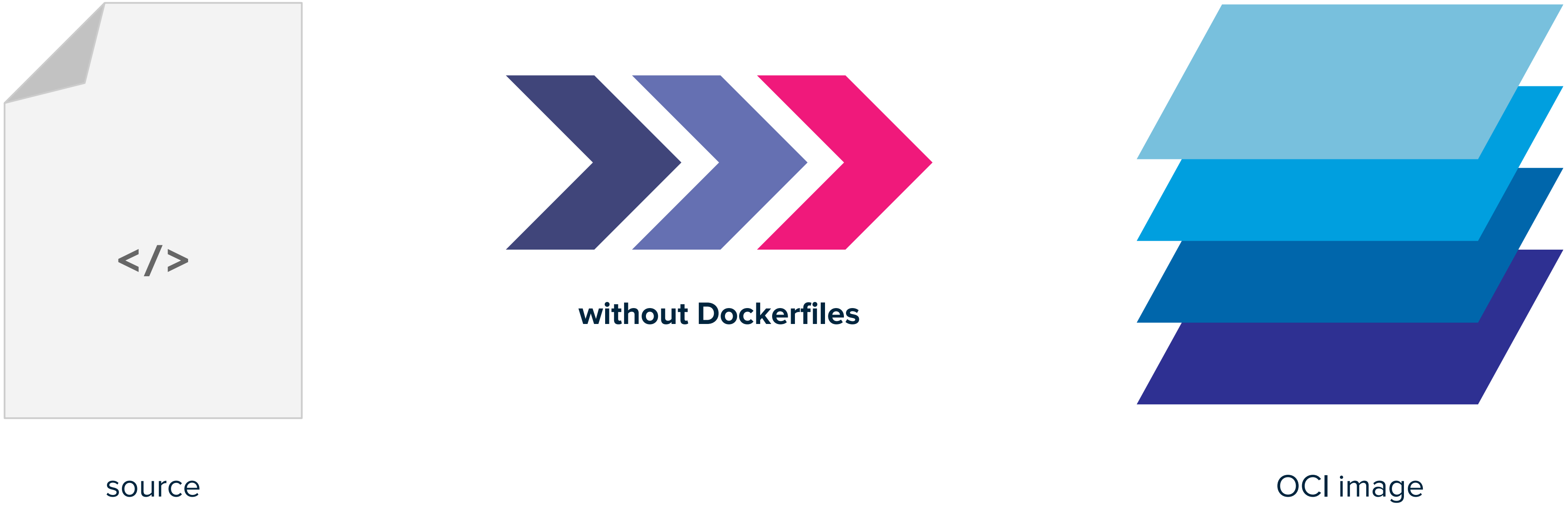
CLOUD NATIVE BUILDPACKS

Customizing Your Buildpacks Build

Natalie Arellano
Buildpacks Maintainer

Aidan Delaney
Buildpacks Maintainer

Buildpacks



Quick Example: Use pack to build an image

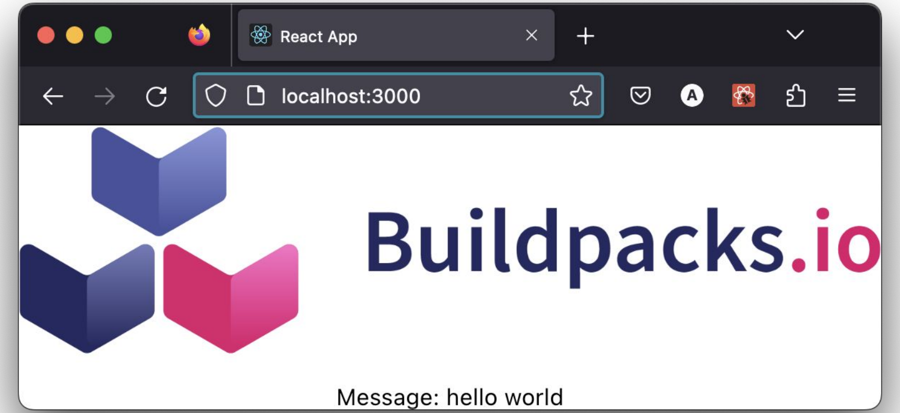
$ pack build example --builder paketobuildpacks/builder:full

```
$ 
```

- Small output image
- Software Bill of Materials (SBOM)
- Reproducible build
- Advanced Caching
- Non-root builds
- Rebasable Images

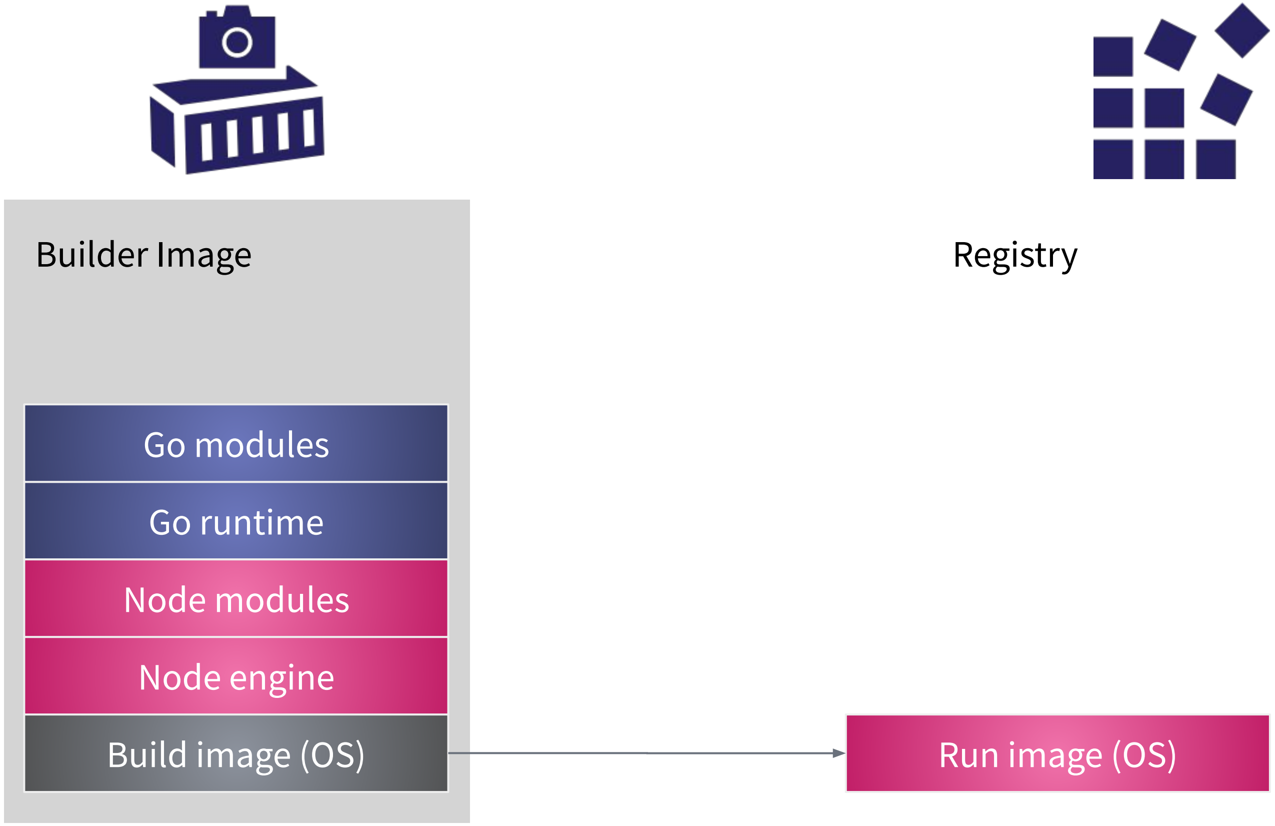
Running the Application

```
docker run -p 8080:8080 example
docker run -p 3000:3000 --entrypoint=web example
```



Message: hello world

Build Input



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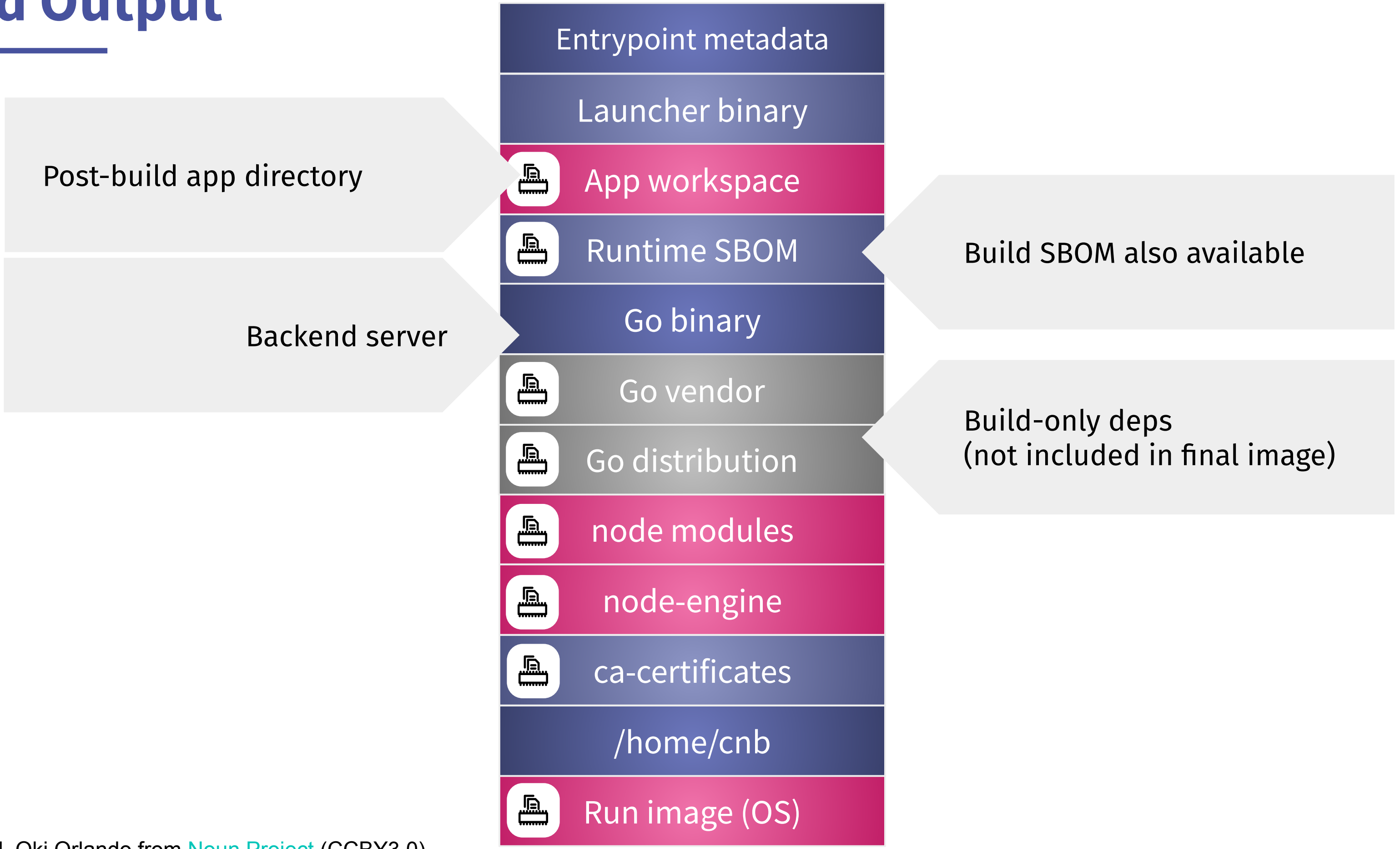
Build Output



Cache icon by M. Oki Orlando from Noun Project (CCBY3.0)

Customizing the Build

1. Build Time Environment Variables
2. Remix Build Order
3. Inline Buildpacks
4. Dockerfile Extensions
5. Write your own Buildpack

1

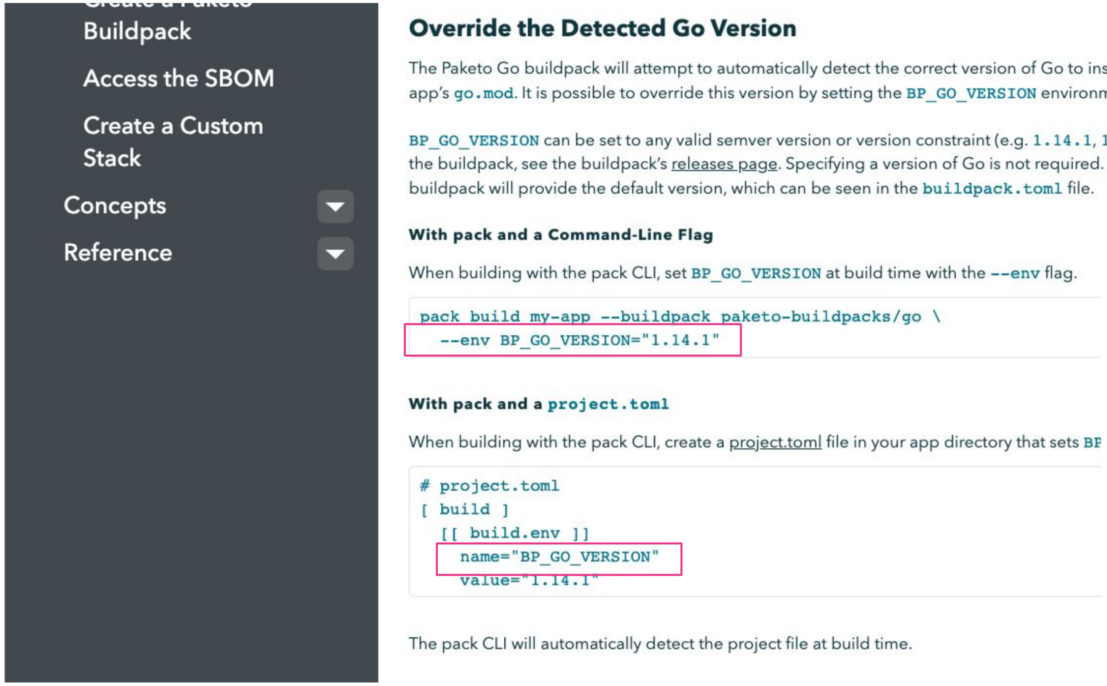
Build Time Environment Variables

pack builder inspect paketobuildpacks/builder:full

```
Buildpacks:

ID                        NAME                            VERSION    HOMEPAGE
paketo-buildpacks/go      Paketo Buildpack for Go         4.1.0      https://github.com/paketo-buildpacks/go
paketo-buildpacks/nodejs  Paketo Buildpack for Node.js    1.1.0      https://github.com/paketo-buildpacks/nodejs
```

Build Time Environment Variables



Override the Detected Go Version

The Paketo Go buildpack will attempt to automatically detect the correct version of Go to install based on the version in your app's `go.mod`. It is possible to override this version by setting the `BP_GO_VERSION` environment variable at build time.

`BP_GO_VERSION` can be set to any valid semver version or version constraint (e.g. `1.14.1`, `1.14.*`). For the versions available in the buildpack, see the buildpack's releases page. Specifying a version of Go is not required. In the case that is not specified, the buildpack will provide the default version, which can be seen in the `buildpack.toml` file.

With pack and a Command-Line Flag

When building with the pack CLI, set `BP_GO_VERSION` at build time with the `--env` flag.

```
pack build my-app --buildpack paketo-buildpacks/go \
  --env BP_GO_VERSION="1.14.1"
```

With pack and a `project.toml`

When building with the pack CLI, create a project.toml file in your app directory that sets BP

```
# project.toml
[ build ]
  [[ build.env ]]
    name="BP_GO_VERSION"
    value="1.14.1"
```

The pack CLI will automatically detect the project file at build time.

```
[_]
id = "hello-world"
version = "0.1"


[[io.buildpacks.build.env]]
name = "BP_KEEP_FILES"
value = "*"
```

Personas

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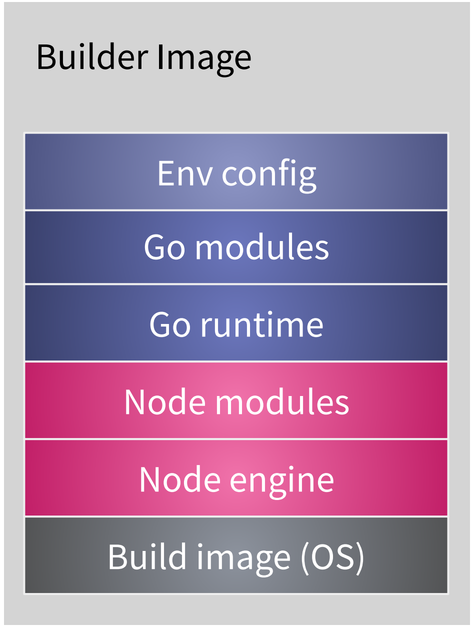
Builder Env Config



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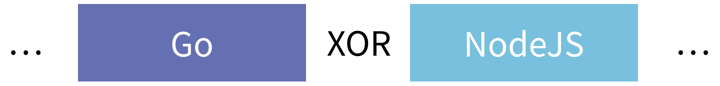
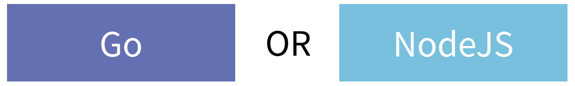
2 Build Order

Build Order for Paketo Full Builder



Desired build order



- Paketo builder contains all the Paketo buildpacks
  - Ruby
  - Dotnet-core
  - Go
  - Python
  - PHP
  - Java
  - NodeJS
  - …
- Paketo builder defines a default build order

Remixing the Build Order

```
[_]
id = "hello-world"
version = "0.1"

[[io.buildpacks.group]]
id = "paketo-buildpacks/nodejs"
version = "1.4.0"

[[io.buildpacks.group]]
id = "paketo-buildpacks/go"
version = "4.3.0"
```

- Project.toml specific to an individual repository
- (not supported by all platforms)

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3 Inline Buildpack

```
[_]
schema-version = "0.2"
id = "hello-world"
version = "0.1"
[[io.buildpacks.group]]
id = "example/logo"
 [io.buildpacks.group.script]
 api = "0.9"
 inline = """
curl -s https://buildpacks.io/images/buildpacks-logo.svg -o
src/logo.svg
"""
```

- detect **always** passes
- Runs as the CNB build user

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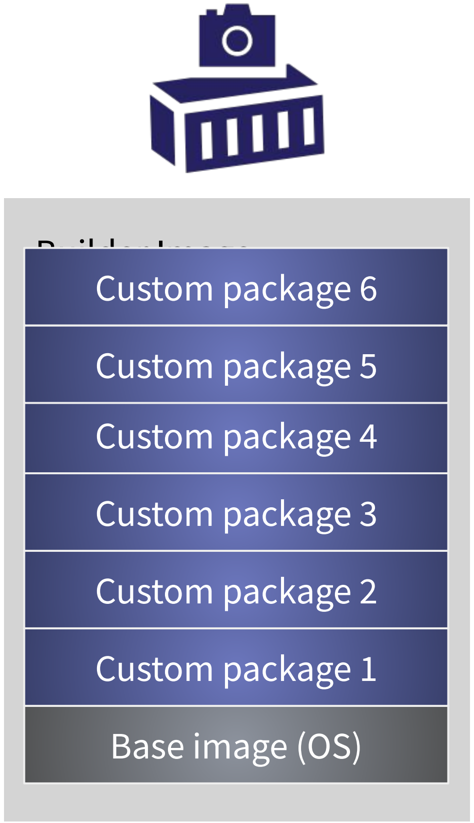
4

Dockerfile Extensions

?

Old way: just add everything to the builder!



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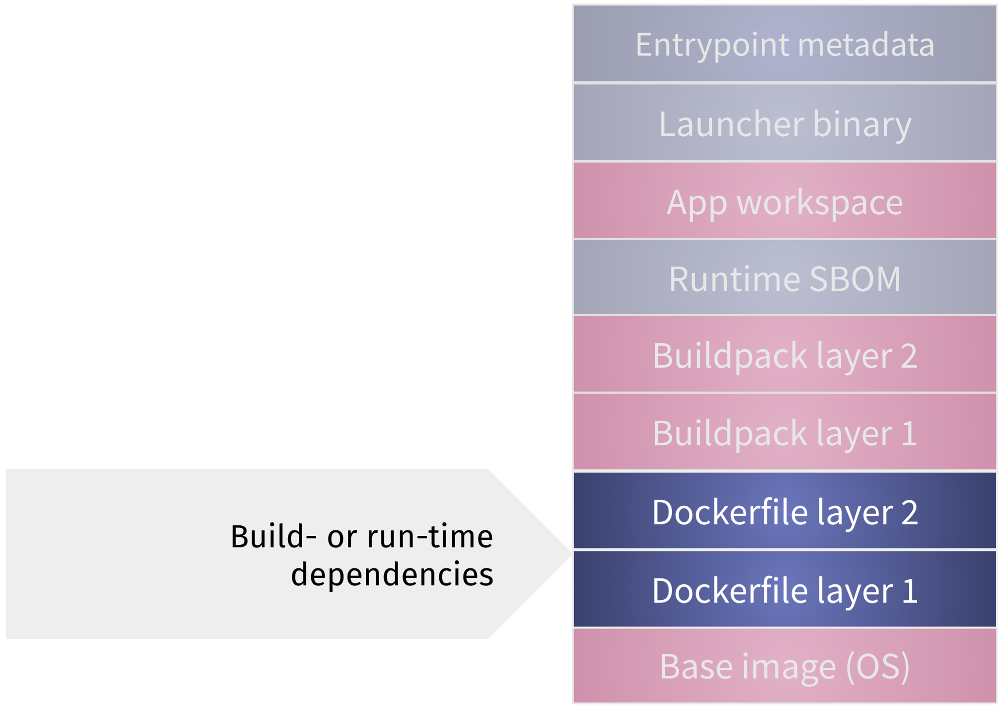
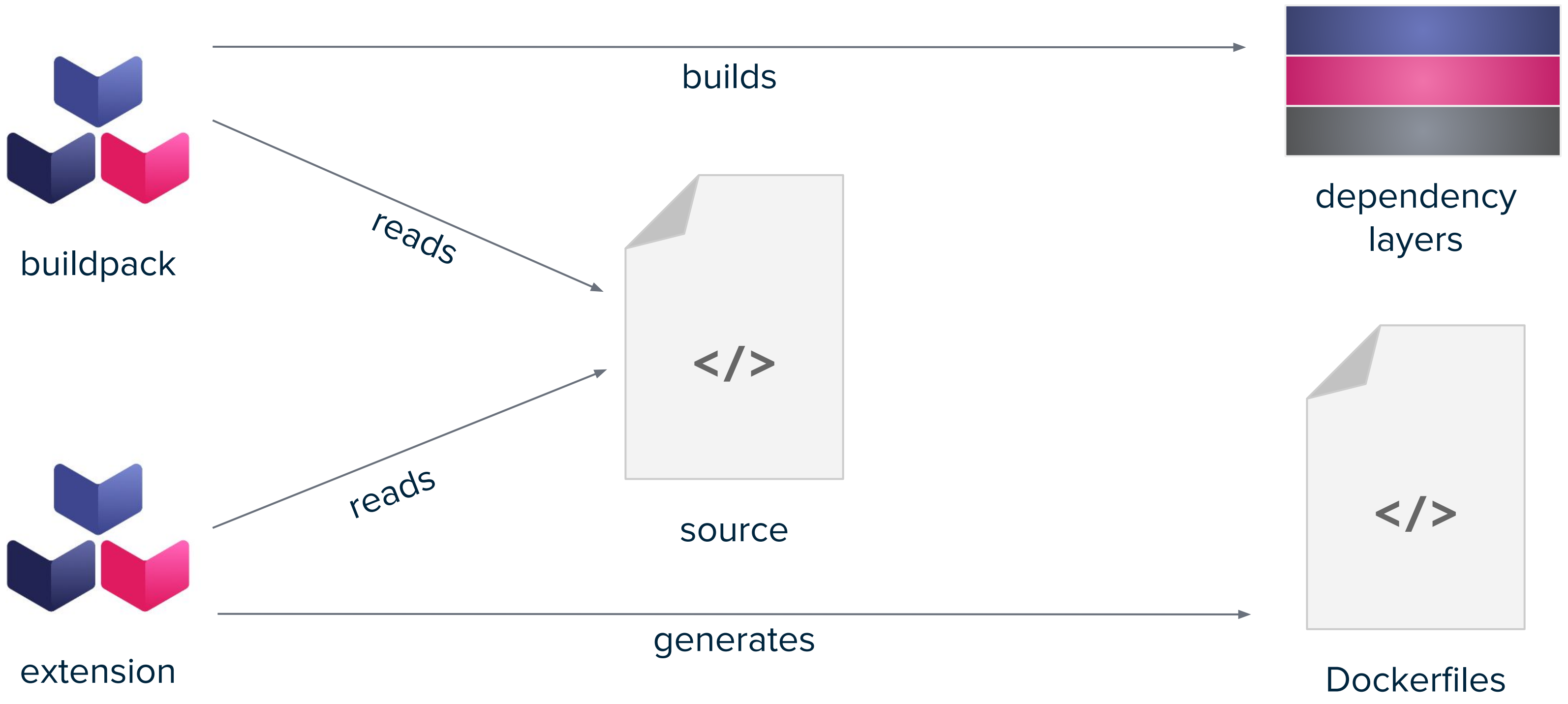
New way: dynamic installation with Dockerfiles



How does it work?



Possible Dockerfiles

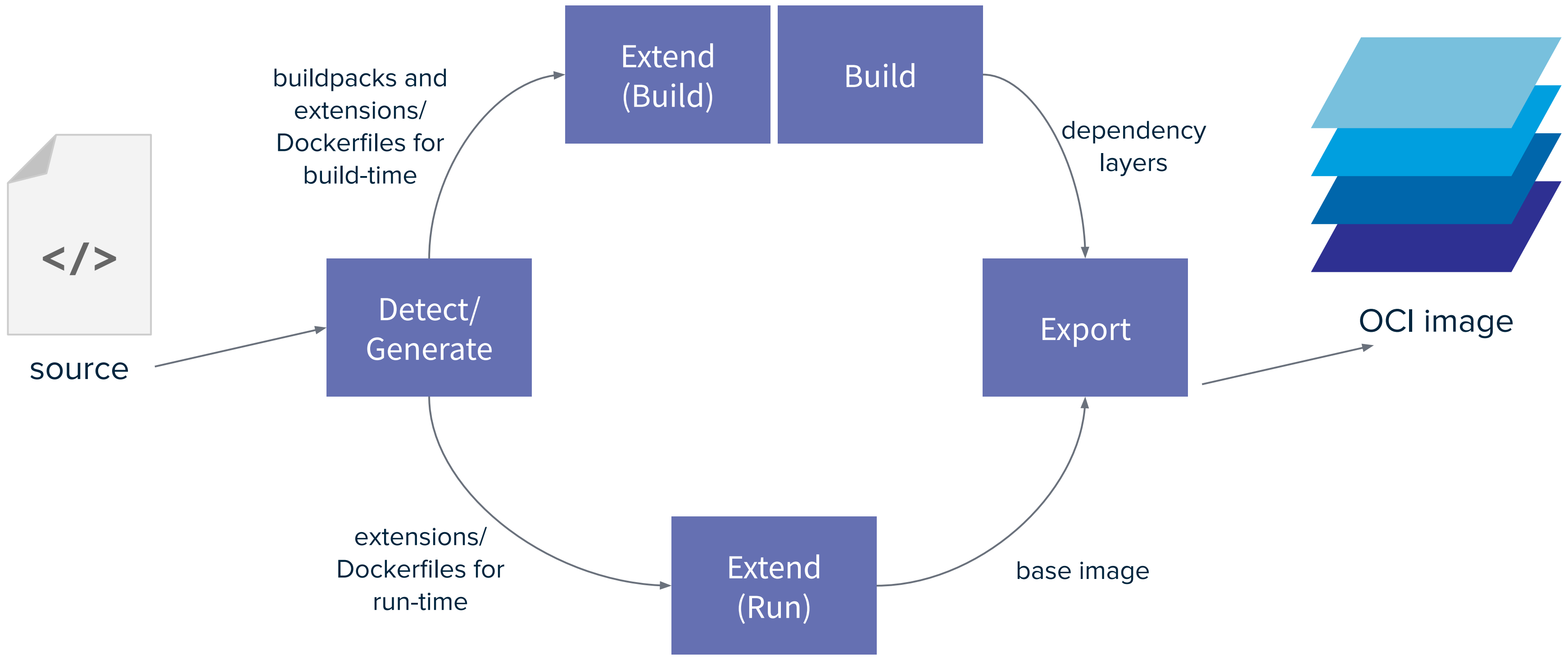
build.Dockerfile

```
ARG base_image
FROM ${base_image}

USER root
RUN apk update && \
    apk add curl
```

run.Dockerfile

```
ARG base_image
FROM ${base_image}

USER root
RUN apk update && \
    apk add curl
```

Simplified lifecycle



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Example Extension

```
$  cat ./extensions/tree/bin/generate
#!/usr/bin/env bash

# 1. GET ARGS
output_dir=$CNB_OUTPUT_DIR

# 2. GENERATE build.Dockerfile
cat >> "${output_dir}/run.Dockerfile" <<EOL
ARG base_image
FROM \${base_image}

USER root
RUN apk update && apk add curl
EOL
```

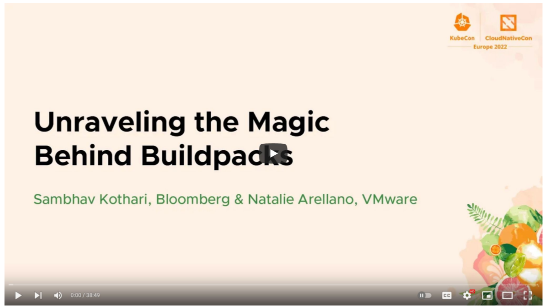
Returning to our example...

```
$
```

- Small output image
- Software Bill of Materials (SBOM)
- Reproducible build
- Advanced Caching
- Non-root builds
- Rebasable Images

5 Write your own Buildpack

- Develop in any language
- Go/libcnb - recommended
- See Buildpack Author Guide
- See previous talks to dive further



Unraveling the Magic Behind Buildpacks

Sambhav Kothari, Bloomberg & Natalie Arellano, VMware

KubeCon EU 2022

Intro to Cloud Native Buildpacks

Javier Romero, VMware; Sambhav Kothari, Bloomberg

KubeCon NA 2021

Introduction to Cloud Native Buildpacks

Stephen Levine, VMware & Jesse Brown, Salesforce

Kubecon EU 2021

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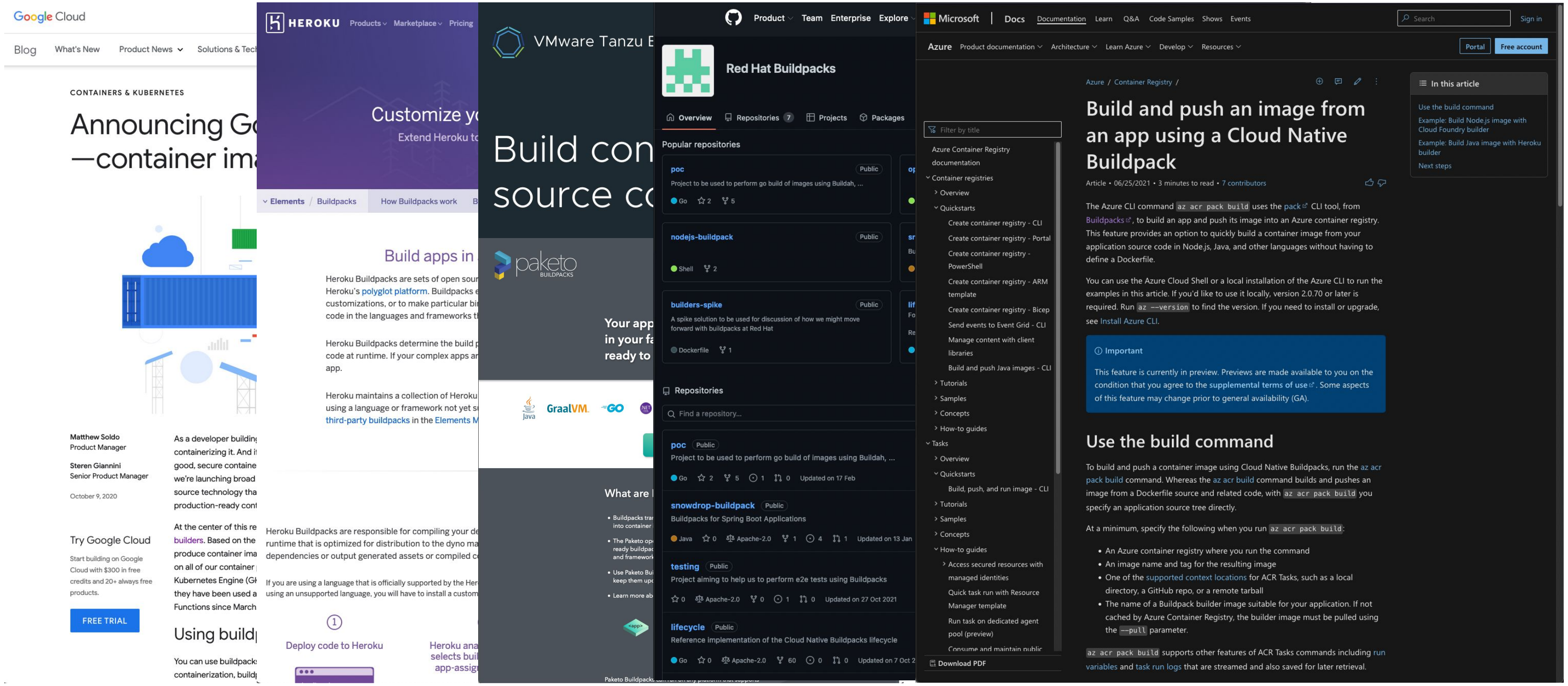
Summary

- Demo using pack to build multi-language monorepo
- Use documented build time environment variables
- Remix buildpack order using project.toml
- Inline buildpack using project.toml
- Dockerfile extensions
- Write your own Buildpack

Cloud Native Buildpack Ecosystem



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October 9, 2020

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Build apps in

Heroku Buildpacks are sets of open sour
Heroku's polyglot platform. Buildpacks e
customizations, or to make particular bi
code in the languages and frameworks t

Heroku Buildpacks determine the build p
code at runtime. If your complex apps ar
app.

Heroku maintains a collection of Heroku
using a language or framework not yet s
third-party buildpacks in the Elements M

Heroku Buildpacks are responsible for compiling your de
runtime that is optimized for distribution to the dyno ma
dependencies or output generated assets or compiled c

If you are using a language that is officially supported by the Her
using an unsupported language, you will have to install a custom

1 Deploy code to Heroku

Heroku ana
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VMware Tanzu B

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Your app
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Java GraalVM GO

What are

- Buildpacks tra into container
- The Paketo op ready buildpac and framework
- Use Paketo Bui keep them upc
- Learn more ab

Paketo Buildpacks

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Overview Repositories 7 Projects Packages

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poc Public
Project to be used to perform go build of images using Buildah, ...
Go ☆2 5

nodejs-buildpack Public
Shell ☆2

builders-spike Public
A spike solution to be used for discussion of how we might move forward with buildpacks at Red Hat
Dockerfile 1

Repositories

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Go ☆2 5 1 0 Updated on 17 Feb

snowdrop-buildpack Public
Buildpacks for Spring Boot Applications
Java ☆0 Apache-2.0 1 4 1 Updated on 13 Jan

testing Public
Project aiming to help us to perform e2e tests using Buildpacks
☆0 Apache-2.0 0 1 0 Updated on 27 Oct 2021

lifecycle Public
Reference implementation of the Cloud Native Buildpacks lifecycle
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Build and push an image from an app using a Cloud Native Buildpack

Article • 06/25/2021 • 3 minutes to read • 7 contributors

The Azure CLI command `az acr pack build` uses the pack CLI tool, from Buildpacks, to build an app and push its image into an Azure container registry. This feature provides an option to quickly build a container image from your application source code in Node.js, Java, and other languages without having to define a Dockerfile.

You can use the Azure Cloud Shell or a local installation of the Azure CLI to run the examples in this article. If you'd like to use it locally, version 2.0.70 or later is required. Run `az --version` to find the version. If you need to install or upgrade, see Install Azure CLI.

Important

This feature is currently in preview. Previews are made available to you on the condition that you agree to the supplemental terms of use. Some aspects of this feature may change prior to general availability (GA).

Use the build command

To build and push a container image using Cloud Native Buildpacks, run the az acr pack build command. Whereas the az acr build command builds and pushes an image from a Dockerfile source and related code, with `az acr pack build` you specify an application source tree directly.

At a minimum, specify the following when you run `az acr pack build`:

- An Azure container registry where you run the command
- An image name and tag for the resulting image
- One of the supported context locations for ACR Tasks, such as a local directory, a GitHub repo, or a remote tarball
- The name of a Buildpack builder image suitable for your application. If not cached by Azure Container Registry, the builder image must be pulled using the `--pull` parameter.

`az acr pack build` supports other features of ACR Tasks commands including run variables and task run logs that are streamed and also saved for later retrieval.

In this article

- Use the build command
- Example: Build Node.js image with Cloud Foundry builder
- Example: Build Java image with Heroku builder
- Next steps

https://buildpacks.io/features/

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