Distributed Architectures

Tools

User Interface Design

# Introduction to Internet Applications Internet Applications, ID1354



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#### Introduction

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# Local Application



 We are familiar with an architecture where the entire application resides on the same computer.



 Now, the application will be split on two tiers (computers). Introduction

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 Now, the application will be split on two tiers (computers).

 A client that has the view and a server that has controller and model. Introduction

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- Now, the application will be split on two tiers (computers).
  - A client that has the view and a server that has controller and model.
- The view is displayed in a web browser.

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- Now, the application will be split on two tiers (computers).
  - A client that has the view and a server that has controller and model.
  - The view is displayed in a web browser.

This architecture is not good, we also need layers for communication.

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 First, we add a server layer, normally called view (a bit confusing). Introduction

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 First, we add a server layer, normally called view (a bit confusing).

However, the server side view layer performs tasks typical of a view:

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However, the server side view layer performs tasks typical of a view:

 Creates views (HTML), which are sent to the client. Introduction

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 First, we add a server layer, normally called view (a bit confusing).

However, the server side view layer performs tasks typical of a view:

- Creates views (HTML), which are sent to the client.
- Interprets user gestures, a click in a web page creates a request to the server.

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 First, we add a server layer, normally called view (a bit confusing).

However, the server side view layer performs tasks typical of a view:

- Creates views (HTML), which are sent to the client.
- Interprets user gestures, a click in a web page creates a request to the server.

It might seem that we need yet a layer, for network handling. There is such a layer, but it is in the web server. We don't write it ourselves.

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# **Client-Side Communication**



 Next, we add a client layer for communication, the net layer.

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# **Client-Side Communication**



- Next, we add a client layer for communication, the net layer.
  - Actually, the browser handles most of the communication.
    - The small network code written by us is normally considered part of the client-side view, the net layer is omitted.

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# **Client-Side Communication**



- Next, we add a client layer for communication, the net layer.
  - Actually, the browser handles most of the communication.
    - The small network code written by us is normally considered part of the client-side view, the net layer is omitted.
- This is a traditional web application.

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The trend is that data is stored also on the client, therefore we get a client-side model. Introduction

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The trend is that data is stored also on the client, therefore we get a client-side model.

This reduces the network communication, since we do not need to resend the entire view each time the user does something. Introduction

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The trend is that data is stored also on the client, therefore we get a client-side model.

- This reduces the network communication, since we do not need to resend the entire view each time the user does something.
- Thereby, the application becomes faster.

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The trend is that data is stored also on the client, therefore we get a client-side model.

This reduces the network communication, since we do not need to resend the entire view each time the user does something.

 Thereby, the application becomes faster.

 This is referred to as the MVVM, model-view-viewmodel pattern.

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# **Programming Languages**



 This is the architecture we will normally use during the course. Distributed Architectures

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# **Programming Languages**



- This is the architecture we will normally use during the course.
- The view is programmed in HTML and CSS, client side behavior is programmed in JavaScript and the entire server side code is written in PHP.

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## **Three-Tier Architecture**



 Of course, we also need to store data. That is done in the data layer, which is often a database. Introduction

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# **Three-Tier Architecture**



 Of course, we also need to store data. That is done in the data layer, which is often a database.

 We also introduce the integration layer, to handle the database calls. Introduction

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### Three-Tier Architecture (Cont'd)





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In a bigger application, we would most likely place the database in a separate node.

### Three-Tier Architecture (Cont'd)



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- In a bigger application, we would most likely place the database in a separate node.
- This is called three-tier architecture and is, since long time, the dominating architecture for web applications.

### **Event-Driven Architecture**



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In the latest year, there is a growing tendency to move business logic to the client, perhaps completely remove the server-side model.

### **Event-Driven Architecture**





Tools

- In the latest year, there is a growing tendency to move business logic to the client, perhaps completely remove the server-side model.
- This is made possible with web sockets, which enable full duplex browser-server communication.

### **Event-Driven Architecture**





Tools

- In the latest year, there is a growing tendency to move business logic to the client, perhaps completely remove the server-side model.
- This is made possible with web sockets, which enable full duplex browser-server communication.
- The motive is to reduce communication latency. The browser informs the server about user actions, but does not wait for response before updating the view.

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### Web Development Tools

 There are many tools that facilitates developing web applications. Distributed Architectures

#### Tools

### Web Development Tools

- There are many tools that facilitates developing web applications.
- Browser support varies between tools, most examples will be using Firefox.

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Tools

### Web Development Tools

- There are many tools that facilitates developing web applications.
- Browser support varies between tools, most examples will be using Firefox.
- You are strongly advised to start using some of the following tools, they will help you a lot.

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#### **Browser Web Console**



 Most browsers have a built-in console.

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### Browser Web Console



- Most browsers have a built-in console.
- The console logs information associated with the web page, for example errors and warnings related to JavaScript, CSS and network requests.

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#### Tools

### Browser Web Console



- Most browsers have a built-in console.
- The console logs information associated with the web page, for example errors and warnings related to JavaScript, CSS and network requests.
- It enables you to run JavaScript expressions in the web page.

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Tools
# **Browser Web Console**



- Most browsers have a built-in console.
- The console logs information associated with the web page, for example errors and warnings related to JavaScript, CSS and network requests.
- It enables you to run JavaScript expressions in the web page.
- It also lets you choose elements from the web page and have their HTML and CSS displayed.

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# Browser Web Console (Cont'd)

The console is opened with Ctrl-Shift-K in Firefox and Ctrl-Shift-J in Chrome.

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## Firebug is a powerful plug-in to Firefox.

# Firebug

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Tools

- ► Firebug is a powerful plug-in to Firefox.
- In addition to console features, you can for example debug JavaScript, mark HTML elements, edit CSS and log network traffic.

# Firebug

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Tools

- Firebug is a powerful plug-in to Firefox.
- In addition to console features, you can for example debug JavaScript, mark HTML elements, edit CSS and log network traffic.
- There are also many plug-ins to Firebug.

# Firebug

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Tools

- Firebug is a powerful plug-in to Firefox.
- In addition to console features, you can for example debug JavaScript, mark HTML elements, edit CSS and log network traffic.
- There are also many plug-ins to Firebug.
- There is a cross-browser version of Firebug, written in JavaScript, that offers a subset of the functionality for most other browsers.

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 Web Developer is a powerful plug-in to Firefox, which allows you to:

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- Web Developer is a powerful plug-in to Firefox, which allows you to:
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  - See the area covered by a chosen element.

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- Web Developer is a powerful plug-in to Firefox, which allows you to:
  - edit HTML and CSS.
  - ► See the area covered by a chosen element.
  - See the page in different screen resolutions.

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- Web Developer is a powerful plug-in to Firefox, which allows you to:
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  - ► See the area covered by a chosen element.
  - See the page in different screen resolutions.
  - Edit cookies.

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- Web Developer is a powerful plug-in to Firefox, which allows you to:
  - edit HTML and CSS.
  - ► See the area covered by a chosen element.
  - See the page in different screen resolutions.
  - Edit cookies.
  - Validate HTML and CSS.

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- Web Developer is a powerful plug-in to Firefox, which allows you to:
  - ▶ edit HTML and CSS.
  - ► See the area covered by a chosen element.
  - See the page in different screen resolutions.
  - Edit cookies
  - Validate HTML and CSS.
- Web Developer has been ported to Chrome.

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### Tools



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There are online validators for both HTML and CSS. Links can be found on the course web site.

# Validators

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- There are online validators for both HTML and CSS. Links can be found on the course web site.
- Remember to always validate your HTML and CSS code.

# **NetBeans**





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 There are many different IDEs for web development, all have their pros and cons.

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# **NetBeans**





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- There are many different IDEs for web development, all have their pros and cons.
- NetBeans will be used for examples during the course. Make sure to download the All version, see image above.

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# **NetBeans**





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- There are many different IDEs for web development, all have their pros and cons.
- NetBeans will be used for examples during the course. Make sure to download the All version, see image above.
- Most important is that you actually use an IDE, do not program in a text editor unless you are really sure it is what you prefer.

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# JSFiddle and JSLint

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## JSFiddle is an online editor where you can test HTML, CSS and JavaScript.

# JSFiddle and JSLint

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- JSFiddle is an online editor where you can test HTML, CSS and JavaScript.
- JSLint is an online tool for testing JavaScript code quality.

# W3Schools Try It Yourself

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## w3schools.com has excellent tutorials for all languages covered in the course.

# W3Schools Try It Yourself

w3schools.com has excellent tutorials for all languages covered in the course.

 All examples are presented with an online editor where you can experiment with your code.

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# Section

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This is not a course in human-computer interaction. Still, it is mandatory to consider basic heuristics for user interface design.

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- This is not a course in human-computer interaction. Still, it is mandatory to consider basic heuristics for user interface design.
- There are some short introductory texts on user interface design available at Nielsen Norman Group, such as:

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Tools

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- There are some short introductory texts on user interface design available at Nielsen Norman Group, such as:
  - 10 Usability Heuristics for User Interface Design,

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  - Other lists linked from the latter.

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  - Top 10 Mistakes in Web Design, http://www.nngroup.com/articles/ top-10-mistakes-web-design/
  - Other lists linked from the latter.
- Here follows the 10 usability heuristics mentioned above.

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1. The system should always keep users informed about what is going on.



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- 1. The system should always keep users informed about what is going on.
- 2. Use words, phrases and concepts familiar to the user, rather than system-oriented terms.

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Tools

- 1. The system should always keep users informed about what is going on.
- 2. Use words, phrases and concepts familiar to the user, rather than system-oriented terms.
- 3. Implement undo and redo.

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Tools

- 1. The system should always keep users informed about what is going on.
- 2. Use words, phrases and concepts familiar to the user, rather than system-oriented terms.
- 3. Implement undo and redo.
- 4. Follow platform conventions, users should not have to wonder whether different words, situations, or actions mean the same thing.

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5. Eliminate error-prone conditions or check for them and ask users to confirm before they commit to the action.



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- 5. Eliminate error-prone conditions or check for them and ask users to confirm before they commit to the action.
- 6. Minimize the user's memory load by making objects, options, etc visible. The user should not have to remember information.

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- 5. Eliminate error-prone conditions or check for them and ask users to confirm before they commit to the action.
- 6. Minimize the user's memory load by making objects, options, etc visible. The user should not have to remember information.
- 7. Use accelerators to speed up interaction for expert users.

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## J. Nielsen's UI Design Principles

- 5. Eliminate error-prone conditions or check for them and ask users to confirm before they commit to the action.
- 6. Minimize the user's memory load by making objects, options, etc visible. The user should not have to remember information.
- 7. Use accelerators to speed up interaction for expert users.
- 8. Remove irrelevant information.

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## J. Nielsen's UI Design Principles

 Error messages should be expressed in plain language, precisely indicate the problem, and suggest a solution. Introduction

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## J. Nielsen's UI Design Principles

- Error messages should be expressed in plain language, precisely indicate the problem, and suggest a solution.
- If necessary, provide help and documentation. The help should be easy to search, focused on the user's task, and list concrete steps to be carried out.

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