IST - FET Initiative

Mobile Metropolitan Ad hoc Networks
MobileMAN

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List of Partners

Partic. Role*	Partic. no.	Participant name	Participant short name	Country	Date enter project**	Date exit project**
C	1	Consiglio Nazionale delle Ricerche	CNR	I	Start of project	End of project
P	2	University of Cambridge	UCAM-CLAB	UK	Start of project	End of project
P	3	Institut Eurecom	EURECOM	F	Start of project	End of project
P	4	Helsinki University	HUT	FIN	Start of project	End of project
P	5	NETikos	NETikos	I	Start of project	End of project
P	6	Scuola Universitaria Professionale della Svizzera Italiana	SUPSI	CH	Start of project	End of project

List of Participants

CNR - Istituto di Informatica e Telematica (IIT)

Principal investigators:

Marco Conti, Enrico Gregori

University of Cambridge - Computer Laboratory

Principal investigators:

Jon Crowcroft, Sven Ostring

Institute Eurecom

Principal investigators:

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University of Helsinki - Networking Laboratory

Principal investigators:

Raimo Kantola Jose Costa-Requena

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Principal investigators:

Piergiorgio Cremonese

Scuola Universitaria Professionale della Svizzera Italiana

Silvia Giordano

1. Laboratory of Microelectronics (DIE)

Principal investigators:

Ivan Defilippis

2. Social Work Depatrment. (DLS)

Principal investigators:

Jennifer Duyne Barenstein

Timing, Costs and Budget

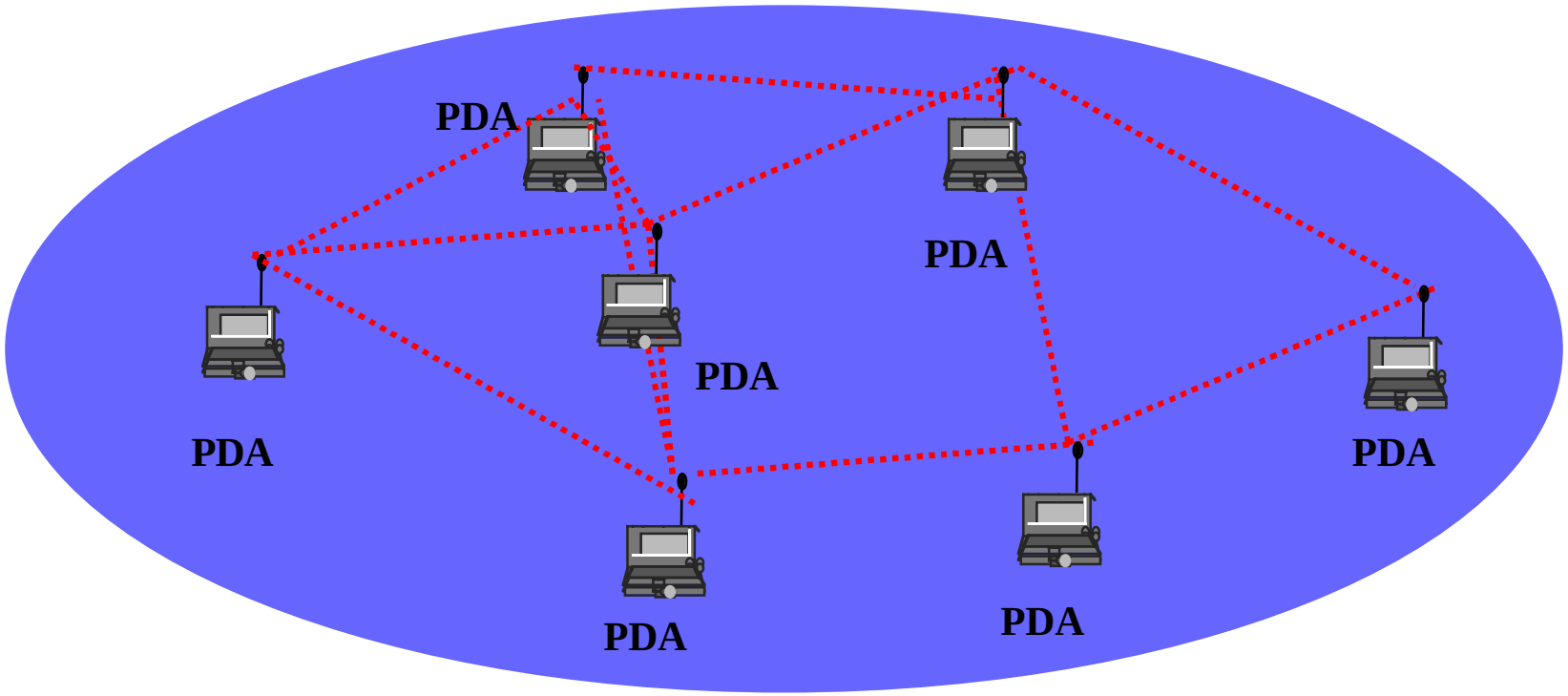
- Operative commencement date of contract:

  October 1st, 2002

- Duration 36 months
- Total effort: 317.7 man months
- Eligible Cost: 2,453,502 EURO
- Funding
  - EC funding: 1,077,000 EURO
  - Swiss Funding to SUPSI ≈570,000 EURO

MobileMAN

The project aims to define and develop a metropolitan area, self-organizing, and totally wireless network that we call Mobile Metropolitan Ad hoc Network (MobileMAN).



Objectives

To investigate the potentialities of the Mobile Ad hoc NETworks (MANET's) paradigm

Technical Standpoint: Development, validation, implementation and testing of the architecture, and related protocols, for configuring and managing a MobileMAN

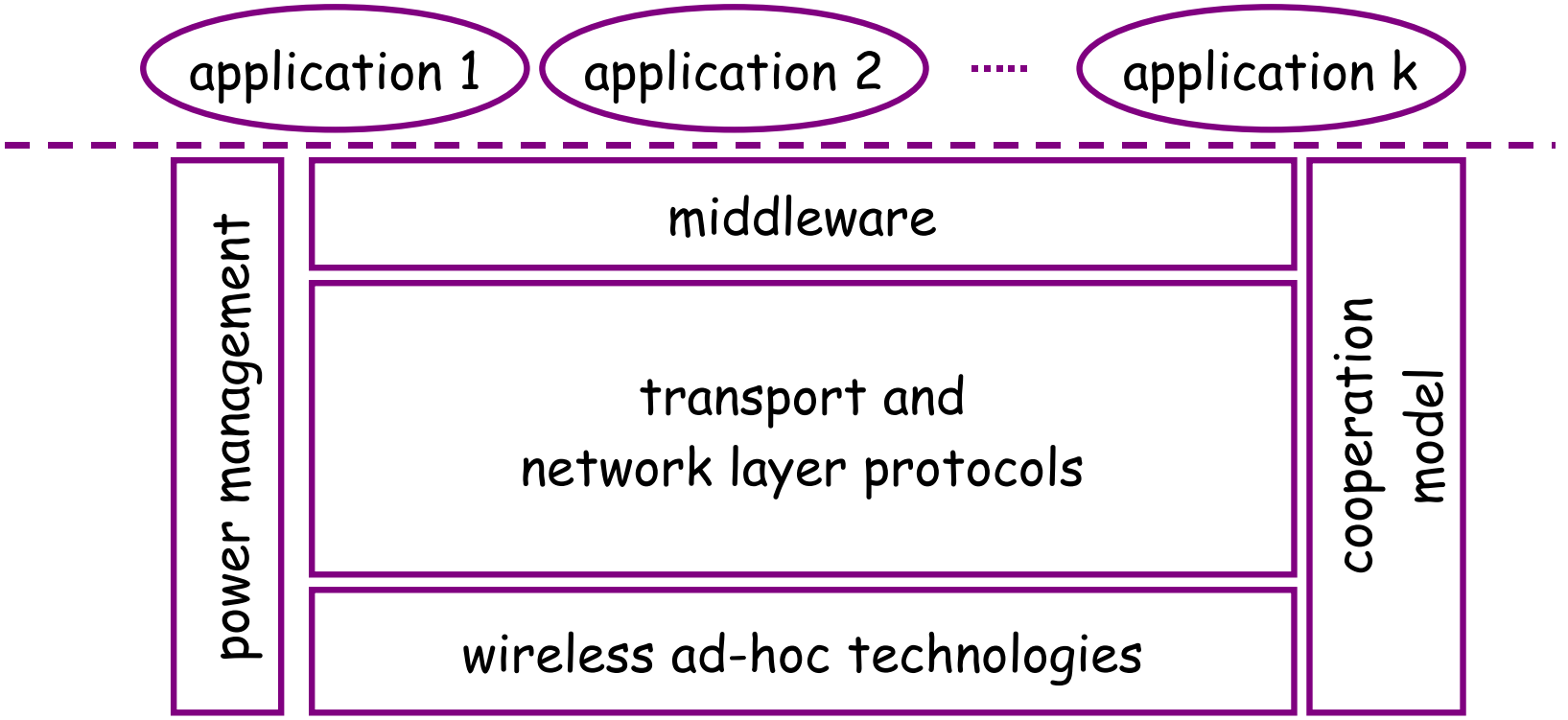
Social Standpoint: Validation of the self-organizing paradigm from the social standpoint

Economic Standpoint: Creation of an environment for promoting new business activities and processes

Expected results

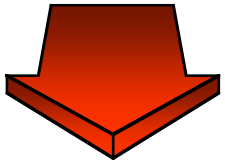
- The development, and validation, of effective solutions for the relevant technical issues of self-organizing networks: routing and medium access control protocols, power management, security, and location.
- The hardware/software implementation of the above solutions.
- The integration of the developed solutions in a fully functioning testbed.
- Large-scale testbed with a large users' community.
- Measures (on the real testbed) of the users' satisfaction of the ad hoc networking paradigm.
- Exploitation of the MobileMAN solutions for the creation of start-ups.
- Novel business processes

Self-organizing Technical Issues



Technical Issues - Applications

- Novel forms of information sharing: free and ubiquitous
- Novel forms of interaction among people : "citizen's network". Virtual community of users, e.g., University students



- Innovative applications = Existing applications that can become a customer advantage by exploiting the self-organizing paradigm (e.g., messaging exchange and net chatting)

Technical Issues - Energy and Cooperation

- *Power management*: Battery power is a strategic resource for each mobile device. Power management will be effective at several layers, from MAC to routing, to,….

- *Cooperation*: A basic requirements of MobileMAN is the nodes co-operation to network operations, mechanisms are required to enforce it

Technical Issues - middleware

- *Peer to peer information distribution in ad hoc networks*
- *Services discovery and location*

Technical Issues - transport & network layer

- **location mechanism** is to dynamically map the terminal logical address to its current location-dependent address.
- **packet-forwarding and routing algorithms** must be provided to route the information through the MobileMAN. We will consider and compare
  - IEFT protocols AODV, DSR
  - the self-organisation and co-operation between nodes approach, see Terminode approach.
- **integration to the Internet**
- **TCP evaluation in the Ad Hoc environment**

Wireless ad-hoc technologies

- Develop an enhancement wireless multiple access layer starting from existing wireless technologies
- Reference technology: IEEE 802.11b (Wi-Fi)
- Design and prototype a new MAC card
  - **minimal change:** modification only to MAC (not to physical layer)
  - **Compatibility** with original 802.11

Self-organizing Economic Value

Ad hoc technology is competitive to legacy wired and wireless networks?

We will explore the innovative idea is to realise a secondary (with respect to the cellular market) wireless market based also on the ad hoc paradigm. There are three main reasons to go in this direction:

i) the **low cost-barrier** for a service provider to enter in the market (no expensive infrastructure is required to start with);

ii) the emerging tendency (mainly in USA) **to deregulate the spectrum environment** to create a secondary market;

iii) the **Wi-Fi success**.

Self-organizing Social Value

- *Empirical research based on forms to be filled.* A relatively large population will be used to gain perception of the system's potentials and limits in broadening people's network of social relationships.

- *Field-trial evaluation.* A large population of users will be provided with MobileMAN terminals and through the developed methodology their satisfaction will be evaluated. This will avoid traditional misunderstandings between information technology designers and their recipient groups.

Ongoing Activities (I)

1. **MobileMAN Architecture definition**
   - Cross layer approach

2. **Wireless Technologies**
   - Analysis of 802.11 in ad hoc environment
   - Burtsy MAC definition
   - Enhanced card novel mechanisms
   - Novel Card implementation issues

Ongoing Activities (II)

3. Networking

- Routing
  - Experiments with MANET IETF Routing
  - Novel appraches to routing
- Reliable Forwarding
- Location
- (Simplified) Transport protocol

Ongoing Activities (III)

4. Security and Co-operation Model and Mechanisms

   - Secure Routing
   - Security mechanisms
   - Co-operation Models
   - Co-operation Mechanisms

Ongoing Activities (IV)

5. Middleware
   - P2P information delivery
   - Analysis of existing middleware
6. Applications (not yet started)
7. Economic issues
8. Social analysis

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