium, and (ii) will be communicated to the "new technology integration" department that HUT includes as part of its dissemination effort. This department is part of HUT, and helps building start-ups companies for developing new business ideas directly from scientific contributions.

3.2.5 NETikos

Netikos SpA is a ICT Company launched in the year 2000 by IT Telecom (Telecom Italia Information Technology) with the objective of providing IP based innovative mobile value added services to enterprises and administrations. Netikos offers its services in that market segment where information is a critical factor for services/products quality and originality, and for a successful management of company processes (value chain). Netikos services will be particularly focused on the vertical segments of m-business, Media and Entertainment, Telecommunications, Healthcare, Public Administration, Tourism, as well as solutions to e-procurement and vertical virtual marketplaces, exploiting direct channels, technology partnerships, and commercial agreements.

3.2.6 SUPSI

The "Scuola Universitaria Professionale della Svizzera Italiana" participates to the project with two departments: the Department of Electronics and Computer Science (DIE) and the Department of Social Work (DLS).

SUPSI-DIE

The Department of Electronics and Computer Science has strong ties, and common projects with the IDSIA institute, which is devoted to heuristic algorithms and which is involved in other networking projects; besides the knowledge and technological exchange which will mutually reinforce both units, a common Wireless and Ad-hoc Networks Laboratory is in construction and will be used to test and disseminate MOBILEMAN results and technology through basic education courses, on-job and post-graduate education, industrial seminars, scientific seminars or conferences, and through scientific publications.

Being part of the Swiss UAS (Universities of Applied Science) system SUPSI-DIE has as a primary mission to help local and national industries (both old ones and startups) in the innovation process; in this sense, collaboration with the company Elektrobit has already been established with strong ties to the MOBILEMAN project. This collaboration could lead to new products and services, as well as to the creation of new job positions.

Moreover, SUPSI-DIE has an applied research agreement with ST which could greatly ease a mass-industrialization of some project results if they would provide a high economical potential.

SUPSI-DLS

DLS contributes to the dissemination and use plans of MOBILEMAN by focusing on the introduction of the MOBILEMAN concepts, ideas and prototypes in the society. This is achieved through a number of actions:

- to produce and disseminate some user-friendly information material about MOBILEMAN, i.e. 'translate' MOBILEMAN project documents into a documents understandable to end-users;

- to test, with a small representative sample of potential end-users, the accessibility and social response to the produced information material about the MOBILEMAN concepts;

- to establish contacts with potential users' communities; to present them the MOBILEMAN concepts and possible applications and to get their feedbacks through focus groups, interviews with key informants, questionnaires, etc;

- to present a MOBILEMAN prototype to users' communities. This is aimed at studying their responses and applications through multi-instrument empirical research methods (observation, participant observation, case studies, interviews, etc.);

- to present an *improved* MOBILEMAN prototype to users' communities. This is aimed to study their responses and applications through multi-instrument empirical research methods (observation, participant observation, case studies, interviews, etc.);

DLS-SUPSI involves in its activities graduate students from the Department of Communication Science (University of Lugano), and from the Department of Social Anthropology (University of Zurich). A number of MA theses are and will be assigned on this subject.