

# Abstract

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## **Threat-Driven Modeling Framework for Secure Software Using Aspect-Oriented Stochastic Petri Nets**

Design-level vulnerabilities are a main source of security risks in software. To improve the reliability of software design, this paper presents a modified threat-driven modeling framework, to determine which threats require mitigation &#97;&#110;&#100; how to mitigate the threats. To specify the functions &#97;&#110;&#100; threat mitigations of a security design as a whole, aspect-oriented Stochastic Petri nets are used as a formal amplified model. Moreover, this paper proposes an adapted augmented approach to define software security metrics based on vulnerabilities included in the software systems &#97;&#110;&#100; their impacts on software quality. The Common Vulnerability Scoring System (CVSS), a vulnerability scoring system designed to provide a standardized method for rating software vulnerabilities, is used as the basis in the metric definition &#97;&#110;&#100; calculations. Furthermore, a case study is detailed, which shows the essence &#97;&#110;&#100; feasibility of using aspect-oriented stochastic Petri net models for threat modeling &#97;&#110;&#100; that the proposed security metrics are consistent with common practice.