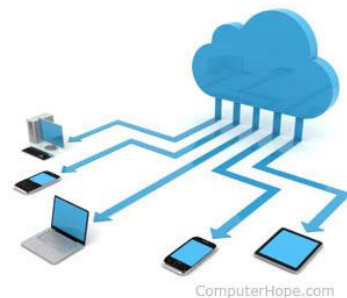


Department Research

Security Risk Modeling and Assessment of Cloud Computing

Abstract: Cyber security attacks are critical threats to cloud computing, which is one of the biggest concerns for businesses to integrate and adopt cloud computing. In order to ensure the security of cloud computing, the first step is to assess and understand the effectiveness of existing cloud security controls and architectures. A major issue in the development of resilient and secure cloud computing is the lack of well-established security metrics, attack models, and security risk assessment methodologies which are necessary to determine the effectiveness of security mechanisms and protocols, assess the impact of combined vulnerabilities, and to enhance the security based on these analyses. Many existing security risk assessment techniques for cloud computing use a checklist manually, but the procedure is error prone, and does not scale for larger dynamic networked system like cloud computing. Most of the existing attack and defense metrics measure the security of static networked systems. Hence, existing metrics may not be able to reflect and capture the essence of dynamic nature of cloud computing. A cloud computing system can dynamically allocate and change resources (e.g., migration of virtual machines), which is not well studied in the existing security models. As a result, security posture of cloud computing cannot be assessed accurately without taking into account dynamic changes. These problems can be resolved by adopting new attack and defense modeling methodologies coupled with security metrics in cloud computing, which can provide automated security risk assessments. The overall objective of this research is to address aforementioned challenges by developing novel attack and defense modeling methods, security metrics, and ultimately incorporate these methods, models and metrics together in a security risk assessment framework and tool. (i.e., how to assess the changes in security risk of the cloud computing systems in a scalable and adaptable way). The framework and tool will enable security decision makers of organizations to assess the security risk of cloud computing in a scalable and adaptive manner more efficiently and effectively to the existing methods.

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