#### Rapid Development of Web Interfaces to Heterogeneous Systems

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#### Intro: Motivation

- Web interfaces to heterogeneous systems
  - Research systems
  - Legacy systems
- Web interfaces:
  - Easily deployable
  - Fairly good visualization and interaction
- Systems:
  - Command line interpreter
  - Text output

#### Intro: Approach

- Framework for web interface support
- Hot spots: XML configuration files
  - System parameters (state)
  - Interaction + state -> system commands
  - System output + state -> web formatting
- Simple communication with system

#### Architecture: MVC (1)



- Pattern Model-View-Controller
- Decouples GUI from logic
- Separates commands from presentation

### Architecture: MVC (2)

- Discovered for Smalltalk
- OO applications with GUI



- Rediscovered as "model2" for webapps
  - Views: JSP
  - Controller: servlets
  - Model: Java beans
- Frameworks implement MVC
  - Struts
  - Spring

#### Architecture: MVC (3)

- System is the model
- Model as set of Java beans
  - Beans define properties (parameters)
  - Access trough setters/getters
  - Usually running in same process
- But system is a remote process
  - Avoid remote calling (e.g. RMI,RPC)
  - Execute command in system's interpreter
  - Process system output



### Architecture: framework (1)



- Framework hot spots inspired by MVC
  - Model abstract the system
  - Controller transform input to system
  - View transforms system output
- But are XML files, not software objects

### Architecture: framework (2)



- Parameters (properties) as interface
- Loaded from XML to DOM object
- Bound to users sessions
- Parameters are interaction state

### Architecture: framework (3)



- HTTP Requests
  - Changes parameters
  - Transforms them in system's commands
- Transformation uses controller.xsl

## Architecture: framework (4)



- System output converted to XML
- Transformed to HTML as response
- XSLT file acts as view definition

#### Implementation (1)



- Framework implemented
  - Java webapp
  - Tomcat servlet container
- UML class diagram (conceptual)

### Implementation (2)



- Single Front controller is HTTP Servlet
- Commands process requests
- Depend on other framework classes

### Implementation (3)



- Sessions control Generator and Choices
  - On creation they are initiated
  - On termination they are disposed
- Connection to a system process

#### Implementation (4)



- Choices hold current parameter state
- DOM loaded from valid model.xml
- Controls life cycle of system connection



- Generator transforms:
  - Choices to commands: controller.xsl
  - System output to HTML: view.xsl
- HTML Cache avoids command execution

### Case study (1)

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- Math exercise sheets generator
- Constraint Logic Program System
- Many parameters
- Produces
  - LaTeX -> PDF
    - QTI + MathML
- Available on-line

## Case study (2)

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- Web wizard
- Controller.XSL produces Prolog queries/predicates
- Changes in DTD of model.xml
- Term to XML conversion
- Cache system

### Conclusions

- +System/GUI decoupling
- + Configuration of
  - Parameters
  - Commands
  - Presentation
- +Efficient

- Model language
- Cache invalidation

# Future work

- More applications
- Highly interactive web interfaces (Ajax)
- Improve cache invalidation