Attribute Function: an enabler for effective inexpensive application-specific security decisions

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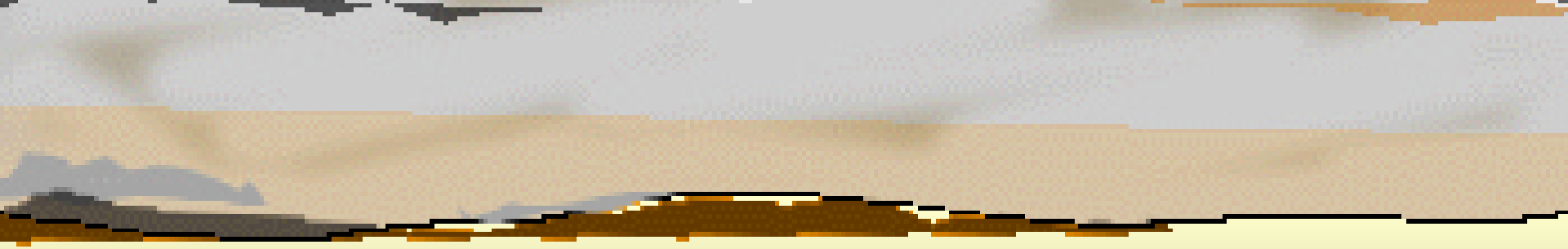
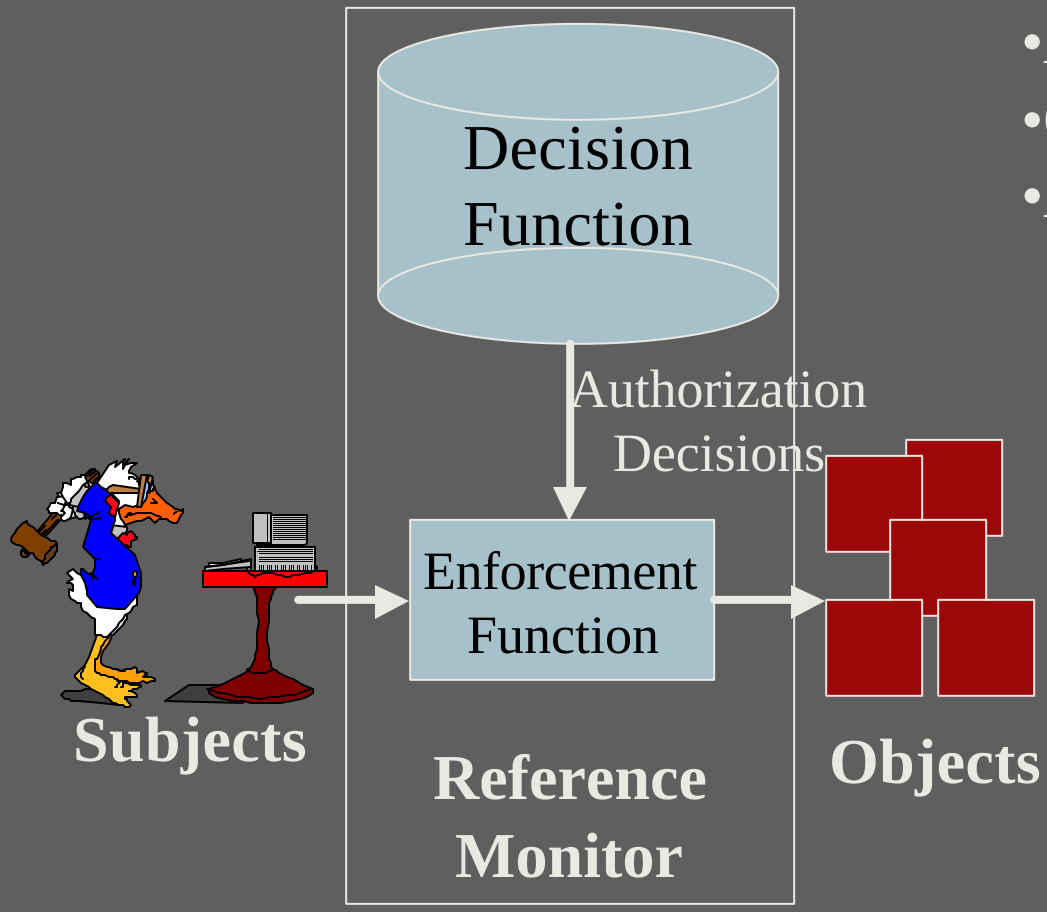
Overview

- overview of security enforcement in distributed applications
- problem motivation
- Attribute Function
- research plans
  - hypothesis
  - methodology

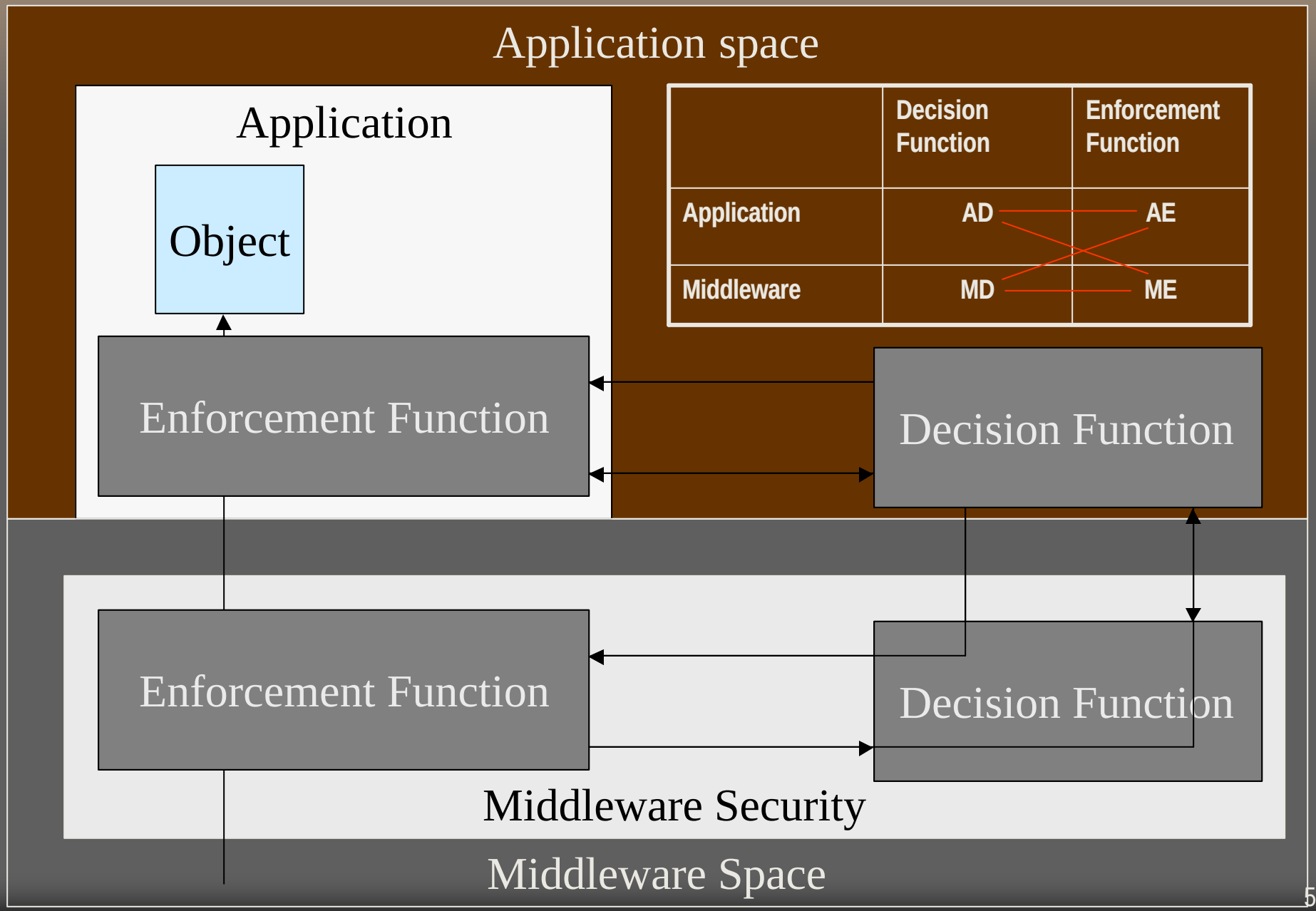


overview of security enforcement in middleware

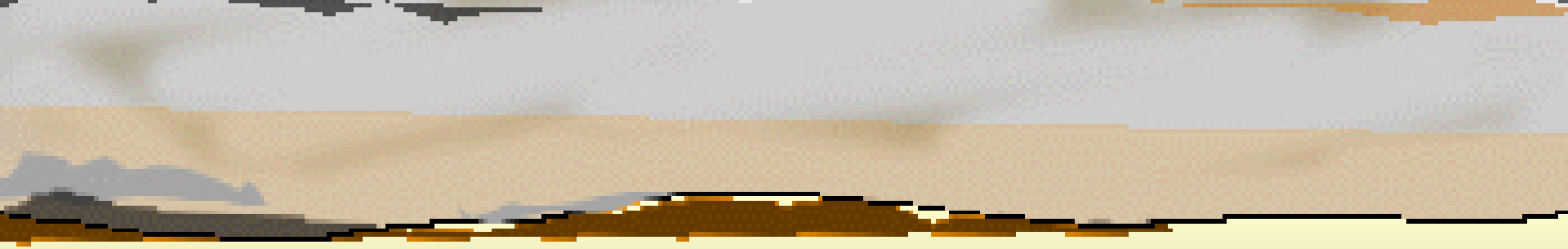
decision-enforcement paradigm



- Access control
- QoP (secrecy, integrity)
- Audit



	Decision Function	Enforcement Function
Application	AD	AE
Middleware	MD	ME



problem motivation

conflict of interests

Vendors:

stable
infrequently
changing
platform
security

Users:

security
decisions
based on
application-
specific factors

application-specific factors

- Certain characteristic or property of an application's resource
  - Produced, modified and processed in the course of normal application execution
- Examples
  - Bank account's holders and their ranks
  - Phone numbers of telecom customer accounts
    - 5,000 changes/day with 10^6 subscribers

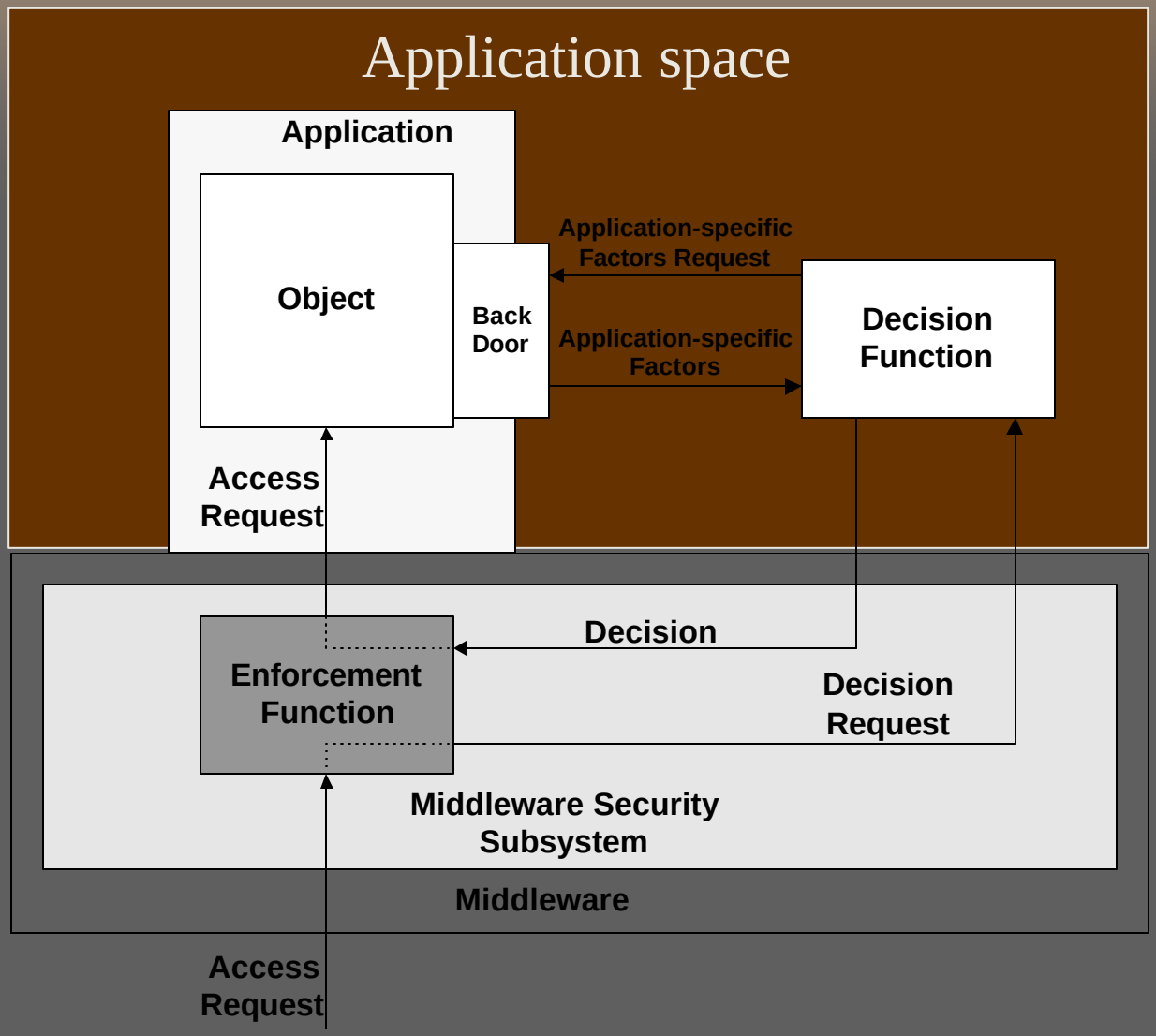
main objective

Keep middleware security generic and yet allow for application-specific security policies

Approach: additional level of indirection ☺

- Separation of concerns

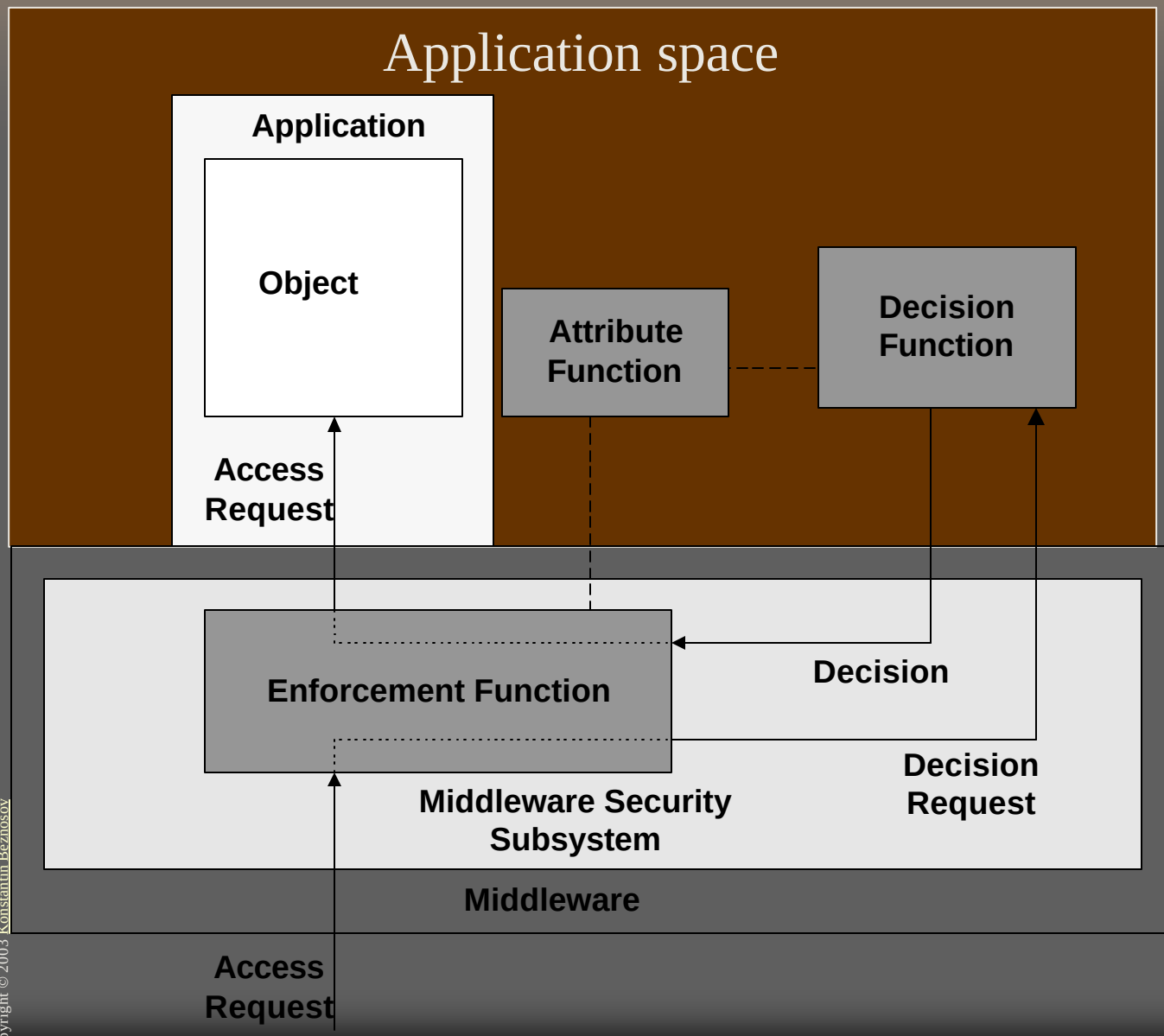
ADME – application decides, middleware enforces



- could be inefficient on expensive to activate objects
- Vulnerable to deny of service attacks
- DF too complex for application developers to implement

Attribute Function

Proposed solution -- ADME/AF



- **Object Attributes**
+ Advantages of ADME
+ Separation of concerns
  - EF – middleware vendor
  - DF – authorization vendor
  - AF – application owner
- AF's input:
  - Information for identifying the target's state

Discussion

- – Only information known before the object is called
- – Not for all middleware platforms
- – Not for all policies

- + Better tradeoff in responsibilities
- + Does not require application to implement either DF or EF

- non-middleware platforms?
- non-security policies

Research Plans

hypothesis

the attribute function allows effective use of application-specific factors in security policy decisions without expensive coupling between the decision function and the application.

methodology

comparative analysis of AF-based designs vs.

- traditional methods
  - mixing security and application logic
  - back-doors
- emerging approaches
  - tool-based weaving using Aspect Oriented Software Development (AOSD) techniques

what should it be compared on?

- performance
- expressiveness of the supported security policies
- costs of application development, deployment, and maintenance
- degree of the separation of responsibilities among application, middleware, and security developers
- other?

experiment design

- Alternative designs of decision/enforcement functions
  - Mixed security and application logic
  - Security logic modularized and weaved using AOSD techniques
  - ADME/backdoor
  - ADME/AF
- Sample access control policies that require application-specific factors
- Sample application
  - Depends on the platform
- Experiment platform candidates
  - EJB
  - ASP.NET
  - CORBA ORB

performance

How fast security decisions are made and enforced

- Decisions/second (throughput) for 1 client
- Throughput = f(|client population|)

expressiveness

- What types of security policies and application-specific factors can be supported by the decision logic?

cost

- How much effort is required to develop, deploy, and maintain secure distributed applications?
  - changes to the application logic
  - changes to the security policy
  - replacement of a security policy with a different type
- Effort measures
  - changed lines of code? :)
  - other metrics?

separation of responsibilities

How many interdependencies exist among application, middleware, and security developers throughout an application life-cycle?

Summary

- Hypothesis
  - Attribute function allows effective use of application-specific factors in security policy decisions without expensive coupling between the decision function and the application
- Methodology
  - Comparative analysis of AF-based design vs. other designs based on performance, cost, expressiveness, and separation of responsibilities

Who will be doing it?

- Looking for
  - faculty, and
  - bright, energetic, and enthusiastic graduate students
- to collaborate on this and similar projects

- Contact Konstantin Beznosov at beznosov@ece.ubc.ca