

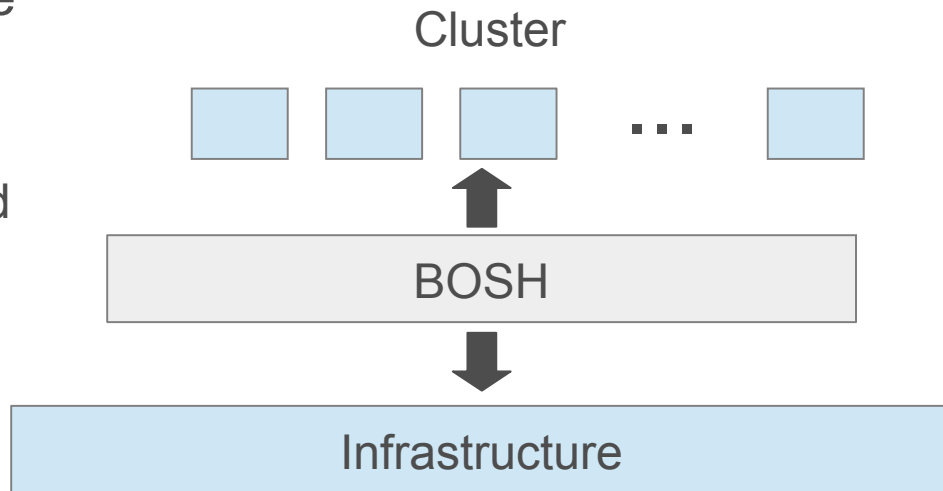
# Ops Manager and BOSH Introduction

# Topics

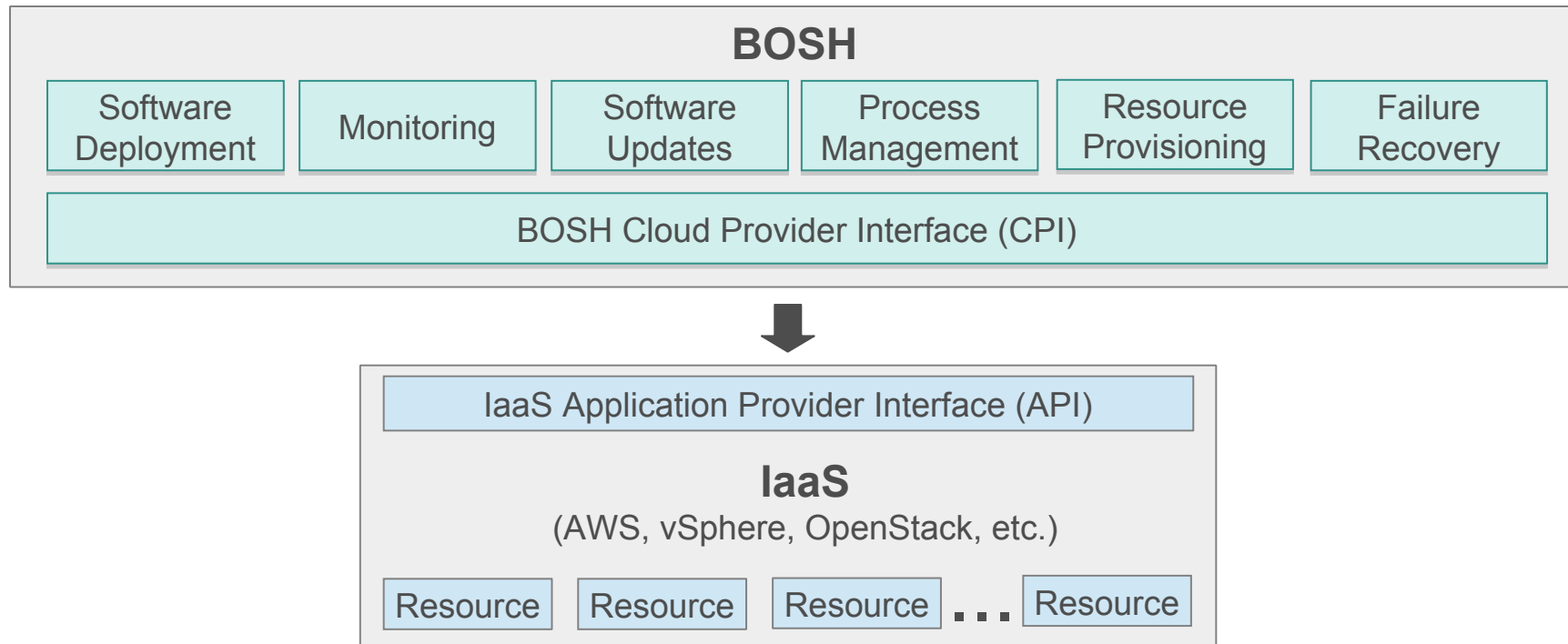
- **BOSH and Ops Manager Introduction**
- BOSH Architecture Introduction
- BOSH Deployments
- Using the BOSH CLI

# What is BOSH?

- BOSH is open source software that can deploy and manage the lifecycle of any software
  - Especially good for distributed systems and clusters
- BOSH can run on any infrastructure
  - For example, vSphere, Amazon Web Services, a Vagrant VM



# BOSH Functionality



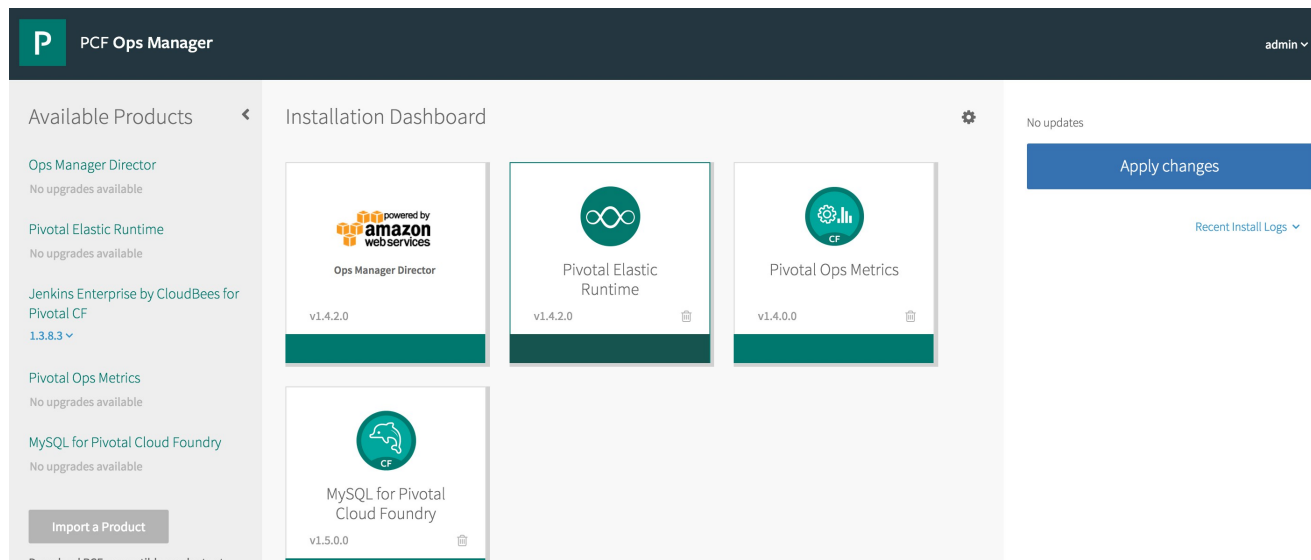
# Why BOSH?

- Cloud Foundry is a distributed system that runs on many infrastructures
- BOSH was mainly designed as a *holistic* approach
  - BOSH keeps the Cloud Foundry runtime running

*Note: Other tools could potentially be used to deploy Cloud Foundry, but you would lose the management and self-healing aspects that BOSH provides*

# Ops Manager and BOSH

- Ops Manager is a user interface on top of BOSH
- When you install or make changes in Ops Manager, BOSH-level changes are being made
  - You will see BOSH-related messages in the logs

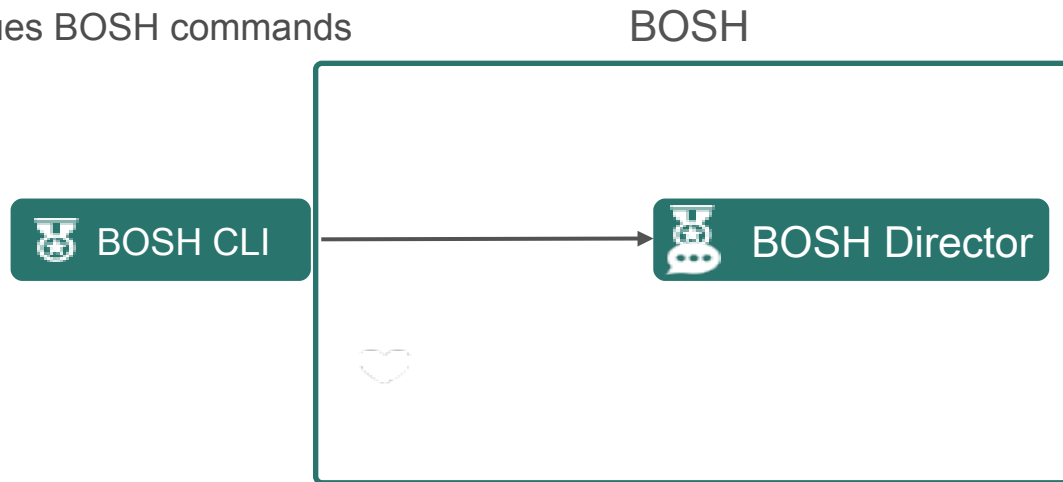


# Topics

- BOSH and Ops Manager Introduction
- **BOSH Architecture Introduction**
- BOSH Deployments
- Using the BOSH CLI

# BOSH Director and CLI

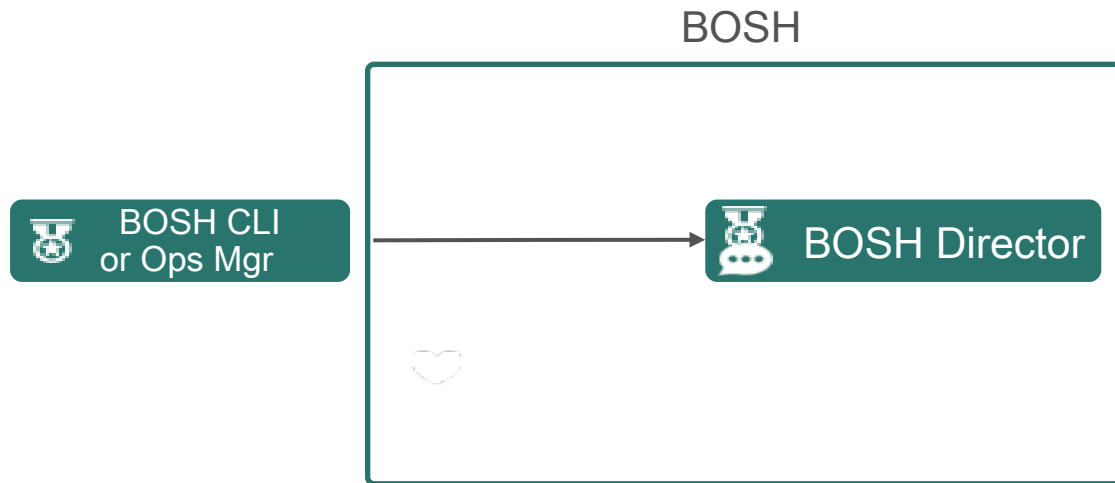
- The BOSH director is the heart of BOSH
  - Communicates with the infrastructure (calls its API) and components of the cluster (usually VMs)
- Connect to it using the BOSH CLI (command line interface)
  - Separate from the cf CLI
  - Issues BOSH commands





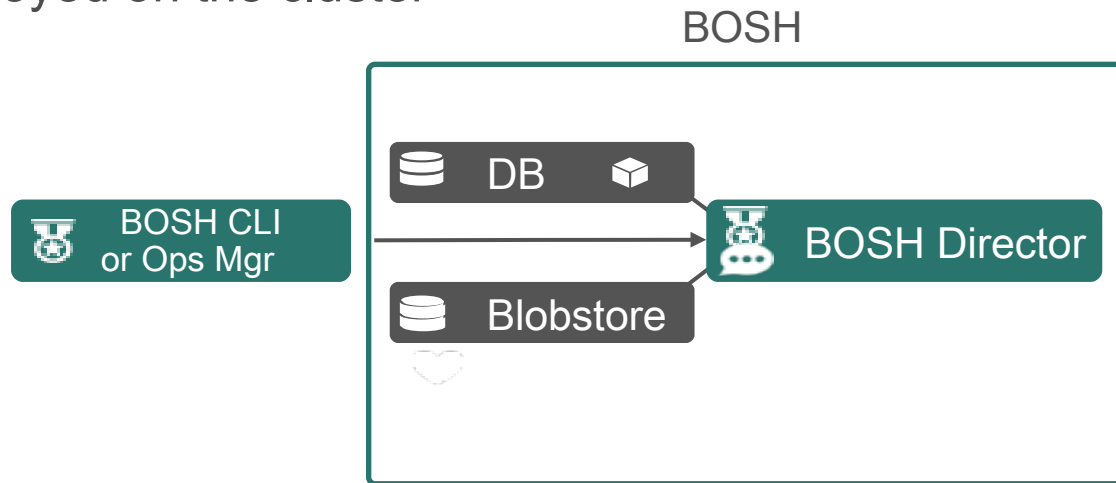
# BOSH Director and Ops Manager

- Ops Manager and the BOSH CLI issue the same BOSH commands



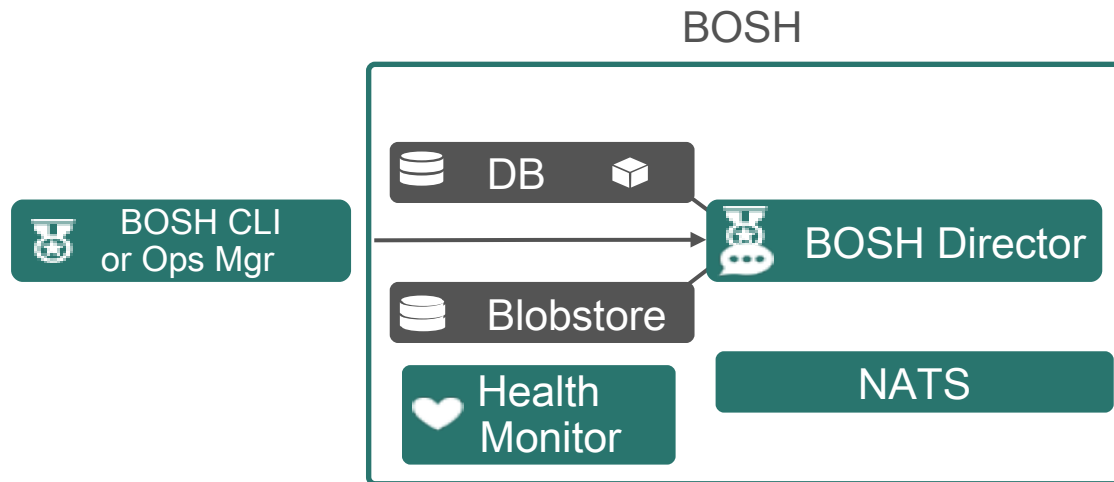
# BOSH Database and Blobstore

- The BOSH Database- stores configuration information for the infrastructure it is using and the cluster that it is deploying
- The BOSH Blobstore- used to store assets associated with the software deployed on the cluster



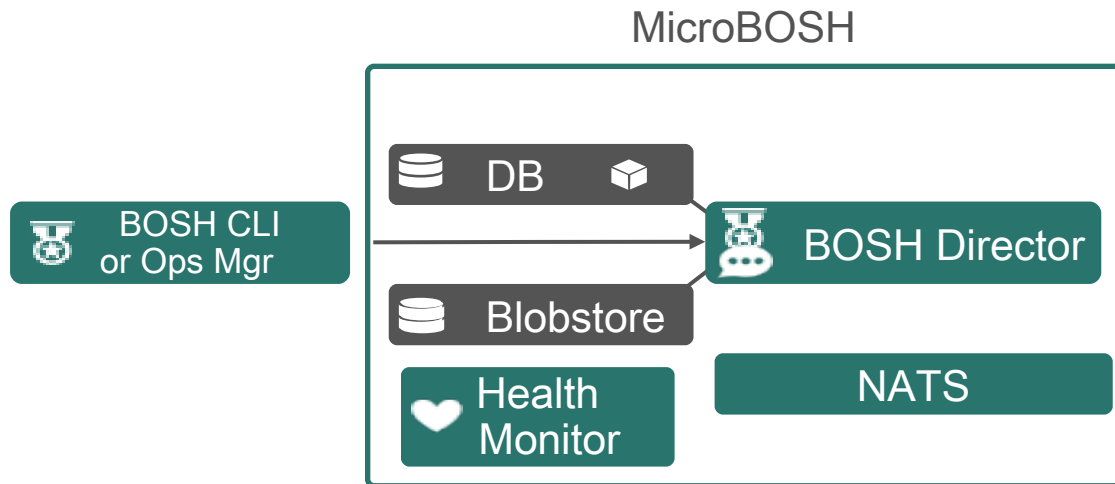
# NATS and Health Monitor

- **NATS:** used for messaging between the components
- **Health Monitor:** used to make sure that the VMs created and the processes started by BOSH are up and running



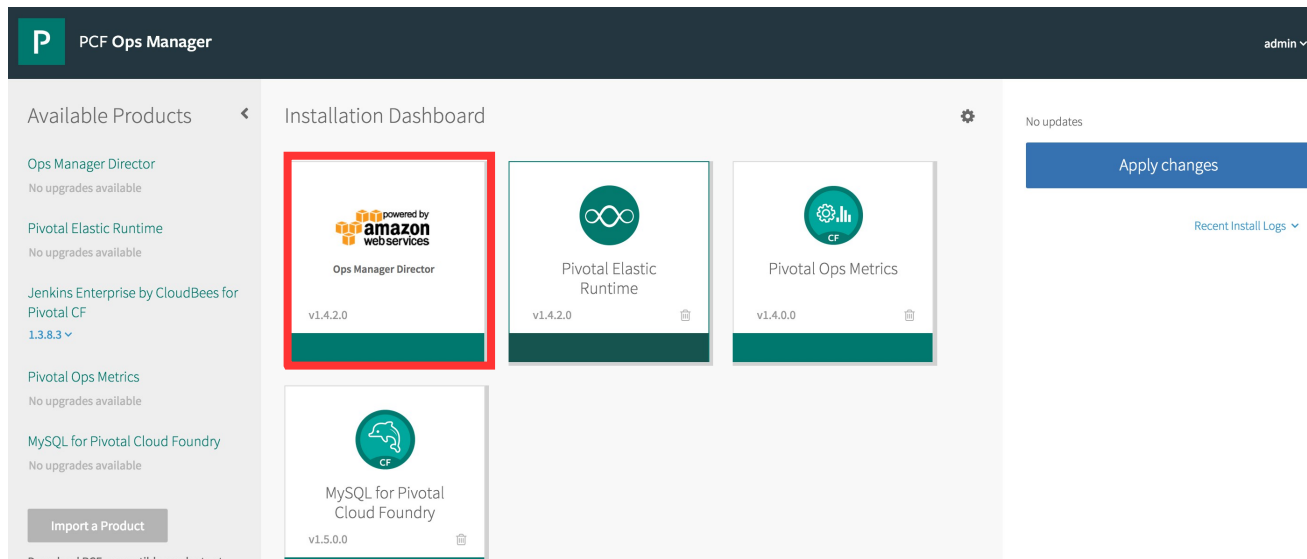
# MicroBOSH

- If the BOSH Director, NATS and Health Monitor are on a single VM, it is called MicroBOSH
- The BOSH database and blobstore can also be on the MicroBOSH VM or may be external



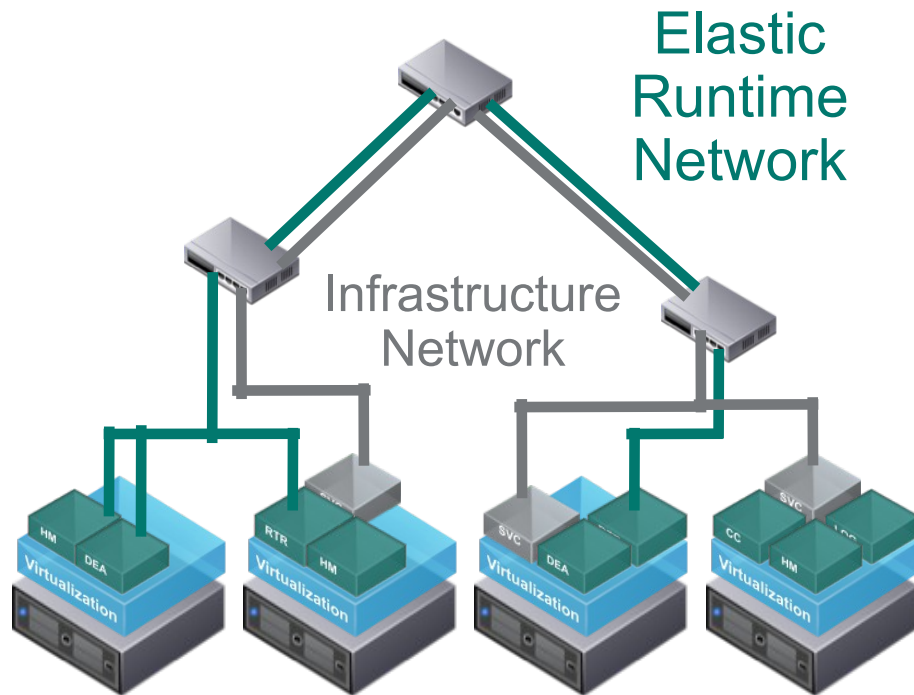
# MicroBOSH and Ops Manager Director

- The Pivotal Cloud Foundry installation uses MicroBOSH
- This is configured using the Ops Manager Director tile
  - After configuring and applying changes, you will see a MicroBOSH VM running in your installation



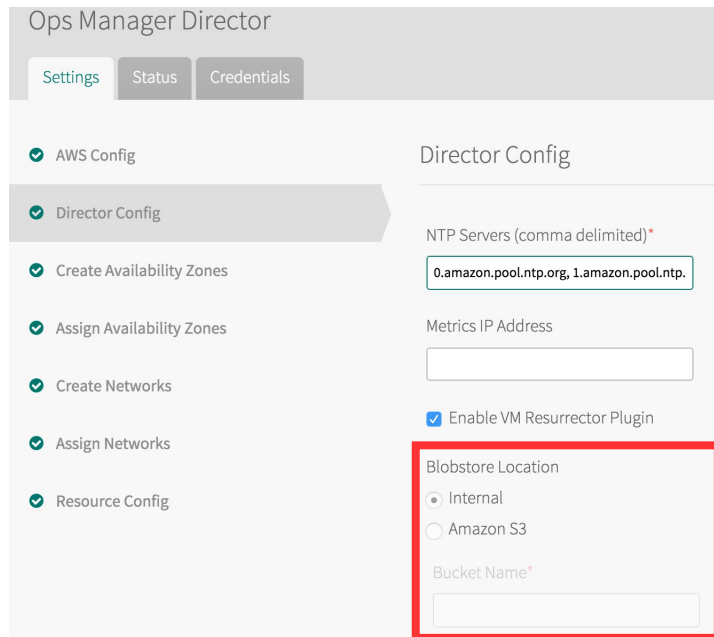
# Configuring Multiple Networks

- Isolate and segregate network traffic for Elastic Runtime from Pivotal Cloud Foundry services
- Operators define networks in Ops Manager
- Operators assign a network during installation of each Pivotal Cloud Foundry tile



# Specifying an External BOSH Blobstore or DB

- When you configure the Ops Manager Director (MicroBOSH), use the Director Config tab to specify the blobstore or DB location



Ops Manager Director

Settings Status Credentials

✓ AWS Config

✓ Director Config

✓ Create Availability Zones

✓ Assign Availability Zones

✓ Create Networks

✓ Assign Networks

✓ Resource Config

Director Config

NTP Servers (comma delimited)\*

0.amazon.pool.ntp.org, 1.amazon.pool.ntp.

Metrics IP Address

☒ Enable VM Resurrecter Plugin

Blobstore Location

☒ Internal

☐ Amazon S3

Bucket Name\*

# Topics

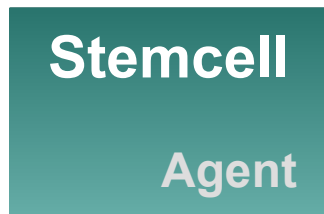
- BOSH and Ops Manager Introduction
- BOSH Architecture Introduction
- **BOSH Deployments**
- Using the BOSH CLI



# BOSH Deployment

## Three Main Components

- **Stemcell:** A template VM used for the cluster
- **Release:** Software and information on how to build the VMs in a cluster
- **Manifest:** Describes the cluster using configuration (YAML file)

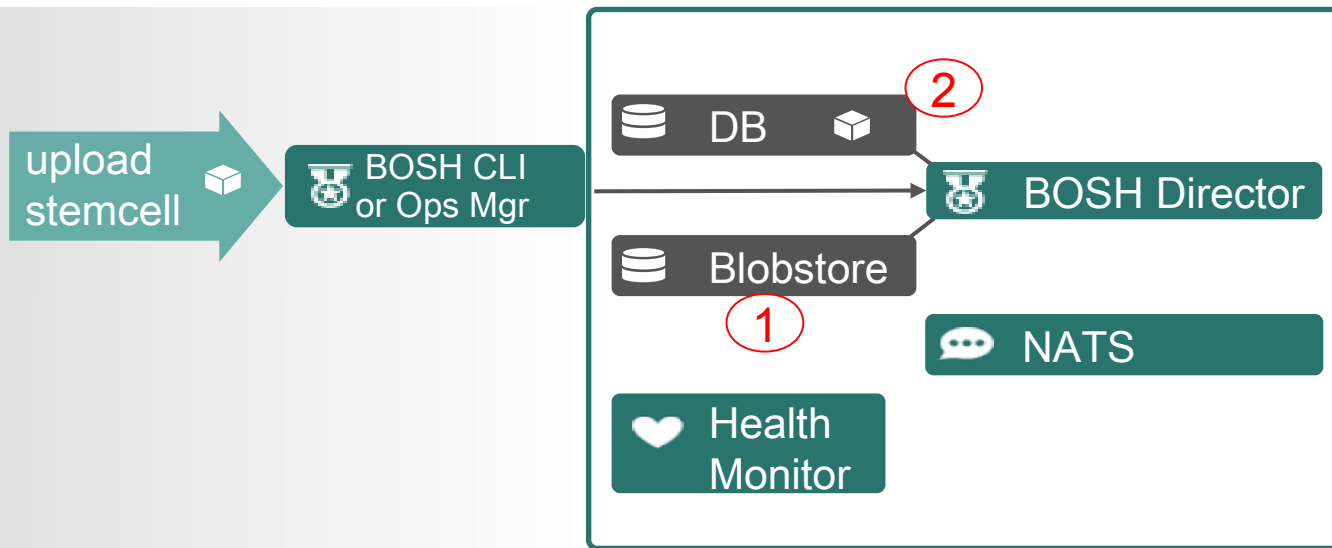


Release



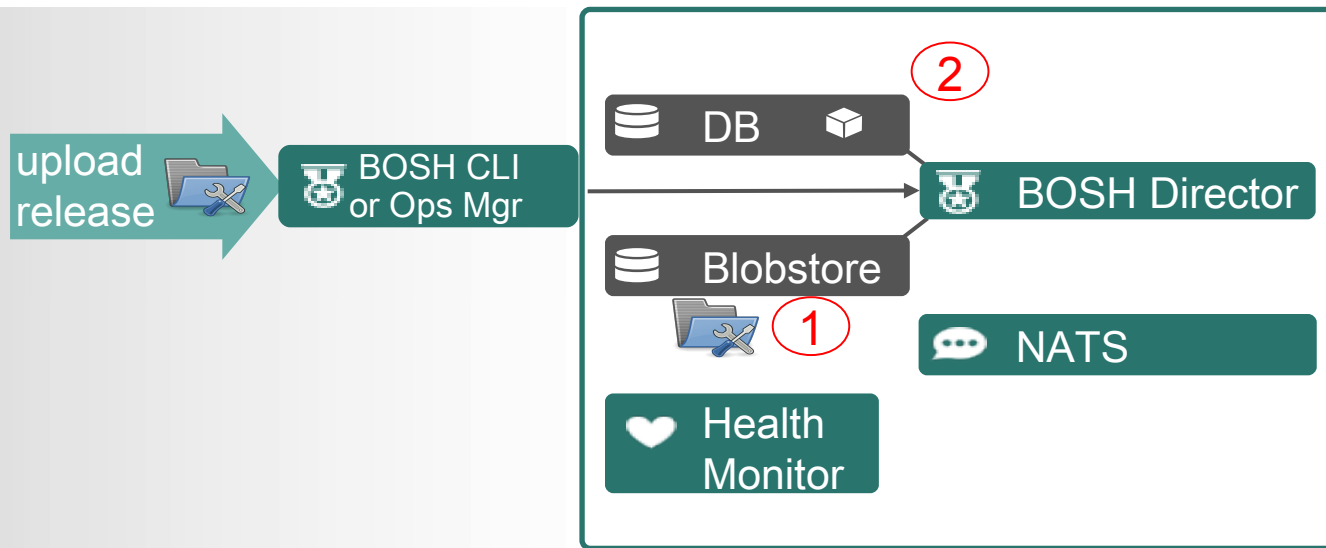
Manifest

# BOSH Deployment (1 of 4)



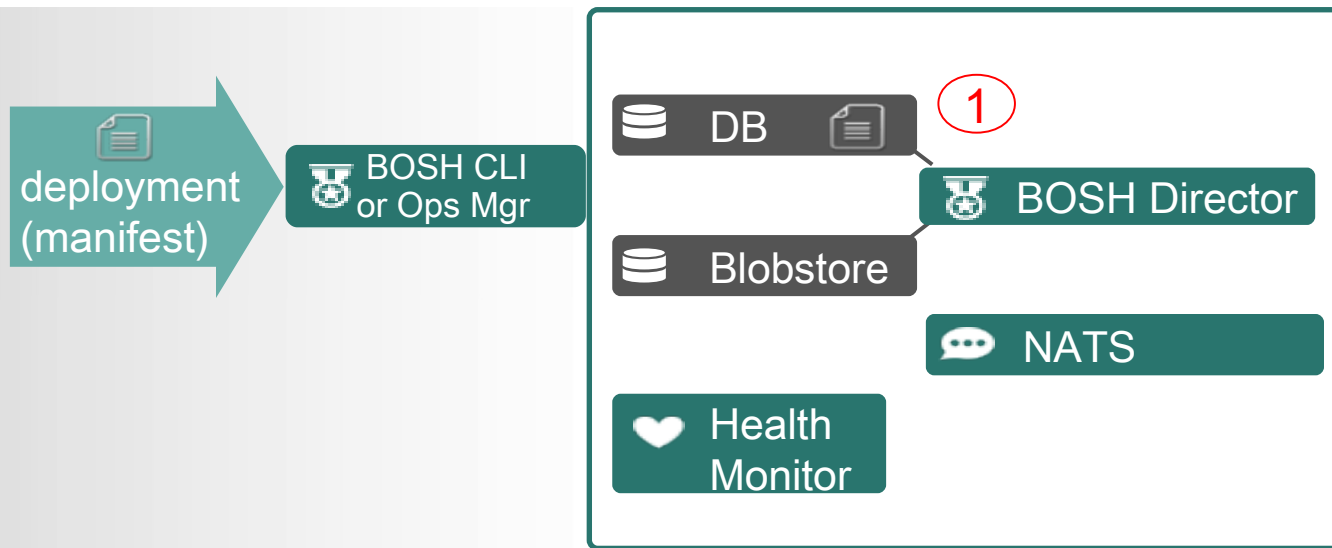
1. Upload stemcell (VM template) to blobstore
2. Register in director's DB

# BOSH Deployment (2 of 4)



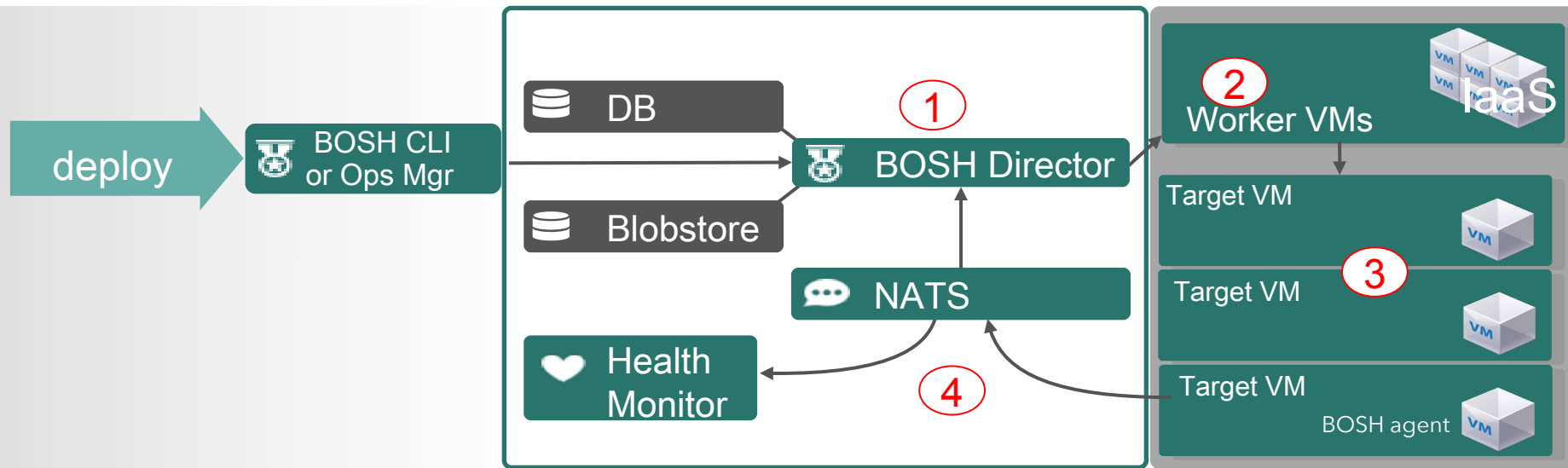
1. Upload release (software to install) into blobstore
2. Register in director's DB

# BOSH Deployment (3 of 4)



1. Pass manifest (deployment instructions) to director

# BOSH Deployment (4 of 4)

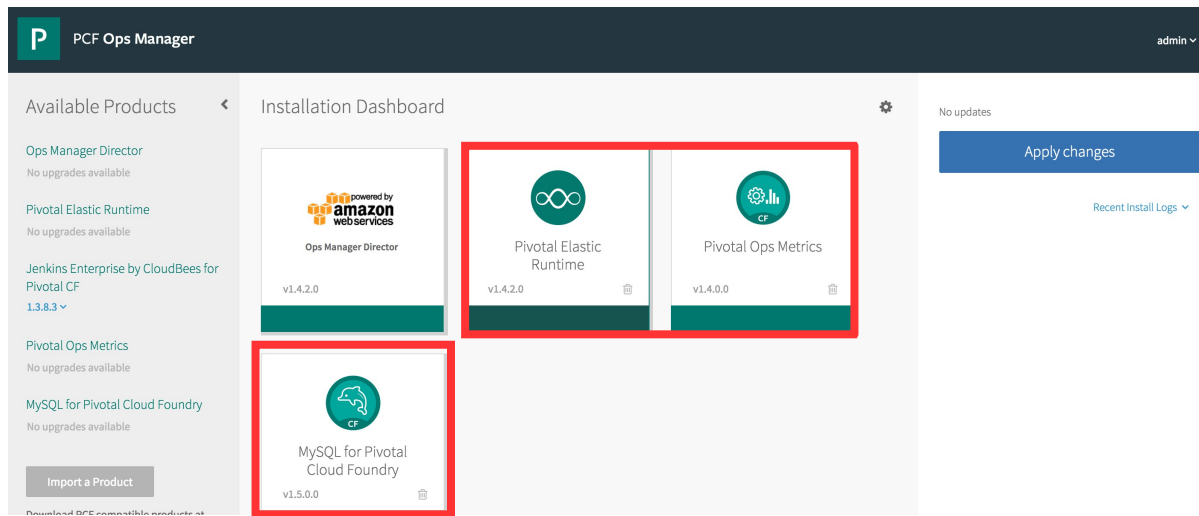


1. Director runs deployment
2. Drives worker VMs

3. Workers deploy desired VMs (from stemcells)
4. Director & HM updated with new system status

# BOSH Deployments and Ops Manager Tiles

- The tiles in Ops Manager are each tied to BOSH deployments
  - The exception is Ops Manager Director, which is BOSH
- Clicking “Apply changes” starts the deployment

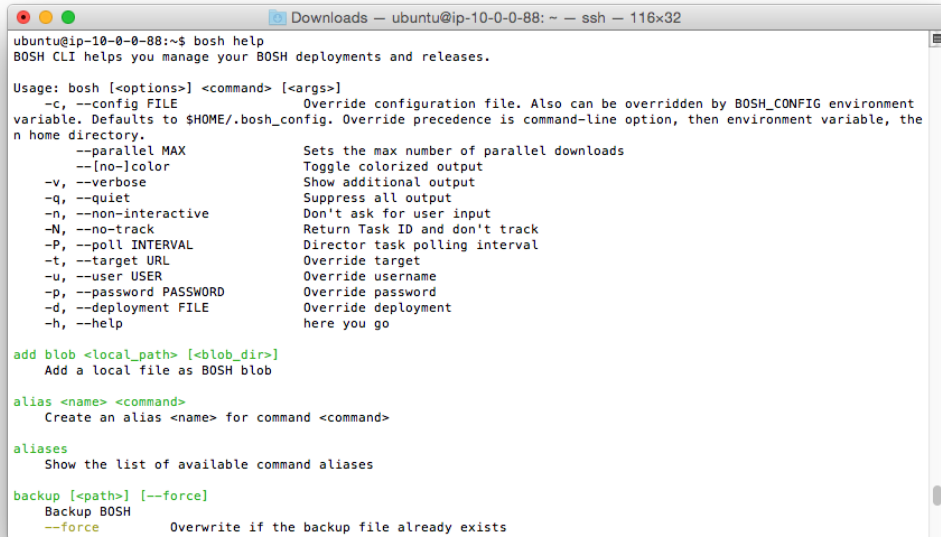


# Topics

- BOSH and Ops Manager Introduction
- BOSH Architecture Introduction
- BOSH Deployments
- **Using the BOSH CLI**

# The BOSH CLI

- The BOSH CLI is a client for communicating with a BOSH Director
- Similar in concept to the CF CLI, but for the BOSH layer rather than the application layer
- Use 'bosh help' to see the commands and options



```
ubuntu@ip-10-0-0-88:~$ bosh help
BOSH CLI helps you manage your BOSH deployments and releases.

Usage: bosh [<options>] <command> [<args>]
  -c, --config FILE           Override configuration file. Also can be overridden by BOSH_CONFIG environment
                              variable. Defaults to $HOME/.bosh_config. Override precedence is command-line option, then environment variable, the
                              n home directory.
      --parallel MAX          Sets the max number of parallel downloads
      --[no]-color            Toggle colorized output
  -v, --verbose               Show additional output
  -q, --quiet                 Suppress all output
  -n, --non-interactive       Don't ask for user input
  -N, --no-track              Return Task ID and don't track
  -P, --poll INTERVAL        Director task polling interval
  -t, --target URL            Override target
  -u, --user USER            Override username
  -p, --password PASSWORD    Override password
  -d, --deployment FILE      Override deployment
  -h, --help                  here you go

add blob <local_path> [<blob_dir>]
  Add a local file as BOSH blob

alias <name> <command>
  Create an alias <name> for command <command>

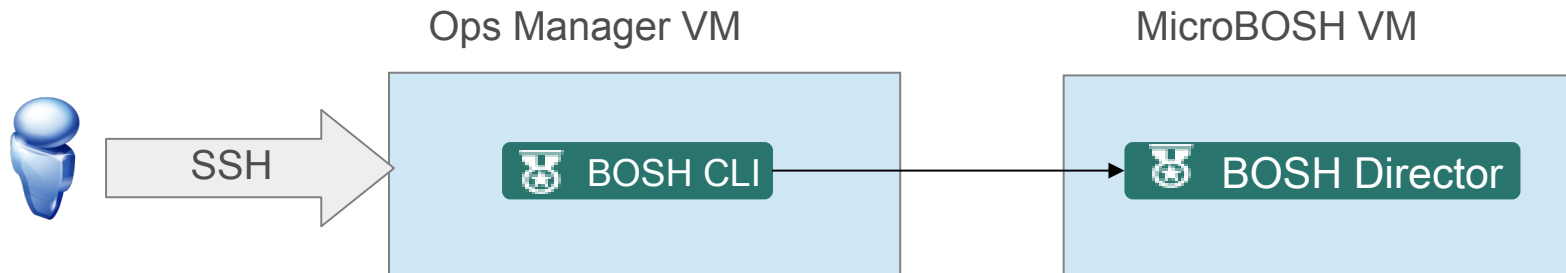
aliases
  Show the list of available command aliases

backup [<path>] [--force]
  Backup BOSH
  --force          Overwrite if the backup file already exists
```



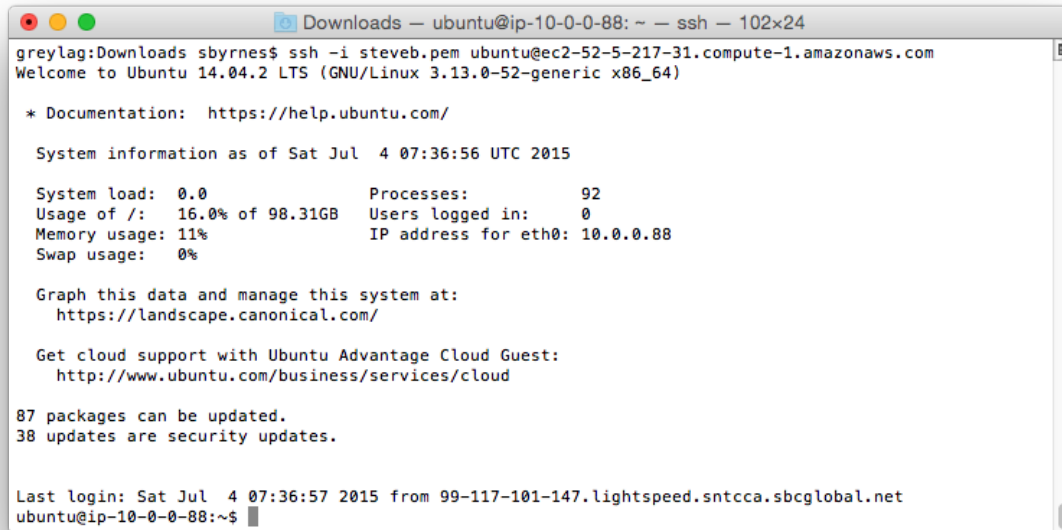
# Accessing the BOSH CLI via the Ops Manager VM

- In a typical Pivotal Cloud Foundry installation, the BOSH director is on the MicroBOSH VM
- The MicroBOSH VM is instantiated from the Ops Manager VM
- The Ops Manager VM has an accessible URL, but the MicroBOSH VM does not
- To access the BOSH director, SSH into the the Ops Manager VM and use the BOSH CLI from there



# SSH into the Ops Manager VM

- In a terminal window:
  - (AWS) `ssh -i mykey.pem ubuntu@[ops manager VM DNS]`
  - (vSphere) `ssh ubuntu@[ops manager VM DNS]`



```
Downloads — ubuntu@ip-10-0-0-88: ~ — ssh — 102x24
greylag:Downloads sbyrnes$ ssh -i steveb.pem ubuntu@ec2-52-5-217-31.compute-1.amazonaws.com
Welcome to Ubuntu 14.04.2 LTS (GNU/Linux 3.13.0-52-generic x86_64)

 * Documentation:  https://help.ubuntu.com/

System information as of Sat Jul  4 07:36:56 UTC 2015

System load:  0.0               Processes:            92
Usage of /:   16.0% of 98.31GB   Users logged in:     0
Memory usage: 11%              IP address for eth0: 10.0.0.88
Swap usage:   0%

Graph this data and manage this system at:
  https://landscape.canonical.com/

Get cloud support with Ubuntu Advantage Cloud Guest:
  http://www.ubuntu.com/business/services/cloud

87 packages can be updated.
38 updates are security updates.

Last login: Sat Jul  4 07:36:57 2015 from 99-117-101-147.lightspeed.sntcca.sbcglobal.net
ubuntu@ip-10-0-0-88:~$
```

# Targeting the BOSH Director on the MicroBOSH VM

- In Ops Manager, use the Status tab for the Ops Manager Director tile to obtain the IP address of the Ops Manager Director (MicroBOSH)
- Use the Credentials tab to determine the login credentials
- Then in a terminal use `bosh target [ops manager IP address]` to target the BOSH director

PCF Ops Manager

Installation Dashboard

Ops Manager Director

Settings Status Credentials

Jobs on Availability Zone "us-east-1a"

JOB	INDEX	IPS
Ops Manager Director	0	10.0.16.10

```
ubuntu@ip-10-0-0-88:~$ bosh version
BOSH 1.2865.0
ubuntu@ip-10-0-0-88:~$ bosh target 10.0.16.10
```

PCF Ops Manager

Installation Dashboard

Ops Manager Director

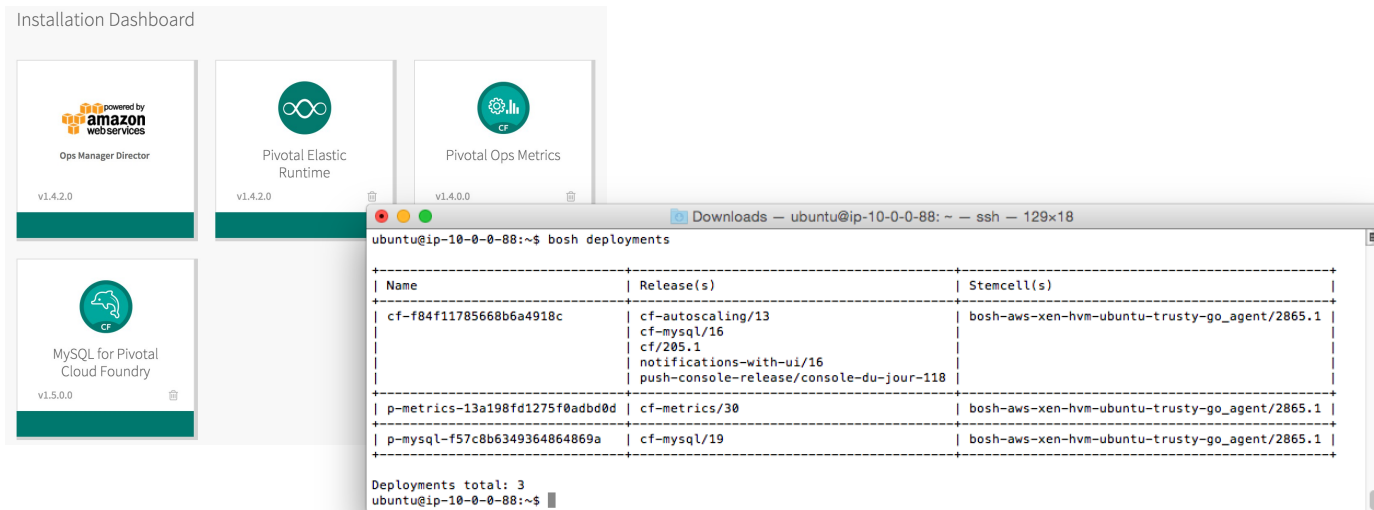
Settings Status Credentials

JOB	NAME	CREDENTIALS
Ops Manager Director	Vm Credentials	vcap / 77d2e06b20825109
	Agent Credentials	vcap / fedf8e9524aa24df5215
	Registry Credentials	registry / ec9357cfe76f69d63b44
	Director Credentials	director / e4995a8cc4f5a1dad5ef
	Nats Credentials	nats / d192b1d42b713915b611

# Viewing the BOSH Deployments

- Use `bosh deployments` to view the current deployments associated with BOSH director
  - Here, we see the deployments for Elastic Runtime, Ops Metrics and MySQL tiles in Ops Manager

Installation Dashboard



The screenshot shows the Pivotal Ops Manager Installation Dashboard. It features four tiles: 'Ops Manager Director' (powered by Amazon Web Services, v1.4.2.0), 'Pivotal Elastic Runtime' (v1.4.2.0), 'Pivotal Ops Metrics' (v1.4.0.0), and 'MySQL for Pivotal Cloud Foundry' (v1.5.0.0). A terminal window is overlaid on the dashboard, displaying the output of the `bosh deployments` command. The terminal output shows a table with three columns: Name, Release(s), and Stemcell(s). It lists three deployments: 'cf-f84f11785668b6a4918c', 'p-metrics-13a198fd1275f0adb0d', and 'p-mysql-f57c8b6349364864869a'. Each deployment is associated with specific releases and a common stemcell.

Name	Release(s)	Stemcell(s)
cf-f84f11785668b6a4918c	cf-autoscaling/13 cf-mysql/16 cf/205.1 notifications-with-ui/16 push-console-release/console-du-jour-118	bosh-aws-xen-hvm-ubuntu-trusty-go_agent/2865.1
p-metrics-13a198fd1275f0adb0d	cf-metrics/30	bosh-aws-xen-hvm-ubuntu-trusty-go_agent/2865.1
p-mysql-f57c8b6349364864869a	cf-mysql/19	bosh-aws-xen-hvm-ubuntu-trusty-go_agent/2865.1

Deployments total: 3  
ubuntu@ip-10-0-0-88:~\$

# Viewing the BOSH-Managed VMs

- Use `bosh vms` to view the VMs associated with each deployment

```
Downloads — ubuntu@ip-10-0-0-88: ~ — ssh — 156x43
Deployments total: 3
ubuntu@ip-10-0-0-88:~$ bosh vms
Deployment 'cf-f84f11785668b6a4918c'

Director task 159

Task 159 done
```

Job/index	State	Resource Pool	IPs
ccdb-partition-45210e4796e44c8b25d4/0	running	ccdb-partition-45210e4796e44c8b25d4	10.0.16.17
clock_global-partition-45210e4796e44c8b25d4/0	running	clock_global-partition-45210e4796e44c8b25d4	10.0.16.23
cloud_controller-partition-45210e4796e44c8b25d4/0	running	cloud_controller-partition-45210e4796e44c8b25d4	10.0.16.20
cloud_controller_worker-partition-45210e4796e44c8b25d4/0	running	cloud_controller_worker-partition-45210e4796e44c8b25d4	10.0.16.24
collector-partition-45210e4796e44c8b25d4/0	running	collector-partition-45210e4796e44c8b25d4	10.0.16.25
consoledb-partition-45210e4796e44c8b25d4/0	running	consoledb-partition-45210e4796e44c8b25d4	10.0.16.19
dea-partition-45210e4796e44c8b25d4/0	running	dea-partition-45210e4796e44c8b25d4	10.0.16.30
doppler-partition-45210e4796e44c8b25d4/0	running	doppler-partition-45210e4796e44c8b25d4	10.0.16.31
etcd_server-partition-45210e4796e44c8b25d4/0	running	etcd_server-partition-45210e4796e44c8b25d4	10.0.16.15
health_manager-partition-45210e4796e44c8b25d4/0	running	health_manager-partition-45210e4796e44c8b25d4	10.0.16.22
loggregator_trafficcontroller-partition-45210e4796e44c8b25d4/0	running	loggregator_trafficcontroller-partition-45210e4796e44c8b25d4	10.0.16.32
login-partition-45210e4796e44c8b25d4/0	running	login-partition-45210e4796e44c8b25d4	10.0.16.27
mysql-partition-45210e4796e44c8b25d4/0	running	mysql-partition-45210e4796e44c8b25d4	10.0.16.29
mysql_proxy-partition-45210e4796e44c8b25d4/0	running	mysql_proxy-partition-45210e4796e44c8b25d4	10.0.16.28
nats-partition-45210e4796e44c8b25d4/0	running	nats-partition-45210e4796e44c8b25d4	10.0.16.14
nfs_server-partition-45210e4796e44c8b25d4/0	running	nfs_server-partition-45210e4796e44c8b25d4	10.0.16.16
router-partition-45210e4796e44c8b25d4/0	running	router-partition-45210e4796e44c8b25d4	10.0.16.21
uaa-partition-45210e4796e44c8b25d4/0	running	uaa-partition-45210e4796e44c8b25d4	10.0.16.26
uaadb-partition-45210e4796e44c8b25d4/0	running	uaadb-partition-45210e4796e44c8b25d4	10.0.16.18

```
VMs total: 19
Deployment 'p-metrics-13a198fd1275f8adb0d'

Director task 160

Task 160 done
```

Job/index	State	Resource Pool	IPs
maximus-partition-45210e4796e44c8b25d4/0	running	maximus-partition-45210e4796e44c8b25d4	10.0.16.11

# Viewing VM Details

- Use `bosh vms --vitals` to get current VM information

```
Downloads — ubuntu@ip-10-0-0-88: ~ — ssh — 61x7
ubuntu@ip-10-0-0-88:~$ bosh help vms
vms [<deployment_name>] [--details] [--dns] [--vitals]
  List all VMs in a deployment
  --details      Return detailed VM information
  --dns          Return VM DNS A records
  --vitals       Return VM vitals information
ubuntu@ip-10-0-0-88:~$
```

```
Downloads — ubuntu@ip-10-0-0-88: ~ — ssh — 265x31
ubuntu@ip-10-0-0-88:~$ bosh vms --vitals
Deployment: 'cf-f041178568b6a4918'
```

Director task 165

Task 165 done

Job/index	State	Resource Pool	IPs	Load (avg01, avg05, avg15)	CPU User	CPU Sys	CPU Wait	Memory Usage	Swap Usage	System Disk Usage	Ephemeral Disk Usage	Persistent Disk Usage
ccdb-partition-45210e4796e44c8b25d4/0	running	ccdb-partition-45210e4796e44c8b25d4	10.0.16.17	0.03, 0.02, 0.05	0.0%	0.0%	0.2%	12% (115.0M)	0% (0B)	69%	7%	3%
clock_global-partition-45210e4796e44c8b25d4/0	running	clock_global-partition-45210e4796e44c8b25d4	10.0.16.23	0.00, 0.01, 0.05	0.1%	0.0%	0.2%	22% (220.5M)	0% (0B)	69%	32%	n/a
cloud_controller-partition-45210e4796e44c8b25d4/0	running	cloud_controller-partition-45210e4796e44c8b25d4	10.0.16.28	0.03, 0.02, 0.05	0.1%	0.0%	0.1%	0% (60.0M)	0% (11.3M)	69%	35%	n/a
cloud_controller_worker-partition-45210e4796e44c8b25d4/0	running	cloud_controller_worker-partition-45210e4796e44c8b25d4	10.0.16.24	0.00, 0.01, 0.05	0.0%	0.0%	0.2%	22% (217.5M)	0% (0B)	69%	32%	n/a
collector-partition-45210e4796e44c8b25d4/0	running	collector-partition-45210e4796e44c8b25d4	10.0.16.25	0.00, 0.01, 0.05	0.0%	0.0%	0.1%	13% (130.0M)	0% (0B)	69%	31%	n/a
consoledb-partition-45210e4796e44c8b25d4/0	running	consoledb-partition-45210e4796e44c8b25d4	10.0.16.19	0.00, 0.01, 0.05	0.0%	0.0%	0.2%	10% (97.3M)	0% (0B)	69%	7%	4%
dea-partition-45210e4796e44c8b25d4/0	running	dea-partition-45210e4796e44c8b25d4	10.0.16.38	0.00, 0.01, 0.05	0.1%	0.2%	0.0%	4% (1.2G)	0% (0B)	69%	42%	n/a
doppler-partition-45210e4796e44c8b25d4/0	running	doppler-partition-45210e4796e44c8b25d4	10.0.16.31	0.00, 0.01, 0.05	0.2%	0.0%	0.1%	11% (109.3M)	0% (0B)	69%	3%	n/a
etcd_server-partition-45210e4796e44c8b25d4/0	running	etcd_server-partition-45210e4796e44c8b25d4	10.0.16.15	0.00, 0.01, 0.05	0.1%	0.0%	0.0%	12% (123.5M)	0% (0B)	69%	4%	0%
health_manager-partition-45210e4796e44c8b25d4/0	running	health_manager-partition-45210e4796e44c8b25d4	10.0.16.22	0.00, 0.01, 0.05	0.0%	0.0%	0.4%	14% (139.0M)	0% (0B)	69%	21%	n/a
loggregator_trafficcontroller-partition-45210e4796e44c8b25d4/0	running	loggregator_trafficcontroller-partition-45210e4796e44c8b25d4	10.0.16.32	0.00, 0.01, 0.05	0.1%	0.0%	0.5%	9% (92.7M)	0% (0B)	69%	2%	n/a
login-partition-45210e4796e44c8b25d4/0	running	login-partition-45210e4796e44c8b25d4	10.0.16.27	0.00, 0.01, 0.05	0.0%	0.0%	0.0%	30% (376.0M)	0% (4.0M)	69%	46%	n/a
mysql-partition-45210e4796e44c8b25d4/0	running	mysql-partition-45210e4796e44c8b25d4	10.0.16.29	0.00, 0.01, 0.05	0.0%	0.0%	0.1%	4% (623.3M)	0% (0B)	69%	7%	5%
mysql_proxy-partition-45210e4796e44c8b25d4/0	running	mysql_proxy-partition-45210e4796e44c8b25d4	10.0.16.28	0.00, 0.01, 0.05	0.1%	0.0%	0.3%	9% (84.6M)	0% (0B)	69%	1%	n/a
nats-partition-45210e4796e44c8b25d4/0	running	nats-partition-45210e4796e44c8b25d4	10.0.16.14	0.05, 0.05, 0.05	0.1%	0.0%	0.2%	9% (87.0M)	0% (0B)	69%	2%	n/a
nfs_server-partition-45210e4796e44c8b25d4/0	running	nfs_server-partition-45210e4796e44c8b25d4	10.0.16.16	0.00, 0.01, 0.05	0.0%	0.0%	0.1%	10% (102.0M)	0% (450.0K)	69%	1%	9%
router-partition-45210e4796e44c8b25d4/0	running	router-partition-45210e4796e44c8b25d4	10.0.16.21	0.00, 0.01, 0.05	0.0%	0.1%	0.4%	11% (105.6M)	0% (0B)	69%	7%	n/a
uaa-partition-45210e4796e44c8b25d4/0	running	uaa-partition-45210e4796e44c8b25d4	10.0.16.26	0.00, 0.01, 0.05	0.1%	0.0%	0.2%	37% (368.0M)	0% (3.7M)	69%	43%	n/a
uaadb-partition-45210e4796e44c8b25d4/0	running	uaadb-partition-45210e4796e44c8b25d4	10.0.16.18	0.00, 0.01, 0.05	0.0%	0.0%	0.5%	11% (113.1M)	0% (0B)	69%	7%	1%

# BOSH status

- Use `bosh status` to view overall BOSH information

A terminal window titled "Downloads — ubuntu@ip-10-0-0-88: ~ — ssh — 96x21" displays the output of the `bosh status` command. The output is color-coded: green for section headers and yellow for values. The sections shown are Config, Director, and Deployment.

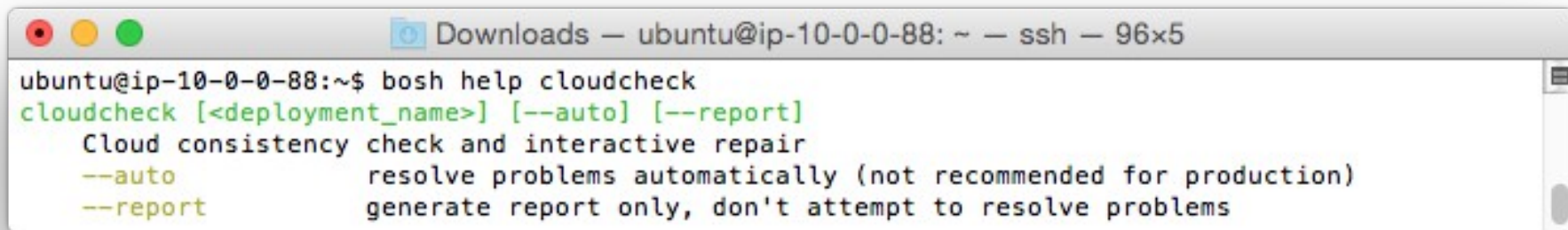
```
status [--uuid]
  Show current status (current target, user, deployment info etc)
  --uuid      Only print director UUID
ubuntu@ip-10-0-0-88:~$ bosh status
Config
      /home/ubuntu/.bosh_config

Director
Name      microbosh-a65ffb6c8d8c90a7c2d9
URL        https://10.0.16.10:25555
Version    1.2865.1.0 (00000000)
User       director
UUID       4c9203b0-d97a-4788-b122-7db27714b40f
CPI        aws
dns        enabled (domain_name: microbosh)
compiled_package_cache disabled
snapshots  disabled

Deployment
not set
```

# BOSH cloudcheck

- Use `bosh cloudcheck --report` to view a problem report
  - Pivotal support may request a copy of this report

A terminal window titled "Downloads — ubuntu@ip-10-0-0-88: ~ — ssh — 96x5" displays the command `bosh help cloudcheck` and its output. The output shows the `cloudcheck` command with optional arguments `--auto` and `--report`, followed by a description of the command's function and the meaning of each flag.

```
ubuntu@ip-10-0-0-88:~$ bosh help cloudcheck
cloudcheck [<deployment_name>] [--auto] [--report]
  Cloud consistency check and interactive repair
  --auto          resolve problems automatically (not recommended for production)
  --report        generate report only, don't attempt to resolve problems
```



# Viewing BOSH Commands in Installation Logs

If you install or update products using Ops Manager, the logs will show deployment-related BOSH commands

```
Running "bundle exec bosh -n upload stemcell  
/var/tempest/stemcells/light-bosh-stemcell-2865.1-aws-xen-  
hvm-ubuntu-trusty-go_agent.tgz -skip-if-exists"
```

```
Running "bundle exec bosh -n upload release  
/var/tempest/releases/cf-metrics-30.tgz --skip-if-exists"
```

```
Running "bundle exec bosh -n deployment  
/var/tempest/workspaces/default/deployments/p-metrics-  
13a198fd1275f0adbd0d.yml"
```

```
Running "bundle exec bosh -n deploy"
```

# Topics

- BOSH and Ops Manager Introduction
- BOSH Architecture Introduction
- BOSH Deployments
- Using the BOSH CLI

# Lab

Install Ops Manager, Ops Manager  
Director and use the BOSH CLI