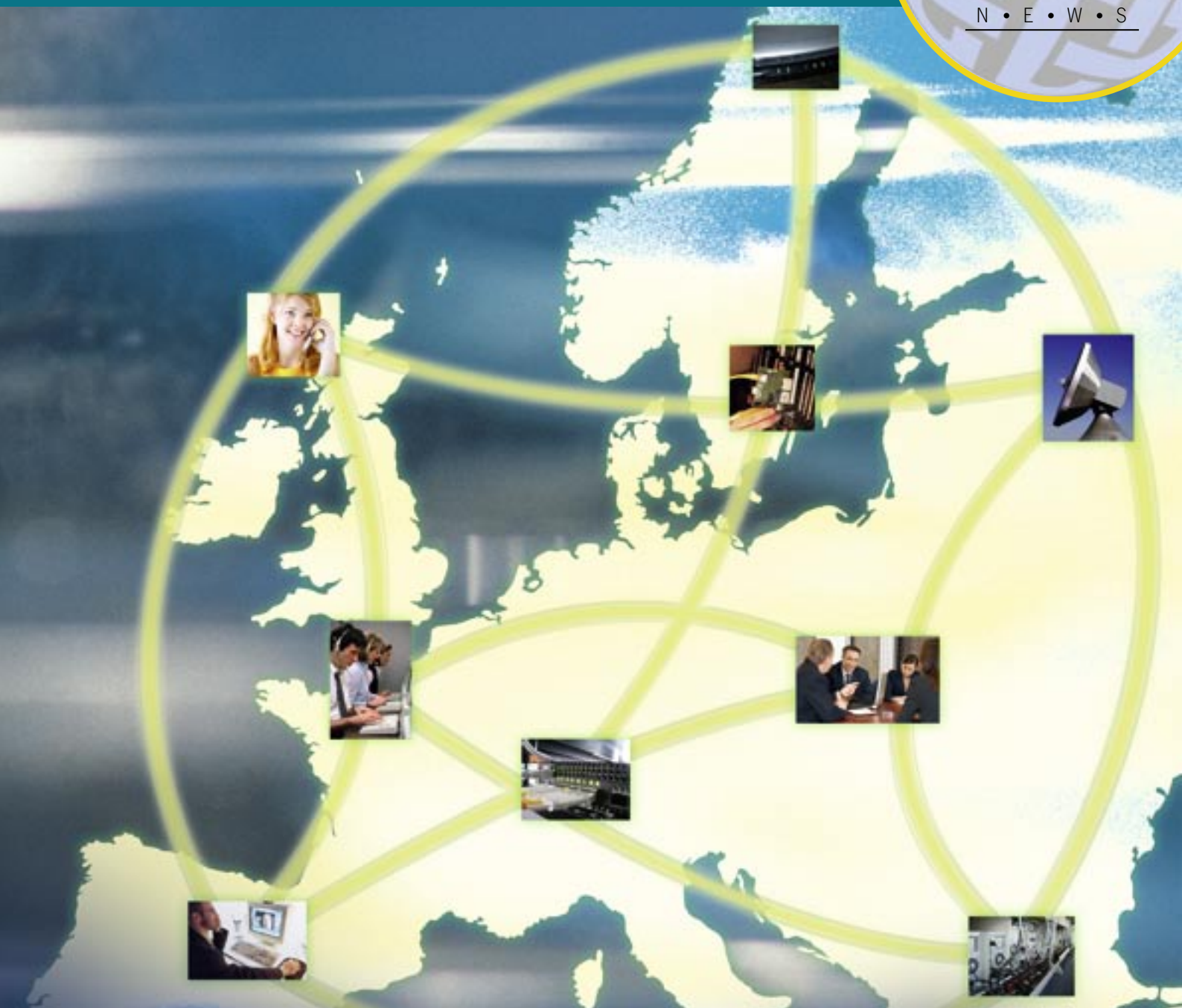
EURESCOM mess@ge
2/2008
The magazine for telecom insiders

includes CELTIC NEWS



European Telecommunication Testbeds

In focus

NESSI – Networked European Software and Services Initiative

Project reports

e-health – Opportunities for telcos

European issues

The Future Internet – Activities in Europe

FIREWORKS

SEVENTH FRAMEWORK PROGRAMME

FIRE Launch Event

Paris, France, 10 September 2008

Purpose of the event

The FIRE initiative for Future Internet Research and Experimentation is addressing the European need for experimentally-driven visionary research on new Internet architectures, protocols and services. To make this approach a reality, FIRE aims at creating a large-scale European experimental facility, built by gradually connecting and federating existing and new testbeds.

This FIRE Launch Event marks the starting point of 14 EU-funded research projects, which have been selected under the second call of FP7. These projects have two related dimensions: building a European experimental facility for Future Internet research and supporting experimentally-driven advanced research.

The event will be a unique opportunity to discuss the research scenario behind FIRE, its expected impact, and the multiple ways to foster synergies and added value in regard to other research initiatives.

Target audience

The event aims to include all FIRE stakeholders from the relevant academic, public and industrial actors: researchers and decision-makers on the Future Internet, national initiatives, FIRE R&D projects, and any other stakeholders on national or European level, including the Celtic EUREKA Cluster and related FP6 and FP7 projects.

Venue

Paris City Hall - Hôtel de Ville, 29, rue de Rivoli,
75004 Paris, France

Agenda

10:00–12:30 Plenary session

Presentations on European as well as French and other national testbed initiatives, including Japan and the USA

14:00–18:00 Panel session on FIRE challenges

- Clean-slate approaches: needs and opportunities from FIRE
- Industrial perspectives and expectations from FIRE
- Existing offers of Future Internet testbeds
- Building synergies with national initiatives
- Wrap-up: building synergies between research projects on the Future Internet

Moderator: Mario Campolargo, European Commission, DG Information Society and Media

In parallel to the meeting there will be a poster session on FIRE and national testbed projects.

Registration

Participation is free of charge, but registration is mandatory to facilitate logistics.

If you would like to participate, we ask you to register by 29 August 2008 via the registration form at *www.ict-fireworks.eu/events/fireweek-in-september/fire-launch-event/registration.html*

Official FIRE Launch Event website:
http://cordis.europa.eu/fp7/ict/fire/launch_en.html

Dear readers,

In the previous issue of Eurescom mess@ge (1/2008), we highlighted the European research efforts towards the Future Internet. The cover theme of our current issue is directly related to the Future Internet, but at the same time goes beyond it.

The practical value of research remains quite limited, as long as theoretical concepts, for example novel Internet architectures, are not tested. As networks, services, and applications are becoming technologically ever more complex, the demands for testbeds are rising. At the same time, the pressure of fast innovation cycles requires fast testing procedures on a large scale to stay competitive. Thus, our cover theme "European testbeds in telecommunications" will primarily focus on the European approach towards large-scale testbeds.

A number of EU-funded projects, like Panlab, OneLab, and FEDERICA, have explored promising federation approaches within the context of the European initiative for Future Internet Research and Experimentation (FIRE). In this issue, you will read exclusive articles by key experts from these projects on their approaches towards testbeds in telecommunications. In addition, we feature an interview with Dr. Udo Bub from Deutsche Telekom Laboratories on the challenges and opportunities of testbed

federation from the perspective of a large network operator. These contributions are by no means comprehensive. However, we hope that they provide some inspiring insights on European testbed activities and stimulate a fruitful discussion on the way ahead.

In addition to the cover theme, we have many more interesting topics. In this issue's "Viewpoint", Eurescom mess@ge editor Peter Stollenmayer debates, how user-friendly the Internet really is.

Our "In focus" section features an article on NESSI, the European Technology Platform on software and services, by the Chairman of the NESSI Steering Committee, Dr. Dario Avallone.

In our "Project reports" section, Ólafur Ingþórsson from Iceland Telecom presents selected results from a recent Eurescom study on e-health. Under "European issues" we feature a report on the Future Internet conference in Bled, Slovenia. And finally, the "A bit beyond" article highlights, how the Internet has changed marital life.

We hope you will find in this issue some information of interest, and we would appreciate your feedback on any of the articles. If you would like to suggest a topic or offer a contribution to Eurescom mess@ge, this is equally welcome.

Your
Eurescom mess@ge editorial team
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Events calendar

1 – 2 July 2008
IPTComm 2008 – Principles, Systems and Applications of IP Telecommunications
Heidelberg, Germany
http://iptcomm.org

8 – 9 September 2008
E-Health 2008
London, United Kingdom
www.electronic-health.org

10 September 2008
FIRE Launch Event
Paris, France
http://cordis.europa.eu/fp7/ict/fire/launch_en.html

13 – 15 October 2008
2008 NEM Summit – Towards Future Media Internet
Saint-Malo, France
www.nem-summit.eu

20 – 23 October 2008
ICIN 2008
Bordeaux, France
www.icin.biz

4 – 5 November 2008
Net-atHome 2008
Nice, France
www.net-athome.com

6 – 7 November 2008
4th International FOKUS IMS Workshop 2008
Berlin, Germany
www.fokus.fraunhofer.de/go/ims-event

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

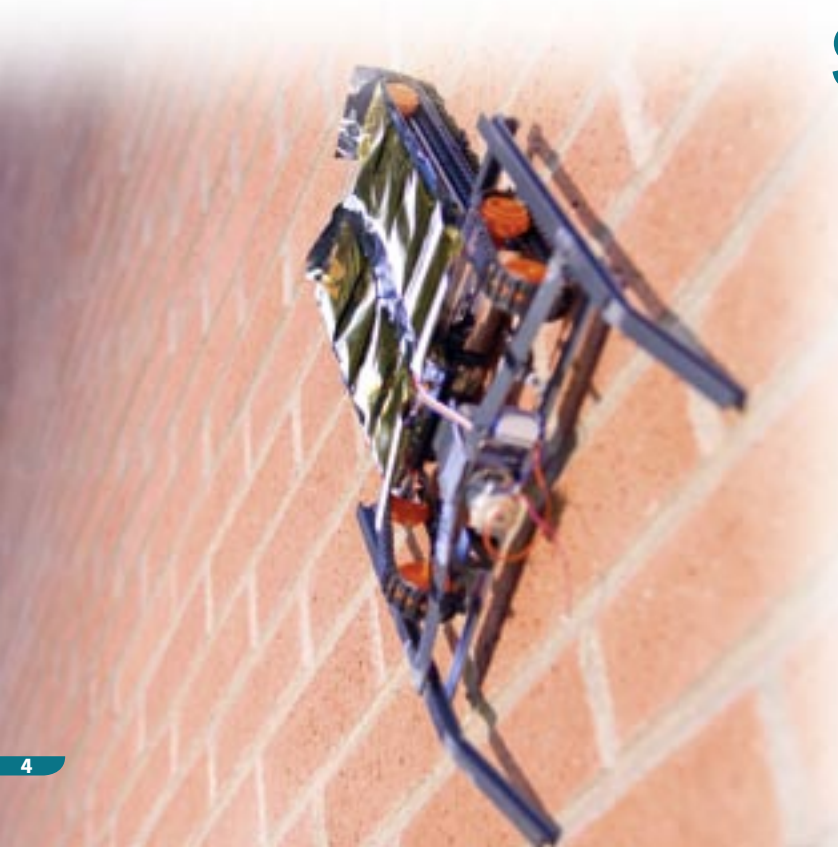
9 – 10 December 2008
Future Internet Assembly
Madrid, Spain

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

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

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

Sn@pshot



Spiderman, go home!

Wall-climbing superhero Spiderman might soon be made redundant. In May, California-based R&D organisation SRI International demonstrated a robust wall-climbing robot using a new electrical adhesive technology called compliant electro-adhesion. The wall-climbing robot can be used for military applications, such as urban reconnaissance, sensor deployment, and installation of network nodes in an urban environment, but also for civilian applications, such as façade and window cleaning.

Website: www.sri.com

Imprint

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The Eurescom study programme 2008

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The Eurescom community of European telecoms network operators and service providers continues its commitment to engage in short and focused collaborative studies, which are facilitated by the Eurescom study programme as the instrument for an efficient setup and execution of such studies. The study programme is financed by its subscribing members. Their commitment is underwritten by their upfront payments to the programme's budget.

The Eurescom study programme is a flexible instrument for bringing together leading experts from its members to address topics of common interest. Eurescom studies develop conclusions on specific topics and pave the way for larger collaborative projects and initiatives.

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

Six study proposals

Following the first call for study proposals in 2008, six studies were proposed by the programme members. These studies were evaluated by experts from Eurescom and the Study Management Group (SMG), which finally concluded via audio conference to recommend four studies. All received proposals were of considerable quality and foresight.

The topics proposed in the recommended studies concern vehicular communication networks, VoIP interconnection challenges, implications of next generation SIM cards with IP connectivity for telecommunication operators, and finally the emerging autonomic computing and networking area.

Vehicular communication

In the area of vehicular communication networks, a study aims to broadly investigate the main technological trends, for example standards, current and future deployments and testbeds as well as external factors such as regulation, policies, societal and human factors. It will provide examples of services and applications that would be appealing to different users. To support the potential engagement of telecom operators in this market the study will also describe the value chain, the different roles that can be assumed, and the main actors active today. Finally, in order to strengthen the role of telecom operators in this market the study aims at proposing an approach to a strategy and related business models.

Inter-provider VoIP interconnection

A further study focuses on the inter-provider VoIP interconnection challenges. It aims to promote global and universal voice and telephony communication over IP. The study proposes to investigate, analyse, evaluate, and develop high-level architectures for interconnecting VoIP service providers by identifying valid business models and suggest VoIP interaction models so as to allow global telephony reachability. The work will take into account specific requirements from traditional PSTN like legal interception, emergency calls and quality of service. In addition to these specific requirements, the study will identify a set of requirements that should be met by the underlying IP network providers and how to ensure a synchronisation between the service and transport layers so as to offer a QoS-enabled VoIP service across several IP and telephony domains.

New generation of Java-enabled SIM cards

In view of the fact that the telecom operators are searching to obtain a portfolio of new services for their customers, another study proposes to investigate the potential capabilities of the new generation of Java-enabled SIM cards. With the introduction of platforms such as Java Card 3.0 Connected Edition, the SIM card becomes a platform for hosting IP networked applications. To gain a competitive edge in the market, telecom operators need to understand the opportunities offered by new and more advanced SIM cards. This study will discuss potential new business opportunities and additional roles that can be assumed by the telecom operators in the value chain. In general, it is vital for the telecom operators' business evolution to identify early the impact of such new technologies on different market segments and business models.

Autonomic network and service infrastructures

The fourth study that has been recommended by the SMG concerns the emergence of autonomic network and service infrastructures, which appears inevitable by analysing the exploding complexity of these infrastructures and associated operation costs. Furthermore, "autonomicity" as a property is pivotal in the Internet of the Future and is enabled by potentially disruptive technology that may significantly impact the business of telecom operators. The purpose of the study is to chart autonomic computing and networking technology from a telecom operators' view, and to elaborate on their strategic positioning in this area in terms of opportunities and risks.

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

European telecommunication testbeds – Visions and initiatives

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Testbeds are becoming key to research and development of innovative networks, applications and services in telecommunications. The growing complexity of telecoms networks and the increasing need to take socio-economic aspects into account have led to intensive collaborative testbed efforts in Europe.

Strong push in FP7

The European Commission and a number of leading players in European ICT research are pushing the vision of large-scale, federated testbeds in telecommunications. The Commission's FP7 ICT work programme for 2009-2010 gives high priority to the building of a federated testbed facility for Future Internet Research and Experimentation (FIRE) as an important objective in Europe's efforts for defining the Internet of the Future. There are several reasons for promoting experimentally driven research. It will help to provide proof of concept for theoretical network research, and it will help to streamline research efforts through iterative cycles of research, experimentation, and validation.

Main driver Internet

The Internet is definitely the most important field, in which a large-scale, European testbed is urgently needed. The Internet has evolved into a critical infrastructure for our society. However, the basic architecture of today's Internet is 30 years old and has never been designed to be a critical infrastructure for all sectors and all kinds of human interaction. Thus, a change of the Internet as we know it will be inevitable. It can be either evolutionary or revolutionary, or a combination of both.

Whatever the way forward will be, developing innovative architectures, applications and services for the Internet will have three major dimensions: technological, socio-economic, and regulatory. In order to check the feasibility of novel Internet concepts, all three dimensions have to be taken into account. The vision is that large-scale European testbeds will enable the multidisciplinary testing of all three dimensions in a way that is as close as possible to real-life conditions.

Challenges

There are plenty of technological challenges that require testing. The convergence of fast optical networks with mobile networks and sensor networks will lead to highly complex systems.

The socio-economic challenges of the Future Internet are no less demanding. Issues of security, accountability, and privacy as well as the economic effects of new technologies need to be closely examined.

Finally, experimental facilities and real-life testing scenarios for the Future Internet also have to take into account regulatory aspects, particularly consumer protection, privacy regulations, and national security.

First steps in FP6

Already in EU Framework Programme 6 (FP6), some European research projects, such as Panlab, OneLab, and VITAL, have explored concepts for large-scale, federated testing. In addition, an expert group on Future Internet Research and Experimentation (FIRE) had drafted recommendations that influenced the new FP7 ICT work programme. There are two major trends in large-scale testing of complex systems as envisaged in the FIRE concept: federation of existing physical testing resources and virtualisation of testing resources. Future European projects will continue to work towards a Europe-wide testbed facility that will utilise these concepts.

Requirements for federated testbeds

There are a number of requirements for federated European testbeds. They have, for instance, to support experimentation that is cutting across several domains, and they have to enable the broad involvement of large user communities.

Further characteristics of a prospective FIRE testing facility are that it enables design, prototyping and experimentation with advanced paradigms and architectures for the Future Internet and that it allows going beyond the connectivity layer, including, for example, the service layer, in addressing the Future Internet.

Furthermore, the future FIRE testing facility should be designed to enable a continuous feedback loop between advanced research and large-scale experimentation. Finally, it should be designed in a way that enables the effective involvement of end-users and standardised methods for socio-economic evaluations.

Open issues

There are still many issues to be tackled on the way towards a European federated testbed respectively a FIRE facility.

A sustainable model for operating the FIRE facility needs to be defined and put into practice. Then, the FIRE facility needs a critical mass of participants to be attractive for testbed users. Furthermore, the federation mechanisms for testbeds, as for example proposed by Panlab, have to be deployed and put into practice in a way that avoids duplication, but fosters synergies and, thus, increases the quality of testing.

Europe in the global context

There are a number of initiatives worldwide, which are similar to Europe's FIRE initiative. In the USA, there are the GENI and FIND programmes funded by the NSF, which also include experimental research via large-scale testbeds. In Japan, the AKARI project works on new network architectures, using a similar approach that includes experimental research. As the Internet is and will remain a global network, Europe will cooperate with other testbed initiatives in the Future Internet area. Today, Europe appears to have a strong position in the area of federated testbeds. If the FIRE facility will be implemented as a federated, large-scale testbed within the next three years, Europe will have good prospects for a technological lead in regard to the Future Internet and other areas of telecommunications.

Panlab How to deliver an infrastructure for a testbed federation

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In the European Union there is a strong push for the interconnection of independent testbeds and laboratories. A general framework for such an interconnection has been defined by the recently finalised FP6 research project Panlab, which also aimed to facilitate the establishment of a Pan-European laboratory. The concept is based on the federation of distributed interconnected testbeds that provide the required facilities for a broad range of testing capabilities for technologies, product interoperability and telecommunications services.

Among other results, the project proposes an approach to establish and control a federation of testbeds from a technical point of view and describes processes that allow for an automated access to remote assets and resources.

Increase utilisation of testing resources

The rationale of Panlab is that a single testbed cannot provide every possible testing environment or every possible testing resource. Furthermore, testing resources, such as high guaranteed bandwidth network links or dedicated testing equipment, are very expensive. These considerations have led to the Panlab concept of federating existing testbeds. By doing so, the scattered available testing resources become available through a single logical entry point, which increases visibility and potential utilization of these expensive resources.

For realizing the proposed Panlab federation, a supporting technical infrastructure must be developed and deployed that takes into account basic technical requirements, such as interconnecting remote testing resources, describing and locating testing resources, and enabling access in a uniform way.

Controlling testbed interconnection

The necessity to interconnect different, potentially remote, testing resources for the provisioning of a specific testing environment leads to the first set of technical requirements. An observation from early Panlab work clearly suggests that the diversity of potential testing resources that could be federated and made available via the proposed infrastructure is very high, allowing the comparison that its complexity exhibits similarities with the complexity of controlling converged networks in the context of next generation networks and services (NGN). Allowing for this comparison, leads to the investigation of the suitability of the IP Multimedia Subsystem (IMS), the control plane of the NGN, as the basic framework for controlling the Panlab federation.

The first conclusion is that it should be possible to reuse the architectural framework of IMS, and potential existing implementation technology thereof, to implement the technical control infrastructure of the Panlab federation. This proposal conforms to the fundamental Panlab approach, which is to maximize reuse of existing knowledge, technology and resources and only to introduce elements that have not existed yet. In the course of a Panlab deployment a number of support functions that adhere to the IMS-based controlling framework will need to be implemented or extended.

Discover testing capabilities

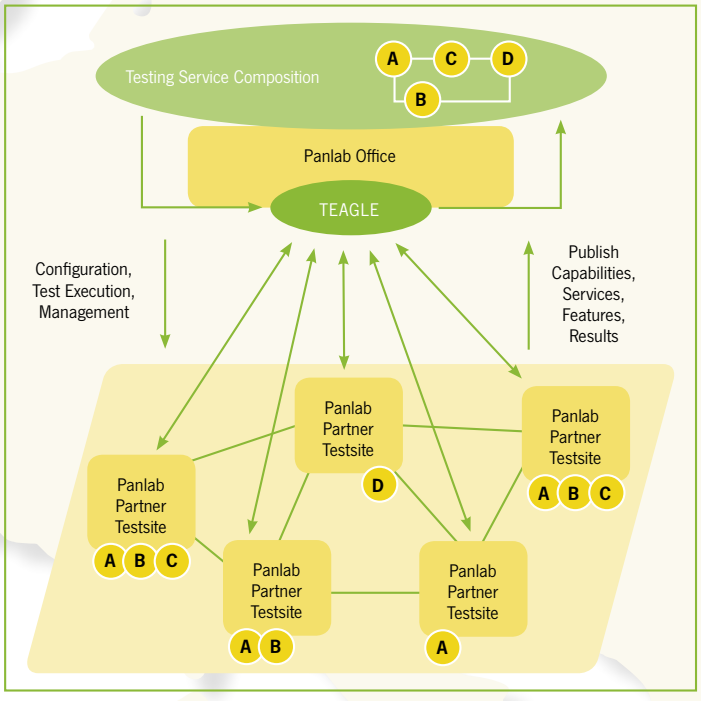
The large variety and heterogeneity of available testing resources that must be made visible, accessible and comparable through a single logical interrogation point leads to the second set of technical requirements, which relates to the way how the testing resources are described, stored, discovered, brokered and provisioned. To satisfy this set of requirements, Panlab proposes the implementation of a new tool, called Teagle (see figure), which unifies the representation of testing resources for the purpose of later automated processing. Resources under consideration in this area include testing environment configurations, test suites and testing results.

In the course of implementing and deploying the proposed Panlab technical infrastructure by a follow-on initiative, the Teagle concept being an essential element of the technical infrastructure, deserves particular attention.

The second conclusion is that research work has to be carried out, in order to identify and develop a suitable representation by re-using and extending existing state-of-the-art description techniques. The description of Teagle currently suggests that the Unified Modelling Language (UML), combined with the Extensible Markup Language (XML), provides the basis for this development.

Grant access

A large number of different stakeholders will be granted access to the Panlab federation, which leads to the third set of technical requirements. These stakeholders will be owners and operators of testing resources and testbeds, customers of the federation seeking access to specific testing environments and different tools, such as Teagle, to configure, provision, and manage assets of the enabling Panlab ▶



The Panlab testbed federation concept

Opportunities of testbed federation Interview with Dr. Udo Bub

Udo Bub, Deutsche Telekom Laboratories

Testbed federation has the potential to accelerate the development of innovative services and applications in Europe. In order to have a real business impact, big players in the European ICT sector need to embrace the federation concept. One of them who does is Deutsche Telekom. Eurescom mess@ge editor-in-chief Milon Gupta asked Dr. Udo Bub from Deutsche Telekom Laboratories, how testbed federation is seen and done at a large network operator and service provider.

Dr. Udo Bub is member of the executive team of Deutsche Telekom Laboratories, the R&D-organization of Deutsche Telekom, where his areas of responsibility include Human Computer Interaction, ICT Architectures and ICT Infrastructures as well as Security.

How important are European testbeds for innovation and value creation in the telecoms sector?

For us, the acceleration of service development through the re-use of existing specialized hardware setups is, of course, a key driver. What is more important for telco providers, however, is the co-operation with a larger developer community. So far, we see several European providers – including Deutsche Telekom – gradually opening the application programmer interfaces to interested developers. The IPTV Award at Deutsche Telekom is an example for that. A testbed federation perfectly complements this effort in providing a platform for pre-development and testing of new services.

In which ways is Deutsche Telekom involved in European testbed initiatives?

We take part in the FP7 Integrated Project PII, which is a part of the FIRE initiative. PII continues the work of Panlab that laid the foundations for a testbed federation during a strategic support action in FP6.

Of course, we as Deutsche Telekom Laboratories are also involved in a number of research projects oriented towards a clean-slate Internet, such as Trilogy and 4WARD. There will have to be a large amount of testing in a second phase of these projects, and we hope to build on the new platform.

There remains the question, who will operate this platform. From our point of view it should be a company-overarching organization such as, e.g., EICT, European Center for Information and Communication Technologies.

What are the benefits of Europe-wide testbed federation?

There is, on the one hand, an aggregation effect by letting more partners share common facilities. All in all, specialized equipment will be re-used and we should all pay less. There is, on the other hand, an advantage that is often underestimated: testbeds as such will improve in their usability, stability, maturity. Funding agencies will have a tool to actually evaluate the results of research projects through a much larger community than the usual set of experts.

What are the risks of testbed federation, and how do you address them?

I see a risk in the complexity of the matter. There are problems that need to be addressed on a case-by-case base, such as different licences, e.g., for the use of hardware components for non-commercial or commercial purposes.

In addition, the effort that is required to actually maintain a testbed at a provider needs to be compensated for. This leads to the necessity of an operational model involving a certain cash flow. How this can be made efficient and simple at the same time needs to be discussed further.

Which challenges need to be overcome on the way to a functioning European testbed federation?

As I said before, I see mostly legal – IPR – and business issues.

By when do you envisage a fully functional European testbed federation to be in place?

This is an ongoing process. We are working on a step-to-step basis as functionalities will be added continuously.

Which relationship should a Pan-European testbed federation have towards similar initiatives in the United States and Asia?

The GENI initiative is interesting, and we will have to stay in touch to see where this evolves to. So far, there are no tangible results yet, just as on our side. We can grow up together.

The same applies to the – especially Japanese – efforts in Asia.

technical infrastructure at the federation level, or in the individual testbeds.

The third conclusion is that the Panlab technical infrastructure must grant controlled access at different levels to different resources, allowing for resource allocation, scheduling, access rights management, as well as access to information related to management of the federation for the purpose of fulfilling service-level agreements and generally to assure quality of offerings. In order to satisfy these requirements in a controlled way, research and development work must be carried out to build on existing resource abstraction and virtualization techniques.

Conclusion

Overall, the Panlab technical infrastructure must impose minimum overhead to the owners of testing resources and their customers, thus a fine balance must be found between efficiency and fine-grained management, so that market dynamics could be induced in the European testbed landscape. The Panlab vision is that the market dynamics will work towards state-of-the-art, high-quality testbed offerings in the federation.

Further information is available on the Panlab website at *www.panlab.net*

Federating testbeds for experimentally driven research

The OneLab2 project

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It is of utmost importance for Europe to have access to tools and testbeds to explore the future directions for Internet technology and services. Although many testbeds exist today, they tend to be highly specialised, or explore near-term product offerings, often with limited availability and openness. The Onelab2 project rises to the challenge of developing and operating an open, general-purpose, and sustainable large-scale shared experimental facility. It leverages the original OneLab project's PlanetLab Europe testbed and its international visibility to make this facility a reality.

Building this facility is a real challenge, as it has to include the right components to satisfy the user's needs, while the right design for some of these components is still under evaluation. Therefore, Onelab2's methodology is pragmatic, starting from PlanetLab, an existing testbed with international visibility, and building on the concept of federation of diverse testbeds to meet the varied needs of a broad customer base. The project's vision and research contributions will materialise in PlanetLab Europe, the European arm of the world's most widely used research networking testbed, having the freedom to innovate on behalf of European industrial and academic research priorities. This will give European Internet stakeholders a means to accelerate the design of advanced networking technologies for the Future Internet.

OneLab should be viewed as a long-term project, with an iterative contribution, identifying priorities and transferring its innovation into PlanetLab Europe when mature. In order to identify these priorities, OneLab explored various transition paths from the current Internet.

Network environments are becoming ever more heterogeneous. Third-generation cellular systems are bringing large numbers of handheld wireless devices into the Internet, and new ways are arising for these devices to self-organise and communicate. In addition, content has become a driving force behind many new network architectures and entirely new paradigms are emerging, such as situated and autonomic communications (SAC).

The Future Internet will be polymorphic, aggregating all these types of systems. Yet, there are few possibilities to experiment in such a hybrid environment. PlanetLab Europe aims to provide a single access model to a diversity of networking technologies, allowing resources to be shared through the powerful paradigm of virtualisation, wherever this is possible, and enabling the federation of multiple testbeds, lowering the entry cost to such a facility.

The original OneLab project established the PlanetLab Europe testbed, added new capabilities, and federated it with the worldwide PlanetLab system. Through this system, European participants have access to over 800 nodes located at over 400 sites in over 30 countries. Experimenters obtain virtual Linux machines on any of these nodes they wish, and have the privileges to configure them according to their needs. They launch applications at a global scale and expose them to the realistic testing environment of the public Internet. With federation comes the freedom to innovate. Now, PlanetLab Europe can deploy its own modified version of the free open-source PlanetLab code, so long as it remains consistent with the agreed-upon interface and policies of the global system. OneLab took advantage of this freedom to introduce new wireless technologies into the testbed. OneLab2 will go further and take the first concrete steps to integrate radically new networking models and make them available to European researchers. OneLab is tightly associated with similar efforts worldwide, especially in the US and Asia.

OneLab2 is strategic, as it will give people wanting to assess new technologies the tools to quickly deploy their experiments, evaluate and analyse the results produced by the testbed, and eventually share these results. As such, it will lower the entry cost to experimentation – often considered as a complex and heavy-weight activity – with little management overhead, accelerating proof-of-concept evaluation and competitiveness.

You can find more information on OneLab2 at *www.one-lab-2.org*

The FEDERICA project

A federated infrastructure for Future Internet research

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FEDERICA is an EU-funded project under Framework Programme 7 (FP7) which aims to create a scalable, Europe-wide technology-agnostic infrastructure in order to support research experiments on new Internet architectures and protocols. For achieving this, the project uses an infrastructure based on gigabit Ethernet circuits from the GÉANT2 backbone that are coupled with virtualisation technologies.

The e-infrastructure

The FEDERICA infrastructure is based on the multi-domain European National Research and Education Networks (NRENs) and the GÉANT2 backbone. FEDERICA resources are hosted at Points of Presence (PoPs) of participating NRENs. These resources are circuits, switches and nodes capable of virtualising hosts, e.g. open source routers or end systems.

FEDERICA uses virtualisation in computing and network systems, to create a technology-agnostic and neutral infrastructure. It creates "slices" from this substrate, which are a set of virtual network and computing resources according to the user's request.

Virtual slices of FEDERICA's infrastructure may be created, allocated and used simultaneously by researchers for testing, even with disruptive experiments, within a large production substrate. The researchers will have full control of the allocated virtual nodes and network in their slice and can access specific network monitoring information. The infrastructure capabilities allow a much faster research and experiment cycle.

Access to the infrastructure is normally free of charge for researchers in both academia and the private sector, with priority given to projects funded by the European Community. Access is subject to compliance with an Acceptable User Policy, which requires the user of the services to provide explicit feedback. A User Policy Board is responsible for accepting and prioritizing user requests. Each user group is assured testing privacy and that testing results are not accessible by other users.

Internal research

Besides the plans to engineer and offer an operational infrastructure as a service in the short term, the project is conducting research towards prototyping and testing certain virtualization elements, such as slicing tools and novel architectures, not deemed sufficiently mature to be offered as a service by the project. Research includes general control, management and monitoring architectures for virtual networks, user controlled networks, and software routers and is being tested on the infrastructure itself.

The research can be divided in two areas. The first is related to the control and management of a set of virtual networks and associated tools and protocols. There is active research for multi-domain services, such as for Bandwidth on Demand and Quality of Service, which only lately is producing draft standards. The other area has the broader scope of evaluating architectures, which radically differ from the ones used in the Internet of today and are focused towards virtual infrastructures. The results of the research will be engineered into the infrastructure where appropriate.

New inter-domain services for virtualized resources are envisaged and will be explored also through the participation in the IPsphere Forum.

User communities

The target users of the infrastructure are researchers actively engaged in research on networking, who use networks not just as the tool, but primarily as the subject of their work. User groups will include EC projects, research groups in universities or research centres, equipment manufacturers and telecommunications research labs, or even individuals (e.g. PhD students). Users of the FEDERICA infrastructure can be distinguished into contributors and consumers. Contributors are able to modify, in a controlled way, their allocated virtual slice, i.e. its properties, configuration and software. Consumers are the users, who are simply using a FEDERICA slice or layer to do higher-layer or application-layer testing.

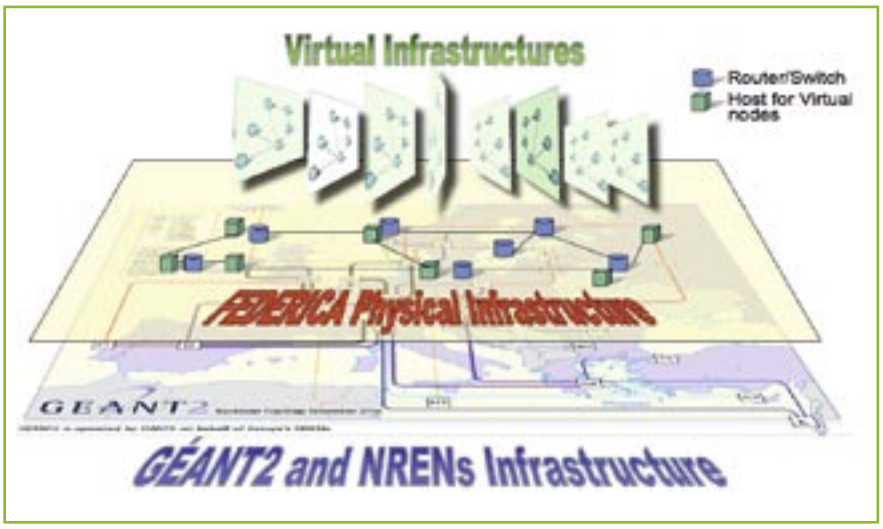
Conclusion

The FEDERICA project enables Future Internet researchers to access rapidly and efficiently resources for their experiments and tailor their own "slice" according to their needs.

Management and control of distributed, parallel, virtual networks, which may communicate among them and with the open Internet, are also key functions in the next generation networks. The FEDERICA project will develop experience and draft a model for managing and using virtual infrastructures as a combination of networks and systems.

Leveraging advanced networking and virtualization offers new scenarios to fundamental and innovative research in the existing infrastructures. The FEDERICA project started on 1 January 2008 and continues for 30 months. By October 2008, the first researchers will be able to access the infrastructure.

More information is available at *www.fp7-federica.eu*



FEDERICA's e-infrastructure

How user-centred is the Internet?

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Is the Internet really user-centred? You may say: "Of course, the Internet is user-centred". After all, millions of users all over the world are happily using numerous Internet applications exactly designed according to their needs. Just think about the huge number of user fora on nearly all matters, the uncountable amount of user-generated content through platforms like YouTube or MySpace, the possibilities of the users in virtual spaces like Facebook or Second Life, or the nearly unlimited variations of Internet-based games like World of Warcraft or Geocaching. Also through platforms like Amazon or eBay users are gaining a lot of power, even for other parts of their life. For example the ratings used at eBay are already used as a level of trust between unknown persons in various on- and offline situations.

Although most Internet services and applications are undeniably centred around users in both private and business life, there are a few Internet areas where the users are not in control, or even left out completely. Two very serious issues are that significant numbers of users are locked out of online information resources for various reasons, and that users have often little or no control of their online privacy and security.

The digital divide

The term "digital divide" expresses the gap between people who have access to online information resources and those who have not. There are various reasons like, for example low education, low income, low affinity to modern technologies, the lack of infrastructure access, or just missing necessary basic know-how. For example nearly all students have access to the Internet, but much fewer older citizens actively use the Internet. According to last year's UK household survey only 4 percent of the age group 16-24 never used the Internet, whilst 71 percent of the age group 65+ say that they never used the Internet. 21 percent of the non-users say that they have no Internet access because of lack of skills (Source: UK National Statistics).

It is of course true that the number of people without Internet access is decreasing as broadband access becomes cheaper, simpler and more widely available, and as people become more computer-literate. However the negative impact of not being able to use online services is dramatically increasing. Currently people still have various alternative methods for circumventing online services; they can for example still do their financial transactions at real banks, register their car with real personnel, or file their tax declarations on forms filled in by hand. As the Future Internet develops, those personnel-intensive services might disappear and leave citizens without access to online services out in the rain. Maybe there is room for a new business: agencies handling such services online for people without access. In any case those people are not only left out of participation in the Future Internet society, but will also have to pay a lot of money to get their needs served in alternative ways. Already now online-banking or online public transport tickets are cheaper than their offline alternatives.

Usability of access and devices

As a large number of users feel that it is too difficult to obtain access to the digital world, it is probably paramount to think about simpler access.

Both simple access and simple access devices are needed. What could probably help is a "one-stop, all-inclusive Internet connection service" with a clear and simple tariff structure, complete installation included for a moderate lump sum, and a simple device providing a simple e-mail function and access to an Internet search engine like Google. The device needs to be pre-configured (true "plug-and-play") and fail-safe, i.e. should there be an unexpected failure, after restarting it always has to work again.

Security and trust issues

The more we depend on online services, security and trust are becoming an increasing problem. 23 percent of the British Internet users reported that they had suffered during the last 12 months from data or time loss due to a malicious virus attack (source: UK National Statistics). But it is not only a matter of loosing a service or important data; security is becoming a much more serious issue where citizens can loose money, be made legally responsible for actions of intruders (for example for illegally downloading files), or even loose their complete identity. Currently industry, service providers and government leave it very much up to the users to care about adequate security measures themselves. For many users it is, however, too complicated or too costly to obtain sufficient security.

It is high time that a basic Internet security service is automatically and freely provided to all online users. This service must be simple to use and include basic security measures against malicious attacks, a backup service for important data and an insurance covering financial and legal liabilities caused by accidents and attacks.

Conclusion

Most Internet applications have been centred around users. Users are increasingly contributing directly and have gained a lot of power through the Internet. However there are a few areas which need urgent improvement. Security and the digital divide are probably the two most outstanding problem areas.

Additional proof that those problems could really challenge the success of the Future Internet are the "drop-outs". According to the US PEW Internet Study, 17 percent of the current group of non-users are online drop-outs. They formerly used the Internet but no longer do. Over a quarter of current Internet users report that at one time or another in their online lives, they went offline for an extended period. The main reason for such drop-outs is that they had problems with their computers or with their Internet access, but also fear of loosing privacy or missing trust were reasons for dropping out. It is time that action is taken by government and industry.

You can find more information on

- PEW Internet and American Life Project at *www.pewinternet.org/index.asp*
- UK Internet Access statistics at *www.statistics.gov.uk/StatBase/Product.asp?vlnk=5672*

CELTIC N • E • W • S
Telecommunication Solutions

CONTENT

EDITORIAL

Dear reader,

Since its start in 2003, Celtic has now really taken off the ground and has become a very successful EUREKA ICT cluster. After the already very successful 4th Call an even better Call 5 followed in 2007, where in total 26 project proposals received a Celtic label.

500 million euro invested

By the end of 2008, around 70 projects will have been launched, with a total budget of more than 500 million euro and over 5,000 person years of effort. It is also interesting to note that the success rate for project proposals to receive the Celtic label is around 70 percent. Very satisfactory for Celtic is also the fact that the participation of small and medium sized companies has increased to over 30 percent.

Celtic success factors

In looking at the success factors of Celtic, there are, at first, the very satisfactory projects that finished in 2007, and, secondly, the very much appreciated Celtic Event, with presentations and show cases of running projects. One of the highlights in 2007 was the launch of the 60 million euro project 100GET, which is currently the largest Celtic project. This project will focus on 100 Gbit/s carrier-grade Ethernet technologies over optical networks. This new technology is considered as an important European innovation and one of the key elements for the future Internet.

In 2007, the finished projects were evaluated on their achievements and impact to select the best projects for receiving the newly created Celtic Excellence Award. As this award has been assigned for the first time, covering basically two calls, a total of 6 projects from Call 1 and Call 2 were finally selected for the Celtic Award.

Celtic, as well as other clusters, still suffers from the most critical problem in launching projects, which is the lack of synchronisation between the different EUREKA member states to commonly agree on providing public funding for labelled projects. Still, many projects encounter large delays – sometimes more than one year – until funding has been approved and the project can start. Many projects are also forced to modify the originally agreed consortium and planned work. There are currently additional attempts going on via EUREKA to improve the situation and to better synchronise funding decisions in the future.

Celtic has been maintaining co-operation relationships with several European Technology Platforms, including NEM, eMobility, NESSI, and ISI. With these organisations observer roles of their steering boards have been agreed and, reciprocally, also offered for the Celtic Steering Board. It is firmly intended to intensify the collaboration even further by aligning the different strategic research agendas with the Celtic work programme (Purple Book) and to define projects that are complementary to existing projects of the ETPs.

Additional agreements on cross-link collaboration have been established and maintained with other European organisations, like COST or PSE Europe (Public Safety in Europe).

Outlook

Celtic has considerably consolidated its status and impact. It has become a widely recognised EUREKA cluster and has also gained a lot of attention by the European research community, including the European Commission.

In the coming years Celtic will further intensify its activity to establish a well functioning collaboration with the related European Technology Platforms eMobility, NEM, NESSI, and ISI. The possibility of forming another Joint Technology Initiative (JTI) will also be further investigated to assure that Celtic, as a EUREKA cluster, will be engaged in the activities, also to foster synergies with its own projects.

Based on some EUREKA actions it is envisaged to intensify the collaboration with the other EUREKA clusters to assure consistency in work processes and work programmes and to establish a much clearer voice towards the EUREKA high level groups (HLG) to overcome the current problems of funding synchronisation and commitment.

In addition the EUREKA communication will follow clearer rules that are currently defined in its working group with the assistance of the clusters.

Heinz Brüggemann
Director Celtic Office

MOVIES

When broadcast meets cellular

The emergence of mobile TV is opening new service opportunities by combining broadcast and cellular technologies into the same, very personal, device. Whereas "mobilisation" of traditional TV services is a key driver for the first launches of mobile TV services, the MOVIES project focuses on the future by leveraging this network combination to provide a unique user experience.

For the first time, TV is becoming personal. Beyond simple combination of two delivery means, this new user environment can be greatly enhanced with a set of key platform features allowing personalised, interactive broadcast services, optimisation through convergent technologies, and consistent user experience.

Personalized broadcast services

The broadcast/cellular combination offers a unique opportunity to personalise services having massive audience. Concurrently with a mobile broadcast delivery of massive audience services, the cellular data network connection allows efficient personalisation of key elements of the user experience. In this case, the cellular mode is used both upstream to collect user data and build a user profile, and downstream to add personalised key features of the service.

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Upstream data collection and profiling consists in deriving relevant user profiles based on user activity and expressed preferences. Using this information, a recommendation engine provides guidelines to the personalised data sender.

Downstream personalisation applies in particular to the look and feel of the user interface and to interactive TV add-ons.

These technologies provide both enhanced user experience, and enhanced customer relation for the mobile TV service provider.

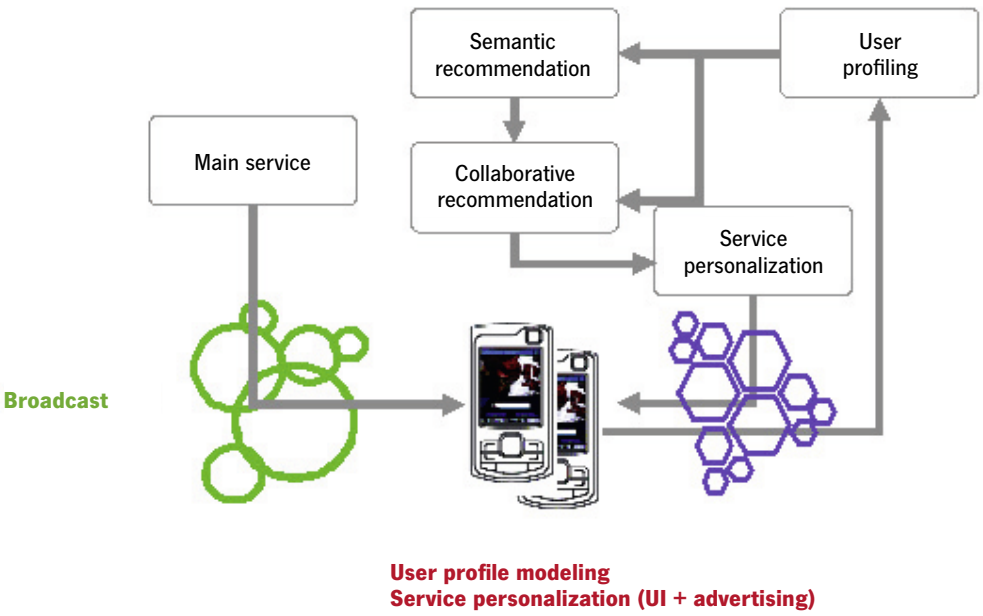
Convergent technologies

Given the specialisation of each network technology (massive delivery versus personal interaction), the building blocks of a powerful convergent platform should exploit the best of each type of network. A good example is file distribution. The broadcast mode allows instant delivery on a massive scale, but does not provide reliability. Some intended receivers may not get the file, and the sender would no know it. The cellular mode is then used to compensate at the lowest cost, by providing "repair" functions used only for failed deliveries, which is statistically a small part of the population.

As SIM cards in mobile phones need updates of their own files, this robust, massive file delivery scheme must be extended to support the SIM card's remote file management system. In this case, the protocol must be consistent with the security schemes used by the SIM cards.

Consistent user experience

While broadcast TV addresses the masses, cellular networks can also be used for TV services with limited audience. Furthermore, the cell broadcast mode, applicable to cellular networks, can be seen as an intermediate solution. The three modes of TV distribution have their own economic rationale and are expected to co-exist in the future. Providing a consistent user experience across the different modes is a key requirement for success. Access control, supported by the SIM card security, is an essential aspect of the user experience. Providing consistent access control requires consistent service protection, keys and rights management.



About MOVIES

MOVIES is a Celtic project gathering key players in the mobile TV industry: Alcatel-Lucent, BCE, Centre Henri Tudor, Comneon, Gemalto, Nagra, SIDSA, Telefonica, Thomson. Started at the end of 2006, the project will terminate in October 2008. The consortium is currently implementing key technologies mentioned above in a DVB-H + 3G environment.

Conclusion

Beyond mobilisation of traditional TV operations, mobile TV services can provide a very personal user experience by leveraging the combination of broadcast and cellular networks. The MOVIES project is already implementing key technologies that will make it happen.

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

BANITS 2

Improving the network: access, aggregation and services

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Every telco is continuously working on the development of their business, constantly evaluating their assets and trying to realize new opportunities. The most obvious is, of course, to increase the number of customers on traditional services, but adding new value through the introduction of new services, like IPTV or HDTV, is a necessity. With an infinite investment budget or a greenfield deployment, that would be an easy task, but how to make the most out of current assets and a limited investment budget? BANITS 2 is about developing the key engineering solutions to help telcos meet new service demands with state-of-the-art networking technology.

It's well known that the access network – the portion of the network which connects the user with the telco's central office – is often the bottleneck for delivering any new, value-adding, but bandwidth-hungry services to the user. Unfortunately, every upgrade of the access network or new deployment requires very large investments. Thus, the rule of thumb for any operator is to investigate, if there is a chance for improvement within their already installed base of broadband access solutions, typically DSL (Digital Subscriber Line) broadband access in any of its flavours, e.g. ADSL2+ (Asymmetric Digital Subscriber Line) or VDSL2 (Very High Speed Digital Subscriber Line).

Any operator's second challenge is the aggregation network, which connects the point where the access network finishes with the core of the network. The aggregation network, which was once designed to transport voice traffic, is nowadays almost completely used for data transport. However, although legacy voice traffic is decreasing its volume, it cannot be removed from the network. BANITS 2 provides solutions on how to upgrade the capacity of the aggregation network in a cost-effective way, without compromising any legacy and quality issues.

Project achievements

Within access networks, BANITS 2 has developed technologies that increase the coverage of existing DSL loops, as well as several planning tools to enable the offering of new value-added services to existing and new customers.

Work on carrier-grade architectures has been carried out within the access and aggregation networks, providing innovative solutions. Ethernet has been chosen as the base technology for the aggregation network as it is cost-effective. However, this was not straightforward, as Ethernet is not per se a "carrier protocol". "Carrier" in this context means mechanisms and capabilities to support resiliency, availability, reliability, quality of service, control of jitter and delay, operation and management, connection and admission control, and quick recovery from failures. Bringing carrier-grade into Ethernet networks required a deep change in aggregation topologies, i.e. to cope with the resilience drawback of Ethernet, RPR (Resilient Packet Ring) technology was needed.

To demonstrate the benefits of the project, a number of existing services have been tested over it. As an

example, a medical robot that allows remote tele-diagnosis of patients has been developed and tested. Figures 1 and 2 show the medical robot.

Conclusion

Although BANITS 2 will finish by the end of 2008, many project achievements have already been demonstrated in various events. The project has also been successful in dissemination with 2 articles in scientific journals, 18 conference contributions, 9 courses/conferences and 19 contributions to standardization bodies (NIPP-NAI, DSL Forum, ITU-T, ETSI, IETF).

Project partners

Telefónica I+D (Spain) – Coordinator
Corrigent Systems (Israel)
Ericsson (Sweden)
Ericsson LMI (Ireland)
Telecommunication Research Viena, ftw (Austria)
Inelcom (Spain)
Lund University (Sweden)
Mobile Robotics (Sweden)
Robotiker-tecnalia (Spain)

Further information about BANITS 2 is available at *www.celtic-initiative.org/Projects/BANITS-2*

TIGER

Enhancing Solutions for Carrier-Grade Ethernet Metro Networks

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Bell Labs Networking & Networks
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The TIGER project (Together IP, GMPLS and Ethernet Reconsidered) addresses solutions for harmonization of IP and Ethernet technologies for the Metro Ethernet market. In this context, GMPLS acts as a catalyser to effectively control both technologies while capitalizing on its carrier-grade features.

Project methodology

Balanced between industrials and academics, the TIGER project consortium includes:

- Telco: France Telecom Orange Labs
- Telecom equipment vendors: Alcatel-Lucent France (Project Leader), Alcatel-Lucent Bell (Belgium), RAD Data Communications (Israel), Nokia Siemens Networks (Israel and Germany),
- SMEs: Virtual Trip and Net Technologies (Greece),
- Universities/Research Institutes: Telecom ParisTech (France), IBBT (Belgium), FORTH (Greece) and UPC (Spain).

Compared to the period of the project beginning in mid-2005, the Metro Ethernet area is now quite "crowded" facing many technologies. Classical IP/MPLS solutions are challenged by emerging Ethernet-derived solutions (e.g. PBB-TE), ITU-T-initiated transport evolution of MPLS (specifically, T-MPLS), and IETF extensions to control an Ethernet data plane (e.g. GMPLS for ELS – GELS). In this situation, the project is attaining even higher importance, as its main goal is to analyse existing and emerging technologies, assess how they fit service and network requirements defined in the project, and propose technology enhancement routes, if necessary.

Selected directions, innovations and results

To overcome limitations of Ethernet-bridging technologies (Provider Bridge evolutions on the Spanning Tree Protocol) in carrier environments, a migration towards traffic engineering solutions was deemed necessary. The project, thus, specified two major evolutionary directions:

- **Ethernet Label Switching (ELS)** based on GMPLS control components and extensions for an Ethernet switching capability (Figure 1). Along GELS path, the proposed technology enhancements include label merging to meet scalability requirements, and the use of Bi-directional Forwarding Detection (BFD) for OAM purposes (replacing IEEE 802.3ag).

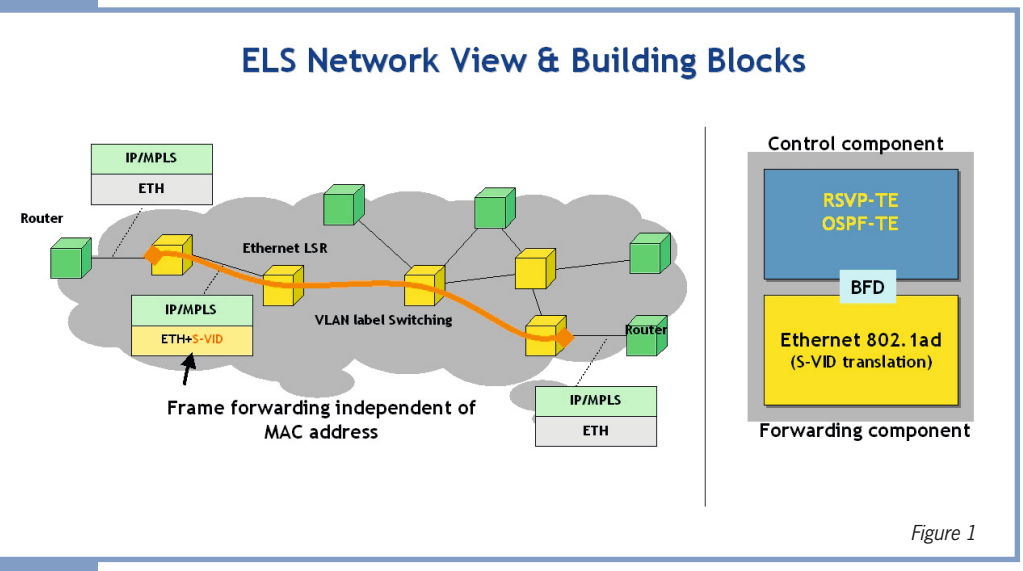

Figure 1

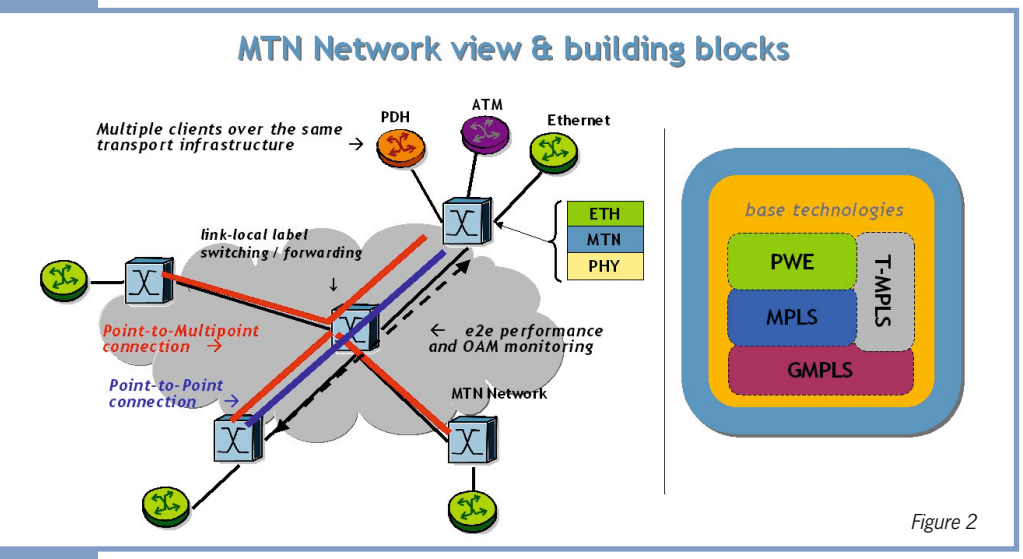

Figure 2

- **MPLS transport network (MTN)** introduced as a transport evolution of the MPLS and pseudowire (PW) technologies. Leveraging the advantages of the MPLS/PW combination, MTN extends the technologies with GMPLS/ASON control plane mechanisms (GMPLS for packets, ASON for Transport MPLS, point-to-multipoint optimizations…) and augmented OAM capabilities (Figure 2).

Solutions have been evaluated with different simulation tools and emulation platforms to test performance criteria (packet-loss rate, delay, etc.), traffic engineering features, economics and implementation feasibility. Key project achievements were presented at the CELTIC Event in Helsinki, Finland, in February 2008 and discussed during the "Benchmarking Carrier Ethernet Technologies" workshop in Krakow, Poland, in April 2008.

Conclusion

TIGER is a good case of a research project that addresses a challenging industrial topic such as Metro Ethernet networking. Being at the forefront of carrier-grade Ethernet technologies, TIGER results will lead to further improvements of the best-of-breed architectures and implementation proposals. TIGER's research results are fuelling both corporate strategies in the ICT industry and new CELTIC projects such as 100GET and TIGER2 that target new high-speed transmission and switching challenges as well as new networking directions, like self-management and content-aware technologies.

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

The Celtic review process – key to success

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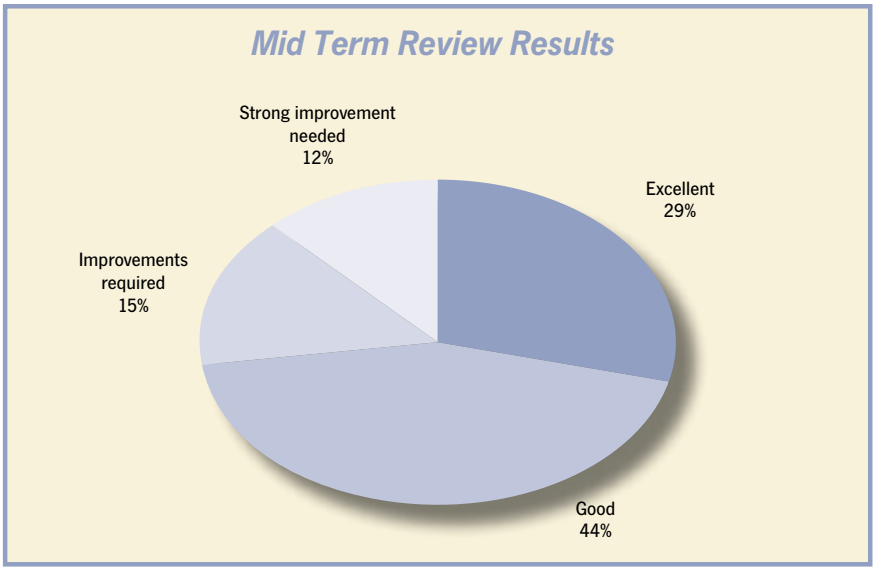
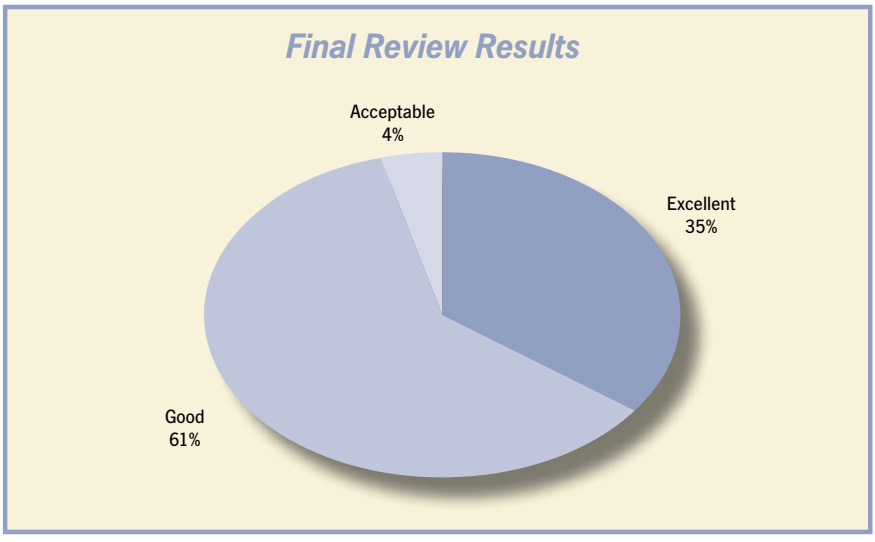
Celtic realises the evaluation of the proposals in the submission phase, but Celtic has also the mission to control the quality of the running Celtic projects. For this it was decided to carry out an efficient but light-weight project controlling process that should not add a high burden to the administrative workload on the project coordinator and the project partners. This is achieved by two reviews, the mid-term review and the final review.

Before the mid-term review and between both reviews, Celtic does not interfere very much with the project management, and the coordinator is in full control of the project coordination. The mid-term review offers therefore the first possibility for Celtic to look more deeply into the project progress at a moment, when first results become available but the project has still half way to go. This is important, because it allows to correct the course of the project, if necessary.





Mid-term review

The mid-term review is realized in three stages, the review of the project documents, the expert's phone conference, and the mid-term review meeting with the project partners. The reviewers are selected by best matching of the reviewers' expertises and the project objectives. All reviewers and the Celtic Programme Coordinator check the main project documents. These include the project description, the deliverables, and the self-assessment. The self-assessment gives the coordinator the possibility to provide his views on the course of the project, achieved successes and encountered problems.

In the reviewers phone conference, the experts discuss their opinion about the project documents and the project's strengths and weaknesses. This information is an important input for the physical mid-term-review meeting that is attended by the project partners, the main reviewer, the Celtic programme coordinator, and, often, also by a representative of the Public Authorities. The review is thought to be

an interactive meeting where the project presents its results and demos and the reviewers can ask their questions. The mid-term review is concluded after discussions between the reviewers and the representative of the Public Authorities.

Until today, 34 projects from the Celtic calls 1 to 3 have passed the mid-term review. The majority of the reviews showed good or excellent results. Only in 8 reviews, significant shortcomings were detected and concrete improvements were requested. It is important to mention that during the final reviews almost all of these projects finally presented good results, and their partners confirmed that the mid-term review was a turning point in the project when the problems were addressed and the project work was better focussed and coordinated.

Final review

The aim of the final review is different from the mid-term review. Celtic still verifies if the work was realised as planned, but the evaluation of the expected project impact is also an important scope of the review. Today, 23 projects have been reviewed, and almost all projects showed good results. Some projects could show results that would be transferred into products, and there were projects that generated direct impact for the creation of new jobs.

Conclusion

The Celtic review process has now been applied to all projects of the first two Celtic Calls. At the mid-term review 27 percent of the projects showed a clear need for improvements. These required improvements were formulated by the reviewers, and the project partners were asked to implement these improvements before the mid-term review was concluded with full approval. This has proven to be quite efficient, as in the final review almost all project showed good or even excellent results.

IMPRINT

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About Celtic

Celtic is a Eureka cluster programme, 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.

NESSI The European Technology Platform on Software and Services

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Chairman of NESSI's Steering Committee

NESSI – Networked European Software and Services Initiative – is the Technology Platform aiming to provide a unified view for European research in service architectures and software infrastructures that will define technologies, strategies and deployment policies fostering new, open, industrial solutions and societal applications that enhance the safety, security and well-being of citizens.

Launched in September 2005, NESSI started from the need to develop a visionary strategy for software and services driven by a common European Research Agenda, where innovation and business strengths are reinforced to support the transformation of the European economy into a knowledge based one and to enable the European software and IT services industry to attain a stronger global position.

Recent and continuous advances in mobile communications and embedded solutions are transforming the environment, at home, at work and on the go. But how will these advances evolve into a continuum of services? How will service technologies benefit citizens and shield users from the complexity of software, networks and computers? How will services contribute to the Future Internet?

The vision for the next ten years is that all electronic devices human beings may think of will have interaction capabilities, enabling new services within continuing changing scenarios according to different business needs and situations in a continuum which, de facto, creates a new global system.

NESSI and R&D challenges – the NESSI Open Service Framework

The vision and the derived R&D challenges are the guiding lines used by NESSI to define NEXOF, the NESSI Open Service Framework and the main delivery of NESSI.

Central to NEXOF's strategy is the creation and management of an open contribution model, fostering as wide participation as possible to build, evolve, use and adopt NEXOF.

In early 2007, NESSI defined a research structure to define how existing and new research projects could contribute to NEXOF as NESSI Strategic Projects or adopt, evolve and use NEXOF through NESSI Compliant Projects. As a result, six NESSI Strategic Projects and a number of projects registered as NESSI Compliant Projects – benefiting from European or national funding – have been launched during the first semester of 2008.

The NESSI Strategic Projects are: EzWEB, MASTER, NEXOF-RA, RESERVOIR, SLA@SOI, SOA4ALL. NEXOF-RA plays a key role to define the Reference Architecture of NEXOF leveraging research results and to manage the open contributions from the NESSI Strategic Projects and any interested party (research projects/initiatives, organizations, individuals).

Through advancements of these projects and refinement of NESSI's Strategic Research Agenda we do expect NESSI to not only deliver an Open Service Framework applicable to a broad range of various domains, but also significantly contribute to the Future Internet.

Focusing on application sectors

From the start, NESSI incorporated a need to elaborate a service environment that would support the creation of solutions. In this context, European society challenges that attract major research and development efforts are health and government, but other sectors such as transport and mobility or energy efficiency are also under analysis. Service technologies are indeed fundamentally impacting many areas of our economy.

An ICT constituency

NESSI includes 325 partner and member organisations represented by 500 individual participants. Its constituency is split between the ICT industry with 22% of large companies and 21% of SMEs, 53% of academic and research organisations and 4% of users. Membership is open to all ICT stakeholders through an online registration mechanism. Members and partners contribute to NESSI's evolution through one or more of NESSI's 13 working groups, active in technology, user or adoption domains.

National NESSI Platforms

Since NESSI's launch in 2005, national platforms have emerged on the topics of software and services. Close collaboration has been set up between NESSI and the national platforms in Belgium, Bulgaria, Hungary, Norway, Slovenia, Spain, The Netherlands and Turkey with new ones emerging in Italy and Poland.

NESSI and the Future Internet

Over the last years, the Internet has become the backbone of the economic environment – while at the same time offering insufficient levels of reliability, safety, security and resilience for industrial quality services. While there is a worldwide vision that the Internet will remain the backbone of society at all levels, there is also a shared understanding that the Internet needs to evolve.

At European level, the ICT ETPs eMobility, EPoSS, ISI, NEM and NESSI are joining forces to define a common vision on what the Future Internet will be, how it will support the emergence of novel scenarios that will provide citizens and public and private organisations with new services. To enable these scenarios, an end-to-end vision has to be shared encompassing all ICT stakeholders, from telecommunication, media, software and services.

NESSI is part of this common effort by the ETPs through two inter-ETP working groups dedicated on the one hand to refining the common vision and challenges and on the other hand to analysing the opportunity of setting up a common initiative.

In this initiative, NESSI is promoting the scenario-based approach, illustrated in the first NESSI movie which was shown in February 2007 at the inauguration of the NESSI Office. In these scenarios, NESSI's approach will support and foster the next generation of electronic services as well as new ways of creating, providing and consuming such services. Through these scenarios, the ambition is to show how everyday lives are affected, if services can be delivered anywhere, to anybody, safely, easily and effectively, at home and at work. NESSI is also an active participant to the Future Internet Assembly initiative and participated in the Future Internet Conference in Bled, Slovenia, from 31st of March to 2nd of April 2008 organised by the European Commission to create a constructive dialogue about the Future Internet from the R&D perspective to find the answers to the challenges which are arising from the emerging new technologies and societal issues related to the Future Internet.

Join NESSI and the ICT Platforms at Service Wave 2008

NESSI is the organiser of the new Service Wave 2008, an important event on services planned from the 10th to the 13th of December 2008 in Madrid. The ambition is for this event to become the annual European event on services, where industry and academia meet to move research to market and to bring market needs to research. The event is co-located with the upcoming Future Internet Assembly scheduled for the 9th and 10th of December 2008. It hosts a scientific track for which a call for papers will be published at the end of May, industry panels and a Future Internet by the ETPs session to present the common vision of the ETPs.

More information?

NESSI website
www.nessi-europe.eu

NESSI Office
11 avenue des Pléiades,
1200 Brussels

Future Internet Assembly
www.future-internet.eu

Panlab Seminar
Testbed Federation in Europe

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On 13–14 May 2008, The Panlab IST FP6 project held a seminar on "Testbed Federation in Europe" in Dinard, France. The seminar was organised in order to provide the grounds for the implementation of testing facilities for various kinds of experiments in a broad area of communications, including telecommunications infrastructure, services, and applications. The main purpose of the seminar was to present Panlab project results as well as to initiate an open discussion on best-practice examples of testing services in Europe and requirements on necessary testing infrastructure.

Local support for the seminar organisation was provided by Thomson and the Media and Networks Cluster "Pôle de compétitivité Images et Réseaux" in Brittany, one of the more than 70 French research clusters focused on networked electronic media (www.images-et-reseaux.com). The Media and Networks Cluster includes 154 organisations, and one of its focal areas is the facilitation of testing approaches in the networked and media area, as stated by Christiane Schwartz, President of the Cluster, in her keynote speech.

The seminar, which attracted 60 attendees from France, Germany, Spain, Greece, Switzerland, Israel, and other countries, was targeted at all stakeholders interested in testbed federation, particularly senior R&D managers and experts who provide or use network testing facilities.

Panlab project results

The Panlab approach is based on the concept of federation of distributed interconnected test laboratories and testbeds that enable usage of required platforms, networks and services for broad interoperability testing. The coordination of resources and access to the testing services will be controlled by a central Panlab organisational entity. A generic roadmap, created within the project, outlines how and when the PANLAB organisation and federated test-bed concept will be implemented, from the prototype and initial operation to full-scale PANLAB operation, considering a time-frame until 2015 and beyond.

Yuri Gittik from RAD, Israel presenting the testbed federation concept of Panlab.

Dominique Guillois, CTO of the French Media and Networks cluster, in the discussion.

The infrastructure of the Pan-European Laboratory consists of testbeds, integrated by Teagle, a dedicated web-based tool for federated testing. The Teagle tool embraces a set of web services that enable customers to express their testing needs and get feedback on where, how and when a required federated testing can take place. Besides technical aspects, the Panlab project considered a legal framework for the future PANLAB organisation and concluded that a non-profit organisation is the most suitable solution for its legal structure, where also provision of commercial testing services will be ensured.

European testing infrastructure – requirements and development

As stated by Georgios Tselentis from the European Commission, two aspects of Future Internet Research and Experimentation (FIRE) are considered as priorities in upcoming European research: experimentally driven advanced research and building European experimental facilities. The necessity for developing the testing infrastructure was stressed also by representatives of European Technology Platforms, the Celtic Eureka Cluster, SMEs, and further potential users of testing services.

A number of speakers representing various organisations and projects, developing different kinds of testing facilities, presented their recent achievements and ideas for the future.

Main conclusions

It was outlined that the establishment of PANLAB as an organisational entity, in charge of facilitating the European testbed infrastructure, will ensure sustainability of numerous testing facilities developed by industry and collaborative projects, giving the opportunity for a wide community to explore and further use them, in order to improve experimental based R&D activities. Thereby, economic advantages in providing and using the federated testing facilities are recognised by both big industry and SMEs. Confidentiality and IPR issues related to testing of new approaches in external testbeds could be overcome by appropriate rules, which will be established in PANLAB.

As important prominent characteristics of the PANLAB organisation and its concept, its openness and neutrality were outlined. From a technological point of view, the proposed incremental development of the PANLAB concept and testbed federation is seen as an important factor. Finally, it was concluded that PANLAB services should be available world-wide, in order to take advantage of a global cooperation by all interested parties.

Presentations from the Panlab Seminar are available for download on the Panlab project website at *www.panlab.net*

Business opportunities in the area of e-health

Results from Eurescom Study P1753

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Is it true that the burgeoning e-health sector really possesses big promises for telcos? Yes indeed, according to new Eurescom Study results, but in a selective way. Especially, Medical Support Services and Homecare appear to offer opportunities that can be promoted and reinforced by utilising telco related technologies and services.

Inasmuch as telcos aspire to capitalise upon emerging e-health services and technologies, they need to develop clear understanding and assessment of not only current technological status and evolvement, but also the interplay of different service segments with particular stakeholder groups.

E-health is being promoted as an encompassing term for improving healthcare practices by support of information and communication technologies (ICT). With the proliferation of new e-health services, telcos need to identify their appropriate roles and impact in the associated value-networks of e-health services.

A Eurescom Study on "Understanding e-health and its promises for telcos" (P1753) was launched in October 2007 to address these issues and perform a business model exercise for describing a telco approach towards selected e-health segments. The collaborative study, coordinated by Iceland Telecom, brought together participants from the network operators Portugal Telecom, France Telecom, Telenor, Austria Telekom and Iceland Telecom. The study was finished in the early summer 2008.

Technological status and e-health segments

Since e-health has a very broad scope in terms of ICT utilisation, it is necessary to extract the primary segments that relate to telcos' core competence, both now and in the foreseeable future. The following seven e-health segments where identified as the most relevant:

1. **Electronic Health Records (EHRs)**
   Represent a coherent and consolidated structure of electronic patient records received from many different clinical and administrative systems
2. **Hospital of the Future**
   Relies on the growing use of ICT for health care processes, sometimes referred to as the "digital hospital" in which no paper is used to record or com-municate information about a patient
3. **Medical Support Services**
   Services that support communications between patients and healthcare providers, using ICT tools and processes
4. **Telemedicine**
   Usually defined as the act of remotely delivering clinical care, supporting services like tele-consultation and medical image transmission
5. **Personal Health Systems**
   Represent a new generation of e-health systems in the form of, for example, wearable, portable and implantable tools and applications
6. **Remote Healthcare**
   Has a focus on long-term "outpatient" residential care, reducing patient check-ups and avoiding unnecessary hospitalisation
7. **Homecare/telecare**
   Healthcare and assisted living services delivered directly in the patient's home. Usually applies to elderly or frailty patients, supporting their needs and increasing inclusion and security awareness

The segments utilise many typical telco services and there is often significant overlapping. Key technologies identified include fixed and mobile networking infrastructure, security and authentication technologies, call centre services and more. Moreover, many medical related technologies increasingly incorporate wireless capabilities through standards like Bluetooth, Infrared, Zigbee and WiFi that support and enable data communication and transfer with various gateways and servers. With escalated complexity and multiplicity of technologies comes the need for interoperability, which has in fact been identified by the EU as currently one of the most crucial concerns in e-health's progression.

Service classes and stakeholder analysis

E-health represents many different value-networks and associated stakeholder groups. Each of the stakeholder groups has their particular characteristics and requirements towards different healthcare processes and derived e-health services. The study identified several service categories within the telco domain that can

The P1753 study team at the kick-off meeting in Heidelberg. Six companies participated in the study: Iceland Telecom, France Telecom, Portugal Telecom, Telenor, Telekom Austria, and Eurescom.

effectively support the stakeholder's different roles and provide long-term added-value to the healthcare provision.

Security services were identified as one of the more predominant value providing services to most of the stakeholders groups, including public and private parties. Secure data management and transmission are a precursor for enabling new e-health services, thereby penetrating all the previously identified segments. Telcos possess the capacity to create a targeted portfolio of security solutions directed specifically at resolving the needs of different stakeholders and their successive roles, such as dispatching e-prescriptions, performing remote medical exams and provide medical records storage, to name a few.

Mobile messaging solutions include another interesting service category that can support increased communication between patients and healthcare providers, reducing costs and improve service-levels. As an example, studies have shown that healthcare providers that offer their customers mobile text-based SMS "Appointment Reminder Services" have significantly reduced the number of patients that do not showing up at their scheduled doctor's appointments.

The study revealed many other interesting and promising telco services that support healthcare stakeholders in performing their tasks.

Selected business models for telcos

After performing a careful analysis it was concluded that the Medical Support Service and Homecare segments offer particularly compelling opportunities for telcos. This was based on multifaceted reasoning, including changing demographics, shift to "outpatient" care, and increased mobility.

Figure 1 provides an overview of potential telco service elements and interrelations of primary stakeholders in the Medical Support Services segment. In this scenario, the telco is responsible for providing the service platform, such as an SMS based "Appointment Service Reminder" platform, managing the billing mechanism, providing and enabling integration with the healthcare provider administrative systems and, finally, providing call centre services for back-up and customer services.

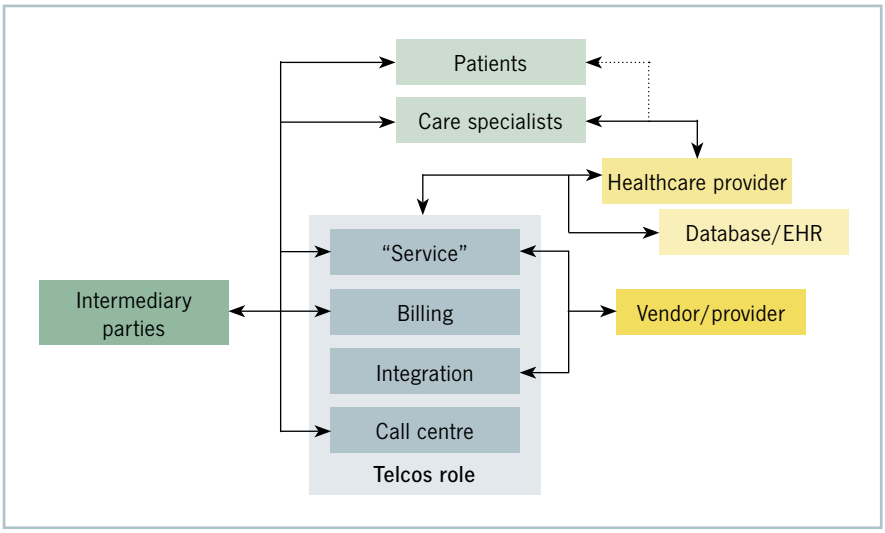

Figure 1: Example of telco roles in medical support services

The scenario assumes the telco acquiring a central role in the service-cycle, connecting different providers to produce a coherent service bundle, benefitting both patients and healthcare providers.

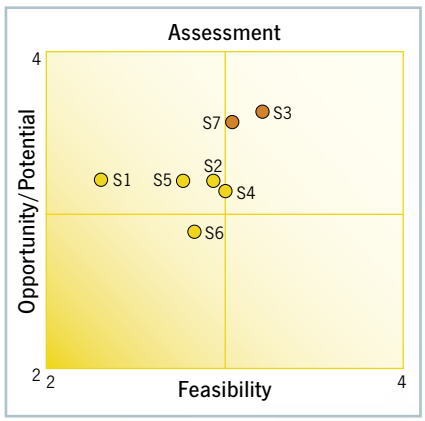

Figure 2: Assessment of e-health segments

Conclusion

The study concludes that telcos are well positioned to take an active role in different e-health segments as they already possess key technologies that can be used as enablers of many e-health services. Increased patient mobility, the proliferation of the outpatient model and the overall aging of societies create conditions that support new services utilising many telco related technologies. Moreover, vastly added security and authentication requirements have become a prerequisite for new e-health services, whereby telcos need to possess immense capabilities to actively participate in and impact the proliferating e-health sector.

Further information on Eurescom Study P1753 is available at *www.eurescom.de/Public/Projects/P1700-series/P1753*

The Future Internet

Activities in Europe after the Bled conference

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The Future Internet conference in Bled, Slovenia, from 31 March to 2 April 2008 was the starting signal for Europe's renewed efforts towards the definition of the Future Internet. More than two months after the event, it is now time to review the outcome of Bled and the next steps in Europe's Future Internet endeavours.

Bled Declaration

The most visible outcome of the event was the endorsement of the Bled Declaration by the European Technology Platforms eMobility, EPOSS, NEM, NESSI and ISI and by over 65 EU-funded FP6 and FP7 projects in the Future Internet area.

The central message of the Bled Declaration is that: "A significant change is required and the European Internet scientific and economic actors, researchers, industrialists, SMEs, users, service and content providers, now assert the urgent necessity to redesign the Internet, taking a broad multidisciplinary approach, to meet Europe's societal and commercial ambitions."

Due to this urgent necessity to redesign the Internet, the signatories called for concerted European action on EU level and by the EU member states. The fact that the European Commission has already invested more than 400 million euros in collaborative research projects on topics directly related to the Future Internet shows that there is a strong political and industrial will to achieve something significant in this area. However, much more investment and effort is needed to turn the commitment expressed in the Bled Declaration into societal, industrial and economical benefits for Europe.

David Kennedy, director of Eurescom, presenting the view of the European Technology Platforms in the ICT area.

Dr. Diogo Vasconcelos from Cisco talking about new usages and trends in Internet technology in Bled.

Prof. Dr. Žiga Turk, Slovenian Minister for Growth, giving his opening speech.

Lively discussion in the panel session on technological developments, barriers, and challenges

Five topical areas

The discussion in Bled was structured around five topical areas:

1. Network Architectures and Mobility,
2. Services and Software,
3. Content Creation and Media Delivery,
4. Security, Privacy and Trust, and
5. Future Internet Research and Experimentation.

The working group discussions on these main topics were constructive in that they helped to clarify the challenges European projects are facing. However, there was also a degree of frustration in some of the discussions, as each potentially revolutionary new insight was complemented with a large number of challenging issues

"A significant change is required ..."

Bled Declaration on the Future Internet

Dr. Joao Schwarz da Silva presenting the Bled Declaration.

Mike Carr, BT, explaining his view on the Future Internet, while Dr. Jan Uddenfeldt, Ericsson, is listening.

to be resolved. One of the first conclusions was that the traditional divisions of the work and research approach were not sufficient and that a more mature cross-domain discussion is required to achieve the advances wanted by everyone involved.

Follow-up events

Looking at the agenda of follow-up Future Internet events in Europe, there will be plenty of opportunity for such discussions. Particularly the events organised by the European Technology Platforms have to be mentioned in this context: ICT Mobile Summit, 10–12 June 2008, Stockholm, Sweden (eMobility), NEM Summit "Towards Future Media Internet", 13–15 October 2008, St. Malo, France (NEM), and ServiceWave2008, 10–13 December 2008, Madrid, Spain (NESSI). Furthermore, it is quite likely that the Future Internet theme will dominate the ICT event in Lyon on 25–28 November 2008 as well.

Future Internet Assembly

A central goal the European Commission wanted to achieve in Bled was to launch the Future Internet Assembly as the focal point for the FP7 Future Internet project activities. It will meet twice a year to ensure that all European projects in this area are well informed and can act coherently towards the Future Internet.

Photos: Adam Kapovits, Eurescom

Dr. Joao Schwarz da Silva and Mario Campolargo from the European Commission promoting the European Future Internet Portal.

Anastasius Gavras, Panlab project coordinator from Eurescom, presenting the results of the session on Future Internet Research and Experimentation in Bled.

One of the crucial questions the Future Internet Assembly will have to address is whether Europe will pursue rather a "clean-slate" or an evolutionary approach towards the Future Internet – or, as is more likely, a sophisticated mix of both. The only certainty is that there will be plenty to discuss at the next meeting of the Future Internet Assembly, which will be co-located with the ServiceWave event in Madrid in December.

Olé! The Internet matadors will continue their discussions at the Future Internet Assembly in Madrid on 9-10 December.

Conclusion

In conclusion, Europe is showing determination to play a major role in the necessary redesign of the Internet. The next half year will show, to what extent Europe will keep the momentum and achieve a common vision of what the Future Internet should be like and how we will get there.

Further information, including presentations from the Bled conference and dates of upcoming events, is available on the European Future Internet Portal at *www.future-internet.eu*

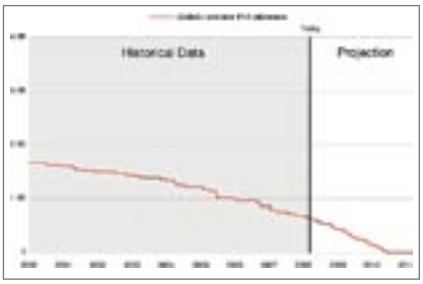
Prof. Dr. Lutz Heuser, SAP, explaining the Future Internet of Services.

Productive discussions in the working group sessions.

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

Commission push for IPv6

The European Commission has made a push for promoting the adoption of the new Internet Protocol IPv6 in Europe. In a Communication presented on 27 May 2008, the Commission announced its plan to have at least 25 percent of users in Europe connected to the IPv6 Internet by 2010. In order to achieve this, the Commission wants to motivate the EU member states to enable IPv6 on public sector websites and e-government services. The Commission itself promised to make the europa.eu and cordis.europa.eu websites IPv6-accessible by 2010. In addition, the Commission aims to have the top 100 European websites IPv6-accessible by 2010.



Projected depletion of IPv4 Internet addresses
Source: Alex Band, RIPE NCC, based on data generated by Geoff Huston, APNIC

The rationale for the Commission plan is the expected depletion of public IP addresses under the current Internet Protocoll IPv4. It is estimated that of the over 4 billion IPv4 addresses only about 700 million, or 16 percent, are available for new connections. The depletion has been slowed down by the IPv4 technology of Network Address Translation (NAT), which translates private addresses from another address space into public IP addresses. However, the Commission does not regard this as a feasible solution in the longer term, because NAT adds a costly layer of complexity and hinders direct device-to-device communication. From the IPv6 roll-out, the Commission expects an innovative drive towards new Internet applications in areas like home networks, building management, mobile communications, defence and security, and car navigation.

Further information is available at *http://ec.europa.eu/information_society/policy/ipv6/index_en.htm*

Fastest supercomputer breaks petaflop barrier

In June, IBM presented the world's fastest supercomputer. The machine called Roadrunner is the first to break the petaflop barrier, which means that it performs 1,000 trillion calculations per second, according to IBM. It has roughly the combined computing power of 100,000 of today's most powerful laptops.

Roadrunner was developed over a period of six years by engineers from IBM and the Los Alamos National Laboratory. It is twice as fast as IBM's Blue Gene system at Lawrence Livermore National Laboratory, which itself is three times faster than any of the world's other supercomputers, according to IBM.

Roadrunner will primarily be used to ensure the safety and reliability of the nation's nuclear weapons stockpile. In 2006, the US Department of Energy's National Nuclear Security Administration selected Los Alamos National Laboratory as the development site for Roadrunner and IBM as the computer's designer and builder. The computer, which weighs 250 tons, is now housed at the IBM research laboratory in Poughkeepsie, New York, and will be moved in July to the Los Alamos National Laboratory in New Mexico.

Apart from simulating nuclear blasts, Roadrunner will also be used for research into astronomy, energy, human genome, and climate change. Further possible applications include calculating cause and effect in capital markets in real-time and medical applications like complex 3-D renderings of tissues and bone structures that are possible in real-time, as patients are being examined.

Further information is available on the websites of IBM Corp. at *www.ibm.com* and Los Alamos National Laboratory at *www.lanl.gov*

Lead engineer Don Grice of IBM inspects the world's fastest computer in the company's Poughkeepsie plant.

Study: Europeans love video games

Video games appear to rate among the most popular leisure activities of Europeans, according to a recent ISFE survey. 40 percent of respondents play video games between 6 and 14 hours a week, nearly as much time as they spend watching TV or socialising with friends and family. This is one of the main results of a study conducted by Nielsen Games on behalf of the Interactive Software Federation of Europe (ISFE). The survey included 6,000 gamers aged 16 to 49 in 15 countries. Although the study is not representative for the leisure behaviour of all Europeans, including gamers and non-gamers, it reveals some findings on European gamers.

In regard to the benefits video games offer, 72 percent of the surveyed gamers said that they play video games for fun; 57 percent play as a way to stimulate their imagination, and 45 percent said gaming makes them think. The social aspect of gaming online with others is a strong secondary motivator for game players, according to the ISFE.

The European market of global videogame-related sales is growing. In 2007, interactive software sales in nine major European markets reached an estimated level of 7.3 billion euro. In regard to games software alone, this figure represents an increase of 25 percent.

Based on a nationally representative sample from the UK, Finland and Spain, the proportion of the adult population playing video games has reached very significant levels. In the UK, 37 percent of the population aged between 16 and 49 describe themselves as active gamers; the same is true for 28 percent of the population in Spain and Finland.

The majority of gamers play online, with 62 percent stating online play as a key part of the overall gaming experience.

Further information, including the full survey report, is available at *www.isfe.eu*

The spy in your bed

How the Internet affects married couples

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Many people are concerned that modern communications technologies have the potential to turn them into transparent citizens. They fear that they are defenceless subjects to the avid snooping efforts by Big Brother, meaning that their privacy is undermined by government and big service providers. However, the most dangerous threat to your privacy could be much closer – it might be your spouse.

In 44 percent of couples in the UK at least one of the partners monitors the other partner's Internet activities without them knowing. This is one of the main results of a recent study on the role of the Internet in UK married life. The survey conducted by the Oxford Internet Institute included a representative sample of over two thousand married Internet users to understand the role played by the Internet in their relationships.

Monitoring of Internet activities

On the question whether they have ever checked up on their partner's activities without them knowing, respondents disclosed a wide variety of monitoring practices: 20 percent read their spouse's e-mails, another 20 percent read their SMS, 13 percent checked their browser history, 5 percent read their Instant Messaging logs, 2 percent used monitoring software, and 1 percent pretended on the Internet to be another person.

Women are significantly more active in monitoring. In 19 percent of the cases only the wife was snooping compared to 8 percent of only the husband spying. However, almost three quarters (73 percent) of the couples have the same monitoring behaviour: in 17 percent of couples, both are spying on each other, while the majority of 56 percent are not monitoring at all.

Suspicion of infidelity

The main reason for this monitoring behaviour seems to be the sneaking suspicion of emotional or physical infidelity. Not surprisingly, the vast majority of spouses would feel unhappy, if their partner engaged in one or more of the following online activities with somebody else: falling in love (97 percent); having cyber-sex (94 percent); disclosing intimate details (92 percent); communicating relationship troubles to others (89 percent); sharing personal information about the other partner (88 percent); flirting (85 percent).

Large agreement on acceptable behaviour

There was general agreement between partners about the level of acceptability of such online behaviours within their relationship. However, 46 percent of couples disagreed about the acceptability of a partner viewing 'adult' sites, with men being more likely to accept this in their partner than women.

Husbands are more accepting

One of the conclusions the Oxford researchers drew from the survey results is that women are more concerned about internet-related behaviours. The researchers offered several different explanations for husbands being more accepting of their wives behaviour. It could be that men tend less to believe that their wives will cheat on them through the Internet. Another explanation is that men approve of their wives' using the Internet for purposes related to sex and relationship in the hope that it will improve their relationship. Furthermore, men consider this behaviour in general more acceptable for themselves and therefore are more inclined to approve it for their wives.

Positive effects

The Internet has also some positive effects on married life in the UK. 6 percent of married Internet users first met their partner online, and 10 percent indicated that the Internet was 'somewhat or extremely important' in maintaining their relationship.

The Internet seems to have a growing importance for marital communication: 19 percent of respondents exchanged messages with their partner at least weekly through e-mail and 14 percent through online chats. However, face-to-fac communication was still by far the most reported way for married Internet users to discuss personal matters and resolve problems, but technologies were also used, including telephone (51 percent of users), text messaging (27 percent of users), and e-mail (14 percent of users). 81 percent said they never used e-mail to discuss personal matters.

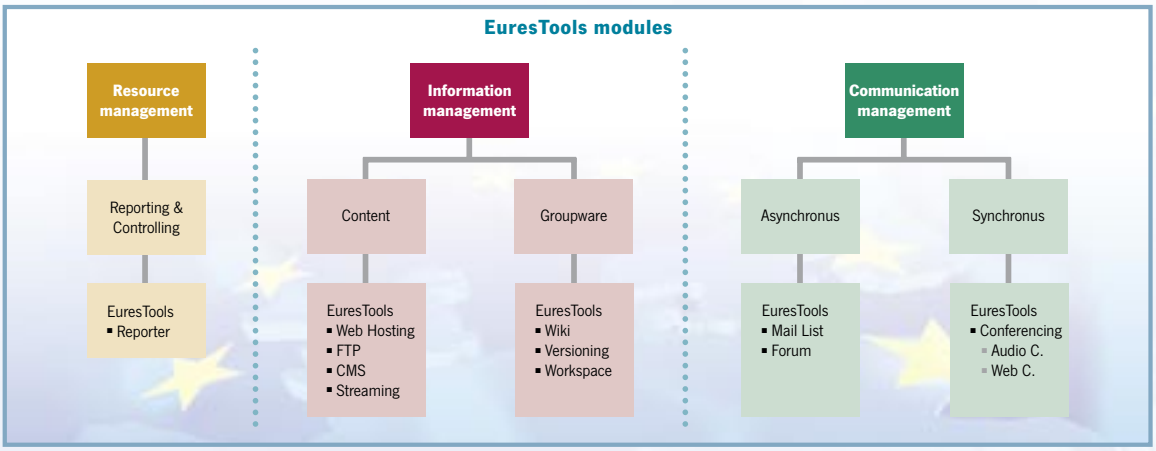
Conclusions

Now, what does this survey really tell us? Even if we assume that the UK results are indicative of married couples in developed countries in general, there are no earth-shattering insights in the study. Married couples, like everybody else, are using the Internet for private purposes. Real-life cheating has been complemented by cyber-cheating, and instead of opening secret love letters and listening in on phone talks from the bedroom phone, spouses snoop on e-mails and instant messages. Apart from that, spouses are still not happy, if they are cheated, independently of whether it is done online or offline. So, marital behaviour has not really been changed by the Internet. The Internet has in this case only provided another communication channel for activities that have been practised for thousands of years, i. e. relationship talk, voyeurism, and cheating. In fact, it appears that marital communication patterns are still more conservative than, for example, job-related communication patterns. It remains to be seen, if the Internet will bring about more radical changes in marital behaviour.

What is obvious is that the Internet offers plenty of opportunities to be at least emotionally unfaithful, with the drawback that online cheating is in most cases easily traceable. On the positive side, geographically separated couples have also more opportunities to stay in touch.

Further information about the survey is available on the project website at *www.oii.ox.ac.uk/research/project.cfm?id=47*

EuresTools
ICT tools for effective project management in EU Framework Programme 7



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

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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

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