

一、准备工作

安装 MySQL

(参考: <https://www.cnblogs.com/starof/p/4680083.html>)

```
dhw@localhost:~  
File Edit View Search Terminal Help  
[dhw@localhost ~]$ cat /etc/redhat-release  
CentOS Linux release 7.8.2003 (Core)  
[dhw@localhost ~]$ yum install mysql  
Loaded plugins: fastestmirror, langpacks  
You need to be root to perform this command.  
[dhw@localhost ~]$ sudo yum install mysql  
Loaded plugins: fastestmirror, langpacks  
Loading mirror speeds from cached hostfile  
* base: mirrors.aliyun.com  
* extras: mirrors.aliyun.com  
* updates: mirrors.aliyun.com  
[dhw@localhost ~]$ sudo yum install mysql-server  
Loaded plugins: fastestmirror, langpacks  
Loading mirror speeds from cached hostfile  
* base: mirrors.aliyun.com  
* extras: mirrors.aliyun.com  
* updates: mirrors.aliyun.com  
No package mysql-server available.  
Error: Nothing to do  
[dhw@localhost ~]$  
[dhw@localhost ~]$ sudo yum install mysql-devel  
Loaded plugins: fastestmirror, langpacks  
Loading mirror speeds from cached hostfile  
* base: mirrors.aliyun.com  
* extras: mirrors.aliyun.com  
* updates: mirrors.aliyun.com  
Resolving Dependencies  
--> Running transaction check  
--> Package mariadb-devel.x86_64 1:5.5.68-1.el7 will be installed  
Installed:  
mariadb-devel.x86_64 1:5.5.68-1.el7  
Complete!  
[dhw@localhost ~]$ wget http://dev.mysql.com/get/mysql-community-release-el7-5.noarch.rpm  
--2020-11-21 12:53:37-- http://dev.mysql.com/get/mysql-community-release-el7-5.noarch.rpm  
Resolving dev.mysql.com (dev.mysql.com)... 137.254.60.11  
Connecting to dev.mysql.com (dev.mysql.com)|137.254.60.11|:80... connected.  
HTTP request sent, awaiting response...  
[dhw@localhost ~]$ rpm -ivh mysql-community-release-el7-5.noarch.rpm  
error: can't create transaction lock on /var/lib/rpm/.rpm.lock (Permission denied)  
[dhw@localhost ~]$ sudo rpm -ivh mysql-community-release-el7-5.noarch.rpm  
Preparing... ##### [100%]  
Updating / installing..  
1:mysql-community-release-el7-5 ##### [100%]  
[dhw@localhost ~]$
```

```
[dhw@localhost ~]$ sudo yum install mysql-community-server
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
* base: mirrors.aliyun.com
* extras: mirrors.aliyun.com
* updates: mirrors.aliyun.com
Resolving Dependencies
--> Running transaction check
---> Package mysql-community-server.x86_64 0:5.6.50-2.el7 will be installed
--> Processing Dependency: mysql-community-common(x86_64) = 5.6.50-2.el7 for pac
```

```
[dhw@localhost ~]$ service mysqld restart
Redirecting to /bin/systemctl restart mysqld.service
[dhw@localhost ~]$ mysql -u root
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 2
Server version: 5.6.50 MySQL Community Server (GPL)
```

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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>

设置密码

```
mysql> set password for 'root'@'localhost' =password('123456')
-> ;
Query OK, 0 rows affected (0.00 sec)
```

mysql>

```
[dhw@localhost ~]$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 4
Server version: 5.6.50 MySQL Community Server (GPL)

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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

配置 Mysql

```

    </charset>

    < charset name="utf8">
      <family>Unicode</family>
      <description>UTF-8 Unicode</description>
      <alias>utf-8</alias>
      <collation name="utf8_general_ci"      id="33">
        <flag>primary</flag>
        <flag>compiled</flag>
      </collation>
      <collation name="utf8_bin"              id="83">
        <flag>binary</flag>
        <flag>compiled</flag>
      </collation>
    </charset>

    < charset name="ucs2">
      <family>Unicode</family>
      <description>UCS-2 Unicode</description>

```

```

dhw@localhost:~
File Edit View Search Terminal Help
[dhw@localhost ~]$ vim /etc/my.cnf
[dhw@localhost ~]$ vim /usr/share/mysql/charsets/Index.xml
[dhw@localhost ~]$ sudo vim /etc/my.cnf

# Recommended in standard MySQL setup
sql_mode=NO_ENGINE_SUBSTITUTION,STRICT_TRANS_TABLES

[mysqld_safe]
log-error=/var/log/mysqld.log
pid-file=/var/run/mysqld/mysqld.pid

[mysql]
default-character-set=utf8
~
~
~
:wq

```

```

[dhw@localhost ~]$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 5
Server version: 5.6.50 MySQL Community Server (GPL)

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> grant all privileges on *.* to root@'%'identified by '123456';
Query OK, 0 rows affected (0.00 sec)

mysql>

```

安装 Redis，首先下载安装包 redis-3.2.7.tar.gz，然后解压放入指定目录中

```
dhw@localhost:~/Downloads
File Edit View Search Terminal Help
[dhw@localhost ~]$ cd /home/dhw/Downloads
[dhw@localhost Downloads]$ ls
eclipse-SDK-4.2.2-linux-gtk-x86_64.tar.gz  my_file.txt
hadoop-2.7.7.tar.gz                      neo4j-community-3.5.22-unix.tar.gz
hbase-1.1.5-bin.tar.gz                  neo4j-community-4.1.3-unix.tar.gz
jdk-8u261-linux-x64.tar.gz              redis-3.2.7.tar.gz
[dhw@localhost Downloads]$ sudo tar -zxvf ./redis-3.2.7.tar.gz -C /user/local
[sudo] password for dhw:
tar: /user/local: Cannot open: No such file or directory
tar: Error is not recoverable: exiting now
[dhw@localhost Downloads]$ sudo tar -zxvf ./redis-3.2.7.tar.gz -C /usr/local
redis-3.2.7/
redis-3.2.7/.gitignore
redis-3.2.7/00-RELEASENOTES
redis-3.2.7/BUGS
redis-3.2.7/CONTRIBUTING
redis-3.2.7/COPYING
```

```
dhw@localhost:/usr/local
File Edit View Search Terminal Help
[dhw@localhost Downloads]$ cd /usr/local/
[dhw@localhost local]$ sudo mv ./redis-3.2.7/ ./redis
[dhw@localhost local]$ ls
bin  games  include  lib  libexec  sbin  src
etc  hadoop  jdk1.8  lib64  redis  share
[dhw@localhost local]$
```

将 redis 目录的权限赋予 dhw 用户

```
[dhw@localhost local]$ sudo chown -R hadoop:dhw ./redis
chown: invalid user: 'hadoop:dhw'
[dhw@localhost local]$ sudo chown -R dhw:dhw ./redis
[dhw@localhost local]$
```

编译和安装 Redis

```
dhw@localhost:/usr/local/redis
File Edit View Search Terminal Help
[dhw@localhost local]$ cd ./redis/
[dhw@localhost redis]$ sudo make
LINK redis-check-aof
Hint: It's a good idea to run 'make test' ;)
make[1]: Leaving directory `/usr/local/redis/src'
[dhw@localhost redis]$ sudo make install
```

启动 Redis

```
crc16.c      lzfP.h      redis-check-aof.o  slowlog.c    zmalloc.h
crc16.o      Makefile    redis-check-rdb    slowlog.h    zmalloc.o
crc64.c      Makefile.dep  redis-check-rdb.c  slowlog.o
crc64.h      memtest.c    redis-check-rdb.o  solarisfixes.h
crc64.o      memtest.o    redis-cli          sort.c
[dhw@localhost src]$ cd ..
[dhw@localhost redis]$ ./src/redis-server
```

```
dhw@localhost:/usr/local/redis
File Edit View Search Terminal Help
http://redis.io

8088:M 21 Nov 10:41:09.319 # WARNING: The TCP backlog setting of 511 cannot be enforced because /proc/sys/net/core/somaxconn is set to the lower value of 128.
8088:M 21 Nov 10:41:09.319 # Server started, Redis version 3.2.7
8088:M 21 Nov 10:41:09.319 # WARNING overcommit_memory is set to 0! Background save may fail under low memory condition. To fix this issue add 'vm.overcommit_memory = 1' to /etc/sysctl.conf and then reboot or run the command 'sysctl vm.overcommit_memory=1' for this to take effect.
8088:M 21 Nov 10:41:09.319 # WARNING you have Transparent Huge Pages (THP) support enabled in your kernel. This will create latency and memory usage issues with Redis. To fix this issue run the command 'echo never > /sys/kernel/mm/transparent_hugepage/enabled' as root, and add it to your /etc/rc.local in order to retain the setting after a reboot. Redis must be restarted after THP is disabled.
8088:M 21 Nov 10:41:09.319 * The server is now ready to accept connections on port 6379
```

新建终端，启动 Redis 客户端

```
dhw@localhost:/usr/local/redis
File Edit View Search Terminal Help
[dhw@localhost ~]$ cd /usr/local/redis/
[dhw@localhost redis]$ ./src/redis-cli
127.0.0.1:6379>
```

安装 MongoDB

(参考: <https://www.cnblogs.com/JThinking/p/9408711.html>)

```
dhw@localhost:/etc/yum.repos.d
File Edit View Search Terminal Help
[dhw@localhost ~]$ cd /etc/yum.repos.d/
[dhw@localhost yum.repos.d]$ touch mongodb-org-3.4.repo
touch: cannot touch 'mongodb-org-3.4.repo': Permission denied
[dhw@localhost yum.repos.d]$ sudo touch mongodb-org-3.4.repo
[dhw@localhost yum.repos.d]$ sudo vim mongodb-org-3.4.repo
```

```
dhw@localhost:/etc/yum.repos.d
File Edit View Search Terminal Help
[mongodb-org-3.4]
name=MongoDB Repository
baseurl=https://repo.mongodb.org/yum/redhat/$releasever/mongodb-org/3.4/x86_64/
gpgcheck=1
enable=1
gpgkey=https://www.mongodb.org/static/pgp/server-3.4.asc
~
~
```

数据库实例默认在/var/lib/mongo 路径下，日志默认在/var/log/mongodb 路径下

```
[dhw@localhost yum.repos.d]$ sudo yum install -y mongodb-org
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
* base: mirrors.aliyun.com
* extras: mirrors.aliyun.com
* updates: mirrors.aliyun.com
Resolving Dependencies
--> Running transaction check
--> Package mongodb-org.x86_64 0:3.4.24-1.el7 will be installed
--> Processing Dependency: mongodb-org-tools = 3.4.24 for package: mongodb-org-3.4.24-1.el7.x86_64
--> Processing Dependency: mongodb-org-shell = 3.4.24 for package: mongodb-org-3.4.24-1.el7.x86_64
--> Processing Dependency: mongodb-org-server = 3.4.24 for package: mongodb-org-
```

```
[dhw@localhost yum.repos.d]$ service mongod start
Redirecting to /bin/systemctl start mongod.service
[dhw@localhost yum.repos.d]$
```

通过查看日志方式，验证服务开启成功

```
[dhw@localhost yum.repos.d]$ cat /var/log/mongodb/mongod.log
cat: /var/log/mongodb/mongod.log: Permission denied
[dhw@localhost yum.repos.d]$ sudo cat /var/log/mongodb/mongod.log
2020-11-21T13:16:50.038+0800 I CONTROL [main] ***** SERVER RESTARTED *****
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] MongoDB starting : pid=17754 port=27017 dbpath=/var/lib/mongo 64-bit host=localhost.localdomain
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] db version v3.4.24
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] git version: 865b4f6a96d0f5425e39a18337105f33e8db504d
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] OpenSSL version: OpenSSL 1.0.1e-fips 11 Feb 2013
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] allocator: tcmalloc
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] modules: none
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] build environment:
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] distmod: rhel70
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] distarch: x86_64
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] target_arch: x86_64
2020-11-21T13:16:50.043+0800 I CONTROL [initandlisten] options: { config: "/etc/
```

关闭服务：

```
[dhw@localhost yum.repos.d]$ service mongod stop
Redirecting to /bin/systemctl stop mongod.service
[dhw@localhost yum.repos.d]$
```

重启服务：

```
[dhw@localhost yum.repos.d]$ service mongod restart
Redirecting to /bin/systemctl restart mongod.service
[dhw@localhost yum.repos.d]$
```

通过命令：mongo 启动

```
ting it to 'never'
2020-11-21T15:03:43.970+0800 I CONTROL [initandlisten]
2020-11-21T15:03:43.970+0800 I CONTROL [initandlisten] ** WARNING: /sys/kernel/mm/transparent_hugepage/defrag is 'always'.
2020-11-21T15:03:43.970+0800 I CONTROL [initandlisten] ** We suggest setting it to 'never'
2020-11-21T15:03:43.970+0800 I CONTROL [initandlisten]
>
```


二、实验

(一) MySQL 数据库操作

启动 MySQL:

```
dhw@localhost:~  
File Edit View Search Terminal Help  
[dhw@localhost ~]$ mysql -u root -p  
Enter password:  
Welcome to the MySQL monitor.  Commands end with ; or \g.  
Your MySQL connection id is 6  
Server version: 5.6.50 MySQL Community Server (GPL)  
  
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owners.  
  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
mysql>
```

(如无特别说明, 所有表创建都位于 test 数据库, 如下创建数据集)

```
mysql> create database test;  
Query OK, 1 row affected (0.00 sec)  
  
mysql>
```

1、(1) 创建学生表, 并录入数据

```
mysql> create table Student( Name varchar(30) not null, English int unsigned not  
null, Math int unsigned not null, Computer int unsigned not null );  
ERROR 1046 (3D000): No database selected  
mysql> use test;  
Database changed  
mysql> create table Student( Name varchar(30) not null, English int unsigned not  
null, Math int unsigned not null, Computer int unsigned not null );  
Query OK, 0 rows affected (0.06 sec)  
  
mysql>
```

```
mysql> insert into Student values("zhangsan", 69, 86, 77);  
Query OK, 1 row affected (0.00 sec)  
  
mysql> insert into Student values("lisi", 55, 100, 88);  
Query OK, 1 row affected (0.00 sec)  
  
mysql>
```

(2) 用 SQL 语句输出 Student 表中的所有记录

```
mysql> select * from Student;  
+-----+-----+-----+-----+  
| Name   | English | Math | Computer |  
+-----+-----+-----+-----+  
| zhangsan |      69 |   86 |        77 |  
| lisi     |      55 |  100 |        88 |  
+-----+-----+-----+-----+  
2 rows in set (0.00 sec)  
  
mysql>
```

(3) 查询 zhangsan 的 Computer 成绩

```
mysql> select name, Computer from Student where name="zhangsan";
+-----+-----+
| name   | Computer |
+-----+-----+
| zhangsan |      77 |
+-----+-----+
1 row in set (0.01 sec)

mysql>
```

(4) 修改 lisi 的 Math 成绩为 95

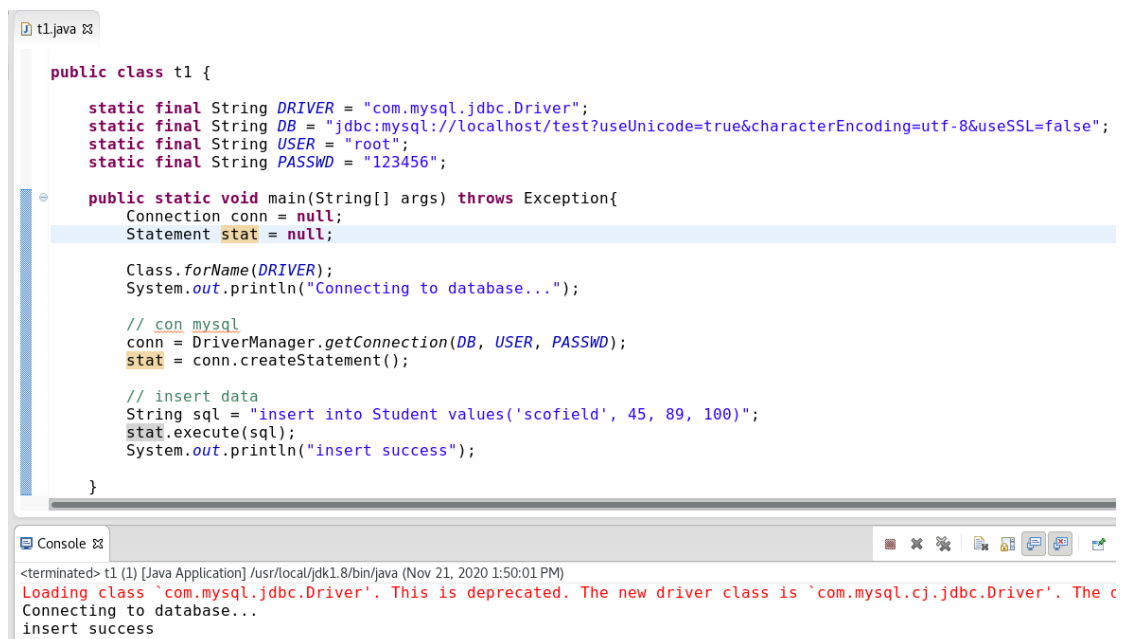
```
mysql> update Student set Math=95 where name="lisi";
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> select * from Student;
+-----+-----+-----+-----+
| Name   | English | Math | Computer |
+-----+-----+-----+-----+
| zhangsan |      69 |   86 |      77 |
| lisi     |      55 |   95 |      88 |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql>
```

2、(1) 向 Student 表中添加记录

(注意下载并添加 jar 包: <https://dev.mysql.com/downloads/file/?id=477057>)



The screenshot shows a Java IDE with a file named `t1.java` open. The code defines a class `t1` with a `main` method that connects to a MySQL database and inserts a record into the `Student` table.

```
public class t1 {
    static final String DRIVER = "com.mysql.jdbc.Driver";
    static final String DB = "jdbc:mysql://localhost/test?useUnicode=true&characterEncoding=utf-8&useSSL=false";
    static final String USER = "root";
    static final String PASSWD = "123456";

    public static void main(String[] args) throws Exception{
        Connection conn = null;
        Statement stat = null;

        Class.forName(DRIVER);
        System.out.println("Connecting to database...");

        // con mysql
        conn = DriverManager.getConnection(DB, USER, PASSWD);
        stat = conn.createStatement();

        // insert data
        String sql = "insert into Student values('scofield', 45, 89, 100)";
        stat.execute(sql);
        System.out.println("insert success");
    }
}
```

The console output shows the execution of the program:

```
<terminated> t1 (1) [Java Application] /usr/local/jdk1.8/bin/java (Nov 21, 2020 1:50:01 PM)
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com.mysql.cj.jdbc.Driver'. The c
Connecting to database...
insert success
```



```
mysql> select * from Student;
+-----+-----+-----+
| Name      | English | Math | Computer |
+-----+-----+-----+
| zhangsan  | 69      | 86   | 77        |
| lisi      | 55      | 95   | 88        |
+-----+-----+-----+
2 rows in set (0.00 sec)

mysql> select * from Student;
+-----+-----+-----+
| Name      | English | Math | Computer |
+-----+-----+-----+
| zhangsan  | 69      | 86   | 77        |
| lisi      | 55      | 95   | 88        |
| scofield  | 45      | 89   | 100       |
+-----+-----+-----+
3 rows in set (0.00 sec)

mysql>
```

(2) 获取 scofield 的 English 成绩信息

```
t2.java
public static void main(String[] args) throws Exception{
    Connection conn = null;
    Statement stat = null;

    Class.forName(DRIVER);
    System.out.println("Connecting to database...");

    // con mysql
    conn = DriverManager.getConnection(DB, USER, PASSWD);
    stat = conn.createStatement();

    // insert data
    String sql = "select Name, English from Student where Name='scofield'";
    ResultSet rs = stat.executeQuery(sql);
    System.out.println("Name" + "\t\t" + "English");
    while (rs.next()) {
        System.out.println(rs.getString(1) + "\t\t");
        System.out.println(rs.getInt(2));
    }
}
```

```
Console
<terminated> t2 (1) [Java Application] /usr/local/jdk1.8/bin/java (Nov 21, 2020 1:55:33 PM)
Loading class `com.mysql.jdbc.Driver'. This is deprecated. The new driver class is `com
Name          English
scofield
45
```

(二) HBase

启动 HBase (首先启动 hadoop)

```
dhw@localhost: /usr/local/hadoop
File Edit View Search Terminal Help
[dhw@localhost ~]$ cd /usr/local/hadoop/
[dhw@localhost hadoop]$ ./sbin/start-dfs.sh
Starting namenodes on [localhost]
dhw@localhost's password:
localhost: starting namenode, logging to /usr/local/hadoop/logs/hadoop-dhw-namenode-localhost.localdomain.out
dhw@localhost's password:
localhost: starting datanode, logging to /usr/local/hadoop/logs/hadoop-dhw-datanode-localhost.localdomain.out
Starting secondary namenodes [0.0.0.0]
dhw@0.0.0.0's password:
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/logs/hadoop-dhw-secondarynamenode-localhost.localdomain.out
[dhw@localhost hadoop]$ jps
26596 org.eclipse.equinox.launcher_1.3.0.v20120522-1813.jar
43079 Jps
42377 SecondaryNameNode
41787 DataNode
41534 NameNode
[dhw@localhost hadoop]$
```

```
dhw@localhost: ~/Documents/hbase
File Edit View Search Terminal Help
[dhw@localhost hbase]$ bin/start-hbase.sh
dhw@localhost's password:
localhost: starting zookeeper, logging to /home/dhw/Documents/hbase/bin/../logs/hbase-dhw-zookeeper-localhost.localdomain.out
starting master, logging to /home/dhw/Documents/hbase/bin/../logs/hbase-dhw-master-localhost.localdomain.out
Java HotSpot(TM) 64-Bit Server VM warning: ignoring option PermSize=128m; support was removed in 8.0
Java HotSpot(TM) 64-Bit Server VM warning: ignoring option MaxPermSize=128m; support was removed in 8.0
starting regionserver, logging to /home/dhw/Documents/hbase/bin/../logs/hbase-dhw-1-regionserver-localhost.localdomain.out
[dhw@localhost hbase]$ jps
46400 HRegionServer
46577 Jps
26596 org.eclipse.equinox.launcher_1.3.0.v20120522-1813.jar
42377 SecondaryNameNode
41787 DataNode
41534 NameNode
46142 HQuorumPeer
46255 HMaster
[dhw@localhost hbase]$
```

```
[dhw@localhost hbase]$ bin/hbase shell
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/home/dhw/Documents/hbase/lib/slf4j-log4j12-1.7.5.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/local/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
HBase Shell; enter 'help<RETURN>' for list of supported commands.
Type "exit<RETURN>" to leave the HBase Shell
Version 1.1.5, r239b80456118175b340b2e562a5568b5c744252e, Sun May 8 20:29:26 PDT 2016

hbase(main):001:0>
```

1、(1) 用 Hbase Shell 命令创建学生表 Student

```
hbase(main):001:0> list
TABLE
Course
SC
Student
t2
testTable
5 row(s) in 0.4040 seconds

=> ["Course", "SC", "Student", "t2", "testTable"]
hbase(main):002:0> disable Student
NameError: uninitialized constant Student

hbase(main):003:0> disable 'Student'
0 row(s) in 3.1920 seconds

hbase(main):004:0> drop 'Student'
0 row(s) in 5.1440 seconds
```

由于已存在遗留的同名表，删除重建

```
hbase(main):005:0> list
TABLE
Course
SC
t2
testTable
4 row(s) in 0.1240 seconds

=> ["Course", "SC", "t2", "testTable"]
hbase(main):006:0> create 'Student', 'score'
0 row(s) in 4.9130 seconds

=> Hbase::Table - Student
hbase(main):007:0> put 'Student', 'zhangsan', 'score:English', '69'
0 row(s) in 0.2430 seconds

hbase(main):008:0> put 'Student', 'zhangsan', 'score:Math', '86'
0 row(s) in 0.0090 seconds

hbase(main):009:0> put 'Student', 'zhangsan', 'score:Computer', '77'
0 row(s) in 0.0080 seconds

hbase(main):010:0> put 'Student', 'lisi', 'score:English', '55'
0 row(s) in 0.0080 seconds

hbase(main):011:0> put 'Student', 'lisi', 'score:Math', '100'
0 row(s) in 0.0040 seconds

hbase(main):012:0> put 'Student', 'lisi', 'score:Computer', '88'
0 row(s) in 0.0050 seconds

hbase(main):013:0>
```

(2) 用 scan 命令浏览表信息

```
hbase(main):013:0> scan 'Student'
ROW COLUMN+CELL
lisi column=score:Computer, timestamp=1605939244628, value=88
lisi column=score:English, timestamp=1605939224165, value=55
lisi column=score:Math, timestamp=1605939235458, value=100
zhangsan column=score:Computer, timestamp=1605939204488, value=77
zhangsan column=score:English, timestamp=1605939181622, value=69
zhangsan column=score:Math, timestamp=1605939192372, value=86
2 row(s) in 0.0670 seconds

hbase(main):014:0> █
```

(3) 查询 zhangsan 的 Computer 成绩

```
hbase(main):014:0> get 'Student', 'zhangsan', 'score:Computer'
COLUMN CELL
score:Computer timestamp=1605939204488, value=77
1 row(s) in 0.1100 seconds

hbase(main):015:0>
```

(4) 修改 lisi 的 Math 成绩为 95

```
hbase(main):015:0> put 'Student', 'lisi', 'score:Math', '95'
0 row(s) in 0.0050 seconds

hbase(main):016:0> scan 'Student'
ROW COLUMN+CELL
lisi column=score:Computer, timestamp=1605939244628, value=88
lisi column=score:English, timestamp=1605939224165, value=55
lisi column=score:Math, timestamp=1605939403751, value=95
zhangsan column=score:Computer, timestamp=1605939204488, value=77
zhangsan column=score:English, timestamp=1605939181622, value=69
zhangsan column=score:Math, timestamp=1605939192372, value=86
2 row(s) in 0.0160 seconds

hbase(main):017:0>
```

2、(1) 添加数据

```
t5_1.java
public static Configuration configuration;
public static Connection connection;
public static Admin admin;

public static void main(String[] args) throws IOException {
    String tableName = "Student";
    String[] fields = {"score:English", "score:Math", "score:Computer"};
    String[] values = {"45", "89", "100"};
    String row = "scofield";

    init();
    Table table = connection.getTable(TableName.valueOf(tableName));
    for (int i = 0; i < fields.length; i++) {
        Put put = new Put(row.getBytes());
        String[] cols = fields[i].split(":");
        if (cols.length == 1) {
            // no limit col
            put.addColumn(cols[0].getBytes(), "", values[i].getBytes());
        } else {
            put.addColumn(cols[0].getBytes(), cols[1].getBytes(), values[i].getBytes());
        }
        table.put(put);
    }
    System.out.println("add success");

    table.close();
    close();
}
```

```

// create connection
private static void init() {
    configuration = HBaseConfiguration.create();
    configuration.set("hbase.rootdir", "hdfs://localhost:9000/hbase");
    try {
        connection = ConnectionFactory.createConnection(configuration);
        admin = connection.getAdmin();
    } catch (IOException e) {
        e.printStackTrace();
    }
}

// close connection
private static void close() {
    try {
        if (admin != null) {
            admin.close();
        }
        if (null != connection) {
            connection.close();
        }
    } catch (IOException e) {
        e.printStackTrace();
    }
}
}

```

Console

```

<terminated> t5_1 [Java Application] /usr/local/jdk1.8/bin/java (Nov 21, 2020 2:28:45 PM)
log4j:WARN No appenders could be found for logger (org.apache.hadoop.metrics2.lib.MutableHistogram).
log4j:WARN Please initialize the log4j system properly.
log4j:WARN See http://logging.apache.org/log4j/1.2/faq.html#noconfig for more info.
add success

```

```

hbase(main):017:0> scan 'Student'
ROW                                COLUMN+CELL
lisi                               column=score:Computer, timestamp=1605939244628, value=88
lisi                               column=score:English, timestamp=1605939224165, value=55
lisi                               column=score:Math, timestamp=1605939403751, value=95
scofield                           column=score:Computer, timestamp=1605940135695, value=100
scofield                           column=score:English, timestamp=1605940135426, value=45
scofield                           column=score:Math, timestamp=1605940135570, value=89
zhangsan                           column=score:Computer, timestamp=1605939204488, value=77
zhangsan                           column=score:English, timestamp=1605939181622, value=69
zhangsan                           column=score:Math, timestamp=1605939192372, value=86
3 row(s) in 0.8540 seconds

hbase(main):018:0>

```

(2) 获取 scofield 的 English 成绩

```

t5_2.java
public static Admin admin;

public static void main(String[] args) throws IOException {
    String tableName = "Student";
    String row = "scofield";
    String column = "score:English";

    init();
    Table table = connection.getTable(TableName.valueOf(tableName));
    Get get = new Get(row.getBytes());
    String[] cols = column.split(":");
    if (cols.length == 1) {
        // no limit col
        get.addFamily(Bytes.toBytes(column));
    } else {
        get.addColumn(Bytes.toBytes(cols[0]), Bytes.toBytes(cols[1]));
    }
    Result result = table.get(get);
    showCell(result);

    table.close();
    close();
}

```

```
// show cells
private static void showCell(Result result){
    Cell[] cells = result.rawCells();
    for (Cell cell : cells){
        System.out.println("RowName:" +
            new String(CellUtil.cloneRow(cell)) + " ");
        System.out.println("Timestamp:" + cell.getTimestamp() + " ");
        System.out.println("column Family:" +
            new String(CellUtil.cloneFamily(cell)) + " ");
        System.out.println("row Name:" +
            new String(CellUtil.cloneQualifier(cell)) + " ");
        System.out.println("value:" +
            new String(CellUtil.cloneValue(cell)) + " ");
    }
}
```

Console [Java Application] /usr/local/jdk1.8/bin/java (Nov 21, 2020 2:37:07 PM)

log4j:WARN No appenders could be found for logger (org.a
log4j:WARN Please initialize the log4j system properly.
log4j:WARN See http://logging.apache.org/log4j/1.2/faq.h

RowName:scofield
Timestamp:1605940135426
column Family:score
row Name:English
value:45

(三) Redis

```
dhw@localhost:/usr/local/redis
File Edit View Search Terminal Help
[dhw@localhost ~]$ cd /usr/local/redis/
[dhw@localhost redis]$ ./src/redis-cli
127.0.0.1:6379>
```

1、(1) 设计表

```
dhw@localhost:/usr/local/redis
File Edit View Search Terminal Help
[dhw@localhost ~]$ cd /usr/local/redis/
[dhw@localhost redis]$ ./src/redis-cli
127.0.0.1:6379> hset student.zhangsan English 69
(integer) 1
127.0.0.1:6379> hset student.zhangsan Math 86
(integer) 1
127.0.0.1:6379> hset student.zhangsan Computer 77
(integer) 1
127.0.0.1:6379> hset student.lisi English 55
(integer) 1
127.0.0.1:6379> hset student.lisi Math 100
(integer) 1
127.0.0.1:6379> hset student.lisi Computer 88
(integer) 1
127.0.0.1:6379>
```

(2) 输出 zhangsan 和 lisi 的成绩

```

127.0.0.1:6379> hgetall student.zhangsan
1) "English"
2) "69"
3) "Math"
4) "86"
5) "Computer"
6) "77"
127.0.0.1:6379> hgetall student.lisi
1) "English"
2) "55"
3) "Math"
4) "100"
5) "Computer"
6) "88"
127.0.0.1:6379>

```

(3) 查询 zhangsan 的 Computer 成绩

```

127.0.0.1:6379> hget student.zhangsan Computer
"77"
127.0.0.1:6379>

```

(4) 修改 lisi 的 Math 成绩为 95

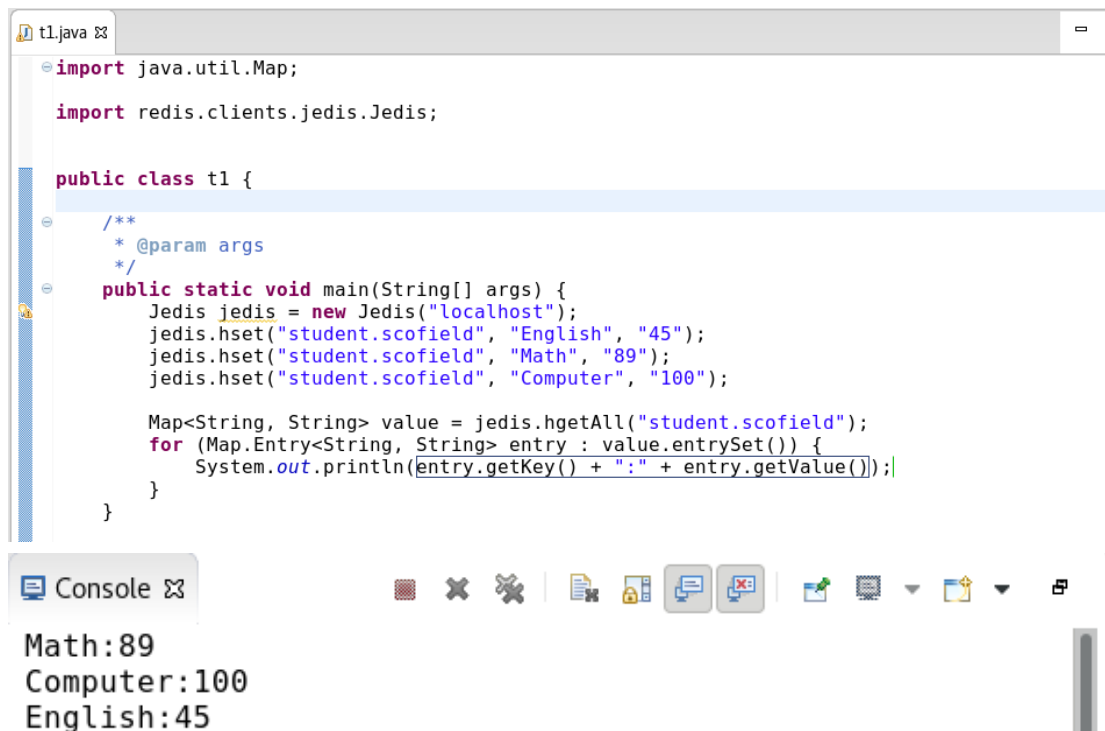
```

127.0.0.1:6379> hset student.lisi Math 95
(integer) 0
127.0.0.1:6379> hgetall student.lisi
1) "English"
2) "55"
3) "Math"
4) "95"
5) "Computer"
6) "88"
127.0.0.1:6379>

```

2、(1) 添加数据

(添加 redis jar 包: <https://mvnrepository.com/artifact/redis.clients/jedis/3.3.0>)



The screenshot shows an IDE with a Java file named `t1.java`. The code imports `java.util.Map` and `redis.clients.jedis.Jedis`. It defines a public class `t1` with a `main` method. In the `main` method, a `Jedis` client is created for `localhost`. Three `hset` calls are used to store data: `student.scofield` with `English` (45), `Math` (89), and `Computer` (100). Then, `hgetAll` is called for `student.scofield`, and the results are printed using a `for` loop over the `entrySet`.

The console output at the bottom shows the results of the `hgetAll` command:

```

Math:89
Computer:100
English:45

```



```
127.0.0.1:6379> hgetall student.scofield
1) "English"
2) "45"
3) "Math"
4) "89"
5) "Computer"
6) "100"
127.0.0.1:6379> █
```

(2) 获取 scofield 的 English 成绩



The screenshot shows an IDE with a Java file named t2.java. The code imports java.util.Map and defines a public class t2 with a main method. The main method uses jedis.hget to retrieve the value for 'English' from the 'student.scofield' key and prints it. The console output shows 'student.scofield English: 45'.

```
import java.util.Map;

public class t2 {
    /**
     * @param args
     */
    public static void main(String[] args) {
        Jedis jedis = new Jedis("localhost");

        String value = jedis.hget("student.scofield", "English");
        System.out.println("student.scofield English: " + value);
    }
}
```

```
student.scofield English: 45
```

(四) MongoDB

```
[dhw@localhost redis]$ sudo service mongod start
Redirecting to /bin/systemctl start mongod.service
[dhw@localhost redis]$ mongo
MongoDB shell version v3.4.24
connecting to: mongodb://127.0.0.1:27017
MongoDB server version: 3.4.24
Welcome to the MongoDB shell.
For interactive help, type "help".
For more comprehensive documentation, see
http://docs.mongodb.org/
```

1、(1) 设计 student 表

```
> use student
switched to db student
> var stus=[
... {"name": "zhangsan", "scores": {"English": 69, "Math": 86, "Computer": 77}},
... {"name": "lisi", "scores": {"English": 55, "Math": 100, "Computer": 88}} ]
> db.student.insert(stus)
BulkWriteResult({
  "writeErrors" : [ ],
  "writeConcernErrors" : [ ],
  "nInserted" : 2,
  "nUpserted" : 0,
  "nMatched" : 0,
  "nModified" : 0,
  "nRemoved" : 0,
  "upserted" : [ ]
})
> █
```

(2) 输出学生信息

```
> db.student.find().pretty()
{
  "_id" : ObjectId("5fb8bd17cc99b326a2f14ebe"),
  "name" : "zhangsan",
  "scores" : {
    "English" : 69,
    "Math" : 86,
    "Computer" : 77
  }
}
{
  "_id" : ObjectId("5fb8bd17cc99b326a2f14ebf"),
  "name" : "lisi",
  "scores" : {
    "English" : 55,
    "Math" : 100,
    "Computer" : 88
  }
}
>
```

(3) 查询 zhangsan 的成绩

```
> db.student.find({"name": "zhangsan"}, {"_id": 0, "name": 0})
{ "scores" : { "English" : 69, "Math" : 86, "Computer" : 77 } }
>
```

(4) 修改 lisi 的 Math 成绩为 95

```
> db.student.update({"name": "lisi"}, {"$set": {"scores.Math": 95}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.student.find({"name": "lisi"}, {"_id": 0, "name": 0})
{ "scores" : { "English" : 55, "Math" : 95, "Computer" : 88 } }
>
```

2、(1) 添加数据

```
tl.java
import java.util.ArrayList;
import java.util.List;

import org.bson.Document;

import com.mongodb.MongoClient;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;

public class tl {

    public static void main(String[] args) {
        MongoClient mongoClient = new MongoClient("localhost", 27017);

        MongoDatabase mongoDatabase = mongoClient.getDatabase("student");
        MongoCollection<Document> collection = mongoDatabase.getCollection("student");

        Document document = new Document("name", "scofield").append("scores",
            new Document("English", 45).append("Math", 89).append("Computer", 100));

        List<Document> documents = new ArrayList<Document>();
        documents.add(document);
        collection.insertMany(documents);

        System.out.println("insert success");
    }
}
```

```
Console 33
<terminated> t1 (3) [Java Application] /usr/local/jdk1.8/bin/java (Nov 21, 2020 3:33:25 PM)
Nov 21, 2020 3:33:26 PM com.mongodb.diagnostics.logging.
INFO: Cluster created with settings {hosts=[localhost:27
Nov 21, 2020 3:33:27 PM com.mongodb.diagnostics.logging.
INFO: No server chosen by WritableServerSelector from cl
Nov 21, 2020 3:33:29 PM com.mongodb.diagnostics.logging.
INFO: Opened connection [connectionId{localValue:1, serv
Nov 21, 2020 3:33:29 PM com.mongodb.diagnostics.logging.
INFO: Monitor thread successfully connected to server wi
Nov 21, 2020 3:33:29 PM com.mongodb.diagnostics.logging.
INFO: Opened connection [connectionId{localValue:2, serv
insert success

> db.student.find({"name": "scofield"}, {"_id": 0, "name": 0})
{ "scores" : { "English" : 45, "Math" : 89, "Computer" : 100 } }
>
```

(2) 获取成绩

```
public class t2 {

    public static void main(String[] args) {
        MongoClient mongoClient = new MongoClient("localhost", 27017);

        MongoDBDatabase mongoDatabase = mongoClient.getDatabase("student");
        MongoCollection<Document> collection = mongoDatabase.getCollection("student");

        MongoCursor<Document> cursor = collection.find(new Document("name", "scofield"))
            .projection(new Document("scores", 1).append("_id", 0))
            .iterator();

        while (cursor.hasNext()) {
            System.out.println(cursor.next().toJson());
        }
    }
}
```

```
Console 33
<terminated> t2 (3) [Java Application] /usr/local/jdk1.8/bin/java (Nov 21, 2020 3:38:41 PM)
Nov 21, 2020 3:38:41 PM com.mongodb.diagnostics.logging.JULLogger log
INFO: Cluster created with settings {hosts=[localhost:27017], mode=SINGLE,
Nov 21, 2020 3:38:41 PM com.mongodb.diagnostics.logging.JULLogger log
INFO: No server chosen by ReadPreferenceServerSelector{readPreference=prima
Nov 21, 2020 3:38:41 PM com.mongodb.diagnostics.logging.JULLogger log
INFO: Opened connection [connectionId{localValue:1, serverValue:8}] to loca
Nov 21, 2020 3:38:41 PM com.mongodb.diagnostics.logging.JULLogger log
INFO: Monitor thread successfully connected to server with description Serv
Nov 21, 2020 3:38:41 PM com.mongodb.diagnostics.logging.JULLogger log
INFO: Opened connection [connectionId{localValue:2, serverValue:9}] to loca
{ "scores" : { "English" : 45, "Math" : 89, "Computer" : 100 } }
```

完成!