WP5 - People security with video analysis

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The WP5 team

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Outline of the presentation

- User requirements people security
- Analysis on Hardware
- Software prototype
- User interface
- Results

Main user requirements

- Detect the presence of people in the work area
- Keep under control the whole terminal and automatically report any operation irregularity
- Let the human operator monitor the area through video cameras

Technical requirements

- Real-time processing
- Immediate feedback
- Limited intervention to the plant
- Work day and night

Analysis on the HW: cameras

- 4 video-surveillance cameras available on the plant before VIT

Analysis on the HW: cameras

- First camera installed for the project:
  - Speed Dome **PTZ Camera** Day-Night, WDR, CCD 1⁄4 Sony, 480 TV lines, optical zoom 23X

Dome camera – Various presets

Analysis on the HW: cameras

- Second camera installed for the project:
  - 3 **Megapixel** IP digital **Camera**, CMOS 1/2,5", MPEG4 and MJPEG compression

The megapixel video quality

Analysis on the HW: server + GUI

- IMAVIS installed ICSVision Analyser server on the Vado Ligure plant in order to:
  - Record videos
  - Run and test software on video live and recorded sequences
  - Supply a graphical user interface

Video-surveillance sw prototype

- The developed video-surveillance system processes a **video-flow** from **each camera** in two steps:
  - Object detection
  - Object classification
- The system **records all events** of people moving in the selected (forbidden) zones
- An **alarm is sent** to the central system if a person is accessing a forbidden zone

Object detection

- The processing loop:
  - **Background** update
  - **Change detection** to localize moving pixels
  - **Connected components** analysis to detect moving objects
  - **Object tracking** based on a Kalman filter to keep track of the object over time
  - Robust **data association** based on appearance deals with objects overlaps

  Note: the case of **stopping objects** is dealt in the background update module

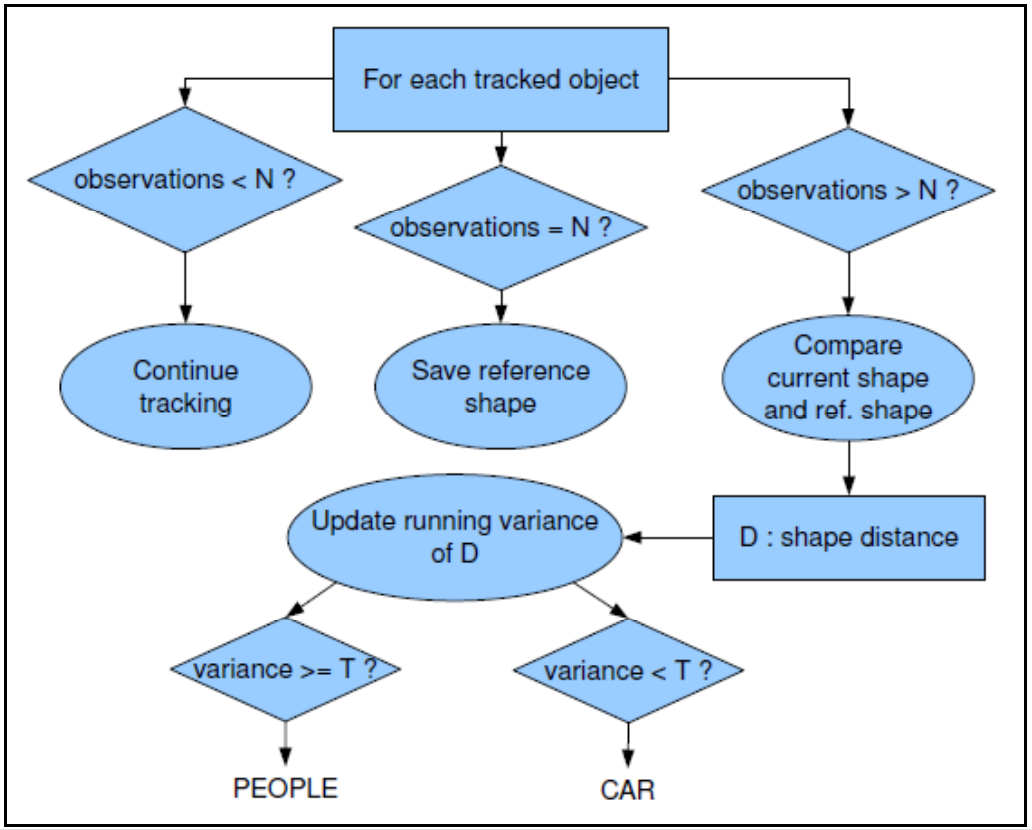
Object detection

- Extensions available:
  - Multi-camera tracking for wide areas
  - Hierarchy of cameras:
    - Off-limit zone cameras
    - Adjacent area cameras

Note: in the present installation on Vado Ligure plant the quality of video surveillance cameras doesn't allow an appearance based approach

Object classification

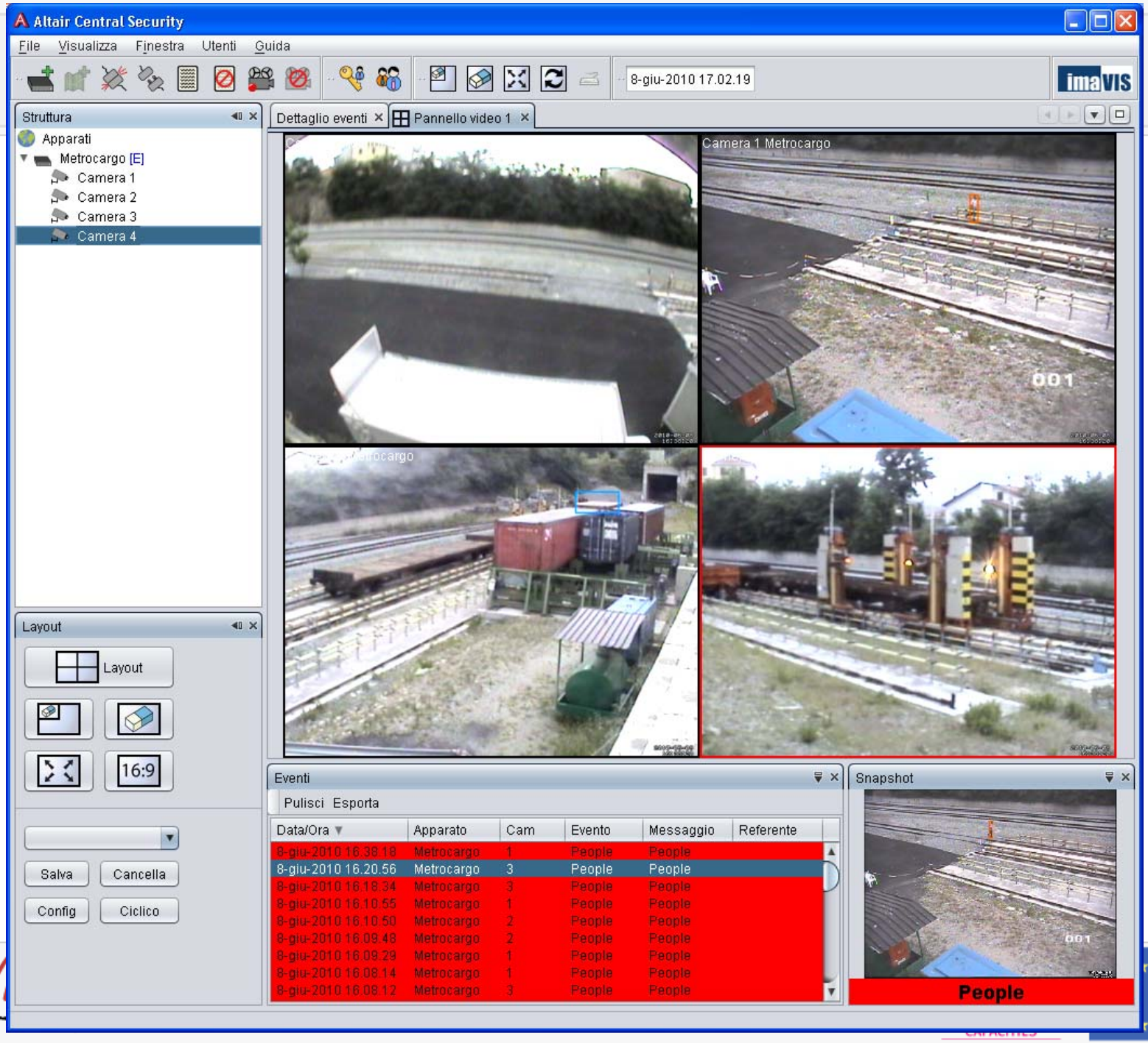
- **Idea**: the shape of a moving mechanic object is more stable than the one of a person walking in the scene.



Object classification - Video

Graphic User Interface

- The interface must be easy to use
- Video live with different layout
- Updated list of events with details and snapshot
- Immediate recall of related recorded video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Apparati
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Camera 2
Camera 3
Camera 4
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Pannello video 1
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Ciclico
Eventi
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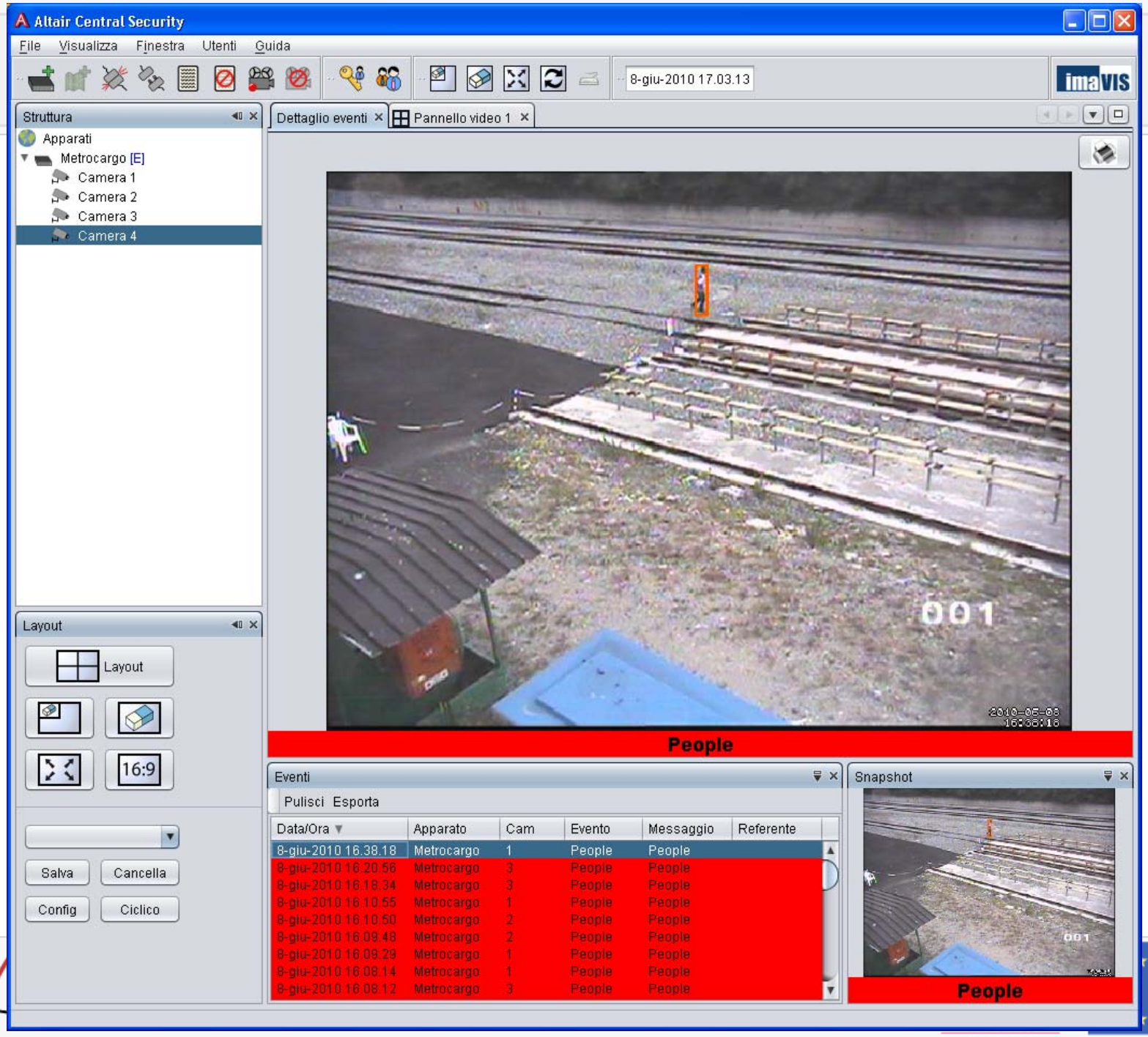
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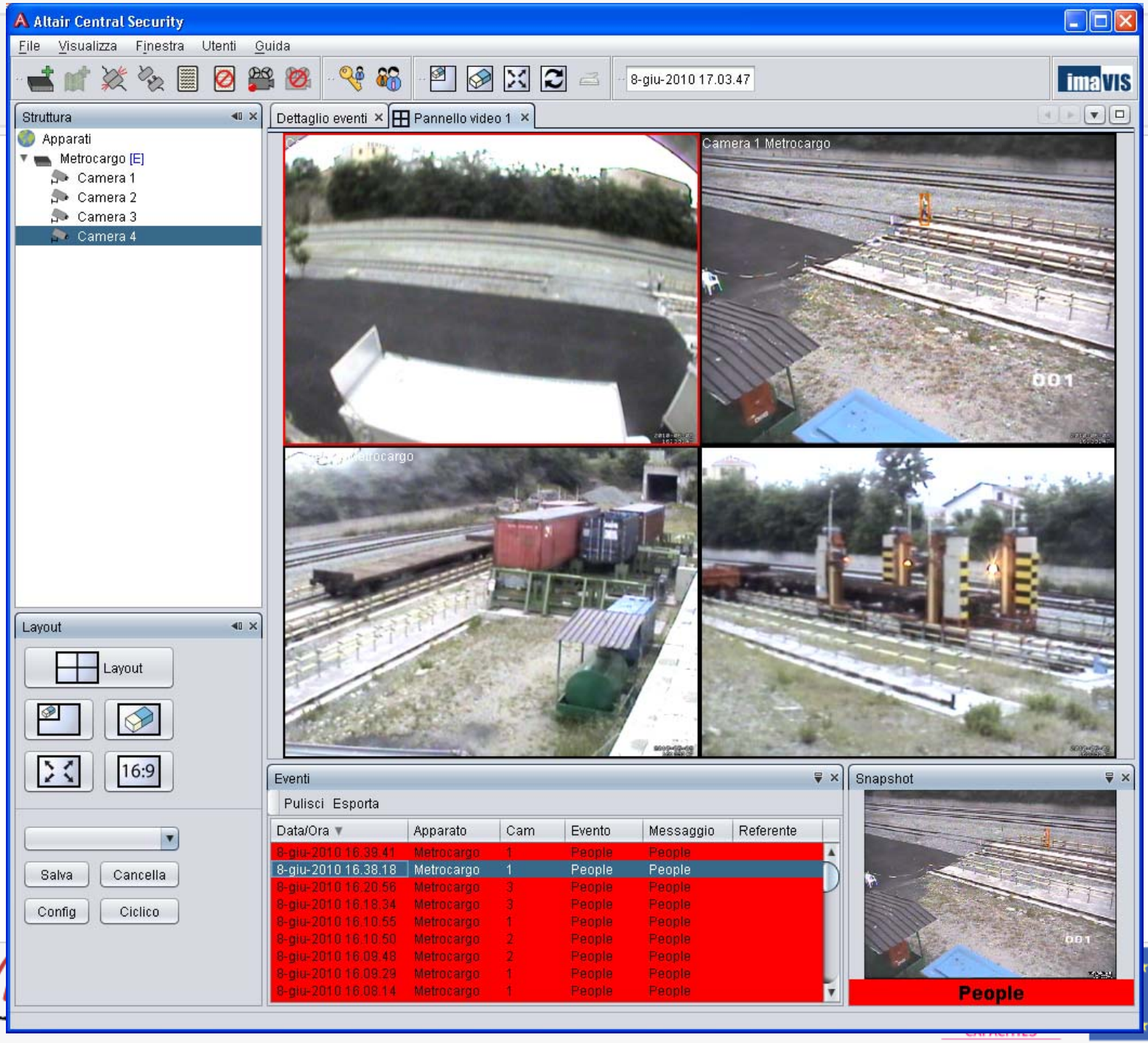
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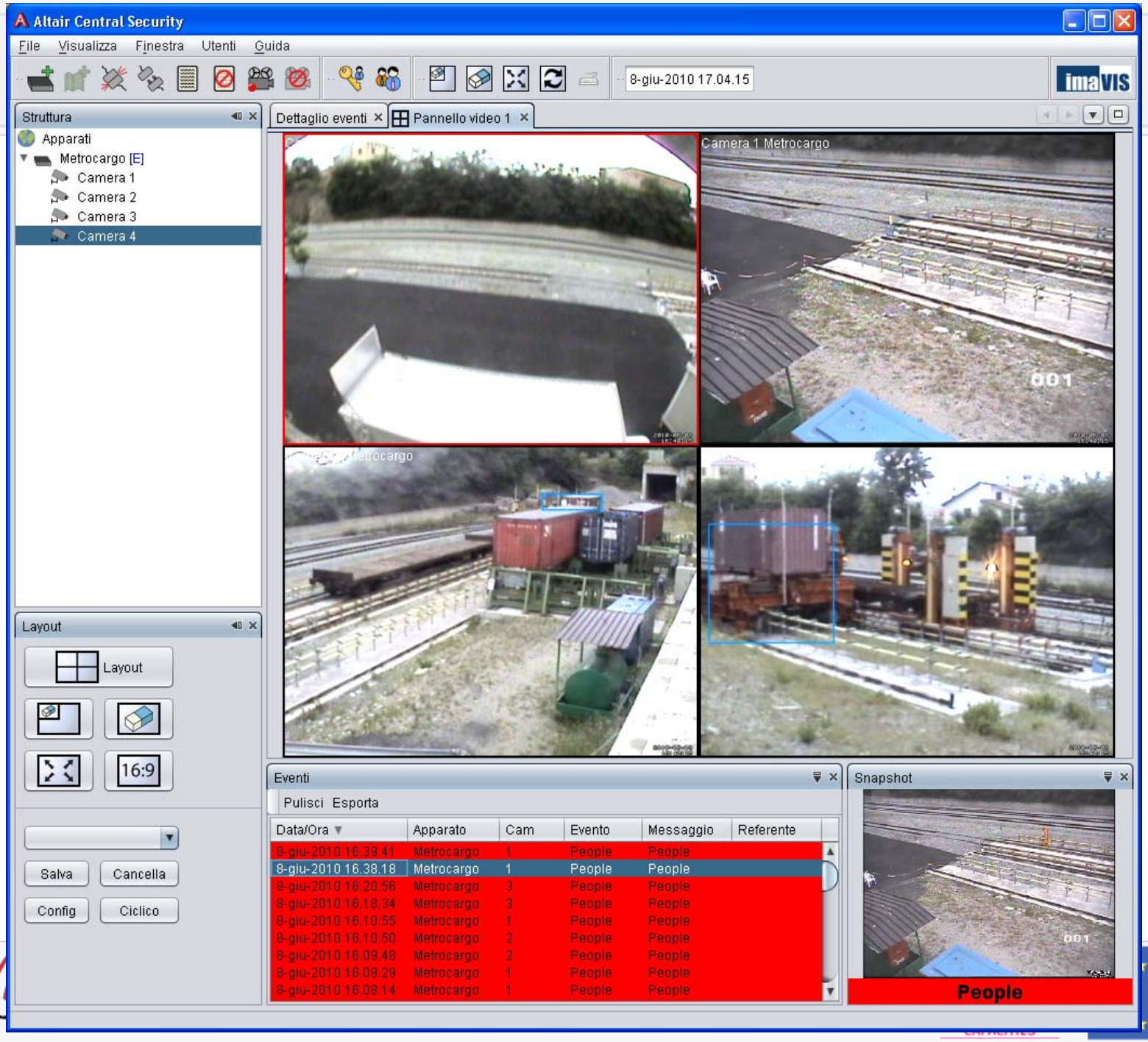
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Results - months 16-18

- At month 16 we collected a set of videos and manually annotated them for a quantitative evaluation:
  - 0.7% false positives
  - 3.6% false negatives

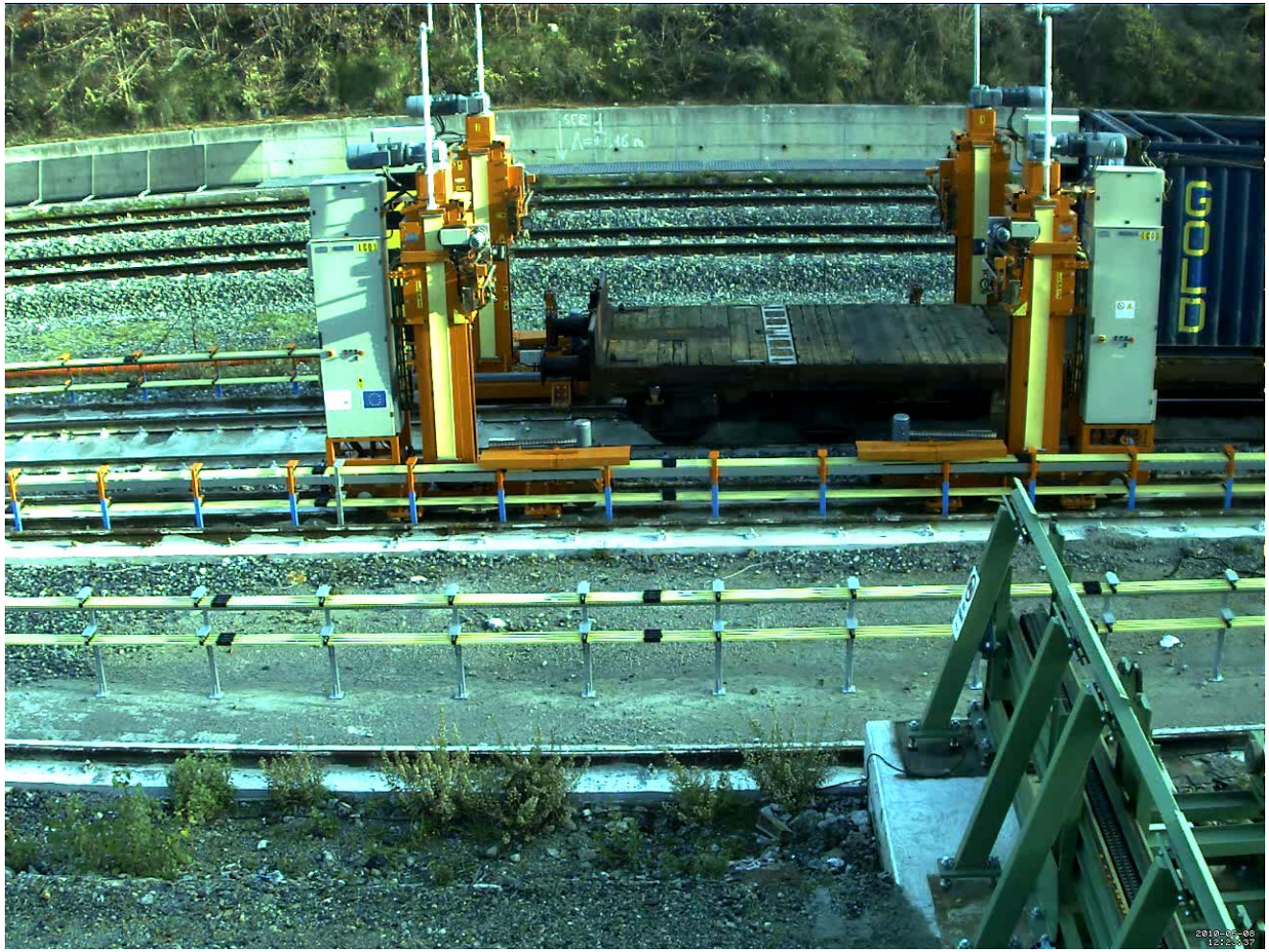
- At months 17-18 (and beyond that) we carried out qualitative evaluation sessions at peak times

Sample results - month 16-18

Example video 1

Example video 2

Example video 3



Main user requirements

- ✓ Detect the presence of people in the work area
- ✓ Keep under control the whole terminal and automatically report any operation irregularity
- ✓ Let the human operator monitor the area through video cameras

Live demo

later today at Vado Ligure plant