

# D46.3 Report on consolidation of operational results

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## History

**NB:** a **status** is associated to each step of the document lifecycle:

- **Draft:** this version is under development by one or several partner(s);
- **Under review:** this version has been sent for review;
- **Issued:** this version of the document has been submitted to EC.

Version	Status	Date	Author	Main Changes
0.1	Draft	15/04/2014	MILANESI Stefano	First internal draft
0.2	Draft	09/07/2014	ROCHE Élodie	Additional inputs on Paris demonstration
1.0	Under review	15/09/2014	MILANESI Stefano	Version sent to peer reviewers
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# 1 Abstract & Purpose

## 1.1 Summary

This deliverable describes the operational results related to all flagship demonstrations of SECUR-ED project: Milan, Berlin, Madrid and Paris.

The deliverable follows the approach introduced in deliverable D46.1 “Guidelines for Results Consolidation” which indicates that all the solutions of the flagship demonstrations must be analysed under the following criteria:

- Functional
- Operational
- Interoperability
- Industrial
- Ethical

The Operational area is the focus of this deliverable within the contest described above.

## 1.2 Purpose of the document

In this document, the results are considered from an operational point of view:

- how the experienced solutions are associated with or may affect the operation constraints
- how the experienced solution interact with other aspect of transit operation (availability of service, safety, easiness of move of passengers, ...)
- how the results could impact on the other transport mode (e.g. private transport).

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## 2 References

### 2.1 List of acronyms

3D	3-DIMENSIONAL
ALS	ALSTOM TRANSPORT S.A.
ANS	ANSALDO STS S.P.A.
ATM	AZIENDA TRASPORTI MILANESI S.P.A.
AXI	AXIS COMMUNICATIONS AKTIEBOLAG
BOM	BOMBARDIER TRANSPORTATION GMBH
CBRN-E	CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR AND EXPLOSIVE
CCTV	CLOSED CIRCUIT TELEVISION
CEA	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
CRTM	CONSORCIO REGIONAL DE TRANSPORTES DE MADRID
DBA	DEUTSCHE BAHN AG
DVR	DIGITAL VIDEO RECORDER
FNM	FERROVIE NORD
FOI	TOTALFORSVARETS FORSKNING SINSTITUT
LEFR	LAW ENFORCEMENTS AND FIRST RESPONDERS
LPT	LOCAL PUBLIC TRANSPORT
MVI	MEDICI VOLONTARI ITALIANI
MPLS	MULTIPROTOCOL LAYERED SWITCHING
NIC	NICE SYSTEMS LTD
OCC	OPERATIONS CONTROL CENTRE
OEVD	ON-BOARD EMPTY VEHICLE DETECTION
PC	PERSONAL COMPUTER
PIR	PASSIVE INFRARED SENSOR
PT	PUBLIC TRANSPORT
PTN	PUBLIC TRANSPORT NETWORK
PTO	PUBLIC TRANSPORT OPERATOR
PTZ	PAN TILT ZOOM



QR	QUICK READ
RF	RADIO FREQUENCY
RFID	RADIO-FREQUENCY IDENTIFICATION
SECUR-ED	SECURED URBAN TRANSPORTATION – EUROPEAN DEMONSTRATION
SES	SELEX ES SPA
SIT	SITE INTEGRATION TEST
SMS	SECURITY MANAGEMENT SYSTEM
SOA	SERVICE ORIENTED ARCHITECTURE
SOCC	SECURITY OPERATING CONTROL CENTRE
THA	THALES COMMUNICATIONS & SECURITY SAS
TUD	TECHNISCHE UNIVERSITAET DRESDEN
UHF	ULTRA-HIGH FREQUENCIES
VA	VIDEO ANALYSIS
VLAN	VIRTUAL LOCAL AREA NETWORK
VTT	TEKNOLOGIAN TUTKIMUSKESKUS VTT

## 2.2 Referenced documents

The following documents are referenced:

- R[1] SCR-WP46-D-JRC-001 - D46.1 Guideline for results consolidation
- R[2] SCR-WP44-D-ATM-061 - D44.5 Consolidated results for Milan demonstration
- R[3] SCR-WP43-D-RTP-020 - D43.5 Consolidated results for Paris demonstration
- R[4] SCR-WP42-D-CTM-027 - D42.5 Consolidated results for Madrid demo



## 3 Operational Constrains

### 3.1 Constrains identified for each demonstration

- How the demonstrated solutions are associated with or may affect operational constraints

#### 3.1.1 Berlin

The biggest challenge met by Berlin, was the procedure with the DB labour representatives. The DB Labour representative has a big influence of many procedures within the DB.

All relevant training documents (agenda, concept etc.) had to be submitted to the DB labour representative until six weeks previous the next session. The DB labour representative decided if the training will take place or if some documents are needed to revise again. In this case it needed again 6 weeks until the next check of the DB labour representative. If the documents were okay and there were no further questions of the labour representative, the documents had to submit to the 2<sup>nd</sup> labour representative of the business units. The target groups of Berlin demonstration involved three different business units of the DB. Each business unit has its own labour representative and makes his own decision.

There was a lot of time and effort required for each preparatory activity.

Capacities	Scenario	Comments/ Constraints
Lesson plan "Basic Awareness" developed within WP 38 by HCO	2, 3	Involve labour representatives earlier
Lesson Plan "Identifying and handling potentially suspicious items" developed within WP 38 by MTRS	2	Involve labour representatives earlier
Lesson Plan "Civil Courage" developed within WP 38 by HCO	2	Involve labour representatives earlier
Training platform based on a PSIM system	4	Long time for installation of all systems
Lesson plan 3.2 Identifying and handling persons based on suspicious behaviour	5	Involve labour representatives earlier
Lesson plan 1.4 Introduction to terrorism directed at PTO systems	5	Involve labour representatives earlier
Lesson plan 1.5 Past terrorist incidents and lessons learned	5	Involve labour representatives earlier
Table Top Exercise with practical elements on-side	6	The location where the exercise will be held will need to be determined very early



### 3.1.2 Madrid

Capacities	Scenario	Comments
Supervision Server	2,3,4	<p>Number of elements and scale factor. In this application if you draw many lines, vehicles...some of them may appear overlapped. It is necessary to be careful with this situation.</p> <p>Incident organisation. The correct organisation of all the incidents that appear in the application is very important for the OCC. The first one that should appear should be the latest one.</p>
Orchestration Engine	2,3,4	<p>Collecting and managing the information related with all the sensors, cameras, panels and other equipment of the PT system. In Madrid region with more than 40 sources and 20.000 panels and 6.000 cameras the collection of information may be difficult.</p> <p>Updating the system with all the new sensors, cameras, panels and other equipment of the PT system. It is crucial for the OCC, in order to have all the information about the system updated.</p> <p>Cameras and panels should have a clear name. OCC needs to know without doubts where each camera and panel are.</p>
Passenger Information	2,3	<p>Collecting and managing the information related with all the panels of the PT system. In Madrid region with more than 40 sources and 6.000 panels the collection of information may be difficult.</p> <p>Updating the system with all the existing panels and the new ones. It is crucial for the OCC, in order to send the correct information to a particular panel.</p>
Operator work station	2,3,4	Users interface is the defined in each application; the constraints for them are the same than the ones explained in each application.
Organisational, operational and IT procedures & plans	1,2,3,4	<p>OCC has to manage new procedures that are the same for all the PT system.</p> <p>OCC and external actors (like emergency services) have to manage new procedures that are the same for all of them.</p>





Capacities	Scenario	Comments
Incident response plan	1,2,3,4	OCC has to manage new procedures that are the same for all the PT system.
Multi-Operator data exchange capacity	2,3,4	Be careful with the integration of different incident management tools (legacy technologies) from different operators. They have their own way of classifying incidents and operators need common classification in order to manage properly all the incidents.
Communication between vehicles and ground/wayside - via 3G/LTE/WIFI	4	The operational constraints are associated with problems with the connection.
Fixed basic CCTV	3,4	Collecting and managing the information related with all the cameras of the PT system. In Madrid region with more than 40 sources and 20.000 cameras the collection of information may be difficult.  Updating the system with all the existing panels and the new ones. It is crucial for the OCC, in order to have an overview of what is happening in the area of the incident.
Road vehicles on-board basic CCTV	4	With the bandwidth of 3G, OCC only can see one on-board camera. For seeing more on-board cameras at the same time they must reduce the quality of the images.
Person tracking in video	4	No particular influence on operational constraints.

### 3.1.3 Milan

Capacities	Scenario	Comments
Supervision Server	1, 2, 3, 4	The solution may affect Security procedures of several operators and Entities (i.e. LEFR), with the possibility to coordinate all stakeholders
SOCC	1, 2, 3, 4	The solution may affect Security procedures, with the possibility to coordinate all stakeholders in one time
Fixed basic CCTV	1, 2, 3, 4	No particular effects, new CCTVs integrate with legacy ones



Capacities	Scenario	Comments
Person tracking in video	1	No effect on operational constraints
Ticketing system	1	No particular influence on operational constraints
RFID ticket tracking	1	No particular influence on operational constraints
Chemical & Explosives Detection - RAID-S2	1	Should be placed in proximity of bottle necks (stairs, turnstiles, etc.)
Radiological Detection – DIRAD (automatic gamma detection system)	1	Should be placed in proximity of bottle necks (stairs, turnstiles, etc.)
Communication between vehicles and ground/wayside	2	It requires specific installations on trains, which could be covered by a guarantee
On-board Empty Vehicle Detection (OEVD)	2	It requires specific installations on trains, which could be covered by a guarantee
Radiological Detection - Portal Monitor	2	Should be placed in proximity of the train passage (bottle necks of the track)
Wayside - Perimeter anti-intrusion and graffiti prevention for Depot Protection and infrastructure protection	2	More efficient intervention to catch the intruders
Wayside - Crowd abnormal behaviour detection (massive fall detection)	3	No effect on operational constraints
Crowd Density Detection - Wayside / Fixed Facilities	3	No effect on operational constraints
Evacuation modelling	3	No direct effect on operational constraints, being an analysis instrument which works independently
Alarm forwarding via Android app	3	No effect on operational constraints
QR code info to first responders	3	No effect on operational constraints

### 3.1.4 Paris

The more sensors there are in a transportation systems, the higher false alarms there are. The security staffs of operators and of public services will have to cope with this situation and to be able to treat them as quickly as possible. The efficiency of the alerts' transmission to the different stakeholders (public and emergency services, PTO ...) and the quality of the response procedures they would build appears to be a major issue.



Scenario 1 – Cyber-attack:

Creates new constraints, like new access control to rooms. Procedures are also impacted. Typically, staff will have to use supervised access control systems for every sensitive technical room. Supervision staff will have to manage operation and maintenance staff movement and to maintain the data base of authorised staff. The procedure will be adjusted depending on the “Vigipirate” current level.

Scenario 2 – Toxic attack:

Staff will have to manage new procedures and potential false alarm.

Scenario 3 – Radiological attack:

Staff will have to manage new procedures and potential false alarm.

Scenario 4 – Tracking (on persons part of the SECUR-ED team):

- Semi-automatic tracking (CEA/THALES)
  - Positive impact on operational constraints
    - Real-time:
      - Help the operator to follow a suspect person within the network
      - Make available the geographic position to other security officers (supervision room, security staff onsite, etc.)
    - Forensics:
      - Help the operator to follow a suspect person within the network
  - Help the operator to follow a suspect person within the network.
- Facial recognition (MORPHO)
  - Help the operator to follow a suspect person within the network.

Scenario 5 – Explosive attack:

Passengers flow may be reduced. Staff will have to manage new procedures and potential false alarm.



## 4 Interaction with other aspect of transit operation

### 4.1 Interactions identified for each demonstration

- How the demonstrated solutions interact with other operational aspects like: availability of service, safety, passenger mobility and comfort, etc.

#### 4.1.1 Berlin

The Scenarios of Berlin Demonstration had no direct influence of operational aspects like availability of service, safety, passenger mobility and comfort. But due to the trainings employee created new vantage points (prospects) for security issues and they learned new methods to identify relevant security situations. Learning best practices, to handle routine and emergency situations efficiently with a training platform based on a PSIM system (Scenario 4). The operator in control centres get an understanding of what to look for, who to inform and what to do, regardless of the tool he is using or the capabilities the tool supports. The purpose of the table top exercise (Scenario 6) was to encourage a discussion among the stakeholders and to develop recognition of coordination and planning requirements. All these aspects are playing a part in contributing to enhance the perceived security of passenger, operational methods in case of crises and of course the security for the transport operator itself.

#### 4.1.2 Madrid

Capacities	Scenario	Comments
Supervision Server	2,3,4	More efficiency in the PTN control and in case of emergency.
Orchestration Engine	2,3,4	More efficiency in the PTN control and in case of emergency. The use of this capacity helps operators to maintain the service in case of emergency
Passenger Information	2,3	The use of this capacity improves the mobility and comfort of passengers.
Operator work station	2,3,4	More efficiency in the PTN control and in case of emergency.
Organisational, operational and IT procedures & plans	1,2,3,4	The external communications make possible to inform users in real time and take decisions quicker That improves the passenger mobility, comfort and the sense of security inside PT system.



Capacities	Scenario	Comments
Incident response plan	1,2,3,4	The procedure makes possible the availability of service in case of emergency. The coordination between all the PT systems (integrating CITRAM in their procedures) may impact in the whole city traffic.
Multi-Operator data exchange capacity	2,3,4	All the PTO are informed about any incident occurred inside PT system so they can take the adequate measures in order to improve the safety for passengers and maintain the service.
Communication between vehicles and ground/wayside - via 3G/LTE/WIFI	4	It improves safety.
Fixed basic CCTV	3,4	It improves safety.
Road vehicles on-board basic CCTV	4	It improves safety.
Person tracking in video	4	It improves safety.

### 4.1.3 Milan

Capacities	Scenario	Comments
Supervision Server	1, 2, 3, 4	More efficiency in the control and in case of emergency
SOCC	1, 2, 3, 4	More efficiency in the control and in case of emergency
Fixed basic CCTV	1, 2, 3, 4	No particular interactions, new CCTVs integrate with legacy ones.
Person tracking in video	1	No interactions
Ticketing system	1	No interactions with availability of service, safety, passenger mobility and comfort
RFID ticket tracking	1	No interactions with availability of service, safety, passenger mobility and comfort
Chemical & Explosives Detection - RAID-S2	1	No specific interactions



Capacities	Scenario	Comments
Radiological Detection – DIRAD(automatic gamma detection system)	1	No specific interactions
Communication between vehicles and ground/wayside	2	No specific interactions
On-board Empty Vehicle Detection (OEVD)	2	No specific interactions
Radiological Detection - Portal Monitor	2	No specific interactions
Wayside - Perimeter anti-intrusion and graffiti prevention for Depot Protection and infrastructure protection	2	No specific interactions
Wayside - Crowd abnormal behavior detection (massive fall detection)	3	There is no specific interaction, the solution is an addition that helps to have an alarm in case of emergency
Crowd Density Detection - Wayside / Fixed Facilities	3	There is no specific interaction, the solution is an addition that helps to have an alarm in case of emergency
Evacuation modelling	3	No direct effect on operational constraints, being an analysis instrument which works independently
Alarm forwarding via Android app	3	No affects to availability of service, safety, passenger mobility and comfort, etc.
QR code info to first responders	3	More safety of passengers

#### 4.1.4 Paris

##### Scenario 1 – Cyber-attack:

Will imply new reactions to incidents: what looks like a pure technical failure may in fact be the first step of a deny of service attack.

##### Scenario 2 – Toxic attack:

Toxic attacks were very rare and false alarms may generate unwanted huge disruption due to the risk that occurs if a real scenario was really in progress. The whole city traffic may be impacted.



Scenario 3 – Radiological attack:

Radiologic attacks were very rare also, and false alarms may generate unwanted huge disruption due to the risk that occurs if a real scenario was really in progress. A part of the traffic may be impacted.

Scenario 4 – Tracking (on persons part of the SECUR-ED team):

- Semi-automatic tracking (CEA/THALES)
  - NA
- Facial recognition (MORPHO)
  - NA

Scenario 5 – Explosive attack:

Explosive attacks occurred several times in the past. Suspect luggage scenarios disrupt heavily operations many times a year for every transportation systems with a significant impact on whole line traffic.

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## 5 Implementation of the scenarios

### 5.1 Implementation of the scenarios for each demonstration

- Implementation scenarios for the demonstrated solutions, including hidden costs, additional / fringe benefits, other conditions and specific constraints.

#### 5.1.1 Berlin

Implementation of scenarios means in case of Berlin demonstration the execution of the trainings itself. The organisational aspects in such a big company are a lot of work.

The material for the demonstration needed to be translated into German and modified to make it appropriate to the situation of Deutsche Bahn AG. A lot of the general content of the training lessons were difficult to put it in the organisational process and organisational context of DB.

For the organisation of the training session itself (scenario 1-5) we needed about 8 month (included the labor representative work, the adaption work, the translation etc.)

The organisation of the table top exercise (scenario 6) needed about 1 year because the cooperation with all necessary stakeholders was a big effort and needed a lot of time for coordination.

To achieve optimal results in the training sessions and simulations for scenario 4 it was necessary to develop relevant training scenarios in the PSIM system. The concept was fundamentally simple:

- The trainer initiated an event in the system for the trainee to handle.
- The trainee responds based on his cognitive understanding of the event. Where relevant, the trainee used a business process that had already been assimilated into the system.
- Elements that test the trainee were assimilated into the business process. These elements were detailed in the Technical Requirements Specification for a PSIM Based Training Platform specification (ref: SCR-WP38-T-NIC-010-01).

The training scenarios/scenes were filmed and performed by students (actors) and were used as material for the training with the NICE Situator. These scenarios were filmed to be based on the daily risks identified by DB. The scenes belong to the daily threats or criminal offence for a PTO. The training content is always the same. The trainees learned how to handle with different scenarios and the different procedures within DB.

The hidden costs will be found in the Workload Expenses Reporting Tool. The tool takes into account all the declared expenses linked to the Berlin demo organization and the capacities adaptation and integration.





### 5.1.2 Madrid

Capacities	Scenario	Comments
Supervision Server	2,3,4	Development, installation and testing of the graphical supervisor system with SOA interface compliance as established by the SECUR-ED project. OCC and PTO operators are directly benefited as the implemented system makes they work easier and faster. PT users are indirectly benefited due to the better results of the OCC and PTOs.
Orchestration Engine	2,3,4	Development, installation and testing of the Decision and Orchestration Engine with SOA interface compliance as established by the SECUR-ED project Costs related to equipment. OCC and PTO operators are directly benefited as the implemented system makes they work easier and faster. PT users are indirectly benefited due to the better results of the OCC and PTOs. As constraint, the incident type, the covered area and the cameras and panels identification.
Passenger Information	2,3	Development, installation and testing of a SOA interface compliance as established by the SECUR-ED project. OCC and PTO operators are directly benefited as the implemented system makes they work easier and faster. PT users are indirectly benefited due to the better results of the OCC and PTOs.
Operator work station	2,3,4	Integration of all the implemented systems with SOA interface compliance as established by the SECUR-ED project. Costs related to equipment. OCC and PTO operators are directly benefited as the implemented system makes they work easier and faster. PT users are indirectly benefited due to the better results of the OCC and PTOs.
Organisational, operational and IT procedures & plans	1,2,3,4	Use the same procedure in all the PT system would be an ideal aim, but, in the case of Madrid, with a complex organisational structure, this is a very difficult issue to achieve.  In the case of communications with external actors like emergency services the main problem is maintain the communication once they arrive to the place.



Capacities	Scenario	Comments
Incident response plan	1,2,3,4	<p>Use the same procedure in all the PT system would be an ideal aim, but, in the case of Madrid, with a complex organisational structure, this is a very difficult issue to achieve.</p> <p>The implementation of this procedure would benefit all the transport modes, as well as, passengers. They will be the ones that are inside the interchange and other ones that will be informed about the new situation before arriving so they can change their routes.</p>
Multi-Operator data exchange capacity	2,3,4	Integration of all the implemented systems with SOA interface compliance as established by the SECUR-ED project. OCC and PTO operators are directly benefited as the implemented system makes they work easier and faster. PT users are indirectly benefited due to the better results of the OCC and PTOs.
Communication between vehicles and ground/wayside - via 3G/LTE/WIFI	4	Development, installation and testing of a SOA interface compliance as established by the SECUR-ED project. Costs related to equipment. OCC and PTO operators are directly benefited as the implemented system makes they work easier and faster. PT users are indirectly benefited due to the better results of the OCC and PTOs. As constraint, the typical ones of 3G (bandwidth, coverage, etc.).
Fixed basic CCTV	3,4	Development, installation and testing of a SOA interface compliance as established by the SECUR-ED project. OCC and PTO operators are directly benefited as the implemented system makes they work easier and faster. PT users are indirectly benefited due to the better results of the OCC and PTOs and security improvements.
Road vehicles on-board basic CCTV	4	Development, installation and testing of a SOA interface compliance as established by the SECUR-ED project. Costs related to equipment. OCC and PTO operators are directly benefited as the implemented system makes they work easier and faster. PT users are indirectly benefited due to the better results of the OCC and PTOs and security improvements. As constraint, the typical ones of 3G (bandwidth, coverage, etc.).



Capacities	Scenario	Comments
Person tracking in video	4	Development, installation and testing of a SOA interface compliance as established by the SECUR-ED project. OCC and PTO operators are directly benefited as the implemented system makes they work easier and faster. PT users are indirectly benefited due to the better results of the OCC and PTOs and security improvements. As constraint, face recognition or automatic tracking not supported, as implemented solution is based in suggestions made from distance to incident.

### 5.1.3 Milan

Capacities	Scenario	Comments
Supervision Server	1, 2, 3, 4	Development, installation and testing of an interface SOA compliance as established by the SECUR-ED project
SOCC	1, 2, 3, 4	Development, installation and testing of an interface SOA compliance as established by the SECUR-ED project
Fixed basic CCTV	1, 2, 3, 4	It depends on the number of necessary CCTV to cover the spaces. For Milan demonstration the biggest costs for CCTVs regarded scenario 2 for the depot protection, which required at minimum 8 Fixed thermal camera plus 3 PTZ new CCTVs to cover all Gorgonzola depot, with a cost of 40K €, cables and manpower costs excluded
Person tracking in video	1	Costs could be very high, requires the integration of all important videos streams of each station
Ticketing system	1	Costs of MIFARE RFID readers and tickets
RFID ticket tracking	1	Costs of UHF RFID tags, antennas, concentrators
Chemical & Explosives Detection - RAID-S2	1	The sensor itself has an high cost, this does not permit to have many different checkpoints for dangerous substances, but they should be accurately be studied
Radiological Detection – DIRAD(automatic gamma detection system)	1	The sensor itself has an high cost, this does not permit to have many different checkpoints for dangerous substances, but they should be accurately be studied



Capacities	Scenario	Comments
Communication between vehicles and ground/wayside	2	The installation on all trains could be a very big effort, considering also that there is the need of power supply for all the installations and not all trains are ready
On-board Empty Vehicle Detection (OEVD)	2	The installation on all trains could be a very big effort, considering also that there is the need of power supply for all the installations and not all trains are ready
Radiological Detection - Portal Monitor	2	The sensors themselves has an high cost, this does not permit to have many different checkpoints for dangerous substances, but they should be accurately be studied
Wayside - Perimeter anti-intrusion and graffiti prevention for Depot Protection and infrastructure protection	2	Costs of <ul style="list-style-type: none"> <li>• CCTV</li> <li>• Installation</li> <li>• Cabling and Wire installations</li> </ul> Configuration of the algorithm
Wayside - Crowd abnormal behavior detection (massive fall detection)	3	Cost is the implementation of Video Analysis software
Crowd Density Detection - Wayside / Fixed Facilities	3	Cost is the implementation of Video Analysis software
Evacuation modelling	3	The cost can vary depending on the complexity of the specific stations and the availability of information
Alarm forwarding via Android app	3	The only cost is the smartphone with a no limit profile to send sms
QR code info to first responders	3	No costs



### 5.1.4 Paris

#### Scenario 1 – Cyber-attack:

The scenario was essentially a demonstration of the major weaknesses of a basic security system (in fact a subset of the SECUR-ED system), if no precaution is taken.

#### Scenario 2 – Toxic attack:

The scenario was run and the procedure applied step by step. The main problem is to confirm that the scenario is a toxic attack and to be sure that it is not a false alarm, especially when only simulants can be used.

#### Scenario 3 – Radiological attack:

The scenario was run and the procedure applied step by step. The main problem is to confirm that the scenario is a radiological attack and to be sure that it is not a false alarm, especially when only simulants can be used.

#### Scenario 4 – Tracking (on persons part of the SECUR-ED team):

- Semi-automatic tracking (CEA/THALES)
  - The solution was implemented on a touch screen, which was found easy to use. If needed, the system can be operated with a mouse + keyboard as well.
  - Installation:
    - Need for creation of simplified maps to be used directly on the interface.
    - Need for calibration of the system: ~30min per camera thanks to a calibration software
  - Specific constraints: fixed cameras (fields of view of the cameras must not change, otherwise calibration should be corrected)
  - Analog legacy cameras were used during the experimentation, proving the ability to adapt to legacy systems (only video encoders were added)
  - Costs are limited by the fact that:
    - Tracking module was robust enough to standard quality cameras
    - Computational power is limited as only few numbers of video streams are processed (used by the operator: typically 6 – 10).
- Facial recognition (MORPHO)
  - The solution was implemented on an embedded computer, installed in a bus.
  - Specific constraints: the camera specifications (resolution, frame rate, position, and angle) needed to be validated before installing the solution.
  - Costs are limited by the fact that:
    - Recognition module was robust enough to use standard quality cameras (the ones used in the bus were sufficient enough);
    - Recognition hardware requirements were sufficiently flexible to be able to use an embedded computer;



- Same solution has been tested in bus/metro corridors, with/without crowd: as long as the suspect face was not occulted by other people the whole time he passed through the camera, the face recognition system worked properly.
- Computational power was limited as only one video stream was processed.

Scenario 5 – Explosive attack:

The scenario was run and the procedure applied step by step. It is clearly not reasonable to consider a systematic check of the passengers in a railway mass transportation system as it is operated in an airport.



## 6 Impact on the other transport modes

### 6.1 Impact of the different demonstrations

→ How the results could impact on other transport modes.

#### 6.1.1 Berlin

One aim of the trainings with different target groups as well as the table top exercise with different stakeholder was to enhance the communication and coordination procedures between stakeholders (even other transport modes) in case of an attack situation with terrorist background. To identify responsibilities and taking them into account or assessing different kind of security situation and preparing decisions. The purpose was to encourage discussion among the stakeholder and to develop recognition of coordination and planning requirements usable for all relevant transport modes

#### 6.1.2 Madrid

Capacities	Scenario	Comments
Supervision Server	2,3,4	The use of this capacity, next to the Orchestration Engine, allows the Operator to identify which transport modes are affected and influenced by an incident, so they can be warned.
Orchestration Engine	2,3,4	The use of this capacity will impact in all the transport modes which are recognised as affected or influenced by a specific incident.
Passenger Information	2,3	The use of this capacity will impact in all the transport modes involved in a specific incident. The passengers of all the transport modes will be warned. They can change from one transport mode to another.
Operator work station	2,3,4	No special impact
Organisational, operational and IT procedures & plans	1,2,3,4	The procedure will impact in all the transport modes involved in a specific incident.
Incident response plan	1,2,3,4	The procedure will impact on all the transport modes involved in a specific incident. In case of emergency the interchange station should be closed. All systems running in the station may be impacted.



Capacities	Scenario	Comments
Multi-Operator data exchange capacity	2,3,4	The use of this capacity will impact in all the transport modes involved in a specific incident. They will be informed about all the details of the incident.
Communication between vehicles and ground/wayside - via 3G/LTE/WIFI	4	No particular impact on other transport modes apart from the ones involved on the incident.
Fixed basic CCTV	3,4	No particular impact
Road vehicles on-board basic CCTV	4	No particular impact
Person tracking in video	4	No particular impact

### 6.1.3 Milan

Capacities	Scenario	Comments
Supervision Server	1, 2, 3, 4	-
SOCC	1, 2, 3, 4	-
Fixed basic CCTV	1, 2, 3, 4	No particular impact, new CCTVs integrate with legacy ones.
Person tracking in video	1	-
Ticketing system	1	No impact
RFID ticket tracking	1	No impact
Chemical & Explosives Detection - RAID-S2	1	It can impact in term of security perception for passengers.
Radiological Detection - DIRAD(automatic gamma detection system)	1	It can impact in term of security perception for passengers.
Communication between vehicles and ground/wayside	2	It can probably works on every kind of transport where there is a 3g coverage
On-board Empty Vehicle Detection (OEVD)	2	-
Radiological Detection - Portal Monitor	2	Security of trains





Capacities	Scenario	Comments
Wayside - Perimeter anti-intrusion and graffiti prevention for Depot Protection and infrastructure protection	2	It can be applied to other type of transport mode
Wayside - Crowd abnormal behaviour detection (massive fall detection)	3	The solution could represent a useful control system to individuate situation of danger
Crowd Density Detection - Wayside / Fixed Facilities	3	The solution could represent a useful control system to individuate situation of danger during emergencies
Evacuation modelling	3	-
Alarm forwarding via Android app	3	It can be used on every kind of transport modes (trains, bus, tram, etc.) providing the drivers a way to send alarms in case of emergency
QR code info to first responders	3	-

### 6.1.4 Paris

#### Scenario 1 – Cyber-attack:

As any disruption to the relevant systems.

In case of alarm, the operator may decide to stop the whole transportation system until it is proved that there is no doubt. The other transport modes may also be impacted if the attack can potentially be transmitted.

#### Scenario 2 – Toxic attack:

All the systems running in the concerned station may be impacted. The operator, or authorities who take over, will apply the identified and corresponding procedures.

#### Scenario 3 – Radiological attack:

All the systems running in the concerned station may be impacted. The operator, or authorities who take over, will apply the identified and corresponding procedures.

#### Scenario 4 – Tracking:

- Semi-automatic tracking (CEA/THALES)
  - System demonstrated was efficient within fixed infrastructure (stations, streets, etc. as soon as the videos are interconnected).



- Need some adaptations to be used inside trains, metros, tramways (availability of the videos through 3G or Wi-Fi, location and fields of view of the cameras).
- Facial recognition (MORPHO)
  - The demonstrated system was efficient within fixed and mobile infrastructures (stations and busses).

Scenario 5 – Explosive attack:

All the systems running in the concerned station may be impacted in case of explosion. The operator, or authorities who take over, will apply the identified and corresponding procedures.

## 6.2 Benefit derived from different demonstrations

Obviously the various demonstrations showed the interest of many solutions, taking into account the specificities of the public transportation systems.

However, private transport, aeronautical sector, maritime transports or other transport modes, can use these solutions in their context as appropriate, as it may have some similarities.

**- End of Document-**

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