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ALWAYS ON — SERVICES AT YOUR FINGERTIPS

PROJECT REPORTS
BIOSCIENCES AND ICT

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TUTORIAL
E-VOTING

3G Technologies and Applications
Securing the Business Case for 3G

**Crowne Plaza, Heidelberg, Germany,
12 November 2001 – Tutorials
13 to 15 November 2001 – Main conference**

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CONFERENCE SCOPE

The advent of the 3rd generation of mobile technologies, services and applications has stimulated research and development in many areas of information and telecommunication technologies. The first EURESCOM Summit on 3G Technologies and Applications aims at capturing a snapshot of the activities with business relevance, providing value to executives, business professionals and developers at network operators and equipment manufacturers as well as to the research community.

The objective of the conference is to explore the challenges and the opportunities of next-generation applications, technologies and services for mobile communications. Furthermore it aims to identify new ways to bridge the gap between technological advances and their business relevance.

The conference is aiming to be a platform for the discussion of marketable solutions, targeted activities for the promotion of technologies and applications, and open issues that need further research. It is a comprehensive event offering in-depth sessions on business and technology aspects, including:

- e-commerce, m-commerce
- Platforms and systems management
- Network control and APIs
- Device aspects/User aspects
- Services & applications

CONFERENCE PROGRAMME

The technical programme is complemented by the keynote speech of Lutz Heuser, Vice President, SAP Corporate Research and the panel session on "Securing the business case for 3G". Invited panellists include Mihai Mateescu, Motorola, Alexander Netzel, SAP, Louis-François Pau, Ericsson, Markus Isomäki, Nokia, Hans-Gerd Servatius, PricewaterhouseCoopers, and Annegret Groebel, German Regulatory Authority for Telecommunications and Posts. Roberto Parodi, Telecom Italia Mobile, chairs the panel.

Furthermore, a set of demonstrations and exhibitions will be available at the conference site. Finally a technical visit to the Future Lab of Deutsche Telekom in Darmstadt will be organised.

Full conference programme details are available at
http://www.eurescom.de/summit2001

TUTORIALS

On Monday, 12 November 2001, four tutorials will be held:

- Pervasive/Ubiquitous Computing by Friedemann Mattern, ETH Zurich and Martin Welsch, IBM
- Mobile portals and associated business models by Andrew Perkis, Norwegian University of Science and Technology
- UMTS, the system for mobile multimedia applications by Werner Mohr, Siemens
- UMTS: Back to reality by Fraser Curley, c-quential

Full details on the tutorials are available at
http://www.eurescom.de/
summit2001/tutorials.htm

REGISTRATION

Registration information can be found at:
http://www.eurescom.de/
summit2001/registration.htm

Please download the registration form and follow the registration instructions.

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Conference Fees (€)	Registration before 15 September 2001	Registration after 15 September 2001
EURESCOM SH/member*)	300 €	380 €
IEEE members*)	400 €	450 €
Non-members*)	450 €	500 €
Students*)	150 €	180 €
Tutorials	180 €	200 €
Additional proceedings	75 €	75 €

THE DISCOVERY OF THE CUSTOMER

Dr. Claudio Carrelli
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It is never too late – also for researchers in telecommunications! For a long time researchers lived without caring too much about the market and customers, but now they are facing a completely new world. In the past years R&D was mainly intended as a technology update, and researchers just kept on producing stunning innovations within their ivory tower. Marketing departments then had full responsibility to manage the new results and it was mainly their own responsibility to work out how these innovations could effectively be transformed into marketable products, and finally into money. In those days R&D laboratories were seen as a sort of 'cage of fools', where researchers could freely play around with ideas and experiments, which could eventually lead to something profitable in a not well defined future. Anyhow, the researchers did not have to have sleepless nights about it, and their contribution to telecom developments, in terms of network updates and new services, was extremely prolific and valuable.

Customer-oriented R&D
As we all know, the world of telecommunications has dramatically changed. All of a sudden, researchers no longer found themselves as 'priest of the temple' in search of the 'truth', but like sailors in stormy weather they were forced to face a multitude of 'customers', while still working on stunning innovations. Now they have to think of the end user, of the finance and the marketing department of their company, of the shareholders and last, but not least, of the financial analysts. Satisfying all of them at the same time has turned out to be like the well-known problem of the quadrangle of the circle. Nevertheless, researchers cannot escape the new reality nor ignore the various customers and their requirements. The old approach, to follow a predetermined way based on technology updates, is over, and competition on the one hand and the convergence of sectors on the other, made it necessary to explore and deploy innovation in a completely new way.

New services that fulfil the essential needs of the "users" are absolutely required

Always On, the cover theme of this issue, is a good example for what I mean. Traditionally, telecom researchers would focus on innovations to upgrade the networks and their relevant services. From this point of view Always On is certainly an important subject to address, but to make it a real a success, technology alone is not sufficient, and new services that fulfil the essential needs of the 'users' are absolutely required. These services have to be user-friendly so that not only academically trained engineers can easily adopt and fully enjoy them. And they should also be marketed keeping in mind the 'generic user', and in a way that he can really understand the benefits. The EURESCOM research community has fully acknowledged this approach and runs several projects on user-centred issues. One interesting feature towards user-friendliness is a 'device unifying service', which is featured in this issue.

Customer orientation is not only essential for the future of research, it is also more than thinking about the needs of end users. Especially under today's financial constraints it is equally important to also convince the internal customers from finance and marketing, as our new Board member Annakaisa Häyrynen points out in the interview in this issue.

EURESCOM's customers
What is true for the R&D departments in the telecom companies applies even more to EURESCOM. In its ten years of life EURESCOM has proven to be highly flexible and efficient in satisfying the needs of its customers. Considering the changes currently happening in the telecommunications domain it is self-evident that EURESCOM will continue to evolve in order to meet the changing needs of its customers and expand the organisation's role towards world-wide telecom research. The considerable interest in our newly introduced membership status shows that the future prospects for collaborative R&D are excellent, despite the current difficulties the telecom industry faces today. The telecomms have a good chance of coming out of this downturn phase stronger than ever, if they act customer-oriented and support customer-oriented research.

Driving technological progress
Satisfying the customer is probably one of the most challenging and hardest to achieve goals. This is especially demanding for researchers, who were raised not only with a foggy perception of the customer, but even in the belief that they were the only ones in the driver seat of technological progress. The complexity of the present scenario offers a new picture: innovation is still the key factor for success, researchers are still the highly esteemed mechanics enabling the customer to have a good ride, but they must be integrated within their companies more and more and be sensitive to customers' requirements. If they do so, they will succeed and discover that customer-orientation will increase their impact on the future direction of human communication.

EURESCOM will continue to evolve in order to meet the changing needs of its customers

EDITORIAL
REMARK

Dear readers,

Last year we promised that we would extend the online edition of EURESCOM mess@ge. This decision was a consequence of the reader poll we carried out in 2000. One of the main results was that the overwhelming majority of readers had been interested in an online edition that goes beyond downloadable pdf files. This meant adding value to the print edition.

We have kept our promise and now proudly present our re-designed EURESCOM mess@ge Web pages at http://www.eurescom.de/message.

You will find several new features there. All articles can be read and printed directly and separately, because they are now also available in html. In some cases, where we had to shorten the articles for the print version, you can now read the unabbreviated original versions with additional details that might be useful for readers with a deeper interest in the subject. At the end of every online article you have the opportunity to publish your comments, which will appear below the respective article.

Another new service is the commented link list, which covers the major topics of the current issue. We will expand this list with every new issue making it a useful reference. Your proposals for further links are always welcome.

The start page of mess@ge now offers daily updated news from the telecomms and ICT R&D sector and a weekly instant poll on current topics making it worthwhile visiting the online edition of EURESCOM mess@ge regularly. Of course, the pdf versions of the current issue and past issues are still available.

The only reward we are asking of you for this added value is your feedback and that you tell others about EURESCOM mess@ge. We are already pretty curious what you will think about EURESCOM mess@ge online. Tell us what you like and what can be improved.

In connection with the extension of our Web pages we have decided to cancel the column 'mess@ge to the editor', because we consider it a bit unfair to publish only two comments per issue. On the Web you now have the opportunity to send your comment instantly and see it on the Web shortly afterwards. As a replacement for the print issue you will see our new column 'Sn@pshot' below, where from now on you will find amusing or impressing pictures from the world of telecommunications and ICT. If you have a picture that fits into this concept, please send it to us with your comments.

And now we invite you to dip into this issue of our magazine and read about Always On and further innovative themes our authors have explored for you.

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Re-designed EURESCOM mess@ge Web pages at http://www.eurescom.de/message

SN@PSHOT
THE PORTABLE PC ...

ALWAYS ON

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EU COMMISSIONER
LIIKANEN
VISITS EURESCOM

On 21st August, EU Commissioner Erkki Liikanen (right), accompanied by his wife, made a non-official visit to EURESCOM in Heidelberg and conducted private talks with EURESCOM's director Dr. Claudio Carrelli about the current situation of telecommunications in Europe.

DARWIN FOR TELECOM RESEARCHERS –
THE EVOLUTION OF EURESCOM

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Charles Darwin made a basic proposition about the animal kingdom, which can be summarised in the phrase "evolve or die". Today we can see parallels to this theory in the telecommunications research community.

When EURESCOM was set up our shareholders had very stable slow moving business with relatively simple infrastructure investment planning and long cost recovery times. Today, with the pace of change in the technology and the advent of many disruptive technologies, telcos often have to revise their investment strategies several times within a single financial year.

Changing the financing scheme
In this environment the attitude of telcos to their own research, and particularly how it is financed, has changed. Most of the organisations in EURESCOM now have a structure where the promised results of any research initiative must be sold internally to a business unit in order to secure the financing for the work.

This operational model means that the existing mechanism for large advance payments to EURESCOM, which are recovered through participation in EURESCOM projects, is very difficult for self-financing research units to maintain.

So we are changing the project-financing model of EURESCOM starting with the new projects in 2002. In the short term, this will mean we will move to a structure where there will be more self-financing of project participation and less pre-payments or repayments in the project budget. This means that we are now looking for more innovative business models for inter-telco collaborative research.

New business models
One of the suggestions is to seek venture capital for projects that will produce an exploitable result. For example there is a need right now to make the wireless LAN access secure – if we run a project that would make wireless LANs secure enough for public network access we would have a result/product that would have a potentially huge market.

Similarly, I believe that innovative service designs could be copyrighted and licensed in the same way as television show ideas (like "Who wants to be a millionaire?") are sold to many TV stations today.

Another option is to collaborate more formally with other organisations and research programmes. EURESCOM could extend and formalise its co-operation with the European IST programme and even propose new IST projects.

Increasing need for collaborative research
The EURESCOM community knows that when resources are limited, collaboration increases the effectiveness of your resources and minimises risks. One thing we all have in common is the desire to generate and offer innovative advanced services in the shortest time possible. The financing of the work may change but the need for progress to satisfy greater market demands will continue to increase.

FOCUSSING ON
MULTIDISCIPLINARY RESEARCH

INTERVIEW WITH ANNAKAISA HÄYRYNEN,
PROJECT DIRECTOR AT ELISA COMMUNICATIONS CORPORATION
AND NEW MEMBER OF THE
EURESCOM BOARD OF GOVERNORS

mess@ge: **How do you feel being the youngest and only female Board member?**

This is probably something I am getting used to, since I already practised the same role in the Strategic Studies Programme Management Group and in the Programme Advisory Committee of EURESCOM. In both positions I also was the only one without the "typical" EURESCOM engineering background, as I have graduated from business school, majoring in international marketing.

mess@ge: **You had led several EURESCOM studies. Which experiences did you have with EURESCOM as a project leader?**

From the studies I have really good experiences. It is so stimulating and often enlightening to discuss and do research together with experts from different shareholders. These aspects are of great importance to me. Collaborative learning and understanding increases the value of research activities. I also like the EURESCOM administration, since it is more or less on an optimum level for the project leader as well as the participants.

mess@ge: **On which areas of research should EURESCOM primarily focus in the next year?**

First of all we must not forget the important subject areas the running EURESCOM projects are covering. However, if I had to emphasise only one important area, I would say multidisciplinary research. With this I mean that in different research activities there should be experts from different backgrounds, so that in the more technically focused activities there would be also human-centred points of views taken into account, as well as marketing or design aspects. We should also consider using a richer collection of methods and methodologies. In addition, we should try to understand what kinds of processes and which combinations would lead to optimum results for future businesses during different stages.

mess@ge: **How will EURESCOM as an organisation develop over the next five years?**

It will develop and change profoundly, because the shareholding companies are changing. I hope that understanding the customer needs will be a big issue for the future work, also in the sense that shareholders, members and different units in these organisations are customers. That would mean an even closer interaction between the EURESCOM core team and the customers. I also hope for more future-oriented and scenario type of work, which could increase our understanding of the changes, opportunities and challenges we are facing. And I hope we will have different types of shareholders and members, perhaps more from converging industries. This diversification should happen in a way that is acceptable to all.

mess@ge: **How could the position of R&D within the telecom companies be strengthened?**

The telecommunications world is changing dramatically. This naturally has an impact on R&D in this area. There is currently a lot of pressure towards changing the typical ways of organising R&D. If we look at one of the big trends, the customer- or user-centredness, I would say that the position will be best strengthened through better communication and interaction. R&D activities are becoming an integral part of different kinds of activities and processes in the companies, be it in the form of exploring new technologies or understanding the market and its players in their different roles. The business cycles are becoming so short that only through intensive co-operation good and timely marketed products and services can be brought successfully to the constantly changing marketplace.

The interview was conducted by Peter Stollenmayer.

ANNAKAISA HÄYRYNEN

- Born on 18 August 1965 in Kajaani, Finland.
- Masters degree in international marketing at Turku School of Economics and Business Administration.
- Joined Helsinki Telephone Corporation in 1997 as Project Manager.
- In 1999 appointed research manager. Current position: Project director at the research center of Elisa Communications since December 2000.
- EURESCOM involvement: Member of the Board of Governors since May 2001; member of the General Assembly since December 2000 and member of the Programme Advisory Committee since March 2000.
- Annakaisa Häyrynen is a specialist for digital economy related issues with emphasis on customers and market environments.
- Hobbies: Postgraduate PhD studies at Helsinki University of Technology; Icelandic horse riding, western riding and "co-riding" on a Vmax motorcycle; literature and visual arts.

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T H E   N E T   T H A T

ALWAYS ON –
SERVICES AT YOUR FINGERTIPS

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Always On has been a buzzword for years. Now the permanent broadband connection of fixed and wireless appliances to the Net is close to becoming a market reality.

To understand why researchers and marketing people are so excited about Always On, try to imagine what happens if users and devices can communicate instantly without the cumbersome procedure of dialling up an Internet connection.

Sun's CEO Scott McNealy, one of the fervent Always On promoters, aims at getting the Net "dial-tone ready", meaning an ever present connection symbolised by the dial tone of the fixed telephone networks. To achieve this, Sun is working on what McNealy calls "BFWTS", the "big freaking Web tone switch", meaning an integrated scalable architecture that is always up and that operates on open standards.

The Evernet vision

Among the first to identify the possibilities of permanent connectivity was the American ICT expert Mark Anderson. He called it Always On Real-Time Access (AORTA). The Always On concept has become popular in the USA under the term Evernet. This buzzword was coined by venture capitalists L. John Doerr and Roger McNamee. They see the Evernet as a place where Internet and the growing range of Internet devices intersect. Millions of homes and billions of devices stay interconnected on an Always On basis through high-speed real-time access. The key for the Evernet is the Always On aspect of the broadband connection, not the speed. This leads to real-time computing on extremely challenging scales, which we have no experience with yet.

In an interview from March 1999, Doerr explained his vision of the Evernet: "Lots and lots of Net everywhere, pervasive Net, Evernet, Always On. And it will be a very high-bandwidth Net. It won't be static little pictures and text. Or if it is a picture when you click on it, you'll get a movie behind it. It'll be highly personal also. It will know that you are there in the room, and it will know a lot by virtue of your portal or your provider. It'll present the stuff you're interested in. It won't show you ads you're not interested in." He predicted this vision would become reality in 2002.

Challenges for R&D

A colourful vision like that is easy to describe for a venture capitalist, but hard to turn into reality for researchers and developers. Three major challenges for the Always On concept have to be considered: Number one is the technological challenge to guarantee a highly reliable Quality of Service, meaning uptime of the Net and access speed. A recently started EURESCOM project, P1103, addresses one of the basic issues for guaranteeing high Quality of Service in an Always On network. The project explores the design of a common inter-operator IP QoS provisioning framework capable of delivering differentiated service quality to IP-based services like Telephony over IP (ToIP) or UMTS packet data services. Read the report in this cover theme.

Number two is the security challenge to protect broadband connections 24 hours a day against cracking by malicious techies. Number three is the service challenge to offer user-oriented services. A recently started EURESCOM project, P1101, is exploring a fundamental service, which might become crucial for the market success of Always On: the Device Unifying Service. This cover theme features an exclusive report about this revolutionary service innovation.

Social aspects

The reports of this cover theme will show that there are still a lot of questions to answer, but nonetheless the implementation of Always On has come into reach. Network operators and service providers, however, should be aware that there is more to Always On than the technological aspect. Always On has the potential to change the way we live like the mobile phone did. This social aspect has to be taken into account. Cultural critics like New York Times columnist Thomas Friedman have already issued warnings against "the virus of overconnectedness" (Friedman) which is supposed to make users slaves of their devices. This notion is certainly exaggerated, but it reflects common fears of a considerable number of potential users. The success of Always On depends heavily on services like the Device Unifying Service that give the users all the benefits of pervasive communication while making the handling of devices easier and thus adding to their quality of life.

N E V E R   S L E E P S

USER AND BUSINESS
ASPECTS OF ALWAYS ON

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Always On services have the potential to change the way people use information and communication technologies, and the way such services are provided. Always On may thus change the business of telecom network operators and service providers.

In the EURESCOM P1003 Always On project, user attitudes and reactions to Always On were investigated through focus groups and actual user trials in four countries. Some patterns of usage are emerging that can help to guide the future development of ADSL and mobile-compatible devices and services.

Results of EURESCOM user trials

The most important observation may be that in all the trials, having an Always On connection always meant that the user spent more time online. Always On communication services have on the whole been the preferred services. However, users were concerned about having sufficient control over these services so that they were not overwhelmed with messages or 'push' information. SMS is the best example of an existing non-intrusive service, which fulfils this need quite well when it is used peer-to-peer.

There was a general increase in 'passive' use of technology. For ADSL, this meant downloading more video and audio files, and for mobile, reading more emails. The test users generally regarded mobile access as an important aspect of Always On. There was also more distributed Internet use, 'playing' with mobile devices during spare time etc. PC and laptop are the preferred terminals overall for Internet connection. The users preferred flat rate subscription in these trials.

Concerns over privacy were common – for ADSL this is reflected in concerns about privacy of information/files, and for mobile, in concerns about invasion of private time in the sense that with Always On you are always available for work. Useful

information services, which help users in everyday life, were appreciated. Among the preferred services are traffic information, weather information and information about events in the neighbourhood.

An example of the types of services that people did not want is 'album on-line' (archiving family photos), which were not considered very useful and did not help them in everyday matters.

Some differences between mobile and fixed use were found during the trials. The equipment used was mobile phones and PDAs 'from the shelf', and limited battery time, which also limits the Always On connection, was experienced as a problem. As interfaces, information storage and processing capacity were limited, users found these devices less useful than fixed net terminals. New terminals and new services should therefore be developed, taking into account the network and terminal characteristics.

In general, the quality of the connection is an essential issue irrespective of the service involved. Fast and reliable access is one of the main requirements of the users, as is security and privacy. Telcos should pay special attention to these issues when they provide services.

Keeping life areas separate

Looking beyond access and service, one should note that most users made a point about not wanting to merge different arenas of life, such as work, study, family and hobby time. An articulated fear was that better tools for networking activities would end up in competition with family life or other social activities. On the other hand, if an activity had to be performed in several places, or if it included moving to or collaborating with distant partners, network services were seen as a benefit, and improvements were wished for. Examples of this kind of activities would be caring for children or elderly relatives and working with remote partners.

Another point worth noting is that increased use of the Internet does not necessarily mean increased e-commerce. Therefore telcos would be well advised to instead develop the platforms and services that users find interesting; and to surround these developments with e-commerce possibilities, rather than concen-

trating on e-commerce per se. Today's traffic in SMS in several countries is a good example where most traffic is user-to-user.

Security and privacy concerns

In conclusion, the user trials raised some important issues for the development of future services. Firstly, the concerns over security and privacy are clearly important Europe-wide, and these will have to be addressed when providing future services suitable for broadband and mobile access. Secondly, there was no increase in e-commerce (possibly because of the security concerns), which has important implications for the business models employed. That is, retail trade online must not be seen as a major source of revenue until security measures have been seen to be developed that address users' concerns. Until that time, business models must suggest other ways of generating revenue, that is, the services developed for Always On connections must be intrinsically useful and relevant to the user, to the point where the user is willing to pay for them. Communication, information and entertainment services have been shown by the trials and other methods to be the most useful, therefore these are the types of services that revenue generation efforts should be concentrated on.

Business aspects

The economic potential of Always On lies in the combination of easy, instant and ubiquitous access with services that are interesting to the customers. An indication of this is the success of the Japanese I-mode service, in which users have access to a rather generous selection of Internet service providers via mobile handsets. As technology is less of a limiting factor, the question "What does the user desire?" becomes central. We have some indications that privacy, control over daily life, and ample communication capabilities the moment the user needs it are part of the answer. The P1003 Deliverable 2 gives numerous examples of practical arrangements for delivering current services in an Always On context. But to get a fuller answer, we must delve deeper into user-oriented research.

EXPLOITING ALWAYS ON WITH THE
DEVICE UNIFYING SERVICE

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The Device Unifying Service (DUS) is a novel service, which extends the "Always On" concept by considering multiple devices. The user is now "always on" in a more comprehensive way through multiple devices. DUS is aiming at assisting the end user in the management of his various devices and making them function like one. Nowadays the user is confronted with several different devices. Almost all of these devices can be autonomous and function independently of each other without any co-ordination, but the proposed DUS service will allow the user to unify them and consider them all as one big terminal – the Virtual Terminal. With the constantly growing number of mobile and stationary devices used by a person, it will become increasingly important to introduce the Device Unifying Service.

The Device Unifying Service may become a commercial service offering great value and potential to different types of operators and service providers, independent of whether they own any infrastructure or not. From a technological point of view, the Device Unifying Service offers immeasurable value because it provides an opportunity to integrate major technologies such as IP telephony, wireless communications, agent concepts, Intelligent Networks, Bluetooth (http://www.bluetooth.com), open APIs, multimedia communications, Service Discovery and others.

The advantage of a DUS

It is often assumed that the communication devices of the future will be complex devices with many functions integrated in one terminal, an all-in-one device. This is, however, not very likely, and the project P1101 anticipates an evolution towards several personal and public devices, each offering different functionality to the end user. These devices might very well be autonomous functioning individually and independently of each other. But if they are unified and co-ordinated in such a way that they can work together as one, they may fulfil the end user's needs in a much better way than they could have done separately. The Virtual Terminal can be composed of several different communications devices, such as a plain old telephone, a mobile phone, a PC or a workstation as well as other devices with different functionality and capabilities

Figure 1: Handling several devices might be difficult for a non-technical user.

such as laptop, digital camera, TV screen, printer and loudspeakers.

Confronted with all these different devices, the user has a formidable task in handling them. In this scenario, there is a need for a management and co-ordination function that will handle the terminal management for the end user. This functionality will be an important feature of the Device Unifying Service.

The DUS will offer an automatic and dynamic configuration of the end user's many different devices. Utilising this service, the user will no longer be required to handle all his devices, and he will be given the opportunity to focus more on the actual communication and less on the management of the communication devices. For example, when several devices are involved, there will be several terminal

profiles and several user profiles the user has to relate to. From the user's point of view, it would certainly be desirable to have one unique user profile. Furthermore, the inconvenience of successively repeating the same tasks for many devices is avoided. Instead of defining his profile and preferences on every device, the user can define it once and for all by the DUS. An address list defined for one device will automatically be available on all other devices included in the Virtual Terminal.

Another important issue is the combination of mobile and stationary devices. The user might visit places away from his home domain where there are stationary devices offering different types of services, like printers and screen displays. Nowadays it is difficult for the user to make use of these stationary devices at visiting sites. Most often he cannot utilise the services they are offering, but has to manage with the limited capabilities offered by his mobile device. The DUS will allow the user to make use of such stationary devices in an easy and straightforward way and hence provide the user with additional services as well as enhancing the quality and the look and feel of services provided by his mobile device.

In order to realise the described vision and demands, the DUS requires the following capabilities:
- Continuously maintain, monitor and update the configuration of the big Virtual Terminal, i.e. it knows exactly which devices are present and active in the Virtual Terminal.
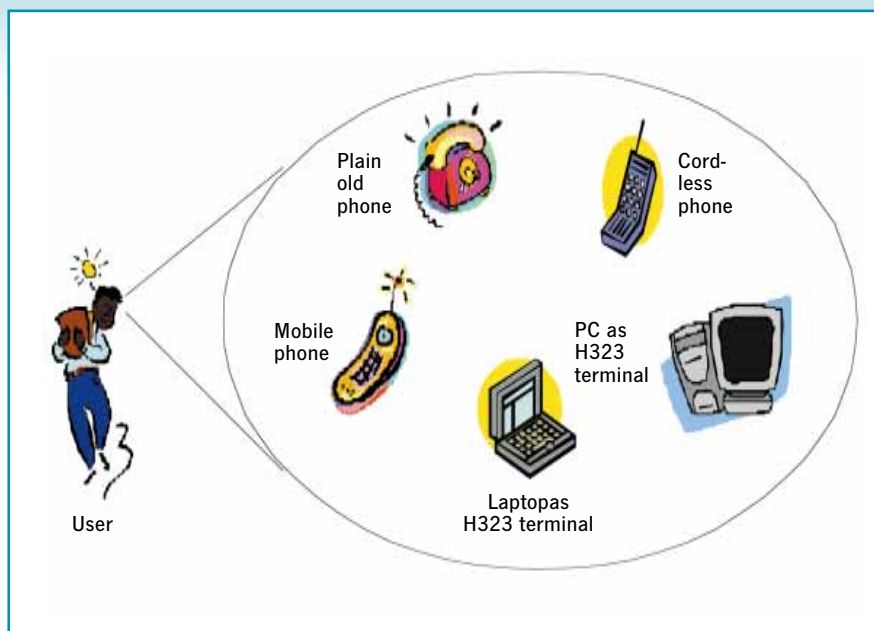
Figure 2: The Virtual Terminal

- Multiply and deliver output streams from applications to respective devices.
- Unify and deliver input streams from different devices to respective applications.

The Virtual Terminal

The Virtual Terminal concept will allow the user to define, add and remove the devices that are included in the Virtual Terminal at any time. The user's many terminal profiles and user profiles on different devices will be replaced by a unique user profile defined once and for all in the DUS. Whenever this profile is set up or updated, it will automatically be accessible from all other devices contained in the Virtual Terminal. In this way, the user can set up and modify his personal preferences for all his devices at one place.

Device unification and co-ordination

Since many communication devices, like mobile and fixed phones, may have a limited user interface, the combination of these devices with various other devices with different capabilities may result in better user interfaces and hence enhance the offered services. During a service session, a user may want to use one or more elementary devices with just input and output functionality in addition to his communication device. Examples of such elementary devices can be a big screen display, loudspeakers or a microphone. In other cases the user may want to re-route the voice or data streams coming in to his mobile phone to other, more convenient devices such as a fixed phone, a PC etc. This can be done via the mobile device using technologies such as Bluetooth, but due to limitations of the mobile device, it might prove a better alternative to introduce the DUS to handle this.

Another task for the DUS might be to send the contents of a file from the mailbox to a nearby printer to provide a hard-copy of incoming text, pictures etc. The Virtual Terminal should be able to offer such functionality, even if the user's mobile device does not.

The DUS will also help the user in utilising stationary devices at visiting places, e.g. printers, TV screens etc., and to co-ordinate them with the mobile devices carried along. Whether stationary devices should be available to the visiting user should depend only on the permission from the owner of the devices and not on the configuration or technical interoperability of the devices. As long as the visiting user has permission to use stationary devices, the DUS will be responsible for unifying and co-ordinating the mobile and stationary devices so that they can work together in a seamless way.

With this concept, all the different communications devices, computing devices and other electronic and peripheral devices will be considered as one big terminal with multiple input and output capabilities. The user terminal will no longer be an integrated and recognisable device but a set of distributed devices that allow access to certain services. The terminal is transparent, meaning it is no longer present and it requires no attention as far as the user is concerned.

User centric approach

The proposed service will be user centric instead of device centric enabling to address a person directly instead of addressing one of his devices (Figure 3). With the DUS, the user will be reachable anywhere, anytime and regardless of what communication device he has at his disposal.

Every user will have a DUS responsible for handling available devices, which may include a variety of personal or public devices, within the Virtual Terminal. The user should in some way keep his DUS informed about which devices can reach him. This, however, does not necessarily have to trouble the user; it can be done automatically according to some predefined settings, for example default registration, a timetable or a location dependent table. Another solution is to make use of service discovery protocols to detect nearby services and devices and automatically inform the DUS about them.

This way the DUS will know which device is most appropriate to contact the user. Anyone wishing to communicate with the user will dial up his or her DUS, which in turn will contact the user. In other words, the DUS will function as the user's personal secretary. Incoming calls will be transferred to the most appropriate devices at any given time, and the DUS will receive messages for the user when he or she does not want to be disturbed.

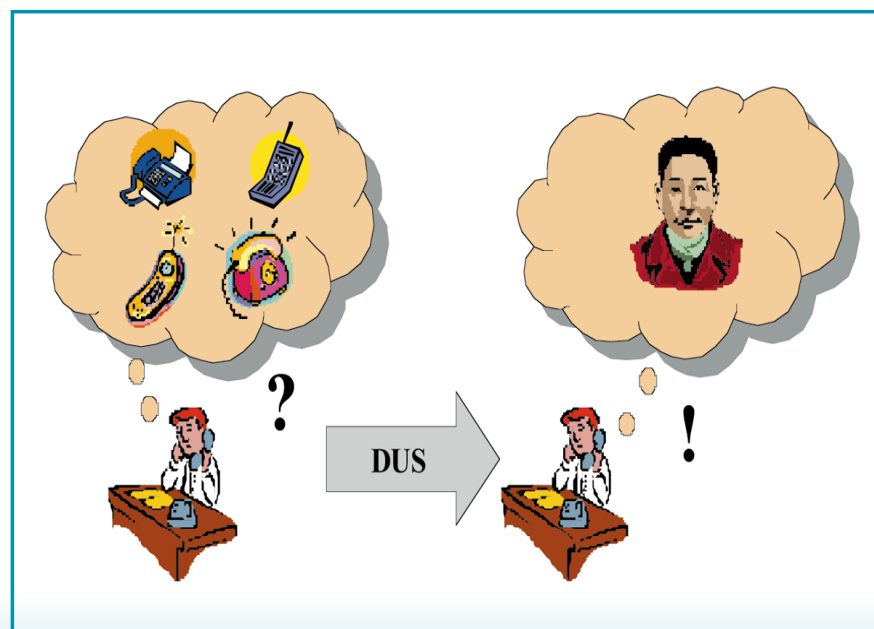The DUS will offer personal mobility to the end user replacing fixed relations

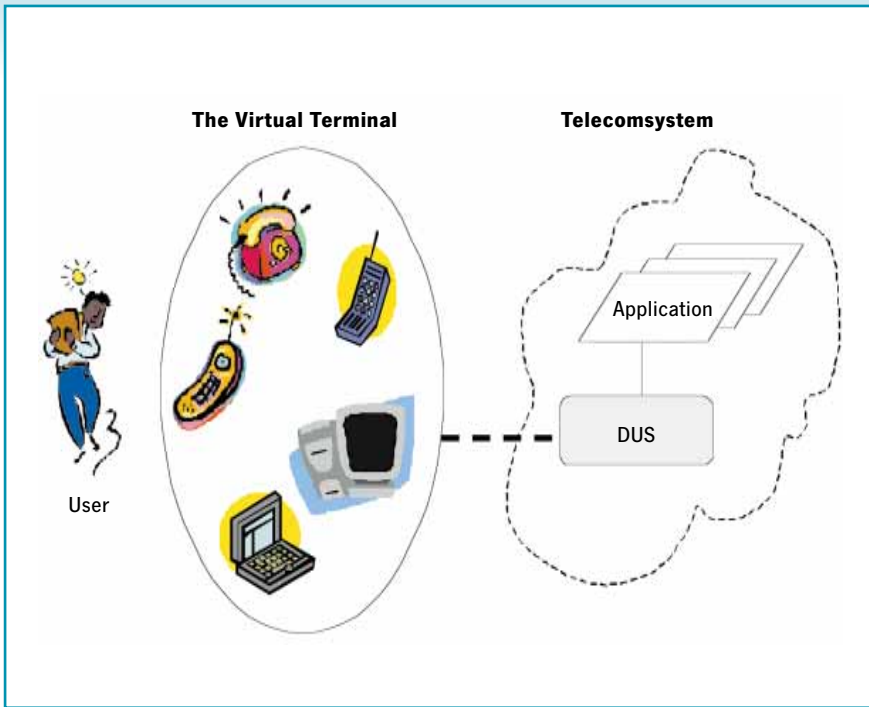**Figure 3: Addressing a person instead of a device**

Figure 4: The logical system architecture

Implementation

The DUS can be implemented as an application on a standard IP-based server. As shown in Figure 5, the DUS stands between devices and services. Both requests from devices and from services are addressed to the DUS. The DUS will then establish connections towards the appropriate device or service. The DUS must therefore be able to establish and terminate connections. For that there are several alternatives. The DUS can interact directly with the Session Initiation Protocol (SIP)(http://www.cs.columbia.edu/~hgs/sip/implementations.html). Alternatively, the OSA/Parlay API (http://www.parlay.org) can also be used. The third alternative is to use the JAIN API (http:www.java.sun.com/products/jain/api_specs.html). At this stage it is still unclear which alternative is the best and further investigations are required.

EURESCOM project on DUS

EURESCOM's project P1101 is currently working on the classification of requirements and the design of a Device Unifying Service. A prototype is planned to be ready next year. However, the implementation of the DUS as a fully deployed service depends on a number of emerging and immature technologies, such as Bluetooth, OSA/Parlay APIs, SIP and mobile agents. The further development of these technologies will be crucial for the implementation of the Virtual Terminal. Nevertheless, there is a genuine need for the Device Unifying Service, and there is little doubt that these technological obstacles will be overcome.

between user and device. Any relations to devices and subscriptions are dynamically set up and cancelled by the DUS. This lets the user switch from device to device and from operator to operator without even temporarily losing network accessibility. The identifier belonging to the Virtual Terminal will stay unchanged, and the different devices will become transparent.

Logical system architecture

There are three alternatives regarding the location of the DUS:

- On a user-owned mobile device.
- On a user-owned stationary device such as a PC or a workstation.
- On a server somewhere in the network, owned by a service provider.

The first alternative has the advantage that it is closer to the devices and hence easier to implement. The major drawbacks are that the mobile device might loose contact with the system and that it is more exposed to damage or theft. It will also be inconvenient when the user wants to get a new mobile device and discard the old one. The second alternative is not convenient since it requires the user to have an expensive stationary device, which is not always the case. Both alternatives will also require that the user leaves his or her devices always on. Finally, although most

challenging to implement, the last alternative proves to be the best since it is most flexible. It does not require that the user owns an expensive terminal, and roaming is provided allowing the user to move away from his or her home domain while keeping in touch with his or her DUS. The logical system architecture is illustrated in Figure 4. Applications are only aware of the DUS and not of the user's different devices. Services are delivered to the DUS, which in turn ensures the delivery to the user through the most appropriate device.
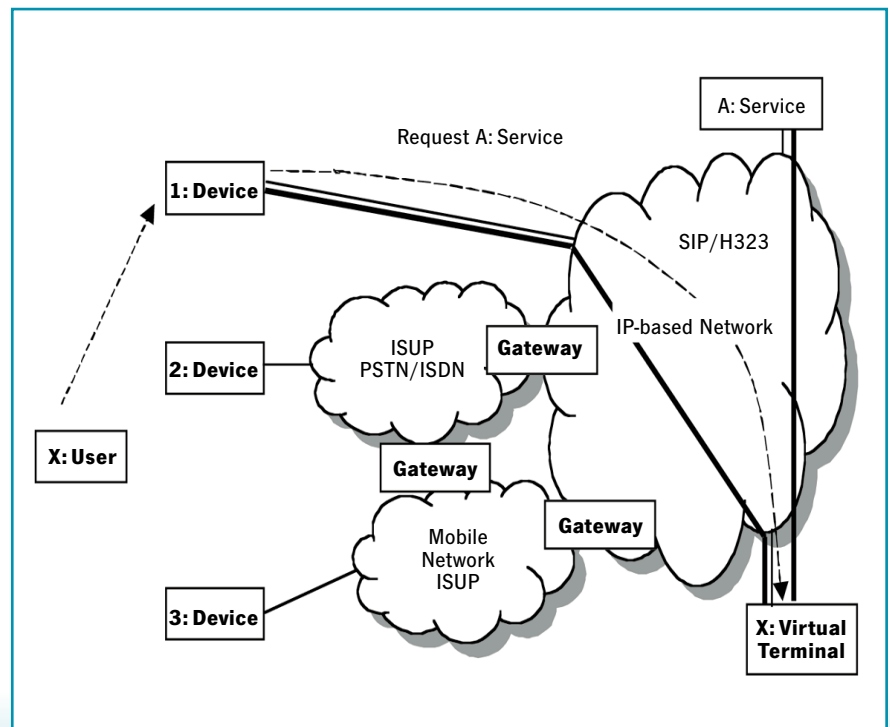

Figure 5: Implementation of the DUS

PERSONAL NETS
A USER DRIVEN NETWORK APPROACH

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Consider for a moment what the future might be like when there are hundreds of microchips for every person on the planet, busily processing information and communicating with each other: The Internet connects permanently all the devices on your person, around your home, and in your car. Artificial agents search the Internet dedicated to satisfying their owner's desires, whether conscious or not. Your every action is monitored, captured and stored on some anonymous database with a 'big brother' ambient intelligence automatically managing what is 'right' for you. Then, there will be no off-switch, no place to hide. Such a scenario is what many technology futurists are predicting.

The EURESCOM study 'Personal Nets' (P 1047) asked some fundamental questions about what all this technology is for, how we want it used and what value does it add to our lives. This study does not advocate an anti-technology rebellion. Our predicament is that, as an industry, we are increasingly at a loss to understand what fulfils users' real needs. We generate and maintain a lot of perceptions about how consumers should use our technology, but what if this is not what they really want?

Personal Nets might provide some answers – the means to apply new technologies in a socially responsible and beneficial manner. Ironically, the current downturn in technology stocks might provide us with both an opportune wake-up call and a chance to rethink our fundamental approaches.

Always On – benefits and dangers
The study started out by acknowledging the many new technologies being developed. Probably the most immediate new development is the Always On property of future network systems. As with all new developments this has both beneficial aspects along with more damaging possibilities. There is the potential for life-saving medical applications through the continuous monitoring of bodily functions. Balancing this will be continuous surveillance and unprecedented amount of personal data collected for commercial purposes.

If we accept that users are not just passive consumers but active participants, which is certainly the case with the more experienced and aware users, then the systems we build have to be user-centered, rather than constructed according to commercial imperatives alone.

Privacy is fundamental
The Personal Net concept offers a new way of envisioning personal systems. A Personal Net is not a technology-based network. It can be thought of as a web of relationships that each person has with others around them, with the ecologies that they live and work in, the business they deal with, the objects and devices they use, and the information and knowledge they need and generate. Collectively the relationships are

Use of Personal Nets in medical care

building blocks of all the applications that a user might need, now and in the future. Some of these relationships will be personal and private while others are public. So the Personal Net, unlike the Internet, begins with the proposition that privacy is fundamental.

Each Personal Net does not exist in isolation, but shares relationships with other Personal Nets and business nets. An important property of a Personal Net is that it is continually present and continually refreshing itself according to the needs, contexts and activities of its owner. It also defines the boundaries of the user's ownership, control and responsibility as well as limiting unwelcome incursions from other parties.

Integrating resources and services
In the study we developed scenarios to illustrate how people might use and behave towards new technologies. We identified a set of fundamental user needs and expectations of future technology systems. There was one important underlying user expectation that became evident: the ability for

users to manage and integrate resources and services from many different suppliers, while still maintaining their own identity, personal safety and sense of control. None of the current systems being developed truly fulfilled this expectation, even if they claimed otherwise.

From the technology perspective one key finding of this study was that all users, whether individuals or businesses, should be able to generate their own unique Personal virtual network infrastructure from underlying private and public communication and computing resource components, meaning mobile networks, fixed networks, home networks, and the like. Many of the technologies necessary to do this already exist or are in development. Such networks would offer users the ability to manage and trade resources from many different sources without relying on highly centralised management, instead management is adaptively distributed amongst components of the virtual network.

The Personal Net infrastructure also provides the user with an individualised distributed applications platform for applications. A further fundamental property of the Personal Net is that it follows its user and extends itself across different systems while still offering similar sets of capabilities. Depending upon each user's situation, the Personal Net may link and connect together with other networks to exchange information and share applications. Personal relationships will govern the privileges that are granted on the connection; for example, family members may choose very open connections between themselves while limiting a commercial relationship to more specific purposes. Finally, the way in which contents, contexts and activities are presented to the user by Personal Net may bear more resemblance to three-dimensional simulated virtual environments, with artificial entities such as avatars, than today's icon driven interfaces, thus making them more fun as well as more intuitive to the user.

The idea that everybody will have his or her own Personal Net may be quite a few years into the future. It is likely that current technology implementations will have to run their course, so that their weaknesses are exposed. However, there are important messages for developers of the next generation communication systems. Foremost is that Always On connectivity and the appearance of ad hoc networks could generate a strong demand for greater user privacy and integration, thereby increasing the importance of user-centred managed systems.

BTexact TECHNOLOGIES
– A NEW PARTNER FOR EURESCOM

In May 2001, BT announced a series of changes to its business designed to deliver greater shareholder value. These included the creation of a new partner for EURESCOM – BTexact Technologies, an advanced technology business comprising BT's engineering and technology research and development activities.

British Telecommunications plc is one of the world's leading providers of telecommunications services and one of the largest private sector companies in Europe. On 10 May 2001, the company initiated a profound transformation. It announced a re-grouping of a number of its activities into new, self-contained business units, collectively known by the working name "Future BT", made up of:

- **BT Ignite**, an international Internet solutions and broadband IP business, focused primarily on corporate and business markets;
- **BTopenworld**, a mass-market Internet business, focused increasingly on broadband services;
- **BT Retail**, serving end-user business and residential customers in the UK; and
- **BT Wholesale**, selling network services and solutions, capacity and call terminations to other carriers and service providers.

In addition, BT Wireless, an international mobile business, which BT plans to demerge before the end of 2001, was created.

The launch of BTexact Technologies at Adastral Park
Also launched in May 2001 was BTexact Technologies, an advanced technology business created to provide a portfolio of professional and consultancy services to external customers while continuing to develop technical solutions and strategies for BT's other businesses and alliance partners.

Building on the international reputation for research and engineering achievement established by BT Laboratories – the name by which BT's research and engineering facility was known before its transformation into Adastral Park – BTexact offers products and services in areas including communication networks, consulting, customer relationship management, mobile communications, multimedia applications, operational support systems, process engineering and transformation, security, test and evaluation services, voice networks and speech services.

Also part of BTexact Technologies is Brightstar, BT's new corporate incubator, the most ambitious programme for budding entrepreneurs ever run by the company. Its main aim is to generate value from BTexact Technologies' intellectual property portfolio – some 14000 patents world-wide – through an incubator environment where groups of BTexact's aspiring entrepreneurs can develop an idea or a patent into a fledgling company under the BTexact Technologies umbrella.

Working closely with EURESCOM
Despite these changes – and arguably even more so because of them – the BT Group remains one of the four major shareholders in EURESCOM and, through BTexact Technologies, will continue to participate actively in its programme of collaborative research.

As John Grierson, Manager of European R&D Collaboration at BTexact, says: "Participation in EURESCOM projects shows that carefully chosen collaborative projects can bring significant benefits to BTexact and the whole of the BT Group – through leverage of outside resources, the sharing

of scarce or complementary resources and increase in knowledge and competence through working with other companies and nationalities."

According to John, there are three main areas of research in which this kind of collaborative work has proved particularly useful to BTexact. These are: projects that involve international interconnect and interworking; speculative or futuristic work which often involves more resource than an individual operator might want to fund in isolation and "softer" issues such as research into customer markets, for example, which benefit greatly from a pan-European perspective.

Taking a project eye's view
Dave Milham, OSS Technical Collaborations Manager at BTexact, is currently involved in P1103, P1106 and P1143 all of which look like being useful to BT and the other shareholders involved. Two of these projects link back to a previous study, P908, which has just ended.

P908 looked at OSS interconnection gateway validation and its purpose was to look at a number of commercial products in the marketplace that are being proposed for intercompany interfaces, specifically for regulated interconnect services like number portability, carrier preselection and local loop unbundling.

Said Dave: "When we started this project we envisaged the focus being on how you test these kinds of projects in the marketplace. However, we actually got a more interesting result in that we began to understand how we could use mainstream e-commerce technology to solve a number of other problems of how companies trade with one another. In essence, we uncovered more questions than we solved which led to P1106 which looks at the impact of e-commerce on service and network operations and management."

According to Dave in many EURESCOM projects it is often the unexpected finding that proves most important to the business. He says: "BT has operationally deployed a variation of the e-commerce interfaces that we defined and demonstrated in May 2000 as part of P908 leased circuit provisioning. That was not planned in the original EURESCOM project but it's a fortuitous by product."

Sverrir Olafsson is also working in a long-term project with EURESCOM, P1112, which looks at network dimensioning at a fundamental level. As Sverrir says, in spite of the phenomenal growth of Internet/Intranet-based services the performance characteristics of large-scale networks are still rather poorly understood. This project seeks to address this over a three-year period and ultimately develop tangible software kits or toolboxes to use in dimensioning or designing networks.

Says Sverrir: "I think this is an excellent project. We have a large pool of expertise and the various shareholders complement each other very well. Some have a more theoretical understanding of the work while others are more experienced in data collection and running real systems. We will definitely get more out of it than if we had just tried to go it alone."

Richard Tateson who has just completed a short study, P1142, around the issue of Biosciences in ICT, concurs. His work, which is very much future-based, looks at interactions between biosciences and the ICT area and, asks what telecoms companies and their shareholders need to do to prepare for this possible future. The report looked at issues including implants in humans, computing with biological molecules and nature-inspired computation and control algorithms. The study concluded that although nature-inspired techniques are already ripe for exploitation, there are still many problems to be overcome in the direct use of biology in telecoms. However, as Richard says, ultimately a company may not want to buy a product or service but it needs to understand what

may be being developed to maintain competitive advantage.

According to Richard: "EURESCOM projects seem to be particularly useful when you are at that stage of research where the thing holding you back is the critical mass. We can collaborate to help get over the threshold where things actually work well enough to become marketable products and services. In principle it should be very good for the kind of work I am involved in where the research is so pre-competitive that we are best off working together to make it happen and then fighting it out for who gets the revenue."

In conclusion, John has this to say: "Over the past ten years our companies have moved from being largely incumbent telcos who worked collaboratively, through a highly competitive stage, to a more rational period where everyone realises that there are some things you lead on but also some areas where you need to work together. One of the constants throughout this has been excellent contacts at a research level – and bodies like EURESCOM help to make that possible. For the successful company, research will always be important but we also know that collaboration is important – none of us can afford to keep reinventing the wheel over and over again."

BRIDGE BETWEEN TECHNOLOGY AND BUSINESS FOR 3G

Interview about the EURESCOM SUMMIT 2001, with David Kennedy, Senior Programme Manager of EURESCOM and Chair of the Technical Programme Committee of the Summit

mess@ge: Mr. Kennedy, can you tell us a little about the EURESCOM Summit 2001?
We're very excited about this event, as it's the first time we've planned to bring this number of business and telecommunications experts together to determine the pragmatic evolution of our services and networks in the current difficult economic climate. EURESCOM has organised many successful technical workshops and conferences. But now we have to integrate technical solutions with a fresh approach to business planning. The challenges of the network operators and service providers today cannot be treated in isolation.

mess@ge: Can you give an example of overlapping topics?
For example, in the past we had fixed quality parameters for voice telephony but today we have seen, from voice over IP trials on the Internet, that speech quality can vary with price. People will accept low quality if it is cheap. This shows us the close linking that must occur between the provisioning cost of a new service and the potential revenue.

mess@ge: What is new in the Summit compared to EURESCOM workshops?
The Summit is designed to allow an integrated view of the evolving telecommunications world. The EURESCOM workshops are typically organised around the work of a number of EURESCOM projects and are addressing focused issues. In organising this Summit we have issued an open call to the telecommunications industry, telecommunications users and academia for contributions. Obviously the programme committee have selected the best papers and we're pleased to see a good mix between the technical and techno-economic issues in the programme.

mess@ge: The concept looks like an ordinary conference.
Yes it is, but with one significant difference. We have positioned the Summit between the purely technical conferences of the academic and research communities, and the purely business oriented conferences. We want the Summit to form a bridge between technology drive, user acceptance and business objectives. This will be the unique event where the exciting technical possibilities of 3G will be prioritised by market reality.

mess@ge: Who is the target audience of the Summit?
Everybody who has a business or technical interest in the cost/benefit of 3G can get something from this Summit. The programme contains many relevant issues, ranging from the excellent tutorials, through presentations and papers on the key issues, to a public discussion with the most influential players in the industry.

mess@ge: What about the organisation of the Summit?
The main difficulty was the timing, but we managed to find a week where our summit is the major event in Europe. Our organising committee performed miracles to get the logistics sorted out in time and we had a lot of help from our friends in related technology companies located in the Heidelberg area.

mess@ge: What is the overall objective?
It is twofold. As the title of the Summit already suggests, we want to "Secure the business case for 3G". Beyond that, we want to establish a yearly event where the whole telecommunications industry can share ideas to make the evolution of 3G a commercially successful reality.

mess@ge: So, there will be future Summits?
Obviously there will. We started planning for the second EURESCOM Summit some time ago and details will be announced at the end of the first Summit.

The interview was conducted by Anastasius Gavras.

EURESCOM Summit 2001 – Heidelberg, 12 to 15 November 2001
3G TECHNOLOGIES AND APPLICATIONS

The objective of the conference is to explore the challenges and the opportunities of next-generation applications, technologies and services for mobile communications. The Summit is meant to bridge the gap between technological advances and their business relevance. The target audience includes executives, business professionals and developers at network operators and equipment manufacturers as well as the research community. Besides the technical programme there will be tutorials, keynote presentations, panel discussions, demonstrations and a technical visit.

For more information and registration visit the Summit's Web pages at *www.eurescom.de/summit2001*, or send an e-mail to *summit2001@eurescom.de*, and you will receive a copy of the printed programme.

PROJECT ON
E-COMMERCE IMPACTS
– VENDORS TO BUILD DEMONSTRATORS

The project team of EURESCOM project P1106 'E-commerce Impacts on Service and Network Operations and Management' held a meeting from 29 to 31 August in Heidelberg. Together with representatives from BEA Systems, Acterna, Spirent Communications and Sodalia, they discussed the requirements and specifications for emerging operational needs of EURESCOM shareholders in the area of service and network management. Members of the P1103 project team dealing with "Inter-Operator IP QoS Framework – ToIP and UMTS Case Studies" participated via teleconference.

THE ARMSTRONG
IPv6 PROJECT "A SMALL STEP FOR IP,
BUT A GIANT LEAP FOR MANKIND"

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The reason why the Armstrong project got it's name during the project kick-off meeting in Heidelberg was that everybody felt, with the investigation of the Internet Protocol Version 6 (IPv6) deployment we are going to a place where nobody at EURESCOM was ever before. Neil Armstrong and his famous sentence therefore seemed the perfect name patron for this IPv6 project.

IPv6 was finally standardised by the Internet Engineering Task Force (IETF) in early 1999. The core protocols and addressing schemes are standardised and possible mechanisms for transition have been proposed. Since operational issues are outside the scope of the IETF framework, the IETF IPv6 working group has asked the Internet community to start deployment of the new IPv6 protocol suite, to gain experience with the new protocols in production environments.

IPv6 in ISP networks
Being the first EURESCOM project that had IPv6 and its deployment as its main focus, the Armstrong project investigated issues, which are very essential for the usage of IPv6 in Internet service provider (ISP) networks. Since upcoming 3G mobile networks are expected to be one of the main beneficiaries of IPv6, a special case was made for such an environment.

Multi-provider tests of IPv6
Routing and basic IP services, like DNS, are the key elements for the operation of an ISP network and the Internet in general. While single partners have gained some IPv6 experience in a lab environment, a multi-provider network reveals issues that show up in realistic network environments only. Some general operational experience with IPv6 has been gained for a while in the global 6bone network. In order to examine the behaviour of the network under special conditions, however, the setup of an IPv6 network between the sites of the project partners was needed. Inter-provider Routing with the Border Gateway Protocol (BGP4+) and services like translation from IPv4 to IPv6 and DNS were set up and practical experience was gained for a variety of realistic situations.

EURESCOM set-up an excellent test platform
The EURESCOM environment provided an excellent platform for the multi-provider tests that were conducted. The Armstrong project participants, British Telecom, Elisa Communications, France Télécom, Deutsche Telekom, Telenor, TeleDenmark, Telefónica and Portugal Telecom ran the IPv6 network for almost a year. A part of the network is still operational in the Tsunami IPv6 project, which just started.

The project had interesting results in several areas. With respect to basic interworking and routing scenarios even the more complex routing scenarios worked quite well. There are problems, how to efficiently aggregate networks and addresses for routing purposes, but this is ongoing work in IETF. Multicast and Anycast are still a construction area, since there are few implementations available for Multicast, Anycast and its routing.

A long transition from IPv4 to IPv6 – EURESCOM helps IETF and 3GPP to ease it
Besides the basic proof of readiness tests, a second main work item of the project was the investigation of transition mechanisms, how to get from IPv4 to IPv6. It

The project members decided to submit the findings of this investigation to IETF. Therefore an Internet-Draft, the usual way of the IETF to communicate among its contributors, was written and presented at the IETF meeting in Minneapolis (http://search.ietf.org/internet-drafts/draft-krampell-v6transition-interaction-01.txt). The feedback of the IETF NG Trans working group was very positive and the authors were asked to continue the work. The Armstrong team members, who continue to collaborate in the Tsunami Project, carry on this work.

Transition scenarios were also investigated with respect to the different deployment scenarios of IPv6 in UMTS networks. Basically, the requirements for transition scenarios for the various 3GPP versions were defined and the advantages and disadvantages of the various transition mechanisms were discussed. This work is submitted to 3GPP through the project shareholders.

The Armstrong test network – A milestone for IPv6 in Europe

So what is left? The Armstrong project has triggered a number of activities in the European environment. As one of the first European IPv6 networks and the first one established between several telco carriers, Armstrong has been a milestone for IPv6 in Europe. Intermediate and final results,

is obvious that there will be no "flag day", when IPv4 is switched off and IPv6 is switched on. Instead, there will be a long transition phase, where both protocols will live on the Net in parallel. The IETF had this in mind and called for proposals for transition mechanisms. Many transition mechanisms have been proposed and some of them were standardised. In the Armstrong project, we had a closer look at these transition mechanisms, how they can be deployed, and what implications they have on ISPs. The large number of transition mechanism standards makes it a quite difficult task to select the appropriate one.

which were made public, were presented on more than half a dozen conferences and events, including several IPv6 Forum events (Stockholm, Madrid, Ottawa), EU meetings, the Internetworking 2000 in Bergen, the 50th IETF and the IETF IPv6 Interim Meeting in Redmond. Further information about the Armstrong project can be found at http://www.eurescom.de/public/projects/P1000-series/p1009/

The work continues in our Tsunami project

The Armstrong network lives on in the Tsunami project P1113. So does the work

on the Internet-Draft. The deployment of IPv6 is work in progress. The work on IPv6 in EURESCOM reflects this. "The tidal wave of IPv6 is going to hit the coast soon." as Internet Pioneer Vint Cerf put it. EURESCOM and the Tsunami project are prepared (http://www.eurescom.de/public/projects/P1100-series/P1113/).

BIOSCIENCES AND ICT
– TWO WORLDS GROWING TOGETHER?

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Can advances in biosciences be put to work in information and communication technology (ICT)? To take full advantage of the opportunities offered by biosciences, it is necessary to assess the impact and maturity of bioscience technologies, which could provide new ICT products and services or address existing ICT weaknesses. The short EURESCOM study 'Biosciences and ICT – two worlds growing together?' (P1142) has looked at a range of bioscience technologies with potential to improve or transform ICT over the next decade.

In many cases there are significant technical hurdles to overcome before such technologies can be applied to ICT, but there are also examples, particularly in the area of bio-inspired ICT, where the technology is already beginning to be exploited.

Why should telecommunication companies look at biosciences?

Bioscience, like ICT, is a rapidly advancing area having an enormous effect on our lives. Inevitably there will be interactions between biosciences and ICT. Will this be only on the application level – using ICT to relay genetic diagnostic data between doctor and patient for example – or will there be more profound mutual benefits? The study team believes the interaction will be profound and important and will lead to new, radical information processing methods, robust, adaptive networks and novel services.

This expectation is based on the fact that many of the features of living systems are exactly those which existing computers and networks lack:
- local, decentralised architectures; biological components work in parallel, are autonomous and self-organising
- robustness/fault tolerance; malfunction of components does not crash the system

- adaptability; systems survive in complex, unpredictable environments, and adapt during their lifetime and through evolution

By contrast, traditional ICT implies:
- centralised design principle; data is acted on, in series, by a central processor
- brittle architecture; single component failure can crash a system
- inflexible solutions; if assumptions about the working environment made at design time are violated when the system is running, performance can degrade substantially

These features of ICT have not prevented the spectacular progress in the field over the last thirty years. Indeed it is in part precisely these principles which have allowed that progress. However, in some cases they now limit ICT performance, particularly when we wish to design and run large, complex, networks, which provide diverse services on demand.

These observations point to two ways to exploit bioscience: Apply the principles of biological systems by analogy to our artificial systems and use biological systems directly as elements in our computers and networks.

In addition there is a third route to exploiting bioscience considered by the study: New services arising from interfacing ICT with living bodies.

Bio-analogous ICT

The largest area of bio-analogous software research is 'evolutionary computation'. The principles of natural selection are used to 'evolve' artificial systems, which adapt to their task as the generations go by. Other areas of software research include inspirations from ecology, immunology, neuroscience, developmental biology and molec-

ular biology for the purposes of information retrieval, system security, network control and information processing.

In hardware, analogies from nature drive 'evolvable hardware' research, whereby re-configurable chips adapt over generations. Another field for analogies are 'neurochips', transistors designed along some principles of biological nerve cells.

Software and hardware come together in research into autonomous robots, which are sufficiently robust and adaptive to operate without close human supervision in challenging environments such as the surface of Mars.

ICT based on biological material

DNA and other biological molecules are under investigation for information storage and processing, exploiting their physical properties as well as the manipulation techniques perfected in molecular biology labs. DNA is also used in 'microarray' technology, which will become an impor-

tant medical diagnostic tool in the near future. More ambitiously there is interest in using whole cells, rather than purified molecules, as processing elements.

Bioscience is also important in nano-fabrication. This includes the use of bio-molecules as a 'scaffold' on which electronic circuits can be built and there is the aim of building 'nano-machines' on the same scale as living cells. These machines will copy things like the 'molecular motors' found in many cells and may also incorporate whole molecular assemblies 'stolen' from nature.

Interfacing ICT with living bodies

The issue of how humans interact with ICT is an important topic already receiving attention from EURESCOM share-

holders. In addition there are bioscience areas which might inspire new interfaces. Medical measurement and imaging techniques have made health monitoring a familiar part of life. As this monitoring becomes more portable it also becomes more interesting to the ICT sector due to the need for applications to link many such devices in ways which best serve users. In the further future it is likely that implanted monitors and actuators, such as today's pacemakers, will become common and again it will require ICT support to derive the best value from such technology.

Away from the medical domain, the interface between humans and machines is under active investigation. For example 'bodynet' includes the body of the human user as part of a local network of devices.

Conclusions

Awareness of bioscience advances will be valuable for telcos of the 21st century. Home-grown research, technology watch and a proactive stance on potential consumer worries all have their place.

Technologies, which draw inspiration from bioscience without directly using biological material, are already having an impact. Telcos should either conduct their own research into this bio-analogous software and hardware, or should form close collaborative ties with external industrial and academic researchers in this area.

The direct use of biological material for computation and telecommunications still faces very significant hurdles to realisation. Telcos should ensure they have access to sufficient expertise so that they can identify breakthroughs in these areas, which might make them ripe for more direct investment. Expertise will also become necessary to evaluate the claims of suppliers of this technology in the future.

The interface between humans and technology is already an area of interest to telcos. Advances in bioscience will tend to make this interface more subtle and invasive. This has potential for great advantages in how people relate to machines and hence come to demand, and rely upon, computational and telecommunication support and services in their daily lives. There are also concomitant dangers in the areas of security, privacy and legal responsibility.

So the answer to the initial question is that bioscience and ICT are indeed growing together making way for a plethora of fascinating opportunities no company in the telecomms domain can ignore.

For more information please refer to the P1142 project page on our Web: http://www.eurescom.de/public/projects/P1100-series/P1142/

WAY AHEAD ON USER-CENTRED R&D
AT EURESCOM

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The best technology is of little value, if it is not accepted by the users and the markets. It is extremely important for the telecommunication companies to know what users think, which services they like or dislike and why. EURESCOM has always considered the understanding of user needs an important part of market success and has for that reason several related projects in its portfolio.

With increased competition, it has become increasingly important for network operators and service providers to have a close look at the users and the rapidly changing market environment.

User-centred activities at EURESCOM

User needs have always played an important role in EURESCOM work. With the famous "JUPITER" projects (Joint Usability, Performability and Interoperability Trials in Europe, P605 and P807) starting in 1996, the focus shifted even more towards the users. In 1998 a comprehensive user-centred initiative on "Social and economical impacts of telecommunication services" was initiated which culminated in three user-centred projects which have just finished. One was looking at tele-learning communities (P902), one at teleworking and quality of life (P904). Another project was running a huge investigation with 9000 interviews in 9 countries to find out why people are using and – more importantly – not using ICT services, and which user segments should be targeted to increase

telecommunication businesses and markets (P903).

Concerning usability, there are 3 new projects running. One ("MUST", P1104) is looking at the question how small mobile terminals can use different in- and output modes to communicate with the user in a user-friendly way. The project will dedicate significant resources for evaluating the possibilities with real users. Another project ("The third dimension", P1119) is evaluating adaptive services and applications on different types of terminals with real users. The third project ("MOBILUS", P1105) is investigating concepts for research and development of UMTS-based information intensive services that support nomadic work and life styles.

EURESCOM is determined to keep its user-centred activities high. Two studies are preparing the ground for a sound and comprehensive future involvement of EURESCOM in user-centred subjects.

The future CAMERA – Customers And Markets EURESCOM Research Activities (P1144)

This EURESCOM study is identifying activities related to customers and markets that could take benefit from international collaboration and give competitive advantages to EURESCOM shareholders and members.

As the title indicates, the study wants to add some new angles to the area of looking at customers: e.g. shifting it slightly towards business orientation but wanting to take into account also companies as customers. However, we must never forget that it is human beings in different roles that are making decisions based on pretty similar criteria.

Another angle the study wants to emphasise as a very important research area is the market environment, e.g. the new structures, roles and players. One of the most prominent features of the current and emerging market environment is that it is chaotic due to rapid changes. It resembles more poker than chess, and the customer is king. There are clear indications that the customer role will be extremely important. The information about existing and potential cus-

tomers may be the most important piece of information a company owns. This also means that there will be a need to integrate the customers in different ways in our processes, even in the R&D processes. This, in a way, leads to another focus point of the study: the methods that can be used to perform customer-oriented research, with special interest in qualitative methods. The study tries to point out the rich variety of choice, which exists in the field of methodologies and is not generally known or used in the telco environment.

At the same time we must not forget the importance of usability or other already applied methods. And finally, the study tries to identify the potential collaborative research themes for future EURESCOM work in the customer and market-related areas.

EXACT – EXploring European ACTual ICT Users and markets data (P1148)

Our project P903 has performed a large survey and extensive analysis on ICT uses in everyday life (see the article "Exploring ICT use in Europe" in this issue). The results are very important for making strategic decisions on ICT services and products, and for analysing the market and users situations. Considering the importance of the topic and the interest shown in the results, this study will further disseminate the results of P903 and prepare the ground for a larger joint activity on European ICT market and user data together with other European bodies in 2002.

Several bodies and initiatives outside EURESCOM are dealing with similar activities:
- COST activities in the market and user analysis area (COST 269)
- IST Projects "E-living" and "SIBIS"
- Activities in Eurobarometer and Eurostat
- "Market Aspects Group" and "Operators Group" of the UMTS Forum

We will try to join forces and collaborate with at least some of these bodies and initiatives. By doing this, we could create a huge collection of actual data on ICT markets and users in Europe and even do some benchmarking outside of Europe. The collaboration with other bodies in the area would also mean sharing costs and hence minimising costs for EURESCOM and at the same time maximising results. This could also include exploring the possibility to propose a programme cluster for the 6th Framework Programme of the EU, which is to start in 2002/2003.

COOLING THE HELL
OF DISTRIBUTED APPLICATIONS' DEPLOYMENT

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Deploying a distributed application on the nodes of a network has undoubtedly been a daunting task. Experience shows today that software support is needed to manage software distribution and configuration in heterogeneous environments featuring different middleware products, development tools, and methods. In late 1999 EURESCOM started a very ambitious project. Its main objective was to automate several steps in this process. Usually these steps have been done by writing and manually executing installation and configuration scripts on hundreds or even thousands of nodes.

Middleware and distributed object technologies have facilitated the development of services, which may span a distributed and heterogeneous execution environment. It is imperative that middleware takes into consideration the particular needs of network operators and service providers. These stakeholders provide wide ranges of services while continuously introducing new ones. Their efficient deployment directly affects cost and time to market.

EURESCOM project on efficient deployment

Therefore support in any form for easing and automating the deployment and configuration of services is a clear advantage. From this motivation the work of the EURESCOM project on "Deployment and Configuration Support for Distributed PNO Applications" (P924) emanated.

The project, which will be closed this year, addressed a wide scope of themes. Deployment and configuration concern the placement of software components onto the nodes of a target environment, their installation, configuration, and instantiation, as well as the distribution and configuration while the service is used. The so-called dynamic re-configuration, includes the runtime configuration of a service and its components, version updating, management and re-distribution of service components. The project team developed a remarkable set of tools and platform services for distribution and configuration support that have been proven valid and useful by demonstrations at several conferences, workshops and OMG meetings.

Service requirements

Under current software engineering practices, a service is composed of software components, which are partitioned along clearly defined interfaces, and tuned appropriately so that given QoS requirements are fulfilled.

For the deployment of a service it must be decided how service components are to be assigned to network nodes. Such a decision is influenced by properties, such as the computing capacity of the nodes, the capacity of the communications links, the type of the computing platform, the communications protocols, and other service-specific constraints.

Furthermore, during the execution of a service certain characteristics may need to be preserved. For example, load balancing may make it necessary to move a component to another node.

Managing complexity with DCL

To tame the complexity of deployment and configuration, the project has developed a formalism called DCL, Deployment and Configuration Language, which is expressive enough to capture deployment and configuration requirements, and through the use of tools to automate the necessary actions. DCL has various forms, a graphical (DCL/gr), a textual (DCL/pr), and an interchange format (DCL/cif). A meta-model has also been defined for the sake of modelling the concepts of the language and their meaning independently of their concrete representation.

The usefulness of such formalism cannot be overrated. All distribution and configuration requirements for a service can be expressed in DCL and then be processed by appropriate tools, which, based on the DCL "specifications", perform all the necessary tasks for the distribution and configuration of the service at hand.

Tool chain

The project succeeded in providing a tool chain that includes:
- Interpretation and handling of the Deployment and Configuration Language (DCL).
- The necessary tool support for automating the distribution and configuration.
- Specification and implementation of platform extensions for runtime support.
- A process model and guidelines for the development of services.

Finally, the tool chain was validated through a popular and illustrative sample application: a distributed version of the 'dining philosophers' example.

The project work has been influenced by and, consequently, evolved around the CORBA Component Model (CCM). The tool chain is a first step towards support of the CCM specification, and the experiences gained helped in clarifying ambiguities and refining portions of the OMG CCM specification.

Furthermore, main parts of the work have been contributed to ITU-T for standardisation. Early next year the DCL and its underlying meta-model are expected to become part of the revised ITU-T Z.130 recommendation.

For more information on the project and to download its publicly accessible project reports, please visit the project's Web page: http://www.eurescom.de/public/projects/P900-series/p924
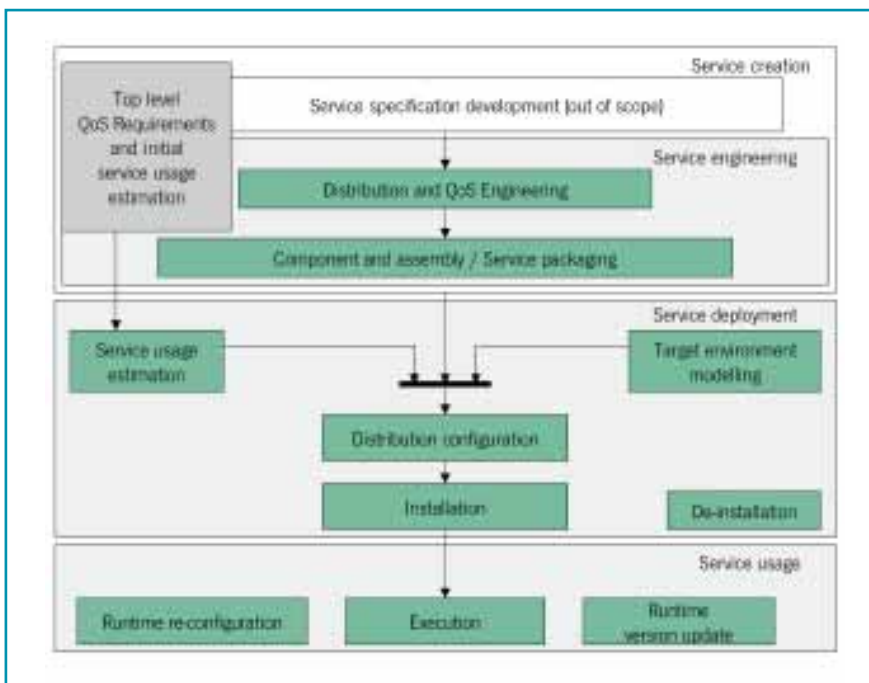
The process model for service creation, deployment and usage

DINING PHILOSOPHERS PROBLEM

A problem introduced by Edsger Dijkstra (a mathematician, pioneer in modern computer science) concerning resource allocation between processes. The dining philosophers problem (DPP) is a model and universal method for testing and comparing theories on resource allocation. Dijkstra hoped to use it to help create a layered operating system, by creating a machine, which could be considered to be an entirely deterministic automaton.

The problem consists of a finite set of processes which share a finite set of resources, each of which can be used by only one process at a time, thus leading to a potential deadlock.

The DPP visualises this as a number of philosophers sitting round a dining table with a fork between each adjacent pair. Each philosopher may arbitrarily decide to use either the fork to his left or the one to his right, but each fork may only be used by one philosopher at a time.

EXPLORING ICT USE IN EUROPE
RESEARCH RESULTS FROM EURESCOM'S EUROPEAN ICT USER AND MARKET SURVEY

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The EURESCOM project "ICT uses in everyday life" (P903) gives new insights for private use and non-use of Internet and mobile services. The heart of the project is a comprehensive, international household survey conducted in nine European countries from October to December 2000. More than 9,000 persons were interviewed including non-users, Internet users, mobile telephone users, and users of both Internet and mobile telephones.

The project team produced three deliverables:

- A project report for executives "Checking it out with the people – ICT markets and users in Europe", which summarises the main findings of the qualitative and quantitative survey (EDIN 0161-0903). This document is designed for high-level decision-makers who want to get a quick overview on some of the most interesting P903 results.
- A technical information paper "Checking it out with the people – ICT markets and users in Europe (detailed documents)" containing detailed information and results of the project (EDIN 0162-0903). This deliverable is suitable for experts who want to dig deeply into the methodology and results of the project. The document consists of two volumes. Volume 1 contains a number of annexes with the theoretical framework, the qualitative analysis, the construction of the questionnaire, and the P903 questionnaire itself. Volume 2 contains detailed results of the statistical analysis of the P903 database.
- A database package containing a short manual on how to use the database, the basic SPSS database, the HTML codebook, and the questionnaire package with the questionnaire in all languages used in the survey. This database package is relevant for analysts who want to do their own analysis, going beyond the more general analysis conducted within the P903 project. Conducting one's own analysis could in particular be interesting for analysing country specific issues.

The documents and the database package are available to our shareholders and members on the EURESCOM Web server at http://www.eurescom.de/public/projects/P900-series/p903
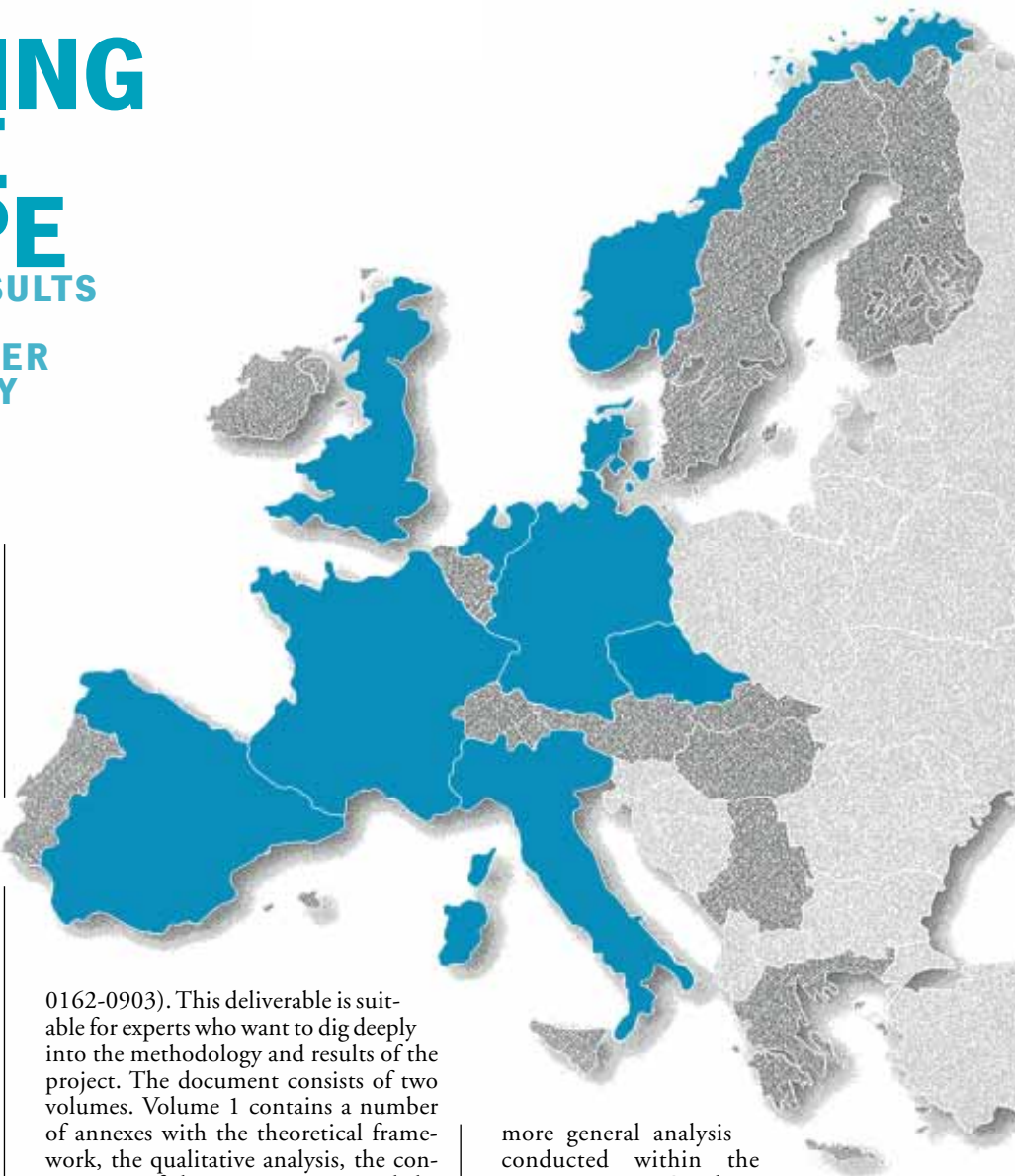
E-VOTING

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People have been voting by mail for years to elect officers for corporations and other organisations, and even in political elections. In many countries, network operators have set up telephone-based voting systems. By making an ordinary telephone call, people can for example decide who wins the Grand Prix de la Chanson d'Eurovision. E-voting is similar, to telephone voting, but based on computers and computer networks, and on cryptographic protocols. One hopes that in this way the voting process becomes faster, cheaper, more convenient, and also more secure.

Activity in the field of electronic voting is growing fast. There is an increasing number of pilot projects, e.g. the Arizona Democratic Party's presidential primaries in March 2000, where almost 50 % of the votes were cast via Internet. There are companies like vote.com who offer infrastructure for e-voting, there are EU-study projects (www.eucybervote.org), there is an extensive study on Internet voting supported by the US National Science Foundation (www.internetpolicy.org). Public interest groups like netvoting.org and voting-integrity.org have stepped up political activities and lobbying.

All these activities do not change the fact that e-voting is still in its infancy. Many open questions about security, feasibility, scalability, cost, business models and standards remain. In addition there are legal, social, and political considerations. Security is of course one of the main issues in e-voting. Therefore this tutorial will concentrate on basic security questions and outline some of the cryptographic mechanisms used for e-voting.

Requirements in e-voting

A voting system should satisfy the following requirements:

- Eligibility and authentication – only registered voters must be admitted.
- Uniqueness – no voter may cast his vote more than once.
- Accuracy – voting systems should record the votes correctly.
- Verifiability and auditability – it should be possible to verify that all votes have been correctly accounted for in the final tally, and there should be reliable and verifiable authentic election records.
- Secrecy – no one should be able to determine how any individual voted.
- Non-coerciability – voters should not be able to prove to others how they voted;

otherwise vote selling and coercion would be facilitated.

In addition, voters should be able to cast votes quickly with minimal equipment or skills, and they should be able to possess a general understanding of the voting process. Of course there are voting scenarios where one or several of these requirements are not relevant.

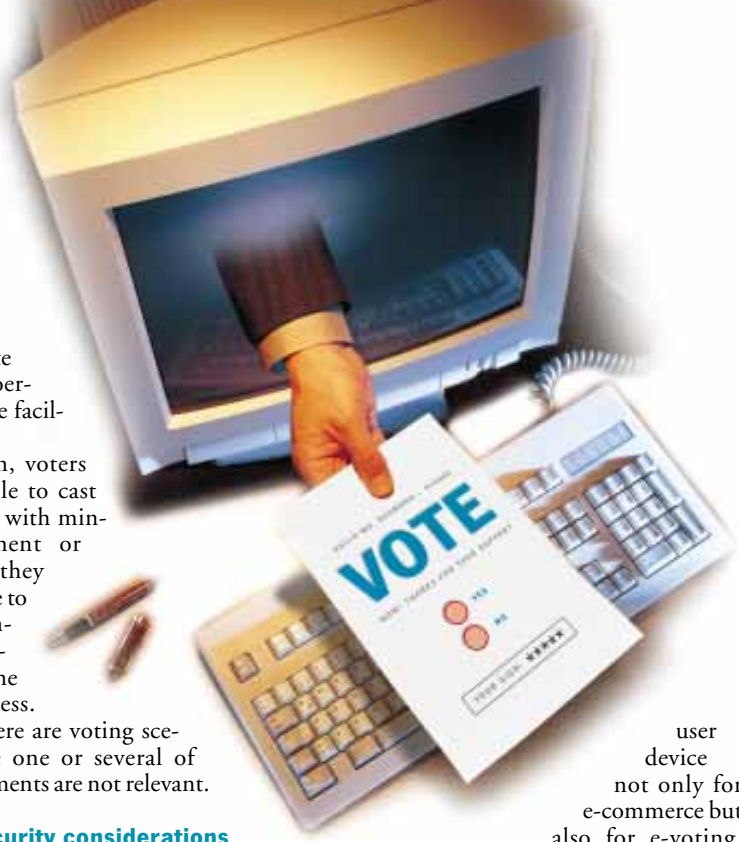## Systems security considerations

In any e-voting system, we have the following technical components:
- Servers and backend systems
- The network
- End user systems

Securing the servers and backend systems fall in the realm of 'traditional' computer security, the threats being similar to the ones faced regularly by online financial services. But unlike financial applications, in which receipts are kept by all parties participating in each transaction and detailed audit trails are maintained, secret-ballot voting systems must be designed receipt-free, and ballot selections must not be traceable back to individual voters. The recent distributed denial of service attacks (DDOS) against e-commerce sites showed the vulnerability of the networked servers; an important political election might inspire more resourceful attackers than 'script kiddies'.

The security of the end user components is more difficult to achieve, in particular if the voter is to use his or her own home PC. The insecurity of the present operating systems gives no protection against mailware agents, which might interfere with voting software. The voter may be maliciously connected to illegitimate servers, the secrecy of the vote may be compromised, or he may think he votes for A, but his software casts a vote for B. Even smartcards cannot protect against such manipulations, lacking a secure display. What is needed – as well as for digital signatures – is a "Personal Security Device" (PSD) which not only protects personal secret keys but also provides for a "secure display" integrated in the voting/signing function.

In the future PDAs will also function as PSDs, but for the present mobile phones are a good approximation to a PSD, already combining smartcard and display functions, which makes them an attractive end user device not only for e-commerce but also for e-voting.

The idea of political elections via remote Internet voting has attracted the most public and media attention, and is often considered synonymous with e-voting. While technical problems and policy issues must be resolved to make this feasible, 'electronic poll site voting' in a political election is much more likely in the near term. Here, one could have tamper resistant voting terminals, which remain under control of the election officials, and one could use private networks that are less susceptible to Denial of service (DOS) and other attacks. At the same time everybody would benefit from e-voting properties like accuracy and verifiability.

A cryptographic protocol for e-voting

At first thought it seems impossible to satisfy criteria like verifiability and ballot secrecy at the same time.

There are several solutions, all derived from Public Key Cryptography techniques.

Here is a high level description of a simplified protocol based on 'blind signatures':
1. The voter constructs an 'anonymous electronic ballot'.
2. The voter identifies himself to the voter registration authority.
3. The registration authority verifies that the voter has not received a ballot before, then 'stamps' the ballot.
4. The voter anonymously inserts the ballot into an electronic ballot box.

After the voting deadline has passed, votes are counted, and a database containing all ballots is made public. Anybody can verify that all ballots have been 'stamped'. Any voter can verify that his vote is contained in the database.

Read how to construct an untraceable electronic ballot on the mess@ge Web pages at http://www.eurescom.de/message/.

LOOKING FORWARD TO THE NEXT FRONTIER
WORK PROGRAMME 2002 IS ON THE WAY AND WILL OFFER EXCITING NEW PROJECTS

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The preparations for the Work Programme 2001 are running very well. By the deadline of 17 August 2001 we received 85 preliminary titles and short abstracts for potential project proposals for the Work Programme 2002. This is in the same range as previous years and – considering the current climate in the telecommunications industry – very encouraging. Used to mostly negative headlines, the response shows that the European telcos working together in EURESCOM are not cutting back sharply on future-oriented investments like R&D which is mostly important, above all in difficult times. This holds in particular for collaborative R&D through which we can achieve more with less money from the individual partners.

A preliminary title does not necessarily mean that a project proposal will be completed and submitted, but we feel confident that also this year we will receive a high number of very interesting and challenging proposals.

Our paramount objective for the period until 7 September 2001 (deadline for submission of Project Proposals) is to get 30 – 40 high quality proposals on innovative topics out of these Preliminary Titles, which should be a good basis for selecting 20 – 25 interesting and innovative new projects for 2002.

Shareholders and members of EURESCOM can keep abreast with the progress of the Work Programme preparations by visiting our Web site at: http://www.eurescom.de/secure/workprogrammes/WP2002/BulletinBoard.asp

Applications and Services

The submitted preliminary titles reflect the currently "burning issues" for the shareholders. Not surprisingly in the Applications and Services area the majority of submissions are addressing new UMTS/3G services and the foundations for successful design of 3G services allowing telcos to recuperate the UMTS license fees sooner. The rapid introduction of DSL, which is currently taking place in Europe, inducts a stream of ideas from multimedia streaming to TV distribution via DSL.

Middleware

One key theme in the Middleware area is the exploitation of the recent progress seen for XML. Telcos are in a great position to benefit from the development of XML Web services allowing them to become applications service providers and allow third party content/application providers to rapidly deploy applications that will utilise TelCos' networks. Another potential benefit of XML – referred to as Semantic Web – is its ability to improve the accuracy of searches through the one billion documents now stored on Intranets and on the Internet. XML will perhaps be most beneficial in applications using semi-structured data such as B2B applications and m-/e-commerce.

3G and beyond 3G management is also addressed from a Middleware perspective: Management systems are often on the critical path for new service introduction. All telcos will need to assess the potential impact of 4G services from the perspective of the extent to which 3G management investments can be stretched to meet 4G service and network management requirements.

Multi-Service Networks

Topics in the Multi-Service Networks area stretch from optical networks via SIP to mobility. A large number of titles are addressing "beyond 3G issues" following the successful conclusion of study P1145 "4G – the next frontier". Whilst according to current plans first 3G networks will be deployed from the end of 2001 onwards, the development of business models, applications, services and appropriate terminal equipment is still going on at network operators, service providers and terminal suppliers. To not lose momentum – and experience from previous "generations" shows that the lead-time for a new generation is around 10 years – system suppliers and vendors are now turning to next generation mobile systems. The network operators and service providers should match these initiatives by outlining their visions for a seamless evolution of mobile systems and identify areas where future research from their perspective is necessary.

XML can also be seen as beneficial in the Security and Support area. The printing and mail delivery of telecom bills is expensive and does not take into account the new possibilities XML offers for the delivery of signed and encrypted bills over the Internet.

Recent research has demonstrated the limitations of purely designer-driven security policies. Evidence for this has arisen from qualitative research on the reality of password use and user requirements for privacy. This has led to a reappraisal of the authentication model for networked services, to include the more mature understanding of passwords, digital certificates and biometrics. One proposal is suggesting developing this model further, and extending it to other aspects of electronic security.

Customers and Markets

Titles in the Customers and Markets area are dominated by the successful conclusion of study P1144 CAMERA set up to identify and scope customers and market themes that could be addressed by EURESCOM in the years to come. EURESCOM is increasingly seen as an ideal forum for addressing operator specific issues of a multidiscipline and multicultural nature. Also economic issues are finding their way to EURESCOM what an interesting proposal on the economics of multiple network infrastructures demonstrates.

NEW STUDIES
KICKED OFF

DIRECT – The potential of peer-to-peer interaction (P1147)

Peer-to-peer computing can be described as a class of applications that takes advantage of resources available at the edges of the Internet. Peer-to-peer computing allows the development of services without using a central server, but using communications between a a loosely associated group of equals. Recently, a computing infrastructure, i. e. protocols and applications, has been introduced that enables this computing and communication paradigm. The main objective of this study is to identify the opportunities and threats that peer-to-peer computing represent to operators.
Contact: kapovits@eurescom.de

EXACT – EXploring European ACTual ICT users and markets data (P1148)

EURESCOM project P903 has performed a European survey and extensive analysis on ICT uses in everyday life. The results provide important answers for making strategic decisions on ICT services and products, and for analysing markets and user habits. Considering the importance of the topic and the interest shown in the results of P903, this study will continue the exploration of European ICT markets and users with the aim of a large joint activity together with other European bodies next year.
**Contact: stollenmayer@eurescom.de**

EURESCOM INFORMATION AND COMMUNICATION SERVICES (EICS)
USER FRIENDLY MAINTENANCE OF EXPLODER LISTS

In March EURESCOM introduced an Exploder Lists Web frontend which makes it very easy to maintain the more than 450 EURESCOM mailing lists, also called exploder lists. After the EICS user has authenticated him/herself with his/her EICS login and password, the list can be viewed and/or modified. The changes are immediately activated after submission. The actual changes are forwarded to the list owner by an automatic e-mail. It is no longer necessary to request a list re-activation from the EURESCOM helpdesk.

The frontend can be accessed at http://lists.eurescom.de or via the "Support" menu on the EURESCOM Web homepage.

For more information on setting up and deploying exploder lists please contact Klaas-Pieter Vlieg (vlieg@eurescom.de) or the EURESCOM Helpdesk (helpdesk@eurescom.de).
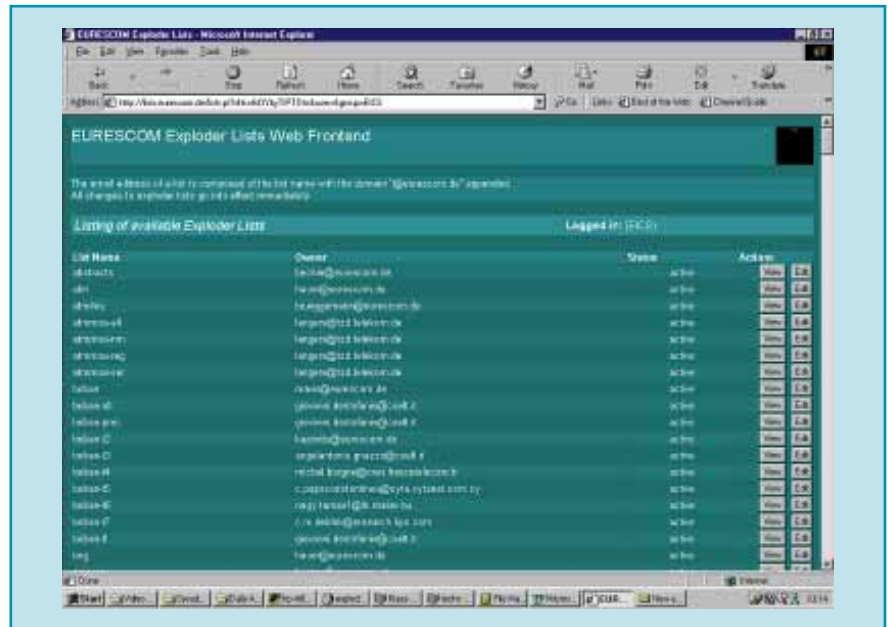
EUROPEAN ISSUES
THE IST "NEXT GENERATION NETWORKS INITIATIVE"

The Next Generation Networks Initiative (NGNi) is an IST networking initiative with the goal of enabling the successful deployment of next generation networks in a competitive environment – assuring acceptable Quality of Service for customers.

Its mission is twofold:
- To resolve issues which create barriers to the deployment of next generation networks (NGN).
- To achieve interoperability, compatibility and commonality between NGN-related projects within the IST programme.

The methodologies used by NGNi are:
- Technology roadmaps
- Technology benchmarks
- Co-ordinated collective contributions to standards

in all areas related to next generation networks.

The initiative started in January 2001 and is scheduled to conclude in December 2002. Its total budget is about 2.5 million euros. Project co-ordinator is Latif Ladid, Ericsson Telebit A/S of Denmark (contact: latif.ladid@tbit.dk or info@ngni.org). Currently about 50 companies, organisations and academic bodies are members of NGNi.

NGNi areas of interest so far
Three main areas of interest were defined and initiated as working groups during the last workshop which took place on 22 June 2001 in Brussels:
- **Infrastructure** with thematic groups on "IPv6 deployment", "NGN architecture design", "Quality of Service in NGN" and "optical technologies".
- **Services** with the following sub-topics: "multicast", "voice over IP with all network implications", "collaborative tools", "open APIs and layering", "service creation", "mobility", "security" and "architecture".
- **Management** and control with the focus areas "evolution of management systems for next generation networks", "Quality of Service, in particular inter-domain" and "management of content distribution".

Those areas and themes are of course only the initial ones. It is quite likely that more areas and themes and maybe different rela-tionships will be identified during the course of NGNi. More information about NGNi is available on their Web site: http://www.ngni.org

What does this mean for EURESCOM?
EURESCOM has several active projects dealing with similar topics identified as very important in the context of NGNi. There is a tremendous opportunity for IST and EURESCOM to join forces and to exploit synergies.

For EURESCOM it means the possibility to discuss topical issues within a wider forum with excellent experts, to have a wider community for dissemination of non-confidential results and besides that to obtain some additional funding from outside the EURESCOM community. For NGNi it means that they can get first-hand information from EURESCOM projects and hence save a lot of energy and resources for other issues. They also get co-ordinated input from the major European telecommunication providers, which is an important prerequisite for defining proper requirements.

new project results

Studies
P1141 E.353 Assessment – Deliverable 1 and PowerPoint presentation – Issues associated with the implementation of ITU-T Recommendation E.353
(Routing of calls when using International Routing Addresses) in public networks (C)
P1142 Biosciences and ICT – Two worlds growing together? – Deliverable 1 – Biosciences and ICT – Two worlds growing together? (C)

Applications and Services
P923 Multilingual Web sites: Best practice, guidelines and architectures – Deliverable 2 –
Experiences in designing and building multilingual Web sites (F)
P923 Multilingual Web sites: Best practice, guidelines and architectures –
Technical Information 1: Annex 1 – Demonstrator Specification (F)
P923 Multilingual Web sites: Best practice, guidelines and architectures –
Technical Information 2: Annex 2 – Development of Demonstrator (F)
P923 Multilingual Web sites: Best practice, guidelines and architectures –
Technical Information 3: Annex 3 – Demonstrator Trial and Evaluation: the lessons learned (F)
P1004 ICE-Commerce (Framework for interoperable and customised E-Commerce Solutions) –
Technical Information 1 – User requirements (C)
P1004 ICE-Commerce (Framework for interoperable and customised E-Commerce Solutions) –
Technical Information 2 – Service descriptions and scenarios (C)
P1004 ICE-Commerce (Framework for interoperable and customised E-Commerce Solutions) –
Technical Information 3 – Initial Functional Architecture
(Market study of components, platforms and interfaces) (F)
P1004 ICE-Commerce (Framework for interoperable and customised E-Commerce Solutions) –
Technical Information 4 – Initial Functional Architecture
(Identification, definition and grouping of functional components) (F)
P1002 TALMUD – Technologies and Architectures for a leap in Multimedia Databases –
Technical Information 1 – Storage, retrieval and filtering architectures (C)

Middleware
P909 Enabling Technologies for IN /Internet Integration – Deliverable 5 – Final Guidelines for evolution of Network Intelligence (F)
P910 Technology Assessment of Middleware for Telecommunications – Deliverable 3 – Management of Middleware Platforms (F)
P910 Technology Assessment of Middleware for Telecommunications – Deliverable 6 – Middleware Platforms Security (F)
P910 Technology Assessment of Middleware for Telecommunications –
Technical Information 24 – White paper on the management of midddleware platforms (F)
P910 Technology Assessment of Middleware for Telecommunications –
Technical Information 25 – White paper on Middleware Platforms Security – (F)
P910 Technology Assessment of Middleware for Telecommunications –
Technical Information 26 – Glossary of Terms (F)
P924 Deployment and configuration support for distributed PNO applications – Deliverable 2 –
Notation and semantics for deployment and configuration (F)
P924 Deployment and configuration support for distributed PNO applications – Deliverable 3 –
Specification of Platform Capabilities and Architecture for Deployment and Configuration (F)
P924 Deployment and configuration support for distributed PNO applications – Deliverable 4 –
Deployment and configuration support for distributed PNO applications (F)
P925 Internet Middleware (for customised service bundling) – Deliverable 4 – Report on Results of Trial 1 on Virtual Communities (C)
P1005 Jini & Friends @ Work – Technical Information 1 – Operator specific security requirements for ubiquitous computing (F)
P1005 Jini & Friends @ Work – Technical Information 2 – Security components and services (F)
P1005 Jini & Friends @ Work – Technical Information 3 – Secure Service Access in Future Networks (F)
P1005 Jini & Friends @ Work – Technical Information 4 – Integration of Small Devices into IT Infrastructure (F)

Multi-Service Networks
P917 BOBAN – Building and Operating Broadband Access Networks – Deliverable 1 – Access systems and standardisation survey (F)
P917 BOBAN – Building and Operating Broadband Access Networks – Deliverable 5 – Broadband service provisioning and management (F)
P1009 Armstrong Ipv6 deployment – "That's a small step for IP, one giant leap for mankind" – Deliverable 2 –
Inter-provider Routing and Peering in Ipv6 (F)
P1009 Armstrong Ipv6 deployment – "That's a small step for IP, one giant leap for mankind" – Deliverable 3 –
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HIDDEN MESSAGES
STEGANOGRAPHY IS MORE THAN A TOOL FOR SPIES

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As long as there has been written communication humans had the desire to conceal their messages from the curious eyes of others. The method of hiding one piece of information within another is called steganography. The meaning of this Greek term is 'covered writing'.

The first examples from ancient Greece were documented by Herodotus. In one story Demeratus wanted to notify Sparta that Xerxes intended to invade Greece. To avoid capture, he scraped the wax off the tablets and wrote a message on the underlying wood. Then he covered the tablets with wax again. The seemingly blank tablets passed inspection by the sentries without suspicion.

Methods in ancient Greece
Another method used in ancient Greece was to shave the head of a messenger and tattoo a message on his head. After allowing his hair to grow, the message would be undetected until the head was shaved at the recipient's place.

The most common form of invisible writing from ancient times up to World War II was the use of invisible inks, which darken when heated. This allowed writing hidden messages between the lines of an innocent letter. Common sources for invisible inks were milk, juices and even urine. In World War II chemical inks came into use. They had to be developed similar to photographs in a processing lab.

Boom in World War II
Steganography was booming in World War II. Another method was to camouflage secret messages through null ciphers contained in innocent messages, which passed the enemy's mail filters. Because these methods became more and more insecure due to increasing detection efforts, the Germans developed the microdot technology. Microdots are photographs the size of a printed period having the clarity of standard-sized typewritten pages. The first microdots were discovered masquerading as a period on a typed envelope carried by a German agent in 1941. The message was neither hidden nor encrypted, but was too small to attract attention – at least for a while.

Steganography renaissance today
Since the end of the war steganography has led a hidden life and seemed to have fallen into oblivion. This has changed only recently when digital communication became dominant. There are three main reasons that led to a renaissance of steganography:

1. Digital cryptography has become a focus of political discussion, and some governments have even banned it. For individuals and companies striving for confidentiality, steganography offers a useful complementary because it has one important advantage: A cryptographic message is always visible as such and arouses suspicion, but the very existence of a steganographic message is unknown to others. So combining cryptography and steganography can help avoid suspicion and protect privacy.
2. Napster and Co. have increased the need of content producers to defend their copyrights with efficient watermarking. Hidden digital watermarks enable producers to trace violations of intellectual property rights. Britain's prime minister Margaret Thatcher demonstrated the use of hidden watermarks already in the 1980's: After several press leaks of cabinet documents she had the word processors programmed to encode their identity in the word spacing, so that disloyal ministers could be traced.
3. Steganographic software has become quite effective. With an increasing amount of communication taking place electronically, digital methods for hiding information in pictures, sound files and text files have gained importance.

Variety of methods
Today there is a vast number of steganographic methods and applications available. Generally, any so-called 'container' can be used to carry the embedded, hidden information. Let us take the example of digital images. The easiest way for hiding information is to set the least significant bits of the image pixels to the bits of the embedded information. Information embedded in this way may be invisible to the human eye. However, it would be relatively easy for a suspecting third party to detect and remove the information. Through trivial filtering processes the value of many of the least significant bits could be changed. One counter-method would be redundancy, embedding the mark several times.

Limits of steganography
However refined the methods may be, some experts see serious drawbacks. Neil Johnson and Sushil Jajodia from the Center for Secure Information Systems of George Mason University in Fairfax, Virginia, state in a contribution on steganalysis that hidden data, like watermarked images, "are not as robust as is claimed". The risk of detection and destruction of the embedded message is considerable, especially if safe watermarking is advertised and potential 'crackers' are made aware that there is some mark to remove. This happened some years ago to a well-known image software. What can generally be problematic is the balance between necessary bandwidth and the amount and robustness of hidden data.

History shows that the race between hide and seek is not always successful for the sender of the hidden information. A famous victim is Mary Queen of Scots, who conspired in 1586 to have Queen Elizabeth of England assassinated. However, the cipher she used was broken, and the English secret police caught the chief conspirator, to whom she wrote, which finally led to Mary's arrest and execution.

Richard E. Smith, a US data security expert, said that he doesn't "see many practical uses for steganography because it only works as long as nobody expects you to use it." Others, like the steganography experts Ross J. Anderson and Fabian Petitcolas, think there are still a lot of opportunities for improvement. Their suggestion is to embed information in parity checks rather than in the data directly. This approach, they say, would allow to do public key steganography. The last word on steganography has not been spoken yet.

However, the risks of the Internet will increase the need for noteworthy tools, which help to reject various assaults on people's privacy. The time for steganography might still be oncoming.

To give you a simple practical demonstration of how steganography works, we have hidden a message in the previous paragraph of this article using a simple algorithm. You will find this algorithm explained on our Web site at www.eurescom.de/public/publications/message.asp together with a selection of interesting links about the subject.

WORKSHOP

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