Speaker: Alberto Canadé

Multimedia Content Production and Streaming Services Platform

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Axmedis 2005 , Florence – Italy , 30 november - 2 dicember 2005

Mission

RUN

BUILD

DESIGN

"Mission Critical" ICT Solutions
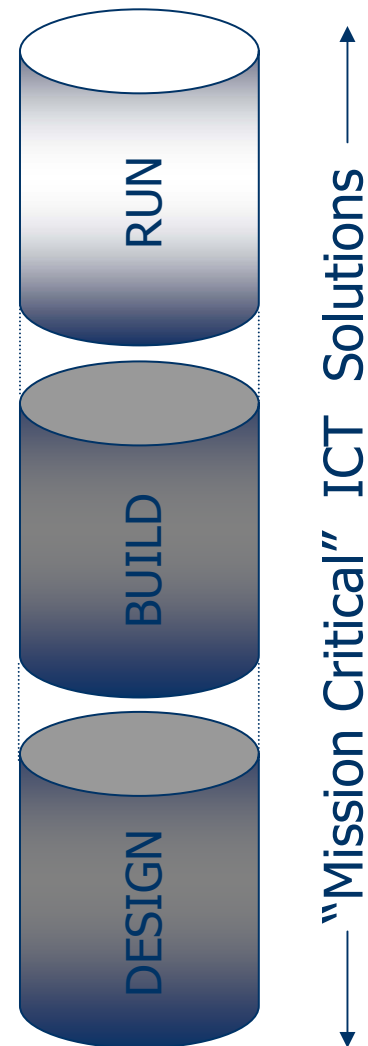
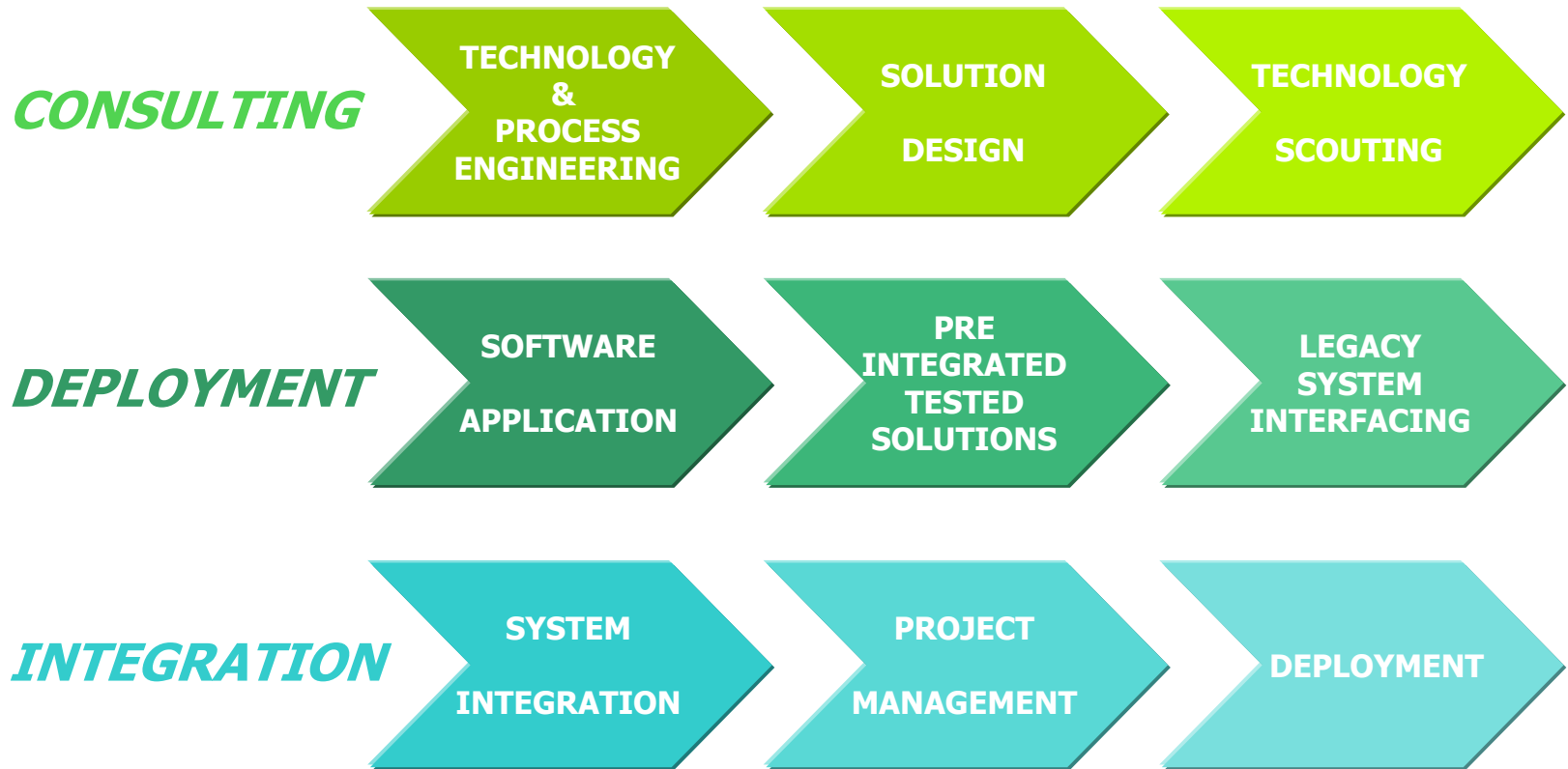Supply ICT solutions for **end users** in **specific segments of our vertical reference markets**

Trough the delivery of: **products**, **systems** and **integrated services**

Leveraging on:

- ✓ Strong **application expertise** (knowledge of client primary processes)

- ✓ Strong **technical and technological competencies** ("state-of-the-art" solutions)

- ✓ **Management and organizational capabilities** in managing complex and high economic value contractual responsibilities

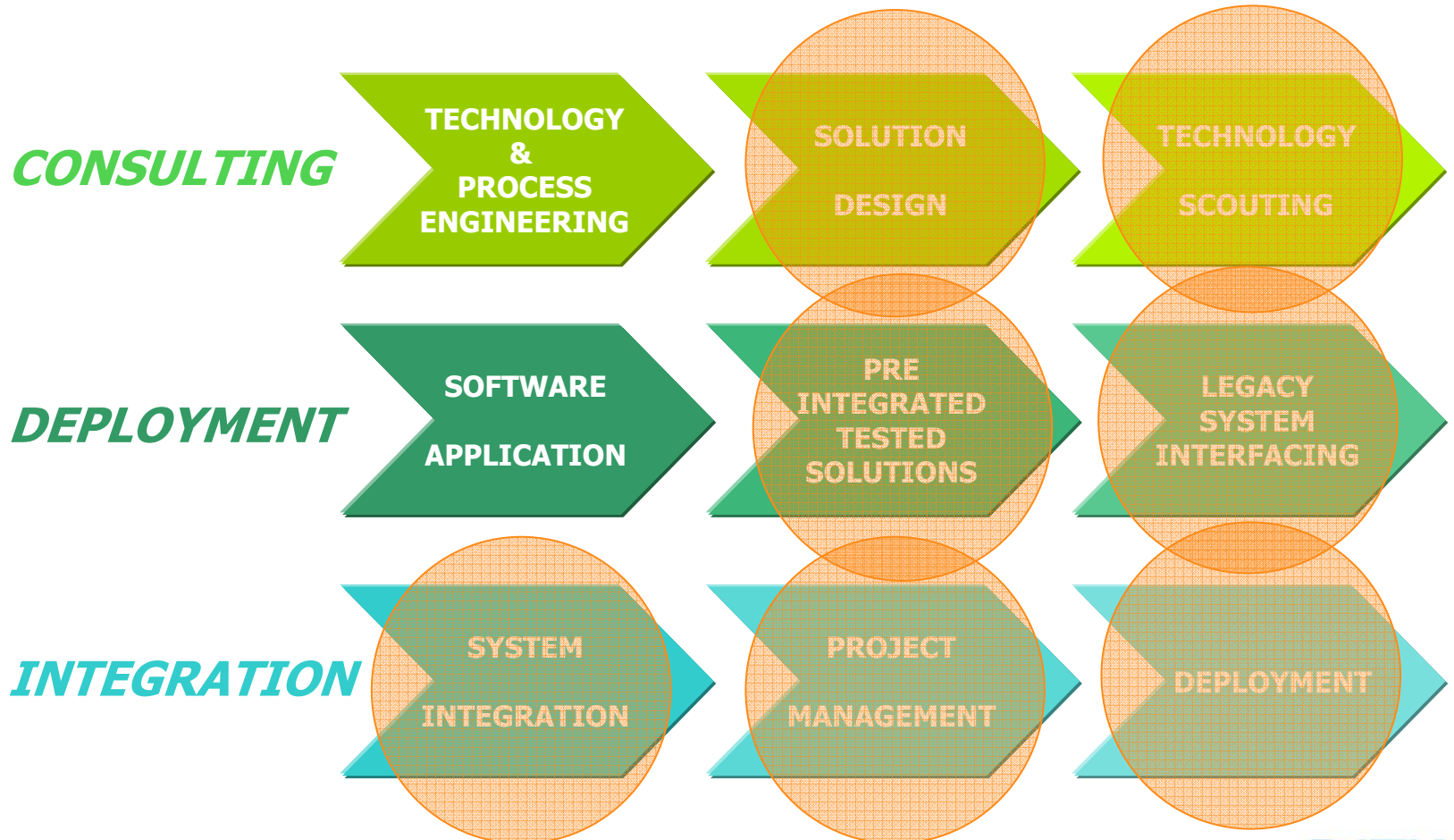- ✓ **Long standing partnership** with top tier clients

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Our Services

Our service offering covers the whole value chain of the Professional Services

CONSULTING
- TECHNOLOGY & PROCESS ENGINEERING
- SOLUTION DESIGN
- TECHNOLOGY SCOUTING

DEPLOYMENT
- SOFTWARE APPLICATION
- PRE INTEGRATED TESTED SOLUTIONS
- LEGACY SYSTEM INTERFACING

INTEGRATION
- SYSTEM INTEGRATION
- PROJECT MANAGEMENT
- DEPLOYMENT

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Agenda

- ✓ The scenario for a business case

- ✓ The implemented platform

- ✓ Solution's architecture

- ✓ Meeting the goals

- ✓ Beyond the project's scope

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The scenario
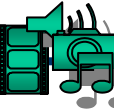
- Over the last few years the steadily **increasing bandwidth available** at end user's side (last mile) both in Mobile and Wireline networks has drawn more and more attention to rich media streaming services

- **Mobile Operators** and Internet Service Providers began to appear as potential competitors or eventually partners of **Broadcast Infrastructure Providers**

- Unlike the traditional Broadcast domain, Content Production and Content Delivery are envisaged to be split between the **Content Provider** and the Infrastructure Provider
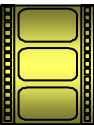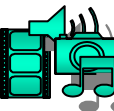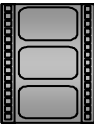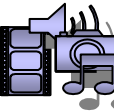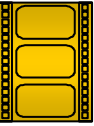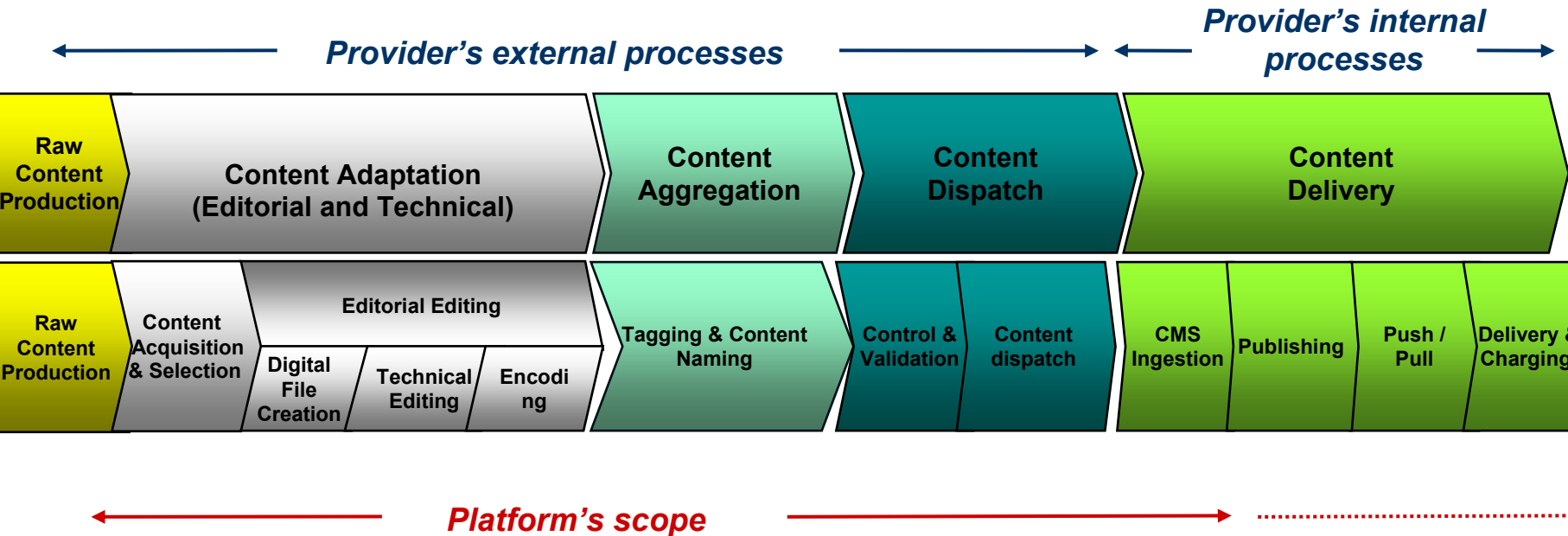
A business case

- **Multimedia content production chain** is a pretty articulate one starting with raw content production and basically including content adaptation, publishing, delivery and charging

- The platform of multimedia streaming services here described fits that context and arises from a scenario we faced at a Mobile Multimedia Service Provider in Italy aiming at improving its operational efficiency through **content production automation**

- The Provider already offered rich media services to its subscribers

- The ever increasing expectation for streaming services by end users and tight requirements for time to market imposed by competitors pushed the Provider to strive to **streamline** its **operations**

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Requirements

- The main objective of the project was to **boost media clips creation** in predefined formats to comply with Provider's requirements. The focus was on real time clip production from live broadcast content. This is in support of streaming services the Provider was already delivering in pull-mode to its customer base .

- This initial assessment indicated **another requirement**: **handset testing** which turned out to be a serious concern for the Provider

- That implies a non trivial effort on the Provider' side both to quickly design new content's formats intended to catch on to subscribers and to timely perform daunting testing activities

- Analysis of existing processes and systems at Provider's site made it clear what was missing: a **lack of integration** in the overall content production platform
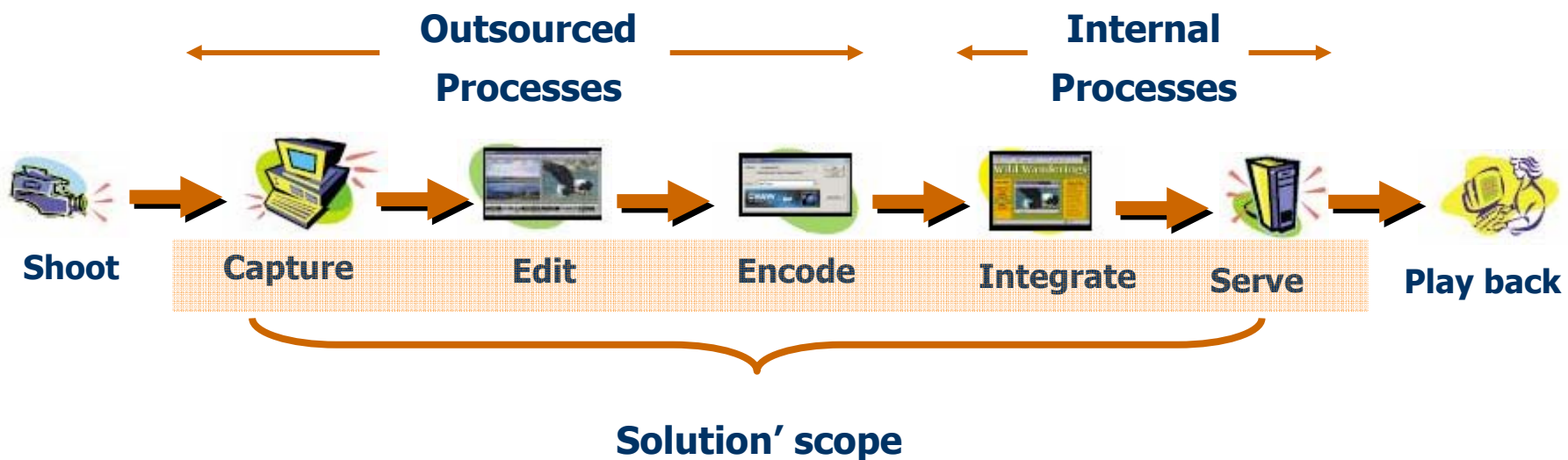
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Solution' scope

- Visualization of the Provider's multimedia production chain and highlighting of Datamat's solution scope

Provider's external processes

Provider's internal processes

| Raw Content Production | Content Adaptation (Editorial and Technical) | Content Aggregation | Content Dispatch | Content Delivery |

| Raw Content Production | Content Acquisition & Selection | Editorial Editing / Digital File Creation / Technical Editing / Encoding | Tagging & Content Naming | Control & Validation / Content dispatch | CMS Ingestion | Publishing | Push / Pull | Delivery & Charging |

Platform's scope

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Solution' scope – cont'd

- External processes are outsourced yet the Provider strongly influences technological choices through its strict requirements

Outsourced Processes　　　　　　**Internal Processes**

Shoot → Capture → Edit → Encode → Integrate → Serve → Play back

Solution' scope

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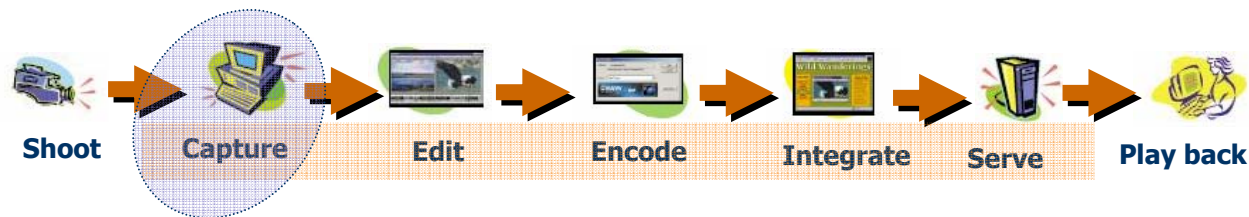
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Content extraction requ's

- The first step in the chain is **raw content production**

- Live broadcast content implies content extraction from a **live feed** (satellite, tv terrestrial broadcast, radio…)

- Provider's main requirements for this step have been:
  - ✓ **near real time extraction**
  - ✓ **scheduled** and recurrent scheduled extraction
  - ✓ **non disruption** of the original flow
  - ✓ independence from the input sources
  - ✓ Integration in existing environment

- Platform's design has been focussed on real time **clip production** from live broadcast content.

- **Off-line sources** are to be supported as well (dvd, betamax, cd, …)

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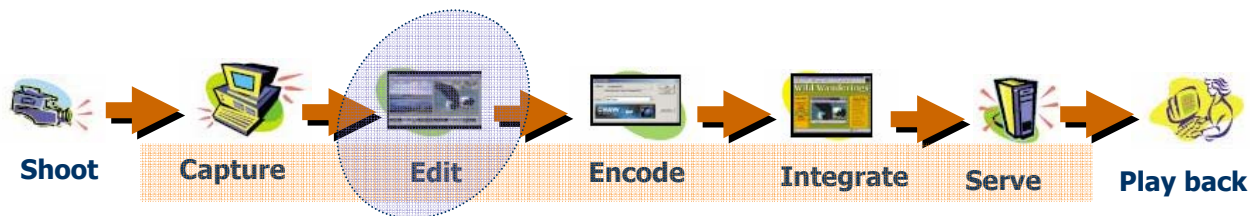enabling your future

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Content extraction

- The Platform has access to a tuned broadcast feed. The **Real Time Capture** has been set up for each broadcast.

- An MPEG-2 continuos video segment from the audio/video source is created, allowing to achieve the **non disruption objective** of the input feed

- The Editor will require visual access to the live event and will have access to the same broadcast (at his/her location) to watch the live event.

- A **web interface** to the Real Time Capture module allows the editor to identify multiple events within the live content which are to be published.

Shoot　　Capture　　　Edit　　　Encode　　Integrate　　Serve　　Play back

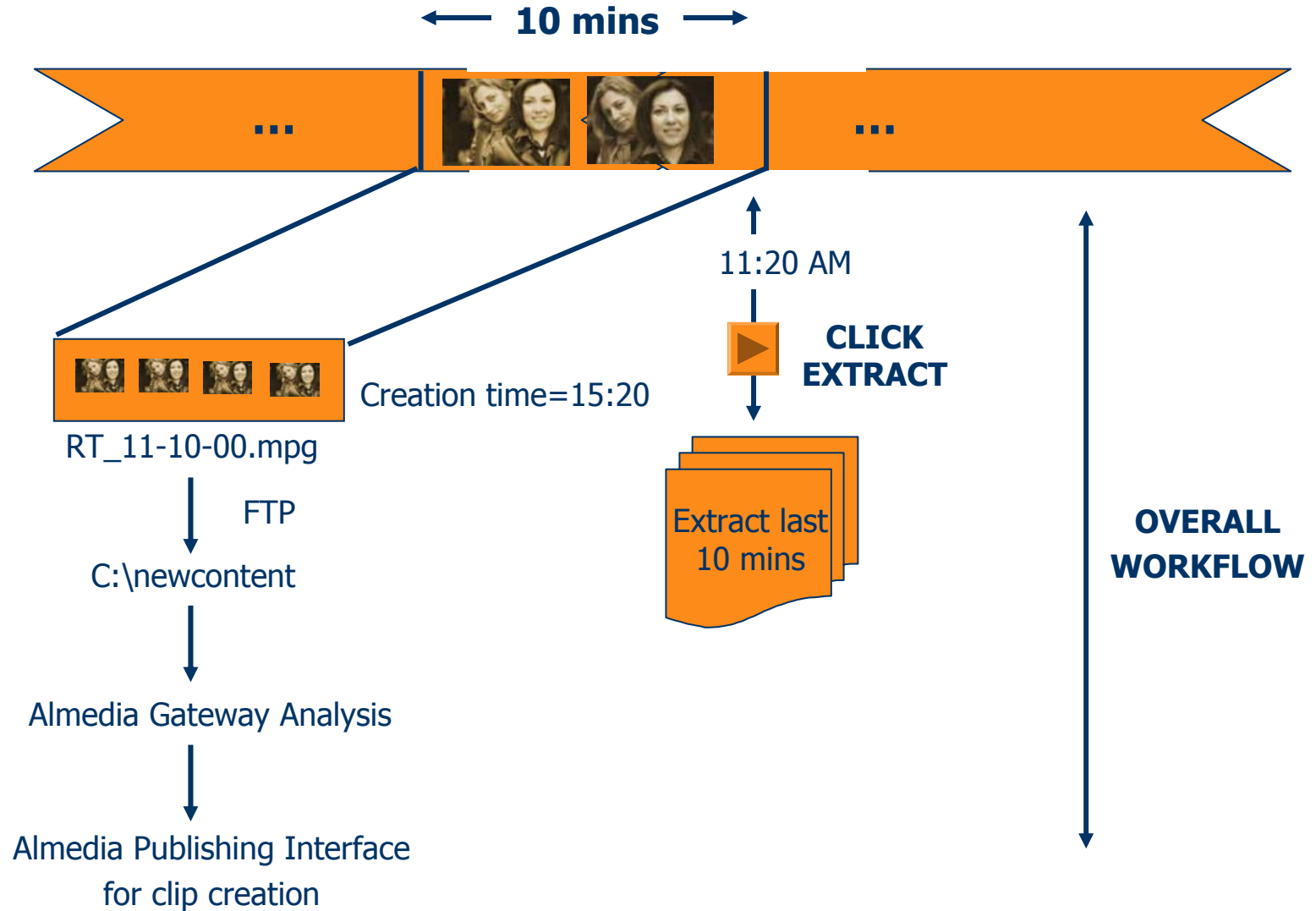DATAMAT
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Media analysis

- Content files with the events identified from the Real Time Capture, isolated from the recording video stream, are transferred to the **Almedia Gateway** for immediate processing.

- They are analysed storing the indexes and the keyframe stills. These are available to the publisher in approximately 50% of real time. Meta data are created and stored in an internal database

- **Key frames** for different delivery target (network, playback devices) are generated

- **Video** is thus **represented** in a **non linear way** and available to the Publisher thorough the same interface
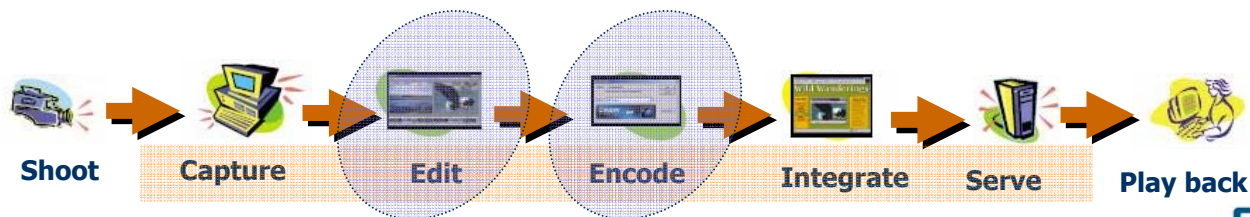

Shoot   Capture   Edit   Encode   Integrate   Serve   Play back

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Realtime extraction workflow

10 mins

Creation time=15:20

RT_11-10-00.mpg

FTP

C:\newcontent

Almedia Gateway Analysis

Almedia Publishing Interface
for clip creation

11:20 AM

CLICK EXTRACT

Extract last
10 mins

OVERALL WORKFLOW

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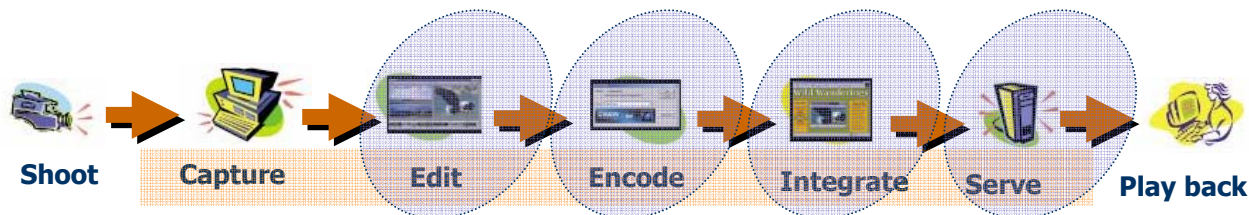enabling your future

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Clip generation

- Clips can be created through the **Publishing interface**, browsing through the GUI and randomly access the extracted events . From here, the publisher can view the content.

- A start and end time can be selected for the clip. The **clip** can be **annotated** with a title, description and a category.

- The **clip** can be **cropped**. The cropping interface allows a region of the video to be selected. The clip creation processing is performed in digital format. It is non-destructive, i.e., the integrity of the original content file is maintained. **Digital filtering** is applied to the cropped output.

- Cropping, zooming, meta data tagging, clip merging, archive of clips Search capabilities for future use

Shoot   Capture   Edit   Encode   Integrate   Serve   Play back

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Encoding and publishing

- Upon selection, annotation and cropping of the clip, the **clip** is **transcoded** into the required format(s). The system is configured with the appropriate codecs. The system allows the clip to be published once and transcoded into **multiple formats (Real, WMT, 3GPP, QT)**

- **Multiple encoding** are supported in parallel

- The transcoded clips are then available to an ftp process which will transfer the files to the Provider's **Media Streaming Servers**

Shoot   Capture   Edit   Encode   Integrate   Serve   Play back

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Logical flow of clip creation

BROADCAST CONTENT CAPTURE STREAM...

1 EVENT EVENT ...

EVENT EVENT ...

EVENTS IDENTIFIED IN INPUT BROADCAST STREAM THROUGH REALTIME PUBLISHING INTERFACE

CONTENT CAPTURE CONTINUES AS PER SCHEDULE

6

2

ALMEDIA GW

5

CLIP

CLIP

4 ALMEDIA DB

ALMEDIA PUBLISHER

3

CLIPS EDITED, CROPPED AND PUBLISHED IN THE REQUIRED FORMATS, AND STORED IN THE CENTRAL DB
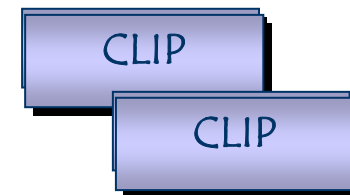
PUBLISHED CLIPS, & ANNOTATION OUTPUT VIA FTP

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SW modules architecture

Live feed

ALMEDIA SERVER #1		ALMEDIA SERVER #1		PROVIDER MEDIA SERVER
MEDIA CAPTURE	→	ALMEDIA GATEWAY	→	
		ALMEDIA PUBLISHER		

Multimedia clips playback (sport, news, …)
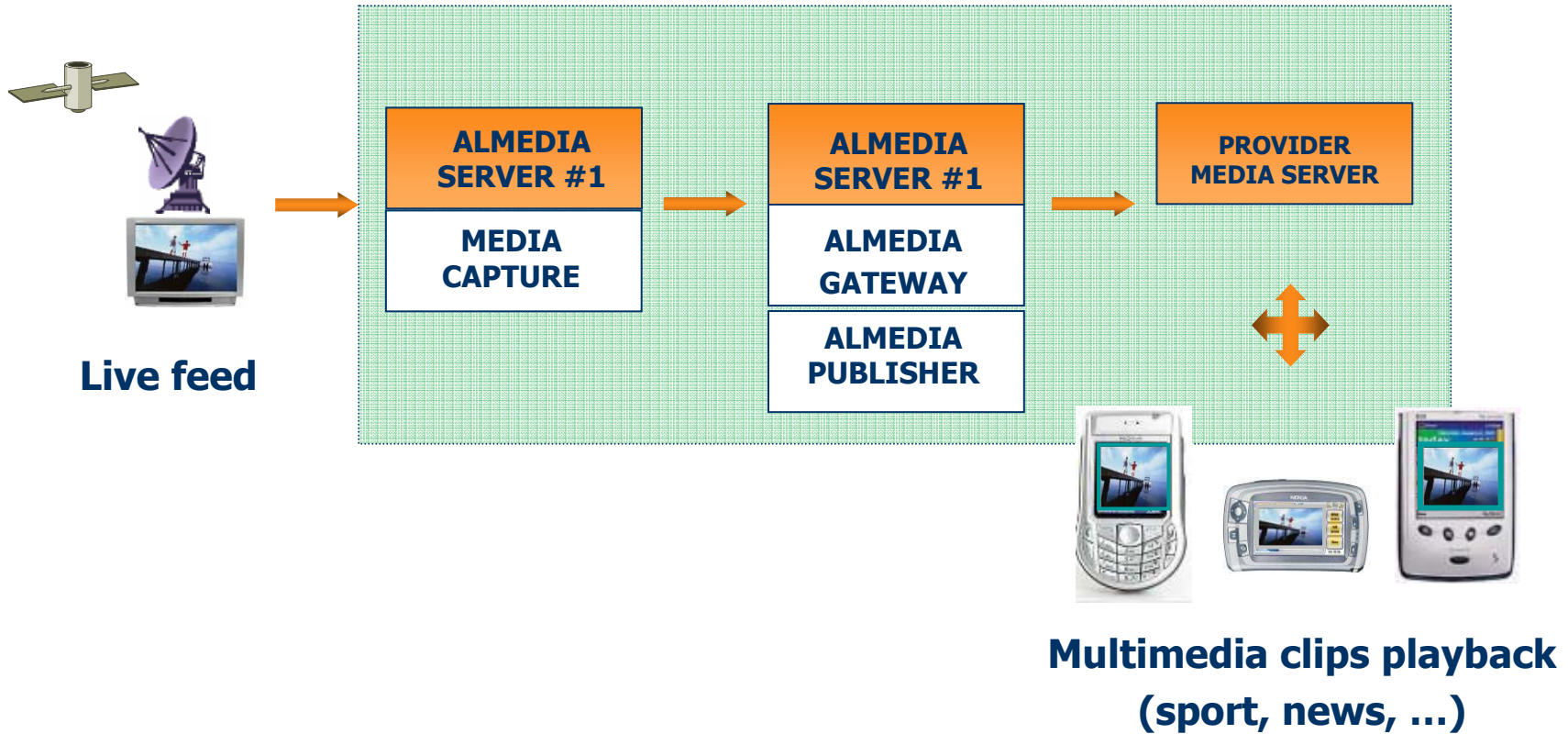
- Software architecture of a "single" clip production chain from live feed

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Timing objectives
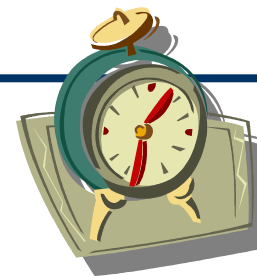
A key focus of the project has been to repeatedly create clips in the **shortest possible time**. There are different stages which have been timed as part of the project's target.

- ✓ **Event to Publishing Interface**
  - ▪ What is the time interval from the time the event occurred to it the content being available on the interface for publishing ?

- ✓ **Publishing Interface to Annotated Cropped, Clip**
  - ▪ What is the time is takes for the Editor to top and tail the clip from the content file, annotate the clip and select the cropping region ?

- ✓ **Annotated Cropped Clip to delivery to Media Server in Transcoded format(s).**
  - ▪ What is the time it takes for the system to implement the selected cropping region, transcode the clip to the required formats and deliver the media files to the media server ?

- ✓ **The overall time it takes to create a clip**
  - ▪ What is the total time it takes to perform all previous items?

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Additional considerations
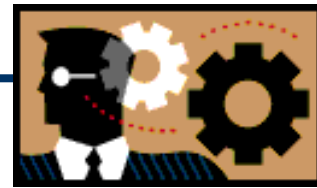
Key frame generation:
- ✓ Used in video list page
- ✓ Generated for different playback devices
- ✓ Clever algorithm with adaptive pace for frame selection

Flexibility for supported file formats and encoding parameters setting:
- ✓ Easy integration for **new codec integration** through a modular architecture

Flexibility for **video acquisition method**:
- ✓ Realtime extraction
- ✓ Programmed Schedule with options for recurrent schedule

Clip statistics page for troubleshooting purposes and **performance measurements**

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Live streaming

A requirements was still missing in the described functional "chain":

- ✓ **Handset testing**

This requirements didn't need all the processing stages required by the clip generation, yet it implied:

- ✓ **Timeliness** from extraction to streaming stage
- ✓ Flexibility for encoding options
- ✓ Strict requirements on **video quality**
- ✓ Integrated solution

Our approach was the choice of a live streaming additional chain

- ✓ Extraction plus **on the fly encoding** plus immediate streaming

The **integration** target was met through streaming node sharing with the clip creation chain and through a common Web interface

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Operative Workflow

Clip creation Workflow

✓ Content is captured and imported in the Almedia System through real time extraction or scheduled extraction

✓ Publisher accesses processing workstation and creates clips

✓ Publisher reviewes and manages clips before publishing stage

✓ Publisher publishes clips

✓ Published clips are transferred to the streaming server

✓ Streaming server detects new content and made it available for streaming or dowload through GPRS/EDGE, UMTS, ADSL etc.

Live Stream Workflow

✓ Broadcast signal feeds the capture card of live capture & encoding station.

✓ Encoding sw acquires signal from the capture card and transcodes it on-the-fly through Helix Mobile Producer into the required live output formats.

✓ This live output format is transferred to the streaming server, Helix Mobile Streaming Server.

✓ Streaming server detects new content and made it available for streaming or dowload through GPRS/EDGE, UMTS, ADSL etc

✓ …process automation & multichannel delivery…
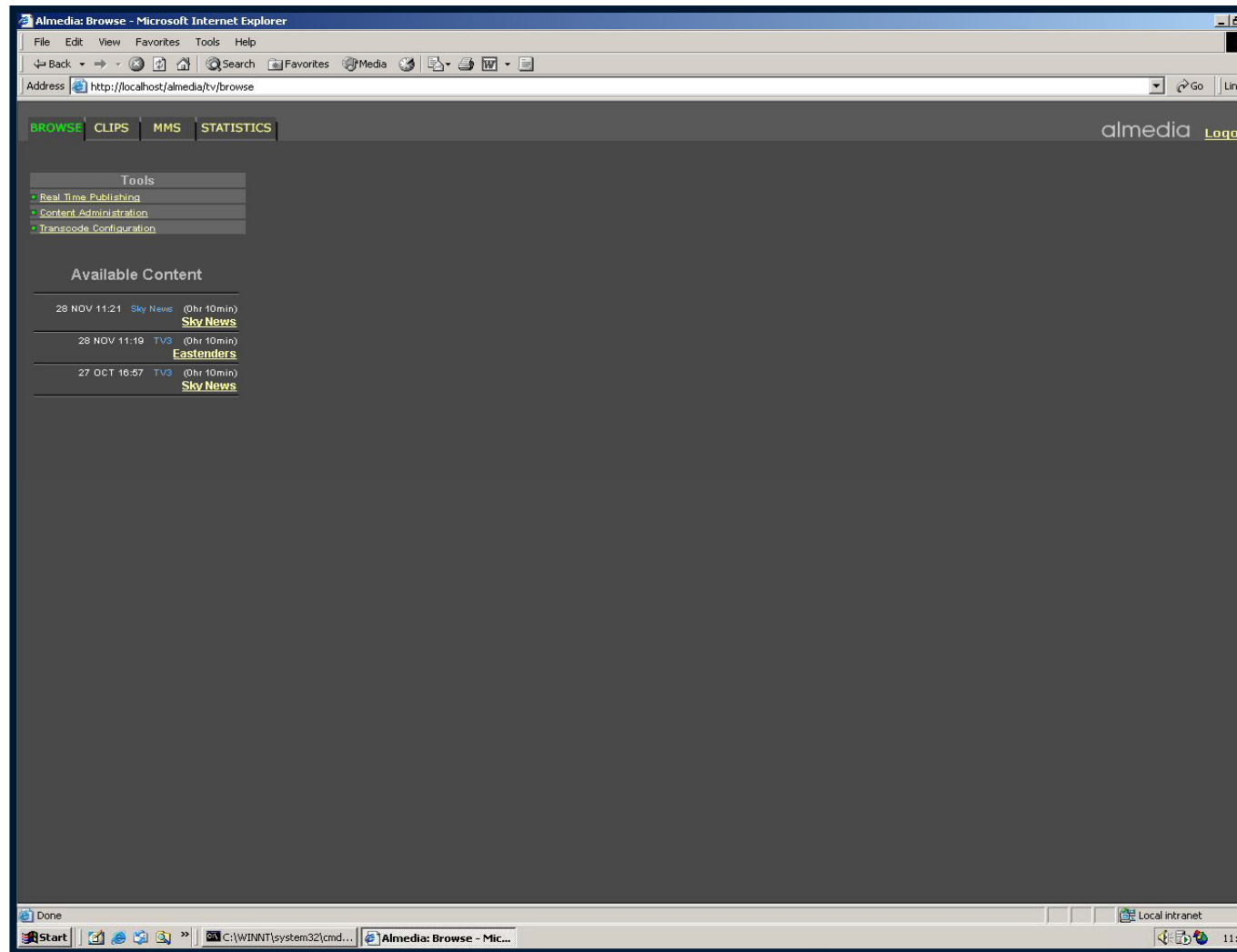
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Main page of Almedia System

Friendly GUI design

All tools and available contents at your fingertips

Available tools:

- Realtime extraction publishing
- Content administration
- Transcode options

Keyframes page

- Easy to use clip generation process:
  - ✓ Selecting start, representative and end keyframes
  - ✓ Selecting one keyframe (end or start) and duration setting
  - ✓ Clicking a button when palying back the video extracted

Clips page

- Metadata annotation to enable searching capabilities:
  ✓ Title
  ✓ Description
  ✓ Category

- Clip merge

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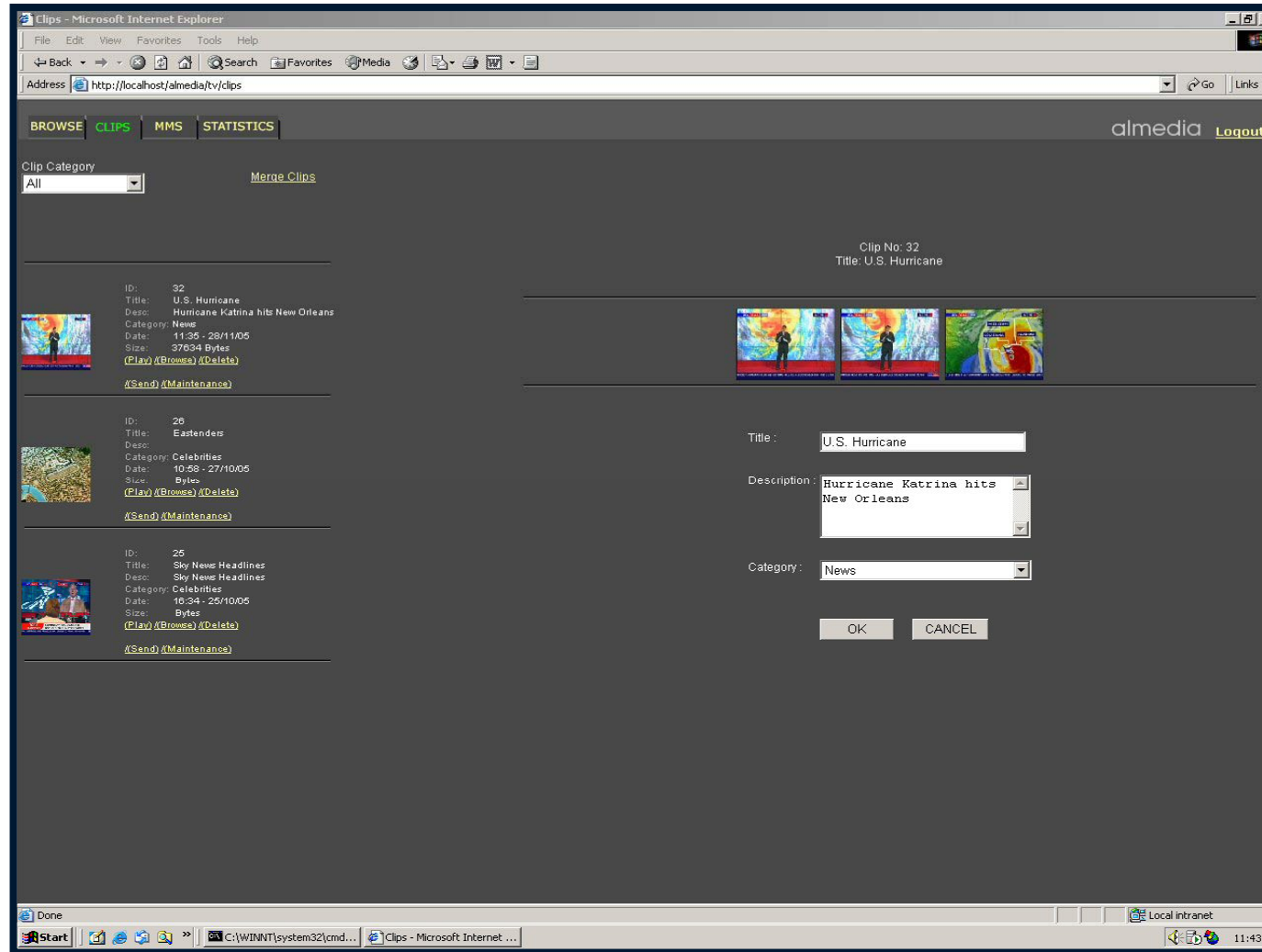
Transcode configuration page

- **As quick as a click!**
- **Easy configurable transcode options:**
  - ✓ Select the network
  - ✓ Select the format

Platform architecture
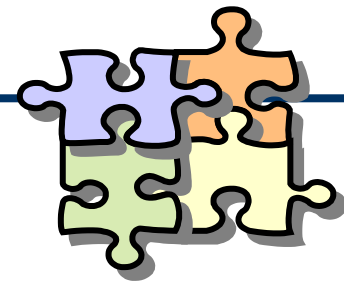
Modularity:

- ✓ Scale as you grow approach
  - ▪ for live and off-line concurrent input feed
  - ▪ for parallel encoding processes
- ✓ Easily add: new streaming file formats and encoding options

Integration required for:

- ✓ User profiles (Ldap)
- ✓ Media archives
- ✓ Streaming node
- ✓ Web portal

High availability and resilience:

- ✓ Network (redundant connections)
- ✓ Storage (Raid configuration)
- ✓ Extraction phase (additional extraction lines)
- ✓ Processing and publishing server clustering

Profiling users for **Access Management**

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Clip creation chain - basic architecture

Operators

input feed

Switched
LAN

FTP
output Clips

Capture
Server

Capture
Area

Network
Area

Video Processing
Server

Processing – Publishing –
Encoding – Storage Area
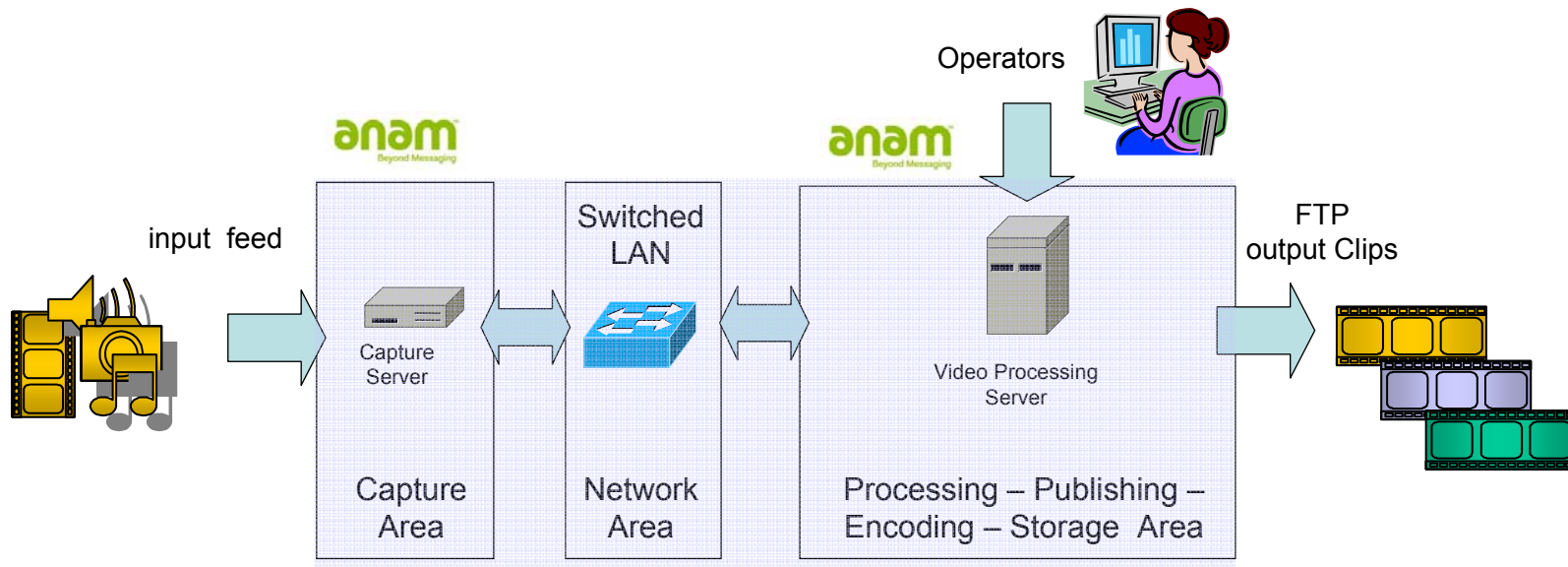
CAPTURE AREA

✓ **Raw content extraction**

✓ **Continous MPEG-2 file creation**

PROCESSING AREA

✓ **Clip generation**

✓ **Cropping, digital filtering**

✓ **Publishing and Media Archiving**

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Clip creation chain – complete architecture

Operators

Input feed

Capture #1

⋮

Capture #N-1

Capture #N

Capture Area

Gbit Eth. Switch

Network Area

Video Processing Server (master)

Video Processing Server (slave)

DiskArray

Processing Storage Area

Encoder #1

Encoder #2

Encoder #M

Encoding Area

Output clip
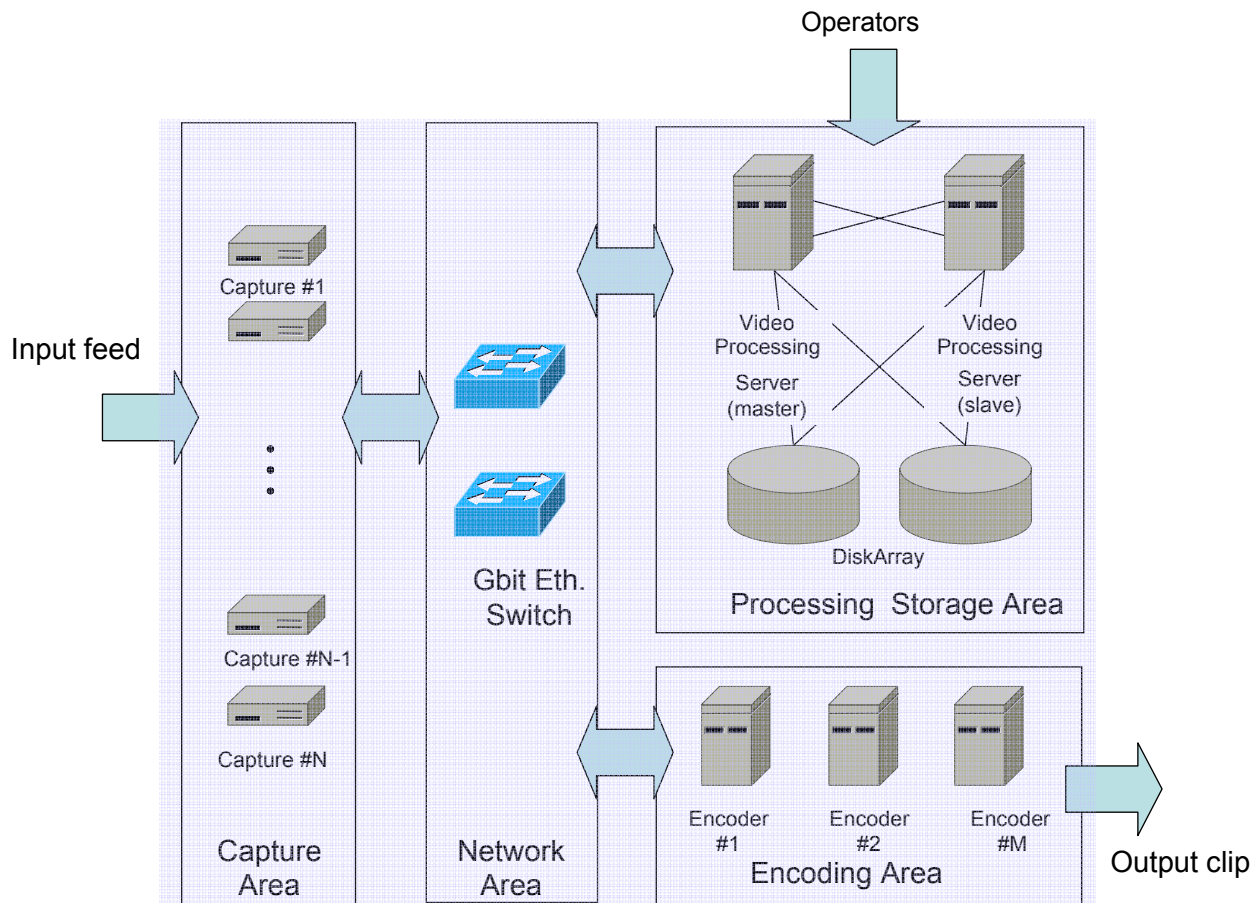
COMPLETE ARCHITECTURE:

✓ **High availability**
✓ **Resilience**
✓ **Scalability**
✓ **High performance**

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Live streaming chain

Mobile Phone

Internet

Almedia Capture

Almedia Processing

Streaming Server

End user' Steaming Station

Live Capture & Encoding

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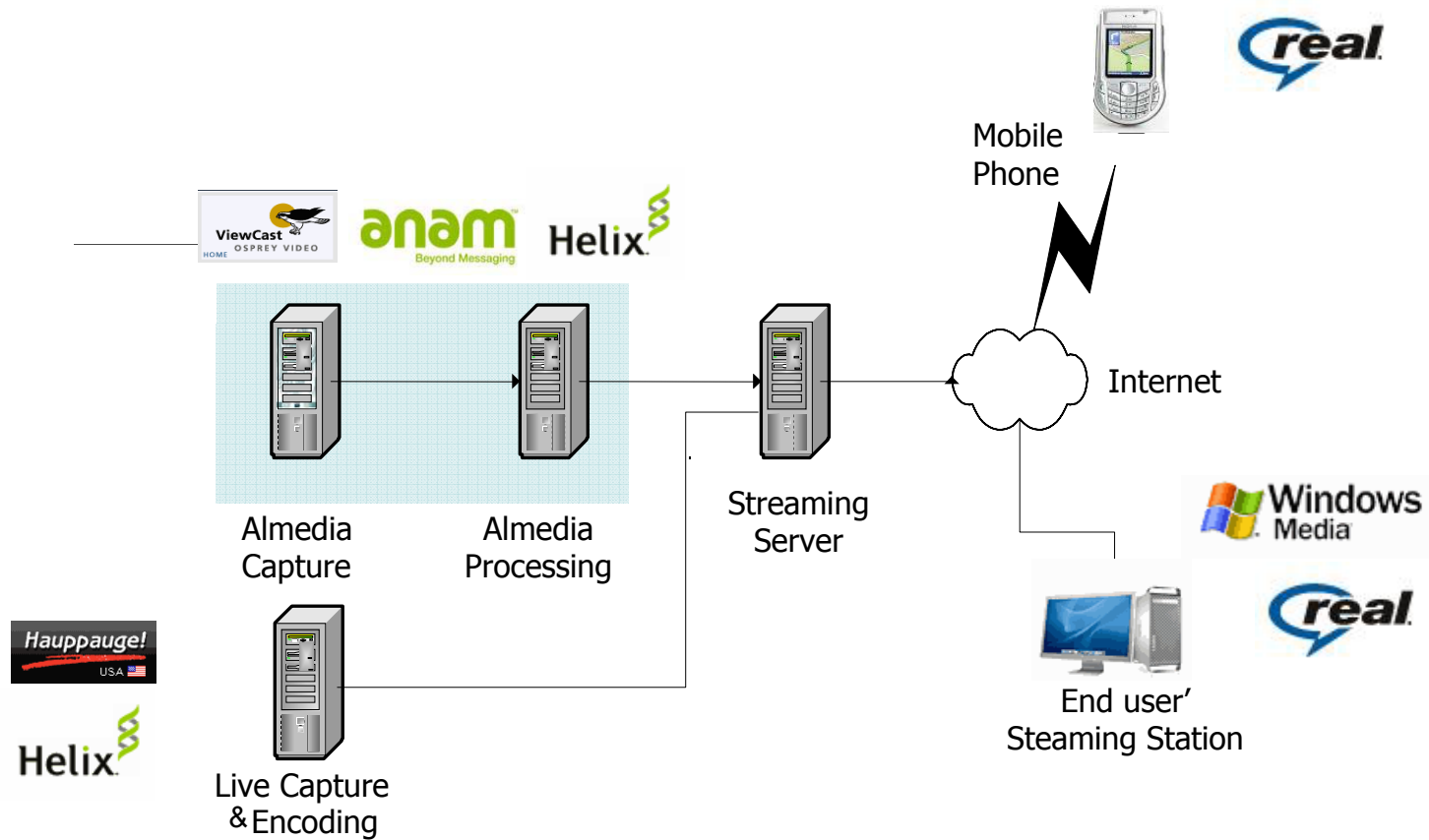
Meeting the objectives

✓**Automation** of repetitive tasks

✓Improved **efficiency**

✓**Cost reduction** for platform integration

✓Non disruption of the input feed

✓Preservation of the **high quality** of video contents

✓Shorter time to market thanks to tasks automation

✓**Errors reduction** thanks to tasks automation

✓GUI user friendly

✓**Centralized** management **interface**

✓Push and pull services enabled

✓**Quick ROI** thanks to minimal implementation requirements

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Beyond the project
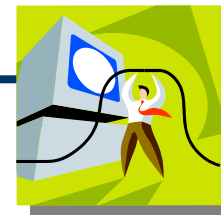
Enhancements of the implemented platform are ongoing:

MMS composer to leverage clip archive

Extensions of **pull services** base :
- ✓ Preview
- ✓ Trailers
- ✓ Video index

Video sequence detection to boost clip generation automation
- ✓ Automate the extraction of video content through clever content recognition (news, weather forecast, etc…)
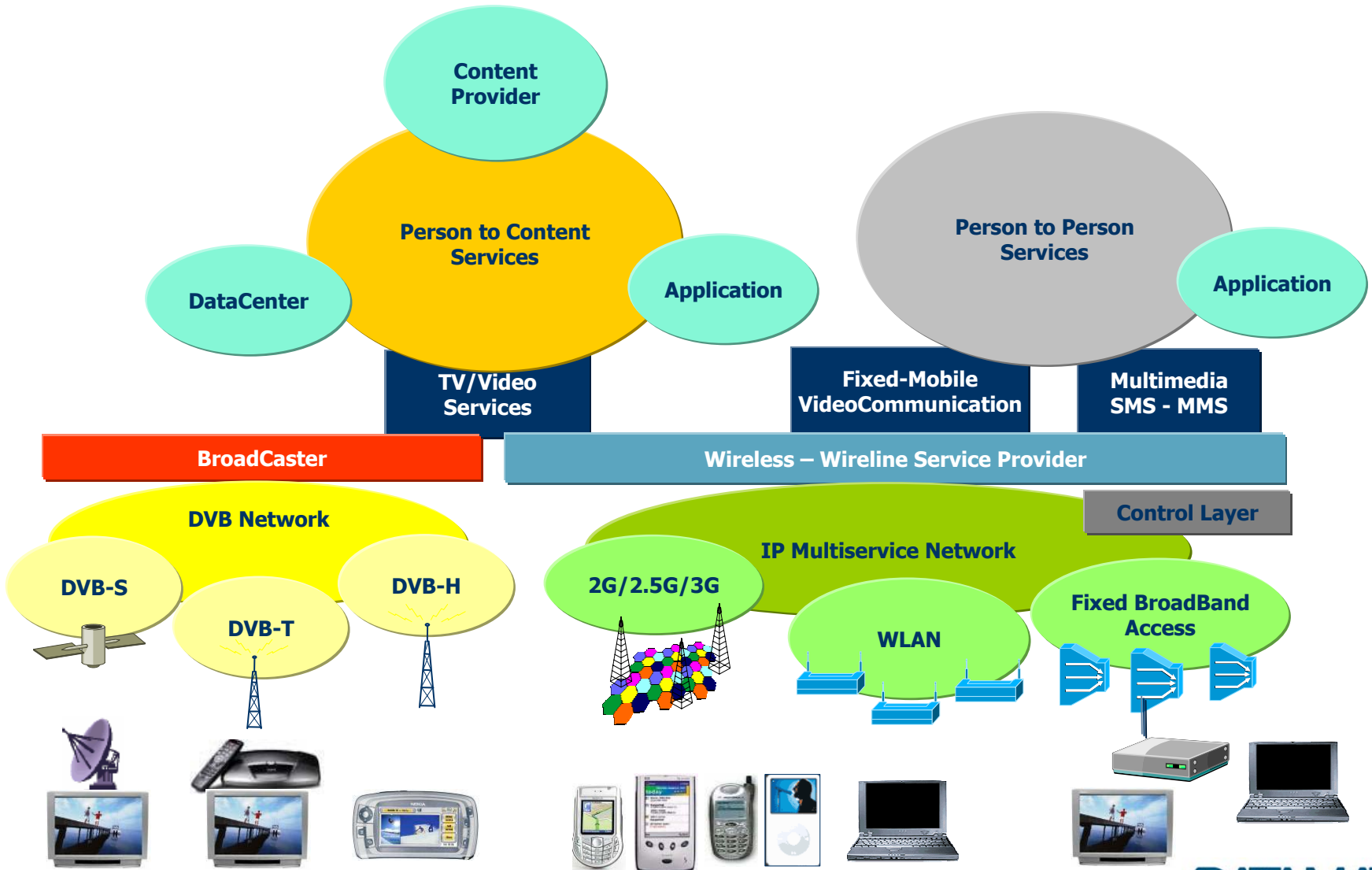- ✓ Setting of generic clip setting (duration, start time,…)
- ✓ Capability of reviewing the generated clip thanks to the preservation of original feed

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Why Datamat ?

- **Various input formats and encoding options**
  - ✓ Almost any format, improved error prevention
- **High quality**
  - ✓ Handset content needs to be optimized for limited bandwidthand screen size. Datamat guarantees you the best quality
  - ✓ Specialized frame rate conversion algorithm lets you easily convert a piece of content to be viewed on a mobile device without losing frames
- **Compatibility**
  - ✓ Proven compatibility provides flexibility with a broad range of handsets
- **Processing**
  - ✓ Advanced processing options let you easily manipulate existing content
  - ✓ efficient motion estimation, advanced scene change detection and optimized rate control
  - ✓ Audio volume control to prevent volume change
- **Ease of Use**
  - ✓ Simple, fancy, intuitive and flexible user interface makes encoding and editing easy, even for complex tasks.

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The streaming media panorama

Content Provider

Person to Content Services

DataCenter

Application

Person to Person Services

Application

TV/Video Services

Fixed-Mobile VideoCommunication

Multimedia SMS - MMS

BroadCaster

Wireless – Wireline Service Provider

Control Layer

DVB Network

IP Multiservice Network

DVB-S

DVB-T

DVB-H

2G/2.5G/3G

WLAN

Fixed BroadBand Access

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...Where the project fits in and...

Content Provider

Person to Content Services

Person to Person Services

DataCenter

Application

Application

TV/Video Services

Fixed-Mobile VideoCommunication

Multimedia SMS - MMS

BroadCaster

Wireless – Wireline Service Provider

DVB Network

Control Layer

DVB-S

DVB-H

IP Multiservice Network

2G/2.5G/3G

DVB-T

WLAN

Fixed BroadBand Access
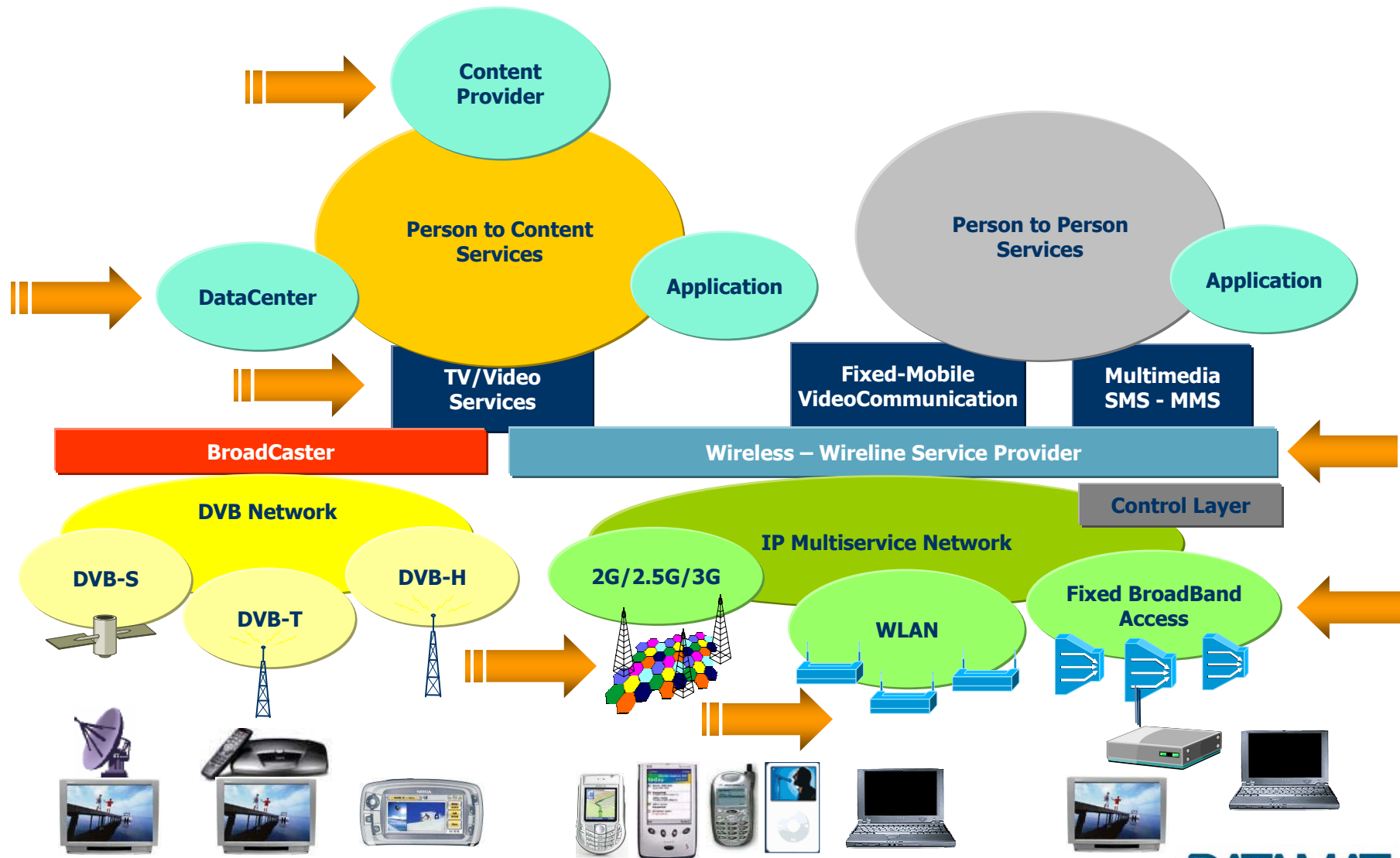
...beyond: R&D at Datamat's in Multimedia

Content Production

Content Provisioning

Content Composition

Service Delivery

Network Delivery

Customer

Objectives:
- **Improve know how**
- **Cutting edge technology scouting and evaluation for solution building purposes**

Content Composition Solution

International projects partecipation:
- **R&D UE: EuQoS**
- **R&D UE: BROTHER**
- **R&D IT: M3-Cast**
- **R&D Datamat**

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Main technology choices

Main Technological off-the-shelf choices:

- ✓ Live streaming chain
  - Hauppage Wintv Go capture card
  - Realnetworks Helix Mobile Producer
  - Helix Universal Server Mobile
- ✓ Clip generation chain
  - Osprey 220 capture card
  - Almedia gateway (Anam Software)
  - Almedia publishing (Anam Software)
  - Realnetworks Universal Server Mobile
- ✓ Gigabit network connectivity
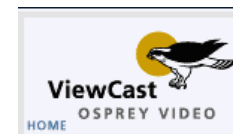
Basic requirements for platform implementation

A/V Input requirements
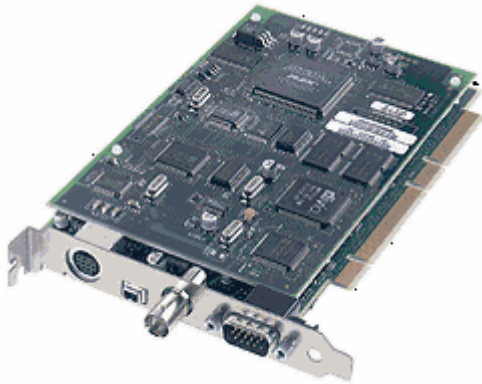
- Video Input:
  - ✓ DV, SDI, Composite (BNC), S-Video
- Audio Input
  - ✓ Balanced stereo (2 x XLR), Unbalanced stereo (2 x RCA), Embedded SDI, DV audio (IEEE1394), AES/EBU (XLR)

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Encoding requirements

Partial list of Provider's requ's for encoding capabilties:

	GPRS	EDGE	UMTS	UMTS evoluto	WLAN 11Mbps	WLAN 54Mbps	ADSL 640Kbps	ADSL 1Mbps	LAN
Video Bitrate	17 kbps	40 kbps	75 kbps	110 kbps	798 kbps	4670 kbps 1500 kbps	230 kbps	406 kbps	9670 kbps 1500 kbps
Audio Bitrate	4,75 kbps	5,15 kbps	7,95 kbps	32 kbps	192 kbps	320 kbps	80 kbps	96 kbps	320 kbps
Frame Rate	7 fps	10 fps	12-14 fps	12.5 fps	25 fps	25 fps	25 fps	25 fps	25 fps
Resolution	176×144	176×144	176×144	176×144	384×288 352×288	768×576 352×288	384×288 352×288	384×288 352×288	768×576 352×288

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Phone compatibility

Partial list of tested handsets:

- ✓ Nokia 6630
- ✓ Nokia 9200 Communicator
- ✓ Pocket PC
- ✓ Palm Handhelds
- ✓ Motorola A920
- ✓ Nokia 6230 (3GPP streaming via RTP, H.263)

Devices running Symbian Series 60 with Real Player Mobile installed

Compatibility Requirements:

- ✓ Phones must be connected to a network that allows video streaming
- ✓ Phones must have video player that supports 3GPP, Real Media or Windows Media video playback

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"Thank you..."

Q&A?