CI/CD Pipelines

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Who am I?

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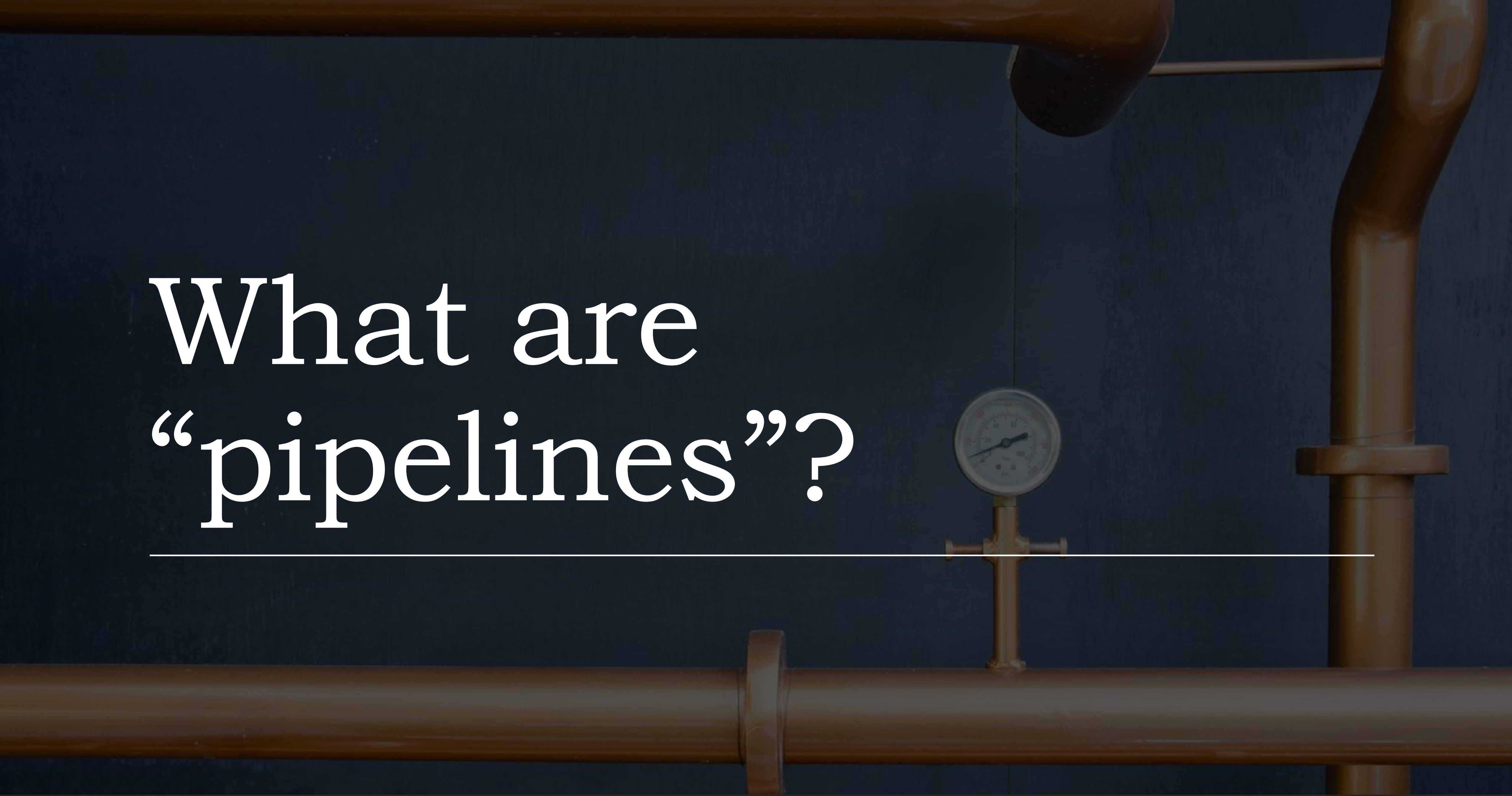


What are “pipelines”?

Introduction to Pipelines

Formally: “A CI/CD pipeline is a series of steps that must be performed in order to deliver a new version of software.” ~ RedHat.com

Continuous Integration and Continuous Delivery (CI/CD) is a well-defined set of operating principles that enable application code to be delivered more frequently and more reliably.

- The implementation of CI/CD principles is called a **CI/CD pipeline.**
- Guiding idea: determine what must be done, automate it so that you never have to think about it again.

A **step** is a command. Example: `javac *.java`

Software **versions** are the artifact result of a pipeline. They are compiled source code, a built package, a Docker container, etc.

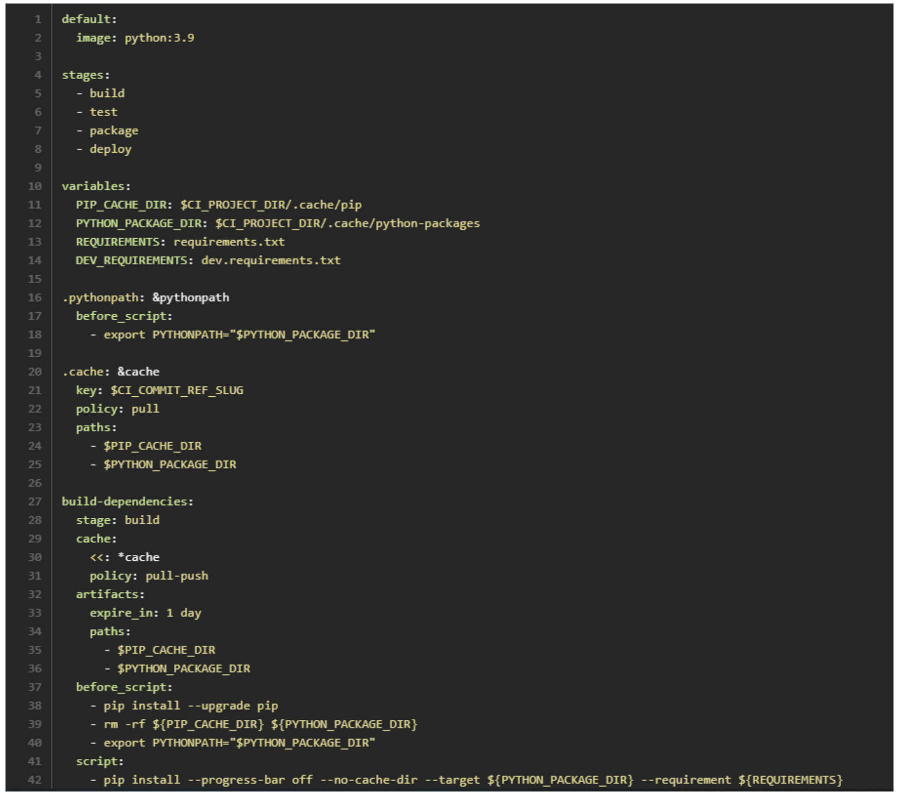
What does a pipeline look like?

In code…

Typically, pipelines are defined in YAML files

YAML is a file format that acts as a *superset* of JSON

- All JSON is valid YAML
- Not all YAML is valid JSON
- Consists of key value pairs
  - Values may be primitives (string, int, etc.) or objects



```yaml
default:
  image: python:3.9

stages:
  - build
  - test
  - package
  - deploy

variables:
  PIP_CACHE_DIR: $CI_PROJECT_DIR/.cache/pip
  PYTHON_PACKAGE_DIR: $CI_PROJECT_DIR/.cache/python-packages
  REQUIREMENTS: requirements.txt
  DEV_REQUIREMENTS: dev.requirements.txt

.pythonpath: &pythonpath
  before_script:
    - export PYTHONPATH="$PYTHON_PACKAGE_DIR"

.cache: &cache
  key: $CI_COMMIT_REF_SLUG
  policy: pull
  paths:
    - $PIP_CACHE_DIR
    - $PYTHON_PACKAGE_DIR

build-dependencies:
  stage: build
  cache:
    <<: *cache
    policy: pull-push
  artifacts:
    expire_in: 1 day
    paths:
      - $PIP_CACHE_DIR
      - $PYTHON_PACKAGE_DIR
  before_script:
    - pip install --upgrade pip
    - rm -rf ${PIP_CACHE_DIR} ${PYTHON_PACKAGE_DIR}
    - export PYTHONPATH="$PYTHON_PACKAGE_DIR"
  script:
    - pip install --progress-bar off --no-cache-dir --target ${PYTHON_PACKAGE_DIR} --requirement ${REQUIREMENTS}
```

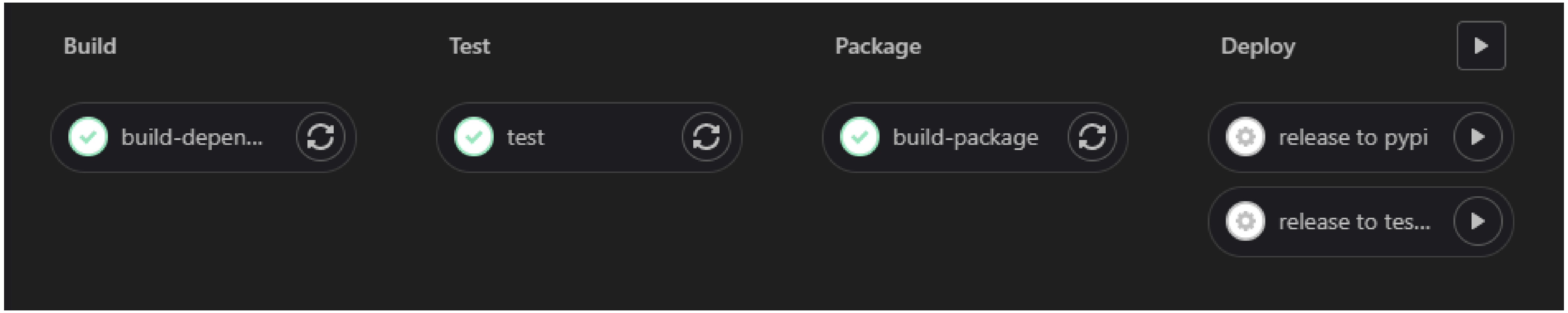
Rendered graphically

Notice we are divided into 4 **stages** and each stage has at least one **job**.

A group of related **steps** (single commands) grouped together make up a **job**.

A group of **stages** make up the **pipeline**.

When two or more jobs share the same stage, they are independent of each other and may run *concurrently.*



How do we choose our steps?

Do it without the pipeline first!

Determine the minimum set of commands to accomplish three tasks:

- **Build** the testing environment from the external dependencies
  - These are Java Packages or Jar files, Python packages, C libraries, etc.
- **Test** the source code in the testing environment
  - In the simplest CI/CD pipelines, this is accomplished with unit tests
  - More complex examples include integration/end-to-end testing
- **Build** the source code into an artifact
  - In this context, an artifact is what the end user should be given access to such as a Jar file or a .class file
- **Publish**/**deploy** the artifact
  - This could be as simple as uploading your source code to GitHub in a .zip file as a “release” or more complicated like uploading to some sort of package registry

So, what do we do with this?