Porting a Swing application to DukeScript using NetBeans

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Agenda

- Prerequisites
- Port to DukeScript

References:

- **TodoDS** http://wiki.netbeans.org/TodoDS

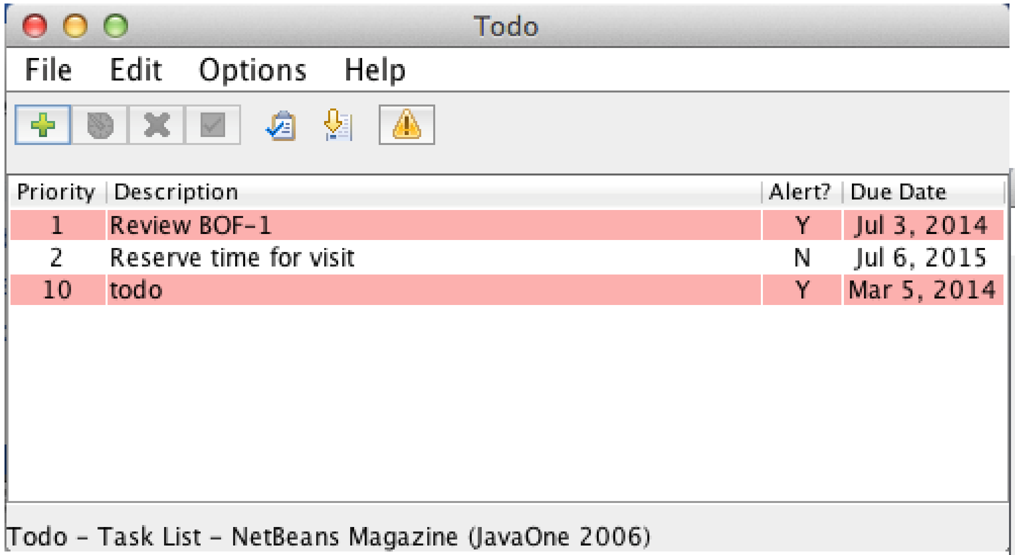
Prerequisites

- ToDo Swing application
- NetBeans 8.0.2 or later
- JDK 7 or later
- HSQL DB
- DukeScript plugin for NetBeans

- Create a Project Group (*Optional*)

To-do Swing application

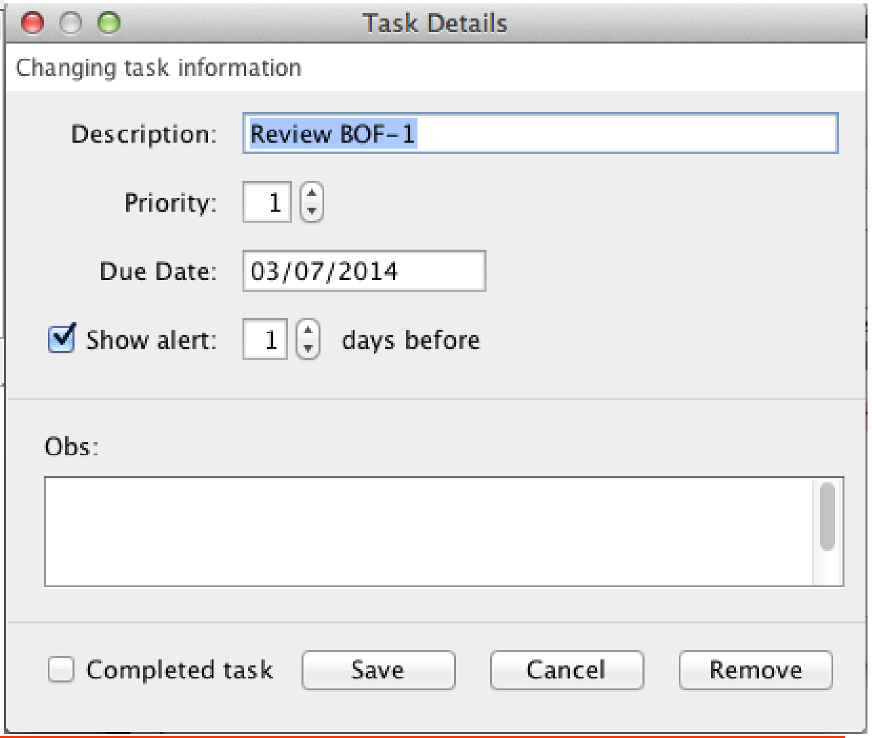
TodoDS



Todo

Priority	Description	Alert?	Due Date
1	Review BOF-1	Y	Jul 3, 2014
2	Reserve time for visit	N	Jul 6, 2015
10	todo	Y	Mar 5, 2014

Todo - Task List - NetBeans Magazine (JavaOne 2006)



Task Details

Changing task information

Description: Review BOF-1

Priority: 1

Due Date: 03/07/2014

☑ Show alert: 1 days before

Obs:

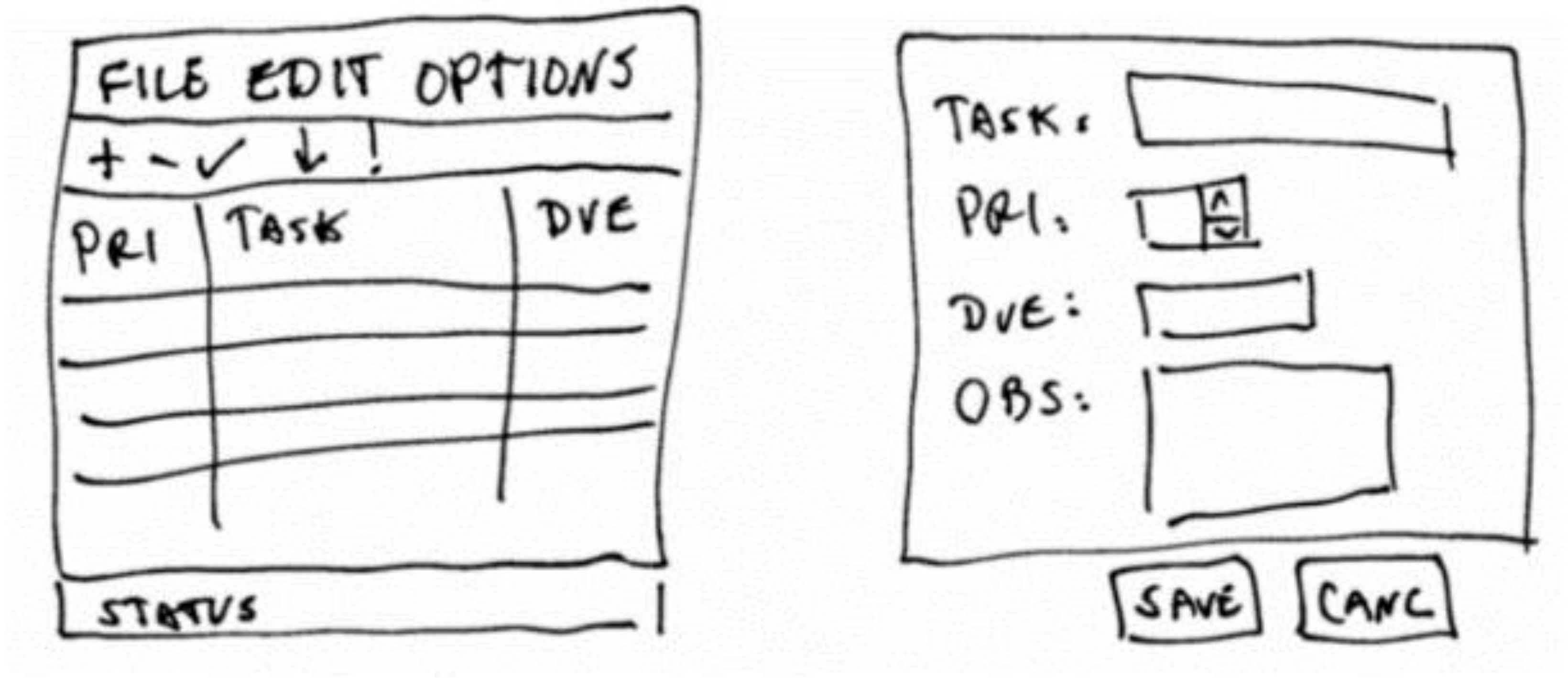
☐ Completed task

Requirements

- Tasks should have a *priority*, so users can focus on higher-priority tasks first.
- Tasks should have a *due da*te, so users can focus on tasks that are closer to their deadline.
- Tasks that are either late or near their deadlines should have visual cues.
- Tasks can be marked as *completed*, but this doesn't mean they have to be deleted or hidden.

Requirements (cont.)

- The to-do application consists of two main windows:
  - A task list window and
  - A task editing form

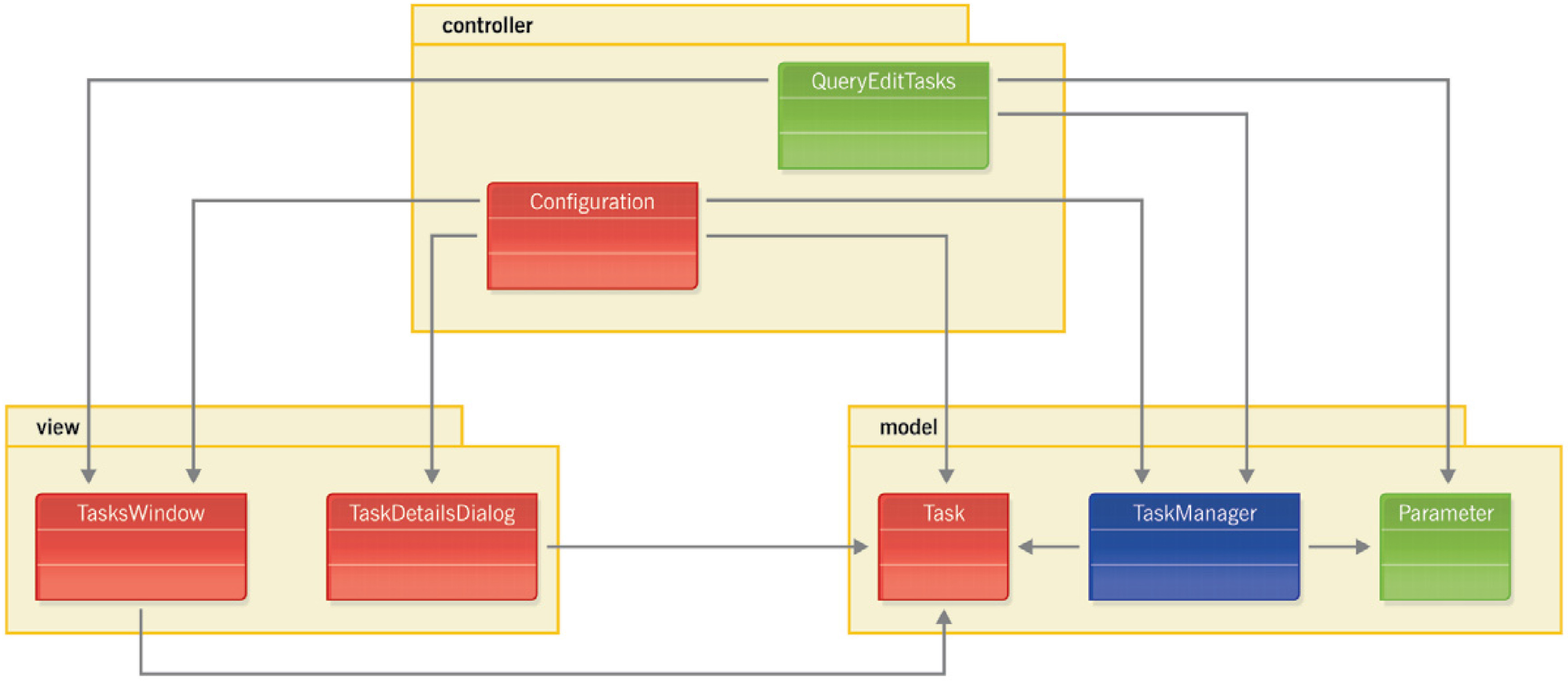


Steps

1. Build a "static" visual prototype of the GUI.
2. Build a "dynamic" prototype of the application, coding user interface events and associated business logic and creating customized GUI components as needed.
3. Code the persistence logic by modeling the classes and the database.

Swing ToDo application Architecture

TodoDS



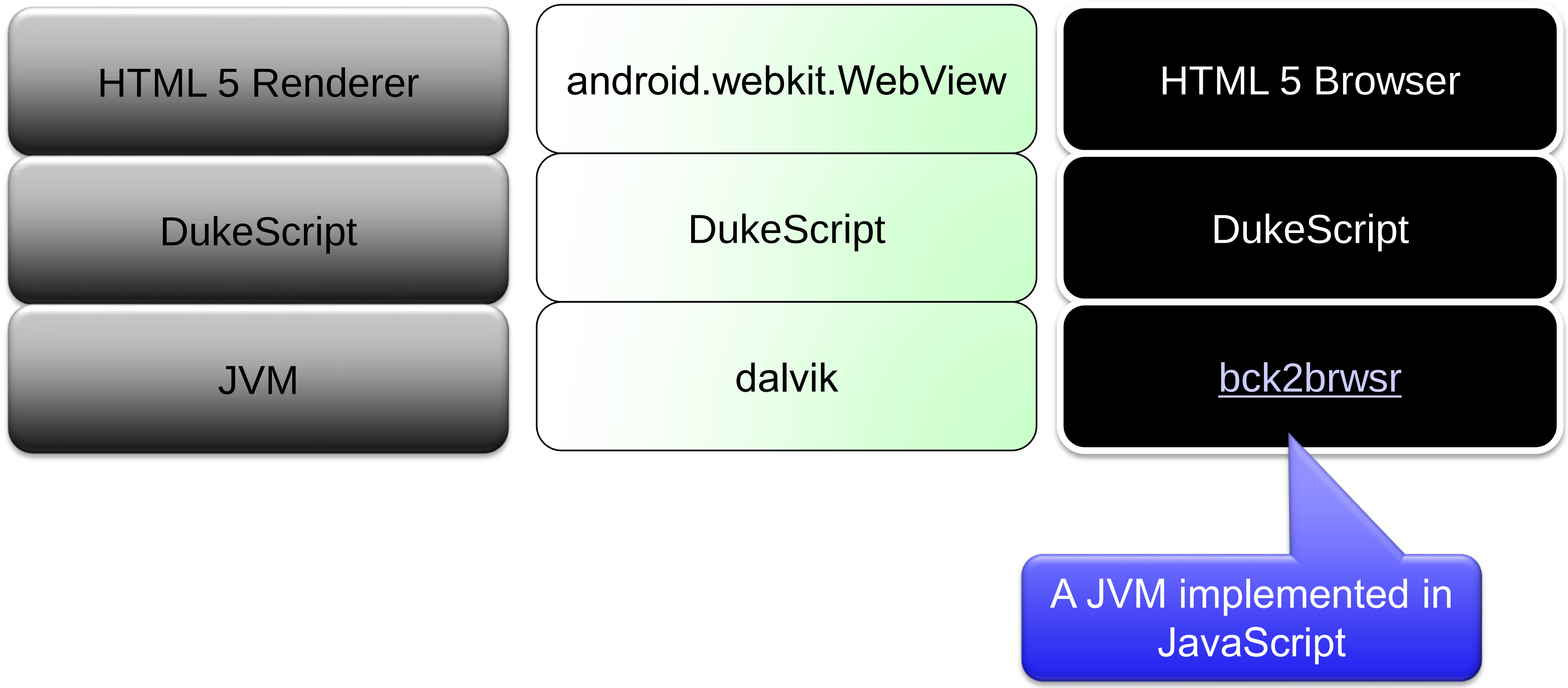
TODO DS

What is DukeScript

TodoDS

- DukeScript is a new technology for creating cross-platform mobile, desktop and web applications. It allows you to write your logic in Java and render the result to a number of clients, which can be web browser, portable devices etc.
- DukeScript applications are plain Java applications that internally use HTML5 technologies and JavaScript for rendering. This way developers only need to write clean Java code and can still leverage the latest developments in modern UI technology.

How does it work



Pros & Cons

+ Write in Java

+ Write once run everywhere (web, JavaFX, Android, iOS, …)

+ API similar to JavaFX

- Not a lot of documentation available

- Need to learn a new API

Technologies to master

- HTML(5)
- CSS(3)
- JavaScript
- Knockout.js
- DukeScript
- Model-View-ViewModel (MVVM)

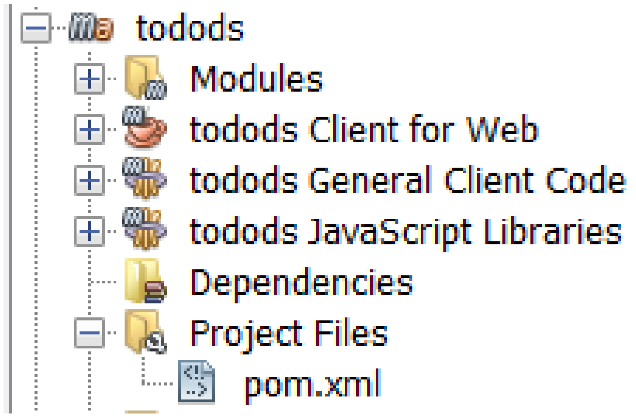
Installation

- In NetBeans install the DukeScript plugin
  - Tools → Plugins → Available Plugins
    - DukeScript Project Wizard
    - Mine Sweeper

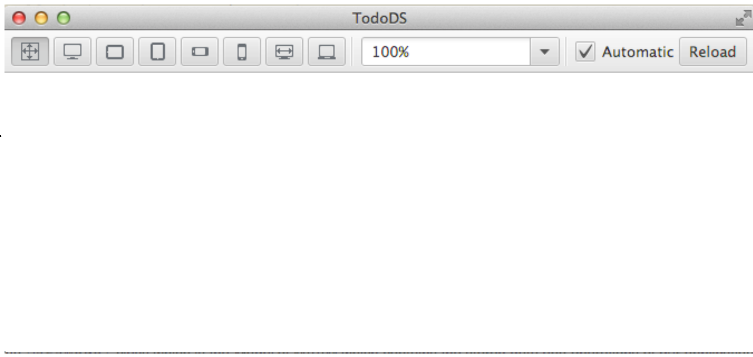
Create a new DukeScript application

TodoDS

- In NetBeans:
  - File → New Project
    - ❑Categories: DukeScript
    - ❑Projects: DukeScript Application
  - Provide an artifact & group id
  - Choose your platform: Browser
  - Select *Knockout for Java Example* template
  - Right click on it and choose **Build with Dependencies**.
  - Execute *todo General Client Code*
  - Contains:
    - ❑2 Java files: `Main` and `DataModel`
    - ❑1 HTML file: `index.html`
    - ❑1 empty CSS file: `index.css`



```
todods
  Modules
  todods Client for Web
  todods General Client Code
  todods JavaScript Libraries
  Dependencies
  Project Files
    pom.xml
```

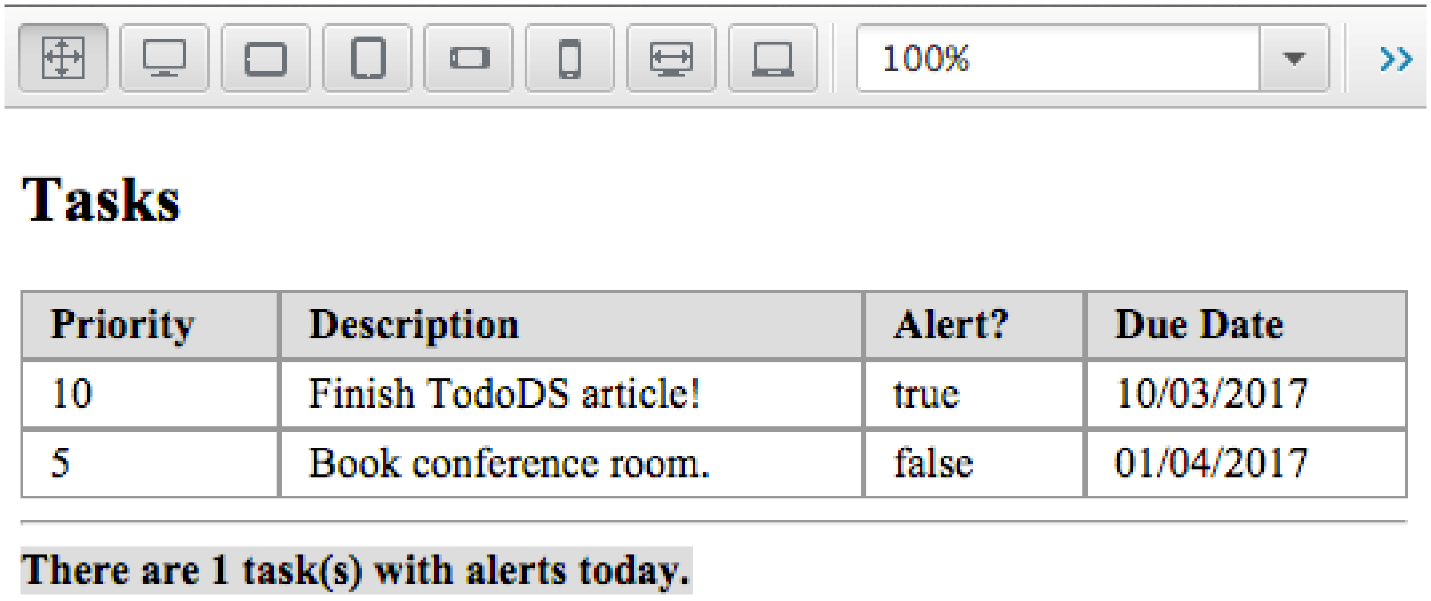


STEP 1

Build a Static Prototype of the GUI

Step 1: Build a Static Prototype of the GUI

- DukeScript claims to have a clean separation of design and development. With DukeScript it is possible to completely outsource the UI design to a designer with no knowledge of DukeScript, or a specific set of tools.
- Dukescript uses HTML for the framework's UI and there are plenty of tools to build HTML UIs with the help of CSS and it is a well known technology to UI designers.
- Using a nice `.css` we can produce the following prototype:



Tasks

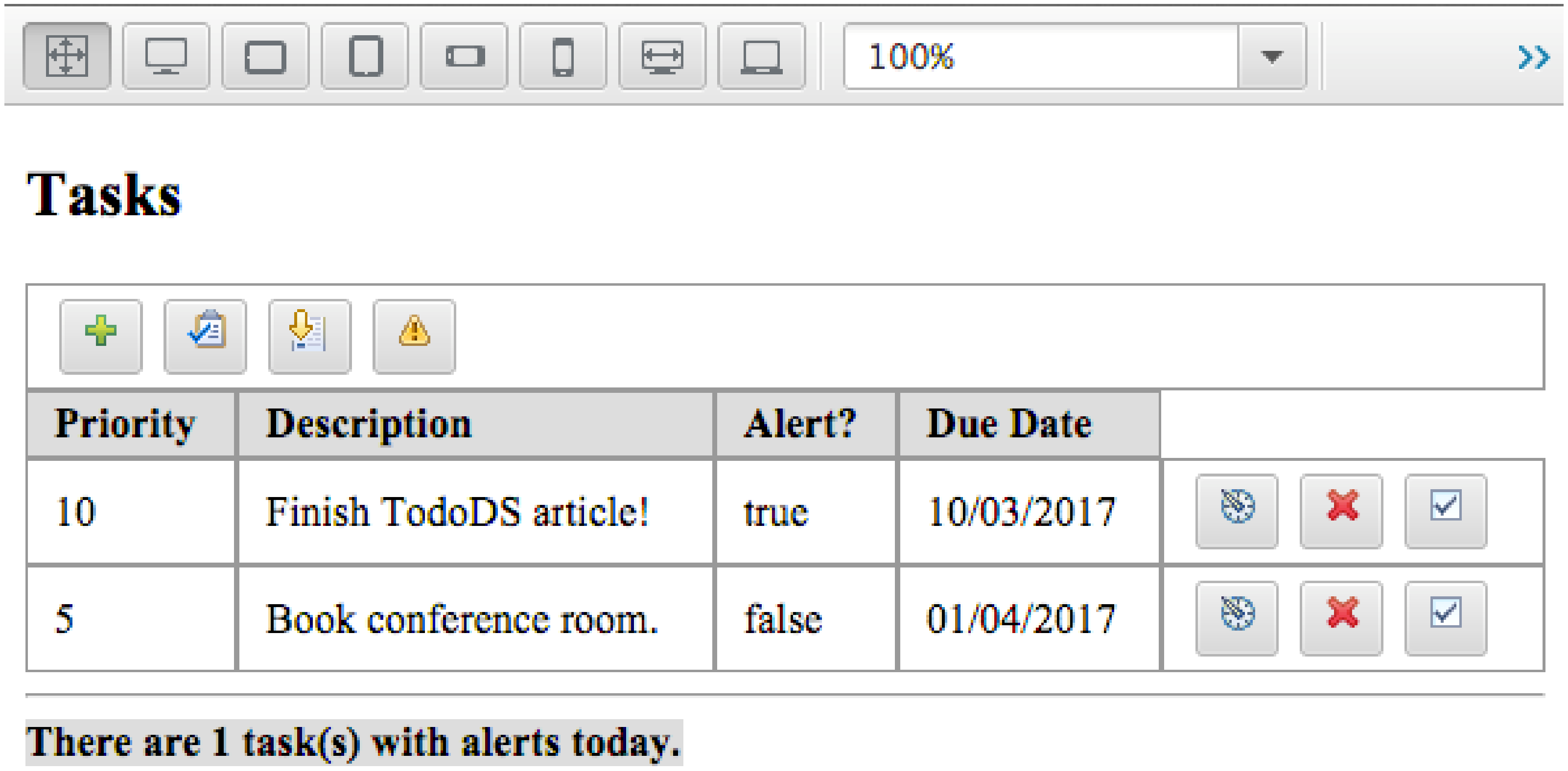
Priority	Description	Alert?	Due Date
10	Finish TodoDS article!	true	10/03/2017
5	Book conference room.	false	01/04/2017

There are 1 task(s) with alerts today.

Step 1: Build a Static Prototype of the GUI

TodoDS

- Copying the icons from the original Todo Swing application and with some more HTML editing, our tasks-list page is almost ready:



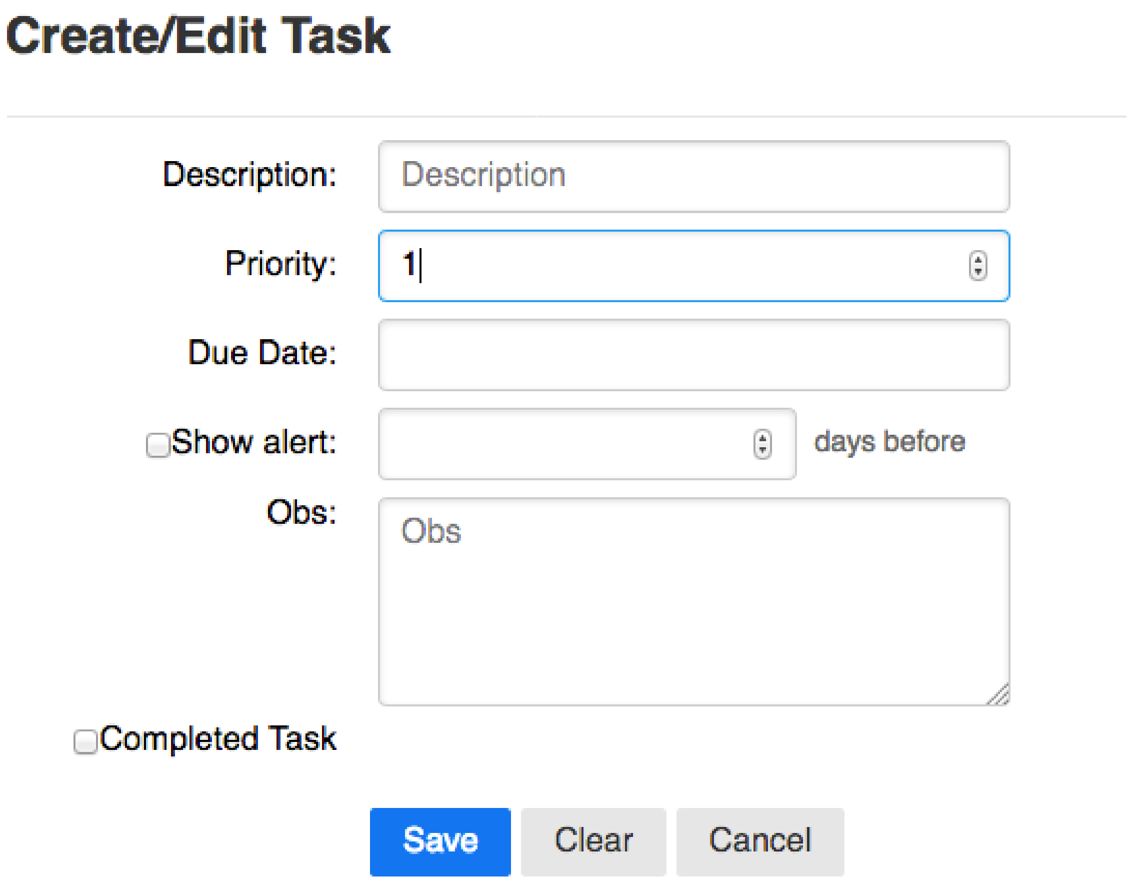
Tasks

Priority	Description	Alert?	Due Date	
10	Finish TodoDS article!	true	10/03/2017	
5	Book conference room.	false	01/04/2017	

There are 1 task(s) with alerts today.

Step 1: Build a Static Prototype of the GUI

- Create `edit.html` for the edit task form and link the two pages together using standard HTML.



Create/Edit Task

Description:	Description
Priority:	1
Due Date:	
☐ Show alert:	days before
Obs:	Obs
☐ Completed Task	

STEP 2

Build a Dynamic Prototype

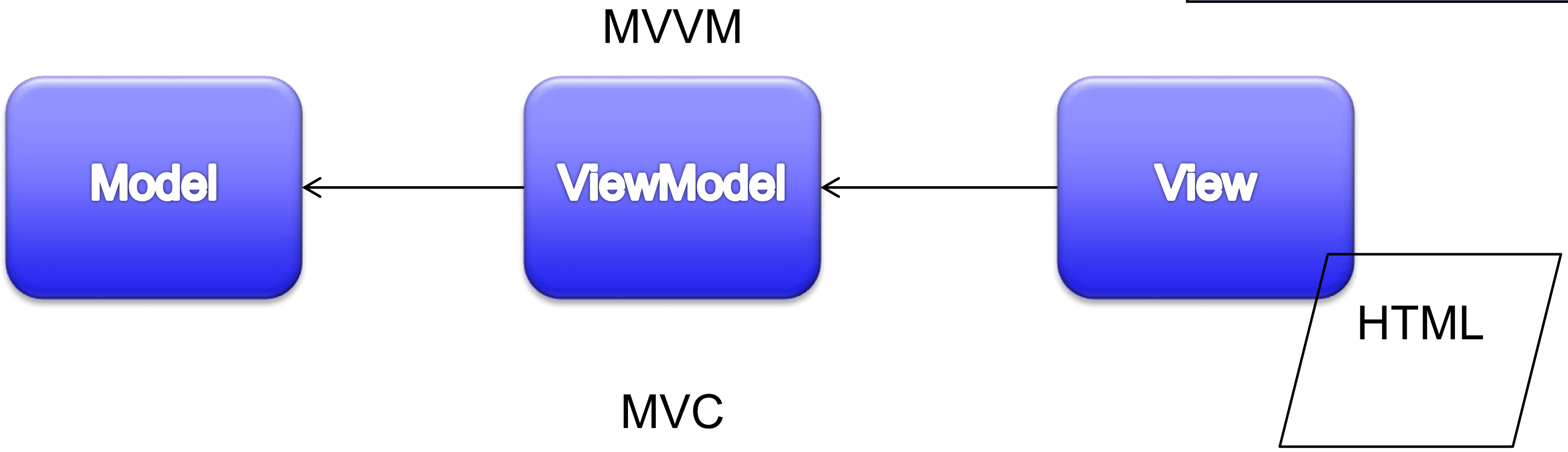
Step 2: Build a Dynamic Prototype

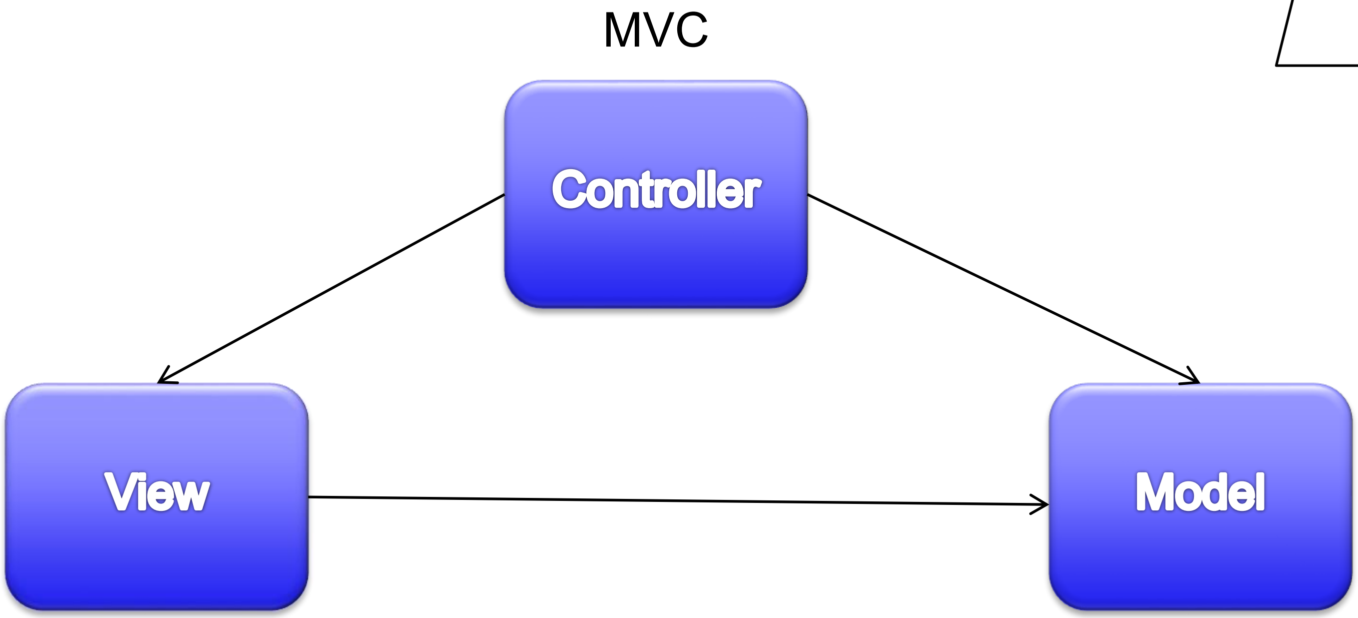
- implement as much user interaction as possible without using persistent storage or implementing complex business logic.

Swing Todo	TodoDS
MVC	MVVM
Value Object (VO): Task	ViewModel: Task
DAO: TaskManager	ViewModel: TaskList

Model-View-ViewModel (MVVM)

TodoDS





Step 2: todods.TodoDS.Main

TodoDS

```
public final class Main {
    private Main() {  }
    public static void main(String... args) throws
  Exception {
        BrowserBuilder.newBrowser().
            loadPage("pages/index.html").
            loadClass(Main.class).
            invoke("onPageLoad", args).
            showAndWait();
        System.exit(0);
    }
    public static void onPageLoad() throws Exception {
        ViewModel.onPageLoad();
    }
}
```

Step 2: todods.TodoDS.DataModel

TodoDS

```
@Model(className = "Data", targetId="",
  properties = { })
final class DataModel {
   private static Data ui;
   /** * Called when the page is ready. */
   static void onPageLoad() throws
  Exception {
        ui = new Data();
        ui.applyBindings();
   }
}
```

Step 2: todods.TodoDS.ViewModel

TodoDS

```
@Model(className = "Task", targetId="", properties = {
  @Property(name = "id", type = int.class),
  @Property(name = "description", type = String.class),
  @Property(name = "priority", type = int.class),
  @Property(name = "dueDate", type = String.class),
  @Property(name = "alert", type = boolean.class),
  @Property(name = "daysBefore", type = int.class),
  @Property(name = "obs", type = String.class),
  @Property(name = "completed", type = boolean.class) })
final class ViewModel {
 static void onPageLoad() throws Exception {
  Task task = new Task(); task.setPriority(10);
   task.setDescription("Finish TodoDS article!");
   task.setAlert(true); task.setDueDate("10/03/2017");
   task.applyBindings();
 }
}
```

Step 2: todods.TodoDS.ViewModel

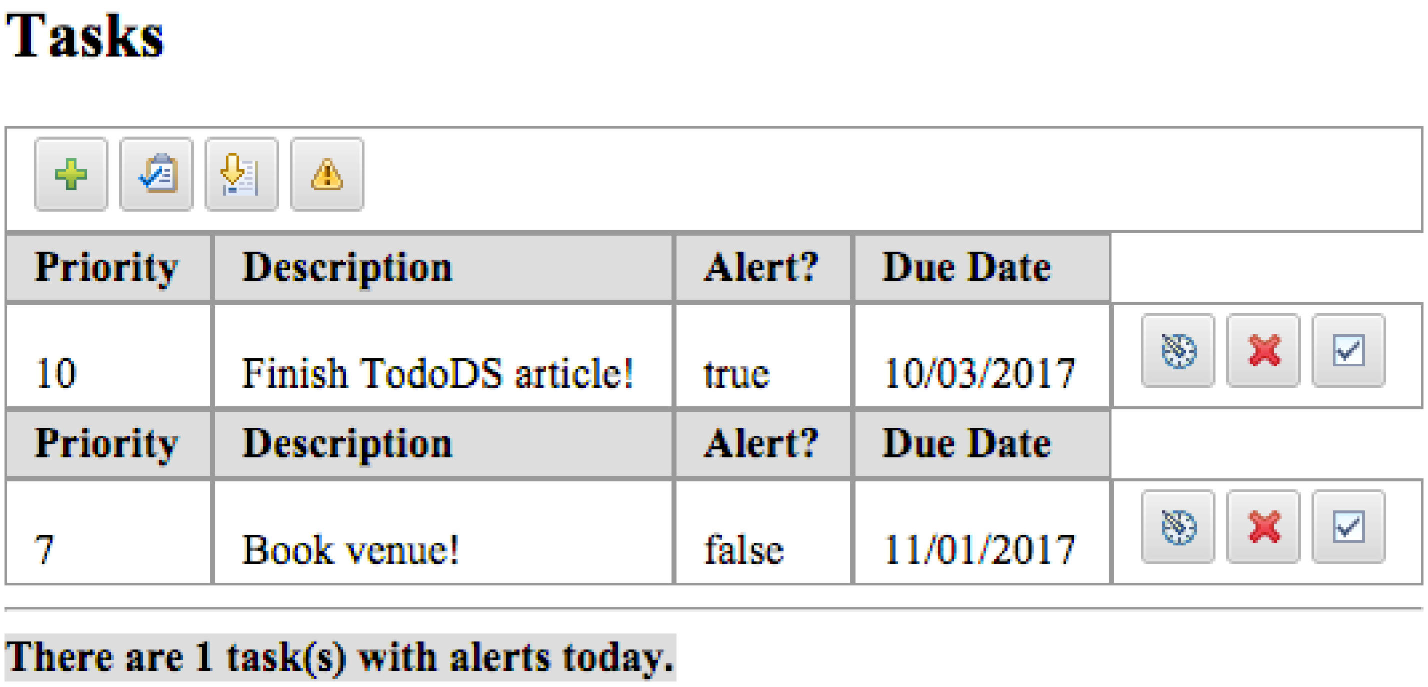
```
@Model(className = "Task", targetId="", properties = {
  @Property(name = "id", type = int.class),
  @Property(name = "description", type = String.class),
  @Property(name = "priority", type = int.class),
  @Property(name = "dueDate", type = String.class),
  @Property(name = "alert", type = boolean.class),
  @Property(name = "daysBefore", type = int.class),
  @Property(name = "obs", type = String.class),
  @Property(name = "completed", type = boolean.class) })
final class ViewModel {
 static void onPageLoad() throws Exception {
  Task task = new Task(); task.setPriority(10);
   task.setDescription("Finish TodoDS article!");
   task.setAlert(true); task.setDueDate("10/03/2017");
   task.applyBindings();
// <div class="rTableCell" data-bind="text: priority"></div>
 }
}
```

Step 2: todods.TodoDS.ViewModel

```
@Model(className = "TaskList", targetId = "", properties = {
@Property(name = "tasks", type = Task.class, array = true) })
final class ViewModel {
 static void onPageLoad() throws Exception {
  TaskList taskList = new TaskList();
  taskList.add(new Task(...));
  taskList.applyBindings();
 }
 @Model(className = "Task", targetId = "", properties = {...})
 public static class TaskModel { }
}
<div class="rTable" data-bind="foreach: tasks">
----------------------------------------------------------------
<div class="rTable">
 <div class="rTableHeading"> ... </div>
 <!-- ko foreach: tasks -->
<div class="rTableRow" > ... </div> <!-- /ko -->
```

Step 2: Build a Dynamic Prototype of the GUI

TodoDS



Tasks

Priority	Description	Alert?	Due Date	
10	Finish TodoDS article!	true	10/03/2017	

Priority	Description	Alert?	Due Date	
7	Book venue!	false	11/01/2017	

There are 1 task(s) with alerts today.

Step 2: add user interaction

TodoDS

```
public void removeTask(final int id) {
   tasks.removeIf(task -> id == task.getId());
}   ➔
@Function
public static void removeTask(TaskList tasks, Task data) {
   tasks.getTasks().remove(data);
}
---------------------------------------------------------
<a class="button" data-bind="click: $parent.removeTask">
  <img src="../resources/icons/delete_edit.gif"
   alt="Remove Task..." title="Remove Task..."/>
</a>
```

Step 2: add user interaction (cont.)

```
@ComputedProperty
public static int numberOfTasksWithAlert(List<Task> tasks)
{
   return listTasksWithAlert(tasks).size();
}
private static List<Task> listTasksWithAlert(List<Task>
   tasks) {
return
   tasks.stream().filter(Task::isAlert).collect(toList());
}
----------------------------------
<div class="rTableFoot">There are
   <label data-bind="text:
      $data.numberOfTasksWithAlert"/></label> task(s) with
   alerts today.
</div>
```

Java 8 not supported by bck2brwsr yet

Binding Contexts

- Properties available only in View:
  - `$root`: refers to the top-level ViewModel
  - `$data`: refers to the ViewModel object of the current context (can be omitted)
  - `$parent`: refers to the parent ViewModel object (useful for nested loops)
  - `$index`: contains the current item’s index in the array

Templates (1/4)

TodoDS

- Applications written with DukeScript typically are single pages, and the scope of a Model is a single page.
- Still we need a way to mimic the behaviour that you typically get in a web application with several linked HTML-pages, like our `index.html` and `edit.html`.
- To overcome this problem we use Knockout templates.
- The template binding has a `name` parameter. Knockout will look for a script tag with the same `id` as specified by the `name` parameter:

```
<div data-bind="template: {name: 'task'}"></div>
<script type="text/html" id="task">
   <h2>Tasks</h2>
   ...
</script>
```

Make sure that the content of the script tag won't be executed as Javascript.

Templates (2/4)

```
<div data-bind="template: {name: 'task',
  if: !edited()}"></div>
<div data-bind="template: {name: 'editor', if: edited(),
  data: edited()}"></div>
<script type="text/html" id="task">
   <h2>Tasks</h2>
   ...
</script>
<script type="text/html" id="editor">
...
</script>
```

Templates (3/4)

TodoDS

```
@Property(name = "selected", type = Task.class),
@Property(name = "edited", type = Task.class)

@Function static void addNew(TaskList tasks){
  tasks.setSelected(null);
  tasks.setEdited(new Task());
}

@Function static void edit(TaskList tasks, Task data) {
  tasks.setSelected(data);
  tasks.setEdited(data.clone());
}
```

Templates (4/4)

TodoDS

```
@Function
static void commit(TaskList tasks) {
    final Task task = tasks.getEdited();
    if (task == null) return;
    final Task selectedTask = tasks.getSelected();
    if (selectedTask != null) {
        tasks.getTasks().set(tasks.getTasks().indexOf(selectedTask),
   task);
    } else {
        tasks.getTasks().add(task);
    }
    tasks.setEdited(null);
}
@Function
static void cancel(TaskList tasks) {
    tasks.setSelected(null);
    tasks.setEdited(null);
}
```

Validation (1/3)

TodoDS

```
private static boolean validate(Task task) {
    String invalid = null;
    if (task.getValidate() != null) {
        invalid = task.getValidate();
    }
    return invalid == null;
}
...
@Function
static void commit(TaskList tasks) {
    final Task task = tasks.getEdited();
    if (task == null || !validate(task)) {
        return;
    }
...
```

TasksViewModel

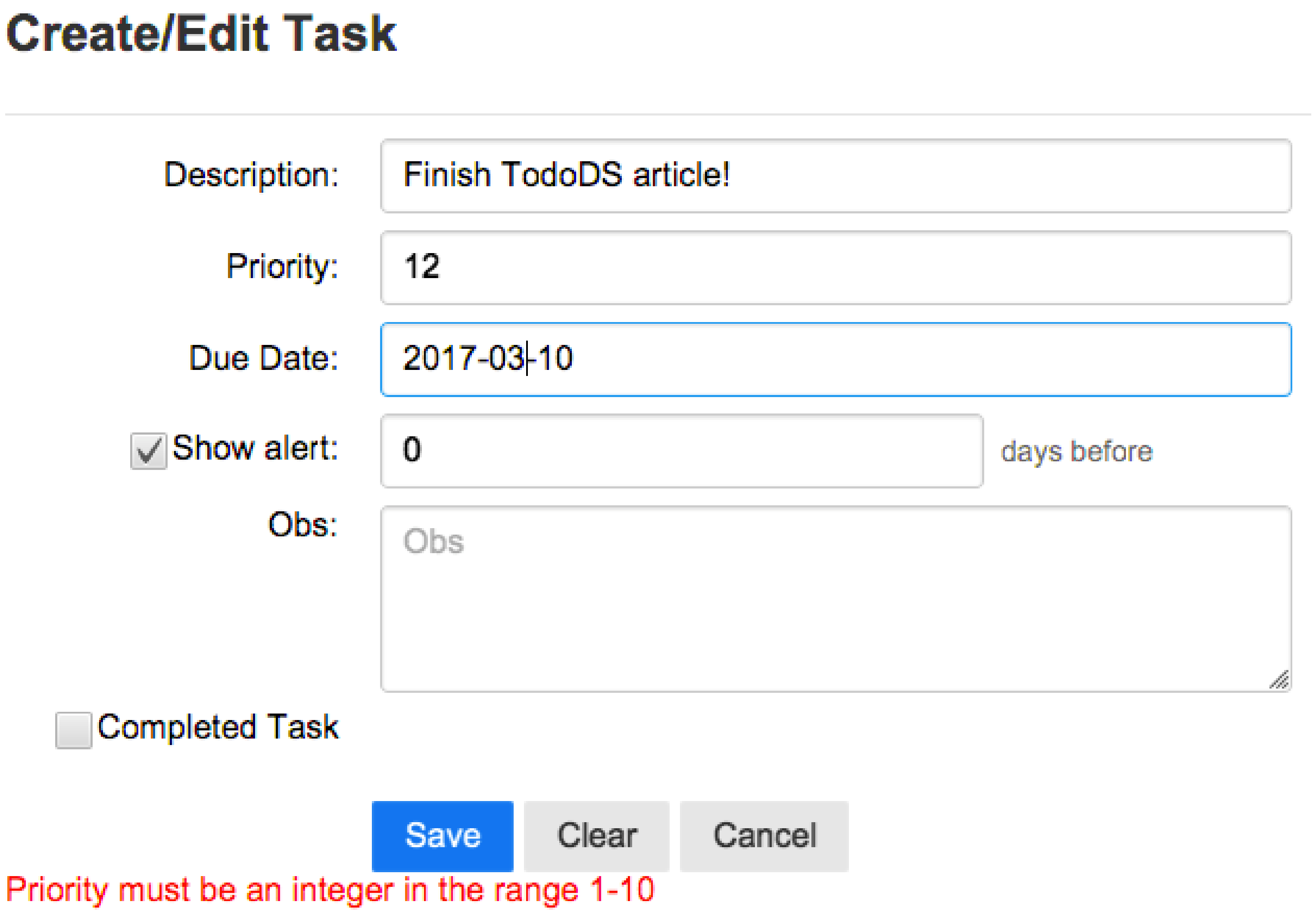
Validation (2/3)

TodoDS

```
@ComputedProperty
static String validate(String description, int priority,
   String dueDate, int daysBefore) {
     String errorMsg = null;
     if (description == null || description.isEmpty()) {
         errorMsg = "Specify a description";
     }
...
     if (errorMsg == null && (daysBefore < 0 || daysBefore
   > 365)) {
         errorMsg = "Days before must be an integer in the
   range 0-365";
     }
     return errorMsg;
}
```

TaskModel

Validation (3/3)



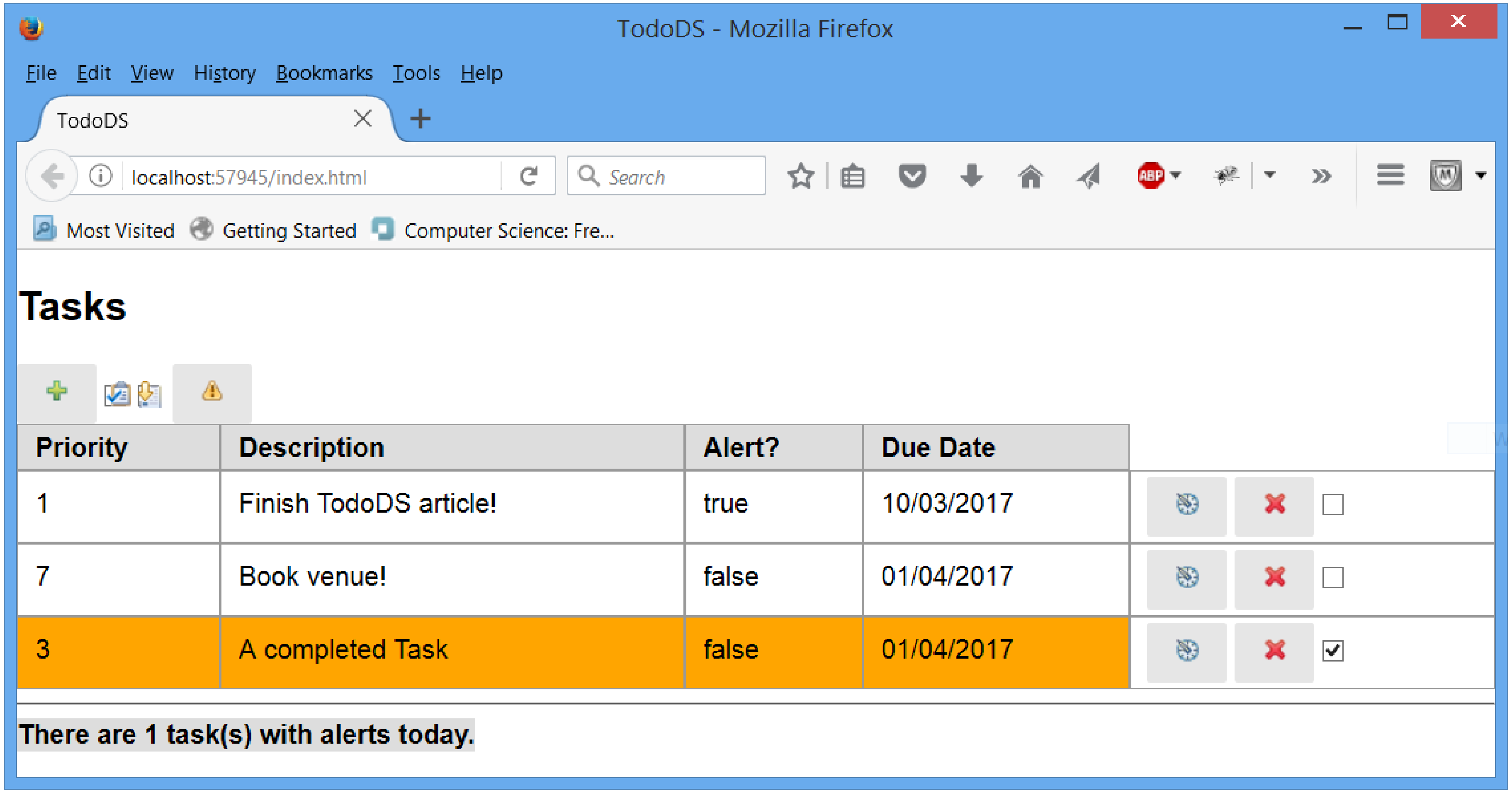
Create/Edit Task

Description:	Finish TodoDS article!
Priority:	12
Due Date:	2017-03-10
✓ Show alert:	0 days before
Obs:	Obs
☐ Completed Task	

Priority must be an integer in the range 1-10

In the browser

TodoDS



Tasks

Priority	Description	Alert?	Due Date			
1	Finish TodoDS article!	true	10/03/2017		✗	☐
7	Book venue!	false	01/04/2017		✗	☐
3	A completed Task	false	01/04/2017		✗	☑

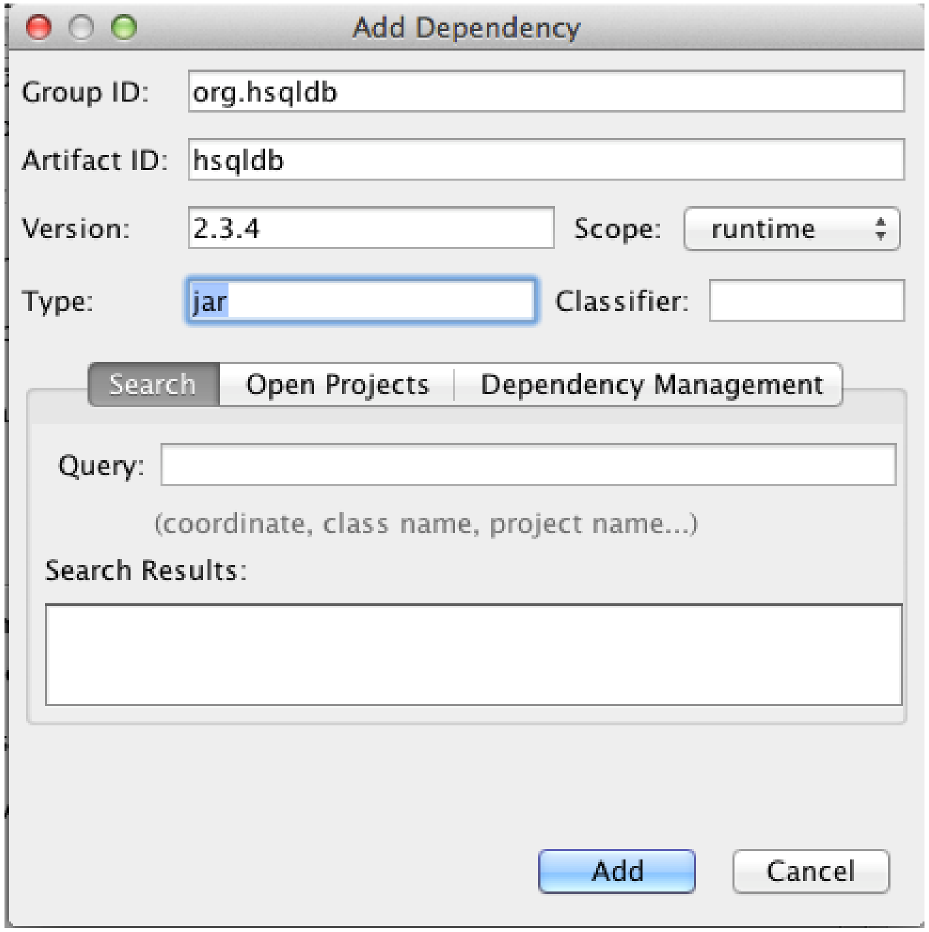
There are 1 task(s) with alerts today.

STEP 3

Add Persistence

Step 3: Add Persistence Logic

1. Add `hsqldb.jar` to your project's repository:
   a) Right-click on *Runtime Dependencies*
   b) Add Dependency
   c) Fill the form as shown in figure
   d) Click **Add**
   e) Clean and Build or **Build with Dependencies**



Group ID: org.hsqldb
Artifact ID: hsqldb
Version: 2.3.4
Scope: runtime
Type: jar
Classifier:

Step 3: Add Persistence Logic

TodoDS

- Copy persistent `TaskManager` from the original *Todo* application
- Make it a singleton
- Copy `Parameters`, `ModelException`, `ValidationException` and `DatabaseException`
- Adapt the `ViewModel` to use `TaskManager`

```
static void onPageLoad(PlatformServices services) throws
   Exception {
     TaskList taskList = new TaskList();
     taskList.setSelected(null);
     taskList.setEdited(null);
     List<Task> tasks =
   TaskManager.getInstance().listAllTasks(true);
     for (Task task : tasks) {
         taskList.getTasks().add(task);
     }
     taskList.applyBindings();
}
```

Common Misconceptions about DukeScript

- "DukeScript is another scripting language"
  - Wrong! DukeScript is not a language but a framework. Don't get confused by its name.
- "DukeScript is just a GWT clone"
  - GWT is a web toolkit that you can use it for writing web applications. You write Java, and it's compiled to JavaScript. Then it's typically deployed to a server and you run it in a browser.
  - DukeScript's is pure client technology: You write your application and it's business logic in Java which is compiled to Java bytecode. The bytecode is running in a normal JVM (Desktop, Dalvik, RoboVM, TeaVM etc).

Common Misconceptions about DukeScript

- "DukeScript has no access to JavaScript"
  - Totally wrong; you can use any JavaScript library available for:
    - The view part (just reference the JavaScript library in the HTML as usual and use it in the View)
    - The Java part (use @JavaScriptResource and the JavaScriptBody Annotation to provide a typesafe way to call it's JavaScript functions from Java. See online example).
- "DukeScript is just for the client"
  - This is true, but there are annotations to make communication to the server as easy as possible (e.g. with the @OnReceive Annotation you can define a JSON communication endpoint in your view model). DukeScript ViewModel classes natively support JSON.

References

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Q&A