Input validation: the Good, the Bad and the Ugly

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OWASP

Motivation

Applications evolve

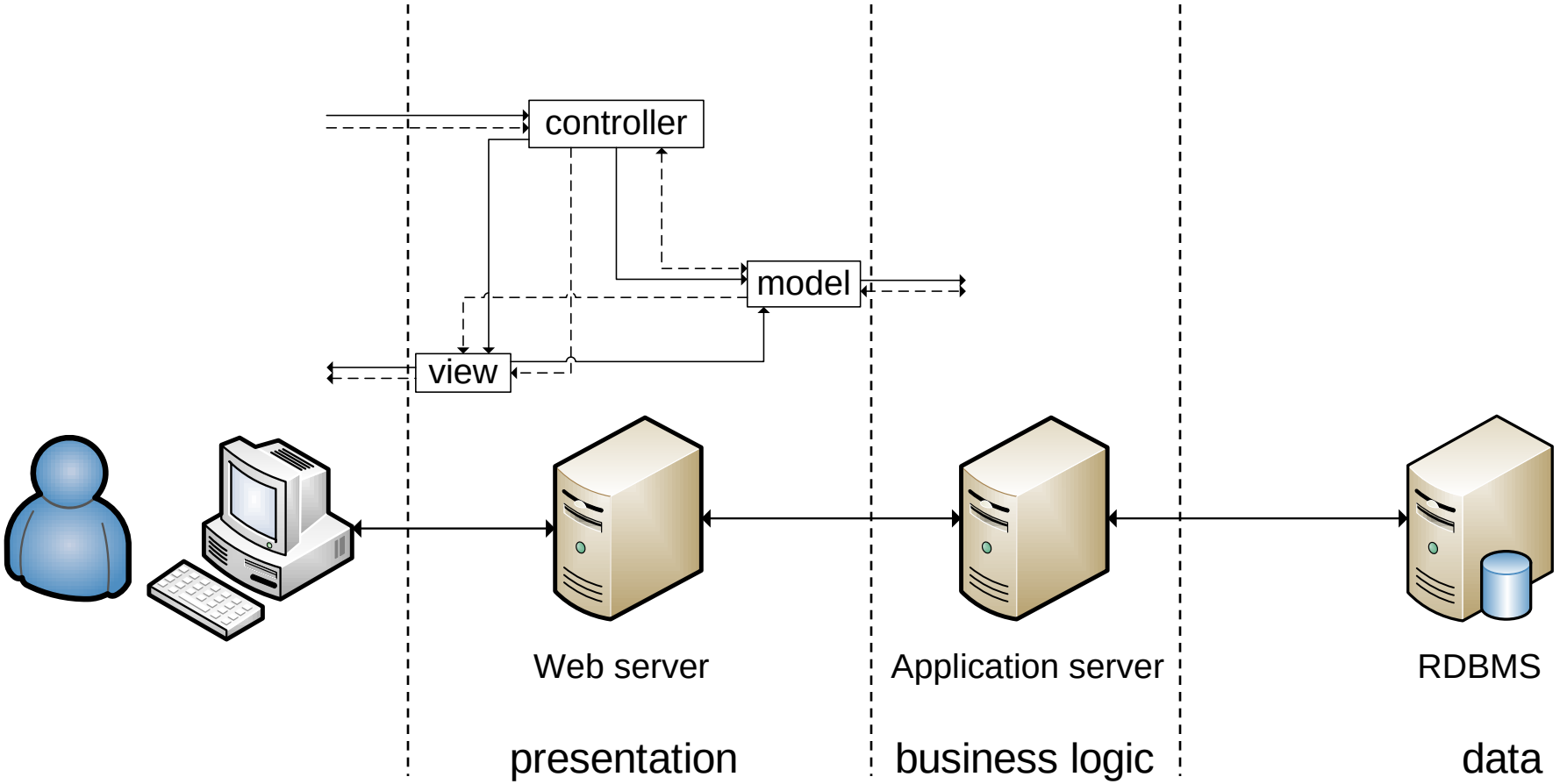
Aim

Validation architecture

Case study

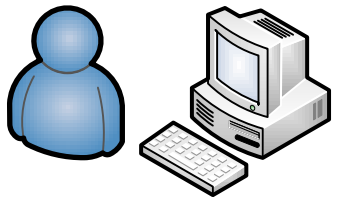
- CRUD securities
- Forms for
  - Create
  - Search
  - Update
- List search results
  - View details
  - Open for modification
  - Delete

Case study


controller
model
view
Web server
Application server
RDBMS
presentation
business logic
data

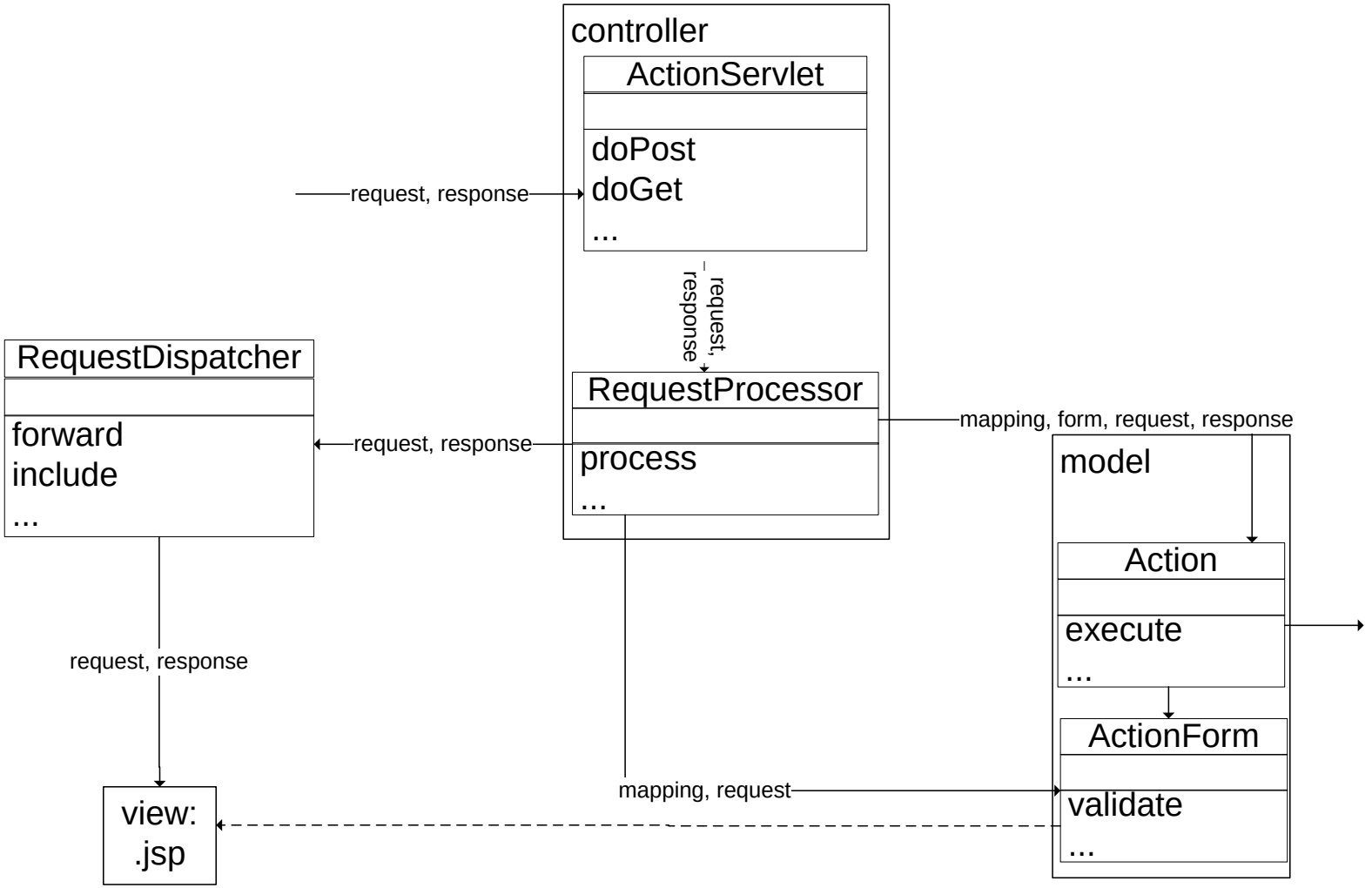
JavaScript in the web browser

- JSPs with script tags
- Custom-built tag library
  - Populate drop-down boxes
  - Standard event handlers
- JavaScript

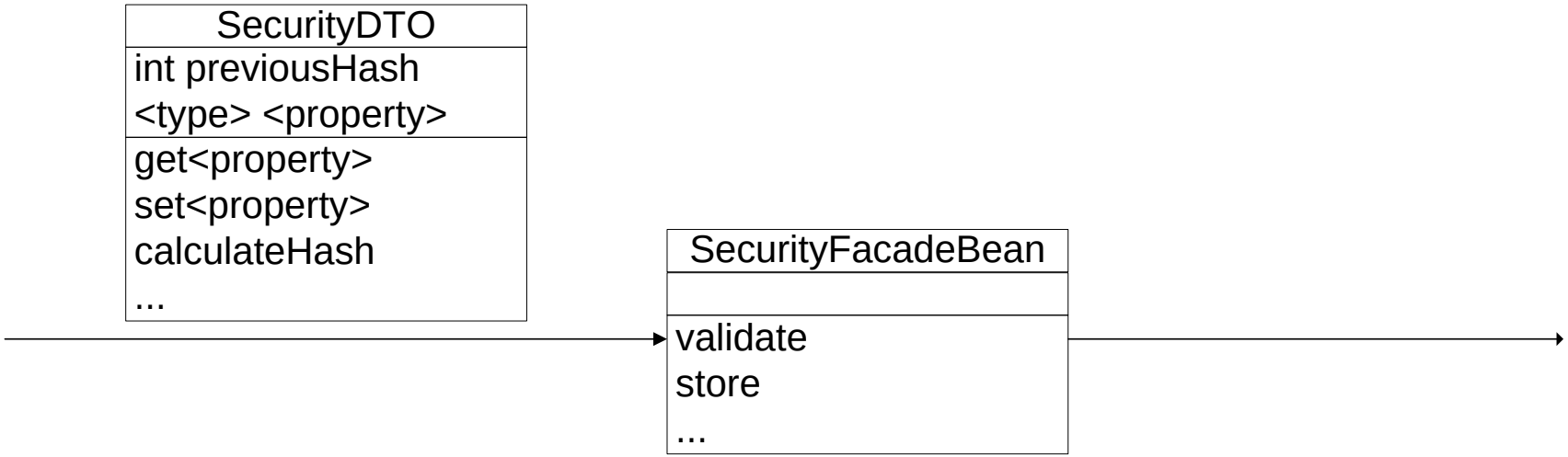


```
<html>
 <head>
  <script src="typeCheck.js"/>
 </head>
 <body>
  <form action="add" method="post">
   <input type="submit" value="Add"/>
   <select>
    <option value="bond">Bond</option>
    <option value="share">Share</option>
   </select>
   <input type="text"
          onkeypress="return isNumeric(event)"
          onchange="return checkSum(event)"/>
  </form>
 </body>
</html>
```

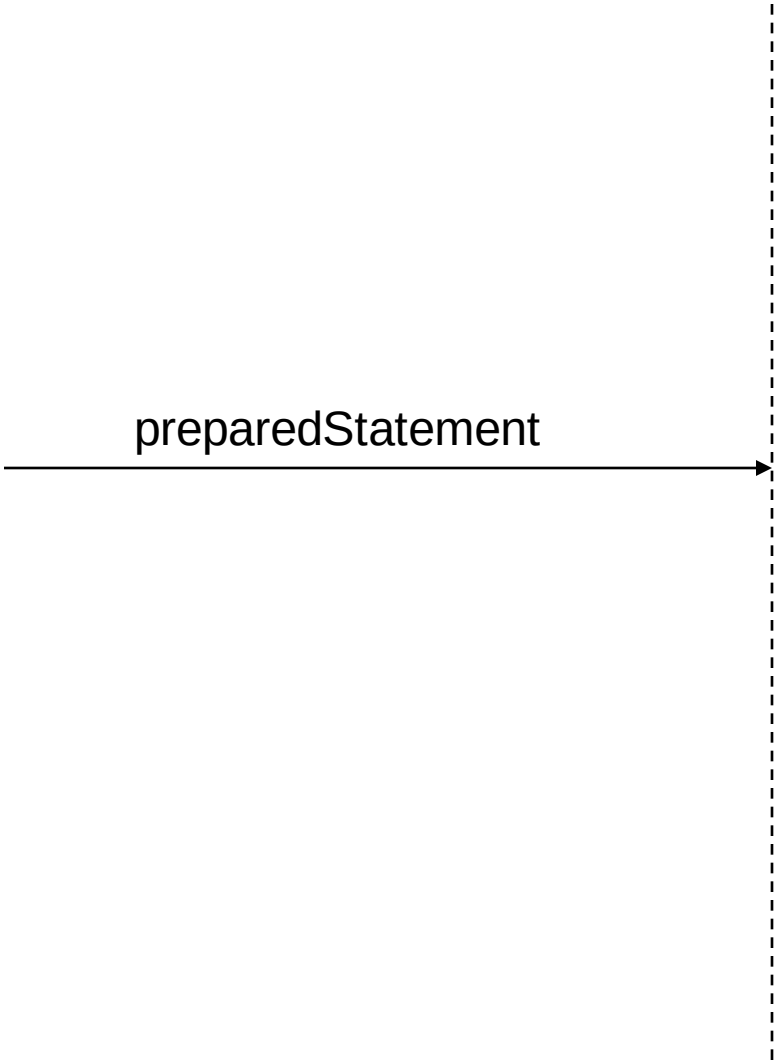
Struts on the web tier



EJBs on the business tier



RDBMS as data tier

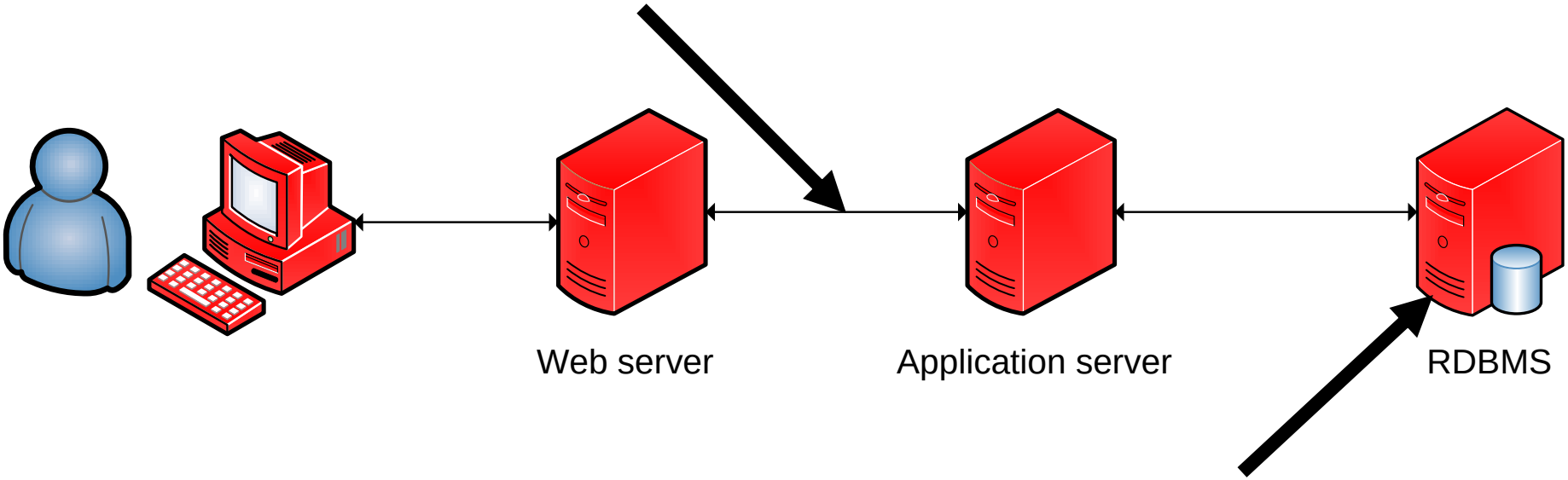


- Not NULL
- Referential constraints
- Columns are typed
- Unicity constraints

Appraisal

- Validation does what it is supposed to
- Validation code is ugly
- Duplication leads to entropy
  - Maintenance nightmare

Defense in depth

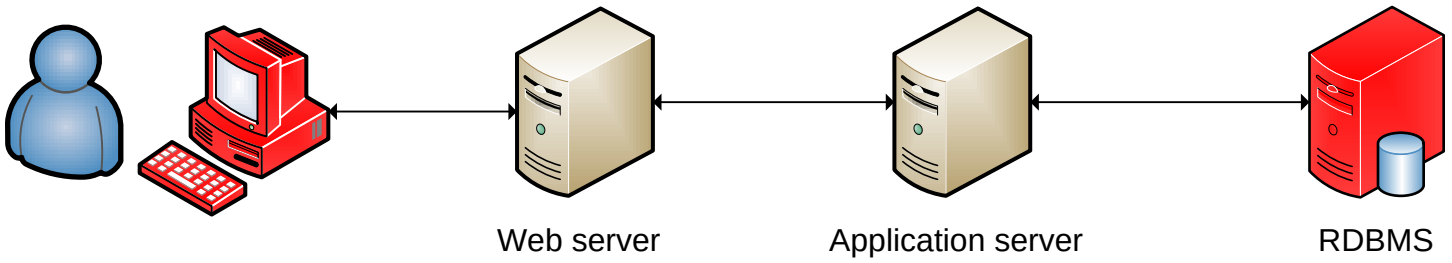


Back to basics

- Integrity
- Validation serves to
  - Provide good user experience
  - Protect against malicious users

Conjecture

- Validate to enhance user experience near user
- Validate to protect against malicious users near data



The front-end revisited

- Provide great user experience
- Embrace JavaScript
- Embrace AJAX

The back-end revisited

- Defend against malicious use
- Supplement data types, not NULL, unicity and referential integrity with
  - Check constraints
  - Triggers
    - Per statement
      - Before
      - After
    - Per row
      - **Before**
      - After
  - Stored procedures

Challenges

- Error handling
  - No big deal: no mercy if you bypass client
- Duplication of business logic

Rooting out duplication

- If single formalism is used, perhaps the same code can be called from the different tiers
- Expressing the same integrity constraints in different formalisms can bring advantages
- Single source distributed over several tiers

Examples of single source to multiple tiers

- Ruby on Rails
- GWT
- Swift

Ruby on Rails code generation

- MVC
- No business tier
- Model is an ActiveRecord instance, its class
  - Contains the business logic
  - maps to a table in RDBMS
  - generated by a model generator
- View is a template with Ruby code
- RDBMS end
  - Model generator also generates DDL
  - Validation in the model, not in the RDBMS
- JavaScript generated by helpers
  - Prototype
  - Script.aculo.us

GWT compiles Java code to JavaScript

- Swing-like APIs for building web user interfaces
- Code annotated as 'client'
  - Is compiled to JavaScript
  - Executes in the browser
  - E.g.
    - com.johanpeeters.gwt.experiment.client
    - com.johanpeeters.gwt.experiment.server
- Shared client- and server-side validation code is possible

Swift places code on client or server according to security requirements

- Annotate variable declarations with security constraints
  - `int {server -> server; server <- server} secret`
  - `int {server -> client; server <- server} tries`
- Partitions application into
  - Client
  - Server
- Compiles to client and server GWT packages
- GWT compiles client packages to JavaScript

Questions and Comments

Thank you!

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