1 PUBLISHABLE SUMMARY

The STAR-TRANS objective is to develop a comprehensive Transportation Security Risk Assessment Framework for assessing related risk and provide cohered contingency management procedures in interconnected, interdependent and heterogeneous transport networks. There are three keys aspects to this objective which make this project innovative and set it apart from other transportation security projects:

1. The first aspect relates to the approach towards transportation networks. STAR-TRANS examines transportation networks wholelistically. Individual transportation networks which are very different (i.e. heterogeneous) are no longer treated in isolation i.e. rail on its own or passenger traffic flows from one mode of transportation to another binding them together (i.e. they are interconnected and interdependent). Taken together, individual transportation networks form a "network of networks".

2. Transportation Security Risk Assessment has a renewed importance in this context. Attacks can have swelling-effects that could result in cascading failures in any asset of a "network of networks". STAR-TRANS recognizes the significant impact such situations can have and the difficulty of recognizing their existence at contingency planning stages. Risk assessment methods at the 'network of networks’ level become, then, important elements of a transportation risk management process, allowing risk management teams to identify major risk contributors, the effectiveness and unintended consequences of various risk reduction options.

3. This new complex situation demands coherent contingency management procedures. The absence of which severely limits the ability to address these types of events at an operational level. This provides a basis for an integrated EU-wide approach to risk management in transportation networks that complements and adds value to the national programmes for critical infrastructure protection already in place in the Member States.

STAR-TRANS overcomes limitations in the European Programme for Critical Infrastructure Protection (EPCIP) by enhancing risk analysis and assessment through consideration of the impact that a risk incident on an asset of a transportation network may have on the assets of interconnected and interdependent transportation networks. The project outcome offers important aids to decision-makers to determine priorities among multiple contingency alternatives by evaluating the consequences, (cost, timing, resources, etc) of proposed actions. The improvement of the response and management capabilities regarding assessment of incidences / failures in critical transport infrastructures is achieved through the identification and closure of relevant knowledge gaps and through the development, validation and usage of computational modelling tools.

STAR-TRANS developed a modelling formalism which is capable of representing:

- possible risk incidents on European transportation networks;
- structure and assets of European transportation networks;
- dependency types between assets of interconnected and interdependent transportation networks.

This formalism serves as the basis for the estimation of an incident’s risk and its propagation through the “the network of networks” indicating possible unanticipated consequences.

A specialised, software system (Impact Assessment Tool) was implemented that exploits the above formalism to support network operators’, policy makers, insurance organizations and security professionals. The software tool provides the technology to link together any relevant assets of interconnected and interdependent transport networks. It is capable of assessing and
reporting the impact that a specific risk incident on assets of a European transportation network may have on the assets of interconnected and interdependent transportation networks. Additionally, it is capable of managing European interconnected and interdependent transportation networks’ structure and assets as well as dependencies between the involved assets.

The work and efforts of the consortium during the current reporting period focused primarily on the tasks and actions required for the successful execution and/or completion of the:

- Impact Assessment Tool (IAT)
- Evaluation of the STAR-TRANS Risk Assessment Framework

These are described in detail in the following sub-sections.

1.1 Work performed and results achieved

Since the beginning of the project, STAR-TRANS developed performed the following work and achieved the following results:

- A critical review of existing vulnerability and risk assessment frameworks published in the literature was compiled in order to identify the most relevant approaches for the STAR-TRANS Risk Analysis Framework.
- A glossary of common Transportation Security Risk Analysis terms was established to facilitate communication.
- A general transportation network asset typology was developed. They define the basic asset types influencing security status of transport networks. The interactions of asset types generated a list of network asset interconnections from which the weakest were identified.
- Developed the STAR-TRANS Transportation Risk Analysis Framework which included: a procedure for the application of the framework; an exhaustive list of threats; incidents and consequences; definitions of likelihood and consequences; a specification of asset interdependencies; the propagation of risk methodology; a definition of Incident Response Procedures
- Definition of the user requirements for the Impact Assessment Tool (IAT) collected through questionnaires, personal interviews, onsite inspections, modelling of business processes and isolating the activities which can be improved using ICT tools.
- Two languages were created comprising the Risk Assessment Modelling Language: the Impact Assessment Modelling Language (IAML) and STAR-TRANS Modelling Language (STML). IAML is capable of expressing assets, dependencies, threats, incidents, consequences, propagation process and assessment process.
- The initial understanding of how the implementation of both the software tool and web based service were constructed and recorded in the Conceptual Architecture of the STAR-TRANS Impact Assessment Tool
- A detailed design of the Impact Assessment Tool was produced including the technical approach to the IAT platform, the data format employed to initialize the IAT system with existing geo-referenced datasets, the structure of the STAR-TRANS Modelling Language that provides the interface to the STML Engine Core (STEC) to model all the elements of the STAR-TRANS framework, and finally, the input and output of the VISTA Dynamic Assignment Traffic simulator tool.


- Implemented and integrated the discrete tools comprising the IAT
- **Defined the pilot framework** for demonstrating and evaluating the IAT.
- **Demonstrations were performed in Bologna, Italy and Athens, Greece.** In both locations, IAT was demonstrated to relevant stakeholders and feedback was collected in the form of questionnaires and open discussions.
- Results from the demonstrations were examined and the conclusions recorded in the evaluation reports.
- STAR-TRANS developed an **exploitation plan** describing the project's exploitable results, relevant markets, market segments, trends, market size, major competitors and SWOT analysis.

Additionally, throughout the project, partners disseminated results to a broad audience of stakeholders in order to collect feedback which in turn would use to guide its progress. For the purpose, it produced a number of dissemination material such as brochures, posters, factsheet and a website. At the same, partners established a project identity through use of a common logo and graphic design unique to project material. Results were disseminated through publications and relevant conferences and workshops. Additionally, a number of connections were established with other projects.

### 1.2 Reference to the project public website and project logo

![Startrans Logo](logomark.png)

Project Website URL: http://www.startrans-project.eu

### 1.3 Final Results and their potential impact and use

The outcome of the STAR-TRANS project is expected to contribute towards the development of a common approach for risk analysis and perception initially in transportation critical infrastructures that can be further upgraded into a common strategic level tool for the design and analysis of surface transportation systems.

Specifically, within STAR-TRNAS a wide range of possible security related risk incidents likely to happen on transportation networks at European level were analysed and treated on a strategic level, allowing for consideration of the optimal planning decisions that will allow for the minimization of the perceived risk, and better preparedness of emergency responders and transport operators alike in the event of such incident.

STAR-TRANS could be pivotal towards in the acceptance of a common and holistic risk management methodology across EU countries, and develop adequate standards and procedures for the harmonised implementation of solutions and services consistent with the defined (across countries) framework.

Furthermore, introduced a common risk analysis approach where risk is propagated between interconnected and heterogeneous transportation networks. Therefore, the operator / security manager of a transport network would not perceive risk only the ones pertaining to its own
network, but would capture 2\textsuperscript{nd} order effects from incidents initiating into different transportation networks.

The proposed methodology viewed risk analysis from the perspective of both the network operator and emergency responders and emphasizes jointly the reduction of the impacts on business continuity, and human losses, economic and societal impacts. To this extend, STAR-TRANS could provide strategic level analysis for the implementation of security solutions and services by embedding them in the conception of existing / upgrade/ new infrastructure, while taking efficiency, business and societal constraints into account.

Additionally, the risk framework has been linked to the VISTA Dynamic Traffic Assignment model providing realistic simulation results on several aspects of the response and recovery process including the ability to capture the combined time varying routing choices accounting for every conceivable control, supply and demand needs, such as evacuation, route diversions, and optimal paths of emergency vehicles.

Furthermore, STAR-TRANS project is linked to Directive 2008/114/EC on Critical Infrastructure Protection. This directive lays down that each Member State must ensure that an Operator Security Plan (OSP) or an equivalent measure is in place for each designated ECI. The Operational Security Plan, imposed by Directive 2008/114/EC, provides concrete operational procedures which are applicable to any transport network given. However, they must be used in parallel with the necessary data describing the significant assets. Such operational procedure, which aim is to improve the organisational results regarding the protection and continuity of transport networks, should consist of the following steps:

1. Identification of important assets
2. A risk analysis based on major threat scenarios, vulnerability of each asset, and potential impact shall be conducted.
3. Identification, selection and prioritisation of counter-measures and procedures
4. Appointment of responsible person
5. Appointment of ECIP contact point

The STAR-TRANS IAT can be directly used to target the implementation of points (1-3) above in an user friendly and time saving manner, allowing for the analysis and thorough examination of a very large number of scenarios in significantly less time. Therefore it could prove a valuable tool for the critical infrastructure operators, national authorities for the protection of critical infrastructures and emergency responders to reduce possible security incidents to critical transportation networks.