

HBase_allocation

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1. Introduction

The HBase allocation tool is designed to help users manage cluster resource among different application and tables.

When we manage a large scale of HBase cluster with many applications running on it, there will be lots of problems. In Taobao^[1] there is a cluster for many departments to test their applications performance, these applications are based on HBase. With one cluster which has 12 servers, there will be only one application running exclusively on this server, and many other applications must wait until the previous test finished.

After we add allocation manage function to the cluster, applications can share the cluster and run concurrently. Also if the Test Engineer wants to make sure there is no interference, he/she can move out other tables from this group.

In groups we use table priority to allocate resource, when system is busy; we can make sure high-priority tables are not affected lower-priority tables

[1] Taobao (simplified Chinese: 淘宝网) is a Chinese language web site for online shopping, similar to eBay, Rakuten and Amazon, operated in the People's Republic of China by Alibaba Group. In 2009 Taobao saw advertising revenues of \$220 Million.

2. Functions

2.1 Group management

When we build an HBase cluster, there would be a default group called "0", it is used to store "-ROOT-" and ".META." Regions. Users can add a new group, set special-conf mark or not. New group name must be integer, and must not be same with the existing groups. If we set special-conf mark to group, it means that group has different in configuration or jar files. When we move region servers in or out from this groups, system will update change the region servers' configuration with new group conf files and jars. When you want to delete a group, you must make sure that there is no region server in this group. If not, you must move region servers out first.

2.1.1 View groups

[http://\\${master_address}:60010/showgroup.jsp](http://${master_address}:60010/showgroup.jsp), this page shows all groups' information, including special configuration marks, region server allocation, delete and add buttons.



Show Regionserver Group Information

[Master](#),
 [Local logs](#),
 [Thread Dump](#),
 [Log Level](#),
[Group Information](#)

List Group

Group name	Special Configuration	Server num	Region num	Action
group: 1	true	(6)	(5903)	Delete
group: 0	false	(6)	(4675)	default group
Add Group:	<input type="text"/> (must be int)	Special ? <input type="checkbox"/>		AddNew

Figure 1: View group information

2.1.2 Add a new group

Example:

[http://\\${master_address}:60010/showgroup.jsp](http://${master_address}:60010/showgroup.jsp), when you want to add a new group, you must set the group name and special configuration mark.



List Group

Group name	Special Configuration	Server num	Region num	Action
group: 1	true	(6)	(5903)	Delete
group: 0	false	(6)	(4675)	default group
Add Group:	2 <input type="text"/> (must be int)	Special ? <input checked="" type="checkbox"/>		AddNew

Figure 2: Add group "2"



List Group

Group name	Special Configuration	Server num	Region num	Action
group: 2	true	(0)	(0)	Delete
group: 1	true	(6)	(5903)	Delete
group: 0	false	(6)	(4675)	default group
Add Group:	(must be int)	Special ? <input type="checkbox"/>		AddNew

Figure 3: Successfully add

2.1.3 Delete a group

Example:

[http://\\${master_address}:60010/showgroup.jsp](http://${master_address}:60010/showgroup.jsp),

Delete a group which has region servers, you will get a warning.



Figure 4: The warning when delete a group with regions

2.2 Region server management

2.2.1 Move region servers between groups

When we move region server to other group, we will check “-ROOT-” and “.META.” region first ,if the region server holding “-ROOT-” or “.META.” regions, users can not move them. When we move a region server out of a group, its regions will be assigned in other region servers left on this group. If there is no region server available, users must change the tables’ group property first. If we move in or out a region server from a special configuration group, system will update the region server’s configuration which includes HBase conf fold , lib fold and hbase-XX.jar.

Example:

[http://{\\$master_address}:60010/showgroup.jsp](http://{$master_address}:60010/showgroup.jsp), Add a new group “2”, without special-conf mark, then move a region server dw93.kgb.sqa.cm4,60020 into group “2”. Click the “UpdateRegionserverGroup” button.

List Group

Group name	Special Configuration	Server num	Region num	Action
group: 2	false	(0)	(0)	Delete
group: 1	true	(6)	(5903)	Delete
group: 0	false	(6)	(4675)	default group
Add Group:	(must be int)	Special ? <input type="checkbox"/>		AddNew

RegionServer Group

Region Server name	Request num	Region num	Original Group	Update to New Group
dw83.kgb.sqa.cm4,60020	0	982	1	
dw85.kgb.sqa.cm4,60020	0	983	1	
dw84.kgb.sqa.cm4,60020	0	983	1	
dw87.kgb.sqa.cm4,60020	0	984	1	
dw86.kgb.sqa.cm4,60020	0	982	1	
dw82.kgb.sqa.cm4,60020	0	989	1	
dw90.kgb.sqa.cm4,60020	82169	781	0	
dw93.kgb.sqa.cm4,60020	661	780	0	2
dw91.kgb.sqa.cm4,60020	248	779	0	
dw92.kgb.sqa.cm4,60020	435	778	0	
dw88.kgb.sqa.cm4,60020	426	779	0	
dw89.kgb.sqa.cm4,60020	378	778	0	
				UpdateRegionserverGroup

Figure 5: move a region server

Show Regionserver Group Information

Master, Local logs, Thread Dump, Log Level, Group Information

System is busy, you can't do any other operations.

Change Regionserver Plan

Move dw93.kgb.sqa.cm4,60020 form 0 to 2

Remaining Region num :763

Refresh

List Group

Group name	Special Configuration	Server num	Region num	Action
group: 2	false	(0)	(0)	Delete
group: 1	true	(6)	(5903)	Delete
group: 0	false	(6)	(4674)	default group
Add Group:	(must be int)	Special ? <input type="checkbox"/>		AddNew

RegionServer Group

Region Server name	Request num	Region num	Original Group	Update to New Group
dw83.kgb.sqa.cm4,60020	0	982	1	
dw85.kgb.sqa.cm4,60020	0	983	1	

Figure 6: Process regions on this region server, remaining regions number will decrease



Figure 7: Change group successfully

2.2.2 Move region servers to a special-conf group

Example:

[http://\\${master_address}:60010/showgroup.jsp](http://${master_address}:60010/showgroup.jsp) .

Add a new group “3”, with special-conf mark, and then move region server dw84.kgb.sqa.cm4,60020 , dw85.kgb.sqa.cm4,60020 from group “1” to group “3” .



Figure 8: group information

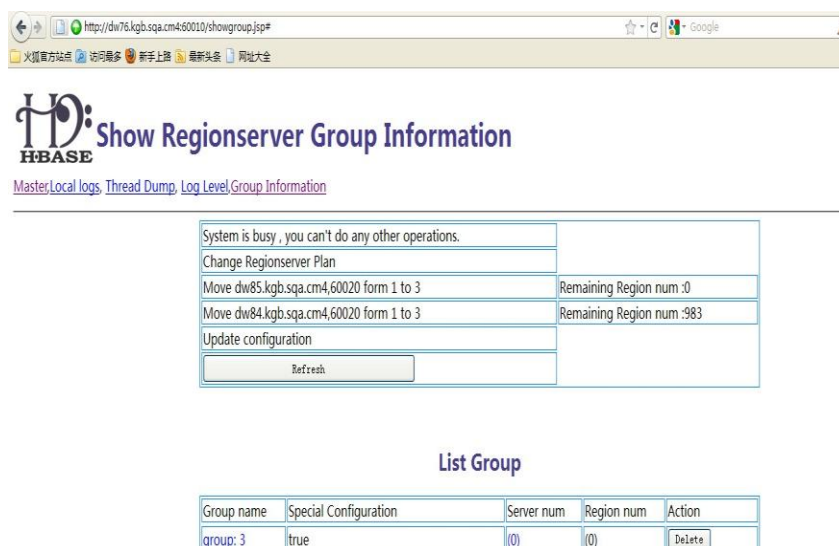


Figure 9: Updating the region servers' configuration

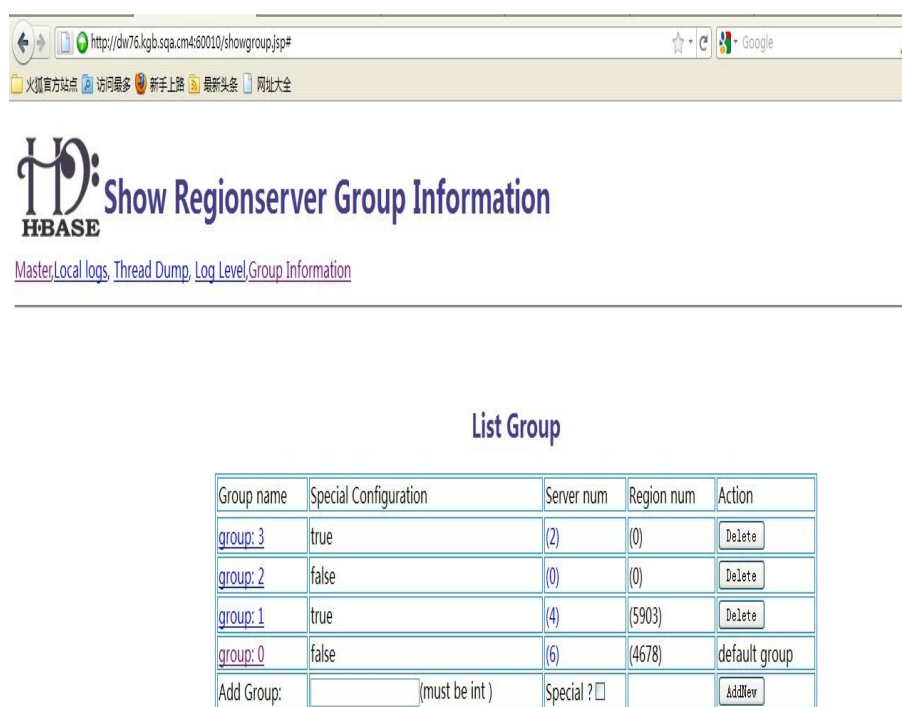


Figure 10: Change group successfully.

2.3 Group Information

2.3.1 View Group Information

Group detailed information page lists all its region servers and the information of this server which including server address, table number, region number and table information.

Table information include table name, region number the table has in this group, table priority and table groups attribute. One table can be assigned to several groups but one region server can only be assign to one group. When we create a table without set group property, its regions can be assigned to all groups without

special-conf mark.

Example:

[http://\\${master_address}:60010/groupinfo.jsp?groupname=1](http://${master_address}:60010/groupinfo.jsp?groupname=1), Take group “1” for example. It has 4 region servers ,10 tables and 5903 regions.

Group Detail Information

group: 1

Need balance ? [balance](#)

Server num :4

Server name	Server detail	Table num	Region num
Serverdw83.kgb.sqa.cm4,60020	dw83.kgb.sqa.cm4,60020	table num:10	region num:1460
Serverdw87.kgb.sqa.cm4,60020	dw87.kgb.sqa.cm4,60020	table num:10	region num:1484
Serverdw86.kgb.sqa.cm4,60020	dw86.kgb.sqa.cm4,60020	table num:10	region num:1474
Serverdw82.kgb.sqa.cm4,60020	dw82.kgb.sqa.cm4,60020	table num:10	region num:1485

Table detail info in this group

Total Table num:10
Total Region num:5903
If you want change table group ,new groups must be int ,and must be split with ","

The priority of table you want to change must between 1 and 10 ,and small num means high priority.

Table name	Region num	Table Priority	Belong Groups	Change Groups	Change Priority	Submit	Table Balance
bashtest2	82	4	1,			ChangeTable	balacne
cache_index	53	5	1,			ChangeTable	balacne
cluster_index	378	5	1,			ChangeTable	balacne
data_org	154	5	1,			ChangeTable	balacne
pwrite1	2048	5	1,			ChangeTable	balacne

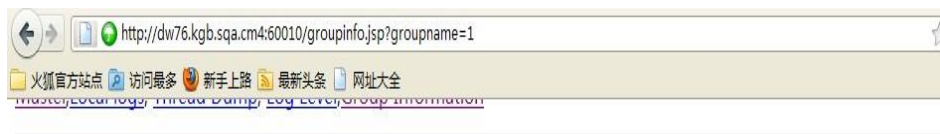
Figure 11: View group detail region server and table information

2.3.2 Balance Group

We provide a page to balance all regions belong to this group.

Example:

[http://\\${master_address}:60010/groupinfo.jsp?groupname=1](http://${master_address}:60010/groupinfo.jsp?groupname=1), the region distribution balanced



Group Detail Information

group: 1

Need balance ? [balance](#)

Server num :4

Server name	Server detail	Table num	Region num
Serverdw83.kgb.sqa.cm4,60020	dw83.kgb.sqa.cm4,60020	table num:10	region num:1475
Serverdw87.kgb.sqa.cm4,60020	dw87.kgb.sqa.cm4,60020	table num:10	region num:1476
Serverdw86.kgb.sqa.cm4,60020	dw86.kgb.sqa.cm4,60020	table num:10	region num:1476
Serverdw82.kgb.sqa.cm4,60020	dw82.kgb.sqa.cm4,60020	table num:10	region num:1476

Figure 12: Balance regions in group

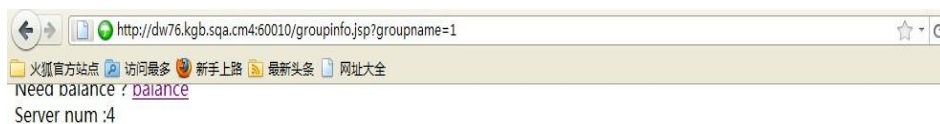
2.4 Table Information

2.4.1 Change Group Assignment of Table

We can change table group property dynamically. If assign table to more than one group, separate group name by “,”.

Example:

[http://\\${master address}:60010/groupinfo.jsp?groupname=1](http://${master address}:60010/groupinfo.jsp?groupname=1), change table bashtest2's group attribute from group “1” to group “3”. Write 3 in “Change Groups” input box, then click “ChangeTable” button. It may take a while, because this process including disable and enable table.



Server name	Server detail	Table num	Region num
Serverdw83.kgb.sqa.cm4,60020	dw83.kgb.sqa.cm4,60020	table num:10	region num:1475
Serverdw87.kgb.sqa.cm4,60020	dw87.kgb.sqa.cm4,60020	table num:10	region num:1476
Serverdw86.kgb.sqa.cm4,60020	dw86.kgb.sqa.cm4,60020	table num:10	region num:1476
Serverdw82.kgb.sqa.cm4,60020	dw82.kgb.sqa.cm4,60020	table num:10	region num:1476

Table detail info in this group

Total Table num:10

Total Region num:5903

If you want change table group ,new groups must be int ,and must be split with ","

The priority of table you want to change must between 1 and 10 ,and small num means high priority.

Table name	Region num	Table Priority	Belong Groups	Change Groups	Change Priority	Submit	Table Balance
bashtest2	82	4	1,	3		ChangeTable	balacne
cache_index	53	5	1,			ChangeTable	balacne
cluster_index	378	5	1,			ChangeTable	balacne
data_org	154	5	1,			ChangeTable	balacne

Figure 12: Change table group property

After change, bashtest2 has moved to group "3".

[http://\\$master_address:60010/groupinfo.jsp?groupname=3](http://$master_address:60010/groupinfo.jsp?groupname=3)



Group Detail Information

group: 3

Need balance ? [balance](#)

Server num :2

Server name	Server detail	Table num	Region num
Serverdw85.kgb.sqa.cm4,60020	dw85.kgb.sqa.cm4,60020	table num:1	region num:36
Serverdw84.kgb.sqa.cm4,60020	dw84.kgb.sqa.cm4,60020	table num:1	region num:46

Table detail info in this group

Total Table num:1

Total Region num:82

If you want change table group ,new groups must be int ,and must be split with ","

The priority of table you want to change must between 1 and 10 ,and small num means high priority.

Table name	Region num	Table Priority	Belong Groups	Change Groups	Change Priority	Submit	Table Balance
bashtest2	82	4	3,			ChangeTable	balacne

Figure 13: Table group has changed from '1' to '3'

2.4.2 Change table priority

We can change table priority in this page. New priority must between 0 and 10, and small number means higher priority.

About table priority performance, please see [Performance of Table priority.pdf](#)

Also you can change table priority use client API, for example:

```
hAdmin.disableTable(tablename);
HTableDescriptor hdesc= hAdmin.getTableDescriptor(Bytes.toBytes(tablename));
hdesc.setValue(Bytes.toBytes("priority"), Bytes.toBytes(priStr));
hAdmin.modifyTable(Bytes.toBytes(tablename), hdesc);
hAdmin.enableTable(tablename);
```

Example:

[http://\\${master_address}:60010/groupinfo.jsp?groupname=3](http://${master_address}:60010/groupinfo.jsp?groupname=3), change table bashtest2 priority from 4 to 1. Write 1 in change priority blank, then click "ChangeTable" button.

The screenshot shows a web browser window with the URL <http://dw76.kgb.sqa.cm4:60010/groupinfo.jsp?groupname=3>. The page title is "Group Detail Information" and it shows "group: 3". Below this, there is a section "Need balance ? [balance](#)" and "Server num :2". A table lists server details:

Server name	Server detail	Table num	Region num
Serverdw85.kgb.sqa.cm4,60020	dw85.kgb.sqa.cm4,60020	table num:1	region num:35
Serverdw84.kgb.sqa.cm4,60020	dw84.kgb.sqa.cm4,60020	table num:1	region num:47

Below the table, it says "Table detail info in this group".

Total Table num:1
Total Region num:82
If you want change table group ,new groups must be int ,and must be split with ","

The priority of table you want to change must between 1 and 10 ,and small num means high priority.

Table name	Region num	Table Priority	Belong Groups	Change Groups	Change Priority	Submit	Table Balance
bashtest2	82	1	3,			<input type="button" value="ChangeTable"/>	balacne

Figure 14: Table priority has changed from 4 to 1

2.4.3 Balance table

Besides balance in group level, we provide table level balance.

Example:

In groupinfo page ,click balance button at the end of table "pweite1".

[http://\\${master_address}:60010/dotablebalance.jsp?tablename=pwrite1](http://${master_address}:60010/dotablebalance.jsp?tablename=pwrite1)

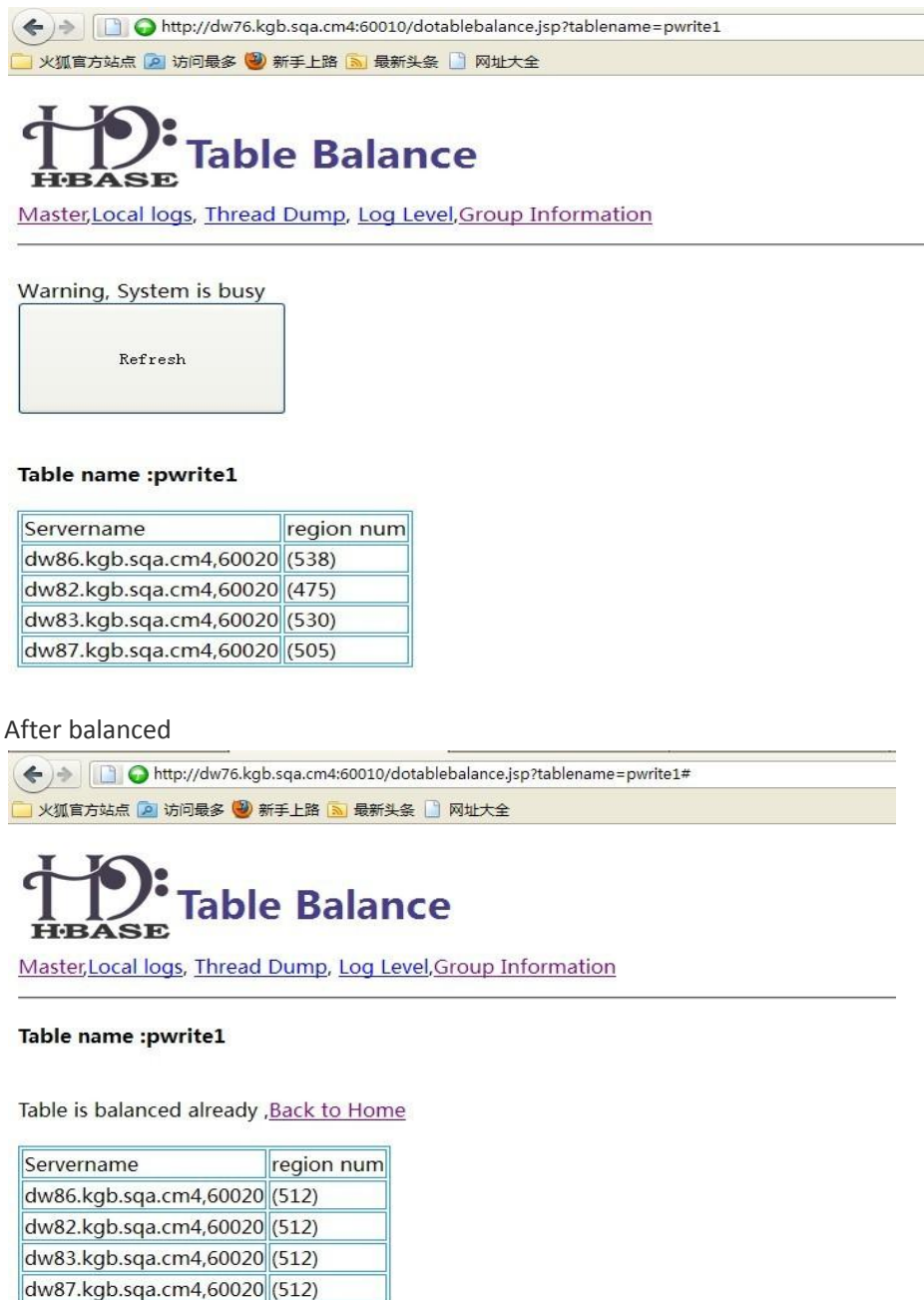


Figure 14: Balance regions of table

2.5 Group Modify and Restart

2.5.1 Group Modify hbase-site.xml

Sometimes we want to update regionserver configurations of a group ,but don't want restart all hbase system.We provide a function only update a group configuration .

Example:

In [http://\\${master_address}:60010/changegroupconf.jsp](http://${master_address}:60010/changegroupconf.jsp), we can update a new hbase-site.xml of all regionservers of a group. First we change group, then write new hbase-site.xml to textbox field. Finally click "Distribute" button.

Choose Group:

New hbase-site.xml:

```
-->
<configuration>
  <property>
    <name>hbase.zookeeper.quorum</name>
    <value>10.232.98.75,10.232.98.76,10.232.98.77,10.232.98.78,10.232.98.80</value>
  </property>
  <property>
    <name>hbase.client.retries.number</name>
    <!--Retry for 2060ms-->
    <value>11</value>
  </property>
  <property>
    <name>hbase.client.pause</name>
    <value>20</value>
  </property>
  <property>
    <name>hbase.ipc.client.tcpnodelay</name>
    <value>true</value>
  </property>
  <property>
    <name>ipc.ping.interval</name>
    <value>3000</value>
  </property>
</configuration>
```

Distribute group configure:

Restart group regionserver:

Figure 15: Distribute group configure

2.5.2 Restart regionservers in group

After we have distribute new hbase-site.xml to all regionservers of a group, we can restart these regionservers to carry them into effect.

Example:

In [http://\\${master_address}:60010/changegroupconf.jsp](http://${master_address}:60010/changegroupconf.jsp) First choose group name, then click "Restart" button.

Choose Group:

New hbase-site.xml:

Distribute group configure:

Restart group regionserver:

Figure 16: Restart group

3. Patches

There are three ways to add this features, you can get the required components from

https://github.com/ICT-Ope/HBase_allocation/

3.1 Full patch

In “fullpatch” fold, the file “PriorityAndGroupInfo.patch” is used to patch all JSP and java source code to HBase source code. After patched, user must compile the source code and replace the hbase-*.jar

When region servers move in or out special-conf groups, system needs to copy configuration files between servers and restart region servers to obtain the new configuration. So there are 2 shell scripts must be changed permission manually.

Example:

```
tar zxvf hbase-0.90.2.tar.gz
cd hbase-0.90.2
ls -l ../ PriorityAndGroupInfo.patch
patch -p1 < ../PriorityAndGroupInfo.patch
cd hbase-webapps/master/
chmod +x *.sh
```

3.2 Compiled jar and JSP patch

In “Jarandwebpatch” fold, there are compiled jar hbase-0.90.2.jar and the JSP patch.

Example:

Assume GroupInfoWeb.patch , our modified hbase-0.90.2.jar and original hbase-0.90.2.tar.gz are in the same directory.

```
tar zxvf hbase-0.90.2.tar.gz
cd hbase-0.90.2
cp ../hbase-0.90.2.jar .
cp ../hbase-0.90.2.jar ./lib
ls -l ../ GroupInfoWeb.patch
patch -p1 < ../ GroupInfoWeb.patch
cd hbase-webapps/master/
chmod +x *.sh
```

3.3 Integrated gzip file

In the hbase-0.90.2 fold we placed an integrated gzib file, It’s all prepared, you only need to extract it and deploy it like deploy HBase.