



PROJECT RESULTS

# Video content analysis and networked delivery architectures

**Although many different types of technology for information systems have evolved over the last decades, the integration of these technologies is just in its infancy and has the potential to introduce 'intelligent' systems. The CANDELA project focuses on video content analysis in combination with networked delivery and storage technologies and is demonstrated for several applications.**

### First concepts

After the introduction of Digital Video Broadcasting, video enhancement and interactive video enabled the user to interact with the video delivery system. As a next step, there exists a growing desire for video retrieval from any location, applying search queries that are understandable by humans onto huge amounts of distributed video content. This requires understanding of the content and implies video content analysis (VCA) techniques to generate content descriptions that are then stored as metadata along with the video.

Although the development of digital video, with its description and management systems, is being standardised at a rapid pace (MPEG-4/H.264, MPEG-7, MPEG-21), many questions remain unanswered. How can we detect and identify a shoplifter in a warehouse without manually observing hundreds of security cameras? Or, how can we retrieve information about our favourite holiday place on a mobile device by applying abstract search queries on huge databases?

In addition to the desire for application-specific algorithms to solve these issues, the architecture of such VCA systems is of importance,

since mobile and distributed access is now a requisite. Hence, networked delivery of compressed video content and its descriptions in metadata is an integral part of CANDELA architectures.

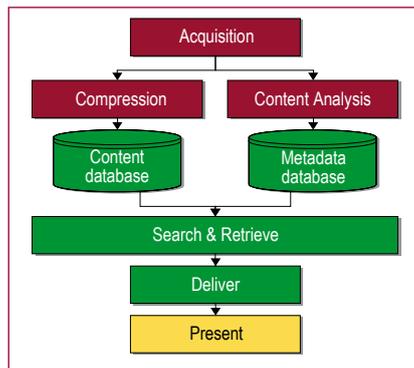


Figure 1: General System Architecture

### The system

The CANDELA system architecture is depicted In Figure 1, and it indicates that the information streams through the system as well as through the relevant system components. With reference to the ITEA Technology Roadmap, the architecture components are an intermediation service to develop VCA-based systems. In the next section we describe the CANDELA demonstrators, which are basically application-specific instances of such systems. The most relevant system aspects:

- **Resource limitations in network and storage:** Bandwidth of the wired and wireless networks between the various components is expected to be limited and variable, implying scalable video coding. Although the proposed MPEG-21/SVC shows superior results, the computational requirements are rather high for mobile terminals. Hence, low-bitrate MPEG-4/AVC has been adopted for the demonstrators.

## CANDELA (ITEA 02013)

### Partners

- Amena
- Bosch Security Systems
- Eindhoven University of Technology
- ESI
- Hantro
- Ibermatica
- IT-Optics
- Microgenesis Producciones
- Multitel
- Philips Medical Systems
- Philips Research
- Solid
- Traficon
- Vrije Universiteit Brussel
- VTT Electronics

### Countries involved

- Belgium
- Finland
- The Netherlands
- Spain

### Start of the project

July 2003

### End of the project

June 2005



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- **Adaptation of content to terminals and users:** Content will be retrieved through different types of terminals, varying from powerful laptops to small-display telephones. In addition, specific user preferences contained in profiles are taken into account. Several CANDELA demonstrators show that automatic adaptation of the graphical user interface and the video content is provided with XSLT style sheets.
- **Interoperability and reliability in distributed processing:** As mentioned above, the components in Figure 1 are physically distributed. The database is seen logically as a single entity but is physically a distributed realisation with automatic data recovery by means of replication. Also the real-time VCA processing is physically distributed, offering universal Plug 'n Play, dynamic task allocation for load balancing, and recovery from failures.

### Demonstrators

The above-described system is demonstrated for five different applications. Each of these demonstrators focus on different aspects of the system as illustrated in Figure 2. A medical and home-multimedia system mainly show the advancement of VCA. In addition, the home multimedia system focuses on aspects of networked delivery, together with a demonstrator on mobile multimedia.

Components	VCA	Networked Delivery	Applications
Appl. domains			
Medical Systems	✓		
Surveillance	✓		
Home multimedia	✓	✓	
Mobile multimedia		✓	
Web-service: eTourism			✓

Figure 2: Focus of the CANDELA demonstrators

The fifth demonstrator for eTourism web-services focuses on the application side: the client terminal that actually retrieves the video.

- **Medical systems:** The demonstrator highlights computer aided detection to automatically detect polyp-like structures and present them to the clinical user.
- **Surveillance:** This demonstrator shows how multiple VCA modules are combined to track and retrieve suspicious objects.
- **Home multimedia:** A highly distributed computing network shows how VCA can be exploited in a consumer environment.
- **Mobile multimedia:** Through geographically distributed database technology, video content is generated, manually annotated and streamed between devices such as laptops and mobile phones.
- **eTourism web-services:** Besides content annotation and distribution, this demonstrator illustrates how content can be created and presented, independent of the terminal device.

### Major project outcomes

#### Dissemination

- 56 publications
- 6 events with demos
- 9 public deliverables
- One public available DVD with CANDELA scenario video sequences
- 5 public websites
- 5 demonstrators

#### Exploitation

- A new single camera chip for object detection and tracking
- Introduction of AmbiLight TV
- A new medical system containing polyp detection
- A new spin-off company: ACIC
- New H.264/AVC-based player for the Nokia 60 series

### Standardisation

- Participation in International Multimedia telecommunications Consortium, IMTC
- Participation in MPEG Industry Forum, MPEG-IF: testing codecs and streaming protocols
- Participation in Service Availability Forum, SAF
- Proposed a UML profile for CANDELA web-services
- Applications to the OMG (evaluation in progress)

### Patents

- 7 published
- 13 submitted

### Spin-offs

- One spin-off company

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