Mobile applications

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Berlin, Germany
18–20 May 2010

TridentCom 2010, this year's **biggest international testbed conference**, is devoted to "**Testbeds and Experimental Facilities for the Future Internet**". It will take place in the vibrant city of Berlin, Germany, from 18 to 20 May 2010.

TridentCom 2010 will provide a forum to explore existing and planned testbed concepts, infrastructures, and tools to address the research and business challenges of ICT convergence.

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Session topics include:

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You can also contact the organisers at *tridentcom2010@eurescom.eu*

Dear readers,

Everybody is crazy about iPhone apps. Even at Eurescom, iPhone apps have become popular, although some colleagues complain about Apple's proprietary approach. As Apple's competitors are now joining forces to come up with alternative apps solutions, the editorial team of Eurescom mess@ge decided the time has come to have a closer look at mobile applications and make them the cover theme of this issue of Eurescom mess@ge.

We asked some of the major players, how they envisage the future of mobile apps. The replies by some of them were characterised by increasing caution, depending on the market position of the company in the mobile apps domain. This already indicates how hot the topic really is. Particularly reluctant to share their views on the future of mobile apps were Apple, giving the explanation that "we never talk on the future".

Well, if Apple does not want to talk about the future of mobile apps, we definitely will. And fortunately, some major players, including RIM and Deutsche Telekom, were ready to share information about their R&D activities in the mobile apps domain. In addition, our cover theme includes an overview article by Eurescom mess@ge editor Uwe Herzog and a critical appraisal of Apple's App Store by Strand Consult.

While smartphones and mobile apps are certainly exciting, we should not lose sight of the users and how they employ advanced ICT technologies. The promise of many of those technologies is to add value to your life and make things easier. Well, after my recent 20-minute service call to Deutsche Telekom on an issue with my iPhone, I am not so sure we are there yet. In any case, coping with the requirements of advanced ICT and the information age we are living in requires particular skills, which the EU has named e-skills.

In order to promote e-skills in Europe, the European Commission organised the first e-Skills Week in early March 2010. Together with a number of major players in the ICT domain, Eurescom supported the e-Skills Week as an international stakeholder. Read the report under "European issues". On this occasion, Eurescom took the opportunity to launch the Eurescom e-Skills Forum, which will discuss how to promote e-skills in the area of European ICT research – see the Forum page at www.eurescom.eu/activities/e-skills.asp. European ICT stakeholders with an interest in promoting e-skills are invited to join the discussion and subscribe to the Forum's mailing list.

I hope you find this issue of Eurescom mess@ge informative and maybe even thought-provoking. My editorial colleagues and myself would appreciate your comments.

Milon Gupta
Editor-in-chief

Events calendar

12 – 13 April 2010
Celtic Event
Valencia, Spain
http://www.celtic-initiative.org/Events/
Celtic-Event10-Valencia/welcome.asp

13 –14 April 2010
The European RTD Framework Programmes:
From economic recovery to sustainability
Valencia, Spain
www.r2sconference.eu

15 – 16 April 2010
Future Internet Assembly (FIA) workshop
Valencia, Spain
http://www.r2sconference.eu/sideEvents_fia.php

26 – 30 April 2010
WWW 2010 – The 19th International
World Wide Web Conference
Raleigh, North Carolina USA
www2010.org/www

10 – 12 May 2010
MobiLight 2010
Barcelona, Spain
www.mobilight.org

18 – 20 May 2010
TridentCom 2010
Berlin, Germany
http://www.tridentcom.org

16 – 18 June 2010
Future Network & Mobile Summit 2010
Florence, Italy
http://www.futurenetworksummit.eu/2010

30 June 2010
FIREweek Conference - Future Internet Research
and Experimentation
Barcelona, Spain
www.ict-fireworks.eu

13 – 17 September 2010
3rd Summer School on Network and Information
Security (NIS 2010)
Crete, Greece
www.nis-summer-school.eu

15 – 17 September 2010
DYMARCOM 2010 – 1st International ICST
Conference on Dynamic Markets for
Communication Resource Management
Edinburgh, United Kingdom
http://dymarcom.org

16 September 2010
eMobility General Assembly
Venice, Italy
www.emobility.eu.org

20 – 23 September 2010
CIP 2010 – 1ST IFIP International Conference
on Critical Information Infrastructure Protection
Brisbane, Australia
www.wcc2010.org/cip

27 – 29 September 2010
ICT 2010
Brussels, Belgium
http://ec.europa.eu/information_society/events/ict/
2010/conference

27 – 29 October 2010
eChallenges e-2010 Conference
Warsaw, Poland
http://www.echallenges.org/e2010

Sn@pshot

Barbie goes geek

Barbie, the popular girl's doll, has entered a new career: computer software engineer. Her 126th career was chosen on the basis of an online voting campaign at the age of 51 (yes, she looks younger, but her birth date is 1959). Computer Engineer Barbie is wearing glasses, a Bluetooth headset and a glamorous look rarely seen in IT departments. According to its manufacturer Mattel, Computer Engineer Barbie "inspires a new generation of girls to explore this important high-tech industry, which continues to grow and need future female leaders".

Mobile applications

CELTIC NEWS

2nd OMEGA Open Event in Rennes

Skills Week

First European e-Skills Week

Wanted: the unbiased reviewer

David Kennedy
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There is a growing problem in the assessments of project proposals in public funded research programmes: the search for unbiased reviewers is in fact making the process biased. At least this is the case in the ICT world.

We now accept that the networks of the future will have tight bindings to the services of the future, and the services of the future will be bound to the application domains. Then, who is independent in this picture any more?

Limitations of academic reviewers

The academics have long been a major group in this process. They can surely add technical competence and a long term view into the assessment process. However, while they do their best to appreciate other viewpoints, they do lack the business dimension.

One key problem with the academic community is that they consider many things from the new science perspective, and the newness has a very high value in their communities. However, for industry, much of the innovation is in the application of emerging sciences and technologies. Here we have a problem. Can you fairly assess my proposal, if your perspective of innovative work is inherently different from mine?

This problem is systematic across many research programmes, as the level of innovation, and therefore applied research, that is needed to take an idea from the point where the academic community has fully explored it to the point, where it might be taken up and used in the marketplace, is often way more than any side can predict. This can take time and can often result in academics being dismissive of proposals as they have been familiar with the technology discussion for several years and believe that there is no more research to be done, while the industrial community does not have it in a form that can be directly used.

Biased reviewers from industry

Industry players are also biased in that they are directly involved, and they might not be the best to impartially evaluate their own or their competitors proposals. However, when the industrial evaluators declare their interest in any proposal and therefore exclude themselves form assessing it, we are logically increasing the risk of their competitors then assessing the proposal.

So where do we go? Some have said that the blind evaluation of proposals would be appropriate, where the project is stripped of identifying characteristics and is assessed as an abstract proposal of work. The risk here is that it might be the right work, but it is possible that the project is being proposed by people who cannot deliver on the promise or do not really have the business relevance to exploit the results in the end.

Are consultants then the least evil party here, who can be trusted to be fair and impartial? Many would argue they are not, as they have an obvious interest in ensuring they continue to secure work in the future and therefore may have more agendas than any of the other players.

So we can rapidly reach a point where we can persuade ourselves that there is no fair way to assess proposals for public programmes, as a set of impartial reviewers is impossible to find. Clearly this is not going to work, so what can we do?

A new evaluation approach

Well I think we need to take a step back and consider the way these programmes are funded. First the percentage of public money is significant so the agents of the authorities need to assess where their money is invested. They chose to do this through a panel of assessors but, in doing this, they have a responsibility to ensure the panel are qualified and the interests are mixed so that we do not get the bias of any one interest group showing. This is being achieved to a fair degree today.

What is not being achieved is the recognition of the other half of the investment in the programme. Here the industrial players invest significant time and effort in creating programmes and project proposals and they, because they are making similar level investments, should provide their panel of appropriate experts and share in the reviewing.

If we could have all proposals evaluated by a mix of evaluators, where some represent the values of the authority and some represent the values of the industry, then we will have both investing parties well represented in the decision on the investment.

As we now enter the new era of public private partnerships, we should strive to ensure the partnerships start with the programme definition and the selection of the projects and not just after the projects are selected.

Mobile applications –
More than a hype

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Mobile applications, short name: apps, currently receive enormous public attention. Application stores of several providers offer various apps for download to your mobile phone. These apps offer all kinds of functionality, from navigation, communication and location-based tools to games and other entertainment software. Is this the revolution of the business for mobile phone services?

There has been a time when it was solely up to network operators to introduce new services and to offer them to their customers. That was when all services were deployed centrally in the network. The breakthrough of Internet and access to it from the PC has, however, started the trend of services being implemented at the edges of the network. The advances in technology, in particular regarding processing capacities, has enabled the construction of powerful smartphones. This together with the higher data rates enabled by 3G technology has finally enabled also sophisticated mobile applications to be realised on the edges of the network, i.e. on a mobile terminal.

Inflation of app stores
In the past one to two years a number of app stores have been launched on the Internet. From these stores users can download thousands of applications to their smartphone. While Apple has been a pioneer in that development and with 140,000 apps has the largest store, there are other stores like Nokia's Ovi, the store of Blackberry producer RIM, or Google's store for Android. The enormous growth of these stores has been enabled by leveraging the creativity of an external developer community that can easily submit their applications and have them made available on the app store. Attractive in that respect is that the store operator takes care of collecting the purchase fee from the end users who download the apps – an enormous relieve for developers. The success of the external developer model has even inspired a carmaker like Ford to consider offering a service development kit for their cars' on-board computer, enabling third-party developers to build applications, as reported by the Wall Street Journal. It is, however, not clear yet if Ford will open their own app store.

The run for opening up an own app store is certainly attractive for any player from a commercial perspective. Gartner has forecasted a turnover of 6 billion dollar made by app stores in 2010 – a 50 percent increase compared to 2009, and 30 billion dollar in 2013.

Tied-up users
From the users' perspective the ability to update their smartphones with additional applications from the app store is an attractive feature, as it allows a kind of personalisation of the device. While in the past users who wanted to have the latest features had to buy a new phone, they now can simply download additional functionality. This is of course limited to applications, and if you are unhappy with hardware-related features, like, e.g., battery lifetime, you still need to purchase new hardware. It is also not clear how many users actually make use of the abundance of applications. The New York Times has reported that the average user installs only 5 to 10 applications which in turn concentrate on the most successful ones.

A severe disadvantage is certainly that apps are not portable to terminals of another manufacturer. This means that you will either stay with your brand or lose all your dearest applications. At least you would need to re-purchase the apps from the store of the manufacturer of the new phone – if they are available there. Apple, for instance, practices in general a very tight control over what users can do with their phone – and for instance my Portuguese colleague who now lives in Germany is not happy that she is not allowed to download apps available on the Portuguese app store from Germany.

Standardisation of apps
Having some sort of standardisation in this environment of proprietary services would certainly be beneficial. One of the articles in this cover theme describes a promising initiative called BONDI which is part of the Open Mobile Terminal Platform (OMTP), and which has a number of influential members. The eStore that Ericsson announced at the recent Mobile World Congress in Barcelona could be another step in this direction, as it targets multiple terminals in a vendor-independent fashion. Mobile operators will be able to built their own customised app store with the eStore. Of course, external developers will have the chance to upload their applications and to receive their share of the revenue.

Implication on operators
The success of the apps model is extending the threat to telecom operators of being degraded to bit-pipe carriers from the fixed-line Internet world to the mobile domain. While new data-heavy applications might be welcomed by operators for getting some return on their 3G investments, they also require operators to continuously invest in the network. Rajeev Suri, head of Nokia Siemens Networks (NSN), estimates that data volumes will increase by 10,000 percent by 2015 due to the growing popularity of smartphones. At the same time sales prices of data packages are dropping. It seems therefore inevitable for network operators to find a new business model that allows them to generate additional revenues. A Deutsche Telecom board member admitted recently in an interview that the relevance of the old classical model declines and that Deutsche Telekom therefore will adapt its business model. And Telefónica CEO César Alierta explained in February 2010 that those who cause high data traffic will in the future have to pay for it.

Initiative of mobile operators
The announcement of 24 mobile operators at the Mobile World Congress to open a joint, central store for smartphone applications is probably one answer in this direction. The participation of large operators as e.g. Vodafone, China Mobile, Telefónica, América Móvil, Orange, T-Mobile etc. representing a total of 3 billion mobile subscribers worldwide shows the power behind the initiative. While details are not clear yet, the alliance announced that it will develop a joint standard within the next 12 months.

Conclusions
In the coming months we will see how the mobile apps market will further evolve. Some people argue that there is a lot of hype around apps. However, the turnover generated with mobile applications already today seems to indicate that mobile applications have already passed the stage of mere hype.

Apple's App Store and beyond

John Strand
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With the launch of the iPhone and its application store, Apple has created a fantastic user-friendly solution that makes it easy for customers to download applications to their iPhone. What Apple has proved is that usability is one of the areas they fully master. But is all the hype justified? And what comes after the Apple Apps?

The Apple Apps success story

The Apple App Store has reached more than 100.000 applications and has handled more than 3 billion application downloads. This is a highly impressive result taken into consideration that Apple is not a first mover on this market – something many still believe they are.

One of the main advantages of the App Store, from Apple's perspective, is that it has assisted the sales of both the iPhone and iPod Touch. The App Store has helped drive incremental hardware sales, and it seems to be a strategic differentiator within the consumer product download industry.

Another advantage Apple has had is their success with iTunes, where millions of customers have been used to using Apple's shop to purchase and pay for music. As many of the iPhone customers are also iPod customers, they are already familiar with this type of store and with the provider that is offering applications for their iPhone. This is an advantage other phone manufacturers do not have.

The App Store hype

Apple is by no means the first handset manufacturer to launch an application store. Handango has been on the market for years, and have in fact been offering mobile software for more than eight years. However, Apple seems to have been able to create an unprecedented hype surrounding the App Store, mainly by creating a more modern design and user-friendly

interface. People are talking about Apple's App Store for the iPhone – but is it really such a huge success as the media write, or is it simply one of the many solutions that are being over-hyped?

The media are giving app stores a lot of coverage, and most phone manufacturers and mobile operators are in the process of launching their own app stores, with the dream of thereby being able to create a commercial success.

The limits of the free apps model

When you read the many articles that are being published about this subject, there is no limit to the optimism and how impressed people are about the many free downloads offered on Apple's App Store. However, in the world that Strand Consult does business in, we do not have many customers that can make a living from giving customers free applications for their mobile phones. We are, for example, more focused on the 8,6 billion dollar market (2008 figures according to the Mobile Entertainment Forum) for premium value added services, of which 10 billion services were services being sold off-portal through third-party providers.

Taking a closer look at the market for various types of services, the mobile phone games market generates around 44 percent of the total premium mobile services market, corresponding to sales of 3.75 billion US dollar.

With more than 2.5 billion phones that support Java on the market, there is no doubt that many application developers prefer to develop Java applications that can be potentially used on 2.5 billion phones, thereby targeting the mass market and a market that already has an

enormous turnover, rather than developing for the narrow iPhone segment – a market with few customers and very little cash flow. An app store can be compared to a bookshop. The mobile industry does not lack booksellers, it lacks the people that can educate users and teach them how to use mobile phones for other things than just voice and SMS. We need to educate the many billions of 'illiterate' mobile users, rather than focusing on building bookshops.

The future of mobile services

We believe that the premium value-added services (VAS) market will explode from the 8.6 billion US dollar of 2008, as an increasing number of new services for the more advanced mobile phones enter the market and as mobile operators launch micro-billing on the mobile broadband connections they are selling. We know that many operators will copy their mobile phone strategy, by implementing premium billing on mobile broadband connections. The big question is not whether there will be a market, or whether it will be huge, but rather who will dominate the market. We do not believe it will be app stores or other similar solutions you read about in the media.

There is no doubt that an app store makes it easy for customers to purchase applications for a certain type of handset, but it doesn't help teach customers how to use the applications or understand the potential value of the applications. If a bookshop doubles the number of books in their store, or give the books away for free that will not increase the share of population that are able and willing to purchase and read books.

A platform for portable apps

Open source initiative BONDI

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Mobile web applications such as widgets or web pages are becoming increasingly popular. However, developers today are confronted with diverse, non-standardised runtime environments on mobile terminals, or closed, vertical ecosystems such as those of Apple or Google. Currently, this prevents a direct portability of applications between mobile terminal systems. The open source initiative BONDI aims to change this. BONDI works towards developing an open platform which enables portability of mobile applications.

Writing applications for one ecosystem today does not allow simple re-deployment in another. In order to tackle that problem, the open source initiative BONDI has the vision of enabling a cross platform ecosystem in which such a portability becomes possible. Some of the largest operators worldwide, like Deutsche Telekom, AT&T, Orange, Smart, Telecom Italia, Telefonica, Vodafone and others, have aligned with terminal and software vendors, with research institutes as e.g. Fraunhofer Fokus, with developers and with other industry bodies to realise this vision. The outcome will be a key driver for the evolution of new mobile applications.

BONDI will provide access to powerful functionalities in a mobile device – in a secure way and consistently across devices and operating systems. The BONDI initiative is part of Open Mobile Terminal Platform (OMTP). OMTP is a forum with members from across the mobile phone value chain, set up with the aim of gathering and driving mobile terminal requirements to ensure consistent and secure implementations, thereby reducing fragmentation and simplifying the customer experience of mobile data services across mobile terminals.
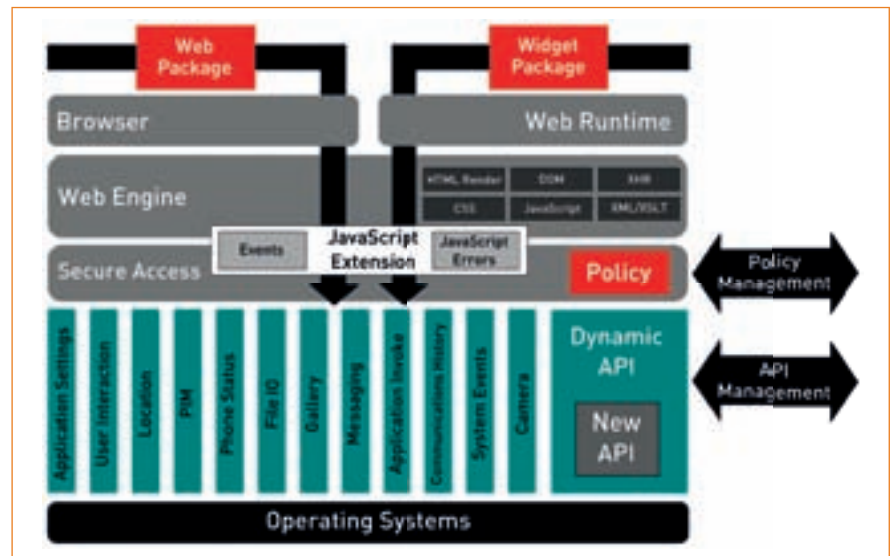
BONDI architecture

Consistent and secure APIs

Since its launch in 2008, BONDI has defined an architecture and delivered specifications, including a set of terminal programming interfaces (APIs), which enable mobile web applications.

The APIs defined include, for example:
- **Location** – assess the phone's current location via: Cell-ID, GPS, Bluetooth GPS, WLAN estimates etc.
- **Personal Information Manager** – use data including calendar, tasks and contacts.
- **Messaging** – use of the phone's messaging capability, including email, SMS, MMS.
- **Camera** – use of the integrated camera for picture and video capturing.
- **Application Invoke** – ability to launch native applications such as the dialler, browser or the messaging client.
- **Phone Status** – query the current phone status, including battery life, network status, accelerometers etc.

As BONDI enables applications to access sensitive terminal functions, it also comes with a very strong security framework to protect users from attacks by malicious applications.

Write once, deploy anywhere

BONDI aims to realise the vision of "Write once, deploy anywhere". Providing developers of mobile web applications with a consistent development environment requires an industry-wide alignment, the use of standards, and a strong compliance framework. BONDI endorses W3C web standards for browser and widget runtimes and is a complete open source solution, available to any vendor or service provider. It provides specifications for terminal APIs, a security framework, a reference implementation, and a strong compliance framework to minimize incompatibility.
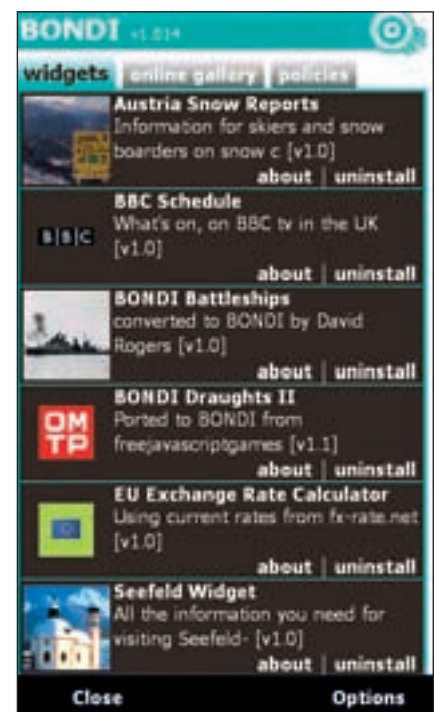
BONDI widget gallery on a mobile phone

Examples of BONDI apps

Gig Guide, one of the first BONDI widgets to be developed, uses a whole range of BONDI APIs: it detects your location and provides you with a list of all music events in your vicinity – regardless of whether you travel in Paris, London, Las Vegas or at home. GigGuide recommends the best route to the event, stores a selected event in your calendar and allows you to send all details via SMS to your friends – all within a few clicks.

In a similarly easy way, a BONDI widget could identify your location, if you are lost in a foreign city and don't have a travel guide. The widget will provide you with all information about the best transport means, prices of tickets and how to find, for example, the next bus stop.

Another BONDI app could provide details for the closest petrol station and a reminder for the next service – all in a few clicks and offering the same functionality across devices and operating systems.
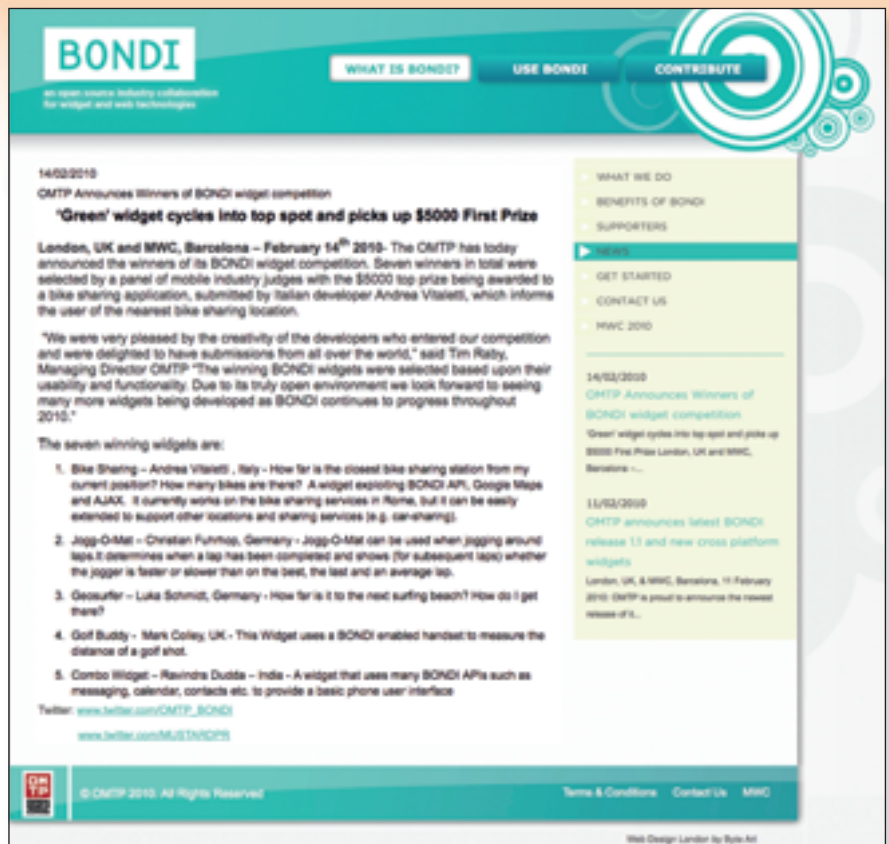
Another BONDI app could provide details for the closest skiing resorts and links to the respective web cams and latest snow reports.

numerous demonstrations already at the Mobile World Congress 2010.

A host of support software is also emerging. There are software development kits and other tools available to developers. BONDI widgets are easy to create. All it requires is a good idea and a little bit of HTML and JavaScript experience. The API specifications for BONDI devices are designed for being used in conjunction with BONDI's application security frame-work by any existing or future application ecosystems.

Outlook

Further BONDI APIs are planned which will address trends such as sensors, Bluetooth, telephony functionalities and security enablers needed, e.g., for m-payment. The testing framework will also be enhanced. Close alignment with W3C will be continued to drive standardisation.

Launched to drive consistent terminal implementations for web applications, the BONDI initiative has attracted a fast-growing community in a very short time. Deutsche Telekom and other large and small players will remain highly committed. Further operators, terminal vendors or application developers are welcome to join.

More information and BONDI's SDK (Software Development Kit) are available at bondi.omtp.org.

Seefeld Information Widget

Widget Austria snow reports

Mobile Web applications
The approach of Research in Motion

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The Mobile Internet has been gaining tremendous momentum in the industry, justified by the astonishing figures indicating that significantly more mobile devices are being connected to the Internet compared to the desktop computers. This is the result of innovation in the mobile space! However, this trend has not transformed into the same level of end-user experience, and the eco-system that drives it. As we are entering the second decade of this millennium, we anticipate the real innovation to predominantly come from the mobile applications as opposed to a higher number of devices and the increasing availability of network bandwidth and radio access.

The success towards developing innovative mobile applications is often based on a rich platform offering a complete ecosystem that will allow developers to rapidly develop, test and deploy applications. These include exposing key device functionality via APIs, necessary development tools, security essentials, and a robust overall development experience, among others. To this end, the business of hosting applications is also gaining popularity among both service providers and handset vendors. An example of an application store is shown in figure 1.

Figure 1: Example of an application store

Until now, the mobile application development efforts have largely been very device and platform centric. In other words, an application that was developed for one platform or device cannot be re-used for another device or platform without significant effort to re-program or tweak the application to fit the new platform.

Mobile Web applications
Today, we all understand that the Web is ubiquitous and is widely used in every home; one can almost say that we cannot be without it. The Mobile Web, on the other hand, originally was meant to bring the functionality of the Web to the mobile domain in an optimized form through languages such as WML and Mobile HTML with limited functionality.

However, this notion has completely changed recently with high powered mobile phones – also referred to as Smartphones – that are now capable of rendering the same "full Web" content that we are used to seeing on conventional desktop computers. This, coupled with the power of mobility, and the diverse functionality that a mobile device offers today, including access to location, camera, sensors, voice capabilities, e-mail, among others, brings a new dimension to mobile application development and enormous opportunity for innovation. To this end, there are several standards efforts in the industry such as widgets, device APIs, policy working groups in W3C, OMTP's BONDI, and other fora that are actively engaged to marry the mobile Web environment with the device functionality.

BlackBerry Widgets platform
At RIM, we are highly sensitive to developer requirements and our focus has always been to give the developers the best tools and device functionality that can empower application development.

BlackBerry Widgets is a platform to allow developers to leverage their existing Web knowledge to build compelling mobile applications. A BlackBerry Widget combines standard Web technologies with local device functionality in a familiar fashion while still providing industry leading security. See figure 2, which shows a high-level architecture. Based off of the W3C Widget specification, a BlackBerry Widget is an alternative approach to building a mobile application in a native SDK yet still provides the same power and functionality. By using standard Web technologies, the barrier for building compelling BlackBerry applications has been significantly lowered.
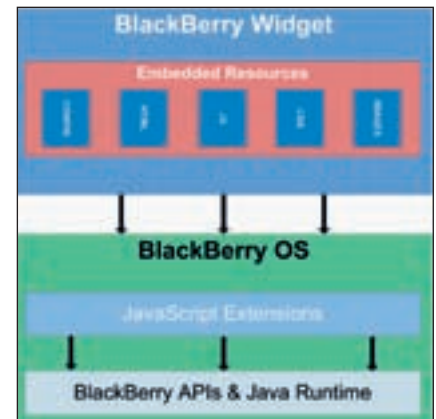

Figure 2: High-level architecture of BlackBerry Widgets platform

BlackBerry Widgets allow you to write your application entirely using web standard technologies such as HTML, JavaScript, SVG and CSS while still providing access to all of the underlying BlackBerry functionality. RIM has provided JavaScript libraries that allow a Web developer to access on-device functionality such as PIM, file storage and BlackBerry push technologies. A developer can also leverage Gears support for local storage via SQLite and also multithreaded JavaScript using Workerpool.

A key feature of the BlackBerry Widget platform is that there isn't a limit of what you can accomplish within JavaScript. A developer can easily wrap any of the existing BlackBerry Java APIs to be consumed by JavaScript. This removes pre-existing barriers that blocked a Web developer from taking their device experience to the next level. All of this functionality comes packaged with existing BlackBerry world class security.

Conclusion
We would like to conclude by saying that the mobile Web platform is a platform of choice for mobile application development. Furthermore, we believe it will be a very promising field for research and development for years to come and a great opportunity for everyone involved in the mobile eco-system ranging from the operators, vendors, content developers, and the end-user – finally bringing the ultimate end-user mobile Web experience the way it is meant to be.

You can find more information on BlackBerry App World and developer resources at:
www.BlackBerry.com/AppWorld
http://docs.blackberry.com/en/developers
Relevant W3C specifications in progress:
Widgets: *www.w3.org/TR/widgets/*
Device APIs and policy: *www.w3.org/2009/dap/*

Challenges for mobile applications
Strategic considerations by eMobility

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This article presents some of the challenges in the development of applications for mobile and wireless communications, addressing specifically the areas of Health and Inclusion, Transport, and Environment, as well as the Future Internet. These areas have been identified by the European Technology Platform eMobility as strategically important for the future of mobile applications.

The perspective

The demand for smart mobile phones has been steadily increasing in the last few years, namely since the iPhone made its appearance in Summer 2007. As expected, Apple competitors ran to offer similar products to the market, and, nowadays, there is quite an offer of touch-screen phones with a myriad of applications. In parallel, the "war" on the smart phones' operating systems started as well, being expected to last still for a while. But for users, the bottom line is, really what applications can be used on the phone.

Many, if not so say most, of the applications that run today on a phone can be considered of the gadget type, i.e., they offer a not very useful service to the user, rather mapping a website onto the phone. Often, the user runs the application a couple of times, in order to try it out, and then stops using it. Of course, other applications are really useful and offer clear benefits to the user. Still, clearly, in the future users have to be offered applications that go much beyond this point, providing a real added value to the many activities of their daily life.

eMobility's Strategic Applications Agenda

The European Technology Platform eMobility has explored strategic directions on how to add value to mobile applications. To this purpose, its Working Group on "Leading-Edge Applications" has organised several workshops, and established a Strategic Applications Agenda. Three focus areas were chosen as particularly promising: Health and Inclusion, Transport, and Environment. In addition, the Future Internet has been considered as well. For each of the areas, a vision and core topics were defined, followed by a review of the state of the art, and then future challenges were identified. Annexes present an extensive survey of projects/applications.

Challenges in key areas

On **Health and Inclusion**, we have identified the following main challenges:
- Requirements on energy, size, cost, mobility, connectivity, and coverage.
- Address of legal and regulatory issues.
- Adaption to the conditions of users and the device they are using, hence, establishing equality and design for all.

On **Transport**, the main challenges include:
- Certification guidelines across a wide range of areas, including safety issues.
- Provision of the right information based on context awareness, potentially with context prediction.
- Requirement for standards to provide multiple services over multiple different platforms, working in different countries.

Environment encompasses these main challenges:
- Requirement-driven solutions that have a commercial and economic justification, and can be provided at best on a global scale.
- Solutions that design and implement usability and reliability.
- Increase of collaboration among environmental organisations, public sector and industry.

On the **Future Internet**, some main challenges are already foreseen:
- Understanding of what users would like to achieve.
- Understanding of the requirements for applications and services.
- Driving research in the right technological direction, so that advancements may translate into business innovation.

Additionally, there are challenges transversal to all areas, which really need to be addressed by all those involved in their development. These challenges include ease of use, overall standardisation, as well as trust, security and privacy of data, whose perception varies.

Conclusion

There are many challenges in the development of services and applications for the daily use in everyone's life. By analysing some key areas (Health and Inclusion, Transport, and Environment, as well as the Future Internet), one can recognise that there are some challenges specific to each area. On the other hand, there are other challenges that are transversal to all areas and that really need to be addressed by all those involved in their development. These challenges address the aspects required by global markets as well as the essential aspect of the ease of use, and include all the features that are related to an individual and its relationship with society.

For further information, see the eMobility website at *www.emobility.eu.org*.

CELTIC N · E · W · S

Telecommunication Solutions

EDITORIAL

Dear reader,

In this issue we present four successful Celtic projects, which recently completed their work. As the final reviews proved, we can indeed be proud of having so many excellent projects, achieving considerable impact, generating new products and business as well as helping to create new jobs.

The presented projects of this issue were looking at home automation and autonomic home networks, efficient and user-centric systems for media distribution and content delivery, and advanced solutions for next generation wireless process manufacturing.

Celtic Call 8

On 8 March 2010, Celtic officially opened its call phase for new proposals in 2010. This 8th call will be carried out, as in previous calls, in two phases, a proposal outline phase and a full project phase. The two-phase concept is a useful means to avoid much work in preparing a fully worked out proposal without knowing if such a proposal would ever have a good chance of being funded or positively evaluated from its technological merits. Only positively rated proposal outlines will be invited to submit a full project proposal during the second half of the years. This approach assures that the acceptance rates of full proposals are over 60 percent.

The submission deadline for project outlines is 14 May 2010.

At the Celtic Event in Valencia there will be a special Information and Brokerage Day on 13th April 2010 where interested people can present and discuss their project ideas with potential project participants or present their company for participation in a project. For further information about this information day you may check the Celtic Event Web site at *www.celtic-initiative.org/Events/Celtic-Event10-Valencia/Information_day.asp.*

Heinz Brüggemann
Director Celtic Office

RUBENS

A holistic approach to a new broadband media delivery paradigm

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Broadband access networks stand at a key crossroad in their history. Similar to the experience of consuming "as you wish/when you wish" Internet content, the network evolutions promise to enable personalized consumption of media, both in terms of the presented content and consumption timing. A key question that both service and network providers have at this point is how this widening range of mostly multimedia-driven services can be combined with a "carrier-grade" network infrastructure in an economically viable way

This has been the starting point of the recently finalized CELTIC project RUBENS. The project brought together key European players to investigate how the network infrastructure can be reorganized to allow a more efficient media delivery for today's and tomorrow's services.

The RUBENS technologies

The RUBENS consortium investigated mechanisms that dynamically optimize the Quality-of-Experience (QoE) for a bouquet of services. The results of the project were organized around the RUBENS functional architecture depicted in figure 1. This architecture immediately reflects a key outcome of the project: there is no single technique that will yield the best QoE. Depending on a wide variety of environment variables (determined by subscriptions, content, and the offered services themselves), QoE needs to be optimized by tuning for instance the video quality, transport and network configuration in an orchestrated way, ensuring a stable and carrier-grade behaviour. The demonstrator presented at the final meeting has shown the interworking of each of these mechanisms.

The economics view

Accompanying the technical studies, a techno-economical validation task supported technical decisions and provided guidelines for strategic decisions. The analysis was split in different questions (figure 2), each one investigated with appropriate scientific methods.

A major finding is that an implicit demand for QoE does exist. However, it remains to be explicated and initiated. An important driver is the increasing personalization of services, discontinuity of linear service perception and resulting larger diversity of consumer habits with demand for similar quality assurance but changes in duration, peak and sustainable bandwidth. This results in higher congestion probability, the major technical driver for QoE enhancing technologies. The current best practice of over-dimensioning the network will become increasingly uneconomic and technologies that increase network efficiency like the ones developed in RUBENS will gain the centre stage.
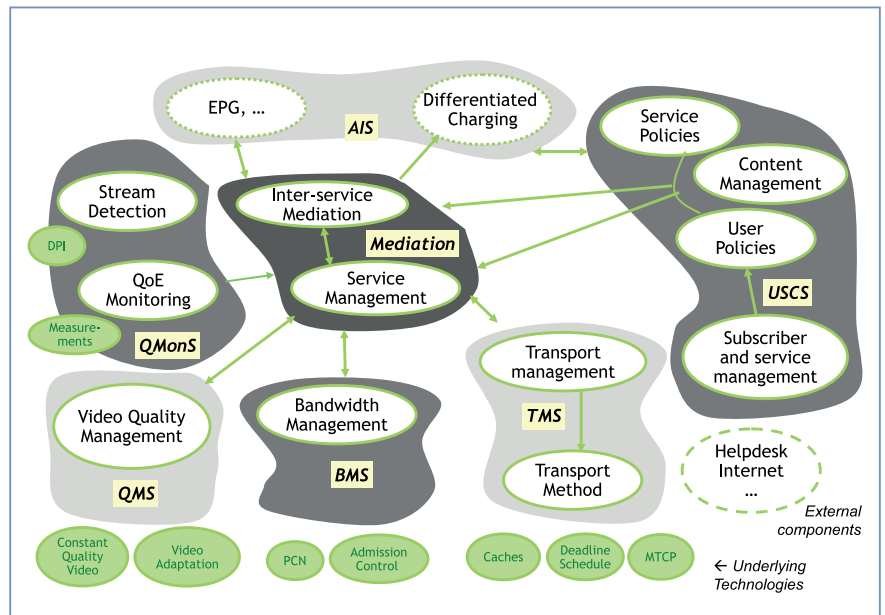

Figure 1: RUBENS functional architecture

Conclusion

Future multimedia content will evolve from static broadcast and on-demand to much more personalized and dynamic consumption patterns. RUBENS has shown that network operators can combine a more dynamic networks organization with value-added services that im-

prove the role of the network access provider in the value chain, in order to facilitate this (r-)evolution. With the largest European providers and the market leader for media delivery in the same consortium, RUBENS is well placed to prepare the resulting new product solutions and concepts for market deployment.
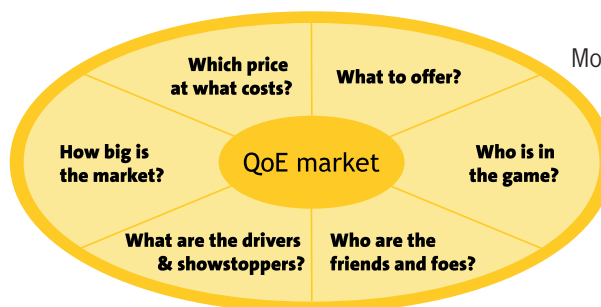

Figure 2: Techno-economic analysis

More information on the project results can be found at *www.celtic-initiative.org/projects/rubens*.

HERMES

Hyper-distribution of online media services

Communication habits as well as ways to access and consume online media are evolving tremendously these days. The trend is towards creation of media applications which are ubiquitously accessed through social Web services rather than traditional dedicated devices/channels and service contracts.

Social media is indeed solidifying its place within the realm of digital consumption. According to Juniper Research, worldwide revenues from social networking, dating and personal content delivery services will increase from $572m in 2007 to more than $5.7bn in 2012, with social networking accounting for 50 percent of the total by the end of this period. Therefore, content should be made accessible to a user anytime and everywhere, supported by trusting and "social proximity" models for communication and exchange. This is the target that the HERMES project

strives to achieve – explore enabling mechanisms for ubiquitous access to online audio/video content independent of its location and in combination with social communication services.

Main focus – unleashing viral media delivery models

HERMES provides means to mobile and IPTV users for ubiquitous access and sharing of their own media and communication/Web services. These exchanges are realized within a trusted user group, guaranteeing access rights and rewarding content owners, which could be professional studios or digital consumers themselves (for UGC – user generated content). Social activities between users are explored to determine possible dynamic social links of HERMES users for viral distribution and recommendation of personalized media. Therefore, project results have significant impact on five main service markets:

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- mobile content
- online video services
- smart-card services
- digital TV and
- social communities.

HERMES is mainly an intermediation platform (see figure) to link various online media sources and transparently distribute content towards users' multi-modal terminals. The platform provides the following main features:

- Media (audio/video) portal with discovery, play list, recommendation and sharing functionalities

- Media format adaptation depending of user terminal
- Meta-data generation/indexing before media delivery to users
- Social networking analysis functionalities including gateways to social network Web sites
- User registration with user account and user preferences management.

Economic analysis and experimentation

The successful adoption of the Hermes platform in the highly dynamic environment of media and communication services requires a sound and viable business model. Some effort is therefore devoted to assessing the main economic and competitive features of a HERMES business model by reviewing alternative offers for relevant market positioning of HERMES services and the associated differentiating strategy. The differentiation potential is evaluated along two dimensions:

1 the balance between individual consumption and collective interactions, like content distribution and communities sharing networks.
2 the nature and degree of personalisation services.

The consortium also elaborated a series of 9 innovative services. Two of them – "Connected PVR" (Personal Video Recorder) and "Social Media Adviser" – will be showcased during the upcoming CELTIC Event in Valencia in April 2010.

Conclusion

HERMES surely constitutes an original and innovative offer for two reasons: a balanced offer of socialization services and painless access to media as well as sophisted customization and integration capabilities.

Further information is available at *www.celtic-initiative.org/Projects/HERMES*
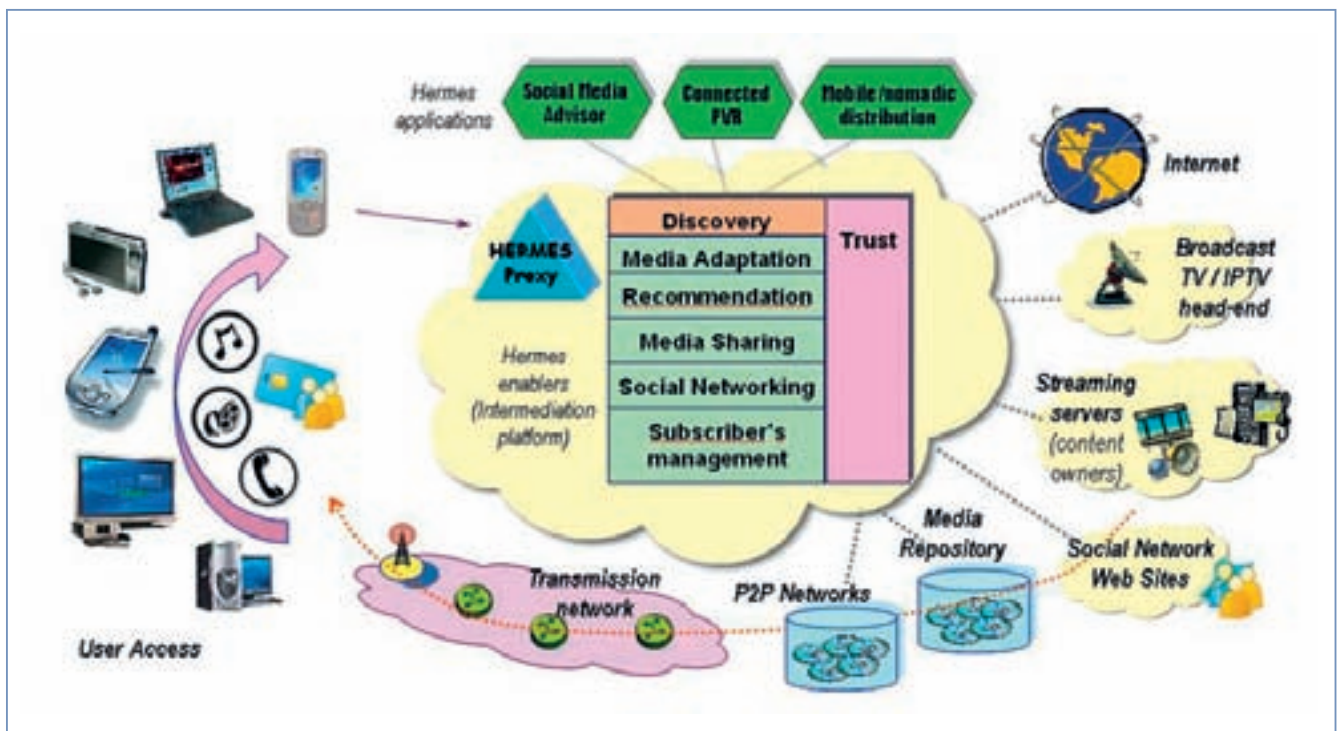
HERMES intermediation platform

AutHoNe – Autonomic Home Networking

Our ambience is getting more and more enriched by technical equipment that aims to support us in our daily activities. In our homes these devices are motion detectors that turn on the light or start playing our favourite tune when we enter, microchips that control heating systems, Internet-enabled TV sets and set-top boxes or remote controls for various devices and functions.

devices to participate in the cooperative scenarios, but also to autonomously optimise the connected nodes all the time.

Knowledge sharing

Authone is creating a middleware that is especially taking into account the heterogeneous nature of home networks. Bridging the resource gap – e.g. computing power, memory, and bandwidth – is the first challenge. The range goes from a variety of low-resource embedded devices, like sensors

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The AutHoNe concept

The support that all these devices provide to residents in their daily lives can be enhanced by facilitating cooperation between them. An intelligent home network that has access to all entities in a house might optimize energy efficiency, for instance through demand driven heating. It could also increase safety and security via presence control of, e.g., iron and stove or via automated door/window locking mechanisms and enhance comfort by adapting to user needs and habits.

One of the major objectives of AutHoNe is to support this kind of cooperative scenarios by providing autonomic mechanisms for integrating new devices into home networks. Our focus is not only on enabling

and actuators in light switches, to one or more powerful control servers that are installed in a typical home of the future.

The second focus is on knowledge representation by means of a flexible data model especially being designed by the project.

Security

Security is essential in our scenario. We introduce a home-local public key infrastructure for that purpose. Our initial "layman proof" registration process equips all nodes with the necessary key and certificate material. Additionally, we equip the network with autonomously adapting trust ratings. Our identities and trust rat-

ings are available to services like video streaming, allowing them to profit from our security mechanisms as well.

Remote access

When interconnecting home networks we have to consider that every home is protected by a combination of NAT/Firewall. Thus, AutHoNe delivers concepts that allow for the secure autonomous configuration of such devices in order to support service usage across multiple domains.

Partners of the Authone project are Siemens CT, Hirschmann Automation and Control GmbH, TU München, Fraunhofer FOKUS (all Germany, partially funded by BMBF) Ginkgo Networks, France Telecom, Université Pierre & Marie Curie (all France), Sony-Ericsson, Lund University (both Sweden).

Further information is available on the Celtic website at *www.celtic-initiative.org/Projects/00Closed-projects/AUTHONE* and on the website of the German partners at *www.authone.de*.

LOOP

Next generation solutions for wireless process manufacturing

The LOOP project takes a step towards Next Generation Network (NGN) solutions to open up new market opportunities in wireless process manufacturing for the automotive industry.

The NGN vision is tending towards a converged wireless networking world, where the user will be able to attain any service at any time on effectively any network that is optimized for the application at hand. The convergence of Internet and mobile services is currently being addressed by the IMS (IP Multimedia Subsystems) platform, driven mainly by the operators to promote market opportunities in combining the appealing services of the Internet with the roaming capability of mobile networks. However, this convergence does not go far enough, and there is a clear need to enhance legacy architectures to provide cost-effective end-to-end communications. This will

raise significant research challenges: undeniably, system coexistence solutions for Wireless Area Networks (WAN) and Long Term Evolution (LTE) RAN (see figure) and their impact on the 3GPP System Architecture Evolution require further innovation to deliver new market opportunities.

Impact of LOOP

LOOP has transferred engineering know-how to meet the short-term market requirements for operators to anticipate the commercial deployment towards NGNs in terms of delivering dual mode terminals to allow efficient mobility between legacy systems and WiFi; new network equipment to support the notion of "co-operative networks"; new testing equipment to allow coverage planning and QoS delivery for WiMAX; and identifying cost-effective wireless deployment scenarios based on cognitive radio.
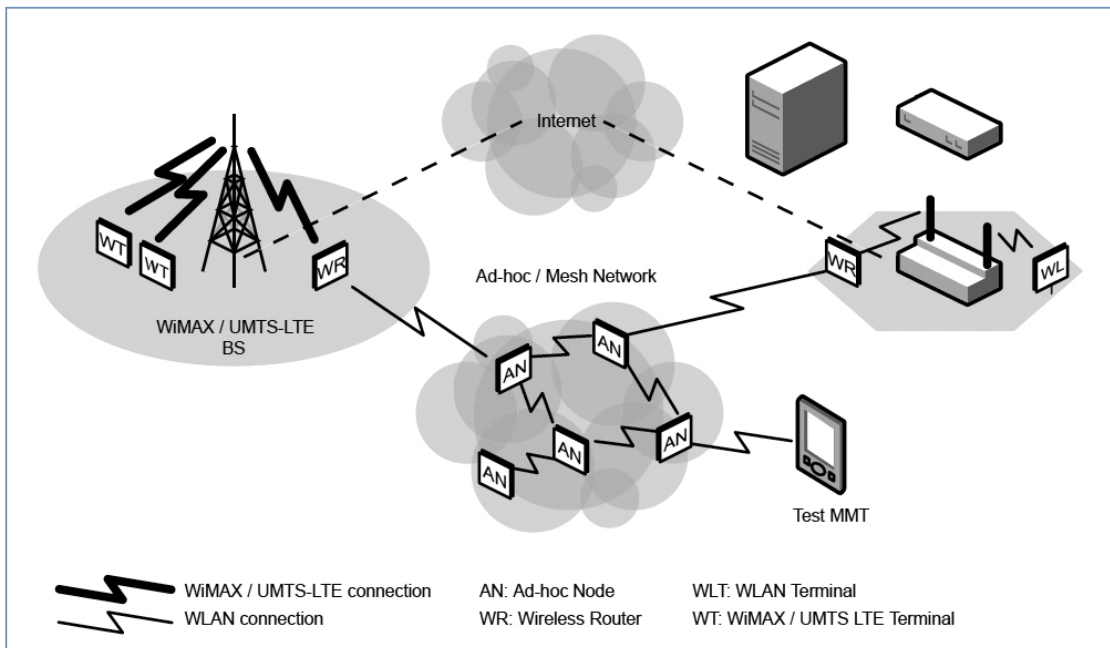
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However, LOOP´s legacy will be the inspiration for new opportunities in the wireless market for process manufacturing. This market is expected to grow at a pace

LOOP scenario

close to 30 percent per year; faster than the market for wired solutions. Nevertheless, adoption of wireless technology is still low and most managers are reluctant to introduce radio solutions; key impediments being latency and performance issues. In LOOP, these challenges have been addressed for metrology-based applications in the automotive industry. The SMEs have highly benefited from their participation due to new opportunities to expand their commercial activities by integrating ubiquitous monitoring and management tools on their 3D coordinate

measurement machine product range. These new features will allow for a new type of services and business models. Such services rely heavily on intensive communication and contextualised exploitation of the ubiquitous multimedia information made available by LOOP technology throughout the factory shop-floor.

Outlook

The impacts of NGN are expected to be significant to the ICT market: NGN will provide, firstly, the vehicle for enhancing access to communication services and

applications. Secondly, NGN will provide a basis for the Ubiquitous Network Society, where easy-to-use networks are connected at anytime, anywhere, with anything and for anyone. LOOP is one piece in the jigsaw, but more investment is required to realise this vision by addressing new emerging challenges that include energy-efficient and secure communications.

You can find more information at *www.theloopproject.com*

Celtic projects

Over 1,000 proposal participants from 31 countries

The recent project statistics prove it again: Celtic is one of the most attractive research and development programmes in the European information and communication technologies sector. Not only companies and academic institutions from Europe are eager to participate, also non-European participants are involved.

As a European R&D programme that supports privately and publicly funded ICT R&D projects, Celtic is a well considered initiative. More than one thousand organisations from thirty-one countries worldwide have been involved in Celtic projects proposals, from thirty-one countries worldwide.

The participating organisations are mainly from Eureka countries, such as Austria, Belgium, Switzerland, Cyprus, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Israel, Italy, Luxembourg, Monaco, The Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Turkey, and

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South Korea that has recently joined Eureka. However, there are also participants from non-Eureka Countries, such as Canada, Japan, South Africa, and Zambia. Currently, around five hundred organisations from twenty-five countries are involved in ongoing Celtic projects.

There are different ways of measuring Celtic project participation by country. One relevant way is to look at how much each country invested in the projects, regarding budget and effort, and considering both public and private contributions. Regarding the investments, for all Celtic projects until today, it is France, Spain, Germany and Finland that are the most participative countries. Other examples with high participation in terms of investment are Sweden, Israel, Belgium, Norway, Turkey, Ireland, and Luxembourg.

A different way of analysing project participation by country is looking at the number of projects in which each country's participants are involved. When looking at the number of projects per country, it is Spain, France, Finland, Sweden and Israel that are the most participative countries in Celtic projects. Other examples of countries participating in a significant number of projects are Sweden, Israel, Germany, Turkey, Greece, Belgium, Ireland, United Kingdom, Luxembourg, and Norway.

Celtic project participation by country in the period from 2003 to 2010

From both presented ways of considering Celtic project participation by country, the most participative ones are indeed France and Spain, regarding the number of projects and the public or private investment. Germany, despite the fact that the number of projects is low, is also significantly investing in Celtic projects, and Luxembourg and Finland are the most participative countries considering the investment per capita.

The Celtic Label indicates the most promising projects from those selected in a process which involves both the Celtic Core Group and the Public Authorities. Celtic has at the moment thirty-six running projects, eleven projects in the set-up phase, and forty-four that have already finished. A new call for projects is now open and accepting new proposals until 14 May 2010.

About Celtic

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

Cloud computing
Europe needs to act now

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There seems to be a general agreement that cloud computing will have a sweeping impact across the IT sector. Cloud computing has clear economic advantages and a number of cloud computing services are already available. However, there are major, non-technical obstacles that need to be overcome before cloud computing can really take off in Europe.

There seem to be no major hurdles blocking the way of cloud computing from a technical perspective. The real issues lie elsewhere. Regulatory aspects seem to be much more critical for the market development of cloud computing, particularly if you look at aspects like openness, interoperability, and data portability. Users of cloud computing services should be able to seamlessly move from one provider to another, as their business interests dictate, or as they wish, but basic standards are missing to support this free-market situation and avoid lock-in.

Another key concern regarding cloud computing is trust. Protection and security of private data and information should be ensured, even if these data are stored somewhere in the cloud. It remains to be seen, how justified some of the privacy and security concerns are, but nevertheless, they should be addressed.

Shortcomings of the EU legal framework

Both business as well as private users have their privacy and security concerns regarding cloud computing services, but many cloud applications target the consumers. In general, the EU data protection directive and e-privacy directive provide a legal framework for cloud computing. These directives were conceived some time ago, but were kept intentionally general, thus they remain applicable to cloud computing. However, the mapping between cloud services and the relevant rules in the directives is quite ambiguous. There are some common cases in which the directives fail to provide a clear guidance, and thus leave it to the interpretation of the court, in case of a dispute. One such critical aspect is whether the cloud service provider can be considered as a so-called controller or a processor. This distinction is very important as the responsibilities of the controller and processor are different. Following the example of the SWIFT case, the court might deem the provider to be a "joint" controller.

Another critical situation arises, if the user of the cloud service is an individual and uses the cloud service for private purposes. In such a very common case even the applicability of the directive is questionable, as individuals cannot be controllers. Thus, the responsibilities of the provider are unclear – a situation which is likely to leave the consumer to the mercy of the provider.

A third critical case is, if the cloud provider targets services to the EU but does not use equipment within the EU, and is not established within EU.

Conclusions

The challenges that cloud computing presents from a legal perspective are not new. Similar challenges have been present since the Internet began. However, cloud computing seems to amplify some of the risks. The good thing is that people close to policy makers are aware, or at least are becoming increasingly aware of these challenges.

There is likely no single magic solution but a combination of solutions to address all the gaps and challenges, and quite some work is needed to assemble a full array of them. In addition, solutions may be part of broader attempts to solve other, wider problems.

Solutions may come at different levels. Some issues could be dealt with by technology, for instance Privacy by Design, which takes into account data protection when designing cloud computing services. Some issues could be solved through the interpretation and guidance given by the courts.

Finally, the regulatory gaps and issues could be addressed within the current review process of the existing Data Protection Directive, by adjusting the criteria for applicability, and potentially creating a new hybrid category of data controller/ processor with clear obligations.

Whatever we do in Europe to create a favourable environment for cloud computing – we need to act now. Cloud computing is a huge business opportunity for Europe. We should not miss it due to inadequate regulation.

The future of home networking
OMEGA Open Event in Rennes

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The second OMEGA Open Event in Rennes, France, presented from 24 to 25 February 2010 leading-edge technologies which will shape the future of home networking. About 100 international experts witnessed the first public demonstration of OMEGA's solutions, which will enable data transmission speeds up to one gigabit per second and the integration of heterogeneous communication technologies in the home.

The Open Event presented the state-of-the-art and the future of home networking technologies and made the participants familiar with OMEGA's concepts and technological solutions. For the first time, OMEGA performed live demonstrations of its leading-edge research results.

The Open Event covered four main topics: Radio, Power Line Communication (PLC), Wireless Optics, and Inter-MAC. The event consisted of two parts: a tutorial part on the first day and a workshop including presentations and technical demonstrations on the second day. The technical demonstrations included implementations of OMEGA solutions for Inter-MAC and Optical Wireless (Infrared Communications and Visible-Light Communications). In addition, the event was complemented by video and poster sessions.

Cyrille Bezard from Technicolor (second from right) explaining the Inter-MAC demonstrator to interested participants in the showroom.
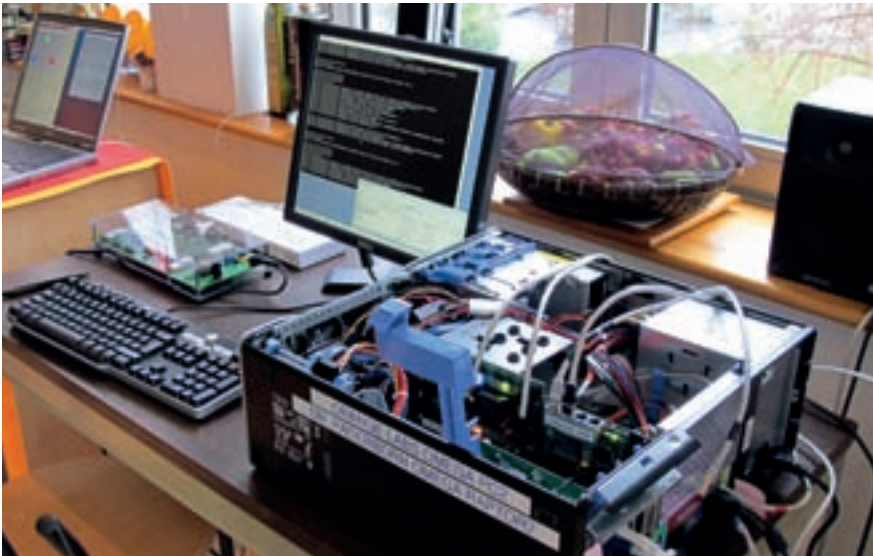
Tutorials

The tutorial part was specifically designed for Ph.D. students and other participants interested in the home networking technologies and concepts explored in the OMEGA project. In this context it was one of the goals of the event to build e-skills among graduate students. Thus, the OMEGA Open Event was part of the first European e-Skills Week 2010, an awareness campaign by the European Commission made to promote e-skills particularly among students, young professionals, and SMEs.

The first tutorial by Jean-Philippe Javaudin and Martial Bellec from Orange Labs, who lead the OMEGA project, presented the vision, challenges and use cases of the digital home network. OMEGA's vision is to develop a home network which is capable of delivering up to one gigabit per second over wired and wireless technologies anytime, anywhere, and on any device. The presenters showed examples of how such an easily configurable home network enables the end-user to enjoy seamless service access.

The second tutorial was held by Vincenzo Suraci from the University of Rome. He explained OMEGA's Inter-MAC concept, outlining the underlying architecture and the challenges to be addressed. Inter-MAC is an additional sub-layer between layers 2 (LLC/MAC) and 3 (IP). It adds features such as auto-configuration, Quality of Service (QoS), redundancy, and security to the OMEGA network. He particularly described the challenges in forwarding high-rate packet streams in future home networks and solutions to this challenge using Inter-MAC as an additional sub-layer.

OMEGA's Inter-Mac demonstrator
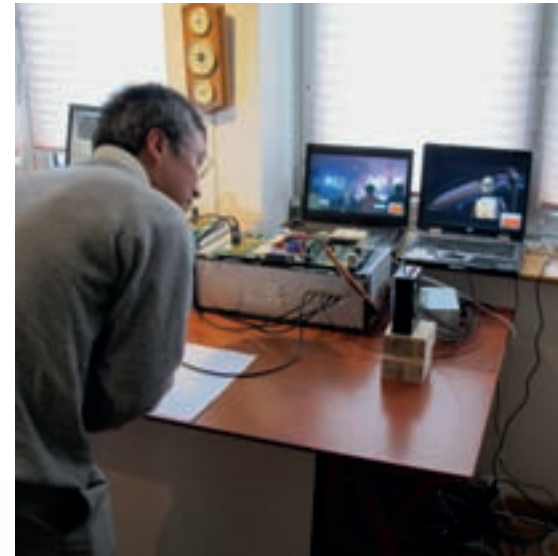
Interested visitor exploring OMEGA's VLC demonstrator.

In the third tutorial Pierre Jaffré from Orange Labs and Rafael Gonzalez from Telefonica I+D presented an introduction to the architecture of OMEGA's gigabit home network. They first provided a functional description of the data, control and management planes and then presented the OMEGA security approach before finally explaining the potential of the OMEGA framework to support self care and customer care utilities as well as resource management.

Workshop

The workshop consisted of three topical sessions. The first session provided an overview on the UPnP-QoS standard for home networks. The standard defines a framework for the quality of service (QoS) of Universal Plug and Play (UPnP). Jelle Nellis from IBBT explained how UPnP-QoS works and which benefits it offers for home networking. Marco Castrucci from the University of Rome pointed out the advantages that can be achieved through the integration of UPnP-QoS and the Inter-MAC layer.

The second session was dedicated to standardisation. Jed Hurwitz, CTO of Gigle Networks, presented his company's solution, referring to several issues relevant for standardisation. Michael Bahr from Siemens presented the current status of OMEGA's standardisation activities, pointing out the importance of standardisation for innovative solutions like the one developed within the OMEGA project.

Finally, in the third session, the focus was on connectivity in the future sustainable home. Kenjiro Nishikawa from NTT in Japan presented the state of the art in ultra high-speed radio communication systems and their applications, pointing out the opportunities and challenges of different emerging communication technologies relevant for sustainable home networking. Andreas Foglar from Lantiq and Marie-Hélène Hamon from Orange Labs presented OMEGA's technical approach towards the sustainable home.

Demonstrations
The highlight of the event were certainly the four demonstrations of OMEGA solutions. The first demonstrator showed how the project implemented Inter-MAC on top of Ethernet, Wi-Fi and Power-Line Communication (PLC). The second implementation demonstrated video streaming via Visible-Light Communications (VLC), where data can be communicated via an ordinary LED lamp.

The live demos were complemented by videos showing OMEGA's implementation of infra-red and 60 GHz radio communication. In addition, the participants had the opportunity to view posters on OMEGA's results in the foyer and discuss with the Omega partners technical subjects like connectivity via radio, power-line, and wireless optics as well as techno-economic aspects.

The final results of OMEGA will be presented at the third Open Event, which will be held in Rennes in December 2010 or January 2011.

Further information about the Open Event 2010, including downloadable presentation slides are available at *www.ict-omega.eu/events/open-event-2010.html.*

Jelle Nellis from IBBT talking about the UPnP-QoS standard for home networks. ▶

Martial Bellec from Orange Labs, technical manager of OMEGA, sharing the OMEGA vision with the audience.

Kenjiro Nishikawa from NTT presented the latest advances in ultra high-speed radio communication systems.

Jed Hurwitz, CTO of Gigle Networks, presenting his solution for flexible intelligent multi-PHY networking. ▶

Cloud computing and telecom networks
Eurescom study P1951

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Eurescom study P1951 has analysed the technical and business implications of cloud services for the telecom networking business. Cloud computing, as a service delivery model, is impacting the whole computing and communication industry. This model can be considered a consequence of the long-held dream of computing as a utility. It is associated to Software-as-a-Service, Infrastructure-as-a-Service and Platform-as-a-Service as computing service market segments, and to some extent to Network-as-a-Service as an emerging network service model.

In the long term, cloud computing will lead to the era of dematerialized computing systems. Only some form of access peripherals and related subsystems will be left, with capabilities, role and usage under definition. As integrators, operators and users of large-scale distributed computing systems, telcos with their networks and data centers are directly concerned by changes arising from cloud service delivery.

Implications of cloud computing

Cloud computing relies heavily on long-term developments in high performance computing (HPC) technologies (multi-core, GPU, modern cluster servers and supercomputers), high-speed networks, high-capacity storage systems and grid computing. These developments are crucial for the availability and aggregation of resources in order to realise the idea of large-scale resource sharing and on-demand usage promoted by computing as a utility. Cloud computing also relies on the success of open-source middleware and service-oriented architecture in conjunction with recent generations of grid middleware platforms, e.g. Globus Toolkit 4, industrial developments of virtualization platforms such as VMware or Xen, and recent developments in autonomics and systems for the deployment and automated management of large data centers. Therefore, from a technical perspective, it is important for any organization involved in the operation of large-scale networks, data centers and cloud services to master all these technologies.

The future of cloud computing

The future of cloud computing relies on synergies between all these technical computing areas, and almost any applications domain involving computable processes. In particular, it will be possible to enhance existing IT and multimedia network applications and to investigate future network applications. This is especially important for critical computing and scientific simulation domains: emergencies, disaster recovery, stabilization of real-time global financial transaction, in-silico research in energy, bio-medical science, climate and meteorology, or complex industrial processes.

Cloud computing is the future of IT and networks. More and more corporate IT executives share this view with researchers and engineers as well as an increasing set of organisations (e.g. government agencies, research institutions or standards bodies). For most of these organisations, the adoption process is likely to start with private clouds, and then hybrid and public clouds. On the other hand, SMEs with varying resource requirements and limited IT budget are subscribing to public cloud services, e.g. Amazon EC2, Google Apps, Microsoft Azure, and others, and hybrid clouds combining resources from relatively small scale internal data centers and public clouds. In order to take full advantage of public clouds and the synergetic features of cloud computing technologies, research and standardization are required, in particular to ensure the dependability and the management of public clouds, openness end interoperability, global IT and networking jurisdiction and data privacy. Distributed computing assets operated by telcos (core networks, attached data centers and access infrastructures) and other data network operators will need to evolve to adapt to cloud computing requirements, which include basically virtualization, performance and scalability.
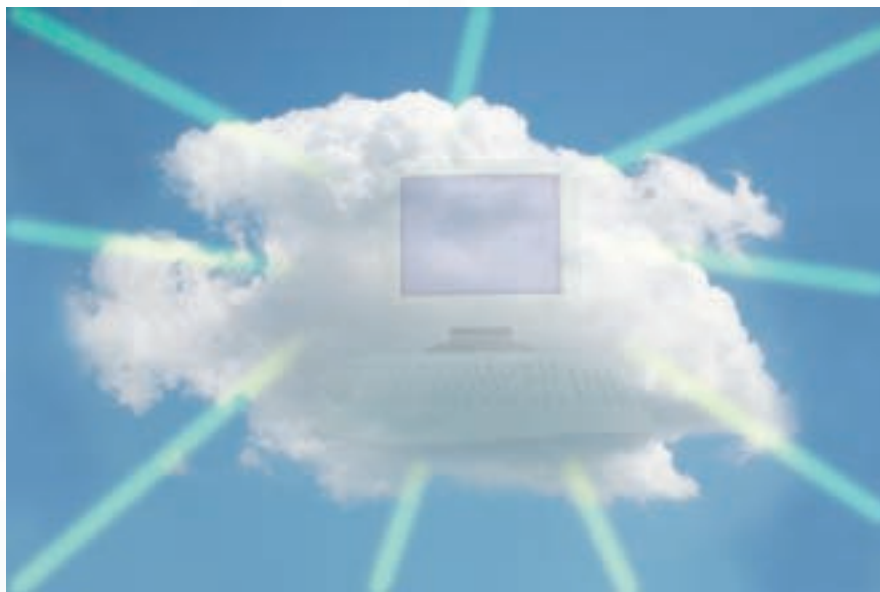
Role of telcos – recommendations

Our analysis of the cloud service environment shows that telcos are set to play a major role in cloud computing, and the positive factors of the new technical and business environment outweigh the negative ones. The environment appears to be largely in favour of telcos, which have the potential to play a key role in the operations of cloud infrastructures, to add value to existing telecom services and explore new services. In fact, global network operators are today the only companies that have the technical skill, capital and operational experience and processes in place to run public and hybrid cloud infrastructures. This places telcos in a unique position in cloud service delivery.

However, in order to make it happen, telcos need to reinforce their position by conducting research to enhance technical capabilities of their equipment. Telcos also need to initiate and support standardization efforts, especially to promote open and interoperable clouds, as it has been the case for OSI and – to some extent – in case of the Reference Model of Open Distributed Processing systems. Furthermore, telcos need to upgrade their operational networks and datacenters, e.g. deploy very high-speed networks, virtualize and manage deep computing capacity grade data centers with virtual supercomputers to support distributed cloud services. New businesses can emerge from cloud service delivery, especially from synergies with the High-Performance Computing (HPC) community and virtually all industries and computing services requiring important resources and elasticity. There are some potentially huge opportunities in terms of revenues, research and industrial development, especially in vertical markets. For example, telcos can use their expertise of global network and service management combined with cloud serv-

ices to stimulate research and industrial development of new techniques for the global management of telecom and cloud services, for example, based on network analytics. Telcos could secure cloud services with more holistic approaches to security attacks and ensure the dependability of clouds.

Conclusion

Cloud computing will most certainly have a deep impact on IT and networking, corporate IT and the telco business in particular. But the industry and the research community need to undertake several actions to support this development and take full advantage of it. Research efforts are needed regarding cloud service security, data location and privacy issues, large data-center management and automation, software licensing, programming tools and techniques for high-performance distributed computing in virtualized environments, open and interoperable clouds, and more. Telcos have most of the technical know-how, capital and operational environments and processes in place that can be converted to support cloud services. However, in some cases telcos need to adapt their networks and data centers. For some specific properties, e.g. exploiting high-speed optical links, scalability and

latency reduction in data centers, telcos need to establish collaborations with the networking and distributed computing research communities, perform research and develop novel standards to enable the coverage of the full spectrum of cloud services. The issue of end-to-end latency reduction in particular seems important for critical applications and high-performance computing, and thus needs further investigation.

Further information is available at *www.eurescom.eu/Public/Projects/P1900-series/P1951*. The confidential study results are only available to members of the Eurescom study programme.

Solutions for IPv4 address exhaustion

Eurescom study P1952

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By the end of 2012, there will be no more public IPv4 addresses left to allocate to Internet Service Providers (ISPs). They will be left with an address pool that cannot be increased anymore. Immediate action is required by all stakeholders in order to mitigate and survive the consequences of IPv4 address exhaustion. Eurescom study P1952 explored how ISPs could tackle the problem in the short term.

The principal solution for the shortage of IPv4 addresses is IPv6, which provides a much larger address space using 128 bits instead of 32 bits. However, at the exhaustion date, many customers and services will not yet have migrated to IPv6 and will only be accessible via IPv4. Therefore, deploying IPv6 is not sufficient to cope with the IPv4 address shortage in the short term.

Facing the IPv4 shortage

There are three main components to solving the problem of IPv4 address shortage, all of which must be carried out in parallel.

The first is the wide deployment of IPv6. IPv6 was created specifically to solve the problem of IP address depletion, and is the only long-term solution.

The second is better utilisation of the existing IPv4 address space. For an ISP this may include network renumbering or restructuring, using private IP addresses or IPv6 addresses internally, using centralised address pools to raise efficiency, or re-assignment of delegated but unused IPv4 addresses (time-multiplexing of public IPv4 addresses.

The third is the implementation of address sharing mechanisms. So far, the practice has been to give a unique IPv4 public address to each customer. In this context, the public addresses that can be seen in any Internet packets always refer to a unique customer. To cope with the IPv4 address exhaustion, this practice is no longer affordable. ISPs should allocate the same IPv4 public address to several

customers at the same time. In this new context, a public IPv4 address seen in an Internet packet can refer to several customers. P1952 considers three main IPv4 address sharing solutions: NAT444 (Network Address Translation), DS-lite (Dual Stack-lite), and A+P (Address+Port).

IPv4 address allocation strategy

ISPs will have to consider the availability of addresses and should decide to whom they allocate shared addresses and to whom they allocate unique public addresses.

This choice will depend on several parameters such as:

- Shared address eligibility – it may not be possible to provide a shared address to all customers.
- Multiplicative factor – how many customers for the same address?
- Service differentiation, e.g., "Premium service" with unique IPv4 address vs. "Standard service" with shared IPv4 address.

ISP high level requirements to IPv4 address exhaustion solutions

All of the approaches to cope with the IPv4 address shortage introduce certain burdens and costs to the ISP. The following high-level requirements have been defined in order to help the ISPs in their decision-making process. The chosen solution for the IPv4 address space exhaustion has to:

- Address the individual ISPs specific IPv4 address exhaustion problem.
- Ensure business flexibility and future-readiness.
- Provide transparency to the customer.
- Be simple to operate and provide.
- Be incrementally deployable.

Conclusion

The IPv4 public address exhaustion is one of the main challenges the Internet is currently confronted with. ISPs should deploy address sharing solutions to maintain connectivity to the IPv4 Internet after the IPv4 addresses are exhausted. The important message to keep in mind is that IPv6 is the only solution, which truly solves the IPv4 address exhaustion problem, and should be deployed as widely and as soon as possible.

Further information on Eurescom study P1952 is available at *www.eurescom.eu/Public/Projects/P1900-series/P1952*

First European e-Skills Week
Eurescom supports initiative for promoting e-skills

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Europe is facing a serious challenge: according to a recent e-skills Monitor study, between 2 percent and 13 percent of job positions in the ICT sector will remain vacant in the year 2015, depending on the respective scenario. Event today, a considerable proportion of ICT positions cannot be filled. The reason is the lack of job candidates with sufficient e-skills. Thus, the EU has launched an initiative, the European e-Skills Week, to raise awareness for the e-skills gap and tackle it.

Launch event at CeBIT
The e-Skills Week was officially launched with a conference at CeBIT in Hannover on 2 March 2010. The strong participation of the ICT industry, including high-level panel participants from Deutsche Telekom, SAP, Microsoft, and other major players, indicated that the ICT industry takes the issue of e-skills very seriously.

The purpose of the e-Skills Week from 1 to 5 March 2010 was to highlight the growing demand for skilled ICT users and professionals to drive a competitive and innovative Europe. The campaign is particularly aimed at students, young professionals and SMEs about the vast range of opportunities that ICT-related jobs present. The initiative by the European Commission's DG Enterprise and Industry has been coordinated by DIGITALEUROPE and European Schoolnet and is supported by a number of national and international stakeholders, including Eurescom.

Critical importance for ICT research
Being a stakeholder on European level, Eurescom has actively supported the e-Skills Week, as the issue is also of critical importance for research in the information and communication technologies sector. David Kennedy, director of Eurescom, sees the risk that human resources in European ICT research may not be sufficient in the mid-term to keep the EU at the leading edge of innovation, if industry and public institutions do not address the issue now.

Discussing the e-skills gap at the launch event in Hanover (from left): moderator Mark Spelman, Managing Director Strategy at Accenture; Douglas Brown, Vice Chair of European Schoolnet; Herbert Heitmann, Chief Communications Officer at SAP; Stefano Venturi, Vice President Public Sector Europe at Cisco; Matthias Schuster, Member of the Board at T-Systems Deutsche Telekom AG.

"The main issue in European ICT research in the near future is to have enough highly qualified researchers and project managers to drive innovation in areas like the Future Internet," said Mr Kennedy. In order to address the issue, he suggests an interdisciplinary discussion between industry, academia, and public institutions on the type of e-skills needed in future research activities and how to create an e-skills-friendly environment, which motivates young people to build the skills that are needed for outstanding research.

"The European e-Competence Framework is a good basis for discussing the e-skills required. However, we need to get more specific. It is not enough to have researchers with a narrow, specialised expert knowledge, we need more versatile researchers, who combine technical expertise with interdisciplinary thinking and project management skills," said Kennedy.

Eurescom e-Skills Forum
In order to kick off the discussion, Eurescom has launched a mailing-list through which stakeholders in the field of ICT research can exchange their views and

David Kennedy, director of Eurescom, started a discussion on e-skills in European ICT research.

discuss a roadmap towards building the e-skills needed to ensure that European ICT research stays at the top worldwide. Representatives of relevant stakeholders are invited to join the Eurescom e-Skills Forum and subscribe to the Eurescom e-skills mailing-list via the form at www.eurescom.eu/activities/e-skills.asp. Based on the discussion, Eurescom plans to write a White Paper on e-skills in ICT research, together with active stakeholders from the community.

Further information:
European e-Skills Week website –
http://eskills-week.ec.europa.eu
Eurescom e-Skills Forum –
www.eurescom.eu/activities/e-skills.asp

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

EC launches new economic strategy Europe 2020

On 3 March 2010, the European Commission launched the Europe 2020 Strategy for economic growth. It is the successor of the Lisbon Strategy, whose ambitious goals the EU failed to achieve. Although the Lisbon goal of becoming the world's leading knowledge economy has been given up, the five targets set out in Europe 2020 are still ambitious:

1. Raise the employment rate of the population aged 20-64 from the current 69 percent to at least 75 percent.
2. Achieve the target of investing 3 percent of GDP in R&D in particular by improving the conditions for R&D investment by the private sector, and develop a new indicator to track innovation.
3. Reduce greenhouse gas emissions by at least 20 percent compared to 1990 levels or by 30 percent if the conditions are right, increase the share of renewable energy in our final energy consumption to 20 percent, and achieve a 20 percent increase in energy efficiency.
4. Reduce the share of early school leavers to 10 percent from the current 15 percent and increase the share of the population aged 30-34 having completed tertiary education from 31 percent to at least 40 percent.
5. Reduce the number of Europeans living below national poverty lines by 25 percent, lifting 20 million people out of poverty.

In order to meet these targets, the Commission has proposed the Europe 2020 agenda consisting of a series of flagship initiatives in the three key areas of smart, sustainable and inclusive growth. The two flagship initiatives particularly relevant for the area of R&D in ICT are the "Innovation Union" and "A digital agenda for Europe". The Innovation Union aims at re-focussing R&D and innovation policy on major challenges, while closing the gap between science and market to turn inventions into products. The flagship initiative "A digital agenda for Europe" aims at delivering sustainable economic and social benefits from a Digital Single Market based on ultra fast Internet. All Europeans should have access to high speed Internet by 2013.

The EC stresses that implementing these initiatives is a shared priority, and action will be required at all levels: EU-level organisations, Member States, local and regional authorities.

http://ec.europa.eu/eu2020

## Record communication speeds over ceiling lights

Researchers at Fraunhofer Heinrich Hertz Institute in Berlin together with their Siemens colleagues have scored a peak data rate of 500 megabits per second (Mbit/s) using off-the-shelf LED lights. The new benchmark breaks the previous record they held of 200 Mbit/s. Data transport over visible light is a means of transmission that is license-free and tap-proof. It opens the way for a range of novel applications in the home, industry and transport.
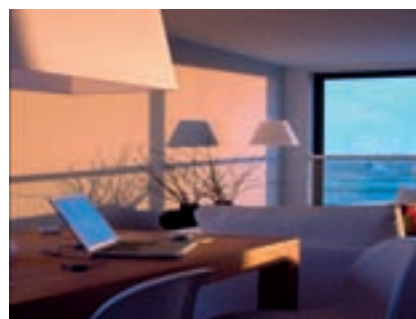
Researchers at Siemens Corporate Technology in Munich and the Heinrich Hertz Institute set the new free space data transmission record for a distance of up to 5 meters using a white light emitting diode from the Siemens subsidiary Osram. Data were directly modulated from the supply current onto the quantity of light emitted by the LED. The Ostar LED can be modulated so rapidly that a high-speed data transmission rate of 500 Mbit/s can be achieved while the human eye detects no change in the level of brightness. The receiver is a photodetector that transforms light signals into electrical impulses.

Visible Light Communication (VLC) can be used as an extension to WLAN in the home. Further application areas are factories, medical facilities and other
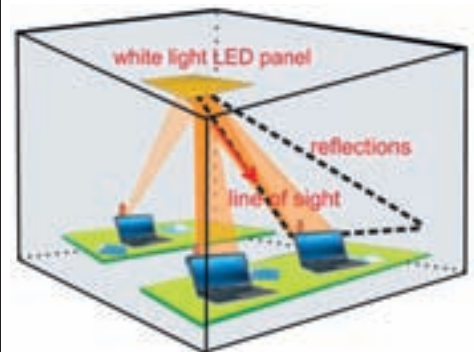
places where wireless cannot be deployed or only to a limited extent. Another application area is the transport domain where LED traffic lights and railway signals could relay information to cars and trains.

The researchers also demonstrated that a network of up to five LEDs is capable of achieving data transmission speeds of up to 100 Mbit/s over a longer distance. This is a critical point for practical applications, as, for instance, data from ceiling lights can then be sent to a receiver on a desktop, no matter where the desk is positioned in the room. Since 2007 the Institute of Electrical and Electronics Engineers (IEEE) has been working on standardization of the technology in a procedure scheduled for completion by late 2010.

Parts of the research work were conducted within the FP7 research project OMEGA.

www.hhi.fraunhofer.de/en/press/ press-and-media/record-communication-speeds-over-ceiling-lights

How to make the Internet forget

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It is common wisdom that the Internet never forgets. This feature of the Net has become an issue for data privacy. With every photo or profile text uploaded to a social networking site, the issue is growing more serious. Now France wants to teach the Internet how to forget.

According to an article published on BBC News in January 2010, France is considering a law which would give Internet users the option to have old data about themselves deleted. The idea is to force Internet service providers and mobile operators to dispose of e-mails and text messages after an agreed length of time or on the request of the individual concerned.

Although the paternal attitude and the effectiveness of such a law would be debatable, there is no doubt that the French considerations have hit a fundamental problem. Since the advent of Web 2.0 and social networking, the relentless memory of the Internet has severely undermined the privacy of users, who, right now, have no way for removing private information from the Internet, which has accidentally or by their own carelessness become public.

Career-terminating pictures
There is a growing number of cases, in which private pictures uploaded to social networking sites like Facebook or MySpace have had career-terminating effects. Take, for example, the case of a prospective teacher in the US who was refused to get her teaching certificate despite the fact that she had passed the exams and completed her credits. The reason: she had put a photo on her MySpace page that showed her wearing a pirate hat and holding a plastic cup in her hand that was subtitled "Drunken Pirate". The dean at her university, who had become aware of the photo, took it as evidence for declaring her not suitable for the teaching profession. The reason given was that the photo would entice her students to drink alcohol. Her attempts to remove the photo from the Web failed.

Career-terminating words
However, it doesn't always take a compromising picture to terminate your career. A written comment can have the same effect. Like in the case of a young woman from the United Kingdom. She posted on Facebook that she found her job boring. Her employer saw the comment and fired her.

Another great career-terminating tool can be Twitter. A lucky job applicant in the U.S. tweeted the following: "Cisco just offered me a job! Now I have to weigh the utility of a fatty paycheck against the daily commute to San Jose and hating the work." The tweet caught the attention of someone at Cisco, who responded: "Who is the hiring manager? I'm sure they would love to know that you will hate the work. We here at Cisco are versed in the web." The job applicant quickly made his Twitter account private, but too late – Twitter search retained the record.

Unwanted popularity
In these cases it could be argued that those affected are responsible for the effects of their own carelessness. Although this is a valid point, the question is rather how long people should suffer from a moment of carelessness through public exposure via the Internet.
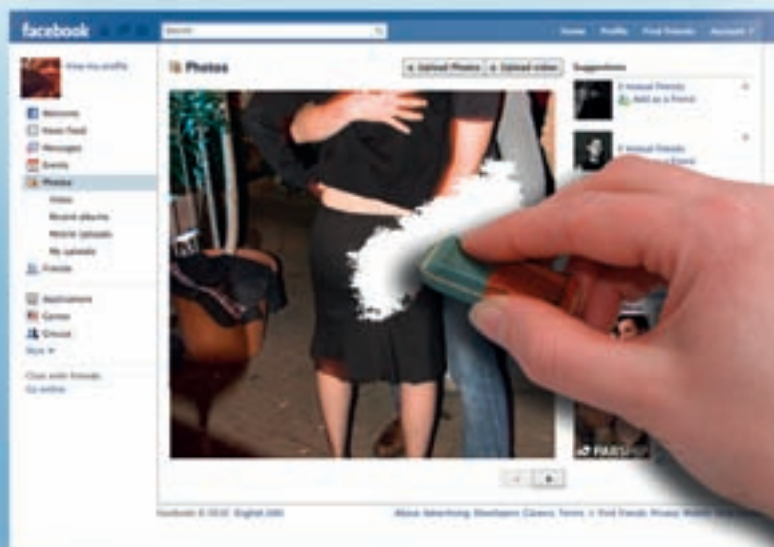
Furthermore, there are also cases, when the public exposure was not caused by the carelessness of the affected person, but through violation of the person's privacy rights by a third party. Like in the case of the young man who applied for a job at a U.S. investment firm by sending a video with his résumé called "Impossible Is Nothing". The video showed the man engaging in a variety of physical feats, from bench pressing and doing a ski jump to breaking bricks with a karate chop, while he bragged about his accomplishments. Someone at the investment firm e-mailed the video to other firms, and it was finally posted on YouTube, where it became an instant hit. His video has become so famous that it even got a Wikipedia entry – not exactly what you would like to happen with your confidential application documents.
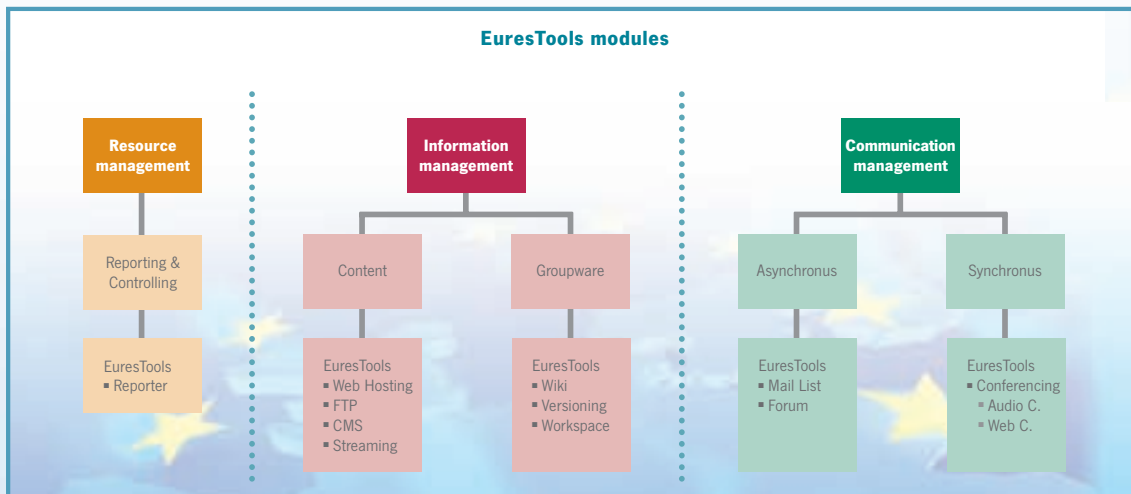
Expiry dates for digital information
Even if we do not focus on such extreme cases, the fact that nothing is forgotten on the Internet can have detrimental effects on the psyche of users. Viktor Mayer-Schonberger, author of "Delete: The Virtue of Forgetting in the Digital Age", stresses the importance of forgetting. He said: "Things that become less important over time fade in our minds and we forget." Thus, he also wants to make the Internet forget according to the biological function of human brains by adding an expiry data for digital information. "What I want to do is to make remembering just a tiny little bit more costly and forgetting just a little cheaper. Expiry dates help us do that," said Mr Mayer-Schonberger.

Content management systems, like Typo3, already allow to add an expiry date to web pages, but it will take some time, before expiry dates will be commonplace also for information hosted on social media sites.

EuresTools

ICT tools for effective management of European R&D projects

EuresTools modules

Resource management	Information management		Communication management	
Reporting & Controlling	Content	Groupware	Asynchronus	Synchronus
EuresTools ▪ Reporter	EuresTools ▪ Web Hosting ▪ FTP ▪ CMS ▪ Streaming	EuresTools ▪ Wiki ▪ Versioning ▪ Workspace	EuresTools ▪ Mail List ▪ Forum	EuresTools ▪ Conferencing ▪ Audio C. ▪ Web C.

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

Eurescom offers a comprehensive package of proven management tools, which are tailored to the specific needs of EU projects. The tools are built on Eurescom's 19 years of experience in managing international research programmes and the lessons learned from 30 FP5, FP6, and FP7 projects as well as around 80 Celtic projects.

All tools have three things in common:
- They are easy and intuitive to use
- They are web-based and accessible anytime anywhere
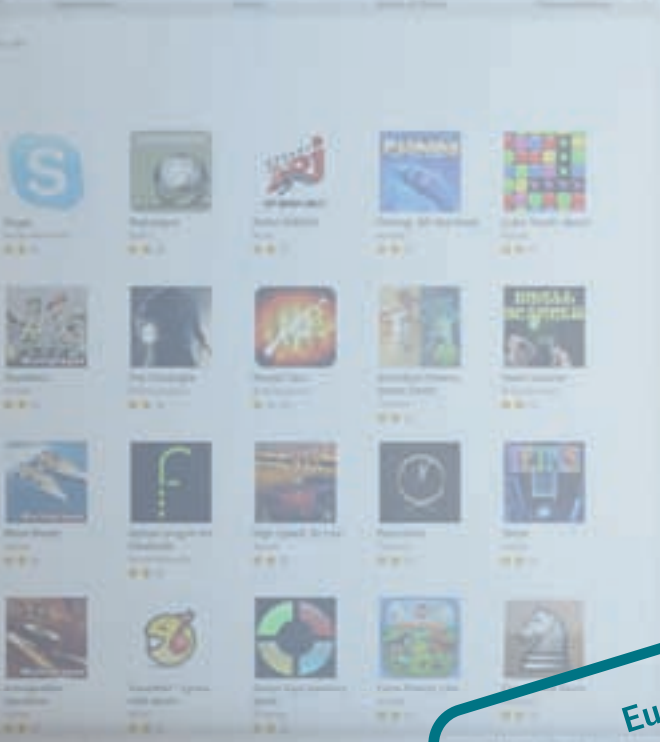- They are secure, reliable, and scalable to any project size

The modular concept of EuresTools enables you to choose, if you would like to have the whole package for your project, or just select the EuresTools modules you need to complement the tools you already have. All EuresTools modules are customisable according to the specific requirements of your project.

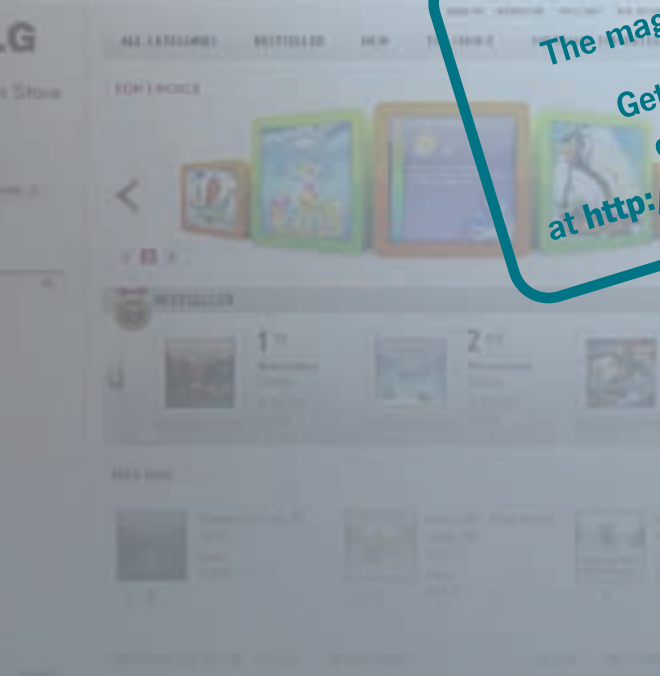Further information about the EuresTools project management tools is available at **www.eurescom.eu/EuresTools**

Contact us at **services@eurescom.eu** if you would like to discuss the tools you need and to get an offer from us.

"For me the EuresTools are essential for managing large collaborative projects. Apart from providing an easy way of reporting effort and work done, the EuresTools are invaluable to me as they allow the information stored in the system to be easily analysed by work package, by partner, by time frame, or by any combination thereof. With the auditors assessing the returns, it is reassuring to know that you can provide a clear breakdown of work done and costs incurred. It makes the whole job much easier. But it's not only the tools; it's the people behind EuresTools that make the difference."

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