VisugXL
GitHub Code To Cloud Workshop

Xpirit

Marcel de Vries
Rob Bos
Dennis Thie

20/11/2021 13.30 –17.00

Xpirit

Let's connect!

Marcel de Vries

Founder and CTO at Xpirit
Microsoft Regional Director, MVP
linkedin.com/in/marcelv
mdevries@xpirit.com

Rob Bos

DevOps Consultant at Xpirit
Microsoft MVP
linkedin.com/in/bosrob
rbos@xpirit.com

Dennis Thie

Consultant at Xpirit

linkedin.com/in/dennisthie
dthie@xpirit.com

Xpirit

GitHub Code to Cloud Workshop Agenda

Introduction to GitHub	13.30 – 14.00
Migrating a repository from Azure DevOps to GitHub	14.00 – 14.15
Codespaces – Your development IDE in the cloud	14.15 – 14.20
Setting up Codespaces to develop a web-app	14.20 – 14.35
GitHub Actions	14.35 – 15.00
Coffee break	15.00 – 15.15
Creating your first Actions workflow	15.15 – 15.30
Creating a .NET Actions workflow	15.30 – 16.00
GitHub Advanced Security	16.00 – 16.15
Code Scanning and Secret Scanning	16.15 – 16.35
Dependabot	16.35 – 16.50
Wrap-up	16.50 – 17.00

Pre-requisites for the workshop

Please ensure you have Git installed on your local machine.
You can find download and install instructions here:
https://git-scm.com/book/en/v2/Getting-Started-Installing-Git

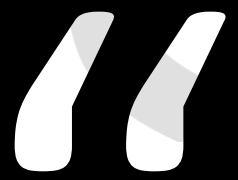
You need access to two repositories:

1) Please ensure you can access the **Workshop repository**

https://github.com/XpiritCommunityEvents/HOL

2) Please ensure you can access **your attendee repository**

https://github.com/XpiritCommunityEvents/attendee-<yourGitHubhandle>

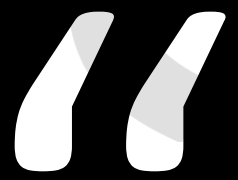


Our highest priority is to satisfy the customer through early and continuous delivery of valuable software

-- 1st principle behind agile manifesto

Continuous Delivery

Continuous delivery is all about creating a repeatable and reliable process for delivering software in order to **deliver high value software** to our customers **fast**!



DevOps is the union of people, process, and products to enable continuous delivery of value to our end users.

-- Donovan Brown

Awesome, but how do we do this?

In a secure and compliant way?

Meet the GitHub Toolset

Project/Product Management

Automation

Package Management

Software Supply Chain

Work From Anywhere

Source Control

Issues, Projects and Pages

Issues

Projects

Kanban

Backlog

Pages/wiki

Automation

GitHub Actions
Continuous integration
Deployment automation
Continuous delivery
Traceability and compliance
Hooks for other products

GitHub Packages

- Package registry
- A standard package manager
  - NPM (NodeJS)
  - NuGet (.NET)
  - RubyGems (Ruby)
  - Maven and Gradle (Java)
- Container Registry
- Unified Identity and permissions

Software Supply Chain

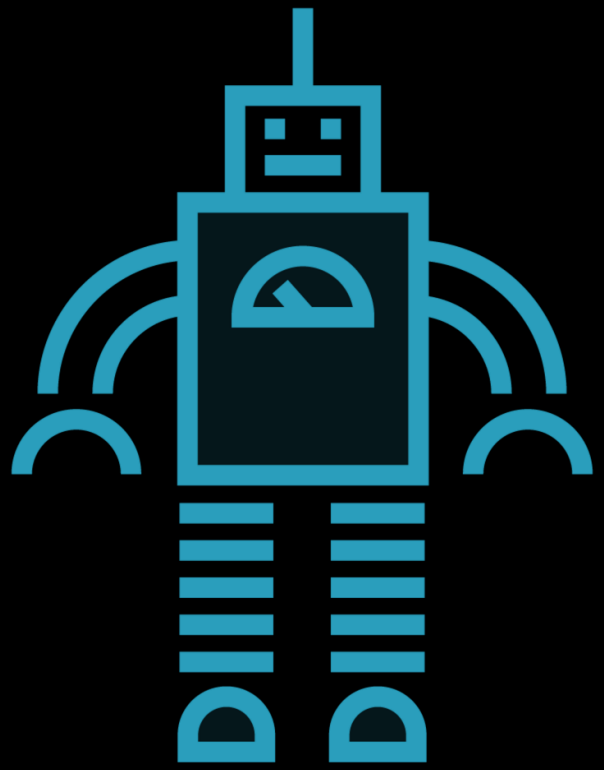
Your software is build on other software
- Has dependencies
- Has known vulnerabilities

Keep it secure
- Keep it up to date
- Scan for known vulnerabilities

GitHub Advanced Security

- Works With GitHub Enterprise
- Code Scanning
  - CodeQL
  - SARIF for 3th party tools
- Secret Scanning
  - Many secrets of known service providers

Dependabot



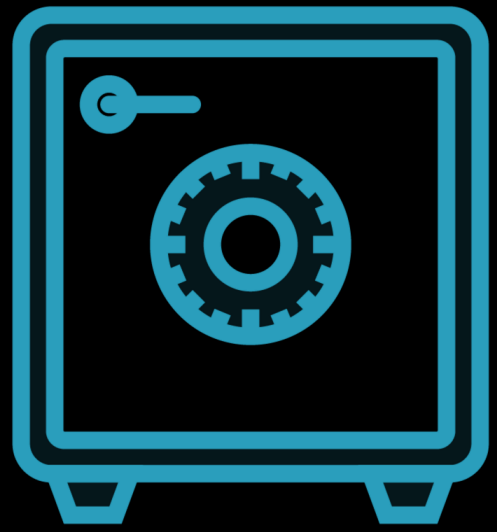
GitHub tooling to keep dependencies up to date
- Outdated Packages
- Vulnerable Packages

Actions in your workflows

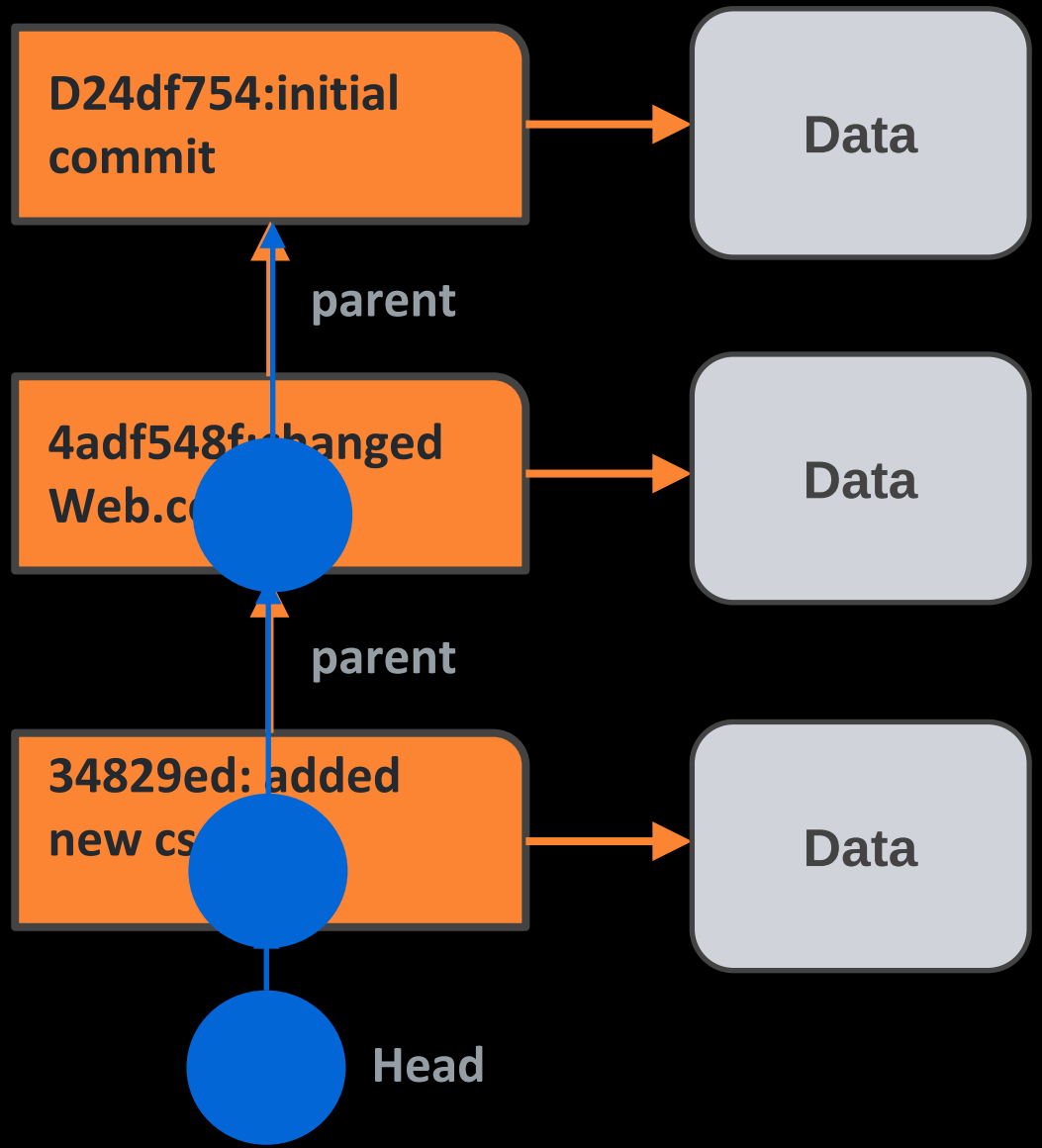
Codespaces

Development environment hosted in the cloud
Different VM sizes
Browser or Visual Studio Code
devcontainer.json
Custom container

SOURCE CONTROL



Git Is All About a Graph of Nodes!



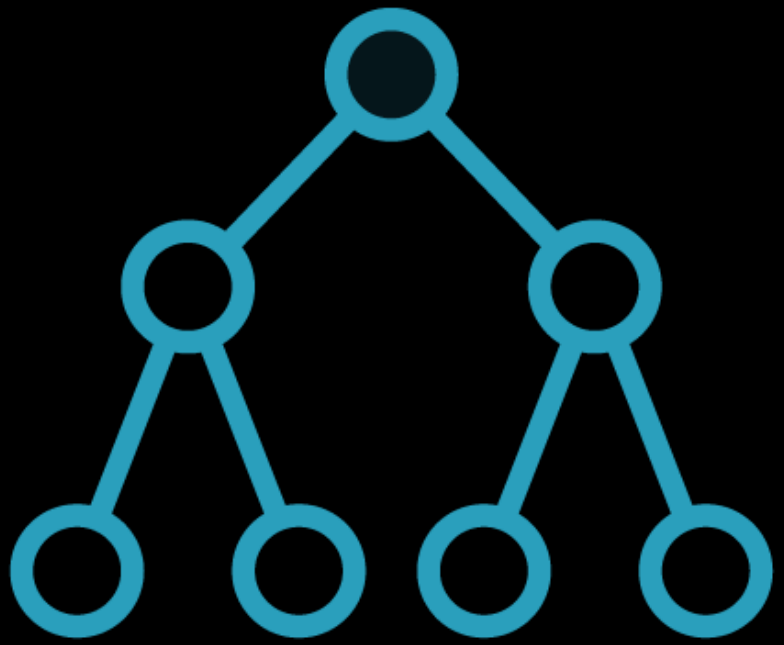
A Git commit is a node in a graph

Every commit has a pointer to its parent

References make commits reachable

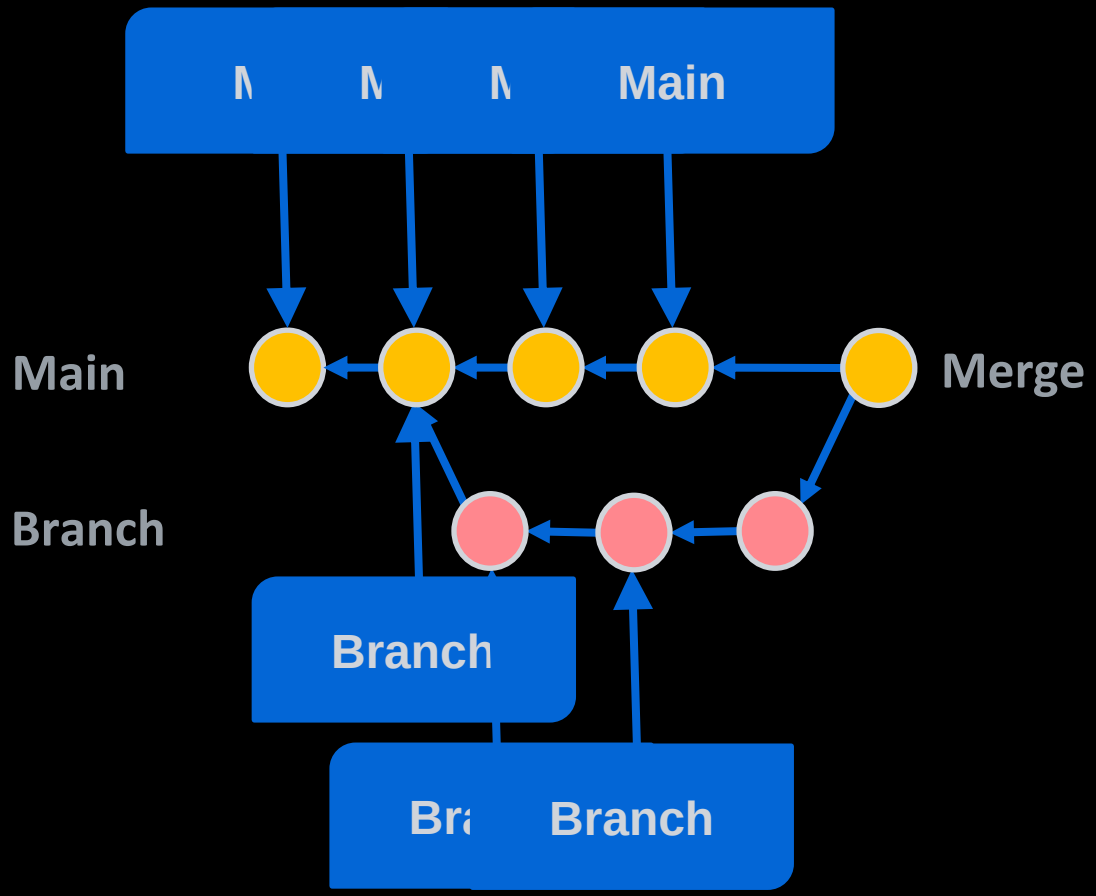
Head, Tag, Branch

Branches in Git



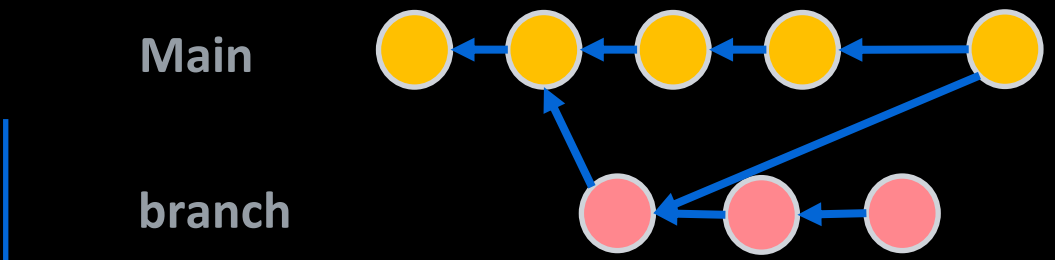
Main
Branch + Publish
Merge

Branch and Merge

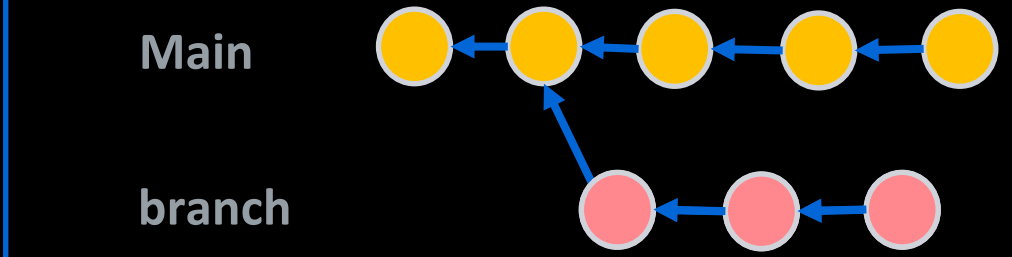


Merge and Rebase

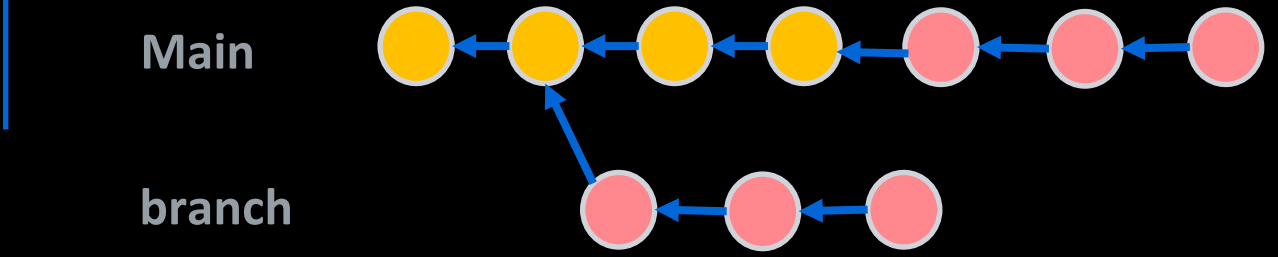
Squash & Merge



Fast forward Merge



Rebase



Visualize Git

https://git-school.github.io/visualizing-git/

Most Common Git Branching Strategies

Git flow

Low deployment frequency

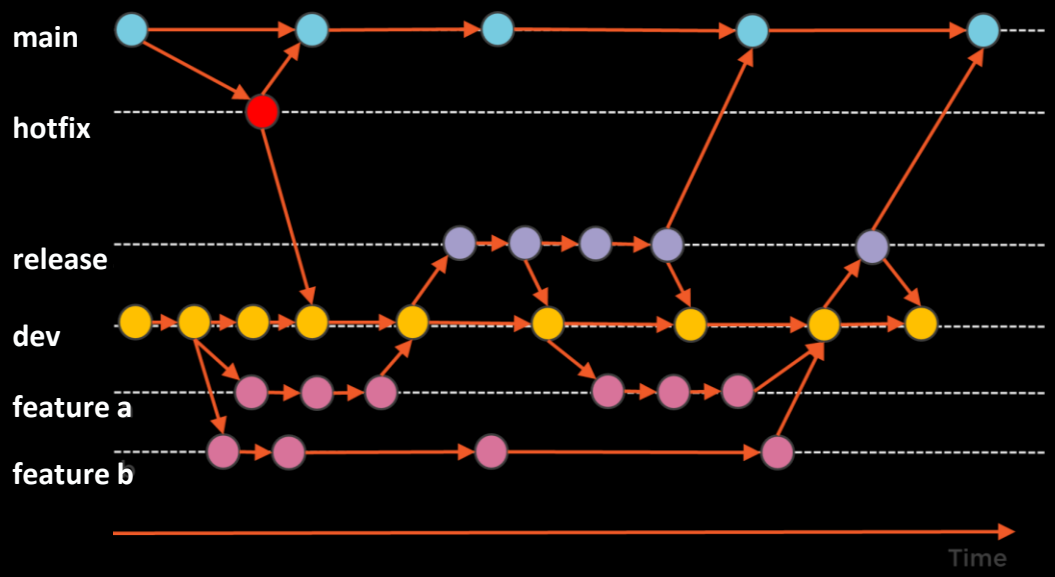
Git Hub Flow

High deployment frequency

Trunk Based Development

High Deployment frequency

Git Flow



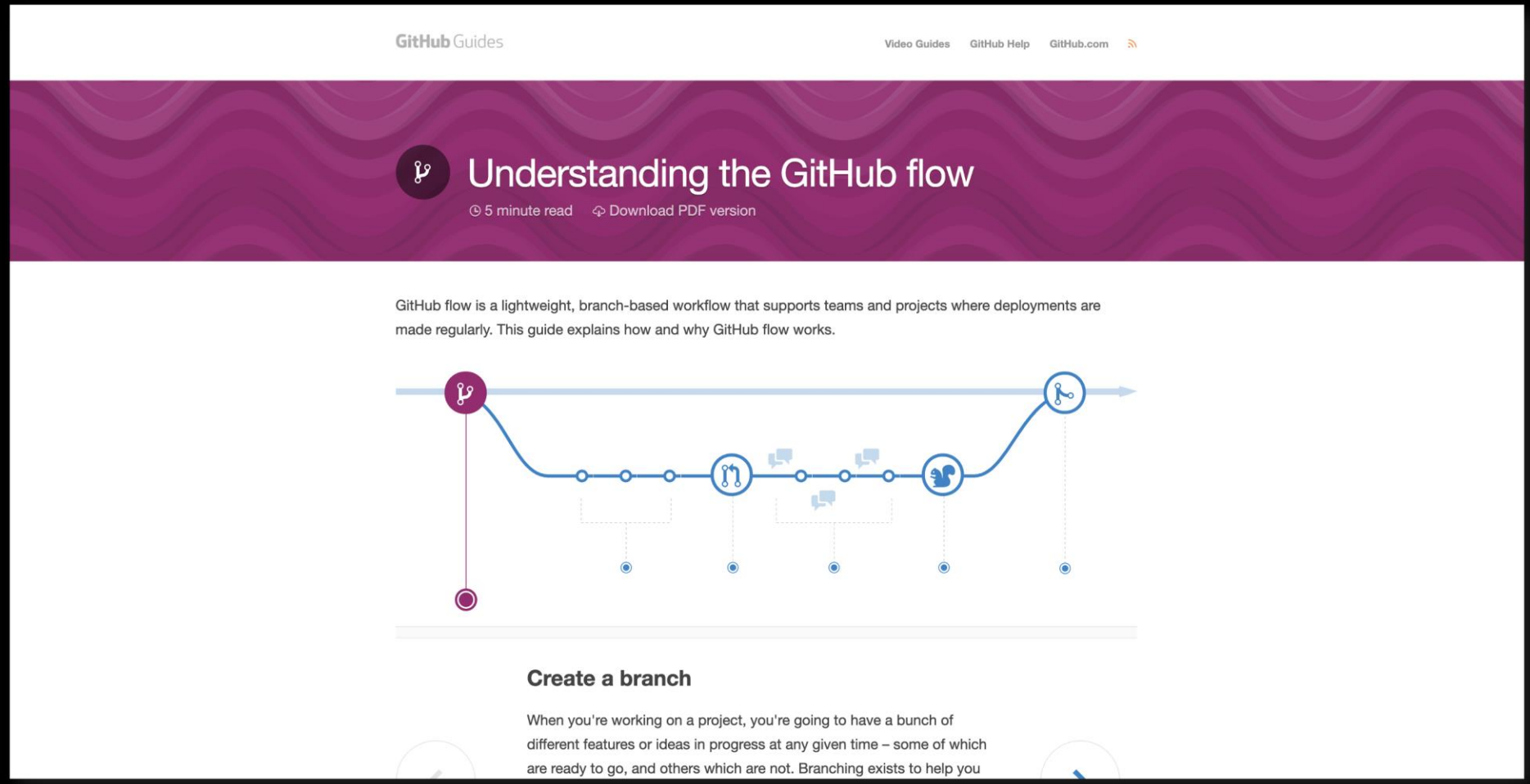
Used for staged delivery

Release every iteration

Delivery of packages, libraries, etc.

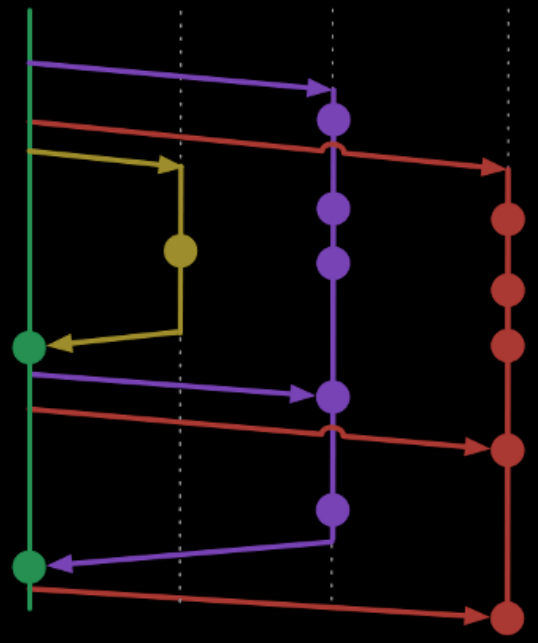
http://nvie.com/posts/a-successful-git-branching-model/

A GitHub flow guide



https://guides.github.com/introduction/flow

Trunk Based Development



Almost the same as GitHub flow

Release always from main

Merge to main before you deploy

Use feature toggles to carry cross multiple integrations to main

Experiment without risk

Branch:

- Lightweight pointer
- Safe to experiment
- New commits
- 1 new branch to 1 Pull Request

Pull Request:

- Compare two branches
- Automation
  - CI
  - Deployment
- Fast feedback **in context**
  - Automation results
  - Peer reviews

Branch vs Fork

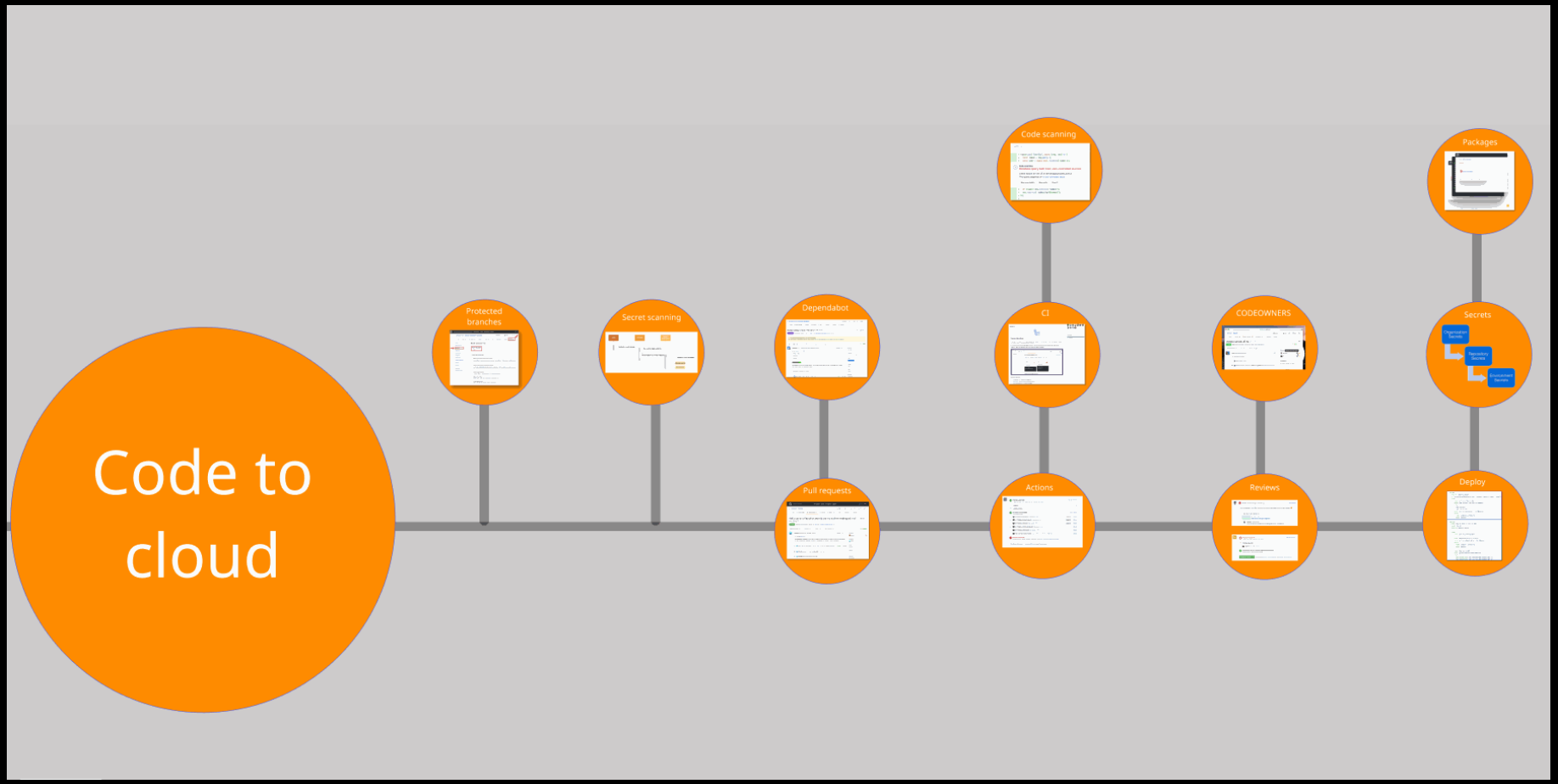
Branch:

- Ideal for collaboration
- Always choose this whenever possible
- Protected branches ensure security

Fork:

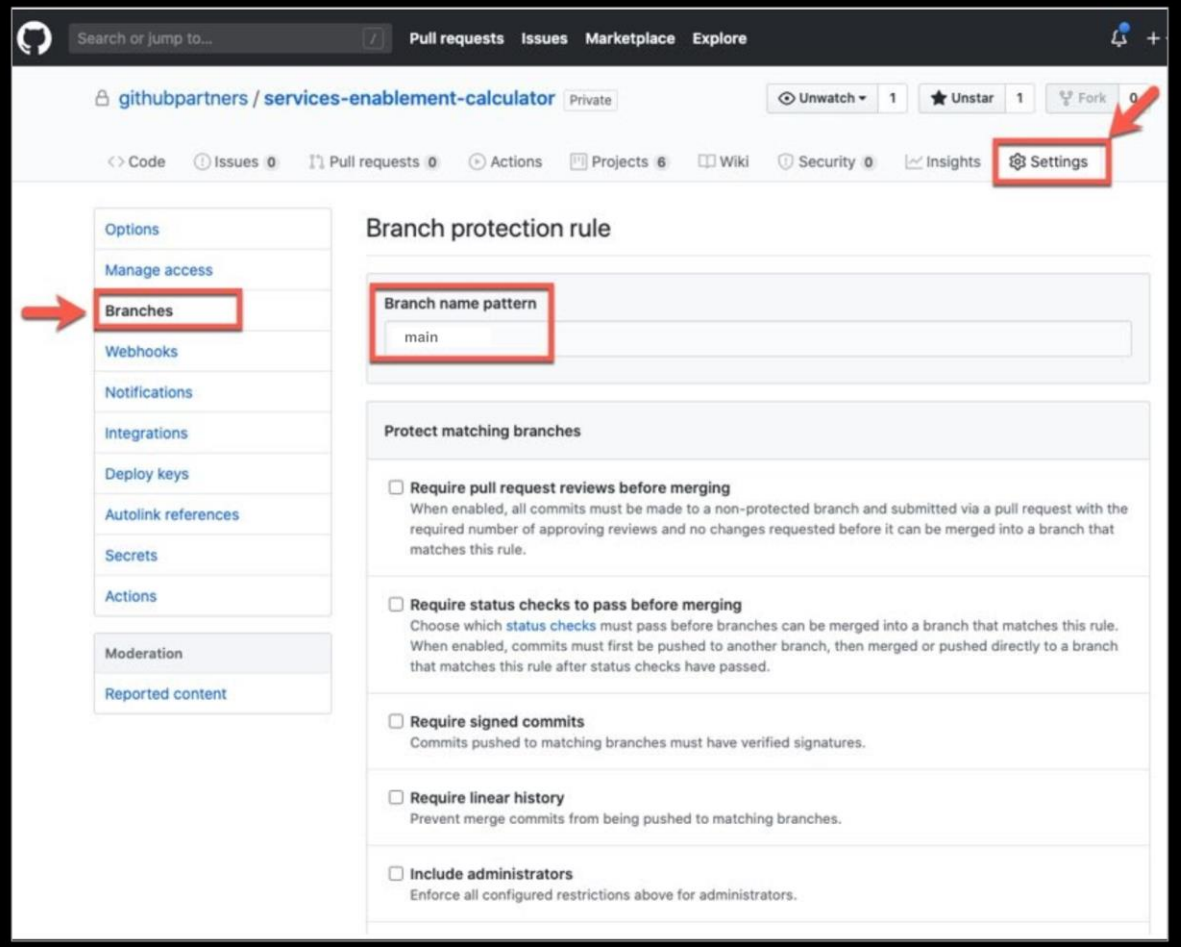
- Required to collaborate without “write” access to repo
- Often used in open source because of access management

About protected branches

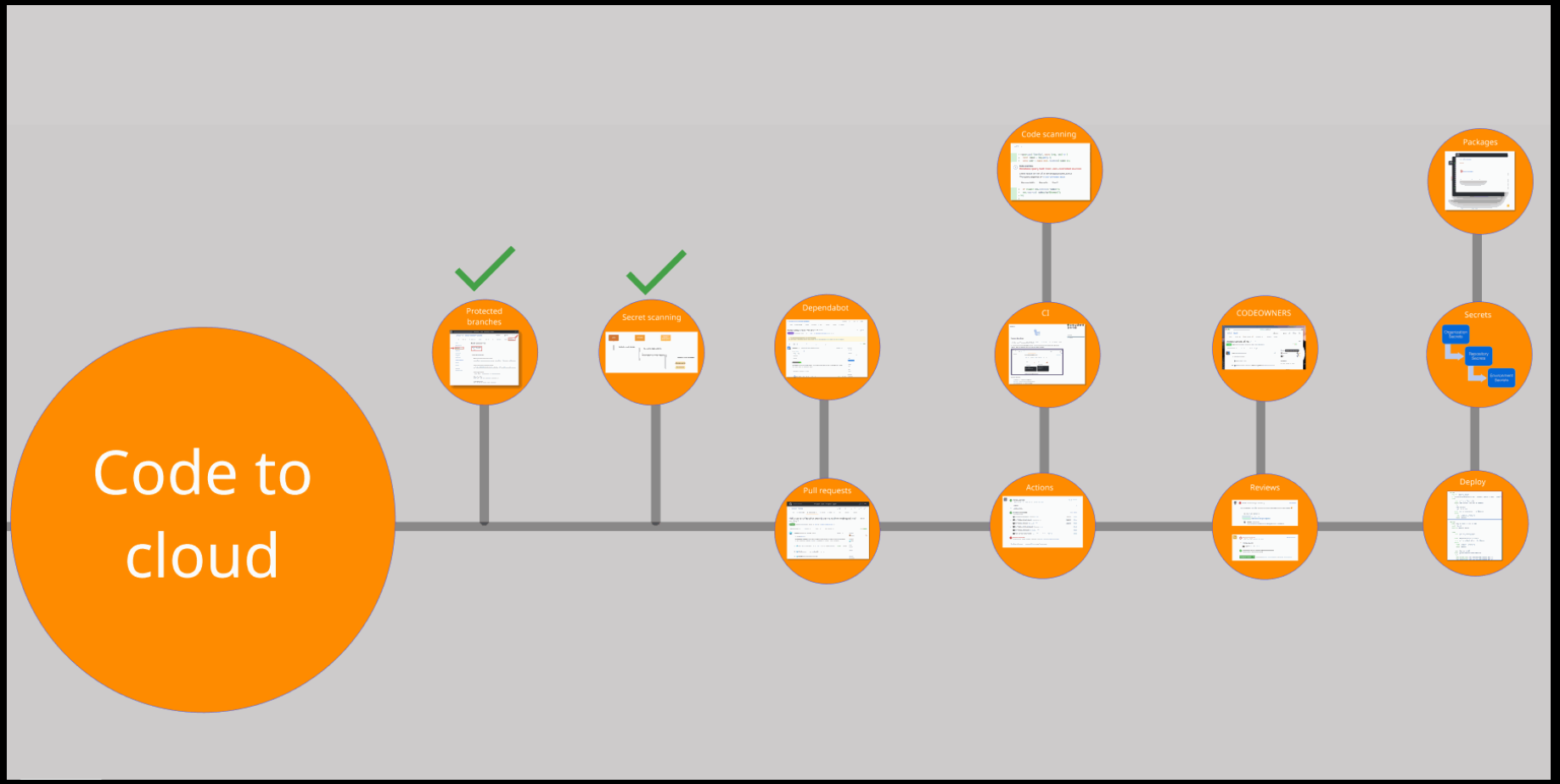


Branch protection implementation

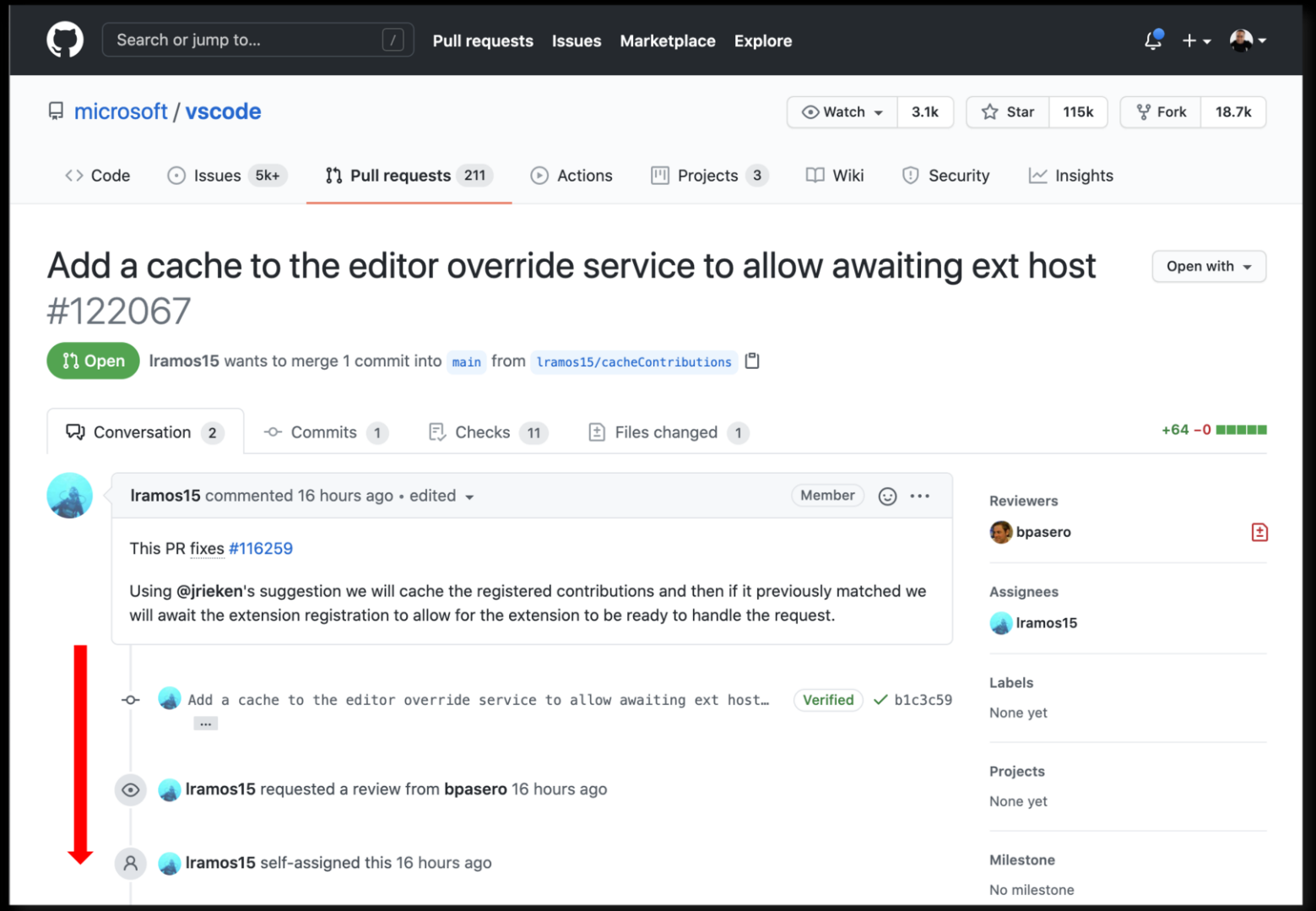
- Repository settings
- Admins only
- Name pattern options
- Limit merging & committing, not creating



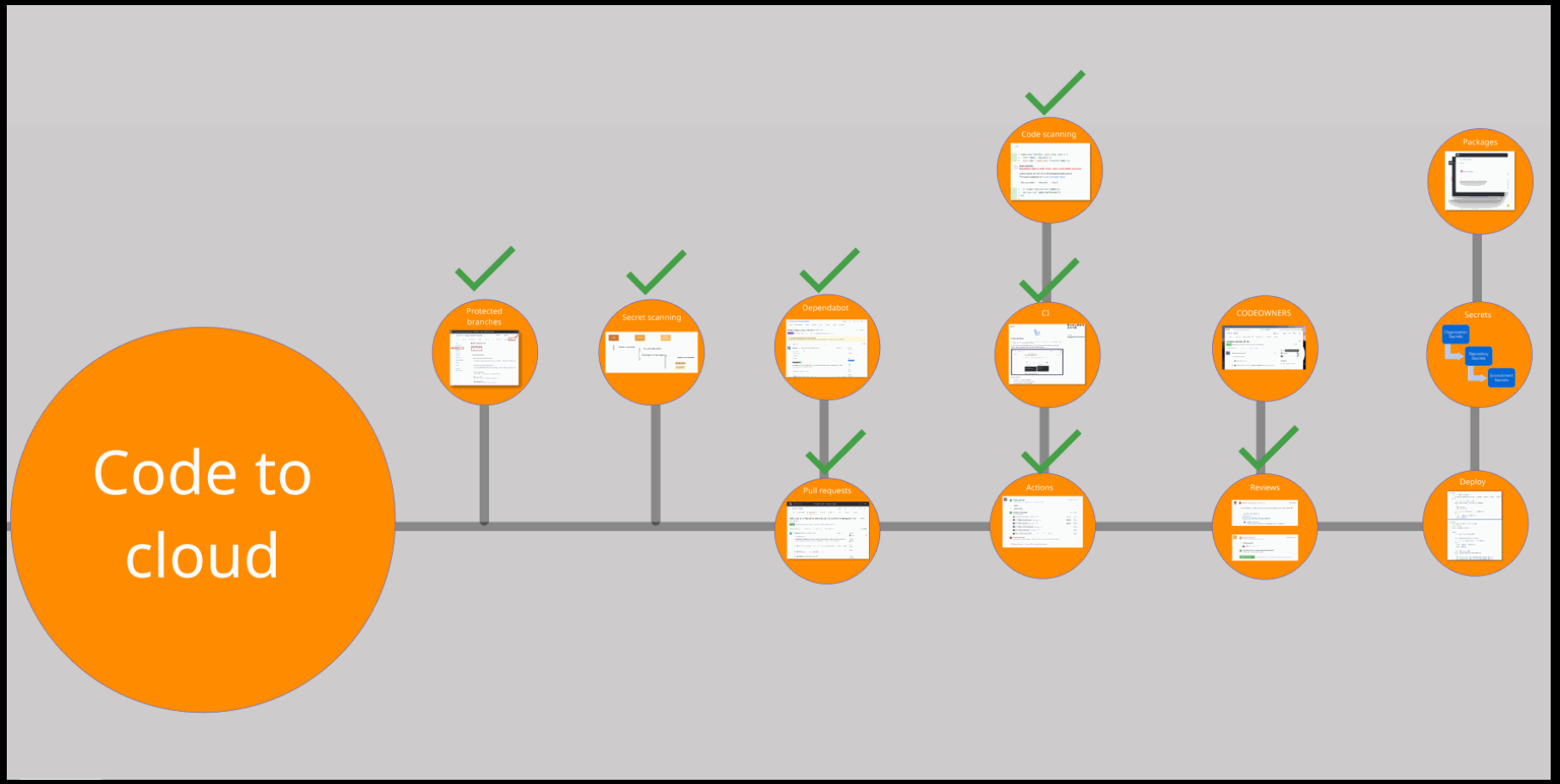
A Pull Request



Pull Request timeline



Codeowners


Code to cloud
Protected branches
Secret scanning
Dependabot
Pull requests
Code scanning
CI
Actions
CODEOWNERS
Reviews
Packages
Secrets
Deploy

Migrating a repository from Azure DevOps to GitHub

Hands-on lab 1:

Migrating a repository from Azure DevOps to GitHub

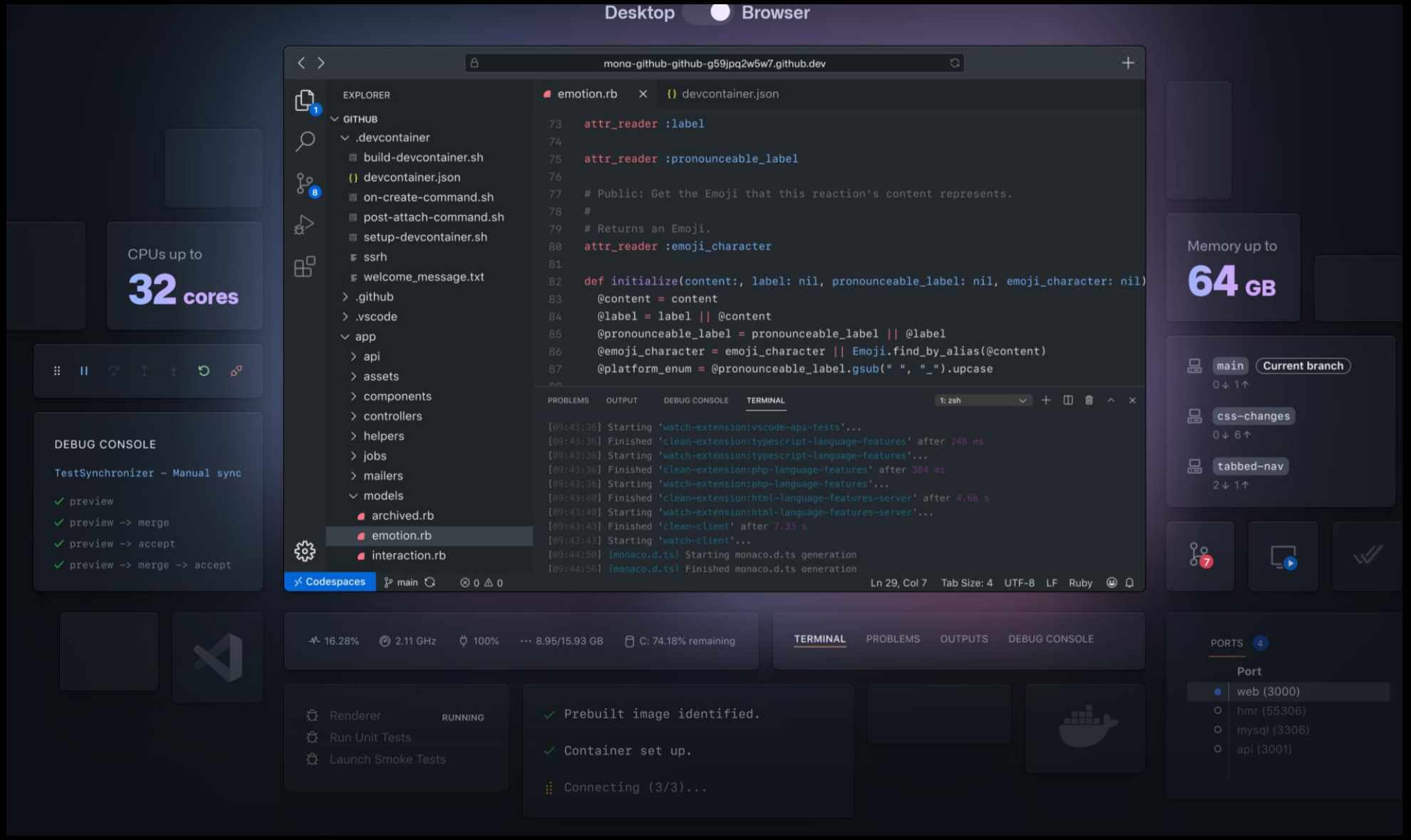
Time:

15 minutes

https://github.com/XpiritCommunityEvents/HOL

Codespaces

CodeSpaces



GitHub

Pricing

Available today for GitHub Teams and GitHub Enterprise Cloud customers

Get started >

Try Codespaces today in free trial until September 10, 2021

Codespaces Compute

Isolated VMs billed per second

Cores	RAM	Price
2 core	4GB	$.18 per hour
4 core	8GB	$.36 per hour
8 core	16GB	$.72 per hour
16 core	32GB	$1.44 per hour
32 core	64GB	$2.88 per hour

Codespaces storage

charged when inactive

$0.07

per gigabyte per month

Setting up Codespaces to develop a web-app

Hands-on lab 2:

Setting up Code Spaces to develop a web-app

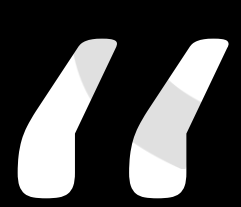
Time:

10 minutes

https://github.com/XpiritCommunityEvents/HOL

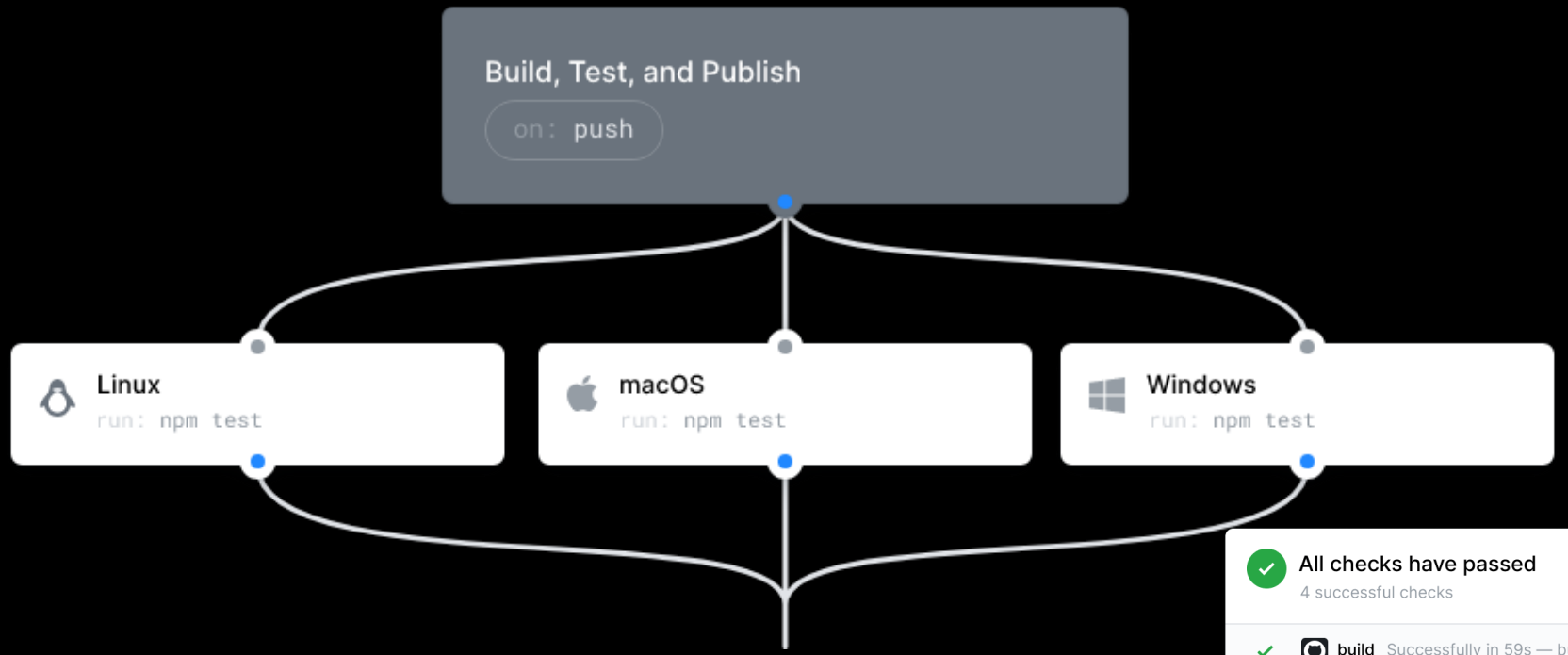
ACTIONS

What is GitHub Actions?



GitHub Actions makes it easy to automate all your software workflows, now with world-class CI/CD. Build, test, and deploy your code right from GitHub. Make code reviews, branch management, and issue triaging work the way you want.

Automate your workflow from idea to production



All checks have passed
4 successful checks
Hide all checks

build Successfully in 59s — build

test Successfully in 59s — build

publish Successfully in 59s — build

This branch has no conflicts with the base branch
Merging can be performed automatically.

Merge pull request

You can also open this in GitHub Desktop or view command line instructions.

GitHub

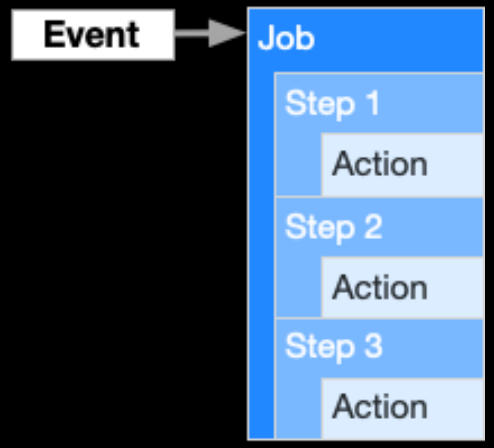
Live Logs

Secret Store

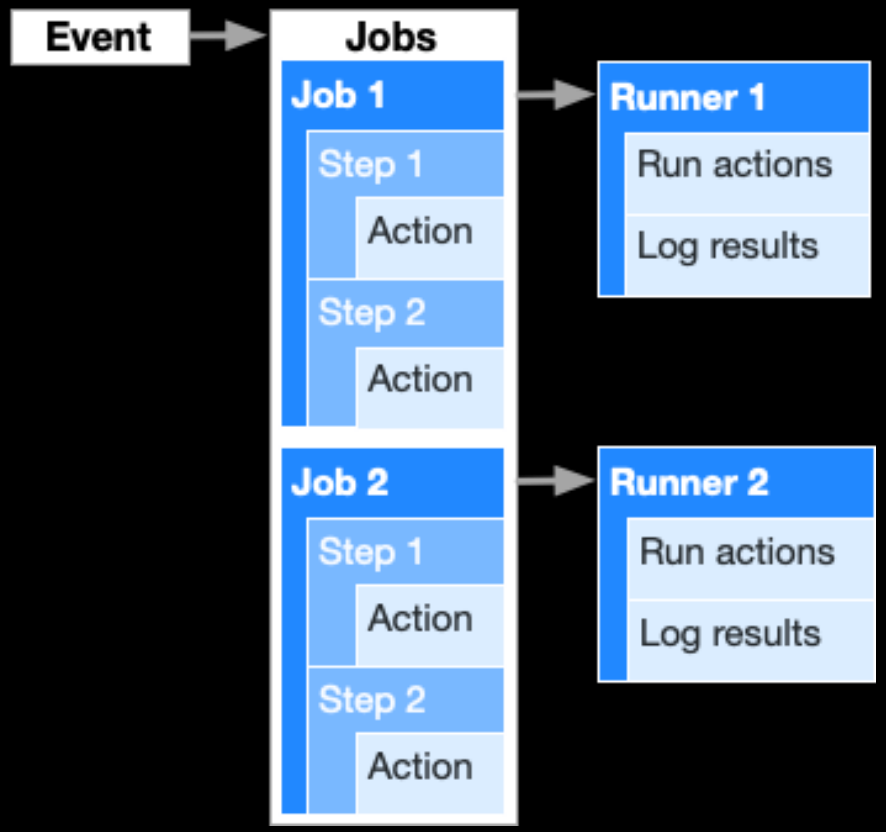
Linux, macOS,
Windows, ARM,
and containers

Matrix Builds

Overview



Components of a workflow



Events:

Repo

Issues

Project

Pages

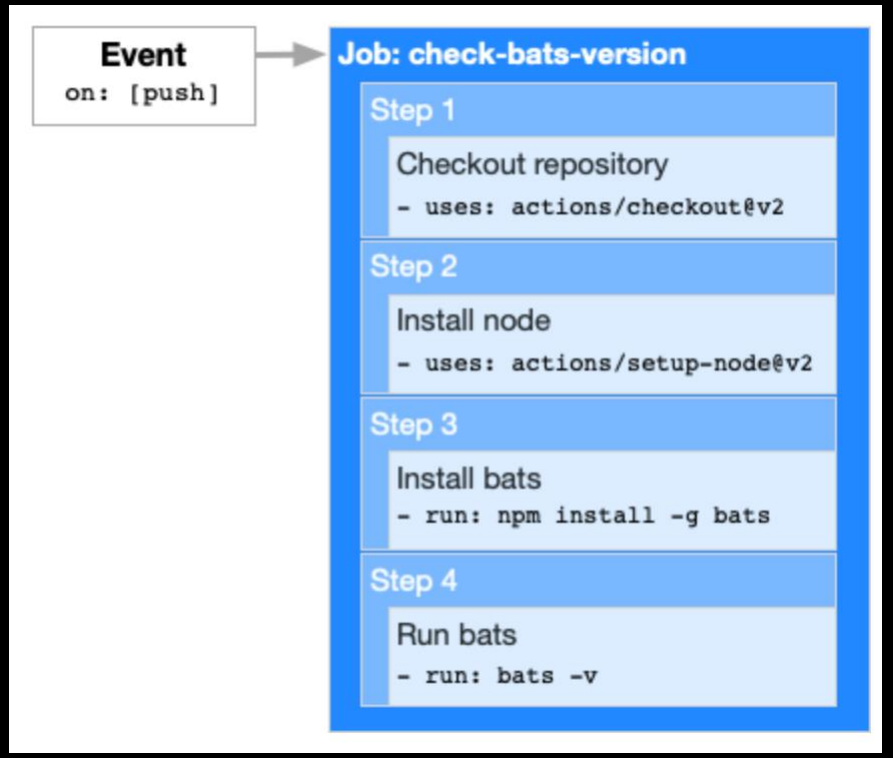
Wiki

Note:

When you use the GITHUB_TOKEN to interact with GitHub, it will not trigger new events

Yaml workflow definitions

```yaml
name: learn-github-actions
on: [push]
jobs:
  check-bats-version:
    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v2
      - uses: actions/setup-node@v2
        with:
          node-version: '14'
      - run: npm install -g bats
      - run: bats -v
```



Context & Expressions

A context provides access to a set of values that we can use in actions or in expressions

An Expression can be used to create more elaborate values or evaluate conditions

Each Step can have conditions that when evaluated to true will execute

Context

Syntax:${{ <context> }}

${{ context.ConstantName }}

GitHub context provides access to: workflow, token, job, event, etc.
Environment provides access to environment variables
Secret provides access to the environment, organizational or repo secrets

Examples:
${{ secrets.MYAPI_TOKEN }}
${{ secrets.AZUREAPPSERVICE_PUBLISHPROFILE }}

"

Expression

Syntax:${{ <expression> }}

Expression:
steps:
  - uses: actions/hello-world-javascript-action@v1.1
    if: ${{ <expression> }}

```
name: CI
on: push
jobs:
  prod-check:
    if: ${{ github.ref == 'refs/heads/main' }}
    runs-on: ubuntu-latest
    steps:
      - run: echo "Deploying to production server on branch $GITHUB_REF”
```

matrix

Create a job per item in the matrix
e.g. for each language a CodeQL run

```yaml
strategy:
  matrix:
    node: [10, 12, 14]
steps:
  # Configures the node version used on
GitHub-hosted runners
  - uses: actions/setup-node@v2
    with:
      # The Node.js version to configure
      node-version: ${{ matrix.node }}
```

Where do actions come from?

GitHub
Community
Marketplace

```
- name: Setup Node
  uses: actions/setup-node@v1
```

https://github.com/actions/setup-node

```
- name: Run Azure webapp deploy
  uses: azure/webapps-deploy@v2
```

https://github.com/azure/webapps-deploy

Runners

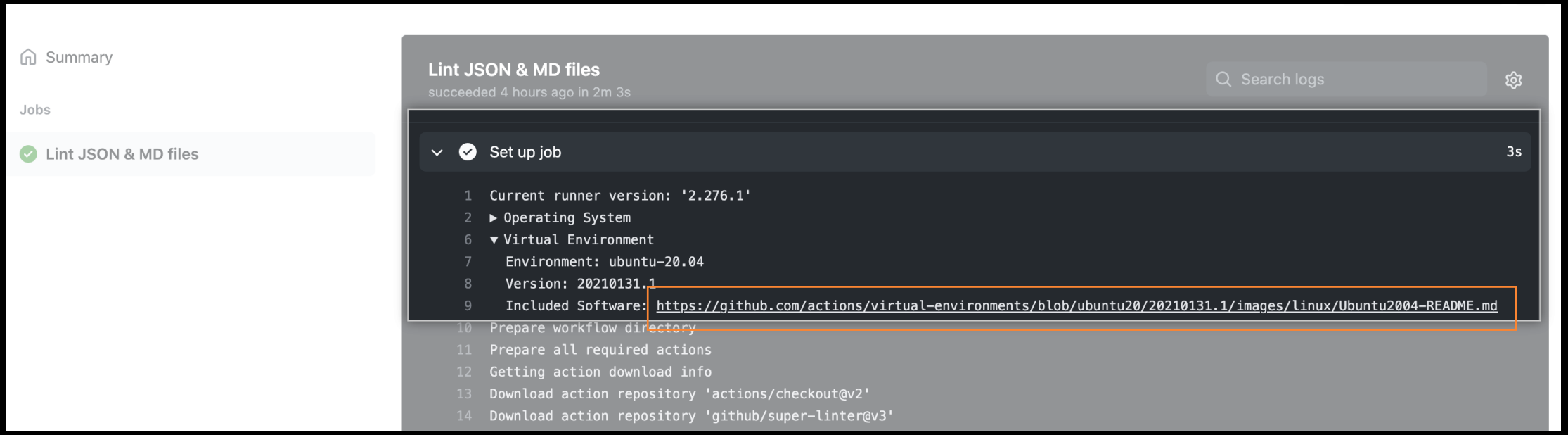
GitHub Hosted

- Hosted on Azure (Standard_DS2_v2 virtual machines)
- Mac is hosted on GitHub's own macOS Cloud.
- The Linux and macOS virtual machines both run using passwordless sudo

> **Note:** If you use an IP address allow list for your GitHub organization or enterprise account, you cannot use GitHub-hosted runners and must instead use self-hosted runners. For more information, see "About self-hosted runners."

Pre-installed software

Look at the install logs of Set up job step:



GitHub-hosted runners are updated weekly
If there is a tool that you'd like to request, please open an issue at actions/virtual-environments

Available Runners (12-09-2021)

Virtual environment	YAML workflow label	Notes
Windows Server 2022[beta]	`windows-2022`	The `windows-latest` label currently uses the Windows Server 2019 runner image.
Windows Server 2019	`windows-latest` or `windows-2019`	
Windows Server 2016	`windows-2016`	
Ubuntu 20.04	`ubuntu-latest` or `ubuntu-20.04`	
Ubuntu 18.04	`ubuntu-18.04`	
Ubuntu 16.04[deprecated]	`ubuntu-16.04`	Deprecated and limited to existing customers only. Migrate to Ubuntu 20.04. For more information, see the blog post.
macOS Big Sur 11	`macos-11`	The `macos-latest` label currently uses the macOS 10.15 runner image.
macOS Catalina 10.15	`macos-latest` or `macos-10.15`	

Self Hosted Runners

You can add self-hosted runners at various levels in the management hierarchy:

- Repository-level runners are dedicated to a single repository.
- Organization-level runners can process jobs for multiple repositories in an organization.
- Enterprise-level runners can be assigned to multiple organizations in an enterprise account

Communication between self-hosted runners and GitHub

Uses HTTPS Long-poll with 50s timeout

If you use an IP address allow list for your GitHub organization or enterprise account, you must add your self-hosted runner's IP address to the allow list

> **Note:** Some of the domains listed below are configured using `CNAME` records. Some firewalls might require you to add rules recursively for all `CNAME` records. Note that the `CNAME` records might change in the future, and that only the domains listed below will remain constant.

```
github.com
api.github.com
*.actions.githubusercontent.com
github-releases.githubusercontent.com
github-registry-files.githubusercontent.com
codeload.github.com
*.pkg.github.com
pkg-cache.githubusercontent.com
pkg-containers.githubusercontent.com
pkg-containers-az.githubusercontent.com
*.blob.core.windows.net
```

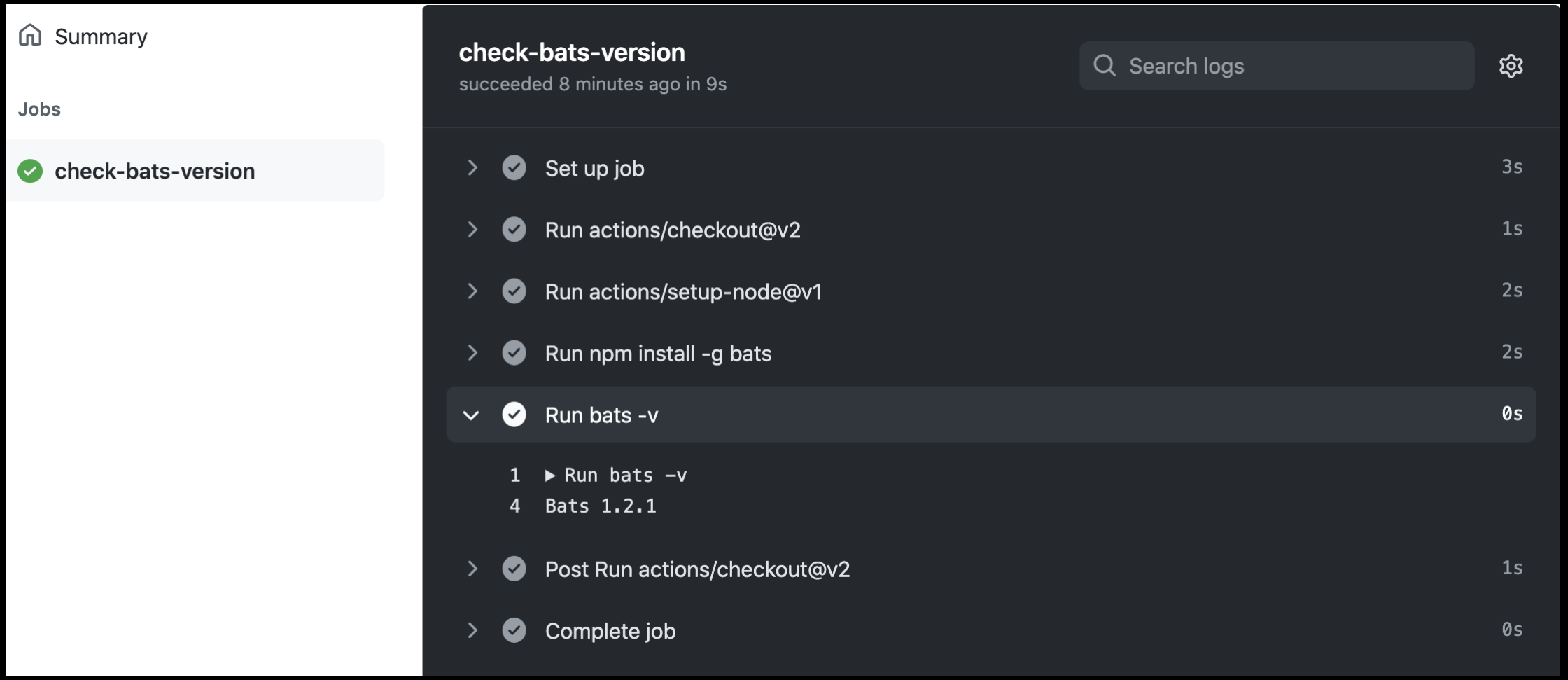
Self hosted and public repos

People love ways to run bitcoin miners!
Recommended to only use self hosted runners on private repos
Forks of your repo, can otherwise run dangerous workflows (via pull request)!

Untrusted workflows running on your self-hosted runner pose significant security risks for your machine and network environment, especially if your machine persists its environment between jobs. Some of the risks include:

- Malicious programs running on the machine.
- Escaping the machine's runner sandbox.
- Exposing access to the machine's network environment.
- Persisting unwanted or dangerous data on the machine.

Job runner logs



Compare AzDo <> GitHub Yaml

Azure Pipelines

```yaml
jobs:
  - job: scripts
    pool:
      vmImage: 'windows-latest'
    steps:
      - script: echo "This step runs in the default shell"
      - bash: echo "This step runs in bash"
      - pwsh: Write-Host "This step runs in PowerShell Core"
      - task: PowerShell@2
        inputs:
          script: Write-Host "This step runs in PowerShell"
```

GitHub Actions

```yaml
jobs:
  scripts:
    runs-on: windows-latest
    steps:
      - run: echo "This step runs in the default shell"
      - run: echo "This step runs in bash"
        shell: bash
      - run: Write-Host "This step runs in PowerShell Core"
        shell: pwsh
      - run: Write-Host "This step runs in PowerShell"
        shell: powershell
```

More information: https://docs.github.com/en/actions/migrating-to-github-actions/migrating-from-azure-pipelines-to-github-actions

Pricing

Private repositories

Included minutes		Additional hosted runner minutes	
Free	2,000 minutes per month	Linux 2 cores, 7GB	$0.008 per minute
Pro	3,000 minutes per month	Windows 2 cores, 7GB	$0.016 per minute
Team	3,000 minutes per month	macOS 2 cores, 7GB	$0.08 per minute
Enterprise	50,000 minutes per month	Self-hosted	Free

Included, hosted runner minutes are consumed at different rates for each operating system. GitHub Actions is not available for private repos in legacy per-repository plans. Learn more

Xpirit

Creating your first Actions workflow

Hands-on lab 3:

Creating your first Action Workflow

Time:

15 minutes

https://github.com/XpiritCommunityEvents/HOL

Creating a .NET Actions workflow

Hands-on lab 4:

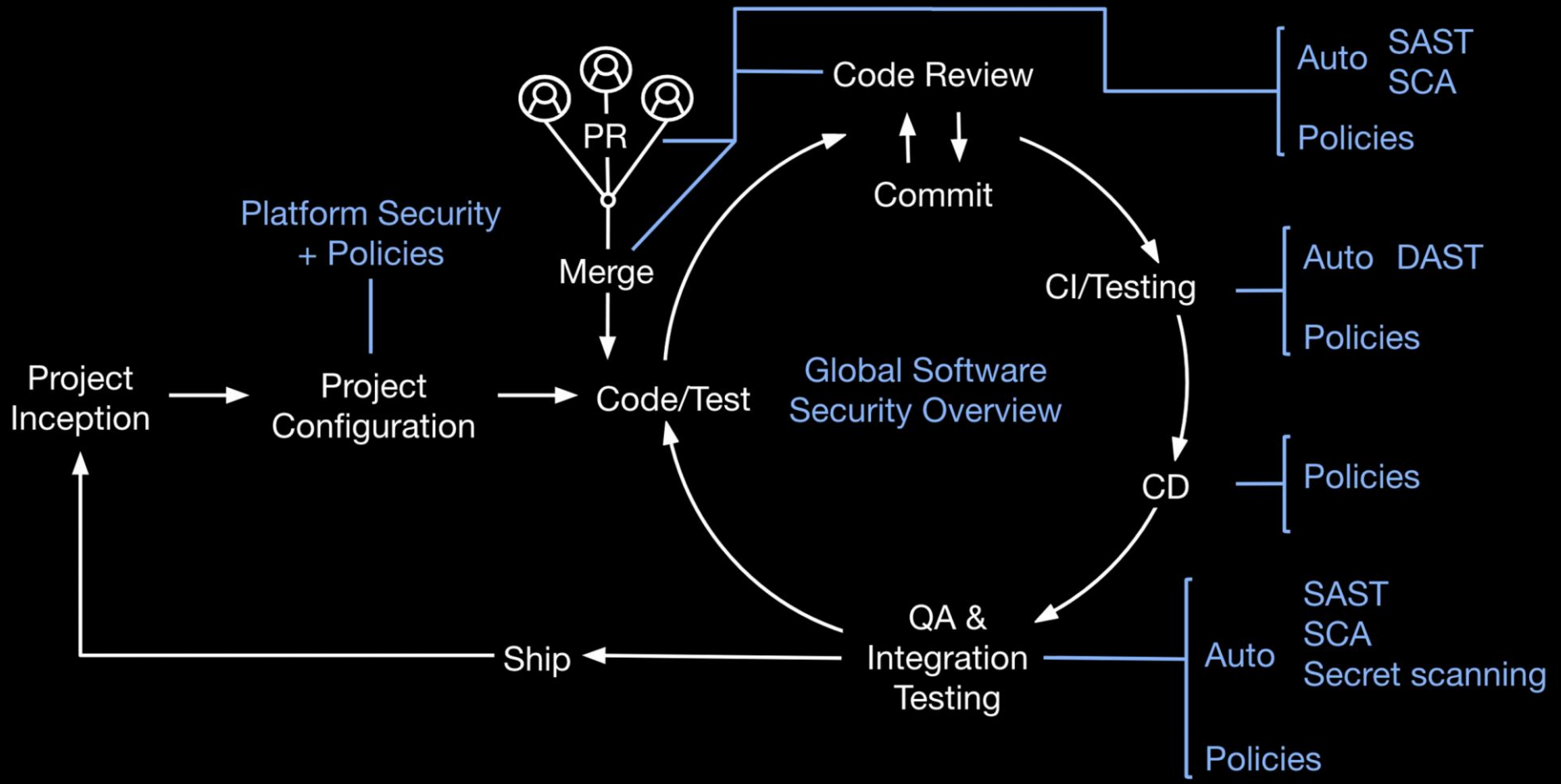
Creating a .NET Actions workflow

Time:

20 minutes

Security

Security is not separate. It's deeply ingrained throughout our development process.



Publicly available

GitHub’s Advanced Security capabilities

Supply Chain

- **Dependency review**
  Identify new dependencies and vulnerabilities in a PR

Code

- **Code scanning**
  Static analysis of every git push powered by CodeQL and extensible with other scanning engines
- **Secret scanning**
  Automatic notifications of API tokens exposed in git history

Development Lifecycle

- **Security overview**
  View security results of all kinds across your organization

Code scanning

CodeQL analysis consists of three steps:

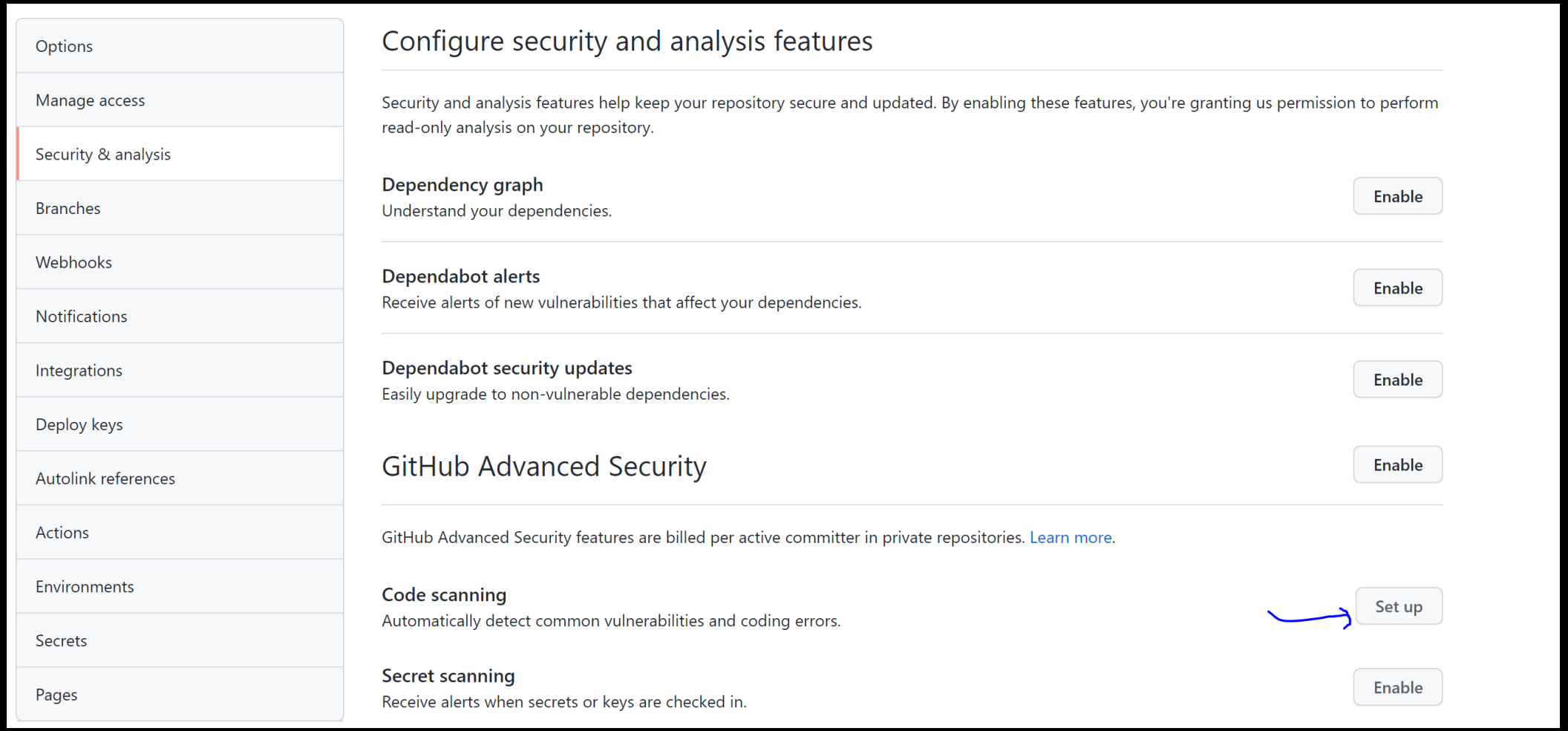
1. Preparing the code, by creating a CodeQL database
2. Running CodeQL queries against the database
3. Interpreting the query results

Supported languages

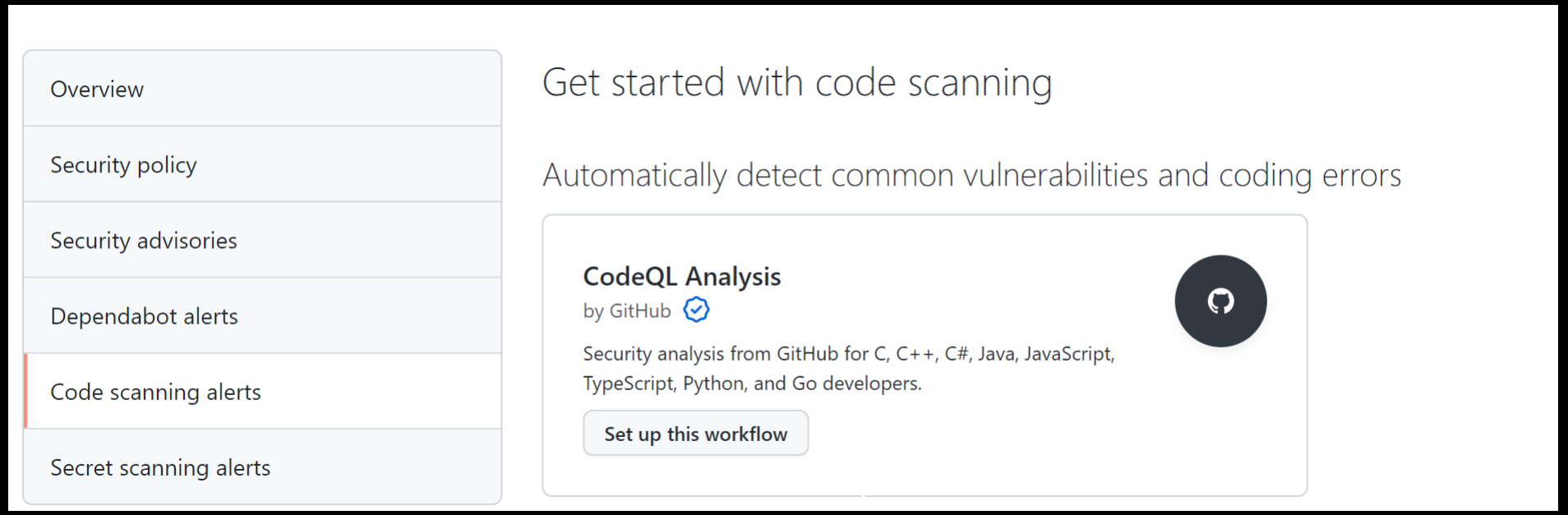
Language	Variants	Compilers	Extensions
C/C++	C89, C99, C11, C18, C++98, C++03, C++11, C++14, C++17, C++20 [1]	Clang (and clang-cl [2]) extensions (up to Clang 12.0), GNU extensions (up to GCC 11.1), Microsoft extensions (up to VS 2019), Arm Compiler 5 [3]	`.cpp`, `.c++`, `.cxx`, `.hpp`, `.hh`, `.h++`, `.hxx`, `.c`, `.cc`, `.h`
C#	C# up to 9.0	Microsoft Visual Studio up to 2019 with .NET up to 4.8, .NET Core up to 3.1 .NET 5	`.sln`, `.csproj`, `.cs`, `.cshtml`, `.xaml`
Go (aka Golang)	Go up to 1.16	Go 1.11 or more recent	`.go`
Java	Java 7 to 16 [4]	javac (OpenJDK and Oracle JDK), Eclipse compiler for Java (ECJ) [5]	`.java`
JavaScript	ECMAScript 2021 or lower	Not applicable	`.js`, `.jsx`, `.mjs`, `.es`, `.es6`, `.htm`, `.html`, `.xhm`, `.xhtml`, `.vue`, `.json`, `.yaml`, `.yml`, `.raml`, `.xml` [6]
Python	2.7, 3.5, 3.6, 3.7, 3.8, 3.9	Not applicable	`.py`
TypeScript [7]	2.6-4.2	Standard TypeScript compiler	`.ts`, `.tsx`

https://codeql.github.com/docs/codeql-overview/supported-languages-and-frameworks/

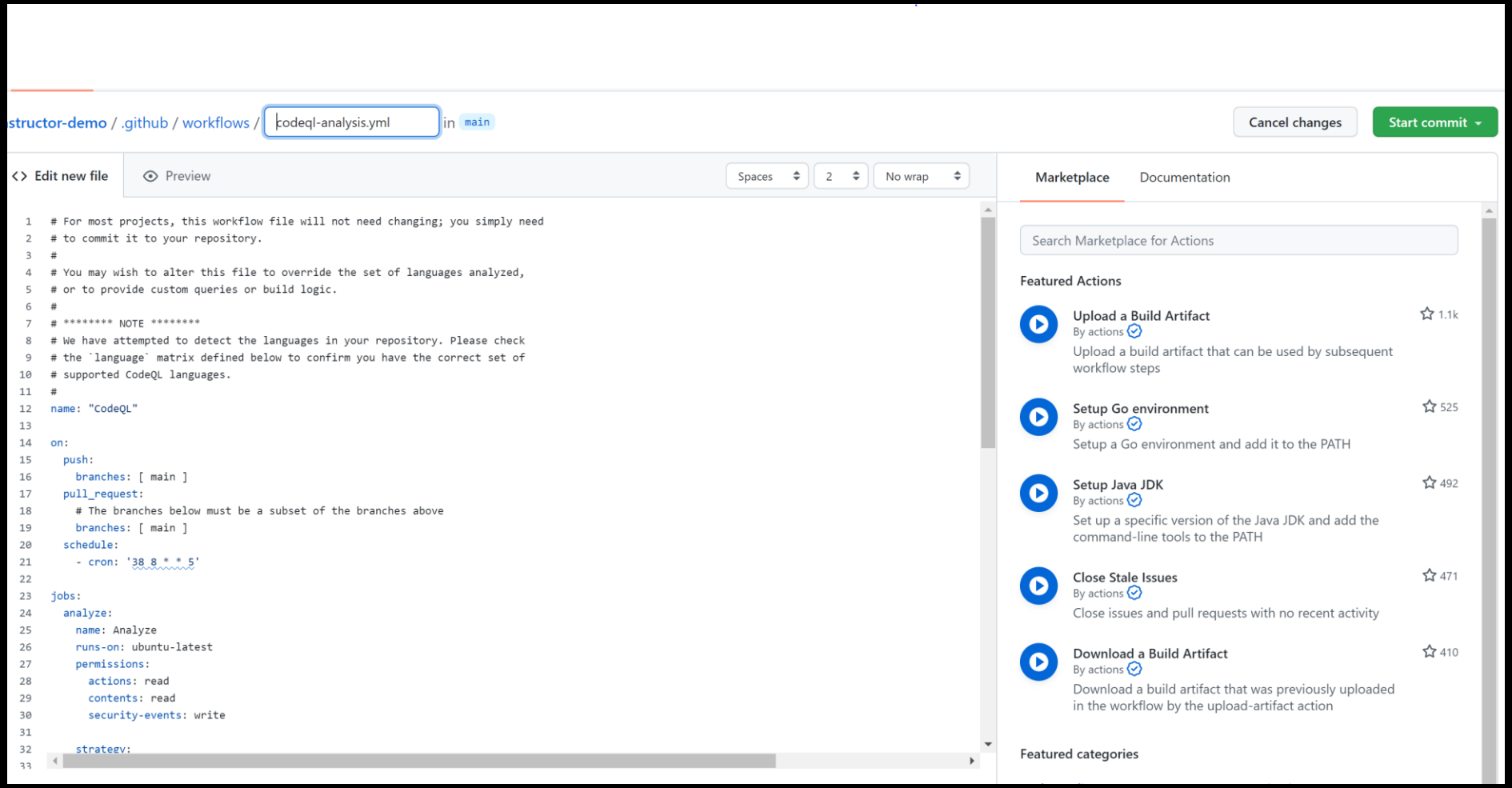
Enable Code Scanning



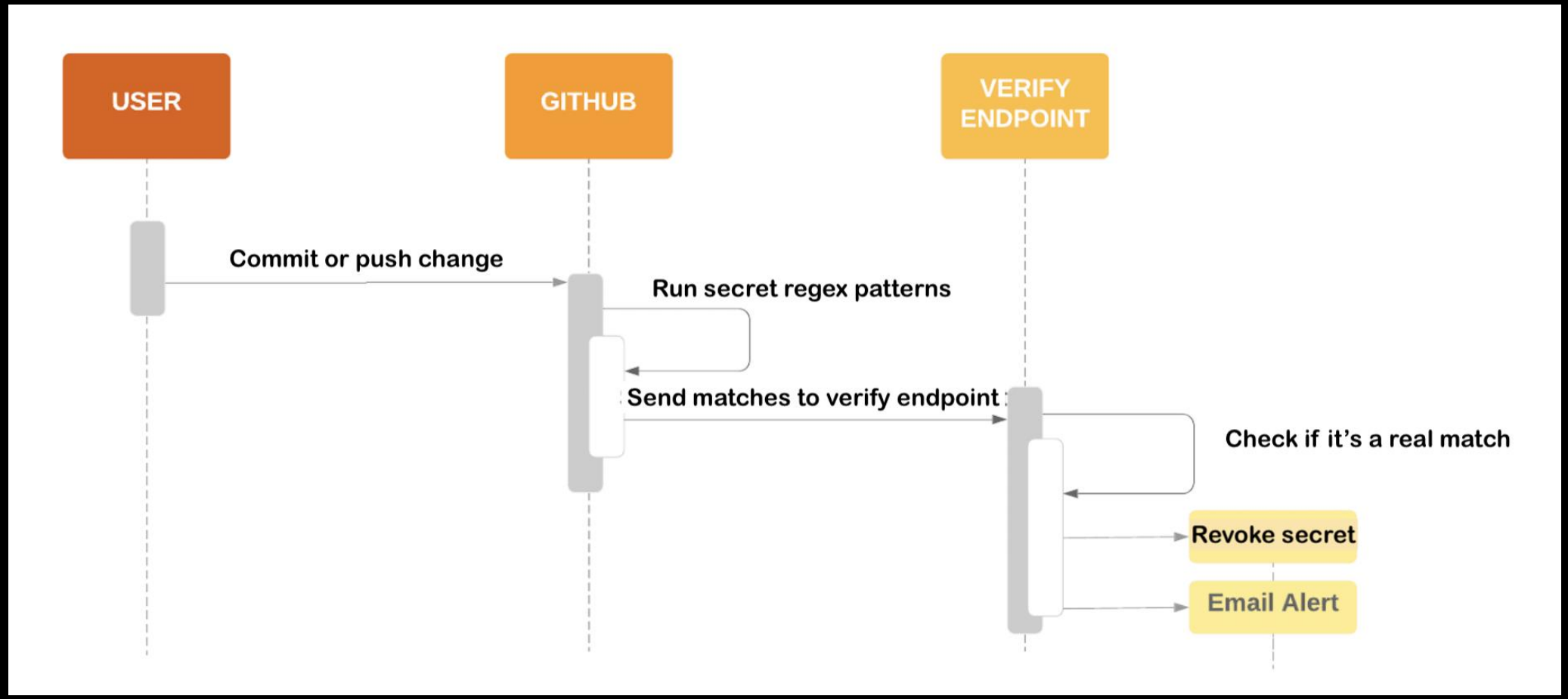
Enable Code Scanning



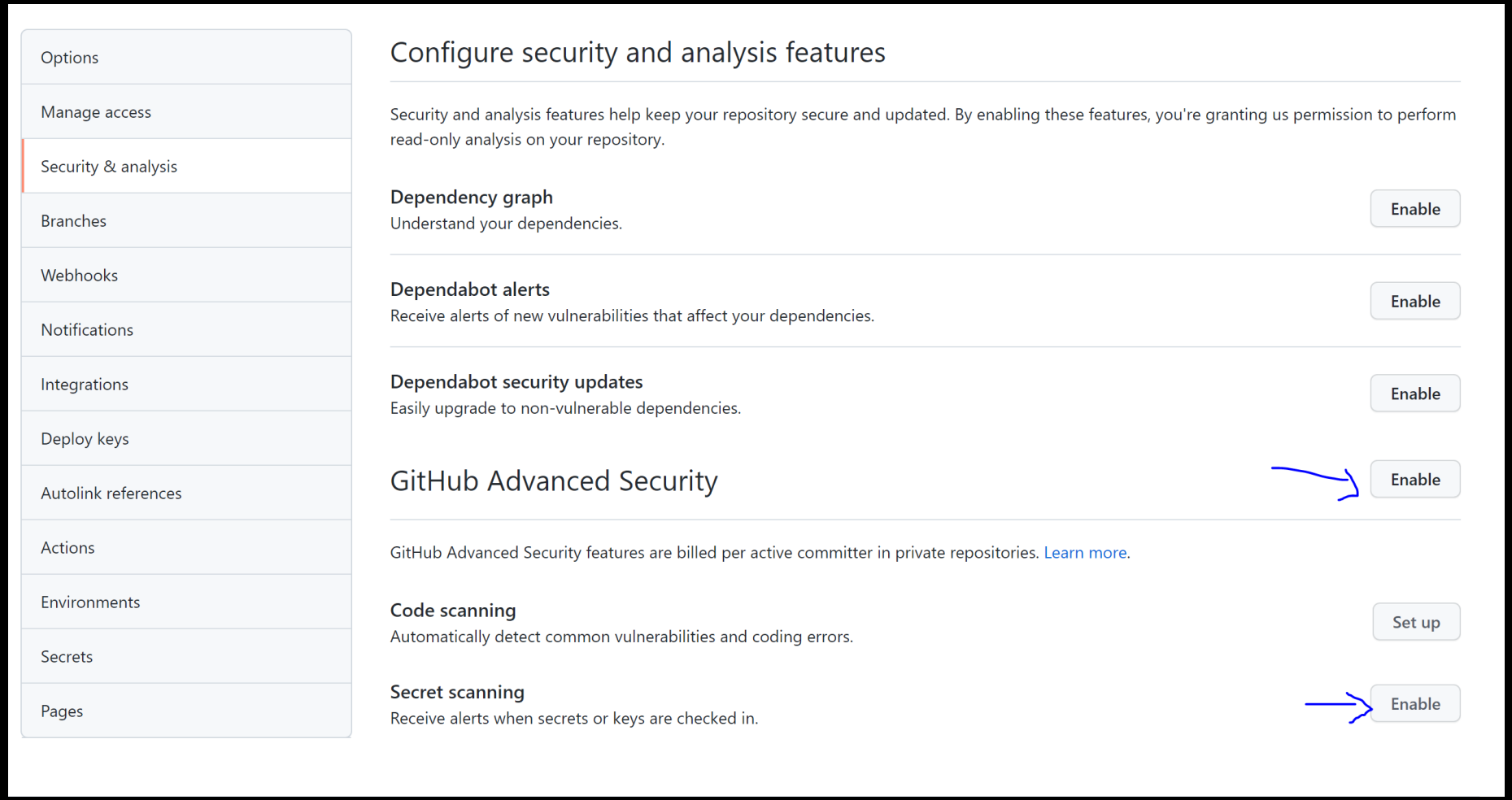
Enable Code Scanning



Secret scanning on every pushed commit



Enable secret scanning



Setting up Code Scanning and Security Scanning for your repository

Hands-on lab 5:

[Setting up Code Scanning and Security Scanning for your repository]

Time:

20 minutes

https://github.com/XpiritCommunityEvents/HOL

Publicly available

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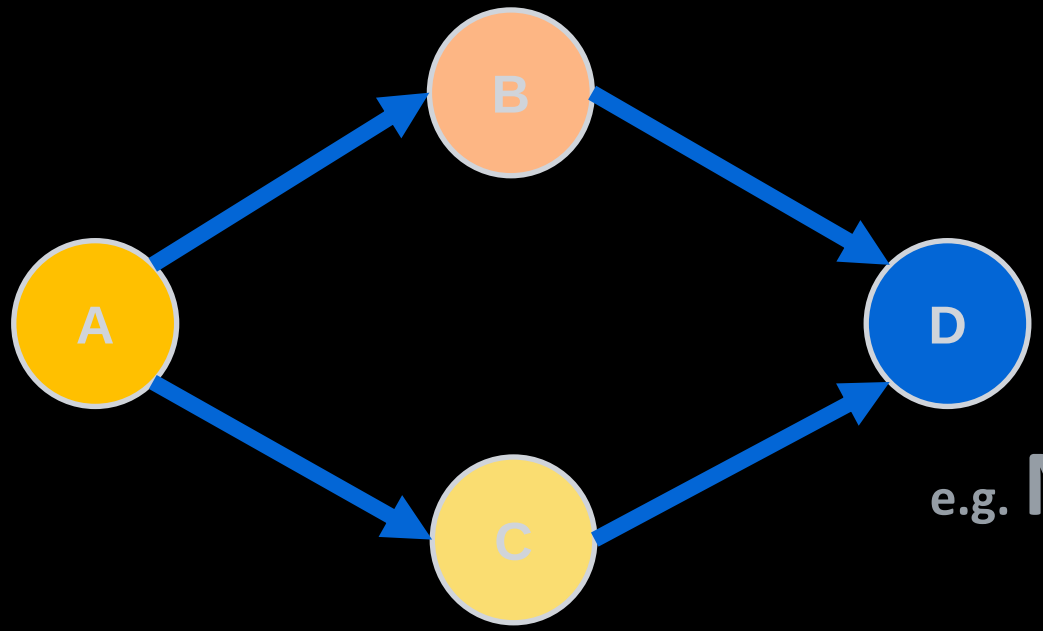
Dependabot

Analyze Dependency Graph
Generate pull request to update to new version
Generate pull request when known vulnerability

Dependency Management

Dependency Hell 101



e.g. **Newtonsoft.Json**

Semantic Versioning

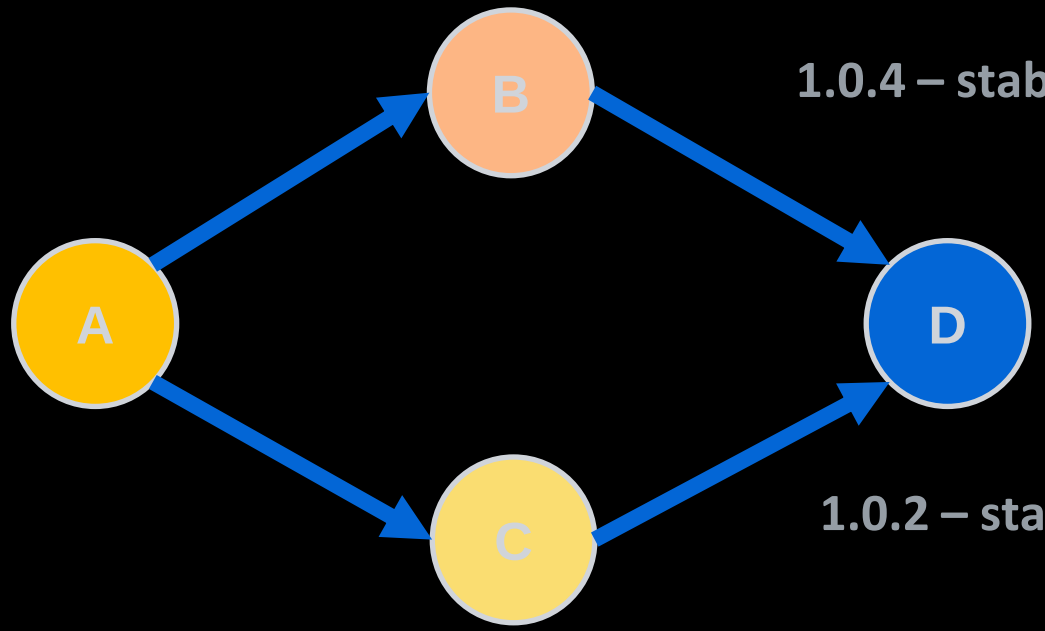
Given a version number **MAJOR**.**MINOR**.**PATCH**, increment the:

- MAJOR version when you make incompatible API changes,
- MINOR version when you add functionality in a backwards-compatible manner, and
- PATCH version when you make backwards-compatible bug fixes.
- Additional labels for pre-release and build metadata are available as extensions to the **MAJOR**.**MINOR**.**PATCH** format.

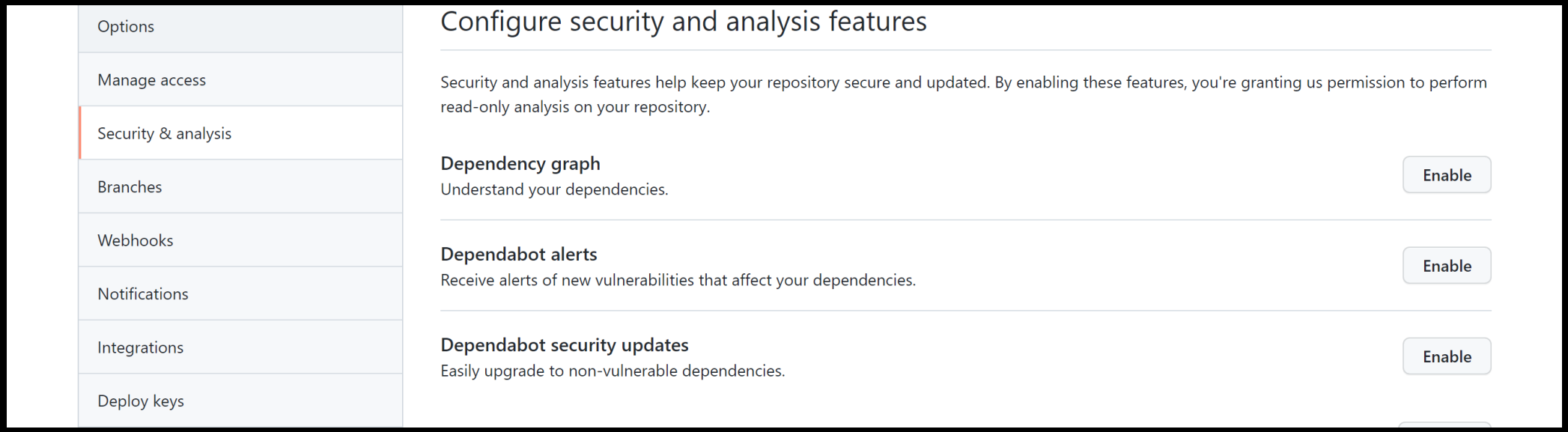
http://semver.org/

Dependency Management

Dependency Hell 101



Enable Dependabot



GitHub

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Enabling and using Dependabot on your repository (If time permits)

Hands-on lab 6:

Enabling and using Dependabot on your repository

Time:

15 minutes

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GitHub Code to Cloud Workshop Agenda

Introduction to GitHub	13.30 – 14.00
Migrating a repository from Azure DevOps to GitHub	14.00 – 14.15
Codespaces – Your development IDE in the cloud	14.15 – 14.20
Setting up Codespaces to develop a web-app	14.20 – 14.35
GitHub Actions	14.35 – 15.00
Coffee break	15.00 – 15.15
Creating your first Actions workflow	15.15 – 15.30
Creating a .NET Actions workflow	15.30 – 16.00
GitHub Advanced Security	16.00 – 16.15
Code Scanning and Secret Scanning	16.15 – 16.35
Dependabot	16.35 – 16.50
Wrap-up	16.50 – 17.00

Xpirit

Marcel de Vries

Founder Xpirit
Microsoft Regional Director, MVP
linkedin.com/in/marcelv
mdevries@xpirit.com

Rob Bos

DevOps Consultant at Xpirit
Microsoft MVP
linkedin.com/in/bosrob
rbos@xpirit.com

Dennis Thie

Consultant at Xpirit

linkedin.com/in/dennisthie
dthie@xpirit.com