

Introduction to Internet Applications

Internet Applications, ID1354

Contents

- Distributed Architectures
- User Interface Design
- Tools

Distributed
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User Interface
Design

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Section

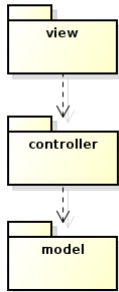
- **Distributed Architectures**
- User Interface Design
- Tools

Distributed
Architectures

User Interface
Design

Tools

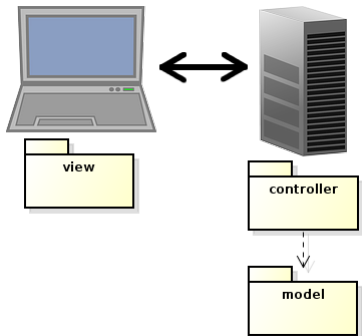
Local Application



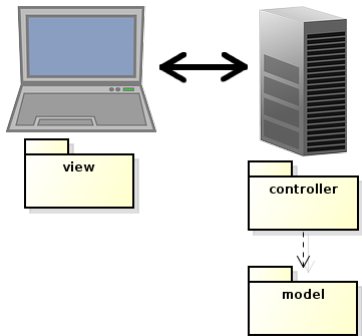
- ▶ We are familiar with an architecture where the entire application resides **on the same computer**.

Introducing a Server

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

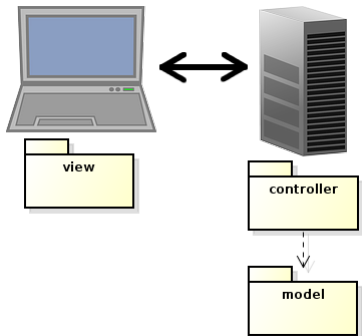


Introducing a Server



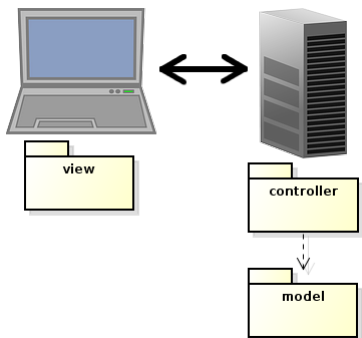
- ▶ Now, the application will be **split on two tiers** (computers).
- ▶ A **client** that has the view and a **server** that has controller and model.

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- ▶ The view is displayed in a **web browser**.

Introducing a Server



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- ▶ 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.

Server-Side Communication



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

Server-Side Communication



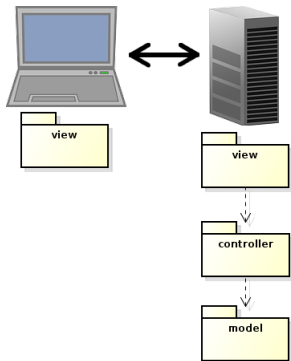
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- ▶ However, the server side view layer performs tasks typical of a view:

Server-Side Communication



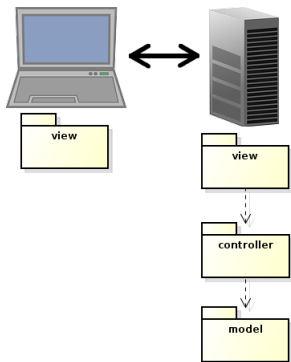
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 - ▶ **Creates views** (HTML), which are sent to the client.

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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.

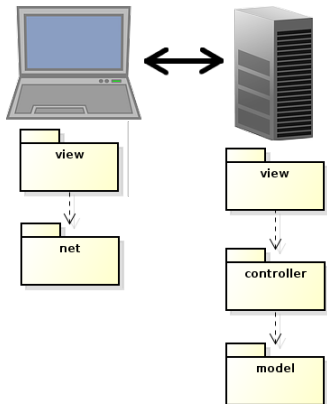
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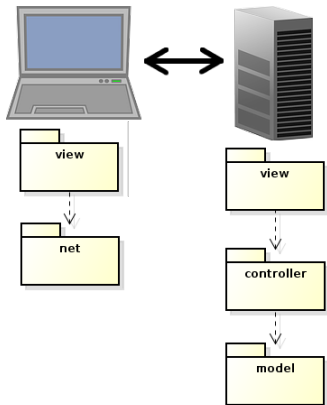
It might seem that we need yet a layer, for network handling. There is such a layer, but it is in the web server. We don't write it ourselves.

Client-Side Communication



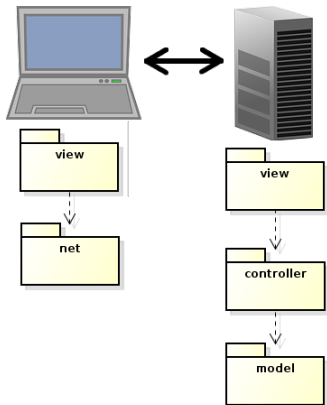
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Client-Side Communication



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- ▶ 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**.

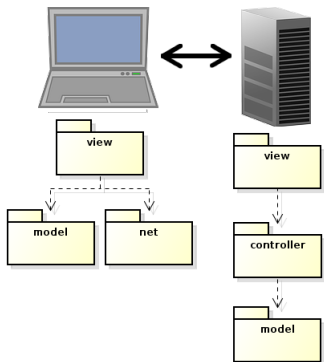
Client-Side Communication



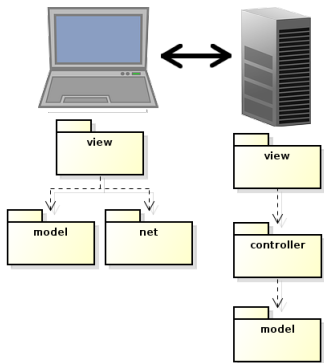
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- ▶ Actually, the browser handles most of the communication.
 - ▶ The small network code written by us is normally considered part of the client-side view, the **net layer is omitted**.
- ▶ This is a traditional web application.

The MVVM Pattern

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

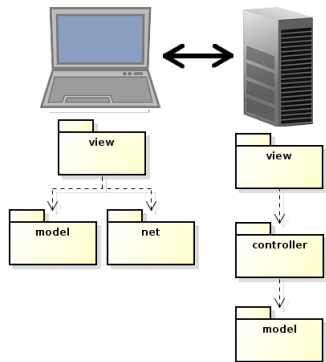


The MVVM Pattern



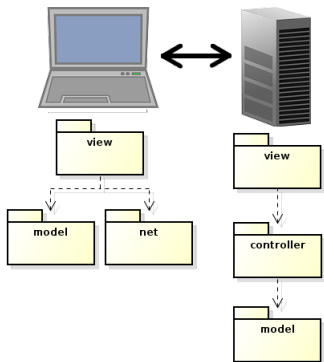
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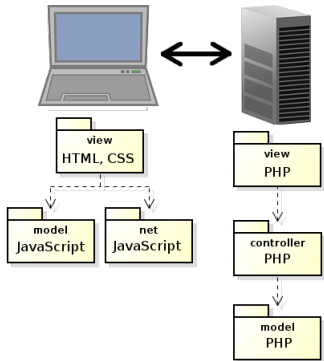
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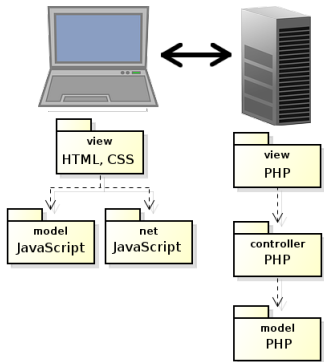
- ▶ The trend is that data is stored also on the client, therefore we get a **client-side model**.
- ▶ This reduces the network communication, since we do **not need to resend the entire view** each time the user does something.
- ▶ Thereby, the application becomes faster.
- ▶ This is referred to as the **MVVM**, model-view-viewmodel pattern.

Programming Languages

- ▶ This is the architecture we will normally use during the course.

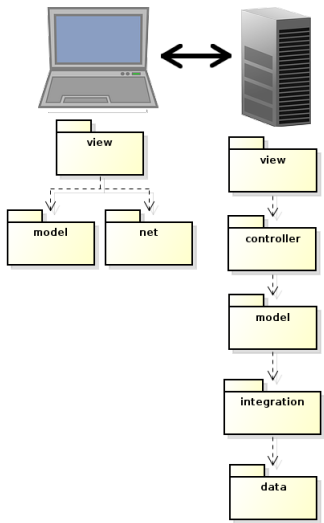


Programming Languages



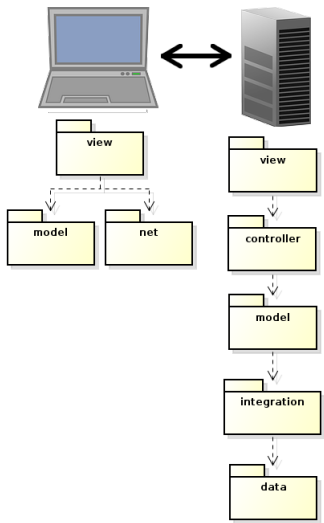
- ▶ This is the architecture we will normally use during the course.
- ▶ The view is programmed in **HTML** and **CSS**, client side behavior is programmed in **JavaScript** and the entire server side code is written in **PHP**.

Three-Tier Architecture



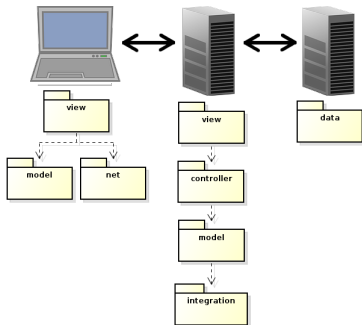
- ▶ Of course, we also need to store data. That is done in the **data** layer, which is often a database.

Three-Tier Architecture



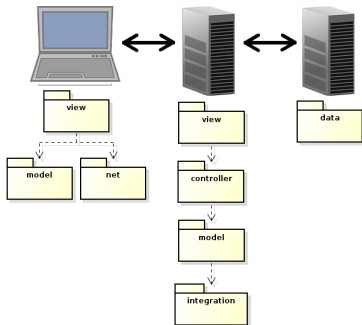
- ▶ Of course, we also need to store data. That is done in the **data** layer, which is often a database.
- ▶ We also introduce the **integration** layer, to handle the database calls.

Three-Tier Architecture (Cont'd)



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

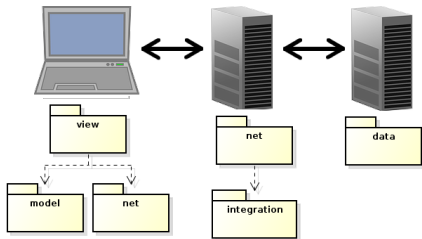
Three-Tier Architecture (Cont'd)



- ▶ 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.

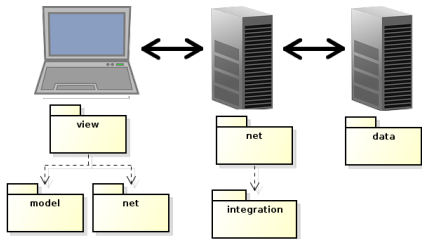
Question 1

Event-Driven Architecture



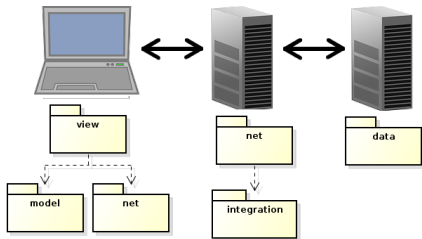
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Event-Driven Architecture



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- ▶ This is made possible with **web sockets**, which enable **full duplex** browser-server communication.

Event-Driven Architecture



- ▶ 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.

Section

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Use UI Guidelines!

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1. Visibility of system status

J. Nielsen's 10 Usability Heuristics

- ▶ The system should always **keep users informed** about what is going on, through appropriate feedback.

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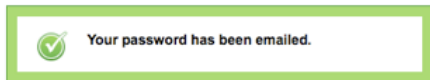
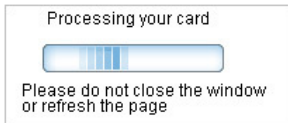
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- ▶ **Good examples:**



2. Match between system and the real world

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How can we help you?

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- ▶ Good example (“How can we help you?” better than “FAQ”):
- ▶ Bad example (“Continue if enabled” is system oriented language):
oops, there is a problem

Target.com requires **cookie** to be enabled.

continue if enabled

3. User control and freedom

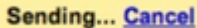
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- ▶ Users often choose system functions by mistake and will need a **clearly marked “emergency exit”** to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

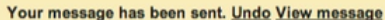
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- ▶ Good examples:



Sending... [Cancel](#)



Your message has been sent. [Undo](#) [View message](#)

4. Consistency and standards

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- ▶ Good example (Sign in at top right, logo with link to index page at top left):



5. Error prevention

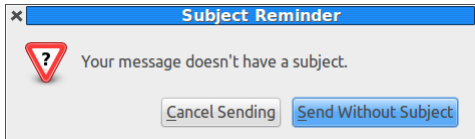
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6. Recognition rather than recall

J. Nielsen's 10 Usability Heuristics

- ▶ Minimize the user's memory load by **making objects, actions, and options visible**. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

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- ▶ **Good example:**

The screenshot shows a hotel search interface with the following elements:

- Hotel search** (Section Header)
- Destination input field with placeholder text: "Destination, hotel, landmark or address"
- Check in** (Section Header) with date input: "13/08/2015" and day: "Thursday"
- Check out** (Section Header) with date input: "14/08/2015" and day: "Friday"
- Rooms** (Section Header) with dropdown menu: "1 room, 2 adults"
- Search** button (Action)
- Calendar icon and "1 Night" indicator (Action/Option)

- ▶ Clear headline.
- ▶ No doubt where to click to start the search.

7. Flexibility and efficiency of use

J. Nielsen's 10 Usability Heuristics

- ▶ Accelerators, **unseen by the novice** user, may often **speed up the interaction for the expert** user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

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- ▶ Accelerators, **unseen by the novice** user, may often **speed up the interaction for the expert** user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
- ▶ Examples are
 - ▶ *Saved searches*
 - ▶ *Items you recently looked at*
 - ▶ *Save query for later*

8. Aesthetic and minimalist design

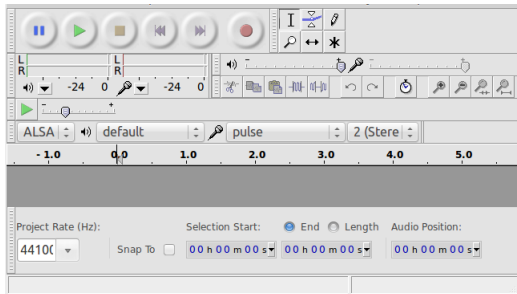
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- ▶ **Bad example:**



9. Help users recognize, diagnose, and recover from errors

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- ▶ **Error messages** should be expressed in plain language (**no codes**), precisely indicate the problem, and constructively suggest a solution.
- ▶ **Do not** tell the user *unexpected exception* or anything similar.
- ▶ **Good examples:**

Please ensure all fields highlighted in red are filled.

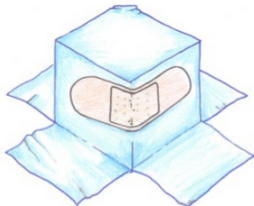
Email: *

Telephone:

D.O.B: DD ▼ MM ▼ YYYY ▼

Select the nature of your request:

Further Education Research request



Error

Something went wrong. Don't worry, your files are still safe and the Dropboxers have been notified. Check out our [Help Center](#) and [forums](#) for help, or head back to [home](#).

10. Help and documentation

J. Nielsen's 10 Usability Heuristics

- ▶ Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

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- ▶ Good example:

The screenshot shows a form with the following fields: Title (Mr), First Name, Date of Birth, and Occupation. A blue tooltip is displayed over the First Name field, containing the text: **Details**
Names should appear exactly as on passport. A red dashed box highlights an error message: All names r Failure to d permits.

Question 2

Section

- Distributed Architectures
- User Interface Design
- **Tools**

Web Development Tools

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- ▶ 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.

Browser Web Console

- ▶ Most browsers have a built-in console.

The screenshot shows the Mozilla Firefox browser displaying the KTH website. The developer console is open, showing the HTML structure of a link element. The console output is as follows:

```

<ul>
+<li></li>
+<li></li>
+<li></li>
-<li>
  <span class="arrow"></span>
  +<a class="standardLink"
    href="/om/work-at-kth/lediga-anstallningar">
  </a>
  </li>
-<li>
  <span class="arrow"></span>
  +<a href="http://www.kth.se/samarbete">
  </a>
  </li>
-<li>
  <span class="arrow"></span>
  +<a class="standardLink" href="/om/2.264">
  </a>
  </li>
-<li>
  
```

The 'Styles' pane shows the following CSS rules for the selected element:

```

pseudo-elements
-:moz-selection {
  background: none
  repeat scroll 0% 0% #24A0DB;
  color: #FF0;
  text-shadow: none;
}
This Element
element {
  inline
}
blockListLinks {
  standardLink {
  blockListAccordion_standardLink {
  blockListExpandable_standardLink {
  blockListLink_standardLink {
    color: #24A0DB;
  }
}
standardLink {
  kth.css:1
  color: #24A0DB;
}
}
}
kth.css:1
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```

Distributed Architectures

User Interface Design

Tools

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<ul>
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  <li></li>
  </ul>
<span class="arrow"></span>
<a class="standardLink" href="/om/work-at-kth/lediga-anstallningar">
</a>
</li>
</ul>
<span class="arrow"></span>
<a href="http://www.kth.se/samarbete">
</li>
</ul>
<span class="arrow"></span>
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</a>
</li>
</ul>

```

The 'Rules' pane shows the following CSS styles for the selected element:

```

Pseudo-elements
  kth.css:1
  + background: none
  repeat scroll 0% 0% #24A0D8;
  color: #AFFF;
  text-shadow: none;

This Element
  inline

blockListLinks
  kth.css:1
  standardLink
  blockList.accordion_standardLink
  blockList.expandable_standardLink
  blockList.standardLink {
    color: #24A0D8;

standardLink {
  kth.css:1
  #24A0D8;

}
  kth.css:1
  }
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```

- ▶ 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.

Distributed Architectures

User Interface Design

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Browser Web Console



- ▶ Most browsers have a **built-in console**.
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- ▶ It enables you to **run JavaScript expressions** in the web page.

Distributed Architectures

User Interface Design

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Browser Web Console



- ▶ It also lets you **choose elements** from the web page and have their HTML and CSS displayed.

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- ▶ 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.

Distributed Architectures

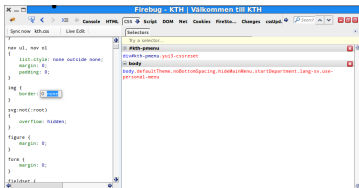
User Interface Design

Tools

Browser Web Console (Cont'd)

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

Firebug

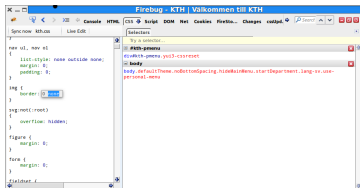


- ▶ Firebug is a powerful **plug-in to Firefox**.

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Firebug

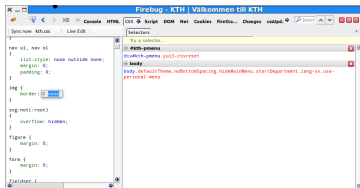


- ▶ Firebug is a powerful **plug-in to Firefox**.
- ▶ In addition to console features, you can for example **debug** JavaScript, mark **HTML elements**, **edit CSS** and log **network traffic**.

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Firebug



- ▶ 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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Tools

Web Developer

<http://www.kth.se/>

▼ Mobile portrait (320x480)



- ▶ 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:
 - ▶ **edit HTML and CSS.**

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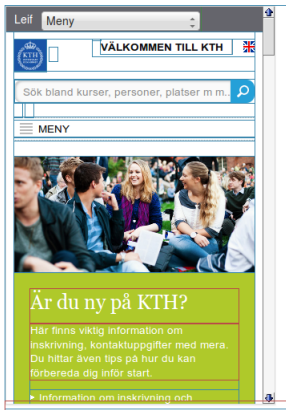
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Web Developer

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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.

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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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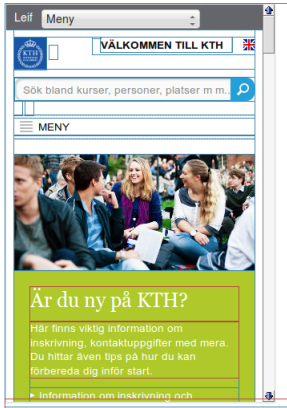
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Web Developer

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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**.

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▼ Mobile portrait (320x480)



- ▶ 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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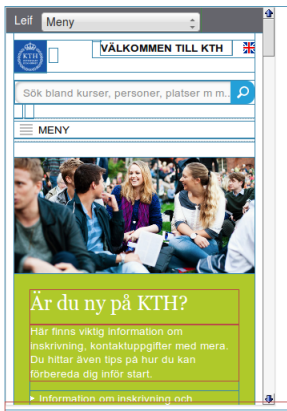
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Tools

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<http://www.kth.se/>

▼ Mobile portrait (320x480)



- ▶ 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**.

Validators

- ▶ There are [online validators](#) for both HTML and CSS. Links can be found on the course web site.

Validators

- ▶ 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

NetBeans IDE Download Bundles

Supported technologies *	Java SE	Java EE	C/C++	HTML5 & PHP	All
NetBeans Platform SDK	•	•			•
Java SE	•	•			•
Java FX	•	•			•
Java EE		•			•
Java ME		•			•
HTML5		•		•	•
Java Card™ 3 Connected					—
C/C++			•		•
Groovy				•	•
PHP				•	•
Bundled servers					•
GlassFish Server Open Source Edition 4.0		•			•
Apache Tomcat 8.0.3		•			•
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- ▶ There are many different **IDEs for web development**, all have their pros and cons.

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NetBeans

NetBeans IDE Download Bundles

Supported technologies *	Java SE	Java EE	C/C++	HTML5 & PHP	All
NetBeans Platform SDK	•	•			•
Java SE	•	•			•
Java FX	•	•			•
Java EE		•			•
Java ME		•			•
HTML5		•		•	•
Java Card™ 3 Connected					—
C/C++			•		•
Groovy				•	•
PHP				•	•
Bundled servers					•
GlassFish Server Open Source Edition 4.0		•			•
Apache Tomcat 8.0.3		•			•
	<input type="button" value="Download"/>	<input type="button" value="Download"/>	<input type="button" value="Download"/>	<input type="button" value="Download"/>	<input type="button" value="Download"/>
	Free, 69 MB	Free, 191 MB	Free, 62 MB	Free, 63 MB	Free, 203 MB

- ▶ 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

NetBeans IDE Download Bundles

Supported technologies *	Java SE	Java EE	C/C++	HTML5 & PHP	All
Ⓜ NetBeans Platform SDK	•	•			•
Ⓜ Java SE	•	•			•
Ⓜ Java FX	•	•			•
Ⓜ Java EE		•			•
Ⓜ Java ME		•			•
Ⓜ HTML5		•		•	•
Ⓜ Java Card™ 3 Connected					—
Ⓜ C/C++			•		•
Ⓜ Groovy				•	•
Ⓜ PHP				•	•
Bundled servers					
Ⓜ GlassFish Server Open Source Edition 4.0		•			•
Ⓜ Apache Tomcat 8.0.3		•			•

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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.

JSFiddle and JSLint

- ▶ **JSFiddle** is an **online editor** where you can test HTML, CSS and JavaScript.

JSFiddle and JSLint

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- ▶ **JSLint** is an online tool for testing JavaScript **code quality**.

W3Schools Try It Yourself

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

W3Schools Try It Yourself

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- ▶ All examples are presented with an [online editor](#) where you can experiment with your code.