

I N T E L L I G E N T

INTELLIGENT LIVING

The Information Society presents many opportunities for individuals to enhance their quality of life through new IST applications and services. The personal spaces which we occupy everyday, such as the home and the car, are becoming "smarter". No longer just passive environments in which to live and play, these spaces are our interface to a whole new world of services: arenas for what we could call "intelligent living".

New IST applications enable people to access services such as education and health directly from their own homes. They are able to use these services where they want, when they want, in ways which they find more convenient, more flexible, and more secure. IST offers particular benefits for the young, the elderly and those with special needs. As the trend towards home-based services becomes more marked, the nature of our homes and their role in our lives will change substantially.

Our personal spaces are increasingly interconnected. Both the home and the car, for example, are emerging as smart, highly networked

environments, in which individual devices and appliances are able to communicate with each other and with the wider world. This raises the need for open platforms and standards that enable equipment to be linked together within their own information space.

Another key feature is that access is no longer confined to the desktop. Increasingly, information and other services are accessible within the home, car or elsewhere through a new generation of information and media appliances, such as laptop computers, mobile phones, personal digital assistants, and digital TV. This opens major new delivery channels in areas such as transport, tourism and e-commerce.

The new services are not only mobile but also more interactive and personalised. In the overloaded information world, people need help to see through the maze of data. Developments in digital broadcasting and multimedia encoding, for example, allow users to automatically filter TV transmissions matching their personal preferences and store the programmes for later viewing.



L I V I N G

Smarter health

Approaches to healthcare are changing. Patients no longer expect to interact with multiple departments and agencies. Instead they expect health services to be delivered seamlessly to them while taking full account of their individual abilities and needs. In short, care is becoming citizen-centred. Electronic health records (EHRs) are a key element in this shift, enabling the free flow of information within hospitals, and between hospitals and other healthcare agencies.

Smart card technology has been shown to be one of the most suitable for EHR applications. Their portability and security make smart cards ideally suited to storing patient's health data, such as clinical history and health insurance information. Smart cards can also be used by healthcare professionals for secure access to electronic networks and, in the near future, for electronic prescriptions.

Millions of health cards are already in use in Europe. In Germany, over 70 million people (90% of the population) hold health insurance cards, and in France more than 40 million cards are in circulation for use by health professionals and as patient data cards. Other large-scale users include Spain, Italy, Belgium and Ireland. The European Union has supported RTD on health cards since 1989. These activities have resulted in agreements to converge national initiatives on health cards towards common or interoperable solutions. Progress has also been achieved on the standardisation of several aspects of health card technology including security.

Building on these achievements, activities under the IST Programme focus on work towards global standards for reading the cards and for interfacing with existing medical information systems. Multilinguality and security are also important issues.



Healthcare is becoming patient-centered

Health smart cards for European travellers

The increased mobility of Europeans, together with differences in health systems, language and culture within Europe, create a clear need for continuous and transparent healthcare provision to travellers outside of their country of residence. IST's MEDITRAV project is developing health smart cards that will ensure access to cost-effective healthcare services for European travellers with chronic diseases, such as diabetes, cardiac failure and asthma. Each traveller is provided with a smart card, issued either by their social security agency or insurance company. Before leaving the country of residence, the Traveller Information Record (TIR) is transferred via a virtual private network to the local server at the traveller's destination. In the event of any health problem or other medical emergency arising while abroad, the smart card provides the key to unlock local access to the patient's medical records. After the medical treatment, the local healthcare professionals can update the central system's information on-line.

Further information
IST Action Lines:
Project References:
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IST-2000 I.1
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The learning citizen

Learning today is no longer confined to institutions such as schools, colleges, universities, companies or training centres. New technologies and tools offer learners greater flexibility, easier access to information and the opportunity to match learning to their specific needs, circumstances and learning profile. The home is increasingly important as a learning environment for many citizens, including disadvantaged groups such as the unemployed or people with special needs, and those in remote and isolated locations. The challenge is to bring together educators and service providers to use the available technology and take on a new supportive, motivating and affordable way of learning that can benefit many groups in society.

Initial work has already been undertaken under FP4. Amongst others, DOMITEL, a TAP project, delivered a range of courses directly to the home allowing learners to interact with the tutor via a two-way video link. A series of prototypes were

developed utilising technologies such as cable television and ISDN. In Ireland, a 30-hour course was delivered live by cable from a purpose-built interactive classroom to 60 learners based in learning centres and at home. In Portugal, a prototype interactive learning service was used to deliver an IT course, also over cable TV. And in the Netherlands, a distance learning solution was developed for a speech therapy course for people with hearing implants.

Under the IST Programme, the role of new ICT-based approaches in enhancing and facilitating lifelong learning for individuals is being addressed under the Learning Citizen action line. The research addresses intelligent, user-friendly solutions with innovative integration of technologies. It is concerned with such questions as: what motivates people to acquire learning?; how do they define and manage their learning goals?; and how can ICT solutions be used to support the learning process? The easy and widest possible access to innovative learning environments from remote locations is also a key issue.

Current projects are investigating the brokerage of relevant learning services and support for the assessment and recognition of the acquired skills. New projects address rehabilitation of young offenders and support to marginalized groups. Others are concerned with general social skills and with portals which aggregate educative services. WAP technology is also being utilised.

A holistic and multi-disciplinary approach is emphasised including a comprehensive evaluation of the appropriateness of the technologies used and the benefits for the user. When fully implemented the work is expected to result in scalable solutions and European-level best practice guidelines and recommendations.



The home is increasingly important as a learning environment

Further information
IST Action Lines:
Project References:
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IST-2000 III.2.2
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Personal services

Traditional models of publishing view dissemination as the final step in the publishing process. Information is packaged and delivered to the market, and accessed by whoever is interested in it. But in the overloaded multimedia world more refined, personalised approaches to distribution are needed. Together, the trends towards increased bandwidth, media convergence, multiple access, mobility and personal mobile devices present a tremendous opportunity for personalised content and services. They also represent a substantial challenge, since the emerging business models are far more complex than current personalisation solutions can cater for.

Personalisation is not the same as customisation. Customisation is a supply-side product strategy, where the content provider adapts and specifies interactive digital products and services for specific target markets. Personalisation, on the other hand, is a demand side activity. Users themselves modify the interactive service to suit their own individual purposes.

In the Information Society, the users' attention is limited and personalised content delivery must optimise this limited attention span. This could be achieved, for example, by making the personalisation transparent, or by providing the user with tools to manage the process themselves. Personalisation applies to various scenarios - business-to-business, business-to-consumer, consumer-to-consumer - and to services as well as content.

The IST Programme supports RTD to develop, validate and demonstrate personalised publishing and personalised delivery and authoring solutions for distributed multimedia content together with appropriate trials and testbeds. Future priorities are likely to focus on: web-based audio-visual production; personalised advertising; personalised services for web communities; and tools and services for mobile content.



A future of personalised and interactive services

Personalisation software is in its infancy and turnkey solutions are still lacking. Furthermore, Europe significantly lags behind the US in getting new tools to the market. Solutions using agent technologies still have many hurdles to overcome, and in general current solutions are too complex and expensive for SMEs. To improve this situation, additional technology approaches are being evaluated and areas of improvement identified.

The effective application of personalisation in complex new scenarios requires a greater understanding of the underlying business and technology issues. Already, multimedia content is delivered via multiple channels and media to users who access through many types of personal devices in a variety of social and environmental situations. Current technological mechanisms are not tuned to business approaches and rules. Hence, new or emerging business models and practices are studied as a basis for better personalisation solutions.

User profiles, the system's model of the user, are currently based on technological or at best marketing/advertising models, and are insufficient. Technology developers are calling for a better understanding of usability and acceptance requirements. They need more guidance on what kinds of information users are prepared to give the service provider, how they can acquire the data and what personalised content and service delivery response is desired by different users.

Another area of interest is social and psychological models of consumers' behaviour online. Research here is directed towards improving understanding of aspects such as personas,

Personalised i-commerce

Professional users of information demand added-value services, like personalisation of information from the internet and the ability to use and combine the information in specific ways. Currently, there is no business model for this type of information commerce (i-commerce) business, which mediates between multiple content owners and professional users.

OPELIX aims to stimulate the appearance of a new type of information business on the internet capable of offering this type of service. These new businesses will be provided with tools to create personalised information offerings, to deal with copyright issues, quality of service and payment schemes. A language for describing business offers based on XML is being developed and tested in an open information commerce scenario. The business models and toolsets will be disseminated to standardisation bodies as a means of stimulating the creation of new i-commerce businesses.

facets of human memory, consumer motivation and on-line purchasing. Users' habits in terms of content consumption and media usage, and their tolerance of automated versus user-controlled personalisation are also being investigated.

Many current day examples of personalisation are cosmetic, unhelpful and in some cases time consuming and annoying to the user. Hence, another focus in RTD is in automating the user interface, a complex undertaking. Delivery of user-friendly services demands higher standards of user interface design together with user consultation and usability trials throughout development.

Further info
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The driver's assistant

With Europe's roads increasingly congested, driving is becoming more hazardous and stressful. Advanced driver assistance systems (ADAS) utilise advanced ICT to support the driver in both routine and emergency driving tasks. They offer improvements in driver and passenger safety as well as comfort and environmental performance. Like an extra pair of eyes and ears, ADAS ensure the driver is fully aware of the surroundings and, where necessary, are able to take remedial action. Potential applications include adaptive cruise control (ACC), adaptive headlight control, collision-avoidance systems, electronic tow-bars, and optimisation of engine control and fuel consumption.

ACC-type systems are already on the market, with surveys and experimental assessments showing that users have a high level of interest and product acceptance. Current commercial

ADAS are based on single sensor approaches with either radar or laser sensors. Their use is limited to motorways and urban expressways without crossings, where processing is focussed on a few, well-defined detected objects. Even in these relatively simple situations, current ADAS systems cannot cope reliably with fixed obstacles.

Future ADAS will need to cope with the much more complex situations found in urban driving: low speeds, traffic jams, tight curves, traffic signs, crossings and vulnerable road users such as motorbikes and bicycles. Future systems will also need to handle a wider range of functions. In difficult traffic situations, for example, the driver should be able to partly handover control of the car to a driver assistance system. The development of ADAS that operate reliably in complex road scenarios represents a significant RTD challenge, however.

Smart cars can save lives



Protecting vulnerable road users

Analysis of the road safety statistics in Europe shows that collisions between pedestrians and vehicles account for around 12% of accidents and 15% of total fatalities. Add to this the figures for cyclists and motorcyclists, and these vulnerable road users account for a quarter of total injuries and an even higher proportion of total road deaths. The PROTECTOR project aims to improve the safety of these vulnerable groups. Cars and other vehicles will be equipped with sensors, based on laser, microwave and computer vision technologies, which will interact with detection equipment, such as transponders and microwave/optical reflectors, carried by the vulnerable road users.

Research into advanced driver assistance systems is a key element of the IST Programme's RTD on intelligent vehicle systems. The work addresses in-vehicle platforms, interfaces to the user and to services through vehicle-to-vehicle and vehicle-to-infrastructure communication. With future vehicles needing to employ multiple ADAS within the same vehicle, the work also focuses on common specifications for in-vehicle platforms and on the interoperability of systems and components.

Building on work started under TAP, CHAUFFEURII is developing an electronic tow-bar system that enables a driver to follow another vehicle at a safe distance. PROTECTOR is defining and validating sensor and communication systems for vulnerable road users, such as

pedestrians, cyclists and motorcyclists (see box). RadarNet is designing sensors and associated processing equipment for a new low-cost radar network that will interact with in-vehicle safety systems. NextMap is defining and evaluating digital map databases required for next generation ADAS.

Vehicle safety systems are an important application area. Every year in the EU there are more than 1.6 million road accidents, involving over 1 million injuries and 42,000 fatalities. Passive safety systems such as airbags, which minimise the consequences of an impact once it has occurred, are already making significant contributions to road safety. Pre-crash sensor systems, able to detect an impending impact before it has occurred, could further reduce deaths and serious injuries. CHAMELEON is studying the robustness and performance of existing sensors and testing new pre-crash activation scenarios.

Sensing for low-speed driver assistance

A novel sensing system for low-speed driver assistance is being developed under the CARSENSE project. Using a combination of image processing technology, radar and laser, the system merges sensor information to achieve a good perception of the car's environment. Based on experience from previous RTD projects, CARSENSE is defining characteristic scenarios for low-speed driving. The specifications developed will be used to improve the sensors and to harmonise the interfaces and data buses. The results will be visualised using data fusion techniques, and tested within a vehicle prototype.

Further info
IST Action Lines:
Project References:

IST-2000 I.5.2
CARSENSE
CHAMELEON
CHAUFFEURII
NEXTMAP
PROTECTOR
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Intelligent vehicle systems
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Audio described television

Millions of visually impaired and elderly people throughout Europe regularly watch and enjoy television, even though they may not be able to assimilate all of the information. An audio description service for television can provide these viewers with an extra speech channel which allows them to fill gaps in their understanding of television programmes. Originally developed under the EU's Technology Initiative for Disabled and Elderly Persons (TIDE) during 1992-95, the system has recently entered commercial service.

TIDE's AUDETEL 1&2 projects developed a speech coding system, guidelines for producing audio descriptions and prototype encoders and decoders for receiving transmissions. A full-scale trial was undertaken involving two UK television companies, ITV and BBC, working to real programme deadlines. The trial allowed the broadcasters to assess the economics of setting up a centre for regular audio-described productions and to explore the studio technologies for producing them efficiently. It concluded in 1995 having explored, at length, the needs and habits of over 100 households of elderly and partially-sighted television viewers over a six-month period.

For the system to be implemented widely appropriate receiver technology had to be available so that people could receive the broadcasts. Originally this was to be done by incorporating the description decoder as part of a video cassette recorder. From discussions with the consumer electronics industry, however, it became clear that their efforts were focused on the major developments in digital TV. Although broadcasters were prepared to produce audio description, manufacturers were not willing to divert resources into it for analogue transmissions.



People with special needs will benefit from new digital TV services

In fact, the digital TV revolution presented a great opportunity for Audetel. It offered the ability to carry any number of high quality audio channels without the congestion suffered by the analogue signal. The production techniques, economics and applications would be the same but the delivery technology would be digital. This meant waiting for the rollout of digital terrestrial television services and, in the meantime, championing the cause of audio-description within the European Digital Video Broadcasting (DVB) consortium.

The UK licensed the first digital terrestrial television broadcasts to begin in November 1998, with the audio description services due to start within one year. It did not prove possible to incorporate Audetel's audio-mixing technology into the standard set-top box but the terrestrial operators developed an add-on adaptor. Commercial services finally began in May 2000 with 3½ hours per week of programmes described on each channel and a commitment to increase the quota by 2% every 2 years.

Currently, the UK is the only European country to have adopted broadcast audio description. Provided that the services are marketed well and are commercially successful other countries seem sure to follow suit.

Further info IST Action Lines:

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The friend on your wrist

In Europe at least 2.2 million people are deaf or have serious hearing impairment. These people are in greater danger than others in emergency situations, notably during fires, because they are extremely unlikely to be alerted by audible alarms, such as sirens or radio broadcasts, or by warnings from other people.

Tactum is a warning system for hearing-impaired and deaf-blind people which makes use of visual and tactile signals delivered through a wristwatch. Originally developed under the Telematics project FASDE, Tactum is now in commercial production.

In addition to the wristwatch, the Tactum system includes a booster (or repeater) to transmit acoustic signals from external sources such as a telephone, a re-charger and an under-pillow vibrator. At night the watch is placed in the re-charger and the under-pillow vibrator alerts the user during sleep. The re-charger has a built-in microphone to pick up sound from the user's alarm clock.

Other transmitters may be added for different sources, such as a baby alarm or fire alarm. A receiver/transmitter may also be added for public emergencies via a public address system. The type of event is shown in a visual display which shows symbols such as a baby, telephone, fire or door. The watch also vibrates mimicking the sounds of these words or, in the case of fire or other emergency, giving a four second pulse.

Tactum is suitable for groups of users in care homes as well as individuals in private homes. The system utilises 15 different radio channels, so allowing for up to 15 users within one building. When a single user receives a call only that person's watch is activated. But in the event of

a fire or public emergency all systems in range are activated.

By providing users with greater security and confidence, Tactum improves the ability of hearing-impaired, deaf and deaf-blind people to lead independent lives.



The Tactum system provides early warning for those with hearing impairments

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What's on TV?

Today's television viewer has no shortage of choice. Over recent years developments in satellite and cable have brought dozens of channels into the home. New generation digital TV services, delivered via satellite, cable and terrestrial networks, will push the choice up into the hundreds. But how is the user expected to find what they are looking for amongst this channel overload?

Future technological developments may exacerbate the problem. Interactive digital video is expected to make a big breakthrough over the next few years. An industry-supported standard for digital video complying with the DAVIC/DVB specifications was issued in 1999, suggesting commercialisation within the EU from about 2002.

The personal home archive

For users to access the literally hundreds of channels that will soon be at their disposal, they need to be able to search and select content according to their personal interests. One way of doing this is for the broadcaster to deliver meta-data describing the actual content in sufficient detail to enable automatic handling by agents residing on the end-user's system. AVIR, an Esprit project, is investigating novel procedures for automatic analysis and indexing of audio-visual information to support consumer service applications.

AVIR's full-scale prototype spans the whole content chain, from the broadcaster to the end-user. Broadcast content is tagged with descriptors which can be compared with the user's own profile. Programmes matching the user's interests can be recorded automatically and stored for later use. A system of visual navigation, search engine and intelligent agents turn the user's home video recorder into a personal multimedia repository with powerful search and retrieval capabilities.

Digital TV is bringing the viewer a world of choice



User acceptance of these new services will depend on the quality of the interactive support available. Faced with hundreds of channels and thousands of services accessible through set-top boxes, Web-PCs and other devices, users will need new tools to guide them through the maze of information. Social and ethical issues also arise, such as the need for safeguards for rated content (i.e. that requiring parental consent), and the use of users' profiles for highly personalised advertising and promotion.

Research has important contributions to make. New electronic programme and service guides will enable users to filter and access content more easily. New tools will be required to search, select, access and manage a wide and diverse range of content. These could cater for a variety of different delivery channels, including hard disk storage, set-top-boxes, and high speed Internet access. New interface designs will make services easier to use. Metadata schemes will enable on-the-fly searches for video content and advanced profiling tools will enable users to compile their own TV schedules. A common priority is the user's need for intuitive and easy access to all types of content whether for business or leisure.

IST's MyTV project is demonstrating a consumer platform with built-in local storage for personalised services in digital broadcasting and broadband communication. New services exploiting this platform are also being developed, such as the ability to turn local storage into a personalised TV channel for non-linear browsing of TV content. The results will be promoted to service providers and consumer terminal manufacturers so as to ensure true interoperability within Europe.

SAMBITs aims to link digital TV services, delivered via DVB, with internet services to provide consumers with easier and personalised access to applications such as e-commerce, training and multimedia information. Multimedia services will be accessible through a consumer terminal that will be able to access both broadcast and internet services interactively. Use of the existing internet and DVB broadcast infrastructures makes this a cost-effective solution which should lead to early commercial take-up.

New business models for interactive digital television are being investigated by NexTV. The project is studying interactive models of consumption, such as those used on the web, and transferring them to the TV environment so as to achieve greater involvement by the viewer. The work includes a set of experimental services for a consumer platform.

Further info

IST Action Lines:

IST-2000 III.4.1
IST-2000 IV.6.2

Content processing for domestic and mobile multimedia platforms
User and service interfaces and buffers for seamless end-to-end services

Project References:

AVIR
Esprit 28798 www.extra.research.philips.com/euprojects/avir
MyTV
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IST-1999 11702
IST-1999 11288
IST-1999 12605

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Multimedia on the move

Motor vehicles offer one of the most exciting platforms for new mobile applications and services. Current and next generation mobile communication systems and digital broadcasting are opening the way to in-vehicular multimedia services for information, education, training and entertainment. Drivers, for example, will have access to accurate, real-time travel data to help them plan, or adjust, their journeys. Passengers will be able to check the departure time of a train or flight, surf the internet for business information, or watch a live TV programme. Children will be able to download and watch a video clip, or listen to one of hundreds of digital radio stations. In short, new, personalised travel information and teleservices will enrich our experience of travel.

Supported by developments in digital mobile communications (such as GSM, GPRS and UMTS), and digital broadcasting (such as DAB and DVB), together with the deregulation and competition in fixed networks, demand for affordable mobile services is set to increase. There are social benefits too. On-board intelligent transportation systems (ITS) dynamically linked to information sources are one of the most effective ways of optimising the usage of overstretched transport infrastructure.

Within the IST Programme, RTD addresses the basic technologies for the seamless communications services, as well as interactive broadcast services to mobiles, in-vehicular multimedia platforms and specific applications of mobile in-vehicular services. The work builds on previous activities sponsored under FP4. For example, the

project MEMO developed a generic architecture for the provision of interactive multimedia services to mobiles combining a broadband down-link based on DAB and a low bit-rate interactive link based on GSM. And MOTIVATE demonstrated the mobile reception of digital terrestrial TV in mobiles using the DVB-T standard.

In-car entertainment

Interoperability between broadcasting, mobile communications networks and positioning systems will bring a whole new dimension to multimedia in the car. The Multimedia Car Platform (MCP) aims to specify and demonstrate the technologies to achieve this. The project is developing the first mobile multimedia terminal to enable users to roam seamlessly between services delivered over existing and upcoming mobile and broadcast networks. Users will have transparent access, with the MCP handling network access, terminal decoding and user preferences, such as quality and delivery modes.

Currently, and from the technology perspective (KA IV), DRIVE focuses on the convergence of cellular and broadcast networks in the provision of cost-effective in-vehicular services based on internet protocol (IP). The project aims to improve the total spectrum efficiency so as to optimise the inter-working of different radio networks (GSM, GPRS, UMTS, DAB, DVB-T) within the vehicle environment. MCP is specifying an architecture for in-car broadband multimedia services (see box).



Smart in-car computers will combine navigation, traffic information and audio-video entertainment systems (Picture from TAP project VODIS)

In the application domain (KA I), ITSWAP is investigating the technical and commercial feasibility of mobility services provided over wireless application protocol (WAP), including trials in the UK, Sweden, France and Italy. INVETE is demonstrating an intelligent in-vehicle terminal (IVT) for transportation collection services, such

as buses, taxis and couriers. IVT will be based on an open architecture and will be compatible with existing environments, such as GSM and private radio networks. Finally, DIAMOND will demonstrate delivery of a range of (interactive) services in vehicles and other settings, both over DAB alone and combined with GSM and/or GPS.

Further info IST Action Lines:	IST-2000 I.5.2	Intelligent vehicle systems Terrestrial wireless systems and networks
	IST-2000 IV.5.2	
Project References:	DIAMOND	IST-1999 11161
	DRIVE	IST-1999 12515
Commission Contacts:	INVETE	IST-1999 10311
	ITSWAP	IST-1999 11138
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	www.cordis.lu/ist/ka1/transport	
	www.cordis.lu/ist/ka4/mobile/index.htm	

Cutting the cost of wireless content

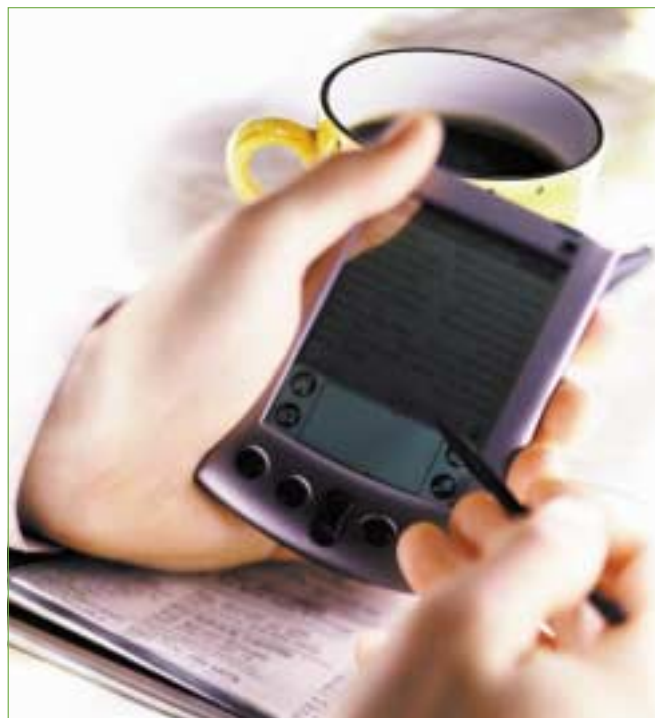
Mobile phones have become a resounding success and users' appetite for mobile services is exploding. Already simple add-on services are emerging: mobile e-mail, primitive web access, basic e-commerce and payment facilities. With the new third generation systems just around the corner, demand for new mobile multimedia services is expected to increase dramatically. Higher bandwidths will open the way to services such as mobile video conferencing, full motion video, hi-fi audio and advanced 3D processing for design or games. But while the networking technologies for these advanced generation networks are approaching maturity, content management technology is still in its infancy.

Current developments in mobile internet services focus on wireless application protocol (WAP), an emerging industry standard. WAP brings device independent web browser functionality to mobile phones and their derivatives using wireless mark-up language (WML), a scaled down version of extensible mark-up language (XML). The standard is being developed within a co-operative environment, the WAP

Forum, whose work is supported by technological research within companies and institutions. The IST Programme is closely involved in this research.

Access to mobile services is not restricted to phones, however. A new generation of smart, portable information appliances is emerging that combine many functions within one device, saving weight and space. The ultimate portable device will be a watch, calculator, organiser, e-mail client, camera and web browser, removing the need for these separate devices.

Communication devices such as the radio, TV, PC and mobile phones are also slowly but surely converging. In the future all of these devices will be able to deliver interactive, as well as one-way, services for internet access, telecommunications and broadcasting. This is being brought about by the convergence of the associated networks that will all be able to carry the same services, probably using a common internet protocol.



Smart devices offer access to a world of new services

The DVB/DAVIC specifications for the multimedia home platform are laying the foundations for multimedia extensions to broadcasting. This will enable the user to view digital TV on the PC, and to access interactive web services on the TV with the appropriate DVB set-top box for either satellite, cable or terrestrial reception. At present DVB/DAVIC is not relevant for mobile applications, which are dominated by WAP.

To cope with this convergence, we need to create a new kind of unified information space where multimedia content can be readily exchanged and scaled between these fixed and mobile networks. Consumer devices should be able to react to the content and to serve it up to the user in an intelligent and user-friendly way rather than just simply displaying it without knowing what it means. This requires attention to the semantics of the information as well as the information itself.

The challenges are to scale the content and its metadata for cross-media use. It needs to be usable across a multitude of devices in a non-proprietary way and through natural, human-centred interfaces. For instance, neither the mobile phone nor the home TV have a mouse. Another area of research is into practical means to better automate the conversion of text from HTML into the WML format used in WAP. Users are also demanding simplicity. Many people still consider the programming of a video recorder a major feat, so hiding the technology from the user is a key challenge.

Scalability across mobile networks will bring benefits for content providers too. Reformatting content for different delivery channels is extremely expensive and a deterrent to content providers investing in new networks. Content providers need to provide seamless new multimedia services over these networks without the cost and inefficiency of converting every page, image or sound that is accessed. Research priorities include: the development of new content presentation and representation formats; scalable graphics; new user support agents linked with mobile network agents; and new user interfaces which reflect the personalised nature of domestic and mobile communications.

Mobile phones offer a new gateway to the net



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Content processing for domestic
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High quality homecare

Increasingly, the home is one of the main environments for delivering healthcare. With an ageing population and new medical treatments emerging, the emphasis in healthcare is shifting from care centred on institutions to care centred on citizens. Healthcare services should be accessible to everyone, wherever they are and whenever they need them. In many cases this is best achieved through home-based healthcare, which can be both more comfortable and convenient for patients and less costly for healthcare providers.

At a technological level, home care requires new telematic environments for monitoring and exchanging information. Personal health systems are also an important feature. These include systems for personal health monitoring, and fixed or portable prevention systems (such as advanced sensors, transducers and microsystems). Other possibilities are personal medical advisors able to supervise prevention and treatment, and certified information systems to support health education and awareness.

Within the IST Programme, homecare is addressed under RTD for intelligent environment for patients. The aim is to enable patients who are not confined to hospital to participate actively, in close collaboration with their healthcare provider, to their on-going care. In particular, the work takes into account new advances in sensor technologies, usability and intelligent agents, virtual reality and simulation, and high bandwidth fixed and wireless communication technologies. Particular emphasis is given to the protection of privacy, to usability and reliability, and to respecting multilingual and multicultural approaches.



A portable medical workstation developed under TAP project ET-ASSIST

IST's CHRONIC project is developing an information environment for home care that is an efficient alternative to conventional institutional care for chronic patients. Personal, safe and reliable home-based health monitoring systems will be connected to healthcare professionals through an open communications platform. The system will be piloted on patients with cardiovascular, neurological or respiratory illness, the three most prevalent chronic disorders.

Personal health systems for diabetes, heart failure and post-trauma patients are being investigated by CHS. The system will consist of a clinical centre unit, deployed in a hospital or other support centre, and a home care unit for the patient's home. The home care unit will be a mobile personal computer equipped with

telemedicine measurement devices, data management and decision support software. It will connect to the hub unit of the supporting clinical centre to provide a variety of functions, including the collection and storage of information from measurement devices and step-by-step instruction for the patient to perform measurements.

Patient-focused distant care

TelemediCare aims to improve the quality of home-based care and medical treatment through a new generation of open platform telemedicine solutions. A series of miniature medical instruments will provide patients with 24-hour medical monitoring in their own home. Advanced and reliable sensors on the patient's body will supply high quality data on key parameters (ECG, blood pressure, oxymetry and temperature) of relevance to the monitoring of several medical conditions. These data will be sent to the patient's computer through wireless communication. Intelligent software will trigger medical supervision, treatment or care by establishing two-way communication over the internet with remote on-call carers.

The system will be piloted at Karolinska Hospital, Sweden, and by municipal healthcare providers in rural areas of Norway and Greece.

M2DM intends to provide new services to residential and mobile diabetic patients that improve the quality of patient care. The system incorporates new telemedicine services that provide personal healthcare 24 hours a day and present new means for physicians and patients to access information, including web-based services and computer telephony interfaces. A crucial aspect of the M2DM solution will be its ability to effectively manage the knowledge necessary for chronic patient care, ensuring that the right people have access to the right information at the right time.

Under WP 2000, the personal dimension in healthcare has been strengthened by a new action line focusing on health promotion and illness prevention. This aims to apply RTD to support citizens, including those predisposed to diseases, with new generation systems that allow them to respond to risk factors, such as high blood pressure or high cholesterol levels, through lifestyle changes or other measures. These include interactive, secure health information and monitoring systems for the home and workplace.

Further info		
IST Action Lines:	IST-2000 I.1.1	Intelligent environment for health promotion and illness prevention
	IST-2000 I.1.2	Intelligent environment for patients
Project References:	CHS	IST-1999 12158
	CHRONIC	IST-1999 13352
	M2DM	IST-1999 10315
	TELEMEDICARE	IST-1999 10754
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Web:	www.ehto.org	http://chronic.cestel.es http://aim.unipv.it/m2dm/ www.telemedicare.net

The networked home

Householders of the future could return home to find the oven preheated, the video set and the washing machine going thanks to home automation systems. The inclusion of micro-processors in home and office devices enables them to communicate with each other and, via the internet, to exchange information with the wider world. Everything from the PC, TV and VCR to lighting, central heating and air conditioning, dishwashers and washing machines, answering machines and security alarms will be capable of being remotely monitored and controlled.

With home devices becoming increasingly "smart", there is a need for open platforms and standards that enable equipment to be linked together within home networks. The two main contenders are wired connections, including mains electricity, and wireless networks provided by radio and/or infrared technologies.

Traditional local area networks are too complex and expensive for the home or small office environment, and in any case are only suitable for PC-based equipment. ETSI, the European stan-

High-speed multimedia home network

In-home audio-visual and automation systems require new kinds of user-friendly networks with high data throughput and reliability. INHOMNET is integrating different home devices and functions inside the home into a comprehensive in-home network concept. Using IEEE 1394 as the underlying networking technology, new interfaces, user software and related middleware are being developed. The research addresses issues of interoperability, usability, reliability and ease of access to other networks. Current data rates with the IEEE 1394 bus are 400 Mbit/s and will rise to 3200 Mbit/s in the future.

dards body, has proposed an approach known as the Home Local Network (HLN) based on the IEEE 1394 high-speed bus. Easy and inexpensive to use, IEEE 1394 has "plug and play" capabilities allowing a device to be added or removed from the network while the bus is operational. Up to 64 devices can be attached to each bus segment using special connectors.

Appliances will talk to each other in the smart home.



Amongst wireless technologies, the strongest contender is Bluetooth, an open specification for wireless communication of data and voice over short-range connections. Based on a low-power radio interface, Bluetooth is expected to replace cable and infra-red connections, such as IrDA. It can be used for connecting mobile devices to an office printer or another mobile device to exchange business cards. The first products with Bluetooth technology are beginning to appear and before long Bluetooth radio links are likely to be supported by office networks and PCs.

An alternative approach for home networking is to use domestic low-voltage circuits, although there are no standards in this area at present. IST's INSONET project proposes an innovative technology enabling high-speed data rates over low-voltage residential power lines for in-home and small office networks. A mixed mode ASIC is being developed in 0.35 micron CMOS technology. High overall efficiencies are expected through the use of advanced modulation and encoding/decoding techniques. The system will also include software to bridge between the power line and existing network standards, such as Ethernet and USB.

SIRLAN is creating a toolkit for connecting domestic and commercial equipment within a local area network in commercial or residential buildings. The platform will be capable of supporting all categories of equipment, from a sim-

ple push-button to computers, TVs, washing machines, alarms, surveillance camera etc. The toolkit involves work on both hardware and software solutions, and will support current standards for home networks.

Within the Work Programme 2000, the integration of applications and services within the home is addressed under IST's Cross-Programme Action on Extended Home Environments. As well as the interconnection and interoperability of household and consumer devices and networked appliances, the work focuses on the convergence of broadcasting and interactive services within the home. Aspects covered include compatibility between home networking technologies, embedding of networked devices in everyday appliances, and the integration of home and public networks. Test beds demonstrating services in key application areas are also supported.

Further info IST Action Lines:

IST-2000 V.1.1 CPA1
IST-2000 IV.8.2

Extended home environments
Application-specific microelectronics

Project References:

INHOMNET
INSONET
SIRLAN

IST-1999 10622
IST-1999 10358
IST-1999 12295

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www.cordis.lu/ist/cpt/2000cpa1.htm
www.cordis.lu/ist/ka4/mel/index.htm

The disappearing computer

Personal computers (PCs) are extremely powerful devices but they can hardly be called user-friendly. Despite major advances in software and hardware, they remain difficult to set up and use – a real deterrent to an "Information Society for all". Things are changing however. A new generation of devices is moving computing power off the desktop and into everyday items making access quick, easy and less costly. Computing power will soon be embedded in everything from TVs and mobile phones, to café tables, school desks, park benches and billboards. Even the clothes we wear will be intelligent.

i3, the European initiative for intelligent information interfaces, focuses on a human-centred approach to computer interfaces. Launched in 1997 under Esprit, the initiative aims to build a community among researchers exploring new relationships between technology, people and design. i3 now involves 300 researchers from more than 100 organisations working on 25 research projects, focusing primarily on computing for communities and schools. Under a new contract with IST's Future and Emerging Technologies action, the network has been extended until September 2001.

The Disappearing Computer is a new initiative launched by FET during 2000 that partly builds on i3's work. The initiative has a vision of the future in which our world of everyday objects and places is bathed in capabilities for processing and exchanging information. The technology providing these capabilities is merged unobtrusively with real world objects and places. In a sense it disappears into the background, taking on a role similar to electricity – an invisible pervasive medium.

Interactive learning

i3's Experimental School Environments cluster focuses on the school environment of the future for 4-8 year olds. The CAB project is probing how children act, think and solve problems through experiments with construction kits, like Lego, made of atoms and bits. CARESS is developing wearable sensors that will be used to monitor the development of cognitive and social skills in children, both in mainstream and special needs schools. In NIMIS, a highly interactive classroom environment for young children is being developed that includes features such as pen-based input and large interactive displays. The eTui project is working on a programmable toy that can teach children to "learn how to learn", and C3 is developing tools that enable children to create and explore maps and develop spatial skills.

In this vision, "information artefacts" are future forms of everyday objects (tools, appliances, clothing etc) enhanced with capabilities of information processing and exchange (based on sensors, actuators, processors, microsystems). These artefacts have the capability to communicate with other artefacts based on local (typically wireless) networks, as well as to access or exchange information at a distance via global networks. One of the initiative's main objectives is to study how to create individual artefacts, particularly ones that are open and connectable within a wider system.

An electronic arena developed under i3 project eRENA



A second key interest is functionality: the range of functions an artefact exhibits or the experience it provides. In reality we may expect a range of different kinds of artefacts, some general purpose and some quite specific. Even if an individual artefact has limited functionality, it can have more advanced behaviour when grouped with others. The initiative is looking at how collections of artefacts can be made to work together, and in particular how they provide behaviour or functionality that exceeds the sum of their parts. Central to this is the ability for artefacts to adapt and for new functionalities to emerge over time.

The integration of adaptive information artefacts with real-world settings and objects offers opportunities for new ways of supporting people's everyday activities that go well beyond those available through existing devices, such as personal computers or mobile phones. In some

cases, groupings of artefacts could substitute some of the functions that the PC performs today, using a more natural form of interaction. In other cases, groupings of artefacts could be designed to take advantage of the new context and support people's activities in completely different ways. Hence, people's experiences of artefacts and how they interact with them is another key theme of the research.

Writing on the community wall

Campiello, an i3 project, has created a prototype multimedia system that works like a "community wall". People interact with the system by means of personal computer, paper or large screen. Locals can write a message on regular paper, insert it into a scanner and see their comments instantaneously organised into categories by intelligent agents and transformed into an electronic message on the billboard. Tourists can use the system to print out a traditional Venetian recipe, discover the names of local craftsmen or request information to match their personal interests. The system was tested in Venice during summer 2000.

Further info
IST Action Lines:
Project References:
Commission Contacts:
Web:

IST-2000 VI.2.1
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