

Chapter 6

Always A Pioneer, Always Ahead



Intelligent Video Analysis

Dr Zaheera Zainal Abidin
zaheera@utem.edu.my

By the end of the lesson, the student will be able to:

- a. understand the concept of video analysis
- b. understand the log format
- c. Identify the challenges of video analysis integration

OVERVIEW

Always A Pioneer, Always Ahead

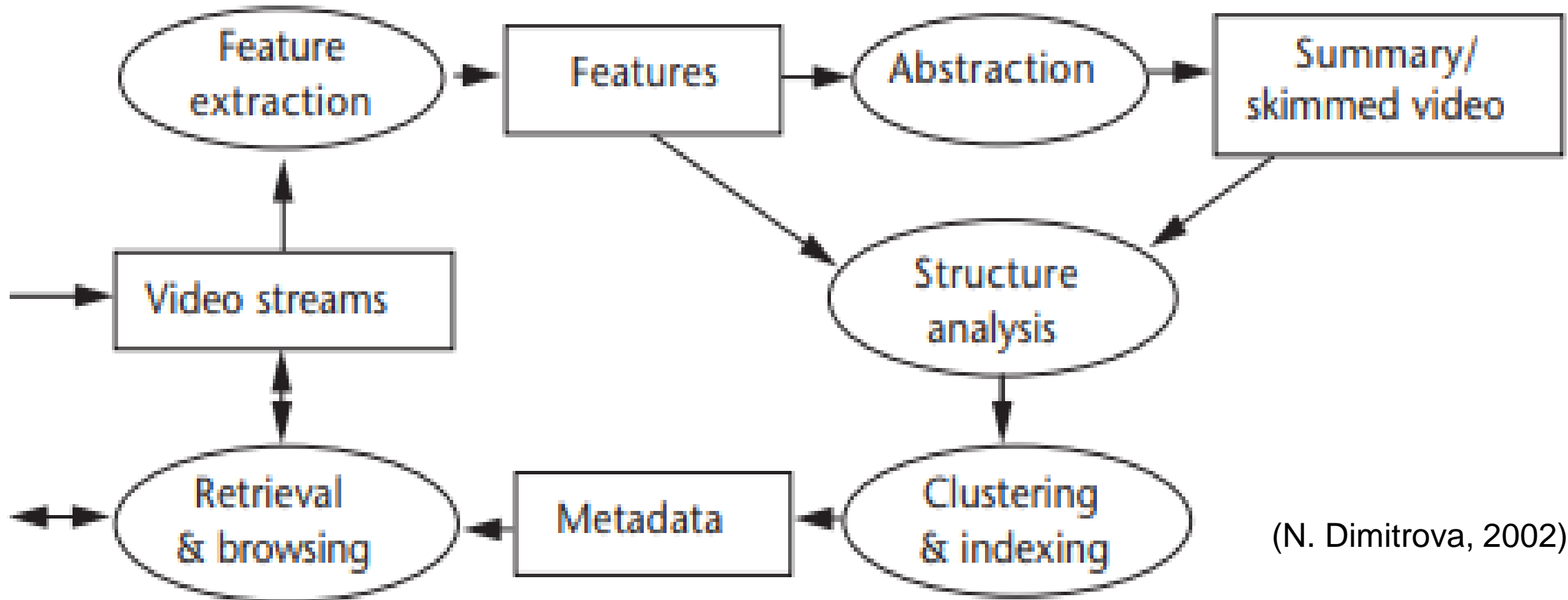
- Introduction
- Technology Background: video content analysis
- Concept of Human Recognition - Gait
- Tools used video analysis: Cernium
- Challenges of integration in video analysis
- Log format
- Vidient

INTRODUCTION

INTRODUCTION

- Intelligent Video (IV) is a technology that leverage the existing video surveillance system from recorded video.
- IV is called as Video Content Analysis (VCA) or Video Analytics (VA).
- Driven by artificial intelligence and deep learning, the software of video intelligence performs detection of an intruder, extracts objects in video and classify object during the video analysis. Besides, the video intelligence software searches, filters, alerts, do the data aggregation and visualization.
- Typical scheme of Intelligent Video content analysis involves 4 majors process:
 - Feature extraction
 - Structure analysis
 - Abstraction
 - Indexing

Scheme of Video Analysis



(N. Dimitrova, 2002)

INTRODUCTION

- Feature Extraction
 - The video feature (such as colour, texture, shape, structure, layout and motion) of video record is obtained and transformed into semantic concept (such as indoor, outdoor, people) and audio domain (such as pitch, energy and bandwidth) that allow for segmentation and classification.
- Structure analysis
 - A process of segmenting the video records according to their temporal structures and relation of databases into an individual scene. Also, in structure analysis, it detects temporal boundaries and identify meaningful segments of video.
 - Two approaches for automatic program sequence recognition, which is a) film production rules and b) prior program models.

INTRODUCTION

- Video Abstraction
 - A process of creating a presentation of visual information about landscape or structure of a video, either should be shorter or longer than the original video.
 - Example: the idea of an abstraction is like finding keyword in a text document.
 - A visual table of contents of a video program is a combination of structure information extracted from video and keyframes from video abstraction.
 - Methods used in video abstraction are: a) skimming, b) highlights and c) summary.
- Indexing for retrieval and browsing
 - Indexing means converting the raw frames into a set of cluster, which is called as semantic information query. The information query refers to metadata.
 - The metadata is important for retrieval and browsing the video.

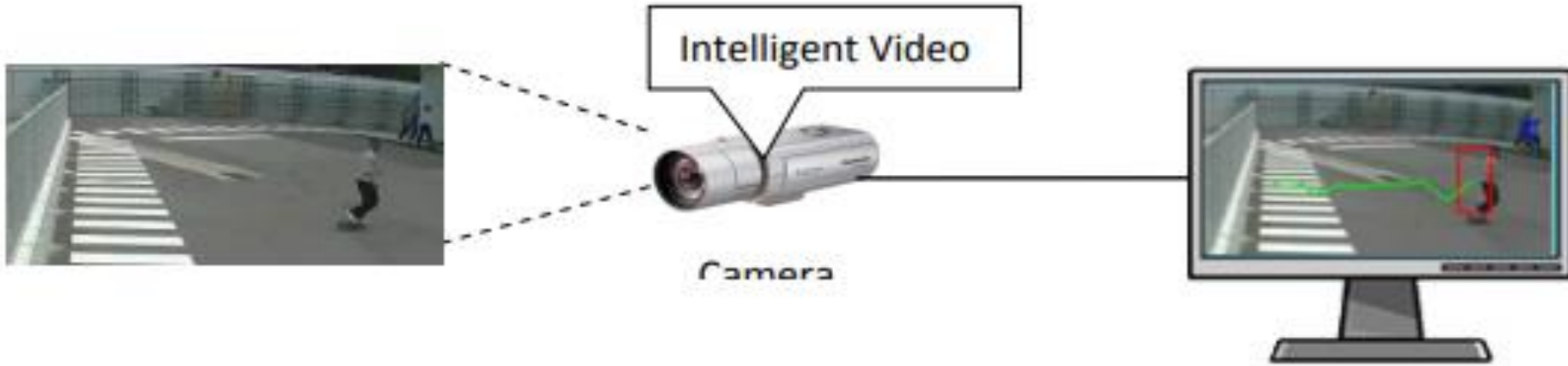
INTRODUCTION

- Intelligent Video focuses on integrating video surveillance and monitoring (VSAM) technology with ESM.
- Dealing with detecting the attacker sneaking into data center and attempting to compromise a system. Eg: brute force login attempt.

Types of System Configurations

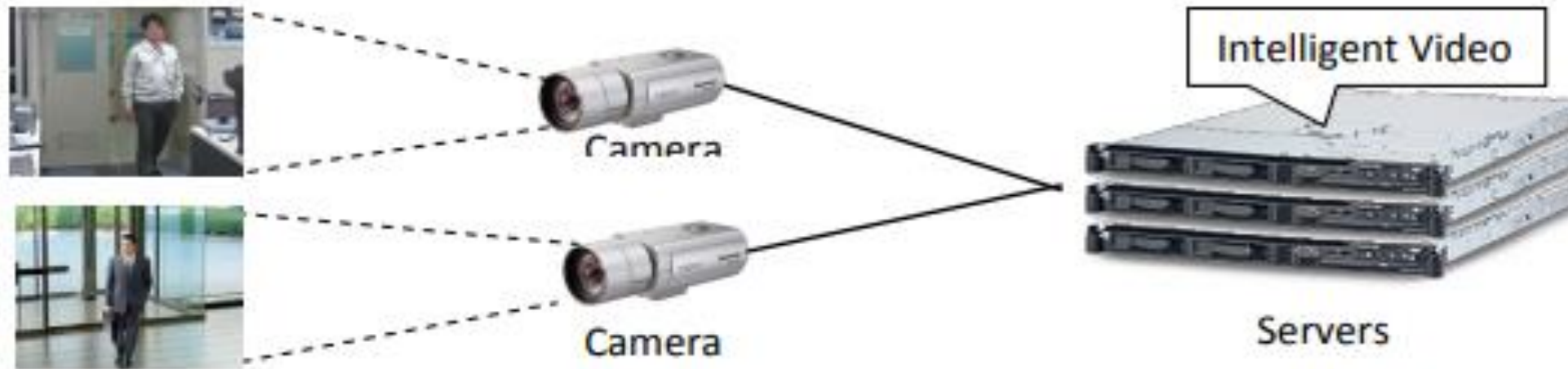
- Edge-Based Systems (Intelligent Video runs on the camera)
- Server-Based Systems (Processing is done on a central server)
- Hybrid Systems (Combine Edge-Based & Server-Based Systems)

Edge-Based Systems (Intelligent Video runs on camera)



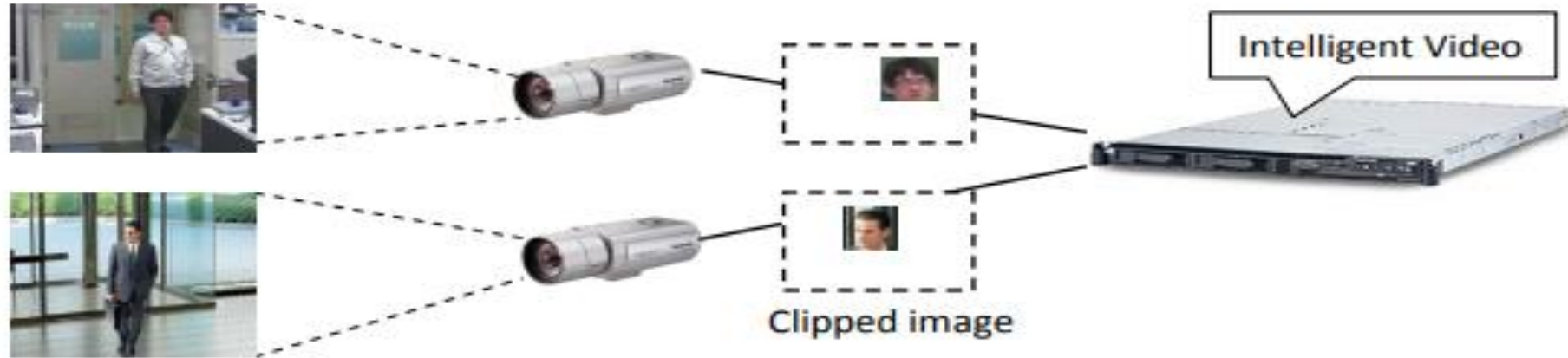
Network camera performs analyses of image and gives an alarm notification to the operators based on pre-configured alerting rules. Edge based system does not require a high-performance central server and it makes system more scalable, reliable and cost-effective. Auto tracking and face detection are example of application that use edge-based system configuration.

Server-Based Systems (Central server does the processing)



Server-based system enables more complex analyses. All images captured by cameras are sent to the central server and the server analyzes them with the stronger processing power, larger memory space, higher-speed data base access and more sophisticated software.

Hybrid Systems (Edge-Based + Server-Based Systems)



Hybrid system combines edge-based system with server-based system and substantially reduces the overload of server and network. It enables smaller size system to execute the Intelligent Video applications. Suppose a system detects anonymous from visitors. It compares every captured image with photos on the database. The server only needs the part of facial expression of the captured image. The rest of video frames are a waste to the server and network. Cameras clip the facial part on the edge and the server did a facial comparison. Hybrid system optimizes it.

Technology Background

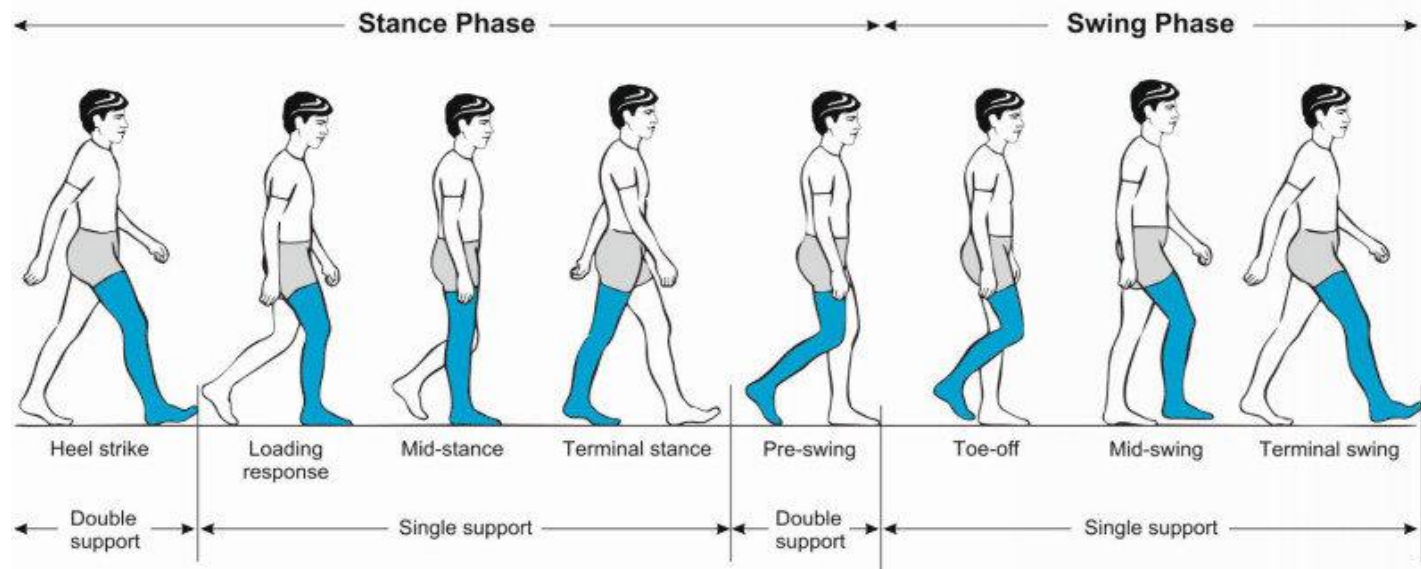
Technology Background

- Begin in early 1970s when video analysis is part of a Carnegie Mellon University project funded by DARPA.
- Video analytics – motion detection to detect the difference between a human and an object such as car passing in front of a camera.
- video surveillance and monitoring (VSAM) is not only used as a security measure but also in case of retail stores and analyze shopper behaviors.
- In most cases, VSAM turned as post mortem and forensics tool since video feeds being used as part of an investigation after incidents has occurred.
- Value proposition using VSAM is in real time and alerting the incidents.

Human Recognition

Human Recognition

- Video Surveillance and Monitoring extracts the image of human from the mass of video streaming into the system using gait.
- **First step:** Look for the distinguishing features of a human being
 - A human has moving parts such arms and legs
 - A human walks or human gait through analyze joint angle between knee joint and foot.
- **Second step:**
 - Video Analysis



Video Analysis for Human and Object Detection

- Video Analysis or Video Content Analysis (VCA) is a process of extraction of the metadata from raw video that is useful for further video processing in applications.
- The purpose of video content analysis is to provide extracted features and object identification for video retrieval, video similarity finding and navigation.
- Algorithms perform content analysis involves object detection in video, recognize specific object. Persons, location, dynamic events in video, image regions and many more.

Video Analysis for Human and Object Detection










FiView- IVS

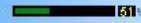

Server List





- Root
 - 2
 - 2 - 192.168.0.232
 - 2 - 192.168.0.235



Basical Control **Analyse Rule**










DISK  61%
 CPU  60%

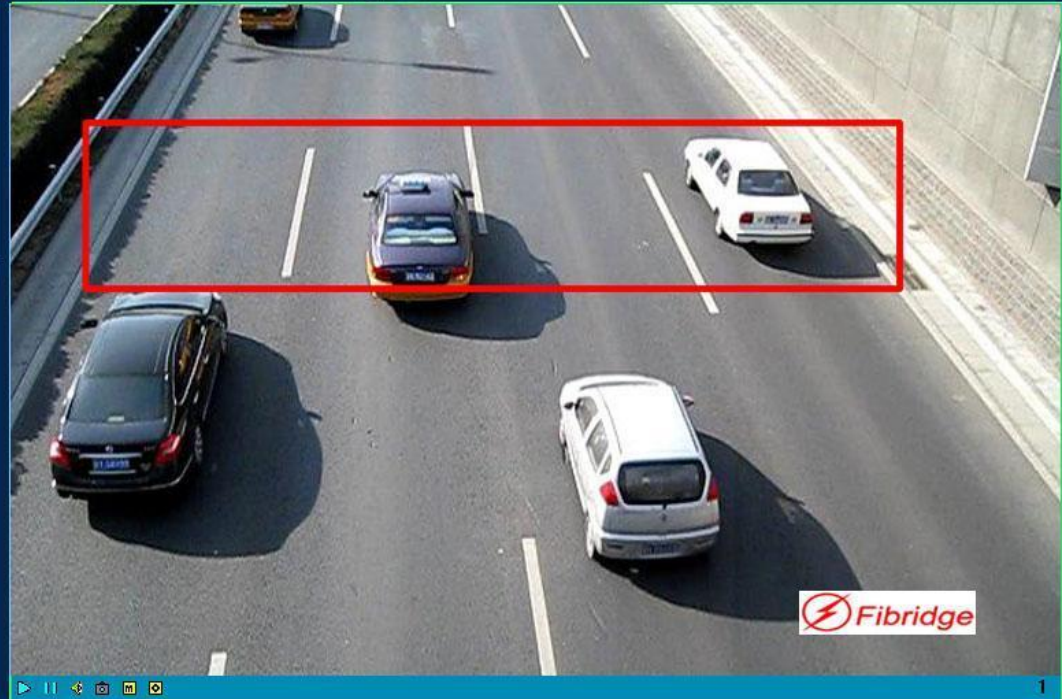





F- A/F F+

FIBRIDGE



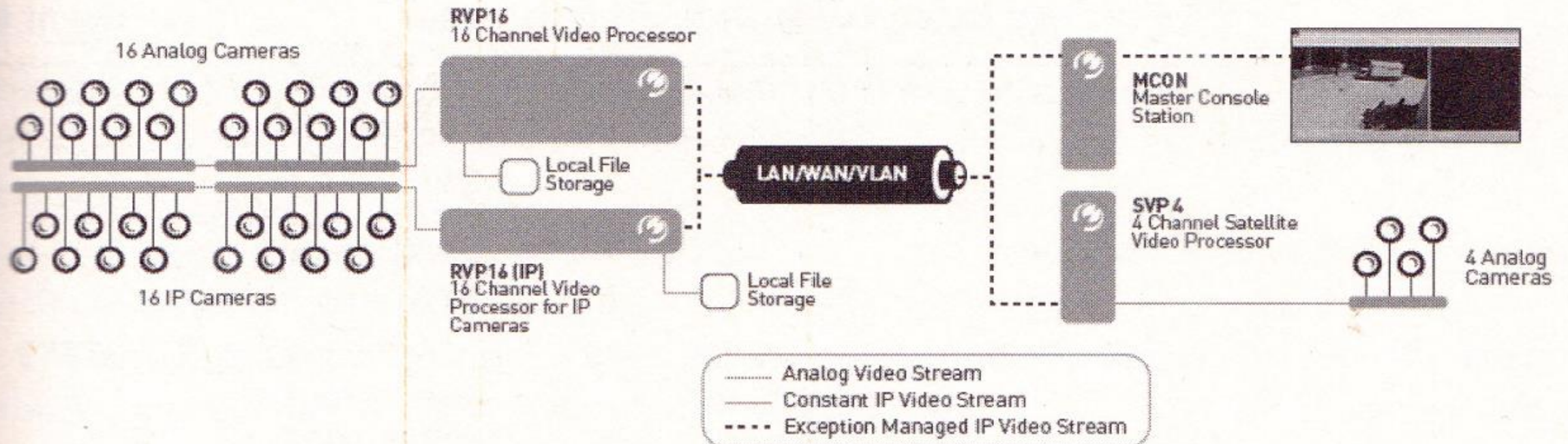
NO.	Type	Date	Time	Content

Tools for Video Analysis

Tools used video analysis: Cernium

Always A Pioneer, Always Ahead

- Combination of physical security device such as video analytics system with common operating system logs to detect intruders.
- Cernium product called as Perceptrak.



Configure Scoring Group

percepttrak



File Day Set Time Zone Help

ScoreAll

All Days

TimeZone 1

Start Time: 12:00 AM End Time: 11:59 PM

☒ Object Selected Recording ☒ Record MPEG ☒ Active

	Single Person	<input type="checkbox"/> Quiet Boost
	Fast Person	<input type="checkbox"/> Quiet Boost
	Fallen Person	<input type="checkbox"/> Quiet Boost
	Lurking Person	<input type="checkbox"/> Quiet Boost
	Erratic Person	<input type="checkbox"/> Quiet Boost
	Multiple People	<input type="checkbox"/> Quiet Boost
	Converging People	<input type="checkbox"/> Quiet Boost
	Crowd Forming	<input type="checkbox"/> Quiet Boost
	Crowd Dispersal	<input type="checkbox"/> Quiet Boost

	Single Vehicle	<input type="checkbox"/> Quiet Boost
	Fast Vehicle	<input type="checkbox"/> Quiet Boost
	Slow Vehicle	<input type="checkbox"/> Quiet Boost
	Sudden Stop	<input type="checkbox"/> Quiet Boost
	Multiple Vehicles	<input type="checkbox"/> Quiet Boost
	Stationary Object	<input type="checkbox"/> Quiet Boost
	Motion	<input type="checkbox"/> Quiet Boost
	Wrong Way	<input type="checkbox"/> Quiet Boost
	Museum Mode	<input type="checkbox"/> Quiet Boost

TimeZone Summary:

Time Zone 1: 12:00 AM - 11:59 PM

CHALLENGES OF INTEGRATION

CHALLENGES OF INTEGRATION

Always A Pioneer, Always Ahead

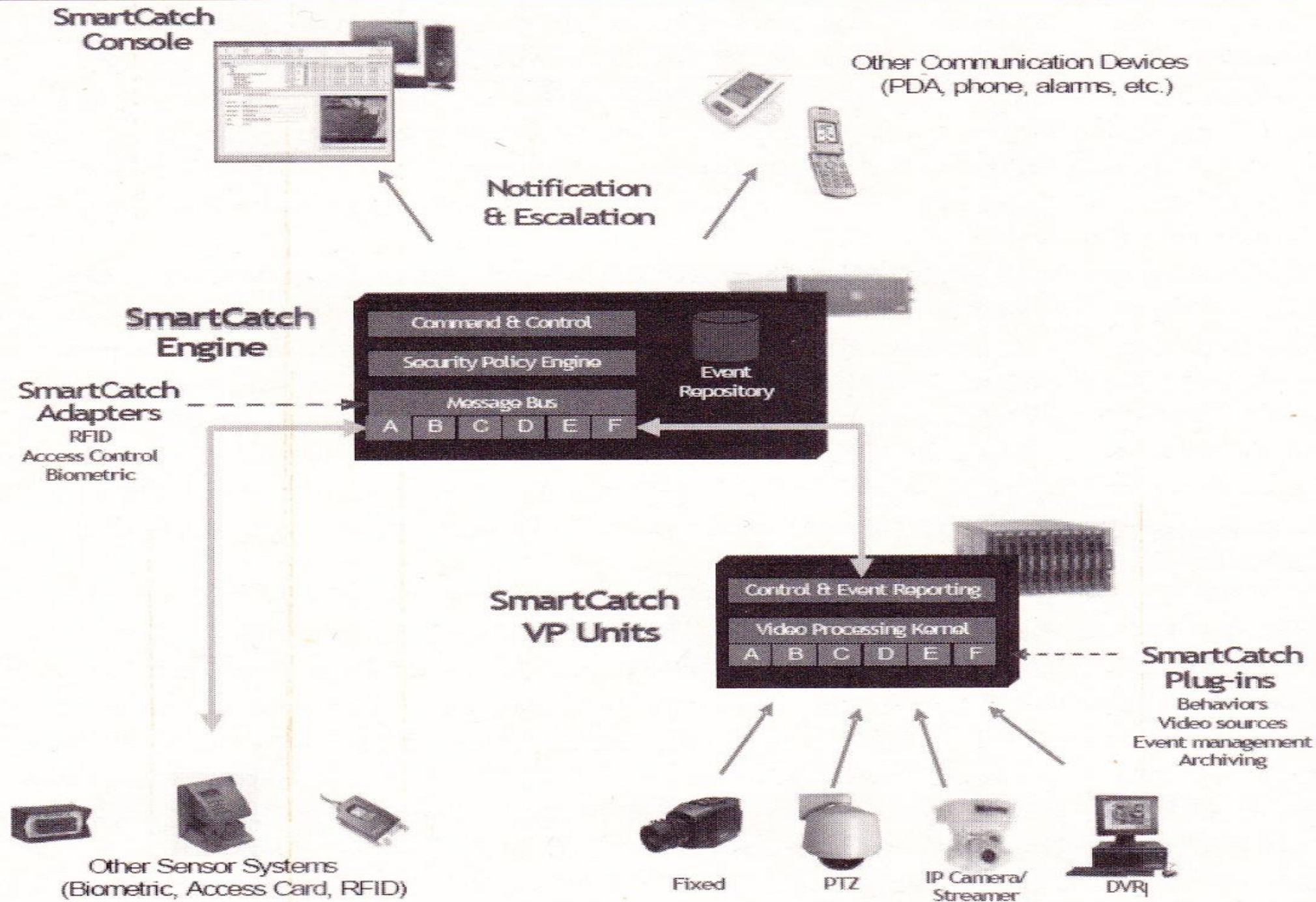
- The easiest way of ESM connector collects data is via an ODBC connection for a remote database. If the linker is not successfully executed, then the video is failed to obtain.
- All alerts written to a database query remotely. Option for remote connection is a must for sending alert or notification.
- The hardest part of any database integration is typically to understand the **device schema** so that the appropriate fields can be designated in the query.

LOG FORMAT

Always A Pioneer, Always Ahead

Camera Name	Camera ID	Event Message	Event Date	Score	Event ID	URL
Lobby-1	2	Multiple Person	11/10/2020 8:28:11 a.m.	30	87654	http://x.x.x.x:8081/events?action=getMovie&camera=2&dte=2020-11-10--08-28-09&type=mobile
Parking Lot-1	1	Anonymous	11/10/2020 8:28:11 a.m.	70	87655	http://x.x.x.x:8081/events?action=getMovie&camera=2&dte=2020-11-10-08-28-10&type=mobile
Section 3-2	4	Object Left	11/10/2020 8:29:10 a.m.	80	87656	http://x.x.x.x:8081/events?action=getMovie&camera=2&dte=2020-11-10-08-28-11&type=mobile

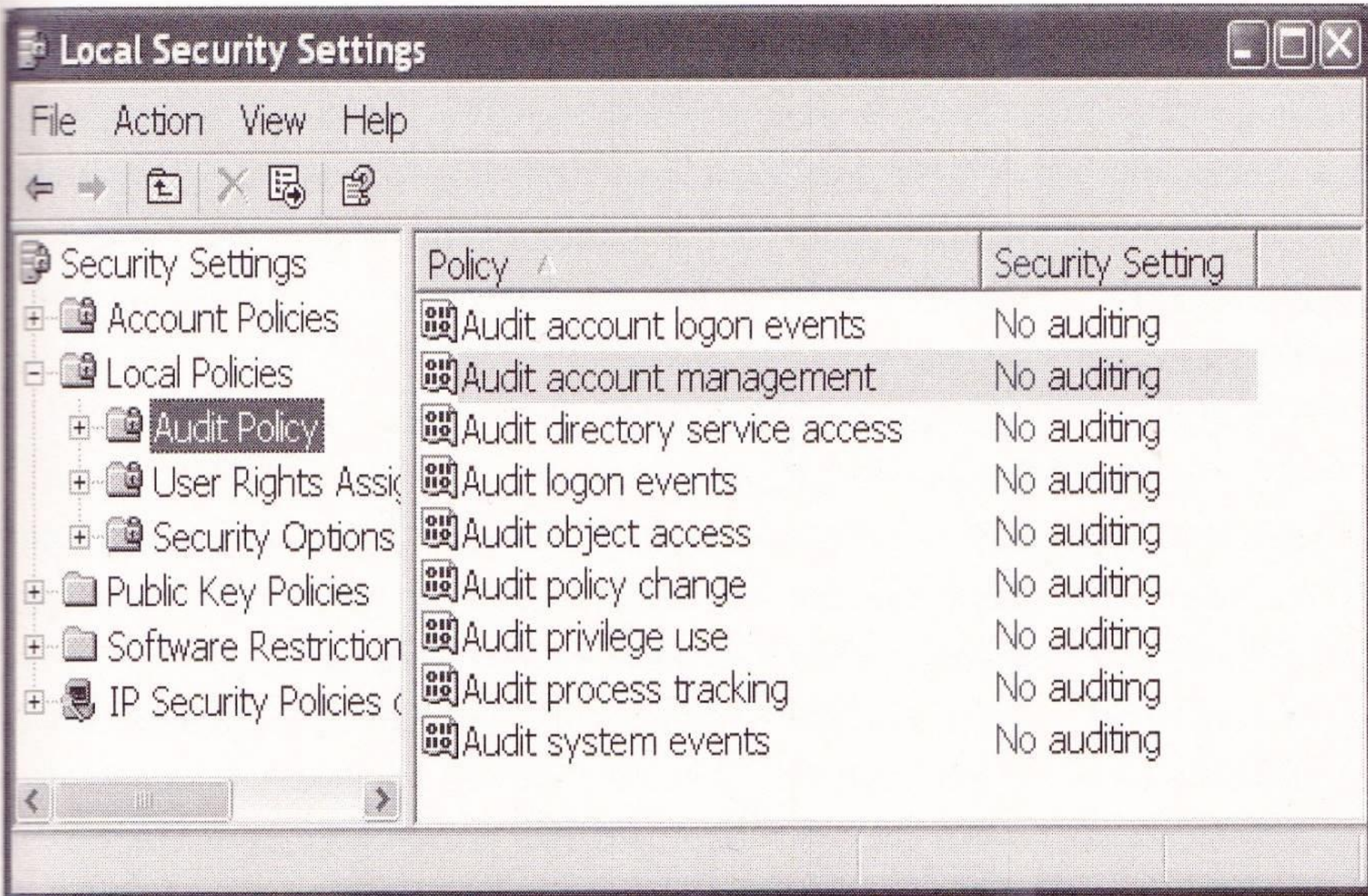
- Vidient is spin-off detection capabilities on algorithms that were developed in NEC Lab.
- Vidient product, SmartCatch, focuses on detecting objects in motion, classifying objects accurately and tracking correlation against predetermined policy.
- It identifies a suspicious person walking through a camera's area and the system tracks the person by reporting the person's current location.
- Airport are on obvious choice for integrating video analytics technology, airports have a lot of security concerns.

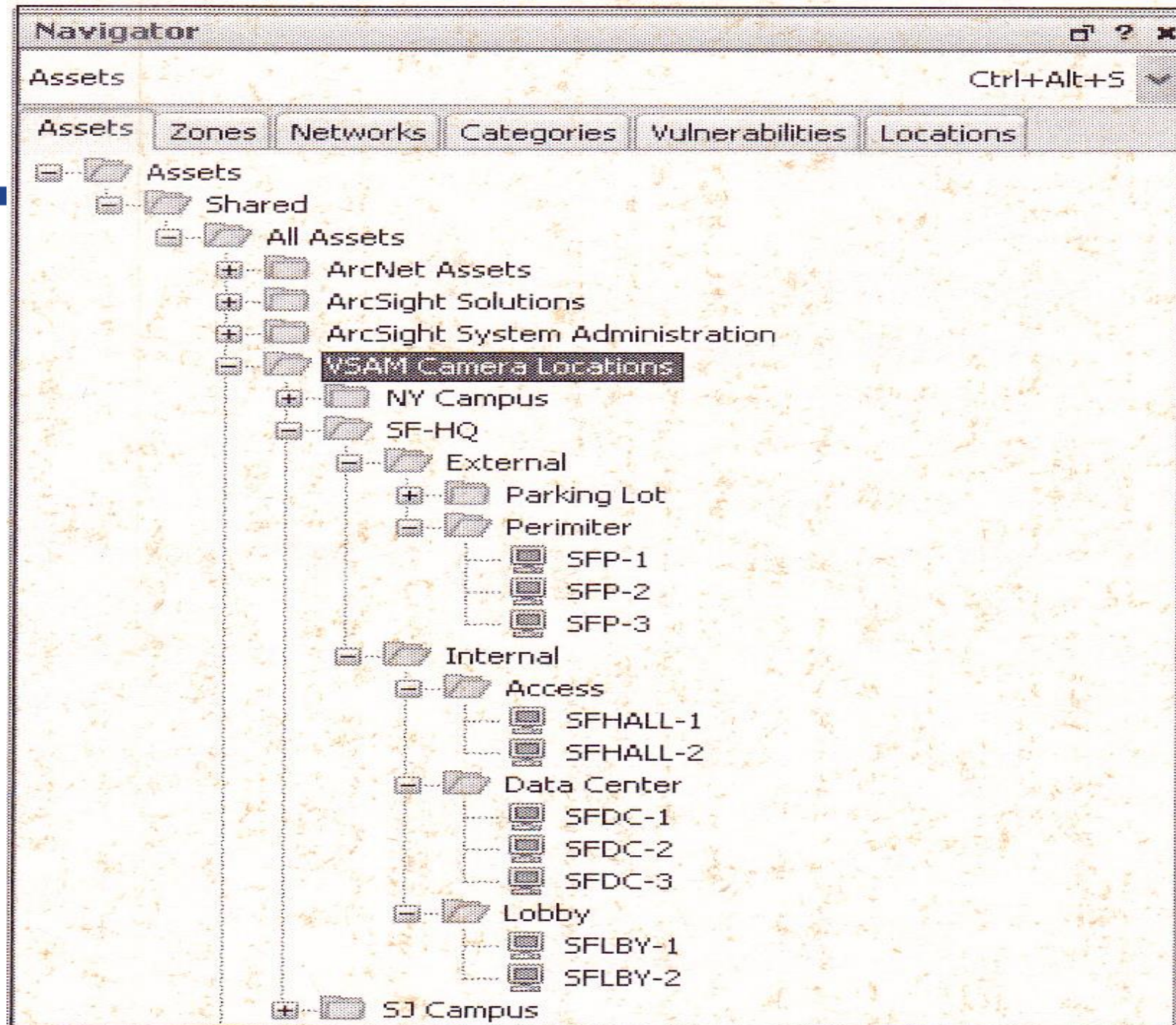


OPERATING SYSTEMS

Always A Pioneer, Always Ahead

- OS generates many different kinds of events
- UNIX uses the syslog facility and binary logging files
- Windows use the Windows Event Log service: the system log, application log, security log
- Control Panel > Administrative Tools > Local Security Policy > Local Policies > Audit Policy

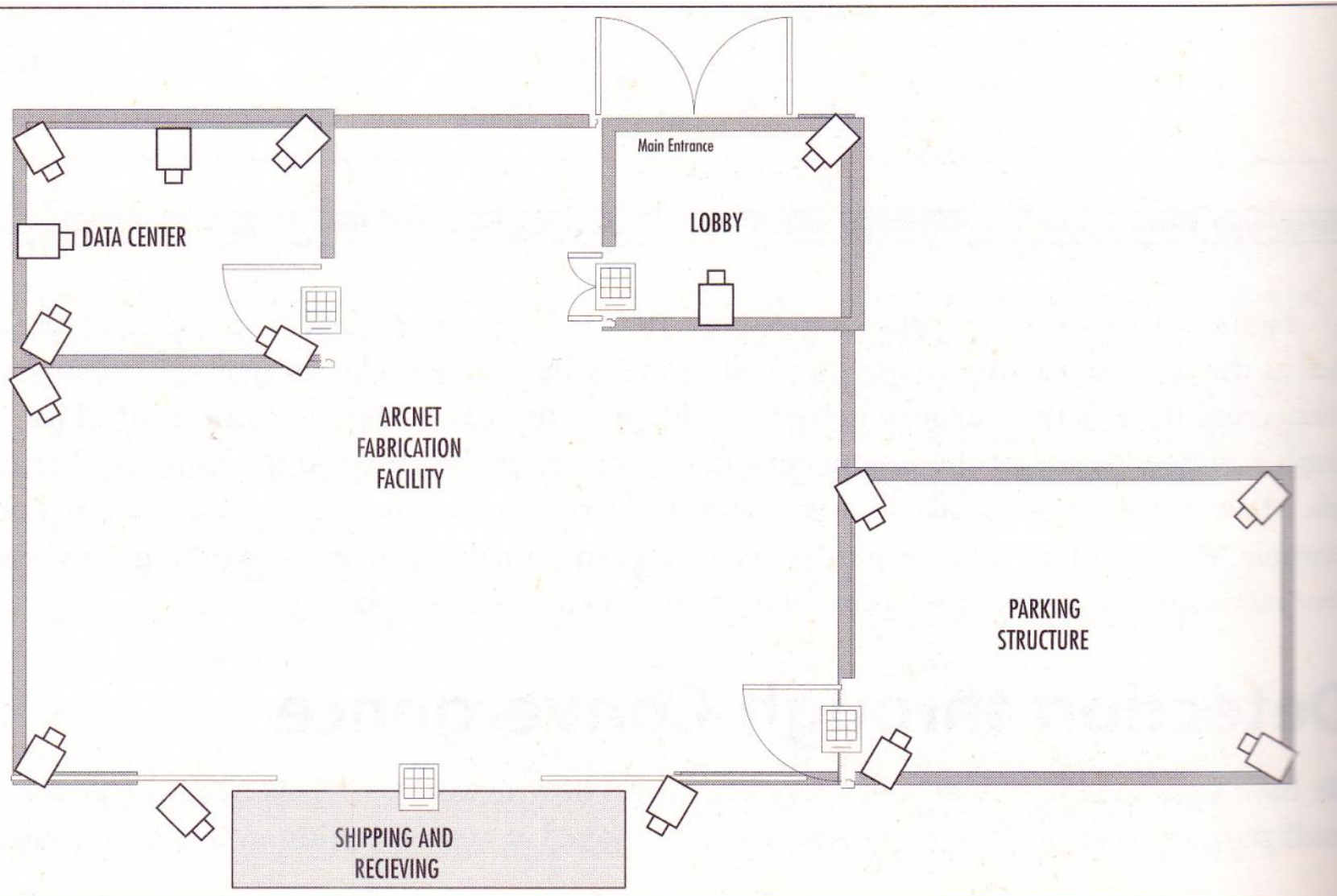




Always A Pioneer, Always Ahead

Detection through Convergence

Always A Pioneer, Always Ahead



Detection through Convergence

Always A Pioneer, Always Ahead

Alert Monitor Console: Con

User: Console Groups: Console Settings: Events: Logs: Controls: Help



Video 1

Parking Garage

Front Drive: 04/18/2006 01:29:14 PM

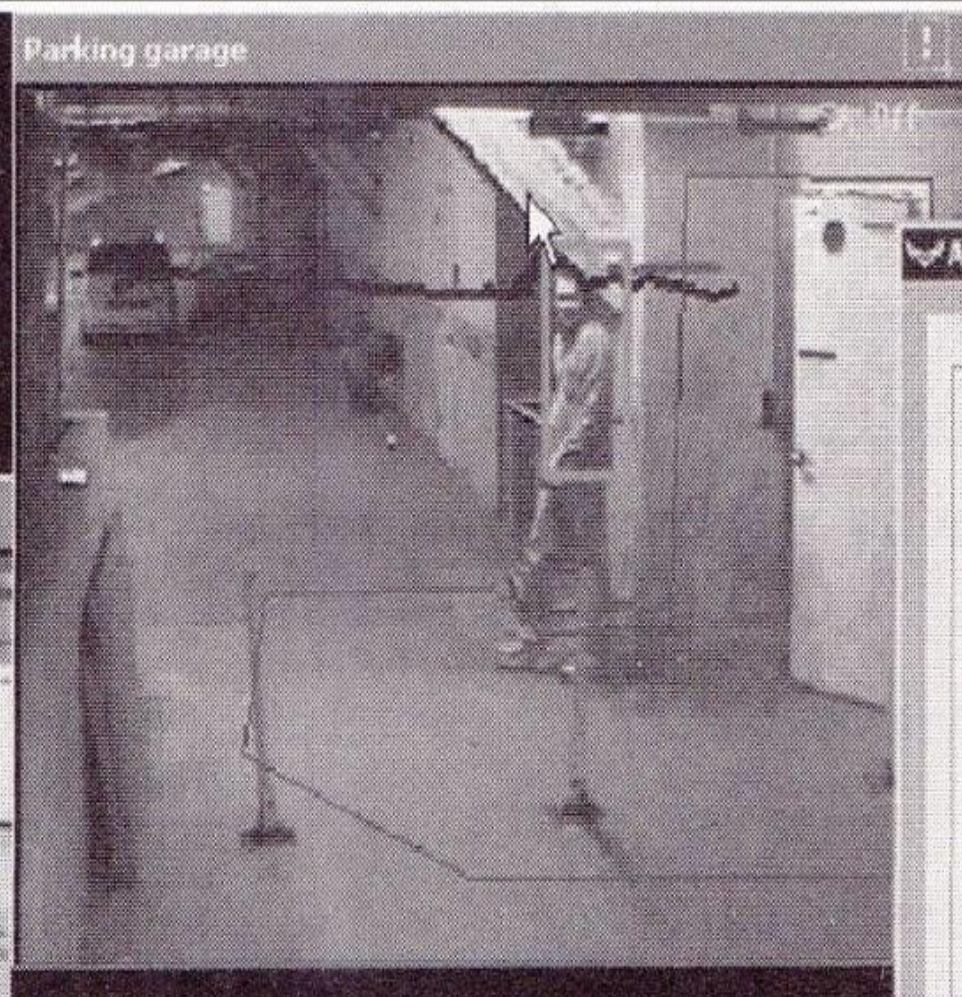
Flight Line

Front Drive

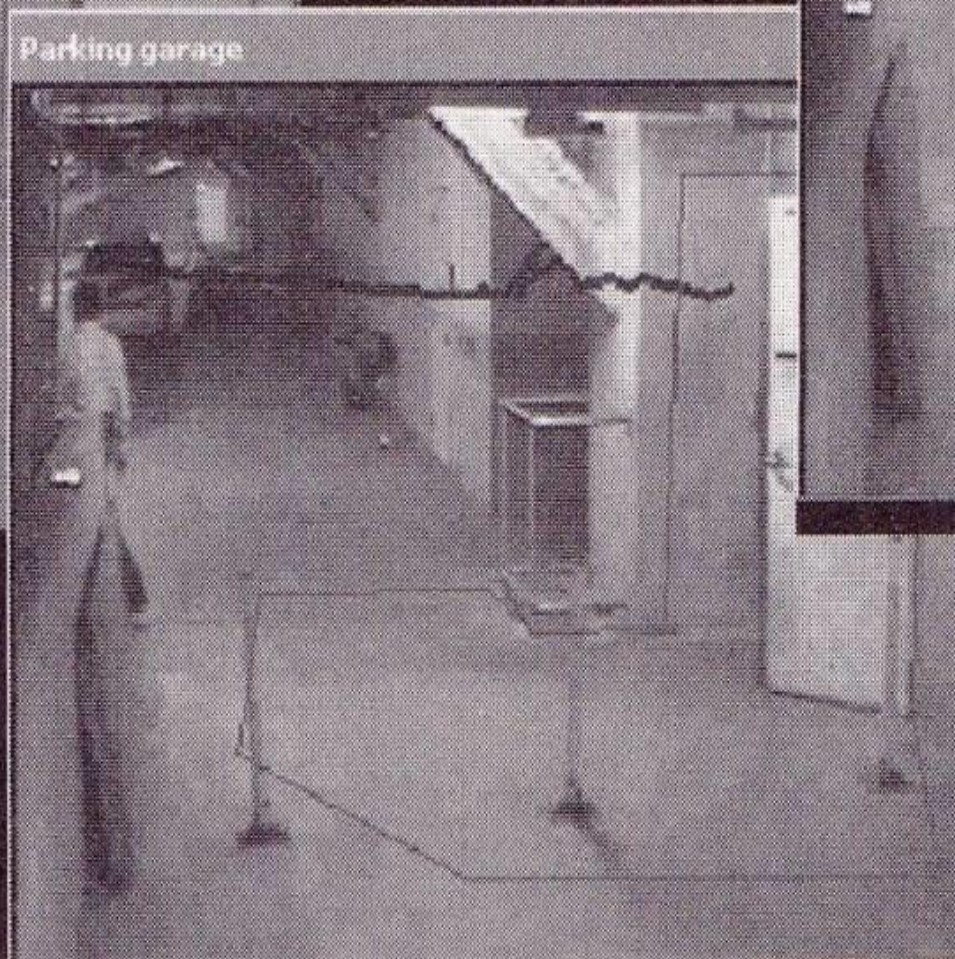
C003 Apr 18 2006, 01:29:13 PM

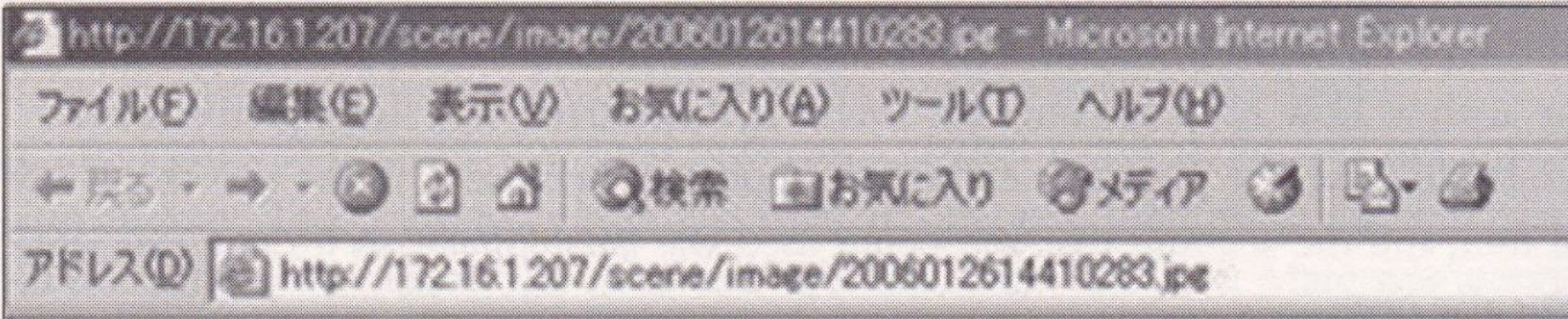
- 01:32:00 PM /Flight Line/ Single Person
- 01:31:51 PM /Parking Garage/ Single Person
- 01:31:50 PM /Front Drive/ Large Vehicle
- 01:31:38 PM /Flight Line/ Fast Person
- 01:31:32 PM /Parking Garage/ Single Person
- 01:31:27 PM /Flight Line/ Single Person
- 01:31:19 PM /Front Drive/ Large Vehicle
- 01:30:49 PM /Front Drive/ Large Vehicle
- 01:30:40 PM /Flight Line/ Fast Person

CMDCTR

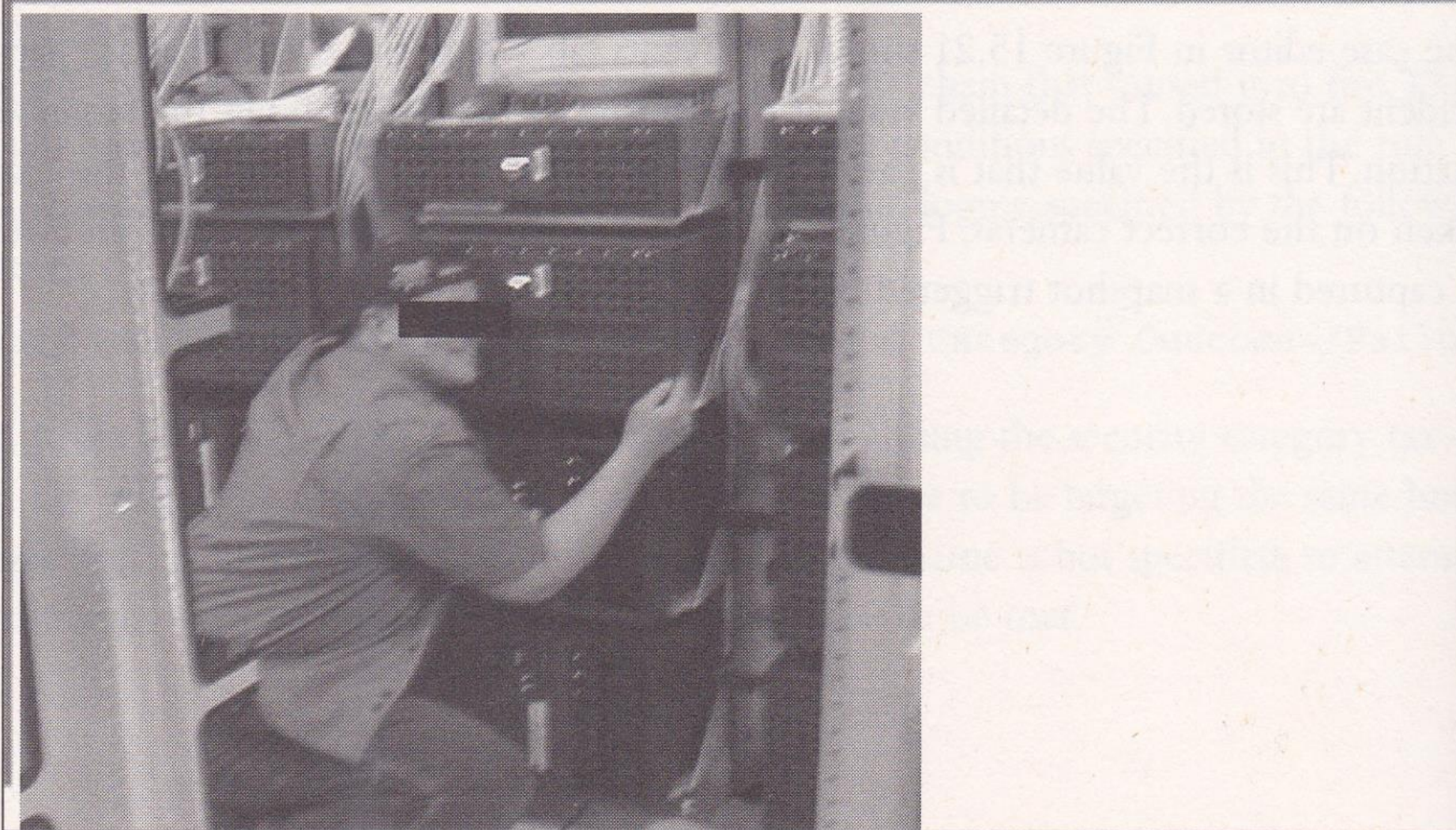


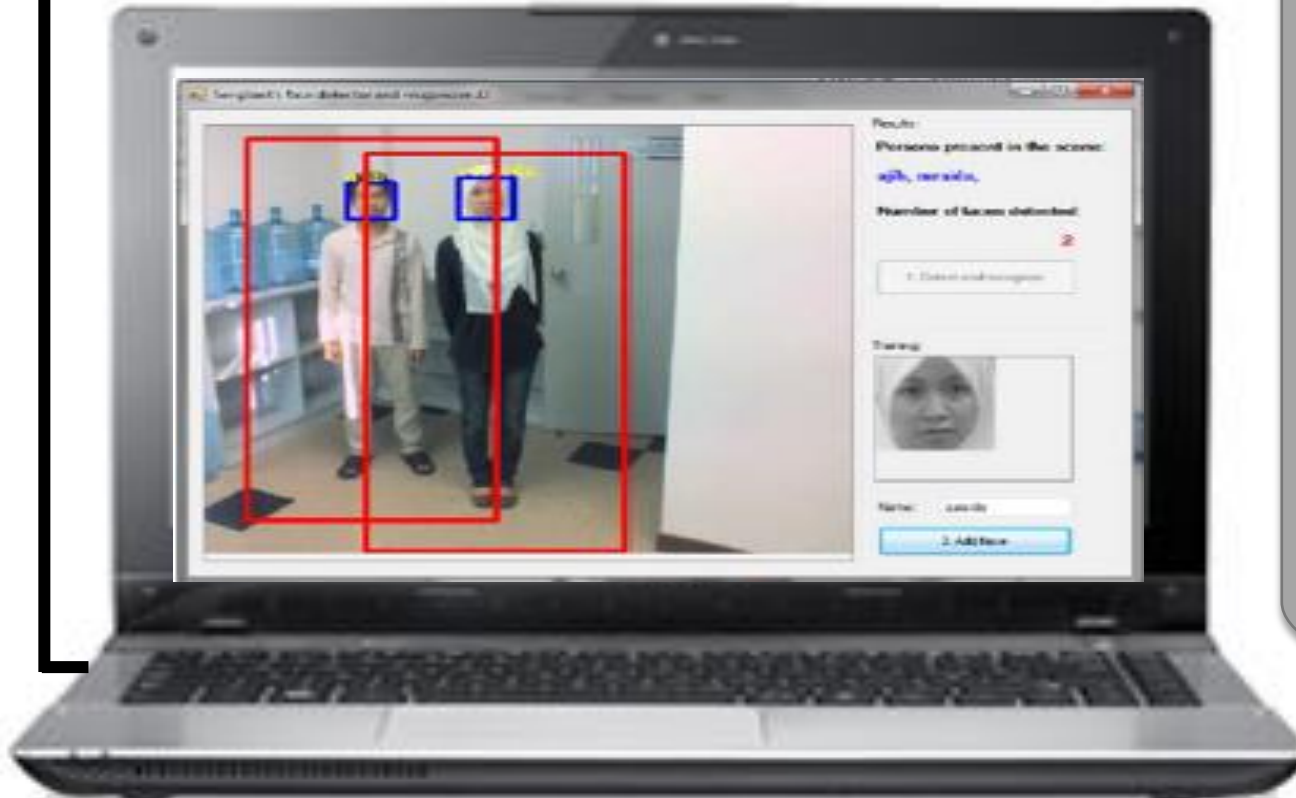
Ahead





Always A Pioneer, Always Ahead





Face Image Database



Conclusion

- VASM becoming more prevalent in today's security infrastructure.
- The integration of intelligent video analytics combined with logical events as been part of a closed-loop incident detection and investigation process.
- Video analytics allows organizations for cost effective due to less use of human operators monitor at the monitor screen.
- Main benefits – prevent insider threats, protection against physical perimeter threats and for public safety concerns.

References

- N. Dimitrova, et. al., Applications of video-content analysis and retrieval, 2002 IEEE Multimedia, IEEE, pp 42-55

Thank You



38

www.utem.edu.my