An Aspect-Oriented Approach to Developing UML Models of Access Control Systems

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Separation of Access Control

The development of access control systems is highly complex due to the cross-cutting nature of access control over the system’s functionality. The complexity can be effectively managed by separating access control from the functional aspects of the system at a high level of abstraction. An access control aspect is designed in a system-independent and reusable form. The access control design is then used to embed automatically access control into the functional models, which produces a model of the system being developed.

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<thead>
<tr>
<th>Aspect-Oriented Approach</th>
<th>Research Impact</th>
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<tbody>
<tr>
<td>✓ Separation of access control aspects from functional aspects</td>
<td>✓ Highly reusable designs of access control models</td>
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<tr>
<td>✓ Design them separately</td>
<td>✓ Mechanical embedment of access control into functional aspects</td>
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<td>✓ Compose them later</td>
<td>✓ Efficient and rigorous development of access control systems</td>
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<td>✓ The resulting model is a model of an access control system</td>
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Research Progress

- Modeling Functional Aspects
  - Using the Unified Modeling Language
- Modeling Access Control Aspects
  - Using the Role-Based Metamodelling Language
- Modeled Role-Based Access Control
- Modeled Mandatory Access Control
- Modeled Discretionary Access Control

- Composition
  - Developed composition algorithm
  - Developed composition rules for sequence diagrams

- Validation of Composed Models
  - Developed a divide-and-conquer technique
  - Developed a logic-programming based technique

Tool Development

- Developed Version 1 of Weaver
  - Developed as a plug-in to IBM Rational Rose
- Developed Version 1 of Evaluator
  - Implemented using Logic Programming

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