

Understanding GitHub Actions: A Comprehensive Guide

Introduction

This document captures a detailed conversation about GitHub Actions, explaining key concepts and configurations.

GitHub Actions YAML Configuration

Let's break down a sample GitHub Actions workflow file:

```
name: GitHub Actions Demo
run-name: ${{ github.actor }} is testing out GitHub Actions ☑️
on: [push]
jobs:
  Explore-GitHub-Actions:
```

Configuration Breakdown:

- **name:** Sets the workflow name visible in the GitHub Actions tab
- **run-name:** Creates a custom name for each workflow run, using `github.actor` to show who triggered it
- **on:** Specifies the trigger (in this case, any push to the repository)
- **jobs:** Defines the jobs to be executed in the workflow

Workflow Steps

Here's a detailed explanation of common workflow steps:

```
steps:
  - run: echo "☑️ The job was automatically triggered by a ${{ github.event_name }} event."
  - run: echo "☑️ This job is now running on a ${{ runner.os }} server hosted by GitHub!"
  - run: echo "☑️ The name of your branch is ${{ github.ref }} and your repository is ${{ github.repository }}."
  - name: Check out repository code
    uses: actions/checkout@v4
  - run: echo "☑️ The ${{ github.repository }} repository has been cloned to the runner."
  - run: echo "☑️ The workflow is now ready to test your code on the runner."
  - name: List files in the repository
    run: |
      ls ${{ github.workspace }}
  - run: echo "☑️ This job's status is ${{ job.status }}."
```

Key Components:

1. Context Variables:

- `github.event_name`: Type of event that triggered the workflow
- `runner.os`: Operating system of the runner
- `github.ref`: Branch or tag reference

- `github.repository`: Repository name in owner/repo format
- `github.workspace`: Working directory path
- `job.status`: Current status of the job

2. Actions:

- `actions/checkout@v4`: Official GitHub action to clone the repository
- Multiple echo commands for status updates
- File system operations (`ls`)

Understanding Runners

A runner is the server that executes your GitHub Actions workflows. There are two types:

1. GitHub-hosted Runners

- Managed by GitHub
- Fresh virtual machine for each job
- Available operating systems:
 - Ubuntu Linux
 - Windows
 - macOS
- Pre-installed with common tools
- Free tier minutes included with GitHub accounts

2. Self-hosted Runners

- User-managed machines
- Can be:
 - Physical machines
 - Virtual machines
 - Containers
 - On-premises servers
 - Cloud instances
- Useful for:
 - Custom hardware requirements
 - Specific software needs
 - Network restrictions
 - Enhanced environment control

Runner Operations

Runners are responsible for:

- Code checkout
- Workflow step execution
- Status and log reporting
- Job output and artifact handling

Each runner:

- Executes one job at a time
- Gets wiped clean after use (GitHub-hosted)
- Returns to the runner pool (self-hosted)

Example runner specification in workflow:

```
jobs:
  build:
    runs-on: ubuntu-latest
```

This configuration requests a GitHub-hosted Ubuntu Linux runner for the job execution.