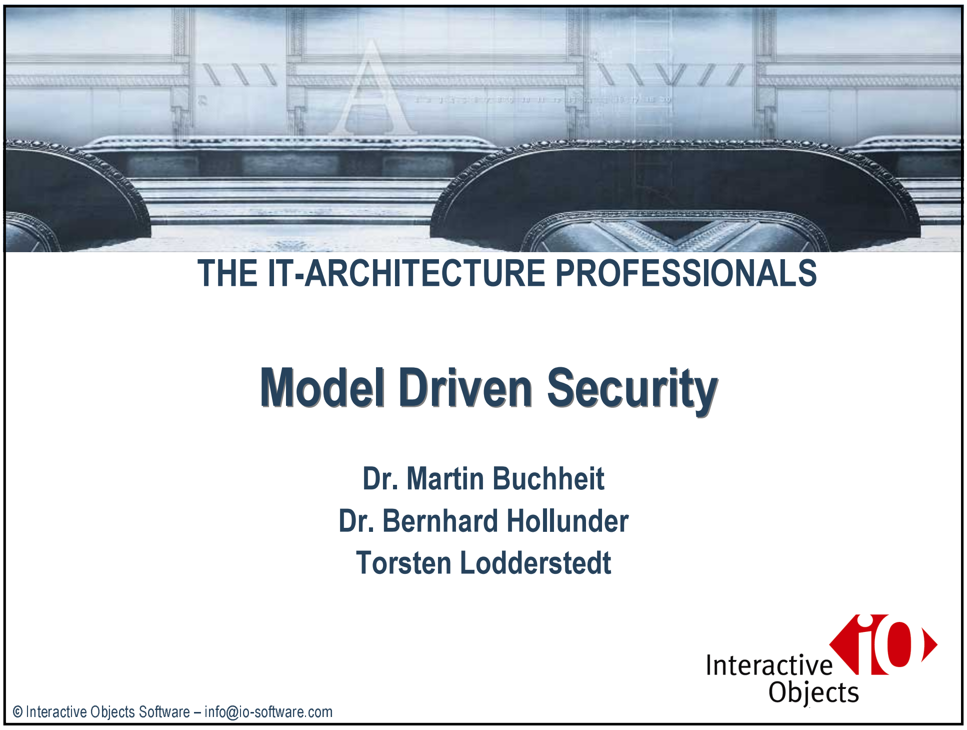

THE IT-ARCHITECTURE PROFESSIONALS

Model Driven Security

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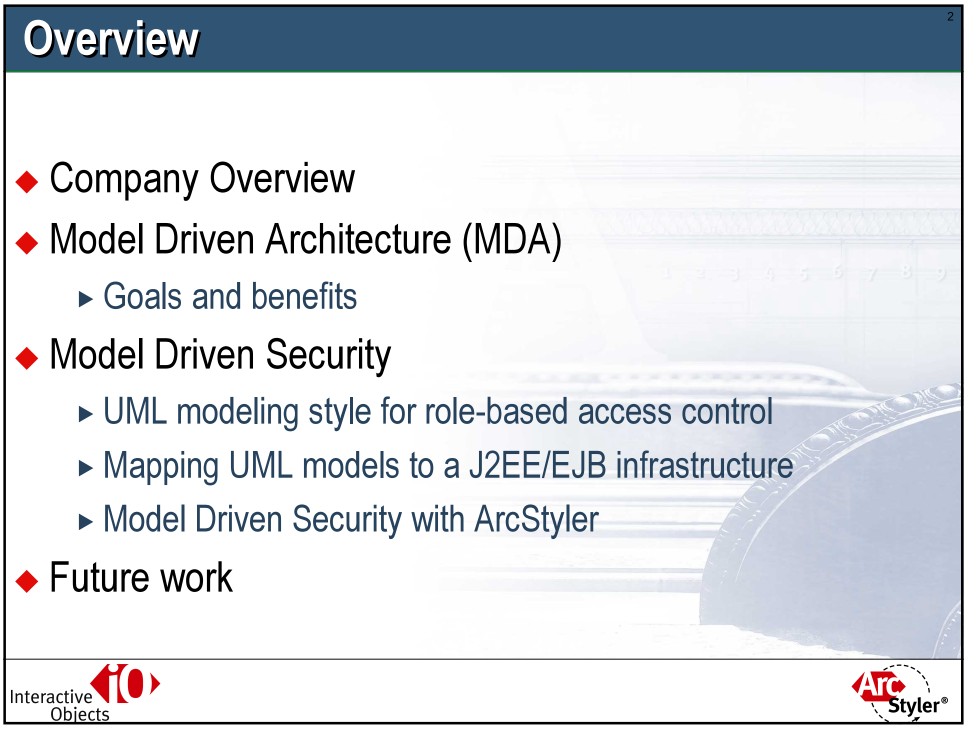
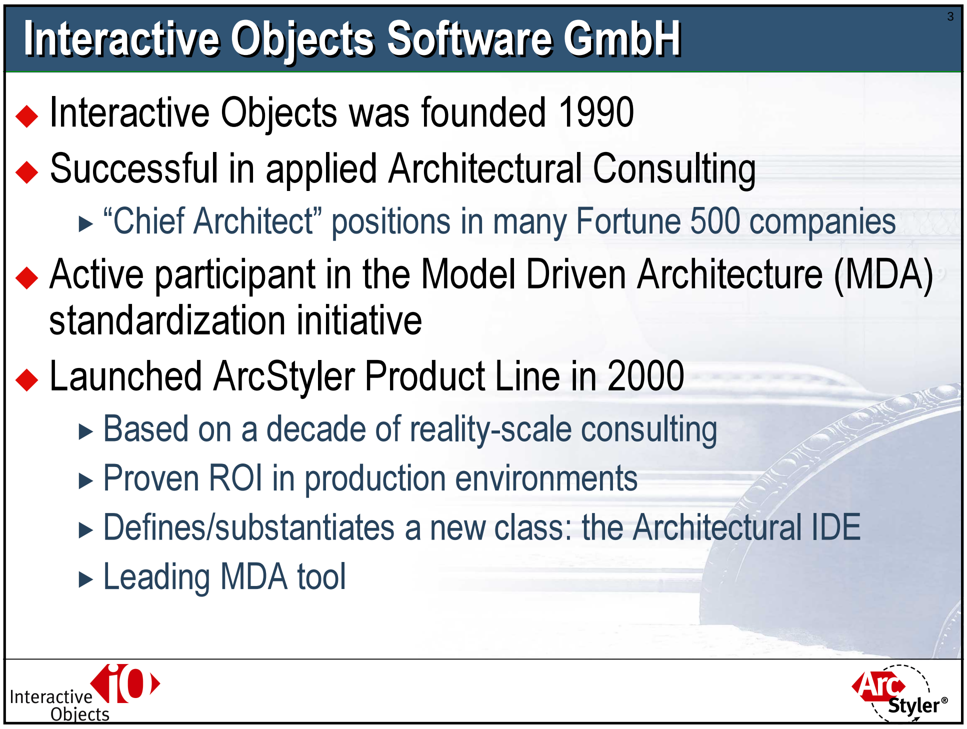
Dr. Bernhard Hollunder
Torsten Lodderstedt



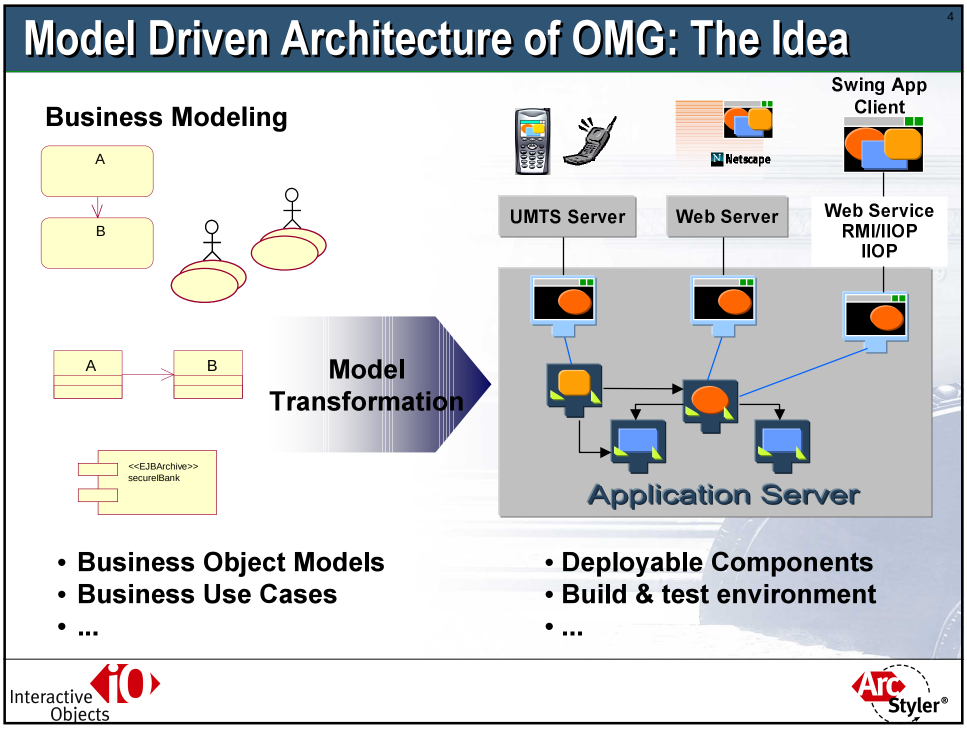
Overview

- Company Overview
- Model Driven Architecture (MDA)
  - Goals and benefits
- Model Driven Security
  - UML modeling style for role-based access control
  - Mapping UML models to a J2EE/EJB infrastructure
  - Model Driven Security with ArcStyler
- Future work



Interactive Objects Software GmbH

- Interactive Objects was founded 1990
- Successful in applied Architectural Consulting
  - “Chief Architect” positions in many Fortune 500 companies
- Active participant in the Model Driven Architecture (MDA) standardization initiative
- Launched ArcStyler Product Line in 2000
  - Based on a decade of reality-scale consulting
  - Proven ROI in production environments
  - Defines/substantiates a new class: the Architectural IDE
  - Leading MDA tool



Model Driven Architecture of OMG: The Idea

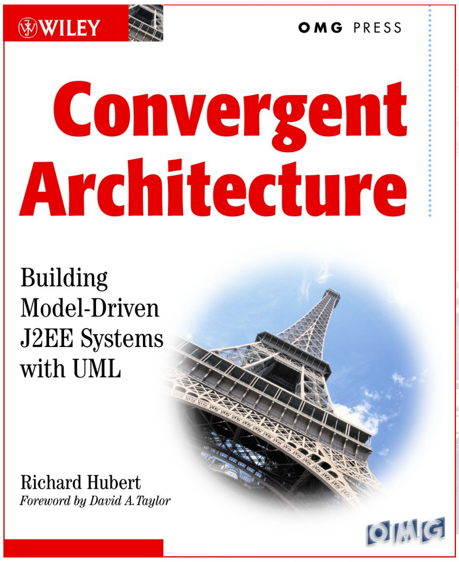
- Business Object Models
- Business Use Cases
- ...

- Deployable Components
- Build & test environment
- ...

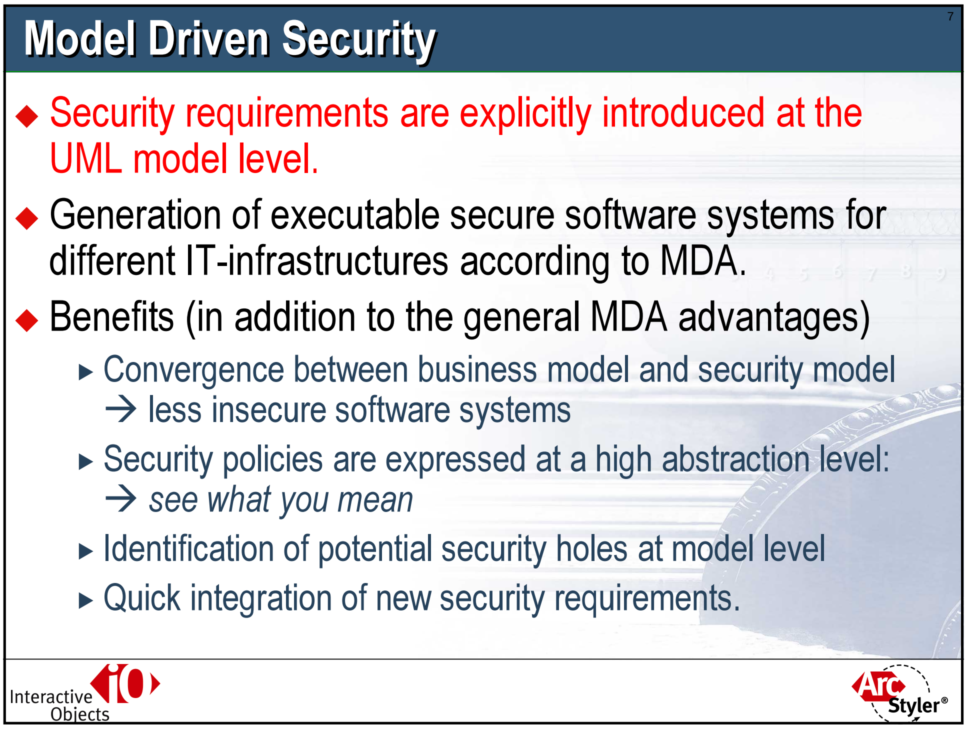
Model Driven Architecture: www.omg.org/mda

- Design goals
  - addresses the complete life cycle of designing, implementing, integrating, testing, deploying, and managing applications
  - separates the fundamental logic behind a specification from the specifics of the particular middleware that implements it
  - built on well-established standards such as Unified Modeling Language (UML) and XML Metadata Interchange (XMI).
- Main benefits
  - reduced cost and complexity of application development
  - improved application quality and validation at model level
  - reuse of business models
  - plattform independence
  - rapid inclusion of emerging technologies

For Details See ...


WILEY
OMG PRESS
Convergent Architecture
Building Model-Driven J2EE Systems with UML
Richard Hubert
Foreword by David A. Taylor
OMG

(J. Wiley, New York, 2002, ISBN 0-471-10560-0)



Model Driven Security

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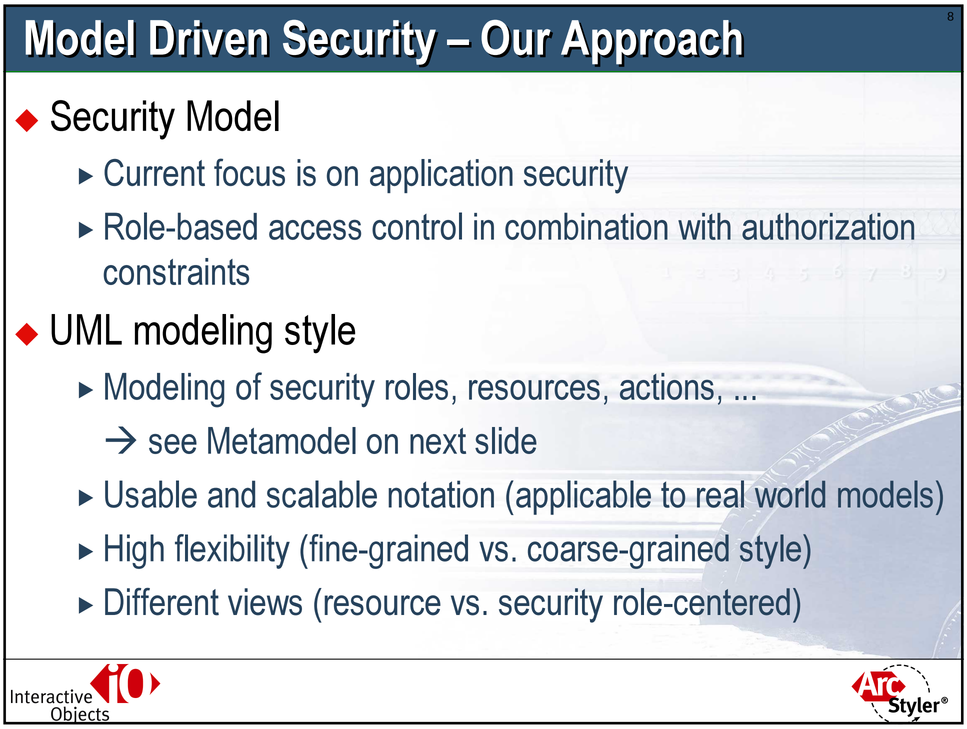
- Security requirements are explicitly introduced at the UML model level.
- Generation of executable secure software systems for different IT-infrastructures according to MDA.
- Benefits (in addition to the general MDA advantages)
  - Convergence between business model and security model → less insecure software systems
  - Security policies are expressed at a high abstraction level: → *see what you mean*
  - Identification of potential security holes at model level
  - Quick integration of new security requirements.



Model Driven Security – Our Approach

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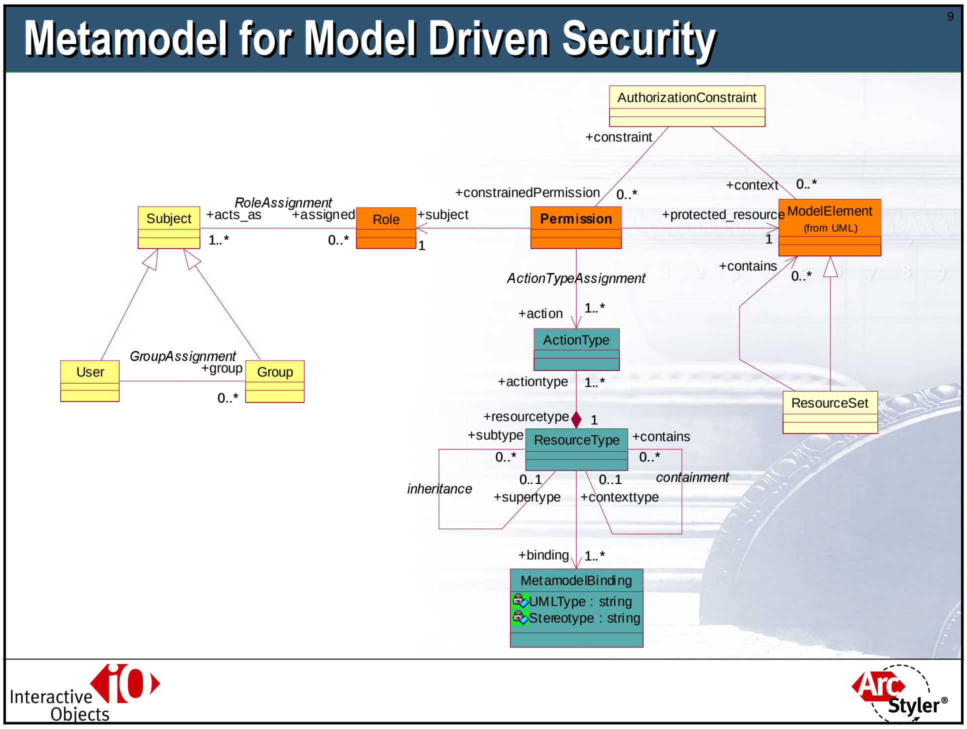
- Security Model
  - Current focus is on application security
  - Role-based access control in combination with authorization constraints
- UML modeling style
  - Modeling of security roles, resources, actions, ...

    → see Metamodel on next slide
  - Usable and scalable notation (applicable to real world models)
  - High flexibility (fine-grained vs. coarse-grained style)
  - Different views (resource vs. security role-centered)



Metamodel for Model Driven Security

AuthorizationConstraint

+constraint

+constrainedPermission 0..*

+context 0..*

Subject +acts_as *RoleAssignment* +assigned Role +subject Permission +protected_resource ModelElement (from UML)

1..* 0..* 1 1

ActionTypeAssignment +contains 0..*

+action 1..*

ActionType

+actiontype 1..*

User *GroupAssignment* +group Group 0..*

ResourceSet

+resourcetype 1

+subtype ResourceType +contains

0..* 0..*

inheritance 0..1 0..1 *containment*

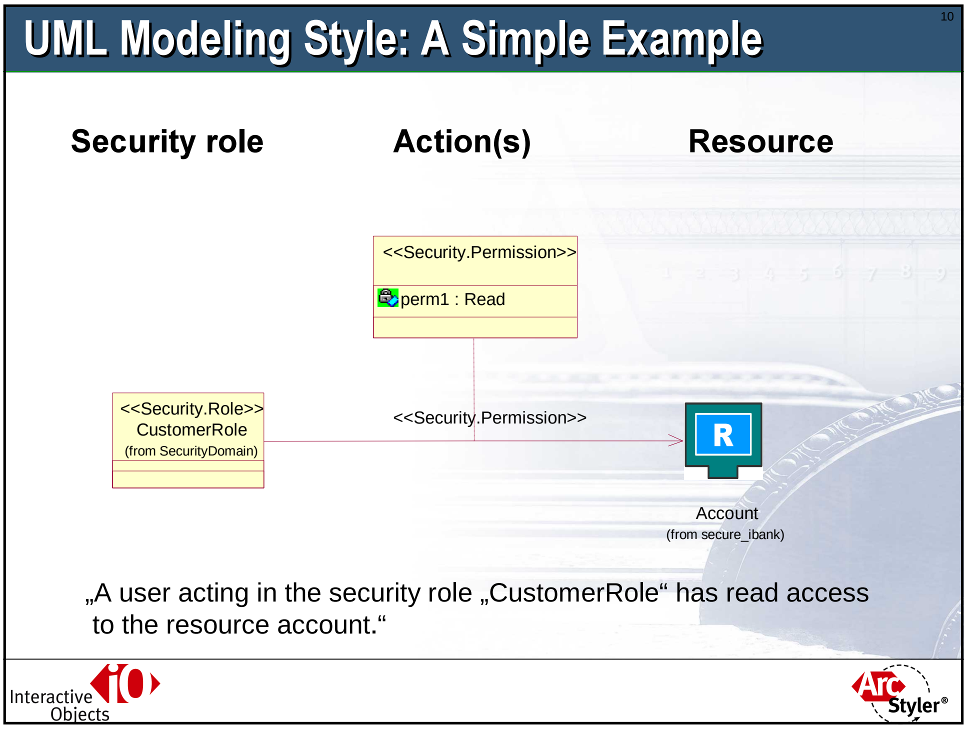
+supertype +contexttype

+binding 1..*

MetamodelBinding

UMLType : string

Stereotype : string



UML Modeling Style: A Simple Example

Security role **Action(s)** **Resource**

<<Security.Permission>>

perm1 : Read

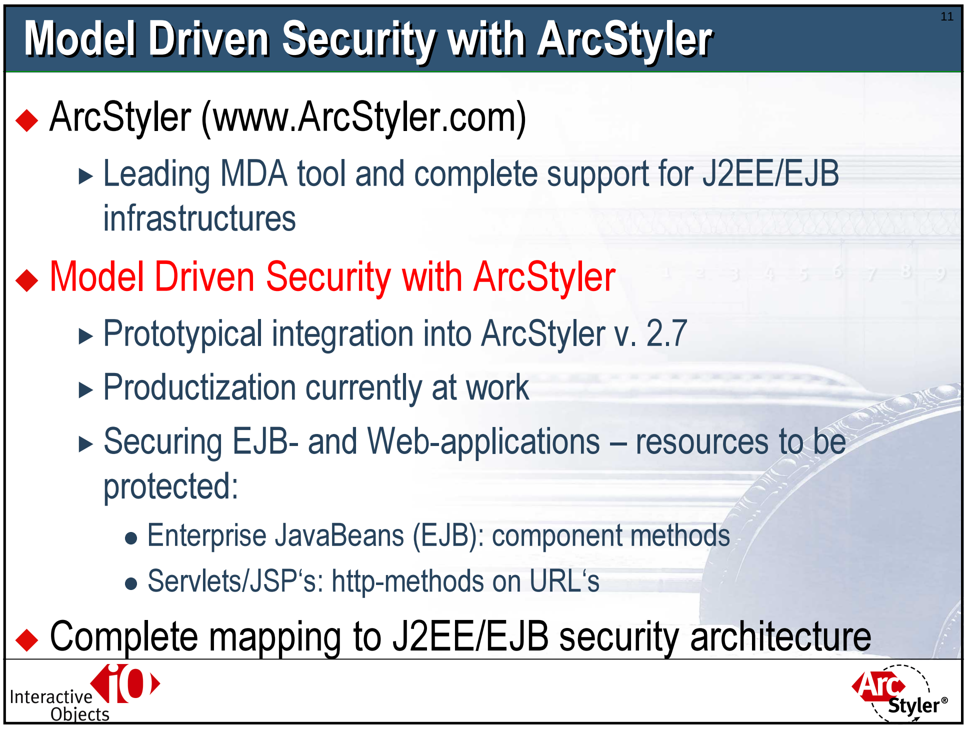
<<Security.Role>>
CustomerRole
(from SecurityDomain)

<<Security.Permission>>

R

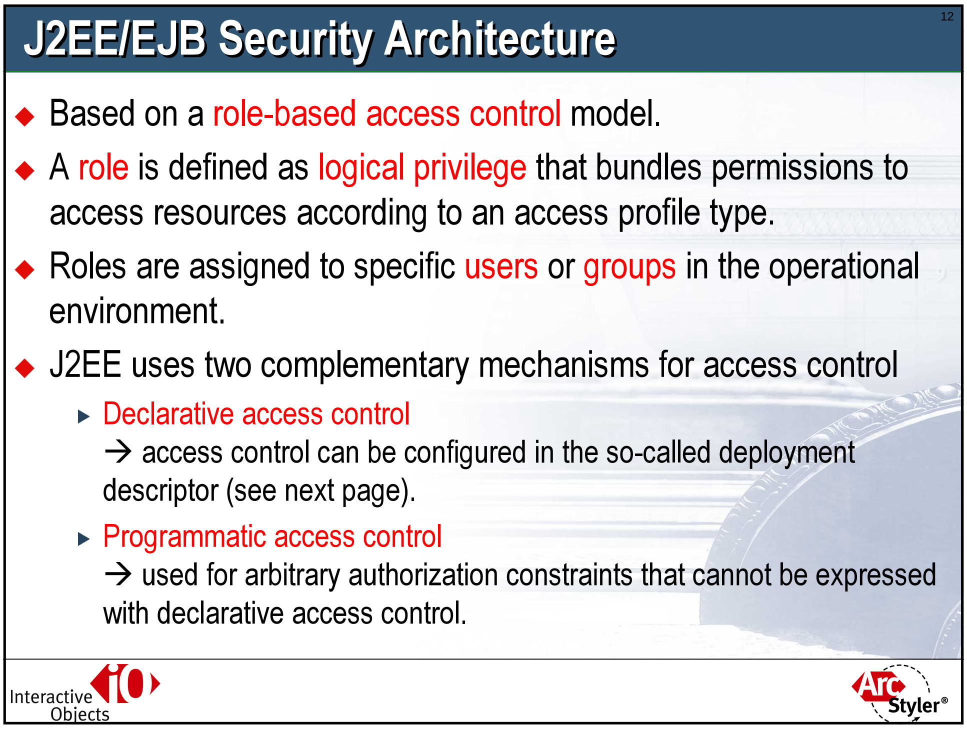
Account
(from secure_ibank)

„A user acting in the security role „CustomerRole“ has read access to the resource account.“



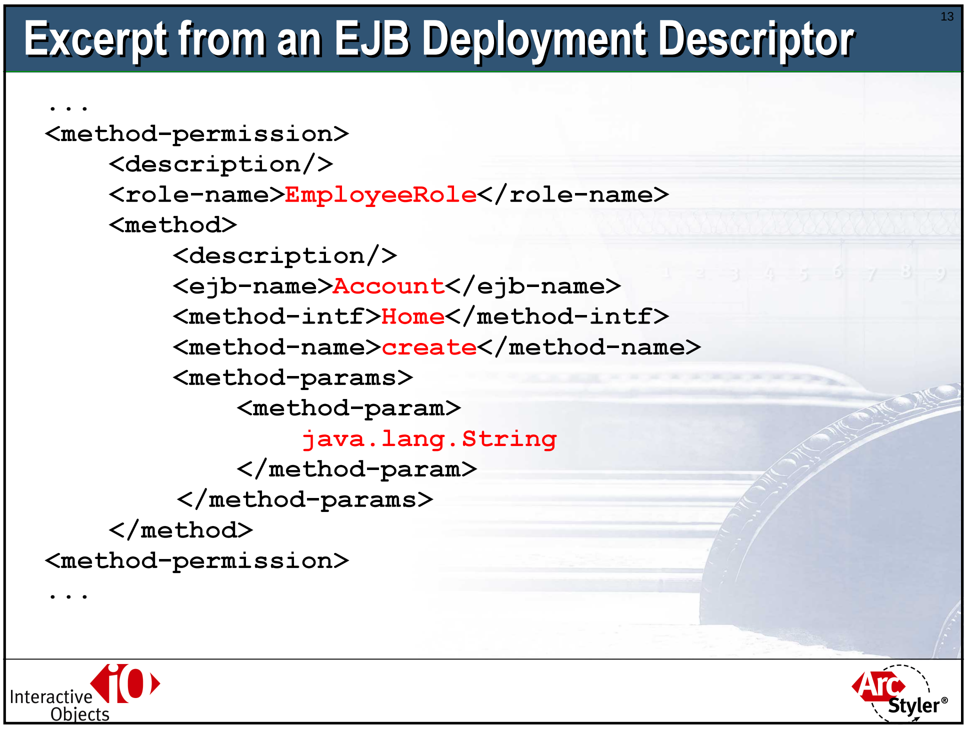
Model Driven Security with ArcStyler

- ArcStyler (www.ArcStyler.com)
  - Leading MDA tool and complete support for J2EE/EJB infrastructures
- Model Driven Security with ArcStyler
  - Prototypical integration into ArcStyler v. 2.7
  - Productization currently at work
  - Securing EJB- and Web-applications – resources to be protected:
    - Enterprise JavaBeans (EJB): component methods
    - Servlets/JSP's: http-methods on URL's
- Complete mapping to J2EE/EJB security architecture



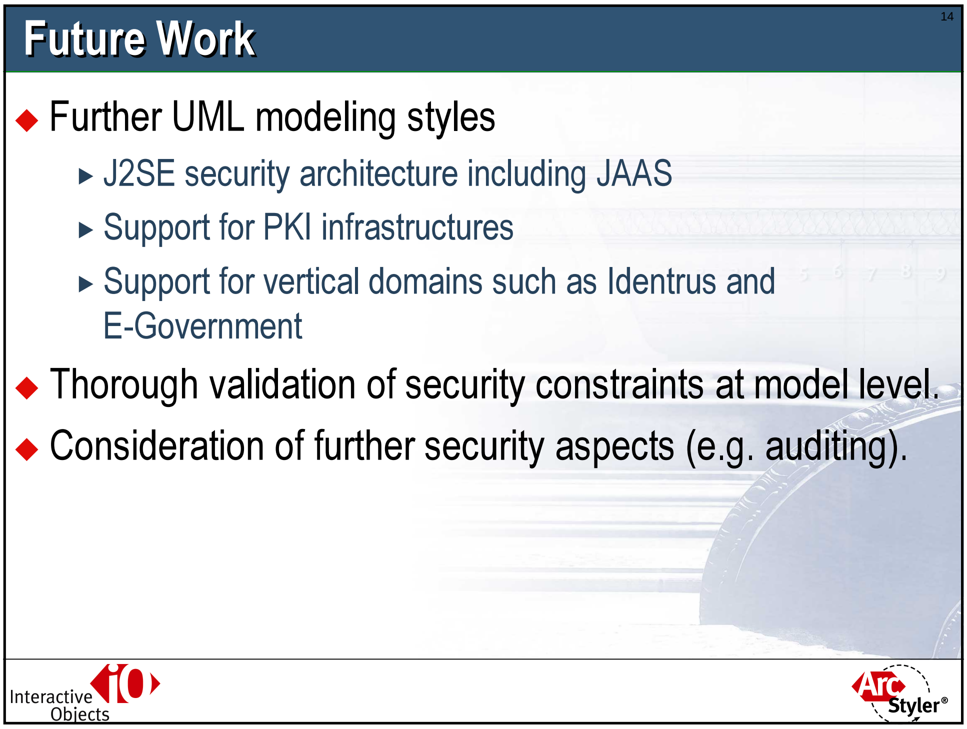
J2EE/EJB Security Architecture

- Based on a role-based access control model.
- A role is defined as logical privilege that bundles permissions to access resources according to an access profile type.
- Roles are assigned to specific users or groups in the operational environment.
- J2EE uses two complementary mechanisms for access control
  - Declarative access control
    → access control can be configured in the so-called deployment descriptor (see next page).
  - Programmatic access control
    → used for arbitrary authorization constraints that cannot be expressed with declarative access control.



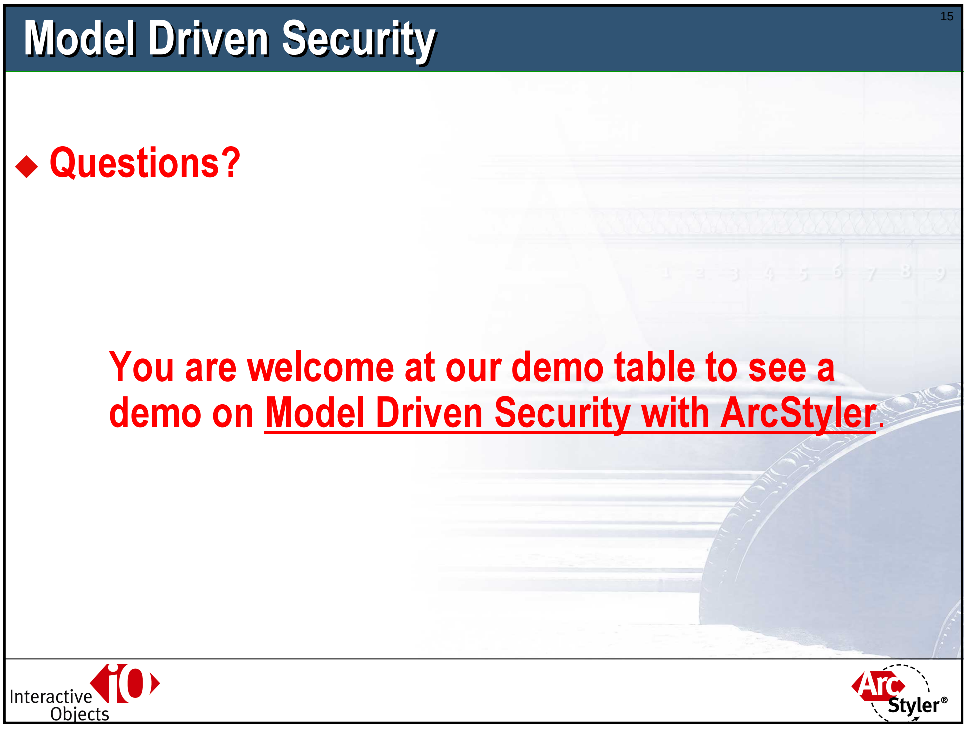
Excerpt from an EJB Deployment Descriptor

```
...
<method-permission>
    <description/>
    <role-name>EmployeeRole</role-name>
    <method>
        <description/>
        <ejb-name>Account</ejb-name>
        <method-intf>Home</method-intf>
        <method-name>create</method-name>
        <method-params>
            <method-param>
                java.lang.String
            </method-param>
        </method-params>
    </method>
<method-permission>
...
```



Future Work

- Further UML modeling styles
  - J2SE security architecture including JAAS
  - Support for PKI infrastructures
  - Support for vertical domains such as Identrus and E-Government
- Thorough validation of security constraints at model level.
- Consideration of further security aspects (e.g. auditing).



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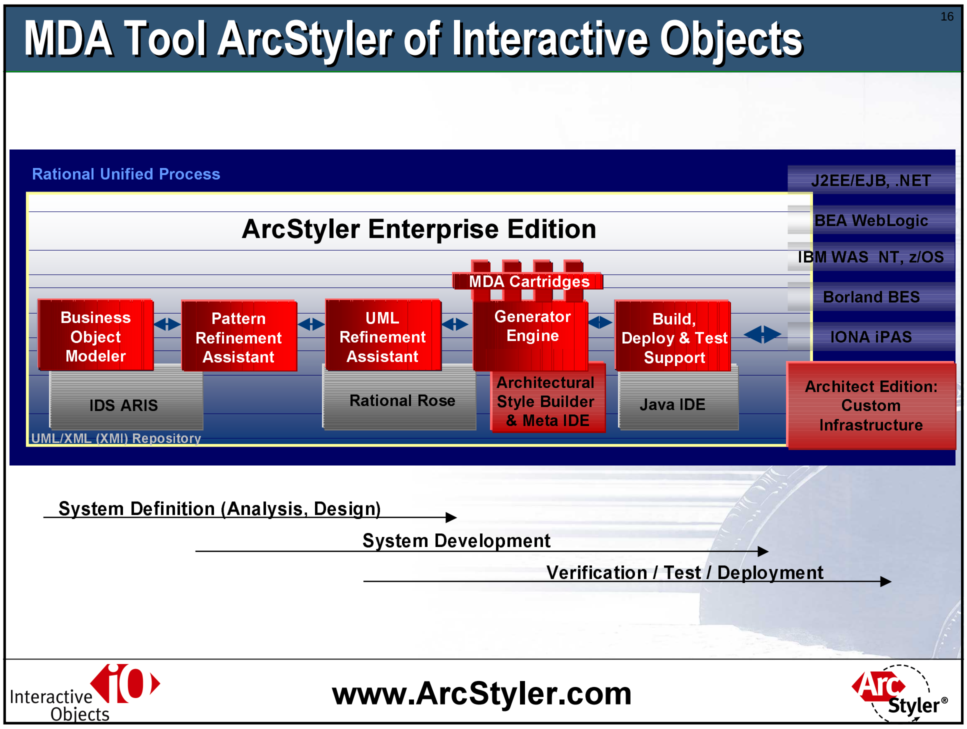
Model Driven Security

- Questions?

You are welcome at our demo table to see a demo on Model Driven Security with ArcStyler.



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MDA Tool ArcStyler of Interactive Objects

Rational Unified Process

ArcStyler Enterprise Edition

MDA Cartridges

Business Object Modeler

Pattern Refinement Assistant

UML Refinement Assistant

Generator Engine

Build, Deploy & Test Support

IDS ARIS

Rational Rose

Architectural Style Builder & Meta IDE

Java IDE

UML/XML (XMI) Repository

J2EE/EJB, .NET

BEA WebLogic

IBM WAS NT, z/OS

Borland BES

IONA iPAS

Architect Edition: Custom Infrastructure

System Definition (Analysis, Design)

System Development

Verification / Test / Deployment

www.ArcStyler.com