

# HTML: the language of the Web

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# Lectures vs. book chapters

- Each lecture **covers one main topic**
- Each book chapter **focuses** on one topic but also covers other topics
- All **required** readings are **relevant** for this course (**midterm/exam**)

O'REILLY<sup>®</sup>



## Learning Web App Development

BUILD QUICKLY WITH PROVEN JAVASCRIPT TECHNIQUES

Semmy Purewal

# At the end of this lecture, you should be able to ...

- **Apply** Web design principles during the design stage of a Web app
- **Explain** the ideas behind usability testing and **employ** it
- **Create** Web apps that can function offline

# Web sites vs. Web applications

*>10 million lines of code*



“As Web browsers and the Web engine components that power them become ubiquitous [...], developers are increasingly **using Web technologies** to build **applications** and are relying on Web engines as **application runtime environments**.”

Examples of applications now commonly built using Web technologies include [...] **games, multimedia applications, maps ...**”

*W3C: Web Applications Working Group*

# Not just for the Web: ELECTRON



Build cross platform desktop apps  
with JavaScript, HTML, and CSS



# Web design basics

# Disclaimer

- Web design is **not trivial**
- Most of you will become computer scientists, not Web designers
- **But:** a few basic rules go a long way
- Most **basic principles** seem obvious, but are often ignored

Steve Krug



**DON'T  
MAKE  
ME  
THINK**  
*revisited*

*and Mobile*  
A Common Sense Approach to Web Usability

# Rule#1: Don't make me think

- The way a web site/app “works”, should be self-evident
- Users’ **cognitive effort** should be **minimal**

The image shows a screenshot of the eBay homepage with several annotations in black callout boxes:

- search box**: Points to the search bar at the top right, which is highlighted with a blue hand-drawn border.
- product categories**: Points to the horizontal menu below the search bar, which is also highlighted with a blue hand-drawn border.
- today's deal**: Points to a promotional banner for "IT IS A BIG DEAL" (Up to 60% off top brands) in the "eBay deals" section, which is highlighted with a blue hand-drawn border.

The screenshot includes the following elements:

- Header**: eBay logo, "Shop by category" dropdown, search bar, "All Categories" dropdown, and "Search" button.
- Navigation**: Horizontal menu with categories: Motors, Fashion, Electronics, Collectibles & Art, Home & Garden, Sporting Goods, Toys & Hobbies, and Deals & Gifts.
- Deals Section**: "eBay deals" banner with "IT IS A BIG DEAL" and "Up to 60% off top brands". Below it are three product cards: "ASUS K550LA" (\$520.00, 26% off), "Canon EOS tD" (\$2699.00, 23% off), and "High Sierra Wave" (\$19.00, 67% off).
- Today's Deal**: "Style Your Summer" banner with text: "Shop for a pair of freshwater cultured pearl stud earrings, a Dooney & Bourke white leather handbag, or a pair of woven Vince Camuto ballet flats—plus a pair of Ray-Ban aviator sunglasses with rose-colored polarized lenses." It features images of a sandal, a handbag, and sunglasses.
- Other Promotions**: "GEAR UP FOR SCHOOL" banner on the left and "Mystery Deal Monday" banner above the product cards.



# Rule#1: Don't make me think

The image shows a screenshot of the Koopplein.nl website. The header features the Koopplein.nl logo (a green recycling symbol with 'KOOPPLEIN.NL' and 'GRATIS' around it) and the text 'WELKOM! DE KOOPPLEIN' followed by 'plaats in je eigen gem' and a blue button labeled 'Nederland'. Below the header is a search bar with 'Je postcode: 1234 AB' and 'Of woonplaats: Typ hier je woonplaats...'. A green bar contains 'Beginletter gemeente: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z'. The main content area has two columns of text. The left column is titled 'Nieuws' and the right column is titled 'Bekijk hieronder onze introductiefilm'. Both columns have a 'Lees verder >' link. At the bottom center is a green thumbs-up icon with a recycling symbol. Three black callout boxes with white text are overlaid on the page: one pointing to the search bar, one pointing to the 'Nieuws' section, and one pointing to the 'Bekijk hieronder onze introductiefilm' section.

How do I get to the offers?

What if I want to look at Delft and Rijswijk?

A lot of text nobody will read ...



# KOOPPLEIN.NL

De gratis marktplaats in je eigen gemeente



## Zoek in je woonplaats

Meer dan 360.000 tweedehands producten in je eigen woonplaats of heel Nederland.

**Zoeken**

## Plaats hier je gratis advertentie

Wil je snel iets verkopen? Plaats dan eenvoudig en **gratis** een advertentie op Koopplein.nl.

**Plaats advertentie**

## Alle aanbiedingen in Nederland

Hieronder een greep uit ons aanbod uit heel Nederland. Kies je woonplaats om lokaal aanbod te kunnen zien.



### Zuivere sinusomvormers mé...

Caravans, Campers en Kamperen > Accessoires en Toebehoren

KENMERKEN: • Co...

n.o.t.k.



### Wit Luipaard booktype cov...

Telecommunicatie > Mobiele telefoons en Smartphones > Hoesjes en Frontjes...

€ 14,95

# Minimising cognitive effort

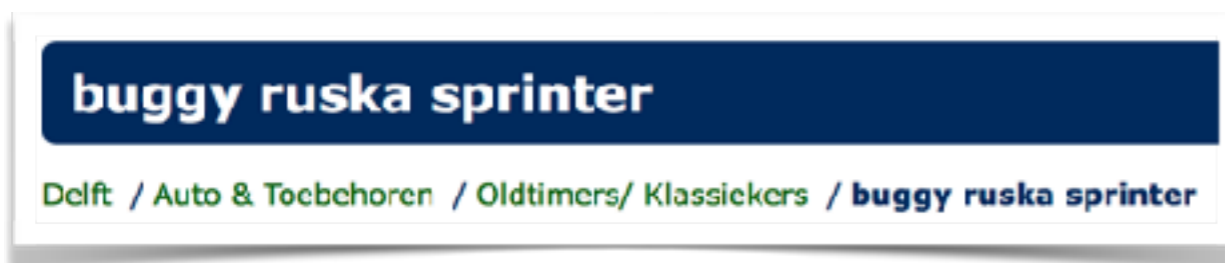
- Name links, buttons, sections, etc. **clearly, not cleverly**



- **Adhere** to established style standards

[this is a link in 1999](#) is this a link?

- Avoid users getting lost within the web site; tell users where they are and how they arrived (leave “**breadcrumbs**”)



- Clearly **divide** the different parts of a site (e.g. advertisements vs. content)



# Rule#2: minimize noise & clutter

News | Reviews | Shop | Business | IT | News | Headlines | Desktop | Laptops | Downloads | Developer

Click Here!

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Smart Shopping • Domain Names • Top Newsbooks • IT Resources • PC CheckUp • ZDNet creator

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### BREAKING NEWS

Apr 10, 2001 5:16 PM PT

- Intel to drop Pentium 4 prices
- Double talk among Apple leaders
- New rules favor Bells, threaten ISPs
- BadTrans virus fails to spread
- Yahoo cuts off porn sales
- Computer junkie kills in
- AnchorDesk: How to find screen frame apps—in your computer programs
- More news headlines...

### HOT PRODUCTS

#### Hot hard drives here

Looking for a hard drive? Now ZDNet's five most popular picks and find a favorite of your own.

- Seagate Barracuda III  
Read review | Check prices
- Maxtor DiamondMax 40  
Read review | Check prices
- Western Digital 30GB  
Check prices
- Maxtor DiamondMax 60  
Read review | Check prices
- IBM Deskstar 70GB  
Read review | Check prices

More product reviews...

#### DVD-RAM is a storage fanatic's dream

Toshiba's new DVD-RAM drive gives you an enormous amount of rewritable storage and a solid backup solution, with no special drives required.

Check it out at ZDNet Reviews

#### Reviews

PCs, Notebooks, Cameras, Handhelds, Digital Audio...

#### Shopping

Hardware, Software, Auctions, Computer Shopping, e-commerce...

#### Business & Tech

IT Resources, Tech Jobs, E-Commerce, Small Biz...

#### Tech News

From Our AnchorDesk, Alerts, Computing, Rumors...

#### GameSpot

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#### Developer

HTML, Java, Free Scripts, Web Graphics, Usability...

#### MyZDNet

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#### Ten tax software bugs to watch out for

Tax software is supposed to save you time and stress when you do your taxes. We show you the bugs that stand in your way and how to fix them. Get details at ZDNet Help & How-To

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## Microsoft builds Snapchat-like WindUp for Windows Phone

With no Snapchat for Windows Phone yet, Microsoft has quietly launched its own rival app.

- Microsoft commits to a file manager app for Windows Phone

### Featured Stories

- Firefox OS: Mozilla shows off flexible RAM on \$170 Firefox OS Flame
- Samsung seals SmartThings deal
- Cash-strapped universities' switch to Google Apps stokes post-Snowden privacy fears
- Google Safe Browsing to expand warnings

### Tip us off!

Can't find what you want or have a tip? Tell us about it and we will endeavour to cover this topic. Drop us a line

### Great Debate

Do we really have a right to be forgotten?  
31% Yes - 67% No

Satya Nadella's brave new strategy: Can Microsoft execute?  
64% Yes - 34% No

In IBM and Apple's wake, has Android lost

### Latest Articles

- Ferguson: Another case for public security cameras  
The benefits are large and the privacy concerns are phony. Police should have cameras on them and the more cameras in public places, the better.  
published 13 minutes ago by Lany Seltzer  
Comments
- The next career limiting opportunity for CIOs: Getting data privacy wrong  
Burgling the data strategy is a good way to get fired, tech chiefs are warned.  
published 13 minutes ago by Steve Ranger  
Comments

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- Windows Phone app challenge: Can it stand up to the big boys?
- This month's update rollout for Windows 8.1 delivers more than just bug fixes
- Microsoft pulls updates, recommends uninstall

### Latest Blog Posts

- Ferguson: Another case for public security cameras
- Sprint doubles the data in \$100 Family plan, ups the ante against rivals
- Google considers kids accounts, family-friendly YouTube and Google+



14.04.2001

14.10.2014

# Rule#3: If you cannot make it self-evident, make it self-explanatory

- Self-explanatory sites require users to expend a **small** amount of cognitive effort
- A **small** amount of explanatory text can go a long way
- Keep the **mobile user** in mind (scrolling is expensive)
- **Avoid “happy talk”** - text without any content for the sake of adding text (e.g. welcome message)

# Rule#3: If you cannot make it self-evident, make it self-explanatory

- Self-explanatory sites require users to expend a **small** amount of cognitive effort



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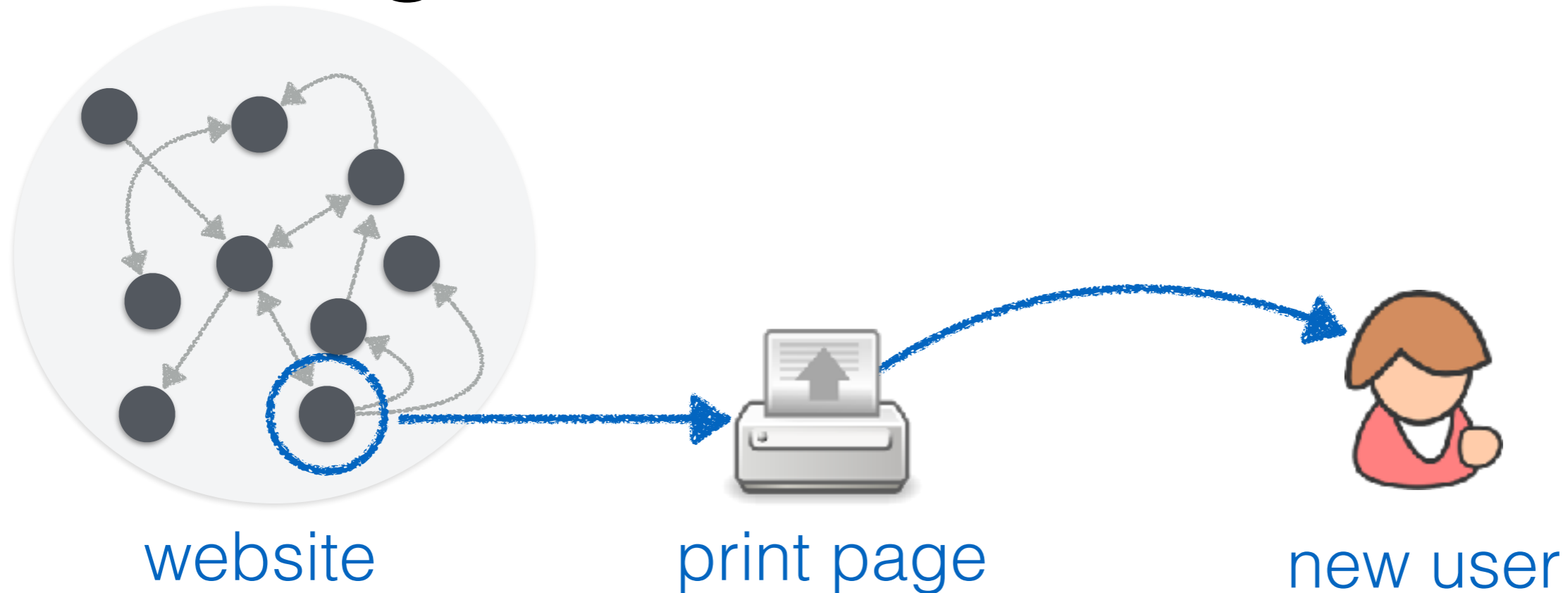
**Idea:** Web users are **rational, attentive** with a **clear goal** in mind

**Reality:** Web users ...

- quickly **scan** (not read!) a Web page
- decide **within seconds** whether or not a site is worth it
- click on the **first link** that looks reasonable
- depend a lot on the browser's **back button**
- do **not read instructions**

A Web site's design should be based on **user reality!**  
**Usability testing** is important to make a site a success.

# Site navigation: the “trunk test”



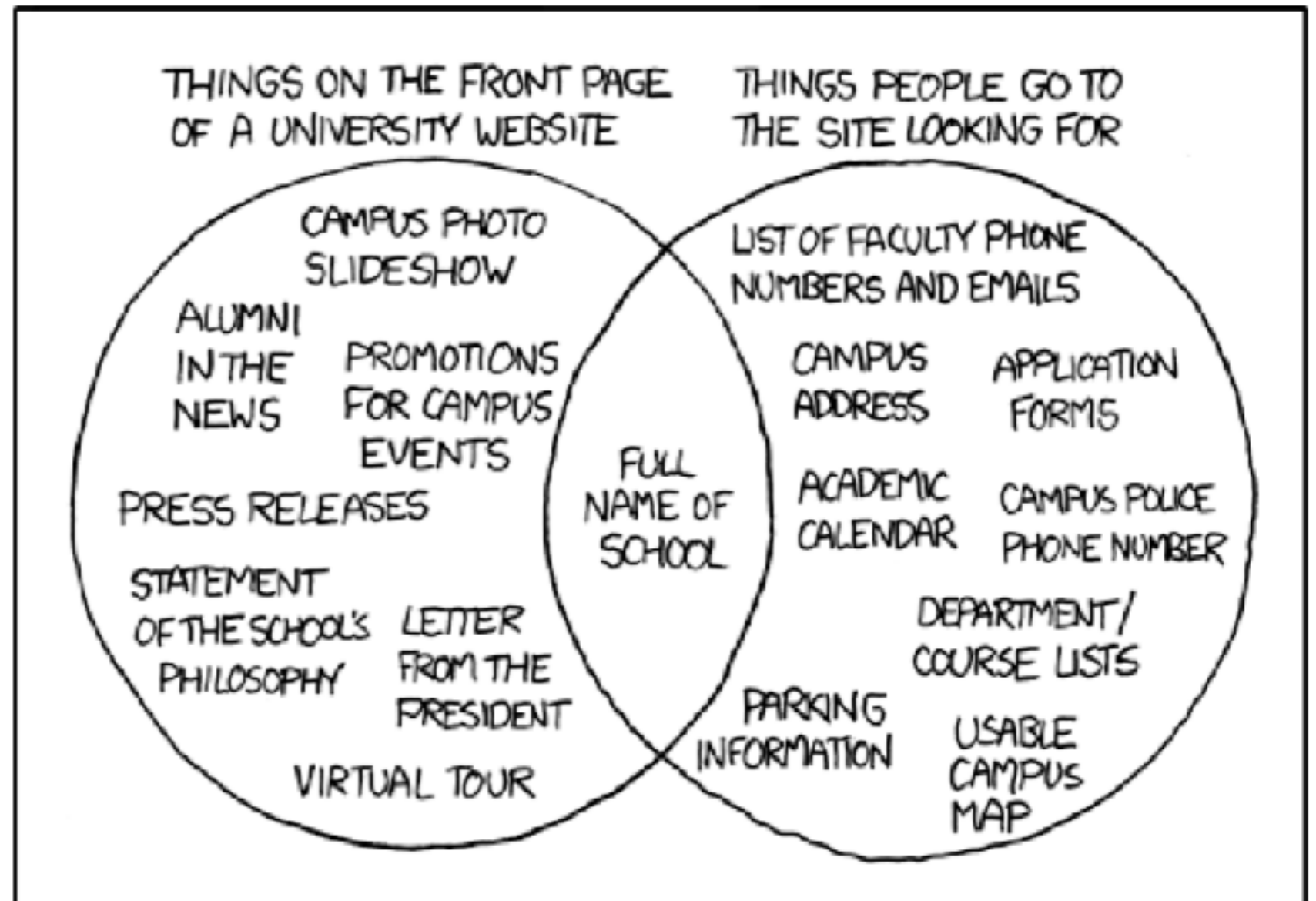
**As quickly as possible** the user should circle:

- **Name** of the Web site
- **Name** of the page he currently views
- **Major sections** of the page
- Possible **navigation options** at this point
- **“You are here”** indicators



# The home page: the **point of entry** for most users

1. What **is** this?
2. What can I **do** here?
3. Why **should** I be here?
4. What do they **have** here?

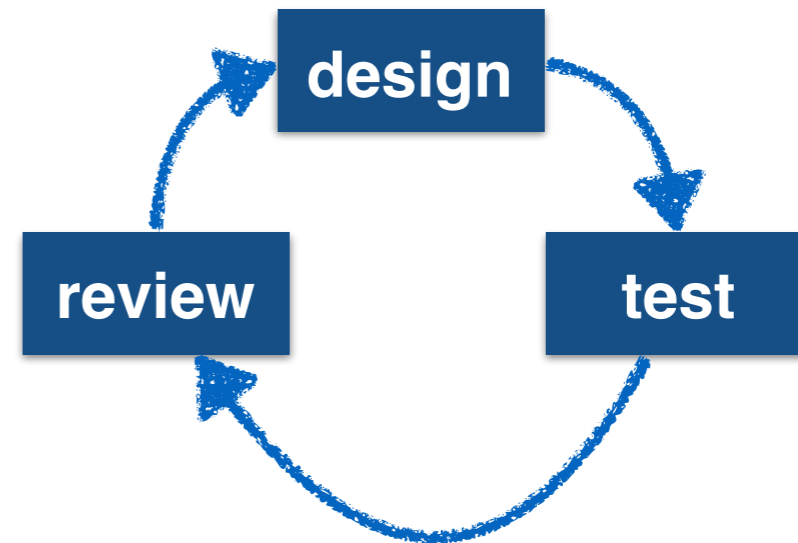
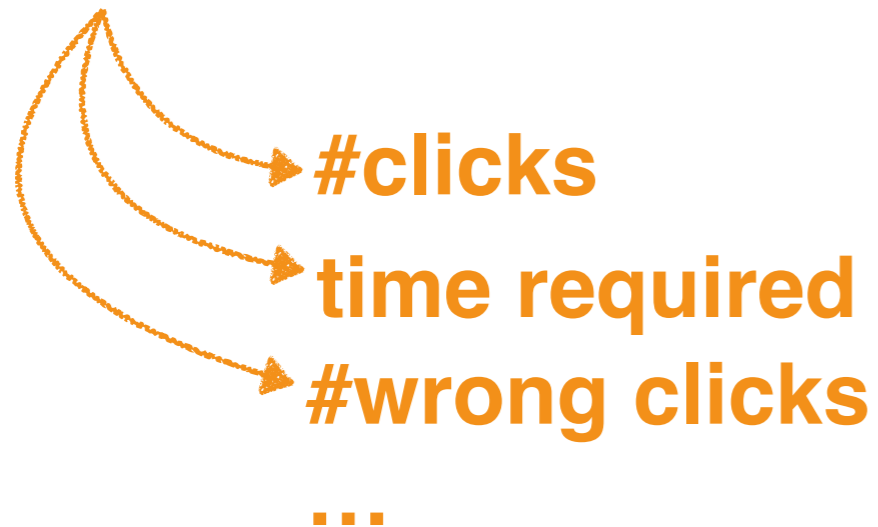


essential questions  
to answer

<http://xkcd.com/773/>

# Rule#4: test often and early

- **Usability test:** give a user a **typical task** and observe **how well** he is able to perform it



- Testers should be a mix of **target audience** and average Web users; **2-3 testers** per iteration are enough

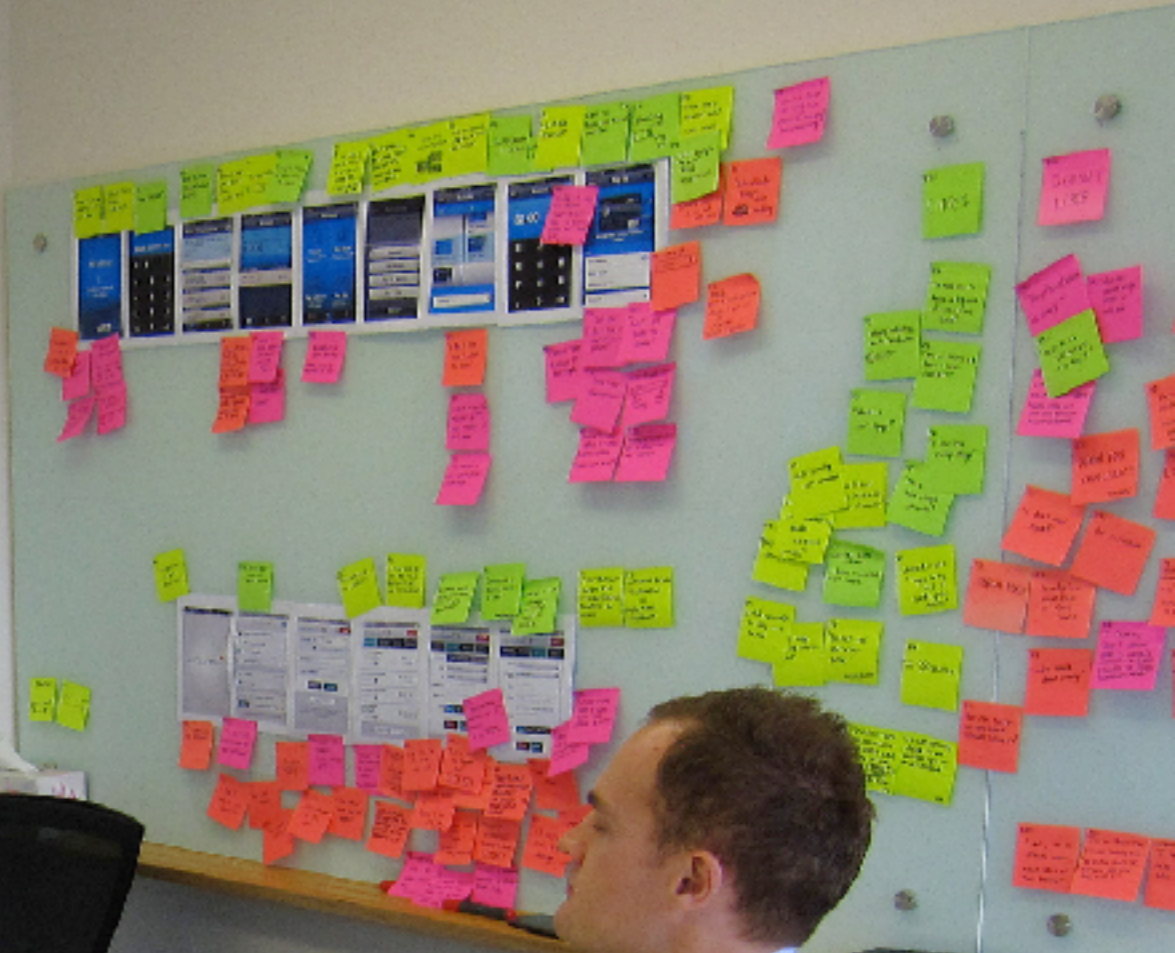
## Setup:

- + **Participant** (tester) sits in front of the laptop/smartphone/...
- + **Facilitator** sits next to him and guides him through the test
- + **Observers** (developers, managers, etc.) watch usability test



Participant & facilitator

<http://bit.ly/1jLXwUy>



Observer

# What can you test?

- How to **create** a user account
- How to **retrieve** a lost password
- How to **change** the credit card information
- How to **delete** a user account
- How to **find** an article in the archive
- How to **edit** a posting made on the forum
- .....

# Usability testing: the aftermath

- Assign each found problem to a **priority** (low, medium, high)
- Focus on the **high priority** problems
- Create an ordered list of high priority problems and **start fixing** the most severe one
- **Do not add** new problems to the list until you fixed everything

**HTML5: lets take a  
closer look**

# HTML5 overview

- A set of related technologies (core HTML5, CSS, JavaScript) that together enable **rich Web content**
- **Core HTML5**: mark up content
- **CSS**: control the appearance of marked-up content
- **JavaScript**: manipulate the contents of HTML documents & respond to user interactions
- **Modern Web (app) development** requires knowledge of all three technologies
- Before HTML5: XHTML and HTML 4.01

**Not all browsers support all features**

**<http://caniuse.com/>**



# HTML5 overview

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html
  PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
  "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
  <head>
    <title>Virtual Library</title>
  </head>
  <body>
    <p>Moved to <a href="http://example.org/">example.org</a>.</p>
  </body>
</html>
```

- Before HTML5: **XHTML** and HTML 4.01

**Not all browsers support all features**

<http://caniuse.com/>

# The move towards HTML5



@BrendanEich

- Initial list of HTML tags (**1991/92**) was **static**:  
`<title>` `<a>` `<isindex>` `<plaintext>` `<listing>`  
`<p>` `<h1>` `<address>` `<hpl>` `<dl>` `<dt>` `<ul>`
- **JavaScript** appeared in 1995, developed by Netscape - beginning of client-side **dynamic** scripting for the browser

JavaScript is not part of HTML, but HTML5 assumes JavaScript to be available.

- **Plugins** (e.g. Adobe Flash, 1996) were created to go beyond what was possible with HTML

HTML5: a drive to return rich content *directly* into the browser.

- **Semantic HTML** became a popular wish to enable large-scale automated processing of Web content

# Who decides the HTML standard?

**W3C recommendation: features are stable & (partially) implemented in multiple (2+) common browsers**

- HTML is widely used, making standardisation a slow process
- Many different stakeholders are part of **W3C's HTML Working Group** (Microsoft, Apple, Google, Mozilla, Nokia, Adobe, Intel, Baidu, etc.)
- HTML5: candidate recommendation in Q4-2012, **W3C recommendation in Q4-2014**
- HTML5.1: candidate recommendation in Q1-2015, **W3C recommendation in Q4-2016**

**In practice:** W3C standardises what the browser vendors have chosen to implement (or will implement) and agree upon.

# What does the standard look like?

## 2.4.4 Numbers

### 2.4.4.1 Signed integers

[Add developer view styles](#)

A string is a **valid integer** if it consists of one or more [ASCII digits](#), optionally prefixed with a "-" (U+002D) character.

A [valid integer](#) without a "-" (U+002D) prefix represents the number that is represented in base ten by that string of digits. A [valid integer](#) with a "-" (U+002D) prefix represents the number represented in base ten by the string of digits that follows the U+002D HYPHEN-MINUS, subtracted from zero.

The **rules for parsing integers** are as given in the following algorithm. When invoked, the steps must be followed in the order given, aborting at the first step that returns a value. This algorithm will return either an integer or an error.

1. Let *input* be the string being parsed.
2. Let *position* be a pointer into *input*, initially pointing at the start of the string.
3. Let *sign* have the value "positive".
4. [Skip whitespace](#).
5. If *position* is past the end of *input*, return an error.
6. If the character indicated by *position* (the first character) is a "-" (U+002D) character:
  1. Let *sign* be "negative".
  2. Advance *position* to the next character.
  3. If *position* is past the end of *input*, return an error.Otherwise, if the character indicated by *position* (the first character) is a "+" (U+002B) character:
  1. Advance *position* to the next character. (The "+" is ignored, but it is not conforming.)
  2. If *position* is past the end of *input*, return an error.
7. If the character indicated by *position* is not an [ASCII digit](#), then return an error.
8. [Collect a sequence of characters](#) that are [ASCII digits](#), and interpret the resulting sequence as a base-ten integer. Let *value* be that integer.
9. If *sign* is "positive", return *value*, otherwise return the result of subtracting *value* from zero.

highly verbose

# HTML5 is modular and complex

- **Web Workers**: Web applications can spawn background workers to run processes (scripts) running in parallel to their main page
- **WebSocket**: bidirectional communication with server-side processes
- **WebRTC**: real-time communication between browsers (for videoconferencing, etc.)
- **HTML Media Capture**: enables user access to a device's media capture mechanism

# HTML5: taking things offline with the AppCache

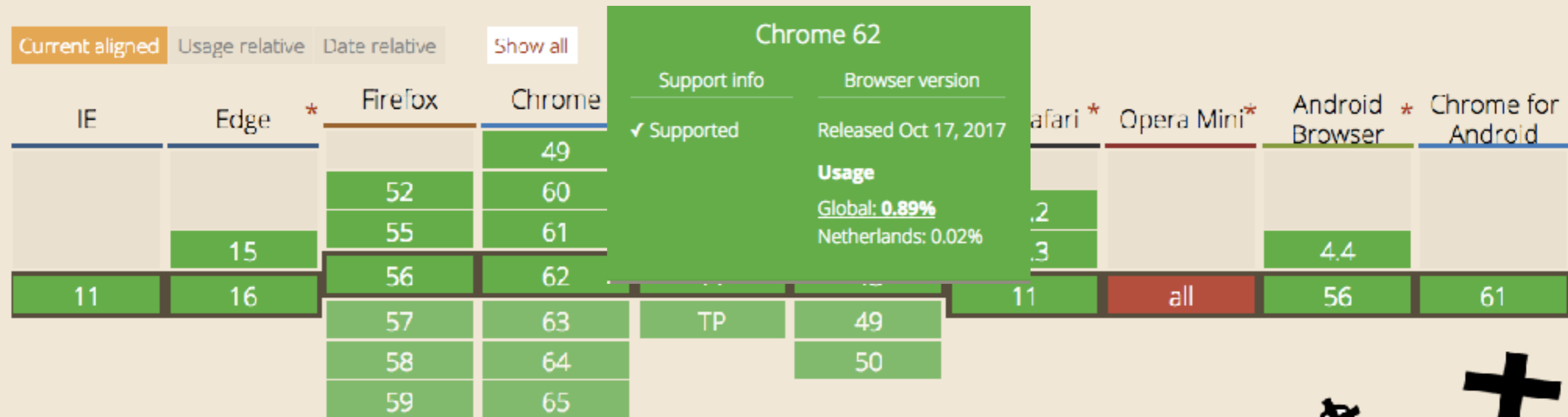


# Long live the AppCache!

Offline web applications - UNOFF

Global 94.75% + 0.01% = 94.76%  
 Netherlands 92.54% + 0.01% = 92.55%

Now deprecated method of defining web page files to be cached using a cache manifest file, allowing them to work offline on subsequent visits to the page.



Notes Known issues (4) Resources (7) Feedback

This technology is being deprecated in favor of **Service Workers**



# Long live the AppCache!

## Service Workers - WD

Method that enables applications to take advantage of persistent background processing, including hooks to enable bootstrapping of web applications while offline.

Global	65.27% + 8.32% =	73.6%
Netherlands	52.82% + 0.59% =	53.41%

Current aligned	Usage relat	Edge 16		Opera	iOS Safari *	Opera Mini*	Android Browser *	Chrome for Android
IE	Edge	Support info	Browser version					
		Not supported by default, but can be enabled	Released Oct 17, 2017					
	15	<b>Notes</b>	<b>Usage</b>		10.2			
	16	Available behind the "Enable service workers" flag	Global: <b>0.04%</b> Netherlands: 0.01%	48	10.3		4.4	
11					11	all	56	61
		57	63	TP				
		58	64					
		59	65					

Notes   Known issues (0)   Resources (8)   Feedback

Overall: for **simple** Web applications the AppCache is the **easiest** way to offer offline capabilities **over the next few years**.



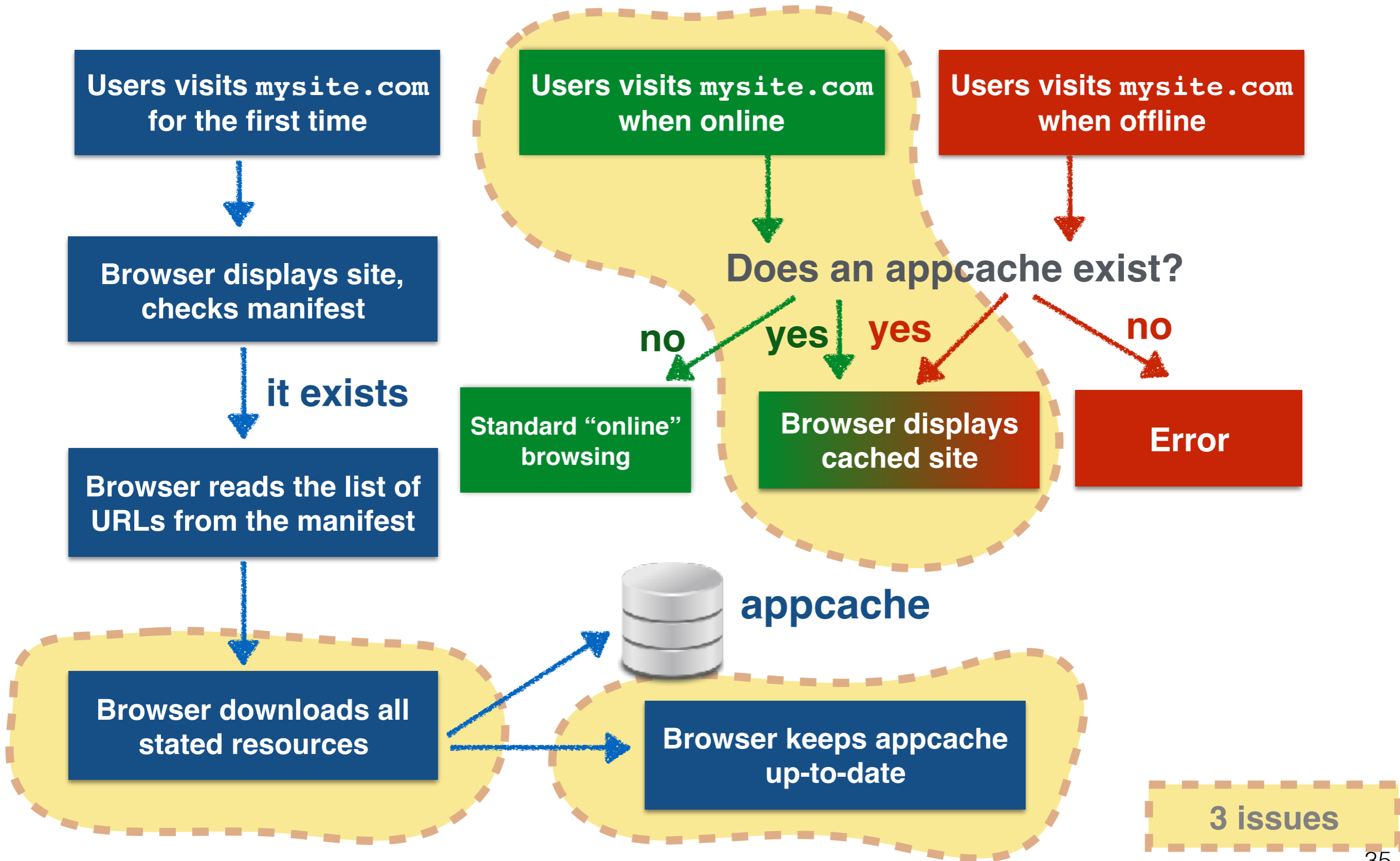
# Offline Web applications

- Until a few years ago: Web applications were mostly available online; browser cache did not provide reliable storage (removed elements from the cache if memory limit reached)
- HTML5 introduced **application caches** that enable **reliable** offline browsing
- **Developers** specify the files the browser should (or should not) cache and make available offline
- Main tool: **the manifest file** (referenced as attribute in the `html` tag)

# Offline Web applications

- Until recently, Web applications were only available when the user was online. Offline storage is not available on all devices, and the amount of storage available is limited. Offline applications should be reliable.
  - HTML5 provides a way to create offline applications. The **manifest file** is a file that describes the resources that should be available offline. It is referenced in the `html` tag.
  - **Development** of offline applications is not as straightforward as development of online applications. The **manifest file** is a key tool in this process.
- ```
<!doctype html>
<html manifest="myman.appcache">
  <head>
    <title>My First Web App</title>
  </head>
  <body>
    <h1>Hello World!</h1>
    <p>Nice to meet you.</p>
  </body>
</html>
```

# Appcache “workflow”



# How to cache a resource

- Web applications consist of numerous resources (\*.html, \*.css, \*.js, \*.mov, \*.wav, ....)
- To cache a **Web page**:

1. add the manifest attribute to the page to be cached
2. list the page in the manifest file itself

- To cache a resource of **any type**

list the resource in the manifest file itself

# A simple manifest file

myman.appcache

```
CACHE MANIFEST
```

required line

```
index.html
```

```
stylesheet.css
```

```
images/logo-small.png
```

```
images/logo.png
```

relative path

```
images/logo-large.png
```

```
scripts/myjs.js
```

```
scripts/jquery.js
```

```
http://myhp.nl/scripts/myjs2.js
```

absolute path

Cached resources can come from any domain.

# A complex manifest file

```
#required, 21.08.2014:0.1
```

#comments

```
CACHE MANIFEST
```

```
#must be cached, list first or add CACHE:
```

```
CACHE:
```

```
index.html
```

```
stylesheet.css
```

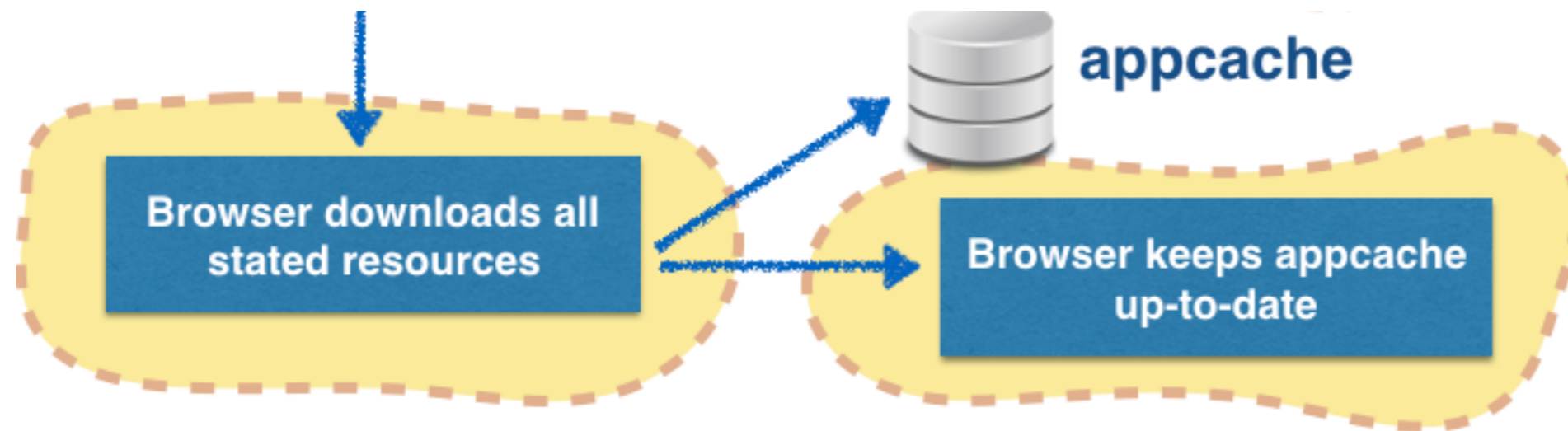
```
images/logo.png
```



# Manifest resource types

- **CACHE**: is the explicit offline section
- **NETWORK**: indicates the “online whitelist” section, its resources are never cached
- **FALLBACK**: defines replacements for online resources that were not cached (fallback resources are automatically downloaded)
- Resource types can be combined for interesting effects
- URL pattern “\*” in **NETWORK**: online whitelist wildcard flag
- URL pattern “/” in **FALLBACK**: matches any resource on the Web site

# Application cache pitfalls I



- Application caches are only **updated** by the browser when the manifest file changes

**Changing a comment within the manifest is sufficient!**

- If a single resource in the manifest **fails** to be downloaded, the appcache is not created



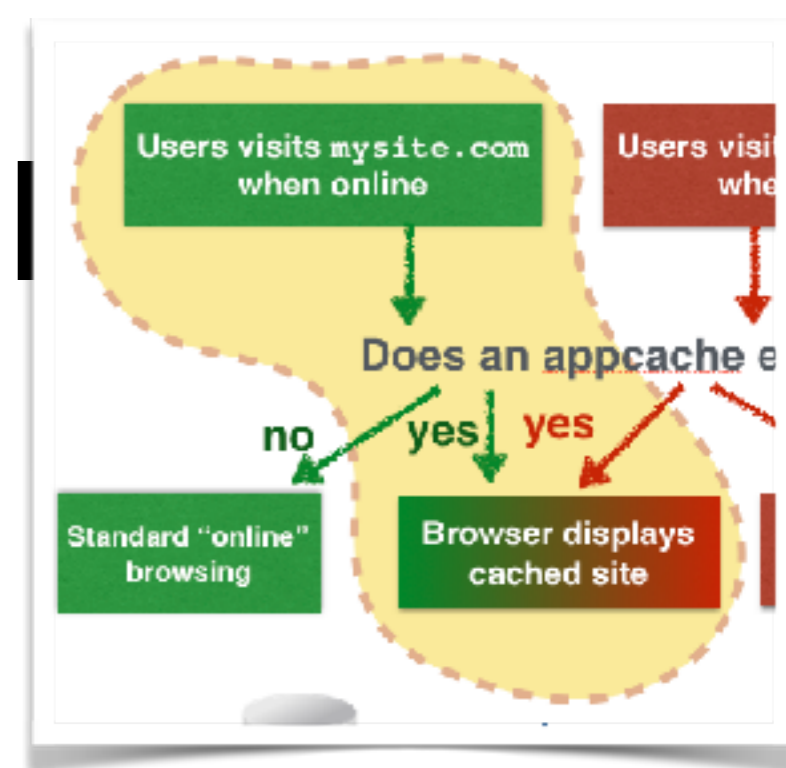
# Application cache pitfalls II

## When you are online

1. If an application cache exists for a site, all files are served from it
2. The browser looks for updates to the manifest
3. Once the cache is updated, the site is **not** automatically refreshed (could interfere with user actions)
4. The user needs to manually refresh the page

## For debugging purposes

The application cache is an additional cache, it obeys standard Web server-sent caching instructions.  
Remember HTTP's Expires and Cache-Control.



# Application cache pitfalls

A non-cached resource does not load on a cached resource.

```
<!-- index.html -->
<!doctype html>
<html manifest="myman.appcache">
  <head>
    <title>My First Web App</title>
  </head>
  <body>
    <h1>Hello World!</h1>
    
  </body>
</html>
```

```
#required
#21.08.2014:0.1
CACHE MANIFEST

CACHE:
index.html
```

**Hello World!**

A ghost

# Application cache pitfalls

A non-cached resource does not load on a cached resource.

```
<!-- index.html -->
<!doctype html>
<html manifest="myman.appcache">
  <head>
    <title>My First Web App</title>
  </head>
  <body>
    <h1>Hello World!
    
</html>
```

**Hello World!**



```
#required
#21.08.2014:0.2
CACHE MANIFEST
```

```
CACHE:
index.html
```

```
NETWORK:
```

```
*
```

**Work through chapters 1, 2 and 3 of the Database course book before the Monday lecture.**

**Find a lab partner by this week Sunday!**