

ICT Research

The policy perspective



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The future of media in a networked world





This brochure has been produced for the Information Society Policy Link (ISPL) by the *ICT Results* editorial service. ISPL is an important part of the Information Society and Media Directorate-General's goal to draw clear lines between policy, policy-making and European research in the field of information and communications technology (ICT).

ISPL publications and other news are available via the website:

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ICT Results is an online editorial service established on behalf of the Information Society and Media Directorate-General.

The service's main aim is to:

- raise the visibility of ICT-funded research results
- support projects' access to markets and encourage uptake of innovations
- raise awareness of European ICT programmes and activities

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Connecting you now... to the future

In this report produced for the publication series *ICT Research: The Policy Perspective*, we look at a future where all media channels – from mobile phones to cinema – are somehow connected online. European R&D is embracing the many benefits of networked media which paves the way for the next-generation internet.

Remember how the internet worked in the olden days? In 1995, the World Wide Web consisted of less than 20,000 sites, the homepages of top-name brands looked laughably amateurish and took forever to download over a dial-up connection. This was also the era of mobile phones the size and weight of house bricks. And satellite navigation was something still firmly locked in sci-fi novels.

Compare that with today's worldwide web of possibilities. The web now contains billions of pages; you can write blogs and upload photos from your mobile phone, download feature films to your laptop whilst sitting in a cafe, perhaps phone your cousin in Australia through your TV. Even cinema – the bastion of "old world" entertainment – is going digital: increasingly films are being produced and distributed in a digital format and delivered to cinemas online.

The evolution of the internet is making it possible for all our media channels to connect to the internet. And there is a growing "network of things" – everyday objects embedded with chips to make them smart, networked and accessible over the internet.

This vast and diverse network of the future will provide us with powerful and functional applications – from television on our mobile phones to remote health monitoring – that deliver more interactive, personalised and "experiential" content than ever.

Media means jobs, too

Europe has an important part to play to ensure that its citizens get all the benefits of this new age of networked media. Regulation, clear policy guidelines, standardisation initiatives – plus a great deal of R&D – must be combined and coordinated to prepare business and consumers for the future internet. These are all brought together under **i2010** – the European Union's main policy framework for ICT.

Networked media is not just another application, gizmo or technology. It is about a converged media world: traditional channels like television and entirely new types of content like 3D media will be created and delivered seamlessly to any device, anywhere through high-capacity, interoperable networks.

With networked media we, the users, matter most – and what we want is a powerful and engaging experience when we access media and content. Quality of experience is the ultimate goal which is driving the rapid development of innovative networked media technologies and applications.

So what motivates Europe to support the development of technologies that, on the face of it, may only serve to enhance our entertainment and leisure experiences?

Firstly, the communications and media sector is a crucial part of Europe's economy consisting of some 270,000 enterprises which together generate €340 billion of added value in the EU-27, over half coming from telecoms, according to 'European Business Facts and Figures 2007' (Eurostat). At least three of the top 10 media content producers worldwide are European companies, making content an important European export market.

In addition, the creative media sector is highly “job intensive” – the audiovisual media sector alone accounts for more than one million jobs in the EU. It is therefore clear that support for this sector and the underlying R&D required to drive innovation and the uptake of next-generation networked media can contribute to economic growth, job creation and new opportunities in new sectors.

But leisure and entertainment is not just about jobs and money: media also plays an important societal role. We consume content because knowledge and entertainment are an essential part of everyday life for European citizens. Media content is required for education, for information, and as a vehicle for communication. Entertainment improves our quality of life, disseminates culture and plays a stabilising role in society.

The EU’s **MEDIA programme** also provides specific support to the European audiovisual industry. MEDIA co-finances training initiatives and the production of feature films, television drama, documentaries, animation and – importantly – new media content.

In 2008, the Commission adopted a policy paper on **creative content online** – building on a 2006 consultation process and launching further measures to support the cross-border delivery of online content. The outlined actions aim to improve the quality of content whilst protecting and helping to manage digital rights.

Later in 2008, the EU also launched the portal Europeana.eu which digitally regroups a vast collection of Europe’s scientific and cultural heritage. The portal, which was given life in the 2005 communication **i2020 digital libraries**, showcases European efforts to develop and deliver top-class, accessible, reliable digital libraries and technology while fostering job creation in the knowledge economy.

User-centric

But even while the EU supports the media industry, media creation is increasingly decentralised. Neither content – nor its distribution – is the exclusive preserve of professionals and corporations. Web 2.0 heralded the importance of consumer-generated content, and with networked media this phenomenon is going to get bigger.

The phenomena of convergence and decentralisation place new types of traffic demands and constraints on networked platforms, create new requirements for information representation, indexing, filtering, aggregation and sharing. They drive demand towards novel media search tools and raise issues of identity management, ownership and the trading of virtual digital objects, as well as privacy, data protection and the fair right of use.

In 2006, the i2010 High Level Group published a working paper **‘The Challenges of Convergence’**. It identified the main policy areas and action that Europe would have to address to realise the future internet vision. “Convergence will go beyond the consumer market for innovative online services,” it states, highlighting its impact on business and citizens. “The possibility of significant developments happening outside the scope of the established analytical and policy frameworks should not be underestimated.”

The full potential of networked media is hard to judge, but it is certain that new developments in this area will transform how we ‘consume’ media content today. The internet will not just deliver content, but enhance it too. Web 2.0 gives us a glimpse into what is already possible, with user-generated content, mash-ups and media sharing. The ‘networked society’ is now poised to exploit online connectivity and transform media into a more accessible, more engaging, more interactive user-centric experience.



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Fast forward

But what the future may bring is driven, at least to some extent, by Europe's vast research in the future internet and networked media fields. As i2010 clearly recognises, policy changes and initiatives alone may prepare the ground, but the technology for fully networked media is still not mature.

The **Seventh Framework Programme** (FP7) – the EU's main research funding instrument – is leading Europe's investment in the development of future internet and networked media technologies. Challenge 1 (Pervasive and trusted network and service infrastructures) of the ICT research programme deals with the various aspects of future networking, content and services, and the move to the service-oriented architectures that will make networked media possible. Tomorrow's networked media require a shift in focus: on top of enabling technologies, content and devices are the users and the quality of their media experience.

Visit the Network Media Systems in FP7 website for more information: <http://cordis.europa.eu/fp7/ict/netmedia/home>

Platform for the future

Stakeholders in networked media find a powerful grouping in the **Networked and Electronic Media European Technology Platform (NEM ETP)**. ETPs are EU-backed initiatives that provide a framework for stakeholders, led by industry, to define research and development priorities, time frames and action plans on a number of strategically important issues.

The NEM ETP has published a strategic research agenda (SRA) and numerous position papers. The

SRA has a significant input into the Commission's consultation processes as it draws up research calls for FP7 in this area.

The NEM ETP is working in cooperation with several related ETPs – eMobility, EPoSS, ISI and NESSI – which address various aspects of the future internet. A **joint vision document** was published in January 2009. It identified 10 future internet objectives and challenges that need to be addressed through research.

The EU realises that the benefits of the future internet, including networked media, are immense. Although the potential of these new technologies is not yet fully appreciated, Europe is ready to drive their development and seize the opportunities they offer. In April 2008 nearly 100 EU-funded research projects and technology platforms issued the Bled Declaration. "A significant change is required," it stated, "and the European Internet scientific and economic actors, researchers, industrialists, SMEs, users, service and content providers, now assert the urgent necessity to redesign the Internet, taking a broad multidisciplinary approach, to meet Europe's societal and commercial ambitions."

Then in the autumn of 2009, the Commission announced the creation of a new €300 million, three-year public-private partnership (PPP) initiative to mobilise resources needed for the emergence of the future internet.

With significant financial support for future internet and networked media research and a major focus on building up Europe's internet infrastructure, the EU is poised to seize all the opportunities that this new generation of networking has to offer.

Quick glance

Networked media research topics in FP7

- User-centric
- Multimedia search
- Delivery platforms and digital cinema
- 3D media

Meeting the challenges

Viviane Reding, Commissioner for Information Society and Media, summed it up nicely in a speech in July 2009: "We are on the threshold of a new era of network and service infrastructures: the internet of the future. This future internet will feature almost unlimited bandwidth capacity, wireless access everywhere, potentially trillions of devices interconnected, integrated security and trust for all parties, and adaptive and personalised services and tools."

But the development of a user-centric internet – which will provide new business opportunities, enhanced, personalised services and novel experiences for consumers – faces numerous technical challenges. Infrastructures must be fully accessible and interoperable, content (from audiovisual material to advanced virtual reality applications) must be delivered and manipulated in a way that is increasingly interactive, immersive and searchable. And these new technologies must find profitable applications to make business more efficient and competitive, and to solve societal problems.

"With its current strengths, Europe should not be content with anything less than leading this development," notes Reding.

Digital delivery

Networking technologies – from wireless routers to the optical fibre cables that run the length and breadth of the EU – provide the backbone of the internet as we know it today. These technologies

are the 'pipes' that today deliver our online content. But these 'pipeworks' needs some serious attention. More research is required to continue the process of network convergence and standardisation and to build platforms that can use the internet for seamless delivery of a rich, multi-functional, multi-media experience.

The user is king

Ask any internet user today and they will tell you plainly. It is not the content or services per se that matter – after all, different people have different preferences and interests. What people want is a satisfying experience, whether that's watching a film that plucks at the heart strings, or sharing photos with a friend. When they go online people want to feel engaged, in control, with a stronger sense of 'presence' between connected individuals. And they want all this irrespective of whether they are using their mobile on a train or sitting in front of their wide screen TV at home. Today, technological limitations tend to get in the way of our online media experience, but not for long. European researchers are on the cusp of delivering this a new era of user-centric media.

Real-world experience

Networked media will open new opportunities for business and consumers. Researchers are thinking big, developing and piloting exciting applications of networked media – from 3D TV to highly realistic virtual reality engines – that would have been unimaginable just a few years ago.

The long-term, visionary research of FP7 is complemented by shorter-term, commercially focused collaborative research. The main avenue for these projects is through the industry funded EUREKA programme. In particular, the CELTIC cluster focuses on research to develop advanced services, tools and multimedia platforms to produce, store and deliver networked media.

The ECONTEC cluster, meanwhile, focuses on technologies that help with developing, packaging, managing, marketing and distributing e-content products and services – themselves an important part of the networked media value chain.



It's in the pipeline...

We all want more from the internet. We want dynamic content and personalised services, regardless of where we are or what kind of device we happen to be using. We want to access rich, multimedia experiences, but care little for how the information travels through the ether. Fortunately, major "behind-the-scenes" activity is building up the platforms and infrastructure to deliver exactly what we want, where and when we want it.

Networked media rely on the processes of convergence. Content – whether text, audiovisual or more futuristic virtual reality 3D imaging – can be distributed, shared and managed across different networks.

Today, the internet infrastructure is formed of many different networks, from the fibre optic backbones that run the length of countries, the WiFi networks found in hotspots (airports, cafes and wireless home networks), to the 3G networks used by mobile devices.

The first hints of a converged world are already visible – you can get onto the web on a mobile phone and call any phone through your computer – but more coordinated research is required to ensure that the networks of tomorrow are smarter about how they handle and transfer data. They need to be more "aware" of the content they handle and the context they are in and adapt intelligently to optimise the network's capabilities.

Digital delivery

Famously referred to once as a "series of tubes" the internet has evolved into a highly complex, heterogeneous data delivery network. But the current architectures and infrastructure is at breaking point. Forward thinking research is developing new internet structures, platforms and protocols to make our media more connected.

Europe has launched numerous actions to address networking issues across the entire spectrum. For example, the **Riga Ministerial Declaration**, signed by 34 countries in 2006, calls for broadband coverage in Europe to at least 90% by 2010. Local authorities, especially in rural areas, can mobilise the EU's **Structural and Rural Development Funds** to install infrastructure and develop e-services and applications for citizens.

Within the i2010 framework, the roll out of broadband is seen as a top priority. But the issue of infrastructure is just a starting point. Europe is also developing appropriate technologies to support networked media.

The 2008 **Communication on Future Networks and the Internet** highlights legislative and policy changes to support the evolution of the internet. It recognises that the adoption of global standards is essential for successful convergence and announces the launch of a policy strategy to address the impact of these changes on its policies in areas like ICT standardisation and the development of pan-European public services.

The Communication concedes that the full potential of next-generation networks is still not fully mapped out. However, it also states that “unlocking this potential... requires responses to make sure that the internet of the future develops into a strong platform for European innovation and growth. The fundamental requirements are an internet that is high speed and ubiquitously available to all; that is internationally open and competitive; and that it is secure and safe to use, with transparent and effective governance procedures.”

Significant research is required to meet these requirements, for example, to develop new protocols and technologies that are capable of producing, delivering and manipulating exciting new forms of content over high-speed connections.

According to the NEM ETP, the creation of interoperable network infrastructures that enable seamless multimedia networking are a big challenge to the development of networked media. NEM ETP calls

for research to develop the necessary new network architectures that support self-adapting services which are capable of managing application layers. Similarly, devices and terminals need to become increasing network-independent, using whichever network is optimal for the content and its context.

FP7 research is geared towards delivering these next-generation, seamless networks, largely through projects funded under Challenge 1. Research projects cover a diversity of issues, from the optimisation and regulation of peer-to-peer networking to consumer user-interfaces for designing and producing not just content, but services too.

In particular, the 2009 Work Programme for networked media calls for research projects to explore the idea of content-aware networks and network-aware applications. The ultimate aim: optimally deliver multimedia content and services on any network, any device, any time and anywhere.





Projects in focus

P2P-Next BIONETS TEAHA

Peer-to-peer (P2P) networking and file sharing gained notoriety in the late 1990s with the Napster music sharing service. But this method of storing and sharing media content is now recognised as a key ingredient for the success of networked media. Indeed, network media is concerned less about the actual content and more about the way it is delivered so that it enhances the user's engagement and experience.

The **P2P-Next** European project is working to improve P2P connectivity so that networked media can flourish, their production and uptake driven by the users themselves.

One of the big problems with the structure of the internet today is that it is not suited to the simultaneous, multimedia transmission of live events to millions of people (i.e. broadcasting). Currently, such media streaming leads to 'internet congestion'; everyone suffers from slow connections and no-one gets the service they have come to expect.

P2P connections promise efficient, low-cost delivery solutions for both professional and user-created content, but as the nature of broadcast material evolves into more two-way, interactive content, the P2P technology must change too.

P2P-Next is developing an open-source platform that will enable P2P 'delivery' of interactive, multimedia content. The platform is being designed with both professional media companies and creative users in mind and involves 21 partners from 12 European countries.

The project has demonstrated the world's first device-to-device streaming of professional quality video. The new P2P technology allows anyone to broadcast a live video stream, from a simple webcam feed to an entire TV channel, to millions of internet viewers. The secret of the technology is the application of an enhanced streaming protocol standard, known as BitTorrent, which can stream to thousands of people using the same bandwidth as for a single user.

"This is an extremely ambitious project," declares Lieven Vermaela, Technical Director of the European Broadcasting Union, "which will create a viable broadcast platform that would enable large audiences to stream and interact with live and on-demand content via a set-top box or a TV receiver... It is our intention to allow audiences to build communities around their favourite content via a fully personalised system."

Seamless networking and convergence also depend on the expanding "internet of things" where everything from clothing to cars will be linked together. Users will effectively have their own personal network that "follows" them around, dynamically adapting their media experience not only to their specific device and location, but also their contexts, like work and leisure.

But there are some big problems facing this rosy future. There's the problem of scale, with billions of devices all hooked up. Heterogeneity also makes things difficult: how can radically different 'devices' – from portable computers to cars – work on the same network?

The €7 million **BIONETS** project believes it has found some answers. The project has been inspired by the natural world, evolution and DNA to tackle some of the fundamental scientific and engineering problems presented by the future internet.

"We need to introduce autonomic properties at the network and service levels, software and protocols, and devices capable of operating reliably but independently," BIONETS' coordinator Daniele Miorandi believes. Take the human heart. It beats reliably and keeps its host alive for decades, all without any conscious intervention or control. BIONETS' networks would work in the same way.

The project succeeded in developing its technique by creating information filtering protocols, data dissemination protocols and data cloud protocols that combine and separate according to the specific needs at the time.

This "bottom-up" approach lets devices, services and content set up the most appropriate networks in the appropriate context to ensure the most robust, secure and useful connection possible. In this way, the media experience can be optimised for every device and situation.

The advancement of network media has much to learn from a wealth of European networking research. The **TEAHA** project, for example, has developed a system for smart homes that allows household appliances to communicate and 'talk' to one another. This kind of interoperability has an important part to play in networked media too.

To date, appliance manufacturers, telecommunications firms, utility companies, software designers and system installers have often taken very different paths towards deploying new consumer technologies. But TEAHA has developed the first open smart-home platform to allow any home device – using any technology and made by any manufacturer – to interoperate seamlessly with the TEAHA system. The system could incorporate a camera, for example, to alert you if anything abnormal occurs while you are away; you could use a mobile phone or PDA to lower the blinds, lock doors or control your set-top box and hi-fi.

TEAHA developed a middleware platform that mediates between different appliances and communication systems. It is based on a software gateway through which information from all the different devices passes, regardless of the network they are using. The platform further provides zero-configuration capability, i.e. appliances are automatically discovered as well as securely connected.

"By taking an open approach, TEAHA avoids locking manufacturers into specific technologies. Instead, it allows them to use a variety of technologies, thereby encouraging the development of different smart-home devices and appliances," the project's coordinator, Enrique Menduiña, says. The potential for linking devices and giving users more control will also help to enhance their experience of networked media accessed at home.

More information:

P2P-Next <http://www.p2p-next.org>

BIONETS <http://www.bionets.eu/>

TEAHA <http://www.teaha.org/>

ICT and networked media stories on ICT Results: <http://cordis.europa.eu/ictresults/> (enter search terms 'future internet', 'networked media', 'future network', 'multimedia')



The internet, at your service

If you are a bit of a geek and a fan of Google, the chances are you'll have already built your own, personalised web service. But networked media puts this kind of personalisation firmly in the hands of every consumer. The user – and the quality of their media experience – is the focus of attention. European researchers are designing and testing the tools and techniques for next-generation, user-centric content and services.

Europe's audiovisual sector might only account for around a million jobs, but it is renowned for being innovative and producing top-quality programmes. Indeed, media production is an important export industry.

Whilst the development of next-generation networks is essential to usher in networked media; without content we would be left with empty boxes and pipes. The creative side of networked media cannot be ignored and must be developed in parallel with the networks and infrastructure.

In less than five years, the process of creating content has been radically democratised. Almost everyone can afford semi-professional digital cameras, and produce and publish videos. The "blogosphere" is crowded with innumerable, yet often excellent, writers. With Web 2.0 we have all become content creators. User-generated content is a must for virtually all websites.

But it is not just words, sound and pictures that we want. We want to manipulate them, share them, and produce or broadcast media through collaboration in online communities. We also want to feel much 'closer' to the people we communicate with online – as if they are in the same room or sitting opposite us at the table. In other words, we demand

The user is king

The Economist magazine saw the writing on the wall in 2003 when it suggested computing would soon become a utility and software a service. And now 'content', whether professional or user-generated is a commodity. What matters most today is what you can 'do' with it; Europe is supporting research that puts the user more in control and at the centre of the media experience.

"media-plus". We want the content, but coupled with personalised services and interactivity. And we don't want the limitations of geography or technology to affect our interactions with others online.

"At present, most users cannot create, manage and share multimedia digital content from various sources as easily as they can manipulate text (with word processors and email)," states the NEM ETP's **Big Challenges** report. "Intuitive end-user applications and pervasive end-user services will require interoperable systems and tools coupled with easy and sensible human interfaces that facilitate creation, enrichment, sharing and consumption of multimedia content and [which] adapt to individual user needs."

Some internet companies are already well down this route. Google Gadgets is an example of how users can build their own web services for their PCs, but this kind of user-generated service will grow massively in coming years, without consumers having to know anything about programming.

Provision for "prosumers"

FP7 is taking a leading roll in the longer-term convergence of content and services. One research objective within Challenge 1 looks specifically at software and services and how to put the user more in control. Research on service front ends, for

example, will enable “communities of networked users easily to compose, configure, share and use services and [in] providing device and context aware service adaptations.”

FP7 is also supporting numerous projects to revolutionise service and software engineering methods to make it easier and faster to build robust, reliable and adaptable services for next-generation networks.

Networked media is at the heart of this new generation of prosumers or “professional consumers”. The NEM ETP has a vision for “a service oriented society in which ambient and context sensitive services are created and provided, personalized and customized to people’s individual and social needs, available to communities of users and including ALL citizens.”

One important ‘service’ that researchers must urgently tackle is how to improve searches of rich, multimedia content. At present image and video searches usually only look at text tags that users

and producers attach to their files. This needs to change. How can searches actually scan the actual content of images, videos and audio?

And the future looks even more exiting as the involvement of consumers moves a step up the hierarchy. It is not just about using tools and services to make the content, but building the tools themselves – no specialist knowledge required. The user really is at the centre – the centre of media creation and its consumption. The user’s experience of both is now the main focus of attention.

Rather than being a threat to professionals, the user-centric nature of media will lead to a highly creative and competitive environment and help to drive the development of innovative and commercially viable services. Europe is backing the technologies that make this possible, ushering in an era where content, services and their networks merge together to create something functional, powerful and compelling for each and every user.



Think culture, think digital

Europe is at the centre of an ambitious challenge to digitise scientific and cultural artefacts not only for everyone to use today but also as an important keepsake for future generations.

Over the years, the European Commission has supported numerous projects exploring this challenge from different angles, from how to preserve works digitally, to accessibility and rights issues (see opposing box). Projects such as **Mosaica** which is using the latest semantic web technology to bring cultural heritage to the virtual stage, or **MultiMatch's** search tools which don't just query the web but delve deeper into archives and deliver multi-lingual, multi-media results optimised for cultural heritage. And projects like **MEMO** which brought together public authorities, tourism industry SMEs, historical experts and tourism associations to deliver technology that helps cultural tourists better plan their trips.

The EU's efforts have also culminated in the Europeana.eu collection which harnesses Europe's rich cultural heritage by combining multicultural and multilingual environments with technological advances and new business models. Launched in November

2008, the portal already boasts nearly 5 million searchable digital items, including images, texts, sounds and films, regrouped from major libraries, museums and galleries such as Rijksmuseum in Amsterdam, the British Library in London and the Louvre in Paris.

In 2005, the Commission published a communication outlining how digital libraries could become a strategic part of the i2020 initiative and the EU's wider efforts to create economic growth and new jobs thanks to the ICT and media industries.

Today, we are well on the way to a "digital Europe" comprising vast and multifarious virtual libraries which not only bring Europe's cultural and scientific resources within reach of everyone, they also usher new economic possibilities and, according to Commissioner Viviane Reding, "a fast-track to economic recovery".

http://ec.europa.eu/information_society/activities/digital_libraries/index_en.htm
www.europeana.eu
www.mosaica-project.eu
www.multimatch.eu
www.memo.fr

Quick glance: rights and access

Europe is not the only one interested in digitisation. Organisations such as the United Nations (UNESCO) and private players like Google are also heavily invested in this future online. All this interest raises an important question of ownership and access rights to digital artefacts, such as books.

This prompted the Commission to issue a communication in October 2009 on **copyright in the knowledge economy** which aims to address the important cultural and legal challenges of mass-scale digitisation and dissemination of books, in particular of European library collections.

The communication was jointly drawn up by Commissioners Charlie McCreevy and Viviane Reding. Digital libraries, such as Europeana.eu (see box) will provide researchers and consumers across Europe with new ways to gain access to knowledge. For this, however,

the EU will need to find a solution for orphan works, whose uncertain copyright status means they often cannot be digitised. Improving the distribution and availability of works for people with disabilities, particularly the visually impaired, is another cornerstone of the communication.

One project called **Arrow** is already on the case developing accessible registries of rights information and orphan works. Launched in 2008, it brings together national libraries, collective management organisations and publishers to reach its goal. It is co-funded by the EU's eContent plus programme .

www.wdl.org
<http://books.google.com/books>
www.europeana.eu
www.arrow-net.eu



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Projects in focus

Semantic Hi-Fi

SAME

TA2

PHAROS

Large-scale digital music distribution is bringing about a profound revolution in the way we 'consume' music. The market is still in flux, but it is very clear that the hi-fi systems of the future will be significantly different to what we see today, say European researchers. In the future, the boundaries between the stereo system, computer and the television will become more and more blurred.

The **Semantic Hi-Fi** European project explored the possibilities opened up by the digital revolution to change fundamentally the way we listen to and interact with music. "Music is no longer limited by a fixed format. Network-based distribution has freed music from the limits imposed by these formats and opened a whole new range of possibilities which will encourage greater interaction with musical pieces," says Hugues Vinet of the French music and acoustics research centre, IRCAM, which coordinated the project.

The user will, for example, be able to visualise the structure of a piece through a graphic display which will enable them to navigate smoothly within a piece and even to modify elements of the musical composition: slow the tempo down, speed it up, modify the relative weight of different instruments in the piece, or remove them altogether...

"Owners of next-generation hi-fi will be able to do more than just passively listen, they will have a tool which also allows them to manipulate music and to create new pieces themselves," says Vinet. Hi-fis of the future will also be linked up to the internet and share personal works with others through peer-to-peer systems – all whilst protecting copyright.

The FP7 **SAME** project is also revolutionising our music experience. It is developing the technologies to transform our passive listening and music-making into an active, context-aware, experience. The project is developing devices and technologies that, in five years time, should have a similar impact as the iPod has had today.

So far, the project has produced several early 'proof-of-concept' systems. One technology uses an accelerometer component embedded in a mobile device to pick up a user's movements, better understand their context and make more appropriate music recommendations (the technology could also be adapted to transform a mobile phone into a virtual drum-stick!). Another prototype system is able to analyse the dynamics of a group in a musical setting, assess how they synchronise their movements, harmonise their emotions and determine who takes the lead.

Technologies like this will make both music listening and creation more participative, immersive and a 'whole body' experience. They could also help to democratise composition in the same way that digital cameras have democratised photography.

It is easy to imagine that networked media are solely concerned with audiovisual content: music, films, cinema. But the online connectivity opens up a vast

range of possible applications where words, pictures, music, sounds – and perhaps even the sense of touch – are combined in entirely new, interactive and participative forms. Media will no longer be just consumed, but experienced, and often as a group (albeit geographically dispersed) rather than in isolation or as individuals.

The **TA2** project, for example, is exploring new technologies that can support and enhance communication especially between groups, with a particular focus on helping to nurture family-to-family relationships.

Current media are still focused primarily on individuals: mobile phones, computers and electronic games tend to be individually owned and provide, for the most part, individual interactivity. But TA2 seeks to redress this balance using the internet to help families share stories, photos and videos, add comments and even play games together despite physical separation.

The project partners plan to combine sensors in the home with online communication services to help families share their experiences yet maintain their individual rights to privacy. The new technologies will use 'natural' control systems (e.g. voice commands) and include tools for rapid, semi-automated intelligent video editing.

The TA2 project imagines a future where two families, who rarely see one another, are able to keep in touch because they frequently share video clips and information. Awareness systems installed within their homes allow the families to call one another at the

most appropriate and convenient times, so they are able to chat rather than get a pre-recorded prompt to "leave a message". They also play board games with one another via their wide-screen TVs and the surround sound systems encourage banter between the families as if they were in the same room.

The quality of experience also depends greatly on how easy such 'experiences' are to find and access. The anticipated explosion of networked media will mean that we need to find new ways to store and search these media. The **PHAROS** project is helping to solve these issues. It is developing technologies that will automatically annotate media and allow full multi-media searching of audiovisual content, whatever its nature, structure or how it is stored. One of the project's major results so far is a method to publish audiovisual content as an RSS feed, similar to subscribing to blogs. The partners are working towards a full search engine platform that will allow users to 'dig around' within audiovisual content to find what they want

More information:

Semantic Hi-Fi <http://shf.ircam.fr/>

SAME <http://www.sameproject.eu/>

TA2 <http://www.ta2-project.eu/>

PHAROS <http://www.pharos-audiovisual-search.eu>

ICT and networked media stories on ICT Results:

<http://cordis.europa.eu/ictresults/>

(enter search term 'audiovisual services', 'e-society', 'social networking', 'future internet', 'software services', 'multimedia')



Experience and emotions: get online

Cutting-edge technology R&D is developing ways to create, deliver and experience exciting new forms of networked media, in particular 3D imaging (without having to wear those silly looking glasses). Virtual reality is getting more lifelike every day.

In many ways, the idea of networking media channels together, or connecting up your myriad devices doesn't actually sound that revolutionary. It all sounds quite feasible, if all the companies and operators were willing to adopt open standards, perhaps with a fillip from the EU in terms of regulation and financing.

But the future of networked media is much more exciting than the ability of any device being able to handle existing content. Significant European research will ensure that the future internet and networks will be able to deliver content that is far more interactive and compelling than anything we have today.

The 2009 Work Programme for networked media puts significant emphasis on two areas: 3D content and "immersive media experiences beyond HDTV and electronic cinema display". Here the emphasis is on the quality of the user's experience. Comparing networked media to the web as we know it today, is like comparing surround sound cinema to the magic lantern shows of the 19th century.

Advances in audiovisual technologies, especially the processing of 3D media, is helping multimedia to become highly "experiential". The first applications of 3D and other content would take the quality of experience way beyond even the best HDTV on the market today.

The most obvious applications of this technology would be in online gaming and virtual worlds, but the healthcare sector could also benefit from 3D images for both training and telemedicine applications. Indeed the 2009 **Networked Media Work**

Real-world experience

If you think that HDTV is amazing, then prepare yourself for the next step in content rich, networked media. 3D display is just around the corner – and Europe is playing a leading role in its development. Combine novel 3D content with other innovative networking technologies, and you begin to create some seriously exciting applications.

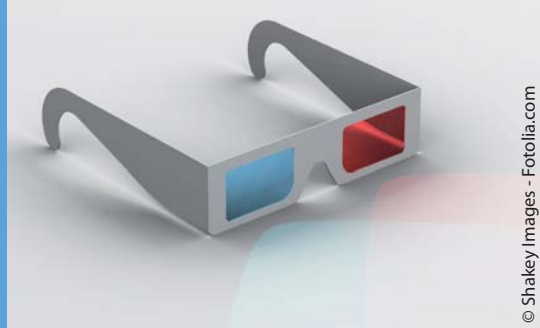
Programme specifically states that architectures and technologies should ensure that "3D augmented worlds are tightly coupled to the physical world, for commercial or social applications, beyond games."

One of the biggest projects in this area is the €15 million **2020 3D Media**, co-financed through FP7. "The media industry knows that astonishing the public is still a route to large audiences and financial success," states the project's website. "It is believed that high quality presentation of stereoscopic or immersive images in the home and in public entertainment spaces (such as cinemas) can offer previously unimagined levels of experience."

This new form of highly interactive and responsive content would greatly increase a user's sense of 'presence' – putting the spectator at the very heart of exciting action. It would also enable the user to move around and explore virtual environments that would feel far more 'real'. And, being networked, it would be adapted and accessible through multiple channels and on multiple devices – issues tackled in several other FP7 projects.

There is little doubt that networked media opens a new world of exciting entertainment experiences, and unanticipated business opportunities, thus fulfilling one of i2010's chief aims which is to improve the quality of life for its citizens.

Thanks to European support for networked media research, be prepared for a world of networked, online content that will stimulate our senses in exciting new ways.



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Projects in focus

IP-Racine
HOLOVISION
OSIRIS
MOBILE3DTV
3DPhone

Big money Hollywood film still likes to record on wheels of reels; digital cinema only has a small share of the world market. But the format is on the up and has the capacity to change the way we make and enjoy film, whether for cinema or for TV.

European researchers are ensuring that the technology moves forward and digital film is already on the verge of entering the mass adoption phase. Global figures show that non-reel film represents about 3% of the market. This may seem somewhat insignificant, but only about three years ago the figures were closer to 0.3%.

The **IP-Racine** project put together a consortium of some 20 partners from a variety of different countries to develop and integrate technologies and workflows that allow the digital cinema industry to deliver a more complete production chain. The overall objective was to offer a more enhanced experience for cinema audiences and facilitate the use of digital cinema technology in other media.

In one test bed, the project connected an image overlay system with a green screen directly to the camera and was able, only a few milliseconds behind real time, to create a composition of the virtual set and the real actors, clearly improving the way movies are shot, and reducing the cost, making it faster and easier.

Europe has always been at the forefront of 3D display technology. The **HOLOVISION** and **OSIRIS** projects, meanwhile, have played an important role in pushing the boundaries of 3D display. Ákos Demeter of Holografika, a partner in both projects, explains that the primary aim of HOLOVISION was to develop technologies capable of producing a very high-resolution 3D image. "We basically organised projection engines in a special way and used holographic imaging film for the display screen. The combination of these, with the projection engines being driven by a cluster of nine high-end PCs, and new sophisticated software, allowed us to achieve our aims," he notes. A prototype system had a resolution around 10 times better than HDTV.

The OSIRIS project then developed high-resolution, big screen, reflective projection 3D cinema. The prototype under development has a wall-mounted 1.7m by 3m screen, with the projector on the ceiling. A complex system of mirrors and light sources provides the re-projected images, the screen display will only have a depth of between 15 and 20 inches to give a much less bulky and more modern look.

Yet these 3D displays do not specifically require the 3D media to be networked. However, connectivity is an essential component for 3D display on mobile phones. "The mobile market has always been much more dynamic and receptive to new technologies than the television market, as the whole idea of mobility is based on dynamism," explains Atanas Gotchev, the scientific coordinator of the **Mobile3DTV** project.

Mobile3DTV is developing the core elements of the next generation of 3D TV television for mobile devices. For example, it is employing so-called auto-stereoscopic displays, which produce 3D images that do not require those awkward glasses to view

them – which is good news for people who want to be incognito about their mobile viewing.

“Auto-stereoscopic displays use additional optical elements aligned on the surface of an LCD, to ensure that the observer sees different images with each eye,” explains Gotchev. “As mobile devices are normally watched by a single observer, two independent views are sufficient for satisfactory 3D perception.”

The project has also been working on specifications for how mobile 3D content should be created, coded and transmitted over DVB-H, in order to be visualised on a portable display with satisfactory quality for the user.

But it is the lack of content that is the major obstacle on the road to the widespread take-up of 3D mobile TV. “A major market challenge is to convince content providers and operators to start producing and distributing 3D content,” observes Gotchev. “With our project, we try to provide the necessary technical evidence of the technology’s potential.”

The **3DPhone** project, meanwhile, take the whole 3D idea up a notch. The aim of this project is to make the entire device a seamless 3D experience. Everything from the phone’s user interface and applications to taking and sharing photos will be displayed in 3D. The wide-ranging project is developing hardware and software with 3D image capture and display capabilities and designing novel user interfaces that fully exploit the added dimension.

More information

IP-Racine <http://www.ipracine.org/>

HOLOVISION <http://www.holovisionproject.org/>

OSIRIS <http://www.osiris-project.eu/>

Mobile3DTV <http://sp.cs.tut.fi/mobile3dtv/>

3Dphone <http://www.the3dphone.eu/>

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What's inside?

Content for this publication was provided by the *ICT Results* editorial service, working to showcase breakthrough ICT research in Europe. It is part of a series of domain surveys drawn together from articles featuring EU-funded ICT research.

ICT Results

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Information Society and Media: Linking European Policies

Further information:

FP7 ICT Work Programme

<http://cordis.europa.eu/fp7/ict/>

Information Society Policy Link initiative:

http://ec.europa.eu/information_society/activities/policy_link

