05. CI with GitHub Actions

GitHub has a built-in CI system called **GitHub Actions**. GitHub Actions use **YAML**.

YAML

Review

```
# YAML stores key-value pairs
student:
   name: "John"
   age: 23
   average-mark: 82
```

```
# YAML is (roughly) a superset of JSON
{
   "student": {
      "name": "John",
      "age": 23,
      "average-mark": 82
   }
}
```

```
# List entries start with a hyphen
students:
   - name: John
     age: 23
     average-mark: 82
   - name: Mary
     age: 25
     average-mark: 87
```

```
# We can freely mix JSON and YAML code
students:
   - name: John
     age: 23
     average-mark: 82
   - { "name": "Mary",
       "age": 25,
       "average-mark": 87
     }
```

YAML datatypes

There are four core datatypes:

- Null
- Number
- String
- Bool

Anything that can't be interpreted as a null, number or bool is automatically turned into a string.

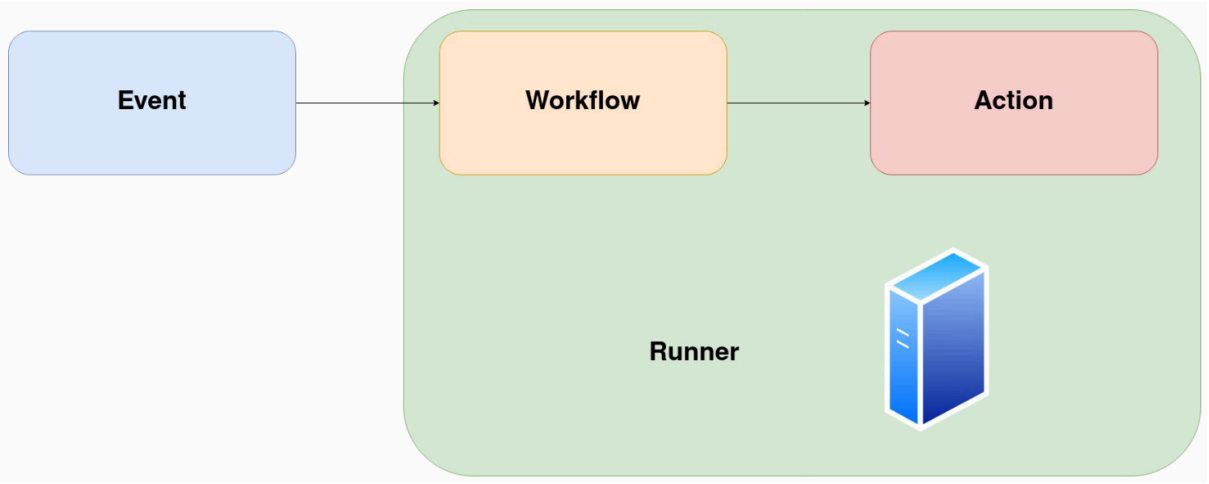
> 💡 No need to use quotes unless we need to store a string that seems like another type of data (e.g. string 12 should be quoted "12" to avoid recognizing the number 12).

> ℹ️ noyaml.com → page with key and strange YAML syntax solutions

GitHub Actions

A continuous integration system build into GitHub.

Key Concepts



- **Event:** a thing which happens and triggers the CI system to do something for us (e.g. a push or pull request).
- **Runner:** a temporary VM created for the build process.
- **Action:** a small programme that runs on the runner and carries out part of the CI process.
- **Workflow:** a YAML script which specifies the complete CI pipeline.

Runners

There is a choice of built-in runners:

- Ubuntu
- Windows
- MacOS
- Docker

Self hosted runners are also supported.

```
# Simple workflow file
name: Simple workflow
on: [push, pull_request]
jobs:
   my-job:
      runs-on: ubuntu-latest
      steps:
         - name: Clone the git repo
            uses: actions/checkout@v4
```

```
      - name: Build the code
        run: |
          make -j2
```

ℹ️ The | in YAML means everything indented below is a big line.

Other important workflow concepts

- **Matrix:** allows you to run multiple variants of a build (e.g. for different operating systems or runtimes).
- **Contexts:** a set of variables that can be accessed from inside the workflow and the GitHub Action code itself.
- **Variables:** you can declare variables inside a workflow.
- **Secrets:** special variables to store sensitive information.

```
# Workflow with matrix (use different OS) and using node (javascript code)
name: Simple workflow
on: [push, pull_request]
jobs:
  my-job:
    matrix:
      os: [ubuntu-latest, windows-latest, macos-latest]
      node-version: [21, 22, 23]
    runs-on: ${{ matrix.os }}
    steps:
      - name: Clone the git repo
        uses: actions/checkout@v4
      - name: Setup Node
        uses: actions/setup-node@v4
        with:
          node-version: ${{ matrix.node-version }}
      - name: Build the code
        run: |
```

```
      make -j2
      echo ${{ github.event }}
```

This will use 9 runners which will run on parallel.

The echo is printing the context details of the build.

Other software forges

For when / if you don't want to use GitHub.