3/2013

EURESCOM mess@ge

The magazine for telecom insiders

NEWS

Celtic-Plus
Smart Connected World

Cybersecurity

The Kennedy Perspective
Social versus professional Internet

Events
ICT 2013 in Vilnius

European Issues
Horizon 2020

Celtic-Plus Event

Co-located with WIMA 2014

Monaco, 23 – 24 April 2014

Hosted by the Principality of Monaco, WIMA Monaco, the international conference for NFC & Proxy Solutions, and the Celtic-Plus Event 2014 will organize their events at the same location in Monaco.

From 23 to 24 April 2014 the 9th Celtic-Plus Event will be organized at the Grimaldi Forum in Monaco.

A co-located exhibition area, open to attendees from both events, will highlight synergies and offer new insights between Celtic-Plus research projects and the ready for market solutions and use cases presented at WIMA, in areas such as mobile payment, transport, healthcare, marketing, retail, access-control and ID management.

Interested researchers and high-level managers from industry and public authorities are invited to attend. The number of participants is limited to 200.

Highlights of the programme and the new Celtic-Plus research areas are in particular:

- New service challenges
- Get connected (telecommunications infrastructure challenges)
- Internet of Things and Smart City concepts
- Cloud services
- Sensor-based networks
- E-Health
- High-level views on future challenges from industry perspective
- Future Internet
- Green-ICT, CleanTech, Smart Grids
- Inter-disciplinary challenges for a better, cleaner, energy-efficient world
- New approaches towards Horizon 2020

Heinz Brüggemann
Director Celtic Office
www.celticplus.eu

Funding Opportunity for European R&D Projects

Celtic-Plus Spring Call for Proposals – Deadline: 15 May 2014

Celtic-Plus is a EUREKA Cluster dedicated to realising the vision of a smart connected world through an industry-driven R&D programme. There are two calls per year, in spring and in autumn, with a total funding of up to 100 million euro. The funding is orchestrated via the Celtic-Plus programme and provided by Public Authorities from 47 EUREKA member countries.

Eligible topical areas

Get Connected

- Infrastructure and connectivity aspects
- Fixed/Wireless, optics, energy-efficiency
- Network architecture, autonomic networks

While Connected

- End-to-end services and applications, like
  - Digital home, digital enterprises
  - Digital City (incl. digital school, digital transport)
  - E-Health
  - Security, privacy, identity

Future Internet relations

- Complement Future Internet (FI-PPP) program by
  - Making the Internet a high-quality service platform
  - Introduce the 'Celtic-Plus Use-Case Factory'
    - Extend the program by additional use cases not covered in the FI-PPP program
    - Contribute to future internet capacity building and test cases/ platforms

Green-Internet relations

- Consider environmental issues in ICT
- Encourage better energy efficiency
- Consider Smart Grid, Water management & ICT
- Develop multi-disciplinary approach

User friendly call process

The Celtic-Plus programme gives proposers the opportunity to submit proposals twice in the year – Spring Call and the Autumn Call. **The Spring Call submission deadline is 15 May 2014.** Celtic-Plus has an accelerated one-stage call process to ensure the shortest possible time between proposal submission and start of selected projects.

Celtic-Plus proposals should be complete and clearly present the technical objectives, timescales, participants, manpower, and expected results. These proposals are evaluated by independent evaluators and the proposals meeting the required standards will be retained and given the Celtic-Plus label. To be eligible for funding, project partners need to be located in EUREKA member countries.

Further information

Please visit the Celtic-Plus website at www.celticplus.eu for call details and the Celtic-Plus Purple Book for details on the R&D priorities of Celtic-Plus. For further information, please contact Heinz Brüggemann, director of the Celtic Office, at brueggemann@celticplus.eu

Celtic-Plus
Smart Connected World

www.celticplus.eu

Dear readers,

In May 2013, former NSA contractor Edward Snowden started revealing secrets on the massive surveillance of global communications networks by the NSA and other national intelligence organisations. Ever since, the question of how citizens and organisations can protect their data against snooping has received widespread attention. Protection against surveillance activities of intelligence agencies is, however, only one of the many facets of cybersecurity.

Already in spring 2013, the editorial team had planned to make cybersecurity the cover theme of the current issue. This was triggered by the EC's presentation of its cybersecurity strategy in February. At that time, cybersecurity did not get too much attention. This changed due to Snowden's revelations, and there is now political pressure to develop European solutions to make network infrastructures more secure. Eurescom mess@ge would like to contribute to this necessary debate, highlighting some issues and solutions.

In the introductory article, Milon Gupta and Anastasius Gavras give an overview on cybersecurity. In an exclusive interview with Eurescom mess@ge, IT security expert Joachim Posegga explains why the Internet is a glass house and what this means for the security of individuals and organisations. The next article present security solutions for future communication networks, which are currently developed by a strong industry consortium in Celtic-Plus project SASER.

These cover theme articles can only provide a glimpse of the manifold developments in the area of cybersecurity. Nevertheless, we hope that the contributions give you some useful insights on the topic.

The other main topic in this issue is the European Union's new framework programme for research and innovation, Horizon 2020, which was officially launched at the ICT 2013 event in Vilnius, Lithuania. In addition to the event report by Milon Gupta and Peter Stollenmayer, we present the major features of the new programme in a dedicated article by Uwe Herzog.

This issue also includes a variety of further articles on different, ICT-related topics. See, for example, the new opinion article by Eurescom director David Kennedy in his column "The Kennedy Perspective" on the difference between the social and the professional Internet. Or read the latest "A bit beyond" article and learn about what happens in the area of digital money.

My editorial colleagues and myself would appreciate your comments on the current issue as well as suggestions for future issues.

Milon Gupta
Editor-in-chief

Events calendar

24 – 27 February 2014
Mobile World Congress 2014
Barcelona, Spain
http://www.mobileworldcongress.com/

10 – 14 March 2014
CeBIT 2014
Hanover, Germany
http://www.cebit.de/en/CeBIT-2014

18 – 20 March 2014
Future Internet Assembly
Athens, Greece
http://ec.europa.eu/digital-agenda/en/future-internet-assembly

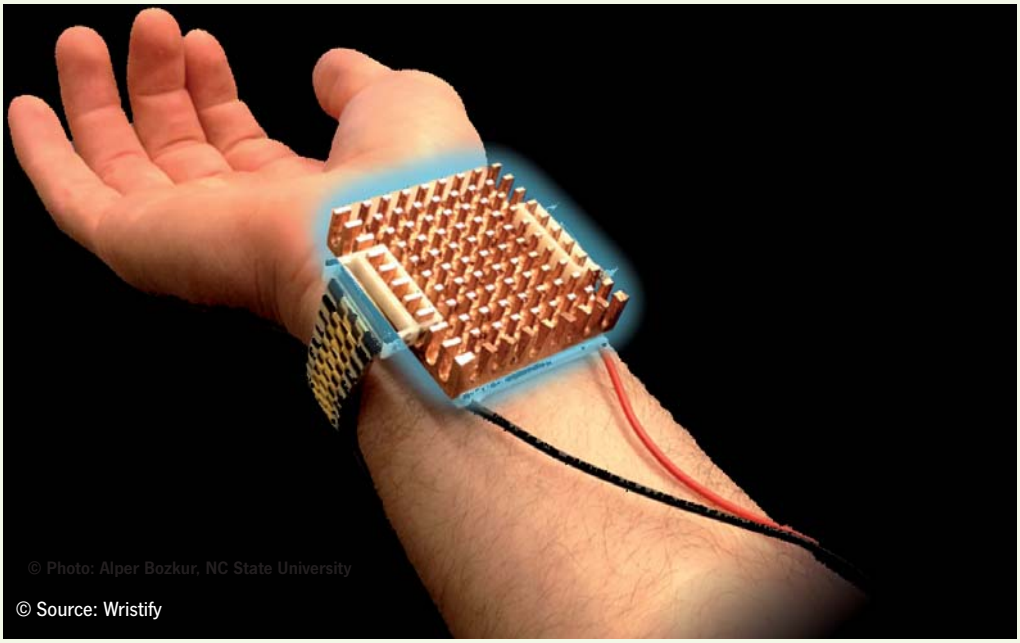
2 – 3 April 2014
1st European Conference on the Future Internet – ECFI
Brussels, Belgium
http://www.ecfi.eu

23 – 24 April 2014
Celtic-Plus Event
Co-located with WIMA 2014
Monaco
http://www.celticplus.eu

5 – 10 September 2014
IFA 2014
Berlin, Germany
http://b2b.ifa-berlin.com/en/

17 – 18 September 2014
2nd European Conference on the Future Internet – ECFI
Munich, Germany
http://www.ecfi.eu

Sn@pshot
Heating via wrist



© Source: Wristify

Wristify is a bracelet that allows its wearers to control their individual thermal levels through highly localized and rapid cooling or heating. The Wristify prototype delivers pulsed thermal waveforms to the user's wrist to influence perceived thermal comfort. Wristify was developed by four members of the Materials Science & Engineering department at the Massachusetts Institute of Technology (MIT).
Further information: http://wristifyme.com

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Social versus professional Internet

Why they are different and how to reconcile them

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At the core of the endless controversy about net neutrality and Internet service limitations is a dichotomy that has been largely neglected so far: it is the difference between the social Internet and the professional Internet. We need to understand and accept this difference in order to address it in a way beneficial to providers, users, and society.

The social Internet

Karl Marx argued that human beings are intrinsically social beings who cannot survive and meet their needs other than through social co-operation and association. The advent of the Internet has allowed us to interact and associate in ways that were never foreseen even one generation ago.

Today it is technologically simple to remain in contact and informed about your friends and their activities, your business interests, your surroundings and your points of interest wherever you or they may be – but it is hard to have this all the time and everywhere in practice. We can now watch TV, shop, listen to music and do lots of other exciting things as long as our peers are not consuming too much of the shared resources that is the Internet.

This exposure to communication and information is also feeding on our collective needs for approval and respect for our actions from our peers. We like it when our friends "like" what we like. It is also documented that the fastest spreading emotion in the Internet is anger, so obviously we really like to dislike what our friends and peers dislike. The point is that current generations have the virtual presence of their friends with them all the time in a way that the previous generations cannot understand.

This is the social Internet, and it has functioned very well as a non-critical best effort infrastructure for our communications. The key point being that we do not expect it to be perfect and we are generally understanding of delays, interruptions and generally poor performance.

Changing requirements and expectations

What has slowly happened over time is that our needs and expectations have changed. We are now asking why my Internet access does not work perfectly all the time. Why am I paying for "up to X Mb/s" rather than a guaranteed X Mb/s. Even then we are moving away from actually caring about the Mb/s as long as our apps and services work as we expect them to.

This new idea of satisfying customers by providing an agreed quality of experience will probably be the basis for changing the provider business models and customer contracts in the future.

I have listened to Internet gurus for years now insisting that Internet traffic is sacred and any moves to manage or control the traffic would be breaking the concept and neutrality of the Internet. I don't disagree with this, but I cannot reconcile it to providing guarantees of service to all Internet users in the future. I am assured by "experts" that such guarantees can be provided by increasing the capacity of the infrastructure and they are right too.

However, what they neglect to consider is that infrastructure has a real cost of provision and operation. At some point in time, if the costs of operation exceed the revenue being generated, then the operator goes out of business. The instant reply is that the operators need a new business model – and I love the innocence of that reply. Clearly none of the future services and apps will work without an infrastructure, and if it is not economic to provide and operate such an infrastructure, then no one will do it.

But we should not get depressed – let us assume that low cost Internet access will pay for a reasonable best effort Internet infrastructure and turn our thoughts to the customers who want more.

The professional Internet

The new generation of customers will be the people and the organisations who want guaranteed availability, reliability and throughput from their data and communications services. These are the up and coming professionals, probably Cloud Service users, who demand 99.999% availability and reliability when accessing their digital work and life in the Cloud. There will also be societal bodies demanding such quality infrastructures for medical, education, security and many more applications.

We will not be able to say to any individual: no you cannot have sufficient bandwidth for your remote medical application, as there are a group of 12 year olds wanting to watch videos of funny cats at this time. Sorry guys, but clearly all bits are not equal.

I am coming to the conclusion that we will soon need to recognise that the Internet must become a two tier structure where there is the social communications provided on a best effort basis and a professional Internet where communications are provided under Service Level Agreements (SLAs) that determine minimum performance levels for the services.

Before I get spammed to death by the Internet purists, you must realise that this is not new – for years companies have been leasing lines to have private data networks as performant as they require and totally secure as they were not part of the shared infrastructure. This has in many cases evolved to the use of VPNs (Virtual Private Networks) within shared resources but with reserved capacity.

The only evolution necessary from this to the professional Internet as I see it will be the active management of the Internet, and the nodes within it, to ensure the configuration of the infrastructure is the best possible to have efficient operations and meet the promises made to the customers in the SLAs.

Luckily SDNs and NFV are arriving now to help us achieve this, but we are still missing vital parts of the picture. What are the Inter-Internet service provider agreements needed to share the constraints of the SLAs and ensure the end-to-end experience is as expected? How are the SLA parameters supported and shared between the domains to ensure end to end performance? These are not trivial problems and professional users of communications services will soon be driving us hard to meet their demands.

The inclusive digital society – for work and play

If we take this idea further into the future, we can foresee that there will be two parallel business models supporting Internet provision: one based on a possible maximum rate in a best effort shared resource and the other based on a guaranteed rate in a managed but also shared resource.

The professional users who place most value on availability and reliability will be happy knowing they get what they pay for, and the societal users who are tolerant of performance deviations will be happy that they pay for what they get.

What cannot succeed in the long term is that we keep pretending that a social Internet can be the professional Internet, as this assumes that providers and operators are working on an altruistic non-profit model, and we all know that the survivors will be the ones with viable commercial models and happy customers.

Cybersecurity – An overview

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Cybersecurity has gained central importance for the functioning of our society in the digital age. In developed countries there is almost no area of production, consumption, transportation, and information storage and sharing that is not directly or indirectly dependent on networked information and communication systems. In parallel to the growing dependency on networked digital systems, the variety and quantity of cyber-threats has rapidly increased. In this article we will explore the different aspects of cybersecurity as well as the challenges, approaches and solutions for maintaining it.

Rising security threats

According to Symantec's "Internet Security Threat Report 2013", threats to online security have grown considerably. The report particularly highlights constant innovations from malware authors in areas like cyber-espionage and industrial espionage as well as malware and phishing, which permanently raise the bar for cybersecurity efforts. Furthermore, traditional threats have expanded into new areas. In particular, social media and mobile devices have come under increasing attack recently, while spam and phishing attacks via traditional routes have fallen.

Despite the huge public attention that cyber espionage received after the scope of snooping by the NSA and other intelligence agencies came to light in 2013 after Edward Snowden's revelations, it can be safely assumed that cyber espionage is the smallest type of cyber threats in quantitative terms. The largest share of cyber attacks on individuals, companies and public institutions falls into the area of cyber crime. Next in terms of volume is probably hacktivism, meaning cyber attacks motivated by political reasons. Cyber warfare and cyber espionage can be considered small in volume but considerable in terms of potential impact.

Now that we defined the scope of cyber threats, let us have a look at what cybersecurity really means.

What is cybersecurity anyway

The term cybersecurity came up in 1994, when the Internet was still in its infancy. By that time there had already been a few Internet incidents including malware that appear relatively harmless in comparison to what we are facing today. The Merriam Webster dictionary defines cybersecurity as "measures taken to protect a computer or computer system (as on the Internet) against unauthorized access or attack."

ITU-T offers a more detailed, but also much wider definition: "Cybersecurity is the collection of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance and technologies that can be used to protect the cyber environment and organization and user's assets." According to ITU-T these assets include "connected computing devices, personnel, infrastructure, applications, services, telecommunications systems, and the totality of transmitted and/or stored information in the cyber environment."

Approaches to achieving cybersecurity

ITU-T defines three general security objectives for information and communication systems: availability, integrity, and confidentiality. These objectives can be pursued on different levels: the level of the individual user, the level of individual organisations, the national level, and the multinational level.

Since the mid-1990s, government bodies like the UK's British Standards Institution, Germany's BSI (Bundesamt für Sicherheit in der Informationstechnik – federal office for security in information technology) as well as major international standards organisations like ISO and ITU-T have been working on ICT security topics, ranging from cryptographic protocols, security architectures, to best practices to protect information and communication systems.

More recently ENISA, the European Union Agency for Network and Information Security, has conducted many studies only to conclude that the cybersecurity strategies across Europe and globally differ significantly. There is a major effort underway to analyse these strategies and identify the common elements that could potential lead to an agreement at European level.

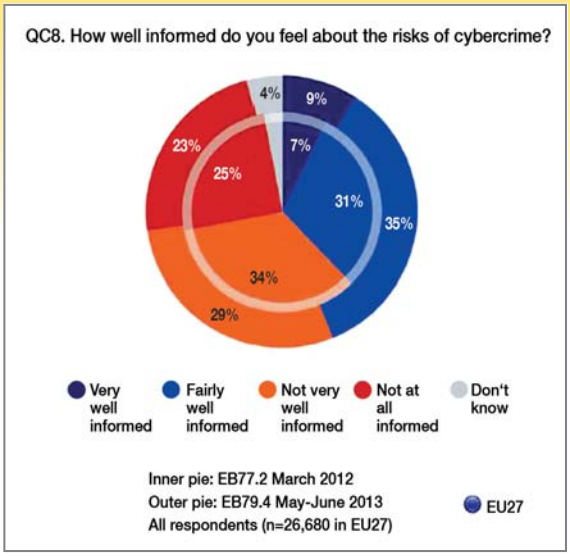
In February 2013, the European Commission and the High Representative of the Union for Foreign Affairs and Security Policy presented their proposal for a European cybersecurity strategy (see Eurescom mess@ge 1/2013). The proposed cybersecurity strategy is based on five "strategic priorities": 1. Achieving cyber resilience, 2. Drastically reducing cybercrime, 3. Developing cyberdefence policy and capabilities related to the Common Security and Defence Policy (CSDP), 4. Develop the industrial and technological resources for cybersecurity, 5. Establish a coherent international cyberspace policy for the European Union and promote core EU values.

These priorities in their general form are probably agreeable to most Member States, but when it comes to translating them into concrete action, fundamental differences occur. Thus, not surprisingly, since the EU cybersecurity strategy was presented, there has not been much progress among Member States in agreeing on the adoption of the suggested EU-wide security policies.

The price of cybersecurity

One aspect that has been mostly neglected in public debates on cybersecurity is the fact that it comes at a price. Built-in security of devices and networks can be expensive and has thus been of secondary priority in the deployment of information and communication technologies. ICT companies have been developing and deploying systems and networks with the functional requirements in mind, and only when everything was working, they considered how to secure these systems and networks.

Not only companies and public institutions, but also users shy away from investing effort and money into protecting the integrity of their communication. Most people do not use encrypted communication, as it is inconvenient and requires time-consuming effort. In any case, expecting users alone to handle the huge cybersecurity threats would be unrealistic. However, protection against cybercrime could certainly be increased through better education of users and the implementation of basic safeguards.



Only 44 % of EU citizens feel well informed about cybercrime (Source: Eurobarometer 404, November 2013)

A recent Eurobarometer survey indicates that there is scope for improvement in regard to cybersecurity education: while 76 % of respondents are concerned about cybercrime, only 44 % feel well informed about the risks of cybercrime.

For all organisations, both public and private, implementing state-of-the-art security solutions should become a high priority, despite the cost and effort. Waiting for European or even global cybersecurity measures to take effect appears at the moment too optimistic and might come at a higher price than implementing security solutions right now.

In view of the importance of ICT infrastructures for our society, we need to invest more into research and development of cybersecurity solutions. In addition, national governments and the EU need to put the agreement and implementation of a Europe-wide cybersecurity strategy high on the political agenda. Beyond Europe, we need in the longer term a global cybersecurity strategy, if we want to contain at least cybercrime and cyber warfare. Otherwise, we can expect serious cyber attacks on critical infrastructures to succeed in the near future, which will make the interception of German chancellor Merkel's phone look incredibly harmless in comparison.

Further information:

- Symantec's "Internet Security Threat Report 2013" http://www.symantec.com/about/news/release/article.jsp?prid=20130415_01
- ENISA website http://www.enisa.europa.eu/
- The EU cybersecurity strategy – Why Europe needs a more concrete plan, by Milon Gupta, Eurescom mess@ge 1/2013 http://www.eurescom.eu/news-and-events/eurescommessage/eurescom-messge-1-2013/the-eu-cybersecurity-strategy-why-europe-needs-a-more-concrete-plan.html
- Special Eurobarometer Report 404: Cyber Security. European Commission, November 2013 http://ec.europa.eu/public_opinion/archives/ebs/ebs_404_en.pdf

"The Internet is a glass house"

Interview with ICT security expert Joachim Posegga

Everybody is talking about cybersecurity nowadays. Beyond heated public debates Eurescom mess@ge tries to explore, what the underlying issues and challenges are that will impact Europe's cybersecurity in the coming years. Editor-in-chief Milon Gupta asked professor Joachim Posegga, who is heading the IT-Security group at the University of Passau. Before changing to academia he was leading the Security Research Program at SAP Corporate Research and worked on security at Deutsche Telekom Research.

Joachim Posegga

Which challenges to cybersecurity in Europe and worldwide do you consider the most important?

Posegga: The biggest challenge is clearly a political one: we need a pan-European vision for cybersecurity and, most importantly, the objectives underlying it. Consider just privacy requirements alone: There are very diverse opinions on this in the different European societies, and it is a major undertaking to map these into a coherent position. Unless this has been achieved at least to some extent, there will be no credible European position the rest of the world would respect.

How will trust in ICT services and their usage be affected by news on data spying by agencies from the US and the UK?

Posegga: Does anyone seriously believe that only such agencies in the US and the UK do invest in

intelligence gathering on the Internet? What became known so far about the activities of the NSA [National Security Agency of the US – the editor] and the GCHQ [UK Government Communications Headquarters – the editor] confirmed an old insight: what can be done, will be done.

Although many security experts, including me, were surprised about the scale and amount of intelligence gathering activities, the individual bits and pieces uncovered could hardly surprise. At the end of the day, what would you expect an intelligence agency to do in the age of the Internet? Analyse the wording of governmental Twitter feeds?

The good side of it is that it is now obvious to everyone: the Internet is a glass house, and anything inside is easily observable. Attaching blinds to this glasshouse is extremely difficult, even for the big players in industry who are increasingly worried about the consequences of being subject to surveillance as the average citizen appears to be. Clearly, we must react to this and learn how to better protect citizens and businesses against mass surveillance. This is primarily a technical challenge, particularly in regard to foreign agencies.

But coming back to your original question on trust in ICT, on what basis would you trust Google more than the NSA? ICT is used to deliver value. This implies risk. It is here more useful to think in terms of risk, rather than trust.

So, let me rephrase your question: is the risk of using ICT services affected by news on data spying by agencies from the US and the UK? The answer is, quite obviously: no. But, thanks to what was published, we are now better in estimating the risk involved. This is the good side of what happened.

What do you think about currently discussed plans for a European Cloud?

Posegga: I am afraid I became fairly buzzword-resistant over the decades. Let us wait until a concrete plan for a European Cloud is put on the table, which would allow us to consider aspects like what sort of architecture and interfaces such a system has, and how lawful interception is handled. Then, possible users could make up their minds about the actual added value of such a European Cloud.

The so-called NSA scandal clearly is a chance to position European technology better than before, not only in cloud services. However, we will not succeed with marketing strategies only, we must deliver more value, or less risk, and this requires better technology. In this respect, I am quite worried about European research, as I did not spot much IT Security in the upcoming Horizon 2020 programme. In order to create European security solutions, we obviously need more research and innovation in this field.

How secure are Europe's critical infrastructures, and what should be done to better protect them?

Posegga: My good friend Dieter Gollmann [professor and head of department for security in distributed application at the technical university of Hamburg – the editor] once remarked that there are no critical infrastructures just critical applications. There is a lot of truth in this. So let me ask what is your favourite critical application – controlling the power grid or water supplies, managing civil aviation, or the traffic on streets? Most of these applications come with barely any security at all these days, and we are just beginning to understand what we actually want to achieve here.

Let me point you to a trivial example: messaging has always been the number one killer application, and it meets the definition of a critical application. So, can we today provide secure e-mail at large? The answer is: no.

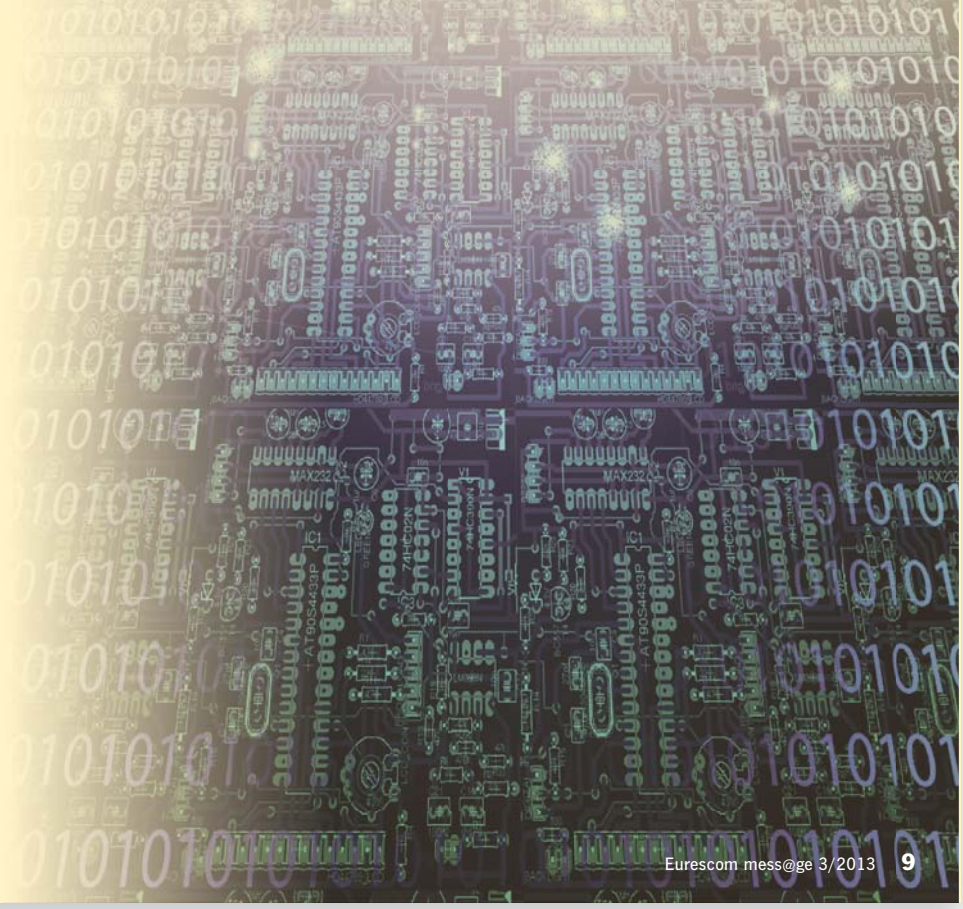
Many people argue for encrypted e-mails. I believe in a few decades our current practice of encrypting e-mail bodies and the corresponding key management will remind us of the "duck and cover"-strategy against atomic bombs in the fifties. We cover single aspects of the problem, but we largely fail to cover crucial aspects like metadata, transport routes, information flow, and centralized architectures.

What recommendations do you have for the EU cybersecurity strategy?

Posegga: My first recommendation would be to have a consistent EU cybersecurity strategy supported by all Member States in the first place. If you follow the debate and just consider the huge differences between the positions of, for example, Germany and the UK, it appears that it will at least be very difficult to achieve.

Beyond immediate actions for strengthening cybersecurity, there is also a cultural aspect that politicians and EU officials should be aware of. Currently, we see something like a global culture of digital natives in the Internet evolving, and cybersecurity in its various facets is a major issue for them. Europe is very well positioned among digital natives; just figure why someone like Jacob Appelbaum, the driving force behind the Tor network [free software for enabling online anonymity – the editor], moved to Berlin? A high level of cybersecurity in Europe could become an important competitive factor.

It is not the digital immigrants or people from the analogue age who will shape the next decades of society and economy. It will be the digital natives, and Europe must attract the most clever brains of them! Any cybersecurity strategy considering the big picture should take the role of cybersecurity as a competitive factor into account.



Security solutions for future communication networks

Celtic-Plus project SASER

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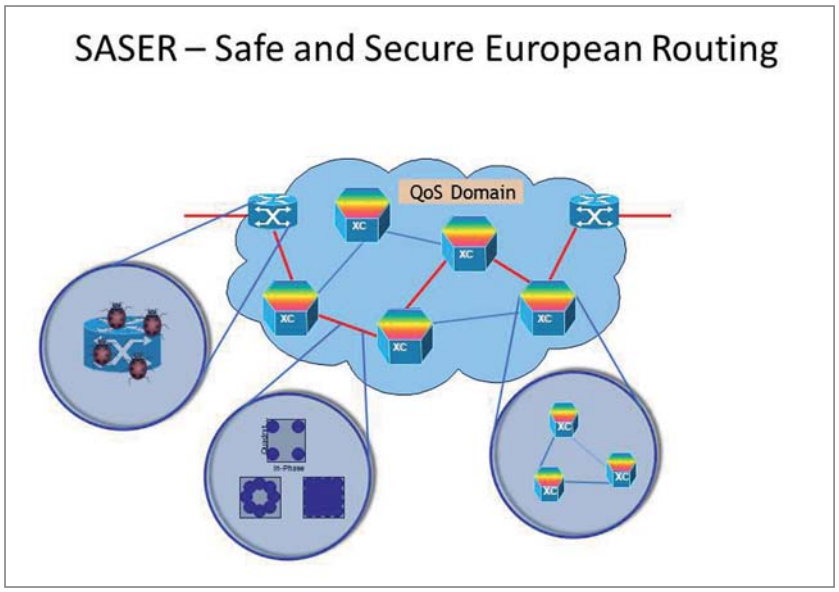


New SASER Routing Architecture

The SASER project for "Safe and Secure European Routing" has the goal to provide scientific and technical solutions for future secure networks with a sustainable energy- and cost structure. SASER is a multi-national research project within Celtic-Plus, the EUREKA Cluster for a Smart Connected World.

The SASER-SaveNet subproject is focused on the investigation of new architectures of opto-electrical network elements, which build the layer 0 and layer 1 optical transport network. A key question is how distributed network element architectures can increase the availability and security of optical network elements:

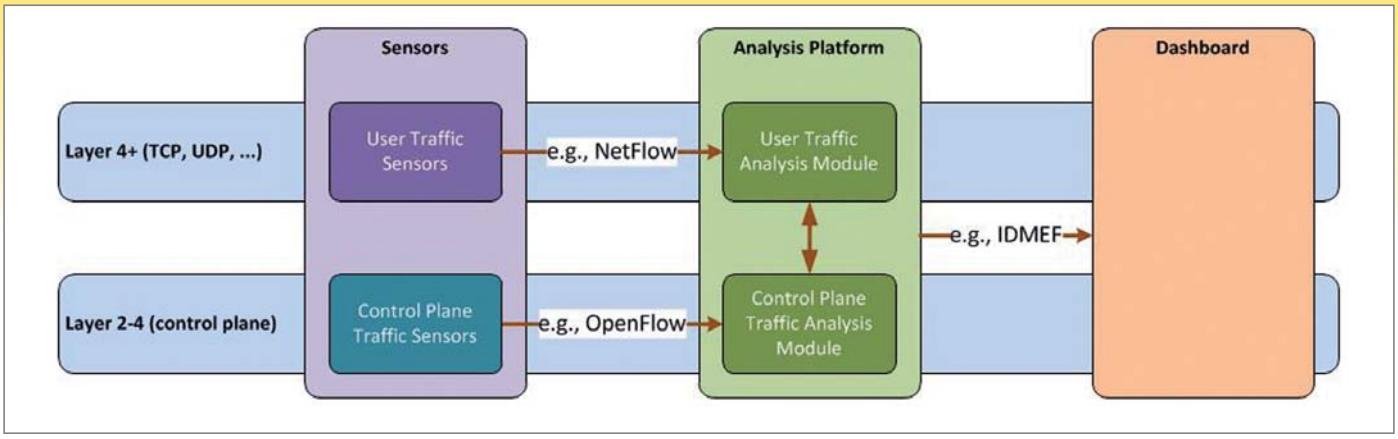
The sub-project SASER-SIEGFRIED has the aim to increase the safety and cyber security capability of communication networks. The partners of the work package "Security" in SASER-SIEGFRIED consist of telecommunication vendors, universities and research facilities from Germany and Finland. They focus on the development of methods to protect networks against external and internal attacks. Their activities include the evaluation of a security concept for a new network architecture based on virtualization, cloudification and software defined networking. Anomaly detection, backdoor detection and visualization technologies are investigated to detect cyber-crime hidden inside massive data.

SASER-SaveNet

The concept of virtualization, which is known from computing, can also be applied to transport networks. In computing virtual computers are established on top of a trusted computing platforms, which controls the virtual machines and makes sure that they are separated from each other, so that a failure on one virtual machine cannot bring down the service of the other virtual machines. Analog to this concept physical transport links can be separated into virtual communication channels and can be operated separately from each other. By guaranteeing bandwidth for each virtual channel, the channels cannot influence each other, which guarantees the availability and achieves high quality of service. Denial-of-service attacks, which aim to overload virtual channels, cannot impair other virtual channels.

Another virtualization concept is to split large network elements into several smaller distributed network elements, which behave like one big (virtual) network element. This increases the overall network security as failed or attacked parts of the virtual network element can be isolated and circumvented. This may reduce or limit the services and bandwidth of the virtual node, but does not bring down the virtual node as a whole.

One security risk of distributed systems is the fact that they expose internal communication interfaces to attackers, as for example two parts of the network element are interconnected via standard Ethernet cabling. This is not only a problem of distributed telecommunication systems, but a general problem of machine-to-machine interfaces. In the mechanical engineering industry, for example, construction engines are more and more integrated with IT systems and also there the communication interfaces of the machines must be secured. Although it is in principle known how to implement encryption and authentification in embedded systems, interfaces are often inadequately secured due to a lack of development time, incomplete protocol specification, incapable implementation, insufficient testing and the like. What is required are software tools, which support development engineers to specify and rapidly deploy secure protocols.



Scalable Sensor and Analysis Platform

In SASER-SaveNet the software defined networking (SDN) approach is seen as a crucial concept to increase network security and reliability. SDN has gained a lot of attraction recently and allows to rapidly develop and deploy new applications and services to packet networks. Originally invented to control switches and routers in data networks, SDN can be extended to transport networks. This allows to dynamically provide connectivity between router ports through the optical network. By providing virtual links between routers, through-traffic in the routers can be reduced. This reduces the power consumption of the network and increases the network security and reliability, as the optical light paths are much harder to manipulate than IP packet streams.

SASER-SIEGFRIED

As a starting point in SASER-SIEGFRIED, a comprehensive threat and risk analysis for an optical network as deployed today was carried out that identified 39 different threats. An assessment based on the methods suggested by ISO 27005 resulted in each threat being classified as either "minor" (applied to 20 threats), "intermediate" (15), "major" (4) or "critical" (0). In particular, the assessment showed that the most critical attack surface of an optical network seems to be the management plane, so securing this part of the network and applying secure operational procedures should be the highest priority of optical network operators when securing their networks.

Future telecom operator services are characterized by global delivery of high-performance applications over high-capacity network infrastructures. As current applications evolve, it is not feasible for telecom operators to set up and configure a dedicated network for each application. Therefore, a key challenge for operators is the deployment and operation of dynamic and scalable network infrastructures capable of supporting all application types. In SASER-SIEGFRIED, we address this issue using Software Defined Networking (SDN) and network virtualization. An integral part of SDN is the separation of data and control plane, leading to increased programmability and flexibility in a network, whereas network virtualization makes a physical infrastructure more easily shareable. However, the introduction of new technologies in the telecommunications environment introduces new security challenges which may demand innovative solutions. Within the project we focus on analysing and designing mechanisms that ensure secure deployment of SDN and network virtualization in a Telco environment. Furthermore we are actively developing an efficient and scalable sensor- and analysis platform for control and data plane monitoring. The approach of the analysis platform is based on the idea shown in the figure below.

The new management flexibility and increased network bandwidth have the potential to open new attack surfaces against the network and can broaden the existing threats against the users. Our security monitoring provides a thorough approach for the task to detect anomalies in control and user traffic. These anomalies could either stem from traditional threats, such as DDoS or botnet activity, but could also be new threats induced through the SDN architecture.

However, the use of anomaly detection in practices is hampered by a high rate of false alarms. Security dashboards can be used to solve the information overload problem and support the analytic tasks to verify that attack alerts are valid attacks. In a first step in SASER-SIEGFRIED, tools for anomaly detection are reviewed for functionality that exists today. This study is accompanied by workshops and interviews with security analysts to understand their complex needs.

As part of SASER-SIEGFRIED we deal with techniques to investigate backdoors in software systems. Our focus is on binary code to build tools and algorithms applicable even if there is no source code available and also to cover malicious functionality injected during or after code generation, e.g., by the compiler tool chain or during operation. As a first approach, methods are developed to foster semi-automated backdoor analysis and detection, intending to discover relevant attack patterns. As a second technique, backdoors are mitigated by preventive, constructive means, in order to minimize the attack surface for malicious code manipulations. In addition, based on state of the art technology and executable backdoor samples, a „Learning Environment" is developed, providing a Linux and Cloud based tool box and teaching material for software analysts, enabling them to quickly understand and apply the techniques examined and developed in SASER-SIEGFRIED.

SASER-Horizontal

In the horizontal activity "Reference Scenarious, test infrastructures and system tests" of the EUREKA/Celtic-plus SASER project the concepts, results and prototypes developed in SASER will be tested and evaluated in a testbed with real Telecom environmental conditions provided for testing the developed advanced optics and packet functionalities and solutions. The feasibility of new functionalities as well as their fitting in existing network infrastructures can be evaluated and demonstrated.

Further information:
SASER website: http://www.SASER.eu
Description and leaflets: http://www.celtic-initiative.org/Projects/Celtic-Plus-Projects/2011/SASER/saser-default.asp

New horizons for Europe

ICT 2013 in Vilnius

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Welcome address by Dalia Grybauskaitė, President of Lithuania, at the opening of the conference

This year's ICT event in the Lithuanian capital of Vilnius was special, as it marked the end of the Seventh Framework Programme (FP7) and the beginning of the new framework programme Horizon 2020. ICT 2013 was, however, also special in terms of contents and style.

Create Connect Grow

The motto of ICT 2013 was "Create Connect Grow". As far as "Create" and "Connect" were concerned, the event fully accomplished its mission in the three days from 6 to 8 November 2013. The creative aspect of research was particularly highlighted in the exhibition, where many projects presented themselves with artistic performances based on the innovative interplay between humans and advanced information and communication technologies (see Vconect example on the next page). In general, the over 200 booths in the exhibition were vivid proof of Europe's creativity in exploring new technologies and their applications.

Concerning the second aspect, the social dimension of "Connect" worked better than the technical dimension. WLAN connectivity was not fully up to European aspirations for technological leadership, while the social connectivity worked fine. Thanks to the overall good organisation by the Lithuanian EU Presidency in collaboration with the European Commission, the event provided ample opportunities for the over 5,000 delegates to connect with each other, share knowledge, and discuss collaborative activities.

Besides discussions at the exhibition booths, this interaction took mainly place at the more than 120 networking sessions. The limited space at the Litexpo facilities forced the local organisers and the session organisers to adapt, proving that scarcity often leads to creative solutions.

Innovation and growth

More than at previous ICT events, the third aspect, "Growth", was permeating almost all presentations and panel discussions. This was particularly true for the plenary sessions on the big stage. The opening session on 6 November included an interesting panel of successful European entrepreneurs, who discussed what is needed for the success of start-up companies.

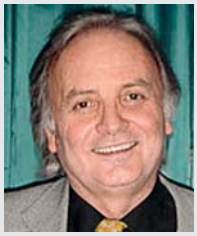
Eben Upton, founder of Raspberry Pi, participated as living proof that Europe can actually produce and sell millions of ICT devices. Teemu Suila, CEO of Rovio, the producers of the popular mobile game Angry Birds, said that "it is not the Commission, which makes the first steps. It is the entrepreneurs." If you listened to US science fiction writer David Brin, Europe has reason for looking optimistically into the future of its ICT sector. He believes that the future lies in Europe more than in the US.

At the end of the session, panelists were asked to summarise the one issue which could make Europe's ICT business prosper. Answers ranged from "Education for a digital world", to "Deregulation of rules which currently hurt business", "Allocate all available public money to infrastructure", and "Value is created through entrepreneurship".

Huge interest at the networking session of Future Internet PPP project FI-STAR

continued on page 13 ▶

Celtic-Plus
Smart Connected World



Editorial

Dear reader,

This issue will be largely devoted to our upcoming Celtic-Plus Event and the Proposers' Day from 23 to 24 April 2014 in Monaco. For the first time we have an arrangement to co-locate our Celtic-Plus project exhibition with the WIMA exhibition, which is held at the same place.

We are very hopeful that this colocation will create new business and research ideas via discussions with WIMA experts. There are several technological aspects covered at the WIMA event, which are also of interest for Celtic-Plus, namely, NFC and proximity technologies, Cloud services and Big Data.

We have included in this issue two related articles, about WIMA and the view from the Monaco Public Authorities. In addition, another article will present our synergy expectation by providing this co-located exchange of views.

Furthermore, one of our project highlights, SPECTRA, will go into the details of their mobile field trial, which was set up in Monaco. Another highlighted project is OPERA-NET+, which is working on the extremely interesting and important aspect of saving considerable energy in mobile networks.

Enjoy reading this issue.

Heinz Brüggemann
Director Celtic Office

CONTENT

Co-located Celtic Event and WIMA in Monaco

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Co-locating the Celtic Event on 23 – 24 April 2014 with the WIMA Forum should allow a cross-fertilization between the open innovation ecosystem of Celtic-Plus and the business ecosystem of the WIMA Forum participants (technology providers, solution integrators, clients, etc.). Such crossing of ideas will be especially interesting as mainstream areas covered by WIMA such as NFC (Near-Field Communication) and Mobile Proximity together with their connection with Cloud Computing and Big Data are becoming core enablers for numerous rapidly emerging markets that are at the core of the Celtic-Plus vision and strategy, such as m-health or m-commerce, mobile ticketing, mobile financial services and the Smart-City and Internet of Things domains.

As a bottom-up and close-to-market cluster, Celtic-Plus will find an immediate benefit in having its projects demonstrated during the Celtic-Plus event also seen by the WIMA community, therefore enhancing immediately the possibility to disseminate their results and to raise the interest of potential new partners for industrializing or adopting their results.

Some Celtic projects related to Mobile Proximity, Cloud, and Big Data could also take the opportunity to advertise their results to a larger audience and respond to the WIMA call for papers and feed the WIMA research track on 22 April 2014.

This opportunity should be of particular interest for some recent Celtic-Plus projects launched in rapidly moving areas such as Smart Cities, where WIMA core technologies cross critical business requirements. A good example is the recently launched the TILAS project aimed at setting up a very large test-bed for the Internet of Things with a very strong focus on secure WSN management in dense urban environments mixing heterogeneous networks (capillary, proximity, CPL, 3G/LTE). More information on the TILAS project: www.celticplus.eu/pub/Project-leaflets/Webquality/TILAS_lq.pdf

Conversely participants to the WIMA Forum could be interested to attend the Celtic Brokerage event on 24 April 2014 at the Grimaldi Forum in Monaco and be interested to join new Celtic proposals, as well as learning from the Celtic-Plus community and get up-to-date information on the most recent development achieved in future telecommunication infrastructure (network and platforms, service and network management, business support systems) or service development frameworks (multimedia, end-user interaction).

Outlook

There are indeed high expectations that this colocation could generate new business contacts and new business impact and may also generate new ideas for extended research on NFC, Mobile Proximity, Cloud, and Big Data. In addition, the extended exhibition of both Celtic-Plus projects and WIMA-related organisations may contribute to paving the ways for new way of collaboration.

About WIMA Monaco 2014

NFC & Proximity Solutions – "Connecting the Physical & Digital Worlds for Interactive Customer Engagement"

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WIMA MONACO – NFC, Proximity & Cloud Solutions Conference & Exhibition, 22 – 24 April 2014, in co-location with Celtic-Plus, 23 – 24 April, Grimaldi Forum, Monaco

The Principality of Monaco will host the next Celtic-Plus conference, proposers day and exhibition from 23 – 24 April 2014, during WIMA MONACO (22 – 24 April 2014, Grimaldi Forum, Monaco), the leading conference and exhibition dedicated to NFC, proximity and cloud solutions connecting the physical and digital worlds.

A co-located exhibition area, open to attendees from both events, will highlight synergies and offer new insights between Celtic-Plus research

projects and the ready for market solutions and use cases presented at WIMA, in areas such as mobile payment, transport, healthcare, marketing, retail, access-control and ID Management.

WIMA welcomes a cross-section of international attendees from research and educational institutions, standards bodies, start-up companies, and major global industry leaders.

Further information:
- WIMA: www.wima.mc
- Celtic-Plus Event 2014: www.celticplus.eu

Views from the Monaco Public Authorities

A long-time will of the Monaco Government for a sustainable economy: The support of innovation

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The policy of support for innovation by the Monaco government took all its dimension in July, 1998 with the implementation of the Monegasque Fund for Innovation (the national innovation fund).

The second step of this policy of support for innovation is the application and the membership of Monaco to the EUREKA network.

The Principality of Monaco is a full member of the EUREKA network since January 1st, 2005.

It is indeed under the French and Dutch Eureka chairs that Monaco presented its application.

It makes Monaco one of the more recent additional member states of the network.

To support this candidacy, and from the start, the Monaco government decided on the implementation of the " Eureka office" , as well as of the " " EUREKA " Monegasque Fund specifically dedicated to funding of the cooperative projects carried out by the companies of the principality within the framework of the network, granted with 2 million Euros .

The Eureka office is located within the Business Development Agency directly under the Ministry of Finance and Economy's authority.

The missions of the Business Development Agency are:
- The examination and the administrative support of applications for the creation of new businesses and the amendments to existing businesses
- Keep the Trade and Industry Register
- Monitor business activity
- Issue industrial property rights certificates and perform the relevant registrations in national records
- Examine applications, grant and monitor financial aid packages for businesses, creation, innovation, international cooperation, investment support, international trade.

The Authority is also entrusted with:
- Creating, maintaining and optimising permanent contacts and relationships with all professional and business partners
- Participating in prospection or economic development organised by the competent bodies

Within this Agency, Monaco Welcome and Business Office is specifically responsible for developing a high quality one-stop-shop and personalised support for entrepreneurs

The Monegasque Fund for Innovation as well the " EUREKA " Monegasque Fund offers support to Monegasque companies for innovative technological projects (involving real technological advances or the introduction of an innovative product to the market), through repayable loans or grants.

The project must result in a technologically innovative project and show real commercial potential.

Who can receive support?

Companies in the industrial sector, tertiary industry and those providing services to industry are eligible for support from this fund.

Stages of the project and costs taken into account:
- Research and development
- Development of a prototype
- "Pilot" implementation of production
- Pre-production

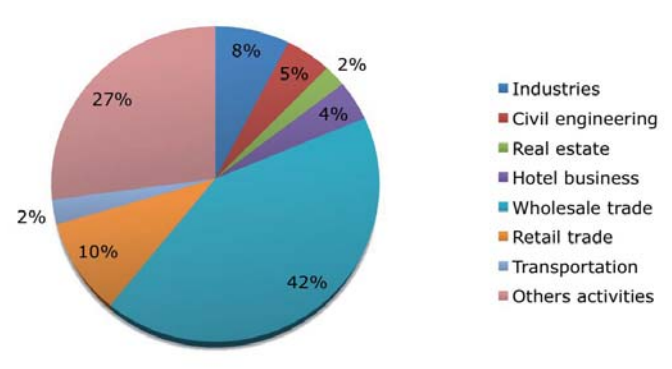
Funding are up to 50% of the total eligible amount budget.

Since 1998, more than 5 million euros have been dedicated to innovative projects
- 42 individuals projects funded by the National Monegasque Innovation Fund since its creation : 30 companies, and a reimbursement rate close to 90 % for the repayable funding part
- The EUREKA project for each Presidency:
  - Project E! 3551 "MONOÏKOS" (ASEPTA - cosmetology)
  - Laboratories EUROPHTA (ophthalmology)
  - Project E! 3896 "MOB-IT" (MC-Tel) > interrupted
  - Belcurves – (3D virtual try-on technology)
  - Entered the EUROGIA + Cluster – ("Floatmet" project with Single Buoy Moorings-meteo floating station)
  - Project E! 4440 "SECUReSHIP" (3D security system for naval protection)
  - Entered the CELTIC+ Cluster – ("SPECTRA " project with MONACO TELECOM- multi-band cognitive radio technology)

Ongoing: - "REVEECO" project (sanitary water treatment –potential

ACQUEAU project with French and Turkish partners).

Global turnover of Monaco in 2011



Distribution of the industrial companies, by subsectors (from 2008 to 2011)

	2008	2009	2010	2011
Plastics processing	11	11	11	11
Chemistry, Pharma, Cosmetics	24	24	24	20
Electric, Electronic	8	8	8	8
Printing, carton, packing	22	22	23	23
Textile	10	10	12	12
Mechanic	17	18	18	19
Alimentary	7	6	6	6
Miscellaneous	11	13	14	12
Total	110	112	116	111

The unknown Monegasque economy:
Quick look at the Monegasque labour pool

- "The commuters" : more than 32.000 employees coming daily in Monaco (for 38.000 residents)
- More than 250.000 m2 of industrial surface built and occupied
- Nearly 2.700 employees in the industry
- More than 1.000 M€ of industrial turnover
- A rich diversity of companies

Overview of Monaco's economical situation in 2011

- Monaco has a global turnover of more than 13.300 M€
- Compared to 2010, it is an evolution of 10,10 %
  (+18,7% for industry)

One major field: chemistry/pharmacy/ cosmetic

- Around 800 employments, 344 M€ turnover, important R&D activity
- Pharmacy:
  - THERAMEX – TEVA (oncology / bio-technology), laboratories TECHNI-PHARMA, EUROPHTA-THEA (ophthalmologic treatment), laboratories DENSMORE ...
- Chemistry, active pharmaceutical ingredients:
  - EXSYMOL, SOMET (active ingredient), MONACHEM,...
- Cosmetic:
  - COTY-LANCASTER, OPALE, PRODIFAC, laboratories ASEPTA,...
- Health and well-being, herbal medicine and food complements
  - FORTE PHARMA, NUTRITION PHARMA, Laboratoires MACANTHY, BIO ENERGIES EUROPE (Groupe NSH), Laboratoires DISSOLVUROL, THERASCIENCE, PHYTO-QUANT,.....

Plastics processing: an historical sector in Monaco's industry

- "Tradition" industry in Monaco
- Linked to the Automotive industry as well as Pharmacy, Cosmetic, Electronic
- Touched by the international crisis, but with a strong capacity of "amortization"
- Injection, extrusion, blow moulding
- Some names:
  - MECAPLAST, SILVATRIM, MICROTECHNIC, PLASCOPAR, PG PLASTIQUE, PLASTRADE ...

Electronic, Electricity, Electromechanical engineering: industrials niches

- Specifics "know-how":
  - SAFAS (laboratories equipments, spectrophotometers...),
  - PHARMED (pharmacy equipments),
  - IEC Electronique (commutators, switches),
  - PROMEPLA (surgery equipments, medical devices),
  - BORGWARNER/EATON (hydraulic valve),
  - INVENSYS (control appliances),
  - SACOME CONTI (coffee machines),
  - ATOMS (guidance devices (analogic, numeric interfaces): Airbus/SNC Thales/ Alstom/Dassault/Bombardier

Miscellaneous industries

- Printing, image managing or packaging related technologies:
  - WEEZAGO (image management), HELIO GRAPHIC SYSTEM (e-commerce management), MONACO FACONNAGE, DORO (luxury packaging)
- Engineering:
  - SINGLE BUOY MOORING/SBMOffshore (oil & gas engineering), 3X Ingénierie (high pressure repairing)
- Textile :
  - BETTINA (textile mesh/Chanel/Hermes), BANANA MOON (prêt à porter)
- Boatyard:
  - MONACO MARINE (Monaco Beaulieu/La Ciotat)

About ICTs – the Monaco Chamber of New Technologies:

- To represent and defend the interests of its businesses members who are engaged in I.T., telecommunications and new technologies. As a result, 30 businesses of this sector have joined the Chamber since its foundation.
- To promote the know-how and expertise of its members, in their various fields of competence (software development, hardware, computer security, internet, telecommunications, cloud, training and other new technologies...),
- To contribute to the development of this business sector in Monaco as well: to bring and develop synergies between experts of this sector, as well as being a communication place with other local or international groups.

SPECTRA

Spectrum and energy efficiency in 4G communication systems and beyond

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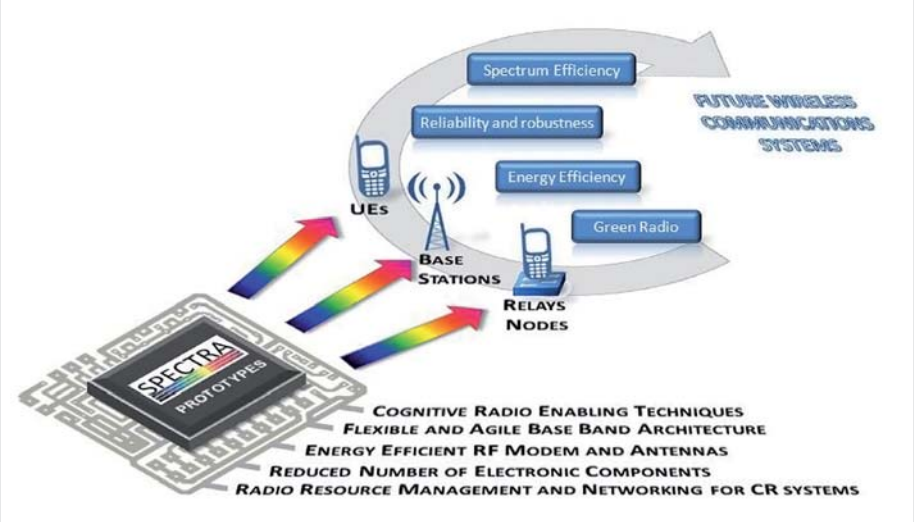

Figure 1: Research topics

The SPECTRA project is designing new techniques for better spectrum and energy efficiency for beyond 4G communication systems. SPECTRA is developing new cognitive radio algorithms and innovative approaches to design radio frequency front-end and base band components, and will demonstrate the resulting blocks through the proof-of-concept developed in the project to communicate cognitively in real time.

Main focus

The development of future wireless communications technologies raises many challenges in terms of energy efficiency and flexibility in the use of the spectrum resources. To address the corresponding challenges, SPECTRA designs and validates new techniques for the global efficiency of wireless systems. More specifically, the following five major research topics (figure 1) are investigated:

- Spectrum efficiency thanks to the use of cognitive radio techniques in wireless systems.
- Minimization of the number of electronic components thanks to an agile radio frequency (RF) architecture and flexible base-band architecture.
- Energy optimisation for wireless communication terminals by optimizing architecture design and algorithm implementation.
- Minimization of the generated interference in the environment by selecting the adequate band which will guarantee the shortest transmission distance and the minimum power while preserving the Quality of Service.
- Reliability and robustness of communications, especially when related to public safety operations.

Cognitive Radio

SPECTRA Cognitive Radio (CR) mechanisms and algorithms are elaborated to improve the Quality of Service (QoS) of the users and the overall efficiency of the network in terms of capacity and energy. SPECTRA has specified a partially distributed resource management architecture to provide an accurate control and usage of the network resources, with a low degree of interaction between the Common Radio Resource Management (CRRM) and the SPECTRA nodes (base stations, relays, femto base stations and user equipments). The IEEE802.21 Media Independent Handover (MIH) standard is applied to this framework to ensure the communication between the resource management entities.

The CRRM manages the access to the spectrum using the outputs of sensing techniques and innovative mixed-signals separation algorithms to select free channels in femto cell or relay-based scenarios, or to deploy robust and reliable systems to face emergency situations. High capacity, energy efficiency and minimization of the generated interference are the key criteria to design the specific cognitive radio resource algorithms that will be implemented into the demonstrator platform.

Antennas and Radio Frequency Modem

SPECTRA is developing a flexible Radio Frequency (RF) front-end to build energy efficient equipment with the capability to operate in the various scenarios that have been specified in the project. The key criteria to design the front-end are the minimization of the number of electronic components and the frequency agility required to address the carrier frequencies and the signal bandwidths for 3G, 4G and cognitive radio systems, i.e. both the licensed bands and the TV White Spaces (TVWS).

The power efficiency of the transmitter is increased by applying advanced Digital Pre-Distortion (DPD) techniques designed in the project to improve the linearity of the power amplifier. New compact antennas and a variable matching circuit are designed to operate over this large frequency range, including at least the upper part of the TV white spaces to find a good tradeoff between the size and the performance of these components.

The hardware board, ExpressMIMO2, presented on figure 2, has been realized to receive and transmit real-time signals using simultaneously two or more bands in the licensed spectrum and in the TVWS (more information on this board is available at http://www.openairinterface.org/expressmimo2).

Figure 2: ExpressMIMO2 board

Impact

SPECTRA enabling techniques can be exploited in promising applications, to be identified based upon the improvements that they can bring from a commercial standpoint.

- SPECTRA solutions will be integrated to deployed femtocells to reduce the wireless traffic from users to a primary base station and hence improve the energy efficiency and the Quality of Service.
- Relays will benefit from SPECTRA techniques to improve the quality of service of User Equipment (UE) at cell borders, decrease energy consumption for a given amount of communications or improve overall cell capacity.
- Energy efficiency and spectrum flexibility optimization provided by SPECTRA techniques will be associated to robustness and reliability required by high-end applications.

SPECTRA will have an impact even outside Europe. Indeed, the hardware and software developed in the project are used in China by two major industrial companies:

- Orange China, Beijing, has connected our code on a USRP platform, in real-time, running at 6.25 MS/s. This achievement illustrates the validity of our Software Defined Radio approach in SPECTRA since the code has been ported successfully on a totally different hardware target. To the best of our knowledge, it is a world first.
- Agilent China has used ExpressMIMO2 as a base station and set up a connection with a commercial UE (Huawei E392U-12, FDD mode). Now the attachment process has been passed and the UE can get an IP address. The work performed shows that our platform is mature enough for industrial application deployment.

First results and next steps

A preliminary demonstration was performed at the last Celtic-Plus Event in Kayseri, Turkey (March 2013). Four different frequency bands (TVWS, Digital Dividend, 2.6 GHz, and 3.5 GHz) have been considered to demonstrate the flexibility of the developed hardware (ExpressMIMO2) and sparse carrier aggregation mechanisms.

SPECTRA concepts will be illustrated publically during the CELTIC event in Monaco, 23-24 April 2014 at Grimaldi Forum (figure 3). The demonstrations will include:

- Real field trials, with a SPECTRA experimental cellular network. Those trials will be feasible thanks to the support of Monaco Telecom and the regulator of Monaco (Direction des Communications Électroniques, Monaco gouvernement)
- Interoperability with commercial equipment (real-time over-the-air operation between the SPECTRA relay and a commercial LTE equipment)
- MBMS service demonstration in the TVWS band
- Specific scientific results such as Digital Predistortion, advanced antenna designs and more.

Further information about the SPECTRA project is available at:
http://spectra-celtic.eu/

Figure 3: Monaco

OPERA-Net 2

A global approach to reduce the environmental impact of 3G and 4G radio access networks

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The OPERA-Net 2 project combines very different skills and capabilities to tackle energy efficiency and reduce environmental impacts.

From base transceiver stations (BTS) to radio access network (RAN), studies include models to reduce energy consumption, as well as new hardware architectures and designs. Further developments include new cooling systems, ways of managing materials embedded within equipment and off-grid hybrid power supply solutions. Studies will conclude with 3 field trials. At mid-project, this article presents a selection of the most interesting achievements.

Building energy efficient access networks for the future

This activity focuses on improving the energy efficiency of LTE and LTE-A access technologies. Based on analytical and simulation processes, studies consider link-level and network management optimization considering different network topologies: homogeneous, heterogeneous and extremely-dense-networks.

Future RAN will be based on coordinated multipoint transmission and reception techniques, and it is crucial to propose innovative mechanisms to improve the energy efficiency at link level.

For example, Figure 1 shows a distributed multiple-input multiple-output (MIMO) scheme providing an energy efficiency gain compared to a localized MIMO scheme.

Other features such as Smart-Frame-Filling on active cells using discontinuous transmission in a macro LTE network can achieve up to 20% of energy efficiency, as illustrated in Figure 2.

Architecture optimization and hardware design In a compact BTS for next-generation RAN, several areas are under investigation to improve energy efficiency: signal generation, power amplifier (PA) technology and power conversion. After thoroughly establishing the state of art, the design and evaluation of improved techniques show encouraging results, and the project is progressing in line with the projected power consumption (PDC) reduction target shown in Figure 3.

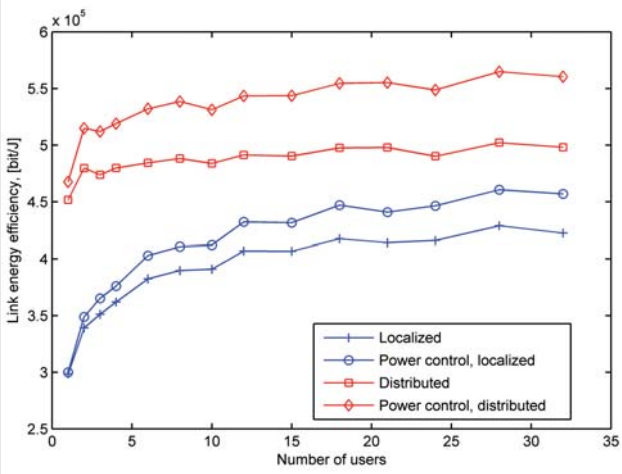


Figure 1: Distributed versus localized 2x2 MIMO energy efficiency

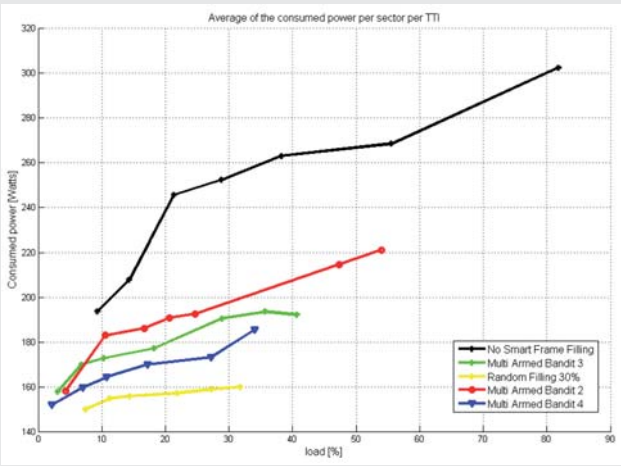


Figure 2: Smart Frame Filling energy efficiency

A number of disruptive techniques are being considered for improved efficiency RF PA transmitters, with a focus on envelope tracking (ET) and Switch Mode PA (SMPA) with associated gallium nitride (GaN) technology development. The first simulation results are highlighted in Figure 4.

In parallel, dedicated power supply design and optimization for compact BTS is focusing on AC input topologies.

As base stations become smaller, digital-front-end (DFE) components become relatively large consumers of power, so the impact of different digital pre-distortion techniques on full system efficiency is being assessed as depicted in Figure 5.

All of these activities combined provide a holistic system optimization dedicated to small cell base stations.

End-to-end efficiency

This activity investigates environmental impacts from a lifecycle perspective. Work focuses on two main areas – material efficiency during lifecycle and thermal solutions for decreasing energy consumption of BTS sites.

The material efficiency activity aims to develop a materials selection methodology, which combines technical and environmental aspects (Figure 6), and improves the accuracy of life-cycle assessment (LCA). The analysis of electro-magnetic interaction of small wind turbines includes material, form-factor and location effects, and is also included within the materials efficiency scope. Outcomes enable implementation of materials efficiency to products and their verification.

Thermal solutions focus on demonstrating the applicability of liquid cooling from component to cabinet level, and developing optimal passive cooling methods for transferring heat out from a BTS site building. As cooling can represent more than 50% of BTS site energy consumption, any decrease will help enable site independency.

Hybrid energy sites

The consequence of a low energy consumption BTS is a potentially stand-alone power system, and OPERA-NET 2 considers combing renewable energy sources, including a wind and solar. A one-year trial starts in Britanny, France, in November 2013 and aims to confirm the energy production model, a new hybrid management system and assess energy storage solutions. The hybrid test platform will produce significant data for research institutes and will also provide test-

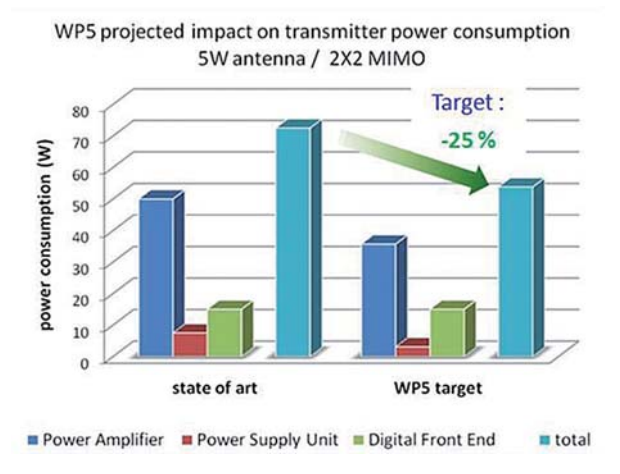


Figure 3: Power consumption reduction target

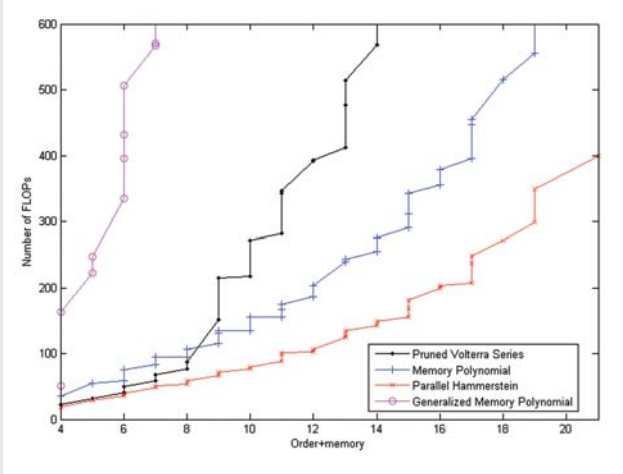
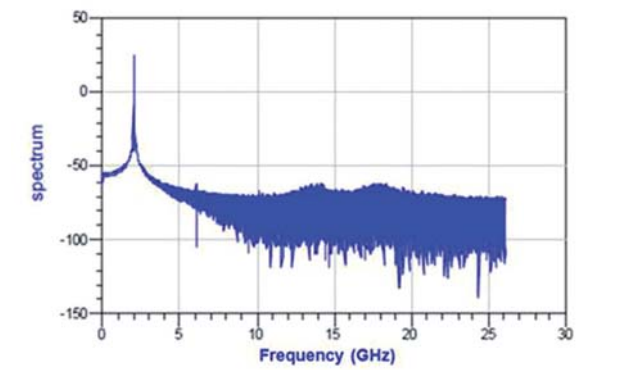


Figure 5: Digital pre distortion power (flops) versus model complexity



Average Pout (W)	Average Efficiency (%)	Peak power (W)	projected PDC in 2x5W MIMO (W)
2.1	27.8	13.2	35.9

Figure 4: GaN switch mode PA simulation using 2 carriers WCDMA, performances at antenna connector

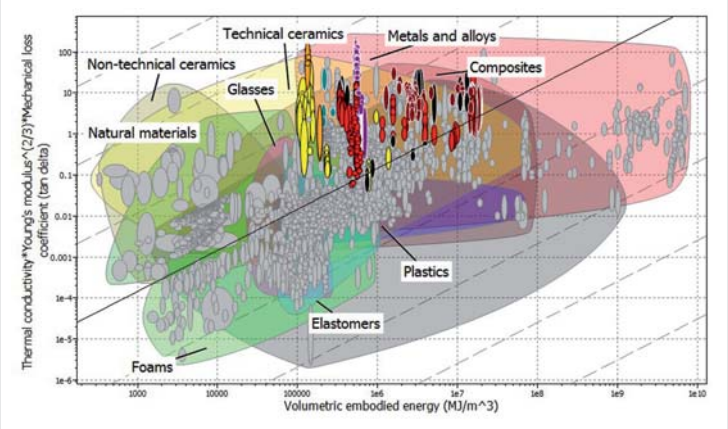


Figure 6: Example of materials comparison chart, which takes into account selected technical and environmental parameters.

ing capabilities beyond existing 4G systems to validate new energy savings techniques. Examples include demonstrating improvements achieved by dynamic network scheduling and deployment of new PA techniques.

Conclusion

This global, environmental approach and the addition of new techniques provide a basis for further competitive development for European industry. As part of this project, early engagement with standardization bodies such as ITU-T, ETSI and 3GPP is essential, and is an important project activity.

So far, the project has disseminated many of its key results in over 20 scientific journals and conference publications. In addition, it has organised a technical workshop in IEEE PIMRC conference, London, in September 2013.

Further information: http://projects.celticplus.eu/opera-net2/

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About Celtic-Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new "Smart Connected World" paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the inter-governmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies or universities and research organisations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

Wide scope of topics

ICT 2013 covered a wide scope of topics. This included digitally empowered citizens, smart and sustainable cities, industry and business of tomorrow as well as culture, science and creativity. One of the central topics at the event was the Future Internet, represented in the exhibition and networking sessions by the Future Internet Public-Private Partnership (FI-PPP), and the Future Internet Research and Experimentation (FIRE) community. The FI-PPP alone had seven networking sessions, which covered application-sector related topics as diverse as media, energy, manufacturing, and health as well as cross-sector topics like web entrepreneurs and Future Internet experimentation.

Horizon 2020

The effort to close the gap between research and innovation was present in almost every session of ICT 2013, and particularly in the sessions dedicated to Horizon 2020, the new framework programme aiming to achieve the realisation of the EU's ambitious Innovation Union goals.

Neelie Kroes, Vice-President of the European Commission responsible for the Digital Agenda, speaking at a session on big and open data

In order to make the new programme more effective, Neelie Kroes, European Commissioner for the Digital Agenda, promised: "Horizon 2020 will be easier to use and impose lower administration burdens." The programme consists of three pillars, which were explained at the conference: excellent science, industrial leadership, and societal challenges. ICT is distributed across these pillars, while cross-cutting activities are also supposed to be facilitated by Horizon 2020.

ICT 2013 was a good start and raised high expectations for Horizon 2020. After five years of financial and economic crisis, the programme could be part of the silver lining on the European horizon – at least this is the impression you could get while listening to the talks in Vilnius.

Further information on ICT 2013 is available at http://ec.europa.eu/digital-agenda/en/ict-2013

Vconect: Waiting for Godot – in Vilnius and Falmouth

In the exhibition of ICT 2013 numerous projects presented their results at their booths and on stage. One of them was FP7 project Vconect, which provided a glimpse into the future of group communication. Vconect demonstrated how group video communications can be used to enable a theatre play performed in two distinct locations, and experienced live by a remote audience over super-fast broadband.

The demo showed a fragment of "Waiting for Godot" from Samuel Beckett, played by the theatre company Miracle, both on the main ICT-2013 stage and live between Falmouth in Cornwall, UK and Vilnius at the Vconect stand. This recreated a theatre hall experience while the stage and the audience were separated. Through so-called "home clients", implemented in standard Web browsers, the theatre play could be watched remotely from anywhere in the world.

The live performance demonstrated how a multi-camera video-communication system, able to adapt to communication contexts, can be used for conveying theatrical performances to remote audiences in cinema halls or living rooms, whilst also allowing them to have presence in the performance space, and even shape the performance itself.

In addition, conversations between members of the distributed audience with each other and with the actors, before and after the performance, can be supported. The demonstrated solution goes beyond the theatre domain, as this novel way of video-mediated communication, which can adapt dynamically to the context of communication and the network constraints, allows for new forms of engagement and communication that would not be possible otherwise.

The Vconect technical project manager, Dr. Marian Ursu from Goldsmiths College, said: "Distributed theatre performances are one of the two use cases we have selected in the project, besides social networking. However, the Vconect system can be utilised for many other applications; it would, for example, be ideal for learning or training purposes."

Live Vconect theatre play between Falmouth and Vilnius

Vconect is a STREP project under FP7 running from December 2011 to November 2014, which aims to improve ad-hoc video communication between groups. The project is performed by a European consortium of nine partners from industry and academia, coordinated by Eurescom.

Further information:
ICT 2013 exhibition Website: http://ec.europa.eu/digital-agenda/events/cf/ict2013/item-display.cfm?id=10896
Vconect project Website: www.vconect-project.eu

Joining forces for Horizon 2020

Launch of new European Technology Platform by Net!Works and ISI

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A new European Technology Platform (ETP) for communication networks was launched in Brussels on 29 October 2013. In the morning, the ETPs Net!Works and ISI had their final General Assemblies, at the end of which both ETPs were closed to give way to the launch of the new ETP.

The event was very well attended and attracted about 160 participants. Besides reports about the platforms' activities and achievements, the main focus was on launching the new ETP, introducing members to its scope, organisational structure, plans and its linkage to the 5G Public Private Partnership (PPP) activities, complemented by a set of presentations on 5G technologies and trends. Furthermore, the members of the new ETP also elected the Steering Board of the new ETP which will have a mandate until the end of 2015.

Short history of the new ETP

The Net!Works European Technology Platform was launched in March 2004 during EC Framework Programme 6; back then the ETP was called eMobility. Also ISI has been launched at around this time. Now we already support the start of the new European Research Framework Program Horizon 2020, following Framework Programme 7. Therefore, the environment is changing.

Since summer 2012 Net!Works has been in discussion with the European Commission on a potential restructuring of ETPs. In particular the ETPs ISI and Net!Works had extensive discussions, and both Steering Boards had agreed to propose the launch of a new ETP focused on communication networks. This new ETP will be the root for the proposed 5G Public-Private-Partnership (PPP) in Horizon 2020. The launch of a PPP requires, according to Horizon 2020 regulations, an association which will be linked directly to the new ETP in order to represent the interests of the sector as best as possible also in the PPP.

View of the audience in the opening session

Nicolas Chuberre and Werner Mohr announce the launch of the new ETP

Inauguration of the new ETP

It was certainly a somehow historic moment in the opening session when both former chairmen of ISI and Net!Works, Nicolas Chuberre and Werner Mohr, stood in the front to open the event and inform the participants that the new ETP is now successfully launched. Many preparatory steps were needed for reaching this point. Among others, a revised ETP governance model has been prepared and agreed by both Steering Boards and was approved by ISI and Net!Works members. The members of both ETPs have also agreed to the setup of the new ETP, and the ISI and Net!Works memberships have been transferred to the new ETP. However, the name of the new ETP as well as website, logo and corporate identity are still under preparation, and this will be concluded by the new Steering Board. The new ETP has more than 1,000 members.

Relationship between ETP Steering Board and 5G-PPP Association

Anne De Moor from Alcatel Lucent explained the details of the relationship between the Steering Board of the ETP and the 5G-PPP Association. The association will be an international non-profit association under Belgian law named "The 5G Infrastructure Partnership", for which all details,

Representatives of the newly elected Steering Board organisations

More information about the event and the presented slides are available for download for members of the new ETP on the Net!Works website that will still be used as the interim information portal:

http://www.networks-etp.eu/meetings-activities/general-assembly/ga2013/2013event.html

like purpose, members and legal requirements, have been defined. The signature of the PPP contractual arrangement between EC and the association is planned for 17 December 2013.

The goal of the 5G-PPP is to foster European industrial leadership in supplying and deploying "5G" future network infrastructures. The focus will be on infrastructures, as proposed by the 5G PPP partners in the Strategic Research & Innovation Agenda (SRIA).

Election of the new Steering Board

During the General Assembly the members also elected the Steering Board (SB) of the new ETP. The interest in becoming member of the SB has been huge with a total of 60 candidates who submitted their candidature for the 30 SB seats. Likewise, there was also a strong interest from the members to give their vote in the elections: a total of 231 members participated in the elections, of which 109 were physically present in Brussels, and 122 have used the proxy voting option, i.e. asked an attending member to vote on their behalf. The list of elected organisations is given in the text box.

Next steps and future plans

Werner Mohr explained that it will be the responsibility of the new SB to identify the next steps and to take the appropriate actions. From today's perspective, however, the next steps will include, among others, the election of the SB chairperson and vice-chairs, the implementation of the new governance model, to agree on the new ETP name and brand, to make the 5G-PPP Association operational, and to initiate an update of the SRIA.

Industry group members (18 seats)

- Alcatel-Lucent
- Astrium Satellites
- Atos
- Deutsche Telekom
- DOCOMO Communications Laboratories Europe GmbH
- Ericsson
- Huawei Technologies Düsseldorf GmbH
- NEC Europe Ltd., NEC Laboratories Europe
- Nokia Solutions and Networks
- Orange Labs
- Portugal Telecom
- SES
- Telecom Italia
- Telefónica I+D
- Telenor ASA
- Telespazio
- Thales Alenia Space
- Turk Telekomünikasyon A.Ş.

Research group members (6 seats)

- CEA-LETI
- Centre Tecnologic de Telecomunicacions de Catalunya (CTTC)
- Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT)
- Fundacion IMDEA Networks
- Instituto de Telecomunicações
- University of Bologna - DEI

SME group members (6 seats)

- Integrasys SA
- INTERINNOV
- M.B.I. S.R.L.
- Nextworks s.r.l.
- Quobis
- Sequans Communications

Steering Board organisations for the period 2014-2015

Implementing the Future Media Internet

NEM Summit in Nantes

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From 28 to 30 October 2013 the sixth NEM Summit 2013 took place in Nantes, France. Building on successful previous Summit editions, this NEM Summit addressed a variety of topics, including research and business challenges of the Future Media Internet, societal and user needs, implementation requirements as well as regulatory and standardisation aspects.

Conference and exhibition

The NEM Summit is an international conference and exhibition, open to co-located events and organised every year since 2008 by Sigma Orionis and Eurescom on behalf of the NEM European Technology Platform for all those interested in Future Internet developments and in the fast paced evolution of the networked electronic media industry. Over the years, the NEM Summit has grown to become an annual not-to-be-missed event, providing attendees with a key opportunity to meet and network with prominent stakeholders, access up-to-date information, discover latest technology and market trends, identify research and business opportunities, and find partners for upcoming EU-funded calls.

The 2013 edition of the NEM Summit was dedicated to the theme of "Implementing Future Media Internet towards new horizons – Maximising the global value of Content, Media and Networks". It attracted over 300 delegates and 18 exhibitors from Europe and other regions of the world, and was supported by 8 sponsors. The conference was structured in plenary and parallel thematic sessions, featuring 26 speakers and authors selected following a competitive call for papers. On this occasion the NEM ETP introduced its new vision for Horizon 2020: "Dedicated to content, connected, converging and interactive media & creative industries"

NEM Summit Conference and exhibition in Nantes

Side events

In addition to the conference, the programme included several side events.

Investment & Entrepreneurship Forum: This was organised for the second time under the aegis of the European Commission (DG CONNECT) to support interaction between entrepreneurs and investors and to encourage transfer of research results to innovation, spin offs and entrepreneurs. Eleven European SMEs and entrepreneurs specialized in Networked Electronic Media development, and selected on the basis of applications to be submitted a couple of weeks prior to the meeting, were coached and presented their business concepts to a group of ten European investors, carefully chosen to fit to companies' and projects profiles and needs for investment. The event also gave researchers and entrepreneurs new insights in how to seek financing, be ready to go-to-market and monetize young companies and the market, business and technological visions and trends, taking the opportunities of the attendance of NEM experts from research, industry and investment communities at the NEM Summit.

Creative@NEM: This consisted of several events namely the NEM Summit Art + Tech Hackathon, and the Open Platform workshop, aiming at attracting, involving artists and facilitating stronger connection between the NEM constituency and the creative industries, for their highest mutual benefit.

The **Art + Tech Hackathon** proved a great success in terms of participation and outcomes, proving the innovative potential of the combina-

tion of Art and ICT: both participants and attendees were highly satisfied with the overall work and collaboration quality. Participants were given several challenges awarded with 1,000 euro each: Five were offered by the EC funded project FIcontent 2, and two respectively from NEMart and Wiki-art. Multidisciplinary teams of up to five persons were formed on the 29th October in the morning, and each of them worked hard for 24 hours on the given challenges, using in same cases the technical specifications furnished by the challenge offerers. Students from Nantes Design School, bio-hackers, artists and developers from London found together excellent solutions for the set challenges.

The **Open Platform workshop**, organised by FIcontent 2, a major ongoing project supported by the European Commission under its FI-PPP programme aiming at building Europe's Future Internet has allowed interested stakeholders to gain better knowledge of the potential of the 3 open platforms made available by the project (addressing social connected TV, smart city guides, and pervasive games) and of the various existing possibilities to get involved and funded: FI content Competition and Open call, FI-PPP Call 3.

Moreover, art and technology have never been more connected at the NEM Summit through the demonstration of artists such as the beat-boxer Ezra, artist in residence at Grenoble's Atelier Arts-Sciences, with his "interactive glove" demonstration, and the digital magician Gilles Rousseau with the art work "Digital tree" and "the IPad Show".

Diverse Data Innovation Workshop: the workshop brought together the best innovators from European SMEs and large corporations currently working with diverse forms of big, open and integrated data, giving insight into the latest innovation across Europe in relation to big and open data, spanning healthcare, media, creative, finance and cities sectors. The workshop also introduced new collaborations between SMEs, entrepreneurs and large organisations to address data challenges and solutions and formed new cross-European partnerships to apply for Horizon 2020 data challenge related funding.

The NEM Summit also hosted a **Green@ NEM workshop**, addressing possible connections between NEM developments and the environment – energy sectors. It focused on the synergies to be developed between the NEM and EeB (Energy efficient Buildings) sectors, to boost research and innovation at the crossroads of ICT, content, networks, media, buildings, energy and the environment.

Many EU-funded projects and other initiatives had taken advantage of the 2013 NEM Summit to co-locate parallel workshops and exhibits: FI-CONTENT 2, PROLIGHT, EIG, ICT & Art Connect, HBB NEXT, Reverie, Vconect, Steer, Ideal-IST, Visionair, Future Internet PPP, and Ouest Valorisation.

Further information on the NEM Summit is available at www.nem-summit.eu

Horizon 2020

Fostering innovation and simplifying participation

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The new EC Framework Programme for research and innovation "Horizon 2020" has been on the horizon for future RTD in Europe for quite a while. The official kick-off finally took place at the ICT 2013 event in Vilnius, Lithuania, in early November. Being part of the Multiannual Financial Framework 2014-2020 it will have a budget of just over 70 billion euros; quite an increase compared to FP7 which had a financial allocation of 53 billion euros. The first Call for Proposals is expected to be issued on 11 December 2013 with a deadline in April 2014.

Horizon 2020 – securing Europe's global competitiveness

Viewing it from the political perspective, Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative. It aims at securing Europe's global competitiveness, and future jobs and growth, but it is also a specific measure in responding to the economic and financial crisis that is still not overcome. It includes peoples' concerns about their livelihoods, safety and the environment.

These aspects are stronger highlighted in the new framework programme, compared to previous programmes, as one part of Horizon 2020, "Societal Challenges", directly addresses these issues. And, last but not least, the programme also aims at strengthening the global position of the EU in research, innovation and technology.

Change of direction towards innovation and commercialisation

Horizon 2020 is expected to further eliminate fragmentation in the fields of scientific research and innovation. Robert Madelin, Director General of the EC's DG Connect, briefly summarised some of the main characteristic changes of Horizon 2020 compared to FP7 in his speech at the "ICT in Horizon 2020" session at ICT 2013 Vilnius.

First, "Horizon 2020 is a de-siloing programme" he said, "and even the three pillars of the Programme, i.e. Excellent Science, Industrial Leadership, and Societal Challenges, will need to be connected". A main goal is indeed to reduce the isolated efforts on scientific and technological advancements, although some individual work is of course important and will keep its share in the overall activities. Still, and in particular flagged by creating the Societal Challenges pillar, any work to be done should be questioned in terms of what and how it can contribute to solving the societal issues that are of concern to individual people and the society.

Moreover, Robert Madelin stated that research and innovation need to get closer. To say it with my own words: we need to look closer and try harder to transfer research results into innovation which has a much stronger potential to enter the commercial market than it was in FP7. "Universities will need to get closer to the market. Innovators who understand the market and what it could demand next should become involved as proposal evaluators", Mr Madelin said. Pre-commercial public procurement could be another instrument for fostering innovative products. Horizon 2020 will have specific measures to help innovative enterprises to develop their technological breakthroughs into viable products with real commercial potential.

Peter Olson from Ericsson, president of DigitalEurope, emphasized that we need to focus on innovation, and to spend the money on value-creating things. Perhaps we will find that as a criterion in the proposal evaluation forms. An interesting proposal was also made by Burton Lee from Stanford University: He urged that we need to stimulate private demand for innovative products as it has the much bigger share in the overall picture of purchasing power.

Europe is not renowned for early adopters. They are, however, needed if we want to cultivate start-ups and entrepreneurship, as these cannot be successful if there is no interest in their products. We also need to find out where actual needs are. Lee gave the example from Stanford, where the teams of four students are required to talk to 100 potential users during their 12-weeks courses. Scaling from that, he suggested that Horizon 2020 consortia should talk to a minimum 1,000 potential users over the project lifetime: "We need to develop a passion for need finding similar to the level we have for technology, or we play only half the game."

Structure of Horizon 2020 and work programme 2014–15

Horizon 2020 is divided into three pillars: Excellent Science will do the blue sky research and will have about 32% of the overall share in budget. The technology focused research will be mainly addressed in Industrial Leadership and will receive about 22%. The Societal Challenges area will receive 38% of the budget. The remaining share will go to other activities, like EIT, JRC, and others.

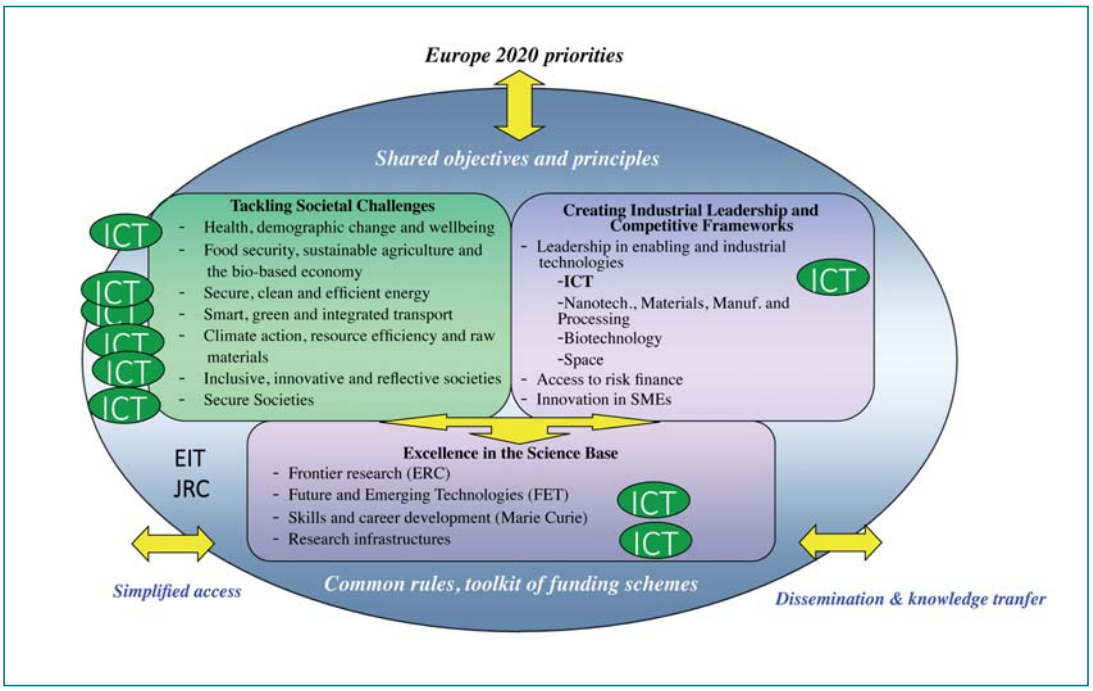
The activities in Horizon 2020 will change from a discipline-based approach to a challenge-based approach. ICT research will be distributed across the three pillars, but the most budget for ICT will be in Industrial Leadership. The figure indicates the areas that contain ICT research. The EC has published "A guide to ICT-related activities in WP2014-15", which can be downloaded from the EC website.

The move to innovation and getting closer to the market is emphasized in the whole programme, although it will be driven most strongly in the Societal Challenges pillar.

Simpler rules for participation

Simplification is a central aim of Horizon 2020. This will be provided through a single set of rules. Simpler funding rules should help to reduce administrative costs for participants and decrease the likelihood for financial errors. The programme will bring simplified access for all companies, universities and institutes in all EU countries and beyond. Horizon 2020 will also integrate all research and innovation funding currently provided through other programmes, such as the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT).

In more concrete terms, a simplified funding model will be used for the reimbursement of activities. There will be a single reimbursement rate for eligible costs that will be applied to all types of partners and activities within an action. In research projects – correctly: research and innovation actions – the funding rate is 100 % of eligible costs. The various FP7 funding rates, like RTD, DEM, and MGT, are gone, and all partners – whether Industry, Research or SME – receive the same funding rate.



Distribution of ICT research in Horizon 2020 areas (Source: EC)

- **H2020-ICT-2014 (ICT Call 1)**
  - Publication date: 11 December 2013
  - Deadline: 23 April 2014 (all topics except 5G Future Internet)
  - Deadline for 5G Future Internet: 25 November 2014
- **H2020-FoF-2014/2015 (Factory of the Future)**
  - Publication date: 11 December 2013
  - Deadlines: 13 March 2014 and 9 December 2014
- **H2020-EUJ-2014 (EU-Japan Call)**
  - Publication date: 7 January 2014
  - Deadline: 10 April 2014
- **H2020-ICT-2015 (ICT Call 2)**
  - Publication date: 15 October 2014
  - Deadline: 14 April 2015
- **H2020-EUB-2015 (EU-Brazil Call)**
  - Publication date: 15 October 2014
  - Deadline: 21 April 2015

Call planning overview in "Leadership in enabling and industrial technologies" (LEIT)

For Innovation actions the funding rate is 70 %. These are close to market activities that directly aim at producing plans and arrangements for products or services. Still, non-profit organisations will receive a 100 % funding also in innovation actions.

The most significant simplification is that only one uniform flat rate of 25% of the total direct eligible costs will be reimbursed to cover indirect costs of all participants, replacing the actual indirect cost or 20 % / 60 % funding rates from FP7.

The minimum condition for standard collaborative actions, i.e. at least three legal entities from three different countries, remains unchanged. There is a small change in the evaluation criteria. These will be 1. Excellence, 2. Impact, and 3. Quality and efficiency in the implementation. The main change seems to be in the first criterion which is not limited to scientific and technological excellence any longer, and maybe a subtle difference in "Impact" which is not just "Potential Impact" anymore. And to give a last example regarding changes, the period between the deadline for the submission of project proposals and the conclusion of a grant agreement is said to become significantly shortened. It will now be maximum 5 months from submission of a proposal to approval or denial, and maximum 3 months for an accepted proposal to the completed Grant Agreement.

Conclusion

Summing up, my personal view is that the shift towards innovation and fostering entrepreneurship is a good move. We can no longer afford to do excellent research in ICT in Europe and leave it to entrepreneurs in other regions of the world to come up with the innovative products on the market. In order to implement and live that new direction a shift in mind-set will be needed – both by the participants and those who organise the programme, if we really want to live up to the new goals.

Further information is available on the Horizon 2020 website at http://ec.europa.eu/research/horizon2020

News in brief

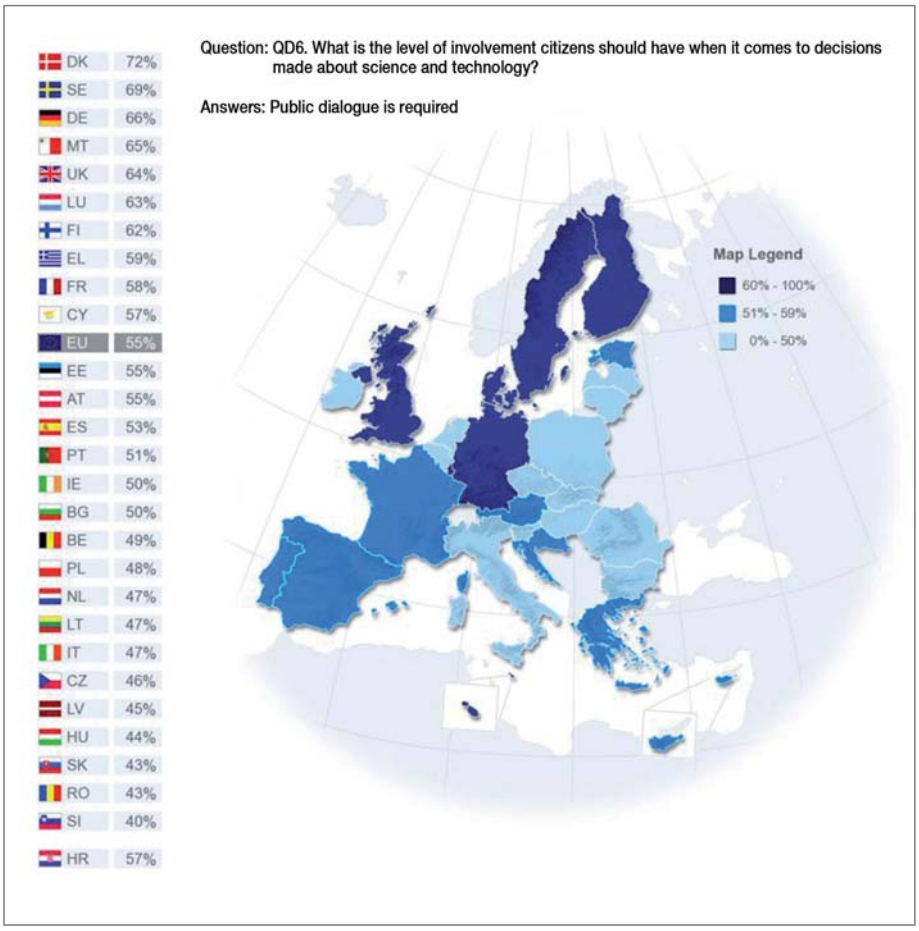
EU-wide poll on science and technology

More than three quarters (77%) of Europeans think that science and technology has a positive influence on society, according to a recent Eurobarometer survey. Respondents, however, also express concern over risks from new technologies to human health and the environment. They want research and innovation to be carried out with due attention to ethical principles (76%), gender balance (84%), and public dialogue (55%). Similar to results of earlier Eurobarometer surveys, more than half of all Europeans are interested in developments in science and technology (53%), but a majority do not feel informed enough (58%).

66% of respondents in the survey think that scientists working at universities or in government laboratories are best qualified to explain the impact of scientific and technological developments on society, and this group is also most likely to be seen (82%) as trying to behave responsibly towards society.

Most Europeans get their information about developments in these areas from television (65%), followed by newspapers (33%), websites (32%) and magazines (26%). Just under half of the respondents (47%) have ever studied science or technology, either at school, university, college or another location. At the same time, Europeans have a positive view of the effect of science education on young people, and the majority of respondents (65%) think that their governments are not doing enough to stimulate young people's interest in science.

This Eurobarometer survey was conducted through face-to-face interviews in the European Union Member States to evaluate European citizens' attitudes towards science and innovation. A total of 27,563 respondents from different social and demographic groups were interviewed between the 26th of April and 14th of May 2013.



For this study the EU averages provided represent EU27 averages, due to the fact that Croatia was not yet an EU Member State at the time when fieldwork was conducted.

http://ec.europa.eu/public_opinion/archives/eb_special_419_400_en.htm#401

Top500 supercomputer rankings

The November 2013 edition of the TOP500 list of the world's most powerful supercomputers did not bring any surprises. Tianhe-2, a supercomputer developed by China's National University of Defense Technology, retained its position as the world's no. 1 system. It has a performance of 33.86 petaflop/s, i.e. quadrillions of calculations per second, on the Linpack benchmark. Titan, a Cray XK7 system installed at the Department of Energy's (DOE) Oak Ridge National Laboratory, remains the no. 2 system, and Sequoia, an IBM BlueGene/Q system installed at DOE's Lawrence Livermore National Laboratory, is again the no. 3 system.

The new entry in the TOP10 is at no. 6 – Piz Daint, a Cray XC30 system installed at the Swiss National Supercomputing Centre (CSCS) in Lugano, Switzerland, and now the most powerful system in Europe. Piz Daint achieved 6.27 Pflop/s on the Linpack benchmark and is also the most energy efficient system in the TOP10 consuming a total of 2.33 MW and delivering 2.7 Gflops/W.

The total combined performance of all 500 systems on the list is 250 Pflop/s. Half of the total performance is achieved by the top 17 systems on the list, with the other half of total performance spread among the remaining 483 systems.

The geographical distribution of supercomputers has only slightly changed, with Europe's share decreasing. The U.S. is clearly leading with 265 of the 500 high-performance computing systems (253 last time). The European share (102 systems compared to 112 last time) is still lower than the Asian share (115 systems, down from 118 last time). Dominant countries in Asia are China with 63 systems (down from 65) and Japan with 28 systems (down from 30). In Europe, UK, France, and Germany, are almost equal with 23, 22, and 20 respectively.

http://www.top500.org/lists/2013/11/

The Cray XC30 supercomputer «Piz Daint» at CSCS in Lugano, Switzerland (Picture: CSCS)

Web Index Report 2013 highlights censorship and surveillance

In November 2013, the World Wide Web Foundation, chaired by Web creator Sir Tim Berners-Lee, published its Web Index Report 2013. The report suggests that 76 of the 81 countries in the index (94 %) do not adequately monitor government Internet interception. Thirty per cent of countries block or filter political content, it indicates. The report concludes that the current legal framework on government surveillance needs urgent review.

The report ranks countries in terms of the social and political impact of the Web. Sweden tops the annual Web index, ahead of Norway, and followed by the UK, US, and New Zealand.

One of the findings is that in 80% of the countries studied, the Web and social media played a role in mobilising the public on a range of issues. It also found that rich countries did not necessarily rank higher in the index. The Philippines, with a per-capita income of 4,410 dollars per year, is more than 10 places ahead of Qatar, the world's richest country. Meanwhile Saudi Arabia is outperformed by 10 sub-Saharan African countries, and Switzerland, the third wealthiest nation, is only one place ahead of Estonia.

http://thewebindex.org

Paying with bits

The rise of digital money

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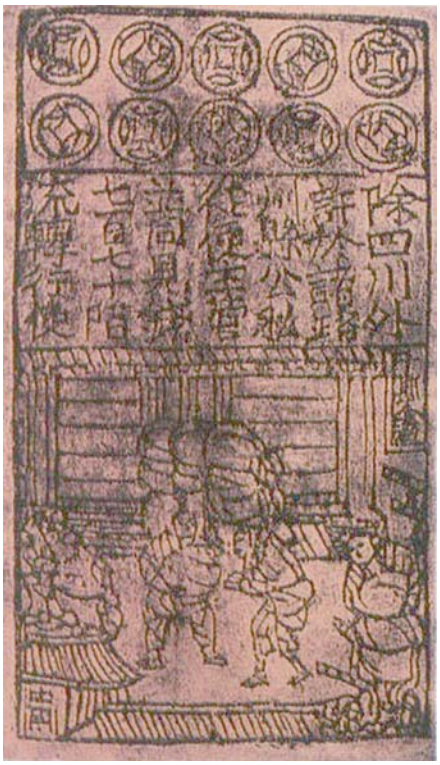
Money makes the world go round – this line from the 'Money' song in the musical 'Cabaret' still applies more than ever. What has changed in the five decades since the musical was first performed on Broadway in the early 1960s is the type of money we are earning and spending today. At that time the credit card began to replace bills and coins as a means of payment. Today, we see the rise of a new means for financial transactions that could have societal effects as revolutionary as the credit back then: digital money.

In order to fully appreciate the revolutionary potential of digital money, let us have a look at how humankind got money in the first place.

A short history of money

Today, we find it hard to imagine a world without money. However, homo sapiens did not have money for most of its 200,000-year history. While barter-like methods of exchange emerged about 100,000 years ago, money is a much more recent cultural achievement. Starting over 3,000 years ago, shell money was used in China and then in India. Gold and silver coins only came up in the 7th century BC.



The world's first paper money – Song Dynasty, China, 7th century AD

The first banknotes were used as representative money, as opposed to commodity money, in China in the 7th century AD, while it took roughly a thousand more years until the first European banknotes were issued by Stockholms Banco in 1661.

Between the 17th and 19th century, the gold standard, a monetary system where the medium of exchange consists of paper notes convertible into pre-defined quantities of gold, replaced the use of gold coins as currency in Europe. The gold standard remained valid for the world economy until 1971, when the United States suspended the convertibility of the US dollar to gold.

From then on, all major currencies have been fiat currencies. This means the value of the money is not derived from any intrinsic value or guaranteed convertibility into a valuable commodity, such as gold. Instead, fiat money only has value by government order, called 'fiat'. From then on, the value of money is based on trust, the trust that the government issuing a currency guarantees by law that everyone accepts this currency as a means of payment and that the amount of money in circulation enables relative stability of prices.

Digital money – from e-gold to Bitcoin

Trust is also the basis for digital money. Since the late 1990s digital currencies have emerged in parallel to the rise of the Internet. The first digital currency was e-gold, launched in 1996. As the name says, e-gold was backed by gold. The intention was to make it an alternative to fiat currencies for international transactions. When it closed in 2009, e-gold had 5 million users. The demise of e-gold was mainly due to legal issues. The digital currency had become a popular target for hackers and fraudsters. Drug dealers used it for illegal transactions and money laundering.

Today, the leading digital currency is Bitcoin, which was founded in 2008. In contrast to e-gold, governance is not organised by a central organisation, but through a peer-to-peer network. In order to control transactions and prevent double-spending, Bitcoin uses a sophisticated transaction process based on cryptography. That is why Bitcoin and similar digital currencies are also called a cryptocurrency.

Like e-gold and othe digital currencies, Bitcoin is exposed to the permanent suspicion of being a tool for illegal transactions. In October 2013, the FBI shut down Silk Road, an online market specialised on illegal drugs that was using bitcoins for transactions.

However, bitcoins are increasingly used for buying legitimate products and services. By November 2013, there were about 600 online businesses ready to accept payment in bitcoins. The main reason why Bitcoin has become popular among some established vendors like OkCupid, Reddit, WordPress, and Chinese Internet giant Baidu is that transaction fees are lower than the 2 to 3 % typically imposed by credit card companies. In general, Bitcoin and other digital currencies have a competitive advantage compared to banks and credit card firms due to lower fees and higher transaction speeds. This has led to an increased popularity, which is reflected by the price: in November the price for own bitcoin topped 1,000 dollars.

Regulatory issues

Regulation for Bitcoin and other digital currencies is still emerging. Open issues include taxation and customer identification. The US Internal Revenue Service has stated that it is actively working on its own rules for Bitcoin. In August 2013, the German Finance Ministry characterized Bitcoin as a unit of account, usable in multilateral clearing circles and subject to capital gains tax if held less than one year. The US Treasury has been warning Bitcoin businesses since March 2013 that they must comply with "know your customer" (KYC) laws that require stringent identity checks, monitoring of accounts, and reporting of suspicious activity. Not all providers have been able to meet these requirements, which has led to the shutdown of several Bitcoin exchanges and brokers in the United States.

Time will tell, if digital money is the next step in the evolution of monetary exchange. Trust, and a regulatory framework to stimulate trust, will be crucial factors for a wider take-up of digital currencies. Until then I prefer to be paid in euros.

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