ApsaraDB for Redis

Best Practices

Best Practices

Online player score ranking

Scenario introduction

ApsaraDB for Redis functions basically the same as Redis. You can use this product to create a ranking function for an online game easily.

Sample code

```
import java.util.ArrayList;
import java.util.List;
import java.util.Set;
import java.util.UUID;

import redis.clients.jedis.Jedis;
import redis.clients.jedis.Tuple;

public class GameRankSample {

static int TOTAL_SIZE = 20;

public static void main(String[] args)
{
//Connection information, obtained from the console
String host = "xxxxxxxxxx.m.cnhz1.kvstore.aliyuncs.com";
int port = 6379;

Jedis jedis = new Jedis(host, port);

try {
//Instance password
String authString = jedis.auth("password");//password

if (!authString.equals("OK"))
{
System.err.println("AUTH Failed: " + authString);
return;
}
```

```
//Key
String key = "Game name:Keep Running, Ali!";

//Clear any data that already exists
jedis.del(key);

//Generate several simulated players
List<String> playerList = new ArrayList<String>();
for (int i = 0; i < TOTAL_SIZE; ++i)
{
//Randomly generate an ID for each player
playerList.add(UUID.randomUUID().toString());
}


System.out.println("Input all players");
//Record the score for each player
for (int i = 0; i < playerList.size(); i++)
{
//Randomly generate numbers as the scores of the simulated players
int score = (int)(Math.random()*5000);

String member = playerList.get(i);

System.out.println("Player ID:" + member + ", Player score: " + score);

//Add the player ID and score to the SortedSet of the corresponding key
jedis.zadd(key, score, member);

}

//Print out the ranking of all players
System.out.println();
System.out.println(" "+key);
System.out.println(" All players ranking ");

//Obtain the sorted list of players from the SortedSet of the corresponding key
Set<Tuple> scoreList = jedis.zrevrangeWithScores(key, 0, -1);
for (Tuple item : scoreList) {
System.out.println("Player ID:"+item.getElement()+", Player score:"+Double.valueOf(item.getScore()).intValue());
}

//Print out Top 5 players
System.out.println();
System.out.println(" "+key);
System.out.println(" Top players");

scoreList = jedis.zrevrangeWithScores(key, 0, 4);
for (Tuple item : scoreList) {
System.out.println("Player ID:"+item.getElement()+", Player score:"+Double.valueOf(item.getScore()).intValue());
}

//Print out a list of specific players
System.out.println();
System.out.println(" "+key);
```

```
System.out.println(" players with scores from 1000 to 2000");

//Obtain a list of players with scores from 1000 to 2000 from the SortedSet of the corresponding key
scoreList = jedis.zrangeByScoreWithScores(key, 1000, 2000);
for (Tuple item : scoreList) {
System.out.println("Player ID:"+item.getElement()+", Player score:"+Double.valueOf(item.getScore()).intValue());
}

} catch (Exception e) {
e.printStackTrace();
}finally{
jedis.quit();
jedis.close();
}
}
}
```

Output

After you access the ApsaraDB for Redis instance with the correct address and password and run the above Java code, the following output is displayed:

```
Enter all players
Player ID: 9193e26f-6a71-4c76-8666-eaf8ee97ac86; score: 3860
Player ID: db03520b-75a3-48e5-850a-071722ff7afb; score: 4853
Player ID: d302d24d-d380-4e15-a4d6-84f71313f27a; score: 2931
Player ID: bee46f9d-4b05-425e-8451-8aa6d48858e6; score: 1796
Player ID: ec24fb9e-366e-4b89-a0d5-0be151a8cad0; score: 2263
Player ID: e11ecc2c-cd51-4339-8412-c711142ca7aa; score: 1848
Player ID: 4c396f67-da7c-4b99-a783-25919d52d756; score: 958
Player ID: a6299dd2-4f38-4528-bb5a-aa2d48a9f94a; score: 2428
Player ID: 2e4ec631-1e4e-4ef0-914f-7bf1745f7d65; score: 4478
Player ID: 24235a85-85b9-476e-8b96-39f294f57aa7; score: 1655
Player ID: e3e8e1fa-6aac-4a0c-af80-4c4a1e126cd1; score: 4064
Player ID: 99bc5b4f-e32a-4295-bc3a-0324887bb77e; score: 4852
Player ID: 19e2aa6b-a2d8-4e56-bdf7-8b59f64bd8e0; score: 3394
Player ID: cb62bb24-1318-4af2-9d9b-fbff7280dbec; score: 3405
Player ID: ec0f06da-91ee-447b-b935-7ca935dc7968; score: 4391
Player ID: 2c814a6f-3706-4280-9085-5fe5fd56b71c; score: 2510
Player ID: 9ee2ed6d-08b8-4e7f-b52c-9adfe1e32dda; score: 63
Player ID: 0293b43a-1554-4157-a95b-b78de9edf6dd; score: 1008
Player ID: 674bbdd1-2023-46ae-bbe6-dfcd8e372430; score: 2265
Player ID: 34574e3e-9cc5-43ed-ba15-9f5405312692; score: 3734

Game Name: Keep Running, Ali!
Full Player Ranking
Player ID: db03520b-75a3-48e5-850a-071722ff7afb; score: 4853
Player ID: 99bc5b4f-e32a-4295-bc3a-0324887bb77e; score: 4852
Player ID: 2e4ec631-1e4e-4ef0-914f-7bf1745f7d65; score: 4478
Player ID: ec0f06da-91ee-447b-b935-7ca935dc7968; score: 4391
Player ID: e3e8e1fa-6aac-4a0c-af80-4c4a1e126cd1; score: 4064
Player ID: 9193e26f-6a71-4c76-8666-eaf8ee97ac86; score: 3860
Player ID: 34574e3e-9cc5-43ed-ba15-9f5405312692; score: 3734
```

```
Player ID: cb62bb24-1318-4af2-9d9b-fbff7280dbec; score: 3405
Player ID: 19e2aa6b-a2d8-4e56-bdf7-8b59f64bd8e0; score: 3394
Player ID: d302d24d-d380-4e15-a4d6-84f71313f27a; score: 2931
Player ID: 2c814a6f-3706-4280-9085-5fe5fd56b71c; score: 2510
Player ID: a6299dd2-4f38-4528-bb5a-aa2d48a9f94a; score: 2428
Player ID: 674bbdd1-2023-46ae-bbe6-dfcd8e372430; score: 2265
Player ID: ec24fb9e-366e-4b89-a0d5-0be151a8cad0; score: 2263
Player ID: e11ecc2c-cd51-4339-8412-c711142ca7aa; score: 1848
Player ID: bee46f9d-4b05-425e-8451-8aa6d48858e6; score: 1796
Player ID: 24235a85-85b9-476e-8b96-39f294f57aa7; score: 1655
Player ID: 0293b43a-1554-4157-a95b-b78de9edf6dd; score: 1008
Player ID: 4c396f67-da7c-4b99-a783-25919d52d756; score: 958
Player ID: 9ee2ed6d-08b8-4e7f-b52c-9adfe1e32dda; score: 63

Game Name: Keep Running, Ali!
Top Players
Player ID: db03520b-75a3-48e5-850a-071722ff7afb; score: 4853
Player ID: 99bc5b4f-e32a-4295-bc3a-0324887bb77e; score: 4852
Player ID: 2e4ec631-1e4e-4ef0-914f-7bf1745f7d65; score: 4478
Player ID: ec0f06da-91ee-447b-b935-7ca935dc7968; score: 4391
Player ID: e3e8e1fa-6aac-4a0c-af80-4c4a1e126cd1; score: 4064

Game Name: Keep Running, Ali!
Players with Scores from 1000 to 2000
Player ID: 0293b43a-1554-4157-a95b-b78de9edf6dd; score: 1008
Player ID: 24235a85-85b9-476e-8b96-39f294f57aa7; score: 1655
Player ID: bee46f9d-4b05-425e-8451-8aa6d48858e6; score: 1796
Player ID: e11ecc2c-cd51-4339-8412-c711142ca7aa; score: 1848
```

E-commerce store item correlation analysis

Scenario introduction

ApsaraDB for Redis, functions basically the same as Redis, can be used to create correlation analysis programs for items on e-commerce sites.

The correlation between items is the chances where the items are added to a user’ s shopping cart. The analysis result plays an important role in analyzing users’ shopping behavior for the e-commerce industry. For example:

To recommend related items to a user who lingers on the details page of a certain item;

To recommend related items to a user who just adds an item to the shopping cart;

To place highly correlated items together on the shelves.

ApsaraDB for Redis can be used to create a sorted set for each type of item. The members of this set are scored based on how often they appear in the same users' carts with the primary item. Each time items A and B appear in the same user's shopping cart, the respective sorted sets for items A and B in ApsaraDB for Redis are updated.

Sample code

```
package shop.kvstore.aliyun.com;

import java.util.Set;
import redis.clients.jedis.Jedis;
import redis.clients.jedis.Tuple;

public class AliyunShoppingMall {

public static void main(String[] args)
{
//Information for connecting ApsaraDB for Redis, which can be obtained from the console
String host = "xxxxxxxx.m.cnhza.kvstore.aliyuncs.com";
int port = 6379;

Jedis jedis = new Jedis(host, port);

try {
//ApsaraDB for Redis instance password
String authString = jedis.auth("password");//password

if (!authString.equals("OK"))
{
System.err.println("AUTH Failed: " + authString);
return;
}

//Product list
String key0="Alibaba Cloud:product:beer";
String key1="Alibaba Cloud:product:chocolate";
String key2="Alibaba Cloud:product:cola";
String key3="Alibaba Cloud:product:gum";
String key4="Alibaba Cloud:product:jerky";
String key5="Alibaba Cloud:product:chicken wing";


final String[] aliyunProducts=new String[]{key0,key1,key2,key3,key4,key5};

//Initialization, clearing any existing data
for (int i = 0; i < aliyunProducts.length; i++) {
jedis.del(aliyunProducts[i]);
}
```

```
//Simulates user shopping behavior
for (int i = 0; i < 5; i++) {//Simulates users' buying items

customersShopping(aliyunProducts,i,jedis);

}

System.out.println();

//Generates correlation between items using ApsaraDB for Redis
for (int i = 0; i < aliyunProducts.length; i++) {
System.out.println(">>>>>>>>>>and"+aliyunProducts[i]+"products bought together<<<<<<<<<<<<<<<");
Set<Tuple> relatedList = jedis.zrevrangeWithScores(aliyunProducts[i], 0, -1);

for (Tuple item : relatedList) {
System.out.println("Product name:"+item.getElement()+", bought together
times:"+Double.valueOf(item.getScore()).intValue());
}

System.out.println();
}

} catch (Exception e) {
e.printStackTrace();
}finally{
jedis.quit();
jedis.close();
}
}

private static void customersShopping(String[] products, int i, Jedis jedis) {

//Simulates three possibilities of shopping behavior at random
int bought=(int)(Math.random()*3);

if(bought==1){
//Simulates the business logic: The user buys the following items
System.out.println("User"+i+"bought"+products[0]+","+products[2]+","+products[1]);

//Adds the correlations between the items to SortSet in ApsaraDB for Redis
jedis.zincrby(products[0], 1, products[1]);
jedis.zincrby(products[0], 1, products[2]);
jedis.zincrby(products[1], 1, products[0]);
jedis.zincrby(products[1], 1, products[2]);
jedis.zincrby(products[2], 1, products[0]);
jedis.zincrby(products[2], 1, products[1]);

}else if(bought==2){
//Simulates the business logic: The user buys the following items
System.out.println("User"+i+"bought"+products[4]+","+products[2]+","+products[3]);

//Adds the correlations between the items to SortSet in ApsaraDB for Redis
jedis.zincrby(products[4], 1, products[2]);
jedis.zincrby(products[4], 1, products[3]);
jedis.zincrby(products[3], 1, products[4]);
jedis.zincrby(products[3], 1, products[2]);
```

```
jedis.zincrby(products[2], 1, products[4]);
jedis.zincrby(products[2], 1, products[3]);

}else if(bought==0){
//Simulates the business logic: The user buys the following items
System.out.println("User"+i+"bought"+products[1]+","+products[5]);

//Adds the correlations between the items to SortSet in ApsaraDB for Redis
jedis.zincrby(products[5], 1, products[1]);
jedis.zincrby(products[1], 1, products[5]);
}

}
}
```

Output

After you access the ApsaraDB for Redis instance with the correct address and password and run the above Java code, the following output is displayed:

```
User 0 bought Alibaba Cloud:Product:Chocolate, Alibaba Cloud:Product:Chicken wings
User 1 bought Alibaba Cloud:Product:Beef jerky, Alibaba Cloud:Product:Cola, Alibaba Cloud:Product:Chewing gum
User 2 bought Alibaba Cloud:Product:Beer, Alibaba Cloud:Product:Cola, Alibaba Cloud:Product:Chocolate
User 3 bought Alibaba Cloud:Product:Beef jerky, Alibaba Cloud:Product:Cola, Alibaba Cloud:Product:Chewing gum
User 4 bought Alibaba Cloud:Product:Chocolate, Alibaba Cloud:Product:Chicken wings

>>>>>>>>>>Items bought with Alibaba Cloud:Product:Beer<<<<<<<<<<<<<<
Item name: Alibaba Cloud:Product:Chocolate, Times: 1
Item name: Alibaba Cloud:Product:Cola, Times: 1

>>>>>>>>>>Products bought with Alibaba Cloud:Product:Chocolate<<<<<<<<<<<<<<
Item name: Alibaba Cloud:Product:Chicken wings, Times: 2
Item name: Alibaba Cloud:Product:Beer, Times: 1
Item name: Alibaba Cloud:Product:Cola, Times: 1

>>>>>>>>>>Products bought with Alibaba Cloud:Product:Cola<<<<<<<<<<<<<<
Item name: Alibaba Cloud:Product:Beef jerky, Times: 2
Item name: Alibaba Cloud:Product:Chewing gum, Times: 2
Item name: Alibaba Cloud:Product:Chocolate, Times: 1
Item name: Alibaba Cloud:Product:Beer, Times: 1

>>>>>>>>>>Products bought with Alibaba Cloud:Product:Chewing gum<<<<<<<<<<<<<<
Item name: Alibaba Cloud:Product:Beef jerky, Times: 2
Item name: Alibaba Cloud:Product:Cola, Times: 2

>>>>>>>>>>Products bought with Alibaba Cloud:Product:Beef jerky<<<<<<<<<<<<<<
Item name: Alibaba Cloud:Product:Cola, Times: 2
Item name: Alibaba Cloud:Product:Chewing gum, Times: 2

>>>>>>>>>>Products bought with Alibaba Cloud:Product:Chicken wings<<<<<<<<<<<<<<
Item name: Alibaba Cloud:Product:Chocolate, Times: 2
```

Publish and subscribe messages

Scenarios

ApsaraDB for Redis provides publishing (pub) and subscription (sub) functions, just like Redis. This allows multiple clients to subscribe to messages published by a client.

It must be noted that messages published using ApsaraDB for Redis are non-persistent. That means the message publisher is only responsible for publishing a message and does not save previously sent messages, whether or not they were received by anyone. Thus, messages are lost once published. Message subscribers receive messages published after their subscription. They do not receive the earlier messages in the channel.

In addition, a message publisher (publish client) does not connect to a server exclusively. While publishing messages, you can perform more operations (for example, List) from the same client, at the same time. However, a message subscriber (subscribe client) connects to a server exclusively. That is, during the subscription, the client may not perform any other operations. Rather, the operations are blocked while the client is waiting for messages in the channel. Thus, message subscribers must use a dedicated server connection or thread (see the following example).

Sample code

For the message publisher (publish client)

```
package message.kvstore.aliyun.com;

import redis.clients.jedis.Jedis;

public class KVStorePubClient {

private Jedis jedis;//
public KVStorePubClient(String host,int port, String password){
jedis = new Jedis(host,port);

//KVStore instance password
String authString = jedis.auth(password);//password

if (!authString.equals("OK"))
{
System.err.println("AUTH Failed: " + authString);
return;
}
}

public void pub(String channel,String message){
```

```
System.out.println(" >>> PUBLISH > Channel:"+channel+" > Send Message:"+message);

jedis.publish(channel, message);
}

public void close(String channel){
System.out.println(" >>> PUBLISH End > Channel:"+channel+" > Message:quit");

//The message publisher stops sending by sending a “quit” message
jedis.publish(channel, "quit");

}

}
```

For the message subscriber (subscribe client)

```
package message.kvstore.aliyun.com;

import redis.clients.jedis.Jedis;
import redis.clients.jedis.JedisPubSub;

public class KVStoreSubClient extends Thread{

private Jedis jedis;
private String channel;
private JedisPubSub listener;

public KVStoreSubClient(String host,int port, String password){
jedis = new Jedis(host,port);

//ApsaraDB for Redis instance password
String authString = jedis.auth(password);//password

if (!authString.equals("OK"))
{
System.err.println("AUTH Failed: " + authString);
return;
}
}

public void setChannelAndListener(JedisPubSub listener,String channel){
this.listener=listener;
this.channel=channel;
}

private void subscribe(){

if(listener==null || channel==null){
System.err.println("Error:SubClient> listener or channel is null");
}

System.out.println(" >>> SUBSCRIBE > Channel:"+channel);
System.out.println();
```

```
//When the recipient is listening for subscribed messages, the process is blocked until the quit message is received
(passively) or the subscription is cancelled actively
jedis.subscribe(listener, channel);
}

public void unsubscribe(String channel){
System.out.println(" >>> UNSUBSCRIBE > Channel:"+channel);
System.out.println();

listener.unsubscribe(channel);
}

@Override
public void run() {
try{

System.out.println();
System.out.println("----------SUBSCRIBE Begin-------");

subscribe();

System.out.println("----------SUBSCRIBE End-------");
System.out.println();
}catch(Exception e){
e.printStackTrace();
}

}

}
```

For the message listener

```
package message.kvstore.aliyun.com;

import redis.clients.jedis.JedisPubSub;

public class KVStoreMessageListener extends JedisPubSub{

@Override
public void onMessage(String channel, String message) {

System.out.println(" <<< SUBSCRIBE< Channel:" + channel + " >Recceived Message:" + message );
System.out.println();

//When a quit message is received, the subscription is cancelled (passively)
if(message.equalsIgnoreCase("quit")){
this.unsubscribe(channel);
}
}

@Override
public void onPMessage(String pattern, String channel, String message) {
// TODO Auto-generated method stub
```

```
}

@Override
public void onSubscribe(String channel, int subscribedChannels) {
// TODO Auto-generated method stub

}

@Override
public void onUnsubscribe(String channel, int subscribedChannels) {
// TODO Auto-generated method stub

}

@Override
public void onPUnsubscribe(String pattern, int subscribedChannels) {
// TODO Auto-generated method stub

}

@Override
public void onPSubscribe(String pattern, int subscribedChannels) {
// TODO Auto-generated method stub

}
}
```

Sample main process

```
package message.kvstore.aliyun.com;

import java.util.UUID;

import redis.clients.jedis.JedisPubSub;

public class KVStorePubSubTest {

//Information for connecting ApsaraDB for Redis, which can be obtained from the console
static final String host = "xxxxxxxxxx.m.cnhza.kvstore.aliyuncs.com";
static final int port = 6379;
static final String password="password";//password

public static void main(String[] args) throws Exception{
KVStorePubClient pubClient = new KVStorePubClient(host, port,password);

final String channel = "KVStore channel-A";

//The message sender starts sending messages, but there are no subscribers, the messages will not be received
pubClient.pub(channel, "Alibaba Cloud message 1:(no subscribers, this message will not be received)");

//Message recipient
KVStoreSubClient subClient = new KVStoreSubClient(host, port,password);

JedisPubSub listener = new KVStoreMessageListener();
subClient.setChannelAndListener(listener, channel);
```

```
//The message recipient starts subscribing
subClient.start();


//The message sender continues sending messages
for (int i = 0; i < 5; i++) {

String message=UUID.randomUUID().toString();
pubClient.pub(channel, message);
Thread.sleep(1000);
}

//The message recipient cancels the subscription
subClient.unsubscribe(channel);

Thread.sleep(1000);
pubClient.pub(channel, "Alibaba Cloud message 2:(subscription cancaled, this message will not be received)");

//The message publisher stops sending by sending a “quit” message
//When other message recipients, if any, receive "quit" in listener.onMessage(), the "unsubscribe" operation is
performed.
pubClient.close(channel);

}

}
```

Output

After you access the ApsaraDB for Redis instance with the correct address and password and run the preceding Java code, the following output is displayed.

```
 >>> PUBLISH > Channel:KVStore Channel-A > Sends the message Alibaba Cloud Message 1: (there are no
subscribers yet, so no one would receive the message)

----------SUBSCRIBE starts-------
>>> SUBSCRIBE > Channel:KVStore Channel-A

>>> PUBLISH > Channel:KVStore Channel-A > Sends the message 0f9c2cee-77c7-4498-89a0-1dc5a2f65889
<<< SUBSCRIBE < Channel:KVStore Channel-A > Receives the message 0f9c2cee-77c7-4498-89a0-1dc5a2f65889

>>> PUBLISH > Channel:KVStore Channel-A > Sends the message ed5924a9-016b-469b-8203-7db63d06f812
<<< SUBSCRIBE < Channel:KVStore Channel-A > Receives the message ed5924a9-016b-469b-8203-7db63d06f812

>>> PUBLISH > Channel:KVStore Channel-A > Sends the message f1f84e0f-8f35-4362-9567-25716b1531cd
<<< SUBSCRIBE < Channel:KVStore Channel-A > Receives the message f1f84e0f-8f35-4362-9567-25716b1531cd

>>> PUBLISH > Channel:KVStore Channel-A > Sends the message 746bde54-af8f-44d7-8a49-37d1a245d21b
<<< SUBSCRIBE < Channel:KVStore Channel-A > Receives the message 746bde54-af8f-44d7-8a49-37d1a245d21b

>>> PUBLISH > Channel:KVStore Channel-A > Sends the message 8ac3b2b8-9906-4f61-8cad-84fc1f15a3ef
<<< SUBSCRIBE < Channel:KVStore Channel-A > Receives the message 8ac3b2b8-9906-4f61-8cad-84fc1f15a3ef
```

```
>>> UNSUBSCRIBE > Channel:KVStore Channel-A

----------SUBSCRIBE ends-------

>>> PUBLISH > Channel:KVStore Channel-A > Sends the message Alibaba Cloud Message 2: (the subscription has been cancelled, so the message is not received)
>>> PUBLISH ends > Channel:KVStore Channel-A > Message: quit
```

The preceding example demonstrates a situation with one publisher and one subscriber. Actually, there can be many publishers, subscribers, and even many message channels. In such cases, you are required to slightly change the code that best fit the situation.

Pipeline

Scenarios

ApsaraDB for Redis provides a pipeline feature similar to that of Redis. A client interacts with a server through one-way pipelines, one for sending requests and the other for receiving responses. You can send operation requests successively from the client to the server; however, the client receives the response to each request from the server until it sends a quit message to the server.

Pipelines are useful, for example, when several operation commands need to be quickly submitted to the server, but the responses and operation results are not required immediately. In this case, pipelines are used as a batch processing tool to optimize the performance. The performance is enhanced mainly because the overhead of the TCP connection is reduced.

However, the client using pipelines in the app connects to the server exclusively, and non-pipeline operations are blocked until the pipelines are closed. If you must perform other operations at the same time, you can establish a dedicated connection for pipeline operations to separate them from conventional operations.

Sample code 1

Performance comparison

```
package pipeline.kvstore.aliyun.com;

import java.util.Date;

import redis.clients.jedis.Jedis;
import redis.clients.jedis.Pipeline;
```

```
public class RedisPipelinePerformanceTest {


static final String host = "xxxxxx.m.cnhza.kvstore.aliyuncs.com";
static final int port = 6379;
static final String password = "password";

public static void main(String[] args) {

Jedis jedis = new Jedis(host, port);


//ApsaraDB for Redis instance password
String authString = jedis.auth(password);// password

if (!authString.equals("OK")) {
System.err.println("AUTH Failed: " + authString);
jedis.close();
return;
}

//Execute several commands successively
final int COUNT=5000;

String key = "KVStore-Tanghan";

// 1 ---Without using pipeline operations---

jedis.del(key);//Initializes the key

Date ts1 = new Date();
for (int i = 0; i < COUNT; i++) {
//Sends a request and receives the response
jedis.incr(key);

}
Date ts2 = new Date();

System.out.println("Without Pipeline > value is:"+jedis.get(key)+" > Operating time:" + (ts2.getTime() -
ts1.getTime())+ "ms");


//2 ----Using pipeline operations---

jedis.del(key);//Initializes the key

Pipeline p1 = jedis.pipelined();

Date ts3 = new Date();
for (int i = 0; i < COUNT; i++) {
//Sends a request
p1.incr(key);
}

//Receives the response
```

```
p1.sync();

Date ts4 = new Date();

System.out.println("Using Pipeline > value is:"+jedis.get(key)+" > Operating time:" + (ts4.getTime() -
ts3.getTime())+ "ms");

jedis.close();

}

}
```

Output 1

After you access the ApsaraDB for Redis instance with the correct address and password and run the preceding Java code, the following output is displayed. The output shows that the performance is enhanced with pipelines.

```
Without pipelines > value: 5000 > Time elapsed: 5844 ms
With pipelines > value: 5000 > Time elapsed: 78 ms
```

Sample code 2

With pipelines defined in Jedis, responses are processed in two methods, as shown in the following sample code:

```
package pipeline.kvstore.aliyun.com;

import java.util.List;
import redis.clients.jedis.Jedis;
import redis.clients.jedis.Pipeline;
import redis.clients.jedis.Response;

public class PipelineClientTest {

static final String host = "xxxxxxxx.m.cnhza.kvstore.aliyuncs.com";
static final int port = 6379;
static final String password = "password";

public static void main(String[] args) {

Jedis jedis = new Jedis(host, port);


//ApsaraDB for Redis instance password
String authString = jedis.auth(password);// password

if (!authString.equals("OK")) {
System.err.println("AUTH Failed: " + authString);
```

```
jedis.close();
return;
}

String key = "KVStore-Test1";

jedis.del(key);//Initialization

// -------- Method 1
Pipeline p1 = jedis.pipelined();

System.out.println("-----Method 1-----");

for (int i = 0; i < 5; i++) {
p1.incr(key);
System.out.println("Pipeline send requests");
}


// After sending all requests, the client starts receiving responses
System.out.println("Sending requests completed,start to receive response");
List<Object> responses = p1.syncAndReturnAll();

if (responses == null || responses.isEmpty()) {
jedis.close();
throw new RuntimeException("Pipeline error: no response received");
}
for (Object resp : responses) {
System.out.println("Pipeline received response: " + resp.toString());
}
System.out.println();

//-------- Method 2
System.out.println("-----Method 2-----");

jedis.del(key);//Initialization

Pipeline p2 = jedis.pipelined();

//Declare the responses first
Response<Long> r1 = p2.incr(key);
System.out.println("Pipeline sending requests");

Response<Long> r2 = p2.incr(key);
System.out.println("Pipeline sending requests");

Response<Long> r3 = p2.incr(key);
System.out.println("Pipeline sending requests");

Response<Long> r4 = p2.incr(key);
System.out.println("Pipeline sending requests");

Response<Long> r5 = p2.incr(key);
System.out.println("Pipeline sending requests");

try{
```

```
r1.get(); //Errors are generated because the client has not yet started receiving responses
}catch(Exception e){
System.out.println(" <<< Pipeline error: not start to receive response yet >>> ");
}


// After sending all requests, the client starts receiving responses
System.out.println("Sending requests completed, start to receive response");
p2.sync();

System.out.println("Pipeline receiving response: " + r1.get());
System.out.println("Pipeline receiving response: " + r2.get());
System.out.println("Pipeline receiving response: " + r3.get());
System.out.println("Pipeline receiving response: " + r4.get());
System.out.println("Pipeline receiving response: " + r5.get());

jedis.close();
}

}
```

Output 2

After you access the ApsaraDB for Redis instance with the correct address and password and run the preceding Java code, the following output is displayed:

```
-----Method 1-----
Pipeline sends a request
Pipeline sends a request
Pipeline sends a request
Pipeline sends a request
Pipeline sends a request
After sending all requests, the client starts receiving responses
Pipeline receives response 1
Pipeline receives response 2
Pipeline receives response 3
Pipeline receives response 4
Pipeline receives response 5

-----Method 2-----
Pipeline sends a request
Pipeline sends a request
Pipeline sends a request
Pipeline sends a request
Pipeline sends a request
<<< Pipeline error: The client has not yet started receiving responses >>>
After sending all requests, the client starts receiving responses
Pipeline receives response 1
Pipeline receives response 2
Pipeline receives response 3
Pipeline receives response 4
Pipeline receives response 5
```

Transactions

Scenarios

ApsaraDB for Redis supports a feature to define transactions, as in Redis. This allows you to use the MULTI, EXEC, DISCARD, WATCH, and UNWATCH commands to run atomic transactions.

Note that the definition of transaction in Redis is slightly different from that in relational databases. If an operation fails or the transaction is cancelled by the DISCARD command, Redis does not perform transaction rollback.

Sample code 1: Two clients operate on different keys

```
package transcation.kvstore.aliyun.com;

import java.util.List;

import redis.clients.jedis.Jedis;
import redis.clients.jedis.Transaction;

public class KVStoreTranscationTest {

static final String host = "xxxxxx.m.cnhza.kvstore.aliyuncs.com";
static final int port = 6379;
static final String password = "password";

//**Note that the two keys have different values
static String client1_key = "KVStore-Transcation-1";
static String client2_key = "KVStore-Transcation-2";

public static void main(String[] args) {

Jedis jedis = new Jedis(host, port);

//ApsaraDB for Redis instance password
String authString = jedis.auth(password);//password

if (!authString.equals("OK")) {
System.err.println("AUTH Failed: " + authString);
jedis.close();
return;
}

jedis.set(client1_key, "0");
```

```
//Starts another thread to simulate another client
new KVStoreTranscationTest().new OtherKVStoreClient().start();

Thread.sleep(500);

Transaction tx = jedis.multi();//Starts the transaction

//The following operations are collectively submitted to the server for processing as "atomic operations"
tx.incr(client1_key);
tx.incr(client1_key);
Thread.sleep(400);//Here, the thread's suspension has no effect on the successive operations in the transaction, but it also suspends the operations of other threads
tx.incr(client1_key);
Thread.sleep(300);//Here, the thread's suspension has no effect on the successive operations in the transaction, but it also suspends the operations of other threads
tx.incr(client1_key);
Thread.sleep(200);//Here, the thread's suspension has no effect on the successive operations in the transaction, but it also suspends the operations of other threads
tx.incr(client1_key);

List<Object> result = tx.exec();//Submitted for execution

//Parses and prints out the results
for(Object rt : result){
System.out.println("Client 1 > in transaction> "+rt.toString());
}

jedis.close();
}

class OtherKVStoreClient extends Thread{
@Override
public void run() {

Jedis jedis = new Jedis(host, port);
//ApsaraDB for Redis instance password
String authString = jedis.auth(password);// password

if (!authString.equals("OK")) {
System.err.println("AUTH Failed: " + authString);
jedis.close();
return;
}

jedis.set(client2_key, "100");

for (int i = 0; i < 10; i++) {
try {
Thread.sleep(300);
} catch (InterruptedException e) {
e.printStackTrace();
}

System.out.println("Client 2 > "+jedis.incr(client2_key));
}
```

```
jedis.close();
}
}
}
```

Output 1

After you access the ApsaraDB for Redis instance with the correct address and password and run the preceding Java code, the following output is displayed. Here, we can see that Client 1 and Client 2 are in different threads. The operations in the transaction submitted by Client 1 are run sequentially. Client 2 requests for operating on another key during this period, but the operation is blocked and Client 2 has to wait until all the operations in Client 1’ s transaction are completed.

```
Client 2 > 101
Client 2 > 102
Client 2 > 103
Client 2 > 104
Client 1 > Transaction > 1
Client 1 > Transaction > 2
Client 1 > Transaction > 3
Client 1 > Transaction > 4
Client 1 > Transaction > 5
Client 2 > 105
Client 2 > 106
Client 2 > 107
Client 2 > 108
Client 2 > 109
Client 2 > 110
```

Sample code 2: Two clients operate on the same key

By slightly modifying the preceding code, we can have the two clients operate on the same key. The other parts of the code remain unchanged.

```
    ... ...

//**Note that the values of the keys are the same
static String client1_key = "KVStore-Transcation-1";
static String client2_key = "KVStore-Transcation-1";

... ...
```

Output 2

After running the modified Java code, the output is displayed as follows. We can see that the two clients are in different threads but operate on the same key. However, while Client 1 uses the

transaction feature to operate on this key, Client 2 is blocked and has to wait until all the operations in Client 1’ s transaction are completed.

```
Client 2 > 101
Client 2 > 102
Client 2 > 103
Client 2 > 104
Client 1 > Transaction > 105
Client 1 > Transaction > 106
Client 1 > Transaction > 107
Client 1 > Transaction > 108
Client 1 > Transaction > 109
Client 2 > 110
Client 2 > 111
Client 2 > 112
Client 2 > 113
Client 2 > 114
Client 2 > 115
```

Redis support for the November 11 shopping spree

Background

With the November 11 shopping spree in full swing, ApsaraDB for Redis has proved that that it could provide full assurance to businesses during this important and demanding event. Currently, ApsaraDB for Redis provides a standard single copy, a standard dual copy, and a cluster edition.

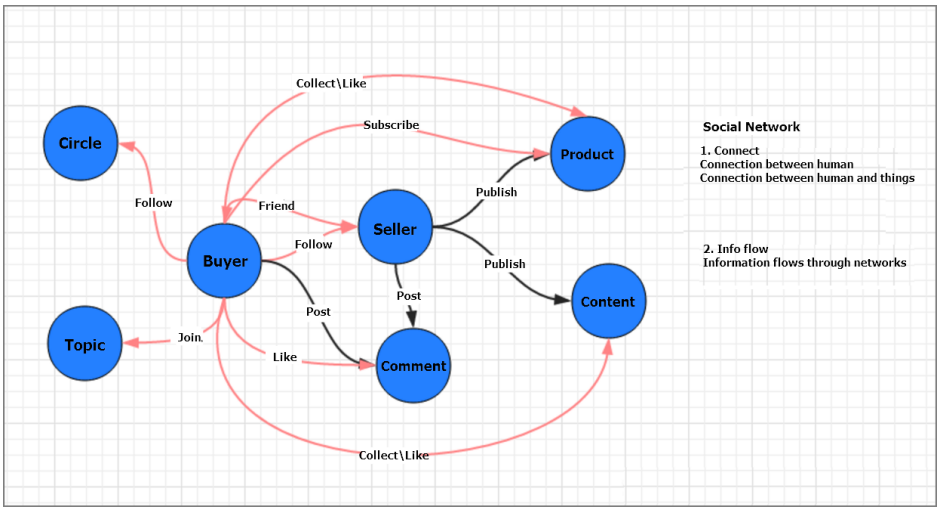
The standard single and dual copies feature high compatibility and support Lua scripts and geographic location computation. The cluster edition provides large capacity and high performance, which breaks through the performance limitations of the single-thread, standalone Redis.

ApsaraDB for Redis works in dual-host hot standby mode by default and supports backup and recovery. It is under continuous optimization and upgrade of Alibaba Cloud’ s Redis team. It comes with powerful security defense capabilities. Here, we introduce this product using several November 11 business scenarios. These scenarios have been simplified for the purpose of easy understanding.

Storing the social relation for hundreds of millions of users in Weitao Community

The Weitao Community carries social relation for hundreds of millions of Taobao users. Taobao users

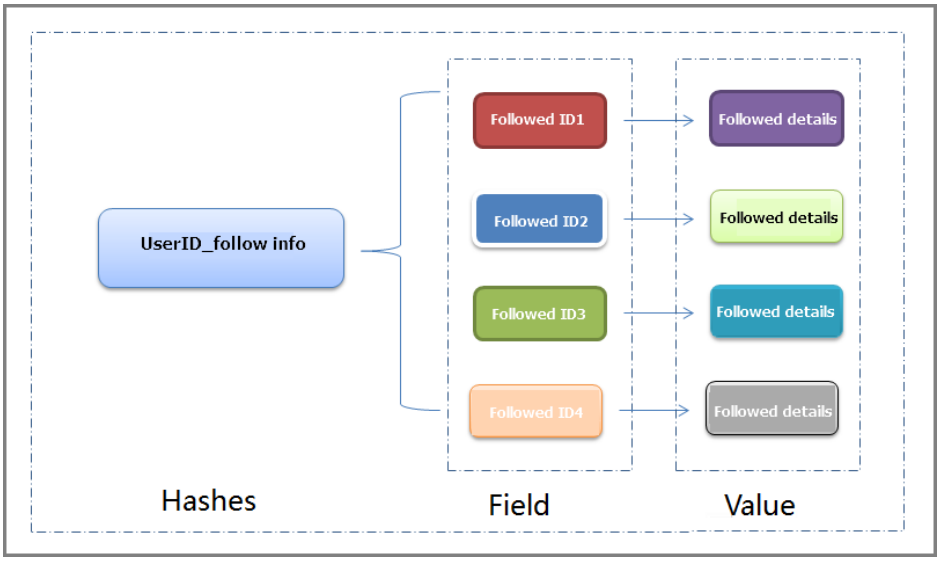
can specify their followers' lists and the stores maintain the data of their regular customers or followers. The overall social relation is as follows.



If a traditional relational database model is used to express the relation chain, this complicates business design and turns out to be inferior performance. The Weitao Community uses a cluster of ApsaraDB for Redis to cache followers chains, which simplifies the storage of followers data and guarantees a smooth business experience during November 11. The Weitao Community uses Hashes to store the relation chains. The storage structure is as shown in the following figure and the following two interfaces are provided for querying:

Whether Users A and B are followers of each other

List of items User A is following



Paginating comments to a live broadcasting in Tmall

When mobile users view live broadcasts during November 11, they can get more comments to the

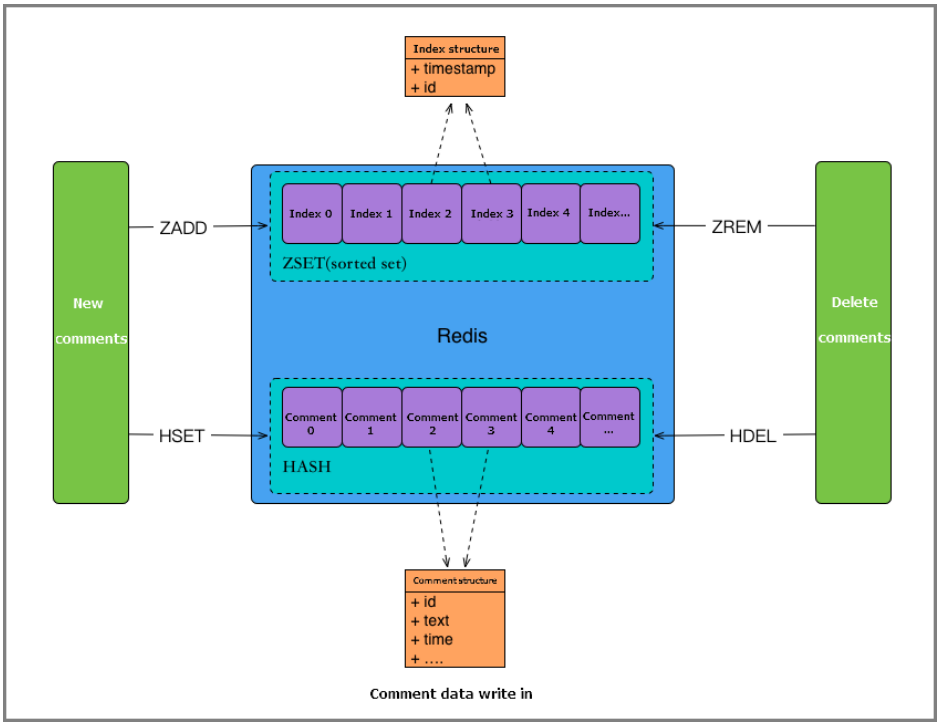
live broadcasts in three ways:

Incremental pull down: Gets a specified number (increment) of comments from the specified position up.

Pull-down refresh: Gets a specified number of the latest comments.

Incremental pull up: Gets a specified number (increment) of comments from the specified position down.

The wireless live broadcasting system uses Redis to optimize the business scenario. This guarantees not only the success rate for the live comment interface but also over 50,000 transactions per second (TPS) and a request response time in milliseconds. The live broadcasting system writes two sets of the data for each broadcast, indexes, and comments. The indexes are written in SortedSet data structure to sort comments, while comments are stored in Hashes. A comment can be retrieved after an index is used to obtain the index ID, which is used to read the Hashes and to obtain a list of comments. A comment is written in the following process:

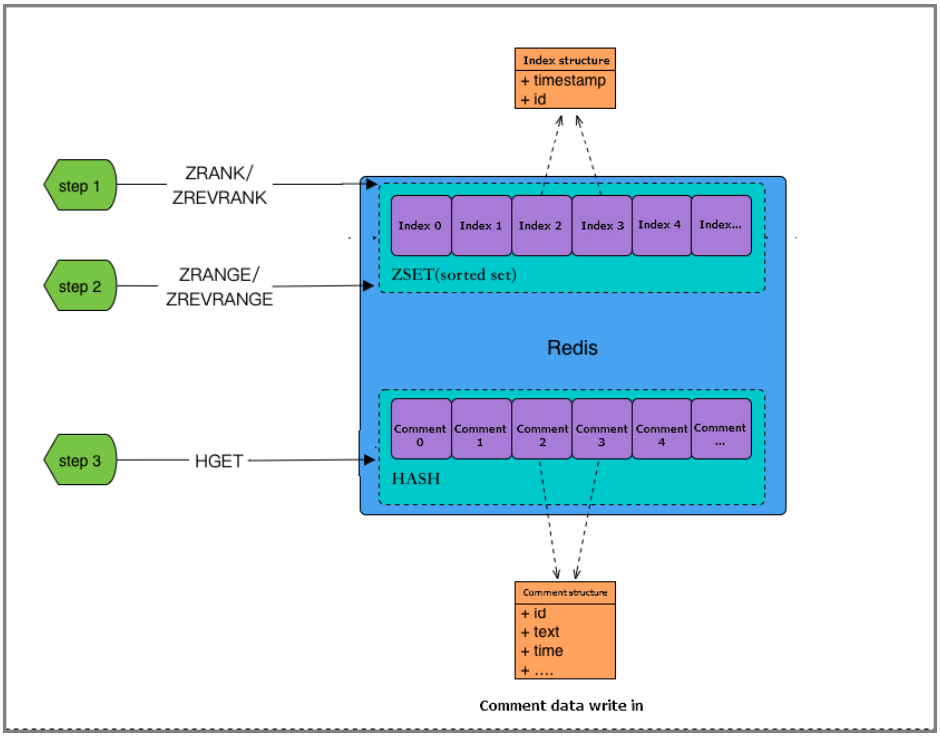


After a user refreshes the list, the background retrieves the corresponding comments. This process is as follows:

Retrieve the index ID.

Retrieve the index list.

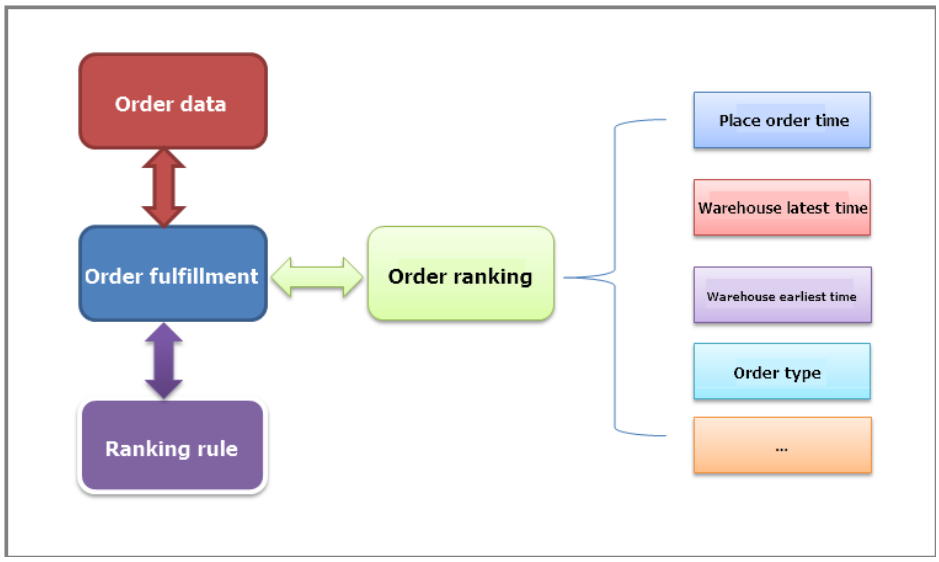
Retrieve the comment.



Sorting orders in Cainiao document fulfillment center

After a user buys an item on November 11, a corresponding logistics order is created, which is to be processed by Cainiao warehouse and logistics system. The decision making system generates an order fulfillment plan based on the order information so that each stage of warehouse and logistics works with each other smartly. The plan specifies the time for issuing the order to the warehouse, the time for outbound delivery, the time for item collection, and the time for delivering the item. The document fulfillment center carries out each stage of logistics services against the fulfillment plan. Owing to the limited capacities of warehouses and logistics, documents to be processed first are orders considered to be of the highest priorities. Therefore, orders are sorted by priorities before being issued.

ApsaraDB for Redis is used to sort logistics orders and to determine their priorities.



Redis memory usage analysis

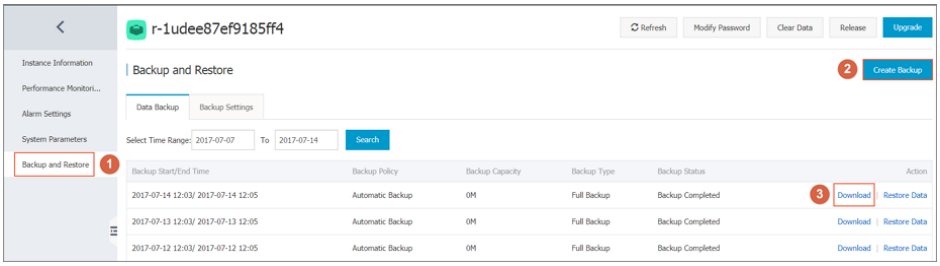
Background

Users often want to see the memory usage for data in their Redis instances.To make sure the normal use of online instances, we generally use bgsave to generate a dump.rdp file and then use this file with redis-rdb-tools and SQlite to perform a static analysis. The analysis process is simple and practical. Redis users can easily learn it.

Create a backup

If you are using a Redis client, run bgsave to generate an .rdb file.

If you have subscribed to an ApsaraDB for Redis instance, perform data backup and download the data on the console. The downloaded data is saved as an .rdb file. See the following figure for more information.



Generate a memory snapshot

The redis-rdb-tools is a Python tool used to parse RDB files. It provides three main functions:

- Generate memory snapshots.
- Dump RDB files into JSON format.
- Use standard diff tools to compare dump files.

When analyzing the memory use, we mainly use the memory snapshot generation function.

Install the redis-rdb-tools

You can install the redis-rdb-tools in either of the following two ways.

Install it from Python Package Index (PyPI)

```
pip install rdbtools
```

Install it from source code

```
git clone https://github.com/sripathikrishnan/redis-rdb-tools
cd redis-rdb-tools
sudo python setup.py install
```

Use redis-rdb-tools to generate a memory snapshot

Run the following command to generate a memory snapshot:

```
rdb -c memory dump.rdb > memory.csv
```

The generated memory report is in CSV format. It contains database IDs, data types, keys, memory usage (bytes), and encoding. The memory usage consists of the key, value, and other values.

> **Note**: The memory usage value is a theoretical approximation. Generally, it is slightly lower than the actual value.Here’ s a sample memory.csv file:

```
$head memory.csv
database,type,key,size_in_bytes,encoding,num_elements,len_largest_element
0,string,"orderAt:377671748",96,string,8,8
0,string,"orderAt:413052773",96,string,8,8
0,sortedset,"Artical:Comments:7386",81740,skiplist,479,41
0,sortedset,"pay:id:18029",2443,ziplist,84,16
0,string,"orderAt:452389458",96,string,8,8
```

Analyze a memory snapshot

SQLite is a lightweight database. Import the previously generated .csv file into the database, and you can use SQL statements to easily perform various analyses on Redis memory data.

Import the .csv file

```
sqlite3 memory.db
sqlite> create table memory(database int,type varchar(128),key varchar(128),size_in_bytes int,encoding
varchar(128),num_elements int,len_largest_element varchar(128));
sqlite>.mode csv memory
sqlite>.import memory.csv memory
```

Make analyses based on the imported data. Here are a few simple examples:

Query the number of keys

```
sqlite>select count(*) from memory;
```

Query the total memory usage

```
sqlite>select sum(size_in_bytes) from memory;
```

Query top 10 keys with highest memory usage

```
sqlite>select * from memory order by size_in_bytes desc limit 10;
```

Query lists with over 1000 members

```
sqlite>select * from memory where type='list' and num_elements > 1000 ;
```

Conclusion

You can easily perform static analyses on the memory usage of an ApsaraDB for Redis instance by using the redis-rdb-tools and SQLite. The process is simple. You only need to obtain the .rdb file.

```
rdb -c memory dump.rdb > memory.csv;
sqlite3 memory.db
sqlite> create table memory(database int,type varchar(128),key varchar(128),size_in_bytes int,encoding
varchar(128),num_elements int,len_largest_element varchar(128));
sqlite>.mode csv memory
sqlite>.import memory.csv memory
```

By using the preceding approach, a user found a list with over 10 GB data, and another user found a

string value of over 43 MB. These analysis results addressed users' concerns and helped them eliminate potential business risks and identify the bottlenecks of their business performance.