

Kiesraad

# Rust at the Dutch Electoral Council

Mark Janssen

RustWeek Industry Track, 13 May 2025

# About me

**Mark Janssen**

[github.com/praseodym](https://github.com/praseodym)

- Self-employed
- Lead Developer / Software Architect the Dutch Electoral Council (Kiesraad)
- Developing software for 20+ years
- MSc Embedded Systems, BSc Computer Science & Engineering

# Agenda

- Elections in The Netherlands
- Dutch Electoral Council
- Software for election results: Abacus
- Rust and our development process

# Paper ballots and red pencils



# Manual counting and handwritten reports



## Lijst 1 - VVD

Zet in elk vakje één cijfer. Begin rechts, met het laatste cijfer.

Naam kandidaat & kandidaatnummer

|   |    |   |   |   |
|---|----|---|---|---|
| Yıldız, D. (Dilara) (v)                       | 1  | 1 | 5 | 3 |
| Hermans, S.T.M. (Sophie) (v)                  | 2  |   | 8 |   |
| Becker, B. (Bente) (v)                        | 3  |   |   |   |
| van der Burg, E. (Eric) (m)                   | 4  |   | 3 |   |
| van der Wal - Zegzelink, C. (Christianne) (v) | 5  |   | 2 |   |
| Brekelmans, R.P. (Ruben) (m)                  | 6  |   |   |   |
| Heinen, E. (Eelco) (m)                        | 7  |   | 1 |   |
| de Vries, A. (Aukje) (v)                      | 8  |   | 2 |   |
| Kamminga, R.J. (Roelien) (v)                  | 9  |   |   |   |
| Paul, M.L.J. (Mariëtte) (v)                   | 10 |   |   |   |
| Erkens, S.P.A. (Silvio) (m)                   | 11 |   | 1 |   |
| Rajkowski, Q.M. (Queeney) (v)                 | 12 |   |   |   |
| Aartsen, A.A. (Thierry) (m)                   | 13 |   |   |   |
| van Campen, A.A.H. (Thom) (m)                 | 14 |   |   |   |
| Tielen, J.Z.C.M. (Judith) (v)                 | 15 |   |   |   |
| Veltman - Kamp, H.N. (Hester) (v)             | 16 |   |   |   |
| van Eijk - Nagel, W.P.J. (Wendy) (v)          | 17 |   |   |   |
| Elliott, U. (Ulysses) (m)                     | 18 |   |   |   |
| Michon - Derkzen, I.J.M. (Ingrid) (v)         | 19 |   |   |   |
| Martens - Americo, C. (Claire) (v)            | 20 |   |   |   |
| Meulenkamp, W.J.H. (Wim) (m)                  | 21 |   |   |   |
| de Groot, P.G. (Peter) (m)                    | 22 |   |   |   |

Naam kandidaat & kandidaatnummer

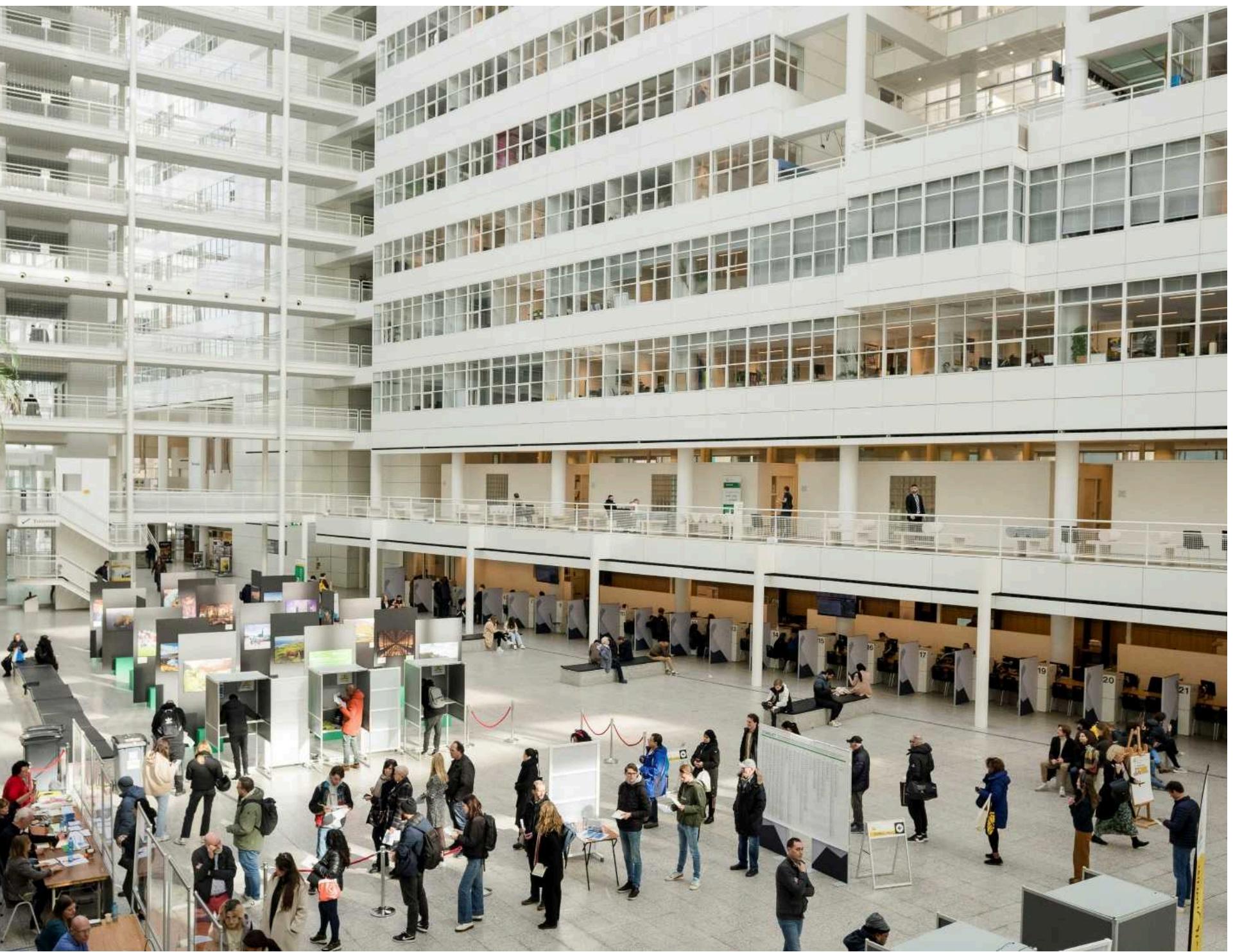
|                                      |    |  |   |
|--------------------------------------|----|--|---|
| Velstar, P.J. (Peter) (m)            | 26 |  |   |
| Bevers, H. (Harry) (m)               | 27 |  |   |
| Buijsse, M.R.G. (Martijn) (m)        | 28 |  |   |
| Draaijers, R.M. (Rosemarijn) (v)     | 29 |  |   |
| Bikkelaar, B.T. (Bart) (m)           | 30 |  |   |
| Verkuijlen, R. (Rouw) (m)            | 31 |  |   |
| Richardson, S.M. (Simone) (v)        | 32 |  |   |
| de Beer, M.E.E. (Martin) (m)         | 33 |  |   |
| van Strien, P.J.T. (Pim) (m)         | 34 |  |   |
| Hartsulker, R.J.J. (Jeroen) (m)      | 35 |  | 1 |
| Klein Lankhorst, H. (Hester) (v)     | 36 |  |   |
| Haverkort, E.A. (Erik) (m)           | 37 |  |   |
| Simons, C. (Chris) (m)               | 38 |  |   |
| Bijenhof, Y. (Yvonne) (v)            | 39 |  |   |
| van Groningen, D.A. (Dikke) (v)      | 40 |  | 2 |
| Zeeuw van der Laan, E.M. (Ellis) (v) | 41 |  |   |
| Volkman, Y. (Youni) (m)              | 42 |  |   |
| van Kessel, P.W. (Peter) (m)         | 43 |  |   |
| Rahimi, H. (Hawra) (m)               | 44 |  |   |
| Omid, B.F. (Bart) (m)                | 45 |  |   |
| Yizhak Cooremans, R.A.T. (Remco) (m) | 46 |  |   |
| Nelisse, R.M.L. (Mirjam) (v)         | 47 |  | 1 |

# Scale of the election process

House of Representatives election:

- 10M voters
- 100K volunteers
- 10K polling stations
- 342 municipal polling committee
- 20 electoral district polling committee
- 1 central polling committee

Software is needed to add everything up!



# Electoral Council

- Determines election results
- Provides advice and support
- Provisions tools
  - Toolbox for paper process
  - Software



**stemgeheim**  
voting secrecy

**onafhankelijkheid**  
independence

**integriteit**  
integrity

**toegankelijkheid**  
accessibility

**transparantie**  
transparency

**stemvrijheid**  
freedom to vote

**kiesgerechtigdheid**  
right to vote

**controleerbaarheid**  
verifiability

**uniciteit**  
unicity

# Kiesraad

# Abacus

- Software for election results
- In-house greenfield development, started end of 2023
- Double entry of polling station results
- Calculates totals for municipality, district, country
- Runs decentralised (for each polling committee)
- No internet connection (airgapped)



418

Fluisterbosdreef 8 1e invoer

16

Invoer afbreken

Is er herteld?

Aantal kiezers en stemmen

Verschillen

## → Lijst 1 – Vurige Vleugels Partij

Lijst 2 – Wijzen van Water en Wind

Lijst 3 – Eeuwenoude Aarde Unie

Lijst 4 – Verbond van Licht en Le...

Lijst 5 – Nieuwe Horizon Beweging

Lijst 6 – VRG

Lijst 7 – Harmonie van Hemel en...

Lijst 8 – Stralende Sterren Alliantie

Lijst 9 – Tijdloze Toekomst Partij

Lijst 10 – Kosmische Kracht Coalit...

Lijst 11 – Magische Melodieën Bew...

Lijst 12 – Zilveren Zonnestralen Pa...

## Lijst 1 – Vurige Vleugels Partij

| Nummer | Aantal stemmen | Kandidaat                    |
|--------|----------------|------------------------------|
| 1      | <b>128</b>     | Zilverlicht, E. (Eldor)      |
| 2      | <b>57</b>      | Donderbrul, G. (Grom)        |
| 3      | <b>63</b>      | Fluisterwind, S. (Seraphina) |
| 4      | <b>28</b>      | Nachtschaduw, V. (Vesper)    |
| 5      | <b>12</b>      | Stormvleugel, R. (Ravian)    |
| 6      | —              | Sterrenzwerver, M. (Mirella) |
| 7      | —              | Maanfluisteraar, X. (Xander) |
| 8      | —              | Windzanger, P. (Paxton)      |
| 9      | —              | Vuurvlinder, F. (Faelia)     |

## Eerste zitting

Steminvoer bezig Schorsen Afronden

## Statusoverzicht steminvoer

[Bezwaren en bijzonderheden](#)[Presentielijst](#)[Stembureaus](#)

## Stembureaus per status

- Fouten en waarschuwingen (5)
- Niet afgeronde invoer (5)
- In onderzoek (3)
- Invoer bezig (6)
- Eerste invoer klaar (5)
- Eerste en tweede invoer klaar (123)
- Werkvoorraad (154)

## Voortgang



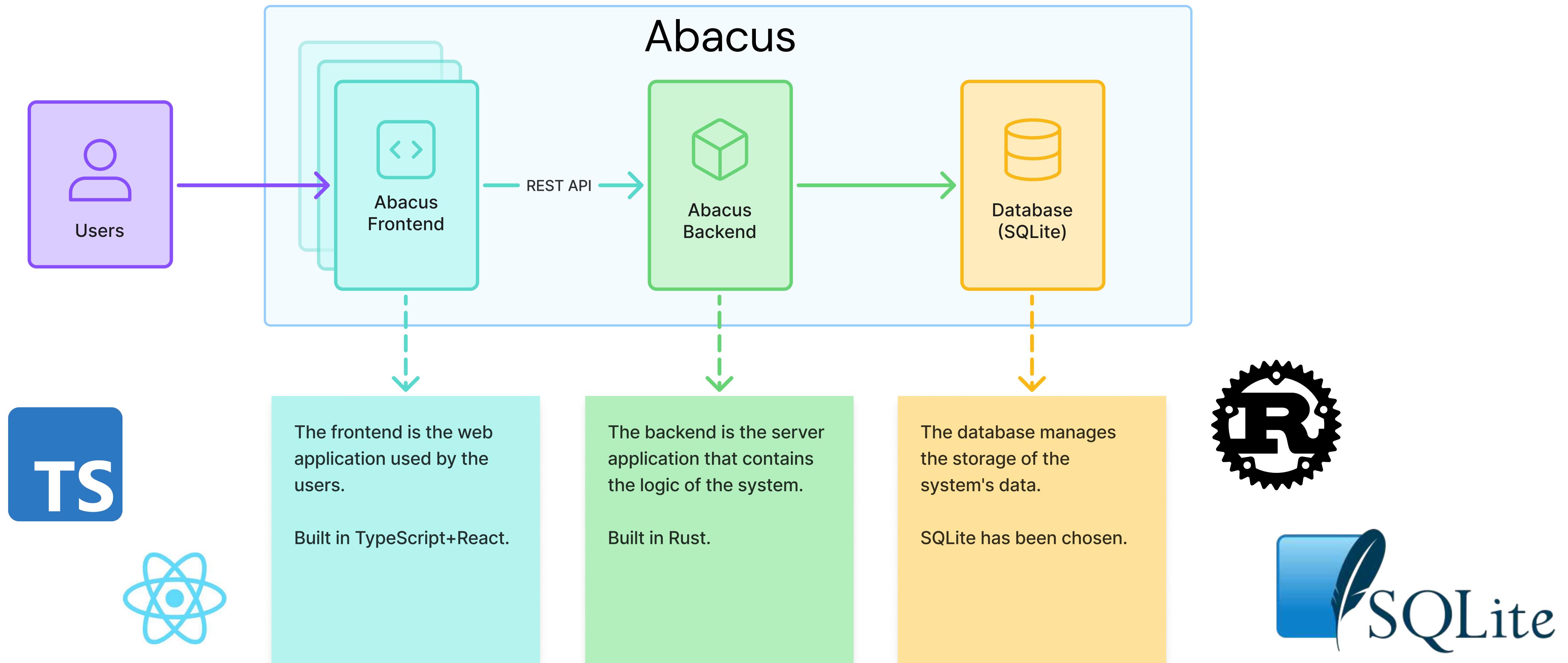
## ● Invoer met fouten en waarschuwingen (5)

| Nummer ↓ | Stembureau ↓↑                              | Te controleren                       |   |
|----------|--|--------------------------------------|---|
| 341      | Schoolstraat 78 <span>2e invoer</span>     | Verschil 1e en 2e invoer             | > |
| 132      | Fluisterbosdreef 8 <span>1e invoer</span>  | Controleer 2 waarschuwingen          | > |
| 47       | Beatrixstraat 19 <span>1e invoer</span>    | Controleer 1 waarschuwing            | > |
| 16       | Zonnebloemstraat 18                        | Beoordeel bezwaren en bijzonderheden | > |
| 15       | Nachthemelstraat 21 <span>2e invoer</span> | Verschil 1e en 2e invoer             | > |

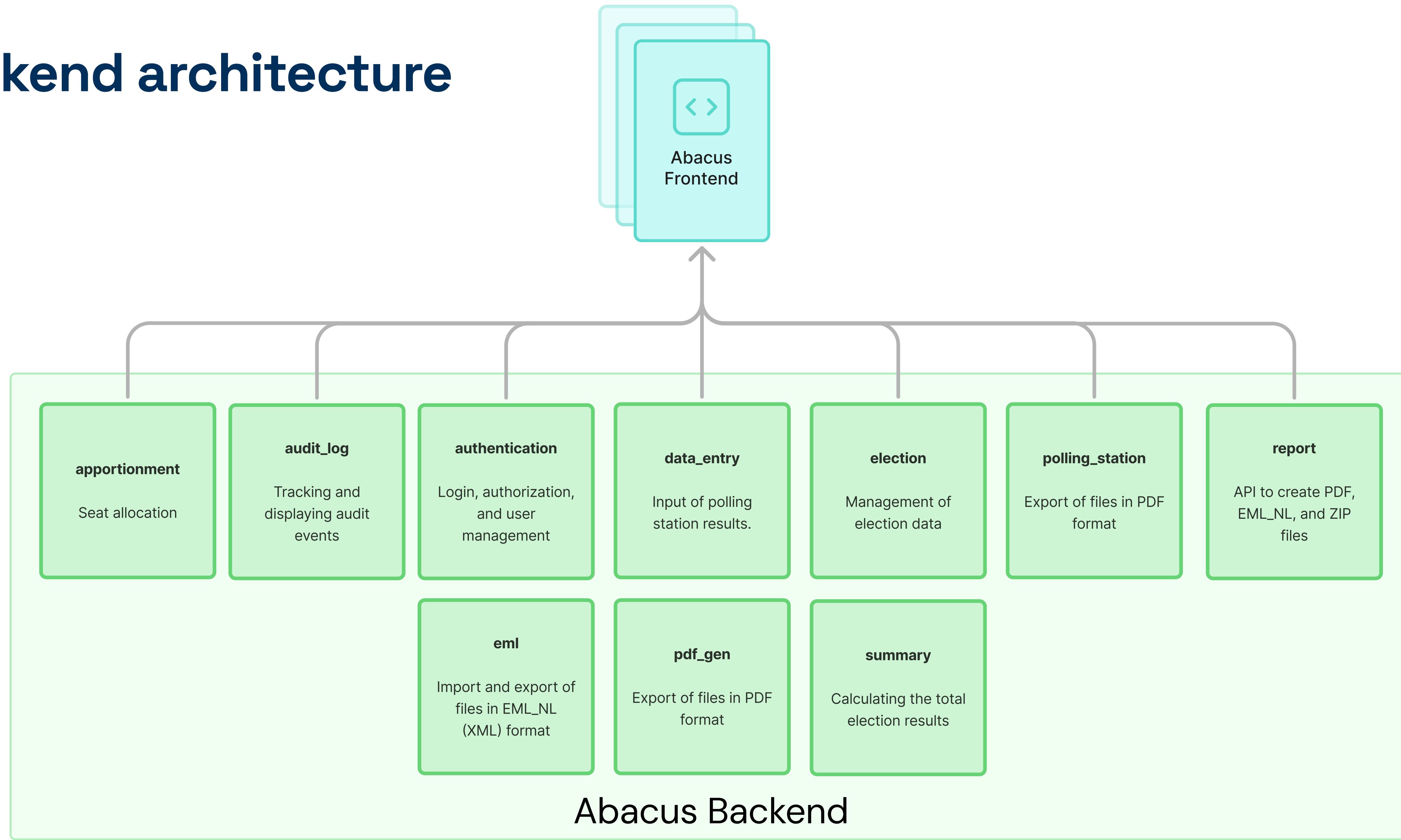
## ● Niet afgeronde invoer (3)

| Nummer ↓ | Stembureau ↓↑                             | Invoerder ↓↑       |   |
|----------|---|--------------------|---|
| 341      | Schoolstraat 78 <span>2e invoer</span>    | 18 Sara van Houten | > |
| 132      | Fluisterbosdreef 8 <span>1e invoer</span> | 21 Leila de Jong   | > |

# Architecture

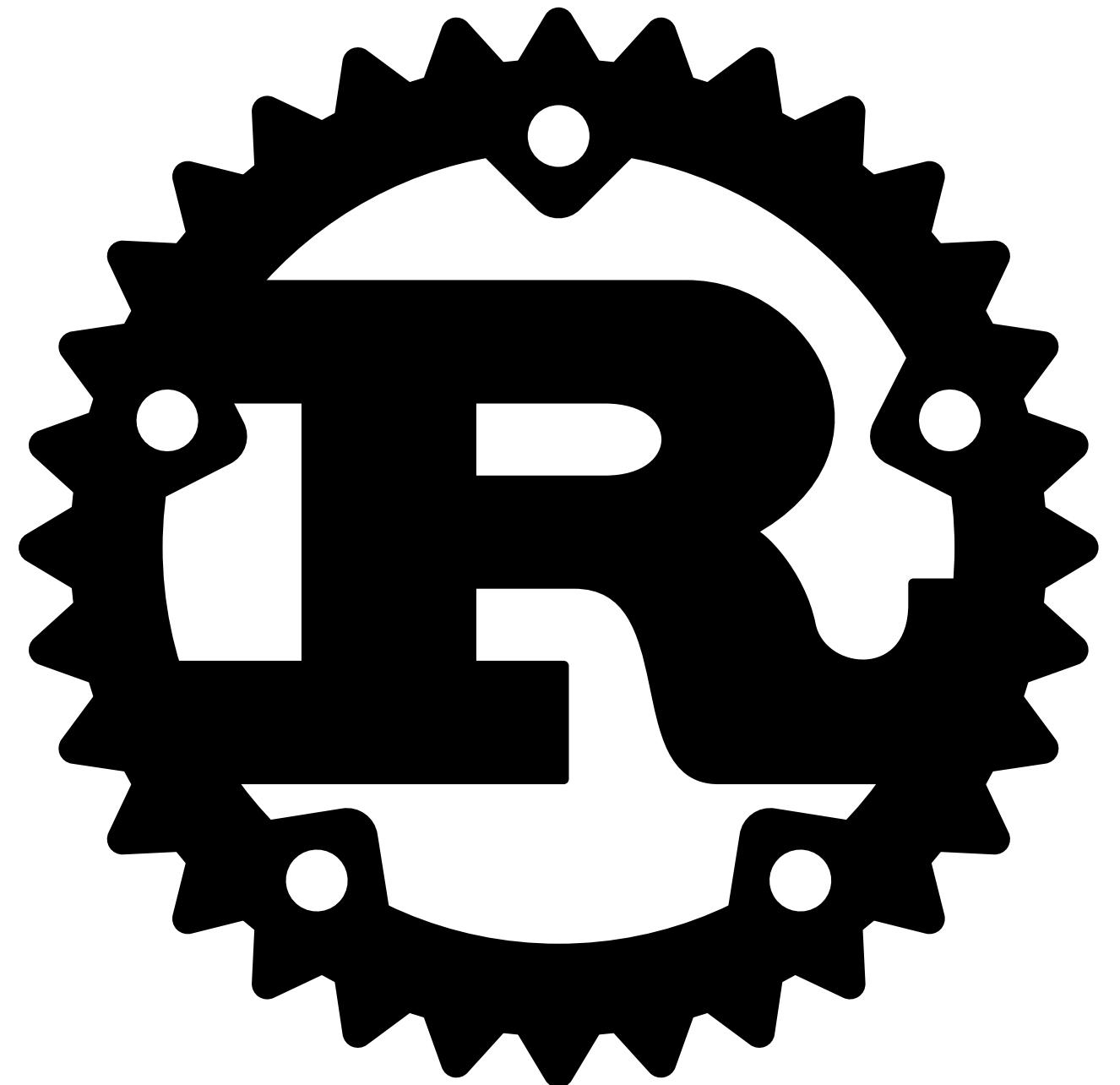


# Backend architecture



# Why Rust?

- Open source (required by election law!)
- Memory-safe
- Strictly typed with a modern type system
- Great tooling (Cargo)
- Cross-platform support
- Easy to deploy: compile to single executable



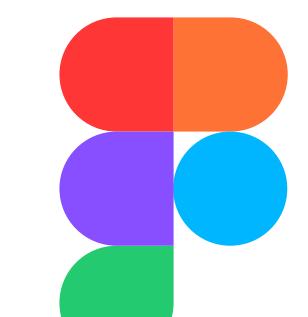
# Development process and tools

- Open source on GitHub: <https://github.com/kiesraad/abacus>
  - EU Public License (EUPL) 1.2
  - Contributions welcome!
- GitHub Actions for CI
  - Static analysis (linting) using Clippy from day 1
- Codecov for test coverage
- Playwright for end-to-end testing
- Test environments using Etes: <https://abacus-test.nl>
  - <https://github.com/tweedegolf/etes>
  - Integrated with GitHub PRs
- Figma for UX design

**GitHub**

 **Codecov**

 **Playwright**

 **Figma**

# Crates

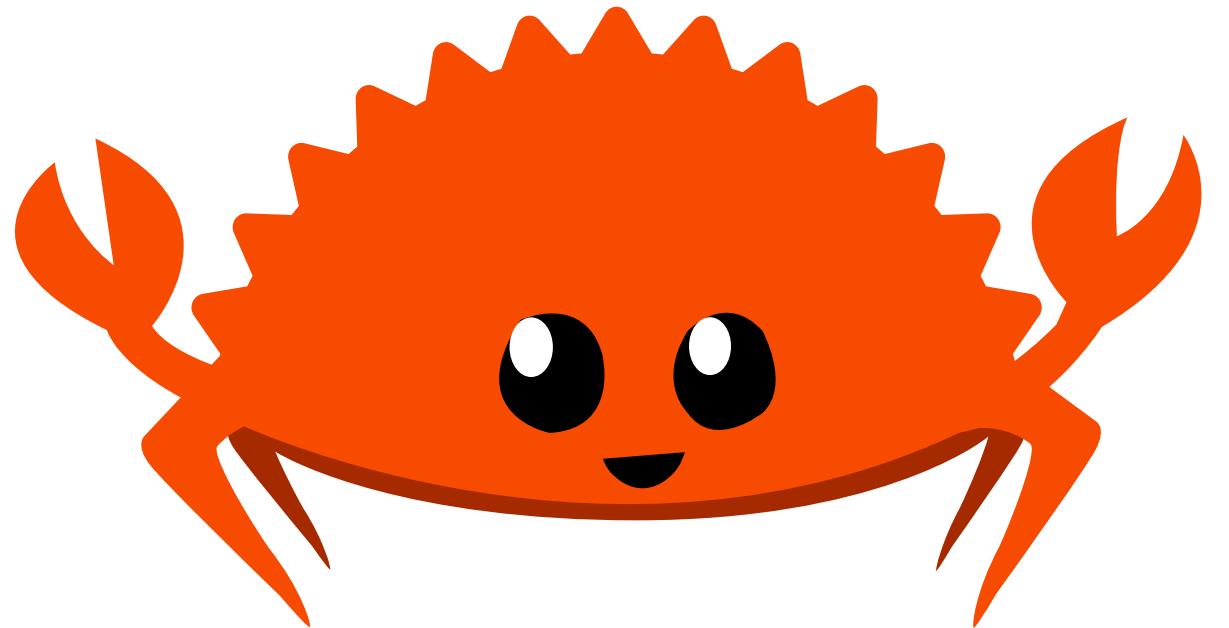
- Axum web framework (Tokio stack)
- Utoipa for OpenAPI
- sqlx for database
- Typst for PDF generation
- quick-xml for XML import/export
- Serde for serializing and deserializing
- .. and some other (smaller) crates



**crates.io**  
the Rust package registry

# Rust 1+ year in: takeaways

- Productive
- Attractive language to hire senior developers
- Median developers able to learn Rust
- Ecosystem has crates for almost everything
  - Stable, although many crates only have 0.x releases
  - Crates for e.g. XML are lacking compared to other languages
- Limited availability of third party code quality and architecture tooling
- Would definitely choose Rust again!





[\*\*github.com/kiesraad/abacus\*\*](https://github.com/kiesraad/abacus)

[\*\*github.com/praseodym\*\*](https://github.com/praseodym)