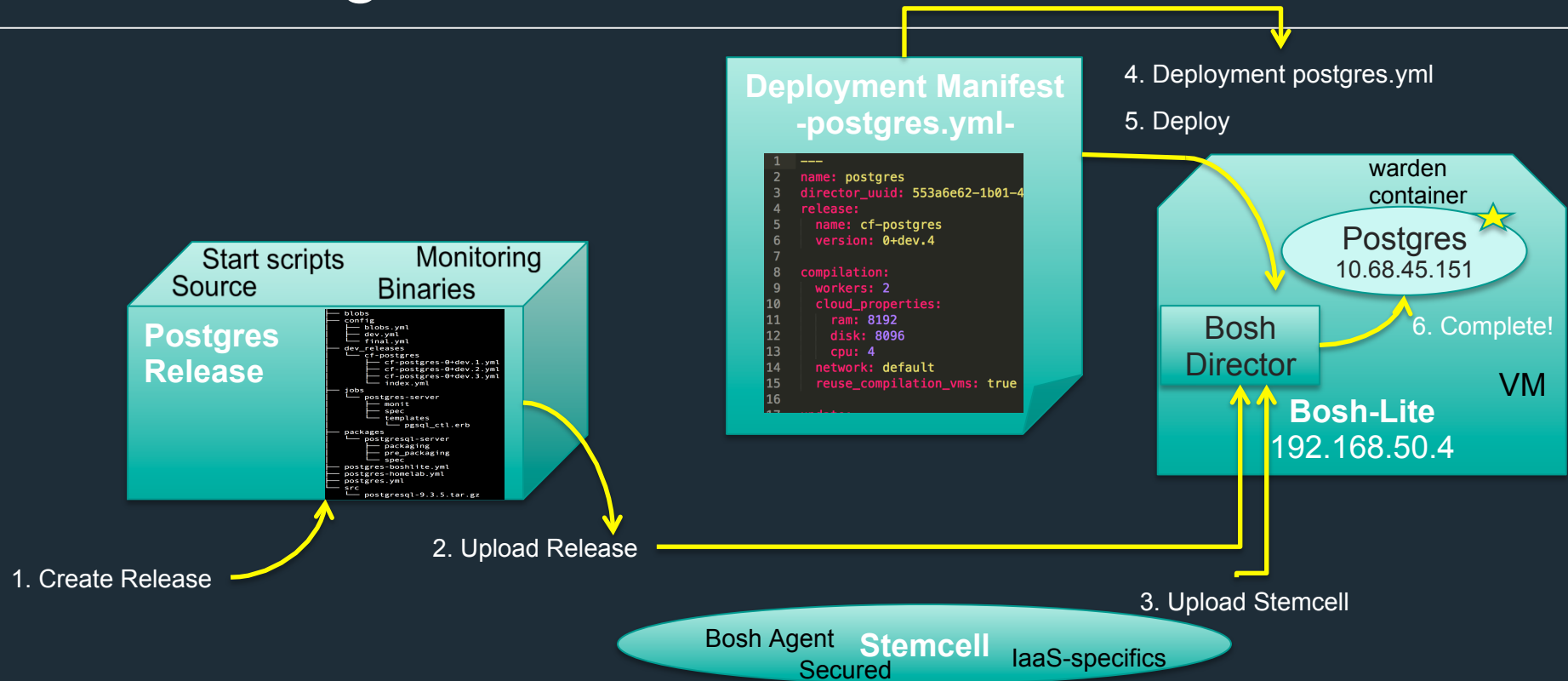


Lecture 2:

Anatomy of a BOSH deployment



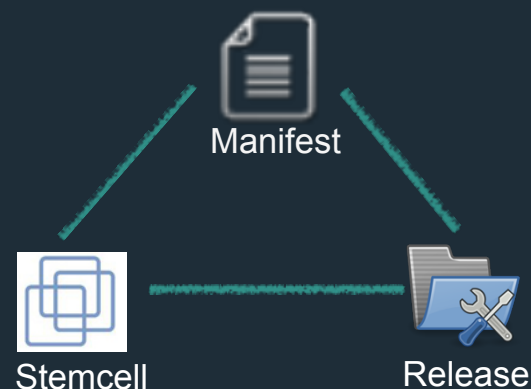
Lab 2: Big Picture



What is a BOSH deployment?

An encapsulation of software and configuration to be deployed to the cloud.

In BOSH terminology, an encapsulation of software **releases** and configuration declared via a **manifest file** to be deployed on VMs built from **stemcells**.



What is a stemcell?

- A versioned Operating System image wrapped with IaaS specific packaging
- Contains a bare minimum OS skeleton with a few common utilities, a BOSH agent, and a few configuration files to securely configure the OS
- Stemcells do not contain any specific information about any software that will be installed

Available stemcells

LATEST STEMCELLS

Ubuntu Trusty

AWS Xen-HVM Light 18KB	3173 / prev...	bosh-aws-xen-hvm-ubuntu-trusty-go_agent 2016-01-07T22:05:30.000Z
AWS Xen 485KB	3173 / prev...	bosh-aws-xen-ubuntu-trusty-go_agent 2016-01-07T22:05:30.000Z
AWS Xen Light 18KB	3173 / prev...	bosh-aws-xen-ubuntu-trusty-go_agent 2016-01-07T22:05:30.000Z
Azure Hyper-V 486KB	3169 / prev...	bosh-azure-hyperv-ubuntu-trusty-go_agent 2016-01-04T19:56:49.000Z
OpenStack KVM 514KB	3173 / prev...	bosh-openstack-kvm-ubuntu-trusty-go_agent 2016-01-07T22:05:30.000Z
OpenStack KVM (raw) 486KB	3173 / prev...	bosh-openstack-kvm-ubuntu-trusty-go_agent-raw 2016-01-07T22:05:30.000Z
vCloud ESXi 512KB	3173 / prev...	bosh-vcloud-esxi-ubuntu-trusty-go_agent 2016-01-07T22:05:30.000Z
vSphere ESXi 512KB	3173 / prev...	bosh-vsphere-esxi-ubuntu-trusty-go_agent 2016-01-07T22:05:30.000Z
BOSH Lite Warden 499KB	3147 / prev...	bosh-warden-boshlite-ubuntu-trusty-go_agent 2015-12-04T07:57:17.000Z

CentOS 7.x

AWS Xen 658KB	3169 / prev...	bosh-aws-xen-centos-7-go_agent 2016-01-04T19:08:01.000Z
AWS Xen Light 12KB	3169 / prev...	bosh-aws-xen-centos-7-go_agent 2016-01-04T19:08:01.000Z
AWS Xen-HVM Light 12KB	3169 / prev...	bosh-aws-xen-hvm-centos-7-go_agent 2016-01-04T19:08:01.000Z
Azure Hyper-V 658KB	3169 / prev...	bosh-azure-hyperv-centos-7-go_agent 2016-01-04T19:58:55.000Z
OpenStack KVM 659KB	3169 / prev...	bosh-openstack-kvm-centos-7-go_agent 2016-01-04T19:08:01.000Z
OpenStack KVM (raw) 658KB	3169 / prev...	bosh-openstack-kvm-centos-7-go_agent-raw 2016-01-04T19:08:01.000Z
vSphere ESXi 697KB	3169 / prev...	bosh-vsphere-esxi-centos-7-go_agent 2016-01-04T19:08:01.000Z

<http://bosh.io/stemcells>

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What is a release?

- A versioned collection of source code, binary artifacts, configuration templates, and anything else required to build and deploy software in a reproducible way
- Ultimately, a release is the layer placed on top of a stemcell
- Releases should not be tied to a particular IaaS and stemcell and should not depend on internet access

Available releases

COMMUNITY RELEASES

[cf-platform-eng/docker-boshrelease](#)
[cf-platform-eng/hadoop-boshrelease](#)
[cf-platform-eng/mesos-boshrelease](#)
[cf-platform-eng/networking-boshrelease](#)
[cf-platform-eng/shipyard-boshrelease](#)
[cloudfoundry-community/admin-ui-boshrelease](#)
[cloudfoundry-community/bosh-cloudstack-cpi-release](#)
[cloudfoundry-community/broker-registrar-boshrelease](#)
[cloudfoundry-community/cf-haproxy-boshrelease](#)
[cloudfoundry-community/cf-services-contrib-release](#)
[cloudfoundry-community/cf-subway-boshrelease](#)
[cloudfoundry-community/consul-boshrelease](#)
[cloudfoundry-community/crate-boshrelease](#)
[cloudfoundry-community/docker-registry-boshrelease](#)
[cloudfoundry-community/jumpbox-boshrelease](#)
[cloudfoundry-community/logstash-docker-boshrelease](#)
[cloudfoundry-community/memcache-release](#)
[cloudfoundry-community/monitor-server-boshrelease](#)

<http://bosh.io/releases>

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What is a deployment manifest?

- A YAML file that identifies one or more releases, one or more stemcells and specifies how to orchestrate and configure them for a given deployment

Anatomy of a deployment manifest

- Deployment identification
- Releases
- Networks
- Resource Pools
- Disk Pools
- Jobs
- Compilation
- Update
- Properties

Deployment Identification

Identifies the name of the deployment and the BOSH Director to be used

```
name: my-redis-deployment
```

```
director_uuid: cf8dc1fc-9c42-4ffc-96f1-fbad983a6ce6
```

Deployment name

BOSH Director UUID

Releases

Identifies a collection of releases (name and version) we want to deploy

```
releases:  
- name: redis  
  version: 12
```

Release name

Release version

Networks

A BOSH network is an IaaS-agnostic representation of the networking layer. There are three types of networks that BOSH supports:

- **Manual**: BOSH decides how to assign IPs
- **Dynamic**: BOSH defers IP selection to the IaaS
- **VIP**: Virtual IP address

Manual networks

Manual networking allows you to specify one or more subnets and let BOSH choose available IPs from one of the subnet ranges

```
networks:  
- name: my-manual-network  
  type: manual  
  subnets:  
  - range: 10.10.0.0/24  
    gateway: 10.10.0.1  
    dns:  
      - 10.10.0.2  
    reserved:  
      - 10.10.0.2-10.10.0.10  
    static:  
      - 10.10.1.11-10.10.1.20  
  cloud_properties:  
    subnet: subnet-9be6c3f7
```

Network name

Network type

Network IP range

Network gateway IP address

DNS IP addresses for this network

IPs that will not be used

IPs that can only be used for static IP reservations

Specific IaaS Properties

Manual networks

```
networks:  
- name: my-manual-network  
  type: manual  
  subnets:  
  - range: 10.10.0.0/24  
    gateway: 10.10.0.1  
    dns:  
      - 10.10.0.2  
    reserved:  
      - 10.10.0.2-10.10.0.10  
    static:  
      - 10.10.0.11-10.10.0.20  
    cloud_properties:  
      subnet: subnet-9be6c3f7
```

10.10.0.0/24

10.10.0.1

← Gateway: BOSH will configure each VM with this gateway

10.10.0.2

...

← Reserved range: BOSH will NOT use these IP addresses

10.10.0.10

10.10.0.11

...

← Static range: BOSH will ONLY use these IP addresses
when the job explicitly sets one

10.10.0.20

10.10.0.21

...

← Dynamic range: BOSH will use these IP addresses
when the job does NOT explicitly set one

10.10.0.254

10.10.0.255

← Broadcast: BOSH will NOT use this IP address

Dynamic networks

Dynamic networking defers IP selection to the IaaS

```
networks:  
- name: my-dynamic-network  
  type: dynamic  
  dns:  
    - 10.10.0.2  
  cloud_properties:  
    subnet: subnet-9be6c3f7
```

← Network name

← Network type


← DNS IP addresses for this network

← Specific IaaS Properties

VIP networks

VIP networking enables the association of a virtual IP address that is not backed by any particular NIC

```
networks:  
- name: my-vip-network  
  type: vip
```



The diagram shows a code snippet for defining a network. Two teal arrows point from text labels to the code. One arrow points from 'Network name' to the value 'my-vip-network' in the 'name' field. The other arrow points from 'Network type' to the value 'vip' in the 'type' field.

Network name

Network type

IP reservation types

	Manual	Dynamic	VIP
Static IP assignment	Supported	Not supported	Supported
Automatic IP assignment	Supported	Supported	Not Supported

- **Static:** IP is explicitly requested by the user in the deployment manifest
- **Automatic:** IP is selected automatically based on the network type

Multi-homing (Network Configuration)

IaaS	Manual	Dynamic	VIP
AWS	Single per job instance	Single per job instance	Single per job instance
OpenStack	Multiple per job instance	Single per job instance	Single per job instance
vSphere	Multiple per job instance	Not supported	Not supported
vCloud	Multiple per job instance	Not supported	Not Supported

Resource Pools

Identifies a collection of VM specifications

```
resource_pools:  
  - name: redis-servers  
    network: default  
    stemcell:  
      name: bosh-aws-xen-ubuntu-trusty-go_agent  
      version: 23173  
    cloud_properties:  
      instance_type: m1.medium  
      availability_zone: us-east-1a
```

Resource Pool name

Network to use

Stemcell (name and version)

Specific IaaS Properties

Disk Pools

Identifies a collection of disk specifications

```
disk_pools:  
  - name: ssd-disk  
    disk_size: 2  
    cloud_properties:  
      type: ssd
```



Disk Pool name

Disk size (Mb)

Specific IaaS Properties

Jobs

A job is a composition of configuration and installed software on a particular VM

```
jobs:
- name: redis-master
  instances: 1
  templates:
  - name: redis-server
    release: redis
  persistent_disk: 10_240
  resource_pool: redis-servers
  networks:
  - name: default

- name: redis-slave
  instances: 2
  templates:
  - name: redis-server
    release: redis
  persistent_disk_pool: ssd-disk
  resource_pool: redis-servers
  networks:
  - name: default
```

← Name of the jobs

← # of instances of this particular job

← Release to be deployed and release process

← Persistent disk or disk pool

← Resource pool

← Network

Job's networks

Depending on the job's network, additional properties might be configured

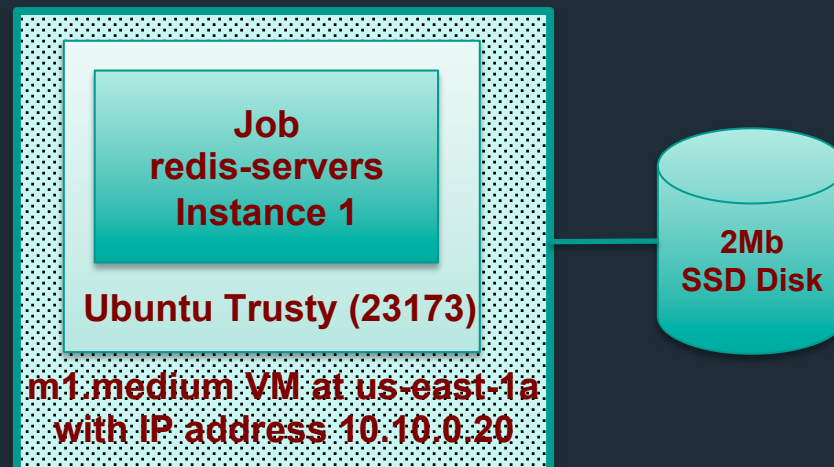
```
jobs:
- name: redis-master
  instances: 1
  templates:
  - name: redis-server
    release: redis
    persistent_disk: 10_240
    resource_pool: redis-servers
    networks:
    - name: static
      static_ips:
      - 10.0.10.20
    - name: vip
      static_ips:
      - 72.52.4.119
```

Manual networks allows to specify the desired private IP address(es)

VIP networks require to specify the public IP address(es)

Jobs

```
resource_pools:  
  - name: redis-servers  
    network: default  
    stemcell:  
      name: bosh-aws-xen-ubuntu-trusty-go_agent  
      version: 23173  
    cloud_properties:  
      instance_type: m1.medium  
      availability_zone: us-east-1a  
  
disk_pools:  
  - name: ssd-disk  
    disk_size: 2  
    cloud_properties:  
      type: ssd  
  
jobs:  
  - name: redis-master  
    instances: 1  
    templates:  
      - name: redis-server  
        release: redis  
    persistent_disk_pool: ssd-disk  
    resource_pool: redis-servers  
    networks:  
      - name: default  
        static_ips:  
          - 10.10.0.20
```



Job types

- **Service** (default): runs indefinitely and restarts if it fails
- **Errand**: starts with a manual trigger and does not restart if it fails

```
- name: acceptance-tests
  templates:
    - name: acceptance-tests
      release: redis
  instances: 1
  lifecycle: errand
  resource_pool: errands
  networks:
    - name: default
```

Job type

Compilation

Compilation VMs are ephemeral instances where the source code from a release package is converted to a binary compatible with the stemcell

```
compilation:
```

```
workers: 2
```

← # of compilation VMs

```
reuse_compilation_vms: true
```

← If VMs are re-used when compiling other packages

```
network: default
```

← Network

```
cloud_properties:
```

```
instance_type: c1.medium
```

← Specific IaaS Properties

```
availability_zone: us-east-1a
```

Update

Describes how BOSH updates job instances during the deployment

```
update:
```

```
  canaries: 2
```

of canary instances

```
  max_in_flight: 2
```

Max # of non-canary instances to update in parallel

```
  canary_watch_time: 1000-30000
```

Wait time (ms) to check whether canary instances are healthy

```
  update_watch_time: 1000-30000
```

Wait time (ms) to check whether instances are healthy

```
  serial: false
```

How jobs are updated (serial or parallel)

Canary Instances

Canary instances are instances updated before other instances. Any update error in a canary instance causes the deployment to stop. Since only canaries instances are affected before an update stops, problematic packages or jobs are prevented from taking over all job instances.



Canaries are Great! - <https://blog.pivotal.io/pivotal-cloud-foundry/products/canaries-are-great>

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Update

Global update properties can be overridden for a particular job

```
jobs:
  - name: redis-master
    instances: 1
    templates:
      - name: redis-server
        release: redis
        persistent_disk: 10_240
        resource_pool: redis-servers
        networks:
          - name: default
        update:
          canaries: 1
          max_in_flight: 1
          canary_watch_time: 10000-60000
          update_watch_time: 10000-60000
          serial: true
```

Properties

Describes the global properties in order to configure jobs for a specific environment

```
properties:  
  redis:  
    max_connections: 10
```

Properties precedence

- BOSH applies the properties in the release template spec file to the job.
- If an identically named property exists in the Properties block of the deployment manifest, the value of this property overrides the previous value.
- If an identically named property exists in the Properties sub-block of the Jobs block of the deployment manifest, the value of this property overrides all previous values.

Properties order

Release template spec

```
---
name: redis-server
packages:
- redis-server
properties:
  redis.max_connections: 3
  description: Maxumim number of connections
  default: 1
```

- 1 Job properties
- 2 Global properties
- 3 Release template default

Deployment manifest

```
jobs:
- name: redis-master
  instances: 1
  templates:
  - name: redis-server
    release: redis
    persistent_disk: 10_240
    resource_pool: redis-servers
    networks:
    - name: default
    properties:
      redis:
        max_connections: 5
  properties:
  redis:
    max_connections: 10
```

Changing the deployment manifest

- An update of a release or stemcell version will trigger the compilation of (newer) packages and the update of the affected jobs
- An update of a network properties might trigger a VM recreation (ie: modifying the network security group)
- An update of a resource pool's properties or a job's resource pool will trigger a VM recreation
- An update of a job's network will trigger a VM recreation
- An update of a job's property will trigger the update of the job

Persistent disk considerations

- Everything inside a VM is considered ephemeral except any attached persistent disk
- A VM recreation will keep all data from the persistent disk intact
- An update of the size and/or type of a persistent disk will trigger a migration of the data to a new persistent disk

BOSH documentation

<http://bosh.io/docs>

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