Introduction to BuildPacks

Deploying applications written in various languages

Java, Ruby, Groovy, JavaScript ... + Cloud

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Overview

- After completing this lesson, you should be able to:
  - Understand what a buildpack is
  - Deploy using a buildpack

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Roadmap

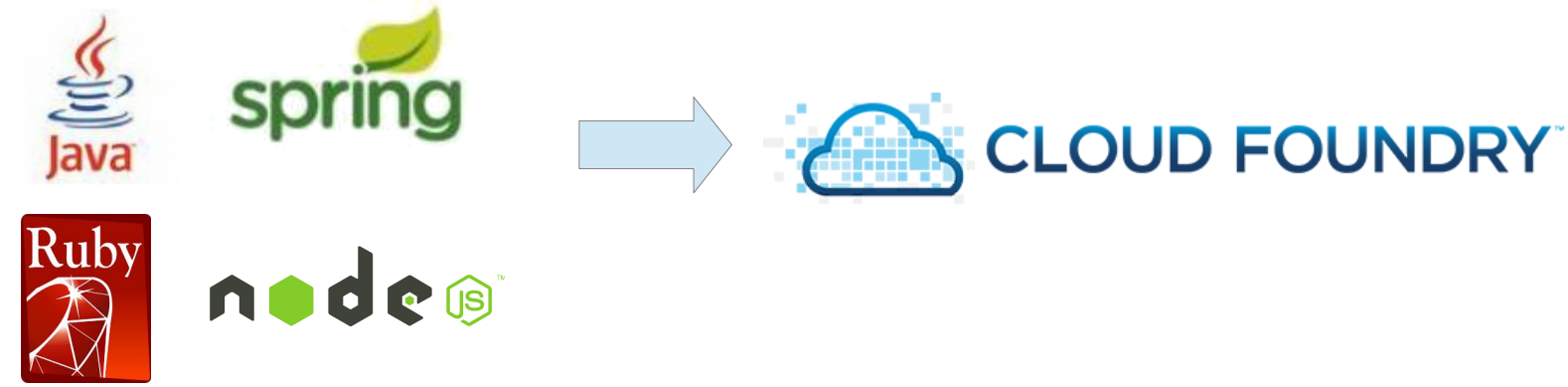
- **What are Buildpacks?**
- Deploying to Cloud Foundry
- Using Buildpacks

Applications

- Consists of source code and application frameworks used by developers to create application
  - Java/Spring
  - Ruby/Rails
  - Java Script for Node.js
  - ...

The Question:

- Applications can be written in many languages / frameworks:



- ...and yet each type can run in Cloud Foundry

- How is this possible?

Configuring a Server from scratch

- If you were configuring a new server to run an application, what would you include / install?

  - Operating system
  - Runtimes for your software (Java, Ruby, Python, etc.)
  - Containers as needed (e.g. Tomcat for Java, Apache HTTPD for PHP)
  - Frameworks as needed (APM tools)
  - Application binaries
- Good idea to write a script to do this.

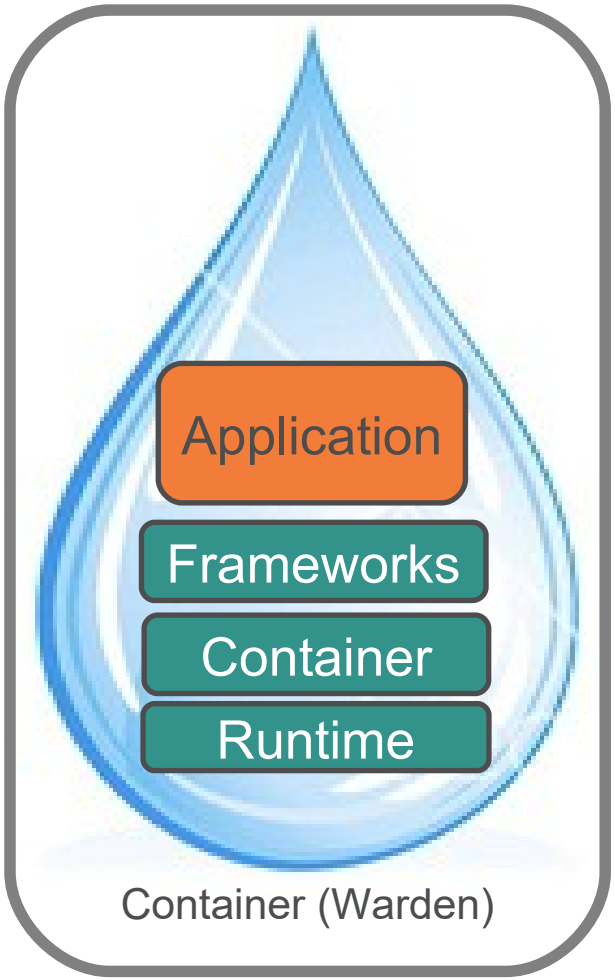
A Buildpack Does the Same Thing

Except the goal is to run on Cloud Foundry

Buildpack – a combination of scripts that assembles runtimes, containers, frameworks, and your application into a *droplet*

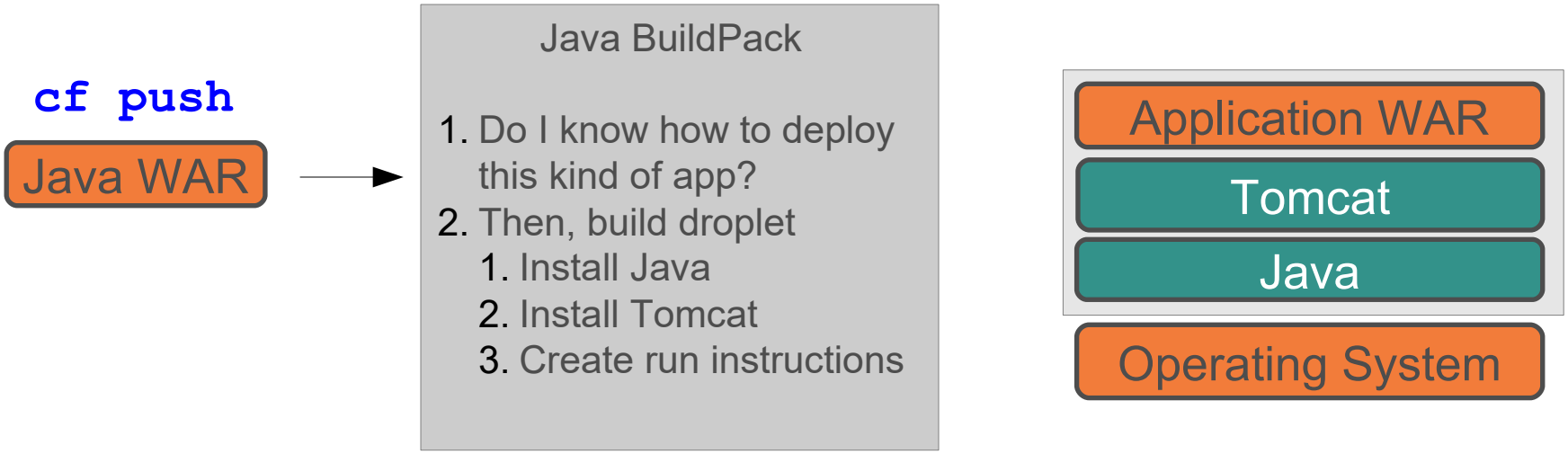
Droplets – run inside Warden Containers

- Which run inside Execution Agents



The Answer: Buildpacks

- **Buildpacks** define how assemble a droplet to run a specific kind of application
- Example:



- The Buildpack “builds” the “droplet” to run an app.
  - Called *staging* the application

Buildpacks are Not...

- Buildpacks...
  - Are *not* a special build process for your application
    - Buildpacks build droplets
  - Do *not* run on your local machine
    - Buildpacks run on CF during the staging process

Buildpack Structure

- Often written as Ruby scripts with three parts:
  - **Detect** if the buildpack should be applied
  - **Compile** (pack) the Droplet by combining the application code with runtimes, frameworks, plugins etc. necessary for the application
  - **Release** the app to be deployed to an assigned Execution Agent

NOTE: *Assemble* or *Pack* would be a better name than *Compile*
No code compilation is happening

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Roadmap

- What are Buildpacks?
- **Deploying to Cloud Foundry**
- Using Buildpacks

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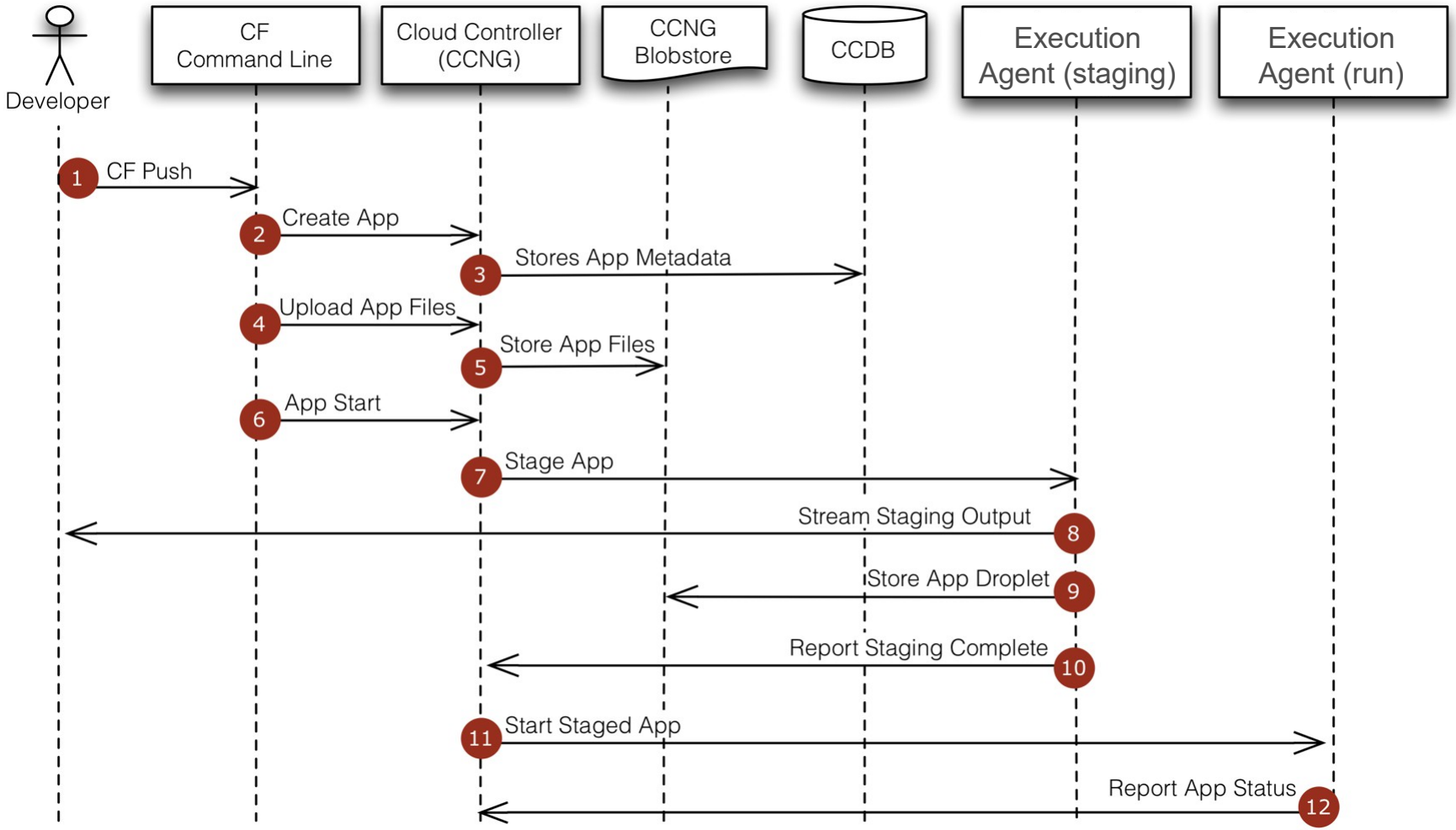
Execution Agent = Cell (or DEA)

Deploying to CF



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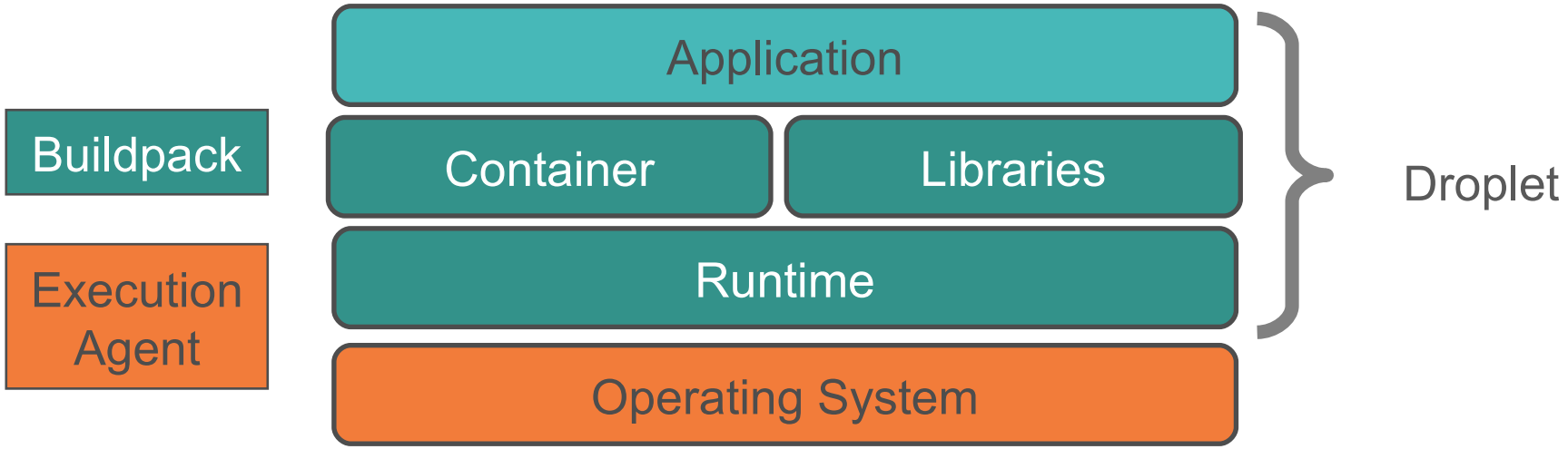
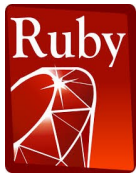
Staging and Buildpacks

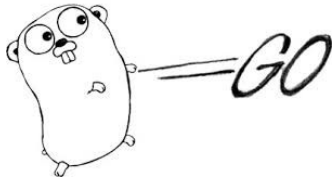
- Build packs are responsible for preparing the machine image for an application



Available Buildpacks

- Buildpacks are either
  - Installed into a cloud foundry instance or
  - Loaded from an external location at push time
- Buildpacks provided by public Cloud Foundry
  - Note: This list expands over time!





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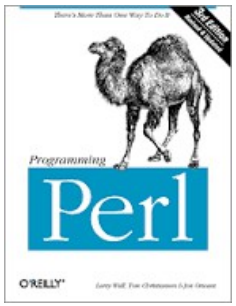
Custom Buildpacks

- CF Community provides buildpacks for other languages
- Or write your own
  - Usually by forking / adapting an existing buildpack
- For list of CF Community Buildpacks
  - https://github.com/cloudfoundry-community/cf-docs-contrib/wiki/Buildpacks



Microsoft .net

jetty://

H A S K E L L 98

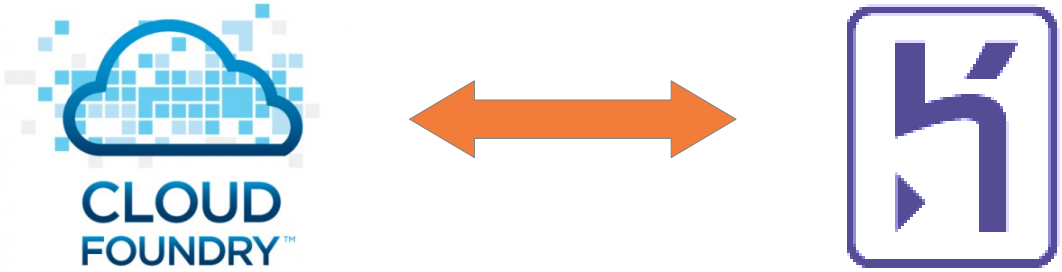
ERLANG

IBM Liberty

elixir

Compatibility

- Buildpacks can be compatible with multiple PaaS offerings
- CF buildpacks follow the Heroku buildpack design
  - CF and Heroku buildpacks are compatible (if you care to make them compatible)
  - Other PaaS offerings adopting the buildpack design



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Built-In Buildpacks

- Use **`cf buildpacks`** to determine installed buildpacks

```
> cf buildpacks
Getting buildpacks...

buildpack          position  enabled  locked  filename
ruby_buildpack     1         true     false   ruby_buildpack-offline-v1.0.1.zip
nodejs_buildpack   2         true     false   nodejs-buildpack-offline-b29.zip
java_buildpack     3         true     false   java-buildpack-v2.4.zip
go_buildpack       4         true     false   go_buildpack-offline-v1.0.1.zip
liberty_buildpack  5         true     false   liberty_buildpack.zip
python_buildpack   6         true     false   python_buildpack-offline-v1.0.1.zip
php_buildpack      7         true     false   php_buildpack-offline-v1.0.1.zip
```

Managing Built-In Buildpacks

`$> cf create-buildpack <name> <path> <order>`

- **`<path>`** – local directory / zip file / URL / URL to zip file
- **`<order>`** – relative order in buildpack list
- **`--enable / --disable`**

- Commands for update, delete, rename available
- Administrator permissions required

Automatic Detection / Explicit Reference

`$> cf push`

- Application checked against pre-defined buildpacks
- Matching buildpack invoked automatically

`$> cf push -b <buildpack-name>`

- Desired buildpack specified (installed buildpack)

`$> cf push -b <url>`

- The desired buildpack is referenced by a Git URL
  - Note: “disable custom buildpacks” disables this option

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Specify within manifest

- Use buildpack element
  - Specify name or URL

```
---
applications:
- name: cf-my-app
  host: cf-my-app
  domain: cfapps.io
  path: target/my-war.war
  buildpack: https://github.com/cloudfoundry/java-buildpack
```

- Remember precedence
  - Options specified in push command override manifest

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Pushing an Executable

- Suppose I have a binary executable?
  - Such as a script or statically compiled C, C++ application
  - *Must* be compiled for x86 Linux
- Then I can push and run it using the “null” buildpack

```
$> ./bin/hello
Hello World
$> cf push hello --no-route -p bin -m 256m -c "./bin/hello"
       -b http://github.com/ryandotsmith/null-buildpack.git
... usual push logging ...
Hello World
$>
```

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Summary

- After completing this lesson, you should have learned:
  - What a buildpack is
  - How to deploy using a buildpack

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Lab

Starting with Buildpacks,

Using a third-party buildpack

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