

Electronic German Voting System

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1 User Interfaces

The designed system includes three main views: the voting view, the results view, and the election officials view.

1.1 Voting View

This view should allow voters to submit their votes into the system.

- **Features:**

- Voters should be able to enter their votes through a unique voter key.

- **Constraints:**

- Voters should not be able to submit their votes twice.
- Votes should not allow tracing the identity back to the voter.

1.2 Results View

This view allows to access, visualize, and compare the results of the 2017 and 2021 elections.

- **Seat distribution results:**

- It includes the overall distribution of seats in the parliament (Sitzverteilung des Bundestags) for a given year.
- It allows the comparison of the distribution of seats in the parliament between the years.

- **Vote distribution results:** The system allows showing the resulting voting percentages for the different political parties on three different granularity: country-, state (Bundesland)-, and region (Wahlkreis)-wide results:

- It includes the resulting voting percentages for the different political parties for a given year.
- It allows the comparison of resulting voting percentages for the different political parties between the years.
- It shows the list of the parliament representatives.

- **Information of the candidates and the members of the parliament:** It shows a detailed view including the personal information, candidate details (direct candidate, list candidate), and their corresponding results.

1.3 Election Officials View

This view allows election officials to add and modify details regarding the candidatures to the parliament.

- **Political parties' data:** Election officials are able to add and modify data related to political parties.
- **Candidates' data:** Election officials are able to add and modify data related to single candidates.
- **Securing write-access:** Adding and modifying data is restricted to election officials (e.g. by using a key)

2 System Requirements

This section gives an overview of the various features and aspects that need to be fulfilled by our designed system.

2.1 Functional Requirements

In the following subsection, we specify the desired functionality of the future system in terms of a set of functional requirements.

- FR1. Store elections' relevant data:** The system should store the data relevant to the 2017 and 2021 elections.
- FR2. Cast single votes electronically:** The system should allow casting first and second votes for an eligible voter electronically once for each election.
- FR3. Load vote batches:** The system should be able to bulk-load votes at once from an election center.
- FR4. Calculate seat distribution in the parliament:** The system should be able to calculate the distribution of the seats based on the cast votes using the Sainte-Laguë Method, while respecting rules such as the electoral threshold (Sperrklausel), overhang seats (Überhangsmandate), and minority parties (Minderheitsparteien).
- FR5. Show the distribution of the seats in the parliament for a given year:** The system displays the distribution of the seats in the parliament for a given year.
- FR6. Show the voting trends for a given year:** The user should be able to set a filter to display the overall second vote trends, or according to a given state, or region, and a specific year.
- FR7. Compare election results:** The system should allow comparing the seats distribution and voting trends over parties between years and on the country-, state- and region-wide levels.
- FR8. Store and display political parties' and candidates' data:** The system should store information regarding political parties and candidates. It should only be possible for election officials to add and modify these data.
- FR9. Provide documentation:** The system must provide the relevant documentation.

2.2 Nonfunctional Requirements

- NFR1. Usability:** The user should be able to apply and remove a filter for the results in at most three actions.
- NFR2. Security:** The system should be secured. In particular, all external data sources (e.g. voting terminals) must be secured through an authentication mechanism.
- NFR3. Scalability:** The system should be able to handle a real-time interaction with large numbers of users exceeding tens of millions. Interactions include requests to view results and cast votes.
- NFR4. Recoverability:** The system should not lose any data, through providing backups and recovery mechanisms.
- NFR5. Performance:** The system should provide a response to all requests within five seconds.
- NFR6. Capacity:** The system should be able to store and process all votes for each supported election.

3 Acceptance Criteria

- AC1. Feature completeness:** All functional requirements should be fulfilled.
- AC2. Quality:** All nonfunctional requirements should be fulfilled.
- AC3. Stress test:** The system should pass an appropriate stress test.
- AC4. Deliverables:** Source code, tests, and documentation should be delivered.