CERIAS

The Center for Education and Research in Information Assurance and Security

End to End Security in Service Oriented Architecture

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Problem Statement

- Most of the modern services outsource a subset of their funcitonalities to external services (subcontracting)
  - Outsourcing leads to chain of service invocations (service consumers may not be aware of it)
  - These services are controlled under different administrations
- Service consumers have no visibility or control on the execution of these services (no accountability)
- Service consumers may have different policies (sec requirements) that they expect to be monitored or enforeced.
- Modern services are continuously changing to meet the business requirements
  - Static security solutions do not work.

We are proposing a *dynamic security framework for SOA,* which is able to monitor/enforce the user-defined policies and maintain the trustworthiness of services based on their execution history

Proposed Solution

The following solutions are proposed:

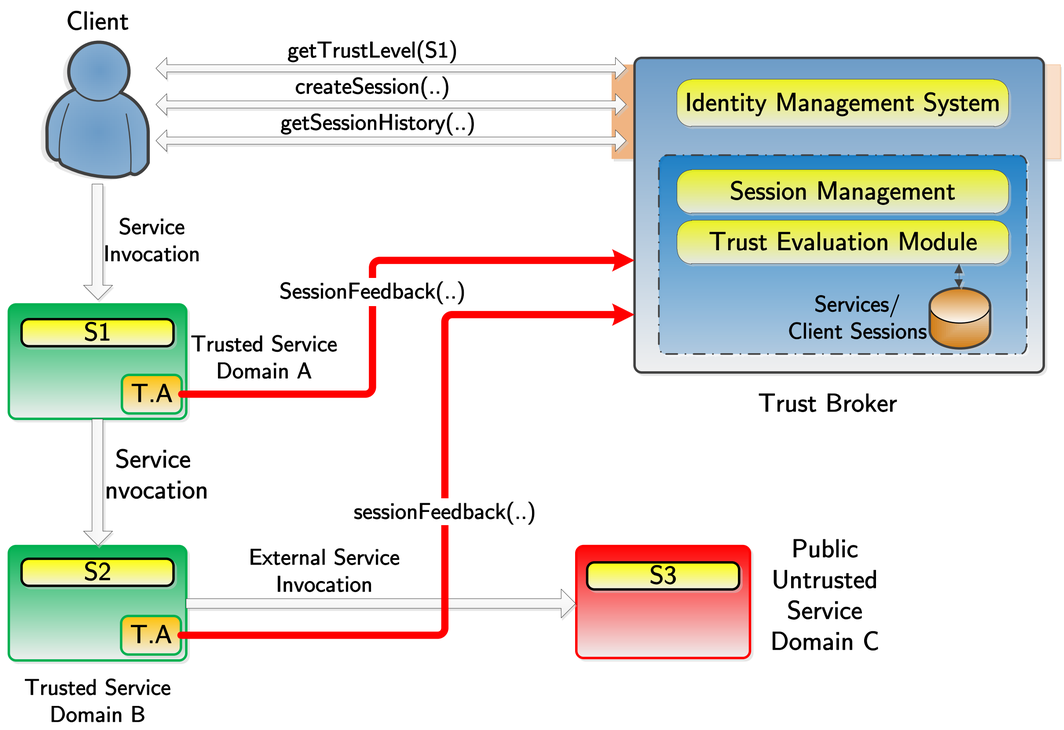
- **End to End security policy monitoring and enforcement**
  - Inter-service information flow control
    - Intercepting external service invocations
    - Using Aspect-Oriented Programming
  - Intra-service information flow control
    - Using taint analysis to detect the propagation of sensitive data to external services
    - Implemented in AOP
  - Service clients are able to define policies in XACML language
  - The proposed system monitors the policies and report back to *Trust Broker*
  - The proposed system enforces the policies and applies the defined action
    - Actions upon violation of policies: Termination of service exectution; delay (throttling); replacing the service with a new service (redirection)

- **Secure and adaptive service composition**

The objective is to select a subset of services from different service categories in order to maximize the overal security of the SOA application

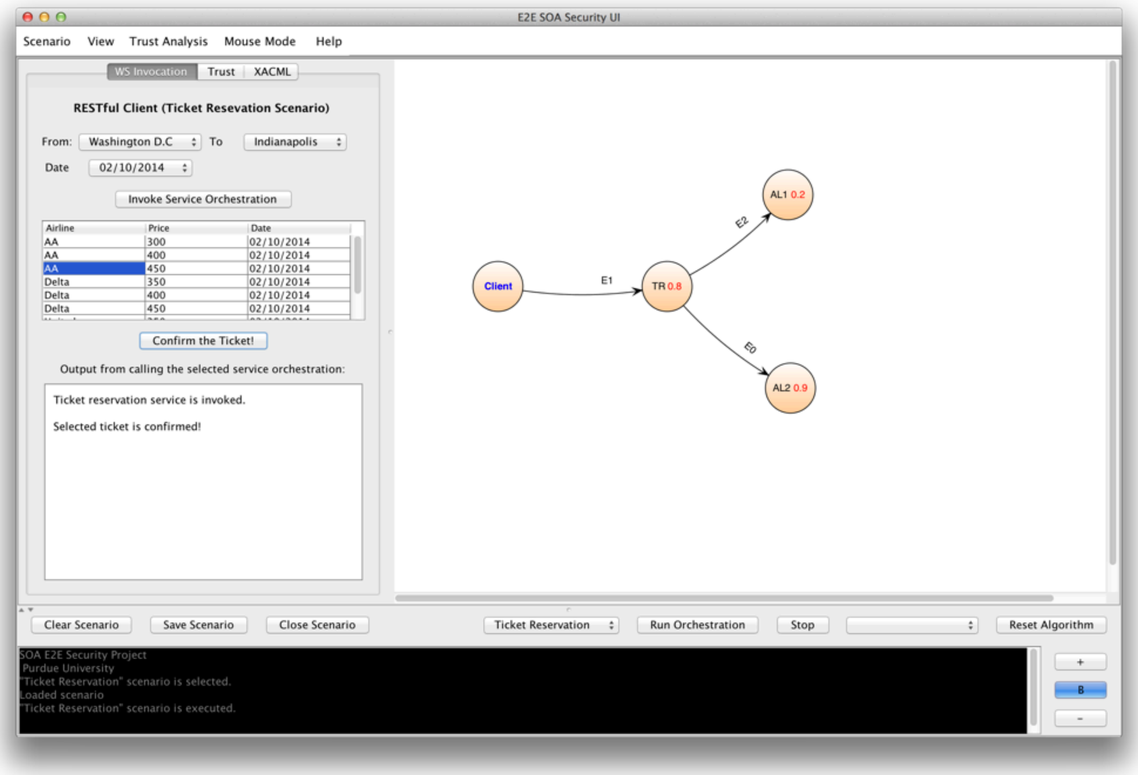
- Leveraging the collected/maintained metrics at the *Trust Broker* subsystem
- Formulating the problem as a variation of the Knapsack problem
- Solving the problem using Dynamic Programming (Pseudo-polynomial solution)

Proposed System Architecture



Implementation

- Implemented in both SOAP and REST web service technologies (Java)
- Implemented a set of representative scenarios
  - Ticket Reservation Scenario
  - Complex Service chains
- Evaluated the effectiveness of the proposed solutions for these scenarios
- Created a GUI to design new scenarios and interact will different subsystems of the framework



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