

FROM RESEARCH TO INDUSTRY

cea tech

# EUROPEAN ICT PROJECTS



# A WORD FROM OUR DIRECTOR

## **CEA Tech is building on CEA Leti's successful track record innovating for industry.**

Our organization's 4,500 researchers and administrative staff are dedicated to bringing manufacturers a broad range of Key Enabling Technologies developed by Leti, List, Liten, and other CEA operating divisions.

What makes CEA Tech unique in France is a strategic focus on four key pillars:

**Pillar 1:** CEA Tech operates at Technology Readiness Levels (TRLs) 3 to 7, serving as an innovation catalyst and accelerator for businesses.

**Pillar 2:** CEA Tech develops Key Enabling Technologies of interest to all industries and all types and sizes of businesses, from major multinational corporations to SMBs and start-ups. These technologies are protected by patents held by the CEA, the world's leading filer of international patents.

**Pillar 3:** CEA Tech boasts international-caliber technology platforms available for use by partner businesses at a competitive cost.

**Pillar 4:** CEA Tech has built a results-oriented organizational culture based on a long history of cooperation between research and industry. Our researchers and staff deliver proven experience transferring new technologies to industrial-scale manufacturing facilities.

We are ready to work with your business to understand your technological innovation needs. Our priority is building long-term partnerships with the ultimate goal of making your business more competitive on global markets. CEA Tech's 4,500 employees are proud of their contributions to making businesses more competitive.

**Jean Therme**

Deputy Director for Renewable Energies, CEA  
Director of Technological Research of CEA, CEA Tech



### **CEA TECH INSTITUTES**

**LETI** Micro- and nanotechnologies and their integration into systems

**LITEN** New energy technologies and nanomaterials

**LIST** Smart digital systems

# CEA TECH DELIVERS UNRIVALLED EXPERIENCE IN TECHNOLOGY RESEARCH

**AT CEA TECH WE FEEL STRONGLY THAT TECHNOLOGY RESEARCH** is a crucial component of both innovation and value creation. It is this belief that has driven our successful technology development activities over the past 50 years.

CEA Tech is the CEA's (the French Atomic Energy and Alternative Energy Commission) technology research unit. CEA Tech's three labs—Leti, Liten, and List—develop a broad portfolio of technologies for ICTs, energy, and healthcare.

CEA Tech leverages a unique innovation-driven culture and unrivalled expertise to develop and disseminate new technologies for industry, effectively bridging the gap between the worlds of research and business.

CEA Tech also provides businesses with access to Key Enabling Technologies developed by other CEA operating divisions.

## KEYS FIGURES

**500** million Annual operating budget of more than euros

**4,500** researchers

More than **50** high-tech start-ups over the past 10 years

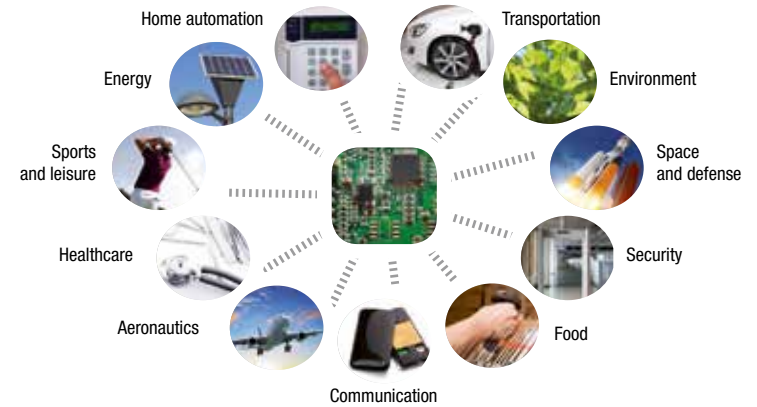
**550** priority patent applications per year

Customers : **80%** listed on the CAC 40,

more than **500** SMBs,

**145** international customers

## CEA TECH OFFERS ADVANCED RESEARCH AND DEVELOPMENT IN KEY ENABLING TECHNOLOGIES

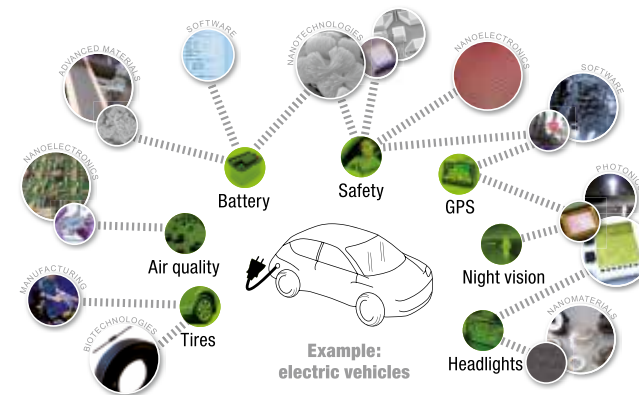


KETs drive new developments across a broad range of industries

**R&D IS BECOMING INCREASINGLY TRANSVERSAL IN NATURE.** Key Enabling Technologies (KETs) are “technology bricks” that can be used in combination with each other to develop a wide range of high-added-value products and applications.

Key Enabling Technologies drive industry across France and around the world. Busi-

nesses of all sizes across all industries—from traditional manufacturing to high tech—leverage new technologies to add value to their products and services. CEA Tech has built up substantial expertise in KETs, which offer the potential to boost business competitiveness and bring economic prosperity.



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## BIOMARGIN: BIOMARKERS OF RENAL GRAFT INJURIES IN KIDNEY ALLOGRAFT RECIPIENTS



[www.biomargin.eu/](http://www.biomargin.eu/)  
[etienne.thevenot@cea.fr](mailto:etienne.thevenot@cea.fr)  
 Reference: FP7-HEALTH-2007-1  
 Marc 2013 > February 2017  
 Budget: 7.856 M€  
 Coordinator: INSERM (France)

**Objectives:** Discover and validate blood/urine biomarkers and provide clinicians with diagnostic tests and interpretation software for more robust/predictive and less invasive monitoring of transplanted patients.

**Description:** Relying on the expertise of 4 European hospitals, 3 SMEs and 6 academic institutes, and using the complementary "omic" and imaging techniques, the project will consist in (i) a discovery step (biobank samples) and (ii) a validation step (prospective cohort), following

the highest European ethics and regulatory requirements.

**CEA Role:** As WP7 leader, CEA is in charge of identifying new molecular signatures through statistical and pathway analysis (step 1) and validating the specificity/sensitivity of the putative biomarkers (step 2), as well as building a knowledge database for efficient query of the data collected during the project.

## BOOSTER: BIO-DOSIMETRIC TOOLS FOR TRIAGE TO RESPONDERS



[www.booster-project.org](http://www.booster-project.org) | [marie-france.robbe@cea.fr](mailto:marie-france.robbe@cea.fr)  
 Reference: FP7-SEC-2009-1  
 July 10 > June 2013  
 Budget: 4.5 M€  
 Coordinator: CEA (France)

**Objectives:** Develop a toolbox for rapid triage of exposed individuals in case of an event involving the exposure of a large number of people to radioactive material, whether accidental or following malevolent act.

**Description:** BOOSTER project is a capability project designed to develop new bio-dosimetric tools in order to quickly evaluate the level of exposure of potential casualties, to determine by appropriate sensors the consequences of radioactive exposure, and to allow an efficient triage of exposed people.

**Results:** A demonstration exercise was carried out with the participation of Hungarian civil protection operators and emergency services.

**CEA Role:** Development of a portable gamma-camera with improved sensitivity by CEA and industrialized by Canberra, Development of an in-field biological test based on yH2AX protein.

## HAPTIMAP: HAPTIC, AUDIO AND VISUAL INTERFACES FOR MAPS AND LOCATION BASED SERVICES



<http://www.haptimap.org/>  
[moustapha.hafez@cea.fr](mailto:moustapha.hafez@cea.fr)  
 Reference: ICT  
 2008 > 2012  
 Budget: 9 270 k€  
 Coordinator: Lund University (Sweden)

**Objectives:** The HaptiMap project is aimed at making maps and location based services more accessible by using several senses like touch, hearing and vision. Our end goal is to increase the number of persons who are able to use mainstream map services.

**Description:** HaptiMap has performed novel and original research into multimodal perceptualizations. We have investigated how, and in what ways, multimodal feedback can both augment and replace visual feedback for diverse users in diverse situations.

**Results:** The results have been published both as research reports and as guideline documents and it has been encapsulated in the HaptiMap toolkit and demonstrators. Research in HaptiMap has been performed in a user centred way. Initial studies and formative evaluations during the development has involved 113 individual users. Our final evaluations involved 392 users.

**CEA Role:** User-centered design and development of haptic feedback devices for navigation and orientation.

## IMAGIC: INTEGRATED MAGNETIC IMAGERY BASED ON SPINTRONICS COMPONENTS



[www.imagic-project.eu](http://www.imagic-project.eu)  
[natalia.sergeeva-chollet@cea.fr](mailto:natalia.sergeeva-chollet@cea.fr)  
 Reference: ICT-NMP GA 288381  
 September 2011 > August 2014  
 Budget: ~5.6 M€

**Objectives:** the aim of IMAGIC is to develop a new integrated magnetic imagery based on high sensitive and high spatial resolution magneto-resistive array sensors.

**Description:** the challenge of the project is based on development of probes compatible for NDT constraints in terms of sensitivity, dynamics of measurements, packaging and manufacturing of array sensors. Two kinds of applications are considered in the project: high frequency application (till 10MHz) for surfacic flaws and low frequency for buried flaws. First

prototypes with ASIC integrated close to sensor have been fabricated.

**CEA Role:** CEA is involved in simulation of probe design, fabrication of magneto-resistive array sensors, validation, processing tools and coordination

## ISI-PADAS: INTEGRATED HUMAN MODELLING AND SIMULATION TO SUPPORT HUMAN ERROR RISK ANALYSIS OF PARTIALLY AUTONOMOUS DRIVER ASSISTANCE SYSTEMS

[www.isi-padas.eu/?q=content/project](http://www.isi-padas.eu/?q=content/project)  
[moustapha.hafez@cea.fr](mailto:moustapha.hafez@cea.fr)



Reference: ICT  
2008 > 2011  
Budget: 4.462 k€  
Coordinator: OFFIS

**Objectives:** Provide an innovative methodology to support risk based design and approval of Partially Autonomous Driver Assistance Systems (PADAS) focusing on elimination and mitigation of driver errors by an integrated Driver-Vehicle-Environment modelling approach.

**Description & Results:** These targets were achieved through research and technology development in:

- 1) improved risk based design
- 2) advanced driver modelling
- 3) Joined Driver-Vehicle-Environment Simulation Platform
- 4) new knowledge about driver behaviour including errors

**CEA Role:** Development of an smart vehicle floor integrating haptic feedback to send alerts to the driver and, thus, prevent collisions.

## NANOCOM: RECONFIGURABLE MICROSYSTEM BASED ON WIDE BAND GAP MATERIALS, MINIATURIZED AND NANOSTRUCTURED RF-MEMS

[www.project-nanocom.com](http://www.project-nanocom.com)  
[samuel.saada@cea.fr](mailto:samuel.saada@cea.fr)



Reference: ENIAC-2010-1  
February 2011 > October 2014  
Budget: 5.570 M€  
Coordinator: Thales Research and Technology (France)

**Objectives:** Develop the necessary design and technological skills for integrating Wide Band Gap devices with RF MEMS and RF NEMS active interconnections and with III-Nitride (GaN, AlN) based sensors.

**Description:** Smart and Integrated Micro and Nano Systems represent the next electronic evolutionary step for the simultaneous integration of sensing, processing, actuation and power management. Future smart systems will have to achieve autonomous and self-reconfigurable

operations, for real-time and efficient self-optimization of their performance. The needs for such systems are not only to overcome the design trade-offs, but also to realize new and more efficient systems with reduced size, weight, power and cost.

**CEA Role:** Focus on diamond film synthesis and characterization for its integration into Micro and Nano systems to improve reliability and thermal management.

## NEUROCARE: NEURONAL NANOCARBON INTERFACING STRUCTURES

<http://neurocare-project.eu>  
[philippe.bergonzo@cea.fr](mailto:philippe.bergonzo@cea.fr)



Reference: FP7-NMP-2011-1  
March 2012 > February 2015  
Budget: 4.9 M€  
Coordinator: CEA (France)

**Objectives:** Neurocare Project aims to create better retinal, cortical and cochlear implantable devices through the use of improved interfacing between the electronic implants and living cells.

**Description:** The project is a multidisciplinary project involving material scientists, electrophysiologists, and clinicians. The NeuroCare concept involves low-cost, carbon-based materials, well-adapted for medical implants, because they (i) offer wide range of electronic properties (metal, semiconductor and insulator), (ii) are bio-inert and (iii) are physically robust.

**CEA Role:** CEA is involved in the fabrication of diamond devices for coating of stimulating implants (retinal, cortical and cochlear) for in-vivo applications aiming at alleviating pathologies, as well as fabricating diamond Micro-Electrode Arrays for recording neuron cell signals for electrophysiology and pharmacology applications.

## READNA: REVOLUTIONARY APPROACHES AND DEVICES FOR NUCLEIC ACID ANALYSIS



[www.cng.fr/READNA](http://www.cng.fr/READNA) | [vincent.picaud@cea.fr](mailto:vincent.picaud@cea.fr)

Reference: FP7-HEALTH-2007-1  
June 2008 > May 2012  
Budget: 12 M€  
Coordinator: CEA (France)

**Objectives:** The goals of the READNA project were to accelerate new breakthrough DNA sequencing technologies and to enhance existing analysis methods.

**Description & Results:** READNA joined 18 partners from 6 countries of the EC in an effort to develop DNA analysis methods. The development of state-of-the-art nucleic acid analysis technologies necessitated the collaboration of specialists of diverse disciplines, such as molecular biology, optics, nanoscience and informatics. The READNA project produced a total of 36 publications from which 12 in Nature journals

**CEA Role:** CEA contributed to develop a software that performs DNA sequencing by MALDI-TOF MS using alkali cleavage of RNA/DNA chimera. The delivered software performs spectra processings followed by the relevant DNA sequence processings. The whole is wrapped into a Graphical User Interface and run under Linux. The tool is operational and helped partners to process their data: [www.lix.polytechnique.fr/bioinfo/colloquium2010/talks/Picaud\\_LIX.pdf](http://www.lix.polytechnique.fr/bioinfo/colloquium2010/talks/Picaud_LIX.pdf)

## SNIFFER: A BIO-MIMICRY ENABLED ARTIFICIAL SNIFFER



[www.sniffer-project.eu](http://www.sniffer-project.eu)  
[emmanuel.scorsone@cea.fr](mailto:emmanuel.scorsone@cea.fr)  
 Reference: FP7-SEC-2011-1  
 February 2012 > January 2015  
 Budget: 4.819 M€  
 Coordinator: CEA (France)

**Objectives:** This project deals with the capture and analysis of odours for border security applications related to the detection of persons, illegal substances and in particular explosives.

**Description:** the approach is based on state-of-the-art technologies centred on a new generation of olfactory biosensors. The SNIFFER devices to be developed combine in a one-stop shop sampling, pre-concentration and pre-treatment with bio-mimicry, synthetic diamond sensor technology and multi-parametric training software. Now at project mid-term,

a first version of artificial sniffer has been built and field trials are being carried out to assess its performances towards explosives and drugs detection.

**CEA Role:** developing diamond-based bio-MEMS for odour detection.

## SIMPOSIUM: SIMULATION PLATFORM FOR NON DESTRUCTIVE EVALUATION OF STRUCTURES AND MATERIALS



[www.simposium.eu](http://www.simposium.eu)  
[steve.mahaut@cea.fr](mailto:steve.mahaut@cea.fr)  
 FOF ICT 2011.7.4. GA 285549  
 2011 > 2014  
 Budget : ~5.91 M€  
 Coordinator: CEA LIST (France)

**Objectives:** the aim of SIMPOSIUM is to combine Non Destructive Evaluation and materials characterization for high level products, using ultrasonic and electromagnetic techniques.

**Description:** the project, gathering various industrial fields (nuclear, automotive, steel, aircraft) shall provide NDE simulation tools with interoperable links to designs and CAD codes, for assessment over industrial targeted cases.

**CEA Role:** CEA LIST, the project coordinator, will enable interoperable links and new simulation skills within the CIVA platform software.

## COSMIC: THE COMPLEMENTARY ORGANIC SEMICONDUCTOR CIRCUIT TECHNOLOGY PLATFORM FOR FLEXIBLE SMART SYSTEM APPLICATIONS



[www.project-cosmic.eu](http://www.project-cosmic.eu)  
[isabelle.chartier@cea.fr](mailto:isabelle.chartier@cea.fr)  
 Reference: IST-IP-247681  
 January 2010 > April 2014  
 Budget: 9.898 k€  
 Coordinator: Fraunhofer EMFT (Germany)

**Objectives:** Develop high performance, robust and cost efficient organic "CMOS" technology platform to realize digital and analog organic circuits on flexible plastic substrates.

**Description:** the Cosmic project integrate organic CMOS circuits at various complexity levels and manufacturing platforms including plastic film processing on wafers, sheets and rolls. COSMIC demonstrators address several applications: RF systems, smart sensors and A/D converters or rollable display drivers.

**CEA Role:** development of a printed organic CMOS with high mobility for both n and p type OTFT on flexible transparent substrate. Design tool kit is available for end-users. The first functional printed 6 Bits A/DC designed by TuEindhoven includes more than 1500TFT

## PICTIC: PRE-INDUSTRIAL PILOT PRINTING PLATFORM FOR PRINTED ELECTRONICS AND SMART SYSTEM ON FOILS PROTOTYPING



[www-pictic.cea.fr](http://www-pictic.cea.fr)  
[isabelle.chartier@cea.fr](mailto:isabelle.chartier@cea.fr)  
 Coordinator: CEA LITEN (France)

**Objectives:** to support the industrialisation of Printed and Large Area Electronic components and systems through processes scale-up, product prototyping and industrial transfer.

**Description:** CEA-LITEN PICTIC is the French Pilot printing platform in OLAE: 600 m<sup>2</sup> clean-room with a set of pre-industrial equipments in Sheet-To-Sheet format: inkjet and US spray, flat screen, gravure press, slot dye, lasers dedicated to the development of printing processes and printed sensors and electronics. PICTIC offers to industrial partner, printed electronic development & prototyping services in 32x38cm

format for Smart System On Foils. Applications includes User Interface, smart packaging, health, transport and buildings.

**CEA Role:** support to CEA start-up ISORG to industrialize printed organic photodiodes. Common lab with Piezotec ARKEMA to develop ferroelectric inks and related devices.

## BALANCE: BALANCE AUGMENTATION IN LOCOMOTION, THROUGH ANTICIPATIVE, NATURAL AND COOPERATIVE CONTROL OF EXOSKELETONS.



<http://www.balance-fp7.eu/>  
[catherine.bidard@cea.fr](mailto:catherine.bidard@cea.fr)

Reference: ICT  
2013 > 2016  
Budget: 4.735 k€  
Coordinator: TECNALIA (Spain)

**Objectives:** in order to move exoskeletons-for-walking toward real life applications, BALANCE will realize a platform-independent control strategy and architecture for such exoskeletons. The work will focus on robust balance performance and thus safety of the human wearing the exoskeleton.

**Description & Results:** the basic steps of BALANCE project are:  
– Understanding in more detail the human control of postural balance

– Realize monitoring of the postural balance of a human-exoskeleton combination in functional human walking.  
– Create a human-cooperative robotic postural balance controller framework  
– Implement the human cooperative postural balance controller on a real exoskeleton.

**CEA Role:** responsible for the System Implementation, Integration and Evaluation WP, development of the experimental platform for human cooperative controller.

## ARTIST & ARTISTDESIGN: EUROPEAN NETWORK OF EXCELLENCE ON EMBEDDED SYSTEM



[www.artist-embedded.org/artist](http://www.artist-embedded.org/artist)  
[sebastien.gerard@cea.fr](mailto:sebastien.gerard@cea.fr)

Reference: NoE FP7  
January 2008 > December 2011  
Coordinator: Verimag

**Objectives:** create a driving force for federating the European research community in Embedded Systems Design.

**Description:** ArtistDesign NoE brings together 31 of the best research teams as core partners, 15 Industrial and SME affiliated Industrial partners, 25 affiliated Academic partners, and 5 affiliated International Collaboration partners.

**Results:** This integration between the central players of the European research community have established a long-term vision for embedded systems in Europe.

**CEA Role:** Active contribution to integration and road map activities related to “Modelling and Validation”. Evangelisation of the new standard for Modeling and Analysing Real Time Embedded Systems (MARTE).

## ECO-FEV: EFFICIENT COOPERATIVE INFRASTRUCTURE FOR FULLY ELECTRIC VEHICLES



[www.eco-fev.eu](http://www.eco-fev.eu)  
[alexandru.petrescu@cea.fr](mailto:alexandru.petrescu@cea.fr)

Reference: GC-ICT-2011.6.8 ICT for fully electric vehicles  
September 2012 > May 2015  
Budget: 5.1 M€  
Coordinator: Hitachi Europe Ltd

**Objectives:** Achieve a breakthrough for FEVs in road transport.

**Description:** the project proposes a general architecture for the integration of FEVs into cooperative infrastructure systems and new solutions for charging.  
– Combination of existing infrastructures relevant for advanced FEV-related services in a cooperative electric mobility system  
– Smart concept for combining energy management and multimodal urban mobility planning

– Improved energy provision via reliable wireless communications, supporting different charging modes

**CEA Role:** FEVs energy consumption monitoring for electrical anomaly detection.

## E-DASH: ELECTRICITY DEMAND AND SUPPLY HARMONIZING FOR ELECTRIC VEHICLES

<http://edash.eu>  
[cedric.auliac@cea.fr](mailto:cedric.auliac@cea.fr)

Reference: FP7-2011-ICT-GC  
September 2011 > August 2014  
Budget: 8.533 M€  
Coordinator: Volkswagen AG (Germany)

**Objectives:** Design, develop and validate an innovative charging solution for fleets of Fully Electric Vehicles (FEVs).

**Description:** The solution will enable sustainable FEVs grid integration in the context of sometimes contradicting requirements like individual driver requests, availability of renewable energies, energy demand as well as low-voltage grid capacity.  
The project's approach involves a fleet manager who interacts with grid stakeholders, like Balancing Responsible Parties, and provides best

effort grid services through controlled charging of his FEV fleet.

**CEA Role:**  
– FEVs load profiles optimization & grid constraints management  
– Li-Ions Battery Management System complying with 61851/15118 standards between EV and CS. It takes into account safety points during charging process  
– IP vehicular networking and secure mobile communications



## ELVIRE: ELECTRIC VEHICLE COMMUNICATION TO INFRASTRUCTURE, ROAD SERVICES AND ELECTRICITY SUPPLY



[www.elvire.eu](http://www.elvire.eu)  
[cedric.auliac@cea.fr](mailto:cedric.auliac@cea.fr)

Reference: ICT-2009.6.1: ICT for Safety and Energy Efficiency in Mobility  
January 2010 > March 2013  
Budget: 9.242 M€  
Coordinator: Continental Automotive GmbH (Germany)

**Objectives:** Develop an effective system which is able to neutralize the driver's "range anxiety", i.e. The fear to break down due to electric vehicles' limited range.

**Results:** This was achieved by developing complementary on-board and external energy management systems for realistic use-cases, including the relevant communication interfaces and support services (AAA, roaming...).

A representative validation test, putting on trial the internal and external systems and their seamless interaction, has been performed.

**CEA Role:** CEA contributed to the external services provided by the e-mobility provider backend, in order to provide end-users with relevant information regarding charging service availability, CEA studied a forecast service based on the modeling of Fully Electric Vehicles (FEV) energy demand in charging infrastructures.

## ENERFICIENCY: USER LED ENERGY EFFICIENCY MANAGEMENT



<http://enerficiency-project.com>  
[sylvain.robert@cea.fr](mailto:sylvain.robert@cea.fr)

Reference: ITEA 2 Call 5 10009  
December 2011 > October 2014  
Budget: 4.607 M€  
Coordinator: Cassidian (France)

**Objectives:** Design, implement and test an open software platform for energy efficiency monitoring and management from the customer (consumers/prosumers) side capable of interaction with the power network and to provide services for efficient energy use.

**Description & Results:** The project is entering its last year, and most results are available. These include a platform for building energy monitoring and management, that is currently being demonstrated based on the CEA INES experimental houses (INCAS Houses).

The platform includes a visualization component, a middleware solution for data exchange, and prediction / planning modules for energy management.

**CEA Role:** In Enerficiency, CEA contribution is twofold: (i) provision of the INCAS houses experimental facilities, and related monitoring data; (ii) provision of a prediction/planning software tool based on simplified physical modeling and machine learning techniques.

## HOLISTEEC: HOLISTIC AND OPTIMIZED LIFE-CYCLE INTEGRATED SUPPORT FOR ENERGY-EFFICIENT BUILDING DESIGN AND CONSTRUCTION



[sylvain.robert@cea.fr](mailto:sylvain.robert@cea.fr)

Reference: EeB.NMP.2013-5  
October 2013 > September 2017  
Budget: 9.703 M€  
Coordinator: D'Appollonia SPA (Italy)

**Objectives:** Design, develop and demonstrate a BIM-based, on-the-cloud, collaborative building design software platform, featuring advanced design support for multi-criteria building optimization.

**Description:** HOLISTEEC main assets are: (i) an innovative feedback/loop design workflow, (ii) a multi-physical, multi-scale simulation engine, (iii) a unified data model for Building and Neighbourhood Digital Modeling, (iv) a full-fledged open software infrastructure for build-

ing design tools interoperability leveraging available standards, (v) innovative and flexible user interfaces.

**CEA Role:** Project technical coordination, participation to dissemination, demonstration and assessment activities, technological contribution: software tools for building information modeling (BIM), simulation-based multi-criteria design optimization, BIM to simulation, BIM reconstruction.

## IOT-A: INTERNET OF THINGS ARCHITECTURE



[www.iiot-a.eu](http://www.iiot-a.eu)  
[christophe.janneteau@cea.fr](mailto:christophe.janneteau@cea.fr)

Reference: ICT-FP7-257521  
September 2010 > November 2013  
Budget: 19 M€  
Coordinator: VDI/VDI

**Objectives:** Produce for the Internet of Things an architectural reference model, together with the definition of an initial set of key building blocks.

**Description:** the IoT-A project outlines principles and guidelines for the technical design of IoT protocols, interfaces, and algorithms. It is also leading to a corresponding mechanism for its efficient integration into the service layer of the Future Internet, to novel resolution infrastructure, allowing scalable look up and discovery of Internet-of-Things resources, entities of the real world, and their associations and to novel platform components. Real-life use

cases are implemented to demonstrate the benefits of the developed architecture.

**Results:** Flagship of the EU Commission with respect to the Internet of Things.

**CEA Role:** CEA LIST produced the IoT-A threat architecture. CEA LIST also specified and implemented novel key establishment solutions for the Internet of Things.

## PERFORMER: PORTABLE, EXHAUSTIVE, RELIABLE, FLEXIBLE AND OPTIMIZED APPROACH TO MONITORING AND EVALUATION OF BUILDING ENERGY PERFORMANCE



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Reference: EeB.NMP.2013-4  
September 2013 > August 2017  
Budget: 8.462 M€  
Coordinator: UPL Utility Partnership Limited (UK)

**Objectives:** Devise a holistic building energy monitoring methodology that factors in appropriate energy performance indicators, information models, and simulation tools.

**Description:** The project will rely on an ICT infrastructure that will re-use, adapt, and further develop a number of open source and commercial technological blocks, including (i) an "Energy instrumentation kit in a box", (ii) an Energy Simulation Environment, and (iii)

a building legacy and monitored data storage and computing infrastructure. The energy monitoring methodology will be tested and validated in the context of four demonstration projects in France, UK, Spain and Poland.

**CEA Role:** WP leader, participates to demonstration and assessment activities and develops software tools for intrinsic and actual performances assessment, software tools for energy management.

## RESILIENT: COUPLING RENEWABLE, STORAGE AND ICTS, FOR LOW CARBON INTELLIGENT ENERGY MANAGEMENT AT DISTRICT LEVEL



[www.resilient-project.eu](http://www.resilient-project.eu)

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Reference: EeB.NMP. 2012-1  
September 2012 > August 2016  
Budget: 8.1 M€  
Coordinator: D'Appolonia S.p.A. (Italy)

**Objectives:** Design, develop and install a new system of interconnectivity between buildings, Distributed Energy Resources and grids, assessing the associated energy and environmental benefits.

**Description:** RESILIENT fulfills the scope to manage and correlate different energy sources and storages in a dynamic way. RESILIENT concept will be finally validated in three different pilot sites located in UK, Italy and Belgium.

**CEA Role:** CEA is the leader of WP – Holistic framework for optimized district energy management – and one of the main technological partners of the project. Its contribution includes a (multi-agent based) distributed optimization software tool for energy distribution and production management at district-level, and the lead of the design of the framework.

## SAFEWATER: INNOVATIVE TOOLS FOR THE DETECTION AND MITIGATION OF CBRN RELATED CONTAMINATION EVENTS OF DRINKING WATER



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Reference: FP7-SEC-2012.1.5-2  
October 2013 > September 16  
Budget: 4.814 M€  
Coordinator: ARTTIC (France)

**Objectives:** SAFEWATER project is to develop a comprehensive and pragmatic platform to manage the safety and security of drinking water, reducing the time to react and effectively respond to a crisis, and thus, covering the Detection, Response, and Recovery stages of potential events.

**Description:** the project will focus in particular on the definitions of different real scenarios and

the development of new and improved CBRN sensors adapted to drinking water security.

**CEA Role:** development of new radiological sensor network adapted to drinking water security.

## SMARTSANTANDER



[www.smartsantander.eu](http://www.smartsantander.eu)

[christophe.janneteau@cea.fr](mailto:christophe.janneteau@cea.fr)

Reference: FP7-ICT-2009-5  
September 2010 > September 2013  
Budget: 8.7 million euro  
Coordinator: Telefonica I+D

**Objectives:** the main target of SmartSantander is the creation of an European experimental test facility for the research and experimentation of architectures, key enabling technologies, services and applications for the Internet of Things (IoT) in the context of the smart city.

**Description:** SmartSantander has elaborated and developed services and architectures that have allowed the deployment of experimental sensor networks in European smart cities.

**Results:** More than 20 000 sensors have been deployed in European smart cities (Santander, Luebeck, Guildford, Luebeck).

**CEA Role:** CEA LIST has contributed to security aspects related to the deployments of federated sensor networks open to research community. In particular the CEA LIST has contributed to the authentication and authorization framework.

## SMARTWATER4EUROPE: DEMONSTRATION OF INTEGRATED SMART WATER MANAGEMENT SOLUTIONS AT 4 SITES ACROSS EUROPE



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Reference: FP7-ENV-2013-WATER-INNO-DEMO  
November 2013 > October 2017  
Budget: 10 M€  
Coordinator: Vitens N.D. (Netherlands)

**Objectives:** SmartWater4Europe brings together public and private water operators, research organizations and smart technology providers in a bid to design the drinking water supply of the future.

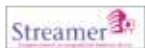
**Description:** the project aims at developing, integrating and demonstrating 4 core aspects of water management: water quality, leak management, energy optimization and customer interaction. Focus will be put on the demonstrations that will be set up in 4 well-scaled and

real-life sites located in Netherlands, France, UK & Spain.

**CEA Role:** CEA will contribute to the development of monitoring & decision support tools for water supply & water quality issues. It will focus on automated early detection and risk assessment of:

- leaks and pipes burst based on flow/pressure metering and consumption data
- bio-contaminations based on regular water quality data

## STREAMER: SEMANTICS-DRIVEN DESIGN THROUGH GEO AND BUILDING INFORMATION MODELLING FOR ENERGY-EFFICIENT BUILDINGS INTEGRATED IN MIXED-USE HEALTHCARE DISTRICTS



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Reference: EeB.NMP.2013-5  
September 2013 > August 2017  
Budget: 11 M€  
Coordinator: TNO (Netherlands)

**Objectives:** 50% reduction of the energy use and carbon emission of new and retrofitted buildings in healthcare districts.

**Description:** Healthcare-related buildings are among the top EU priorities since they play a key role for a sustainable community, but their energy use and carbon emission are among the highest of all building types. In almost every European city there is at least one healthcare district making a huge impact on the whole

city's energy performance. STREAMER is an industry-driven collaborative research project on Energy-efficient Buildings (EeB) with cases of mixed-use healthcare districts.

**CEA Role:** WP (demonstration) leader, the CEA contributes to dissemination and to semantic web building modelling, semantic design configuration software tool design and development.

## EARTH: ENERGY AWARE RADIO AND NETWORK TECHNOLOGIES



[bscw.ict-earth.eu/](http://bscw.ict-earth.eu/)  
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Reference: ICT-FP7-247733  
January 2010 > June 2012  
Budget: 15 million euro  
Coord: Alcatel Lucent

**Objectives:** Achieve a reduction in overall energy consumption of mobile broadband networks of 50%, and target energy consumption which is proportional to system load.

**Description & Results:** EARTH developed key solutions for improved energy efficiency of cellular infrastructure. It found ways to integrate hardware, deployment and management solutions efficiently into an Integrated Solution that allows decreasing energy consumption by more than 50%. The methodology EARTH developed for the evaluation of such gains is also adopted

outside the project in other research initiatives and provides foundations in standardization towards characterizing network energy efficiency in ETSI Eco-environmental Product Standards.

**CEA Role:** CEA LIST contribution focused on the assessment of energy efficiency brought by physical layer cooperation techniques and resource allocation strategies. To enhance the energy efficiency at the infrastructure side

## EXALTED: EXPANDING LTE FOR DEVICES



[www.ict-exalted.eu](http://www.ict-exalted.eu) | [christophe.janneteau@cea.fr](mailto:christophe.janneteau@cea.fr)

Reference: ICT-FP7-258512  
September 2010 > February 2013  
Budget: 7 M€  
Coordinator: SAGEM Communications

**Objectives:** Lay out the foundations of a new scalable network architecture supporting most challenging requirements for future wireless communication systems, whilst providing secure, energy-efficient and cost-effective Machine-to-Machine (M2M) communications for low-end devices.

**Description:** EXALTED vision is that of "a new scalable network architecture supporting the most challenging requirements for the future wireless communication systems and providing secure, energy-efficient and cost effective M2M communications suitable for low end devices" toward the future Internet of Things.

**Results:** Delivered a rich set of solutions addressing various aspects of a M2M system.

**CEA Role:** IP networking and IP communications between vehicles have been studied and an IP addressing architecture for vehicular networks has been proposed. V2V2I communications and VIN conversion to IPv6 address or prefix have been investigated. For V2V2I, an analysis of the state-of-the-art for IPv6 addressing protocols was performed. The proposed method was compared against ETSI-ITS and IETF standards.

## INSTANT MOBILITY: INSTANT MOBILITY FOR PASSENGERS AND GOODS



[www.instant-mobility.eu/](http://www.instant-mobility.eu/)  
[christophe.janneteau@cea.fr](mailto:christophe.janneteau@cea.fr)

Reference: ICT-FP7-284906  
Apr 2011 > March 2013  
Budget: 5 M€  
Coordinator: Thales (France)

**Objectives:** Define requirements for Future Internet technology tools and enablers, so that major transportation-related services is available to any Internet-connected user, whether using a portable, vehicle-based or fixed terminal.

**Description:** the Instant Mobility project has created a concept for a virtual "Transport and Mobility Internet", a platform for information and services able to support radically new types of connected applications for scenarios centered on several stakeholder groups.

**Results:** a set of integrated services and enablers prototypes for three selected scenarios has been shown.

**CEA Role:** CEA focused on the specification and implementation of a protocol that enable the sharing of cellular Internet access from multiple smartphones to the car on-board unit. The car system is now able to opportunistically use and multiply the available bandwidth thanks to surrounding smartphones.

## TROPIC: DISTRIBUTED COMPUTING, STORAGE AND RADIO RESOURCE ALLOCATION OVER COOPERATIVE FEMTOCELLS



[www.ict-tropic.eu](http://www.ict-tropic.eu)  
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Reference: ICT-FP7-318784  
September 2012 > February 2015  
Budget: 4.6 million euro  
Coordinator: Universitat Politècnica de Catalunya (Spain)

**Objectives:** Satisfy user demands by a concept of "Small Cell-Clouding", whereby the small Base Stations offer Cloud services to the terminals nearby.

**Description:** cloud computing services demanded by smartphones could be moved from large server farms to HeNBs. TROPIC addresses that scenario by exploiting advanced MP2MP communications schemes, innovative virtualization procedures, and a cross-layer approach to the allocation of resources understood

in a wide sense: radio, computational/storage capacity and energy.

**Results:** Evolve LTE standards and Small Cell industries into a new generation that supports new functionalities of Cloud Computing.

**CEA Role:** Multipoint-to-multipoint cooperative communications through Distributed Coding and Device-to-Device communications.

## TWISNET: TRUSTWORTHY WIRELESS INDUSTRIAL SENSOR NETWORKS



[www.twisnet.eu](http://www.twisnet.eu)  
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Reference: ICT-FP7-258280  
October 2010 > September 2013  
Budget: 3.4 million euro  
Coordinator: Dresden Elektronik (Germany)

**Objectives:** Develop a platform supporting the integration of sensor networks in a secure, efficient and reliable way, considering the strong technical constraints of sensor networks.

**Description:** Leveraging of a solid threat analysis carried out on industrial scenarios, TWISNet developed an exhaustive security suite provide integrity, confidentiality and availability to wireless sensor networks while also enabling adaptability and longevity. This security suite was implemented on a platform conceived within the project.

**Results:** TWISNet platform running the project security solution was shown to be able to defeat the initially identified threats.

**CEA Role:** CEA focused on the specification and implementation of the following security services: authentication, network access control, key management, privacy enforcement & management, threat detection and security adaptation.

## PROTECTRAIL: RAILWAY-INDUSTRY PARTNERSHIP FOR INTEGRATED SECURITY OF RAIL TRANSPORT



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[geraud.canet@cea.fr](mailto:geraud.canet@cea.fr)

Reference: FP7-SEC-2009-2.2-01  
September 2010 > March 2014  
Budget: 21 M€  
Coordinator: AnsaldoSTS

**Objectives:** Increase the security of mainline rail transport in Europe.

**Description:** The PROTECTRAIL challenge is to make interoperable the single asset-specific solutions and to conceive and design a modular architectural framework where each asset-specific solution can be "plugged".

**Results:** the PROTECTRAIL project addressed the following security sub-missions: protection of signal and power distribution systems against any terrorism act, track clearance, clearance of trains before and after daily use, staff clearance,

luggage clearance control, passenger clearance control, freight clearance control, tracking and monitoring of rolling stock carrying dangerous goods, protection of communication and information systems, stations, buildings and infrastructure protection.

**CEA Role:** Development and live on-site demonstration of a technological module to track a suspicious person in the video.

## PSOPHIA: INCREASING SECURITY AWARENESS OF CRITICAL INFRASTRUCTURES OPERATORS INTRODUCING INTELLIGENCE TECHNIQUES AND FOCUSING ON PSYCHO-SOCIAL AND HUMAN FACTORS



<http://psophia.infosecuregroup.com/>

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Reference: CIPS Program  
April 2013 > July 2014  
Budget: 346 k€  
Coordinator: Tecnalia (Spain)

**Objectives:** improve security of critical infrastructures taking into account human factors during risks analysis.

**Description:** 5 technical WP states of art, HUMINT techniques, AI techniques, elaboration of guidelines, training tool improvement and final demonstration.

**Results:** state of art to identify lacks in existing risks analysis (special focus on human factor), elaboration of new models to include and/or to improve existing tools.

**CEA Role:** survey on existing AI techniques in security and propose new methods to analyze human factors with two main axes (i) social engineering (data leakage by unconscious acts) (ii) sabotage (malicious and conscious acts).

## SCINTILLA: SCINTILLATION DETECTORS AND NEW TECHNOLOGIES FOR NUCLEAR SECURITY



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Reference: FP7-SEC-2010-2  
January 2012 > December 2014  
Budget: 3.868 M€  
Coordinator: CEA (France)

**Objectives:** Europe monitors transits using radiation detectors to prevent illicit trafficking of nuclear materials. The SCINTILLA project aims to develop a toolbox of innovative technologies designed to RPM (Radiation Portal Monitor).

**Description:** 6 Usage Cases defined specific detection solutions for checking luggage, pedestrian, vehicle and container. Detector for First responders (Fire man), Police and Customs are designed to target radioactive sources and shielded material.

**Results:** Three benchmark campaigns are scheduled in order to test innovative technics. 4 types of scintillator-based technologies (organic and inorganic scintillation materials that exhibit fluorescence light when excited by ionizing radiation), 2 CZT technologies (CdZnTe – Cadmium Zinc Telluride) complemented by advanced image processing technologies.

**CEA Role:** New Plastic detector set, CZT detector and camera with suitable electronic device and software, Patent technology.

## SECUR-ED: SECURED SOLUTION FOR URBAN TRANSPORTATION – A EUROPEAN DEMONSTRATION



[www.secur-ed.eu](http://www.secur-ed.eu)

[karim.boudergui@cea.fr](mailto:karim.boudergui@cea.fr)

Reference: FP7-SEC-2010-2  
April 2011 > September 14  
Budget: 40 M€  
Coordinator: Thales (France)

**Objectives:** the SECUR-ED Project is a demonstration project with an objective to provide a set of tools to improve urban transport security. Participants include all the major stakeholders from across Europe. The objective of the project is to provide public transport operators of large and medium European cities with the means to enhance urban transport security.

**Description:** this will be demonstrated in various cities in order to show how to increase security in mass transportation with various scenarios and various threats. 4 main demon-

strations will take place in Paris, Milan, Madrid and Berlin. First results are planned in December 2013.

**CEA Role:** CEA knowledge on NRBCE fields especially with several devices like DIRAD, SGP, TREX, SAWEX, GAMPIX and KATRINA portal monitor installed in real situation on site.

## USEMP: USER EMPOWERMENT FOR ENHANCED ONLINE PRESENCE MANAGEMENT



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Reference: ICT  
October 2013 > September 2016  
Budget: 3.200 k€  
Coordinator: CEA LIST (France)

**Objectives:**

- Advance the understanding of Web privacy through a multidisciplinary approach
- User empowerment through semi-automatic tools for personal data management

**Description:** Online privacy is an important concern for Europeans. USEMP combines expertise in legal and social studies, user empowerment research and multimedia processing to cope with this complex problem.

**Results:** tools for user empowerment in social media, raised awareness concerning the ad-

vantages and risks of sharing personal data on the Web.

**CEA Role:** CEA LIST contributed to multimedia information extraction, user interfaces.

## VIRTUOSO: VERSATILE INFORMATION TOOLKIT FOR END-USERS ORIENTED OPEN SOURCES EXPLOITATION



[virtuoso.eu/](http://virtuoso.eu/)  
[geraud.canet@cea.fr](mailto:geraud.canet@cea.fr)  
Reference: FP7-SEC--242352  
May 2010 > June 2013  
Budget: 12 M€  
Coord: CEA LIST (France)

**Objectives:** Virtuoso provides a technical framework for the integration of tools for collection, processing, analysis and communication of open source information. The project complies with legal considerations and enforces the principles of privacy and data protection to ensure the interests of citizens within the European Union.

**Description & Results:** “Plug and play” functionalities that improve the ability of border control, security and law enforcement profes-

sionals to use data from across the source/format spectrum in support of the decision making process are enabled by this middleware framework. As a proof of concept, and to highlight the efficiency of this open-source code framework, a prototype has been built and demonstrated using operational scenarios.

**CEA Role:** CEA LIST contributed to framework definition and language technologies: information extraction, summarization, image analysis.

## CESAR PROJECT (COST-EFFICIENT METHODS AND PROCESSES FOR SAFETY RELEVANT EMBEDDED SYSTEMS) IS A EUROPEAN FUNDED PROJECT FROM ARTEMIS JOINT UNDERTAKING (JU)



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[patricia.mouy@cea.fr](mailto:patricia.mouy@cea.fr)  
Reference: Artemis Call 2008  
March 2009 > June 2012  
Budget CEA: 994 / 398 K€  
Coordinator: AVL

**Objectives:** Stronger integration, of safety engineering methods and techniques, all along the phases of the development process.

**Description:** The purpose is to optimize globally the safety critical embedded system architecture by taking into account simultaneously all viewpoints and associated criteria (cost, mass, safety). The project addresses different classes of applications and their protocols as well as

the levels of criticality and the different behavior types.

**CEA role:** CEA focus is on (i) common unified model of concepts required to model the various aspects and points of view of a software based system and on hardware architecture modeling and (ii) software component deployment under safety and resource constraints.

## INTERESTED: INTEROPERABLE EMBEDDED SYSTEMS TOOL CHAIN FOR ENHANCED RAPID DESIGN, PROTOTYPING AND CODE GENERATION



[francois.terrier@cea.fr](mailto:francois.terrier@cea.fr)  
Reference: IP FP7  
January 2008 > April 2011  
Coordinator: Esterel Technologies (France)

**Objectives:** Reduce the cost and improve the quality of safety-critical embedded systems.

**Description:** With a large set of European embedded tool vendors (AbsInt, Atego, CEA LIST, Esterel Technologies, Evidence, Symtavision, Sysgo and TTTech), the project has provided tool integrations evaluated on industrial applications at Airbus, Thales, Siemens Mobility (Rail) and Magneti Marelli.

**Results:** Creation of an integrated and open reference tool chain for system & software design, networking & execution platform, timing

& code analysis – covering the full spectrum of embedded systems & software development.

**CEA Role:** Development of a system modeling tool (Papyrus) integrated to Esterel design tool, SCADE Suite.

Connection floating point accuracy analysis, scheduling analysis and deployment on safe time triggered OS.

## MAENAD: MODEL-BASED ANALYSIS & ENGINEERING OF NOVEL ARCHITECTURES FOR DEPENDABLE ELECTRIC VEHICLES



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Reference: EU FP7  
September 2010 > February 2014  
Budget: 4 M€  
Coordinator: Volvo (Sweden)

**Objectives:** Extends the coverage of Full-Electrical Vehicles (FEV) engineering challenges by the EAST-ADL2, an automotive architecture description language (ADL) developed in the context of two other precedent projects: ATESS2 and ATESS22, e.g. advanced capabilities for assisting the safety process defined in the ISO 26262 automotive safety standard and for predicting performance; import of external requirement and architecture descriptions, formalized description of behaviours, early resource and timing analysis, multi-objective optimization.

**Results:** analysis and optimization tools will provide automated exploration of potentially huge design spaces to achieve better or optimal trade-offs among dependability, performance and cost.

**CEA Role:** a modelling solution based on Papyrus and Papyrus-based tools for early resource and timing analysis and AUTOSAR synthesis.

## MBAT: COMBINED MODEL-BASED ANALYSIS AND TESTING OF EMBEDDED SYSTEMS



<https://www.mbat-artemis.eu>  
[nicky.williams@cea.fr](mailto:nicky.williams@cea.fr)

Reference: ARTEMIS Joint Undertaking (Grant Agreement No. 269335)  
Nov 2011 > October 2014  
Budget CEA: 475 k€  
Coordinator: Siemens (Jans Herman)

**Objectives:** MBAT aims at developing new verification and validation techniques within a reference platform (MBAT RTP) for the production of high end safe systems. For this, novel techniques in static analysis and test on high-level models will be combined by RTOs in the projects and validated on industrial use cases.

**Results:** at this stage, the project is currently focusing on the RTP specifications and use cases selection.

**CEA Role:** CEA brings various analysis tools and technological bricks: PathCrawler, Diver-

sity, Fluctuat and HySon. These tools will be integrated in the RTP and new links are under development for instance between PathCrawler and Diversity.

## OPENETCS: OPEN PROOFS METHODOLOGY FOR THE EUROPEAN TRAIN CONTROL ONBOARD SYSTEM



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Reference: ITEA2 Project  
July 2012 > July 2015  
Budget: 19 M€ (for CEA: 1.4 M€)  
Coordinator: Deutsche Bahn (Germany)

**Objectives:** OpenETCS' main goal is to produce an Open Source tool chain for designing, developing and validating railways controlling systems according to ETCS norm (European Train Control System).

**Description:** OpenETCS gathers partners from the railways industry (SNCF, DB, Alstom, Siemens,...) as well as software tools providers. It will identify relevant tools, and required enhancements during the development of a prototype for a representative subset of a complete systems.

**Results:** during the first year of the project, the first semi-formals models have been extracted from the norm, and some evolutions to existing tools have been specified in order to better meet specific ETCS needs.

**CEA role:** CEA is participating in OpenETCS through its Papyrus, Diversity, and Frama-C tools, in close interaction with various partners who put these tools into action.

## RT-DESCRIBE: ITERATIVE DESIGN PROCESS FOR SELF-DESCRIBING REAL-TIME EMBEDDED SOFTWARE COMPONENTS



<http://www.esk.fraunhofer.de/en/projects/RT-Describe.html>  
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Reference: Carnot Fraunhofer PICF 09  
September 2009 > August 2012  
Budget: 588/342 k€ (total/funding CEA)  
Joint coordination

**Objectives:** make systems more robust and efficient by being adaptive; focus on modelling of adaptability and suitable development processes  
Two partners: CEA as Carnot, ESK as Fraunhofer institute

**Results:**  
– “Self-X” UML profile: modelling of configurations, add non-functional properties (e.g. resource consumption) related to adaptation

– Transformation provides Self-X information at runtime  
– Feedback about runtime behaviour with Fraunhofer simulator

**CEA Role:**  
– Model-driven-development & associated tools  
– UML modeler Papyrus

## SAFEADAPT: SAFE ADAPTIVE SOFTWARE FOR FULLY ELECTRIC VEHICLES



<http://www.safeadapt.eu>  
[ansgar.radermacher@cea.fr](mailto:ansgar.radermacher@cea.fr)

Reference: FP7-2013-ICT-GC  
July 2013 > June 2013  
Budget: 9255/5937k€ (total/funding)  
Coordinator: Fraunhofer ESK (Germany)

**Objectives:** vehicle has to recover from failures in flexible way, improve energy efficiency, add or improve features:  
– Update and re-organize software at runtime in a safe & reliable way  
– Suitable development process, platforms and tools  
– ISO26262 compliance

**Description:** The project is conducted by several partners from Europe; a small Dutch company (Duracar) provides an electrical car as test platform.

**CEA Role:**  
– Model-driven-development & associated tools, UML modeler Papyrus  
– System simulation with UNISIM

## SAFECER: CERTIFICATION OF SOFTWARE-INTENSIVE SYSTEMS WITH REUSABLE COMPONENTS



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[armand.puccetti@cea.fr](mailto:armand.puccetti@cea.fr)  
 Reference: SafeCer ARTEMIS JU  
 April 2012 > April 2015  
 Budget: 968 k€  
 Coordinator: Volvo (Sweden)

**Objectives:** SafeCer aims to increase efficiency and reuse in the development and certification of safety-relevant embedded systems (SRES) by providing process and technology for composable qualification (i.e. by re-use of the established certification data for the parts, where a part could be a component, subsystem or even another system).

**Description:** Creation of a generic framework for certification instantiable to multiple domains (Automotive, Trains, Health)

Results a tools platform and the definition of a generic certification workflow

**CEA Role:** V&V tools. Tests generation and Model Checking (DIVERSITY), Traces Checking / Monitoring (ARTiMon).

## STANCE PROJECT: A SOURCE CODE ANALYSIS TOOLBOX FOR SOFTWARE SECURITY ASSURANCE



[armand.puccetti@cea.fr](mailto:armand.puccetti@cea.fr)  
 Reference: CP FP7  
 Octobre 2012 > September 2015  
 Budget: 5,565 k€  
 Coordinator: CEA LIST (France)

**Objectives:** the main objective is to define, implement and validate a set of program analysis tools capable of verifying the security of complex software systems made in C, C++ and Java.

**Description:** STANCE will perform research on new methods and algorithms to detect security vulnerabilities in C, C++ and Java programs, and will implement them within the existing partners tools.

**Results:** New plug-ins for Frama-C, extensions of VeriFast, other tools. Validated use-cases.

**CEA Role:** CEA will bring into the project its Frama-C analysis platform and its expertise for the analysis of code.

## VERDE: VALIDATION-DRIVEN DESIGN FOR COMPONENT-BASED ARCHITECTURES ITERATIVE DESIGN PROCESS FOR SELF-DESCRIBING REAL-TIME EMBEDDED SOFTWARE COMPONENTS



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 Reference: ITEA 2 ~ 08020  
 June 2009 > May 2012 - Budget: 16.660 k€  
 Coordinator: Thales Communications (France)

**Objectives:** Develop a solution for iterative, incremental development and validation of RTES that integrates testing and analysis tools; foster its industrialisation through a close collaboration between technology providers and end users from different domains (software radio, aerospace, railway and automotive).

**Description:** with the growing complexity of software intensive, real-time embedded systems combined with constant quality and time-to-market constraints, systems are de-

veloped according to a traditional application of the verification-and-validation cycle. VERDE is promoting a more iterative and incremental approach to software development that will be driven by the early V&V activities.

**CEA Role:** CEA defined a compositional testing technique for real time component based systems, tooled as an extension of the DIVERSITY symbolic execution platform techniques based on the EC3M technology.





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