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Deliverable D3.5: User Requirements with logbook to prioritise tasks

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TABLE OF CONTENTS

1 INTRODUCTION

This deliverable translates the outcomes of the different tasks conducted in work package (WP) 3 into requirements for the technical development of the FORTRESS tools. In order to ensure that the technology developed in WP6 and 7 will follow the outcomes and requirements, two specification documents have been developed:

a) Ontology specification document: The FORTRESS Scenario Builder (FSB) is conceptualized as a multi-user platform for stakeholders to identify mutual relations of dependency between systems and to estimate/determine what impact a disturbance of this relation would have on the continuity of a given system. In this document the basic elements of these dependency and impact-models are defined. Categories of systems, sub-systems, dependency-relations and a whole range of parameters that turned out to be relevant when dealing with inter-sectoral cascading effects. The latest version of the ontologies are featured as Annex 1 in this report.
b) End-user requirement log-book: The purpose of this logbook is to name, define and prioritize requirements of end-users that have been collected during interviews, workshops or in bilateral discussions in emails. The logbook is a "user-story based" document that links all functionality requirements to a concrete way of using this functionality from the practitioner's perspective. The latest version of the end-user requirement document is featured as Annex 2 in this report.

In tasks 3.1 to 3.3 nine case studies on past crisis situations have been conducted. Analyses focused on the triggers of and conditions for cascading effects (task 3.1), relations between actors involved in crisis management and the characteristics of these relations (task 3.2) and on consequences of decision-making during the crisis (task 3.3). The outcome of these analyses contributed to the specification of the ontology.

In task 3.4 a multi-stakeholder workshop was held on the 10th of April at University College of London. In this workshop first mock-ups of the FORTRESS Scenario Builder (FSB) and FORTRESS Incident Evolution tool (FIET) were presented to different stakeholders of the FORTRESS project. These stakeholders included representatives from the Metropolitan Police of Turin, Italy and two Safety Advisors (one representing industrial safety and one for physical safety) from Safety Region Twente, a municipal authority for civil protection in Netherlands, as well as a risk manager from this organisation. A retired Police Officer responsible for gold level command and control in the UK was also present, along with a Command and Control Consultant from London, engaged in developing public sector response to crises. Also in attendance was an Emergency Manager from the city of Antwerp in Belgium. The main purpose of this workshop was to gain feedback on the state of work, especially the conceptual modelling approach that has been derived from the analyses of past crisis events (WP3) and from the system analyses that have been conducted in WP4, task 4.1 for the four scenario case study contexts. The results of this multi-stakeholder workshop will feed directly into the definition of a first set of user requirements for the two FORTRESS tools.

The following chapter summaries the main requirements that have emerged from work package 3. The third chapter documents the current state of the ontology specification document as well as the end-user requirement logbooks.

2 ONTOLOGY-REQUIREMENTS

The following findings of the analyses of past crisis events in Tasks 3.1-3.3 contributed to the modelling ontology:

a) Criticality of communication relations

In the vast majority of the case studies, the disruption of communication relations between organisations or organisational units involved in crisis management triggered cascading effects. One problem that needs to be taken into account is the congestion of telecommunication networks (radio, mobile phone) which complicates communication between first responders and thus coordination of action. This shows how important a resilient communication infrastructure is. Thus communication infrastructure needs to be taken into account as a main aspect of the vulnerability of systems and thus as an important cascading impact factor. The impact of a disrupted communication infrastructure needs to be assessed for each actor, organisation, system or sub-system (which is methodologically considered to be a 'node' linked with other 'nodes', see D4.1). Furthermore, it is recommended to the users to collect information about alternative communication channels that are able to buffer the disruption of a certain communication channel.

b) Organisational relations behind communication relations

The analysis of past crisis scenarios clearly showed that disrupted or even failed coordination of actors during crisis management is an important trigger for cascading effects. This kind of disruption was referred to as a disruption of 'organisational relations' between actors. Different scenarios for a disruption of coordination/organisation were identified: Incorrect, wrong or incomplete information leading to wrong decisions; sufficient information was available but decisions nevertheless turned out to be wrong in hindsight; lack of coordination due to missing coordination of crisis plans and agreements on organisational responsibilities. Based on these findings, a detailed analysis of organisational connections between actors involved in crisis management has been carried out in D3.2 (see Hagen et al., 2015).[1] Coordination and decision making turned out to be the core element of organisational relations. Other elements identified were transmission of information, advice, operation, planning and command. These different elements of organisational relations led to the requirement to distinguish between different contents of communication (expertise/advice, operational information, decisions/instructions, and approval for planned actions). Furthermore the category of a jurisdictional relation was introduced to highlight authority-relations between actors.

c) Supply and resource relations

In many cases the disruption of supply and/or resource relations triggered cascading effects. If road connections to a waterworks are destroyed, but the waterworks is dependent on a steady supply of chloride via road transport, its functionality might be disturbed even if it was not affected by the initial event. This confirms that emphasis should be placed on gathering knowledge about these dependencies and to make them visible before a crisis occurs.

[1] All FORTRESS deliverables are available on the project website: http://fortress-project.eu

d) Human resources available in organisations

The case studies confirmed that cascading effects can also result from a lack of resources and a sub-optimal allocation of resources available in different organisations (see also Alexander et al., 2014). A crucial type of resources are human resources. This results in the requirement to consider human resources as an important property of entities to be modelled in the Scenario Builder Tool.

e) Indirect impacts of events

The analysis of dependency relations and impacts highlighted the need to take into account possible indirect impacts of an event. For instance, in the case of the London attacks, the bomb explosions triggered a certain behaviour (i.e., many people utilising their mobile phones) which led to the congestion of the communication network. As the Scenario Builder aims to acquire knowledge about cross-impacts between entities, the aspect of indirect impacts needs to be taken into account in the impact assessment methodology for the tool.

3 END-USER REQUIREMENTS (TASK 3.4)

This chapter summaries end-user requirements for the two FORTRESS tools that have emerged from the multi-stakeholder workshop that was held on the 10th of April at University College of London.

3.1 ACTORS AND TARGET GROUPS

We need to be very clear about who we are addressing. So far we have collected valuable feedback especially from first responders, but infrastructure institutions might think differently about some of the suggestions we gathered, as different user groups will want to do different things with the FORTRESS tools:

- **First responders** may be interested in the decision-support capacities of the FIET, on a detailed level (if available) but also on a generic level.
- **Infrastructure providers** may be more interested in the relations-building capacities of the FSB; however they might want to test their dependencies in a variety of different scenarios and thus benefit from the shared knowledge that would have been made possible via the FSB.

3.2 SCOPE OF THE TOOLS

The intended scope of the FORTRESS tools has been discussed with end-users at length, in regard to (a) the level of data aggregation (generic vs. specific) and (b) different situations (crisis vs. pre-crisis). The end users feedback was very clear about this issue in that the FORTRESS consortium should cut back some functionalities that would be very difficult to implement and instead concentrate on features that will work. As one participant put: “Help us with the simple things so that we are free to think about the complex ones”.

However, a tool that would provide some insights on a generic level (raising awareness of relations between infrastructure X and Y or between sub-system of infrastructure X and sub-system of infrastructure Y) would be welcomed by most, and would already be seen as quite an achievement, while the idea to provide live decision support during a crisis on the very specific level (hospital X will run out of power in Y hours in the case of event A) was seen as very hard to achieve and implement.

Therefore the overall objectives of the tools include:

- Make visible the invisible before a crisis happens: help end-users to identify interconnections between systems/-sub-systems; raise awareness of interconnections and this related ‘generic risks’;
- Display interconnections and possible cascades during crisis;
- Established relationships and a joint knowledge-base that fosters inter-organisational communication during a crisis.

3.3 FRAMEWORK SCENARIO OF USING THE TOOLS

Collaborative Data collection in the preparation phase (FSB)
The FSB provides a collaborative modelling platform for interdependencies between infrastructure systems. It is also the main application to feed information into the database. This information will be the knowledge gathered through our case studies and by stakeholder’s input to indicate:

- Relevant sub-systems and objects,
- Main resource and communication relations between sub-systems and,
- Assessment of mutual impacts.

The aggregation level of modelling is adaptable (system or generic, sub-system or specific, which might include GIS objects). The FSB builds a generic model of interdependencies between core infrastructures that have been examined during the FORTRESS case studies. This generic level is not only a fall-back level should collaborative modelling not have taken place, but it also serves as a decision support tool during crisis.

Decision support during real crisis or training (FIET)
The FIET provides functionalities to display and visualise relations and impacts that have been built pre-crisis, during crisis or for training purposes. Its main output could be some sort of "interactive checklists" of directly and indirectly affected infrastructures (as one end user put it during the April workshop) as well as information about the criticality of the affected nodes. Depending on the aggregation level of available data, it can indicate "systems of interests", "sub-systems of interests" or even "points of interests".

Depending on further inputs by the user, e.g., buffer-times and propagation time, the tool can also provide timelines for cascading effects. The end-user feedback revealed that there is no tool that provides cascading impact functionalities right now, which is a gap the FIET aims to fill. All of the participants in the workshop mentioned that they already have geo-analytics tools. The practitioners pointed out very clearly, that during a crisis they do not have the personnel capacities to use a tool that requires further input. Therefore, the FIET should be able to work with minimal input. For every system you use during a crisis you need resources, so if you have a system that has already been used pre-crisis, it can more easily be used during a crisis. A problem during crisis management is getting the right people in the right place and doing the right thing. People will need to complete activities in the pre-crisis phase in order to carry them out during the crisis.

How the tool will be deployed is an issue for the practitioners. A multiplatform approach is preferred (web). The idea of having the tool available for commercial mobile devices (i.e., tablets) was very well received. It has been mentioned that the FIET should provide a means to record decisions (although they were not clear about what to do later with that information).

REFERENCES

Hagen, K., Watson, H., Wadhwa, K., Anson, S., Tzanetakis, M., Kreissl, R., Ritchey, T., Zaidi, Z., Pescaroli, G., Alexander, D. 2015. Map of stakeholder inter-relationships and ecosystems. *Deliverable 3.2 of the FORTRESS project.* http://fortress-project.eu/research/ (Accessed: 25 April 2015).

Alexander, D., Bartels, M., Hagen, K., Hahne, M., Hempel, L., Kreissl, R., Pelzer, R., Pescaroli, G., Ritchey, T., Tzanetakis, M., Wadhwa, K., Watson, H. 2014. Interdependencies and cascading effects in crisis situations. *Deliverable 1.1 of the FORTRESS project.* http://fortress-project.eu/research/ (Accessed: 25 April 2015).

ANNEX I: ONTOLOGY AND CLASSIFICATION OF RELATIONS

Resource relation				
Definition	*Functional relation between actors where one actor depends on the provision of a resource by other actors*			
ATTRIBUTES				
Nr.	**Name**	**Description**	**Type/Measure**	**Values**
1	Type of resource	Which resource is transported/transmitted from A to B?	Numeric, nominal	Energy Water Oil Gas Fuel Telecommunication Transport
2	Means of transport	By which means of transport is the resource transported/transmitted from A to B?	Numeric, nominal	via network via road via see via air
3	Trigger	Does the relation is triggered by a crisis or is it also present in the regular operation mode of infrastructures/organisations?	Numeric, nominal	Crisis Also in routine mode
4	Person in charge in A	Who is in charge of dealing with problems in case of a disturbance in organisation A?	String	
	Person in charge in B	Who is in charge of dealing with problems in case of a disturbance in organisation B?	String	
5	Existing mitigation measure	Which mitigation measures are available in the case of a disturbance?	String	
6	Time dependency	Is the relation independent by time, or takes place only in a determined period of time?	String	

Service Relation				
Definition	*Functional relation between actors where one actor depends on the provision of services by other actors (e.g. repair, maintenance)*			
ATTRIBUTES				
Nr.	**Name**	**Description**	**Type/Measure**	**Values**
1	Type of service	Which service?	Numeric, nominal	Repair Maintenance
2	Mobility	Which means of transport are needed to provde the service?	Numeric, nominal (multiple possible)	road based see based air based
3	Trigger	Does the relation is triggered by a crisis or is it also present in the regular operation mode of infrastructures/organisations?	Numeric, nominal	Crisis Also in routine mode
4	Person in charge in A	Who is in charge of dealing with problems in case of a disturbance in organisation A?	String	
	Person in charge in B	Who is in charge of dealing with problems in case of a disturbance in organisation B?	String	
5	Existing mitigation measure	Which mitigation measures are available in the case of a disturbance?	String	
6	Time dependency	Is the relation independent by time, or takes place only in a determined period of time?	String	

Communication relation				
Definition	*Communication channels between two actors/systems which do exist in routine operations or come into place in a crisis situation in order to coordinate actions*			
Nr.	**Name**	**Description**	**Type/Measure**	**Values**
1	Specification of communication channel	How, by using which communication channel, do or should both actors/system communicate?	Numeric, nominal (multiple answers possible)	Face-to-face Land-line Mobile Satellite
2	Specification of actors	Are humans or machines communication with eachother?	Numeric, nominal	Human-human Human-machine Machine-machine
3	Specification of the content of communication	What is the content of communication between A and B? What does A need from B to be communicated?	Numeric, nominal (multiple answers possible)	Expertise (A needs Expertise from B) Information (A needs information from B) Approval (A needs approval from B) Instruction (A needs instructions from B)
4	Trigger	Does the relation is triggered by a crisis or is it also present in the regular operation mode of infrastructures/organisations?	Numeric, nominal	Crisis Also in routine mode
5	Person in charge in A	Who is in charge of dealing with problems in case of a disturbance in organisation A?	String	
	Person in charge in B	Who is in charge of dealing with problems in case of a disturbance in organisation B?	String	
6	Existing mitigation measure	Which mitigation measures are available in the case of a disturbance?	String	
7	Time dependency	Is the relation independent by time, or takes place only in a determined period of time?	String	

Interference relation				
Definition	*Unintended interactions between actors/systems that only come into being in the case of a disturbance.*			
Nr.	**Name**	**Description**	**Type/Measure**	**Values**
1	Specification of interference	How, by using which communication channel, do or should both actors/system communicate?	Numeric, nominal	Geospatial Meteorological Other Socio-oeconomic
2	Person in charge in A	Who is in charge of dealing with problems in case of a disturbance in organisation A?	String	
	Person in charge in B	Who is in charge of dealing with problems in case of a disturbance in organisation B?	String	
3	Existing mitigation measure	Which mitigation measures are available in the case of a disturbance?	String	
4	Time dependency	Is the relation independent by time, or takes place only in a determined period of time?	String	

Jurisdictional relation				
Definition	*A has authority over B, thus A overrules decisions made by B*			
Nr.	**Name**	**Description**	**Type/Measure**	**Values**
1	Specification of the authority	?	Numeric, nominal	?
2	Trigger	Does the relation is triggered by a crisis or is it also present in the regular operation mode of infrastructures/organisations?	Numeric, nominal	Crisis Also in routine mode
3	Person in charge in A	Who is in charge of dealing with problems in case of a disturbance in organisation A?	String	
	Person in charge in B	Who is in charge of dealing with problems in case of a disturbance in organisation B?	String	
4	Existing mitigation measure	Which mitigation measures are available in the case of a disturbance?	String	
5	Time dependency	Is the relation independent by time, or takes place only in a determined period of time?	String	

ANNEX 2: FIET REQUIREMENTS

Req. ID	Req. Priority	Test	% done	Notes	Cat. ID	Category	Short	User Story	Task	Notes	Requirement description
FR-01	1		0%				Scenario selection	As a user, I want to be able to select one scenario to work with. An overview of the scenarios could help me to select.		The FIET will provide a Scenario Selection view. This view will display a list with available scenarios. When the user selects one, the FIET will display the description of the scenario and the list of the nodes involved in it. The Scenario Selection view will present a Load button that the user will use to load the scenario into the FIET. Only one scenario can be loaded at the same time.	The FIET should provide the means to load one of the different available scenarios. The FIET could display some details about the scenarios (description, area of interest, involved nodes…) to ease the selection.
FR-02	2						Relations map	The application will show a complete representation of the scenario selected. At this point, I want to be able to modify any parameter of the scenario before beginning a simulation.		The FIET will provide the Relations Map view. The Relations Map view will present the Entities Relationship Model of the scenario to the user. Nodes will be represented as boxes containing a representative name. Relations will be represented as arrows linking two boxes. The FIET will allow the user to select a node or relation. When the user selects a node or a relation, the FIET will display the Node Definition view or the Relation Definition view accordingly. The Definition views present all the information related with the node or relation and the input parameters that must/can be defined.	The FIET should be able to represent the nodes involved in the scenario and their relationships. The FIET should provide the means to define the values of any of the parameters of the different nodes or relations.
FR-03	2						Timeline	In order to understand how actions in one system impact another, I need an understanding of how the different systems and dependencies may change over time.		The timeline control will display the foreseen AEs ordered by expected time of occurrence. It will also allow changing the output of other controls (maps, lists of AEs, risk analysis graphs) by selecting a moment in time to analyse. The user could change the selected time by clicking on the time bar or by grabbing and moving the “current” time indicator. The timeline will provide a Details view, available by clicking on one of the AEs of the timeline. This view will display basic	The FIET should provide a common place to represent the foreseen AEs as a sequence depending on time and to select the moment in time which the FIET would be representing. It would be interesting if the FIET could allow the user to select one of these AE and then display its details.

										information about the selected AE and will provide the means to navigate between AEs, moving to the previous or the next.	
FR-04	**3**						Ongoing AE's list	As a DM, I want to have a list with all the ongoing events and I want to be able to sort them, i.e. by time of occurrence, criticality or priority.		The FIET will provide a sortable, filterable list of past AEs. The list will provide as much meaningful information about the AEs as possible. The user will be able to select the fields to be displayed.	The FIET should display a list of AEs that have actually happened at an instant in time. This instant in time could be the current time or a time selected by the user. The list of incidents should be sortable and filterable. The FIET should allow grouping AEs when a relation of dependency exists between them.
FR-05	**3**						Foreseen AE's list	Taking into account that the tool is a foresight tool, I want to have a list with all the foreseen events and I want to be able to sort them, i.e. by expected time of occurrence, criticality or priority.		The FIET will provide a sortable, filterable list of past AEs. The list will provide as much meaningful information about the AEs as possible. The user will be able to select the fields to be displayed.	The FIET should display a list of AEs foreseen from an instant in time. This instant in time could be the current time or a time selected by the user. The list of incidents should be sortable and filterable. The FIET should allow grouping AEs when a relation of dependency exists between them.
FR-06	**3**						Geo-analytics	As a user, I want to have as much information as possible represented over a map, to have a common operational picture of the situation and so improve situation awareness.		The FIET will provide a Geo-Analytics view. The Geo-Analytics view will consist of a map of the area enclosing the scenario nodes where all the georeferenced elements defined by the scenario are represented. These elements could be nodes, AEs, relations, among others. The FIET will allow activating or deactivating the different layers of information represented over the map. By default, the visible layers will be the layer of ongoing AEs and the layer of relations between ongoing AEs, as these two layers provide an understanding of the current situation via a geographical lens. Depending on the information provided by the scenario, different representations will be available. For example, relations will be represented by black arrows by	The FIET should provide an understanding of the current situation via a geographical lens.

										default, but if relations had a type parameter, then different colours would be used for each type.	
FR-07	**2**						Risk Analysis	As a DM, I want the tool to provide some guidance in the decision making, for example providing some kind of risk analysis.		The FIET will provide a Risk Analysis view. The FIET will present the foreseen AEs in a Consequence vs Probability graph or risk matrix. The consequences could refer to people, assets, environment or cost. The Risk Analysis view will allow the user to select one of the AE. If a user selects an AE, the FIET will display basic information about the AE.	The FIET should provide the means to prioritize AEs for further actions by assessing and combining their probability of occurrence and impact.
FR-08	**2**			Previous Cascading impact, changed as CI will refer to nodes instead of effects			Cascade of effects	As a user, I think it will be interesting to have a graphic representation of the cascade of effects.		The FIET will provide the Cascade of Effects view. The Cascade of Effects view will show a graph of AEs with the trigger AE as root element.	The FIET should be able to display the cascade of AEs consequence of an initial AE.
FR-09	**4**						Mitigation	As a DM, I am not only interested in what is happening but also in what ways I can reduce its impact. I want the application to provide information on how my decisions change the foresight.		The FIET will allow the user to select an AE for mitigation. The FIET will provide the Mitigation view where the actions and strategies defined in the scenario to lessen the severity or scale of the selected AE will be presented. The user will be able to select among the different actions and strategies those which he considers appropriates. Depending on the situation, the FIET will have different approaches about when applying the mitigation measures. During a training exercise, mitigation measures will be considered as soon as they are chosen. For a simulation, the actions could be selected at the beginning, in which case they will apply as soon as the AE takes place unless the user defines a different time, or they can be entered during the simulation, and then the current timestamp will be used (just as in the case of the training exercise). Finally, during a crisis, the current timestamp will be used by default for ongoing AEs while the actions will be processed as if they are made as soon as the	The FIET should present the user with actions and strategies to lessen the severity or scale of an AE; should allow the user selecting among these actions and strategies those which he wants to take; and should modify its predictions according to the actions and strategies made.

										foreseen AEs occurs; in both cases the user can define different timestamps. Whatever the execution mode, the FIET will always update its outcome accordingly.	
FR-10	**4**						Optimization	As a user, I would like the application to show me ways to improve my protocols and reduce the consequences of adverse events.		The FIET will provide an Optimization view. The user will select, between all the input parameters of the scenario, two which he would like to analyse. The rest of the inputs will take their default values or the user will set their values. The user will define the range of values to assign to each input. The user will select one of the outputs of the scenario to act as evaluation criterion.	The FIET should provide the means to evaluate the influence of several factors in the outcome of the scenario in order to find the optimal values for them.
FR-11	**1**			This functionality will focus on who/what is affected by cascading effects, but not on what effects occur in the afected elements. FIET will provide the means to select where the trigger event takes place and then it will highlight the affected elements and the relations through which they are affected.			Cascading impact: graph	As a Gold DM, I want to have a 3D representation of the relations between the different elements affected by a crisis. I expect the view to be simple but allowing to move to complex representations.		FIET will provide a Cascading Impact: Graph view. This view will provide a visualization of the network of nodes that could be affected by a trigger event. The view will allow the user to navigate between the different levels of aggregation (system, sub-system, geo-referenced object) by selecting the desired aggregation level for the view (which set the aggregation level for the whole graph) or by clicking on the nodes (which will expand/collapse the selected node(s)). The different nodes will be represented in different ways to highlight their importance (different size, different colours…) if information is available to enable this feature (criticality, vulnerability, public perception…). The view will allow the user to view detailed information about a selected node.	The FIET should be able to display the network of nodes affected by the cascading effects. It would be interesting to be able to highlight how each node influence other nodes or the (relative) importance of the node (perception). This visualization should be available for all levels of aggregation: system, sub-system, geo-referenced objects. It would be useful to be able to navigate between the different levels of aggregation.
FR-12	**1**						Cascading impact: ordered list	As a DM, I want to have a list with the elements that can be affected after an event takes place. A check list of elements ordered by		The FIET will provide a Cascading Impact: Sorted List view. This view will present the list of nodes which would be affected as a result of the current crisis. The list will be sorted if information is available to enable	The FIET should be able to provide the list of nodes affected by the cascading effects. The information should be presented as a list of items of the same aggregation level or as a tree of elements

								importance could be sometimes enough.		this feature (criticality, vulnerability, public perception…). The user will be able to select the level of aggregation he wants to be displayed: all, system, sub-system, geo-referenced object. The all options will display the list of system nodes, each of which will be expandable to show the sub-systems affected, and so on. For the other options (concrete aggregation levels), only the nodes of such aggregation level will be displayed.	where each level of the tree represents a different aggregation level. It would be interesting to be able to sort the list by influence over other nodes or by the (relative) importance of the node (perception). If a list of actions to be taken for each node was available (i.e. based on emergency plans), then this information could be unfold when an item of the list was selected or could be presented as a lower level of the tree of nodes.
FR-13	**2**			London participants said that they already have GIS systems, but I think that the representation of the foreseen consequences on a map is a must.			Cascading impact: map	As a user, I want to see over a map all the actors that are related (and therefore can be affected) to the system where a trigger event takes place.		The FIET will provide a Cascading Impact: Map view. This view will present on a map the geo-referenced objects that could be affected by the cascading effects. The view will provide a tree of layers to configure the information presented on the map. In the tree view, the GIS objects will be grouped by sub-systems and these by systems. The different nodes will be represented in different ways to highlight their importance (different size, different colours…) if information is available to enable this feature (criticality, vulnerability, public perception…). The view will allow the user to view detailed information about a selected node.	The FIET should be able to show on a map the geo-referenced nodes that would be affected after a trigger event. It should be able to show or hide the relations between the nodes. It would be interesting to be able to highlight how each node influence other nodes or the (relative) importance of the node (perception).
FR-14	**2**						Deactivate node	As a user, I want to be able to select a node and mark it as secured. The node is no longer at risk and is not considered to be a trigger for effects on related nodes.		All the views of FIET where nodes are represented will allow to deactivate (and reactivate) them. Deactivating or re-activating a node will change the outcome of FIET.	The FIET should allow the user to deactivate a node. This will make the node and all its relations not to be considered as part of the scenario as long as the node stays deactivated.