

# **Networked Media Current Research, Results and Future Trends**

Complement of the September 2009 edition  
including new projects

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# Foreword

This publication is an update of "Networked Media Current Research, Results and Future Trends", published in September 2009. It includes all the new projects that were selected in the 4th Call for Proposals and that started in the beginning of 2010.

The new projects are grouped around four areas that are the continuation of those presented in the September 2009 publication. In some cases, the clusters have modified their names. This publication refers to their current denominations. These are:

- 3D, Immersive, Interactive Media
- User Centric Media
- Future Media Networks
- Multimedia Search

An updated version including all the on-going projects, a synthesis of the main results and trends, as well as the main lines of the work programme 2011-2013, will be issued in the autumn 2010.



# 3D, Immersive, Interactive Media

As a consequence of the recent commercialization of 3D media in the form of 3D cinema and first prototypes of 3D television and mobile 3D applications, new types of media formats have emerged. These technological developments have been accelerated by the availability of high-quality 3D displays. However, these emerging 3D media systems primarily focus on the capturing, transmission and reproduction of 3D content, just allowing passive consumption of 3D content.

**Therefore, the next logical step towards further technology development requires full immersion and interaction with 3D content.** This will allow users to interact actively with different types of multimedia content, easily create and share their own content and assemble individual multimedia environments to be displayed on various types of terminal devices. For the realization of such new technologies, methods for multimodal content creation, adapted coding and transmission, scalable rendering of immersive environments for different display resolutions, as well as user-adapted individual content need to be investigated. Examples of immersive applications are new types of interactive games, virtual gathering rooms with avatar-based interaction for virtual training, video conferencing, e-learning and other applications (e.g. health and medical interventions).

The avatar technology, i.e. the usage of realistic virtual characters represents one key element for enhanced 3D virtual environments, as avatars can be used to represent humans in the context of inter-personal and collaborative online applications. Thus avatars must be capable of conveying information through dialogue and non-verbal behaviour, and must be realistic and believable both in situations of human-machine multimodal interaction and in relation with other virtual characters.

# Overview of Projects in 3D, Immersive, Interactive Media Cluster



Today, in spite of advanced video conferencing, shared virtual environments, and gaming environments such as Second Life, it is still simply much more efficient to physically travel to remote locations for business, scientific or family meetings—even if at a huge environmental, energetic and opportunity cost.

Beaming will address this challenge developing a new kind of virtual transportation where the person can be physically embodied interacting with life-sized people who may be thousands of kilometers away. This will be achieved through shifting their means for perception into the destination, and decomposing their actions, physiological and emotional state into a stream of data that will be transferred across the internet.

Beaming will bring today's networking, computer vision, computer graphics, virtual reality, haptics, robotics and user interface technologies together in a way that has never been tried before. This will be underpinned by the practical utilization of recent advances in cognitive neuroscience in understanding the process whereby the brain represents our own body.

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## **Distribution Of Multi-view Entertainment using content aware DELivery Systems**

The delivery of 3D immersive entertainment to the home remains a highly challenging problem due to the large amount of data involved. As the number of high quality 3D views provided to users increases, current video delivery systems (e.g. terrestrial broadcast) will struggle to meet the demanding requirements for many 2D/3D displays/TVs at homes.



DIOMEDES is a collaborative project, involving seven partners from five countries from across Europe. The project work will focus on developing new methods for the compression and delivery of multi-view video and multi-channel audio to users. The DIOMEDES approach is to develop a 3D Peer-to-Peer (P2P) distribution

system, which will be designed jointly with novel video compression techniques. The compression, distribution, and security technologies developed within DIOMEDES will be demonstrated in the form of an integrated test bed.

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## **Freeviewpoint Immersive Networked Experience**

FINE will focus on researching and developing a novel end-to-end architecture for the creation and delivery of a new form of live media content. FINE introduces the concept of live free-viewpoint content which will provide rich and compelling immersive experiences.

The 3D reconstruction of the action will open a lot of new possibilities for content creation based on live events that will be exploited on several platforms: Internet, broadcast TV, interactive TV, mobile, online video games and digital cinema.

Advances in the acquisition, processing, transmission and exhibition of live free-viewpoint content will be accomplished by focusing the research in four main areas:

1. Fast (real-time) and highly accurate algorithms for smooth view interpolation and photorealistic 3D reconstruction of live events from multiple, high quality live video streams.
2. Real-time tracking and marker-less motion capture of multiple characters.
3. New coding and transmission technologies to allow the synchronized delivery of geometry, imagery and metadata to a wide variety of end-users through New Generation Networks.
4. Integration of the developed free-viewpoint technologies in a networked end-to-end architecture, and their validation in experimental productions.

The expected results of this project will have a large impact on both home users and media professionals by providing new production environments with the ability to create very rich and immersive media experiences for sports and other action sequences.

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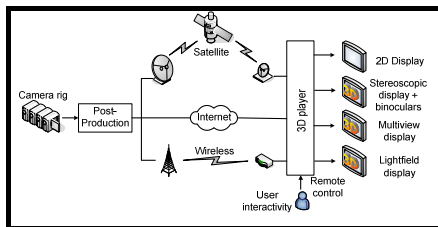
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**MUSCADE**  
Multimedia Scalable 3D for Europe

The MUSCADE project aims at developing a technically efficient and commercially successful 3DTV broadcast system by generating major innovations in the field of capture, data representation, compression, transmission and rendering.



With the contribution of 12 European partners, the MUSCADE objectives cover the whole 3DTV chain:

- Definition of a scalable and generic 3DTV representation format, development of advanced multi-view coding algorithms
- Development of an intelligent audio-visual capture and production assistance system
- Development of advanced versions of "spatialised" sound
- Implementation of techniques for the scalable and robust transmission of 3DTV
- Design and development of a 3DTV player
- Development of a 3D video interactive application platform
- Validation and demonstration of a complete multi-view 3DTV live chain over wireline, wireless or satellite networks
- Definition and implementation of a quality metric to measure the quality of experience for 3D audio-visual media

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## **UAV-based capturing of HD/3D content with WSN augmentation, real-time processing and immaterial rendering for immersive media experiences**

The objective of the SkyMedia project is to explore, design, and demonstrate a novel multimedia end-to-end architecture that can provide unique immersive media experiences to audiences during live events.

The keys to enable such a rich portfolio of experiences are both in the media technologies and in the overall system architecture, which has to be scalable, flexible, and easy to manage.

In particular, the following key technologies are combined in the SkyMedia architecture:

- Innovative 3D coding methods with MVD (Multi-view plus Depth), to be executed in real-time.
- Advanced transcoding methods that work in real-time to filter and adapt multimedia content to different distribution networks, terminals, and rendering methods.
- Unique, interactive walk-through mid-air screens, materializing high resolution 3D pseudo-holographic scenes.
- Innovative interactive user applications for mobile terminals with 2D/3D displays, enabling personalization of the provided 3D & HD content.
- UAV platforms, to provide access to the scene in a silent, convenient, and safe fashion, capturing HD and 3D video and images from the sky.
- Wireless Sensors, to form an Augmentation Network deployed on ground to enrich the multimedia content with useful and interesting side-information, to be fused with the main audiovisual content.
- Advanced Content Fusion technologies to extract the relevant information from a plethora of sensing devices.

All technologies will come together to form a very advanced multimedia service platform.

SkyMedia will empower the audience to interact with the live scene, enabling multiple user roles. The project will culminate in an immersive media experience demonstration during a public live event, to prove the potential and test the users' reaction to the ensemble of these exciting technologies.

SkyMedia is expected to have a very significant impact on the 3D and HD media industry.

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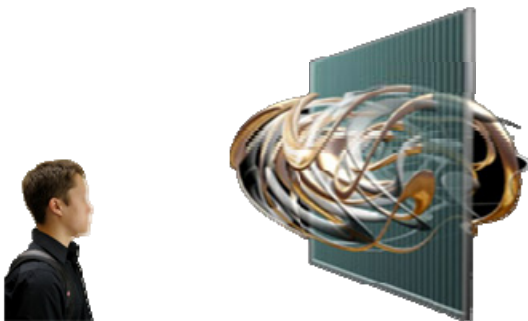
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# 3D VIVANT

## Live Immerse Video-Audio Interactive Multimedia

The aim of the project 3D VIVANT is to capture events automatically in 3D and deliver them for realistic, interactive and immersive play back to home users-viewers. Real and virtual 3D content will be homogeneously combined producing a novel form of rich and interactive content, defined as "3D Hologscopic content".



The 3D VIVANT project will investigate the possibility of using different technologies for capture and display of 3D content. For the capture, 3D VIVANT will take full advantage of 3D Hologscopic imaging technology, where a single camera is required.

Hence in this project a world first single aperture ultra-high definition 3D Hologscopic imaging camera will be constructed which will permit live capture of 3D content. For the display, the project will take advantage of Holography to provide immersive, ultra high resolution presentation of 3D content. To increase the immersive experience, the generation and playback of 3D spatial sound is also investigated. The developed system will be tested using two user cases, namely, broadcasting and online hyperlinking. For this purpose various 3D Hologscopic video processing algorithms, such as 3D codecs and 3D object segmentation, as well as search and retrieval techniques will be developed.

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# User Centric Media

The Internet and media landscapes are undergoing a revolution driven by more active participation of users and resulting in the exponential growth of user generated content (UGC).

An increased user control on multimedia contents and on the Internet allows a more gratifying user experience, while imposing new challenges both related to business models and to design processes.

**To meet these challenges the convergence of networking, broadcasting, consumer electronic industries and interaction designers plays a key role.**

It will pave the way to a universe of new Internet multimedia services, where dynamically evolving applications are continuously adapting to users' needs, but also to which users can now contribute with their own generated content and services.

On the one hand, this higher level of interaction will enhance human creativity by unlocking the potential of a digital media-world which, while still being associated with the physical experience, is revolutionary in terms of the infinite shapes it may take. On the other hand, new solutions will have to be developed.

Along with user generated content, content produced and released by traditional media will continue to exist, but traditional media needs to evolve in order to survive this epochal turning point.

Several projects focus on new technologies and methods to enhance the user participation in the media value chain, enabling them **to interact, consume, author and publish content on future networked rich media systems, at any location, efficiently adapted to any device.**

*User Generated Content will enhance inventive and creative practices in the field of arts, science, engineering, education and leisure, based on entirely new types of creative media.*

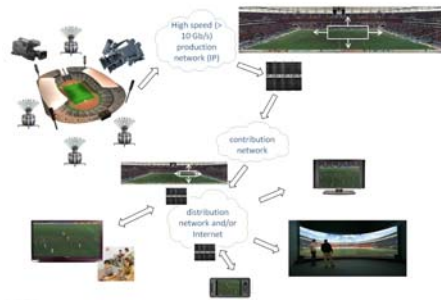
# Overview of Projects in User Centric Media Cluster

## FascinatE

### Format Agnostic Script-based INTERActive Experience

FascinatE will create an innovative end-to-end system and associated standards for future immersive and interactive TV services. It will allow users to navigate around an ultra-high resolution video panorama, showing live or recorded content, with matching accompanying audio. The output will be adapted to the viewing device locally or in the network, covering anything from a mobile handset to an immersive panoramic display with surround sound, delivering a true personalized multi-screen experience.

Imagine the following use-case of enhanced home viewing: Jim has returned home from a business trip to Barcelona, and decides to watch the UEFA match Ajax – Barcelona on his 60-inch LCD set. He selects the FascinatE URtv service and the current match. The match has already started. Jim points his remote at the screen, “grabs” a player and “drags” him to the top of the screen. After he “releases” the player, the top left hand corner of his screen now shows a close-up of the player, always from the best possible camera angle. In the same manner, he selects the two goals, and chooses to watch always from behind them, to have a good view of the 16-metre area.



The match is halfway through when Jim’s daughter comes in and starts making gestures to the TV. She is using the gesture recognition system to try to change the channel to MTV, to watch her favourite show. The TV set refuses since Jim has control over the set. Jim sighs and allows the TV to change

channels. He moves to another room taking his mobile TV terminal. The screen is much smaller, but here he can at least watch the

game without being disturbed. But he decides that, after watching the game on a large screen for a while, he doesn't want to use the director's default shot framing for a small screen and he wants to change his preferences. He therefore selects another mode and can navigate freely around the scene to follow his favourite player again or to select wider shots than those available in the default setting.

The FascinatE project brings together eleven project partners from eight European countries.

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## **Open Media Web**

Web technology is currently undergoing a sea-change which makes it a strong contender for becoming an open, royalty-free standards-based platform for networked media that levels the playing field and enables new market participants, including European players.

The Open Media Web project aims to build on Europe's strength in multimedia technology and content to enable European research and industry to strengthen its position in Web technology.

The project is lead by the World Wide Web Consortium (W3C), an industry consortium of currently more than 400 members from research and industry. The Director of the consortium is Sir Tim Berners-Lee, the inventor of the Web.

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### **3DLife: Bringing the Media Internet to Life**

The Network of Excellence 3DLife aims at stimulating joint research and integrating leading European research groups to create a long-term critical mass promoting innovation of currently fragmented research addressing media Internet. It fosters the creation of sustainable and long-term relationships between existing national research groups in order to eventually establish a sustainable Virtual Centre of Excellence (VCE) in media Internet. The long term sustainability of the centre is pursued through a combination of funding streams including industry collaboration, national and European research funding initiatives and the creation of future STREPs and IPs as the research results of 3DLife mature

**3DLife is creating sufficient momentum by integrating a large number of researchers and resources to enable realistic, efficient and to some extent autonomic media communication and interaction over the Internet, thus influencing the long-term European research agenda in several important aspects of Media Internet.**



3DLife is building an open and expandable framework for collaborative research on Media interactive communication over the Internet. **The 3DLife framework** is based on a distributed repository of software tools. This framework integrates complementary expertise, enable resource optimization and sharing, and foster innovative research in Media Internet technology.

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# Future Media Networks

The projects in the area of Future Media Networks are concerned with the algorithms, protocols, techniques, tools and platforms for the support, by future networks, of advanced interactive media applications and the seamless delivery of a range of content including text, images, audio-visual streams and 3D media, virtual and augmented worlds, and games.

**The approach of these projects is based around the idea that the development of future Internet technologies should not proceed in isolation of the way networks are used.** The projects start from the point of view of the demanding network problems posed by distributed media applications and content delivery systems. The projects are therefore in a privileged position to research novel networking solutions in the context of such demanding usage drivers.

The projects have a spectrum of approaches to the networking of such applications and content, ranging from P2P overlays that make no assumptions on the underlying network through to visionary and potentially disruptive novel network architectures that are able to access, discover and route content natively. Topics of common interest that are currently under investigation include:

- Network architectures for supporting advanced media applications.
- Adaptation of content to network capabilities.
- P2P applications and their interaction with underlying networks.
- Distributed versus centralised media/content servers and positioning of caching functions for content distribution systems.
- Proposals for new business models investigating alternative relationships between content producers, users, service providers, ISPs and CDNs.

- Personalisation and enrichment of media/content according to user context.
- Development of QoE metrics and accountability means to determine the entities responsible for QoE degradations.

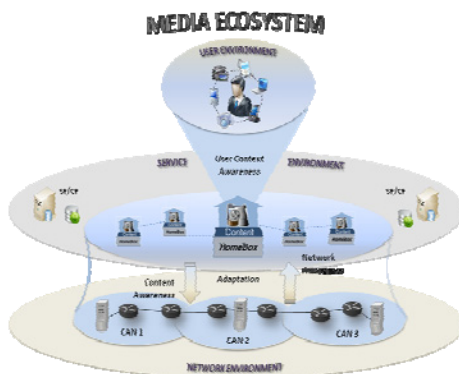
## Overview of Projects in Future Media Network Cluster



### Media Ecosystem Deployment through Ubiquitous Content-Aware Network Environments

The **ALICANTE** project proposes a novel concept towards the deployment of a new networked 'Media Ecosystem'. The proposed solution is based on a flexible cooperation between providers, operators and end-users, finally enabling every user – first – to access the offered multimedia services in various contexts, and – second – to share and deliver his own audiovisual content dynamically, seamlessly, and transparently to other users.

Towards this goal, **ALICANTE's** advanced concept provides Content-awareness to the Network Environment, Network- and User Context-awareness to the Service Environment, and adapted services/content to the End-User for his best service experience possible, taking the role of a consumer and/or producer.



The **ALICANTE** architecture introduces two novel virtual layers on top of the traditional Network layer, i.e. a Content-Aware Network layer (CAN) for network packet processing and a Home-Box layer for the actual content delivery.

The validation of the project architecture and results will be done in a large-scale trans-national pilot, in preparation for bringing it to the market.

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## **CNG**

The Community Network Game (CNG) project focuses on the application of new network technologies to support community activities over highly interactive centrally managed massively multiplayer online games (MMOG). CNG intends to research and develop in-game community activities using in-game graphical insertion technology (IGIT) and a Combined CDN (Content Delivery Network)-P2P architecture for the distribution of game and User Generated Content (UGC). The InGame Graphics Insertion Technology (IGIT) is an innovative technology of replacing or inserting content to the game in real time without the need to change the game's code in the client or server. The User Generated Content (UGC) proposed by the Community Network Game Project includes 3D objects and Video to be streamed from one user to another user or from one user to many users. This UGC traffic represents a real challenge to the network already occupied by the MMOG client server data. The project intends to research and develop new techniques for P2P 3D/Video streaming that are "friendly" to the MMOG client server traffic.

Gamers on an MMOG typically become members of an active community with common interest, adventures and with common objectives. CNG intends to enhance collaboration activities between

the online gamers and to develop new tools for the generation, distribution and insertion of UGC into existing MMOGs.

The Community Network Game project will support and enhance community activities between gamers via P2P to overcome the limits of most current MMOGs which, due to network load, can provide only limited community services via the MMOGs central servers. By enabling users to share richer UGC, CNG will enhance users' activities and roles within and around the MMOG. The world of online gaming is all about the friendships you make and the experiences you share together.

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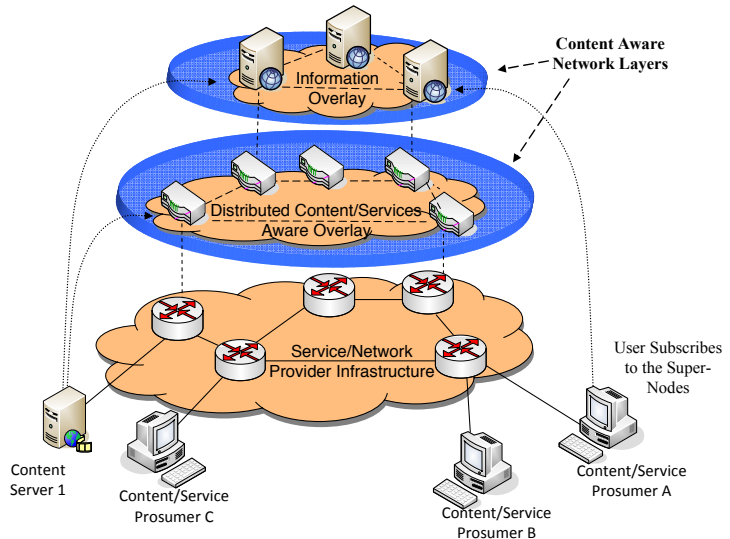


## Content Aware Searching, retrieval and sTreaming

Today, most of the Internet traffic is already dominated by P2P traffic, which does not conform to the client-server paradigm and generates unnecessary indirection overheads when users try to retrieve the desired data. The inconsistency between the Internet design and the real usage is expected to be further increased, as the Future Internet is envisaged to provide the means to share and distribute (new) multimedia business and user-centric services, with superior quality and striking flexibility from everyone to everyone.

COAST aims to redesign the Future Internet based on a content-centric paradigm to provide data/content to the users in an efficient manner. It will build a Future Content-Centric Network (FCN) overlay architecture able to intelligently and efficiently link billions of content sources to billions of content consumers, and offer fast content-aware

retrieval, delivery and streaming, while meeting network-wide Service Level Agreements (SLAs) in content and services consumption. In short, COAST is expected to deliver an FCN overlay network, where



*COAST Content-Aware Network Architecture*

the users will just specify which content or service they need, and the COAST framework will find the desired or the most relevant data and forward it to the users in an efficient, timely and network-friendly way.

To realise the above vision, COAST will focus on three key innovation pillars:

- **"On the fly" identification and distributed "on-line" discovery.** COAST will create a content-aware network of intelligent nodes (edge routers, home gateways, terminal devices), which will a) "on the fly" identify/classify content and identify Web services via inspection of the traffic that flows through them and b) discover "on line", where services are located and content is located/cached, in order to optimal match users' requests with availability, while meeting specific Service Level Agreements (SLAs) in content consumption.

- **Content-Aware Delivery Network Architecture.** COAST will efficiently and dynamically discover the underlying network infrastructure as well as user terminal devices and user needs considering the (possibly variable) capacity and quality (especially variable with mobility), the actual foreground (multimedia distribution) and background (other traffic) load, and construct content-aware overlays to offer distributed, robust and network-/service-provider friendly content delivery with optimal utilisation of the networking topology and resources.

- **Future media content adaptation and enrichment.** COAST will provide for scalable, high-definition 3D/free-viewpoint video with interactive virtual panning/zooming, which will be on-the-fly adapted, enriched and optimized to the user preferences, network and terminal characteristics and conditions and optimal streamed over dynamic constructed overlays.

COAST will be validated over two interconnected testbeds: the Pan-European FIRE facilities and the PlanetLab/GENI and b) the TIDs' FTTH User Experience and Digital Home Laboratories

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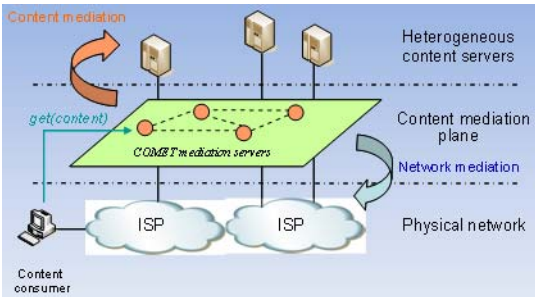
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## Content Mediator architecture for content-aware nETworks

The COMET project aims to define a novel, content-oriented Internet architecture that will radically simplify content access and will support content distribution in a network-aware fashion. The proposed architecture could be deployed over the current Internet but has aspects that may benefit or even influence evolutionary or revolutionary Future Internet architectures.

COMET aims to provide a *unified* interface for content location and access, whatever the content's temporal nature (pre-recorded or live), physical location (centralised or distributed), interactivity requirements (elastic or real-time), or any other relevant features.



COMET also aims to apply the most appropriate end-to-end transport strategy for each type of content, supporting all different types of distribution (unicast, anycast, multicast, peer-to-peer) and mapping the content requirements to the appropriate network resources for achieving the best quality of experience for the end users.

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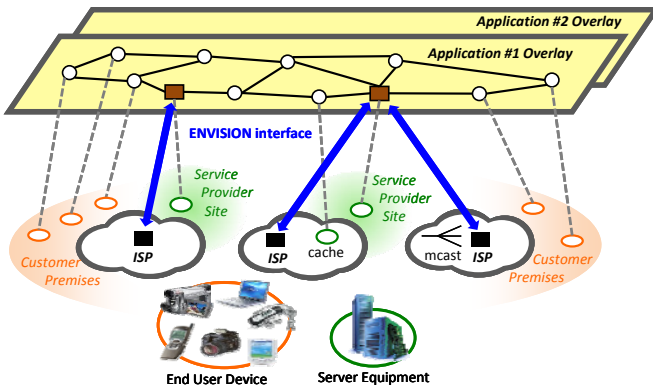
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## Enriched Network-aware Video Services over Internet Overlay Networks

Future networked media applications will be multi-sourced, highly interactive distributed meshes of HD and 3D multi-sensory channels. While such high-quality user-centric applications offer tremendous advantages to their participants and to society at large, they present a major problem to ISPs. They demand unprecedented quantities of network resources in unpredictable locations and pre-provisioning sufficient resources everywhere is not economically viable given the huge capacities required. If these services are ever to become a reality then a fundamentally different approach is required.



ENVISION proposes a three-pronged, cross-layer solution through cooperation between service providers, ISPs, users and their applications, where:

i) intelligent overlay applications are optimised for true end-to-end performance according to the actual capabilities of the underlying ISPs; ii) network resources are dynamically mobilised to where they are most needed; and iii) content, the way it is generated, accessed and distributed is adapted on-the-fly to what the network is able to deliver and according to the terminal capabilities.

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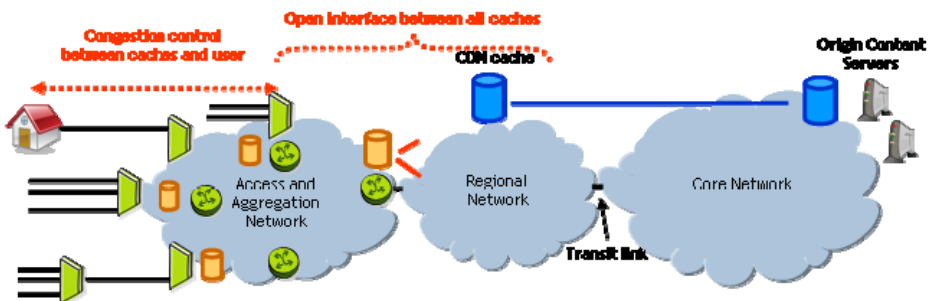
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# OCEAN

## Open Content Aware Networks

OCEAN designs a new open content delivery framework that optimizes the quality of users' experience by caching content closer to the user than traditional CDNs do and by deploying network-controlled, scalable, and adaptive content delivery techniques. The OCEAN architecture defines light-weight signaling protocols and public interfaces between its major building blocks to foster multi-vendor solutions and contribute to cutting down content delivery cost. OCEAN elaborates business strategies that provide better investment incentives to all players in the value chain (content providers, Internet service providers, CDN service providers and industrials). OCEAN builds innovative self-learning caching algorithms that meet the specificities of highly unpredictable location and time-dependent consumption patterns and dynamically adapt to the rising popularity of future delivery services. In addition, the project studies novel media-aware congestion control mechanisms based on slight, but controlled quality degradation, that will provide a better alternative than a mere blocking of user requests. The project is going to assess the validity and performance of these algorithms and mechanisms through simulations, large-scale emulations, and a trial in a real telecom operator network.



To reach these objectives OCEAN combines complementary business and technical expert partners representing the whole online multimedia content delivery chain.

The OCEAN partners are committed to leveraging their strong position in standard development organizations and their influence on the marketplace to disseminate the project outcomes.

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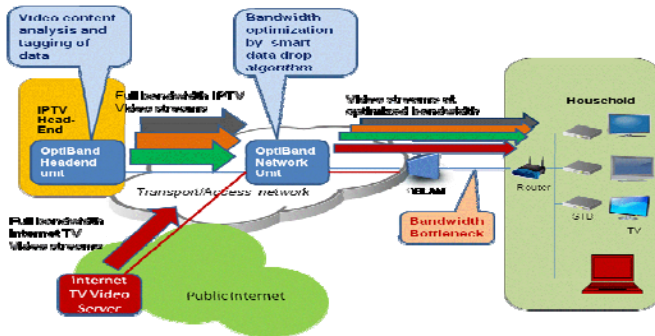
**Project Web site:** <http://www.ict-ocean.eu>

# OptiBand

IPTV provides telecommunication operators the opportunity to better serve the video market and better compete with the industry transition to HD (High Definition) and unicast video (e.g. Video on Demand), both creating challenges to the existing CATV (Cable TV) and SAT (Satellite) providers. One of the main challenges in IPTV is the line rate of the access lines, which is predominantly ADSL.

OptiBand will focus on optimizing the bandwidth of IPTV for the delivery of multiple HD streams over a single ADSL line, and by that enabling multiple HD channels per household.

OptiBand consortium gathers leading operator, vendors and research entities in order to consider the entire IPTV network, including economical aspects, of delivering premium video content over existing installed base.



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## **SARACEN**

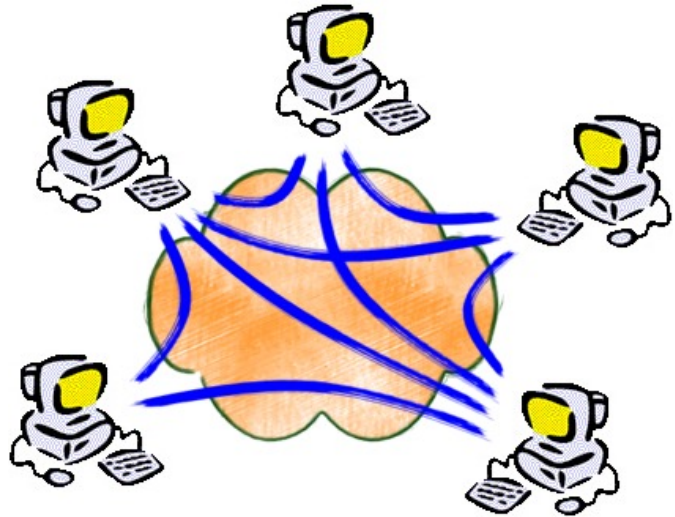
### **Socially Aware, collaboRative, scAlable Coding mEdia distribution**

The main goal of the SARACEN project is to research and create a platform, which will support encoding and distribution of multimedia streams through innovative techniques.

The project will make use of scalable media coding techniques including both standard and state of the art research methods (wavelets, multiple description coding), combined with new transport and real time streaming protocols deployed over peer to peer connections between end users.

In addition, SARACEN will make use of social networking (Facebook, twitter) related information, as this is available in user communities over the internet. The use of social networking information will allow content awareness of the platform, which includes adaptation to the personal needs and requirements of the end users.

Addressing the question of QoE, SARACEN will attempt to use several alternatives, designed according to the needs of the use case scenarios, using approaches both at the transport level (use of novel transport protocols that incorporate light



headers-reduced overhead and flow control mechanisms such as DDCP), as well as at the application-media encoding level, using both standard and state of the art scalable media encoding techniques (wavelets and multiple description coding)

Finally, SARACEN will apply these research results to HD content in order to fully evaluate the potential of the prototypes produced in the context of the project.

SARACEN will integrate these areas of research into a common target: the creation of a novel, state of the art platform for real time media distribution over the internet that takes advantage of user profiles for media creation and distribution. The SARACEN project will allow for the delivery of ensured quality, content aware, personalised, network adaptable streaming information to end users .

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# Multimedia search

Search engines are one of the most popular 21<sup>st</sup> century technology inventions. For the vast majority of users, a good web search engine is an essential entry point to find out what's on the World Wide Web.

**Free search engines have become the end-user's on-line media knowledge brokers.**

An essential and interactive technology to match questions with answers, search engines allow for entry or for expansion of commercial viability for any networked media service. As such they play a key role for both scalability and growth of future Internet services.

Gigabytes of data flow into the web daily, increasingly due to user-generated and image-based content. For anyone to access, find, or navigate the visible portion of the Internet, requires smarter, faster and more powerful audio-visual search engines. Yet the visible web is but the tip of the iceberg when compared to the data that is collected and that could one day be mined or reused.

Media search of broadcasted material involves database access, storage and smart indexing & retrieval solutions. Search engines must understand better the user's query. The best search engines are both multimedia and metadata savvy. Multimedia search engines don't just handle text-based documents, as commercially done today, but also process natural language, music recordings, photo archives, streamed video sequences, live theatre recordings and possibly also multi-avatar virtual performances.

**One day soon n-dimensional digital data objects of any kind will be easily modelled, captured, transferred and retrieved by multimedia search platforms; not to mention multimodal and multilingual search.**

Going beyond the visible internet search domain, the multimedia search technology finds equally important usage within enterprise

networks (*Enterprise search*), or as embedded service component within media rich applications (content enrichment).

Enterprise search engines allow search of unstructured information which as phone call logs, emails, photos... allowing use of materials that are not already organized in a specific database.

Indexing programs enable networked PCs to organize knowledge, to understand multimedia as words, images, sounds... Thus analysis patterns or relations.

Since the internet economy relates to the global economy, and because the ICT sector is fundamental for Europe's growth, research in this domain has been prominent. In addition to the collaborative EU funded R&D projects, specific national initiatives have been launched to focus on the discovery of new algorithms techniques and interoperability standards able to handle new search needs (eg. QUAERO, THESEUS, iAD, MC2).

**The big research challenge is how to progress from today's commercial text and language-based search engines to multimedia search engines. How to achieve this technological breakthrough remains a fundamental and open question. The outcome of the ongoing projects' results will tell us more over the next years of experimentation and discovery.**

# Overview of Projects in Multimedia Search Cluster



## Event-based Retrieval of Networked Media

### The problem

We describe the world by using words. Yet, words usually bring to mind different mental views of the world in different individuals, because of their personal experience and context. This is the reason why the “semantic gap” between our conceptualizations of the world, expressed using language, and our experience of the world, whose most direct representations are media, is far beyond the reach of current systems.

### The approach

The key idea underlying GLOCAL is to use events as the primary means to organize and index media. Events provide the common framework inside which the local experience-driven contextual information can be not only coded, but also shared and reduced to a common denominator. Events have both a local and a global dimension. The local dimension enables the mapping of tags (conceptualizations) to media (personal experiences), while the global dimension enables the sharing of event descriptions (thus enabling social sharing and networking of events, media, and tags) but also of event structures across similar events, thus providing a common way to index media (social sharing and networking of event structures).

## **The enabling technologies**

- Event modelling (media & knowledge)
- Event instantiation (matching models to reality: create, evolve and maintain events)
- Event population (effortlessly attaching media to events)
- Event sharing (sharing event structures and contents)
- Event-based indexing and search (using events to access media)
- Event-based interfacing (putting the user in the loop)

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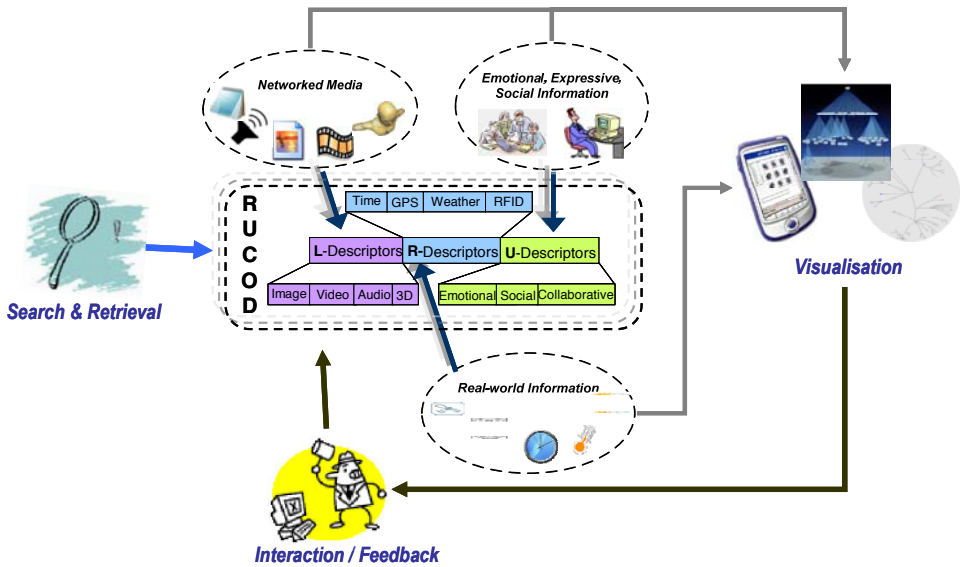
**Project Web site:** [www.glocal-project.eu](http://www.glocal-project.eu)



## **A unIfied framework for multimodal content SEARCH**

I-SEARCH aims to create the first search engine able to handle multimedia and multimodal content (text, 2D image, sketch, video, 3D objects, audio and combination of the above), which can be used as queries and retrieve any available relevant content of any of the aforementioned types.

I-SEARCH will overcome the limitations of current content-based multimedia retrieval methods through the realization of a novel Rich Unified Content Description (RUCoD), which will integrate descriptions of all of the above types of content, real-world information (GPS, temperature, time, weather sensors, RFID objects), emotional cues and social descriptors, in order to better express what the user wants to retrieve. I-SEARCH will develop a novel generation of multimodal search engines providing users with natural and expressive interfaces. Additionally, I-SEARCH will propose novel solutions for relevance feedback, based on users' social behaviour and recommendations. The above will result in a highly user-centric search engine, able to deliver to the end-users only the content of interest, satisfying their information needs and preferences. I-SEARCH will also introduce efficient tools for visualising the search results in order to enhance the presentation layer of search engines. Several aspects, such as user profile, end-user terminal, available network bandwidth, interaction modality preference, will be taken into account to achieve the optimal presentation result. Finally, the search engine will be dynamically adapted to end-user's device, which will vary from a simple mobile phone to a high-performance PC.



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# Coordination and Support Actions



## FutureNEM

FutureNEM will prepare a new phase of the NEM European technology platform in a strongly renewed environment (Future Internet PPP, KIC). As a Support Action, it will stimulate the activities that industry cannot perform by itself. It includes necessary tasks to meet the following objectives:

- To **keep a high visibility** of the NEM Initiative thanks to publication of the NEMLetter and new communication tools where needed,
- To **promote the contribution of NEM** to the various Future Internet coordination instruments in order to keep a high profile of content related matters in the Future (Media) Internet
- To support the organisation of the Open NEM discussion Forum that will advise the platform on various issues
- To prepare the definition of the **future of the NEM Initiative**, NEM2.0,
- To assist the **production of relevant positions** on research directions and to organise the emergence of NEM public positions,
- To support the organisation of the **NEM Summit**,



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- To facilitate **liaison with other R&D communities** around the world in order to promote the NEM messages,
- To foster the development of academic initiatives to develop **training courses** at the service of the NEM industry,
- To promote NEM to new communities, especially **Content producers**,
- To develop the **presence of NEM at the national/local level** in order to involve more SME actors in its works.

The FutureNEM consortium consists of key actors of the NEM platform and is strongly connected to the operational organization of the platform.

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## **SUPPORT ACTION for a European and Latin American Strategic Cooperation on 3D Internet R&D**

**SALA3D** is a Support Action aiming at fostering the cooperation among European researchers and Colombian and Uruguayan researchers in the field of content-aware networks, network-aware applications and 3D Media Internet through the alignment of research priorities between the Colombian and Uruguayan R&D programmes with European R&D programmes.

The ultimate goal of SALA3D is to develop roadmaps particularized for Colombia and Uruguay, which will attempt to influence the Colombian and Uruguayan R&D Programmes as to include research themes of interest for European researchers. Similarly, SALA3D will help European researchers to identify key research priorities from Colombia and Uruguay, which are of mutual interest.

SALA3D will establish a sustainable cooperation structure between Europe, Colombia and Uruguay through the development of a customized Research and Development roadmap, making the European research programmes more visible in Colombia and Uruguay and strengthening the cooperation with Colombian and Uruguayan researchers.

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**Project Web site:** under construction



## **Future Media Internet coordination action**

nextMEDIA aims at coordinating and supporting activities towards strengthening the European position in Future Media Internet.

**nextMEDIA will** enhance the coordination of the efforts in Europe towards creating common pillars (e.g. the Future Media Internet reference architecture for Europe) and support the results of the developments of the European projects by means of:

### **Coordinating, supporting and driving high-level groups:**

- Creating a new "Future Media Internet Architecture" Think Tank to reinforce the leadership of the EU in this field.
- Coordinating initiatives organised by the EC, including "Future Media Internet Task Force" and the "Future Content Networks" group.

### **Structuring the Future Media Internet research evolution path by:**

- Join standardisation efforts of European research projects
- Organising the existing knowledge in a unified form and comparing the research situation in Europe with other areas of the world: Japan, USA, Korea, China, etc. to elaborate a research roadmap
- Coordinating efforts of European projects in media, by collecting and analysing the short and long term implications and priorities
- Promoting the results of the European research inside and outside Europe (organise the participation in top-notch events, forums, leading conferences and scientific journals, exhibition events, etc.) and support the European talent in Media Internet.

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CHORUS+ is a coordination action, which intends to create the conditions of mutual information and cross-fertilization between research efforts on multimedia search and mining technology within Europe and beyond. Search and knowledge discovery companies have become major stake holders impacting various facets of our modern lives. From an economic and industrial perspective, business that are affected include, but are not limited to, network operators, content providers, device manufactures, content owners and producers. Social and legal aspects include governmental policy makers and legislators that are impacted due to privacy and copyright issues. Clearly, multimedia search and mining is omnipresent and often embedded in different business services over diverse use-cases and application domains within Future Internet and beyond. As a result, policy makers funding research initiatives, as well as researchers themselves, require a broader vision to position their research and develop possible exploitation avenues. **CHORUS+ is a coordination action that intends to create a knowledge exchange platform that will allow relevant parties to interact and share ideas and experience about multimedia search in its broadest context.** To this extent CHORUS+ organizes periodic think-tanks meeting that gather key players to discuss cross-disciplinary issues of multimedia search and knowledge discovery. In addition, CHORUS+ organizes workshops for larger audiences and discussion panels and practitioner days at conferences and trade-shows to interact with stakeholders on more specific topics and foster cohesion between communities. A tangible example of this is the (wild) grow of various benchmarking and evaluation initiatives related to multimedia search technology. CHORUS+ intends to map the evaluation dimensions beyond research requirements and toward user and market needs including incubating new large scale experiments along with existing benchmarking initiatives to foster search technology uptake by stakeholders.

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# **Networked Media Current Research, Results and Future Trends**

Complement of the September 2009 edition  
including new projects

