Platform Integration 101
Agenda

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🤖 GitHub Apps
🔍 GitHub Actions
🚀 Summary
GitHub platform overview
GitHub platform

- 60+ million developer reach
- Thousands of integrations in GitHub Marketplace
- Robust REST and GraphQL APIs
- Reliable webhook delivery
- App authentication model
- Built-in workflow automation tool called GitHub Actions
- Rich ecosystem of integrators and tooling
- Programs like secret scanning
Common touchpoints

- CI/CD flow (linting, parsing, scanning, commenting)
  - Checks API
  - Pull Requests API
  - Deployments API
  - Releases API
  - Git Data API

- Issue flow (conversation, utility, commenting)
  - Issues API
  - Reactions API

- Project Management flow
  - Repos API
  - Projects API
  - Organizations API
  - Teams API

- Security flow
  - Secret scanning and code scanning
GitHub Apps
GitHub Apps are a tool to build comprehensive integrations with GitHub:

- First class actors on GitHub -- operating independently of any user identity
- Offer fine-grained permissions
- Installed on a user’s or organization’s repos
- Replace and offer many advantages over OAuth apps
- Come with built-in webhooks
- Work on GitHub.com and GitHub Enterprise Server
- Compatible with web technologies and standards, such as HTTP-based APIs and OAuth-like flows
- Rich open source tooling and libraries available, eg. octokit
Advantages for customer

- **Confidence** in granting third parties access to their assets in GitHub due to fine-grained and repo-centric permissions model
- **Convenience** through user-friendly (un)installation flow
Advantages for integrator

- Can **decouple** integration from GitHub user identities due to first class actor model of GitHub Apps.
- Can take advantage of **dedicated, scalable rate limits**, as opposed to the shared rate limit model offered by OAuth apps.
- Can utilize **modern GitHub APIs** like **Checks** and **Content Attachments**
Creating your first GitHub App

Option 1: Manual creation

1) Navigate to GitHub Apps from your GitHub Developer Settings
2) Register a New GitHub App, setting up URLs, permissions, and events
3) Download the private key and App ID and start coding!

For more, see here.

Option 2: Using Probot

Demo
## Authentication overview

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Authentication at a glance

Deciding which authentication type to use comes down to:

- What resource do I need to access?
- Who do I need to access it as?
Server-to-server requests are those made from the perspective of an *installation* and are authenticated by *installation access tokens*.

Using your *JWT*, generate an *installation access token* via:

```
curl -i -X POST \
    -H "Authorization: Bearer YOUR_JWT" \
    -H "Accept: application/vnd.github.machine-man-preview+json" \
    https://api.github.com/app/installations/:installation_id/access_tokens
```

As a security measure, these tokens expire after 1 hour. They can be used like:

```
curl -i \
    -H "Authorization: token YOUR_INSTALLATION_ACCESS_TOKEN" \
    -H "Accept: application/vnd.github.machine-man-preview+json" \
    https://api.github.com/installation/repositories
```
User-to-server requests

User-to-server requests act as a user who has authorized your GitHub App and are authenticated using an OAuth access token.

First, users authorize your GitHub App via OAuth and receive a code:

Then, your GitHub App trades the code, client_id and client_secret for an OAuth access token to be used like:

```bash
```

Unlike typical OAuth, the scope is determined by the GitHub App.
Onboarding new users

Optimal flow (Demo)
1. Optional -- User purchases app on GitHub Marketplace
2. User installs app on repositories and authorizes the app
3. GitHub redirects to app's registered callback URL
4. App exchanges OAuth code for access token
Notable APIs for GitHub Apps

- GitHub App information
  - Get the authenticated GitHub App (JWT)
- Identify installation information
  - List installations (JWT)
  - Get an organization installation (JWT)
  - Get a user installation (JWT)
- Token creation / revocation
  - Create a new installation token (JWT)
  - Revoke an installation token (installation access token)
- Identify installation resources
  - List repositories (installation access token)
- Identify user-accessible resources
  - List installations for a user (user-to-server OAuth access token)
  - List repositories accessible to the user for an installation (user-to-server OAuth access token)
GitHub Apps best practices

✅ Do:
- Cache and re-use installation tokens
- Use webhooks for real-time data
- Throttle requests to stay within rate limits
- Consider if REST or GraphQL APIs (or both) are best for your use case
- Use conditional requests wherever possible
- Subscribe to this RSS feed for Platform updates
- Include a descriptive User-Agent header
- Save the X-GitHub-Request-Id response header value, especially for error responses
- Follow other best practices listed here

❌ Don’t:
- Depend on concurrent requests, this can trigger secondary rate limits
- Poll, use webhooks where possible
GitHub Actions makes it easy to automate all your software workflows, now with world-class CI/CD.

- Built in CI/CD
- Linux, Mac, Windows, and containers
- Matrix builds
- Easy to write, easy to share
- Streaming, searchable, linkable logs
- Built-in secret store
- Artifact caching
- Self hosted runners
- Event-driven or schedule-driven
- GitHub Enterprise Server support soon
Getting started

1. Head to the Actions tab on any of your repositories.

2. Set up a workflow using one or more actions, triggered upon event or on schedule. ✨
Workflow

A configurable automated process that you can set up in your repository.

For example:
- Organizational: Welcoming new contributors
- Legal: Ensuring license uniformity
- Application: Testing across multiple operating systems

```yaml
# .github/workflows/build.yml
name: Node CI

on: [push]

jobs:
  build:
    runs-on: ubuntu-latest
    strategy:
      matrix:
        node-version: [8.x, 10.x, 12.x]
    steps:
    - uses: actions/checkout@v1
    - name: Use Node.js ${{ matrix.node-version }}
      uses: actions/setup-node@v1
      with:
        node-version: ${{ matrix.node-version }}
    - run: npm install
    - run: npm run build --if-present
    - run: npm test
    env:
      CI: true
```
Event

Workflows are triggered on events.

For example:
- push, pull_request, public, etc.
- schedule
- workflow_dispatch (manual trigger)
- repository_dispatch (outside systems)
Action

Individual unit of work that you combine as steps to create a job in a workflow.

For example:

- actions/checkout
- actions/cache
- actions/javascript-action
- Lots more on GitHub Marketplace
Actions API

Actions is **backed by a RESTful API**, allowing programmatic access to workflows, artifacts, secrets, and even self-hosted runners.

For example:

- **List artifacts for a repository**
- **Re-run a workflow**
- **Create or update a secret**
- **List self-hosted runners for a repository**
- More information in [this blog](#)
- **Example implementation** in Marketplace
- **Full capabilities described in** [the docs](#)
Community

GitHub Actions is powered by an open ecosystem and community contributions.

For example:

- Workflows: actions/starter-workflows
- Actions: github.com/actions
- Tooling: actions/toolkit
GitHub Actions best practices

✅ Do:
- Prefer JavaScript to container
- Prefer chainable to monolithic
- Documentation, examples, blog posts, releases, LICENSE
- GitHub Marketplace for discoverability
- Use open source tooling (eg. @vercel/ncc, actions/toolkit)
- Use inputs and outputs

❌ Don’t:
- Produce undocumented side effects
- Waste users’ runner minutes (they’ll notice)
GitHub Apps vs. GitHub Actions

**Apps**
- Your integration requires user interaction
- Your integration needs to handle state
- Your integration acts across multiple repos, or at the organization level
- Your integration is available to the public but no part of the code is public
- You are comfortable hosting the app yourself
- You need permissions that are outside the set provided by Actions
- You need events that are outside the set provided by Actions

**Actions**
- Your integration is essentially “headless”, i.e. it does not require user interaction, or uses GitHub.com for its user interface
- Your integration does not need to persist data in a database
- Your integration wraps an existing CLI, or API
- You are comfortable with your action code being publicly visible
- You would prefer GitHub to run your integration
GitHub hosted runners

- "Just Works" solution for maximum ease
- Linux, Windows, macOS
- Compatible with public, internal, and private repos
- Ephemeral runner VMs in predictable environment
- Integrated billing and security model
- GitHub provides machine maintenance and upgrades

Self hosted runners

- Custom solution for maximum control
- Linux, Windows, macOS supported, container possible
- Recommended only for private repos
- Can utilize custom hardware and processor architectures (e.g. ARM) and operate in your network
- You assume responsibility for environment, security, billing, and management
Libraries and resources

- Developer Documentation
- GitHub REST and GraphQL APIs
- GitHub Apps
- GitHub Webhooks
- Octokit
- Probot
- Actions Documentation
- Example JavaScript action
- Example container action
- Actions toolkit
- GitHub Marketplace, filterable by Apps or Actions
Summary

GitHub Apps are more **FLEXIBLE**, and **POWERFUL**, but come with some overhead (mostly hosting the app) 💪

GitHub Actions are **SMALLER**, more **LIGHTWEIGHT**, and probably will **JUST WORK** for most integration needs ✨

GitHub APIs are available through either type of integration.