Engineering Open Source Projects

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Introduction to the EOSP course.

Table of contents

Let's get acquainted `hello`

What do you think false here?

- I'm Anton. Study at 2nd course of SWE at Central University.
- Involved in the development of 70+ repositories and have sent ~1600 commits.
- I'm graduate of Yandex Lyceum golden certificate.
- I used Linux as main operation system for last 3 years.
- ~~I can type 120 words per minute on qwerty keyboard.~~
- I used to be a professional volleyball player.
- I am using only terminal for developing.
- Author of blog: `alchemmist.xyz`

Tell us about yourself `hello`

What is Open Source  `open-source`

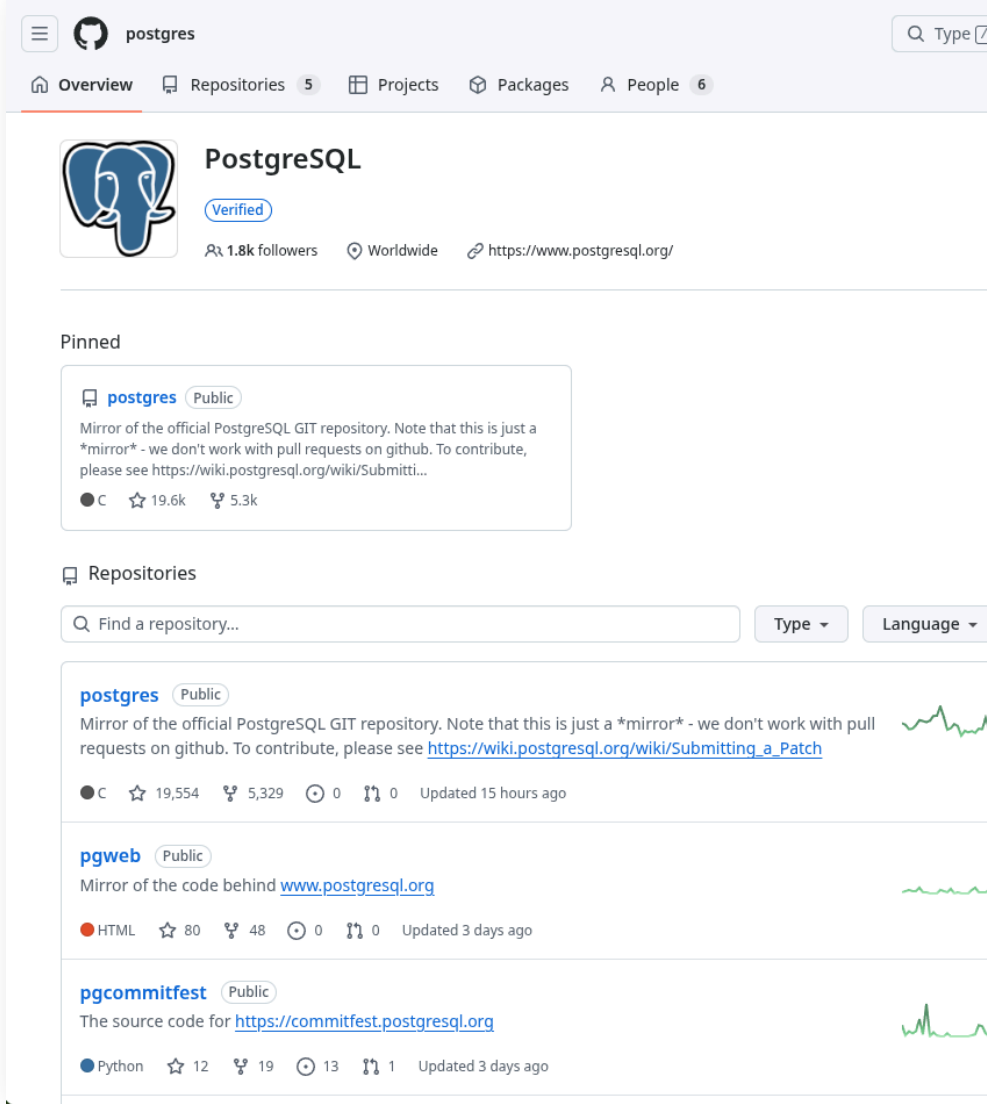
Source code of project is open to see for everyone.

Open to copy? Open to appropriate? Open to sell?

Postgres DBMS `(MIT/BSD)`

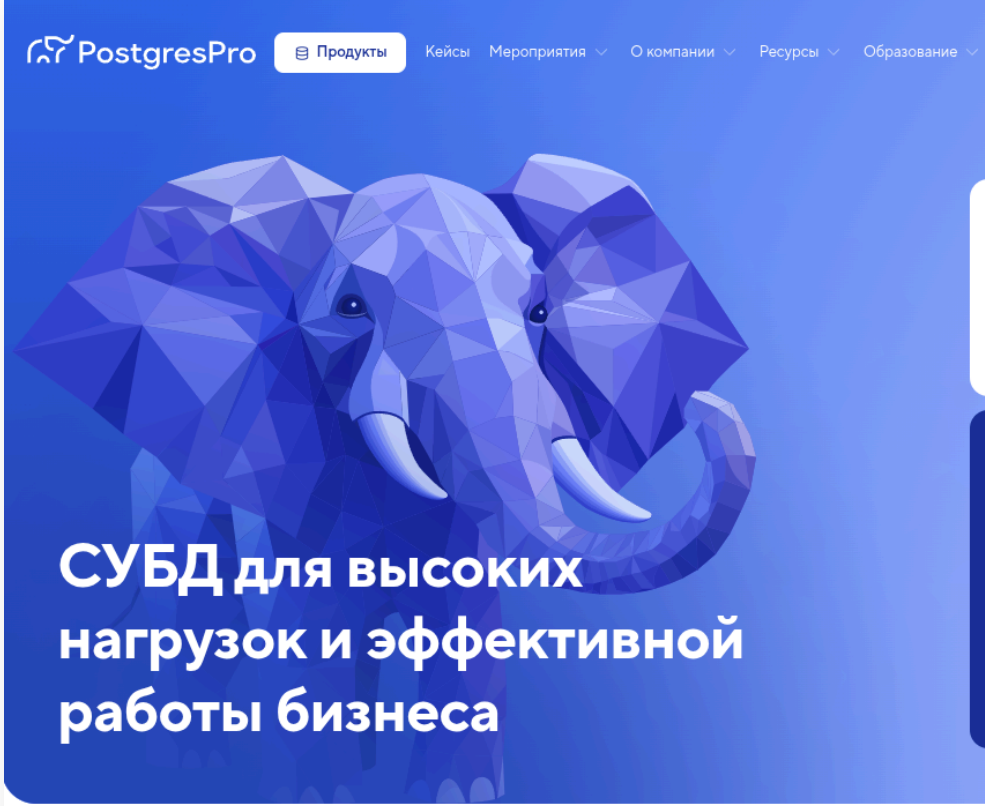
`open-source`

- Full access to the source code
- Use in commercial products
- Selling as part of your own product
- Closing your code on top of PostgreSQL
- Please, save the license and author name



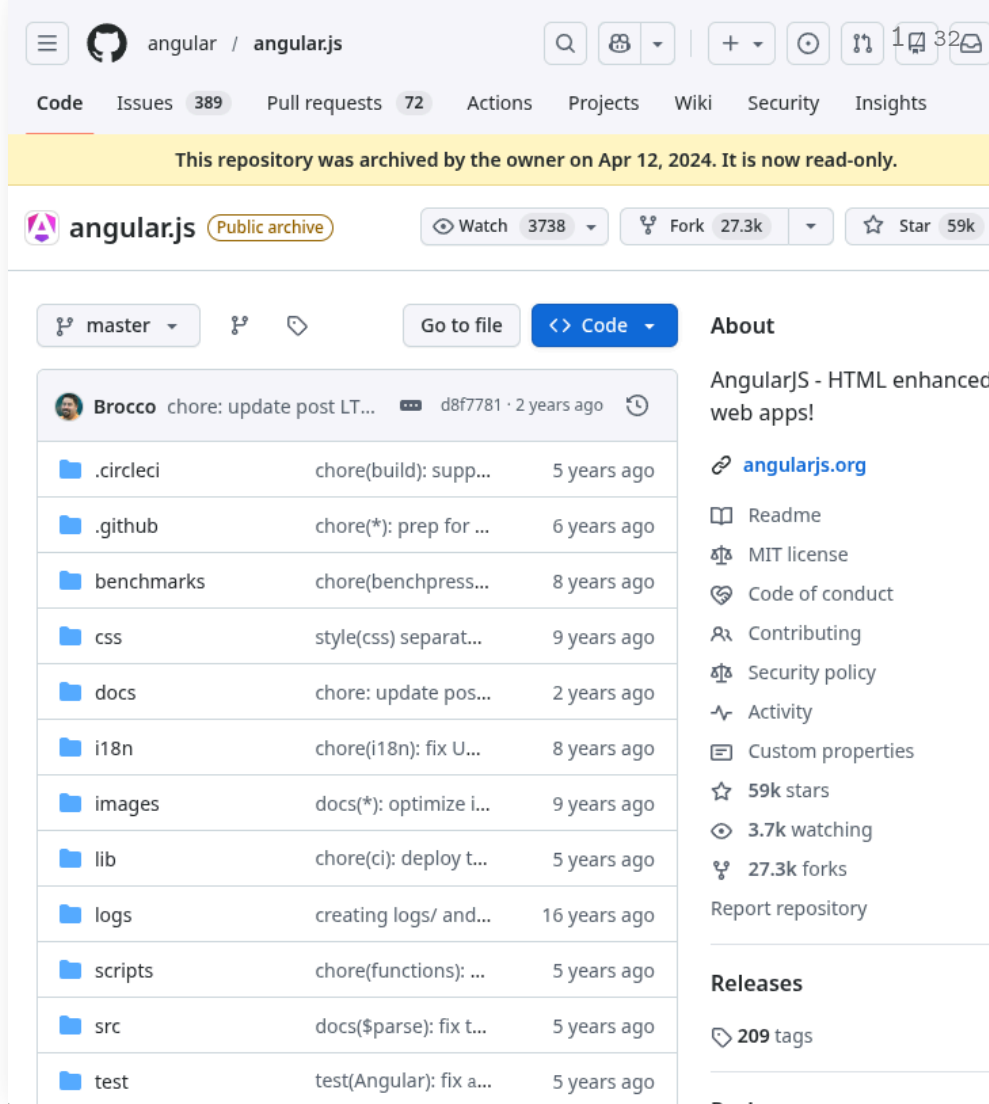
Postgres PRO `(EULA)` open-source

- EULA — End User License Agreement
- Distributed for a money
- OpenCore model



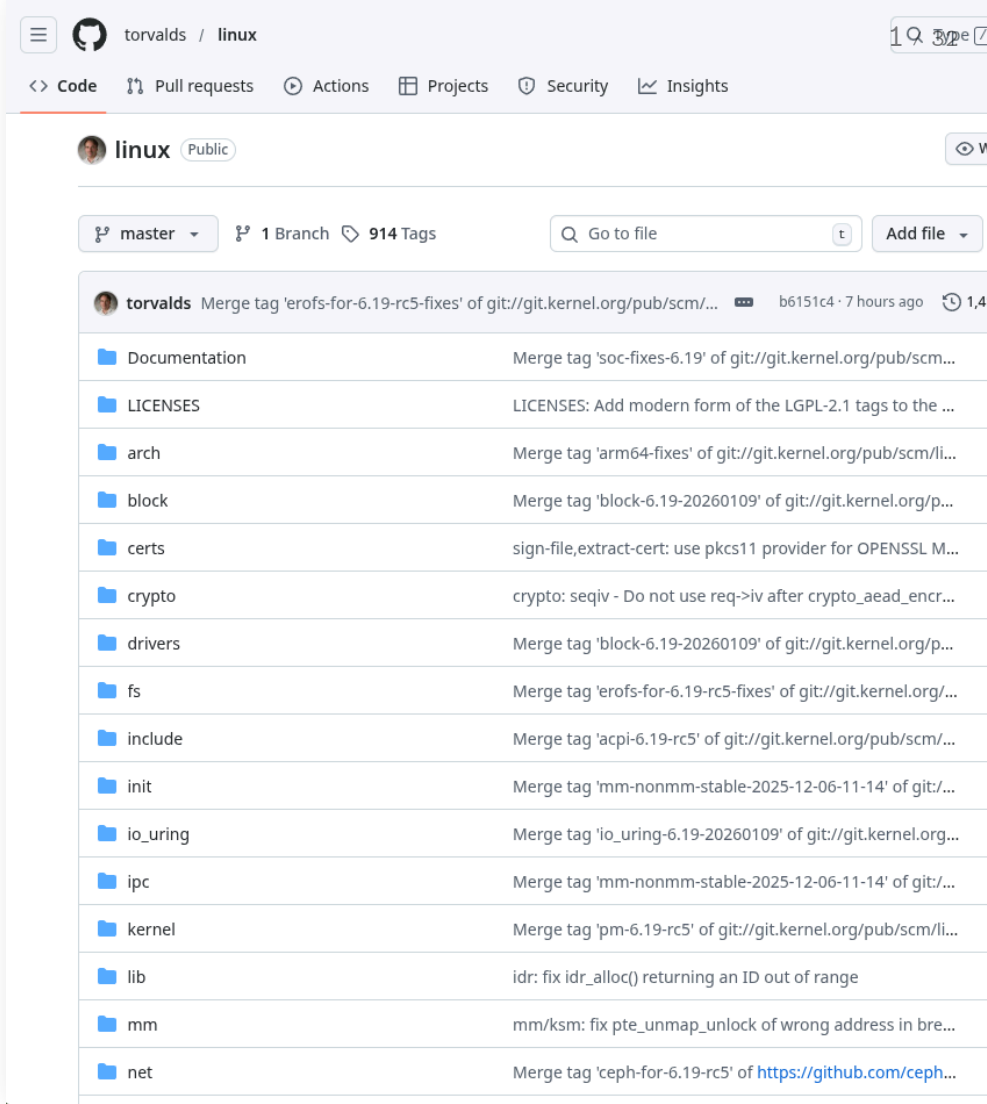
Angular JS (MIT) open-source

- Fully open (as Postgres)
- Repo is exist, but deprecated
- No support
- No improves
- No bug fixes
- The reason is switched on TypeScript



Linux kernel (GPLv2) `open-source`

- Full access to the source code
- Use in commercial products
- Forks must remain GPL if distributed: copyleft



OpenSource is the foundation of modern IT `open-source`

A space where technology is emerging.

> *«99% of Fortune 500 companies currently use open source software. <...> Over 56 million developers are contributing to open source projects. <...> Due to ever-rising workloads, the Linux operating systems market is expected to grow at the rate of 7% a year, reaching $9.7 billion by 2024.»*
>
> Pranay Ahlawat, Boston Consulting Group
> Article «Why You Need an Open Source Software Strategy», April 2021

The idea and goal of our project `course`

Course is totally practice-driven.

- Build a practical system to evaluate developer contributions based on GitHub activity
- Learn modular software design: `library` → `CLI` → `Telegram bot`
- Practice real-world Open Source workflows: issues, pull requests, reviews and so on
- Focus on clean, maintainable, and testable code
- Experience CI/CD pipelines, releases, and deployment automation
- Document, setting and organize projects properly
- Develop skills to build slide deck and pitch project publicly

Two main problem cases course

Profile analytics

- HR wants quick insight into a developer's activity without digging into GitHub manually
- Analyze the **entire GitHub profile**: all repositories, contributions, and activity history
- Understand which languages and technologies a developer uses
- Track contributions across repositories: commits, pull requests, issues
- Generate a concise profile summary for recruitment decisions

Leader board of team

- Team leads want visibility into team productivity
- Analyze **contributions within a single repository** to compare team members fairly
- Track per-developer metrics: code quality, review participation, issue resolution
- Identify who is actively contributing and who may need support or guidance
- Provide fair, data-driven insights to improve collaboration and team performance

Three setups, three projects course

Python library

- Calculate developer contribution metrics from GitHub data
- Provide reusable, modular functions for metrics computation
- Include comprehensive unit tests and follow TDD approach
- Serve as the core foundation for CLI and bot integrations
- Support easy extension and maintainability

CLI

- Provide command-line access to library metrics
- Support multiple commands, flags, and options
- Enable fetching, displaying, and exporting data conveniently
- Handle errors gracefully and show meaningful messages
- Integrate with CI/CD for automated releases

Telegram bot

- Provide easy access to metrics via Telegram interface
- Interact with users, handle commands and queries
- Securely manage secrets and API tokens
- Fetch data from library and format it for user-friendly display
- Support notifications, updates, and automated alerts

How should this course be perceived? `course`

Motivation and mindset.

> *«It's a bit sad to think of all the high school kids turning their backs on building treehouses and sitting in class dutifully learning about Darwin or Newton to pass some exam, when the work that made Darwin and Newton famous was actually closer in spirit to building treehouses than studying for exams.»*

Paul Graham
Essay «A Project of One's Own», June 2021

It’s time to come up with a name!

practice

Go to Figma board!

Let’s make first step `live-demo`

Creating GitHub organization and repo.

Introduction to GitHub API. `api`

`gh api /octocat`

GitHub API is just HTTP `api`

Any tool that can send HTTP requests can work with GitHub API.

- `gh` — convenient wrapper around the API
- `curl` — raw HTTP from terminal
- `Python` — programmatic access for automation and logic

Official `gh` cli `api`

The cli utility for using all github functionality from terminal.

Install into your shell:

```
# Mac:
brew install gh

# Windows:
winget install --id GitHub.cli

# Arch:
sudo pacman -S github-cli
```

And try something, for example:

```
gh api /users/alchemmist
```

As result:


```
{
  "login": "alchemmist",
  "avatar_url": "https://avatars.githubusercontent.com/u/104511335?v=4",
  "html_url": "https://github.com/alchemmist",
  "followers_url": "https://api.github.com/users/alchemmist/followers",
  "subscriptions_url": "https://api.github.com/users/alchemmist/subscriptions",
  "repos_url": "https://api.github.com/users/alchemmist/repos",
  "type": "User",
  "name": "Anton Grishin",
  "blog": "alchemmist.xyz?utm_source=github",
  "location": "Russia, Moscow",
  "email": "anton.ingrish@gmail.com",
  "followers": 18,
  "created_at": "2022-04-27T14:12:26Z",
  "updated_at": "2026-01-09T06:23:55Z",
  ...
}
```

More in documentation api

Using `curl` for GitHub API

api

Raw HTTP requests from terminal.

Send GET authenticated request:

```
curl -L \
  -H "Accept: application/vnd.github+json" \
  -H "Authorization: Bearer <TOKEN>" \
  -H "X-GitHub-Api-Version: 2022-11-28" \
  https://api.github.com/repos/alchemmist/eosp/stats/contributors
```

According to the documentation

- `w` — Start of the week, given as a Unix timestamp.
- `a` — Number of additions
- `d` — Number of deletions
- `c` — Number of commits

As result:

Sun Dec 14 2025


```
[{
    "total": 37,
    "weeks": [{
        "w": 1765670400,
        "a": 6477,
        "d": 0,
        "c": 1},
       {"w": 1768089600,
        "a": 0,
        "d": 0,
        "c": 0}, ...
    ],
    "author": {
      "login": "alchemmist",
      "id": 104511335,
      "node_id": "U_kgDOBjq3Zw",...
    }
}]
```

More in documentation api

Using GitHub API with Python

api

Efficient, parallel, production-ready requests.

Example with `httpx`:

```python
import asyncio, httpx


async def fetch_prs(username):
    url = f"https://api.github.com/search/issues?"\
          f"q=author:{username}+type:pr+created:>2025-01-01"
    async with httpx.AsyncClient() as client:
        resp = await client.get(
            url,
            headers={
                "Authorization": "Bearer <TOKEN>"
            },
        )
        data = resp.json()
        for pr in data["items"]:
            print(f"{pr['title']}\n\t-> {pr['html_url']}")


asyncio.run(fetch_prs("alchemmist"))
```

As result:

```
Add alchemmist.xyz individual blog
  -> https://github.com/kilimchoi/engineering-blogs/pull/1201
Add alchemmist.xyz personal blog
  -> https://github.com/learn-anything/blogs/pull/21
Add alchemmist.xyz blog
  -> https://github.com/logancyang/awesome-personal-websites/pull/1
Add alchemmist.xyz blog
  -> https://github.com/jkup/awesome-personal-blogs/pull/173
Add @alchemmist_blog to personal blogs section
  -> https://github.com/goq/telegram-list/pull/992
Add @alchemmist_blog to personal blogs section
  -> https://github.com/alchemmist/telegram-list/pull/1
Add a "quiet" exit (#104)
  -> https://github.com/cqfn/aibolit/pull/818
```

*GraphQL - a query language for APIs that lets you request exactly the data you need in a single query, without extra fields.

GitHub API Limitations `api`

Understanding these limits is essential when building scalable, reliable systems for collecting GitHub data.

- Rate limits: **5000 requests per hour** for authenticated users
- Rate limits: **60 requests per hour** for unauthenticated users
- Pagination: most endpoints return max **100 items per page**, need to handle paging
- Private data requires proper authentication and scopes
- GraphQL vs REST: some data easier via GraphQL, but query complexity may hit limits
- API responses may be delayed or cached; real-time metrics may require retries
- Some endpoints change over time; library must handle API versioning

Git vs GitHub Flow `github-flow`

- Git: a version control system, local, focused on branching and commits
- GitHub: an online platform for Git with social and collaboration tools
- GitHub Flow: a lightweight workflow that allows fast development and integration via pull requests
- Main goal: a safe, transparent, and repeatable development process within a team

Why GitHub Flow?

- All changes go through **pull requests** → code review, CI/CD checks
- Encourages small, incremental updates rather than long-lived branches
- Clear separation: `main` branch is always deployable
- Integration with issues and project boards → planning and tracking in one place
- Transparency and collaboration: team members can comment, review, approve, or reject changes

Key Entities in GitHub Flow

- **Issue** – describes a bug, feature, task, or question; starting point for development
- **Branch** – isolated workspace for a specific feature or fix
- **Commit** – individual changes tracked in Git history
- **Pull Request (PR)** – proposes changes from a branch into `main`; facilitates review and discussion
- **Code Review** – teammates review PRs to ensure quality and maintainability
- **CI/CD checks** – automated tests, linting, build, and deployment pipelines
- **Merge** – approved PR is merged into `main`, usually triggers deployment

GitHub Flow in Action

Visual representation of the workflow:

1. Create an **issue**
2. Create a **branch** for the issue
3. Commit changes locally and push to GitHub
4. Open a **pull request** referencing the issue
5. Conduct **code review** and CI/CD validation
6. Merge into **main** after approval
7. Deploy automatically (if CI/CD is configured)

Issue → Merge: Step by Step

- **Step 1:** Issue is created describing bug, feature, or task
- **Step 2:** Developer creates a branch named after issue (e.g., `issue-42-fix-login`)
- **Step 3:** Commit small, meaningful changes to the branch
- **Step 4:** Push branch to GitHub and open a **pull request** linked to the issue
- **Step 5:** Team reviews code, CI/CD runs tests automatically
- **Step 6:** Address feedback, push updates to the PR
- **Step 7:** PR approved → merge into `main`
- **Step 8:** `main` is deployable, issue closed, cycle completed

Best Practices in GitHub Flow

- Keep branches **short-lived** → frequent integration reduces conflicts
- Write **descriptive commits** → history becomes meaningful
- Reference issues in PRs → link work to context
- Use **templates** for PRs and issues → standardize workflow
- Automate as much as possible → CI/CD, tests, linters, code quality checks
- Encourage **review culture** → better code, knowledge sharing, accountability