ANNUAL **REPORT**

2009

CENTRE OF EXCELLENCE IN INFORMATION AND COMMUNICATION TECHNOLOGIES

cetic

Your Connection to ICT Research

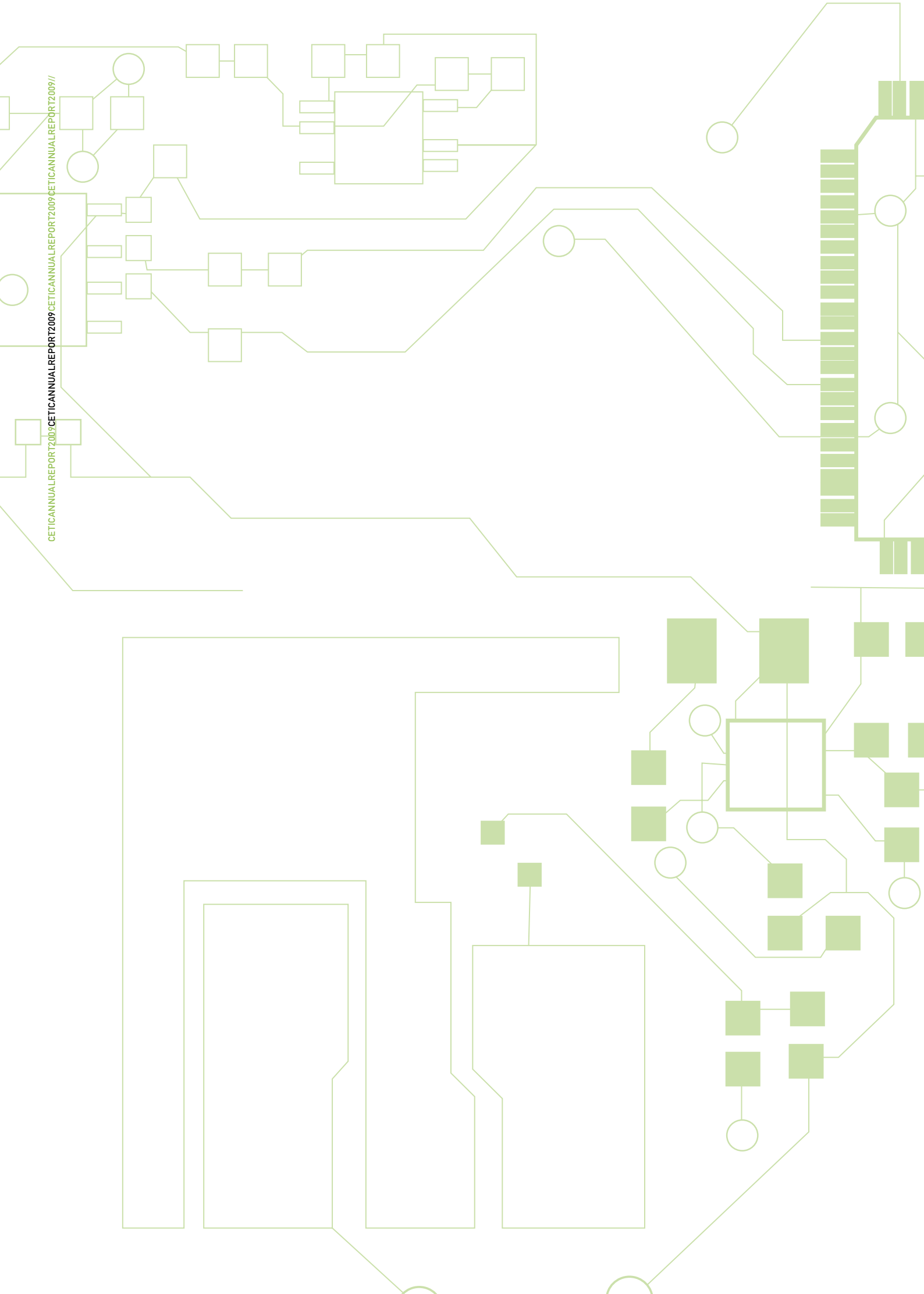
CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

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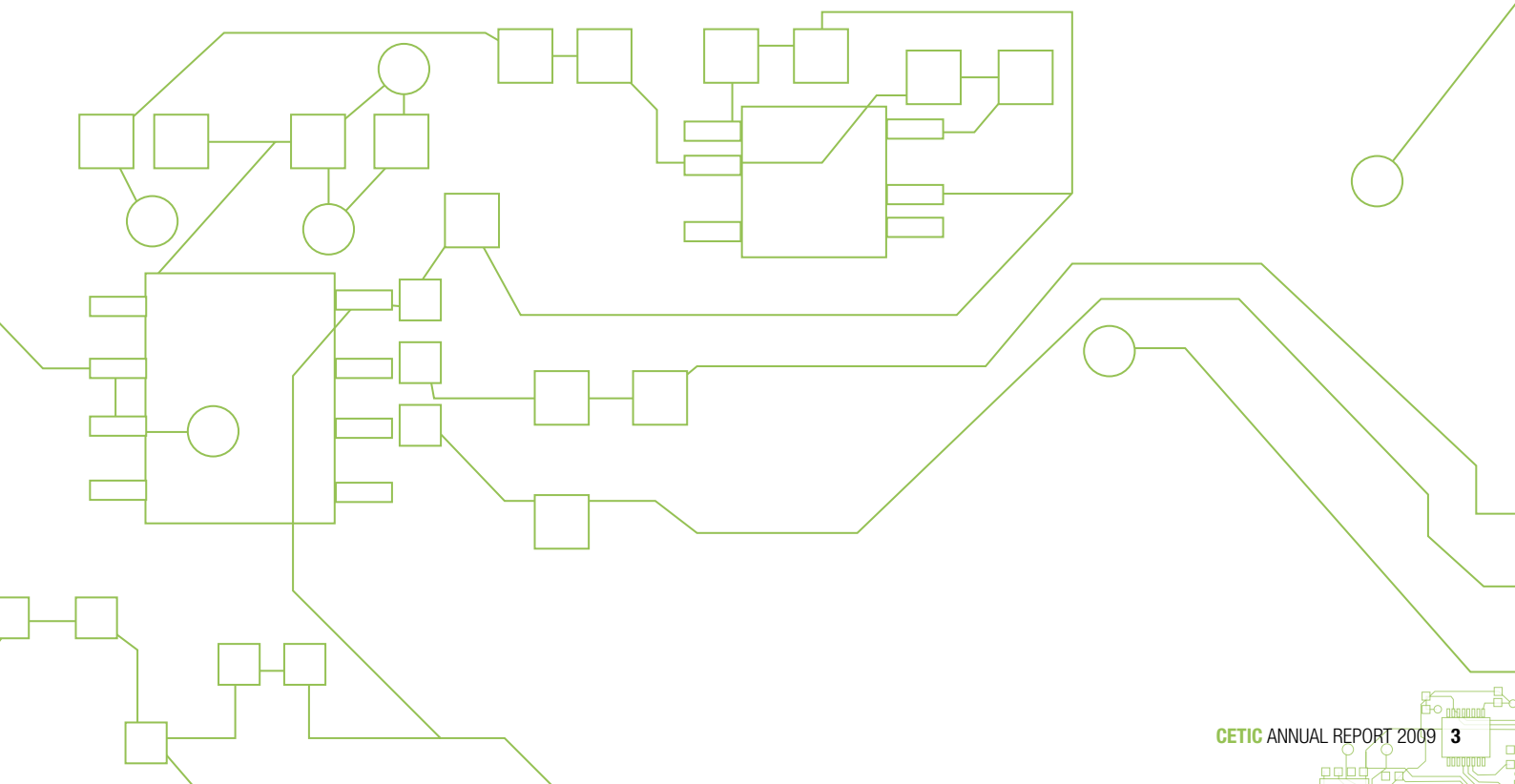
TABLE OF CONTENTS



ABOUT CETIC

CETIC at a Glance

CETIC is the Belgian ICT applied research centre dedicated to supporting industry, providing expertise in software engineering, innovative service-oriented technologies and embedded systems.

This expertise has been gained through CETIC's active involvement in Walloon and European projects for research and technological development.

Investing in leading sectors such as eHealth, cloud computing, open source, security and wireless (among others), CETIC develops partnerships with technological leaders and European industries and accelerates this technological transfer to local Belgian businesses.

In addition to partnerships in collective research projects, CETIC supports businesses in their innovative products and provides technological advice, prototype development and feasibility studies. To strengthen the Walloon Region's competitiveness and leadership, CETIC stimulates research, providing IT support to local businesses, enabling them to adopt advanced technologies, innovate faster, save money and time, and meet new needs.

This annual report covers CETIC's activities and achievements realised in 2009 through the numerous projects and business-support missions driven by CETIC's experts.

Introducing CETIC

CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

The consequences of the global financial crisis that struck the world economy in 2009 underline the importance of investing in innovation and high added-value activities. The crisis slowed down the progressive improvement in ICT R&D investments. However, recent public policy initiatives aim to sustain – and even increase – the support of R&D. CETIC's applied research contributes to this overall trend by strengthening Walloon companies – and, more specifically, SMEs – through efficient technology development and transfer.

In this context, Information and Communication Technologies are critical for European companies, as they help boost innovation by providing new capabilities through infrastructures and tools. The most recent European figures show that ICT contributes to more than 40% of the total productivity growth. In daily life, European citizens can observe the increasing impact of ICT in business-related activities as well as in health, culture and education.

ICT also represents a major opportunity to address today's key societal challenges: that is, sustainable healthcare linked to ageing well and a lower carbon economy. These two challenges provide an ideal opportunity for Walloon companies to develop new innovative solutions that will be exported worldwide. That's why CETIC teams are already working on innovative technologies and approaches in the field of eHealth and the use of ICT to reduce energy consumption.

Therefore, mastering ICT skills and knowledge is a major social, economic and political challenge. Having regional expertise, research and innovation capacity available to citizens and businesses is neither a luxury nor an option but rather a crucial requirement for a region that needs to accelerate its economic development. That is the mission of the CETIC research centre accredited by the Walloon Region.

Our mission as an applied research centre for industry is being implemented by three departments:

1. Software and System Engineering provides methodological support to help companies develop high-quality IT products and services, ensuring reliability, safety, security, and compliance with international standards.

2. Software and Services Technologies provides businesses with strong technological expertise to help them implement distributed, service-oriented and dynamic computing architectures. Through the use of semantic technologies and by exploiting the real business opportunities of open source software, this department helps accelerate the transformation of information into knowledge.

3. Embedded and Communication Systems helps companies prototype innovative embedded systems. This department focuses primarily on embedded software for intelligent wireless systems for a wide range of applications, ranging from road transport to eHealth, consumer electronics, home automation, etc.

These core expertises are supported by three laboratories, providing the latest equipment and technologies to serve businesses.

Since 2004, CETIC has been accredited by the Walloon Region as a "collective research centre". The key criterion for this certification is the centre's self-financing capacity, which must be above 50%. This means that – in addition to the support from the Walloon Region – the centre generates internal funding for at least 50% of its total financial resources. Since 2008, CETIC's self-financing has been at this level, thanks to the significant increase in revenues generated by technology transfer to businesses. Included in this is the growth in R&D outsourcing to CETIC by a few major partners.

CETIC realised many achievements in 2009. Three key outcomes were:

- In March 2009, the Walloon government approved funding for "eHealth for Citizens" and labelled it an exemplary project. This ambitious collaborative project aims to develop an automatic service composition based eHealth platform.

- In June 2009, the GridTrust project, coordinated by CETIC, presented the results of its open source reference implementation of trust and security management systems that can be integrated in cloud computing middleware.

- In November 2009, CETIC finalised and published the QualOSS methodology and tools used to objectively measure the quality and the evolvability of open source software. The BEinGRID project was also successfully finalised. CETIC published the BEinGRID case studies booklet "Approaching the Cloud: Better Business Using Grid Solutions", encouraging end users to investigate the advantages that grid technologies can bring them. As the BEinGRID project was such a success, CETIC is now exploiting the project's results through IT-Tude.com.

Because CETIC cultivates excellence to provide real business support, we have made 'operational excellence' our motto.

We thank our industrial partners for the active interest and the trust they place in us, and all CETIC employees for their great creativity and expertise.

Simon ALEXANDRE
General Manager

According to the European Commission, investments in ICT are estimated to have been responsible for about half of the EU's productivity growth in recent years. ICT enables process and product innovation, and ICT goods and services are important drivers of productivity growth and economic performance across all sectors [1].

1 http://ec.europa.eu/enterprise/sectors/ict/index_en.htm

ABOUT CETIC

MEMBERS AND ORGANISATION

CETIC is a non-profit organisation (ASBL under Belgian law), established at B-6041 Charleroi, Rue des Frères Wright 29/3, and composed of the following members:

Four corporate bodies:

- Technology Industry Federation, Agoria
- Facultés Universitaires Notre-Dame de la Paix de Namur (FUNDP)
- Université catholique de Louvain (UCL)
- Faculté Polytechnique at the Université de Mons (UMONS)

Fourteen physical bodies:

- Mr Bernard Bolle, Siemens IT Solutions and Services sa
- Mr Claude Cambier, Unisys Belgium
- Mr Marc Debois, IGRETEC
- Mr Philippe Fortemps, Professor, Faculté Polytechnique at UMONS
- Mr Naji Habra, Professor, FUNDP
- Mr Jean-Luc Hainaut, Professor, FUNDP
- Mr Benoît Hucq, Océ Software Laboratories Namur sa
- Mr Roland Keunings, UCL
- Mr Jean-Didier Legat, Professor, UCL
- Mr Benoît Macq, Professor, UCL
- Mr Roger Malchair, Evadix.Net sa
- Mr Pierre Manneback, Professor, Faculté Polytechnique at UMONS
- Mrs Nicole Moguilevsky, Research administration, FUNDP
- Mr Daniel Tuyttens, Professor, Faculté Polytechnique at UMONS
- Mr Christian Verdonck, BizzDev sa

Members of the association have met on the following occasions:

- In statutory General Assembly, on May 19, 2009, to approve 2008 annual accounts.
- In extraordinary General Assembly on December 15, 2009, to approve the 2010 annual budget.

TECHNICAL COMMITTEE

The research decree published on July 3, 2008 defines conditions and modalities for Walloon Research Centre accreditation. The decree specifies the Research Centre mission, which is to perform general industrial research that can be transferred to industry according to expressed needs and specificities.

In particular, the decree states that the Research Centre conducts collaborative industrial research that is general enough to be of interest to companies with similar requirements.

The Centre's areas of research are determined by these needs, coupled with the typology of the Walloon Region, under the guidance of a technical committee composed primarily of representatives of corporations and industries.

In order to align research activities with industry needs, the Research Centre has set up a permanent technical committee in charge of validating the R&D strategy. The CETIC Technical Committee is composed of:

- Mr Simon Alexandre, General Manager, CETIC
- Mr Thierry Bingen, Haulogy
- Mr Jean-Louis Bolsée, Thales Alenia Space ETCA
- Mr Patrick Crasson, Sun MicroSystems
- Mr Laurent Cuvelier, Thales Alenia Space ETCA
- Mr Jean-Christophe Deprez, Scientific Coordinator, CETIC
- Mr Michaël Demeyere, AGC
- Mr Denis Flandre, UCL - Dice
- Mr Naji Habra, FUNDP
- Mr Jean-Luc Hainaut, FUNDP
- Mr Marc Hermant, Agoria ICT
- Mr Patrick Heymans, FUNDP
- Mr Benoit Hucq ,Océ Software Laboratories Namur sa
- Mr Christian Huvelle, Siemens IT Solutions and Services sa
- Mr Igor Klapka, Open Engineering
- Mr Pierre Leclercq, Microsoft Innovation Center
- Mr Philippe Lecourt, Technord Automation
- Mr Jean-Didier Legat, UCL - President
- Mr Alain Leroy, Pentacle
- Mr Philippe Mack, Pepite
- Mr Benoit Macq, UCL - Tele
- Mr Pierre Manneback, Faculté Polytechnique at UMONS
- Mr Philippe Massonet, Scientific Coordinator, CETIC
- Mr Kim Mens, UCL - INGI
- Mr Yves Moulart, ST Microelectronics
- Mr Dominique Orban, REVER sa
- Mr Emmanuel Ottevaere, BizzDev
- Mr Frederic Peters, DTI
- Mr Xavier Petre ,United Pepper
- Mr Etienne Pourbaix, Thales Communications Belgium
- Mr Frédéric Robert, ULB
- Mr Patrice-Emmanuel Schmitz, Unisys Belgium
- Mr Pierre Schaus, DYNADEC
- Mr Bruno Schroder, Microsoft
- Mr Daniel Tuyttens, Faculté Polytechnique at UMONS
- Mr Luc Vandendorpe, UCL
- Mr Christian Vanhuffel, Agoria ICT
- Mr Axel van Lamsweerde, UCL

CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

The mission and objectives of the Technical Committee are to:

- Advise the Board of Administrators and the General Manager on the scientific and technological objectives to be developed according to the sectors' needs. The Committee works at the request of the General Manager, in particular for developing or updating CETIC's strategic plan.
- Evaluate, on request of the Board or the General Manager, proposals for new research directions. If relevant, the Committee proposes new business opportunities and/or research projects consistent with the scientific and technological orientations.
- Support CETIC in its continuous effort to remain an independent and internationally recognised applied research centre in ICT.
- Advise CETIC management on research exploitation opportunities for CETIC projects that are ongoing or likely to be initiated.
- Report annually to the CETIC Board of Administrators on its work and scientific achievements.

BOARD OF ADMINISTRATORS

Since December 31, 2009, CETIC's Board of Administrators has been composed of:

- Mr Bernard Bolle, Siemens IT Solutions and Services sa
- Mr Serge Boucher, Faculté Polytechnique at UMONS
- Mr Claude Cambier, Unisys Belgium
- Mr Patrick Donnay, Haulogy sa
- Mr Marc Durvaux, Thales Alenia Space ETCA - President
- Mr Jean-Luc Hainaut, FUNDP
- Mr Benoît Hucq, Océ Software Laboratories Namur sa
- Mr Roland Keunings, UCL
- Mr Benoît Macq, UCL
- Mr Roger Malchair, Evadix.Net sa
- Mr Pierre Manneback, Faculté Polytechnique at UMONS - Treasurer and Secretary
- Mr Lucyan Papiernik, IGRETEC
- Mr Michel Scheuer, FUNDP
- Mr Olivier Verbeke, Whatever sa
- Mr Christian Verdonck, BizzDev sa

Mr Pierre Villers, DGO6, is the observing member, appointed by the Walloon Region, on the Board of Administrators and in the General Assembly.

Mr Simon Alexandre is the General Manager, appointed by the Board of Administrators.

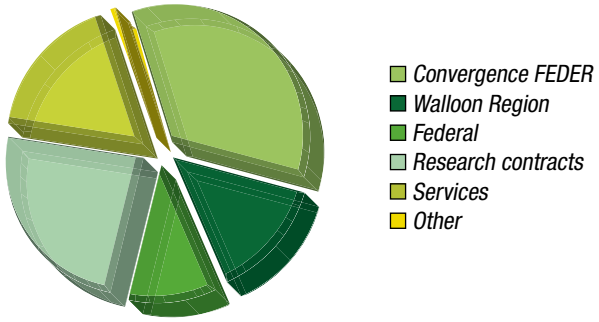
KEY FIGURES

FINANCIAL RESOURCES

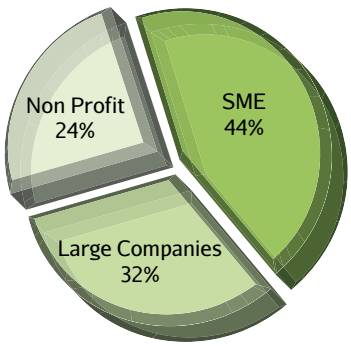
CETIC funding sources are:

- The subsidies granted by the Objective of Convergence in Hainaut through two research conventions co-financed by the European Regional Development Fund (FEDER), two conventions facilities and a convention of recovery also co-financed by FEDER, all of which are also co-financed by the Walloon Region.
- The subsidies granted by the Walloon Region in connection with the financing of the technological "guidance" cell, co-funding of Sixth Framework Programme projects and collective research.
- The turnover in the context of collaborative research contracts, for example through the Sixth and Seventh Framework Programmes.
- The turnover in the context of research contracts.
- The turnover from services to third parties through the use of research results.

The distribution of CETIC's financial resources are well balanced keeping the rate of CETIC's self-funding above the 50% requested by the Walloon Region.



R&D activities and services offered by CETIC to the industry target the Walloon SMEs in particular.

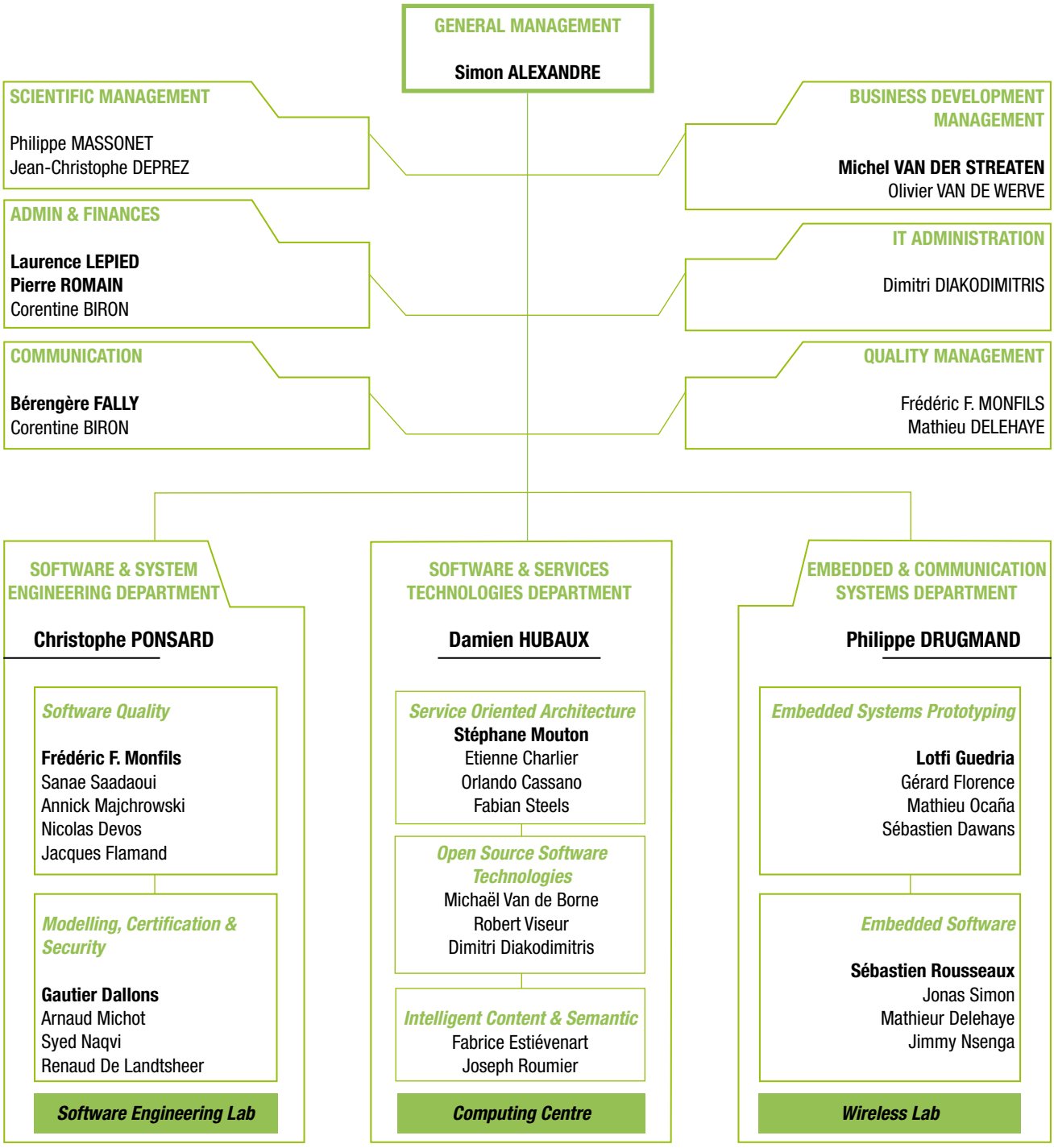


ABOUT CETIC

HUMAN RESOURCES

In 2009, CETIC hired several new researchers, despite the financial crisis affecting all sectors, in order to work on innovative technologies to reach the number of 38 employees (5 women, 33 men), 35 of whom are researchers divided into three departments:

- Embedded and Communication Systems
- Software and Services Technologies
- Software and System Engineering



CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

QUALITY POLICY

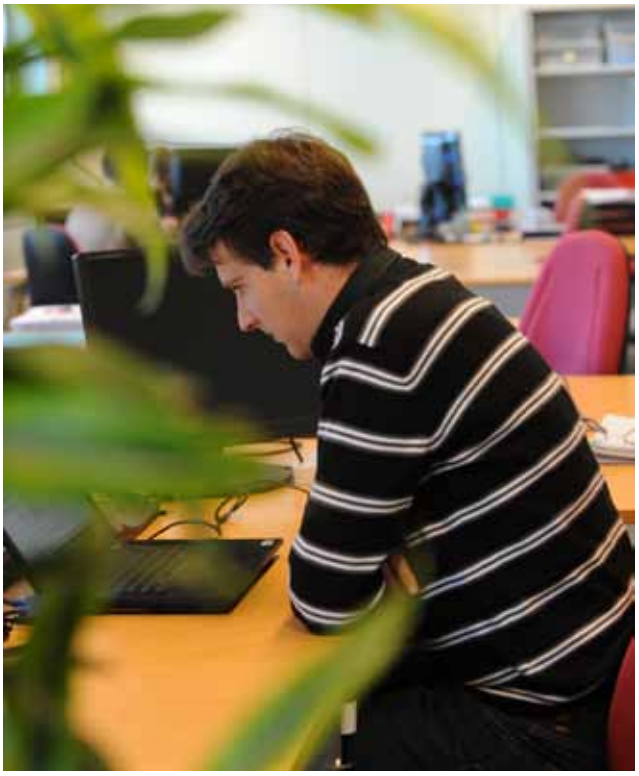
CETIC's mission is to make companies in the Walloon Region more efficient and more competitive by helping them integrate ICT into their products and services quickly and effectively.

In this context, to ensure the satisfaction of all of its partners (companies, universities, and public organisations), CETIC practices 'Operational Excellence' and is engaged in an ISO/IEC9001 certification process.

CETIC is committed to:

- Developing cutting-edge expertise in ICT.
- Delivering innovative results with high added-value for companies by improving its technological innovation process.
- Ensuring objectivity and quality results thanks to its independent position, its international recognition, and its strict respect of ethical and scientific protocols.
- Ensuring the quality of its competences and technical capabilities by conducting ongoing training and appropriate recruitment.
- Promoting the development and fulfilment of its employees by promoting a healthy environment conducive to creativity, professional achievement and teamwork.

This commitment applies to all of the research projects that CETIC leads with and for companies, as well as the management of these research projects and the organisation of CETIC's development in the long run.



CETIC VALUES

Prompted by its commitment to operational excellence, CETIC maintains a set of values that enable it to achieve a high level of partner and customer satisfaction.

Respect for the customer

CETIC employees make the quality of partner reception a point of honour, understanding client needs in order to provide the best tailored solutions. In particular, CETIC offers customers an honest and user-friendly relationship. Its status as a private, non-profit SME allows it to collaborate with industry and the public sector in total independence, within a framework of trust and in a spirit of cooperation without competition.

Technological innovation

CETIC teams demonstrate initiative, creativity and curiosity in the research topics they select, using their complementary skills to ensure an innovative, high-quality result. Strong links with industry (including those maintained by the Technical Committee) ensure the relevance of the research projects CETIC chooses.

A high level of quality

CETIC applies its expertise to achieve the highest level of software quality to yield maximum benefit. Thanks to the close ties between research teams, CETIC maintains control of all phases of a project.

Regional commitment

CETIC actively contributes to the development of the Walloon Region by supporting and stimulating innovation in the local economy, especially in SMEs. CETIC research orientations are validated by the Technical Committee, which is made up primarily of businesses, and which guarantees the competencies to meet regional industries' needs.

National and international visibility

Thanks to its scientific and technological expertise, its ability to forge collaborations, and its excellent results, CETIC is a reference both nationally and internationally. This is evident in the numerous projects CETIC contributes to, as well as in the numerous scientific reports it publishes about its projects.

Team spirit

CETIC works collaboratively both within and among teams. This team spirit is one of CETIC's major strengths, allowing it to provide services and products of very high quality.

Respect for co-workers

CETIC offers its employees a challenging work environment that combines friendliness, flexibility and autonomy. Personal development opportunities and freedom of speech are offered to all employees in order to empower creativity and innovation. In addition, all collaborators have the opportunity to continually improve their skills, thanks especially to the diversity of expertise represented in CETIC and the close collaboration among the teams.

SERVICES

Are you a Walloon-based SME? Then innovate for peanuts!

If you are ready to innovate, you can get simple, flexible and quick financial support from the Walloon Region.

Working with an accredited research centre such as CETIC, you can benefit from the Walloon Region technology voucher called 'Chèques Technologiques'.

For each technology voucher of €500, an SME located in the Walloon Region only pays €125, as the rest is covered by the Walloon Region and the federal government.

You can find more details about these technology vouchers on the CETIC website and on www.ct.innovons.be.

SERVICES

SERVICES

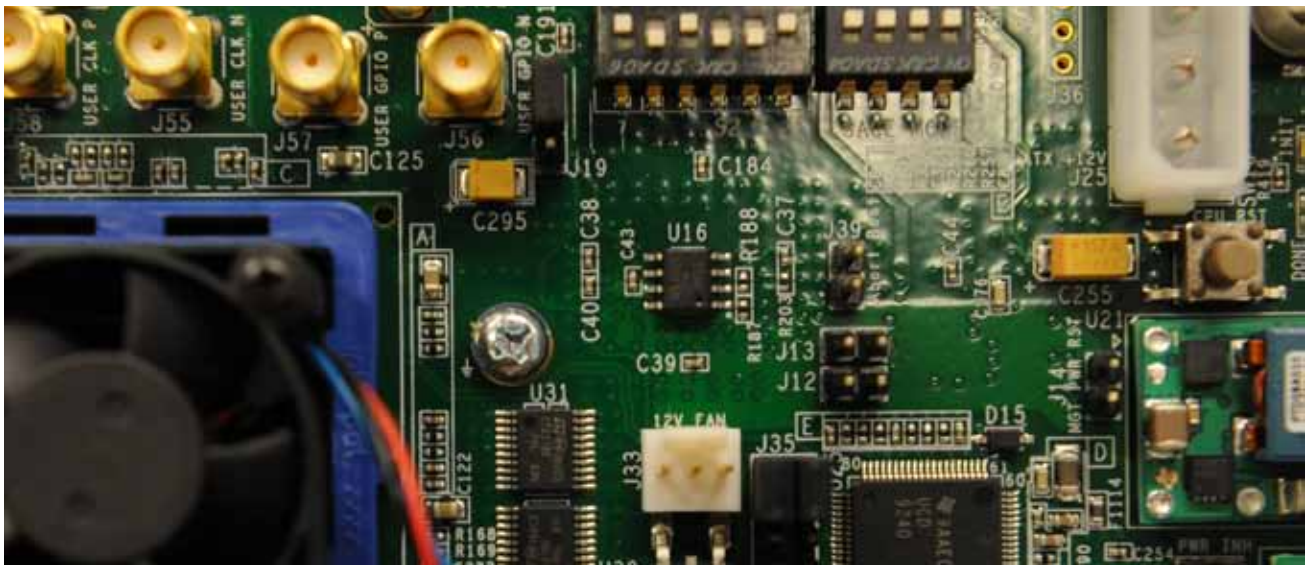
EMBEDDED AND COMMUNICATION SYSTEMS (ECS)

The Embedded and Communication Systems (ECS) department develops innovative solutions in the integration of embedded systems based on wireless technologies and programmable logic. ECS studies new technologies and processes in the world of embedded systems and sets up proofs-of-concept to demonstrate efficient solutions to industrial problems.

EMBEDDED SYSTEM DESIGN

Expertise

The design of embedded systems requires a variety of skills: knowledge of electronic components, electronic design, embedded operating systems and software development, and systems integration. The rapidly growing competition in this field obliges everyone to increase efficiency and reduce costs, while the rapidly evolving technologies offer new solutions.



Companies – and especially SMEs – are finding it more and more difficult to monitor all new technological developments and to smoothly integrate them in an optimised solution. The ECS department has developed extensive expertise in emerging technologies for embedded and communications systems in a wide range of applications. It has also studied several development platforms for accelerating the development of prototypes.

User interfaces in embedded systems have very specific requirements. This is due to the simplicity and restrictions of the interfaces – small LCDs or screens, a limited number of buttons, the basic packaging for industrial applications, etc. CETIC explores ergonomic end-user interfaces for industrial systems, as well as interfaces for specific uses, like eHealth systems to be used by elderly people.

CETIC also sets up demonstrations to illustrate that these efficient solutions are applicable to industrial problems. In specific cases, configurable electronic circuits (FPGA, PSoC) can greatly improve the flexibility and the time-to-design for advanced proofs-of-concept. CETIC masters and transfers to enterprises the full range of expertises (electronic design, including VHDL, use of softcores and development of embedded software).

Services

ECS teams master leading-edge technologies for modelling and implementing embedded systems. ECS can develop embedded electronic systems to meet the needs of industry in applied research and development (prototyping). The design flow covers several aspects: an evaluation of user needs, the development of specifications, system design and the implementation of the embedded code or the operating system. The ultimate goal of the applied research is to produce a proof-of-concept. ECS's objective is to transfer the technologies to enterprises so that they can achieve their industrial application goals. The transfer concerns both the source code and the hardware description files and, whenever possible, the complete development environment and methodologies. When relevant, ECS, with the support of the CELLaVI expertise centre (see page 26), promotes open source and Open Hardware models, thus helping CETIC's partners to study a corresponding business model and to initiate the environment and the community to manage it. In association with the Software and System Engineering department, the ECS department can help enterprises assess their technical requirements and their user interfaces. Thanks to its generic platforms and its expertise in embedded software for smart devices, ECS accelerates prototyping.

Success Story

SQR Technologies – a spin-off of the Université Libre de Bruxelles (ULB) – develops leading-edge solutions that harness the laws of Quantum Physics. For its next generation CED (Cloud Encryption Device) platform,

CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

The ECS department has developed extensive expertise in emerging technologies for embedded and communications systems in a wide range of applications.

SQR Technologies has called on CETIC to specify and design the ultra-high bandwidth electronic board. Based on its expertise in FPGA design, the ECS department has studied groundbreaking technologies in order to guarantee a quantum leap in expected performances.

WIRELESS COMMUNICATION AND LOW POWER SOLUTIONS

Expertise

CETIC has developed extensive expertise in wireless standards and protocols and in low-power technologies. These fast-growing technologies offer a multitude of possibilities that could not be envisioned until recently. Many types of equipment can benefit from a suitable connection, while taking their particular constraints into account. The multiplicity of technologies is magnified by the explosion of electronic architecture and modules. In the real world, the new embedded systems have to integrate various wireless technologies such as WiFi, Bluetooth, Zigbee, GSM, GPRS, 3G, etc. They must be designed efficiently and rapidly, using commercially available components, to provide the best performance/cost ratio. In addition to the transmission technologies, these systems often require advanced network capabilities like network auto-discovery, dynamic routing, mobility of nodes, etc.

Power consumption is an essential parameter in the performance of embedded systems. In industrial use, the deployment of embedded systems may be hampered by installation and maintenance costs due to poor battery autonomy. The market requires energy-efficient and energy-aware systems in order to improve system performance, lifetime and reliability, and to lower service interruptions and maintenance costs. When their location prevents easy maintenance or battery replacement, purely autonomic systems and sensor networks can be applied, thanks to embedded renewable energy devices like photovoltaic cells.

Services

CETIC can advise enterprises about the best technologies to adopt. Using the most precise technology can provide a significant competitive advantage. By using several wireless standards, solutions can be adapted to their usage context. New protocols and technologies are introduced to optimise throughput, range and power consumption.

Enterprises also require state-of-the-art studies of technologies, tools or components based on their specific requirements in order to precisely identify the most accurate solutions to their particular problems. But a theoretical study is not always sufficient for initiating an industrial development. In addition, a proof-of-concept is often required to demonstrate the feasibility and efficiency of the proposed solution and its suitability for the envisioned industrial use. ECS has developed its capabilities to rapidly prototype an embedded system – hardware and software – to demonstrate the relevance of the proposed solution. In cooperation with the Wireless Lab (see the description of the labs on page 53), CETIC can also evaluate and provide training on the relevant equipment and tools.

Success Story

For AGC Flat Glass, and in collaboration with the Université catholique de Louvain (UCL) and the Centre Spatial de Liège (CSL), CETIC led an interdisciplinary study to identify the best technologies for a particular area at the cutting edge of the field. The results of this study allowed AGC to prototype a solution in accordance with its specifications.

SERVICES

SOFTWARE AND SYSTEM ENGINEERING (SSE)

As software becomes ever more pervasive and business-critical, the mission of the Software and System Engineering (SSE) department is to actively help enterprises reach higher quality standards requirements, both for their IT development process and the resulting software-based products. The department's expertise covers many aspects of the software development lifecycle, such as requirements engineering, architecture design, model-driven engineering, code quality, tests design/coverage, safety/security certifications, software product lines and effort estimation. Walloon enterprises of all sizes – ranging from SMEs to IT departments in large companies – can benefit from this expertise through a number of well-defined services.

REQUIREMENTS ENGINEERING

Expertise

Requirements Engineering (RE) is the process of defining a software system's purpose by identifying stakeholders and their needs and documenting these in a form that can be analysed, communicated, and subsequently implemented. RE plays a critical and fundamental role in the software development process, and several studies have shown that it is one of the most critical success factors for on-schedule and within-budget delivery of software projects.

CETIC has developed extensive expertise in RE, covering the whole spectrum of methods and application contexts, from lightweight methods combining structured templates and UML-based notations to rigorous models enabling early formal reasoning. The related expertise relies on the use of goal-oriented methodologies (KAOS) developed at UCL, for which CETIC is actively maintaining and developing tool support and formal models for critical systems (see DEPLOY project on page 39).

Services

CETIC actively helps enterprises in fields related to Requirements Engineering by:

- Improving RE practices by auditing current RE processes, assessing the quality of requirements documents, delivering coaching on specific projects, and helping in the selection of appropriate tool support.
- Conducting organisational audits in order to produce an objective and precise picture of the organisation's structure, goals and business processes and how well they interrelate and what the risks are.
- Conducting requirements analyses in order to produce precise requirements documents in a specific context, typically as part of an invitation-to-tender process.
- Conducting formal modelling at early stages in order to perform specific verification and validation activities or to achieve process optimisation inside the organisation.

Success Story

In 2009, CETIC performed an organisational audit of the Brussels Regional Parliament in order to help in the evolution of the IT support. As part of this work, the complex internal procedures for producing regional laws were modelled as goals, state machines and workflows. The Parliament now has a clearer vision, enabling it to plan and prioritise the future evolution of its IT support.

PROCESS QUALITY

Expertise

SSE has developed strong expertise in process quality and in related standards such as CMMI and ISO/IEC15504. However, because these standards target large organisations and are complex and expensive to implement, they cannot be adopted by small structures. In response to this problem, the department has developed a software improvement approach for use by very small development structures, staged as follows:

- The first stage is a lightweight questionnaire called the micro-assessment, which is used to collect information about current software practices and to make people aware of the importance of software quality aspects.
- The second stage is OWPL, directly inspired from CMM and SPICE, and covering 10 processes, which are broken down into discrete practices.

CETIC is now very active in the standardisation of these processes through ISO/IEC JTC1-SC7, which is developing a new software lifecycle standard for Very Small Enterprises (ISO/IEC29110).

Services

A number of process-related services are available to assess the maturity of the software process, to plan software process improvements at an adequate pace, and to address specific needs:

- Micro-assessment, carried out in one day, provides a risk-based evaluation and proposes concrete recommendations for improvement.
- OWPL provides a more detailed assessment and more precise recommendations, without consuming too many resources. It efficiently helps to prepare for future CMMI or ISO/IEC15504 certification.
- A security micro-assessment highlights current security strengths and weaknesses and identifies practical solutions for improvement. It can also focus on specific practices.

Success Story

Micro-evaluation has been applied in several SMEs throughout the Walloon Region. OWPL has been applied in a number of companies that produce commercial software, in order to improve specific software processes.

SOFTWARE PRODUCT QUALITY

Expertise

While process quality is an enabling condition for delivering quality products, it is necessary to measure product quality as well. Drawing on its expertise in software metrics, CETIC has adopted a static analysis approach for performing precise code-level measurements of maintenability, security and reliability. This expertise is supported by state-of-the-art tools,

CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

Companies that develop software can closely monitor the evolution of the quality of their code through a secured code analysis SaaS platform and, if necessary, they can receive advanced analysis from our experts.

maintained by the software engineering lab, that have originated from the open source world (e.g. PMD, FindBugs) and leading tool vendors (e.g. CAST, Kalistick, Fortify, Polyspace).

Services

CETIC proposes that code be analysed by addressing all key technologies in a variety of contexts such as:

- Continuous code assessment during project development to assess delivery maturity with direct customer reporting through quality cockpit.
- Internal assessment of code that is subject to evolution or legacy code.
- External quality assessment of the delivery quality in a client-provider relationship.
- Quality validation of open source components (see also CELLaVI on page 26).

Different tools are deployed, depending on the context. Regardless of the tool used, a clear code analysis report is produced, which assists project managers in the decision-making process and developers in the code improvement process.

Direct customer benefits are: reduced development time by continuously evaluating quality, reduced maintenance costs by strategic decision-making about bad components, improved confidence in the code quality, and a supported decision process.

Success story

Numerous source code audits have been carried out, especially in a public sector context, for the French Community Parliament (evaluation of open source components, assessment of newly developed components), and for IT companies active in the finance domain and in the CRM domain.

DEVELOPMENT EFFORT ESTIMATION

Expertise

Accurately estimating a software development effort is a challenge with high impact on the project's organisation and schedule. Currently, the estimate often relies mainly on past experience. CETIC has developed expertise in this area based on COSMIC (ISO/IEC19761), a widely used method for estimating software functional size. The COSMIC function point estimation is based on objective criteria allowing repetitiveness of measures and is applicable to requirements documents early in the software lifecycle. This functional size is then converted into development effort based on the ISBSG project database. Additionally, CETIC can also help companies implement their own internal reference effort database.

Services

CETIC provides the following effort estimation services:

- Functional size, effort and cost estimation for sizing internal development or as part of an invitation-to-tender process.
- Real effort estimation based on ISBSG and guidelines for producing an internal project database over time.
- Complementary expert-based estimation for specific components as part of service-oriented embedded systems.
- Training and coaching IT companies in software functional size and development effort estimation.

Success Story

Siemens IT Solutions and Services, Belgium, developed a strong interest in COSMIC, a software functional size estimation methodology. The objective was to comply with specific EU calls for tender, but also to estimate size for other developments. CETIC performed a full transfer of the COSMIC methodology by delivering both general and targeted training sessions.

CERTIFICATION

Expertise

Certification is often required in a number of industrial domains, as a condition for accessing a particular market or to comply with regulatory stipulations. Security-critical products like smart cards or firewalls can be subject to the Common Criteria (ISO/IEC15408). A number of safety standards – such as DO-178B (aeronautics) and Cenelec 50126/8/9 (railways) – are also required in safety-critical domains. Mastering the certification process is not trivial and requires knowledge about the standard and how to implement it within the software lifecycle. CETIC is actively developing expertise and experience in these fields. CETIC has also mastered a number of leading software tools that help assess the security and safety of code and assist in the writing of specific certification documents.

Services

In the area of security certification, CETIC can:

- Analyse security risks and assess the return-on-investment of corrective actions.
- Perform advanced security analysis of code based on the most advanced analysis tools.
- Help prepare for Common Criteria certification by guiding the writing and reviewing of protection profiles or security targets.

In the area of safety, CETIC can:

- Provide expertise regarding the generic IEC-61508 standard and domain-specific specialisations.
- Perform advanced safety analysis of code based on tools like Polyspace.

Success Story

Thales Alenia Space - CETIC has contributed to the evaluation process for the first security device approved by the Belgian national security authority (ANS). The device was developed by Thales Alenia Space. CETIC reviewed the security target based on the common criteria standard and made a number of suggestions for improving it.

SERVICES

SOFTWARE AND SERVICES TECHNOLOGIES (SST)

The Software and Services Technologies (SST) department covers three key areas in the context of Information and Communications Technologies: Service Oriented Architectures, Open Source Software Technologies, and Intelligent Content and Semantics. The skills and approaches focus on new capabilities that companies need to master.

The objective of the SST department is to support companies wishing to take advantage of the new service-oriented trend of the ICT industry, by helping those companies select and implement the appropriate technologies. CETIC provides advisory services, feasibility studies, proof-of-concept, training and technical support in these areas.

SAAS FEASIBILITY AUDIT AND ADVICE ON SOA SOLUTIONS

Expertise

The idea of offering not merely infrastructure but also software services on demand has become widespread. Because of intrinsic advantages and market trends, many software vendors are planning to adopt the Software as a Service (SaaS) business model . Moreover, one may want to combine these services in order to provide more advanced ones.

Services

CETIC supports software vendors validating the technical and economic feasibility of offering all or part of their bundled software in SaaS mode. CETIC helps to identify critical points that should be taken into consideration so that vendors can base their decisions on objective, documented and verified criteria. We propose to proceed in two phases:

- The first phase will take into account the technological aspects in order to determine the necessary changes to applications in SaaS mode, the constraints of operating in terms of tools, computing capabilities and storage, and the definition of the SLAs that the vendor wishes to offer its customers.
- In a second phase, these elements will contribute to the business model elaboration including investment in applications, the recurring costs of maintenance, and renting the cloud infrastructure.

Success story

For local SMEs, CETIC has validated the portability of traditional software applications that need to be provided as a service on the Internet. The analysis included redesign of portion of the existing software architecture, notably to take into account multi-tenant constraints of SaaS applications.

SELECTION AND IMPLEMENTATION OF CLOUD COMPUTING MIDDLEWARE

Expertise

Typically, once software solutions are available as a service, customers use them on-demand, causing a lot of changes in the underlying infrastructure usage. Cloud computing enables the necessary flexibility. By taking advantage of web services and virtualisation, the computing infrastructure is now becoming part of the network. All the technologies mentioned above are rapidly evolving, and CETIC is tracking them through numerous research projects in which its expertise is recognised.

Services

This service typically includes assistance in undertaking the following activities:

- State-of-the-art and definition of strategic choices and technology
- Drafting of specifications
- Preparation and execution of a benchmark
- Development of Proof of Concept (PoC)
- Workload performance measurements of the target infrastructure
- Deployment of the solution

Success story

For local SMEs, CETIC is validating the portability of traditional software applications on cloud computing, either on public infrastructure, like Amazon EC2, or private enterprise clouds managed by applications like OpenNebula. CETIC designed the necessary architecture changes of existing applications and began implementation of changes on source code of one of the applications.

TESTING CLUSTER, GRID AND CLOUD-BASED SOLUTIONS

Expertise

Thanks to its infrastructure and its experience with tools and middleware, CETIC can test cluster, grid and cloud computing solutions. Our computing infrastructure was developed for flexibility. It can be partitioned to run multiple groups of operating systems and different applications.

Services

The cluster represents an opportunity for companies that want to adopt technologies like cloud computing or SOA more rapidly. The cluster can also efficiently host proof-of-concept activities in the context of cloud computing, SOA and SaaS services.

Success Story

An SME needed to know if the resource intensive software it sells to design composite materials and structures was able to use computing power of cluster infrastructures. CETIC helped the SME perform scalability test on its own cluster.

CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

CETIC provides advisory services, feasibility studies, proof-of-concept, training, and technical support in Service Oriented Architectures, Open Source Software Technologies and Intelligent Content and Semantics.

INDEXING DIGITAL CONTENT

Expertise

Companies today must stay in control of the increasing amount of information they handle. The Intelligent Content and Semantic (ICS) team at CETIC develops methods and tools for information management in business, targeting unstructured information on the Internet and in private networks.

Some intrinsic features of information make it difficult to manage. With the advent of the Internet and integrated enterprise information systems, digital content has become overwhelmingly abundant, while it is still poorly structured and constantly changing.

Services

In this context, CETIC can intervene with content indexing and knowledge extraction from unstructured content, search engines, semantic Web concepts and tools, and Web services standards and protocols.

With regard to semantic extraction from unstructured data, CETIC has developed tools able to automatically extract content from Web pages using reverse engineering techniques while preserving the meaning of the data. Hence, Web-based data migration is simplified, and tracking Web content (like press releases, product catalogues, news, etc.) becomes easier.

CETIC's ability to develop tailored search tools allows for more comprehensive and fresh-page databases, handling of specific file types, and implementation of semantic search capabilities. CETIC has extensive expertise in all the steps involved in search engine development, including crawling (i.e. discovering and collecting Web pages or files), indexing (i.e. transforming information into a searchable structure), and defining and implementing user interfaces. The main applications are custom search engines, intranet search engines, search engines for product catalogues, general purpose public search engines of several million pages, and automated processes for website migration and Web intelligence tools.

Success story

CETIC helped the DocLedge company in the conception and the development of ArcheWeb, a tool dedicated to Web Intelligence for SMEs. The application provides an innovative way to submit queries to traditional search engines and to monitor web content. It relies on leading-edge technologies, such as Web services or dynamic forms, in order to provide the user with a search environment that best fits its needs.

TAKING ADVANTAGE OF OPEN SOURCE

Expertise

For years, CETIC has been involved in the open source movement, covering aspects like business models, development models, software quality measurement, open source community analysis, and so on.

Specifically, CETIC has developed recognised expertise regarding:

- Support for releasing software in open source, existing code audit, and open source project management, as well as help in setting up collaborative development infrastructures. Indeed, releasing source code to an open community requires preparation in order to maximise the chances for a successful operation.
- Architecture analysis and selection of software components: to prevent disappointment, the integration of open source blocks in an application must not be overlooked.
- Choice of a license and impact on business models: the open source model has already been successfully embraced by many providers. However, licensing and the business model are of crucial importance and vary with the context and objectives.

Services

CETIC helps develop software specifications, taking into account the specificity of open source. Releasing the sources of existing software or pooling development resources requires specific skills. As a follow-up to drafting specifications, CETIC can also participate in the selection of open source providers in the context of a call for tenders.

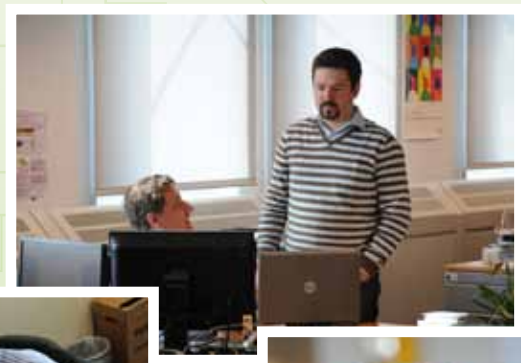
CETIC can help analyse open source code, facilitate the development process, and assist in the selection of open source components.

Success story

CETIC has assisted a local company in evaluating the quality of their software, analysing the competitive position of their technologies, structuring their commercial offer, and encouraging the adoption of open source for some products. The decision to release as open source software was made in conjunction with an expansion of the development process (APIs and open formats).

SUPPORTING INDUSTRY THROUGH ICT RESEARCH AND INNOVATION

cetic










SEMANTIC

CLOUD COMPUTING

SOFTWARE QUALITY

SECURITY

SERVICE ORIENTED ARCHITECTURE

REQUIREMENTS ENGINEERING

- RESEARCH
- DEVELOPMENT
- TECHNOLOGY TRANSFER
- INNOVATION
- BUSINESS










PROTOTYPING

WIRELESS TECHNOLOGIES

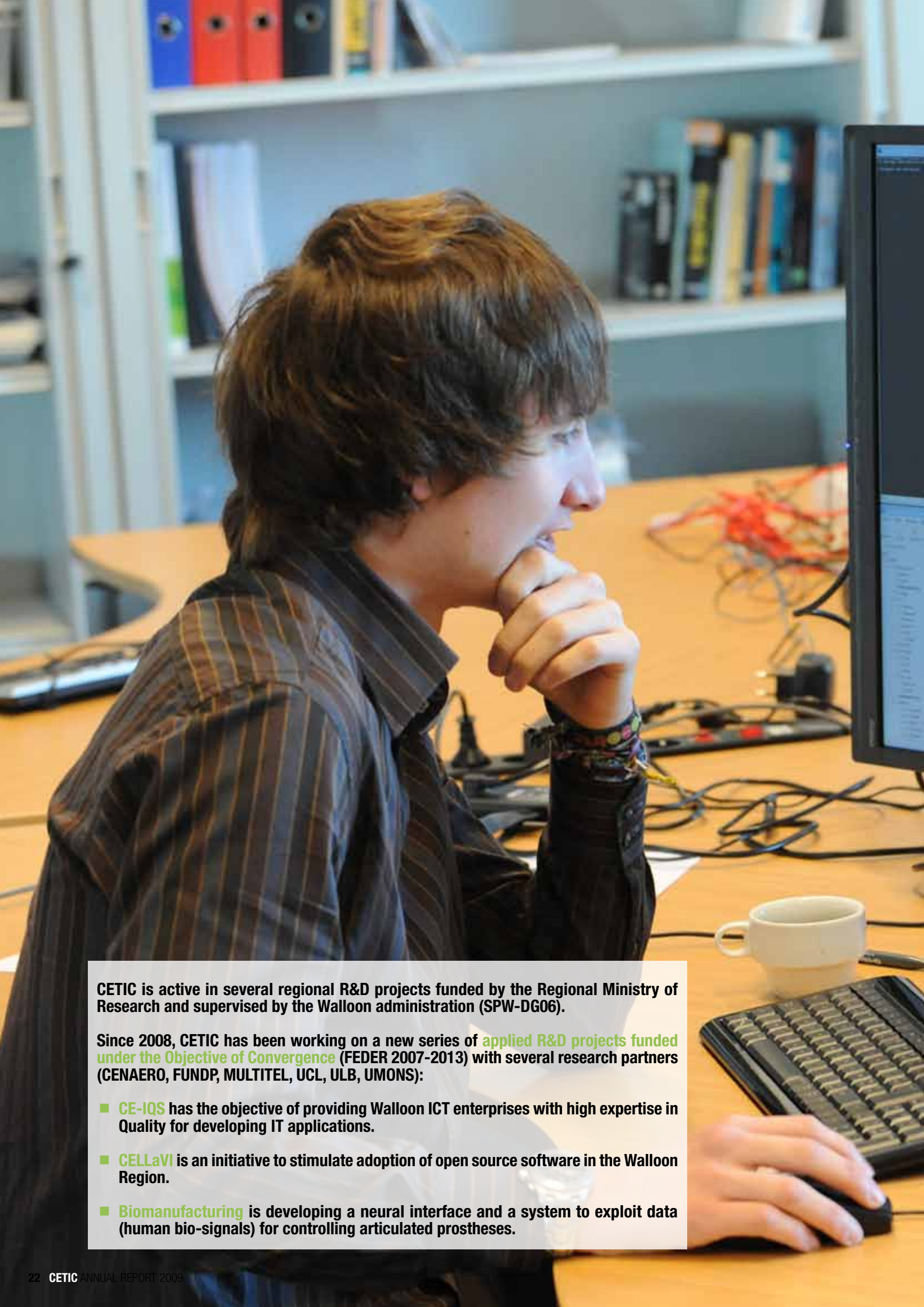
CERTIFICATION

EMBEDDED SYSTEMS

TRUST

ENERGY EFFICIENCY

OPEN SOURCE

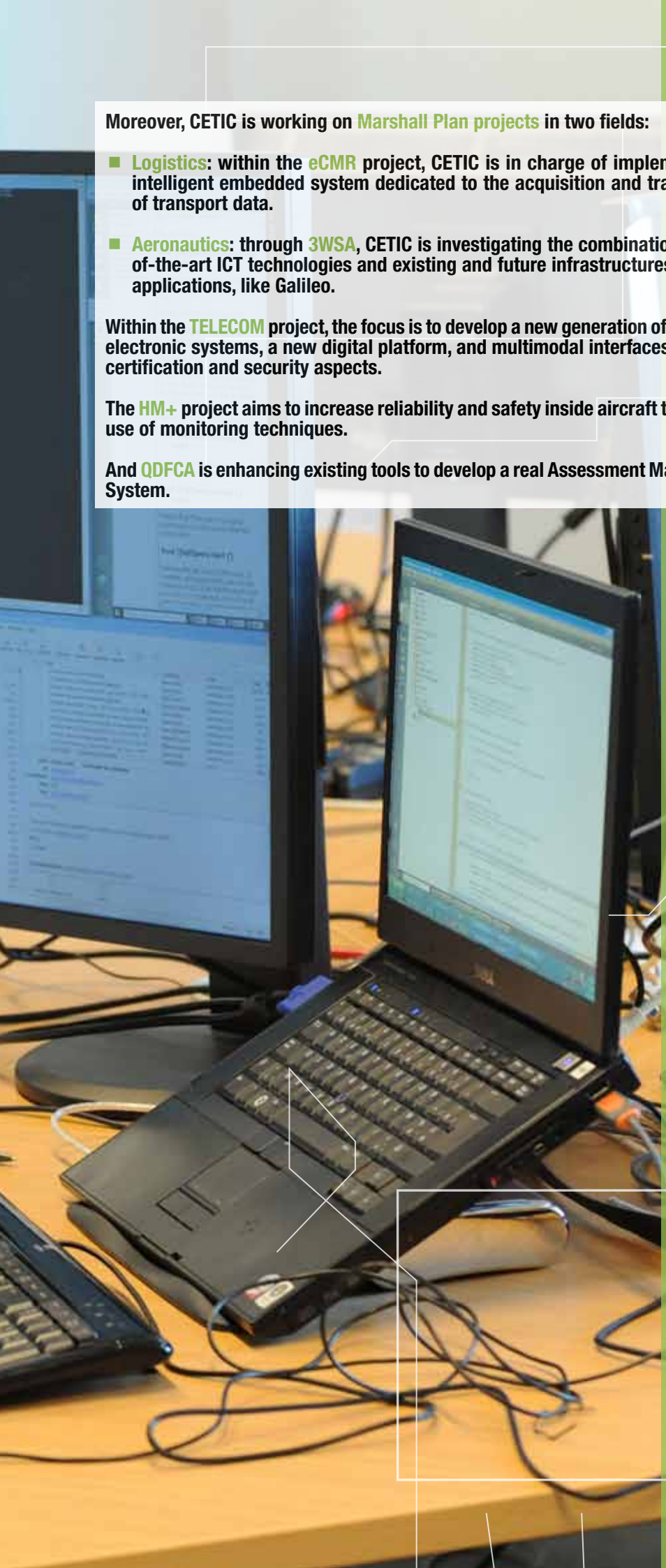


CETIC is active in several regional R&D projects funded by the Regional Ministry of Research and supervised by the Walloon administration (SPW-DG06).

Since 2008, CETIC has been working on a new series of applied R&D projects funded under the Objective of Convergence (FEDER 2007-2013) with several research partners (CENAERO, FUNDP, MULTITEL, UCL, ULB, UMONS):

- **CE-IQS has the objective of providing Walloon ICT enterprises with high expertise in Quality for developing IT applications.**
- **CELLaVI is an initiative to stimulate adoption of open source software in the Walloon Region.**
- **Biomanufacturing is developing a neural interface and a system to exploit data (human bio-signals) for controlling articulated prostheses.**

WALLOON RESEARCH PROJECTS



Moreover, CETIC is working on Marshall Plan projects in two fields:

- **Logistics: within the eCMR project, CETIC is in charge of implementing an intelligent embedded system dedicated to the acquisition and transmission of transport data.**
- **Aeronautics: through 3WSA, CETIC is investigating the combination of state-of-the-art ICT technologies and existing and future infrastructures for space applications, like Galileo.**

Within the TELECOM project, the focus is to develop a new generation of embedded electronic systems, a new digital platform, and multimodal interfaces, including certification and security aspects.

The HM+ project aims to increase reliability and safety inside aircraft through the use of monitoring techniques.

And QDFCA is enhancing existing tools to develop a real Assessment Management System.

CE-IQS

Centre d'Expertise en Ingénierie et Qualité des Systèmes

Type of project: Walloon Region – FEDER – Objective of Convergence
CETIC budget: €7,131,576
Duration: 2008-2013
CETIC departments: Embedded and Communication Systems, Software and Services Technologies, Software and System Engineering
Project website: www.cetic.be/rubrique306.html
CETIC contact: Christophe Ponsard – christophe.ponsard@cetic.be

CETICANNUALREPORT2009 CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

BACKGROUND

CE-IQS is the centre of expertise for engineering and system quality. Its objective is to provide Walloon ICT enterprises with advanced expertise for developing software-based systems. More than ever, the performance and competitiveness of companies relies on mastering information and communication technologies. CE-IQS answers this need by closely associating ICT enterprises with innovative research carried out by a strong applied research consortium composed of major research centres and universities active in this field.

Any enterprise in the Walloon Region can join the project throughout its lifespan by getting in touch with CETIC. The needs of the enterprise will be discussed and matched with one or more research tasks structured around five main themes:

Theme 1: methodologies for system development and evolution.

In this theme, state-of-the-art methodologies for system development are investigated, especially with the aim of facilitating their evolution. In particular, specific activities are devoted to model-driven development at an earlier stage than code (architecture, requirements), software product lines and measuring the evolution of software systems. Within this theme, CETIC works on new methodologies and productivity tools used to maintain and improve the control of systems throughout their lifespan. This also includes the study of embedded and open source systems.

Theme 2: strategies for verification, validation and quality assessment of systems.

The objective is to improve quality assurance practices, especially those related to testing in order to allow cost reduction, better quality and quicker time-to-market. More specifically, this theme investigates techniques for identifying optimal test coverage related to code quality, for precisely assessing that coverage, for test plan design and for automating the test process based on a number of techniques, including model-based testing. A complementary task related to design time verification is also planned.

Theme 3: certification.

Certification is required in a growing number of applications with critical aspects, such as security or dependability; moreover, assurance levels are also constantly increasing due to the ubiquitous presence of software in current systems. A number of standards define the certification rules to be met, such as the common criteria (IEC/ISO15408) for security IT and DO-178B in aeronautics. The CE-IQS helps companies prepare for certification through all phases of the project and, in particular, improves required practices. This theme also focuses on specific constraints (e.g. adapting the process to SMEs) and on specific domains (e.g. Belgian electronic identity). CE-IQS is also actively representing the needs of the Walloon enterprises in standardisation work groups at the national and international (ISO) levels.

Theme 4: distributed and embedded systems.

Software systems are increasingly interconnected through a variety of networks. This results in richer – but also more complex to design – systems. A variety of such systems are being investigated, including:

- Service-oriented applications composed in highly dynamic business chains, especially stimulating SME ecosystems.
- Grid and cloud applications enabling on-demand access to resources and scaled performance.
- Embedded communication systems combining wireless, low-power consumption, and intelligent sensors and processing devices.

Theme 5: semantic information processing.

In the Information Age, being able to filter, organise and process information is critical for many companies that rely on this information for their business. The aim of this theme is to identify, adapt and further develop new processing technologies such as search engines, indexers and optical character recognition to meet the needs of these companies.

PARTNERS

Cenaero, Facultés Universitaires Notre-Dame de la Paix de Namur (FUNDP), Université catholique de Louvain (UCL), Université de Mons (UMONS), Université Libre de Bruxelles (ULB)

The applied research conducted in CE-IQS typically involves an industrial prototype or methodological deployment which results in an effective transfer to the partnering companies.

ICT EQUIPMENT

To be effective, the above methodological research must be supported by state-of-the-art tools. A number of general barriers also prevent Walloon companies – and especially SMEs – from benefiting from the high-quality return on such tools: ignorance of the tool's existence, costs of acquisition and maintenance, casual use, complexity of installation, learning curve, etc. The aim of the ICT equipment support project is to break through these barriers by providing access to such tools and associated consulting and support services. This equipment (described on page 53) is composed of software engineering tools and software/hardware tools for designing and testing embedded and communicating systems.

CETIC'S ROLE

CETIC is coordinating this project and actively involving SMEs in project activities. CETIC is also actively contributing to the main research themes and triggering specific dissemination activities directed towards the enterprises.

KEY RESULTS

The applied research conducted in CE-IQS typically involves an industrial prototype or methodological deployment that results in an effective transfer to the partnering companies. The main achievements in 2009, and examples of results transfer to industrial partners, are:

- The research conducted on the theme of **development and evolution methodologies** was mainly related to model-driven engineering and its application to embedded systems. Specific research topics were model versioning and architecture modelling techniques for embedded systems. Prototypes were successfully developed, validated and, in some cases, transferred to companies involved in those tasks: for example, Respect-IT sa started integrating the research results as part of its Objectiver requirements engineering tool. Specific research on the qualimetry of embedded system source code was also conducted with a number of Walloon companies and helped specialise the generic code analysis techniques.

- The **verification and validation** activities explored a number of complementary techniques for raising confidence levels concerning produced software. First, strong model-based techniques were investigated in the context of security-critical applications. A complete model-based chain was produced and deployed in an industrial context to assess feasibility. Second, test coverage tools were reviewed against a number of criteria, such as coverage, reporting facilities and integrability. A specific tool for analysing the quality of coverage was also designed. Third, the degree of automation of code extraction and analysis was increased at the code level.

- The **certification activities** covered a large range of problems. To address **SME** needs, existing assessments (micro-evaluation, OWPL) were disseminated. Specific needs related to the estimation of effort were also identified and answered based on the COSMIC function point evaluation complemented by the ISBSG project database acquired by the software engineering lab. In the area of **security**, specific risk analyses and micro-evaluation techniques were developed and validated in real enterprise environments together with practical supporting tools. Related to the common criteria evaluation, the case study initiated in 2008 was publicly advertised by the Belgian national security authority as a first step in the deployment of a common criteria scheme in Belgium. In the area of **safety**, the scope was enlarged from the DO-178B aeronautic standard to the IEC61508 norm. Finally, CETIC was very active in representing SME needs in standardisation committees such as the national SC27 security group, the BISI initiative and the international ISO/IEC-SC7 (more precisely, WG6 on quality and WG24 on SME software processes).

- In the application theme of **distributed systems**, the area of Service Oriented Knowledge Utilities (SOKU) was investigated with a specific focus on server virtualisation and was further extended to cloud computing.

- In the application theme of **embedded systems**, heterogeneous wireless systems were investigated with the focus on lowering power consumption. An industrial case study was conducted to feed a short-range communication component with a small photovoltaic cell. A number of wireless techniques were surveyed: Zigbee, Ultra Wide Band, and other industrial protocols, including some proprietary ones. Other case studies were also conducted on the real-time acquisition of truck data and the design optimisation of a communication hardware component for use in telemedicine.

- Finally, in the application theme of **semantic information processing**, the RETROWEB software previously developed by CETIC was consolidated and open sourced. A semantic search engine, targeting medical guidelines for Parkinson's disease, was also jointly developed by CETIC and FUNDP.

CELLaVI

Centre d'Expertise en Logiciel Libre à Vocation Industrielle

Type of project: Walloon Region – FEDER – Objective of Convergence
CETIC budget: €3,056,390
Duration: 2008-2013
CETIC departments: Embedded and Communication Systems, Software and Services Technologies, Software and System Engineering
Project websites: www.cellavi.be – https://forge.pallavi.be
CETIC contact: Damien Hubaux – damien.hubaux@cetic.be

CETICANNUALREPORT2009 - CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

BACKGROUND

Many companies are interested in open source software, both technologically and economically, but the path to successful adoption is not clear. Open source software brings new licensing schemes, requires clear economic choices, and encourages new models for development. The so-called hybrid licensing (i.e. between full open source and classic software licenses) makes the choice even more complicated.

Moreover, few mutualisation structures exist. These structures support networking among the different industrial actors from both the private and public sectors (the public sector plays a role in adopting open source software and can act as a stimulus). An efficient collaborative environment must remain independent with respect to business actors, licensing, business models and technologies used.

Through its various research tasks, the project will support three categories of companies:

- **Software editors:** open source implies specific business models, as free software creates a distinction between primary development activities and value-added activities such as support and advanced functionalities. Software companies can take advantage of free software to turn these two characteristics into assets for exporting their skills. Open source allows very small companies to become worldwide references, while the availability of the code provides a strong guarantee for the customer. On the other side, open access can oblige the publisher to remain the expert on its reference product. With open source, classic ISVs also face the risk of competition from new entrants distributing free software.

- **Software services companies:** free software can be incorporated into specific solutions. Integrating free software based on the re-use of proven components and avoiding licensing costs can provide a strong competitive advantage. Still, help is needed in selecting the appropriate software components and, where appropriate, taking into account trust issues, traceability of licenses and possible legal risks. There is also the opportunity to provide a knowledge base of existing free software in some areas, and knowledge about outstanding contributions coming from research projects and innovative initiatives.

- **End users:** free software is important for companies and administrations for various strategic tasks. As new applications emerge, their functionality and quality catch up with, and even out-perform, classic commercial applications. Users face the difficulty of selecting open source software tailored to their needs, with the required quality and support.

In order to support all these actors, CELLaVI provides several answers in different areas:

1. By setting up a forge and a collaborative environment, CELLaVI meets the needs of companies looking for an online service to host their applications. While this service is a means to promoting the software, it is also a tool to support co-development between a company and its partners.

2. CELLaVI helps companies questioning the potential benefits of free software by providing services in these areas:

   - Legal: choice and combination of licenses
   - Economic: choice of business model, support in management of open source projects
   - Technical: choice of software components, application architecture, etc.
   - Training: knowledge of open source platforms, training certificates, etc.

3. By taking into account emerging fields such as open hardware, or automated software analysis, CELLaVI provides a decisive advantage for companies federated around the initiative: it will help them remain at the leading edge of developments in the area of open source software.

CETIC is coordinating the CELLaVI Centre of Expertise and is responsible for the active involvement of SMEs in project activities. CETIC is also leading the main research themes and is triggering specific dissemination activities directed towards the enterprises.

PARTNERS

Multitel, Facultés Universitaires Notre-Dame de la Paix de Namur (FUNDP), Université de Mons (UMONS)

A successful large scale event, "Open the Source" (www.openthesource.be), was organised in collaboration with INFOPOLE Cluster TIC and the LIEU network.

CETIC is specifically responsible for:

- Deploying the project portal (called PALLAVI), based on a forge, and supporting the dissemination of the project outcomes: https://forge.pallavi.be.
- Quality assurance of open source software, especially analysing metrics, software life-cycle and product lines.
- Specific expertise about the use of open source software for embedded devices, and specifically open hardware.
- Dissemination and exploitation of project results.

KEY RESULTS

The PALLAVI portal is now online, in the form of a forge. Opened to the public in the second half of 2009, particular attention has been paid to the choice of the forge software and infrastructure, fully using open source software and heavily based on virtualisation. Several projects are already available. The forge is especially available to projects with a link to Walloon business ecosystem and to volunteer users. See https://forge.pallavi.be.

The operational aspects of PALLAVI are backed by general purpose open source expertise, focused mainly on infrastructures, and aligned with local industry needs, especially tackling virtualisation techniques and open source cloud middleware.

The quality of open source software is of crucial for use and adoption in the business context.

The project also benefits from the results of the QualOSS project, which are now available through the forge and are being developed further via the CELLaVI project.

With regard to business aspects, CETIC has made a study of trends and opportunities brought by adoption of open source by the public sector and the software industry, as well as the public release of code with an open source model. CETIC continues to gather experiences and opinions from its partners.

The project activities also include progress on training aspects and legal expertise, managed by Multitel and FUNDP/CRID, respectively.

With regard to exploitation of the research results, specific advice has been provided to several partners and local companies.

Finally, a large scale event, « Open the Source » (www.openthesource.be), has been organised in collaboration with INFOPOLE Cluster TIC and the LIEU network (Interfaces Entreprises Universités). More than 180 persons attended the event, including 50% from industry, 30% from universities and 20% from the public sector. Moreover, renowned speakers, including François Elie (Adullact) and Clémentine Valayer (Trasys, OSOR.eu), provided a global perspective.

BIOMANUFACTURING

Type of project: Walloon Region – FEDER – Objective of Convergence
CETIC budget: €139,307
Duration: 2008-2011
CETIC department: Embedded and Communication Systems
CETIC contact: Valéry Ramon – valery.ramon@cetic.be

CETICANNUALREPORT2009 - CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

BACKGROUND

The Biomanufacturing project works on the processing and exploitation of human bio-signals to control orthotic devices, a sub-class of articulated prostheses. The main goal of this project is to develop a neural interface and a system to exploit measured brain activity. Extracting representative information from EEG (electroencephalogram) and EMG (electromyogram) signals and processing this data through an artificial neural network will enable matching patterns to activate the orthotic devices.

Orthotic devices are prostheses designed to compensate for absent articular or muscular functions. Performing this body assistance requires intelligent guidance, raising a great challenge in the field of human-to-machine interfaces. The Biomanufacturing project aims to develop intuitive control for orthotic devices, using state-of-the-art processing of bio-signals from EEGs and EMGs, which measure brain and muscle activity, respectively.

This multidisciplinary project will require collaboration between several research teams to elaborate a functional orthotic prototype. The bio-signals must be processed in order to extract useful information concerning the control of the orthotic devices. This will likely be implemented using a Dynamic Recurrent Neural Network (DRNN), following encephalographic signal sampling and processing. This DRNN will be a critical part of the decision-making process, as its output will determine the design of control signals and the manufacturing of adequate orthotic devices and their associated actuators and regulation systems. The overall system architecture is yet to be determined, but the different components will most likely be connected wirelessly using a Wireless Personal Area Network (WPAN) standard such as Bluetooth or ZigBee.

KEY RESULTS

In this project, CETIC's Embedded and Communication Systems (ECS) department is in charge of the design of the overall system architecture, and of the technical integration of system components. Over the course of 2009, CETIC developed and maintained a document depicting key state-of-the-art developments in two technical areas of interest: wireless communication systems for EEG signals, and implementation of DRNNs in embedded systems.

Following this work, CETIC is responsible for defining the specifications of the wireless communication system and implementing the DRNN and the overall system architecture in accordance with the partners' choices concerning the EEG signal processing and DRNN theoretical design. Ongoing collaborations with the UMONS will allow CETIC to make the best technical choices for ensuring coherent and effective processing of EEG signals and their transmission to the orthotic devices' actuators.

Over the course of 2009, CETIC developed and maintained a document depicting key state-of-the-art developments in two technical areas of interest: wireless communication systems for EEG signals, and implementation of DRNNs in embedded systems.

PARTNERS

Cenaero, Sirris, Université de Mons (UMONS)

eCMR

Type of project: Walloon Region – Marshall Plan
CETIC budget: €147,861
Duration: 2007-2009
CETIC department: Embedded and Communication Systems
CETIC contact: Gérard Florence – gerard.florence@cetic.be

BACKGROUND

The CMR paper form (a legal vehicle form defined and regulated by the Convention on the Contract for the International Carriage of Goods by Road) is essential in transport and logistics. However, the CMR form is tedious to fill out and process, particularly for small and medium-sized fleets that provide services for third parties. Therefore, the introduction of an electronic CMR with handwriting recognition will simplify and speed up commercial and administrative procedures while preserving current practices in using paper forms. There is a real opportunity to ensure traceability of goods with precise cost evaluation for operations. A significant amount of time will be saved compared to the current procedures for encoding and managing data, especially for high volumes.

The eCMR project targets efficient electronic handling and exploitation of the CMR forms. Through the development of an embedded system for seamless acquisition and transmission of a CMR form's information, the eCMR project aims to cleverly cross and combine CMR data with available in-vehicle information from various other sources (tachograph, GPS, sensors, etc.).

The information sources used to enhance the CMR form's information can be extracted from different devices embedded in trucks. These include:

- CAN/FMS
- Various sensors
- Positioning system (GPS)
- Digital tachograph (recording the driver's activities, distances travelled, the vehicle's speed and identification data, etc.)

CETIC is in charge of implementing an intelligent embedded system dedicated to the acquisition, local pre-processing and transmission to a remote server of aggregated data from CMR and various truck-embedded devices. That is why CETIC is taking on the challenge of mastering the heterogeneity of embedded equipments, communication protocols and interfaces.

In addition to the communication devices, a remote information management system is required. Such a system requires an adequate level of abstraction to allow the end operator to focus on data and rid himself of specific constraints and details related to the heterogeneity of the equipment.

KEY RESULTS

In 2008, CETIC developed the Bluetooth Dongle which is a smart wireless communication device in charge of transferring the digitised CMR forms from a digital note recorder to any Bluetooth-enabled device. This device automatically detects new files on the digital note recorder and autonomously manages authentication with a trusted Bluetooth peripheral.

As a starting point, CETIC implemented the abstraction layers required for position data collection from vehicle devices. Thanks to modular software architecture, the system was easily enhanced in 2009 with the support of new data sources. CETIC also developed the software layer that provides an interface to an external application so that it can operate the system.

A real world demonstrator was exhibited at the Microsoft Innovation Centre (Mons) inauguration event in March 2009.

Then, in a second step, the embedded system was enhanced by the addition of an embedded PC. This PC is permanently connected to devices such as the tachograph data broadcast interface, the CAN/FMS interface, the AVL (Automatic Vehicle Location) device that provides GPS and various sensors data.

Extensive real world testing of CMR file transmission and position tracking between a truck and the remote information system were started.

CETIC is taking on the challenge of mastering the heterogeneity of embedded equipments, communication protocols and interfaces.

PARTNERS

Connector, Docledge, Facultés Universitaires Notre-Dame de la Paix de Namur (FUNDP), Orditool, Paquet, Smolinfo

HM+

Health Monitoring in Aeronautics

Type of project: Walloon Region – Marshall Plan – Aeronautical and Space Pole (Skywin)
CETIC budget: €51,900
Duration: 2008–2011
CETIC department: Embedded and Communication Systems
Project website: https://www.skywin-hmplus.be
CETIC contact: Mathieu Delehaye – mathieu.delehaye@cetic.be

CETICANNUALREPORT2009 - CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

BACKGROUND

Since January 2008, CETIC has been collaborating in HM+ ("Health Monitoring +"), a Marshall Plan-funded project that meets the requirements of the Walloon competitiveness cluster for aeronautics and space: Skywin (www.skywin.be). The HM+ project aims at reducing health-monitoring (predictive maintenance) costs in aeronautics by using embedded devices and information technologies in aircraft.

The HM+ project is divided into two 2-year phases. The first phase (2008-2009) consists of specifying and designing a complete health monitoring system for three specific applications. The second phase (2010-2011) will entail developing and validating a functional prototype. The HM+ project is now entering its second phase (Prototyping phase).

Health monitoring is a broad, multidisciplinary domain for which all of the special skills are already present in the Walloon Region, but their combined use within a coordinated project and practical experience on the aeronautics market are still lacking. The HM+ project has been proposed to remedy this situation.

Generally speaking, the project aims at increasing reliability and safety inside aircraft through the use of health monitoring techniques. Three specific applications have been envisioned in this context:

- Actuator systems and damage simulation inside aircraft (this application is managed by SONACA).
- Monitoring of engines and equipment inside aircraft (managed by Techspace Aero).
- Electrical distribution systems and arc fault detection inside aircraft (managed by Thales Alenia Space ETCA).

The research subjects are: design, integration and validation of new sensors, electronics and interfaces inside aircraft, damage assessment, methodologies and algorithms for default detection and error recognition, and processing of signals from sensors inside aircraft.

CETIC is contributing to HM+ by monitoring engine oil system status in terms of temperature, pressure, rejection rate, coking phenomenon (obstruction by carbon deposits), etc. With extensive expertise in embedded software development, CETIC is assisting the migration of the detection algorithms developed by University partners onto the prototype of the platform designed by industrial partners. This task takes into account the embedded platform constraints (like processor and memory limitations) at the engines' working temperatures. More specific aspects, such as the certifiability of the embedded platform by the aeronautical standards RTCA-DO-178B (software norm) and RTCA-DO-254 (hardware norm), are also planned for this project.

KEY RESULTS

During the course of 2009, CETIC pursued the design of a platform to monitor the engine oil system status. The technical-economic study and scorecard realisation that was initialised by Techspace Aero in the second quarter of 2008 has been continued in collaboration with the partners of the Oil system workgroup. The objective of this study is to optimise the costs distribution among the various parts of the prototype development (algorithm research, software development, certifiably aspects, sensors…), according to the HM+ project budget constraints, and in order to prepare the development of a future product (this product development is beyond the scope of the HM+ project).

The results of the CETIC preliminary study regarding the production of an RTCA-DO-178B (software norm) and RTCA-DO-254 (hardware norm)-compliant aeronautic platform indicated that the cost necessary to produce a certifiable platform (up to 5X the hardware and software development costs) was unaffordable in the context of an R&D project like HM+. However, CETIC will continue to track the platform development and will provide advice regarding the use of the RTCA-DO-178B standard during the platform software development phase.

Regarding the migration of the detection algorithms developed by the Universities, CETIC monitored the University partners' research between January and December 2009. CETIC's expertise concerning algorithm migration from the Matlab – Simulink environment will also be useful in optimising the automatic generation of an embedded C code from Matlab and integrating this code in the platform monitoring software.

PARTNERS

Cissoïd, CRIBC, Deltatec, GDTech, Open Engineering, SONACA, Samtech, Thales Alenia Space ETCA, Techspace Aero, Université catholique de Louvain (UCL), Université Libre de Bruxelles (ULB), University of Liège (ULg) and Université de Mons (UMONS)

QDFCA

Quality Design For Competency Assessment

Type of project: Walloon Region – Marshall Plan
CETIC budget: €138,747.5
Duration: 2009-20012
CETIC department: Software and System Engineering
CETIC contact: Sanae Saadaoui – sanae.saadaoui@cetic.be

BACKGROUND

The objective of the QDFCA project is to enrich the current ExAMS examination platform with new functionalities and to transform it into a true Assessment Management System, covering assessment needs from the classical standardised testing to the evaluation of high-level competencies. The improvement in functionalities and performance will allow the ExAMS platform to become more competitive in the expanding European market of Learning Management Systems.

The research methodology used to meet the project's objective is a systemic approach that decomposes the test construction process into 8 stages:

1. ANALYSIS: to identify the competencies to assess;
2. DESIGN: docimology processes (case studies, observations, traditional standardised tests, etc.) to be used. (Docimology is the science of assessment and testing in a pedagogy field);
3. ITEMS: to feed the test with solicitation modalities and complex performances. For example, open questions or complex tasks defined at stage 2. The evaluation criteria should also be specified;
4. TRAINING: if necessary, the assessor may offer the assessed persons the possibility to perform a white test to help them become familiar with the proposed tasks;
5. TESTING: the questions created or selected in the third stage are put in the standardised test, which is proposed to the people who perform the test;
6. CORRECTION: to let the assessor judge the performances of the preceding step ("testing"). The research will explore the possibilities of automated or semi-automated trails of piloting the concordance of Inter-judges and Intra-judges;
7. FEEDBACK: provide detailed feedback and diagnosis, the web channel can be used for this;
8. MACRO-REGULATION: here opinions of all the people that intervened in the test construction process are collected and analysed. The aim is to improve the quality of the test that will be created in the next cycle.

CETIC's role in the project focuses on technological aspects, helping the platform reach a high level of performance and ensuring interoperability and all technical constraints. CETIC also has extensive expertise in software possesses assessment and will participate in the scientific studies of assessment methodologies and will also refine its own assessment methodology.

CETIC is a key partner for achieving IT project quality and mastering IT technologies: SMART and Assess group contribute their expertise in the test assessment field, while CETIC contributes its expertise in the technology aspects. Technology quality and high performance are strong success factors for the project. CETIC will intervene in several technology fields:

- Open source technologies
- Security, robustness and performance of the application
- Interoperability with client systems
- Quality of code and improvement of development practices

KEY RESULTS

During this first phase of the project, the main tasks were:

- Analysis of the docimology literature to improve and adapt the test construction model described above to the assessment of competencies;
- Analysis of the existing platform and development of a list of recommendations to improve it. First analysis concern: quality of code, quality of classes, project management and open source aspects;
- Selection of tools and technologies for enhancing security aspects of the platform, i.e.: coding conventions or platform management. A requirements document was developed to detail functional and non-functional needs related to the evolution of the platform.

CETIC's role in the project focuses on technological aspects, helping the platform reach a high level of performance and ensuring interoperability and all technical constraints.

PARTNERS

Assess Group sa, SMART – University of Liège

TELECOM

Type of project: Walloon Region – Marshall Plan – Aeronautical and Space Pole (Skywin)
CETIC budget: €219,380
Duration: 2007-2010
CETIC department: Software and System Engineering
Project website: www.skywin-telecom.be
CETIC contact: Gautier Dallons – gautier.dallons@cetic.be

CETICANNUALREPORT2009 - CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

BACKGROUND

The TELECOM project is a research project in the aeronautical enterprise sector (Skywin) whose goal is to increase the economic potential of this sector by developing ways to loosen the constraints to which this market is subjected during innovation phases. TELECOM is a technological answer to the Walloon Region's limitations with respect to this field of expertise.

The project is focused on developing a new generation of embedded and electronic systems such as a new redundant clock. It covers both the essential technological bricks and the research needed to design new generic systems. The project is centred on the use of these new elements in applications and products in order to address the future needs of the aeronautical and space industry, such as safety norms, radiation hardening, etc.

In order to address these new markets, the control of new digital technologies is essential – in particular, certification of their compatibility with civil and military aviation safety regulations. It will also be necessary to obtain concrete results (i.e. demonstrators) that will be used as technological bases for the development and industrialisation of the concrete applications derived from the new needs addressed by this project.

The project is divided into three successive phases. The first phase consists of developing new competences in certification and components in critical environments, supported by two expert centres. The second phase will use this expertise to create new generic technologies, such as synchronisation systems and multimodal interfaces. Based on these technologies, new products will be designed (i.e. new cockpit interface) in the third phase.

CETIC is responsible for establishing an expert centre to support the certification of software components used within embedded systems in aeronautics and that require assurance regarding their safety behaviour. By leveraging this acquired expertise, CETIC will be able to assist companies seeking to certify their product's safety.

KEY RESULTS

The project is based on the creation of two expert centres that make it possible to develop three new technologies that support the creation of new applications. Hence, the main deliverables are:

- Expert centres able to bring essential know-how to the aeronautical markets that may be too expensive for SMEs or large companies due to problems with certification and/or qualification of their components.
- Strong potential and high added-value technologies, including a new system of synchronisation, a new digital platform and multimodal interfaces.
- Short-term marketable products for both targeted niches and a very broad market such as a new redundant clock, a new aeronautical modem and a new cockpit interface.

In 2009, the project completed the activities related to the certification centre. A tool was developed to support this activity, and it was presented at the EUROSPI Conference in Madrid in September 2009.

Through the expertise acquired in this project, CETIC will be able to assist the companies that want to certify one of their products in the field of safety.

PARTNERS

CISSOID, Facultés Universitaires Notre-Dame de la Paix de Namur (FUNDP), GILLAM-FEI, Multitel, Thales Alenia Space ETCA, Thales Communication Belgium, Université catholique de Louvain (UCL), Université de Mons (UMONS), University of Liège (ULg)

WALLOON RESEARCH PROJECTS

3WSA

Wallonia Worldwide Space Applications

Type of project: Walloon Region – Marshall Plan – Aeronautical and Space Pole (Skywin)
CETIC budget: €126,700
Duration: 2007-2010
CETIC departments: Software and Services Technologies, Software and System Engineering
Project website: www.skywin.be/3wsa
CETIC contact: Fabian Steels – fabian.steels@cetic.be

BACKGROUND

The 3WSA project addresses the development of, and experimentation with, technical tools merging state-of-the-art Information and Communication Technologies (ICT) with existing and future infrastructures for space applications, especially GALILEO and GMES. The purpose of the project is to provide decision tools to security agencies and citizens in the areas of public security, environmental issues, mobility and management of natural resources.

The 3WSA project intends to initiate a centre of geomatic services in the Walloon Region, addressing European and even global markets, built on existing infrastructures and providing several industrial and commercial initiatives, namely:

- A reference platform (technical infrastructure and operational structure) for service orchestration in security, the environment, mobility, natural resources and disaster management.
- A European centre for communication of secured and broadband messaging between fixed and mobile entities.
- A European reference centre for management of industrial risks, particularly addressing hazardous sites like SEVESO plants and transportation of hazardous substances.
- A start-up incubator, WSLux, to support Walloon initiatives in space infrastructure.

An example of an application of service orchestration is the selection of satellite photography from a limited zone – e.g. a SEVESO plant – from which a specific service provider will identify the storage tanks and their contents. Then, it should be possible to launch a new service to determine the required security zones and dispersion areas around the tanks according to the risk posed by the substances of concern.

CETIC is participating in the development of the MASS/SSE platform (based on SOA - Services Oriented Architecture), implementing the service orchestration by providing its expertise in the areas of security, certification and billing. CETIC is providing 3WSA its competences in conception and prototyping to upgrade a service platform and add new services. CETIC will transfer the corresponding technologies to its partner, Spacebel.

Thanks to its federative character, the 3WSA project makes it possible for Walloon companies to take a more competitive position with respect to the technological tools necessary to build secured geomatic service platforms.

KEY RESULTS

CETIC's role is to provide its expertise in the areas of security, certification and billing. In each of these 3 domains, CETIC has made a state-of-the-art and developed a prototype to demonstrate the technology.

- Concerning security, various standards where investigated and GEO-XACML, which enabled the association of access rights with geographical areas, was studied in more detail.
- Concerning invoicing, a prototype was made for a service that would manage the establishment of the offer, the recording of the necessary information and the creation of the invoices between the customers and the service providers (and also between suppliers, in the case of composed services).
- Concerning certification, CETIC ensured that only the services that respected the minimum requirements as defined in the Service Level Agreement (SLA) were allowed to be integrated into the platform.

It intends to initiate a centre of geomatic services in the Walloon Region, addressing European and even global markets.

PARTNERS

Agence Prévention et Sécurité (ULg), AMOS, Aquapole, Centre Spatial de Liège (CSL), CREACTION, IONIC Software, SPACEBEL, Vitrociset-EPB, WALPHOT, WSLlux

Under the Sixth and Seventh Framework Programmes designed by the European Commission, CETIC is developing new expertise in future technologies that will improve the daily life of European citizens. These technologies are being developed in close partnership with academic and industry partners through ambitious collaborative projects.

CETIC has been mainly involved in five projects from the Sixth Framework Programme, coordinating two of these: QualOSS and GridTrust.

QualOSS has developed methods and software tools to evaluate the risk for businesses in using open source components and entering into collaboration with the existing contributor communities. GridTrust has developed the technology to manage trust and security for the Next Generation Grids.

CETIC has also increased its grid expertise in other FP6 projects, notably AssessGrid and BEinGRID – project continuing through IT-Tude.com, a cloud web portal CETIC is also partner of.

EUROPEAN RESEARCH PROJECTS

Under the Seventh Framework Programme, CETIC teams are working on two ambitious Integrated Projects: RESERVOIR, concerning service technologies (cloud computing) fundamentals; and DEPLOY, concerning the industrial take-up of a formal engineering method.

In the coming years, CETIC will continue to dedicate significant efforts to FP7 R&D activities in order to foster the transfer of these technologies to Walloon companies (large, small and medium-sized).

CETIC has also contributed to several more specific projects:

- C2A is an INTERREG project. The C2A consortium is designing and developing a generic and intelligent interconnection system for embedded hybrid systems in the transport/logistics sector.
- EXTRA is a CORNET project that delivers to SMEs a set of good practices in software development by using innovative knowledge management techniques.

Setting up European projects is an ideal opportunity to meet new partners and to explore new ideas and new ways of putting them into practice for the benefit of Walloon companies.

ASSESSGRID

Advanced Risk Assessment and Management for Trustable Grids

Type of project: European Commission – FP6 – ICT – Specific Targeted REsearch Project
CETIC budget: €455,110
Duration: 2006-2009
CETIC department: Software and Services Technologies
Project website: www.assessgrid.eu
CETIC contact: Stéphane Mouton – stephane.mouton@cetic.be

CETICANNUALREPORT2009 CETICANNUALREPORT2009 CETICANNUALREPORT2009 CETICANNUALREPORT2009 CETICANNUALREPORT2009

BACKGROUND

The goal of AssessGrid is to address obstacles to wide adoption of grid technologies by bringing risk management and assessment to this field, enabling the use of grid computing in business and society. AssessGrid delivers open source software providing users' estimation and aggregated confidence information for provider selection and fault-tolerance/penalty negotiations, as well as risk assessment methods such as decision support for accepting/rejecting Service Level Agreements (SLAs), price/penalty negotiation, and capacity and service planning.

The project develops and integrates methods for risk assessment and management in all grid layers. The outcomes of the project support all grid actors by increasing transparency, reliability, and trustworthiness, as well as by providing an objective foundation for planning and management of grid activities. Thus, AssessGrid supplies Next Generation Grids and Cloud with innovative components to close the gap between SLAs as a concept and as an accepted tool for commercial grid uptake. Software tools developed to implement SLA negotiation by extending "WS-Agreement" standards can also be used in a Service Oriented Architecture (SOA). Generally speaking, in addition to delivering software components directly usable for grid infrastructure, AssessGrid delivers methods and algorithms for Risk Assessment and Management also usable in SOA, extending possible exploitation of the results of the project to the Internet of Services.

CETIC led one of the project's critical tasks: articulating the project requirements. By providing the AssessGrid requirements, CETIC not only gains expertise in the specificities of grid domain requirements, but also reinforces its know-how offered as services to enterprises. CETIC has also contributed to experimental testing of risk models, notably by collecting data from existing grid infrastructures. CETIC is also involved in the dissemination activities, which strengthens CETIC's experience in this field and contributes to its mission of providing Belgian enterprises with a high level of technical information.

KEY RESULTS

Methods and algorithms developed in AssessGrid are applied and delivered through generic, customisable, and interoperable open source software for risk assessment, risk management and decision support in each grid layer. Following the use-cases defined in the project, AssessGrid software is released in three steps: for the end-user, from a grid service broker's viewpoint, and for all stake-holders.

1. **Risk-aware end-user client**

The first outcome focuses on the end-user perspective. It contains basic mechanisms on risk management and allows negotiation of grid jobs from end-user to several providers through a brokering service.

2. **Risk-enhanced broker service**

In the second phase, the AssessGrid system is enhanced to consider risk management methods, especially for improving analysis performed by the broker service. The risk assessment is based on dynamic data. The software prototype was released in July 2008.

3. **AssessGrid risk management system**

This is the main AssessGrid software outcome: a vertically integrated solution including all planning, monitoring and risk management methods for the grid end-user client, grid broker and grid provider. It further enhances the risk assessment by considering statistical/historical data (like events log), ad-hoc input, and general data on the grid infrastructure (such as human operator availability).

AssessGrid delivers methods and algorithms for Risk Assessment and Management also usable in SOA, extending possible exploitation of the results of the project to the Internet of Services.

PARTNERS

Åbo Akademi , ATOS Origin, Technical University of Berlin, TÜV Rheinland help AG, University of Leeds, University of Paderborn, Wincor Nixdorf GmbH

BEINGRID

Business Experiments in GRID

Type of project: European Commission – FP6 – ICT – Integrated Project
CETIC budget: €1,313,510
Duration: 2006-2009
CETIC departments: Scientific Communication, Software and Services Technologies
Project websites: www.beingrid.eu / www.it-tude.com
CETIC contact: Damien Hubaux – damien.hubaux@cetic.be

BACKGROUND

ICT is evolving toward more widespread use of service-oriented software solutions and the use of private, public or hybrid cloud computing infrastructures. grid infrastructures still play a crucial role in this context by providing high-level services to the user (standard interfaces, security, reliability, optimal resource usage, etc.). The overall concept of grid is to take advantage of distributed resources connected through a network, presenting them as a coherent and scalable infrastructure in order to obtain access to a coordinated set of services.

The mission of Business Experiments in GRID (BEinGRID) is to establish effective routes to facilitate the adoption of grid technologies across the European Union (EU) and to stimulate research into innovative business models using grid technologies.

The project's aims are: to understand the requirements for grid uptake in the commercial environment, involving software vendors, IT integrators, service providers and end users; and to enable and validate the adoption of grid technologies by business.

BEinGRID has undertaken 25 targeted Business Experiments (BEs) designed to implement grid solutions across a broad spectrum of European business sectors, in order to develop and deploy a critical mass of business-oriented pilots with different needs and requirements in terms of technological challenges.

Complementing this work, IT-Tude.com, a web portal dedicated to business use of cloud computing technologies, is now available. This portal contains up-to-date information and best practices to support European businesses with the adoption of these technologies (see page 42).

CETIC's key project responsibilities are:

- Leading the first wave of 18 experiments, involving 70 partners, for a total effort of about 1100 person-months.
- Leading dissemination activities.
- Conducting the security analysis of work packages, business modelling, and content management for the project dissemination portal IT-Tude.com.

KEY RESULTS

The project is reaching its conclusion, having fully achieved its original objectives, while taking market changes, like the transition from grid computing to cloud computing, into account.

The case studies resulting from BEinGRID's 25 Business Experiments are collected in two booklets entitled "BEinGRID: Better Business Using Grid Solutions" and "Approaching the Cloud: Better Business Using Grid Solutions". As dissemination leader, CETIC led the publication process and coordinated the editing of the content across the 25 business experiments. Part of the project's dissemination activities included:

- developing a website;
- designing and producing marketing materials;
- distributing 15 press releases;
- dispatching 7 newsletters;
- organising promotion for 127 events;
- setting up 4 major events;
- producing over 300 articles and publications.

The project produced five "BEinGRID Demonstrators" – promotional materials describing the successful use of the grid within industry settings, from both business and technology perspectives. One was built on CETIC's Business Experiment "Grid for Architects" – it explains how CETIC built a portal offering on-demand grid rendering services, which provided substantial cost-savings to their clients. The demo package contains a key story explaining the business benefits, a set of slides, and a video.

The outcomes of the technical and business transversal support activities have been published in two books available on www.it-tude.com/beingridbooks.html.

CETIC built a portal offering on-demand grid rendering services, which provided substantial cost-savings to their clients.

PARTNERS

Consortium of 98 partners - Core team: ATOS Origin, British Telecom, Centrale Recherche sa, Centro di Ricerca in Matematica Pura ed Applicata, ENEA, the Edinburgh Parallel Computing Centre (EPCC), Fraunhofer SCAI, K.U. Leuven, Logica, National Technical University of Athens, Telefónica I+D, T-Systems, University of Economics and Business of Athens, University of Stuttgart, University of St. Gallen

EUROPEAN RESEARCH PROJECTS

C2A

Connect to All

Type of project: European Commission – Interreg IV
CETIC budget: €327,000
Duration: 2008-2012
CETIC department: Embedded and Communication Systems
CETIC contact: Lotfi Guedria – lotfi.guedria@cetic.be

BACKGROUND

C2A is a cross-boarder cooperation project between the Walloon Region and France, targeting the transport and logistics sectors. The project idea started from a general observation about ICT usage in transport vehicles. The number of embedded communicating devices has significantly increased over time. Systems include mandatory devices such as the digital tachograph as well as radio communication systems (GSM/GPRS), localisation devices (GPS), data loggers, PC tablets, cameras, mobile phones, on-board computers, etc.

These devices and their associated services represent a substantial investment. Although they are intended to automate processes and offer significant added value and an economic return, their technology exploitation is sub-optimal in actual practice, and usually communication and resource sharing among systems is very limited. This results in feature redundancy, service duplication, and sub-utilisation of deployed hardware and software resources.

To address this issue, the C2A project will design, develop and implement a generic and intelligent interconnection system for embedded hybrid equipment, enabling more interoperability and efficient resource sharing. The system should have a flexible architecture that allows efficient data handling from a wide range of devices, sensors and communication interfaces.

The project is structured around two main actions:

- A research and development (R&D) action, focusing on the design of the innovative embedded system (hardware and software);
- A dissemination and communication action, whose objective is to implement a structured and interactive platform involving both ICT service companies and transport and logistics operators.

CETIC is focusing on the R&D action of the project. The work entails developing specifications, defining relevant use cases and implementation scenarios, and designing and prototyping a flexible, open and upgradeable architecture.

KEY RESULTS

In February 2009, we organised our first annual workshop dedicated to discussing and validating the need for more interoperability between embedded devices in the transport sector.

In addition, in order to well prepare the specifications and the development, we studied, analysed and conducted research on a wide range of commercially available equipments. We classified these devices based on relevant criteria regarding their targeted utilization.

Furthermore, we studied several national and European transport research projects – focusing mainly on system architecture – in order to identify state-of-the-art achievements relevant to our project.

We also defined several implementation scenarios that were discussed during a working group in September, which was attended by several industrial and academic participants.

The system architecture of the C2A concept has been established, and future work will focus on real demonstrators of seamless dynamic recognition and interconnection between hybrid embedded devices.

C2A project will design, develop and implement a generic and intelligent interconnection system for embedded hybrid equipment, enabling more interoperability and efficient resource sharing.

PARTNERS

Carinna, CReSTIC/URCA, Docledge, Forem, Gunnebo, INFOPOLE Cluster TIC, Monnier Borsu Sotradel, NeXXtep Technologies, Smolinfo

CETICANNUALREPORT2009 CETICANNUALREPORT2009 CETICANNUALREPORT2009 CETICANNUALREPORT2009 CETICANNUALREPORT2009

DEPLOY

Type of project: European Commission – FP7 – ICT – Integrated Project
CETIC budget: €829,776
Duration: 2008-2010
CETIC department: Software and System Engineering
Project website: www.deploy-project.eu
CETIC contact: Christophe Ponsard – christophe.ponsard@cetic.be

BACKGROUND

DEPLOY is a European Commission (FP7) research project that will promote the use of formal methodology in European industry and develop industrially scalable formal methods. DEPLOY is a technological response to the increasing complexity of engineering systems and to our increasing dependence on automated systems for critical tasks, notably in safety-critical contexts.

The overall aim of DEPLOY is to make major advances in industrial practices of engineering dependable systems through the deployment of formal engineering methods and tools.

Industries are facing the challenge of mastering the development of ever more complex systems with ever higher levels of assurance. Formal engineering methods provide an answer to this challenge through precise modelling of the system, powerful reasoning support for those models (using automated analysis tools such as theorem provers and model checkers), and then exploitation in domain-specific models and code generation.

Industries are increasingly considering formal engineering methods, and DEPLOY aims to overcome problems of integrating these methods into industrial development lifecycles and to present evidence of their overall efficiency and benefits in order to facilitate their adoption.

Throughout the lifetime of the project, DEPLOY methods and tools are intensively deployed in real industrial settings by the industrial partners in order to test them against the industrial imperatives of cost-effectiveness, scaling and ability to cope with the evolution of requirements. The industrial deployment is in five sectors, each of which is key to the future of European industry and society: automotive, rail transportation, space systems, telecommunications and business information. Each deployment sector is led by a partner who is a major player in that sector.

The rich and complementary mix of expertise concerning engineering challenges from the industrial deployment partners, together with the extensive technology base of the academic partners and service providers, comprises a consortium that is unique in Europe, and indeed internationally, and that is ideally suited to addressing DEPLOY's aims.

CETIC's responsibility in the project is to quantify the benefits gained by the deployment of formal methods in industry. This assessment is particularly critical, as it will be the main motivation for additional industrial players to deploy formal methods. To this end, CETIC must first propose concrete measures that can provide such evidence, and then evaluate the improvement in practice for industrial partners that deploy formal methods.

KEY RESULTS

In 2009, CETIC produced a rich set of evidence supporting the claim that formal methods provide substantial benefits when deployed in industrial settings. This evidence was developed by first identifying the concrete needs of DEPLOY's industrial partners through interviews. From these interviews, industrially relevant evidence was selected, and the evidence was then organised in a structured taxonomy for ease of use.

Latest developments include translating the set of evidence, together with its structured taxonomy, into Frequently Asked Questions (FAQ), where managers, engineers and other workers from industry can easily find answers to their questions regarding the effectiveness of formal methods in industry.

DEPLOY aims to overcome problems of integrating these methods into industrial development lifecycles and to present evidence of their overall efficiency and benefits in order to facilitate their adoption.

PARTNERS

Bosch, Clearsy, ETH Zurich, Newcastle University, SAP, Siemens Transportation Systems, Space System Finland, University of Southampton, Systerel, University of Düsseldorf

EUROPEAN RESEARCH PROJECTS

EXTRA

Experience Transfer and Knowledge Management in SMEs Developing and Delivering Software Products

Type of project: European Commission/Walloon Region – CORNET
CETIC budget: €300,000
Duration: 2008-2010
CETIC department: Software and System Engineering
Project website: www.cornet-extra.eu
CETIC contact: Sanae Saadaoui – sanae.saadaoui@cetic.be

BACKGROUND

EXTRA's main goal is to help European SMEs active in software development and delivery to improve their practices in order to increase their competitiveness at the European and international levels. This will be achieved by helping SMEs capitalise on previous experiences using adapted knowledge management approaches.

The EXTRA project was launched in April 2008. Using the Action Research Methodology, the project aims to produce a set of methodological practices for SMEs. This methodology is based first of all on theoretical research in the Knowledge Management (KM) field. Secondly, it uses feedback from SMEs on knowledge transfer and knowledge management. The outcome of the project will be a handbook consisting of a set of tools: knowledge management techniques, templates and training material. The techniques and tools are being specially developed to meet the needs of SMEs.

As a key partner in the EXTRA project, CETIC has several roles:

- Leading the work package related to the requirements and needs of the SMEs.
- Leading the work package related to the development of the toolset.
- Taking an active part in the validation and exploitation tasks.
- Making use of CETIC's expertise in process assessment and improvement methods.

KEY RESULTS

In 2009, the participating SMEs validated the first version of the handbook.

This validation was conducted in two ways:

- The SMEs commented on the descriptions of the knowledge management techniques;
- Some SMEs implemented a knowledge management technique and then provided feedback for improvements.

The feedback from the participating SMEs was analysed, synthesised and then integrated into the second version of the handbook. In addition, some new techniques were suggested and integrated into the handbook. The training material was updated at the same time.

The participating SMEs validated this second version of the handbook. A new knowledge management technique called "World Café" was used to conduct the SMEs' validation. The technique aims at "awaking and engaging collective intelligence through conversations about questions that matter". Concretely, groups of participants are formed to discuss selected issues during a brief period of time (10 to 15 minutes). Then, the participants form new groups that discuss the same issues. This technique produces new insights on the issues being discussed.

A self-assessment tool was developed to help SMEs evaluate their knowledge management practices and choose the most suitable knowledge management techniques. The assessment chapter and tool are under the responsibility of CETIC, which has recognised expertise in software process assessment methodologies.

A variety of papers and newsletters were published to disseminate the results.

EXTRA aims to help European SMEs active in software development and delivery to improve their practices in order to increase their competitiveness at the European and international levels.

PARTNERS

CITEA, IKT Norway, Intelliscape, SINTEF, Virtual IT

CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009

GRIDTRUST

Trust and Security for Next Generation Grids

Type of project: European Commission – FP6 – ICT – Specific Targeted Research Project
CETIC budget: €540,697
Duration: 2006-2009
CETIC department: Software and System Engineering
Project website: www.gridtrust.eu
CETIC contact: Philippe Massonet – philippe.massonet@cetic.be

BACKGROUND

GridTrust is a European project from the Sixth Framework Programme coordinated by CETIC. The overall objective of the GridTrust project is to develop technology to manage trust and security for the Next Generation Grids (NGG). The project proposes a vertical approach for tackling issues of Trust, Security and Privacy (TSP) from the requirements level down to the application, middleware and foundation levels. CETIC has contributed to the development of models and tools to assist in reasoning about TSP properties across the entire architecture.

The GridTrust consortium involves a large panel of industrial partners, end users, SMEs and European research groups, covering requirements for engineering, grid technology and security, among other issues.

Moviquity, HP and Interplay have provided important case studies for the validation of the GridTrust framework, including innovative applications such as inter-enterprise knowledge management and distributed authoring. Moviquity and De Agostini have committed to the implementation and exploitation of the results of the project's middleware and foundation levels. GridTrust's main output is a framework consisting of the following elements:

1. A methodology and an interactive execution environment to help grid service requestors and providers to express and reason about trust, security and privacy properties for different kinds of Virtual Organisation (VO) topologies, taking aspects such as self-organisation, self-management, self-adaptation and evolvability into account.
2. A reference grid security architecture, including an autonomic policy management for fine-grained usage control of grid resources.
3. An open source reference implementation of trust and security management systems, validated by scenarios in the business domain.

The resulting tools are generic and can be validated on innovative applications from a variety of application sectors.

These tools are compliant with the Open Grid Services Architecture (OGSA) and are not specific to the applications considered in the GridTrust project.

CETIC has coordinated the project and remains actively involved in the tasks related to the specification of trust and security requirements and the derivation of trust and security policies based on formal modelling and model transformation technologies.

KEY RESULTS

The results of the GridTrust project have the real world potential to allow companies to set up and operate virtual organisations that are secure and trusted. The approach provides tools for designing security and trust requirements into the virtual organisation. Virtual organisations can enable companies to provide and access grid resources in order to achieve common goals. Virtual organisations are also valuable in the larger context of Service Oriented Architectures to set up virtual markets. The GridTrust framework has already been implemented by several project partners. The industrial partners are exploiting the project results in their products and business lines. By benefiting from the GridTrust framework to securely tap the potential of distributed computing and storage resources, the SMEs of the Walloon region have the opportunity to obtain a competitive advantage.

The results of the GridTrust project have the real world potential to allow companies to set up and operate virtual organisations that are secure and trusted.

PARTNERS

Consiglio Nazionale delle Ricerche, De Agostini, HP Innovation, Interplay, Moviquity, Science and Technology Facilities Council, Vrije Universiteit Amsterdam

IT-TUDE.COM

Type of project: European Commission – FP6 – ICT – Integrated Project – Part of BEinGRID
CETIC budget: €2,500/year
CETIC department: Software and Services Technologies
Project website: www.it-tude.com
CETIC contact: Michaël Van de Borne – michael.vandeborne@cetic.be

BACKGROUND

The BEinGRID project (see page 37) produced a large amount of technical outcomes, such as demonstrators and components, available for industry.

IT-Tude.com, a consortium composed of previous BEinGRID partners was formed. These are ATOS Origin, the Edinburgh Parallel Computing Centre (EPCC), the National Technical University of Athens (NTUA) and CETIC, as the director of the initiative.

IT-Tude.com connects emerging ICT research with business solutions and offers your organisation the opportunity to use this new and dynamic online platform for your own outreach.

CETIC is coordinating IT-Tude.com and, in this context, is helping Belgian SMEs with grid and cloud technology developments, which can benefit them.

IT-Tude.com covers the newest and most promising technologies and services: cloud and grid computing, virtualisation, Software as a Service (SaaS), and more.

IT-Tude.com delivers:

- Use-cases to relate to your business needs, especially for the SME.
- Neutral and dependable analysis to provide you with better advice
- Technology expertise to fulfil your IT side of operations.
- Emerging services and technologies to highlight future research.
- Links and online visibility that lets your organisation jump on board of IT-Tude.com.

Let us focus on the latter: anyone can contribute to IT-Tude.com. As you submit content related to your organisation's research or business focus, we offer you online visibility that can be updated as you see fit. This participation makes IT-Tude.com distinct from the rest: we connect content with those involved, providing further service in expanding your network, while keeping the site rich with content, both from our end and yours.

This way, on the one hand, businesses gain visibility in the market by promoting their IT offering and research areas and, on the other hand, the IT-Tude.com website keeps on delivering up to date information in such technologies. This win-win situation prevents the website from becoming obsolete as IT evolves. Moreover, this provides CETIC with an important way of disseminating its services to Belgian SMEs and, more widely, to other European organisations.

KEY RESULTS

The new IT-Tude.com website was launched in November 2009.

Multiple organisations were federated to become content partners of IT-Tude.com.

IT-Tude.com was promoted in major conferences (ICSOC/Servicewave, FIA, Digibiz, etc.) and a marketing campaign was conducted on the web (forums, blogs, banners, etc.).

CETIC is coordinating IT-Tude.com and, in this context, is helping Belgian SMEs with grid and cloud technology developments, which can benefit them.

PARTNERS

ATOS Origin, the Edinburgh Parallel Computing Centre (EPCC), the National Technical University of Athens (NTUA)

CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009

QUALOSS

QUALity of Open Source Software

Type of project: European Commission – FP6 – ICT – Specific Targeted REsearch Project
CETIC budget: €799,465
Duration: 2006-2009
CETIC department: Software and System Engineering
Project website: www.qualoss.eu
CETIC contact: Jean-Christophe Deprez – jean-christophe.deprez@cetic.be

BACKGROUND

QualOSS is developing a methodology to assess Free and Open Source Software (F/OSS) endeavours. In particular, the standard QualOSS assessment method evaluates the robustness (capability to handle problems) and the evolvability (ability to remain viable in the long term) of F/OSS endeavours. These two aspects are very important for making informed decisions before integrating a F/OSS component (or a new version of a F/OSS component) in products, services or infrastructure. Indeed, organisations should trust only F/OSS endeavours they consider to be robust and evolvable; otherwise, they run the risk of wasting time and effort learning and integrating F/OSS components that will soon become obsolete.

Besides using the QualOSS methodology to develop a smart F/OSS acquisition programme, companies may also use it to monitor their own software development endeavours. For example, it is possible (with minimal effort) to tailor the standard QualOSS assessment method to evaluate internal proprietary software projects. In particular, the QualOSS platform that uses the QualOSS methodology will perform automated measurements on data repositories from tools often used by F/OSS projects, such as CVS, Subversion, GIT, Bugzilla, and Sourceforge Tracker but connecting proprietary tools often used in the software industry is definitely feasible.

KEY RESULTS

In the first quarter of 2009, QualOSS created an initial complete version (v1 release candidate) of the Standard QualOSS Assessment Method (Std QAM). The applicability of the method was shown through the assessment of two open source projects, FindBugs and K3b. Subsequently, the Std QAM was fine-tuned, based on the experience gathered from additional assessments of Evolution, Eclipse Platform, Evince, and other F/OSS.

Effort in 2009 focused primarily on solving the problem encountered with the prototype built in 2007. Based on the lessons learned, the QualOSS methodology is now flexible and imposes rigour when conducting assessments. In particular, it is designed to adapt to many F/OSS acquisition situations and to make the recording of information obligatory to guarantee a high degree of traceability in assessment results. This is achieved by splitting the methodology from the assessment methods. The QualOSS methodology consists of a framework of requirements that assessment methods must satisfy. The standard QualOSS assessment method was built to fulfil these requirements. Furthermore, it addresses the other weaknesses of the prototype. First, it clearly identifies specific questions that an assessment answers, which makes assessment results easier to understand. Second, the standard QualOSS assessment method imposes a workflow to better orchestrate an assessment. As a consequence, the synchronisation of datasets measured in an assessment is performed a priori.

In parallel to the R&D effort, an initial set of three industrial case studies was identified. The initial studies want to verify whether the standard QualOSS assessment method can be used, first of all, by AdaCore to assess F/OSS endeavours corresponding to different versions of the GCC backend, second, by Océ Software Laboratories to determine whether to integrate the lpr client from yanolc in one of its products or whether to re-implement it from existing OSL internal components, and third, by Freecode to identify how to better collaborate with the Asterisk developer community.

The standard QualOSS assessment was tested on various F/OSS endeavours and also on the initial set of case studies. Subsequently, the measures and indicators were adjusted until an initial version of the standard QualOSS assessment method was frozen around June 2009. In the second half of 2009, the QualOSS platform was made more robust. Furthermore, validation on two additional real world case studies was performed to check whether the results satisfied the user and whether or not the user found them profitable (i.e. whether the information gained from the results was worth the effort to obtain the results).

QualOSS is developing a methodology to assess Free and Open Source Software (F/OSS) endeavours.

PARTNERS

AdaCore, Facultés Universitaires Notre-Dame de la Paix de Namur (FUNDP), Fraunhofer IESE, Maastricht Economic and Social Research and Training Centre on Innovation and Technology (MERIT), PEPITe, Universidad Rey Juan Carlos, ZEA Partners

RESERVOIR

REsources and SERvices Virtualisation withOut BarrIeRs

Type of project: European Commission – FP7 – ICT – Integrated Project
CETIC budget: €494,827
Duration: 2008-2011
CETIC departments: Software and Services Technologies, Software and System Engineering
Project website: www.reservoir-fp7.eu
CETIC contact: Philippe Massonet – philippe.massonet@cetic.be

BACKGROUND

The RESERVOIR project (REsources and SERvices Virtualisation withOut BarrIeRs) will provide a foundation for a service-based online economy, in which – using virtualisation technologies – resources and services are transparently provided and managed on an on-demand basis at competitive prices and with high-quality service. The project consortium is coordinated by IBM Haifa Research Lab, and includes a good balance of industry and academia.

Cloud computing allows data centres to operate more like the Internet by enabling computing across a distributed, globally accessible fabric of resources, delivering on-demand services over the Web, reducing software complexity and costs, expediting time-to-market, improving reliability and enhancing the accessibility of government and business services for consumers. Thus, cloud computing represents a true materialisation of Service Oriented Computing's (SOC) visionary promise.

In RESERVOIR, we are developing breakthrough systems and service technologies that will serve as the infrastructure for cloud computing. However, conditional to SOC's wide-scale penetration of the economic landscape, the ICT industry needs to solve several well-recognised technical challenges. One key challenge is the development of a scalable and effective service oriented infrastructure.

This is the challenge addressed by RESERVOIR.

The vision of RESERVOIR is to enable the delivery of services on an on-demand basis, at competitive prices, and without requiring a large capital investment in infrastructure.

The Service Oriented Infrastructure (SOI) Equation

To accomplish the vision, our work will extend, combine and integrate three technologies: virtualisation, grid computing and Business Service Management (BSM). We believe this approach can deliver ubiquitous utility computing by harnessing the complementary strengths of these technologies. Virtualisation technology has been shown to be useful in overcoming some barriers to commercial adoption of grid technology. On the other hand, RESERVOIR will add virtualisation-awareness to the grids, by using low-level monitoring information for metering and billing.

To benefit fully from the dynamic nature of the RESERVOIR computing cloud, the project is developing a uniform policy-driven management layer that will automatically allocate resources to services and monitor execution and utilisation to ensure compliance to Service Level Agreements (SLA) by adjusting the level and location of resource allocation. The new capabilities of the infrastructure will enable us to explore new allocation policies, optimising over a range of parameters (e.g. the reduction of power consumption) that is more comprehensive than what is commonly used today.

CETIC is the dissemination activity leader and is in charge of analysing threats, defining security architecture, and implementing security solutions for the RESERVOIR infrastructure.

KEY RESULTS

The main outcome of the project will result in an architecture for a flexible, secure and scalable service-oriented infrastructure together with a reference implementation. This implementation will be based on open standards and new technologies for the provision of on-demand services. These scenarios will illustrate the significant and measurable improvements in productivity, quality, availability, reliability and cost of service delivery.

During the second year of the project, the whole RESERVOIR stack from top to bottom was integrated, and the RESERVOIR framework was created to make it easier for the European community to take advantage of RESERVOIR artefacts.

The RESERVOIR vision is to enable the services delivery on an on-demand basis, at competitive prices and with guaranteed quality.

PARTNERS

Elsag Datamat, IBM Haifa Research Lab, SAP Research, Sun Microsystems, Telefónica Investigación y Desarrollo, Thales, The Open Grid Forum E.E.I.G. Standards Organisation, Universidad Complutense de Madrid, University College of London, University of Lugano, University of Messina, University of Umeå

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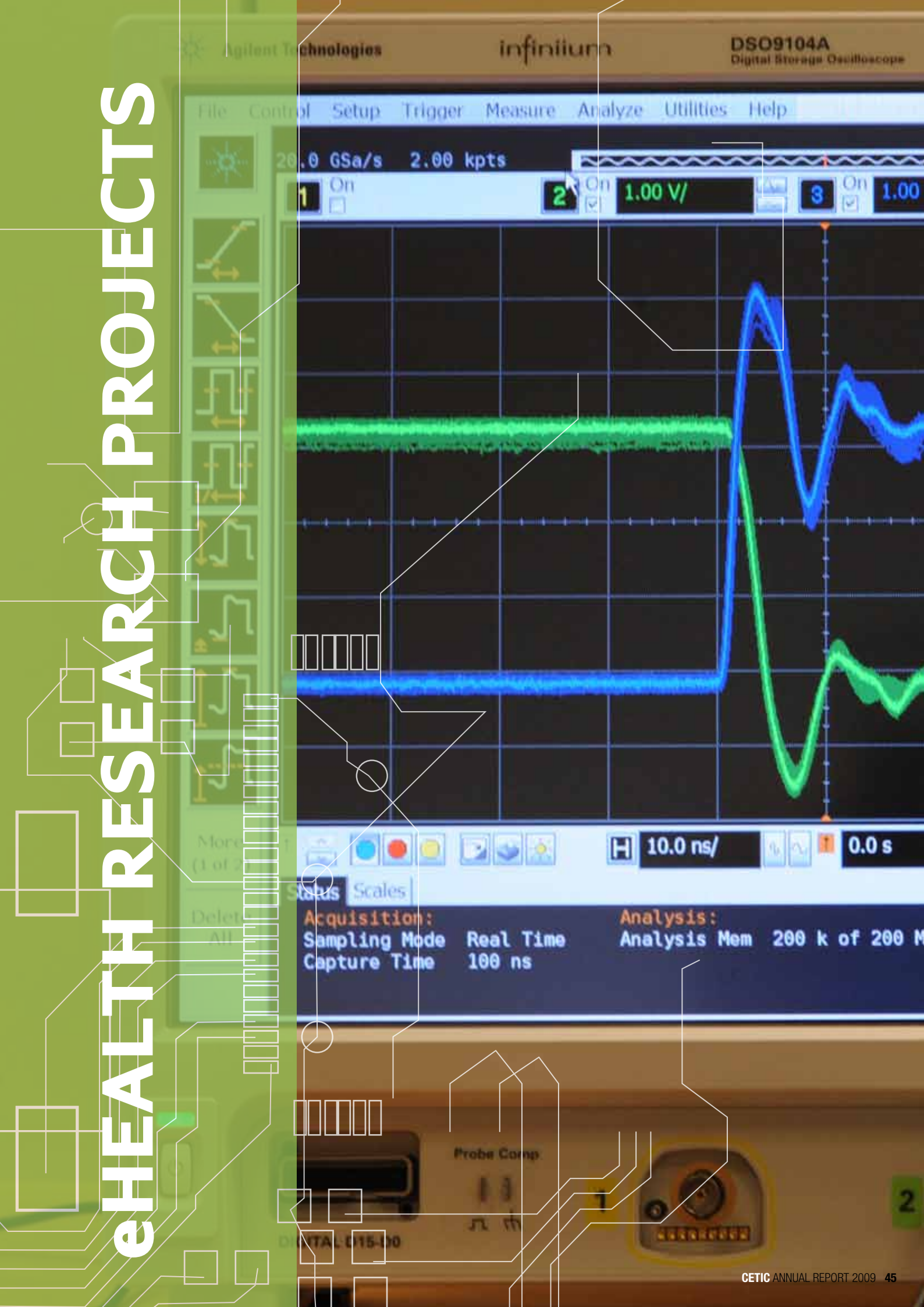
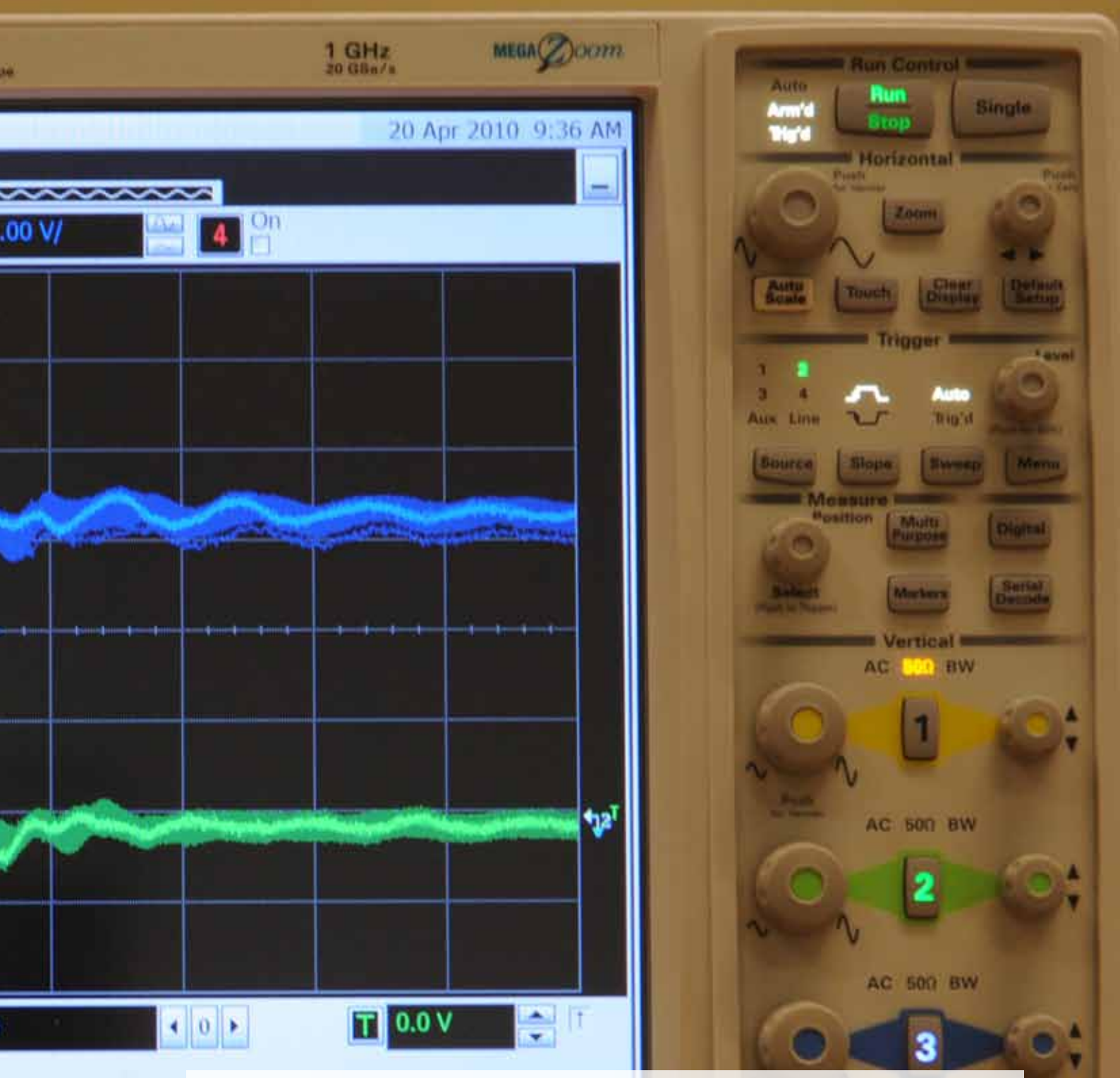
eHEALTH RESEARCH PROJECTS





CETIC is involved in several research projects focused on eHealth.

The Health sector is faced with challenges related to the ageing of the population and to the increased incidence of chronic diseases, which entail high costs for domestic Social Security systems. These changes, and the decrease in the number of health specialists, underline the need for adequate solutions and innovative processes.

Thanks to its growing expertise in eHealth solutions, CETIC is coordinating a regional project eHealth for Citizens. This project will contribute technological solutions to assist homecare and to monitor diseases from home. It aims to provide a platform that delivers specialised services to help with patient care.

CETIC is also participating in the OLDES European project, which is focused on new home technologies for older people. This project aims to use technologies to reduce older people's isolation and, at the same time, to promote new communication channels to enable interactivity among seniors.

In addition to this, CETIC is coordinator of the PONTE European project. Medical trials are a means for validating new drugs that can treat new diseases or disorders. This project will enable a service-oriented platform to be established. This new tool will make intelligent and automatic identification possible for individuals who are participating in clinical trials.

eHEALTH FOR CITIZENS

Type of project: Walloon Region – FEDER – Objective of Convergence
CETIC budget: €1,205,509
Duration: 2009-2013
CETIC departments: Embedded and Communication Systems, Software and Services Technologies, Software and System Engineering
CETIC contacts: Gautier Dallons – gautier.dallons@cetic.be
Sébastien Rousseaux – sebastien.rousseaux@cetic.be

BACKGROUND

This project is a technological response to the challenges created by the evolution of health care. The health sector is currently facing a major evolution in the world's population: the ageing population, combined with the increased incidence of chronic disease, are changing the way health care is provided. The shortage of specialists, combined with this global population evolution, are catalysing the search for new solutions. The project's primary goal is to design a technological service-oriented platform to address this issue.

The key objective is to enable, enhance and support technological evolution to facilitate the care of patients in their homes. The project focuses on providing specialised services that are customised to match patient healthcare needs, such as monitored services. The platform will offer great opportunity for achieving better quality medical care, while providing new added-value services in the eHealth market.

The project addresses a variety of research topics:

- **Management of a multimodal user interface adapted to the patient:** this research activity is focused on the development of a new Graphical User Interface (GUI) to exploit multi-modalities that are customized according to the capacities of the patient.
- **Service composition:** this research topic studies the mechanisms of service composition in order to automatically provide improved and integrated services to the patient.
- **Communication protocol design:** this study focuses on the design of an interoperable protocol for sharing information between medical devices and the platform.
- **Security and certification:** various mechanisms must be implemented to secure the platform and to promote confidence in its services.
- **Data integration:** the consolidation of medical data is a key challenge in providing new specialised services for the patient (like detection of a fall or an emergency).
- **Legal constraints:** as medical records are sensitive data, this research topic focuses on the legal requirements that the platform must meet.

Based on the results of these research activities, validation scenarios will be implemented to demonstrate the achievements. Demonstrators will focus on three main health care cases:

- Diabetic patients;
- Epileptic patients;
- Patients suffering from multiple pathologies.

Demonstrators will include medical devices that collect medical records. Based on their data, patients will receive a specific composition of services to help them implement their health care management. For example, in the case of diabetic patients, this could be a 'food at home' service, based on a medical service specifying the diet and an added-value service providing food at home.

CETIC is in charge of the project coordination and the research items related to service composition, security and communication protocol design. Furthermore, CETIC is responsible for the deployment of the demonstrator scenarios.

KEY RESULTS

CETIC collected the requirements for the first versions of the demonstrators and conducted state-of-the-art studies on service composition techniques and eHealth platforms.

The key objective is to enable, enhance and support technological evolution to facilitate the patient care at home.

PARTNERS

Facultés Universitaires Notre-Dame de la Paix de Namur (FUNDP), ImmuneHealth, Multitel, Université catholique de Louvain (UCL)

OLDES

Older People's e-Services at Home

Type of project: European Commission – FP6 – ICT – Specific Targeted REsearch Project
CETIC budget: €555,360
Duration: 2007-2009
CETIC department: Embedded and Communication Systems
Project website: www.oldes.eu
CETIC contact: Sébastien Rousseaux – sebastien.rousseaux@cetic.be

CETICANNUALREPORT2009 - CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009CETICANNUALREPORT2009//

BACKGROUND

In the next few years, due to the ageing of the population, Europe and the rest of the world will have to cope with significant challenges in supporting elderly persons and providing them with quality healthcare services.

The OLDES project started in January 2007 with two main objectives for improving the quality of life of elderly persons living at home. The first objective of the OLDES project is to develop IT solutions to improve this quality of life – more precisely, the aim is to develop a low-cost computer-based digital companion connected to a television to enable an elderly person to access online services easily. The project is focusing on home health telemonitoring with wireless medical devices (glucometer, pulse oxymeter, sphygmomanometer, weight scale, and electrocardiogram) and interactive online entertainment. Users can access online news, videos and audio content and are able to communicate easily using modern Internet-based Voice Over Internet Protocol (VOIP) communication technologies. The OLDES system includes an online discussion group led by facilitators who encourage interest and solicit reactions from participants. The second objective is to ensure the optimal exploitation of the project results by focusing on engaging all of the stakeholders in the co-construction of the system to guarantee that all of their needs are taken into account and to ensure the acceptance of the final project results.

Starting in October 2009, two 12-month pilots were deployed in Bologna and Prague to evaluate the OLDES technical solution and to assess the final acceptance of the system, the improvement to the quality of life of the elderly persons, and the economic impact of such systems in Bologna and Prague. The Bologna pilot focuses on the assessment of the entertainment system with 100 elderly persons and 10 elderly persons suffering from a chronic disease. The Prague pilot validates the health telemonitoring system with 20 diabetic patients.

The OLDES project has a high potential for exploitation and valorisation. Indeed, the system helps elderly persons live longer at home and helps reduce hospitalisation stays. The system also significantly reduces travel costs for the medical and paramedical staff, because they are able to monitor the health of the elderly persons remotely. The new communication and entertainment mechanisms designed and developed in the project help improve quality of life by reducing the elderly persons' feelings of loneliness.

The development of eHealth solutions for elderly persons concerns many companies and public institutions in the field of homecare services, hospitals (public or private) and doctors, and organisations involved in medical device development, health informatics, and health insurance. All of them could benefit from the innovative platform and the expertise developed through the OLDES project.

In July 2009, CETIC started a 5-year regional research project in Belgium's Walloon Region, called "eHealth for Citizens", in order to evaluate, implement and deploy an eHealth service-oriented infrastructure based on the expertise built through the OLDES project (for more information see page 47).

As key partner in the OLDES project, CETIC leads the work package related to the platform development; collects the user and system requirements; and develops the platform specifications. CETIC also develops the health telemonitoring system and the entertainment system, using its extensive expertise in wireless technologies and embedded hardware and software development.

KEY RESULTS

In 2009, the work focused mainly on improving the functionalities of the platform and adding new services according to the results of the technical tests. As a result of these developments, a stable OLDES system was produced, ready to be deployed in the homes of elderly persons. During the summer, we organised the first pilots: 90 elderly persons have been enrolled for the Bologna pilot. OLDES systems began to be deployed in the homes during the last quarter of 2009.

OLDES develops IT solutions to improve elderly persons' quality of life at home.

PARTNERS

Agentscape, Bologna Health Authority, Bologna University, CUP2000, ENEA, INK Media, Municipality of Bologna, Technical University of Prague, University of Charles, University of Newcastle

PONTE

Efficient Patient Recruitment for Innovative Clinical Trials of Existing Drugs to Other Indications

Type of project: European Commission – FP7 – ICT – Specific Targeted REsearch Project
CETIC budget: €694,875
Duration: 2010-2013
CETIC departments: Software and Services Technologies, Software and System Engineering
CETIC contacts: Joseph Roumier – joseph.roumier@cetic.be
Philippe Massonet (coordinator) – philippe.massonet@cetic.be

BACKGROUND

Due to the global economic crisis, which is impacting pharmaceutical research, new research funding is being reduced and existing medications are being re-positioned for new uses and applied to new diseases and disorders.

However, expected benefits may be limited by the presence of side effects, and new efficacies may be missed in the trials. Translation into clinical therapy must also overcome barriers at the pre-clinical and clinical levels. Thus, bridging basic science to clinical practice comprises a new scientific challenge which can result in successful clinical applications with low financial cost.

PONTE aims at providing a platform following a Service Oriented Architecture (SOA) and Semantic approach that will offer semi-automatic intelligent identification of patients eligible to participate in well-specified clinical trials for drug re-positioning, with particular focus on mitigating patient safety risks, reducing clinical trial costs, and improving clinical trial efficacy. Work in this direction involves decision support mechanisms fed with information retrieved from a semantic search engine – with the search engine operating on top of a data representation, linking data in drug and disease knowledge databases, clinical care and clinical research information systems.

CETIC has three key responsibilities in the PONTE project:

- As coordinator of the project, CETIC is responsible for the overall management with a focus on quality assurance tasks.
- Standardisation activities: continuous interaction between the activities of eHealth-related international standards, and particularly in the area of semantic interoperability between clinical research and clinical care information systems, and the international standardisation activities.
- Data representation and organisation: semantic data and metadata representations for clinical trials, in order to support interoperability of clinical care information system data, enabling search, data mining and advanced machine learning across clinical care information systems following an SOA approach.

KEY RESULTS

PONTE will provide four main outcomes:

1. Consistent linking of clinical research information systems with clinical care information from Electronic Health Records (EHRs) through the development of a Semantic Specification Language. An innovative Ontology-Based Search Engine able to mine information based on this semantic data representation. Development of mechanisms that automatically identify the semantic information of schemas and detect semantic relationships between the distributed databases' constructs. Combination of ontology-driven data integration and text mining techniques to enable the mining of information required from the various heterogeneous data sources involved.
2. Integration of a wide spectrum of existing clinical data standards into an innovative core ontology-driven scheme that encompasses the entire clinical research and clinical care processes within the PONTE objectives. As scalability is considered to be of major importance, the proposed platform will be implemented following the SOA concepts.
3. Advanced authentication and data confidentiality techniques will be incorporated, and usage control techniques will be explored for providing access control services as well as privacy protection services.
4. Current legislation related to access and use of patient health data for the purposes of the PONTE platform (among other legal issues) will be studied and will guide the PONTE architecture through the duration of the project.

PONTE aims at providing automatic intelligent identification of patients.

PARTNERS

CNR, CUH, ICCS/NTUA, IoPR, LUH, NKUA, SMI, TUD

STRUCTURED COLLABORATIONS

STRUCTURED COLLABORATIONS

RESEARCH IN THE WALLOON REGION

CETIC research teams are actively collaborating with the following academic laboratories:

- The Communications and Remote Sensing Laboratory (TELE), the Microelectronics Laboratory (DICE) and the Department of Computer Science and Engineering (INGI) at the Université catholique de Louvain (UCL - www.uclouvain.be).
- The Faculty of Computer Science at the Facultés Universitaires Notre-Dame de la Paix de Namur (FUNDP - www.fundp.ac.be).
- The Computer Science and Management Group at the Faculté Polytechnique at the Université de Mons (UMONS - www.fpms.ac.be).
- The Computer Science Institute at the Université de Mons (UMONS - www.umh.ac.be).
- The Embedded Electronics research unit at the Université Libre de Bruxelles (ULB - www.ulb.ac.be).

CETIC is a founding member of Accord Wallonie (www.accord-wallonie.be), the association of Walloon research centres, and participates in the work and events organised by it. Through this association, CETIC participates in many bilateral exchanges and cooperative projects with other research centres and universities active in the Walloon Region.

With Cenaero (www.cenaero.be), the Centre for Aerospace Research, CETIC established a computer centre that is unique in that it provides equipment from both organisations for high performance. Cenaero and CETIC form an outstanding team at the European level, which is at the service of research activities and businesses.

ENTERPRISE NETWORKS

CETIC is an active member and representative of the Board of Administrators of the association INFOPOLE Cluster TIC (www.infopole.be), the network of partners for information systems in the Walloon Region, with more than 150 members. In 2008, CETIC and INFOPOLE Cluster TIC signed a partnership agreement to structure collaboration between the two organisations.

Since 2009, CETIC has been collaborating closely with the new Microsoft Innovation Center (MIC - www.mic-belgique.be), located in Mons, by acting as key R&D partner, particularly in the eHealth area. Moreover, CETIC is a member of the MIC's Scientific Advisory Board.

CETIC has also reinforced its involvement in the Marshall Plan (www.polesdecompetitivite.eu) through strong participation in R&D calls launched by the competitiveness clusters by the end of 2008.

INTERNATIONAL COLLABORATIONS

CETIC and CITI – the Innovation Centre for Information Technology, Department of Public Research Centre Henri Tudor based in Luxemburg (www.tudor.lu) – have developed a strategic collaboration to establish a European centre of excellence in quality services and software products to companies in the Benelux region.

CETIC and the Ecole de Technologie Supérieure (www.etsmtl.ca - Montréal, Canada) have established a network of international experts in software engineering to help very small enterprises (0 to 25 employees) active in software development. Both institutions – participants in the International Organisation for Standardisation (ISO) on system and software engineering – are collaborating to help SMEs by providing training materials, including guides for improving software practices.

CETIC is a member of the European Technology Platform NESSI (Networked European Software and Services Initiative, www.nessi-europe.com) and participates in four working groups: software engineering, trust and security, service engineering and service-oriented infrastructure. CETIC also works with ARTEMIS (https://www.artemis-ju.eu), the technological platform on embedded systems.

In the field of software quality, CETIC has also entered into a partnership with Océ Software Laboratories Namur, Kalistick, Respect-IT, REVER sa and Idéo Technologies.

OTHER PARTNERS

CETIC is also a partner with Innovatech (www.innovatech.be), promoting innovation in the Walloon Region. With the support of universities and research centres, Innovatech offers technological and legal advice to companies. It informs, educates and supports companies to facilitate the process of technological innovation. CETIC works in collaboration with IGRETEC (www.igretec.com), the economic development agency of Charleroi in charge of finding global solutions for large or small companies and new or established investors in the region. And CETIC works as well with the Heracles (www.heracles.be) business centre.

ICT EQUIPMENT

ICT EQUIPMENT

To be effective, methodological research must be supported by state-of-the-art tools. In general, a number of barriers also prevent Walloon companies, and especially SMEs, from benefiting from the high-quality return of such tools: ignorance of the tool's existence, costs of acquisition and maintenance, casual use, complexity of installation, learning curve, etc. The aim of the ICT equipment support project is precisely to break through these barriers by providing access to such tools and the associated consulting and support services.

Two main categories of tools are supported: software engineering tools, and software and hardware tools for designing and testing embedded and communication systems. These tools are managed by the Software Engineering Lab and the Wireless Lab, respectively, with the following specific focuses (subject to continual evolution):

- The Software Engineering Lab is currently focusing on advanced tools for code analysis, targeting specific properties such as security (absence of vulnerabilities), reliability (absence of run-time errors) and maintainability (quality of architecture, documentation, complexity). Such tools rely on advanced analysis techniques such as static analysis and abstract interpretation.

- The Wireless Lab is focusing on new wireless technologies associated with multiple electronic choices, which make the design of an adequate solution difficult. For its Wireless Lab, CETIC selects software and hardware tools, encompassing all emerging technologies, especially related to new protocols and standards introduced to increase throughput, improve range, lower power consumption, or optimise performance trade-offs.

In addition, CETIC has significantly improved its cluster through the Sinus project (Objective of Convergence). This cluster does not intend to provide gross performances for high resource-demanding applications, but it constitutes a live test bed for experimentation in the areas of grid computing, cloud computing and other applications of distributed systems like Service Oriented Architectures (SOA), Software as a Service (SaaS), etc. The cluster is used intensively for CETIC's own research projects, and it is also available for experimentation by partners or enterprises.

ACHIEVEMENTS

The two labs were initiated in 2009. During the first quarter, the tools and devices of utmost importance were selected according to their industrial demand, which was verified with the partners of the CE-IQS project.

Concerning the Wireless Lab, several tools were acquired for the purpose of modelling, simulation and design of embedded systems (hardware and software). These tools include high bandwidth oscilloscopes, an advanced signal generator, and several protocol sniffers.

For the Software Engineering Lab, the first batch of tools included advanced code analysis tools with the ability to detect security vulnerabilities, run-time errors, and architecture problems, and also covering a wide spectrum of languages. A commercial analysis platform working in SaaS was also acquired and made available to Walloon SMEs.

A public call for tenders was issued for this first set of equipment and tools. During the second quarter, the tools were deployed in the labs and the teams involved trained themselves in their uses. Several preliminary studies were started in collaboration with Walloon enterprises in order to define standard services associated with these devices.

The aim of the ICT equipment support project is to provide access to cutting-edge tools and the associated consulting and support services.

SCIENTIFIC PUBLICATIONS

SCIENTIFIC PUBLICATIONS

- Benjamin Aziz, Alvaro Arenas, Juan Bicarregui, Christophe Ponsard, Philippe Massonet, **From Goal-Oriented Requirements to Event-B Specifications**, The First NASA Formal Methods Symposium (NFM 2009), Moffett Field, California (USA), April 6-8, 2009.

- David Brossard, Theo Dimitrakos, Angelo Gaeta, Stéphane Mouton, **Aspects of General Security and Trust, In : Service Oriented Infrastructures and Cloud Service Platforms for the Enterprise**, T. Dimitrakos, J. Martrat, S. Wesner ed(s), Springer-Verlag, 2010 - ISBN 978-3-642-04085-6 (to be published).

- Jeremie Chevalier, Stéphane Mouton, **A Lightweight Specialized Meta-scheduler for Business-oriented Applications**, IEEE Asia Modelling Symposium, AMS2009, Bandung (India), May 25-26, 2009.

- Jeremie Chevalier, Stéphane Mouton, **A Lightweight Specialized Meta-scheduler for 3D Image Rendering Applications**, GVS 2009, Grid and Visualisation Systems, Opatija (Croatia), May 25-29, 2009.

- Jeremie Chevalier, Stéphane Mouton, **A Lightweight Specialized Meta-scheduler for Business and Applications Constrains Management**, COMPSAC 2009, IEEE International Computer Software and Applications Conference, BINDIS workshop, Barrier towards Internet Driven Information Services, Seattle/Washington (USA), July 20-24, 2009.

- Gautier Dallons, Annick Majchrowski, Jean-Christophe Trigaux, **Addressing IEC 61508 Certification in a Multi-norms Context: A Generic Approach**, EuroSPI 2009, University of Alcada (Spain), September 2-4, 2009.

- Michal Dyrda, Maciej Malawski, Marian Bubak, Syed Naqvi, **Providing Security for MOCCA Component Environment, In Proceedings of International Workshop on Java and Components for Parallelism**, Distribution and Concurrency 2009 (IWJPDC'09), IEEE International Parallel and Distributed Processing Symposium 2009 (IPDPS'2009), Rome (Italy), May 25-29, 2009 - ISBN: 978-1-4244-3751-1.

- Bérengère Fally, Damien Hubaux, BEinGRID consortium, **Approaching the Cloud: Better Business Using Grid Solutions**, BEinGRID, October 2009.

- Alex Galis, Henrik Abramowicz, Marcus Brunner, Danny Raz, Prosper Chemouil, Joe Butler, Costas Polychronopoulos, Stuart Clayman, Hermann de Meer, Thierry Coupaye, Aiko Pras, Krishan Sabnani, Philippe Massonet, Syed Naqvi, **Management and Service-aware Networking Architectures (MANA) for Future Internet**, IEEE International Conference on Communications and Networking, Xi'an (China), August 26-28, 2009.

- Lotfi Guedria, Damien Hubaux, Mathieu Ocaña, Jean-Didier Legat, **Flexible Embedded System for Sensor Integration and Custom Data Processing in an Automotive Application**, Vehicular Communication Technology Workshop of IWCMC 2009 Conference, Leipzig (Germany), June 2009.

- Philippe Massonet, Syed Naqvi, Francesco Tusa, Massimo Villari, Joseph Latanicki, **Mitigating Security Threats to Large-scale Cross Border Virtualization Infrastructures**, International Conference on Cloud Computing, Munich (Germany), October 19-21, 2009.

- Syed Naqvi, Gautier Dallons, Arnaud Michot, Renaud De Landtsheer, Christophe Ponsard, **Assuring Privacy of Medical Records in an Open Collaborative Environment - A Case Study of Walloon Region's eHealth Platform**, IFIP and PrimeLife Joint Summer School on Privacy and Identity Management for Life, Nice (France), September 7-11, 2009.

- Syed Naqvi and Paolo Mori, **Security and Trust Management for Virtual Organisations: GridTrust Approach**, IFIP International Conference on Trust Management (IFIPTM'09), West Lafayette (USA), June 15-19, 2009.

- Syed Naqvi, Massimo Villari, Joseph Latanicki, Philippe Massonet, **From Grids to Clouds – Shift in Security Services Architecture**, Krakow Grid Workshop 2009 (CGW'09), Krakow (Poland), October 12-14, 2009.

- Frédéric F. Monfils, Sanae Saadaoui, **Improving Software Development Through Knowledge Sharing: A practical Approach**, International Conference on Knowledge Management and Information System (KMIS) 2009, Madeira (Portugal), October 6-8, 2009.

- Daniel Novak, Uller Miroslav, Rousseaux Sébastien, Mraz Milos, Smrz Jan, Stepankova Olga, Haluzik Martin, Massimo Busuoli, **Diabetes Management in OLDES Project**, 31st Annual International IEEE EMBS Conference, Hilton Minneapolis, Minnesota (USA), September 2-6, 2009.

- Christophe Ponsard, Mathieu Delehaye, **Towards a Model-Driven Approach for Mapping Requirements on AADL Architectures**, Fourth IEEE International workshop UML and AADL Held in conjunction with the 14th International International Conference on Engineering of Complex Computer Systems, ICECCS 2009, Postdam (Germany), June 2009.

- Christophe Ponsard, Arnaud Michot, Renaud De Landtsheer, **Towards Event-B Metrics Support in RODIN**, in proc. DEPLOY Technical Workshop (University of Newcastle Technical Report), December 2009.

- Christophe Ponsard, Vincent Fries, **Enhancing the Accessibility for All of Digital Comic Books**, International Journal on Human-Computer Interaction (eMinds), Vol I, No. 5, February 2009.

- Christophe Ponsard, Joelle Sutera, and Michael Henin, **Video Relay Service for Signing Deaf - Lessons Learnt from a Pilot Study**, proc. USAB'09 Usability and Human–Computer Interaction for eInclusion , Linz (Austria), November 9-10, 2009.

- Sébastien Rousseaux, Lotfi Guedria, **A Flexible Framework for Patient Remote Health Monitoring**, SAME Forum, Sophia Antipolis (France), September 2009.

- Sanae Saadaoui, Annick Majchrowski, Christohe Ponsard, **Experiment with COSMIC V3.0: Case Studies in Business Applications**, EuroSPI 2009, University of Alcada (Spain), September 2-4, 2009.

DISSEMINATION

DISSEMINATION

FAIRS AND EVENTS

CETIC participated in the following fairs and events in 2009:

- January 13-14, 2009 – Brussels (BE): CETIC actively participated in SOOKU'09 and gave two presentations
- January 19-20, 2009 – Zurich (CH): Industrial workshop on DEPLOY Requirement Engineering
- January 22-23, 2009 – Mons (BE): CETIC participated in EuroDocInfo09
- January 29, 2009 – Mons (BE): CETIC led a plenary at the Digital Innovators Tour
- February 5, 2009 – Paris (FR): CETIC presented OLDES at the Colloque TIC-Santé
- March 4, 2009 – Mons (BE): Stand CETIC at the Microsoft Innovation Center's opening
- March 31, 2009 – Namur (BE): CETIC and INFOPOLE Cluster TIC co-organised 'Security of ICT Products and Services' Information: from Challenges to Solutions'
- April 23, 2009 – Charleroi (BE): CETIC Presentation at Solutions Business
- May 11-12, 2009 – Luxembourg (LU): CETIC at the FP7 Information Days
- May 19, 2009 – Namur (BE): CETIC presented how to archive e-mails at the information day dedicated to this topic
- May 29, 2009 – Indonesia : CETIC presented its Grid research results (SST) at the Asia Modeling Symposium's third edition
- June 2, 2009 – Potsdam (DE): CETIC presented "Towards a Model-Driven Approach for Mapping Requirements on AADL Architecture" (SSE and ECS) at the UML&AADL'09 workshop
- June 3-5, 2009 – Geneva (CH): CETIC represented at the Linux Days
- June 9, 2009 – Ghent (BE): CETIC presented ECS at the seminar entitled "Exploring GUI Design for Embedded Systems"
- June 10-11, 2009 – Brussels (BE): CETIC presented its European projects at the Internet of Services Collaboration Meeting
- June 17, 2009 – Gembloux (BE): CETIC presented C2A at Innovation Logistique
- June 15-19, 2009 – Lafayette (USA): CETIC presented research results at the IFIP Trust Management 2009 conference
- June 18, 2009 – Meux (BE): CETIC presented its eHealth portfolio at the INFOPOLE Cluster TIC's General Assembly
- June 21, 2009 – Leipzig (DE): CETIC presented a paper entitled "Flexible Embedded System for Sensor Integration and Custom Data Processing in an Automotive Application" at IWCMC 2009
- July 7, 2009 – Nantes (FR): CETIC presented "Belgium – Open Source for Public Sector" at the World's meeting on Open Source 2009
- July 20-24, 2009 – Brëme (DE): CETIC presentation at the FISS'09 Summer School
- July 24, 2009 – Seattle (USA): CETIC presented the BEinGRID project at the COMPSAC 2009 conference
- September 3-4, 2009 – Madrid (ES): CETIC presented the COSMIC research results at the EUROSPI 2009 conference
- September 10, 2009 – Mons (BE): CETIC presented C2A at the Transport and ICT Seminar organised by the Microsoft Information Center
- September 7-11, 2009 – Nice (FR): CETIC presented a paper on medical files' security and confidentiality at the PIML'09 Summer School
- September 8, 2009 – Charleroi (BE): COSMIC workshop organised at CETIC
- September 22-23, 2009 – Sofia Antipolis (FR): CETIC presented an article entitled "A Flexible Framework for Patient Remote Health Monitoring" at the SAME2009 conference
- September 22, 2009 – Gembloux (BE): CETIC presented its expertise in Software Quality at the "Software Quality" event addressed to business
- October 1-2, 2009 – Paris (FR): CETIC participated in the Open World Forum
- October 4, 2009 – Charleroi (BE): CETIC presented its activities during the "Journée Découverte Entreprises"
- October 22, 2009 – Brussels (BE): CETIC participated in the BEgrid Seminar
- November 23-24, 2009 – Stockholm (SE): CETIC represented its RESERVOIR project at FIA09
- November 24-26, 2009 – Stockholm (SE): CETIC represented IT-Tude.com at the ICSOC/ServiceWave event
- November 26, 2009 – Charleroi (BE): With LIEU and the INFOPOLE Cluster TIC, CETIC co-organised the Open The Source event
- December 16, 2009 – Mons (BE): CETIC presented the open source's economical aspects at the ST² Libre TIC conference
- December 17, 2009 – Brussels (BE): CETIC presented its Security expertise at La Défense
- December 17-18, 2009 – Louvain-la-Neuve (BE): CETIC presented QualOSS research results at the BENEVOL 2009 workshop

CETIC NEWSLETTER

The CETIC electronic newsletter is a key communication and dissemination tool targeting all the regional actors impacted by the research and technology transfer activities conducted inside our research centre. It also reports on the major events in which CETIC has been involved and on future events (especially events organised or co-organised by us) where it will be possible to meet our researchers. The newsletter – issued in French every three months (except during the summer) – contains four main sections: services for companies, innovation, publications, and an interview with a CETIC employee. In 2009, three issues were produced on the following topics: innovation as a way to revitalise economy, SOA and cloud computing, and CETIC as a support to companies.

You can subscribe to the CETIC newsletter by clicking on the 'Newsletter' tag on the CETIC website's homepage (www.cetic.be).

ACRONYMS

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ANS: Agence Nationale de Sécurité - Belgian national security authority
ASBL: Association Sans But Lucratif - Non-profit organisation
API: Application Programming Interface
AVL: Automatic Vehicle Location
BE: Business Experiments
BSM: Business Service Management
CAN/FMS: Control Area Network/Fleet Management System
CED: Cloud Encryption Device
CETIC: Centre d'Excellence en Technologies de l'Information et de la Communication - Centre of Excellence in Information and Communication Technologies
CE-IQS: Centre d'Expertise en Ingénierie et Qualité des Systèmes - Centre of Expertise in Engineering and Quality Systems
CELLaVI: Centre d'Expertise en Logiciel Libre à Vocation Industrielle - Centre of Expertise in Open Source Software
CMMI: Capability Maturity Model Integrated
CMR: Contrat Marchand Routier
CNR: Consiglio Nazionale delle Ricerche
CoE: Centre of Expertise
CReSTIC: Centre de Recherche en Sciences et Technologies de l'Information et de la Communication
CRM: Customer Relationship Management
CRMPA: Centro di Ricerca in Matematica Pura
CRID: Research Centre on IT and Law - FUNDP
CUH: Cambridge University Hospitals
DSP: Digital Signal Processor
DRNN: Dynamic Recurrent Neutral Network
EC: European Commission
ECS: Embedded and Communication Systems
EEG: Electroencephalogram
EMG: Electromyogram
ENEA: Italian National Agency for New Technologies, Energy and Sustainable Economic Development
EPCC: Edinburgh Parallel Computing Centre
EU: European Union
FEDER: Fonds Européen de Développement Régional - European Regional Development Fund
F/OSS: Free and Open Source Software
FP6: Sixth Framework Programme
FP7: Seventh Framework Programme
FPGA: Field Programmable Gate Array
FUNDP: Facultés Universitaires Notre-Dame de la Paix de Namur
GPRS: General Packet Radio Service
GSM: Global System for Mobile Communication
GUI: Graphical User Interface
HDL: Hardware Description Language
ICS: Intelligent Content and Semantic
ICT: Information and Communication Technologies
IGRETEC: Intercommunale pour la Gestion et la Realisation d'Etudes Techniques et EConomiques
IoPR: Institute of Psychophysiology and Rehabilitation of the Kaunas University of Medicine
IP: Integrated Projects
ISO: International Organisation for Standardisation
IST: Information Society Technologies
ISV: Independent Software Vendor
IT: Information Technologies
KM: Knowledge Management
LCD: Liquid Crystal Display
LUH: Gottfried Wilhelm Leibniz Universitaet Hannover
NGG: Next Generation Grids
NKUA: National Kapodistrian University of Athens
NTUA: National Technical University of Athens
OCR: Optical Character Recognition
OGF: Open Grid Forum
OGSA: Open Grid Services Architecture
OWPL: Observatoire Wallon des Pratiques Logicielles
PALLAVI: Plate-forme d'Accueil pour le Logiciel Libre à Vocation Industrielle
PHP: Personal Home Page
PoC: Proof of Concept
PSoC: Programmable System on Chip
R&D: Research and Developments
RE: Requirements Engineering
SaaS: Software as a Service
SLA: Service Level Agreements
SMEs: Small and Medium Enterprises
SMI: Strategic Medicine Inc
SOA: Service Oriented Architecture
SoC: System on Chip
SOC: Service Oriented Computing
SOI: Service Oriented Infrastructure
SOKU: Service Oriented Knowledge Utilities
SSE: Software and System Engineering
SST: Software and Services Technologies
STREP: Specific Targeted REsearch Projects
TSP: Trust, Security and Privacy
UCL: Université catholique de Louvain
ULB: Université Libre de Bruxelles
ULg: University of Liège
UML: Unified Modelling Language
UMONS: Université de Mons
VO: Virtual Organisation
VOIP: Voice Over Internet Protocol
WPAN: Wireless Personal Area Network

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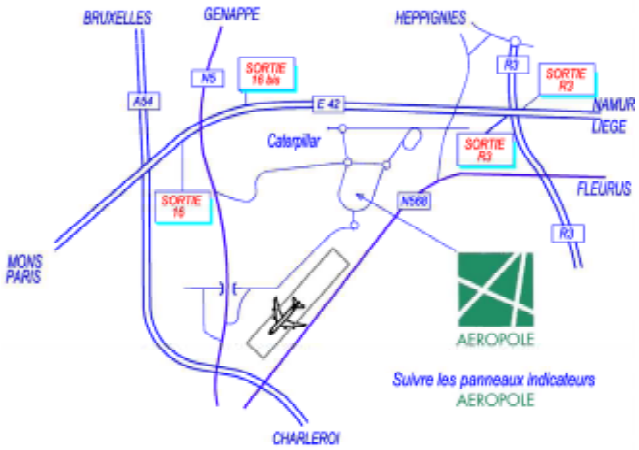

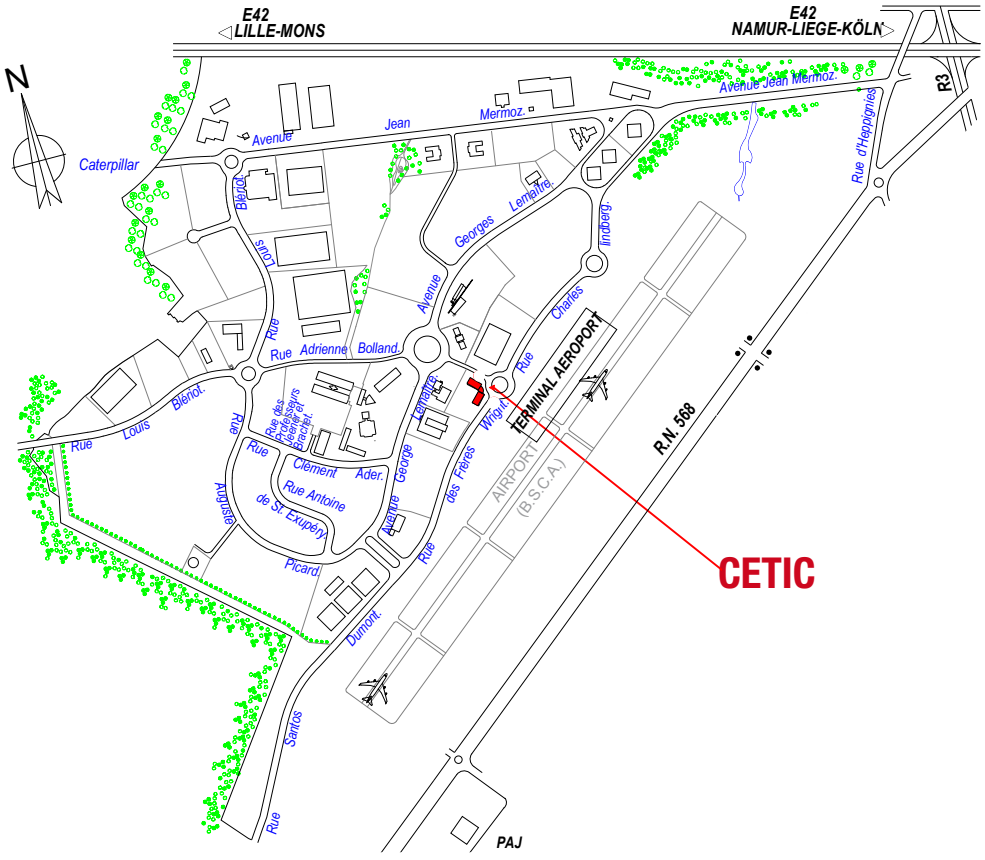

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