

**SAFER
ROADS**

**SAVE
LIVES**

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**Image-based Tunnel Safety
Management System**

Sunsky International Ltd.

Agenda

- >> Why need Image Incident Detection(IID)?
- >> Major function of IID system
- >> Tunnel safety management application
- >> Case study



Why We Need Image Incident Detection?



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Why Need Image incident detection?



- ❏ It's difficult to relieve when tunnel accident occur
- ❏ How to take actions as soon as possible at the initial stage of the accident is an more important issue.



How Can We Do?

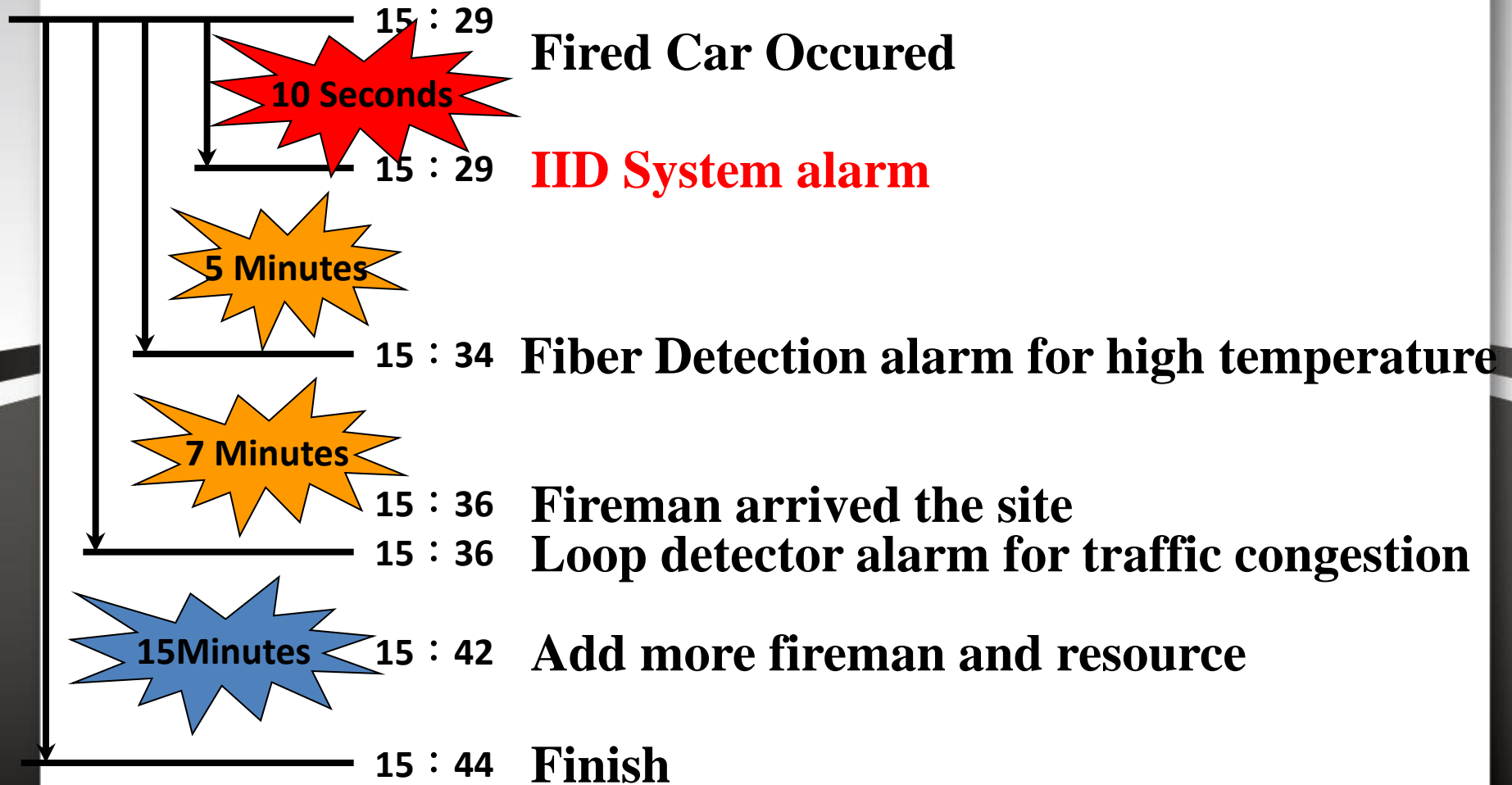


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2007 / 7 / 13 Fired Car in Bagua Tunnel



IID Advantage



The Concept of IID

Step 1

Grab
Images

Step 2

Analyze
Images

Step 3

Incidents
Alarm



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Video Image Processing Algorithm

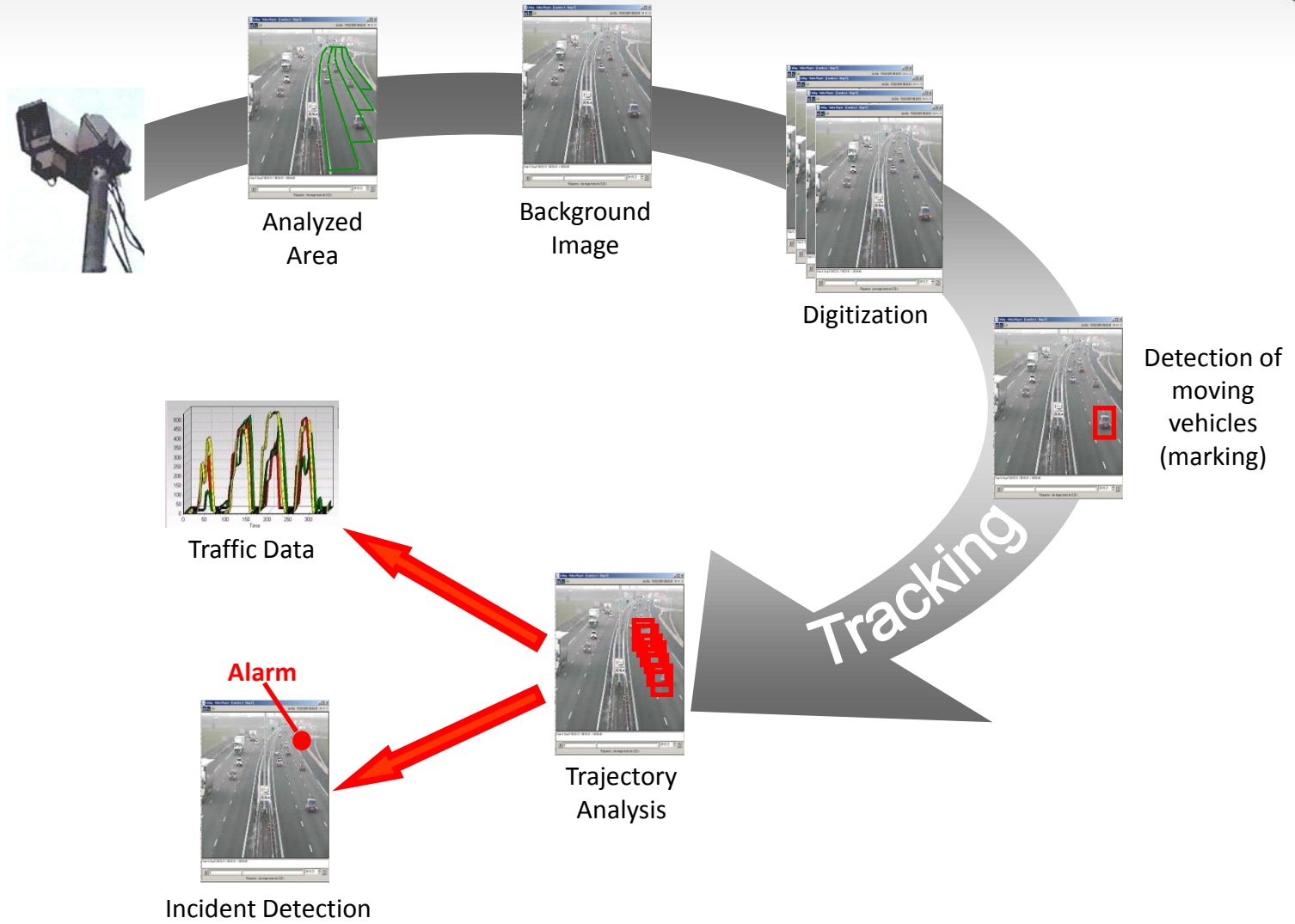
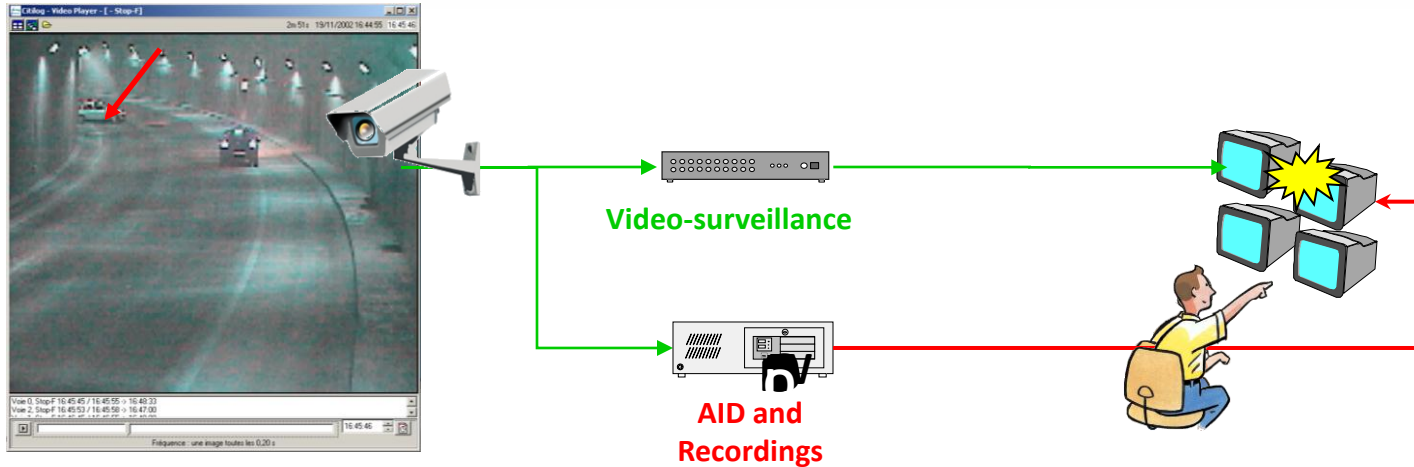


Image is the Key

The image language is **universal and consensual**



Permanent analysis of all the cameras

Automatic alarms with **live** and **recorded** images

Live

Validation of the incident through the live images

Removing of all doubts using the video sequences of the incident

Immediate and relevant decision making

Off-line analysis

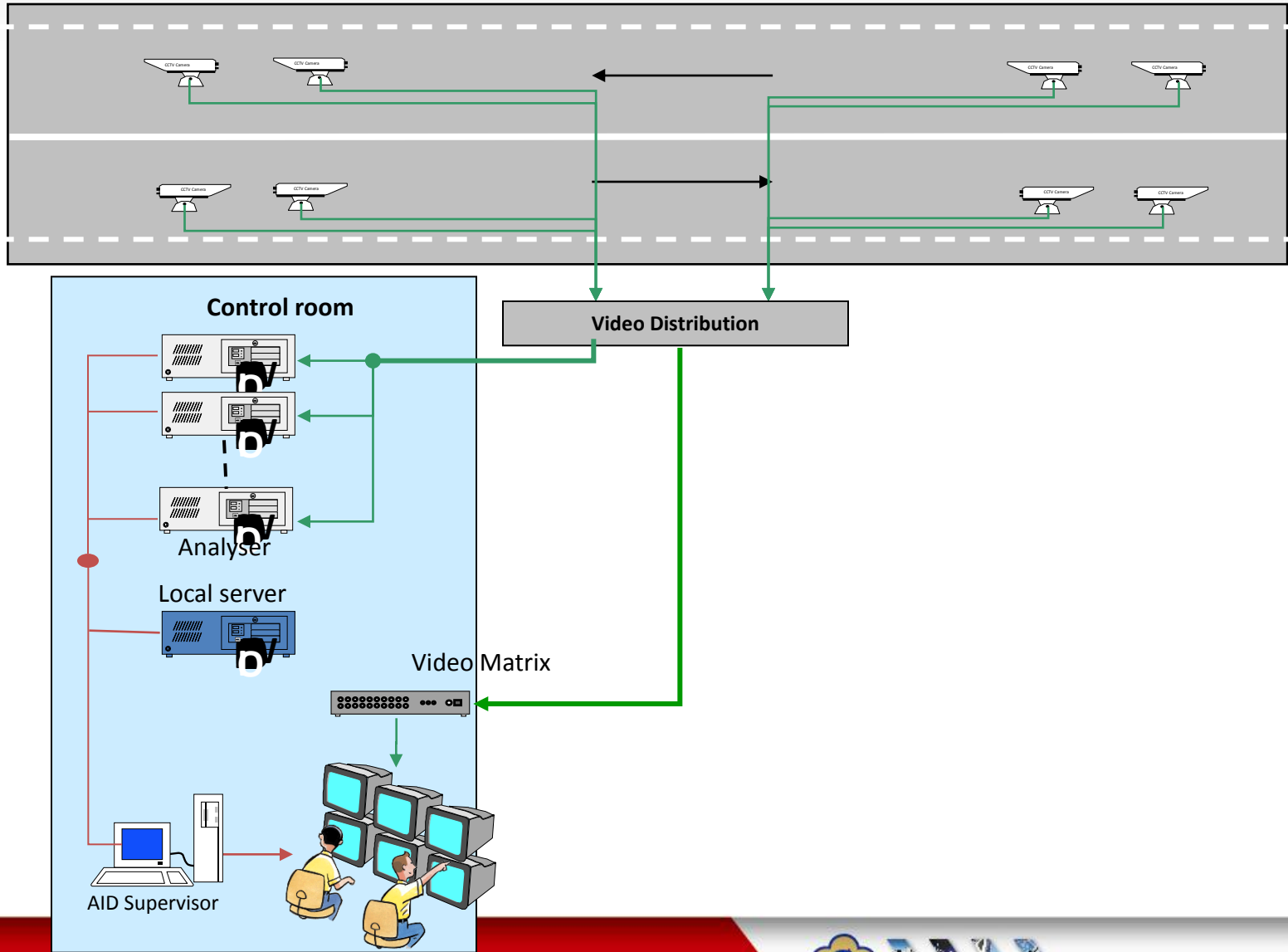
Deeper analysis of the incidents: 24 hours digital recordings (MPEG 4, H.264)

Memory of the road network: Database, SQL request



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Typical System architecture

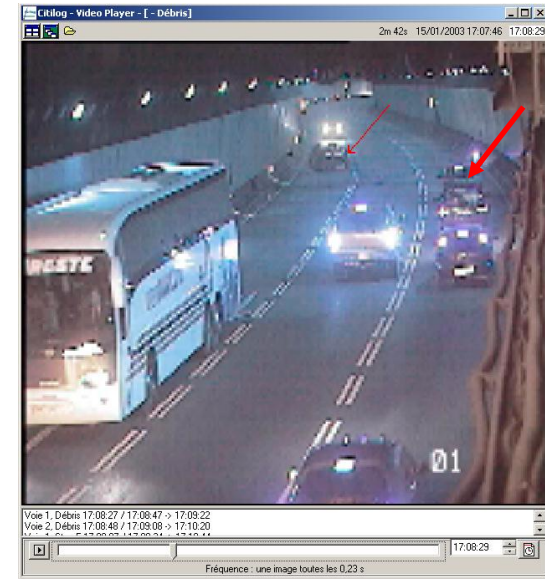


IID system Features

IID system is an important tool for **safety** and **management** of tunnels.

Alarms

- | | |
|----------------------------------|--------------|
| Stopped vehicle | Wrongway |
| Congestion | Slow vehicle |
| Pedestrian | Debris |
| Smoke | |
| Speed above or below a threshold | |

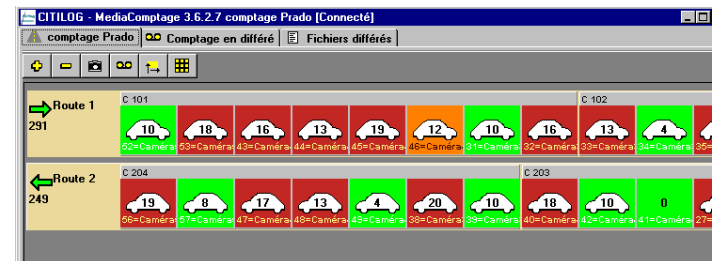


Traffic Measurement

- | | |
|---------------|----------------|
| Flow | Occupancy rate |
| Average Speed | Queue length |

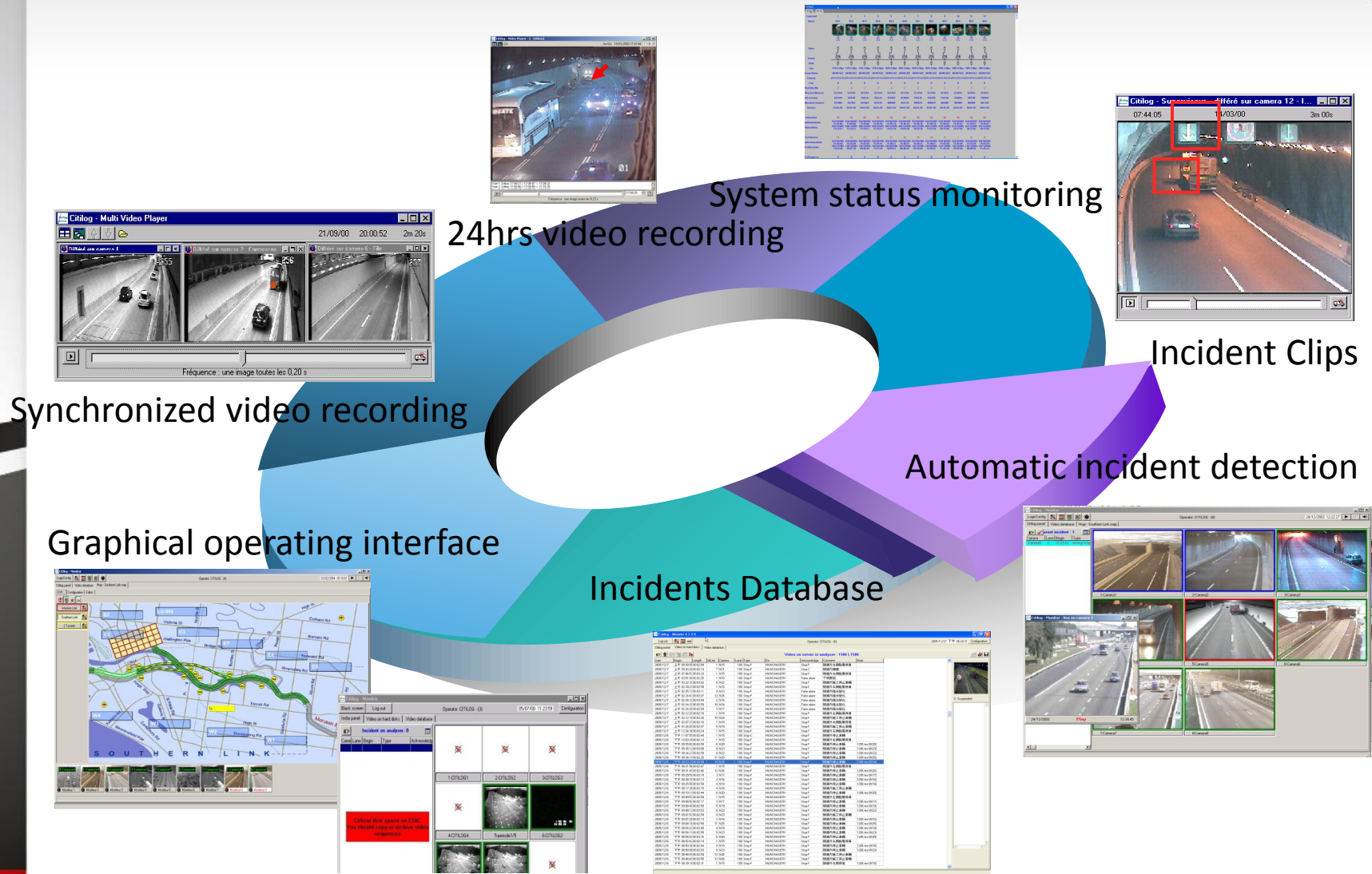
Management for operators

- Video sequences of the incident
- Permanent digital recording
- Timed and dated files of measures



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IID system Main Function



Actually Detection Examples

Stopped Vehicle



Wrong Way



Debris



Traffic Congestion



Visibility



Pedestrians



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Case Study - Shueshan Tunnel Group Project(1/2)

- Project Statements
 - Length of Shueshan Tunnel is 12.9km
 - Top 5 long tunnel worldwide
 - The longest tunnel in Taiwan
 - Tunnel groups contain 4 tunnels(8 tubes)
 - Subsystem
 - IID System - 360 cameras inputs
 - VMS - 591 cameras inputs
 - Fiber transmission system
 - Traffic data collection
 - UPS Power system



Case Study II - Tunnel Groups of North Freeway Project

- Project Statements
 - Total 8 tunnels(16 tubes)
 - 3 sub-traffic control centers
- Advantaged
 - Integrated freeway AID system
 - Enhance Tunnel groups safety management
 - Coordinate with SCADA and CMS system



Thanks for Your Listening



Sunsy International Ltd.
Safer Roads Save Lives



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