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CAMPANIA REGION COMPETENCE CENTRE INFORMATION AND COMMUNICATION TECHNOLOGY (CRDC-ICT)

by

Sergio Betti

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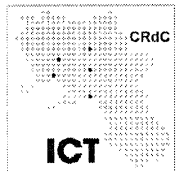
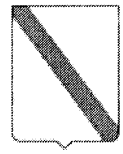
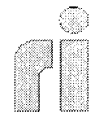
European Union







Campania Region

Research & Innovation

MISSION OF THE CENTER

The CRdC ICT was set up at the end of the year 2002 within the Campania Regional Operative Program 2000/2006.

The mission of the CRdC ICT is to create a stable organization aimed at orientating the results of the fundamental research (developed within the academic environment) towards applicative projects realized together with companies, in order to respond to the necessities of the ITC sector. The technological transfer of the results and the creation of new industrial companies (via spin-offs or specific company build-up) complete the background where the organization carries out its mission.

Thirteen Internal Partners provide the CRdC ICT with their scientific skills and capabilities: seven University departments, two National (Italy) Research Council Institutes, one National Consortium on IT, one Institute of an Oncology Foundation, two Regional Organizations for the Technology Transfer through the Region (see the table for the detailed list of the Internal Partners). More than 200 Professors/Researchers/Technicians, from the Internal Partners, are the "virtual" staff of the CRdC ICT. They work to develop new projects and to complete the "Demonstrator Project", the Internal Project of the CRdC ICT described later in this document. The activities of the "virtual" staff are managed or supported by the internal staff of the CRdC ICT.

The CRdC ICT develops projects together with the Companies with well-defined characteristic: they must have scientific and research components, where the competencies of the Internal Partners may provide the best results, they must involve more than one Internal Partner, in order to utilize multiple competencies, they must be developed in an integrated way between the Internal Partners and the Companies, in order to take advantage of the mutual experience. In this way, Companies will increase their theoretic and scientific competencies, and the Internal Partners will work in a more structured and planned way.

Two tactical objectives support the development of the CRdC ICT: the integration of infrastructural equipment of the CRdC ICT Internal Partners and the realization of a "Demonstrator Project". These objectives must be reached by September 2005, the end of the period granted by the Campania Region and the EU. By that time, the CRdC ICT will be able to be self-sufficient.

The integration of the current equipment is carried out through investments in the purchase of computing equipment and of connection that permit the development of projects of high complexity in a co-operative way, using heterogeneous instruments of connection. In this way, the network composed by the Internal Partners is able to develop ICT project with any level of complexity and without any limit due to the infrastructure or the connections.

The "Demonstrator Project" consists in a software-hardware platform that permits the access to network services, distributed in a wide geographical area, from mobile terminals of different nature and complexity through traditional services (like access to the net, web sites for searching information, e-commerce, communication services) or mobile applications based or not on location, (information about

traffic, sanity, distance control on remote apparatus, domotic). The results achieved with the realization of the "Demontrator Project" will be the creation of simple-diffusion products, integrable in pre-existent systems that will increase their functional level and their reliability. A further result is the creation, in the academic environment, of a teamwork mentality with articulate plans defined in detail and the attention on times and costs.

The integration and the Demostrator Project have a budget of 25M €; 70% is granted by EU, through the Campania Region, and 30% is from the Internal Partners.

The CRdC ICT Internal Partners
University of Sannio RCOST – Research Centre on Software Technology DING - Department of Engineering
University of Napoli "*Federico II*" DIS – Information Science and Statistics Department DIET – Electronic Engineering and Telecommunications Department
University of Salerno DMI - Mathematics and Information Science Department
University of Napoli SUN DII – Information Engineering Department
University of Napoli "*Parthenope*" Electromagnetic Waves Theory and Tecnique Institute
National Research Council Microelectronics and Microsystems Institue IMM - Napoli Electromagnetic Survey of Environment Institute – Napoli
Oncology National Institute "Fondazione G. Pascale" – Napoli
National Cross-University Information Science Consortium CINI
Technological and Scientific Park – Salerno and Campania internal regions
Technapoli Consortium

Strategy of Growth

The growth of the CRdC ICT is affected by the scenery of the scientific research and, mainly, by the regional and national economical situation that determines the way companies relate to scientific research. The context of the aid to research (and most of all national aid) and the logic through which the joint initiatives academy-companies are rewarded, are changing rapidly. Therefore the CRdC ICT must have an organizational and relational structure allowing it to adapt its strategies rapidly to the change.

The CRdC ICT vision is that, as time goes by, the joint activities between Scientific Research and Companies will have an ever greater ability to continue, trying to rely less and less on public grants. For this reason the CRdC ICT is making an effort in organizing all activities together with its Internal Partner based on a logic of planning and control, typical of a company.

The CRdC ICT, in order to be self-sufficient, must have a light and flexible structure of costs: a very limited number of staff dedicated to support activities and a very limited number of Delivery Managers whose role is to provide Project Management for the activities developed by the Internal Partners.

The relationship with companies has an essential role in the strategy of growth of the CRdC ICT. Credibility and the level of partnership are the basic elements that have to be accompanied by real results. That's why the research projects of the CRdC ICT have been initially realized with big companies (because of their experience in working on such projects). Support has been given to small/medium sized companies when they have shown their wish to join the CRdC ICT creating co-operative structures able to compete, sharing the competences of all participants.

MARKET ANALYSIS

1.1. ICT Market in Campania Region

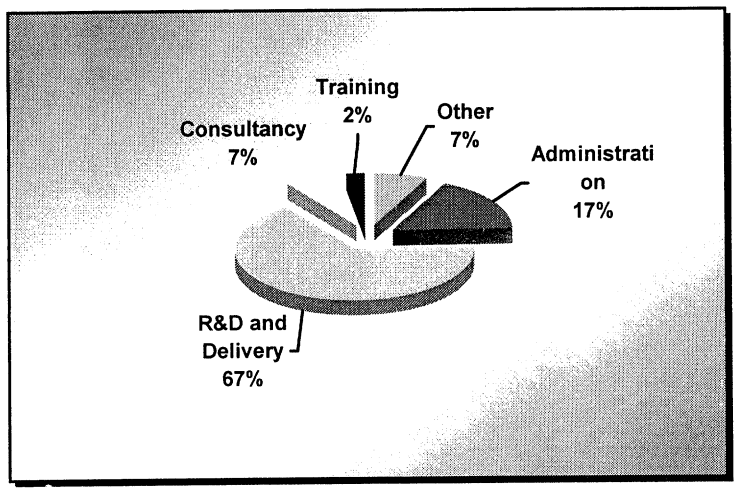
The brief description that follows depicts a general overview of ICT market in Campania Region. The data are a summary of the report "RCOST 2003 - ICT competencies in Campania Region", written by KLEOS-RCOST, the Economic and Gestional Engineering Laboratoryil of RCOST (University of Sannio).
The National Statistic Institute states that Campania Region ICT companies have a percentage of 6,4% employees of Italy ICT companies, 34,1% employees of South Italy ICT companies.
The RCOST report provides the following data:

i) The number of "potential" ICT companies in Campania Regioni s 7.178, with 624 of them classified as TLC companies and 6.554 classified as IT companies;
ii) Among the above companies, 2.480 are really working in the ICT market;
iii) The ICT companies with non- specialistic competencies are 1.755 (of 2.480). They work as reseller of HW and SW products (#785), or in hardware maintenance (#204), or in administrative data processing (#766);
iv) A significant presence of large-sized ICT Companies (#41) is an important factor of the high-level relationship between Universities and Companies, because of the habit of these companies to work together with the Researchers and Professors;
v) A significant amount of small-medium sized companies provide software and IT services (>300). They can be effectively leveraged if their mindset will be moved to the cooperation with the Research, in order to use emergine methodologies and technologies in their activities;
vi) The high level of young graduated in ICT from the 5 Universities of Campania Region (20 University Courses, 7 Specialised University Courses, 12 Master) is an huge asset to accelerate and to strenghten the Technology Transfer Process and the creation os new companies.

Large-sized companies in Campania Region

Large-sized companies in Campania Region are mostly sited around Napoli town (71% of 41). They are nation-wide companies or local sites of international companies.
The following picture shows that most of the activities of these companies are in Research & Development branch or in Delivery branch (67%). Some companies are fully dedicated to Research Activities. Many of these companies have a stable relationship with the Universities of the Campania Region.

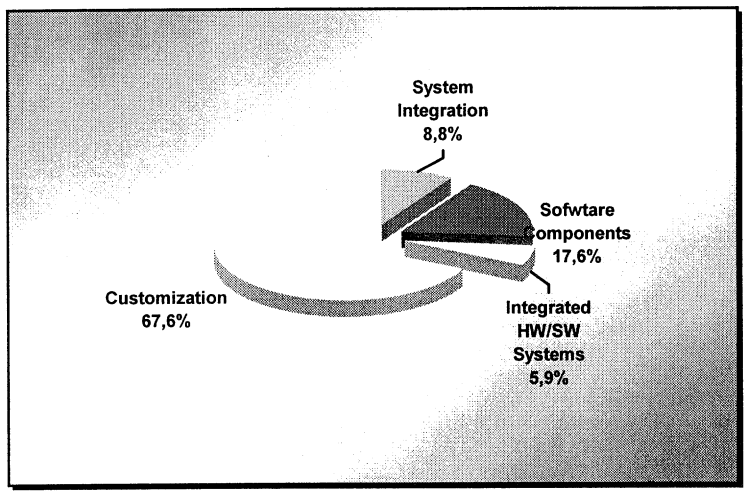
Main activities of Large-sized Companies in Campania Region



Small-sized companies in Campania Region

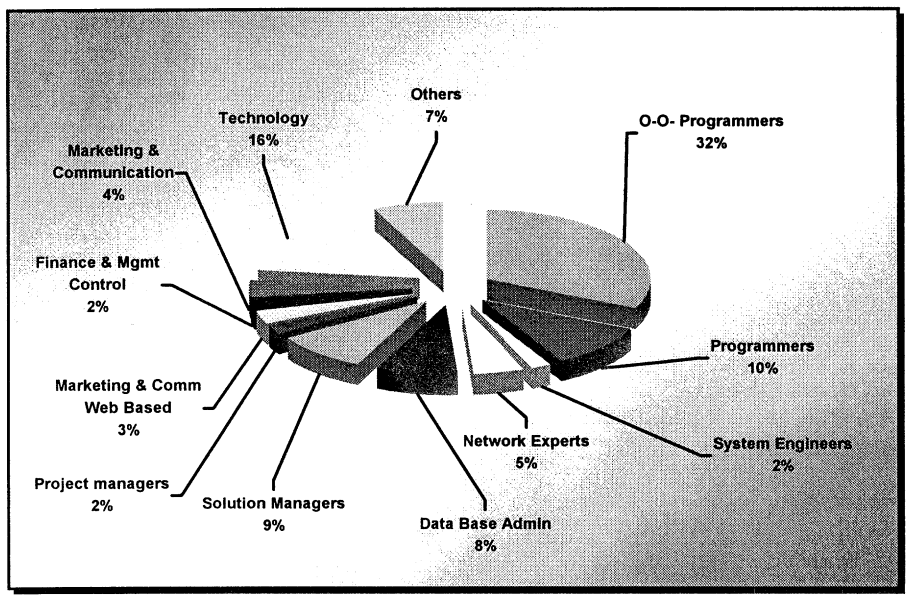
The following results are based on data collected by an empirical survey on the 31,35% of small-sized companies providing software and IT services in the Campania Region. The companies are defined as "small-sized" in accordance with UE classification (less than 2 M€ revenues and less than 10 employees). The activities portfolio of these companies includes IT consultancy and integrated systems of software, hardware and services.The following picture shows the tipology of activities provided by the companies..

Tipology of activities of the Small-sized companies



The next picture shows the competencies of the companies, obtained by using the skill set of their human resources

Human Resources Skills



The survey confirms the preponderance of specialised IT competencies with object oriented programmers and many other professionals in web technologies.

2. PRODUCTS/SERVICES

2.1. Products/Services Offering

The CRdC ICT offers a wide range of products and services. The product and services support the companies of the Campania Region, aiming to increase their technological level to effectively face competition in the global and local market. The Products/services offering is mainly addressed to ICT companies. The CRdC ICT provides both Project Management activities and Research activities, to develop the projects together with the companies. Project Management activities are provided by the staff of the CRdC ICT, whereas Research activities are provided by all the Professors, Researchers and Technicians of the Internal Partners of the CRdC ICT.

Products and Services Portfolio constists of three Line of Business:

1. **Promotion and Realization of Applied Research Projects**, together with ICT Companies;
2. **Value Added Services**, provided by the CRdC ICT with the aim of increasing company capabilities and promoting new companies birth and growth;
3. **Technology Transfer <u>on-demand</u>**, with the aim of providing small and medium-size ICT companies with information and products to help in specific issues;

New LoBs will be setup if new market scenarios suggest that these LoBs will produce effective results on labour market and on applied research.

1. Promotion and Realization of Applied Research Projects.

This LoB meets the requirement to enlarge the relationship between companies and universities in order to put in place joint applied research activities. Many companies do not have a Research&Development department, or, if they have, this department is strongly focused on the increase of effectiveness of the products of the company. At the same time, companies need to have information of new potentialities offered by the fundamental research developed inside the University or the Research Centres. On the other hand, the University can take a significant advantage by testing the theory and the methodology in a real environment, using real data, thus having an increased reliability of the results.

The projects are usually granted by the Local/National/International Authorities.

The activities of the CRdC ICT in this LoB will be:

a) **Verification of the project abstract.** The CRdC ICT will verify if the project contents have such scientific contents to justify an activity of the Professors/Researchers of the Internal Partners. The CRdC ICT can integrate the project contents or can suggest additional topics in order to increase the project scientific value.

b) **Contribution to Project definition.** The CRdC ICT will contribute to define in detail all the contents of the project. High level Researchers/Professors are assigned to this activity in order to increase the scientific value of the project. This activity is developed together with company resources and it is the result of a strong cooperation.

c) Financial Consultancy. The CRdC ICT will suggest how the projects can be financed by the Local/National/International Authorities, in accordance with the characteristics of the project and with the granted initiatives currently active. The CRdC ICT contributes to define the Financial section of the project in order to meet the rules of the granted initiative. The CRdC ICT verifies the profitability of the project, together with the company CFO. The CRdC maintains the relationship with the Authorities in order to solve any issue during project execution.

d) Project Management. Project management is in charge of the CRdC ICT. The PM activities can be restricted only to part of the project developed by the CRdC ICT or they can be carried out on the whole project.

2. Value Added Services

The activities of the CRdC ICT in this LoB will be:

1. *Industrial Projects with Research Components.* The CRdC ICT may be involved in Industrial Projects, with considerable amount of application development activities in comparison to research activities. In this case, the CRdC ICT may decide to participate in the project because of the tipology of the target company or of the project topics (e.g. project with positive impact on the social life of the country). The CRdC ICT is obviously involved in all the research activities and at the same time contributes to the general level of the projects, with suggestions about forefront solutions, instead of mature solutions usually preferred by the companies. The CRdC ICT may play a leadership role in these projects too, managing the relationship with the top management of the final customers, coordinating the activities of the partners involved in the projects, providing the Project management activities.

2. *Services related to research activities.* Both the projects of the LoB 1. and, mainly, the projects in the previous paragraph will deliver application products. It is possible to provide services to final customers using these products. In this case, it is necessary to keep the services functionalities and performances in line with the boundaries of technology and scientific research. In this scenario, the CRdC ICT competencies can provide the best solutions with an evolutive maintenance that uses the results of the fundamental research. On the other hand, the CRdC ICT can take two advantages: first, the possibility to experiment in a real environment, second, the possibility to have recurring revenues from the provided services. The CRdC ICT works as a Technical Leader in this environment and in this role can have new opportunities from the application area of the provided services.

3. *Services to support the creation of new companies* New companies can have heterogeneous characteristics. For this reason, high-level and wide-range competencies must be provided in order to support their startup and their growth. Some examples of new companies are: 1- the aggregation of already existing companies in order to have a new offering, 2 - research spin off, 3- industrial companies coming from outside the Campania Region in order to take advantages of the high-level of the graduates in the Campania Region and of the labour market situation. In order to provide an effective contribution to the creation of new companies, the technical and scientific competencies of the Internal Partners of the CRdC ICT must be integrated by organisational, managerial, economic and marketing competencies provided by the managers of the CRdC ICT.

   The typical services provided by the CRdC ICT to support the creation of new companies are:

   a) **Assess the feasibility of a project**;

   b) **Management support** to the Business Plan, starting from the market analysis to the Technological Implementation Plan until the Financial Plan;

   c) **Assessment and selection of Business Plan** with best successful probabilities;

   d) **Support to the selected start-up,** both from economic point of view and from technical point of view;

   e) **SWOT analysis;**

   f) **Promotion of relationship among the companies;**

   g) **Support to find best initiatives to finance new companies**

3. Technological Transfer On-demand

The technological transfer can be realized towards both large sized and small-medium sized companies, in different ways and conditions.

In general, the technological transfer towards companies can be achieved through a real co-operation between the CRdC ICT and companies. Companies usually use scientific results of the fundamental research, realized in the institutional seats (University, Research Centers)and transform them in emerging techniques (i.e. new but applicable) that together with complementary knowledge (organizational, economical, management and commercial knowledge) create the emergent technologies (Knowledge Transfer).

The "Demonstrator Project" results, and the CRdC ICT activity results in general, follow a different and more immediate path. These results are instruments and techniques immediately available for market use or they are products ready to solve problems of general interest (Competences And Solutions Transfer).
These various opportunities together with the necessary financial resources, formerly possessed or acquired from public funds, allow companies to realize product innovations, effective process and commercialization. However, in our productive system, a large-sized company, that has chosen scientific co-operation for acquiring the desired emergent technique, possesses, in most cases, all necessary and complementary knowledge to realize it. On the contrary, a small-sized company which is often far from research activities but needs to acquire new techniques, meets greater difficulties since most frequently it has neither sufficient financial resources nor complementary knowledge to realize it. Then it is necessary that processes of transfer will be opportunely articulated as to allow an effective and productive transfer towards the target company. The approach will be like "demand push" i.e. from the world of industry to the Research.

In the meantime the communication processes carried out by the CRdC ICT (and particularly the diffusion of information on achieved results) will generate technologies demand by companies (technology push).

The main topics of the CRdC ICT current development activities are: Connection (problems relating to computing connections), Domotic (domestic automation systems) and Security (problems of security during electronic transactions).

Technological Transfer activities, as said before, vary according to the type of company and its level of maturity.

The Technological Transfer of products and results of the activities of the CRdC ICT:

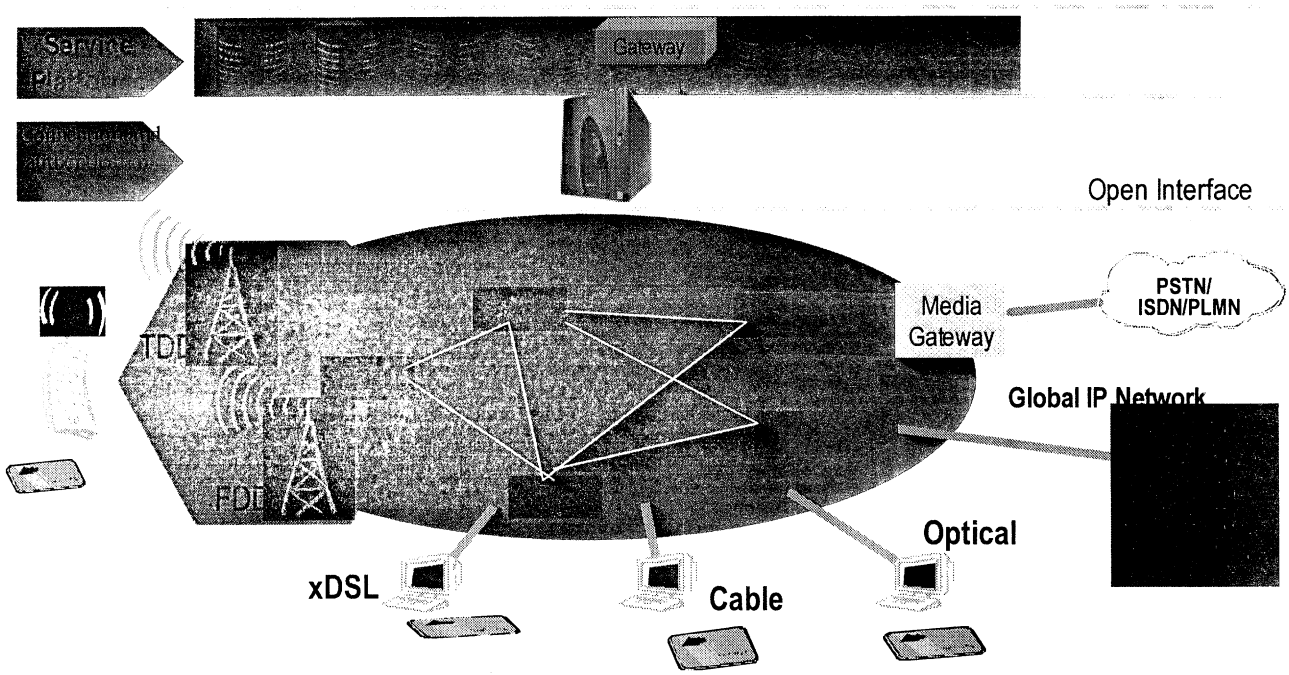
- can occur as a consequence of a scientific co-operation in the realization of a particular technical solution chosen by the company;
- can be realized into a "training on-the job activity" for the re-engineering of internal process first (Business Improvement Planning, Business Process, Re-engineering) and of information systems then;
- can consist in integration of products realized within the CRdC ICT with the IT and TLC patrimony of a company, allowing a quick growth of efficiency and competences.

3. THE DEMONSTRATOR PROJECT

We list in the following a description of the Demonstrator project and of the activities planned for its realization.

The aim of the "Demonstrator Project (DP)" is to analyze, design and develop an hardware/software platform in order to provide an access point to network services distributed on a wide geographic area from different devices, such as GSM mobile phones, PCs, laptops, palms, satellite receiver, etc (see the next picture), and to experiment advanced services and technology. A part of traditional services (Internet access, web portals for information search, e-commerce, chat, video chat, etc.) available to mobile devices, services also include mobile applications (remote control of distant devices, domotic systems), and location-based mobile applications: tourist information, urban and extra-urban traffic management and optimization, hotel reservation, etc. Furthermore, a significant care is taken in analyzing the requirements of multimedia applications..

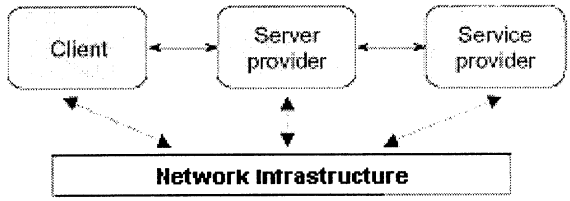
The platform should support both the currently available and widely used network technologies, and the next-generation network technologies (UMTS, fibre-based networks, satellites), and should guarantee the required levels of security, reliability, and availability of the implemented services. Our purpose is to use and integrate the currently available technologies for wired and wireless solutions, allowing the deployment of multimedia services with a medium/low mobility. The technologies we intend to consider are ranged from traditional copper-based media, to optical fibres and satellites.



From the application point of view, as technologically different terminals for their elaboration facilities and graphical capabilities need to cooperate, and networks with heterogeneous parameters to co-exist, when defining the system we tried to hide its complexity. As a solution to this problem, we have designed and partially implemented a multi-layered software architecture, where the mechanism of usage of a service may differ according to the device used, the communication medium and its band and reliability features. In particular, this means that it is possible to choose among different implementations of the service required by the user, on the basis of the particular device or connection protocol he/she is using. Also, the

system will guarantee the required levels of security and reliability, and will eventually distribute the elaborative load so to obtain optimal performances, independently of the number of users/programs and/or the network traffic.

The system architecture is illustrated in the next picture, and consists of three logical layers performing different tasks, that we explain in the following.



Network infrastructure

The main contribution of the Telecommunications Department to the Demonstrator Project is especially related to wireless technology applied to multimedia applications. Wireless technology has been chosen for two reasons:

- the need for mobility of devices, which is a relevant feature of many advanced telecommunication services;
- wireless technology has the potential to provide flexible and non-invasive solutions whenever telecommunication infrastructures are immediately or temporarily needed.

The main disadvantages of this technology compared to wired technology are:

- communication is harder, as it requires overhead of transmission;
- regulations exist for band assignment;
- the speed of transmission is generally lower, except for the *optical wireless* technology;
- longer delays;
- less security with respect to the access to resources;
- less security from the ecological and electromagnetic point of view;
- more electromagnetic compatibility problems;
- several users sharing the same resource for transmission.

Providing solutions to these problems becomes difficult as wider bands are required to satisfy the always increasing communication needs. It is well known that these needs not only concern phone applications but mainly multimedia applications for which the current telecommunication systems are not able to provide adequate bands.

Integrating current *wireless* technologies, terrestrial and satellite, may be a solution to our problems. In fact, the terrestrial technology may refer to Laser Technology on Air or Optical Wireless, instead satellite technology may work both on Ka and Ku bands.

Client

The *Client* block is representative of several categories of devices that may be used to access services. The problem of handling heterogeneous terminals has been addressed by creating a *reconfigurable software*. This has been achieved through *code mobility*, applied to both directions: from the server to the client (*download*) e from the client to the server (*upload*). As a consequence, we obtain two functionalities:

- it is possible to download the most suitable version of the code for the receiving device, through techniques based on *mobile agents*, *middlet* and *applet;*
- code mobility in the upload mode allows to configure and/or control remote platforms, or to ask for commercial transactions (e-commerce, bank transactions, ...).

Server Provider

The Server Provider block manages connection requests coming from different Clients. This component provides the following functionalities:

- *User authentication,* needed to check that the user is actually allowed to access the system, and to attach a *profile* to him/her. The user profile contains permissions information on services.
- *Customization,* to be able to select the most appropriate configuration for the client device, depending on the required service and on the particular user.
- *Communication Technology* When a client requires a connection, the Server Provider component will select the most suitable communication protocol based on the channel, on the type and quality of the service to provide, and taking into account the potential and limits of the client device.
- *Service reliability* The Server Provider may guarantee service reliability depending on the reliability of the service implementation chosen, the features of the communication channel or the communication technology of the client device.
- *Presentation (languages and QoS)* Different versions of a service may exist, each for a specific user interface (graphic or textual), a different quality of service or for the hardware characteristics of the client (resolution for images, audio availability..).
- *Performance* The ratio performance/quality of service may depend on the technical characteristics of the client device, the communication channel, the available band. These factors are taken into account when choosing the right implementation of the service. For example, a high quality for images is not desired if the client device is not able to appreciate it because of hardware or software limits.

Service Provider

The Service Provider component provides service implementations, selecting them for the particular user.
Although the platform has been conceived to support all kinds of services, in this project we focus on two representative categories:

- *Services that require a trusted WEB access,* for applications like e-Commerce and secure transactions
- *Domotic systems,* to remotely control home appliances (electric appliances, heating systems, answering machines,...)

The service provider component does not necessarily depend from the server provider. A service provider may offer services independently, but should be able to use the server provider functionalities through some interfaces that will be defined in the next months. This way, service providers may keep their autonomy (do not need to be modified), and may also take advantage of the platform.

From the architecture point of view, each service will be exposed to the platform through some interface that essentially wrap the service, and is the same for all services. This allow to have a unique policy for access and management of services. Our aim is to describe functionalities and access mode to services independently of their type. Services will be used through ad-hoc clients, that will be programmed depending on the particular service and of the requesting device.

4. CURRENT RESULTS OF THE JOINT ACTIVITIES WITH THE COMPANIES

Most of the effort of the CRdC ICT managers is spent in establishing a strong partnership with the companies. As a first step, they defined the process to realize joint activities with the companies. The process relates to the Applied Research Projects and to the Industrial Projects with Research components.

The main steps of the process are as follows:

The companies usually send to the CRdC ICT an abstract of the project they want to realize together with the CRdC ICT. This is the result of the relationship activities in order to provide the companies with a clear picture of the competencies of the CRdC ICT and of the advantage of developing activities together with the Researchers of the CRdC ICT. The abstract contains information related to the project objectives, the main topics, the scientific contribution the company expects from the CRdC ICT and the spin-off from the project.

The CRdC ICT management and the Scientific Committee verify the project contents. If the project is in line with the CRdC ICT mission, in terms of contents, research activities and contribution required, the CRdC ICT assigns one of the Professors/Researchers of the Internal partners as the project Tutor.
The project Tutor is responsible for developing (together with company people) a detailed project document, including the list of project objectives, their description, the effort, all in a standard format. The project Tutor may involve in this activity other Professors/Researchers in order to ensure that all the multiple-competencies requested by the project are available.

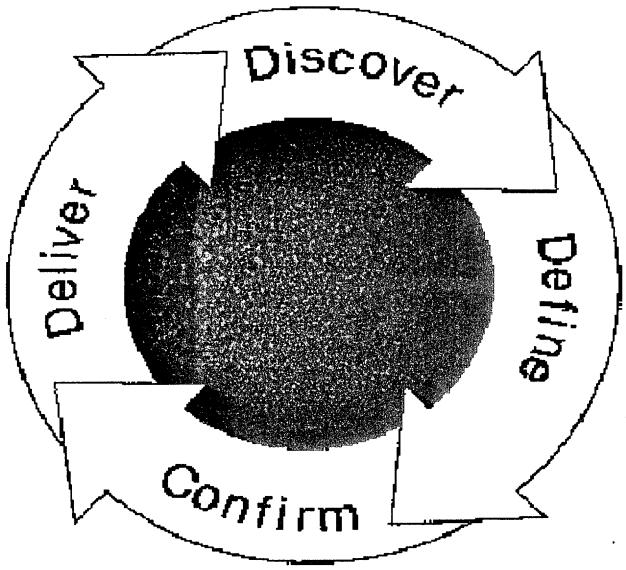
The CRdC ICT management agrees with the Company management regarding the economics of the project, taking into account the internal and external constraints and providing information regarding National and International grants available for the project. The project document is now ready to be submitted to the National/International authorities or to the final Customer.

This process is quite different from current activities where the integration between the Research and the Companies is not so strong. The positive difference continues during the project execution. The CRdC ICT provides the Project management of all the activities of the Internal Partners involved in the project, including the work-in-progress in terms of delivery, effort spent and related costs. In this way, the company has a single interface and it has no problem related to the management of the Researchers involved in the project.

Results

The CRdC ICT established a wide network of relationships since the startup The following pipeline describes the number of projects and their current stage. .The Discover stage refers to projects under verification. The Define stage refers to projects assigned to a Tutor who is developing their contents together with company staff. The Confirm stage refers to projects submitted to the Authority or to a Final Customer. The Deliver stage refers to projects in execution.

8 Projects



5 Projects

3 Projects

7 Projects

5. CONCLUSIONS

After one and half year from the startup, the CRdC ICT exceeded all the expected results. It represents an unique experience in the Italian scenario, in terms of integration of multiple competencies and experiences inside the Research and between the Research and the Companies. The approach to the projects, using a customized Project management, increases the effectiveness of the Research activities.
This is a successful model that can be exported wherever it is necessary to improve the delivery level of ICT companies.