TECHNISCHE UNIVERSITÄT
IN DER KULTURHAUPTSTADT EUROPAS
CHEMNITZ

Datenbanken und Web-Techniken

Project Task

Abteilung Datenmanagement
Prof. Dr. Michael Martin
Florian Hahn

Organisation - Contacts

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Project Task DBW 25
Agenda

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- Introduction
- Task Description
- Task Description Groups
- Submission and Examination
- Dates

Project Task DBW 25
Preliminary Remarks

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- All students in this semester have one practical project task. This task can be completed in groups of up to two people or alone, but solutions cannot be shared with other groups.
- Detecting significant solution parts shared between submissions from different groups is considered attempted fraud and will be marked as such for all students involved (regardless of who shared or used the solutions).
- If working in a group, the additional tasks mentioned at the end are obligatory (although individuals may also complete them). Also, the written work should be divided evenly between both group members, and all parts must be clearly attributed to their respective authors.
- The subtasks can be solved using any database management system, programming language, framework, library or web service API technique, or system architecture or deployment; there are no restrictions on choice.
- Supported languages are German and English.
- You will receive two marks for this subject as listed in the study regulations. One mark will be awarded for the project/term paper and another for the presentation.

Project Task DBW 25
Introduction

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- In today's world, we like to get important information optimally without barriers (licensed accordingly), instantly and in a non-proprietary form - as **Open Data** .
- Open Data Sources are heterogeneous.
  - This data could be obtained from services such as OpenStreetMap, WikiData and public repositories (GitLab, etc.), or from open government portals such as the one in Chemnitz.

Project Task DBW 25
Motivation and Task

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- Chemnitz is a vibrant city rich in cultural landmarks, including an opera house, museums, art galleries, and a diverse culinary scene.
- Imagine:
  - You're a tourist visiting our city for the first time, eager to explore all its cultural highlights.
  - Using your web-based interactive map tool, you explore on a journey with the main goal: “Visit Chemnitz Cultural City Places.”
- How would you do that with publicly available Portals such as Google Maps?

Project Task DBW 25
Motivation and Task

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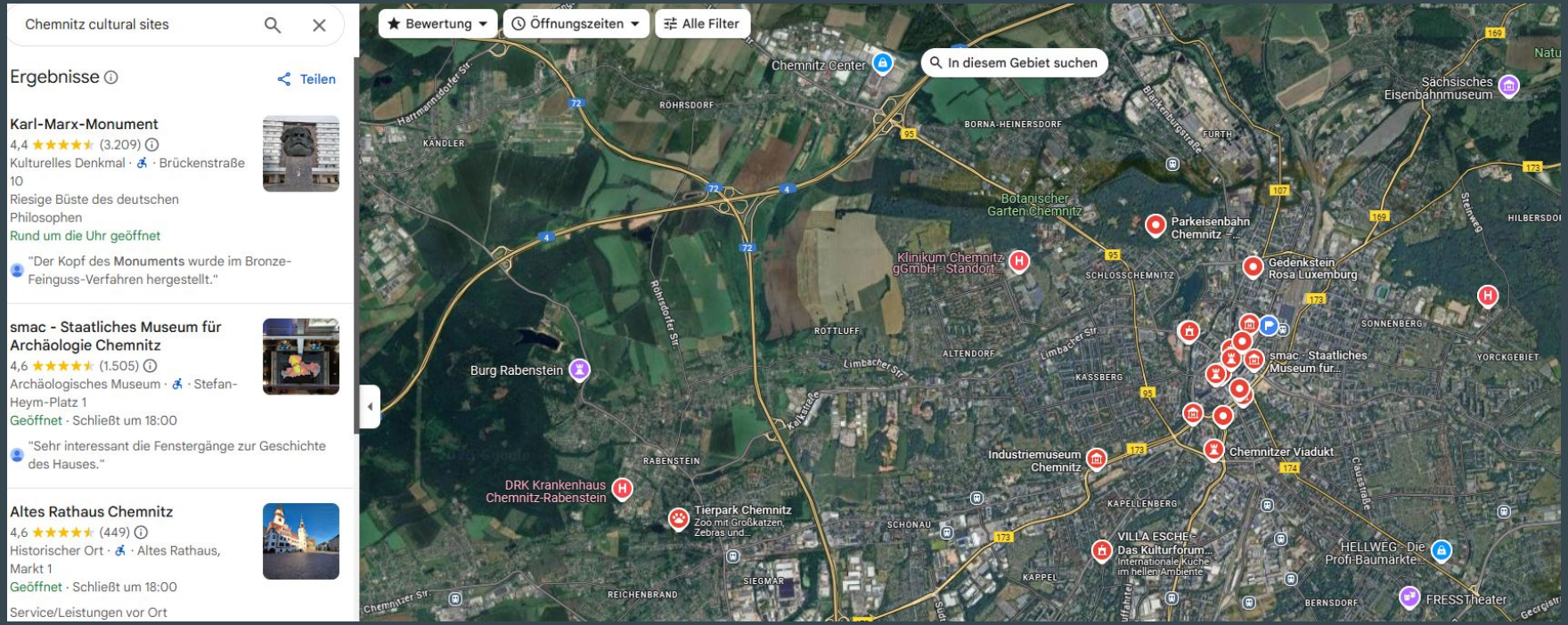

Project Task DBW 25
Motivation and Task

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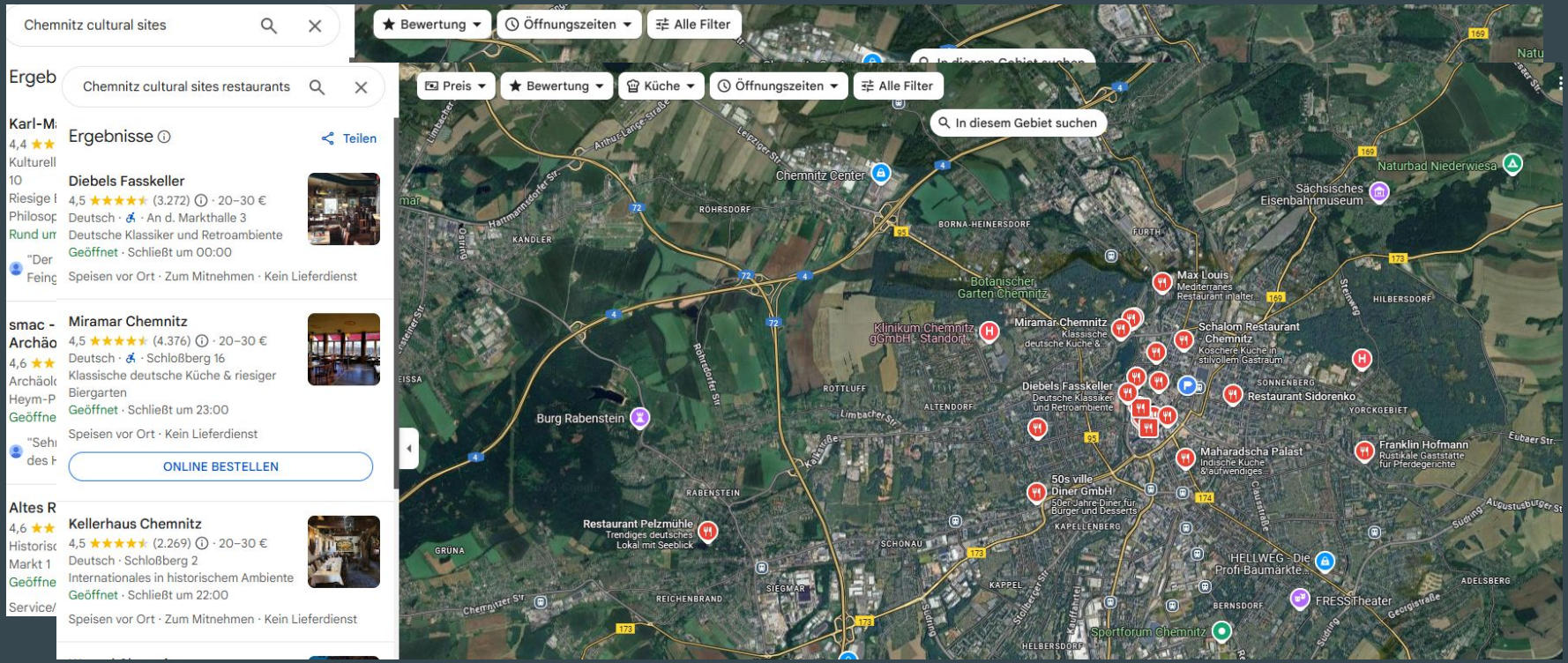

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Project Task DBW 25
Main Part of the Project

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- Main Part of your Project: Presenting Cultural Sites of Chemnitz:
  - A web application that provide a list of cultural sites (categorized)
    - Cultural sites can be filtered and searched by keywords
    - Cultural sites are published on a map and additionally as a resultlist (textform)
    - Details about each Cultural site can be displayed (in dependence to the category)
    - A user can register and submit/manage user details such as name, current location
    - A registered user is able to add and remove favorite cultural sites from the given datasets
- OK, that is a nice idea! ;-) but what about the data?
  - last year the data was published as Open Governmental Data (OGD) on Chemnitz ARCGIS
  - This year we didn't find data regarding our topic as OGD but from a community driven Open Data Initiative

Project Task DBW 25
Main Part of the Project

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OPENSTREETMAPS

Project Task DBW 25
Data for the Project

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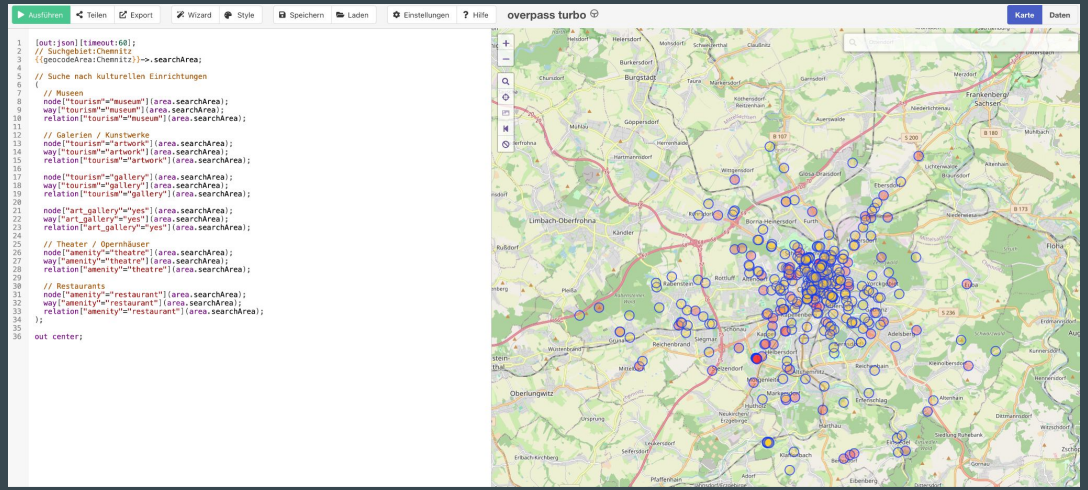
- One Example Endpoint to retrieve Data from OSM is Overpass API



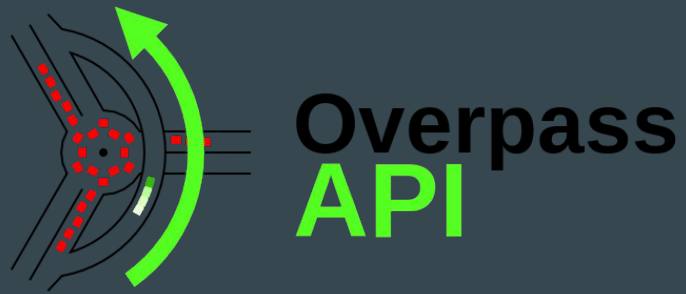


Image source:
https://wiki.openstreetmap.org/wiki/File:Overpass_API_logo.svg

```
[out:json][timeout:60];
// Suchgebiet:Chemnitz
{{geocodeArea:Chemnitz}}->.searchArea;

// Suche nach kulturellen Einrichtungen
(
  // Museen
  node["tourism"="museum"](area.searchArea);
  way["tourism"="museum"](area.searchArea);
  relation["tourism"="museum"](area.searchArea);

  // Galerien / Kunstwerke
  node["tourism"="artwork"](area.searchArea);
  way["tourism"="artwork"](area.searchArea);
  relation["tourism"="artwork"](area.searchArea);

  node["tourism"="gallery"](area.searchArea);
  way["tourism"="gallery"](area.searchArea);
  relation["tourism"="gallery"](area.searchArea);

  node["art_gallery"="yes"](area.searchArea);
  way["art_gallery"="yes"](area.searchArea);
  relation["art_gallery"="yes"](area.searchArea);

  // Theater / Opernhäuser
  node["amenity"="theatre"](area.searchArea);
  way["amenity"="theatre"](area.searchArea);
  relation["amenity"="theatre"](area.searchArea);

  // Restaurants
  node["amenity"="restaurant"](area.searchArea);
  way["amenity"="restaurant"](area.searchArea);
  relation["amenity"="restaurant"](area.searchArea);
); out center;
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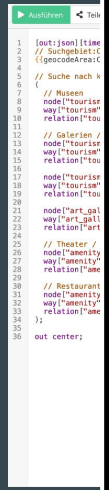

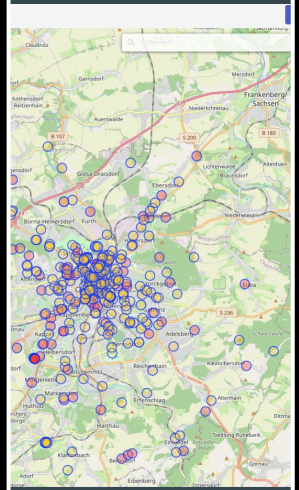


```
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  "timestamp": "2025-05-19T12:37:15Z",
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        "website": "https://www.sem-chemnitz.de/",
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        "wikidata": "Q573580",
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          50.8621274
        ]
      },
      "id": "way/23757830"
    },
    {
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        "addr:housenumber": "55",
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        "addr:street": "Reichenhainer Straße",
...
```

Project Task DBW 25
Data for the Project

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- One Example Endpoint to retrieve Data from OSM is Overpass API
  - keep track of license used for the data.
  - the data for the project is provided to you via opal, but could be downloaded from API by yourself.
    - Maybe you have further ideas of cultural site categories or a broader viewport ;-)

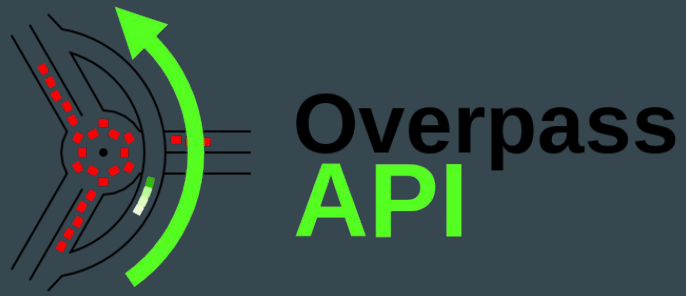

Image source:
https://wiki.openstreetmap.org/wiki/File:Overpass_API_logo.svg

Project Task DBW 25

Interactive Part of the project: Your ideas are welcome

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- Interactive Part of the Project (A Set of ideas - its on you!!!)
  1. Collect (automatically) sites in the near and make them available in your useraccount -> dashboard of visited sites
  2. Reviews about visited locations
  3. The 10 Minute City: Which cultural places can I visit within 10 minutes of my current location using public transport?
  4. The Bicycle Race: Who can visit all the cultural places by bike first?
  5. Gotta catch 'em all: Collect cultural places like Pokémon in your inventory (and trade them)!
  6. Open Chemnitz Contributor: Visit cultural places and contribute to an open data dataset on the places with your information
  7. ...

Project Task DBW 25

What we want to see - the Exam within the project

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- You should showcase, that you are able:
  - to set up a database,
  - to develop a useful database schema and integrate respective data
  - to make the data available on the web using web standards, i.e. REST and HTTP (Slide: Main Part of the project)
  - to interact with the data (Slide: Interactive Part of the Project), means:
    - write data to the database using your frontend
    - integrate a security mechanism
    - test and -if necessary- improve application performance
  - to document the application and the API
- Main Question by students on this point:
  - Which technology should i use? -> Your decision, but you need to explain!

Project Task DBW 25
The result in detail

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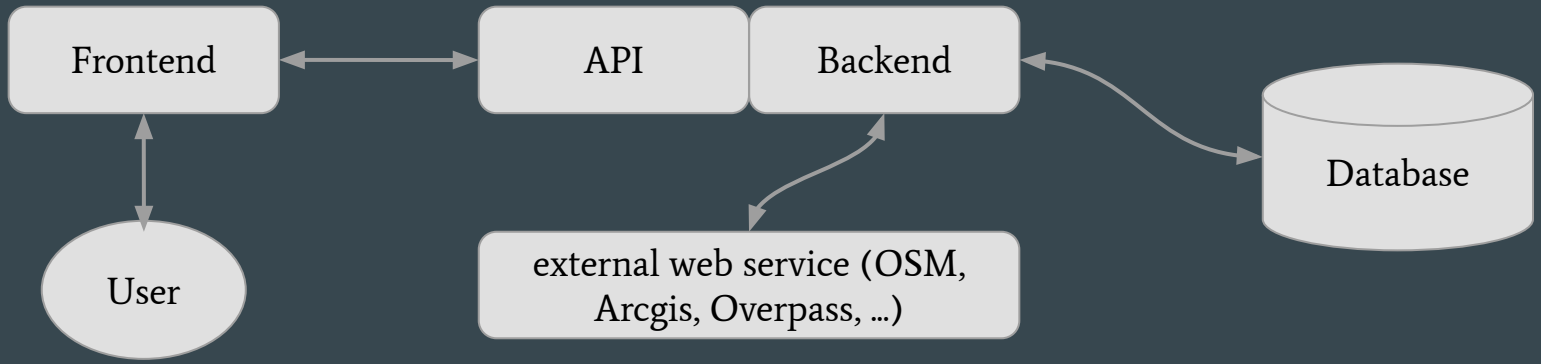
- The program consists of:
  - a database for storing the data;
  - a backend for processing the data and interacting with the web service API;
  - a web service application programming interface to provide the data,
  - a front end displays the data and facilitates user interaction.



Project Task DBW 25
The result in detail

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- Database
  - All data used by the application is stored in the database, except configurations:
    - Program configuration data, database configuration ...
    - ok, if you use caching, maybe that as well ...
  - Direct communication between user interface and database is not allowed

Project Task DBW 25
The result in detail

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- Backend
  - The backend processes the data.
  - Required data are at least given amenities (4 types) from Chemnitz (theatres, restaurants, artworks, tourism spots (museum)) – more data for groups
  - It handles all communication with the database.
  - It provides the web service API to be accessed by the frontend.
  - It handles the communication with the web services, for saving your own data
  - You can save your data in your own format, i.e. map the external data schema towards your own or add/delete/modify attributes.
    - Write a script, which automatically update the database with new or changed data from data sources. (Please download and use resp. source files and not (D)DOS the API‘s)
    - Attention: The different sources offer different schemas and API’s please always follow their rules and restrictions!
    - Example API endpoint: https://overpass-turbo.eu/#

Project Task DBW 25
The result in detail

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- API
  - The web service application programming interface facilitates communication between the frontend and backend.
  - It also passes user input from the frontend to the backend for processing.
  - API access failures are identified and responded to with meaningful error messages (and possibly corresponding HTTP status codes).

Project Task DBW 25
The result in detail

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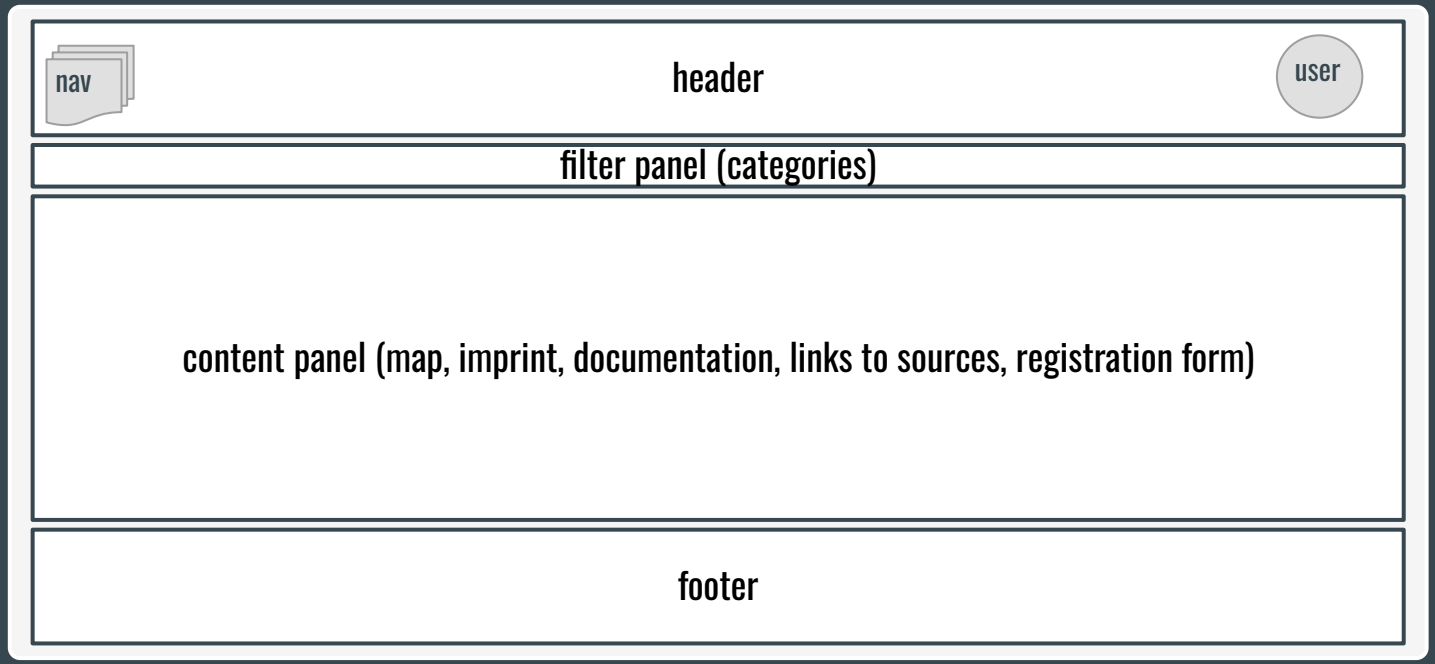
- FrontEnd UI MockUp - don’t laugh ;-)



Project Task DBW 25
The result in detail

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- The front end is a web application that can be accessed via a web browser.
  - Users can interact with the data by using a search field (i.e. keywords, name of the site...) and categories of the data
    - each category and its respective sites (instances of category/type) can be identified by a color
  - The results are being presented by using a Map and a Table
  - The Map (i.e. Leaflet, Google Maps, MapLibre, Mapbox, OSM), offers the resultset as placemarks from the data sources.
  - The Placemarks can be clicked and lead to a respective details page
  - A User need an user account, which can be created, updated and deleted (CRUD).
  - Not only Nice to Have (lower weighted criteria)
    - It supports more than one of the common web browsers (e.g. Mozilla Firefox and Chromium derivatives).
    - It is a responsive web application that supports different device types, orientations and screen sizes.
    - Usability aspects would be taken into account.
    - A mobile-first approach would also be great.
  - Comfort/Bonus Features
    - GPS Tracking, to get the current position of the user, i.e. to check if the user is in range of a data source.
    - Offline Support: Implement caching or PWA capabilities to allow users to access certain features without an active internet connection.
    - Performance Optimization: Optimize map rendering, data fetching, caching and user interactions for a smooth experience.

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The result in detail - additional tasks for groups

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- Security and Management Features:
  - Distinguish between a regular user and an admin user. The admin user has access to an admin dashboard with information about all active users and some statistics, as well as the ability to manage them.
  - The deletion process is always a 'soft delete' process (i.e. only flag that the user has been deleted).
  - Additionally, an API endpoint is available to display all 'soft deleted' users.
  - An authentication layer needs to be added to the API communication; for example, JWT or OAuth. Please mark this option in your API documentation!
  - User data, and specifically user passwords, are encrypted.
- More Data , More Fun!
  - The data shape is not limited to Chemnitz, but to the federal state of Saxony.
  - Displaying the parking lots for busses and caravans in Chemnitz,
    - it could be used to calculate an optimal route from the parking lot to the next data source.
- Comfort Feature (nice to have)
  - Offline support: Due to a poor internet connection, the tool should be available offline.
    - Implement front-end caching or PWA capabilities to allow users to access certain features without an active internet connection.

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Submission

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- The submission consists of ONE ZIP-archive named with the matriculation number(s):
  - a PDF-file of the term paper in paper format A4 and
  - a separate ZIP-archive (with a maximum file size of 20 MiB) that contains:
  - the program sources (i.e. the source code and additional files like pictures or other resources that are required by the program),
  - a script to initialize the database (i.e. the submission of the database itself is not required) and
  - a brief manual on how to use the sources to get a working web application (i.e. the submission of an executable program is not required).
- Only one submission is required per group (but if you still insist on uploading the same project twice to OPAL, the latest submission will count for your group).
- The submission has to be (including all parts) on time.
- Please make sure to not exceed the file size limit(20MiB)! If you have problems with your file size limit, try to downsize your files, i.e. with reducers or delete unused code/node_modules/builds/pictures/descriptions.

Project Task DBW 25
Term paper conditions (1)

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- A term paper has to be written, that satisfies the following conditions:
  - There is an amount of about 5 pages of content
    - (excluding cover, index, lists, appendix, bibliography, API docs, etc.)
    - by using default values for font size (12 px), letter format (A4), line spacing, word wrapping and an TU Chemnitz cover sheet.
- A good form and a balanced ratio of pictures and text is kept (i.e. just including dozens of screenshots without referring to them in describing text is bad form and may also rarely be counted as content).
- On the cover page, there is recorded the name, study course and matriculation number of all participating students.
- An overview of all utilized technologies (i.e. DBMS, programming and other languages, frameworks, web service API implementation, etc.) is given along with a short motivation, why they were chosen to solve a certain subtask.
  - These technologies are also classified in the context of the lecture.

Project Task DBW 25
Term paper conditions (2)

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- All used sources, libraries and technologies are referenced.
  - There are no restrictions on reference or citation style (but styles should not be mixed).
  - There is no need for scientific writing (i.e. citing scientific papers), but it is not allowed to use content or citations without giving references.
- The project is presented in such a way that, after reading, we understand all components of the program and their (major) functions.
- The appendix includes a complete web service API documentation (i.e. just listing examples is not sufficient) containing:
  - a list of all endpoints and methods of the web service application programming interface,
  - for every endpoint the list of the parameters and the return values each with type and meaning and the available status codes and
  - for complex structures also the inner structure is to be documented respectively.
  - Example requests and responses
  - The API documentation may be created using some tool.
- The term paper will be part of your first mark!

Project Task DBW 25
Examination

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- The examination consists of a 10-minute presentation, which should meet the same criteria as the content of the term paper, but focus is on the live demonstration. The API documentation is not presented here.
- The project, its development process/problems/challenges etc. should be briefly introduced, used technologies should be presented.
- The main part of the presentation is to present your features and functionalities,
  - so include a live demonstration of the project or
  - a demonstration video showing all parts of the practical task.
- For group work, the presentation time should be divided equally between both students.
- Afterwards, a few questions are given, which primary focus on the project and the term paper, but may also cover the lecture and exercise.
- Finally, there will be a short consultation and you will be informed of your two official presentation/term paper grades and the third grade for the project.

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Project Task DBW 25
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- Handout of task description:
  - starting 2025-05-22 15:30 CEST (UTC+2) (22.05.2025 – 15:30)
- Submission of project:
  - until thursday night: 2025-07-03 11:59 PM CEST (UTC+2) (03.07.2025 – 23:59)
  - via OPAL:
    - https://bildungsportal.sachsen.de/opal/auth/RepositoryEntry/297435137/CourseNode/1654050630382772004
- Oral exam and presentation:
  - between 2025-07-07 (07.07.2025) and 2025-07-17 (17.07.2025)
  - Enrollment for the oral exam begins on 2025-07-04 (04.07.2025) at 09:00 in OPAL
  - appointment allocation for each will be done via OPAL
  - examination will take place in person, the room will be announced in OPAL

Q&A

The End

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