

**MASTER'S PROJECT (SUMMER 2012)**

TOPIC: *A Model Checking Approach to Detecting Abnormal User Behaviors in Cloud-Based Transactions*

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LOCATION: Dion 311

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ABSTRACT

With the fundamental paradigm shift to service-oriented architecture (SOA) in web-based systems and the recent advancement in cloud computing, there are major concerns in service security in cloud-based applications. As cloud services are potentially to be exposed to any end user, efficient and effective security measures must be taken to stop and prevent hackers from attacking cloud services. The existing techniques of Web Service Security (WS-Security) such as XML Encryption and XML Signature, are typically based on request message scanning to determine if predefined security policies have been breached and if there are potential threats on the underlying web services. In this project, we demonstrate a novel technique that uses a model checking approach to detecting abnormal user behaviors in cloud-based transactions, which could be potential threats on cloud services. The real-time interaction model is written in Promela, which is, basically, a simulation of the transactions made by a user to cloud services. The complex abnormal user behaviors are specified using linear temporal logic (LTL), which can be verified using an existing model checker called SPIN, to determine if the specified abnormal user behaviors are present in the model or not. With this approach, we achieve service security by examining the user behaviors for any malicious or illegal activities rather than plainly scanning request messages. Finally, we developed a prototype cloud-based e-commerce application and an intrusion detection system (IDS) using our model checking approach to demonstrate the feasibility and effectiveness of our approach.