Database-driven Web Technology (LIX021B05)

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Information science/Informatiekunde

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Who, where, when

Course	Database-driven Web Technology (LIX021B05) 2013/14
Instructor	Çağrı Çöltekin
Email	c.coltekin@rug.nl
Lectures	Mon 11:00–13:00, `1313.0338`
Labs	Thu 11:00–13:00, `1312.0107A`
Office hours	Thu 09:00–11:00, `H1311.0426` (or by appointment)
Course page	`http://www.let.rug.nl/coltekin/courses/dbweb2013/`

Literature

There is no compulsory textbook for this course.

- A good database book, for example one of the following, will be handy to have at hand.
  - *Database System Concepts* by A. Silberschatz, H. F. Korth & S. Sudarshan.
  - *Database Management Systems* by Ramakrishnan & Gehrke
  - *A First Course in Database Systems* by Ullman & Widom
  - *Fundamentals of Database Systems* by Elmasri & Navathe
  - *Database Systems: The Complete Book* by Garcia-Molina, Ullman & Widom
  - *Database Systems: A Practical Approach to Design, Implementation, and Management* by Connolly & Begg
- You will be referred to online sources if/when necessary.

What you should already know

Databases You are assumed know basic relational database design concepts and SQL. We will only have a quick review/reminder session.

HTML You are assumed know the basics of HTML. We will only revisit/review HTML forms in this course.

Programming You are assumed to have some experience with programming, and some earlier exposition to PHP (from the web programming course). If not, you should be able to pick it up quickly.

After this course . . .

You should be able to

- develop interactive server-side web applications with a relational database back end
- develop a relational database for a real-world application
- understand what happens behind the browser in a web-based application
- be able to identify potential security problems in web-based applications
- be familiar with performance issues for large scale web-based applications using databases.

Time plan

Week	Lecture (Wed)
1	Introduction & organization
2	Meeting with teams: no course
3	Web programming & Accessing databases from PHP
4	Session management
5	Security
6	Summary & QA & Discussion
7	Project (prototype) demonstrations

Evaluation

- Project: 70%.
  - Requirements and initial design report (Due date: Nov 26).
  - Project (prototype) demonstration (Dec 17).
  - Finalized project (Jan 31).
- Individual homeworks: 30%.
  - Homeworks will consist of steps of a small similar project.

You need a minimum of 5.5 (from each component) to pass.

About projects

Project form the main part of this course.

- Ideal team size is 3, ± 1 is also fine.
- Contribution by all members are compulsory.
- Naturally, you will share tasks, however, everybody should understand the project they are working on fully.
- You are required to use a version management system for all project related files (more on this today).
- There is a single project subject. But, your end results will differ based on your requirement collection as well as your choices to implement additional features.

Time is short: you need to act quickly to team up, and start working.

Project subject

Current topic (tentative): A web-based crowd-sourcing application.

- All teams will be working on the same topic.
- The project will bi finalized by Friday, and announced on Nestor.
- You may affect the project subject: if you have an idea it is not time to talk to me.
- You will collect the full requirements yourself by interviewing the user(s). (next week)

Projects and deadlines

November 2013

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	1

December 2013

2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

January 2014

6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

22 Team formation and requirements collection.

02 Requirements documentation & initial project report.

06 Prototype demonstration & presentation.

31 Deadline for the finalized project. **No extensions!**

Project evaluation

- Good database design
- Secure and efficient web programming
- Continuous effort

There are two early steps that that contribute to the evaluation:

- An initial project report (about 3 pages, due 2013-12-02). It should include,
  - a summary of the project requirements
  - your Initial database design (e.g., E-R design, DB schema)
  - type(s) of users, typical queries expected, security (authentication, authorization) requirements.
- Project demonstration/presentation (2014-01-06): you will present an early version/prototype, explain planned work for the final version.

Rest of today

Today:

- A quick refresher on PHP & HTML form processing.
- A quick introduction to software version control using git.

HTML forms

```
<form action="form.php" method="post">
Name: <input type="text" name="name">
Password: <input type="passowrd" name="pass">
</form>
```

- HTML forms are defined in <form> tag.
- **action** attribute specifies the URL that will handle the form input when submitted.
- method is either **GET** or POST.
- Input elements are specified inside the form.
- <**input**> tag specifies most common input types, but some elements have different tags, e.g., <textarea>.
- You can specify a default value, typically using **value** attribute.

Input types

text	A single line text field
password	Same as text, but the input is not displayed
textarea	A multi-line text field
radio	Radio button, among a set of buttons user can select only one
checkbox	Like radio buttons, but user can select multiple (or none)
option/select	Create drop-down lists.
button	A button
img	A button with an image
file	A file upload button
hidden	A static value.

GET or POST ?

- **GET** method,
  - Encodes the form output in the URL: http://my.hostname/form.php?name=myname&age=myage
  - \+ users can bookmark it.
  - − the values are visible on the URL bar (passwords?).
  - − there may be size limitation. No set standard, but rule of thumb: no more than about 2K characters.
- POST method,
  - Encodes the form output in the message body.

```
POST /form.php HTTP/1.1
header: value
....

name=myname&age=myage
```

  - \+ with the help of HTTP, you can pass values securely.
  - \+ it can handle much more data.
  - − you cannot bookmark the output of a form submission.

PHP and forms

- Form output from PHP is easy, it is just HTML output.
- If a form uses your PHP script as **action**, you can access the form input using two super globals,
  - $_POST if you used method=post
  - $_GET if you used method=**get**
- PHP also provides a unified associative array $_REQUEST, which combines both $_POST and $_GET.
- All these variables are associative arrays. For example, if you had a form input with name="username", the value could be accessed using $_REQUEST['username'].

A simple form example

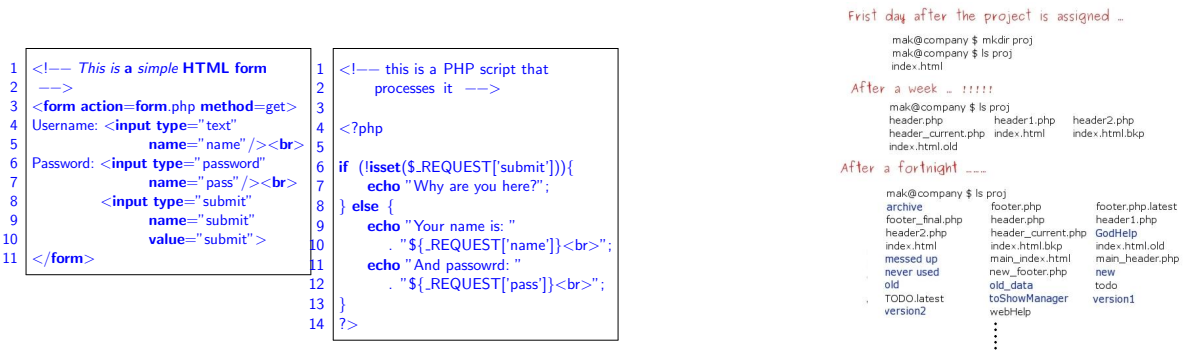
```
<!-- This is a simple HTML form
 -->
<form action=form.php method=get>
Username: <input type="text"
                 name="name"/><br>
Password: <input type="password"
                 name="pass"/><br>
          <input type="submit"
                 name="submit"
                 value="submit">
</form>
```

```
<!-- this is a PHP script that
     processes it -->

<?php

if (!isset($_REQUEST['submit'])){
    echo "Why are you here?";
} else {
    echo "Your name is: "
       . "${_REQUEST['name']}<br>";
    echo "And passowrd: "
       . "${_REQUEST['pass']}<br>";
}
?>
```


Is this familiar?



From `http://maktoons.blogspot.nl/2009/06/if-dont-use-version-control-system.html`

Version Control Systems

A version control system (or, *revision control* or *source control* system) is an indispensable tool in software development.

A VCS,

- Records a history of all changes to all files under VC.
- Allows going back in time: you can go back to any past state recorded in VCS.
- Allows inspecting which change happened when.
- Allows maintaining multiple branches of the same software without multiple copies.
- Allows sandboxing: you can try (experimental) changes without disrupting the 'working copy'.
- Facilitates team work.
- It can also be used for other purposes, for example, web pages, documents . . .

VCS: some terms

repository is the database where the VCS stores the code, versions and associated information.

working copy is where the programmer makes the changes.

tag is a name given to the state of the repository at a certain time.

branch is a *virtual* copy of the whole repository for a specific purpose.

check-in operation updates the repository using the working copy.

merge brings code in different branches (possibly from different programmers) together.

conflict may occur during a merge, if same segment of the code was changed in different ways.

Some VC systems

RCS Dates back to early 1980's. Typically single user, single system. Keeps track of single files.

CVS Client-server system with support for multiple users on a network. Server side manages the central repository, client side keeps the users' working copies.

SVN An improvement over CVS.

GNU arch, mercurial, bazaar, git . . . are distributed VCSs. Every working copy keeps a repository. The repository for each programmer is local, but can be merged using different methods.

Git: introduction

- Git is a distributed VCS.
- Developed (primarily) for Linux kernel, but used by many projects.
- Available for almost all operating systems.
- Can be shared through HTTP, SSH, git, rsync, email . . .
- Many (somewhat) free software-hosting providers for projects using git. Just a few: GitHub, Gitorious, Bitbucket . . .

Git: starting a new repository

`git init`

- Initializes an empty git repository in the current directory (you should already be in your 'project directory').
- All repository files live in .git subdirectory.
- You rarely touch files under .git (although, you can if you know what you are doing).

```
mkdir testproject
cd testproject
git init
$EDIT index.php #======>
```

```
<html>
<head></head>
<body>
<?php
    echo "Hello Wrold!\n";
?>
</body>
</html>
```


Git: recording changes in the repository

`git add` and `git commit`

- Git has a two-stage commit process. First you need to **add** the changes you want to commit. (This adds the change to a 'cache', called 'index', but we are not concerned with that.)
- Then, **commit** updates the repository with the changes.

```
git add index.php
git commit -m "added index.php"
```

- `-m` option to **commit** gives a short comment. Otherwise, git fires up a text editor to write a comment.
- Comments are important. Do not skip and be descriptive.

Git: inspecting changes

git diff

```
# found a bug!
# edit index.php, change 'Wrold' to 'World'
git diff
--- a/index.php
+++ b/index.php
@@ -4,7 +4,7 @@
 <?php
- echo "Hello Wrold!";
+ echo "Hello World!";
 ?>
```

- Without options, diff will give you differences between the working copy and the HEAD of the repository for all files.
- You can inspect differences for any set of files between any two states of the repository using diff (more on this later).

Git: checking the status

git status

```
git status
# On branch master
# Changed but not updated:
# (use "git add <file>..." to update what will be committed)
#
# modified:   index.php
#
no changes added to commit (use "git add" and/or "git commit -a")
```

- status gives you a summary of the current state of your working copy.
- Let's commit our bug-fix:

```
git commit -a -m "fixed a typo"
```


Git: logs

git log

```
git log
commit 933f1de6b727d7816df9420aa4f0c85c00455d19
Author: Cagri Coltekin <c.coltekin@rug.nl>
Date: Sun Nov 6 15:59:31 2011 +0100

    fixed a typo

commit 7742fd6ff2a90372bf9545732a9e6923588d3052
Author: Cagri Coltekin <c.coltekin@rug.nl>
Date: Sun Nov 6 15:31:56 2011 +0100

    added inex.php
```


Git: working with branches

git branch and git checkout

- Branches are fast and cheap: use them!
- Branches can be used for maintaining long-term different versions of software, or short term experimental changes.

```
$ git branch experimental #       we are about to do a major change create
$ git checkout experimental #     a new branch and switch to it
Switched to branch "experimental"
$ git status # let's see if everything is as expected
# On branch experimental
nothing to commit (working directory clean)
$ $EDITOR index.php # change 'Hello' to 'Hi'
$ $EDITOR LICENSE # also add a LICENSE file
$ git status #          check the status again
# On branch experimental
# Changed but not updated:
# (use "git add <file>..." to update what will be committed)
# modified:   index.php
# Untracked files:
# (use "git add <file>..." to include in what will be committed)
# LICENSE
no changes added to commit (use "git add" and/or "git commit -a")
```


Git: working with branches (2)

```
$ git add LICENSE # add the new file
$ git add index.php # add the changes to index.php
$ git status #          checking once more doesn't hurt
# On branch experimental
# Changes to be committed:
# (use "git reset HEAD <file>..." to unstage)
#
# new       file:   LICENSE
# modified:         index.php
#
$ git commit -m "Major change in index.php + added LICENSE"
$ ls
index.php LICENSE
$ grep World index.php
    echo "Hi World!";
$ git checkout master
$ ls
index.php
$ grep World index.php
    echo "Hello World!";
```

- Note: your commits should better be atomic.

Git: merging branches

git merge

```
$ git merge experimental
Updating 933f1de..e07aa49
Fast forward
 index.php | 2 +-
 1 files changed, 1 insertions(+), 1 deletions(-)
 create mode 100644 LICENSE
```

- this merge succeeds with no conflicts
- now both branches are identical. We can delete the experimental branch if we like with the command git branch -d experimental.
- if there were conflicts, we'd need to resolve them manually (helpful tools exist).

Git: interacting with other repositories

git clone, git pull and git push

- clone makes a complete copy of a repository.
- As well as local files, a repository can be accessed (and cloned) through a number of ways. Including, ssh, http.
- This allows git to be used in a client–server-like setup.
- Once you cloned an original source, you can use git pull to receive updates, and git push to push your changes.
- You can pull from or push to multiple repositories.
- A number of software hosting sites are primarily dedicated for git.

Git: graphical user interfaces

git gui, gitk, qgit ...

- the native gui git gui allows you to do most of these operations by point&click.
- a few others exist: gitk, qgit, Git Extensions (for Windows), GitX (for Mac) ... See `http://git-scm.com/tools` for more.
- Hosting sites, e.g., GitHub, BitBucket, also provide some web-based functionality.

Git (or other VCS) in your projects

- We did not even cover the tip of the iceberg, git (and most other VCSes) provide many possibilities that makes your life easier in the long run.
- More documentation and pointers to good tutorials can be found at `http://git-scm.com/documentation`.
- Take it seriously in your projects.
- The time you invest to learn to use a VCS will pay off.
- You are required to point me to a repository that I can inspect for your projects.

Summary & next week

Today:

- Some refresher on PHP & HTML forms processing.
- A quick introduction to software version control using git.

Next week:

- Form your team, and arrange a project meeting within next week.
- Homework part 1.
- No course.