



Resilience Enhancement of Communication Infrastructures

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The Horizon2020 project RESISTO (Resilience enhancement and risk control platform for communication infrastructure operators) aims to reduce the risk as well as the impact of an anomalous incident for the telecommunication infrastructure. Incidents here can be natural hazards such as floods, earthquakes etc., but also cyber attacks, physical attacks or a combination of the latter two.

The approach uses a short-term control loop (STCL) that detects anomalies via various sensors or factors: internal remote sensors such as cameras, external sensing such as weather data, social media data mining, etc.. By doing so, the STCL is a risk predictor, but it also predicts effects of countermeasures and simulates short-term effects of failure with respect to performance degradation. This real-time risk and resilience assessment and the integrated interdependency analysis (among virtual and physical domains) lead to an effective Decision Support System (DSS) that detects critical situations and supports their management.

A risk and resilience analysis of the system is performed on a regular basis by the long term control loop (LTCL). It is used to generally evaluate the resilience of the system via network simulation techniques, to identify weak points and test effects of various improvement measures. The resilience management process is based on the risk management process defined in the ISO 31000 and refined to the specific needs of RESISTO. The outcome of the LTCL analysis can be compared to the measured values of the STCL to validate and improve the simulation model.

The functionality, modularity and adaptability of the DSS is validated by nine use cases with various sub-scenarios, led by the telecommunication providers in the consortium. The use cases apply differing combinations of real and virtual parts, posing a specific threat to the infrastructure. An example for the added value to the resilience and recovery strategies of a telecommunication infrastructure and its provider is given by a use case where an unspecified natural disaster hits a rural area:

Because the RESISTO system interfaces with specific national sensing platforms such as weather and seismic ones, it is aware of the natural disaster and its severity. Simultaneously, RESISTO receives the congestion events from the provider's Network Management Center (NMC) and monitoring tools. It responds by "ordering" an Unmanned Aerial Vehicle (UAV) to make a damage

inspection in the area. With the UAV, the platform identifies the affected critical network assets (antennas, switches, routers etc.) as the potential cause of the congestion, and correlates the loss of the network resources with the congestion events. RESISTO then suggests suitable mitigation actions, i.e. traffic redirection and or activation of auxiliary network resources. Also conceivable is the direct dispatch of technical / maintenance personnel, depending on safety aspects.

Telecommunication nowadays is crucial for the functioning of a society, on the corporate as well as on the private level. During the response and recovery phases of disasters, telecommunication infrastructures also play a central role. The RESISTO platform aims to be another step towards more resilient societies.