

From Risk to Resilience: Analytical Methodology and Applications

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As society relies more upon integrated cyber-physical systems, the importance of the security of these systems increases. As new safeguards are developed and implemented, adversaries continue to develop novel ways to breach and disrupt critical infrastructure. While significant advances in the field of risk assessment have been achieved, risk-based solutions tend to focus on assessing and hardening individual component of complex systems under specific threat scenarios. Realization of the inability to predict threats resulted in significant interest in resilience-based management. The US National Academy of Sciences (NAS) defines resilience as “the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.” This definition calls for a system view of resilience and provides the basis for several interagency efforts in the US and EU on developing metrics for resilience management and for integrating temporal capacity of a system to absorb and recover from heterogeneous adverse events, and then to adapt; resilience provides an entity with the ability to repair, replace, patch, or otherwise reconstitute lost capability or performance in physical, cyber, social and cognitive domains. Resilience thus uses strategies of adaptation and mitigation to augment traditional risk management. This presentation will focus on ways in which decision makers could utilize resilience management in operations. Ongoing attacks require immediate response and thus real time decision making; resilience, as a property of a system, must transition from concepts and definitions to an operational paradigm for system management, especially under emergent and future threats. Methods and tools that are able to reconcile conflicting information, as well as the complex context of the decision making environment will be discussed.