GitHub *Actions* Workflows

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COMS W4156: *Advanced Software Engineering*

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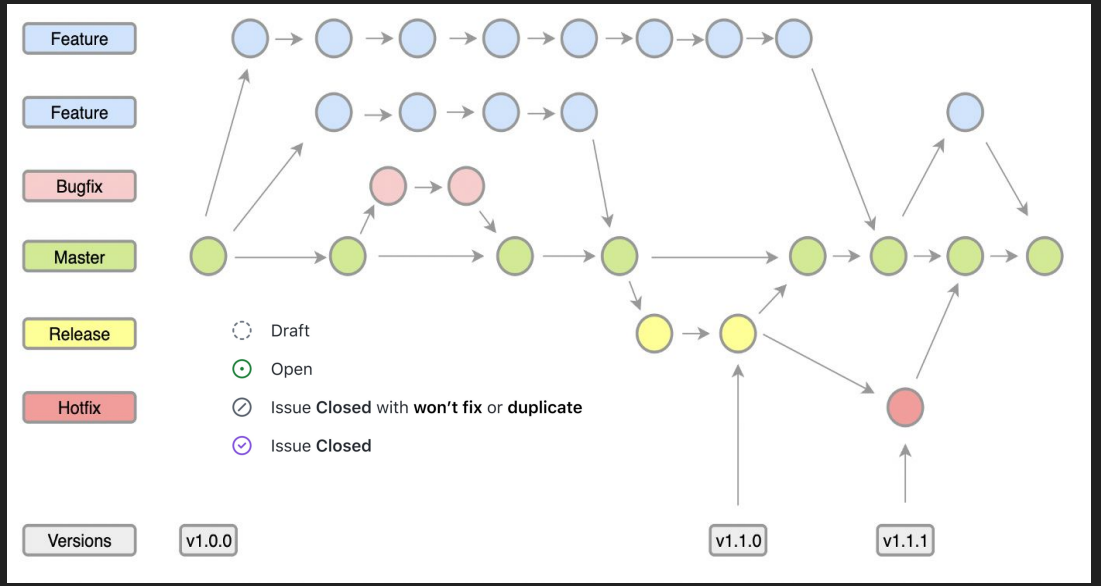
Basic Idea and Motivation Behind GitHub Actions

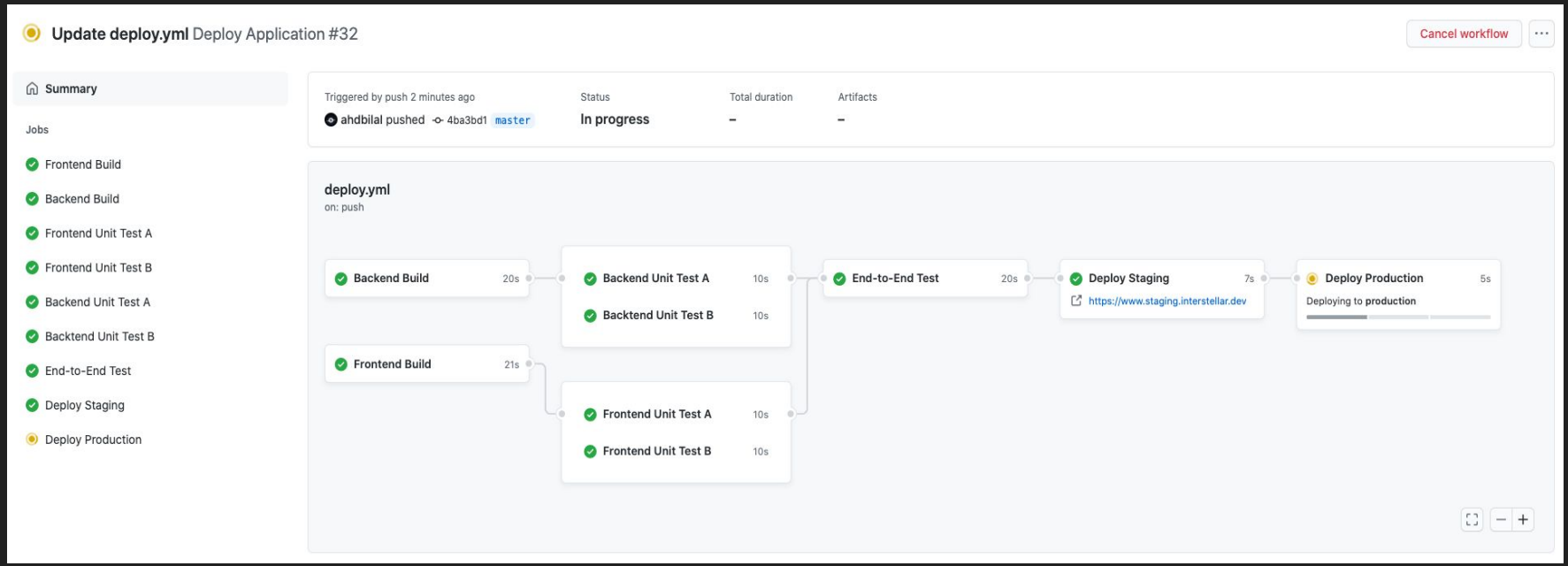
Platform to automate developer workflows, enabling **continuous integration**

Why GitHub Actions?

- Maintaining a repository over new contributors, issues, commits and PRs
  - Categorizing, assigning issues
  - Review PRs, merges
  - Prepare release notes, update version numbers
- Organizational tasks: Lots of redundant manual effort, especially at scale

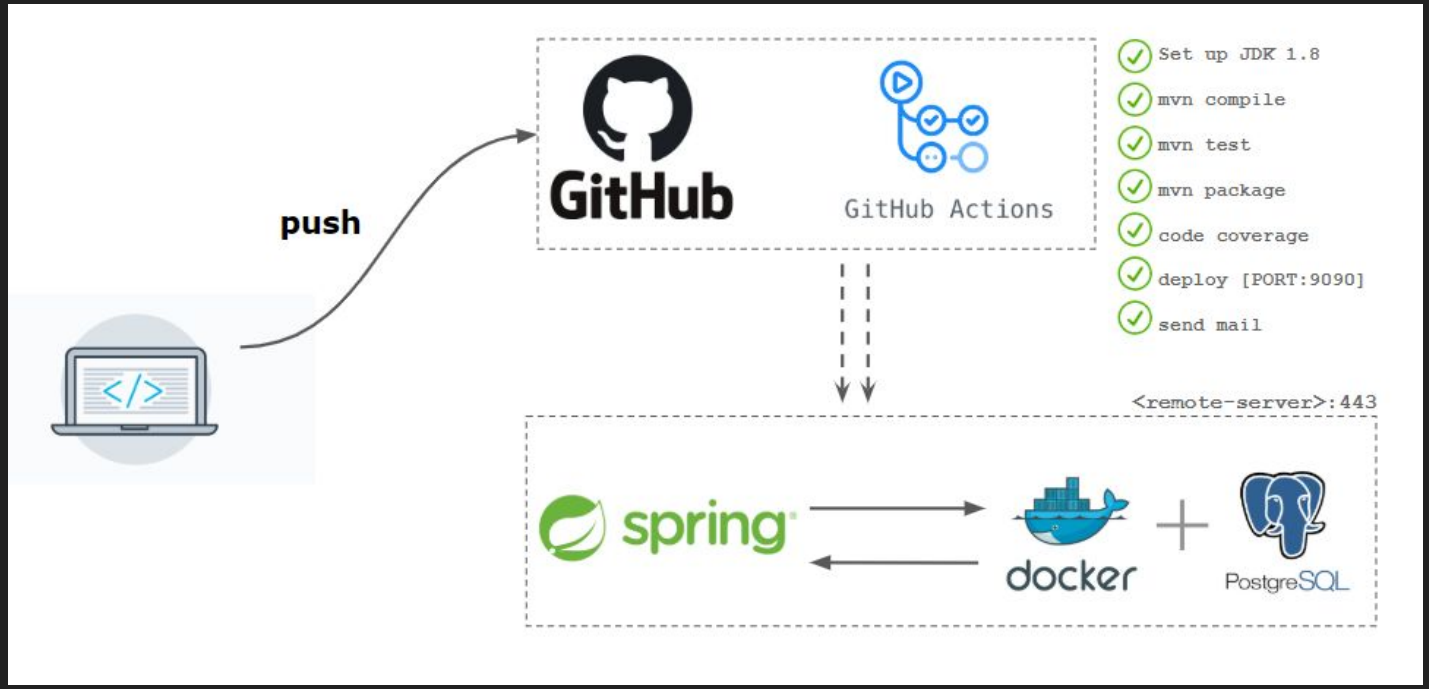


Workflows Example: Simple Deploy



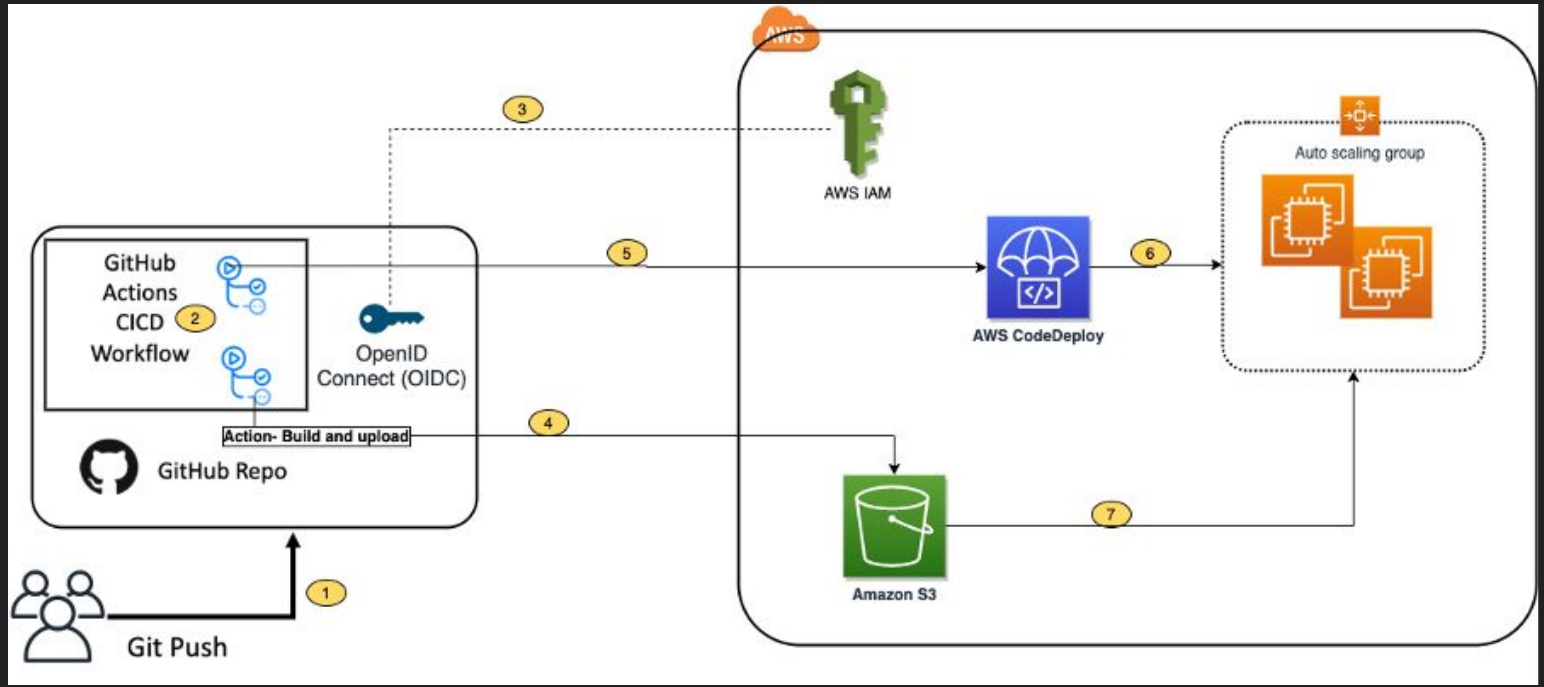
https://github.blog/changelog/2020-12-08-github-actions-workflow-visualization/

Workflows Example 2: Slightly more complex



https://dzone.com/articles/automate-your-development-workflow-with-github-act-1

Workflows Example 3: Complex

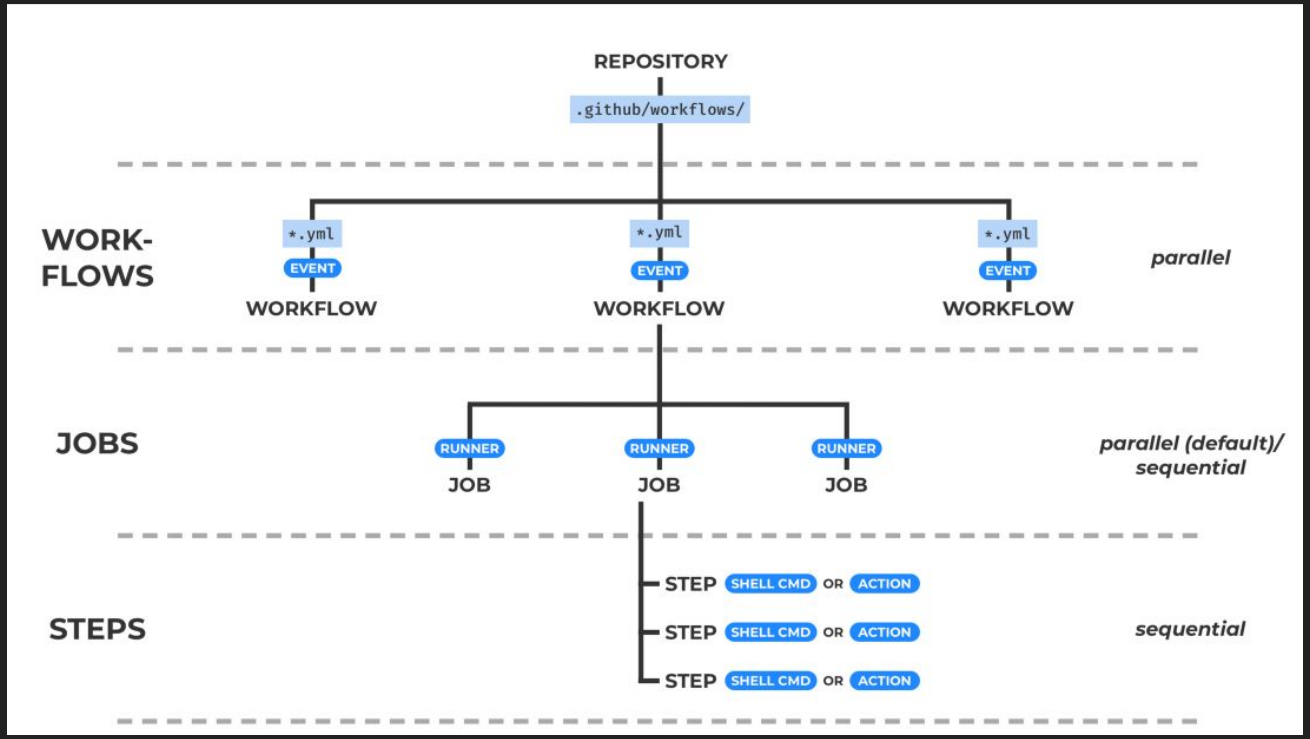


https://aws.amazon.com/blogs/devops/integrating-with-github-actions-ci-cd-pipeline-to-deploy-a-web-app-to-amazon-ec2/

Core Concepts

- **Event:** A specific activity in a repo that may trigger a workflow.
  - A workflow can be triggered by one or more events.
  - New commit/pull request!
  - Types of events: Internal, external (*repository_dispatch* event), scheduled, manual
- **Action:** Application which performs a complex but frequently repeated task.
  - Custom or from GitHub Marketplace
- **Step:** An executable component, could be a shell script or an Action
- **Job:** A series of steps in a workflow that execute on the same server, which is called a “**runner**”. Can configure dependencies between jobs.
- **Workflow:** A configurable automated process that runs multiple jobs. Defined by a YAML file in .github/workflows. A repo can have multiple workflows.

Core Concepts Visualized



https://itnext.io/getting-started-with-github-actions-fe94167dbc6d

More about that YAML file: Example

```yaml
name: learn-github-actions
run-name: ${{ github.actor }} is learning GitHub Actions
on: [push]
jobs:
  check-bats-version:
    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v3
      - uses: actions/setup-node@v3
        with:
          node-version: '14'
      - run: npm install -g bats
      - run: bats -v
```

-> *Optional.* Workflow name.
-> *Optional.* Name for workflow run

-> Event. Push to any branch
-> Groups together all jobs
-> Defines a job “check-bats-version’
-> Runner is Latest Ubuntu version
-> Groups together all steps under job
-> Checkout v3 action: checks out repo onto runner

-> Installs the specified version of the Node.js
-> This example uses v14!

-> Executes a command in the runner

Demo

Simple C++ project

Let’s play around with this project with varied syntax, and see how our Workflows work with success and failure scenarios.

https://github.com/Prahlad-K/GitHubActionsExample

Comparisons with other CI/CD tools

Pros:

1. If you're maintaining your repo on GitHub, straightforward instead of third-party integrations
2. Setting up the pipeline is easy and intuitive
3. Lesser DevOps expertise and time consumed: built for Developers

Cons:

1. Super young; launched in 2018: not as robust with community support as, say, Jenkins
2. For Private codebases, need to pay for runner minutes to ensure workflows execute

Other Useful Resources + References

GitHub Marketplace for Actions: https://github.com/marketplace?type=actions

GitHub Actions for C++ Projects:
https://www.incredibuild.com/blog/using-github-actions-with-your-c-project
https://cristianadam.eu/20191222/using-github-actions-with-c-plus-plus-and-cmake/

GitHub Docs on Actions:
https://docs.github.com/en/actions/using-workflows/about-workflows
https://docs.github.com/en/actions/learn-github-actions/understanding-github-actions
https://docs.github.com/en/actions/using-workflows/workflow-syntax-for-github-actions

GitHub Actions vs Other CI/CD tools:
https://blog.mergify.com/is-github-action-better-than-jenkins/https://acloudguru.com/blog/engineering/comparing-github-actions-vs-jenkins-ci-showdown
https://www.techtarget.com/searchsoftwarequality/tip/CircleCI-vs-GitHub-Actions-CI-CD-platform-comparison

Questions?