CS 298

Model-Controller Interfacing for Struts-Based Web Applications

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Outline

- Purpose
- Introduction
- Background
- Design and Architecture
- Implementation
- Performance
- Usability Testing
- Conclusion

Purpose

- Traditional Desktop-based IDEs such as Eclipse and NetBeans.
  - Installation and configuration are required
  - User responsible for his workspace

- Existing Web-based IDEs are Mozilla Skywriter or Bespin, and Aurorasdk IDE.
  - No installation is required
  - Can be used anywhere with internet connection

Purpose

- Limitations of existing Web-based IDE
  - Need to write a lot of code
  - Need to set up the database schema for database-driven Web applications

Introduction – StrutsHib IDE

- Our StrutsHib Web-based IDE allows users to develop Struts based web applications with minimal hand-coding.
- It is developed using Java technologies: Struts, Hibernate framework, JSP and JavaScript
- We have implemented jQuery Javascript framework for client-side features.
- We have used the CKEditor which is a Web-based WYSIWYG text editor.

Technologies Used

Struts

- a Model –View-Controller (MVC) design pattern based framework
- an open source Java framework and used to develop web applications

Hibernate

- a framework for mapping an object-oriented domain model to a traditional relational database
- an object-relational mapping (ORM) library for the Java language

Technologies Used

JQuery

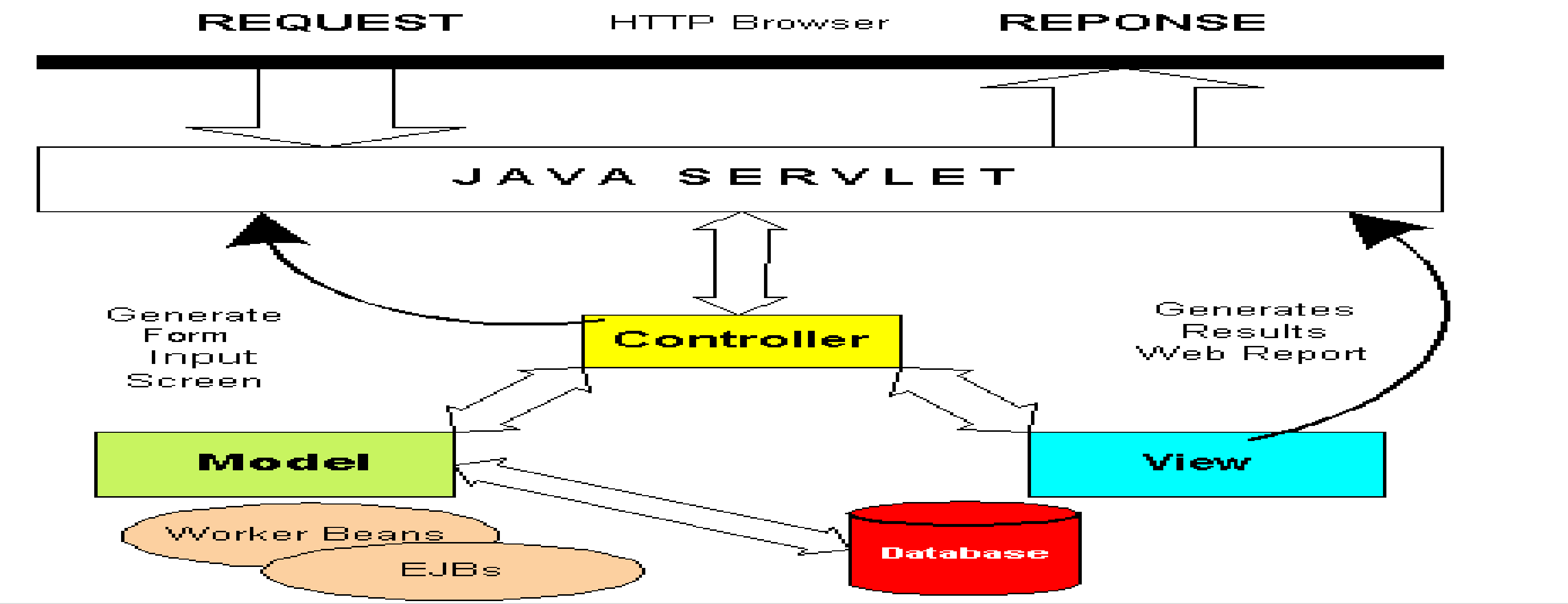
- an open source JavaScript framework
- simplify the client-side scripting

Preliminary Work

- **File Creation application**

Goal: understand MVC architecture

get comfortable with Struts Framework



Preliminary Work

- **Web-based IDE “Aurorasdk”**

  Goal: to study the architecture of a web-based IDE

  Technologies Used:

  Google Web Toolkit (GWT), Servlet and MySQL

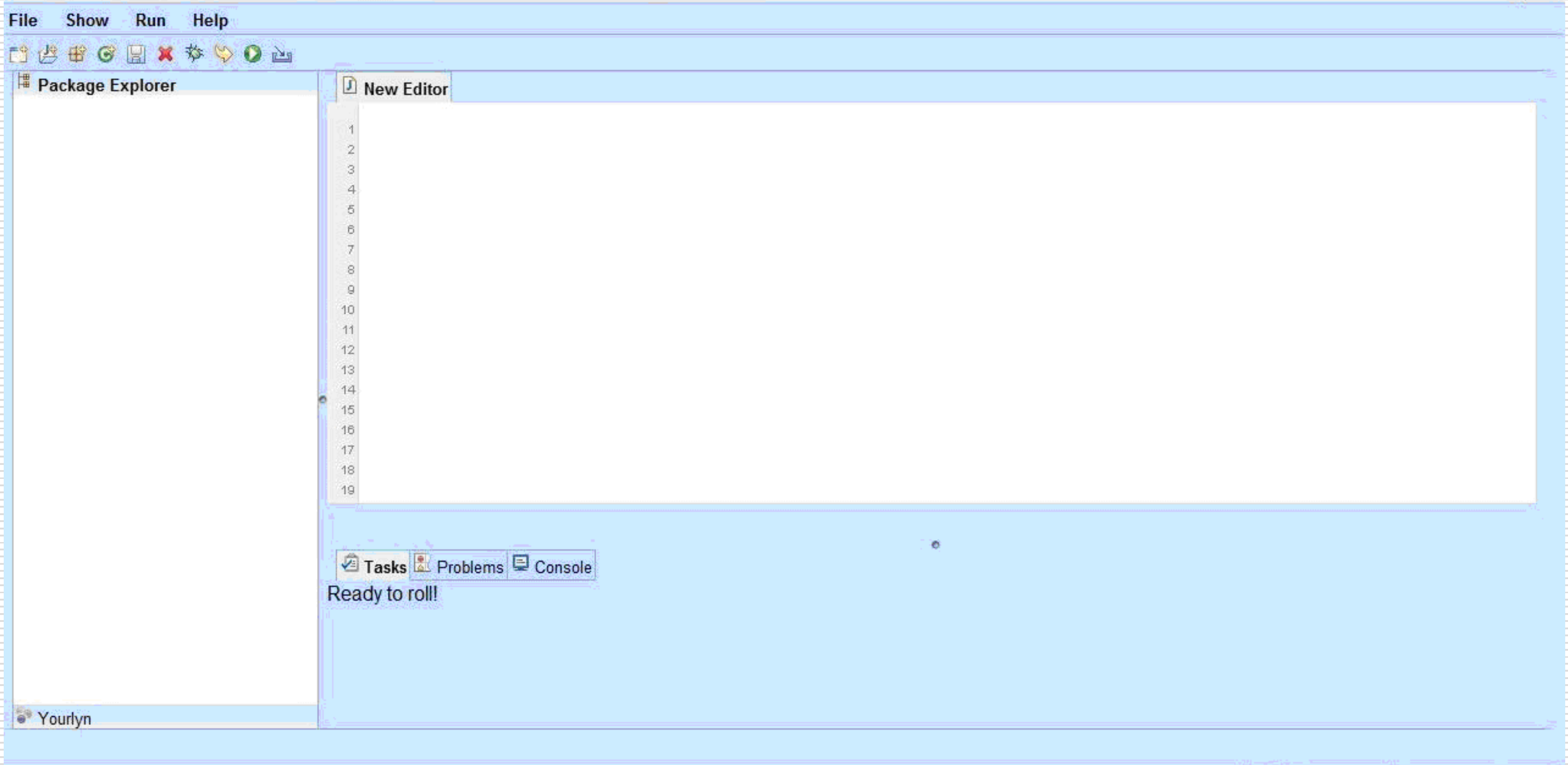
  Limitations:

  users require to do hand-coding

  does not provide cross-browser compatibility

  does not provide collaboration feature

Preliminary Work



Ready to roll!

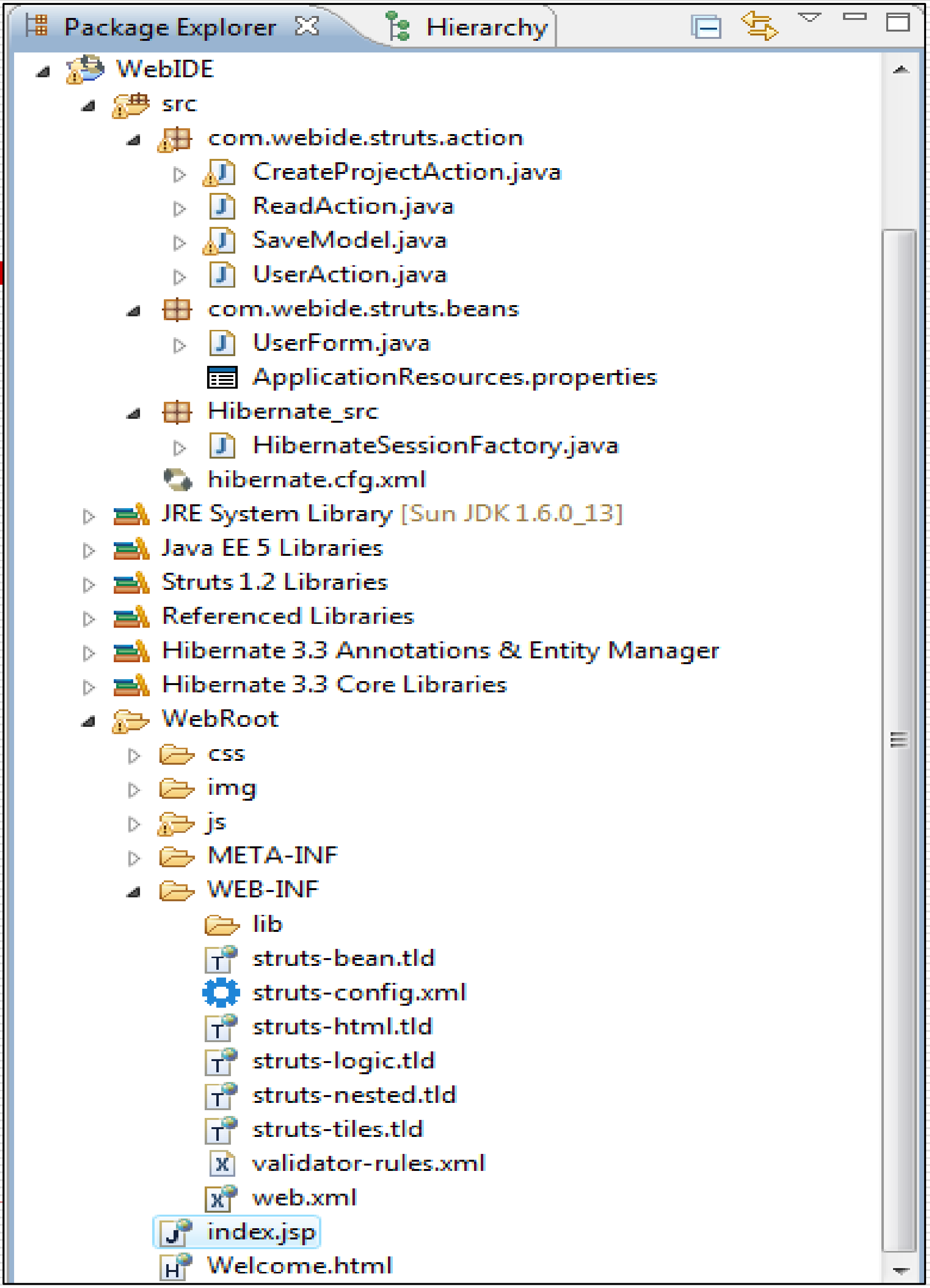
Design

Features of our StrutsHib IDE

- Automatic setup of files, databases, and database tables
- Creating New Model or Controller
- Associating Models
- Interfacing Model and Controller

Design

- **Directory Structure –** Struts Application



```
WebIDE
  src
    com.webide.struts.action
      CreateProjectAction.java
      ReadAction.java
      SaveModel.java
      UserAction.java
    com.webide.struts.beans
      UserForm.java
      ApplicationResources.properties
    Hibernate_src
      HibernateSessionFactory.java
    hibernate.cfg.xml
  JRE System Library [Sun JDK 1.6.0_13]
  Java EE 5 Libraries
  Struts 1.2 Libraries
  Referenced Libraries
  Hibernate 3.3 Annotations & Entity Manager
  Hibernate 3.3 Core Libraries
  WebRoot
    css
    img
    js
    META-INF
    WEB-INF
      lib
      struts-bean.tld
      struts-config.xml
      struts-html.tld
      struts-logic.tld
      struts-nested.tld
      struts-tiles.tld
      validator-rules.xml
      web.xml
    index.jsp
    Welcome.html
```

Design

- **Struts Component**

Action Class Files: stored under *com.webide.struts.action*

Action Form Files: stored under *com.webide.struts.beans*

struts-config.xml: placed under the *Web-INF* directory

View Resources: placed under the *Web Root* directory

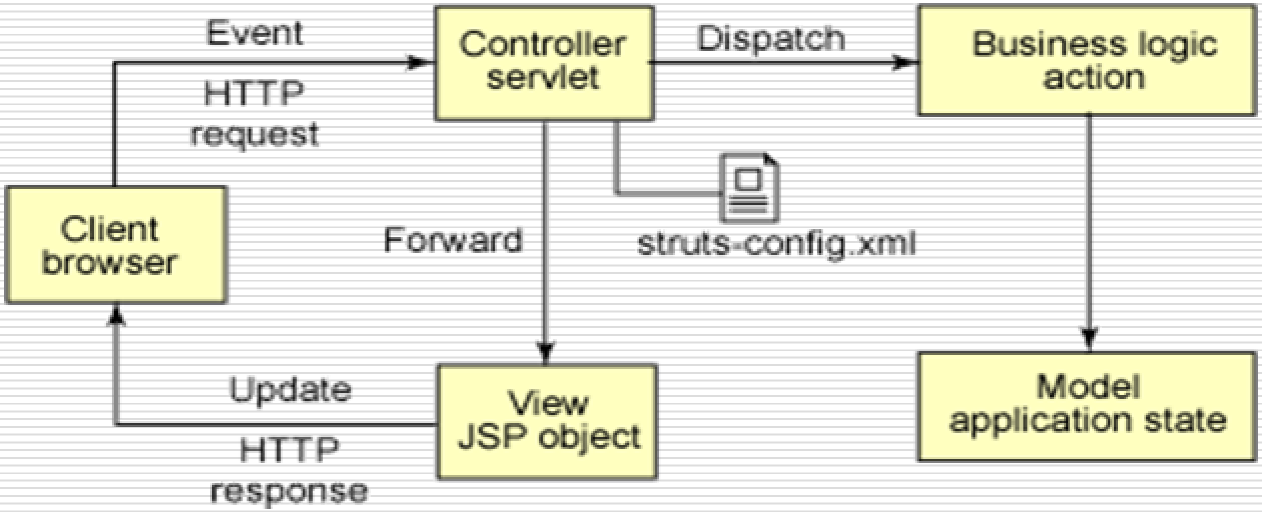
Database Design

- MySQL database name *web_ide* is used for StrutsHib IDE

- Database tables
  - Users (id, Name, Password, UserName)
  - Projects (id, projectname, projectpath, user_id)
  - Models (id, modelname, modelpath, project_id)
  - Models_Association (id, model_id1, model_id2, asso_type)
  - Controllers (id, controllername, controllerpath, project_id)

Architecture

- When a user creates a new project, three subfolders gets created on the server.
  - Model
  - Controller
  - View



Implementation

- When a user creates a new project, three subfolders gets created on the server i.e. Model, Controller and View.
  Returns the physical path on the server
  getServlet().getServletContext().getRealPath()

- The folder is traversed stored in a string buffer.

  Request.setAttribute("ProjectUserName",Buffer);

- In client side values can be retrieved by using *<%StringBuffervalues=(StringBuffer)request.getAttribute (" ProjectUserName"); %>*

Hibernate Instantiation

- SessionFactory is a immutable and thread-safe object for creating new Hibernate sessions

- Session is intended to last as long as the logical transaction on the database.

```
static {
     try {
        configuration.configure(configFile);
        sessionFactory = configuration.buildSessionFactory();
     } catch (Exception e) {
         e.printStackTrace();  }
}
```

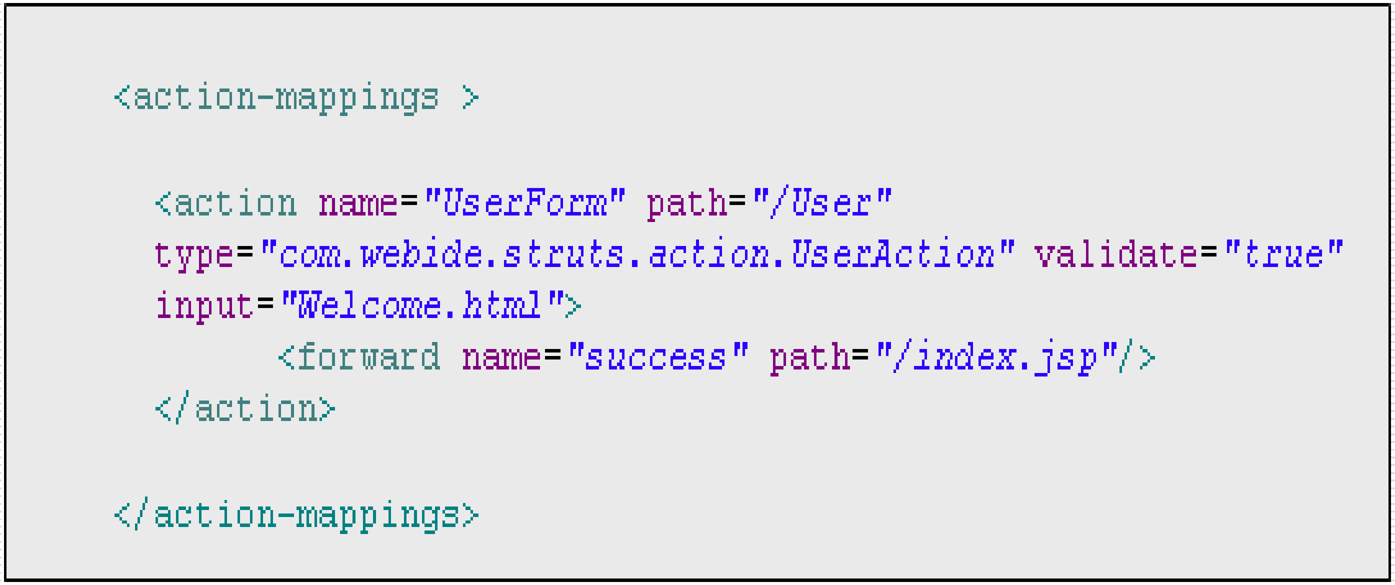
Hibernate Initialization

- Implemented SessionFactory using Singleton pattern
- Lazy initialization is done

```
public static Session getSession() throws HibernateException {
    Session session = (Session) threadLocal.get();
    if (session == null || !session.isOpen()) {
      if (sessionFactory == null) {
        rebuildSessionFactory();
      }
      session = (sessionFactory != null) ? sessionFactory.openSession(): null;
      threadLocal.set(session);
    }
   return session;
}
```

Struts Configuration

- Binding information for the different components of the Struts framework.

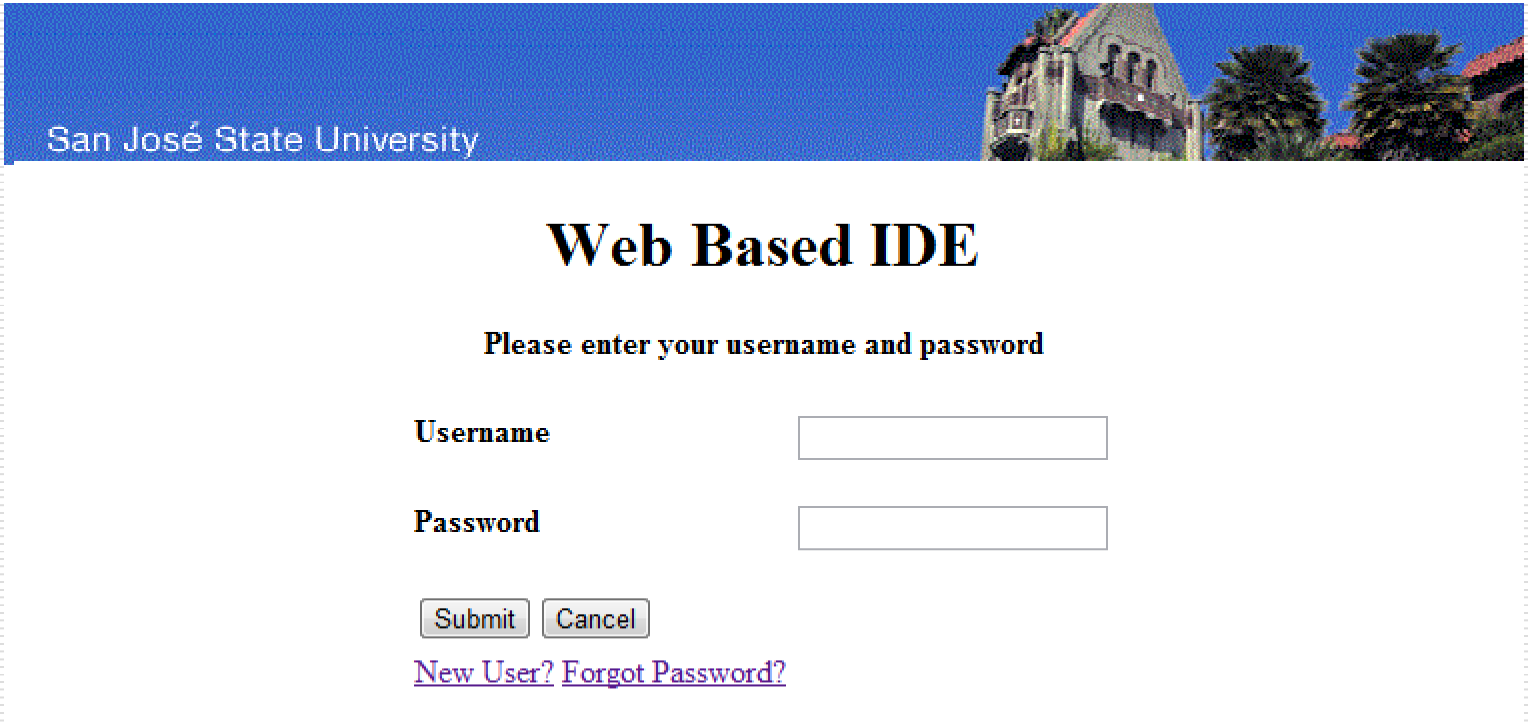


```
<action-mappings >

  <action name="UserForm" path="/User"
  type="com.webide.struts.action.UserAction" validate="true"
  input="Welcome.html">
        <forward name="success" path="/index.jsp"/>
  </action>

</action-mappings>
```

StrutsHib IDE



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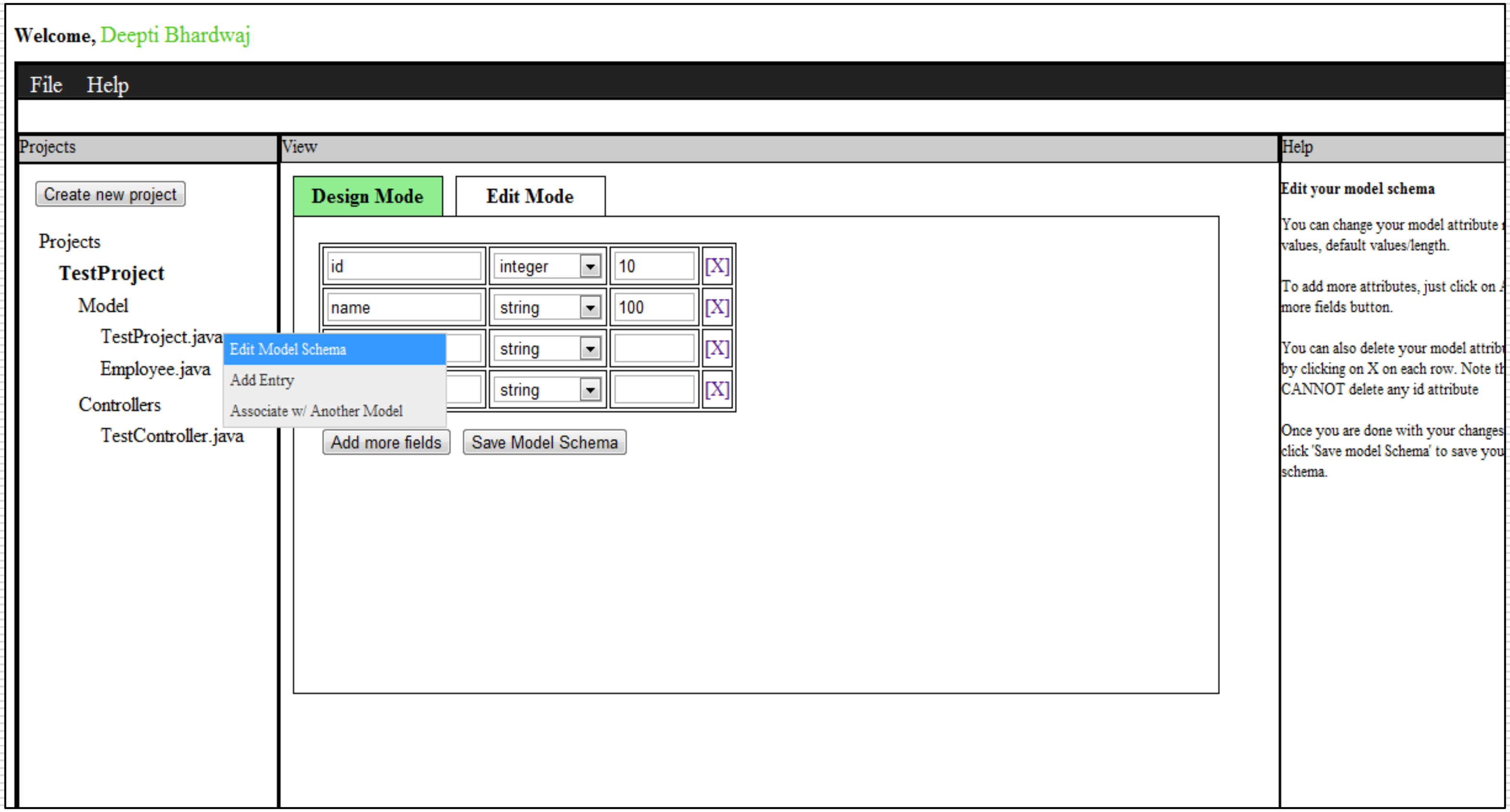
Web Based IDE

Please enter your username and password

Username

Password

StrutsHib IDE Main Page



Welcome, Deepti Bhardwaj

id	integer	10	[X]
name	string	100	[X]
	string		[X]
	string		[X]

Edit your model schema

You can change your model attribute
values, default values/length.

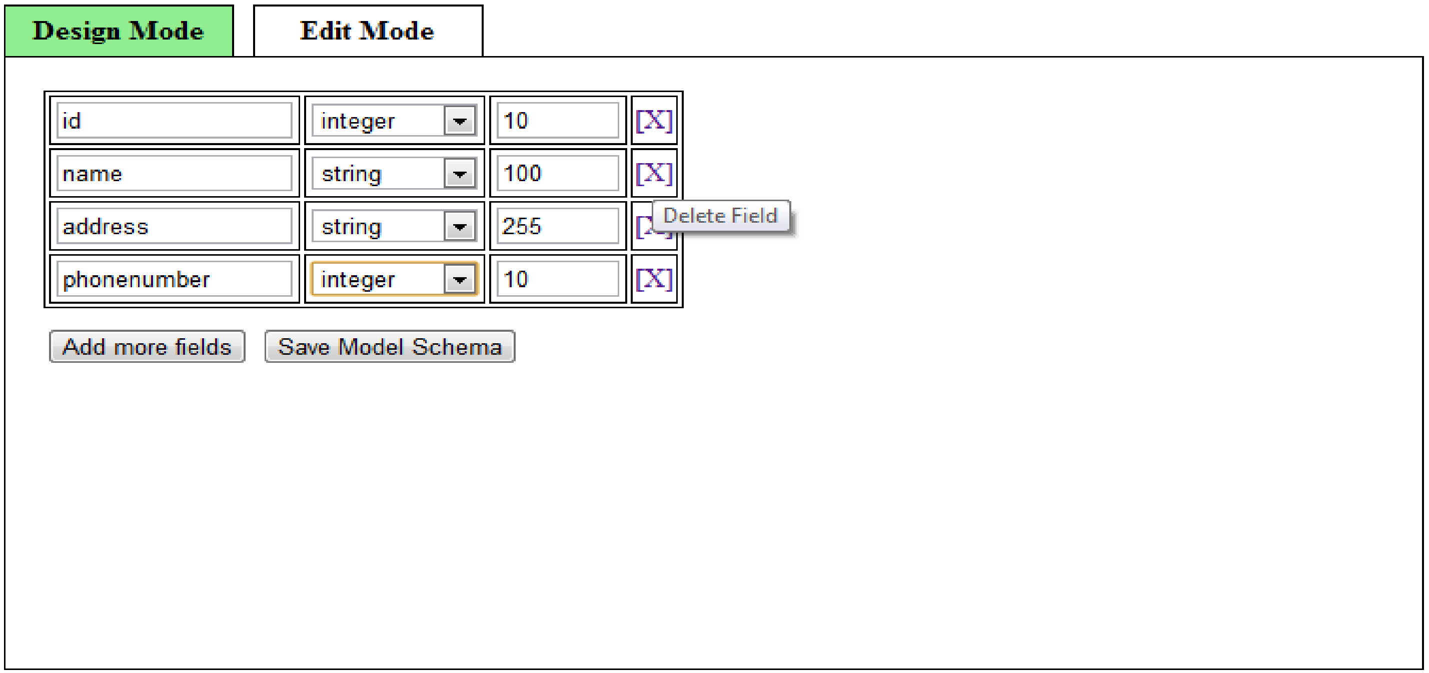
To add more attributes, just click on A
more fields button.

You can also delete your model attrib
by clicking on X on each row. Note th
CANNOT delete any id attribute

Once you are done with your changes
click 'Save model Schema' to save you
schema.

Design Mode – Edit Model

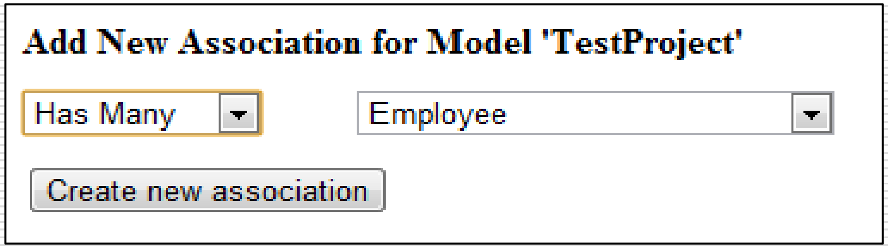
- Right-click on model file gives an option to edit the model schema.



id	integer	10	[X]
name	string	100	[X]
address	string	255	[X]
phonenumber	integer	10	[X]

Associating Models

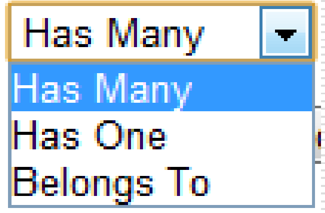
- Models can be interfaced by creating associations between them
- hasMany, hasOne, and belongsTo are the association types



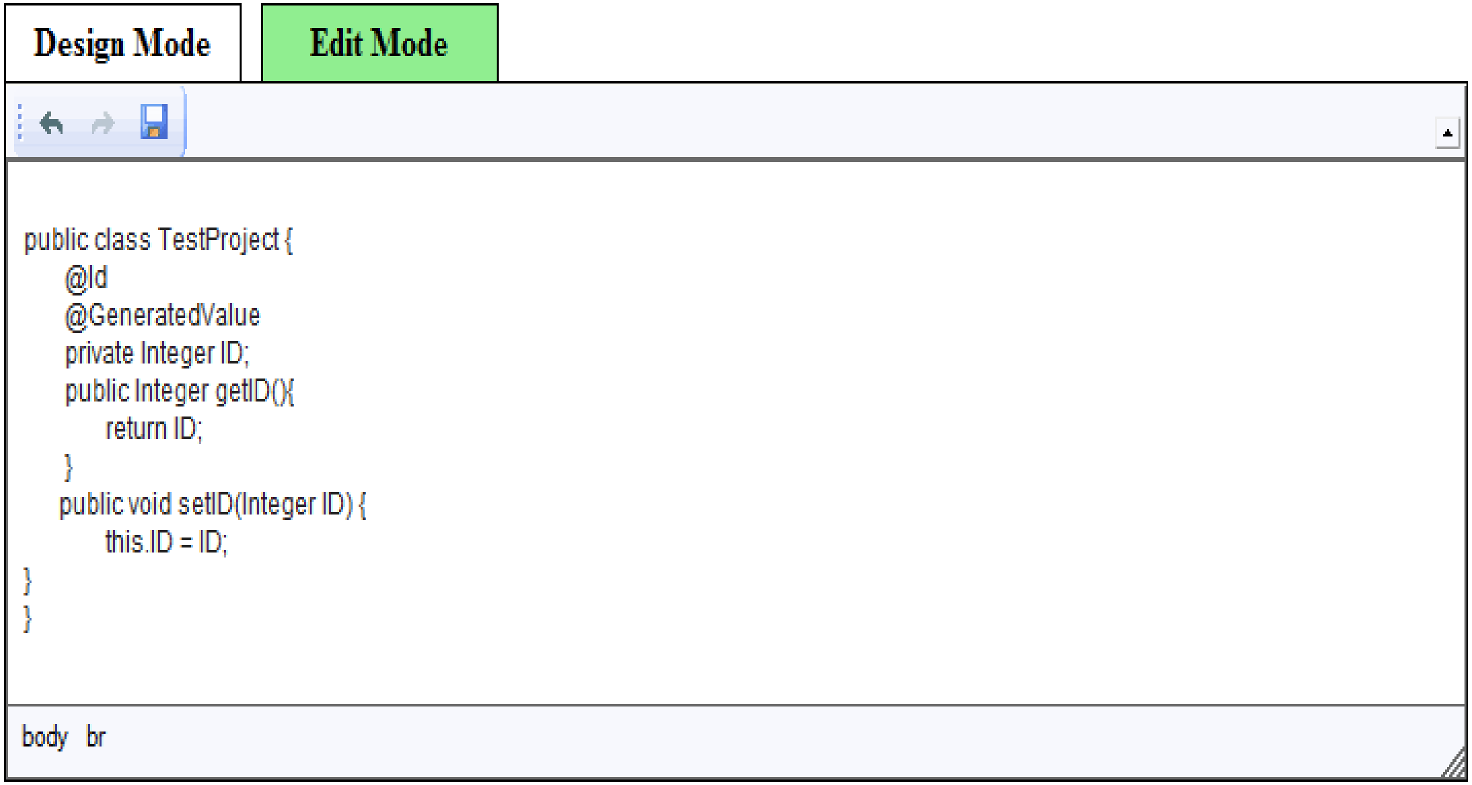
Add New Association for Model 'TestProject'

Has Many

Employee



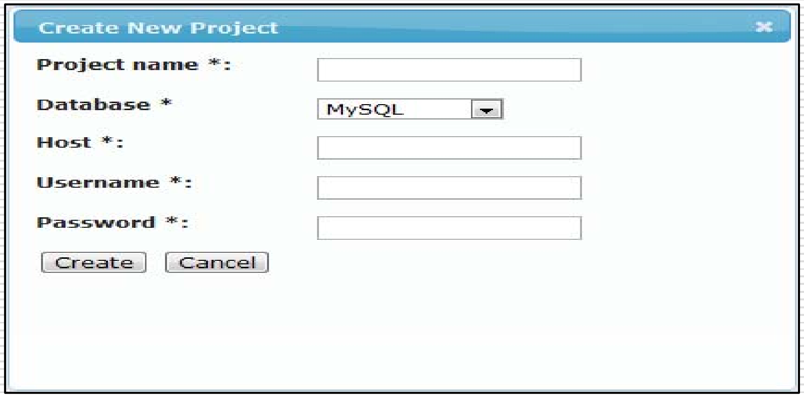
Middle Panel – Edit Mode



```
public class TestProject {
      @Id
      @GeneratedValue
      private Integer ID;
      public Integer getID(){
            return ID;
      }
     public void setID(Integer ID) {
            this.ID = ID;
}
}
```

Add Project, Models or Controllers

- New project, model and controller can be created
- On clicking “Create” button, JavaScript will send an Ajax call to the controller along with user inputs.
- The controller will create the files on server and store the information in database.



Create New Project

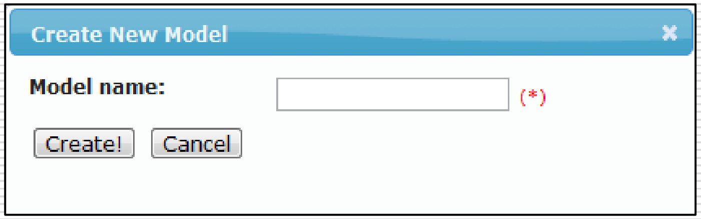
Project name *:

Database * MySQL

Host *:

Username *:

Password *:

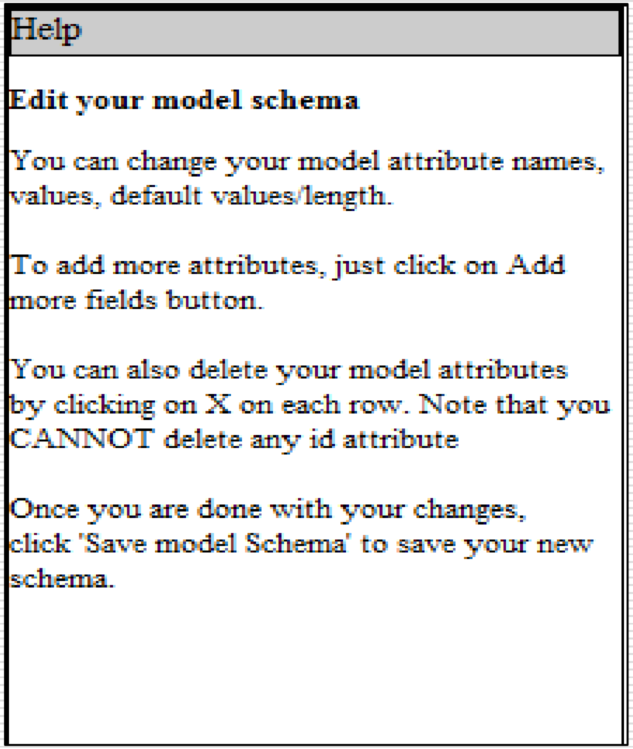


Create New Model

Model name: (*)

Right Panel

- Interactive Help panel is associated with the user action.



Edit your model schema

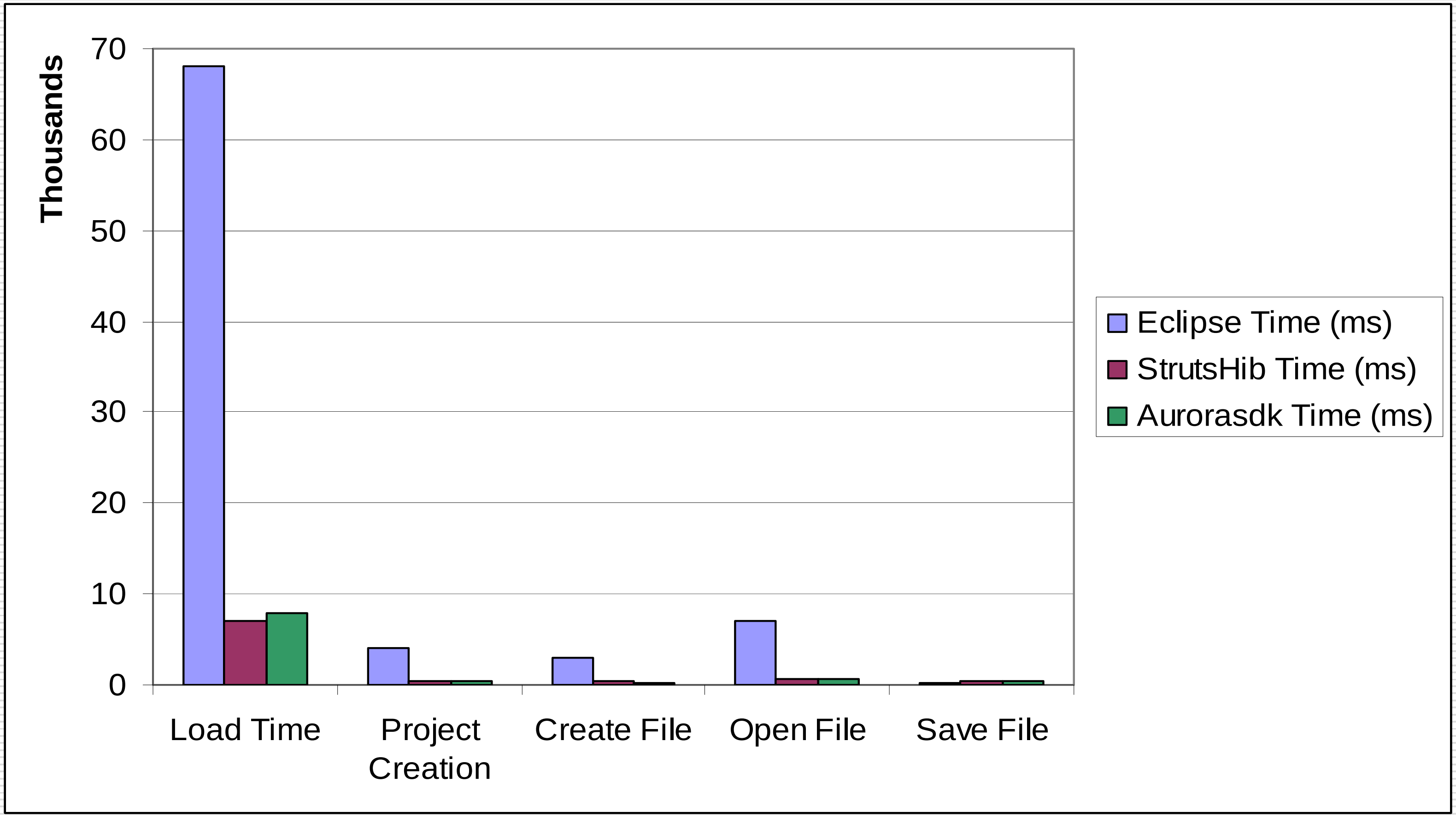
You can change your model attribute names, values, default values/length.

To add more attributes, just click on Add more fields button.

You can also delete your model attributes by clicking on X on each row. Note that you CANNOT delete any id attribute

Once you are done with your changes, click 'Save model Schema' to save your new schema.

Performance



Usability Testing

- Six users are asked to perform following tasks:

Task 1. Create a user account and login using username and password.

Task 2. Create your new project ‘TestProject’ and browse the files structure created by the StrutsHib IDE.

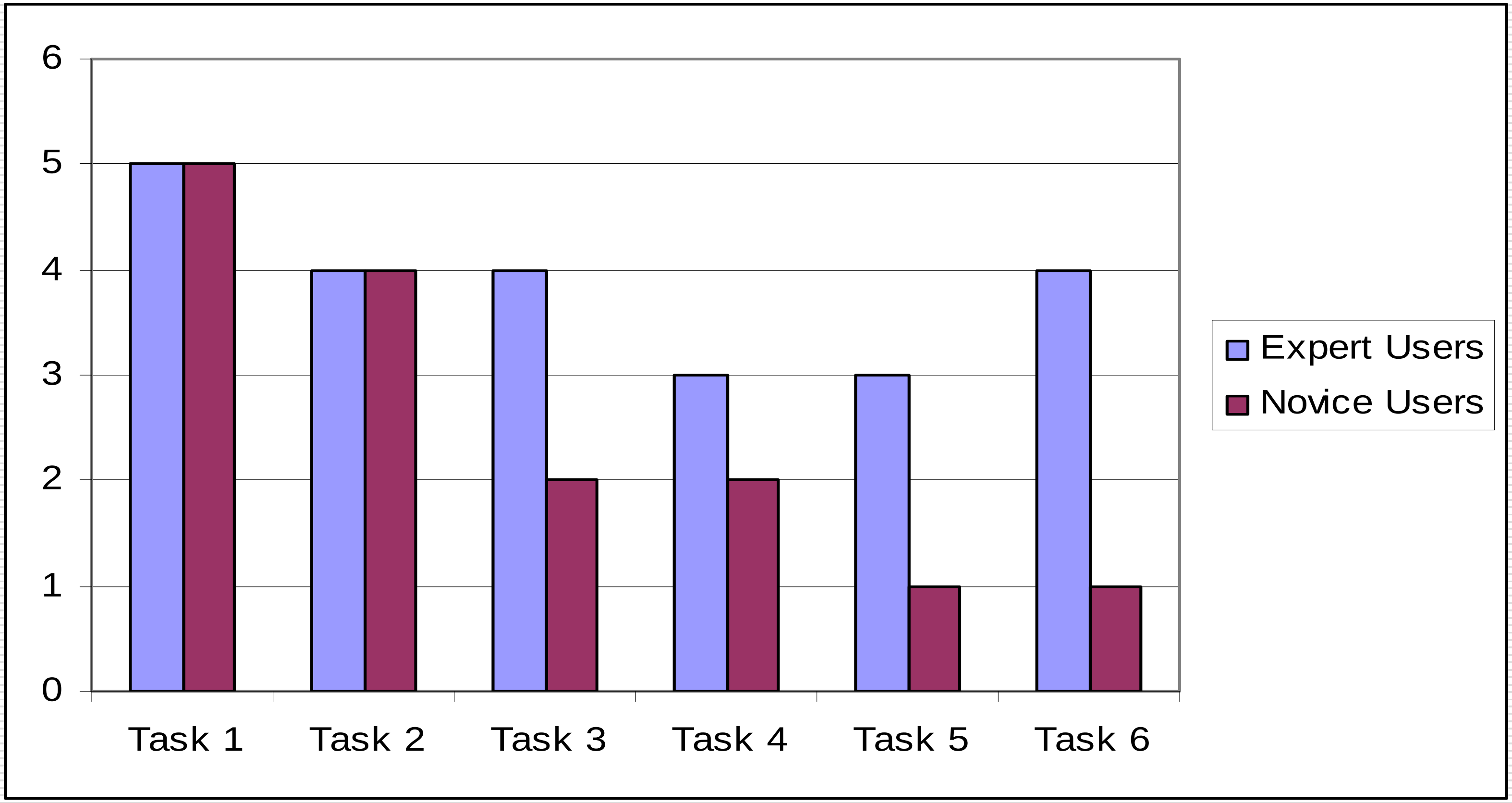
Task 3. Create a new model ‘TestModel’ under Model directory and open the file in the design mode.

Task 4. Edit the model schema by adding new fields to it using design mode editor.

Task 5. Create association between ‘TestModel’ model component and default model ‘TestProject’ using design mode editor.

Task 6. Create interfacing between ‘TestModel’ model and controller component ‘TestController’ using drag and drop feature.

Usability Testing



Usability Testing

- Users found that our StrutsHib IDE simplifies the process of creating a project with its models and controller components.

- Users evaluated it against other IDEs and found it easy to use and requires less learning curve.

Observation

- Less hand-coding increases productivity.

Conclusion

- Achieved the goal of the project by implementing the IDE that automates the processes of creating Web application.
- Our StrutsHib web-based application is user-friendly and it has features which help the user in rapid development of their projects.
- Overall, users found our StrutsHib IDE easy to use.
- StrutsHib IDE can be enhanced to support team collaboration.

Questions?

Thank you