Technische Hochschule Augsburg

Programmierung von Web-Anwendungen

27.06.2025

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Agenda

1. Motivation
2. Projektorganisation
3. Demonstration der Anwendung
4. Technologie-Stack
5. Technische Umsetzung
6. Fazit

Motivation

Probleme von Reddit, Twitter, Threads, …

Motivation

Idee

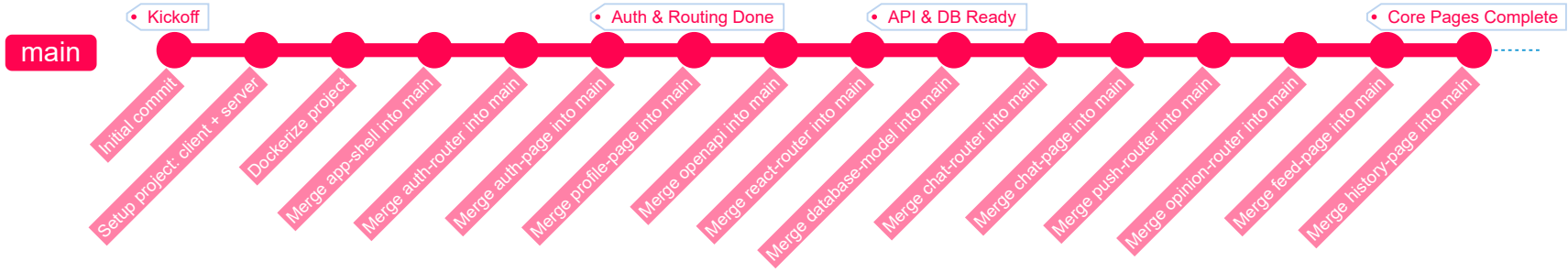
Motivation

- skizze/entwurf/...
- content

Projektorganisation

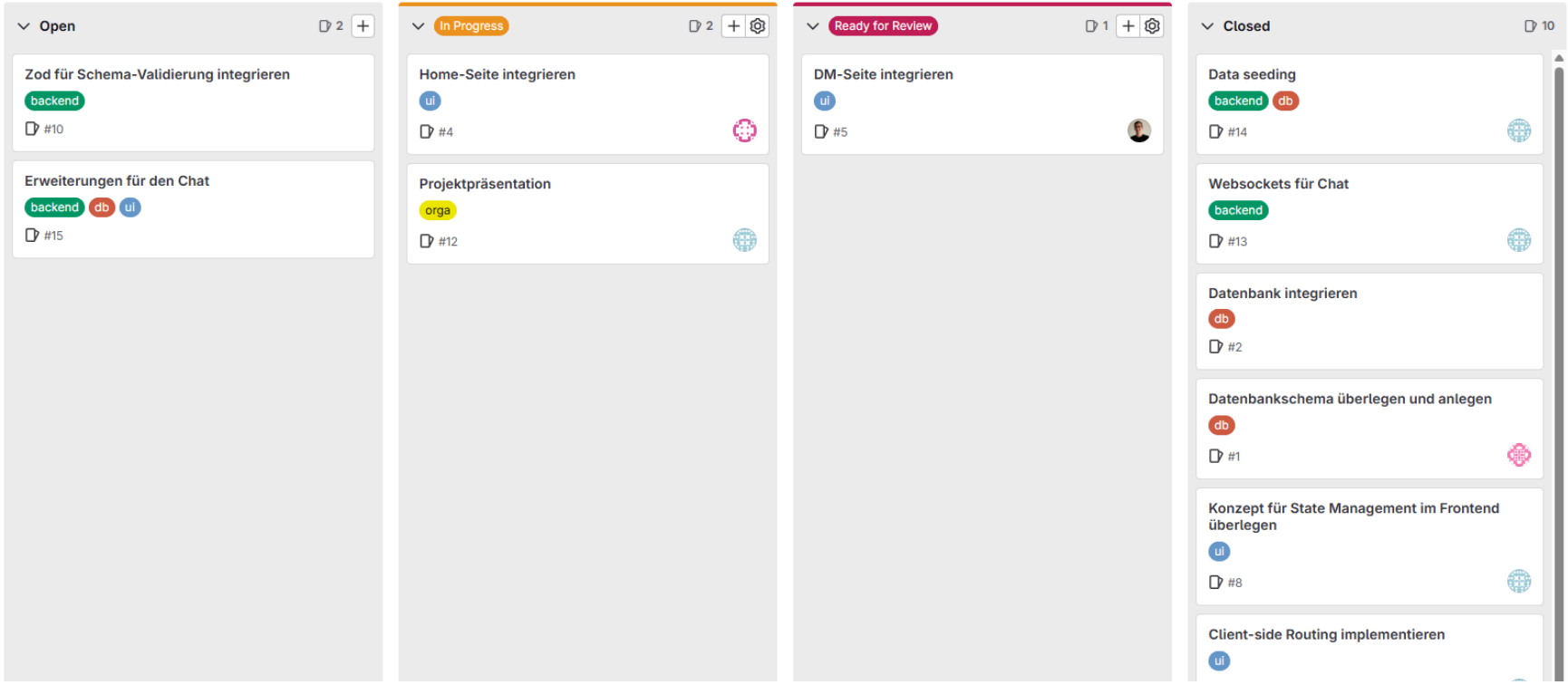
Timeline & Milestones

Projektorganisation



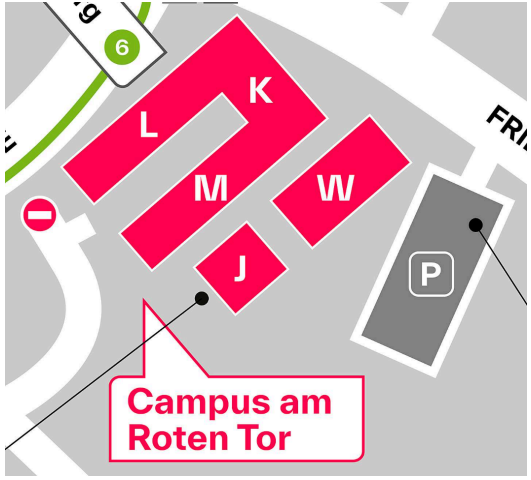
Issue Board

Projektorganisation



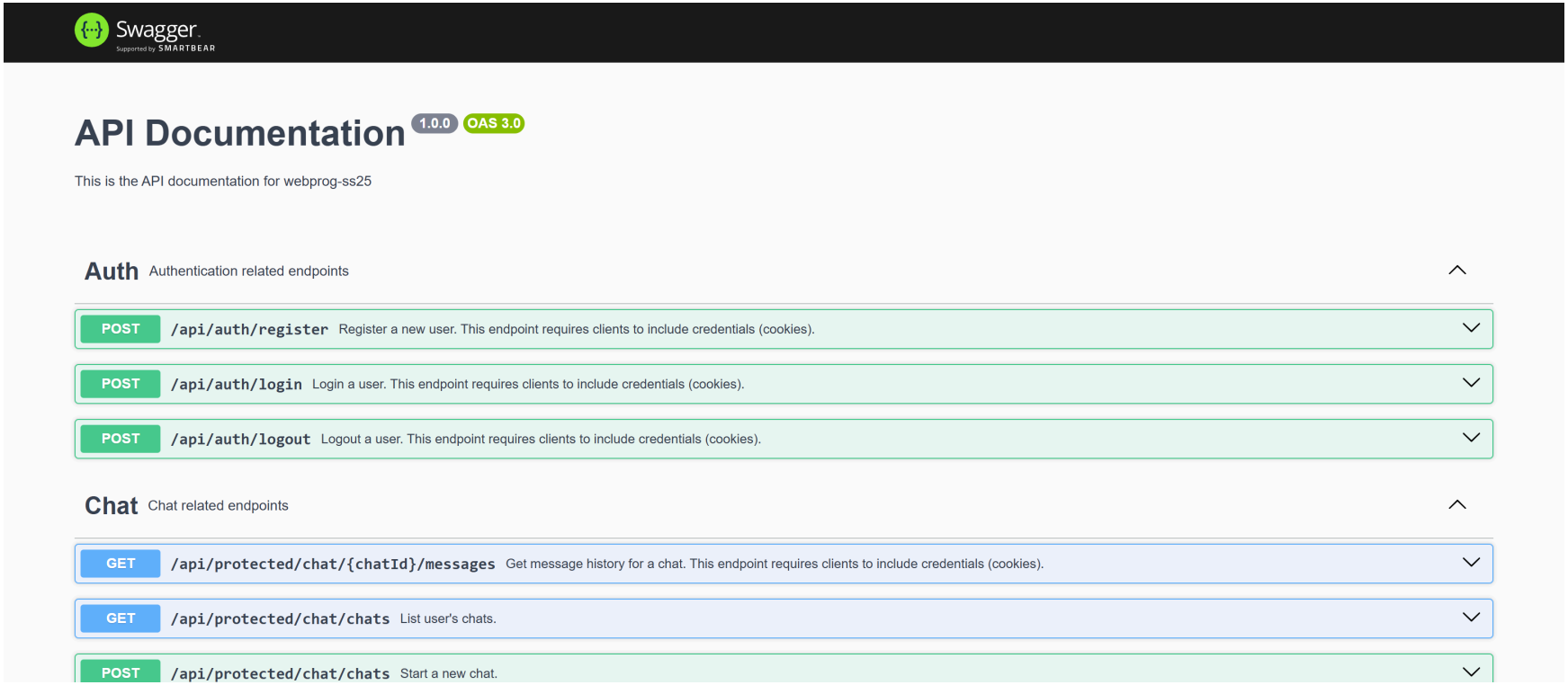
Kommunikation im Team

Projektorganisation



API-Dokumentation

Projektorganisation



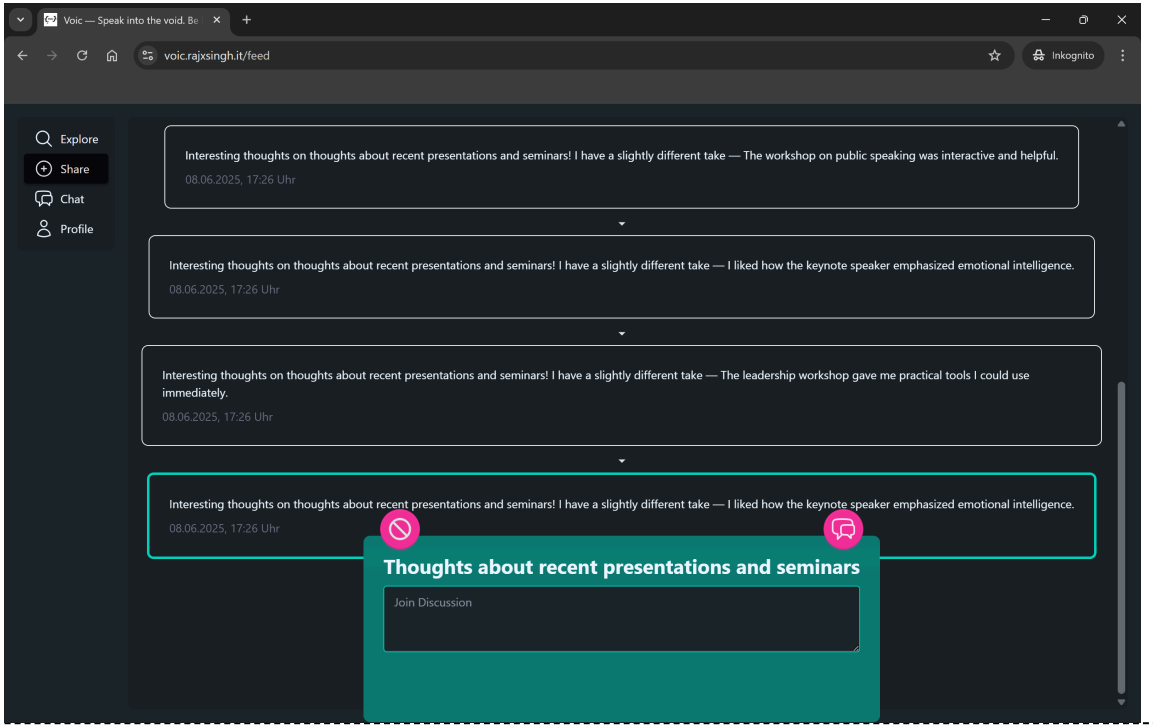
Dokumentation

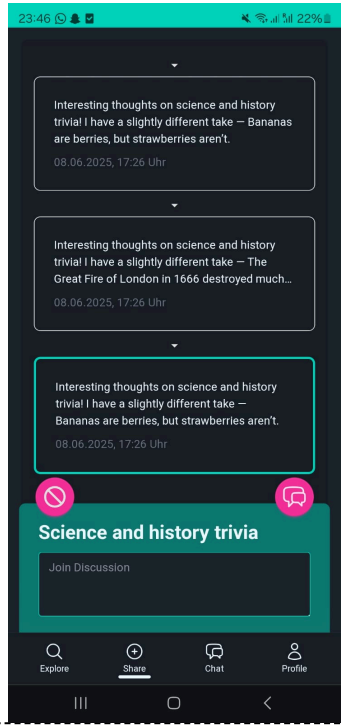
Projektorganisation

> “**Good code is its own best documentation.** As you’re about to add a comment, ask yourself, 'How can I improve the code so that this comment isn’t needed?' Improve the code and then document it to make it even clearer.”
>
> — Steve McConnell, Code Complete: A Practical Handbook of Software Construction

Demonstration der Anwendung

Demonstration der Anwendung





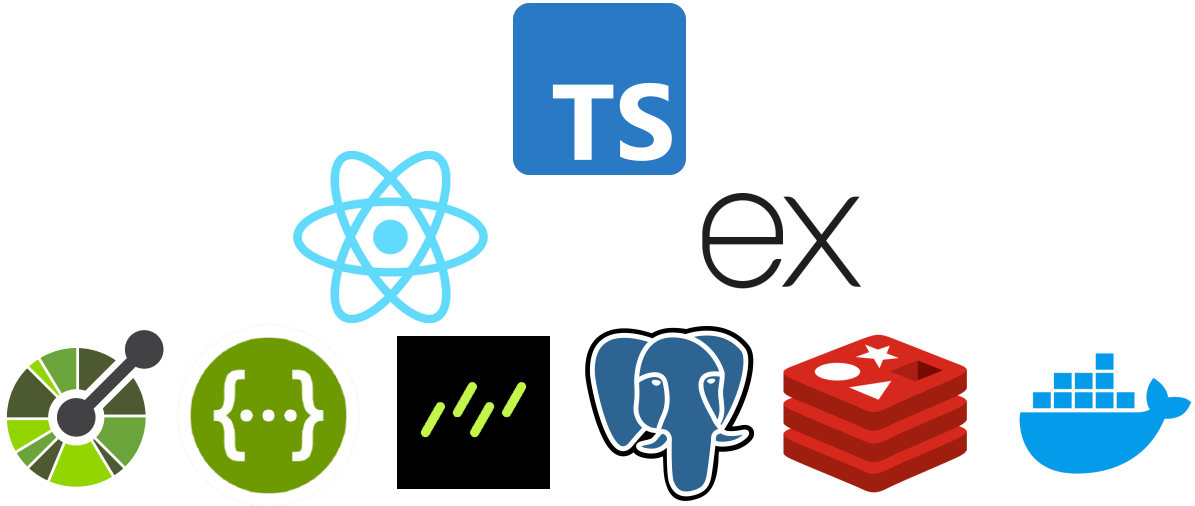
Demonstration der Anwendung

Jetzt selber ausprobieren!

Technologie-Stack

Übersicht

Technologie-Stack



React

Technologie-Stack

React: JSX

Was ist JSX?

React: JSX

Vorteile von JSX

React: Hooks

Was sind Hooks?

React: Hooks

`useState` → lokaler State in Komponenten

```
import { useState } from "react";

function Counter() {
  const [count, setCount] = useState(0);

  return (
    <button onClick={() => setCount(count + 1)}>
      Count: {count}
    </button>
  );
}
```

React: Hooks

`useEffect` → Side-Effects (z. B. API-Aufrufe, DOM-Manipulation)

```tsx
import { useState, useEffect } from "react";

function DataLoader() {
  const [data, setData] = useState<string>("");
  const [searchString, setSearchString] = useState<string>("");

  useEffect(() => {
    fetch("/api/data/?query=${searchString}")
      .then((res) => res.text())
      .then((text) => setData(text));
  }, [searchString]);

  return <div>{data}</div>;
}
```

React: Hooks

`useContext` → Zugriff auf Kontext (z. B. globale Zustände)

```
import { createContext, useContext, useState, ReactNode } from "react";

const AuthContext = createContext(undefined);

export const AuthProvider = ({ children }) => {
  const [userId, setUserId] = useState(null);

  const login = (userId) => setUserId(userId);
  const logout = () => setUserId(null);

  return (
    <AuthContext.Provider value={{ userId, loggedIn: Boolean(userId), login, logout }}>
      {children}
    </AuthContext.Provider>
  );
};

// Verwendung in Komponenten:
const { userId, login, logout } = useContext(AuthContext);
```

Browser DOM

This is shown on the left

```
<html>
  <head>
    <title>This is the title</title>
  </head>
  <body>
    <h1>This is a header</h1>
    <p> This is a paragraph</p>
  </body>
</html>
```

- Repräsentiert die Struktur der Webseite als Baum von Knoten (*Nodes*)

- DOM-Operationen sind teuer (*Performance*)

Virtual DOM

Von React generierter virtueller DOM-Baum

```
const domTree = {
  tagName: 'html',
  attributes: {},
  children: [
    {
      tagName: 'head',
      attributes: {},
      children: [
        {
          tagName: 'title',
          attributes: {},
          children: ['Href Attribute Example'],
        },
      ],
    },
    {
      tagName: 'body',
      attributes: {},
      children: [
        {
          tagName: 'h1',
```

React Internals: Virtual DOM

Wie React Änderungen effizient rendert

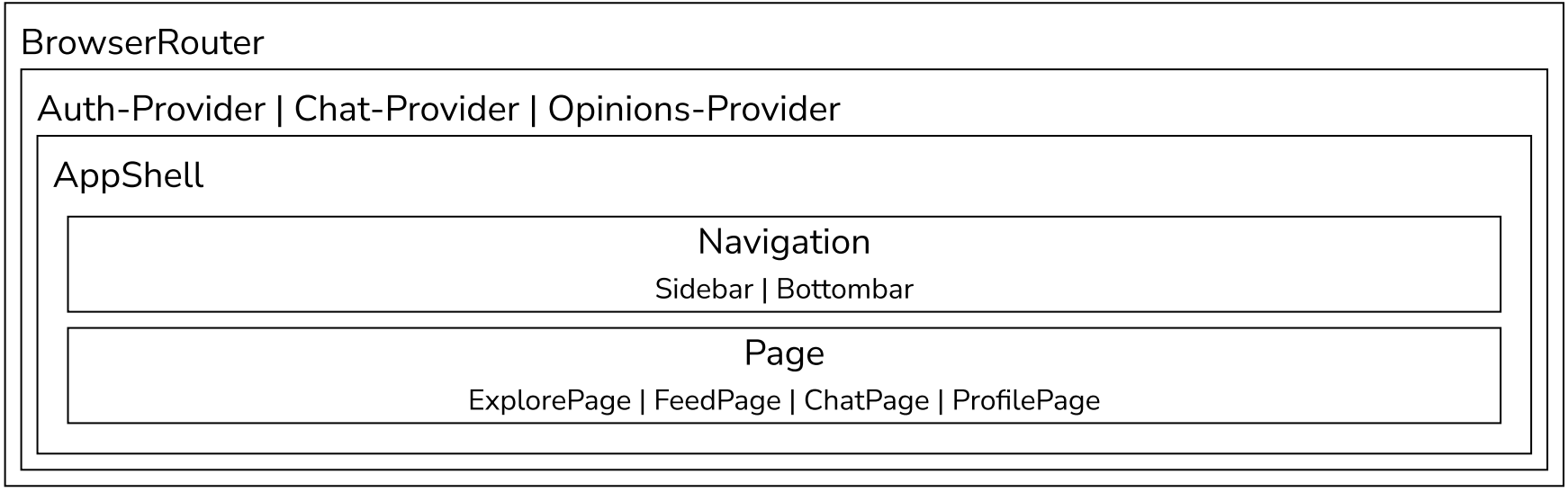
Express.js

Technologie-Stack

Technische Umsetzung

Frontend

Technische Umsetzung



Tailwind

Technische Umsetzung

- wenn wir noch Zeit brauchen, dann ausformulieren

Animationen

Warum Motion?

- Einfache deklarative Implementierung von Animationen
- `motion`-Komponente können wie normale HTML-Elemente verwendet werden
- Hohe Performance durch optimierte Rendering-Pipelines

Animationen

Verwendung in unserer Anwendung

- `motion.div`:

```
<motion.div
    drag="x"
    animate={animationController}
    whileDrag={{ scale: 1.02 }}
    onDragEnd={(_, dragInfo) ⇒ handleSwipe(dragInfo)}
>
    { /* …DiscussionCards… */ }
</motion.div>
```

- `useAnimation`:

```
const animationController = useAnimation();
const handleDismissed = async () ⇒ {
    await animationController.start({ x: -500, opacity: 0, transition: { duration: 0.2 } });
    // fetch new data
    animationController.set({ x: 50, opacity: 0 });
    await animationController.start({ x: 0, opacity: 1, transition: { duration: 0.4 } });
};
```

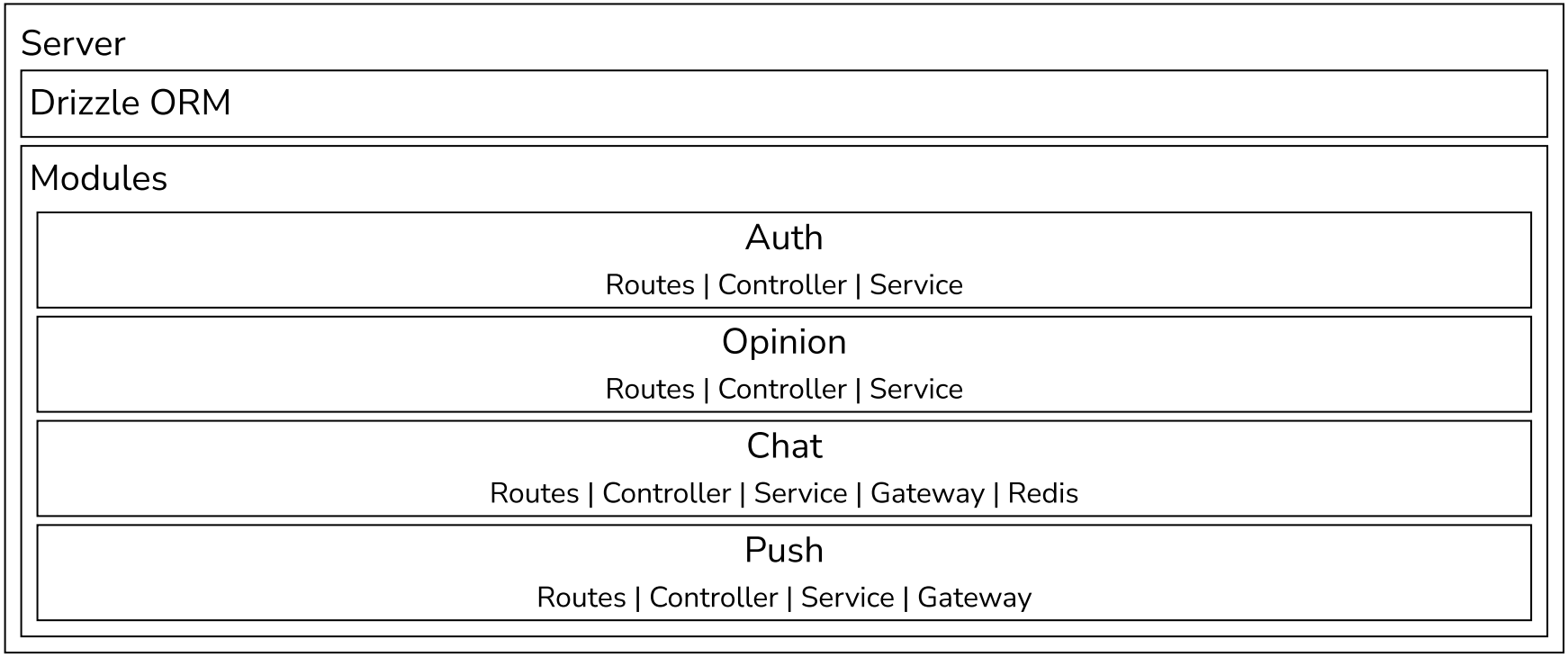
Animationen

Gesten und Dragging

```
<motion.div
drag
onDragEnd={(e, info) => console.log(info.offset.x)}
>
  Drag Me
</motion.div>
```

Backend

Technische Umsetzung



Datenbank

Technische Umsetzung

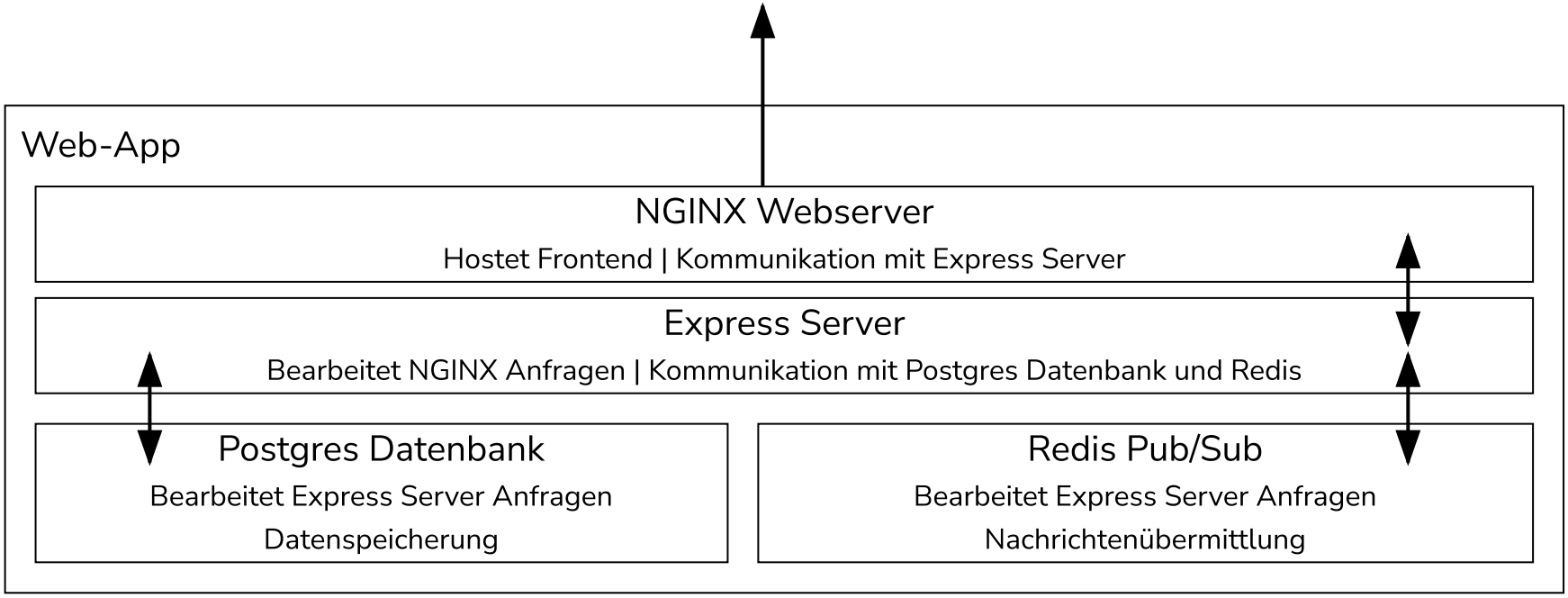
- todo: Drizzle ORM
- Postgres
- Datenbank-Schema etc.

Authentifizierung

Technische Umsetzung

DevOps – Überblick

Technische Umsetzung



DevOps – Frontend

Technische Umsetzung

```
# BUILD APP
FROM node:lts-alpine as builder

WORKDIR /app

COPY package*.json ./

RUN npm install

COPY . .

RUN npm run build

# SERVE APP
FROM nginx:stable-alpine

WORKDIR /usr/share/nginx/html

RUN rm -rf ./*

COPY --from=builder /app/dist
```

DevOps – Backend

Technische Umsetzung

```
ARG NODE_VERSION=22.15.0
FROM node:${NODE_VERSION}-alpine

WORKDIR /app

COPY package*.json ./

RUN npm install

COPY . .

RUN npm run build

EXPOSE 80

CMD ["npm", "run", "start"]
```

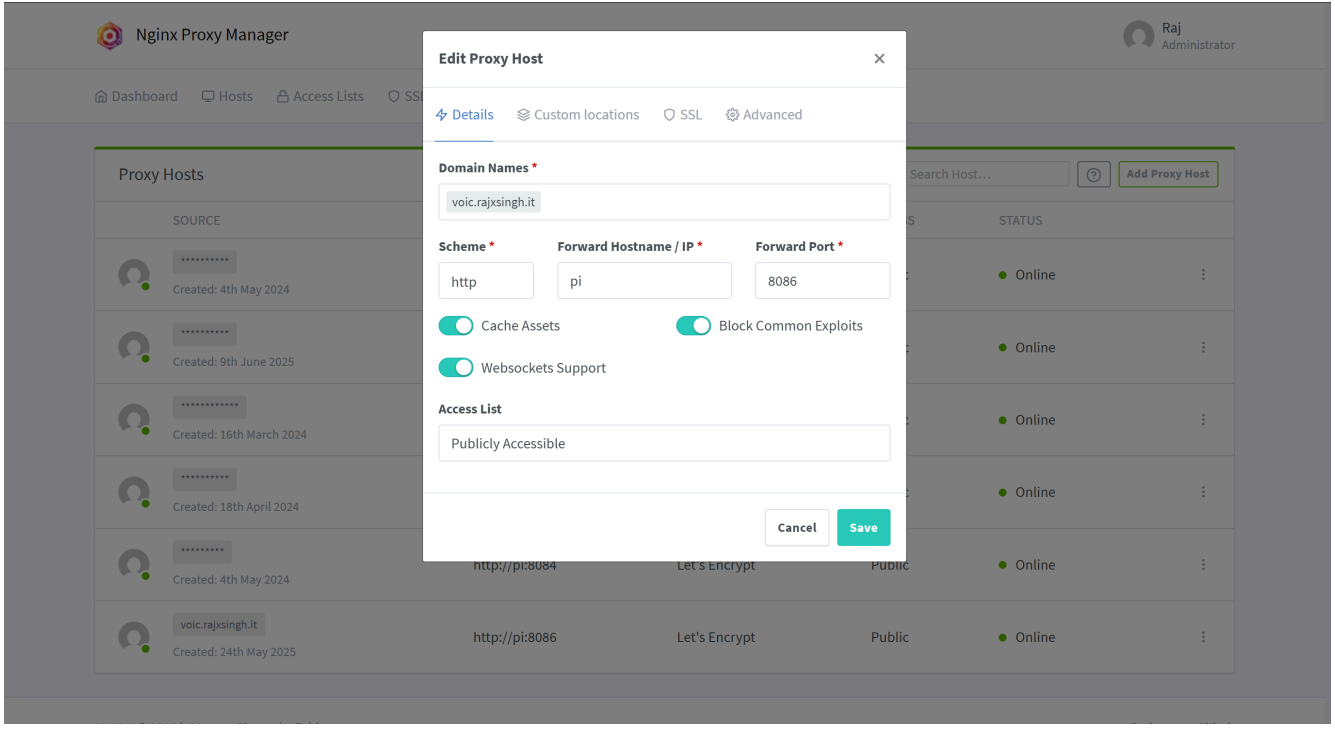
DevOps – Docker Compose

Technische Umsetzung

```yaml
services:
  client:
    build: ./client
    restart: always
    container_name: webprog-ss25-fe
    volumes:
      - ./client/nginx/client.conf:/etc/nginx/conf.d/client.conf
    ports:
      - "8084:80"
    env_file:
      - ./client/.env.production
    depends_on:
      - server

  server:
    build: ./server
    restart: always
    container_name: webprog-ss25-be
    ports:
      - "8085:80"
```

DevOps – Nginx Proxy Manager

Technische Umsetzung



OpenAPI – Konfiguration

Technische Umsetzung

```
import swaggerJSDoc from "swagger-jsdoc";

const swaggerDefinition = {
  openapi: "3.0.0",
  info: {
    title: "API Documentation",
    version: "1.0.0",
    description: "This is the API documentation for webprog-ss25",
  },
  components: {
    schemas: {
      Message: {
        type: "object",
        required: ["message"],
        properties: {
          message: {
            type: "string",
            example: "Request failed/successful.",
          },
        },
```

OpenAPI – Initialisierung

Technische Umsetzung

```
import swaggerUi from "swagger-ui-express";
import { openapiSpec } from "./openapi";

const app = express();

app.use("/api-docs", swaggerUi.serve, swaggerUi.setup(openapiSpec));
app.get("/openapi.json", (req, res) ⇒ {
    res.setHeader("Content-Type", "application/json");
    res.send(openapiSpec);
});
```

OpenAPI – Dokumentation

Technische Umsetzung

```
import { Router } from "express";
import { testController } from "./test.controller";

/**
 * @swagger
 * tags:
 *   name: Protected
 *   description: Protected endpoints.
 */
const testRouter = Router();

/**
 * @swagger
 * /api/protected/test:
 *   post:
 *     summary: Test if user is logged in.
 *     tags: [Protected]
 *     operationId: testProtected
 *     responses:
 *       200:
```

OpenAPI – Client-Generierung

Technische Umsetzung

```
$ npm run openapi-ts

$ tree client/src/api/
client/src/api/
├── auth.ts
├── client.gen.ts
├── index.ts
├── schemas.gen.ts
├── sdk.gen.ts
├── setup.ts
└── types.gen.ts
```

WebSockets & Redis Pub/Sub – Initialisierung 1

Technische Umsetzung

```
import http from "http";
import express from "express";
import WebSocket from "ws";
import { initRedis } from "./modules/chat/chat.redis";
import {
    upgradeWebSocket,
    handleWebSocketConnection,
} from "./modules/chat/chat.gateway";

const app = express();
const server = http.createServer(app);
const wss = new WebSocket.Server({ noServer: true });

server.on("upgrade", (req, socket, head) => {
    upgradeWebSocket(wss, req, socket, head);
});

wss.on("connection", handleWebSocketConnection);

initRedis().then(() => {
```

WebSockets + Redis Pub/Sub – Initialiserung 2

Technische Umsetzung

```
import { createClient } from "redis";

export const redisConfig = {
  url: process.env.REDIS_URL,
};

export const redisPub = createClient(redisConfig);

export async function initRedis() {
  await redisPub.connect();
}
```

WebSockets + Redis Pub/Sub – Initialisierung 3

Technische Umsetzung

```
export const upgradeWebSocket = (
  server: WebSocketServer,
  request: IncomingMessage,
  socket: any,
  head: any,
) ⇒ {
  // Überprüfung ob Cookie vorhanden und gültig
};

export const handleWebSocketConnection = async (
  ws: WebSocket,
  request: IncomingMessage,
) ⇒ {
  // get chats

  const subClient = createClient(redisConfig);
  await subClient.connect();

  await Promise.all(
    chats.map((chat) ⇒
```

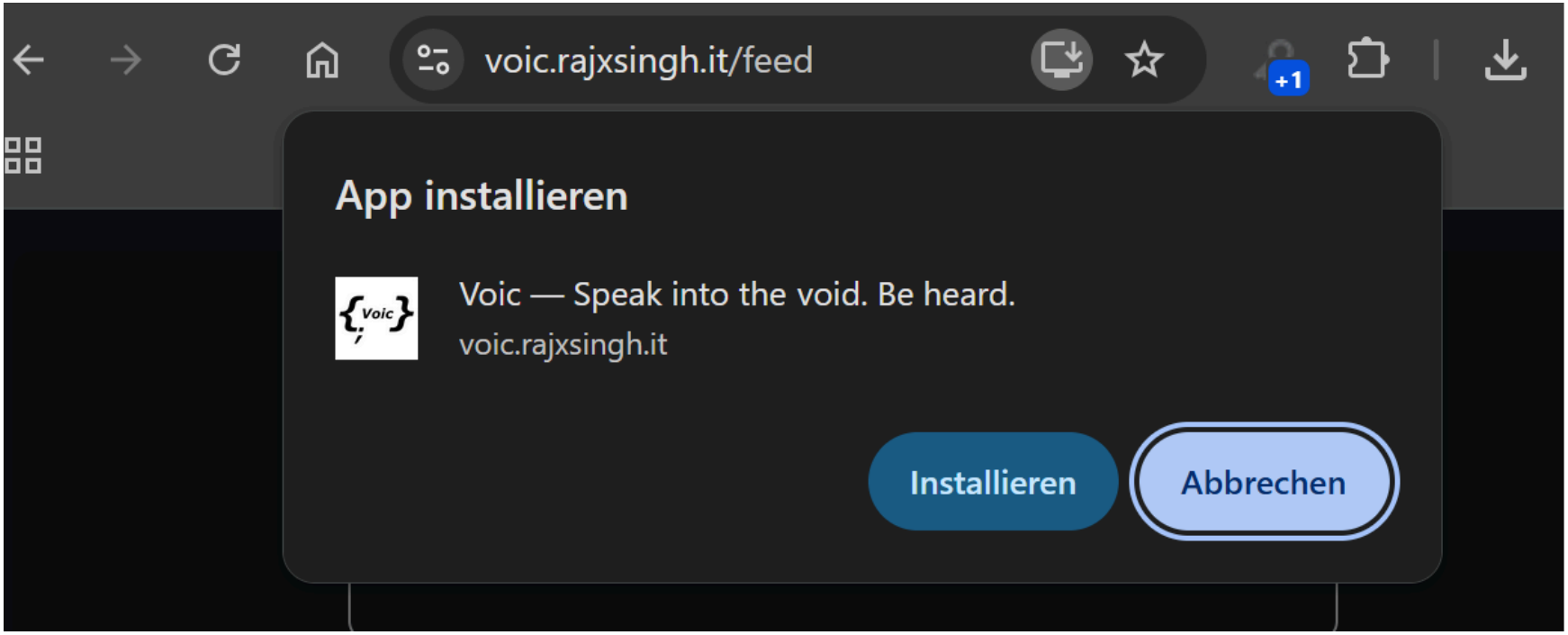
WebSockets + Redis Pub/Sub – Client

Technische Umsetzung

```
// ...

export const ChatProvider = ({ children }: { children: ReactNode }) => {
  const wsRef = useRef<WebSocket | null>(null);

  useEffect(() => {
    const loadChats = async () => {
      // Use REST API for initial load
    };

    void loadChats();
  }, [userId]);

  useEffect(() => {
    const ws = new WebSocket(import.meta.env.VITE_WEBSOCKET);
    wsRef.current = ws;

    const handleMessage = (event: MessageEvent) => {
      try {
        const data = JSON.parse(event.data);
```

PWA

Technische Umsetzung



PWA – manifest.json

Technische Umsetzung

```
{
    "name": "Voic – Speak into the void. Be heard.",
    "short_name": "Voic",
    "description": "Voic is an anonymous space for honest thoughts and open conversation. No profiles, no likes, no foll
    "start_url": ".",
    "display": "standalone",
    "background_color": "#00d3bb",
    "theme_color": "#00d3bb",
    "icons": [
        {
            "src": "icon-192×192.png",
            "sizes": "192×192",
            "type": "image/png"
        },
        {
            "src": "icon-512×512.png",
            "sizes": "512×512",
            "type": "image/png"
        }
    ]
}
```

PWA – service-worker 1

Technische Umsetzung

```
self.addEventListener("push", function (event) {
    const data = event.data ? event.data.json() : {};
    const title = data.opinionTitle;
    const options = {
        body: data.body,
        icon: "/icon-192×192.png",
        data: data,
    };
    event.waitUntil(self.registration.showNotification(title, options));
});

self.addEventListener("notificationclick", function (event) {
    event.notification.close();
    event.waitUntil(
        clients.matchAll({ type: "window" }).then(function (clientList) {
            for (const client of clientList) {
                if (client.url && "focus" in client) {
                    return client.focus();
                }
            }
```

PWA – service-worker 2

Technische Umsetzung

```
if ("serviceWorker" in navigator) {
  window.addEventListener("load", () ⇒ {
    navigator.serviceWorker.register("/sw.js").catch(console.error);
  });
}
```

PWA – WebPush API 1

Technische Umsetzung

```
useEffect(() => {
  const vapidPublicKey = import.meta.env.VITE_VAPID_PUBLIC_KEY;

  async function subscribeUserToPush(publicKey: string) {
    if ("serviceWorker" in navigator && "PushManager" in window) {
      const reg = await navigator.serviceWorker.ready;
      const sub = await reg.pushManager.subscribe({
        userVisibleOnly: true,
        applicationServerKey: urlBase64ToUint8Array(publicKey),
      });
      return sub;
    }
  }

  if (userId && vapidPublicKey) {
    subscribeUserToPush(vapidPublicKey).then(async (sub) => {
      // save subscription to db using REST API
    });
  }
}, [userId]);
```

PWA – WebPush API 2

Technische Umsetzung

```
import webpush from "web-push";
import { getUserSubscriptions, removeSubscription } from "./push.service";

// Generate VAPID keys only once and store them securely. For demo, you can generate and log them here:
// const vapidKeys = webpush.generateVAPIDKeys();
// console.log('VAPID Public Key:', vapidKeys.publicKey);
// console.log('VAPID Private Key:', vapidKeys.privateKey);

webpush.setVapidDetails(
    process.env.VAPID_CONTACT_EMAIL as string,
    process.env.VAPID_PUBLIC_KEY as string,
    process.env.VAPID_PRIVATE_KEY as string
);

export async function sendPushNotification(userId: string, payload: any) {
    const userSubs = await getUserSubscriptions(userId);
    for (const sub of userSubs) {
        const pushSubscription = {
            endpoint: sub.endpoint,
            keys: {
```

Fazit

Fazit

Fazit

- Neue Technologien erfolgreich eingesetzt
- Alle haben Neues gelernt und ausprobiert
- Hohe Motivation durch kreative Freiheit
- Viel Spaß durch praxisnahes Arbeiten

Ausblick

Fazit

- Anonyme Plattform als bewusstes Experiment
- Raum für ehrliche Diskussion – aber Missbrauch möglich
- Bedarf an Mechanismen zur Erkennung von problematischem Content
- Ziel: Balance zwischen Freiheit und Verantwortung
- Viel Potenzial für Weiterentwicklung

Fragen?

Meinungen?