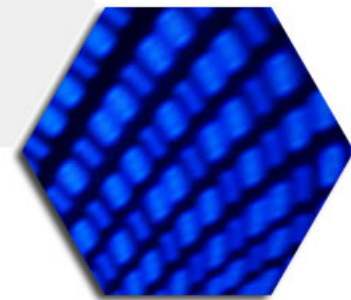




Resilience Enhancement of Communication Infrastructures

A use case on display

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- «The threat» → What is the use case about?
- «The impact» → What effects does the threat have on the telecommunication system?
- «The concept» → What does the RESISTO platform do to assess, cope with and mitigate the effects?
- «Excursus» → What did the Shiny app do during the use case?



A transmission tower damaged by Hurricane Michael in Callaway, Florida, U.S., October 11, 2018. REUTERS/Jonathan Bachman

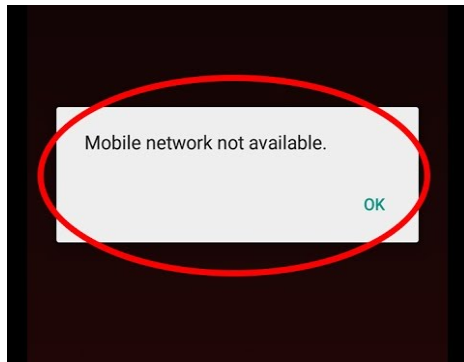
- RESISTO is a multihazard, multi tool decision support system
 - short term control loop → real time, data from various sources, correlator engine, risk predictor
 - long term control loop → indicator based risk and resilience assessment
- Methodological approach: 3 macro-scenarios, each with a set of various use cases
- **Macro-scenario 1** «The protection of the current existing Telecommunication Critical Infrastructures», **use case 2** «Terrorist attack and natural hazards causing network failure and telecommunication congestion», **sub use case 2** «A natural disaster affects telecom assets»



Earthquake (comparable to the one in Athens on 19 July 2019, with a magnitude of 5.1, but in a sub-urban area)



- **Wireless assets** (antenna pillars) and their accompanying **buildings** with routing circuits and the networks that they support (backhaul paths and consumer cellular networks), and sites for broadcast and radio transmissions.



Source:
https://www.youtube.com/watch?v=6sbIIYi_mwY

- **Telecom network:** network failure and DoS (denial of service) especially for mobile communications, telecommunication congestion in the local area of impact.

Speech traffic on 19 July 2019 (in daily call minutes)



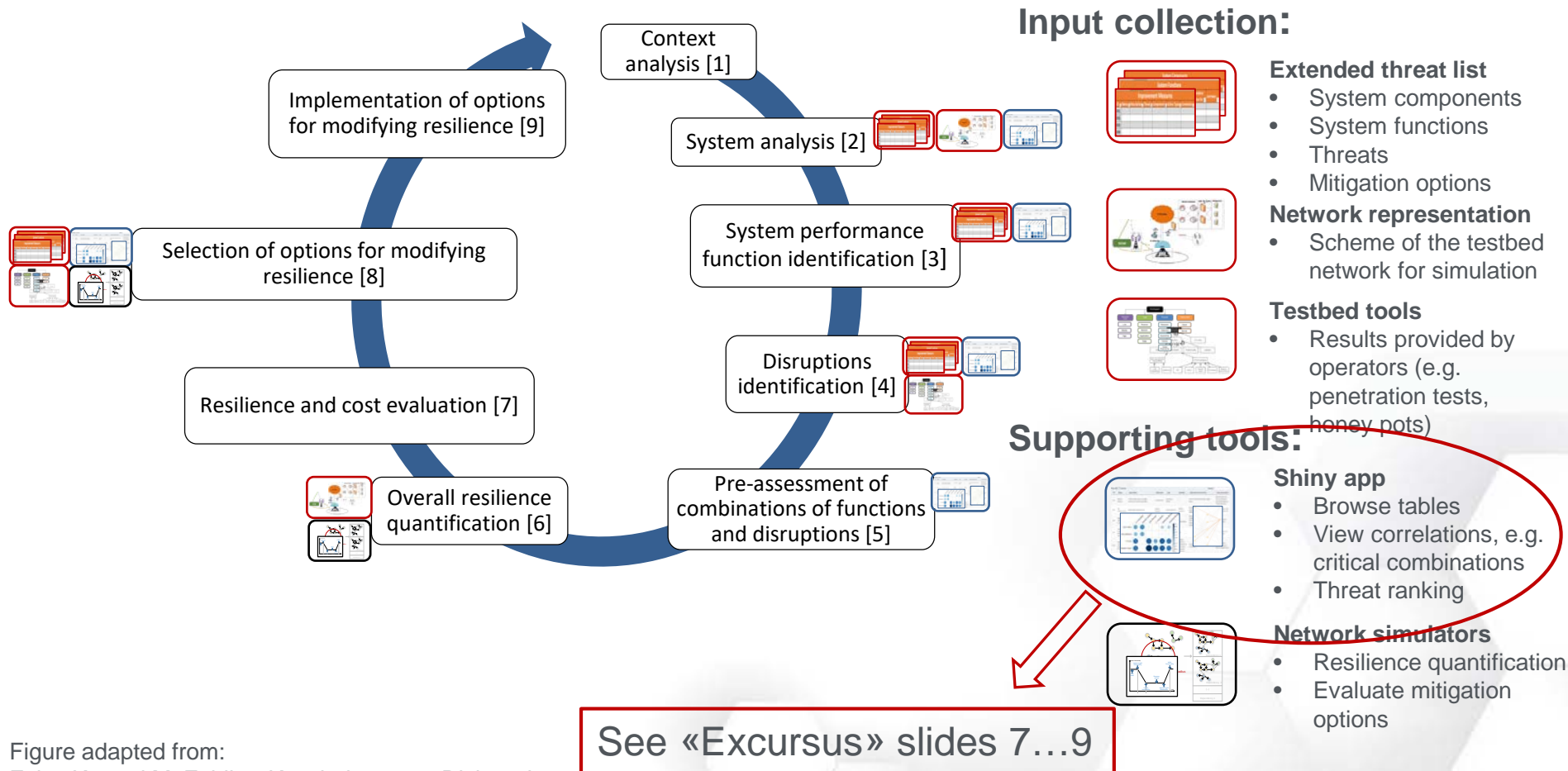
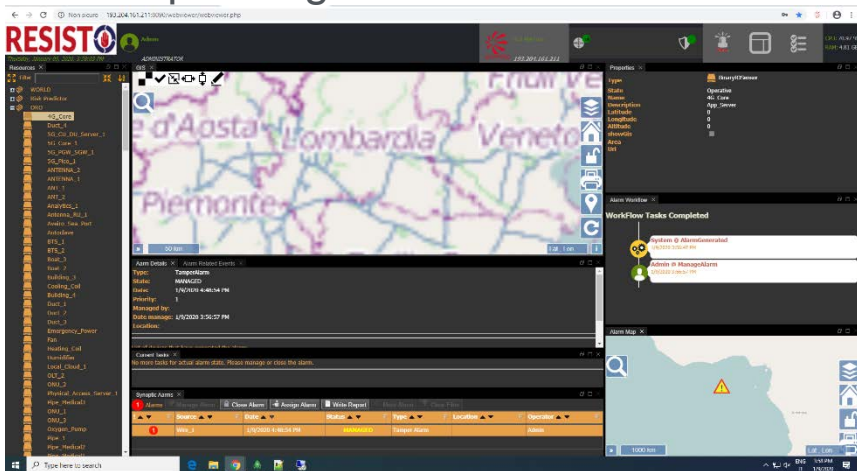


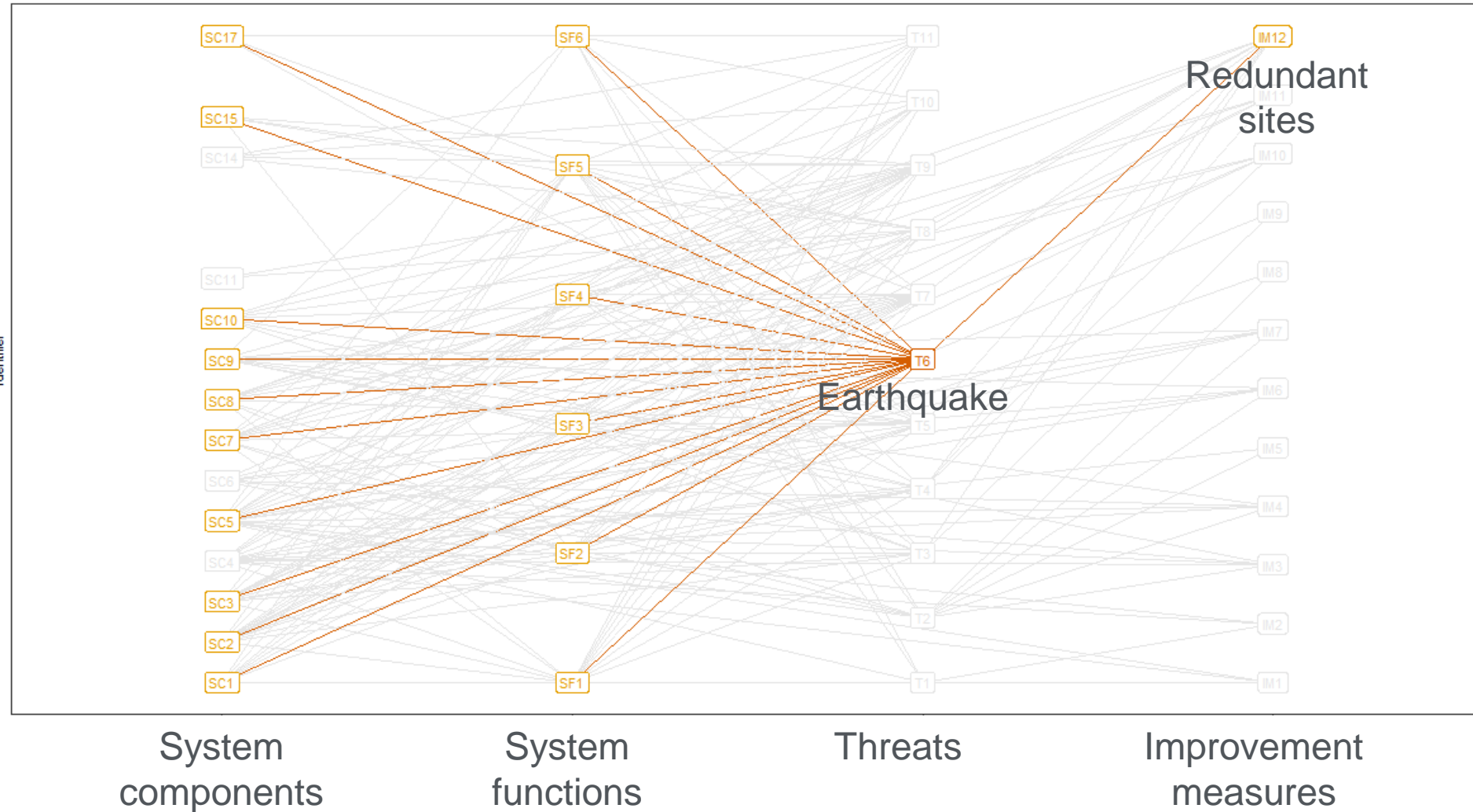
Figure adapted from:
 Faist, K., und M. Fehling-Kaschek. 2019. „Risk and resilience management process for cyber-physical threats of telecom CI.“ *RESISTO project | Deliverable*. Aug. Zugriff am 29. April 2020. <http://www.resistoproject.eu/resources/>

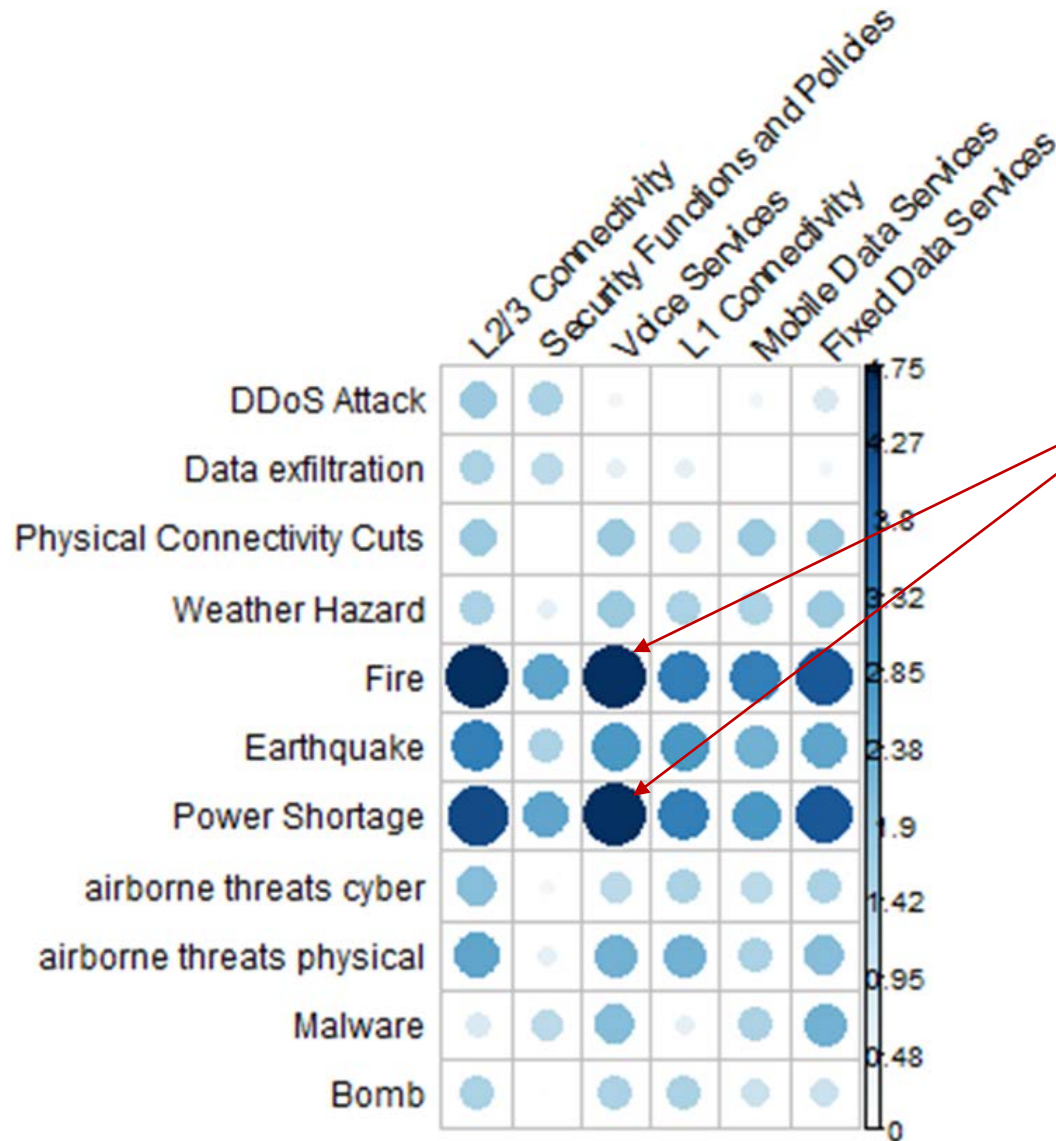
- External data
 - weather
 - seismic
 - big data (mining)
 - ...
- Internal data
 - congestion events
 - fault reports
 - video surveillance
 - ...

Three screen HMI: alarm management window, risk predictor and an individual window depending on the situation:



- All data clearly arranged
- Decision support:
 - Immediate measures, e.g. UAVs for damage checks
 - Long-term measures for resilience enhancement
- Self-learning platform





- Correlation matrix (not normalized)
- Larger, darker blue circles are more critical
- Correlation considers connections
 - Threats that directly connect to function
 - Threats that connect to system components that are connected to the function

