2/2013

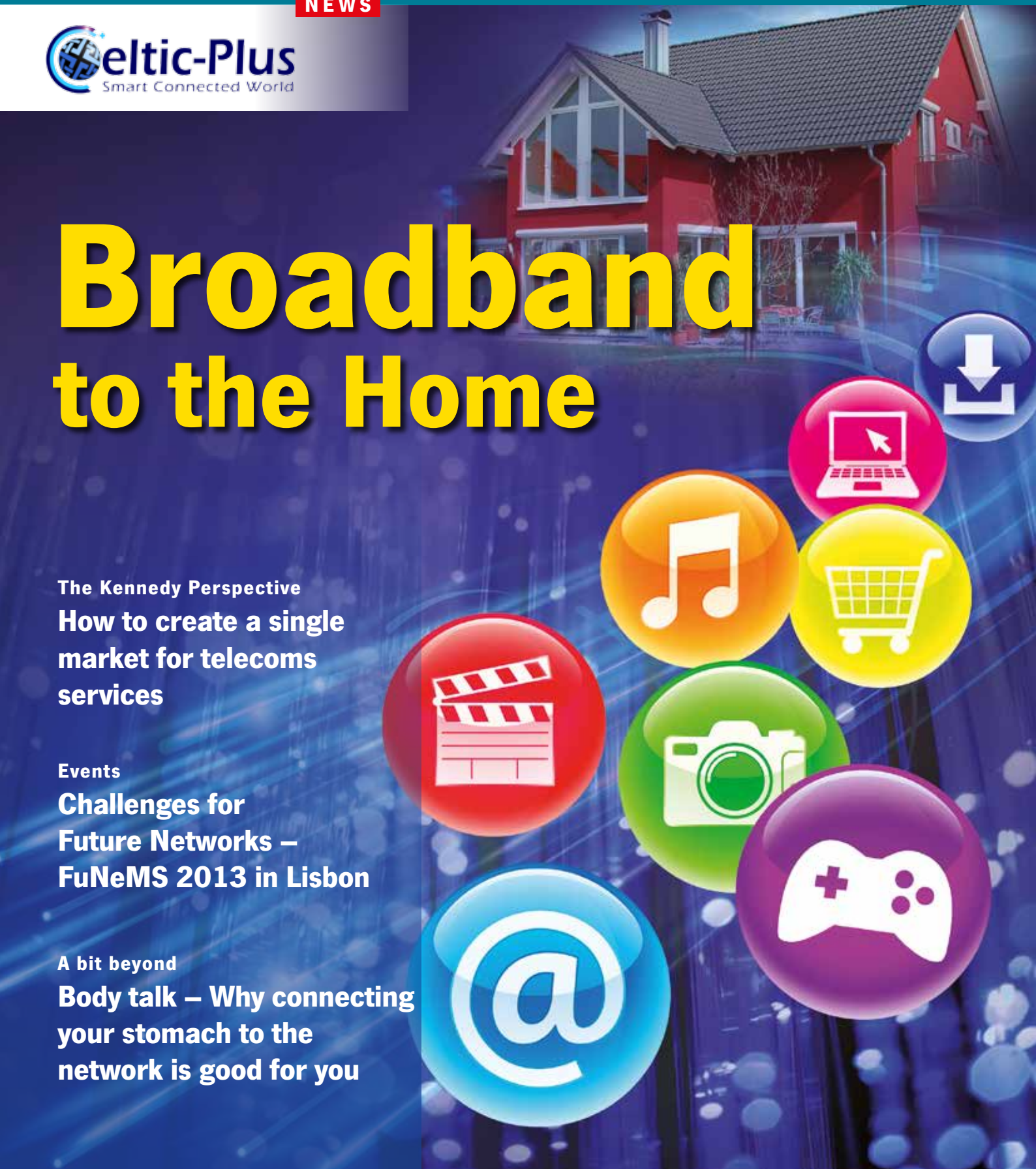
EURESCOM mess@ge

The magazine for telecom insiders

NEWS

Celtic-Plus
Smart Connected World

Broadband to the Home



The Kennedy Perspective

How to create a single market for telecoms services

Events

Challenges for Future Networks – FuNeMS 2013 in Lisbon

A bit beyond

Body talk – Why connecting your stomach to the network is good for you

Net!Works

Net!Works Event 2013 "Implementing Horizon 2020" and General Assembly

29 October 2013

Brussels, Bedford hotel

This year's Net!Works event and GA will inform and make several important decisions about a number of changes regarding the future of Net!Works:

- In preparation of Horizon 2020 Net!Works is in discussions with ISI ETP, planning a change in the ETP landscape that, if successful, will be for members' approval at this event.
- In addition, Net!Works is contributing to the proposed launch of a Public-Private-Partnership on 5G Infrastructure in Horizon 2020, which is intended to be linked to the Net!Works ETP / the new ETP set-up respectively.
- A new Steering Board will be elected at this event. The organisations in the new Steering Board will become members of the 5G PPP Association, which will sign the PPP contract with the EU Commission. Therefore, the Net!Works Event 2013 will be an essential milestone for the implementation of the 5G PPP in Horizon 2020

We would like to encourage your participation in the event in order to participate actively in shaping the research environment in Horizon 2020. A strong participation from the Net!Works membership is important.

Further information and registration

www.networks-etp.eu

All participants have to register and pay the registration fee before the event. For queries please contact Ms. Ellen Tallås, tallas@eurescom.eu

Funding Opportunity for European R&D Projects

Celtic-Plus Autumn Call for Proposals – Deadline: 14 October 2013

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

Eligible topical areas

Get Connected

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

While Connected

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

Future Internet relations

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

Green-Internet relations

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

User friendly call process

The Celtic-Plus programme gives proposers the opportunity to submit proposals twice in the year – Spring Call and the Autumn Call. **The Autumn Call submission deadline is 14 October 2013.** Celtic-Plus has an accelerated one-stage call process to ensure the shortest possible time between proposal submission and start of selected projects.

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

Further information

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

Celtic-Plus
Smart Connected World

www.celticplus.eu

Dear readers,

Broadband to the home has been an important topic for a long time. Connecting every household in Europe to the Internet via a high-speed broadband connection is still a political goal that is high on the European agenda. Besides fixed-line broadband access via copper or fibre, alternative access technologies have gained attention and importance, especially wireless technologies and satellite communication. In the cover theme of this issue, we would like to present a snapshot of recent trends in the different areas of broadband to the home.

In the introductory article, Eurescom's broadband expert Adam Kapovits gives an overview on the status of broadband to the home in Europe. In the next article, a team of experts from Deutsche Telekom Laboratories explains the latest advances of broadband access to homes using the IEEE 802.11x technology. Nicolas Chuberre from Thales Alenia Space and Oliver Johnson from Point Topic explain in their contribution how satellite broadband can help in meeting the objectives of the Digital Agenda for in Europe. Finally, we feature a more technical article from Celtic-Plus project HFCC/G.fast on Hybrid Fibre-Copper Connectivity using G.fast, which shows that the capacity of copper for achieving higher access speeds has not yet reached its limit.

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

Broadband to the home is closely connected to the Internet, a topic that has received widespread attention in European research, not the least through the Future Internet Public-Private Partnership (FI-PPP), a programme aimed at supporting the sustainability of Europe's economy through the smart use of ICT. Currently, the programme has a call for project proposals open, FI-PPP Call 3, and Eurescom mess@ge editor Uwe Herzog, who is himself involved in two FI-PPP projects, provides an overview on the call.

This issue also includes a variety of further articles on different, ICT-related topics. See, for example, the new opinion article by Eurescom director David Kennedy in his column "The Kennedy Perspective" on how to create a single market for telecoms services. Or read the latest "A bit beyond" article and learn about the latest developments in body sensors and what challenges and opportunities this brings.

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

Milon Gupta
Editor-in-chief

Events calendar

3 – 4 October 2013
FI-PPP Call 3 Information Days
Brussels, Belgium
https://ec.europa.eu/digital-agenda/fi-ppp-phase-3

28 – 30 October 2013
NEM Summit 2013
Nantes, France
http://nem-summit.eu

29 October 2013
Net!Works Event 2013 "Implementing Horizon 2020" and General Assembly
Brussels, Belgium
http://www.networks-etp.eu

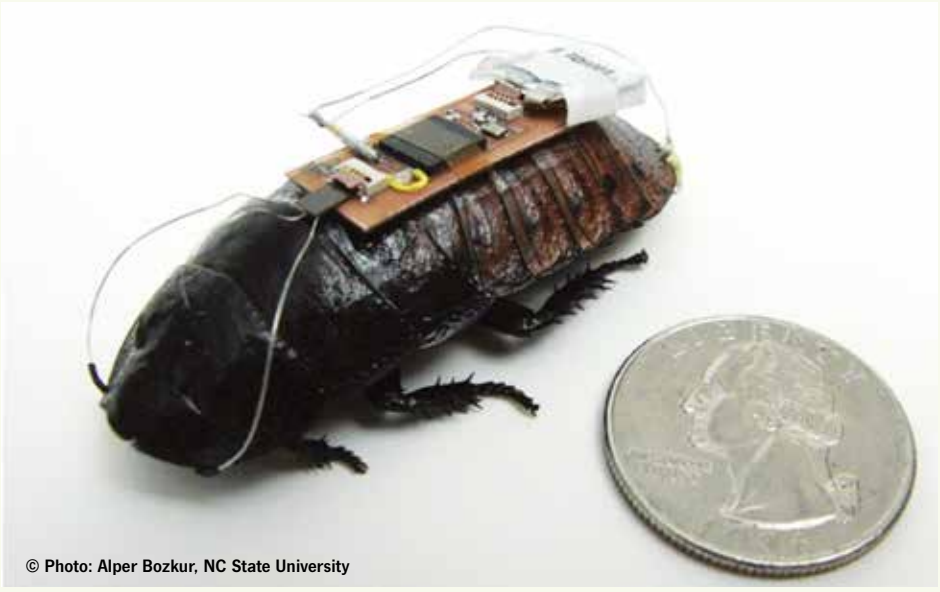
6 – 8 November 2013
ICT 2013 Event
Vilnius, Lithuania
https://ec.europa.eu/digital-agenda/en/ict-2013

28 November 2013
Celtic-Plus Proposers' Day
Stockholm Kista, Sweden
http://www.celticplus.eu/Events/Proposerday-Sweden/programme-PD-Sweden.asp

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

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

Sn@pshot
Robo-Roach

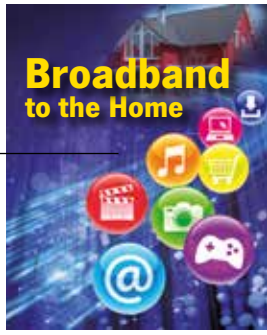


© Photo: Alper Bozkur, NC State University

In July 2013, a novel biobot was presented in Osaka, Japan, at the 35th annual conference of the IEEE Engineering in Medicine and Biology Society: the first remote-controlled cockroach cyborg. The technique was developed by Dr. Alper Bozkurt, assistant professor for electrical and computer engineering at North Carolina State University. His solution uses an electronic interface to remotely steer cockroaches.

The challenge was to develop a cost-effective and electrically safe way to control the roaches, in order to ensure the roaches operate within defined parameters – such as a disaster site – and to steer the roaches to specific areas of interest.
Further information: http://www.ece.ncsu.edu/news/21712/

Contents



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How to create a single market for telecoms services

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I have noticed with interest that there is now a potentially stressful agreement between two of the European Commissioners about opening up the European market for telecommunications services.

Neelie Kroes, the champion of the digital agenda, promotes a true single market for telecommunications services by making the point that currently telecommunication services are managed and regulated within each country of the EC, and "international" arrangements kick in if you travel to another European country. She describes a true single market as one where telecoms operators can both compete and consolidate where necessary, without experiencing diverse regulation and complexities within the single market.

Her competition commissioner colleague, Joaquin Almunia, actually agrees but raised temperatures by referring to Ms Kroes's plans as "unambitious". He was quoted in an FT report saying there should be one European telecoms regulator to replace the 28 national ones. Are we getting a European version of good cop – bad cop here?

The issue of roaming agreements

Anyone who travels in Europe will fully agree with Ms Kroes that the roaming charges are excessive and frustrating. Most of us are now trained to kill our data services until we are safely within the confines of a friendly Wi-Fi network.

But where is the actual problem? Well, in principle it is the use of someone else's resources. When I am at home I download data through my providers' network, but when I am abroad I download data through a third-party network. Roaming agreements created for symmetrical mobile telephony were not designed for the data services, so new agreements have been formed.

If the nature of these agreements is the problem, then limiting data roaming costs will not necessarily solve the problem, as service providers will be forced to have more creative agreements to obtain the lower costs – maybe at the expense of more time and speed restrictions.

Why market competition is not the problem

In some ways, competition could be considered the problem, but not the way you think. There is sufficient diversity of network and service providers and operators in most European countries. Actually, in some countries the competition rules have resulted in an over-provisioning of parallel networks making many of them less than optimal in terms of the size of market they are addressing.

So if infrastructures and operators are not the problem, where do we need competition? I think the real lack of competition is rather in the area of regulations than on the market.

One regulator instead of 28 regulators?

We currently have an antiquated model of 28 national authorities insisting on national regulation. The possible competition for this is a single European regulator, and this is the logical conclusion of having a single market. A single market with 28 different policies, licencing structures and spectrum allocations is not a consistent market by any means.

However, as the 28 individual states are all at varying levels of maturity in terms of their telecoms markets – some have regulated for fibre, some are still promoting basic connectivity roll out – the possibility to treat the European market as one entity is not viable in the short term.

Another critical factor that cannot be overlooked is that the respective national authorities have been taxing the telecoms market for the spectrum allocations for many years now and they will be very reluctant to let this money earning scheme fall into European hands.

Outlook

What is the way forward here? Well, sooner or later we must establish a true single market for telecoms services in Europe. This is what I understand as the essence of the debate between the two commissioners: is it sooner (Almunia) or will it be later (Kroes)?

Short-term regulations to reduce costs are not wrong, but as Ms Kroes herself says: "it is by creating a single market that we will end roaming surcharges". In fact, I would go further on this and say that a European regulator must be established and must have a 10-year plan for harmonisation.

However, given the status quo, I think that a more imaginative approach is needed to make this happen. National policies and priorities to ensure their infrastructures are healthy and competitive must be supported in the model. Maybe we need an approach where the revenues gained from European level licences and spectrum allocations can be deducted from national contributions to the EC in a proportional way.

And the competition directorate must now decide what level of pan-European operation will be allowed as previous competition "improvement" decisions can now be seen as over-diluting markets to the benefit of nobody. A single market where consolidation and co-operation agreements will be deemed as limiting competition will not work either. We need a better balance where consolidation and competition are in proportion to the market size and the societal needs. Are our telecoms authorities brave enough to look for this new balance, or will European telecoms always be fragmented and lagging?

Further information:
Speech by Neelie Kroes on a single market for telecommunications services – http://europa.eu/rapid/press-release_SPEECH-13-622_en.htm

Broadband to the home – An overview

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Investments of about 82 billion euro will be needed in order to reach the EU's broadband targets by 2020.

What access speeds are necessary for a reasonable user experience for the various services? For basic ones, such as e-mail, voice over IP (VoIP) telephony, streaming radio, web browsing and short videos moderate speeds (≤ 1 Mbps) would suffice. However, streaming feature movies does require already slightly more and HD content would demand at least 4 Mbps [1], mostly however 8-15 Mbps [2].

If we want to get the full picture we need however to consider the whole household including all concurrent users – humans, but increasingly also machines/devices – and their usage patterns. If there are four or more users – plus devices – at a time, then even at light use – i.e. basic functions only, like e-mail, web surfing, or basic streaming video – a 6-15 Mbps connection might be necessary [3].

For certain services, including video conferencing, the upload speed becomes an important factor besides the download speed. Finally, it has to be said that bandwidth is not the only parameter affecting user experience. For certain services more than simply bandwidth needs to be considered, and latency might play an important role in that. For example video conferencing and online gaming are two applications that are particularly sensitive to latency.

In the following an overview of the current situation regarding broadband access is provided, with a focus on fixed access.

Connection speed – global situation and regional highlights

The most recent Akamai report on the State of the Internet [4] reports a global average of 3.1 Mbps connection speed (up from 2.9 Mbps in Q4/2012). South Korea, Japan and Hong Kong are the leading countries concerning average connection speed, with figures of 14.2, 11.7 and 10.9 Mbps, respectively. Notably, there are 6 European countries among the top 10 countries in the world. These are Switzerland, Netherlands, Latvia, Czech Republic, Sweden and Denmark, three of which also showed a particularly strong increase of more than 10% in the last quarter. The average connection speed in Switzerland is also just above the 10 Mbps threshold, which Akamai calls "high broadband".

Globally the average peak connection speed has reached 18.4 Mbps (up 9.2% in the last quarter). Again 6 European countries are among the top ten in the world. Hong Kong and Japan are at the lead with 63.6 and 50.0 Mbps, respectively. Then comes Romania with 47.9 Mbps average peak connection speed, surpassing South Korea standing at 44.8. Latvia, Switzerland, Bulgaria, Netherlands and Belgium are the other five European countries among the top regarding this measure, all of which showing at least 10% growth quarter on quarter, but often actually a lot more.

Broadband trends

Global fixed broadband access numbers show a steady growth despite all economic troubles, and have surpassed the 650 million figure (see figure 1).

Looking more closely how the various technologies fare in delivering those broadband access connections, FTTx shows a very remarkable, more than 10% growth on a quarter on quarter basis, followed by FTTH, somewhat below 5% (figure 2).

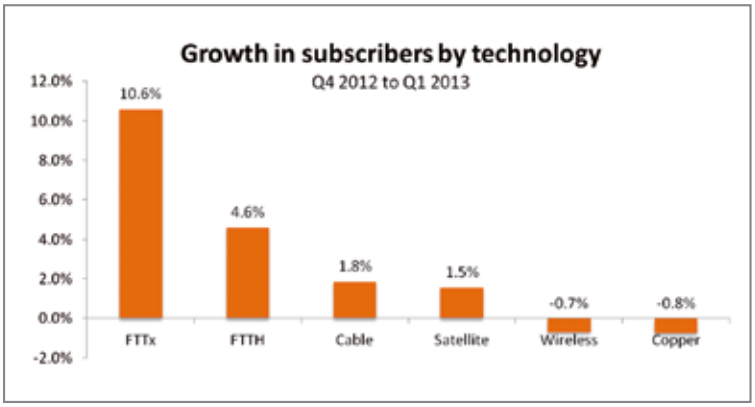

Figure 1: Number of fixed broadband subscribers Q1/2013 (source: Point Topic research)

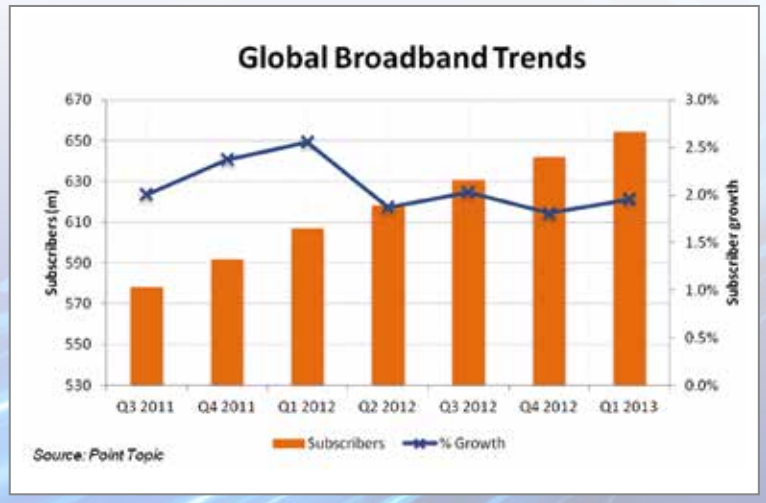

Figure 2: Fixed broadband subscriber numbers by technology Q1/2013 (source: Point Topic research)

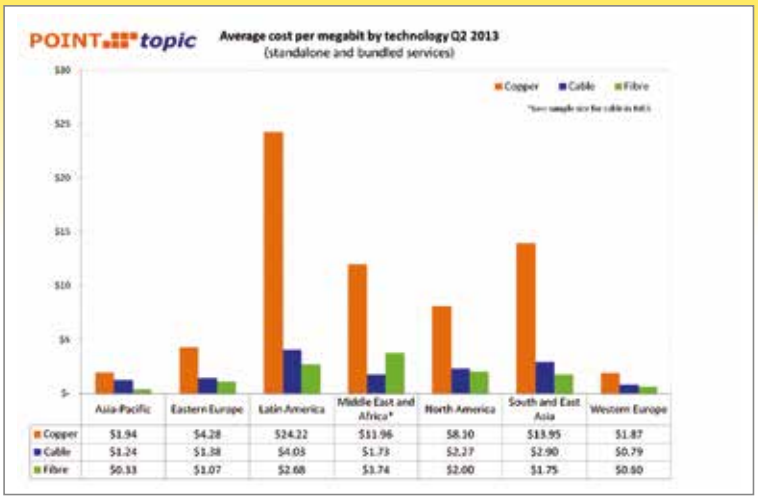

Figure 3: Residential broadband – average cost per megabit by technology Q2/2013 (source: Point Topic research)

Cable and satellite are both below 2%, whilst traditional DSL (copper based delivery) is actually declining.

Finally, it is interesting to see how the average cost per megabit by technology compare in the different regions of the world. Once again Point Topic has interesting insight in this regard summarised in figure 3.

The megabit costs in Europe compare very favourably with regard to the rest of the world. Basically, Western Europe is very similar to Asia-Pacific – the costs are the lowest in those two regions of the world. Eastern Europe follows them very closely, whilst the costs in all other regions – including North America – are considerably higher. It is also interesting to see how the costs per megabit by technologies fare copper being the most expensive, and fibre the least – except in one single geographic area, Middle East and Africa.

Future outlook – further investment needed

Let's look at the investments needed to realise the next stages of broadband to the home. As part of the Digital Agenda programme the European Union has set ambitious targets for the availability of broadband services. By 2020 all European homes should have access to broadband services providing download speeds of 30 Mbps or above, known as Next Generation Access broadband or NGA.

Even considering the relatively advanced situation in most of Europe as highlighted earlier this target is ambitious and the cost of achieving this will be high, but the societal impact and transformation it brings and the economic opportunities it opens are expected to outweigh it by far. A recently released study by Point Topic gives detailed insight into the investment requirements. The results suggest that investments of about €82 billion will be needed in order to reach the objective of 100% NGA coverage.

This is much less than is often suggested. For example, the European Commission generally quotes a range of €180 to €270 billion as the cost of achieving all the Digital Agenda targets.

Of the €82 billion total cost it is estimated that 52 billion euro is needed for reaching the rural areas, accounting for 14% of the EU's homes. A further 22 billion euro is needed to cover semi-rural areas. Finally, 8 billion euro should be sufficient to bring NGA to all European cities, towns and suburbs – 148 million households, 71% of the total in Europe. This distribution creates a rural challenge, but also presents an urban opportunity by rolling out broadband in those big cities of Europe which still have limited NGA coverage. Figure 4 illustrates this and gives insight into specific country situations by providing a map highlighting particularly challenging areas and areas that should be easy to cover. Apparently, the biggest urban opportunities are almost all in the economically troubled countries of southern Europe, specifically Greece, Spain and Italy, and using that opportunity would help alleviating present economic problems.

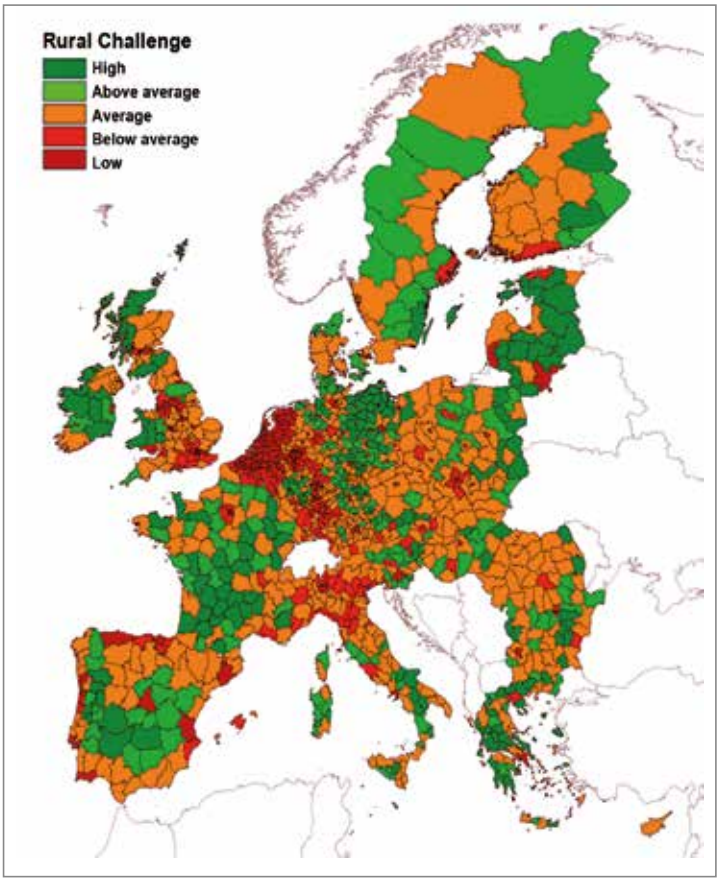

Figure 4: Europe's rural challenge broadband investment needs (source: Point Topic research)

Conclusion

Mobile Broadband growth is happening in spite of all the economic problems around, and broadband access shows a rather healthy growth in comparison to other sectors. A very interesting picture emerges regarding the cost per megabit by technology, giving a clear advantage to fibre (and to a lesser extent to cable) over copper. These cost figures put Europe in favourable light, as both Western and Eastern Europe are at the lead following Asia-Pacific. The information available clearly indicates that the broadband access market in Europe is a mature one. The ambitious target set in the Digital Agenda programme of the European Union for the availability of broadband services, namely that by 2020 all European homes should have access to broadband services providing download speeds of 30 Mbps or above, is an ambitious plan, but seems achievable.

References

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[2] http://en.wikipedia.org/wiki/Bit_rate
[3] http://www.fcc.gov/guides/household-broadband-guide
[4] http://www.akamai.com/stateoftheinternet

Broadband access to homes using IEEE 802.11x technology

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In today's highly interconnected information society, users are connected anytime and anywhere: at work, on the move, or at home. However, not all homes have a fixed broadband access due to various reasons, e.g. the roll-out of fibre or copper is too expensive, the lines are not capable of carrying high-speed Internet, or it is not allowed to install cables because of monument protection reasons.

Wireless technologies can help here, and different approaches exist. Long Term Evolution (LTE) is already in place and the roll-out is going on. IEEE 802.11x technology with its different topology and deployment options is another alternative. This article focuses on the IEEE 802.11x technology and presents suited solutions providing broadband wireless access to homes. Special focus will be on solutions that are already in place, like for instance radio relay links and mesh networks.

In some countries, the regulation stipulates the roll-out of broadband access. However, it is still very expensive to dig cables into the ground. Therefore some rural areas still have no connection to fixed high-speed broadband access networks and, thus, the Internet. Current approaches to fill this gap are available to provide broadband access via wireless technologies. One example is the LTE roll-out in Germany. LTE is a good solution not only for mobile broadband Internet access but also for fixed broadband Internet access, and several products are already on the market. A schematic representation is shown in the figure "Wireless DSL". LTE is a wireless access technology, therefore it is important to have in mind that it is a shared medium. The available bandwidth per user depends, for instance, on the number of bandwidth-consuming end-users, distance to the base station, and interference situation. The cell size of such a scenario is typically several kilometres.

IEEE 802.11x technologies

In certain scenarios IEEE 802.11x (WirelessLAN) is well suited to provide broadband wireless access to homes and can be seen as an alternative to LTE. This is due to the relatively cheap hardware, the flexibility, the wide distribution, and the acceptance of the technology. The family of the IEEE 802.11x technologies can cover a wide range of different use cases. Some of them will be highlighted in the following.

Long-distance coverage is not part of the WirelessLAN air interface. However, WirelessLAN can be used to bridge gaps, if it is used as radio relay/point-to-point transmission. Hence, broadband access can be brought to rural areas by setting-up radio relay chains – see figure "Radio Relay". This was investigated in various research and development projects by Fraunhofer Gesellschaft FOKUS. Out of the results a start-up was founded [1].

Mesh networks

Another scenario to bring broadband access to homes without fixed lines is to use mesh networks based on IEEE 802.11x (WirelessLAN) technologies, shown in figure "Mesh Network". The wireless mesh network acts as a backhaul with three different kinds of nodes: Mesh relay mesh, mesh Internet gateways, and mesh home gateways. The WirelessLAN backhaul, i.e. the connection between the mesh nodes, can either work on the same or a different frequency as the home network. Using a different frequency is the most suited approach, as the backhaul does not have to share and will not interfere with the bandwidth/frequency of the connected wireless home network.

A typical example is the interconnection of a village in a rural area. One or more homes have fixed Internet connections, which are shared with other homes by using a wireless mesh network. Therefore, the DSL routers at home also act as mesh Internet gateways. Mesh nodes are distributed in the village. Some of them are acting as local mesh home gateways and some act as mesh relay nodes. During the bootstrap, the network will configure itself. Special routing protocols will control the backhaul connectivity and will re-route traffic if needed. The performance of

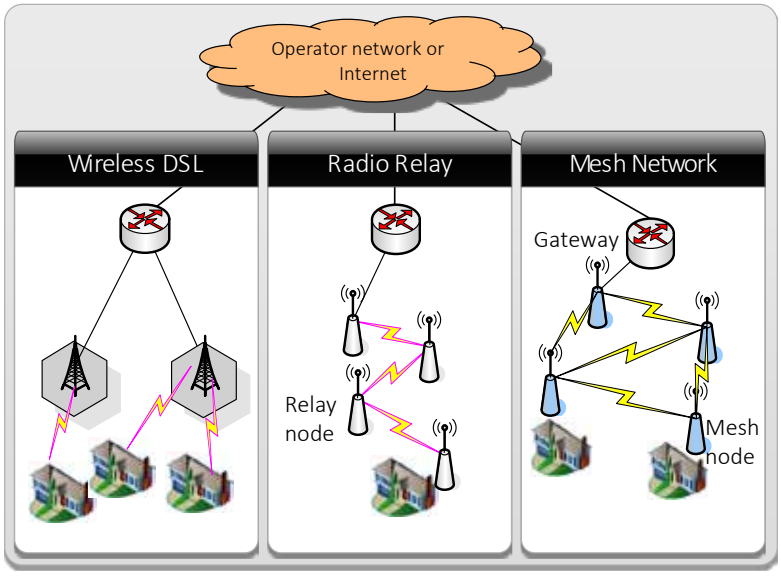

Figure: Concept overview for wireless DSL, relay links, and mesh networks

coverage and provided capacity is depending on the number of nodes deployed as well as the relation between mesh Internet gateways and pure mesh nodes. However, it is a wireless technology, and the bottleneck will be the air interface, as the wireless resources have to be shared. Wireless mesh networks are still a research topic. Nevertheless, some implementations already exist. Examples are: a public-private initiative in the USA [4] or a purely public initiative in Sundhausen, Thuringia – Germany, (here DSL-access was too expensive for inhabitants), or Nobel Laureate Meeting in Lindau, Bavaria – Germany (here cable connectivity was not allowed due to monument protection reasons), and others.

Additional concepts can optimise the traffic load in the mesh networks. One possibility is the use of Content Delivery Network (CDN) concepts as well as the introduction of local caches and an intelligent decision engine. Frequently used information can be cached locally and will only be downloaded through the gateway to the operator network/Internet once. Another possibility is the efficient aggregation of small packets before sending them into the backhaul [2] or the intelligent access control of the home gateway connection towards the mesh node [3].

Access point sharing via OpenFlow

Not certainly bound to rural areas is another approach, the sharing of an access point. Following the fon approach, neighbours can share one fixed broadband connection through intelligent splitting of the wireless traffic [5]. Through OpenFlow the WirelessLAN can serve and separate the involved parties. Certain throughput limits can be defined, to ensure a fair distribution of the available bandwidth. A typical example is: User Susan is the owner of the access, including an access point as well as the DSL connection. User Helen has an agreement with Susan; Helen will be able to consume a certain amount of bandwidth up to a defined limit. In case Helen is not using her complete bandwidth, Susan can use the whole bandwidth of her Internet connection. It is not necessarily needed to use OpenFlow for such a mechanism but we have proven in a research project, that OpenFlow is capable to solve the issue in an easy, flexible, and programmable way.

Conclusion

To summarise, WirelessLAN can be an alternative providing wireless broadband access towards homes in special cases. Even if there are already products and solutions available, many open issues are still under research. Other developments are already on product level. How to integrate and implement these concepts by network operators is mostly a question of the costs. A bigger roll-out and general use cases are hard to justify, because the presented solutions are too expensive. Private initiatives or local network providers can use the technologies to set up local installations filling the gap where fixed broadband access roll-out is too expensive, and wireless DSL is not available.

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Satellite broadband in Europe

Meeting the objectives of the Digital Agenda

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Increased speeds and equality of access are the key criteria and political motivators for broadband services. While in Europe's towns and cities, optical fibre networks are being deployed, citizens in rural areas are still struggling with narrowband connections, as illustrated by the EC's recently published Digital Agenda Scoreboard 2013. This is why the capabilities of satellite broadband solutions are being upgraded to address the current and forecasted unserved areas.

According to studies by Broadband Consultancy firm Point Topic, 33 million European homes will be unable to obtain superfast broadband (30Mbps) by 2020. This is illustrated in the figure below. The Council of the Regions has estimated that meeting the EU's Digital Agenda targets without satellite technology will cost as much as 270 billion euro.

This represents a significant market opportunity for existing satellite broadband solutions but also in the future – provided that the technology matches the increased bandwidth demand.

SatCom solutions for high-speed broadband

The European satellite communication (SatCom) industry, with the support of space agencies and the European Commission, is spending a lot of efforts to develop and deploy satellite broadband solutions to offer ubiquitous broadband, especially to remote and rural areas throughout the EU at subscription prices and performances comparable to ADSL. The industry roadmap is illustrated in the table below.

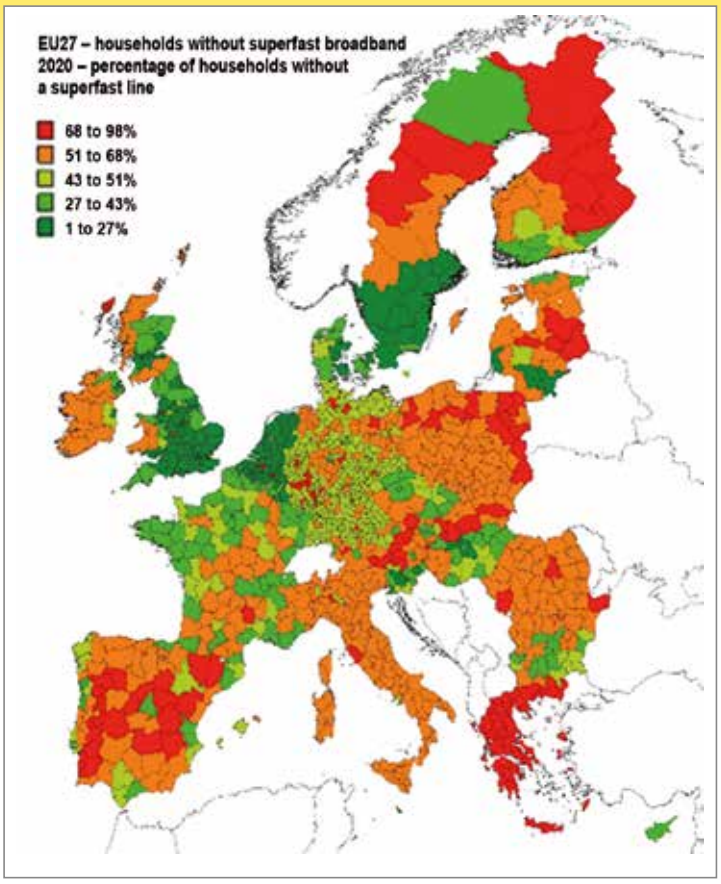

Figure: Households with superfast broadband in the EU27

The roadmap is driven by the need to reduce both the monthly subscription fee and the connection fee. The connection fee includes customer premise equipment and installation. The target is to achieve a CAPEX of 1 to 2 million euro per Gbps transmitted and a connection fee, including installation, of less than 150 euro per subscriber.

Capacity is a major driver to reduce service price offerings, it is also needed to meet the increasing bandwidth demand. This requires a frequency re-use scheme enabled by multi-beam antenna systems, additional spectrum chunks currently shared with other service (e.g. shared Ka band) thanks to cognitive radio techniques, and the exploitation of new bands (e.g. Q/V), especially for the feeder links.

In such a frequency pattern, the pointing accuracy, inter-beam interference as well as the attenuation due to atmospheric gas, clouds and rain become limiting factors for the capacity. Specific system features have been developed to address them.

TIMELINE	2005	2010	2015	2020
Generation	• Ku-band satellites	• 1st generation multi beam Ka-band satellites	• 2nd generation multi beam Ka-band satellites	• 3rd generation multi beam Ka-band satellites
Service capability	• Internet broadband	• High speed broadband internet	• Superfast broadband internet	• Very high speed broadband internet
Maximum service rate	• 2-3 Mbps	• ~10-20 Mbps	• ~30-50 Mbps	• ~100 Mbps
Number of users per satellite	• ~ 100,000	• Several 100,000	• Up to 1 million	• Above 1 million
Example of service offer	• Astra2Connect (SES), Tooway (Eutelsat)	• Tooway service via KaSat (Eutelsat)		
		• SES Broadband Services based on enhanced Ka capacity (SES),		
		• Custom/select offers via Hylas1 (Avanti)		
Capacity per satellite (Gbps)	• ~5	• 50 – 100	• 150 - 200	• > 500

Table: Roadmap of satellite broadband development (Source: ISI European Technology Platform)

Due to its expected capabilities, satellite solutions will not compete with fibre everywhere.

Cost-effectiveness: satellite vs. fibre

The central question in considering the use of satellite solutions is, in which areas satellite is more cost-effective than fibre. As with many questions in broadband deployment, the answer depends on a number of variables. We shall assume three straightforward scenarios.

Scenario 1: Over 600 people per square kilometre – In the dense, urban areas of a market there is typically existing infrastructure in place. Ducts exist, wayleaves are in place and the presence of revenue generating units (RGUs – businesses and households) mean there is usually competition for business. Satellite is generally not competitive, as the equipment is usually more expensive and tariffs are generally higher for the bandwidth provisioned. There is, however, a market to ensure that a business in particular is not subject to a single point of failure for a critical system.

Scenario 2: 100 to 600 people per square kilometre – In the suburbs there is more variance in coverage by fixed internet access technologies. In a mature market where the population has a relatively high disposable income there will very often be at least one fixed supplier although this is not guaranteed. Typically any gaps in high-bandwidth coverage are filled by legacy end-to-end copper based solutions. This can mean lower bandwidths than are available in the denser urban areas. However, suburbs are usually still close enough to a telephone exchange so that they can get reasonable bandwidths today, and the upgrade path for tomorrow's requirements is usually achievable on a commercial basis.

Scenario 3: Less than 100 people per square kilometre – Rural areas around the world are often the last to get an infrastructure, in particular a fixed infrastructure. The economics of cost recovery mean that, unless mandated or subsidised, most suppliers will not be able to make a business case for deployment in these areas. As a result there is often no fixed coverage and often very little mobile presence (2G, 3G or LTE) either. The case for satellite in these instances is very strong. The unit cost of deployment, per home, per business or per any RGU is now significantly lower in most instances than for any other Internet access technology.

Relative cost effectiveness for satellite depends on geography and

the extent of the existing fixed networks. If the market in question has absorbed the massive sunk costs of a complete passive infrastructure deployment, then the market for satellite is far more niche. However, from a standing start, where there is little or nothing available, it is satellite that holds the advantage outside all but the densest areas. The question is whether low-density population areas are the main target of state-aided broadband deployments.

SatCom for rapid deployment

A natural consequence of superfast next-generation network broadband schemes is the need for detailed network planning, infrastructure build and deployment. As has been seen across the UK and other countries in Europe, such schemes tend to take several years from bidding to contract award, planning, core network build and phased network roll-out by geographic area. Households furthest from the core network are generally those with the poorest connectivity, and are also the most likely to be left until last. Sometimes these households are not addressed. The reasons are that business cases tend to get progressively more difficult. The cost for deployments addressing rural households is increasing, and the cost of running fibre or xDSL into low population-density areas increases as well.

If decision makers consider schemes addressing the most rural consumers not last but at the same time as customers in other areas, the latest generation of satellite broadband can present a solution. With an implementation time measured in days rather than years, households can be offered 10 or 20Mbit/s services from the very start of a project.

Conclusion

Universal access to broadband is not just a European need - there is a worldwide market for satellite broadband solutions worth 33 billion euro by 2030 (source: The Space Innovation and Growth Strategy Main Report). Although three of the first dedicated broadband satellites were built by European manufacturers, the industry needs further public support to develop next generation satellite broadband technologies. They are needed to i) remain in the race in a highly competitive market, especially in face of US players who have been awarded the recent satellite broadband contracts, and ii) deliver an increased broadband performance in a manner economically comparable to terrestrial solutions. The Horizon 2020 programme should contribute to this public support for R&D, while other European funds could trigger a wider deployment of those solutions, typically the Structural Funds.

The future 5G network will also benefit from future satellite broadband to bolster its resilience and to extend its service coverage to under- and un-served areas as well as to passengers on board of vessels, trains, and aircraft. This will lead to a connected Europe, increased European exports, high-value manufacturing in European factories, and job creation across Europe.

Further information

- Digital Agenda Scoreboard 2013 – http://ec.europa.eu/digital-agenda/en/scoreboard
- CIP Thematic Network BRESAT – www.cip-bresat.eu
- ISI technology platform – www.isi-initiative.org

Hybrid Fibre-Copper Connectivity using G.fast

Celtic-Plus project HFCC/G.fast

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HFCC/G.fast is a Celtic-Plus project aiming to maintain the European technology lead in the broadband area, advancing the European Commission's "Digital Agenda", and to lay the foundation for continued export successes. The project delivers the next generation DSL line-code standard (G.fast) and the creation of a new access delivery architecture – Fibre-to-the-Distribution Point (FttDP). The work reaches into driving the completed G.fast standard forward towards commercial success, including widespread deployment in Europe.

The much sought for deployment of optical fibre deeper into the access network is always a challenging business case. There is an extensive standards activity in progress to ensure that operators have consistent and realistic deployment scenarios and corresponding techno-economical models to base their investment decisions on. However, there is no debate regarding the value of deep broadband penetration and the economic and social upside of higher speeds and better coverage to maximize digital inclusion.

Whole system design

G.fast aims to deliver data at fibre-like speeds over the final-drop on existing copper networks whilst retaining the same ease of self-install as ADSL and VDSL. However, this requires new system architectures to be developed which in-turn impacts many facets of access network design. Prototype G.fast chipsets and systems will become available during the lifetime of the project, about mid-2014, but innovation is also required in areas such as the fibre/electrical interface to minimise complexity (and hence cost) whilst increasing reliability of the remote fibre-fed node. Considering the vast numbers of potential nodes that could be addressed using G.fast (4.5 million in the UK alone), cost, complexity, reliability and manageability are all equally important.

Systems-oriented standards

The whole system approach means that contributions will be made not only into the ITU-T to cover the G.fast standards work, but also technical input will be delivered into bodies such as the Broadband Forum and ETSI. This will include in-

Celtic-Plus
Smart Connected World

Editorial

Dear reader,

In this new issue we want to present you several interesting articles about our recent Celtic-Plus activities.

During the Turkish EUREKA chairmanship Celtic-Plus was acting as "spokes-person" for all EUREKA clusters within the EUREKA organisation. Celtic-Plus chairman Jacques Magen contributes to this issue with some particular perspectives about this activity.

Celtic-Plus was also engaged at the FuNEMS summit in Lisbon. Read the report about this event by our programme coordinator Maria Barros-Weiss.

As usual, we give the floor to three interesting Celtic projects that are approaching their closure or that have recently started:

- **EO-Net:** on Elastic Optical Networks for smarter networks as a next generation of optical transport.
- **CRUMBS:** on geo-localized social application for smartphones
- **HuSIMS:** on a Human Situation Monitoring System for safety and security in crowed places.

Enjoy reading this issue.

Heinz Brüggemann
Director Celtic Office

CONTENT

Promising Celtic-Plus Proposers' Day in Paris

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Celtic-Plus Proposers' Days are organised two to three times a year. Their main intention is to provide a platform for presenting new project ideas and discussing them with other experts. On 13 June 2013, a Celtic-Plus Proposers' Day was organised in Paris where also nearly all relevant French Competitiveness Clusters took part.

The Proposers' Day was organised at Paris Tech Telecom and was attended by about 100 people. The atmosphere at the university-style location was well suited for the purpose to discuss about research issues. Due to the active participation of the French Competitiveness Cluster and the French Celtic-Plus Core Group members as well as the presentation of many highly interesting project ideas, it was indeed a very successful and stimulating event.

About Competitiveness Clusters

Since 2009 there exist many French Competitiveness Clusters (Pôles de Competivité), both with worldwide vocation and national focus, which are considered as a partnership, based around a specific theme and a specific region. Their aim is to bring together large and small firms, research laboratories and educational establishments, all working together in a specific region to develop synergies and cooperative efforts. The French state provides support for cluster development, at both national and regional levels in the following ways:

- by allocating financial aid R&D projects and innovation platforms, through partial financing of cluster governance structures, alongside local authorities and firms;
- by providing financial aid for theme-based collective actions; and
- by helping competitiveness clusters and their member firms find the best international partners and set up technological partnerships with them focused on value creation.

Gérald LeBihan talking about the Images & Reseaux Cluster

Around 7300 organisations are involved, 64% of them are SMEs. Several Competitive Clusters, like Images & Reseaux (I&R), Pôle TES (e-secure Transactions), Systematic and Pôle SCS, are closely related with Celtic-Plus research topics and some are already involved in several Celtic-Plus projects. These clusters presented their concepts and ideas for possible collaboration.

As Gérald LeBilan from the Images & Reseaux cluster stated: "There is an interesting offer for international partners: Give insight into their region technology expertise; Contribute to technical analysis on inbound investments and to open the door for new innovative project opportunities."

15 new project ideas

In addition to the presentations of the competiveness clusters some additional presentation were held about the funding priorities in France, research strategies of some French core group members, and a presentation about the new FI-PPP call 3, where in particular the possibility of additional Celtic-Plus use cases via the "Use-case Factory" concept was considered. These more general presentations were closed by two presentations about the potential interest of Korean and Canadian organisations to participate in Celtic-Plus projects. Both South Korea and Canada are associate members of EUREKA.

The floor was now open for the presentation of a number of very interesting new project ideas. Many of the presented ideas were related to research concepts like Smart Cities, energy saving and energy efficiency in ICT, multimedia, transport, logistics and factory automation, security and life as well as education related topics. During the very active networking sessions that followed after these presentations a number of first consortium building contacts were already established.

As many of the presented proposals are still looking for additional partner to join a potential consortium we recommend to check the Celtic-Plus website at www.celticplus.eu where all presentations and contact details of the Paris Proposers' Day can be found.

Conclusion

The Celtic-Plus Proposers' Day has become an important and useful means to present new ideas for new projects, to discuss these ideas with interested experts, and to network with other organisations in order to build a strong consortium for a successful project proposal. But even organisations and experts not directly participating at a Proposers' Day there could still be interesting proposals found on the Celtic-Plus website, not only of the past Paris meeting, but also of some earlier meetings, e.g. in Kayseri or Istanbul, which still could be very relevant for one of the coming calls, especially for the Autumn Call that is closing on 14 October 2013.

One year Inter-Cluster Spokesperson

A professional and personal journey

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From July 2012 to June 2013, Celtic-Plus' Chairman Jacques Magen took over the role of "Inter-Cluster Spokesperson". He explains in this article what this was about, and what was achieved under his "spokespersonship".

Celtic-Plus and the other EUREKA Clusters decided in 2009 to set up an "Inter-Cluster Committee" with mainly two objectives in mind: to share best practices and commonalities among the Clusters; and to liaise in a more efficient manner with the rest of the EUREKA network. It was felt at the time that the EUREKA activities in general, and more specifically the strategic roadmap of EUREKA, needed more contribution from industry. This is how the inter-cluster committee was born.

Every year, a new spokesperson is mandated to represent all EUREKA Clusters. Besides Celtic-Plus in the telecommunications area, there are currently six other Clusters, dedicated to various areas of ICT, energy, environment, and manufacturing, as shown in picture 1.

I was nominated for this position in conjunction with the Turkish EUREKA Chairmanship. Considering the increasing involvement of Turkey in Clusters, both the Turkish Chair team and I saw this as a great opportunity to strengthen even more the participation of Turkish organisations in Celtic-Plus projects and in Cluster projects in general.

Clusters' contribution to EUREKA under the Turkish Chairmanship

A lot of effort was dedicated during the year to explain to various audiences and also to the representatives from countries not involved in Celtic-Plus and in other Clusters the "beauty of Clusters": industry-driven, flexible, and bottom-up initiatives, with a light overhead, and open to international cooperation (see picture 2).

It was an exciting year for EUREKA at international level: Canada joined as a new associated member; I was involved in the front line as inter-cluster spokesperson in several events that happened in conjunction with South Korea, the other EUREKA associated country; and now South Africa is the next in line. We can only hope that Canada and South Africa will step into the path of Korea, which is the 2nd fastest growing supporting country in Celtic-Plus, and will bring relevant participants from their countries in Celtic-Plus projects –and in Cluster projects in general. Contacts have already started with Canada to achieve this in the near future.

The Clusters also contributed to the overall EUREKA Annual Report 2012. This is the first time that EUREKA Clusters have a dedicated section in this report, and that the Cluster projects figures are embedded into the detailed EUREKA country review. This was made possible through a combined effort from all Clusters and the EUREKA Secretariat to work together and exchange project data in a more harmonized format.

Milestones of the year

For the first time in the almost 30 years of existence of EUREKA, a Cluster Event, i.e. the Celtic-Plus Event, was organised in conjunction with a formal EUREKA meeting, see picture 3.

This was a great opportunity for Celtic-Plus project exhibitors to show their achievements, and for many high-level representatives from EUREKA countries, especially those not (yet) involved in Celtic-Plus, to discover how impressive the results of Celtic-Plus projects could be.

Another milestone was the presentation of the EUREKA Clusters Annual Report to all 43 EUREKA country representatives. The first report had been presented the preceding year during the Hungarian Chairmanship, and it showed how much Clusters are represented within EUREKA, i.e. about 70% of the overall budget. I chose this

year to focus on concrete achievements from Cluster projects, stressing the impact on the economy and on jobs creation.

This without a doubt led to another important step for EUREKA Clusters: the production of a document entitled EUREKA Clusters – Essential instruments for the global competitiveness. This document shows how important it is for European competitiveness and for European society to keep Clusters into the EUREKA framework for the years to come, in complement to other EUREKA, EC and national initiatives. This paper, which has been edited by a common working group composed of representatives from EUREKA public authorities and Clusters, will soon be officially released by EUREKA.

Last but not least, two Clusters were labelled for a follow-up of their activities: Eurogia2020 in the energy domain, and Euripides2 in the smart systems area.

Also a personal journey

Of course holding such a position also means more personal encounters. First of all I want to say how much I have learnt to appreciate our Turkish colleagues, their dynamism and their enthusiasm to promote Turkish innovation and to show how much Turkey can bring to Europe. Without being the Inter-Cluster Spokesperson during the year of the Turkish EUREKA Chairmanship I may have never understood this the way I have. Then the year was quite challenging at the EUREKA Secretariat, with a change of Head of Secretariat. I have particularly appreciated the support to the EUREKA Clusters at management level, and the particularly active role of the Communications Team in promoting Cluster projects as well as other EUREKA projects. They were also very helpful in helping me release an article entitled "Innovation via collaboration" in Science Omega Europe.

I cannot finish this article without also mentioning how proud I am of the results of Celtic-Plus projects. Moreover, this is recognized by others as well: the 100GET Celtic-Plus project was selected this year as a finalist of the EUREKA innovation award.

What's next?

My term as Inter-Cluster Spokesperson is now over. I will turn back to some important issues that we have to deal with in Celtic-Plus, in particular with the new "Strategic Action Plan" that we have worked out with the Celtic Public Authorities to improve again and again our strategic initiative. Of course I will still participate in the Inter-Cluster Committee on behalf of Celtic-Plus. I want to wish good luck to the next spokesperson, Mr. Gabriel Marquette from Eurogia2020, who will have the challenging task to contribute on behalf of all EUREKA Clusters to the new EUREKA Strategic Roadmap which is scheduled to be released during the Norwegian EUREKA Chairmanship.

References

[1] There are 41 EUREKA full members and 2 associated countries. Each member is represented by at least two people, the HLR (High-Level Representative) and the NPC (National Programme Coordinator) – see http://www.eureka-network.org/in-your-country

[2] "Innovation via collaboration" in Science Omega Europe - http://www.scienceomega.com/article/989/innovation-via-collaboration and http://www.eurekanetwork.org/about/-/journal_content/56/10137/2031307

Celtic Workshop at FuNeMS 2013 in Lisbon

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On 4 July 2013, Celtic-Plus organised a workshop with the title "Smart Connected World: the Celtic-Plus EUREKA R&D programme. Overview and Matchmaking opportunities" at FuNeMS 2013, the Future Network and Mobile Summit in Lisbon, Portugal.

Considering the success of the collaborations in 2011 in Warsaw and in 2012 in Berlin, this year Celtic-Plus carried on with this trend with a dedicated half-day workshop in Lisbon, with a fully attended room for a good part of the afternoon.

The Celtic-Plus EUREKA R&D programme overview

At the workshop the Celtic Chairman, Jacques Magen, presented the audience with the latest news of Celtic-Plus, briefly explaining the programme to those listening about it for the first time.

The Celtic-Plus EUREKA R&D programme (www.celticplus.eu) was initiated in 2011, as a follow-up of the successful Celtic initiative, which started in 2003. Celtic-Plus is bottom-up, industry-driven, and aims at a short to medium term impact on the market. It follows the intergovernmental structure of EUREKA (www.eurekanetwork.org).

The Celtic-Plus call for proposals was announced, with the next call being the Autumn call (deadline on the 13th October 2013), and recommendations were brought to the proposers, who were invited to contact the Celtic-office for further assistance with ideas and project proposals. Relevant research items were described as proposed in the Celtic-plus Purple book, available on the Celtic-plus website.

Portuguese participation in EUREKA and Celtic-Plus projects

Jorge Liz, the Portuguese Eureka NCP, participated in the workshop to speak about Eureka Portugal and its interaction with Celtic-Plus, offering his contact to those who would like to know

more and participate.

The process to apply for funding in Portugal was described and the audience had the chance to hear about different experiences from Portuguese Coordination of Celtic projects: Ayman Radwan spoke about his experience with Green-T-Green Terminals for Next Generation Wireless Systems, a Celtic running project ending in June 2014; and the Coordinators of the successfully finished Celtic projects gave the audience an outlook of their experiences with: OPTRONET- Optimized transponders for robust optical networks, Paulo P. Monteiro; ICARUS- Distributed Wireless Networking Experimental Infrastructure for Optimization and Convergence, Luis Miguel Campos; and LOOP- Coexistence and Optimization for E-UTRAN and WLAN; Ayman Radwan substituting Jonathan Rodriguez.

Research priorities and business aspects of some Celtic-Plus Core Group companies

Members of some Celtic-plus core-group companies participated in the workshop to talk about their research and business priorities, helping understanding the Industrial support to the Celtic-plus initiative.

Werner Mohr, Head of Research Alliances for Nokia Siemens Networks, revisited the changes in the ICT Industry since the 90s to present their vision of the networks towards 2020 and the need for networks to undergo into a fundamental transformation for flexibility and efficiency through virtualization and automation.

Didier Bourse, Director for the European Research Cooperation at Alcatel-Lucent Bell Labs, explained their European research cooperation framework and ecosystems to better illustrate the role of Celtic-plus on their strategy, and presented their current research priorities, highlighting the Alcatel-Lucent involvement in Celtic and Celtic-Plus projects.

Pierre-Yves Danet, the Head of collaborative research in Europe at Orange Labs, presented their R&I priorities and vision for 2020, explaining their involvement in cooperative research programmes and participation in Celtic and Celtic-Plus projects as a mean to pave the way for a single digital market on a digital society; fast, flexible and mobile to be always there, in a relevant and sustainable way.

The last speaker from the core-group members was David Kennedy from Eurescom, who closed the first part of the workshop with an amazing and yet amusing presentation illustrating how IT conquered the World and the demand for a Future Internet that can be intangible and invisible, but omnipresent.

Celtic-Plus and Horizon 2020 interactions

Directly from Bernard Barani, the Deputy Head of Unit of Network Technologies, from the DG CONNECT, at the European Commission, the audience could understand the commonalities between Celtic-Plus programme and the new Horizon 2020 and the potential role of Celtic-Plus to complement piloting and deployment initiatives from the European Commission and to help bringing emphasis to demonstrators, pilots, and testbeds through Celtic-Plus projects, which are typically closer to the market than the European Commission Framework Programme projects, even considering the new innovation orientation of the Horizon 2020.

Bernard Barani referred to the Celtic-Plus Use-Case Factory as a way of developing use-cases using the FI-PPP technology, which will be open to third parties through the FI-WARE Open Innovation Lab, or, as more recently called, FI-WARE Lab.

Outlook

Presenting the Celtic-plus workshop to FUNEMS participants was another successful case of Celtic-Plus collaborations with the Future Network and Mobile Summit, and once again Celtic-Plus realised how important these informative sessions on the programme are for the success of the proposals for Celtic-Plus projects. During the workshop the audience was offered not only information on the programme, the strategy of some core-group companies, project calls process and recommendations for proposals, but they also had the opportunity to hear and exchange information with colleagues that have coordinated and/or participated in Celtic projects before.

You can find more information on Celtic-plus and future events at http://www.celticplus.eu

EO-Net: Elastic Optical Networks

Smarter networks as a next generation of optical transport

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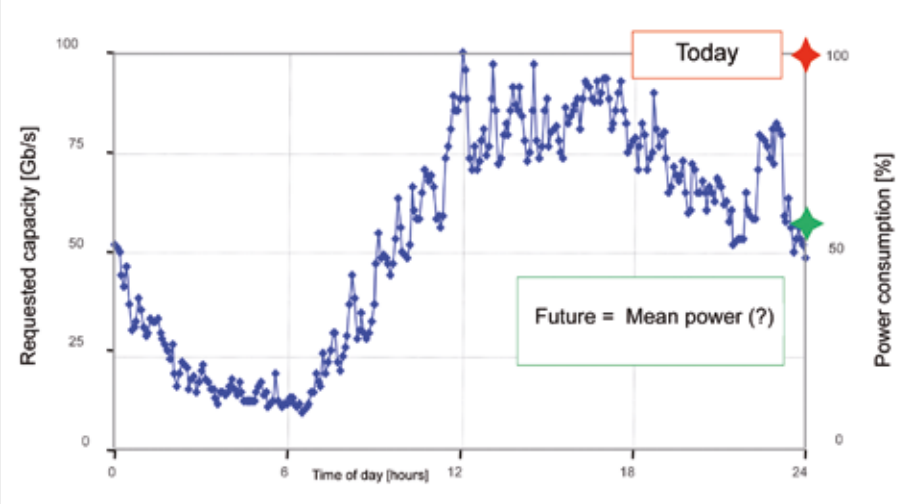

Figure 1: Day-night variations

To accommodate the ever-increasing traffic demand and change in traffic dynamics (less predictable and more dynamic) in a sustainable manner in core networks, the EO-Net project aimed to design and demonstrate a novel networking concept for an improved resource usage. This "elastic" concept, very common and successful in other telecommunication areas, is a newcomer in optical transport.

Elastic optical networks can adapt various transmission parameters such as the optical data rate, modulation format, wavelength spacing between channels, to cope with traffic requirements and transmission impairments. Elasticity allows a more dynamic resource management whose benefits are increased capacity, improved energy-efficiency, and cost reduction. However, the full benefits would come only, when elastic functionalities will be provided to all building blocks of optical transport networks.

Key building blocks

At the project start, very little work was performed on elastic optical networks. The project made considerable headway in the proposal of technical solutions. Research activities covered:

1. variable-rate transponders including both simulations and hardware prototypes – Among others, EO-Net showed the benefits of coded modulations over conventional formats such as QPSK, 16QAM. The project also demonstrated in hardware the feasibility of a (burst-mode) elastic transponder up to 100 Gbps, where the modulation format could be adjusted among QPSK, 8QAM, and 16QAM.
2. bit error rate predictions to design optical links and be able to adjust the transmission parameters appropriately – New models for elastic networks have been introduced where non-linearities are modelled as an additive white Gaussian noise. This breakthrough in performance modelling allows very accurate and fast prediction tools.
3. routing and resource allocation algorithms accounting for physical impairments and variable-rate devices – A wide-range of scenarios were covered such as single-layer and multi-layer networks. A software tool with a graphical interface was also developed to advertise part of EO-Net results.
4. elastic aggregation between routers and elastic transponders – This elastic interface was prototyped and allowed a flexible aggregation of client traffic onto variable-rate optical signals.
5. development of protocol extensions of GMPLS control plane to support elastic parameters – Implementations were realized in OPNET modeller and simulations confirmed and evaluated the GMPLS functionality in variable channel spacing networks.
6. The outcomes of all aforementioned activities were exploited in techno-economic studies whose advantages are briefly summarised below.

Techno-economic studies

The ability of elastic networks to adapt to traffic variations and network topology yields capacity improvement and/or energy reduction. For instance, flexgrid networks are adjusting the spectral occupation and channel spacing to the demands to avoid the partial filling of wavelengths. In such case, a 30% capacity increase was estimated within EO-Net compared to 50GHz spacing fixed-grid networks.
Sustainable development comes by trading off either spectral efficiency or optical reach for power consumption. Current networks are designed and work for the peak hour traffic while elasticity could handle day-night variations to become greener, see Figure 1.

EO-Net showed that the symbol rate adaptation offers the best flexibility in this case, for which ~25% energy savings were estimated in typical trans-continental scenarios. The project was also the first to demonstrate energy-proportional operations of a coherent muxponder prototype to the actual time-varying traffic, see Figure 2. Note that a muxponder combines the function of an aggregation card and those of a transponder.

In addition, elastic networks allow cost reductions. This is particularly true for non-static networks, e.g. networks supporting optical restoration, upgrades or even dynamic traffic demands, as the resource sharing occurs more often and yields good savings. The EO-Net results of optical restoration supporting one failure showed up to 37% cost savings compared to the non-elastic case.

Conclusion

The elastic concept encompasses various means of flexibility, such as variable FEC, modulation formats, symbol rates, and/or channel spacing.

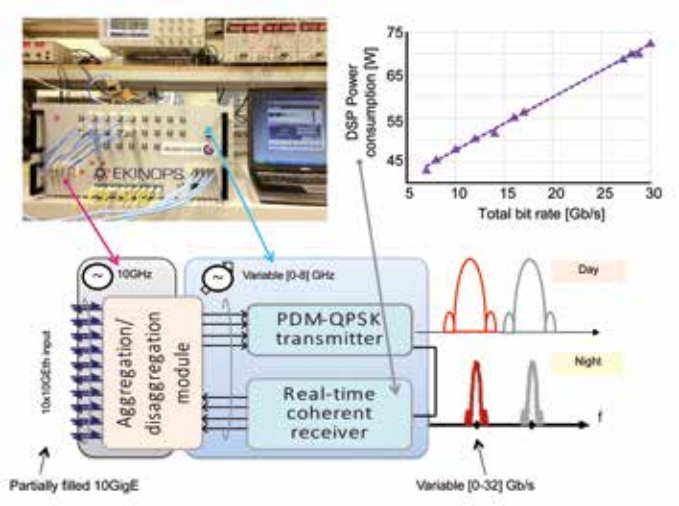

Figure 2: Muxponder prototype

Considering the latter degree of freedom, one can distinguish between fixed-grid and flexgrid networks. Fixed-grid is backward compatible with existing optical nodes, implying an easier upgrade by operators. Alternatively, flexgrid offers improvements in spectrum usage but also requires a more sophisticated control plane.
EO-Net focused on simulations, design, creating software tools and prototyping technology concepts. This article briefly presented some of the achievements and key benefits. An application of EO-Net was illustrated, which shed light on future refinements needed towards a commercial solution.

Find out more on EO-Net at www.celtic-eonet.eu/About.aspx

CRUMBS

Geo-Localized Social Application for Smartphones

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There are many applications in the tourism field, but none of them fully satisfies the interactivity and social needs that could be expected by users while providing the best location technology and Augmented Reality (AR). This article describes some features of the application developed in the framework of the CRUMBS project on Geo-localized Social Networks enhanced through the use of Augmented Reality (AR) technology.

Figure 1: Map view

The Crumb concept

The application is based on the traces left by people while wandering around with their smartphones. We call this trace a Crumb. The Crumb concept is central to the application. A "Crumb" is the name for a trace left consciously by a person using a smartphone and the CRUMBS application. Besides including any information needed, the Crumb has a category, may be tagged, commented, or rated by the user who created it or by anyone who is allowed by him to do so.

Geo-localization and Augmented Reality

There are many systems in the market that already provide geo-located social networking. They all rely on the key positioning technology available today, which is GPS. This is good enough for outdoor environments, but fails when the users move indoors.

In the CRUMBS project we integrate three innovative indoor positioning technologies: WiFi

Fingerprinting, Inertial Navigation and a Visual Tracking technique: Silhouette Matching.

The good news about these technologies is that a pre-existing infrastructure is not needed. WiFi Fingerprinting relies on the fingerprint of WiFi networks inside a building requiring to elaborate a model which needs to be previously loaded to the application. Inertial Navigation uses the compass and the gyroscope in smartphones to determine a valid location; it starts with an initial valid location and then calculates the user`s steps translating them into real distance.

The algorithm for Silhouette Matching performs a continuous analysis of an image stream and tries to calculate the position and rotation of the recording camera (known as pose) in relation to the real world. In the first stage an initial guess of the camera's position is performed. In this stage a manually created silhouette is placed in the user's view. Then the user moves the device until the superimposed silhouette matches approximately the real world object (snap-in). Once this is done the initial pose is calculated and actual tracking is started: the user can move the terminal, but the superimposed objects (i.e. elements of the building) will remain in place.

For AR we rely on the Junaio Browser, which is a product developed by one of the partners in the CRUMBS project, Metaio, providing an easy way for publishing the content, i.e. the Crumbs, in Augmented Reality. Junaio is easily included in the application via a plug-in. The Crumbs are overlaid on the camera view.

Figure 1 shows the main screen of the application. This screen is shown upon starting the application. Figure 2 shows the Augmented Reality screen. This screen is shown by rotating the smartphone (portrait mode).

Figure 2: Augmented Reality view

Application field

The CRUMBS project has developed an initial prototype which shows that the concept could give ground to a wide array of applications. To mention some:

- Trip planner: The Crumbs could be marked on the map according to a plan previously devised by the user.
- Museum/Exhibition guide: Using the indoor location providers the user could find his location inside a building and spot the main Points of Interest.
- Commercial advertising: Commercial establishments could publish their Crumbs according to a category framework. Also events (concerts, conferences, etc.) could be published using the expiration date feature provided.
- Tourist guide: Tourism institutions could publish Crumbs in the application which could also be enriched by the users.

The former application types could be packed into one single application, i.e., Trip Planner or Tourist Guide. The only limitation would be an excessive amount of information, slowing down the application or making the screen unreadable. This issue is partially solved through the use of caching, which allows the application to work offline.

Conclusion

The CRUMBS application could represent the next step for tourism applications. We believe that its uptake shall depend more on economic than on technology factors.

Further information on the CRUMBS project is available at http://crumbs.tid.es.

HuSIMS

Human Situation Monitoring System

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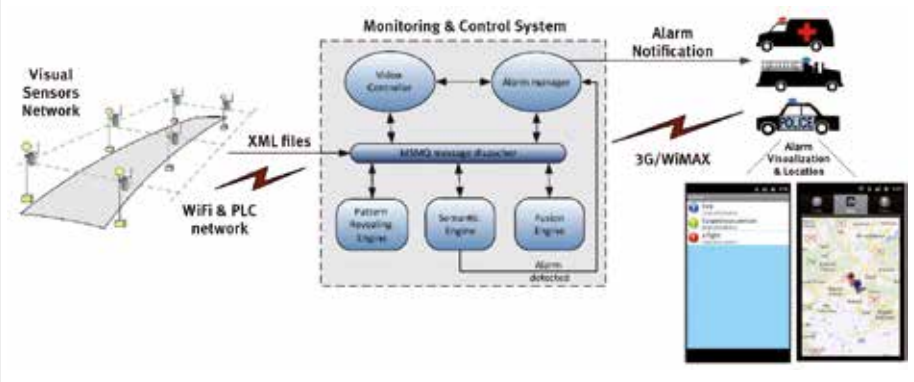

Figure 1: Alarm detection and notification

The concern for safety and security in crowed places has strongly grown in the last few years. Video surveillance systems have been deployed all around the world. However, current solutions are expensive and inefficient, depend too much on the human factor, and generate too many false alarms. On the other hand, people start to be worried about their own privacy. There is a big challenge on the development of a new generation of cost-efficient video surveillance systems that are unobtrusive, don't compromise people's privacy and reduce false alarms.

HuSIMS is an alternative approach to video surveillance systems for wide areas. It is sensitive to irregular behavior patterns in the monitored area. For example a parameter violation situation in which a wrong object is detected in a wrong place at a wrong time and/or moving in a wrong way. It targets real-time alarm detection, focusing more on prevention than obtaining crime evidence.

Cost reduction

Current video surveillance systems use high-definition cameras, which require lots of bandwidth to transmit video to control nodes. HuSIMS employs instead low-resolution analytic Visual Sensors (VS) able to track objects in motion and to send low-weight XML messages containing the objects' motion parameters to a backend application for further analysis. This makes the streaming of video on a regular basis unnecessary, reducing the amount of required bandwidth and therefore the cost of the network, enabling large and dense deployments for the coverage of crowed scenarios.

Automatic detection of alarms

The XML messages sent from the VS are processed in parallel by three search engines that use complementary technologies. The Pattern Revealing Engine converts the moving object data into Key Performance Indicators (KPI) and learns their typical patterns. When the pattern starts to drift away from a normal one, an alarm is raised. The Semantic Engine gives a semantic meaning to the objects' motion parameters and then uses ontologies and a semantic reasoner to detect abnormal events. Finally, the Fusion Engine is an advanced rule engine able to fuse data from multiple VS.

When an alarm is raised, a notification is sent to the security officers' smart-phones (see Figure 1). They can request on-demand video streaming from the alarm's place (Figure 2).

Enhanced privacy

As detection is based on processing XML messages, the system only transmits video upon alarm detection. The same approach is applied to video storage: only short periods of a few minutes are stored – those related to confirmed alarm situations and specifically requested to the VS. These two features reduce the effect of public privacy intrusion in the monitored areas.

Furthermore, the fact that the system is using low resolution VS provides an additional advantage: they don't allow recognition of people's faces, which makes the system more respectful of privacy. This enables HuSIMS to provide a novel and compelling trade-off between privacy and enhanced security in a public space.

Field deployment in Israel

A prototype of HuSIMS was deployed in Ness Ziona, an Israeli municipality (population: 38,000) that already owns a video-surveillance system but misses features like automatic event detection. The security officers need to receive a lower number of false alarms and to get the relevant information on their smart-phones.

This field tests enabled us to validate HuSIMS.

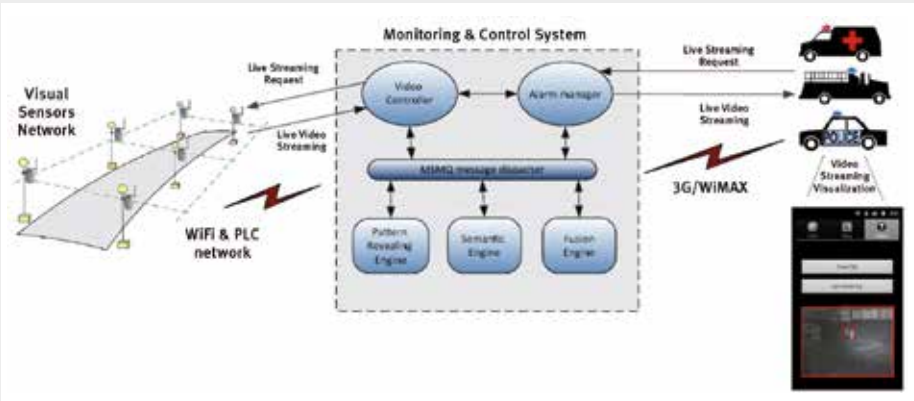

Figure 2: Video streaming request upon alarm-detection

The system was able to deal with complex scenarios like this: at the swimming-pool, a fence separates the swimming-pool itself from the green where the people sunbathe (height: 1 meter). People can lean on the fence, can put their towels on it, but jumping over the fence is not allowed. In this scenario, in which other systems would have generated false alarms, HuSIMS raised alarms only when someone was jumping over the fence.

Conclusions

HuSIMS has been designed with wide area, dense deployments in mind, using sensors with low bandwidth requirements making it a perfect candidate for integrated surveillance systems in smart cities and big facilities.

Our system combines several generic, multi-domain alarm detection engines to automatically detect a wide range of dangerous situations. Further tests are ongoing at Ness Ziona with the purpose of evaluating the engines' capacity to collaborate in the detection of more complex scenarios.

Further information is available at
http://projects.celtic-initiative.org/HuSIMS/

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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.

terworking issues between fibre and copper technologies, reverse/remote powering of nodes, Layer 2 end-to-end architecture and management functionalities. This will help the industry translate the requirements into technical solutions and consolidate these in standards.

The backhaul

The copper/fibre interconnect is the means to provide Gb/s bit rates and high-QoS services to the end user without the need of replacing the final copper drop with optical fibre. But to-date, the link between the DSL final copper drop and the optical back-haul has never much been considered beyond whether the backhaul is optical point-to-point or PON. In principle other backhaul technologies are also possible such as microwave links or bonded DSL solutions, especially for remote areas, but the HFCC/G.fast project focuses on optical backhaul.

Functionalities such as Physical Layer Retransmission and Quality of Service may be best implemented via an end-to-end approach rather than being instantiated only over the G.fast link. Such approaches may also reduce complexity at the remote node by utilising commodity processing functionality where shared resource is available. This is similar to cloud computing ideas of moving complexity upwards into the network.

System enablers and deployment scenarios

One major objective of the HFCC/G.fast project is to analyse the system from a service and commercial point of view involving requirements from the vendor, operator and customer communities, including:

- Operational maintenance in terms of installation and operation of the system, and the corresponding CAPEX and OPEX trade off.
- Performance monitoring and maintenance in terms of service requirements and corresponding parameters reported by the system, as well as fault detection and localization.
- Lifetime analysis in terms of techno-economics and sustainability.
- Additional system-level technological challenges such as the support and evolution of voice service, reverse power feeding and inadequate in-home wiring.

Self-install and zero touch

Self-install is an aspect that must be addressed in order to provide competitive cost of service whilst minimizing OPEX (although engineer-install is always a commercial option). A zero-touch approach basically attempts to find the best CAPEX vs. OPEX trade-off by the deployment of redundant capacity in the Distribution Point Unit (DPU) in order to give the equipment some self-heal capability and remove truck-rolls for service activation. Factors such as service deployment, churn and fault repair all have an impact on the number of truck-rolls required to operate a service. For an architecture that is likely to consist of many millions of small remote nodes, it is a fundamental requirement that a single visit is required to install the DPU and that the only subsequent visit to the site should be to either perform a hardware upgrade or replace a DPU that is beyond self-repair.

Techno-economic models

Predicting the economic benefits from an access network with very short copper loops (<250m) requires realistic modelling of investment across a number of candidate solutions. Also, application scenarios depending on geo-statistics need to be developed in order to determine the optimum locations for deployment.

Sustainability and management

Life-cycle economic analysis of G.fast solutions need to be compared with alternative and existing solutions and also from an environmental perspective. For example, it is generally considered that communication over fibre consumes less energy/carbon than that over copper. However this often neglects any civil works and installation costs. To offer a comparison from the construction industry we note that the environmental impact (e.g. in CO2 emissions or energy consumption) from constructing a modern building is often larger than the rest of its total life-time impact.

From a management perspective, the power consumption of a G.fast system should be made proportional to the traffic load being delivered. Low-power modes built into the G.fast standard can provide order-of-magnitude power saving capabilities. However, how such modes are managed may have a direct impact upon the customer experience, making the area an important research topic.

Conclusion

The HFCC/G.fast project is a cornerstone in the toolbox to advance the European Commission's Digital Agenda. It considers a broad range of aspects of deep-fibre access networks with the aim of producing a whole system concept that is economic to deploy, energy efficient, has high QoS/QoE, and is reliable and manageable. Whether this technology ultimately becomes main-stream or remains niche is highly dependent upon the results generated by the HFCC/G.fast project.

Further information is available at www.celtic-plus.eu/Projects/Celtic-Plus-Projects/2012/HFCC_G_FAST/hfcc_g_fast-default.asp

Unprecedented opportunities

4th European Summit on Future Internet in Aveiro

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As the Internet evolves and enters an unprecedented phase of new usage and technological development, questions are being asked as to the breadth and likely scope of its evolution. At a time of massive data proliferation, of major economic uncertainty, of growing cyber threats and of rampant deindustrialization, Europe faces challenges in terms of R&D priorities and policy setting. The 4th European Summit on Future Internet was organised as a forum to exchange ideas and trends and to discuss some of these questions.

The 4th European Summit on Future Internet took place in Aveiro, Portugal, on 13-14 June 2013. The event was a highlight in the plethora of workshops and conferences in the Future Internet area in Europe. It was organised by TICE.PT, the Portuguese Research & Innovation agency, and SND, the security and trust laboratory of the University of Luxembourg. Despite the strike of air traffic controllers in France, which had a profound impact on travels to Portugal, around 80 high-profile experts made it to Aveiro and were rewarded by five very interesting sessions and an extraordinary opening session.

Socio-economic impact

The explosive growth of the amount of digital data and the advances in the corporation's capabilities to capture, search, discover and analyse unstructured data, offer unprecedented opportunities for progress and for abuse. We have reached the point where modelling and analytical tools can help Internet corporations and commercial institutions to predict future individual behaviour, while government agencies have the means to anticipate social unrest, political crisis or disease outbreaks.
In the opening session, Antonio Murta, Digital Champion Europe for Portugal and Joao Barros from the University of Porto gave exciting insights into the potential opportunities of new technologies, without hesitating to point to the big socio-economic challenges that are an inherent part of these new technologies.

Joao da Silva, co-organiser from the University of Luxembourg

Joao Barros, Antonio Murta, and Vilmos Németh at the opening session.

Multifaceted sessions

In the four main sessions of the summit, several projects of the European Future Internet initiative, set up as a public-private partnership (FI-PPP), had the opportunity to discuss their work. These project included FI-STAR in the health sector, FITMAN in the manufacturing sector, XIFI, the FI-PPP infrastructure project, as well as CONCORD, the programme's facilitation and support project. The first session, chaired by Joao da Silva, examined the approaches currently being adopted by Smart Cities and discussed the visions and perspectives of Smart Cities in the Future Internet context. In the same session, usage areas of the Future Internet were discussed, among others the health sector, the energy sector and multiple Smart Cities applications.

The second session, chaired by Prof. Rui Aguiar, provided the opportunity for the audience to get an insight into the work of the capacity building project of the European Future Internet initiative and to discuss the expectations that have been put onto this project. The session further discussed the current developments of new architectural designs for the Internet and questioned the extent to which such developments enable sustained innovation. Finally, the participants discussed the robustness of the Internet in light of the increasing number of wireless connected devices.

The third session examined the important role of governments, legislators and regulatory agencies in view of the rapidly changing Internet tech-

nologies and their use. Data privacy and data protection emerged as the most prominent issues during the interaction with the audience.

The fourth and fifth sessions, chaired by Latif Ladid and Thomas Michael Bohnert, discussed the emerging opportunities in the area of the Internet of Things, machine-to-machine communications, big data challenges, and the widespread adoption of cloud computing approaches and principles. The sessions examined, among others, the societal challenges arising from the widespread adoption of these technologies in a variety of sectors, such as transport, health, robotics, and the environment.

Conclusion

In spite of the wide range of topics that the summit covered, it was an event that was refreshingly different from many other Future Internet events in Europe which focus on various technological aspects and which typically propose technical solutions to overcome known problems, or present new ways of using the technology. The speakers confronted the participants with a number of non-technical questions, and indeed the audience picked up the challenge and were rewarded with an extraordinary lively discussion, which very likely brought some new insights to every participant.

The summit closed with the announcement of the 5th European Summit on Future Internet, which will be held in Winterthur, Switzerland, on 5-6 June 2014, hosted by the Institute of Applied Information Technology (InIT) at Zürich University of Applied Sciences (ZHAW).

The presentations are available on the website of the 4th European Summit on Future Internet at http://www.av.it.pt/Future_Internet_European_Summit/program.html

Challenges for Future Networks

FuNeMS 2013 in Lisbon

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The Future Networks Communications Summit (FuNeMS) has established itself as an ideal place for getting first-hand information about directions and on-going projects in the area of Future Networks. The 22nd edition of this event, which took place in Lisbon from 3-5 July 2013, did not fall short behind this expectation. In addition, the event was a good opportunity for face-to-face networking with people in the community.

Located in the summer-hot city of Lisbon, the professional organising team of IIMC had found an excellent, well air-conditioned venue which provided sufficient space for the 325 participants to attend the plenary sessions and technical sessions and workshops, the latter of which taking place in five parallel streams. In the demo area 27 booths by projects, companies and organisations displayed and demonstrated hands-on results. This was complemented by two poster sessions where further projects had the opportunity to inform about their status and results.

FuNeMS programme

The FuNeMS Steering Committee, which this time organised the call for papers and planned the programme, had put together a good mixture of presentations ranging from invited high-level keynote speeches and panel discussions to detailed technical presentations of the latest research results that responded to the Call for papers from which 65 papers had been selected. This year's event had a focus on the challenges related to building the Future Internet infrastructures based on mobile, wireless and fixed communications technologies. The programme was divided into five technical streams: Future Internet Technologies, Radio Access and Spectrum, Converged and Optical Networks, Integrated Satellite Communications and Internet of Things.

Zeinal Bava, CEO of Portugal Telecom

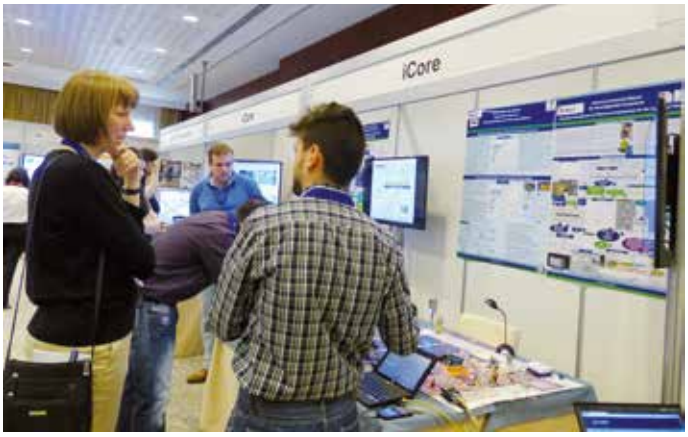
Changing user habits, exploding bandwidth needs, and a new EC research initiative 5G PPP

The opening plenary session gave a good overview of the current situation in technologies and the market from the view of an operator, manufacturer and the EC. The CEO of Portugal Telecom (PT), Zeinal Bava, started with explaining about changing consumer habits in his presentation, accordingly titled "A sector in transformation".

The wish to always being connected goes now beyond voice, and social networks are driving user generated content. The digitalisation of content enables users to access this content anywhere and anytime. There is a trend towards multitasking across multiple screens: 88% of US consumers use their mobile as second screen while watching TV. A question (not only) for operators is how to maintain and increase revenues for which Bava sees European operators in a more difficult position compared to the US due to regulation and the strong competition. Bava finally reveals that PT sees large potential for competitive advantages in a strong IT infrastructure which e.g. enables to deploy new services within days and new tariffing within hours.

A perspective on the evolution of optical networking was given by Aref Chowdhury, CTO Op-

Demo at the Future Cities booth



Demo of the i-CORE project

tics at Alcatel-Lucent. "100 Gb/s is deployed around the globe, trials with 400 Gb/s are being done around the world, and the terabit area is almost upon us". Chowdhury thinks that Cloud Networking is a main driver and that this will ultimately enable the Terabit network. However the major driver of bandwidth needs will be the increase in video which is estimated to contribute to about 60% of the Internet traffic in 2015. The main research challenges will in his view focus on capacity, density i.e. the form factor, power consumption and cost.

"From leaders in 3G to followers in 4G"

Mario Campolargo from the EC presented some recent economic figures of the European telecom sector that showed that growth is negative in fixed and mobile voice telephony, but significantly grows (6% p.a.) in mobile data, which however cannot compensate the losses in voice. A European share of only 6% in the global LTE/FDD connections market triggered his provoking statement that Europe is falling behind: "From leaders in 3G to followers in 4G".

Furthermore, he said that new types of devices and applications put pressure on bandwidths, and cloud computing will also affect networking. He sees the major research trends to focus around e.g. Network Function Virtualisation, Software Defined Networks, and automated deployment and operation of networks. Perhaps also as a response to the above, the EC is currently preparing the launch of a 5G PPP in the framework of Horizon 2020. Instead of just continuing from the previous generation mobile networks, a major focus is on convergence between networks and cloud computing, convergence between fixed and mobile, and to enable a true Always Best Connected, only to name a few. This 5G is in close cooperation with the community and is linked to the Net!Works ETP.

Mario Campolargo from the European Commission

Best paper awards:
The Best Paper was awarded to "A Control Architecture for Wireless MAC Processor Networking", authored by Pierluigi Gallo from the University of Palermo et al in the area Radio Access and Spectrum.
The Runner up paper was awarded to "A Cognitive Management Framework for Service Provisioning in the Internet of Things", authored by Vera Stavroulaki from the University of Piraeus et al.

The best-demo award went to the i-CORE project in the area Internet of Things. The demo showed the cognitive management of objects and applications, a processing optimization of live streams and granting controlled access to streaming video to other interested parties.

The runner-up demonstration stand was awarded to the Future Cities project in the area of cross-cutting technologies. The Future Cities project aims at turning the city of Porto into an urban scale living lab where researchers and companies can develop and test technologies and applications e.g. for sustainable mobility, safety, sensing, and quality of life.

Short video statements from speakers and exhibitors

As in previous years a number of short video statements were given by speakers and exhibitors, this time kindly supported by FP7 Support Action project NetSoc. All videos can be watched on the website of the Net!Works ETP at www.networks-etp.eu.

Here are some key messages from three selected video statements:

Dr. Aref Chowdhury, CTO Optics at Alcatel-Lucent, expects that in the coming years 60% of all data traffic will be video, and around the year 2020 there is a capacity crunch on the horizon: research advances enabling optical bandwidth capacity increase, e.g. in multi-level modulation formats, and advances in optical amplifiers, spatial division multiplexing and nonlinearity compensation can help to tackle that.

For *Dr. Diego R. Lopez,* Head of Technology Exploration Activities at Telefónica I+D, the greatest challenges for building real virtualised networks include two aspects: firstly, the virtualisation of networks has to work end-to-end and not just virtualising part of it, and secondly, it has to address complexity. Networks are much more complex and heterogeneous than what one can find in data centre environments where virtualisation has been applied so far. Providing an appropriate layer of abstraction on top of the heterogeneous network infrastructures will be key for the success of virtualisation.

Mojca Volk from the University of Ljubljana presents the 6inACTION project, which aims to bring IPv6 into government environments, using IPv6 particularly for communication in the area of large incidents. The two main aspects addressed are to bring reliable communications to first responders: if one network goes down, the connection will be transparently transferred to the best available alternative, which in addition will be supported by sensors that provide various information from the scene to the catastrophe management centre.

Further information on FuNeMS 2013 is available at www.futurenetworksummit.eu/2013

Future Internet PPP Call 3 in a nutshell

Large scale experiments, sustainability and economic impact

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On 28 June 2013, the EC has published Call 3 of the FP7-ICT programme Future Internet Public-Private Partnership (FI-PPP). This is the third and last call in a series of calls issued within the context of the FI-PPP. The main goal of the FI-PPP is to accelerate the development and adoption of Future Internet technologies in Europe, to advance the European market for smart infrastructures, and increase the effectiveness of business processes through the Internet.

FI-PPP development so far

Before looking closer at Call 3, let us briefly revisit what has happened so far. In the scope of Call 1, eleven projects were launched back in spring 2011:

The Technology Foundation project FI-WARE (still running) defines, implements and provides a set of generic enablers for Future Internet services, which the use case projects can use for trials. Eight industry-sector-specific use case projects, which had defined potential use cases, were also started, and they performed experiments in their respective application domains, e.g. environment or logistics, until spring 2013. These activities were supported by the INFINITY and CONCORD support action projects.

As the use case projects from call 1 ended, five larger use case projects, from Call 2, were started in spring 2013. These projects are planning to implement trials of a significant size. In addition, a capacity building project XIFI has been launched to assist the provision of the runtime environments – i.e. physical capacity – for the experiments of the phase II Use Case projects and the large scale experiments planned for phase 3.

Towards phase 3

The first two phases have been successful in involving key organisations from European industry, academia, and SMEs – over 200 so far. One of the main intentions for FI-PPP phase 3 is to ensure that a different community of players take part.

The goal of phase 3 will be to dramatically increase the number of actors involved, with a specific focus on involving SMEs and web entrepreneurs. The ambitions of Phase III are: to attract those not typically involved in EU Framework Programmes, to ensure sustainability of the developed components, to trigger seed-type activities, to accelerate regional growth, and to promote economic impact and strengthening of the European industry of all sizes.

FI-PPP Call 3

In the light of the above and according to the official call text, Call 3 aims at

1. providing and running a stable infrastructure for the large-scale trials, expanding the core platform, the use-case specific functionalities and their demand-driven instantiations, and
2. involving, through open calls, SMEs and web entrepreneurs as developers of highly innovative, infrastructure based, data-rich services and applications, building on, and extending, the large scale trials and the core platform functionalities.

Objective 1.8 – Expansion of Use Cases

In order to implement that, Call 3 in Objective 1.8 calls for **up to 20 CP-CSA projects** for an expansion of the use cases with a duration of 2 years. As the total funding available in objective 1.8 is 100 million euro, the average funding per project could be at about 5 million euro. I have heard many opinions in the community that say that less than 20 projects should be funded for the sake of allowing larger projects, as it is necessary that the projects achieve critical mass, and this would not be possible with small projects.

In each project at least 80% of the funding must be reserved for redistribution via open calls for SMEs and web-entrepreneurs. A successful proposal will need to have 3 independent partners from 3 different countries with the competence to run Open Calls and having close links to innovative SMEs and web-entrepreneurs to involve them in the project. Arrangements must also be prepared to ensure the applications developed have access to innovative ICT infrastructures to operate and demonstrate their services.

The really new aspect this time is that the SMEs and web-entrepreneurs will not become partners in the projects, as done before, but they will receive grants as Third Parties to perform agreed work.

The EC has introduced a new Special Clause 42 to allow financial support to be given to third parties in this way. As with any new instrument, this clause leaves a few questions open regarding evaluation criteria, financial liability, access rights for Third Parties and more that will still need to be clarified.

According to the FP7-ICT work programme, the financial assistance to the Third Parties should be 80% of the available funds (100 million euro), i.e. 80 million euro. If we assume each grant is typically in the order of 50,000 to 150,000 euro with an average of 100,000 euro, then phase 3 is ambitiously planning to motivate altogether 800 SMEs or web entrepreneurs, meaning 30 to 80 per project, to get involved. Clearly, this presents new challenges for project management, call management and programme coordination on a level not yet experienced.

If we add the complexity of doing this using a new instrument for the first time we can see that the Phase 3 is a completely new approach in the way EC programmes are trying to support research and the evolution of sustainable commercial models.

Objective 1.9 Technology Foundation Extension and Usage

In Objective 1.9 the Call is for **one Integrating Project (IP)**, which is the Technology Foundation extension, i.e. the follow-up to FI-WARE, and **2 to 5 CSA** projects that should support usage and participation.

The **technology foundation extension IP** should address the needs identified in the use case trials of phase 2 and those arising in the phase 3 use case expansions. These could be, for example, updates of existing or the development of new additional Generic Enablers. The project must also ensure availability of the Generic Enablers for use in different infrastructures including regional context, and ensure sustainability beyond the FI-PPP lifetime. Training of SMEs and web-entrepreneurs will also fall under its responsibility. A funding of 23 million euro is planned for this project, of which 10% must be reserved for open calls, with a duration of 1.5 – 2 years.

The **2 to 5 CSAs** should provide support for SMEs and web-entrepreneurs for developing best practises, fostering entrepreneurship, enabling access to finance, support the creation of Internet innovation hubs, gathering evidence of the socio-economic impact of the FI-PPP activities and more. A total funding of 7 million euro is reserved for CSAs.

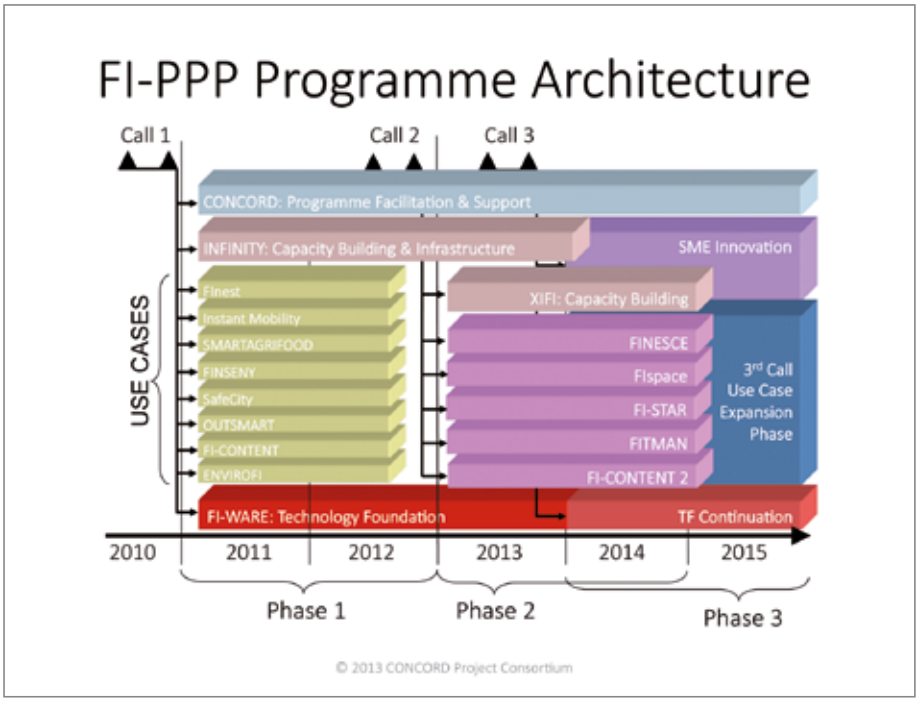


Figure: FI-PPP programme architecture

Conclusion

Phase 3 of the FI-PPP is the radical and ambitious final phase of an already ambitious programme. A lot has been learned through the implementation of this programme which will assist the development of focused European initiatives in future programmes, and we should congratulate the Commission and the National Authorities for being brave enough to try this different approach.

Participating in Call 3, or, more specifically, in the open calls of the Call 3 projects, may represent the least complicated way for SMEs and web entrepreneurs to get support with a minimum of overhead. This approach of making it as simple as possible for the small players to get support and working relationships with bigger industrial players may be yet another valuable sustainable result from this innovative programme.

Further information

- on Call 3: http://cordis.europa.eu/fp7/ict/netinnovation/call3_en.html
- on the FI-PPP: http://www.fi-ppp.eu/

News in brief

Open Signature Initiative launched

On 11 September 2013, leading European institutions, associations, enterprises and projects launched the Open Signature Initiative at the Open Identity Summit 2013 in Germany. The non-profit initiative aims at enhancing transparency and interoperability with respect to electronic signature technology and related trust services in order to support the process of implementing a single European market of trustworthy services.

Among the 19 founding members are the European Network and Information Security Agency (ENISA), the European Association for e-Identity and Security (EEMA), the German Federal Office for Information Security (Bundesamt für Sicherheit in der Informationstechnik, BSI), the German IT Security Association (TeleTrusT), and the Estonian Certification Center (AS Sertifitseerimiskeskus, SK).

The reason for launching the Open Signature Initiative is that the practical adoption of the numerous standards for electronic signatures needs to be improved. The founders of the initiative see in particular many interoperability problems, which make signature technology hard to deploy, and they consider it unclear, which products support which standards.

The Open Signature Initiative covers the entire life cycle of electronic signatures ranging from the issuing of certificates, over the creation and verification of electronic signatures to the long-term preservation of digital evidence.

To reach its goal, the initiative invites all relevant stakeholders to join and contribute to the implementation of a single European market for trusted services and transactions. In the initial phase, the Open Signature Initiative in particular invites issuers of signature creation devices and product vendors to contribute.

http://opensignature.org

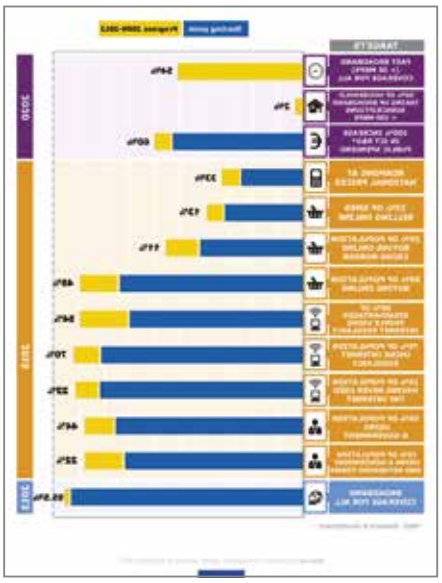
Digital Agenda Scoreboard 2013

In June 2013, the European Commission presented the Digital Agenda Scoreboard report 2013. It assesses progress at EU and national level in achieving the goals of the Digital Agenda, based on 2012 data.

According to the EC, Europeans have basic digital networks and services, but are missing out on the main current and future benefits of the digital revolution. This is, the EC says, because of problems in Europe's telecoms and wider digital markets. The Commission will later this year adopt proposals for concrete measures in response to a European Council request to create a Single Telecoms Market, in order to address the problems confirmed in the report.

In regard to Internet progress the report says that basic broadband is now virtually everywhere in Europe, partly due to satellite performance having improved, helping to cover the 4.5% of population not covered by fixed basic broadband. Fast broadband now reaches half the population – 54% of EU citizens have broadband available at speeds greater than 30 Mbps.

Internet access is increasingly going mobile – 36% of EU citizens access the internet via a portable computer or other mobile device (access via mobile phone is up from 7% in 2008 to 27% in 2012). 4th generation mobile (LTE) coverage tripled to 26% in one year.



https://ec.europa.eu/digital-agenda/en/scoreboard

Major incidents 2012 report by ENISA

In August 2013, the European Union Agency for Network and Information Security (ENISA) presented its report on major security incidents in the EU in 2012. The aggregated information shows that out of the 79 incident reported in 18 countries, almost 40% of the incidents affected the possibility of dialling the emergency number "112". Mobile telephony and mobile Internet were most affected, disrupting communications for millions of users.

Major conclusions of the Annual Incident Reports 2012 include:

- About 50% of the incidents affected mobile telephony or mobile Internet.
- Incidents affecting mobile telephony or mobile Internet affected most users, around 1,8 million users per incident.
- Incidents caused by overload followed by power failures respectively had most impact in terms of number of users affected times duration.
- Switches were the most frequent point of failure (e.g. routers and local exchange points), followed by mobile network home location registers.
- The root cause of third-party failure incidents, mostly power supply failures, affected around 2.8 million user connections per incident on average.
- Incidents involving overload affected around 9.4 million user connections per incident on average.
- Incidents caused by natural phenomena – mainly storms and heavy snowfall – lasted the longest, on average around 36 hours.

Examples of the incidents reported show a wide range of causes:

- Overload causing VoIP outage
- Faulty upgrade halting IP-based traffic
- Cable theft causing fibre-optic cable break
- Distributed Denial of Service (DDoS) attacks on Domain Name System (DNS) affecting mobile Internet
- Faulty software update affecting mobile telephony

ENISA's next Annual Incident Reports, for 2013, is scheduled to be published in spring 2014.

http://enisa.europa.eu

Body talk

Why connecting your stomach to the network is good for you

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Many pop artists have sung about body talk. While they have been focusing on the emotionally stimulating aspects of non-verbal communication, researchers are currently thinking about something completely different, when they plan to make your body talk. Their concepts are rather based on sensors instead of hormones for making our bodies communicate.

Swallow your surgeon

The idea of implanting sensors in the human body is not new. Ten years ago, in 2003, I predicted in a Eurescom mess@ge article that the combination of nano-technology and mobile communications would revolutionise medicine [1]. My article was actually inspired by an earlier Eurescom report: In 2001, Eurescom had performed a study on Bioscience and ICT, in which swallow-your-surgeon scenarios were explored [2]. A decade later, these scenarios have started to travel from the research lab to the market.

Ingestible sensors

In July 2012, the first ingestible sensor, produced by Proteus Digital Health Inc., received approval as a medical device by the U.S. Food and Drug Administration (FDA). The ingestible sensor is part of a digital health feedback system, which is designed to help improve patients' health habits and connections to caregivers.

The Proteus ingestible sensor can be integrated into an inert pill, as the producer explained in a press release. Once the ingestible sensor reaches the stomach, it is powered by contact with stomach fluid and communicates a unique signal that determines identity and timing of ingestion. The pill contains a switch and a battery which creates electricity from the chemical processes in the body when swallowed. The result is the switch toggling on and off, and creating an 18-bit ECG-like signal. This information is transferred through the user's body tissue to a patch worn on the skin that detects the signal and marks the precise time an ingestible sensor has been taken.

Ingestible sensor system by Proteus Digital Health

Additional physiologic and behavioural metrics collected by the patch include heart rate, body position and activity. The patch relays information to a mobile phone application. With the patient's consent, the information is accessible by caregivers and clinicians, helping individuals to develop and sustain healthy habits, families to make better health choices, and clinicians to provide more effective, data-driven care.

Proteus Digital Health plan to market their ingestible sensor in the United States as well as in Europe. In May 2013 the company announced a collaboration with Oracle for clinical trials and product development of its ingestible sensor platform.

Authentication pills and tattoos

Besides medical purposes ingestible sensors could also be used for other ends. In May 2013, Regina Dugan, chief of Motorola's Advanced Technology And Projects Group, suggested at the D11 Conference in Rancho Palos Verdes, California that the Proteus pill could also be used for identification. "Essentially your entire body becomes an authentication token," she explained. The technology itself still needs work, she admitted, but the pills are already safe for human consumption.

For those who are not overly excited about swallowing pills to authenticate themselves, Motorola is working on an alternative – the electronic tattoo. According to Ms Dugan, the electronic tattoo could be worn on the skin for a week at a time, allowing users to go through authentication processes without hassle every day. The tattoos are based on a novel, stretchable electronics system that functions even as it is bent on the wearer's arm.

In this context, it is interesting to know that before joining Motorola, which is part of the Google empire, Ms Dugan was director of the US Defense Advanced Research Projects Agency (DARPA) from 2009 to 2012. It does not take too much imagination to speculate that DARPA has been exploring pills and tattoos for authentication as a means to figure out the whereabouts of each US soldier in war zones.

Authentication versus privacy

Using ingestible sensors and electronic tattoos obviously raises privacy concerns. What may be good for the US army in order to track their soldiers may not be equally desirable if used by ordinary citizens. Before we condemn this innovative way of authentication outright for all civil scenarios, including Internet access, it is worthwhile to notice that currently used authentication methods are getting increasingly vulnerable.

If you think, for example, that passwords are secure, there are good reasons to reconsider. It appears that hackers are now able to crack even long passwords. A team of hackers, commissioned by technology website ArsTechnica.com, recently managed to crack more than 14,800 supposedly random passwords, out of a list of 16,449, as part of an experiment. The success rate for each hacker ranged from 62 to 90 percent, with the most successful hackers requiring less than an hour. The hackers even managed to crack 16-character passwords like, for example, "qeadzcwrsfxv1331".

So, the need for more secure authentication is there, and it will be a big technological and political challenge for the coming years to balance security and privacy needs in the use of communication sensors on and in our bodies.

Electronic tattoo developed by the Rogers' Research Group at University of Illinois

References

[1] Milon Gupta: Submarines in your body, Eurescom mess@ge, June 2003
[2] Eurescom Study P1142: Biosciences and ICT – two worlds growing together? September 2001

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