# Carnegie Mellon University 15-415/615 Database Applications Fall 2015, C. Faloutsos & A. Pavlo

## HW7: Database Application

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## Overview

- Design & implement a simple web application called 'CMUYak'
- Today:
    - Application specs
    - Homework deliverables
    - Very brief intro to PHP

## Data requirements

- **Users**
  - Username (2-50 characters)
  - Password (hashed 32 characters)
- **Posts**
  - Has title and body text
  - Have to record **when** they were posted
  - Have to record **where**(represented in integer x, y coordinates) they were posted
  - Posts can be "voted" by users
  - Posts may contain one or more hastags
- **Hashtags**
  - tagname (2-50 characters)

## Data requirements

**Example:**

The user “Smith” creates a new post with

- the title “Savage DB Research” and
- the content as “Winter is coming! #GOT”
- at location (0, 0).

This should be stored in the table that contains information about posts.

The application will also parse and extract the hashtag “#GOT” contained in this post and stored separately in the database without the number sign prefix (i.e., “#”).

The database should also contain a reference that identifies that the particular hashtag was used in the post.

## Functionality requirements

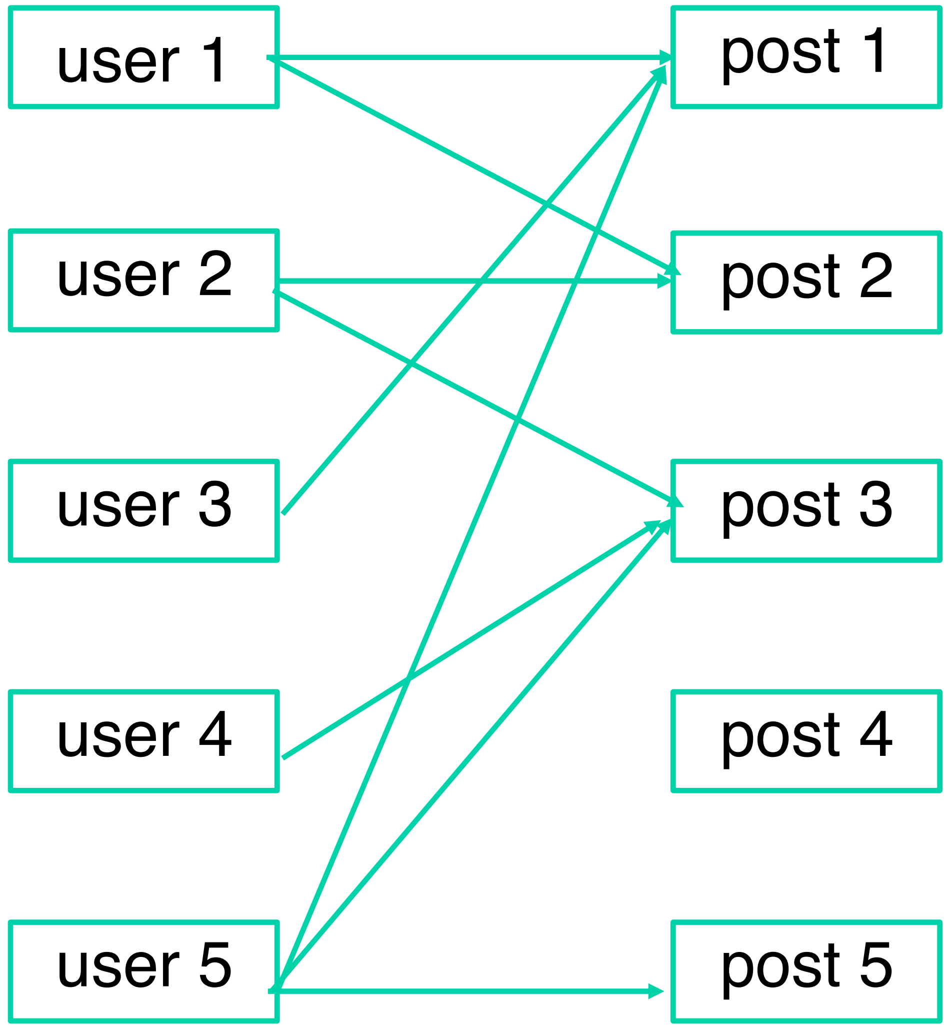
1. Reset database
2. Create user account
3. Login
4. Add Posts with possible hashtags
5. Timeline
6. List all posts for a given user
7. Search for posts
8. Search for posts within range
9. Search for a tag
10. Delete a posts
11. Vote for a post
12. Unvote for a post
13. List most popular post

# Functionality requirements

14. Recommend posts based on votes

- For user U recommend posts that are “voted” by like-minded users.
- Like-minded users of U are users who “vote for” what U would vote for.
- Rank them according to how many common votes a post has
- Don’t include posts that U already voted for

# User recommendation example



**Recommend posts to user1**

**user 2, user 3, user 5 also vote for what user 1 votes for**

**user 2: post 3**
**user 5: post 3, post 5**

***Note that it doesn't include posts user 1 already voted for**

**sort by # votes for each post**
**=> recommend post 3, post 5**

# Functionality requirements

15. User statistics
    - # posts by the user
    - # votes by the user
    - The number of unique hashtags used by that user's posts

      *(For example, if a user has two posts, each of them contains"#CMU" in their content. We'd say that the number of unique hashtags used by this user is 1 )*
16. Global statistics
    - List of *K* posts with most likes
    - List of *K* most active users
    - List of K hashtags that appear the most often
    - List of K hashtag pairs that appear together the most often

## Example web application

http://www.contrib.andrew.cmu.edu/~jiaxix/cmuyak/

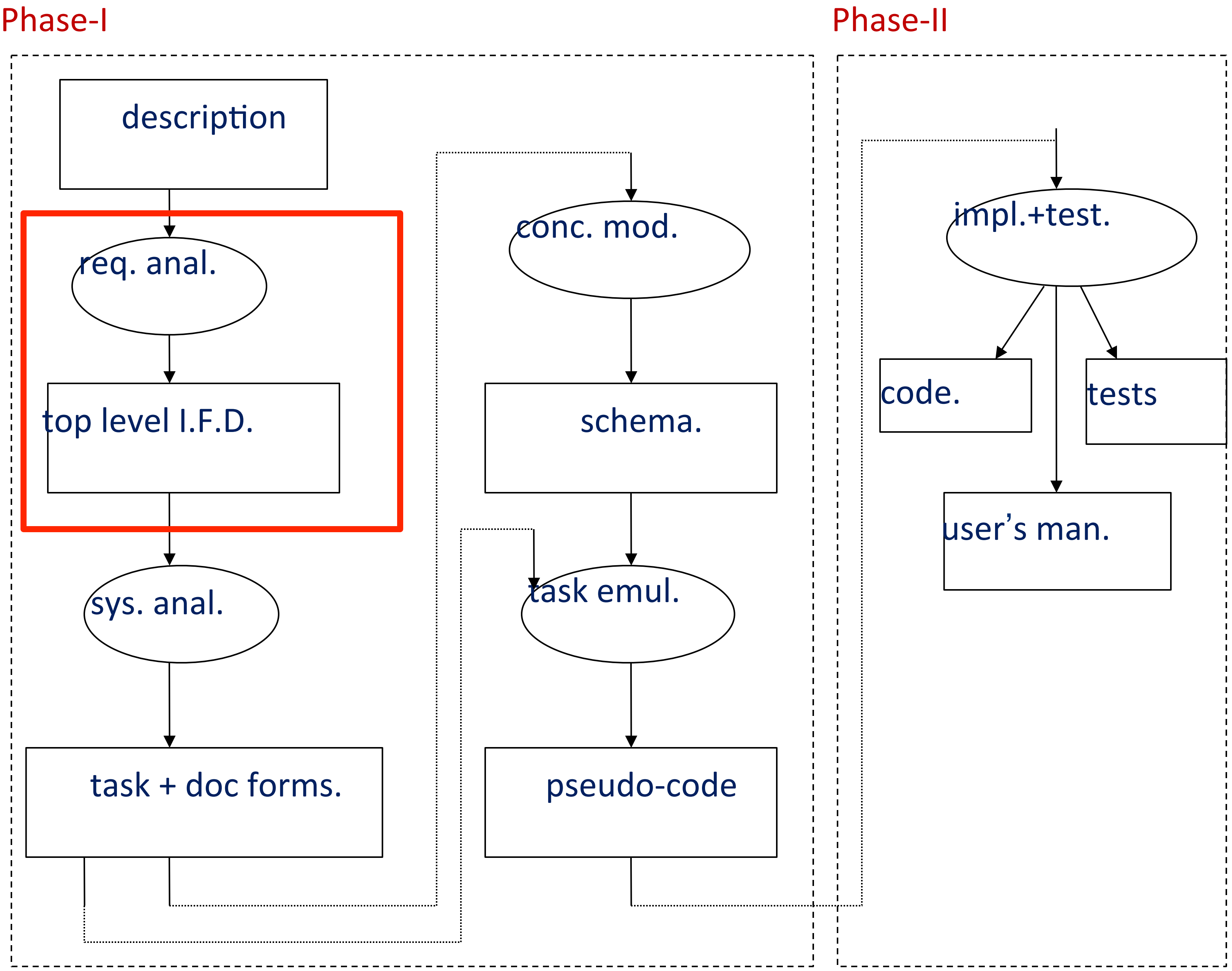
## Homework Specifics

- Follow the design methodology from **Lecture 18**
- Organized in 2 Phases
  - Phase 1 – Design: **due 11/11**
  - Phase 2 – Implementation: **due 11/30**

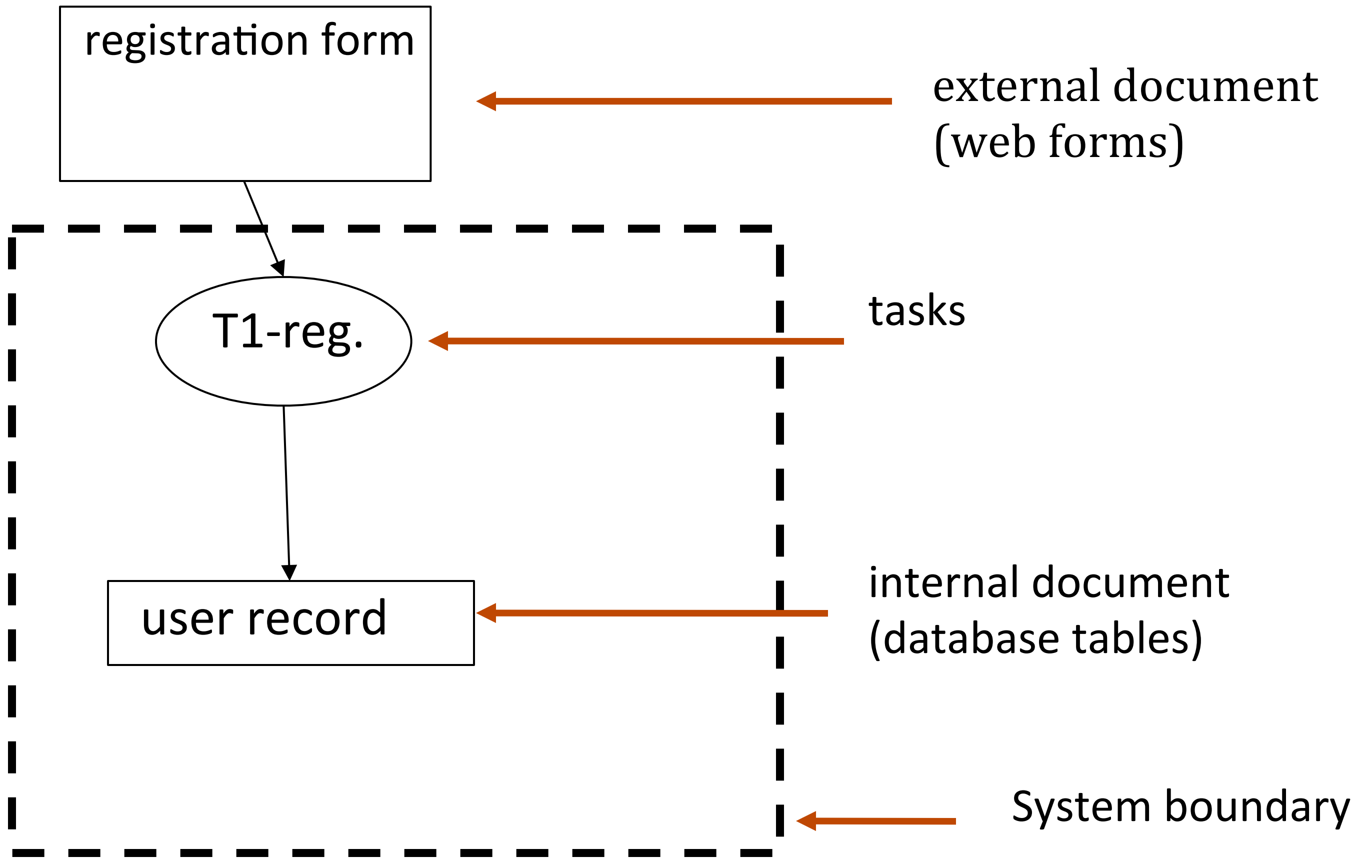
## Phase 1

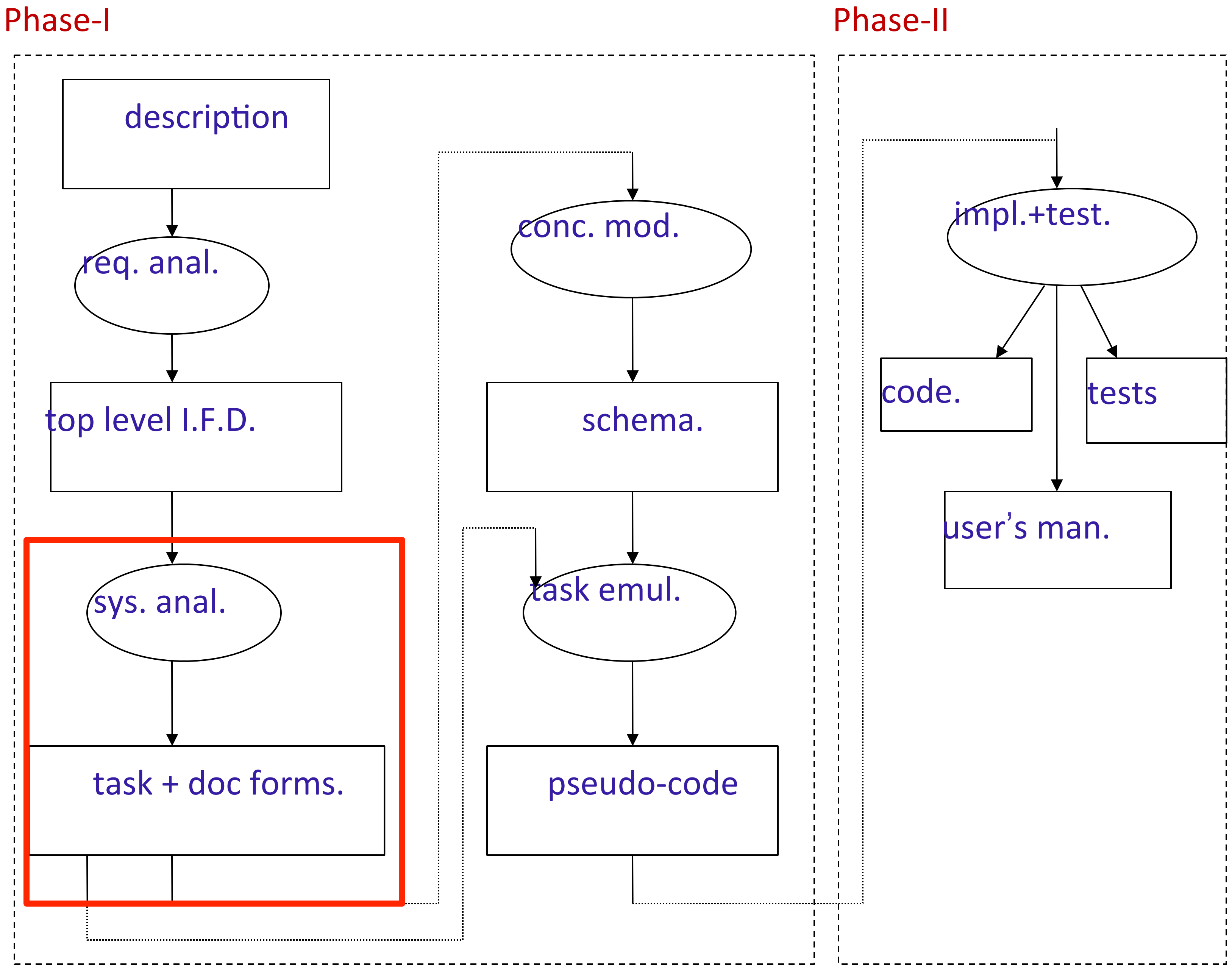
You are free to come up with your own design choices as long as

- they follow the methodology
- they are reasonable
- you are able to justify unconventional choices


Phase-I
Phase-II
description
req. anal.
top level I.F.D.
sys. anal.
task + doc forms.
conc. mod.
schema.
task emul.
pseudo-code
impl.+test.
code.
tests
user’s man.

# Top level information flow diagram

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## Document + Task forms

### Task forms and task list

- not required for this homework

### Document forms and document list

$$\left.\begin{array}{l}\bullet\ \text{D1: registration form}\\ \bullet\ \text{D2: login form}\\ \bullet\ \text{D3: timeline form}\end{array}\right\}\ \text{external}$$

$$\left.\begin{array}{l}\bullet\ \dots\\ \bullet\ \text{Dx: user record}\\ \bullet\ \dots\end{array}\right\}\ \text{internal}$$

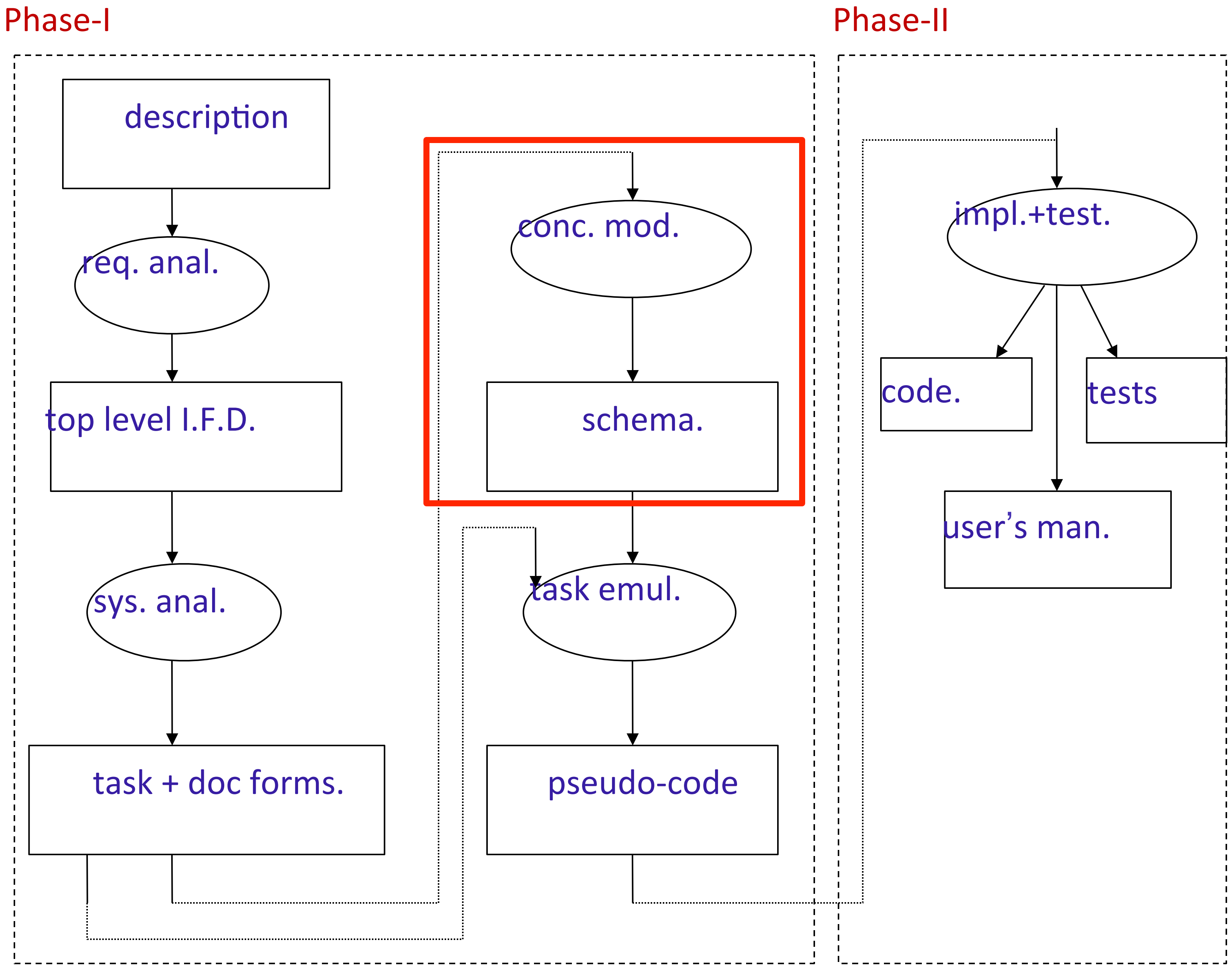
## Document forms

D1: registration form

- username
- Password

Dx: user record

username
Password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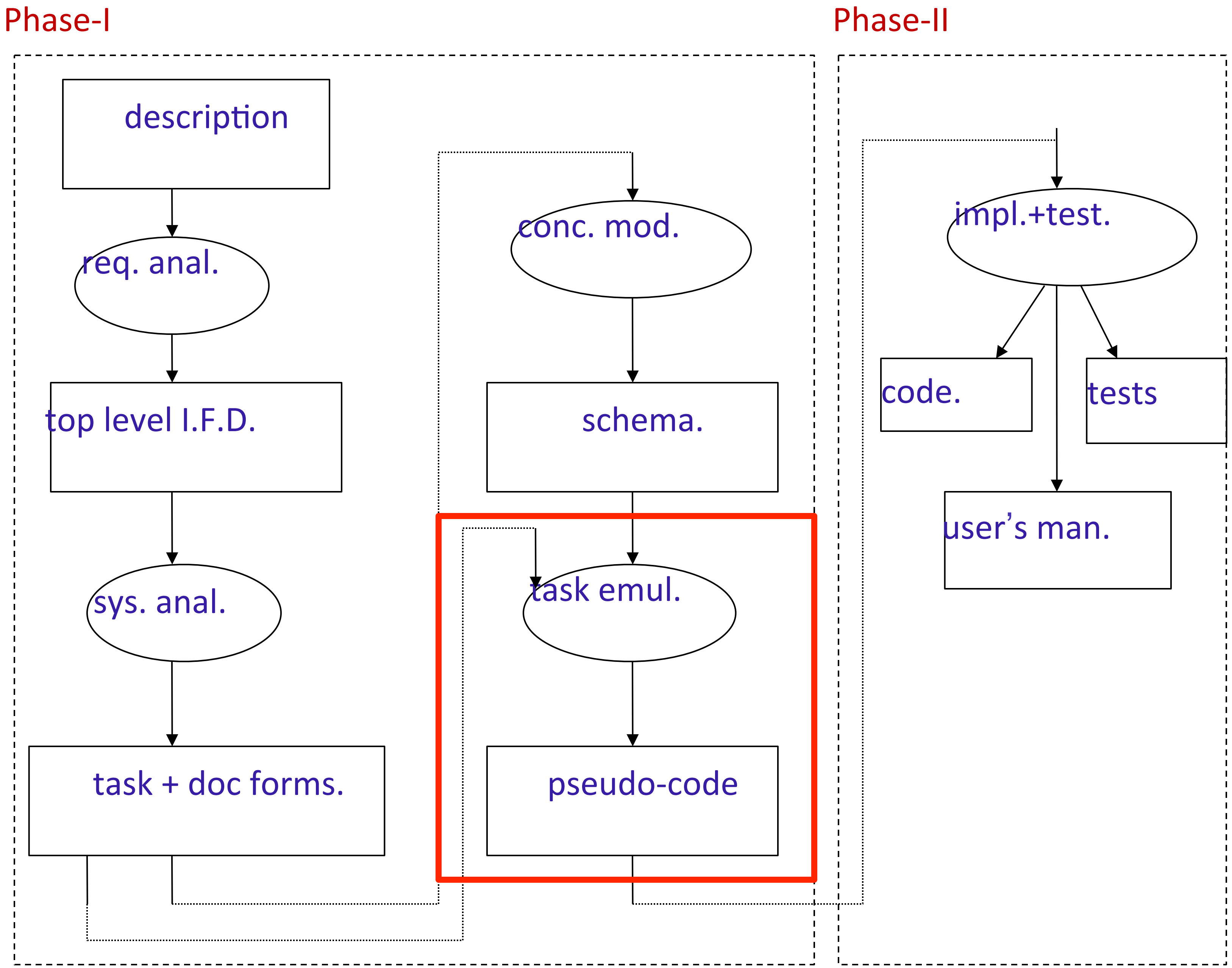
## E-R diagram

- Specify cardinalities
- Think about weak/strong entities
- Justify unconventional choices

## Relational schema

- Give the definition of the schema
- Give SQL DDL statements including constraints.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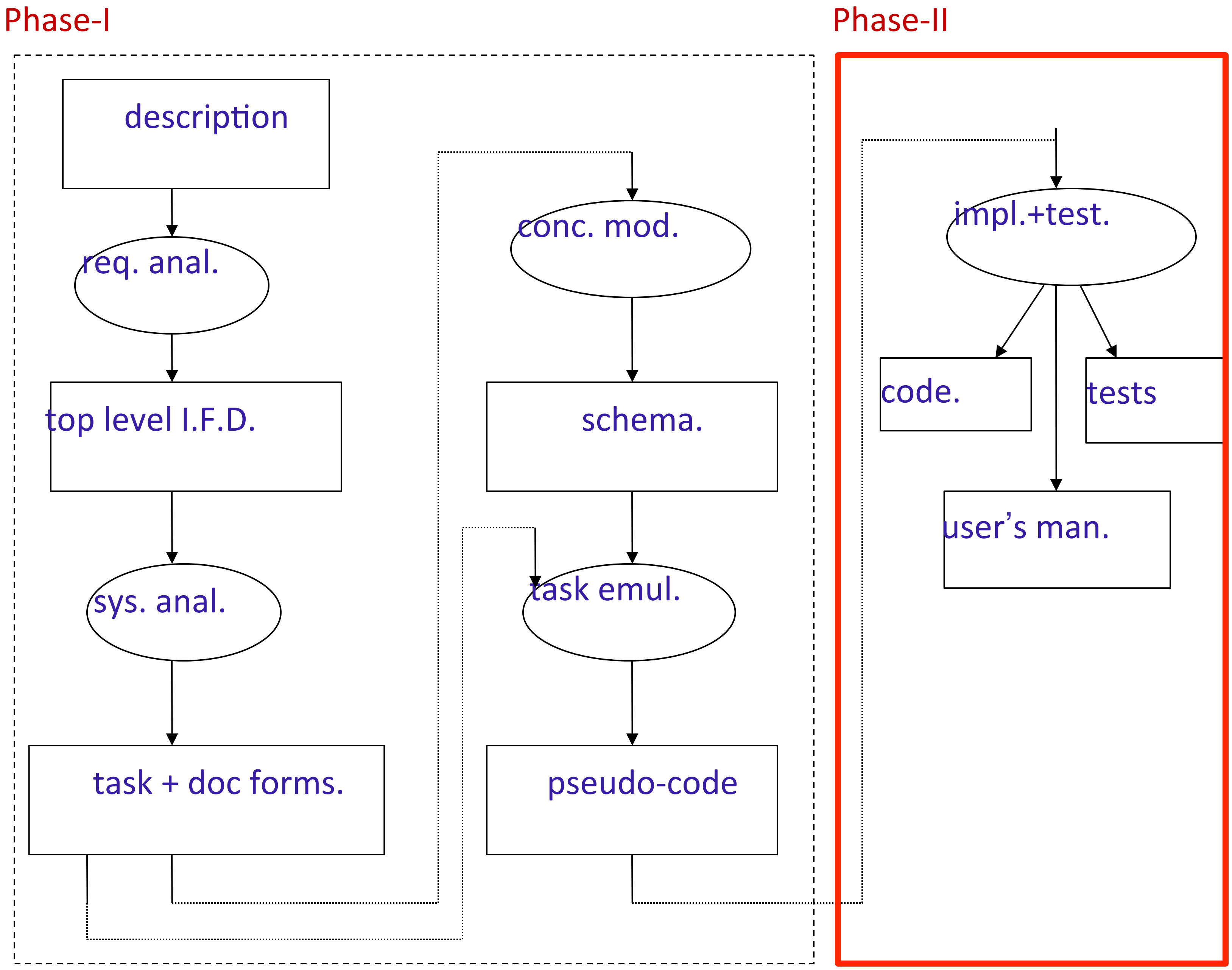
## Task emulation/pseudo-code

- No need to write pseudocode
- Simply give all SQL DML statements for all tasks

## Phase 1: What to hand-in

- **Due 11/11**
- **Hard copy** (in class)
- **Electronic copy** (Blackboard)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## Phase 2

- We provide an API in **PHP**
- Implements the web site functionality
- Has empty calls to the database
- write PHP code that

1. wraps the SQL statements
2. returns the output to the rest of the given code (PHP arrays)

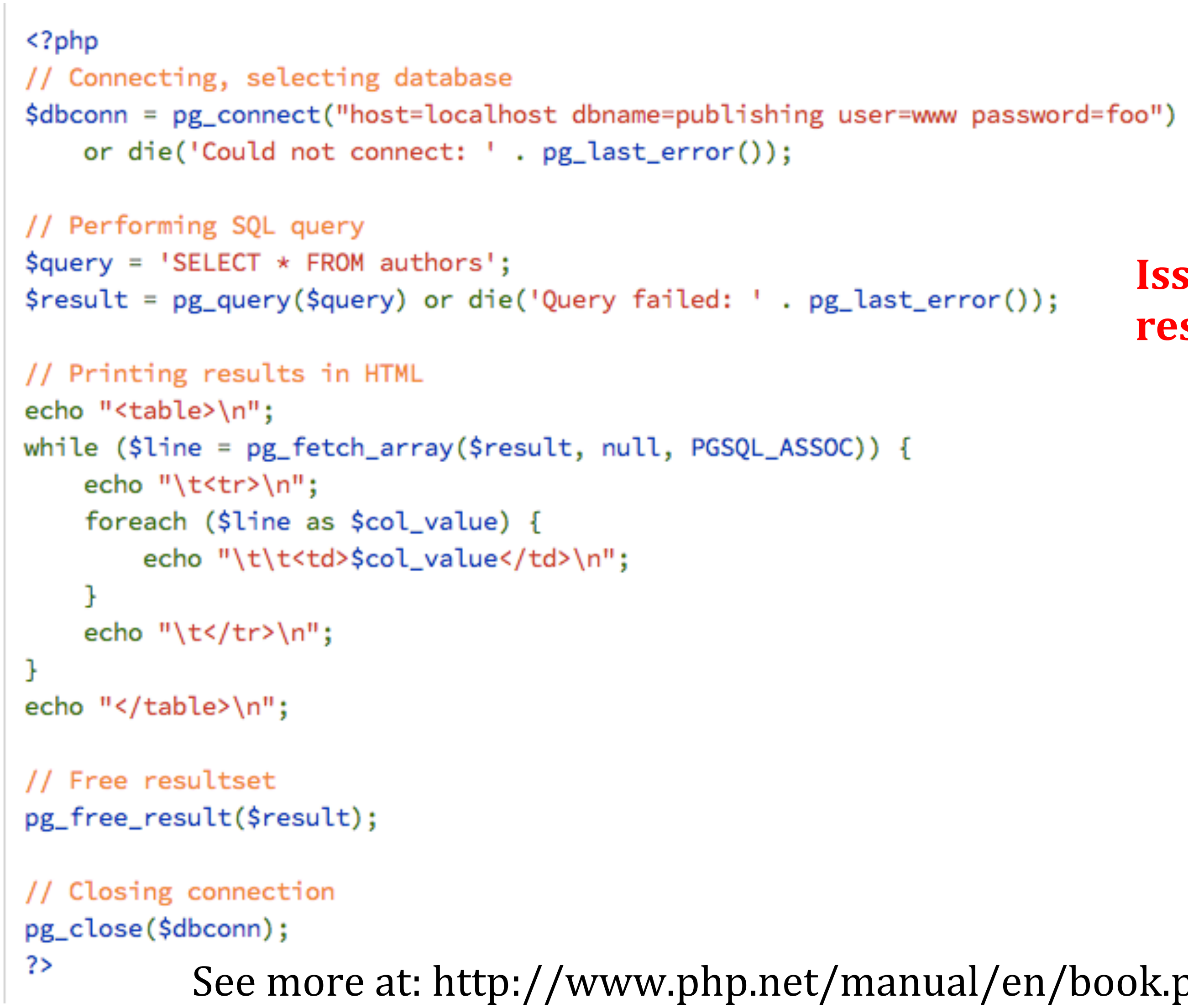
- No need to provide user manual

## Phase 2

- **Unzip `hw7.zip`**
- **You need to edit 2 files**
- `config.php`

  add **your** login & url info
- `functions.php`
  - Contains empty definitions of the functions that you have to implement
- **We don't you suggest other part of code base, but you may look into them and see how they function.**

## PHP & Postgres



```php
<?php
// Connecting, selecting database
$dbconn = pg_connect("host=localhost dbname=publishing user=www password=foo")
    or die('Could not connect: ' . pg_last_error());

// Performing SQL query
$query = 'SELECT * FROM authors';
$result = pg_query($query) or die('Query failed: ' . pg_last_error());

// Printing results in HTML
echo "<table>\n";
while ($line = pg_fetch_array($result, null, PGSQL_ASSOC)) {
    echo "\t<tr>\n";
    foreach ($line as $col_value) {
        echo "\t\t<td>$col_value</td>\n";
    }
    echo "\t</tr>\n";
}
echo "</table>\n";

// Free resultset
pg_free_result($result);

// Closing connection
pg_close($dbconn);
?>
```

**Start connection**

**Issue query & read results**

See more at: http://www.php.net/manual/en/book.pgsql.php

## PHP arrays

Array creation:

```
$array = array(
    "foo" => "bar",
    "bar" => "foo",
);
```

Bulk insertion (like stack):

```
<?php
$stack = array("orange", "banana");
array_push($stack, "apple", "raspberry");
print_r($stack);
?>
```

See more at: http://www.php.net/manual/en/language.types.array.php

## Securing your application

- SQL injection

```
statement = "SELECT * FROM users WHERE name ='" + userName + "';"
```

- Set name equal to `' or '1'='1`
- The SQL statement that gets executed is

```
SELECT * FROM users WHERE name = '' OR '1'='1';
```

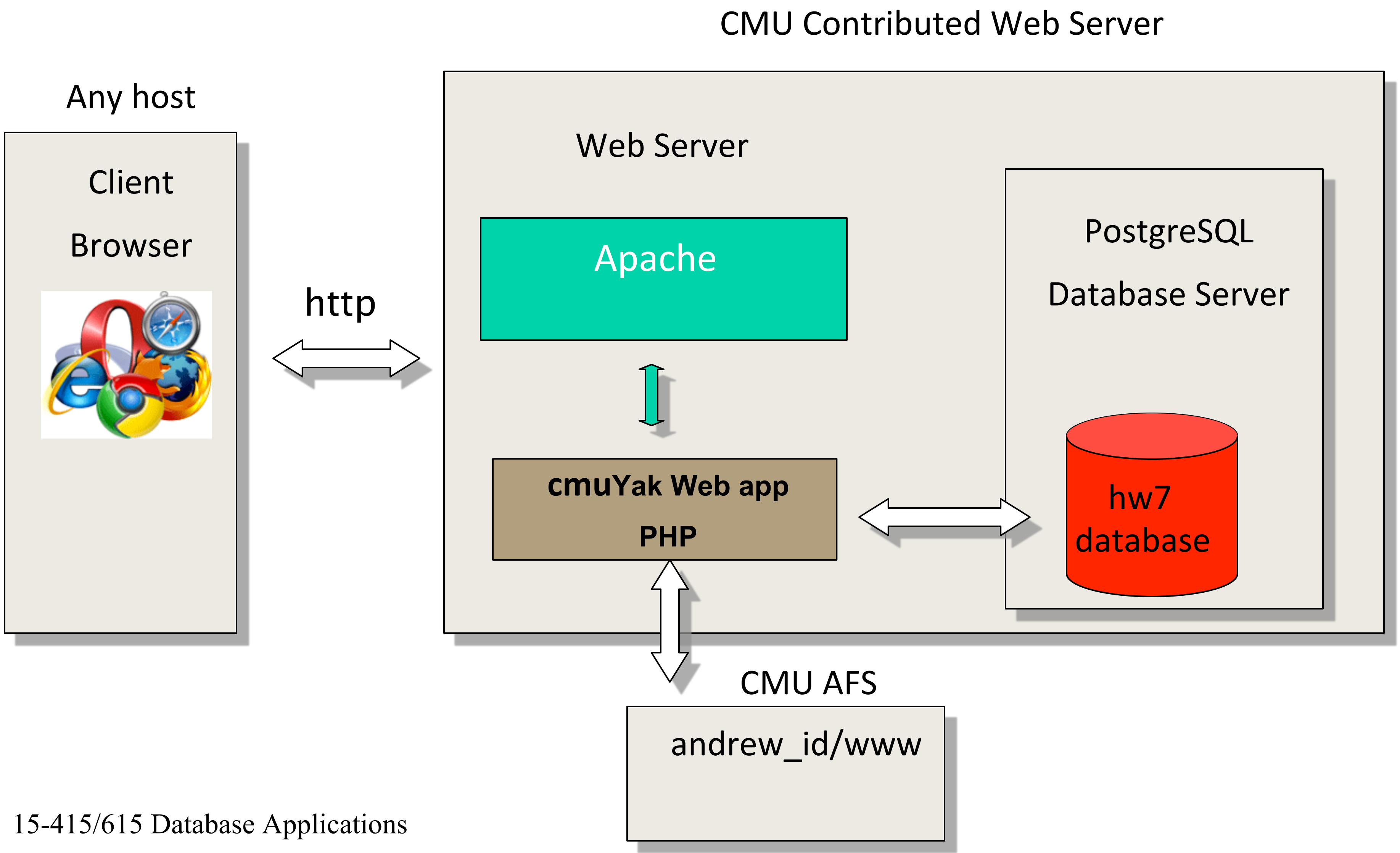
- **Results in un-authorized log-in!!!!**
- Your code has to account for that

•Hint: `pg_escape_string()`

## Phase 2: What to hand-in

- **Due 11/30**
- **Website (IMPORTANT)**: See hw7.pdf for details
- **Hard copy** (in class): ONLY new/changed code (save the trees ☺ )
- **Electronic copy:** A .zip with all the code

# Homework 7: Architecture



## Access to web server

- You will use the Computer Club Contributed Web Server
- Apache server + Postgres DB server
- Publishes *.php code in your AFS ‘www’ directory
- More details
  - http://www.club.cc.cmu.edu/doc/contribweb.php
  - HW7 description (read carefully)

## Publishing your web app

- **Please do the following ASAP and let us know if it doesn't work!**

1. Sign up for the web server here
   http://my.contrib.andrew.cmu.edu
2. Create DB user account here
   http://www.club.cc.cmu.edu/doc/contribweb/sql.php
3. Unzip hw7.zip and copy contents on folder 'cmupostly' under your AFS www directory
4. Edit config.php with your own db+server parameters
5. Edit folder content permissions: chmod +rx
6. Go to
   http://www.contrib.andrew.cmu.edu/~andrew_id/cmuyak

## Questions?

- Come to **office hours** (5 TAs + 2 instructors)
- Post your questions on **blackboard**.