

**Mestrado em Engenharia
Eletrotécnica e de Computadores**

Sistemas de Informação e Bases de Dados

Project (Part3) Report

Group 21

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Expected Results

1. Search patient name

In this question it was asked to create a set of web pages to search for a patient, list all results and give the possibility to add a new patient if no search results were obtained.

Image 1 contains the screenshot of the first page created. It contains a text field, in which the user can insert a search term.

Healthcare Center

Search patient by name

Name:

Image 1 - Form to search the patient by name or portion of the name

When the Submit button on the form of *Image 1* is pressed, a query is performed to get all names that match the name provided by the user. If any results are retrieved, they are presented to the user in a table, as seen on *Image 2*.

Search results

Results for: Edu

Name	Studies	Regions
Eduarda Gonçalves	<input type="button" value="Add study"/>	<input type="button" value="Add region"/>

Image 2 - Example of a positive result for a name search

On the other hand, if there aren't any patients that match the user input, an additional form is presented, in which the user can insert a new patient into the healthcare system, as seen in *Image 3*.

Search results

Results for: João

No patient was found!

Add a new patient

Number (ID):

Name:

Birthday:

Address:

Image 3 - Example of a negative result for a name search. Form to register new patient.

When the submit button of *Image 3* is pressed, the information gathered in that form is used to create a new patient. *Image 4* contains the output if the insertion is successful and *Image 5* shows the output if an error occurred and the user isn't added to the system.

Adding a new patient

SUCCESS: Patient added successfully!

Patient info:

Number (ID):	133
Name:	Leonor Marques
Birthday:	1992-02-06
Address:	Lisboa

Image 4 - Result web page after adding a new patient

Adding a new patient

An error occurred! The patient was not added!

Image 5 - Result web page if new patient can't be added

The php files created to perform this question are now attached. The file **db.php** contains the code needed to return a new PDO (php data object), which will be used to connect to the database. This file is used in all the questions, but it's content will only be presented once, to reduce the report size. The file **index.php** produces the form visible on *Image 1*. *Images 2* and *3* are produced by the **search_patient.php** file. The form present on *Image 3* is obtained with **new_patient.php**. When submitting the data, the file **insert_patient.php** will be responsible to insert the new patient in the database and display a page similar to *Image 4* or *5*.

FILE: db.php

```
<?php
    $host = 'db.tecnico.ulisboa.pt';
    $user = 'ist181013';
    $pass = 'yq406999';

    $dsn = "mysql:host=$host;dbname=$user";

    try {
        return new PDO($dsn, $user, $pass);
    } catch(PDOException $ex) {
        echo("<p>ERROR: " . $ex->getMessage() . "</p>");
        exit();
    }
}
```

FILE: index.php

```
<!DOCTYPE html>
<html>
    <head>
        <title>Patient search</title>
    </head>
    <body>
        <h1>Healthcare Center</h1>
        <h2>Search patient by name</h2>
        <form action="search_patient.php" method="post">
            <p>Name: <input type="text" name="patient_name"></p>
            <p><input type="submit" value="Submit"></p>
        </form>
    </body>
</html>
```

FILE: search_patient.php

```
<!DOCTYPE html>
<html>
  <head>
    <title>Patient search results</title>
  </head>
  <body>
    <h2>Search results</h2>
    <?php
      $patient_name = (empty($_REQUEST['patient_name']) ? '' :
$_REQUEST['patient_name']);
      $connection = require_once('db.php');
      $stmt = $connection->prepare("SELECT number, name FROM Patient WHERE name
LIKE :pat_name");
      echo("<h4>Results for: $patient_name </h4>");
      $patient_name = '%'.$patient_name.'%';
      $stmt->bindParam(':pat_name', $patient_name);
      if ( !$stmt->execute() ) {
        echo("<p>An error occurred!</p>");
        exit();
      }
      if ($stmt->rowCount() > 0 ) {
        echo("<table border=1 cellpadding='5'>");

echo("<thead><tr><th>Name</th><th>Studies</th><th>Regions</th></tr></thead>");
        foreach($stmt as $patient) {
          echo("<tr><td><a
href='patient_details.php?pat_id=".$patient['number']."'>".$patient['name']."'</a
></td>");
          echo("<td><form action='list_requests.php' method ='post'>");
          echo("<input type='hidden' name='patient_id'
value='".$patient['number']."'>");
          echo("<input type='submit' value='Add study'>");
          echo("</form></td>");
          echo("<td><form action='list_series.php' method ='post'>");
          echo("<input type='hidden' name='patient_number'
value='".$patient['number']."'>");
          echo("<input type='submit' value='Add region'>");
          echo("</form></td></tr>");
        }
        echo("</table>");
      } else {
        echo("<p>No patient was found!</p>");
        include('new_patient.php');
      }
      $connection = NULL;
    ?>
  </body>
</html>
```

FILE: new_patient.php

```
<!DOCTYPE html>
<html>
  <body>
    <h3>Add a new patient</h3>
    <form action="insert_patient.php" method="post">
      <table>
        <tr>
          <td align='right'>Number (ID):</td>
          <td><input type="text" name="new_patient_number"></td>
        </tr>
        <tr>
          <td align='right'>Name:</td>
          <td><input type="text" name="new_patient_name"></td>
        </tr>
        <tr>
          <td align='right'>Birthday:</td>
          <td><input type="date" name="new_patient_birthday"></td>
        </tr>
        <tr>
          <td align='right'>Address:</td>
          <td><input type="text" name="new_patient_address"></td>
        </tr>
      </table>
      <p><input type="submit" value="Submit"></p>
    </form>
  </body>
</html>
```

FILE: insert_patient.php

```
<!DOCTYPE html>
<html>
  <head>
    <title>Adding a new patient</title>
  </head>
  <body>
    <h2>Adding a new patient</h2>
    <?php
      if ( empty($_REQUEST['new_patient_name']) ||
empty($_REQUEST['new_patient_number']) ||
empty($_REQUEST['new_patient_birthday']) ||
empty($_REQUEST['new_patient_address']) ) {
        // Invalid request / user directly opened file.
        echo("<p>ERROR: Patient info must be provided on the
request!</p>");
      } else {
        // Request with all required parameters was made
        $new_patient_number = $_REQUEST['new_patient_number'];
        $new_patient_name = $_REQUEST['new_patient_name'];
        $new_patient_birthday = $_REQUEST['new_patient_birthday'];
        $new_patient_address = $_REQUEST['new_patient_address'];
```

```

        $connection = require_once('db.php');
        $stmt = $connection->prepare("INSERT INTO Patient VALUES(:id,
:name, :birthday, :address)");
        $stmt->bindParam(':id', $new_patient_number);
        $stmt->bindParam(':name', $new_patient_name);
        $stmt->bindParam(':birthday', $new_patient_birthday);
        $stmt->bindParam(':address', $new_patient_address);

        if ( $stmt->execute() ) {
            // Patient added
            echo("<p>SUCCESS: Patient added successfully!</p>");
            echo("<p>Patient info:</p>");
            echo("<table border=1>");
            echo("<tr><td align='right'>Number
(ID):</td><td>$new_patient_number</td></tr>");
            echo("<tr><td
align='right'>Name:</td><td>$new_patient_name</td></tr>");
            echo("<tr><td
align='right'>Birthday:</td><td>$new_patient_birthday</td></tr>");
            echo("<tr><td
align='right'>Address:</td><td>$new_patient_address</td></tr>");
            echo("</table>");
        } else {
            // Failed to insert a patient
            echo("<p>An error occurred! The patient was not added!</p>");
        }
        // Close connection
        $connection = NULL;
    }
    ?>
</body>
</html>

```

2. Changing the devices currently attached to a patient

On this question the user is able to change the device worn by a certain patient. He might be confronted with 3 situations: there are one or more devices currently being used by a certain patient, there aren't any devices in this patient's history or he used devices in the past but none is currently being used.

Users can select a patient by clicking on his/her name, as shown on *Image 2*. If the patient selected has never used a device nor is currently using one, a web page like the one present on *Image 6* is shown.

Patient details

The patient doesn't wear or worn any devices!

Image 6 - Web page if the selected patient does not have any attached devices neither had one before.

If there are any devices in use, the situation will be the following (*Image 7*). There is a button for each device in use and by clicking on it we are choosing the device that is going to be replaced. There is also a list of previously worn devices in "Device History" section.

Patient details

Currently worn devices:

Manufacturer	Serial Number	Start	End	Replace
Philips Healthcare	5899700	2017-11-27 10:52:39	2017-12-04 17:33:23	Replace
Philips Healthcare	80218251	2017-11-27 09:48:09	2017-12-04 17:33:23	Replace

Device history:

Manufacturer	Serial Number	Start	End
Philips Healthcare	1938116	2017-11-28 00:27:14	2017-11-28 13:02:18
Philips Healthcare	1524578	2017-11-27 09:40:51	2017-11-27 09:44:16
Philips Healthcare	50524548	2017-06-04 12:43:54	2017-10-17 13:34:28

Image 7- Result web page if the given patient is currently wearing devices. Button to replace these devices. Worn devices are listed in "Device history"

After choosing the device to be replaced, a table will be presented (*Image 8*) containing all the available devices of the same manufacturer as the one in use. If there are no devices available to replace the one currently being used, the situation will be the one on *Image 9*.

Device replacement

Devices available:

Manufacturer	Serial Number	Model	Replace
Philips Healthcare	1524578	DSUOQPXGQU	Replace
Philips Healthcare	1938116	BHWLDQLEZQ	Replace
Philips Healthcare	3089614	VCIRDPUBUC	Replace
Philips Healthcare	45770515	ZOUGGOKXHD	Replace
Philips Healthcare	50524548	LDEZBYTBXL	Replace
Philips Healthcare	66388554	PQRXBBZWFM	Replace
Philips Healthcare	93396993	TVOSQNALVT	Replace
Philips Healthcare	96004656	HZOKPNCOET	Replace

Image 8 - Result web page showing the current available devices. Button to replace current device with selected available device.

Device replacement

There isn't any device available!

Image 9 - Result web page if there isn't any device available.

By pressing one of the “Replace” buttons, the user selects which one of the available devices will replace the current one. The device exchange will occur and if everything goes ok then a confirmation message will be presented (*Image 10*).

Device replacement

Device changed!

Image 10 - Result web page after a successfully replacement.

The php files for this question are now listed. When the user clicks the patient's name the file `patient_details.php` will render a page as seen on *Image 6* (if no devices related to that patient were found) or a page as seen on *Image 7* (if there are devices attached to the patient). It also saves the `patient_id` in a session variable, which will be used later on. If the "Replace" button on *Image 7* is pressed, then `available_devices.php` will query the database for all the devices that can be used as a replacement and list them (*Image 8*), or show a message alerting that no devices are available (*Image 9*). By clicking the "Replace" button on *Image 8*, the file `replace_device.php` will replace the device chosen on *Image 7* with the one selected on *Image 8*. If the exchange is successful, then a message like the one on *Image 10* is presented on the browser. If an error occurs, then an error message is shown.

FILE: `patient_details.php`

```
<!DOCTYPE html>
<html>
  <head>
    <title>Patient details</title>
  </head>
  <body>
    <h2>Patient details</h2>
    <?php
      session_start();
      if (isset($_REQUEST['pat_id'])) {
        $patient_id = $_REQUEST['pat_id'];
        // Save patient id in a session variable
        $_SESSION['patient_id'] = $patient_id;
        $connection = require_once('db.php');
        $stmt = $connection->prepare("SELECT manuf, snum, start, end FROM
Wears WHERE patient=:pat_id ORDER BY start DESC");
        $stmt->bindParam(':pat_id', $patient_id);
        if ($stmt->execute() ) {
          if ($stmt->rowCount() > 0 ) {
            // Store all worn devices.
            $notInUse = [];
            echo("<h3>Currently worn devices:</h3>");
            echo("<table border=1 cellpadding='5'>");
            echo("<thead><tr><th>Manufacturer</th><th>Serial
Number</th><th>Start</th><th>End</th><th>Replace</th></tr></thead>");
            foreach ($stmt as $row) {
              if (time() < strtotime($row['end']) and time() >
strtotime($row['start'])) {
                //currently using device
                echo("<tr><td>".$row['manuf']. "</td>");
                echo("<td>".$row['snum']. "</td>");
                echo("<td>".$row['start']. "</td>");
                echo("<td>".$row['end']. "</td>");
                echo("<td><form action='available_devices.php'
method = 'post'>");
                echo("<input type='hidden' name='manufacturer'
value='".$row['manuf']."'>");
                echo("<input type='hidden' name='serialnumber'
value='".$row['snum']."'>");
```

```

        echo("<input type='hidden' name='time_start'
value='\".$row['start'].\"'/>");
        echo("<input type='hidden' name='time_end'
value='\".$row['end'].\"'/>");
        echo("<input type='submit' value='Replace'/>");
        echo("</form></td></tr>");
    } else {
        //worn in the past, must be printed only after
all others
        array_push($notInUse, $row);
    }
}
echo("</table>");
echo("<h4>Device history:</h4>");
// print all worn devices
echo("<table border=1 cellpadding='5'>");
echo("<thead><tr><th>Manufacturer</th><th>Serial
Number</th><th>Start</th><th>End</th></tr></thead>");
    foreach ($notInUse as $row) {

echo("<tr><td>\".$row['manuf'].\"</td><td>\".$row['snum'].\"</td><td>\".$row['start']
.\"</td><td>\".$row['end'].\"</td></tr>");
    }
    echo("</table>");
} else {
    echo("<p>The patient doesn't wear or worn any
devices!</p>");
}
} else {
    echo("<p>An error occurred!</p>");
    exit();
}
// close connection
$connection = NULL;
} else {
    echo("<p>No patient ID was given!</p>");
}
?>
</body>
</html>

```

FILE: available_devices.php

```

<!DOCTYPE html>
<html>
    <head>
        <title>Device replacement</title>
    </head>
    <body>
        <h2>Device replacement</h2>
        <?php
            session_start();

```

```

        if (isset($_REQUEST['manufacturer'], $_REQUEST['serialnumber'],
$_REQUEST['time_start'], $_REQUEST['time_end'])) {
            $manufacturer = $_REQUEST['manufacturer'];
            // save some info in session variables
            $_SESSION['manufacturer'] = $manufacturer;
            $_SESSION['old_snum'] = $_REQUEST['serialnumber'];
            $_SESSION['time_start'] = $_REQUEST['time_start'];
            $_SESSION['time_end'] = $_REQUEST['time_end'];
            $connection = require_once('db.php');
            $stmt = $connection->prepare('SELECT serialnum, model FROM Device
WHERE manufacturer = :manuf AND serialnum NOT IN(SELECT snum FROM Wears WHERE
Wears.manuf = :manuf AND NOW() BETWEEN Wears.start AND Wears.end)');
            $stmt->bindParam(':manuf', $manufacturer);
            if ($stmt->execute() ) {
                if ($stmt->rowCount() > 0) {
                    //List all alternatives
                    echo("<h3>Devices available:</h3>");
                    echo("<table border=1 cellpadding='5'>");
                    echo("<thead><tr><th>Manufacturer</th><th>Serial
Number</th><th>Model</th><th>Replace</th></tr></thead>");
                    foreach ($stmt as $row) {
                        echo("<tr><td>".$manufacturer."</td>");
                        echo("<td>".$row['serialnum']."</td>");
                        echo("<td>".$row['model']."</td>");
                        echo("<td><form action='replace_device.php' method
='post'>");
                        echo("<input type='hidden' name='new_snum'
value='".$row['serialnum']."'>");
                        echo("<input type='submit' value='Replace'/>");
                        echo("</form></td></tr>");
                    }
                    echo("</table>");
                } else {
                    // No alternatives available!
                    echo("<p>There isn't any device available!</p>");
                }
            } else {
                echo("<p>An error occurred!</p>");
                exit();
            }
        } else {
            echo("<p>No information [manufacturer] was given!</p>");
        }
    }
?>
</body>
</html>

```

FILE: replace_device.php

```
<!DOCTYPE html>
<html>
  <head>
    <title>Device replacement</title>
  </head>
  <body>
    <h2>Device replacement</h2>
    <?php
      session_start();
      if (isset($_SESSION['patient_id'], $_SESSION['manufacturer'],
$_SESSION['time_start'], $_SESSION['time_end'], $_SESSION['old_snum'],
$_REQUEST['new_snum']) ) {
        $patient = $_SESSION['patient_id'];
        $manufacturer = $_SESSION['manufacturer'];
        $old_serialnum = $_SESSION['old_snum'];
        $new_serialnum = $_REQUEST['new_snum'];
        $start_time = $_SESSION['time_start'];
        $end_time = $_SESSION['time_end'];
        $connection = require_once('db.php');
        $current_time = date('Y-m-d H:i:s');
        $connection->beginTransaction();
        $stmtPeriod = $connection->prepare("INSERT INTO Period
VALUES(:start, :end)");
        // Create a new period (start_time, current_time)
        if ( !$stmtPeriod->execute([':start' => $start_time, ':end' =>
$current_time]) ) {
          echo("<p>An error occurred!</p>");
          $connection->rollback();
          $connection = NULL;
          exit();
        }
        // Create a new period (current_time, end_time)
        if ( !$stmtPeriod->execute([':start' => $current_time, ':end' =>
$end_time]) ) {
          echo("<p>An error occurred!</p>");
          $connection->rollback();
          $connection = NULL;
          exit();
        }
        // Update entry
        $stmtUpdate = $connection->prepare("UPDATE Wears SET end =
:current_time WHERE Wears.end = :end AND Wears.start = :start AND patient =
:pat_id");
        $stmtUpdate->bindParam(':current_time', $current_time);
        $stmtUpdate->bindParam(':end', $end_time);
        $stmtUpdate->bindParam(':start', $start_time);
        $stmtUpdate->bindParam(':pat_id', $patient);
        if ( !$stmtUpdate->execute() ) {
          echo("<p>An error occurred!</p>");
          $connection->rollback();
          $connection = NULL;
          exit();
        }
      }
    }
  </body>
</html>
```

```

        // create a new wear entry
        $stmtInsert = $connection->prepare("INSERT INTO Wears VALUES
(:start, :end, :patient, :snum, :manuf)");
        $stmtInsert->bindParam(':start', $current_time);
        $stmtInsert->bindParam(':end', $end_time);
        $stmtInsert->bindParam(':patient', $patient);
        $stmtInsert->bindParam(':snum', $new_serialnum);
        $stmtInsert->bindParam(':manuf', $manufacturer);
        if ( !$stmtInsert->execute() ) {
            echo("<p>An error occurred!</p>");
            $connection->rollback();
            $connection = NULL;
            exit();
        }
        $connection->commit();
        // unset session variables
        session_unset();
        $connection = NULL;
        echo("<p>Device changed!</p>");
    } else {
        echo("<p>No information [patient, manufacturer, serial number,
time] was received!</p>");
    }
    ?>
</body>
</html>

```

3. Creating a new study and series

In this topic the goal is to create a new study and series associated with a certain patient. That study will have to be associated with an existing request for that patient, therefore, by adding a study to a patient we will be presented a table with the available requests associated to that patient. By clicking the “Add Study” button (*Image 2*), it will be presented a requests list, where the user can choose the one in which the study will be inserted (*Image 11*).

Available requests

Request	
Request 5	Select
Request 7	Select
Request 10	Select

Image 11 - Result web page showing the existing Requests for selected Patient.

There might exist some patients with no requests associated. If that is the case, then the page presented is the following (*Image 12*):

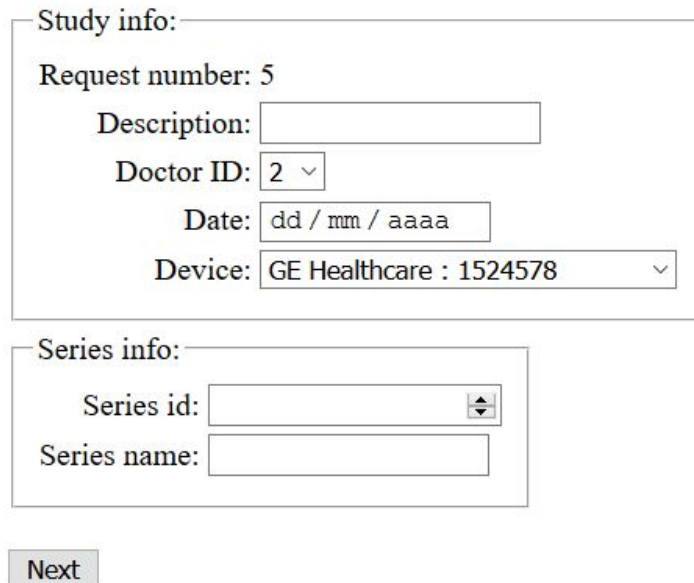
Available requests

No requests are available!

Image 12 - Result web page when the given Patient has no existing Requests.

By selecting the request in which the study/series will be inserted, we will arrive to the page presented in *Image 13*. At this point, the user will be asked for a description of the study being created and choose a doctor between the available ones (all but the one who created the request). This will reduce the chances of errors upon inserting the study. A new series will also be specified by the user.

Add a new study on request 5



The form is divided into two main sections: 'Study info' and 'Series info'. The 'Study info' section contains fields for 'Request number' (set to 5), 'Description' (text input), 'Doctor ID' (dropdown menu showing '2'), 'Date' (text input with format 'dd / mm / aaaa'), and 'Device' (dropdown menu showing 'GE Healthcare : 1524578'). The 'Series info' section contains fields for 'Series id' (dropdown menu) and 'Series name' (text input). A 'Next' button is located below the 'Series info' section.

Image 13 - Form to create a new study and series

The insertion will occur successfully (as depicted in *Image 14*) if the following criteria are met: the pair *[request, description]* specified is non existent in the database; the attribute *series_id* is unique in the Series table. Otherwise the insertion will not take place and an alert will be shown (*Image 15*).

Creation of a new study

Results

Study created!

Image 14 - Result web page after creating the new study

Creation of a new study

Results

An error occurred!

Study not created!

Image 15 - Result web page if creating a new study is not possible

By pressing the “Add study” button for a given patient (result of the search started on the homepage - *Image 2*), his information is carried to the `list_requests.php` that queries the database for all the possible requests. By selecting one of the request buttons, the user is presented with `new_study.php` that shows a *form* to be filled with the required information. After submitting it, the result to this last action is given by `create_study.php` that shows the user whether the submission was successful or not.

FILE: `list_requests.php`

```
<!DOCTYPE html>
<html>
  <head>
    <title>List requests</title>
  </head>
  <body>
    <h2>Available requests</h2>
    <?php
      if(isset($_REQUEST['patient_id'])){
        $patient_id = $_REQUEST['patient_id'];
        $connection = require_once('db.php');
        $stmt = $connection->prepare("SELECT number FROM Request WHERE
patient_id = :patient_id ORDER BY number");
        $stmt->bindParam(':patient_id', $patient_id);
        if ( !$stmt->execute() ) {
          echo("<p>An error occurred!</p>");
          exit();
        }
        if ($stmt->rowCount() > 0 ) {
          echo("<table border=1 cellpadding='5'>");
          echo("<thead><tr><th>Request</th><th></th></tr></thead>");
          foreach ($stmt as $row) {
            echo("<tr><td>Request ".$row['number']."</td>");
            echo("<td><form action='new_study.php' method ='post'>");
            echo("<input type='hidden' name='request_id'
value='".$row['number']."'>");
            echo("<input type='submit' value='Select'>");
            echo("</form></td></tr>");
          }
          echo("</table>");
        } else {
          echo("<p>No requests are available!</p>");
        }
        $connection = NULL;
      }
      else{
        echo("<h1>No Patient was specified</h1>");
      }
    ?>
  </body>
</html>
```

FILE: new_study.php

```
<!DOCTYPE html>
<html>
  <head>
    <title>Add a study</title>
  </head>
  <body>
<?php
  if (empty ($_REQUEST['request_id']) ) {
    echo("<p>ERROR: A request id must be provided!</p>");
    exit();
  } else {
    $request_id = $_REQUEST['request_id'];
    $connection = require_once('db.php');
    $stmt = $connection->prepare("SELECT doctor_id FROM Doctor WHERE
doctor_id NOT IN (SELECT doctor_id FROM Request WHERE number=:req_num) ORDER BY
doctor_id");
    $stmt->bindParam(':req_num', $request_id);
    if ( !$stmt->execute() ) {
      echo("<p>An error occurred!</p>");
      exit();
    }
    $available_doctors = [];
    foreach($stmt as $row) {
      array_push($available_doctors, $row['doctor_id']);
    }
    $stmt = $connection->prepare("SELECT serialnum, manufacturer FROM Device
ORDER BY manufacturer");
    if ( !$stmt->execute() ) {
      echo("<p>An error occurred!</p>");
      exit();
    }
    $available_devices = [];
    foreach($stmt as $row) {
      array_push($available_devices,
array('manufacturer'=>$row["manufacturer"], 'serialnum'=>$row['serialnum']));
    }
    $connection = NULL;
  }
?>

  <h2>Add a new study on request <?=$_REQUEST['request_id']?></h2>
  <form action="create_study.php" method="post">
    <fieldset style="display: inline-block">
      <legend>Study info:</legend>
      <table>
        <tr>
          <td align='right'>Request number:</td>
          <td>
            <?=$_REQUEST['request_id']?>
            <input type='hidden' name='request_id'
value='<?=$_REQUEST['request_id']?>'>
          </td>
        </tr>
        <tr>
```

```

        <td align='right'>Description:</td>
        <td><input type="text" name="description"></td>
    </tr>
    <tr>
        <td align='right'>Doctor ID:</td>
        <td>
            <select name="doctor_id">
                <?php
                    foreach( $available_doctors as $doctor) {
                        echo("<option
value=".$doctor.">$doctor</option>");
                    }
                ?>
            </select>
        </td>
    </tr>
    <tr>
        <td align='right'>Date:</td>
        <td><input type="date" name="date"></td>
    </tr>
    <tr>
        <td align='right'>Device:</td>
        <td>
            <select name="device">
                <?php
                    foreach( $available_devices as $device) {
                        $strjson =
"value='".json_encode($device)."'";
                        echo("<option
".$strjson.">".$device['manufacturer'].": ".$device['serialnum']."</option>" );
                    }
                ?>
            </select>
        </td>
    </tr>
</table>
</fieldset>
<br>
<fieldset style="display: inline-block">
<legend>Series info:</legend>
<table>
    <tr>
        <td align='right'>Series id:</td>
        <td><input type="number" name="series_id"></td>
    </tr>
    <tr>
        <td align='right'>Series name:</td>
        <td><input type="text" name="series_name"></td>
    </tr>
</table>
</fieldset>
<p><input type="submit" value="Next"></p>
</form>
</body>

```

```
</html>
```

FILE: create_study.php

```
<!DOCTYPE html>
```

```
<html>
```

```
  <head>
```

```
    <title>Study creation</title>
```

```
  </head>
```

```
  <body>
```

```
    <h2>Creation of a new study</h2>
```

```
    <h3>Results</h3>
```

```
<?php
```

```
  if ( empty($_REQUEST['request_id']) || empty($_REQUEST['description']) ||  
empty($_REQUEST['doctor_id']) || empty($_REQUEST['date']) ||  
empty($_REQUEST['device']) || empty($_REQUEST['series_id']) ||  
empty($_REQUEST['series_name']) ) {
```

```
    echo("<p>ERROR: Insuficient information provided!</p>");
```

```
    exit();
```

```
  } else {
```

```
    $description = $_REQUEST['description'];
```

```
    $doctor_id = $_REQUEST['doctor_id'];
```

```
    $date = $_REQUEST['date'];
```

```
    $device = json_decode($_REQUEST['device'], true);
```

```
    $series_id = $_REQUEST['series_id'];
```

```
    $series_name = $_REQUEST['series_name'];
```

```
    $request_id = $_REQUEST['request_id'];
```

```
    $connection=require_once('db.php');
```

```
    $connection->beginTransaction();
```

```
    $stmtStudy = $connection->prepare("INSERT INTO Study VALUES(:req_num,  
:desc, :date, :doctor_id, :manuf, :snum)");
```

```
    $stmtStudy->bindParam(':req_num', $request_id);
```

```
    $stmtStudy->bindParam(':desc', $description);
```

```
    $stmtStudy->bindParam(':date', $date);
```

```
    $stmtStudy->bindParam(':doctor_id', $doctor_id);
```

```
    $stmtStudy->bindParam(':manuf', $device['manufacturer']);
```

```
    $stmtStudy->bindParam(':snum', $device['serialnum']);
```

```
    if ( !$stmtStudy->execute() ) {
```

```
        echo("<p>An error occurred!</p>");
```

```
        echo("<p>Study not created!</p>");
```

```
        $connection->rollback();
```

```
        $connection = NULL;
```

```
        exit();
```

```
    }
```

```
    $base_url =
```

```
    "http://web.tecnico.ulisboa.pt/~ist181013/series/".$series_id;
```

```
    $stmtSeries = $connection->prepare("INSERT INTO Series VALUES(:series_id,  
:series_name, :base_url, :req_num, :desc)");
```

```
    $stmtSeries->bindParam(':series_id', $series_id);
```

```
    $stmtSeries->bindParam(':series_name', $series_name);
```

```
    $stmtSeries->bindParam(':base_url', $base_url);
```

```
    $stmtSeries->bindParam(':req_num', $request_id);
```

```
    $stmtSeries->bindParam(':desc', $description);
```

```
    if ( !$stmtSeries->execute() ) {
```

```
        echo("<p>An error occurred!</p>");
        echo("<p>Study not created!</p>");
        $connection->rollback();
        $connection = NULL;
        exit();
    }
    $connection->commit();
    unset($_REQUEST);
    $connection = NULL;
    echo("<p>Study created!</p>");
}
?>
</body>
</html>
```

4. Add a region to an element of a series

The goal of this question is to add a region to an element of an existing series. The information added has to be associated with a specific patient and, given the patient's most recent studies, check for overlaps with regions already existent in the database. By selecting the button "Add a region" [Image 2], the user will be presented a table showing all series associated with that patient's most recent study (Image 16).

Available series

Series ID	Series Name	
1000	Raio-X ao dedo	<input type="button" value="Next"/>

Image 16 - Result web page showing available series on a patient's most recent study

If the selected patient has no associated studies or if the most recent study does not contain any series, an error message like the following page will be presented (Image 17):

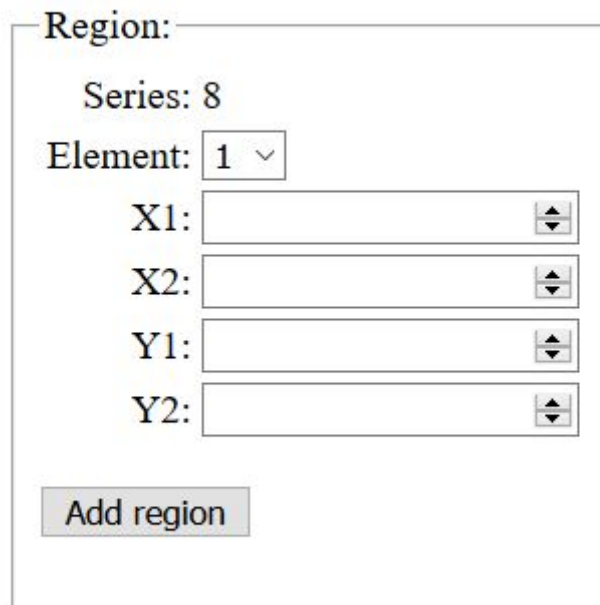
Available series

No series are available to this patient's last study!

Image 17 - Result web page when the patient has no studies on his most recent study

By selecting the series in which the new region will be inserted, we will arrive at the page presented in Image 18. Here, the user will be asked to choose the element in which the new region will be inserted and for all the attributes necessary to create it. Being given the choice of only the possible elements greatly reduces the chances of errors upon inserting the region.

Add a new region



Region: _____

Series: 8

Element: ▾

X1: ▴ ▾

X2: ▴ ▾

Y1: ▴ ▾

Y2: ▴ ▾

Image 18 -Form to add a new region to the selected element

It is possible that the selected series does not have any elements. If so, the page depicted in *Image 19* will open.

Add a new region

No elements are available for this series! :(

Image 19 - Result web page when the series has no elements

After pressing the button “Add region”, the insertion will occur and the added region will be compared to all the regions that make up the study with the highest date, excluding the study in which we are adding the region. The resulting page will consist of a table listing all of these regions and stating if the new region overlaps with any of them. A sample result is shown in *Image 20*, in which there was new clinical evidence found.

Add a new region

List of all elements of the patient last study

Series ID	Element Index	Overlaps?
11	1	No
11	2	Yes

NEW CLINICAL EVIDENCE FOUND!

Image 20 - Table with the result for the region overlap

This set of pages start in the result of a successful patient search, in `search_patient.php`. By pressing 'Add region' (*Image 2*), patient info is carried to `list_series.php`. In this file, we will query the database for the list of series of the last study performed on the patient. It is impossible to add a region if no studies for the given patient exist or if the studies do not contain any series. The region will be added to an element of the selected series by pressing the button 'Next' (*Image 16*). This leads us to `new_region.php` which presents a form to be filled by the user with the relevant information in order to add the region. The result of the insertion will be shown at `add_region.php` that also might present an alert if the region inserted overlaps another one from the latest study (older than the current one).

FILE: `list_series.php`

```
<!DOCTYPE html>
<html>
  <head>
    <title>List Series</title>
  </head>
  <body>
    <h2>Available series</h2>
    <?php
      session_start();
      if ( empty($_REQUEST['patient_number']) ) {
        echo("<p>No patient ID was given!</p>");
        exit();
      } else {
        $patient_number = $_REQUEST['patient_number'];
        $connection = require_once('db.php');

        $stmt = $connection->prepare("SELECT request_number, description FROM
Study WHERE request_number IN (SELECT number FROM Request WHERE
patient_id=:pat_id) ORDER BY date DESC LIMIT 2");
        $stmt->bindParam(':pat_id', $patient_number);
        if ( !$stmt->execute() ) {
          echo("<p>An error occurred!</p>");
          exit();
        }
        if ( $stmt->rowCount() == 0 ) {
```



```

        echo("<p>No studies are available to this patient!</p>");
        $connection = NULL;
        exit();
    } else {
        // studies available
        $last_study_1 = $stmt->fetch();
        $last_study_2 = $stmt->fetch(); //This one might not exist
        $_SESSION['last_study_1'] = $last_study_1;
        $_SESSION['last_study_2'] = $last_study_2;
        $req_num = $last_study_1['request_number'];
        $desc = $last_study_1['description'];
        $stmtSeries = $connection->prepare("SELECT series_id, name FROM
Series WHERE request_number=:req_num AND description=:desc");
        $stmtSeries->bindParam(':req_num', $req_num);
        $stmtSeries->bindParam(':desc', $desc);
        if ( !$stmtSeries->execute() ) {
            echo("<p>An error occurred!</p>");
            $connection = NULL;
            exit();
        }
        if ($stmtSeries->rowCount() > 0 ) {
            echo("<table border=1 cellpadding='5'>");
            echo("<thead><tr><th>Series ID</th><th>Series
Name</th><th></th></tr></thead>");
            foreach ($stmtSeries as $row) {
                echo("<tr><td>".$row['series_id']. "</td>");
                echo("<td>".$row['name']. "</td>");
                echo("<td><form action='new_region.php' method
='post'>");
                echo("<input type='hidden' name='series_id'
value='".$row['series_id']."'>");
                echo("<input type='submit' value='Next'>");
                echo("</form></td></tr>");
            }
            echo("</table>");
        }else{
            //no series available
            echo("<p>No series are available to this patient's last
study!</p>");
            $connection = NULL;
            exit();
        }
    }
    $connection = NULL;
}
?>
</body>
</html>

```

FILE: new_region.php

```
<!DOCTYPE html>
<html>
  <head>
    <title>Add a new region</title>
  </head>
  <body>
    <h2>Add a new region</h2>
  <?php
    if ( empty($_REQUEST['series_id']) ) {
      echo("<p>No information [series id] was given!</p>");
      exit();
    }
    else {
      $series_id = $_REQUEST['series_id'];
      $connection = require_once('db.php');
      $stmt = $connection->prepare("SELECT element_index FROM Element WHERE
series_id=:series_id");
      $stmt->bindParam(':series_id', $series_id);
      if ( !$stmt->execute() ) {
        echo("<p>An error occurred!</p>");
        exit();
      }
      if ($stmt->rowCount() > 0 ) {
        //elements available
        $elements = [];
        foreach ($stmt as $row) {
          array_push($elements, $row);
        }
      } else {
        echo("<p>No elements are available for this series! :(</p>");
        $connection = NULL;
        exit();
      }
      $connection = NULL;
    }
  <?>

  <form action="add_region.php" method="post">
    <fieldset style="display: inline-block">
      <legend>Region:</legend>
      <table>
        <tr>
          <td align='right'>Series:</td>
          <td>
            <input type='hidden' name='series_id'
value='<?=$series_id?>'><?=$series_id?>
            </td>
          </tr>
        <tr>
          <td align='right'>Element:</td>
          <td>
            <select name="element">
              <?php
                foreach( $elements as $element) {
```

```

                                echo("<option
value='\".$element['element_index'].\"'>\".$element['element_index'].\"</option>\" );
                                }
                                ?>
                                </select>
                                </td>
                                </tr>
                                <tr>
                                <td align='right'>X1:</td>
                                <td><input type="number" step="any" name="x1"></td>
                                </tr>
                                <tr>
                                <td align='right'>X2:</td>
                                <td><input type="number" step="any" name="x2"></td>
                                </tr>
                                <tr>
                                <td align='right'>Y1:</td>
                                <td><input type="number" step="any" name="y1"></td>
                                </tr>
                                <tr>
                                <td align='right'>Y2:</td>
                                <td><input type="number" step="any" name="y2"></td>
                                </tr>
                                </table>
                                <p><input type="submit" value="Add region"></p>
                                </fieldset>
                                </form>
                                </body>
                                </html>

```

FILE: add_region.php

```

<!DOCTYPE html>
<html>
    <head>
        <title>Add a new region</title>
    </head>
    <body>
        <h2>Add a new region</h2>
    <?php
        session_start();
        if ( empty($_REQUEST['series_id']) || empty($_REQUEST['element']) ||
empty($_SESSION['last_study_1']) ) {
            echo("<p>Can't create a new region!</p>");
            echo("<p>Insuficient information given!</p>");
            exit();
        } else {
            $series_id = $_REQUEST['series_id'];
            $element = $_REQUEST['element'];
            $x1 = $_REQUEST['x1'];
            $x2 = $_REQUEST['x2'];
            $y1 = $_REQUEST['y1'];
            $y2 = $_REQUEST['y2'];
            $connection = require_once('db.php');

```

```

        $stmt = $connection->prepare("INSERT INTO Region VALUES (:series_id,
:element, :x1, :y1, :x2, :y2)");
        $stmt->bindParam(':series_id', $series_id);
        $stmt->bindParam(':element', $element);
        $stmt->bindParam(':x1', $x1);
        $stmt->bindParam(':y1', $y1);
        $stmt->bindParam(':x2', $x2);
        $stmt->bindParam(':y2', $y2);

        if ( !$stmt->execute() ) {
            echo("<p>An error occurred!</p>");
            $connection = NULL;
            exit();
        }
        // get the other study (if exists) by session variables
        if ( !empty($_SESSION['last_study_2']) ) {
            // second study exists
            $last_study_2_req_num = $_SESSION['last_study_2']['request_number'];
            $last_study_2_desc = $_SESSION['last_study_2']['description'];
            // get all series from this study
            $stmtSeries = $connection->prepare("SELECT series_id FROM Series
WHERE request_number=:req_num AND description=:desc");
            $stmtSeries->bindParam(':req_num', $last_study_2_req_num);
            $stmtSeries->bindParam(':desc', $last_study_2_desc);
            if ( !$stmtSeries->execute() ) {
                echo("<p>An error occurred!</p>");
                $connection = NULL;
                exit();
            }

            if ( $stmtSeries->rowCount() > 0 ) {
                // series related to the 2nd study exists
                $series_list = [];
                foreach ($stmtSeries as $row) {
                    array_push($series_list, $row['series_id']);
                }
                // get all elements from all series
                $stmtElements = $connection->prepare("SELECT series_id,
element_index FROM Element WHERE series_id IN (".implode('
',$series_list).")");
                if ( !$stmtElements->execute() ) {
                    echo("<p>An error occurred!</p>");
                    $connection = NULL;
                    exit();
                }
                if ( $stmtElements->rowCount() > 0 ) {
                    // list all elements!
                    echo("<h3>List of all elements of the patient last
study</h3>");
                    echo("<table border=1 cellpadding='5'>");
                    echo("<thead><tr><th>Series ID</th><th>Element
Index</th><th>Overlaps?</th></tr></thead>");
                    $stmtOverlap = $connection->prepare("SELECT
region_overlaps_element(:series_id, :element, :x1, :y1, :x2, :y2)");

```

```

        $new_clinical_evidence = 0;
        foreach ( $stmtElements as $element ) {
            if ( !$stmtOverlap->execute( [ ':x1'=>$x1, ':x2'=>$x2,
':y1'=>$y1, ':y2'=>$y2,
                                ':series_id'=>$element['series_id'],
':element'=>$element['element_index'] ] ) ) {
                echo("<p>An error occurred!</p>");
                $connection = NULL;
                exit();
            }
            $result = $stmtOverlap->fetch();
            if ($result[0]) {
                $new_clinical_evidence = 1;
            }
            echo("<tr><td>".$element['series_id']."</td>");
            echo("<td>".$element['element_index']."</td>");
            echo("<td>".($result[0] ? 'Yes': 'No')."</td></tr>");
        }
        echo("</table>");
        if ($new_clinical_evidence ) {
            echo("<h2>NEW CLINICAL EVIDENCE FOUND!</h2>");
        }
    } else {
        echo("<p>No elements in the series of the second
study!</p>");
    }
    // got all elements, call for overlaps function
} else {
    // no series exist for the second study
    echo("<p>No series for second study!</p>");
}
} else {
    // second study doesn't exist!
    echo("<p>No second study!</p>");
}
unset($_REQUEST);
}
?>
</body>
</html>

```