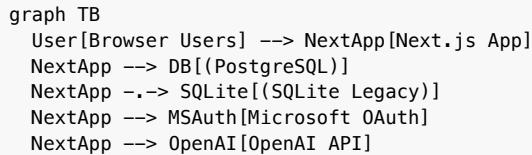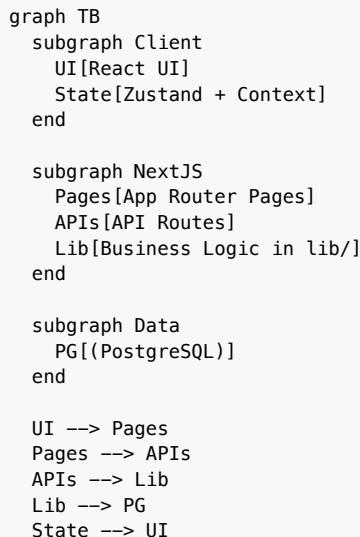# Architecture Overview

This document provides a high-level overview of the AMPCode system: major components, data stores, integrations, and core flows. For deeper detail, see `ARCHITECTURE.md`.

System Context

- Users access the app via web or mobile browsers.
- The Next.js application serves both UI and API routes.
- The system integrates with Microsoft OAuth and OpenAI APIs.
- Primary data is stored in PostgreSQL (SQLite is legacy).

```
graph TB
  User[Browser Users] --> NextApp[Next.js App]
  NextApp --> DB[(PostgreSQL)]
  NextApp -.-> SQLite[(SQLite Legacy)]
  NextApp --> MSAuth[Microsoft OAuth]
  NextApp --> OpenAI[OpenAI API]
```

High-Level Architecture

```
graph TB
  subgraph Client
    UI[React UI]
    State[Zustand + Context]
  end

  subgraph NextJS
    Pages[App Router Pages]
    APIs[API Routes]
    Lib[Business Logic in lib/]
  end

  subgraph Data
    PG[(PostgreSQL)]
  end

  UI --> Pages
  Pages --> APIs
  APIs --> Lib
  Lib --> PG
  State --> UI
```

Key Components

Frontend

- `app/` for page routing (Next.js App Router).
- `components/`, `hooks/`, `contexts/`, `store/` for UI, state, and shared logic.
- Tree/goal views and time management widgets built as reusable components.

Backend (API Routes)

- `app/api/` handles authentication, OKRT CRUD, groups, comments, notifications, time blocks, and AI endpoints.
- `lib/` provides shared business logic (auth, database access, notifications, progress propagation, cache updates).

Data Layer

- PostgreSQL is the primary store.
- SQLite remains for legacy compatibility and migration paths.

Database ER Diagram

```
erDiagram
  USERS ||--o{ OKRT : owns
  USERS ||--o{ USER_GROUP : belongs_to
  USERS ||--o{ FOLLOWS : follows
  USERS ||--o{ NOTIFICATIONS : receives
  USERS ||--o{ COMMENTS : sends
  USERS ||--o{ COMMENTS : receives
```

```
USERS ||--o{ TIME_BLOCKS : schedules

GROUPS ||--o{ USER_GROUP : contains
GROUPS ||--o{ SHARE : shared_with
GROUPS ||--o{ GROUPS : parent_of

OKRT ||--o{ OKRT : parent_of
OKRT ||--o{ SHARE : shared_as
OKRT ||--o{ FOLLOWS : followed_by
OKRT ||--o{ COMMENTS : has
OKRT ||--o{ TIME_BLOCKS : scheduled_in

COMMENTS ||--o{ COMMENTS : replies_to

USERS {
  int id PK
  string username UK
  string password_hash
  string display_name
  string email UK
  string microsoft_id UK
  string first_name
  string last_name
  string profile_picture_url
  string auth_provider
  jsonb preferences
  timestamp created_at
  timestamp updated_at
}

OKRT {
  string id PK
  string type
  int owner_id FK
  string parent_id FK
  string title
  string description
  float progress
  string status
  string area
  string cycle_qtr
  int order_index
  string visibility
  string objective_kind
  float kr_target_number
  string kr_unit
  float kr_baseline_number
  float weight
  string task_status
  date due_date
  string recurrence_json
  string blocked_by FK
  string header_image_url
  timestamp created_at
  timestamp updated_at
}

GROUPS {
  string id PK
  string name UK
  string type
  string parent_group_id FK
  string thumbnail_url
  timestamp created_at
  timestamp updated_at
}

USER_GROUP {
  int user_id FK
  string group_id FK
  boolean is_admin
  timestamp created_at
}

SHARE {
  string okrt_id FK
  string group_or_user_id
  string share_type
  timestamp created_at
}
```

```
FOLLOWS {
    int id PK
    int user_id FK
    string objective_id FK
    timestamp created_at
}

NOTIFICATIONS {
    int id PK
    int user_id FK
    string type
    string title
    string message
    string related_okrt_id FK
    string related_group_id FK
    int related_user_id FK
    boolean is_read
    timestamptz created_at
}

COMMENTS {
    int id PK
    string comment
    int parent_comment_id FK
    string type
    int count
    int sending_user FK
    int receiving_user FK
    string okrt_id FK
    timestamptz created_at
    timestamptz updated_at
}

TIME_BLOCKS {
    int id PK
    string task_id FK
    int user_id FK
    timestamptz start_time
    int duration
    string objective_id FK
    timestamptz created_at
    timestamptz updated_at
}
```

Core Domains

- Objectives/Key Results/Tasks (OKRT) hierarchy.
- Groups and sharing.
- Comments, rewards, and notifications.
- Time blocks and scheduling.
- AI coaching assistance.

Data Flow (Representative)

OKRT Create/Update

1. UI submits a create or update request to `app/api/...`.
2. API validates auth and input, writes to PostgreSQL via `lib/`.
3. API returns updated OKRT data and cache update instructions.
4. UI updates local state (Zustand) and re-renders tree views.

Authentication

1. UI posts credentials to auth route or uses Microsoft OAuth callback.
2. API verifies credentials and issues JWT-based session cookie.
3. UI fetches `/api/me` to hydrate user state.

External Integrations

- Microsoft OAuth for enterprise login.
- OpenAI for LLM coaching and text-to-speech endpoints.

Deployment and Configuration

- Environment variables: database connection, session secret, OAuth credentials, OpenAI key, and `NODE_ENV`.

- Stateless API design supports horizontal scaling.
- Assets are CDN-friendly when deployed on Vercel or similar platforms.

Security and Access Control

- JWT-based sessions with HTTP-only cookies.
- Permission checks on all protected API routes.
- Ownership and group membership validation for shared data.

Scalability Notes

- PostgreSQL connection pooling in `lib/`.
- Cache update instructions to reduce full-tree refetching.
- Database indexes on common access paths (OKRT hierarchy, groups, notifications).

Node Libraries

Library	Intended purpose	Example source file
`@emotion/react`	CSS-in-JS engine (MUI peer dependency)	N/A (no direct import found)
`@emotion/styled`	Styled component API for Emotion (MUI peer dependency)	N/A (no direct import found)
`@mui/material`	Material UI components and styling utilities	`components/OKRTs.js`
`@mui/x-tree-view`	MUI Tree View components	`components/OKRTs.js`
`@playwright/test`	End-to-end testing framework	N/A (no direct import found)
`@prisma/client`	Prisma ORM client	`lib/db.js`
`bcryptjs`	Password hashing	`lib/auth.js`
`boring-avatars`	Avatar generation	N/A (no direct import found)
`d3`	Data visualization core library (dependency of org chart)	N/A (no direct import found)
`d3-org-chart`	Org chart visualization	`app/organisation/GroupsView.js`
`dotenv`	Load environment variables from `.env`	`scripts/initPostgresDB.js`
`jose`	JWT/JOSE utilities	`lib/auth.js`
`lucide-react`	Icon set for React	`components/ShareModal.js`
`next`	Next.js framework runtime and helpers	`app/api/login/route.js`
`next-auth`	Authentication for Next.js	`app/api/auth/[...nextauth]/route.js`
`openai`	OpenAI API client	`app/api/text-to-speech/route.js`
`pg`	PostgreSQL client	`lib/pgdb.js`
`primeicons`	PrimeReact icon set	`app/organisation/page.js`
`primereact`	PrimeReact UI components	`components/OKRTModal.js`
`react`	React UI library	`components/HeaderBar.js`
`react-dom`	React DOM renderer	N/A (no direct import found)
`react-icons`	Icon packs for React	`components/LeftMenu.js`
`react-markdown`	Markdown rendering in React	`components/MessageMarkdown.jsx`
`remark-gfm`	GitHub Flavored Markdown plugin	`components/MessageMarkdown.jsx`
`sqlite`	SQLite wrapper utilities	`lib/db.sqlite.backup.js`
`sqlite3`	SQLite driver	`lib/db.sqlite.backup.js`
`uuid`	UUID generation	`app/api/okrt/route.js`
`zustand`	State management	`store/mainTreeStore.js`

Page Component Trees (Left Menu)

Dashboard

```
graph TD
    DashboardPage["/dashboard"] --> TwelveWeekClock
    DashboardPage --> TodayWidget
    DashboardPage --> OKRTModal
    DashboardPage --> NotificationsWidget
```

```
    DashboardPage --> DailyInspirationCard
    TwelveWeekClock --> OKRTs
    OKRTs --> MUITextTree["MUI SimpleTreeView"]
    OKRTs --> MUITextItem["MUI TreeItem"]
    TodayWidget --> TodayClock
    TodayWidget --> TaskUpdateModal
    OKRTModal --> PrimeCalendar["PrimeReact Calendar"]
```

My OKRs

```
graph TD
    OKRTPage["/okrt"] --> ObjectiveHeader
    OKRTPage --> KeyResultCard
    OKRTPage --> AddKeyResultCard
    OKRTPage --> OKRTModal
    OKRTPage --> ShareModal
    OKRTPage --> CommentsSection
    ObjectiveHeader --> Chip
    ObjectiveHeader --> ProgressRing
    ObjectiveHeader --> RewardsDisplay
    KeyResultCard --> ProgressBar
    OKRTModal --> PrimeCalendar["PrimeReact Calendar"]
```

Schedule

```
graph TD
    CalendarPage["/calendar"] --> TaskUpdateModal
```

Shared OKRs

```
graph TD
    SharedPage["/shared"] --> SharedHierarchyView
    SharedHierarchyView --> PrimeOrgChart["PrimeReact OrganizationChart"]
```

Business

```
graph TD
    BusinessPage["/organisation"] --> StrategyHouse
    BusinessPage --> GroupsView
    BusinessPage --> ObjectivesView
    BusinessPage --> AddGroupModal
    GroupsView --> D3OrgChart["d3-org-chart"]
    ObjectivesView --> PrimeOrgChart["PrimeReact OrganizationChart"]
```

Members

```
graph TD
    MembersPage["/members"] --> InlineUI["Inline UI (no shared components)"]
```

Coach

```
graph TD
    CoachPage["/coach"] --> OkrtPreview
    CoachPage --> MessageMarkdown
    MessageMarkdown --> ReactMarkdown["react-markdown"]
```

Notifications

```
graph TD
    NotificationsPage["/notifications"] --> PrimeDataView["PrimeReact DataView"]
    NotificationsPage --> PrimeButton["PrimeReact Button"]
    NotificationsPage --> PrimeBadge["PrimeReact Badge"]
```

```
    NotificationsPage --> PrimeSkeleton["PrimeReact Skeleton"]
    NotificationsPage --> PrimeToast["PrimeReact Toast"]
```

API Endpoints

API source file	Endpoint function name	Description	Client file using it
app/api/auth/[...nextauth]/route.js	GET, POST	/api/auth/[...nextauth] NextAuth (Azure AD OAuth, session)	N/A (NextAuth internal)
app/api/login/route.js	POST	/api/login authenticate and create session	app/login/page.js
app/api/logout/route.js	POST	/api/logout clear session cookies	components/AvatarDropdown.js
app/api/signup/route.js	POST	/api/signup create user and session	app/signup/page.js
app/api/me/route.js	GET	/api/me return current user session	hooks/useUser.js
app/api/profile/route.js	PUT	/api/profile update current user profile	app/profile/page.js
app/api/users/route.js	GET	/api/users list/search users	app/members/page.js
app/api/users/[id]/route.js	PUT	/api/users/[id] update user role/profile	app/members/page.js
app/api/groups/route.js	GET	/api/groups list groups	components/ShareModal.js
app/api/groups/route.js	POST	/api/groups create group	app/organisation/page.js
app/api/groups/[id]/route.js	GET	/api/groups/[id] get group detail	N/A (no direct client call found)
app/api/groups/[id]/route.js	PUT	/api/groups/[id] update group	app/organisation/page.js
app/api/groups/[id]/route.js	DELETE	/api/groups/[id] delete group	app/organisation/page.js
app/api/groups/[id]/members/route.js	GET	/api/groups/[id]/members list group members	N/A (no direct client call found)
app/api/groups/[id]/members/route.js	POST	/api/groups/[id]/members add group members	N/A (no direct client call found)
app/api/groups/[id]/members/[userId]/route.js	PUT	/api/groups/[id]/members/[userId] update member role	components/AddGroupModal.js
app/api/groups/[id]/members/[userId]/route.js	DELETE	/api/groups/[id]/members/[userId] remove member	components/AddGroupModal.js
app/api/groups/admin/route.js	GET	/api/groups/admin list admin groups	N/A (no direct client call found)
app/api/okrt/route.js	GET	/api/okrt list OKRTs (optional parent_id)	app/okrt/page.js
app/api/okrt/route.js	POST	/api/okrt create OKRT	app/okrt/page.js
app/api/okrt/[id]/route.js	GET	/api/okrt/[id] get OKRT by id	app/okrt/page.js
app/api/okrt/[id]/route.js	PUT	/api/okrt/[id] update OKRT	app/okrt/page.js
app/api/okrt/[id]/route.js	DELETE	/api/okrt/[id] delete OKRT	app/okrt/page.js
app/api/okrt/[id]/share/route.js	GET	/api/okrt/[id]/share list shares	components/ShareModal.js
app/api/okrt/[id]/share/route.js	POST	/api/okrt/[id]/share create share	components/ShareModal.js
app/api/okrt/[id]/share/route.js	DELETE	/api/okrt/[id]/share remove share	components/ShareModal.js
app/api/okrt/shared/route.js	GET	/api/okrt/shared list shared OKRTs	N/A (no direct client call found)
app/api/shared/route.js	GET	/api/shared list shared objectives	components/OKRTModal.js
app/api/follow/route.js	POST	/api/follow follow objective	app/shared/page.js
app/api/follow/route.js	DELETE	/api/follow unfollow objective	app/shared/page.js
app/api/comments/route.js	GET	/api/comments list comments by okrt	app/shared/[id]/page.js
app/api/comments/route.js	POST	/api/comments create comment or reward	components/CommentsSection.js
app/api/comments/[id]/route.js	GET	/api/comments/[id] get comment by id	N/A (no direct client call found)
app/api/comments/[id]/route.js	PUT	/api/comments/[id] update comment	N/A (no direct client call found)

API source file	Endpoint function name	Description	Client file using it
`app/api/comments/[id]/route.js`	`DELETE`	`/api/comments/[id]` delete comment	N/A (no direct client call found)
`app/api/comments/rewards/route.js`	`GET`	`/api/comments/rewards` reward summary	N/A (no direct client call found)
`app/api/notifications/route.js`	`GET`	`/api/notifications` list notifications	`app/notifications/page.js`
`app/api/notifications/route.js`	`POST`	`/api/notifications` mark all as read	`app/notifications/page.js`
`app/api/notifications/[id]/route.js`	`PUT`	`/api/notifications/[id]` mark as read	`app/notifications/page.js`
`app/api/notifications/[id]/route.js`	`DELETE`	`/api/notifications/[id]` delete notification	`app/notifications/page.js`
`app/api/notifications/sse/route.js`	`GET`	`/api/notifications/sse` server-sent events stream	`app/notifications/page.js`
`app/api/main-tree/progressive/route.js`	`GET`	`/api/main-tree/progressive` progressive main tree load	`hooks/useMainTree.js`
`app/api/main-tree/calendar/route.js`	`GET`	`/api/main-tree/calendar` calendar-scope main tree load	`hooks/useMainTree.js`
`app/api/time-blocks/route.js`	`GET`	`/api/time-blocks` list time blocks	`app/calendar/page.js`
`app/api/time-blocks/route.js`	`POST`	`/api/time-blocks` create time block	`app/calendar/page.js`
`app/api/time-blocks/[id]/route.js`	`GET`	`/api/time-blocks/[id]` get time block	`app/calendar/page.js`
`app/api/time-blocks/[id]/route.js`	`PUT`	`/api/time-blocks/[id]` update time block	`app/calendar/page.js`
`app/api/time-blocks/[id]/route.js`	`DELETE`	`/api/time-blocks/[id]` delete time block	`app/calendar/page.js`
`app/api/time-blocks/tasks/route.js`	`GET`	`/api/time-blocks/tasks` tasks for scheduling	N/A (no direct client call found)
`app/api/tasks/current-cycle/route.js`	`GET`	`/api/tasks/current-cycle` tasks in current cycle	N/A (no direct client call found)
`app/api/tasks/[id]/route.js`	`PUT`	`/api/tasks/[id]` update task progress	`components/TodayWidget.js`
`app/api/calendar/route.js`	`GET`	`/api/calendar` external calendar integration	N/A (no direct client call found)
`app/api/objectives/search/route.js`	`GET`	`/api/objectives/search` search objectives	N/A (no direct client call found)
`app/api/llm/route.js`	`POST`	`/api/llm` AI chat/tooling	`app/coach/page.js`
`app/api/text-to-speech/route.js`	`POST`	`/api/text-to-speech` generate audio from text	`app/coach/page.js`
`app/api/speech-to-text/route.js`	`POST`	`/api/speech-to-text` transcribe audio	`app/coach/page.js`