



Strategic Risk Assessment and Contingency Planning in Interconnected Transportation Networks (STAR-TRANS)

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Warsaw, November 30th ,2011

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Strategic Risk Assessment and Contingency Planning in Interconnected Transport Networks

Co-funded by European Commission under
FP7 Theme 4 (ICT) & Theme 10 (Security)

Duration: 01/11/2009 – 30/04/2012

Budget: ~3.2 million Euros

Objective:

To develop a comprehensive Strategic Transportation Security Risk Assessment Framework for assessing related risk and provide coherent contingency management procedures in interconnected, interdependent and heterogeneous transport networks.



Startrans Motivation: Transport as a CI




- Widely Used Open Systems
 - 460 million citizens in the EU-25 use transportation
 - 36 kilometres will be travelled every day by each citizen, and 27 of these will be by car
 - 1h12min everyday travelling by all means of transportation
- Intentional Incidents
 - Coordinated attacks on the Madrid commuter rail network in March 2004 results 192 dead and 2,050 wounded
 - 498 attacks carried out in the EU in 2006 only 1 by an Islamist (SPIEGEL)
- Un-intentional Incidents and Natural Disasters
 - 4.5 accidents per million trainmiles
 - At least 300.000 people are seriously injured on EU roads every year (ETSC)

- In April 2007 the Council adopted conclusions on the EPCIP
- Directive 2008/114/EC:
 - CIP is the responsibility of the Member States
 - Defines 'risk analysis' as consideration of relevant threat scenarios, in order to assess the vulnerability and the potential impact of disruption or destruction of critical infrastructure
 - Asks for common methodological guidelines for carrying out risk analyses in respect of EU Critical Infrastructures.
 - Requests for each Member State to implement an appropriate communication mechanism for exchanging relevant information concerning identified risks and threats in relation to critical infrastructure

- Fundamental: At the heart of daily lives & Fosters social cohesion
- Complex:
 - Heterogeneous – Interconnected - Interdependent
 - Involves multiple jurisdictions
- Highly vulnerable:
 - Difficult to protect + High Impact = Attractive target
 - Incidents may have extended and unexpected consequences
- No common approach

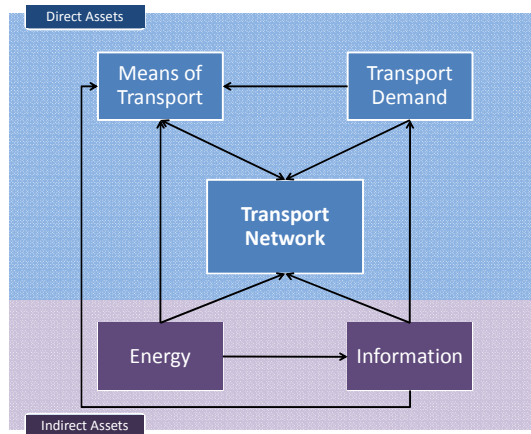
- To produce a comprehensive Strategic Transportation Security Risk Assessment Framework
 - Evaluate risk at a Strategic level
 - Harmonized Examination of Critical Events
 - Expand risk assessment in the Network of Networks (heterogeneity)
 - Risk Assessment accounting for risk propagation ((interconnection and interdependencies)
 - Coherent contingency management procedures irrespective of region and geographic focus
- To provide ICT tools for the network of networks:
 - Manage risk assessment models
 - Assess and report incident impact

- **To produce a Strategic Security Risk Assessment Framework** for European interconnected and interdependent transportation networks.
 - *A modelling formalism* capable of representing: incidents, structure and assets as well as asset interdependencies
 - *Impact Assessment Tool (IAT)*: a SW tool to manage risk assessment models and capable of assessing and reporting the impact of a specific risk incident
 - **To evaluate the proposed Risk Assessment Framework** in two demonstrators: Urban (Athens) and Regional (Bologna)
 - **To disseminate the results of the project** and to formulate a viable and sustainable exploitation strategy.
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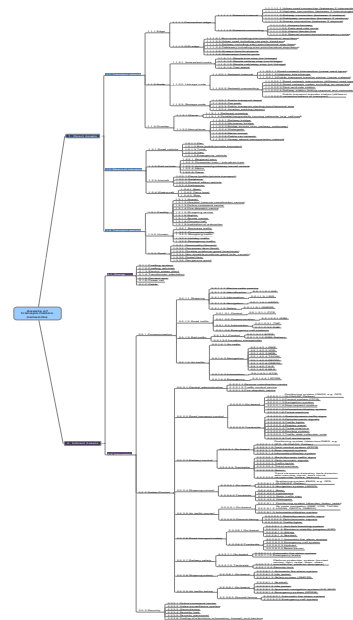
Startrans Approach & Expected Results

- Informal Modelling: Collection and analysis of vulnerabilities, threats and intermodal transportation networks:
 - Possible risk incidents on European transportation networks.
 - Structure and assets of European transportation networks.
 - Interdependency types between assets of transportation networks.
 - Possible risk incidents on European transportation networks.
 - Transportation Risk Propagation model
 - Description of contingency plans and responses
- Formal Modelling: Describe Risk assessment constituents in a formal manner.
 - Impact Assessment Modelling Language (IAML)
 - STAR-TRANS Modelling Language (STML)
- Impact Assessment Tool (IAT)The incorporation of the above in an integrated framework support by an advance ICT tool
- Demonstrate its operation and evaluate its effectiveness

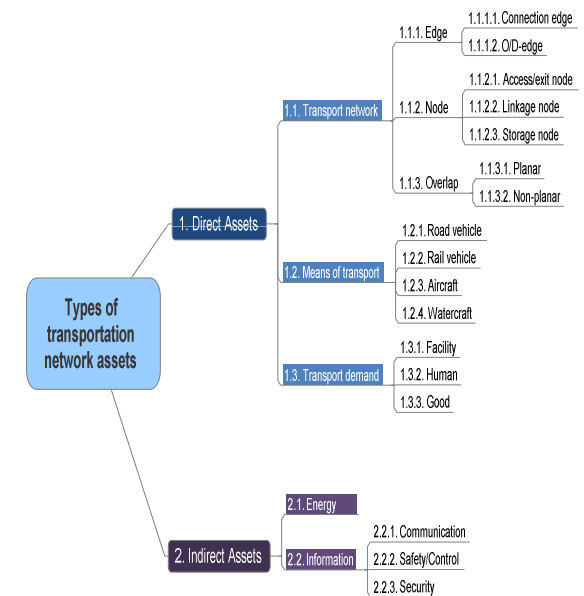
1. Developed a risk assessment glossary
2. Definition of transportation network asset types



Identification of elements influencing security status





Hierarchical breakdown of transportation network assets



Definition of Transport NW asset types



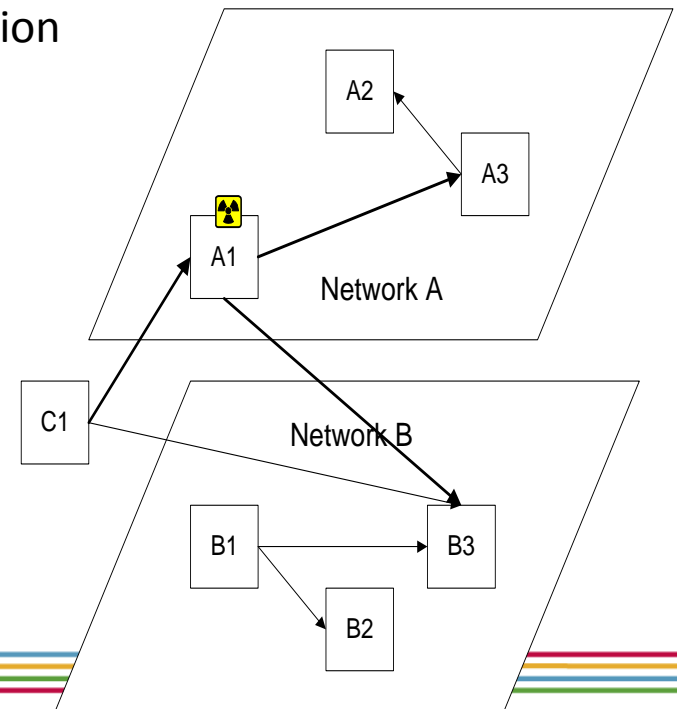
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3. Network Interconnection (Physical, System, Geographical, Logical, Self)
 4. Risk Analysis
 1. Identify Threats:
 1. Typology of Threats
 2. Threats are coupled with Assets and form pairs
 3. Threat Scenarios containing multiple pairs
 2. Defining Likelihood & Defining Impact
 - 5 level scale
 - Impact: Casualties, Economic losses, Environmental impacts, Response, Cascading Events (non-transportation), events, Social & Psychological, Business Continuity
 3. Risk Calculation
 1. Risk matrix
 2. Several calculation methods: maximum, weighted mean, majority rule, median
 3. Several Levels: Asset, Network, Network Segment, NW of NWs, other
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5. Response procedures

- Who will respond to the incident (and magnitude of team)
- What means are required
- Incident scene (extent – geographical impact on transport network)
- Emergency routes to / from the incident location


6. Risk propagation

- Step 1. Define initial scenario
- Step 2. Estimate risk on the 1st asset
- Step 3. Find interconnected assets
- Step 4. Estimate risk in interconnected asset



Startrans Impact Assessment Tool



- Most important aspect manage transportation risk :
 - Identify risk
 - Evaluate and prioritize risk
 - Define countermeasures
 - Monitor risk
 - Operators' primary interests
 - ✓ Use for incident response planning, impact assessment and critical infrastructure identification
 - ✓ Use in personnel incident response training, simulation of risk incidents and calculation of asset interdependencies
- 

- Asset Manager
 - Security Manager
 - Risk Analyst
 - Administrator
 - Web visitor
- 

Network of Networks Editor

The screenshot shows the 'Network of Networks Editor' interface. At the top, there are navigation links for 'summary', 'help', and 'profile', and a 'log' link. The main title is 'Network of Networks Editor'. The interface is divided into several sections:

- Top Bar:** Contains a title field 'Athens Normal', a dropdown menu 'Athens Network', and a 'Validate' button.
- Left Panel:** A sidebar with a search bar and a list of network types: Buses, Metro, Tram, Urban Rail, Urban Roads, Airport, and Port. Below this is a 'Selected Networks' list containing Metro, Urban Rail, Bus, and Road.
- Center:** A satellite map of Athens, Greece, showing roads and infrastructure. A blue box labeled 'Save Draft' points to a button on the map. Another blue box labeled 'make city available for others to use' points to a button on the map.
- Right Panel:** A 'Asset Properties' window showing a table of assets. The table has columns for 'Asset' and 'Interco'. The visible rows are 'Doukisis Plake...' and 'Bus Stop 311', both with 'Physic...' in the 'Interco' column. Below the table is a text area for 'Vulnerabilities (free text)' containing the text: 'multiple exits', 'back up generators', and 'back up information system'.

Numbered callouts (1-10) are placed throughout the interface to highlight specific features:

- 1: Title field
- 2: Networks tab
- 3: Map area
- 4: Deployed Assets tab
- 5: Asset Properties window
- 6: Validate button
- 7: Save Draft button
- 8: Make city available button
- 9: Search bar
- 10: Asset table

Annotations include:

- 'For the administrator they are enabled' pointing to the top right area.
- 'Networks already created for the specific city' pointing to the 'Selected Networks' list.
- 'make city available for others to use' pointing to the 'Save Draft' button.

Critical Scenario Editor

A Threat scenario may incorporate multiple Incidents

A Threat scenario must be associated with a NoNs

Threat Scenario Title:

Network of Networks:

Threat - Incident

Title:

Threat:

Organized and non-

Anti-social behavior

Risk:

Incident:

Incident Description:

Assets

Network:

Asset:

Vulnerability:

Asset	Incidents	Vulnerabilities
<input type="checkbox"/> Content 2		
<input type="checkbox"/> Content 4		

Likelihood

Ordinal Scale

Cardinal Scale

Consequences

Consequences	Value
Casualties	<input type="text" value="Negli..."/>
Economic Losses	<input type="text" value="Small"/>
Response	<input type="text" value="Medi..."/>
Cascade Event	<input type="text" value="Negli..."/>
Social & Psychological	<input type="text" value="Negli..."/>

It could propose Incident Response based on type and location

Incident Response


Title	Threat	Risk	Incident	Network	Asset	Likelihood	Impact	Risk Level	Incident Re...

Response Procedures Editor

Response Procedure Title:

Threat Scenario:

Marchaling Area



Step	Actor	Activity	Phase	Location
<input type="checkbox"/> 1	Police	Establishes inner cordon	Initial	Inner Cordon
<input type="checkbox"/> 1	Fire Brigade	Provide Personnel Safety	Initial	Inner Cordon
<input type="checkbox"/> 1	Operator	Shutdown of Metro Blueline	Initial	Ethniki Amyna
<input type="checkbox"/> 1	Operator	Shutdown of Suburban	Initial	Neratziotisa
<input type="checkbox"/> 2	Police	Evacuate passengers	Initial	Doukisis Plakentia
<input type="checkbox"/> 3	Operator	Reroute passengers	Initial	Doukisis Plakentia
<input type="checkbox"/>			Initial	Outet Cordon

Responder Routing Road Blocking Evacuation

Validation Messages

Connection with VISTA

Save

Critical Scenario Validator

Threat Scenario Title:

Network of Networks: ▼

	Title	Threat	Risk	Incident:	Network	Asset	Likelihood	Impact	Risk Level	Incident Re...
<input checked="" type="checkbox"/>	Panic	Panic Without I...	Business...	Bombs in Abandoned Objects	Suburb...	Doukisis Plaken...	Low	High	High	IRP1
<input type="checkbox"/>	<input type="text" value="Text"/>	Abandoned Obj...	Losses	Loss/Misplacement of Objects	Suburb...					

Consequences

Consequences	Value
Deaths	<input type="text" value="High"/> ▼
Injuries	<input type="text" value="High"/> ▼
Monetary Loss for Operator	<input type="text" value="High"/> ▼
Monetary Loss in General	<input type="text" value="High"/> ▼
Area Affected	<input type="text" value="High"/> ▼
Recovery Time	<input type="text" value="High"/> ▼

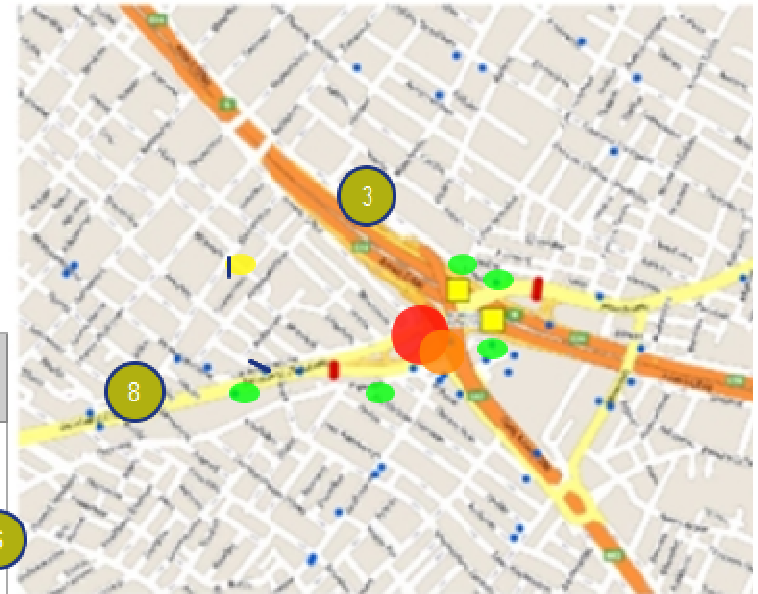
Incident Response

Type of Threat ▼

Risk Output

Threat Scenario

<input type="checkbox"/>	Title	Threat	Risk	Network	Asset	Incident	Response	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Bomb Threat in Doukisis Plakentias	Anti-Social Behaviour	Hoax-Threat:	Metro	Doukisis Plakentias Station	False bomb call	IRP1	<input checked="" type="checkbox"/>



Propagated Risk

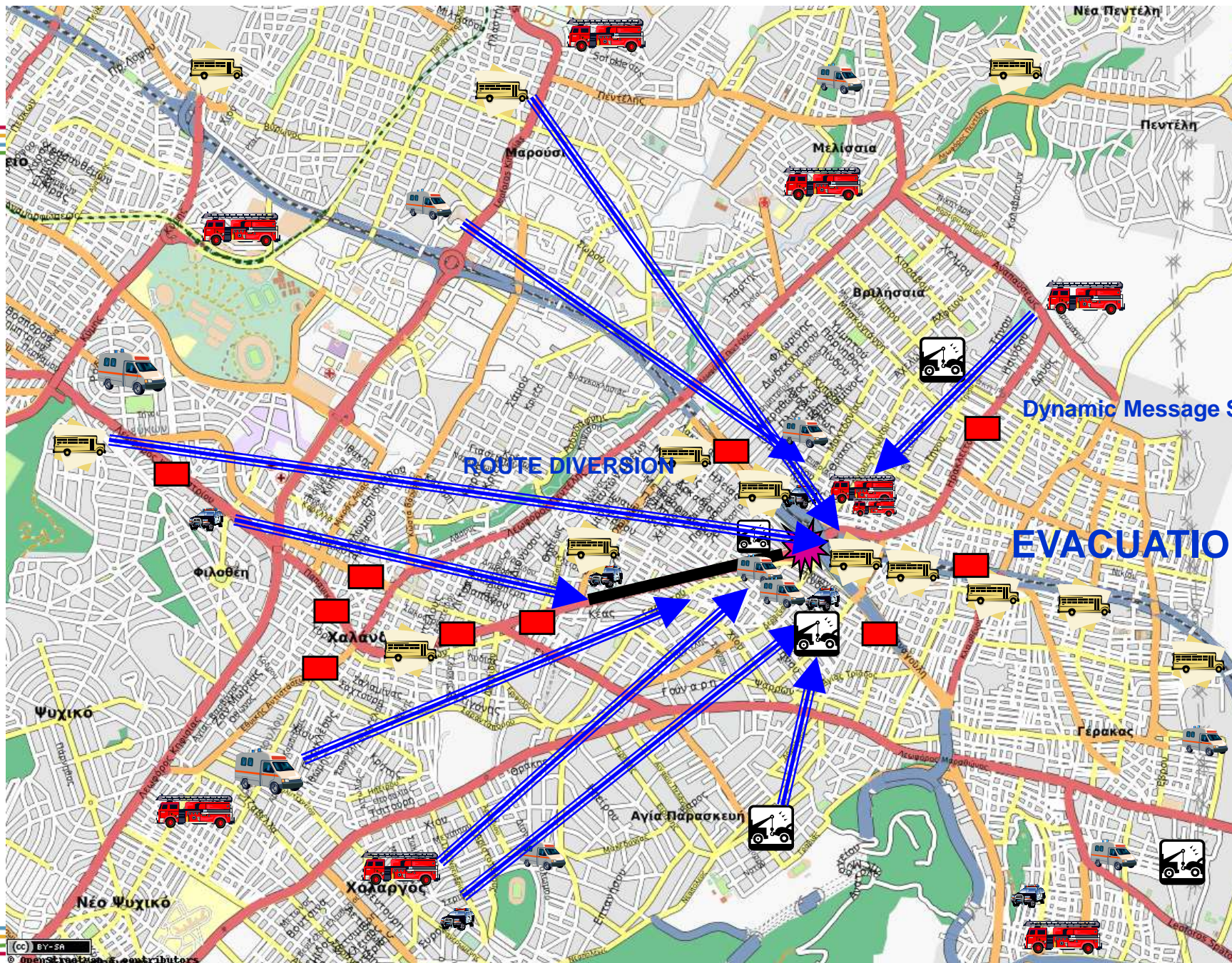
<input type="checkbox"/>	Title	Threat	Risk	Network	Asset	Incident Response	<input type="checkbox"/>
<input type="checkbox"/>	Panic	Panic Without Reason	Business Continuity	Metro	Doukisis Plakentias Station	IRP1	<input type="checkbox"/>
<input type="checkbox"/>	Property Loss	Abandoned Object	Losses	Metro	Doukisis Plakentias	IRP2	<input type="checkbox"/>

Response Procedure

Step	Actor	Activity	Phase	Location
1	Police	Establishes inner cordon	Initial	Inner Cordon
1	Fire Brigade	Provide Personnel Safety	Initial	Inner Cordon

Asset	Risk
Asset	MEDIUM
Network	HIGH
Network of Networks	MEDIUM

[View](#)



Dynamic Message Signs

ROUTE DIVERSION

EVACUATION

- Introduction of a harmonized holistic approach for preventive measures and risk assessment
 - Identification of best practices and tools for emergency preparedness and response
 - Provide the basis for an integrated transportation security policy
 - Offer ICT tools to decision makers to determine priorities among multiple contingency alternatives by evaluating consequences from propagating risks across the NoN
 - Develop a state of the art Service Oriented Architecture for integrated transportation vulnerability assessment and risk management
- => a reduction of the impact of risk incidents on interconnected transportation networks through Europe, minimizing significantly social, economic and political disruptions

1	INTRASOFT International S.A.	INTRASOFT	
2	National Center for Scientific Research Demokritos – Environment Research Laboratory	NCSR	
3	Center for Security Studies	KEMEA	
4	Confederation of Organizations in Road Transportation Enforcement	CORTE	
5	QinetiQ S.A.	QINETIQ	
6	Fraunhofer Institute for Transportation and Infrastructure Systems	FhG	
7	Center for Research and Technology Hellas – Information & Telematics Institute	CERTH	
8	Metropolitan Police Service	MET	
9	CTL Cyprus Transportation Logistics Ltd.	CLT	
10	SQUARIS Ltd.	SQUARIS	
11	SCOCIETA' RETI E MOBILITA' SpA	SRM	

Startrans

The logo graphic consists of a stylized, multi-colored line drawing of a star or a network node, with lines in red, green, yellow, and blue. It is positioned to the left of the text 'Startrans'.

THANK YOU

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Contact Us: info@startrans-project.eu