Pivotal

PRODUCT DOCUMENTATION

On-Demand Services SDK Documentation

Version 0.18

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On-Demand Services SDK

Note: On-Demand Services SDK v0.18 does not support any of the currently supported versions of Ops Manager. For your product to stay up-to-date with the latest software, features, and security updates, use the latest version of On-Demand Services SDK.

This guide is intended for people who want to author service tiles for Pivotal Cloud Foundry (PCF) using the on-demand services SDK, part of the Pivotal Cloud Foundry Services SDK.

Overview

PCF operators make software services such as databases available to developers by using the Ops Manager **Installation Dashboard** to install service tiles. Before BOSH 2.0, operators configured a service tile by pre-assigning a block of VMs with fixed CPU, hard disk, and RAM levels to allocate as instances for each service. This limited the possible number of instances and demanded wasteful one-size-fits-all resource provisioning.

On-demand services let you provision instances more flexibly. The operator does not pre-allocate a block of VMs for the instance pool, and they can specify an allowable range rather than fixed settings for instance resource levels. When a developer creates an on-demand service instance, they then provision it at creation time.

The on-demand services SDK simplifies broker and tile authoring, and is the standard approach for both Pivotal internal services teams and Pivotal partner independent software vendors (ISVs) to develop on-demand services for PCF.

The About the On-Demand Services SDK topic describes in greater detail how the on-demand broker works within PCF.

Product Snapshot

Current On-Demand Services SDK details:

Version: 0.18.0
Release date: 11/21/17
Compatible Ops Manager version(s): v1.10, v1.11, v1.12
Compatible Elastic Runtime version(s): v1.10, v1.11, v1.12
vSphere support? Yes
AWS support? Yes
GCP support? Yes
Azure support? Yes
OpenStack support? Yes

Key Features

The benefits of provisioning IaaS resources on-demand are:

- Scale resource consumption linearly with need, without having to plan for pre-provisioning.
- App developers get more control over resources, and do not have to do acquire them through the operator.

The benefits of using ODB to develop on-demand services are:

- ODB reduces the amount of code service developers have to write by abstracting away functionality common to most single-tenant on-demand service brokers.
- ODB uses BOSH to deploy service instances, so anything that is BOSH-deployable can integrate with Cloud Foundry's services marketplace.

ODB uses the following BOSH features:

- Dynamic IP management
- Availability zones
- Globally-defined resources (**Cloud Config**). This results in manifests that are portable across BOSH CPIs, and are substantially smaller than old-style manifests.
- Links between deployed BOSH instances consuming information, e.g. IP addresses, of other instances.

Prerequisites for deploying brokers that use ODB

Minimum versions of Cloud Foundry and BOSH are described in the operator section.

On-Demand Services SDK Release Notes

v0.18.0 Release Notes

Minimum Version Requirements

- BOSH 257+ (261+ for lifecycle errands) / BOSH lite v9000.131.0
- CF 238+

Known Issues

- None

New Features

- Added support for Cloud Foundrys “Secure Service Instance Credentials” workflow. The On Demand Broker optionally stores credentials in CredHub and returns a reference to the credential location in CredHub. Cloud Foundry resolves this reference for the application process env in the container. This feature requires PCF 2.0. For more information, see Enabling Secure Binding.
- Added support for using colocated errands for `post_deploy` service instance lifecycle errands. This requires PCF 1.12 (BOSH v263). See the BOSH docs for more details.
- Ability to disable startup checks to stop ODB reaching out to Cloud Foundry during startup, useful when restoring On Demand Services and Cloud Foundry is not available. Not recommended for regular operations. Use `broker.disable_cf_startup_checks`.

Breaking Changes

- If you are using `post_deploy` service instance lifecycle errands, you need to update your manifest:

```
plans: - name: <CF marketplace plan name> lifecycle_errands: post_deploy: name: <post_deploy_errand_job> instances: [<service_release_job>/0]
```

Bug fixes

- None

About the On-Demand Services SDK

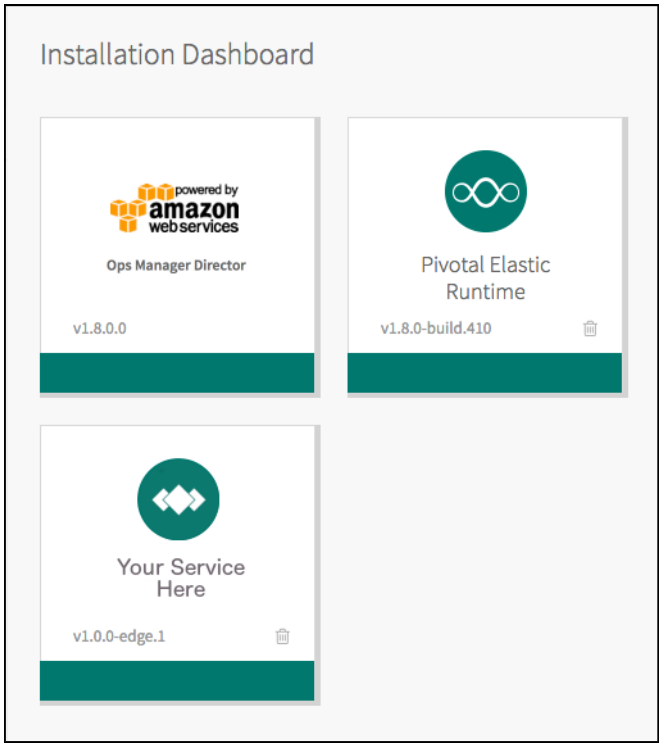
Cloud Foundry Service Brokers and PCF Tiles

Service brokers let developers create service instances in their development spaces that they can call from their code. To do this, the brokers provide an interface between the Cloud Controller and the add-on software service that they represent. The service can run internal or external to a CF deployment, but the service broker always runs inside the cloud.

The service broker works by providing an API which the Cloud Controller calls to create service instances, bind them to apps, and perform other operations. Cloud Foundry service brokers are implemented as HTTP servers that conform to the service broker API.

In addition to providing an API, a service broker publishes a service catalog that may include multiple service plans, such as a free tier and a metered tier. Brokers register their service plans with the Cloud Controller to populate the services marketplace, which developers access with `cf marketplace` or through the Pivotal Cloud Foundry (PCF) Apps Manager.

On PCF, cloud operators make software services available to developers by finding them on Pivotal Network and then installing and configuring them through a tile interface in the Ops Manager **Installation Dashboard**. Installing a service tile creates a service broker, registers it with the Cloud Controller, and publishes the service plans that the broker offers. Developers can then create service instances in their spaces and bind them to their apps.



The central element behind a service tile is the service broker, but the tile software includes other components that make the service easy for operators to install and maintain, and easy for developers to use. These components include configuration layouts, upgrade rules, lifecycle errands, and BOSH manifests for deploying the service instances.

BOSH 2.0 and Service Networks

When you deploy PCF, you must create a statically defined network to host the component virtual machines that constitute the PCF infrastructure.

PCF components, like the Cloud Controller and UAA, run on this infrastructure network. In PCF v2.0 and earlier, on-demand PCF services require that you host them on a network that runs separately from this network.

Cloud operators pre-provision service instances from Ops Manager. Then, for each service, Ops Manager allocates and recovers static IP addresses from a pre-defined block of addresses.

To enable on-demand services in PCF v2.0 and earlier, operators must create a service networks in Ops Manager Director and select the **Service Network**

checkbox. Operators then can select the service network to host on-demand service instances when they configure the tile for that service.

On-Demand Services

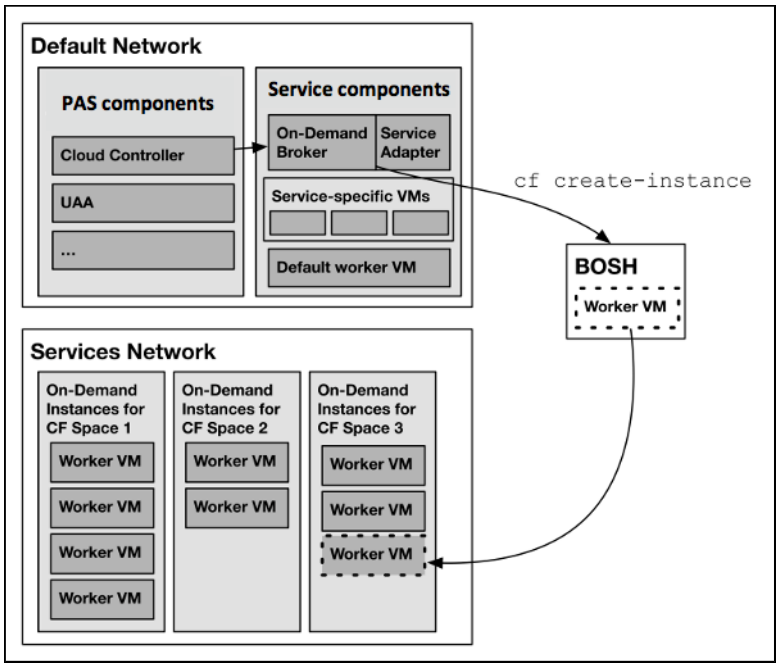
On-demand PCF services rely on the BOSH 2.0 ability to dynamically deploy VMs in a dedicated network. The on-demand service broker uses this capability to create single-tenant service instances in a dedicated service network.

On-demand services use the dynamically-provisioned service network to host the single-tenant worker VMs that run as service instances within development spaces. This architecture lets developers provision IaaS resources for their service instances at creation time, rather than the operator pre-provisioning a fixed quantity of IaaS resources when they deploy the service broker.

By making services single-tenant, where each instance runs on a dedicated VM rather than sharing VMs with unrelated processes, on-demand services eliminate the “noisy neighbor” problem when one application hogs resources on a shared cluster. Single-tenant services can also support regulatory compliance where sensitive data must be compartmentalized across separate machines.

An on-demand service splits its operations between the default network and the service network. Shared components of the service, such as executive controllers and databases, run centrally on the default network along with the Cloud Controller, UAA, and other PCF components. The worker pool deployed to specific spaces runs on the service network.

The diagram below shows worker VMs in an on-demand service instance running on a separate services network, while other components run on the default network.



On-Demand Services SDK and the On-Demand Broker

The on-demand services SDK is an SDK you can use to create on-demand brokers for single-tenant service offerings.

The on-demand services SDK simplifies broker and tile authoring, and is the standard approach for both Pivotal internal services teams and Pivotal partner independent software vendors (ISVs) to develop on-demand services for PCF.

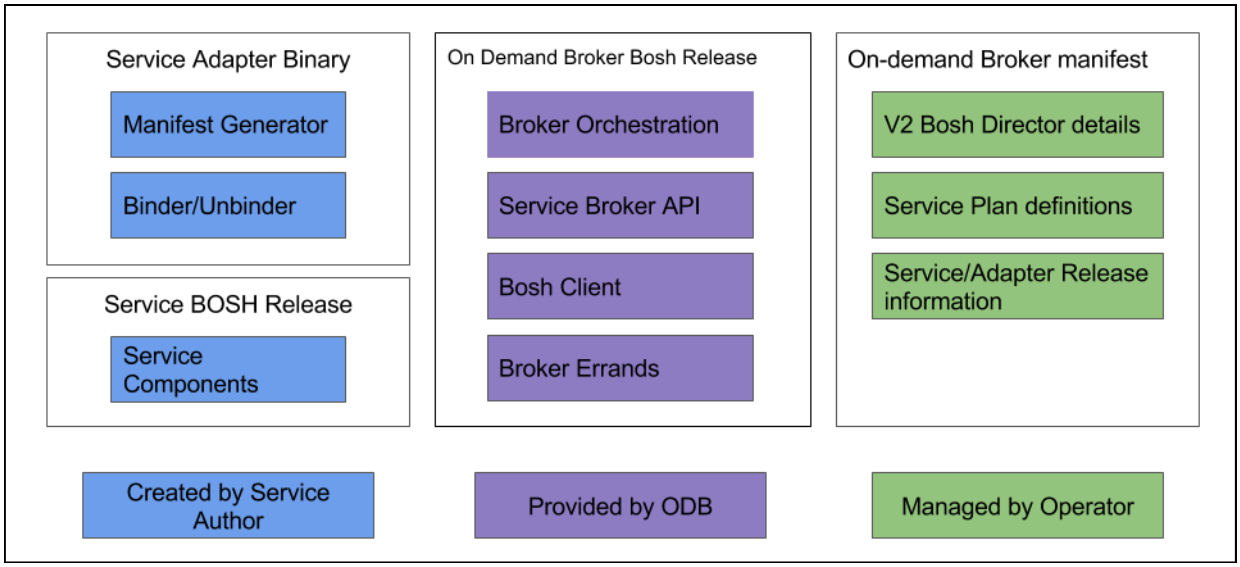
The ODB SDK provides a generic on-demand broker (ODB) that answers API calls from the Cloud Controller. The service author plugs service-specific functionality into the ODB SDK via an executable called a **Service Adapter**. For more information about the responsibilities of service authors, please see Creating the Service Author Deliverables.

No additional or third-party components other than the service broker and the BOSH release for the service itself are required. This simplifies the setup. Everything is done through the single install process. This approach also simplifies support because there are fewer moving parts, and your customer’s network needs less customizing of DNS rules and additional firewall ports.

The on-demand services SDK imposes no constraints on the service authors’ ability to offer new functionality or expose configuration options in their service plans, such as rate limiting and external load balancers.

Service Adapters

A service adapter is a binary that is called out by the ODB when it wants to do service-specific tasks.



The above diagram shows where responsibility lies for each aspect of the ODB workflow.

The service author can focus on building the BOSH release of their service and provide a service adapter binary that manages manifest generation, binding, and unbinding. The ODB manages all interactions with Cloud Foundry and BOSH.

Thanks to BOSH v2, service authors can define resources globally (in **Cloud Config**). This makes manifests portable across BOSH CPIs and lets them be substantially smaller than old-style manifests. The ODB takes advantage of other BOSH v2 features as well, including dynamic IP management, availability zones, and links through which deployed BOSH instances can access IP addresses and other information from other instances.

Once an on-demand tile is authored and distributed, the operator installs and configures it the same way they do with any other Pivotal products. In the process, they select which of the tile's available service plans to offer their developers.

Procedures for Using ODB

The following procedures outline how to set up, create and maintain a service tile based on the ODB SDK:

- Setting up networking — The operators ensure that network rules are set up to allow the necessary communication between components.
- Setting up your BOSH director — The operators ensure that minimum versions of Cloud Foundry and BOSH are available.
- Creating the Service Author Deliverables — The service authors provide their deliverables.
- Deploying an On-Demand Broker — The operators upload their releases and write a manifest.

Getting Started: ODB on a Local Development Environment

This guide describes how to create and manage an on-demand service using PCF Dev and BOSH lite, which are tools that allow you run BOSH and Pivotal Cloud Foundry on a local development machine. This tutorial bases its example service on Kafka open source messaging and uses the following sample code directories:

- Kafka example service
- Kafka example service adapter
- Kafka example app

About the BOSH CLI

The BOSH CLI is available in two major versions, v1 and v2.

Where appropriate, this topic provides examples of using each version of the BOSH CLI. Consult the table below to determine which version of the CLI is supported for your Pivotal Cloud Foundry (PCF) installation.

PCF Version	BOSH CLI Version
v1.10	CLI v1
v1.11	CLI v1 or CLI v2 (Pivotal recommends CLI v2)
v1.12 and later	CLI v2

Prerequisites

Before setting up and using ODB on your local development environment, install and configure the following components:

- BOSH Lite - *min version v9000.131.0*

> **Note**: For PCF Dev to route requests to the deployments on BOSH Lite ensure you run the script `bin/add-route` in the BOSH Lite repository. You may need to run this again if your networking is reset (e.g. reboot, or connecting to a different network).

- PCF Dev - *pcfdev-v0.19.1-rc.46*
- Once PCF Dev has finished installing, a success message displays.

```
  _______ _______ _______  ______  _______ __  __
 |    ||    ||    | |    | ||    || | | |
 |  _ ||    ||   ___| | _  ||   ___|| |_| |
 | |_||||    ||  |___  |||  ||  |___ |    |
 |  ___||    _||   ___| ||_|  ||   ___||    |
 | |   |   |_| |  |   |    ||  |___ |   |
 |___|   |_______||___|    |______||_______| |___|
is now running.
To begin using PCF Dev, please run:
   cf login -a https://api.local.pcfdev.io --skip-ssl-validation
Apps Manager URL: https://local.pcfdev.io
Admin user => Email: admin / Password: admin
```

Make note of the PCF Dev domain. You will need this later on. The default is `local.pcfdev.io`.

About the BOSH CLI

The BOSH CLI is available in two major versions, v1 and v2. Pivotal recommends that you use the BOSH CLI v2 when possible.

This topic provides examples of using each version of the BOSH CLI. Your PCF installation may affect which version of the BOSH CLI you can use. Consult the table below to determine which version of the CLI is supported for your installation.

Creating and Managing an On-Demand Service with the BOSH CLI v2

The following procedures are for v2 of the BOSH CLI. For instructions using v1, see Creating and Managing an On-Demand Service with the BOSH CLI v1.

Step 1: Set Up BOSH Lite

1. Target your BOSH Lite installation:

```
$ bosh2 alias-env YOUR-ENV -e
Current target is https://192.168.50.4:25555 (Bosh Lite Director)
```

2. Upload the BOSH Lite stemcell:

```
$ bosh2 upload stemcell https://bosh.io/d/stemcells/bosh-warden-boshlite-ubuntu-trusty-go_agent?v=3262.2
```

Step 2: Set Up the Kafka Example Service

1. Clone the Kafka example service into your workspace:

```
$ git clone https://github.com/pivotal-cf-experimental/kafka-example-service-release.git
```

2. In the `kafka-example-service-release` directory, create and upload the kafka example service:

```
$ cd kafka-example-service-release
$ bosh2 create release --name kafka-example-service
```

3. Upload the service to the BOSH director:

```
$ bosh2 upload release
```

Step 3: Set Up the Kafka Example Service Adapter

1. Clone the Kafka example service adapter and run `git submodule update --init` to bring in the adapter's dependencies

```
$ git clone https://github.com/pivotal-cf-experimental/kafka-example-service-adapter-release.git
```

2. Update the service adapter dependencies:

```
$ cd kafka-example-service-adapter-release
$ git submodule update --init --recursive
```

3. Create the example service adapter:

```
$ bosh2 create release --name kafka-example-service-adapter
```

4. Upload the example service adapter to the BOSH director:

```
$ bosh2 upload release
```

Step 4: Set Up the On-Demand Service Broker

1. Download the on-demand service broker from PivNet

2. Upload the `on-demand-service-broker` release (replace X.Y.Z with the ODB release version):

```
$ bosh2 upload release on-demand-service-broker-X.Y.Z.tgz
```

Step 5: Create a BOSH Deployment

1. Create a new directory in your workspace and a `cloud_config.yml` for the BOSH Lite Director. For example:

```
vm_types:
- name: container
  cloud_properties: {}

networks:
- name: kafka
  type: manual
  subnets:
  - range: 10.244.1.0/24
    gateway: 10.244.1.1
    az: lite
    cloud_properties: {}

disk_types:
- name: ten
  disk_size: 10_000
  cloud_properties: {}

azs:
- name: lite
  cloud_properties: {}

compilation:
  workers: 2
  reuse_compilation_vms: true
  network: kafka
  az: lite
  cloud_properties: {}
```

2. Update the BOSH Lite cloud config using the deployment manifest created in the previous step:

```
$ bosh2 update cloud-config cloud_config.yml
```

3. Obtain the URL and UUID BOSH Lite director information:

```
$ bosh2 env
```

This command produces output similar to the following:

```
→ bosh2 env
Config
            /Users/pivotal/.bosh_config


Director
  Name       Bosh Lite Director
  URL        https://192.168.50.4:25555
  Version    1.3215.0 (00000000)
  User       admin
  UUID       17a45148-1d00-43bc-af28-9882e5a6535a
  CPI        warden_cpi
  dns        disabled
  compiled_package_cache enabled (provider: local)
  snapshots  disabled
```

Record the URL and UUID from your output. You will add them to the `deployment_manifest.yml` in the next step.

4. Create a BOSH Lite deployment manifest in a file called `deployment_manifest.yml` using the following as a base.

Replace `BOSH_LITE_UUID`, `BOSH_LITE_URL` and `PCF_DEV_DOMAIN` with the values obtained in the previous steps.

```
name: kafka-on-demand-broker

director_uuid: <BOSH_LITE_UUID>

releases:
- name: &broker-release on-demand-service-broker
  version: latest
- name: &service-adapter-release kafka-example-service-adapter
  version: latest
- name: &service-release kafka-example-service
  version: latest
```

```
stemcells:
- alias: trusty
  os: ubuntu-trusty
  version: <STEMCELL_VERSION>

instance_groups:
- name: broker
  instances: 1
  vm_type: container
  persistent_disk_type: ten
  stemcell: trusty
  azs: [lite]
  networks:
  - name: kafka
  jobs:
  - name: kafka-service-adapter
    release: *service-adapter-release
  - name: admin_tools
    release: *service-release
  - name: broker
    release: *broker-release
    properties:
      port: 8080
      username: broker #or replace with your own
      password: password #or replace with your own
      disable_ssl_cert_verification: true
      bosh:
        url: <BOSH_LITE_URL>
        authentication:
          basic:
            username: admin
            password: admin
      cf:
        url: https://api.<PCF_DEV_DOMAIN>
        authentication:
          url: https://uaa.<PCF_DEV_DOMAIN>
          user_credentials:
            username: admin
            password: admin
      service_adapter:
        path: /var/vcap/packages/odb-service-adapter/bin/service-adapter
      service_deployment:
        releases:
        - name: *service-release
          version: <SERVICE_RELEASE_VERSION>
          jobs: [kafka_server, zookeeper_server]
        stemcell:
          os: ubuntu-trusty
          version: <STEMCELL_VERSION>
      service_catalog:
        id: D94A086D-203D-4966-A6F1-60A9E2300F72
        service_name: kafka-service-with-odb
        service_description: Kafka Service
        bindable: true
        plan_updatable: true
        tags: [kafka]
        plans:
        - name: small
          plan_id: 11789210-D743-4C65-9D38-C80B29F4D9C8
          description: A Kafka deployment with a single instance of each job and persistent disk
          instance_groups:
          - name: kafka_server
            vm_type: container
            instances: 1
            persistent_disk_type: ten
            azs: [lite]
            networks: [kafka]
          - name: zookeeper_server
            vm_type: container
            instances: 1
            persistent_disk_type: ten
            azs: [lite]
            networks: [kafka]
          properties:
            auto_create_topics: true
            default_replication_factor: 1

update:
  canaries: 1
  canary_watch_time: 30000-180000
  update_watch_time: 30000-180000
  max_in_flight: 4
```

5. Change the BOSH deployment to use the deployment manifest created in the previous step:

```
$ bosh2 deployment deployment_manifest.yml
```

6. Deploy the manifest:

```
$ bosh2 deploy
```

7. Obtain the IP address of the deployed broker:

```
$ bosh2 instances
```

This command produces output similar to the following:

```
Acting as client 'admin' on deployment 'kafka-on-demand-broker' on 'Bosh Lite Director'

Director task 147

Task 147 done

+-----------------------------------------------+---------+-----+-----------+------------+
| Instance                                      | State   | AZ  | VM Type   | IPs        |
+-----------------------------------------------+---------+-----+-----------+------------+
| broker/0 (59231277-d7b8-46bb-8bbb-8154b6bae347)* | running | n/a | container | 10.244.1.2 |
+-----------------------------------------------+---------+-----+-----------+------------+

(*) Bootstrap node

Instances total: 1
```

Record the IP address of the broker. You will use this in the next step to create a service broker.

Step 6: Create a Service Broker on PCF Dev

1. Create a service broker on PCF Dev and enable access to its service offering. You will need the broker's credentials set in the deployment manifest and the IP of the broker VM.

> Replace `BROKER_IP` with the value obtained in the previous step.

```
$ cf create-service-broker kafka-broker broker password http://<BROKER_IP>:8080
```

For more details on service brokers see here.

2. Enable access to the broker's service plans:

```
$ cf enable-service-access kafka-service-with-odb
```

3. View the services offered by the broker in the marketplace:

```
$ cf marketplace
```

This command produces output similar to the following:

```
Getting services from marketplace in org pcfdev-org / space pcfdev-space as admin...
OK

service                 plans       description
kafka-service-with-odb  small       Kafka Service
p-mysql                 512mb, 1gb  MySQL databases on demand
p-rabbitmq              standard    RabbitMQ is a robust and scalable high-performance multi-protocol messaging broker.
p-redis                 shared-vm   Redis service to provide a key-value store
```

4. Create a service instance using the Kafka on-demand broker.

```
$ cf create-service kafka-service-with-odb small k1
```

Step 7: Verify Your BOSH Deployment and On-Demand Service

1. Check the status of your service:

```
$ cf service k1
```

   Initially, the service status state is: `create in progress`. After the service is created, the status changes to: `create succeeded`.

2. Verify that the on-demand service is provisioned in the BOSH deployment

```
$ bosh2 deployments
```

   The output of this command appears as follows:

```
+-----------------------------------------------------+-------------------------------------+-----------------------------------------------------+-------------+
| Name                                                | Release(s)                          | Stemcell(s)                                         | Cloud Config |
+-----------------------------------------------------+-------------------------------------+-----------------------------------------------------+-------------+
| kafka-on-demand-broker                              | kafka-example-service-adapter/0+dev.2 | bosh-warden-boshlite-ubuntu-trusty-go\_agent/3262.2 | latest      |
|                                                     | on-demand-service-broker/0.2.0+dev.1 |                                                     |             |
+-----------------------------------------------------+-------------------------------------+-----------------------------------------------------+-------------+
| service-instance\_2715262c-8564-4cd9-b629-0ae99e6aa4b9 | kafka-example-service/0+dev.2       | bosh-warden-boshlite-ubuntu-trusty-go\_agent/3262.2 | latest      |
+-----------------------------------------------------+-------------------------------------+-----------------------------------------------------+-------------+
```

   This example shows that the service instance is provisioned and the service releases are specified in the ODB deployment manifest.

Step 8: Use Your On-Demand Service

The Kafka Example App shows how you can use the service instance that you created with `cf create-service`.

1. Clone the Kafka example app in your workspace:

```
$ git clone https://github.com/pivotal-cf-experimental/kafka-example-app.git
```

2. Push the app.

```
$ cd kafka-example-app
$ cf push --no-start
```

3. Bind the app to your service instance:

```
$ cf bind-service kafka-example-app k1
```

   Note: You can use `cf bs` as an alias for `cf bind-service`

4. Start the app:

```
$ cf start kafka-example-app
```

Now the app runs at `https:/kafka-example-app.<PCF_DEV_DOMAIN>`, and you can use it to read and write to your on-demand Kafka service instance. For example:

- To write data, run `curl -XPOST http://kafka-example-app.<PCF_DEV_DOMAIN>/queues/my-queue -d SOME-DATA`
- To read data, run `curl http://kafka-example-app.<PCF_DEV_DOMAIN>/queues/my-queue`

Creating and Managing an On-Demand Service with the BOSH CLI v1

The following procedures are for v1 of the BOSH CLI. For instructions using v2, see BOSH CLI v2.

Step 1: Set Up BOSH Lite

1. Target your BOSH Lite installation:

```
$ bosh target
Current target is https://192.168.50.4:25555 (Bosh Lite Director)
```

2. Upload the BOSH Lite stemcell:

```
$ bosh upload stemcell https://bosh.io/d/stemcells/bosh-warden-boshlite-ubuntu-trusty-go_agent?v=3262.2
```

Step 2: Set Up the Kafka Example Service

1. Clone the Kafka example service into your workspace:

```
$ git clone https://github.com/pivotal-cf-experimental/kafka-example-service-release.git
```

2. In the `kafka-example-service-release` directory, create and upload the kafka example service:

```
$ cd kafka-example-service-release
$ bosh create release --name kafka-example-service
```

3. Upload the service to the BOSH director:

```
$ bosh upload release
```

Step 3: Set Up the Kafka Example Service Adapter

1. Clone the Kafka example service adapter and run `git submodule update --init` to bring in the adapter's dependencies

```
$ git clone https://github.com/pivotal-cf-experimental/kafka-example-service-adapter-release.git
```

2. Update the service adapter dependencies:

```
$ cd kafka-example-service-adapter-release
$ git submodule update --init --recursive
```

3. Create the example service adapter:

```
$ bosh create release --name kafka-example-service-adapter
```

4. Upload the example service adapter to the BOSH director:

```
$ bosh upload release
```

Step 4: Set Up the On-Demand Service Broker

1. Download the on-demand service broker from PivNet

2. Upload the `on-demand-service-broker` release (replace X.Y.Z with the ODB release version):

```
$ bosh upload release on-demand-service-broker-X.Y.Z.tgz
```

Step 5: Create a BOSH Deployment

1. Create a new directory in your workspace and a `cloud_config.yml` for the BOSH Lite Director. For example:

```
vm_types:
- name: container
  cloud_properties: {}

networks:
- name: kafka
  type: manual
  subnets:
  - range: 10.244.1.0/24
    gateway: 10.244.1.1
    az: lite
    cloud_properties: {}

disk_types:
- name: ten
  disk_size: 10_000
  cloud_properties: {}

azs:
- name: lite
  cloud_properties: {}

compilation:
  workers: 2
  reuse_compilation_vms: true
  network: kafka
  az: lite
  cloud_properties: {}
```

2. Update the BOSH Lite cloud config using the deployment manifest created in the previous step:

```
$ bosh update cloud-config cloud_config.yml
```

3. Obtain the URL and UUID BOSH Lite director information:

```
$ bosh status
```

This command produces output similar to the following:

```
→ bosh status
Config
             /Users/pivotal/.bosh_config


Director
  Name       Bosh Lite Director
  URL        https://192.168.50.4:25555
  Version    1.3215.0 (00000000)
  User       admin
  UUID       17a45148-1d00-43bc-af28-9882e5a6535a
  CPI        warden_cpi
  dns        disabled
  compiled_package_cache enabled (provider: local)
  snapshots  disabled
```

Record the URL and UUID from your output. You will add them to the `deployment_manifest.yml` in the next step.

4. Create a BOSH Lite deployment manifest in a file called `deployment_manifest.yml` using the following as a base.

Replace `BOSH_LITE_UUID`, `BOSH_LITE_URL` and `PCF_DEV_DOMAIN` with the values obtained in the previous steps.

```
name: kafka-on-demand-broker

director_uuid: <BOSH_LITE_UUID>

releases:
- name: &broker-release on-demand-service-broker
  version: latest
- name: &service-adapter-release kafka-example-service-adapter
  version: latest
- name: &service-release kafka-example-service
  version: latest

stemcells:
- alias: trusty
  os: ubuntu-trusty
```

```
  version: <STEMCELL_VERSION>

instance_groups:
- name: broker
  instances: 1
  vm_type: container
  persistent_disk_type: ten
  stemcell: trusty
  azs: [lite]
  networks:
  - name: kafka
  jobs:
  - name: kafka-service-adapter
    release: *service-adapter-release
  - name: admin_tools
    release: *service-release
  - name: broker
    release: *broker-release
    properties:
      port: 8080
      username: broker #or replace with your own
      password: password #or replace with your own
      disable_ssl_cert_verification: true
      bosh:
        url: <BOSH_LITE_URL>
        authentication:
          basic:
            username: admin
            password: admin
      cf:
        url: https://api.<PCF_DEV_DOMAIN>
        authentication:
          url: https://uaa.<PCF_DEV_DOMAIN>
          user_credentials:
            username: admin
            password: admin
      service_adapter:
        path: /var/vcap/packages/odb-service-adapter/bin/service-adapter
      service_deployment:
        releases:
        - name: *service-release
          version: <SERVICE_RELEASE_VERSION>
          jobs: [kafka_server, zookeeper_server]
        stemcell:
          os: ubuntu-trusty
          version: <STEMCELL_VERSION>
      service_catalog:
        id: D94A086D-203D-4966-A6F1-60A9E2300F72
        service_name: kafka-service-with-odb
        service_description: Kafka Service
        bindable: true
        plan_updatable: true
        tags: [kafka]
        plans:
        - name: small
          plan_id: 11789210-D743-4C65-9D38-C80B29F4D9C8
          description: A Kafka deployment with a single instance of each job and persistent disk
          instance_groups:
          - name: kafka_server
            vm_type: container
            instances: 1
            persistent_disk_type: ten
            azs: [lite]
            networks: [kafka]
          - name: zookeeper_server
            vm_type: container
            instances: 1
            persistent_disk_type: ten
            azs: [lite]
            networks: [kafka]
          properties:
            auto_create_topics: true
            default_replication_factor: 1

update:
  canaries: 1
  canary_watch_time: 30000-180000
  update_watch_time: 30000-180000
  max_in_flight: 4
```

5. Change the BOSH deployment to use the deployment manifest created in the previous step:

```
$ bosh deployment deployment_manifest.yml
```

6. Deploy the manifest:

```
$ bosh deploy
```

7. Obtain the IP address of the deployed broker:

```
$ bosh instances
```

This command produces output similar to the following:

```
Acting as client 'admin' on deployment 'kafka-on-demand-broker' on 'Bosh Lite Director'

Director task 147

Task 147 done

+-----------------------------------------------+---------+-----+-----------+------------+
| Instance                                      | State   | AZ  | VM Type   | IPs        |
+-----------------------------------------------+---------+-----+-----------+------------+
| broker/0 (59231277-d7b8-46bb-8bbb-8154b6bae347)* | running | n/a | container | 10.244.1.2 |
+-----------------------------------------------+---------+-----+-----------+------------+

(*) Bootstrap node

Instances total: 1
```

Record the IP address of the broker. You will use this in the next step to create a service broker.

Step 6: Create a Service Broker on PCF Dev

1. Create a service broker on PCF Dev and enable access to its service offering. You will need the broker's credentials set in the deployment manifest and the IP of the broker VM.

> Replace `BROKER_IP` with the value obtained in the previous step.

```
$ cf create-service-broker kafka-broker broker password http://<BROKER_IP>:8080
```

For more details on service brokers see here.

2. Enable access to the broker's service plans:

```
$ cf enable-service-access kafka-service-with-odb
```

3. View the services offered by the broker in the marketplace:

```
$ cf marketplace
```

This command produces output similar to the following:

```
Getting services from marketplace in org pcfdev-org / space pcfdev-space as admin...
OK

service                 plans        description
kafka-service-with-odb  small        Kafka Service
p-mysql                 512mb, 1gb   MySQL databases on demand
p-rabbitmq              standard     RabbitMQ is a robust and scalable high-performance multi-protocol messaging broker.
p-redis                 shared-vm    Redis service to provide a key-value store
```

4. Create a service instance using the Kafka on-demand broker.

```
$ cf create-service kafka-service-with-odb small k1
```

Step 7: Verify Your BOSH Deployment and On-Demand Service

1. Check the status of your service:

   ```
   $ cf service k1
   ```

   Initially, the service status state is: `create in progress`. After the service is created, the status changes to: `create succeeded`.

2. Verify that the on-demand service is provisioned in the BOSH deployment

   ```
   $ bosh deployments
   ```

   The output of this command appears as follows:

   ```
   +-----------------------------------------------------+-------------------------------------+-----------------------------------------------------+--------------+
   | Name                                                | Release(s)                          | Stemcell(s)                                         | Cloud Config |
   +-----------------------------------------------------+-------------------------------------+-----------------------------------------------------+--------------+
   | kafka-on-demand-broker                              | kafka-example-service-adapter/0+dev.2 | bosh-warden-boshlite-ubuntu-trusty-go\_agent/3262.2 | latest       |
   |                                                     | on-demand-service-broker/0.2.0+dev.1 |                                                     |              |
   +-----------------------------------------------------+-------------------------------------+-----------------------------------------------------+--------------+
   | service-instance\_2715262c-8564-4cd9-b629-0ae99e6aa4b9 | kafka-example-service/0+dev.2       | bosh-warden-boshlite-ubuntu-trusty-go\_agent/3262.2 | latest       |
   +-----------------------------------------------------+-------------------------------------+-----------------------------------------------------+--------------+
   ```

   This example shows that the service instance is provisioned and the service releases are specified in the ODB deployment manifest.

Step 8: Use Your On-Demand Service

The Kafka Example App shows how you can use the service instance that you created with `cf create-service`.

1. Clone the Kafka example app in your workspace:

   ```
   $ git clone https://github.com/pivotal-cf-experimental/kafka-example-app.git
   ```

2. Push the app.

   ```
   $ cd kafka-example-app
   $ cf push --no-start
   ```

3. Bind the app to your service instance:

   ```
   $ cf bind-service kafka-example-app k1
   ```

   Note: You can use `cf bs` as an alias for `cf bind-service`

4. Start the app:

   ```
   $ cf start kafka-example-app
   ```

Now the app runs at `https:/kafka-example-app.<PCF_DEV_DOMAIN>`, and you can use it to read and write to your on-demand Kafka service instance. For example:

- To write data, run `curl -XPOST http://kafka-example-app.<PCF_DEV_DOMAIN>/queues/my-queue -d SOME-DATA`
- To read data, run `curl http://kafka-example-app.<PCF_DEV_DOMAIN>/queues/my-queue`

Creating the Service Author Deliverables

Service Author Requirements

The following deliverables are required from the service authors:

- Service release(s)
- BOSH release(s) to be deployed by the manifest that is generated by the Service Adapter
- Service Adapter BOSH release
- Contains the Service Adapter CLI
- Documentation for the operator to configure plan definitions for the Service Adapter
- Documentation for the operator to backup and restore service instances

For information about what is required of the Operator, see Responsibilities of the Operator.

Create a Service Release

A service release is a BOSH release that is deployed at instance creation time, once for each service instance, by the on-demand broker (ODB). We have created two examples:

- Redis
- Kafka

See the BOSH docs for help creating a BOSH release. We recommend creating sample manifests that deploy the service release(s), as this will help you write the `generate-manifest` component of the Service Adapter later.

Service Instance Lifecycle Errands

Note: This feature requires BOSH director v261 or later.

A service release can provide job errands that can be used by ODB during the management of an instance lifecycle. Service instance lifecycle errands may be configured by the operator.

ODB supports the following service instance lifecycle errands:

- `post-deploy` - Runs after the creation or updating of a service instance. See the workflow here.
- `pre-delete` - Runs before the deletion of a service instance. See the workflow here.

A deployment is only considered successful if along with the deployment the lifecycle errand completes successfully.

See an example implementation of a health check post-deploy job in the example redis release.

In the generate-manifest command ensure to validate and include any supported errands that are specified in the instance groups array.

Service Instance Lifecycle Colocated Errands

Note: This feature requires BOSH director v263 or later.

A job errand can be run as a `post-deploy` colocated errand. Colocated errands run on an existing service instance group, avoiding additional resource allocation.

In order to enable a new colocated errand, they must be added to the list of jobs of an instance group.

For more information see the BOSH documentation.

Job links

When generating a manifest, we recommend not using static IPs as this makes network IP management very complex. Instead, we recommend using BOSH's job links feature. There are two types of job links, implicit and explicit. The example Kafka release uses implicit job links to get the IPs of the brokers and the zookeeper. Details on how to use the links feature are available here.

Create a Service Adapter

A Service Adapter is an executable invoked by ODB. It is expected to respond to these subcommands:

- `generate-manifest` Generate a BOSH manifest for your service instance deployment and output to stdout as YAML, given information about the:
  - BOSH director (stemcells, release names)
  - service instance (ID, request parameters, plan properties, IAAS resources)
  - previous manifest, if this is an upgrade deployment

  Note: ODB requires `generate-manifest` to be a **pure function**. Given the same arguments when a previous manifest is supplied—which happens during a deployment update—the command should always output the same BOSH manifest.
- `dashboard-url` Generate an optional URL of a web-based management user interface for the service instance.
- `create-binding` Create (unique, if possible) credentials for the service instance, printing them to stdout as JSON.
- `delete-binding` Invalidate the created credentials, if possible. Some services (e.g. Redis) are single-user, and this endpoint will do nothing.

The parameters, and expected output from these subcommands will be explained in detail below. For each of these subcommands, exit status 0 indicates that the command succeeded exit status 10 indicates not implemented, and any non-zero status indicates failure.

Handle Errors

If a subcommand fails, the adapter must return a non-zero exit status, and may optionally print to stdout and/or stderr.

When a subcommand exits with an unrecognized exit code anything printed to stdout will be returned to the CF CLI user.

Both the stdout and stderr streams will be printed in the broker log for the operator. For that reason, we recommend not printing the manifest or other sensitive details to stdout/stderr, as the ODB does no validation on this output.

See an example implementation here.

Inputs for manifest generation

Request parameters

The body of the provision request from Cloud Controller, including arbitrary parameters from the CLI user.

Service authors can choose to allow Cloud Foundry users to configure service instances with arbitrary parameters. See the PCF docs on Managing Service Instances with the CLI. Arbitrary parameters can be passed to the service adapter when creating, or updating a service instance. They allow Cloud Foundry users to override the default configuration for a service plan.

Service authors must document the usage of arbitrary parameters for Cloud Foundry users.

For example:

- the Kafka service adapter supports the `auto_create_topics` arbitrary parameter to configure auto-creation of topics on the cluster.

Previous Manifest Properties

Service authors can choose to migrate certain properties for the service from the previous manifest when updating a service instance. If the previous manifest is ignored then any properties configured using arbitrary parameters will not be migrated when a service instance is updated.

Service authors must document the migration of previous manifest properties for operators.

For example:

- the Kafka service adapter supports migration of the `auto_create_topics` previous plan property to configure auto-creation of topics on the cluster.

Service Plan Properties

Service authors can choose to support certain properties for the service in the adapter code. These properties are service-specific traits used to customize the service. They do not necessarily map to jobs one to one; a plan property may affect multiple jobs in the deployment. Plan properties are a mechanism for the operator to define different plans.

Service authors must document the usage of plan properties for the operator.

For example:

- the Redis service adapter supports the `persistence` property which can be used to attach a disk to the vm.
- the Kafka service adapter supports the `auto_create_topics` property to enable auto-creation of topics on the cluster.

Order of Precedence

Note, we recommend service authors use the following order of precedence in their service adapters when generating manifests:

1. arbitrary parameters
2. previous manifest properties
3. plan properties

For example, see `auto_create_topics` in the example Kafka service adapter.

Defensive upgrade behaviors for stemcells or releases

Service Authors should ensure that the service release or the stemcell satisfies the functional requirements of the service adapter. This can be achieved, for example, by checking that the service release satisfies a minimum version constraint.

The generate manifest subcommand for the Kafka example has an example of this approach.

Service Adapter Interface

A service adapter is expected to be implemented as a binary with the interface

```
service-adapter [subcommand] [params ...]
```

where the subcommand can be generate-manifest, create-binding, delete-binding

Examples are provided for Redis and Kafka. Note that these Golang examples us the SDK to help with cross-cutting concerns such as unmarshalling the JSON command line parameters. For example, see the use of `HandleCommandLineInvocation` in the redis-adapter.

Subcommands

generate-manifest

```
service-adapter generate-manifest [service-deployment-JSON] [plan-JSON] [request-params-JSON] [previous-manifest-YAML] [previous-plan-JSON]
```

The generate-manifest subcommand takes in 5 arguments and returns a BOSH deployment manifest YAML.

Notes:

- ODB requires `generate-manifest` to be a **pure function**. Given the same arguments when a previous manifest is supplied—which happens during a deployment update—the command should always output the same BOSH manifest.
- When determing whether there are pending changes for an instance during an update, ODB *ignores* any configuration supplied in the update block of the manifest returned by the `generate-manifest` subcommand.

Output

The following table describes the supported exit codes and output for the `generate-manifest` subcommand:

Supported Exit Codes for generate-manifest

exit code	Description	Output
0	success	Stdout: BOSH manifest YAML
10	not implemented	
anything else	failure	Stdout: optional error message for CF CLI users Stderr: error message for operator ODB will log both stdout and stderr

Parameters

service-deployment-JSON

Provides information regarding the BOSH director

field	Type	Description
deployment_name	string	name of the deployment on the director, in the format `service-instance_$guid`
releases	array of releases	list of service releases configured for the deployment by the operator
release.name	string	name of the release on the director
release.version	string	version of the release
release.jobs	array of strings	list of jobs required from the release
stemcell	map	the stemcell available on the director
stemcell.stemcell_os	string	stemcell OS available on the director
stemcell.stemcell_version	string	stemcell version available on the director

For example

```
{
  "deployment_name": "service-instance_$GUID",
  "releases": [{
    "name": "kafka",
    "version": "dev.42",
    "jobs": [
      "kafka_node",
      "zookeeper"
    ]
  }],
  "stemcell": {
    "stemcell_os": "BeOS",
    "stemcell_version": "2"
  }
}
```

ODB only supports injecting one stemcell into each service deployment (different instance groups cannot have different stemcells).

ODB only supports using exact release and stemcell versions. The use of `latest` and floating stemcells are not supported.

Your Service Adapter should be opinionated about which jobs it requires to generate its manifest. For example, the Kafka example requires `kafka_node` and `zookeeper`. It should not be opinionated about the mapping of BOSH release to job. The jobs can all be provided by one release, or across many. The SDK provides the helper function `GenerateInstanceGroupsWithNoProperties` for generating instance groups without any properties. The Kafka example service adapter uses this helper function and invokes it to map the service releases parameter to the BOSH manifest `releases` and `instance_groups` sections.

You should provide documentation about which jobs are required by your Service Adapter, and which BOSH releases operators should get these jobs from.

plan-JSON

Plan for which the manifest is supposed to be generated

plan-JSON schema

field	Type	Description
instance_groups	array of instance groups	instance groups configured for the plan
instance_group.name	string	name of the instance group
instance_group.vm_type	string	the vm_type configured for the instance group, matches one in the cloud config on the director
instance_group.vm_extensions	array of strings	Optional, the vm_extensions configured for the instance group, must be present in the cloud config on the director
instance_group.persistent_disk_type	string	Optional, the persistent_disk_type configured for the instance group, matches one in the cloud config on the director
instance_group.networks	array of strings	the networks the instance group is supposed to be in
instance_group.instances	int	number of instances for the instance group
instance_group.lifecycle	string	Optional, specifies the kind of workload the instance group represents. Valid values are `service` and `errand`; defaults to `service`
instance_group.azs	array of strings	a list of availability zones that the instance groups should be striped across
instance_group.migrated_from	array of migrations	Optional, list of bosh migrations
migration.name	string	Optional, name of the instance group to be migrated from
properties	map	properties which the operator has configured for deployments of the current plan
update	map	update block which the operator has configured for deployments of the current plan
update.canaries	int	plan-specific number of canary instances
update.max_in_flight	int	plan-specific maximum number of non-canary instances to update in parallel
update.canary_watch_time	string	plan-specific time in milliseconds that the BOSH Director sleeps before checking whether the canary instances are healthy
update.update_watch_time	string	plan-specific time in milliseconds that the BOSH Director sleeps before checking whether the non-canary instances are healthy
update.serial	boolean	Optional, plan-specific flag to deploy instance groups sequentially (`true`), or in parallel (`false`); defaults to `true`

For example

```
{
  "instance_groups": [
    {
      "name": "example-server",
      "vm_type": "small",
      "vm_extensions": ["some", "extensions"],
      "persistent_disk_type": "ten",
      "networks": [
        "example-network"
      ],
      "azs": [
        "example-az"
      ],
      "instances": 1,
      "migrated_from": [{
        "name": "old-example-server"
      }]
    },
    {
      "name": "example-migrations",
      "vm_type": "small",
      "persistent_disk_type": "ten",
      "networks": [
        "example-network"
      ],
      "instances": 1,
      "lifecycle": "errand"
    }
  ],
  "properties": {
    "example": "property"
  },
  "update": {
    "canaries": 1,
    "max_in_flight": 2,
    "canary_watch_time": "1000-30000",
    "update_watch_time": "1000-30000",
    "serial": true
  }
}
```

Plans are composed by the operator and consist of resource mappings, properties and an optional update block:

- **Resource Mappings**

The `instance_groups` section of the plan JSON. This maps service deployment instance groups (defined by the service author) to resources (defined by the operator). The service developers should document the list of instance group names required for their deployment (e.g. “redis-server”) and any constraints they recommend on resources (e.g. operator must add a persistent disk if persistence property is enabled). These constraints can of course be enforced in code. The `instance_groups` section also contains a field for `lifecycle`, which can be set by the operator. The service adapter will add a lifecycle field to the instance group within the BOSH manifest when specified.

- **Properties**

Properties are service-specific parameters chosen by the service author. The Redis example exposes a property `persistence`, which takes a boolean value and toggles disk persistence for Redis. These should be documented by the service developers for the operator.

- **Update Block (optional)**

This block defines a plan-specific configuration for BOSH’s update instance operation. Although the ODB considers this block optional, the service adapter must output an update block in every manifest it generates. Some ways to achieve that are:

1. *(Recommended)* Define a default update block for all plans, which is used when a plan-specific update block is not provided by the operator
2. Hard code an update block for all plans in the service adapter
3. Make the update block mandatory, so that operators must provide an update block for every plan in the service catalogue section of the ODB manifest

request-params-JSON

This is a JSON object that holds the entire body of the service provision or service update request sent by the Cloud Controller to the service broker. The request parameters JSON will be `null` for upgrades.

The field `parameters` contains arbitrary key-value pairs which were passed by the application developer as a `cf` CLI parameter when creating, or updating

the service instance.

Note: when updating an existing service instance, any arbitrary parameters passed on a previous create or update will not be passed again. Therefore, for arbitrary parameters to stay the same across multiple deployments they must be retrieved from the previous manifest.

previous-manifest-YAML

The previous manifest as YAML. The previous manifest is nil if this is a new deployment. The format of the manifest should match the BOSH v2 manifest .

It is up to the service author to perform any necessary service-specific migration logic here, if previous manifest is non-nil.

Another use-case of the previous manifest is for the migration of deployment properties which need to stay the same across multiple deployments of a manifest. For example in the Redis example, we generate a password when we do a new deployment. But when the previous deployment manifest is provided, we copy the password over from the previous deployment, as generating a new password for existing deployments will break existing bindings.

For example see the example Redis service adapter.

previous-plan-JSON

The previous plan as JSON. The previous plan is nil if this is a new deployment. The format of the plan should match plan schema. The previous plan can be used for complex plan migration logic, for example the kafka service adapter, rejects a plan migration if the new plan reduces the number of instances, to prevent data loss.

---

dashboard-url

```
service-adapter dashboard-url [instance-ID] [plan-JSON] [manifest-YAML]
```

The `dashboard-url` subcommand takes in 3 arguments and returns a JSON with the `dashboard_url`. The dashboard URL is optional. If no dashboard URL is relevant to the service, the subcommand should exit with code 10. Provisioning will be successful without the dashboard URL.

Output

If the `dashboard-url` command generates a url successfully, it should exit with 0 and return a dashboard URL JSON with the following structure:

field	Type	Description
dashboard_url	string	dashboard url returned to the cf user

```
{
  "dashboard_url":"https://someurl.example.com"
}
```

Supported exit codes for dashboard-url

exit code	Description	Output
0	success	Stdout: dashboard URL JSON
10	not implemented	
anything else	failure	Stdout: optional error message for CF CLI users Stderr: error message for operator ODB will log both stdout and stderr

instance-ID

Provided by the cloud controller which uniquely identifies the service-instance.

plan-JSON

Current plan for the service instance as JSON. The structure should be the same as the plan given in the generate manifest

manifest-YAML

The current manifest as YAML. The format of the manifest should match the [BOSH] v2 manifest](https://bosh.io/docs/manifest-v2.html)

---

create-binding

```
service-adapter create-binding [binding-ID] [bosh-VMs-JSON] [manifest-YAML] [request-params-JSON]
```

Binding credentials for a service instance should share a namespace, and should be unique if possible. E.g. for MySQL, two bindings could include a different username/password pairs, but share the same MySQL database tables and data. The first step is to determine which credentials are best to supply in the context of your service. We recommend that users can be identified statelessly from the binding ID, and the simplest way to do this is to name the user after the binding ID.

Output

If the `create-binding` command is successful, it should return an exit code of 0 and print a service broker API binding JSON response on stdout. An example response is shown below. If the command failed, it should return any non-zero exit code, see the supported exit code table for details of supported failure cases. Stdout and stderr from the command will be logged by the ODB.

Example success response to `create-binding`:

```
{
  "credentials": {
    "username": "user1",
    "password": "reallysecret"
  },
  "syslog_drain_url": "optional: for syslog drain services only",
  "route_service_url": "optional: for route services only"
}
```

Supported exit codes for binding

exit code	Description	Output
0	success	Stdout: binding credentials JSON
10	subcommand not implemented	
42	app_guid not provided in the binding request body	Stderr: error message for operator ODB will log both stdout and stderr
49	binding already exists	Stderr: error message for operator ODB will log both stdout and stderr
anything else	failure	Stdout: optional error message for CF CLI users Stderr: error message for operator ODB will log both stdout and stderr

Parameters

---

binding-ID

The binding-ID generated by the Cloud Controller.

bosh-VMs-JSON

A map of instance group name to an array of IPs provisioned for that instance group.

For example

```
{
  "mysql_node": ["192.0.2.1", "192.0.2.2", "192.0.2.3"],
  "management_box": ["192.0.2.4"]
}
```

This can be used to connect to the instance deployment if required, to create a service specific binding. In the example above, the Service Adapter may connect to MySQL as the admin and create a user. As part of the binding, the `mysql_node` IPs would be returned, but maybe not the `management_box`.

manifest-YAML

The current manifest as YAML. This is used to extract information about the deployment that is necessary for the binding (e.g. admin credentials with which to create users). The format of the manifest should match the BOSH v2 manifest

request-params-JSON

This is a JSON object that holds the entire body of the service binding request sent by the Cloud Controller to the service broker.

The field `parameters` contains arbitrary key-value pairs which were passed by the application developer as a `cf` CLI parameter when creating, or updating the service instance.

Credentials for Bindings

We have identified three approaches to credentials for a service binding.

Static Credentials

In this case, the same credentials are used for all bindings. One option is to define these credentials in the service instance manifest.

This scenario makes sense for services that use the same credentials for all bindings, such as Redis. For example:

```
properties:
  redis:
    password: <same-for-all-bindings>
```

Credentials Unique to Each Binding

In this case, when the adapter `generate-manifest` subcommand is invoked, it generates random admin credentials and returns them as part of the service instance manifest. When the `create-binding` subcommand is invoked, the adapter can use the admin credentials from the manifest to create unique credentials for the binding. Subsequent `create-binding`s create new credentials.

This option makes sense for services whose binding creation resembles user creation, such as MySQL or RabbitMQ. For example, in MySQL the admin user can be used to create a new user and database for the binding:

```
properties:
  admin_password: <use-to-create-credentials>
```

Using an Agent

In this case, the author defines an agent responsible for handling creation of credentials unique to each binding. The agent must be added as a BOSH release in the service manifest. Moreover, the service and agent jobs should be co-located in the same instance group.

This option is useful for services where the adapter cannot or prefers not to directly call out to the service instance, and instead delegates responsibility for setting up new credentials to an agent.

For example:

```
releases:
  - name: service-release
    version: 1.5.7
  - name: credentials-agent-release
    version: 4.2.0

instance_groups:
  - name: service-group
    jobs:
      - name: service-job
        release: service-release
      - name: credentials-agent-job
        release: credentials-agent-release
```

delete-binding

```
service-adapter delete-binding [binding-ID] [bosh-VMs-JSON] [manifest-YAML] [request-params-JSON]
```

This should invalidate the credentials that were generated by `create-binding` if possible. E.g. for MySQL, it would delete the binding user.

Output

The following table describes the supported exit codes and output for the `delete-binding` subcommand:

Supported exit codes for delete-binding

exit code	Description	Output
0	success	No output is required
10	not implemented	
41	binding does not exist	Stderr: error message for operator ODB will log both stdout and stderr
anything else	failure	Stdout: optional error message for CF CLI users Stderr: error message for operator ODB will log both stdout and stderr

Parameters

binding-ID

The binding to be deleted.

bosh-VMs-JSON

A map of instance group name to an array of IPs provisioned for that instance group.

For example

For example

```
{
  "my-instance-group": ["192.0.2.1", "192.0.2.2", "192.0.2.3"]
}
```

This can be used to connect to the actual VMs if required, to delete a service specific binding. For example delete a user in MySQL.

manifest-YAML

The current manifest as YAML. This is used to extract information about the deployment that is necessary for the binding (e.g. credentials). The format of the manifest should match the BOSH v2 manifest

For example see the kafka delete binding

Request Params JSON

This is a JSON object that holds the entire body of the service unbinding request sent by the Cloud Controller to the service broker.

The field `parameters` contains arbitrary key-value pairs which were passed by the application developer as a `cf` CLI parameter when creating, or updating the service instance.

Packaging

This topic describes workflows for setting up and maintaining of a service instance. The diagrams show which tasks are undertaken by the ODB and which require interaction with the Service Adapter.

The adapter should be packaged as a BOSH release, which should be co-located with the ODB release in a BOSH manifest by the operator. This is only done in order to place the adapter executable on the same VM as the ODB server, therefore the adapter BOSH job's `monit` file should probably have no processes defined.

Example service adapter releases:

- Kafka
- Redis

Golang SDK

We have published a SDK for teams writing their service adapters in Golang. It encapsulates the command line invocation handling, parameter parsing, response serialization and error handling so the adapter authors can focus on the service-specific logic in the adapter.

You should use the same version of the SDK as your ODB release. For example if you are using v0.8.0 of the ODB BOSH release you should checkout the v0.8.0 tag of the SDK.

For the generated BOSH manifest the SDK supports properties in two levels: manifest (global) and job level. Global properties are deprecated in BOSH, in favour of job level properties and job links. As an example, refer to the Kafka example service adapter property generation.

Usage

Get the SDK:

```
go get github.com/pivotal-cf/on-demand-services-sdk
```

In the main function for the service adapter, call the `HandleCommandLineInvocation` function:

```
package main

import (
    "log"
    "os"

    "github.com/bar-org/foo-service-adapter/adapter"
    "github.com/pivotal-cf/on-demand-services-sdk/serviceadapter"
)

func main() {
  logger := log.New(os.Stderr, "[foo-service-adapter] ", log.LstdFlags)
  manifestGenerator := adapter.ManifestGenerator{}
  binder := adapter.Binder{}
  dashboardUrlGenerator := adapter.DashboardUrlGenerator{}
  serviceadapter.HandleCommandLineInvocation(os.Args, manifestGenerator, binder, dashboardUrlGenerator)
}
```

Interfaces

The `HandleCommandLineInvocation` function accepts structs that implement these interfaces:

```
type ManifestGenerator interface {
    GenerateManifest(serviceDeployment ServiceDeployment, plan Plan, requestParams RequestParameters, previousManifest *bosh.BoshManifest, previousPlan *Plan) (bosh.BoshManifest, error)
}

type Binder interface {
    CreateBinding(bindingID string, deploymentTopology bosh.BoshVMs, manifest bosh.BoshManifest, requestParams RequestParameters) (Binding, error)
    DeleteBinding(bindingID string, deploymentTopology bosh.BoshVMs, manifest bosh.BoshManifest, requestParams RequestParameters) error
}

type DashboardUrlGenerator interface {
    DashboardUrl(instanceID string, plan Plan, manifest bosh.BoshManifest) (DashboardUrl, error)
}
```

Helpers

The helper function `GenerateInstanceGroupsWithNoProperties` can be used to generate the instance groups for the BOSH manifest from the arguments passed to the adapter. One of the inputs for this function is the mapping of instance groups to jobs for the deployment (`deploymentInstanceGroupsToJobs`). This mapping must be provided by the service author. This function will not address job level properties for the generated instance groups; these properties must also be provided by the service author. For an example implementation see the job mapping in the Kafka example adapter.

Error handling

Any error returned by the interface functions is considered to be for the Cloud Foundry CLI user and will accordingly be printed to stdout.

The adapter code is responsible for performing any error logging to stderr that the authors think is relevant for the operator logs.

There are three specialised errors for the `CreateBinding` function, which allow the adapter to exit with the appropriate code:

```
serviceadapter.NewBindingAlreadyExistsError()
serviceadapter.NewBindingNotFoundError()
serviceadapter.NewAppGuidNotProvidedError()
```

For more complete code examples please take a look at the kafka adapter or the redis adapter.

Operating an On-Demand Broker

Operator Responsibilities

The operator is responsible for performing the following:

- Request appropriate networking rules for on-demand service tiles.
- Configure the BOSH Director
- Upload the required releases for the broker deployment and service instance deployments.
- Write a broker manifest
  - If you are unfamiliar with writing BOSH v2 manifests, see Manifest v2 Schema.
  - Core broker configuration
  - Service catalog and plan composition
- Manage brokers
- Documentation for the operator

For a list of deliverables provided by the Service Author, see Required Deliverables.

For an example manifest for a Redis service, see redis-example-service-adapter-release.

For an example manifest for a Kafka service, see kafka-example-service-adapter-release.

About the BOSH CLI

The BOSH CLI is available in two major versions, v1 and v2.

Where appropriate, this topic provides examples of using each version of the BOSH CLI. Consult the table below to determine which version of the CLI is supported for your Pivotal Cloud Foundry (PCF) installation.

PCF Version	BOSH CLI Version
v1.10	CLI v1
v1.11	CLI v1 or CLI v2 (Pivotal recommends CLI v2)
v1.12 and later	CLI v2

Set Up Networking

Prior to deploying any service tile that uses the on-demand broker (ODB), the operator must request the network connections needed to allow various components of Pivotal Cloud Foundry (PCF) to communicate with ODB. The specifics of how to open those connections varies for each IaaS.

The following table shows the responsibilities of the key components in an on-demand architecture.

Key Components	Their Responsibility
BOSH Director	Creates and updates service instances as instructed by ODB
BOSH Agent	BOSH includes an Agent on every VM that it deploys. The Agent listens for instructions from the Director and carries out those instructions. The Agent receives job specifications from the Director and uses them to assign a role, or Job, to the VM.
BOSH UAA	As an OAuth2 provider, BOSH UAA issues tokens for clients to use when they act on behalf of BOSH users.
ERT	Contains the apps that are consuming services
ODB	Instructs BOSH to create and update services, and connects to services to create bindings
Deployed service instance	Runs the given data service (for example, the deployed Redis for PCF service instance runs the Redis for PCF data service)

Regardless of the specific network layout, the operator must ensure network rules are set up so that connections are open as described in the table below.

This component…	Must communicate with…	Default TCP Port	Communication direction(s)	Notes
ODB	• BOSH Director • BOSH UAA	• 25555 • 8443	One-way	The default ports are not configurable.
ODB	Deployed service instances	Specific to the service (such as RabbitMQ for PCF). May be one or more ports.	One-way	This connection is for administrative tasks. Avoid opening general use, app-specific ports for this connection.
ODB	ERT	8443	One-way	The default port is not configurable.
Errand VMs	• ERT • ODB • Deployed Service Instances	• 8443 • 8080 • Specific to the service. May be one or more ports.	One-way	The default port is not configurable.
BOSH Agent	BOSH Director	4222	Two-way	The BOSH Agent runs on every VM in the system, including the BOSH Director VM. The BOSH Agent initiates the connection with the BOSH Director. The default port is not configurable.
Deployed apps on ERT	Deployed service instances	Specific to the service. May be one or more ports.	One-way	This connection is for general use, app-specific tasks. Avoid opening administrative ports for this connection.
ERT	ODB	8080	One-way	This port may be different for individual services. This port may also be configurable by the operator if allowed by the tile developer.

Set Up Your BOSH Director

Dependencies for the On-Demand Broker:

- BOSH Director v257 or later (PCF v1.8)

> **Note:** BOSH Windows is not supported.

- Cloud Foundry v238 or later (PCF v1.8)

> **Note**: Service Instance Lifecycle Errands require BOSH Director v261 (PCF v1.10) or later.

SSL Certificates

You have two options to configure certificate-based authentication between the BOSH Director and the ODB:

1. Add the BOSH director's root certificate to ODB's trusted pool in the ODB manifest:

```
bosh:
  root_ca_cert: <root-ca-cert>
```

2. Use BOSH's `trusted_certs` feature to add a self-signed CA certificate to each VM BOSH deploys. For more details on how to generate and use self-signed certificates for BOSH director and UAA, see Director SSL Certificate Configuration.

You can also configure a separate root CA certificate that is used when ODB communicates with the Cloud Foundry API (Cloud Controller).

For more information, see manifest snippets below.

BOSH Teams

BOSH has a teams feature that allows you to further control how BOSH operations are available to different clients. Pivotal recommends using this feature to ensure that your on-demand service broker client can only modify deployments it created. The example below shows how you can configure UUAC to create the client.

```
uaac client add <client-id> \
  --secret <client-secret> \
  --authorized_grant_types "refresh_token password client_credentials" \
  --authorities "bosh.teams.<team-name>.admin"
```

If you use this process, when you configure the broker's BOSH authentication, you can use this client ID and secret. Then the broker is only able to perform BOSH operations on deployments it has created.

For how to set up and use BOSH teams, see Director teams and permissions configuration.

For more details on securing how ODB uses BOSH, see Security.

Cloud Controller

ODB uses the Cloud Controller as a source of truth about service offerings, plans, and instances. To reach Cloud Controller, ODB needs to be configured with credentials. These can be either client or user credentials:

- Client credentials: as of Cloud Foundry v238, the UAA client must have authority `cloud_controller.admin`.
- User credentials: a Cloud Foundry admin user, such as a member of the `scim.read` and `cloud_controller.admin` groups as a minimum.

Upload Required Releases

Upload the following releases to the BOSH Director:

- On-demand-service-broker
- Your service adapter
- Your service release(s)

Write a Broker Manifest

Core Broker Configuration

Your manifest should contain one non-errand instance group that co-locates the `broker` job from on-demand-service-broker and your service adapter job from the service adapter release.

The broker is stateless and does not need a persistent disk. The VM type can be quite small; in most cases, a single CPU and 1 GB of memory should be sufficient.

An example snippet is shown below:

```
instance_groups:
  - name: broker # this can be anything
    instances: 1
    vm_type: <vm type>
    stemcell: <stemcell>
    networks:
      - name: <network>
    jobs:
      - name: <service adapter job name>
        release: <service adapter release>
      - name: broker
        release: on-demand-service-broker
        properties:
          # choose a port and basic auth credentials for the broker
          port: <broker port>
          username: <broker username>
          password: <broker password>
          disable_ssl_cert_verification: <truelfalse> # optional, defaults to false. This should NOT be used in production
          shutdown_timeout_in_seconds: 60 # optional, defaults to 60 seconds. This allows the broker to gracefully wait for any open requests to complete before shutting down.
          cf:
            url: <CF API URL>
            root_ca_cert: <ca cert for cloud controller> # optional, see SSL certificates
            authentication: # either client_credentials or user_credentials, not both as shown
              url: <CF UAA URL>
              client_credentials:
                client_id: <UAA client id with cloud_controller.admin authority and client_credentials in the authorized_grant_type>
                secret: <UAA client secret>
              user_credentials:
                username: <CF admin username in the cloud_controller.admin and scim.read groups>
                password: <CF admin password>
          bosh:
            url: <director url>
            root_ca_cert: <ca cert for bosh director and associated UAA> # optional, see SSL certificates
            authentication: # either basic or uaa, not both as shown
              basic:
                username: <bosh username>
                password: <bosh password>
              uaa:
                client_id: <bosh client id>
                client_secret: <bosh client secret>
          service_adapter:
            path: <path to service adapter binary> # optional, provided by the Service Author. Defaults to /var/vcap/packages/odb-service-adapter/bin/service-adapter

          # There are more broker properties that are discussed below
```

This snippet is using the BOSH v2 syntax and making use of global cloud config and job-level properties.

Note: The `disable_ssl_cert_verification` option is dangerous and **should not be used in production**.

Service Catalog and Plan Composition

The operator must:

1. Supply each release job specified by the Service Author exactly once. You can include releases that provide many jobs, as long as each required job is provided by exactly one release.

2. Supply one stemcell that is used on each VM in the service deployments. ODB does not currently support service instance deployments that use a different stemcell for different instance groups.

3. Use exact versions for releases and stemcells. The use of `latest` and floating stemcells are not supported.

4. Create Cloud Foundry service metadata in the catalog for the service offering. This metadata will be aggregated in the Cloud Foundry marketplace and displayed in Apps Manager and the `cf` CLI.

5. Compose plans. In ODB, service authors do not define plans but instead expose plan properties. The operator's role is to compose combinations of these properties, along with IaaS resources and catalog metadata into as many plans as they like.

    a. Create Cloud Foundry service plan metadata in the service catalog for each plan.
    b. Provide resource mapping for each instance group specified by the Service Author for each plan. The resource values must correspond to valid resource definitions in the BOSH Director's global cloud config. In some cases, Service Authors will recommend resource configuration; for example, in single-node Redis deployments, an instance count greater than 1 does not make sense. Here the operator can configure the deployment to span multiple availability zones (AZs) by using the BOSH multi-az feature. For example, the kafka multi AZ plan. In some cases, service authors will provide errands for the service release. You can add an instance group of type errand by setting the lifecycle field.

For example the smoke_tests for the kafka deployment.

c. Provide values for plan properties. Plan properties are key-value pairs defined by the Service Author. Some examples include a boolean to enable disk persistence for Redis, and a list of strings representing RabbitMQ plugins to load. The Service Author should document whether these properties are mandatory or optional, whether the use of one property precludes the use of another, and whether certain properties affect recommended instance group to resource mappings. Properties can also be specified at the service offering level, where they will be applied to every plan. If there is a conflict between global and plan-level properties, the plan properties will take precedence.

d. Provide an (optional) update block for each plan. You may require plan-specific configuration for BOSH's update instance operation. The ODB passes the plan-specific update block to the service adapter. Plan-specific update blocks should have the same structure as the update block in a BOSH manifest. The Service Author can define a default update block to be used when a plan-specific update block is not provided, and whether the service adapter supports their configuration in the manifest.

Add the snippet below to your broker job properties section:

```
service_deployment:
  releases:
    - name: <service-release>
      version: <service-release-version> # Exact release version
      jobs: [<release-jobs-needed-for-deployment-and-lifecycle-errands>] # Service Author will specify list of jobs required
  stemcell: # every instance group in the service deployment has the same stemcell
    os: <service-stemcell>
    version: <service-stemcell-version> # Exact stemcell version
service_catalog:
  id: <CF marketplace ID>
  service_name: <CF marketplace service offering name>
  service_description: <CF marketplace description>
  bindable: <true|false>
  plan_updatable: <true|false> # optional
  tags: [<tags>] # optional
  requires: [<required permissions] # optional
  dashboard_client: # optional
    id: <dashboard OAuth client ID>
    secret: <dashboard OAuth client secret>
    redirect_uri: <dashboard OAuth redirect URI>
  metadata: # optional
    display_name: <display name>
    image_url: <image url>
    long_description: <long description>
    provider_display_name: <provider display name>
    documentation_url: <documentation url>
    support_url: <support url>
  global_properties: {} # optional, applied to every plan.
  global_quotas: # optional
    service_instance_limit: <instance limit> # the maximum number of service instances across all plans
  plans:
    - name: <CF marketplace plan name>
      plan_id: <CF marketplace plan id>
      description: <CF marketplace description>
      cf_service_access: <enable|disable|manual> # optional, enable by default.
      bindable: <true|false> # optional. If specified, this takes precedence over the bindable attribute of the service
      metadata: # optional
        display_name: <display name>
        bullets: [<bullet1>, <bullet2>]
        costs:
          - amount:
              <currency code (string)>: <currency amount (float)>
            unit: <frequency of cost>
      quotas: # optional
        service_instance_limit: <instance limit> # the maximum number of service instances for this plan
      instance_groups: # resource mapping for the instance groups defined by the Service Author
        - name: <service author provided instance group name>
          vm_type: <vm type>
          vm_extensions: [<vm extensions>] # optional
          instances: <instance count>
          networks: [<network>]
          azs: [<az>]
          persistent_disk_type: <disk> # optional
        - name: <service author provided lifecycle errand name> # optional
          lifecycle: errand
          vm_type: <vm type>
          instances: <instance count>
          networks: [<network>]
          azs: [<az>]
      properties: {} # valid property key-value pairs are defined by the Service Author
      update: # optional
        canaries: 1 # required
        max_in_flight: 2  # required
        canary_watch_time: 1000-30000 # required
        update_watch_time: 1000-30000 # required
        serial: true # optional
      lifecycle_errands: #optional
        post_deploy:
          name: <errand name> #optional
          instances: [<instance name>] #optional, for co-locating errand
        pre_delete: <errand name> #optional
```

Enabling Secure Binding

ODB optionally allows secure storage of service credentials in CredHub. To use this feature, you will need to be able to connect to CredHub v1.6.x or later. This may be provided as part of your Cloud Foundry deployment. Credhub depends on being addressed by a local domain name so your instance group will require access to the local DNS provider. Most Cloud Foundry deployments currently use Consul as a DNS provider. In the ODB manifest, you will need to consume the credhub link and include the secure binding credentials section. You may also wish to consume Consul links to enable DNS. An example

manifest snippet assuming you are connecting to a Cloud Foundry deployment is shown below:

```
instance_groups:
- name: broker
  ...
  jobs:
  - name: broker
    consumes:
      credhub:
        from: credhub
        deployment: cf
    properties:
      ...
      secure_binding_credentials:
        enabled: true
        authentication:
          uaa:
            client_id: ((credhub.client_id))
            client_secret: ((credhub.client_secret))
            ca_cert: ((cf.uaa.ca_cert))
  - name: consul_agent
    release: consul
    consumes:
      consul: nil
      consul_client:
        from: consul_client_link
        deployment: cf
      consul_common:
        from: consul_common_link
        deployment: cf
      consul_server: nil
```

Note: The CredHub UAA Client must have `credhub.write` and `credhub.read` in its list of `authorities`.

If the Secure Binding Credentials section is omitted, or if `secure_binding_credentials.enabled` is `false`, the service credentials will be set explicitly in the application's VCAP_SERVICES environment variable.

How credentials are stored on CredHub

The credentials for a given Service Binding are stored with the following format:

```
/c/:service-guid/:service-instance-guid/:binding-guid/credentials
```

The plain-text credentials are stored in CredHub under this key, and the key is available under the VCAP_SERVICES environment variable for the application.

Route Registration

You can optionally co-locate the `route_registrar` job from the routing release with the on-demand-service-broker, in order to:

- Load balance multiple instances of ODB using Cloud Foundry's router.
- Access ODB from the public internet.

To do this, upload the release to your BOSH Director and configure the job properties, replacing the version in that docs URL query string as appropriate.

Remember to set the `broker_uri` property in the register-broker errand if you configure a route.

Service Instance Quotas

ODB offers global and plan level service quotas to set service instance limits.

Plan quotas restrict the number of service instances for a given plan, while the global limit restricts the number of service instances across all plans.

When creating a service instance, ODB will check the global service instance limit. If it has not been reached, it checks the plan service instance limit.

Note: These limits do not include orphans. See List Orphan Deployments and Delete Orphaned Deployments.

Broker Metrics

The ODB BOSH release contains a metrics job that can be used to emit metrics when co-located with service metrics. You must include the loggregator release in order to do this.

Add the following jobs to the broker instance group:

```
- name: service-metrics
  release: service-metrics
  properties:
    service_metrics:
      execution_interval_seconds: <interval between successive metrics collections>
      origin: <origin tag for metrics>
      monit_dependencies: [broker] # hardcode this
      ....snip....
      #Add Loggregator configuration here: see examples @ https://github.com/pivotal-cf/service-metrics-release/blob/master/manifests
      ....snip....
- name: service-metrics-adapter
  release: <ODB release>
```

For an example of how the service metrics can be configured for an on-demand-broker deployment, see the kafka-example-service-adapter-release manifest.

Pivotal have tested this example configuration with loggregator v58 and service-metrics v1.5.0.

For more information about service metrics, see Service Metrics for Pivotal Cloud Foundry.

Broker Startup Checks

The following startup checks occur:

- Verify that the CF and BOSH versions satisfy the minimum requirement.

  Note: If your service offering includes lifecycle errands, the minimum requirement for BOSH is higher. See Set Up Your BOSH Director. If your system does not meet minimum requirements, an error appears. For example:
  `CF API error: Cloud Foundry API version is insufficient, ODB requires CF v238+.`

- Verify that no service offering plan IDs have changed for plans that have existing service instances. If there are instances, you see following error:
  `You cannot change the plan_id of a plan that has existing service instances.`

Broker Shutdown

The broker waits for any incomplete `https` requests to complete before shutting down. This reduces the risk of leaving orphan deployments in the event that the BOSH Director does not respond to an initial `bosh deploy` request. The `broker.shutdown_timeout` property determines how long the broker waits before it is forced to shut down. The default is 60 seconds, but can be configured in the manifest. For more information, see Write a Broker Manifest below.

Service Instance Lifecycle Errands

Note: This feature requires BOSH director v261 or later.

Service instance lifecycle errands allow additional short lived jobs to be run as part of service instance deployment. A deployment is only considered successful if the lifecycle errand exits successfully.

The service adapter must offer this errand as part of the service instance deployment.

ODB supports the following lifecycle errands:

- `post_deploy`: Runs after the creation or updating of a service instance. An example use case is running a health check to ensure the service instance is functioning. See the workflow here.
- `pre_delete`: Runs before the deletion of a service instance. An example use case is cleaning up data prior to a service shutdown. See the workflow here.

Service Instance lifecycle errands are configured on a per-plan basis. To enable lifecycle errands, the errand job must be:

- Added to the service instance deployment.
- Added to the plan's instance groups.
- Set in the plan's lifecycle errands configuration.

An example manifest snippet configuring lifecycle errands for a plan:

```
service_deployment:
  releases:
    - name: <service-release>
      version: <service-release-version>
      jobs:
      - <service_release_job>
      - <post_deploy_errand_job>
      - <pre_delete_errand_job>
service_catalog:
  plans:
     - name: <CF marketplace plan name>
       lifecycle_errands:
         post_deploy:
           name: <post_deploy_errand_job>
         pre_delete: <pre_delete_errand_job>
       instance_groups:
         - name: <service_release_job>
           ...
         - name: <post_deploy_errand_job>
           lifecycle: errand
           vm_type: <vm type>
           instances: <instance count>
           networks: [<network>]
           azs: [<az>]
         - name: <pre_delete_errand_job>
           lifecycle: errand
           vm_type: <vm type>
           instances: <instance count>
           networks: [<network>]
           azs: [<az>]
```

Changing a plan's lifecycle errands configuration while an existing deployment is in progress is not supported. Lifecycle errands will not be run.

Service Instance Lifecycle Colocated Errands

Note: This feature requires BOSH director v263 or later.

A job errand can be run as a `post-deploy` colocated errand. Colocated errands run on an existing service instance group, avoiding additional resource allocation. For more information see the BOSH documentation.

Similarly to the other lifecycle errands, colocated errands are deployed on a per-plan basis. Currently the ODB supports only colocated post-deploy errands. In order to enable a colocated post deploy errand, the errand job must be:

- Added to the service instance deployment (1).
- Set in the plan's lifecycle errands configuration (2).
- Set the instances where the errand should run on (3).

An example manifest for colocated errands looks like the following:

```
service_deployment:
  releases:
    - name: <service-release>
      version: <service-release-version>
      jobs:
      - <service_release_job>
      - <post_deploy_errand_job> # (1)
service_catalog:
  plans:
    - name: <CF marketplace plan name>
      lifecycle_errands:
        post_deploy:
          name: <post_deploy_errand_job> # (2)
          instances: [<service_release_job>/0] # (3)
      instance_groups:
        - name: <service_release_job>
          ...
```

Broker Management

Management tasks on the broker are performed with BOSH errands.

Register Broker

This errand registers the broker with Cloud Foundry and enables access to plans in the service catalog. The errand should be run whenever the broker is re-deployed with new catalog metadata to update the Cloud Foundry catalog.

If the `broker_uri` property is set, you should also register a route for your broker with Cloud Foundry. For more information, see Route Registration above.

When `enable_service_access: false` is set, the errand will not change service access for any plan.

Individual plans can be enabled via the optional `cf_service_access` property. This property accepts three values: `enable`, `disable`, `manual`.

- `cf_service_access: enable`: register-broker errand will enable access for that plan
- `cf_service_access: disable`: register broker errand will disable access for that plan
- `cf_service_access: manual`: register-broker errand will perform no action

If the `cf_service_access` property is not set at all, the register-broker errand will enable access for that plan.

Plans with disabled service access are not visible to non-admin Cloud Foundry users (including Org Managers and Space Managers). Admin Cloud Foundry users can see all plans including those with disabled service access.

Add the following instance group to your manifest:

```
- name: register-broker
  lifecycle: errand
  instances: 1
  jobs:
    - name: register-broker
      release: <odb-release-name>
      properties:
        broker_name: <broker-name>
        broker_uri: <broker URI, only required when a route has been registered> # optional
        disable_ssl_cert_verification: <truelfalse> # defaults to false
        enable_service_access: <truelfalse> # defaults to true
        cf:
          api_url: <cf-api-url>
          admin_username: <cf-api-admin-username>
          admin_password: <cf-api-admin-password>
  vm_type: <vm-type>
  stemcell: <stemcell>
  networks: [{name: <network>}]
  azs: [<az>]
```

Execute the errand in one of two ways, depending on which version of the BOSH CLI you're using.

BOSH CLI v2

Run the errand with `bosh2 run-errand register-broker`.

BOSH CLI v1

Run the errand with `bosh run errand register-broker`.

Delete All Service Instances and Deregister Broker

This errand performs a similar operation to the errand delete-all-service-instances and deregister-broker. In addition, it also disables service access to the service offering before deleting all the instances, and then deregisters the broker after all instances have been successfully deleted. Pivotal disables service access to ensure that new instances cannot be provisioned during the lifetime of the errand.

The errand does the following:

1. Disables service access to the service offering for all orgs and spaces
2. Unbinds all applications from the service instances
3. Deletes all service instances sequentially
4. Deregisters the broker from Cloud Foundry

This errand should only be used when you want to destroy all of the on-demand service instances and deregister the broker from the Cloud Foundry.

Add the following instance group to your manifest:

```
- name: delete-all-service-instances-and-deregister-broker
  lifecycle: errand
  instances: 1
  jobs:
    - name: delete-all-service-instances-and-deregister-broker
      release: <odb-release-name>
      properties:
        broker_name: <broker-name>
        polling_interval: <interval in seconds when waiting for service instance to be deleted> # defaults to 60
        polling_initial_offset: <offset in seconds before starting to poll Cloud Foundry to check if the instance has been deleted> # defaults to 5

  vm_type: <vm-type>
  stemcell: <stemcell>
  networks: [{name: <network>}]
  azs: [<az>]
```

Note: The `polling_interval` default is set to 60 seconds because the Cloud Controller itself polls the on-demand broker every 60 seconds. Setting your polling interval to anything lower than 60 seconds will not speed up the errand.
The `polling_initial_offset` default is set to 5 seconds. In systems with more load, consider increasing the polling offset.

Execute the errand in one of two ways, depending on which version of the BOSH CLI you're using.

BOSH CLI v2

Run the errand with `bosh2 run-errand delete-all-service-instances-and-deregister-broker`.

BOSH CLI v1

Run the errand with `bosh run errand delete-all-service-instances-and-deregister-broker`.

Deregister Broker

This errand deregisters a broker from Cloud Foundry. It requires that there are no existing service instances.

Add the following instance group to your manifest:

```
- name: deregister-broker
  lifecycle: errand
  instances: 1
  jobs:
    - name: deregister-broker
      release: <odb-release-name>
      properties:
        broker_name: <broker-name>
  vm_type: <vm-type>
  stemcell: <stemcell>
  networks: [{name: <service-network>}]
  azs: [<az>]
```

Execute the errand in one of two ways, depending on which version of the BOSH CLI you're using.

BOSH CLI v2

Run the errand with `bosh2 run-errand deregister-broker`.

BOSH CLI v1

Run the errand with `bosh run errand deregister-broker`.

Delete All Service Instances

This errand deletes all service instances of your broker's service offering in every org and space of Cloud Foundry. It uses the Cloud Controller API to do this, and therefore only deletes instances the Cloud Controller knows about. It does not delete orphan BOSH deployments, which are deployments that don't correspond to a known service instance. Orphan BOSH deployments are rare, but can occur. Use the orphan-deployments errand to identify them.

The errand does the following:

1. Unbinds all applications from the service instances
2. Deletes all service instances sequentially
3. Checks if any instances have been created while the errand was running
4. If instances are detected, the errand fails
5. Re-runs the errand

This errand should only be used when you want to destroy all of the on-demand service instances from Cloud Foundry.

Add the following instance group to your manifest:

```
- name: delete-all-service-instances
  lifecycle: errand
  instances: 1
  jobs:
    - name: delete-all-service-instances
      release: <odb-release-name>
      properties:
        polling_interval: <interval in seconds when waiting for service instance to be deleted> # defaults to 60
        polling_initial_offset: <offset in seconds before starting to poll Cloud Foundry to check if the instance has been deleted> # defaults to 5

  vm_type: <vm-type>
  stemcell: <stemcell>
  networks: [{name: <network>}]
  azs: [<az>]
```

Note: The `polling_interval` default is set to 60 seconds because the Cloud Controller itself polls the on-demand broker every 60 seconds. Setting your polling interval to anything lower than 60 seconds will not speed up the errand.
The `polling_initial_offset` default is set to 5 seconds to give Cloud Foundry time to finish processing the delete request and contact the broker before the `delete all` errand starts polling Cloud Foundry. In systems with more load on Cloud Foundry, this process could take a longer, in which case you might consider increasing the polling offset.

Execute the errand in one of two ways, depending on which version of the BOSH CLI you're using.

BOSH CLI v2

Run the errand with `bosh2 run-errand delete-all-service-instances`.

BOSH CLI v1

Run the errand with `bosh run errand delete-all-service-instances`.

Delete Orphaned Deployments

The deployment for a service instance is defined as 'orphaned' when the Bosh deployment is still running, but the service is no longer registered in Cloud Foundry.

The `orphan-deployments` errand will collate a list of service deployments that have no matching service instances in Cloud Foundry and return the list to the operator. It is then up to the operator to remove the orphaned BOSH deployments.

Add the following instance group to your manifest:

```
- name: orphan-deployments
  lifecycle: errand
  instances: 1
  jobs:
  - name: orphan-deployments
    release: <odb-release-name>
  vm_type: <vm-type>
  stemcell: <stemcell>
  networks: [{name: <network>}]
  azs: [<az>]
```

Execute the errand in one of two ways, depending on which version of the BOSH CLI you're using.

BOSH CLI v2

Run the errand with `bosh2 run-errand orphan-deployments`.

BOSH CLI v1

Run the errand with `bosh run errand orphan-deployments`.

If orphan deployments are present, the errand will output a list of deployment names

```
[stdout]
[{"deployment_name":"service-instance_aoeu39fgn-8125-05h2-9023-9vbxf7676f3"}]

[stderr]
None

Errand 'orphan-deployments' completed successfully (exit code 0)
```

WARNING: Deleting the BOSH deployment destroys the VM. Any data present is lost.

Execute the errand in one of two ways, depending on which version of the BOSH CLI you're using.

BOSH CLI v2

Run the errand with `bosh2 delete-deployment service-instance_aoeu39fgn-8125-05h2-9023-9vbxf7676f3`.

BOSH CLI v1

Run the errand with `bosh delete deployment service-instance_aoeu39fgn-8125-05h2-9023-9vbxf7676f3`.

Updates

Update Broker

To update the core broker configuration:

- Make any necessary changes to the core broker configuration in the broker manifest
- Deploy the broker

Update Service Offering

To update the service offering:

- Make any changes to properties in the `service_catalog` of the broker manifest. For example, update the service metadata.
- Make any changes to properties in the `service_deployment` of the broker manifest. For example, update the jobs used from a service release.
- Deploy the broker

> **WARNING**: After the broker has been registered with Cloud Foundry, do not change the `service_id` or the `plan_id` for any plan. When the ODB starts, it checks that all existing service instances in Cloud Foundy have a `plan_id` that exists in the `service_catalog`.

After changing the `service_catalog`, you should run the register-broker errand to update the Cloud Foundry marketplace.

When the plans are updated in the `service_catalog`, upgrades will need to be applied to existing service instances. See upgrading all service instances.

Disable Service Plans

You can disable access to a service plan by using the Cloud Foundry CLI:

```
$ cf disable-service-access <service-name-from-catalog> -p <plan-name>
```

Also, when a plan has the property `cf_service_access: disable` in the `service_catalog` then the register-broker errand errand will disable service access to that plan.

Remove Service Plans

A service plans can be removed if there are no instances using the plan. To remove a plan, remove it from the broker manifest and update the Marketplace by running the register-broker errand.

WARNING: If any service instances remain on a plan that has been removed from the catalog, the ODB fails to start.

Upgrades

Upgrade the Broker

The broker is upgraded in a similar manner to all BOSH releases:

- Upload new version of `on-demand-service-broker-release` BOSH release to the BOSH Director
- Make any necessary changes to the core broker configuration in the broker manifest
- Deploy the broker

Upgrade Service Offering

The service offering consists of:

- Service catalog
- Service adapter BOSH release
- Service BOSH release(s)
- Service stemcell

To upgrade a service offering:

- Make any changes to the service catalog in the broker manifest
- Upload any new service BOSH release(s) to the BOSH Director
- Make any changes to service release(s) in the broker manifest
- Upload any new service stemcell to the BOSH Director
- Make any changes to the service stemcell in the `service_deployment` broker manifest
- Deploy the broker

Any new service instances will be created using the latest service offering.

To upgrade all existing instances, run the upgrade-all-service-instances errand.

WARNING: Until a service instance has been upgraded, `cf update-service` operations is blocked and an error appears. For more information, see Update Service Offering above.

Upgrade an Individual Service Instance

Cloud Foundry users cannot upgrade their service instances to the latest service offering.

Until a service instance has been upgraded, Cloud Foundry users cannot set parameters or change plan until the service instance has been upgraded by an operator:

```
$ cf update-service my-redis -c '{"maxclients": 10000}'
Updating service instance my-redis as admin...
FAILED
Server error, status code: 502, error code: 10001, message: Service broker error: Service cannot be updated at this time, please try again later or contact your operator for more information.
```

Operators should run the upgrade-all-service-instances errand to upgrade all service instances to the latest service offering.

Upgrade All Service Instances

To upgrade all existing service instances after the service offering has been updated or upgraded:

1. Add the following instance group to your broker manifest:

```
yaml
- name: upgrade-all-service-instances
  lifecycle: errand
  instances: 1
  jobs:
    - name: upgrade-all-service-instances
      release:
      properties:
        polling_interval:  # defaults to 60
  vm_type:
  stemcell:
  networks: [{name: }]
  azs: [ ]
```

2. Deploy the broker manifest.

3. Run the errand in one of two ways, depending on which version of the BOSH CLI you use:

    - **For v2 of the CLI:** `bosh run-errand upgrade-all-service-instances`.
    - **For v1 of the CLI:** `bosh run errand upgrade-all-service-instances`.

Note: The `upgrade-all-service-instances` errand triggers service instance lifecycle errands configured for the broker. For more information, see Service Instance Lifecycle Errands below.

Security

BOSH API Endpoints

The ODB accesses the following BOSH API endpoints during the service instance lifecycle:

API endpoint	Examples of usage in ODB
`POST /deployments`	Create or update a service instance
`POST /deployments/<deployment_name>/errands/<errand_name>/runs`	Register or de-register the on-demand broker with the Cloud Controller, run smoke tests
`GET /deployments/<deployment_name>`	Passed as argument to the service adapter for `generate-manifest` and `create-binding`
`GET /deployments/<deployment_name>/vms?format=full`	Passed as argument to the service adapter for `create-binding`
`DELETE /deployments/<deployment_name>`	Delete a service instance
`GET /tasks/<task_ID>/output?type=result`	Check a task was successful (i.e. the exit code was zero), get list of VMs
`GET /tasks/<task_ID>`	Poll the BOSH director until a task finishes, e.g. create, update, or delete a deployment
`GET /tasks?deployment=<deployment_name>`	Determine the last operation status and message for a service instance, for example 'create in progress'. This is used when creating, updating, deleting service instances

BOSH UAA Permissions

The actions that the ODB needs to be able to perform are:

Modify:

BOSH CLI v2

- `bosh2 deploy`
- `bosh2 delete-deployment`
- `bosh2 run-errand`

BOSH CLI v1

- `bosh deploy`
- `bosh delete deployment`
- `bosh run errand`

Read only:

- `bosh deployments`
- `bosh vms`
- `bosh tasks`

Note: The read-only actions are identical between v1 and v2 of the BOSH CLI. When using the BOSH CLI v2, use `bosh2` instead of `bosh`.

The minimum UAA authority required by the BOSH Director to perform these actions is `bosh.teams..admin`.

Note: A team admin cannot view or update the director's cloud config, nor upload releases or stemcells.

For more details on how to set up and use BOSH teams, see Director teams and permissions configuration.

Unused BOSH Permissions

The team admin authority also allows the following actions, which currently are not used by the ODB:

- `bosh start/stop/recreate`
- `bosh cck`
- `bosh ssh`
- `bosh logs`
- `bosh releases`
- `bosh stemcells`

Note: These permissions are identical between v1 and v2 of the BOSH CLI. When using the BOSH CLI v2, use `bosh2` instead of `bosh`.

PCF IPsec Add-On

The ODB has been tested with the PCF IPsec Add-On. The BOSH Director is excluded from IPsec ranges, as the BOSH add-on cannot be applied to BOSH itself.

CF API Endpoints

The ODB accesses the following CF API endpoints during the service instance lifecycle:

API endpoint	Examples of usage in the ODB
`GET /v2/info`	Identify CF API version, to determine feature compatibility and availability
`GET /v2/services`	List all services, to find our own service based on defined unique ID rather than GUID
`GET /v2/services/<service_guid>/service_plans`	Find registered service plans for ODB service e.g. for calculating plan quota usage

API endpoint	Examples of usage in the ODB
`GET /v2/service_brokers`	Find servicebroker metadata by name during broker deregistration
`DELETE /v2/service_brokers/<service_broker_guid>`	Delete ODB service broker during broker deregister errand
`GET /v2/service_plans/<service_plan_guid>`	Identify service plan when upgrading an instance to trigger any lifecycle errands
`PUT /v2/service_plans/<service_plan_guid>`	Disable service access prior to service deletion
`GET /v2/service_plans/<service_plan_guid>/service_instances`	Find service instances for given plan when determining global quota and running startup checks
`GET /v2/service_instances/<service_instance_guid>`	Determine service instance state to check an operation is not in progress before triggering an upgrade
`DELETE /v2/service_instances/<service_instance_guid>`	Deleting a service instance during delete all service instances errand
`GET /v2/service_instances/<service_instance_guid>/service_bindings`	Finding bindings for given service instance during delete all service instances errand
`GET /v2/service_instances/<service_instance_guid>/service_keys`	Finding service keys for given service instance during delete all service instances errand
`DELETE /v2/apps/<app_guid>/service_bindings/<service_binding_guid>`	Unbinding a service instance during delete all service instances errand
`DELETE /v2/service_keys/<service_key_guid>`	Deleting a service key during delete all service instances errand

CF UAA Permissions

The actions that the ODB needs to be able to perform are:

Modify:

- `cf enable-service-access`
- `cf disable-service-access`
- `cf create-service-broker`
- `cf delete-service-broker`
- `cf delete-service`
- `cf unbind-service`
- `cf delete-service-key`

Read only:

- `cf api`
- `cf marketplace`
- `cf service-brokers`
- `cf services`
- `cf service`
- `cf app`
- `cf service-keys`

The minimum UAA authority required by CF to perform these actions is `cloud_controller.admin`. Admins can perform operations required by all on demand service instances across a foundation.

Unused CF permissions

The Cloud Controller admin authority also allows the following actions, which currently are not used by the ODB:

- `cf push`
- `cf delete`
- `cf start`
- `cf restart`

- `cf restage`
- `cf stop`
- `cf create-service-key`
- `cf create-user-provided-service`
- `cf update-user-provided-service`
- `cf run-task`
- `cf logs`
- `cf ssh`
- `cf scale`
- `cf events`
- Route and domain management
- Space management
- Org management
- CLI plugin management

Troubleshooting

Administer Service Instances

Pivotal recommends using the bosh cli gem for administering the deployments created by ODB; for example for checking VMs, ssh, viewing logs.

Pivotal does **not** recommend using the BOSH CLI to update or delete ODB service deployments. The CLI might accidentally trigger a race condition with Cloud Controller-induced updates/deletes or result in ODB overriding your snowflake changes at the next deploy. Perform all updates to the service instances using the errand to upgrade all service instances.

Logs

The on-demand broker writes logs to a log file and to syslog.

The broker log contains error messages and non-zero exit codes returned by the service adapter, as well as the stdout and stderr streams of the adapter.

The log file is located at `/var/vcap/sys/log/broker/broker.log`. In syslog, logging is written with the tag `on-demand-service-broker`, under the facility `user`, with priority `info`.

If you want to forward syslog to a syslog aggregator, Pivotal recommends co-locating the syslog release with the broker.

The ODB generates a UUID for each request and prefixes all the logs for that request, for example:

```
on-demand-service-broker: [on-demand-service-broker] [4d63080d-e038-45a3-85f9-93910f6b40b1] 2016/09/05 16:43:26.123456 a valid UAA token was found in cache, will not obtain a new one
```

Note: The ODB's negroni server and start up logs are not prefixed with a request ID.

All ODB's logs have a UTC timestamp.

Secure Binding Credentials

If you have configured secure binding credentials, the broker will store credentials on CredHub. You can see and consume these credentials by using the CredHub CLI.

Note: Usually, CredHub is not accessble from outside the Cloud Foundry network. Use the CredHub CLI from within the internal network, or connect using an appropriate tunnel.

In failure scenarios, like when CredHub is down or when the CredHub client credentials are wrong, the broker will log to the file at `/var/vcap/sys/log/broker/broker.log` where the root cause will be generally given. See Troubleshooting > Logs for details.

Common causes of errors

- CredHub down / Wrong CredHub URL / Cannot access URL
- Wrong credentials to access CredHub
- Problem with CA certs for CredHub or UAA
- Binding credentials in an exotic format (the broker only accepts string and string map credentials)

Metrics

If you have configured broker metrics, the broker will emit metrics to the CF firehose. You can, for example, consume these metrics by using the CF CLI firehose plugin.

Note: The broker must be registered with a Cloud Foundry in order for metrics to be successfully emitted

Service-level Metrics

The broker will emit a metric indicating the total number of instances across all plans. In addition, if there is a global quota set for the service, a metric showing how much of that quota is remaining is emitted. Service-level metrics are emitted in the following format:

```
origin:"<broker deployment name>" eventType:ValueMetric timestamp:<timestamp> deployment:"<broker deployment name>" job:"broker" index:"<bosh job index>" ip:"<IP>" valueMetric:<name:"/on-demand·
origin:"<broker deployment name>" eventType:ValueMetric timestamp:<timestamp> deployment:"<broker deployment name>" job:"broker" index:"<bosh job index>" ip:"<IP>" valueMetric:<name:"/on-demand·
```

Plan-level Metrics

For each service plan, the metrics will report the total number of instances for that plan. If there is a quota set for the plan, the metrics will also report how much of that quota is remaining. Plan-level metrics are emitted in the following format:

```
origin:"<broker deployment name>" eventType:ValueMetric timestamp:<timestamp> deployment:"<broker deployment name>" job:"broker" index:"<bosh job index>" ip:"<IP>" valueMetric:<name:"/on-demand·
origin:"<broker deployment name>" eventType:ValueMetric timestamp:<timestamp> deployment:"<broker deployment name>" job:"broker" index:"<bosh job index>" ip:"<IP>" valueMetric:<name:"/on-demand·
```

If `quota_remaining` is `0` then you need to increase your plan quota in the BOSH manifest.

Identify Deployments in BOSH

There is a one to one mapping between the service instance ID from CF and the deployment name in BOSH. The convention is the BOSH deployment name is the service instance ID, prepended by `service-instance_`. To identify the BOSH deployment for a service instance, follow the procedure below:

1. Determine the GUID of the service

   ```
   $ cf service --guid <service-name>
   ```

2. Identify deployment in `bosh deployments` by looking for `service-instance_<GUID>`

3. Get current tasks for the deployment by using

   ```
   $ bosh tasks --deployment service-instance_<GUID>
   ```

Identify Tasks in BOSH

Most operations on the on demand service broker API are implemented by launching BOSH tasks. If an operation fails, it may be useful to investigate the corresponding BOSH task. To do this:

1. Determine the ID of the service for which an operation failed. You can do this using the Cloud Foundry CLI:

```
$ cf service --guid <service name>
```

2. SSH on to the service broker VM:

```
$ bosh deployment <path to broker manifest>
$ bosh ssh
```

3. In the broker log, look for lines relating to the service, identified by the service ID. Lines recording the starting and finishing of BOSH tasks will also have the BOSH task ID:

```
on-demand-service-broker: [on-demand-service-broker] [4d63080d-e038-45a3-85f9-93910f6b40b1] 2016/04/13 09:01:50.793965 Bosh task id for Create instance 30d4a67f-d220-4d06-9989-58a976b86b35
on-demand-service-broker: [on-demand-service-broker] [4d63080d-e038-45a3-85f9-93910f6b40b1] 2016/04/13 09:06:55.793976 task 11470 success creating deployment for instance 30d4a67f-d220-4d06-

on-demand-service-broker: [on-demand-service-broker] [8bf5c9f6-7acd-4ab4-9214-363a6f6bef79] 2016/04/13 09:16:20.795035 Bosh task id for Update instance 30d4a67f-d220-4d06-9989-58a976b86b35
on-demand-service-broker: [on-demand-service-broker] [8bf5c9f6-7acd-4ab4-9214-363a6f6bef79] 2016/04/13 09:17:20.795181 task 11473 success updating deployment for instance 30d4a67f-d220-4d06-9

on-demand-service-broker: [on-demand-service-broker] [af6fab15-c95e-438b-aa6b-bc4329d4154f] 2016/04/13 09:17:52.803824 Bosh task id for Delete instance 30d4a67f-d220-4d06-9989-58a976b86b35
on-demand-service-broker: [on-demand-service-broker] [af6fab15-c95e-438b-aa6b-bc4329d4154f] 2016/04/13 09:19:56.803938 task 11474 success deleting deployment for instance 30d4a67f-d220-4d06-9
```

4. Use the task ID to obtain the task log from BOSH (adding flags such as `--debug` or `--cpi` as necessary):

```
$ bosh task <task_ID>
```

Note: This action is identical between v1 and v2 of the BOSH CLI. When using the BOSH CLI v2, use `bosh2` instead of `bosh`.

Identify Issues When Connecting to BOSH or UAA

The ODB interacts with the BOSH Director to provision and deprovision instances, and is authenticated via the Director's UAA. See Core Broker Configuration for an example configuration.

If BOSH and/or UAA are wrongly configured in the broker's manifest, then meaningful error messages will be displayed in the broker's log, indicating whether the issue is caused by an unreachable destination or bad credentials.

For example

```
on-demand-service-broker: [on-demand-service-broker] [575afbc1-b541-481d-9cde-b3d3e67e87bf] 2016/05/18 15:56:40.100579 Error authenticating (401): {"error":"unauthorized","error_description":"Bad crede
```

List Service Instances

The ODB persists the list of ODB-deployed service instances and provides an endpoint to retrieve them. This endpoint requires basic authentication.

You can use this endpoint during disaster recovery to assess damage or availability.

Request

`GET http://username:password@<\ON_DEMAND_BROKER_IP>:8080/mgmt/service_instances`

Response

200 OK

Example JSON body:

```
[
  {
    "instance_id": "4d19462c-33cf-11e6-91cc-685b3585cc4e",
    "plan_id": "60476620-33cf-11e6-a841-685b3585cc4e",
    "bosh_deployment_name": "service-instance_4d19462c-33cf-11e6-91cc-685b3585cc4e"
  },
  {
    "instance_id": "57014734-33cf-11e6-ba8d-685b3585cc4e",
    "plan_id": "60476620-33cf-11e6-a841-685b3585cc4e",
    "bosh_deployment_name": "service-instance_57014734-33cf-11e6-ba8d-685b3585cc4e"
  }
]
```


List Orphan Deployments

The On-Demand Broker provides an endpoint that compares the list of service instance deployments against the service instances registered in Cloud Foundry. When called, the endpoint will return a list of orphaned deployments, if any are present.

This endpoint is exercised in the `orphan-deployments` errand. To call this endpoint without running the errand, use curl.

Request `GET http://username:password@<\ON_DEMAND_BROKER_IP>:8080/mgmt/orphan_deployments`

Response

200 OK

Example JSON body:


```
[
  {
    "deployment_name": "service-instance_d482abd3-8051-48d2-8067-9ccdf02327f3"
  }
]
```

Troubleshooting On-Demand Services

This topic provides information for operators about troubleshooting on-demand services.

How to Retrieve a Service instance GUID

You need the GUID of your service instance to run some BOSH commands. To retrieve the GUID, run the command `cf service SERVICE-INSTANCE-NAME --guid`

.

If you do not know the name of the service instance, run `cf services` to see a listing of all service instances in the space. The service instances are listed in the name column.

Troubleshooting Errors

This section provides information about how to troubleshoot specific errors or error messages.

Failed Install

1. Certificate issues: The on-demand broker (ODB) requires valid certificates. Ensure that your certificates are valid and generate new ones if necessary.
2. Deploy fails: Deploys can fail for a variety of reasons. View the logs using Ops Manager to determine why the deploy is failing.
3. Networking problems:
    - Cloud Foundry cannot reach the on-demand service broker
    - Cloud Foundry cannot reach the service instances
    - The service network cannot access the BOSH director
4. Register broker errand fails.
5. The smoke test errand fails.
6. Resource sizing issues: These occur when the resource sizes selected for a given plan are less than the on-demand service requires to function. Check your resource configuration in Ops Manager and ensure that the configuration matches that recommended by the service.
7. Other service-specific issues.

Broker Request Timeouts

If developers report errors such as:

```
Server error, status code: 504, error code: 10001, message: The request to the service broker timed out: https://BROKER-URL/v2/service_instances/e34046d3-2379-40d0-a318-d54fc7a5b13f/ser
```

1. Confirm that Cloud Foundry (CF) is connected to the service broker.
2. Check the BOSH queue size:
    a. Log into BOSH as an admin.
    b. Run one of these commands depending on your Ops Manager version:
        - 1.10 and earlier: `bosh tasks`
        - 1.11: `bosh2 tasks`

- 1.12 and later: `bosh tasks`

3. If there are a large number of queued tasks, the system may be under too much load. BOSH is configured with two workers and one status worker, which may not be sufficient resources for the level of load. Advise app developers to try again once the system is under less load.

Cannot Create or Delete Service Instances

If developers report errors such as the following:

```
Instance provisioning failed: There was a problem completing your request. Please contact your operations team providing the following information: service: redis-acceptance, service-instance-g
```

1. If the BOSH error shows a problem with the deployment manifest:

    a. Download the manifest for the on-demand service instance by running:
    `bosh download manifest service-instance_SERVICE-INSTANCE-GUID MY-SERVICE.yml.`

    b. Check the manifest for configuration errors.

> **Note**: This error does not apply if you are using BOSH CLI v2. In that case, to troubleshoot possible problems with the manifest, open it in a text editor and inspect the manifest there.

2. To continue troubleshooting, Log in to BOSH and target the on-demand service instance using the instructions on parsing a Cloud Foundry error message.

3. Retrieve the BOSH task ID from the error message and run one of the following commands depending on your Ops Manager version:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh task TASK-ID`
1.11	`bosh2 task TASK-ID`
1.12 and later	`bosh task TASK-ID`

4. If you need more information, access the broker logs and use the `broker-request-id` from the error message above to search the logs for more information. Check for:

    - Authentication errors
    - Network errors
    - Quota errors

Cannot Bind or Unbind Service Instances to Apps

Instance Does Not Exist

If developers report errors such as:

```
Server error, status code: 502, error code: 10001, message: Service broker error: instance does not exist`
```

Follow these steps:

1. Type `cf service MY-INSTANCE --guid`. This confirms that the the on-demand service instance exists in BOSH and CF, and returns a GUID.

2. Using the GUID obtained above, run one of the following BOSH CLI commands depending on your Ops Manager version:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh vms service-instance_GUID`

Ops Manager Version	BOSH Command
1.11	`bosh2 -d service-instance_GUID vms`
1.12 and later	`bosh -d service-instance_GUID vms`

If the BOSH deployment is not found, it has been deleted from BOSH. Contact Pivotal support for further assistance.

Other Errors

If developers report errors such as:

```
Server error, status code: 502, error code: 10001, message: Service broker error: There was a problem completing your request. Please contact your operations team providing the following infor
```

To find out the exact issue with the binding process:

1. Access the service broker logs.
2. Search the logs for the `broker-request-id` string listed in the error message above.
3. Contact Pivotal support for further assistance if you are unable to resolve the problem.
4. Check for:
    - Authentication errors
    - Network errors

Cannot Connect to a Service Instance

If developers report that their app cannot use service instances that they have successfully created and bound:

Ask the user to send application logs that show the connection error. If the error is originating from the service, then follow service-specific instructions. If the issue appears to be network-related, then:

1. Check that application security groups are configured correctly. Access should be configured for the service network that the tile is deployed to.
2. Ensure that the network the PCF Elastic Runtime tile is deployed to has network access to the service network. You can find the network definition for this service network in the Ops Manager Director tile.
3. In Ops Manager go into the service tile and see the service network that is configured in the networks tab.
4. In Ops Manager go into the ERT tile and see the network it is assigned to. Make sure that these networks can access each other.

Upgrade All Service Instances Fails

If the `upgrade-all-service-instances` errand fails, look at the errand output in the Ops Manager log.

If an instance fails to upgrade, debug and fix it before running the errand again to prevent any failure issues from spreading to other on-demand instances.

Once the Ops Manager log no longer lists the deployment as `failing`, re-run the errand to upgrade the rest of the instances.

Missing Logs and Metrics

If no logs are being emitted by the on-demand broker, check that your syslog forwarding address is correct in Ops Manager.

1. Ensure you have configured syslog for the tile.
2. Ensure that you have network connectivity between the networks that the tile is using and the syslog destination. If the destination is external, you need to use the public ip VM extension feature available in your Ops Manager tile configuration settings.
3. Verify that the Firehose is emitting metrics:
    a. Install the `cf nozzle` plugin
    b. Run `cf nozzle -f ValueMetric | grep --line-buffered "on-demand-broker/MY-SERVICE"` to find logs from your service in the `cf nozzle` output.

If no metrics appear within five minutes, verify that the broker network has access to the Loggregator system on all required ports.

Contact Pivotal support if you are unable to resolve the issue.

Troubleshooting Components

This section provides information about troubleshooting on-demand broker components.

BOSH Problems

Missing BOSH Director UUID

Note: This error does not occur if you are using BOSH CLI v2

If using the BOSH CLI v1, re-add the `director_uuid` to the manifest:

1. Run `bosh status --uuid` and record the `director_uuid` value from the output.
2. Edit the manifest and add the `director_uuid: DIRECTOR-UUID` from the last step at the top of the manifest.

For more, see Deployment Identification in the BOSH docs.

Large BOSH Queue

On-demand service brokers add tasks to the BOSH request queue, which can back up and cause delay under heavy loads. An app developer who requests a new service instance sees `create in progress` in the Cloud Foundry Command Line Interface (cf CLI) until BOSH processes the queued request.

Ops Manager currently deploys two BOSH workers to process its queue. Future versions of Ops Manager will let users configure the number of BOSH workers.

Configuration

Service Instances in Failing State

You may have configured a VM / Disk type in tile plan page in Ops Manager that is insufficiently large for the on-demand service instance to start. See tile-specific guidance on resource requirements.

Authentication

UAA Changes

If you have rotated any UAA user credentials then you may see authentication issues in the service broker logs.

To resolve this, redeploy the service tile in Ops Manager. This provides the broker with the latest configuration.

> **Note**: You must ensure that any changes to UAA credentials are reflected in the Ops Manager `credentials` tab of the Elastic Runtime tile.

Networking

Common issues include:

1. Network latency when connecting to the on-demand service instance to create or delete a binding.
    - Solution: Try again or improve network performance
2. Network firewall rules are blocking connections from the on-demand service broker to the service instance.
    - Solution: Open the service tile in Ops Manager and check the two networks configured in the **Networks** pane. Ensure that these networks allow access to each other.
3. Network firewall rules are blocking connections from the service network to the BOSH director network.
    - Solution: Ensure that service instances can access the Director so that the BOSH agents can report in.
4. Apps cannot access the service network.
    - Solution: Configure Cloud Foundry application security groups to allow runtime access to the service network.
5. Problems accessing BOSH's UAA or the BOSH director.
    - Solution: Follow network troubleshooting and check that the BOSH director is online.

Validate Service Broker Connectivity to Service Instances

1. To validate you can `bosh2 ssh` onto the on-demand service broker:
    - **With BOSH CLI v2:** Target the deployment, and reach the service instance.
    - **With BOSH CLI v1:** Download the broker manifest and target the deployment, then try to reach the service instance.
2. If no BOSH `task-id` appears in the error message, look in the broker log using the `broker-request-id` from the task.

Validate App Access to Service Instance

Use `cf ssh` to access to the app container, then try connecting to the on-demand service instance using the binding included in the `VCAP_SERVICES` environment variable.

Quotas

Plan Quota Issues

If developers report errors such as:

```
Message: Service broker error: The quota for this service plan has been exceeded.
Please contact your Operator for help.
```

1. Check your current plan quota.
2. Increase the plan quota.
3. Log into Ops Manager.
4. Reconfigure the quota on the plan page.
5. Deploy the tile.
6. Find who is using the plan quota and take the appropriate action.

Global Quota Issues

If developers report errors such as:

```
Message: Service broker error: The quota for this service has been exceeded.
Please contact your Operator for help.
```

1. Check your current global quota.
2. Increase the global quota.
3. Log into Ops Manager.
4. Reconfigure the quota on the on-demand settings page.
5. Deploy the tile.
6. Find out who is using the quota and take the appropriate action.

Failing Jobs and Unhealthy Instances

To determine whether there is an issue with the on-demand service deployment, inspect the VMs. To do so, run one of the following commands:

Ops Manager Version	BOSH Command
1.10 or earlier	`bosh vms --vitals service-instance_GUID`
1.11	`bosh2 -d service-instance_GUID vms --vitals`
1.12 and later	`bosh -d service-instance_GUID vms --vitals`

For additional information, run one of the following commands:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh instances --ps --vitals`
1.11	`bosh2 instances --ps --vitals`
1.12 and later	`bosh instances --ps --vitals`

If the VM is failing, follow the service-specific information. Any unadvised corrective actions (such as running BOSH `restart` on a VM) can cause issues in the service instance.

Techniques for Troubleshooting

This section provides general techniques for troubleshooting, which might include the following: - Interacting with the on-demand service broker - Interacting with on-demand service instance BOSH deployments - Performing general maintenance and housekeeping tasks

Parse a Cloud Foundry (CF) Error Message

Failed operations (create, update, bind, unbind, delete) result in an error message. You can retrieve the error message later by running the cf CLI command `cf service INSTANCE-NAME`.

```
$ cf service myservice

Service instance: myservice
Service: super-db
Bound apps:
Tags:
Plan: dedicated-vm
Description: Dedicated Instance
Documentation url:
Dashboard:

Last Operation
Status: create failed
Message: Instance provisioning failed: There was a problem completing your request.
    Please contact your operations team providing the following information:
    service: redis-acceptance,
    service-instance-guid: ae9e232c-0bd5-4684-af27-1b08b0c70089,
    broker-request-id: 63da3a35-24aa-4183-aec6-db8294506bac,
    task-id: 442,
    operation: create
Started: 2017-03-13T10:16:55Z
Updated: 2017-03-13T10:17:58Z
```

Use the information in the `Message` field to debug further. Provide this information to Pivotal Support when filing a ticket.

The `task-id` field maps to the BOSH task ID. For more information on a failed BOSH task, use the `bosh task TASK-ID`.

The `broker-request-guid` maps to the portion of the On-Demand Broker log containing the failed step. Access the broker log through your syslog aggregator, or access BOSH logs for the broker by typing `bosh logs broker 0`. If you have more than one broker instance, repeat this process for each instance.

Access Broker and Instance Logs and VMs

Before following the procedures below, log into the cf CLI and the BOSH CLI.

Access Broker Logs and VM(s)

You can access logs using Ops Manager by clicking on the **Logs** tab in the tile and downloading the broker logs.

To access logs using the BOSH CLI, do the following:

1. Identify the on-demand broker (ODB) deployment by running one of the following commands, depending on your Ops Manager version:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh deployments`
1.11	`bosh2 deployments`
1.12 and later	`bosh deployments`

2. **For BOSH CLI v1 only:**

   a. Run `bosh download manifest ODB-DEPLOYMENT-NAME odb.yml` to download the ODB manifest.
   b. Select the ODB deployment using `bosh deployment odb.yml`.

3. View VMs in the deployment using one of the following commands:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh instances`
1.11	`bosh2 -d DEPLOYMENT-NAME instances`
1.12 and later	`bosh -d DEPLOYMENT-NAME instances`

4. SSH onto the VM by running one of the following commands:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh ssh service-instance_GUID`
1.11	`bosh2 -d service-instance_GUID ssh`
1.12 and later	`bosh -d service-instance_GUID ssh`

5. Download the broker logs by running one of the following commands:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh logs service-instance_GUID`
1.11	`bosh2 -d service-instance_GUID logs`
1.12 and later	`bosh -d service-instance_GUID logs`

The archive generated by BOSH or Ops Manager includes the following logs:

Log Name	Description
broker.log	Requests to the on-demand broker and the actions the broker performs while orchestrating the request (e.g. generating a manifest and calling BOSH). Start here when troubleshooting.
broker_ctl.log	Control script logs for starting and stopping the on-demand broker.
post-start.stderr.log	Errors that occur during post-start verification.
post-start.stdout.log	Post-start verification.
drain.stderr.log	Errors that occur while running the drain script.

Access Service Instance Logs and VMs

1. To target an individual service instance deployment, retrieve the GUID of your service instance with the cf CLI command `cf service MY-SERVICE --guid`.

2. **For BOSH CLI v1 only:**

   a. Run `bosh status --uuid` to retrieve the BOSH Director GUID.

   > **Note**: “GUID” and “UUID” mean the same thing.

   b. To download your BOSH manifest for the service, run `bosh download manifest service-instance_BOSH-DIRECTOR-GUID MANIFEST.yml` using the GUID you just obtained and a filename you want to save the manifest as.

c. Edit the following line in the service instance manifest that you just saved, to include the current BOSH Director GUID:

```
director_uuid: BOSH-DIRECTOR-GUID
```

d. Run `bosh deployment MANIFEST.yml` to select the deployment using the Director UUID.

3. View VMs in the deployment using one of the following commands:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh instances`
1.11	`bosh2 -d DEPLOYMENT-NAME instances`
1.12 and later	`bosh -d DEPLOYMENT-NAME instances`

4. SSH onto a VM by running one of the following commands:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh ssh service-instance_GUID`
1.11	`bosh2 -d service-instance_GUID ssh`
1.12 and later	`bosh -d service-instance_GUID ssh`

5. Download the instance logs by running one of the following commands:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh logs service-instance_GUID`
1.11	`bosh2 -d service-instance_GUID logs`
1.12 and later	`bosh -d service-instance_GUID logs`

Run Service Broker Errands to Manage Brokers and Instances

From the BOSH CLI, you can run service broker errands that manage the service brokers and perform mass operations on the service instances that the brokers created. These service broker errands include:

- `register-broker` registers a broker with the Cloud Controller and lists it in the Marketplace
- `deregister-broker` deregisters a broker with the Cloud Controller and removes it from the Marketplace
- `upgrade-all-service-instances` upgrades existing instances of a service to its latest installed version
- `delete-all-service-instances` deletes all instances of service
- `orphan-deployments` detects “orphan” instances that are running on BOSH but not registered with the Cloud Controller

To run errands:

1. **For BOSH CLI v1 only:** Select the broker deployment by running this command:
   `bosh deployment BOSH_MANIFEST.yml`

2. Run one of the following commands depending on your Ops Manager version:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh run errand ERRAND_NAME`
1.11	`bosh2 -d DEPLOYMENT_NAME run-errand ERRAND_NAME`
1.12 and later	`bosh -d DEPLOYMENT_NAME run-errand ERRAND_NAME`

   Examples:
   `bosh run errand deregister-broker`
   `bosh2 -d DEPLOYMENT-NAME run-errand deregister-broker`

Register Broker

The `register-broker` errand registers the broker with Cloud Foundry and enables access to plans in the service catalog. Run this errand whenever the broker is re-deployed with new catalog metadata to update the Cloud Foundry catalog.

Plans with disabled service access are not visible to non-admin Cloud Foundry users (including Org Managers and Space Managers). Admin Cloud Foundry users can see all plans including those with disabled service access.

The errand does the following:

- Registers the service broker with Cloud Controller.
- Enables service access for any plans that have the radio button set to `enabled` in the tile plan page.
- Disables service access for any plans that have the radio button set to `disabled` in the tile plan page.
- Does nothing for any for any plans that have the radio button set to `manual`.

To run the errand, do the following:

1. **For BOSH CLI v1 only:** Select the broker deployment by running this command:
   `bosh deployment BOSH_MANIFEST.yml`

2. Run one of the following commands depending on your Ops Manager version:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh run errand register-broker`
1.11	`bosh2 -d DEPLOYMENT-NAME run-errand register-broker`
1.12 and later	`bosh -d DEPLOYMENT-NAME run-errand register-broker`

Deregister Broker

This errand deregisters a broker from Cloud Foundry.

The errand does the following:

- Deletes the service broker from Cloud Controller
- Fails if there are any service instances, with or without bindings

Use the Delete All Service Instances errand to delete any existing service instances.

To run the errand, do the following:

1. **For BOSH CLI v1 only:** Select the broker deployment by running the command:
   `bosh deployment BROKER_MANIFEST.yml`.

2. Run one of the following commands depending on your Ops Manager version:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh run errand deregister-broker`
1.11	`bosh2 -d DEPLOYMENT-NAME run-errand deregister-broker`
1.12 and later	`bosh -d DEPLOYMENT-NAME run-errand deregister-broker`

Upgrade All Service Instances

If you have made changes to the plan definition or uploaded a new tile into Ops Manager, you may want to upgrade all the on-demand service instances to

the latest software/plan definition.

The `upgrade-all-service-instances` errand does the following:

- Collects all of the service instances the on-demand broker has registered.
- For each instance the errand serially:
  - Issues an upgrade command to the on-demand broker.
  - Re-generates the service instance manifest based on its latest configuration from the tile.
  - Deploys the new manifest for the service instance.
  - Waits for this operation to complete, then proceeds to the next instance.
- Adds to a retry list any instances that have ongoing BOSH tasks at the time of upgrade.
- Retries any instances in the retry list until all are upgraded.

If any instance fails to upgrade, the errand fails immediately. This prevents systemic problems from spreading to the rest of your service instances. Run the errand by following either of the procedures below.

To run the errand, you can either select the errand through the Ops Manager UI and have it run when you click `Apply Changes`, or do the following:

1. **For BOSH CLI v1 only:** Select the broker deployment by running this command:
   `bosh deployment BOSH_MANIFEST.yml`

2. Run one of the following commands depending on your Ops Manager version:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh run errand upgrade-all-service-instances`
1.11	`bosh2 -d DEPLOYMENT-NAME run-errand upgrade-all-service-instances`
1.12 and later	`bosh -d DEPLOYMENT-NAME run-errand upgrade-all-service-instances`

Delete All Service Instances

This errand deletes all service instances of your broker's service offering in every org and space of Cloud Foundry. It uses the Cloud Controller API to do this, and therefore only deletes instances the Cloud Controller knows about. It will not delete orphan BOSH deployments.

Orphan BOSH deployments don't correspond to a known service instance. While rare, orphan deployments can occur. Use the `orphan-deployments` errand to identify them.

The errand does the following:

- Unbinds all applications from the service instances.
- Deletes all service instances sequentially.
- Checks if any instances have been created while the errand was running.
- If newly-created instances are detected, the errand fails.

WARNING: Use extreme caution when running this errand. You should only use it when you want to totally destroy all of the on-demand service instances in an environment.

To run the errand, do the following:

1. **For BOSH CLI v1 only:** Select the broker deployment by running the command:
   `bosh deployment BROKER_MANIFEST.yml`.

2. Run one of the following commands depending on your Ops Manager version:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh run errand delete-all-service-instances`
1.11	`bosh2 -d service-instance_GUID delete-deployment`
1.12 and later	`bosh -d service-instance_GUID delete-deployment`

Detect Orphaned Instances Service Instances

A service instance is defined as ‘orphaned’ when the BOSH deployment for the instance is still running, but the service is no longer registered in Cloud Foundry.

The `orphan-deployments` errand collates a list of service deployments that have no matching service instances in Cloud Foundry and return the list to the operator. It is then up to the operator to remove the orphaned BOSH deployments.

To run the errand, do the following:

1. **For BOSH CLI v1 only:** Select the broker deployment by running the command:
   `bosh deployment BROKER_MANIFEST.yml`

2. Run the errand using one of the following commands depending on your Ops Manager version:

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh run errand orphan-deployments`
1.11	`bosh2 -d DEPLOYMENT-NAME run-errand orphan-deployments`
1.12 and later	`bosh -d DEPLOYMENT-NAME run-errand orphan-deployments`

If orphan deployments exist, the errand script will:

- Exit with exit code 10
- Output a list of deployment names under a `[stdout]` header
- Provide a detailed error message under a `[stderr]` header

For example:

```
[stdout]
[{"deployment_name":"service-instance_80e3c5a7-80be-49f0-8512-44840f3c4d1b"}]



[stderr]
Orphan BOSH deployments detected with no corresponding service instance in Cloud Foundry. Before deleting any deployment it is recommended to verify the service instance no longer exists i



Errand 'orphan-deployments' completed with error (exit code 10)
```

These details will also be available through the BOSH `/tasks/` API endpoint for use in scripting:

```
$ curl 'https://bosh-user:bosh-password@bosh-url:25555/tasks/task-id/output?type=result' | jq .
{
  "exit_code": 10,
  "stdout": "[{"deployment_name":"service-instance_80e3c5a7-80be-49f0-8512-44840f3c4d1b"}]\n",
  "stderr": "Orphan BOSH deployments detected with no corresponding service instance in Cloud Foundry. Before deleting any deployment it is recommended to verify the service instance no lo
  "logs": {
    "blobstore_id": "d830c4bf-8086-4bc2-8c1d-54d3a3c6d88d"
  }
}
```

If no orphan deployments exist, the errand script will:

- Exit with exit code 0
- Stdout will be an empty list of deployments
- Stderr will be `None`

```
[stdout]
[]

[stderr]
None

Errand 'orphan-deployments' completed successfully (exit code 0)
```

If the errand encounters an error during running it will:

- Exit with exit 1
- Stdout will be empty
- Any error messages will be under stderr

To clean up orphaned instances, run the following command on each instance:

WARNING: Running this command may leave IaaS resources in an unusable state.

Ops Manager Version	BOSH Command
1.10 and earlier	`bosh delete deployment service-instance_SERVICE-INSTANCE-GUID`
1.11	`bosh2 delete-deployment service-instance_SERVICE-INSTANCE-GUID`
1.12 and later	`bosh delete-deployment service-instance_SERVICE-INSTANCE-GUID`

Select the BOSH Deployment for a Service Instance

This is an additional troubleshooting option for **BOSH CLI v1 only**. It does not apply to the BOSH CLI v2.

1. Retrieve the GUID of your service instance with the command `cf service YOUR-SERVICE-INSTANCE --guid`.
2. To download your BOSH manifest for the service, run `bosh download manifest service-instance_SERVICE-INSTANCE-GUID myservice.yml` using the GUID you just obtained and a file name you want to use when saving the manifest.
3. Run `bosh deployment MY-SERVICE.yml` to select the deployment.

Get Admin Credentials for a Service Instance

To retrieve the admin and read-only admin credentials for a service instance, perform the following steps:

1. Identify the service deployment by GUID.
2. Log into BOSH.
3. Download the manifest for the service instance and add the GUID if using the BOSH CLI v1.

   Skip this step if you are using the BOSH CLI v2. You cannot download the manifest with the BOSH CLI v2. Open it in a text editor instead.

4. Look in the manifest for the `admin` and `roadmin` credentials.

Identify Apps using a Service Instance

If you want to identify which apps are using a specific service instance from the BOSH deployments name, you can run the following steps:

1. Take the deployment name and strip the `service-instance_` leaving you with the GUID.

2. Log in to CF as an admin.
3. Obtain a list of all service bindings by running the following: `cf curl /v2/service_instances/GUID/service_bindings`
4. The output from the above curl gives you a list of `resources`, with each item referencing a service binding, which contains the `APP-URL`. To find the name, org, and space for the app, run the following:
    a. `cf curl APP-URL` and record the app name under `entity.name`
    b. `cf curl SPACE-URL` to obtain the space, using the `entity.space_url` from the above curl. Record the space name under `entity.name`
    c. `cf curl ORGANIZATION-URL` to obtain the org, using the `entity.organization_url` from the above curl. Record the organization name under `entity.name`

Note: When running `cf curl` ensure that you query all pages, because the responses are limited to a certain number of bindings per page. The default is 50. To find the next page curl the value under `next_url`

View BOSH Resource Saturation and Scaling

BOSH CLI v2: Viewing statistics

To view usage statistics for any service do the following:

1. **For BOSH CLI v1 only:** Select the broker deployment by running this command:
`bosh deployment BOSH_MANIFEST.yml`
2. Run the following commands depending on your Ops Manager version:

Ops Manager Version	BOSH Commands
v1.10 and earlier	Run the BOSH CLI v1 command `bosh vms --vitals`. To view process-level information, run `bosh instances --ps`.
v1.11	Run the BOSH CLI v2 command `bosh2 -d DEPLOYMENT-NAME vms --vitals`. To view process-level information, run `bosh2 -d DEPLOYMENT-NAME instances --ps`
v1.12 and later	Run the BOSH CLI v2 command `bosh -d DEPLOYMENT-NAME vms --vitals`. To view process-level information, run `bosh2 -d DEPLOYMENT-NAME instances --ps`

Monitor Quota Saturation and Service Instance Count

Quota saturation and total number of service instances are available through ODB metrics emitted to Loggregator. The metric names are shown below:

Metric Name	Description
`on-demand-broker/SERVICE-NAME-MARKETPLACE/quota_remaining`	global quota remaining for all instances across all plans
`on-demand-broker/SERVICE-NAME-MARKETPLACE/PLAN-NAME/quota_remaining`	quota remaining for a particular plan
`on-demand-broker/SERVICE-NAME-MARKETPLACE/total_instances`	total instances created across all plans
`on-demand-broker/SERVICE-NAME-MARKETPLACE/PLAN-NAME/total_instances`	total instances created for a given plan

Note: Quota metrics are not emitted if no quota has been set.

Reinstall a Tile

To reinstall a tile in the same environment where it was previously uninstalled:

1. Ensure that the previous tile was correctly uninstalled as follows:

    a. Log in as an admin with `cf login`.
    b. Use `cf m` to confirm that the Marketplace does not list the service.
    c. Depending on which version of the BOSH CLI you are using, follow one of the steps below to log in to BOSH as an admin:

        i. **For BOSH CLI v2:** Use `bosh2 log-in`.
        ii. **For BOSH CLI v1:** Use `bosh login`.

    d. Depending on which version of the BOSH CLI you are using, follow one of the steps below to display your BOSH deployments to confirm that the output does not show a the service deployment:

        i. **For BOSH CLI v2:** Use `bosh2 deployments`.
        ii. **For BOSH CLI v1:** Use `bosh deployments`.

    e. Run the "delete-all-service-instances" errand to delete every instance of the service.
    f. Run the "deregister-broker" errand to delete the service broker.
    g. Depending on which version of the BOSH CLI you are using, follow one of the steps below:

        i. **For BOSH CLI v2:** Use `bosh2 delete-deployment BROKER-DEPLOYMENT-NAME` to delete the service broker BOSH deployment.
        ii. **For BOSH CLI v1:** Use `bosh delete deployment BROKER-DEPLOYMENT-NAME` to delete the service broker BOSH deployment.

    h. Reinstall the tile.

Knowledge Base (Community)

Find the answer to your question and browse product discussions and solutions by searching the Pivotal Knowledge Base.

File a Support Ticket

You can file a support ticket here. Be sure to provide the error message from `cf service YOUR-SERVICE-INSTANCE`.

To help expedite troubleshooting, also provide your service broker logs, your service instance logs and BOSH task output, if your `cf service YOUR-SERVICE-INSTANCE` output includes a `task-id`.

Backup and Restore Considerations

On-Demand Service Broker

The on-demand service broker is stateless, so there is nothing to backup or restore.

On-Demand Service Instances

Service instances created by the on-demand service broker may have state that needs to be backed up, e.g. data services.

It is the responsibility of the Service Author to provide documentation for the operator to backup and restore on-demand service instances. For a list of deliverables provided by the Service Author, see Required Deliverables.

Disaster Recovery

The on-demand service broker fetches the state of service instances and their deployments from the Cloud Foundry API and BOSH Director respectively. Therefore, to recover on-demand service instances in a disaster both the Cloud Controller database and BOSH Director database must be restored from a backup.

- Backing Up and Restoring Pivotal Cloud Foundry
- How to backup and restore a BOSH Director deployment

Creating an On-Demand Service Tile

This documents the process for deploying an on-demand broker (ODB) with a service in a single tile, on a AWS installation of Ops Manager 1.8. We have built a reference Kafka tile.

Requirements

Before ODB, Ops Manager controlled the IP allocation of the private networks. When you use ODB in a tile, you will need at least two private networks:

- a network where Ops Manager will deploy the ODB VM, and
- a different network where the ODB will deploy service instance VMs.

The network for service instances should be flagged as a Service Network in Ops Manager.

Deploying Ops Manager to AWS

1. Follow the default Ops Manager deployment docs, but with these modifications:
    a. Create a self-signed wildcard SSL certificate for a domain you control. This is often `*.some-subdomain.cf-app.com`.
    b. Upload the SSL cert (along with the associated private key) to AWS by following these instructions.
    c. Download the CloudFormation JSON and save it in the Ops Manager directory.
    d. Run the CloudFormation stack, saving any pertinent inputs (e.g BOSH DB credentials) you type into the web console into the Ops Manager directory for safe keeping (e.g. in `info.txt`).
    e. Launch an instance of the AMI. If possible, use an elastic IP so that we can always keep the same DNS record even if we recreate the VM. Failing that, auto-assign a public IP.
    f. Create a DNS record for `pcf.<the domain you made a wildcard cert for earlier>`. To use the earlier example, the record will be for `pcf.some-subdomain.cf-app.com`. It should point to the public IP of the Ops Manager VM.
2. Keep following the docs to log into Ops Manager (save the credentials).
3. Configure the Ops Manager Director (BOSH) tile.
4. Click “Apply Changes”, and steal the BOSH init manifest for future reference.
    `scp -i private_key.pem ubuntu@opsmanIP:/var/tempest/workspaces/default/deployments/bosh.yml bosh.yml`

Deployment Configuration Tips

1. The ELBs created by CloudFormation are both for CF, not Ops Manager. One of them will be configured with your wildcard certificate. This takes the place of HAProxy in AWS PCF deployments, and is therefore not used until you deploy the ERT tile.
2. To target the BOSH Director from the Ops Manager VM:
    `bosh --ca-cert /var/tempest/workspaces/default/root_ca_certificate target 10.0.16.10`

Build a Tile

Follow the default build your own product tile documentation and configure the `handcraft.yml` with the accessors listed below. To access the `$self` accessors, the `service-broker` flag in the handcraft.yml must be set to `true`.

> **Note**: If you are publishing a tile to be consumed by Ops Manager 1.8.x or 1.9.x, you will need to build your tile using releases with SHA-1 internal checksums. ODB releases are published using SHA-2 internal checksums. You can convert these releases to use SHA-1 internal checksums using the BOSH CLI command `sha1ify-release`.

Non-Exhaustive Accessors Reference

Ops Manager Director

These accessors are used to provide fields relating to the BOSH Director installation present.

Accessor	Description
$director.hostname	The Ops Manager Director's hostname or IP address
$director.ca_public_key	The Ops Manager Director's root CA certificate. For more information, see How to configure SSL certificates for the ODB.

For example:

```
bosh:
  url: https://(( $director.hostname )):25555
  root_ca_cert: (( $director.ca_public_key ))
```

Self

These accessors are used to provide fields that belong to the specific tile (in this case, the broker tile).

Accessor	Description
$self.uaa_client_name	UAA client name, that can authenticate with the BOSH Director
$self.uaa_client_secret	UAA client secret, that can authenticate with the BOSH Director
$self.service_network	Service network configured for the on-demand instances

You must create the service network manually. Create a subnet on AWS and then add it to the Director by configuring the Director tile. Configuration options are in the tile, under *Create Networks > ADD network*.

`$self` accessors are enabled by setting `service_broker: true` at the top level of `handcraft.yml`.

Note: Setting `service_broker: true` causes a redeployment of the BOSH director when installing or uninstalling the tile.

For example:

```
bosh:
  authentication:
    uaa:
      url: https://(( $director.hostname )):8443
      client_id: (( $self.uaa_client_name ))
      client_secret: (( $self.uaa_client_secret ))
```

CF CLI

These accessors are used to provide fields from the Elastic Runtime Tile (Cloud Foundry) present in the Ops Manager installation.

Accessor	Description
..cf.ha_proxy.skip_cert_verify.value	Flag to skip SSL certificate verification for connections to the CF API
..cf.cloud_controller.apps_domain.value	The application domain configured in the CF installation
..cf.cloud_controller.system_domain.value	The system domain configured in the CF installation
..cf.uaa.system_services_credentials.identity	Username of a CF user in the `cloud\_controller.admin` group, to be used by services
..cf.uaa.system_services_credentials.password	Password of a CF user in the `cloud\_controller.admin` group, to be used by services

For example:

```
disable_ssl_cert_verification: (( ..cf.ha_proxy.skip_cert_verify.value ))
cf:
  url: https://api.(( ..cf.cloud_controller.system_domain.value ))
  authentication:
    url: https://uaa.(( ..cf.cloud_controller.system_domain.value ))
    user_credentials:
      username: (( ..cf.uaa.system_services_credentials.identity ))
      password: (( ..cf.uaa.system_services_credentials.password ))
```

Reference

For more accessors, see the ops-manager-example product

Public IP address for on-demand service instance groups

Ops Manager 1.9 RC1+ provides a VM extension called `public_ip` in the BOSH Director's cloud config. This can be used in the ODB's manifest to give instance groups a public IP address. This IP is only used for outgoing traffic to the internet from VMs with the `public_ip` extension. All internal traffic / incoming connections need to go over the private IP.

Here is an example showing how to allow operators to assign a public IP address to an on-demand service instance group in the tile handcraft:

```
form_types:
- name: example_form
  property_inputs:
  - reference: .broker.example_vm_extensions
    label: VM options
    description: List of VM options for Service Instances

job_types:
- name: broker
  templates:
  - name: broker
    release: on-demand-service-broker
    manifest: |
      service_catalog:
        plans:
        - name: example-plan
          instance_groups:
          - name: example-instance-group
            vm_extensions: (( .broker.example_vm_extensions.value ))
  property_blueprints:
  - name: example_vm_extensions
    type: multi_select_options
    configurable: true
    optional: true
    options:
    - name: "public_ip"
      label: "Internet Connected VMs (on supported IaaS providers)"
```

Floating stemcells

Ops Manager provides a feature called Floating Stemcells that allows PCF to quickly propagate a patched stemcell to all VMs in the deployment that have the same compatible stemcell. Both the broker deployment and the service instances deployed by the On-Demand Broker can make use of this feature. Enabling this feature can help ensure that all of your service instances are patched to the latest stemcell.

In order for the service instances to be installed automatically with the latest stemcell, you will need to make sure the `upgrade-all-service-instances` errand is ticked.

Here is an example of how to implement floating stemcells in `handcraft.yml`:

```
job_types:
  templates:
  - name: broker
    manifest: |
      service_deployment:
        releases:
        - name: release-name
          version: 1.0.0
          jobs: [job_server]
        stemcell:
          os: ubuntu-trusty
          version: (( $self.stemcell_version ))
```

Here is an example of how to configure the `stemcell_criteria` in `binaries.yml`:

```
---
name: example-on-demand-service
product_version: 1.0.0
stemcell_criteria:
  os: ubuntu-trusty
  version: '3312'
  enable_patch_security_updates: true
```

Note: Configuring `enable_patch_security_updates` to `false` disables this feature.

On-Demand Broker errands

In the reference Kafka tile, you can see how the ODB release's errands in use.

Specify the errands in the following order, as shown in the example Kafka tile:

Post-deploy:

- `register-broker`
- `upgrade-all-service-instances`

Pre-delete:

- `delete-all-service-instances-and-deregister-broker`

These errands are documented in the operating section.

Secure Binding Credentials

Runtime CredHub can securely store service instance credentials. To include this feature in your tile, make some changes to the tile metadata, as described below:

1. Add `secure_binding_credentials` to the top-level properties block in the on-demand broker manifest. For example:

```
secure_binding_credentials:
  enabled: true
  authentication:
    uaa:
      client_id: CREDHUB_CLIENT_ID # client ID used by broker when communicating with CredHub
      client_secret: CREDHUB_CLIENT_SECRET # client secret used by broker when communicating with CredHub
      ca_cert: UAA_CA_CERT
```

2. To let users enable and disable this feature in the Ops Manager UI, add an element to the `property_blueprints` section of your tile's `handcraft.yml`, and add a selector that templates in the appropriate manifest snippet.

For an example, see the **example-kafka-on-demand-tile**:

- 'Enable Secure Bindings' form field
- `property_blueprint`
- broker manifest template

To use the secure binding credentials feature you must use Pivotal Cloud Foundry (PCF) 2.0 or later.

How On-Demand Services Process Commands

These sequence diagrams in this topic show how an on-demand service sets up and maintains service instances, indicating which tasks are undertaken by the on-demand broker (ODB) and which require interaction with the Service Adapter.

Register Service Broker with Cloud Foundry

sequenceDiagram User->>Cloud Controller:cf create-service-broker Cloud Controller->>On Demand Broker:GET catalog On Demand Broker->>Cloud Controller:catalog Cloud Controller->>User:OK

Create Service Instance

Note that there are two ways this can fail: synchronously and asynchronously. When it fails synchronously, the Cloud Controller will subsequently delete the service according to its orphan mitigation strategy. In the case when it fails asynchronously (e.g. while BOSH deploys the service instance), the Cloud Controller won't issue a delete request.

sequenceDiagram User->> Cloud Controller: cf create-service Cloud Controller->> On Demand Broker: POST instance (provision) On Demand Broker->>Service Adapter: generate-manifest Service Adapter->>On Demand Broker: manifest On Demand Broker->>BOSH: deploy BOSH->>On Demand Broker: accepted On Demand Broker->>Cloud Controller: accepted Cloud Controller->>User: create in progress loop until bosh task is complete Cloud Controller->>On Demand Broker: GET last operation On Demand Broker->>BOSH: GET deploy task BOSH->>On Demand Broker: task in progress On Demand Broker->>Cloud Controller: create in progress end Cloud Controller->>On Demand Broker: GET last operation On Demand Broker->>BOSH: GET task BOSH->>On Demand Broker: task done On Demand Broker->>Cloud Controller: create succeeded User->>Cloud Controller:cf service Cloud Controller->>User: create succeeded

Delete Service Instance

In the delete service workflow the service adapter is not invoked.

sequenceDiagram User->>Cloud Controller:cf delete-service Cloud Controller->>On Demand Broker:DELETE instance On Demand Broker->>BOSH:delete deployment BOSH->>On Demand Broker:accepted On Demand Broker->>Cloud Controller:accepted Cloud Controller->>User: delete in progress loop until bosh task is complete Cloud Controller->>On Demand Broker: GET last operation On Demand Broker->>BOSH: GET task BOSH->>On Demand Broker: task in progress On Demand Broker->>Cloud Controller: delete in progress end Cloud Controller->>On Demand Broker: GET last operation On Demand Broker->>BOSH: GET task BOSH->>On Demand Broker: task done On Demand Broker->>Cloud Controller: delete succeeded User->>Cloud Controller:cf service Cloud Controller->>User: not found

Create/Update Service Instance with Post-Deploy Errand

ODB will not report create/update succeeded to Cloud Foundry until both the deployment and post-deploy errand have completed successfully.

sequenceDiagram User->> Cloud Controller: cf create-service Cloud Controller->> On Demand Broker: POST instance (create) On Demand Broker->>Service Adapter: generate-manifest Service Adapter->>On Demand Broker: manifest On Demand Broker->>BOSH: deploy BOSH->>On Demand Broker: accepted On Demand Broker->>Cloud Controller: accepted Cloud Controller->>User: create in progress loop until bosh task is complete Cloud Controller->>On Demand Broker: GET last operation On Demand Broker->>BOSH: GET deploy task BOSH->>On Demand Broker: task in progress On Demand Broker->>Cloud Controller: create in progress end Cloud Controller->>On Demand Broker: GET last operation On Demand Broker->>BOSH: GET task BOSH->>On Demand Broker: task done On Demand Broker->>BOSH: run post-deploy errand BOSH->>On Demand Broker: accepted loop until bosh task errand is complete Cloud Controller->>On Demand Broker:GET last operation On Demand Broker->>BOSH:GET errand task BOSH->>On Demand Broker:task in progress On Demand Broker->>Cloud Controller:create in progress end Cloud Controller->>On Demand Broker:GET last operation On Demand Broker->>BOSH:GET errand task BOSH->>On Demand Broker:task done On Demand Broker->>Cloud Controller:create succeeded User->>Cloud Controller:cf service Cloud Controller->>User: create succeeded

Delete Service Instance with Pre-Delete Errand

ODB will not report delete succeeded to Cloud Foundry until both the pre-delete errand and delete deployment have completed successfully.

sequenceDiagram User->>Cloud Controller:cf delete-service Cloud Controller->>On Demand Broker:DELETE instance On Demand Broker->>BOSH:run pre-delete errand BOSH->>On Demand Broker:accepted On Demand Broker->>Cloud Controller:accepted Cloud Controller->>User: delete in progress loop

until errand bosh task is complete Cloud Controller->>On Demand Broker:GET last operation On Demand Broker->>BOSH:GET errand task BOSH->>On Demand Broker:task in progress On Demand Broker->>Cloud Controller:delete in progress end Cloud Controller->>On Demand Broker:GET last operation On Demand Broker->>BOSH:GET errand task BOSH->>On Demand Broker:task done On Demand Broker->>BOSH:delete deployment BOSH->>On Demand Broker:accepted loop until delete deployment bosh task is complete Cloud Controller->>On Demand Broker: GET last operation On Demand Broker->>BOSH: GET delete deployment task BOSH->>On Demand Broker: task in progress On Demand Broker->>Cloud Controller: delete in progress end Cloud Controller->>On Demand Broker: GET last operation On Demand Broker->>BOSH: GET delete deployment task BOSH->>On Demand Broker: task done On Demand Broker->>Cloud Controller: delete succeeded User->>Cloud Controller:cf service Cloud Controller->>User: not found

Update Service Instance

Updates can only proceed if the existing service instance is up-to-date. ODB calls `generate-manifest` on service adapter to determine whether there are any pending changes for the instance.

When There Are Pending Changes

Note: When determing whether there are pending changes for an instance during an update, ODB *ignores* any configuration supplied in the update block of the manifest returned by the service adapter's `generate-manifest` subcommand.

sequenceDiagram User->> Cloud Controller: cf update-service -c '{"some":"config"}' Cloud Controller->> On Demand Broker: PATCH instance (update) On Demand Broker->>BOSH:GET manifest BOSH->>On Demand Broker:previous manifest On Demand Broker->>Service Adapter: generate-manifest (without request parameters) Service Adapter->>On Demand Broker: manifest On Demand Broker->>Cloud Controller: update failed, pending changes detected Cloud Controller->>User: update failed, pending changes detected

When There Are No Pending Changes

The manifest from the second call to `generate-manifest` is deployed.

sequenceDiagram User->> Cloud Controller: cf update-service -c '{"some":"config"}' Cloud Controller->> On Demand Broker: PATCH instance (update) On Demand Broker->>BOSH:GET manifest BOSH->>On Demand Broker:previous manifest On Demand Broker->>Service Adapter: generate-manifest (without request parameters) Service Adapter->>On Demand Broker: manifest On Demand Broker->>Service Adapter: generate-manifest (with request parameters) Service Adapter->>On Demand Broker: manifest On Demand Broker->>BOSH: deploy BOSH->>On Demand Broker: accepted On Demand Broker->>Cloud Controller: accepted Cloud Controller->>User: update in progress loop until bosh task is complete Cloud Controller->>On Demand Broker:GET last operation On Demand Broker->>BOSH:GET task BOSH->>On Demand Broker:task in progress On Demand Broker->>Cloud Controller:update in progress end Cloud Controller->>On Demand Broker:GET last operation On Demand Broker->>BOSH:GET task BOSH->>On Demand Broker:task done On Demand Broker->>Cloud Controller:update succeeded User->>Cloud Controller: cf service Cloud Controller->>User: update succeeded

Bind

sequenceDiagram User->>Cloud Controller:cf bind-service Cloud Controller->>On Demand Broker:PUT binding On Demand Broker->>Service Adapter:create-binding Service Adapter->>On Demand Broker:binding credentials alt Secure Binding enabled On Demand Broker->>CredHub:Store credentials with ACLs for app On Demand Broker->>Cloud Controller:CredHub reference else Secure Binding disabled On Demand Broker->>Cloud Controller:binding credentials end Cloud Controller->>User:OK

Unbind

sequenceDiagram User->>Cloud Controller:cf unbind-service Cloud Controller->>On Demand Broker:DELETE binding On Demand Broker->>Service Adapter:delete-binding Service Adapter->>On Demand Broker:exit 0 opt Secure Binding enabled On Demand Broker->>CredHub:Delete credentials CredHub->>On Demand Broker:OK end On Demand Broker->>Cloud Controller:OK Cloud Controller->>User:OK

Upgrade All Service Instances

ODB provides BOSH errand to upgrade all the instances managed by the broker. This can also be used in the scenario when a plan changes; this errand will update all instances that implement the plan with the new plan definition.

sequenceDiagram Operator->>Upgrade Errand:bosh run errand upgrade-all-service-instances Upgrade Errand->>On Demand Broker:GET instances On Demand Broker->>Cloud Controller:GET instances Cloud Controller->>Upgrade Errand:instances loop for all instances Upgrade Errand->>On Demand Broker: PATCH instance (upgrade) On Demand Broker->>Service Adapter: generate-manifest Service Adapter->>On Demand Broker: manifest On Demand Broker->>BOSH: deploy BOSH->>On Demand Broker: accepted On Demand Broker->>Upgrade Errand: accepted Note over Upgrade Errand,BOSH: Upgrade Errand polls On Demand Broker for last operation until complete end Upgrade Errand->>Operator:completed successfully

Delete All Service Instances

ODB provides BOSH errand to delete all the instances managed by the broker.

sequenceDiagram Operator->>Delete Errand:bosh run errand delete-all-service-instances Delete Errand->>Cloud Controller:GET instances Cloud Controller->>Delete Errand:instances loop for all instances Delete Errand->>Cloud Controller:GET bindings Cloud Controller->>Delete Errand:bindings loop for all bindings Delete Errand->>Cloud Controller:cf unbind-service Cloud Controller->>On Demand Broker: DELETE binding On Demand Broker->>Service Adapter:delete-binding Service Adapter->>On Demand Broker:exit code 0 On Demand Broker->>Cloud Controller:OK Cloud Controller->>Delete Errand:OK end Delete Errand->>Cloud Controller:GET service keys Cloud Controller->>Delete Errand:service keys loop for all service keys Delete Errand->>Cloud Controller:cf delete-service-key Cloud Controller->>On Demand Broker: DELETE binding On Demand Broker->>Service Adapter:delete-binding Service Adapter->>On Demand Broker:exit code 0 On Demand Broker->>Cloud Controller:OK Cloud Controller->>Delete Errand:OK end Delete Errand->>Cloud Controller:cf delete-service Cloud Controller->>On Demand Broker:DELETE instance On Demand Broker->>BOSH:delete deployment BOSH->>On Demand Broker:accepted On Demand Broker->>Cloud Controller:accepted Cloud Controller->>Delete Errand:accepted loop until DELETE completes Delete Errand->>Cloud Controller:GET instance Cloud Controller->>Delete Errand:delete instance in progress Note over Cloud Controller,BOSH: Cloud Controller asynchronously polls On Demand Broker, which in turn polls BOSH for last operation status end Delete Errand->>Cloud Controller:GET instance Cloud Controller->>Delete Errand:instance not found end Delete Errand->>Operator:completed successfully

Delete All Service Instances And Deregister Broker

ODB provides BOSH errand to delete all the instances managed by the broker and to deregister the broker from Cloud Foundry.

sequenceDiagram Operator->>Delete Errand:bosh run errand delete-all-service-instances Delete Errand->>Cloud Controller:POST disable-service-access Cloud Controller->>Delete Errand:completed successfully Delete Errand->>Cloud Controller:GET instances Cloud Controller->>Delete Errand:instances loop for all instances Delete Errand->>Cloud Controller:GET bindings Cloud Controller->>Delete Errand:bindings loop for all bindings Delete Errand->>Cloud Controller:cf unbind-service Cloud Controller->>On Demand Broker: DELETE binding On Demand Broker->>Service Adapter:delete-binding Service Adapter->>On Demand Broker:exit code 0 On Demand Broker->>Cloud Controller:OK Cloud Controller->>Delete Errand:OK end Delete Errand->>Cloud Controller:GET service keys Cloud Controller->>Delete Errand:service keys loop for all service keys Delete Errand->>Cloud Controller:cf delete-service-key Cloud Controller->>On Demand Broker: DELETE binding On Demand Broker->>Service Adapter:delete-binding Service Adapter->>On Demand Broker:exit code 0 On Demand Broker->>Cloud Controller:OK Cloud Controller->>Delete Errand:OK end Delete Errand->>Cloud Controller:cf delete-service Cloud Controller->>On Demand Broker:DELETE instance On Demand Broker->>BOSH:delete deployment BOSH->>On Demand Broker:accepted On Demand Broker->>Cloud Controller:accepted Cloud Controller->>Delete Errand:accepted loop until DELETE completes Delete Errand->>Cloud Controller:GET instance Cloud Controller->>Delete Errand:delete instance in progress Note over Cloud Controller,BOSH: Cloud Controller asynchronously polls On Demand Broker, which in turn polls BOSH for last operation status end Delete Errand->>Cloud Controller:GET instance Cloud Controller->>Delete Errand:instance not found end Delete Errand->>Cloud Controller:DELETE service-broker Cloud Controller->>Delete Errand:completed successfully Delete Errand->>Operator:completed successfully

Frequently asked questions

How many dedicated service instances has Pivotal managed in a PCF environment?

The on-demand broker has been tested with 500 dedicated service instances using the example Kafka on-demand tile.

We recorded how long it took to create, upgrade all and delete all, with 50, 101 and 500 dedicated service instances.

Set up

Environment	
IaaS	Google Cloud Platform
PCF Operations Manager	v1.9.7
PCF Elastic Runtime	v1.9.13
Example Kafka On-Demand Tile	v0.15.1

BOSH Director Configuration	
Workers	3
Dedicated status worker	enabled

On-demand plan configuration	
Zookeeper VM type	small (1 CPU, 2GB RAM, 8GB Disk)
Kafka VM type	small (1 CPU, 2GB RAM, 8GB Disk)

Test

1. Upload the example Kafka on-demand tile
2. Configure the on-demand plan
3. Apply changes to install the on-demand service, ensuring that `Register on-demand broker` is checked
4. Create N dedicated service instances using the CF CLI
5. Make a change to the plan configuration
6. Apply pending changes, ensuring that `Upgrade all on-demand service instances` is checked
7. Delete the tile and apply changes, ensuring that `Delete all on-demand service instances` is checked

Results

Durations presented in HH:MM:SS format.

Create	50	101	500
average create	00:01:02	00:01:03	00:01:02
total	00:51:28	01:45:40	08:33:37

Upgrade All	50	101	500
average upgrade	00:01:10	00:01:05	00:01:00
total	00:58:37	01:49:42	08:21:08

Delete All	50	101	500
average delete	00:05:09	00:05:04	0:05:00
total	04:17:38	08:31:10	41:38:26

These durations may vary for a number of reasons, for example:

- Number of BOSH director workers
- IaaS performance
- Network latency
- Service instance BOSH release(s)
- Service instance deployment configuration
- VM type of service instance
- Activity of Elastic Runtime
- Activity of BOSH Director

Notes

For create operations, the on-demand broker creates a BOSH deployment for each service instance. By default, the BOSH Director in Operations Manager v1.9 has three workers with a dedicated status worker, so only two workers are available to process deployment tasks. Therefore, only two service instances can be created at the same time.

For upgrade all and delete all operations, Operations Manager runs a BOSH errand. This errand task occupies a BOSH Director worker, leaving one worker available to upgrade, or delete deployments.