Alibaba Cloud ApsaraDB for Redis

FAQs

Issue: 20190705

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Generic conventions

Table -1: Style conventions

Style	Description	Example
⛔	This warning information indicates a situation that will cause major system changes, faults, physical injuries, and other adverse results.	⛔ Danger: Resetting will result in the loss of user configuration data.
⚠	This warning information indicates a situation that may cause major system changes, faults, physical injuries, and other adverse results.	⚠ Warning: Restarting will cause business interruption. About 10 minutes are required to restore business.
📋	This indicates warning informatio n, supplementary instructions, and other content that the user must understand.	ⓘ Notice: Take the necessary precautions to save exported data containing sensitive information.
	This indicates supplemental instructions, best practices, tips, and other content that is good to know for the user.	📋 Note: You can use Ctrl + A to select all files.
>	Multi-level menu cascade.	Settings > Network > Set network type
Bold	It is used for buttons, menus , page names, and other UI elements.	Click OK.
`Courier font`	It is used for commands.	Run the `cd / d C :/ windows` command to enter the Windows system folder.
Italics	It is used for parameters and variables.	`bae log list --instanceid` *Instance_ID*
[] or [a|b]	It indicates that it is a optional value, and only one item can be selected.	`ipconfig` *[-all|-t]*

Style	Description	Example
{} or {a|b}	**It indicates that it is a required value, and only one item can be selected.**	`swich` *{stand | slave}*

Contents

1 Common Jedis exceptions in ApsaraDB for Redis

Jedis is simple to use. However, if you cannot set valid parameters such as JedisPool parameters that are suitable for your scenarios and if you use some features such as Lua and transactions in an incorrect way, some issues may occur. This topic describes how to solve these issues.

List of exceptions

- 1. redis.clients.jedis.exceptions.JedisConnectionException: Could not get a resource from the pool
- 2. redis.clients.jedis.exceptions.JedisConnectionException: Unexpected end of stream
- 3. redis.clients.jedis.exceptions.JedisDataException: ERR illegal address
- 4. redis.clients.jedis.exceptions.JedisDataException: ERR max number of clients reached
- 5. redis.clients.jedis.exceptions.JedisConnectionException: java.net.SocketTimeoutException: Read timed out
- 6. redis.clients.jedis.exceptions.JedisDataException: NOAUTH Authentication required
- 7. redis.clients.jedis.exceptions.JedisDataException: EXECABORT Transaction discarded because of previous errors
- 8. java.lang.ClassCastException: java.lang.Long cannot be cast to java.util.List
- 9. redis.clients.jedis.exceptions.JedisDataException: WRONGTYPE Operation against a key holding the wrong kind of value
- 10. redis.clients.jedis.exceptions.JedisDataException: OOM command not allowed when used memory > ‘maxmemory’
- 11. redis.clients.jedis.exceptions.JedisDataException: LOADING Redis is loading the dataset in memory
- 12. redis.clients.jedis.exceptions.JedisDataException: BUSY Redis is busy running a script. You can only call SCRIPT KILL or SHUTDOWN NOSAVE
- 13. redis.clients.jedis.exceptions.JedisConnectionException: java.net.SocketTimeoutException: connect timed out

- 14. UNKILLABLE Sorry the script already executed write commands against the dataset. You can either wait the script termination or kill the server in a hard way using the SHUTDOWN NOSAVE command
- 15. java.lang.NoClassDefFoundError
- 16. redis.clients.jedis.exceptions.JedisDataException: ERR unknown command
- 17. redis.clients.jedis.exceptions.JedisDataException: Please close pipeline or multi block before calling this method
- 18. redis.clients.jedis.exceptions.JedisDataException: ERR command role not support for normal user

1. Failure to obtain Jedis connections from JedisPool

1.1. Exception stack

(1) The JedisPool parameter blockWhenExhausted is set to true by default.

If no Jedis connection is available in JedisPool, the Jedis client waits for a period in milliseconds as specified in the maxWaitMillis parameter. Afterward, if the Jedis connection is still not available, the Jedis client throws the following exception:

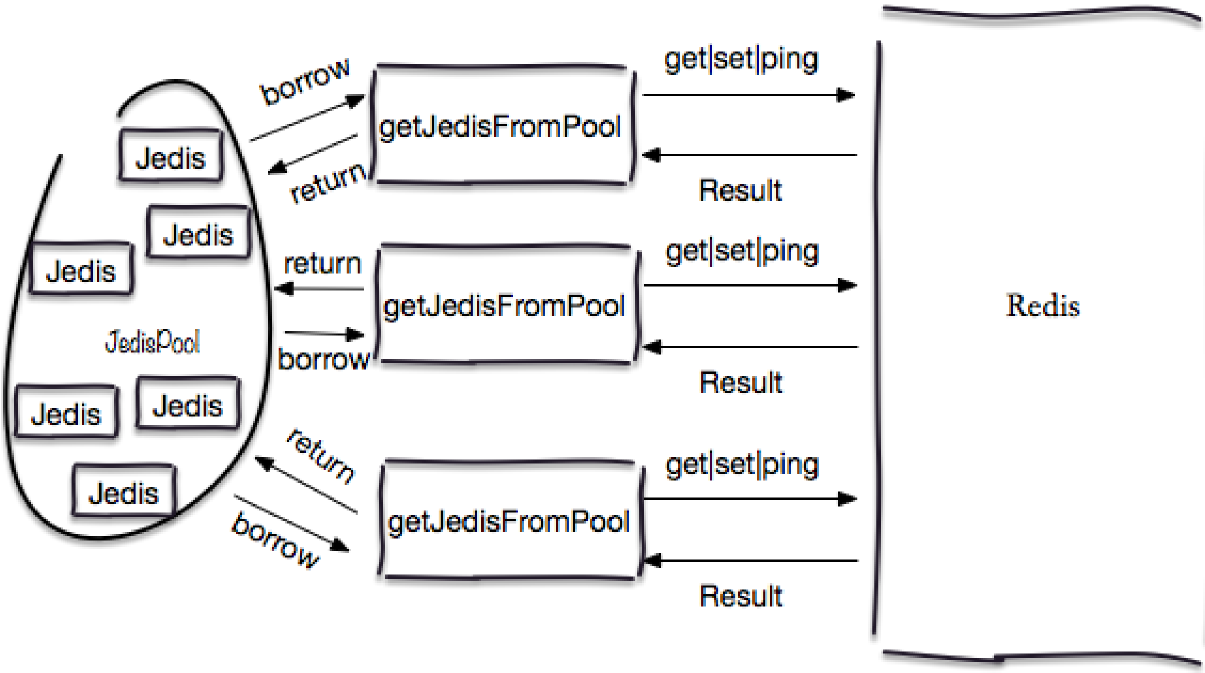
```
redis . clients . jedis . exceptions . JedisConne  ctionExcep  tion
:  Could   not   get   a   resource   from   the   pool
   …
Caused   by :  java . util . NoSuchElem  entExcepti  on :  Timeout
waiting   for   idle   object
    at   org . apache . commons . pool2 . impl . GenericObj  ectPool
. borrowObje  ct ( GenericObj  ectPool . java : 449 )
```

(2) The JedisPool parameter blockWhenExhausted is set to false.

When you set this parameter in this way, if no Jedis connection is available in JedisPool, the Jedis client directly throws the following exception:

```
redis . clients . jedis . exceptions . JedisConne  ctionExcep  tion
:  Could   not   get   a   resource   from   the   pool
   …
Caused   by :  java . util . NoSuchElem  entExcepti  on :  Pool
exhausted
    at   org . apache . commons . pool2 . impl . GenericObj  ectPool
. borrowObje  ct ( GenericObj  ectPool . java : 464 )
```

1.2. Exception description



The preceding exception occurs when the client fails to obtain any Jedis connection from JedisPool. You can set the maxTotal parameter to specify the maximum number of available connections in JedisPool. Possible causes are listed as follows:

(1) Connection exposure (a common cause)

The value of maxTotal is set to 8 by default. In the following code, the client has obtained eight Jedis connections from JedisPool, and not returned these connection s. When the client attempts to obtain the ninth Jedis connection by using jedisPool. getResource().ping(), the attempt fails.

```
 GenericObj  ectPoolCon  fig   poolConfig  =  new   GenericObj
 ectPoolCon  fig ();
 JedisPool   jedisPool  =  new   JedisPool ( poolConfig , " 127 . 0 .
 0 . 1 ",  6379 );
// The   client   borrows   connection  s   from   JedisPool   for
 eight   times ,  but   does   not   return   these   connection  s .
 for  ( int   i  =  0 ;  i  <  8 ;  i ++) {
     Jedis   jedis  =  null ;
     try  {
         jedis  =  jedisPool . getResourc  e ();
         jedis . ping ();
    }  catch  ( Exception   e ) {
         logger . error ( e . getMessage (),  e );
    }
}
 jedisPool . getResourc  e (). ping ();
```

We recommend that you follow these code rules:

```
 Run   the   following   command :
 Jedis   jedis  =  null ;
 try  {
     jedis  =  jedisPool . getResourc  e ();
    //  The   specific   service   request   that   the   client
 processes   after   obtaining   a   Jedis   connection .
     jedis . executeCom  mand ()
}  catch  ( Exception   e ) {
    // If   the   command   contains   a   key ,  we   recommend
 that   you   also   print   the   key   in   the   error   log .  You
   can   use   the   key   to   locate   the   node   where   the
 exception   occurs   in   a   cluster .
     logger . error ( e . getMessage (),  e );
}  finally  {
    // The   client   does   not   close   a   borrowed   Jedis
 connection .  Instead ,  the   client   returns   the   connection
 to   JedisPool   when   you   use   this   resource   pool .
     if  ( jedis  ! =  null )
         jedis . close ();
}
```

(2) For a high concurrency level, the maxTotal parameter is set to a low value.

The following example describes this issue:

- The time for running a command to obtain a resource consists of the time for borrowing and returning the resource, the time for JedisPool to run the command , and the time for network connection. The time is approximately 1 ms on average. The QPS for each connection is approximately 1,000.
- The required QPS is 50,000.

Therefore, the total number of available connections in JedisPool is theoretically 50 (50,000/1,000 = 50), and you can fine-tune the actual value of maxTotal according to the theoretical value.

(3) Jedis connection blocking

For example, connections to Redis are blocked in the conditions such as slow query . All connections wait for a period less than the timeout value. In this case, a high concurrency level can result in insufficient resources in JedisPool.

(4) Jedis connection denied

When the client attempts to obtain a connection from JedisPool, JedisPool has to generate a connection due to the lack of idle connections. However, the new connection is denied, as shown in the following code:

```
redis . clients . jedis . exceptions . JedisConne  ctionExcep  tion
:  Could   not   get   a   resource   from   the   pool
    at   redis . clients . util . Pool . getResourc  e ( Pool . java
: 50 )
    at   redis . clients . jedis . JedisPool . getResourc  e (
JedisPool . java : 99 )
    At   testadmin .  Main  ( testadmin .  Java :  14 )
```

```
Caused   by :  redis . clients . jedis . exceptions . JedisConne
ctionExcep  tion :  java . net . ConnectExc  eption :  Connection
refused
    at   redis . clients . jedis . Connection . connect ( Connection
. java : 164 )
    at   redis . clients . jedis . BinaryClie  nt . connect (
BinaryClie  nt . java : 80 )
    at   redis . clients . jedis . BinaryJedi  s . connect (
BinaryJedi  s . java : 1676 )
    at   redis . clients . jedis . JedisFacto  ry . makeObject (
JedisFacto  ry . java : 87 )
    at   org . apache . commons . pool2 . impl . GenericObj  ectPool
. create ( GenericObj  ectPool . java : 861 )
    at   org . apache . commons . pool2 . impl . GenericObj  ectPool
. borrowObje  ct ( GenericObj  ectPool . java : 435 )
    at   org . apache . commons . pool2 . impl . GenericObj  ectPool
. borrowObje  ct ( GenericObj  ectPool . java : 363 )
    at   redis . clients . util . Pool . getResourc  e ( Pool . java
: 48 )
   ...  2   more
Caused   by :  java . net . ConnectExc  eption :  Connection
refused
    at   java . net . PlainSocke  tImpl . socketConn  ect ( Native
Method )
    at   java . net . AbstractPl  ainSocketI  mpl . doConnect (
AbstractPl  ainSocketI  mpl . java : 339 )
    at   java . net . AbstractPl  ainSocketI  mpl . connectToA
ddress ( AbstractPl  ainSocketI  mpl . java : 200 )
    at   java . net . AbstractPl  ainSocketI  mpl . connect (
AbstractPl  ainSocketI  mpl . java : 182 )
    at   java . net . SocksSocke  tImpl . connect ( SocksSocke  tImpl
. java : 392 )
    at   java . net . Socket . connect ( Socket . java : 579 )
    at   redis . clients . jedis . Connection . connect ( Connection
. java : 158 )
   ...  9   more
```

The code at Redis. clients. jedis. connection. connect (connection. java: 158) indicates that the connection is a socket connection as follows:

```
 socket . setSoLinge  r ( true ,  0 ); //  Control   calls   close
()  method ,
      //  the   underlying   socket   is   closed
      //  immediatel  y
      // <-@ wjw_add
158 :   socket . connect ( new   InetSocket  Address ( host ,  port
),  connection  Timeout );
```

Note:

In this case, you must check whether the domain name configuration for ApsaraDB for Redis is correct and whether network conditions are normal during this period less than the timeout value.

(4) Other issues

1.3. Solutions

Based on the preceding analysis, the causes of the failure to obtain connections from JedisPool are complex. If you want to provide sufficient resources in JedisPool , increasing the value of maxTotal is not the only solution. The solution varies according to actual conditions.

1.4. Approaches

You can locate the issue and perform troubleshooting according to the preceding description. If the issue persists, submit a ticket.

2. Client buffer exception

2.1. Exception stack

```
 redis . clients . jedis . exceptions . JedisConne  ctionExcep  tion
 :  Unexpected   end   of   stream .
     at   redis . clients . util . RedisInput  Stream . ensureFill (
 RedisInput  Stream . java : 199 )
     at   redis . clients . util . RedisInput  Stream . readByte (
 RedisInput  Stream . java : 40 )
     at   redis . clients . jedis . Protocol . process ( Protocol .
 java : 151 )
......
```

2.2. Exception description

This client buffer exception may occur due to the following causes:

(1) Common cause: multiple threads use the same Jedis connection. Normally, one thread uses one Jedis connection. You can use JedisPool to manage Jedis connections to secure threads and avoid this issue. The following example shows that two threads share one Jedis connection:

```
 new   Thread ( new   Runnable () {
     public   void   run () {
         for  ( int   i  =  0 ;  i  <  100 ;  i ++) {
             jedis . get (" hello ");
         }
     }
}). start ();
 new   Thread ( new   Runnable () {
     public   void   run () {
         for  ( int   i  =  0 ;  i  <  100 ;  i ++) {
             jedis . hget (" haskey ", " f ");
         }
     }
}). start ();
```

(2) The client buffer is full.

ApsaraDB for Redis provides three types of client buffers:

- Normal client buffer: receives normal commands, such as GET, SET, MSET, HGETALL, and ZRANGE.
- Replica client buffer: synchronizes write commands from a master node during replications.
- PUBSUB buffer: the PUBSUB command is not a normal command, so the command has an independent buffer.

You can configure the client buffer for ApsaraDB for Redis in the following way:

```
client - output - buffer - limit  < class > < hard   limit > < soft
limit > < soft   seconds >
```

- class: specifies the type of the client. Valid values: normal, slave, and pubsub.
- hard limit: if a client uses the output buffer that is more than the value of hard limit, the system terminates the client immediately. Unit: bytes.
- soft limit and soft seconds: if a client uses the output buffer more than the value of soft limit (unit: bytes) and if the client uses the output buffer for a period of time equal to the value of soft seconds (unit: seconds), the system terminates the client immediately.

The following example shows the buffer configuration for ApsaraDB for Redis. In the specified condition, the system terminates the client immediately and shows the exception `Unexpected   end   of   stream`.

```
redis >  config   get   client - output - buffer - limit
1 ) " client - output - buffer - limit "
2 ) " normal   524288000   0   0   slave   2147483648   536870912
480   pubsub   33554432   8388608   60 "
```

(3) The Redis service automatically disconnects a long idle connection. You can check the timeout setting and JedisPool configuration to determine whether the idle connection detection is required.

3. Solutions and approaches

Customer: you can check the code of your service to make sure that you use JedisPool to manage Jedis connections and check whether multiple threads share one Jedis connection.

Ticket: you can submit a ticket to check whether the preceding condition (2) or (3) causes the issue. The value of `timeout` is 0 in ApsaraDB for Redis by default. You cannot modify this value. The value of `client - output - buffer - limit` is 500

MB by default. This is a value that Alibaba Cloud has optimized. If the value of the parameter is more than 500 MB, the client returns too many values. In this case, to ensure performance and stability of the service, we recommend that you optimize the application.

3. Invalid client address (ApsaraDB for Redis provides a whitelist of clients)

3.1. Exception stack

```
Caused   by :  redis . clients . jedis . exceptions . JedisDataE
xception :  ERR   illegal   address
    at   redis . clients . jedis . Protocol . processErr  or (
Protocol . java : 117 )
    at   redis . clients . jedis . Protocol . process ( Protocol .
java : 151 )
    at   redis . clients . jedis . Protocol . read ( Protocol . java
: 205 )
   ......
```

3.2. Exception description

The ApsaraDB for Redis instance has a whitelist of clients configured. The IP address of the current client that connects to the instance does not exist in the whitelist.

3.3. Solutions

Add the IP address of the current client to the whitelist.

3.4. Approaches

You can perform troubleshooting or submit a ticket.

4. The maximum number of client connections reached

4.1. Exception stack

```
redis . clients . jedis . exceptions . JedisDataE  xception :  ERR
max   number   of   clients   reached
```

4.2. Exception description

The number of client connections is more than the value of maxclients configured on an ApsaraDB for Redis instance.

4.3. Solutions

You can submit a ticket to temporarily increase the value of maxclients and locate the cause of the connection burst.

4.4. Approaches

- Ticket: you can submit a ticket to temporarily adjust the value of maxclients and locate the cause of the connection burst.
- Customer: you can locate the client that most frequently connects to the ApsaraDB for Redis instance, and analyze the cause, such as JedisPool configuration.

5. Client read and write timeout

5.1. Exception stack

```
redis . clients . jedis . exceptions . JedisConne  ctionExcep  tion
:  java . net . SocketTime  outExcepti  on :  Read   timed   out
```

5.2. Exception description

The possible causes of the exception are listed as follows: (1) The read and write timeout values are too low. (2) Slow query or connection blocking occurs. (3) The network is unstable.

5.3. Solutions

You can submit a ticket and provide read and write timeout values for troubleshooting purposes.

5.4. Approaches

You can submit a ticket for troubleshooting purposes.

6. Exceptions related to passwords

6.1. Exception stack

ApsaraDB for Redis has password verification configured. But a client does not provide any password in a request as shown in the following code:

```
Exception   in   thread  " main "  redis . clients . jedis .
exceptions . JedisDataE  xception :  NOAUTH   Authentica  tion
required .
     at   redis . clients . jedis . Protocol . processErr  or (
Protocol . java : 127 )
     at   redis . clients . jedis . Protocol . process ( Protocol .
java : 161 )
     at   redis . clients . jedis . Protocol . read ( Protocol . java
: 215 )
```

ApsaraDB for Redis does not have password verification configured. But a client provides a password in a request as shown in the following code:

```
Exception   in   thread  " main "  redis . clients . jedis .
exceptions . JedisDataE  xception :  ERR   Client   sent   AUTH ,
but   no   password   is   set
```

```
     at   redis . clients . jedis . Protocol . processErr  or (
Protocol . java : 127 )
     at   redis . clients . jedis . Protocol . process ( Protocol .
java : 161 )
     at   redis . clients . jedis . Protocol . read ( Protocol . java
: 215 )
```

A client provides an incorrect password in a request as shown in the following code:

```
redis . clients . jedis . exceptions . JedisDataE  xception :  ERR
invalid   password
    at   redis . clients . jedis . Protocol . processErr  or (
Protocol . java : 117 )
    at   redis . clients . jedis . Protocol . process ( Protocol .
java : 151 )
    at   redis . clients . jedis . Protocol . read ( Protocol . java
: 205 )
```

6.2. Solutions: check whether the service has password authentication configured and whether the client provides a correct password.

7. Transaction exception

7.1. Exception stack

```
redis . clients . jedis . exceptions . JedisDataE  xception :
EXECABORT   Transactio  n   discarded   because   of   previous
errors
```

7.2. Exception description

This is a transaction exception in ApsaraDB for Redis. The transaction contains an incorrect command, such as the unknown sett command in the following code:

```
 127 . 0 . 0 . 1 : 6379 >  multi
 OK
 127 . 0 . 0 . 1 : 6379 >  sett   key   world
( error )  ERR   unknown   command  ' sett '
 127 . 0 . 0 . 1 : 6379 >  incr   counter
 QUEUED
 127 . 0 . 0 . 1 : 6379 >  exec
( error )  EXECABORT   Transactio  n   discarded   because   of
 previous   errors .
```

7.3. Solutions and approaches

Customer: you can check the code of your service for troubleshooting purposes.

8. Class conversion error

8.1. Exception stack

```
java . lang . ClassCastE  xception :  java . lang . Long   cannot
be   cast   to   java . util . List
         at   redis . clients . jedis . Connection . getBinaryM
ultiBulkRe  ply ( Connection . java : 199 )
```

```
          at   redis . clients . jedis . Jedis . hgetAll ( Jedis .
 java : 851 )
          at   redis . clients . jedis . ShardedJed  is . hgetAll (
 ShardedJed  is . java : 198 )
```

```
 java . lang . ClassCastE  xception :  java . util . ArrayList
 cannot   be   cast   to  [ B
          at   redis . clients . jedis . Connection . getBinaryB
 ulkReply ( Connection . java : 182 )
          at   redis . clients . jedis . Connection . getBulkRep  ly (
 Connection . java : 171 )
          at   redis . clients . jedis . Jedis . rpop ( Jedis . java :
 1109 )
          at   redis . clients . jedis . ShardedJed  is . rpop (
 ShardedJed  is . java : 258 )
.......
```

8.2. Exception description

Normally, one thread uses one Jedis connection. If multiple threads share the same Jedis connection, this exception occurs. You can use JedisPool to avoid this exception . The following example shows that two thread share the same Jedis connection. The GET and HGETALL commands return different types of data.

```
 new   Thread ( new   Runnable () {
     public   void   run () {
         for  ( int   i  =  0 ;  i  <  100 ;  i ++) {
             jedis . set (" hello ", " world ");
             jedis . get (" hello ");
         }
     }
}). start ();
 new   Thread ( new   Runnable () {
     public   void   run () {
         for  ( int   i  =  0 ;  i  <  100 ;  i ++) {
             jedis . hset (" hashkey ", " f ", " v ");
             jedis . hgetAll (" hashkey ");
         }
     }
}). start ();
```

8.3. Solutions and approaches

You can check the code of your service for troubleshooting purposes.

9. Command error

9.1. Exception stack

```
 Exception   in   thread  " main "  redis . clients . jedis .
 exceptions . JedisDataE  xception :  WRONGTYPE   Operation   against
   a   key   holding   the   wrong   type   of   value
     at   redis . clients . jedis . Protocol . processErr  or (
 Protocol . java : 127 )
     at   redis . clients . jedis . Protocol . process ( Protocol .
 java : 161 )
```

```
     at   redis . clients . jedis . Protocol . read ( Protocol . java
 : 215 )
.....
```

9.2. Exception description

For example, key=” hello” indicates a key of String type, but the HGETALL command returns a key of hash type. Therefore, the exception occurs.

```
jedis . set (" hello "," world ");
jedis . hgetAll (" hello ");
```

9.3. Solutions and approaches

You can check the code of your service for troubleshooting purposes.

10. Memory usage of ApsaraDB for Redis is more than the value of maxmemory

10.1. Exception stack

```
redis . clients . jedis . exceptions . JedisDataE  xception :  OOM
command   not   allowed   when   used   memory  > ' maxmemory '.
```

10.2. Exception description

The memory usage of a node of ApsaraDB for Redis is more than the value of maxmemory on the instance.

10.3. Solutions

Possible causes are listed as follows:

- Service data increases normally.
- Client buffer exceptions occur due to reasons such as the improper use of the MONITOR and PUBSUB commands.
- In cache-only scenarios, ApsaraDB for Redis has maxmemory-policy configured in an incorrect way. For example, the volatile-lru eviction policy is not configured for expired keys.

In emergency conditions, you can submit a ticket to temporarily adjust the value of maxmemory. Afterward, you can require upgrading or downgrading of the configuration.

10.4. Approaches

- Customer: you can locate the cause of increased memory usage.
- Ticket: you can submit a ticket to temporarily adjust the value of maxmemory. Afterward, you can require upgrading or downgrading the configuration.

11. ApsaraDB for Redis is loading persistence files

11.1. Exception stack

```
redis.clients.jedis.exceptions.JedisDataException: LOADING Redis is
 loading the dataset  in  memory
```

11.2. Exception description

When a Jedis client tries to connect to an ApsaraDB for Redis instance, the instance is loading persistence files and cannot normally process read and write requests.

11.3. Solutions

Normally, this exception does not occur in ApsaraDB for Redis. If this exception occurs, submit a ticket.

4. Approaches

You can submit a ticket for troubleshooting purposes.

12. Lua script timeout

12.1. Exception stack

```
redis . clients . jedis . exceptions . JedisDataE  xception :  BUSY
Redis   is   busy   running   a   script .  You   can   only   call
SCRIPT   KILL   or   SHUTDOWN   NOSAVE .
```

12.2. Exception description

An ApsaraDB for Redis instance is running a Lua script for a period of time that is more than the value of LUA-time-limit. In this case, if a Jedis client tries to connect to the instance, the preceding exception occurs.

12.3. Solutions

The system displays the exception message: `You can only call SCRIPT KILL or SHUTDOWN NOSAVE`. Therefore, you can run the `SCRIPT KILL` command to terminate the Lua script.

12.4. Approaches

You can handle the exception by yourself. If the exception persists, submit a ticket to request technical support.

13. Connection timeout

13.1. Exception stack

```
redis . clients . jedis . exceptions . JedisConne  ctionExcep  tion
:  java . net . SocketTime  outExcepti  on :  connect   timed   out
```

13.2. Exception description

Possible causes are listed as follows:

- The connection timeout value is too low.
- The value of tcp-backlog reaches the upper limit. This fails the new connection.
- Network failures occur between the client and the service.

13.3. Solutions

You can submit a ticket and provide the connection timeout value for troubleshooting purposes.

13.4. Approaches

You can submit a ticket for troubleshooting purposes.

14. Lua script write timeout

14.1. Exception stack

```
( error )  UNKILLABLE   Sorry   the   script   already   executed
 write   commands   against   the   dataset .  You   can   either
 wait   the   script   terminatio  n   or   kill   the   server   in
 a   hard   way   using   the   SHUTDOWN   NOSAVE   command .
```

14.2. Exception description

An ApsaraDB for Redis instance is running a Lua script for a period of time more than the value of lua-time-limit, and has run a write command. In this case, if a Jedis client tries to connect to the instance, the preceding exception occurs.

14.3. Solutions

You can submit a ticket to require emergency troubleshooting. Afterward, the administrator restarts the service or performs the failover operation on the ApsaraDB for Redis instance.

14.4. Approaches

You can submit a ticket for troubleshooting purposes.

15. Class loading error

15.1. Exception stack

The following example shows that required classes and methods are not available:

```
Exception   in   thread  " commons - pool - EvictionTi  mer "  java .
lang . NoClassDef  FoundError :  redis / clients / util / IOUtils
    at   redis . clients . jedis . Connection . disconnect (
Connection . java : 226 )
    at   redis . clients . jedis . BinaryClie  nt . disconnect (
BinaryClie  nt . java : 941 )
    at   redis . clients . jedis . BinaryJedi  s . disconnect (
BinaryJedi  s . java : 1771 )
    at   redis . clients . jedis . JedisFacto  ry . destroyObj  ect (
JedisFacto  ry . java : 91 )
    at           org . apache . commons . pool2 . impl . GenericObj
ectPool . destroy ( GenericObj  ectPool . java : 897 )
    at   org . apache . commons . pool2 . impl . GenericObj  ectPool
. evict ( GenericObj  ectPool . java : 793 )
    at   org . apache . commons . pool2 . impl . BaseGeneri
cObjectPoo  l $ Evictor . run ( BaseGeneri  cObjectPoo  l . java :
1036 )
    at   java . util . TimerThrea  d . mainLoop ( Timer . java : 555
)
    at   java . util . TimerThrea  d . run ( Timer . java : 505 )
Caused   by :  java . lang . ClassNotFo  undExcepti  on :  redis .
clients . util . IOUtils
......
```

15.2. Exception description

A Jedis client throws an exception to indicate that the target class is not available when running the required command. This exception is probably caused by loading multiple Jedis versions such as Jedis 2. 9. 0 and Jedis 2.6. The code runs well during compilation. However, the class loader loads an earlier Jedis version and leads to the failure to load the target class at runtime.

15.3. Solutions

You can exclude repeated Jedis code to solve this issue. For example, use the Maven dependency tree to remove or exclude useless dependencies.

15.4. Approaches

You can check the code of your service for troubleshooting purposes.

16. Unknown commands for the service

16.1. Exception stack

The following example shows that a client runs the GEOADD command, but the ApsaraDB for Redis service indicates that the command is unknown in the response.

```
redis . clients . jedis . exceptions . JedisDataE  xception :  ERR
unknown   command  ' GEOADD '
```

16.2. Exception description

Possible causes of the exception are listed as follows:

- ApsaraDB for Redis does not support some Redis commands, or only some minor versions of ApsaraDB for Redis support these Redis commands. For example, the GEOADD command is included in the GEO API for Redis 3.2.
- The command is incorrect. The Jedis client does not support the commands that you combine directly. Instead, each API calls a required function.

16.3. Solutions

You can ask the administrator to check whether any ApsaraDB for Redis edition supports the required command. If so, you can upgrade to the target minor version.

16.4. Approaches

- Administrator: checks whether the ApsaraDB for Redis edition supports the required command.
- Customer: you can upgrade to the target minor version if the ApsaraDB for Redis edition supports the required command.

17. Improper use of a pipeline

17.1. Exception stack

```
redis.clients.jedis.exceptions.JedisDataException: Please close
 pipeline  or  multi  block  before calling this  method .
```

17.2. Exception description

A Jedis client usually calls response.get() to obtain target values before calling pipeline.sync(). However, the client fails to call pipeline.set() before calling pipeline .sync(). You can run the MONITOR command to check whether any write command runs successfully. The following example shows the exception.

```
Jedis   jedis  =  new   Jedis (" 127 . 0 . 0 . 1 ",  6379 );
Pipeline   pipeline  =  jedis . pipelined ();
pipeline . set (" hello ", " world ");
pipeline . set (" java ", " jedis ");
Response < String >  pipeString  =  pipeline . get (" java ");
```

```
// The   GET   command   must   follow   the   SYNC   command .  To
   obtain   multiple   values ,  we   recommend   that   you   use
 List < Object >  objectList  =  pipeline . syncAndRet  urnAll ();
 System . out . println ( pipeString . get ());
// The   command   takes   effect .
 pipeline . sync ();
```

The set field in the response is initialized as false. When the Jedis client obtains the analysis response, if the set field is set to false, the client reports an error.

```
 public   T   get () {
  //  if   response   has   dependency   response   and   dependency
 is   not   built ,
  //  build   it   first   and   no   more !!
   if  ( dependency  ! =  null  &&  dependency . set  && !  dependency
 . built ) {
     dependency . build ();
  }
   if  (!  set ) {
     throw   new   JedisDataE  xception (
        " Please   close   pipeline   or   multi   block   before
 calling   this   method .");
  }
   if  (!  built ) {
     build ();
  }
   if  ( exception  ! =  null ) {
     throw   exception ;
  }
   return   response ;
}
```

The pipeline.sync() method sets the set field to true in each result value.

```
 public   void   sync () {
   if  ( getPipelin  edResponse  Length () >  0 ) {
     List < Object >  unformatte  d  =  client . getAll ();
     for  ( Object   o  :  unformatte  d ) {
       generateRe  sponse ( o );
    }
  }
}
```

generateResponse(o):

```
 protected   Response <? >  generateRe  sponse ( Object   data ) {
   Response <? >  response  =  pipelinedR  esponses . poll ();
   If  ( response ! =  null ) {
     response . set ( data );
  }
   return   response ;
}
```

response.set(data);

```
 public   void   set ( Object   data ) {
     this . data  =  data ;
     set  =  true ;
```

```
}
```

17.3. Solutions

To parse multiple result values, we recommend that you use pipeline.syncAndRet urnAll(). In the following example, the pipeline simulates running the HGETALL command for multiple times.

```
/**
*  The   pipeline   simulates   running   the   HGETALL   command
 for   multiple   times .
* @ param   keyList
* @ return
*/
 public   Map < String ,  Map < String ,  String >>  mHgetAll ( List <
 String >  keyList ) {
//  1 .  Generate   the   pipeline   object .
 Pipeline   pipeline  =  jedis . pipelined ();
//  2 .  The   pipeline   runs   the   command .  The   command   does
   not   take   effect   at   the   moment .
 for  ( String   key  :  keyList ) {
   pipeline . hgetAll ( key );
}
//  3 .  The   Jedis   client   runs   the   command .  The
 syncAndRet  urnAll ()  method   returns   the   result .
 List < Object >  objectList  =  pipeline . syncAndRet  urnAll ();
 if  ( objectList  ==  null  ||  objectList . isEmpty ()) {
   return   Collection  s . emptyMap ();
}
//  4 .  Parse   the   result .
 Map < String , Map < String ,  String >>  resultMap  =  new   HashMap
 < String ,  Map < String , String >>();
 for  ( int   i  =  0 ;  i  <  objectList . size ();  i ++) {
   Object   object  =  objectList . get ( i );
   Map < String ,  String >  map  = ( Map < String ,  String >)
 object ;
   String   key  =  keyList . get ( i );
   resultMap . put ( key ,  map );
}
 return   resultMap ;
}
```

17.4. Approaches

You can modify the code of your service.

18. Administrator commands unavailable to common users

18.1. Exception stack

```
 redis . clients . jedis . exceptions . JedisDataE  xception :  ERR
 command   role   not   support   for   normal   user
```

18.2. Exception description

The required command is not available.

18.3. Solutions

You cannot use the command directly. To solve this issue, submit a ticket.

18.4. Approaches

You can check whether the command is available by reading related documents.

Other issues:

1. How do I select a Jedis version?

In principle, you can select the latest release. However, we recommend that you select a version that has been released for a certain period. A serious issue occurred in an earlier Jedis version during the release history. Jedis 2.9.0 is a stable version so far.

```
< dependency >
    < groupId > redis . clients </ groupId >
    < artifactId > jedis </ artifactId >
    < version > 2 . 9 . 0 </ version >
    < type > jar </ type >
    < scope > compile </ scope >
</ dependency >
```

2. Is JedisCluster in Jedis is the client of the ApsaraDB for Redis cluster edition?

For more information, see Comparison among Redis 4.0, Codis, and ApsaraDB for Redis clusters

JedisPool parameters

1. Resource setting and usage

Number	Name	Description	Default value	Recommended value
1	maxTotal	The maximum number of connections in the JedisPool.	8	-
2	maxIdle	The maximum number of idle connections in JedisPool.	8	-
3	minIdle	The minimum number of idle connections in JedisPool.	0	-

Number	Name	Description	Default value	Recommended value
4	blockWhenExhausted	Specifies whether the client waits for the connection when no resource is available in JedisPool. The maxWaitMillis parameter takes effect only when the blockWhenExhausted parameter is set to true.	true	We recommend that you use the default value.
5	maxWaitMillis	Specifies the maximum time for the client to wait for the connection when no resource is available in JedisPool. Unit: milliseconds.	-1: specifies no timeout.	We recommend that you do not use the default value.
6	testOnBorrow	Specifies whether to use the Ping command to check the connection validity when a client borrows a connection from JedisPool. If the connection is invalid, JedisPool removes the connection.	false	We recommend that you set the parameter to false when handling large data volumes. If you set the parameter to true, the system runs the Ping command once more.

Number	Name	Description	Default value	Recommended value
7	testOnReturn	Specifies whether to use the Ping command to check the connection validity when a client returns a borrowed connection to JedisPool. If the connection is invalid, JedisPool removes the connection.	false	We recommend that you set the parameter to false when handling large data volumes. If you set the parameter to true, the system runs the Ping command once more.
8	jmxEnabled	Specifies whether to enable Java Management Extensions (JMX) monitoring to monitor the utilization of Jedis clients.	true	We recommend that you set the parameter to true. The monitored application must be running during the monitoring.

2. Monitoring of idle resources

This is to detect idle Jedis objects. This feature includes four parameters. You can set the testWhileIdle parameter to true to enable the feature. The parameters are described in the following table.

Number	Name	Description	Default value	Recommended value
1	testWhileIdle	Specifies whether to enable the monitoring of idle resources.	false	We recommend that you set the parameter to true.
2	timeBetweenEvictionRunsMillis	Specifies the cycle of monitoring idle resources. Unit: milliseconds.	-1: specifies that the system does not monitor idle resources.	We recommend that you customize a monitoring cycle. You can also use the default value.
3	minEvictableIdleTimeMillis	Specifies the minimum idle time for resources in JedisPool. The system removes the resource that has been idle for the specified period. Unit: milliseconds.	1,000 × 60 × 30 milliseconds = 30 minutes	You can customize the value as needed, or use the default value in most scenarios.
4	numTestsPerEvictionRun	Specifies the number of connections sampled during the monitoring of idle resources.	3	You can fine-tune the value according to the number of connections in your application. If you set the parameter to -1, JedisPool monitors all connections.

2 Comparison among Redis 4.0, Codis, and ApsaraDB for Redis clusters

Architecture comparison

Redis 4.0 cluster

The Redis 4.0 cluster runs in a decentralized structure. The metadata of the cluster is distributed across nodes. During the master-replica failover operation, multiple nodes negotiate with each other and elect a master node. Redis provides the redis-trib .rb tool for cluster deployment and operations and maintenance (O&M).

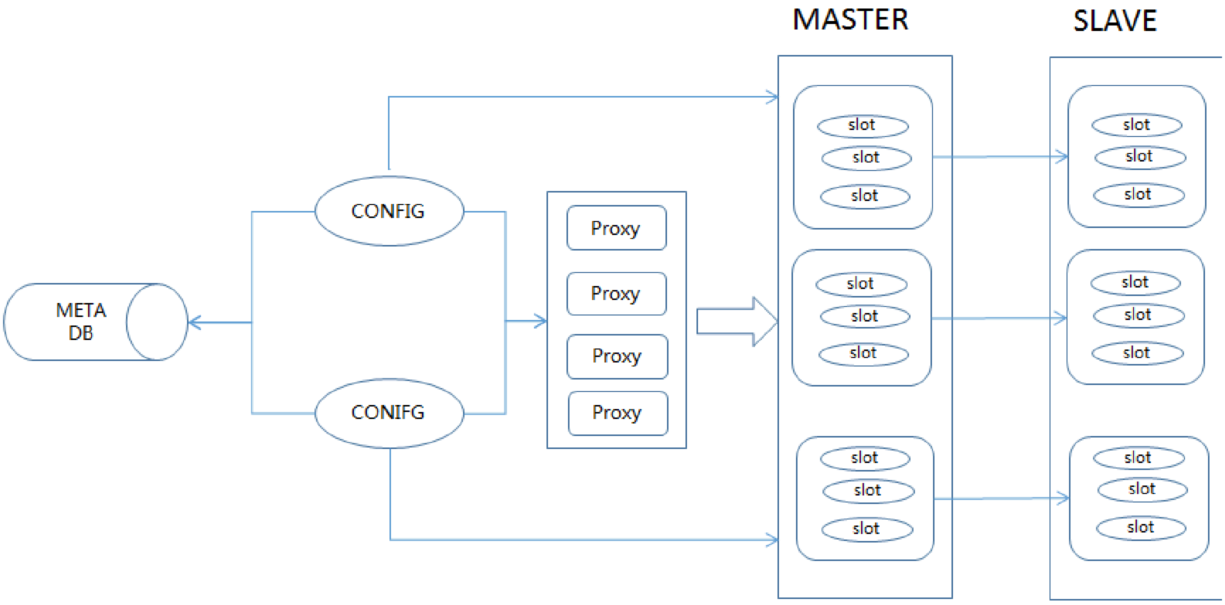
The connection from a client to hashed database nodes is dependent on a smart client . The client evaluates and selects a route based on the node information that Redis returns. For example, if a client initiates a request for a node and the requested key is not located on this node, the client evaluates the returned MOVE or ASK redirection and redirects the request to the corresponding node.

Codis cluster

- The Codis cluster consists of the following components:
  - Codis-server: a Redis database where the source code has been modified and that supports slots, scaling up and out, and migration.
  - Codis-proxy: a multi-thread kernel written in Go.
  - Codis Dashboard: a cluster management tool.
- Codis provides a Web-based graphical interface for managing the cluster.
- The metadata of the cluster is stored in ZooKeeper or etcd.
- The independent module Codis-HA performs the master-replica failover operation for Redis nodes.
- The client of proxy-based Codis is insensitive to changes of a route table. The client uses the `LIST PROXY` command from Codis Dashboard to retrieve the list of all proxy nodes. Based on the round-robin scheduling policy, the client determines the target proxy node to perform load balancing.

ApsaraDB for Redis

The ApsaraDB for Redis cluster edition uses the architecture as follows:



- The ApsaraDB for Redis cluster edition consists of the following components:
    - Redis-config: a cluster management tool that uses a dual-node structure and that supports disaster recovery.
    - Redis-server: a Redis database where source code has been optimized and that supports slots, scaling up and out, and migration.
    - Redis-proxy: a single-thread stateless kernel written in C++ 14. An ApsaraDB for Redis cluster can contain multiple proxy nodes according to the cluster type.
- The metadata of the cluster is stored on a meta database.
- The independent high-availability (HA) module performs the master-replica failover operation in the cluster.
- In the proxy-based ApsaraDB for Redis cluster, a client accesses the service based on a virtual IP address (VIP) that is resolved into a connection address. You are insensitive to the route information and do not need to handle load balancing for proxy nodes.

Performance comparison

Stress testing environment

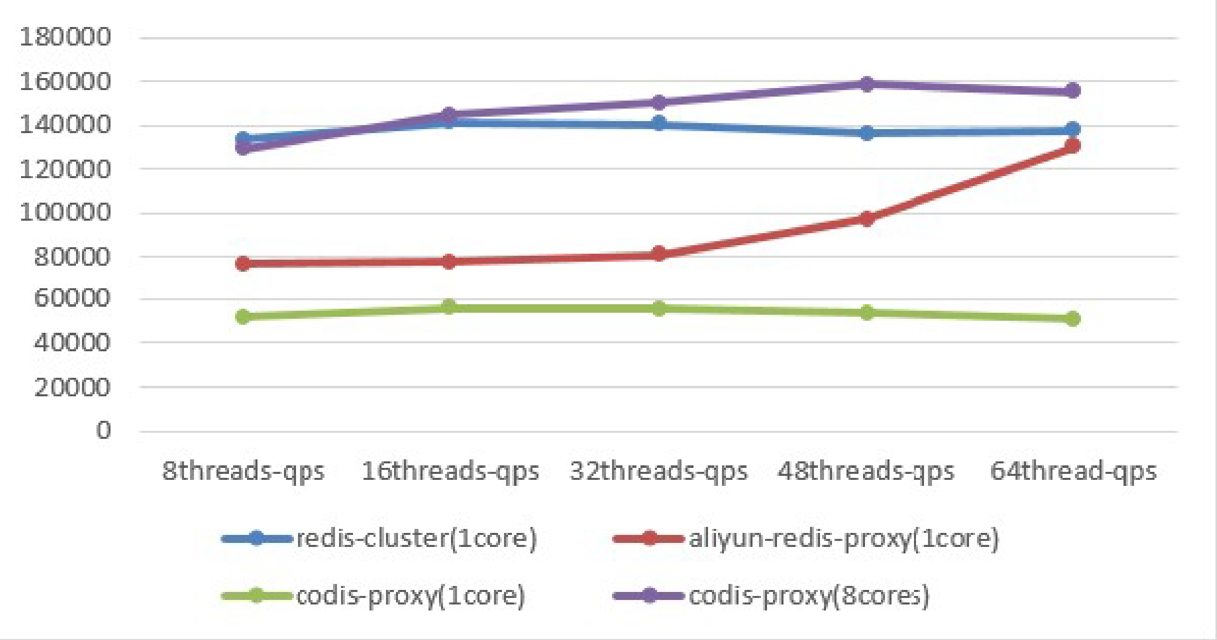
Each of the preceding Redis clusters has been established on three different physical servers. Each physical server supports the gigabit network interface controller (NIC), 24-core CPU, and 189 GB memory. The memtier_benchmark, Codis proxy or Alibaba Cloud proxy, and Redis server stress testing tools run on different physical servers. The Redis server uses the Redis kernel of the corresponding cluster.

The key size is 32 bytes and the ratio of set/get operations is 1:10. Each thread processes 16 clients. The stress testing for each cluster lasts five minutes in the 8-thread, 16-thread, 32-thread, 48-thread and 64-thread scenarios.

[DO NOT TRANSLATE]

Every cluster has eight master databases and eight replica databases. The append-only file (AOF) feature is enabled for these databases. The minimum buffer for an AOF rewrite operation is 64 MB. The stress testing is targeted to a single Redis 4.0 node, a single-core Redis-proxy node of ApsaraDB for Redis, a single-core Codis-proxy node, or an 8-core Codis-proxy node. Codis uses Go 1.7.4.

The stress testing results are as follows.



According to the result, the single-core Codis-proxy delivers the poorest performanc e. In the stress testing for the 8-core Codis-proxy node, hashtags are not used for keys . This is equivalent to scattering the requests to eight backend database nodes, or equivalent to eight Redis-proxy nodes of ApsaraDB for Redis. Therefore, the result data indicates excellent performance.

The performance of the single-core Redis-proxy node of ApsaraDB for Redis approximates to that of the original Redis database node under sufficiently stressed conditions. In the running environment that your service requires, if you use an original Redis cluster, the client must support cluster protocols, parse the `MOVE` and `ASK` redirections, and redirect requests to the corresponding node. If the client tries to access a key randomly, the access attempts may be repeated twice before the client can access the key. Therefore, the performance cannot be the same as that of a single-node cluster.

Comparison of features

Comparison of protocols

Feature	Redis 4.0 cluster	Codis cluster	Alibaba Cloud ApsaraDB for Redis cluster
Transactions	Supported in the same slot	Not supported	Supported in the same slot
SUB/PUB	Supported in the same slot	Not supported	Supported
FLUSHALL	Supported	Not supported	Supported
SELECT	Not supported	Not supported	Supported
MSET/MGET	Supported in the same slot	Supported	Supported

Comparison of horizontal scaling

The Redis 4.0 cluster, Codis cluster, and ApsaraDB for Redis distributed cluster support slot-based management. A slot is the basic unit for scaling.

Horizontal scaling of a distributed cluster includes managing routing information and migrating data for cluster nodes. A key is the basic unit for data migration in these clusters.

Principle of horizontal scaling of the Redis 4.0 cluster

In the Redis 4.0 cluster, specified slots can move in a node. The cluster automatically redistributes slots that have been added to an empty node according to the distribution of existing slots in the nodes of the cluster. You can use the move_slot method of redis-trib.rb to move slots in the way as follows:

1. Call the `SETSLOT` command to modify status of source and target nodes.
2. Retrieve the list of slots on the source node.
3. Call the `MIGRATE` command to migrate keys. During the migration, the Redis 4.0 cluster stays in blocking status. The system indicates a successful migration only after the migrated keys are restored on the target node.

4. Call the `SETSLOT` command to modify status of source and target nodes.

How can the system ensure data consistency during the migration process?

The Redis 4.0 cluster supports redirections during a migration. The system returns the ASK redirection to a client. After receiving the redirection , the client sends the `ASKING` command and then a request to the target node. Afterward, the client can connect to the target node. The system returns the redirection to the client when the target key stays in all of the following conditions:

- The slot that the key belongs to is located on the node. If not, the system returns the MOVE redirection.
- The slot stays in migration status.
- The key does not exist.

Therefore, the migration in the Redis 4.0 cluster is a synchronous-blocking operation . If the key is not empty, the key is readable and writable even when the correspond ing slot stays in migration status to ensure data consistency.

Principle of horizontal scaling of the Codis cluster

Codis redistributes slots in the same way as the Redis 4.0 cluster. The kernel of Codis-server neither stores slot information nor analyzes the slot that the target key belongs to. Codis-server records the key in the slot-key format to a dictionary that contains key-value pairs only during the `DBADD` operation. If the key contains a tag, Codis-server performs the CRC32 calculation for the tag, and adds the key in the CRC value-key format to the skip list that contains key-value pairs.

Codis Dashboard initiates the migration state machine program in the background. The program notifies all proxy nodes to start the migration in the preparation stage. If one or more proxy nodes fail, the migration fails. The migration procedure of the Codis cluster is similar to that of the Redis 4.0 cluster, except the following items:

- The Codis cluster stores slot status in ZooKeeper or etcd.
- The Codis cluster uses the `SLOTSMGRTT AGSLOT` command instead of the `MIGRATE` command. When running the `SLOTSMGRTT AGSLOT` command, Codis migrates a key. If the key contains a tag, Codis migrates all keys from the preceding skip list.

How can the system ensure data consistency during the migration process?

The migration in the Codis cluster is also a synchronous-blocking operation. The proxy module works to ensure data consistency, because the Codis-server kernel does not maintain slot status. In response to a request, the Codis-proxy node checks the status of the slot that the target key belongs to. If the slot stays in migration status , the Codis-proxy node sends the command for migrating the specified key to the target Codis-server node. At the end of key migration, the Codis-proxy node routes the request to the target Codis-server node. This migration is simple and requires few modifications to the Redis kernel. But the slow migration may cause client lag for long time.

Principle of horizontal scaling of ApsaraDB for Redis

ApsaraDB for Redis allows you to specify a source, a node, and a slot to distribute the slot. The service also supports dynamic distribution of slots based on parameters such as node capacity and slot size to minimize the interruption of the cluster service . The migration procedure is as follows:

1. The Redis-config node calculates the source and target nodes and slots.
2. The Redis-config node sends the command for migrating slots to the Redis-server node.
3. The Redis-server node starts the state machine program and migrates multiple keys.
4. The Redis-config node regularly checks the Redis-server node and updates the slot status.

How can the system ensure data consistency during the migration process?

Different from Codis, ApsaraDB for Redis maintains slot information in the kernel. Codis supports migrating a complete slot and Redis 4.0 supports migrating a single key. However, Alibaba Cloud has optimized the kernel of ApsaraDB for Redis to support multiple migrations and accelerate the migration speed.

The data migration in ApsaraDB for Redis is an asynchronous operation. The system does not check whether data has been restored on the target node before the response of successful migration. Instead, to verify that the migration is successful, the target node notifies the source node of the successful migration and the source node regularly checks the migration status on the target node. In this way, the migration can minimize the synchronous-blocking impact on the connections to other slots.

During the asynchronous migration, to ensure data consistency, ApsaraDB for Redis processes a normal write operation if the request is a write request and if the key does not exist in the list of keys for migration. Other mechanisms to ensure data consistency in ApsaraDB for Redis are the same as that in the Redis 4.0 cluster.

Other comparisons

Feature	Redis 4.0	Codis	ApsaraDB for Redis
Kernel hot upgrade	Not supported	Not supported	Supported
Proxy hot upgrade	No proxy	Not supported	Supported
Number of slots	16,384	1,024	16,384
Password	Not supported. You need to modify the redis-trib.rb script.	Supported. All components must use the same password.	Supported

The kernel and proxy node of ApsaraDB for Redis support hot upgrades. Connections to the service are maintained and clients still work normally during hot upgrades.

3 View memory usage of all instances under the current account

You can call an API operation based on the RAM user information and the region ID to check memory usage of the instances under the current account. The script is as follows:

get_used_memory.zip

Note:
The query result is the memory usage during the period 20 minutes before the current time of the instances.

Procedure

1. Install the Alibaba Cloud Python SDK dependency package by running the following command: `pip install aliyun-python-sdk-core`.
2. Run the preceding script file in Python. In the script, the -r parameter is cn-hangzhou by default. Separate multiple region values with commas. The detailed command is as follows:

```
python get_used_memory.py -i ****** -s **********-r cn-hangzhou,cn-beijing -o XXX.csv
```

Note:
You can run the `python get_used_memory.py -h` command to check the usage of each parameter.

4 How do I search for large keys?

Background

ApsaraDB for Redis provides complex data structure types such as lists, hash tables , and sorted sets. When you use the service, improper key design may result in large keys. Due to Redis single-thread model, the operation to obtain or delete large keys may affect the service. In a cluster, large keys are prone to run out of memory of a certain node. Therefore, you can use a search tool to find large keys.

To scan for large keys of ApsaraDB for Redis, run the `SCAN` command for the master-replica edition or `ISCAN` command for the cluster edition. To obtain the number of nodes, run the `INFO` command. The command rules are as follows:

```
ISCAN   idx   cursor  [ MATCH   pattern ] [ COUNT   count ]
```

In this command, idx specifies the node ID that starts from 0. For an eight-node cluster instance of 16 GB to 64 GB, idx ranges from 0 to 7. A 128 GB or 256 GB cluster instance contains 16 nodes.

Procedure

1. Run the following command to download the Python client package:

```
wget  " https :// pypi . python . org / packages / 68 / 44 /
5efe9e98ad  83ef5b742c  e62a15bea6  09ed5a0d1c  af35b79257
ddb324031a / redis - 2 . 10 . 5 . tar . gz # md5 = 3b26c2b970
3b4b56b30a  1ad508e310  83 "
```

2. Decompress the package and install the Python client.

```
 tar  - xvf   redis - 2 . 10 . 5 . tar . gz
 cd   redis - 2 . 10 . 5
 sudo   python   setup . py   install
```

3. Create the following scanning script:

```
 import   sys
 import   redis
 def   check_big_  key ( r ,  k ):
   bigKey  =  False
   length  =  0
   try :
     type  =  r . type ( k )
     if   type  == " string ":
       length  =  r . strlen ( k )
     elif   type  == " hash ":
       length  =  r . hlen ( k )
     elif   type  == " list ":
       length  =  r . llen ( k )
     elif   type  == " set ":
       length  =  r . scard ( k )
     elif   type  == " zset ":
       length  =  r . zcard ( k )
   except :
     return
   if   length  >  10240 :
     bigKey  =  True
   if   bigKey  :
     print   db , k , type , length
 def   find_big_k  ey_normal ( db_host ,  db_port ,  db_passwor  d
,  db_num ):
   r  =  redis . StrictRedi  s ( host = db_host ,  port = db_port
,  password = db_passwor  d ,  db = db_num )
   for   k   in   r . scan_iter ( count = 1000 ):
     check_big_  key ( r ,  k )
 def   find_big_k  ey_shardin  g ( db_host ,  db_port ,
db_passwor  d ,  db_num ,  nodecount ):
   r  =  redis . StrictRedi  s ( host = db_host ,  port = db_port
,  password = db_passwor  d ,  db = db_num )
   cursor  =  0
   for   node   in   range ( 0 ,  nodecount ) :
     while   True :
       iscan  =  r . execute_co  mmand (" iscan ", str ( node ),
str ( cursor ), " count ", " 1000 ")
       for   k   in   iscan [ 1 ]:
         check_big_  key ( r ,  k )
       cursor  =  iscan [ 0 ]
       print   cursor ,  db ,  node ,  len ( iscan [ 1 ])
       if   cursor  == " 0 ":
         break ;
 if   __name__  == ' __main__ ':
   if   len ( sys . argv ) ! =  4 :
      print  ' Usage :  python  ',  sys . argv [ 0 ], '  host
port   password  '
      exit ( 1 )
   db_host  =  sys . argv [ 1 ]
   db_port  =  sys . argv [ 2 ]
   db_passwor  d  =  sys . argv [ 3 ]
   r  =  redis . StrictRedi  s ( host = db_host ,  port = int (
db_port ),  password = db_passwor  d )
   nodecount  =  r . info ()[' nodecount ']
   keyspace_i  nfo  =  r . info (" keyspace ")
   for   db   in   keyspace_i  nfo :
     print  ' check  ',  db , ' ',  keyspace_i  nfo [ db ]
     if   nodecount  >  1 :
       find_big_k  ey_shardin  g ( db_host ,  db_port ,
db_passwor  d ,  db . replace (" db ",""),  nodecount )
     else :
       find_big_k  ey_normal ( db_host ,  db_port ,  db_passwor  d
,  db . replace (" db ", ""))
```

4. Run the `python   find_bigke  y  < host >  6379  < password >` command to search for large keys.

Note:

The command returns a list of large keys in the master-replica edition and cluster edition of ApsaraDB for Redis. The default threshold for large keys is 10,240. Large keys include string-type keys with a value greater than 10,240, list-type keys with a length greater than 10,240, or hash-type keys with more than 10,240 hash fields.

By default, the script searches 1,000 keys to minimize the adverse impact on service performance. However, we recommend that you run the script during off-peak hours to prevent the adverse impact caused by running the SCAN command.

5 How do I view the memory of child instances of an ApsaraDB for Redis cluster instance?

Background

An ApsaraDB for Redis cluster instance contains multiple nodes. You need to check the memory and the number of keys of each node. Alibaba Cloud provides the `iinfo` command for you to check performance of a specified node. In the future, you will be able to view the data of each node in the console.

```
 iinfo   db_idx  [ section ]
```

In the command, the value range of db_idx is [0, nodecount). You can obtain the value of nodecount by running the INFO command. To set the section parameter, you can follow the way to set the section parameter for the INFO command of Redis.

Procedure

1. Download the Python client package.

```
wget  " https :// pypi . python . org / packages / 68 / 44 /
5efe9e98ad  83ef5b742c  e62a15bea6  09ed5a0d1c  af35b79257
ddb324031a / redis - 2 . 10 . 5 . tar . gz # md5 = 3b26c2b970
3b4b56b30a  1ad508e310  83 "
```

2. Decompress the package and install the Python client.

```
tar  - xvf   redis - 2 . 10 . 5 . tar . gz
 cd   redis - 2 . 10 . 5
 sudo   python   setup . py   install
```

3. Run the following scanning script:

```
 import   sys
 import   redis
 from   redis . _compat   import   nativestr
 def   parse_info ( response ):
    " Parse   the   result   of   Redis ' s   INFO   command   into
  a   Python   dict "
     info  = {}
     response  =  nativestr ( response )
     def   get_value ( value ):
         if  ','  not   in   value   or  '='  not   in   value :
             try :
                 if  '.'  in   value :
                     return   float ( value )
                 else :
                     return   int ( value )
             except   ValueError :
                 return   value
         else :
             sub_dict  = {}
             for   item   in   value . split (','):
                 k ,  v  =  item . rsplit ('=',  1 )
                 sub_dict [ k ] =  get_value ( v )
             return   sub_dict
     for   line   in   response . splitlines ():
         if   line   and   not   line . startswith ('#'):
             if   line . find (':') ! = - 1 :
                 key ,  value  =  line . split (':',  1 )
                 info [ key ] =  get_value ( value )
             else :
                #  if   the   line   isn ' t   splittable ,  append
  it   to   the  " __raw__ "  key
                 info . setdefault (' __raw__ ', []). append ( line
)
     return   info
 if   __name__  == ' __main__ ':
   if   len ( sys . argv ) ! =  4 :
      print  ' Usage :  python  ',  sys . argv [ 0 ], '  host
port   password  '
      exit ( 1 )
   db_host  =  sys . argv [ 1 ]
   db_port  =  sys . argv [ 2 ]
   db_passwor  d  =  sys . argv [ 3 ]
   r  =  redis . StrictRedi  s ( host = db_host ,  port = int (
db_port ),  password = db_passwor  d )
   nodecount  =  r . info ()[' nodecount ']
   for   node   in   range ( 0 ,  nodecount ):
      info  =  r . execute_co  mmand (" iinfo ",  str ( node ))
      info_res  =  parse_info ( info )
      print  "============  node  ",  str ( node ), "
================"
      print  ' used_memor  y_human :',  info_res [' used_memor
y_human ']
      print   r . execute_co  mmand (" iinfo ",  str ( node ), "
keyspace ")
   info_res  =  r . info ()
   print  "============  total   ================"
   print  ' used_memor  y_human :',  info_res [' used_memor
y_human ']
   print   r . info (' keyspace ')
```

Run the `python   check_shar  ding_db   host   port   password` **command to output the following content:**

```
============  node    0   ================
 used_memor  y_human :  37 . 56M
#  Keyspace
 db0 : keys = 9887 , expires = 0 , avg_ttl = 0
============  node    1   ================
 used_memor  y_human :  37 . 58M
#  Keyspace
 db0 : keys = 9835 , expires = 0 , avg_ttl = 0
 Db1 :  Keys  =  1 ,  expires  =  0 ,  avg_ttl  =  0
============  node    2   ================
 used_memor  y_human :  41 . 24M
#  Keyspace
 db0 : keys = 9956 , expires = 0 , avg_ttl = 0
 db1 : keys = 1 , expires = 0 , avg_ttl = 0
============  node    3   ================
 used_memor  y_human :  37 . 58M
#  Keyspace
```

```
 db0 : keys = 9863 , expires = 0 , avg_ttl = 0
============  node    4   ================
 used_memor  y_human :  37 . 61M
#  Keyspace
 db0 : keys = 10045 , expires = 0 , avg_ttl = 0
============  node    5   ================
 used_memor  y_human :  37 . 58M
#  Keyspace
 db0 : keys = 10038 , expires = 0 , avg_ttl = 0
============  node    6   ================
 used_memor  y_human :  37 . 58M
#  Keyspace
 db0 : keys = 10055 , expires = 0 , avg_ttl = 0
============  node    7   ================
 used_memor  y_human :  37 . 57M
#  Keyspace
 db0 : keys = 9969 , expires = 0 , avg_ttl = 0
============  total   ================
 used_memor  y_human :  304 . 31M
{' db1 ': {' keys ':  2 , ' expires ':  0 , ' avg_ttl ':  0 }, '
db0 ': {' keys ':  79648 , ' expires ':  0 , ' avg_ttl ':  0 }}
```

6 Troubleshooting for the JedisPool error

When you use JedisPool, the following error may occur, indicating the failure to obtain a resource from the pool.

```
redis.clients.jedis.exceptions.JedisConnectionException
: Could not get a resource from the pool
```

You can solve this issue in the following ways.

Check the network

First, check the network condition. You can test the network by running the `telnet host 6379` command. After the host is connected, input a combination of `auth, a space and a password`, and then press ENTER. If the system returns `+OK\r\n`, run the `Ping` command or read and write requests to check whether the system indicates a successful operation. Perform multiple test operations to check the network conditions.

Check the setting of JedisPool connections

You must set JedisPool connections when using the connection pool. A failure to obtain a resource from the pool may occur when the number of connections is more than the value of MaxTotal. In this case, you can run `netstat -an | grep 6379 | grep EST | wc -l` on the client to view the number of connections and compare the result with the value of MaxTotal. If the two values are close to each other, the setting of the connection pool is correct.

Check JedisPool code

When you use JedisPool, after the `getResource` operation, you must call the `returnResource` or `close` operation to return the resource. You can check whether the operation code is correct. The example code is as follows:

```
 JedisPoolConfig config = new JedisPoolConfig();
// The maximum number of idle connections. You can
 set the parameter for your application as needed.
 The value of this parameter cannot be more than the
   maximum number of clients connected to each ApsaraDB
   for Redis instance.
 config.setMaxIdle(200);
// The maximum number of connections. You can set
 the parameter for your application as needed. The
   value of this parameter cannot be more than the
 maximum   number   of   clients   connected   to   each   ApsaraDB
 for   Redis   instance .
 config . setMaxTota  l ( 300 );
 config . setTestOnB  orrow ( false );
 config . setTestOnR  eturn ( false );
 String   host  = "*. aliyuncs . com ";
 String   password  = " Password ";
 JedisPool   pool  =  new   JedisPool ( config ,  host ,  6379 ,  3000
 ,  password );
 Jedis   jedis  =  null ;
 try  {
     jedis  =  pool . getResourc  e ();
    /// ...  do   stuff   here  ...  for   example
     jedis . set (" foo ", " bar ");
     String   foobar  =  jedis . get (" foo ");
     jedis . zadd (" sose ",  0 , " car ");
     jedis . zadd (" sose ",  0 , " bike ");
     Set < String >  sose  =  jedis . zrange (" sose ",  0 , - 1 );
}  finally  {
     if  ( jedis  ! =  null ) {
         jedis . close ();
    }
}
/// ...  when   closing   your   applicatio  n :
 pool . destroy ();
```

Check for nf_conntrack packet loss

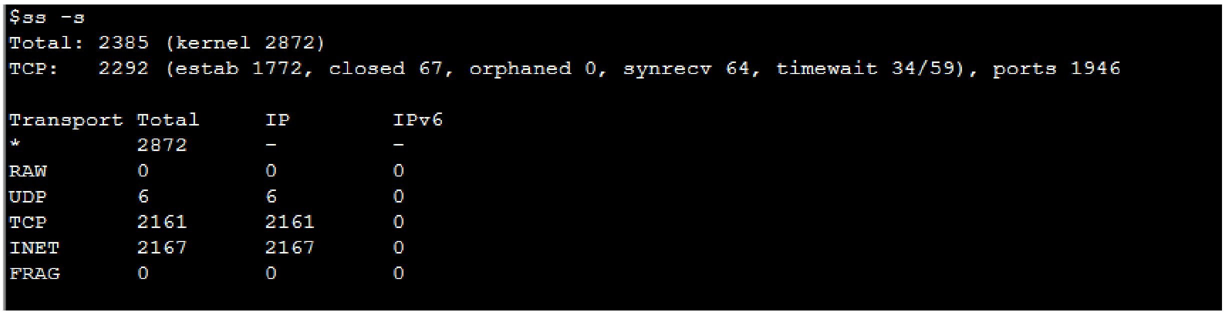
Run the `dmesg` command to check whether the client has any exceptions.

```
 nf_conntra  ck :  table   full ,  dropping   packet
```

If nf_conntract packet loss occurs, modify the setting `sysctl  - w   net .` `netfilter . nf_conntra  ck_max = 120000`.

Check TIME_WAIT connections

Run the `ss  - s` command to check whether excessive TIME_WAIT connections exist.



```
$ss -s
Total: 2385 (kernel 2872)
TCP:   2292 (estab 1772, closed 67, orphaned 0, synrecv 64, timewait 34/59), ports 1946

Transport Total     IP        IPv6
*         2872      -         -
RAW       0         0         0
UDP       6         6         0
TCP       2161      2161      0
INET      2167      2167      0
FRAG      0         0         0
```

If so, modify the following parameters:

```
 sysctl  - w   net . ipv4 . tcp_max_tw  _buckets = 180000
 sysctl  - w   net . ipv4 . tcp_tw_rec  ycle = 1
```

Check DNS resolution

Bind the host address in the /etc/hosts file and then check whether the issue persists. If so, DNS resolution is normal.

```
192 . 168 . 1 . 1   *. redis . rds . aliyuncs . com
```

Help

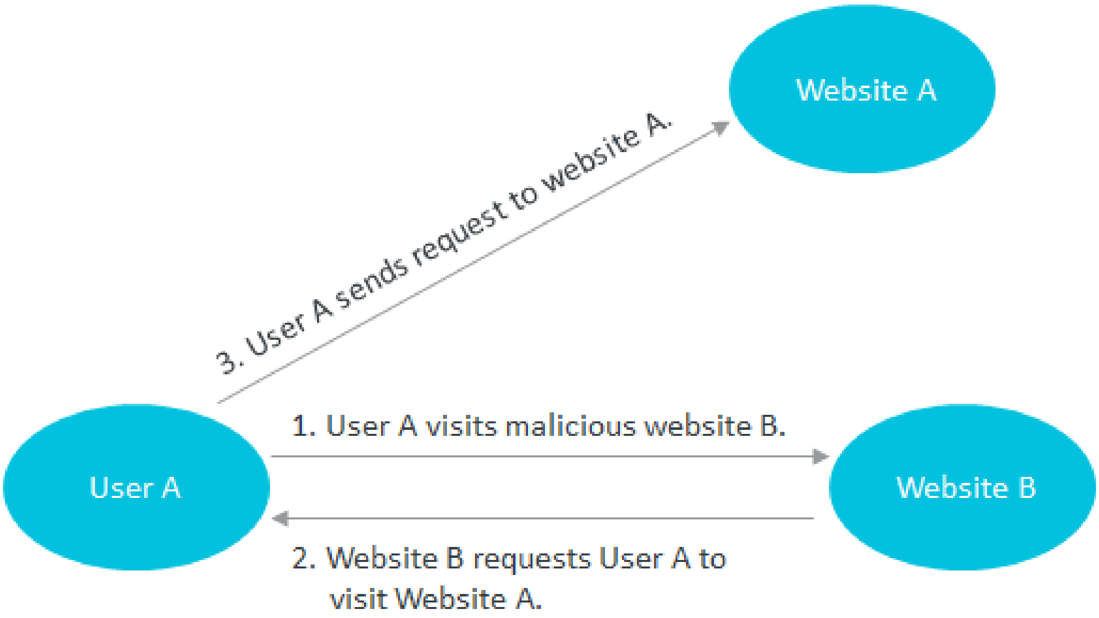
If the issue persists, capture packets, record the error occurrence time and error messages, and then submit a ticket to request technical support. You need to provide the record and the packet capture file in the ticket. The packet capture command is as follows:

```
sudo   tcpdump  - i   eth0   tcp   and   port   6379  - n  - nn  - s
  74  - w   redis . cap
```

7 Analysis of the Redis CSRF vulnerability and the corresponding security measure in ApsaraDB for Redis

What is CSRF?

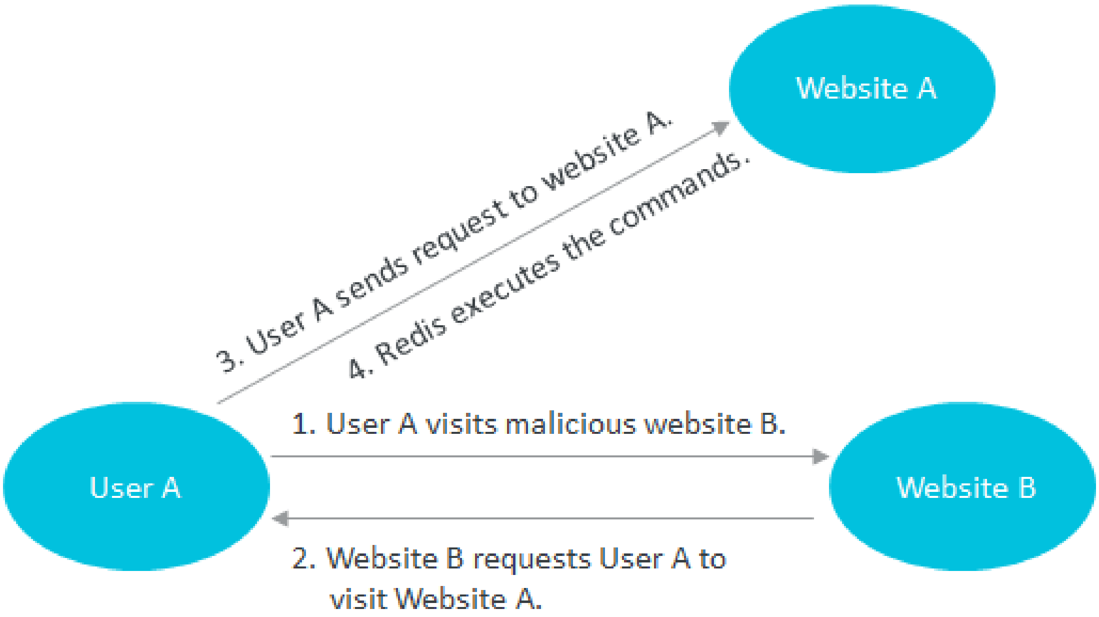
Cross-site request forgery (CSRF), also known as XSRF, one-click attack, or session riding, is a type of malicious exploitation of websites.


Website A
3. User A sends request to website A.
1. User A visits malicious website B.
User A
Website B
2. Website B requests User A to visit Website A.

The preceding figure shows a simple model of a CSRF attack. A user visits the malicious website B, and the malicious website B replies to the user with an HTTP message that requires the user to visit the website A. If the user has maintained a trust relationship with the website A, the system processes the request as if the user personally sent the request to visit the website A.

[DO NOT TRANSLATE]

Redis CSRF attack model


Website A
3. User A sends request to website A.
4. Redis executes the commands.
1. User A visits malicious website B.
User A
Website B
2. Website B requests User A to visit Website A.

Based on the preceding principle of CSRF, a malicious website can require a user to send an HTTP request to Redis. Redis supports text protocols, and does not break off the connection in the case of illegal protocols during protocol parsing. An attacker can attach a Redis command to a normal HTTP request to run the command in Redis . If the user and Redis do not require password verification, Redis runs the command normally. Consequently, the attacker can encrypt data to extort money, similar to the earlier MongoDB ransom attacks.

Repair the kernel

Redis 3.2.7 provides a fix for this issue. The system processes the POST method and HOST keywords in a special way, keeps a log of events, and disconnects from the service to prevent Redis from running subsequent legitimate requests.

Redis security risks

Earlier Redis versions have exposed a security vulnerability where an attacker can obtain the root permissions of the Redis service in a certain condition. Similar security vulnerabilities occur because some users know less about security mechanisms of Redis and have little experience of operations and maintenanc e for Redis. In addition, Redis lacks sufficient security protection mechanisms. However, the ApsaraDB for Redis service can provide more security mechanisms. We recommend that you use ApsaraDB for Redis as the Redis service in the cloud.

Security rules of ApsaraDB for Redis

Connections over an internal network instead of a public network

ApsaraDB for Redis only supports trusted connections over an internal network. You cannot connect to ApsaraDB for Redis from a public network.

Physical network isolation

ApsaraDB for Redis provides a physical isolation between the physical server network and the virtual server network. Your virtual servers cannot directly connect to the backend physical server network.

VPC network isolation

If you use a virtual private cloud (VPC) of Alibaba Cloud, only the services in the same VPC can interconnect with each other.

Whitelist

ApsaraDB for Redis supports whitelists. You can set a whitelist of IP addresses in the console to allow connections based on these IP addresses.

Password verification

ApsaraDB for Redis enforces password verification for instances in a classic network. You can set a complex password to prevent password cracking.

Access permission isolation

ApsaraDB for Redis isolates permissions and accessible directories for each backend instance. The instances can only access resources by using their own path to avoid mutual interference.

Dangerous commands forbidden

ApsaraDB for Redis forbids some dangerous system management commands such as CONFIG and SAVE. If you want to modify parameters, you must pass the secondary authentication in the console. This can also avoid direct operations of the backend configuration files and management commands.

Security monitoring

ApsaraDB for Redis provides comprehensive security monitoring for physical servers . The system performs regular scans and updates security monitoring policies to locate security risks in advance.

Redis cluster password

The original Redis 3.0 cluster does not support password verification. ApsaraDB for Redis clusters support password verification to improve system security.

8 How can I obtain the requestId?

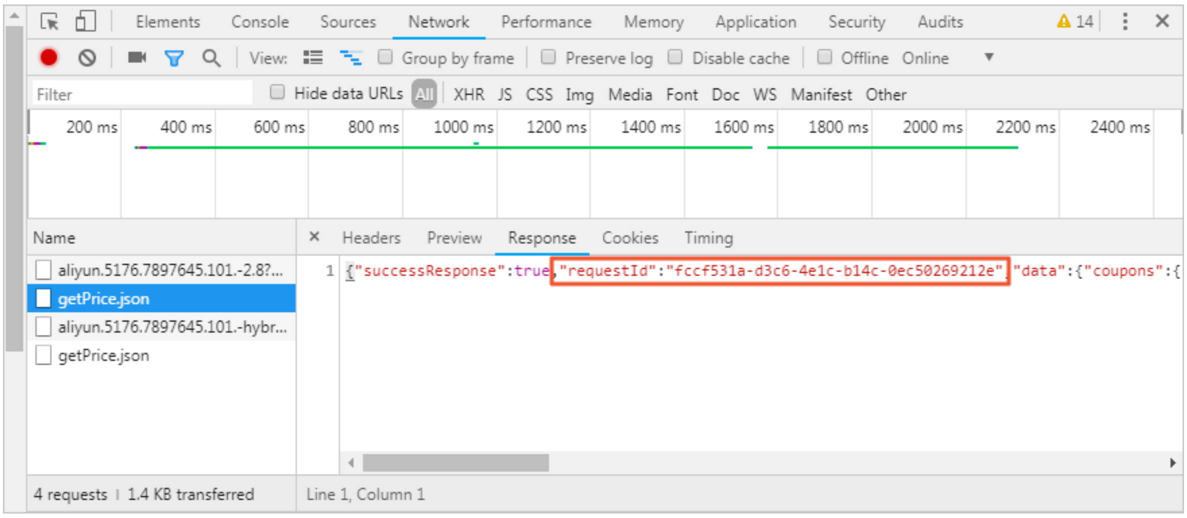
When you create an instance, upgrade or downgrade an instance, or fail to call an API operation in ApsaraDB for Redis, you may submit a ticket to request technical support. We recommend that you provide the corresponding requestId in these cases for troubleshooting. This topic describes the method for generating the requestId when you use Google Chrome.

Procedure

1. In Google Chrome, click ⋮ and choose More Tools > Developer Tools, or press F12 on the keyboard.

   Afterward, the DevTools window appears.
2. Submit the last failed request.
3. In the Response panel, locate the `requestId` of the target request.

   Figure 8-1: Response details

   ```
   {"successResponse":true,"requestId":"fccf531a-d3c6-4e1c-b14c-0ec50269212e","data":{"coupons":{
   ```

9 Delete multiple keys in the Linux operating system

You can use the xargs command of Linux and the DEL command of Redis to delete multiple target keys. This topic describes the operations in details.

The xargs command is used in the Linux operating system. The command passes a list of parameters to other commands in segments. Therefore, the system does not need to process a long list of parameters and can avoid related issues. The command can be used independently, or used with pipeline operators, relocation operators and other commands.

Cautions

- The `KEYS` command may cause high CPU usage. Use this command during off-peak hours.
- If you use the `KEYS` command in a large database, the command affects the database performance. We recommend that you use this command in a database that contains small amounts of data.

Procedure

1. Install ApsaraDB for Redis in the Linux operating system.

```
yum  install  redis
```

2. Run the following command to delete multiple target keys in a database. In the following figure, "test *" contains multiple target keys, such as test1, test2, and test3.

```
redis - cli  - h  < host > - a  < password >  keys  "< key >" |
xargs  redis - cli  - h  < host > - a  < password >  del
```

- <host>: the connection address of the ApsaraDB for Redis instance.
- <password>: the password of the ApsaraDB for Redis instance.
- "<key>": the target key such as "test" in a database.

Note:

The system matches a target key in the following ways.

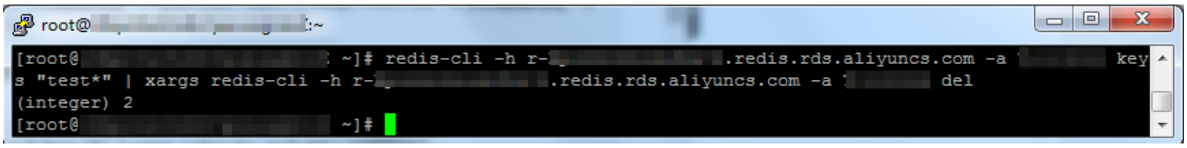
w? rld: matches world, warld and wxrld.

w*rld: matches wrld and wooooorld.

w[ae]rld: matches warld and werld, but does not match world.

w[^e]rld: matches world and warld, but does not match werld.

w[a-b]rld: matches warld and wbrld.

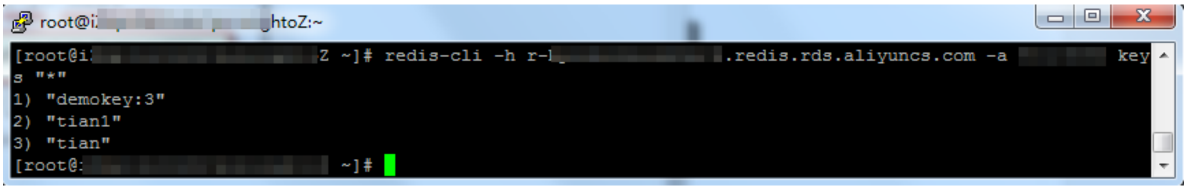


```
root@[redacted]:~
[root@[redacted] ~]# redis-cli -h r-[redacted].redis.rds.aliyuncs.com -a [redacted] key
s "test*" | xargs redis-cli -h r-[redacted].redis.rds.aliyuncs.com -a [redacted] del
(integer) 2
[root@[redacted] ~]#
```

3. Run the following command to check whether the system has deleted the keys that contain test.

```
redis - cli  - h  < host > - a  < password >  keys  "*"
```

- <host>: the connection address of the ApsaraDB for Redis instance.
- <password>: the password of the ApsaraDB for Redis instance.



```
root@i[redacted]htoZ:~
[root@i[redacted]Z ~]# redis-cli -h r-[redacted].redis.rds.aliyuncs.com -a [redacted] key
s "*"
1) "demokey:3"
2) "tian1"
3) "tian"
[root@[redacted] ~]#
```

10 View the connection address of an ApsaraDB for Redis instance

You can view the internal connection address (domain name) of an ApsaraDB for Redis instance in the ApsaraDB for Redis console.

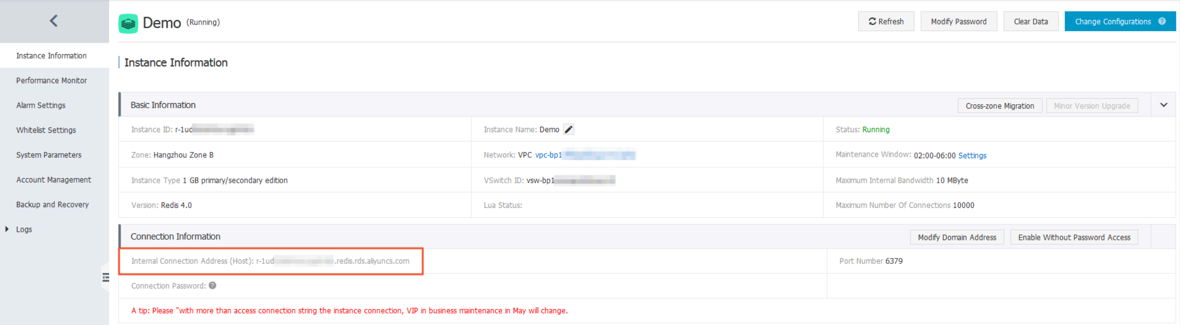
Note:

- To secure data, ApsaraDB for Redis only supports connections over an internal network. You have to use an ECS instance to connect to the ApsaraDB for a Redis instance.
- The virtual IP (VIP) address of the ApsaraDB for Redis instance may change when you maintain or modify the service. To ensure connection availability, we recommend that you use the connection address in your business to connect to the ApsaraDB for Redis instance.

Procedure

1. Log on to the ApsaraDB for Redis console.
2. On the menu bar, select the region where the instance is located.
3. On the Instance List page, click the target instance ID or Manage in the Action column next to the target instance.
4. On the Instance Information page, view the Internal Connection Address (Host) in the Connection Information field.

Figure 10-1: Connection address of the ApsaraDB for Redis instance



Instance Information

Basic Information

Instance ID: r-1ud[redacted]

Instance Name: Demo

Status: Running

Zone: Hangzhou Zone B

Network: VPC vpc-bp1[redacted]

Maintenance Window: 02:00-06:00

Instance Type 1 GB primary/secondary edition

VSwitch ID: vsw-bp1[redacted]

Maximum Internal Bandwidth 10 MByte

Version: Redis 4.0

Lua Status:

Maximum Number Of Connections 10000

Connection Information

Internal Connection Address (Host): r-1ud[redacted].redis.rds.aliyuncs.com

Port Number 6379

Connection Password:

A tip: Please "with more than access connection string the instance connection, VIP in business maintenance in May will change.

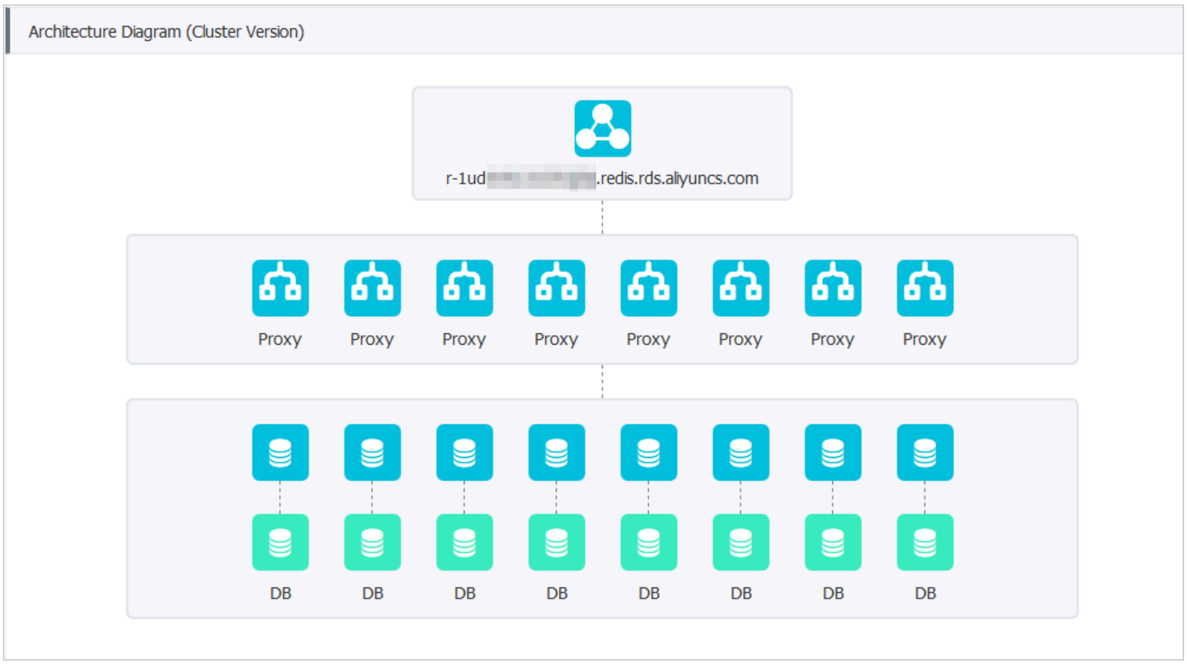
11 View the architecture and monitoring data of an ApsaraDB for Redis cluster instance

On the Instance Information page in the ApsaraDB for Redis console, you can view the architecture of an ApsaraDB for Redis cluster instance. The architecture displays information about the proxy servers, master and replica nodes. You can also click a node to view the monitoring data of the node.

Procedure

1. Log on to the ApsaraDB for Redis console.
2. On the menu bar, select the region where the instance is located.
3. On the Instance List page, click the target instance ID or Manage in the Action column next to the target instance.
4. In the Architecture Diagram field on the Instance Information page, view the architecture of the cluster instance.

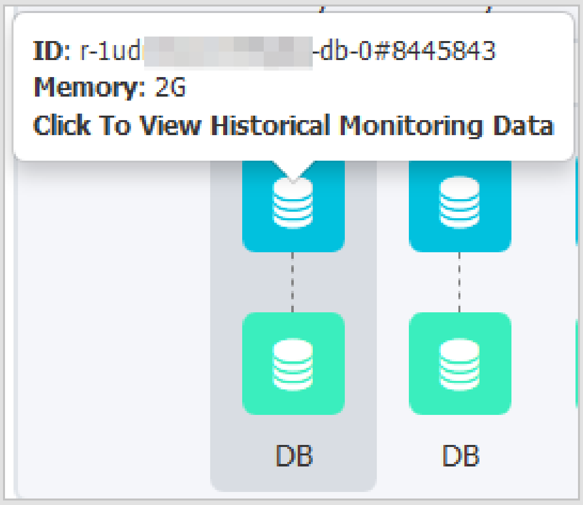
Figure 11-1: Architecture of the cluster instance


Architecture Diagram (Cluster Version)
r-1ud[redacted].redis.rds.aliyuncs.com
Proxy
Proxy
Proxy
Proxy
Proxy
Proxy
Proxy
Proxy
DB
DB
DB
DB
DB
DB
DB
DB

5. Click a node icon to view the monitoring data of the node.

Note:

Place the pointer over the node icon to view the node ID and other information.



ID: r-1ud[redacted]-db-0#8445843

Memory: 2G

Click To View Historical Monitoring Data