z1. Web Service Monitoring in IP networks

Introduction

Cyclical services monitoring in IP networks is an activity that must be carried out by staff responsible for maintaining the uninterrupted work of servers providing these services. The enormous amount of marketing, commercial, financial and other services carried out via the Internet means that many companies have decided to give up independent maintenance, supervision, servicing of servers providing specific services and entrust to them the outsourcing companies. These companies are often very large, specialized corporations, employing specialists monitoring the work of servers, as well as providing service, with maintaining, optimizing and restoring systems and services after failures. Such companies have multilingual staff, which supports Customer Service Office / Call Center, accepting a failure report from customers in the 24/7 system. It is very expensive to keep multilingual staff in continuous readiness to receive and service trouble reports. A much better solution is creating software for automatic monitoring of selected services, running on servers and server groups serviced by a given corporation.

Wide range of tasks to do when you want to make such application in professional way

1. You should create the application implementing among others the functions listed below:
   - gathering information on customer resources to be looked after:
     - domain names / IP numbers of client servers,
     - ports on which individual services operate on particular servers,
     - the frequencies with which selected services should be monitored (ie ports on specific servers),
     - the number of attempts to connect with individual services or other criteria on the basis of which individual services should be considered as not working properly and should be restored,
   - collecting the information about the customers:
     - name, customer's address,
     - the contact details of persons from the clients' side dealing with the operation of services maintenance,
   - gathering information about employees, obliged to maintain the services of clients:
     - lists of clients / servers / services that individual employees have to look after,
     - employees specialty, their certificates and professional experience, languages in which they can use on the communicational level,
   - monitoring the operation of individual services on individual servers and handling detected failures:
     - collecting a record of detected service failures,
     - gathering a history of generated prompts sent to employees responsible for handling failures of particular services on individual computers,
     - collecting a confirmation history of accepting reminders by employees responsible for handling failures of particular services on individual computers,
     - collecting a history concerning the classification of service failures, specified by the employees servicing them and their remedial actions (especially the last aspect is important because it allows to build a database of proven solutions that can be an indication of future actions, especially those undertaken by implementing employees of the 2nd line of support),
     - generating and collecting statistical data related to the determination and optimization of customer service costs, in connection with the support of tasks assigned to them, carried out on the basis of the number of tasks generated, resulting from service failures and their servicing time.
2. The functions listed above are only a dozen or so percent of a specialized CRM system (Customer Relationship Management) for servicing clients who ordered maintenance of network services, and full implementation of such CRM system would exceed the time prescribed for laboratory classes. Therefore below there is a minimal list of required actions necessary to create a draft for such web application. Just to present its functionality to a client or a project manager who could decide on its further development or shape.

The tasks to do during labs

1. You should perform all actions using your own hosting, or shared hosting if you do not have your own hosting.
2. Define the UTF-8 code page in each web document, configure your tools and database accordingly.
3. Please put to the main document created on your hosting a title such as your first name, it makes it possible for your teacher to verify the work of many students in the same time. Thank you in advance for complying with this request.

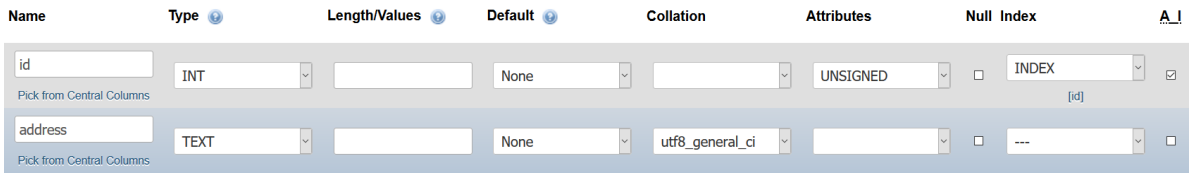
```
<head>
    <title>Your first name</title>
</head>
```

4. Test on your hosting the operation of various PHP scripts to monitor the operation of services on selected ports running on selected hosts. Remember that **you should not use** .gov hosts or any other hosts belonging to government or state institutions

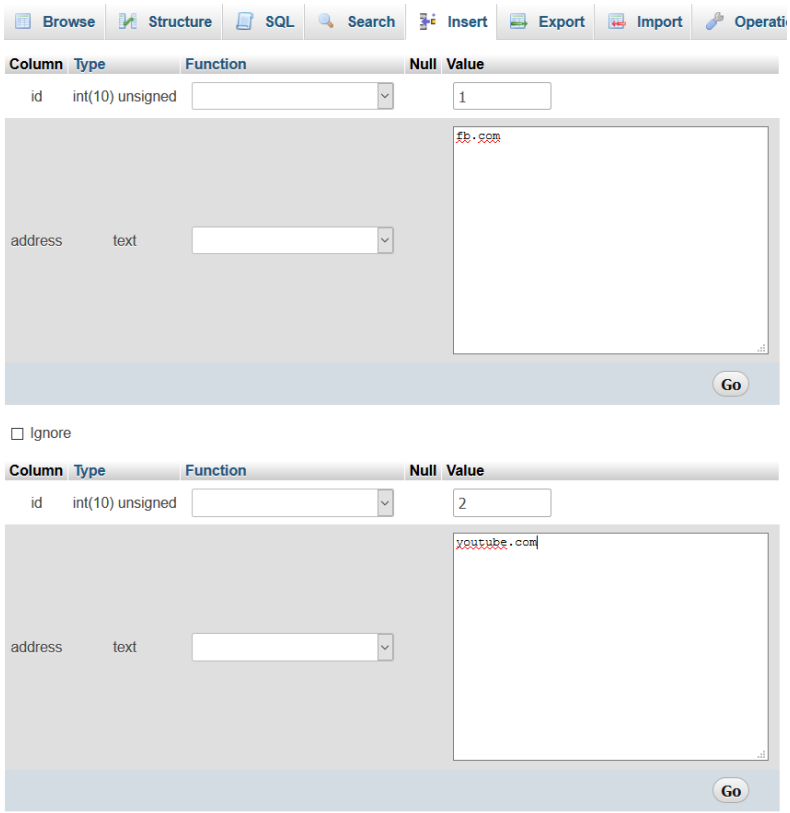
to test your scripts, because port scans can be treated by their administrators as a beginning of illegal hacker activities. Without a fear of being accused of breaking the law, you can try to use the addresses of popular information or social portals, for example facebook.com etc.
Read the description of the fsockopen command http://php.net/manual/en/function.fsockopen.php
Test whether the following script works on your hosting. If it does not work - look in the hosting description to see if the fsockopen command is blocked by default for all users of the given hosting. If this is the reason why it is not working - you can ask the hosting administrators to unblock this command individually for the purposes of laboratory tasks. To make your request more credible, you can introduce yourself as a university student by giving the full name of the university, faculty, field of study and year of study, university postal address, college website, and the name of the laboratory subject. In most cases, such arguments convince the majority of hosting administrators, if they prove to be relentless, use other methods of checking the open ports of selected hosts.

```
<?php
    $host = 'fb.com';
    $port = '80';
    {
        $fp = @fsockopen($host, $port, $errno, $errstr, 30);
        echo 'Host '.$host.':'.$port.' is ';
        if ($fp) { echo 'OK'; } else { echo ' out-of-order '; }
        if (!$fp) { echo "$errstr ($errno)"; }
    }
?>
```

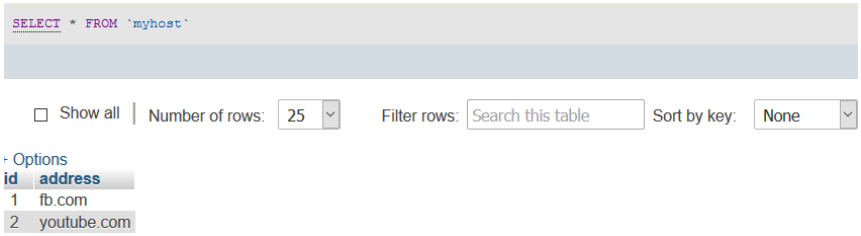
5. Create a database using phpMyAdmin. If you did not use phpmyadmin before your can have a look at some films on youtube: https://www.youtube.com/results?search_query=phpmyadmin
   Create a table **hosts** with the domain names in this database. In that table place two columns:
   a. **id** - int type (AI - autoincrement), table primary key,
   b. **address** - text type.



6. Insert to that table several host names which you can use for cyclical services monitoring



So finally you can get for instance such view



7. Please create the following script in PHP that generates on your website a table with HTML tags, containing the names of entered hosts

```
<body>
  <?php
        $dbhost="Your_host "; $dbuser="Your_account"; $dbpassword="Your_pass"; $dbname="Your_DB_name";
        $connection = mysqli_connect($dbhost, $dbuser, $dbpassword, $dbname);
        if (!$connection) {
              echo " MySQL Connection error." . PHP_EOL;
              echo "Errno: " . mysqli_connect_errno() . PHP_EOL;
              echo "Error: " . mysqli_connect_error() . PHP_EOL;
              exit;
        }
        $result = mysqli_query($connection, "SELECT * FROM hosts") or die ("DB error: $dbname");
        print "<TABLE CELLPADDING=5 BORDER=1>";
        print "<TR><TD>id</TD><TD>Address</TD></TR>\n";
        while ($row = mysqli_fetch_array ($result)) {
              $id = $row[0];
              $address = $row[1];
              print "<TR><TD>$id</TD><TD>$address</TD></TR>\n";
        }
        print "</TABLE>";
        mysqli_close($connection);
?>
```

8. The result of executing this script should look like the one below on the left, it is presented the table's appearance in the next step, next to that table on the right.

id	Address
1	fb.com
2	youtube.com

id	Address	Status
1	fb.com	OK
2	youtube.com	OK

9. Modify the script to display host names and the information if the 80 port of these hosts are open - "OK".
10. Using phpMyAdmin enter the next hostname into the **hosts** table, but this time put the domain address that does not exist for instance fbbbb.com, to verify if the host test script is working properly.
11. In order to be able to observe the results of your script, ie the work of hosts defined in DB, you have to refresh the page periodically (in most browsers - the F5 key). This is uncomfortable in the long run, so add automatic reloading to your script every 10 seconds:

```
<head>
    <meta http-equiv="refresh" content="10" />
</head>
```

12. Please expand your application with some of the elements listed below,
    a. Expand the table with another column and display in it the number of attempts to communicate with the given host that are left unanswered. If the host starts responding again - then display the number "0" again in this column.
    b. Expand the table with another column and display in it the time from which communication with the host has been lost. If the host starts responding again - then display the "-" sign again in this column.

c. Expand the table by another column to display the total time when the host was not available since the beginning of the time in which you are monitoring it. Due to the fact that the script is called cyclically every 10 seconds - it is easy to count the number of communication attempts that were left unanswered for a time when there was no communication with the given host. This time is expressed in seconds and minutes.
d. Create a subdomain of your own domain (if it is possible without any extra cost) and place a simple web page on it, creating an index.html file in its home directory. Check if it is available. Enter the name of this subdomain on the list of monitored hosts. Delete and re-insert the file to the subdomain's home directory and at the same time check how it is presented in the statistics of the monitored host.
e. Expand the application so that it is possible to create a form by means of which a new server address to be monitored and a port number to be polled are added. Add monitoring of your own hosting activity.
f. Add another table to the database called Employees (id, surname, firstname), in which workers responsible for the maintenance of individual hosts will be saved. Expand the application so that you can create a form by which you add a new server address to monitor and the port number to be polled and select the name of the worker who will be responsible for the maintenance of the host.

13. Report the end of the exercise.