EURESCOM mess@ge 3/2008
The magazine for telecom insiders

includes CELTIC N • E • W • S

Public safety and ICT

In focus
ISI – Integrated Satcom Initiative

Viewpoint
Why there is no such thing as "green ICT"

Events
NEM Summit 2008

2nd Future Internet Assembly

Madrid, Spain, 9–10 December 2008

The Future Internet has become a focal point of the discussion in the global ICT research community. Europe is particularly active in this area. On 31 March 2008, the Future Internet Assembly (FIA) was kicked off at the Bled conference that was organised by the EC and the Slovenian EU Presidency.

The 2nd Future Internet Assembly will take place from 9 to 10 December 2008 in Madrid as a continuation of the Bled event. The meeting will provide opportunities for discussion and networking of the European Future Internet community.

The purpose of the event is to take stock of the progress achieved since the launch of the FIA in Bled as well as to further move ahead the discussion among the participating projects and European Technology Platforms with particular focus on the research issues cutting across the different dimensions of the Future Internet.

Speakers from industry and academia will present their views on how the Future Internet should be shaped. Working groups will discuss different aspects of the subject in a cross-disciplinary way. Ongoing research projects in the Future Internet domain will present their approaches and contribute to the discussion on the related technological, societal and economic challenges.

Target audience

Experts, researchers and decision-makers from academia and industry who are involved in Future-Internet-related research in the FP7 ICT programme.

Registration

The registration deadline is 30 November 2008.
You can register online via *www.fi-madrid.eu*

Further information

Further information about the Future Internet Assembly and other European Future Internet activities is available at *www.future-internet.eu*

4th Annual Celtic Event 2009

Future Directions in Telecommunications and ICT

Paris, France, 11–12 March 2009

The Celtic Initiative will organise its fourth annual event on 11 and 12 March 2009 at the Marriott Hotel (Rive Gauche) in Paris. The event is targeted at decision-makers, managers, and technical experts from the telecommunications industry, operators, and academia. Participation is by invitation only.

Objectives

The main objective of the event is to present the current status, the available results, and the latest developments of the running Celtic projects.

Furthermore, the event will provide an excellent opportunity to get an overview on the state-of-the art in the development towards integrated next-generation telecommunications and multimedia systems for seamless use across mobile and fixed networks. Leading European experts will discuss the needs on future research in these areas.

Exhibition

At the exhibition, which will run in parallel to the workshop and conference sessions, Celtic project teams will demonstrate their achievements, demos or prototypes and discuss their results with interested experts.

Participation

The Celtic Event is open only to personally invited people. Interested experts may contact the Celtic Office at *office@celtic-initiative.org*, if they wish to suggest that a personal invitation should be sent to them.

The Celtic Event is supported by:

Dear readers,

After a year full of events, there is yet one to come that beats them all: Christmas. Although the schedule of this event has not changed in the last 1,000 years, it seems to come as a surprise every year. Or have you already bought Christmas presents for your loved ones? Most people only start their Christmas shopping in December, and some, mostly men, even start buying their Christmas presents only on 23rd December.

You may ask, what Christmas presents have to do with research on information and communication technologies. Well, if you could look at what is lying under European Christmas trees, the connection would become apparent. Christmas presents reflect the technological status of our society. Despite continuous erosion of privacy in 2008, we still cannot actually look under everybody's Christmas tree, but there are marketing surveys that give us an idea, which presents people buy at Christmas.

According to a German survey done by eCircle in 2007, printed books, an analogue medium with good interface but low storage capacity, are still leading the hit list – 44 percent of respondents bought books. However, if you combine consumer electronics and information and communications devices, their share appears to be much higher. Although the percentage of CDs and MP3 players has already decreased over the years, still 32 percent bought them, compared to 27 percent for computer games, 21 percent for TV, DVDs, and video, and 21 percent for computers.

What will be the top gadget of Christmas 2008? Will it be smart phones, Internet notebooks, or gaming consoles? Whatever it is, you can be sure that the digital Christmas presents of 2008 will be endowed with more wireless connectivity than any of the presents before.

Looking into the crystal ball, I see that this trend will continue. In the future, any electronic device under the Christmas tree will offer some kind of wireless connectivity, either directly to the Internet or at least via Bluetooth or near-field communication to the nearest PC connected to the Net. Despite the trend to make mobile phones ever smarter and bundle ever more functions within them, we will see new devices entering the Christmas gift charts, like, for example, the e-book reader, which is still a toy for some early adopters. However, with the increasing supply of e-books, e-book readers with an eye-friendly interface might become popular. This may even threaten the leading role of printed books as the single most popular Christmas gift.

Considering that year by year we are getting closer to the Internet of Things, it will probably be hard to find anything under the Christmas tree in five years that does not have some type of connectivity. Or will we experience a nostalgic counter-revolution under the Christmas tree in 2013? Will people deliberately choose some non-electronic, non-connected gifts, as they are already connected in everyday life via all kinds of electronic devices?

I hope these considerations have triggered your own futuristic thinking. My colleagues from the Eurescom mess@ge editorial team and I would be very keen to learn about your views. What will be the most popular Christmas presents in 2013? Please write us what you think and send your ideas via e-mail to *message@eurescom.eu* – we will, with your permission, publish some selected views on our website. It will be interesting to see in 2013, which of your prophecies will have come true.

On behalf of the Eurescom mess@ge editorial team, I wish you a Merry Christmas and a Happy New Year.

Milon Gupta
Editor-in-chief

Events calendar

25–27 November 2008
ICT Event 2008
Lyon, France
http://ec.europa.eu/information_society/events/ict/2008

9–10 December 2008
2nd Future Internet Assembly
Madrid, Spain
www.fi-madrid.eu

9–12 December 2008
CoNext 2008
Madrid, Spain
www.sigcomm.org/co-next2008

9 December 2008
ReArch 2008–Re-Architecting the Internet)
Madrid, Spain (co-located with CoNext 2008)
www.sigcomm.org/co-next2008/rearch.html

10–13 December 2008
ServiceWave2008
Madrid, Spain
www.nessi-europe.com/Nessi/NewsEvents/Events/ServiceWave2008/tabid/386/Default.aspx

5–6 February 2009
1st OMEGA Open Event
Rennes, France
www.ict-omega.eu

26–28 February 2009
Mobile Learning 2009
Barcelona, Spain
www.mlearning-conf.org

6–8 April 2009
TridentCom 2009
Washington D.C., USA
www.tridentcom.org

28–30 April 2009
Mobileware 2009
Berlin, Germany
www.mobilware.org

11–13 May 2009
Future Internet Conference
Prague, Czech Republic

10–12 June 2009
ICT Mobile Summit 2009
Santander, Spain
www.ict-mobilesummit.eu/2009

14–18 June 2009
IEEE ICC 2009
Dresden, Germany
www.comsoc.org/confs/icc/2009

18 June 2009
Future-Net '09
Dresden, Germany
www.future-network09.org

Sn@pshot

Web surfing in 3D

Will Web surfing become three-dimensional? The screenshot shows the model of a city programmed in 3DMLW, the 3D Markup Language for Web. This XML-based Open Source file format has been developed for representing three-dimensional and two-dimensional interactive content on the World Wide Web.

Displaying 3DMLW requires the 3DMLW browser plug-in to be installed on a computer, using OpenGL for rendering. The 3DMLW plug-in is available for common web browsers, like Internet Explorer, Mozilla Firefox, and Opera.

Website: www.3dmlw.com

Imprint

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The Eurescom study programme 2008

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One of the strengths of the Eurescom community is its commitment to engage in short and focused collaborative studies. The Eurescom study programme is an instrument that enables the efficient setup and execution of such studies. The programme is financed by its subscribing members, and their commitment is underwritten by their upfront payments to the programme's budget.

The Eurescom study programme continues to demonstrate its flexibility in bringing together leading experts from its members to address topics of common interest. Eurescom studies develop conclusions on specific topics and pave the way for larger collaborative initiatives.

The fundamental working principle within the Eurescom study programme is collaboration. Any network operator or service provider may become a subscriber of the study programme and participate in it, if he shares the interest of having the substantial issues facing the telecoms industry addressed in a collaborative way. The results of the studies are exclusively available to the members of the programme so that the study subscriber organisations benefit from a direct competitive advantage through collaborative work.

Following the second call for proposals in 2008, a number of very interesting study proposals were evaluated and positively assessed by the study management group and are expected to start by the end of 2008. After the closure of the call, a further study proposal was received and evaluated, underlining the flexibility of the study programme, which enables the submission and realisation of proposals at any time.

The issues addressed in the selected study proposals concern the need for standardisation in the area of machine-to-machine (M2M) communications, an ultra-flat architecture for high bit-rate services in fixed mobile convergent networks, and the potential socio-economic impact of mobile micro-credit.

M2M standardisation

The starting point of the proposal for a "Pre-study for European level M2M standardisation" is that the Internet of Things with machine-to-machine communications needs a certain standardisation level in order to become commercially successful and technically viable. Lack of standardisation and coordination has hindered the introduction of novel services in the Internet as well as the growth of the M2M market. Standardisation can support the elaboration of a migration path from existing infrastructure towards the required flexible environment for service development and ubiquitous deployment and operation.

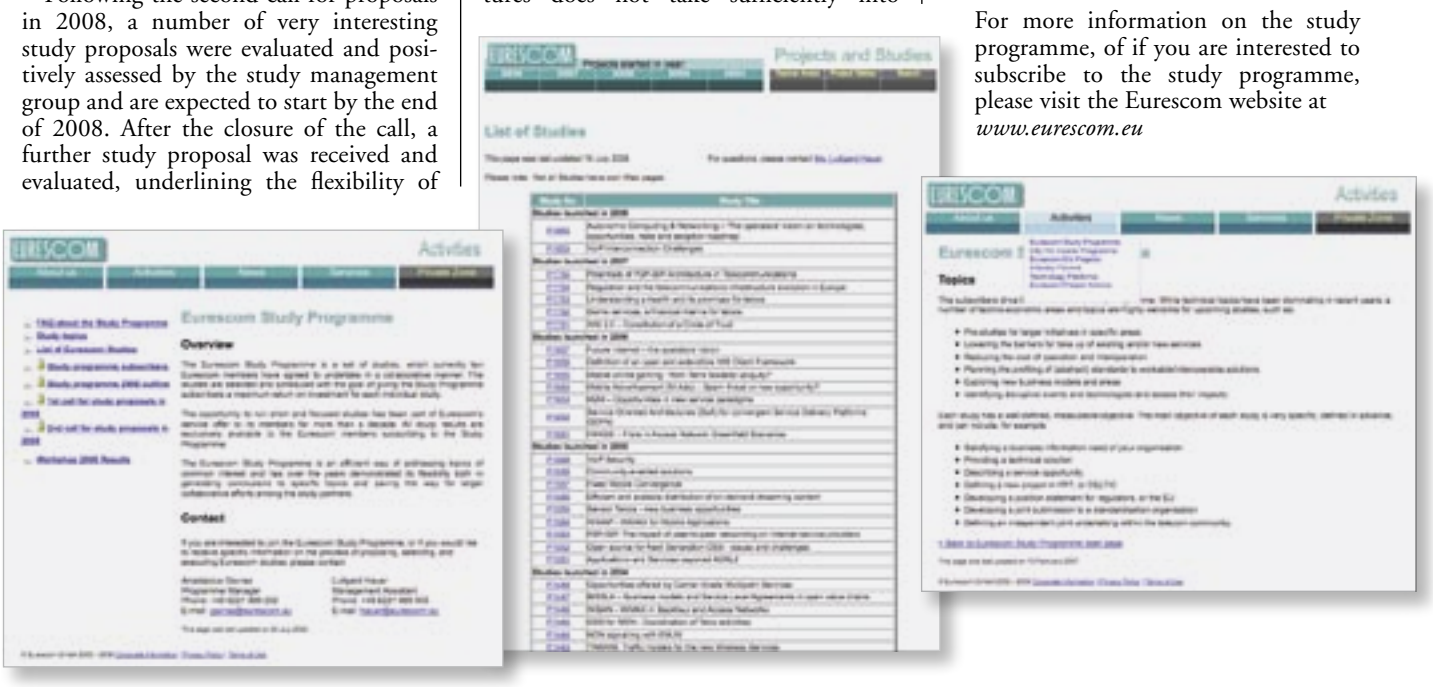
Ultra-flat architecture

The study proposal on an "Ultra Flat Architecture for high bit rate services in fixed mobile convergent networks" aims to tackle the challenge of the coming years to offer much higher bit-rate data services to mobile customers. Future mobile architectures are being standardised to offer mobility between heterogeneous access technologies. The design of these architectures does not take sufficiently into account scalability requirements, since they are centralised with many network levels and dependencies. The study proposes to provide a new architecture that integrates scalability requirements with the reduction of the number of network nodes to one node, which is the base station, via the distribution of traditional user and control plane functions in this node. This new ultra-flat architecture must optimise service establishment and mobility procedures in a fixed-mobile convergence environment. One of the objectives of the study is to evaluate the general industry interest in an ultra-flat architecture and potentially pave the way for a large-scale research project.

Mobile micro-credit

Finally, the study proposal on the "Socio-economic impact of mobile micro-credit" aims to assess the impact of micro-financial transactions that are based on mobile phones, acknowledging the successful business model in certain countries that is based on large poor and low-income populations. Thus, one part of the study will be dedicated to assess the real socio-economic impacts of mobile micro-credit for mobile operators, but also the impact on micro-credit clients and on micro-finance institutions in developing countries. Mobile banking is above all developed in under-developed or emerging economies. However, micro-credit initiatives are growing in Europe as well. Therefore, the other part of the study will evaluate the opportunities for European network operators to develop this kind of services in some European markets.

For more information on the study programme, of if you are interested to subscribe to the study programme, please visit the Eurescom website at *www.eurescom.eu*



"Futures" and "Internets"

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The expression "Future Internet" is rapidly becoming one of the most overloaded phrases in the English language. What it means is becoming lost in a sea of unreliable promises and reports that should be more appropriately described as science fiction or disinformation.

But rather than getting depressed, let us look for the real Future Internet.

If I ask the big companies who are making money today putting services out on the Internet, they tell me that they would like an overlay network for distributing their services. They want to satisfy demanding customers with reliable services and they don't trust the IP network of today to ever be able to meet their throughput demands. It is interesting that they consider an overlay the answer.

If we look at the first experimental large-scale all-IP network rollouts, we can see that most have considered an overlay network approach to separate the voice traffic from the rest of the IP traffic. Again, this overlay approach is suggested, because they cannot guarantee the quality and throughput for the real-time services when in a common pipe.

Then we can look at the games community and the millions of people that go online every evening to spend hours in virtual worlds living virtual lives. These people already have – in Germany anyway – special connections with less error correction in favour of faster throughput. The point for them is they want high-quality real-time communications for shared applications – and they are prepared to negotiate quality against price for this.

Then there are the road warriors who want their office environment available to them wherever they are. High-capacity data, reliable voice, video, total mobility and accessibility are the de-facto characteristics of their Future Internet. Cost is not the most critical point. Although road warriors are price-sensitive, availability and reliability are things they pay for. They cannot accept the painful process of downloading megabytes of mails and files over kilobyte connections.

If we add the world of what I will call "micro-communications" – the very small data messages where the size of the individual communication is very small, but there are literally billions of them – we need to handle these with a little overhead as possible. Sensors will generate such traffic in the future, and maybe we should be considering instant messages in the same way. Do we put this traffic in a pipe of its own?

What can we conclude? Well, it seems many domains are rapidly developing a view that to get the best deal for themselves and their services, they need to fence off part of the network for themselves. This may not be the most efficient way of using resources in the future, but it could be a very good way for allocating the costs of future networks.

But if we insist on a unified network, the question becomes, what architectural model can we develop that would allow us to support many virtual networks within one network?

If we do it at a packet level, we will be attacked by the net neutrality zealots for discriminating against traffic. It is now clear that a strict adherence to a totally neutral network will not allow normal market forces to prevail, and customers will not be able to make price-performance choices. Markets must be open to supporting customer choices.

So maybe we have to consider doing it by allocating capacity in the network at a megabyte, wavelength or physical fibre level. This is nothing new – this is just a development of the leased-lines business that has been working for years.

If we deny either of these approaches and commit to a network that integrates and supports all requirements, then we need to start working now on how the future network can be constructed and managed to deliver the required quality in a measurable fashion to all users at the same time.

This, to me, is the real Future Internet: an all-inclusive network that can provide high bandwidth communications on demand and maintain the quality through the entire communication. To do this, it must be a service-aware network with network-aware services and a management system to guarantee the quality purchased.

The Future Internet must also handle the management negotiations, not just between the networks and the services, but also between the multiple network operator and service provider domains that each communication involves. We could even expect the management system to collect DRM (digital rights management) tickets and inform the content producers, when their content is being copied and distributed.

This just leaves the question of who collects the money, but we will discuss that another day.

Public safety and ICT

Preventing incidents and minimizing their impacts

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We are living in a world of risks. Every year, natural or man-made disasters take many lives and cause severe damage. After disaster has struck we ask ourselves, whether anything could have been done in order to avoid the incident or to reduce its impact. ICT already plays a significant role in this, but the question is, whether we sufficiently exploit the capabilities of modern ICT.

There are numerous types of incidents that affect public safety, some of which are natural, and some of which are man-made. Most prominent natural disasters in this decade were hurricane Katrina in America in 2005 and the Tsunami of 2004 in Asia. However, we don't need to go that far, as the severe forest fires in Greece and Portugal have shown more recently. Besides the danger caused by nature, there are many threats which are man-made: terrorist attacks, accidents in plants, potentially leading to emission of toxins or radiation, power outages, or just high-crime areas.

Unused potential of ICT

According to Wikipedia, public safety involves "the prevention of and protection from events that could endanger the safety of the general public from significant danger, injury/harm, or damage, such as crimes or disasters". ICT is clearly capable of giving support in all phases of disaster management, e.g. in preparation, mitigation, response, or recovery. Although all phases are important, the phase of preparation has a key role, as it enables protective measures like, e.g., evacuation. Advanced ICT allows to forecast the route of a tornado, it can listen to seismic activities and interpret them. Supercomputers are helpful tools for analysis and simulation.

While it is challenging enough to coordinate counteractions once a warning was given well in advance, it gets much more complicated if the warning is rather a notification of an event that has already started, leaving practically no time for preventive actions. Modern and robust communication networks that help in spreading information and coordinating activities have an important role at such events. The power blackouts in the US and Italy are specific examples, as these are cases that impact also the systems used for warning and recovery. There are a number of aspects which need closer attention in order to improve use and availability of ICT for public safety. This includes cross-border aspects – important for incidents that effect more than one country. Further progress on standardised solutions is a basic requirement to enable interworking of systems. Inhomogeneous systems are by far not overcome. Finally, there are security issues related to convergence toward IP-based networks and Next Generation Networks.

Unfortunately, ICT nowadays is not fully exploited to the extent state-of-the-art technologies would allow. Attitudes of ignorance at political level like "it can't happen in my country", debates about how to finance or distribute the costs, or lengthy disputes about the right implementation strategy are some of the non-technical barriers. But extended use of ICT going along with automated control and management could even help to keep costs low, and also to improve speed of reaction.

Impact of future communication networks

The usability of future networks for public safety applications will require specific consideration of their design. While many users are nowadays happy to enjoy lower cost for VoIP calls over the Internet, this goes along with a lower guarantee of service. This is critical, if this medium is needed in emergency situations. If a disaster goes along with power outage, then users of today's Internet telephony could not make phone calls, as both their PC and WLAN router would not work. Other issues are network congestion, which can easily occur at larger disasters causing peaks in communication, the missing capability of locating the caller origin, or the ease of faking the identity of the caller or callee.

European efforts on public safety

To facilitate consensus-building in the area of public safety communication and information management systems, the Forum for Public Safety Communication Europe has been established. Another major organisation is the International Emergency Management Society – TIEMS, which focuses on the use of innovative methods and technologies within emergency and disaster management. In addition, the European Commission is active in this area. In December 2004 the European Council endorsed a European Programme for Critical Infrastructure Protection (EPCIP), in which ICT is one element. Political agreement between Member States on the directive has been reached in June 2008. In 2006-2007, a study on Availability and Robustness of Electronic Communications Infrastructures (ARECI) was conducted for the European Commission. As part of its ten recommendations, the study revealed that preparing for disasters is often insufficient and often lacks involvement of respective governments. Priority communications must be ensured also in future networks. Another concern raised relates to the shift to outsourcing without sufficient quality control, and the increasing risk through dependency on software controlled technology.

Wireless Sensor Networks for Homeland Security – Securing public places during high risk events

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Homeland security and, more specifically, perimeter/area surveillance for intrusion detection is one of the most promising Wireless Sensor Network (WSN) applications. In such scenarios, WSNs can be easily deployed permanently (e.g. in public places) or on-demand (e.g. at high risk events) in a very short time, with low cost and with little or no supporting communication infrastructure. They can also be removed and reused anywhere else very rapidly.

The increased use of WSNs for homeland security motivated the inclusion of this scenario as one of the demonstrators in FP6 project UbiSec&Sens – Ubiquitous Sensing and Security in the European Homeland. UbiSec&Sens aims at providing a comprehensive architecture for medium and large-scale wireless sensor networks with the full level of security that will make them trusted and secure for all applications. The project is currently in its third and last project year and is about to complete the three demonstrators that highlight and validate the feasibility of the developed concepts.

As mentioned above, one of them is the Homeland Security WSN (HS-WSN) demonstrator which has been developed in close cooperation with the Portuguese police. It recreates a typical environment for the application of WSN for perimeter surveillance. One of its goals is to help police forces improve the security of facilities that might be the target of attacks by criminal groups. This involves clearing and securing the surrounding area and all possible accesses which could be used for the infiltration of intruders and/or harmful devices. Force management during those missions can be significantly improved if the police teams have the capability to deploy an intrusion detection WSN in some of the restricted areas, namely inside buildings and underground passages, when clearing them for the first time. These unmanned scouts can later be easily retrieved after mission completion in order to be reused at the next mission.

Due to the nature of the application the most important requirements for the WSN are robustness, reliability, and security.

Homeland Security WSN scenario

The envisioned HS-WSN scenario is depicted in figure 1.

Each sensor node is equipped with one or more intrusion detection sensors such as infra-red based movement detector, window/door opening detector, acoustic sensor, and still-image sensor.

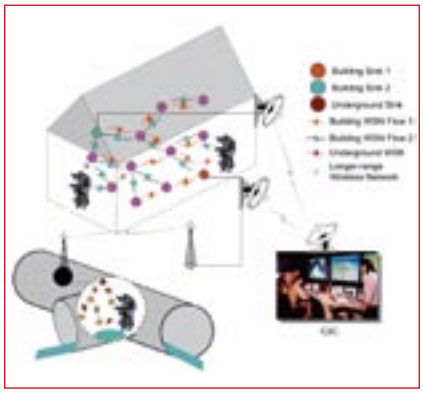

Figure 1: Homeland Security WSN scenario

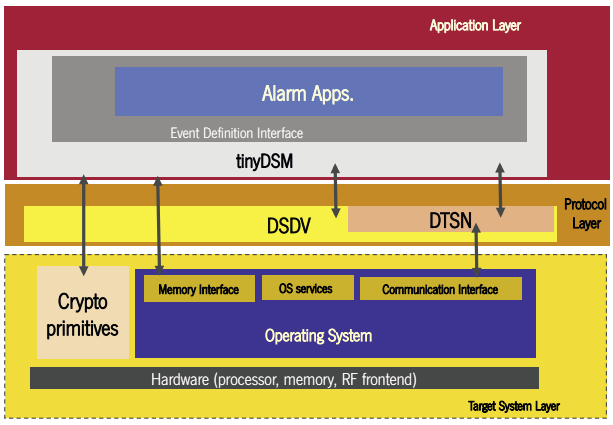

Figure 2: HS-WSN software architecture

Intrusion alerts are both sent to the remotely located Command and Control Centre (C2C) and to individual agents deployed in the area. The sensor data can be monitored in the C2C in real-time. Police agents may also be equipped with laptops or PDAs that allow direct connectivity to the WSN.

In the HS-WSN node software (see figure 2), the application layer includes a distributed shared memory module, which provides a very robust data storage due to its inherent replication means and which comes with an event mechanism. The mechanism allows the definition of thresholds and actions to be executed in case the threshold is passed. With these mechanisms the data handling system ensures a significant level of dependability due to the replicas maintained and provides real-time detection of alarms.

The protocol layer needs to support the local distribution of replication messages of the distributed shared memory and the propagation of event messages. Distributed Transport for Sensor Networks (DTSN) is a protocol for reliable data transport, and Destination Sequenced Distance Vector routing (DSDV) is a routing protocol, which, in our case, was modified to achieve secure routing.

The target system layer provides services such as memory management. It also supports security mechanisms used by the application by providing an implementation of cipher means.

Conclusion

The demonstrator has shown the usability of a WSN for homeland security applications. The required robustness, reliability and security are achieved through the correct deployment of the WSN and also through the inclusion of the right software components.

More information about the UbiSec & Sens project can be found at *www.ist-ubisecsens.org*.

DeHiGate

Deployable High-Capacity Gateway for emergency services

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The Deployable High Capacity Gateway has been developed in the Celtic DeHiGate project to give emergency services new and innovative communications capabilities in emergency operations. It adds a deployable wireless network capability to the emergency network infrastructures recently deployed in many European nations.

Whereas these TETRA-based systems create a fixed, narrowband infrastructure covering mainly the populated areas of the country, the DeHiGate solution is a lightweight mobile solution that can be deployed in minutes in emergency situations. It extends the coverage of the network to remote areas and can use any available infrastructure to connect the emergency teams with their central command sites. Hence, high-capacity data transfer and live images can be exchanged to improve the operations at the emergency sites, giving better situational awareness to the commanders.

Overall project idea

As the fixed TETRA-based infrastructure has quite low capacity, mainly used for voice but also some narrowband data, the main idea of the project was to develop a gateway that can connect the mobile users at an operations site with each other, and with a central command site over various existing infrastructures. Examples of these infrastructures are 3G and WIMAX networks, satellite communications, and TETRA networks. The gateway will automatically find the available networks and route the traffic over the network best suited, so voice communications can be routed over the TETRA network, whereas high-capacity data traffic, such as live images or database queries, can be routed over a network with higher capacity.

The users will be connected with small handheld terminals using commercial WiFi-technology to a Wireless Local Area Network (WLAN) that can be extended far away from the gateway by a wireless backbone network. This network is made up of small lightweight backbone nodes that can be placed in emergency vehicles at or around the operations site, or placed on the ground, in a tree, a pole or on a nearby building. The backbone nodes are interconnected with a separate WLAN using ad-hoc networking technology and directive antennas.

Deployable gateway

The deployable gateway prototype developed in the project is based on available Linux routing software extended with auto-configuration features and a multi-topology routing capability that creates different routing topologies for the various applications and services. Two topologies were used, one narrowband for voice and position updates of the various users, and one broadband for the high capacity services. This way the high-capacity traffic was not routed over the TETRA network, but routed solely over high-capacity links to the central command centres.

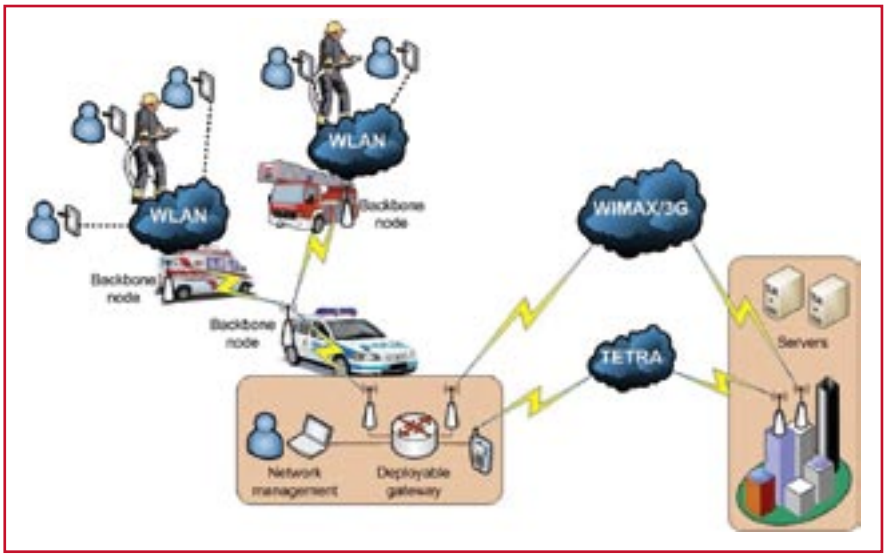

Figure 1: The DeHiGate system

Figure 2: The deployable gateway prototype

Network management

The network management application utilises Geographical Information System services to visualise the positions of the units collected from all the teams and resources to create an improved situational awareness for the local and central operational commanders. It also assists in maximising the network performance and resource utilisation by tuning radio parameters and the network structure.

Field trial

The project ran a field demonstration at the emergency services training site in Kuopio, Finland, in April 2008. A number of key public safety and emergency service users were present at the demonstration.

Conclusion

The DeHiGate project developed and demonstrated a network concept for the users that, if deployed in real operations, will increase the effectiveness of the emergency services in the crucial moments at the emergency sites. This was done by deploying a highly mobile gateway solution increasing the network capacity; hence, utilising advanced services such as live image transfer and database retrieval directly during the operations.

Further information is available on the DeHiGate web page at *www.celtic-initiative.org/Projects/DEHIGATE*

ICT challenges in emergency management – Interview with TIEMS President Kåre Harald Drager

ICT has profoundly changed public safety and particularlyemergency management. Eurescom mess@ge editor-in-chief Milon Gupta talked to Kåre Harald Drager, an internationally renowned expert in this field, about the future of ICT and emergency management.

Kåre Harald Drager is an international consultant in risk, safety, emergency and disaster management and president of The International Emergency Management Society – TIEMS (*www.tiems.org*).

How has ICT changed emergency management in the past decade?

Drager: This depends on the kind of emergency management; there are two: response to emergencies by police, fire fighters, ambulances and other institutional providers of emergency response, and response to disasters, involving a wide spectrum of institutional as well as ad-hoc responders.

The scope of ICT applications for institutional emergency responders has become very wide, and only the financial resources available to each responder limit the use of the numerous tools. In the case of disaster response, however, the first rule will always be to use whatever is available; it will never be possible to cover all needs from a single ICT system or under a comprehensive preparedness concept.

A typical development over the past 10 years has been the increasing number of applications available, many of them incompatible with each other and with systems already in use.

ICT brought to the emergency management field more flexibility, speed of reaction, better interoperation of various agencies and efficient international collaboration, more effective resource management and better focused deployment.

In addition, it brought the possibility of smart modelling of natural and industrial hazards and building better preparedness of our society.

ICT also brought faster response and the possibility to notify or warn large groups of citizens under the risk. The penetration of mobile networks enables to efficiently inform the public in case of emergency.

What is the role of critical ICT infrastructures in public safety and emergency management?

Drager: ICT infrastructures are nowadays essential to all public safety and emergency management activities. There is no way to cope with current challenges without ICT. ICT critical infrastructures serve as communication environment, planning tools, modelling systems for qualified forecasting of the situation development. They interconnect all the subjects related to emergency situations and help them to build the common operation picture, which is a basic tool for effective collaboration. In case of a major disaster, infrastructures are likely to be affected by the events, if not by physical impact, then by overload or by intentional disruptions or even by administrative interference.

How should the security of critical ICT infrastructures be improved to increase public safety?

Drager: Improving the resilience of existing infrastructures is necessary to increase their capabilities to survive the impact of an event; such measures need to include mechanical impact resistance as well as functionality without dependence on a secondary infrastructure, like emergency power or other backup capacities. At present, a major shortcoming of critical infrastructures used by institutional responders is the lack of interoperability.

There are three basic challenges for improving ICT security:

Firstly, critical ICT infrastructures should be immune to the attacks of cyber-terrorists or similar groups of people or organizations. It means that advanced methods and technologies should be implemented to defend critical systems.

Secondly, as a critical ICT infrastructure works with and for people, there should be improved authentication mechanisms to make all usage of critical information and functions personally accountable, and all the processes auditable. This means, for example, that simple name/password authentication mechanisms are no more acceptable and will be replaced by common security policies, certificates, security tokens, etcetera.

Thirdly, public safety service organisations should have the flexibility of having their own spectrum and networks so that they can maximise the advantages provided by broadband services.

What is the status of interoperability and cooperation between emergency management systems and actors in Europe, and how could it be further improved?

Drager: A major obstacle towards interoperability is the lack of resources to implement appropriate, available technologies by all responders. In many cases, the institutions of one geographical or administrative entity do not have the means to acquire the equipment, including infrastructure, to ensure interoperability with the advanced systems of neighbouring entities. Improvement could only result from better planning. Separate, interoperable and non-infrastructure-dependent systems, such as analogue radio networks, should be maintained when advanced, increasingly infrastructure-dependent systems are being introduced, and potential users should be aware of their existence and be trained in their use.

There are ad-hoc activities targeted mainly to financial or professional support, like firemen, police, and resources, in case of concrete emergency situation or crisis. Interoperability is mainly achieved through existing bodies, such as NATO or UN OCHA, and there is permanent progress.

There are activities not only between national governments, but more and more between regional governments, even across national borders. With the help of ICT and standards, interoperability has improved, despite the multi-language European environment.

Which are the main R&D challenges in ICT for improving emergency management in Europe?

Drager: The challenges are less in R&D work on technology, but in the administrative sector. Co-operation during an extreme situation can only work, if it is planned, and the use of all available means requires the awareness of what is available.

Challenges include standardization of information exchange between inter-agency systems in order to establish a common, international operational picture of major emergency situations.

Also needed are advanced monitoring systems, including data fusion of various information resources with effective awareness outputs as well as global risk management support, utilizing monitoring and modelling of the situation development.

Public safety networks of the future

Celtic projects HNPS and FT PSC

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Public safety users such as firemen, police forces and paramedics often use different types of communication networks for their communication. Many countries have introduced digital narrowband professional mobile radio (PMR) networks such as TETRA, TETRAPOL, and P25. But still many public safety users are carrying two devices (PMR and a GSM/UMTS device).

To provide new type of service for public safety, such as video and transmission of large images (GIS, maps, fingerprints), safety radio networks have to support broadband communications. WiFi and WiMAX technologies could provide such capabilities but are not integrated yet into PMR systems. To provide resilient and reliable communication in the areas where communication infrastructure does not exist or had been destroyed, a deployable ad-hoc communication system has to be available.

The Celtic projects Heterogeneous Network for Public Safety (HNPS) and Federated Testbed for Public Safety Communication (FT PSC) are addressing these issues, focusing on the future public safety communication networks integration.

HNPS project

The Celtic Call-5 project HNPS started on 1 July 2008. The project will develop a heterogeneous network concept for future European Public Safety communications. This will be based on the integration of different networks, including ad-hoc deployable systems. The project focuses on the integration of existing communication systems, including PMR systems such as TETRA and TETRAPOL in combination with new technologies like WiFi, WiMax, and wireless sensor access.

The heterogeneous network concept will allow:

- the rapid integration of available communication resources in the event of crisis or disaster (figure 1)
- optimization of resource allocation
- integration of a set of advanced digital services (video, images and sensors).

FT PSC open project and Celtic project proposal

The federated testbed for the open project on Public Safety Communications was established jointly by Panlab (*www.panlab.net*) and the Safety Research Initiative of the PSCE Forum (*www.publicsafetycommunication.eu*).

The FT-PSC open project is building a federated European testbed for interoperability testing of public safety communication and information systems. The testbed will allow European telecom manufactures and software providers to carry out tests and evaluation of their products and R&D results in an international environment with participation of public safety users. The federated testbed will allow to test large-scale heterogeneous communication systems in heterogeneous networks based on several standards such as GPRS, UMTS, WLAN, WiMAX, PMR (TETRA, TETRPOL, and P25) simultaneously. The integrated, deployable and fixed networks will be part of the federated testbed (figure 2).

The FT-PSC project will connect and use unique resources and testing facilities available in different countries, developed by European R&D projects, national projects, and industry.
The FT-PSC project will provide a platform for experimentally-driven research in several areas of communication and information systems important for public safety.

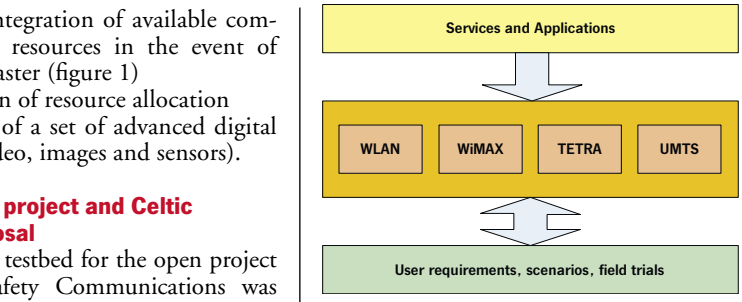

Figure 1: Heterogeneous networks – overview

The project will provide not only a technology platform but will also establish an administrative and legal framework for a permanent entity for interoperability and conformance testing in Europe for public safety.

The first FT PSC Celtic Call 6 project proposal was submitted for labelling decision in November 2008. The project includes 22 partners form 7 countries.

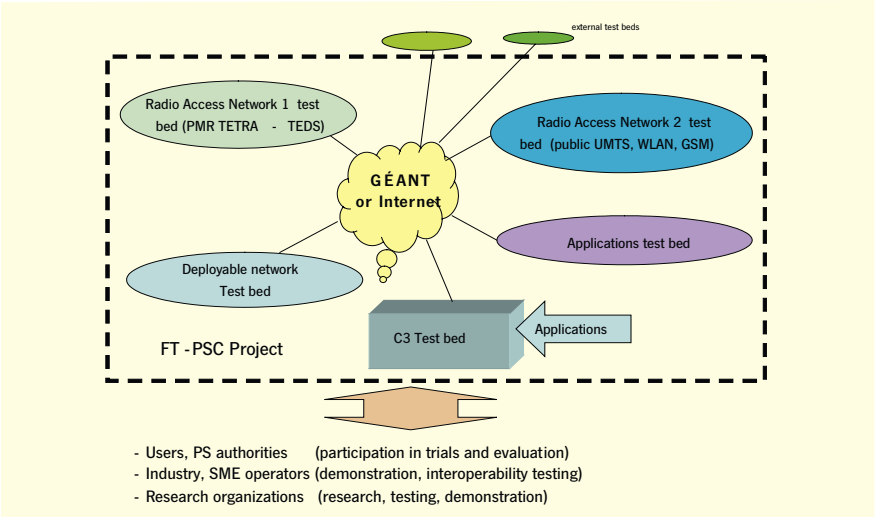

Figure 2: FT-PSC project overview

Conclusion

The interoperability, integration and joint optimisation of different types of communication networks according to private requirements of public safety users is interesting and an important research area that will require future research efforts, multidisciplinary approaches, and international collaboration between research relevant research projects.

Further information:

- HNPS: *www.celtic-initiative.org/Projects/HNPS*
- FT PSC: *www.celtic-initiative.org/Projects/FTPSC/abstract.asp*

CELTIC N • E • W • S
Telecommunication Solutions

CONTENT

EDITORIAL

Dear reader,

Celtic has just closed its 6th call for project proposals. This year, we received 15 full project proposals, totalling a requested budget of around 121 million euro and an effort of about 1,250 person years. According to Celtic processes, these proposals are currently under technical review. The labelling of the accepted proposals will be done in November 2008.

In this issue we will focus on the processes and tools that Celtic provides for the projects to assure that the work is progressing according to plan and will achieve the expected quality. The additional work required for this quality assurance is rather low but, nevertheless, very efficient. Public Authorities who provide the public funding also rely on the quality assurance Celtic provides.

Peter Herrmann, Celtic Programme Coordinator, provides a summary on Celtic's rather successful project situation.

Again, we give successful Celtic projects a platform to present their project work and project achievements. For the Eurescom mess@ge cover theme in this issue, three more Celtic projects – DeHiGate, HNPS and FT-PTC – provide an overview of their research work on public safety.

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Celtic project quality assurance

Processes and tools for good project quality

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In complex projects with international participation it is not always easy to manage resources and monitor the progress of the work according to plan. Project participants and Public Authorities require, however, that running projects are carefully monitored, important deviations are detected, and possible problems in a project are solved at early stages. Celtic provides a number of processes and tools that assure a smooth implementation of the projects to guarantee that public funding for the project will be used as planned with the results expected.

Quality assurance processes

Quality assurance in research projects needs to focus on different aspects than quality assurance processes in production lines where standardised quality control has a direct impact on the quality of the product. Quality of a research project is often not directly measurable by its final "product", e.g. usefulness for new products or possible impact on business or new jobs. A high-quality project is classified by its work organisation, timeliness and completeness of results as intended, agreed, and planned by the project team.

The Celtic processes for quality assurance in research projects comprise the following steps:

1. Project definition and initial proposal assessment
2. Monitoring of project progress
3. Quality reviews and intermediate assessment
4. Final assessment

Project definition and initial assessment

One of the most crucial aspects is a careful definition of the project to assure that the project team understands how work will be organised, structured and carried out under clearly defined responsibilities and dates. To assure the quality at the initial phase of a project, each project proposal, before it is selected as a Celtic project, will be reviewed by a group of experts.

Monitoring of project progress

Once a project has received the Celtic label and the set-up process has been finalised, the project work can start. For international projects with widely distributed work teams, a regular and transparent monitoring of the project's progress is essential to detect gaps, delays, or other problems at early stages. Monitoring is generally performed via regular reporting, meetings, or audio/video conferences.

Quality reviews

Celtic carries out two important quality reviews:

- Mid-term review (MTR)
- Final review (FR)

The mid-term review is carried out by several experts from the group of experts. It is very important for the intermediate assessment of the project to detect deficiencies or critical variations early in a project and to give recommendations and clear guidelines for the continuation of the project, in order to assure that the planned results will be achieved. The final review provides a picture on the achieved quality of the results and gives recommendations how they could be further used.

Final assessment

The final assessment is, generally, performed by the Celtic Office some time after a project has been finished. At the final assessment, we will particularly investigate and evaluate the further use of the produced results and the impact of the results on new products, new business, or new jobs.

Project management tools

In order to enable projects to monitor their progress and achieve high-quality results, the Celtic Office provides a set of specifically designed and proven tools, most of them at no additional cost to the project.

These tools are all part of the widely used EuresTools suite of project management tools, which was developed by Eurescom, the R&D management company which also runs the Celtic Office. Particularly important and useful for quality monitoring and assurance are the following EuresTools modules:

- EuresTools Reporter; an easy-to-use Web-based reporting tool
- EuresTools Audio-Conferencing
- EuresTools Mailing-List
- EuresTools Wiki

Besides these tools, which are cost-free for Celtic projects, a number of useful additional tools are available at a service fee:

- EuresTools Versioning, which is a secure implementation of the Open Source tool Subversion
- EuresTools CMS, a secure and customised implementation of Typo3
- EuresTools Web-Conferencing for video-conferencing and application sharing.

Further details on the EuresTools modules are available on the Web at *www.eurescom.eu/EuresTools*.

Conclusion

Efficient processes and easy-to-use tools are essential for an efficient quality assurance of Celtic projects without burdening the projects too much with additional work. Celtic's quality mechanisms have proven to be effective and successful in terms of good project results. They are very appreciated by projects and Public Authorities who trust Celtic to monitor their funded projects and to assure that public money is well spent.

Celtic project situation

Set-up of Call 5 projects

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There are currently 32 running projects from the Celtic calls 3, 4 and 5, and 30 projects from the two first calls are terminated. Most of the Call 3 projects are also heading for their final review and will finish soon. Some of the Call 4 projects have already had their mid-term review, but most of them will be realised in the coming months; the Call 5 projects are just starting. There are currently 12 running projects and 5 more that have good prospects to start this year or early next year. The set-up phase after a project has received the Celtic label until the project start is still a crucial period, where the funding agreements with the Public Authorities are negotiated.

Since the start of Celtic there has been a high percentage of labelled projects that could finally not start, which was in most cases due to insufficient public funding. This success rate was increased, reaching a quite good value of 72 % in Call 4. The final result for Call 5 is not yet known, but it is already clear that it will only be in the range of 60 %. The reason for this is the success of Call 5 that has reached for the first time a total budget of 215 million euro for all labelled projects. The consequence is that the available budget in some countries was oversubscribed by a factor of up to 3 in Finland and in France, generating a strong competition between projects. If at the end 17 projects will be running, this can still be considered as a reasonably good result.

Cross-national funding process

The main challenge, however, remains the coordination and synchronisation of the funding decisions in different countries. The Celtic label is given for the quality of a whole project, but the national funding decisions are often taken exclusively on the national impact for the national sub-consortium. It is understandable that national tax money should have the highest possible benefit in the country of the tax payers. In the case of labelled Celtic projects, this could, however, have the consequence that a project receives green light in one country, but other countries may decide to fund a different project or to delay the decision by several months. In the best case, this delays the start of the project, and in the worst case, the project looses all international partners and must stop, because it does not comply any more with the EUREKA rules. In the set-up phase of Call 5, the Celtic office has started to communicate on a regular base with the Public Authorities of the most active countries in Celtic. The goal is to increase the awareness about

the progress of the negotiation in other partner countries and to try to favour more coherent funding decisions. The feedback on this was quite positive, and it may have helped for a few projects.

However, it remains true that whoever grants the money has also the power of decision, and the cross-national coherence is obviously only one of many other parameters for the decision.

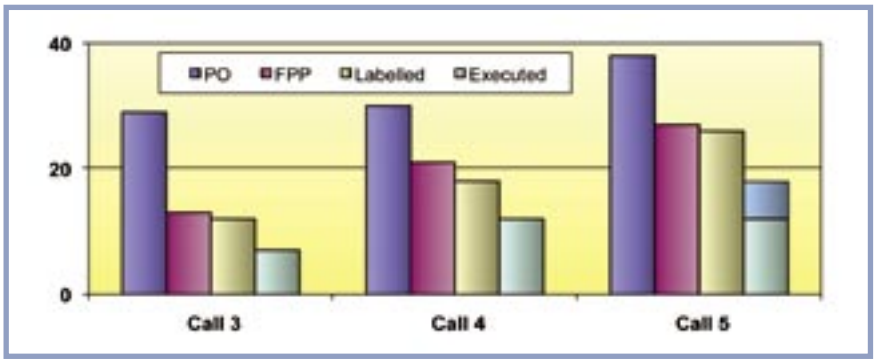

Figure 1: Number of current Celtic projects from Calls 3-5

BOSS

On-board wireless secured video surveillance

The purpose of the BOSS project is the design and prototype development of an efficient railway communication system. This system is aimed to support the high demands of an audio/video surveillance system in a rolling train from a control centre on the wayside, but also to address related issues, such as predictive maintenance.

Approach

The BOSS project is developing a communication system relying on an IP gateway placed inside a train to enable the communications both inside the train, for communications inside carriages and for mobile passengers and controllers (e.g. WiFi links), and outside the train, mobile in the terrestrial reference frame, with a link towards wireless base stations (e.g. WiMAX, HSUPA links). Consequently, working on a dual mobility level, the BOSS project works to guarantee a differentiated Quality of Service for the different targeted services.

Due to the bandwidth limitations in wireless communications and the large amount of data generated by a set of surveillance cameras, hardly analysable by an operator, a fair share of the BOSS technical work is done on the adaptation of video surveillance applications. This is done not only to robustify the multimedia data but, more importantly, to improve behaviour analysis and audio processing tools for abnormal events detection. Detection of such events will generate alarms to attract the attention of the operator in the control centre (PCC) but will also be directed to controllers on-board trains for immediate action. Figure 1 presents the overall BOSS system functional architecture, from data acquisition to display towards the control centre or controller while passing by alarm processing, adaptation to the transmission conditions (including intelligent transcoding of the video stream for best perceived video quality at the reception) and transmission over the mobile IP links.

Specific additions, such as the restriction of access to the audio/video surveillance streams to authenticated users, necessary

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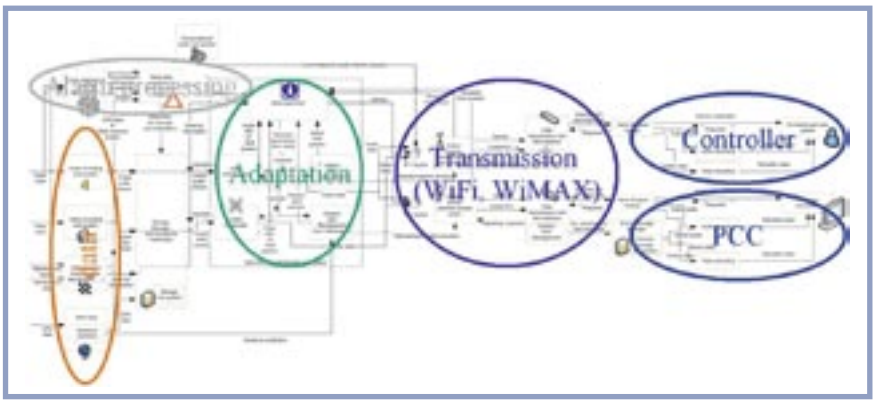

Figure 1: BOSS system – functional architecture

Figure 2: BOSS simulation chain with dual mobility and video display

as per national regulations, is also being considered via use of near-field communication (NFC) authentication devices by the controllers. It is also to be noted that other traveller-oriented services, such as Internet access, travel information services or video on demand, could also be integrated in the BOSS framework via an adapted level of service management.

First results and achievements

The functional architecture has been developed into a full communication architecture used in an OMNeT++ discrete events framework. It is enriched all through the project lifetime by the modules and algorithms developed within the project's technical packages on radio communications, signalling, adaptation to impairments, efficient multimedia compression, and abnormal events detection.

The OMNeT++ simulator is a key element to ensure firstly validation of the system before prototyping, secondly establishment of initial working settings for the demonstration phase, and thirdly measurement and assessment of techniques that will not be realistically implantable in the BOSS demonstrator. The OMNeT++ simulator is illustrated in figure 2, where the two mobility levels (the train on its rails and the controller in his carriage) are displayed together with the visual rendering of the video transmission on one window towards the control centre (PCC) through the outdoor WiMAX/HSUPA link and towards the controller through the indoor WiFi link.

Field demonstrations

A first field campaign was carried out in April 2008, during which audio/video acquisitions of different events played by team actors have been performed. The BOSS approach and the validation of the platform will be demonstrated in the first quarter of 2009 under real conditions in a Civia train operating on the RENFE Cercanias line from Atocha train station.

Consortium members

The BOSS consortium consists of THALES Communications France, Alstom-Transport, SNCF, INRETS, UPMC (France), UCL, BARCO-SILEX (Belgium), TELEFONICA I+D, Arteixo-Telecom, INECO (Spain), BME, E-GROUP (Hungary).

For further information, please visit the BOSS website at *www.celtic-boss.org* or contact us at *contact@celtic-boss.org*.

ReD

Reaction after Detection

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Due to the widespread use and increased reliance on telecommunication and information systems, the global Internet has become an attractive vehicle for service delivery. Unfortunately, there is an increased interest of malicious entities for IP-based attacks, as shown by the large number of published vulnerabilities and publicized successful attacks on large organisations. The RED project aims to provide an advanced single management console for security incident detection and reaction management for fast reaction on detected threats.

Context and objectives

Currently, the Internet is an attractive means for service delivery. Network operators and providers are supplying new services, such as voice or television based on the Internet Protocol (IP). This has also increased the number of IP-based attacks on network systems. To address the evolution of security incidents in current communication networks, it is important to react quickly and efficiently to an attack. This reaction can range from blocking the traffic to defining new security policies that solve the problem if they are applied while the attack is happening.

The ReD project is designing and developing solutions to enhance the detection/reaction process, improving the overall resilience of IP networks to attacks by embedding means to enrich the alert with better characterized information, and additional information about the origin and the impact of the security incident.

Types of reactions

To achieve its objectives, ReD proposes three different types of reactions:

- **Immediate**, which is an automatic reaction with a diagnosis based on the capabilities embedded in the device.
- **Short-term**, where the diagnosis is done with a limited and local vision of the monitored information system.
- **Long-term**, where the diagnosis is done with a global vision of the monitored information system. The reaction gives the ability to modify the security policy of the system for solving the problem temporarily or permanently.

The goal of the immediate and short-term reactions is to contain the impact of the security incident and increase the time available for diagnosis, which results in more accurate reactions.

ReD architecture

To provide the detection and reaction functionalities, the ReD architecture is based on:

- **ReD node**, which gathers alert management, reaction management and policy-based configuration management capabilities.
- **ReD security console**, which provides to operators the functions of security view of the system, reporting tools and decision support.

The ReD node is connected to the global security console to ensure a coherent vision of the reaction process.

The ReD node (see figure) is composed of the following elements:

- ACE (Alert Correlation Engine), which receives alerts from network nodes and enhances the detection of attacks by combining several diagnosis combinations.

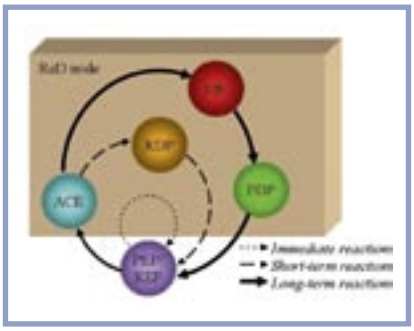

Figure: ReD node – overview

- PIE (Policy Instantiation Engine), which receives the information about attacks from the ACE and instantiates security rules to react to the attack in a long-term reaction loop. These security rules are specified using the OrBAC (Organization Based Access Control) security model.
- PDP (Policy Decision Point), which receives the security policies defined by the PIE and deploys them in the enforcement points.
- RDP (Reaction Decision Point), which receives the information about attacks from the ACE and decides a reaction in a short-term reaction loop.
- PEP/REP (Policy Enforcement Point/Reaction Enforcement Point), which enforces security policies provided by the PDP and reaction provided by the RDP. It also performs an immediate reaction.

The three types of reactions will be differently activated: immediate reactions are directly decided by the PEP/REP, short-term reactions are decided by the RDP based on the information provided by the ACE and without instantiating new security policies, and finally, long-term reactions are decided by the PIE, generating new security policies based on the ACE alerts that are passed to the PDP to deploy them in the PEPs.

Conclusion

The ReD architecture with the three reaction loops will be implemented for use cases which are representative of telecom operator contexts, like VoIP. The ReD node components will be implemented, and some IP attacks will be instantiated to activate reactions varying from automatic, predefined reactions to reactions that imply the reconfiguration of a security policy and its deployment. The security console will allow managing the attack detection and reaction process in a single view. A ReD demonstration will be performed during the CELTIC Event 2009 in Paris.

Further information is available on the project Web page at *www.celtic-initiative.org/Projects/RED*

CARLINK

Advanced Wireless Vehicle Networking Platform

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Increasing amounts of traffic, congestion, pollution, accidents and climate change have created a growing need for advanced real-time traffic-related information systems and services. Safety and mobility can, however, be jeopardized by poor highway design and construction, or by operating procedures which allow unsafe driving conditions, e.g. construction work zones, incident management, or response to emergencies caused by adverse weather. CARLINK (Wireless Platform for Linking Cars) has developed an intelligent wireless traffic service platform between cars with roadside wireless transceivers.

The main outcomes in the three participating countries (Finland, Luxembourg and Spain) are the platform, real-time local road weather, traffic management, and urban information broadcasting/sharing. Various additional applications, like accident warnings and traffic intensity information for route planning can and will be integrated into this system.

The platform is designed to provide a basis for a wide range of commercial and governmental wireless traffic and safety services. The platform itself is the key element, but the various services created for the platform in the participating countries have an important role. These services offer different ways of using and exploiting the platform efficiently and showcase the platform towards the consumers. It is important to raise the interest of end-users to invest on the platform and, furthermore, to entice the vehicle industry to integrate platform equipment into their vehicles. For this, there is the need to promote some key applications and services that are considered both interesting and useful for the end-users. The project does not cover a wide range of alternative services but, instead, focuses on a few key services that are expected to promote the applicability, usefulness, and necessity of the platform.

The local road weather service (RWS) collects observed weather data from vehicles and uses these together with weather information from other sources to generate comprehensive local road weather forecasts to be forwarded back to cars. The incident/emergency warning service uses vehicle data to generate warnings about exceptional traffic condi-

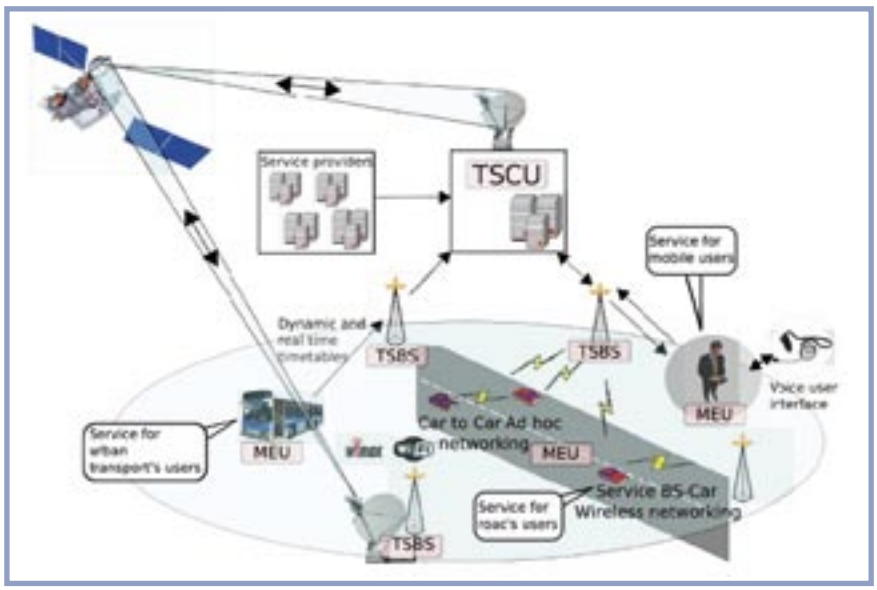

Figure: Carlink platform

tions or accidents. The traffic management service will generate traffic logistics data for the public authorities. Finally, the multimodal transport service delivers commercial-like travel data to users on the move. The platform is shown in the figure.

It is divided into the Traffic Service Central Unit (TSCU), the base station network with the Traffic Service Base Stations (TSBS), and Mobile End Users (MEU) with ad-hoc connectivity and non-continuous backbone network connectivity. The MEUs form a wireless network, communicating in an ad-hoc manner, typically when two cars are passing each other. When passing a TSBS, MEU gets up-to-date traffic platform information. The TSBS receives regular updates from the TSCU, located in the fixed network. The MEU also transmits data to/from TSCU over a lower-capacity connection, e.g. GPRS, when critical weather, warning, incident or accident information emerges. The vehicle data are used to enhance the services of traffic/traveller management, local road weather and accident warnings. These data are delivered back to vehicles almost in real time.

Outlook

CARLINK provides benefits to several different stakeholders, such as the car industry, telecommunication operators, drivers, public transportation, truck operators, and basically all road users and road maintenance authorities. It also provides new safety features to cars. CARLINK's new kind of telecommunication service will bring new business opportunities to telecommunication operators. Equipment manufacturers, municipalities, and commercial companies have new types of services to offer. Platform equipment development will bring new kinds of products for the electronic component industry. Advertising and value-adding services can generate new private business through the platform.

Further information is available on the project Web page at
www.celtic-initiative.org/Projects/CARLINK

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About Celtic

Celtic is a Eureka cluster, which initiates and runs privately and publicly funded R&D projects in the field of telecommunications. The cluster, which runs until 2011, is supported by most of the major European players in communication technologies. Celtic projects are focusing at telecoms networks, applications, and services looking at a complete system approach. The size of the Celtic budget is in the range of 1 billion euro. Celtic is open to any kind of project participants from all Eureka countries.

Why there is no such thing as "green ICT"

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Information and Communication Technologies (ICTs) constitute an industry sector of its own that has pervaded all other sectors of our economy having a profound impact on economic, societal and environmental indicators. Today, it has become fashionable to talk about "green ICT", although most of the discussion merely concentrates on the greenhouse gas emissions, like CO_2, related directly or indirectly to the use of ICT. In this article I prefer to use the term more widely and include in the discussion the overall environmental impact, in particular to point out that "green ICT" is a very immature definition, when it comes to environmental sustainability of the sector.

Effects of ICT

The effects of ICT are commonly ordered in first, second and third order effects. The first-order effects are directly related to the mere physical existence of ICT and include production, use and end-of-life treatment. The second-order effects are related to the application of ICT and include effects leading to optimisation of processes in other sectors (e.g. traffic optimisation), substitution effects (e.g. e-processes that replace traffic) and induction effects (when ICT creates more demand in other sectors).

The third-order effects are related to the societal changes that ICT brings along. This includes the deep structural change towards a de-materialised economy, the rebound effects, and the increased dependency on a critical infrastructure. The rebound effects include the stimulation of increased demand due to time-saving optimisation (e.g. increased leisure time traffic), the software-induced hardware obsolescence and the miniaturisation paradox, which indicates that hardware is getting cheaper faster than it is getting smaller.

First-order effects

Considering the first-order effects, we must keep in mind the environmental impacts of ICT caused by the material used in the production (e.g. fossil fuels, water, and chemicals), the possible long-term health effects due to chemical exposure during manufacturing, and exposure to toxic materials in ICT arising from recycling. The manufacturing process of semiconductor chips consumes large amounts of ultra-pure water. Major units of ICT equipment are composed of various materials, which, in turn, consist of a wide range of chemicals, elements and heavy metals. Some of these materials, such as platinum, have a high recovery and recycling efficiency (95%), while others cannot be recycled at all (e.g. mercury, arsenic and barium). It is essential to make the shift from simply calculating CO_2 emissions of ICT production to evaluating the net impact of the technology life-cycle, including operations and use considerations, as well as end-of-life management.

Environmental impacts

The environmental impacts of a 2G mobile phone network are dominated by the use phase. On the other hand the production of a desktop PC uses three times the energy this PC will consume in one year, while considering the aggregated environmental impacts, the ratio is 6:1 under Chinese conditions. This statement also points to another environmental weakness of the ICT economy, namely the trend to produce a large part of the global ICT equipment demand in countries with lower environmental constraints during production. This outweighs all efforts we undertake in developed economies to minimise the environmental impact of ICT.

Uncertain environmental indicators

A study by the Institute for Prospective Technological Studies (IPTS) from 2004 points out that the projections of the development of environmental indicators are based on many uncertainties caused both by future scenario variation and available data uncertainty. According to this study, the total future energy consumption could increase by 37% on worst-case assumptions, but decrease by 17% on best-case assumptions. The greenhouse-gas emissions could increase by 32% under worst-case assumptions, but decrease by 29% under best-case assumptions. Similar uncertainties about the environmental impact are concluded for non-recycled municipal solid waste.

Recycling

Recycling of e-waste pays off in environmental terms due to the materials recovered, saving energy otherwise used for their primary production. However, there is a much more profound reason to recover certain materials from e-waste, namely their sparse occurrence on earth. One example is indium (In), a rare chemical element with soft, malleable and easily fusible properties. Its current primary application is to form transparent electrodes from indium tin oxide in liquid crystal displays (LCD). The amount of indium consumed is largely a function of worldwide LCD production, accounting for more than 50% of its worldwide consumption. Based on the current worldwide reserve base of economically viable indium, it has been estimated that there is only 13 years of indium supply left.

Unless we are able at some point in time to write down the whole equation related to environmental sustainability of ICT, we should be very cautious talking about "green ICT".

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ISI European Technology Platform – The Integral Satcom Initiative

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The ISI (Integral Satcom Initiative) European Technology Platform gathers all the Stakeholders of the European satellite communications sector. At present, 180 organisations are ISI members, representing European and national institutions, space agencies, universities and research centres, small and medium-sized enterprises.

Satellite communications (Satcom) represent a very important part of the space industry. Satcom is fully complementary and synergic with Galileo and Kopernikus/GMES developments and represent an essential element of the global broadband and broadcast infrastructures, also providing innovative mobile services worldwide to a broad community. Furthermore, the evolution of the ICT technology and market scenario is moving towards interoperability of satellite communication systems with the terrestrial communication networks: satellite communications will contribute to the successful development of the global communication networks of the future. Satellite Communications systems are in particular expected to play an important role in the Future Internet framework.

Space-based systems open up many capabilities complementary to ground-based systems:

- Ubiquitous access to information for all of the citizens
- Enhanced mobility
- Interoperability capabilities
- Cost-effective broadcasting and multicasting of video, voice and data
- Improved disaster protection and security management
- Quick set-up and infrastructure restoration capabilities of satellite-based systems in emergency situations

Europe is aiming to act as a global player, in particular in vital sectors like security and emergency management; to achieve this aim a European global communication capability should be put in place.

On the basis of the above considerations and taking into account the functionalities and capabilities of satellite communications, the ISI European Technology Platform has recently launched the innovative ISICOM system concept.

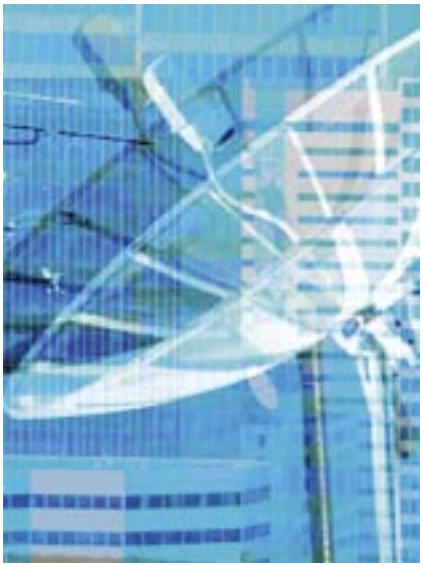
ISICOM

ISICOM (Integrated Space Infrastructure for global Communications) is the ISI proposal for an advanced European satellite communication system fully integrated with the global communication networks of the future and able to complement Galileo and Kopernikus/GMES by adding important value and functionalities.

Coherently with the recent European Union initiatives on Future Internet, ISICOM has been conceived as a high-capacity microwave and optical network in space, made of advanced next-generation satellites with very high data rate telecommunication connections, including inter-satellite links.

ISICOM can be regarded both as a self-standing solution and a space-based element of an integrated communication network, to which the satellite component adds innovative features and performance.

Some basic technological building blocks are already available, but a number of more advanced key technologies, permitting the full development of the entire ISICOM system, are still to be developed through an innovation and R&D path. Technologies left to be developed are included in the areas of inter-satellite laser



communications, advanced on-board IP routing, fast packet switching, bulk and packet encryption/decryption, multi-beam or steerable communication antennas, radiation-hardened on-board components, software-defined radio and cognitive radio, dynamic bandwidth and resource allocation techniques, protected bandwidth-efficient modulation.

The setting-up of a proper regulatory, standardisation and legislative framework, together with the availability of the needed frequency spectrum resources, are other very important elements for the successful development of ISICOM.

Of great importance are the ISICOM system capabilities to meet key potential user requirements. The proper definition of user requirements paves the way for the subsequent development of the new ISICOM space-based services and applications. Some of ISICOM's potential user groups are characterized by a complex co-operational/hierarchical structure, implemented through a central co-ordination centre and some peripheral operative structures. An efficient central organization is needed in order to support and co-ordinate these peripheral activities.

Complex user domain structures depict a scenario with many involved actors and a lot of potentially overlapping competences, asking for a rapid and confidential information flow among many responsible people and organizations in the institutional and commercial domain, a very crucial role being played by high-quality, reliable and secure communication systems.

Across the range of informational services, it is the lack of and the need for reliable, secure, wide bandwidth communications, which is strongly emphasised by some key potential Satcom user groups. For instance, the availability of an easily deployable telecommunications system is a requirement of the highest priority for a European intervention capability at global level. Such a system should provide wide bandwidth, secure connections and the ability to quickly deploy a regional communication infrastructure, invulnerable to damages to local infrastructures, for secure fixed and mobile communications within the considered zone, with easy-to-use terminals.

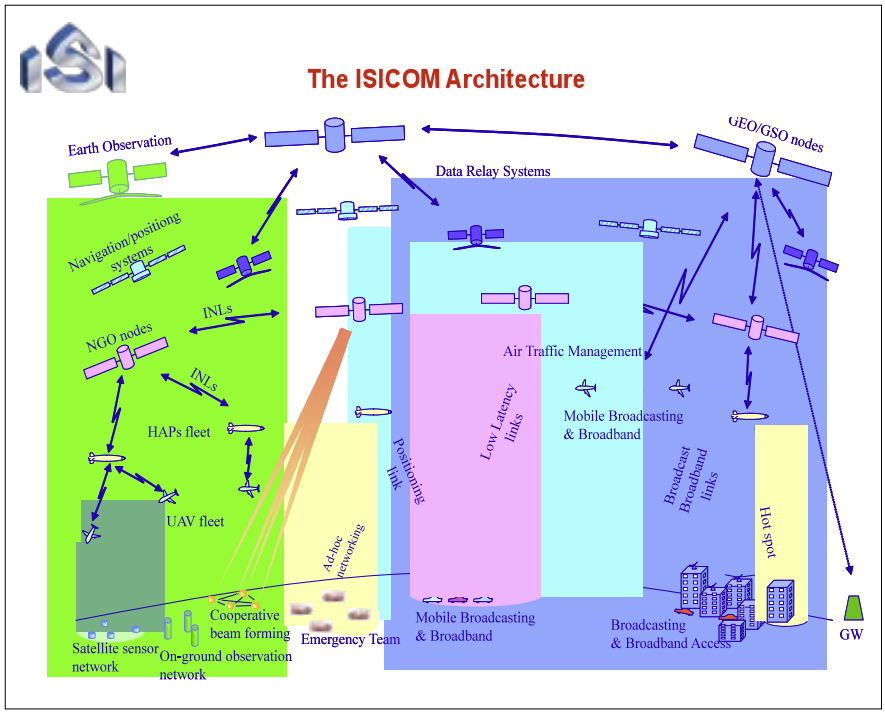


Figure: ISICOM concept

ISICOM architectural concept

The figure gives a pictorial view of the general ISICOM concept. Heterogeneous nodes are integrated in the ISICOM architecture to realize a "network-of-things approach". In general, two sets of architecture elements constitute the ISICOM architecture: flying nodes and terrestrial nodes.

The flying nodes consist of communication, navigation and earth observation elements: Geo Stationary or GEO Synchronous Satellites (GEO/GSO), Medium or Low Orbit satellites (MEO/LEO), High Altitude Platforms (HAPs), and Unmanned Air Vehicles (UAVs). Satellites of different classes – from very large platforms to pico-satellites – can be included, according to a modular and scalable multi-step approach with appropriate elements being implemented in different time-frames, according to a progressive roadmap. The terrestrial infrastructure is included as a global entity, to which some specific terrestrial nodes must be added, such as high-capacity fixed and mobile/relocatable gateways, on-ground relays, distributed antenna systems, institutional, professional, and consumer communication terminals for fixed and mobile applications, positioning devices for navigation and location based applications, sensors devices for monitoring applications, RFID tags, etcetera.

The ISICOM nodes are organized in a multi-layered approach and communicate through Inter Node Links (INLs). The variety of nodes present in the ISICOM architecture allows to provide an extremely wide set of functionalities: from large coverage for broadcast applications through GEO satellites to ad-hoc hot-spot coverage through HAP/UAV constellations for fast emergency service deployment; from broadband access for institutional/professional services to narrowband coverage for environmental monitoring and early warning systems. In this scenario, ISICOM flying nodes can, in principle, vary from very simple repeater-like payload to more sophisticated payloads with on-board data storage and processing capabilities for on-board IP routing, network reconfigurability, etc. Distributed storage and processing is also enabled in the ISICOM architecture through high capacity INLs that connect flying nodes.

ISICOM nodes cooperation is possible at different levels: from the application level, e.g., distributed storage in flying nodes for fast data retrieval and network dependability, to the lower layers, e.g., virtual beam forming and virtual MIMO for coverage extension in power limited applications.

Further information is available on the ISI website: *www.isi-initiative.org*

eMobility General Assembly

Run-up for FP7 calls 4 and 5

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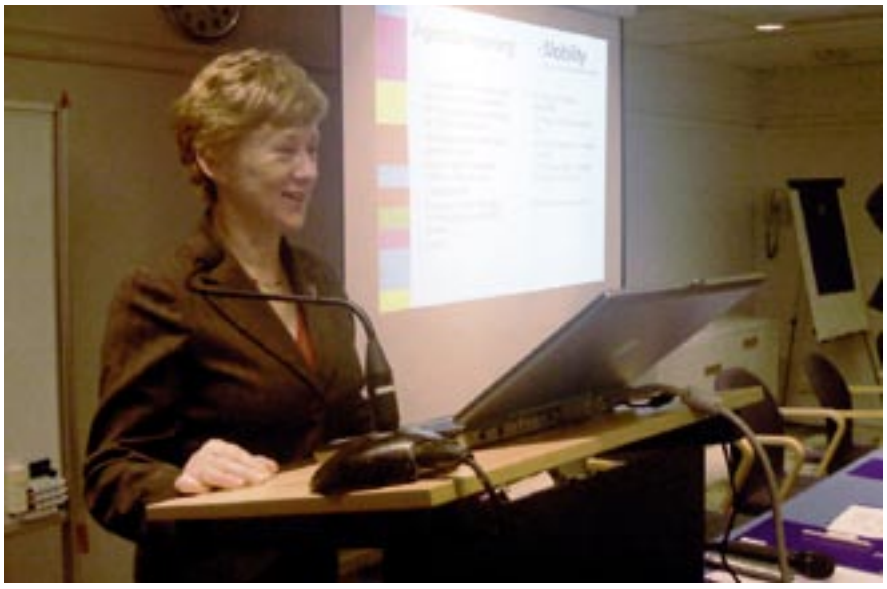
The fourth eMobility General Assembly took place in Stockholm on 16 October 2008. It attracted about 90 participants. Besides reporting about activities and achievements in the past year, and presenting the plans for 2009, a major goal was to discuss the interest of eMobility members in FP7 calls 4 and 5 and how a coordination of proposals could be made.

In her opening speech Fiona Williams, chairperson of the eMobility Steering Board, reported about the activities and achievements of the last year. A number of activities have been done in the past year to facilitate networking. Relationships to other European Technology Platforms (ETPs) have been strengthened, and discussions have taken place on the formation of a Joint Technology Initiative (JTI) and a potential merger of ETPs. Furthermore, a collaboration with photonics 21 has been started in order to set up a link to research on optical networks. In the past year eMobility's membership grew by 20 percent; eMobility has now 584 members. The plan is to develop eMobility as a club of innovators. Significant progress has also been achieved on technical work: The eMobility Steering Board has developed a vision on how communications will look like in 2020.

Rainer Zimmermann from the European Commission briefed the audience about the upcoming FP7 calls 4 and 5. The Future Internet will be a federating research theme in the FP7 ICT work programme 2009/10. Objective 1.1, Network of the future, will have 110 million euro budget in call 4, and 80 million euro in call 5. Call 4 is expected to open in November 2008 and to close in April 2009. Call 5 will close in November 2009. The Commission expects that the new projects will strengthen the European position in the Future Internet domain, reinforce European leadership in mobile and wireless, and widen the market opportunities for new classes of applications.



Fiona Williams speaking at the eMobility General Assembly

eMobility and the other ICT ETPs are working on coordinating proposal preparation activities. The goal is to increase the awareness of planned proposals in the community of the different platforms, to reduce the number of competing project proposals, and for eMobility to ensure good coverage of its priorities. Uwe Herzog reported about the outcome of a survey among eMobility members on their interest in Call 4 and 5. A questionnaire had been sent to eMobility members which was based on the priorities of the FP7 draft work programme 2009-10 and priorities of eMobility's Strategic Research Agenda (SRA), version 6. In total 64 replies have been received. The feedback revealed areas of strong interest and also gaps. The interest can be ranked as follows:

- Strongest interest in: 1.1 The Network of the Future (topic of FP7 WP) / Ubiquitous Connectivity / Post-IP (topic of eMobility SRA)
- Also very strong interest in: 1.3 Internet of Things and Enterprise Environments (FP7 WP) /Ubiquitous Services (SRA)
- High interest (but lower as in above) in: 1.2 Internet of services, Software and Virtualisation (FP7 WP) / Seamless User Experience and Ubiquitous Services (SRA)
- Average interest in areas: 1.4 Trustworthy ICT, 1.5 Networked Media and 3D Internet (both FP7 WP)/Trust, Security, and Dependability, Service Mediation (both SRA)
- Low interest in: 1.6 Future Internet experimental facility and experimentally-driven research (FP7 WP), Non-Technical Barriers, Green Communications (both SRA)

The detailed results are available to all eMobility members.

As the next step in the process of coordinating proposals, consortia should make themselves known to the eMobility Steering Board. Input from proposal leaders is required by 11 November in the form of a brief sketch of their project idea. A meeting of consortium leaders will be organised in Brussels on Wednesday, 19 November.

Further information is available on the eMobility website at *www.emobility.eu.org*

NEM Summit 2008
Towards Future Media Internet

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NEM Summit exhibition – networking with sea view in Saint Malo

The First NEM Summit was held in Saint-Malo, France, on 13-15 October 2008. The conference was organised by the European Technology Platform (ETP) on Networked and Electronic Media (NEM) under the aegis of the European Commission and addressed topics related to the Future Media Internet. More than 400 Summit participants discussed the creation and delivery of future rich-media content by using new media applications and the future generation of communications networks. The Summit was organised in close collaboration with the Media & Networks cluster from the region of Brittany.

The new NEM Summit is a major annual conference and exhibition devoted to the field of Networked and Electronic Media and ICT at large. The conference offered participants an opportunity to share information and viewpoints on the R&D status in this area, network with peers from all over the world, and get up-to-date and reliable information on the technology and market perspectives.

The aim of the NEM Summit is to bring together representatives of NEM community from Europe and worldwide; Major manufacturers and service companies, start-ups and SMEs, research centres and institutions, industry associations and groups, standardisation and regulation bodies.

The First NEM Summit 2008 was dedicated to the main R&D theme "Towards Future Media Internet". The Summit included 45 papers, selected by technical programme committee among more than 90 submitted papers, six invited papers, four keynote talks, and 50 exhibitions, presenting the latest R&D results in the NEM area achieved by industry and academia, as well as collaborative projects. The main topics addressed at the NEM Summit were electronic media content, distributed media applications, new media delivery networks and network services, user devices and terminals, and NEM enabling technologies.

More than 400 participants of the NEM Summit 2008 discussed various issues related to the Future Media Internet at 14 parallel technical sessions, three plenary sessions, and during a plenary panel discussion. The papers presented at the Summit considered specific technical research topics, related particular problems to be solved in order to make the Future Media Internet happen, and visions and concepts, on a high level, for the future of the broader NEM area. Thus, the Summit ensured an opportunity for personal discussions among researchers and engineers working on different levels of development and realisation of the NEM future. Several topics were spontaneously discussed in depth, such as the future 3D media, relations between content creation and production, on one side, and its delivery over the networks and creation of relevant media applications using the content, on the other side, as well as the relation between people's life styles and future media applications.

More information about the NEM Summit and its programme can be found at *www.nem-summit.eu.*

Rethinking innovation – Joao da Silva, European Commission, speaking at the opening session of the Summit

About the NEM Initiative

Set up in 2005, NEM is a European Technology Platform dedicated to Networked and Electronic Media. With more than 600 members, it is a large scale European industrial initiative to accelerate the pace of innovation through convergence between content creation, audiovisual, telecommunications and broadcasting, as well as information technologies sectors and to place the European industry in the forefront of the information era. NEM brings together industrial players and research institutes from more than 30 countries.

More information about NEM Initiative is available at *www.nem-initiative.org.*

The potential of P2P-SIP architecture in telecoms

Results from Eurescom Study P1755

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One of the current challenges of the VoIP (Voice over IP) architectures is to build lightweight architectures that meet service providers' requirements such as legal interception and emergency calls. The complexity of the current proposed solutions should be questioned against the added-value of the enclosed functional elements.

In order to meet the lightweight and flexibility requirements of conversational services and to benefit from the autonomy characteristics of new emerging peer-to-peer applications (P2P), service providers have to investigate new solutions either starting from the architectures already deployed in their operational networks or radically explore new paths. Of course, backward compatibility with the already running service offerings and migration strategies of individual service providers must be taken into account when designing these new solutions. Note that the challenge is not only to allow exchange of media streams between users but to offer telephony services compliant with both regulatory constraints and also with operational directives. These include control of the experienced quality of service, the ease of troubleshooting operations, the ease of introduction of new services, the management of the interconnection with adjacent VoIP service providers and the implementation of basic billing features.

P2P-SIP refers to an implementation mode of SIP (Session Initiation Protocol) architectures where the proxy server and registrar functions are distributed and not implemented by central nodes. Several solutions have been proposed to implement this mode. Some of these proposals assume that SIP can be used for the maintenance of the peer connections and therefore the overlay SIP network. Besides this mode, other solutions advocate for the design of dedicated peer protocols such as RELOAD (REsource LOcation And Discovery).

Exploitable options

Two options may be envisaged in order to exploit the newly proposed P2P-SIP schemes in operational networks as maintained and operated by telcos today:

- Investigate how current peer-to-peer solutions, based on the work of the P2P-SIP initiative, may be enhanced so as to meet service providers' requirements. Two sub options may be considered: (i) Rely on a pure peer-to-peer solution and do not rely on any central element managed by the service providers. In this case, all the service logic will be embedded in the software running in customer devices, either as soft hosted by end user devices or in home gateways nodes so as to avoid NAT (Network Address Translation) problems. (ii) Introduce service-specific elements which may support a portion of the service logic, such as authentication, and interconnection rights. Some functions may be delegated to end user applications.
- Investigate how current centralised architectures such as IMS (IP Multimedia Subsystem) could evolve, be adapted and enhanced to meet the aforementioned requirements. This approach is suitable for traditional telephony service providers. Incremental solutions should be adopted so as to ensure backward compatibility and to optimise the required investment both in term of CAPEX (Capital Expenditure) and OPEX (Operational Expenditure). A migration strategy should be proposed and elaborated so as to drive the introduction of such lightweight architectures into operational networks. An example of a migration strategy could consist in enhancing the current IMS architecture with the introduction of ad-hoc distributed functions at the access segments in order to improve the resilience of the service. Once these capabilities would be supported by the access segment elements, some core functions could be delegated to these elements.

Future work

Concretely the following two alternatives could be investigated:

- Overlay-based conversational services: the spirit of this approach would be to investigate the benefits of using P2P-SIP architectures to offer conversational services. A focus should be put on the ability of such architectures to offer PSTN-like services and sophisticated "high level" services.
- Enhanced IMS architecture: this approach aims to promote the "logical partitioning" adopted by the IMS model. One of the objectives of this analysis is to question the current mapping of the IMS functional elements into service segments (for instance access and core), and "redraw" the correlation of these functional elements to offer similar service but in a lightweight, robust and efficient fashion.

FIRE Launch Event in Paris

Future Internet Research and Experimentation

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Opening session: Per Blixt, European Commission; Nakita Vodjdani, French National Research Agency; Gilles Bloch, French Ministry of Higher Education and Scientific Research; Jean-Charles Pomerol, President of University Pierre et Marie Curie; and Jean-Louis Missika, City of Paris (from left)

On 10 September 2008, the FIRE Launch Event took place at Paris City Hall. FIRE stands for Future Internet Research and Experimentation. The event was organised by the European Commission DG Information Society and Media together with the FIREworks project. It attracted more than 200 participants sharing a common interest in new paradigms and experimental facilities worldwide. The urgent need for multidisciplinary research on the Future Internet is currently addressed in every continent. Approaches vary in tackling the challenge of saving and developing the backbone of today's society, but as heard at the FIRE Launch Event, the motivation for cooperation and exchanging research experiences is common for Europeans, Americans as well as for Asians.

The FIRE Launch Event celebrated the newly established initiative in the 7th Framework Programme ICT call 2, Objective 1.6: "New Paradigm and Experimental Facilities", and the kick-off of its 14 new projects, with a total value of 55 million euro. This is the European contribution to the two axes of Future Internet Research and Experimentation: firstly, experimentally-driven visionary research on new paradigms, networking concepts and architectures for the Future Internet; and secondly, building a large-scale experimentation facility to support both medium- and long-term research on networks and services by gradually federating existing and new testbeds. In addition to presenting the European approach, including presentations from various perspectives and national initiatives, experts from the US and Japan were invited to the FIRE Launch Event to exchange best practices and discuss further ideas, challenges and synergies around the FIRE topic.

Reality-checker FIRE

Within the context of the French Presidency, FIRE was privileged to convene at the prestigious premises of Paris City Hall. The University Pierre et Marie Curie (UPMC), Paris, was the local host as partner in the FIREworks project, but also coordinating one of the flagship projects of FP7-ICT Objective 1.6, namely OneLab2, which started the day after the Launch Event. Welcome notes from the City of Paris, the French Ministry of Research and Education together with the National Research Funding Agency (ANR) were followed by presentations from FIRE and related initiatives worldwide. The Head of Cabinet of Commissioner Reding, Rudolph Strohmeier, gave a keynote speech on Commission strategies for fostering the versatile research needs of the Future Internet. FIRE was addressed in his speech as the reality-checker, supporting inter-disciplinary approaches, involving as many real users as possible and working across the information society domain, operationally across the topics covered by the FIA (Future Internet Assembly), for the common goal of the best possible Future Internet.

The afternoon of the FIRE Launch Event was dedicated to focused panel discussions taking different perspectives on FIRE. Well-known researchers took the floor to forward their needs for European experimental facility. In addition, industrial viewpoints on FIRE were carried further. The Launch Event served as an inspiring platform for the discussion on synergies between various national initiatives relevant to FIRE. France, Germany and Finland shared their approaches together with counterparts both in the US and Japan. The discussion continued vividly during the poster session of more than 30 projects, including all 14 FIRE projects as well as at the networking event hosted by UPMC and sponsored by ANR.

Conclusion

The FIRE Launch Event was a success. Interest in Future Internet Research and Experimentation was evident; a broad group of key persons in the field was reached and important topics raised: Moreover, the importance of a joint effort in the area of FIRE was acknowledged. However, the work in the projects has only started, and we need to keep the rock rolling.

Further information on the event and FIRE is available via the FIREworks website at *www.ict-fireworks.eu*

Regulation and the evolution of telecoms infrastructures in Europe

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Regulation has played an important role in the evolution of the European telecommunications infrastructure in recent years. As the European Commission is planning a revision of the regulatory framework, we need to assess the impact of regulation on the infrastructure evolution, and in particular on the necessary upgrade of the network infrastructure to be able to provide advanced broadband services.

Regulation has brought many clear benefits for consumers in Europe over the last decade. The market has become more competitive, broadband access has become widespread and affordable, services have improved. This was made possible by focusing on the reuse of the existing copper infrastructure and promoting unbundling. However, the same regulations have resulted in little investment into new optical access build-outs. This is becoming more and more a critical issue as the demand for bandwidth consuming services like video, online gaming and virtual reality applications grows. Regarding fibre-based connections, Asia and the USA have already gained a considerable lead ahead of Europe.

Local loop unbundling

Local loop unbundling has been a very successful regulatory measure that drove broadband development over copper in Europe in the last years. It has various forms, but in essence unbundling is a means to give access to alternative service providers to the local loop facilities of incumbent operators. As a result of unbundling, users benefit from competition and are able to choose products and services from different providers. One can say that local loop unbundling in Europe is result-proven and in many cases was sufficient to solve market competition problems. However, these rules have not proved appropriate for stimulating market forces to invest in fibre-based access infrastructure.

What we have seen is that too specific regulation can have both positive and negative effects.

New regulatory ideas

In the current revision of the regulatory framework, the European Commission proposes to go beyond this with a new measure, functional separation, as an additional regulatory tool in cases where regulators deem the market not to be open enough.

Functional separation is the separation of an entity into different functional areas. In case of a telecommunications operator this means dividing the organisation into two parts with distinct functions, namely the "service" function and the "network" function. Both parts remain within the overall company, but are separated by defined interfaces. The objective of this separation is to allow the "network" side to provide services to the "service" side in an open and transparent manner, and the same network services should be available on a wholesale basis to any service provider. This could create a situation where the network side would logically have little competition for network provision.

Functional separation is clearly a major undertaking that requires substantial organisational changes and the case is not proven if it is a positive approach for stimulating the future telecommunications services market and supporting the future Internet.

Impact of functional separation

The impact of functional separation on a number of aspects needs to be considered. Major aspects include:

- the incentive to invest into the necessary upgrades of the networks
- evolution of the service offerings and roll out of advanced services
- fixed mobile convergence
- operational processes and evolution of operational costs.

The primary conclusions are that functional separation brings a lot of uncertainties, and it risks creating the same unintended impact on future service provision that local loop unbundling has on optical access provision today.

Historical experience has shown that vertical slices in the marketplace allow effective cost distribution for the introduction of new features and services, but with functional separation there is a great challenge to get networks to evolve harmoniously with the services, as the networks and the services have separate business plans.

The risk is that the business model for the network function does not provide enough incentives for investment in infrastructure development. It is also perceived that convergence is not adequately considered in functional separation concepts.

Conclusions

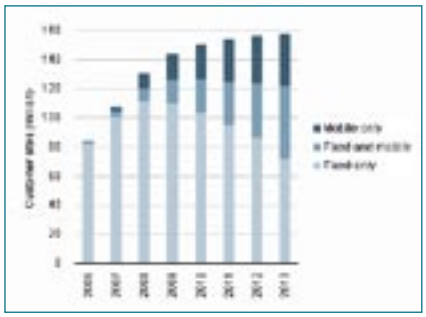
The evolution of the European telecommunications infrastructure will be driven by technology evolution and consumer demands for the foreseeable future. As we move to have an all-inclusive societal communications model we need support from the regulatory framework to help ensure access is available to all who want it, and networks are developed and maintained to be able to provide these services.

In this context, it is important that the regulatory framework proposed by the European Commission recognises the newness of the future networked society and ensures that emerging regulations, however well meaning, don't have the opposite effect to the intention of the regulators. We need new regulations for our 21st century networks and services, and we need to avoid the trap of retrofitting 19th century regulations to 21st century concepts.

+++ News in brief +++ News in brief +++

Europe: 47 per cent mobile broadband share in 2013

In 2013, 47 per cent of European broadband customers will use mobile networks, and nearly a quarter of broadband-equipped sites will have no fixed-line Internet access, using mobile-only. This is the main result of a report by telecoms consulting firm Analysys Mason, which was published in October 2008. Already today, in some European markets, the share of mobile broadband has reached close to 20 per cent, according to Analysys Mason. *www.analysysmason.com*



6.5 million robots in operation worldwide

At the end of 2007, about 1 million industrial robots and 5.5 million service robots were operating worldwide in factories, in dangerous or tedious environments, in hospitals, in private houses, in public buildings, underwater, underground, on fields, in the air, and in space. By the end of 2011, more than 17 million service robots and 1.2 million industrial robots will populate the world, according to the "World Robotics 2008" study, which was published by the IFR Statistical Department in October 2008.

In 2007, 114,365 new industrial robots were installed worldwide, the world market grew by 3%. In terms of value, the market grew by 11% to almost US$6 billion. This generally does not include the cost of software, peripherals and systems engineering. The actual robotic systems market value may be about two or three times as large. The world market for robot systems in 2007 can therefore be estimated to be in the order of US$18 billion.

As in recent years, the results in the major regions were quite different: decline in Asia, recovery in the Americas, and continuing growth in Europe. In 2007, about 59,300 robots were supplied to Asian countries (including Australia), about 4% fewer than in 2006. The main markets, Japan and the Republic of Korea, saw a continuing decline in robot investments, as did Taiwan. On the other hand, the emerging markets, such as China, the Southeast Asian countries and India, all achieved significant increases in supply. The electrical/electronics industry, which invested very heavily in 2005, cut robot purchases by half in 2006 and continued to cut back in 2007 throughout Asia and Australia. Supplies to the automotive industry also decreased further. Supplies to all other industries only decreased slightly.

With 310 operating robots per 10,000 employees in the manufacturing industry Japan has by far the highest robot density in the world. Although it has to be taken into account that the operational stock includes to a certain degree all types of robots, Japan is by far the most automated country in the world. It is followed by Germany with a density of operating 234 robots per 10,000 employees in the manufacturing industries. Thereafter follows the Republic of Korea with a robot density of 185 robots. Here also it has to be considered that the operational stock still includes to a certain degree all types of robots. Italy and the United States had 116, each, and Sweden 115 robots per 10,000 employed in manufacturing industry. All other surveyed countries had robot densities under 100.
www.worldrobotics.org

Families are heaviest Internet and mobile users

A recent survey by the Pew Internet & American Life Project has found that among all household types in the United States, the traditional nuclear family has the highest rate of technology usage and ownership.

According to the survey of 2,252 adults, households with a married couple and minor children are more likely than other household types – such as single adults, homes with unrelated adults, or couples without children – to have mobile phones and use the Internet.

Some findings in detail: 89% of married-with-children households own multiple mobile phones, and nearly half own three or more mobile devices. 66% of married-with-children households have a high-speed broadband Internet connection at home, well above the national average for all households of 52%. Both spouses and at least one child go online in 65% of married-with-children households. 58% of married-with-children households contain two or more desktop or laptop computers.

The survey shows that these high rates of technology ownership affect family life. In particular, mobile phones allow family members to stay more regularly in touch even when they are not physically together. Moreover, many members of married-with-children households view material online together.
www.pewinternet.org

Stone-age brains in the information age

Do we have to update our wetware?

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One of the unfulfilled promises of information and communication technologies has been that they will make our lives easier. Instead, computers, the Internet and mobile communication have increased our cognitive load, causing sometimes symptoms like info-stress and attention deficit trait. No wonder, as our brains have not very much evolved since the stone age. Is it now time to consider updating our wetware in order to cope with the demands of soft- and hardware? Recent research results promise that this might be possible, up to a certain extent.

Swedish neuroscientist Torkel Klingberg believes that we can improve our working memory, the critical bottleneck in an age of information overload, through systematic training.

ICT tools for better brains

Paradoxically, information and communication technologies (ICT) might provide the tools to exercise our brain cells in order to better cope with the overloading effects of ICT-induced complexity. In his new book "The Overflowing Brain", he claims that through computer-based training the working memory performance of children suffering from attention-deficit hyperactivity disorder (ADHS) can be sustainably improved by 18 percent. This is based on a study with 50 children, who trained their working memory for five weeks with a serious game called RoboMemo that Dr. Klingberg had developed together with game designers.

Even plain Internet-surfing could have a beneficial impact on our brain performance. At least this is what a recent study from the University of California suggests. According to this study, the decrease of elderly people's memory has been slowed down through Web-surfing.

Limited working memory

However, even Dr. Klingberg admits that there are limits to the working memory's capacity to cope with information overload caused by a plethora of digital technologies. The effects can be disorientation and info-stress. Particularly e-mail seems to be a source of info-stress. In a study quoted by Dr. Klingberg, people who only received 20 e-mails per day had the same feeling of being overloaded as people who received 100 e-mails.

Particularly the pressure for multitasking at the workplace, enhanced by ICT, contributes to info-stress. Already in 1956 psychologist George A. Miller had found out in an empirical study that our capacity for processing information is limited to a maximum of seven items.

Multitasking

Apart from this limitation, it is also very doubtful to what extent humans are capable of multitasking, if at all. Neuroscientist Earl Miller from the MIT is convinced that "people can't multitask very well, and when people say they can, they're deluding themselves." The reason is that the tasks to be performed simultaneously compete for the same resource in our brain, and thus interfere with each other. "Think about writing an e-mail and talking on the phone at the same time. Those things are nearly impossible to do at the same time," Mr. Miller explains.

So, if we are driving and seemingly focusing at the same time on the traffic, a phone conversation, and the speedometer, we are rather switching very quickly between these tasks, but not really doing them in parallel.

Trying to do multi-tasking can sometimes be even quite dangerous, as researchers from the British Transport Research Laboratory recently found out. According to their study, texting while driving impairs motorists more than being under the influence of drink or drugs.

Overburdened executive

Daniel Weissman, a neuroscientist from the University of Michigan, has found out in his research that there is a part of the brain in the frontal lobe which serves as an executive system for deciding, which of the competing tasks we should perform first.

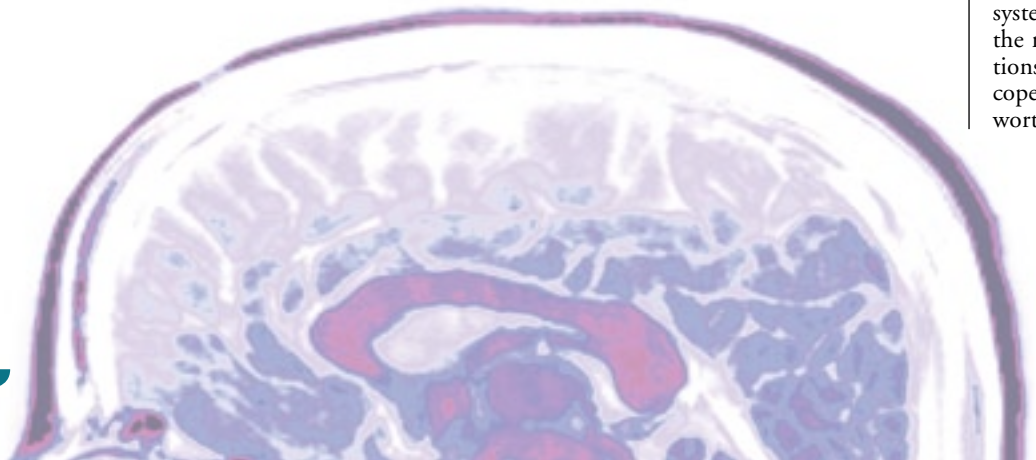
In human evolution this might have been an important factor for survival. When our ancestors hunted in groups, they were able to quickly switch between communicating with their fellow hunters, observing the terrain, and focusing on the mammoth.

However, it seems that today's ICT is overwhelming our executive system's capacity to prioritise the right tasks. If the choice is between focusing your attention on berries you want to collect and a tiger suddenly crashing through the underwood, the decision is easy. But what should be the priority, if your choice is between a ringing phone, an e-mail popping up, and a blinking website?

Brain-friendly technology

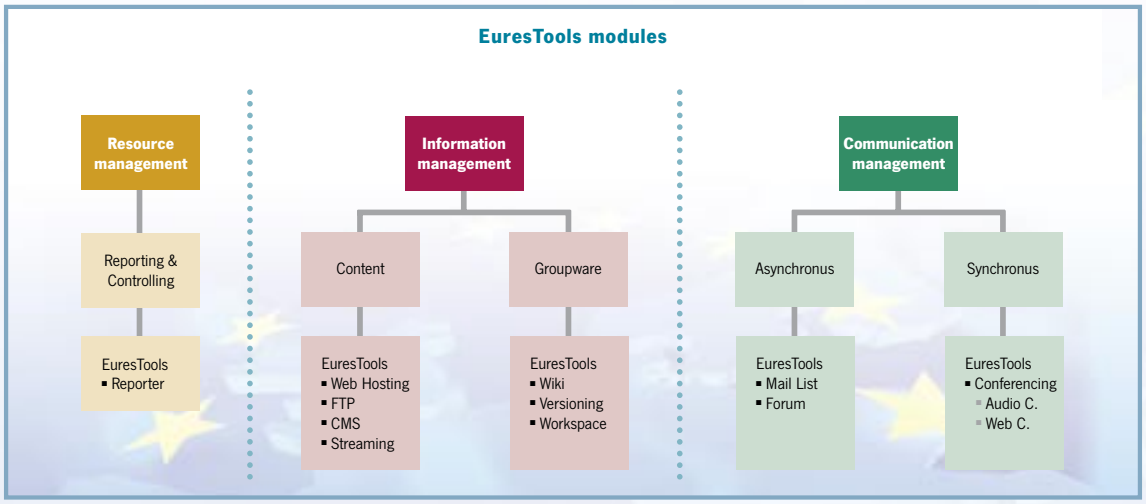
So, expanding the capacities of our wetware might not be sufficient to cope with the demands of our information society. If we don't want to wait for human evolution to take care of this, we should rather adapt our information and communication technologies to the limits of our stone-age brains, and particularly our stone-age working memory.

Intelligent user interfaces based on advanced knowledge-management systems may some day reduce our cognitive load caused by interruptions and too much information. However, we may then become dependent on the quality of the system's selection mechanism. In view of the risks of the purely technological solutions, improving our cognitive ability to cope with information is still an option worthwile pursuing.



EuresTools

ICT tools for effective management of European R&D projects



The basis for the success of research projects in EU Framework Programme 7 (FP7) and other European R&D projects are effective management tools which support you in managing resources, information, and communication.

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Dr. Douglas Williams, Broadband Research Project Director, BT Technical Project Manager of EU Integrated Project TA2

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