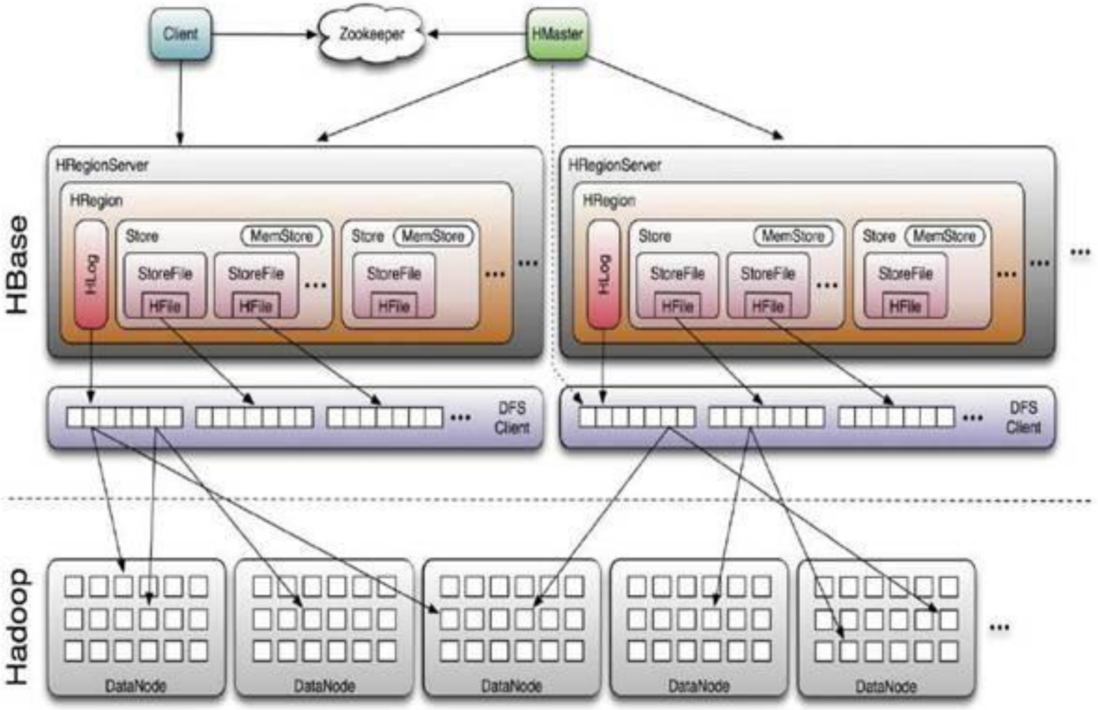


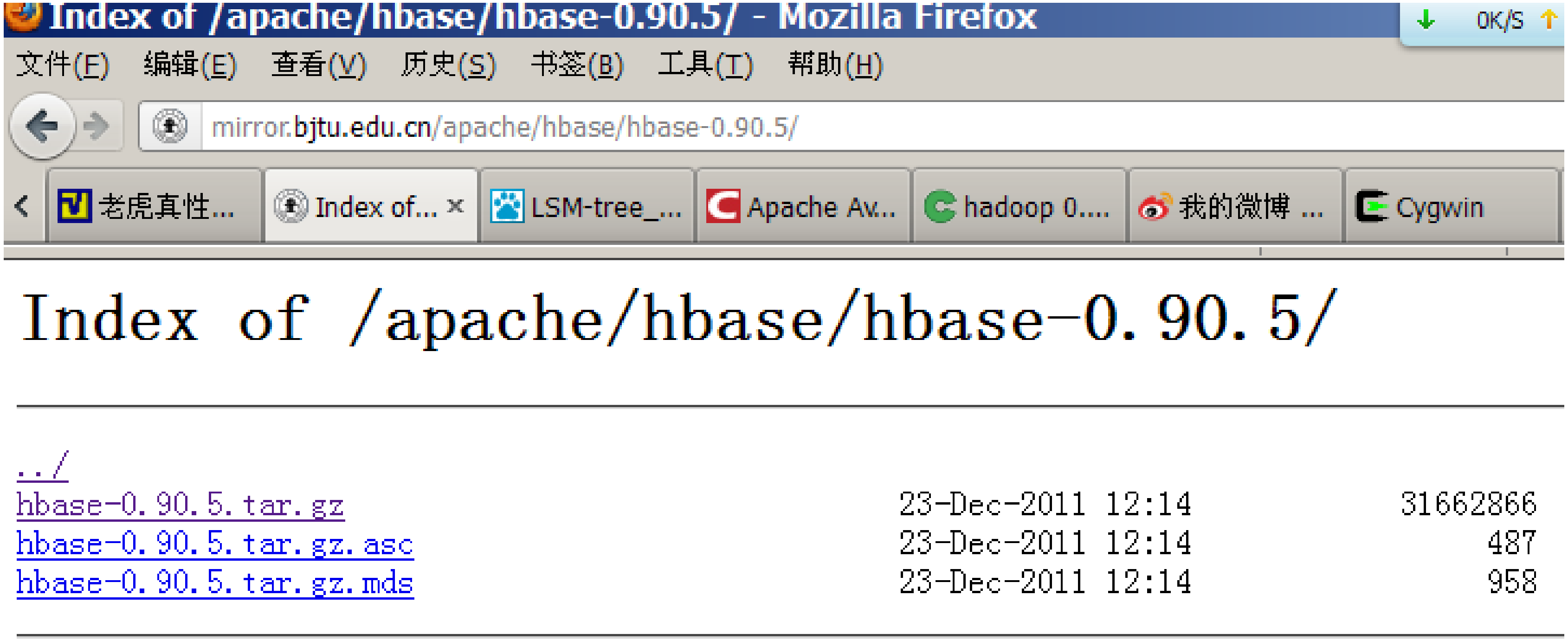
Hadoop数据分析平台 第7周

2012.10.23

Hbase安装：单机模式

- 下载及解压hbase安装包
- 修改conf/hbase-env.sh脚本，设置环境变量
- 编辑hbase-site.xml进行配置
- 启动Hbase
- 验证Hmaster已经启动
- 进入shell

下载及解压Hbase安装包


Index of /apache/hbase/hbase-0.90.5/ - Mozilla Firefox
0K/S
文件(F) 编辑(E) 查看(V) 历史(S) 书签(B) 工具(T) 帮助(H)
mirror.bjtu.edu.cn/apache/hbase/hbase-0.90.5/
老虎真性...
Index of...
LSM-tree_...
Apache Av...
hadoop 0....
我的微博 ...
Cygwin

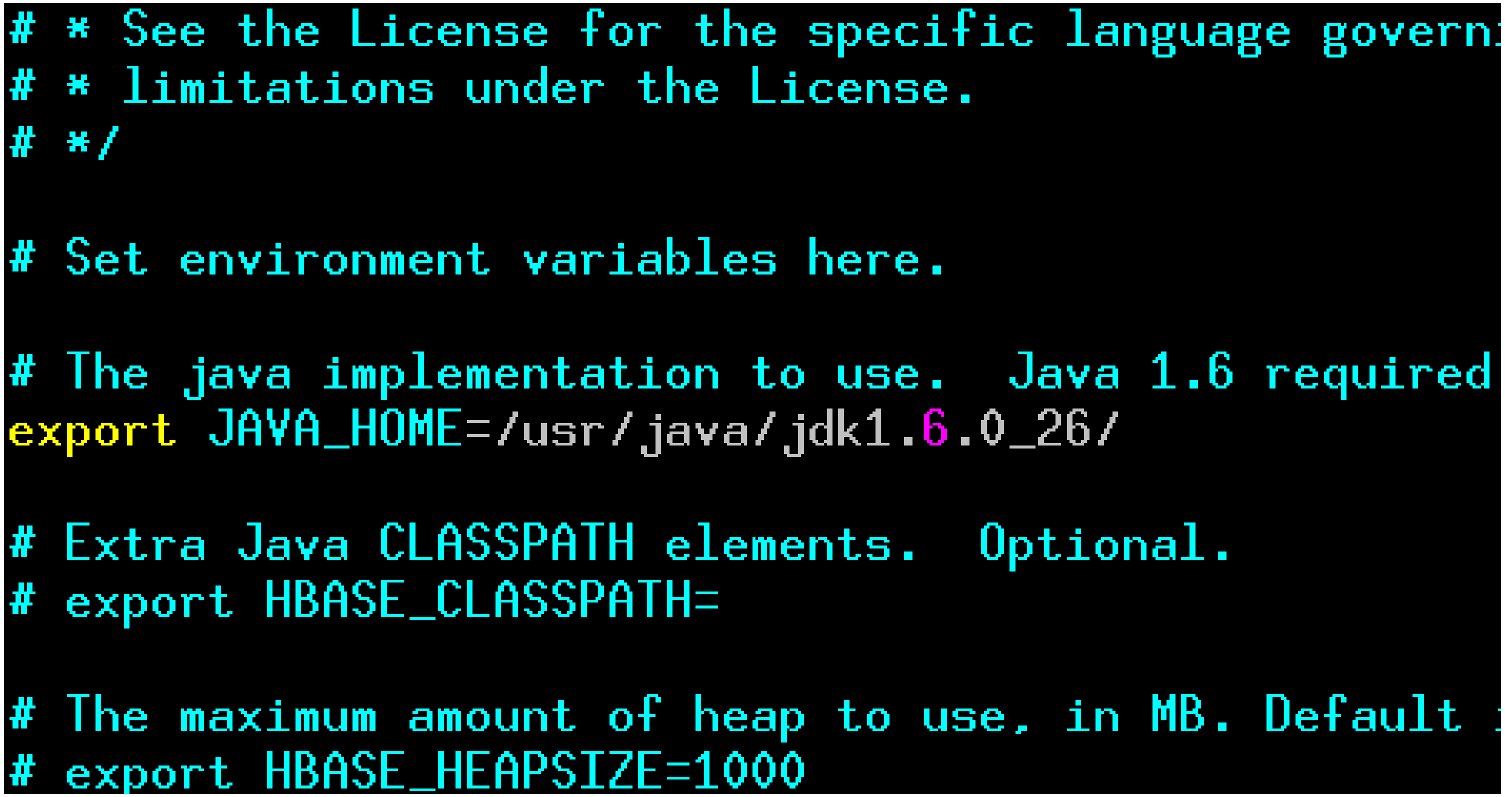
Index of /apache/hbase/hbase-0.90.5/

```
../
hbase-0.90.5.tar.gz                                23-Dec-2011 12:14          31662866
hbase-0.90.5.tar.gz.asc                            23-Dec-2011 12:14               487
hbase-0.90.5.tar.gz.mds                            23-Dec-2011 12:14               958
```

2012.10.23

修改hbase-env.sh

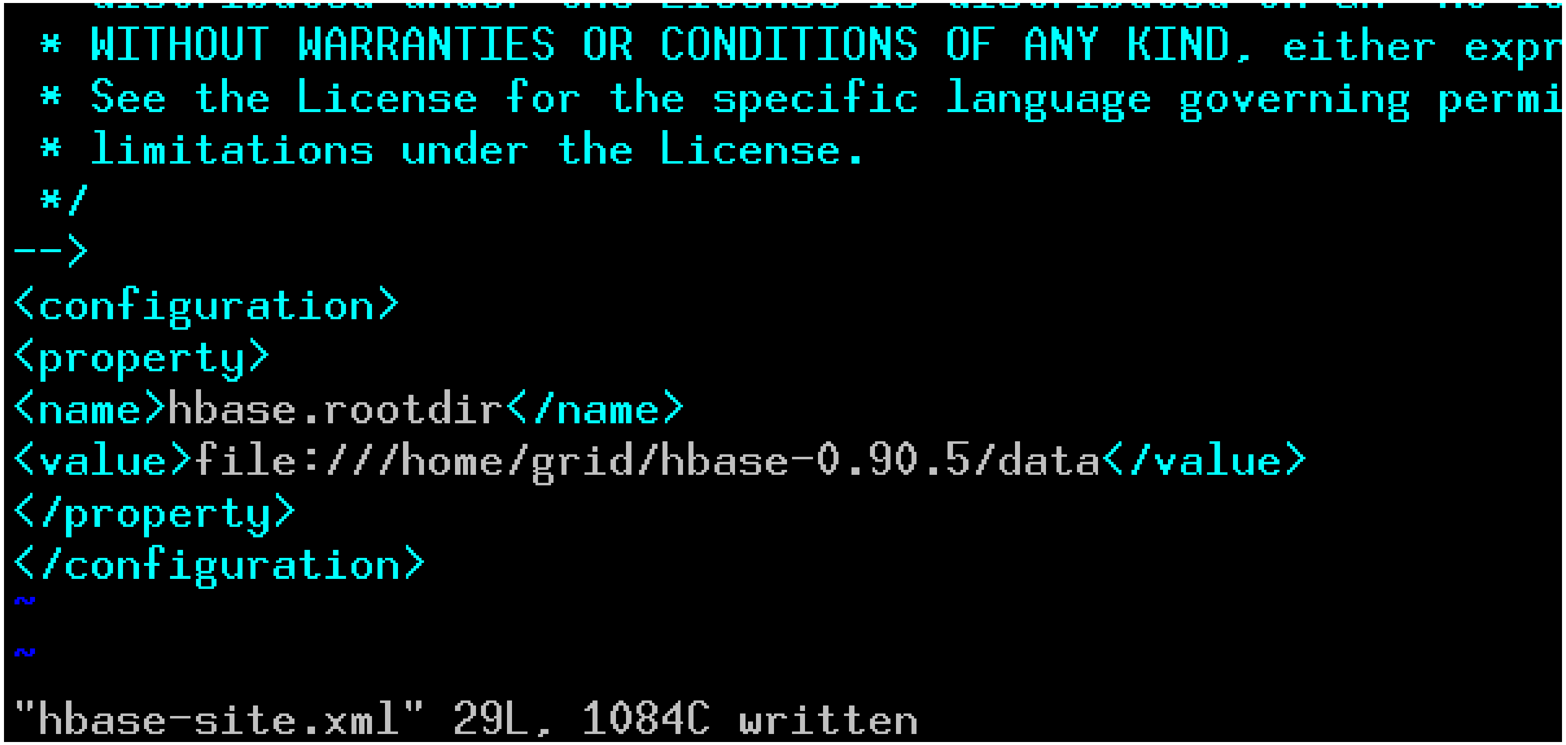
- 设置JAVA_HOME环境变量



```
# * See the License for the specific language govern
# * limitations under the License.
# */

# Set environment variables here.

# The java implementation to use.  Java 1.6 required
export JAVA_HOME=/usr/java/jdk1.6.0_26/

# Extra Java CLASSPATH elements.  Optional.
# export HBASE_CLASSPATH=

# The maximum amount of heap to use, in MB. Default
# export HBASE_HEAPSIZE=1000
```

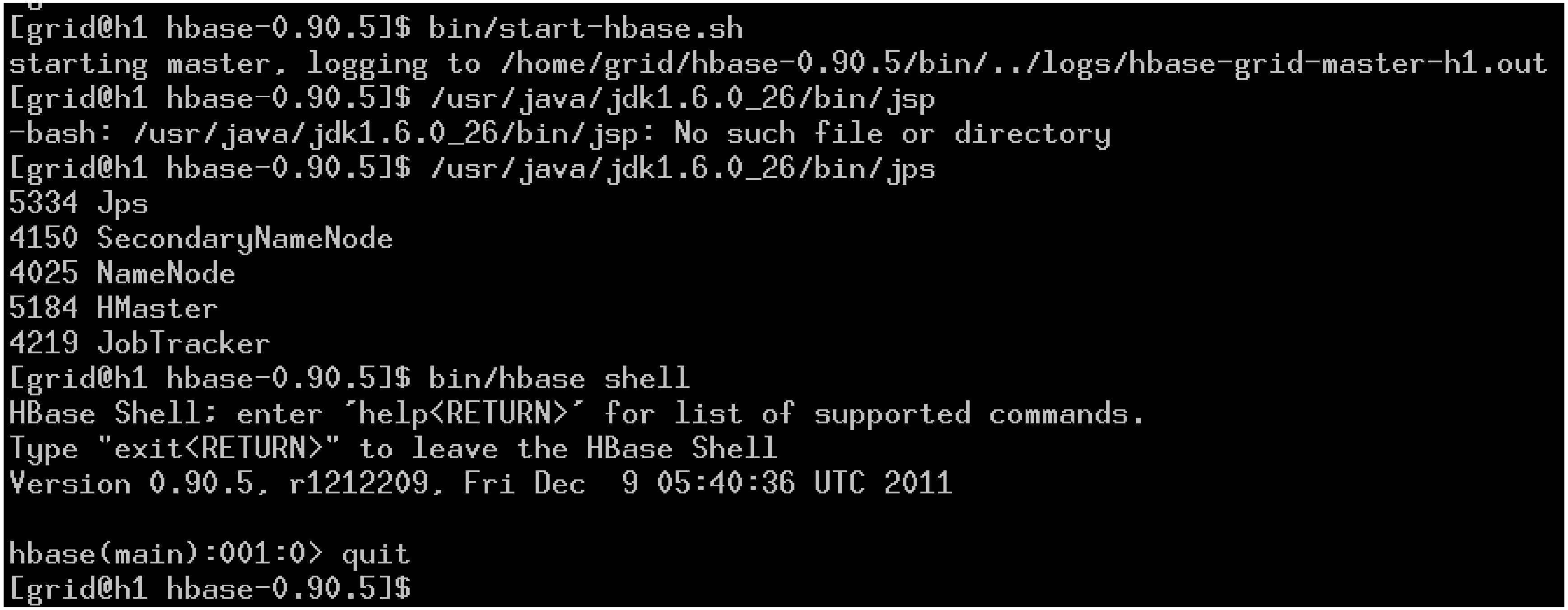
配置hbase-site.xml

- 先创建用于存放数据的目录/home/grid/hbase-0.90.5/data



```
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either expr
 * See the License for the specific language governing permi
 * limitations under the License.
 */
-->
<configuration>
<property>
<name>hbase.rootdir</name>
<value>file:///home/grid/hbase-0.90.5/data</value>
</property>
</configuration>
~
~
"hbase-site.xml" 29L, 1084C written
```

启动Hbase及验证



```
[grid@h1 hbase-0.90.5]$ bin/start-hbase.sh
starting master, logging to /home/grid/hbase-0.90.5/bin/../logs/hbase-grid-master-h1.out
[grid@h1 hbase-0.90.5]$ /usr/java/jdk1.6.0_26/bin/jsp
-bash: /usr/java/jdk1.6.0_26/bin/jsp: No such file or directory
[grid@h1 hbase-0.90.5]$ /usr/java/jdk1.6.0_26/bin/jps
5334 Jps
4150 SecondaryNameNode
4025 NameNode
5184 HMaster
4219 JobTracker
[grid@h1 hbase-0.90.5]$ bin/hbase shell
HBase Shell; enter 'help<RETURN>' for list of supported commands.
Type "exit<RETURN>" to leave the HBase Shell
Version 0.90.5, r1212209, Fri Dec  9 05:40:36 UTC 2011

hbase(main):001:0> quit
[grid@h1 hbase-0.90.5]$
```

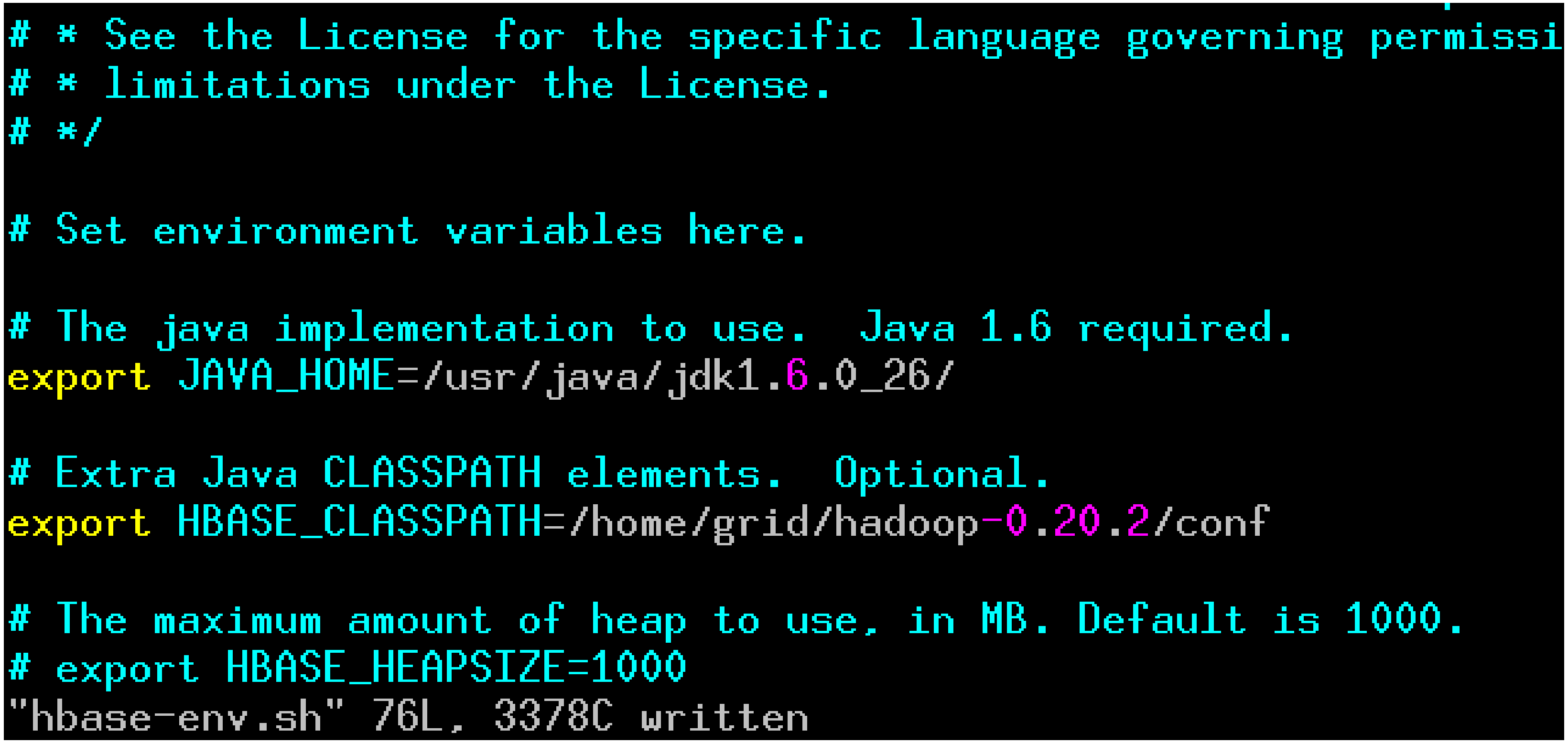
Hbase安装：伪分布模式

- 在单点模式的基础上继续
- 编辑 hbase-env.sh增加HBASE_CLASSPATH环境变量
- 编辑hbase-site.xml打开分布模式
- 覆盖hadoop核心jar包
- 启动hbase
- 验证启动

2012.10.23

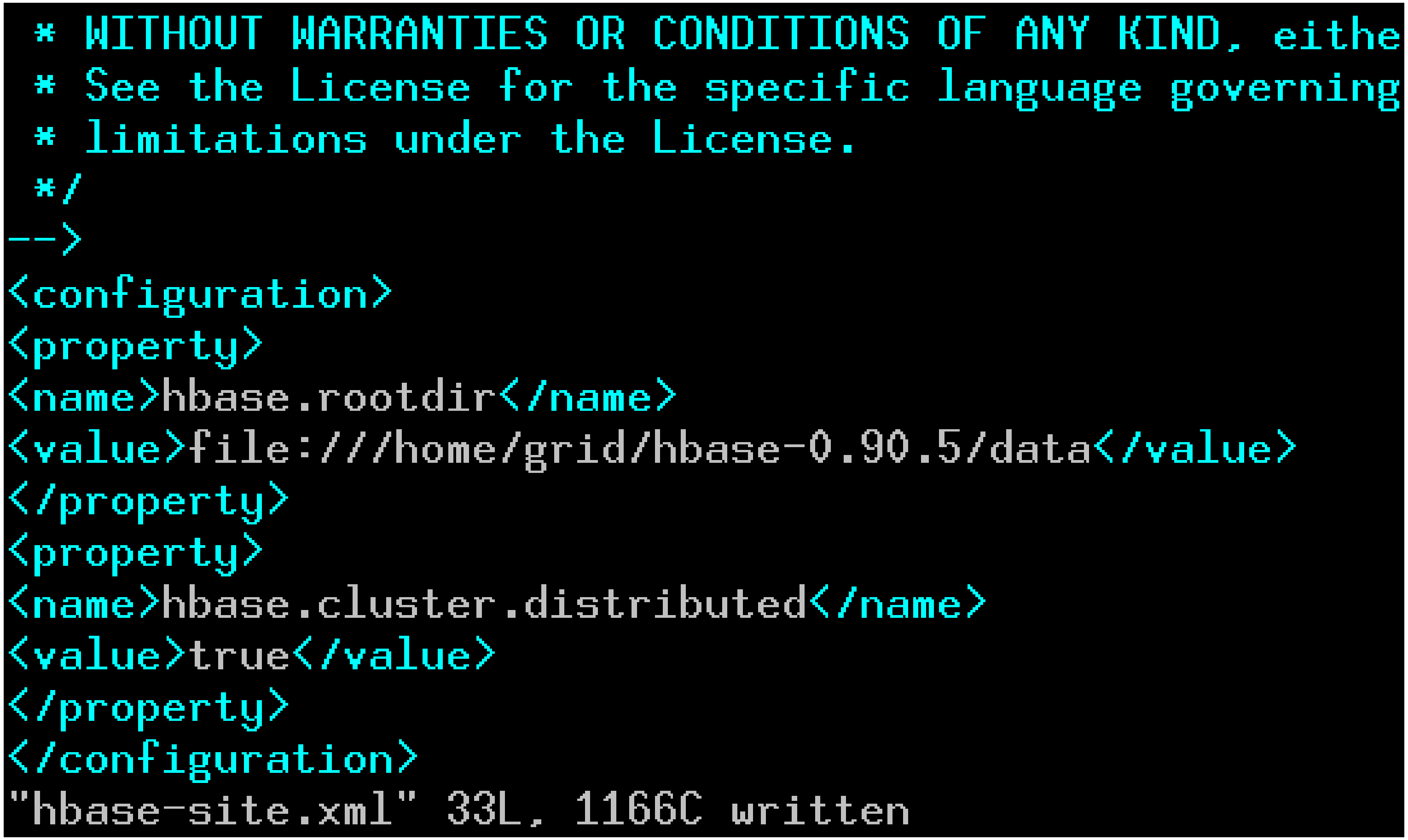
编辑 hbase-env.sh增加 HBASE_CLASSPATH环境变量

- 用于帮助hbase找到hadoop



```
# * See the License for the specific language governing permissi
# * limitations under the License.
# */

# Set environment variables here.

# The java implementation to use.  Java 1.6 required.
export JAVA_HOME=/usr/java/jdk1.6.0_26/

# Extra Java CLASSPATH elements.  Optional.
export HBASE_CLASSPATH=/home/grid/hadoop-0.20.2/conf

# The maximum amount of heap to use, in MB. Default is 1000.
# export HBASE_HEAPSIZE=1000
"hbase-env.sh" 76L, 3378C written
```

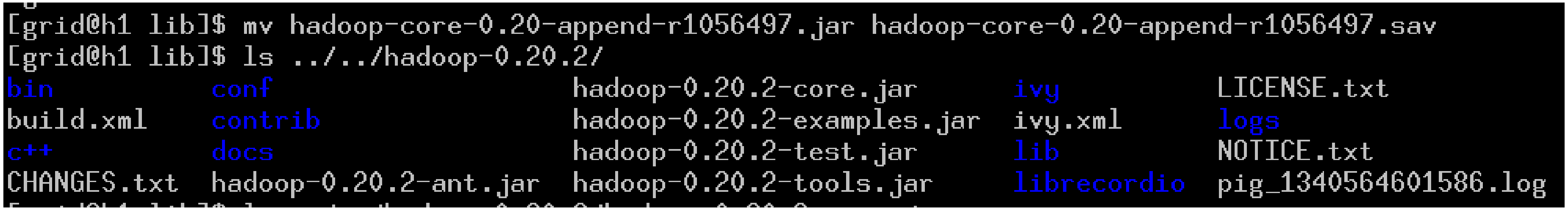
编辑hbase-site.xml打开分布模式



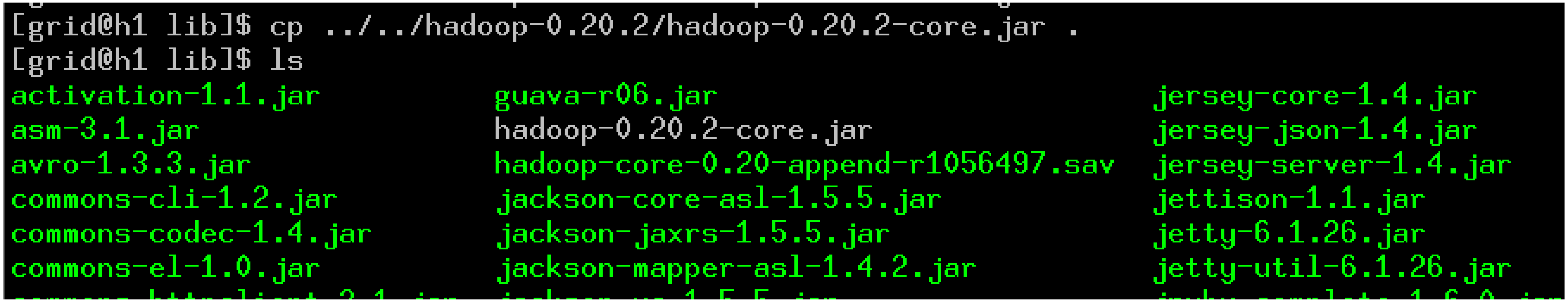
```
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, eithe
 * See the License for the specific language governing
 * limitations under the License.
 */
-->
<configuration>
<property>
<name>hbase.rootdir</name>
<value>file:///home/grid/hbase-0.90.5/data</value>
</property>
<property>
<name>hbase.cluster.distributed</name>
<value>true</value>
</property>
</configuration>
"hbase-site.xml" 33L, 1166C written
```

覆盖hadoop核心jar包

- 这是关键一步，主要目的是防止因为hbase和hadoop版本不同出现兼容问题，造成hmaster启动异常

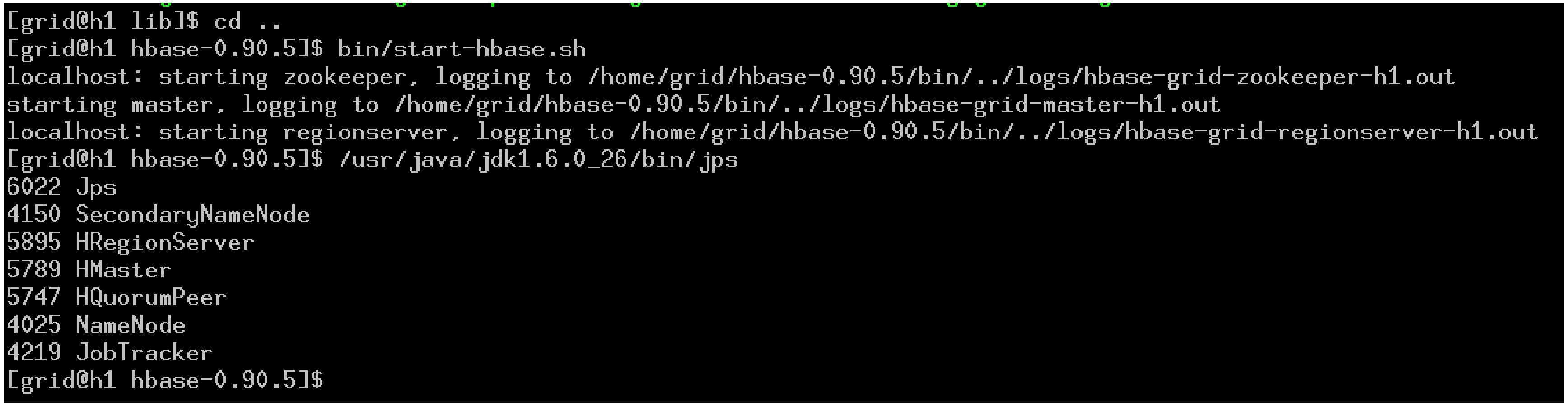


```
[grid@h1 lib]$ mv hadoop-core-0.20-append-r1056497.jar hadoop-core-0.20-append-r1056497.sav
[grid@h1 lib]$ ls ../../hadoop-0.20.2/
bin           conf                  hadoop-0.20.2-core.jar      ivy           LICENSE.txt
build.xml     contrib               hadoop-0.20.2-examples.jar  ivy.xml       logs
c++           docs                  hadoop-0.20.2-test.jar      lib           NOTICE.txt
CHANGES.txt   hadoop-0.20.2-ant.jar hadoop-0.20.2-tools.jar     librecordio   pig_1340564601586.log
```



```
[grid@h1 lib]$ cp ../../hadoop-0.20.2/hadoop-0.20.2-core.jar .
[grid@h1 lib]$ ls
activation-1.1.jar         guava-r06.jar                        jersey-core-1.4.jar
asm-3.1.jar                hadoop-0.20.2-core.jar               jersey-json-1.4.jar
avro-1.3.3.jar             hadoop-core-0.20-append-r1056497.sav jersey-server-1.4.jar
commons-cli-1.2.jar        jackson-core-asl-1.5.5.jar           jettison-1.1.jar
commons-codec-1.4.jar      jackson-jaxrs-1.5.5.jar              jetty-6.1.26.jar
commons-el-1.0.jar         jackson-mapper-asl-1.4.2.jar         jetty-util-6.1.26.jar
```

启动hbase并验证

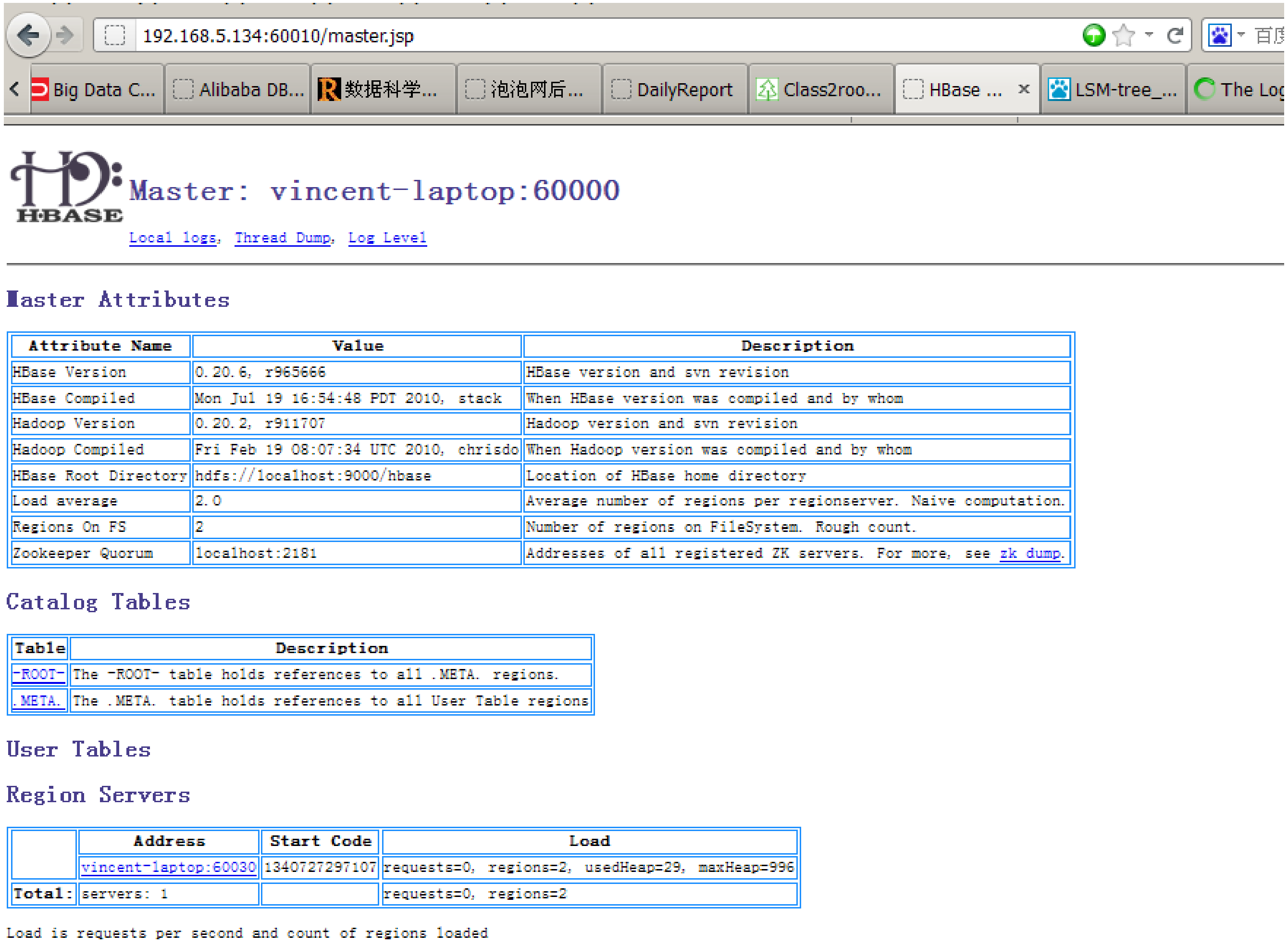


```
[grid@h1 lib]$ cd ..
[grid@h1 hbase-0.90.5]$ bin/start-hbase.sh
localhost: starting zookeeper, logging to /home/grid/hbase-0.90.5/bin/../logs/hbase-grid-zookeeper-h1.out
starting master, logging to /home/grid/hbase-0.90.5/bin/../logs/hbase-grid-master-h1.out
localhost: starting regionserver, logging to /home/grid/hbase-0.90.5/bin/../logs/hbase-grid-regionserver-h1.out
[grid@h1 hbase-0.90.5]$ /usr/java/jdk1.6.0_26/bin/jps
6022 Jps
4150 SecondaryNameNode
5895 HRegionServer
5789 HMaster
5747 HQuorumPeer
4025 NameNode
4219 JobTracker
[grid@h1 hbase-0.90.5]$
```

Hbase安装：完全分布模式

- 配置hosts，确保涉及的主机名均可以解析为ip
- 编辑hbase-env.xml
- 编辑hbase-site.xml
- 编辑regionservers文件
- 把Hbase复制到其它节点
- 启动Hbase
- 验证启动

Web管理界面



Master: vincent-laptop:60000

Local logs, Thread Dump, Log Level

Master Attributes

Attribute Name	Value	Description
HBase Version	0.20.6, r965666	HBase version and svn revision
HBase Compiled	Mon Jul 19 16:54:48 PDT 2010, stack	When HBase version was compiled and by whom
Hadoop Version	0.20.2, r911707	Hadoop version and svn revision
Hadoop Compiled	Fri Feb 19 08:07:34 UTC 2010, chrisdo	When Hadoop version was compiled and by whom
HBase Root Directory	hdfs://localhost:9000/hbase	Location of HBase home directory
Load average	2.0	Average number of regions per regionserver. Naive computation.
Regions On FS	2	Number of regions on FileSystem. Rough count.
Zookeeper Quorum	localhost:2181	Addresses of all registered ZK servers. For more, see zk dump.

Catalog Tables

Table	Description
-ROOT-	The -ROOT- table holds references to all .META. regions.
.META.	The .META. table holds references to all User Table regions

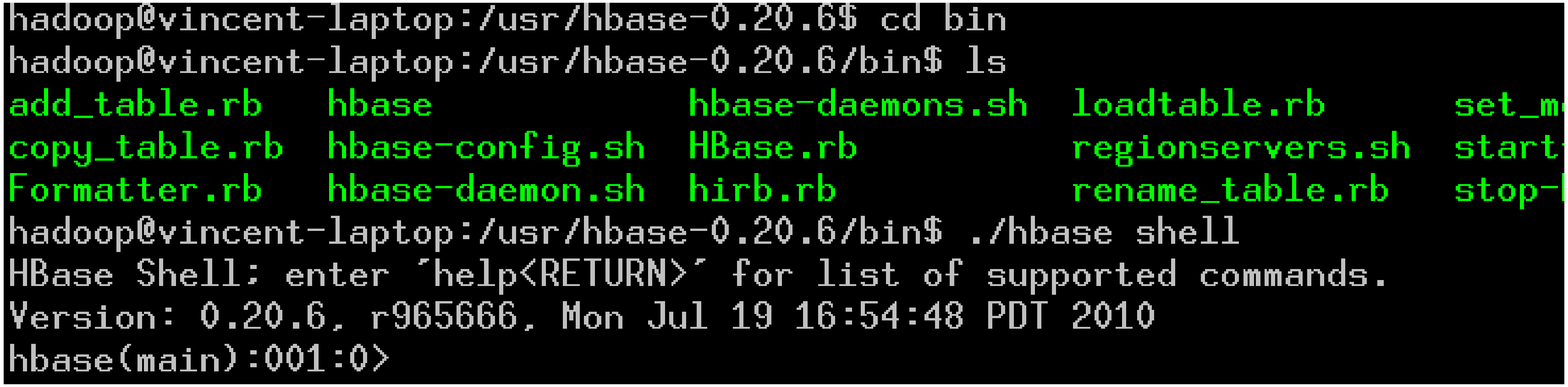
User Tables

Region Servers

	Address	Start Code	Load
	vincent-laptop:60030	1340727297107	requests=0, regions=2, usedHeap=29, maxHeap=996
Total:	servers: 1		requests=0, regions=2

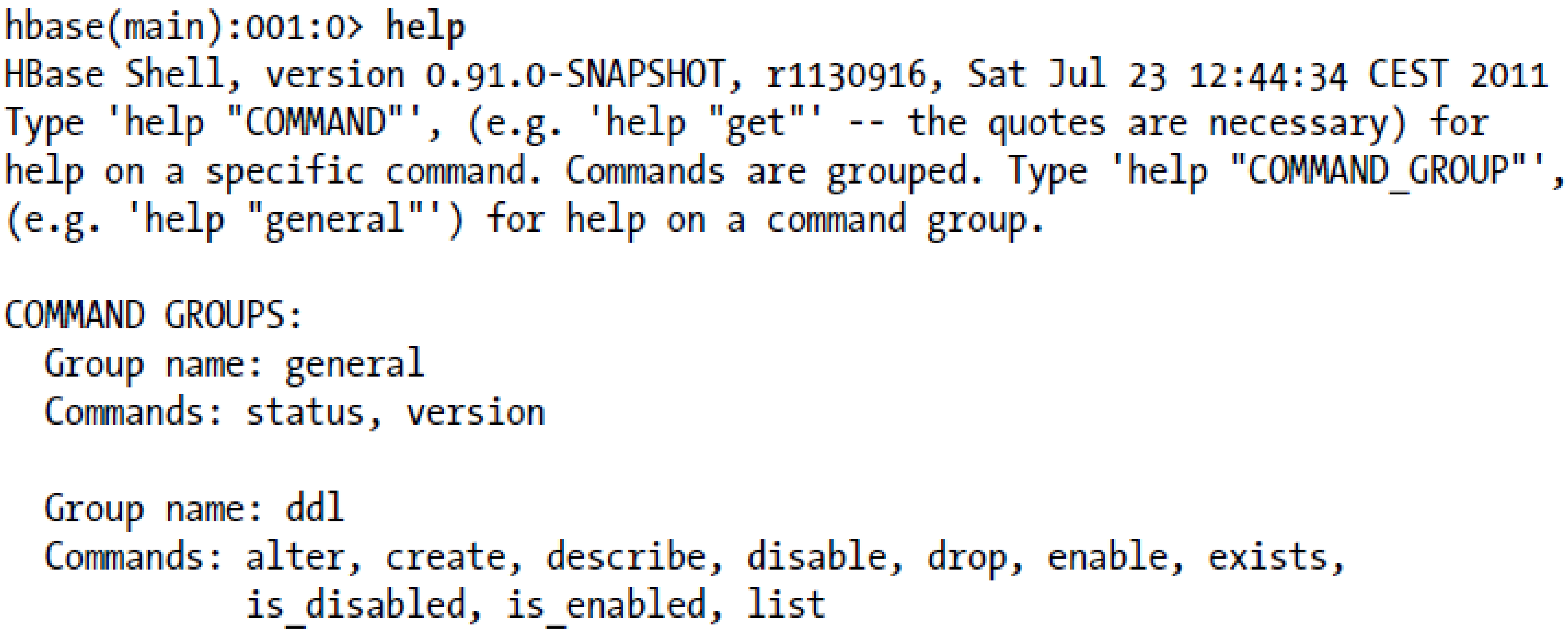
Load is requests per second and count of regions loaded

Shell



```
hadoop@vincent-laptop:/usr/hbase-0.20.6$ cd bin
hadoop@vincent-laptop:/usr/hbase-0.20.6/bin$ ls
add_table.rb   hbase            hbase-daemons.sh  loadtable.rb      set_m
copy_table.rb  hbase-config.sh  HBase.rb          regionservers.sh  start
Formatter.rb   hbase-daemon.sh  hirb.rb           rename_table.rb   stop-
hadoop@vincent-laptop:/usr/hbase-0.20.6/bin$ ./hbase shell
HBase Shell; enter 'help<RETURN>' for list of supported commands.
Version: 0.20.6, r965666, Mon Jul 19 16:54:48 PDT 2010
hbase(main):001:0>
```

Shell命令帮助



```
hbase(main):001:0> help
HBase Shell, version 0.91.0-SNAPSHOT, r1130916, Sat Jul 23 12:44:34 CEST 2011
Type 'help "COMMAND"', (e.g. 'help "get"' -- the quotes are necessary) for
help on a specific command. Commands are grouped. Type 'help "COMMAND_GROUP"',
(e.g. 'help "general"') for help on a command group.

COMMAND GROUPS:
  Group name: general
  Commands: status, version

  Group name: ddl
  Commands: alter, create, describe, disable, drop, enable, exists,
            is_disabled, is_enabled, list
```

查询数据库状态

```
hbase(main):024:0>status
3 servers, 0 dead,1.0000 average load
```

查询数据库版本

```
hbase(main):025:0>version
0.90.4, r1150278,Sun Jul 24 15:53:29 PDT 2011
```

创建表

```
hbase(main):011:0>create 'member','member_id','address','info'
0 row(s) in 1.2210seconds
```

查看表信息

```
hbase(main):012:0>list
TABLE
member
1 row(s) in 0.0160seconds
hbase(main):006:0>describe 'member'
DESCRIPTION                                                        ENABLED
 {NAME => 'member', FAMILIES => [{NAME=> 'address', BLOOMFILTER => 'NONE', REPLICATION_SCOPE =>
     '0', true
 VERSIONS => '3', COMPRESSION => 'NONE',TTL => '2147483647', BLOCKSIZE => '65536', IN_MEMORY =>
     'false', BLOCKCACHE => 'true'}, {NAME =>'info', BLOOMFILTER => 'NONE', REPLICATION_SCOPE => '0',
     VERSI
 ONS => '3', COMPRESSION => 'NONE', TTL=> '2147483647', BLOCKSIZE => '65536', IN_MEMORY =>
     'false',
 BLOCKCACHE => 'true'}]}
1 row(s) in 0.0230seconds
```

删除列族：alter、disable、enable命令

```
hbase(main):003:0>alter 'member',{NAME=>'member_id',METHOD=>'delete'}

ERROR: Table memberis enabled. Disable it first before altering.

hbase(main):004:0>disable 'member'
0 row(s) in 2.0390seconds
hbase(main):005:0>alter'member',{NAME=>'member_id',METHOD=>'delete'}
0 row(s) in 0.0560seconds
hbase(main):008:0> enable 'member'
0 row(s) in 2.0420seconds
```

列出所有的表

```
hbase(main):028:0>list

TABLE


member


temp_table


2 row(s) in 0.0150seconds
```

删除表

```
hbase(main):029:0>disable 'temp_table'
0 row(s) in 2.0590seconds

hbase(main):030:0>drop 'temp_table'
0 row(s) in 1.1070seconds
```

查询一个表是否存在

```
hbase(main):021:0>exists 'member'
Table member
    doesexist

0 row(s) in 0.1610seconds
```

判断表是否enable或disable

```
hbase(main):034:0>is_enabled 'member'

true


0 row(s) in 0.0110seconds


hbase(main):032:0>is_disabled 'member'

false


0 row(s) in 0.0110seconds
```

插入记录

```
put'member','scutshuxue','info:age','24'
put'member','scutshuxue','info:birthday','1987-06-17'
put'member','scutshuxue','info:company','alibaba'
put'member','scutshuxue','address:contry','china'
put'member','scutshuxue','address:province','zhejiang'
put'member','scutshuxue','address:city','hangzhou'
 put'member','xiaofeng','info:birthday','1987-4-17'
put'member','xiaofeng','info:favorite','movie'
put'member','xiaofeng','info:company','alibaba'
put'member','xiaofeng','address:contry','china'
put'member','xiaofeng','address:province','guangdong'
put'member','xiaofeng','address:city','jieyang'
put'member','xiaofeng','address:town','xianqiao'
```

获取一个行健的所有数据

```
hbase(main):001:0>get 'member','scutshuxue'
COLUMN                      CELL
address:city               timestamp=1321586240244,value=hangzhou

 address:contry              timestamp=1321586239126,value=china

address:province             timestamp=1321586239197,value=zhejiang

 info:age                  timestamp=1321586238965,value=24

 info:birthday               timestamp=1321586239015, value=1987-06-
     17
 info:company                timestamp=1321586239071,value=alibaba

6 row(s) in 0.4720seconds
```

获取一个行键，一个列族的所有数据

```
hbase(main):002:0>get 'member','scutshuxue','info'
COLUMN                    CELL

info:age                timestamp=1321586238965,value=24

 info:birthday            timestamp=1321586239015, value=1987-06-
    17
info:company               timestamp=1321586239071,value=alibaba

3 row(s) in 0.0210seconds
```

获取一个行键，一个列族中一个列的所有数据

```
hbase(main):002:0>get 'member','scutshuxue','info:age'

COLUMN                          CELL


 info:age                   timestamp=1321586238965,value=24


1 row(s) in 0.0320seconds
```

更新一条记录

```
hbase(main):004:0>put 'member','scutshuxue','info:age' ,'99'

0 row(s) in 0.0210seconds


hbase(main):005:0>get 'member','scutshuxue','info:age'

COLUMN                   CELL


 info:age              timestamp=1321586571843,value=99


1 row(s) in 0.0180seconds
```

通过timestamp来获取数据

```
hbase(main):010:0>get 'member','scutshuxue',{COLUMN=>'info:age',TIMESTAMP=>1321586238965}
COLUMN                    CELL
info:age               timestamp=1321586238965,value=24

1 row(s) in 0.0140seconds

hbase(main):011:0>get 'member','scutshuxue',{COLUMN=>'info:age',TIMESTAMP=>1321586571843}
COLUMN                    CELL
info:age               timestamp=1321586571843,value=99

1 row(s) in 0.0180seconds
```

全表扫描

```
hbase(main):013:0>scan 'member'
```

结果略

删除指定行键的字段

```
hbase(main):016:0>delete 'member','temp','info:age'

0 row(s) in 0.0150seconds

hbase(main):018:0>get 'member','temp'

COLUMN                        CELL


0 row(s) in 0.0150seconds
```

删除整行

```
hbase(main):001:0>deleteall 'member','xiaofeng'
0 row(s) in 0.3990seconds
```

查询表中有多少行

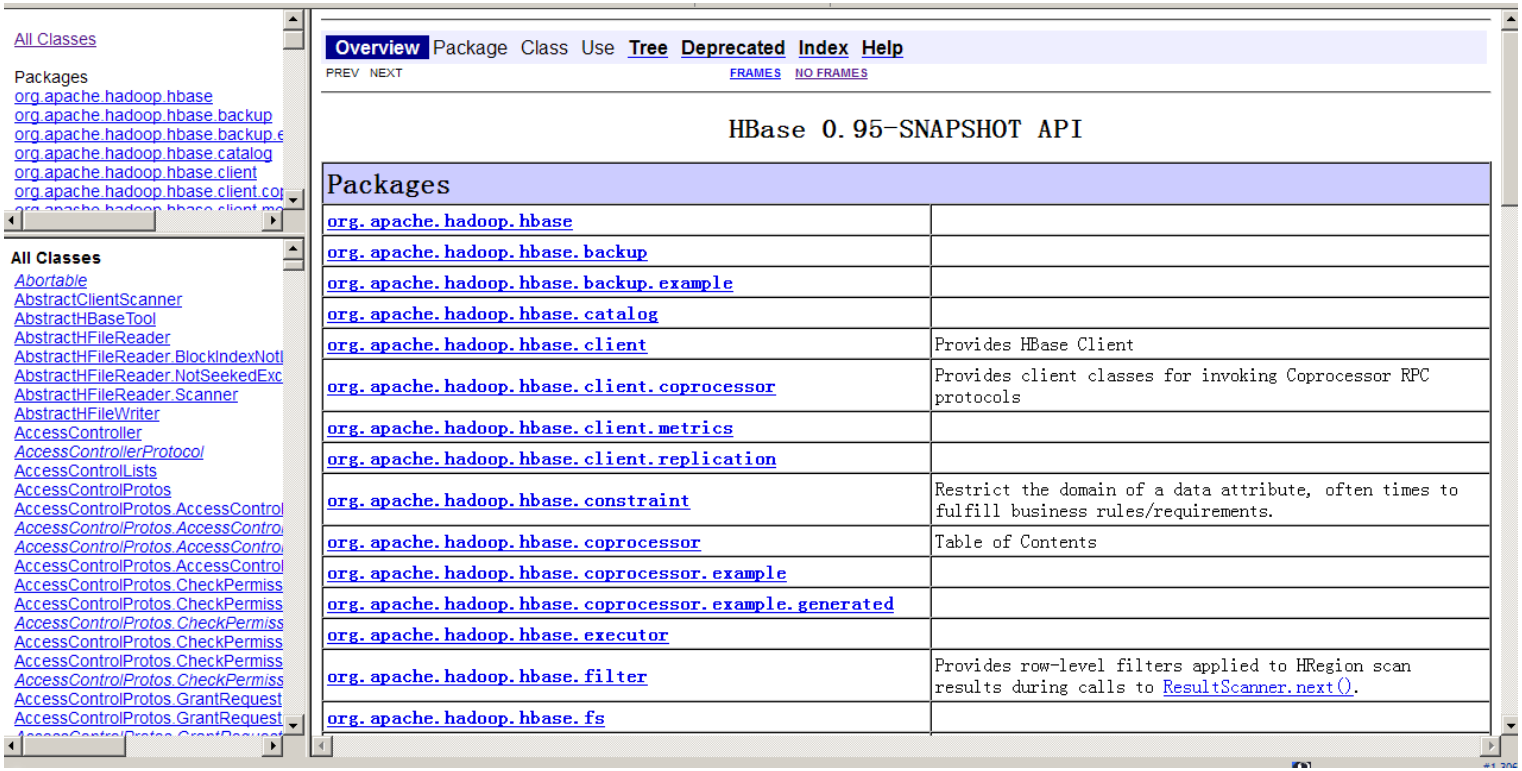
```
hbase(main):019:0>count 'member'
2 row(s) in 0.0160seconds
```

清空表

```
hbase(main):035:0>truncate 'member'
Truncating 'member'table (it may take a while):
- Disabling table...
- Dropping table...
- Creating table...
0 row(s) in 4.3430seconds
```

Hbase API

- 《Hbase权威指南》第3-5章
- http://hbase.apache.org/apidocs/index.html



All Classes

Packages
org.apache.hadoop.hbase
org.apache.hadoop.hbase.backup
org.apache.hadoop.hbase.backup.e
org.apache.hadoop.hbase.catalog
org.apache.hadoop.hbase.client
org.apache.hadoop.hbase.client.co

All Classes
Abortable
AbstractClientScanner
AbstractHBaseTool
AbstractHFileReader
AbstractHFileReader.BlockIndexNot
AbstractHFileReader.NotSeekedExc
AbstractHFileReader.Scanner
AbstractHFileWriter
AccessController
AccessControllerProtocol
AccessControlLists
AccessControlProtos
AccessControlProtos.AccessControl
AccessControlProtos.AccessContro
AccessControlProtos.AccessContro
AccessControlProtos.AccessControl
AccessControlProtos.CheckPermiss
AccessControlProtos.CheckPermiss
AccessControlProtos.CheckPermiss
AccessControlProtos.CheckPermiss
AccessControlProtos.CheckPermiss
AccessControlProtos.CheckPermiss
AccessControlProtos.GrantRequest
AccessControlProtos.GrantRequest

Overview Package Class Use **Tree** **Deprecated** **Index** **Help**
PREV NEXT
FRAMES NO FRAMES

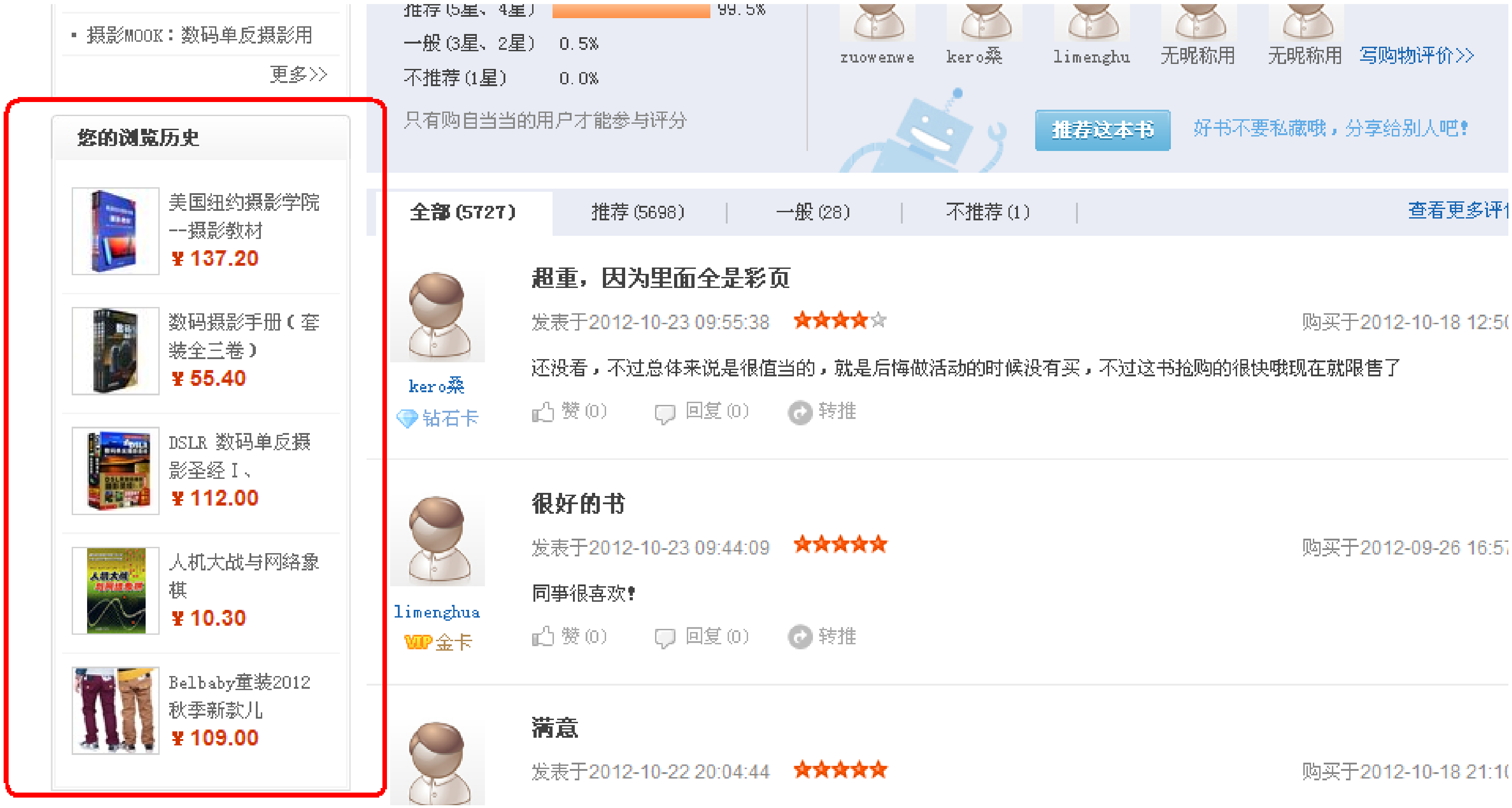
HBase 0.95-SNAPSHOT API

Packages	
org.apache.hadoop.hbase	
org.apache.hadoop.hbase.backup	
org.apache.hadoop.hbase.backup.example	
org.apache.hadoop.hbase.catalog	
org.apache.hadoop.hbase.client	Provides HBase Client
org.apache.hadoop.hbase.client.coprocessor	Provides client classes for invoking Coprocessor RPC protocols
org.apache.hadoop.hbase.client.metrics	
org.apache.hadoop.hbase.client.replication	
org.apache.hadoop.hbase.constraint	Restrict the domain of a data attribute, often times to fulfill business rules/requirements.
org.apache.hadoop.hbase.coprocessor	Table of Contents
org.apache.hadoop.hbase.coprocessor.example	
org.apache.hadoop.hbase.coprocessor.example.generated	
org.apache.hadoop.hbase.executor	
org.apache.hadoop.hbase.filter	Provides row-level filters applied to HRegion scan results during calls to ResultScanner.next().
org.apache.hadoop.hbase.fs	

什么情况下使用Hbase？

- 成熟的数据分析主题，查询模式已经确立并且不轻易改变
- 传统的关系型数据库已经无法承受负荷，高速插入，大量读取
- 适合海量的，但同时也是简单的操作（例如key-value）

场景一：浏览历史



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还没看，不过总体来说是很值当的，就是后悔做活动的时候没有买，不过这书抢购的很快哦现在就限售了

赞(0) 回复(0) 转推

很好的书

limenghua
VIP金卡

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同事很喜欢!

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满意

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2012.10.23

关系型数据库的困难

- 简单的事情只要上了量就会变成无比复杂的事情
- Order by耗费很多性能
- 大量发生，但又无法分布式处理
- 顾客需要实时看到自己的足迹，因此不能使用缓存技巧

2012.10.23

Hbase迎接挑战

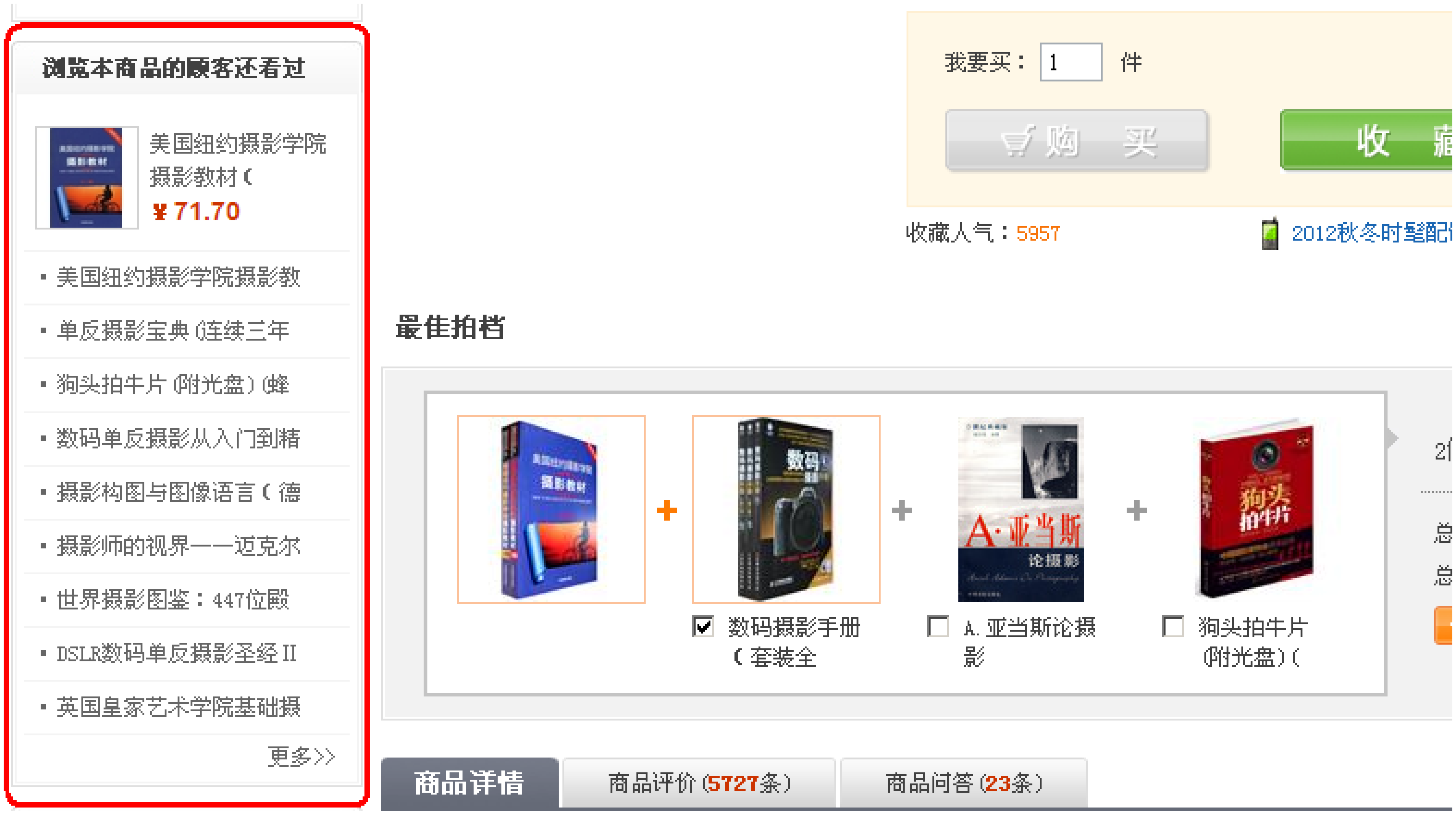
- 天生就是面向时间戳查询
- 基于行键的查询异常快速，特别是最近的数据被放在内存的memstore里，完全没有IO开销
- 分布式化解负荷

2012.10.23

模式设计

- 行键：userid
- 列族和列：book:bookid
- 为了充分利用分布式，可以用reverse key，hash等技巧改造行键

场景二：商品推荐



浏览本商品的顾客还看过

美国纽约摄影学院摄影教材（
¥71.70

- 美国纽约摄影学院摄影教
- 单反摄影宝典（连续三年
- 狗头拍牛片（附光盘）（蜂
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□ A.亚当斯论摄影

□ 狗头拍牛片（附光盘）（

商品详情　商品评价（5727条）　商品问答（23条）

用关系型数据库实现

- http://f.dataguru.cn/thread-84-1-1.html
- 拿ITPUB实验了一把。

  阅读推荐说白了，就是你打开一个帖子，看到有一个提示写着读了本帖的人有xx%读了xxxx贴，有xx%读了xxxx帖。。。等等，这项功能也可以推广到商品推荐，音乐推荐，下载推荐等等。

  在ITPUB中设置了一个log表，记录每次用户点击，有3个列，分别是时间戳，用户id，还有点击的主题id

  使用了一段时间的数据大约有1000万行，写了个sql搞定

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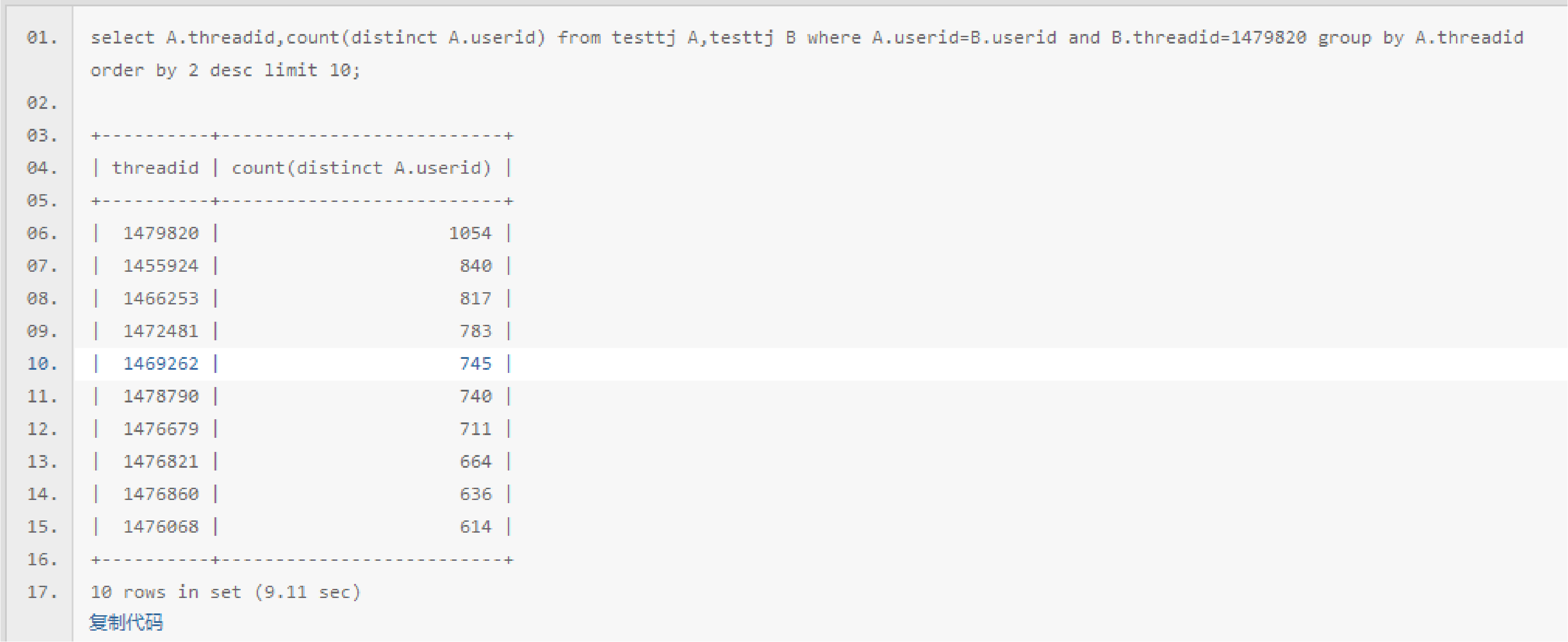
用关系型数据库实现



```
select A.threadid,count(distinct A.userid) from testtj A,testtj B where A.userid=B.userid and B.threadid=1479820 group by A.threadid order by 2 desc limit 10;

+----------+--------------------------+
| threadid | count(distinct A.userid) |
+----------+--------------------------+
|  1479820 |                     1054 |
|  1455924 |                      840 |
|  1466253 |                      817 |
|  1472481 |                      783 |
|  1469262 |                      745 |
|  1478790 |                      740 |
|  1476679 |                      711 |
|  1476821 |                      664 |
|  1476860 |                      636 |
|  1476068 |                      614 |
+----------+--------------------------+
10 rows in set (9.11 sec)
```

使用Hbase：表设计与查询实现

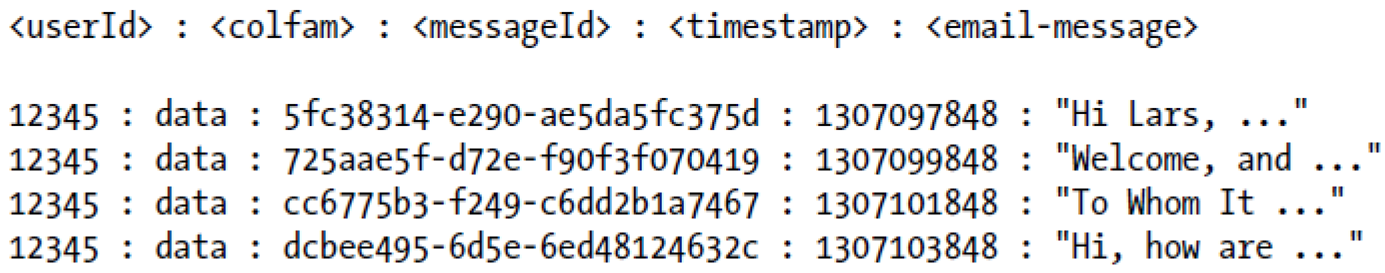
- 两个表，一个是u-t，另一个是t-u
- U-t表的结构：行键为userid，列族和列为thread:threadid
- T-u表结构：行键为threadid，列族和列为user:userid
- 查询：先在u-t表从userid->threadid，再从t-u表从threadid->userid，在计算程序中 实现去重和统计功能

2012.10.23

辅助索引

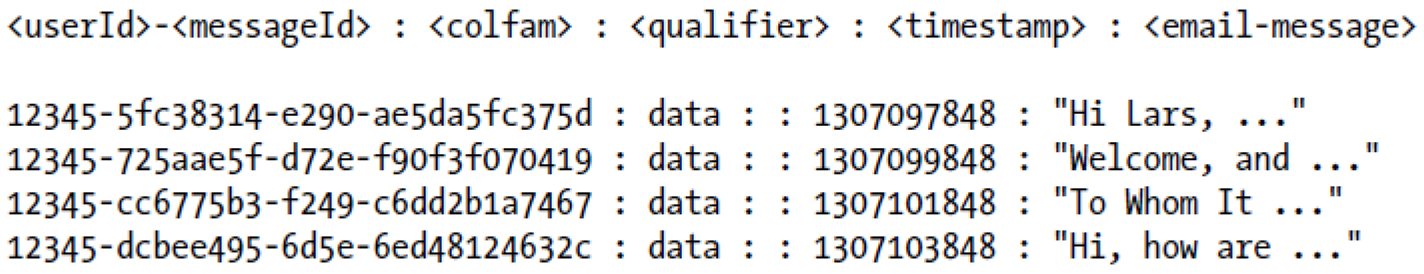
- 例子：学生表（学号，身份证号，姓名，性别，系，年龄），有时在学号上查询，有时在身份证号上查询
- 主表：行键为学号，列族为学生，下面的列是身份证号，姓名，性别，系，年龄
- 辅助（索引）表：行键为身份证号，列族和列为学号

复合行键设计



```
<userId> : <colfam> : <messageId> : <timestamp> : <email-message>

12345 : data : 5fc38314-e290-ae5da5fc375d : 1307097848 : "Hi Lars, ..."
12345 : data : 725aae5f-d72e-f90f3f070419 : 1307099848 : "Welcome, and ..."
12345 : data : cc6775b3-f249-c6dd2b1a7467 : 1307101848 : "To Whom It ..."
12345 : data : dcbee495-6d5e-6ed48124632c : 1307103848 : "Hi, how are ..."
```



```
<userId>-<messageId> : <colfam> : <qualifier> : <timestamp> : <email-message>

12345-5fc38314-e290-ae5da5fc375d : data : : 1307097848 : "Hi Lars, ..."
12345-725aae5f-d72e-f90f3f070419 : data : : 1307099848 : "Welcome, and ..."
12345-cc6775b3-f249-c6dd2b1a7467 : data : : 1307101848 : "To Whom It ..."
12345-dcbee495-6d5e-6ed48124632c : data : : 1307103848 : "Hi, how are ..."
```

好处

- 便于分布
- 便于多条件伸缩查询

2012.10.23

Thanks

FAQ时间