Datenbanken und Web-Techniken
Exercise 1:
Server-side Database Access

General Database Access

In general you follow these steps, to access a database:

1. Open the connection
   - Create a database-handle
   - Connect through this handle
2. Execute a query
   - Create a statement-handle
   - Bind the result-buffer to the statement-handle
   - Execute a query through this handle
3. Fetch the result
   - Request more result-tuple, while there is data
4. Close the connection
   - Free all handles

DBMS-specific Database Access

For historical reasons, DBMS have their own APIs to provide access to their data. For PostgreSQL this is the C client library libpq. This library is used and abstracted by PHP to provide all functionality. The provided PHP-example-script (see Sources) shows the usage of some basic functions.

A short abstract to illustrate the four steps, to access a PostgreSQL database with PHP:

1. Open the connection

```
$db_handle = pg_connect("host=" . $host . " port=" . $port . " dbname="
. $databaseName . " user=" . $userName . " password=" . $password)
```

2. Execute a query

```
$result = pg_query($db_handle, "SELECT * FROM " . $tableName)
```

3. Fetch the result

```
foreach(pg_fetch_row($result, $ri) as $value)
```

4. Close the connection

```
pg_close($db_handle)
```

Tasks
Hints and more description follow on the following pages

Basic Tasks (should be done by everybody):

1. Get a PostgreSQL database
2. Create a table with some data in your database
3. Modify the provided postgresql_test.php script to use your database and created table
4. Run your PHP script and see the data from your table in the returned HTML page

Advanced Tasks (additionally for those, who like to have more exercise):

5. Modify the provided postgresql_cgi_test.c script to use your database and created table
6. Compile the C script as a CGI script
7. Run your CGI script and see the data from your table in the returned HTML page

Basic Task 1: Get a PostgreSQL database

You can

- install one locally on your own computer
- or set it up on a server, you have access to
- or simply use the service form the URZ and get one at IdM-Portal → Databases → PostgreSQL

  ➔https://idm.hrz.tu-chemnitz.de/user/service/database/postgresql/add/
  - please be aware, that the PostgreSQL-server from URZ is only reachable from inside the network of TU Chemnitz (use a VPN to access from outside)

URZ provides version 9.6 but it should also work with an older or newer one.

Basic Task 2: Create a table with some data in your database

- If you use URZ service, you can use our install of phpPgAdmin
  ➔https://phppgadmin.informatik.tu-chemnitz.de/
  - if you have problems with the self-signed certificate, just access the server in the more unsecure way without HTTPS
  - server is only reachable from inside the network of TU Chemnitz (use a VPN from outside)
  - select server “PostgreSQL“ at the left side
  - enter the read-write-username (e.g. dvs2018_rw) with the corresponding password
  - select your database (e.g. dvs2018)
- Otherwise set up your own phpPgAdmin for your database or any other frontend you like or be familiar with (e.g. psql, pgAdmin3 or pgAdmin4)
- Create a table and insert some data
  - you should know how to do this from your basic database course

Basic Task 3: Modify the provided postgresql_test.php script to use your database and created table

- Download the script or copy and paste the content to some text-file
- Edit your file with any editor your are familiar with (even Windows Notepad should be sufficient)
- There are several variables defined at the beginning (lines 5 to 10)
  - change theme accordingly (and replace your_… with the correct values)

Basic Task 4: Run your PHP script and see the data from your table in the returned HTML page

You can

- run PHP locally on your own computer as stand-alone or within some web-server
- or set it up on a server, you have access to
- or simply use the service form the URZ.

URZ provides version 7.2 but it should also work with an older or newer one.

If you like to use the service from the URZ, you have to do several steps, as described at the next page.

Basic Task 4: Run your PHP script and see the data from your table in the returned HTML page by using the service from URZ

- Activate your personal homepage in IDM portal:
  ➔https://idm.hrz.tu-chemnitz.de/user/security/#server_security
  - changes take about 15 minutes
- Put your PHP script into your **`public_html`** directory inside your URZ home directory
  - you may use SSH (if activated in IDM portal) to upload the file, but using Web-File-Manager might be easier:
    ➔https://wfm.hrz.tu-chemnitz.de/wfm/
  - make sure you rename the PHP-file to extension .php (otherwise it won't work)
  - there is also a PHP-file-editor in Web-File-Manager, so you can just edit and test your file online
- Access your file by calling the URL in the browser
  - https://www-user.tu-chemnitz.de/~*your_urz_id*/*your_php_script_file_name_with_extension*
- If you don’t see any result, you certainly did any mistake
  - to see PHP-error-messages
    - create a file named **`.htaccess`** in your **`public_html`** directory
    - edit this file and put **`php_flag display_errors on`** there

Advanced Task 5: Modify the provided postgresql_cgi_test.c script to use your database and created table

- Download the script or copy and paste the content to some text-file
- Edit your file with any editor your are familiar with (even Windows Notepad should be sufficient)
- There are several variables defined at the beginning (lines 11 to 16)
  - change them accordingly (and replace your_… with the correct values)

Advanced Task 6: Compile the C script as a CGI script

- This could be done at any computer with the required C compiler
  - PostgreSQL header-files and libpq are also required
    - try to use the same version as your database (otherwise your program might crash)
- You can also use some server from URZ
  - connecting there trough SSH
    - `ssh your_urz_id@login.tu-chemnitz.de`
    - no problem for Linux or MacOS users from the Console / Terminal / Shell
    - Windows users might use PuTTY
    - you have to activate this service in IDM portal (see Task 4)
  - compile as CGI script
    - copy your C script to your working directory
    - `cc -I/usr/include/ -lpq -o output_name.cgi postgresql_cgi_test.c`
    - the file-extension `.cgi` is required by many servers

Advanced Task 7: Run your CGI script and see the data from your table in the returned HTML page

You can

- run a CGI activated web-server locally on your own computer
- or use some web-server, you have access to
- or simply use the service form the URZ.

If you like to use the service from the URZ, you have to do several steps, as described at Basic Task 4 (but replace PHP with CGI).

If you use your own server on a Non-Windows-OS, you might have to give the script execution permissions (`chmod +x output_name.cgi`).

Please be aware, that you have to compile your script for your target OS. If you compile and run it on an URZ-Linux-server, you can't copy the CGI to your Windows-PC and expect, that this magically can be executed.