

在前文《Docker 搭建 Redis Cluster 集群环境》中我已经教过大家如何搭建了，本文使用 Docker Compose 再带大家搭建一遍，其目的主要是为了让家感受 Docker Compose 所带来的便捷之处。

按照 Redis 官网：<https://redis.io/topics/cluster-tutorial> 的提示，为了使 Docker 与 Redis Cluster 兼容，您需要使用 Docker 的 `host` 网络模式。

`host` 网络模式需要在创建容器时通过参数 `--net host` 或者 `--network host` 指定，`host` 网络模式可以让**容器共享宿主机网络栈**，容器将不会虚拟出自己的网卡，配置自己的 IP 等，而是使用宿主的 IP 和端口。

关于 Docker 网络模式更多的内容请阅读《Docker 网络模式详解及容器间网络通信》。

### Redis Cluster and Docker

Currently Redis Cluster does not support NATted environments and in general environments where IP addresses or TCP ports are remapped.

Docker uses a technique called *port mapping*: programs running inside Docker containers may be exposed with a different port compared to the one the program believes to be using. This is useful in order to run multiple containers using the same ports, at the same time, in the same server.

In order to make Docker compatible with Redis Cluster you need to use the **host networking mode** of Docker. Please check the `--net=host` option in the [Docker documentation](#) for more information.

## 环境

为了让环境更加真实，本文使用**多机**环境：

- 192.168.10.10
- 192.168.10.11

每台机器所使用的基础设施环境如下：

- CentOS 7.8.2003
- Docker version 19.03.12

```
[root@localhost ~]# rpm -q centos-release
centos-release-7-8.2003.0.el7.centos.x86_64
[root@localhost ~]# docker -v
Docker version 19.03.12, build 48a66213fe
```

## 搭建

整体搭建步骤主要分为以下几步：

- 下载 Redis 镜像（其实这步可以省略，因为创建容器时，如果本地镜像不存在，就会去远程拉取）；
- 编写 Redis 配置文件；
- 编写 Docker Compose 模板文件；
- 创建并启动所有服务容器；
- 创建 Redis Cluster 集群。

## 编写 Redis 配置文件

### 创建目录及文件

分别在 192.168.10.10 和 192.168.10.11 两台机器上执行以下操作。

```
# 创建目录
mkdir -p /usr/local/docker-redis/redis-cluster
# 切换至指定目录
cd /usr/local/docker-redis/redis-cluster/
# 编写 redis-cluster.tpl 文件
vi redis-cluster.tpl
```

### 编写配置文件

192.168.10.10 机器的 redis-cluster.tpl 文件内容如下：

```
port ${PORT}
requirepass 1234
masterauth 1234
protected-mode no
daemonize no
appendonly yes
cluster-enabled yes
cluster-config-file nodes.conf
cluster-node-timeout 15000
cluster-announce-ip 192.168.10.10
cluster-announce-port ${PORT}
cluster-announce-bus-port 1${PORT}
```

192.168.10.11 机器的 redis-cluster.tpl 文件内容如下：

```
port ${PORT}
requirepass 1234
masterauth 1234
protected-mode no
daemonize no
appendonly yes
cluster-enabled yes
cluster-config-file nodes.conf
cluster-node-timeout 15000
cluster-announce-ip 192.168.10.11
cluster-announce-port ${PORT}
cluster-announce-bus-port 1${PORT}
```

- `port`: 节点端口;
- `requirepass`: 添加访问认证;
- `masterauth`: 如果主节点开启了访问认证, 从节点访问主节点需要认证;
- `protected-mode`: 保护模式, 默认值 yes, 即开启。开启保护模式以后, 需配置 `bind ip` 或者设置访问密码; 关闭保护模式, 外部网络可以直接访问;
- `daemonize`: 是否以守护线程的方式启动 (后台启动), 默认 no;
- `appendonly`: 是否开启 AOF 持久化模式, 默认 no;
- `cluster-enabled`: 是否开启集群模式, 默认 no;
- `cluster-config-file`: 集群节点信息文件;
- `cluster-node-timeout`: 集群节点连接超时时间;
- `cluster-announce-ip`: 集群节点 IP, 填写宿主机的 IP;
- `cluster-announce-port`: 集群节点映射端口;
- `cluster-announce-bus-port`: 集群节点总线端口。

每个 Redis 集群节点都需要打开**两个 TCP 连接**。一个用于为客户端提供服务的正常 Redis TCP 端口, 例如 6379。还有一个基于 6379 端口加 10000 的端口, 比如 16379。

第二个端口用于集群总线, 这是一个使用二进制协议的节点到节点通信通道。节点使用集群总线进行故障检测、配置更新、故障转移授权等等。客户端永远不要尝试与集群总线端口通信, 与正常的 Redis 命令端口通信即可, 但是请确保防火墙中的这两个端口都已经打开, 否则 Redis 集群节点将无法通信。

在 192.168.10.10 机器的 `redis-cluster` 目录下执行以下命令:

```
for port in `seq 6371 6373`; do \
    mkdir -p ${port}/conf \
    && PORT=${port} envsubst < redis-cluster.tpl > ${port}/conf/redis.conf \
    && mkdir -p ${port}/data;\
done
```

在 192.168.10.11 机器的 `redis-cluster` 目录下执行以下命令:

```
for port in `seq 6374 6376`; do \
    mkdir -p ${port}/conf \
    && PORT=${port} envsubst < redis-cluster.tpl > ${port}/conf/redis.conf \
    && mkdir -p ${port}/data;\
done
```

上面两段 shell for 语句, 意思就是循环创建 6371 ~ 6376 相关的目录及文件。

在 192.168.10.10 机器执行查看命令结果如下，如果没有 tree 命令先安装 yum install -y tree。

```
[root@localhost redis-cluster]# tree /usr/local/docker-redis/redis-cluster/
/usr/local/docker-redis/redis-cluster/
├── 6371
│   ├── conf
│   │   └── redis.conf
│   └── data
├── 6372
│   ├── conf
│   │   └── redis.conf
│   └── data
├── 6373
│   ├── conf
│   │   └── redis.conf
│   └── data
└── redis-cluster.tpl

9 directories, 4 files
```

在 192.168.10.11 机器执行查看命令结果如下。

```
[root@localhost redis-cluster]# tree /usr/local/docker-redis/redis-cluster/
/usr/local/docker-redis/redis-cluster/
├── 6374
│   ├── conf
│   │   └── redis.conf
│   └── data
├── 6375
│   ├── conf
│   │   └── redis.conf
│   └── data
├── 6376
│   ├── conf
│   │   └── redis.conf
│   └── data
└── redis-cluster.tpl

9 directories, 4 files
```

以下内容为每个节点的配置文件详细信息。

```
===== 192.168.10.10 =====
[root@localhost redis-cluster]# cat /usr/local/docker-redis/redis-
cluster/637{1..3}/conf/redis.conf
port 6371
requirepass 1234
masterauth 1234
protected-mode no
daemonize no
appendonly yes
cluster-enabled yes
cluster-config-file nodes.conf
cluster-node-timeout 15000
```

```
cluster-announce-ip 192.168.10.10
cluster-announce-port 6371
cluster-announce-bus-port 16371
```

```
port 6372
requirepass 1234
masterauth 1234
protected-mode no
daemonize no
appendonly yes
cluster-enabled yes
cluster-config-file nodes.conf
cluster-node-timeout 15000
cluster-announce-ip 192.168.10.10
cluster-announce-port 6372
cluster-announce-bus-port 16372
```

```
port 6373
requirepass 1234
masterauth 1234
protected-mode no
daemonize no
appendonly yes
cluster-enabled yes
cluster-config-file nodes.conf
cluster-node-timeout 15000
cluster-announce-ip 192.168.10.10
cluster-announce-port 6373
cluster-announce-bus-port 16373
```

```
===== 192.168.10.10 =====
```

```
===== 192.168.10.11 =====
```

```
[root@localhost redis-cluster]# cat /usr/local/docker-redis/redis-
cluster/637{4..6}/conf/redis.conf
```

```
port 6374
requirepass 1234
masterauth 1234
protected-mode no
daemonize no
appendonly yes
cluster-enabled yes
cluster-config-file nodes.conf
cluster-node-timeout 15000
cluster-announce-ip 192.168.10.11
cluster-announce-port 6374
cluster-announce-bus-port 16374
```

```
port 6375
requirepass 1234
masterauth 1234
protected-mode no
daemonize no
appendonly yes
cluster-enabled yes
cluster-config-file nodes.conf
cluster-node-timeout 15000
cluster-announce-ip 192.168.10.11
cluster-announce-port 6375
```

```

cluster-announce-bus-port 16375

port 6376
requirepass 1234
masterauth 1234
protected-mode no
daemonize no
appendonly yes
cluster-enabled yes
cluster-config-file nodes.conf
cluster-node-timeout 15000
cluster-announce-ip 192.168.10.11
cluster-announce-port 6376
cluster-announce-bus-port 16376
===== 192.168.10.11 =====

```

## 编写 Docker Compose 模板文件

在 192.168.10.10 机器的 /usr/local/docker-redis 目录下创建 docker-compose.yml 文件并编辑。

```

# 描述 Compose 文件的版本信息
version: "3.8"

# 定义服务，可以多个
services:
  redis-6371: # 服务名称
    image: redis # 创建容器时所需的镜像
    container_name: redis-6371 # 容器名称
    restart: always # 容器总是重新启动
    network_mode: "host" # host 网络模式
    volumes: # 数据卷，目录挂载
      - /usr/local/docker-redis/redis-cluster/6371/conf/redis.conf:/usr/local/etc/redis/redis.conf
      - /usr/local/docker-redis/redis-cluster/6371/data:/data
    command: redis-server /usr/local/etc/redis/redis.conf # 覆盖容器启动后默认执行的命令

  redis-6372:
    image: redis
    container_name: redis-6372
    network_mode: "host"
    volumes:
      - /usr/local/docker-redis/redis-cluster/6372/conf/redis.conf:/usr/local/etc/redis/redis.conf
      - /usr/local/docker-redis/redis-cluster/6372/data:/data
    command: redis-server /usr/local/etc/redis/redis.conf

  redis-6373:
    image: redis
    container_name: redis-6373
    network_mode: "host"
    volumes:

```

```
- /usr/local/docker-redis/redis-cluster/6373/conf/redis.conf:/usr/local/etc/redis/redis.conf
- /usr/local/docker-redis/redis-cluster/6373/data:/data
command: redis-server /usr/local/etc/redis/redis.conf
```

在 192.168.10.11 机器的 /usr/local/docker-redis 目录下创建 docker-compose.yml 文件并编辑。

```
# 描述 Compose 文件的版本信息
version: "3.8"

# 定义服务，可以多个
services:
  redis-6374: # 服务名称
    image: redis # 创建容器时所需的镜像
    container_name: redis-6374 # 容器名称
    restart: always # 容器总是重新启动
    network_mode: "host" # host 网络模式
    volumes: # 数据卷，目录挂载
      - /usr/local/docker-redis/redis-cluster/6374/conf/redis.conf:/usr/local/etc/redis/redis.conf
      - /usr/local/docker-redis/redis-cluster/6374/data:/data
    command: redis-server /usr/local/etc/redis/redis.conf # 覆盖容器启动后默认执行的命令

  redis-6375:
    image: redis
    container_name: redis-6375
    network_mode: "host"
    volumes:
      - /usr/local/docker-redis/redis-cluster/6375/conf/redis.conf:/usr/local/etc/redis/redis.conf
      - /usr/local/docker-redis/redis-cluster/6375/data:/data
    command: redis-server /usr/local/etc/redis/redis.conf

  redis-6376:
    image: redis
    container_name: redis-6376
    network_mode: "host"
    volumes:
      - /usr/local/docker-redis/redis-cluster/6376/conf/redis.conf:/usr/local/etc/redis/redis.conf
      - /usr/local/docker-redis/redis-cluster/6376/data:/data
    command: redis-server /usr/local/etc/redis/redis.conf
```

## 创建并启动所有服务容器

分别在 192.168.10.10 和 192.168.10.11 机器的 /usr/local/docker-redis 目录下执行以下命令：

```
docker-compose up -d
```

```
[root@localhost docker-redis]# docker-compose up -d
Creating redis-6371 ... done
Creating redis-6372 ... done
Creating redis-6373 ... done
[root@localhost docker-redis]# docker-compose ps
      Name                                Command                                State      Ports
-----
redis-6371  docker-entrypoint.sh redis ...      Up
redis-6372  docker-entrypoint.sh redis ...      Up
redis-6373  docker-entrypoint.sh redis ...      Up
```

```
[root@localhost redis-cluster]# docker-compose up -d
Creating redis-6375 ... done
Creating redis-6374 ... done
Creating redis-6376 ... done
[root@localhost redis-cluster]# docker-compose ps
      Name                                Command                                State      Ports
-----
redis-6374  docker-entrypoint.sh redis ...      Up
redis-6375  docker-entrypoint.sh redis ...      Up
redis-6376  docker-entrypoint.sh redis ...      Up
```

## 创建 Redis Cluster 集群

请先确保你的两台机器可以互相通信，然后随便进入一个容器节点，并进入 `/usr/local/bin/` 目录：

```
# 进入容器
docker exec -it redis-6371 bash
# 切换至指定目录
cd /usr/local/bin/
```

接下来我们就可以通过以下命令实现 Redis Cluster 集群的创建。

```
redis-cli -a 1234 --cluster create 192.168.10.10:6371 192.168.10.10:6372
192.168.10.10:6373 192.168.10.11:6374 192.168.10.11:6375 192.168.10.11:6376 --
cluster-replicas 1
```

出现选择提示信息，输入 **yes**，结果如下所示：



```

root@localhost:~# redis-cli -a 1234 --cluster create 192.168.10.10:6371 192.168.10.10:6372 192.168.10.10:6373 192.168.10.11:6374 192.168.10.11:6375 192.168.10.11:6376 --cluster-replicas 1
Warning: Using a password with '-a' or '-u' option on the command line interface may not be safe.
>>> Performing hash slots allocation on 6 nodes...
Master[0] -> Slots 0 - 5460
Master[1] -> Slots 5461 - 10922
Master[2] -> Slots 10923 - 16383
Adding replica 192.168.10.11:6376 to 192.168.10.10:6371
Adding replica 192.168.10.10:6373 to 192.168.10.11:6374
Adding replica 192.168.10.11:6375 to 192.168.10.10:6372
M: 0444afa3ca66de6af4a182984c79d4d140293d7 192.168.10.10:6371
slots:[0-5460] (5461 slots) master
M: fb76ada83a70ea8d367f22f8a6436d427f12022c 192.168.10.10:6372
slots:[10923-16383] (5461 slots) master
S: 20f6913a4b08afe3b4092a4f6c70fddd9506f2fa 192.168.10.10:6373
replicates c130120ffbd7c4e442ac9fc9870e977dc801cb54
M: c130120ffbd7c4e442ac9fc9870e977dc801cb54 192.168.10.11:6374
slots:[5461-10922] (5462 slots) master
S: d4d5f7fd94fcd2239e82e481f0529380b288ff51 192.168.10.11:6375
replicates fb76ada83a70ea8d367f22f8a6436d427f12022c
S: e08b8f629e2dfa474a836910634052d83c77d06a 192.168.10.11:6376
replicates 0444afa3ca66de6af4a182984c79d4d140293d7
Can I set the above configuration? (type 'yes' to accept): yes

```

集群创建成功如下：

```

Can I set the above configuration? (type 'yes' to accept): yes
>>> Nodes configuration updated
>>> Assign a different config epoch to each node
>>> Sending CLUSTER MEET messages to join the cluster
Waiting for the cluster to join
.
>>> Performing Cluster Check (using node 192.168.10.10:6371)
M: 0444afa3ca66de6af4a182984c79d4d140293d7 192.168.10.10:6371
  slots:[0-5460] (5461 slots) master
  1 additional replica(s)
S: 20f6913a4b08afe3b4092a4f6c70fddd9506f2fa 192.168.10.10:6373
  slots: (0 slots) slave
  replicates c130120ffbd7c4e442ac9fc9870e977dc801cb54
S: d4d5f7fd94fcd2239e82e481f0529380b288ff51 192.168.10.11:6375
  slots: (0 slots) slave
  replicates fb76ada83a70ea8d367f22f8a6436d427f12022c
M: fb76ada83a70ea8d367f22f8a6436d427f12022c 192.168.10.10:6372
  slots:[10923-16383] (5461 slots) master
  1 additional replica(s)
M: c130120ffbd7c4e442ac9fc9870e977dc801cb54 192.168.10.11:6374
  slots:[5461-10922] (5462 slots) master
  1 additional replica(s)
S: e08b8f629e2dfa474a836910634052d83c77d06a 192.168.10.11:6376
  slots: (0 slots) slave
  replicates 0444afa3ca66de6af4a182984c79d4d140293d7
[OK] All nodes agree about slots configuration.
>>> Check for open slots...
>>> Check slots coverage...
[OK] All 16384 slots covered.

```

以下是创建集群时返回的详细信息，也就是上两幅图中的所有内容。

```

root@localhost:~# redis-cli -a 1234 --cluster create
192.168.10.10:6371 192.168.10.10:6372 192.168.10.10:6373 192.168.10.11:6374
192.168.10.11:6375 192.168.10.11:6376 --cluster-replicas 1
Warning: Using a password with '-a' or '-u' option on the command line interface
may not be safe.
>>> Performing hash slots allocation on 6 nodes...
Master[0] -> Slots 0 - 5460

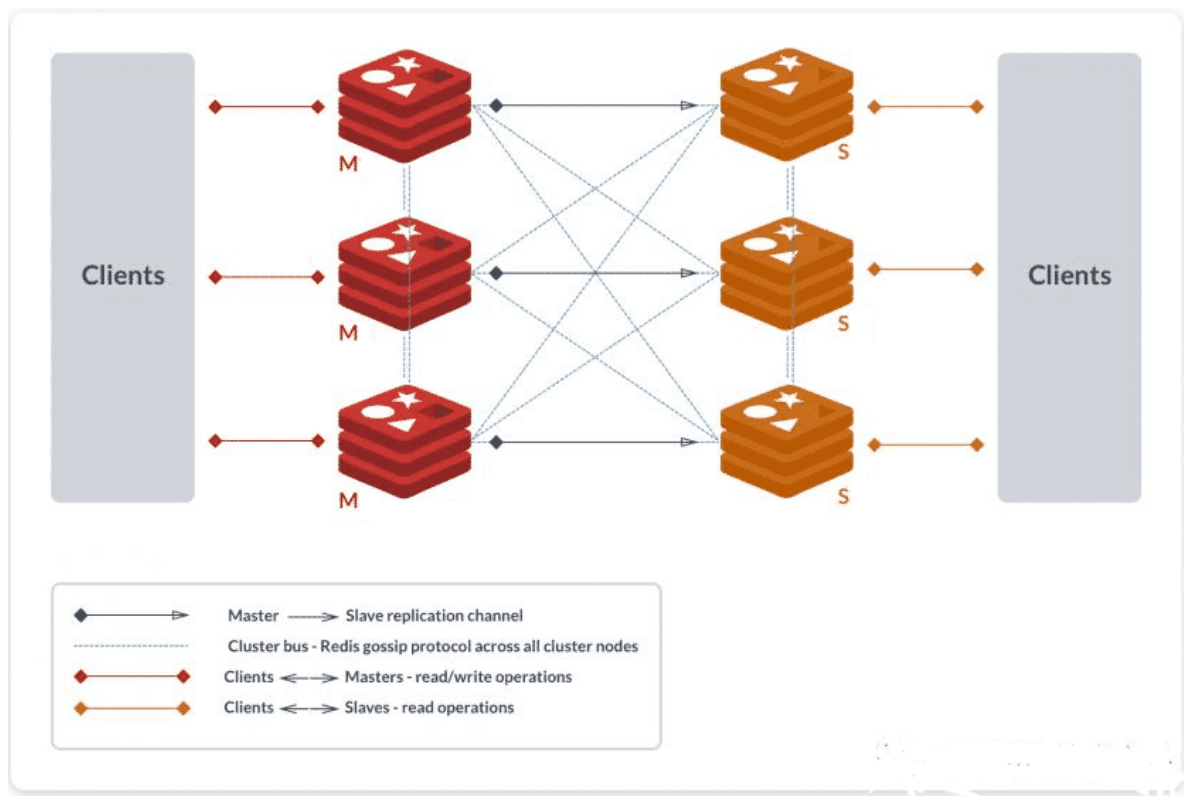
```

```

Master[1] -> Slots 5461 - 10922
Master[2] -> Slots 10923 - 16383
Adding replica 192.168.10.11:6376 to 192.168.10.10:6371
Adding replica 192.168.10.10:6373 to 192.168.10.11:6374
Adding replica 192.168.10.11:6375 to 192.168.10.10:6372
M: 04444afa3ca66de6af4a182984c79d4d140293d7 192.168.10.10:6371
  slots:[0-5460] (5461 slots) master
M: fb76ada83a70ea8d367f22f8a6436d427f12022c 192.168.10.10:6372
  slots:[10923-16383] (5461 slots) master
S: 20f6913a4b08afe3b4092a4f6c70fddd9506f2fa 192.168.10.10:6373
  replicates c130120ffbd7c4e442ac9fc9870e977dc801cb54
M: c130120ffbd7c4e442ac9fc9870e977dc801cb54 192.168.10.11:6374
  slots:[5461-10922] (5462 slots) master
S: d4d5f7fd94fcd2239e82e481f0529380b288ff51 192.168.10.11:6375
  replicates fb76ada83a70ea8d367f22f8a6436d427f12022c
S: e08b8f629e2dfa474a836910634052d83c77d06a 192.168.10.11:6376
  replicates 04444afa3ca66de6af4a182984c79d4d140293d7
Can I set the above configuration? (type 'yes' to accept): yes
>>> Nodes configuration updated
>>> Assign a different config epoch to each node
>>> Sending CLUSTER MEET messages to join the cluster
Waiting for the cluster to join
.
>>> Performing Cluster Check (using node 192.168.10.10:6371)
M: 04444afa3ca66de6af4a182984c79d4d140293d7 192.168.10.10:6371
  slots:[0-5460] (5461 slots) master
  1 additional replica(s)
S: 20f6913a4b08afe3b4092a4f6c70fddd9506f2fa 192.168.10.10:6373
  slots: (0 slots) slave
  replicates c130120ffbd7c4e442ac9fc9870e977dc801cb54
S: d4d5f7fd94fcd2239e82e481f0529380b288ff51 192.168.10.11:6375
  slots: (0 slots) slave
  replicates fb76ada83a70ea8d367f22f8a6436d427f12022c
M: fb76ada83a70ea8d367f22f8a6436d427f12022c 192.168.10.10:6372
  slots:[10923-16383] (5461 slots) master
  1 additional replica(s)
M: c130120ffbd7c4e442ac9fc9870e977dc801cb54 192.168.10.11:6374
  slots:[5461-10922] (5462 slots) master
  1 additional replica(s)
S: e08b8f629e2dfa474a836910634052d83c77d06a 192.168.10.11:6376
  slots: (0 slots) slave
  replicates 04444afa3ca66de6af4a182984c79d4d140293d7
[OK] All nodes agree about slots configuration.
>>> Check for open slots...
>>> Check slots coverage...
[OK] All 16384 slots covered.

```

至此一个高可用的 Redis Cluster 集群搭建完成，如下图所示，该集群中包含 6 个 Redis 节点，3 主 3 从。三个主节点会分配槽，处理客户端的命令请求，而从节点可用在主节点故障后，顶替主节点。



## 查看集群状态

我们先进入容器，然后通过一些集群常用的命令查看一下集群的状态。

```
# 进入容器
docker exec -it redis-6371 bash
# 切换至指定目录
cd /usr/local/bin/
```

## 检查集群状态

```
redis-cli -a 1234 --cluster check 192.168.10.11:6375
```

```

root@localhost:/usr/local/bin# redis-cli -a 1234 --cluster check 192.168.10.11:6375
Warning: Using a password with '-a' or '-u' option on the command line interface may not be safe.
192.168.10.10:6371 (04444afa...) -> 0 keys | 5461 slots | 1 slaves.
192.168.10.11:6374 (c130120f...) -> 0 keys | 5462 slots | 1 slaves.
192.168.10.10:6372 (fb76ada8...) -> 0 keys | 5461 slots | 1 slaves.
[OK] 0 keys in 3 masters.
0.00 keys per slot on average.
>>> Performing Cluster Check (using node 192.168.10.11:6375)
S: d4d5f7fd94fcd2239e82e481f0529380b288ff51 192.168.10.11:6375
   slots: (0 slots) slave
   replicates fb76ada83a70ea8d367f22f8a6436d427f12022c
M: 04444afa3ca66de6af4a182984c79d4d140293d7 192.168.10.10:6371
   slots:[0-5460] (5461 slots) master
   1 additional replica(s)
M: c130120ffbd7c4e442ac9fc9870e977dc801cb54 192.168.10.11:6374
   slots:[5461-10922] (5462 slots) master
   1 additional replica(s)
S: e08b8f629e2dfa474a836910634052d83c77d06a 192.168.10.11:6376
   slots: (0 slots) slave
   replicates 04444afa3ca66de6af4a182984c79d4d140293d7
M: fb76ada83a70ea8d367f22f8a6436d427f12022c 192.168.10.10:6372
   slots:[10923-16383] (5461 slots) master
   1 additional replica(s)
S: 20f6913a4b08afe3b4092a4f6c70fddd9506f2fa 192.168.10.10:6373
   slots: (0 slots) slave
   replicates c130120ffbd7c4e442ac9fc9870e977dc801cb54
[OK] All nodes agree about slots configuration.
>>> Check for open slots...
>>> Check slots coverage...
[OK] All 16384 slots covered.

```

## 查看集群信息和节点信息

```

# 连接至集群某个节点
redis-cli -c -a 1234 -h 192.168.10.11 -p 6376

# 查看集群信息
cluster info

# 查看集群结点信息
cluster nodes

```

```

root@localhost:/usr/local/bin# redis-cli -c -a 1234 -h 192.168.10.11 -p 6376
Warning: Using a password with '-a' or '-u' option on the command line interface may not be safe.
192.168.10.11:6376> cluster info
cluster_state:ok
cluster_slots_assigned:16384
cluster_slots_ok:16384
cluster_slots_pfail:0
cluster_slots_fail:0
cluster_known_nodes:6
cluster_size:3
cluster_current_epoch:6
cluster_my_epoch:1
cluster_stats_messages_ping_sent:469
cluster_stats_messages_pong_sent:458
cluster_stats_messages_meet_sent:1
cluster_stats_messages_sent:928
cluster_stats_messages_ping_received:458
cluster_stats_messages_pong_received:470
cluster_stats_messages_received:928
192.168.10.11:6376> cluster nodes
20f6913a4b08afe3b4092a4f6c70fddd9506f2fa 192.168.10.10:6373 slave c130120ffbd7c4e442ac9fc9870e977dc801cb54 0 1599633730000 4 connected
e08b8f629e2dfa474a836910634052d83c77d06a 192.168.10.11:6376 myself,slave 04444afa3ca66de6af4a182984c79d4d140293d7 0 1599633728000 1 connected
04444afa3ca66de6af4a182984c79d4d140293d7 192.168.10.10:6371 master - 0 1599633731891 1 connected 0-5460
fb76ada83a70ea8d367f22f8a6436d427f12022c 192.168.10.10:6372 master - 0 1599633731000 2 connected 10923-16383
c130120ffbd7c4e442ac9fc9870e977dc801cb54 192.168.10.11:6374 master - 0 1599633729000 4 connected 5461-10922
d4d5f7fd94fcd2239e82e481f0529380b288ff51 192.168.10.11:6375 slave fb76ada83a70ea8d367f22f8a6436d427f12022c 0 1599633731000 2 connected

```

## SET/GET

在 6371 节点中执行写入和读取，命令如下：

```
# 进入容器并连接至集群某个节点
docker exec -it redis-6371 /usr/local/bin/redis-cli -c -a 1234 -h 192.168.10.10 -p 6371
# 写入数据
set name mrhelloworld
set aaa 111
set bbb 222
# 读取数据
get name
get aaa
get bbb
```

```
[root@localhost ~]# docker exec -it redis-6371 /usr/local/bin/redis-cli -c -a 1234 -h 192.168.10.10 -p 6371
Warning: Using a password with '-a' or '-u' option on the command line interface may not be safe.
192.168.10.10:6371> set name mrhelloworld ①
-> Redirected to slot [5798] located at 192.168.10.11:6374
OK
192.168.10.11:6374> set aaa 111 ②
OK
192.168.10.11:6374> set bbb 222 ③
-> Redirected to slot [5287] located at 192.168.10.10:6371
OK
192.168.10.10:6371> get name ④
-> Redirected to slot [5798] located at 192.168.10.11:6374
"mrhelloworld"
192.168.10.11:6374> get aaa ⑤
"111"
192.168.10.11:6374> get bbb ⑥
-> Redirected to slot [5287] located at 192.168.10.10:6371
"222"
192.168.10.10:6371>
```

别着急，让我来解释一下上图中的操作过程：

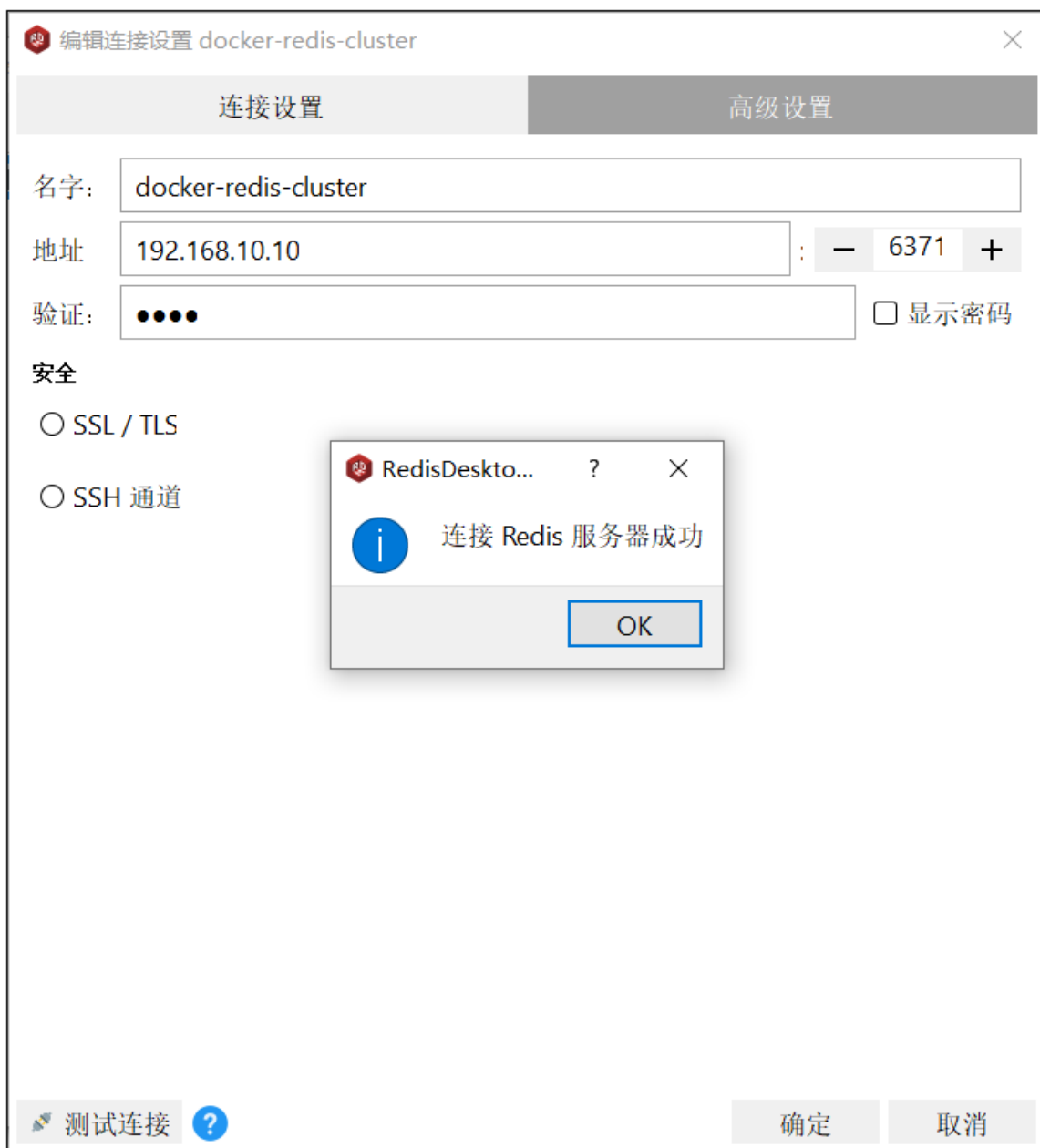
- 首先进入容器并连接至集群某个节点；
- 然后执行**第一个** set 命令 `set name xxxx`，`name` 键根据哈希函数运算以后得到的值为 `[5798]`。当前集群环境的槽分配情况为：`[0-5460]` 6371节点，`[5461-10922]` 6374节点，`[10923-16383]` 6372节点，所以该键的存储就被分配到了 **6374** 节点上；
- 再来看**第二个** set 命令 `set aaa`，这里大家可能会有一些疑问，为什么看不到 `aaa` 键根据哈希函数运算以后得到的值？因为刚才重定向至 **6374** 节点插入了数据，此时如果还有数据插入，正好键根据哈希函数运算以后得到的值也还在该节点的范围内，那么直接插入数据即可；
- 接着是**第三个** set 命令 `set bbb`，`bbb` 键根据哈希函数运算以后得到的值为 `[5287]`，所以该键的存储就被分配到了 **6371** 节点上；
- 然后是读取操作，**第四个**命令 `get name`，`name` 键根据哈希函数运算以后得到的值为 `[5798]`，被重定向至 **6374** 节点读取；
- **第五个**命令 `get aaa`，`aaa` 键根据哈希函数运算以后得到的值也在 **6374** 节点，直接读取；
- **第六个**命令 `get bbb`，`bbb` 键根据哈希函数运算以后得到的值为 `[5287]`，被重定向至 **6371** 节点读取。

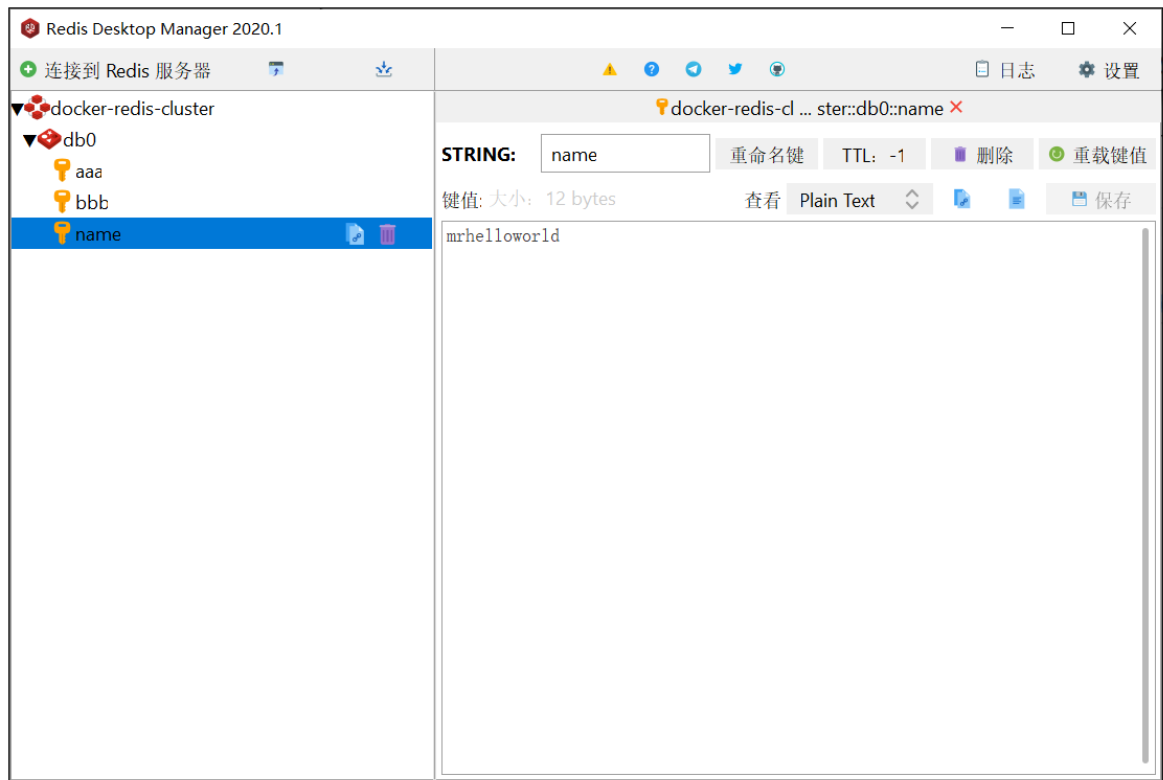
通过以上操作我们得知 `name` 键的存储被分配到了 6374 节点，如果直接连接 6374 节点并获取该值会怎么样？没错，不需要重定向节点，因为数据就在该节点，所以直接读取返回。

```
[root@localhost ~]# docker exec -it redis-6371 /usr/local/bin/redis-cli -c -a 1234 -h 192.168.10.11 -p 6374
Warning: Using a password with '-a' or '-u' option on the command line interface may not be safe.
192.168.10.11:6374> get name
"mrhelloworld"
192.168.10.11:6374> get bbb
-> Redirected to slot [5287] located at 192.168.10.10:6371
"222"
192.168.10.10:6371> get aaa
-> Redirected to slot [10439] located at 192.168.10.11:6374
"111"
192.168.10.11:6374> get name
"mrhelloworld"
192.168.10.11:6374> █
```

## 客户端连接

最后来一波客户端连接操作，随便哪个节点，看看可否通过外部访问 Redis Cluster 集群。





至此使用多机环境基于 Docker Compose 搭建 Redis Cluster 就到这里。虽然整体搭建过程感觉比起之前并没有简化太多。但是，如果我们想要停止并删除 Redis Cluster 集群环境，之前的方式就需要一个个去操作，而 Docker Compose 只需要一个 `docker-compose down` 命令的操作即可。Docker Compose 的学习及使用就到这里，下文开始我们学习 Docker Swarm 的相关内容。