Getting Started with Cloud Foundry

Deploying your First Application

Setup, Deploy and Manage

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Overview

- After completing this lesson, you should be able to:
  - Deploy an application to CloudFoundry using CLI
  - Manage application instances using online Dashboard

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Roadmap

- **Getting Started with the Command Line Interface**
- Login
- Deploying an Application
- Managing Application Instances

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The Command Line Interface

- Several interface options exist for Cloud Foundry
  - Command Line Interface (CLI)
  - Web-based *Application Manager* Console
  - Eclipse / STS plugin

- Primary access is done via the CLI
  - Make sure you have it installed
    - Installation was covered in the “Welcome” module

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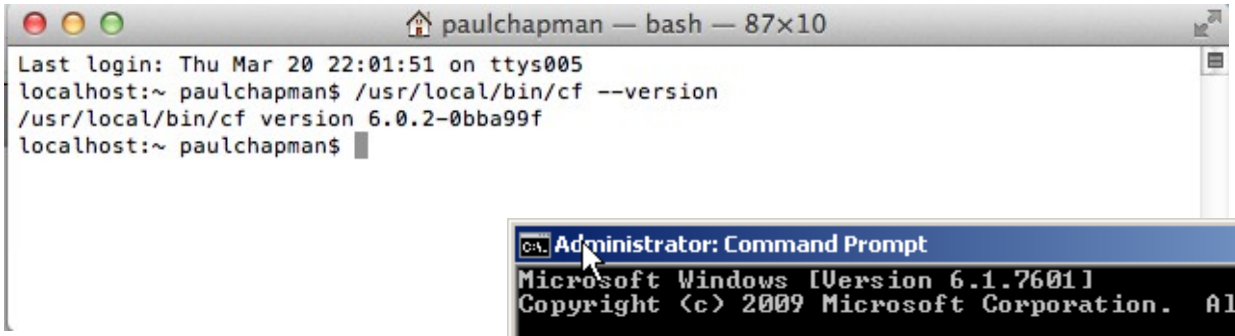
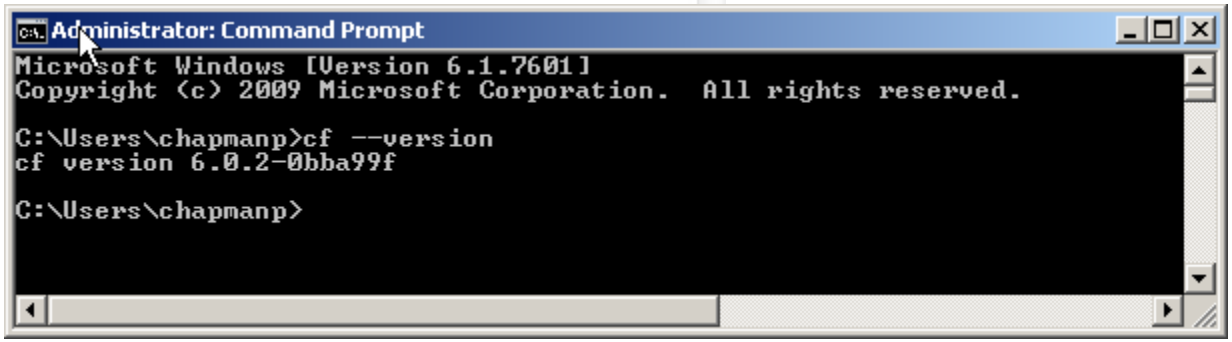
Test the CLI Utility

- Version *must* be **6** or more
- *Must* remove any earlier (Ruby) version

- It is called cf
  - Open a Command/Shell window
  - At the prompt type: `cf --version`





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Getting Help

- Get help at any time via **`cf help`**
- Or **`cf help <command>`**

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DO NOW – Get Help on a Command

- Perform these steps on your computer:
  - Open a command prompt
  - Issue the **`cf help`** command
  - Get help on the login command: **`cf help login`**

- Answer these questions:
  - What option do you use to specify username?
  - Is specifying the password option encouraged?

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Roadmap

- Getting Started with the Command Line Interface
- **Login**
- Deploying an Application
- Managing Application Instances

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Login to Cloud Foundry

- Need to tell cf
  - What cloud foundry instance you are using
  - What your account details are
  - Use **`cf login`**

Color highlighting
MacOS, Linux only

```
> cf login -a api.run.pivotal.io -u <username>
API endpoint: api.run.pivotal.io
Authenticating...
OK

Targeted org Cloud Foundry Course

Targeted space development

API endpoint: https://api.run.pivotal.io (API version: 2.0.0)
User:         qzqz2020@yahoo.com.au
Org:          Cloud Foundry Course
Space:        development
```

Will prompt for anything you don't specify
No -p? Prompts for password

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Cloud Foundry URLs

- To access CF you need to know 3 URLs
  - *API Endpoint*
    - Identifies your CF instance
    - Used to deploy applications, manage spaces, routes …
    - The **`cf`** utility makes *RESTful* requests to this URL
      - Actually to the Cloud Controller
  - Apps Manager
    - Application management dashboard (console)
    - *Pivotal CF only*
  - Apps Domain
    - Used to access deployed applications
    - *May* be same as System Domain

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Cloud Foundry URLs

For simplicity, most examples in this section show PWS URLs

- System & App domains defined when CF was installed
- *If using PWS*
  - System domain: `run.pivotal.io`
    - API Endpoint: `api.run.pivotal.io`
    - Apps Manager: `console.run.pivotal.io`
  - Apps domain: `cfapps.io`
- *Your own CF installation*
  - System domain: `<your-cf-system-domain>`
    - API Endpoint: `api.<your-cf-system-domain>`
    - Apps Manager: `console.<your-cf-system.domain>`
  - Apps domain: `<your-cf-apps-domain>`

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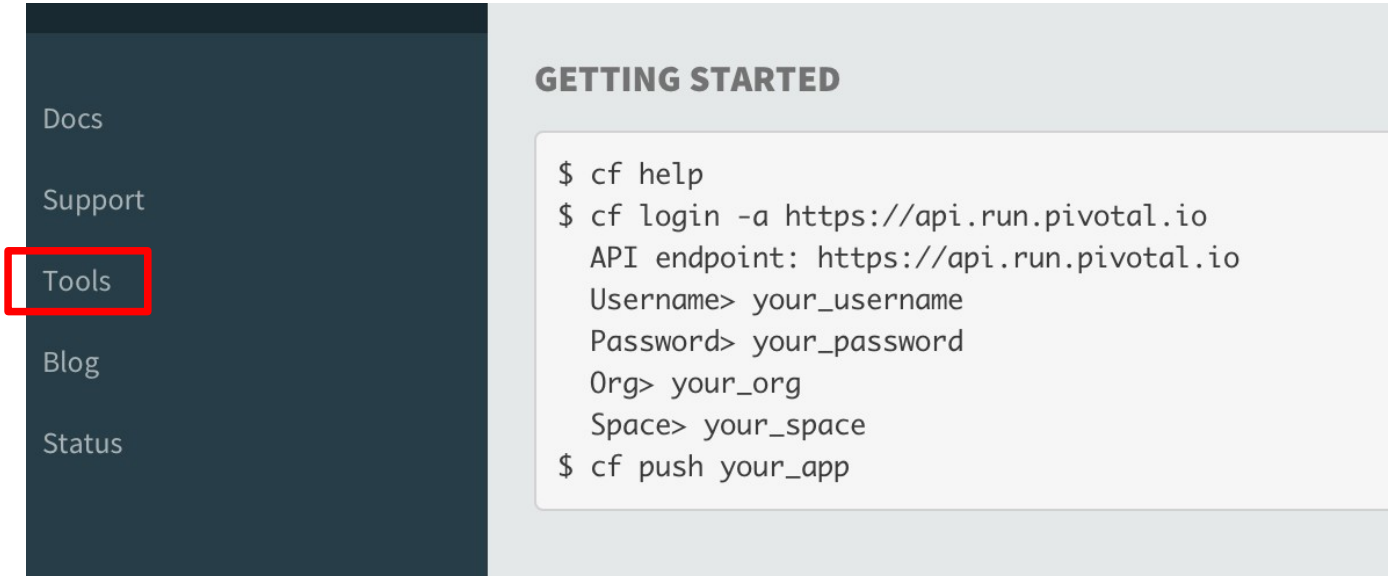
Finding the API Endpoint URL

- URL of Cloud Controller in your Cloud Foundry instance
  - On Apps Manager home-page on first login
  - Or click *Tools*
  - Shows how to run **`cf login`**, including the API Endpoint



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DO NOW – Login

- Perform these steps on your computer:
  - Login with **`cf login`** command
    - Specify CF instance using **`-a <API-URL>`**
      - For PWS: **`-a api.run.pivotal.io`**
    - Specify email / password
    - If prompted, select an organization and space

```
$> cf login -a <API-URL> -u <your-email-or-username>
API endpoint: api.run.pivotal.io
...
```

    - Firewall issues?

      http://docs.cloudfoundry.org/devguide/installcf/http-proxy.html

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The .cf Directory

- **`cf`** creates a *.cf* directory in your *home* directory
  - Stores context, logs, crash reports …
  - Remembers your CF API Endpoint
    - Don't need to specify **`-a`** option at next login

```
localhost:dev$ ls -l ~/.cf
total 48
-rw-------  1 paulchapman  staff   2491 15 Aug 14:06 config.json
-rw-r--r--  1 paulchapman  staff  11737 29 Nov  2013 crash
drwxr-xr-x  3 paulchapman  staff    102 12 Sep  2013 logs
-rw-r--r--  1 paulchapman  staff     26 12 Sep  2013 target
-rw-r--r--  1 paulchapman  staff   2084 29 Nov  2013 tokens.yml
```

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DO NOW – .cf folder

- Perform these steps on your computer:
  - Find the **`.cf`** folder / directory on your computer
    - You won't (yet) have all the files shown on previous slide
  - Open the **`config.json`** file, observe the contents

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Current Targets

- When you first login you see output like this:
  - Notice it shows *current* organization and space
  - At any time, run cf target to get same information

```
API endpoint: https://api.run.pivotal.io (API version: 2.6.0)
User:         pchapman@pivotal.io
Org:          pivotaledu
Space:        development
```

- By default your organization only has one space
  - Development
- **Note:** On PWS you are setup as your own organization

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Viewing Organization

- Commands
  - **`cf orgs`** — All orgs for current user
  - **`cf org <org-name>`** — Shows specified org

```
>$ cf org pivotaledu
Getting info for org myorg as user@somedomain.com
OK

pivotaledu:
    domains:          cfapps.io
    quota:            paid (10240M memory limit, Unlimited instance
                        memory limit, 1000 routes, -1 services,
                        paid services allowed)
    spaces:           development, production, staging
    space quotas:
>$
```

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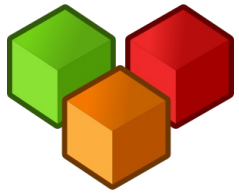
Managing Spaces



- To see all the spaces in an organization
  - **`cf spaces`**

- Create a *new* space (in current organization by default)
  - **`cf create-space <space-name>`**
  - **`cf create-space <space-name> -o <org-name>`**

- Use *target* command to *change* space (or organization)
  - **`cf target -s <space-name>`**
  - **`cf target -o <org-name>`**

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Roadmap

- Get Setup
- Login
- **Deploying an Application**
- Managing Application Instances

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Deploy Using the CLI

- You need a deployable application
  - For example with Java: a jar or war
    - Ant, Maven or Gradle build-tools can make it for us
    - Cloud Foundry doesn't care how you build your application
  - Other languages (Ruby, Node.js, etc.): the source will do

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The cf push Philosophy

Haiku

- Onsi Fakhouri (Cloud Foundry PM)
  - *Here is my source code*
  - *Run it on the cloud for me*
  - *I do not care how*
- The architecture of CF is fascinating
  - And we *will* cover it
  - But ultimately irrelevant
- I just want to push an application
  - I no longer need to know: how that happens, how it is packaged or how it is run?

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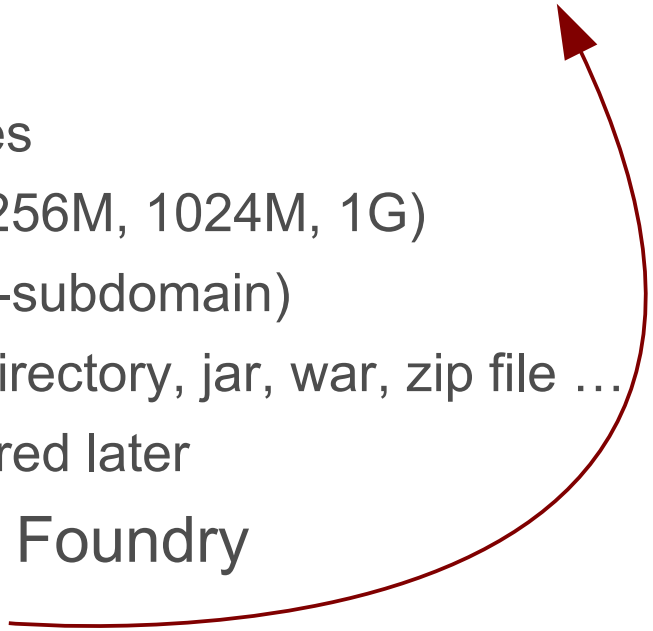
Deploy (*push*) to Cloud Foundry

- Deploy by running **`cf push <name-of-your-app>`**
  - Many options
    - -i Number of instances
    - -m Memory limit (e.g. 256M, 1024M, 1G)
    - -n Hostname (e.g. my-subdomain)
    - -p Local path to app directory, jar, war, zip file …
    - … Others will be covered later
- Your application appears in Cloud Foundry under the name you specify here



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Domains and URLs

- Every CF instance is assigned a domain at installation
  - Known as the *Apps Domain*
  - For PWS this is ***cfapps.io***
- When you deploy, your application gets a unique route (URL) to access it: **hostname + app domain name**
  - By default, hostname = application name
  - Make sure hostname is **unique**
    - *cf push* returns an HTTP 400 error if not
- PWS example:
  - **`cf push spring-music ...`**
  - gets route: ***spring-music.cfapps.io***

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Examples of Using cf push

Specify unique sub-domain by adding numbers, initials ...

- Fully specified (recommended)

```
cf push spring-music -i 1
                     -m 512M
                     -n spring-music-678
                     -p build/libs/spring-music.war
```

  - Deploys war file (specify path if needed)
  - 1 instance, 512M memory
  - Name: **`spring-music`**
    - Appears as **`spring-music`** in Cloud Foundry
  - Hostname: **`spring-music-678`**
    - Creates URL (PWS): **`spring-music-678.cfapps.io`**

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What Happens ?

- `cf` connects to Cloud Foundry using your credentials
- It 'pushes' your application to CF and tells it to deploy it
  - The whole application is uploaded – takes a while
  - CF “stages” your application
    - Recognizes Java WAR file, prepares a “droplet” with a JRE and Tomcat server
  - “Droplet” is deployed to a container and starts running
  - All requests to the *Deployed URL* route to your application
- Whole process logged on screen
  - *See next 3 slides*

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What Happens - 1

URL: spring-music-678.cfapps.io

```
cf push spring-music -n spring-music-678 -i 1 -m 512M
                     -p pre-built/spring-music.war
```

```
> cf push spring-music -n spring-music-678 -p build/libs/spring-music.war -i 1 -m 512M

Updating app spring-music in org your-org / space development as your-id@company.io...
OK

Using route spring-music-678.cfapps.io
Uploading spring-music...
Uploading app files from: pre-built/spring-music.war
Uploading 574.8K, 95 files
Done uploading
OK

Starting app spring-music in org your-org / space development as your-id@company.io...
...
```

Updates CF metadata
(app name, instances, memory)

Establish route

Uploads war

Next...

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What Happens - “Staging”

CF must prepare the app before its first run

```
...
Starting app spring-music in org your-org / space development as your-id@company.io...
OK

-----> Downloaded app package (21M)
-----> Java Buildpack Version: v2.7.1 | https://github.com/cloudfoundry/java-
buildpack#fee275a
-----> Downloading Open Jdk JRE 1.8.0_40 from
https://download.run.pivotal.io/openjdk/lucid/x86_64/openjdk-1.8.0_40.tar.gz (6.1s)
       Expanding Open Jdk JRE to .java-buildpack/open_jdk_jre (1.3s)
-----> Downloading Spring Auto Reconfiguration 1.7.0_RELEASE from
https://download.run.pivotal.io/auto-reconfiguration/auto-reconfiguration-1.7.0_RELEASE.jar
(0.2s)
-----> Downloading Tomcat Instance 8.0.20 from
https://download.run.pivotal.io/tomcat/tomcat-8.0.20.tar.gz (1.1s)
       Expanding Tomcat to .java-buildpack/tomcat (0.1s)
-----> Downloading Tomcat Lifecycle Support 2.4.0_RELEASE from
https://download.run.pivotal.io/tomcat-lifecycle-support/tomcat-lifecycle-support-
2.4.0_RELEASE.jar (0.0s)
-----> Uploading droplet (73M)
...
```

“Buildpack” selected and executed

Buildpack configures Java

Reconfigure Spring for cloud environment

Buildpack obtains Tomcat

Buildpack creates “Droplet”

Next...

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What Happens - “Start”

```
...
0 of 1 instances running, 1 starting
0 of 1 instances running, 1 starting
1 of 1 instances running

App started

OK

App spring-music was started using this command `JAVA_HOME=$PWD/.java-buildpack/open_jdk_jre JAVA_OPTS="-
Djava.io.tmpdir=$TMPDIR -XX:OnOutOfMemoryError=$PWD/.java-buildpack/open_jdk_jre/bin/killjava.sh
-Xmx382293K -Xms382293K -XX:MaxMetaspaceSize=64M -XX:MetaspaceSize=64M -Xss995K
-Daccess.logging.enabled=false -Dhttp.port=$PORT" $PWD/.java-buildpack/tomcat/bin/catalina.sh run`

Showing health and status for app spring-music in org your-org as your-id@company.io...
OK

requested state: started
instances: 1/1
usage: 512M x 1 instances
urls: spring-music-678.cfapps.io
last uploaded: Tue Mar 17 17:58:35 UTC 2015

     state     since                    cpu    memory           disk
#0   running   2015-03-17 01:59:35 PM   0.0%   474.4M of 512M   150.3M of 1G
```

Cloud Foundry runs the “Droplet” on a “container”

Health Check

Done! 1 application instance running on spring-music-678.cfapps.io

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Application State and Logs

- Run **`cf apps`**

```
> cf apps
Getting apps in org pivotaledu / space development as kkrueger@pivotal.io...
OK

name            requested state   instances   memory   disk   urls
spring-music     started          1/1         512M     1G     spring-music-678.cfapps.io
```

- **`cf logs spring-music`**

```
> cf logs spring-music
Connected, tailing logs for app spring-music in org pivotaledu / space development as
kkrueger@gopivotal.com...
2014-06-07T23:01:47.68-0400 [RTR]      OUT spring-music-678.cfapps.io -
[08/06/2014:03:01:47 +0000] "GET /assets/js/status.js HTTP/1.1" 200 844 "http://spring-
music-678.cfapps.io/" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_7_5)
AppleWebKit/537.73.11 (KHTML, like Gecko) Version/6.1.1 Safari/537.73.11"
10.10.66.34:64401 vcap_request_id:73037523-63ef-498f-6cd8-d3b48fe69e84
response_time:0.003693009 app_id:314f0434-d2c9-446c-ab4a-6c310878ca80
2014-06-07T23:01:48.47-0400 [RTR]      OUT spring-music-678.cfapps.io -
[08/06/2014:03:01:48 +0000] "GET /assets/templates/header.html HTTP/1.1" 200 1060
"http://spring-music-678.cfapps.io/" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_7_5)
AppleWebKit/537.73.11 (KHTML, like Gecko) Version/6.1.1 Safari/537.73.11"
10.10.66.34:64324 vcap_request_id:39fbb3f2-46fb-4bd7-78d6-8994fafade9f
response_time:0.004132254 app_id:314f0434-d2c9-446c-ab4a-6c310878ca80
```

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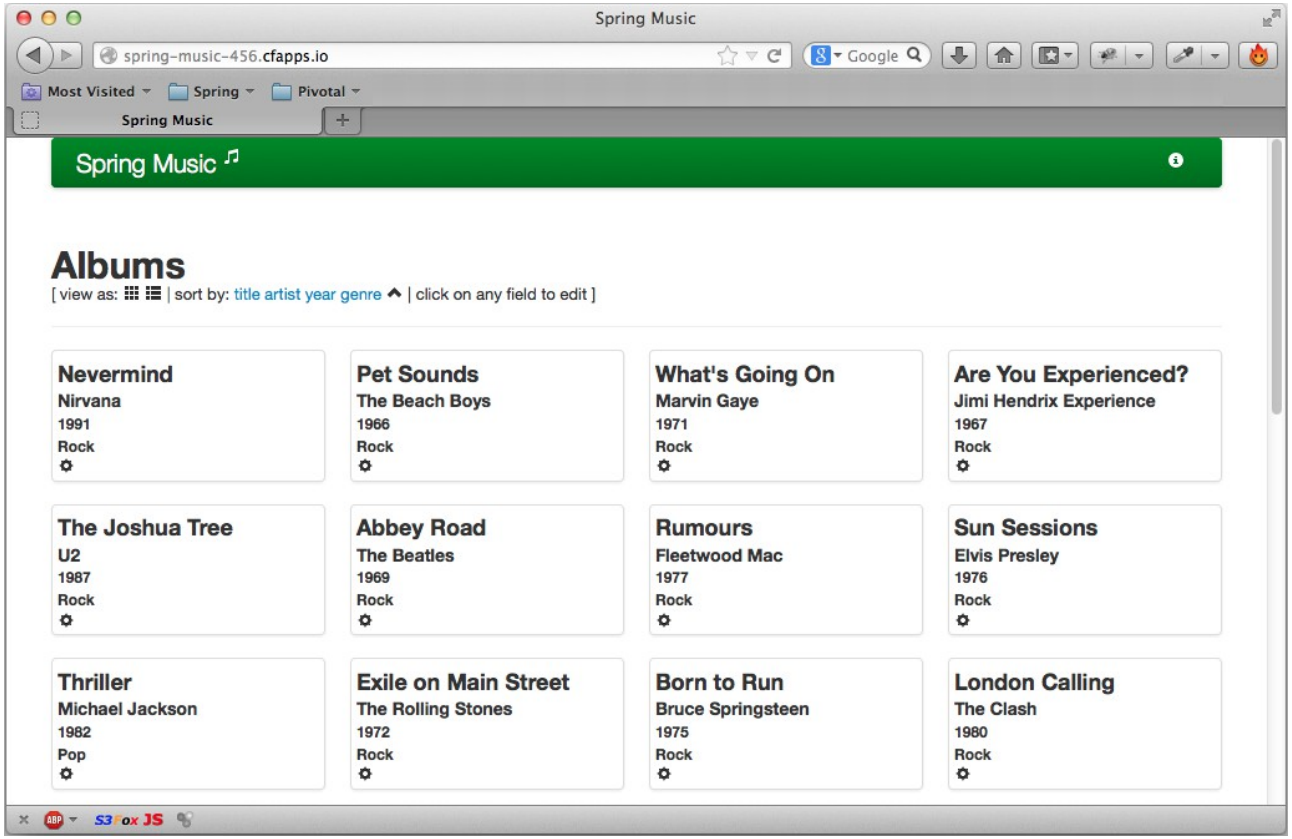
See The Application Running

- Open a browser window to **`spring-music-678.cfapps.io`**



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Configuring a Deployed Application

- Change the number of instances
  - **`cf scale <app> -i <new-value>`**
  - Two instances: **`cf scale spring-music -i 2`**
  - New instances added, *or* some existing instances stopped
- Change the memory allocation
  - **`cf scale <app> -m <new-value>`**
  - 1024M: **`cf scale spring-music -m 1024M`**
  - Requires a restart to take effect

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Stopping and Starting

`cf stop`

- Sends SIGTERM message to application
- Sends SIGKILL 10 seconds later if still running

`cf start`

- Starts existing application

`cf restart`

- **`cf stop`** followed by **`cf start`**

`cf restage`

- Repeats the staging process, and starts the app.
- Useful when environment variables / bound services change
  - (Covered later)

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Adding / Removing Routes

- Add a new domain mapping
  - `cf map-route <app> <domain> -n <hostname>`
  - `cf map-route spring-music cfapps.io -n mymusic`
    - `mymusic.cfapps.io` **also** maps to spring-music
- Remove mapping
  - `cf unmap-route <app> <domain> -n <hostname>`
  - `cf unmap-route spring-music cfapps.io -n spring-music-678`
    - `spring-music-678.cfapps.io` **no longer** maps to spring-music

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Cleaning Up Unused Routes

- Routes tend to accumulate over time
  - Applications in other Orgs / Spaces cannot use these routes
- Find all other routes used in a space:
  - `cf routes`
- Remove route:
  - `cf delete-route`
- Very Useful! Remove unused routes:
  - `cf delete-orphaned-routes`

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Roadmap

- Get Setup
- Login
- Deploying an Application
- **Managing Application Instances**

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Apps Manager

- Login to Cloud Foundry using your web-browser
  - Pivotal Web Services: **`http://run.pivotal.io`**
    - Your Cloud Foundry instance URL will be different
    - **`console.<your-cf-domain>`**
  - Use the username and password you registered with
  - Our new application should show green in the Apps Manager
- Next slide ...

NOTE: Only Pivotal CF comes with the Apps Manager
Open Source Cloud Foundry *does not*

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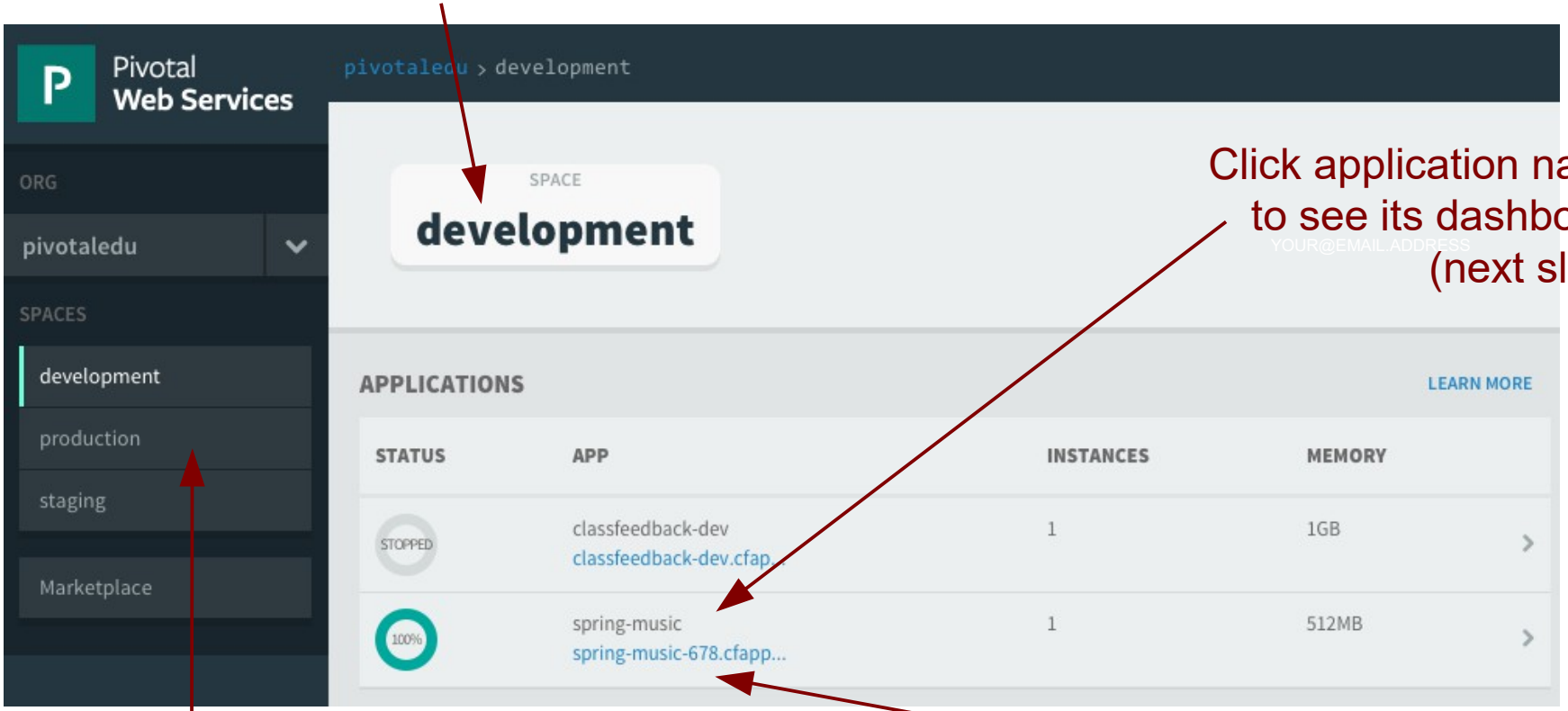
Apps Manager Home Page

- At a glance view of all your applications
  - Shows current space



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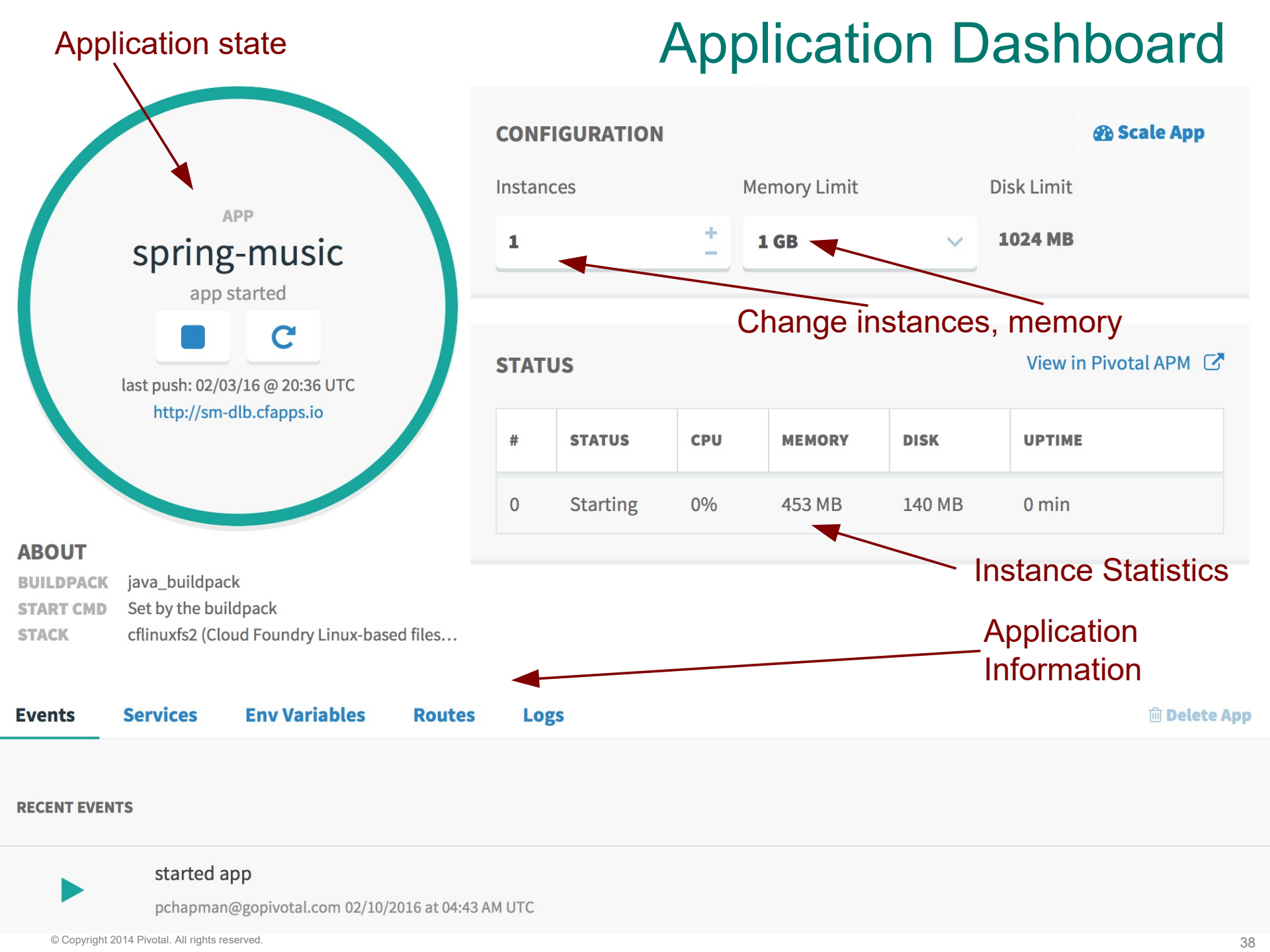
Application Dashboard



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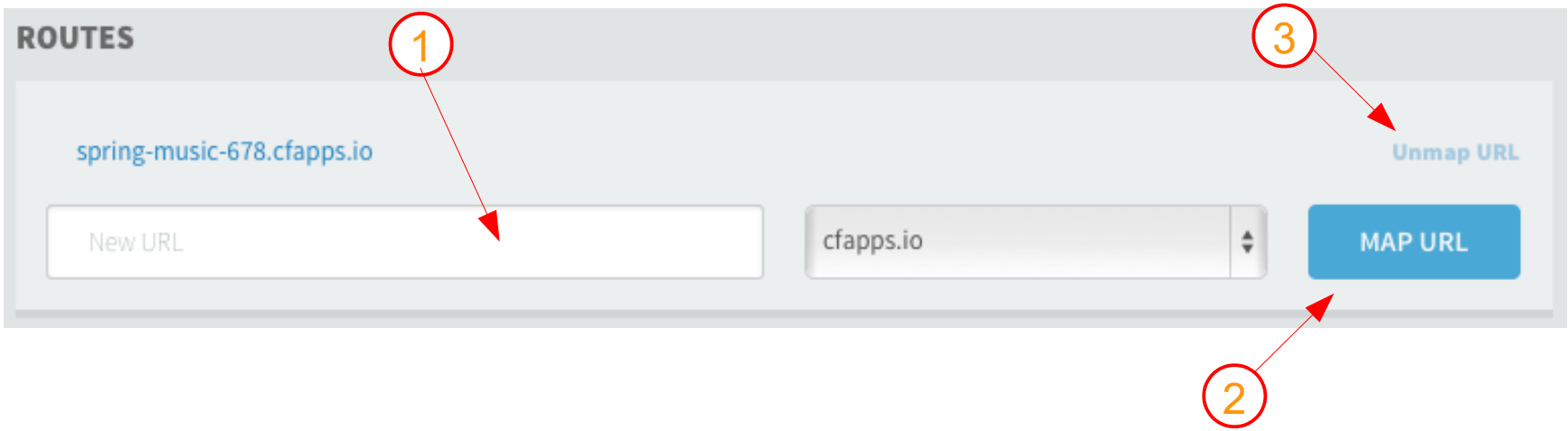
Change Mapped URL

- Enter new domain (1)
  - Remember to make it *unique*
- Click MAP URL (2)
- To remove a mapping (3)
  - Click UNMAP URL at far right of same line



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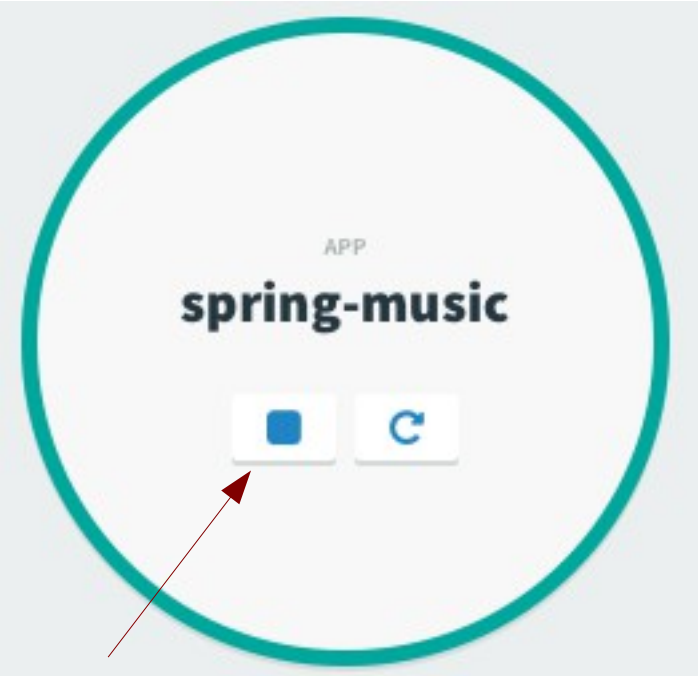
Stopping and Starting

- Just click the square to stop
- Click play to start



Click to Stop

Click to Start

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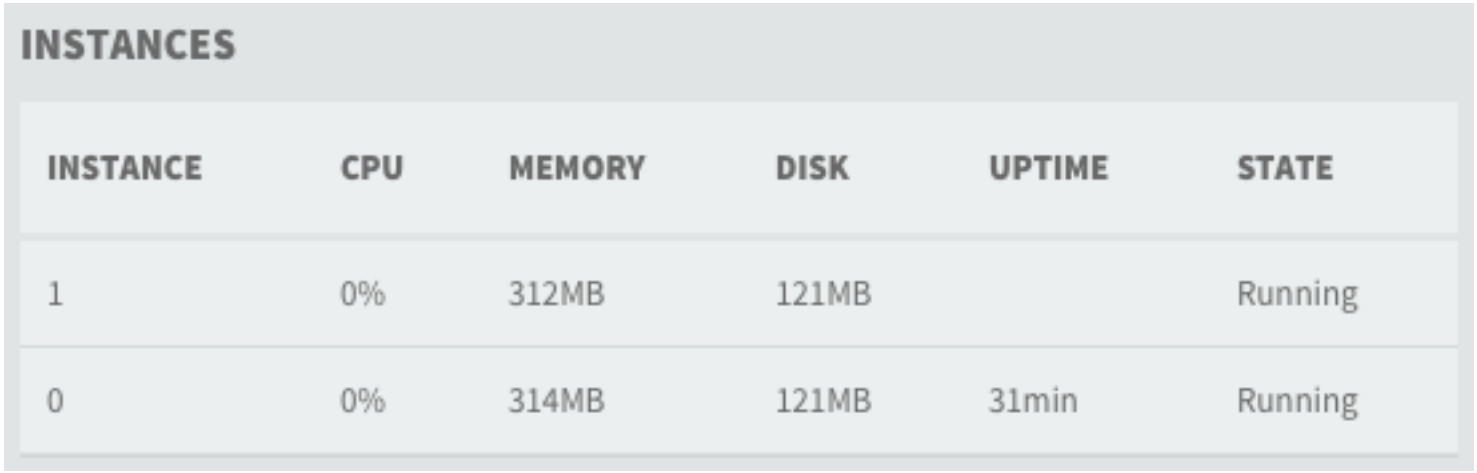
Monitoring Instances

- The very bottom panel shows all your instances
  - Provides statistics
  - Updated live (slight time-lag)



INSTANCES

INSTANCE	CPU	MEMORY	DISK	UPTIME	STATE
1	0%	312MB	121MB		Running
0	0%	314MB	121MB	31min	Running

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Summary

- After completing this lesson, you should have learned:
  - How to Deploy an application to CloudFoundry using CLI
  - Managing application instances using Apps Manager

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Lab

Push an existing application to Pivotal CF

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