

INFORMATION SYSTEMS IN HEALTH CARE

Lesson 10 – Winter Term 2014

Agenda

- 1. Database programming in PHP**
- 2. Object-oriented programming in PHP**
- 3. Projects**

Accessing a MySQL database from PHP

→ http://databaze.fbmi.cvut.cz/yourlogin/login.html

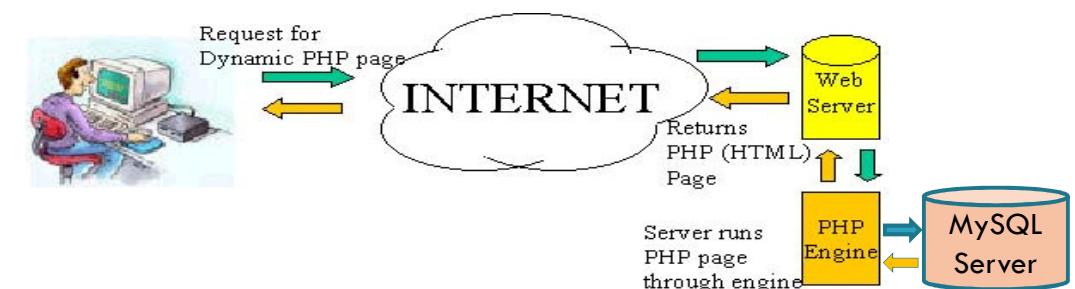
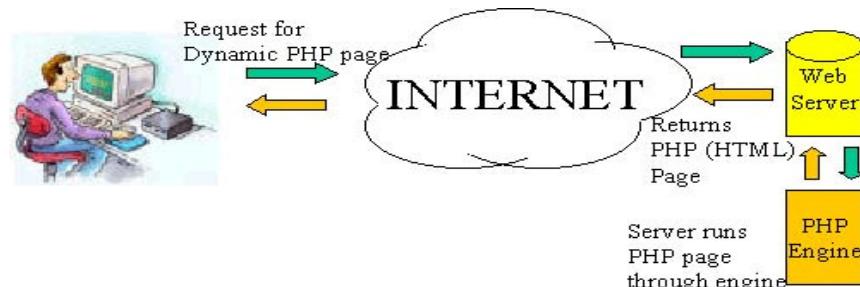
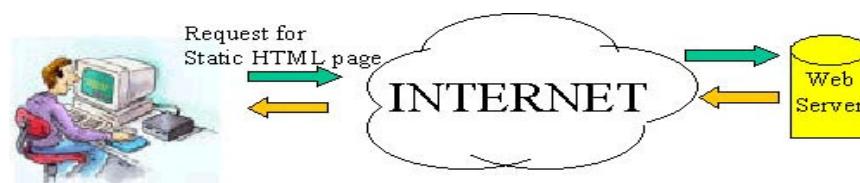
←
Login:
Heslo:

→
Login: student
Heslo:

← Prihlašování úspěšné.

→
Login: student
Heslo:

← Prihlašování úspěšné.



Accessing a MySQL database

- **Prepare the database**
 - <http://databaze.fbmi.cvut.cz/mysql>
 - CREATE TABLE user (user_id int AUTO_INCREMENT, user_name varchar(60), user_login varchar(60), user_password varchar(60), user_department_id int, PRIMARY KEY (user_id));
 - INSERT INTO user (user_name, user_login, user_password, user_department_id) VALUES ('administrator', 'admin', 'admin', 1), ('MUDr. Pavel Janda', 'janda', 'janda', 2), ('MUDr. Jana Novakova', 'novakova', 'nova123', 2)
- **Connect to the database system**
 - \$db_connector= mysql_connect("localhost", "yourlogin", "yourpassword");
- **Control database connection**
 - if (!\$db_connector) { die('Connection failed: ' . mysql_error()); }
- **Setup UTF8 charset for e.g. Czech special characters**
 - mysql_query("SET CHARACTER SET utf8");
- **Connect to the database**
 - mysql_select_db("yourlogin");

Accessing a MySQL database

□ Selecting data from a database

- \$query = "SELECT * FROM user WHERE user_login ='" . \$login . "' AND user_password ='" . \$heslo . "'";
- \$rs = mysql_query(\$query);

□ Controlling selected data

- if (!\$rs) { echo "Could not execute query: \$query"; }

□ Storing selected data to an associative array

- \$row = mysql_fetch_assoc(\$rs)

□ Displaying results

- echo 'Login successful. Homepage for ' . \$row['user_name'];
- print 'Login unsuccessful. Wrong login or password!';

Accessing a MySQL database

login.html

```
<form method="post" action="login.php">
<table border="0" cellpadding="0" cellspacing="0">
<tr>
<td>Login:</td>
<td><input type="text" name="log" size="20"></td>
</tr>
<tr>
<td>Heslo:</td>
<td><input type="password" name="pwd" size="20"></td>
</tr>
<tr>
<td colspan="2"><input type="submit" name="submit" value="Odeslat"></td>
</tr>
</table>
</form>
```

login.php

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN" "http://www.w3.org/TR/html4/strict.dtd">
<html>
<head>
<title>Úvodní stránka</title>
<meta http-equiv="content-type" content="text/html; charset=utf-8">
</head>
<body>

<?php

$login = $_POST['log'];
$heslo = $_POST['pwd'];

$spojeni = mysql_connect("localhost", "atoudmic", "");
if (!$spojeni) {
die('Připojení k databázi neúspěšné: ' . mysql_error());
}

mysql_query("SET CHARACTER SET utf8");
mysql_select_db("atoudmic");

$query = "SELECT * FROM user WHERE user_login ='" . $login . "' AND user_password ='" . $heslo . "'";
$rs = mysql_query($query);
if (!$rs) {
echo "Could not execute query: $query";
}

if ($row = mysql_fetch_assoc($rs)) {
echo 'Prihlašování úspěšné. Úvodní stránka pro ' . $row['user_name'];
} else{
print 'Prihlašování neúspěšné. Nesprávné login nebo heslo!';

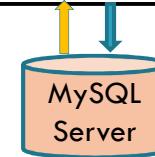
mysql_close();

?>
</body>
</html>
```

login.php

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN" "http://www.w3.org/TR/html4/strict.dtd">
<html>
<head>
<title>Úvodní stránka</title>
<meta http-equiv="content-type" content="text/html; charset=utf-8">
</head>
<body>

Prihlašování úspěšné. Úvodní stránka pro MUDr. Jana Novakova
</body>
</html>
```



```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN" "http://www.w3.org/TR/html4/strict.dtd">
<html>
  <head>
    <title>úvodní stránka</title>
    <meta http-equiv="content-type" content="text/html; charset=utf-8">
  </head>
  <body>

    <?php

      $login = $_POST['log'];
      $heslo = $_POST['pwd'];

      $spojeni= mysql_connect("localhost", "atoudmic", "");
      if (!$spojeni) {
        die(' Připojení k databázi neúspěšná: ' . mysql_error());
      }

      mysql_query("SET CHARACTER SET utf8;");
      mysql_select_db("atoudmic");

      $query = "SELECT * FROM user WHERE user_login ='" . $login . "' AND user_password = '" . $heslo . "'";
      $rs = mysql_query($query);
      if (!$rs) {
        echo "Could not execute query: $query";
      }

      if ($row = mysql_fetch_assoc($rs)) {
        echo 'Prihlašování úspěšné. Úvodní stránka pro ' . $row['user_name'];
      }else{
        print 'Prihlašování neúspěšné. Nespravné login nebo heslo!';
      }

      mysql_close();

    ?>

  </body>
</html>
```

Programming Classes in PHP

- A class can be defined anywhere in a PHP file

- `class class_name{ }`

- Attributes and operators of a class

- `class class_name{
 $attribute = “...”;
 function operator($parameter){
 $this->attribute = $parameter;
 }
}`

- Object creation

- `$object_name = new class_name();`

- Calling an operation

- `$object_name->operator(“Hello”);`
 - `$object_name->attribute = “Hello”;`

Classes in PHP

class.viewer.php

```
<?php

class viewer{
    function display_login_form(){
    }

    function display_homepage($user_name){
    }

}

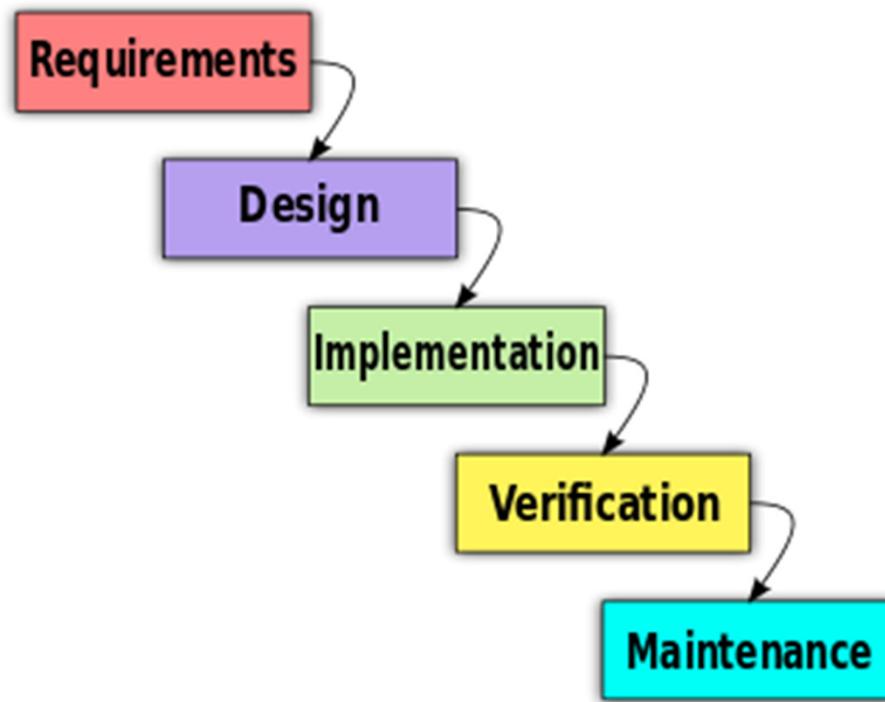
$form_id = $_POST['id'];
$gui = new viewer();

if ($form_id == 1){
    $gui->display_login_form();
}elseif ($form_id == 2){
    $gui->display_homepage($_SESSION['user_name']);
}

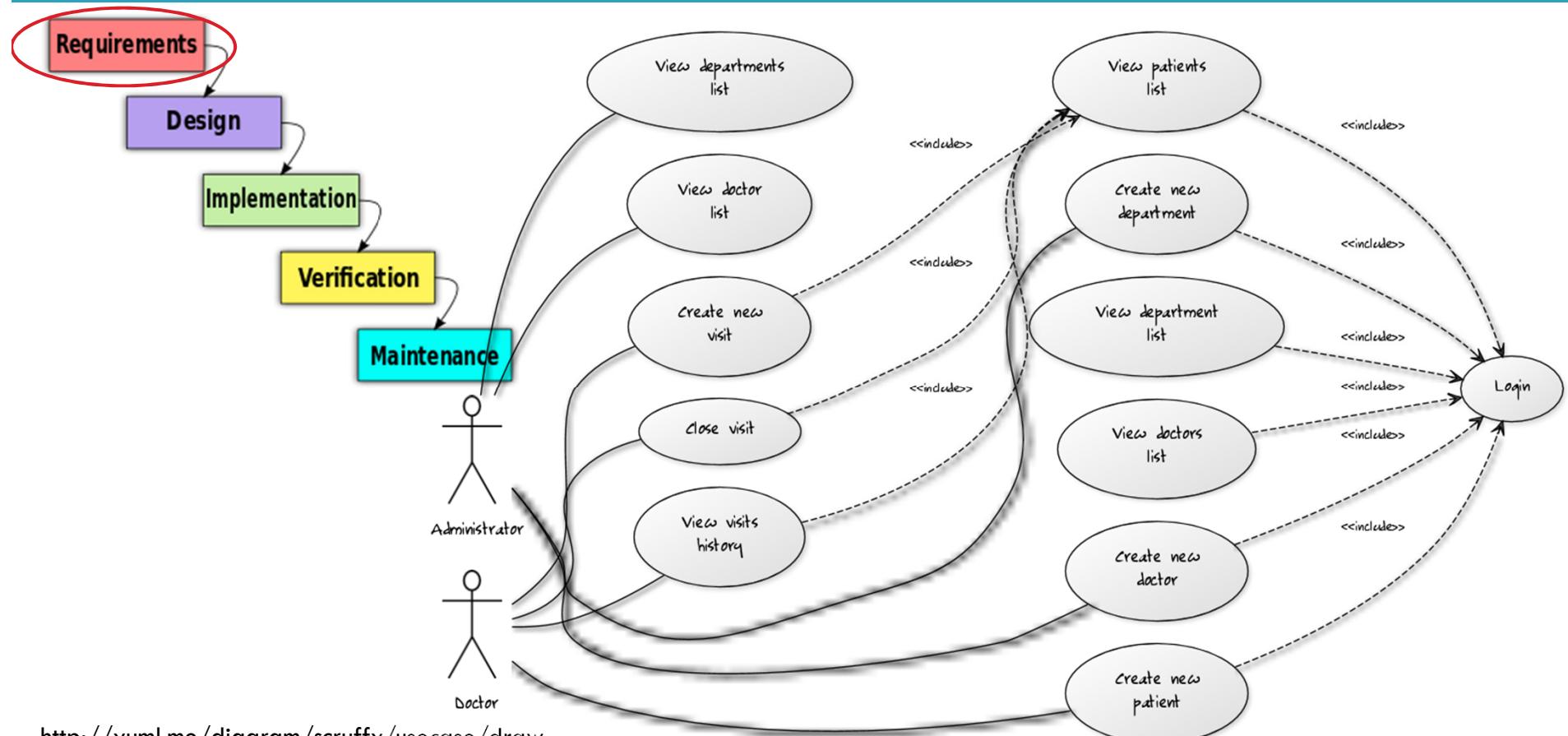
?>
```

<http://databaze.fbmi.cvut.cz/yourlogin/lclass.viewer.php?id=1>  <http://databaze.fbmi.cvut.cz/yourlogin/login.html>

Software development process

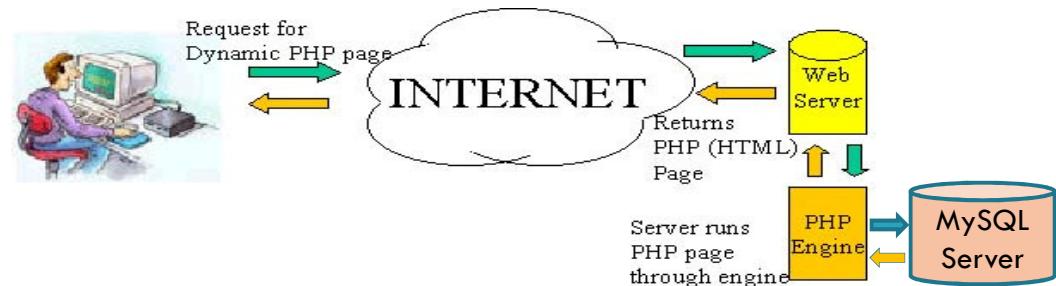
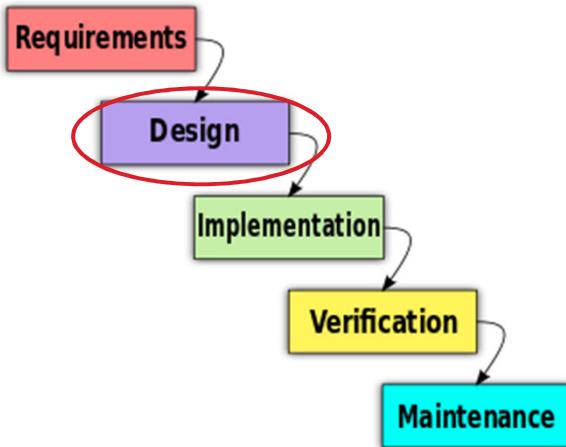


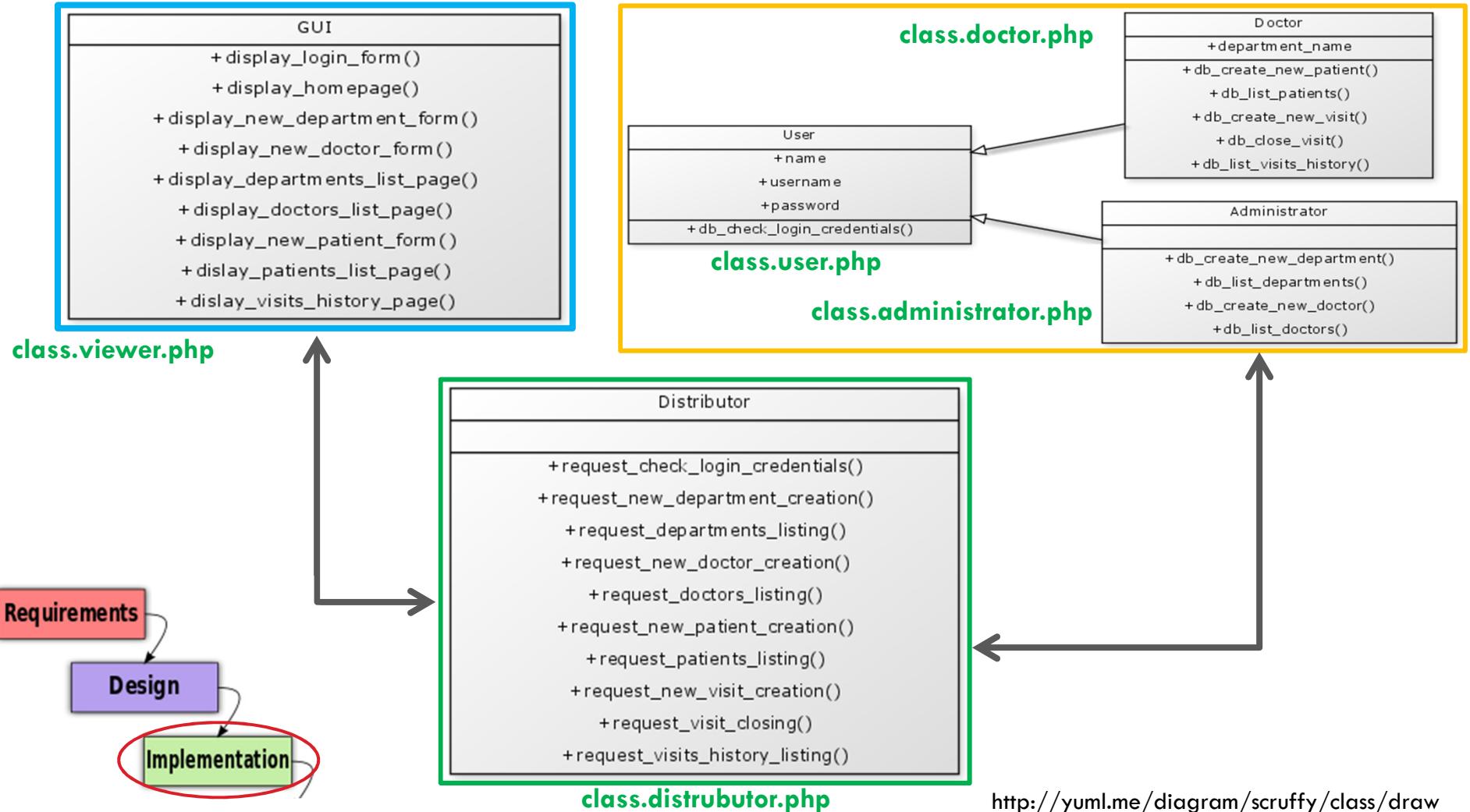
Requirements analysis



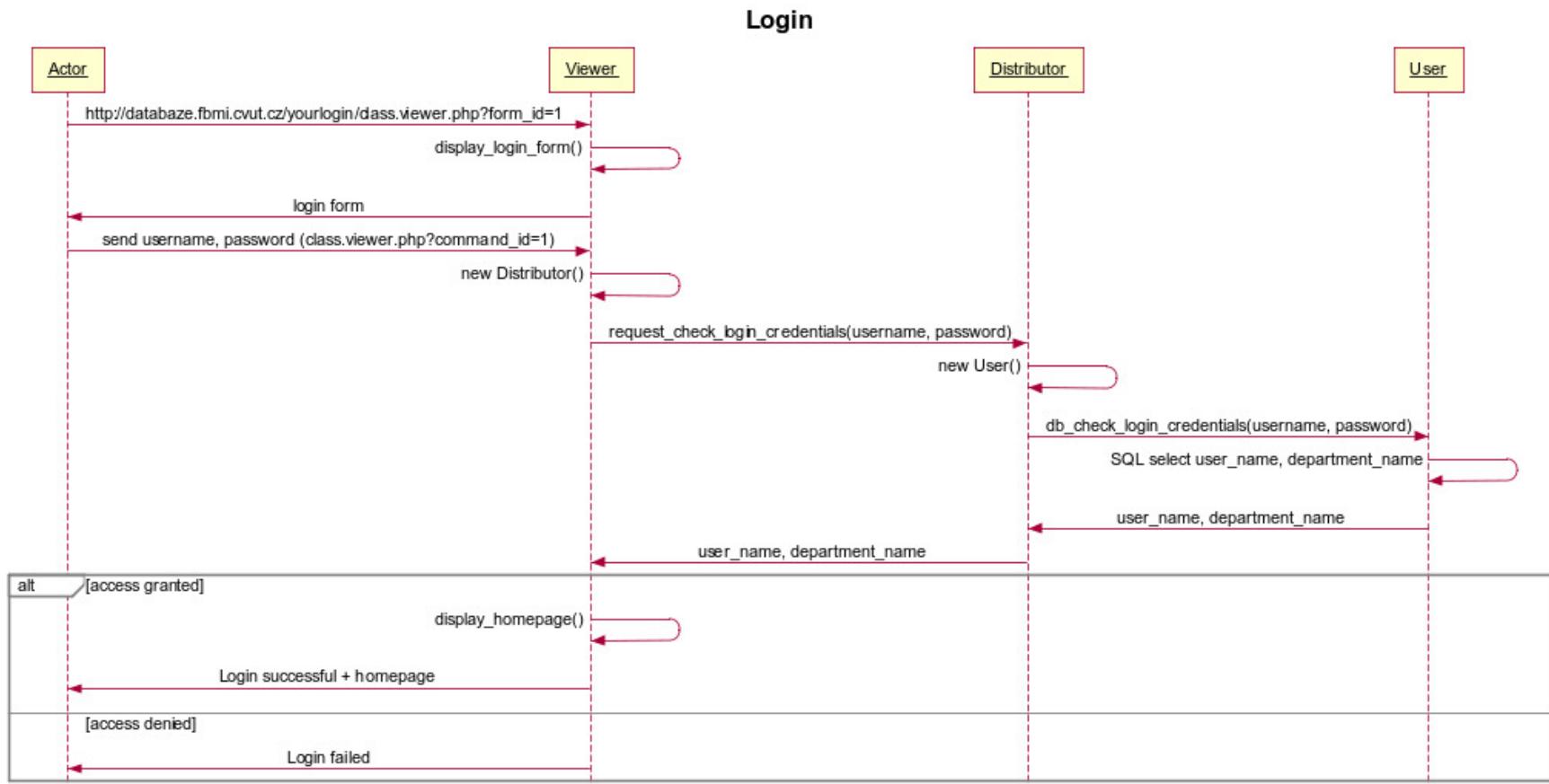
<http://yuml.me/diagram/scruffy/usecase/draw>

Design





Implementation – login – UML sequence diagram



Implementation – login - class.viewer.php

```
<?php

include("class.distributor.php");

class viewer{
    function display_login_form(){

        function display_homepage($user_name, $user_department, $message){

    }

    $form_id = $_REQUEST['form_id'];
    $command_id = $_REQUEST['command_id'];

    $login = $_REQUEST['log'];
    $password = $_REQUEST['pwd'];

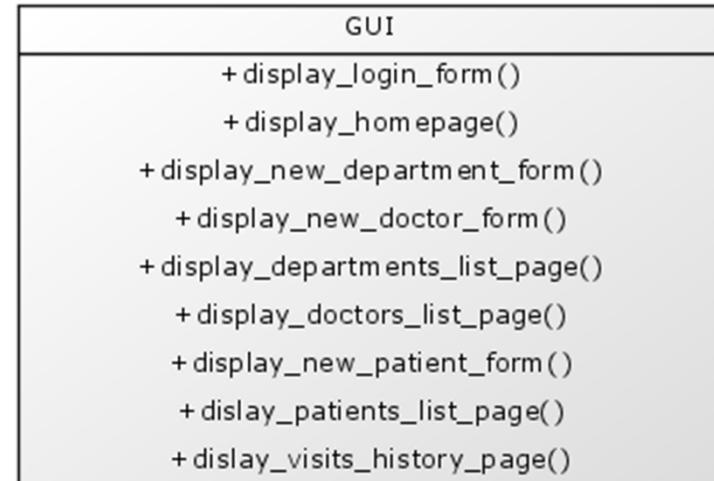
    $user_name = $_SESSION['user_name'];
    $user_department_name = $_SESSION['user_department_name'];

    $gui = new viewer();
    $distrib = new distributor();

    if ($form_id == 1){
        $gui->display_login_form();
    }elseif ($form_id == 2){
        $gui->display_homepage($user_name, $user_department_name, "");
    }

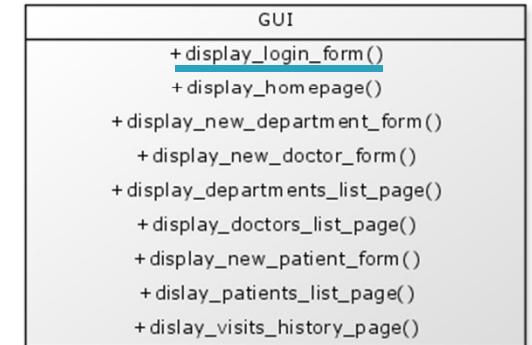
    if ($command_id == 1){ // log in
        $distrib->request_check_login_credentials($login, $password);
        $user_name = $_SESSION['user_name'];
        $user_department_name = $_SESSION['user_department_name'];
        if (! $user_name){
            $message = "Login failed. Wrong username or password!";
        }else{
            $message = "Login successful. Homepage for <b>" . $user_name . "</b>, from department <b>" . $user_department_name . "</b><br><br>";
        }
        $gui->display_homepage($user_name, $user_department_name, $message);
    }
}

?>
```



Implementation – login - class.viewer.php

```
function display_login_form(){
    echo "
        <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN" "http://www.w3.org/TR/html4/strict.dtd">
        <html>
            <head>
                <title>Login form</title>
                <meta http-equiv="content-type" content="text/html; charset=utf-8">
            </head>
            <body>
                <form method="post" action="class.viewer.php?command_id=1">
                    <table border="0" cellpadding="0" cellspacing="0">
                        <tr>
                            <td>Login:</td>
                            <td><input type="text" name="log" size="20"></td>
                        </tr>
                        <tr>
                            <td>Heslo:</td>
                            <td><input type="password" name="pwd" size="20"></td>
                        </tr>
                        <tr>
                            <td colspan="2"><input type="submit" name="submit" value="Login"></td>
                        </tr>
                    </table>
                </form>
            </body>
        </html>
    ";
}
```



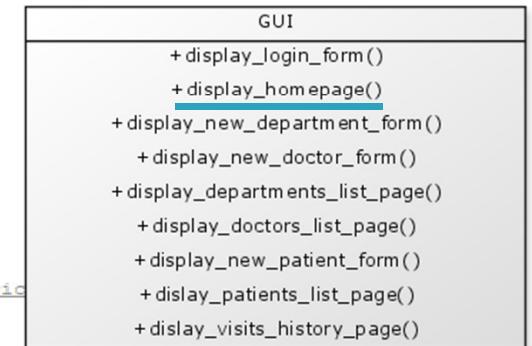
Implementation – login - class.viewer.php

```
function display_homepage($user_name, $user_department, $message){

    if (! $user_name){
        $menu = " ";
    }else{
        if ($user_department == 'admin'){
            $menu = "<a href=\"class.viewer.php?form_id=3\">Create new department</a> | "
                . "<a href=\"class.viewer.php?command_id=5\">Show departments list</a> | "
                . "<a href=\"class.viewer.php?form_id=4\">Create new doctor</a> | "
                . "<a href=\"class.viewer.php?command_id=6\">Show doctor list</a> <br><br>";
        }else{
            $menu = "<a href=\"class.viewer.php?form_id=5\">Register new patient</a> | "
                . "<a href=\"class.viewer.php?command_id=7\">Show patients list</a> <br><br>";
        }
    }

    echo "
        <!DOCTYPE HTML PUBLIC \"-//W3C//DTD HTML 4.01//EN\" \"http://www.w3.org/TR/html4/strict.dtd\">
        <html>
            <head>
                <title>Homepage</title>
                <meta http-equiv=\"content-type\" content=\"text/html; charset=utf-8\">
            </head>
            <body>
                "
                . $menu
                . $message . "
                    </body>
                </html>
            ";
}

}
```



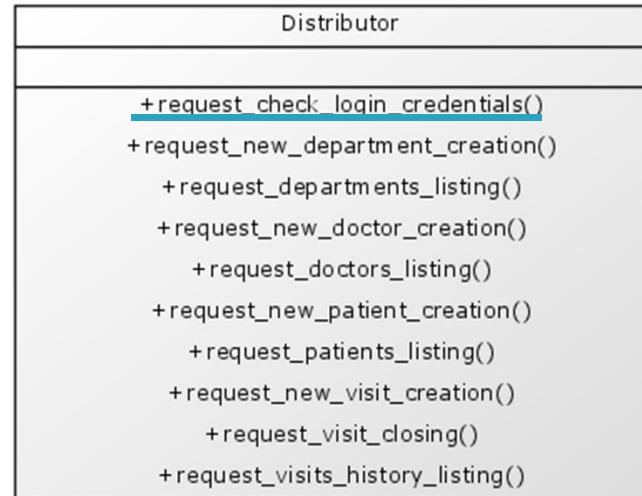
Implementation – login - class.distributor.php

```
<?php
include("class.user.php");

class distributor{

    function request_check_login_credentials($login, $password) {
        $current_user = new user();
        list($user_name, $user_department_name) = $current_user->db_check_login_credentials($login, $password);
        $_SESSION['user_name'] = $user_name;
        $_SESSION['user_department_name'] = $user_department_name;
    }
}

?>
```



Implementation – login - class.user.php

```
<?php

class user{

    function db_check_login_credentials($login, $password){
        $db= mysql_connect("localhost", "atoudmic", "euloc5ni" );
        if (!$db) {
            die(' Connection to database failed: ' . mysql_error());
        }
        mysql_query("SET CHARACTER SET utf8");
        mysql_select_db("atoudmic");

        $query = "SELECT user.user_name user_name, department.department_name department_name FROM user, department " .
            "WHERE user.user_department_id = department.department_id " .
            "AND user.user_login ='$login' " .
            "AND user.user_password = '$password' ";
        $rs = mysql_query($query);
        if (!$rs) {
            echo "Could not execute query: $query";
        }

        if ($row = mysql_fetch_assoc($rs)) {
            $user_name = $row['user_name'];
            $user_department_name = $row['department_name'];
            return array($user_name,$user_department_name);
        }else{
            return array(null, null);
        }
        mysql_close();
    }

}

?>
```

User
+ name
+ department
+ username
+ password
+ db_check_login_credentials()

Test – login

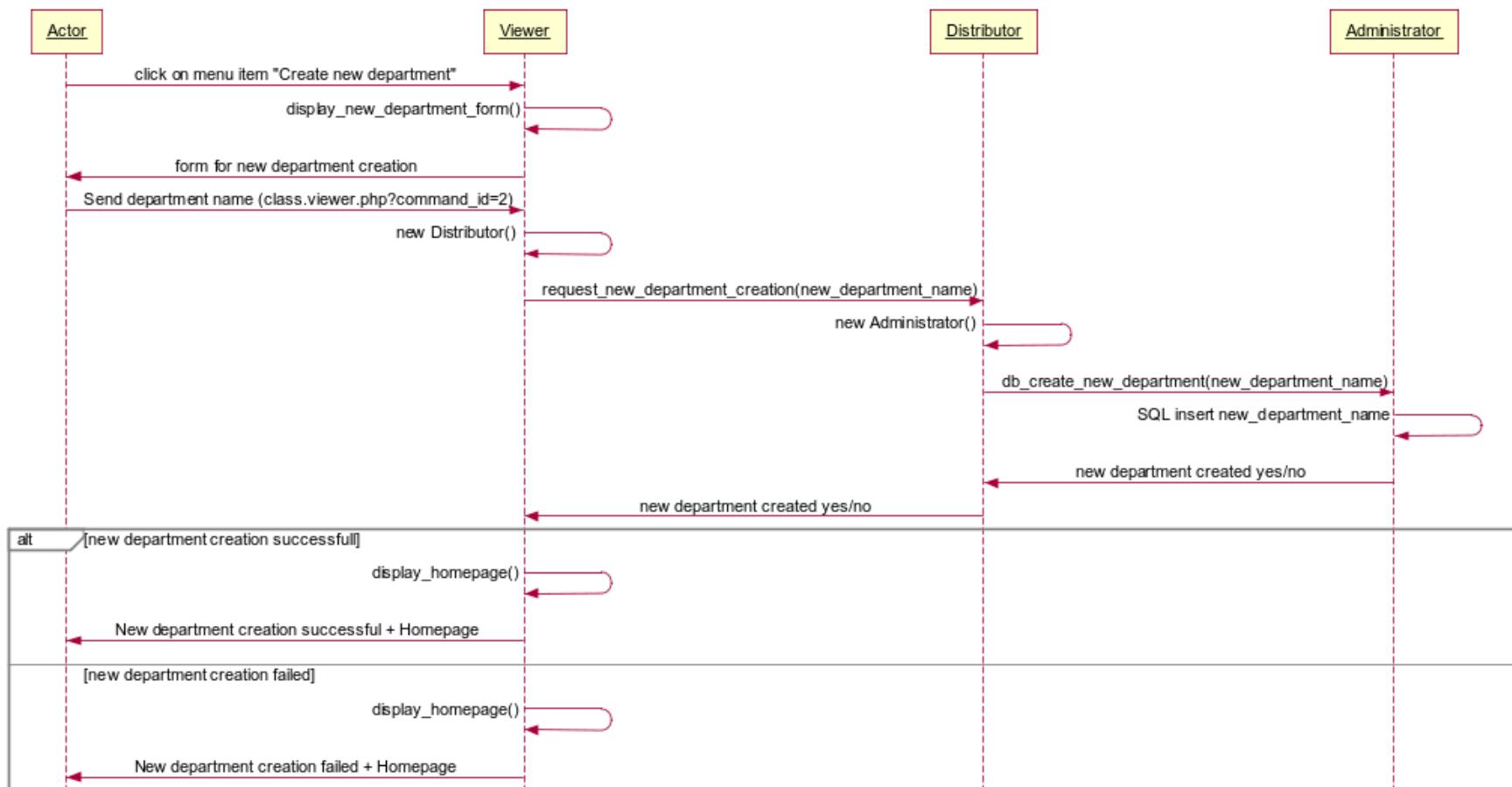
□ Prepare the database

- <http://databaze.fbmi.cvut.cz/mysql>
- CREATE TABLE user (user_id int AUTO_INCREMENT, user_name varchar(60), user_login varchar(60), user_password varchar(60), user_department_id int, PRIMARY KEY (user_id));
- INSERT INTO user (user_name, user_login, user_password, user_department_id) VALUES ('administrator', 'admin', 'admin', 1), ('MUDr. Pavel Janda', 'janda', 'janda', 2), ('MUDr. Jana Novakova', 'novakova', 'nova123', 2);
- CREATE TABLE department (department_id int AUTO_INCREMENT, department_name varchar(60), PRIMARY KEY (department_id));
- INSERT INTO department(department_name) VALUES ('admin'), ('pediatr')

□ Login as administrator or doctor

- http://databaze.fbmi.cvut.cz/yourlogin/class.viewer.php?form_id=1

Implementation – create new department – UML sequence diagram



```

?php
session_start();

include("class.distributor.php");

class viewer{
    function display_login_form(){
        function display_homepage($user_name, $user_department_name, $message){
            function display_new_department_form(){

                $form_id = $_REQUEST['form_id'];
                $command_id = $_REQUEST['command_id'];
                $login = $_REQUEST['log'];
                $password = $_REQUEST['pwd'];
                $new_department_name = $_REQUEST['new_department_name'];
                $user_name = $_SESSION['user_name'];
                $user_department_name = $_SESSION['user_department_name'];

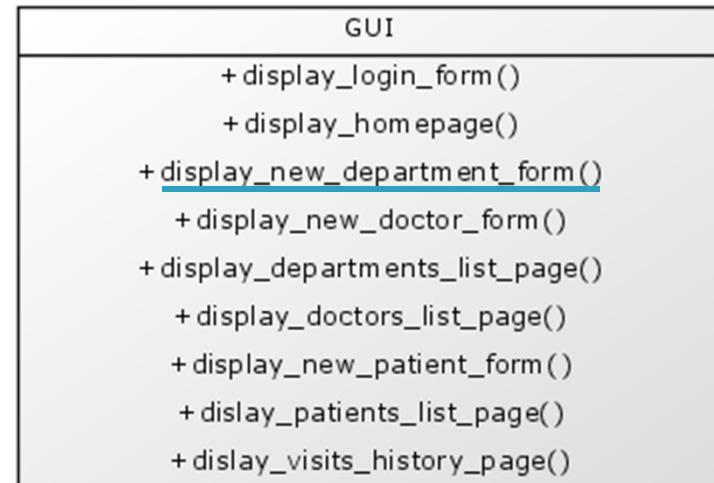
                $gui = new viewer();
                $distrib = new distributor();

                if ($form_id == 1){
                    $gui->display_login_form();
                }elseif ($form_id == 2){
                    $gui->display_homepage($user_name, $user_department_name, "");
                }elseif ($form_id == 3){
                    $gui->display_new_department_form();
                }

                if ($command_id == 1){ // log in
                    $distrib->request_check_login_credentials($login, $password);
                    $user_name = $_SESSION['user_name'];
                    $user_department_name = $_SESSION['user_department_name'];
                    if (! $user_name){
                        $message = "Login failed. Wrong username or password!";
                    }else{
                        $message = "Login successful. Homepage for <b>" . $user_name . "</b>, from department <b>" . $user_department_name . "</b><br><br>";
                    }
                    $gui->display_homepage($user_name, $user_department_name, $message);
                }elseif ($command_id == 2){ // create new department
                    $success = $distrib->request_new_department_creation($new_department_name);
                    if ( $success ){
                        $message = "Creation of a new department <b>" . $new_department_name . "</b> with success.";
                        $gui->display_homepage($user_name, $user_department_name, $message);
                    }else{
                        $message = "Creation of a new department <b>" . $new_department_name . "</b> failed!";
                        $gui->display_homepage($user_name, $user_department_name, $message);
                    }
                }
            }
        }
    }
}

```

Implementation – create new department – class.viewer.php



Implementation – create new department – class.viewer.php

```
function display_new_department_form(){
    echo "
        <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN" "http://www.w3.org/TR/html4/strict.dtd">
        <html>
            <head>
                <title>Department creation form</title>
                <meta http-equiv="content-type" content="text/html; charset=utf-8">
            </head>
            <body>
                <form method="post" action="class.viewer.php?command_id=2">
                    <table border="0" cellpadding="0" cellspacing="0">
                        <tr>
                            <td>Department name: </td>
                            <td><input type="text" name="new_department_name" size="20"></td>
                        </tr>
                        <tr>
                            <td colspan="2"><input type="submit" name="submit" value="Submit"></td>
                        </tr>
                    </table>
                </form>
            </body>
        </html>
    ";
}
```

GUI
+ display_login_form()
+ display_homepage()
+ <u>display_new_department_form()</u>
+ display_new_doctor_form()
+ display_departments_list_page()
+ display_doctors_list_page()
+ display_new_patient_form()
+ display_patients_list_page()
+ display_visits_history_page()

Implementation – create new department – class.distributor.php

```
<?php
include("class.user.php");
include("class.administrator.php");

class distributor{

    function request_check_login_credentials($login, $password) {
        $current_user = new user();
        list($user_name, $user_department_name) = $current_user->db_check_login_credentials($login, $password);
        $_SESSION['user_name'] = $user_name;
        $_SESSION['user_department_name'] = $user_department_name;
    }

    function request_new_department_creation($department_name) {
        $current_admin = new administrator();
        $success = $current_admin->db_create_new_department($department_name);
        return $success;
    }
}

?>
```

Distributor
+request_check_login_credentials() +request_new_department_creation() +request_departments_listing() +request_new_doctor_creation() +request_doctors_listing() +request_new_patient_creation() +request_patients_listing() +request_new_visit_creation() +request_visit_closing() +request_visits_history_listing()

Implementation – create new department – class.administrator.php

```
<?php

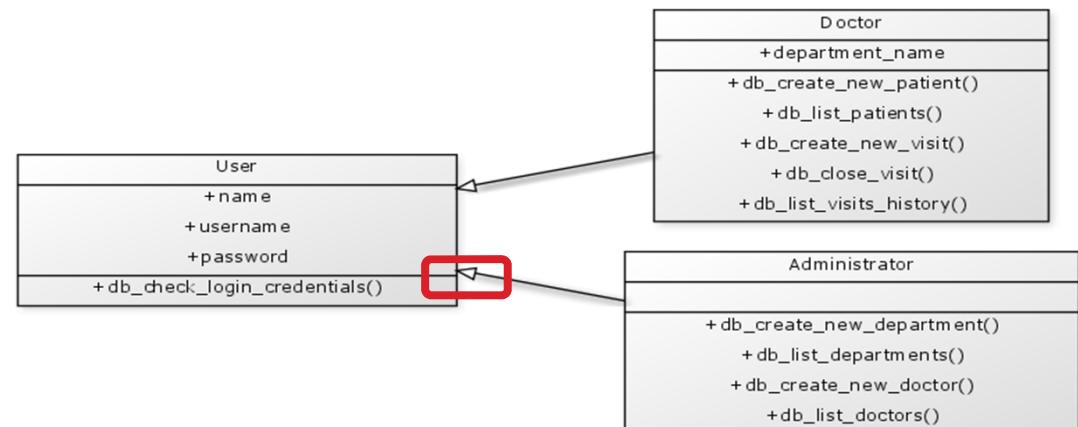
class administrator extends user{

    function db_create_new_department($department_name){
        $db= mysql_connect("localhost", "atoudmic", "euloo5ni");
        if (!$db) {
            die(' Connection to database failed: ' . mysql_error());
        }
        mysql_query("SET CHARACTER SET utf8");
        mysql_select_db("atoudmic");

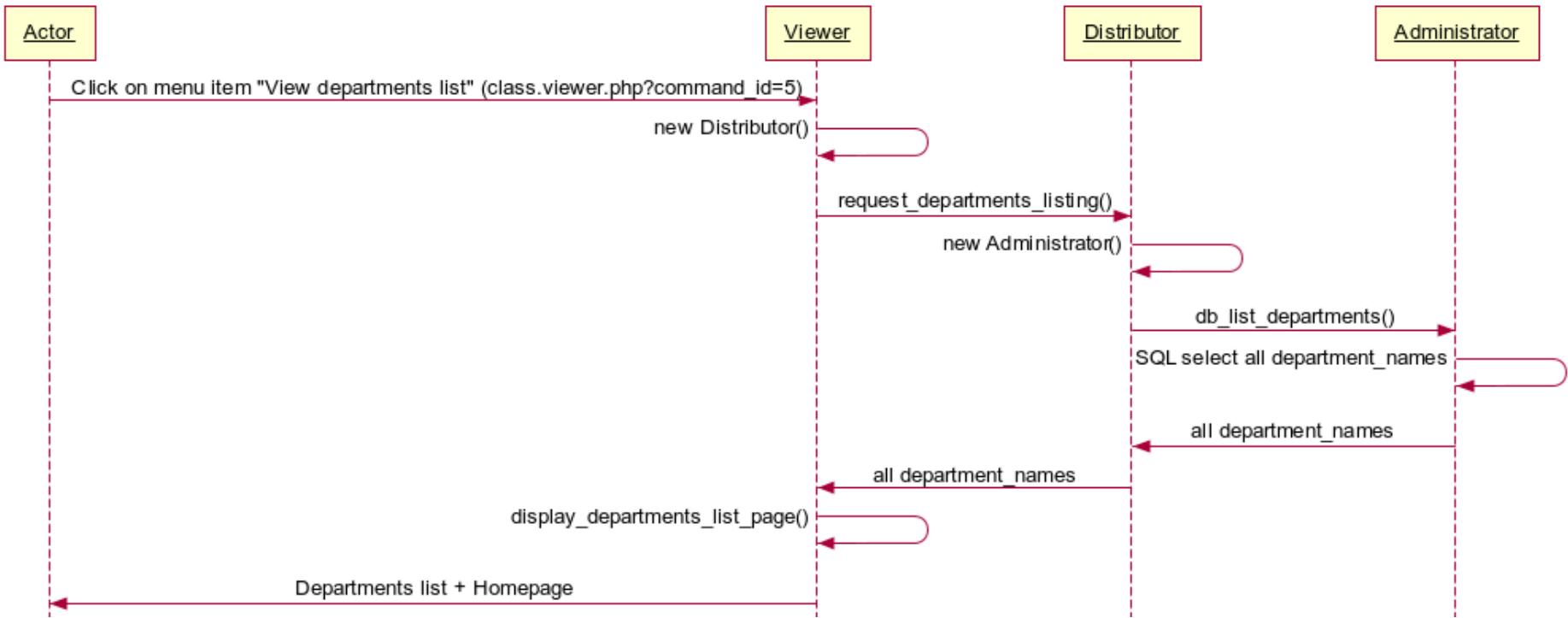
        $query = "INSERT INTO department (department_name) VALUES ('" . $department_name . "')";
        $rs = mysql_query($query);
        if (!$rs) {
            echo "Could not execute query: $query";
            return false;
        }else{
            return true;
        }
        mysql_close();
    }

}

?>
```



Implementation – view departments list – UML class diagram



Implementation – view departments list – class.viewer.php

```
<?php
    session_start();
    include("class.distributor.php");
    class viewer{
        function display_login_form(){
        }
        function display_homepage($user_name, $user_department, $message){
        }
        function display_new_department_form(){
        }
        function display_departments_list_page($departments){
        }

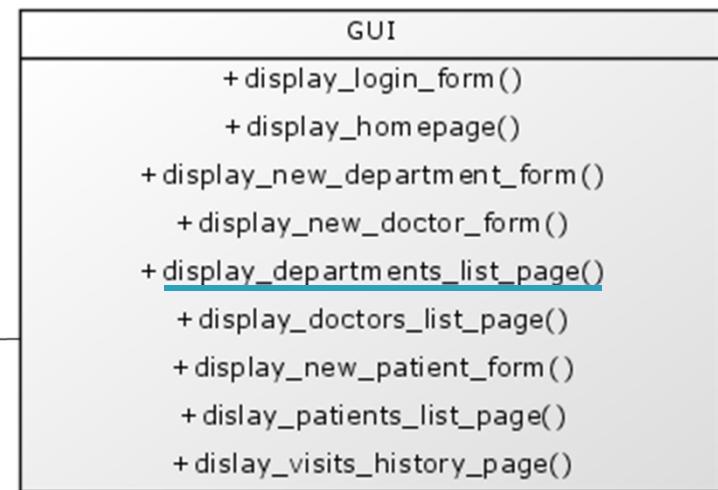
        $form_id = $_REQUEST['form_id'];
        $command_id = $_REQUEST['command_id'];
        $login = $_REQUEST['log'];
        $password = $_REQUEST['pwd'];
        $new_department_name = $_REQUEST['new_department_name'];
        $user_name = $_SESSION['user_name'];
        $user_department_name = $_SESSION['user_department_name'];

        $gui = new viewer();
        $distrib = new distributor();

        if ($form_id == 1){

            if ($command_id == 1){ // log in
                $distrib->request_check_login_credentials($login, $password);
                $user_name = $_SESSION['user_name'];
                $user_department_name = $_SESSION['user_department_name'];
                if (! $user_name){
                    $message = "Login failed. Wrong username or password!";
                }else{
                    $message = "Login successful. Homepage for <b>" . $user_name . "</b>, from department <b>" . $user_department_name . "</b><br><br>";
                }
                $gui->display_homepage($user_name, $user_department_name, $message);
            }elseif ($command_id == 2){ // create new department
                $success = $distrib->request_new_department_creation($new_department_name);
                if ( $success ){

                    elseif ($command_id == 5){ // view departments list
                        $departments = $distrib->request_departments_listing();
                        $departments_list_html = $gui->display_departments_list_page($departments);
                        $gui->display_homepage($user_name, $user_department_name, $departments_list_html);
                }
            }
        }
    }
}
```



Implementation – view departments list – class.viewer.php

```
function display_departments_list_page($departments) {
    $html = "
        <table border=\"1\" cellpadding=\"0\" cellspacing=\"0\">
            <tr>
                <td><b>Department name</b></td>
            </tr>
        ";
    while ($row = mysql_fetch_assoc($departments)) {
        $html = $html .
        "
            <tr>
                <td>" . $row['department_name'] . "</td>
            </tr>
        ";
    }
    $html = $html .
    "
        </table>
    ";
    return $html;
}
```

GUI
+ display_login_form()
+ display_homepage()
+ display_new_department_form()
+ display_new_doctor_form()
+ <u>display_departments_list_page()</u>
+ display_doctors_list_page()
+ display_new_patient_form()
+ display_patients_list_page()
+ display_visits_history_page()

Implementation – view departments list – class.distributor.php

```
<?php
include("class.user.php");
include("class.administrator.php");

class distributor{

    function request_check_login_credentials($login, $password){
        $current_user = new user();
        list($user_name, $user_department_name) = $current_user->db_check_login_credentials($login, $password);
        $_SESSION['user_name'] = $user_name;
        $_SESSION['user_department_name'] = $user_department_name;
    }

    function request_new_department_creation($department_name){
        $current_admin = new administrator();
        $success = $current_admin->db_create_new_department($department_name);
        return $success;
    }

    function request_departments_listing(){
        $current_admin = new administrator();
        $departments = $current_admin->db_list_departments();
        return $departments;
    }
}

?>
```

Distributor
+request_check_login_credentials() +request_new_department_creation() +request_departments_listing() +request_new_doctor_creation() +request_doctors_listing() +request_new_patient_creation() +request_patients_listing() +request_new_visit_creation() +request_visit_closing() +request_visits_history_listing()

Implementation – view departments list – class.administrator.php

```
<?php
```

```
class administrator extends user{

    function db_create_new_department($department_name){

        function db_list_departments(){
            $spojeni= mysql_connect("localhost", "atoudmic", "") ;
            if (!$spojeni) {
                die(' Pripojení k databázi neúspěšné: ' . mysql_error());
            }
            mysql_query("SET CHARACTER SET utf8;");
            mysql_select_db("atoudmic");

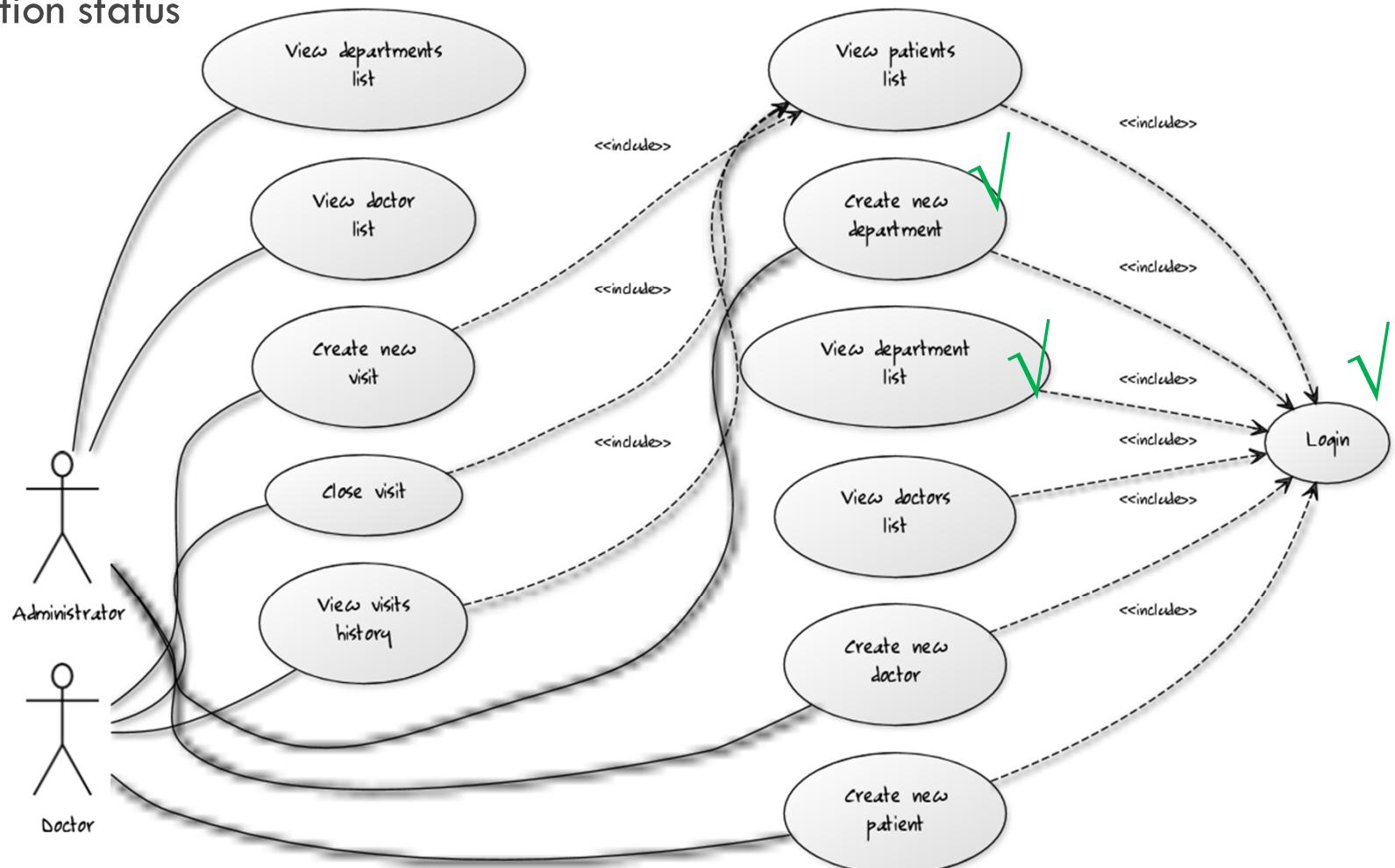
            $query = "SELECT department_name FROM department";
            $rs = mysql_query($query);
            if (!$rs) {
                echo "Could not execute query: $query";
                return false;
            }else{
                return $rs;
            }

            mysql_close();
        }

    }
}
```

```
?>
```

Implementation status



Syllabus of lectures and tutorials

		Lectures (45 min)	Tutorials (45 min)
Lesson 1	Sep 30	Medical Informatics and IS definition	OpenEMR
Lesson 2	Oct 7	HW infrastructure of IS	OpenEMR
Lesson 3	Oct 14	Operation systems	GaiaEHR
Lesson 4	Oct 21	Databases of IS	SQL
Lesson 5	Oct 28		
Lesson 6	Nov 4	Clinical oriented IS	SQL
Lesson 7	Nov 11	Decision support systems Medical data coding	OpenMRS
Lesson 8	Nov 18	Phase and IS development principles	UML
Lesson 9	Nov 25	Standard implementation methodology	Programing in HTML and PHP
Lesson 10	Dec 2	Standard implementation methodology	Programing in PHP and MySQL
Lesson 11	Dec 9	Data and communication standards	OpenMRS
Lesson 12	Dec 16	Final exam	
Lesson 13	Jan 20	Presentation of practical project	

Requirements for grade

- Attendance to ALL lessons
 - In case of non-attendance, provide a valid reason
- 30 points from homework
 - 1 homework per week
 - 3 points per homework
 - The homework is an essay about the topics covered in the lecture
- 20 points from practical projects
 - 4 points for analyzing your own information system
 - 10 points for implementing your own information system
 - 4 points for testing your own information system
 - 2 points for presenting your own information system
- 50 points from final exam
 - 30 points about the lectures
 - 20 points about the tutorials