Spring 2014

EURESCOM message

The magazine for telecom insiders

NEWS

Celtic-Plus
Smart Connected World

5G technologies and services

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The perils of short-termism

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Future Internet conference in Brussels

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Security by conditioning

Funding Opportunity for European R&D Projects

Celtic-Plus Spring Call for Proposals – Deadline: 15 October 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

H2020 and 5G-PPP

- Complementing H2020 or 5G-PPP ICT-related project proposals, safe-guarding your project by re-submitting and redefining your proposal

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 Autumn Call submission deadline is 15 October 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 the Celtic Office at office@celticplus.eu

Celtic-Plus
Smart Connected World

www.celticplus.eu

Dear readers,

The 5th generation of mobile and wireless networks, 5G, is currently one of the central themes in European ICT research. In December 2013, the 5G-Infrastructure Public Private Partnership (PPP) was launched. It is a 1.4 billion euro joint initiative between the European ICT industry and the European Commission aiming to rethink the infrastructure and to create the next generation of communication networks and services that will provide ubiquitous super-fast connectivity and seamless service delivery in all circumstances.

As Eurescom has been involved in the run-up towards the realisation of this European 5G initiative, the editorial team did not have to think twice about the selection of the cover theme of the current issue of Eurescom message. What made this cover theme quite challenging is that there is no consent about what 5G really is and where the boundaries are. Furthermore, a number of potential authors on this topic are currently extremely busy setting up the 5G-Infrastructure PPP. Nevertheless, we think our cover theme gives the interested reader a good insight on the 5G discussion and trends in Europe.

In the introductory article, Eurescom message editor Uwe Herzog gives an overview on the European 5G research agenda. In the next article, Brigitte Cardinael and her co-authors from Orange provide a European operator view on 5G. This is complemented by a 3GPP article on the standardisation of 5G. Finally, we interviewed 5G expert Sergey Andreev from Tampere University of Technology on the challenges and opportunities of 5G.

This issue also includes a variety of further articles on different, ICT-related topics. See, for example, the event articles on the Future Internet Assembly in Athens and the 1st European Conference on the Future Internet in Brussels. Or the new opinion article by Eurescom director David Kennedy in his column "The Kennedy Perspective" on the perils of short-termism. In the "A bit beyond" article you can learn about the latest creative approaches to password protection, one of the unsolved challenges in the area of ICT security.

Finally a note concerning our magazine: from this edition on, our magazine will only be published twice a year. The main reason is that the editors are fully occupied with other work. Another novelty is the name of the magazine, which we slightly changed from 'Eurescom mess@ge' to 'Eurescom message'. As change is the only constant factor in the ICT industry, we assume our loyal readers will understand that our magazine is also subject to change. At the same time, we are committed to continue providing relevant information to the ICT R&D community.

My editorial colleagues and myself hope you find value in this edition of Eurescom message and would appreciate your comments on the current issue as well as suggestions for future issues.

Milon Gupta
Editor-in-chief

Events calendar

5 – 10 September 2014
IFA 2014 Consumer Electronics Unlimited
Berlin, Germany
http://b2b.ifa-berlin.com/en/Home.html

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

15 – 18 October 2014
16th IEEE International Conference on e-Health Networking, Application & Services – IEEE HEALTHCOM 2014
Natal, Brazil
http://www.ieee-healthcom.org

20 – 21 October 2014
TechCrunch Disrupt Europe
London, UK
http://techcrunch.com/events/disrupt-eu

29 – 31 October 2014
eChallenges e-2014 Conference and Exhibition
Belfast, Northern Ireland
http://www.echallenges.org/e2014/default.asp

4 – 6 November 2014
The Summit
Dublin, Ireland
http://summitdublin.com

13 – 14 November 2014
FOKUS FUSECO Forum 2014 on Future Seamless Communication
Berlin, Germany
http://www.fokus.fraunhofer.de/en/fokus_events/ngni/fuseco_forum_2014/index.html

9 – 11 December 2014
LeWeb
Paris, France
http://www.leweb.net

Snapshot

Tea 2.0

A British beverage technology company has built a novel tea brewing machine, which is supposed to create “the perfect cup of tea”. The BKON Craft Brewer is, according to the manufacturer’s website, nothing less than “a revolution” leading to “tea enlightenment”. The “Tea 2.0” revolution is made possible by RAIN™, the Reverse Atmospheric INfusion™ technology, which uses negative pressure during the infusion process for optimising the extraction of flavour from the tea leaves. The tea revolution will come at a price: the machine is expected to cost £7,700 (€9,400) – not everyone’s cup of tea.
Further information: http://bkonbrew.com

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Imprint

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Getting ready for 5G

Research agenda and benefits

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One of the hottest topics in ICT nowadays is 5G, the 5th generation of mobile and wireless networks. This article explores the European research agenda and the potential benefits of 5G for users.

User experience in the hills

Recently I was enjoying an afternoon "day-out" at the Eastern outskirts of Heidelberg where the hills quickly rise to nearly 600m – the edge of the Odenwald nature park. On the way back I was trying to find out the address of a place I wanted to pass by on the way home – which should be an easy thing thanks to modern smartphone and mobile networks technologies. While LTE is deployed in downtown Heidelberg, I found that even 3G was difficult to get on my tour and mostly only EDGE was available. That should have been sufficient – in the light of the bandwidth theoretically achievable with this technology.

However, in practice I could not get any response from the network over several kilometres in spite of good signal strength. Equally, an attempt to check the rain prognosis in the light of dark clouds approaching from the West failed. This is frustrating. Quality of Experience is often referred to as one of the ultimate goals – and not just recently. Sometimes I feel we are still far away from that, and I think that much work still needs to be done in order to improve on that. Can 5G contribute to this?

Steps towards 5G

As 4G / LTE deployments are making good progress – some 250 LTE networks have been deployed across almost 100 countries by end 2013 according to GSMA – the research community has started preparations for 5G. A large Public Private Partnership on 5G, the 5G-Infrastructure-PPP, has been proposed by European industry to the European Commission, and officially launched by the signing of the 5G-PPP contract in December 2013. But not only in Europe, also in North America and Asia activities towards 5G have started. The Next Generation Mobile Networks (NGMN) Alliance plans to define End-to-End Operator Requirements for 5G, and a 5G whitepaper is planned for release end of 2014. Standards bodies are also preparing the grounds, e.g. ETSI organised a Summit on Future Mobile and Standards for 5G in November 2013.

To date it seems, however, not yet fully clear what 5G really will be, what it will comprise, and what specific benefits it will actually bring for operators and users. This is not to say that no opinions and views have been expressed so far, but a clear statement or definition is missing. And what you will hear also depends on who you ask. The experts in charge of radio technologies have different views compared to someone in charge of overall network architecture evolution. The timing seems however agreed as 2020+ is nearly uniformly mentioned as the start of commercialisation.

Where 5G might go

In my view, what we doubtlessly will see is an increase of data rates and capacity, but this will not be enough, as I indicated above. Energy efficiency will certainly be another key target, given the huge growth of mobile data usage and in the light of climate targets. Finally, I also expect that the reduction of capital and operational expenses will be an important goal. While CAPEX and OPEX aspects have always been in the discussions, revenue growth rates of operators are slowing down in many markets and are forecasted to further decrease – according to GSMA from over 5% in the previous 5 years to 2.9% per year out to 2020. In addition, regulatory interventions increase competition and make the air for profits thinner, forcing operators to look for cost saving opportunities.

Current research directions

Here is a snapshot of some current views on targets and focus of research directions towards 5G. There are statements that were given at Globecom in December 2013 regarding 5G performance targets:

- the capacity is to increase by a factor of 1,000.
- data rates are to go up to 50 Gbps for low mobility, 5Gbps for high mobility and 1 Gbps anywhere, i.e. this seems the minimum everyone should be able to enjoy also in remote areas.
- Latency should further decrease to less than 1 ms (it is 5-10 ms in LTE), and
- energy consumption should be reduced by a factor between 10 and 100.

The key enabling technologies in order to achieve these targets will be twofold: first, enhancements to LTE, and second, specification of completely new radio access technologies. Regarding the first, LTE enhancements will include the deployment of dense, smaller cells and may include other general enhancements like the combined usage of higher and lower frequency bands and the massive use of MIMO techniques.

New Radio Access Technologies on the other hand are intended to enable the large performance gains, possibly facilitated by mm wave work and new spectrum made available at World Radio Conferences WRC-15 and -18.

While the above shows a strong focus on the radio part of the network, the concept proposed by the 5G-PPP seems more holistic. A pre-structuring proposal has been released by the 5G-PPP Association, based on the Horizon 2020 work programme 2014-15, identifying four research strands:

- R&I Strand: Radio network architecture & technologies
- R&I Strand: Convergence beyond last mile
- R&I Strand: Network management and
- INNO Strand: Network Virtualization and Software Networks.

The shared vision is that 5G is not just another generation of mobile networks but a new network concept. 5G is meant to enable the integration of a ubiquitous access continuum composed of cooperative, cognitive fixed and heterogeneous wireless resources with fixed optical access. Moreover, new functionalities shall allow simplified and unified control. The next step is the Horizon 2020 call for project proposals on 5G, which will close on 25 November 2014; selected projects are expected to start in the second quarter of 2015.

Satisfaction guaranteed?

As we move towards 5G, the assessment of the new networks will ultimately be based on my user experience in the hills near Heidelberg. In 2020, we will not be talking about Gb/s data rates or milliseconds of latency. We will talk about the user experience – The service I want must work where and when I want to a standard that I find acceptable. It means we must translate satisfaction parameters into network performance guarantees. This will not be easy but the 5G infrastructure must keep everybody happy – this is the only parameter that will count at the end of the day.

Further information:
is available on the website of the 5G-PPP Association at http://5g-ppp.eu

Orange 5G vision

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Orange has strongly contributed to the design of 4G and is currently deploying 4G in Orange European countries. We do believe that 4G is an efficient technology: all-IP architecture with the ability to evolve in order to increase the throughput and the capacity. Even if we are currently rolling out 4G networks and will still be investing in that technology, we have to be well prepared for the next step, which is referred to as 5G, and be involved, starting from today, in 5G research activities.

New usages for customers are emerging. They will lead to new extremely large markets by 2020 such as the Internet of Things, Machine to Machine, business critical applications (including public safety), near-real-time or low-latency applications, and all the future yet unknown services that will need a very flexible infrastructure.

On the other side, new technologies and new capabilities can lead to revisit the way we design a 5G system. We are working from IP-ization to IT-ization of the networks (Network Function Virtualization, Software Defined Networks). Moreover, devices have vastly increased their capabilities (processing power, multiple wireless technologies).

At Orange, we are not considering 5G as 4G+1. We will of course have to continue improving spectral efficiency and peak throughputs, as we always did moving from one generation to the next one. But those promising market opportunities and new technologies lead us to believe that three major aspects will have to guide all the research and standardization phases, if we want to make 5G a success:

- Improve energy efficiency: energy unit costs do not benefit from the same efficiency gains as bandwidth unit costs. Electricity consumption and CO2 emission are sharply increasing, while our customers are intensifying their digital usage. 5G must address this issue, if we want to keep our ecological and economic bill at a reasonable level.
- Put Quality of Experience at the core of the 5G design: 5G should not be just about achieving always higher throughput, it should also provide a consistent throughput experience so that users are being always well connected wherever they are and whenever they want.
- Design the system for Total Cost of Ownership (TCO) reduction so that we are smartly allocating our collective capabilities for investment. This should include CAPEX and OPEX, with a focus on the simplicity and cost of operations and maintenance.

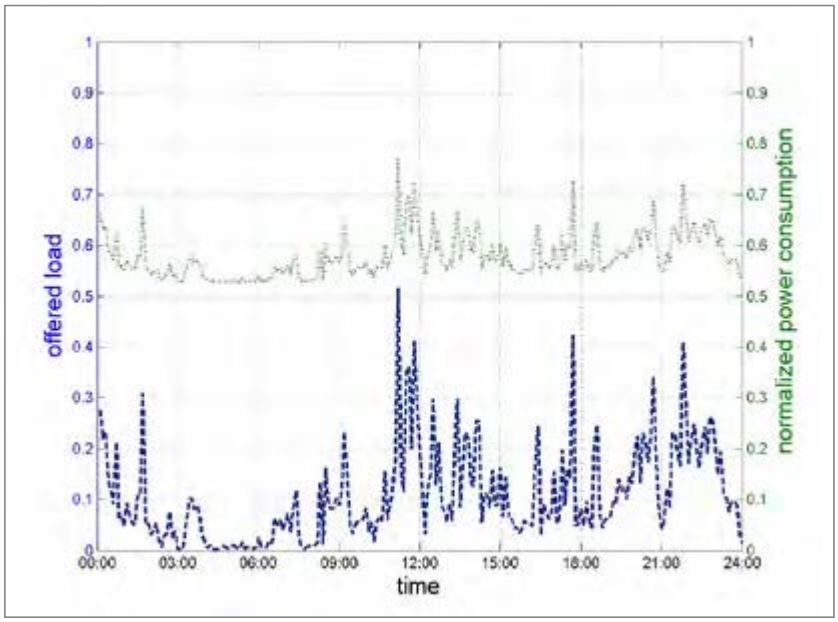

Figure 1: typical traffic evolution and related power consumption of a mobile base station

Energy efficiency as the key driver for 5G

Orange Group has committed to reduce its energy consumption by 15% in 2020 compared to a reference taken in 2006. Following this trend initiated a couple of years ago, one of the key drivers of 5G must be the reduction of power consumption. Indeed, access sites, including backhaul, currently consume roughly 80% of the energy required for the operation of a cellular network and, unfortunately, traffic variation has low influence on base-station power consumption, as can be seen in Figure 1.

On the network side, in order to save energy, an efficient sleep mode independent of the traffic load must be designed: equipment must be activated / de-activated with a very small delay (a few tens of micro-seconds), and the design of an air interface must allow user equipment and base stations to stay in sleep mode during a whole frame by limiting the transmission of reference and synchronization signals. On top of that, a smart management and supply of energy must be enabled via energy metering inside all products, energy harvesting products, and more.

On the device side, in a perspective of Internet of Things / Machine to Machine communications, a specific radio interface, optimized in terms of power consumption, will probably have to be defined. Indeed the current LTE Machine Type Communications profile does not seem to be able to allow sufficient battery life for applications such as water/gas smart metering modules or smart parking modules. In addition, wireless remote powering could be considered to reduce or avoid the need for primary battery.

New challenges for 5G radio

The need for more capacity and higher spectrum efficiency will remain a critical point in the context of mobile traffic explosion and increased number of connections. This should not only lead to higher throughputs available for each user, but 5G should also be optimized in such a way that the user experience becomes homogeneous in each and every position over the coverage area, and whatever the mobility situation (from static to high-speed train speeds).

Reduced latency is one of the key advantages of LTE when compared to 3G. However, if LTE

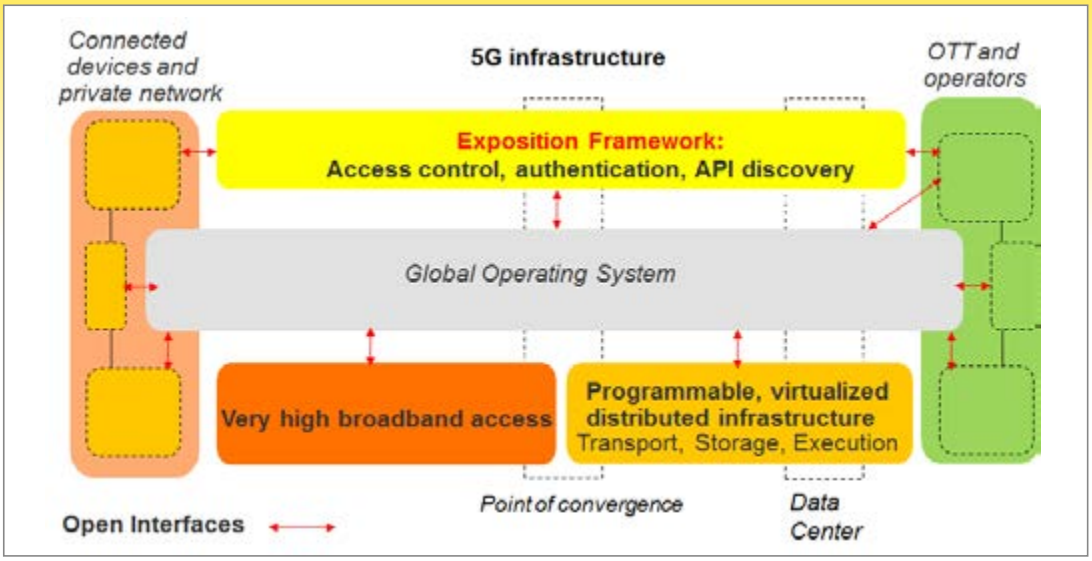

Figure 2: 5G target architecture

radio access network latency is already rather small (around 5ms), end-to-end latency may still suffer from backhaul link quality and network architecture design; these two aspects should significantly be improved in 5G in order for the end-user to experience a "fibre-like" behaviour with a wireless system. 5G RAN latency could also be improved, e.g. by reducing the sub-frame size, but with some physical limitations.

As far as spectrum is concerned, quite large bandwidths of consecutive spectrum are under study within the range 6GHz (or 10GHz) – 100 GHz. However the technical feasibility must still be assessed and it may happen that the design of specific technologies could be required, e.g. massive number of antennas in order to counterbalance the reduced coverage areas of this so-called millimetre waves. In order to optimally take part of spectral and energy efficiencies improvements, a flexible use of the spectrum allocated to an operator should be considered: the coexistence with other radio technologies should be optimised with 5G, and dynamic use of spectrum by several technologies should be allowed. Smart carriers aggregation should also be defined in order to benefit from any spare MHz.

A fundamental requirement for 5G is also availability of licensed spectrum, harmonized on a global or at least regional basis. For this purpose, ITU-R offers an appropriate framework for 5G to benefit the harmonisation process within IMT Family. For 5G/IMT spectrum, a licensing regime based on well-defined exclusive access rights is prioritized, thus ensuring Quality of Experience, good interference management and a high degree of market certainty to create incentives for investment and innovation.

As mentioned above, specific air interfaces could be designed in order to address higher frequencies (mmWaves) and cover the Internet of Things use case (for which a low energy/low cost solution is needed). In addition, smooth enhancements of LTE / LTE-Advanced specifications should lead to a system able to address most of the use cases currently considered for 5G. So what could be the major revolution brought by 5G?

New approaches for network architecture

New applications are emerging that may stretch the ability of a shared carrier to support all services/applications on a unified air interface, for instance Machine Type Communications.

This opens the possibility to consider alternative air interface solutions, each one addressing some of the multiplicity of use cases currently considered for 5G which, if it happens, would lead to multiple new air interfaces supported by a single 5G network architecture. This new architectural revolution would then create a new paradigm where there should be scope to develop a more flexible and future proof architecture, in order to support future evolutions; a kind of radio technology agnostic architecture for 5G.

The acceleration of innovations in technologies and in services, combined with a competitive market that is evolving very fast, makes the prospective exercise in network evolutions difficult. However, there is one certainty: this evolution will not slow down in the following years. Orange and other telcos will have to innovate and to adapt their business models. In the context of a fierce competition between telcos (at least in some areas such as Europe), it is essential to keep a level of revenues that:

- supports the huge network investments for deploying new access technologies in order to face the continuous increase of bandwidth demand, and
- supports the deployment of IT-ized infrastructures, which are necessary to enable the telcos to compete in the race for new IT and applicative services, from infrastructure up to service provider.

We see five transformations which aim at proposing some solutions to meet these objectives and, combined, draw the outline of what could be the Orange network in 2020.

- Implementing convergence of access
- In-network cloud: transforming the network itself into a distributed cloud platform
- Transforming network operations towards a Global Operating System of the infrastructure
- Opening networks with APIs relying on Web technologies
- Transforming networks/IT and IS to address the Internet of Things.

Conclusion: 5G should be addressed by all of us with new eyes

The primary requirements for previous generations (3G/4G) have been spectral efficiency and peak throughputs. Orange thinks that it is important to revisit these traditional requirements and to drive the research that will lead to 5G with a focus on energy efficiency, Quality of Experience for users, and Total Cost of Ownership for operators.

Our goal is to define the technologies and standards in order to make sure that 5G will be ready for the challenges of being the backbone of our digital lives beyond 2020; Orange will contribute to this exciting agenda through the 5G PPP and the NGMN group.

3GPP system standards heading into the 5G era

Balazs Bertenyi
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3GPP standards have played a pivotal role in the success of LTE, making it the fastest growing cellular technology in history. Never before has a new radio technology made it to the market so quickly and widely after the finalization of the first version of the standards (3GPP Release 8 was finalized in December 2008).

For the first time in history LTE has brought the entire mobile industry to a single technology footprint resulting in unprecedented economies of scale. After the initial LTE release, work in 3GPP has been centred on the following strategic areas:

- Enhancing LTE radio standards to further improve capacity and performance;
- Enhancing system standards to make LTE and EPC available to new business segments;
- Introducing improvements for system robustness, especially for handling exponential smart phone traffic growth.

This article focuses on the latter two aspects, and outlines the potential standards path towards the 5G era.

Here is a snapshot of the main features and their timelines 3GPP has been working on (see figure 1).

Addressing new business segments

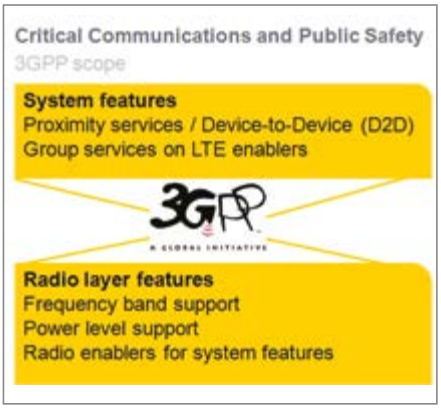

Figure 2: 3GPP scope

The converged footprint of LTE has made it an attractive technology baseline for several segments that had traditionally operated outside the commercial cellular domain (see figure 2).

In particular, the critical communication and public safety community has turned to LTE for developing their next generation broadband data system. 3GPP has embraced this initiative and committed to deliver the necessary standards enhancements to make the LTE/EPC system suitable for this purpose. Work has started in Release-12, and standards for the first batch of features will be completed by December 2014.

These features include enhancements for direct device-to-device (D2D) communications as well as group communication services, both of which are essential to achieve TETRA/P.25-like functionality for broadband data.

- D2D allows devices in close proximity to communicate directly with each other, thereby enabling authorities to communicate out-of-network-coverage or during network outages (e.g. in case of a natural disaster). There are also commercial benefits of D2D, with new applications building on the physical proximity of users being trialed by operators.
- Group communications allow authorities to create and dissolve groups on demand with resource efficient communications (e.g. multicast) within the group.

Work on further functions for critical communications will continue in Release 13, for example, in the area of enabling relays (relaying between in-coverage and out-of-coverage devices) and push-to-talk type functionality.

Machine-type Communications (e.g. smart meters) have been using the cellular networks for some time now, primarily over GSM and GPRS. Whilst 2G technologies provide cheap means for basic connectivity and data rate, there is growing demand for a more versatile M2M platform. The challenge in the industry (and in 3GPP standards) is the lack of convergence across the M2M providers with respect to traffic patterns and system needs. Hence, a holistic approach to an LTE-based M2M architecture design has not (yet) materialized. This has led to 3GPP standards work being focused on several different, smaller, enablers so far:

- Radio optimizations to allow for lower cost LTE chipsets;
- System level awareness of M2M devices, i.e. the system can identify such devices and apply

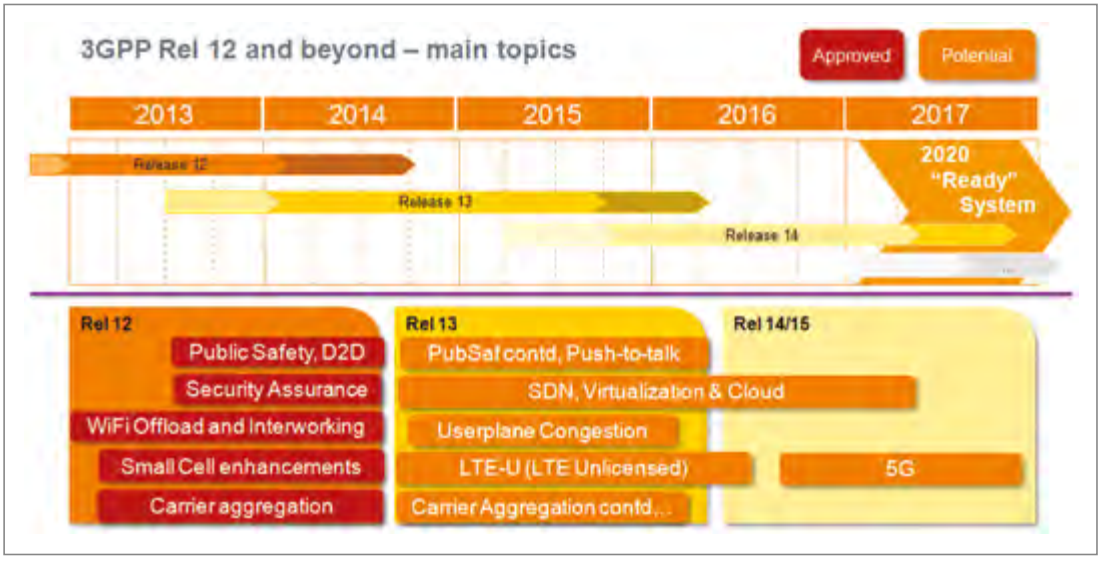

Figure 1: 3GPP timeline

selective handling as per operator configuration (e.g. selective disabling in case of overload);
- Device power consumption optimizations;
- Mechanisms for optimized handling of small amounts of data.

System capacity and robustness

The exponential growth of smartphones and the traffic they generate have become a major challenge of the industry. Network investments are not able to keep pace with the growing data demand. A big portion of the work 3GPP has been undertaking in recent years was driven by alleviating this challenge.

One key element to decrease data load of cellular networks is to offload traffic to WiFi, especially bulk traffic that does not require any special handling for service delivery or charging. The 3GPP-standard mechanism for this is built around a new functional element, the Access Network Discovery and Selection Function (ANDSF). The ANDSF conveys policies to the devices facilitating selection of either cellular or WiFi access for different kinds of traffic (e.g. based on IP flow designation – see figure 3):

Release-12 is enabling seamless mobility between WiFi and cellular accesses with multiple connections, see figure below (cf 3GPP TS 23.402 – see figure 4):

Release-12 will also develop an even tighter integration of cellular and WiFi access through having the LTE RAN convey parameters and rules for offloading (see figure 5):

All in all, as traffic growth continues operators will need more and more innovative functionality in their network to cope with it. Unlicensed spectrum (via WiFi or with other technologies) will continue to play an important role in this quest.

Security certification of network elements is becoming an increasingly important issue in many regions. To ease deployments and avoid fragmentation it is critical for operators, and vendors alike, that certification of network products is harmonized as much as possible. To this end 3GPP initiated a new endeavour together with GSMA to converge security assurance of network elements around a single methodology. Release-12 specifications outline a method whereby 3GPP generates Security Assurance Specifications (SAS) for each functional element. GSMA takes responsibility for accreditation using the SAS documents, and also manages potential dispute processes.

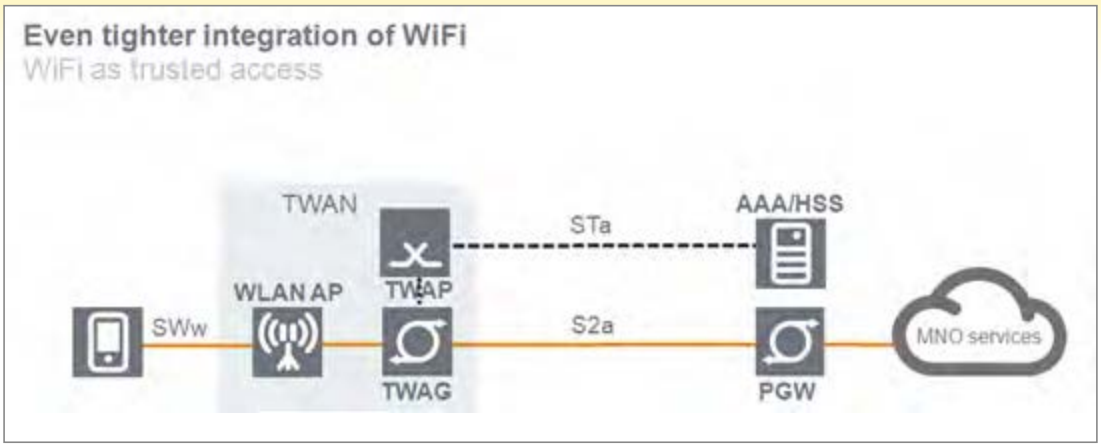

Figure 4: WiFi as trusted access

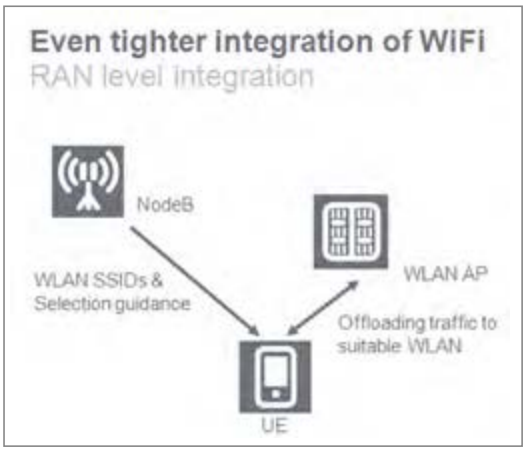

Figure 5: RAN level integration

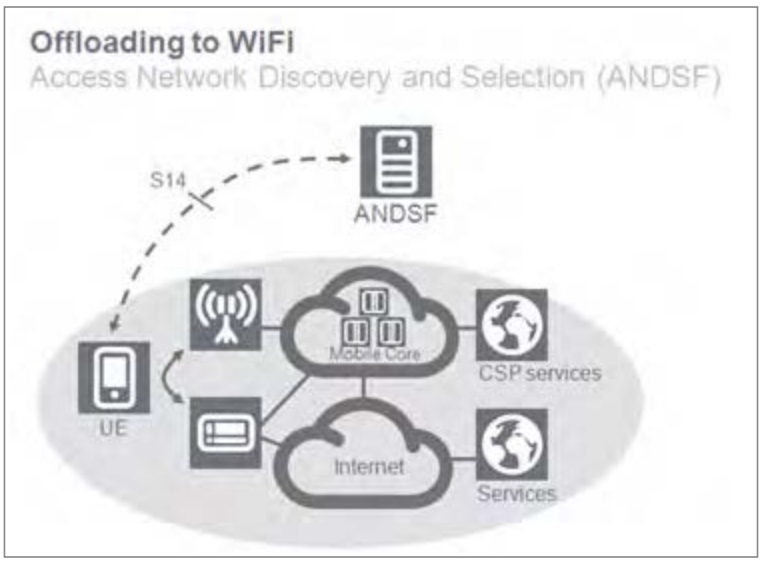

Figure 3: Access Network Discovery and Selection (ANDSF)

Moving towards the 5G era

The term '5G' is rapidly coming into the limelight. Much of this early hype phenomenon is directly attributable to the (well-founded) bandwidth-thirst of the industry. Examining the potential technology trends behind this hype one can find the following likely pillars going forward:

Extensive capacity need in dense areas

LTE already has a Small Cell concept defined in Release-12 that is optimized as much as technologically possible for the current bands. A potential enhancement being discussed for Release 13 is to make LTE suitable for unlicensed spectrum bands. Whilst the exact nature and focus of this work is still under discussion, it is clear that such an enhancement would provide further means to deal with the traffic load.

To further boost the capacity of dense areas it is expected that new licensed spectrum bands (in particular in higher frequency bands up to ~1

GHz carrier bandwidth) will also be needed. Initial research shows that such high frequency bands might require a new radio waveform, a new radio technology. It is yet unclear when/whether/where the standardization of such a new radio will be undertaken. Nonetheless, the earliest such work is expected to be potentially initiated in 3GPP is around the 2015-2016 timeframe.

Ubiquitous coverage

For the currently available bands LTE is very close to reaching the technologically possible efficiency limits. Hence, it is expected that LTE will remain as the baseline technology for wide area broadband coverage also in the 5G era. 3GPP will continue working on enhancing LTE not only from the radio perspective, but also from service delivery perspective, e.g. making it more suitable for M2M. Consequently, interworking with LTE will remain to be a critical factor.

Ever increasing cost pressure

Traditional telecommunications equipment has tied hardware and software close together. Advancements in hardware technology, as well as success of virtualization in the IT industry have brought the notion of virtualization into the mobile network space. Separation of user plane and control plane have long since been a key design element of mobile networks, making most of the mobile network architecture an ideal candidate for virtualized deployments. Industry activities and inception of specialized industry interest groups (e.g. ETSI NFV) all point towards the feasibility of this approach bringing the following main benefits:

Enhancing the level of automation

Decoupling software functions from the resources

Allowing faster service introduction

Providing service and network performance analysis and optimization

3GPP standards work on virtualization is about to be started, in Release 12. Initial focus will be turned towards operation and maintenance aspects; work on core network and radio architecture is expected to follow later.

History has shown that the mobile industry undergoes a major technology shift roughly once every 10 years. Readers of Eurescom message will be well aware that there are vast arrays of technology developments on the horizon and that demand for these is greater than ever.

The global footprint, and the success, of 3GPP standards will continue to put pressure on the Project to get new specifications out in a timely manner. To achieve this, intensified industry collaboration becomes more important than ever before. As we add 5G discussions to the mix, we will have plenty to keep us busy in 3GPP for the foreseeable future.

Further information

on 3GPP is available at www.3gpp.org

The potential of 5G to enrich our lives

Interview with 5G expert Sergey Andreev

The hype around 5G is not yet matched by clarity on what 5G actually is and how we get there. In order to shed more light on the topic and get a better understanding of the challenges and opportunities of 5G for Europe, Eurescom message editor-in-chief Milon Gupta interviewed 5G expert Dr. Sergey Andreev, who is Senior Research Scientist at Tampere University of Technology.

What is 5G?

Andreev: Currently, due to the ongoing debate, there is no complete technical definition of what exactly is 5th generation wireless systems. Given a historical 10-year cycle for every existing cellular generation, it is expected that 5G technologies will be deployed sometime around the year 2020. However, the anticipated communication requirements may already be understood from the end user perspective. Regardless of their current location, human users would like to be connected at all times taking advantage of the rich set of services provided by the contemporary multimedia-over-wireless networks. On the other hand, network-side intelligence is likely to evolve as well by offering service opportunistically when a user, or an unattended machine-type device, actually needs it.

Will 5G be rather an optimisation of 3G/4G, or is there a revolutionary element?

Andreev: It is widely believed that the only feasible solution to mitigate the increasing disproportion between the desired service quality and the limited wireless resources is by deploying a higher density of increasingly smaller cells in current network architecture. However, the "small-cell revolution" requires massive investment on CAPEX and OPEX from mobile network operators. Another promising approach, avoiding high associated costs and offering an entirely new perspective, enables offloading cellular traffic onto direct device-to-device connections whenever the communicating users are in proximity.

At the end of the day, I expect that a variety of diverse 5G techniques and technologies, both conventional and innovative, would integrate synergistically, rather than a new killer technology would emerge to replace the 4G.

How can 5G help improve connectivity?

Andreev: Uniform user connectivity, mindful of the service quality, is envisioned to dramatically improve our daily wireless experience in light of explosive mobile data volumes, massive numbers of wireless devices, and increasingly varying requirements of application services. Unfortunately, contemporary 3G/4G networks are still unable to deliver the desired ubiquitous connectivity experience. Bridging this gap requires decisive changes in both network infrastructure and device architecture, where the user equipment is jointly optimized with the surrounding network context. As a result, 5G communication technologies will be able to seamlessly connect people to one another and to a surrounding world of information and services, across a plethora of available radio access technologies.

What are the major challenges that need to be tackled on the way to technological maturity of 5G?

Andreev: Transforming user experience indeed creates significant challenges for 5G technology design, as users' connectivity experience should match service rate requirements and be uniform no matter where the user is, who the user connects to, and what the user service needs are. One glaring problem is that licensed spectrum continues to be scarce and expensive, whereas the traditional methods to improve its efficient use approach their theoretical limits. Therefore, we expect the majority of near-term gains to come from advanced architectures and protocols that would leverage the unlicensed spectrum, for example exploiting WLAN solutions such as Wi-Fi, and take advantage of the intricate interactions between the device and the network, as well as between the devices themselves, across the converged heterogeneous deployments.

What should be done to ensure 5G will become a true global standard?

Andreev: Global acceptability of 5G depends on the consensus between major technological players in this field as well as the pace of related standardization activities. The associated challenges are many and range from how to develop an understanding of new 5G technology with a combined pursuit of analysis, computer simulations and prototyping, to ensuring that the relevant ideas would promptly land in corresponding wireless standards and products. However, given the dominant working practices and disjoint opinions of competing companies, standardization of new 5G technology with the current procedures is slow going, which has plenty of room for improvement.

What is your vision for a new service experience based on 5G?

Andreev: The forthcoming 5G networks have the potential to enrich our very lives beyond what we can even imagine today. One inspiring example is the emerging concept of network-assisted D2D communication, which is commonly believed to alleviate congestion on current cellular networks as well as enable novel ways of interaction for human users and the entire future networked society. Network assistance can provide secure D2D connectivity between proximate users that are currently outside each other's social spheres, meaning that user devices may talk securely to "strangers", which has not been possible with the 4G technology. Ultimately, a user's smart device will be able to connect him or her to a smart network and other devices providing a deeply personal information experience.

Celtic-Plus
Smart Connected World

Editorial

Dear reader,

In April 2014 a very spectacular Celtic-Plus Event took place in Monaco. This event had been co-located for the first time with the WIMA conference on NFC, Clouds, and Big Data. In the following article I will provide some interesting information about the event and the exhibition. I also will describe our 2014 award winners and their main achievements.

Another very important conference will be organised on 24 June 2014 in Berlin, the SASER conference on "Secure Communications in Europe". SASER is our current flagship project, largely sponsored by the Federal Ministry of Education and Research in Germany (BMBF), La Direction Générale de la Compétitivité, de l'Industrie et des Services, France (DGCIS), and by TEKES, Finland. At this conference several state secretaries and high level representatives from Germany (BMBF and BMI), from France, and from Finland are expected as well as representatives at CEO/CTO level from several large companies involved in SASER.

After the conference, on 25 June, another Celtic-Plus Proposers' Day will take place allowing presenting and discussing possible new projects with other experts.

The advertisement in this magazine issue provides some additional details.

As always we will give the floor to some of our currently running projects to explain what these projects intend to achieve.

Finally, I would like to inform you that this is the last issue of Celtic-Plus News I am responsible for, as I will leave Celtic-Plus by end of June.

Enjoy reading this issue.

Heinz Brüggemann
Director Celtic Office

CONTENT

Celtic-Plus Event 2014 in Monaco

Smart Connected World – Towards a New Horizon

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About 150 people attended the Celtic-Plus Event in Monaco from 23 to 24 April 2014. For the first time this event was co-located with another conference, WIMA on Near Field Communications (NFC), Clouds, and Big Data. The event was complemented by a common exhibition of around 20 Celtic-Plus projects, the EU's Future Internet programme, and an exhibition from WIMA complemented the show cases.

The Celtic-Plus Event in Monaco was supported and sponsored by the Principality of Monaco. One important reason why the event was organised in Monaco was the participation of Monaco Telecom in the SPECTRA project which arranged a field trial over the whole Principality of Monaco. In our last issue SPECTRA already presented the project and explained further details about the field trial.

Jacqques Magen, chairman of Celtic-Plus

Conference sessions

The main part of the Celtic-Plus Event was the conference, where several high-level representatives presented their views on the future challenges of ICT research in this fast changing world and the positioning of EUREKA clusters within the new landscape.

In the opening session Serge Pierryves, director of the Business Development Agency (Directeur de l'Expansion Economique) of Monaco provided a very interesting overview about the position of Monaco in the market and its activities in ICT.

Kristin Danielsen from the Norwegian Research Council, currently the chairwoman of the EUREKA High Level Group presented their views on the future development and needs for changes of the current instruments and activities. High level presentations were given, among others, on Secure Cloud Technology & Services, augmented reality, Smart City of Oulu and on 5G PPP, Objectives and Opportunities.

A very interesting panel discussion was organised between WIMA and Celtic-Plus participants on Mobile technologies and contactless services for Smart Cities. In the discussion it became obvious that NFC, cloud and Big Data technologies are very important elements to realise the Smart City and Smart Connected World concept. Aspects that still need a lot of attention are security and privacy assurance.

Representatives of the government of Monaco at the event with Celtic-Plus officials

After the panel session the Celtic-Plus Innovation and Excellence Awards were presented to representatives of the winning projects, and all award winners had the opportunity to explain their project achievements.

Celtic-Plus Proposers' Day

On the second day of the event, the Celtic-Plus Proposers' Day took place. The meeting was intended for proposers to present and discuss new project ideas, in this case, ideas which could become a proposal to be submitted for the Celtic-Plus spring call (deadline: 15 May) or autumn call (15 October 2014). Besides the presentations of new project ideas, this meeting aimed to establish new connections with other potentially interested project partners. There had been very useful networking discussions with other experts, as well as with exhibitors working on related ideas. The Celtic-Plus web site offers links to the presented proposals, and Celtic will help to establish additional liaisons where needed.

Project exhibition

Another important highlight of the Celtic-Plus Event was the exhibition of project demos. These demonstrations and the discussions of results with the project experts highlighted how many good and impressive projects are currently on their way and may have good chances to generate real impact and new business. Due to the fact that also the WIMA exhibition was combined with the Celtic-Plus exhibition a much larger number of participants visited both exhibitions.

In total 21 interesting and impressive Celtic projects demonstrated their current results and some preliminary new products. Some of the products may come to the market in a relatively short time. A special highlight was the visit of S.E.M Michel Roger, the State Minister of Monaco, and other officials from the Government and Principality. He was particularly interested in the SPECTRA booth and the Monaco field trial.

Further information about the Celtic-Plus Event is available on the Celtic-Plus website at http://www.celticplus.eu

Celtic-Plus Innovation and Excellence Awards 2014

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Every year Celtic-Plus selects the three best projects for the Celtic-Plus Excellence Award and the most successful project which closed some time ago for the Celtic-Plus Innovation Award.
The following projects received the Celtic-Plus Awards in Monaco

Celtic-Plus Award winners and officials

4GBB – Innovation Award winner 2014

The Celtic Innovation Award, which has been given out for the third time, was handed over to 4GBB, a highly successful project, which generated a significant amount of impact and innovation.

The 4GBB project developed a new generation of broadband access systems delivering up to 1 Gb/s. The system is a hybrid fibre-copper system where optical fibre is deployed to near the homes and existing copper wiring is used for the last say 20-250 meters. The project successfully aimed at initiating and driving a new standard which is called G.fast.

The project delivered a very valuable input to the Commission's "Digital Agenda for Europe" for assuring high-speed Internet connectivity to Europe's society. The project will continue with the definition the deployment of the G.fast standard with the project HFCC-G.fast.

The project was led by Per Ola Börjesson, Ericsson and Pernilla Schuber, Lund University, Sweden. The project budget was roughly 8 million euro.

In addition to the Innovation Award Celtic-Plus honours the three most successful, recently finished projects with the Celtic-Plus Excellence Award.

Gold Award: EO-Net project

The EO-Net project brings "elasticity" to optical transport networks, so that its ability to adapt data rates and allocated bandwidths of each optical signal according to both the traffic demand and the amount of physical degradation of the network.

This innovative project is targeting a disruptive technology. The partners of this consortium were among the first looking into this topic of elastic optical networks. This new concept of elasticity in optical networks could become an enabler to achieve Energy efficiency which is an important topic for next generation NWs.

The business relevance is high: 8 prototypes have been realized and there were already 9 product improvements using results of the project. The project was led by Patricia Layec, Alcatel-Lucent, France. The project budget was 5.2 million euro.

Silver award: HIPERMED project

The Hipermed project realized a high performance telemedicine platform based on a unified service oriented architecture (SOA) providing media over IP using SIP-based control plane services and network services over the Internet.

The business relevance is considered to be very high and the project realized 12 new and improved products. The return on investment of the project has been estimated to 100. In several countries a large amount of commercial users and many clinics have become interested to adopt the HIPERMED system. The project was led by Oscar Chabrera, Merkum, Spain. The project budget was about 6.3 million euro.

Bronze Award: ENGINES project

The project focused on the support and development of the Digital Video Broadcasting-Next Generation Handheld (DVB-NGH) and DVB-T2 standard. This standard has been adopted or deployed in more than 140 countries. DVB-T2 has been adopted in 32 and deployed in 24 other countries mainly from Asia and Africa.

The business relevance is considered high. In some regions the commercial perspectives are very good, like in Russia, India and in Africa. In total the project partners have realized 13 new and 8 improved products that are sold on the DVB market. The project was led by Jani Väre, Teleste, Finland. The project budget was around 13.3 million euro.

COMMUNE

Cognitive Management under Uncertainty

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Network management remains a major challenge for service providers as the complexity and heterogeneity of devices and technologies increases in the ecosystem that is today's global communication network. Today only human operators are able to perform the required reasoning to deal with these problems and that is a heavy burden for automation. The COMMUNE project has explored the latest advances in knowledge based reasoning and other relevant cognitive methods to develop a set of algorithms and management frameworks to provide concrete and real solution sets to help operators reduce uncertainty in network management.

"Network management today is a real problem for operators and leads to continually increasing expenditures. Smarter management systems will greatly help provide tangible automated management solutions. The technologies and frameworks developed in COMMUNE will play a key role in the development of these solutions," says NSN's Jukka Salo, project coordinator of COMMUNE.

Focus

The main focus of COMMUNE has been to investigate and evaluate the suitability of applying cognitive algorithms to resolve problems in management of networks. A broad set of scenarios was considered in order to derive the most general set of results. These included radio access (SON) management, Fibre to the Home (FTTH) management, Internet of Things (IoT) and multimedia QoE management for both over the top (P2P) and mobile networking cases, Another area of focus was experimentation with decentralized management architectures in order to both evaluate distributed management coordination and candidate implementation technologies.

Approach

COMMUNE adopted a two-pronged approach to address the challenges described above. Firstly the project teams experimented with and evaluated the application of cognitive algorithms in a variety of networking scenarios outlined above. Candidate cognitive algorithms were selected after an analysis of the technical and usage requirements for each scenario. Technologies used here included Q-Learning, Fuzzy Logic, Neural Networks, Bayesian Networks and statistical techniques as well as policy based management for coordination purposes. In the second approach the project used the generic architecture for autonomic and cognitive network management (GARSON), which allows for centralized or distributed implementation of management functions as a framework to evaluate the suitability of a number of different middleware frameworks for distributed cognitive management from both coordination/communication and service lifecycle management perspectives.

See the project website for more information: http://projects.celtic-initiative.org/commune/index.html

Partners

Partners in the COMMUNE project include leading companies and research institutes in the field of communications technology including Athlone Institute of Technology, Ireland Daysha Consulting, Ireland, Elisa Corporation, Finland, Magister Solutions, Finland, Nokia Solutions and Networks, Finland, Orange Polska S.A.,Poland, Oy L M Ericsson Ab, Finland, SistelNetworks, Spain, Telenium, Tecnologia y Servicios S.L., Spain, Telnet Redes Inteligentes SA, Spain, Temida, Slovenia and VTT Technical Research Centre of Finland, Finland.

MACICO

Multi-agency cooperation in cross-border operations

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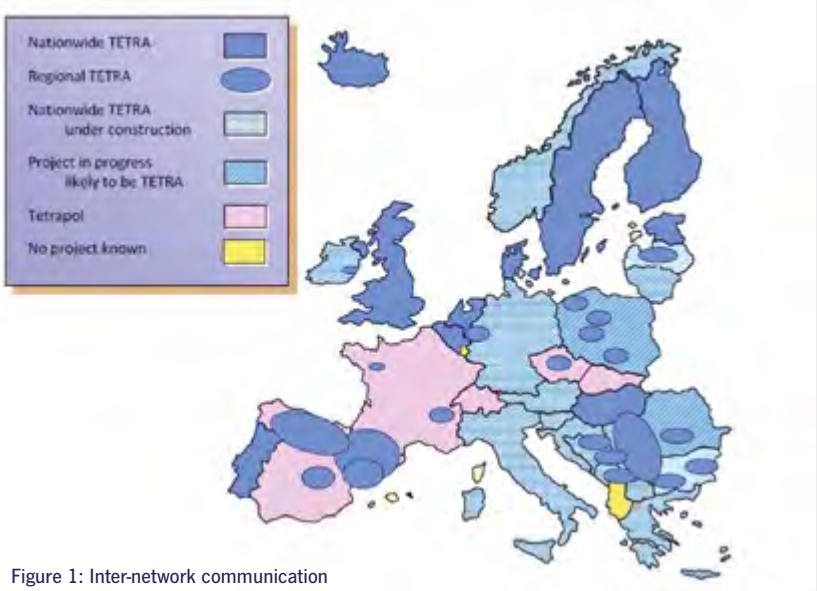
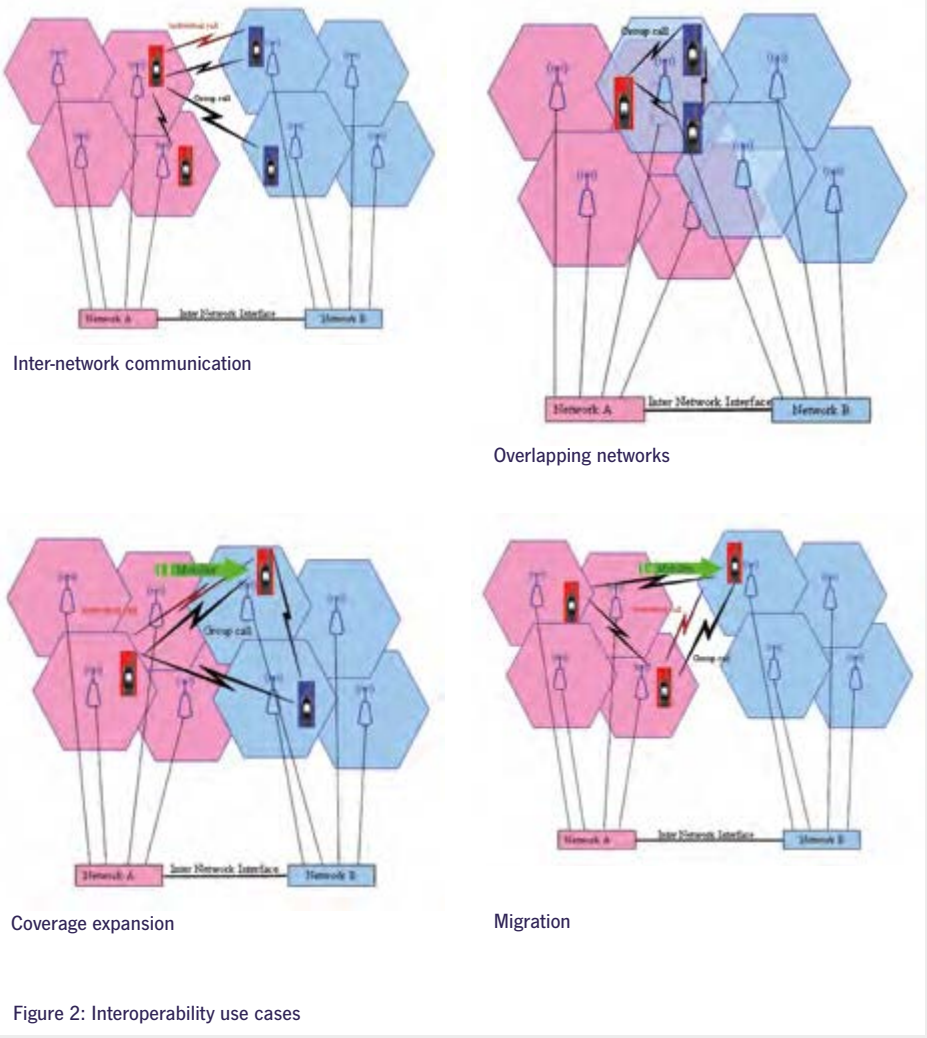


Figure 1: Inter-network communication

MACICO developed a concept for interworking of security organisations in their daily activity. It deals with cooperation of security organisations that do not use the same radio network, but in some missions could take benefit of a share of their respective infrastructure. Use cases such as pursuit of criminals across a border or border, disaster relief operations require security organisations from both countries to communicate together and to continue to communicate with their control room.

Security organisations increasingly face interoperability issues at all levels (technical, operational and human) as they interact with other national, regional or international organisations. Not only assets and standards must be shared across Europe to empower joint responses to threats and crises in an increasingly interconnected network, but also security organisations have to benefit from interoperability functionality in their day-to-day work.

MACICO's main goal is addressing in a short-term perspective the needs for improved systems, tools and equipments for radio communication in cross-border operations, like, e.g., cross-border surveillance and cross-border pursuit, as well as during operations taking place on the territory of other member states, for example high-scale civil crisis operations or complex emergencies requiring support of public safety services from other Member States. On the other hand, MACICO encompasses the interoperability issues European countries will be faced to in a long term perspective, tackling the necessary transition between currently deployed legacy network and future broad band networks.



Inter-network communication

Overlapping networks

Coverage expansion

Migration

Figure 2: Interoperability use cases

Interoperability use cases

MACICO studied the interoperability for the networks Tetra-Tetra, Tetrapol-Tetra, and Tetrapol-Tetrapol. Each interoperability solution is in charge of interfacing the networks, encrypting and decrypting voice flow according to the rules of its network, and of exchanging in a technology- and provider-agnostic mode the voice flow to the other gateway.

In the design phase of the project, the most appropriate available and open interface was selected, and the gateway was designed accordingly. The project also studied the interoperability with the next generation networks.

Conclusion

The Macico project validated the Tetra-Tetra interoperability (ISI phase 2) with a demonstration in Helsinki on december 2013.

MACICO will demonstrate in May 2014 the Tetrapol-Tetra interoperability with a gateway linking the infrastructures and the Tetrapol-Tetrapol as a tactical network deployment.

You can find more information on MACICO at http://www.macico.com .

MediaMap+

From production to publishing

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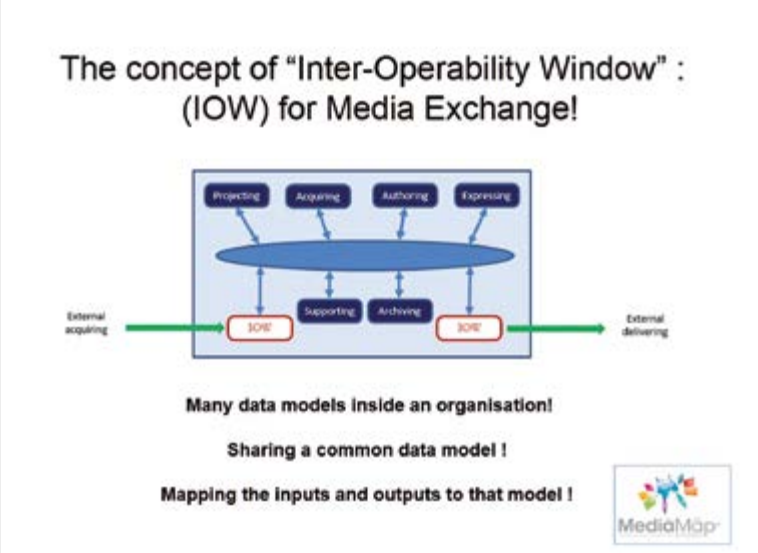
Media production and publication requires the simultaneous use of digital production output and enterprise resources management. Digital factory involves processes, including projecting, acquisition, authoring, expressing, supporting, archiving, as well as representation modes, like objects, events, and facts.

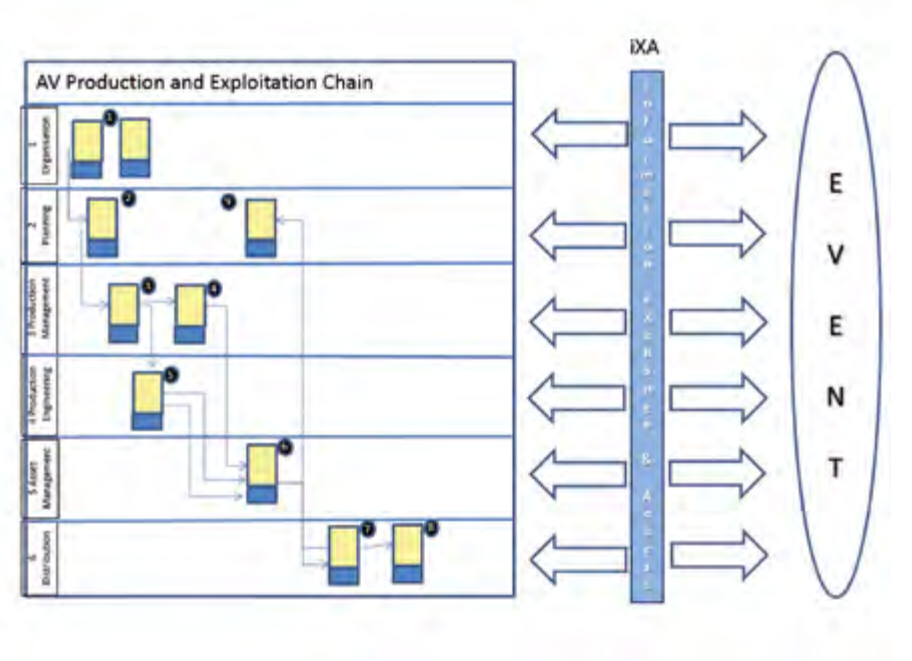


MediaMap+ aims at setting up a platform that will fit these needs:

- Adressing a new profile of audiences that becomes wider and heterogeneous
- Adopting a production chain that can process a big and multiple streams of data
- Developing new scenarios of consumption of the information

Knowledge representation

In a new media architecture, it's important to share information. It must be handled directly by web services with the support of ontologies for interpretation and rules of inference.



Production

The MediaMap+ ''semantic middleware'' works with existing infrastructures, generating from and associating all the semantic triplets to a knowledge base and to a service that ensures the mapping of the content. It serves one unique search point to all your existing asset management systems, converting external sources into semantically understandable content.

Requirements

The general architecture is based on the following requirements:

- The architecture covers the global flow: information management, production and exploitation chains and the link to the outside world.
- The global production process is divided in six layers: organization, planning, production management, production engineering, asset management, and distribution.
- The semantic middleware relies on open standards, like, e.g. EBUCore and FIMS
- The semantic middleware interfaces each of applications or databases involved in the process and ensures the consolidation of enriched information through a distributed architecture. It manages multilingual objects.
- On the top of the middleware, the View offers to each contributor a personalized constructed GUI which opens the field to navigation within and between information and segments of works.

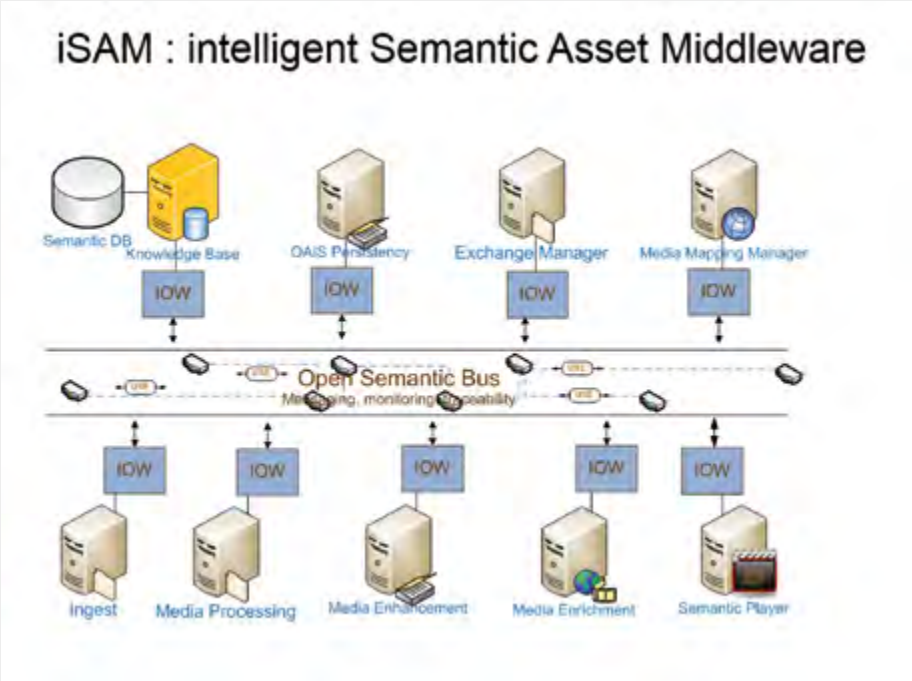
The intelligent Semantic Asset Manager (iSAM)

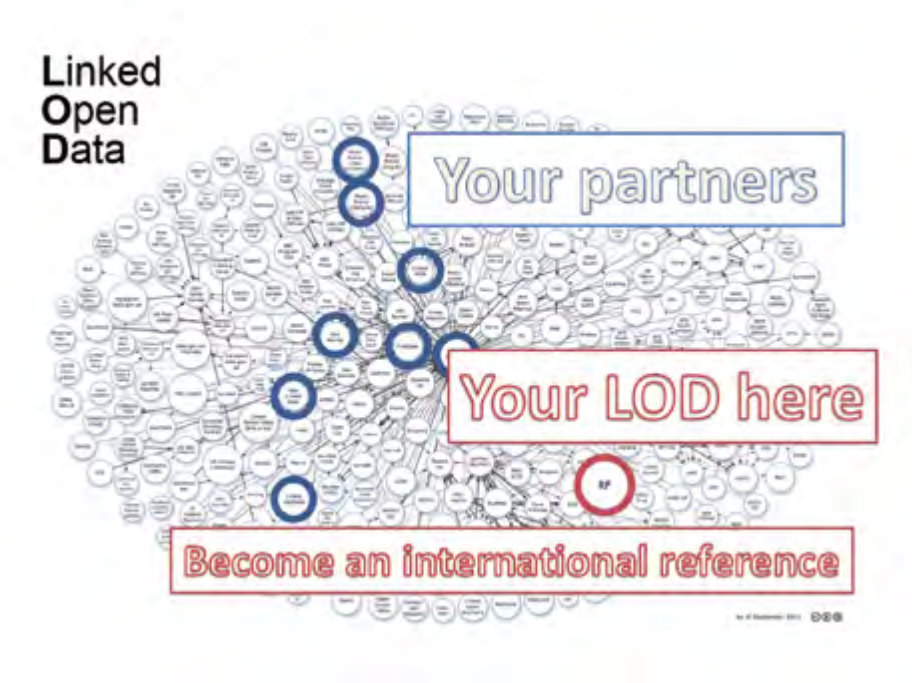
Inside of the middleware, the ontologies mapping, the properties of the AV wrapper, the distributed architecture ensures interoperability in space (interoperability) and time (sustainability), cover the dynamic aspects of interchanges and present to users relevant information based on their roles and skills.

Exploitation

Running a process like content enrichment for assets now covered by semantic middleware – such that you can identify named entities and make connections with other knowledge available on the Linked Open Data cloud – adds up to liberating the exposure of this content.

A large part of information to enrich assets already is available on the semantic web, and organizations have to develop a strong way to build knowledge from available outside knowledge sources





Conclusions

Semantic technologies are key to solving these issues. A cost-effective, durable and scalable solution can be created by carefully selecting and extending available open communication standards based on the semantic web.

The integration of semantically meaningful media representations will facilitate novel content creation processes and exploitations.

Combining databases and ontologies substantially increases the value of works by contributing to their ongoing enrichment and creating the conditions for their persistence.

Further information is available at www.celtic-initiative.org/Projects/Celtic-Plus-Projects/2011/MEDIAMAP+/mediamap+-default.asp

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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.

The perils of short-termism

How the common denominator kills disruptive innovation in ICT

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It is a known problem in politics that, in this age of easy and fast communications, the politicians ask the public what they want and get their feedback and views pretty quickly. They then decide on policies based on the common denominator of the feedback to ensure populist acceptance – and getting re-elected. The obvious weakness of this approach is that plans and actions are based on the collective opinions of the crowd – who are not experienced in, or in many cases capable of, taking the long-term view. So we get short-term policies limited by the perspective of the crowd.

If we now consider how the Horizon 2020 framework programme has an increased emphasis on declaring a measurable impact of every research project as you write the proposal, we see that projects default into the same short-termism behaviour as the politics described above. Projects feel they must limit ambition in order to have a measurable impact in the project timeframe. The politicians deciding on the EC budget are insisting the projects are accountable and we must see the value of the research funded.

This current fashion for accountability and short term return on investment is good, even essential, when you have defined the direction of development, but is it still viable when we are looking for new directions?

Here we must realize that a significant part of research work has a subjective impact in changing the mindset of the people involved, changing the expectations of the communities who eventually will consume the fruits of these programmes and changing the business models of those who must provide the new services – and getting people to think in new ways is not trivial.

Looking for the clever individuals

This short-termism approach of the research programmes, made me think about how we are going to progress in the long term. How are we going to have major evolutions, if we don't support visionaries?

As I thought about this I realised that we are not doing first generation research here. The Wright brothers did basic research and developed the first practical controls for aircraft from 1903 (first flight). In comparison, the Airbus A380 made its first flight on 27 April 2005 – more than 100 years later. It still uses the basic principles developed by the Wright brothers, but every aspect of the airplane from its construction to its electronics had 100 years more development. Carbon-fibre reinforced plastic, glass-fibre reinforced plastic and quartz-fibre reinforced plastic are used extensively in wings, fuselage sections (such as the undercarriage and rear end of fuselage), tail surfaces, and doors. But we do not talk about who invented the Airbus.

The need for new models in ICT

The same is now happening in the ICT field at a much more accelerated pace. We now know we can build communications systems that give high-speed connectivity to everyone everywhere. We also know we can create massive data stores and capture all the information in the world. We think we can improve the performance of the different elements of the infrastructure so the overall system performance becomes truly incredible – while staying economical and energy efficient. But we don't know what the most economic, most sustainable, or even commercially viable model for putting all these pieces together is.

If we are to build the ICT equivalent of the Airbus we need to develop completely new models of how all the bits of the communication process fit together with all the information we may wish to access, while making sure that the environmental and energy resources consumption does not negate the benefits of this fully interconnected world. We need to do this by focusing on the goals and letting the projects contribute – not by expecting each project to provide a complete answer.

So how do we avoid short-termism?

We have to think big – the 5G-PPP must be commended in that it has put performance goals in its definition. We can now see that projects either contribute to the goals or not. If not they should not be done under this programme. Europe needs more goal setting.

We need goals like the digital agenda to be closely related to the research agendas, we need government procurement to ascribe to the community goals and we need people to feel the benefits of such goals.

What we must not do is lose the view of the goals in order to validate single project results. If we go too far down this road, we are abdicating our rights in Europe to be global leaders. For all our sakes – think big!

Future Internet Assembly in Athens

Infrastructure focus at last FIA under FP7

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For six years, the Future Internet Assembly has been the lighthouse event of the European research community working on Future Internet related topics. This year's event marked the transition towards a more infrastructure-oriented event in contrast to more services and applications oriented previous events.

The 11th Future Internet Assembly took place from 17-20 March 2014 in Athens, organised by the Greek National Research and Education Network, GRNET, and the European Commission, with contributions by a high number of researchers and experts working in the related European research frameworks.

Attendance and impact

With almost 800 registered participants the FIA Athens was one of the most successful Future Internet Assemblies, supported by an excellent local organisation. The event featured plenary sessions, 9 parallel working sessions and 14 half-day or full-day workshops. In addition several special sessions were organised, such as, among orhers, a session on the upcoming 5G-PPP programme, or a session on EU-Mexico R&D collaboration. The event was also streamed to the Internet, which added up to 27 hours of live steaming via 3 channels, serving interested viewers worldwide.

Considering the size of the event, FIA Athens matched the previous events in many respects. In one aspect though, this event was outstanding. This year the exhibition space was the highest attraction and provided an excellent opportunity for the participants to interact with the demonstrations of systems, services and applications that originate in European research on Future Internet.

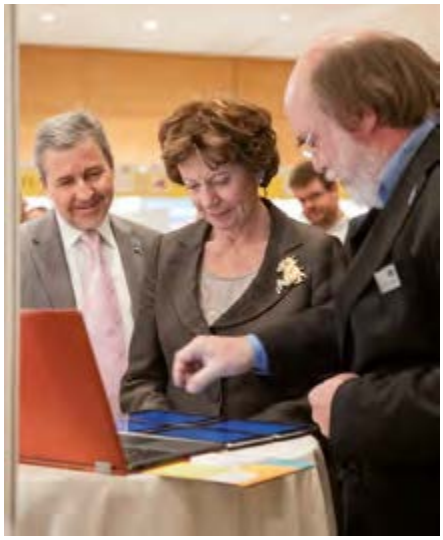
Highlights

The highlights of the event included the welcome addresses by Ms. Neelie Kroes, Vice President of the European Commission, and Mr. Zoran Stančič, Deputy Director-General for Communications Networks, Content and Technology. Both expressed their appreciation for the excellent organisation the high quality of the event as well as the impressive exhibition of tangible results. Further welcome speakers included Secretary General of Research and Technology, Dr. Christos Vasilakos, the Chairman of GRNET, Prof. Panayiotis Tsanakas, and Secretary General of Telecommunications & Post, Mr. Menelaos Daskalakis.

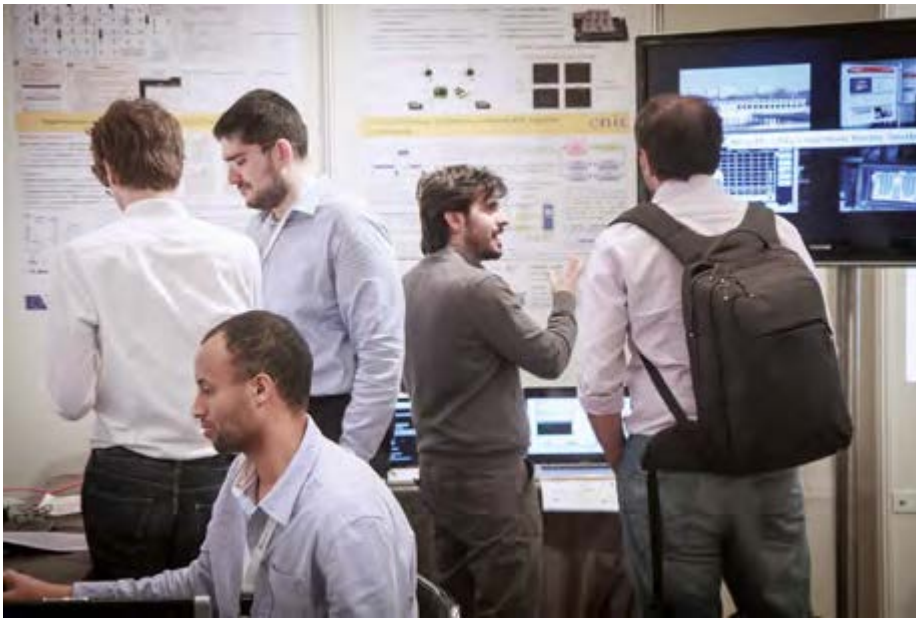
In her keynote Commissioner Kroes discussed a number of policy topics such as network neutrality, the EU regulations on data roaming charges and topics related to data privacy. All of these topics are of high relevance for the European research on Future Internet, and Mrs Kroes pointed out that the EU is relying on research to suggest possible solutions to these grand challenges.

Workshop sessions

As the sub-title of the event – "Reshaping Infrastructure for Innovation" – suggests, the focus of the event was on the infrastructure. Consequently many of the sessions addressed the emerging trends of resource virtualisation at all levels, e.g. computing, networking, and the provisioning of network functions in virtualised environments. Further topics that were addressed included the future of learning on the Internet, digital business innovation and the evergreen: innovation potentials and opportunities for SMEs.



EC Vice President Neelie Kroes watching a demonstration at the stand of Future Internet PPP project FIcontent



Pre-FIA workshops

Resource virtualisation played also an important role among the topics of the pre-FIA workshops. However the workshops offered a broader scope to the audience, ranging from radio access and spectrum, networked media, business models, smart cities, big data, creativity and last but not least research and experimentation on future Internet systems and technologies (FIRE).

Network demand for the event

For the first time in the history of the FIA events, the organisers presented at the closing plenary network statistics which showed that basically all participants were connected. The statistics exhibited an important key indicator for the uptake of IPv6. The number of allocated IPv6 addresses was almost equal to the number of allocated IPv4 addresses. About 25% of the participants used the Eduroam service, which illustrates the high success of this secure, world-wide roaming Internet access service provided by the European National Research and Education Networks (NRENs) and GÉANT for the research and education community.

Outlook

At the closing plenary of the Future Internet Assembly 2014, the European Commission announced that from 2015 the Future Internet Assembly will be drastically re-designed and restructured to better accommodate the objectives of the new framework programme Horizon 2020. The new conference will be called Net Futures Conference.

Further information
FIA Athens website – http://fi-athens.eu
Programme overview on Future Internet website – http://www.future-internet.eu/home/future-internet-assembly/athens-mar-2014.html

Internet-driven growth

1st European Conference on the Future Internet in Brussels

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ECFI opening panel (from left): Ilkka Lakaniemi, Chairman of the FI-PPP; Ajit Jaokar, Advisor to the European Internet Foundation; **John McSweeney, Head of Innovation at ESB Group; and Juanjo Hierro, FI-WARE Coordinator and Chief Architect**

At the 1st European Conference on the Future Internet the Future Internet PPP programme showed its high potential to industry and political stakeholders. In addition, the ECFI provided opportunities to discuss central socio-economic and technological topics of Future Internet infrastructures and services in Europe. More than 200 attendees joined the event, which took place at The Egg in Brussels on 2–3 April 2014.

One of the insights from the event was that Europe is quite competitive in the digital arena. In his opening presentation, Ilkka Lakaniemi, Chairman of the Future Internet PPP, presented study results by ETLA, the Research Institute of the Finnish Economy, according to which 7 out of the 10 most advanced countries in regard to digitalisation of business are from Europe. Based on this, he expects a considerable impact of the FI-PPP on European growth and competitiveness and called the FI-PPP an "engine for growth".

Mario Campolargo, Director Net Futures at the EC's DG Connect, discussing **how the Future Internet will drive innovation in Europe**

Wide range of topics

The ECFI programme consisted of three plenary and nine parallel sessions. In these 12 conference sessions speakers from the nine FI-PPP projects and from a variety of political and industry stakeholder organisations, including Digital Europe and the European Internet Foundation, presented and discussed results and foresight on how Europe can achieve global leadership in ICT by 2020 through innovative Internet technologies. As proof of the high business relevance of the FI-PPP, several speakers from SMEs already using FI-PPP technologies explained how these technologies have helped them become more competitive.

Insights at the opening session

In the opening session of the conference, after the encouraging opening words by FI-PPP Programme chair Ilkka Lakaniemi, a video message to the ECFI participants by Neelie Kroes, Vice-President of the European Commission, was presented. She emphasized the importance of providing the right framework for the Future Internet as well as the necessity of having all stakeholders involved in the development of the right solutions. Further contributions were provided by Ajit Jaokar (EIF), John McSweeney (ESB), as well as Juanjo Hierro (TID, FI-WARE project).

After the opening session, a high-level panel explored how the Future Internet will drive innovation in Europe. Unfortunately, two of the panel participants, Daniel Pataki (ETNO Director) and Malcolm Harbour (MEP), cancelled shortly before the event. Nevertheless, a vivid and interesting discussion developed. Mario Campolargo, director Net Futures at the EC's DG Connect, made an inspiring contribution, pleading to "enable the entrepreneurs enable the end users". According to Mr Campolargo, openness is the key to the process of making FI-PPP platforms sustainable on the market. Moderator David Kennedy (Eurescom, CONCORD project) added to this by saying: "We need consistent platforms on a European scale to enable innovative applications." The other panelists were Patrice Chazerand, Digital Europe, and Ilkka Lakaniemi.

The conference was concluded with a final plenary session on the Future Internet PPP and the new 5G PPP, which discussed how outcomes from the Future Internet PPP will be used as input for the new 5G PPP, for which a call for proposals is open under Horizon 2020.

Privacy and data protection

In the early afternoon of the first conference day, the session on "Privacy and Data Protection" opened the discussion on what should be done for protecting citizens' data and their privacy on the Internet. Among the speakers in this session were Achim Klabunde, European Data Protection Supervisor, and Claus-Dieter Ulmer, Chief Privacy Officer at Deutsche Telekom.

In parallel, the "Future Internet and Smart Utilities" session focused on energy and the current, global shift to sustainability. This session highlighted how the moment has arrived to design solutions that make use of energy generation from renewable energy sources and optimize energy usage efficiency, as well as a smart energy system supported by disruptive Future Internet technologies. FINESCE, the smart energy use case project of the 2nd phase of FI-PPP, was also introduced, and its contribution to the development of innovative open IT infrastructures was presented.

Smart Cities

The third session in the early afternoon on "Network Infrastructures for Smart Cities" addressed the role of Future Internet technologies and experimental infrastructures for the development of Smart Cities. During this session several representatives from smart cities and public authorities reported on their work and efforts in the Smart Cities area. The second part of the session moved to the technology providers, FI-WARE and XIFI. During the active and fruitful debate, citizen engagement, difficulties of scalability of services, procurements and integration of technological legacy were addressed.

Bridging the gap between R&D - innovation

The first conference day concluded with three sessions, including the session "Crossing the chasm – moving European R&D to the market", which was organized by Digital Europe. It addressed the crucial issue of how Europe can bridge the gap between R&D and innovation on the market. Representatives from the European Business Network, from industry and from different institutions discussed the topic.

The session on a "European roadmap for Future Internet infrastructures" explored a roadmap for the further evolution of Future Internet infrastructures in Europe, which takes into account socio-economic as well as technological requirements. The basis for the discussion was a roadmap report proposed by INFINITY, an FI-PPP Support Action project focusing on FI infrastructures. The audience seemed to be particularly interested in the XiPi platform, which was as a great opportunity to publicize user's experimentations based on one or more infrastructures. A final dialogue with the audience confirmed that companies accessing phase 3 of the FI-PPP framework would particularly benefit from XiPi and its diverse use cases.

The final session for the day, "Future Internet at the crossroads of content, media, networks and creativity", organized by the FI-CONTENT 2 project, tackled main platforms and specific enablers being developed in Smart Cities, connected television and pervasive games domains. The FI-Content trials are being developed across Europe in a set of open platforms that SMEs and developers can use to quickly develop applications and services for the marketplace.

ECFI exhibition: smart energy demo at the FINESCE stand

FI-WARE session on Open APIs

On the second conference day, the FI-WARE session on "Open APIs and Open Minds – Success stories of today, opportunities for tomorrow" addressed the elements in the title via three subsessions: Open APIs as one of the elements of the available results reflecting the technical part that supports the FI-WARE philosophy; Open Minds and success stories of today ranging from the suppliers to the real users and players of the innovation ecosystem as well as opportunities for tomorrow providing information on the coming opportunities to become part of the FI-PPP community.

In parallel a session on "Future Internet – Enabling opportunities for vertical application sectors" set the stage for a productive discussion between the stakeholders from ICT and vertical application sectors using, and planning to use, the services and facilities of the future communications network infrastructures. A key theme of the session was to identify the opportunities for supported ICT cross-sector collaborative research in FI-PPP Phase 3 and planned Open Calls for developers of innovative applications.

The third parallel session on "Business models for the use of Future Internet technologies was organized by the FI-PPP Exploitation and Business Modeling Working Group. It explored alternative business models for the exploitation of Future Internet technologies that enable the virtualization of business from product development to marketing and consumer support. Interesting questions came out of the debate. In particular on how to best assess and define Cloud services, as some services delivered in the Cloud do not necessarily need to be in it.

FI-PPP results in the ECFI exhibition

Between the conference sessions, the ECFI participants visited the exhibition, which highlighted the results achieved in the FI-PPP programme so far. In the exhibition eight FI-PPP projects demonstrated cutting-edge research results on the European Internet infrastructures and services of the future. In addition an FI-PPP info desk offered the attendees information about the event as well as the FI-PPP programme in general.

Further information
on the 1st European Conference on the Future Internet is available at
http://www.ecfi.eu/Brussels2014/

News in brief

EU court backs 'right to be forgotten' against Google

Members of the European Court of Justice (Photo: Court of Justice of the European Union)

On 13 May 2014, the European Court of Justice ruled that Google must amend some search results at the request of ordinary people in order to comply with the so-called "right to be forgotten". Links to "irrelevant" and outdated data should be erased on request, said the court.

The test case privacy ruling by the European Union's court of justice against Google Spain was brought by a Spanish man, Mario Costeja González, after he failed to secure the deletion of an auction notice of his repossessed home dating from 1998 on the website of a mass circulation newspaper in Catalonia. Mr Costeja González argued that the matter, in which his house had been auctioned to recover his social security debts, had been resolved and should no longer be linked to him whenever his name was searched on Google.

The European court judges ruled that under existing EU data protection laws Google has to erase links to two pages on La Vanguardia's website from the results that are produced when Mr Costeja González's name is put into the search engine. The European judges made it clear that in their view the EU data protection directive already established a "right to be forgotten".

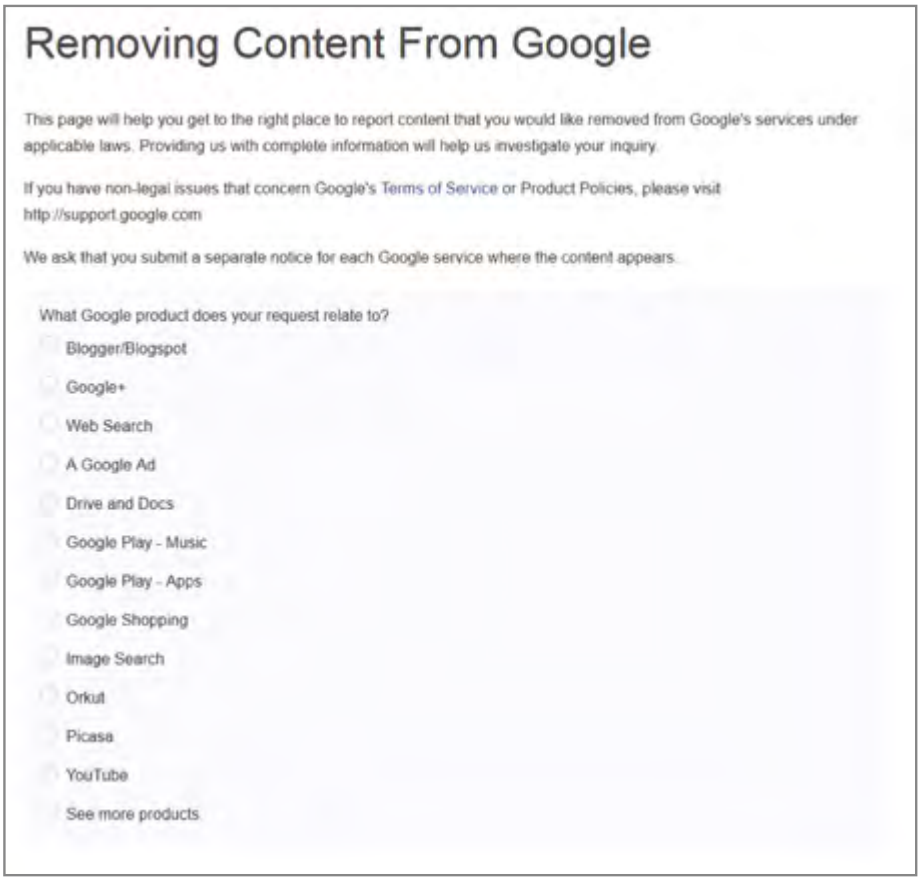
The judges said the data that had to be erased could "appear to be inadequate, irrelevant or no longer relevant or excessive ... in the light of the time that had elapsed". They added that even accurate data that had been lawfully published initially could "in the course of time become incompatible with the directive".

The ruling establishes that a search engine like Google must be regarded as a "data controller" under the data protection laws in those EU countries where it establishes a branch to promote and sell advertising.

The case is the first of more than 200 cases against Google in which Spanish citizens want the search engine to delete personal information about them from their search results.

Responding to the court rule, Google set up a form for requesting the removal of content from any Google Web service. Content will only be removed for Google services in the 28 EU member states as well as Iceland, Norway, Liechtenstein, and Switzerland. Within one day, Google received about 12,000 requests for content removal

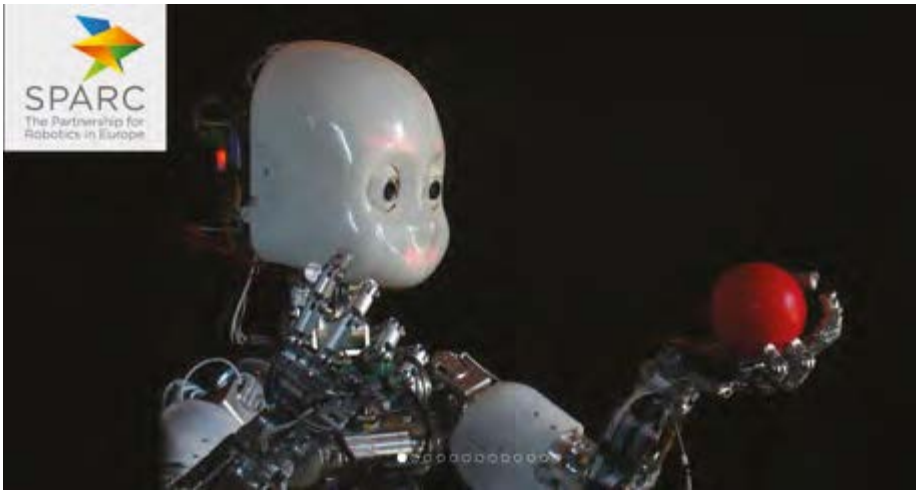
- Website of the European Court of Justice – http://curia.europa.eu
- Google form for content removal – https://support.google.com/legal/troubleshooter/1114905?rd=1&hl=en



Google form for content removal

European partnership for robotics launched

The European Commission and 180 companies and research organisations launched the world's largest civilian research and innovation programme in robotics in June 2014. The programme is called SPARC and runs under the umbrella of the euRobotics association. Covering manufacturing, agriculture, health, transport, civil security and households, the initiative is the EU's industrial policy effort to strengthen Europe's position in the global robotics market, which is estimated to have a volume of €60 billion per year by 2020. The EC expects this initiative to create over 240,000 jobs in Europe, and increase Europe's share of the global robotics market to 42%, which would mean a boost of €4 billion per year. The European Commission will invest 700 million euro and euRobotics 2.1 billion euro.



http://sparc-robotics.eu

Emotional robot presented in Japan

On 5 June 2014, the SoftBank Group unveiled a robot called Pepper, which the Japanese company says can read human emotions. Pepper uses an "emotional engine" and a cloud-based artificial intelligence system that allows it to analyse gestures, expressions and voice tones. The firm said people could communicate with it "just like they would with friends and family". According to SoftBank, it can also perform various other social tasks, like making jokes, dancing and amusing people thanks to a wide variety of entertainment capabilities.

Pepper will go on public sale in February 2015 for a base price of 198,000 yen (1,420 euro).

http://www.softbank.jp/en/corp/group/sbm/news/press/2014/20140605_01/

Memorandum signed for secure network communication in Europe

On 24 June 2014, major European communication technology companies signed a memorandum of understanding on secure network technologies for Europe. At a conference in Berlin, ADVA Optical Networking, Alcatel-Lucent, Nokia Siemens Networks, Orange and Deutsche Telekom Laboratories agreed to coordinate their joint research efforts for a secure, robust, and reliable network within the SASER project for "Safe and Secure European Routing". SASER is a flagship project under Celtic-Plus, the EUREKA Cluster for a Smart Connected World.

http://www.celtic-plus.eu/Projects/Celtic-Plus-Projects/2011/SASER/saser-default.asp

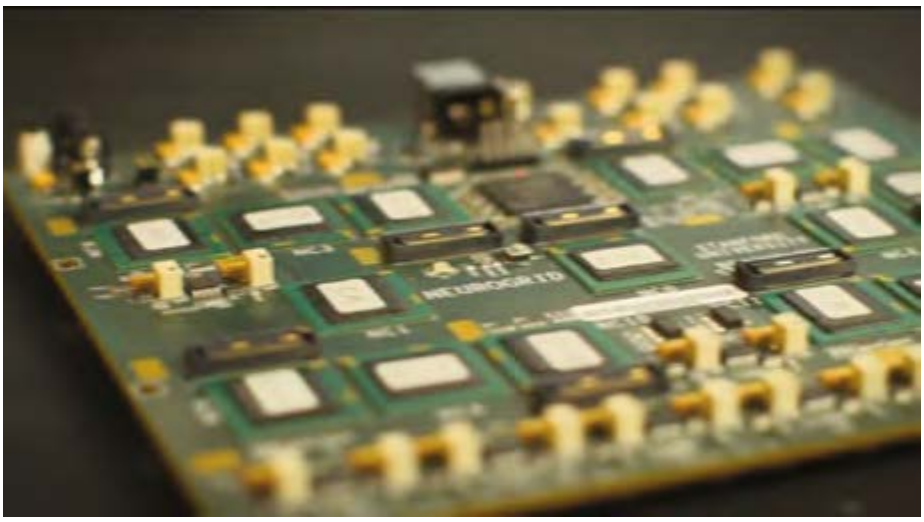
After signing the SASER memorandum of understanding (from left): Dr. Andreas Leven (Alcatel-Lucent), Christoph Glingener (CTO of ADVA), Dr. Georg Schütte (BMBF – German ministry for education and research), Alain Maloberti (Senior VP Network, Orange), Dr. Hermann Rodler (Managing Director, NSN Germany), Cornelia Rogall-Grothe (State Secretary, BMI – German ministry of the interior), Jacques Magen (Chairman of Celtic-Plus), and Wilhelm Dresselhaus (CEO of Alcatel-Lucent Germany).

US researchers create microchip imitating human brain

Stanford bioengineers have developed faster, more energy-efficient microchips based on the human brain – 9,000 times faster and using significantly less power than a typical PC. The researchers expect their microchips to enable advances in robotics and a new way of understanding the brain. The Stanford scientists are working on the development of prosthetic limbs that would be controlled by a Neurogrid-like chip. The vision is that a chip as fast and efficient as the human brain could drive artificial limbs as fast as natural limbs.

In comparison to the brain even today's PCs are very slow. The modest cortex of a mouse, for instance, operates 9,000 times faster than a personal computer simulation of its functions. In addition, the PC takes 40,000 times more power to run, according to the Stanford researchers.

In order to address this challenge, the Stanford team has developed Neurogrid, a circuit board consisting of 16 custom-designed "Neurocore" chips. Together, these 16 chips can simulate one million neurons and billions of synaptic connections. The team designed these chips with power efficiency in mind. Their strategy was to enable certain synapses to share hardware circuits. Neurogrid is a device about the size of an iPad that can simulate orders of magnitude more neurons and synapses than other brain mimics on the power it takes to run a tablet computer.



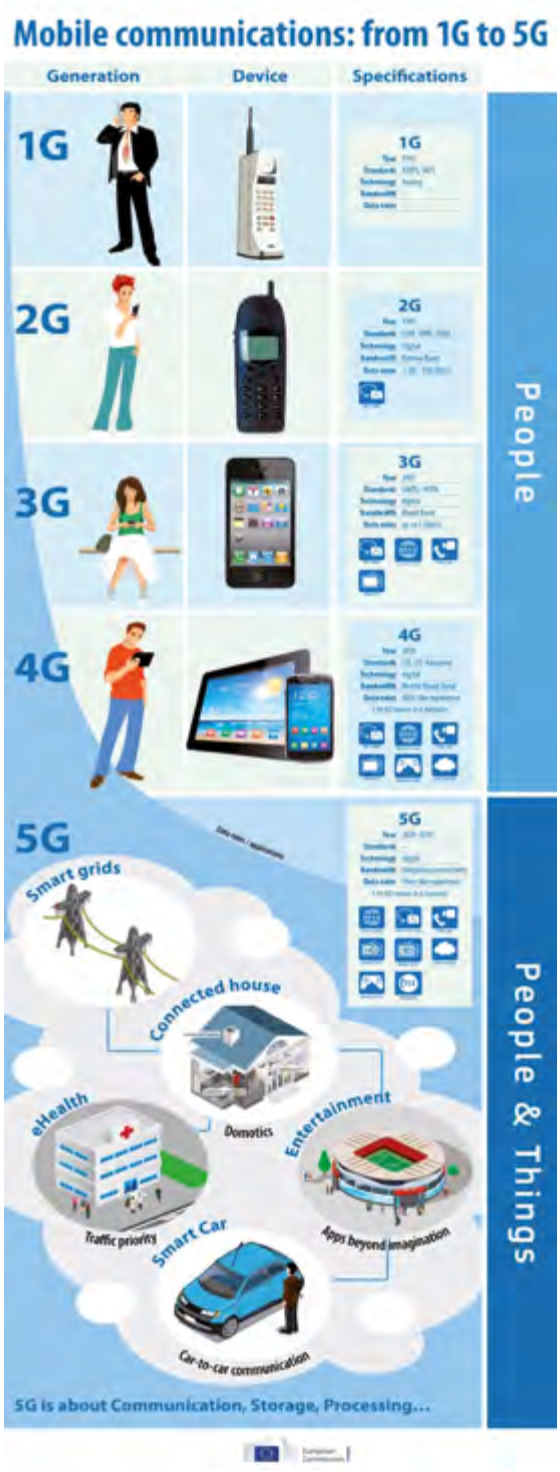
The Stanford researchers claim that Neurogrid is far more cost-effective for simulating neurons than alternative projects in the US and Europe on simulating the brain. However, each of the current million-neuron Neurogrid circuit boards still cost about $40,000 (almost €30,000). The Stanford team envisages dramatic cost reductions, suggesting that the cost for a million-neuron board could be reduced to $400 a copy, which would make numerous applications affordable. Even then, the human brain has 80,000 times more neurons than Neurogrid while consuming only three times as much power.

The work of the Stanford researchers is funded under a five-year grant by the US National Institutes of Health (NIH).

http://news.stanford.edu/news/2014/april/neurogrid-boahen-engineering-042814.html

5G agreement between the European Commission and South Korea

Mun-Kee Choi, South Korea's Minister of Science, ICT and Future Planning, and Neelie Kroes, EC Vice-President for the Digital Agenda, at the 5G signature ceremony in Seoul



On 16 June 2014, the European Commission and the South Korean government signed an agreement in Seoul on a collaboration in developing 5G mobile technologies. Neelie Kroes, Vice-President of the European Commission for the Digital Agenda, and Mr Mun-Kee Choi, South Korea's Minister of Science, ICT and Future Planning, have agreed to work towards a global definition of 5G and to cooperate in 5G research. They also agreed on the need for harmonized radio spectrum to ensure global interoperability and on the preparation of global standards for 5G.

Both sides signed a Joint Declaration on Strategic Cooperation in Information Communications Technology (ICT) and 5G, agreeing to deepen discussions in the area of Net Futures (network and communications, 5G, cloud computing), an element of on-going relations on ICT topics. Both sides will also work towards a coordinated call for research project proposals, to be launched in 2016. An industry memorandum of understanding will be signed between the EU's 5G Infrastructure Association – whose members include Alcatel-Lucent, Atos, Deutsche Telekom, Ericsson, Nokia, Orange, Telecom Italia, Telenor and Telefonica – and South Korea's 5G Forum.

Vice President @Neelie KroesEU said: "5G will become the new lifeblood of the digital economy and digital society once it is established. Both Europe and South Korea recognise this. This is the first time ever that public authorities have joined together in this way, with the support of private industry, to push forward the process of standardisation. Today's declaration signals our commitment to being global digital leaders."

5G is a new network technology and infrastructure that will bring the capacities needed to cope with the massive growth in the use of communication – especially wireless – technologies by humans and by machines. According to the EC, 5G won't just be faster, it will bring new functionalities and applications with high social and economic value.

The two sides reaffirmed to strengthen the agreement of the November 2013 summit meeting, where both sides agreed on promoting R&D collaboration in the area of ICT. As a follow up, both sides decided to set up a Korea-EU ICT working group to prepare for ICT R&D cooperation as well as relevant policy discussions in the areas of 5G, Cloud and Internet of Things, and eventually to launch jointly funded R&D programmes in 2016-2017.

http://europa.eu/rapid/press-release_IP-14-680_en.htm

Security by conditioning

Creative approaches to safer password management

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Hacker attacks have become more frequent and widespread in recent years. One of the main targets: weak passwords. Many passwords still do not even hold up against dictionary attacks, despite corporate IT security policies, user education, and password management software. Recently, some peculiar suggestions for better password management focusing on the weakest link – the user – have emerged.

Popular passwords – especially among hackers

It is amazing that even 25 years after the launch of the World Wide Web, a significant number of users seem to be still largely ignorant to the perils awaiting them in the depths of the Internet. The top three passwords in 2013, according to password management company SplashData, were "123456", "password", and "12345678".

Their major merit is that they are easy to remember, which at the same time means easy to crack in split-seconds. The other seven passwords on the top ten list for 2013 are not particularly imaginative either (quotation marks are not part of the password): 4. "qwerty'', 5. "abc123" 6. "123456789", 7. "111111", 8. "1234567", 9. "iloveyou" (it's mutual – hackers love you too!), and 10. "adobe123".

So besides "iloveyou" and a few other simple groups of characters, the most popular method is to count from 1 to x; x depending on how long the password should be.

Looking at this list could make IT security experts despair about the carelessness of users. Nevertheless, some took it as a challenge and thought of novel ways for encouraging users to pick stronger passwords.

« L0$abP3#x?dbJw » versus long pass phrases

The traditional way to safer passwords has been asking users to create passwords that contain a combination of letters, numbers, and special characters. While this method might lead to more secure passwords, it is at the same time not highly popular with the average user, as only a brainiac could memorise randomly generated passwords like "L0$abP3#x?dbJw".

Thus, the University of Stanford has chosen a different approach, which offers users more flexibility and tries to find a better balance between password complexity and usability. The Stanford policy gives students, faculty, and staff a choice: they can go either for short passwords, .e.g. eight characters, if their passwords contain a mix of upper- and lower-case letters, numbers, and symbols. Or they can go for less complex but longer passcodes.

From a length of 20 characters or more, passwords can contain any character type an end user wants, including all lower case. The Stanford quick guide gives the following example: "orange eagle key shoe", which has 21 characters, including spaces, and is easier to remember than a randomly generated complex password.

Conditioning the users

A completely different approach has been proposed by Lance James, head of Cyber Intelligence at Deloitte & Touche. He believes that people can be programmed and wants to condition users towards a more disciplined behaviour in setting passwords.

He gives the following example for setting an incentive for stronger passwords based on cost and time: A user enters the password "test123@#". An algorithm in the password administration system calculates the probable time for offline cracking of the password, in the example case about 4.5 days. The user will then receive an automated confirmation of his password, which at the same time says that his password expires in 3 days. When the time is up, an automated mail will ask him to give a new password.

In order to avoid the permanent annoyance of having to change his password every 3 days, the user might be triggered through this negative incentive to come up with a stronger password with a longer life time.

Mr James calls this "Pavlovian password management" referring to classical conditioning developed by Russian physiologist Ivan Petrovich Pavlov. Unfortunately, the catchy reference to Pavlov is wrong. The essence of classical conditioning, which Pavlov experimentally proved in experiments with dogs, is the combination of a conditioned stimulus, e.g., the sound of a bell, with an unconditioned, mostly neutral stimulus, e.g., the taste of food. After a couple of repetitions, the conditioned stimulus will lead to a conditional response, i.e. when the bell rings, the dog will salivate, even if there is no food.

What Mr James proposes is rather operant conditioning, made popular by the American psychologist B. F. Skinner, which is based on reinforcement and punishment for changing behaviour. Thus, the correct term for his concept should be rather "Skinnerian password management".

Simulating success for hackers

Another very different approach has been developed by Fraunhofer with its iMobileSitter application for iPhone and Android for protecting master passwords of a secure password storage (http://www.imobilesitter.com/index_en.php). Hackers are always "successful" and see the data in the storage, no matter what they enter as master password. The trick is that they only see the correct data if the password was correct. In all other cases the data is incorrect, but the hackers would not know. This makes it impossible for hackers to try different passwords until they are successful.

The cases above were only a few examples of some inventive methods to improve security in case of bad password behaviour of the users. Anybody with another creative solution for improving passwords is invited to send it to message@eurescom.eu – we will publish the best and most original proposals on the Eurescom Blog at https://blog.eurescom.eu.

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