
Regional programme ICT-Asia Project proposal (research – innovation)

Project proposal application form

To fill up this application form, please refer to the guidelines included in the call for proposals.

A. General presentation

A1	Lead institution and project leader
	Polytech Nice-Sophia Prof. Philippe Gourbesville Ass. Prof. Jean-Yves Tigli
A2	Project title
	Euro Asia Ubi-Flood
A3	Theme
	Distributed systems - Communication Networks/Wireless Networks, Ubiquity computing in flood warning and forecasting systems in different Asian background (India, Thailand and Singapore)
A4	Project objective
	<ol style="list-style-type: none"> 1) To promote new middleware research for ubiquitous computing emerging in France and Europe 2) To explore development of new devices adapted to the different Asian environments (mobile devices, communication network, data acquisition disposals, real time data treatment and means for public awareness) 3) To develop and structure collaboration between France and Asian partners on ubiquitous computing for flood warning and forecasting systems 4) To promote good practices and define standards
A5	Project summary
	<p>Floods in Asia represent the first natural hazard. During the last 5 years, major events have affected more than 600 millions in Asian countries and constitute one of the main obstacles to the economical and social developments. Many factors contribute to make Asia the most flood prone area of the world: size of the catchments and rivers, extreme rainfall events, growing urbanization, changes in land use, etc. To cope with this challenge, societies have to adapt and develop new organization able to face the flooding situations. In parallel to the structural measures dedicated to the hydraulic management of the flows, phenomena have to be analyzed in real time in order to provide knowledge and information both to the stakeholders and to the public. The modeling tools developed during the last 20 years are able today to provide an accurate representation of the physical processes and could be the platform for the creation of a Decision Support System.</p> <p><i>However as for the public information, the data collection on the field remains a very difficult task which is not always easy to implement.</i></p>

At the same time, ubiquitous computing applications based on the post-desktop computer model, in which information processing has been thoroughly integrated into everyday objects and activities, are strongly emerging. They can be found in a diverse range of appliances, from mobile phones with people to smoke alarms in buildings, from sensors networks to digital boards in the cities, etc. Enabling these systems to communicate opens up new areas of applications: smart buildings, industrial automation, healthcare, power distribution and host of others, ...

Thus ubiquitous computing potentially offer the possibility:

- *to multiply easily high added value services based on preexisting ubiquitous infrastructures, like sensors networks, equipments of ground and mobile workers and even general public devices,*
- *to reduce drastically the time to deploy such new service, exclusively based on the software.*

Unfortunately, such attractive perspectives need some major improvements in software computing (especially in middleware for ubiquitous computing) to manage such fickle ubiquitous infrastructures of smart objects and devices.

Scientifically, Ubiquitous Computing, was introduced by Mark Weiser in 1991, raised many challenges across computer science: in systems design and engineering, in systems modeling, and in user interface design. But, initially the effective integration and interaction with the physical world sufficed to promote ubiquitous computing interest due to significantly increased real world visibility as well as real world control, towards ambient intelligence. These first ubiquitous systems were often proofs of concept with a single static configuration with a priori known devices.

Most of the early software results for ubiquitous computing can't allow to design ubiquitous applications that we address in flood warning and forecasting systems. In our case, mobility of users and an increasing heterogeneity of devices introduce new significant challenges for middleware for ubiquitous computing. We witness to a kind of inversion in the classical software methodology where the software applications levels are much more stable and stationary than the software infrastructure level. The operational environment is then tightly connected with the real world but is also partly unknown at design time and is always changing at runtime in uncountable manner.

Scientifically, due to new ubiquitous computing constraints, we are moving towards an era of emergent middleware that is middleware that emerges at run-time to match the current operational environment and application requirements

These challenges are conjointly addressed by the French National Research (ANR) project CONTINUUM (<http://continuum.unice.fr/>), principally to solve continuity of service problem for mobile and ground workers in water industry equipped with multiple heterogeneous smart devices. Polytech'Nice Sophia and especially the Rainbow team (University of Nice Sophia Antipolis, I3S Laboratory, CNRS) is the lead of this project.

The Euro Asia Euro Asia Ubi-Flood project aims to foster international scientific cooperation between France and Asian partners to improve middleware for ubiquitous computing and to validate such results in ubiquitous applications in flood warning and forecasting systems to extend existing forecasting systems (applicable to Bangkok, Thailand) and to realize the design of new systems (applicable in Mumbai, India); furthermore, to support and establish partnership from mobility program in a short and long term perspective.

A6 Information on the project partners			
Asian partner A :		Asian partner B :	
Organization	Asian Institute of Technology (AIT)	Organization	Indian Institute of Technology Bombay (IITB), Mumbai
Name of the lead researcher	Dr. Mukand S. Babel	Name of the lead researcher	Kapil Gupta
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Asian partner C :		Asian partner D :	
Organization	Tropical Marine Science Institute (TMSI), National University of Singapore	Organization	DHI India Water & Environment Pvt Ltd. (DHI)
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Asian partner E :		France :	
Organization	Centre for Mobile Computing & Communication, Jadavpur University Calcutta, India (JU)	Organization	Polytech'Nice-Sophia/ I3S UMR 6070
Name of the lead researcher	Dr. Pradip K. Das	Name of the lead researcher	Jean-Yves Tigli Philippe Gourbesville
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A7	Other associated partners			
	Asian partners			
	Organization A	DHI research center Singapore		
	Organization B	Public Utility Board Singapore		
	Organization C	various Indian companies involved in telecommunication and IT		

B. Detailed project presentation

B1. General orientation of the project (basic research – applied research with the participation of a company)

Euro Asia Ubi-Flood is an applied research project taking advantage of the various expertise's of public and private French and Asian laboratories from several leading research institutions.

Floods in Asia represent the first natural hazard. During the last 5 years, major events have affected more than 600 millions in Asian countries and constitute one of the main obstacles to the economical and social developments. To cope with this challenge, societies have to adapt and develop new organization able to face the flooding situations. In parallel to the structural measures dedicated to the hydraulic management of the flows, phenomena have to be analyzed in real time in order to provide knowledge and information both to the stakeholders and to the public. At the same time, ubiquitous computing applications based on the post-desktop computer model, in which information processing has been thoroughly integrated into everyday objects and activities, are strongly emerging and represent a potential alternative to improve the flood warning and management systems. The mobile devices offer today the possibility to multiply easily and for a reduced cost the number of potential data sources. The ubiquitous computing allows to federate and to communicate with ground agents like sensors networks and ground workers or even the public for data acquisition.

The Euro Asia Ubi-Flood project aims to foster international scientific cooperation between France and Asian partners in ubiquitous computing for flood warning and forecasting systems, to explore the potentialities of the ubiquitous computing research to extend existing forecasting systems (applicable to Bangkok, Thailand) and to realize the design of new systems (applicable in Mumbai, India); furthermore, to support and establish partnership from mobility program in a short and long term.

The Euro Asia Ubi-Flood project aims to develop a generic template for ubiquitous systems applied to the major natural hazard in Asia. Of course the project will develop a new cooperation and foster international scientific cooperation between France and Asian partners in ubiquitous computing, explore the potentialities of the ubiquitous computing research to extend existing forecasting systems (applicable to Bangkok, Thailand) and to realize the design of new systems (applicable in Mumbai, India); furthermore, to support and establish partnership from mobility program in a short and long term perspective.

The Euro Asi Ubi Flood project is taking place in research effort which has been initiated and supported during the last year through the ANR and the FP7 frameworks. In fact, the French team is now coordinating and involved in two projects directly related to the topic:

- CONTINUUM: CONTINuity of service in UbiquitoUs and aMbiEnt computing (ANR-08-VERS-005) is a three years project, selected by the French Research Agency on 2008 (2009-2012). The scientific objective of CONTINUUM is to define the theoretical models that will support service continuity for mobile users/workers. A core problem is to achieve software adaptation to a variety of resources in dynamic and heterogeneous environments with an appropriate balance between system autonomy and human control. Three key scientific issues will be addressed: context management and awareness, semantic heterogeneity, and human control versus system autonomy.
- CORFU : The team of Polytech'Nice-Sophia involved in the present proposal is one of the core partners of the newly selected project under the FP7 framework: CORFU - Collaborative research on flood resilience in urban areas. This project, selected by the DG Research of the European Commission in June 2009 will start in January 2010. CORFU is focused on resilience concept for urban flooding and is targeting 3 main countries in Asian: India, Bangladesh and China. One of the aims in these 4 years is develop strategies through several case studies and especially Mumbai. The Indian partners of the CORFU project are of course partners for this new project and will benefit from the experience gained and developed through CORFU and especially on Mumbai. The CORFU project is covering the urban flooding warning system and the communication aspects. The project will analyze the different technical solutions according to the specific situation of each location and cover the

cases of Mumbai, Dakha, Beijing, Barcelona, Hamburg and Nice. The present proposal will immediately benefit from the developments realized in the definition of generic architecture for ubiquitous computing environments.

The Euro Asia Ubi Flood will benefit of synergetic effects with the ongoing developments of the existing projects and will receive a higher exposure at the international level. At the same time, the project will help the development of the partnership among the Asian and French teams.

B2. Project description

- Objectives, origin, implementation plan including the contribution of each organization involved

Project Summary

Due to Networked Embedded Systems, software applications are now ubiquitous. They can be found in a diverse range of appliances, from mobile phones with people to smoke alarms in buildings, from sensors networks to digital boards in the cities, etc. Enabling these systems to communicate opens up new areas of applications: smart buildings, industrial automation, healthcare, power distribution and host of others, generally augmenting behavioral intelligence of the corresponding system. In the field of flood warning and management systems, ubiquitous computing opens a new research field which could potentially attract the interest of stakeholders and companies. Floods in Asia represent the first natural hazard. During the last 5 years, major events have affected more than 600 millions in Asian countries and constitute one of the main obstacles to the economical and social developments. To cope with this challenge, societies have to adapt and develop new organization able to face the flooding situations. In parallel to the structural measures dedicated to the hydraulic management of the flows, phenomena have to be analyzed in real time in order to provide knowledge and information both to the stakeholders and to the public. The modeling tools developed during the last 20 years are able today to provide an accurate representation of the physical processes and could be the platform for the creation of a Decision Support System. However as for the public information, the data collection on the field remains a very difficult task which is not always easy to implement.

Ubiquitous computing could potentially provide alternative solutions with a real added value for exposed populations. Some of the applications will result in a more efficient, accurate or cost effective solution than previous ones, taking much more advantage of existing communication devices than planning to deploy new ones for a specific application instead.

This main research topic allows deploying dynamically software application on partly a priori unknown multi-device targets, taking into account variations of context and user preferences (if necessary).

This project aims to conduct experiments of ubiquitous computing approaches with real use cases coming from the flood warning system established for the city of Bangkok and for the design of a completely new system for the city of Mumbai.

Project reach

- Define and share standards for ubiquitous computing and flood warning and management systems in the Asian environments (Thailand and India mainly).

The city of Bangkok has already set up with the support of AIT a first flood warning and management system. However this environment is not providing today the full services requested by the population exposed to the flood. The ubiquitous computing approach allows potentially investigating alternative solution in order to extend and enlarge the functionalities of the existing environment. For Mumbai, no system has been yet setup but some basic sensors like rainfall gauges are already implemented on the field. In the both situations, standards are needed and will be defined jointly by the teams of

Polytech’Nice-Sophia/I3S, AIT and Jadavpur University. In the both cases, the Asian partners have already a long experience of such systems and are following different technological approaches. The project aims to conduct interoperability between the existing communication environment and the flood warning and management systems.

- Experiment on ubiquitous computing and flood warning and management systems.

Give the programmers and the modelers the possibility to use the ubiquitous computing approach to update and define a flood warning and management system. Important feedback through users experience will be obtained, which can be used for ubiquitous computing to be further refined and developed. Experiments will be done on Bangkok existing system (AIT) and on Mumbai environment (IIT Mumbai, Jadavpur University) where a new system has to be implemented. The real case applications will provide insight and assessment of the ubiquitous computing design and implementation.

The experiments and the applications developed for Bangkok and Mumbai will be linked to research activities developed by TMSI in Singapore. The results will be integrated in the ongoing research activities for the Public Utility Board (PUB) in charge of the water management in Singapore. Part of the sustainability of the project could come from the PUB that can provide substantial support for an operational implementation after the first year activity.

As a result, all partners will be able to develop recommendation for the use ubiquitous computing and standards according to each specific environment (India, Thailand and Singapore).

- Disseminate standards on ubiquitous computing and flood warning and management systems.

One of the major results of the Euro Asia Ubi-Flood will be the definition of standards for ubiquitous computing and flood warning and management systems according to the specificities of the Thai and Indian environment. Several dissemination activities will be taken into account and actively performed by the partners of the project and especially the industrial partners. The projects will actively link with stakeholders of Bangkok and Mumbai involved in the flood warning and organize a set of internal and external dissemination activities to enforce the impact of Euro Asia Ubi-Flood on the stakeholders and on the ubiquitous computing and hydroinformatics communities. The presence of non European partners, especially from Asia will be exploited to reach a larger audience with the dissemination activities especially in the prone flood Asian countries.

- Foster international scientific cooperation on ubiquitous computing and flood warning and management systems.

The first objective of this project is to bring together European and Asian researchers involved in ubiquitous computing and the design of flood warning and management systems to do experiments and explore the added value of this new paradigm. The project has the ambition to define first standards in that field. Seeking for international scientific cooperation is the way to share standards and then markets while leveraging investments made in research on both sides. This project will contribute to a long-term Europe-Asia cooperation in ubiquitous computing and flood warning and management systems. One of the goals is to see the feasibility of such new environment in the specific situation of Bangkok (task for AIT) and in Mumbai (task for IIT Mumbai and Jadavpur University). The industrial implementation will be covered by DHI India and several Indian telecommunication companies.

- Support and establish partnership from mobility programme in short and long term.

Establish the mobility programme to scientific research activities and exchange across France and Asian young postgraduate or post-doc, funded for 9-12 months from one institute to another one. Also a scholarship is set to attract and encourage more undergraduates to get involved in research activities in the area, stimulate and strengthen cooperation. The project will provide support package to ensure collaboration will last beyond the scope of this initiative, and in particular:

- A post-doc mobility scheme, one post-doc funded for 12 months from Asia to France each year;
- A fellowship programme, at least 2 PhD students, funded 9-12 months from one institute to another institute.

- A postgraduate scholarship, at least 3 postgraduates funded 12-24 months from Asia studying in France
- Each year a workshop/conference is to be held linked with international conference on ubiquitous computing. This year, ACM Mobility 2009 international conference (The International Conference, on Mobile Technologies, Applications and Systems) hold in Polytech'Nice Sophia Antipolis (September 2-4), organized by the research group RAINBOW. Next year, special sessions will be proposed on the main topics of this project: Middleware for Ubiquitous Computing and Continuity of Service.

Expected outcomes

The following list of deliverables will be produced as outcomes of the project:

- New middleware approach to design high added value services on ubiquitous infrastructure,
- Definition of new applications and dissemination of first standards for ubiquity computing approach for flood warning and management systems,
- Further refinement and development of ubiquitous computing for flood warning and management systems,
- Clear identification of some European - Thailand – India or others interoperability gaps,
- Develop a new multi disciplinary approach for the flood warning and management systems,
- A core team to bring new participants (academic and industrial worlds) into the approach,
- Enlarge community of users thanks to increased awareness of ubiquitous computing for flood warning and management systems,
- Long-term Europe/ Asia collaboration,
- Project annual reports,
- Technical reports from conference and workshop organized during the project.

The benefits of this project are foreseen at different levels:

For Asian partners:

- Operational research on a topic of big concern in the area (600 millions people)
- Build further collaboration with France and different Asian countries
- Develop new approach that could be immediately supported at the industrial level
- Exchanges of postgraduates and support researchers short visiting

For French partners:

- Reinforce and enlarge collaborations with Asian partners in a very demanding field
- Disseminate European software research results and standards
- Exchanges of postgraduates, support post-doc and researchers short visiting

B3. Timeline and main implementation phases

The whole project is subdivided into a number of tasks. For each task, the involved partners are presented, as well as associated partners.

Task 1 – Definition and validation of scenarios for new ubiquitous applications

The task leader is Polytech'Nice-Sophia.

This task is devoted to:

- Introduce new middleware approach to design high added value services on ubiquitous infrastructure,
- define and validate scenarios and use cases for ubiquity computing approach for flood warning and management systems,
- propose standards for interoperability and to prepare real experiments on largest area in Task 2.

Having examined conjointly the state of the art in the field of flood warning and management systems and middleware for ubiquitous computing (first internal deliverable **D1.1**, responsible: Polytech’Nice-Sophia with AIT and Jadavpur university), this task is first dedicated to the definition of scenarios and use cases that describes some ubiquitous computing improvements in the flood warning and management systems, thanks to last middleware evolutions.

A list of scenarios will then be defined by groups of partners according to their topics of interest. These scenarios might address either the improvements of the system for people on the ground, such as stakeholders of Bangkok and Mumbai involved in the flood warning (with AIT and IITB), or the improvement of the flood management and decision systems using multi-devices environment towards mixed reality interfaces (with IITB).

The Ubiquarium Lab of Polytech’Nice (described later in Section B.5), with the most advanced software methods and tools to design ubiquitous applications, will be the place to receive Asian partners in Euro Asia Ubi-Flood to test and validate first experimental prototypes in each group. At this stage, some technological simplifications may be done. For example certain new devices may be simulated in this Lab. Nevertheless, the feasibility of such scenarios in Task 2 must be strongly considered and studied with help of for example TMSI, DHI India, and several Indian telecommunication companies.

Each group will be led by a responsible in charge to produce a common internal deliverable (**D1.2.g**) for its group “g”.

After having provided the state of art on the standards to guarantee interoperability for flood warning and management systems (as a part of the first internal deliverable **D1.1**, responsible: Polytech’Nice-Sophia with AIT and Jadavpur university), we will compare them to the common standards for middleware in ubiquitous computing and smart devices.

The use case experiments will contribute to the definition and refinement of new standards to address the interoperability of both ubiquitous systems and flood warning and management systems in Ubi-Flood.

Upon the completion of this task, we will propose (deliverable of the task **D1**, responsible: Jadavpur University +TMSI):

- first standards to guarantee interoperability in ubiquity computing approach for flood warning and management systems,
- real experiments based on validated scenarios.

Task 2 – Experiments in various environments

The task leaders are AIT and IIT Mumbai.

The main purpose of this task is to deploy and experiment the defined and validated scenarios of Task 1 in real and specific situations, i.e. in Bangkok and in Mumbai.

Experiments will be done on Bangkok existing system (AIT) and on Mumbai environment (IIT Mumbai and Jadavpur University for the telecommunication part with the participation of DHI India) where a new system has to be implemented to study the industrial feasibility including:

- standards for interoperability defined in Task 1 between different modules of the existing flood warning and management systems (internal deliverable **D2.1** as hardware/software prototypes feasibility and evaluation, responsible Jadavpur University and AIT)
- standards for interoperability defined in Task 1 between different existing devices identified in the validated scenarios in Task 1 (internal deliverable **D2.2** as hardware/software prototypes feasibility and evaluation, responsible Polytech’Nice-Sophia with AIT and Jadavpur University)
- new devices identified in the validated scenarios but yet only simulated in Task 1 (internal deliverable **D2.3** as hardware/software prototypes feasibility and evaluation, responsible Polytech’Nice-Sophia)

The operational condition of the experiments (mobile network connectivity, target devices, target mobile

computers, etc.) will be guaranteed by AIT in Bangkok, Jadavpur University, DHI India and several Indian telecommunication companies.

Important feedback from users experience will be obtained, which can be used for ubiquitous computing to be further refined and developed especially in the Singaporean environment. TMSI will realize this specific investigation. Industrial implementation will be carried out by DHI India and several Indian telecommunication companies.

All these points will be detailed in the deliverable of Task 2, **D2** (responsible: AIT).

Task 3 - Dissemination

All partners are involved in this task.

The dissemination will be supported by the organization of two workshops during the project. The first workshop will be organized in South Korea, in September 2010 in association with the ACM international conference Mobility'2010. This conference was organized for the first time in Europe in 2009, follows several events all based in Asia so far. The organization in France brought a large number of Asian participants and supported greatly the exchanges between the two communities. The workshop will be included in the conference program and various industrial partners are expected to attend.

The second workshop will take place in AIT Bangkok, Thailand.

During workshops, demos and presentations will be also performed with the objective to ensure the dissemination of the results and the approach to the academic and industrial world, in Europe and Asia.

Task 4 - Mobility

All partners are involved in this task.

Postgraduate students (Master and PhD) and post-doc will be supported to work between French partner and Asia partners.

A post-doc mobility scheme, a fellowship program and postgraduate scholarship will be set to encourage the cooperation between partners, and furthermore, workshop/conference is to be held linked with international conference such ACM Mobility'2010 international conference.

Timeline:

Three meetings are planned for this project:

1) T0 : First meeting in France

- Kick-off meeting
- Definition of all tasks and goals expected in this project
- Definition of expected works between partners
- Start to run mobility programme and selection of researchers, post-doctorates, PhDs and Master students

2) T0+12: Second meeting in Sophia Antipolis, France

- Project meeting
- Presentation of the state-of-the-art for individual tasks in Task 1
- Development plan for each task
- Preparation second year mobility programme and selection of postgraduate

3) T0+23: Third meeting in AIT Bangkok, Thailand

- Project meeting
- Presentation of the state-of-the-art for all tasks (Task 1 and Task2)

- Development plan for each task
- Definition of project long term cooperation

B4. Contributions

- Outline of the coordination between each contribution and of the specific part of each organization

Project Coordinator (PCO)

The Project Coordinator, to be provided by Polytech'Nice-Sophia, is a single point of contact for the project in its interactions. PCO responsibilities include:

- Coordinate the project partners and manage the project
- Coordinate financial, legal and contractual activities including project audits and technical verifications
- Provide project control reports and final reports
- Manage risks by identifying and assessing factors which influence the project; identify solution to manage risks

The Project Coordinator will also endorse the knowledge manager responsibility. Its responsibility will include gathering, shaping and dissemination of information within and outside the project consortium. Due to the transversal approach Prof. Jean-Yves Tigli and Prof. Philippe Gourbesville will be the Project Coordinators of this project.

Project Committee (PC)

The Project Committee is the body responsible for making and overseeing all decisions made within the project. It has the power to directly control all technical activities, through the consensus of the partners. The PC is responsible for putting into place mechanisms to be used by the research activities to ensure the quality of their work, produced deliverables, and any technical papers produced at the activities level. Tasks leaders are responsible for summarizing the progress of their activities during PC meetings. The PC will meet periodically, at least once a year. Each partner will have a membership in the PC.

Task leaders

Each task leader is responsible for coordinating the technical work within its task. They will contribute to the definition of the detailed work plan for the work area. They will work with the PCO and the PC to ensure effective monitoring and control of the tasks. They will actively contribute to supplying all required information, for dissemination and communication purposes. They will be in charge of monitoring the task progress and deliverables preparation together with the deliverables responsible.

B5. Organization & Credentials

- Presentation of each organization of the lead researcher in each of them.

Polytech'Nice-Sophia/ I3S UMR 6070

Department of Computer Science and I3S Laboratory

The Department of Computer Science is responsible for education and training in Software Engineering in Polytech'Nice-Sophia. The department develops numerous courses and manages several Master and Engineer degree programs for applied research and industry. Thus Graduate and Master Students of the department can be specialized in the field of distributed software engineering, man machine interfaces, information systems, knowledge engineering, ambient intelligence and ubiquitous computing.

Teachers of the department are also researchers in the I3S laboratory. I3S (Computer Science, Signals and Systems in Sophia Antipolis) is a joint research laboratory (UMR 6070) of the University of Nice Sophia Antipolis and CNRS (the French National Research Center). The I3S lab is composed of 135 permanent

members, including 18 CNRS research directors or researchers, 10 INRIA researchers and 80 assistant professors or professors from all teaching department of the Nice-Sophia Antipolis University. The I3S lab also contains 84 PhD students of the STIC (the Sciences and Techniques of information and communication) Doctoral School.

The Rainbow group is specialized in software composition and adaptation, among others, applied to Service Oriented Architecture for ambient computing. Its knowledge is devoted to the conception of a unified platform for multi-device targets and to envisage the future of such platforms in ambient intelligence.

Its knowledge and research results open up new perspectives for the deployment of applications in a dynamic real environment consisted of heterogeneous smart objects and devices. A part of the Rainbow group is also involved in various industrial and applied research projects in collaboration with numerous European companies and research centers like CSTB (French Scientific and Technical center for building industry), CIRSEE (International research center on Water and the Environment) of Suez Environment, GEMALTO (the European company, world leader in digital security) and other innovative companies of one of the largest European technology park in the fields of software engineering and telecommunication: Sophia Antipolis.

The department of Computer Science and the research group Rainbow are both managed by Prof. Michel Riveill who is also involved in the project.

Ubiquarium Lab

Ubiquarium is an experimental lab for ambient intelligence and ubiquitous computing. It's jointly supported by Polytech'Nice-Sophia and PACA French region in a local research program. Numerous research laboratories and companies of the first science and Technology Park in Europe, Sophia Antipolis, are also associated to the project through various research and graduate degree programs of Polytech'Nice-Sophia. The main purpose of this Lab is to bring together, innovative communicating devices from companies, contributions of research groups like I3S/Rainbow and their Ph.D. students, and developments of computer and software engineering students from Polytech'Nice-Sophia, in order to prospect new applications of ubiquitous computing and ambient intelligence.

In order to focus on software composition challenges to design at run time ubiquitous and ambient applications, Ubiquarium is working according to the international internet standards from institutions like ETSI, IETF, W3C, OASIS, etc. For example, every usable device (Mobile phone, PDA, Light, TV, and sensors) in the Ubiquarium must apply international standards like UPnP (from the UPnP forum, <http://www.upnp.org/>) or more recently DPWS, Device profile for Web Services (from the famous W3C consortium).

Numerous companies have been interested in extending their own communicating devices in collaboration with Polytech'Nice-Sophia to implement these standards. In order to simulate real environment Ubiquarium also integrate 3D virtual scene to immerse users in a realistic virtual environment and to evaluate the behavior of the users and the usability and relevance of the application. The virtual devices in this virtual environment are also based on the previous standards to offer a technological homogeneous software environment to the emulated application.

The I3S research on adaptive middleware for ubiquitous computing is based on a software architecture model called SLCA (Service based on Lightweight component architecture). This architecture model is inspired from both SOA model (Service Oriented Architecture) and EDA model (Event Driven Architecture) to jointly support event-based programming well-adapted for application in a real world and interoperability and discoverability of services. A software platform based on this architecture model is currently provided by the Rainbow research group to design and adapt on the fly, ambient and ubiquitous applications from the standard multi-devices infrastructure of the Ubiquarium. This overall approach is currently used to prospect new applications in the fields of Home Control, Health at Home, environments for people with disabilities.

This laboratory will support the first experiments of Euro Asia Ubi-Flood to explore the potentialities of the ubiquitous computing research to extend existing forecasting systems, mainly in Task 1 of Euro Asia Ubi-Flood. Some of the applications will result in a more efficient, accurate or cost effective solution than previous ones taking much more advantage of existing communicating devices rather than a dedicated specific infrastructure.

- JY Tigli is associate professor in Software Engineering, Networks and System in the Computing Department in the Engineering School, Called "Polytech" of the University of Nice Sophia Antipolis and he's also, this year, delegated by his University, as INRIA researcher in Team PULSAR to pursue research on middleware for ubiquitous computing and activity recognition. He has published lot of papers in the field of Software for Robotics, and more recently, Middleware for Ubiquitous Computing. He's in the PCs of international conferences in these fields and this year the program chairman of the 6th ACM International Mobility Conference. He is also Head of the Embedded Software Engineering specialty for the MSc in Software Engineering and the last year of the Engineering degree of Polytech, having served in this role for the past 10 years. In 2008 he promoted and headed, the first french specialty at the MSc level in Software Engineering for Ubiquitous Computing (called IAM, for "Mobile and Ubiquitous Computing").

He has been primarily responsible for a large number of research projects (Region Project "Ubiquarium", ANR Project "ErgoDyn", ANR Project "Continuum", NUS collaboration project ...) in the research group "Rainbow", headed by Michel Riveill at the University of Nice Sophia Antipolis. His current research interests include software architectures, middleware (including service oriented and adaptive middleware) for multi-device systems, and aspect oriented approaches applied to reactive adaptation in middleware for mobile and ubiquitous systems. His researches also conduct to various software licenses and industrial collaborations with numerous companies interested in M2M software environments. He holds a PhD in computer science from the University of Nice Sophia Antipolis, in January 1996, in which he proposed a behavioral programming model for intelligent robotic systems in collaboration with National Research Council of Canada.

Other member of the research group Rainbow/ I3S involved in this project:

- Michel Riveill has been a Professor of Computer Science at University de Savoie, Chambéry since 1993. Prior to this appointment, he worked as a Research Engineer at Bull. He graduated from ENSIMAG, Grenoble in 1981 and holds a Doctorate from Institut National Polytechnique de Grenoble (1987). In 1992, he was on a post-doctoral stay at Trinity College, Dublin in the Distributed Systems Group. He has been a member of the Bull-IMAG laboratory from 1989 to 1995 and he was the principal designer of the Guide language for distributed objects; and member of the Sirac INRIA Project from 1996 to 2000. He is now a director of the Rainbow project at the CNRS I3S Laboratory (<http://www.i3s.unice.fr>), head of the computer science department of the school of engineering of the University of Nice-Sophia Antipolis. Professor Riveill has published 60 papers in the areas of Distributed systems and applications, Object-oriented programming, Languages and programming environments for distributed systems, System support for CSCW. He has organized summer schools on Distributed Systems and several workshops.

- Stéphane Laviotte is Associate Professor at the University of Nice-Sophia Antipolis since 2001. Prior to this appointment, he graduated from ESSI (Engineering school in Computer Sciences of the University of Nice-Sophia Antipolis) in 1995 and holds a Doctorate from the same university in Software Engineering, prepared at INRIA (National Institute of Computer Science and Automation) in 2000. During one year, before being recruited, he was in a post-doctoral position at I3S CNRS, working on European projects: Trial Solution and OpenMath thematic Network. He joined the Rainbow group in 2005 managed by Prof. Riveill to extend his previous research topics to ambient intelligence.

- Gaëtan Rey, Associate Professor at University of Nice-Sophia Antipolis he has joined the RAINBOW group in December, 2007 after having led researches in field of Computer Human Interaction on a component model for sensing and distributing contextual information in ambient computing (participation to European projects Gloss, Fame, Cameleon as well as to the Irish program AIC) and about new

interaction Techniques on “interactive tables” in ambient computing (ANR Digitable project rewarded by the first Noblanc award in 2006).

Department of Hydroinformatics & Water engineering

The department is responsible for education and training in Hydroinformatics and water sciences in Polytech’Nice-Sophia. With a specific approach, the department develops courses are mainly focused on modeling methods and tools applied the water management. The department is managing several master courses and in particular EuroAqua [www.euroaqua.org] which is an Erasmus Mundus master course established since 2004 with 4 others European universities and delivering a real joint Msc. In the Erasmus Mundus framework, the EuroAqua consortium led by Polytech’Nice-Sophia has established institutional collaboration with the Tropical Marine Sciences Institute (TMSI) of the National University of Singapore. This collaboration started since 2005 - and based on existing links since more than 10 years – involves different researchers and master/students in different projects located in Asia and with several partners (mostly all the partners involves in this project). The cooperation between TMSI and Polytech has been supported in 2006 with a first Merlion project called HydroAsia. This very successful experience [www.hydroasia.org] has attracted the interest of different partners (Korea, Thailand, China, Japan) which are now fully involved in the activities. Industrials of the water field (Suez Environment and DHI mainly) have underlined their interest such cooperation and research activities.

The research activities of the department are jointly developed with the different departments/labs of the schools and with the EuroAqua research group which gathers the researchers of the five European participating institutions. Most of the research activities are carried out with a strong industrial partnership [see below]. The main scientific topics covered by the research group strong of 75 participants are:

- Urban waters management
- Sustainable watershed management
- Coastal zone and marine environment management
- Climate change and consequences on water uses.
- Risk assessment for extreme events
- Water quality management in rivers, lakes and networks – Hydroecology
- Methods and theoretical aspects
- Data acquisition and analysis
- Software engineering and computing

Most of the researches are developed in an international environment (at least European) with many applications focused on Asia.

o Philippe Gourbesville is Professor at University of Nice-Sophia Antipolis, director of Polytech’Nice-Sophia and leads the Hydroinformatics and Water engineering department. He is also the coordinator of the EuroAqua Consortium and the project leader for HydroEurope [www.hydroeurope.org] and the HydroAsia Merlion project [www.hydroasia.org] with TMSI since 2006. During the last 15 years, he has been involved in several international research & development projects through different European frameworks – FP6, Marie Curie actions, Socrates / Erasmus, Tempus, Asialink, etc. - mainly focused on water management and the development of hydroinformatics. He is participating as reviewing and external expert for the European Commission and for several national research agencies on projects dealing with water. In parallel, he is a member of the Scientific board of the French Hydrotechnique Society and a member of the Council of the International Association for engineering and Hydraulic Research, representing Europe. He is also coordinating several scientific advisory groups involved in international projects related to new coastal infrastructure developments or flood protection systems in Europe and worldwide.

Asian Institute of Technology (AIT), Thailand

The AIT is an international post-graduate institute founded in 1959 in Bangkok, Thailand with affiliated centers in the region and is Asia’s pioneer institution to help the region meet the growing need for advanced education in engineering, science, technology, business management and public administration. AIT’s mission is to develop highly qualified and committed professionals who will play a leading role in the sustainable development of the region and its integration into the global economy. As such, AIT is a vector and hub of collaboration in education and research with many European universities, research

institutions, development agencies and government (e.g. within ASEM, EU-ASEAN dialogue and cooperation tools, Asia-link etc.).

Over the decades, AIT through its academic field of study - Water Engineering and Management WEM (formerly Hydraulic Engineering) - is playing a unique role to develop highly qualified and committed graduates ready to take up challenges of the evolving needs to solve complex water issues in Asia. In 2006, AIT embarked on a new approach in offering a more comprehensive and relevant services in providing education and conducting researches on water. This approach is embedded in the Institute's new Strategic Development Plan which aims to focus AIT's academic and research activities on five thematic knowledge areas, one of which is the thematic area on Water Management and Technology. The thematic area on water has pooled together the existing allied academic programs at AIT and established strong linkages with national/international development partners as well as water industry to provide a more coordinated and flexible environment for water education and research.

As part of the on-going thrust to the water sector, AIT recognizes that the rapid pace and scale of urbanization in Asia represents a considerable challenge in urban water management. Already a balanced effort has been made to address gaps in education, applied research and outreach in Urban Water Management. Available post-graduate courses give extensive coverage ranging from addressing water supply and sanitation problems to integrated management of urban water resources in Asia. At the same time, a number applied research activities are being conducted addressing different aspects of urban water management. Some of these researches focus on developing and integrating hydro-informatics tools into the solution of urban water issues.

For example, AIT is using its decade long experience in urban water modeling to develop and demonstrate a near real-time Flood Risk Information System for the city of Bangkok since 2003. The system is an essential intelligent non-structural tool to aid vehicular traffic control, operation of sewer systems and many allied activities in urban life. It consists of an online real time rainfall forecast system using radar and rain gauge data, and an urban flood model to produce flood inundation maps. Extensive use of IT tools has been made to disseminate inundation warning through Internet and Wireless Application Protocol (WAP) devices in Inner Bangkok area (see www.wap.ait.ac.th). In future AIT plans to expand the coverage of the flood warning dissemination across greater Bangkok and its vicinity areas.

In another research in collaboration with the Royal Irrigation Department of Thailand (RID), AIT developed Flood Forecasting and Management System of the Ta Chin River Basin. For the resort city of Pattaya in Thailand, AIT developed and tested a urban drainage and water quality information system to evaluate storm handling capacity of the sewers and determine the bathing water quality on the beach. In 2006, AIT joined hands with a Thai consulting company to model water pressure in the piped water distribution network in parts of Bangkok which provided a promising solution to control leakage in the network.

Apart from works in Thailand, AIT's recent urban water research activities cover many large Asian Cities. For example, for the cities of Kathmandu (Nepal), Hi Phong City (Vietnam), Thimphu Valley (Bhutan) AIT developed Urban Water Demand Forecasting Models. For Dhaka (Bangladesh), AIT developed two-Dimensional Urban Flood Modeling for Real Time Flood Forecasting. For Sta. Cruz, Manila AIT developed Urban Drainage Model to evaluate current situation and develop sustainable strategy to alleviate drainage congestion in the city.

o Dr. Mukand Singh Babel is an Associate Professor and Program Coordinator of Water Engineering and Management at the Asian Institute of technology, Thailand where he has been on the faculty since 2001. Dr Babel specializes in hydrologic and water resources modeling as applied to integrated water resources management. Particular interest areas are: water supply system and management; watershed modeling and management; water resources allocation and management; and water resources and socio-economic development. Dr Babel teaches Integrated Water Resources Management, Modeling of Water Resources Systems, Watershed Hydrology, and Water Supply and Sanitation. He is involved with supervision or co-supervision of 16 Doctoral students and 81 Masters students. He has published extensively over the years and has authored or co-authored 22 peer-reviewed journal papers apart from contributions to various book chapters and conference papers.

o Dr. Sutat Weesakul is an Affiliate faculty in Water Engineering and Management program at AIT. He obtained his D.Eng. from the Asian Institute of Technology, Thailand, 1987. His research focuses on solving urban drainage problem using both engineering and management approaches. In one of his research work, he collaborated with Dr.

Ole Mark from DHI to demonstrate an on-line urban flood warning system of Sukumvit area in Bangkok , Thailand. Dr Weesakul teaches post-graduate courses on “Urban Drainage Management” and “Concepts in Water Modeling” at AIT.

Indian Institute of Technology Bombay (IITB), Mumbai

Indian Institute of Technology Bombay (IITB), Mumbai, India in one of the leading under-graduate and post-graduate institute of technology founded in 1959 in Bombay, India. Over the decades, there has been dynamic progress at IIT Bombay in all academic and research activities, and a parallel improvement in facilities and infrastructure, to keep it on par with the best institutions in the world. Institutes in positions of excellence grow with time. The ideas and ideals on which such institutes are built evolve and change with national aspirations, national perspectives, and trends worldwide.

o Dr. Kapil Gupta is Professor at Civil Engineering Department. He obtained his B.Tech (Civil Eng.) from IIT Delhi, M. Tech (Hydraulic Eng.) from IIT Madras and a PhD from the University of Sheffield, UK. He has been focusing on urban water supply, wastewater and drainage issues for the past 20 years. Areas of his specialization and research include:

- o Hydraulics and Water Resources Engineering
- o Urban Drainage/ Stormwater Management
- o Hydrologic Disaster Management
- o Flood Protection Structures
- o Early Warning Systems For Urban Flood Disaster Management

He is a member of the Sewer Systems and Processes Working Group (SSPWG), the GUR sub-committees of the Joint Committee on Urban Drainage and a member of the Indian National Committee on infrastructure development as well as other international working groups of the IAHR/IWA joint committee. He is also on the expert committee of disaster management of the Greater Mumbai Municipal Corporation.

Tropical Marine Science Institute (TMSI)/ National University of Singapore

TMSI, a research institute of National University of Singapore, is a centre of excellence for research, development and consultancy in tropical marine science as well as environmental science. With its multi-disciplinary research laboratories and active international links, it handles projects relevant to Physical Oceanography, Acoustics, Marine Biology, Aquaculture, Marine Mammals, Marine Bio-toxicology & Chemistry, Marine IT, Marine Biotechnology, Water Resources and Climate Change. TMSI also provides postgraduate research opportunities.

The most recent research projects range from operational tsunami forecasting system, operational integrated water resources system, operational water quality forecasting system, to climate change impacts on Singapore. Many of the above mentioned projects involve TMSI colleagues from various disciplines (instrumentation, acoustic, oceanography, marine biology and chemistry, water resources, GIS, modeling, data mining, etc). TMSI has a series of international collaborative works on national and international projects.

o Dr. S.Y. Liong is Associate Director of TMSI and Associate Professor at Civil Engineering Department. His main expertise is in hydrology, water resources, data mining. He is an Editor of Journal of Hydroinformatics and President-Elect of Hydrology Section of Asia-Oceania Geoscience Society.

o Dr. P. Tkalich is Head of Physical Oceanography Research Laboratory of TMSI. His main expertise evolves around Coastal Ocean Hydrodynamics and Water Quality Modeling. Particular scientific interests include development of Mixed Reality Decision Support Systems, tsunami and wind-waves modeling, oil spills and eutrophication processes.

o Dr. D.K. Raju is Research Fellow at Physical Oceanography Research Laboratory, Tropical Marine Science Institute (TMSI). His main expertise is application of GIS, photogrammetry and remote sensing techniques for Coastal and Marine systems management, Digital terrain visualization and topographic mapping using LIDAR and GPS techniques. Presently responsible for developing centralized coastal and marine database development at national and regional level.

o Dr. Venu Pallayil is a Research Fellow at the Acoustic Research Laboratory (ARL), TMSI, National University of Singapore. He is also discharging duties of Deputy Head for the lab as well as Manger, Operations for TMSI. His research interests are design and development of instrumentation systems for underwater acoustic research as well

as for oceanographic research. He has been managing a number of projects at ARL during the last 10 years and won the Defense Technology Prize 2004 for one of the projects. He is a Senior Member of IEEE and Chair for the local Chapter of IEEE Oceanic Engineering Society.

DHI India Water & Environment Pvt Ltd. (DHI)

DHI is an independent, international consulting and research organization approved as an authorized Technological Service Institute by the Ministry of Science, Technology and Innovation. The consulting services are based on the Development and application of know-how and advanced technologies within water resources, river basin planning, reservoir inflow forecasting, reservoir operation optimization, hydraulic structures and hydrodynamics and other areas related to water environment.

For DHI Water & Environment it is essential to establish a thorough understanding of the processes behind the environmental and hydraulic phenomena - and to develop the appropriate tools. The consultancy work thus combines sound physical/chemical and biological knowledge with the most advanced tools and technologies available. Projects have been undertaken in more than 140 countries.

Decision Support System

DHI has been developing and implementing user and client-specific integrated water information, modeling and decision support systems around the world for the past decades. DHI staff works closely with users and clients in defining needs, functionality and usage of these systems to ensure local ownership and sustainability. We focus on working with and involving future executive users and information systems staff and managers. DHI staff applies expertise and knowledge gained from hands on experience working with local, regional, national and global agencies and institutions. DHI develops state-of-the-art applied technologies and tools covering the entire design and implementation train from databases, web application, analysis, scenario management to the decision processes with emphasis on clients' needs and requirements for rapid deployment, ease of use, transparency and sustainability. DHI's worldwide experience is centered around users' needs to ensure that solutions meet current and future demands. DHI is committed to the success and sustainability of your DSS project through training, documentation and support for institutionalization and capacity building.

Depending on needs, requirements and scale a DSS can be tailored to support a set of focused and dedicated decision processes and objectives or be designed to meet the needs of an enterprise DSS supporting a wide range of users with a broad management scope. The structure and functionality of the DSS is at the heart of the design and implementation process. DHI engineers and scientists work closely with the user and owner of the DSS - to configure, design and implement the DSS. Our design process is highly evolved to keep focused on your needs, your data, your decision process, your clients' needs while, at the same time, applying the best and most economic tools and technologies available. The DSS in all its uses must be focused, fast, flexible and adaptive. The DSS provides cost-effective information management, enabling professional communication between colleagues, other technical staff, managers, decision makers, major stake holders and the public. A DSS can include a number of interactive and integrated components:

Data and information management

The data and information component is integral in developing a DSS. This component focuses on integrating databases and connecting data islands into a dynamic framework with advanced display, mapping, query and presentation capabilities.

Analysis and modeling

The data framework provides the basis for further analysis and interpretation of data and information. Depending on the stage and scope of the DSS, the analysis can range from simple to complex using a wide range of models and tools.

Scenario management and alternative formulation

The DSS framework is capable of supporting and providing information (costing and prioritization) for project feasibility and planning projects as well as design and implementation. Upon implementation the project may have an operations component requiring real time and online decision making.

Decision making

Configurable GIS and web-based interfaces are tailored to meet specific needs and requirements. Advanced graphics, online access, custom rules and interpretations can be embedded into the DSS to support and provide the basis for decision makers to make timely, reproducible and well informed decisions. Moreover, as a process, the decision support techniques applied by DHI involve the user and decision maker - in defining the problems and the objectives. Together, these components, tools and techniques form the living DSS tailored to meet specific needs.

DHI has comprehensive experience from India and neighboring countries. In 1981 DHI commenced collaboration with Central Water Committee (CWC), which continued for more than 10 years. The aim of this collaboration financed by DANIDA was to transfer numerical modeling techniques within flood control and flood forecasting to CWC. One (of many) results of this collaboration was a reservoir inflow forecasting system for the Maithon Reservoir – a system which is still operational.

Since the eighties DHI has undertaken a large number of projects in India, e.g. Andra Pradesh Hazard Mitigation and Emergency Cyclone Recovery Project (ref. 16), studies for Baglihar Reservoir (ref. 6), Swan River (ref. 7) and many more.

In neighboring countries DHI has been involved in comprehensive technology transfer and institutional strengthening programmes, e.g.

- 1989-92, 1995-98, 2000-04 :Flood Forecasting and Warning Centre, Bangladesh Water Development Board, Bangladesh (ref. 15)
- 1986-99 :Surface Water Modelling Centre, Bangladesh (now Institute of Water Modelling)
- 1985-90 :River Research Institute, Bangladesh
- 1982-88, 1991-94:Lanka Hydraulic Institute, Sri Lanka

o Mr. Ajay Pradhan has over 15 years of professional experience in directing and coordinating multi-disciplinary team of experts engaged in various types of Water Environment projects in India and abroad. Specialized in areas of Geographical Information Systems and Remote Sensing, Project Management (Water Resources, Marine Area and Urban Water), Information Technology and Management, Environmental Planning and Management.

Attended more than 65 National and International Conferences, symposium, workshops, etc. in India and abroad on themes; GIS, Environmental Mapping, Hydrology, Marine Sciences, Watershed, GPS integration in GIS, Thematic Cartography, Ecology, Microzonation of Urban Centers, Remote Sensing and Photogrammetry, etc. Managed Multi-million dollar Offshore Pipeline, Coastal Engineering Projects for ONGC and Cyclone and Hazard Planning for Bangladesh and Andhra Pradesh. Has got an excellent skill of managing inter-disciplinary team of professionals in executing and timely delivery of projects. Has successfully executed a large Flood Mapping projects for Federal Government in US for GFCC, USA.

o Mr. Vijay Kumar has 32 years of experience and has contributed significantly in the fields of water resources, watershed development, water supply and sanitation and Hydrology and hydrological modeling including multi-purpose multi-reservoir operation.

Mr. Kumar worked for nine years in Water and Power Consultancy Services (India) Ltd. in senior positions and was responsible for several projects as Team Leader and Hydrologist. Following this, he worked for more than seven years in the Royal Danish Embassy, as the Senior Programme Officer and lead the Water sector for Danida assisted programme in India. Here he was responsible for strategic planning, guidance and co-ordination of Danida assisted Watershed Development Program that comprised five large projects in the States of Orissa, Tamil Nadu, Karnataka and Madhya Pradesh. In the Water Sector, he coordinated a large programme of rural water supply and sanitation in the States of Tamil Nadu and Karnataka that benefited at least 2 million people. Both the programs have been highly successful and the participatory approaches and other successful practices therein have been incorporated in the policy statements and guidelines of the Government of India.

As a Senior Consultant, Mr. Kumar has professionally contributed to several studies funded the Water and sanitation Program-south Asia (World Bank), UNICEF, Danida and Ausaid.

He has authored 20 papers/ articles.

o Dr. Rama Sastri Kota has more than 37 years in Research and Development in Hydrology, Hydro-meteorology and Climatology. He was involved in numerous Hydro-meteorology projects in Himalayan region. He was extensively involved in Hydrology project – I and other projects across India. He was instrumental in installations, observations and monitoring of meteorological instruments at various Himalayan locations for monitoring the climatic change in River Satluj and its effects on Bhakra Beas Power station.

To his credit he has published 20 technical papers in International Journals and 30 in National Journals. In addition, 70 papers have been published in Proceedings of International and National Conferences, Seminars and Symposia.

Centre for Mobile Computing & Communication/ Jadavpur University Calcutta, India (JU)

The Centre for Mobile Computing & Communication was funded by the University Grants Commission under the scheme of “Universities with Potential for Excellence” - Phase I completed in March 2008. This Centre of Excellence of International standard has close tie-up with various overseas universities and research labs such as Rutgers University, University of Texas at Arlington, Lucent Technology in USA, Carleton University in Canada and major IT giants like IBM, Hewlett Packard and Avaya. The Centre, which led to the creation of the School of Mobile Computing & Communication in Jadavpur University has created various infrastructures like an IBM p690 (Regatta) Server, IBM p650 server (at the Salt Lake campus), a new 2-storey building with an 8-storey foundation, a State-of-the-art Mobile Computing laboratory, wireless corridor linking several buildings in the main campus, wireless infrastructure in the Salt Lake campus and 24X7 connectivity with the main server that is accessible through the Internet on an anytime anywhere basis.

Memorandum of Understanding signed with IBM made it possible to include JU as a member of IBM’s prestigious Centre of Advanced Studies group worldwide and another signed with HP created the state-of-the-art Mobile Computing laboratory with 60% funding from HP.

As part of its outreach program the Centre was involved in two Disaster Management projects: (i) Development of a Flood Forewarning System in association with the Irrigation & Waterways Department, Govt. of West Bengal and (ii) Development of a Cyclone Warning System in association with Digha-Sankarpur Development Authority and the School of Oceanographic Studies, JU. A few other projects are also on the anvil. Of these a project of much social relevance is an Agricultural Information Dissemination System using Mobile Technology in association with Bidhan Chandra Krishi Vishwavidyalaya, Kalyani, Nadia.

o Dr Pradip K. Das is Professor at Dept. of Computer Science & Engineering at Jadavpur University Calcutta, India. He started the School of Mobile Computing & Communication as its founder Director. The School, which grew out of the Centre of Excellence in Mobile Computing & Communication, obtained the necessary clearance from UGC and AICTE and is currently the only school of its kind in India. It has several international collaborations with both academia and industries (such as IBM and Hewlett Packard). He has been involved in teaching both at the undergraduate and postgraduate levels without break since joining Jadavpur University in 1973 and have also taught abroad while visiting the Queen’s University of Belfast, Northern Ireland, U. K., between 1986 and 1988. He has been teaching various subjects offered by the Departments of Electronics & Tele-Communication Engineering, Computer Science & Engineering, Information Technology and recently the School of Mobile Computing & Communication. He has been honored by the prestigious “Technology for Teaching” award in the Asia Pacific & Japan region instituted by Hewlett Packard Philanthropy trust. It is the first time since its inception that this award was given to an Indian University.

o Ajay Kumar Basu is Electronics & Tele-Communication Engineer with post-graduation in Computer Science and 37 years of experience in Information Technology in R&D, Information System Development, IT Infrastructural Support & General Management. Areas of his interest are General Management / Consultancy in Information & Communication Technologies. He has served as President, GM and Regional Manager of HCL, NELCO and Thakral Group in India, Singapore and Moscow. In addition he served R&D Laboratories (TIFR & BARC) as Computer Scientist for 10 years, IT industry in regional and corporate level for 22 years and as IT consultant/advisor for the last five years. He possesses extensive experience of building and implementation of On-line Data Acquisition & Information Systems for government and private sectors. This includes Nuclear Data Acquisition Systems for Dept. of Atomic Energy, Bank Mechanization and Port (Container Terminal) Automation. He has further extensive experience in building wireless communication applications using public networks (Mobile and Internet), e.g. specialization in building remote sensing and monitoring systems for Industry using Mobile Communication and digital Encoding Technologies. He is also experienced in IT and Management Consultancy & Training and has wide international exposure - experience in setting up operations in UK, Singapore and Moscow.

B6. Others

- Experience of the lead researchers in the implementation of similar programmes

Philippe Gourbesville is full professor at University of Nice-Sophia Antipolis, director of Polytech’Nice-Sophia and led the Hydroinformatics and Water engineering department. He is also the coordinator of the

EuroAqua Consortium and the project leader for HydroEurope [www.hydroeurope.org] and the HydroAsia Merlion project [www.hydroasia.org] with TMSI since 2006. During the last 15 years, he has been involved in several international research & development projects through different European frameworks – FP6, Marie Curie actions, Socrates / Erasmus, Tempus, Asialink, etc. - mainly focused on water management and the development of hydroinformatics. He is participating as reviewing and external expert for the European Commission and for several national research agencies on projects dealing with water. In parallel, he is a member of the Scientific Board of the French Hydrotechnique Society and a member of the Council of the International Association for engineering and Hydraulic Research, representing Europe. He is also coordinating several scientific advisory groups involved in international projects related to new coastal infrastructure developments or flood protection systems in Europe and worldwide.

Jean-Yves Tigli is Associate Professor at the University of Nice-Sophia Antipolis, Polytech'Nice-Sophia since 2000. Prior to this appointment, he graduated from ESSI (Engineering school in Computer Sciences of the University of Nice-Sophia Antipolis) in 1991 and holds a Doctorate from the same university in Software Engineering for Robotics in 1996. In 1996 and 1997 he worked as a post-doctoral position at I3S CNRS on both robotic European projects: NARVAL (LTR-ESPRIT) and MAUVE (MAST III). In 1997 and 1999, he was research assistant at ISIA of the Ecole des Mines de Paris, always leading research in the field of software engineering for robots. He joined the RAINBOW group in 2003 managed by Prof. Riveill to extend his previous research knowledge in ambient intelligence.

- Presentation of existing activities correlated with the main objective of the project

The I3S lab has the following 4 scientific thematic focuses:

- COMRED: Communications, Networks, Distributed Systems, Embedded Systems
- GLC: Software Engineering and Knowledge Engineering
- MDSC: Discrete Models for Complex Systems
- SIS: Signal, Image and Image Processing

The Rainbow group of the GLC thematic is managed by Professor Michel Riveill. The Rainbow crew is made of 14 fulltime researchers or professors-researchers, 8 PhD students and 2 post-docs. Its research area covers software engineering, ubiquitous and distributed applications. It is particularly active in the following topics:

- Modeling, orchestration and model transformation
- HCI interfaces, in the context of dynamic evolution of distributed application architectures
- Dynamic adaptation to the execution environment in the context of dynamic applications designed by orchestrating software components and devices
- Services orchestration and enactment on a large scale distributed infrastructure such as grids, application to medical imaging

The Rainbow group is specialized in software composition and adaptation, among others, applied to Service Oriented Architecture for ambient computing. Its knowledge is devoted to the conception of a unified platform for interactive surfaces and to envisage the future of such platforms in ambient intelligence. Its knowledge and research results open piece of new perspectives for the deployment of applications in a dynamic real environment consisted of heterogeneous smart objects and devices. A part of the Rainbow group is also involved in various industrial and applied research projects in collaboration with numerous European companies and research centers like CSTB (French Scientific and Technical center for building industry), CIRSEE (International research center on Water and the Environment) of Suez Environment, GEMALTO (the European company, world leader in digital security) and other innovative companies of one of the largest European technology park in the fields of software engineering and telecommunication: Sophia Antipolis.

Polytech'Nice-Sophia jointly with I3S and the Rainbow team will organize and host in September 2009 the Mobility conference in Sophia Antipolis. The ubiquitous computing is one of the main topics covered by this well established event which has been based in Asia until now.

- Prospect for the sustainability of the collaboration after the end of the ICT-Asia project financing

All partners have been committed to continuously promote future collaborations between France and Asia. Commitment by the associated partners such as DHI Research Center and Public Utility Board Singapore will particularly guarantee the sustained finance resources for the execution of the proposed project both for the time frame of the initiative and beyond. Indian industrial partners in telecommunication fields will be involved in further development and application of the research results.

. Budget proposal

	Income €	Expenditure €
1st year	Asian partners: 25k AIT: 5k IITB: 15k TMSI: 15k DHI: 5k JU: 5k	Mobility -Master students: 10k -doctoral students: 20k -post-docs/ researchers: 20k Equipment : 10k Operational cost: 5k
	French partners: 35k Polytech'Nice-Sophia: 45k -MAE : 50k	Scholarships: 40k International seminars: -logistics 15k -mobility 15k Other (expand): 5k
2nd year	Asian partners: 25k AIT: 5k IITB: 15k TMSI: 15k DHI: 5k JU: 5k	Mobility -Master students: 10k -doctoral students: 20k -post-docs/ researchers: 20k Equipment : 10k Operational cost: 5k
	French partners: Polytech'Nice-Sophia: 35k -MAE : 50k	Scholarships: 40k International seminars: -logistics 10k -mobility 10k Other (expand): 5k
Total	270k	270k

Financial support request to the French Ministry of foreign affairs (MAE) in €:

1st year	Mobility -Master students: 8k -doctoral students: 16k -post-docs/ researchers: 16k International seminars: -logistics 5k -mobility 5k
	Mobility -Master students: 8k -doctoral students: 16k -post-docs/ researchers: 16k International seminars: -logistics 5k -mobility 5k
Total	100k €

Annexes

Annexe 1 : CONTINUUM

CONTINUUM: CONTINuity of service in UbiquitoUs and aMBient computing (ANR-08-VERS-005) is a three years project, selected by the French Research Agency on 2008 (2009-2012). The scientific objective of CONTINUUM is to define the theoretical models that will support service continuity for mobile users/workers. A core problem is to achieve software adaptation to a variety of resources in dynamic and heterogeneous environments with an appropriate balance between system autonomy and human control. Three key scientific issues will be addressed: context management and awareness, semantic heterogeneity, and human control versus system autonomy.

WP 1: Identification of the socioeconomic frame and its constraints

Among all methods of comprehension of the computer systems, approach based on scenarios is only one of the possible alternatives. It is the one that we shall keep as part of plan CONTINUUM.

Having identified the characteristics for a scenario, there is numerous manners to realize the realization.

To realize a scenario within the framework of CONTINUUM, we shall associate two methods: **a theoretical approach** and **a technical approach**. The ethnographical point of view will be associated with this construction of a scenario of CONTINUUM according to the context of this scenario.

The objective of this WP is to decline two scenarios:

- the first one directed on the industrial concrete case, which will be the frame of the in vivo experiments of the WP 6.1,
- The second, more prospective, will be a scenario bringing to light complementary actions which will want a shape of generalization in the other types of professions by mobile workers.

These scenarios will bring to light the needs of the continuity of service.

This WP also aims at working out a precise and reliable model of the various potential users "profiles" of the services in the course of development, by leaning on the information collected in the WP 1.1 and 1.2. The purpose of the modeling is double: on one hand, understand and know how to interpret the behavior human being (in terms of reactions, preferences, understanding of the information) and on the other hand, know how to predict the future behavior to anticipate needs and manners of tomorrow.

WP 2: Fit to context

This WP has for objective to conceive the models and the mechanisms of the platform CONTINUUM by endowing the operational platform WComp, of the RAINBOW group, of dynamic adaptation services to the context of used. We shall lean in particular on a functional decomposition centered on the consideration of the context in four phases: contextual information sensing, context, calculation of the reaction plan, and implementation of the reaction.

WP 3: Master the heterogeneousness

This WP has for objective to take into account the heterogeneousness of the context description as well as components and their features for the deployment of interactive applications in which the useful devices confide, connect and interact in the air and in a decentralized way.

In this project, we distinguish the heterogeneousness of the interoperability which we suppose acquired thanks to the use of formats and protocols allowing making communicate and interact physical devices or components software.

We want to allow a description high level of abstraction of the context, components and their features:

- **Enough compact** so that every device can store its description and download the descriptions of the other devices, as well as the contextual information,
- **Rich enough** so that we can argue about this contextual and functional information for example to deduce properties of adaptation to be able to qualify various assemblies of components, according to the request of the user and/or the context.

WP 4: Put the user in the loop

This WP has as objective to provide the end user means to understand and to control the adaptation of the ambient space while letting the system assure its basic functions in an autonomous way. We want to attain interactional following qualities:

- **Inform without overloading:** the user must know which services are listening and how he can contact them,
- **Assure a good equilibrium between software self-government and human workmanship:** the system assures the functions assigned with the expected quality, but leaves to the user the possibility of inspecting and of checking, easily bringing some change in services, or even to build new assemblies in the style of a meccano,
- **Seek the user in a convenient way:** protect the user against the inconvenient disturbances by a soothing and calmed technology, but bring in him in the cases where the system cannot assure its function in an autonomous way (for example, instead of surprising him, letting the user decide on the final choice between several propositions).

WP 5: Integration and validation in equipped and checked environment

This WP has for objective to integrate the various developments of the industrial prototypes and academic demonstrators to bring to a successful conclusion the WP of experiments detailed in the WP 6. This integration will have for main purpose to realize a coherent system established on the basis of the scenarios referenced and put in evidence in the WP 1, what will allow bringing to a successful conclusion coherent evaluations both on the industrial and prospective plan (WP 6).

WP 6: Experiment and estimate

The objective of this WP is to estimate by the experiment on the ground in the industrial context and in an environment feigned for the prospective scenario the prototype developed during the WP 5 from the scenarios established in the WP 1. In agreement with an iterative approach, the data stemming from experiments led in the WP 6.1 and 6.2 we will allow to validate/counter/to refine the user profiles finalized in the WP 1.

Jean-Yves Tigli, Stéphane Laviotte, Gaëtan Rey, Vincent Hourdin et Michel Riveill. « *Context-aware Authorisation in Highly Dynamic Environments* ». International Journal of Computer Science Issues (IJCSI), volume 4, septembre 2009. ISSN 1694-0784.

Jean-Yves Tigli, Stéphane Laviotte, Gaëtan Rey, Vincent Hourdin et Michel Riveill. « *Lightweight Service Oriented Architecture for Pervasive Computing* ». International Journal of Computer Science Issues (IJCSI), volume 4, pages , septembre 2009. ISSN 1694-0784.

Jean-Yves Tigli, Stéphane Laviotte, Gaëtan Rey, Vincent Hourdin, Daniel Cheung-Foo-Wo, Eric Callegari et Michel Riveill. « *WComp Middleware for Ubiquitous Computing: Aspects and Composite Event-based Web Services* ». Annals of Telecommunications, volume 64, numéro 3-4, pages 197, avril 2009. ISSN 0003-4347 (Print) 1958-9395 (Online)

Vincent Hourdin, Jean-Yves Tigli, Stéphane Laviotte, Gaëtan Rey et Michel Riveill. « *Context-Sensitive Authorization for Asynchronous Communications* ». Dans 4th International Conference for Internet Technology and Secured Transactions (ICITST), London, UK, novembre 2009.

Nicolas Ferry, Vincent Hourdin, Stéphane Laviotte, Gaëtan Rey, Jean-Yves Tigli et Michel Riveill. « *Models at Runtime: Service for Device Composition and Adaptation* ». Dans 4th International Workshop Models@run.time at Models 2009 (MRT'09), Denver, Colorado, USA, octobre 2009.

Marcel Cremene, Jean-Yves Tigli, Stéphane Laviotte, Florin-Claudiu Pop, Michel Riveill et Gaëtan Rey. « *Service Composition based on Natural Language Requests* ». Dans International Conference on Service Computing (SCC), Bangalore, India, septembre 2009. IEEE Computer Society Press.

Nicolas Ferry, Stéphane Laviotte, Jean-Yves Tigli, Gaëtan Rey et Michel Riveill. « *Context Adaptive Systems based on Horizontal Architecture for Ubiquitous Computing* ». Dans International Conference on Mobile Technology, Applications and Systems (Mobility), Nice, France, septembre 2009.

Vincent Hourdin, Jean-Yves Tigli, Stéphane Lavirotte, Gaëtan Rey et Michel Riveill. « *Context-Sensitive Authorization in Interaction Patterns* ». Dans International Conference on Mobile Technology, Applications and Systems (Mobility), Nice, France, septembre 2009. ACM.

Annexe 2 : CORFU

SEVENTH FRAMEWORK PROGRAMME THEME: ENVIRONMENT (INCLUDING CLIMATE CHANGE)



CORFU - Collaborative research on flood resilience in urban areas

Participant no.	Participant organisation name (short name)	Country
1 (Coordinator)	University of Exeter (UNEXE)	United Kingdom
2	DHI Water & Environment (DHI)	Denmark
3	University of Nice - Sophia Antipolis (UNS)	France
4	Hamburg University of Technology (TUHH)	Germany
5	Indian Institute of Technology in Bombay (IITB)	India
6	The AREP Group (AREP)	France
7	Institute of Water Modelling in Dhaka (IWM)	Bangladesh
8	Beijing University of Technology (BUT)	China
9	China Academy of Urban Planning Design (CAUPD)	China
10	Beijing Municipal Institute of City Planning and Design (BMICPD)	China
11	CETaqua (CET)	Spain
12	Hydrometeorological Innovative Solutions (HYDS)	Spain
13	Cranfield University (CRAN)	United Kingdom
14	Dura Vermeer Business Development (DVG)	The Netherlands
15	Hamburg Institute of International Economics (HWWI)	Germany

Collaborative research on flood resilience in urban areas (CORFU) is an interdisciplinary international project that will look at advanced and novel strategies and provide adequate measures for improved flood management in cities.

The differences in urban flooding problems in Asia and in Europe range from levels of economic development, infrastructure age, social systems and decision making processes, to prevailing drainage methods, seasonality of rainfall patterns and climate change trends. Our vision is that this project will use these differences to create synergies that will bring new quality to flood management strategies globally. Through a four-year collaborative research programme involving leading European and Asian institutions in this subject, the latest technological advances will be cross-fertilised with traditional and emerging approaches to living with floods.

The overall aim of CORFU is to enable European and Asian partners to learn from each other through joint investigation, development, implementation and dissemination of short to medium term strategies that will enable more scientifically sound management of the consequences of urban flooding in the future. Flood impacts in urban areas – potential deaths, damage to infrastructure and health problems in the first place and consequent effects on individuals and on communities – and possible responses will be assessed by envisaging different scenarios of relevant drivers: urban development, socio-economic trends and climate changes. The cost-effectiveness of resilience measures and integrative and adaptable flood management plans for these scenarios will be quantified.

Planned research is structured in *six Work Packages (WPs)*, which are further split into a number of tasks that are strongly interrelated. **The concept and the overall scientific and technical objectives of the WPs** can be summarized as follows.

WP1 will look at *drivers* that impact on urban flooding. The objective will be to determine the interactions between economic and urban growth, societal trends and the urban structure, which will serve as the basis for the development of a DPSIR (drivers-pressures-state-impact-response) logical framework. The analysis will be completed in conjunction with IPCC-based projections of climate change, economic, health and social development, aiming at identifying the future policy areas where the responses to the drivers and pressures can be most effective. This will be achieved through developing a fundamental understanding of how human capacity and action can shape the future dealing with urban flooding by identifying the future mechanisms through which feedback to drivers/pressures can be achieved and delivered to stakeholders. Consequently, WP1 will consider *all* different drivers outlined in the call – economic, social, land use/planning, soil sealing limitation strategies and mitigating practices and climate trends.

WP2 will assess and enhance methodologies and tools for off-line and real-time *flood hazard assessment based on urban flood modelling*. Missing elements in existing models for *system analysis* will be developed in order to identify consistent procedures for calibration of urban flood models at different scales, having in mind the envisaged technological advances – wider availability of weather radars and on-line rain gauges, increase in computer speed and possibilities for coupling of runoff-sewer-river hydrologic and hydraulic models. The ultimate objective is to develop generic tools for urban flood mitigation plans and test real time urban flood forecast systems, including real time data assimilation and including uncertainty estimates. WP2 will enable evaluation of future impacts of urban growth and climate change on flood probability through scenario studies. That way the call demand that strategies for urban flood management are developed analysing the dynamics of urban flood risks will be fulfilled and the boundaries in knowledge and practice in urban flood modelling will be taken forward.

WP3 will improve, extend and integrate modern methods for flood *impact assessment*. The objective will be to develop a comprehensive and flexible framework that will amalgamate different methodologies for evaluation of *all* types of damage. Assessment of health problems will be taken to a higher level by a combination of hydraulic modelling of floods and quantitative microbial risk assessment. Interrelationships between risk perception, level of preparedness and actual responses will be studied, distinguishing between impacts on individual and on communities. WP3 will enable comprehensive and realistic assessment of vulnerability to urban flooding at different spatial and temporal scales, aiming at quantification of the efficiency of adaptive management strategies related to changes in drivers in alternative scenarios context and of the cost-effectiveness of resilient measures. Thus, WP3 will include a wide range of possible impacts and interactions of different drivers.

WP4 will assess and enhance existing *flood risk management strategies* related to planning and prevention for the minimisation of flood risk, management during flood events including early warning systems, emergency protocols and crisis management and measures to be taken after a flood event, including evaluation of damages, recovery measures and the procedures that allow learning from experience. This approach guarantees comprehensive coverage of the whole flood management cycle. WP4 will develop new *strategic flood risk assessment strategies* by building on the outputs from the first three WPs. A general strategic scheme for urban planning will be developed and tested, such that flood resilience is defined and implemented according to the situation of any city. The ultimate objective will be to formulate good practices and good standards that can be implemented nationally in partner countries. As a result, WP will contribute to the crucial element of the call, which is to develop efficient medium- to long-term strategies and provide adequate measures for improved flood management at relevant levels.

WP5 will *disseminate new approaches* and support exploitation of opportunities at local, national and international levels. The aim will be to engender a ‘flood resilience’ culture through awareness rising of proposed strategies and comprehensive adoption of CORFU tools. This will be accomplished through engaging policy makers, especially in the CORFU study areas, to share best practice in flood resilient design and planning enabling policy decision making to be positively influenced by new urban flood risk management principles. Hence, CORFU will be a Collaborative Project for specific collaboration actions dedicated to international cooperation partner countries, targeted to Asia, in-line with the Funding Scheme.

WP6 will *co-ordinate the project* within a robust organisational framework that supports collaboration, oversees science and society issues, promotes gender equality, ensures the financial viability of the entire project and ensures good internal and external communication. CORFU project management will therefore be fully compliant with FP7 guidelines and principles.

The research will involve **six case studies in Europe and Asia** through which the new strategies will be investigated and enhanced. Comparisons will be made by implementation of new approaches in cities in different socio-economic systems and different climate zones. In defining the CORFU work programme, particular attention has been paid to the careful identification of case studies such that they (as a set) satisfy a range of criteria summarised in Table 1.1a.

Table 1.1a: Criteria for selection of case studies

Criterion	Motivation
Major large urban centre with history of flooding	Relevance to a variety of spatial scales
Specific flooding problems that are not common	To cover a wide range of conditions
Flooding problems linked to different causes and interactions at different scales	To cover all relevant types of flooding
Local flood management systems with different levels of sophistication in place	Potential for knowledge exchange
Team members are involved in developing local flood management strategies	Our good understanding of case studies
Rich databases with rainfall patterns, urban surfaces and drainage systems exist	To reduce start-up phase of the project
Verified hydrologic and hydraulic models exist and are accessible	To build on earlier sound S/T analysis
Possibilities for engagement of stakeholders and their interest are present	To enable wide dissemination of results

As a result of this process, the following cities – three in Europe and three in Asia – have been selected:

- Barcelona in Spain,
- Beijing in China,
- Dhaka in Bangladesh,
- Hamburg in Germany,
- Mumbai in India,
- Nice in France.

Each of these cities has been working for many years with urban flood modelling and has extensive experience in urban flood management. Hence, the CORFU project partners have considered flooding issues and current management strategies and identified available datasets in the above cities (and in several other candidate case studies that were eventually discounted). Asian case studies are from the three countries that are specified in the call: China, India and Bangladesh. These cities represent both some of the most important and flood prone cities. We believe these to be excellent choices which will enable us to test the new methodologies comprehensively and to disseminate them among local institutional entities, technical people and citizens, and beyond.

The proposed research programme has been developed based on the following principles:

1. **Interdisciplinarity:** CORFU research will involve a broad range of disciplines relevant to dealing with urban flooding, such as hydrology and hydraulics, urban planning, economic and social sciences, technology and management, and this is clearly reflected in the composition of research team.
2. **Reliance on real-world examples:** The methodologies that will be developed will have generic components, but they will be tested and implemented in a series of case studies, i.e. we will strongly rely on real-world data on infrastructure, meteorological inputs, population and economic parameters.
3. **Emphasis on ‘responding’, including adaptation and resilience measures.** The first two elements of environment research (‘understanding’ and ‘assessing impact’ in particular) will be part of the programme, though mainly in order to enable more sound focus on the third one – ‘responding’, as defined in Theme 6 Environment, Approach for 2009.

4. **Building on both the CORFU team experience and tools as well as on general scientific and technological progress in the field.** We will implement and further develop our own methodologies and tools, with adequate consideration and inclusion of recent advances made by other research teams.

5. **International collaboration between the EU and Asia.** We wish to make scientific progress by cross-fertilising the latest technological advances with traditional and emerging approaches to living with floods, including those based on involving socio-economic aspects, which will particularly be driven by interactions between the EU and Asian partners.

