Pivotal

PRODUCT DOCUMENTATION

Redis for PCF®

Version 1.7

User's Guide

Table of Contents

Redis for PCF

Note: Redis for PCF v1.7 is no longer supported. The support period for v1.7 has expired. To stay up-to-date with the latest software and security updates, upgrade to Redis for PCF v1.10 or later.

This is documentation for the Redis for PCF service tile. This tile can be downloaded from Pivotal Network.

This documentation:

- Describes the features and architecture of Redis for PCF
- Instructs the PCF operator on how to install, configure, maintain and backup Redis for PCF
- Instructs the App developer on how to choose a service plan, create and delete Redis service instances, and bind an app

About Redis

Redis is an easy to use, high speed key-value store that can be used as a database, cache, and message broker. It supports a range of data structures including strings, lists, hashes, sets, bitmaps, hyperloglogs, and geospatial indexes. It is easy to install and configure and is popular with engineers as a straightforward NoSQL data store. It is used for everything from a quick way to store data for development and testing through to enterprise-scale apps like Twitter.

About Redis for PCF

Redis for PCF packages Redis for easy deployment and operability on Pivotal Cloud Foundry (PCF). Redis for PCF can be used as a datastore or cache. Metrics and logging enable operators to monitor Redis health. Operators can configure scheduled backups to a variety of destinations. There are manual backup and restore scripts for individual service instances. New features are regularly introduced. Upgrading Redis for PCF is straightforward and preserves configuration and data.

Product Snapshot

The following table provides version and version-support information about Redis for PCF:

Element	Details
Version	v1.7.8
Release date	January 2, 2018
Software component version	Redis OSS v3.2.11
Compatible Ops Manager version(s)	v1.8.0, v1.9.0, and v1.10.0
Compatible Elastic Runtime version(s)	v1.8.0, v1.9.0, and v1.10.0
IaaS support	AWS, Azure, GCP, OpenStack, and vSphere
IPsec support	Yes

About Upgrading to the Latest Version

Consider the following compatibility information before upgrading Redis for PCF.

For more information, see the Product Compatibility Matrix.

Ops Manager Version	Supported Upgrades from Imported Redis Installation	
	From	To
v1.5.x, v1.6.x	v1.40 – v1.4.3	v1.4.4 – latest v1.4.x
		v1.5.0 – v1.5.7
	v1.4.4 – latest v1.4.x	Next v1.4.x – latest v1.4.x

	v1.4.4 – latest v1.4.x	v1.5.0 – latest v1.5.x
	v1.5.0 – latest v1.5.x	Next v1.5.x – latest v1.5.x
v1.7.x	v1.5.0 – latest version	v1.5.1 – latest version
v1.8.x	v1.5.17 – latest version	v1.6.0 – latest version
v1.9.x	v1.6.0 – latest version	v1.7.0 – latest version
v1.10.x	v1.7.2 – latest version	v1.8.0 – latest version
v1.11.x	v1.8.0 – latest version	1.8.x

More Information

The following table lists where you can find topics related to the information on this page:

For more information about…	See…
product compatibility	Product Version Matrix
a particular version of Redis for PCF	Release Notes
how to upgrade Redis for PCF	Upgrading Redis for PCF
how to use Redis	Redis Documentation

Feedback

Please provide any bugs, feature requests, or questions to the Pivotal Cloud Foundry Feedback list.

Pivotal

Overview of Redis for PCF v1.7

This topic describes the significant new features in Redis for PCF v1.7. This topic also presents a checklist that you can use to decide if Redis for PCF is ready to meet your business requirements.

Introduction

Redis for PCF v1.7 focuses on enhanced backup and restore capabilities. Operators can configure a schedule for backups, as well as a several options for where to put the backup artifacts. The release also includes scripts that can be run by the operator to back up and restore dedicated-vm or shared-vm service instances. Redis for PCF 1.7 is configured as a datastore, if you wish to use Redis as a cache, please upgrade to Redis for PCF 1.8.

New in This Release

The following features are new in Redis for PCF v1.7

- **A choice of destinations for backup artifacts**— Redis for PCF v1.7 can send backup artifacts to AWS S3, SCP, Azure or Google Cloud Storage
- **Scripts for manual backup and restore**— Redis for PCF v1.7 includes scripts for backing up and restoring dedicated and shared VM instances.
- **Operator configured backup schedule** — The operator can configure a `cron` schedule for triggering backups.

Known Issues

- Upgrade from 1.6 sometimes fails at cf-redis-broker. Clicking `apply changes` again will successfully complete upgrade.
- Backup configuration is not preserved when upgrading from PCF Redis 1.5 or 1.6; if backing up to AWS S3, operators will need to re-enter S3 configuration.
- The service broker and all shared-vm service instances are unavailable while the manual restore script is being run.
- If the manual restore script fails, the Redis service instance that is being restored to is left in an unusable state.
- The manual restore script can time out on very large files, e.g. larger than 60GB.
- The Redis broker vm instance listens on port 12350 instead of port 80. Any vms that need to communicate to the broker (e.g. broker-registrar, cloud_controller) should have this port open. Please ensure you have the appropriate firewall settings.

Enterprise-Ready Checklist

Review the following table to determine if Redis for PCF v1.7 has the features needed to support your enterprise.

Plans and Instances		**More Information**
Dedicated and shared plans	Redis for PCF provides both dedicated VM and shared VM plans.	Plans
Customizable plans	For the dedicated VM plan, the operator can customize the VM and disk size.	Configuring
Installation and Upgrades		**More Information**
Product upgrades	Redis for PCF can be upgraded from v1.5 and v1.6 tiles	Upgrading Redis for PCF
Deployment Smoke Tests	Redis for PCF installation and upgrade runs a post deployment BOSH errand that validates basic Redis operations	Smoke Tests
Maintenance and Backups		**More Information**
Operational Monitoring and Logging	Redis for PCF v1.7 provides metrics for health monitoring and syslog redirection to external log ingestors.	Monitoring Redis for PCF
Backup and Restore	Redis for PCF v1.7 provides automatic backups on a configurable schedule to a variety of destinations, as well as scripts for backup and restore of service instances.	Manual Backup and Restore of Redis for PCF
Scale and Availability		**More Information**
Scale	Redis for PCF has been tested with 60GB of data	
Ability to Scale Up /	Operators can scale VMs up, but not down	Configuring

Down		
Rolling Deployments	Redis for PCF does not support rolling deployments because it is single node; the service is unavailable during upgrades.	Upgrades
AZ Support	Assigning multiple AZs to Redis jobs does not guarantee high availability.	About Multiple AZs in Redis for PCF
Encryption		**More Information**
Encrypted Communication in Transit	Redis for PCF has been tested successfully with the BOSH IPsec Add-on	Securing Data in Transit with the IPsec Add-on

About Multiple AZs in Redis for PCF v1.7

Redis for PCF v1.7 supports configuring multiple AZs. However, assigning multiple AZs to Redis jobs does not guarantee high availability.

- Shared-VM instances run on a single node in just one of the configured availability zones and are therefore not highly available.
- Dedicated-VM instances can be assigned to any of the configured availability zones. However each instance still operates as a single node with no clustering. This separation over availability zones provides no high availability.

More Information

The following table lists where you can find topics related to the information on this page:

For more information about...	See...
the v1.7 releases	Release Notes

Release Notes

Redis for PCF v1.7.8

January 2, 2018

Compatibility

This tile uses the following releases: Service Backup 18.1.3 and Service Metrics 1.5.8.

See the change to metrics configuration introduced in v1.7.2.

Features

No change

Bug Fixes

No change

Known Issues

No change

Redis for PCF v1.7.7

November 15, 2017

Compatibility

This release is compatible with stemcell line 3445.

See the change to metrics configuration introduced in v1.7.2.

Features

No change

Bug Fixes

No change

Known Issues

No change. Redis backups to AWS S3 are still limited to standard region.

Redis for PCF v1.7.6

October 27, 2017

Compatibility

This release is compatible with stemcell line 3468.

This release uses OS Redis 3.2.11.

See the change to metrics configuration introduced in v1.7.2.

Features

No change

Bug Fixes

No change

Known Issues

This stemcell line was not intended to be supported. Redis Backups to AWS S3 still limited to standard region.

Redis for PCF v1.7.5

April 27, 2017

Compatibility

Bump stemcell line to 3363.

See the change to metrics configuration introduced in v1.7.2.

Features

Implemented Redis 3.2.8

Adjusted smoketests to be more resilient to unresponsive factors external to Redis, which will reduce false failures.

Bug Fixes

No change

Known Issues

No change. Redis Backups to AWS S3 still limited to standard region.

Redis for PCF v1.7.4

April 5, 2017

Compatibility

No change. See the change to metrics configuration introduced in v1.7.2.

Features

No change

Bug Fixes

Fix an issue with process watcher being restarted every two/three hours.

Known Issues

No change. Redis Backups to AWS S3 still limited to standard region.

Redis for PCF v1.7.3

March 6, 2017

Compatibility

No change. See the change to metrics configuration introduced in v1.7.2.

Features

No change

Bug Fixes

Fix an issue with Redis being restarted every three hours. This issue was introduced in Redis for PCF v1.7.1 and also exists in 1.7.2.

Redis for PCF v1.7.2

Known Issues

No change. Redis Backups to AWS S3 still limited to standard region.

February 16, 2017

Compatibility

In order for Redis for PCF v1.7 to work with PCF v1.8 and later, the operator needs to be able to configure whether TLS is turned on or off for metrics communications. Redis for PCF v1.7.2 adds the ability for the operator to turn on/off TLS communications for metrics, via a `Use non-secure communication for metrics` checkbox on the metrics configuration page in Ops Manager. You should configure this checkbox for different versions of PCF as follow:

- **PCF v1.8**: This checkbox must be checked for metrics to be emitted to the Firehose.
- **PCF v1.9**: Metrics communications are secure by default but will work in a non-secure mode.
- **PCF v1.10 and later**: Metrics communications are secure by default so this checkbox must be unchecked for metrics to be emitted to the Firehose.

Features

No change

Bug Fixes

No change

Known Issues

In order to enable TLS communications for metrics, the addition of a consul agent to all instances was required. This means there are now new open ports required. Please make changes to any firewall rules to allow outbound traffic from all Redis vm instances on port `8301`.

Redis Backups to AWS S3 still limited to standard region.

Redis for PCF v1.7.1

January 25, 2017

Compatibility

No change

Features

No change

Bug Fixes

Fix issue with migration of backup configuration when upgrading from Redis for PCF v1.6.

Fix issue with the service broker and shared vm instances being unavailable while running the restore script on a shared VM instance.

Fix issue with very large files being restored.

Resolved Security Issues

Upgrade to Golang v1.7.4

Known Issues

No change. Redis Backups to AWS S3 still limited to standard region.

Redis for PCF v1.7.0

December 22, 2016

Known Issues

Redis Backups to AWS S3 Limited to Standard Region Backups are only sent to AWS S3 buckets that have been created in the US Standard region, “us-east-1.”

Release notes here.

Redis for PCF 1.6 Architecture and Lifecycle

How Redis for PCF Configures Redis

Redis for PCF configures Redis in the following ways. These configurations cannot be changed.

- Redis is configured with a maxmemory-policy of no-eviction. This policy means that when the memory is full, the service does not evict any keys or perform any write operations until memory becomes available.
- Persistence is configured for both `RDB` and `AOF`. The default maximum number of connections, maxclients, is set at 10000 but this number is adjusted by Redis according to the number of file handles available.
- Replication and event notification are not configured.

A sample `redis.conf` from a Dedicated-VM plan instance can be viewed on Sample Redis Configuration

Service Plans

Redis for PCF offers Dedicated-VM and Shared-VM plans.

Shared-VM Plan

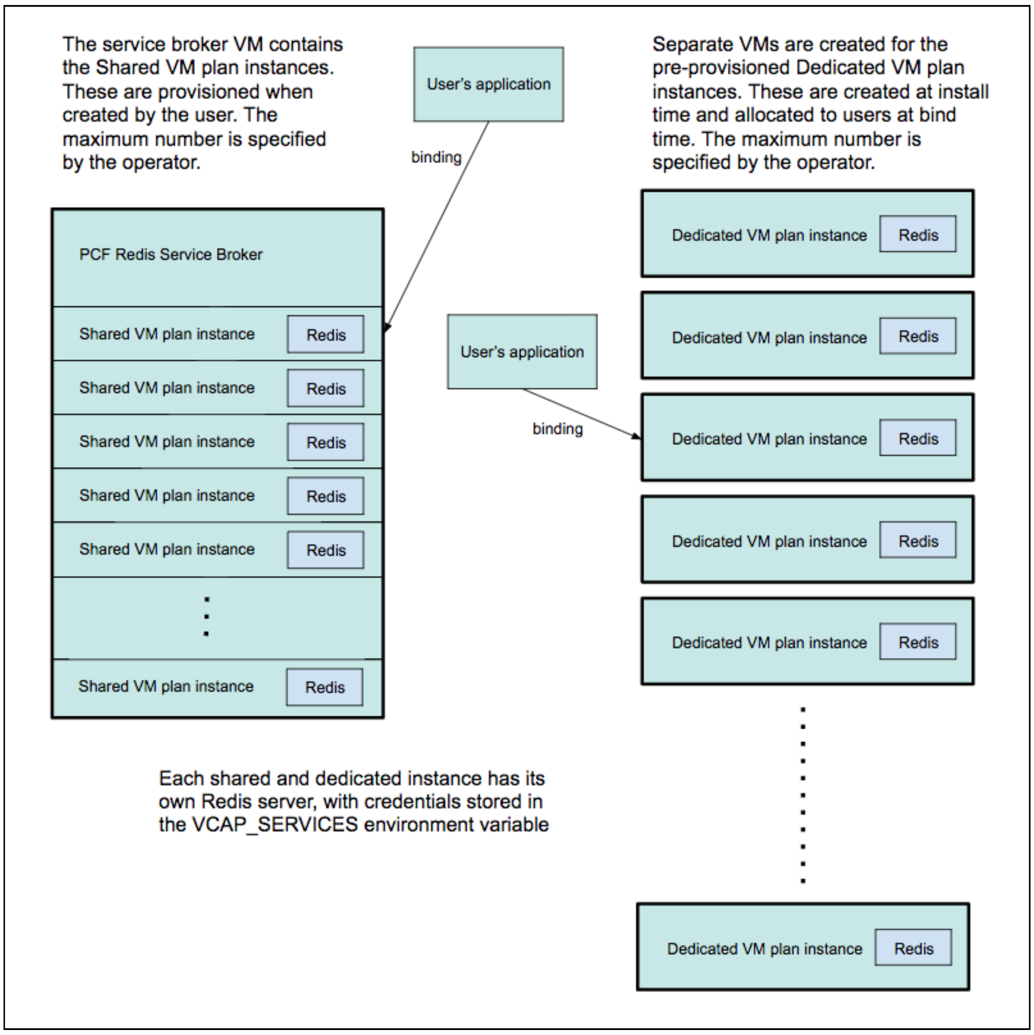
- This plan deploys a Redis instance inside the service broker VM.
- You can disable this plan by setting the `Max instances limit` on the `Shared-VM plan` tab in OpsManager to be `0`.
- The maximum number of instances can be increased from the default 5 to a value of your choosing. If you increase the number of instances that can be run on this single VM, you should consider increasing the resources allocated to the VM. In particular RAM and CPU. You can overcommit to a certain extent, but may start to see performance degradations.
- You can also increase the maximum amount of RAM allocated to each Redis process (service instance) that is running on this VM
- If you decrease the service instance limit, any instances that are running where the count is now greater than the limit are not terminated. They are left to be removed naturally, until the total count drops below the new limit you cannot create any new instances. For example if you had a limit of 10 and all were used and reduced this to 8, the two instances will be left running until you terminate them yourself.

Dedicated-VM Plan

- This plan deploys the operator-configured number of dedicated Redis VMs alongside the service broker VM.
- These instances are pre-provisioned during the deployment of the tile from OpsManager into a **pool**. The VMs are provisioned and configured with a Redis process ready to be used when an instance of the Dedicated-VM plan is requested.
- A default deployment will provision `5 instances` of the Dedicated-VM plan into the **pool**. This number can be increased on the `Resource Config` tab in Ops Manager, either in the initial deployment, or subsequently thereafter. The number of VMs **cannot** be decreased once deployed.
- When a user provisions an instance, it is marked as in use and taken out of the **pool**.
- When a user deprovisions an instance, the instance is cleansed of any data and configuration to restore it to a fresh state and placed back into the pool, ready to be used again.
- You can disable this plan by setting the number of instances of the `Dedicated node` job in Ops Manager to `0`.

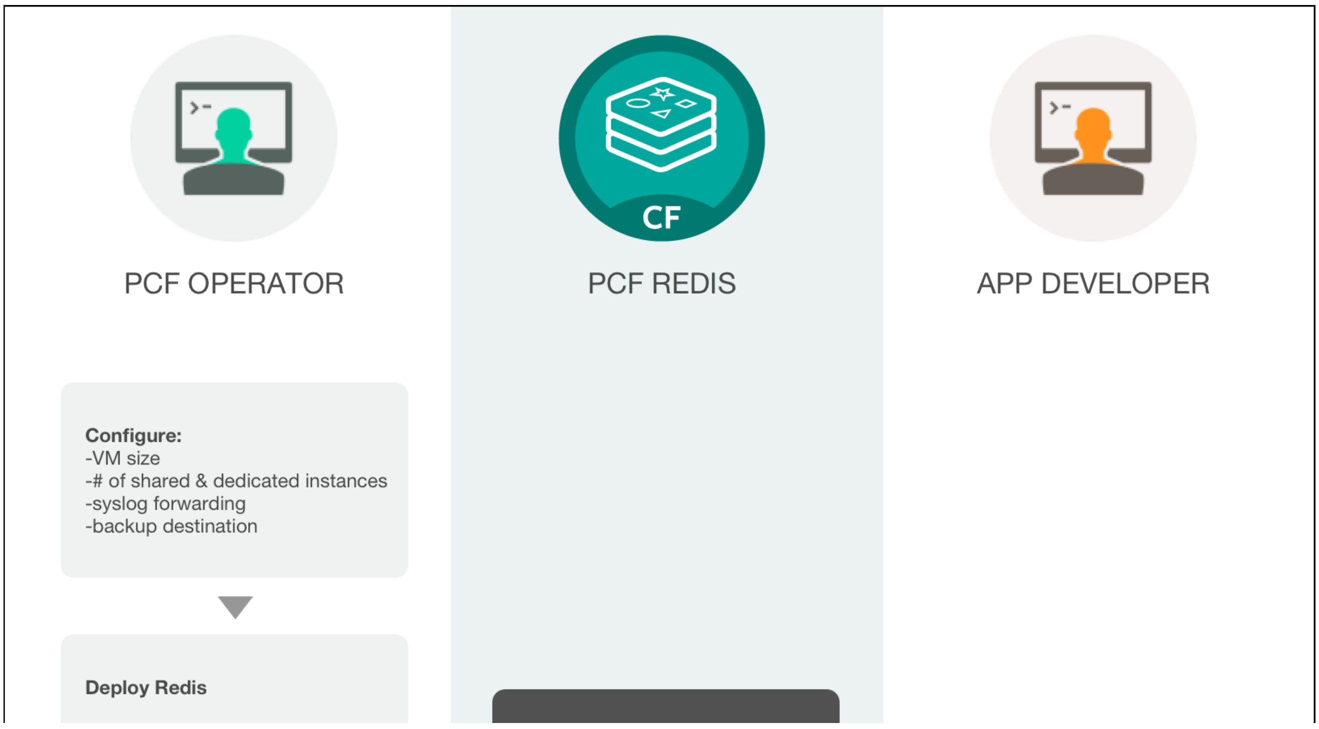
Redis for PCF Architecture

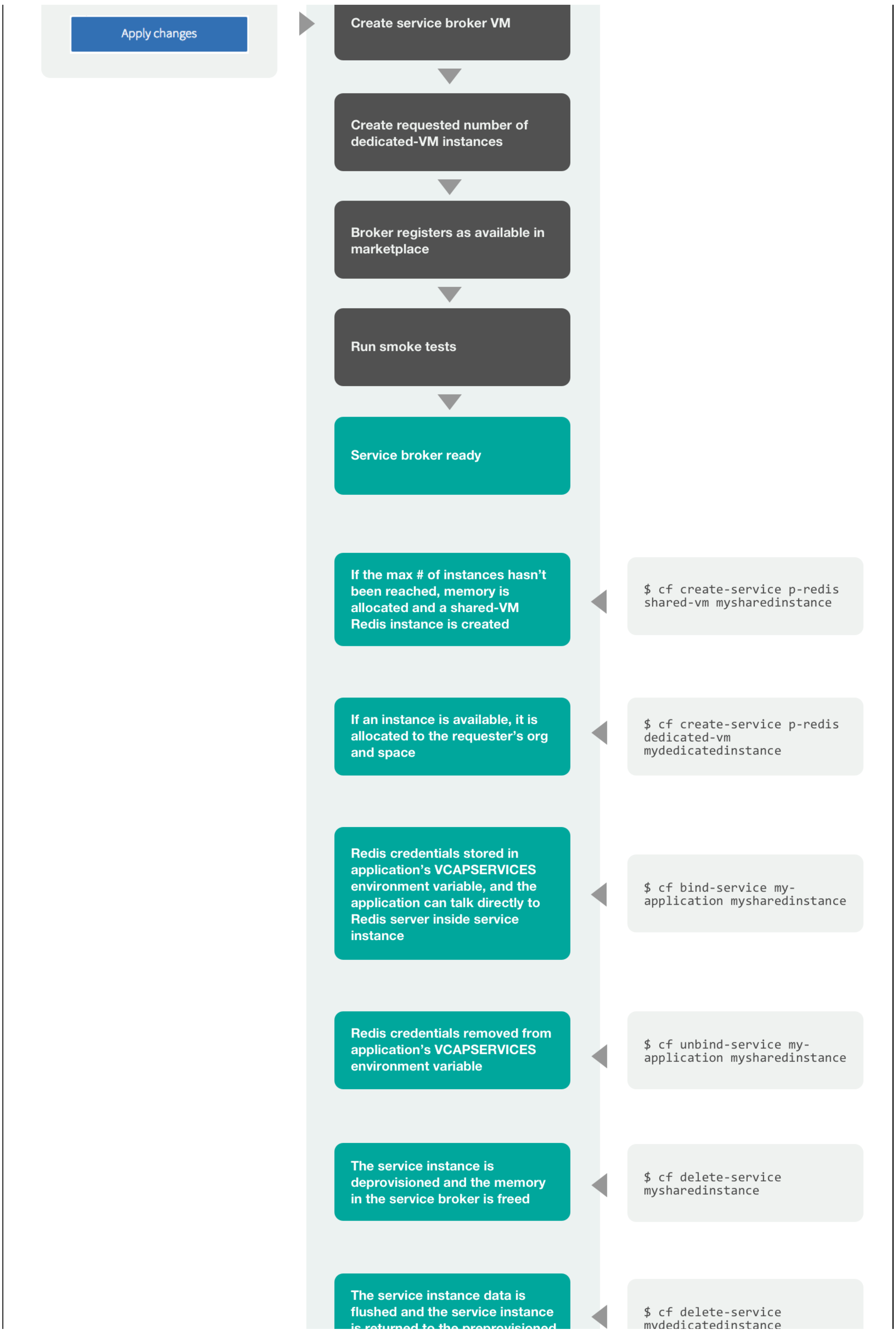
This diagram shows how the architecture of the service broker and Shared-VM and Dedicated-VM plans and how the user's app binds to a Redis instance.


The service broker VM contains the Shared VM plan instances. These are provisioned when created by the user. The maximum number is specified by the operator.
User's application
binding
Separate VMs are created for the pre-provisioned Dedicated VM plan instances. These are created at install time and allocated to users at bind time. The maximum number is specified by the operator.
PCF Redis Service Broker
Shared VM plan instance
Redis
User's application
binding
Dedicated VM plan instance
Redis
Each shared and dedicated instance has its own Redis server, with credentials stored in the VCAP_SERVICES environment variable

Redis for PCF Lifecycle

Here is the lifecycle of Redis for PCF, from an operator installing the tile through an app developer using the service then an operator deleting the tile.





Create service broker VM

Create requested number of dedicated-VM instances

Broker registers as available in marketplace

Run smoke tests

Service broker ready

If the max # of instances hasn't been reached, memory is allocated and a shared-VM Redis instance is created

```
$ cf create-service p-redis
shared-vm mysharedinstance
```

If an instance is available, it is allocated to the requester's org and space

```
$ cf create-service p-redis
dedicated-vm
mydedicatedinstance
```

Redis credentials stored in application's VCAPSERVICES environment variable, and the application can talk directly to Redis server inside service instance

```
$ cf bind-service my-
application mysharedinstance
```

Redis credentials removed from application's VCAPSERVICES environment variable

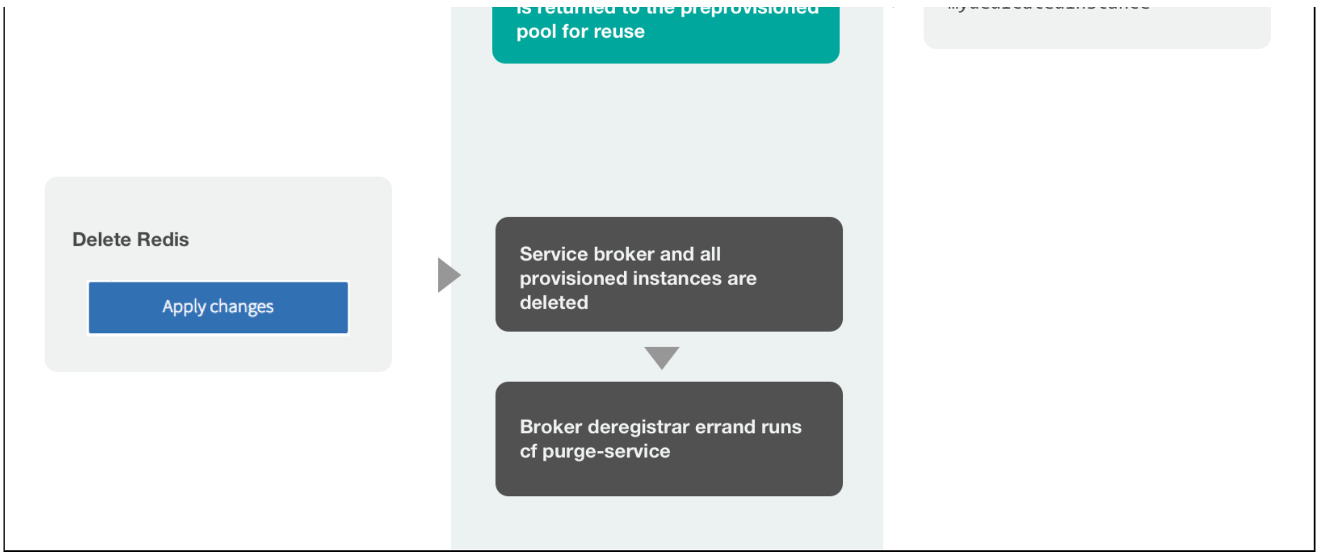
```
$ cf unbind-service my-
application mysharedinstance
```

The service instance is deprovisioned and the memory in the service broker is freed

```
$ cf delete-service
mysharedinstance
```

The service instance data is flushed and the service instance is returned to the preprovisioned

```
$ cf delete-service
mydedicatedinstance
```



pool for reuse
Delete Redis
Apply changes
Service broker and all provisioned instances are deleted
Broker deregistrar errand runs cf purge-service

Redis for PCF Recommended Usage and Limitations

Recommended Use Cases

Redis for PCF can be used as a datastore or cache.
It is configured with `maxmemory-policy = noeviction` and RDB and AOF persistence.

Redis can be used in many different ways, including:

- Key/value store for strings and more complex data structures including Hashes, Lists, Sets, Sorted Sets
- Session cache - persistence enables preservation of state
- Full page cache - persistence enables preservation of state
- Database cache - cache queries
- Data ingestion - because Redis is in memory it can ingest data very quickly
- Message Queues - list and set operations. `PUSH` , `POP` , and blocking queue commands.
- Leaderboards/Counting - increments and decrements of sets and sorted sets using `ZRANGE` , `ZADD` , `ZREVRANGE` , `ZRANK` , `INCRBY` , `GETSET`
- Pub/Sub - built in publish and subscribe operations - `PUBLISH` , `SUBSCRIBE` , `UNSUBSCRIBE`

Service Plan Recommended Usage and Limitations

Dedicated-VM Plan

- Each dedicated VM plan instances is deployed to its own VM and is suitable for production workloads.
- The number of Dedicated-VM plan instances available to developers is set by the operator. Configurations of up to 100 Dedicated-VM plan instances have been tested.
- No ability to change the Redis configuration. The `CONFIG` command is disabled.
- Cannot scale down the number of VMs on the plan once deployed.
- Cannot scale down the size of VMs on the plan once deployed (this protects against data loss).
- The default maximum number of connections, maxclients, is set at 10000 but this number is adjusted by Redis according to the number of file handles available.

Shared-VM Plan

- The Shared-VM plan does not manage 'noisy neighbor' problems so it is not recommended for production apps.
- The number of Shared VM instances available to developers is set by the operator. The maximum number of shared VM instances is relative to the memory allocated to each Shared VM instance and the total memory of the Redis service broker. Please see Configuring Service Plans for more detail.
- It cannot be scaled beyond a single virtual machine.
- The following commands are disabled: `CONFIG` , `MONITOR` , `SAVE` , `BGSAVE` , `SHUTDOWN` , `BGREWRITEAOF` , `SLAVEOF` , `DEBUG` , and `SYNC` .
- Constraining CPU and/or disk usage is not supported.
- The default maximum number of connections, maxclients, is set at 10000 but this number is adjusted by Redis according to the number of file handles available.

Availability Using Multiple AZs

Redis for PCF 1.6 supports configuring multiple availability zones but this configuration does not provide high availability.

Downtime During Redeploys

Redeploying PCF Redis for configuration changes or upgrades will result in Redis being inaccessible to apps for a brief period of time.

Redis Key Count and Memory Size

Redis can handle up to 2^{32} keys, and was tested in practice to handle at least 250 million keys per instance. Every hash, list, set, and sorted set, can hold 2^{32} elements. VM memory is more likely to be a limiting factor than number of keys that can be handled.

Redis for PCF Security

Security

Pivotal recommends that Redis for PCF is run in its own network.

Redis for PCF works with the IPsec Add-on for PCF. For information about the IPsec Add-on for PCF, see Securing Data in Transit with the IPsec Add-on.

To allow this service to have network access you must create Application Security Groups. For more information, see Networks, Security, and Assigning AZs.

Best Practices for Operating Redis for PCF

This topic is for PCF operators. It introduces some best practices, but does not provide details about operation.

Best Practices

Pivotal recommends that operators do the following:

- Resource Allocation — Work with app developers to anticipate memory requirements and to configure VM sizes. Redis for PCF is configured by default with small VMs. For information about configuring VM sizes, see Configure Redis Service Plans.
- Logs — Configure a syslog output. Storing logs in an external service helps operators debug issues both current and historical.
- Monitoring — Set up a monitoring dashboard for metrics to track the health of the installation.
- Backing Up Data — When using Redis for persistence, configure automatic backups so that data can be restored in an emergency. Validate the backed-up data with a test restore.

About Creating Backups of Redis Instances

You can back up Redis for PCF instances in two way:

- Configure automatic backups to be run for each instance, across both service plans. For information about setting up automatic backups, see Configure Backups.
- Create manual backups of individual instances. For information about how to make manual backups of instances, see Manual Backup and Restore of Redis for PCF.

About Monitoring Redis for PCF

Redis Metrics

Redis for PCF emits Redis metrics via the firehose. Details here

Logging

Syslog can be forwarded to an external log service.

The following example shows syslog message:

```
Nov 15 17:05:01 10.0.24.10 audispd: [job=dedicated-node index=4]  node=7bfe8b1b-6c
fd-4d33-b704-c9214ce6bb3e type=USER_ACCT msg=audit(1479229501.290:86): pid=6655 ui
d=0 auid=4294967295 ses=4294967295 msg='op=PAM:accounting acct="root" exe="/usr/sbi
n/cron" hostname=? addr=? terminal=cron res=success'
```

For information about how to set up syslog output, see Configure Syslog Output.

Smoke Tests

Redis for PCF has smoke tests that are run as a post-install errand by Ops Manager. Information on what they do is here. They can be run by the operator via `bosh run errand smoke-tests`.

Installing and Upgrading Redis for PCF

Installation Steps

To add Redis for PCF to Ops Manager, follow the procedure for adding Pivotal Ops Manager tiles:

1. Download the product file from Pivotal Network.
2. Upload the product file to your Ops Manager installation.
3. Click **Add** next to the uploaded product description in the Available Products view to add this product to your staging area.
4. (Optional) Click the newly added tile to configure your possible service plans, syslog draining, and backups.
5. Click **Apply Changes** to install the service.

After installing, be sure to:

- Monitor the health and performance of your Redis instances by setting up logging and tracking metrics.
- Configure automatic backups.

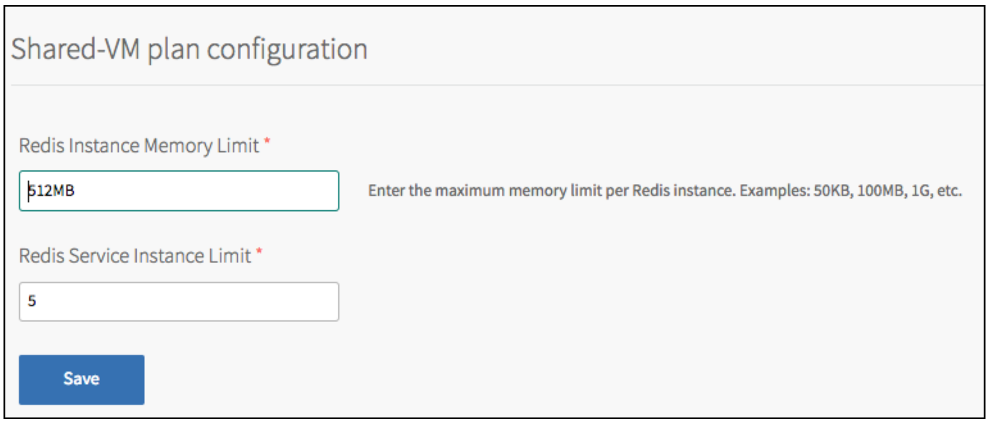
Configuring PCF Redis

Configure Redis Service Plans

Select the **Redis** tile from the Installation Dashboard to display the configuration page and allocate resources to Redis service plans.

Shared-VM Plan

1. Select the **Shared-VM Plan** tab.



Shared-VM plan configuration

Redis Instance Memory Limit *

512MB

Enter the maximum memory limit per Redis instance. Examples: 50KB, 100MB, 1G, etc.

Redis Service Instance Limit *

5

2. Configure these fields:
   - **Redis Instance Memory Limit**—Maximum memory used by a shared-VM instance
   - **Redis Service Instance Limit**—Maximum number of shared-VM instances

   Memory and instance limits depend on the total system memory of your Redis broker VM and require some additional calculation. For more information, see Memory Limits for Shared-VM Plans below.

3. Click **Save**.
4. If you do not want to use the on-demand service, you must make all of the on-demand service plans inactive. Click the tab for each on-demand plan, and select **Plan Inactive**. See the example in Step 4 of Removing On-Demand Service Plans above.

5. To change the allocation of resources for the Redis broker, click the **Resource Config** tab.

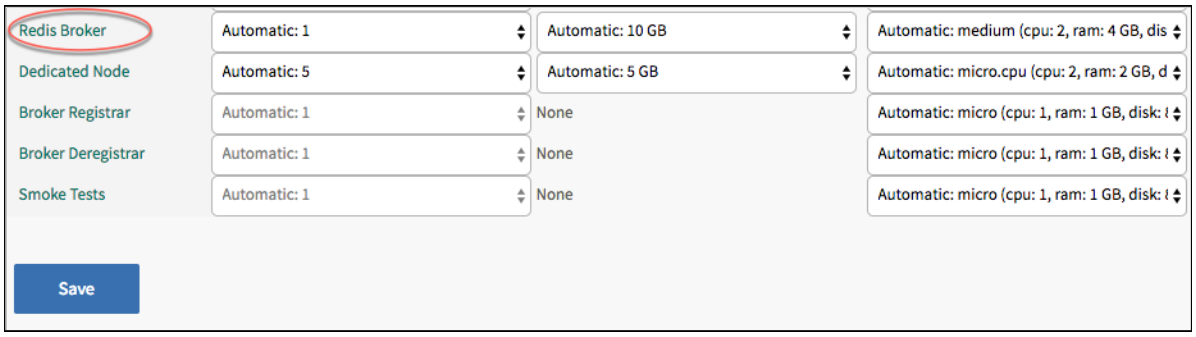
   The Redis broker server runs all of the Redis instances for your Shared-VM plan. From the **Resource Config** page, you can change the CPU, RAM, Ephemeral Disk, and Persistent Disk made available, as needed.

Memory Limits for Shared-VM Plans

Additional calculation is required to configure memory limits for shared-VM plans. With these plans, several service instances share the VM, and the Redis broker also runs on this same VM. Therefore, the memory used by all the shared-vm instances combined should be at most 45% of the memory of the Redis broker VM.

To configure the limits in these fields, estimate the maximum memory that could be used by all your Redis shared-VM instances combined. If that figure is higher than 45% of the Redis broker VM's total system memory, you can do one of the following:

- Decrease the **Redis Instance Memory Limit**.
- Decrease the number of instances in **Redis Service Instance Limit**.
- Increase the RAM for the Redis Broker in the **Resource Config** tab as shown below.



Redis Broker	Automatic: 1	Automatic: 10 GB	Automatic: medium (cpu: 2, ram: 4 GB, dis
Dedicated Node	Automatic: 5	Automatic: 5 GB	Automatic: micro.cpu (cpu: 2, ram: 2 GB, d
Broker Registrar	Automatic: 1	None	Automatic: micro (cpu: 1, ram: 1 GB, disk: ε
Broker Deregistrar	Automatic: 1	None	Automatic: micro (cpu: 1, ram: 1 GB, disk: ε
Smoke Tests	Automatic: 1	None	Automatic: micro (cpu: 1, ram: 1 GB, disk: ε

Here are some examples for setting these limits:

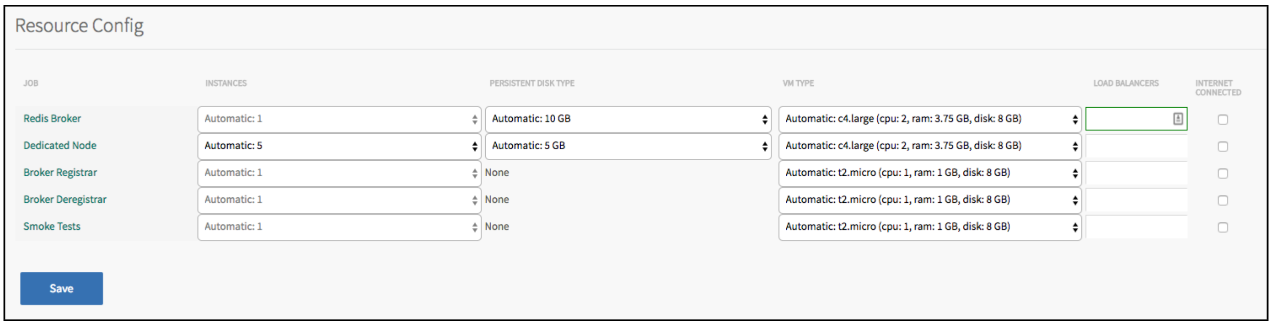
Redis Broker VM Total Memory	Redis Instance Memory Limit	Redis Service Instance Limit
16 GB	512 MB	14
16 GB	256 MB	28
64 GB	512 MB	56

Note: It is possible to configure a larger **Redis Service Instance Limit**, if you are confident that the majority of the deployed instances will not use a large amount of their allocated memory, for example in development or test environments.

However, this practice is not supported and can cause your server to run out of memory, preventing users from writing any more data to any Redis shared-VM instance.

Dedicated-VM Plan

1. Select the **Resource Config** tab to change the allocation of resources for the Dedicated Node.



Resource Config

JOB	INSTANCES	PERSISTENT DISK TYPE	VM TYPE	LOAD BALANCERS	INTERNET CONNECTED
Redis Broker	Automatic: 1	Automatic: 10 GB	Automatic: c4.large (cpu: 2, ram: 3.75 GB, disk: 8 GB)		☐
Dedicated Node	Automatic: 5	Automatic: 5 GB	Automatic: c4.large (cpu: 2, ram: 3.75 GB, disk: 8 GB)		☐
Broker Registrar	Automatic: 1	None	Automatic: t2.micro (cpu: 1, ram: 1 GB, disk: 8 GB)		☐
Broker Deregistrar	Automatic: 1	None	Automatic: t2.micro (cpu: 1, ram: 1 GB, disk: 8 GB)		☐
Smoke Tests	Automatic: 1	None	Automatic: t2.micro (cpu: 1, ram: 1 GB, disk: 8 GB)		☐

   - The default configuration creates five dedicated nodes (VMs). Each node can run one Redis dedicated-VM instance.
   - You can change the number of dedicated nodes, and configure the size of the persistent and ephemeral disks, and the CPU and RAM for each

node.
- The default VM size is small. It is important that you set the correct VM size to handle anticipated loads.
- With dedicated VM plans, there is one Redis service instance on each VM. The maximum memory an instance can use should be at most 45% of the total system RAM on the VM. You can set this with the `maxmemory` configuration. The app can use 100% of `maxmemory`, that is, up to 45% of the system RAM.
- Pivotal recommends the persistent disk be set to 3.5x the amount of system RAM.

2. After you have finished configuring resource allocations, click **Save**.

Configure Resources for Dedicated-VM and Shared-VM Plans

To configure resources for the Shared-VM and Dedicated-VM plans, click the **Resource Config** settings tab on the Redis for PCF tile.

- The Shared-VM plan is on the **Redis Broker** resource.
- The Dedicated-VM plan is on the **Dedicated Node** resource.

The following are the default resource and IP requirements for Redis for PCF when using the Shared-VM or Dedicated-VM plans:

Product	Resource	Instances	CPU	Ram	Ephemeral	Persistent	Static IP	Dynamic IP
Redis	Redis Broker	1	2	3072	4096	9216	1	0
Redis	Dedicated Node	5	2	1024	4096	4096	1	0
Redis	Broker Registrar	1	1	1024	2048	0	0	1
Redis	Broker De-Registrar	1	1	1024	2048	0	0	1
Redis	Compliation	2	2	1024	4096	0	0	1

Disable Shared and Dedicated VM Plans

You can disable Shared and Dedicated VM Plans by doing the following while configuring Redis tile:

1. Ensure at least one On-Demand plan is active.

2. Configure the following tabs:

   - **Shared-VM Plan**:
     a. Set **Redis Service Instance Limit** to 0.
     b. Click **Save**.

   - **Errands**:
     a. Set **Broker Registrar** to Off.
     b. Set **Smoke Tests** to Off.
     c. Set **Broker Deregistrar** to Off.
     d. Leave all four On-Demand errands On.
     e. Click **Save**.

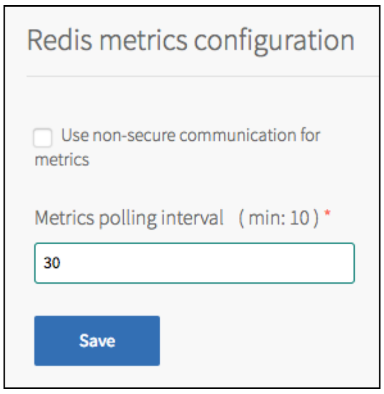
   - **Resource Config**:
     a. Decrease **Redis Broker** Persistent disk type to the smallest size available.
     b. Decrease **Redis Broker** VM type to the smallest size available.
     c. Set **Dedicated Node** Instances to 0.
     d. Click **Save**.

Configuring Secure Communication

Redis for PCF v1.7.2 lets the operator turn on/off TLS communications for metrics, via a `Use non-secure communication for metrics` checkbox on the metrics configuration page in Ops Manager. Configure this checkbox for different versions of PCF as follows:

- **PCF v1.8**: Select this checkbox to send metrics to the Firehose.
- **PCF v1.9**: Clear this checkbox to send metrics to the Firehose securely, or select it to send metrics insecurely.

- **PCF v1.10 and later**: Clear this checkbox to send metrics to the Firehose and avoid errors.

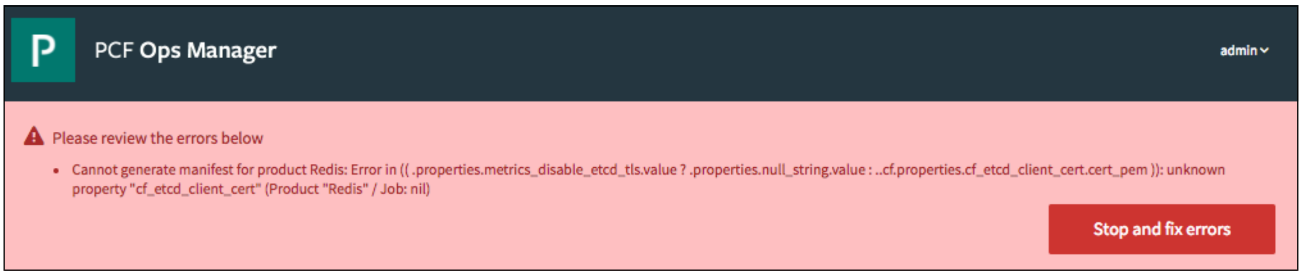

Redis metrics configuration

☐ Use non-secure communication for metrics

Metrics polling interval (min: 10) *

30

Setting this checkbox incorrectly can cause a `Cannot generate manifest... unknown property "cf_etcd_client_cert"` error:



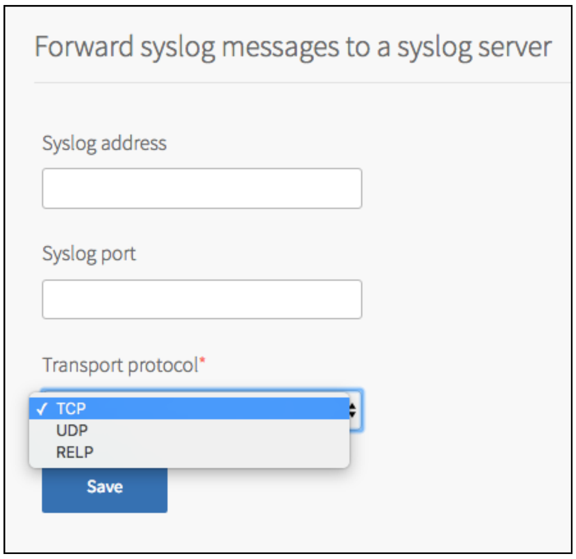
Please review the errors below

- Cannot generate manifest for product Redis: Error in ((.properties.metrics_disable_etcd_tls.value ? .properties.null_string.value : ..cf.properties.cf_etcd_client_cert.cert_pem)): unknown property "cf_etcd_client_cert" (Product "Redis" / Job: nil)

Configure Syslog Output

Pivotal recommends that operators configure a syslog output.

1. Add the Syslog address, Syslog port and transport protocol of your log management tool.
   The information required for these fields is provided by your log management tool.


Forward syslog messages to a syslog server

Syslog address

Syslog port

Transport protocol*

✓ TCP
UDP
RELP

2. Click **Save**.

Creating Backups of Redis Instances

You can configure backups to be run for all instances, across both service plans.

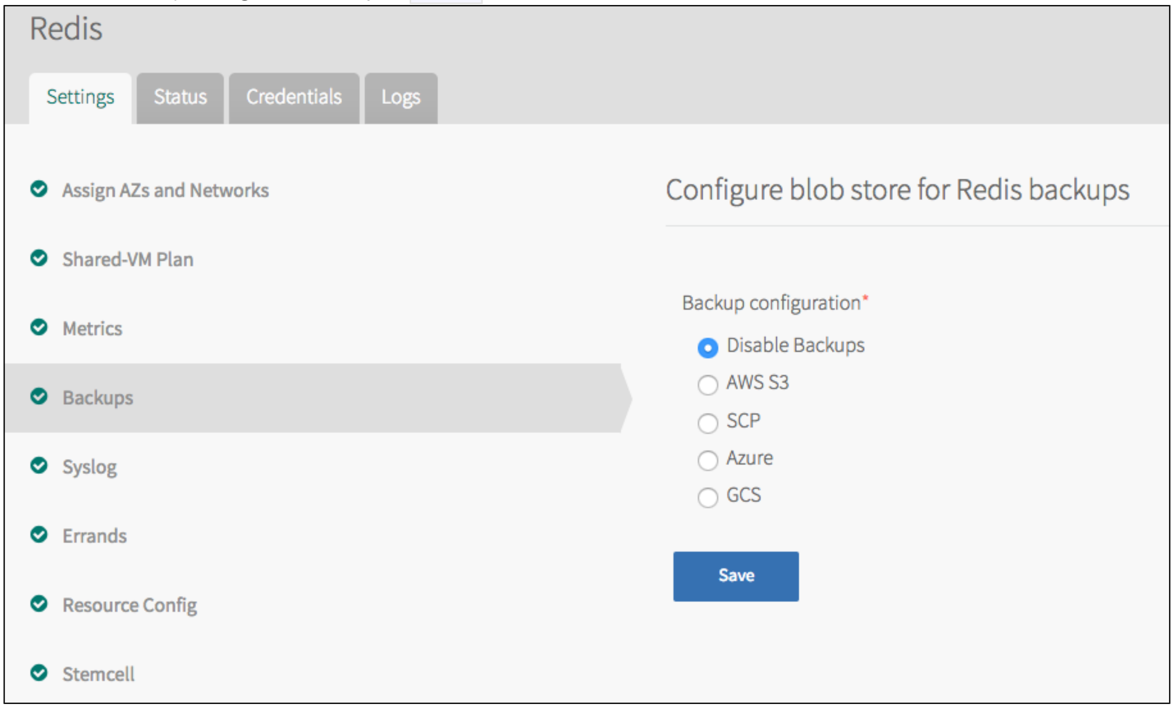
The key features are:

- Runs on a configurable schedule
- Every instance is backed up, across both service plans
- The Redis broker statefile is backed up
- For each backup artefact, a file is created that contains the MD5 checksum for that artifact. This can be used to validate that the artefact is not corrupted.
- You can configure AWS S3, SCP, Azure or Google Cloud Storage as your destination
- Data from Redis is flushed to disk, before the backup is started by running a `BGSAVE` on each instance
- Backups are labelled with timestamp, instance GUID and plan name

Configuration

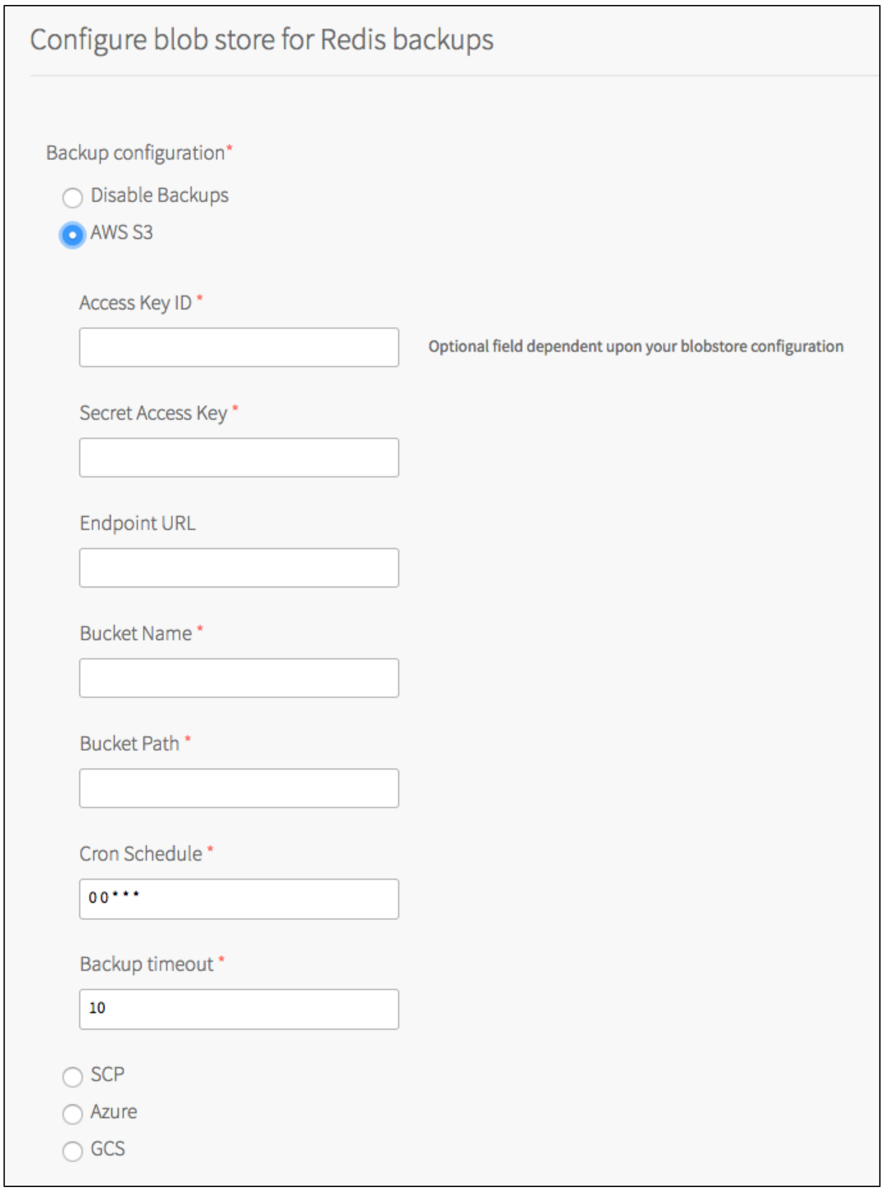
To enable backups, you will first need to choose your backup destination type - AWS S3, SCP, Azure or Google Cloud Storage.

Click on the tile in OpsManager, followed by the `Backups` link on the left hand menu.



Backup configuration*
[✓ Disable Backups] AWS S3 SCP Azure GCS

S3 backup fields



Configure blob store for Redis backups

Backup configuration*

Disable Backups

[✓ AWS S3]

Access Key ID *

Optional field dependent upon your blobstore configuration

Secret Access Key *

Endpoint URL

Bucket Name *

Bucket Path *

Cron Schedule *

0 0 * * *

Backup timeout *

10

SCP

Azure

GCS

Field	Description	Mandatory/Optional
Access Key ID	The access key for your S3 account	Mandatory
Secret Access Key	The Secret Key associated with your Access Key	Mandatory
Endpoint URL	The endpoint of your S3 account, e.g. `http://s3.amazonaws.com`	Optional, defaults to `http://s3.amazonaws.com` if not specified
Bucket Name	Name of the bucket you wish the files to be stored in.	Mandatory
Path	Path inside the bucket to save backups to.	Mandatory
Backup timeout	The amount of time, in seconds, that the backup process will wait for the BGSAVE command to complete on your instance, before transferring the RDB file to your configured destination	Mandatory
Cron Schedule	Backups schedule in crontab format. For example, once daily at 2am is `* 2 * * *`. Also accepts a pre-defined schedule: any of `@yearly`, `@monthly`, `@weekly`, `@daily`, `@hourly`, or `@every <time>`, where `<time>` is any supported time string (e.g. `1h30m`). For more information, see the cron package documentation.	Mandatory

AWS IAM Policy

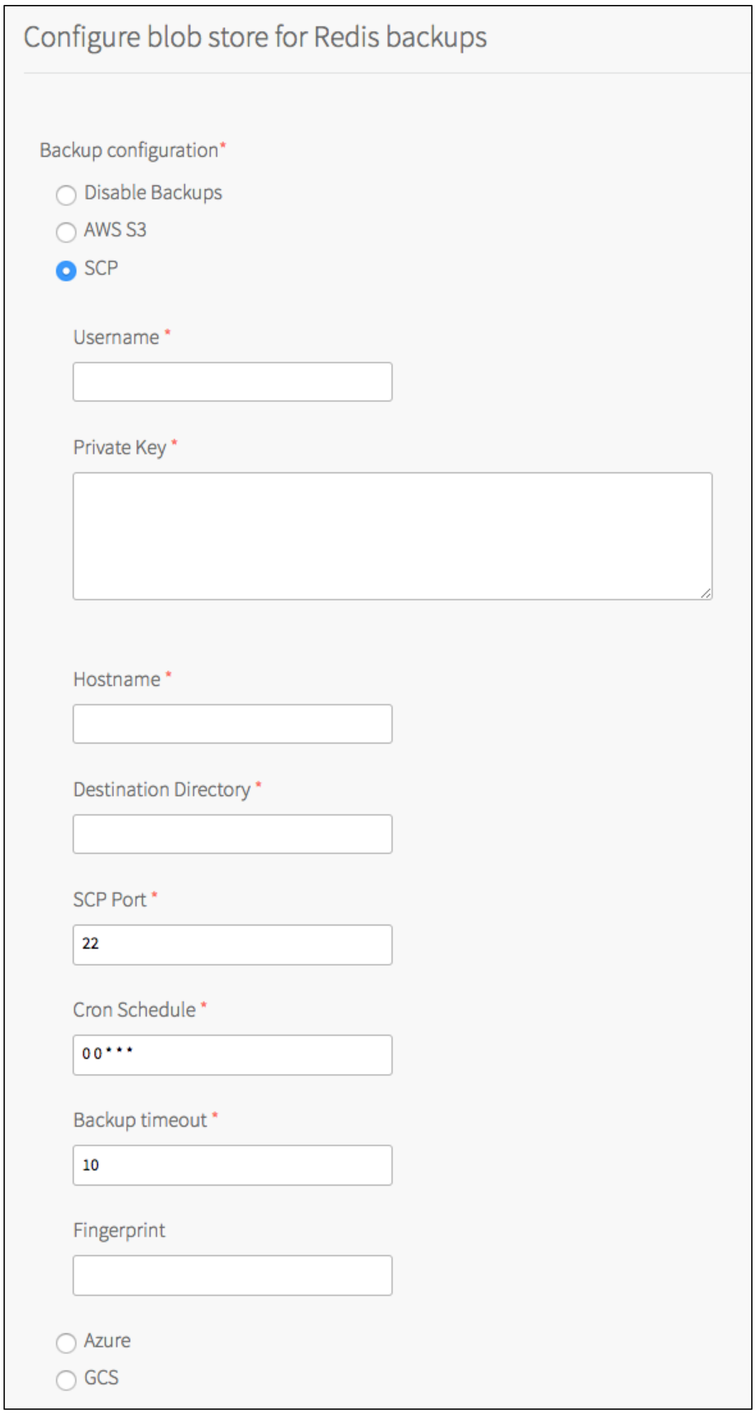
An AWS IAM policy describes the permissions related to your bucket. The minimum set of policies required in order to upload the backup files are:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "s3:ListBucket",
        "s3:ListBucketMultipartUploads",
        "s3:ListMultipartUploadParts",
        "s3:PutObject"
      ],
      "Resource": [
        "arn:aws:s3:::<bucket-name>",
        "arn:aws:s3:::<bucket-name>/*"
      ]
    }
  ]
}
```

Notes:

- Make sure to replace `<bucket-name>` with your correct values.
- `s3:CreateBucket` is only required if the S3 bucket does not exist.
- The additional `s3:CreateBucket` action is also required if the S3 bucket does not exist.

SCP backup fields



Configure blob store for Redis backups

Backup configuration*

- ( ) Disable Backups
- ( ) AWS S3
- [✓ SCP]

Username *

Private Key *

Hostname *

Destination Directory *

SCP Port *
22

Cron Schedule *
0 0 * * *

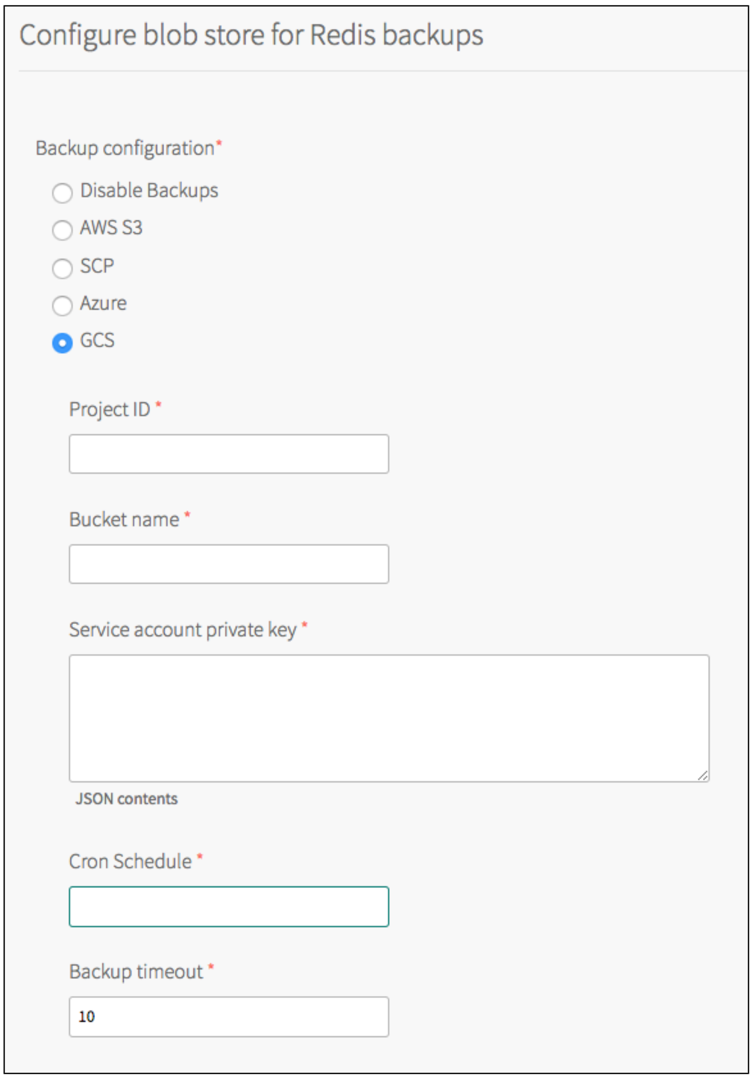
Backup timeout *
10

Fingerprint

- ( ) Azure
- ( ) GCS

Field	Description	Mandatory/Optional
Username	The username to use for transferring backups to the scp server	Mandatory
Private Key	The private ssh key of the user configured in `Username`	Mandatory
Hostname	The hostname or IP address of the SCP server	Mandatory
Destination Directory	The path in the scp server, where the backups will be transferred	Mandatory
SCP Port	The scp port of the scp server	Mandatory
Cron Schedule	Backups schedule in crontab format. Refer to table for S3 backups for details	Mandatory
Backup timeout	The amount of time, in seconds, that the backup process will wait for the BGSAVE command to complete on your instance, before transferring the RDB file to the scp server	Mandatory

GCS backup fields


Configure blob store for Redis backups

Backup configuration*

Disable Backups

AWS S3

SCP

Azure

[✓ GCS]

Project ID *

Bucket name *

Service account private key *

JSON contents

Cron Schedule *

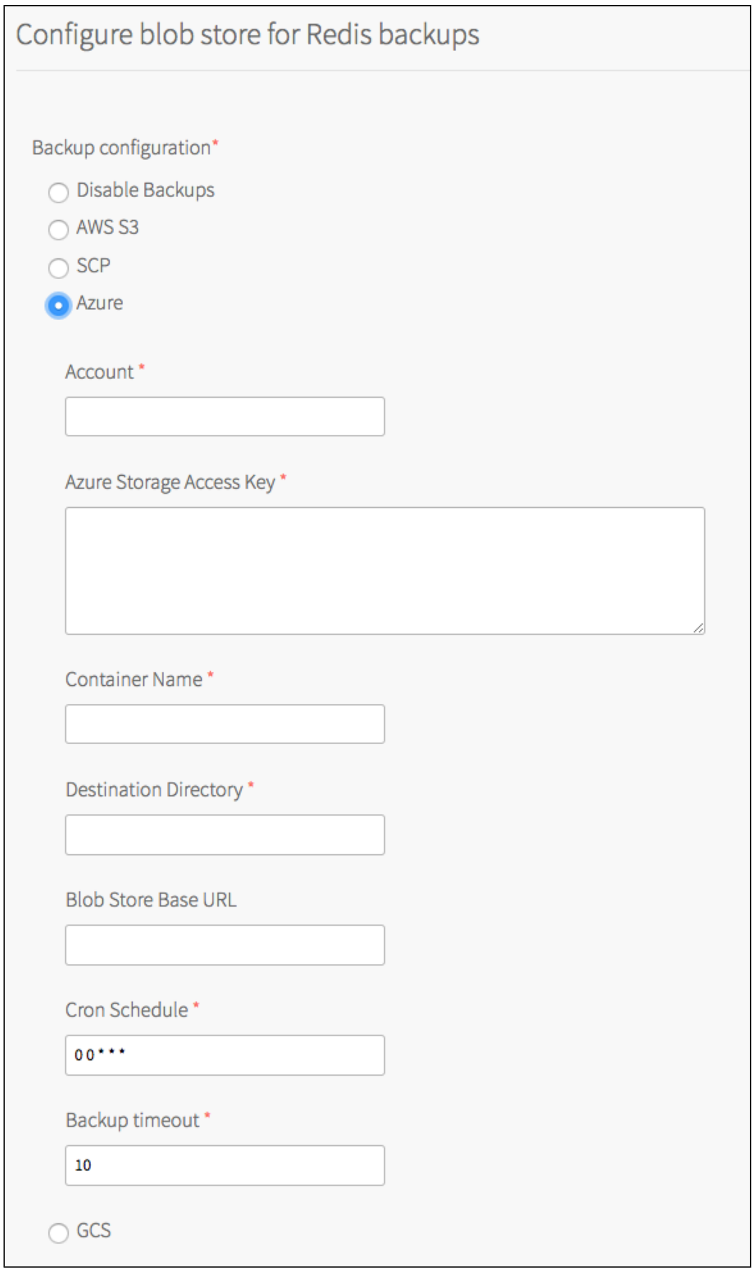
Backup timeout *

10

PCF Redis uses service account credentials to upload backups to Google Cloud Storage. The service account should have `Storage Admin` permissions. Please refer to the documentation for details on how to set up a GCP service account.

Field	Description	Mandatory/Optional
Project ID	GCP Project ID	Mandatory
Bucket name	Name of the bucket you wish the files to be stored in.	Mandatory
Service account private key	The JSON Secret Key associated with your Service Account. See documentation for details on how to set up service account keys.	Mandatory
Cron Schedule	Backups schedule in crontab format. For example, once daily at 2am is * 2 * * *. Also accepts a pre-defined schedule: any of @yearly, @monthly, @weekly, @daily, @hourly, or @every , where is any supported time string (e.g. 1h30m). For more information, see the cron package documentation.	Mandatory
Backup timeout	The amount of time, in seconds, that the backup process will wait for the BGSAVE command to complete on your instance, before transferring the RDB file to your configured destination	Mandatory

Azure backup fields


Configure blob store for Redis backups

Backup configuration*

- ( ) Disable Backups
- ( ) AWS S3
- ( ) SCP
- [✓ Azure]

Account *

Azure Storage Access Key *

Container Name *

Destination Directory *

Blob Store Base URL

Cron Schedule *

`0 0 * * *`

Backup timeout *

`10`

- ( ) GCS

Field	Description	Mandatory/Optional
Account	Account name	Mandatory
Azure Storage Access Key	Azure specific credentials required to write to the Azure container	Mandatory
Container name	Name of the Azure container which will store backup files.	Mandatory
Destination Directory	Directory where the backup files will be stored within the Azure container.	Mandatory
Blob Store Base URL	URL pointing to Azure resource	Optional
Cron Schedule	Backups schedule in crontab format. For example, once daily at 2am is * 2 * * *. Also accepts a pre-defined schedule: any of @yearly, @monthly, @weekly, @daily, @hourly, or @every , where is any supported time string (e.g. 1h30m). For more information, see the cron package documentation.	Mandatory
Backup timeout	The amount of time, in seconds, that the backup process will wait for the BGSAVE command to complete on your instance, before transferring the RDB file to your configured destination	Mandatory

For each backup destination, the field `Backup timeout` causes backups to fail after a configured timeout. Redis' BGSAVE will continue, but backups will not be uploaded to destinatons if this timeout is reached.

Networks, Security, and Assigning AZs

Network Configuration

The following ports and ranges are used in this service:

Port	Protocol	Direction and Network	Reason
8300 8301	tcp tcp and udp	Inbound to CloudFoundry network, outbound from service broker and service instance networks*	Communication between the CF consul_server and consul_agents on Redis deployment; used for metrics
4001	tcp	Inbound to CloudFoundry network, outbound from service broker and service instance networks*	Used by the Redis metron_agent to forward metrics to the CloudFoundry etcd server
80	tcp	Outbound from CloudFoundry to the cf-redis-broker service broker network	(Only if using a cf-redis-broker) Access to the cf-redis-broker from the cloud controllers.
6379	tcp	Outbound from CloudFoundry to any service instance networks	Access to all nodes from the Diego Cell and Diego Brain network(s)
32768-61000	tcp	Outbound from CloudFoundry to the cf-redis-broker service broker network	From the Diego Cell and Diego Brain network(s) to the service broker VM. This is only required for the shared service plan.
80 or 443 (Typically)	http or https respectively	Outbound from any service instance networks	Access to the backup blobstore

* Typically the service broker network and service instance network(s) are the same.

Application Security Groups

To allow this service to have network access you must create Application Security Groups (ASGs). Ensure your security group allows access to the Redis Service Broker VM and Dedicated VMs configured in your deployment. You can obtain the IP addresses for these VMs in Ops Manager under the **Resource Config** section for the Redis tile.

Note: Without ASGs, this service is unusable.

Application Container Network Connections

Application containers that use instances of the Redis service require the following outbound network connections:

Destination	Ports	Protocol	Reason
`ASSIGNED_NETWORK`	32768-61000	tcp	Enable application to access shared vm service instance
`ASSIGNED_NETWORK`	6379	tcp	Enable application to access dedicated vm service instance

Create an ASG called `redis-app-containers` with the above configuration and bind it to the appropriate space or, to give all started apps access, bind to the `default-running` ASG set and restart your apps. Example:

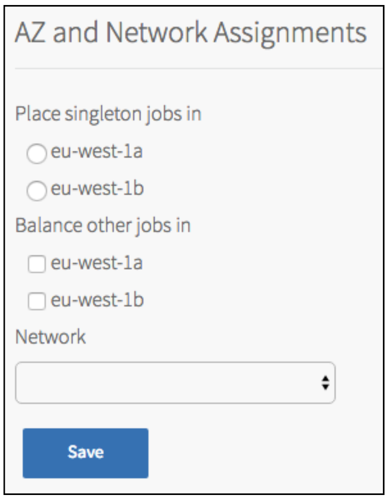
```
[
  {
   "protocol": "tcp",
   "destination": "ASSIGNED_NETWORK",
   "ports": "6379"
  }
]
```

Assigning AZs

Assigning multiple AZs to Redis jobs will not guarantee high availability.

All of your Shared-VM instances will run on a single node in just one of the configured availability zones and are therefore not highly availabile.

Each Dedicated-VM instance could be assigned to any of the configured availability zones, however each instance still operates as a single node with no clustering. This separation over availability zones provides no high availability.


AZ and Network Assignments

Place singleton jobs in

- ○ eu-west-1a
- ○ eu-west-1b

Balance other jobs in

- ☐ eu-west-1a
- ☐ eu-west-1b

Network

Validating Installation

Smoke tests

Smoke tests are run as part of Redis for PCF installation to validate that the install succeeded. Smoke tests are described here.

Upgrading Redis for PCF

This product enables a reliable upgrade experience between versions of the product that is deployed through Ops Manager.

The upgrade paths are detailed here for each released version.

To upgrade the product:

- The Operator should download the latest version of the product from Pivotal Network
- Upload the new .pivotal file to Ops Manager
- Upload the stemcell associated with the update (*if required*)
- Update any new mandatory configuration parameters (*if required*)
- Press “Apply changes” and the rest of the process is automated

During the upgrade deployment each Redis instance will experience a small period of downtime as each Redis instance is updated with the new software components. This downtime is because the Redis instances are single VMs operating in a non HA setup. The length of the downtime depends on whether there is a stemcell update to replace the operating system image or whether the existing VM can simply have the redis software updated. Stemcells updates incur additional downtime while the IaaS creates the new VM while updates without a stemcell update are faster.

Ops Manager ensures the instances are updated with the new packages and any configuration changes are applied automatically.

Upgrading to a newer version of the product does not cause any loss of data or configuration. This is explicitly tested for during our build and test process for a new release of the product.

Release policy

When a new version of Redis is released we aim to release a new version of the product containing this soon after.

Where there is a new version of Redis or another dependent software component such as the stemcell released due to a critical CVE, Pivotal’s goal is to release a new version of the product within 48 hours.

Uninstalling Redis for PCF

To uninstall Redis for PCF, click on the trashcan icon in the lower right hand corner of the PCF Redis tile in the PCF Ops Manager Installation dashboard. Confirm deletion of the product and click apply changes.

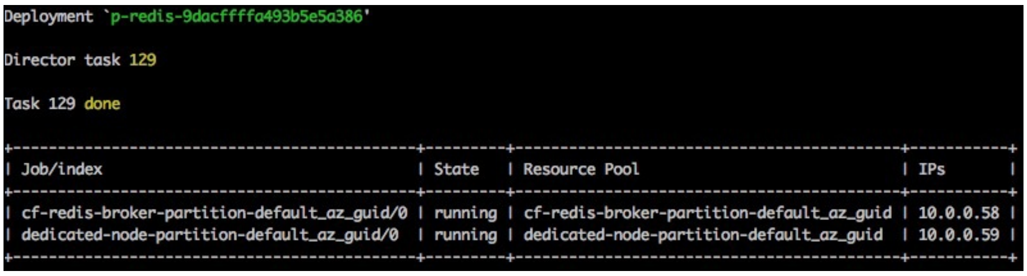
Manual Backup and Restore of Redis for PCF

Triggering a Manual Backup

Backups of your Redis deployment will automatically occur per the Cron Schedule you set in your deployment. You can trigger manual backups at any time by following the steps below. The backup artifacts will be sent to the destination configured in Ops Manager for automatic backups.

- Follow these steps to log into your Ops Manager installation and target the Redis tile deployment.
- Identify the VM which holds your instance by running `bosh vms`.
    - For the `shared-vm` plan this will be the job name containing `cf-redis-broker`. Running `manual-backup` will back up all of the shared-vm instances and the broker state in the `statefile.json` file.
    - For the `dedicated-vm` plan this will be the job name containing `dedicated-node`. Running `manual-backup` will back up the Redis dump.rdb file for that dedicated-vm instance.
    - You can identify the exact node for your `dedicated-vm` service instance by comparing the IP Address from your application bindings.

An example output from `bosh vms`:



```
Deployment `p-redis-9dacffffa493b5e5a386'

Director task 129

Task 129 done

+-----------------------------------------+---------+----------------------------------------------+------------+
| Job/index                               | State   | Resource Pool                                | IPs        |
+-----------------------------------------+---------+----------------------------------------------+------------+
| cf-redis-broker-partition-default_az_guid/0 | running | cf-redis-broker-partition-default_az_guid | 10.0.0.58 |
| dedicated-node-partition-default_az_guid/0  | running | dedicated-node-partition-default_az_guid  | 10.0.0.59 |
+-----------------------------------------+---------+----------------------------------------------+------------+
```

- Target the manifest of your deployed Redis with `bosh deployment PATH-TO-MANIFEST.yml`. If you do not have this file, you can download it by running `bosh download manifest DEPLOYMENT-NAME`.
- `bosh ssh` into the node you wish to back up (or the `cf-redis-broker` node in a `shared-vm` plan).

Once you have connected to the node, a manual backup can be triggered with these steps:

1. Switch to root using `sudo -i`.
2. Run `/var/vcap/jobs/service-backup/bin/manual-backup`

Notes

Triggering a manual backup of a large dump.rdb could take sufficiently long that your SSH connection will timeout. Ensure that you have given yourself enough of a timeout to complete the backup.

Making Your Own Backups

It is possible to create a back up of a Redis instance by hand, bypassing the automated backup tool altogether.

Persistence is enabled on these plans through the use of `RDB` files, using the following Redis config rules:

```
save 900 1
save 300 10
save 60 10000
```

Shared-VM Plan

You can either take the latest RDB file held on disk, which is generated by the above the rules, or trigger a recent update by using the `redis-cli` to trigger a `BGSAVE`. Credentials to log into the `redis-cli` can be obtained from `VCAP_SERVICES` for your bound application.

The `redis-cli` is located in `/var/vcap/packages/redis/bin/redis-cli`.

On this plan, the `BGSAVE` command is aliased to a random string. This can be obtained from Ops Manager in the credentials tab.

Steps to Backup

1. `bosh ssh` into your desired node. See the above section on identifying the correct VM.
2. Change to root using `sudo -i`.
3. Copy the contents of the `/var/vcap/store/cf-redis-broker` directory to a .zip or .tar file.
4. Backup the folder / compressed file to your chosen location.

The `/var/vcap/store/cf-redis-broker` has sub-directories for each instance created of this plan. The backup file for each instance is called `dump.rdb`.

For example, here are two instances:

```
root@66358f3e-3428-46df-9bb3-9acc7770b188:/var/vcap/store/cf-redis-broker# find -type f | xargs ls -1
./redis-data/3124f373-e9e2-44e1-ad12-a8865d8978b0/db/dump.rdb
./redis-data/3124f373-e9e2-44e1-ad12-a8865d8978b0/redis.conf
./redis-data/3124f373-e9e2-44e1-ad12-a8865d8978b0/redis-server.pid
./redis-data/62333bf9-f023-4566-b233-6686f26b8f4d/db/dump.rdb
./redis-data/62333bf9-f023-4566-b233-6686f26b8f4d/redis.conf
./redis-data/62333bf9-f023-4566-b233-6686f26b8f4d/redis-server.pid
./statefile.json
```

Dedicated-VM Plan

You can either take the latest RDB file on disk, as generated by the above rules, or trigger a more recent RDB file by executing the `BGSAVE` command using the `redis-cli`. Credentials can be obtained from the `VCAP_SERVICES` from your bound application. The `redis-cli` can be found in `/var/vcap/packages/redis/bin/redis-cli`.

Steps to Backup

- `bosh ssh` into your desired node. See the above section on identifying the correct VM.
- Change to root using `sudo -i`.
- Copy the contents of the `/var/vcap/store/redis` directory to a .zip or .tar file.
- Backup the folder / compressed file to your chosen location.

The backup file will be named `dump.rdb`.

Restore Redis Instance from a Backup

To a Local System

You can choose to restore the RDB file to a local Redis instance.

The steps to do this depend on your configuration and setup. Refer to the Redis documentation for more details.

To Pivotal Cloud Foundry

You can also restore your backup file to another instance of the `Redis for PCF` tile.

Prerequisites

- Same resource configuration as the instance from which you backed up.
- Ensure that the persistent disk is large enought to accommodate the temporary files used during the restore process. It should be **3.5x the amount of RAM in the VM**.

To restore your backup file to another instance of a `Redis for PCF` tile service instance:

1. Create a new instance of the plan that you wish to restore to.
2. Identify the VM which the instance of your plan is located on by following the steps from the `Manual Backups` section above. If you are restoring an instance of `shared-vm`, this VM is the broker VM.
3. `bosh ssh` into the identified VM. This is the broker VM if restoring a `shared-vm` instance.

`Redis for PCF` version 1.7 and later provides a script to automatically restore data in a newly provisioned Redis instance.

Preparation

1. Transfer your backup RDB file to a local path on the VM (`PATH-TO-RDB-BACKUP-ON-VM` has to be under `/var/vcap/store`.
2. To verify that the RDB file hasn't been corrupted, run `md5sum PATH-TO-RDB-BACKUP-ON-VM` and compare it against the contents of the `.md5` file named after the backup file. The values should be the same. The `.md5` file is located in the same bucket as the original backup file.
3. Switch to root user `sudo su`

Dedicated-VM Plan

The restore script will restore the data for the specified dedicated-vm instance.

Execution

1. Run `/var/vcap/jobs/redis-backups/bin/restore --sourceRDB PATH-TO-RDB-BACKUP-ON-VM`.
2. Tail the script logs at `/var/vcap/sys/log/redis-backups/redis-backups.log` to see progress. When the data restore has been successfully completed, you will see the message `Redis data restore completed successfully`.

Debugging

The data restore script runs the steps listed below. It logs its process along the way and provides helpful messages in case of failure.

The script logs at `/var/vcap/sys/log/redis-backups/redis-backups.log`.
If a step has failed, resolve the reason that caused it to fail and execute the failed step and every next step manually. You can retrieve `{instance_password}` through the binding to your service instance: `cf service-key {instance_name} {key_name}`

1. **`StopAll`**
   Run `monit stop all`
2. **`WaitForStop`**
   Wait for monit services to enter the `not monitored` state, you can watch this with `watch monit summary`
3. **`DeleteExistingPersistenceFiles`**
   Clean up existing Redis data files:
   - `rm -f /var/vcap/store/redis/appendonly.aof`
   - `rm -f /var/vcap/store/redis/dump.rdb`
4. **`CopyBackupFileWithCorrectPermissions`**
   Restore your Redis backup file to `/var/vcap/store/redis/dump.rdb` and correct the owner and permissions with `chown vcap:vcap /var/vcap/store/redis/dump.rdb && chmod 660 /var/vcap/store/redis/dump.rdb`
5. **`SetAppendOnly`**
   `Edit the template Redis config file with` vim $(find /var/vcap/data/jobs/ -name redis.conf)` and make the following line changes:

   - `appendonly yes` -> `appendonly no`

6. **`StartAll`**
   Run `monit start all`

7. **`WaitForStart`**
   Wait for monit services to enter the `running` state, you can watch this with `watch monit summary`

8. **`RewriteAOF`**
   Run `/var/vcap/packages/redis/bin/redis-cli -a {instance_password} BGREWRITEAOF`

9. **`RewriteAOF`**
   Run `watch "/var/vcap/packages/redis/bin/redis-cli -a {instance_password} INFO | grep aof_rewrite_in_progress"` until `aof_rewrite_in_progress` is `0`

10. **`StopAll`**
    Run `monit stop all`

11. **`WaitForStop`**
    Wait for monit services to enter the `not monitored` state, you can watch this with `watch monit summary`

12. **`ChownToUserAndGroup`**
    Set correct owner on `appendonly.aof` by running `chown vcap:vcap /var/vcap/store/redis/appendonly.aof`

13. **`SetAppendOnly`**
    Edit the template Redis config file with `vim $(find /var/vcap/data/jobs/ -name redis.conf)` and make the following line changes:
    - `appendonly no` -> `appendonly yes`

14. **`StartAll`**
    Run `monit start all`

Shared-VM Plan

The restore script will restore the data for the specified shared-vm instance.

Execution

1. Retrieve `{instance_guid}` by running: `cf service {instance_name} --guid`

2. Run `/var/vcap/jobs/redis-backups/bin/restore --sourceRDB {path-to-rdb-backup-on-vm} --sharedVmGuid {instance_guid}`.

3. Tail the script logs at `/var/vcap/sys/log/redis-backups/redis-backups.log` to see progress. When the data restore has been successfully completed, you will see the message `Redis data restore completed successfully`.

Debugging

The data restore script runs the steps listed below. It logs its process along the way and provides helpful messages in case of failure.

The script logs at `/var/vcap/sys/log/redis-backups/redis-backups.log`.
If a step has failed, resolve the reason that caused it to fail and execute the failed step and every next step manually. You can retrieve `{instance_password}` and `{port}` through the binding to your service instance: `cf service-key {instance_name} {key_name}`

1. **`StopAll`**
   Run `monit stop all`

2. **`WaitForStop`**
   Wait for monit services to enter the `not monitored` state, you can watch this with `watch monit summary`

3. **`SetConfigCommand`**
   Edit the template Redis config file with `vim /var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/redis.conf` and comment out

the line:
- `rename-command CONFIG "configalias"` -> `#rename-command CONFIG "configalias"`

4. `SetRewriteCommand`
   Edit the template Redis config file with `vim /var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/redis.conf` and comment out the line:
   - `rename-command BGREWRITEAOF ""` -> `#rename-command BGREWRITEAOF ""`

5. `DeleteExistingPersistenceFiles`
   Clean up existing Redis data files if they exist:
   - `rm -f /var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/db/appendonly.aof`
   - `rm -f /var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/db/dump.rdb`

6. `CopyBackupFileWithCorrectPermissions`
   Restore your Redis backup file to `/var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/db/dump.rdb` and correct the owner and permissions with
   ```
   chown vcap:vcap /var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/db/dump.rdb && chmod 660 /var/vcap/store/cf-
   redis-broker/redis-data/{instance_guid}/db/dump.rdb
   ```

7. `SetAppendOnly`
   Edit the template Redis config file with `vim /var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/redis.conf` and make the following line changes:
   - `appendonly yes` -> `appendonly no`

8. `StartAll`
   Run `monit start all`

9. `WaitForStart`
   Wait for monit services to enter the `running` state, you can watch this with `watch monit summary`

10. `RewriteAOF`
    Run `/var/vcap/packages/redis/bin/redis-cli -a {instance_password} BGREWRITEAOF`

11. `RewriteAOF`
    Run `watch "/var/vcap/packages/redis/bin/redis-cli -a {instance_password} INFO | grep aof_rewrite_in_progress"` until `aof_rewrite_in_progress` is `0`

12. `StopAll`
    Run `monit stop all`

13. `WaitForStop`
    Wait for monit services to enter the `not monitored` state, you can watch this with `watch monit summary`

14. `ChownToUserAndGroup`
    Set correct owner on `appendonly.aof` by running `chown vcap:vcap /var/vcap/store/redis/appendonly.aof`

15. `SetAppendOnly`
    Edit the template Redis config file with `vim /var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/redis.conf` and make the following line changes:
    - `appendonly no` -> `appendonly yes`

16. `SetConfigCommand`
    Edit the template Redis config file with `vim /var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/redis.conf` and uncomment the line: `#rename-command CONFIG "configalias"` -> `rename-command CONFIG "configalias"`

17. `SetRewriteCommand`
    Edit the template Redis config file with `vim /var/vcap/store/cf-redis-broker/redis-data/{instance_guid}/redis.conf` and uncomment the line: `#rename-command BGREWRITEAOF ""` -> `rename-command BGREWRITEAOF ""`

18. `StartAll`
    Run `monit start all`

Recovering Redis Instances

In the event of a recovery of Cloud Foundry, it is possible to recover bound Redis instances to healthy states that are in sync with Cloud Foundry. There are a few caveats to being able to recover previous instance state fully that depend on your plan.

Shared-VM Plan Caveats

- You need a backed up RDB Redis dump file - this would be stored in your S3 buckets if you have backups configured
- You need a backed up `/var/vcap/store/cf-redis-broker/redis-data` directory from the service broker node (you do not need to backup and `*.aof` or `*.rdb` files from subdirectories if you have backups configured)

Dedicated-VM Plan Caveats

- You need a backed up RDB Redis dump file - this would be stored in your S3 buckets if you have backups configured
- You need a backed up `/var/vcap/store/redis/statefile.json` from the service broker node

Note

This procedure assumes that a recovery of service information and service keys assigned to instances are restored with a restore of Cloud Foundry.

Recovery Procedure

After redeploying Redis, take the following steps.

Shared-VM Plan

1. `bosh ssh` into the service broker node of your Redis deployment
2. Run `monit stop all && pkill redis-server`
3. Wait for monit services to enter the `not monitored` state, you can watch this with `watch monit summary`
4. Confirm no running instances of `redis-server` with `ps aux | grep redis-server`
5. Copy the backed up `redis-data` directory into `/var/vcap/store/cf-redis-broker`
6. Follow the instructions here for your plan, skipping the first four steps described here, for restoring your backed up Redis data
7. Your Redis instance is now recovered

Dedicated-VM Plan

1. `bosh ssh` into the service broker node of your Redis deployment
2. Run `monit stop all`
3. Wait for monit services to enter the `not monitored` state, you can watch this with `watch monit summary`
4. Copy the backed up `/var/vcap/store/cf-redis-broker/statefile.json` and ensure ownership and permissions are correct with `chown vcap:vcap /var/vcap/store/redis/dump.rdb && chmod 660 /var/vcap/store/redis/dump.rdb`
5. Follow the instructions here for your plan, skipping the first three steps described here, for restoring your backed up Redis data
6. Your Redis instance is now recovered

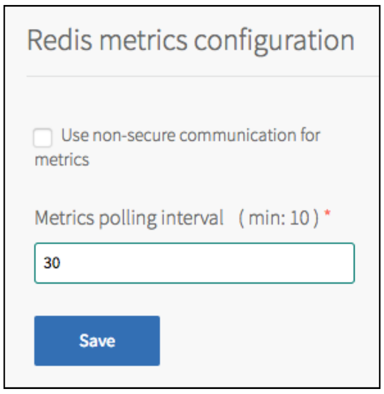
Monitoring Redis for PCF

The PCF Firehose emits Redis metrics.

Configuring Secure Communication

Redis for PCF v1.7.2 lets the operator turn on/off TLS communications for metrics, via a `Use non-secure communication for metrics` checkbox on the metrics configuration page in Ops Manager. Configure this checkbox for different versions of PCF as follows:

- **PCF v1.8**: Select this checkbox to send metrics to the Firehose.
- **PCF v1.9**: Clear this checkbox to send metrics to the Firehose securely, or select it to send metrics insecurely.
- **PCF v1.10 and later**: Clear this checkbox to send metrics to the Firehose and avoid errors.



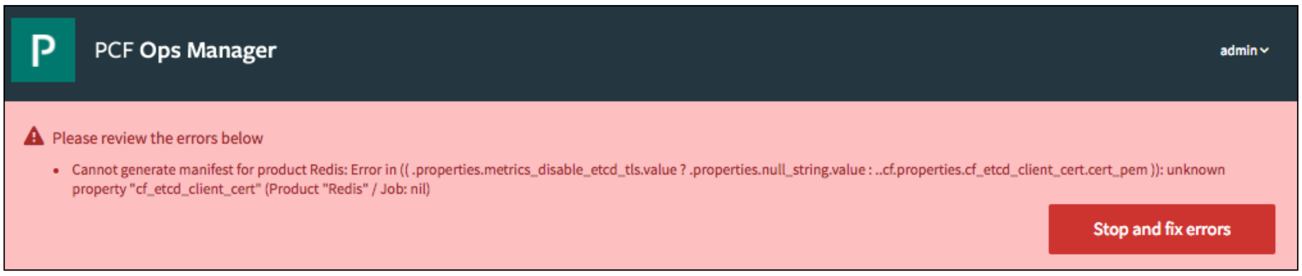
Redis metrics configuration

☐ Use non-secure communication for metrics

Metrics polling interval (min: 10) *

30

Setting this checkbox incorrectly can cause a `Cannot generate manifest... unknown property "cf_etcd_client_cert"` error:

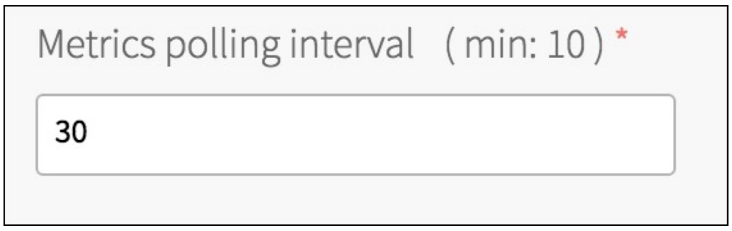


Please review the errors below

- Cannot generate manifest for product Redis: Error in ((.properties.metrics_disable_etcd_tls.value ? .properties.null_string.value : ..cf.properties.cf_etcd_client_cert.cert_pem)): unknown property "cf_etcd_client_cert" (Product "Redis" / Job: nil)

Polling Interval

The metrics polling interval defaults to 30 seconds. This can be changed by navigating to the Metrics configuration page and entering a new value in **Metrics polling interval (min: 10)**.



Metrics polling interval (min: 10) *

30

Third-party monitoring tools can consume Redis metrics to monitor Redis performance and health. For an example Datadog configuration that displays some of the significant metrics outlined below, see the CF Redis example dashboard. Pivotal does not endorse or provide support for any third party solution.

The following example shows the number of available instances for the Dedicated-VM plan metric:

```
origin:"p-redis" eventType:ValueMetric timestamp:1480084323333475533 deployment:"cf-redis" job:"cf-redis-broker" index:"3be5f4b9-cdf3-45c4-a3b2-19d923d63a01" ip:"10.0.1.49" valueMe
```

Redis Metrics

Redis emits a number of metrics that can be used to monitor the health and performance of your Redis deployment.

keyspace_hits

Description	Number of successful lookups of keys in the main dictionary. "/p-redis/info/stats/keyspace_hits"
Significance	In conjunction with `keyspace_misses`, it can be used to calculate the hit ratio.
Notes	A successful lookup is a lookup on a key that exists.

keyspace_misses

Description	Number of unsuccessful lookups of keys in the main dictionary. "/p-redis/info/stats/keyspace_misses"
Significance	In conjunction with `keyspace_hits`, it can be used to calculate the hit ratio.
Notes	An unsuccessful lookup is a lookup on a key that does not exist.

used_memory

Description	Number of bytes allocated by Redis. "/p-redis/info/memory/used_memory"
Significance	Grows as the number of unsaved keys increases.

maxmemory

Description	Maximum number of bytes available in Redis. "/p-redis/info/memory/maxmemory"
Significance	Indicates the max memory available in Redis.

blocked_clients

Description	Number of connected clients pending on a blocking call. "/p-redis/info/clients/blocked_clients"
Significance	Can be used as an indicator to detect deadlocks.

connected_clients

Description	Number of clients connected to the Redis instance. "/p-redis/info/clients/connected_clients"

rdb_changes_since_last_save

Description	Number of keys currently in memory. "/p-redis/info/persistence/rdb_changes_since_last_save"
Significance	Memory usage grows in proportion to the number of keys in memory. If the Redis instance is stopped ungracefully, these changes may be lost.
Notes	Performing a `BGSAVE` writes these keys to disk and frees up memory.

total_commands_processed

Description	Total number of commands processed by Redis. "/p-redis/info/stats/total_commands_processed"
Significance	A crude indicator of activity. Can be used in conjunction with `uptime_in_seconds`.

mem_fragmentation_ratio

Description	Ratio of memory allocated by the operating system to the memory requested by Redis. "/p-redis/info/memory/mem_fragmentation_ratio"
Significance	A ratio in excess of 1.5 indicates excessive fragmentation, with your Redis instance consuming 150% of the physical memory it requested..

total_instances

Description	Total number of `dedicated-vm` instances of Redis. "/p-redis/service-broker/dedicated_vm_plan/total_instances"
Significance	Used in conjunction with `available_instances`, provides information about used instances.

available_instances

Description	Number of available `dedicated-vm` instances of Redis. "/p-redis/service-broker/dedicated_vm_plan/available_instances"
Significance	If zero, no more instances are available.

total_instances

Description	Total number of `shared-vm` instances of Redis. "/p-redis/service-broker/shared_vm_plan/total_instances"
Significance	Used in conjunction with `available_instances`, provides information about used instances.

available_instances

Description	Number of available `shared-vm` instances of Redis. "/p-redis/service-broker/shared_vm_plan/available_instances"
Significance	If zero, no more instances are available.

Other Metrics

Redis also exposes the following metrics. for more information, see the Redis documentation.

- `arch_bits`
- `uptime_in_seconds`
- `uptime_in_days`
- `hz`
- `lru_clock`
- `client_longest_output_list`
- `client_biggest_input_buf`
- `used_memory_rss`
- `used_memory_peak`
- `used_memory_lua`

- `mem_fragmentation_ratio`
- `loading`
- `rdb_bgsave_in_progress`
- `rdb_last_save_time`
- `rdb_last_bgsave_time_sec`
- `rdb_current_bgsave_time_sec`
- `aof_rewrite_in_progress`
- `aof_rewrite_scheduled`
- `aof_last_rewrite_time_sec`
- `aof_current_rewrite_time_sec`
- `total_connections_received`
- `total_commands_processed`
- `instantaneous_ops_per_sec`
- `total_net_input_bytes`
- `total_net_output_bytes`
- `instantaneous_input_kbps`
- `instantaneous_output_kbps`
- `rejected_connections`
- `sync_full`
- `sync_partial_ok`
- `sync_partial_err`
- `expired_keys`
- `evicted_keys`
- `keyspace_hits`
- `keyspace_misses`
- `pubsub_channels`
- `pubsub_patterns`
- `latest_fork_usec`
- `migrate_cached_sockets`
- `connected_slaves`
- `master_repl_offset`
- `repl_backlog_active`
- `repl_backlog_size`
- `repl_backlog_first_byte_offset`
- `repl_backlog_histlen`
- `used_cpu_sys`
- `used_cpu_user`
- `used_cpu_sys_children`
- `used_cpu_user_children`
- `cluster_enabled`
- `rdb_last_bgsave_status`
- `aof_last_bgrewrite_status`
- `aof_last_write_status`

Troubleshooting Redis for PCF

This topic lists troubleshooting information relevant to Redis for PCF.

Troubleshooting Guides for PCF

General troubleshooting guides for Pivotal Cloud Foundry:

- PCF 1.8
- PCF 1.7
- PCF 1.6

Knowledge Base Articles

Pivotal Knowledge Base articles specifically about Redis for PCF:

- Can't redeploy PCF Redis if shared-vm persistent disk full
- Issue with upgrading tile
- Issue with deploy failing
- Redis Instance Alive after Successful De-provisioning
- PCF Redis dedicated instance fails to persist to disk
- Redis error when saving changes after a back to AWS S3: Error: Access Denied for bucket'

Other Issues

Error	`Cannot generate manifest for product Redis: Error in (( .properties.metrics_disable_etcd_tls.value ? .properties.null_string.value : ..cf.properties.cf_etcd_client_cert.cert_pem )): unknown property "cf_etcd_client_cert" (Product "Redis" / Job: nil)`
Cause	You are using PCF 1.10 and did not untick the `Use non-secure communication for metrics` checkbox on the metrics configuration page in Ops Manager.
Solution	Please untick the checkbox and redeploy. See here for more information.

Error	`Failed to target Cloud Foundry`
Cause	Your Pivotal Cloud Foundry is unresponsive
Solution	Examine the detailed error message in the logs and check the PCF Troubleshooting Guide for advice

Error	`Failed to bind Redis service instance to test app`
Cause	Your deployment's broker has not been registered with Pivotal Cloud Foundry
Solution	Examine the broker-registrar installation step output and troubleshoot any problems.

Useful Debugging Information

If you encounter an issue, here is a list of useful information to gather, especially before you perform any destructive operations such as `cf purge-service-offerings` or `bosh delete deployment`.

- PCF Redis version
- Previous PCF Redis version if upgrading
- Ops Manager version, and previous if upgrading Ops Manager
- IaaS description

From OpsManager:

- The installation logs
- A copy of all files in `/var/tempest/workspaces/default/deployments`

For all VMs, unless specified otherwise:

- Copy of `/var/vcap/sys/log` (particularly the broker)
- If unable to get logs from disk, logs from a forwarded endpoint
- `monit summary`
- Full `ps aux` - Has monit done its job?
- `ps aux | grep redis-serve[r]` - Are Redis instances running?
- `df -h` - disk usage
- `free -m` - memory usage
- `cf m`
- `tree /var/vcap/store/cf-redis-broker/redis-data` (broker only)
- Copy of `/var/vcap/store/cf-redis-broker/statefile.json` (broker only)

For App Developers

Redis Configuration

Redis is configured with a maxmemory-policy of no-eviction. This policy means that the once memory is full, the service will not evict any keys and no write operations will be possible until memory becomes available. Persistence is configured for both RDB and AOF. The default maximum number of connections, maxclients, is set at 10000 but this number is adjusted by Redis according to the number of file handles available. Replication and event notification are not configured.

Service Plans

PCF Redis offers Dedicated VM and Shared VM plans. The memory allocated to the plans is determined by the operator at deploy time. For more information on the plans see the architecture and recommended usage pages.

Using Redis for PCF

Instructions for creating, binding to, and deleting an instance of the dedicated-VM or shared-VM plan are here.

Getting Started

Using PCF Redis with Spring

Spring Cloud Connectors can connect to PCF Redis. Spring Cloud Cloud Foundry connectors will automatically connect to PCF Redis.

PCF Dev

PCF Dev is a small footprint version of PCF that's small enough to run on a local developer machine. More info herehttps://pivotal.io/pcf-dev.

Redis Example App

Sample ruby code that uses PCF can be found here https://github.com/pivotal-cf/cf-redis-example-app.

Redis

To learn more about Redis itself, visit redis.io.

Using Redis for PCF

Redis for PCF can be used both via Pivotal Apps Manager and the CLI, both methods are outlined below. An example application has also been created to help application developers get started with Redis for PCF, and can be downloaded here.

See Redis for PCF Recommended Usage for recommendations regarding Redis for PCF service plans, and memory allocation.

Creating a Redis Service Instance

The following procedure describes how to create a Redis service instance in the Pivotal Cloud Foundry Elastic Runtime environment.

Available Plans

Before creating a Redis instance, it is worth being aware of the two available plans:

Plan Name	Suitable for	Tenancy Model per Instance	Highly Available	Backup Functionality
Shared-VM	Lighter workloads that do not require dedicated resources	Shared VM	No	Yes
Dedicated-VM	Increased workloads that require dedicated resources	Dedicated VM	No	Yes

Using Pivotal Apps Manager

1. From within Pivotal Apps Manager, select Marketplace from the left navigation menu under Spaces. The Services Marketplace displays.
2. Select **Redis** from the displayed tiles and click to view the available plans.
3. Click on the appropriate **Select this plan** button to select the required **Redis Service Plan**.
4. In the Instance Name field, enter a name that will identify this specific Redis service instance.
5. From the Add to Space drop-down list, select the space where you or other users will deploy the applications that will bind to the service.
6. Click the **Add** button.

Using the CLI

1. Run `cf marketplace` to view the available service plans:

```
$ cf marketplace

Getting services from marketplace in org system / space apps-manager as admin...
OK

service      plans                    description
p-redis      shared-vm, dedicated-vm   Redis service to provide a key-value store

TIP:  Use 'cf marketplace -s SERVICE' to view descriptions of individual plans of a given service.
```

2. Run `cf create service` to create the service plan. Include the service plan name as listed in the Services Markeplace and a descriptive name you want to use for the service:

```
$ cf create-service p-redis SERVICE-PLAN-NAME SERVICE-INSTANCE-NAME
```

For example:

```
$ cf create-service p-redis shared-vm redis
```

Binding an Application to the Redis Service

The following procedures describe how to bind a Redis service instance to your Pivotal Cloud Foundry application. This can be done via the Pivotal Apps Manager or Using the Pivotal Cloud Foundry CLI.

Using Pivotal Apps Manager

1. Select the application that you wish to bind to the service. A page displays showing the already bound services and instances for this application.
2. Click Bind. A list of available services displays.
3. Click the Bind button for the Redis service you want to bind to this application.
4. Start or restage your app from the command line:

   ```
   $ cf restage APPLICATION-NAME
   ```

Using the CLI

1. Run `cf services` to view running service instances.

   ```
   $ cf services

   Getting services in org system / space apps-manager as admin...
   OK

   name              service    plan       bound apps   last operation
   my-redis-instance  p-redis    shared-vm               create succeeded
   ```

2. Run `cf bind-service` to bind the application to the service instance.

   ```
   $ cf bind-service APPLICATION-NAME SERVICE-INSTANCE-NAME
   ```

   For example:

   ```
   $ cf bind-service my-application redis
   ```

3. Run `cf restage` to restage your application.

   ```
   $ cf restage APPLICATION-NAME
   ```

Entries in the VCAP_SERVICES Environment Variable

Applications running in Cloud Foundry gain access to the bound service instances via an environment variable credentials hash called VCAP_SERVICES. An example hash is show below:

```
{
 "p-redis": [{
  "credentials": {
      "host": "10.0.0.11",
      "password": "<redacted>",
      "port": 6379
  },
  "label": "p-redis",
  "name": "redis",
  "plan": "dedicated-vm",
  "provider": null,
  "syslog_drain_url": null,
  "tags": [
   "pivotal",
   "redis"
  ],
  "volume_mounts": []
 }]
}
```

You can search for your service by its `name`, given when creating the service instance, or dynamically via the `tags` or `label` properties.

Deleting a Redis Instance

When you delete a Redis service instance, all applications that are bound to that service are automatically unbound and any data in the service instance is cleared.

Using Pivotal Apps Manager

1. Locate the row under Services that contains the service instance you want to delete and click **Delete**.
2. If you had applications that were bound to this service, you may need to restage or re-push your application for the application changes to take effect.

```
$ cf restage APPLICATION-NAME
```

Using the CLI

1. Run `cf delete-service` and include the service instance name that you would like to delete. Enter `y` when prompted to confirm.

```
$ cf delete-service SERVICE-INSTANCE-NAME
```

For example:

```
$ cf delete-service my-redis-instance

Really delete the service my-redis-instance?> y
Deleting service my-redis-instance in org system / space apps-manager as admin...
OK
```

2. If you had applications that were bound to this service, you may need to restage or re-push your application for the application changes to take effect.

```
$ cf restage APPLICATION-NAME
```

Sample Redis Configuration

The following is a `redis.conf` file from a Dedicated-VM plan instance:

```
daemonize yes
pidfile /var/vcap/sys/run/redis.pid
port 6379
tcp-backlog 511
timeout 0
tcp-keepalive 0
loglevel notice
logfile /var/vcap/sys/log/redis/redis.log
syslog-enabled yes
syslog-ident redis-server
syslog-facility local0
databases 16
save 900 1
save 300 10
save 60 10000
stop-writes-on-bgsave-error yes
rdbcompression yes
rdbchecksum yes
dbfilename dump.rdb
dir /var/vcap/store/redis
slave-serve-stale-data yes
slave-read-only yes
repl-diskless-sync no
repl-diskless-sync-delay 5
repl-ping-slave-period 10
repl-timeout 60
repl-disable-tcp-nodelay no
slave-priority 100
maxmemory-policy noeviction
appendonly yes
appendfilename appendonly.aof
appendfsync everysec
no-appendfsync-on-rewrite no
auto-aof-rewrite-percentage 100
auto-aof-rewrite-min-size 64mb
aof-load-truncated yes
lua-time-limit 5000
slowlog-log-slower-than 10000
slowlog-max-len 128
latency-monitor-threshold 0
notify-keyspace-events ""
hash-max-ziplist-entries 512
hash-max-ziplist-value 64
list-max-ziplist-entries 512
list-max-ziplist-value 64
set-max-intset-entries 512
zset-max-ziplist-entries 128
zset-max-ziplist-value 64
hll-sparse-max-bytes 3000
activerehashing yes
client-output-buffer-limit normal 0 0 0
client-output-buffer-limit slave 256mb 64mb 60
client-output-buffer-limit pubsub 32mb 8mb 60
hz 10
aof-rewrite-incremental-fsync yes
rename-command CONFIG "A-B-Ab1AZec_-AaC1A2bAbB22a_a1Baa"
rename-command SAVE "SAVE"
rename-command BGSAVE "BGSAVE"
rename-command DEBUG ""
rename-command SHUTDOWN ""
rename-command SLAVEOF ""
rename-command SYNC ""
requirepass 1a1a2bb0-0ccc-222a-444b-1e1e1e1e2222
maxmemory 1775550873
```