

The background image is a photograph of the Golden Gate Bridge, tilted diagonally from the top left towards the bottom right. The bridge's towers and cables are visible against a hazy sky. The water below is dark and textured.

Pivotal

# PCF Operations Workshop - Platform & Application Health

Dan Herold – Platform Architect

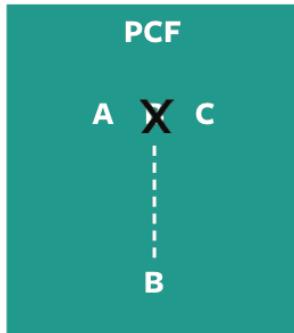
Nenad Momcilovic – Platform Architect

# Operations Workshop Agenda

- PCF Introduction
- Services Overview
- Platform Installation & Setup
- Role Based Access Control
- Platform & Application Scaling
- **Platform & Application Health**
- Patching & Updates
- Security
- Advanced BOSH

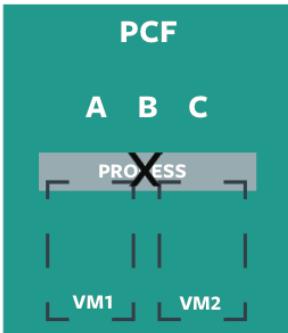
# 4 Layers of Self Healing

1



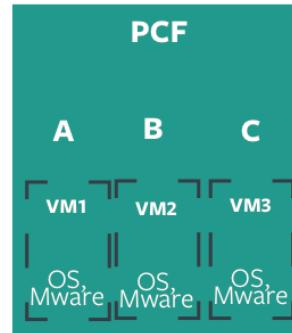
If an app fails, PCF reboots app in a new container

2



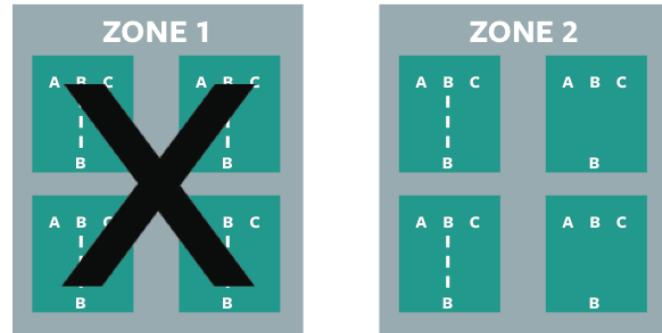
If a process fails, PCF reboots process in a new virtual machine

3



If an OS or network failure occurs, PCF kills the VM and reboots the host in a new virtual machine

4



If a datacenter rack fails, PCF ensures applications stay running in multiple availability zones

APP FAIL

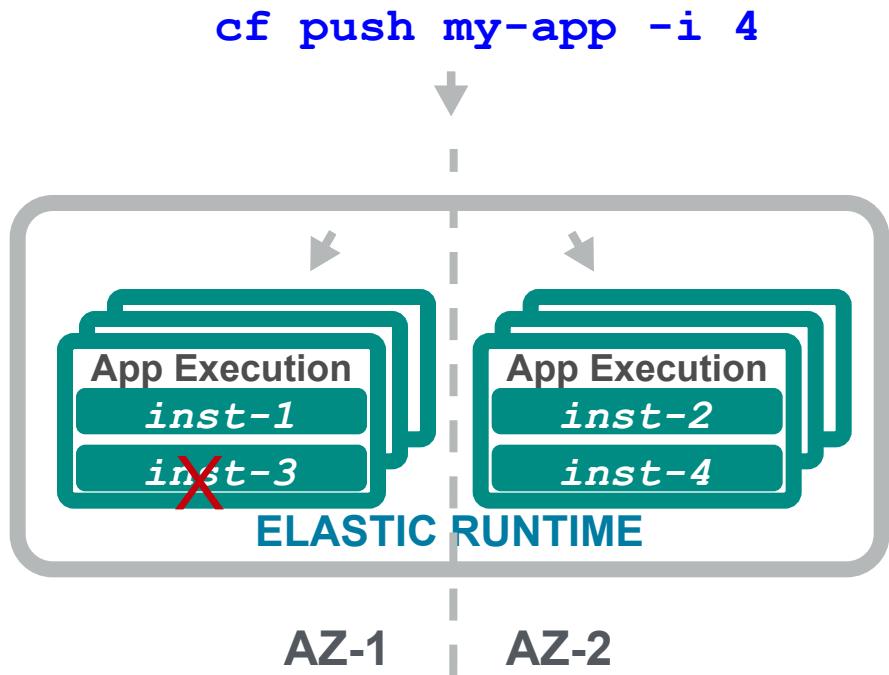
PROCESS FAIL

VM FAIL

RACK FAIL

# Scenario 1: Application Failure & Recovery

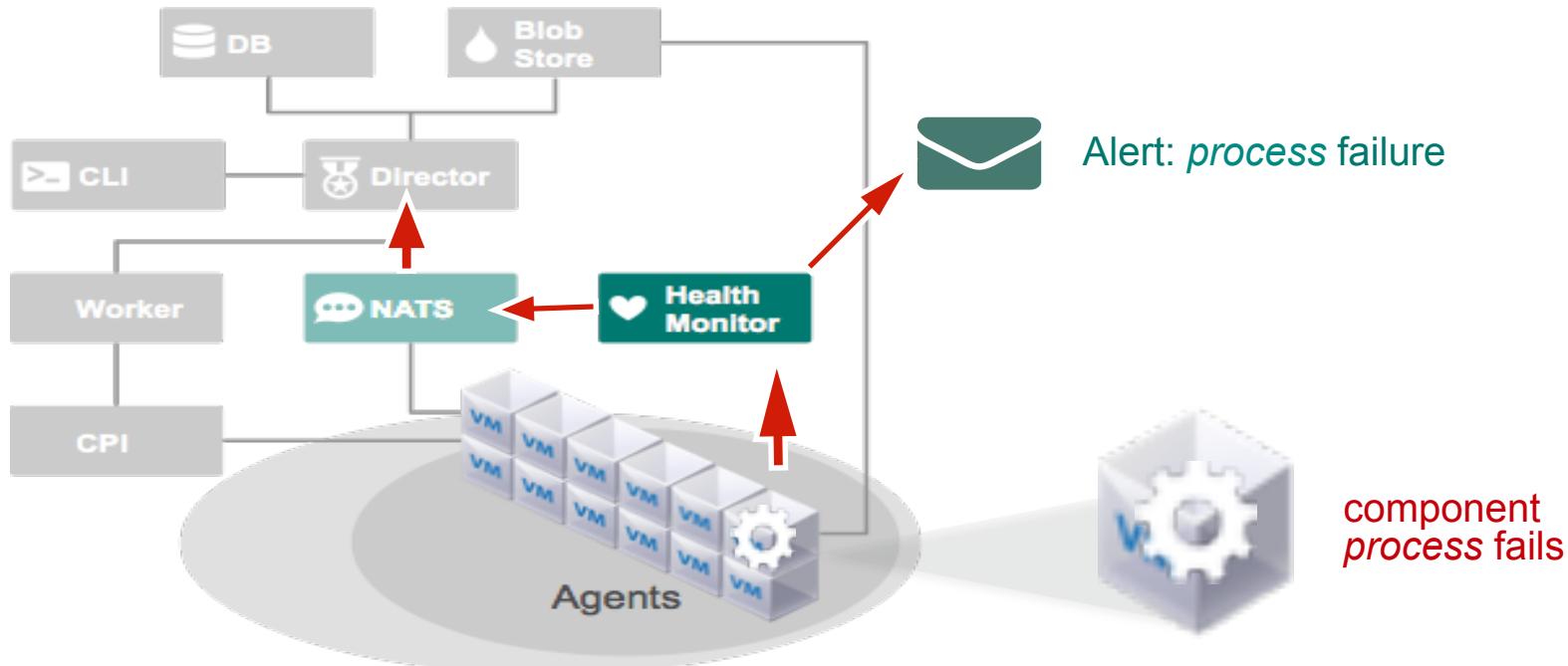
- The Elastic Runtime monitors application instance processes, and detects failures
- On failed instances, the container is destroyed and a new container is created
  - Droplet is copied from the Cloud Controller blobstore to the container and started



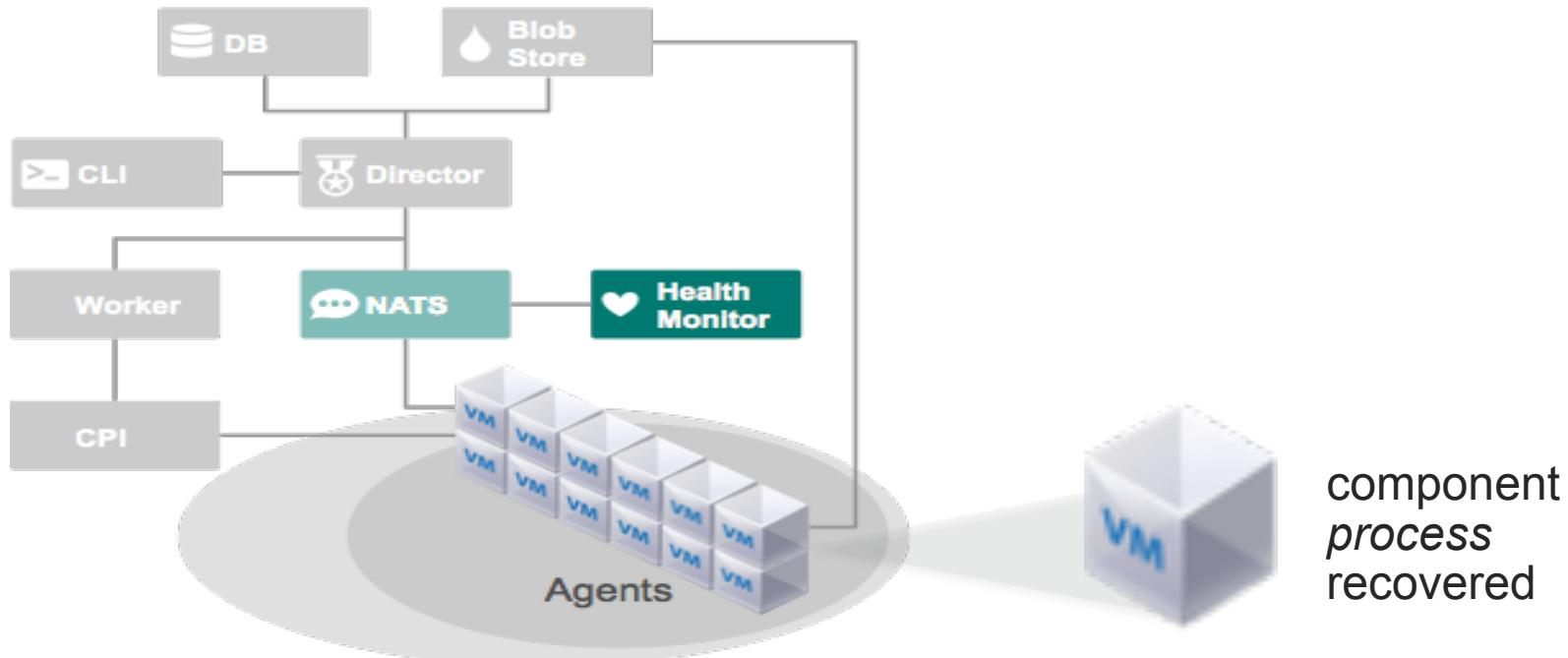
# Scenario 2: Process Failure & Recovery

- Monit utility running on the component VMs automatically restarts failed processes
- BOSH release defines which processes to monitor

# Scenario 2: Process Failure & Recovery



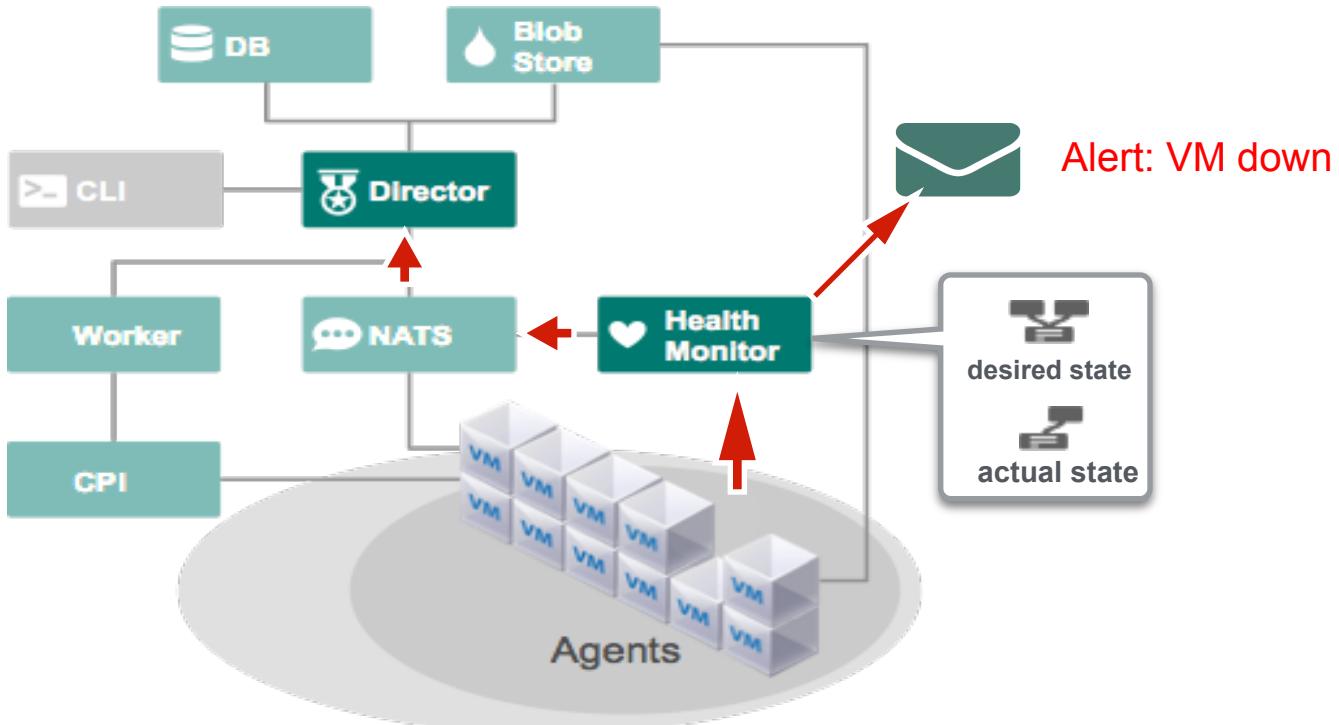
# Scenario 2: Process Failure & Recovery



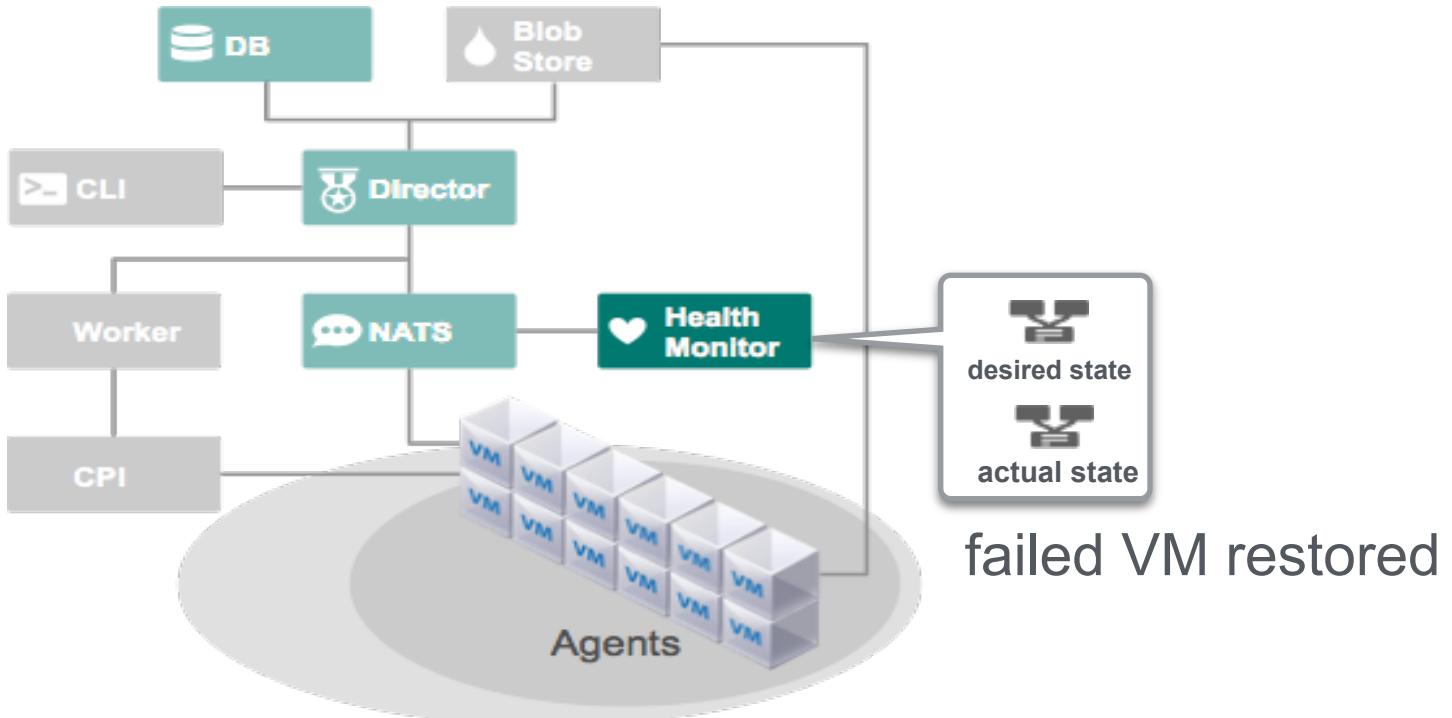
# Scenario 3: VM Failure & Recovery

- Each component of Cloud Foundry is a VM deployed and managed by BOSH
- BOSH health monitor continuously compares current component state to desired state, including:
  - number of instances
  - running processes
- If current state differs from desired state, the health monitor:
  - triggers the VM resurrector, or
  - sends alerts

# Scenario 3: VM Failure & Recovery

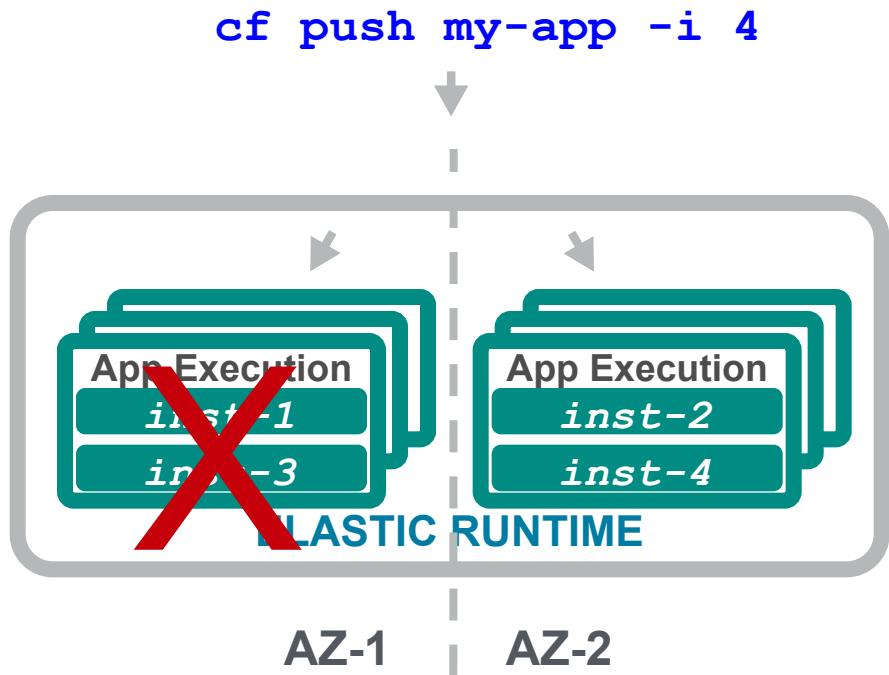


# Scenario 3: VM Failure & Recovery



# Scenario 4: AZ Failure & Recovery

- If one zone fails, the application instances in the other zone pick up the load
- No outage



# Logging

- Available through the CLI and Apps Manager
- Application layer log aggregation provides consolidated view across all application instances and Routers.
- Ability to tail logs for real-time aggregated analysis
- Flush logs to permanent storage

```
x_forwarded_proto:"http" vcap_request_id:e8979907-3eab-41bd-7fc-83a11bb832bc response_time:0.003097931 app_id:e60f5ec-0205-4247-94db-ald989aec073 2016-06-24T16:24:47.236+04:00 [RTN] [OUT] spring-music-nonrelatice-flannelet.cfapps.io - [24/06/2016:20:24:47.232 +0000] "GET /assets/templates/grid.html HTTP/1.1" 204 0 "http://spring-music-nonrelatice-flannelet.cfapps.io/" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_10_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/51.0.2704.84 Safari/537.36" 10.10.2.201:53179 x_forwarded_for:"71.230.15.252" x_forwarded_proto:"http" vcap_request_id:ea6392d23a-0475-4cc8-9eef-f15df2de7c44 response_time:0.003854428 app_id:e60f5ec-0205-4247-94db-ald989aec073 2016-06-24T16:24:47.239+04:00 [RTN] [OUT] spring-music-nonrelatice-flannelet.cfapps.io - [24/06/2016:20:24:47.225 +0000] "GET /albums HTTP/1.1" 200 0 4669 "http://spring-music-nonrelatice-flannelet.cfapps.io/" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_10_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/51.0.2704.84 Safari/537.36" 10.10.2.201:53179 x_forwarded_for:"71.230.15.252" x_forwarded_proto:"http" vcap_request_id:ea6392d23a-0475-4cc8-9eef-f15df2de7c44 response_time:0.003854428 app_id:e60f5ec-0205-4247-94db-ald989aec073 2016-06-24T16:24:50.689+04:00 [RTN] [OUT] spring-music-nonrelatice-flannelet.cfapps.io - [24/06/2016:20:24:50.685 +0000] "GET /assets/templates/albumForm.html HTTP/1.1" 200 0 2518 "http://spring-music-nonrelatice-flannelet.cfapps.io/" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_10_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/51.0.2704.84 Safari/537.36" 10.10.2.201:52705 x_forwarded_for:"71.230.15.252" x_forwarded_proto:"http" vcap_request_id:7b1a2eac4-f169-4235-591d-e1ab9d762f72 response_time:0.003882736 app_id:e60f5ec-0205-4247-94db-ald989aec073 2016-06-24T16:24:52.118+04:00 [RTN] [OUT] spring-music-nonrelatice-flannelet.cfapps.io - [24/06/2016:20:24:52.056 +0000] "POST /albums HTTP/1.1" 200 153 153 "http://spring-music-nonrelatice-flannelet.cfapps.io/" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_10_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/51.0.2704.84 Safari/537.36" 10.10.2.201:15428 x_forwarded_for:"71.230.15.252" x_forwarded_proto:"http" vcap_request_id:823be47c919c-4cf6-45f4-529ba4a303b4 response_time:0.059990324 app_id:e60f5ec-0205-4247-94db-ald989aec073 2016-06-24T16:24:52.159+04:00 [RTN] [OUT] spring-music-nonrelatice-flannelet.cfapps.io - [24/06/2016:20:24:52.143 +0000] "GET /albums HTTP/1.1" 200 0 4669 "http://spring-music-nonrelatice-flannelet.cfapps.io/" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_10_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/51.0.2704.84 Safari/537.36" 10.10.2.201:15428 x_forwarded_for:"71.230.15.252" x_forwarded_proto:"http" vcap_request_id:8e262348-1741-4a4b-6cf3-14efbf5aaf65 response_time:0.0162998 app_id:e60f5ec-0205-4247-94db-ald989aec073
```

# Loggregator - The Voice of the System

- Provides logging and metrics for the Elastic Runtime
- A modern approach to logging that emphasizes:
  - Support for ephemeral, container-based applications
  - Productivity by streaming logs and metrics to operators and developers (no log shipping)
  - Accessibility and visibility into your applications and the platform
  - Seamless integration with modern log management services (e.g. Splunk, LogStash)

# How can Loggregator help me?

- Debugging applications
- Application insights
- Monitoring system and application health
- Exporting metrics into visualization tools

# Viewing App Logs Using Apps Manager

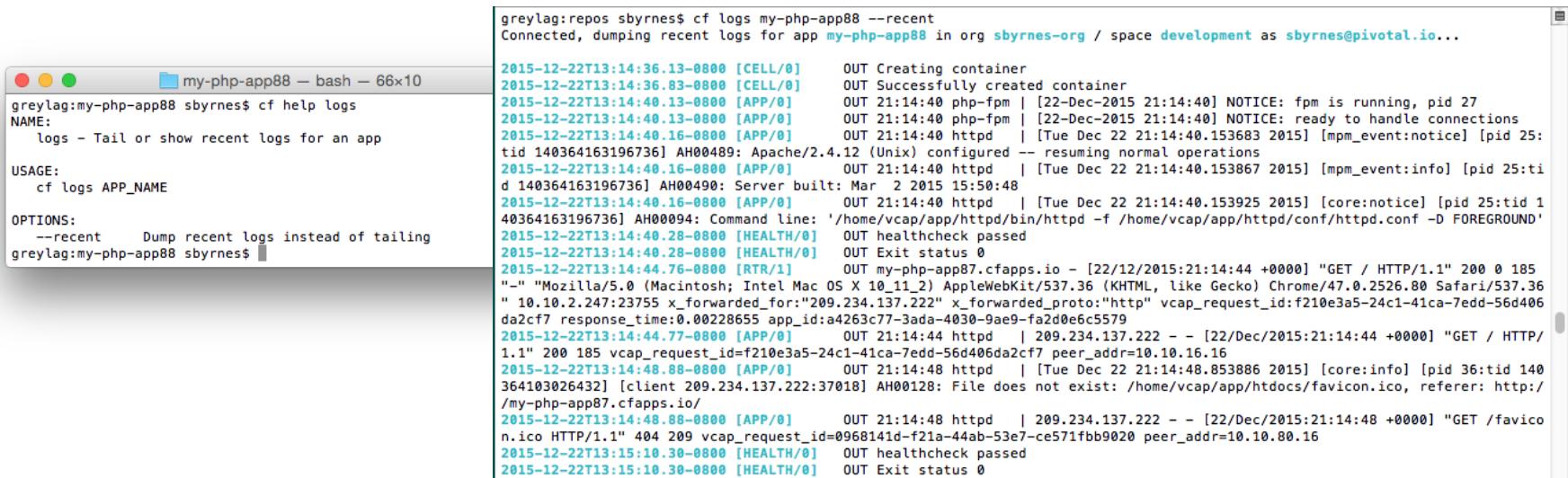
- In Apps Manager, select your app, then select Logs

The screenshot shows the Apps Manager interface for a specific application. At the top, there are tabs for Events, Services, Env Variables, Routes, and Logs. The Logs tab is highlighted with a red oval. To the right of the tabs is a 'Delete App' button. Below the tabs, there are two sections: 'RECENT LOGS' and 'Tail Logs'. The 'RECENT LOGS' section contains a list of log entries from December 8, 2015, at 00:57:36. The log entries are as follows:

```
2015-12-08T00:57:32.000+00:00 [CELL] OUT Successfully created container
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 php-fpm | [08-Dec-2015 00:57:36] NOTICE: fpm is running, pid 31
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 php-fpm | [08-Dec-2015 00:57:36] NOTICE: ready to handle connections
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 httpd | [Tue Dec 08 00:57:36.497003 2015] [mpm_event:notice] [pid 29:tid 140562639148864] AH00489: Apache/2.4.16 (Unix) configured -- resuming normal operations
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 httpd | [Tue Dec 08 00:57:36.497108 2015] [mpm_event:info] [pid 29:tid 140562639148864] AH00490: Server built: Jul 22 2015 20:20:52
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 httpd | [Tue Dec 08 00:57:36.497122 2015] [core:notice] [pid 29:tid 140562639148864] AH00094: Command line: '/app/httpd/bin/httpd -f /home/vcap/app/httpd/conf/httpd.conf -D FOREGROUND'
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 php-fpm | [08-Dec-2015 00:57:36] NOTICE: fpm is running, pid 27
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 php-fpm | [08-Dec-2015 00:57:36] NOTICE: ready to handle connections
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 httpd | [Tue Dec 08 00:57:36.514493 2015] [mpm_event:notice] [pid 26:tid 140164087265088] AH00489: Apache/2.4.16 (Unix) configured -- resuming normal operations
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 httpd | [Tue Dec 08 00:57:36.514655 2015] [mpm_event:info] [pid 26:tid 140164087265088] AH00490: Server built: Jul 22 2015 20:20:52
2015-12-08T00:57:36.000+00:00 [APP] OUT 00:57:36 httpd | [Tue Dec 08 00:57:36.514716 2015] [core:notice] [pid 26:tid 140164087265088] AH00094: Command line: '/app/httpd/bin/httpd -f /home/vcap/app/httpd/conf/httpd.conf -D FOREGROUND'
```

# Viewing Logs For an App Using the cf CLI

- Use “cf logs <app\_name> --recent” to see recent logs
- Use “cf logs <app\_name>” to tail application logs

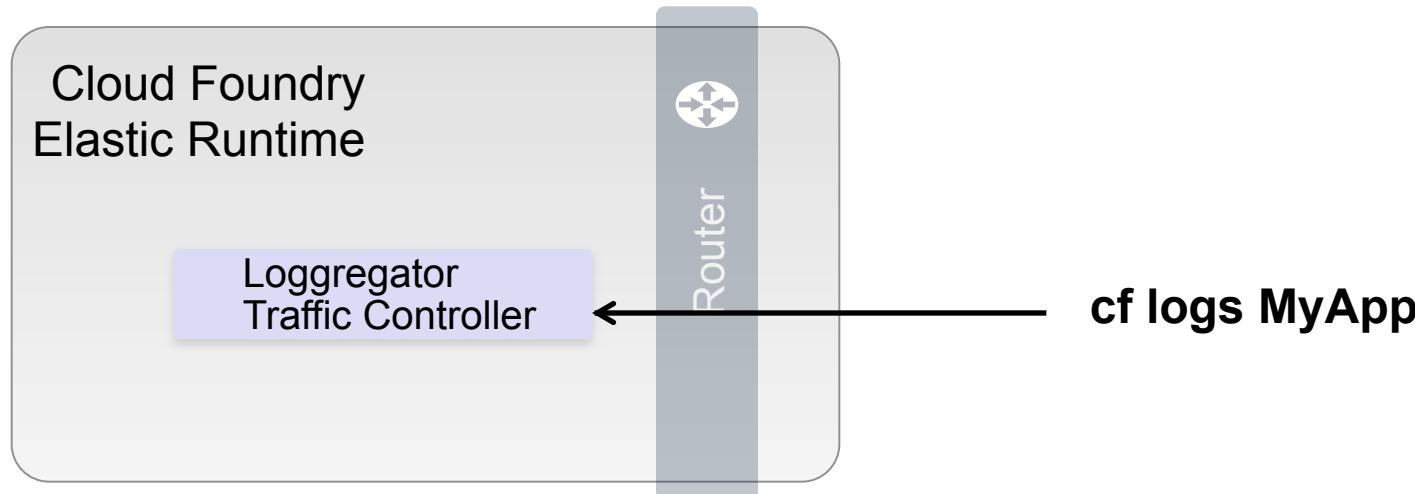


The screenshot shows a terminal window titled "my-php-app88 – bash – 66x10". The user has run the command "cf logs my-php-app88" which displays log entries for the application. The log entries are timestamped and show various system and application events.

```
greylag:repos sbyrnes$ cf logs my-php-app88 --recent
Connected, dumping recent logs for app my-php-app88 in org sbyrnes-org / space development as sbyrnes@pivotal.io...
2015-12-22T13:14:36.13-0800 [CELL/0] OUT Creating container
2015-12-22T13:14:36.83-0800 [CELL/0] OUT Successfully created container
2015-12-22T13:14:40.13-0800 [APP/0] OUT 21:14:40 php-fpm | [22-Dec-2015 21:14:40] NOTICE: fpm is running, pid 27
2015-12-22T13:14:40.13-0800 [APP/0] OUT 21:14:40 php-fpm | [22-Dec-2015 21:14:40] NOTICE: ready to handle connections
2015-12-22T13:14:40.16-0800 [APP/0] OUT 21:14:40 httpd | [Tue Dec 22 21:14:40.153683 2015] [mpm_event:notice] [pid 25:tid 140364163196736] AH00489: Apache/2.4.12 (Unix) configured -- resuming normal operations
2015-12-22T13:14:40.16-0800 [APP/0] OUT 21:14:40 httpd | [Tue Dec 22 21:14:40.153867 2015] [mpm_event:info] [pid 25:tid 140364163196736] AH00490: Server built: Mar 2 2015 15:50:48
2015-12-22T13:14:40.16-0800 [APP/0] OUT 21:14:40 httpd | [Tue Dec 22 21:14:40.153925 2015] [core:notice] [pid 25:tid 140364163196736] AH00094: Command line: '/home/vcap/app/httpd/bin/httpd -f /home/vcap/app/httpd/conf/httpd.conf -D FOREGROUND'
2015-12-22T13:14:40.28-0800 [HEALTH/0] OUT healthcheck passed
2015-12-22T13:14:40.28-0800 [HEALTH/0] OUT Exit status 0
2015-12-22T13:14:44.76-0800 [RTR/1] OUT my-php-app87.cfapps.io - [22/12/2015:21:14:44 +0000] "GET / HTTP/1.1" 200 0 185
"- Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_2) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/47.0.2526.80 Safari/537.36
" 10.10.2.247:23755 x_forwarded_for:"209.234.137.222" x_forwarded_proto:"http" vcap_request_id:f210e3a5-24c1-41ca-7edd-56d406da2cf7 response_time:0.00228655 app_id:a4263c77-3ada-4030-9ae9-fa2d0e6c5579
2015-12-22T13:14:44.77-0800 [APP/0] OUT 21:14:44 httpd | 209.234.137.222 - - [22/Dec/2015:21:14:44 +0000] "GET / HTTP/1.1" 200 185 vcap_request_id:f210e3a5-24c1-41ca-7edd-56d406da2cf7 peer_addr=10.10.16.16
2015-12-22T13:14:48.88-0800 [APP/0] OUT 21:14:48 httpd | [Tue Dec 22 21:14:48.853886 2015] [core:info] [pid 36:tid 140364103026432] [client 209.234.137.222:37018] AH00128: File does not exist: /home/vcap/app/htdocs/favicon.ico, referer: http://my-php-app87.cfapps.io/
2015-12-22T13:14:48.88-0800 [APP/0] OUT 21:14:48 httpd | 209.234.137.222 - - [22/Dec/2015:21:14:48 +0000] "GET /favicon.ico HTTP/1.1" 404 209 vcap_request_id=0968141d-f21a-44ab-53e7-ce571fb9020 peer_addr=10.10.80.16
2015-12-22T13:15:10.30-0800 [HEALTH/0] OUT healthcheck passed
2015-12-22T13:15:10.30-0800 [HEALTH/0] OUT Exit status 0
```

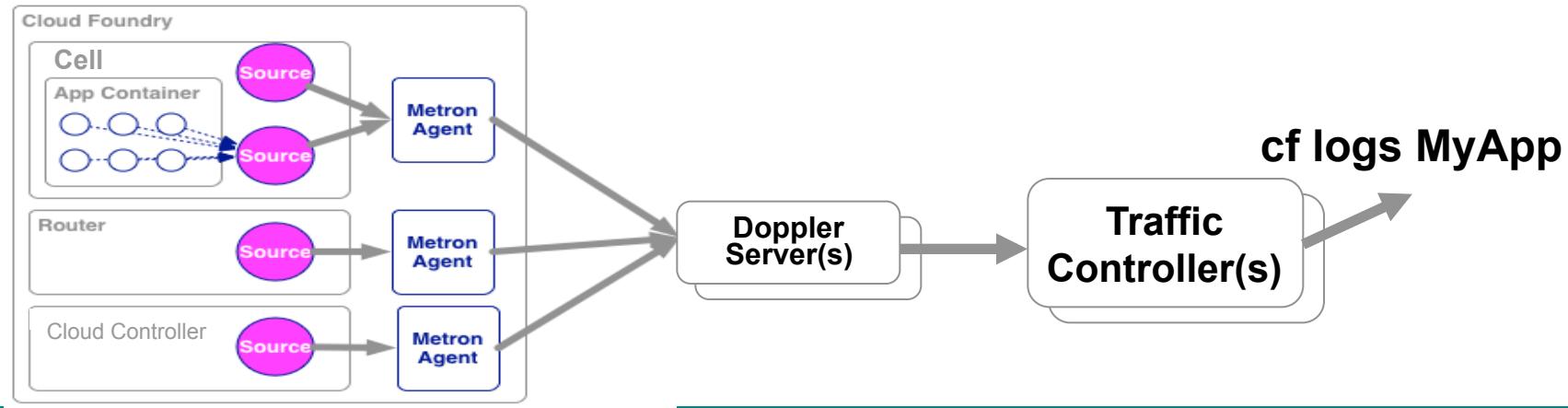
# cf logs- Behind the Scenes

- A component of the Loggregator system called the Traffic Controller receives and responds to requests for logs and metrics



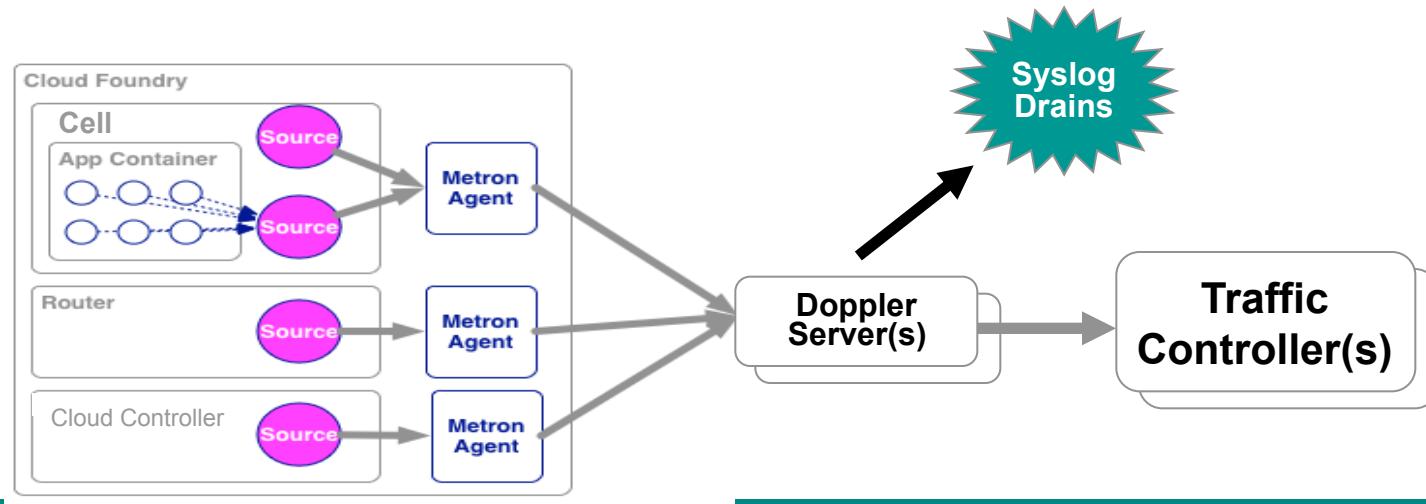
# cf logs MyApp- Deeper Behind the Scenes

- Sources of logging and metrics data send data to Metron Agents, which reside on Cloud Foundry components
- The Metron Agents send the data to Doppler Servers
- When the request for logs is made, the Traffic Controller gets the data from the Doppler Servers



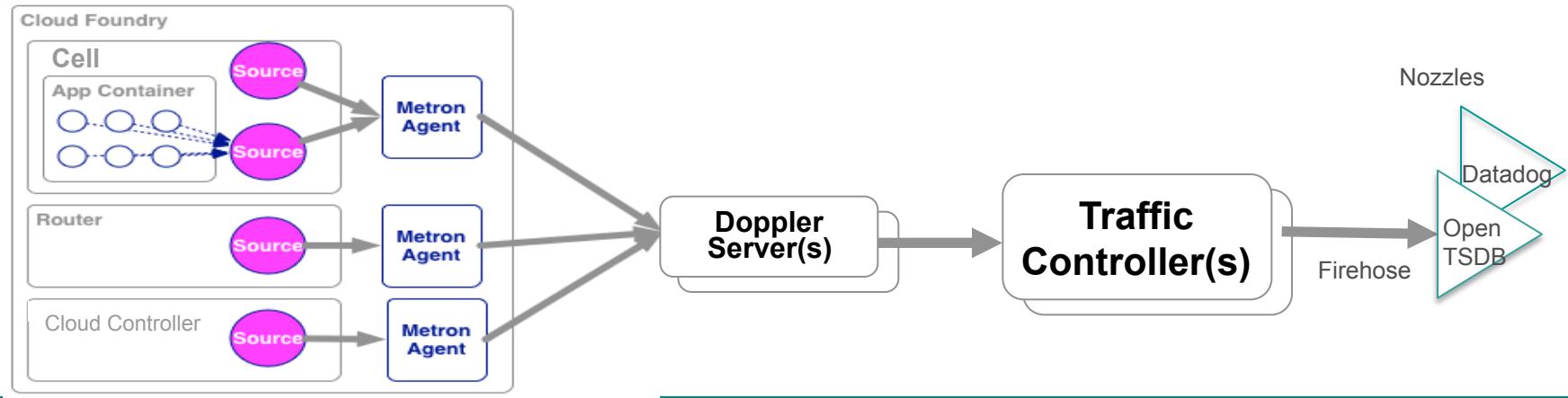
# Syslog Drains

- Syslog drains allow data related to an application to be sent to third-party log managers
- The data from the Doppler Servers is sent to the Syslog drain
  - The Traffic Controller is not used



# Firehose and Nozzles

- Traffic Controllers have a Firehose endpoint
- The Firehose streams all the event data coming from an Elastic Runtime deployment
  - Includes application logs, HTTP events and container metrics
  - Includes metrics from all Elastic Runtime components
  - Does not include Elastic Runtime component logs
- Operators can deploy nozzles to the Firehose endpoint, which listen for a subset of data from the Firehose



# Platform syslog

- Elastic Runtime can send system logs to an external syslog server
- Configure this in the System Logging tab

The screenshot shows the PCF Ops Manager interface for Pivotal Elastic Runtime. The top navigation bar includes a logo, the text "PCF Ops Manager", and a user dropdown. Below the header, a breadcrumb navigation shows "Installation Dashboard < Pivotal Elastic Runtime". A horizontal navigation bar at the top of the main content area includes tabs for "Settings", "Status", "Credentials", and "Logs", with "Logs" being the active tab. On the left side, there is a sidebar with a list of configuration items, each preceded by a green checkmark: "Assign Networks", "Assign Availability Zones", "System Database Config", "File Storage Config", "IPs and Ports", "Security Config", "MySQL Proxy Config", "Cloud Controller", and "System Logging". The main content area has a heading "Configure system logging. Leave the External Syslog fields blank unless you wish to use an external syslogd server." Below this, there are three input fields: "External Syslog Aggregator Hostname" (containing a placeholder "I"), "External Syslog Aggregator Port" (empty), and "External Syslog Network Protocol" (a dropdown menu). A note below the first field states: "The aggregator must be reachable from the Elastic Runtime network, accept TCP, UDP or RELP connections, and use the RELP protocol (e.g. rsyslogd). This can also be configured with an IP address." At the bottom of the form is a "Save" button.

# PCF JMX Bridge

- Collects and exposes system data from PCF components via a JMX endpoint (Cloud Controller, Router, Diego, VMs, etc)
- Composed of the following VMs:
  - JMX provider
  - VM that governs compilation
  - Nozzle for the Loggregator Firehose
- Rebranded version of “Pivotal Cloud Foundry Ops Metrics”

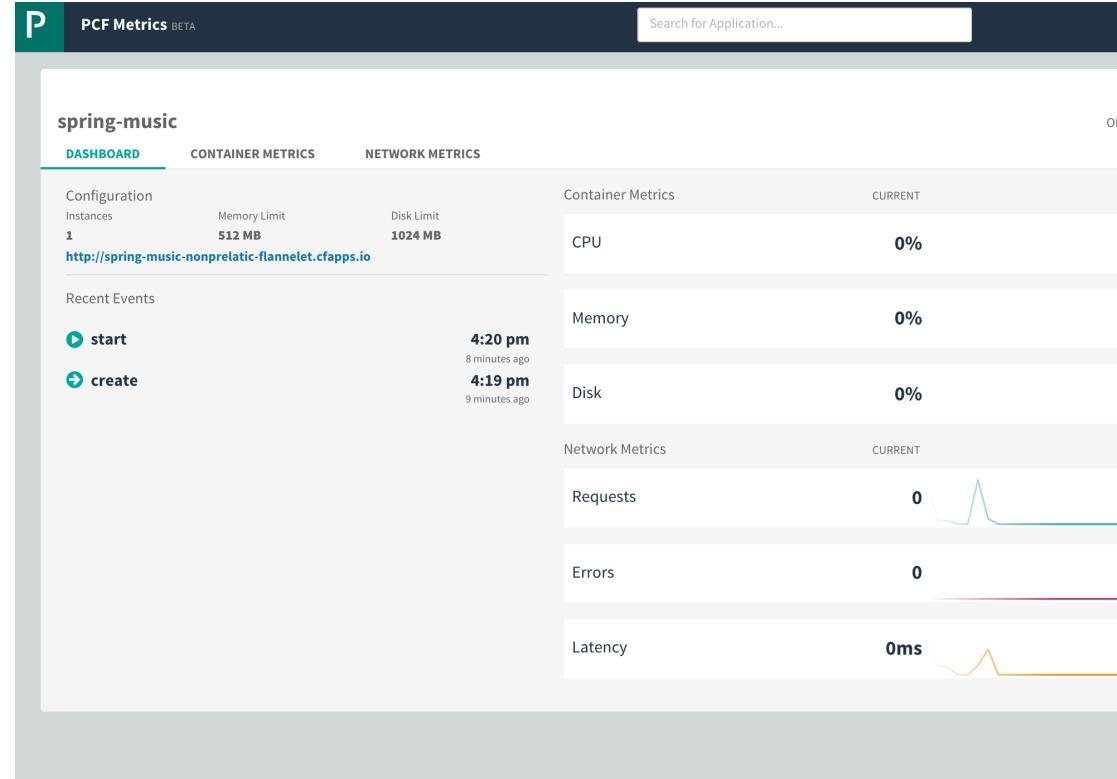
# Viewing the Events for your App

- In Apps Manager, select your app, then select Events
  - Or in the cf CLI cf events <my-app-name>

The screenshot shows the 'Events' tab of the Pivotal Apps Manager interface. The tab bar includes 'Events' (selected), 'Services', 'Env Variables', 'Routes', and 'Logs'. Below the header, a section titled 'RECENT EVENTS' displays four entries:

Event Type	Description	User	Date
	scaled app instances to 2	sbyrnes@pivotal.io	06/04/2015 at 12:24 AM UTC
	updated app	sbyrnes@pivotal.io	06/03/2015 at 11:09 PM UTC
	scaled app instances to 1	sbyrnes@pivotal.io	06/03/2015 at 11:09 PM UTC
	started app	sbyrnes@pivotal.io	06/03/2015 at 10:52 PM UTC

# PCF Metrics



# Application Performance Monitoring

- PCF Metrics provides a real-time application monitoring dashboard
- 3<sup>rd</sup> Party Tiles provide in-depth monitoring of applications running on PCF via an embedded agent bundled with applications that are deployed using Buildpacks
  - Dynatrace
  - New Relic
  - AppDynamics

# PCF Platform Health Demo