Integrating Mission-Centric Impact Assessment to Operational Resiliency in Cyber-Physical Systems

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Abstract	Developing mission-centric impact assessment techniques to address cyber resiliency in the cyber-physical systems (CPSs) requires integrating system inter-dependencies to the risk and resilience analysis process. Generally, network administrators utilize attack graphs to estimate possible consequences in a networked environment. Attack graphs lack to incorporate the operations-specific dependencies. Localizing the dependencies among operational missions, tasks, and the hosting devices in a large-scale CPS is also challenging. In this work, we offer a graphical modeling technique to integrate the mission-centric impact assessment of cyberattacks by relating the effect to the operational resiliency by utilizing a combination of the logical attack graph and mission impact propagation graph. We propose formal techniques to compute cyberattacks' impact on the operational mission and offer an optimization process to minimize the same, having budgetary restrictions. We also relate the effect to the system functional operability. We illustrate our modeling techniques using a SCADA (supervisory control and data acquisition) case study for the cyber-physical power systems. We believe our proposed method would help evaluate and minimize the impact of cyber attacks on CPS's operational missions and, thus, enhance cyber resiliency.
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