Cloud Foundry Deep Dive

Part 2: Architecture and Operations

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Before we get started…

Install Prerequisites

- VirtualBox (https://www.virtualbox.org/wiki/Downloads)
- Vagrant (http://www.vagrantup.com/downloads.html)
- Ruby 1.9.3 - use one of these version managers:
  - RVM (http://rvm.io)
  - rbenv (https://github.com/sstephenson/rbenv)
- BOSH CLI Gem (gem install bosh_cli)
- Git (http://git-scm.com/downloads) or “brew install git”
- spiff (https://github.com/cloudfoundry-incubator/spiff/releases)
- cf (https://github.com/cloudfoundry/cli/releases)

After all of that:

```
curl https://raw2.github.com/pivotalservices/bosh-lite-installer/update-cf-boshrelease/binscripts/bosh-lite-cloudfoundry-demo | bash
```

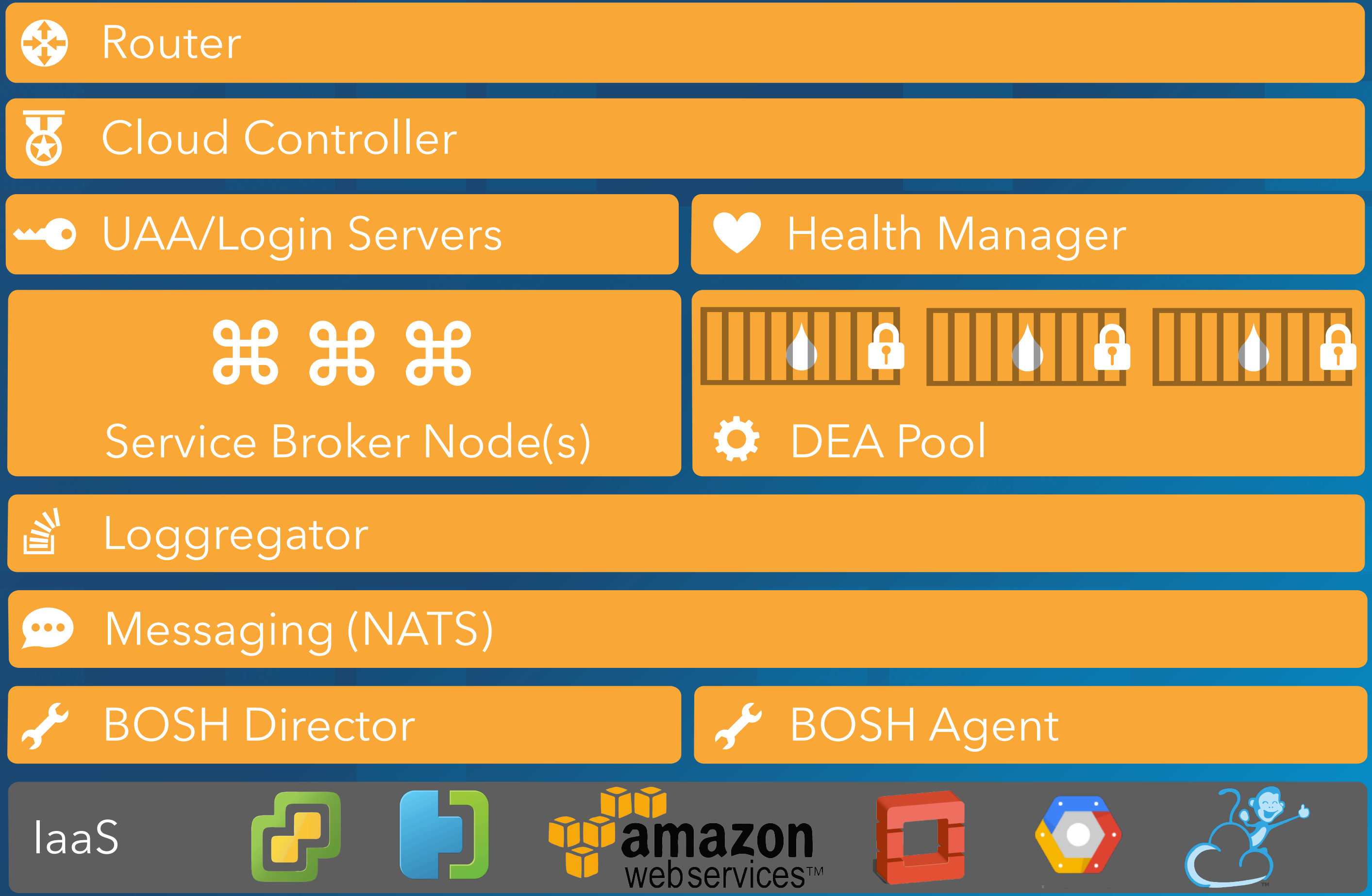
If you want to see what this is doing first:

https://github.com/pivotalservices/bosh-lite-installer/blob/update-cf-boshrelease/binscripts/bosh-lite-cloudfoundry-demo

Architecture and Operations

- ~~Install Prerequisites~~
- ~~Install Cloud Foundry Runtime on BOSH Lite~~
- Cloud Foundry Architecture Overview
- Cloud Foundry BOSH Overview
- Test Your New Private Cloud Foundry!

Cloud Foundry Architecture Stack



Router

Cloud Controller

UAA/Login Servers

Health Manager

Service Broker Node(s)

DEA Pool

Loggregator

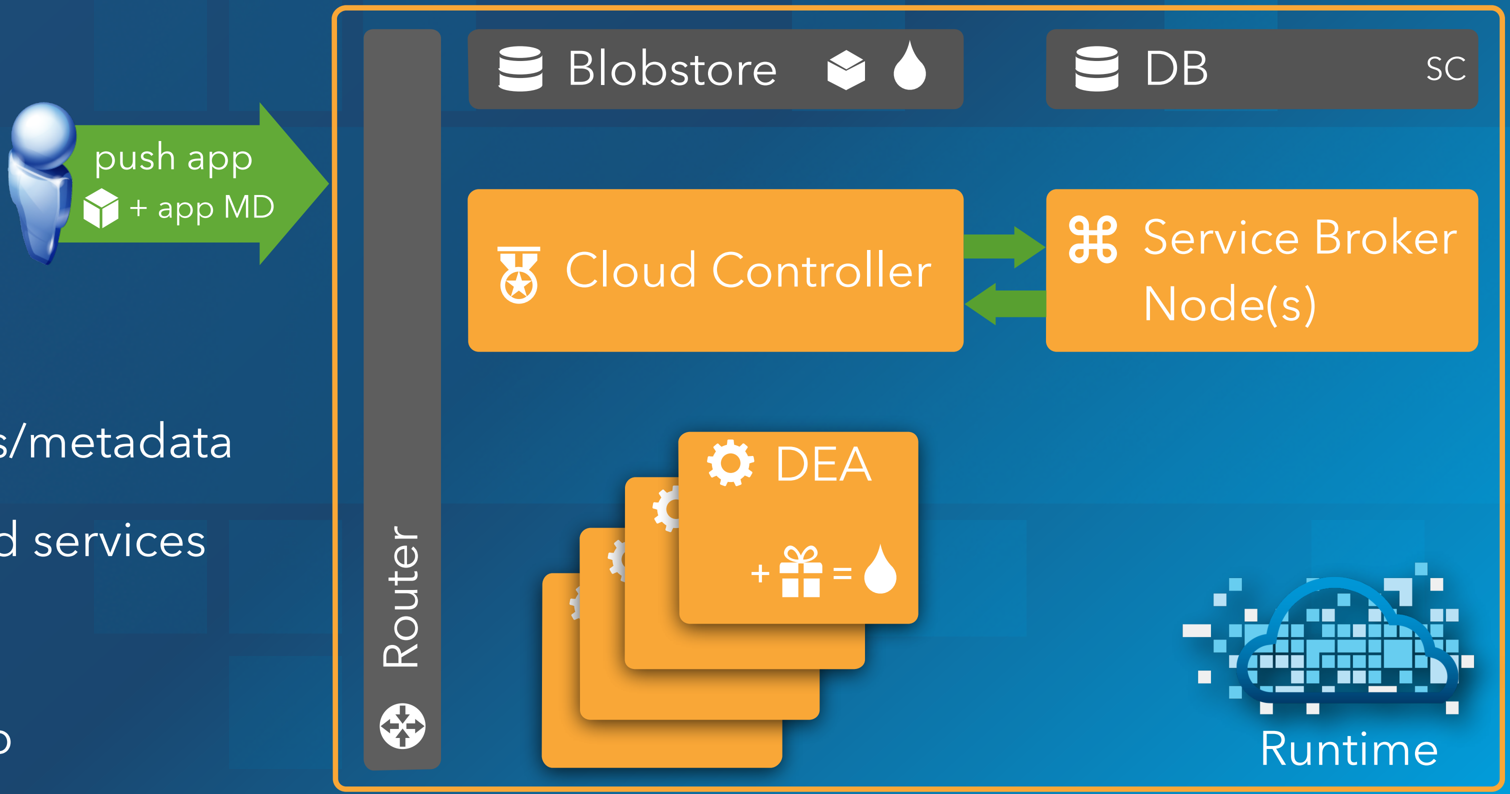
Messaging (NATS)

BOSH Director

BOSH Agent

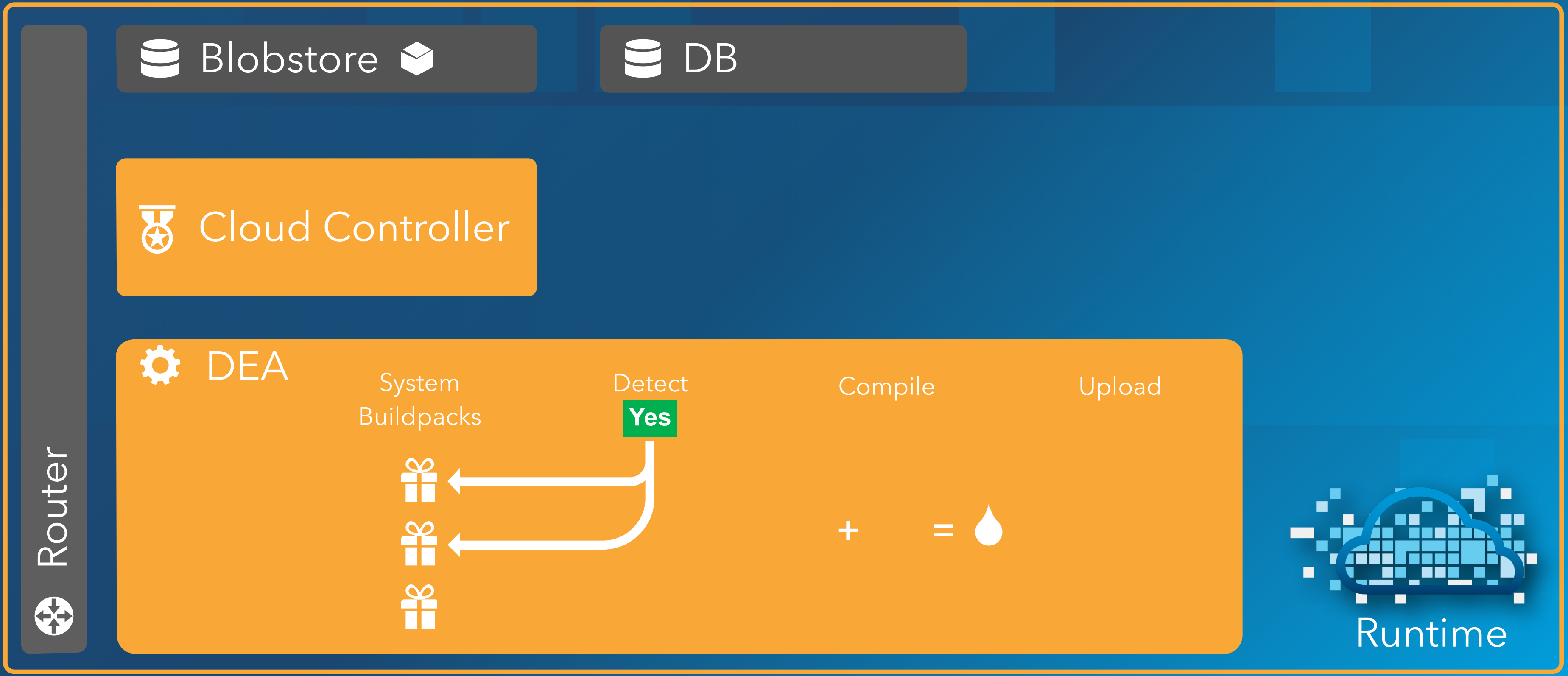
IaaS

Deploying Applications to Cloud Foundry Runtime



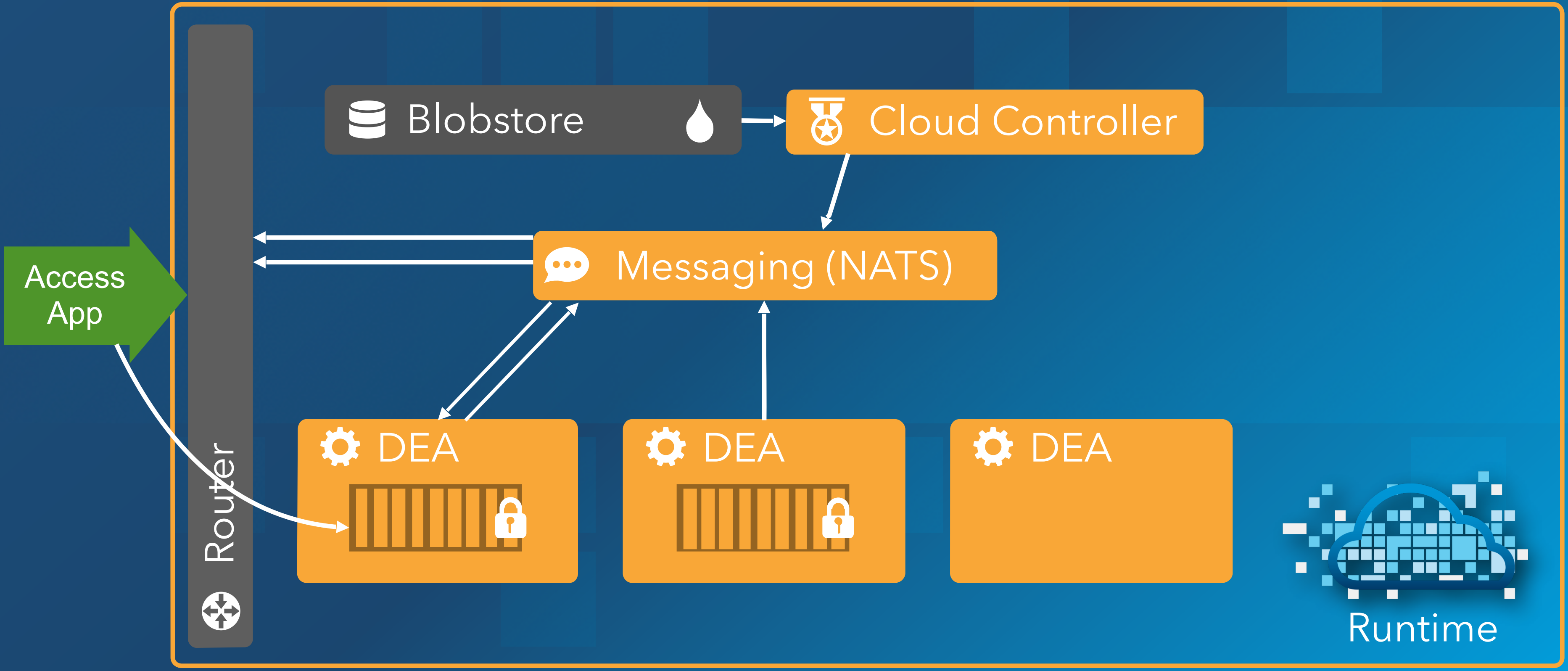
1. Upload bits/metadata
2. Create/bind services
3. Stage app
4. Deploy app

Stage an App

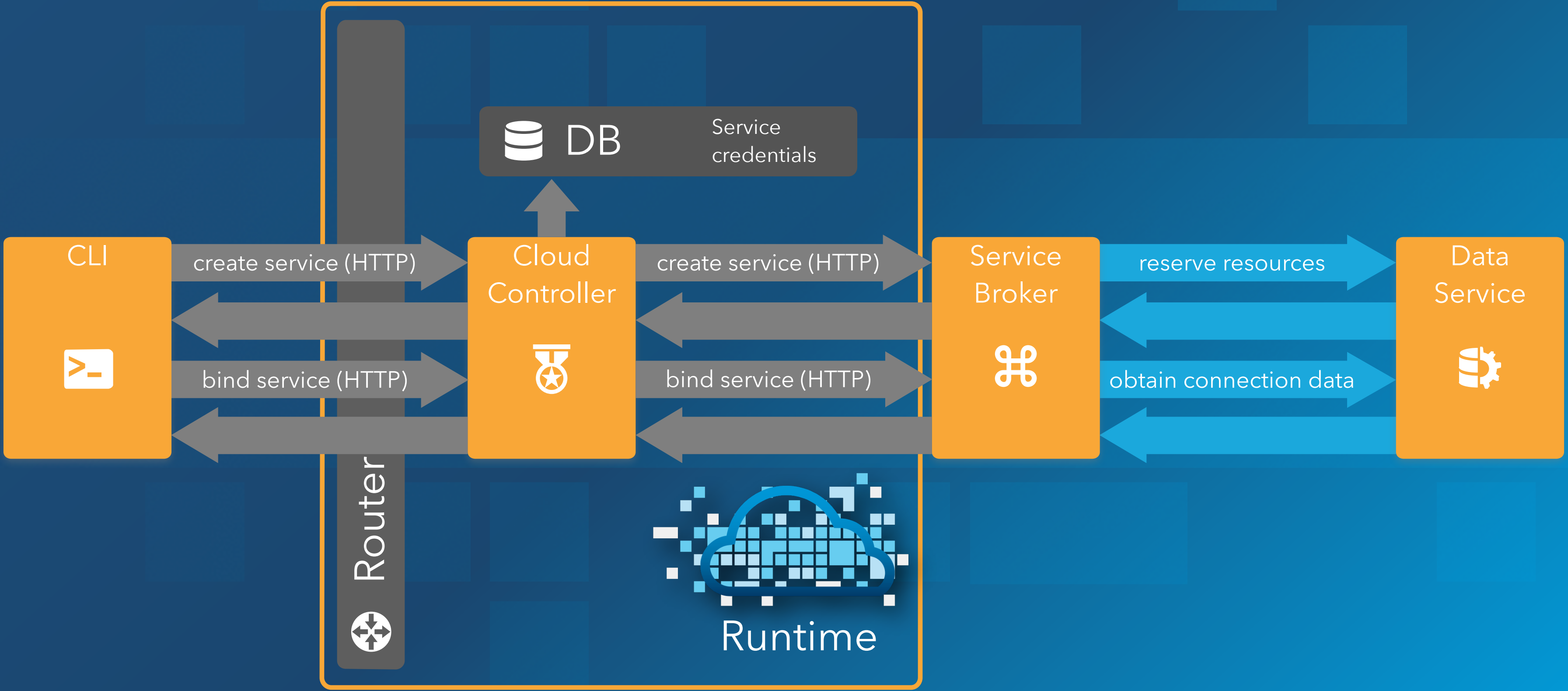


Blobstore
DB
Cloud Controller
DEA
System Buildpacks
Detect
Yes
Compile
Upload
+
=
Router
Runtime

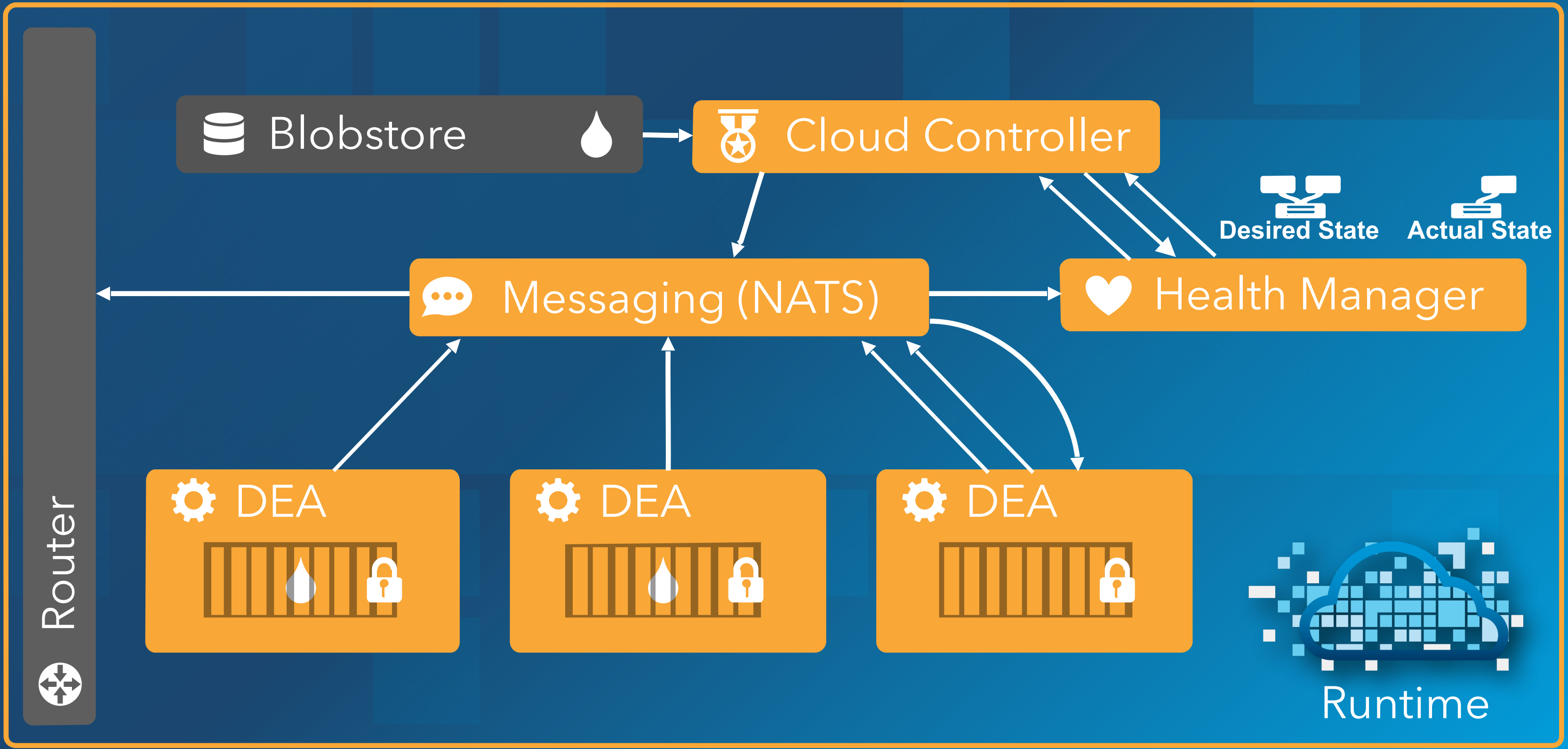
Deploy and Scale an App



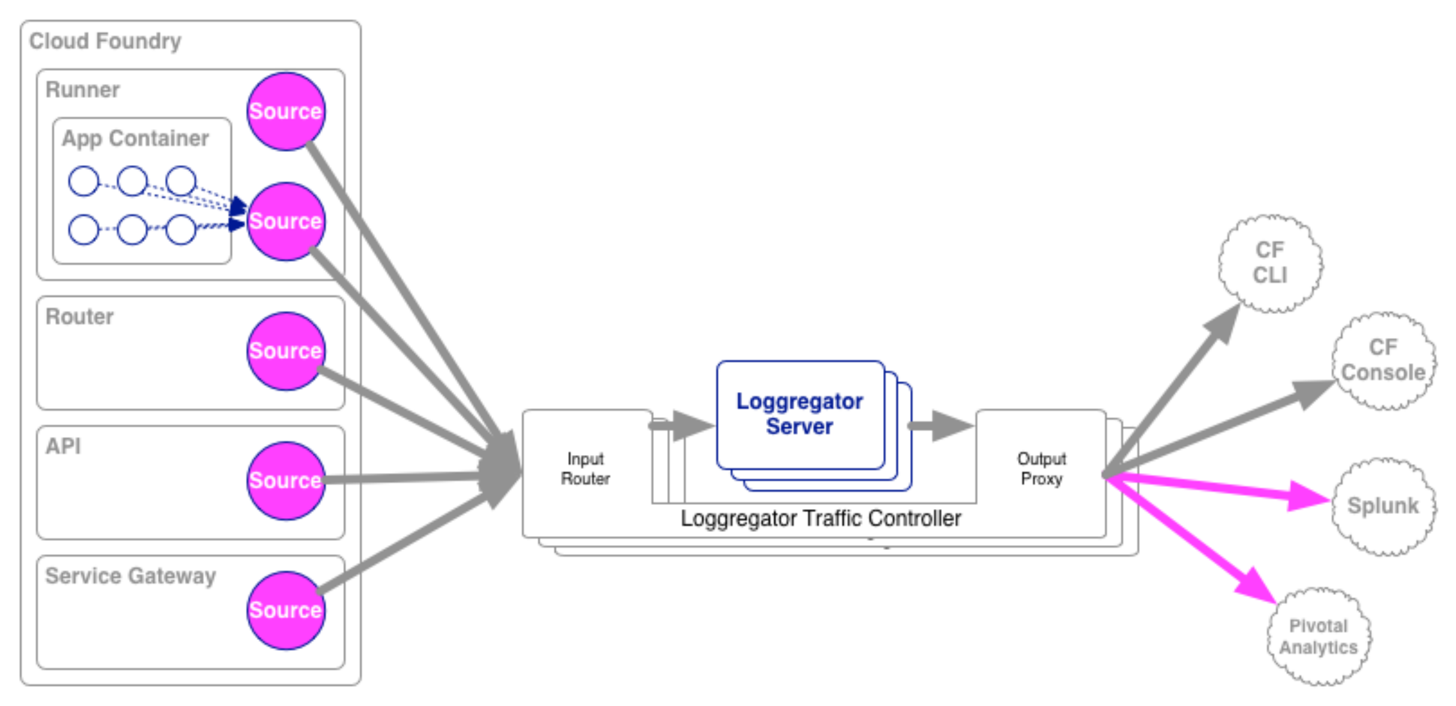
Create and Bind Services



Maintain App Health



Monitor App Logs



Architecture and Operations

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Cloud Foundry Architecture: Why?

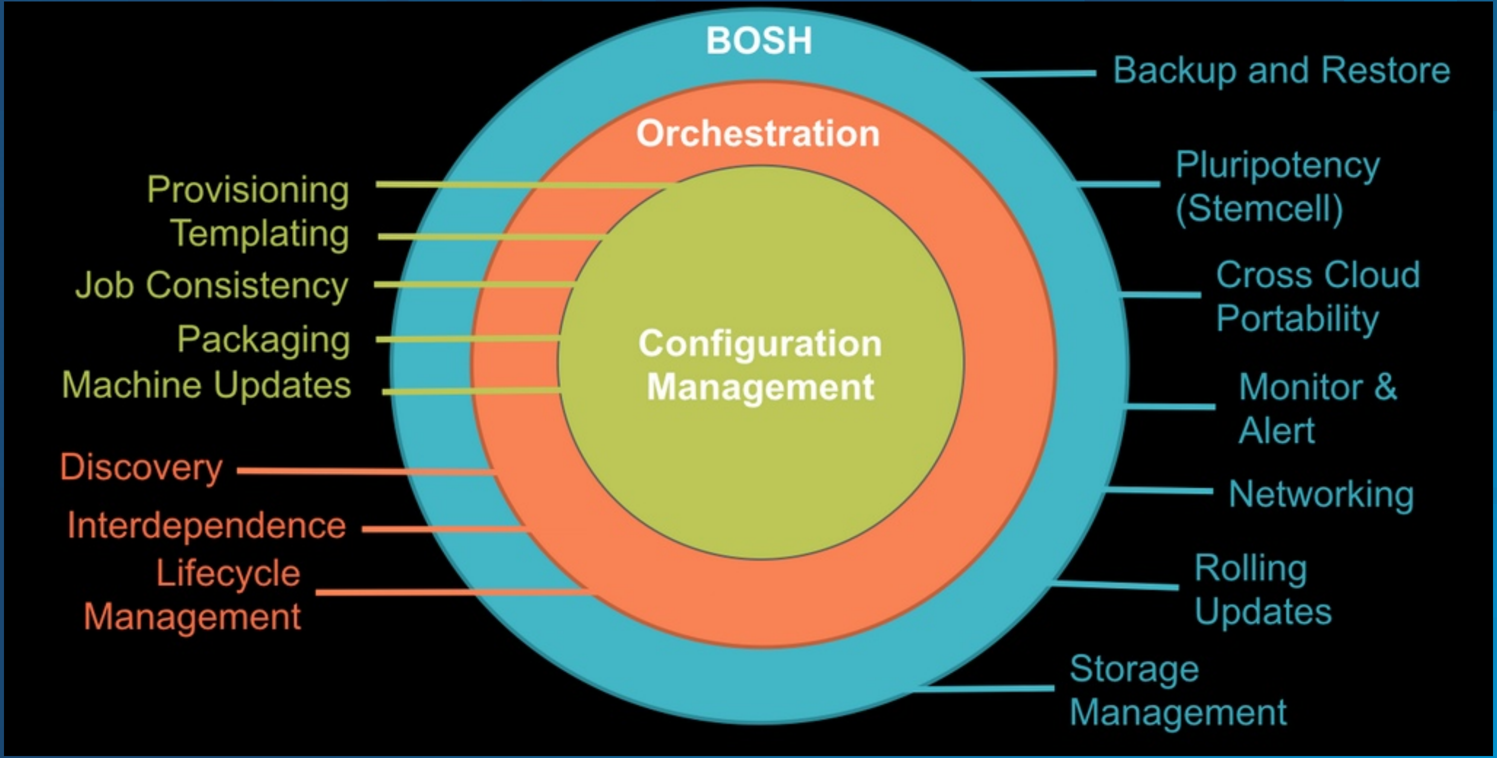
- Component Isolation
- Scalability
- Fault Tolerance
- Pre-provisioned Capacity (Containers/Warden)

How do we manage this thing?

We need a toolchain that can manage a large distributed system through:

- Deployment
- Configuration Changes
- Updates/Upgrades (w/ minimal - zero - downtime!)
- Component Failure / Restoration of Service
- Scale Out / Scale In
- Across multiple IaaS providers: vSphere, OpenStack, AWS, Apache Cloudstack, Google Compute Engine, and beyond...

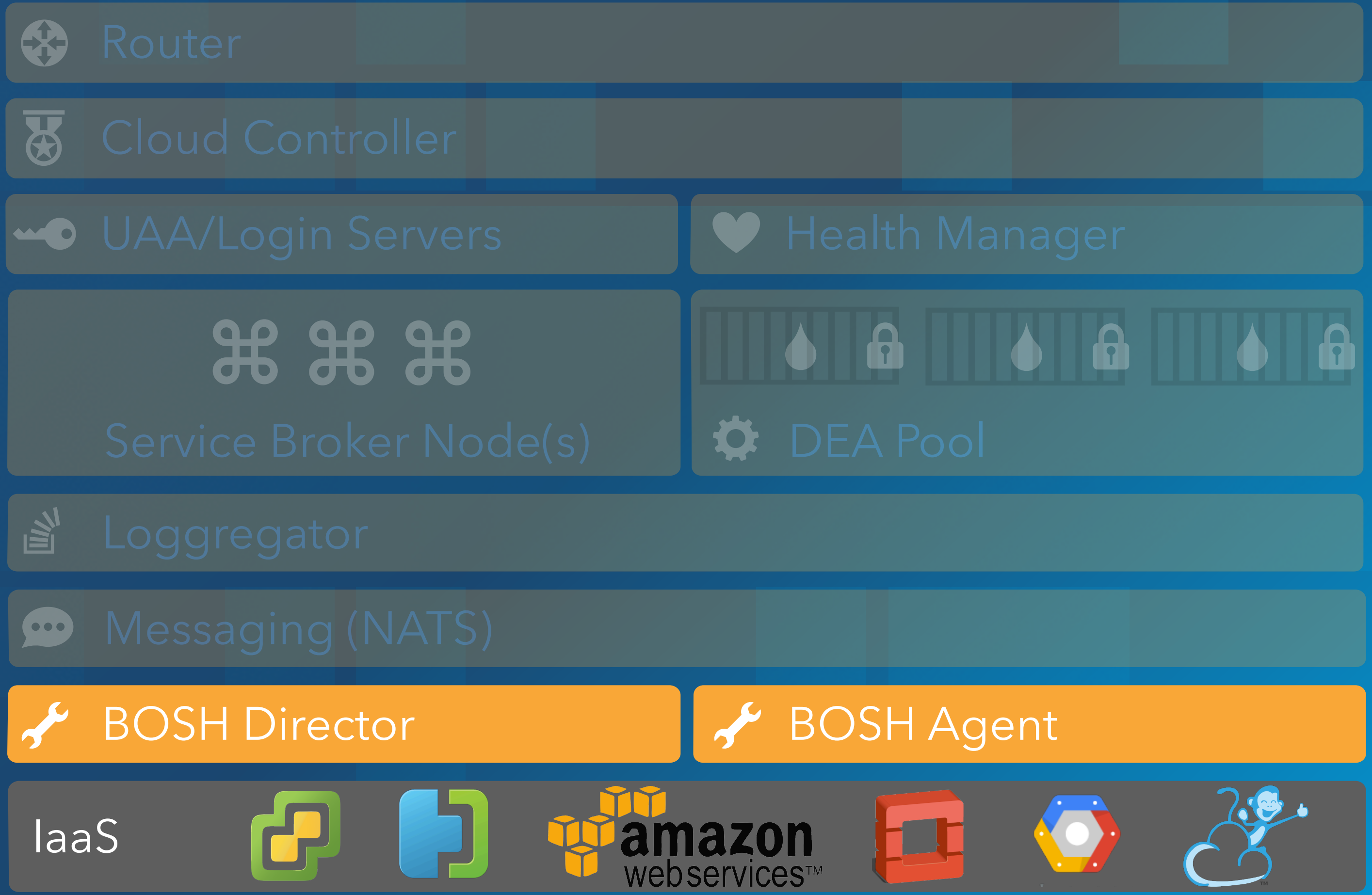
Cloud Foundry BOSH



Why BOSH?

- Provision services, not machines
- Eliminate bespoke automation on top of configuration management
- Enable continuous delivery of platform services
- Cloud-agnostic view of platform operations
- Holistic toolchain to "rule them all"
- How we manage Cloud Foundry in production!

Cloud Foundry Architecture Stack



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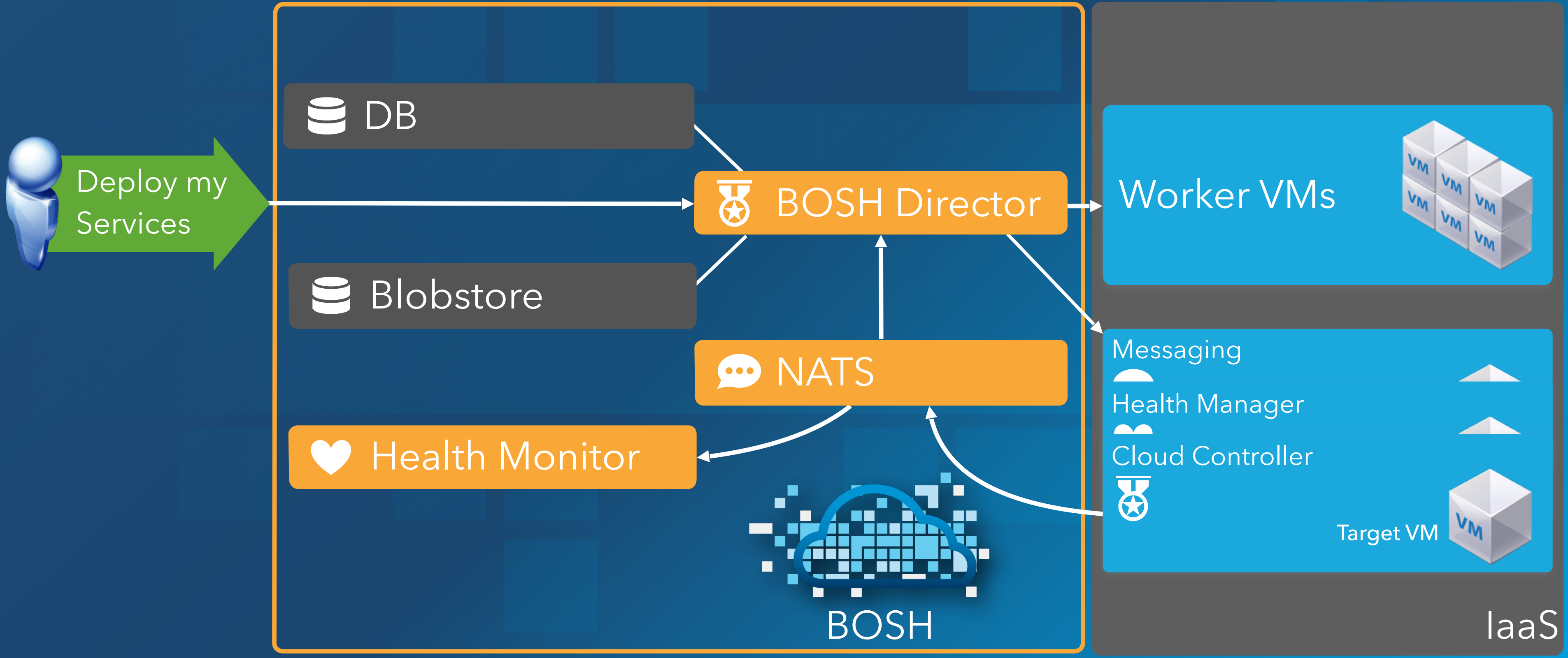
BOSH Agent

IaaS

BOSH in Action



BOSH: Cloud Provider Interface

Stemcell

```
create_stemcell(image, cloud_properties)
delete_stemcell(stemcell_id)
```

VM

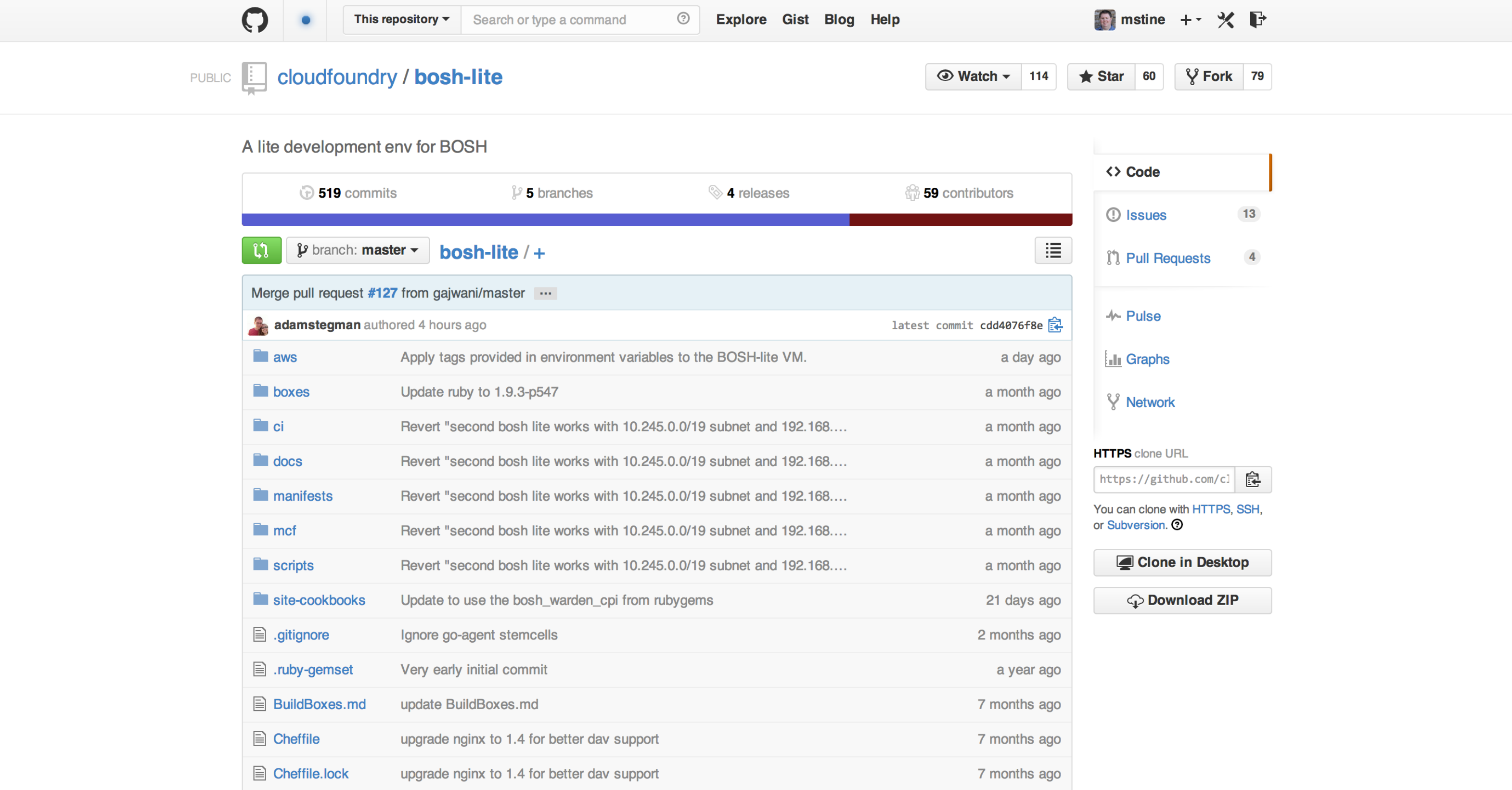
```
create_vm(agent_id, stemcell_id, resource_pool,
          networks, disk_locality, env)
delete_vm(vm_id)
reboot_vm(vm_id)
configure_networks(vm_id, networks)
```

Disk

```
create_disk(size, vm_locality)
delete_disk(disk_id)
attach_disk(vm_id, disk_id)
detach_disk(vm_id, disk_id)
```

IaaS Neutral

BOSH Lite



PUBLIC cloudfoundry / **bosh-lite**

A lite development env for BOSH

519 commits · **5** branches · **4** releases · **59** contributors

Merge pull request #127 from gajwani/master ···

adamstegman authored 4 hours ago — latest commit cdd4076f8e

aws	Apply tags provided in environment variables to the BOSH-lite VM.	a day ago
boxes	Update ruby to 1.9.3-p547	a month ago
ci	Revert "second bosh lite works with 10.245.0.0/19 subnet and 192.168.…	a month ago
docs	Revert "second bosh lite works with 10.245.0.0/19 subnet and 192.168.…	a month ago
manifests	Revert "second bosh lite works with 10.245.0.0/19 subnet and 192.168.…	a month ago
mcf	Revert "second bosh lite works with 10.245.0.0/19 subnet and 192.168.…	a month ago
scripts	Revert "second bosh lite works with 10.245.0.0/19 subnet and 192.168.…	a month ago
site-cookbooks	Update to use the bosh_warden_cpi from rubygems	21 days ago
.gitignore	Ignore go-agent stemcells	2 months ago
.ruby-gemset	Very early initial commit	a year ago
BuildBoxes.md	update BuildBoxes.md	7 months ago
Cheffile	upgrade nginx to 1.4 for better dav support	7 months ago
Cheffile.lock	upgrade nginx to 1.4 for better dav support	7 months ago

HTTPS clone URL

https://github.com/cl

You can clone with HTTPS, SSH, or Subversion.

https://github.com/cloudfoundry/bosh-lite

Architecture and Operations

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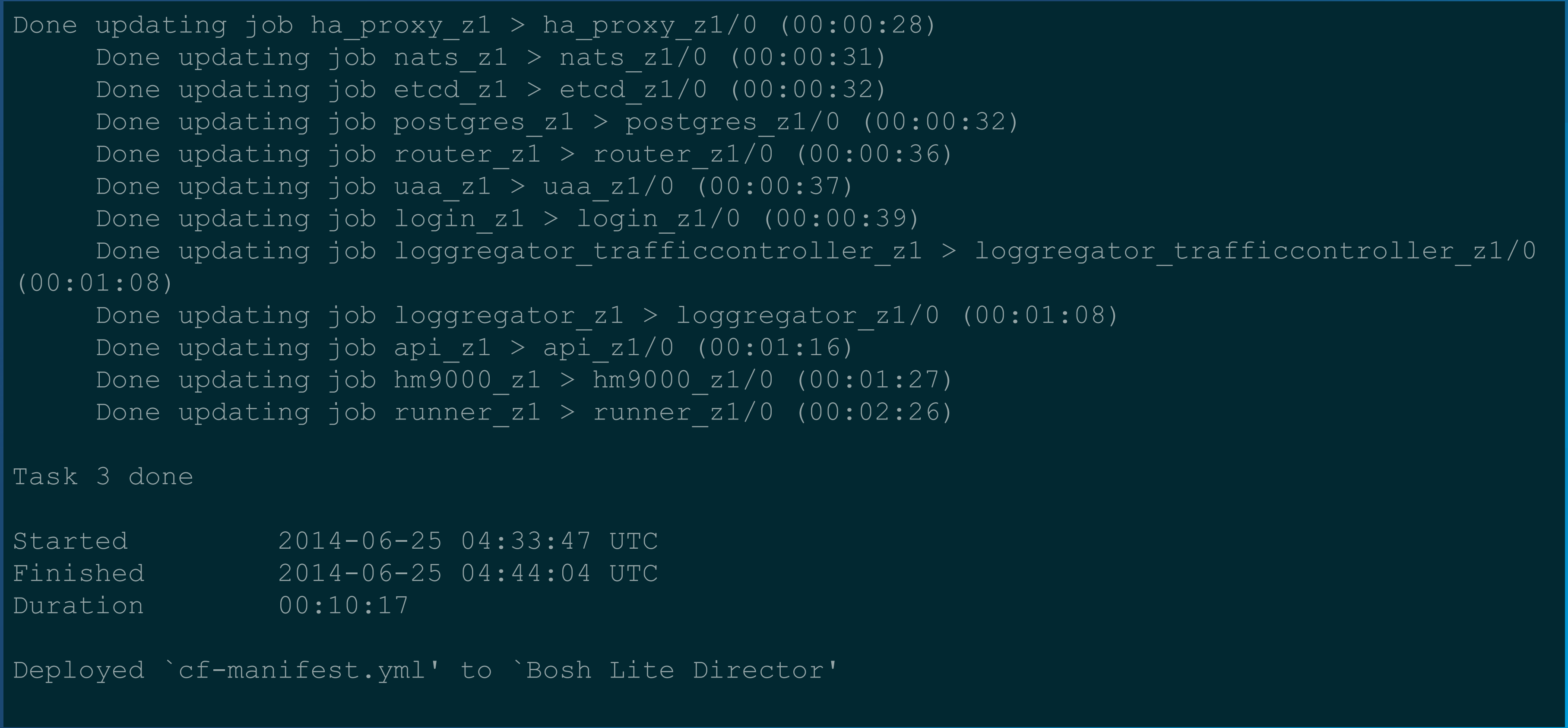
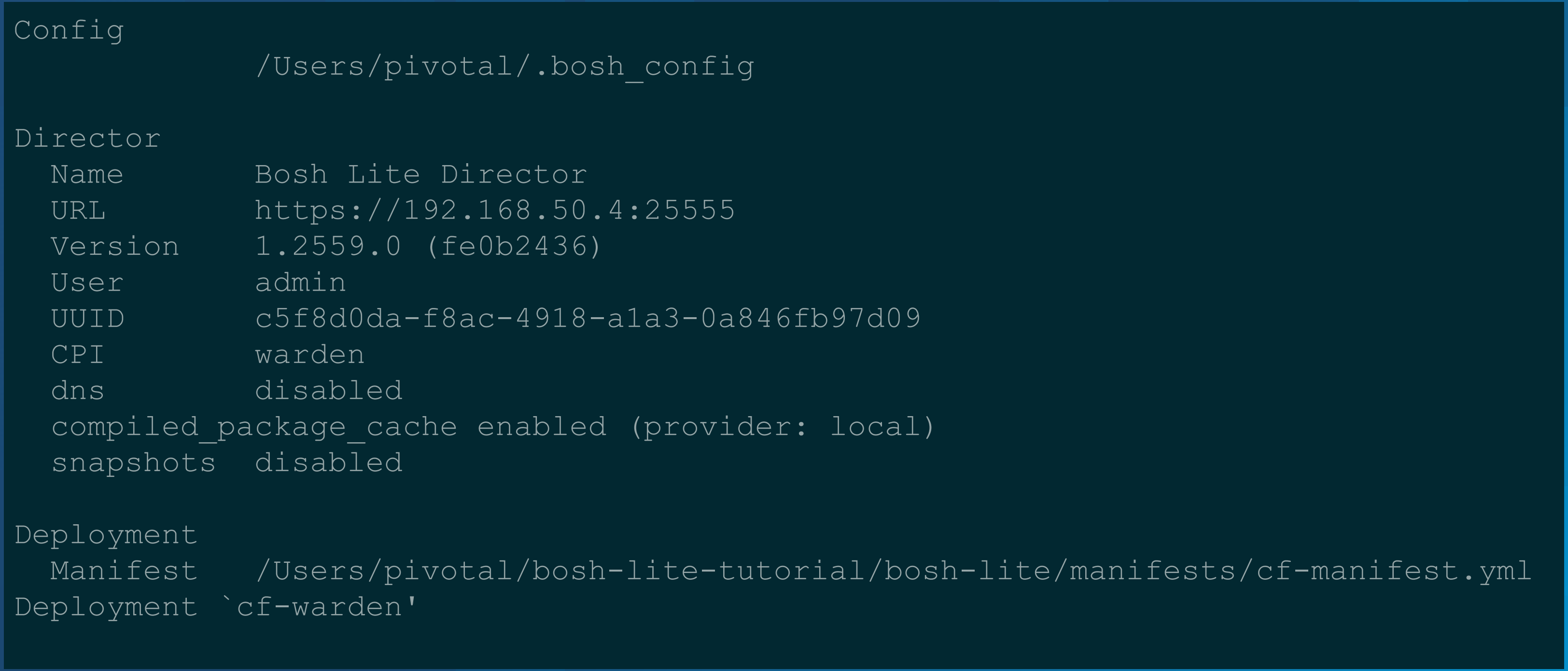
Completed BOSH Lite Deploy



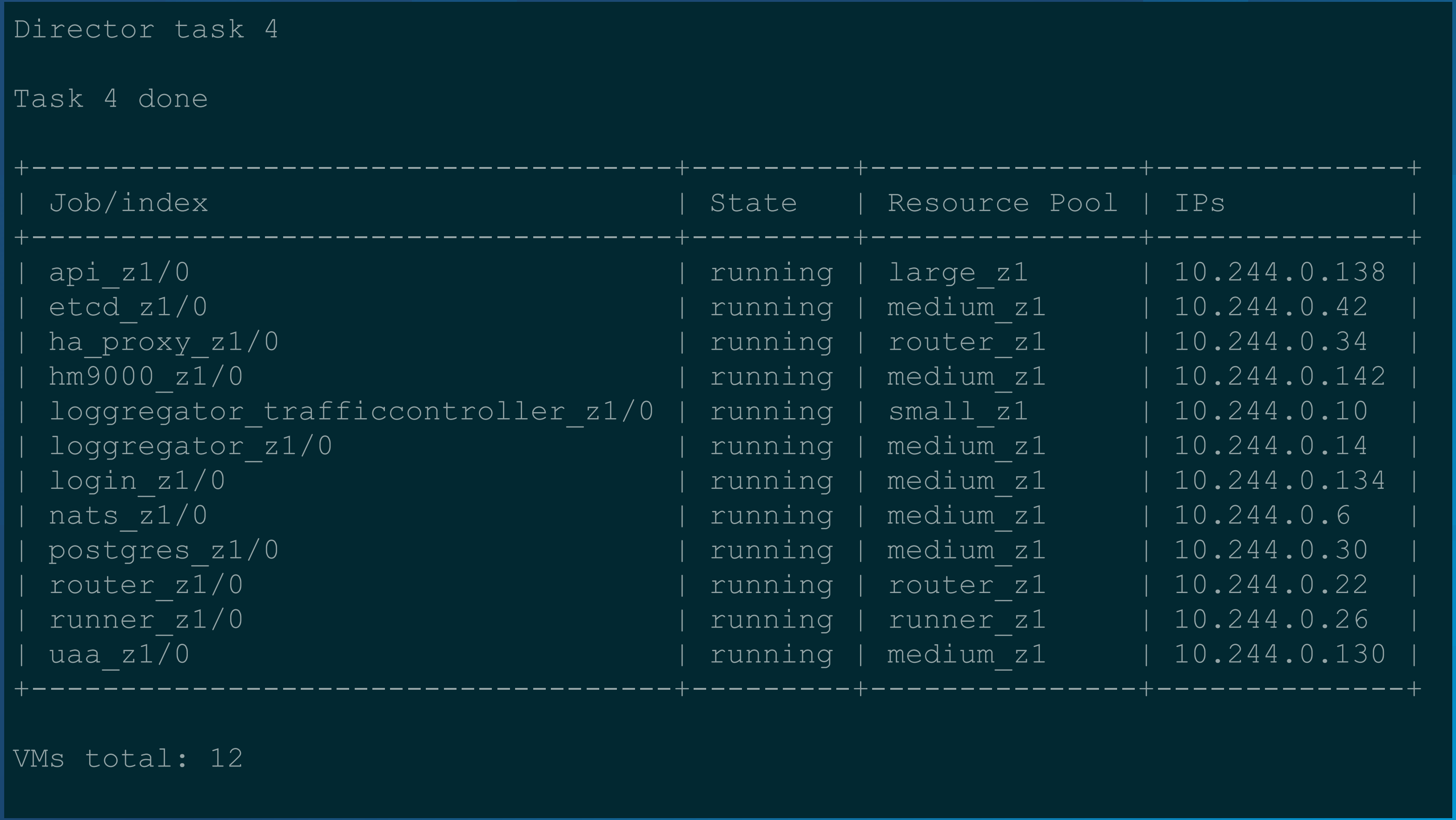
```
Done updating job ha_proxy_z1 > ha_proxy_z1/0 (00:00:28)
     Done updating job nats_z1 > nats_z1/0 (00:00:31)
     Done updating job etcd_z1 > etcd_z1/0 (00:00:32)
     Done updating job postgres_z1 > postgres_z1/0 (00:00:32)
     Done updating job router_z1 > router_z1/0 (00:00:36)
     Done updating job uaa_z1 > uaa_z1/0 (00:00:37)
     Done updating job login_z1 > login_z1/0 (00:00:39)
     Done updating job loggregator_trafficcontroller_z1 > loggregator_trafficcontroller_z1/0
(00:01:08)
     Done updating job loggregator_z1 > loggregator_z1/0 (00:01:08)
     Done updating job api_z1 > api_z1/0 (00:01:16)
     Done updating job hm9000_z1 > hm9000_z1/0 (00:01:27)
     Done updating job runner_z1 > runner_z1/0 (00:02:26)

Task 3 done

Started         2014-06-25 04:33:47 UTC
Finished        2014-06-25 04:44:04 UTC
Duration        00:10:17

Deployed `cf-manifest.yml' to `Bosh Lite Director'
```

BOSH Status



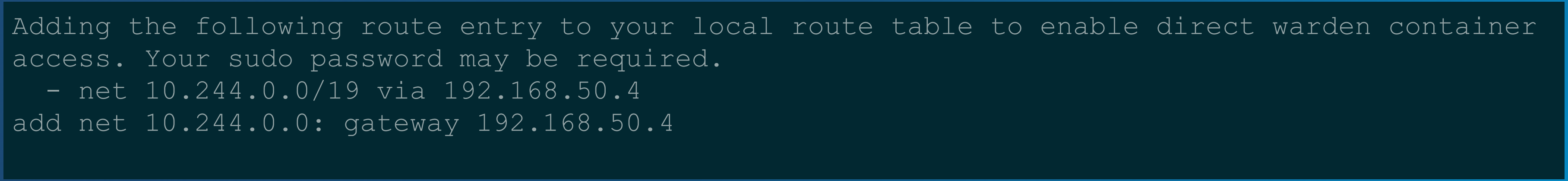
```
Config
             /Users/pivotal/.bosh_config

Director
  Name       Bosh Lite Director
  URL        https://192.168.50.4:25555
  Version    1.2559.0 (fe0b2436)
  User       admin
  UUID       c5f8d0da-f8ac-4918-a1a3-0a846fb97d09
  CPI        warden
  dns        disabled
  compiled_package_cache enabled (provider: local)
  snapshots  disabled

Deployment
  Manifest   /Users/pivotal/bosh-lite-tutorial/bosh-lite/manifests/cf-manifest.yml
Deployment `cf-warden'
```

“bosh vms --details"



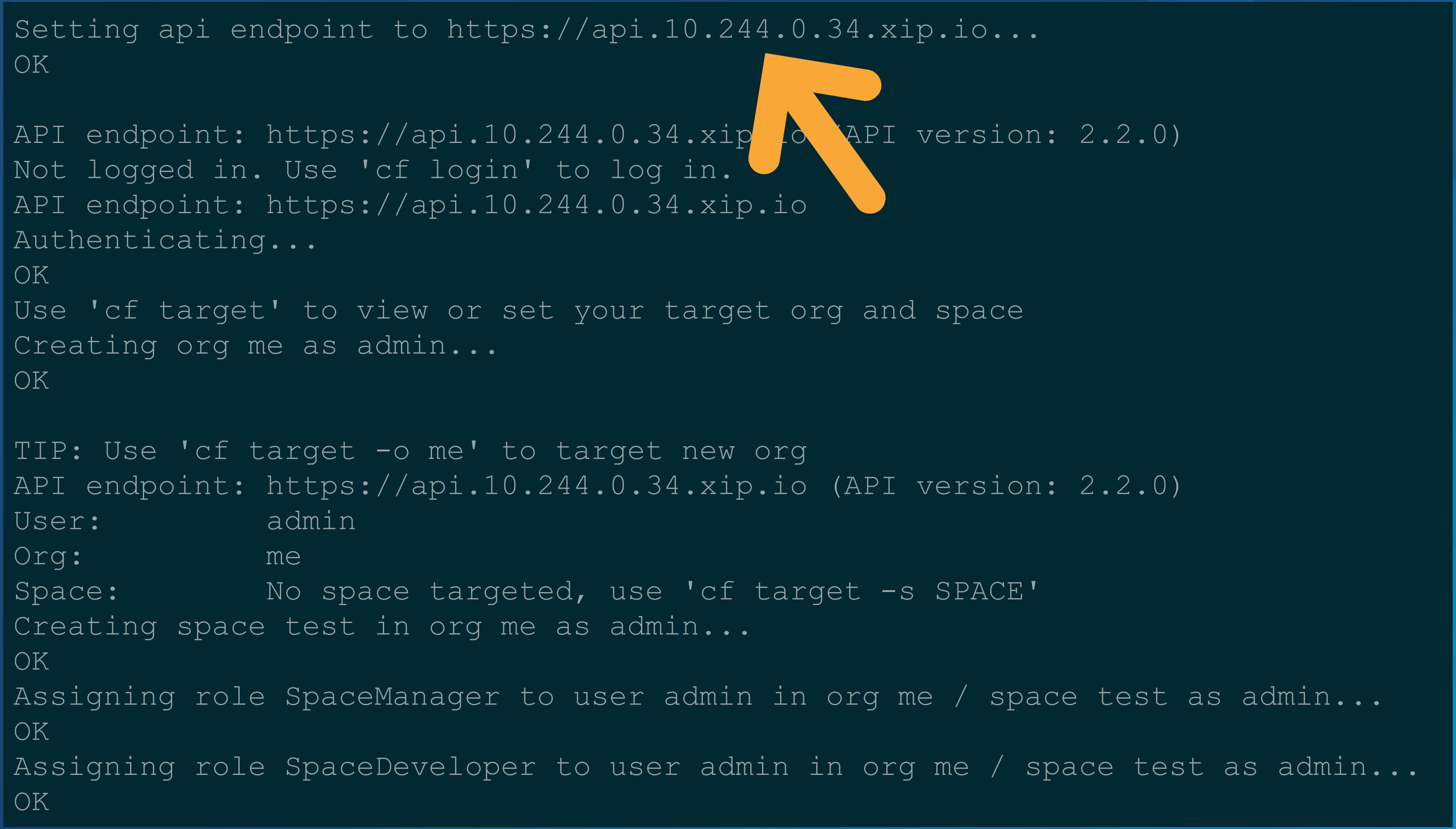
```
Director task 4

Task 4 done

+------------------------------------+---------+---------------+--------------+
| Job/index                          | State   | Resource Pool | IPs          |
+------------------------------------+---------+---------------+--------------+
| api_z1/0                           | running | large_z1      | 10.244.0.138 |
| etcd_z1/0                          | running | medium_z1     | 10.244.0.42  |
| ha_proxy_z1/0                      | running | router_z1     | 10.244.0.34  |
| hm9000_z1/0                        | running | medium_z1     | 10.244.0.142 |
| loggregator_trafficcontroller_z1/0 | running | small_z1      | 10.244.0.10  |
| loggregator_z1/0                   | running | medium_z1     | 10.244.0.14  |
| login_z1/0                         | running | medium_z1     | 10.244.0.134 |
| nats_z1/0                          | running | medium_z1     | 10.244.0.6   |
| postgres_z1/0                      | running | medium_z1     | 10.244.0.30  |
| router_z1/0                        | running | router_z1     | 10.244.0.22  |
| runner_z1/0                        | running | runner_z1     | 10.244.0.26  |
| uaa_z1/0                           | running | medium_z1     | 10.244.0.130 |
+------------------------------------+---------+---------------+--------------+

VMs total: 12
```

bosh-lite/scripts/add-route



```
Adding the following route entry to your local route table to enable direct warden container
access. Your sudo password may be required.
  - net 10.244.0.0/19 via 192.168.50.4
add net 10.244.0.0: gateway 192.168.50.4
```

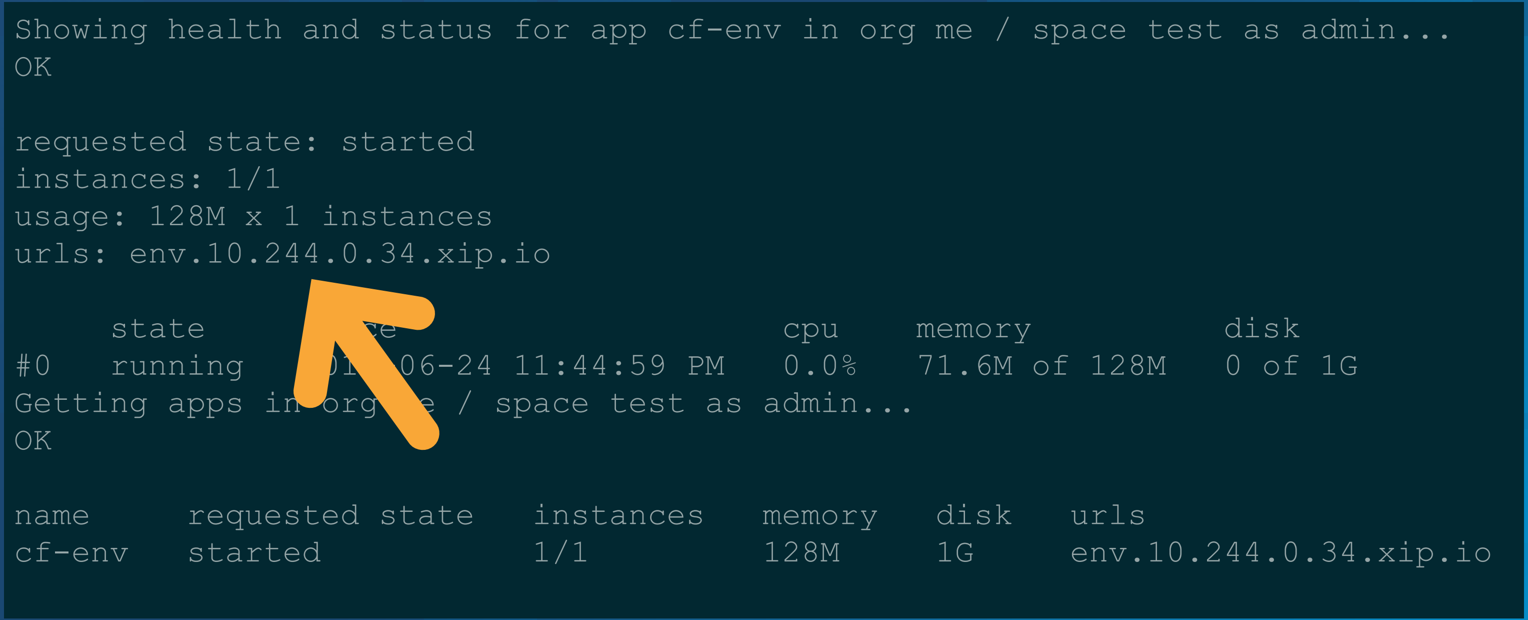
Setting up "me" org, "test" space...



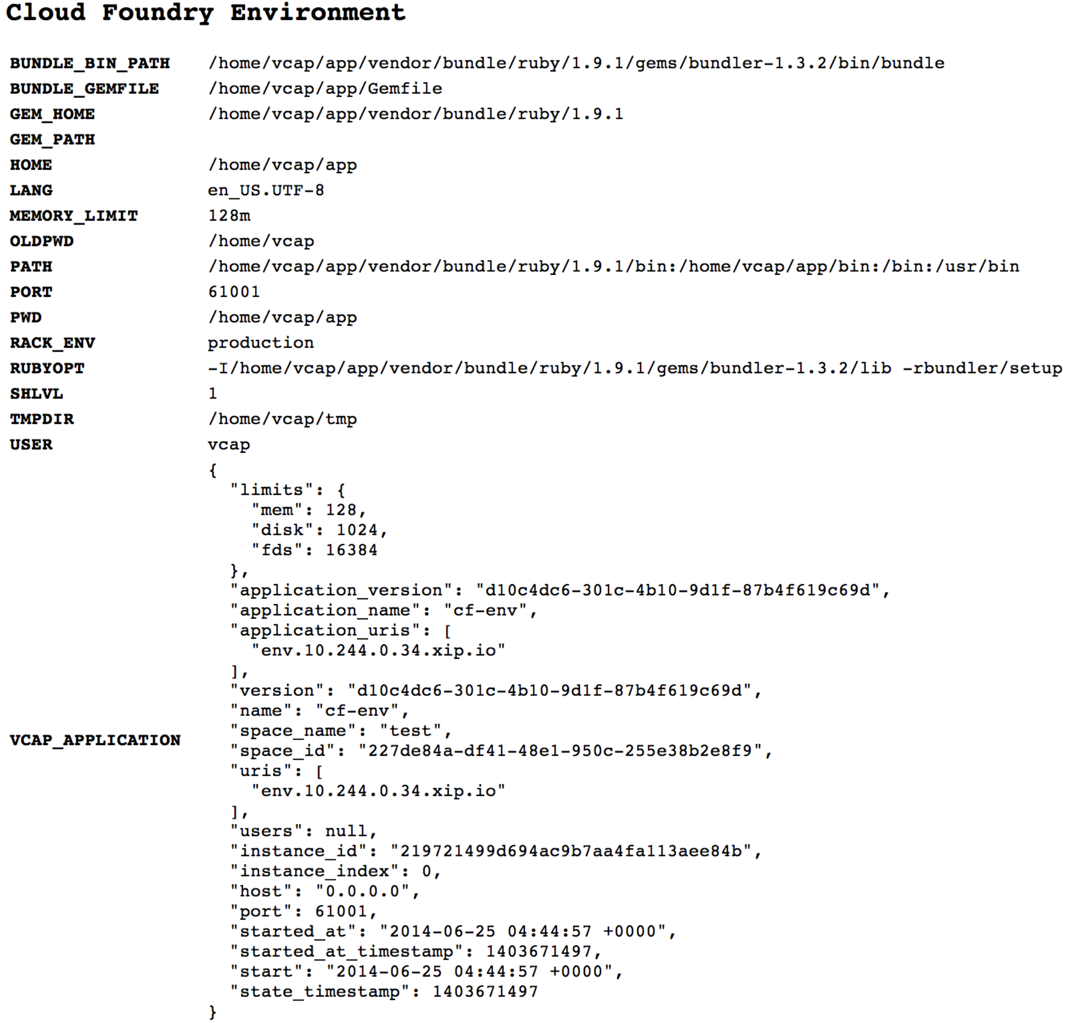
```
Setting api endpoint to https://api.10.244.0.34.xip.io...
OK

API endpoint: https://api.10.244.0.34.xip.io (API version: 2.2.0)
Not logged in. Use 'cf login' to log in.
API endpoint: https://api.10.244.0.34.xip.io
Authenticating...
OK
Use 'cf target' to view or set your target org and space
Creating org me as admin...
OK

TIP: Use 'cf target -o me' to target new org
API endpoint: https://api.10.244.0.34.xip.io (API version: 2.2.0)
User:          admin
Org:           me
Space:         No space targeted, use 'cf target -s SPACE'
Creating space test in org me as admin...
OK
Assigning role SpaceManager to user admin in org me / space test as admin...
OK
Assigning role SpaceDeveloper to user admin in org me / space test as admin...
OK
```

It goes on to push an app called:
“cf-env”

cf-env successfully pushed...



```
Showing health and status for app cf-env in org me / space test as admin...
OK

requested state: started
instances: 1/1
usage: 128M x 1 instances
urls: env.10.244.0.34.xip.io

     state     since                    cpu    memory          disk
#0   running   2014-06-24 11:44:59 PM   0.0%   71.6M of 128M   0 of 1G
Getting apps in org me / space test as admin...
OK

name     requested state   instances   memory   disk   urls
cf-env   started           1/1         128M     1G     env.10.244.0.34.xip.io
```

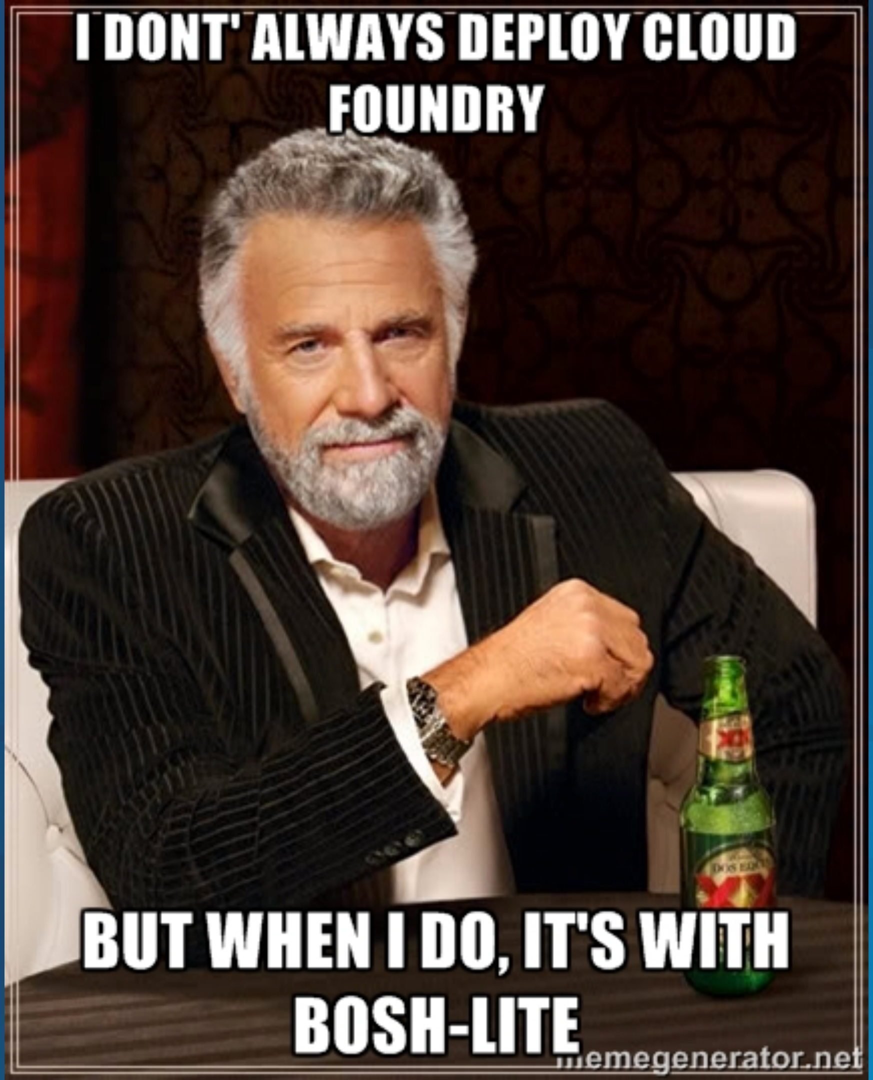


Cloud Foundry Environment

BUNDLE_BIN_PATH	/home/vcap/app/vendor/bundle/ruby/1.9.1/gems/bundler-1.3.2/bin/bundle
BUNDLE_GEMFILE	/home/vcap/app/Gemfile
GEM_HOME	/home/vcap/app/vendor/bundle/ruby/1.9.1
GEM_PATH	
HOME	/home/vcap/app
LANG	en_US.UTF-8
MEMORY_LIMIT	128m
OLDPWD	/home/vcap
PATH	/home/vcap/app/vendor/bundle/ruby/1.9.1/bin:/home/vcap/app/bin:/bin:/usr/bin
PORT	61001
PWD	/home/vcap/app
RACK_ENV	production
RUBYOPT	-I/home/vcap/app/vendor/bundle/ruby/1.9.1/gems/bundler-1.3.2/lib -rbundler/setup
SHLVL	1
TMPDIR	/home/vcap/tmp
USER	vcap

VCAP_APPLICATION

```
{
  "limits": {
    "mem": 128,
    "disk": 1024,
    "fds": 16384
  },
  "application_version": "d10c4dc6-301c-4b10-9d1f-87b4f619c69d",
  "application_name": "cf-env",
  "application_uris": [
    "env.10.244.0.34.xip.io"
  ],
  "version": "d10c4dc6-301c-4b10-9d1f-87b4f619c69d",
  "name": "cf-env",
  "space_name": "test",
  "space_id": "227de84a-df41-48e1-950c-255e38b2e8f9",
  "uris": [
    "env.10.244.0.34.xip.io"
  ],
  "users": null,
  "instance_id": "219721499d694ac9b7aa4fa113aee84b",
  "instance_index": 0,
  "host": "0.0.0.0",
  "port": 61001,
  "started_at": "2014-06-25 04:44:57 +0000",
  "started_at_timestamp": 1403671497,
  "start": "2014-06-25 04:44:57 +0000",
  "state_timestamp": 1403671497
}
```


I DONT' ALWAYS DEPLOY CLOUD FOUNDRY
BUT WHEN I DO, IT'S WITH BOSH-LITE
memegenerator.net

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Coming Up

- **Lunch (12:15 - 1:30)**
- **Part Three (1:30 - 3:00)**
  - Learn How CF Enables Continuous Delivery
  - Setup a CD Pipeline with Jenkins, Artifactory, CF Client, and PWS
- **Part Four (3:15 - 4:45)**
  - Learn CF Extension Points
  - Customize a Buildpack -OR-
  - Write and Deploy a Service Broker

THANK YOU!

See you after lunch!

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Credits

Thanks to Cornelia Davis (@cdavisafc) for contributing the animated architecture portion of this slide deck.