

AVITRACK



D2.1-B-
Sensors characteristics and network
surveillance architecture

WP 2 - Sensors & Video Device
Task 2.1 Sensors Studies

Abstract: This document presents the studies of the implementation of the video sensors, networking, video recording and video storage on one of the aprons of the Toulouse-Blagnac Airport.

1 Objectives

The objectives of this work are the installation of the system to record and store video streams from eight cameras on Toulouse airport.

2 System requirements

There are three major locations where components have to be installed for the recording of apron scenes:

- Eight image sensors are installed on the **apron / terminal building** in order to image the scenery to be analyzed.
- In the **technical room**, the scenery sensed by the eight cameras is captured by the video encoders.
- The multi-media storage PC is placed in the **operating room**, where the user interface for the video capturing, video retrieval and camera control is located.

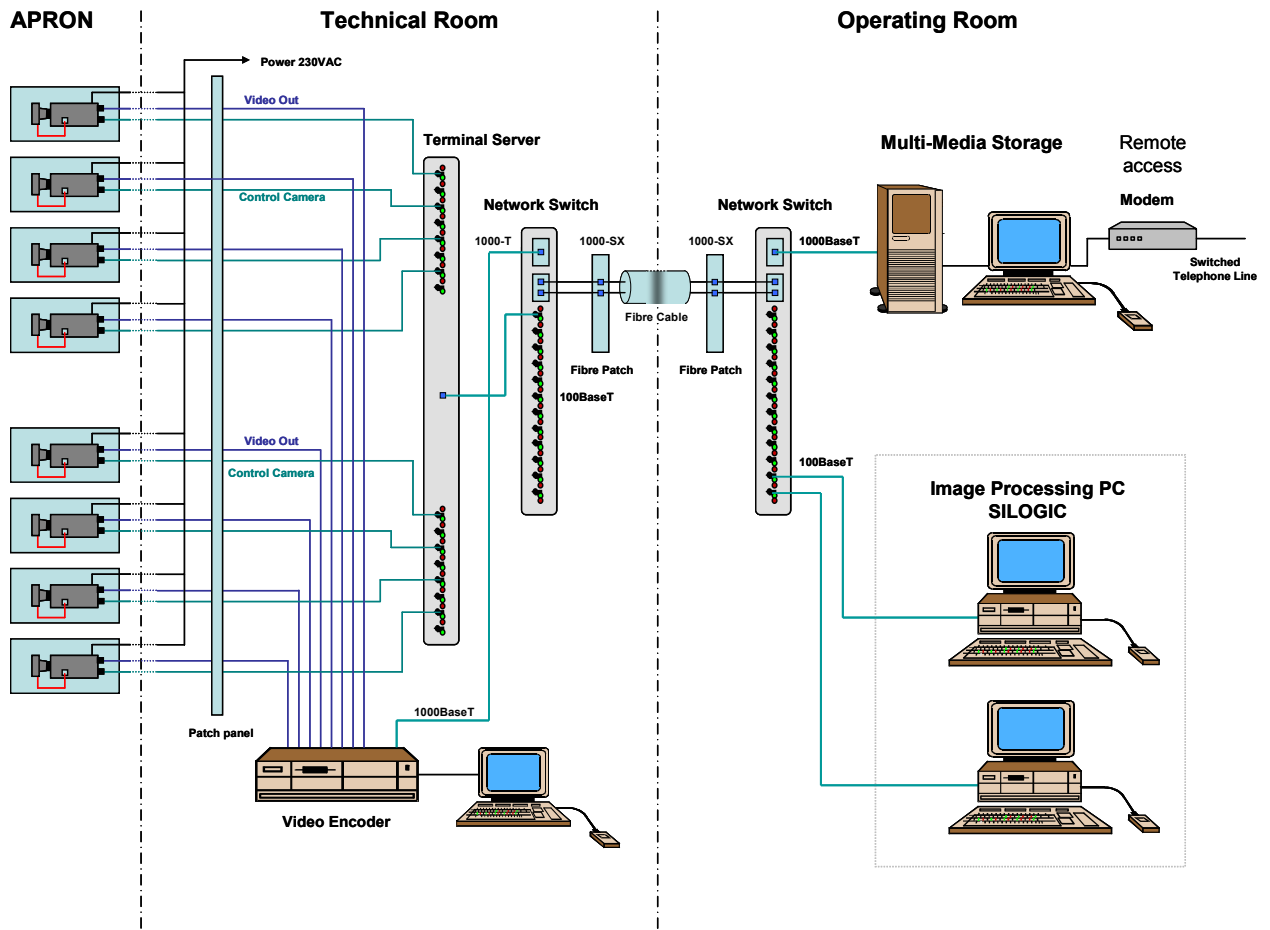


Figure 1: Block diagram of the video recording and storage system

3 Image Sensor

3.1 Camera

This section describes the decision process for the cameras and introduces the main features of the selected camera.

3.1.1 List of Desired Camera Features

Table 1 summarizes the ordered list of desired camera features.

Priority No	Criterion
1	Immediate Availability
2	Progressive Scan
3	Sensitivity
4	Colour
5	High Dynamic Range
6	Blooming/Smearing Characteristics
7	Camera Price
8	Resolution
9	SNR
10	Remote control of gain + other parameters
11	S-Video (additional to composite)
12	C-Mount /CS-Mount

Table 1: Priority list of desired camera features

3.1.2 Cameras Test

We have initially tested three cameras the key features of which are listed in the table following:

	Pulnix TMC 9700	JAI CV S3300	Bosch LTC 0610
Market Segment	Machine Vision	CCTV	CCTV
Scanning System	Progressive (NTSC)	Interlaced (PAL)	Interlaced (PAL)
CCD chip size	2/3"	1/3" ExView HAD	1/2"
Sensitivity on sensor	10.0 lux at f=1.4	0.09 lux (50 % video)	0.29 lux
Video Output	Composite / S-Video	Composite / S-Video	Composite / S-Video
SNR	50 dB	> 50 dB (AGC Off)	> 50 dB
Camera Setup	Switch of RS232	On screen or RS232	On screen or coax
Lens Mount	C- mount	CS-mount	C-mount

In order to do a choice between the two cameras types several comparisons and tests have been realized tacking account the features following:

- Differences between CCTV and machine vision cameras
- Key Properties of tested cameras
- Indoor Scene captured with different illuminations
- Night Scene captured
- Performance differences at night

3.1.3 Camera Selection

The final camera selection is the **JAI S3300 with a 1/3" sensor**.



3.2 Lenses

This section describes the choice of the lenses, which is based on the preliminary sensor positions.

3.2.1 Viewing Angles

Fixed-focus lenses are the simplest type of lens, and therefore the cheapest. Vari-Focal lenses offer more flexibility, allowing the viewing angle to be adjusted manually but it's more expensive.

3.2.2 Lens control

To provide optimum imaging performance neither too much nor too little light should fall onto the camera sensor. This can be adjusted by means of the lens iris.

1. **Manual Iris lenses** can be adjusted at the time of installation, allowing an optimum picture to be obtained for a fixed lighting level.
2. **Automatic Iris lenses** offer the best performance for outdoor use, as the iris aperture automatically adjusts to create the optimum image by monitoring the output signal from the camera.
3. **Automatic Iris lenses with manual override** have a remote voltage control.
4. **Motor Zoom lenses with motor iris** control the iris with a motor

3.2.3 Lens Selection

In order to remove uncertainties and to assure that every object can be imaged by the sensor according to the plan, the safest way is to select Vari-Focal lenses, which allow the adjustment of the viewing angle.

The JAI S3300 is a 1/3 " version of the JAI S3200, having identical camera features except of the sensor size. In order to be able to use the 1/3 ", the camera choice has changed from JAI S3200 to JAI S3300 after the lens discussion.

The elected lenses are:

Model	Format	Mount	Focal Length [mm]	Iris Range	Iris Type	Viewing Angle
TS2V214AED	1/3"	CS	2,8 - 6.0	1,4 – 300	DC iris	96°42'-47°6'
TS2V314BED	1/3"	CS	3.5 - 8,0	1,4 – 300	DC iris	79°48'-35°24'

3.3 Weather protection case

The camera and the lens are protected from bad weather, to guaranteed that the cameras can work in the operating temperature (-5° - +45°) on the operational airport site.(i.e. Figure 2: Camera housing)



Figure 2: Camera housing

4 Video Recorder

4.1 Video Encoder

The video encoder provided by ARC is based on the Texas Instruments c64x DSP. The analogue video input is captured (even or odd field) and the lines from the second field are interpolated by bilinear interpolation in order to get a complete frame with 576 lines with no interlace effects.

4.2 Recorder-PC

The Recorder-PC is based on a high-end standard PC in a 19" rack mountable chassis. The operating system we use is WinXP.

5 Network

The Recorder-PC is connected via 1 Gbit copper Interface-module over the Ethernet-Switch with 1 Gbit fibre uplink to the Multi-media Storage PC.

5.1 Switch

The HP ProCurve Switch 2512 is a managed (layer 2) 12-port switch with 10/100 auto-sensing per port and two open transceiver slots for Gigabit uplinks.

It's composed of:

- Transceivers Ports for fibre uplink
- Transceivers Port for connection to Recorder and storage system



Figure 3: HP Switch 2512

5.2 Fibre Link

There are two possible ways for the data transfer:

- To use a 50/125µm multimode fibre optic cable to connect the two computers via HP procure 2512 Switches with Gigabit-SX Transceivers.
- To use a 9/125µm mono mode fibre optic cable. In that case we need the Gigabit-LX Transceiver, which allows also longer cable length.

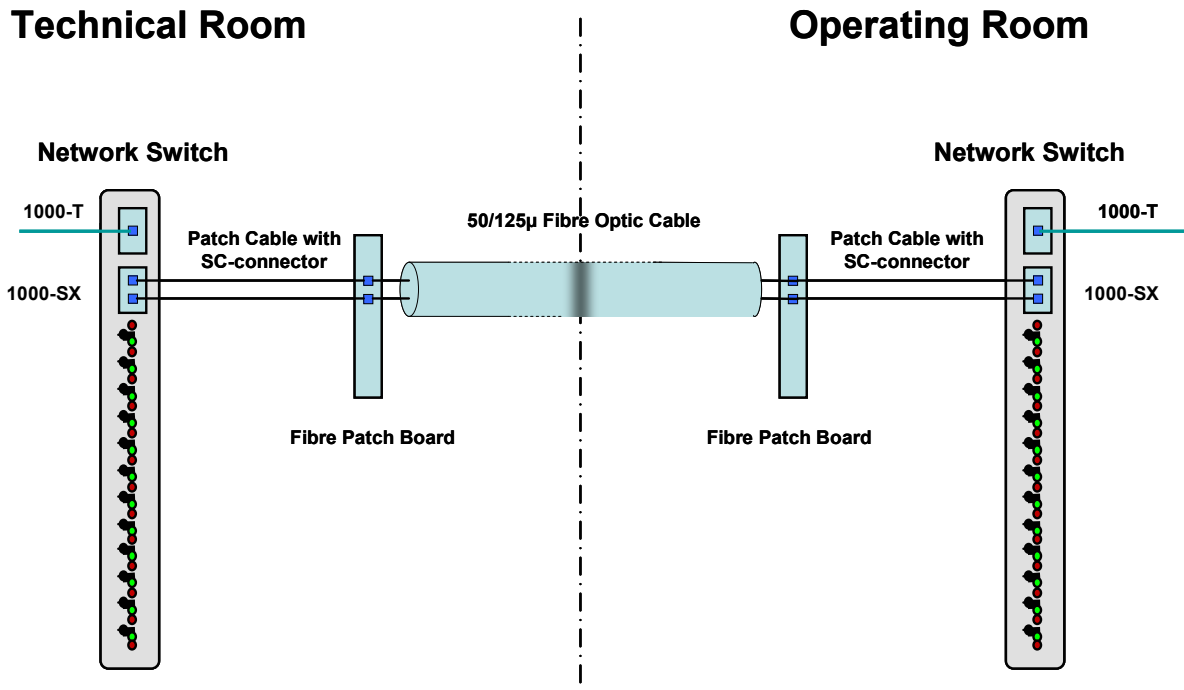


Figure 4: Fibre optic cable

5.3 Network Serial Concentrator

The “Serial Network Concentrator” is used for the remote control of the cameras and for the manual control of the iris.

6 Multi-Media Storage MMS

The Multimedia Storage is realized on standard PCs with integrated hard disks to store the video scenes. The operating system is Win2000 or WinXP from Microsoft.

7 Hardware integration on Airport

The integration and installation of the hardware, consisting of the 8 cameras, recording PC, network with two switches and storing PC, including software will take place on the airport in Toulouse.

7.1 Airport installation

The installation on the test site must be done in cooperation with the airport Toulouse and possibly with other partners.

8 Electrical Installation on Airport

Several electrical installations have been realized on airport Toulouse:

- Camera Installation
- Connections between Cameras and 'Technical Room'
- Fibre optic link between 'Technical Room' and operating room
- Weather conditions compliance