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BUILDING
THE SMART HOME

EURESCOM Summit 2003
29 September to 1 October 2003
in Heidelberg, Germany

Evolution of Broadband Services
Satisfying user and market needs

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SCOPE OF THE CONFERENCE

The continuing evolution of telecommunications services and technologies, including broadband, mobility and pervasiveness has reached levels where users and customers are often confronted with technology instead of service aspects. They often feel overwhelmed by confusing functionality, different handling modes, and user interfaces and device layouts that are difficult to understand and to use. There is an increasing risk that the potential of new communication services and technologies cannot be fully exploited and users may not enjoy the full benefits of the new technologies. As a result, expected market shares and business success may not be achieved.

This third Eurescom Summit 2003 on the 'Evolution of Broadband Services' aims at capturing a snapshot of ongoing activities in these areas, providing value to executives, business professionals and technical experts of network operators, service providers, equipment manufacturers, content providers as well as to the research community. It aims at looking into technical issues of advanced services and technologies, showing how the advances in service creation technologies can support the creation of user- friendly services. It will consider usability and user acceptance of advanced services and devices, as well as looking at their business relevance.

An objective of the conference is to explore business challenges, threats and opportunities for the next generation of applications, services and communication technologies, by covering the whole value chain. Furthermore it aims to identify new ways to bridge the gap between a purely technology-driven and a more user-focused service evolution.

The conference will provide a platform for the discussion of innovative and marketable solutions, strategies for the promotion of new communication technologies and applications, as well as open issues for further research. It will cover the following list of issues both from a user perspective, as well as from a technology and a business point of view:

- Applications & services including mobility
- Business aspects, opportunities and threats
- User aspects and customer relations
- User requirements
- Personalisation
- Identifying the market pull

- Technology trends including:
- Service platforms
- Service platform related systems & architectures
- Device evolution
- Content related aspects

The programme is complemented by keynote presentations, panel discussions, tutorials, exhibitions, and demonstrations.

TARGET AUDIENCE

Experts, researchers, executives, business and product planners, strategists, service developers from telecom operators and IT vendors, content providers, manufacturers of IT/telecom software/hardware, application service providers, telecom service providers and consultant companies.

EXHIBITION – EXPERTS MEET EXPERTS

The conference will also host an exhibition presenting available and emerging products, devices and tools demonstrating recent advances in communication services and enabling technologies, Please send requests for exhibition space to summit2003@eurescom.de .

Access @ home

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Current trends in the smart-home sector show us how crucial user-focused service development is. Despite the huge potential of smart home services and applications to facilitate our everyday life, many users are still reluctant towards networked devices in their homes.

A recent study by German social research institute BIS (Berliner Institut für Sozialforschung) showed that 50 per cent of users in Berlin who were queried in 2001, were yet undecided in their attitude towards the smart home, while 42 per cent had a positive attitude. The good news is that user acceptance in this case has increased from 30 to 42 within four years. The bad news: The telecoms industry has not yet developed concepts convincing enough for the undecided half. Though the scope of the study is limited, I see good reason to assume that it is representative of the current climate among customers. There is a mix of rational and irrational reasons, which have to be addressed if smart home services and technologies are to be successful.

The relevance of the networked home for the future of society in Europe and beyond cannot be overestimated

Customers are sceptical

In their survey the BIS researchers found out a number of reasons, why people objected to the smart home: too expensive, handling too complex, more repairs, and fear of being dominated by technology ranged prominently among the given reasons. This shows that rational reasons and irrational fears are inextricably connected like the cable chaos that rules in most people's homes. With video recorders requiring engineer skills, the electronics industry has made its contribution to raising user fears of the networked home. Many people feel either threatened by networked devices in their home or they regard them as completely irrelevant ("I don't need an Internet fridge to get milk from the supermarket").

Underlying this widespread sceptical attitude of customers towards technology is a general change of paradigm. 30 years ago, the public regarded technology in itself as positive. The general belief was that technology could solve every problem. Today, customers have grown sceptical. With the exception of some tech freaks, the majority seems to be no more interested in technology as such, but only in the benefit for one's own wellbeing. Traditional, technology-focused researchers may deplore this, but it is a fact of life to which R&D has to respond. Customers will always want to buy a benefit or a service, not a technology.

R&D trends

Looking at current R&D trends there are many encouraging signs visible that the importance of focusing on the needs of the end-user is understood in the smart-home sector. All over Europe, prototypes of smart homes have been jointly built by vendors, suppliers, network operators and service providers. In some cases these prototypes have been directly tested by real users. As active proponents of user-focused service development we at Eurescom regard this approach as very promising. It is ever again amazing how far the real user behaviour deviates from the predicted user behaviour. This is what adds value to the research work, providing feedback that could make the difference between a successful service and a flop. The European smart home projects have so far proven to be an excellent example of inter-disciplinary R&D between vendors and suppliers from the IT, telecoms, and construction industry, network operators and service providers, as well as architects and urban planning experts.

The challenge is to develop services and applications that are easy to handle and at the same time leave the control of the home environment to the user

Smart home and information society

The relevance of the networked home for the future of society in Europe and beyond cannot be overestimated. In most developed countries people spend a major part of their time using audio-visual media. The average German, for example, spends more than 7 hours per day using audio-visual media. A large part of audio-visual media usage happens at home and serves both entertainment and information. Changing the audio-visual experience in the networked home of tomorrow will, thus, change a large part of our lives. The social challenge that lies ahead is to give everyone the same opportunities to get access to the networked society. The networked home is key to this.

In view of the global demographic change, the smart home could be crucial for the social inclusion of a growing part of society: the elderly. According to UN estimates 22 per cent of the world population will be over 60 by the year 2050. Even today we face the problem that many elderly people are practically excluded from many benefits of the information society because technological barriers are too high for them. The development of the smart home offers a unique opportunity to address the specific needs of elderly people and prepare the way to the inclusive information society.

The challenge for all companies involved in the smart home is to develop services and applications that are easy to handle and at the same time leave the control of the home environment to the user. All of this should be done by developing solutions that can be run on non-proprietary, open e-home platforms, if rapid market growth is to be achieved.

What I am personally really looking forward to is to enter my home without a key through a door that recognises me. The time saved by this alone is worth the effort.

Dear readers,

In the first issue 2003, *Eurescom mess@ge* offers again a broad range of interesting R&D topics. For this issue we have chosen the 'smart home' as a cover theme. There are several reasons why we thought this topic to be timely. First, there are a number of products, services, and prototypes maturing rapidly. Second, there is an important Eurescom workshop taking place in Heidelberg from 20 to 21 March, which covers the latest findings on 'Broadband and Wireless Services in the Future Home'. We do not claim to present a comprehensive picture of the current R&D activities in the area of the 'smart home', which are also labelled networked home, intelligent home, e-home, or even differently. However, we think that we selected some highly interesting aspects in this area, which are covered by exclusive articles written by renowned experts. See for yourself.

Besides the cover theme, there are plenty of topics covered in this issue, which are of equal importance. First of all articles related to the research activities of the European Union have to be mentioned. Under 'Events', we report about an important conference in Potsdam/Germany, which focused on innovation transfer to small and medium-sized enterprises. Under 'European issues' you will find a report about the current state regarding Framework Programme 6 (FP6).

If you are already planning your summer holiday at the beach and dream of diving through beautiful reefs, you might be interested in the latest research results on underwater communication, which are covered under 'A bit beyond'.

We hope you will find the contents of this issue interesting. Please tell us what you think. Your feedback is important for us, the editors, but also for the authors, who spent a lot of time giving you exclusive insights in their work.

Finally, we would like to raise an organisational issue: In distributing *Eurescom mess@ge* we sometimes encounter the problem that the mailing is returned to sender. So please inform us, if your address changes. For your convenience, there is a form on the Web, which can be used both for address updates and for subscriptions, at www.eurescom.de/message/subscribe.asp. Please use it.
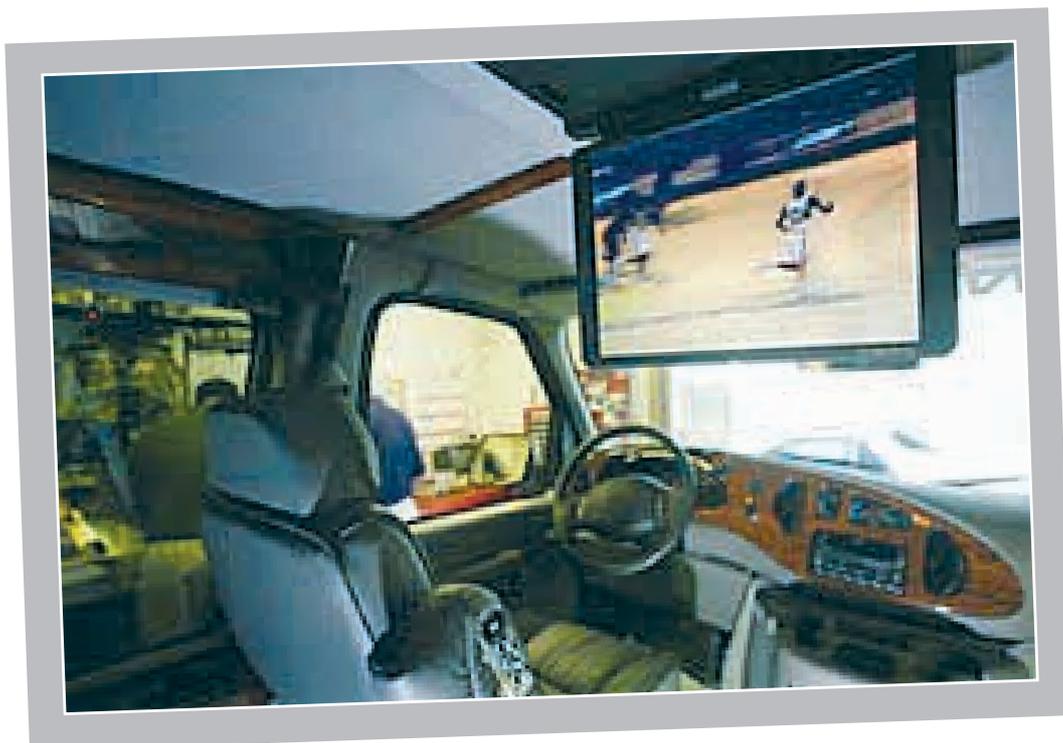
If you are interested in contributing yourself as an author to one of the next issues, please contact us, and we discuss if and how it would fit. Please do not send unsolicited articles but rather a short abstract and a short biographical note about yourself.

Enjoy the magazine!

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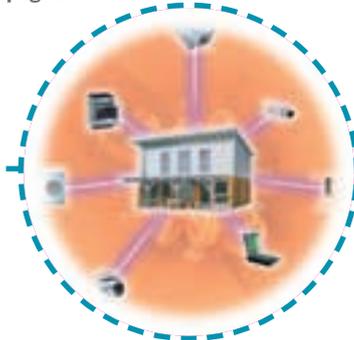
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Big telecoms players enter mobile gaming

In February, two big players have given a further push to mobile gaming. On 5 February, Nokia launched its new handheld games-platform N-Gage in London. At the same time, Nokia and T-Mobile International announced to co-operate in the development of new mobile services for the N-Gage game deck. The Nokia N-Gage game deck enables interactive games by introducing a wireless multiplayer platform for both local and remote gaming.

Mobile gaming in Western Europe will grow from € 500m in 2003 to over € 3bn in 2005, according to a market forecast by Danish consulting firm Strand Consult. John Strand, CEO of Strand Consult, is, however, sceptical how many mobile consumers will be interested in buying a game-focused platform like N-Gage. According to the study by Strand Consult, games forming the primary focus of the N-Gage platform will only comprise a modest percentage of the total mobile gaming revenue. Other forms of gaming like betting and lottery games, TV voting, and interaction with game shows, the study says, will contribute to the predicted revenue growth.

The positive estimate of the service opportunities of mobile gaming is in line with the results of Eurescom's project on 'Mobile Electronic Commerce' (P1102). The project has analysed service scenarios for mobile gaming in the broader context of a number of different mobile commerce services. The confidential project results are available for Eurescom members at www.eurescom.de/ public/projects/P1100-series/p1102/

European user survey on 3G

Forty two per cent of European mobile phone users are interested in 3G services. The good news for telecoms operators and manufacturers: the majority of those users interested in 3G were prepared to pay extra for 3G handsets and services. This is the central result of a user survey carried out in 10 European countries by TNS Telecoms.

Half of these respondents who stated that they were interested in 3G services (21 per cent of all mobile users), said they would pay an additional 6 to 10 euros per month for some 3G services such as MMS, high speed internet, and e-mails.

Similarly, those interested in 3G services would also be happy to pay more for a 3G handset than they paid for their existing one. Across all countries surveyed, the majority of respondents would be willing to pay up to 330 euros for a 3G handset. However, this figure changes considerably by country, depending, among other reasons, on whether handsets are subsidised by the operators, as in France or the UK.

Users interested in using 3G applications are most interested in sending and receiving e-mails on their mobile phones (77 per cent) or using videophone handsets (77 per cent). They are least interested in downloading music files and viewing video clips (47 per cent and 40 per cent respectively were interested).

On average, 42 per cent of all mobile phone users are interested in 3G. Interestingly, mobile phone users in Eastern Europe show more interest in using 3G applications than their counterparts in Western Europe. 59 per cent of users in Turkey and 51 per cent in Poland said they are 'interested' compared to only 34 per cent in the UK or in Germany. 48 per cent of men are interested in 3G compared to only 36 per cent of women.

Further information on the survey is available at www.tnsofres.com

For comparison see also the confidential results of Eurescom's European ICT user survey, which are available to members of Eurescom at www.eurescom.de/public/projects/P900-series/p903/

For non-members the database 'Information and Communication Technology Uses in Everyday Life', which is based on the project results, can be tried out and purchased at http://eurescom.img.is/

Building the smart home
Technology for a better quality of life

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How many technological devices do you have at home? You may be an adept of home networking with some wires all over your place, or even have already installed Wireless LAN to avoid your vacuum-cleaner to get stuck in a messy wiring on the floor. However, do your connected home devices fully satisfy you?

User friendliness

No doubt user friendliness will be one of the critical issues that companies in the area of home networking and services will have to ensure in order to make the smart home happen on a large scale. Even as an engineer I am myself sometimes annoyed by the cumbersome programming of such common devices like videotape recorders.

The challenge of integration

The first step towards the smart home is to have technological devices or appliances at home, like a PC, a satellite dish or a decoding unit. The next important step is to make all those entities talk to each other in order to multiply the possibilities, facilitate the control and ease of use. Some standards are emerging but some work remains to be done. So far no integrated offers are made to the end-user.

This is all the more problematic as a private user usually considers the purchase of home technological devices as a real investment. Given the current market and service offering, there is a risk that some 'online' homes may look like a jigsaw puzzle of pieces which are incompatible or at least not making use of all technological possibilities.

Market prospects

Some surveys show that reaching the market segments beyond the group of early adopters of technology will be difficult at least in the next couple of years.

The market size will depend on the services to be offered and their price. In the case of Switzerland the market size range is estimated between 5% to 50% of the residential homes according to the different possible scenarios.

Whereas in the United States it is estimated that by the end of 2005, U.S. households will have more than 80 million connection points for entertainment-specific applications (Parks Associates report).

We should also not forget that housing ownership is an important factor in the incentive to invest in home improvement. No global conclusion can be made today. However, it is already obvious that home networking deployment will be easier and quicker in some countries where the ground is already prepared like in the US or in Scandinavia.

The current situation should be an incentive to potential business players in the area of home networking. Network operators in particular start positioning themselves to provide integrated solutions and services to the users. Since home networks will often be installed by the end-user or by non-technical people, they need to be very easy to install or they will not be a market success. In view of the existing and legacy equipment it must be taken into account that most users are not willing to invest in new expensive equipment every year.

Service and network architecture

As a consequence, open and scalable platforms as well as automated configuration are necessary. Eurescom project P1206 on 'Broadband Services in the Intelligent Wireless Home' has been working on those issues. In this project Telenor, Swisscom, Deutsche Telekom, France Telecom, and Elisa Communications have been performing collaborative research to get a clearer view of possible service and network architectures in the home area and to help network operators achieve a stronger position towards suppliers.

Connecting your house to the wide area networks means that administration functions are required for configuration, management, and maintenance. Security and reliability are expected by the users and are challenges that could be solved in particular by telecom operators.

Visions for the smart home

If the vision of the smart home becomes true, networks will not only make your house more intelligent inside, they will also allow you to solve your daily home rou- tines remotely and to enjoy more person- alised entertainment and targeted servic- es from your favourite chair.

Users should not regard technology as a problem, also if they are no high-tech fans. Even today it is possible to enjoy life in a smart home.

If you are not fully convinced read about the Steiners enjoying their 'Futurelife', or, even better, visit them in the quiet Swiss village of Hünenberg. There you will see how technology can improve the quality of life.

This issue of *Eurescom mess@ge* presents a selection of exclusive articles covering different aspects of the smart home. You will get some concrete visions for home networking from Eurescom project P1206, as well as a presentation of the 'inHaus' testing and demonstration center in Duis- burg/Germany, and finally an exciting report about the experiences of real inhab- itants of the 'Futurelife' house in Switzer- land.

Home networking
Eurescom project P1206 explores the Intelligent Wireless Home

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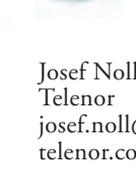
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This article summarises the basic con- cepts and goals of Eurescom's project 'Broadband Services in the Intelligent Wireless Home' (P1206). The project started in June 2002 and addresses the smart-home concept from a network- operator perspective. Project activities include the examination of new broad- band and wireless technologies that are slowly coming to our homes, the analy- sis of usage scenarios to evaluate user needs and service value, and the formu- lation of a vision for home networking. Finally, the participants from five Euro- pean network operators will propose a platform architecture as a home net- working solution.

Home networking is meant to smartly inte- grate technologies such as user devices and appliances connected to various home and remote networks. This will enable users to acquire new habits and may even, over time, influence their behaviour and social structure. The process usually begins by acquiring the enabling technology, learn- ing to use it, applying it to solve problems, adding value to daily life, and exchanging experiences with other prospective users.

This cycle is likely to be repeated every six months. Consequently, support is needed for the majority of these users.

We view home networking as the base on which these new behaviours and social values can be launched such that everyone can make their own choices to suit and enhance their life quality. However, oper- ators may have a 'moral' and a challeng- ing responsibility towards their customers by ensuring that a home network solution is easy to use, safe, secure, obliging, sup- ported and skill responsive!

The vision
The project sub-title 'My Home Sphere' expresses a vision of the home of the future. My Home Sphere will provide the users with seamless and personalised services which will make their home even more enjoyable. These services will be tailored to the well-being as well as the communi- cation and entertainment needs of the users. Services could be offered in an intu- itive way, getting input from sensors in your home and from your known prefer- ences for example regarding control, light, and temperature. A broadband and wire- less communication infrastructure will support My Home Sphere services and in particular allow you to exchange person- alised multimedia messages with your family and friends.

User scenarios
"My Home Sphere" will be configured and profiled to match different life styles. Typical scenarios investigated are described below.

■ **A single, active professional**
32-year-old Kurt is an early adopter but not a technology freak. His favourite ser- vices are Unified Messaging Services (UMS), Personal Video Recording (PVR), security alarm, electrical switch control, sharing home-made videos and digital pho- tos with his friends, and listening jointly to music using a videoconferencing serv- ice. Kurt has an advanced set-top box but it is his personal digital assistant (PDA) that provides him with full control of the home while travelling and at work, so he carries his PDA with him everywhere he goes except under the shower and in the bathtub. He does not feel overwhelmed by all the technology in his home because the system has been developed gradually and with the support from his friends and online learning/support. Although the sys- tem has never failed, he does not trust it completely, e.g. Kurt has not installed an electrical opening mechanism to his front door yet.

■ **A couple, active professional, without children**
Maria is a free-lancer around 30 working in the IT business. Maria lives together with her boyfriend in an apartment. Both are early adopters of new mobile termi- nals, fingerprint recognition, home secu- rity, automated light and air control, and more. They have the latest home enter- tainment system, which starts immediate- ly to play a selection of personalised music as soon as one of them enters the apart- ment. Besides staying together for the future, the young couple dreams of access- ing and editing all available media.

■ **Home with children**
Erkki is a 43-year old entrepreneur. He lives together with a 9-year old daughter and a very unreliable companion named Kalle. Erkki wants to enjoy his life with-

out unnecessary worries about his family members and their daily needs. He uses smart devices and related services to save time and make daily routines as easy as possible.

■ **Elderly people**

Grandmother Martha is 69 years old and lives alone in her small home. She has recognised that she is no longer mobile and sometimes feels lonely and forgotten. A recent advertisement combined with the strong encouragement by her children motivated her to subscribe to My-Home-Sphere services. The included security and health care devices and services give her now a good feeling of being well protected. Videoconferences, gymnastics in tele-communities, network games like crossword puzzles, old favourite tunes and entertainment help her to feel an active part of society.

Technology

In the last years a number of innovations and developments have been done in the whole chain starting from the user terminals through the in-house networks, gateways, access networks to the services. Corresponding devices will be soon available on the market at acceptable prices. All these innovations can now co-operate to realise the vision of My Home Sphere and to change the home from a conglomeration of appliances to a single harmonic system.

Architecture of 'My Home Sphere'

The architecture of the My Home Sphere system consists of:
■ Wireless mobile user devices
■ A home server connected to fixed and wireless home networks and to broadband links
■ A remote My Home Sphere server

Together they shall offer:
■ Easy configuration and interaction with local appliances
■ Easy finding and interacting with remote service providers
■ Personalisation, location awareness and context awareness

The technical and service platform components of the system are shown in the figure.

Solutions are investigated concentrating primarily on the home server and the 'My Home Sphere' server. Both are platforms from which an operator can launch a wide range of secure personalised services to users and take the responsibility of the proper operation and management of these services. Solutions for 'My Home Sphere' services can be provided by both network operators and third parties. Additionally, these solutions should securely allow owners and service management companies a secure remote access to homes.

Next Steps

The second phase of the project will examine various standards proposed for the home server and the 'My Home Sphere' server, namely service gateways, like OSGi (Open Service Gateway Initiative), Multimedia Home platform (MHP), Cable-Home, and more. Analysing these standards will help to define the required criteria during the assessment of service-gateway products. Demonstration platforms are planned to facilitate important aspects of a service gateway such as architecture, security, personalisation and profiling, user interfaces, and remote management.

About the project

Eurescom project P1206 started on 1st June 2002 with a planned duration of 18 months. First demonstrations are planned for the Eurescom workshop 'Broadband and Wireless Services in the Future Home' in Heidelberg on 20 - 21 March 2003. Further demonstrations resulting from co-operations with industrial partners will be presented during the Eurescom Summit 2003.

Additional information is available at www.eurescom.de/public/projects/P1200-series/P1206/.
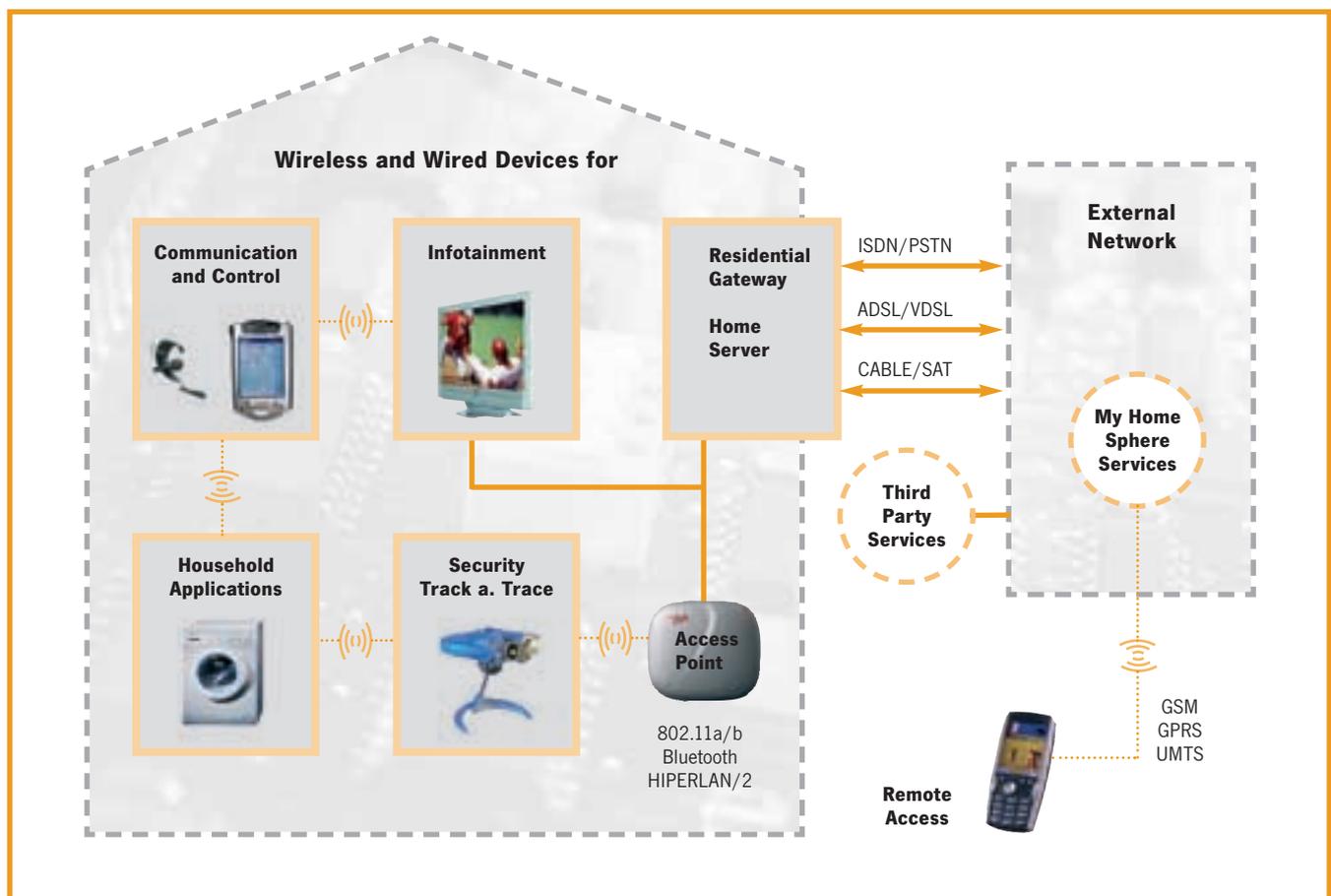
My Home Sphere system

Living in Futurelife
Meet the Steiners in their smart home in Switzerland

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For more than two years, Daniel and Ursi Steiner have been living in the future, together with their two children. The future takes place in the small Swiss village of Hünenberg. The Steiners participate in a project called Futurelife and can pride themselves of being the first permanent inhabitants of an intelligent house world-wide. Intelligent household appliances and prototypes from more than 60 partner companies have been tested for their usefulness in daily life.

The future cannot be recognised from a distance, this is the basic belief underlying the Futurelife project. The Steiners' home does not look any different from the other houses in the residential area of Huobhalde. The bells of cows grazing in the field across the small street provide quite a rural feeling in the neighbourhood. Bushes are planted neatly in the little garden, and looking down the valley, sunrays are reflecting on the lake of Zug. More than 20 families are living in the terraced houses, one saddle back roof next to the other. Each house has three levels and a living space of about 150 square meters. Only a gentle buzzing sound behind the bushes indicates a different lifestyle of the Steiners.

While the neighbours are pushing conventional lawn mowers over their lawns to provide a perfect Swiss picture of their garden, Daniel Steiner is sitting very relaxed at the garden table, sipping a coffee. He doesn't have to bother cutting the grass in his garden. "This is the job of the bug," he explains. The 'bug' is a solar-energy-driven lawn mower, which is guided through the garden by an underground induction loop. Steiner's 'bug' is autonomously cutting grass from spring to autumn, in a time saving, gentle and environmentally friendly way. As the machine is constantly in motion, the cut grass doesn't have to be collected, because it falls to the ground and serves as fertiliser, closing the biological cycle.

Overcome inhibitions
On first sight, nothing spectacular can be seen within the house although it is packed with electronic components. "We have chosen this design very consciously", explains Daniel Steiner (40), who is living in the Futurelife house with his wife Ursi (42) and the two adopted children Grace (13) and Carlo (6) since 26 November 2000. "Futurelife's raison d'être is the testing and presenting of technologies, which are really functional and facilitate people's lives," says Daniel Steiner . There are no little robot dogs and other fancy gimmicks in the house. "Many visitors are not only coming with expectations, but also with inhibitions. In order to overcome these inhibitions, we would like to present the technology of tomorrow without any show", Daniel Steiner explains.

This technology facilitates live from dusk until dawn. Not all the opportunities are everybody's favourites within the family: Ursi Steiner resigns in view of the automatic temperature regulation in the shower. She hardly ever uses the saved data profile of preferred water temperature. "Sometimes I like the water a bit cooler, sometimes more hot, that depends," says Ursi Steiner. But the automatic door opening system of the front door is something she would not want to miss. "It is very practical, if you do not have to find the key first and neither have to put down the flower pot you have just purchased, in order to enter the house". A sensor recognises the chip in her wristwatch, opens and locks the door automatically. Grace, the daughter, is carrying the chip as 'jewellery' around her neck. Daniel carries it in his trousers and Carlo as a toy. If a family member forgets his or her electronic key, the biometric lock-system opens the door via fingerprint.

Complex network
In every household an average of 20 appliances with a built-in chip can be found. Only few of the options of these appliances can be used, because they are talking different languages and are not able to communicate with each other. The appliances and installations in Futurelife are networked in a unique way. Most of them can be operated easily via computer, from the mobile phone, or even from the car – a research vehicle of BMW.

Communication in all directions
The chaos of having a bunch of different remote controls belongs to the past. Futurelife has one central control system, not a tool but a software based on Internet technology.

The physical remote control can be done from the computer in the office, from the touch screen in the kitchen or one of the portable web pads. The handling is very easy. The graphical user interface is always the same: on the schematical display, the single levels of the house can be selected. Each appliance, every light switch, and every plug can be operated via touch screen. The children prefer the portable web pads, which enable them to surf the Internet no matter where they are. In addition, they can play a wide range of games with the web pads. Sometimes, Daniel Steiner browses the latest news with his web pad when he is already in bed.

The (wo)man-machine communication is reciprocal: no more waiting at the washing machine in the basement until the spin cycle is over. The washing machine sends an SMS as soon as the laundry is clean. Furthermore, the washing machine communicates with the dishwasher and the dryer in order to work with the least possible and cheapest possible energy. As soon as the energy market in Switzerland will

Ursi Steiner attending the oven.

The Steiner family enjoying their smart home.

be liberalised, the appliances will automatically choose the cheapest provider. For manufacturers options like these mean totally new service scenarios. Networked appliances would report errors automatically to the manufacturer. Software updates could be loaded via Internet, and service staff would never again bring the wrong spare parts.

Saving time and money

Online-shopping saves Ursi Steiner four to five hours a week. The bulk buying for the weekend does not belong to Ursi's life any more. Ursi buys all regularly needed goods, from pasta to cleaning supplies, via Internet. Directly from her kitchen she orders the required items either by choosing them from the choice of Internet shops or by scanning the barcode of a specific item. Nobody needs to be at home when the delivery person brings the ordered goods. The delivery person of the supermarket receives a code via SMS which grants access to the Skybox, something like an oversized letterbox with integrated fridge and freezer located at the outside of the house but accessible from the inside as well for emptying the box. "Today, I have much more time for fun shopping", explains Ursi Steiner. In case she is tempted too much and time gets tight, the programmed oven might be due to finish the prepared dish a bit too early. However, this is no problem for her: Ursi contacts the oven from the car and delays the starting time. The intelligent oven, at the same time cooker and convection oven, is also a big help if the Steiners have unannounced visitors for lunch. The oven suggests dishes, calculates amounts of ingredients for any number of guests, creates a shopping list and calculates the cooking time.

Integrated energy saving

In the network an environment-friendly system is integrated. The dishwasher, for example, measures the dirt particles of the water and optimises the programme with the goal to save time, energy, and water, no matter if the machine is half-empty or full. The heat-pump-driven dryer consumes only half the energy of a conventional dryer. The sun provides hot water via the collectors and electricity in the photovoltaic cells. Solar energy provides energy for warming the floor heating in wintertime. This can be reversed in summertime, providing the Steiners with a nice and cool floor.

According to the weather conditions, the windows open and close automatically constantly providing fresh air and an optimum ventilation.

Materials like a shower cabin made from PET and fittings made from chrome steel are environmentally friendly beyond their span of life, because they are fully recyclable or easily disposable.

Individual set control

Another advantage of the network is the capability to be able to compose sets with different parameters via the Bus system. With one single command on the touch screen in the kitchen, either from the computer in the office or, mostly, from one of the mobile web-terminals, a number of processes are initiated. If a member of the family enters, for example, the command 'TV', the blinds are automatically lowered, the curtains close, the lights are dimmed, and a data projector is lowered from the ceiling and projects a picture on the wall across the room.

Futurelife is connected to the network via optical-fibre cables, enabling broadband Internet access and high data rates. The Steiners are always online: even when they watch TV, they can have, in parallel, a smaller window with Web sites open on the TV screen.

If the Steiners go on vacation, their neighbours would hardly notice if the family wishes so. The house has saved the behaviour patterns of the family in the preceding 30 days and simulates the presence of the family, including all activities like switching on and off the light or opening and closing the window shades.

Tests in daily life instead of labs

Futurelife is not the only model house, but it is unique compared to other projects in Germany, the UK, or Italy, because it is an inhabited intelligent house. The Steiners are not only testing the appliances for their functioning, but also for their usability in daily life, thus probing their value to the customer. Their experiences are being documented. The Steiners provide input for improvements, enhancements of the new appliances or prototypes to the manufacturers. Futurelife is a vision factory, which is based on user tests not in labs but in daily life. The approach of this project allows target-oriented and market-driven statements. In this respect, Futurelife rewards the partner companies in a very direct way for their involvement.

Further information on the Futurelife project is available at www.futurelife.ch

inHaus Duisburg
Added-value services for integrated house systems

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In spite of partially euphoric market forecasts, marketing results of intelligent house systems in the field of residential buildings and small trades have not been satisfactory at all during the past ten years. Causes and reasons are manifold. Meanwhile, the advancing technologies concerned with computers, the Internet, cellular phone networks, and multimedia devices are beginning to incite the potential market for intelligent systems in the fields of living and working from a very different direction than we have been used to so far.

Intelligent house systems

In accordance with this development, the technical conception of the inHaus centre comprises the creation of integrated platforms – spanning formerly separated maintenance groups, such as heating, ventilation, and air-conditioning – for novel system applications on the basis of open communication standards, like OSGi (Open Service Gateway initiative).

Within this project, the inclusion of all relevant equipment and communication standards is meant to make sure that application functions of intelligent house sys-
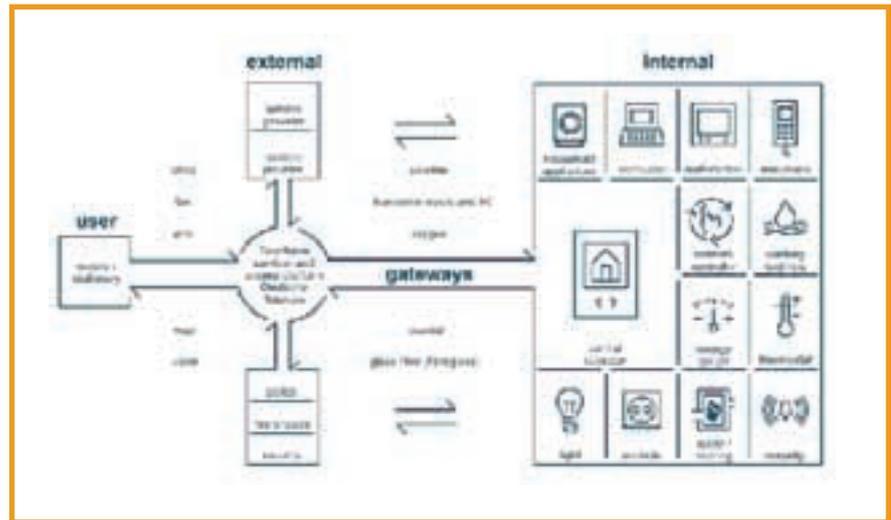
Overview of internal and external structures of the inHaus centre Duisburg including TeleHome service and access platform

tems can be tapped to their full potential. Devices, functions, and communication standards of multimedia technologies and conventional building services engineering as well as building automation are connected with each other first and are then connected to the external services of the Internet by means of a home manager- and service-gateway. The integrated inHaus-system solutions are tested technically as well as regarding real usage in the inHaus facility. For this reason, they are tailored to potential target markets, such as housing estates for senior citizens and vacation rentals. Thus, partial solutions and variants do certainly make sense and are practicable depending on the concrete project.

TeleHome platform

Technologies and services for the networked home can only be successfully designed and introduced, if the people involved – manufacturer, service provider, home owner, craft, and others – join in good time to co-operate on projects such as inHaus Duisburg, in order to experiment, learn and reach the requisite standards.

In the future, there will be no restrictions on the terminal equipment that can be connected to these systems: lighting, heating, thermostats, household appliances, consumer electronics, sensors, actuators, motion detectors, video cameras, communication systems, alarm systems, sprinkler systems, and consumption measurement devices.

However, a home is only really 'intelligent' or 'smart', if it is not only networked within but also linked to the outside world. In the case of inHaus, the system integrated

into the house is enhanced with TeleHome, Deutsche Telekom's secure access and service platform in the Net. The house owner, or a service provider acting in his name, can access his home from outside via the Internet, voice control, or WAP. Problems or alarms from the home can be reported per e-mail, fax, SMS, or a generated voice message.

How does this all work in the inHaus project? When you use your mobile or fixed-network phone, for example, you don't speak to inHaus directly. You actually communicate with a personalised home portal, which is generated on Deutsche Telekom's TeleHome platform. This home portal, which can also be used as a Web or WAP variant, bundles not only information on the status of your home but also other important information. This

Living and working within intelligent house systems: the building of the inHaus testing and demonstration centre in Duisburg, which includes a living laboratory house and a workshop house.

Typical terminal device for internal and external use of TeleHome services: personal digital assistant (PDA) or a smart-phone, mobile digital assistant (MDA)

includes e-mails, voice messages, faxes, local weather and traffic reports, offers from shops nearby, the latest information on the appliances installed in your home, and even a family calendar that can be used by all those who live in your home. You can also use the portal to delegate tasks to inHaus appliances, like a video-tape recorder, or to control the system as a whole, for example 'set home to absence': lights off, reduce heating setting, lower blinds. In addition, the platform communicates active status to you personally, or to monitoring companies or suppliers. Status messages could be messages like 'everything OK', 'broken kitchen window', or 'oil tank almost empty'.

The TeleHome platform also guarantees secure access to selected appliances in the home for servicing and other purposes. It assumes responsibility for automatically providing a service offer tailored to your appliances and infrastructure, from MP3 tracks for your MP3 player to software updates for your washing machine.

The TeleHome platform communicates with inHaus via T-DSL. inHaus communicates per mobile network, via the existing electrical cabling or a separate data bus. Example: a gateway will forward data to the video recorder or the heating system, or pass data to the platform for further processing or forwarding. The gateway offers various performance levels and, equipped suitably, implements specific

service functions itself, like, for instance, an evaluation of different sensors, which can send a qualified alarm message to the platform if required. The functions that are implemented on the gateway can be downloaded dynamically from the service platform to the gateway, dependent on the appliances that are connected in the home and the functions that are activated.

About inHaus

The Intelligent House Duisburg Innovation Centre, abbreviated 'inHaus', is a thematically and organisationally unique and integral concept in the field of product-oriented innovations for a networked life. The basis of the project is the inHaus facility in Duisburg/Germany, which includes a residential home, a workshop, a networked car, and a networked garden.

17 prominent national and international companies, which hold five-year contracts with the Fraunhofer Institute, are involved in this project. The project is supervised by the IMS Duisburg, the Fraunhofer Institute for Microelectronic Circuits and Systems.

Further information is available at www.inhaus-duisburg.de

Telekom Austria
Communication is our business

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Telekom Austria Group is Austria's leading communications provider and by far the largest telecommunications group in Austria. The Vienna-based group is the only Austrian company fully listed on the New York Stock Exchange (NYSE).

Telekom Austria is Austria's incumbent national telecommunications operator. Previously 100 per cent owned by the Austrian government, the company has gone through a radical strategic transformation. Prior to 1998, our telecommunications services were operated as a division of Post and Telekom Austria AG, which provided telecommunications, postal and public transportation services in the country. Since its IPO (Initial Public Offering) in November 2000, Telekom Austria's shares have not only been listed at the Vienna Stock Exchange, but the group is also the first Austrian company to be quoted at the New York Stock Exchange (NYSE).

In parallel, Telekom Austria Group has gone through a transformation from a fixed line network operator to an information and communications group that offers a wide range of services from fixed line and mobile telecommunications to multimedia and business solutions.

At the beginning of 2002, the Telekom Austria Group had about 16,600 employees. The group has international subsidiaries in the Czech Republic, Slovenia, Croatia, and Liechtenstein. Telekom Austria is the leading communications provider for fixed line, mobile, data communications, and Internet services in Austria.

Business Segments

Telekom Austria is focused on becoming an exemplary customer-oriented organisation. At the end of 2001, the supervisory board approved the new Wireline organisation, which became effective at the beginning of 2002. The company is now no longer divided into the technology-oriented fixed line, data communications, and Internet business segments.

These segments have been merged into a customer-oriented structure, which includes a wholesale division targeting telecommunications operators and a retail division for end-user customer services.

The Internet segment focuses on content and portal services. As part of this process, Telekom Austria AG reintegrated its wholly owned subsidiaries.

Research activities

Innovation is the combination of creativity, technology, and marketing leading to new or enhanced products. We believe that research and development are important to our continuing success and to keep innovation leadership. Co-operation is a very concrete thing for Telekom Austria; it is about the transfer of results and knowledge. In the research sector today, Telekom Austria enters into co-operation ventures in specific areas in the form of 'Partnerships of Excellence'. This is manifested in numerous co-operation projects with universities, research institutes, technical col-

leges, well-established industrial partners, but also by participating in research programmes in Austria as well as on an international level. The operative backbone of the Wireline research activities is located in our strategic product and technology development division.

Our participation in projects within the research initiatives of the European Union with focus on information technology as well as participation in Eurescom projects is of considerable importance to us. However, R&D activities on national level, such as participation in the Research Center for Telecommunications Vienna within the government's K-Plus Programme, are also important to us. Besides Telekom Austria's multilateral activities there are a number of bilateral initiatives.

Research highlights

The cultural change in Telekom Austria has also manifested itself in the strategic orientation of research and development. Until recently, research was only technology driven. Within the past years there was a considerable shift to consumer oriented topics. Thus, our current research programme covers both technology and market aspects.

To assure technological leadership in the future, Telekom Austria see the further study of changing user patterns as an integrated component of its innovation management.

■ **Study of new content and new forms of communication**
The social and cultural area has changed considerably through new technologies and vice versa. Young people find partners for their interests and ideas less frequently in the neighbourhood or school class, but in new forms of community such as the youth scene or in cliques. Due to the close relationship between market and technology aspects we had an in depth investigation on circulation and use of multimedia content and value added services, which goes hand in hand with the availability of broadband networks.

■ **In depth analysis of media streaming and broadband portals**
With the development of the Internet from an information source to an interactive multimedia-platform, audio and video content may be delivered 'on mouse click' now. Telekom Austria looked into the challenges of broadband portals in terms of customer acceptance, service bundling and content delivery network infrastructure.

Our technical focus areas include the wide range of Broadband Access, All Optical Core, Service Platforms, Applications & Services, and Security and Support.

Telekom Austria and Eurescom

Telekom Austria has been committed to Eurescom's reseach work since its early days. We value the principle "more value for money" by sharing knowledge and experience with other operators.

Our participation in recent Eurescom projects has covered various technical areas such as voice technologies, quality of service, IP networking and evolution, and more.

Just to mention some of our recent activities:
■ Over the years, the challenges of network-integration testing have been addressed by Telekom Austria in several projects. It has started with various ISDN projects. Recently, the adoption of the P1016 MINIT project results by ETSI has stressed the value and reputation of the results achieved in this project.
■ The future of IP networks is key to operators like us. In order to be prepared for the challenges that will go along with the introduction of the next generation Internet protocol IPv6 we participated in P1113 Tsunami, which investigated the planning and building of IPv6 networks.
■ Managing end-to-end QoS in a heterogeneous IP network is a significant challenge to network operators. In P1115 Saltamontes we evaluated issues related to QoS, implemented by the Differentiated Services approach and Multi Protocol Label Switching (MPLS).

Telekom Austria Profile

Telekom Austria is Austria's leading provider of telecommunications services and one of the top 5 companies in Austria. The group has two main business areas: the Wireline segment encompasses fixed line telephony, data and Internet; the Wireless segment comprises mobile communications. Telekom Austria has international operations in the Czech Republic, Croatia, Slovenia, and Liechtenstein.

With approximately 15,280 employees (end of September 2002), the Telekom Austria Group had total managed revenues of € 3.9 billion in the business year 2001 and revenues of € 2,899.8 million in the third quarter of 2002.

Further information on Telekom Austria is available at www.telekom.at

International Symposium on
Innovation Methodologies
A new perspective for European innovation

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Sustainable economic growth is closely connected with the ability of individual companies and the national economies as a whole to innovate. Strong efforts are dedicated to learning the mechanisms of innovation to overcome barriers in an ever-changing environment.

The European Union has recognised this challenge for a long time and has implemented a special programme within its 5th Framework Programme called 'Innovation and SMEs', aimed at small and medium-sized enterprises (SMEs) to support the innovation process. More than 70 projects with about 700 involved organisations have been started by the programme, dealing with technical and organisational innovation, supported by 6 accompanying measures and 5 clusters of projects.

An international symposium on innovation methodologies took place from 4-6 December 2002 in Potsdam, Germany, and brought together participants from European innovation projects and accompanying measures as well as representatives from research bodies and policy makers. The symposium was organised as a two-day workshop, followed by a one-day conference.

Diversity and complementariness
It is within the nature of the programme that the individual projects and activities are quite diverse. Diversity is critical, because innovation projects are quite different in their nature and the subject they are addressing. "Diversity is often seen as an obstacle, more than an opportunity. Turning it into an opportunity is not easy, but it implies a high potential of creativity", said Dr. Lars Karlsson from the Department of Education at the Lund University.

For getting the most out of the programme for the benefit of the European economy there are a number of questions that were extensively discussed among the participants, like:
- Could it be possible to find a model for determining when diversity is welcomed and when homogeneity is preferred?
- What are the consequences for human resources development, and how can

Wolfgang Gessner (VDI/VDE-IT, Germany) presented innovation aspects of the 6th Framework Programme.

organisations organise training across different disciplines?
- How can we organise knowledge, and what are the concepts of knowledge creation, application and transfer?

During a poster session participants took the opportunity to exchange their views on aims, challenges, and experiences regarding their involvement in innovation projects. This session facilitated the networking of experts at the level of individual companies and organisations, beyond the networking at the project level.

Innovation project management
Project management is obviously a key factor to project success. During a separate session the participants discussed their experiences stemming from different approaches to project management. As with all collaborative projects, the main issues that became apparent were:
- Cultural differences and trans-national management
- Trust building and baseline understanding of the commitments and actions
- Communication and dissemination
"The main role of every project manager is to get the most out of the competences of the team", said Mr. Bengt Brattgard, one of the main facilitators of the symposium.

Communication strategies
A selection of information and communication tools was presented and demonstrated that are supporting communication within clusters of innovation projects. These tools have been developed in innovation projects and focus on the specific requirements posed by diversity.

Improving innovation
On the third day of the symposium, a conference was held with a number of high profile speakers. Some of the highlights are covered in this article.

In his introduction Mr. Wolfgang Geßner, head of the department 'Innovation Europe' of VDI/VDE-IT, stressed that Innovation is vital to boost EU competitiveness and that Europe is under-performing, compared to the US and Japan, in productivity growth due to insufficient innovation activity. He appealed to all member states to upgrade their innovation policies.

Mr. Engelbert Beyer from the German Federal Ministry of Education and Research gave an overview on the German policy related to supporting innovation. The main priorities currently include to increase private R&D spending, to stabilise venture capital markets, to create lean funding mechanisms, and to increase support for SMEs.

Joao Mena de Matos (European Design Centre, Netherlands) summarising the workshop results.

European Design Centre in Eindhoven said that the main challenges ahead are to increase the transparency of available expertise and knowledge in innovation and to improve the dissemination and marketing of innovation results through user and consumer involvement.

To address the challenges he proposed to create an 'Innovation Toolbox' to enable access to innovation knowledge, create awareness in industry, and support policy decisions at European and national levels. Finally he proposed to launch a 'European Innovation Award' to promote and communicate the best and most successful innovations.

More information about the symposium is available at www.innovation-show-case.net and www.innovation-matters.net

Professor Dominique Foray, Research Director at the Centre for Education, Research and Innovation of OECD, pointed out that the domain of innovation is larger than the innovation of an organisation and that the unit of analysis must be larger as well. The production and collective adoption of innovation occurs in different areas, for example:

■ As a result of industry-university interaction (start-ups and adoption in large companies)
■ As a result of user-producer interaction and
■ In industry consortia

Mr. Christopher John Hull, Deputy Secretary General European Association of Research and Technology Organisations (EARTO), analysed current and emerging trends related to 'improving innovation'.

These trends include:
■ Increase in R&D outsourcing
■ Reduction in public institutional funding for R&D
■ Search for alternative, autonomous income by academia
■ Growth in technology consulting and services
■ Increasing acceptance of 'Commercialism' in universities

Conclusion

Concluding the conference and the whole event, Mr. Joao Mena de Matos from the

Systems beyond 3G
Eurescom project P1203 explores the operators' vision on B3G

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Third generation (3G) mobile systems are currently being rolled-out worldwide. Although commercial offerings of 3G services have only been started in few countries, the identification and definition of systems beyond 3G is already progressing. Systems beyond 3G are considered to encompass heterogeneous access networks to provide highest availability of mobile connectivity. These systems are not only expected to integrate several network platforms. They also strongly encourage substantial richness of services and applications and promise to provide virtually unlimited opportunities to a global, connected user community. Eurescom project P1203 identifies key drivers of these next-generation mobile systems from an operator's perspective.

Until now most discussions regarding systems B3G have focused on wireless transmission technology. In the past, generations of mobile systems were in fact mainly characterised by different radio interface technologies. However, there is mounting evidence that the manufacturer-led evolution to 3G has not succeeded to adequately address the economic realities of high-speed cellular service provision. For mobile systems B3G to commercially succeed, operators will have to move beyond merely providing different networks and air interfaces. To meet the various user expectations and to promote the acceptance of emerging services, their mobile business will have to comprise user-intuitive abstractions from network layers, the provisioning of personalised value-

added services as well as the implementation of novel business models.

On the way to systems beyond 3G

Building on results from previous Eurescom studies and projects, the work of P1203 is expected to clarify and strengthen the operators' position within the evolution beyond 3G. Eurescom project P1145, for instance, has already shown that future systems have to focus on users and services – not only on technology. Within P1203 the vision 'It's simple, it works, it's personalised' is brought forward, combining the quality of the telecoms world ('it works') with the possibilities of the IT world ('it's simple') and the user context ('it's personalised'). Based on P1145's roadmap beyond 3G, several application scenarios have been selected to illustrate key features and drivers of future mobile systems. Open systems B3G will also invite new players to enter the market, shifting the focus from competition on geographical coverage and price to competition on services. As a consequence, the traditional role of mobile operators is likely to change.

Key drivers of systems B3G

With the variety and complexity of services constantly increasing, we can only grasp a vague impression of how most end-users will soon be confronted with a broad variety of services and ways to combine them. Difficulties in using and accessing new services have already been the most frequently mentioned reasons for slow service adoption in the past. This might even be more so for novel-media-type services or context-aware applications of the future. As a consequence, it is critical that future users are able to get intuitive and convenient access to the services they personally need in a given situation. Within B3G environments, we expect operators to aggregate services and partner products going beyond sole connectivity provision-
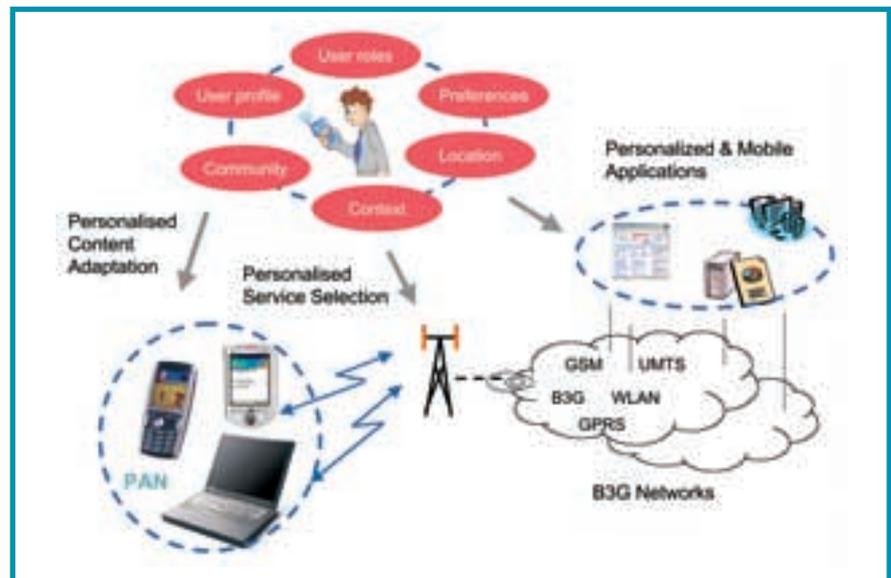

Figure 2: Vision of personalised applications in B3G systems

ing. In P1203 we have identified several system concepts and application domains that promise to be key drivers of systems beyond 3G. The most essential ones and their impact on systems beyond 3G are shown in figure 1. In the following we will briefly explain the role of personalisation as an example.

Personalisation as a killer feature

Personalisation is regarded to be one of the most compelling features for mobile communication systems by supporting customers in selecting specific services from a rapidly increasing diversity of mobile service offerings and adjusting selected services to their individual needs. Service personalisation not only promises to foster and improve the relationship between the customer and the operator. An open personalisation environment will also encourage third-party providers to enter the attractive market of personal services:

exclusive support of individual users, proactive discovery of information sources, or seamless service adaptation according to the varying context of a user are only some of the potential applications.

Even today, the need for personalised information goes far beyond the mere storage and access of digital content. Recent standardisation efforts concerned with user identity and personal access include only very basic user modelling and profiling capabilities. These efforts include W3C's Composite Capabilities/Preference Profiles (CC/PP), .NET PASSPORT, or profiling as discussed within the Liberty Alliance Project, 3GPP, the Open Mobile Alliance, ETSI and the Parlay Group. Figure 2 shows how we envision personalised applications in systems B3G. Besides modelling and profiling there are further challenges concerning service and network infrastructure involved in personalisation. Appropriate signalling mechanisms and service discovery technologies have to make sure that the right information is consumed at the right place at the right time. Moreover, networks have to be designed for reconfiguration to allow for dynamic service adaptability.

Driving the operators role beyond 3G

P1203 is strongly committed to stimulate discussion on B3G among its project participants and outside Eurescom. Through workshops and active participation in forums like the WWRF we are trying to clarify the operators' position in forthcoming B3G environments. Strategic discussions aim at strengthening this position and to derive concrete operator requirements and technology roadmaps for B3G.

More information on Eurescom project P1203 'The Operators' Vision of Systems Beyond 3G' is available at www.eurescom.de/public/projects/P1200-series/P1203
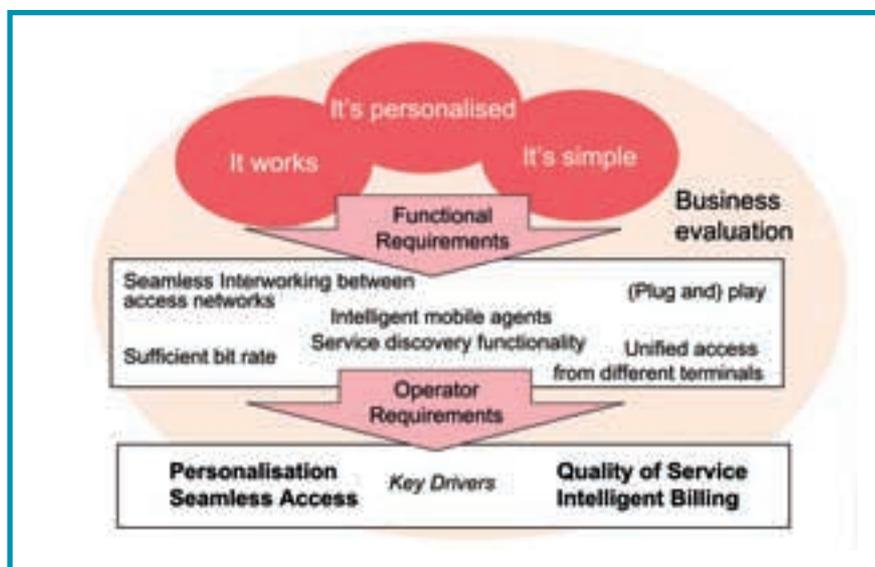

Figure 1: Deriving requirements and key drivers of systems B3G

New dimensions
Network Dimensioning based on modelling of Internet traffic

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In spite of the phenomenal growth in network-based services, the performance characteristics of dynamic networks carrying statistically diverse data-streams are still rather poorly understood. As IP networks develop towards the integration of services with different Quality of Service (QoS) requirements, the need for service differentiation or service guarantees becomes urgent. The Eurescom project NEW DIMENSIONS studied various aspects of networks and service characteristics essential for proper dimensioning of IP data networks and for the provision of high quality services.

The performance of network services depends on a variety of interacting elements and control functions in a multi-layered environment. Data networks consist of a large number of stochastic components, with partly unpredictable behaviour such as links, routers, topology, routing protocols, transmission protocols and traffic characteristics. These components impact in a complex and integrated manner the overall network performance and, as a consequence, they impact the overall network QoS as users perceive it. Modelling data networks as multi-layered complex systems supports the engineering task to design and manage networks which provide a whole spectrum of services, each with its QoS requirements.

Component-wise analysis of network performance

Basic understanding of all network components is required for efficient planning, operations and resource management in multi-service IP networks. This includes the modelling of different traffic classes in multi-service environments. The Eurescom project NEW DIMENSIONS (P1112) studied stochastic models for various traffic types, characterising the variability for long and short time scales. Initially some work was done on how the dimensioning of network resources like bandwidth, forwarding and buffering capacity in routers impact on resource allocation at different network levels. The work provided new insight into the behaviour of individual network and traffic components essential for an integrated approach to network performance evaluation.

Modelling of networks as large complex systems was also studied. After gathering evidence for phase transition like processes when spontaneous performance deterioration occurs in data networks, ways to delay the onset of these processes or at least to make them more gradual were considered. The modelling focused on capturing the essential and common features in network performance deterioration. Analogies between the congestion behaviour in data networks and road traffic systems were studied. Further studies of these similarities will provide deep and useful insight into the dynamic behaviour of data networks under high load conditions.

TCP performance and other bandwidth sharing strategies

The key driver for traditional telecommunication networks is the provision of time critical services offering users very reliable, low-delay performance. In general, only connection-orientated networks can meet such a constraint mainly because they establish an end-to-end connection (communication channel) between users before they start communicating with each other. Connectionless IP networks however were initially designed for supporting only best-effort data flows between two communicating computers. At the transport layer the TCP protocol ensures reliable end-to-end delivery of data and uses congestion control algorithms to allocate bandwidth between connections sharing network resources.

Will the future Internet be able to rely on an end-to-end control only for best-effort traffic? The motivation behind end-to-end control is to keep the Internet simple by placing most of its complexities at the edge. Does that policy result in an Internet that scales better than it would if some congestion control was placed in internal nodes? The project tackled the following question: How does the distribution of network intelligence impact on network scalability?

Wherever network control is placed, understanding the relation between capacity, traffic demand and performance is necessary for the development of performance-related network provisioning procedures. The work has shown that the performance of so-called elastic flows (see explanation in the text box) competing for bandwidth on a network link is generally satisfactory as long as traffic demand does not exceed the link capacity. Under these conditions TCP does a good job at allocating bandwidth fairly on simultaneous connections sharing links across the network. However, under conditions of over-
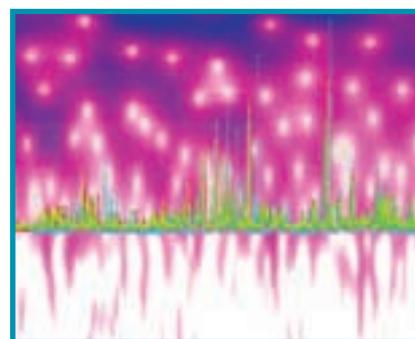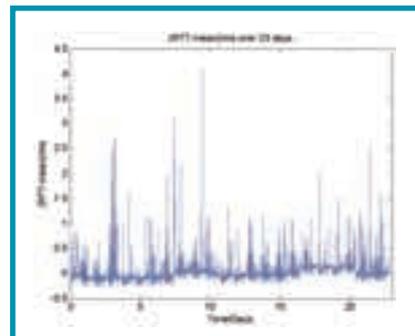
Round trip times are being analysed by wavelets and multi-fractal methods

load, instability is observed which leads to inefficient resource usage as well as poor and unpredictable throughput performance. Mechanisms like random early detection (RED) and explicit congestion notification (ECN) may improve fairness and overall performance, but they do not prevent the overload situation from happening in the first place.

To accommodate for the strict delay requirements of streaming applications

Elastic flows

Broadly one classifies traffic as being elastic if it does not have strict time delay requirements and streaming if it has only very limited tolerance for time delays. Data transmission is generally elastic in nature but may have strict error and data loss requirements. Streaming data generally does not tolerate jitter very well but may be less sensitive to errors and data losses.

(audio and video) two new service models, IntServ and DiffServ, were introduced in the early and mid 1990s respectively. By now, the differential forwarding treatment between elastic and streaming traffic appears to be commonly accepted as reasonable. The project has evaluated the impact of streaming traffic characteristics on elastic flow performance as a function of different bandwidth sharing strategies. Our analytical studies have shown that there is limited scope for differentiation into several classes of elastic traffic in nominal load conditions.

QoS and performance models for streaming traffic

The project studied also the possibility of providing statistical – as opposed to deterministic – performance guarantees suitable for audio- and video-streaming applications in IP networks. It was found that probabilistic guarantees generally allow higher link utilisation than deterministic guarantees and can also result in simpler traffic management procedures. A particularly demanding application is telephone quality voice over IP (VoIP) for which packet queuing delay in the backbone should not exceed 10ms.

Evaluation of delays is substantially more complicated by the phenomenon of jitter, which tends to accumulate across networks as soon as flows are multiplexed in common queues. To derive useful statistical performance bounds it is important to understand how jitter impacts traffic management functions such as admission control, buffer sizing and traffic shaping. Useful conjecture laying out the conditions for flows retaining a negligible jitter property throughout the network was derived in the course of the project. The results are likely to provide useful guidance in the designing of various traffic- and network-managing functions.

Admission control and QoS from the user perspective

Presently, the Internet does not exercise an active access control. Users are accepted even if their acceptance may lead to poor QoS for them and other users already connected. To solve this problem various strategies are being investigated that aim

Delay time series for different traffic intensities

—	0.5
—	1.7
—	1.95
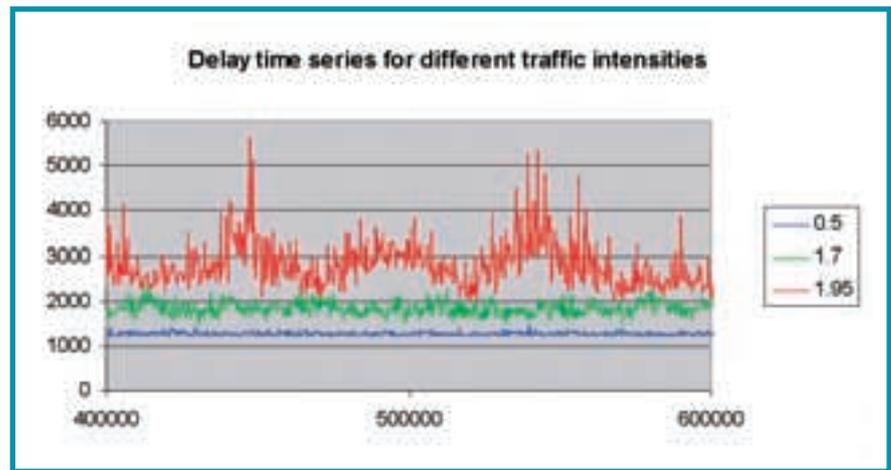
Emergence of congested areas (red colouring) as the total network load is increased

to introduce different quality-of-service level agreements for time critical applications.

Two different approaches may be distinguished as far as admission control is concerned: reservation-based and measurement-based. In the first approach, new flows specify their QoS requirements along with their traffic descriptors through a signalling protocol such as RSVP. The amount of resources to be allocated to an incoming flow is computed accordingly. In the measurement-based approach, resources are not dedicated to a given flow. Hence, the admission criterion does not depend on the amount of reserved resources, but on their real utilisation (for instance, a link). This approach generally calls for simple traffic descriptors such as the peak rate. Most admission control studies are concerned with streaming flows. While admission control is generally agreed for streaming flows, it seemed to be a common understanding that, because the rate of elastic traffic is controlled by TCP, there is no need to limit the number of users concurrently sharing network bandwidth. However, recently there has been a growing interest in applying admission control to elastic flows. Part of the work undertaken in the project explains the rationale behind such a mechanism, presents models that prove its efficiency and covers related implementation issues.

The project studied also different ways of implementing admission control based on learning strategies and neural networks. In this approach admission control is defined as a pattern classification over the space of all traffic configurations. A traffic configuration is specified as a state vector in which the components present the number of sessions being present in each class. From the observation of a given state vector the classifier has to recognise whether the observed pattern is to be accepted or rejected. Such an admission control system is capable of learning, and its decisions should improve over time.

Conclusion

It is of fundamental importance to study in detail the interrelationships between network components and traffic variables that have an impact on network performance, stability and scalability. The project 'NEW DIMENSIONS' has provided new insights to these important questions, and its results could serve as a basis for future network dimensioning and traffic engineering models.

For more information, please see the project Web page at:
www.eurescom.de.public/projects/P1100-series/P1112/
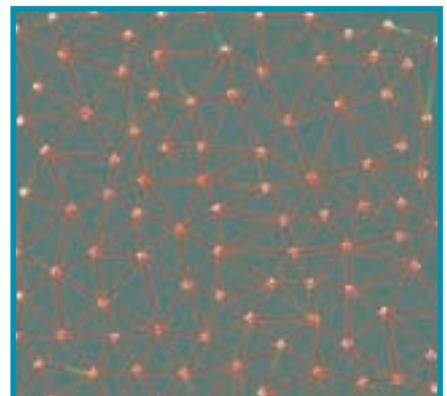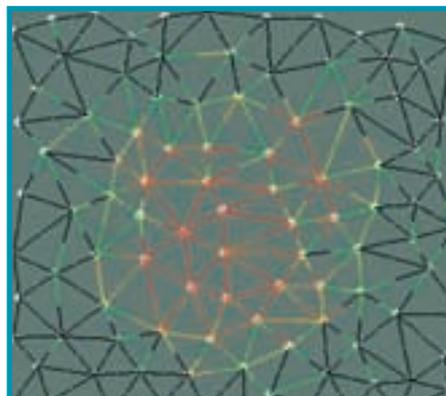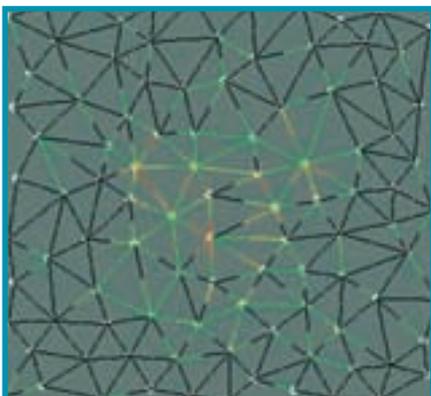
e-home service platforms
Standardisation for easy development of e-home applications

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The evolution of home gateways has gone through a number of development cycles starting from simple modems and expanding to routers as the number of PCs in homes increased. The latest development is the integration of software platforms into residential gateways making them a complete service platform and execution environment for residential broadband services and networked applications. Thus, the residential gateway has become much more than a simple gateway to the Internet – it is also a digital hub of the home network and a server platform for new applications.

This tutorial gives an overview on some of the major projects and standardisation efforts in the field of e-home service platforms.

Open Service Gateway Initiative (OSGi)

The primary goal of OSGi is to define and foster rapid adoption of open specifications for the delivery of managed broadband services over Internet to local networks and devices in homes, cars and other environments.

The OSGi Service Platform offers standardised Application Programming Interfaces (API's) which enable third party service providers to implement Java-based services for home and business use. The service platform supports a wide variety of networking standards and can be implemented on many different devices varying from small, embedded systems to large servers. Devices include, for example, Java-enabled mobile terminals, broadband modems and access points, res-idential gateways, set-top-boxes, and car navigation systems. Thus, the OSGi Service Platform helps operators to achieve their objectives by providing an open platform for rapid development and deployment of new services.

Today, there are over ten certified commercial OSGi Service Platform manufacturers and service providers, who start to arise to the market.

Multimedia Home Platform (MHP)

The Multimedia Home Platform (MHP) defines a generic API for all types of digital television terminals. The open standard is developed by Digital Video Broadcasting (DVB), a global standardisation organisation for broadcasting transmissions. MHP extends the existing DVB transmission and broadcast standards to cover also interactive services.

Several versions of MHP, called profiles, exist. Each version brings something new to the software platform. Currently available implementations enable basic usage of Java applications and interactivity through a return channel. Future versions will include local storage features and optional dvb-html support. Later on application delivery via the return channel will be introduced and the platform will move towards a fully compliant e-mail and web-browser terminal.

Microsoft .NET

Microsoft .NET is a language-neutral environment for writing programmes that can easily and securely inter-operate. Rather than targeting a particular hardware/OS combination, programmes will instead run wherever .NET is implemented. .NET forms a platform for so called 'Web services'.

The core of the .NET architecture is the XML Web services, which are run in the .NET framework. The services are small, reusable applications, which are written in XML or another suitable programming language. They allow data to be communicated across the Internet between otherwise unconnected sources that are enabled to host or act on them. Smart clients or devices, for example, can host and apply XML Web services that allow data to be shared anywhere, and XML Web services can share data from a server application to a desktop or mobile computing device via the Internet.

CableHome

CableHome is a project conducted by Cable Television Laboratories, Inc. (CableLabs) and its member companies. CableHome specifies how home networking equipment will interact with the cable operator's system. A cable operator may securely manage, diagnose, repair, and upgrade CableHome devices built in accordance with the CableHome specification. The goal of the CableHome architecture is to establish a home network infrastructure to manage the delivery of high-quality, cable-based multimedia services. This architecture concentrates on the management of home networks as well as their quality-of-service and security mechanisms.

Conclusion

Home networks come in different shapes and sizes, as the needs and preferences of each family are unique. To handle the huge diversity of connected devices and technologies, some unifying elements are needed. In terms of networking it is relatively simple: the unifying element is the Internet Protocol (IP). On the software side the answer tends to be open Application Programming Interfaces (APIs). Standardised APIs enable applications to run on almost any hardware and operating system – as long as the APIs are supported by the device. This makes the application development rapid and easy. Interoperability and easy reuse of existing software parts are further benefits.

From the operator point of view, interoperable devices and software are absolutely necessary, but the real task is to manage the delivery and execution of e-home applications. Fortunately, service platforms such as OSGi and CableHome address these management issues seriously. They offer tools, which enable and support the customer in having an enjoyable home-networking experience – My Home Sphere.

You can find more information on the following Web sites:
www.osgi.org
www.dvb.org
www.microsoft.com/net/
www.cablelabs.com

Sustaining innovation
The Eurescom work programme 2003

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Robert Noyce, co-founder of Intel, once said: "Innovation is everything. When you are on the forefront, you can see what the next innovation needs to be". The Eurescom shareholders and members being at the forefront of innovation helped Eurescom to put together a work programme for 2003 that has the potential to show us all what the next innovations need to be. Eurescom received 21 high quality proposals. A selection of them is briefly described below:

Multiple devices service Delivery (MultiDeli)

The ability to access the same services with the same 'look and feel' has become a top priority in satisfying user needs. Service delivery on multiple devices needs to be device independent, uniform, co-ordinated and integrated. The work will focus on the service adaptation to heterogeneous terminals and networks according to the user's preferences. Key elements of the work will be the exploration of tools and techniques to enable data and voice session mobility between different device types as well as the definition and architecture of the user's profile definition. The project will combine state-of-the-art technologies, such as XML Web Services, SIP, and Bluetooth to make life easier for the user.

Cost-Effective migration to FTTx-Networks for Tomorrow's Services (CENTS)

Next Generation Networks (NGN) will change the traditional access networks in terms of topologies, architectures and functions and will overcome the limits of the classical access models. As a consequence, operators have to change the traditional way of thinking. The availability of fibre is a key factor for the possible evolution steps. CENTS is aiming at an exploitation of all means and will deliver concepts, strategies and guidelines for the migration towards NGN in order to enable operators to select the proper economical migration solution and the right transition phases. The work requires a paramount view to be able to combine all cost-saving potentials given by the optimisation of traditional and suited alternative solutions. This implies considering various aspects, such as network topologies and architectures (e.g. meshed networks), technologies (e.g. Ethernet, MPLS), advances in optics (e.g. polymer optics) and infrastructure (e.g. improved and alternative cabling techniques).

GMPLS and MPLS in Enhanced IP Networks (GENIE)

Most network carriers have implemented the migration of MPLS (Multi Protocol Label Switching) in IP backbone networks. MPLS provides the carriers with a faster and more economical network management and new tools to build innovative services. However, the MPLS evolution path is still far from completion and new opportunities and challenges lie ahead for network carriers. One of the next steps in the development of these network architectures is GMPLS (Generalised MPLS). GMPLS makes it possible to manage the whole network with one management plane. Carriers can offer new attractive services for the customers and a more efficient network management. In the meantime, MPLS networks and services will have to coexist with emerging developments in several networking fields, such as mobile IP, IPv6 and new access technologies. The results of the work will give answers to the challenge of migrating the current MPLS infrastructure to a GMPLS infrastructure.

OSA – From Lab to Live

Previous Eurescom work has proven that the OSA/Parlay approach is a valid and promising concept, so that the next relevant step for operators is to bring the OSA/Parlay equipment from the laboratory to commercial deployment. This project will work on relevant issues for commercial deployment and will investigate how operators can best benefit from the use of open API's for their 3G UMTS/GPRS networks. It will give answers to how and when to deploy open API's for service provisioning and will continue the work on possible enhancements to the Parlay specifications giving recommendations to how existing standards should be enhanced.

The work will give an answer to operators on how to solve the open issues relevant to commercial deployment, such as OSA acceptance tests, OSA interoperability, OSA security for third party business, OSA management and OSA subscriber administration and billing. Moreover, advantages and disadvantages of OSA compared to competing technologies will be evaluated. The results will help the operators to bring OSA to commercial deployment more quickly and with less risk.

Further information on the Eurescom work programme 2003 is available to Eurescom shareholders and members at http://www.eurescom.de/secure/workprogrammes/WP2003

New Eurescom projects

The Eurescom work programme 2003 has already started with four new projects and one new study. More projects and studies will follow during the first half of 2003.

E-TRACS – E-Commerce Trading of Connectivity Services (P1301)

This project aims at advancing the state of the art in electronic trading of complex connectivity services as commodities. The main goal is to increase technical and economical efficiency of the expensive telecom infrastructure for the benefit of both users and providers. E-TRACS focuses on designing, implementing, and validating an electronic marketplace for connectivity services. It features formal service representation, the use of forwards and options, sophisticated trading mechanisms (such as staged matching, auctions, and bilateral negotiations), and intelligent agents representing providers and customers, based on user-profiles, in the trading process. The marketplace will facilitate the trading of telecom commodities between providers and users. The main objectives of the proposal are to:

- Analyse, design, implement and integrate an electronic marketplace for connectivity services
- Design and implement sophisticated trading mechanisms for formally defined commodities, on the basis of requirements of actual markets
- Validate the implementation of the e-marketplace in an appropriate trial environment.

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PROFIT – Potential pRofit Opportunities in the Future ambient InTelligence world (P1302)

The radical changes of the Information Society, driven by the boost in information and communication technologies and their adoption, have opened a fast path towards the vision of Ambient Intelligence (AmI). This offers tremendous business opportunities and challenges to network operators and service providers. Furthermore, the roles and the environments are changing dramatically. It is, thus, of paramount importance to analyse the new scenarios, roles and environments, and to identify the opportunities and challenges. This project will tackle the issues related to AmI through two approaches: exploring roles and identities in an AmI world, and a socio-economic analysis of AmI scenarios.

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ANFINA – Access Networks control Functions and Interfaces in NGN Architectures (P1303)

This project will start with the identification of the most appropriate services (including voice, data, video and TV, multimedia applications) and delivery systems (typically xDSL-based) in an NGN environment. Based on this, ANFINA will address the access network requirements that would enable cost effective delivery of a wide variety of innovative multimedia and broadband services to end users through various distribution systems and access network technologies. A further goal is to investigate how operators can re-use and integrate their existing access network infrastructures, enhanced with the diverse new access technologies, to provide coherent and harmonised interfaces towards the emerging core NGN architectures.

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CENTS – Cost Effective migration to FTTx-Networks for Tomorrow's Services (P1304)

Currently, network operators offer broadband services via DSL, mainly ADSL. The deployment of these systems represents a natural evolution of the copper access plant, but it is certain that these technologies represent only an intermediate step because of the serious transmission limitations of copper lines, which restrict the range of broadband services that can be supported. There is no doubt that 'true' broadband access requires a fibre-based infrastructure in order to overcome the bandwidth bottleneck. The CENTS project will analyse the cost structure in today's access networks and assess the cost optimisation potential. It will identify novel system concepts and network component/equipment alternatives for hybrid fibre architectures and demonstrate the new concepts and technologies in laboratory and field tests. Finally, CENTS will deliver a techno-economic evaluation of the novel access network concepts in realistic deployment scenarios and provide recommendations and guidelines to the deployment strategy of next generation optical access networks.

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NGN Service Concepts (P1341)

Most network operators are facing similar challenges regarding market saturation of network traffic and a stagnating number of users. New investments in network infrastructure like NGN/3G have to be carefully justified. In this context, cost-saving strategies are not sufficient. Additional revenues from innovative applications are becoming more critical to business success.

This study aims at analysing new service concepts, here called Next Generation Service Concepts (NGSC), which may only be provided by NGN/OSA networks. The study evaluates how new NGN/OSA characteristics, like access independence, convergence and openness, can promote the emergence of new NGSC concepts, and lead to new business opportunities and models and so new revenue streams. A promising feature of NGSC is that users will be able to do business by providing their own applications.

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FP6 – an opportunity for Europe
Creating the European Research Area

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The European Union's Sixth Framework Programme (FP6) covers activities in the field of research, technological development and demonstration for the period 2002 to 2006. FP6 is the frame for the EU activities in the field of science, research and innovation. It has a total budget of 17.5 billion euros and therefore represents nearly 5 percent of the overall expenditure on R&D in EU member states. The Information Society Technology (IST) part of FP6, which is of particular interest to telecommunication companies, has a budget of 3.625 billion euros.

The main objective of FP6 is to contribute to the creation of the European Research Area (ERA) by improving integration and co-ordination of research in Europe. FP6 will strengthen the competitiveness of the European economy, solve major societal questions and support the formulation and implementation of EU policies.

The first call

The first call for IST proposals was launched on 17 December 2002 with a deadline for proposals on 24 April 2003. The budget for this call is 1,070 million euros. Many preparation groups and potential consortia are working out proposals based on traditional instruments, like 'Specific Targeted Research Projects' or 'Accompanying Measures', and on the even more attractive new instruments 'Integrated Projects' and 'Networks of Excellence'.

Eurescom is involved in two ways:
- With its substantial experience in managing collaborative projects, Eurescom is largely involved in several proposals and is determined to take up the challenging task of their administrative and financial management.
- With its great networking capabilities within the Eurescom member companies and other companies, the organisation is a catalyst for bringing together interested top researchers from network operators and service providers to participate in suitable FP6 activities.

National info events to kick off FP6

After the successful IST 2003 Conference in Copenhagen and the FP6 launch event 'European Research 2002' in Brussels in November 2002, many national FP6 info events have taken place. The largest of them was the German event under the motto 'Chance für Deutschland und Europa' (Opportunity for Germany and Europe), which took place from 3 to 4 February 2003 in Hanover (www.rp6.de) and was attended by about 1,300 people. Although it was quite late for starting an initiative for the first call, the information can well be used by already ongoing preparation teams and for later calls.

This is a selection of some interesting information from the event in Hanover for people involved in proposal preparation:
- More than 2,500 people have so far registered as proposal evaluators.
- The EPSS (Electronic Proposal Submission System) is not yet available, but will hopefully soon be (maybe it is available when this issue of *Eurescom mess@ge* is distributed).
- It is recommendable that Integrated Projects (IP) maintain a project handbook containing amongst other things: addresses, responsibilities, deputy and replacement rules, successor rules, cost plans, milestone plans, information flows, publication rules, rules for increasing the consortium, Intellectual Property Rights (IPR) issues, the Consortium Agreement.
- Several model Consortium Agreements have been prepared by different groups. They can be used as examples. Although the Commission does not specify an exact date when the Consortium Agreement needs to be signed, it should be signed before the contract with the Commission is signed (mainly because of the IPRs).
- It is very important to use experienced companies and personnel for the management of the activities, particularly for the large Integrated Projects. Eurescom with its long experience in managing collaborative projects has a strong advantage in this matter.
- There have been very differing statements concerning the size of Integrated Projects (IP). It looks like an average IP could be between 10 and 35 million euro, have 15 to 40 partners, and could be running 4 to 5 years. Because of the concentration on fewer larger projects, it is likely that there will be less participants in FP6 than in FP5, meaning there will even be a tougher competition.
- It looks like there will only be three cost models left: FC (full costs), FCF (full costs with fixed overhead of 20%), and ACF (additional costs with fixed overhead of 20%). In the contracts there will probably be no different cost categories (e.g. manpower, travel, equipment) any more.

Conclusion

The Sixth Framework Programme is a great opportunity for Europe to increase its scientific and technological status in the world. It is also a great chance for European collaborative R&D. All it needs is excellent people to participate in excellent projects. The time is right, the first call is out, and other calls will follow.

Eurescom is determined to play an important supportive role in this and to use its networking facilities and its large experience in managing collaborative R&D projects for making a substantial contribution to achieving the challenging objectives of FP6.

There is a world of FP6 information available on the Web:
- in the Commission area: http://europa.eu.int/comm/research/fp6/index_en.html
- in the CORDIS area: http://www.cordis.lu/fp6/

new project results

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Deliverable 3 · Overall Architecture and Models for DUS (TI) · (Eurescom confidential)

P1101   Always-On – Device Unified Services (DUS)
Deliverable 4 · Evaluation of the Always-On Device Unifying Service · (For full publication)

P1101   Always-On – Device Unified Services (DUS)
Deliverable 5 · Evaluation of the Always-On Device Unifying Service · (Eurescom confidential)

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(Eurescom confidential)

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P1105   MobilUS – Architecture to support information services on UMTS
Deliverable 5 · Description of Architecture for Mobile Multimedia Information Services on UMTS · (Eurescom confidential)

P1105   MobilUS – Architecture to support information services on UMTS
Deliverable 6 · Summary Report · (Eurescom confidential)

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Technical Information 4 · User needs analysis and scenarios · (Eurescom confidential)

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P1106   **P1106 E-commerce impacts on service and network operations and management**
Deliverable 7 · IP QoS Validation and Testing (VV&T) Results · (For full publication)

GSM for scuba divers
Wireless communication under water

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Wireless communication has become ubiquitous on our planet. People are using their mobile phones anywhere: in cars, trains, planes, boats, cinemas, theatres, restaurants, bathrooms, at the beach, and on mountaintops. There seems to be only one place, where you can escape the ubiquitous communication: under water. However, this has ceased to be true. GSM is on the brink of conquering the submarine space.
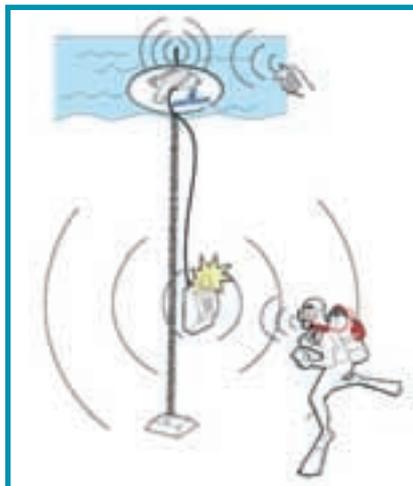
First submarine phone booth

In November 2001, France Télécom had already announced the first submarine telephone booth. In co-operation with Amphicom, a French company specialised on underwater communication, they had developed the first phone connection to a diver working underwater. The system comprises a buoy fitted with a GSM phone relay that handles two-way communications with an underwater terminal. The terminal is connected to the buoy by a wire and is equipped with a dial pad, a special mouthpiece, a light, and a buzzer.

This is how it works: The buzzer and a flashing light alert the diver of an incoming call. The sound wave from the surface goes through the system to the mouthpiece. The diver just has to bite down on the mouthpiece and push a button to accept the call. Sound vibrations propagate to his ear via his skull, which acts as a resonance chamber. He can then clearly hear the incoming call and also talk back. With the dialling pad, the diver can also call anybody on a fixed or wireless phone.

Application areas

The 'submarine phone booth' has been tested by archaeologists at the Alexandrine Research Centre in Egypt, who have been carrying out underwater excavations at the presumed site of the Alexandria Lighthouse. By providing direct, instantaneous communications between the divers and excavation managers, the system eliminated the need for frequent returns to the surface for reporting new findings. Other possible application areas include oil plat-

forms, shipyards, scientific research, salvaging ships, civil security, and military use. Divers can quickly signal any sign of discomfort or danger, or report to the surface.

However, the new underwater communications system is not yet commercially available. This is due to the fact that several research issues have not yet been solved. To make underwater GSM really popular among professional and leisure divers, the wire link between the buoy and the submerged terminal has to be eliminated. Divers would then be totally independent and could wirelessly communicate with each other under water.

Underwater transmission of sound

Today, when scuba divers want to talk to each other underwater, they use hand signals or write on a slate. There is, however, already a wireless technology for underwater communications commercially available.

Devices for two-way, wireless underwater communication have been available for many years. They are based on ultrasound waves. However, ultrasound has some severe practical limitations. It is very sensitive to obstacles. This can be any-thing: rocks, weeds, and even dirt particles muddying the water.

Exploring current fields

For this reason, the research team at France Télécom's partner Amphicom near Toulouse explores a different way of transmission: current fields. Current field transmission uses the conductivity property of water. The main advantage is that current fields are less sensitive to water than ultrasound. Water can be considered as a wide range conductor, with a low load resistance. Bipolar electrodes put in this conductor, and supplied with DC or AC voltage, will deliver a DC or AC current. This current will generate an ionic field in the whole conductor. The current wave goes through the water, along the surface and the bottom. The wave can bypass obstacles and is not sensitive to changes of water temperature or the degree of water pollution.

In summer 2002, Amphicom successfully tested a prototype of a wireless underwater communication device using current fields. Despite the advantages of current field transmitters, Amphicom's marketing manager Kenneth Mackern could not yet specify a date for the market launch of communication systems based on current fields. Many specific questions regarding range, power consumption and battery power have still to be answered.

Phonation under water

Furthermore, there is another problem: phonation. How to speak underwater and get the sound into the transmitter? Technically, this problem is already solved. Half-face masks with a voice transmitter integrated in the mouthpiece are available on the market. However, they are not very popular among scuba divers. "Scuba divers don't like masks," explains Kenneth Mackern. They prefer to have just a mouthpiece with a regulator connected to the air tank. Integrating the communications device into the mouthpiece is the easy part, but doing it in a way that not only a gurgling sound but understandable speech is transmitted has proven to be quite difficult. Thus, communicative scuba divers probably will have to wait some more years until they can describe colourful sea plants and exotic fishes to their loved ones at home via GSM.

Further information on the topic of underwater communication is available in the online version of this article at:
http://www.eurescom.de/message/

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