ICT and healthcare

In focus
DANTE

Viewpoint
Security of Voice over IP

European issues
Future Internet

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Dear readers,

The Greek physician Hippocrates already said 24 centuries ago: "A wise man should consider that health is the greatest of human blessings." Since the days of Hippocrates, humankind has made enormous progress in medicine in order to preserve the human blessing of health. Despite the fact that today we have the best medical care ever in history, the healthcare systems worldwide are facing enormous challenges. ICT has already made an important contribution to improving healthcare systems worldwide. However, it looks like we are just at the beginning of a major transformation of healthcare through information and communication technologies.

Following a Eurescom workshop on ICT and healthcare at the IST Event in Helsinki last year, we decided to make this also the cover theme of this issue. There are three reasons why we think this subject is very timely now. Firstly, a number of European research projects have finalised some interesting results by now. Secondly, the pressure on healthcare systems worldwide has increased to a point where major reforms are unavoidable, and ICT will be a crucial factor in reducing costs. Thirdly, the new Framework Programme 7 has devoted considerable funding resources to the development of new solutions for today's and tomorrow's healthcare challenges.

The introduction article by Eurescom mess@ge editor-in-chief Milon Gupta provides an overview on the development of ICT and healthcare. The article by Alice Backes from T-Systems provides a glimpse of the R&D and market activities of Europe's biggest network operator in the e-health sector. Safdar Ali from Fraunhofer IBMT presents an innovative solution in the area of telematics services in home care. Researchers from ETH Zürich provide insights into the fascinating developments in the area of wearable healthcare applications. Finally, Morten Brattvoll from NST shares his insights on the future of healthcare.

As always, this cover theme can cover only show a small fraction of the exciting developments in ICT and healthcare. Readers who have a deeper interest in this subject are invited to visit the Eurescom ICT and Healthcare Forum pages at *www. eurescom.eu/activities/ict-healthcare.asp*

In addition to the cover theme, we have many more interesting topics.

Our "In focus" section this time features an article by and on DANTE (Delivery of Advanced Network Technology to Europe), the European association which plans, builds and operates advanced networks for research and education, including the well-know GÉANT network.

Those of you who are interested in the technical development of mobile communication systems beyond 3G should read the tutorial by Dr. Werner Mohr from Siemens on 3GPP LTE/SAE – you will learn in the tutorial, what these cryptic abbreviations mean.

Talking about abbreviations, under "A bit beyond" you will learn almost everything about acronyms and initialisms in ICT you ever wanted to know but never dared – or cared – to ask.

If you are interested in the Future Internet and how Europe will contribute to its emergence, read the article by Eurescom director David Kennedy.

There are many more articles in this issue, which cover subjects as diverse as security of VoIP and the Pan-European Laboratory.

We hope that you will find some of them interesting and relevant to your work.

We would appreciate your feedback on any of the articles in this issue. If you would like to suggest a topic or offer a contribution to Eurescom mess@ge, this is equally welcome. If you would like to provide feedback on CELTIC News, the newsletter of EUREKA Cluster Programme CELTIC, please send an e-mail to the CELTIC Office at *office@celtic-initiative.org*

Enjoy reading this issue.

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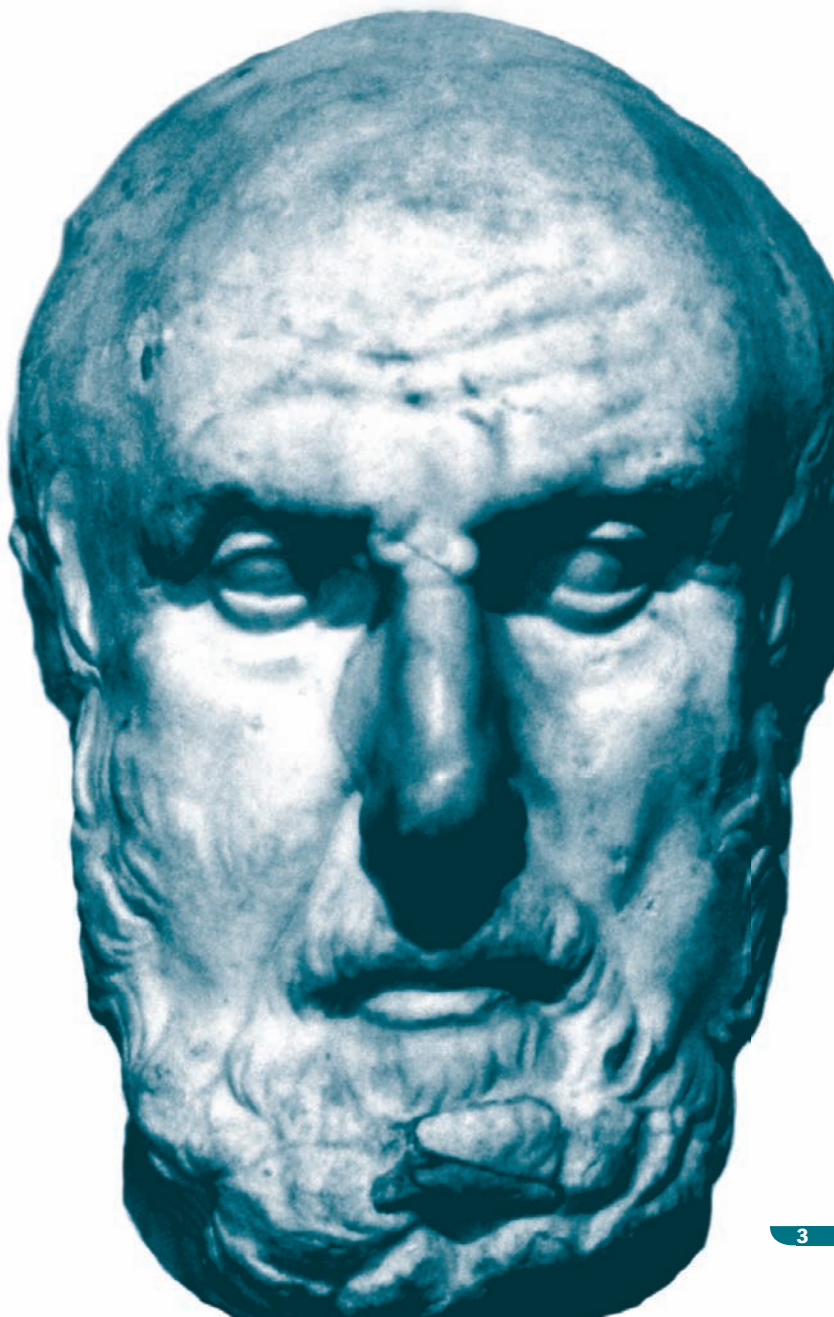
Events calendar

18 – 21 April 2007
German-Japanese Symposium: Convergent Media & Networks - New Business Chances and Economic Opportunities
Berlin, Germany
http://www.muenchner-kreis.de/veranstaltungen.html

18 – 20 April 2007
Med-e-Tel 2007 – The International Educational and Networking Forum for eHealth, Telemedicine and Health ICT
Luxembourg
http://www.medetel.lu

13 – 15 May 2007
Pervasive 2007 – Fifth International Conference on Pervasive Computing
Toronto, Ontario, Canada
http://pervasive07.org

14 – 15 May 2007
Broadband Gap 2007
Brussels, Belgium
http://ec.europa.eu/information_society/events/broad-band_gap_2007/index_en.htm

24 – 25 May 2007
EuroITV 2007
Amsterdam, The Netherlands
http://www.cwi.nl/events/2007/euroitv2007

1 – 5 July 2007
16th IST Mobile and Wireless Communications Summit
Budapest, Hungary
http://www.mobilesummit2007.org

5 – 9 August 2007
SIGGRAPH 2007
San Diego, USA
http://www.siggraph.org/s2007

6 – 11 September 2007
IBC 2007
Amsterdam, The Netherlands
http://www.ibc.org

3 – 5 October 2007
AAATE 2007 – 9th European Conference for the Advancement of Assistive Technology
San Sebastian, Spain
http://www.fatronik.com/aaate2007

Sn@pshot

Mobile phone for the bathtub

Communicative people who like to have a mobile chat in their bathtub can cheer up now: Fujitsu has developed a washable mobile phone. Bath chatters do not need to fear anymore for the integrity of their sensitive communication device.

According to the manufacturer, the Fujitsu F703 is totally waterproof, which means you can submerge it in water and it will still work.

As researchers claim that most mobile phones are dirtier than toilet seats, washing your phone now and then may be a good idea. Hard times for bacteria!

COVER THEME
ICT and healthcare

CELTIC NEWS

The Eurescom Study Programme

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One of the strengths of the Eurescom community is its commitment to engage in short and focused collaborative studies. The Eurescom study programme is the framework that enables an efficient setup of such studies and is financed through upfront payments by the programme's subscribers.

The Eurescom study programme continues to demonstrate its flexibility in bringing together leading experts from its members to address topics of common interest both in developing conclusions on specific topics, and to pave the way for larger collaborative 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 he shares the interest in having the substantial issues facing the telecom community addressed in a collaborative way. The results of the studies are only available to the members of the programme so that the study subscriber organisations have a direct competitive advantage from their collaborative work.

Studies in 2006

In 2006, five studies were performed as a result of two calls for proposals. Two additional studies were launched as a result of proposals that were received outside regular calls, demonstrating the flexibility of the programme to evaluate and start studies at any time, provided the subject is strategically important for the study programme subscribers.

A novelty in the 2006 programme was the "guest" participation of NTT Japan in the P1652 study, offering the opportunity to NTT Japan to gain first hand-experience of the pre-competitive collaboration model enabled by Eurescom.

The study P1652 addressed the subject of Service Delivery Platforms (SDPs), which aim to enable telecom operators to provide a complete environment for the creation, deployment, execution, management and billing of a wide range of value-added content and services. It did so by elaborating on the relevance of Service Oriented Architectures (SOA), an architectural principle of loosely coupled, location independent services providing published contract-based, platform and technology neutral interfaces. The study reports provide details regarding the applicability of SOA for SDPs. After the end of the study, its results were released to 3GPP/ETSI TC5, demonstrating the flexible rules and procedures that govern the programme and which evidently are suitable to quickly respond to the needs of its customers.

Another study which benefited from the flexibility of the study programme is P1657, titled "Future Internet – the operators' vision". It was initiated by Eurescom programme managers outside the regular calls. The ongoing study responds to the growing interest in discussing the technologies and architecture of the future networks in a risk-taking and disruptive manner. The aim of this study is to contribute to the Future-Internet discussion a consolidated opinion of the operators in a technology-independent way. The large participation of study programme members in this study confirms the importance of the programme as an incubator for focused research on long-term strategic topics.

For information about the studies that were started in 2006 please visit *www.eurescom.eu/activities/studyprogrammes/list-studies.asp*

First call for study proposals in 2007

In mid-February 2007, the first call for study proposals in 2007 was issued. The deadline for receiving proposals responding to the call is 23 March 2007. The evaluation of the proposals will be done in the week from 26-30 March, allowing studies to start work from mid-April 2007. It should be noted that the call for proposals is only an instrument for structuring the collection of proposals and streamline their evaluations by the study management group and the Eurescom programme management. A subscriber to the study programme can submit a study proposal anytime.

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*

ICT and healthcare –
An overview on the future of healthcare

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Healthcare has become one of the most important application areas for information and communication technologies. Ageing, diseases of civilisation and increasing treatment costs expose the healthcare systems in all industrialised countries to heavy financial and organisational pressure. At the same time, many citizens are becoming more health-conscious and are interested in ways for increasing their well-being beyond the absence of diseases. ICT is crucial for addressing these challenges and achieving more efficient healthcare.

Ageing society

The European society is ageing. The share of elderly people in the total population will rise dramatically in the next decades. From 2005 to 2030 the number of people in the age group 65+ will rise by 52 % or 40 million, while the age group of 15-64 will decrease by about 7 % or 20,8 million. According to the EC Green Paper "Confronting demographic change", the total EU-25 population is expected to grow from 450 million in 2000 to 470 million in the year 2025. After this, the population is likely to decrease to 449 million in 2050.

Exploding costs

The new age composition of the European society will place high demands on the health and long-term care sector, which will inevitably result in rising costs. Since 1997, health spending in proportion to the gross domestic product has been accelerating among the OECD countries. In 2002, the cumulative health spending of 24 OECD countries was $2.7 trillion. PricewaterhouseCoopers estimates that health spending for OECD countries will more than triple to $10 trillion by 2020. In Europe, healthcare expenditure has already reached an average share of 8.5% of the GDP and is rising faster than the overall economic growth. According to the Economist (28 April 2005) it is estimated that redundancy and inefficiency account for 25-40% of the $3.3 trillion spent worldwide on healthcare every year.

In order to limit the cost explosion and to be able to serve the needs of a growing number of elderly people, healthcare systems in Europe need to become more effective and efficient. Apart from organisational and regulatory reforms, the use of ICT can be one of the main drivers for higher efficiency and effectiveness in the healthcare sector.

ICT application areas

There are three main areas in which ICT can help to make healthcare more effective and efficient beyond solutions which are already available:
1. Management of healthcare
2. Medical treatment
3. Prevention

Management of healthcare

ICT can improve the management of healthcare in many ways. One important area is information management in hospitals. This includes RFID-based equipment tracking and patient tracking in hospitals, workflow improvements, and interoperable electronic health records.

Medical treatment

Enabled by ICT, medical treatment and monitoring of patients with chronic diseases will be moved more and more out of hospitals and doctors' practices into the private realm of the patient. Wearable health monitoring systems and applications like automated medication remind-ers at home will provide ubiquitous, personalised health support to patients while reducing the cost for medical treatment in hospitals and doctors' practices.

Prevention

ICT will become ever more important in enabling healthy people and people with health risks to sustain or improve their well-being. Wearable health monitoring applications like, for example, the dietary monitoring system and the BackManager, which are presented in this issue of Eurescom mess@ge, will provide citizens the opportunity to be their own health manager and take care of their well-being in a self-determined way, while benefiting from the competent monitoring and advice from a tele-doctor.

Outlook

Innovative ICT solutions in the areas mentioned above are very likely to be based on advancements towards ubiquitous and personalised network access and the miniaturisation and connectivity of devices. New or improved equipment might be used for enhancing healthcare, such as miniaturised and cheaper electronics and sensors, high-density memory, micro-electromechanical systems, and novel combinations of existing devices.

The decreasing cost and size of sensors, monitors and other equipment enables both novel uses for existing technologies and applications of completely new technologies. The increasing bandwidth and pervasiveness of communication networks, including ad-hoc and sensor networks, opens up new opportunities for transferring medical information faster through both wired and wireless systems.

The healthcare sector could benefit tremendously by adopting and adapting the latest advances in ICT, which will improve the quality of healthcare. At the same time society and patients could benefit from the cost-reducing effects of ICT, which will make high-quality healthcare available to everyone at affordable costs.

However, ICT can only unfold its positive effects on healthcare systems, if technological innovations go hand in hand with improved processes and structural reforms in national healthcare systems.

Further information is available under the Eurescom ICT and Healthcare Forum page at *www.eurescom.eu/activities/ict-healthcare.asp*

Networked healthcare in Germany
Market solutions from T-Systems

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Hospitals, medical practices and health insurers are increasingly streamlining processes to counteract competitive and cost pressure. Yet, alongside economic constraints we must not lose focus on the real task, that of providing the patient with the best possible care. Information and communication technology helps healthcare players to perform this balancing act successfully and is increasingly becoming the key to efficient patient healthcare delivery.

T-Systems, a subsidiary of Deutsche Telekom, offers integrated ICT solutions for healthcare, which improve communications between all concerned, optimise processes and cut costs. One of our key targets is to network everyone involved in the healthcare system with due regard for the high requirements of data protection and data security.

Cut out media discontinuity

With a view above all to managing complex processes in hospitals, T-Systems offers i.s.h.med, a clinical information system. It maps the medical and nursing processes around in-patient or out-patient treatment and networks them with administrative processes. The system combines all patient data in a single electronic patient file and integrates existing proprietary systems into the system architecture via standardised interfaces, thereby cutting out media discontinuity.

We are also one of the leading implementers for the largest ICT project in the German healthcare system. The electronic health insurance card (EHIC) is intended to lay the groundwork nationwide for integrated medical care and to contribute toward greater operating efficiency in the healthcare system. We are currently testing the EHIC in a pilot project with health insurer Knappschaft-Bahn-See and are gaining important experience in preparation for setting up the new infrastructure all over the country.

Outsourcing processes

Hospitals are increasingly outsourcing processes that do not form part of their core business. For hospitals or groups of hospitals T-Systems handles sub-processes such as payroll accounting or their entire IT and operates them at its computing centres.

To reduce investment in PC hardware and cut the cost of maintaining and servicing individual systems, we offer hospitals our server-based medical solution SBmedS. We centralise the hospital's entire software landscape, thereby eliminating the need for expensive software installations and updates on every individual PC. What is more, medical staff can access from any computer in the hospital their individual application environment, which is stored centrally on the SBmedS server. Users identify themselves to the system swiftly and securely by means of a digital smart card.

In healthcare as in other industries, radio frequency identification (RFID) offers benefits in a wide range of application scenarios. Using our RFID solutions, hospitals can optimise their delivery and logistics processes. RFID, for instance, protects medical devices from theft. What is more, hospitals can maintain a constant inventory of its drugs by barcode or use transponder technology to check which beds or other key resources are available in which ward.

Keep the flood of data under control

Eliminating the paperwork from medicine is a leading agenda item at hospitals and practices. In the years ahead new imaging processes in, say, oncology or radiology and statutory safekeeping of records will make increasing demands on data storage requirements at medical facilities. We offer a digital long-term archiving system that will ensure legally watertight safe custody of administrative and medical data for 30 years.

Belt and braces protection

Be it the electronic health insurance card, the electronic patient file, hospital information systems or digital archiving, a secure infrastructure inside and outside the building is indispensable. That is why we are setting up a cross-industry healthcare network. Healthcare players share electronic data and documents around the clock via this network or the network platform that is accessible via in-house corporate wireless LAN and thereby look after their patients across specialisations and sectors. That improves collaboration and optimises work processes. To ensure data protection and security, we have realised the solution as a virtual private network that is closed to the outside world.

Conclusion

Hospitals would like to cushion growing cost pressure by investing in information technology. Every euro that is invested in IT is to cut costs and at the same time enhance the quality of service. We offer comprehensive ICT healthcare solutions from a single source, taking care of all processes, both medical and administrative. Standardised electronic process models that eliminate media discontinuity facilitate communication between all concerned and take healthcare a step closer to integrated service delivery.

Semantic Medical Devices Space
An infrastructure for ambient – intelligent medical devices

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In the present electronic healthcare era, the most widely used communication standards for the transmission of medical data from medical devices to Hospital Information Systems (HISs) or Laboratory Information Systems (LISs) include HL7, ASTM, DICOM and CEN/ISO/IEEE 11073, depending on the nature of the device. On the other hand, many of the medical devices use proprietary or vendor specific protocols to communicate with the HISs/LISs developed by the same vendor, which reduces the chances of interoperability of such medical devices with the HISs/LISs developed by some other manufacturer. Furthermore, the ad-hoc networking of medical devices with HISs/LISs or with other medical devices is not yet realized. Semantic Medical Devices Space (SMDS) is the solution to such limitations and alleviates the hurdles in achieving ad-hoc networking/communication of medical devices with HISs/LISs as well as with other medical devices in a plug-and-play fashion.

Figure 1 depicts an example of state-of-the-art inter- and intra-departmental ICT infrastructures in the hospitals and the clinical environments. In addition, the IEEE 1073 family of protocols has laid down a foundation for the communication of medical devices, but there are few implementations. On the other hand, recent trends in the field of electronic healthcare show the adoption of open Internet-based communication standards for transferring the patient's health information.
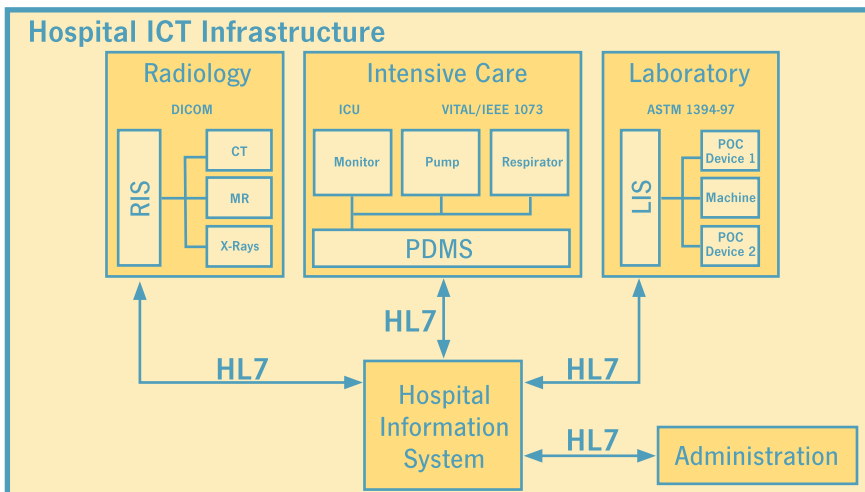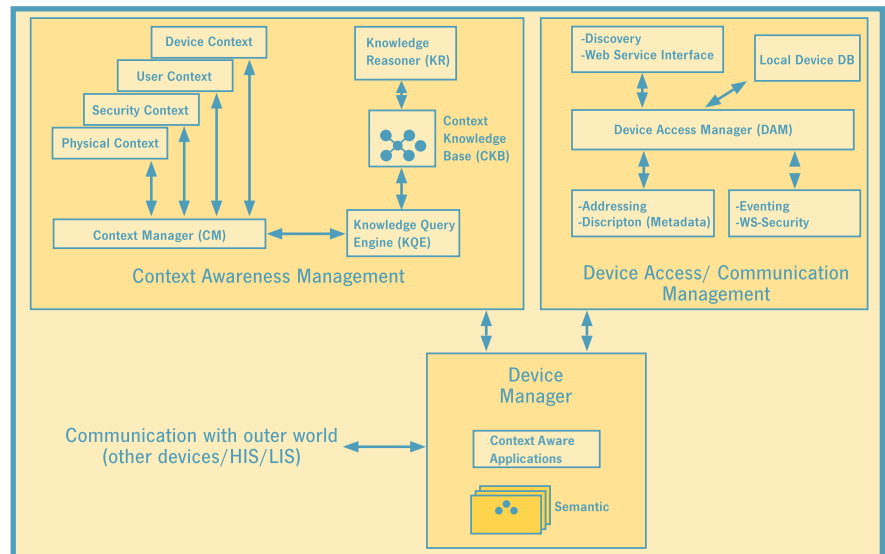
Figure 2: SMDS architecture

During the present decade, enormous research has been carried out to adopt distributed computing middleware technologies, i.e. Web Services, in order to provide interoperability solutions for health information systems so that the patient's medical information could be provided to the authorized health professionals remotely on demand. Additionally, with the advent of Semantic Web, ontologies, and the RDF (Resource Description Framework)/ OWL (Web Ontology Language) languages have helped to provide a solid foundation for enriching the contents with well-defined meanings for a better human-computer interaction and collaboration.

Philosophy of SMDS
Before two autonomous medical devices can interact with one another or with HIS/LIS, they need to know what interfaces each of them supports and what protocols or commands they understand.

In an ambient intelligent environment, this cannot be known in advance. New medical devices may enter the environment at any time, and they need to interact with the existing medical devices and the HISs/LISs. The interaction must be based on common, well-defined terms and concepts in order to achieve true interoperability.

In order to cope with these challenges, we have devised an architecture called Semantic Medical Devices Space (SMDS) which alleviates the hurdles in achieving ad-hoc networking/communication of medical devices with HISs/LISs as well as with other medical devices in a plug-and-play fashion. In addition, our architecture, as shown in figure 2, supports the medical devices to deliver semantically enriched context-aware services for the interoperability. SMDS is a pervasive computing infrastructure that exploits Semantic Web, Web Services and UPnP (Universal Plug-and-Play) technologies to enrich the medical devices with ambient-intelligence and semantic-interoperability capabilities. The semantic descriptions of Web Services provided by the medical devices will enable them to discover, select, compose and execute the services available locally in a hospital, laboratory and clinic or in a patient's home to accomplish the desired composite task.

Applications of SMDS
SMDS can be applied in the following domains:

1. Hospitals and clinical environments
SMDS can be used to realize the vision of smart hospitals/clinics. The real-time monitoring values of a patient are directly accessible to the authorized personnel every-

Figure 1: Hospital ICT infrastructure

where, anytime on their PDAs in order to take timely decisions, as shown in figure 3. Thus, SMDS supports the provision of mobile access to the patient's Electronic Health Record (EHR).

2. Laboratories
SMDS can be used to realize the vision of smart laboratories, which means that the laboratory automation solutions can be better improved in a decentralized fashion.

3. Tele-medicine and tele-homecare
SMDS can be used for tele-medicine and tele-homecare purposes, which means that the medical devices at a patient's house can send emergency alerts (e.g. via SMS) to the handheld devices (e.g. a mobile phone or a pager) of the caretakers of the patient (e.g. relatives or friends). SMDS can be scaled to provide ambient-assisted living to the elderly people (i.e. medication reminders, cognitive assistance, etc.), which means that such pervasive healthcare
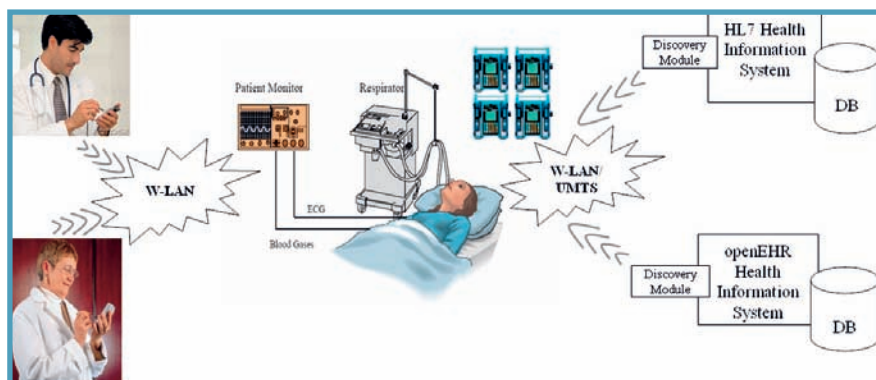
Figure 3: Real-time monitoring in smart hospitals and clinics

services are provided anywhere and anytime, whether the patient is staying at home or travelling.

Conclusion
SMDS is a pervasive computing infrastructure that exploits Semantic Web Services technology to enrich the medical devices with ambient intelligence and semantic interoperability capabilities. SDMS uses UPnP technology to provide ad-hoc networking capabilities to the medical devices. SMDS favours the use of open communication standard in order to leverage the maximum interoperability functionalities.

Wearable health and life-style assistants
Technology in support of well-being

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Over the last decade a new form of personal computing has developed, fostered by advances in electronics, sensor miniaturization, and low-power wireless communication. The wearable computer is the seamless integration of sensing, computing and feedback into everyday clothing and accessories, and it is now becoming a reality.

Wearable computers are at an ideal location to continuously evaluate the state of the user and empower him with information tailored to his needs, anytime and anywhere. With the increasing costs of healthcare, wearable computers now develop into personal health and life style assistants.

Increasing costs of healthcare are related to many factors, among which the aging population, the ever increasing quality and complexity of medical treatments, as well as new issues related to our sedentary lifestyle, such as obesity which impacts the future health prospects of citizens, especially with respect to cardio-vascular diseases.

In order to cope with increasing healthcare costs while keeping the quality of care that citizens expect, the need to emphasize prevention, in addition to treatment, becomes stronger.

Wearable Health assistants
Prevention is an everyday effort which may be difficult to achieve without continuous coaching or external guidance, especially since the outcomes may lie several years in the future. This continuous process cannot be effectively provided by the traditional healthcare system, and until now prevention has not yet been successfully implemented.

Wearable health assistants have the potential to support the shift from traditional health care to effective prevention. The wearable health assistant is an electronic coach that helps the user to adapt his habits in order to better his health prospects. By monitoring user behavior it can collect statistics (e.g. how many calories were burned doing sports) and provide informative feedback to the user. Wearable health assistants are at the crossroads of human computer interactions, miniaturization and low-power electronics, textile integration, sensing, and medical expertise.

MyHeart
Improving healthcare through ICT is now a priority in Europe with several large-scale EU-wide research projects testifying this. The research project MyHeart with more than 35 participants across Europe is an illustration of this effort. Its goal is to fight cardio-vascular diseases by preventive lifestyle and early diagnosis.

As a partner in MyHeart, the Wearable Computing Laboratory at ETH focuses on automatic dietary monitoring, since this aspect of life style is strongly related to heart diseases (other factors being sedentary lifestyle and stress). By automatically detecting food intake with a wearable system instead of relying on paper and pencil, the user can obtain immediate feedback about his dietary habits and trends without having to consult a clinician, therefore improving the interactivity of the system and protecting the privacy of the user.

Currently automatic classification of various categories of food are investigated, such as "dry-crisp" (e.g. potato chips) or "wet-crisp" (e.g. apple, lettuce), by

Dietary monitoring

fusing information from multiple sensors. Sensors include motion sensors to detect nutrition-related hand gestures, microphones placed in the inner ear (similar to a hearing aid) to detect chewing sounds, as well as an electromyograph to detect swallowing. Detection accuracy depends on the number of food categories and types of sensors. As an example, a 70% to 90% accuracy can be achieved with 4 food categories by analyzing chewing sounds. Ongoing research includes improving recognition algorithms, but also making the sensors less obtrusive.

BackManager

Unobtrusiveness may be achieved by integrating sensors into clothing. This is the approach that is followed in another project of our laboratory: the BackManager. Back pain is often caused by bad posture. It can become handicapping, and it is an important cause of work interruption. The BackManager aims to detect the user posture and provide corrective feedback by integrating within garments a large number of textile elongation sensors interconnected with textile conductive fibers. Textile-integrated posture and motion sensing may also be applied to rehabilitation where precise gestures must be exercised. After consultation with a clinician, such a device may improve the autonomy of the user by allowing him to train gestures nearly anytime. Nevertheless, the development of reliable smart clothes

remains challenging due to the strong constraints imposed on the fabric (e.g. during washing and folding) and by the complexity of textile-electronic interconnections.

From health assistants to life style management

As prevention becomes more important, health assistants will become more and more life style assistants, seeking not only to improve health prospects but also everyday well-being. They will differ from current state-of-the-art devices by the timescale on which they operate as well as the sensing domains.

First of all, these assistants will operate continuously, even before any clinical event. Furthermore, instead of monitoring a limited set of medical parameters (e.g. the heart rate), health assistants will become multimodal. They will fuse information coming from physical and physiological sensors, but they will also consider cognitive, social and environmental factors, since these aspects cannot be separated from life style and have an influence on health prospects and well-being.

Two projects illustrate this evolution. The EU project Daphnet aims at a dynamic analysis of physiological networks over long periods of time. Within this project we develop together with medical partners the technology to perform long-term multimodal recording as well as algorithms to detect and quantify life-style trends over long periods of time.

The EU project SEAT (Smart technologies for stress free Air Travel) focuses on improving the comfort of passengers in airplanes by combining sensing and feedback in a novel cabin environment with health alert option and context-based entertainment. Within this project we will fuse information from a large number of environmental and wearable sensors (from vision up to heart rate and speech) in order to investigate how affects (e.g. positive and negative emotions) of passengers can be quantified. Based on this, the environmental parameters (e.g. cabin temperature) can be adapted to maximize the comfort of passengers.

Outlook

From a technologic point of view, life style assistants capable of continuous monitoring of the user's state will benefit from further development in miniaturization, textile integration (smart-textiles and bio-medical clothing offering the same comfort as normal clothing), lower power electronics and wireless communication, and distributed information processing in body-worn and environmental sensor nodes.

Yet, and possibly more important, prevention is intimately linked to life style which cannot be reduced to physical aspects only. Depression, which affects
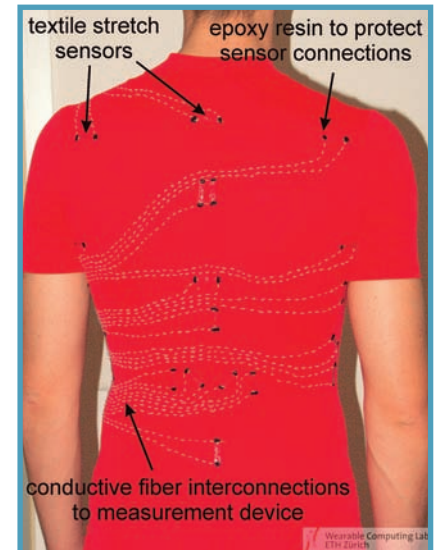
Correcting user posture with BackManager

20% to 30% of the European population and has a costly impact on society due to work interruptions, as well as social and cognitive issues affecting elderly (e.g. decreasing social interactions, spurious loss of memory or orientation) illustrate the need for a broader view of the life style assistant. Mental and social factors will have to be taken into consideration in the future. Indeed, the World Health Organization defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" in a preamble to its constitution.

Combining physical, mental and social aspects will require a fruitful exchange between social science, psychology, medical science and engineering. As a result a more accurate estimation of the state of the user will be possible. This holistic view of the user state will allow to develop truly personalized, proactive life-style assistants. Finally, we expect this holistic contextual awareness to benefit other disciplines as well, such as sports, where social and mental factors play an important role in obtaining top performance, or enhanced man-machine interactions.

More information about the projects mentioned in this article is available on the website of the Wearable Computing Laboratory at *http://www.wearable.ethz.ch*

From hospitals to e-health in smart homes

Interview with Morten Brattvoll from the Norwegian Centre for Telemedicine on the future of healthcare

ICT is in the process of transforming healthcare in Europe and other parts of the world. Eurescom mess@ge editor-in-chief Milon Gupta asked Morten Brattvoll, Chief Consultant and Political Scientist at the Norwegian Centre for Telemedicine, which changes ICT will bring to the healthcare sector. The Norwegian Centre for Telemedicine (NST) is a research and development centre that aims to gather, produce and provide knowledge about telemedicine and e-health both nationally and internationally.

Europe's population is ageing. What effects will this have on the healthcare sector?
Morten Brattvoll: The ageing of Europe's population will affect both the public and private sector, simply because the man-power need will increase. At the same time the labour force is declining, and there will be a struggle for qualified labour. The healthcare sector will be affected in particular, because its impossible to change the evolution of ageing people, and ageing people will legitimately require minimum standards for healthcare, which are already high in rich countries.

For these reasons I believe we will see a healthcare system in transition for the next years.

How will ICT evolve the healthcare sector?
Morten Brattvoll: We can already see some ICT-induced changes in the healthcare sector, but I think the large-scale changes are yet to come, and they will occur in three main steps.

The first step, as we can see already, is the movement of healthcare services from hospitals to primary care institutions. ICT and telemedicine solutions will create "high speed roads" between these institutions, where competencies, skills and qualifications from both sides will merge.

In the second step, primary healthcare workers will use the same services in the patients' private homes, simply by using the same technology through mobile units.

The third step will be the spread of smart-home technology, where patients, especially those with chronic illnesses, will handle their own health in a much more adequate and independent way. At the same time, this independent living will be combined with possibilities to communicate with primary healthcare institutions, general practitioners, and hospital staff.

How large is the potential market for ICT in health-related applications, and who will be the main players?
Morten Brattvoll: I believe the potential market is big, but it is moving quite slowly. My estimate is that it will take 2 to 5 years until the market for ICT in health-related applications has fully unfolded.

Among the main players will be industry, universities, and research institutes. The most important player, however, will be governments, who decide on legislation, standards and use of resources to start large-scale implementations of ICT in healthcare.

What are the main barriers hindering a wider adoption of e-health applications?
Morten Brattvoll: There are many barriers, which are currently slowing down the adoption of e-health applications. Barriers include the mismatch of organisational structures between the different healthcare levels and professions as well as the lack of involvement of potential users. Another critical barrier is the lack of integration of different ICT solutions in the healthcare sector. If you look at hospitals or doctors' practices, for example, there are many different software systems in use, and they are not integrated to seamlessly communicate with each other.

CELTIC N·E·W·S
Telecommunication Solutions

EDITORIAL

Celtic Call 5 – challenges and opportunities

Dear reader,

The new 5th Celtic call for proposals is currently open, and the submission deadline for proposal outlines is 22nd May 2007. This call runs largely in parallel to the first IST Call of the new EU Framework Programme 7. For this FP7 call, a large number of thoroughly prepared proposals are expected because of the substantial budget of this call. It is therefore obvious and understandable that most researchers will mainly focus on the IST Call and will use much of their resources to prepare a solid and well-defined project proposal.

Experiences from the former framework programmes show that the success rates of proposals to be accepted and funded have been rather low. The majority of the work invested in the preparation of failed proposals must be considered as lost, if the proposal was only submitted to that particular IST call. Because of the heavy competition, it is obvious that many of the failed proposals would still be of very good and profound quality, and it would be a pity if those proposals could not be started at all.

To assure that a proposal may have a second possibility to be launched, even if not as an IST project, it is advisable to submit a project proposal to IST but, in parallel, also a proposal outline to Celtic. As such a proposal outline would not require too much additional effort, this strategy could considerably increase the chances of a proposal. By following this approach the requirements for a two-phase call phase in Celtic can be fulfilled. The project may then still decide to prepare a full proposal for the second phase in case it failed in the IST call failed and provided the proposal outline received a good review and was invited to submit a full proposal.

Further aspects for consideration if a proposal should be prepared as FP7 or Celtic proposals should be the duration and industrial focus of a project. Especially shorter-term (i.e. between 2 to 3 years), more pre-product development oriented as well as more bottom-up defined projects could be a better target for Celtic than for FP7.

In any case the recommended strategy of preparing the best proposals should be to keep a close focus on assuring the best possible and broadest coverage of work items that are defined in the Strategic Research Agendas of the related technology platforms (NEM, eMobility, NESSI and ISI) and in the Celtic work programme. This could best be done by considering both FP7 and Celtic project calls.

Expected research items in Call 5

As for all previous calls, call 5 proposals shall focus on the technology issues described in the latest version of the Celtic Purple Book (Version 2007), which is covering the following main areas:

- The new telecommunications scenario
- The new scenario for media and content
- Challenges of mobility
- Ubiquitous services, connectivity and networks
- Understanding the business landscape
- Service Elements Framework
- The satellite component
- Development of the Pan European Laboratory

It is also possible to consider research topics of the Strategic Research Agendas (SRA) from the following European Technology Platforms:

- NEM (Networked and Electronic Media Technology Platform)
- eMobility (Mobile and Wireless Communications Technology Platform)
- NESSI (Networked European Software and Services Initiative)
- ISI (Intergral Satcom Initiative)

The detailed descriptions of Purple Book and SRAs are accessible through the Celtic web site (www.celtic-initaitive.org).

Heinz Brüggemann
Director Celtic Office

A glimpse of the future of telecommunications

CELTIC EVENT IN BERLIN

From 22 to 23 February, the Celtic Event in Berlin provided a glimpse of the future of telecommunications. Under the title "Facing the Challenges of Ubiquitous ICT – The Next Generation of Communication", 200 international experts discussed the latest Celtic results at the Deutsche Telekom representative office.

The Celtic Event was opened by Peter Möckel, managing director of Deutsche Telekom Laboratories. Mr Möckel stressed the importance of collaborative R&D for Deutsche Telekom. He showed how results from collaborative European projects, like, for example, Celtic project VIDIOS, are supporting the development of the company's services and products. He said: "Celtic is the ideal programme to close the gap between short-term product development and long-term research."

Another keynote was given by Dr. Volkmar Dietz, head of the communications tech-

nologies division at BMBF, the German Ministry of Education and Research. He presented an outlook on the new German research programme ICT 2020, which will strengthen the European orientation and the importance of telecommunication in German ICT research. Dr. Dietz announced the 100GET initiative on developing a 100-gigabit Ethernet network, in order to push back the US dominance in this sector. 100GET is a Celtic Call 4 project and will be launched in mid-2007.

Celtic chairman José Jimenez from Telefónica explained four routes to the future of telecommunications in Europe, which Celtic projects cover: the route to new multimedia services, the route to solving the infrastructure dilemma, the route to serving security needs, and the route to providing customer-driven services.

On the second day, the general direction of European research and the relationships between different actors and pro-

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grammes in European research were discussed. Fiona Williams, chair of the European Technology Platform eMobility, pointed out that Europe is spending a significantly lower share of GDP in R&D than the United States or Asian countries like Japan, South Korea and China.

Kari Tilli, director of the Finnish funding authority Tekes, stressed the importance of Eureka clusters: "Eureka clusters are extremely important for international cooperation." As advantages of Eureka clusters he mentioned that they are very flexible, pragmatic, and industry-driven. Tekes

Demonstration of telemedicine application via medical robot by Celtic project BANITS.

does not accept Celtic proposals without industry-participation. As a problem of Eureka he mentioned that synchronisation between national authorities is not always easy.

Victor Izquierdo, General director of Industry at the Spanish Ministry of Industry, Tourism and Trade (MITYC), explained that Spain has funded 47 Celtic projects with a total of 10.6 million euro of grants. The MITYC is focusing on projects with critical mass. The Spanish funding authority is also ready to support suitable proposals which fail to receive funding under EU Framework Programme 7 (FP7).

Jean-Michel Dupont, chairman of the European Technology Platform NEM, explained that the scope of work needed to realise NEM's vision of a new market for networked and electronic media will require a large-scale and focused effort. "We need all the possible support from FP7, Eureka Clusters, national programmes, and industry initiatives."

Giovanni E. Corazza, chairman of the European Technology Platform ISI, pointed out what needs to be improved in European research. In order to make effective use of the funding resources, vision, leadership and harvesting of results are needed. Especially in regard to the last point, the harvesting or exploitation of results, Europe is weak, according to Dr. Corazza. In order to improve exploitation, he suggested to have projects only dedicated to looking at the results of research projects.

Joao da Silva, head of the directorate Converged Networks and Services at the EC DG Information Society and Media, explained the opportunities and challenges of the Internet as a new frontier on the European market of 500 million people. "If we do not coordinate and develop the future of the Internet, European competitiveness will be at stake." Mr da Silva highlighted that Europe does not play an important role in Internet standardisation, for example in IETF. Another problem, according to da Silva, is the fragmentation of the ICT landscape in Europe. As an example he mentioned mobile TV, where different standards are competing on the European market.

Fiona Williams drew the attention to another funding source, EC Structural Funds. Expenditure on innovation in Structural Funds should be, according to the EC, increased to a level of up to 20 percent. Ireland, Lithuania and Portugal are good examples of countries who have used Structural Funds for modernising their ICT infrastructure and financing ICT training and testbeds. Furthermore, she criticised the low level of risk-taking in Europe. Ms Williams said: "We miss opportunities on a large scale, because we don't take risks."

In the discussion, Dr.Corazza demanded that the time from project idea to market implementation should be shortened to increase European competitiveness.

Concerning FP7 proposals, Mr da Silva said: "We like forward-looking proposals with a very broad systems view."

Eurescom director David Kennedy, who moderated the panel discussion, summarised the discussion: "We are not short of opportunities. We are only short of ambition."

In the parallel exhibition, 17 Celtic projects presented their results. The outstanding Celtic project results shown at the exhibition included an advanced identity management solution (FIDELITY), a medical robot (BANITS), advanced multimedia solutions (MACs), radio resource management (Gandalf), and mobile TV via the DVB-H standard (Wing-TV).

As part of the one-billion-euro programme, 34 projects have already been started since 2003, and 18 more projects are expected to be launched this year. Currently, there are about 350 companies from 29 countries involved in Celtic projects, almost one-third of them small and medium sized enterprises. By the end of 2007, Mr Jimenez expects that the number of participating companies will have reached 450. He is convinced that "these industry-driven projects will help Europe to stay on top of the technological development in ICT."

The presentations are available in pdf format at
www.celtic-initiative.org/Events/Celtic-Event07-Berlin/programme-1.asp

Panel discussion on European research (from left): David Kennedy (Eurescom), Joao da Silva (European Commission), Victor Izquierdo (MITYC), Kari Tilli (Tekes), Fiona Williams (eMobility), Dario Avallone (NESSI), Giovanni E. Corazza (ISI), and Jean-Michel Dupont (NEM).

MaCS

THE NEW GENERATION OF MULTIMEDIA CONVERSATIONAL SERVICES

MaCS (Multimedia Communication Service) is a collaborative, pan-European project within Eureka cluster programme Celtic. This project, which is coordinated by France Telecom, brings together a consortium of operators, service-platform providers, terminal manufacturers and universities.

The goal of MaCS is to develop and experiment the new generation of broadband telephony service for the residential market. By integrating different platforms, terminals and services, MaCS intends to cover the real needs of residential customers, allowing more complete and flexible interpersonal communications.

Approach

MaCS gathered a consortium of operators and manufacturers from three different countries in the set-up of a pan-European test bed:

- Telecom operators: France Telecom, Telefónica, Deutsche Telekom,
- Platform suppliers: Nokia France, Ericsson Spain and IPtel in Germany,
- Device manufacturers: Philips and Sagem in France. Telefónica and France Telecom contributed as well with two soft-phones,
- Universities: University of Valladolid in Spain.

This pan-European test bed (see figure) encompassed the development of innovative services from their specifications to the end-user valuation. Services were developed in a fully interoperable environment with three different networks, three service platforms, and four terminals.

The MaCS SIP/ IMS test platform

The MaCS project successfully conducted the set-up of interoperable pan-European IMS (IP Multimedia Sub-system) platforms.

In September 2005, MaCS demonstrated for the first time a pan-European multimedia call (voice and image) via a SIP/IMS infrastructure. This was followed by the inclusion of advanced services such as:

- Multimedia Identity Presentation for customized content push at call set-up
- Presence management and reachability services as Intelligent Call Routing,
- Media management: addition/cancellation of media during a communication,
- Multi-users and multi-devices management: respectively several users on the same phone and one user on several phones.

These services were qualified against the various networks, platforms and terminals demonstrating their full interoperability and by that, one of the main IMS promises.

Impact and outlook

IMS is an international standard that defines a platform with multi-service capabilities and multiple network access. At the start of MaCS only few operators were working on fixed IMS and only theoretical knowledge was available. As MaCS ran on, IMS became standardized at TISPAN

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and spread among main telecom operators and vendors as the NGN architecture for leveraging the convergence between fixed and mobile networks. MaCS contributed as a trial run for the oncoming deployment of Next Generation Networks based on IMS/SIP and partners are already preparing and performing roll-out of project results, steered by their strategic business units. For instance, the IMS platform was already deployed in Spain, and the service has been launched there. In France, IMS has been selected for PSTN renewal.

At last, based on MaCS results, the roll-out and commercialization could be considered in the next future for a multimedia communication suite, operating seamlessly in multi-operator environment over any network, service platform and terminal.

Further information on MaCS is available at *http://projects.celtic-initiative.org/macs*

MaCS pan-European test bed
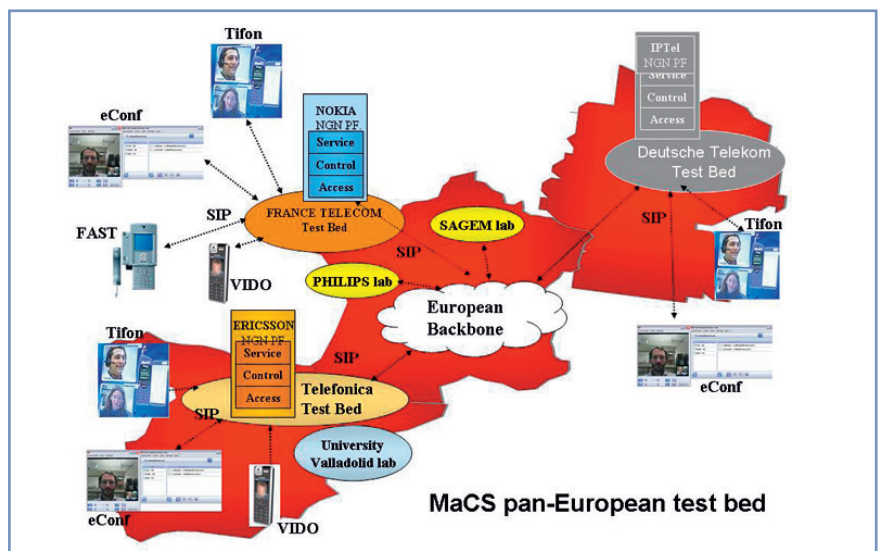
Wireless Festival – Customer-driven mobile services

 The Wireless Festival project started with the question, whether fast economic growth in the event industry might have a viable connection with very fast economic growth in wireless technologies. The project objectives were to identify relevant business models based on demand rather than on supply, based on customers rather than on users, based on suitable services and infrastructures rather than what is dreamed up by technicians and economists inside large companies.

The field tests were carried out at the Hultsfred Rock Festival in Sweden, with some 30,000 participants, and the Nest Rally in Finland with some 100,000 participants.

At the Hultsfred Rock Festival the project addressed problems of the event organizer in reaching the visitors at the event with information on up-to-date schedules, artists, and more. This application, called Dynamic Booklet, also gives visitors the possibility to personalize their scheduling. At the Nest Rally the project addressed the problems of visitor groups for sharing information during the event. The application, called Mgroup, gives visiting groups the possibility of creating shared stories.

Project work

The project was organized in three competence groups:

1. In a business analysis the viability of the service was evaluated from the perspective of economics was investigated. The important question in this project was, who the customer of the service is. This turned out to be the event organizer.
2. In a user analysis the user experience was evaluated. The important question was if mobile services give an added value to the event experience. As a result it turned out that single-user applications are not accepted, and only groupware applications will have a value.
3. The technology analysis evaluated mobile phones and the mobile infrastructure and the question if an operator-independent service could be created and how traffic peaks could be handled.

Conclusion

The main result of the project was the development of two wireless services, two niche applications that have been field-tested twice, and one of them, the Dynamic Booklet, is in the process of being commercially deployed after project termination.

As **business conclusions** it can be stated that a viable business model still needs to be found. The organiser has to decide if for the visitor groups, an integration of fixed and wireless services would be preferred. This service could, for example, include buying tickets before the event starts, getting information about artists, and chatting with fellow visitors during the event.

As **user conclusions** it can be stated that during the event only user groups are of certain importance. Members of groups are more or less active seekers of experience and information, i. e., they are not

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passive consumers of information. The offered services should include collaborative and co-operative aspects.

The **technical conclusions** are very clear on the infrastructural side. WiMAX ("Last Mile access") will be a very good backbone communication solution for large scale events, providing good coverage and high on-site capacity. On the application development side most of the existing network enablers with protected and non-standardised services are only of limited value for the developers, as software/application development of wireless services will become unnecessarily expensive.

Outlook

The successor project of the Wireless Festival project is called **Mobile City Moments**. It will focus on the fact that cities are the growth engines of the economy. Permanent large-scale events need more efficient means of service creation and adoption to fill the gaps between demand and supply of information and communication. The question will be, if the mobile phone can act as a sophisticated information, communication and co-ordination device, which generates customer value in terms of being available, simple and safe to use by individuals and groups in the city for managing more or less risky transitional periods in people's lives. The question is, if use of a mobile device could be a complement to existing infrastructures.

Wing TV

MOVING ON WITH DVB-H

DVB-H is the new European standard which fosters network co-operation between terrestrial broadcast and mobile telecommunications technologies, thus materializing the vision of wireless broadband access anywhere, anytime. DVB-H provides streamed IP multimedia contents to handheld devices, such as mobile phones and PDAs, with an unequalled efficiency in terms of power consumption and reception performance. The objective of Wing TV is to validate the DVB-H standard, giving an in-depth view of all the capabilities of the new technology.

DVB-H aims at sustaining the European leadership in telecommunications, in particular in the mobile multimedia environment, by using a set of DVB Forum standards.

Commom Lab test session in Turku

DVB-H provides streamed IP Multimedia contents to handheld devices, such as mobile cellular phones, with an unequalled efficiency, supporting an advantageous comparison with other standards. DVB-H provides a coherent set of features. The features include time-sliced service transmissions, additional link layer protections, new physical layer modes and signalling to efficiently serve handheld terminals. The impact of DVB-H in terms of users may be

in Europe around 2010 in the numbers of several hundred millions of users, and turnover could be at the same date around several hundred million euros.

Project overview

The objectives of Wing TV are strategic to the fulfilment of the above-mentioned vision: to test and to verify in detail the DVB-H specification, to check interoperability of appliances and to constitute mandatory goals in order to guarantee a successful deployment of services. The mission of the Wing TV project is to help in speeding up the worldwide adoption of the DVB-H standard by validating the technology and providing adequate inputs to forum and standardization bodies

The Wing TV consortium was formed by 22 European members including operators, manufacturers and universities from 8 European countries: Finland, France, Germany, Hungary, Italy, The Netherlands, Spain, and Sweden. The participating organizations did not only form a well-balanced consortium in terms of the project needs, but also included many of the leaders in the broadcast industry and in telecom research in Europe. The key issue was the collaborative worked performed within the project, where the 22 partners, in some cases competitors, worked together with a common goal: drive DVB-H toward success.

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The main results of the project for the industry and for standardization bodies have been the following:

- The validation of the DVB-H suite of standards by means of simulation activities, laboratory tests and field trials in different countries.
- Development of DVB-H equipment prototypes and network testing methodology.
- The definition of a DVB-H WING TV Reference Receiver.
- Development of a new channel model for pedestrian environment
- Contributions to the main output for the standardization bodies as DVB TM-H and MBRAI, or ITU with the outcomes from lab and field trials.

Conclusions

The Wing TV project has performed the technical validation of the DVB-H technology providing updated figures of the performance of this technology for the different modes and configurations. The results of lab test and field trials
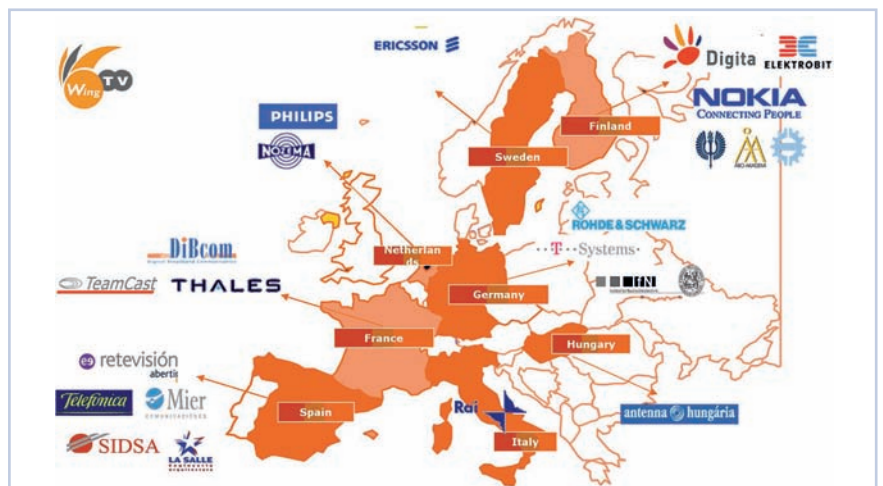
performed within the project have helped manufacturers to develop competitive equipment fully compliant with the DVB-H standard and with better performance. Furthermore, a new channel model for pedestrian reception has been developed. The results of the project have been contributed to several standardization bodies and will help network operators, broadcasters and other media industry players to deploy DVB-H networks and develop the business of providing content to-mobile users. The dissemination activities performed by the project also result in the wide spread of the DVB-H technology, which is currently competing with other technologies in an increasing global world. The Wing TV project has set the basis for a strong European consortium which will continue the R&D activities of the emerging broadcast technologies in the Celtic B21C project, in accordance with the strategies promoted by the European Commission, Celtic and the European Technological Platform NEM.

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

Celtic project situation

In the course of the last year 15 of 18 Celtic Call 1 projects were terminated. Most of them have produced interesting results and demos. Many projects have contributed to standards and there results have already been transferred to existing or new products. It can be seen clearly that Celtic gains now in momentum in the development of ICT products. The review process has proven to be quite effective. The purpose of the Mid Term Review was to assess the projects and to provide recommendations for further improvements. Some of the projects were asked

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to implement corrective actions. It is a special satisfaction for Celtic that most of them were indeed strongly improved in the Final Review. At the end of their duration, these projects showed a much better management, lesser delays and most important, convincing results.
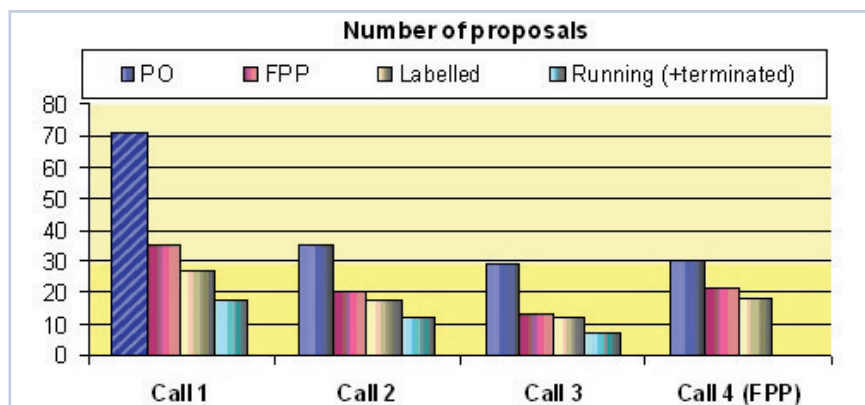
Figure 1: Number of Celtic proposals

Call 3 projects had a comparably slow start. This was in some cases related to lengthy negotiations for funding. Some consortia decided for internal reasons and availability of internal resources to delay the start of their project. Only seven projects from this Call (see figure 1) were started, this makes this Call the smallest since the start of Celtic. As these projects are quite large, the overall budget (see figure 2) is slightly more important than the total Budget of the Call 2 projects.

Figure 2: Total budget of Celtic projects

The Celtic Coordinators Day

The Workshop for the coordinators for the newly labelled Celtic projects (Call 4) was organized for the first time. The main motivation for this was the need to establish an early face-to-face contact with the coordinators of the projects. For the earlier Calls this first contact was only at the Kick Off meeting of the projects. It became clear to Celtic that not all coordinators did realize the important role they have to play in the critical start up phase of the projects. There are examples where a coordinator was investing a lot of effort in his country for achieving an agreement with his PAs but he neglected that his partners in other countries should do the same for starting the project together.

The most important goal for the Workshop was therefore to communicate on the set up phase, explaining the role of the coordinator and to give them directly information about the EUREKA countries that are most favourable for supporting Celtic projects. This is important as it is happening quite regularly that one or the other partner steps out of a project. The flexible EUREKA framework allows with relatively little administrative effort to bring in a new partner that can be from a different country. This partner can replace or even add expertise in the project. Of course this makes negotiation with the PAs from the country of the partner necessary and must be approved by Celtic. A side aspect of the Coordinators

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Day is to bring together the coordinators (Networking) of the Call 4 projects that have similar questions to be solved. Each of them could present his project to the coordinators and show where additional expertise in the Celtic community can be found. At the end Celtic also provided the necessary information about the documents that need to be prepared before the Kick Off of the project. As the Celtic Programme Coordinator will not assist in the Kick off meetings (he assists in the final meetings instead) the information for the management of a Celtic project was explained and distributed to the coordinators.

The feed back from the Coordinators Day was positive from many of the attendees. Some coordinators realized during this event that their active role in this set-up-phase is at least as important as their management role in the normal project lifecycle after the Kick off meeting.

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.

DANTE
Deploying Advanced Networks on a Global Scale

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Established in 1993, DANTE is a not-for-profit organisation whose primary mission is to design and implement pan-continental research and education networks. Though its main activities focus on Europe, it has built several networks in other world regions, extending connectivity for European researchers. It is responsible for running the GÉANT2 network, which is co-funded by the European Commission and Europe's National Research and Education Networks (NRENs).

GÉANT2 is the largest network of its kind ever built for the European academic community. A 200 million euro initiative, it connects 34 countries across the continent, with more than 50,000 km of connections linking millions of users. GÉANT2 has deployed direct links to North America, China and India. In addition, DANTE has implemented a number of regional networks with links back to Europe. The TEIN2 network operates in the Asia-Pacific region, connecting 10 countries to each other and to Europe. The ALICE project has created the RedCLARA network in Latin America – the first of its kind in the region. The EUMEDCONNECT network extends the reach of GÉANT2 into the Mediterranean, linking eleven countries in North Africa and the Middle East to Europe. The overall result of this activity is a growing global community of connected researchers and academics where international collaboration is supported by high speed networking.

Advanced applications in all areas

Any not-for-profit research and education application can make use of the connectivity provided by networks like GÉANT2 and TEIN2. All academic disciplines are welcome, from arts and humanities to weather forecasting and particle physics. Projects in the areas of e-health, e-learning and e-culture are all benefiting from DANTE-run infrastructures.

Application area: networked health services

The Internet brought about a huge revolution in how we live our lives. The ways in which we work, shop and socialise have all been transformed beyond recognition. With ever faster connections, new applications and pervasive networking, soon we will find ourselves permanently connected, always online.

The benefits of the "digital life" also extend to healthcare. Whether it is holding a videoconference with your doctor, or booking a consultation via e-mail, networked healthcare is a growing environment. High-speed networks now make patient location irrelevant.

Although invisible to the average user, without high-speed networks, our "digital lives" would not exist. The availability of fast, reliable connections is crucial for a whole range of disciplines – perhaps none more so than in the field of healthcare and medicine. e-health applications are increasingly supported by research and education networks. These high-speed links operate at speeds of up to 10 Gbps – a thousand times faster than a standard broadband connection. This capacity

GÉANT2 At the Heart of Global Research Networking

GÉANT2 Global Connectivity November 2006
GÉANT2 is operated by DANTE on behalf of Europe's research and education networks

★Connect ★Communicate ★Collaborate
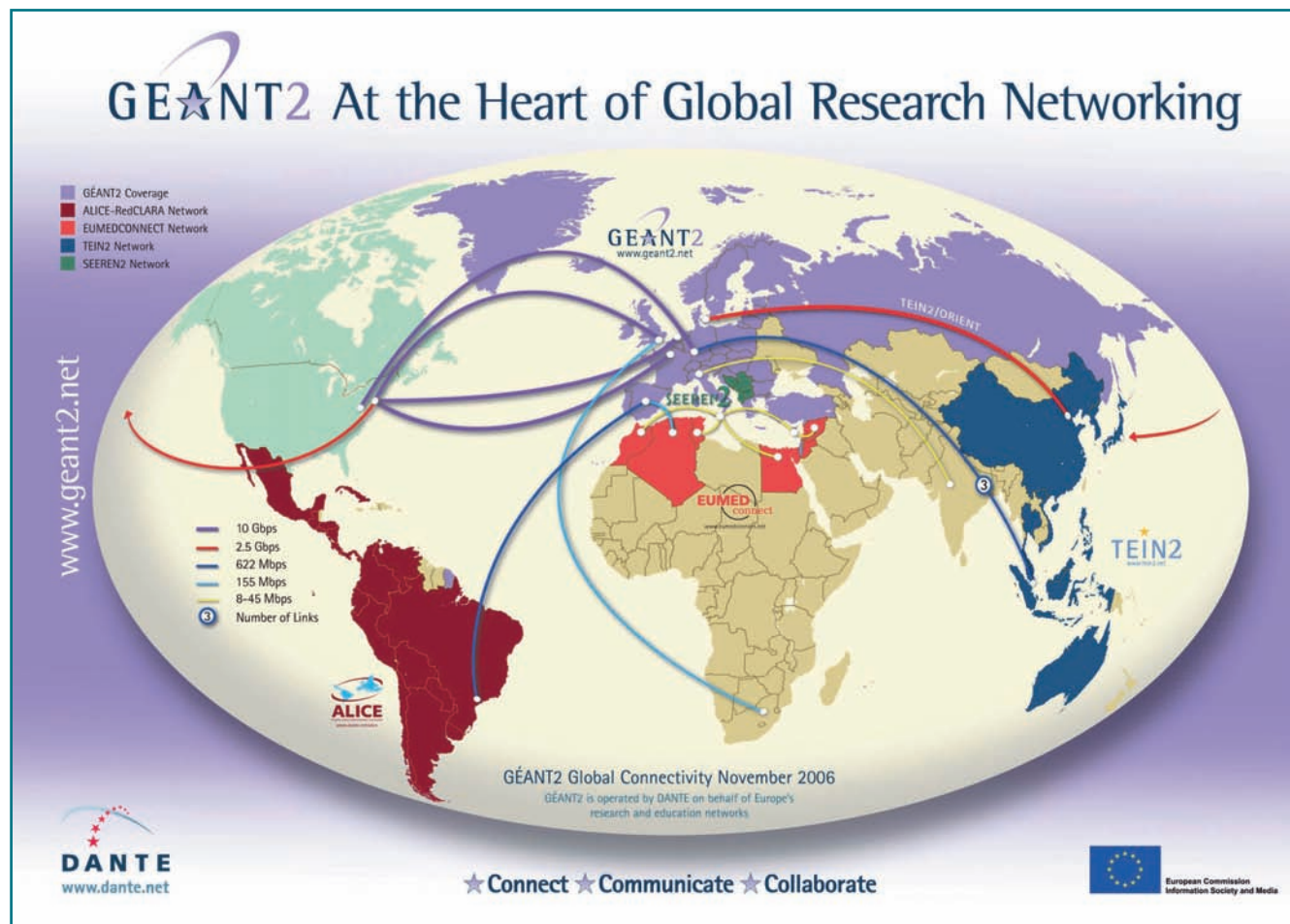
makes international high-quality video-conferencing a reality, and quickly transfers the huge amounts of data generated by research such as genetic modelling.

The examples given below are just a few of the ways in which research networks support healthcare projects, with tangible benefits for the average citizen.

Bringing world-class healthcare to the Amazon

In the most remote parts of the world, access to the types of healthcare services taken for granted by urban populations is just not possible. A project called T@lemed is bringing essential healthcare services to rural districts in Brazil. It uses specialist equipment and software developed by Medcom at the Fraunhofer Institute in Germany, and utilises the Brazilian national research network, RNP. Via the infrastructure provided by the pan-continental RedCLARA and GÉANT2 networks, it is now possible to consult with expert doctors thousands of kilometres away from the patient.

The telemedicine process starts at a remote clinic, many hours travel from the nearest hospital. The clinic's dedicated,

portable equipment allows patients to be scanned for a variety of conditions from pregnancy to cancer. The local doctor is able to transfer the images from these scans electronically to a hospital in a provincial centre. There, the image can be viewed immediately, and a real-time discussion can take place between the hospital specialists and the referring doctor in the remote clinic.

If necessary, the image and case files may then be passed electronically to another hospital within Brazil or, using RedCLARA's transatlantic link, to Europe. The capacity of the RedCLARA and GÉANT2 networks means that detailed images can be transferred almost instantaneously to waiting specialists for rapid advice.

Telemedicine in the Asia-Pacific region

Throughout Asia-Pacific, high-quality videoconferencing is transforming the teaching of medicine in the region's leading hospitals. The TEIN2 network, managed by DANTE, connects ten countries in the region, to each other and to Europe.

TEIN2 assists trainee surgeons throughout the Asia-Pacific region in adopting complex clinical techniques, such as endoscopy, by supporting interactive tele-surgical training. Thanks to
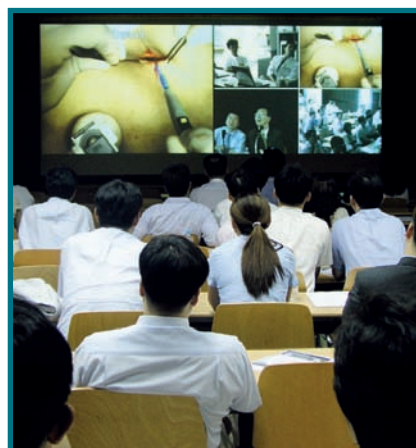
Telesurgical training across Asia

fast and stable network connections, it is possible to stream a live surgery event in near-real time from an operating theatre to a remote classroom setting. These uncompressed images are accompanied by a two-way audio connection for immediate interaction between the trainees and surgeons. Further medical teams can join the training despite being located hundreds or even thousands of kilometres away. By observing the procedure in real time members of the team can provide instant feedback. Remote surgical training sessions, based on such a multimedia link setup, are already being carried out between university hospitals in Australia, Korea, Japan, and Singapore.

With the deployment of the network link in Vietnam, medical staff at the National Hospital of Paediatrics in Hanoi are now connected to their counterparts at the Royal Children's Hospital in Melbourne. Specialists in Australia carry out regular tele-consultations with patients in Hanoi, saving both time and money. This enables them to maximise their collaboration in the treatment of Vietnamese children affected by cleft lip and palate: surgery planning, pre- and post-surgery examinations, and training can all now be carried out online.

EUMEDCONNECT

Genetic medicine and cancer prevention form one of the most rapidly growing fields of medicine, and the European Commission has helped to create a new network to share scientific expertise and resources and to establish genetic centres of excellence in the Mediterranean region.

The EC has funded the EuMed Cancer – GeMed Network project, led by the European Genetics Foundation, to help develop centres of excellence in genetics in Mediterranean countries. Training courses are delivered online in real time using the
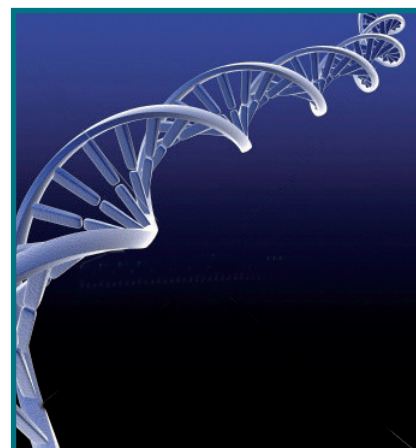
Genetics tutorials throughout the Mediterranean

EUMEDCONNECT backbone network which links 11 countries in the region. The project has established an active network of 16 partner research centres in genetics, each featuring a lecture hall connected through EUMEDCONNECT to the European School of Genetic Medicine's main training centre in Italy.

The benefits of telemedicine

Bringing medical diagnostics to emerging nations and remote, rural communities offers obvious benefits to the patient. These e-health projects also bring benefit to medical professionals. Specialists can reach a far greater number of patients without ever leaving their consultation room. The tele-training offered to medical students promotes professional learning and development on a wide scale. For many of us, just being able to schedule a doctor's appointment online is a useful time-saver. Whether great or small, the benefits offered by networked healthcare can be available to all – so long as you are connected, of course.

Further information on DANTE, its activities and these applications is available at:
www.dante.net
www.geant2.net
www.tein2.net
www.eumedconnect.net
www.dante.net/alice

Security weaknesses of VoIP

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The technology is not new, at least not new in Internet time measures, but has recently disrupted traditional business models of telecommunications operators providing voice services to their customers. In the hype of fast deployment some of the fundamental properties of the service have been neglected. Also some of the fundamental requirements that were satisfied by the plain old telephony service (POTS) are no longer met.

In the past, voice has been the killer application of the telecommunications industry, and for quite some time it really was the only application. Today, voice is integrated with other types of communication, such as video, context information, and messaging, in so-called communication sessions.

At the same time, the provisioning of these services is being put on a completely different technology basis. Delivering a session-based real-time service via the Internet Protocol (IP) is a paradigm shift, which de-couples the service from the access network. The impact on security in general is that it changes the trust model. In traditional wireline telephony trust between the subscriber and the network operator was established by the fact that the "plug" in the wall was installed at a fixed location, and ownership of the premises was clear. Thus, it is also clear who is the originating party and who is accountable for the call. Roaming is not possible. In GSM trust between the subscriber and the network operator is established via the Subscriber Identity Module (SIM) card, which is personalised. Based on the tight relationship between a known identity and the SIM card roaming is possible. In the roaming case the visiting network operator trusts the notification by the home network operator that the user can be trusted and can be accounted for.

In a session-based scenario over IP, there is no tight relationship between a "plug" in the wall and the communication device, and personalised SIM cards are also not used. Authentication has to rely on credentials stored in a VoIP phone or a computer in a rather unsecured way, at least when compared to the strong security applied for storing information in the SIM cards. Usually the user has a contract with an access provider (e.g. xDSL at home), an Internet service provider (ISP) and, in addition, a VoIP service provider. Roaming is possible, but this de-coupling of access and service has a serious impact on some services.

SPIT attacks

The service grade offered to the end user is threatened. Today, Denial of Service (DoS) attacks are a reality also for the voice customer. Malicious users, using the "fire-power" of a standard PC, can easily block a VoIP phone making repeatedly calls to it. This scenario also threatens the POTS when executed over the border gateways that connect the POTS and the new IP based voice services. Cost is no longer a prohibitive factor for this scenario, since even for long-distance calls the cost has become marginal. Another annoying scenario involves receiving unsolicited calls from any origin in the world, regardless of the time of day. Users will receive computer-initiated calls in the middle of the night. This scenario has been named SPIT, Spam for Internet Telephony. The important difference to Spam e-mails is that calls are pushed to the user, instead of being pulled by the user, thus being much more obtrusive. Privacy of communication, another end user requirement, appears reasonably well addressed. Most transport protocols in VoIP, including the proprietary Skype protocol, support encryption.

Regulatory concerns

The concerns from a regulatory point of view are different. Emergency calls no longer work as they used to, since the tight coupling of the origin of a call and the location no longer exists. This is also the reason why most contract terms of VoIP service providers explicitly exclude the offering of emergency call services. In other cases the emergency calls are routed based on fixed and contractually pre-defined locations.

Lawful interception, which is the interception of telecommunications by law enforcement authorities, is threatened by several factors. Lawful interception in VoIP is difficult or sometimes impossible because traffic is encrypted and usually mixed with other types of traffic. For identifying the caller one has to interact both with the access provider, as well as with the ISP and VoIP service provider. Furthermore, the uncertain origin of a call raises the question, which national law is actually applicable.

All these requirement and service features meet at the operator or service provider, who has to balance them against each other in the most cost-efficient way. The requirement for data retention that is being posed on operators and ISPs is a good business for storage device manufacturers, but I strongly doubt that it will be very effective in tracing criminal activities, since storage of exabytes of data, i.e. quintillions or 10^{18} of bytes, will only allow posterior examination of communications and can never prevent a criminal activity. It is only suitable to encourage criminals to move on technology-wise, using more advanced end-to-end encryption protocols and utilizing potentially hidden peer-to-peer overlay networks, a phenomenon that can already be observed. To effectively meet most security objectives, a universal trust infrastructure would be required, for example a worldwide public-key infrastructure (PKI) with one root-certificate authority trusted by all as well as compatibility and interoperability for all users. Even though progress has been made in PKI, I think this is a hopeless endeavour. The issue of security weaknesses in VoIP remains unsolved.

NM2 seminar on managing
European research projects

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EU project NM2, which develops tools to support the production and delivery of new media genres, has gained considerable experience in managing large-scale European research projects with geographically distributed partners. In order to share this experience, NM2 organised a training seminar at the Eurescom premises in Heidelberg on 8 February 2007.

The seminar focused on best practises of managing European collaborative R&D projects and on the upcoming Framework Programme 7. NM2 was used as an example for presenting and discussing hands-on experience.

The agenda contained:

- An overview on EU Framework Programme 7 by guest speaker Francesca Possenti from the EU Office of the German Federal Ministry of Education and Research (BMBF).
- An encouraging report on why and how collaborative projects add value to BT by the NM2 technical project manager Dr. Doug Williams from BT.
- A hands-on-experience presentation on forming and managing project consortia by the NM2 administrative coordinator Peter Stollenmayer from Eurescom.
- An overview on effective project management tools for communicating and reporting by Milon Gupta from Eurescom.
- A presentation on the importance of training by NM2 partner Dr. Marian Ursu from Goldsmiths College.

The participants contributed to the seminar with many questions and remarks. They were particularly pleased with the practical, hands-on approach of the speakers. One of the key messages was that creating a successful project proposal needs a good vision, high-quality content and committed partners. It is crucial for the success of such a project that the partners develop good personal relationships based on mutual trust. NM2 coordinator Peter Stollenmayer explained that: "People who had a drink together can solve problems much easier than people who never met personally".

One of the unexpected lessons for many seminar participants was that training is much more important for the success of a large research project than is reflected in the attention and budget training usually gets in most projects. Dr. Marian Ursu convincingly conveyed the message that training is an excellent means of disseminating and exploiting project results. "It is important that during the project we train the trainers, who can then train external audiences towards the end of the project," Dr. Ursu said.

Further information is available on the NM2 website at *www.ist-nm2.org*

3GPP LTE/SAE
A step towards systems beyond 3G

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The next generation of mobile broadband services is becoming available. Services like high-speed internet access, distribution of video content (Mobile TV), fast interactive gaming, wireless DSL, fixed-mobile convergence and voice substitution will produce tremendous traffic in future mobile networks. To make this happen, three major focus areas have to be tackled: improve the user experience, reduce network cost, and support fast and flexible service provisioning.

As a step for achieving such a system beyond the third generation of mobile communication systems (3G), the Third Generation Partnership Project (3GPP) has launched the project LTE (Long Term Evolution)/SAE (Service Architecture Evolution).

The LTE air interface technology will be significantly different from existing 3G technologies. Advanced OFDM (Orthogonal Frequency Division Multiplex) technologies are used for the downlink to achieve the requested performance and cost goals for low total cost of ownership. For the uplink Single Carrier FDMA (Frequency Division Multiplex Access) is applied due to higher power efficiency and the respective impact on battery lifetime.

Data rates exceeding 100 Mbps in the downlink with full mobility are achieved. OFDM allows for usage of MIMO (Multiple-input/multiple-output) antenna technology which significantly increases throughput rates. Flexible bandwidth ranging from 1.25 to 20 MHz allow for deployment of LTE in a range of frequency bands. Due to its scalability, deployments in lower frequency bands become possible, taking advantage of attractive propagation characteristics. Lower frequencies mean larger cell sizes that have a positive impact on CAPEX (capital expenditures).

Reducing network cost will be achieved by introducing new, fully IP-based networks which will have a flat architecture with the enhanced Node B (eNB) directly connected to the access gateway (aGW). The first migration steps towards flat architectures are made with the introduction of iHSPA (Internet High-Speed Packet Access). 3GPP LTE/SAE will provide a smooth evolution path for existing 2G and 3G networks.

User expectations

End-user surveys performed only recently have shown that user expectations are difficult to predict in the long run. Quite in contrast, services are expected to become a short-term business. The creation of new services, which take user expectations into account, requires:

- Means for fast and highly personalized service creation and provisioning of any type of service including self-provisioning by the end-user.
- Unique service support for every type of access based on a common service control and provisioning.
- Improvements in user experience for all services offered.

Diversification of service offerings includes flexible service bundling across all types of access networks.

Currently, the mobile market as a whole is experiencing tremendous changes. New service requirements posted by end-users, comparable and aligned with those for fixed networks, new business models introduced by competitive market entrants and, last but not least, enhanced radio and networking technologies are hallmarks of this increasingly aggressive but extremely lucrative market.

Economic aspects

It is all about staying profitable, and profitability is highly related to lifecycle optimization of the total network value.

On the one hand, this is an issue of successfully introducing and operating new services as well as opening up new revenue streams, in general. On the other hand, it is strongly related to saving cost, in particular OPEX (operational expenditures).

Assumingly, the increase of data revenues will not keep pace with the explosion of data volumes, resulting in a remarkable decline of revenues per delivered data volume. In order for the operator to keep offering high-bandwidth applications profitably in the long run, the cost per Megabyte transported across the network will have to come down.

For the end-user it is all about the "killer experience". Today's benchmark has been set by DSL; now the end-users expect a similar performance in a mobile environment.

Conclusion

3GPP LTE/SAE is a future-oriented radio access system to support future end-user requirements as a significant step towards systems beyond 3G. Its standardization is about to be finalized in the course of 2007, and commercial introduction is expected in the 2009/2010 timeframe.

Further information is available at
www.3gpp.org

Pan-European laboratory for next
generation networks and services

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The Pan-European laboratory is a concept that is being introduced to enable the trial and evaluation of service concepts, technologies, system solutions and business models to the point where the risks associated with launching them as commercial products will be minimised. The accomplishment of this objective, which will assist many different European collaborative projects, is an important step towards the establishment of a truly pan-European collaboration network.

The Panlab project is a Specific Support Action (SSA), co-funded by the European Commission, which enables and facilitates the vision of a Pan-European laboratory. Panlab aims to build trust and respect in order to form a functioning forum for the vital work of drafting the pan-European laboratory for networks and services. The objective of Panlab is to define a framework for the interconnection of independent testbeds and laboratories. The project will combine both innovative and realistic views in the field. It will also combine a wide variety of different technologies,

saving the margin for newcomers. Panlab will provide a self-sustainable, long-term, and well-functioning legacy of guidelines, principles and rules, enabling the implementation of the Pan-European telecommunication test laboratory.

Panlab assures the visibility of the virtual network of laboratories, which means that the testing sites and testbeds will be known and accessible for the potential customers. On the other hand, individual testing facilities and groups gain valuable publicity by joining the pan-European laboratory network. Panlab relies on the existing and future testing facilities and presents enhanced collaboration mechanisms between them. The federative approach to distributed testing has the benefit of flexibility, but at the cost of the management of the distributed environment. The issues addressed by Panlab range from logistics, availability of qualified personnel, remote access and management of systems to address the legal, economic and operational matters.
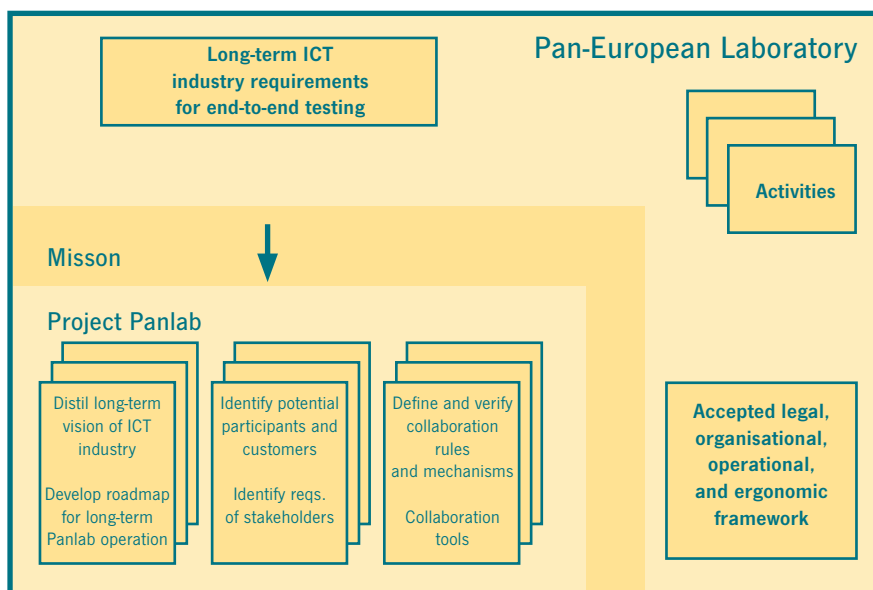
The results enable the implementation of a physical infrastructure (interconnecting facilities, remote access and management capabilities, collaboration tools, etc.), aiming at establishing integration, testing, validation / verification, and possibly certification services for specific technologies and services as well as global solution prototypes developed by European collaborative projects. The ultimate goal of Panlab is the establishment of the grounds for a future operational and long term self-sustainable pan-European laboratory. This includes a business model on the continuation of Panlab as an independent entity, targeting customers, such as

European or national collaborative projects and the industry during its pre-competitive research and development phase.

All the relevant information and metrics collected from the independent test sites are standardised in order to allow meaningful comparison of the sites. The result of such a standardisation is a transparent classification and rating of the sites, which improves the overall quality of the offered services. By bringing the individual test sites on the same line, a competitive situation is induced between the sites. This alone is an incentive for the sites to stay up-to-date in their offering, and to strive for improving their services. Panlab realises a web brokering service for the test facilities that makes recommendations for projects who need lab facilities for testing, based on the search criteria executed against the standard metrics database of available test facilities and their capabilities.

Important aspects about test sites are for example:
- **Definition of**
  Resources include technical advancement, capabilities, capacity, equipment, labour resources, lead-time. It is necessary to know what type of tests and with what type of capacity can be carried out.
- **Descriptions**
  The test processes should be described related to the first item as well.
- **Possibility for roadmap testing**
  In order to shorten time-to-market it would be feasible to make pre-competitive conceptual tests of services / contents / products.
- **Availability, publicity**
  If there are restrictions in the access to a certain site for certain parties it should be stated. A booking calendar can be maintained.
- **Linkage**
  Possible connections to other test sites or telecommunication stakeholders. Availability of ad-hoc or permanent connections and their types.
- **Marketing**
  Test sites should make themselves well-known. A peer recommendation system needs to be considered. User experiences need to be solicited and stored in the web service.
- **Offer, pricing, cost calculations**
  The whole procedure ranging from offer request practice to cost calculations, fee setting and pricing should be transparent.
- **Booking**
  How to book and how the commitment of the test site for the booking is guaranteed.

Long-term ICT industry requirements for end-to-end testing

Pan-European Laboratory

Activities

Misson

Project Panlab

Distil long-term vision of ICT industry

Develop roadmap for long-term Panlab operation

Identify potential participants and customers

Identify reqs. of stakeholders

Define and verify collaboration rules and mechanisms

Collaboration tools

Accepted legal, organisational, operational, and ergonomic framework

Panlab lays the basis for a testbed search engine. The Pan-European laboratory will be mainly a web service managed by a Panlab consortium member/members. It is very important to bear in mind in Panlab that the mechanism to be created needs to operate on the ad-hoc principle to be successful. Heavy, bureaucratic and static structures will not survive. The test sites must be 'loadable' when needed to avoid any unnecessary manning or idle costs, which cannot be afforded.

Panlab aims at creating a tradition of arranging testing events and opportunities, e.g., 'Interoperability Weeks', during which different products or even concepts could be tested. A question remains how far manufacturers, operators and service providers are willing to go, without fearing to lose critical information into competitor's hands. Much is also dependant on the credibility and trustworthiness of the trials. How to control and guarantee independent test sites?

Panlab validates also the needs and requirements for offering concurrent design services. In concurrent design several virtually connected parties from many sites or organisations may jointly work on a common project. This is aided by facilitating a central service consisting of, e.g., joint libraries for software, system architecture, pattern and form design, open source software components, version management systems, software build trees, software license leasing, repositories, storage, messaging, discussion fora, messaging of both instant and pervasive kind, and others. All these would be offered in a secure way with the necessary authentication and authorisation means.

For more information about Panlab visit *www.panlab.net* or send an e-mail to *info@panlab.net*

The future internet discussion in Europe heats up

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There are many different opinions about the future internet and how we get there. This has been the case with every network evolution for the last 50 years, but this time there is a new twist in the discussion. We are now seeing the emergence of a conceptual dispute about how we should define and design the future internet. In this article I will explore some of the differing opinions and, of course, give my view on the situation. I fully expect that some of the evangelists for one or other approach will consider my view biased but this is fair, as I consider their views biased too. The question is who will arbitrate between the different viewpoints and how can we get past this to exploit the great potential we have in Europe for leading the changes.

In the many discussions about how future networks will look one point must be understood from the start: the future internet cannot be more than the network. Pervasive services require a pervasive network. The evolution of the networks, as the infrastructure, is a fundamental element of enabling the future internet. I will use the future internet and the future network terms without trying to identify what the difference is as, to all intents and purposes, they will become synonymous in the future.

The organic approach
We have a large sector of the intellectual community who believe that the future internet will be an almost self-defining concept coming from many advances in technologies, and the best approach we can have is to seed a number of exploratory actions to determine which one has the most potential to be the basis for the future internet. This approach has its merits – particularly when we cannot define the problem statement with any great accuracy.

The architectural approach
We have a growing community of people who have already determined clear identifiable needs for future networks. They are aware of problems, they are aware of pragmatic issues related to the operation of large scale networks and services, and they want to have better networks to offer better services in the future internet.

The approach is to define some target architecture as a focus for the research efforts over the next few years. It is essential to get some commonality on the architecture so that we, collectively, work towards the same goal.

Revolutionary versus evolutionary ideas
Many of the polarised arguments are about the philosophical problem whether the future internet should be determined by revolutionary ideas or by evolutionary ideas. Here the number of preconceptions and misconceptions are unbelievable. Academics accuse the industrial players of not being capable of revolutionary thinking. Industrial players accuse academics of having no contact with reality.

The truth is, as always, in the middle. Industry players want revolutionary solutions as they can see the limits of over-engineering today's concepts to cater for things they were never intended for. We can make this work for a while but sooner or later it will collapse.

Academic players want revolutionary ideas as well as they are the most challenging for our skilled intellectuals to provide. Evolutionary ideas should be the discussion on how we get from here to there – but this has an inherent assumption that we know where there is.

Now we are back to the discussion about if we can determine an architecture now.

The first version future internet architecture
I believe we can define an architecture now, and I am prepared to start. I challenge all experts out there to correct my architectural ideas.

The first and most important point is to ask, if we will have any technological advances in the next 15 years. I assume we will. Therefore, I expect that we will have the technological capability to have a much improved network. I do not know yet where the advances will be, but

I can contemplate advances that demand improvements in the technologies.

My choice for where we can start working now to allow us to make significant progress within a couple of years is in admitting it is time to change the protocol stack – a basic element of the architecture. If we decide this and say the future one should be simpler – say 3 layers – we are already well on the way to enabling the future internet.

The 3-layer model represents the ambition that future communications should have a simple three-layer model protocol stack. The three layers are transport layer, network layer and application layer. There should be intelligence and security at all layers.

Transport layer: We need to be able to carry lots of different forms of data: packets, streams, flows, virtual circuits, multicasts, 1:1, 1:N, N:1, N:N, high priority, low priority, guaranteed quality, contracted quality, best effort, and lots more. The question is what future structure can give us the best characteristics of fixed, mobile, broadcast and private networks in a friendly, flexible and manageable way.

Network layer: The network layer needs to be where the real issues of large scale network operations are addressed. It should deal with signalling, addressing, routing, negotiations with other domains as well as interactions with home and business networks. The administrative parts of network and customer management should be supported in capturing communications records for billing, accounting, statistics, and provide for the lawful interception requirements that are going to be there in the future. Other basic network rules need to be investigated such as management of traffic to ensure equal treatment of traffic or managed treatment of traffic as appropriate.

Applications layer: The application layer should be a totally open concept where we can encourage professional service providers to offer their services in a secure environment. However, it should also be open to the support of peer-to-peer type services, end-user generated services and the legal distribution of content of all forms. We should also be expecting that the future applications will involve more innovative service interactions where the user level services can invoke network level services and there is lots of work to be done in creating the technical, legal and social environment for this to happen.

Immediate requirements

Develop an architecture: We know we will not get it right first time, but if we do not have a first time we will never get it right – an obvious starting point!

Identity management: A simple, but again obvious, challenge now is to solve the identification and protection of the individual identities. In 15 years we should have developed clear unique ways of identifying people. People using the future networks should be recognised by the network so they, and they alone, can access their service portfolio. Strong measures should be in place to prevent identity theft.

This will be a key factor for protecting digital rights and ensuring the digital commerce is going to work fairly.

Addressing is an area where many issues can be solved. Having an effective way of identifying people will allow us to determine where they are and how to get their communications to them. We have to demand something more efficient than semi-random packet forwarding in the hope that some other node knows what to do with it, and it also must be more flexible than the telephone book. Maybe there is a possibility for the con-

cept of the home-location register to be expanded to take account of names, nicknames and even the context people are in.

Routing requires intelligence in the network to address the problem where we want the nodes to be autonomous in handling their traffic, but we also want them to be aware of the greater network context so that their independent actions do not generate problems for other network nodes. Some of the original network management concepts need to be revised and applied here. The question of signalling being in-band or out of band could have a major effect on the management capabilities and the robustness of the network.

These are just a few examples of where work is necessary. I am sure every reader has a few more priority areas to add to this list.

Conclusion

I could continue my theory on why a new architecture is needed and I am sure others will be happy to say they think no architecture is needed. However, I cannot see us providing efficient global services unless we stand back and take a long hard look at the problems of today, where they are leading and how we can avoid them in the future.

The opportunities in FP7 Objective ICT-2007.1.1 and the Celtic programme 2007 to start projects on the future internet solutions immediately are very important – don't miss them.

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*http://www.celtic-initiative.org*
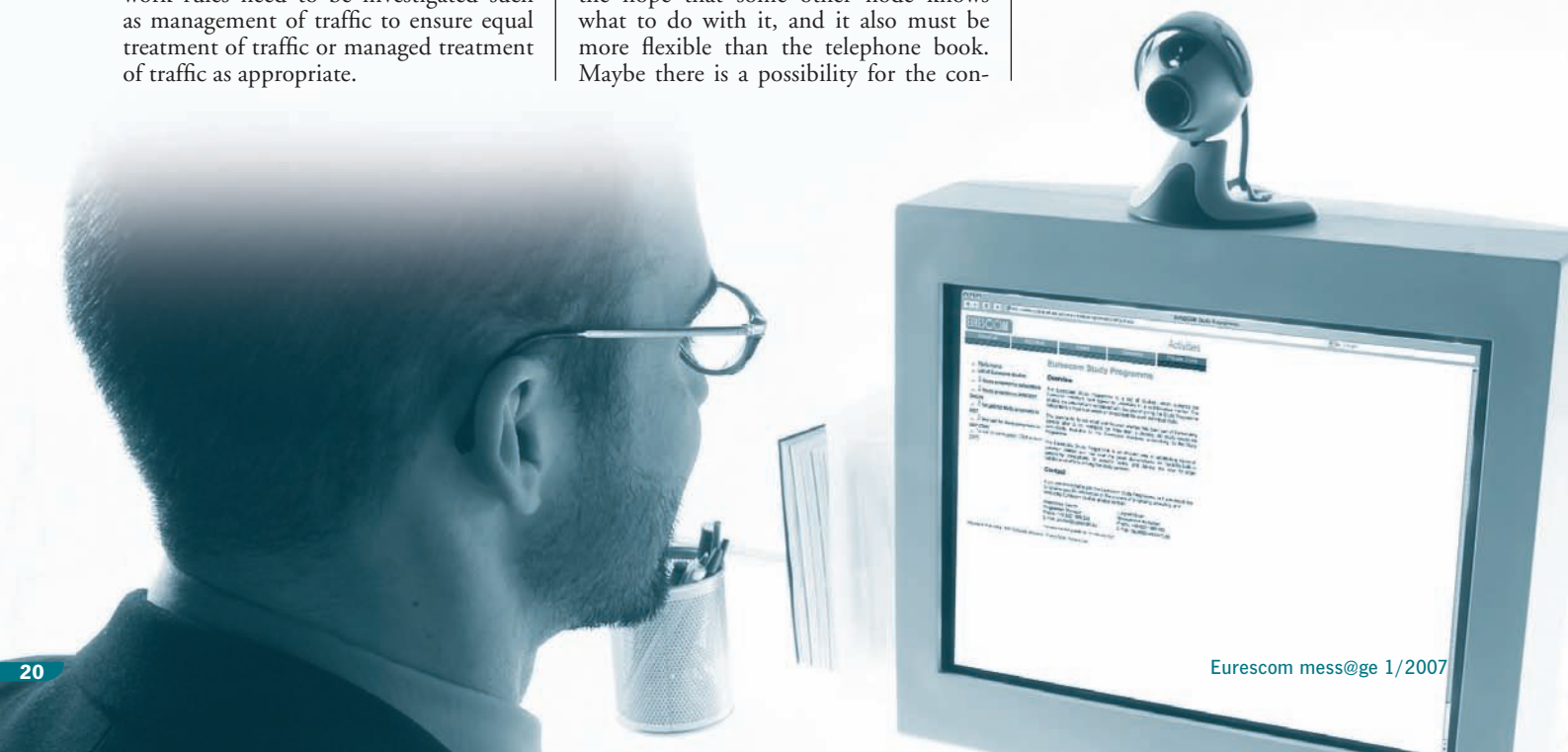
+++ News in brief +++ News in brief +++

Virtual data glove

In a project called "Virtual Dataglove", researchers at Bonn University have developed a method to control 3D computer applications through hand movements. Their "hand-tracking" method replaces the use of data gloves.

The system is based on three camcorders, which follow the movements of the fingertips. This allows, for instance, to steer a plane in a 3D animation just with hand gestures over the Alps.
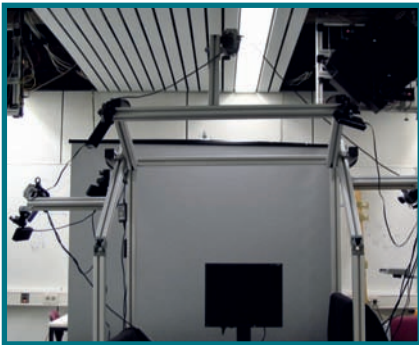
The developers point out that their system does not require to be initialised. As soon as a hand appears in the visual field of the camera, the tracking software starts to work.

The hand-tracking system can be used in virtual games, but also in medicine. In computerized tomography, the software allows the doctor, for example, to navigate through the virtual representation of a scanned brain in order to find a tumour.

Further information is available at
http://cg.cs.uni-bonn.de

Intel presents teraflops-capable chip

Intel Corporation has developed a programmable processor that delivers supercomputer-like performance from a single, 80-core chip. The chip has about the size of a fingernail and achieves a teraflop performance, which means a trillion calculations per second, while consuming just 62 watts, less than many home appliances. Technical details of the teraflop research chip were presented in February at the annual Integrated Solid State Circuits Conference (ISSCC) in San Francisco.

The first time teraflop performance was achieved was in 1996, on the ASCI Red Supercomputer built by Intel for the Sandia National Laboratory. That computer took up more than 2000 square feet, was powered by nearly 10,000 Pentium® Pro processors, and consumed over 500 kilowatts of electricity. Intel's research chip achieves this same performance on a multi-core chip that could rest on the tip of a finger.

According to Intel, tera-scale performance, and the ability to move terabytes of data, will play a pivotal role in future computers with ubiquitous access to the Internet by powering new applications for education and collaboration, as well as enabling the rise of high-definition entertainment on PCs, servers and handheld devices. Applications which Intel envisages to enable via teraflop chips include artificial intelligence, instant video communications, photo-realistic games, multimedia data mining, and real-time speech recognition.
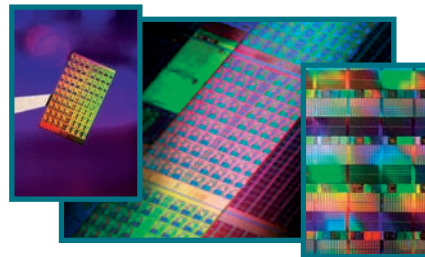
Intel declared to have no plans to bring this exact chip designed with floating point cores to market. The teraflop research chip is rather a step in the company's research efforts to investigate innovations in individual or specialized processor or core functions, the types of chip-to-chip and chip-to-computer interconnects required to best move data, and how software will need to be designed to best leverage multiple processor cores. According to Intel, the teraflop research chip offered specific insights in new silicon design methodologies, high-bandwidth interconnects, and energy management approaches.

Further information is available at
http://www.intel.com

Mobile devices – too many features, too little user experience

Users of mobile devices are overwhelmed by too many features, while they are under-whelmed by a poor buying and usage experience. This is the key result of the CMO Council's Global Mobile Mindset Audit, a global survey of mobile technology users including nearly 15,000 participants across 37 countries. The study is part of the CMO Council's Forum to Advance the Mobile Experience (FAME), a strategic interest group of marketers, associations and experts from the wireless sector.

Key findings show that function fatigue and feature frustration among users will challenge device makers to improve usability and education. The problems begin at the point-of-purchase as users see lack of demos, product knowledge and slow service as problematic at retail. In addition, users are irritated by the cost of service along with poor battery life of mobile devices. Americans and Western Europeans are most bothered by loud cell phone conversations. Data loss, theft and the annoyance of disconnects and drop-offs are also among the key user concerns.

Given the opportunity to reengineer their own devices, mobile users would first upgrade memory and storage and reduce the form factor; then improve design and styling, and make the device simpler and easier to use; and lastly, improve voice quality.

http://www.fameforusers.org

From AAA to ZZT
The flood of ACRs and other abbrev.s in ICT is growing

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It is still open, which earth-shaking innovations the European Union's Framework Programme 7 (FP7) and other European research efforts will generate in the future. One thing, however, is certain: there will be a flood of new acronyms and other abbreviations, when the next European ICT research projects indulge in their innovative work.

Even today, the number of abbreviations is already impressive. The web portal www.acronymfinder.com lists more than 4 million acronyms, initialisms and other abbreviations. The contribution of information and communication technologies (ICT) is considerable, although there are no exact figures.

FP6 project acronyms

There are 937 projects in the European Union's Framework Programme 6 (FP6) listed on the website of CORDIS (Community Research and Development Information Service). Each of these projects has a project acronym, which often represents a long title.

Take, for example, this one: "Accurate Diagnosis of prostate cancer using Optoacoustic detection of biologically functionalized gold Nanoparticles – a new Integrated biosensor System"; project acronym: "**ADONIS**". This already shows an important function of acronyms in research: they save time in reading and talking, and they save print space. In the above example, 19 words with 134 characters are reduced to one word with 6 characters.

In addition to inventing a catchy project acronym: for themselves, research projects also develop numerous technology-related abbreviations for standards, systems, applications, and other subjects. The FP6 project SECOQC (Development of a global network for secure communication based on quantum cryptography), for instance, has developed the abbreviation **QKD**, which stand for Quantum Key Distribution and is not yet to be found in the Acronym Finder portal.

Acronyms and initialisms

According to the definition on Wikipedia, QKD would not be classified as an acronym, but as an initialism. The difference is that acronyms are pronounced as a word, like, for example, **WIMAX** (Worldwide Interoperability for Microwave Access, Inc. [group promoting the IEEE 802.16 wireless broadband standard]). Initialisms, in contrast, are abbreviations formed of the initial letters of a combination of words, which are pronounced as separate letters, like GPRS (General Packet Radio Service).

The example of **GPRS** shows one problem which initialisms, but also acronyms, create: they have different meanings to different people. GPRS has the following alternative meanings: Global Packet Radio Service, Generalized Partial Response Signalling, Global Personnel Recovery System, Grant Proposal & Research Services, Ground Penetrating Radar System. Another problem is that most technical acronyms do not mean anything to the average user, although he is proudly buying a GPRS-enabled mobile phone.

The advantage of the vast majority of acronyms and initialisms is that they are short. However, there are remarkable exceptions – fortunately outside of the **ICT** sector – which show that bureaucracies are a very fertile ground for the growth of abbreviations.

In the 1965 edition of the Acronyms, Initialisms and Abbreviations Dictionary, the following acronym can be found: ADCOMSUBORDCOMPHIBSPAC. This is a United States Navy term that stands for "Administrative Command, Amphibious Forces, Pacific Fleet Subordinate Command" and is regarded as the world's longest acronym.

The world's longest initialism, according to the Guinness Book of World Records, is NIIOMTPLABOPARMBETZHELBETRABSBOMONIMONKONOTDTEKHSTROMONT. The 56-letter initialism (54 in Cyrillic) is from the Concise Dictionary of Soviet Terminology and means: "The laboratory for shuttering, reinforcement, concrete and ferroconcrete operations for composite-monolithic and monolithic constructions of the Department of the Technology of Building-assembly operations of the Scientific Research Institute of the Organization for building mechanization and technical aid of the Academy of Building and Architecture of the USSR."

Back to ICT: some readers may have wondered about the meaning of the initialisms in the headline. The first one, **AAA**, is relatively well-known in ICT, and means Authentication, Authorization, and Accounting. However, it also has 249 other meanings from very different topical contexts. The second initialism, **ZZT**, is less common and stands for Zoo of Zero Tolerance, which is a game creation system. The only other meaning is ZZ Top, the name of a famous US blues rock band. By the way, the letters ZZ in the band name do not stand for anything in particular, with the effect that devotees are still pondering on various theories about their meaning.

Conclusion

The conclusion is that there is still ample scope for further acronyms (ACRs) and initialisms. Soon, all ICT services, applications and devices might just have an abbreviation as a name, and no longer a usual word from the dictionary. In the language of Internet chats, abbreviations have already replaced expressions using normal words, for example "rofl" (rolling on the floor laughing). So, in a not too distant future, our current language may be largely replaced by abbreviations, raising human abstraction to a higher level.
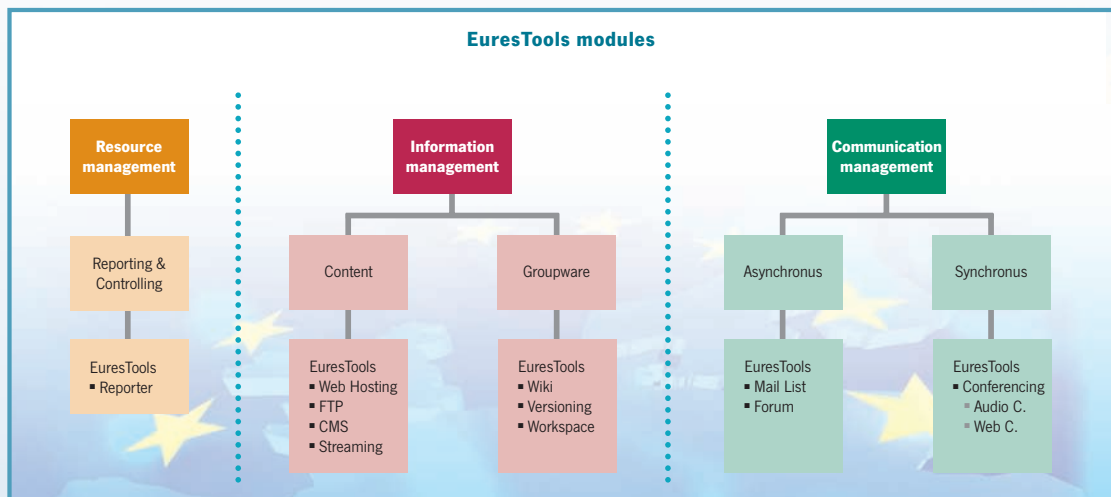
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