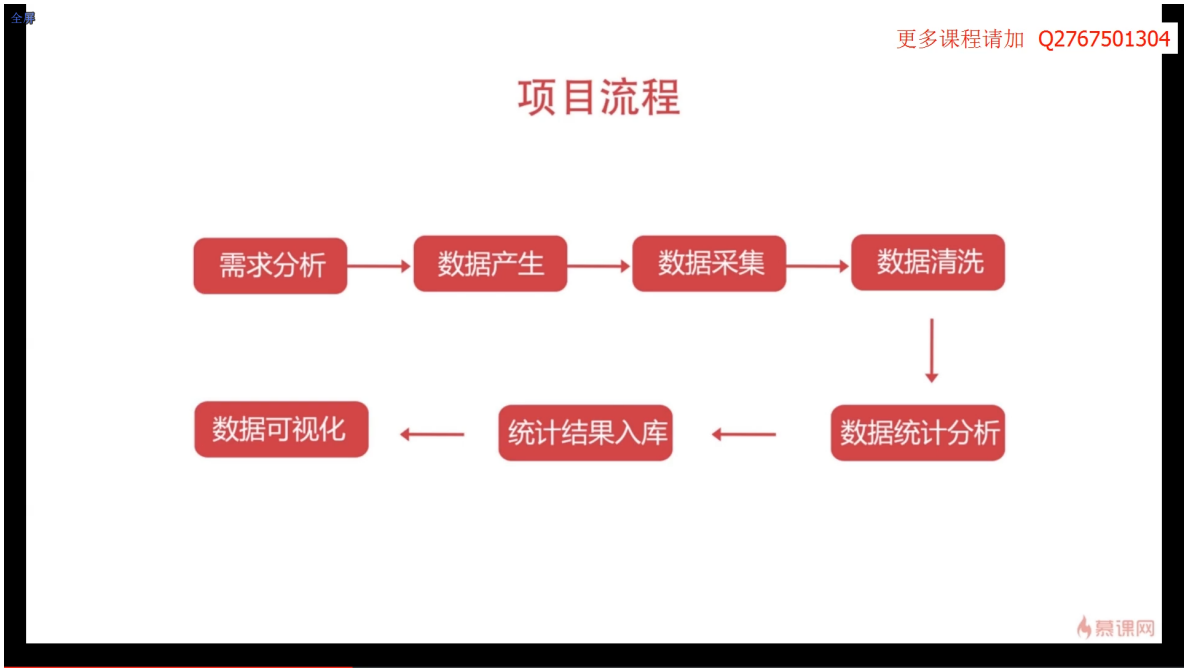
第1章 课程介绍

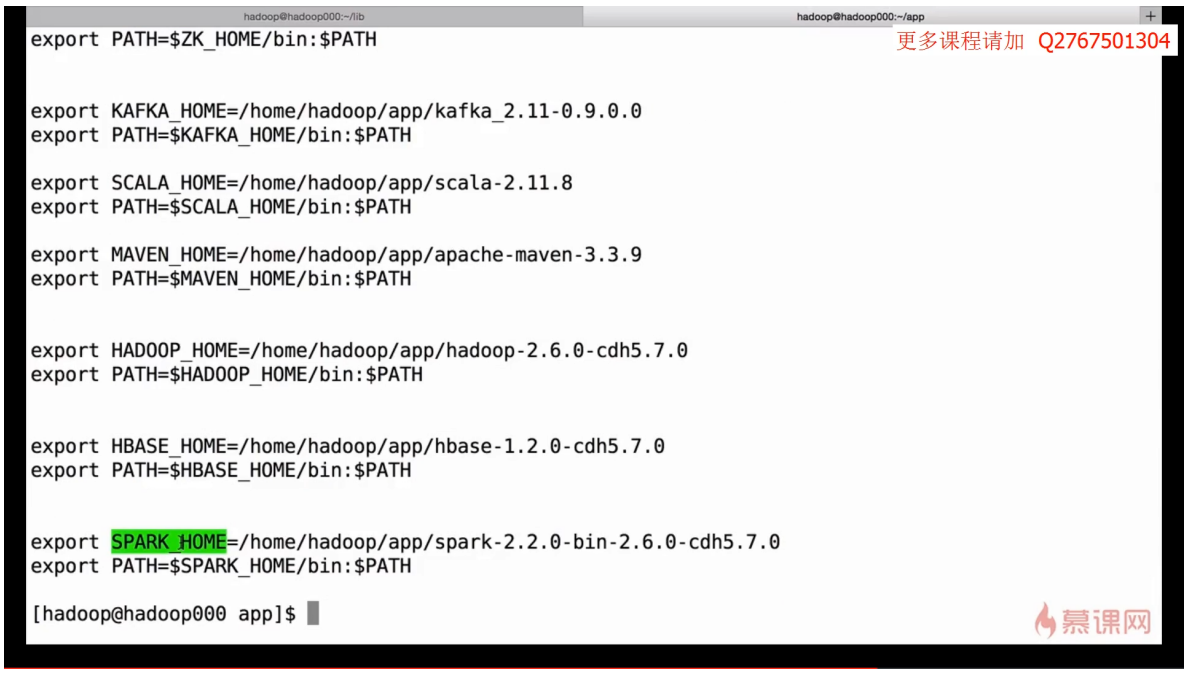



```
需要大家在linux的hadoop用户的根目录(/home/hadoop)上创建如下目录
    app     存放我们所有的软件的安装目录
    data    存放我们的测试数据
    lib     存放我们开发的jar
    software   存放软件安装包的目录
    source    存放我们的框架源码
```

```
Hadoop生态系统：cdh5.7.0
所有的Hadoop生态的软件下载地址：http://archive.cloudera.com/cdh5/cdh/5/
jdk：1.8
spark：2.2
scala：2.11.8
```

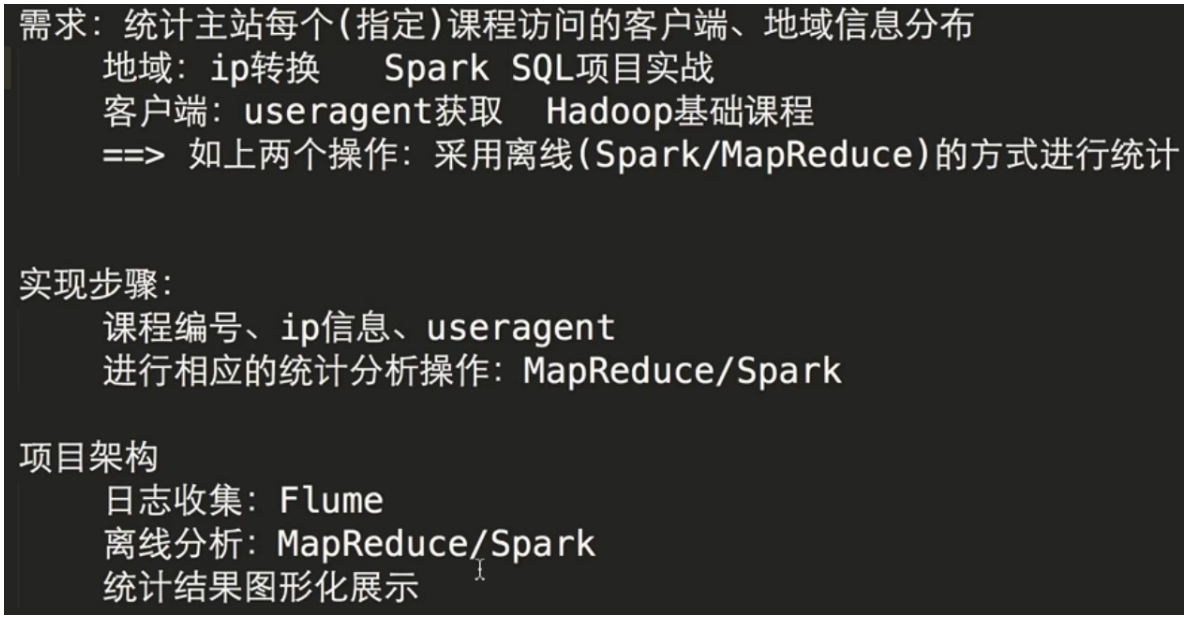
Spark版本升级

网址



第2章 初识实时流处理

一、业务现状分析

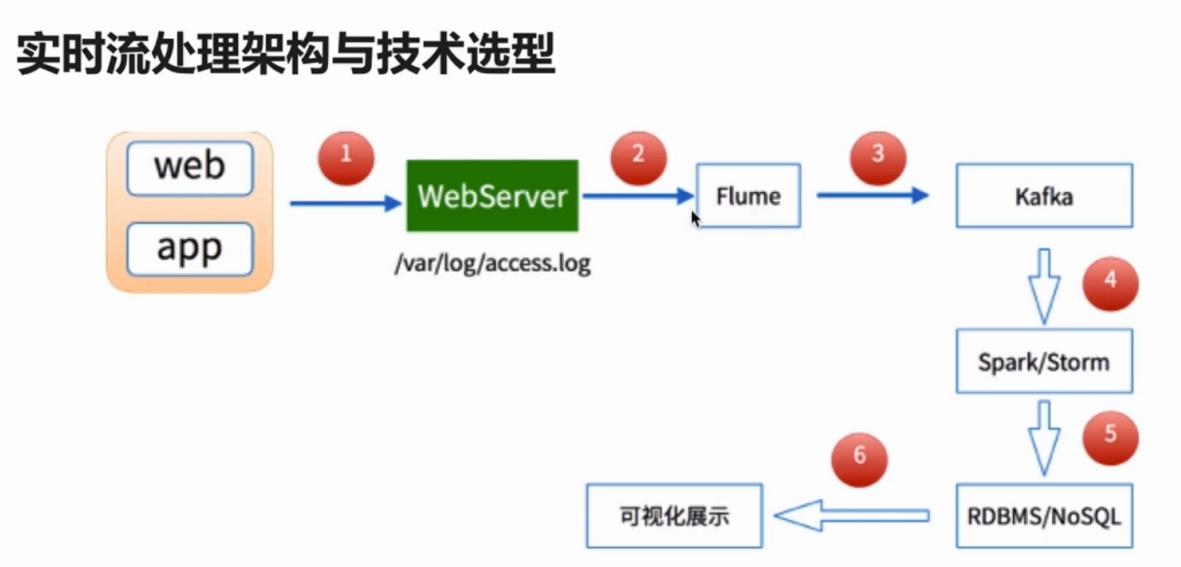


二、离线与实时对比

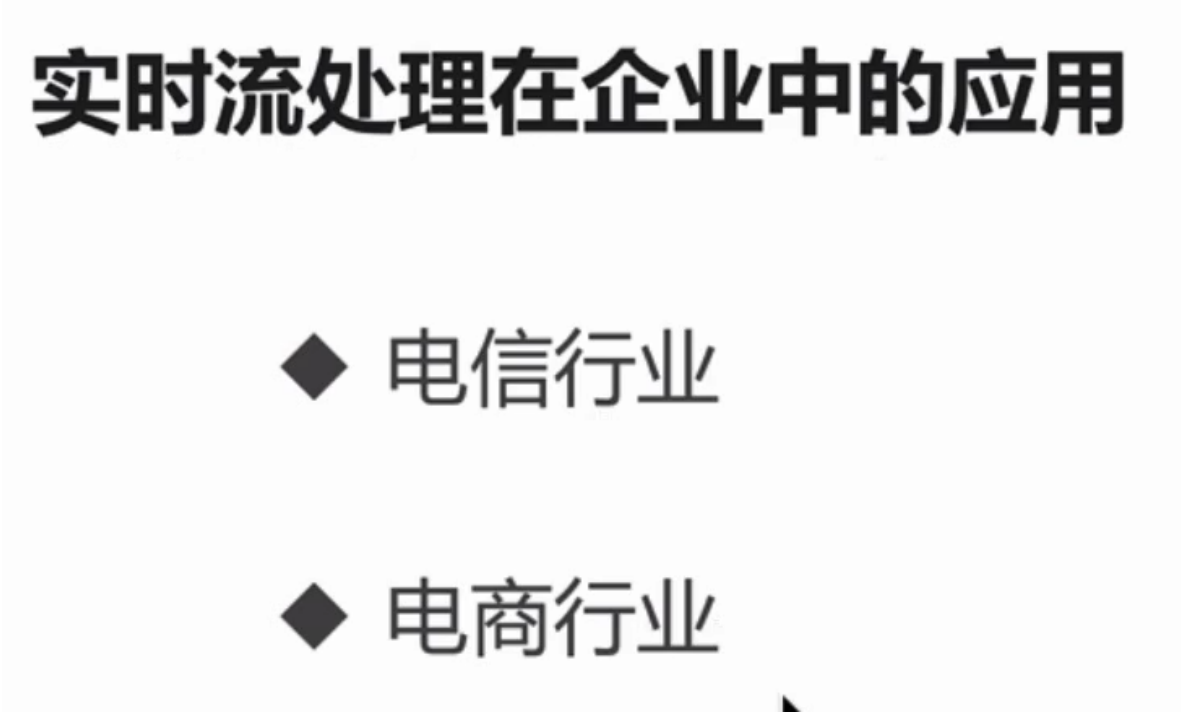
```
离线计算与实时计算的对比
1）数据来源
    离线：  HDFS 历史数据   数据量比较大
    实时：  消息队列(Kafka)，实时新增/修改记录过来的某一笔数据

2）处理过程
    离线：  MapReduce：  map + reduce
    实时：  Spark(DStream/SS)

3）处理速度
    离线：  慢
    实时：  快速

4）进程
    离线：  启动+销毁
    实时：  7*24
```

三、框架对比

四、架构与技术选型



五、应用

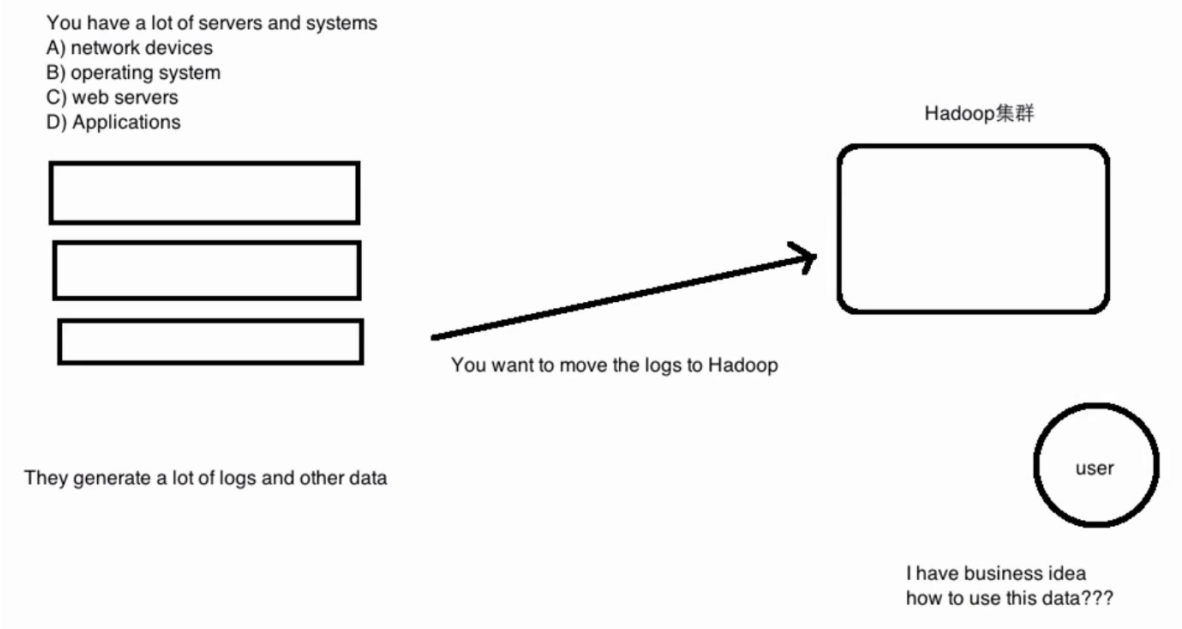


第3章 分布式日志收集框架Flume

一、业务现状分析

业务现状分析

- WebServer/ApplicationServer分散在各个机器上
- 想大数据平台Hadoop进行统计分析
- 日志如何收集到Hadoop平台上
- 解决方案及存在的问题

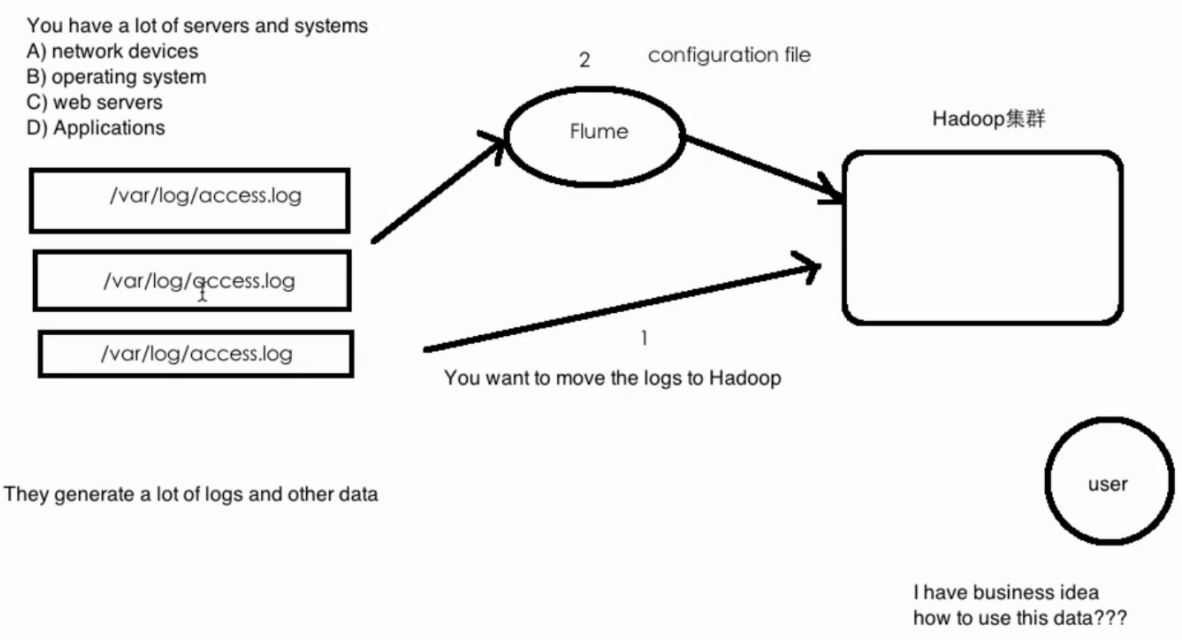


现状分析：见图

如何解决我们的数据从其他的server上移动到Hadoop之上？？？

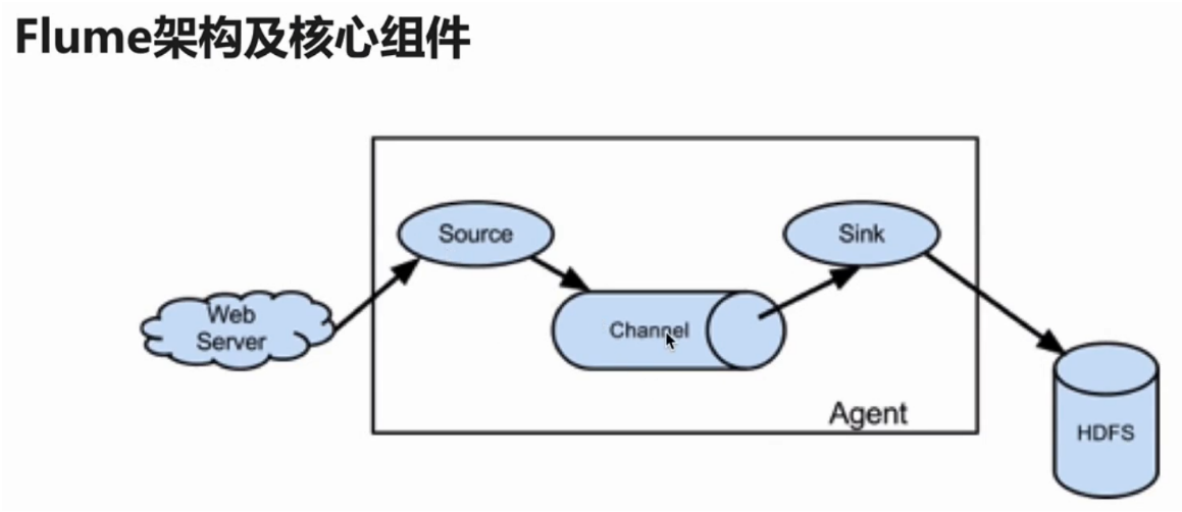
shell cp hadoop集群的机器上， hadoop fs -put ..... /

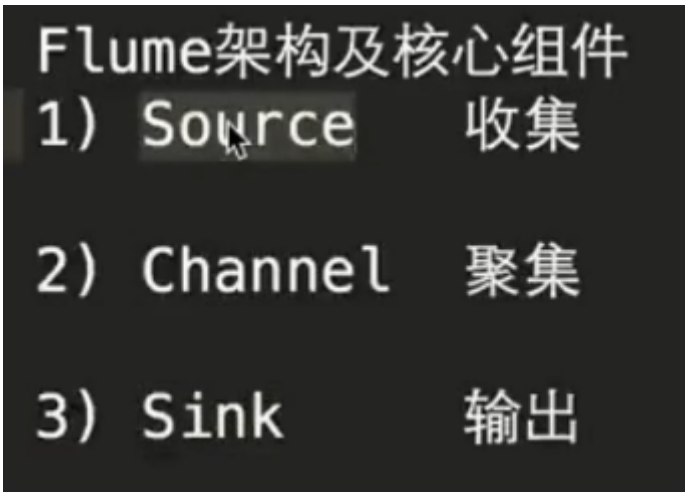
===> Flume

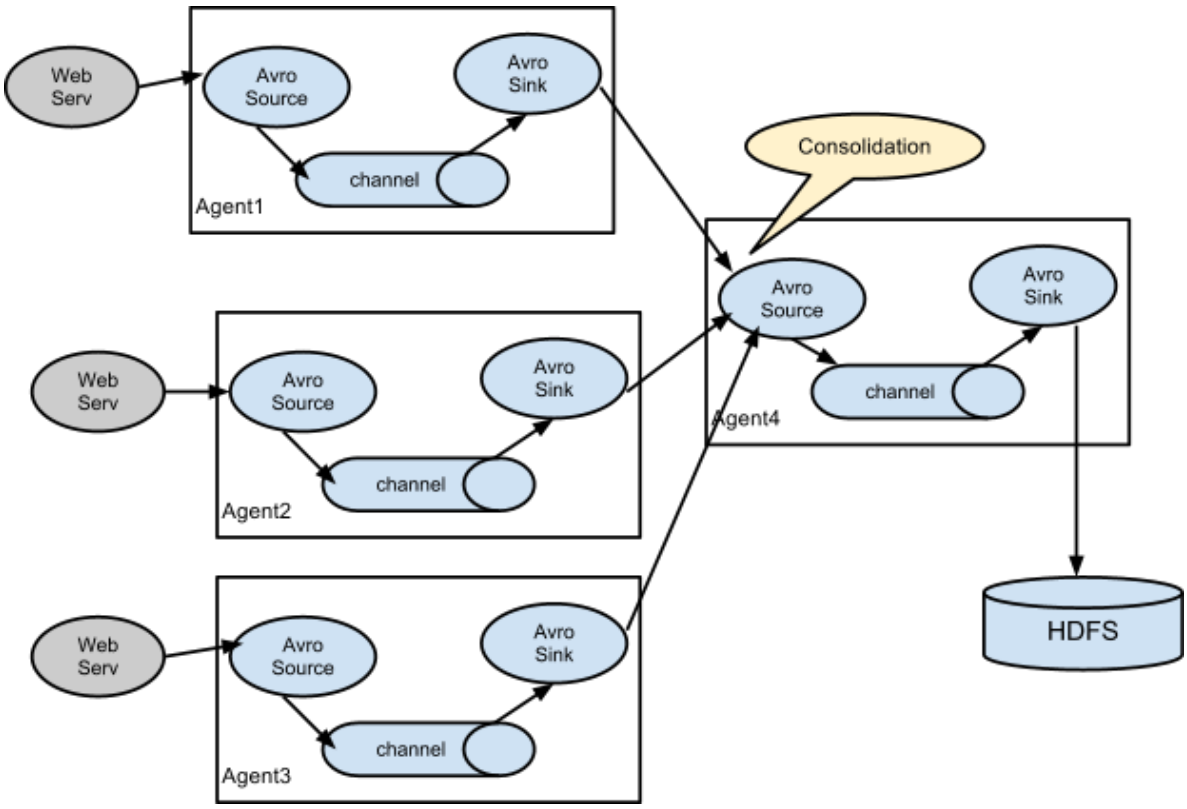


二、Flume架构及核心组件

官网







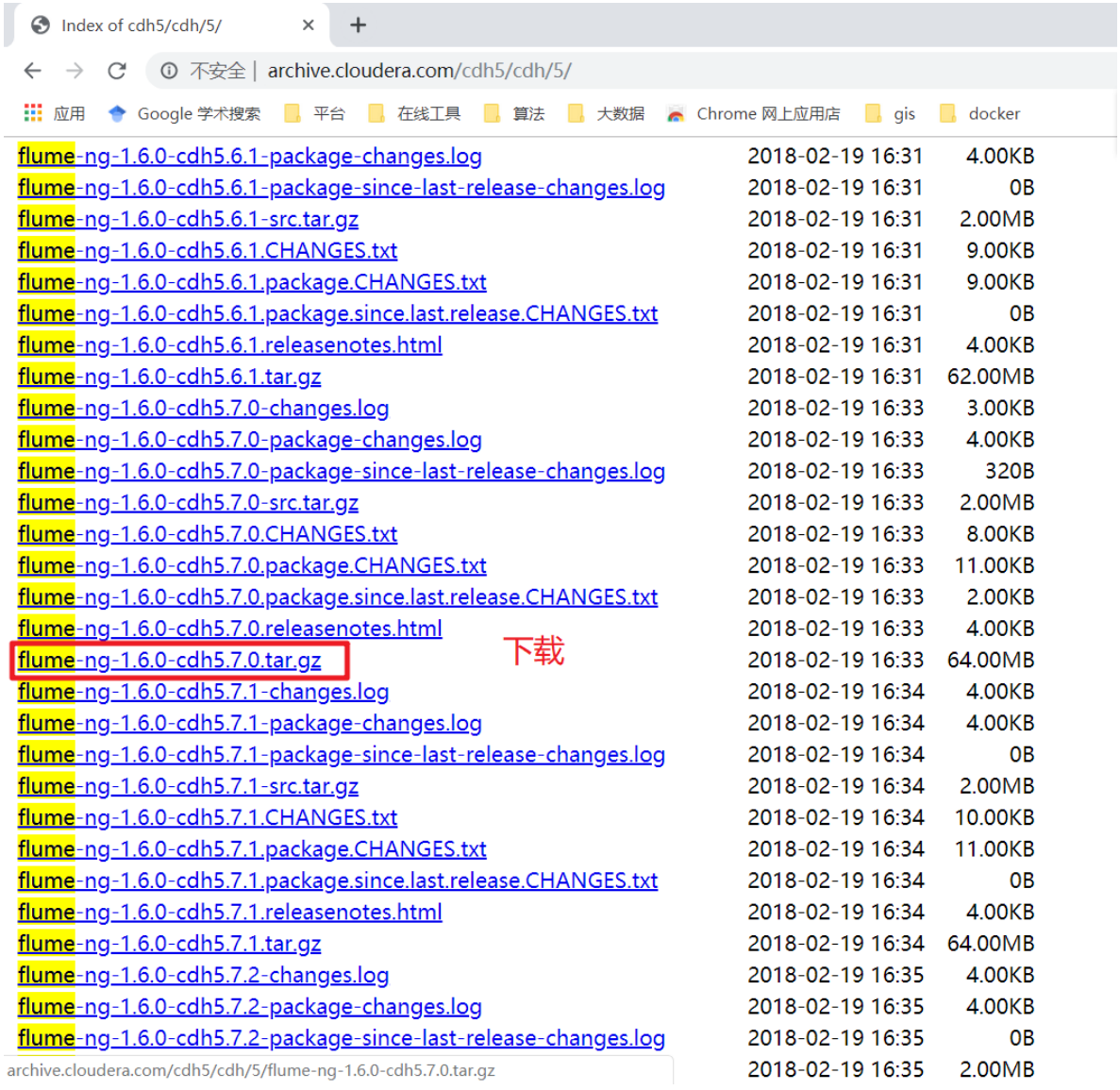
三、Flume&JDK环境部署

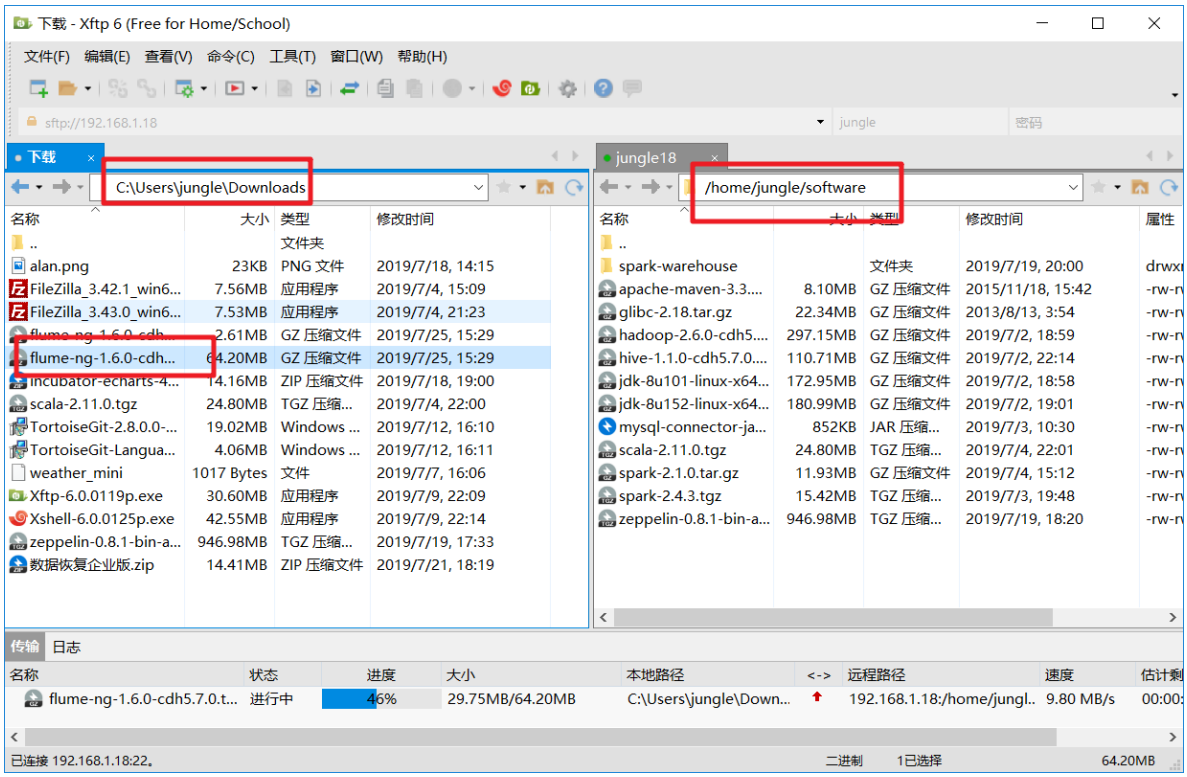
1.前置条件

```
Java Runtime Environment - Java 1.8 or later
Memory - Sufficient memory for configurations used by sources, channels or sinks
Disk Space - Sufficient disk space for configurations used by channels or sinks
Directory Permissions - Read/Write permissions for directories used by agent
```

2.安装Flume

下载





- 解压

```
tar -zvxf flume-ng-1.6.0-cdh5.7.0.tar.gz -C ~/app/
```

- 配置环境变量

```
cd
vi .bash_profile
```

```
export FLUME_HOME=/home/jungle/app/apache-flume-1.6.0-cdh5.7.0-bin
export PATH=$FLUME_HOME/bin:$PATH
```

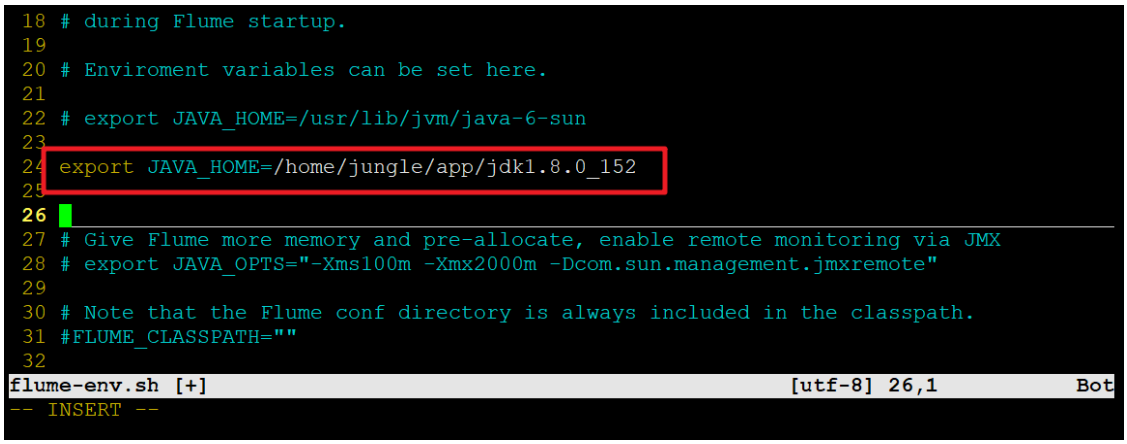

```
source .bash_profile
```

- 配置conf

```
cd $FLUME_HOME
cd conf/
```

```
cp flume-env.sh.template flume-env.sh
vi flume-env.sh
```

```
export JAVA_HOME=/home/jungle/app/jdk1.8.0_152
```



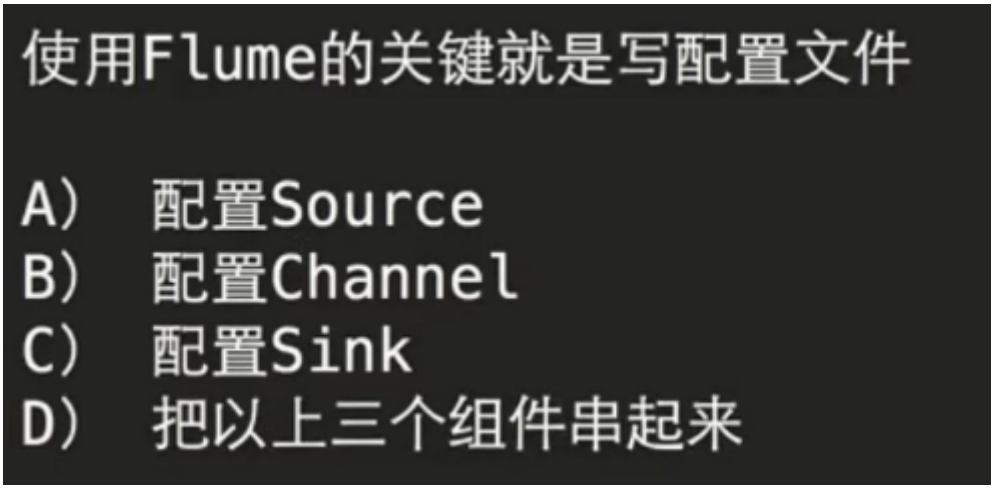

```
cd $FLUME_HOME/bin
flume-ng version
```

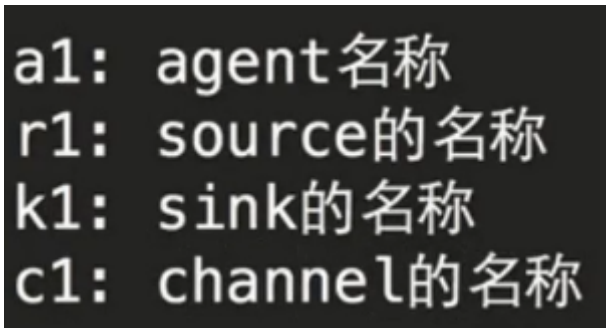
==检测==

```
-rwxr-xr-x 1 jungle jungle 13388 Mar 24  2016 flume-ng
-rw-r--r-- 1 jungle jungle   936 Mar 24  2016 flume-ng.cmd
-rwxr-xr-x 1 jungle jungle 14041 Mar 24  2016 flume-ng.ps1
jungle@centosserver1:[/home/jungle/app/apache-flume-1.6.0-cdh5.7.0-bin/bin]
jungle@centosserver1:[/home/jungle/app/apache-flume-1.6.0-cdh5.7.0-bin/bin]ll
total 36
-rwxr-xr-x 1 jungle jungle 13388 Mar 24  2016 flume-ng
-rw-r--r-- 1 jungle jungle   936 Mar 24  2016 flume-ng.cmd
-rwxr-xr-x 1 jungle jungle 14041 Mar 24  2016 flume-ng.ps1
jungle@centosserver1:[/home/jungle/app/apache-flume-1.6.0-cdh5.7.0-bin/bin]flume-ng vers
ion
Flume 1.6.0-cdh5.7.0
Source code repository: https://git-wip-us.apache.org/repos/asf/flume.git
Revision: 8f5f5143ae30802fe79f9ab96f893e6c54a105d1
Compiled by jenkins on Wed Mar 23 11:38:48 PDT 2016
From source with checksum 50b533f0ffc32db9246405ac4431872e
jungle@centosserver1:[/home/jungle/app/apache-flume-1.6.0-cdh5.7.0-bin/bin]
```

四、Flume实战

1.案例一






```
# example.conf: A single-node Flume configuration

# Name the components on this agent
a1.sources = r1
a1.sinks = k1
a1.channels = c1

# Describe/configure the source
a1.sources.r1.type = netcat
```

```
a1.sources.r1.bind = localhost
a1.sources.r1.port = 44444

# Describe the sink
a1.sinks.k1.type = logger

# Use a channel which buffers events in memory
a1.channels.c1.type = memory

# Bind the source and sink to the channel
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

- 配置

```
cd $FLUME_HOME/conf
vi example.conf
```

```
# Name the components on this agent
a1.sources = r1
a1.sinks = k1
a1.channels = c1

# Describe/configure the source
a1.sources.r1.type = netcat
a1.sources.r1.bind = localhost
a1.sources.r1.port = 44444

# Describe the sink
a1.sinks.k1.type = logger

# Use a channel which buffers events in memory
a1.channels.c1.type = memory

# Bind the source and sink to the channel
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

```
# Name the components on this agent
a1.sources = r1
a1.sinks = k1
a1.channels = c1

# Describe/configure the source
a1.sources.r1.type = netcat
a1.sources.r1.bind = localhost
a1.sources.r1.port = 44444

# Describe the sink
a1.sinks.k1.type = logger

# Use a channel which buffers events in memory
a1.channels.c1.type = memory

# Bind the source and sink to the channel
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
~
```

- 启动agent

```
flume-ng agent \
--name a1 \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/example.conf \
-Dflume.root.logger=INFO,console
```

==使用telnet进行测试==：`telnet localhost 44444`

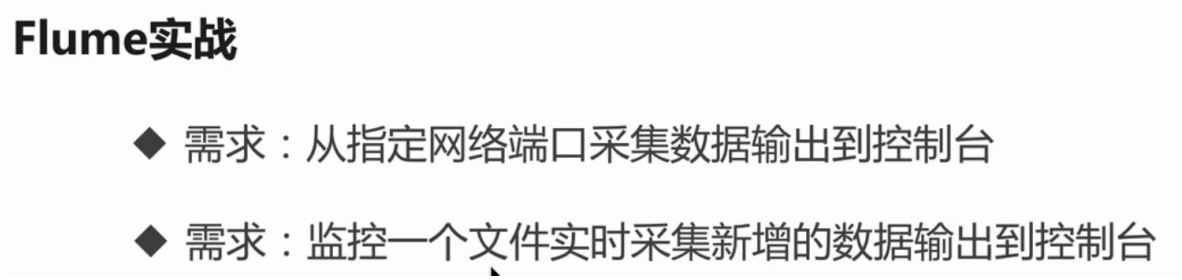
> 另开一个终端

```
jungle@centosserver1:[/home/jungle/app]telnet localhost 44444
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
hello
OK
```

```
c1
019-07-25 16:03:19,456 (lifecycleSupervisor-1-0) [INFO - org.apache.flume.instrumentation.MonitoredCounterGroup.register(MonitoredCounterGroup
va:120)] Monitored counter group for type: CHANNEL, name: c1: Successfully registered new MBean.
019-07-25 16:03:19,466 (lifecycleSupervisor-1-0) [INFO - org.apache.flume.instrumentation.MonitoredCounterGroup.start(MonitoredCounterGroup.ja
96)] Component type: CHANNEL, name: c1 started
019-07-25 16:03:19,468 (conf-file-poller-0) [INFO - org.apache.flume.node.Application.startAllComponents(Application.java:173)] Starting Sink
019-07-25 16:03:19,477 (conf-file-poller-0) [INFO - org.apache.flume.node.Application.startAllComponents(Application.java:184)] Starting Sourc
1
019-07-25 16:03:19,478 (lifecycleSupervisor-1-2) [INFO - org.apache.flume.source.NetcatSource.start(NetcatSource.java:155)] Source starting
019-07-25 16:03:19,488 (lifecycleSupervisor-1-2) [INFO - org.apache.flume.source.NetcatSource.start(NetcatSource.java:169)] Created serverSock
sun.nio.ch.ServerSocketChannelImpl[/127.0.0.1:44444]
019-07-25 16:04:21,486 (SinkRunner-PollingRunner-DefaultSinkProcessor) [INFO - org.apac
e.flume.sink.LoggerSink.process(LoggerSink.java:94)] Event: { headers:{} body: 68 65 6C
6C 6F 0D                                          hello. }
```

```
Event: { headers:{} body: 68 65 6C 6C 6F 0D hello. }
Event是FLume数据传输的基本单元
Event =  可选的header + byte array
```

2.案例二



==需求二==

> Agent选型：exec source + memory channel + logger sink

```
cd $FLUME_HOME/conf
vi exec-memory-logger.conf
```

```
# Name the components on this agent
a1.sources = r1
a1.sinks = k1
a1.channels = c1

# Describe/configure the source
a1.sources.r1.type = exec
a1.sources.r1.command = tail -F /home/jungle/data/data.log
a1.sources.r1.shell = /bin/sh -c

# Describe the sink
a1.sinks.k1.type = logger

# Use a channel which buffers events in memory
a1.channels.c1.type = memory

# Bind the source and sink to the channel
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

1 jungle18 | 2 jungle18

```
a1.sources = r1
a1.sinks = k1
a1.channels = c1

# Describe/configure the source
a1.sources.r1.type = exec
a1.sources.r1.command = tail -F /home/jungle/data/data.log
a1.sources.r1.shell = /bin/sh -c

# Describe the sink
a1.sinks.k1.type = logger

# Use a channel which buffers events in memory
a1.channels.c1.type = memory

# Bind the source and sink to the channel
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

```
flume-ng agent \
--name a1 \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/exec-memory-logger.conf \
-Dflume.root.logger=INFO,console
```

==测试==

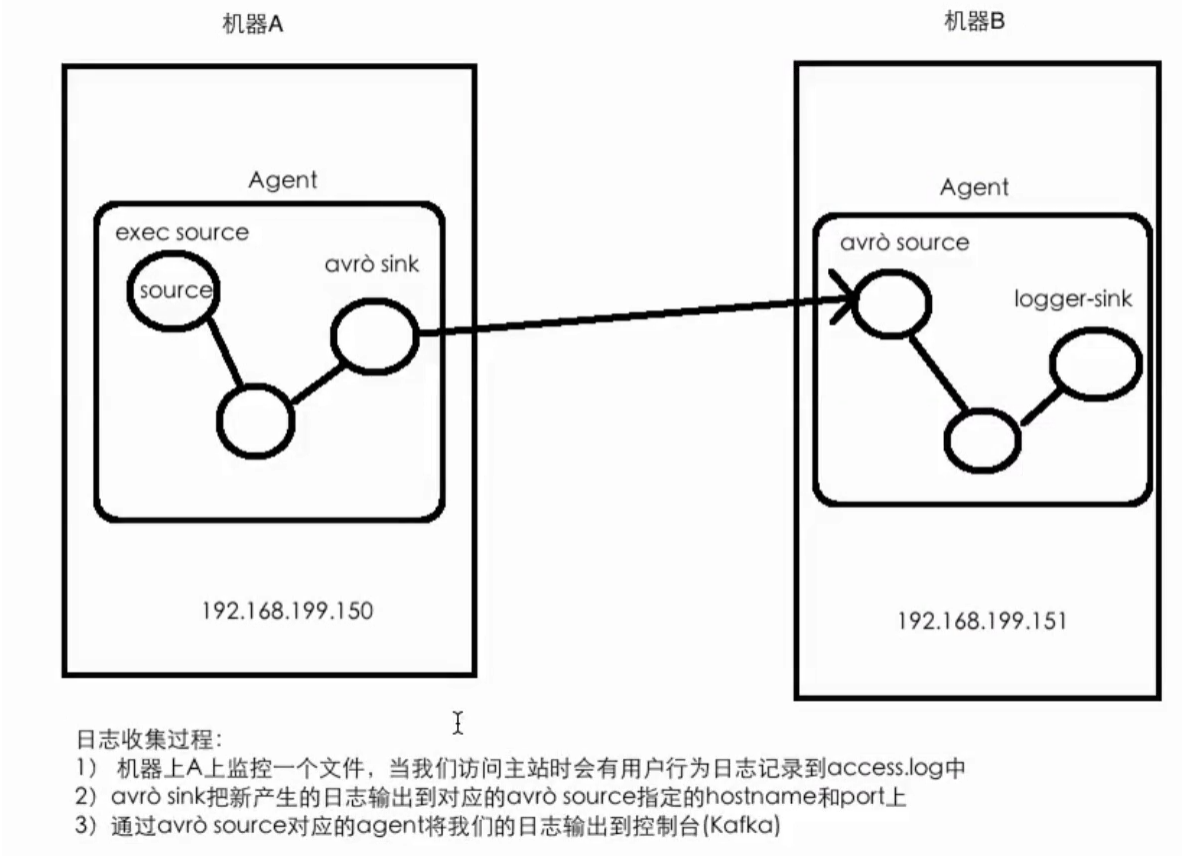
```
echo hello >>data.log
echo world >>data.log
echo world >>data.log
```

```
2019-07-25 18:18:54,430 (conf-file-poller-0) [INFO - org.apache.flume.sink.DefaultSinkFactory.create(DefaultSinkFactory.java:42)] Creating instan
ce of sink: k1, type: logger
2019-07-25 18:18:54,433 (conf-file-poller-0) [INFO - org.apache.flume.node.AbstractConfigurationProvider.getConfiguration(AbstractConfigurationPr
ovider.java:114)] Channel c1 connected to [r1, k1]
2019-07-25 18:18:54,441 (conf-file-poller-0) [INFO - org.apache.flume.node.Application.startAllComponents(Application.java:138)] Starting new con
figuration:{ sourceRunners:{r1=EventDrivenSourceRunner: { source:org.apache.flume.source.ExecSource{name:r1,state:IDLE} }} sinkRunners:{k1=SinkRu
nner: { policy:org.apache.flume.sink.DefaultSinkProcessor@3be0c0af counterGroup:{ name:null counters:{} } }} channels:{c1=org.apache.flume.channe
l.MemoryChannel{name: c1}} }
2019-07-25 18:18:54,456 (conf-file-poller-0) [INFO - org.apache.flume.node.Application.startAllComponents(Application.java:145)] Starting Channel
 c1
2019-07-25 18:18:54,612 (lifecycleSupervisor-1-0) [INFO - org.apache.flume.instrumentation.MonitoredCounterGroup.register(MonitoredCounterGroup.j
ava:120)] Monitored counter group for type: CHANNEL, name: c1: Successfully registered new MBean.
2019-07-25 18:18:54,615 (lifecycleSupervisor-1-0) [INFO - org.apache.flume.instrumentation.MonitoredCounterGroup.start(MonitoredCounterGroup.java
:96)] Component type: CHANNEL, name: c1 started
2019-07-25 18:18:54,629 (conf-file-poller-0) [INFO - org.apache.flume.node.Application.startAllComponents(Application.java:173)] Starting Sink k1
2019-07-25 18:18:54,631 (conf-file-poller-0) [INFO - org.apache.flume.node.Application.startAllComponents(Application.java:184)] Starting Source
r1
2019-07-25 18:18:54,636 (lifecycleSupervisor-1-0) [INFO - org.apache.flume.source.ExecSource.start(ExecSource.java:169)] Exec source starting wit
h command:tail -F /home/jungle/data/data.log
2019-07-25 18:18:54,655 (lifecycleSupervisor-1-0) [INFO - org.apache.flume.instrumentation.MonitoredCounterGroup.register(MonitoredCounterGroup.j
ava:120)] Monitored counter group for type: SOURCE, name: r1: Successfully registered new MBean.
2019-07-25 18:18:54,655 (lifecycleSupervisor-1-0) [INFO - org.apache.flume.instrumentation.MonitoredCounterGroup.start(MonitoredCounterGroup.java
:96)] Component type: SOURCE, name: r1 started
2019-07-25 18:18:58,657 (SinkRunner-PollingRunner-DefaultSinkProcessor) [INFO - org.apache.flume.sink.LoggerSink.process(LoggerSink.java:94)] Eve
nt: { headers:{} body: 68 65 6C 6C 6F                                     hello }
2019-07-25 18:18:58,658 (SinkRunner-PollingRunner-DefaultSinkProcessor) [INFO - org.apache.flume.sink.LoggerSink.process(LoggerSink.java:94)] Eve
nt: { headers:{} body: 77 6F 72 6C 64                                     world }
2019-07-25 18:18:58,658 (SinkRunner-PollingRunner-DefaultSinkProcessor) [INFO - org.apache.flume.sink.LoggerSink.process(LoggerSink.java:94)] Eve
nt: { headers:{} body: 77 6F 72 6C 64                                     world }
2019-07-25 18:19:52,661 (SinkRunner-PollingRunner-DefaultSinkProcessor) [INFO - org.apache.flume.sink.LoggerSink.process(LoggerSink.java:94)] Eve
nt: { headers:{} body: 65 6C 6B                                           elk }
```

3.案例三

Flume实战

- 需求：从指定网络端口采集数据输出到控制台
- 需求：监控一个文件实时采集新增的数据输出到控制台
- 需求：将A服务器上的日志实时采集到B服务器



日志收集过程：
1） 机器上A上监控一个文件，当我们访问主站时会有用户行为日志记录到access.log中
2） avrò sink把新产生的日志输出到对应的avrò source指定的hostname和port上
3） 通过avrò source对应的agent将我们的日志输出到控制台(Kafka)

需求三：
技术选型：
exec source + memory channel + avro sink
avro source + memory channel + logger sink

```
cd $FLUME_HOME/conf
vi exec-memory-avro.conf
```

==exec-memory-avro.conf==

```
exec-memory-avro.sources = exec-source
exec-memory-avro.sinks = avro-sink
exec-memory-avro.channels = memory-channel

exec-memory-avro.sources.exec-source.type = exec
exec-memory-avro.sources.exec-source.command = tail -F
/home/jungle/data/data.log
exec-memory-avro.sources.exec-source.shell = /bin/sh -c
```

```
exec-memory-avro.sinks.avro-sink.type = avro
exec-memory-avro.sinks.avro-sink.hostname = centosserver1
exec-memory-avro.sinks.avro-sink.port = 44444

exec-memory-avro.channels.memory-channel.type = memory

exec-memory-avro.sources.exec-source.channels = memory-channel
exec-memory-avro.sinks.avro-sink.channel = memory-channel
```

```
cd $FLUME_HOME/conf
vi avro-memory-logger.conf
```

==avro-memory-logger.conf==

```
avro-memory-logger.sources = avro-source
avro-memory-logger.sinks = logger-sink
avro-memory-logger.channels = memory-channel

avro-memory-logger.sources.avro-source.type = avro
avro-memory-logger.sources.avro-source.bind = centosserver1
avro-memory-logger.sources.avro-source.port = 44444

avro-memory-logger.sinks.logger-sink.type = logger


avro-memory-logger.channels.memory-channel.type = memory

avro-memory-logger.sources.avro-source.channels = memory-channel
avro-memory-logger.sinks.logger-sink.channel = memory-channel
```

==先启动avro-memory-logger==

```
flume-ng agent \
--name avro-memory-logger \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/avro-memory-logger.conf \
-Dflume.root.logger=INFO,console
```

==然后启动exec-memory-avro==

```
flume-ng agent \
--name exec-memory-avro \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/exec-memory-avro.conf \
-Dflume.root.logger=INFO,console
```

==测试==

```
echo jungle >> data.log
```

第4章 分布式发布订阅消息系统Kafka

一、Kafka概述

官网

更多课程请

Kafka概述
和消息系统类似

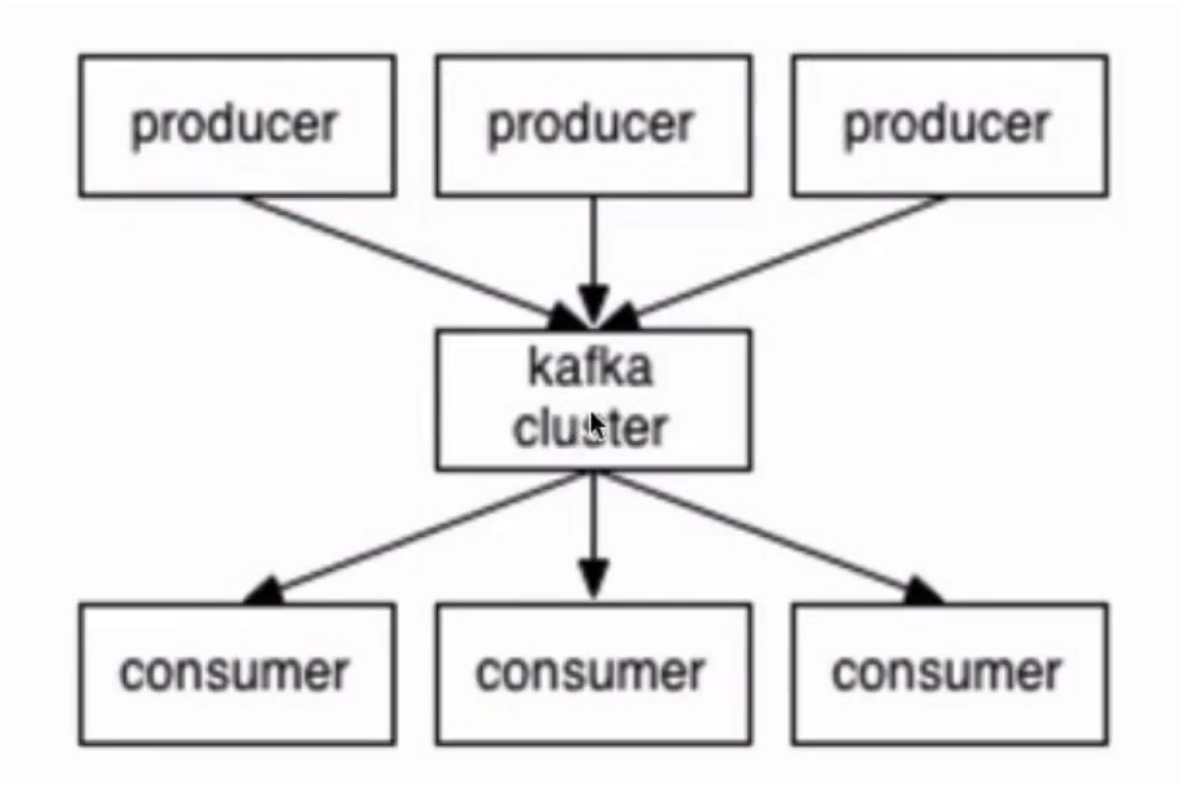
消息中间件：生产者和消费者

妈妈：生产者
你：消费者
馒头：数据流、消息

正常情况下： 生产一个 消费一个
其他情况：
一直生产，你吃到某一个馒头时，你卡主(机器故障)， 馒头就丢失了
一直生产，做馒头速度快，你吃来不及，馒头也就丢失了

拿个碗/篮子，馒头做好以后先放到篮子里，你要吃的时候去篮子里面取出来吃

篮子/框： Kafka
当篮子满了，馒头就装不下了，咋办?
多准备几个篮子 === Kafka的扩容



Kafka架构
producer：生产者，就是生产馒头(老妈)
consumer：消费者，就是吃馒头的(你)
broker：篮子
topic：主题，给馒头带一个标签，topica的馒头是给你吃的，topicb的馒头是给你弟弟吃

二、Kafka单节点单Broker部署

1.Zookeeper安装

- 下载

```
cd software
wget http://archive.cloudera.com/cdh5/cdh/5/zookeeper-3.4.5-cdh5.7.0.tar.gz
```

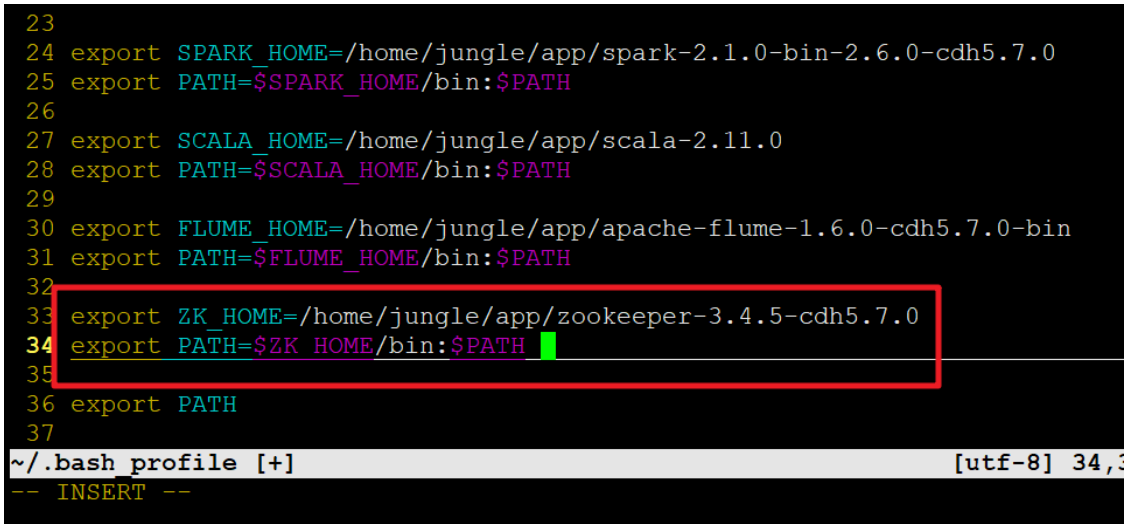
- 解压

```
tar -zxvf zookeeper-3.4.5-cdh5.7.0.tar.gz -C ~/app/
```

- 配置环境变量

```
vi ~/.bash_profile
```

```
export ZK_HOME=/home/jungle/app/zookeeper-3.4.5-cdh5.7.0
export PATH=$ZK_HOME/bin:$PATH
```




```
source ~/.bash_profile
```

- 配置文件

```
cd $ZK_HOME/conf
cp zoo_sample.cfg zoo.cfg
vi zoo.cfg
```

```
 dataDir=/home/jungle/app/tmp/zk
```

```
 5 initLimit=10
 6 # The number of ticks that can pass between
 7 # sending a request and getting an acknowledgement
 8 syncLimit=5
 9 # the directory where the snapshot is stored.
10 # do not use /tmp for storage, /tmp here is just
11 # example sakes.
12 dataDir=/home/jungle/app/tmp/zk
13 # the port at which the clients will connect
14 clientPort=2181
15 #
16 # Be sure to read the maintenance section of the
17 # administrator guide before turning on autopurge.
18 #
19 # http://zookeeper.apache.org/doc/current/zookeeperAdmin.html#sc_m
zoo.cfg [+]                                                    [utf-8]
-- INSERT --
```

- 启动

```
cd $ZK_HOME/bin
./zkServer.sh start
```

==验证==

```
jps
```

```
jungle@centosserver1:[/home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin]jps
34008 Jps
33884 QuorumPeerMain
```

- 连接

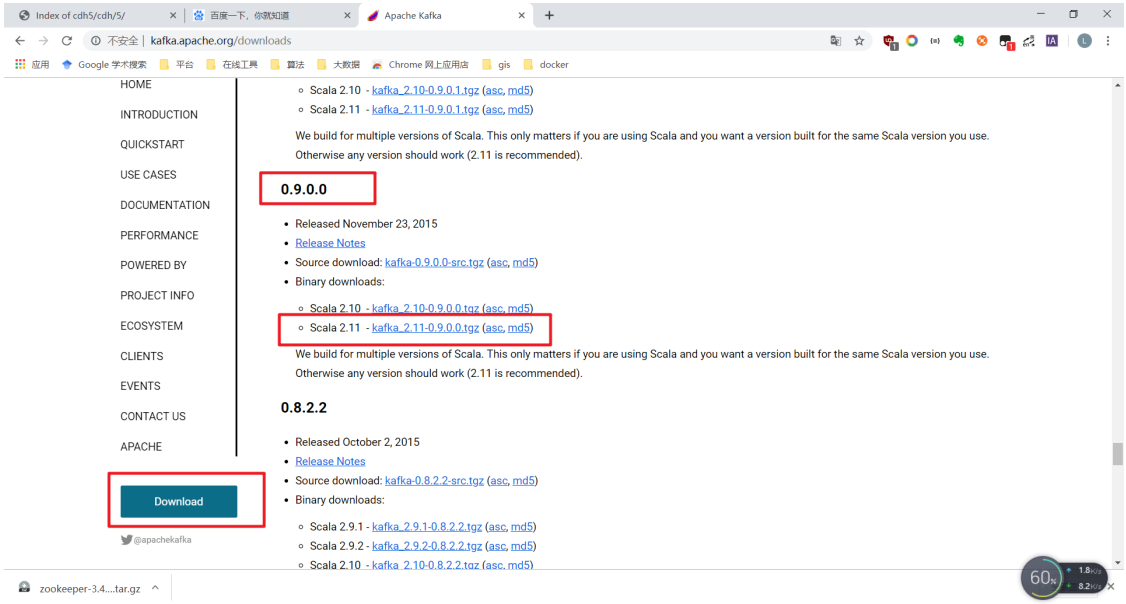
```
./zkCli.sh
```

```
2019-07-27 11:16:20,138 [myid:] - INFO  [main-SendThread(localhost:2181):ClientCnxn$Send
Thread@975] - Opening socket connection to server localhost/127.0.0.1:2181. Will not att
empt to authenticate using SASL (unknown error)
JLine support is enabled
2019-07-27 11:16:20,393 [myid:] - INFO  [main-SendThread(localhost:2181):ClientCnxn$Send
Thread@852] - Socket connection established, initiating session, client: /127.0.0.1:4506
2, server: localhost/127.0.0.1:2181
2019-07-27 11:16:20,451 [myid:] - INFO  [main-SendThread(localhost:2181):ClientCnxn$Send
Thread@1235] - Session establishment complete on server localhost/127.0.0.1:2181, sessio
nid = 0x16c316bde820000, negotiated timeout = 30000

WATCHER::

WatchedEvent state:SyncConnected type:None path:null
[zk: localhost:2181(CONNECTED) 0] ls /
[zookeeper]
[zk: localhost:2181(CONNECTED) 1]
```

2.单节点单broker的部署及使用

- 下载kafka

  下载地址




```
wget https://archive.apache.org/dist/kafka/0.9.0.0/kafka_2.11-0.9.0.0.tgz
```

- 解压

```
tar -zxvf kafka_2.11-0.9.0.0.tgz -C ~/app/
```

- 配置环境变量

```
vi ~/.bash_profile
```

```
export KAFKA_HOME=/home/jungle/app/kafka_2.11-0.9.0.0
export PATH=$KAFKA_HOME/bin:$PATH
```

```
26
27 export SCALA_HOME=/home/jungle/app/scala-2.11.0
28 export PATH=$SCALA_HOME/bin:$PATH
29
30 export FLUME_HOME=/home/jungle/app/apache-flume-1.6.0-cdh5.7.0-bin
31 export PATH=$FLUME_HOME/bin:$PATH
32
33 export ZK_HOME=/home/jungle/app/zookeeper-3.4.5-cdh5.7.0
34 export PATH=$ZK_HOME/bin:$PATH
35
36 export KAFKA_HOME=/home/jungle/app/kafka_2.11-0.9.0.0
37 export PATH=$KAFKA_HOME/bin:$PATH
38
39 export PATH
40
~/.bash_profile [+]                                    [utf-8] 37,34          Bot
-- INSERT --
```

```
source ~/.bash_profile
```

- 修改配置文件


```
cd $KAFKA_HOME/config
vi server.properties
```

```
host.name=centosserver1
```

```
23
24 listeners=PLAINTEXT://:9092
25
26 # The port the socket server listens on
27 #port=9092
28
29 # Hostname the broker will bind to. If not set, the server will bind to all interfac
30 host.name=centosserver1
31
32 # Hostname the broker will advertise to producers and consumers. If not set, it uses
33 # value for "host.name" if configured.  Otherwise, it will use the value returned fr
34 # java.net.InetAddress.getCanonicalHostName().
35 #advertised.host.name=<hostname routable by clients>
36
37 # The port to publish to ZooKeeper for clients to use. If this is not set,
server.properties [+]                                [utf-8] 30,24          20%
-- INSERT --
```

```
log.dirs=/home/jungle/app/tmp/kafka-logs
```

```
53 # The maximum size of a request that the socket server will accept (protection again
54 socket.request.max.bytes=104857600
55
56
57 ############################# Log Basics #############################
58
59 # A comma separated list of directories under which to store log files
60 log.dirs=/home/jungle/app/tmp/kafka-logs
61
62 # The default number of log partitions per topic. More partitions allow greater
63 # parallelism for consumption, but this will also result in more files across
64 # the brokers.
65 num.partitions=1
66
67 # The number of threads per data directory to be used for log recovery at startup an
server.properties [+]                                [utf-8] 60,41          48%
-- INSERT --
```

```
zookeeper.connect=centosserver1:2181
```

```
109 # By default the log cleaner is disabled and the log retention policy will default t
110 # If log.cleaner.enable=true is set the cleaner will be enabled and individual logs
111 log.cleaner.enable=false
112
113 ############################# Zookeeper #############################
114
115 # Zookeeper connection string (see zookeeper docs for details).
116 # This is a comma separated host:port pairs, each corresponding to a zk
117 # server. e.g. "127.0.0.1:3000,127.0.0.1:3001,127.0.0.1:3002".
118 # You can also append an optional chroot string to the urls to specify the
119 # root directory for all kafka znodes.
120 zookeeper.connect=centosserver1:2181
121
122 # Timeout in ms for connecting to zookeeper
123 zookeeper.connection.timeout.ms=6000
server.properties [+]                                    [utf-8] 120,37        Bot
-- INSERT --
```

- 启动kafka

  ==之前要先启动zookeeper==

```
cd $KAFKA_HOME/bin
kafka-server-start.sh $KAFKA_HOME/config/server.properties
```

```
jps
jps -m
```

```
jungle@centosserver1:[/home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin]jps
3456 Kafka
3650 Jps
33884 QuorumPeerMain
jungle@centosserver1:[/home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin]jps -m
3456 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server.properties
3714 Jps -m
33884 QuorumPeerMain /home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin/../conf/zoo.cfg
jungle@centosserver1:[/home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin]
```

- 创建topic

```
kafka-topics.sh --create --zookeeper centosserver1:2181 --replication-factor
1 --partitions 1 --topic hello_topic
```

```
jungle@centosserver1:[/home/jungle/app/zookeeper-3.4.5-cdh5.7.0/conf]kafka-topics.sh --create --zookeeper centosserver1:2181 --replication-factor
 1 --partitions 1 --topic hello_topic
WARNING: Due to limitations in metric names, topics with a period ('.') or underscore ('_') could collide. To avoid issues it is best to use eith
er, but not both.
Created topic "hello_topic".
jungle@centosserver1:[/home/jungle/app/zookeeper-3.4.5-cdh5.7.0/conf]
```

==验证==

```
# 查看所有topic
kafka-topics.sh --list --zookeeper centosserver1:2181
```

```
jungle@centosserver1:[/home/jungle]kafka-topics.sh --list --zookeeper centosserver1:2181
hello_topic
jungle@centosserver1:[/home/jungle]
```

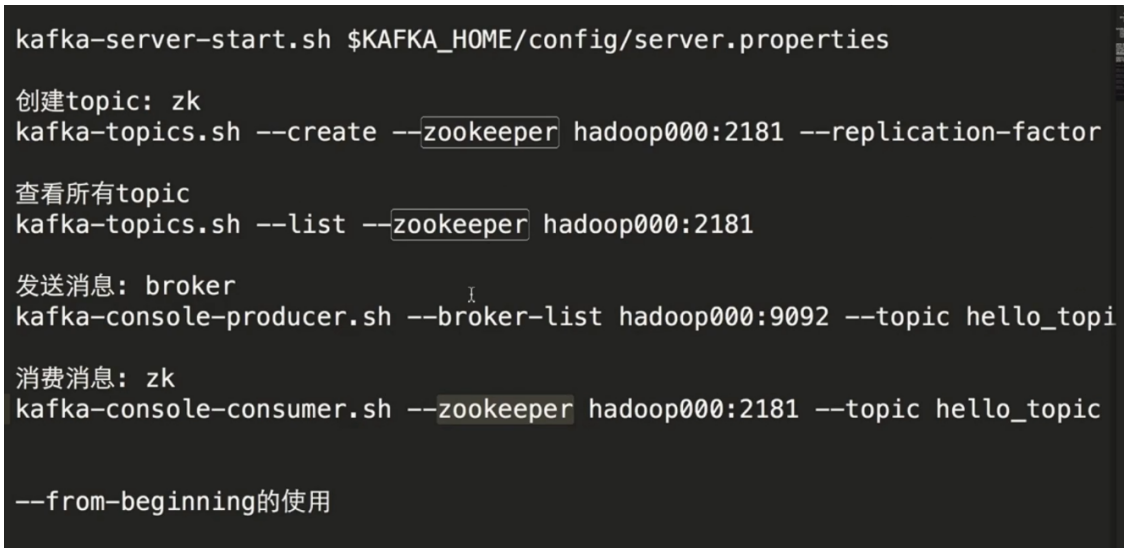
- 生产消息

```
kafka-console-producer.sh --broker-list centosserver1:9092 --topic
hello_topic
```

- 消费消息

```
kafka-console-consumer.sh --zookeeper centosserver1:2181 --topic hello_topic
--from-beginning
```

==--from-beginning==:表示从头开始消费



- 查看topic的详细信息

```
# 所有的topic
  kafka-topics.sh --describe --zookeeper centosserver1:2181
```

```
# 指定的topic
  kafka-topics.sh --describe --zookeeper centosserver1:2181 --topic
hello_topic
```

3.单节点多broker部署及使用

- 复制配置文件

```
cd $KAFKA_HOME/config
cp server.properties server-1.properties
cp server.properties server-2.properties
cp server.properties server-3.properties
```

- 修改配置文件

  ==server-1.properties==

```
vi server-1.properties
```

```
broker.id=1
listeners=PLAINTEXT://:9093
log.dirs=/home/jungle/app/tmp/kafka-logs-1
```

==server-2.properties==

```
vi server-2.properties
```

```
broker.id=2
listeners=PLAINTEXT://:9094
log.dirs=/home/jungle/app/tmp/kafka-logs-2
```

==server-3.properties==

```
vi server-3.properties
```

```
broker.id=3
listeners=PLAINTEXT://:9095
log.dirs=/home/jungle/app/tmp/kafka-logs-3
```

- 启动

  ==-daemon== : 后台启动

```
kafka-server-start.sh -daemon $KAFKA_HOME/config/server-1.properties &
kafka-server-start.sh -daemon $KAFKA_HOME/config/server-2.properties &
kafka-server-start.sh -daemon $KAFKA_HOME/config/server-3.properties &
```

```
 jps -m
```

```
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]jps -m
11428 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server-3.properties
11211 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server-2.properties
33884 QuorumPeerMain /home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin/../conf/zoo.cfg
11212 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server-1.properties
11868 Jps -m
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]
```

- 创建topic

```
kafka-topics.sh --create --zookeeper centosserver1:2181 --replication-factor
3 --partitions 1 --topic my-replicated-topic
```

- 查看topic

```
# 查看所有topic
kafka-topics.sh --list --zookeeper centosserver1:2181
```

```
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]kafka-topics.sh --list
--zookeeper centosserver1:2181
hello_topic
my-replicated-topic
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]
```

- 生产消息

```
kafka-console-producer.sh --broker-list
centosserver1:9093,centosserver1:9094,centosserver1:9095 --topic my-
replicated-topic
```

- 消费消息

```
kafka-console-consumer.sh --zookeeper centosserver1:2181 --topic my-replicated-topic
```

==可以开启多个==、

三、Kafka容错性测试

- 查看指定topic的详细信息

```
kafka-topics.sh --describe --zookeeper centosserver1:2181 --topic my-replicated-topic
```

```
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]kafka-topics.sh --describe --zookeeper centosserver1:2181 --topic my-replicated-topic
Topic:my-replicated-topic       PartitionCount:1        ReplicationFactor:3     Configs:
        Topic: my-replicated-topic      Partition: 0    Leader: 2       Replicas: 2,1,3Isr: 2,1,3
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]
```

主节点

==2为主节点==

- 干掉主节点

```
jps -m
```

```
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]jps -m
13217 ConsoleConsumer --zookeeper centosserver1:2181 --topic my-replicated-topic
14386 Jps -m
13027 ConsoleProducer --broker-list centosserver1:9093,centosserver1:9094,centosserver1:9095 --topic my-replicated-topic
11428 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server-3.properties
11211 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server-2.properties
33884 QuorumPeerMain /home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin/../conf/zoo.cfg
11212 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server-1.properties
13404 ConsoleConsumer --zookeeper centosserver1:2181 --topic my-replicated-topic
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]
```

```
kill -9 11211
jps -m
```

```
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]jps -m
13217 ConsoleConsumer --zookeeper centosserver1:2181 --topic my-replicated-topic
14514 Jps -m
13027 ConsoleProducer --broker-list centosserver1:9093,centosserver1:9094,centosserver1:9095 --topic my-replicated-topic
11428 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server-3.properties
33884 QuorumPeerMain /home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin/../conf/zoo.cfg
11212 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server-1.properties
13404 ConsoleConsumer --zookeeper centosserver1:2181 --topic my-replicated-topic
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]
```

==结果==

还是一样可以运行的

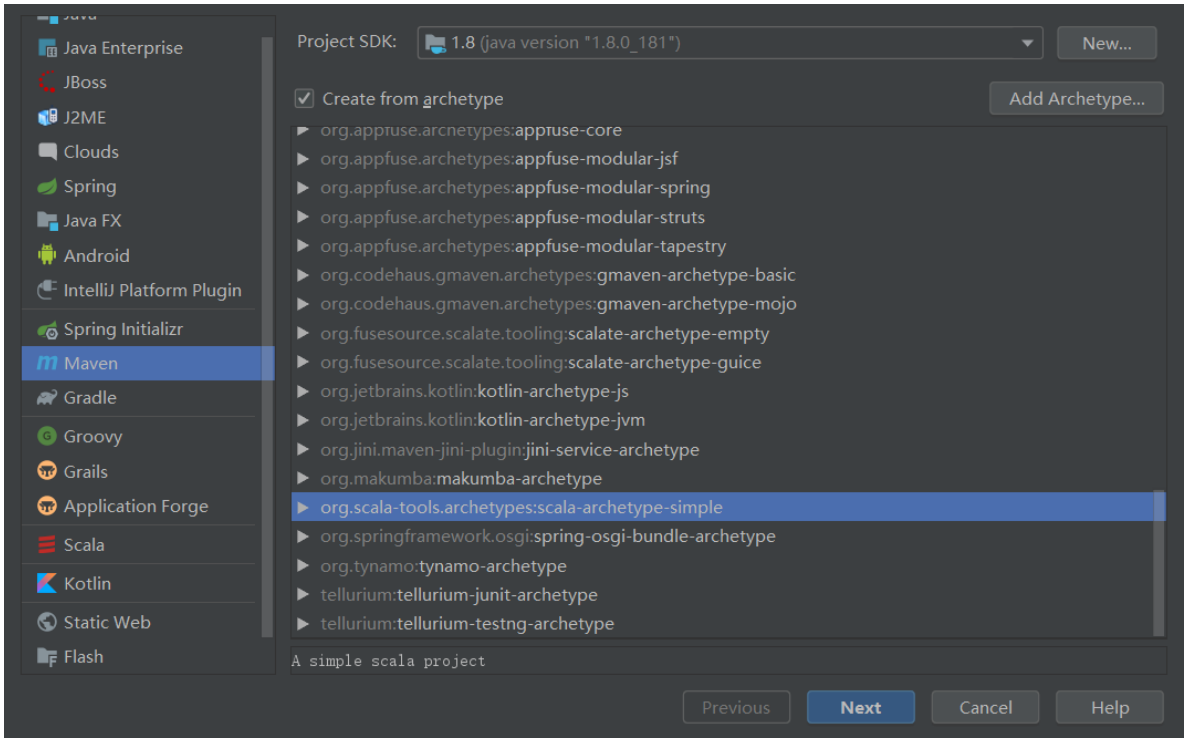
```
kafka-topics.sh --describe --zookeeper centosserver1:2181 --topic my-replicated-topic
```

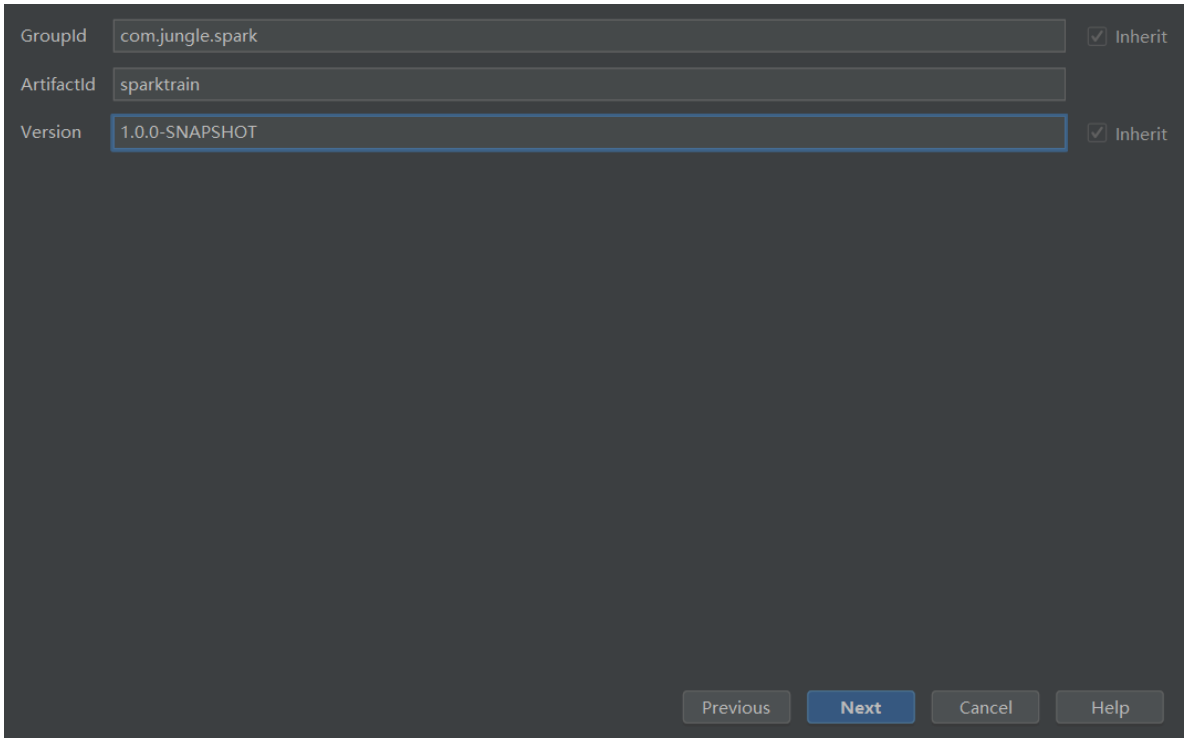
```
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]kafka-topics.sh --descr
ibe --zookeeper centosserver1:2181 --topic my-replicated-topic
Topic:my-replicated-topic       PartitionCount:1        ReplicationFactor:3     Configs:
        Topic: my-replicated-topic      Partition: 0    Leader: 1       Replicas: 2,1,3I
sr: 1,3
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/config]
```

==1变成了主节点==

四、使用IDEA+Maven构建开发环境

- 新建项目



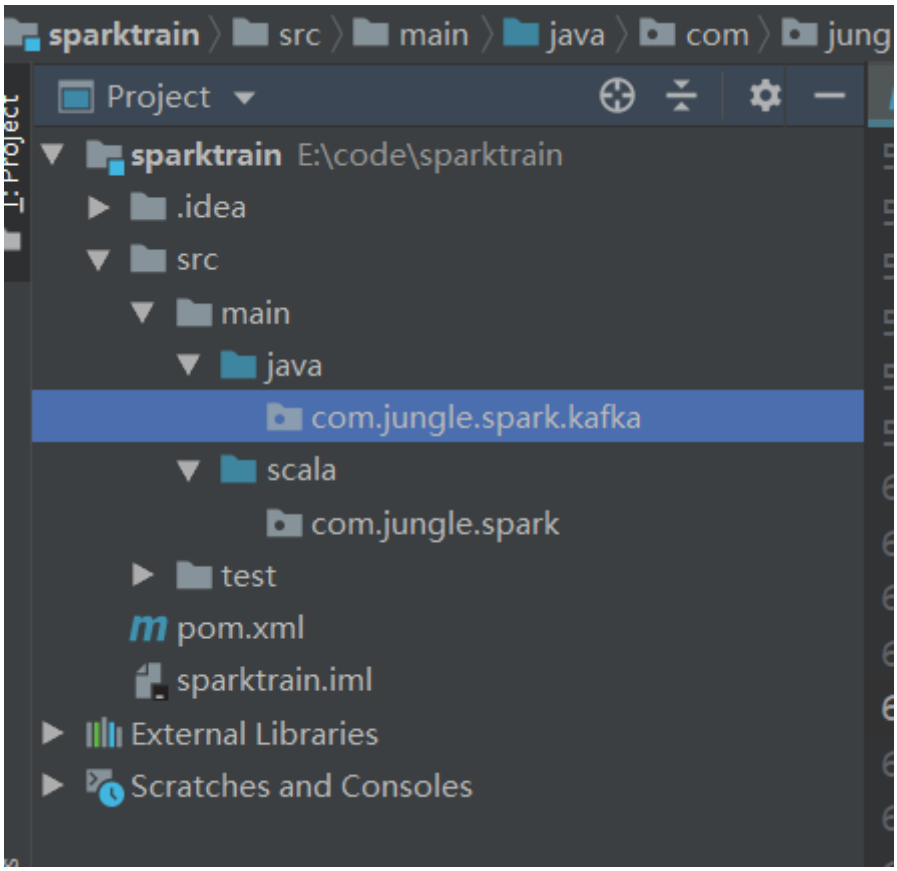


- 修改pom.xml文件

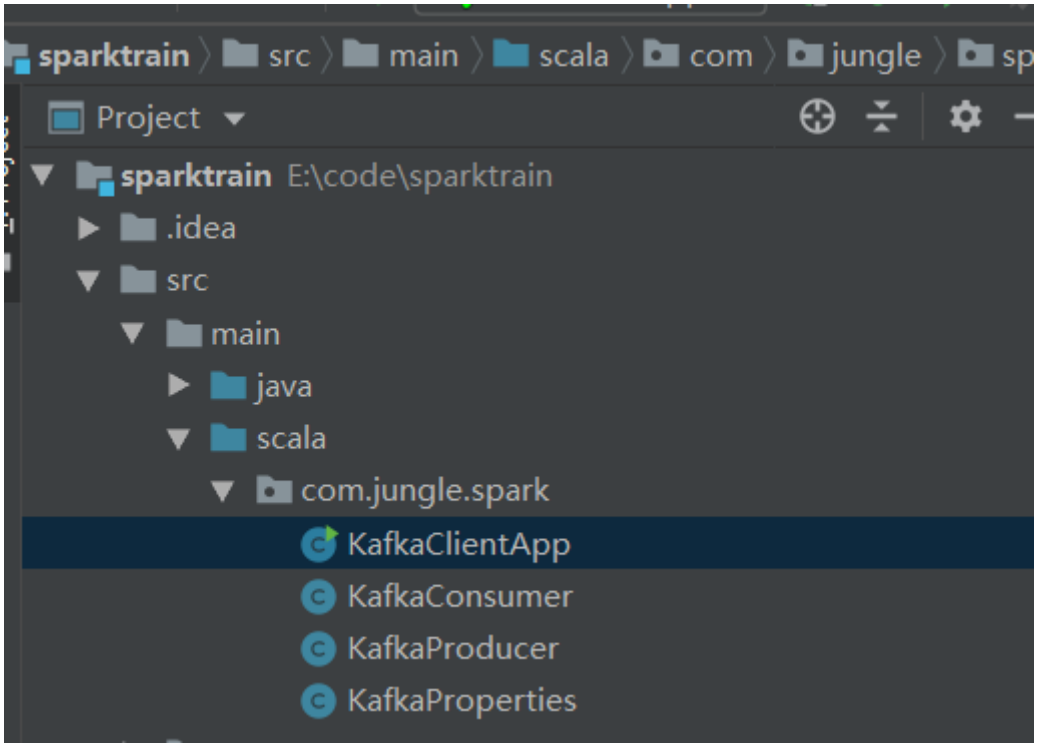
```
  <properties>
    <scala.version>2.11.8</scala.version>
  </properties>
```

- 引入依赖

```
<!-- https://mvnrepository.com/artifact/org.apache.kafka/kafka -->
    <dependency>
      <groupId>org.apache.kafka</groupId>
      <artifactId>kafka_2.11</artifactId>
      <version>0.9.0.0</version>
    </dependency>
```



五、Kafka Java API编程



1.Producer

(1)提供端

- Kafka常用配置文件

```
package com.jungle.spark;

/**
 * Kafka常用配置文件
 */
public class KafkaProperties {

    public static final String ZK = "192.168.1.18:2181";

    public static final String TOPIC = "hello_topic";

    public static final String BROKER_LIST = "192.168.1.18:9092";

    public static final String GROUP_ID = "test_group1";

}
```

- Kafka生产者

```
package com.jungle.spark;

import kafka.javaapi.producer.Producer;
import kafka.producer.KeyedMessage;
import kafka.producer.ProducerConfig;

import java.util.Properties;

/**
```

```
 * Kafka生产者
 */
public class KafkaProducer extends Thread{

    private String topic;

    private Producer<Integer, String> producer;

    public KafkaProducer(String topic) {
        this.topic = topic;

        Properties properties = new Properties();

        properties.put("metadata.broker.list",KafkaProperties.BROKER_LIST);
        properties.put("serializer.class","kafka.serializer.StringEncoder");
        properties.put("request.required.acks","1");

        producer = new Producer<Integer, String>(new
ProducerConfig(properties));
    }


    @Override
    public void run() {

        int messageNo = 1;

        while(true) {
            String message = "message_" + messageNo;
            producer.send(new KeyedMessage<Integer, String>(topic,
message));
            System.out.println("Sent: " + message);

            messageNo ++ ;

            try{
                Thread.sleep(2000);
            } catch (Exception e){
                e.printStackTrace();
            }
        }

    }
}
```

- Kafka Java API测试

```
package com.jungle.spark;

/**
 * Kafka Java API测试
 */
public class KafkaClientApp {

    public static void main(String[] args) {
        new KafkaProducer(KafkaProperties.TOPIC).start();
```

```
//        new KafkaConsumer(KafkaProperties.TOPIC).start();

    }
}
```

(2)消费端

- 开启zookeeper

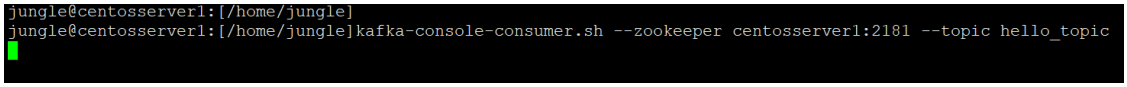
```
cd $ZK_HOME/bin
./zkServer.sh start
```

- 开启kafka

```
cd $KAFKA_HOME/bin
kafka-server-start.sh $KAFKA_HOME/config/server.properties
```

- 消费者

```
kafka-console-consumer.sh --zookeeper centosserver1:2181 --topic hello_topic
```



(3)测试

启动KafkaClientApp

==遇到报错==

```
 Exception in thread "Thread-0" kafka.common.FailedToSendMessageException:
Failed to send messages after 3 tries.
```

==解决==

> 可能是防火墙的原因

查看防火墙状态

```
firewall-cmd --state
```

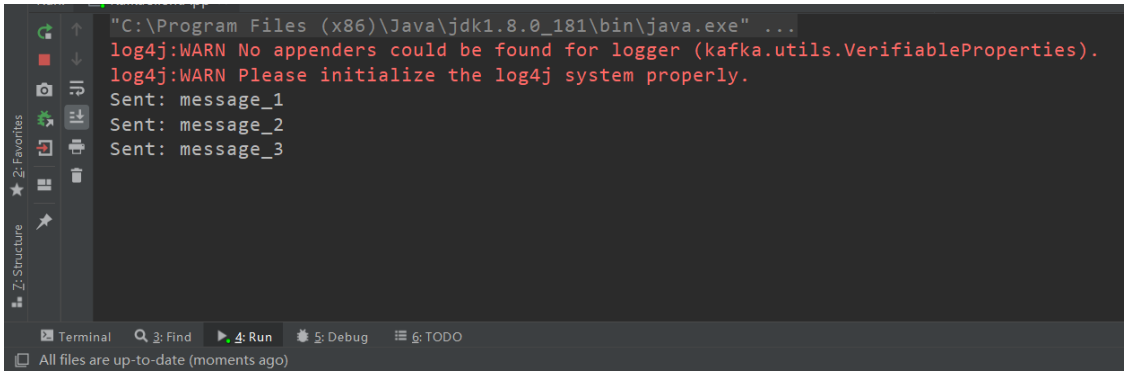
停掉防火墙

```
systemctl stop firewalld.service
```

禁止开机启动防火墙

```
systemctl disable firewalld.service
```

- 解决后




```
jungle@centosserver1:[/home/jungle]
jungle@centosserver1:[/home/jungle]kafka-console-consumer.sh --zookeeper centosserver1:2181 --topic hello_topic
message_1
message_2
message_3
message_4
message_5
message_6
message_7
message_8
message_9
message_10
message_11
```

2.Consumer

- Kafka消费者

```
package com.jungle.spark;

import kafka.consumer.Consumer;
import kafka.consumer.ConsumerConfig;
import kafka.consumer.ConsumerIterator;
import kafka.consumer.KafkaStream;
import kafka.javaapi.consumer.ConsumerConnector;

import java.util.HashMap;
import java.util.List;
import java.util.Map;
import java.util.Properties;

/**
 * Kafka消费者
 */
public class KafkaConsumer extends Thread{

    private String topic;

    public KafkaConsumer(String topic) {
        this.topic = topic;
    }


    private ConsumerConnector createConnector(){
        Properties properties = new Properties();
        properties.put("zookeeper.connect", KafkaProperties.ZK);
        properties.put("group.id",KafkaProperties.GROUP_ID);
        return Consumer.createJavaConsumerConnector(new
ConsumerConfig(properties));
    }

    @Override
```

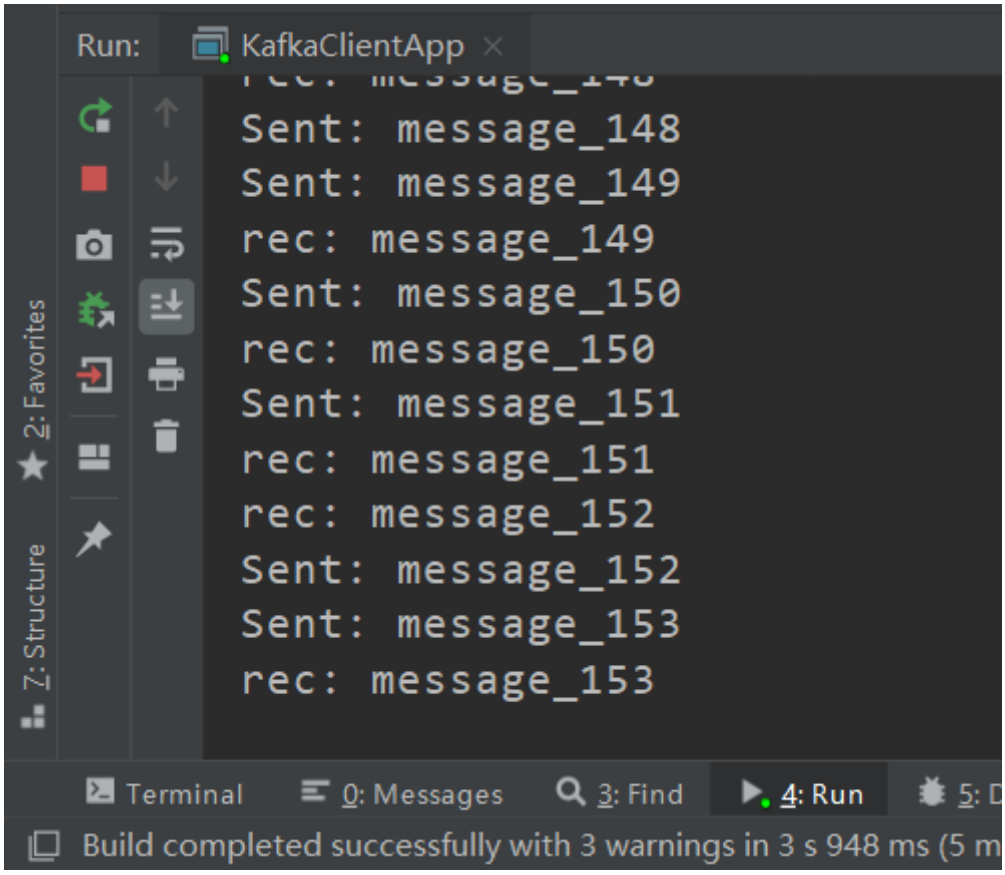
```
    public void run() {
        ConsumerConnector consumer = createConnector();

        Map<String, Integer> topicCountMap = new HashMap<String, Integer>();
        topicCountMap.put(topic, 1);
//        topicCountMap.put(topic2, 1);
//        topicCountMap.put(topic3, 1);

        // String: topic
        // List<KafkaStream<byte[], byte[]>>  对应的数据流
        Map<String, List<KafkaStream<byte[], byte[]>>> messageStream =
 consumer.createMessageStreams(topicCountMap);

        KafkaStream<byte[], byte[]> stream =
messageStream.get(topic).get(0);    //获取我们每次接收到的数据

        ConsumerIterator<byte[], byte[]> iterator = stream.iterator();


        while (iterator.hasNext()) {
            String message = new String(iterator.next().message());
            System.out.println("rec: " + message);
        }
    }
}
```

- Kafka Java API测试

```
package com.jungle.spark;

/**
 * Kafka Java API测试
 */
public class KafkaClientApp {

    public static void main(String[] args) {
        new KafkaProducer(KafkaProperties.TOPIC).start();

        new KafkaConsumer(KafkaProperties.TOPIC).start();

    }
}
```

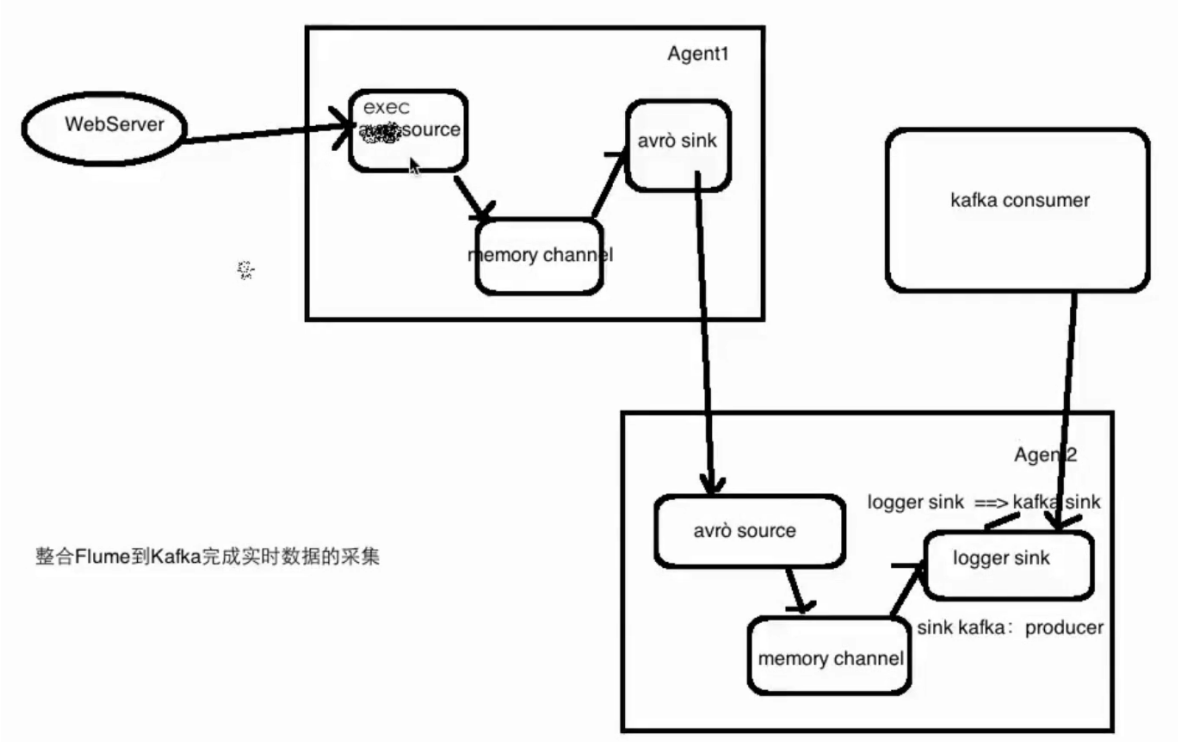
启动KafkaClientApp

==结果==



六、整合Flume和Kafka完成实时数据采集

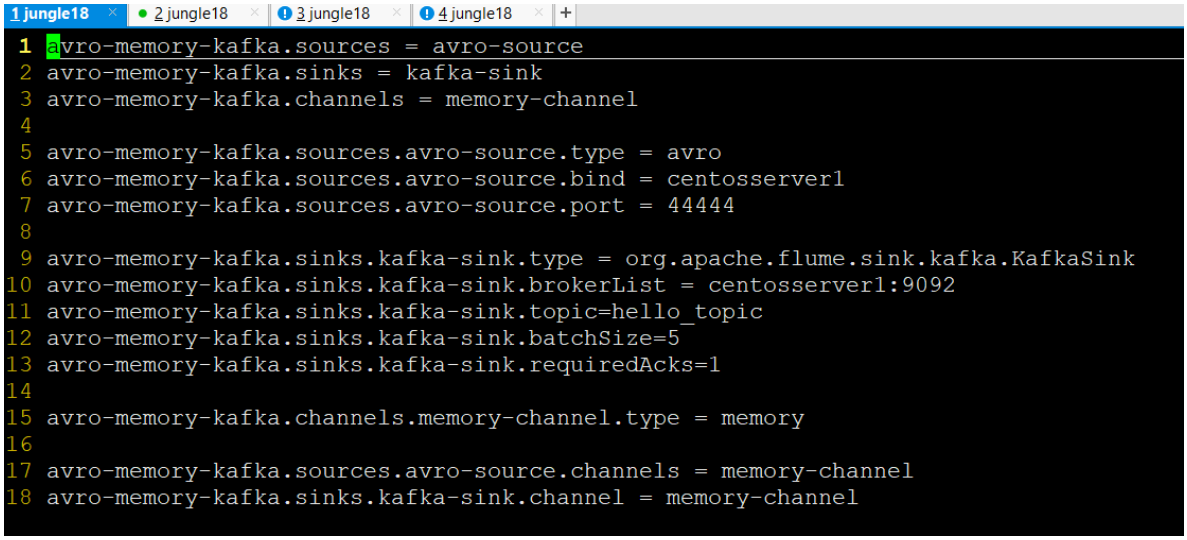
1.架构图



2.修改flume相关文件

```
cd /home/jungle/app/apache-flume-1.6.0-cdh5.7.0-bin/conf
vi avro-memory-kafka.conf
```

```
avro-memory-kafka.sources = avro-source

avro-memory-kafka.sinks = kafka-sink
avro-memory-kafka.channels = memory-channel

avro-memory-kafka.sources.avro-source.type = avro
avro-memory-kafka.sources.avro-source.bind = centosserver1
avro-memory-kafka.sources.avro-source.port = 44444

avro-memory-kafka.sinks.kafka-sink.type = org.apache.flume.sink.kafka.KafkaSink
avro-memory-kafka.sinks.kafka-sink.brokerList = centosserver1:9092
avro-memory-kafka.sinks.kafka-sink.topic=hello_topic
avro-memory-kafka.sinks.kafka-sink.batchSize=5
avro-memory-kafka.sinks.kafka-sink.requiredAcks=1

avro-memory-kafka.channels.memory-channel.type = memory

avro-memory-kafka.sources.avro-source.channels = memory-channel
avro-memory-kafka.sinks.kafka-sink.channel = memory-channel
```



3.启动

1. 启动zookeeper，Kafka
2. 启动avro-memory-kafka

```
flume-ng agent \
--name avro-memory-kafka \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/avro-memory-kafka.conf \
-Dflume.root.logger=INFO,console
```

3. 启动exec-memory-avro

```
flume-ng agent \
--name exec-memory-avro \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/exec-memory-avro.conf \
-Dflume.root.logger=INFO,console
```

4. 测试

```
jps -m
```

```
jungle@centosserver1:[/home/jungle]jps -m
38482 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server.properties
46952 Jps -m
33884 QuorumPeerMain /home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin/../conf/zoo.cfg
45981 Application --name avro-memory-kafka --conf-file /home/jungle/app/apache-flume-1.6.0-cdh5.7.0-bin/conf/avro-memory-kafka.conf
46478 Application --name exec-memory-avro --conf-file /home/jungle/app/apache-flume-1.6.0-cdh5.7.0-bin/conf/exec-memory-avro.conf
jungle@centosserver1:[/home/jungle]
```

5. kafka消费端

```
kafka-console-consumer.sh --zookeeper centosserver1:2181 --topic hello_topic
```

6. 测试传输

```
cd data
echo hellospark >>data.log
echo hellospark1 >>data.log
echo hellospark2 >>data.log
```

```
-rw-rw-r-- 1 jungle jungle       1104 Jul 12 14:19 wrk.lua
jungle@centosserver1:[/home/jungle/data]echo hellospark >>data.log
jungle@centosserver1:[/home/jungle/data]echo hellospark1 >>data.log
jungle@centosserver1:[/home/jungle/data]echo hellospark2 >>data.log
jungle@centosserver1:[/home/jungle/data]
```

```
jungle@centosserver1:[/home/jungle]jps -m
38482 Kafka /home/jungle/app/kafka_2.11-0.9.0.0/config/server.properties
46952 Jps -m
33884 QuorumPeerMain /home/jungle/app/zookeeper-3.4.5-cdh5.7.0/bin/../conf/zoo.cfg
45981 Application --name avro-memory-kafka --conf-file /home/jungle/app/apache-flume-1.6
46478 Application --name exec-memory-avro --conf-file /home/jungle/app/apache-flume-1.6.
jungle@centosserver1:[/home/jungle]kafka-console-consumer.sh --zookeeper centosserver1:2
hellospark
hellospark1
hellospark2
```

第5章 实战环境搭建

一、安装Scala、maven、hadoop

更改maven本地仓库

```
cd $MAVEN_HOME/conf
cd settings.xml
```

```
<localRepository>/home/jungle/maven_repos/</localRepository>
```

```
 |-->
<settings xmlns="http://maven.apache.org/SETTINGS/1.0.0"
          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
          xsi:schemaLocation="http://maven.apache.org/SETTINGS/1.0.0 http://maven.ap
  <!-- localRepository
   | The path to the local repository maven will use to store artifacts.
   |
   | Default: ${user.home}/.m2/repository
  <localRepository>/path/to/local/repo</localRepository>
  -->
<localRepository>/home/jungle/maven repos/</localRepository>

  <!-- interactiveMode
   | This will determine whether maven prompts you when it needs input. If set to fa
   | maven will use a sensible default value, perhaps based on some other setting, f
   | the parameter in question.
   |
   | Default: true
settings.xml [+]                                    [utf-8] 55,43          18%
```

二、HBase安装

- 下载

  地址

  ```
  wget http://archive.cloudera.com/cdh5/cdh/5/hbase-1.2.0-cdh5.7.0.tar.gz
  ```

- 解压

  ```
  tar -zxvf hbase-1.2.0-cdh5.7.0.tar.gz -C ~/app/
  ```

- 配置环境变量

  ```
  vi ~/.bash_profile
  ```

  ```
  export HBASE_HOME=/home/jungle/app/hbase-1.2.0-cdh5.7.0
  export PATH=$HBASE_HOME/bin:$PATH
  ```

```
export PATH=$ZK_HOME/bin:$PATH

export KAFKA_HOME=/home/jungle/app/kafka_2.11-0.9.0.0
export PATH=$KAFKA_HOME/bin:$PATH

export HBASE_HOME=/home/jungle/app/hbase-1.2.0-cdh5.7.0
export PATH=$HBASE_HOME/bin:$PATH

export PATH

~/.bash_profile [+]
-- INSERT --
```

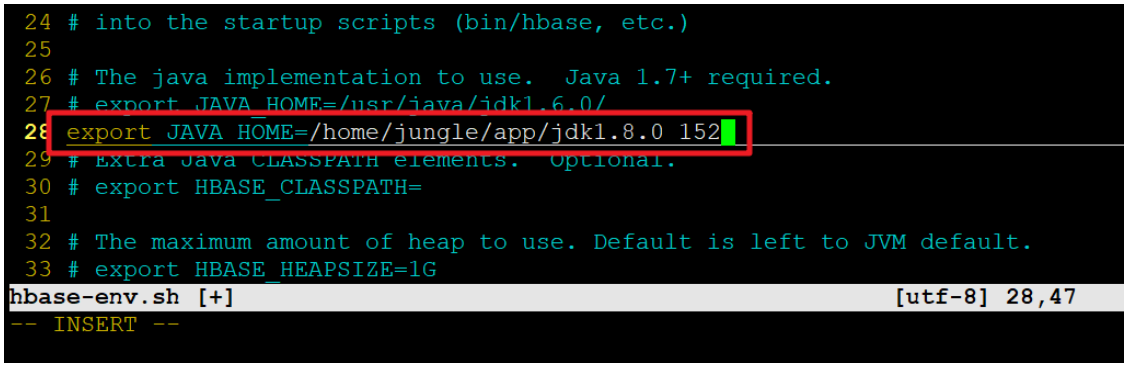
  ```
  source ~/.bash_profile
  ```

- 配置文件

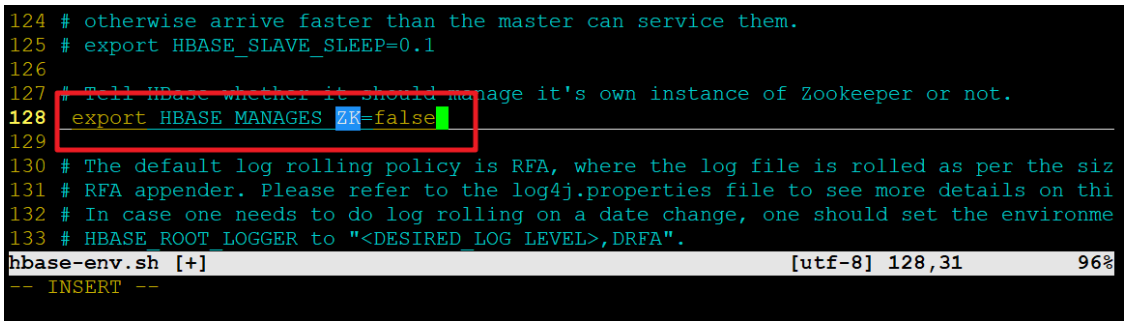
  ```
  cd $HBASE_HOME/conf
  ```

```
vi hbase-env.sh
```

```
export JAVA_HOME=/home/jungle/app/jdk1.8.0_152
```




```
export HBASE_MANAGES_ZK=false
```




```
vi hbase-site.xml
```

```
<property>
<name>hbase.rootdir</name>
<value>hdfs://centosserver1:8020/hbase</value>
</property>

<property>
<name>hbase.cluster.distributed</name>
<value>true</value>
</property>

<property>
<name>hbase.zookeeper.quorum</name>
<value>centosserver1:2181</value>
</property>
```

```
 15  *
 16  * Unless required by applicable law or agreed to in writing, software
 17  * distributed under the License is distributed on an "AS IS" BASIS,
 18  * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 19  * See the License for the specific language governing permissions and
 20  * limitations under the License.
 21  */
 22 -->
 23 <configuration>
 24     <property>
 25         <name>hbase.rootdir</name>
 26         <value>hdfs://centosserver1:8020/hbase</value>
 27     </property>
 28
 29     <property>
 30         <name>hbase.cluster.distributed</name>
 31         <value>true</value>
 32     </property>
 33
 34     <property>
 35         <name>hbase.zookeeper.quorum</name>
 36         <value>centosserver1:2181</value>
 37     </property>
 38
 39
 40 </configuration>
~
~
~
hbase-site.xml [+]
-- INSERT --
```

```
vi regionservers
```

```
centosserver1
```

```
1 centosserver1
```

- 运行

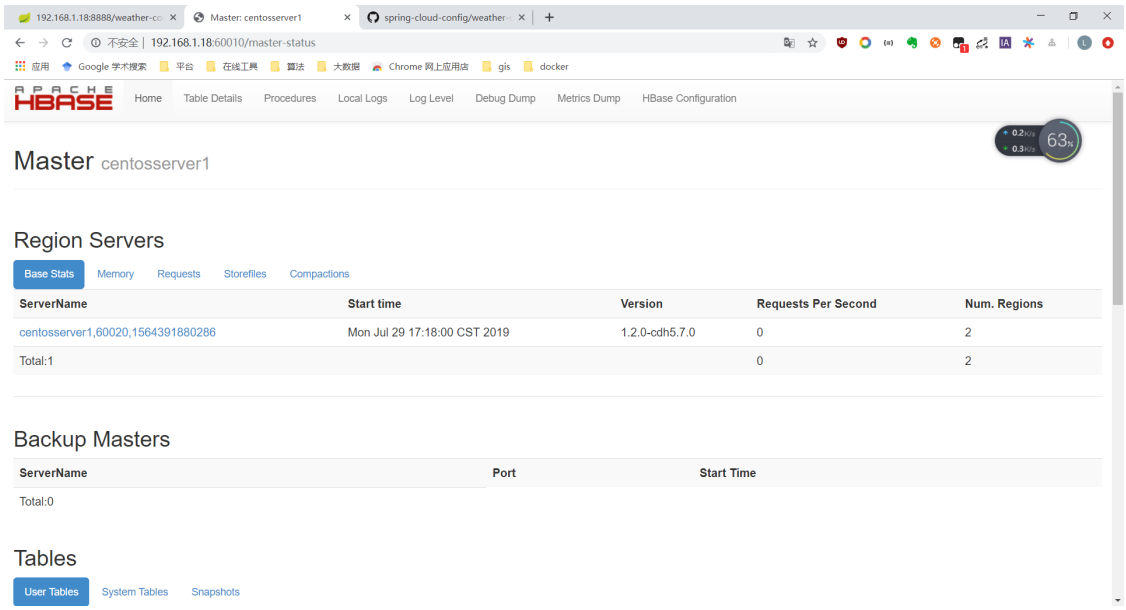
  ==先启动zookeeper==

```
cd $HBASE_HOME/bin
./start-hbase.sh
```

```
jps
```

```
jungle@centosserver1:[/home/jungle/app/hbase-1.2.0-cdh5.7.0/bin]jps
41937 NameNode
42115 DataNode
42757 ResourceManager
42902 NodeManager
43897 HMaster
31451 HRegionServer
33884 QuorumPeerMain
44284 Jps
42382 SecondaryNameNode
jungle@centosserver1:[/home/jungle/app/hbase-1.2.0-cdh5.7.0/bin]
```

```
http://192.168.1.18:60010
```



==启动命令行==

```
cd $HBASE_HOME/bin
./hbase shell
```

```
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/home/jungle/app/hbase-1.2.0-cdh5.7.0/lib/slf4j-log4j1
2-1.7.5.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/home/jungle/app/hadoop-2.6.0-cdh5.7.0/share/hadoop/co
mmon/lib/slf4j-log4j12-1.7.5.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 1.2.0-cdh5.7.0, rUnknown, Wed Mar 23 11:46:29 PDT 2016

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

```
version
status
```

```
hbase(main):001:0> version
1.2.0-cdh5.7.0, rUnknown, Wed Mar 23 11:46:29 PDT 2016

hbase(main):002:0> status
1 active master, 0 backup masters, 1 servers, 0 dead, 2.0000 average load

hbase(main):003:0>
```

```
create 'member','info','address'
```

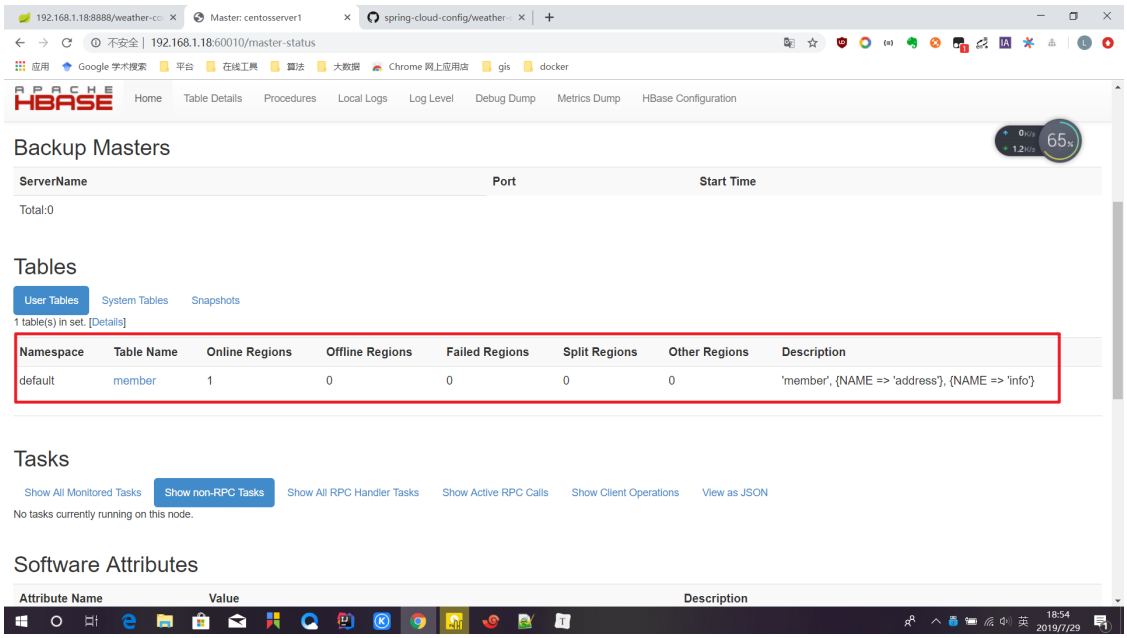
```
hbase(main):005:0> create 'member','info','address'
0 row(s) in 2.3180 seconds

=> Hbase::Table - member
hbase(main):006:0>
```

```
list
```

```
hbase(main):006:0> list
TABLE
member
1 row(s) in 0.0350 seconds

=> ["member"]
hbase(main):007:0>
```

```
describe 'member'
```

```
hbase(main):003:0> describe 'member'
Table member is ENABLED
member
COLUMN FAMILIES DESCRIPTION
{NAME => 'address', BLOOMFILTER => 'ROW', VERSIONS => '1', IN_MEMORY => 'false', KEEP_DE
LETED_CELLS => 'FALSE', DATA_BLOCK_ENCODING => 'NONE', TTL => 'FOREVER', COMPRESSION =>
'NONE', MIN_VERSIONS => '0', BLOCKCACHE => 'true', BLOCKSIZE => '65536', REPLICATION_SCO
PE => '0'}
{NAME => 'info', BLOOMFILTER => 'ROW', VERSIONS => '1', IN_MEMORY => 'false', KEEP_DELET
ED_CELLS => 'FALSE', DATA_BLOCK_ENCODING => 'NONE', TTL => 'FOREVER', COMPRESSION => 'NO
NE', MIN_VERSIONS => '0', BLOCKCACHE => 'true', BLOCKSIZE => '65536', REPLICATION_SCOPE
=> '0'}
2 row(s) in 0.2940 seconds
```



二、spark安装

- 启动

```
spark-shell --master local[2] --driver-class-path /home/jungle/app/hive-
1.1.0-cdh5.7.0/lib/mysql-connector-java-5.1.27-bin.jar
```

三、开发环境搭建

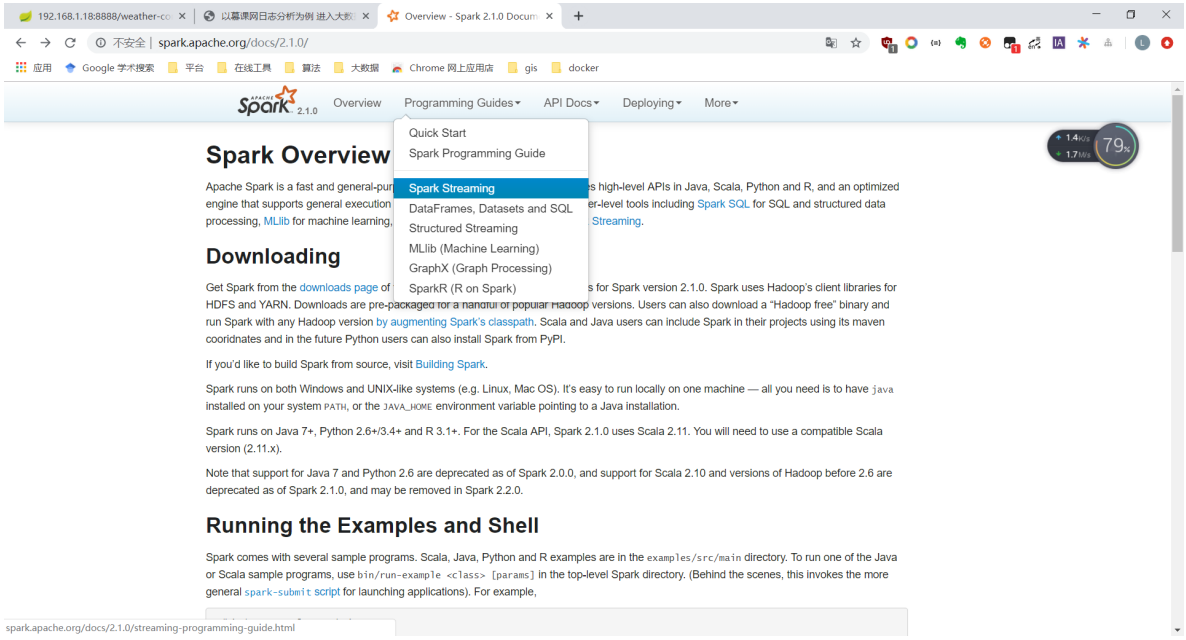
使用IDEA整合 Maven搭建 Spark Streaming开发环境

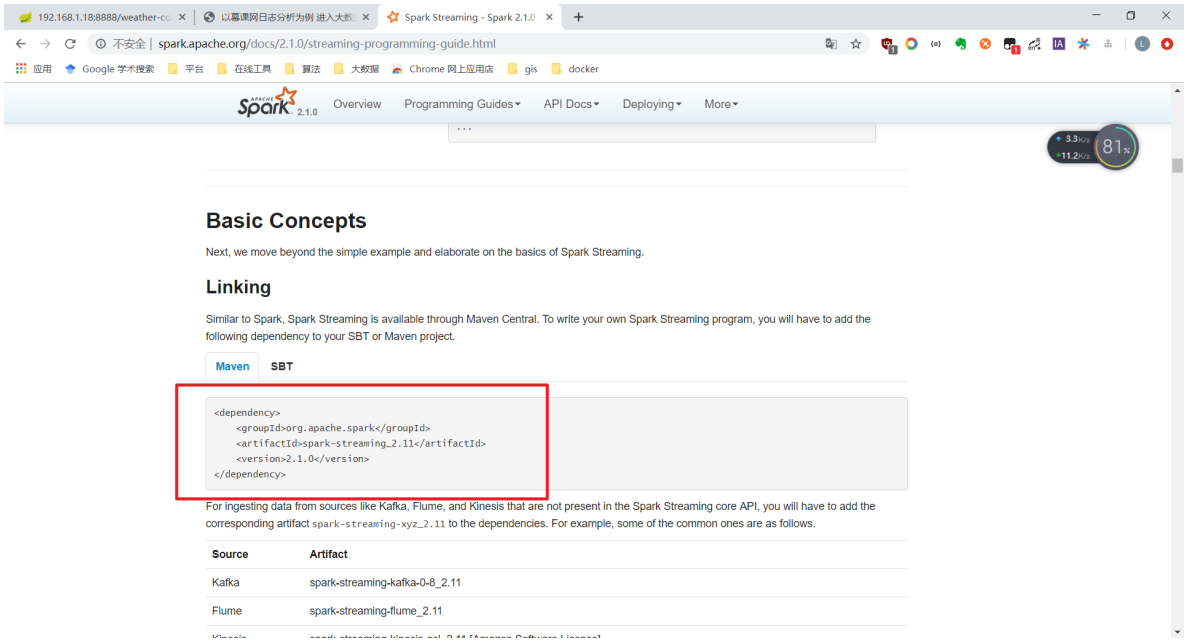
==在sparktrain中==

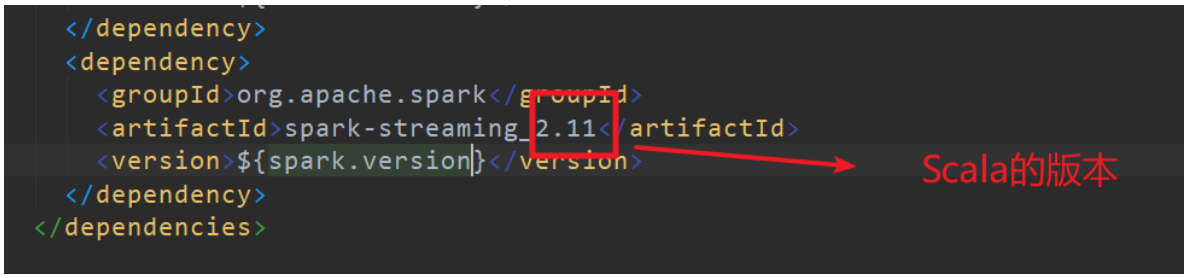
◆pom.xml中添加对应的依赖

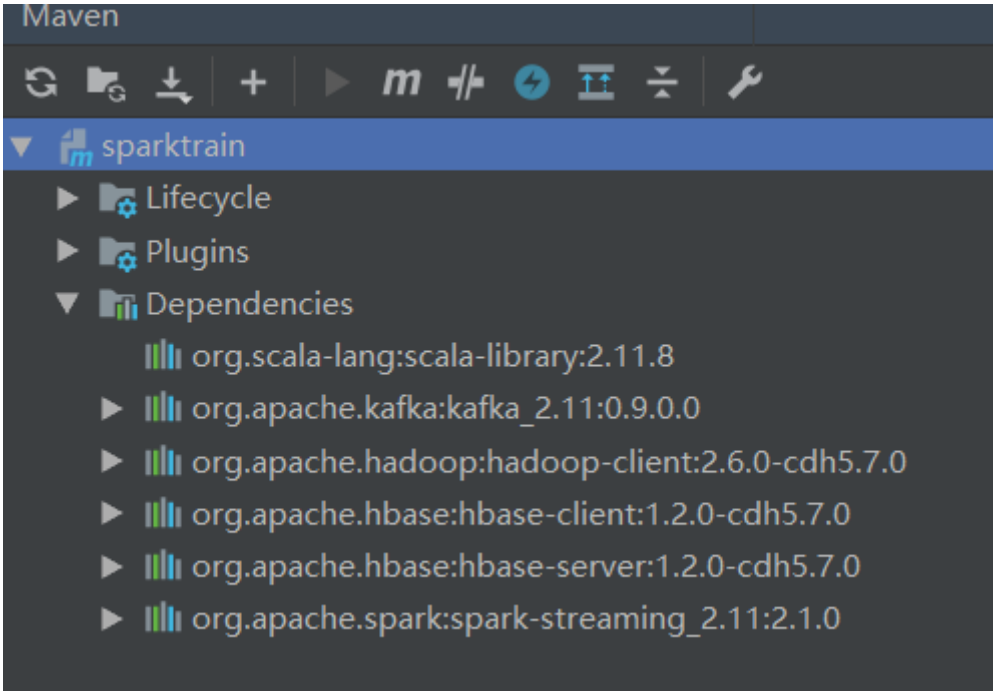
```
<properties>
    <scala.version>2.11.8</scala.version>
    <kafka.version>0.9.0.0</kafka.version>
    <spark.version>2.2.0</spark.version>
    <hadoop.version>2.6.0-cdh5.7.0</hadoop.version>
    <hbase.version>1.2.0-cdh5.7.0</hbase.version>
  </properties>


<repository>
      <id>cloudera</id>
      <name>cloudera Repository</name>
      <url>https://repository.cloudera.com/artifactory/cloudera-repos</url>
</repository>


<dependency>
      <groupId>org.apache.hadoop</groupId>
      <artifactId>hadoop-client</artifactId>
      <version>${hadoop.version}</version>
    </dependency>
    <dependency>
      <groupId>org.apache.hbase</groupId>
      <artifactId>hbase-client</artifactId>
      <version>${hbase.version}</version>
    </dependency>
    <dependency>
      <groupId>org.apache.hbase</groupId>
      <artifactId>hbase-server</artifactId>
      <version>${hbase.version}</version>
    </dependency>
    <dependency>
      <groupId>org.apache.spark</groupId>
      <artifactId>spark-streaming_2.11</artifactId>
      <version>${spark.version}</version>
    </dependency>
```

spark streaming的依赖


Spark 2.1.0
Overview
Programming Guides
API Docs
Deploying
More
Quick Start
Spark Programming Guide
Spark Streaming
DataFrames, Datasets and SQL
Structured Streaming
MLlib (Machine Learning)
GraphX (Graph Processing)
SparkR (R on Spark)
Spark Overview
Downloading
Running the Examples and Shell
spark.apache.org/docs/2.1.0/streaming-programming-guide.html


spark.apache.org/docs/2.1.0/streaming-programming-guide.html
Spark 2.1.0
Overview
Programming Guides
API Docs
Deploying
More
Basic Concepts
Linking
Maven
SBT
<dependency>
<groupId>org.apache.spark</groupId>
<artifactId>spark-streaming_2.11</artifactId>
<version>2.1.0</version>
</dependency>
Source
Artifact
Kafka
spark-streaming-kafka-0-8_2.11
Flume
spark-streaming-flume_2.11


</dependency>
<dependency>
<groupId>org.apache.spark</groupId>
<artifactId>spark-streaming_2.11</artifactId>
<version>${spark.version}</version>
</dependency>
</dependencies>
Scala的版本



第6章 Spark Streaming入门

一、Spark Streaming概述

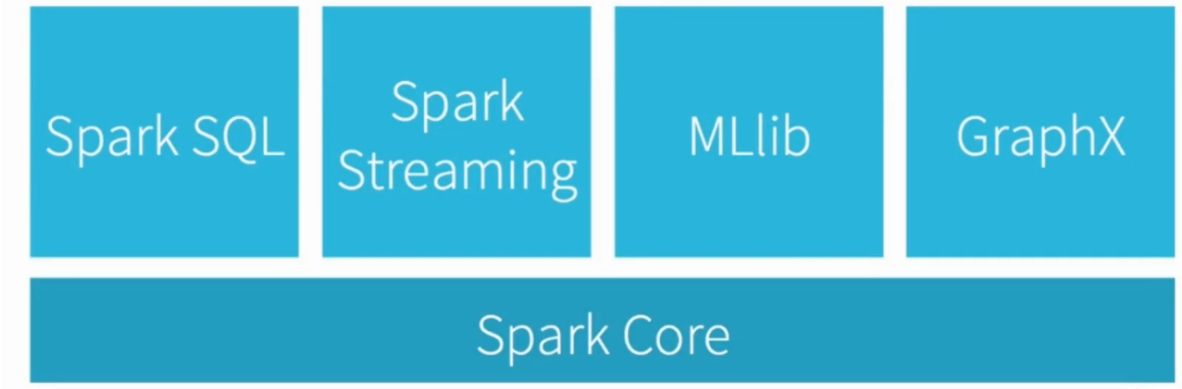
官网

```
Spark Streaming is an extension of the core Spark API that enables scalable,
high-throughput, fault-tolerant stream processing of live data streams.
```


```
Spark Streaming.个人的定义
    将不同的数据源的数据经过 Spark Streaming处理之后将结果输出到外部文件系统
特点
    低延时
    能从错误中高效的恢复: fault- tolerant
    能够运行在成百上千的节点
    能够将批处理、机器学习、图计算等子框架和 Spark Streaming综合起来使用

    One stack to rule them all:一栈式
```

二、Spark Streaming集成Spark生态系统的使用

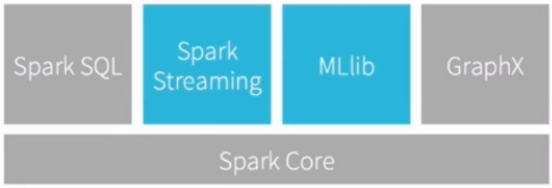
集成Spark生态系统的使用



◆ Combine machine learning with streaming processing

Learn models offline, apply them online

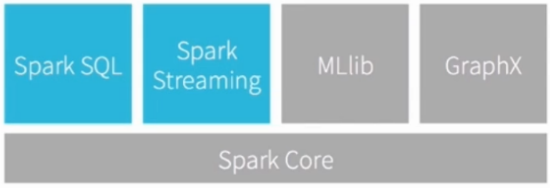
```
// Learn model offline
val model = KMeans.train(dataset, ...)

// Apply model online on stream
kafkaStream.map { event =>
  model.predict(event.feature)
}
```



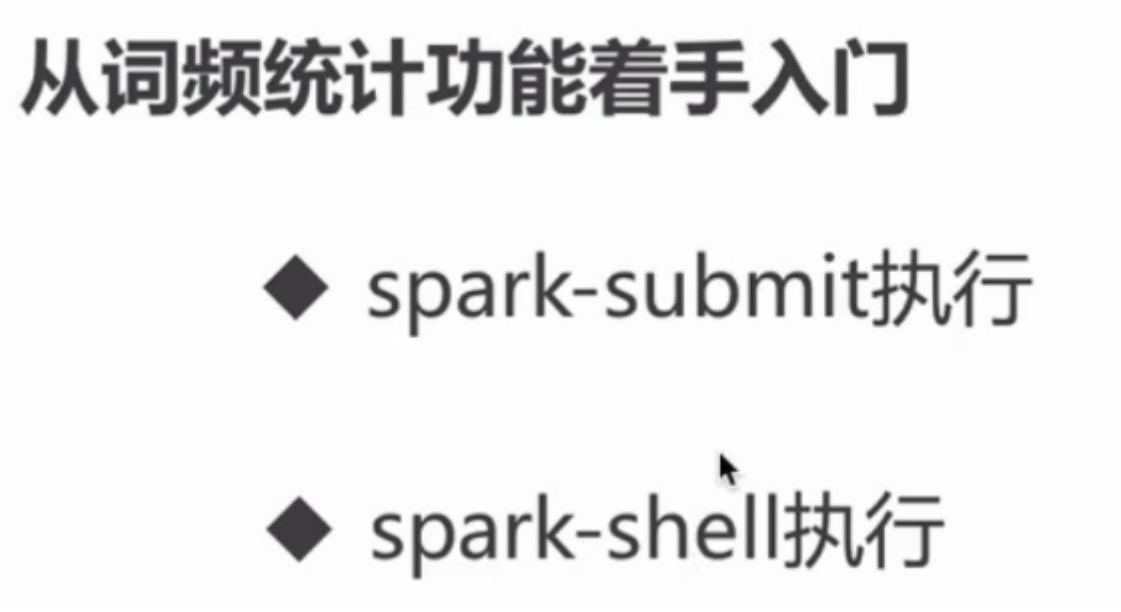
◆ Combine SQL with streaming processing

Interactively query streaming data with SQL

```
// Register each batch in stream as table
kafkaStream.map { batchRDD =>
  batchRDD.registerTempTable("latestEvents")
}

// Interactively query table
sqlContext.sql("select * from latestEvents")
```



三、词频统计功能着手入门Spark Streaming



源码

参考案例

```
nc -lk 9999
```

```
jungle@centosserver1:[/home/jungle]nc -lk 9999
-bash: nc: command not found
jungle@centosserver1:[/home/jungle]
```

```
yum install -y nc
```

```
---> Package nmap-ncat.x86_64 2:6.40-16.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
 Package          Arch          Version              Repository          Size
================================================================================
Installing:
 nmap-ncat        x86_64        2:6.40-16.el7        base                206 k

Transaction Summary
================================================================================
Install  1 Package

Total download size: 206 k
Installed size: 423 k
Downloading packages:
nmap-ncat-6.40-16.el7.x86_64.rpm                           | 206 kB  00:00:00
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : 2:nmap-ncat-6.40-16.el7.x86_64                               1/1
  Verifying  : 2:nmap-ncat-6.40-16.el7.x86_64                               1/1

Installed:
  nmap-ncat.x86_64 2:6.40-16.el7

Complete!
jungle@centosserver1:[/home/jungle]
```

```
Complete!
jungle@centosserver1:[/home/jungle]nc -lk 9999
```

1.spark-submit

==spark- submit的使用==

使用 spark- submit来提交我们的 spark应用程序运行的脚本(生产)

```
spark-submit --master local[2] \
--class org.apache.spark.examples.streaming.NetworkWordCount \
--name NetworkWordCount \
/home/jungle/app/spark-2.1.0-bin-2.6.0-cdh5.7.0/examples/jars/spark-
examples_2.11-2.1.0.jar centosserver1 9999
```

```
-------------------------------------------


-------------------------------------------
Time: 1564413273000 ms
-------------------------------------------


-------------------------------------------
Time: 1564413274000 ms
-------------------------------------------


-------------------------------------------
Time: 1564413275000 ms
-------------------------------------------
```

==测试效果==

```
jungle@centosserver1:[/home/jungle]nc -lk 9999
a a a s s s d d d a s d a s da^H s a s d
```

```
-------------------------
Time: 1564413357000 ms
-------------------------
(d,5)
(s,7)
(a,6)
(d,1)
```

2.spark-shell

如何使用spark-shell来提交(测试)

```
spark-shell --master local[2] --driver-class-path /home/jungle/app/hive-1.1.0-
cdh5.7.0/lib/mysql-connector-java-5.1.27-bin.jar
```

```
import org.apache.spark.SparkConf
import org.apache.spark.storage.StorageLevel
import org.apache.spark.streaming.{Seconds, StreamingContext}
val ssc = new StreamingContext(sc, Seconds(1))
val lines = ssc.socketTextStream("centosserver1", 9999)
val words = lines.flatMap(_.split(" "))
val wordCounts = words.map(x => (x, 1)).reduceByKey(_ + _)
wordCounts.print()
ssc.start()
ssc.awaitTermination()
```

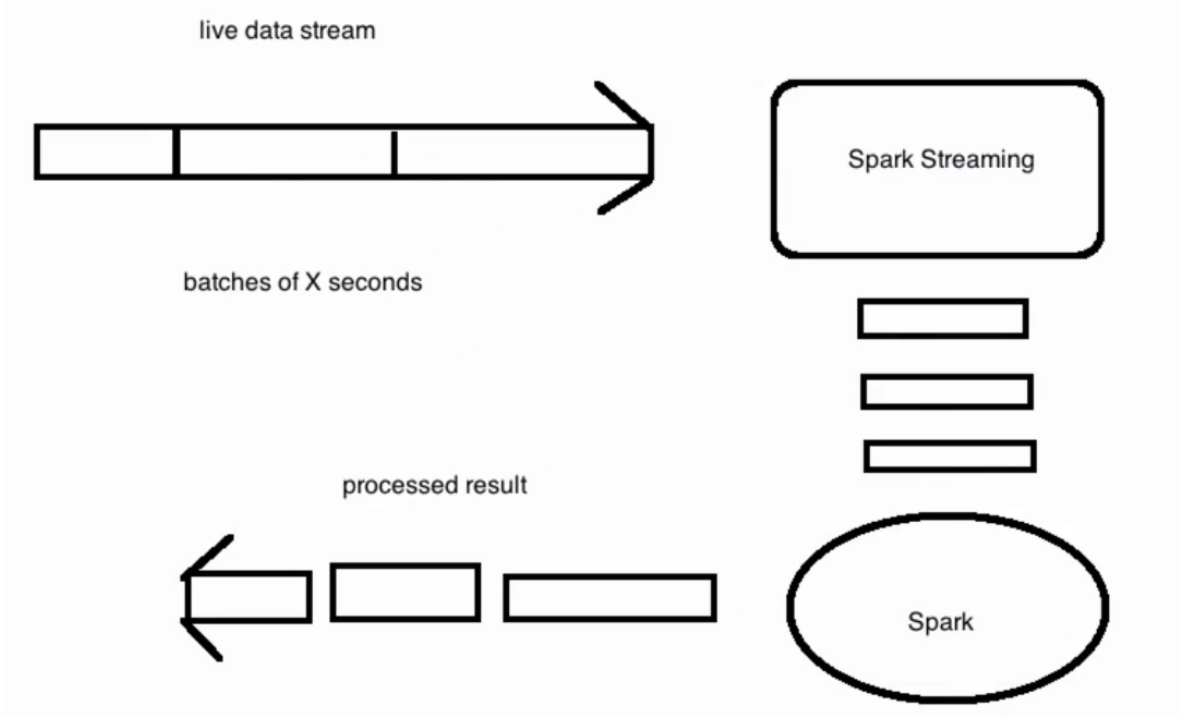
```
scala> import org.apache.spark.streaming.{Seconds, StreamingContext}
import org.apache.spark.streaming.{Seconds, StreamingContext}

scala> val ssc = new StreamingContext(sc, Seconds(1))
ssc: org.apache.spark.streaming.StreamingContext = org.apache.spark.streaming.StreamingContext@5fe80760

scala> val lines = ssc.socketTextStream("centosserver1", 9999)
lines: org.apache.spark.streaming.dstream.ReceiverInputDStream[String] = org.apache.spark.streaming.dstream.SocketInputDStr

scala> val words = lines.flatMap(_.split(" "))
words: org.apache.spark.streaming.dstream.DStream[String] = org.apache.spark.streaming.dstream.FlatMappedDStream@648e25f2

scala> val wordCounts = words.map(x => (x, 1)).reduceByKey(_ + _)
wordCounts: org.apache.spark.streaming.dstream.DStream[(String, Int)] = org.apache.spark.streaming.dstream.ShuffledDStream@

scala> wordCounts.print()

scala> ssc.start()

scala> ssc.awaitTermination()-------------------------------------------
Time: 1564413999000 ms
-------------------------------------------
```

==测试效果==

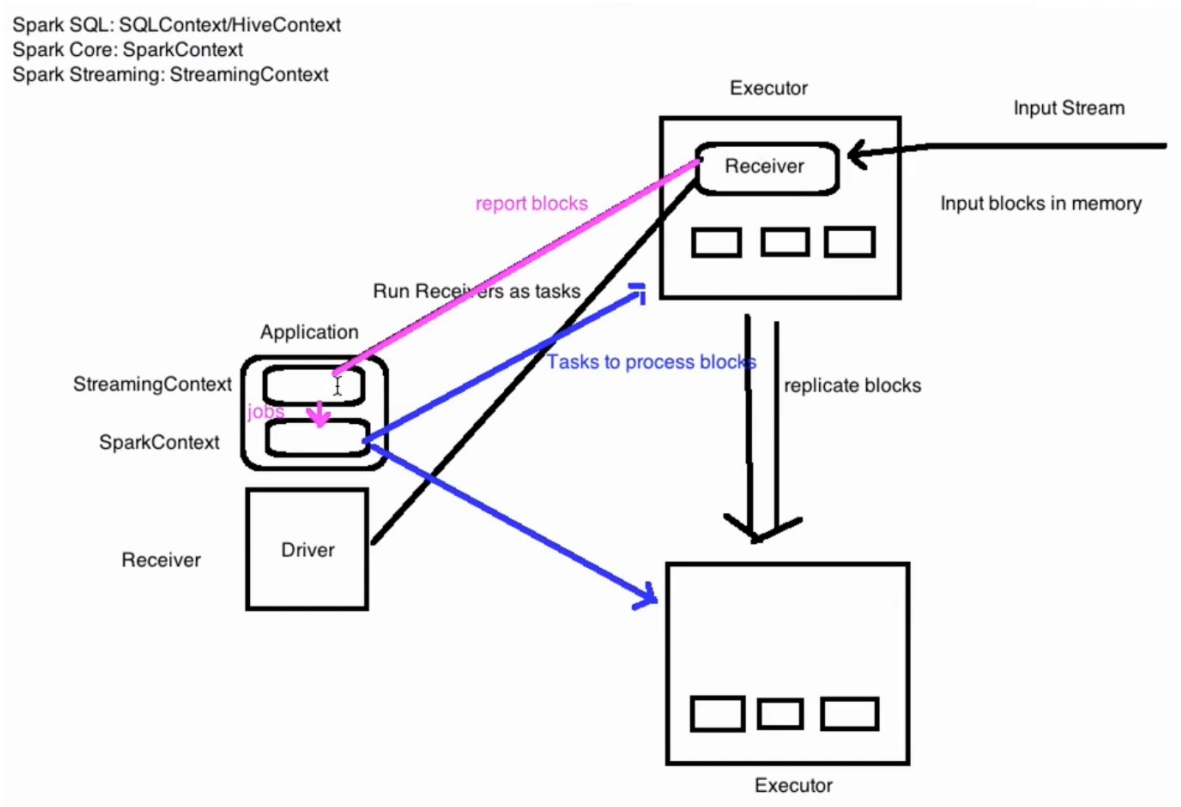
```
jungle@centosserver1:[/home/jungle]nc -lk 9999
a a a s s s d d d a s d a s da^H s a s d
a a s s d d a s d f
```

四、Spark Streaming工作原理(粗粒度)

工作原理:粗粒度
Spark Streaming接收到实时数据流,把数据按照指定的时间段切成一片片小的数据块,
然后把小的数据块传给 Spark Engine处理。



五、Spark Streaming工作原理(细粒度)



第7章 Spark Streaming核心概念与编程

一、核心概念

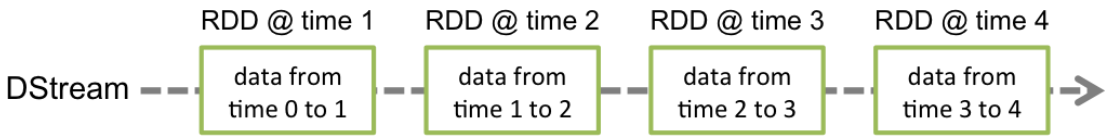
1.StreamingContext

```
StreamingContext

def this(sparkContext: SparkContext, batchDuration: Duration) = {
    this(sparkContext, null, batchDuration)
}

def this(conf: SparkConf, batchDuration: Duration) = {
    this(StreamingContext.createNewSparkContext(conf), null, batchDuratio
}

batch interval可以根据你的应用程序需求的延迟要求以及集群可用的资源情况来设置
```

2.DStream

```
Discretized Streams (DStreams)
Internally, a DStream is represented by a continuous series of RDDs
Each RDD in a DStream contains data from a certain interval
```

对 DStream操作算子,比如map/ flatmap,其实底层会被翻译为对 Dstream中的每个RDD都做相同的操作



3.Input DStreams和Receivers

```
Input DStreams and Receivers

Every input DStream (except file stream, discussed later in this section)
is associated with a Receiver object which
receives the data from a source and stores it
in Spark's memory for processing.
```

二、案例实战

1.Spark Streaming处理socket数据

- NetworkWordCount

```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * Spark Streaming处理Socket数据
  *
  * 测试： nc
  */
object NetworkWordCount {
```

```
  def main(args: Array[String]): Unit = {

    val sparkConf = new
SparkConf().setMaster("local[2]").setAppName("NetworkWordCount")

    /**
      * 创建StreamingContext需要两个参数：SparkConf和batch interval
      */
    val ssc = new StreamingContext(sparkConf, Seconds(5))

    val lines = ssc.socketTextStream("192.168.1.18", 6789)

    val result = lines.flatMap(_.split(" ")).map((_,1)).reduceByKey(_+_)

    result.print()

    ssc.start()
    ssc.awaitTermination()
  }
}
```

==出错==

```
Exception in thread "main" java.lang.NoSuchMethodError:
com.fasterxml.jackson.module.scala.deser.BigDecimalDeserializer$.handledType()Lj
ava/lang/Class;
```

解决：

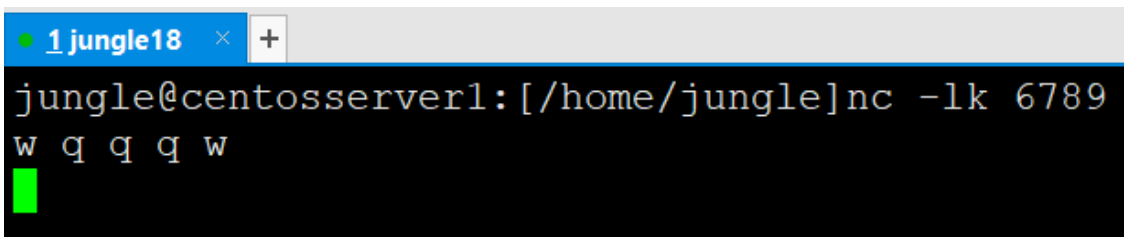
> 手动在pom.xml文件中添加该依赖

```
    <dependency>
      <groupId>com.fasterxml.jackson.module</groupId>
      <artifactId>jackson-module-scala_2.11</artifactId>
      <version>2.6.5</version>
    </dependency>
```

- shell端

```
nc -lk 6789
```

```
w q q q w
```

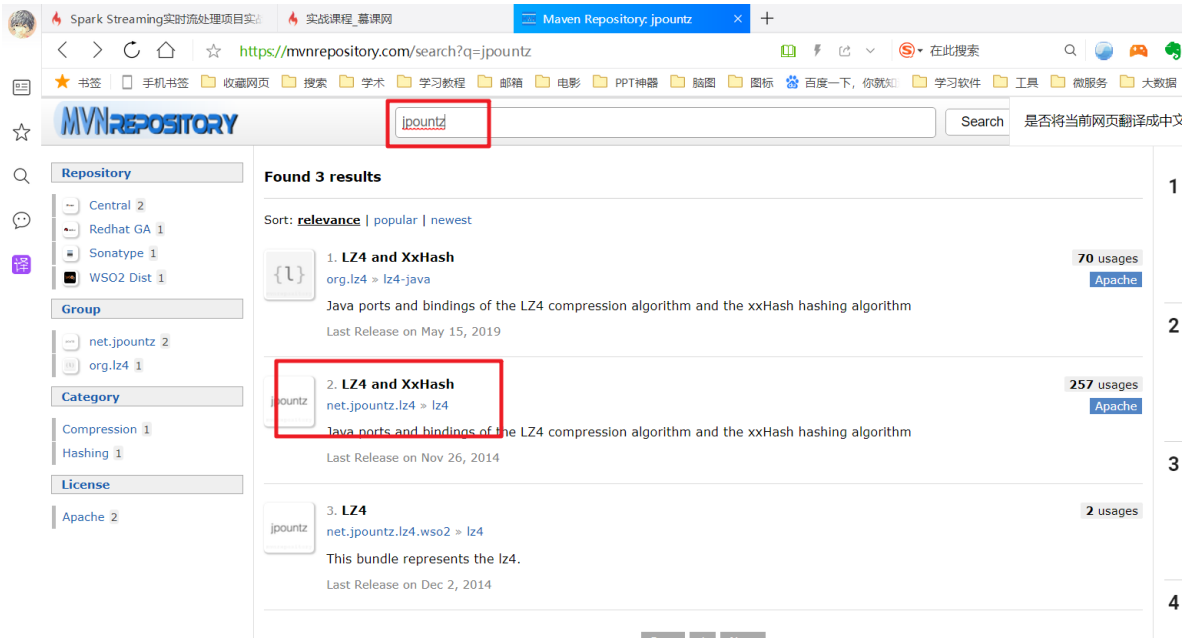


==出错==

```
Caused by: java.lang.NoClassDefFoundError: net/jpountz/util/SafeUtils
```

解决：

去maven上查找

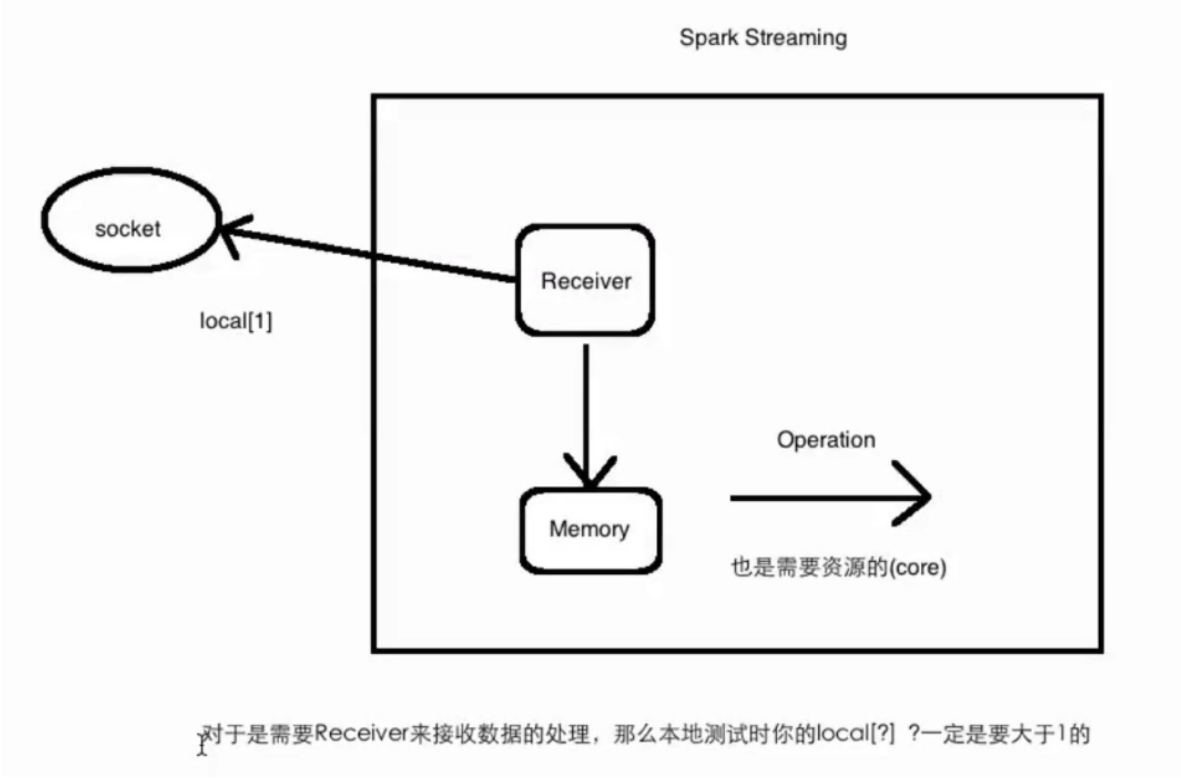



```
<!-- https://mvnrepository.com/artifact/net.jpountz.lz4/lz4 -->
<dependency>
    <groupId>net.jpountz.lz4</groupId>
    <artifactId>lz4</artifactId>
    <version>1.3.0</version>
</dependency>
```

==再次运行==

```
jungle@centosserver1:[/home/jungle]nc -lk 6789
w q q q w
wq wq
wqw wqw ewq ewq
```

```
NetworkWordCount
19/07/31 15:24:05 INFO scheduler.DAGScheduler: ResultStage 36
19/07/31 15:24:05 INFO scheduler.DAGScheduler: Job 18 finished
-------------------------------------------
Time: 1564557845000 ms
-------------------------------------------
(wqw,2)
(ewq,2)

19/07/31 15:24:05 INFO scheduler.JobScheduler: Finished job st
19/07/31 15:24:05 INFO scheduler.JobScheduler: Total delay: 0.
19/07/31 15:24:05 INFO rdd.ShuffledRDD: Removing RDD 32 from p
19/07/31 15:24:05 INFO storage.BlockManager: Removing RDD 32
```



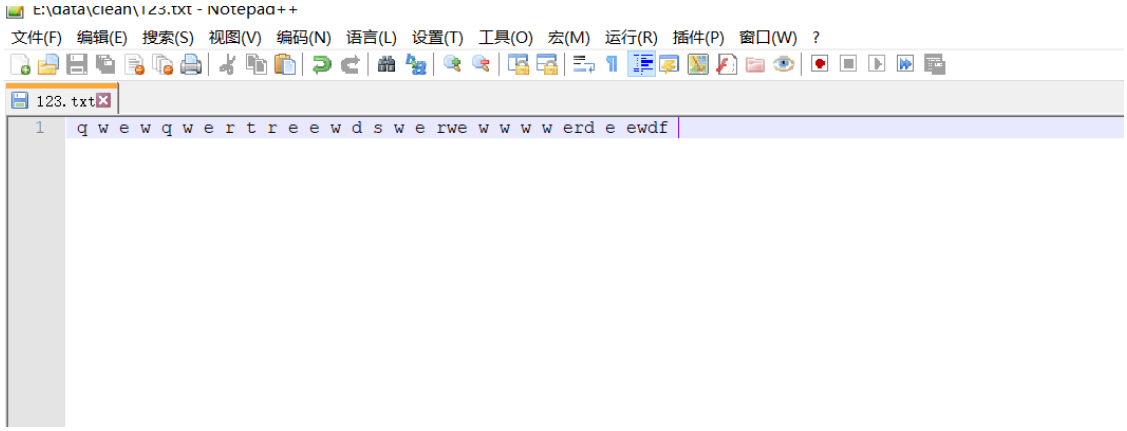
2.Spark Streaming处理文件系统数据

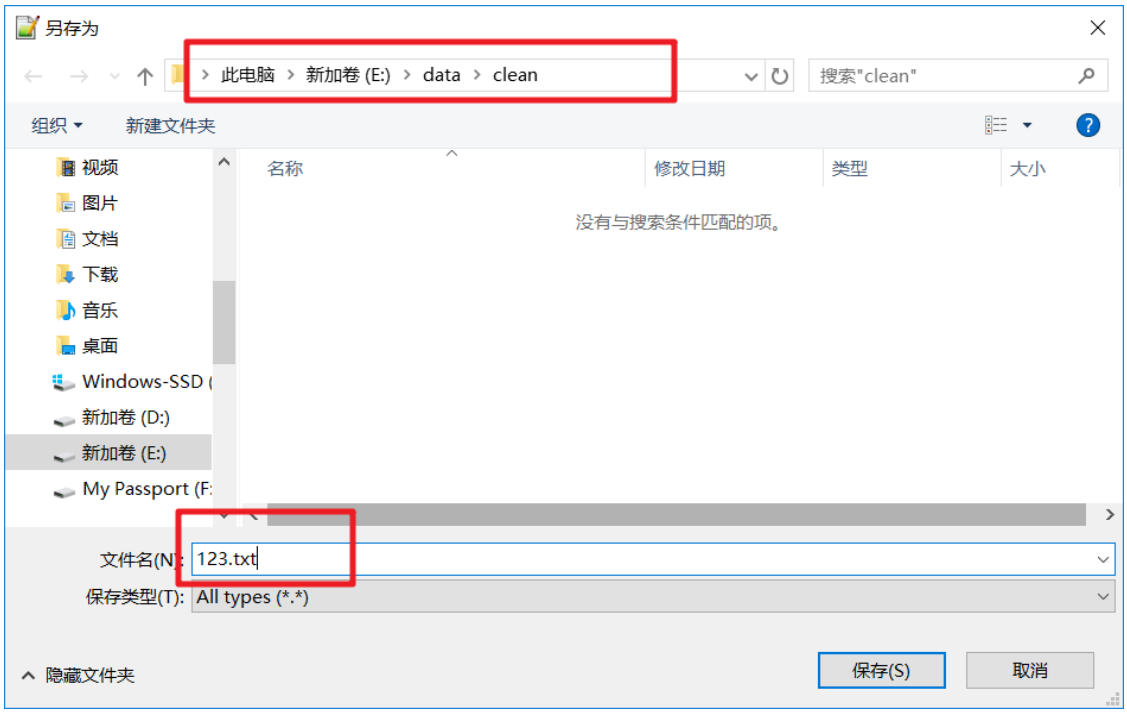
- FileWordCount

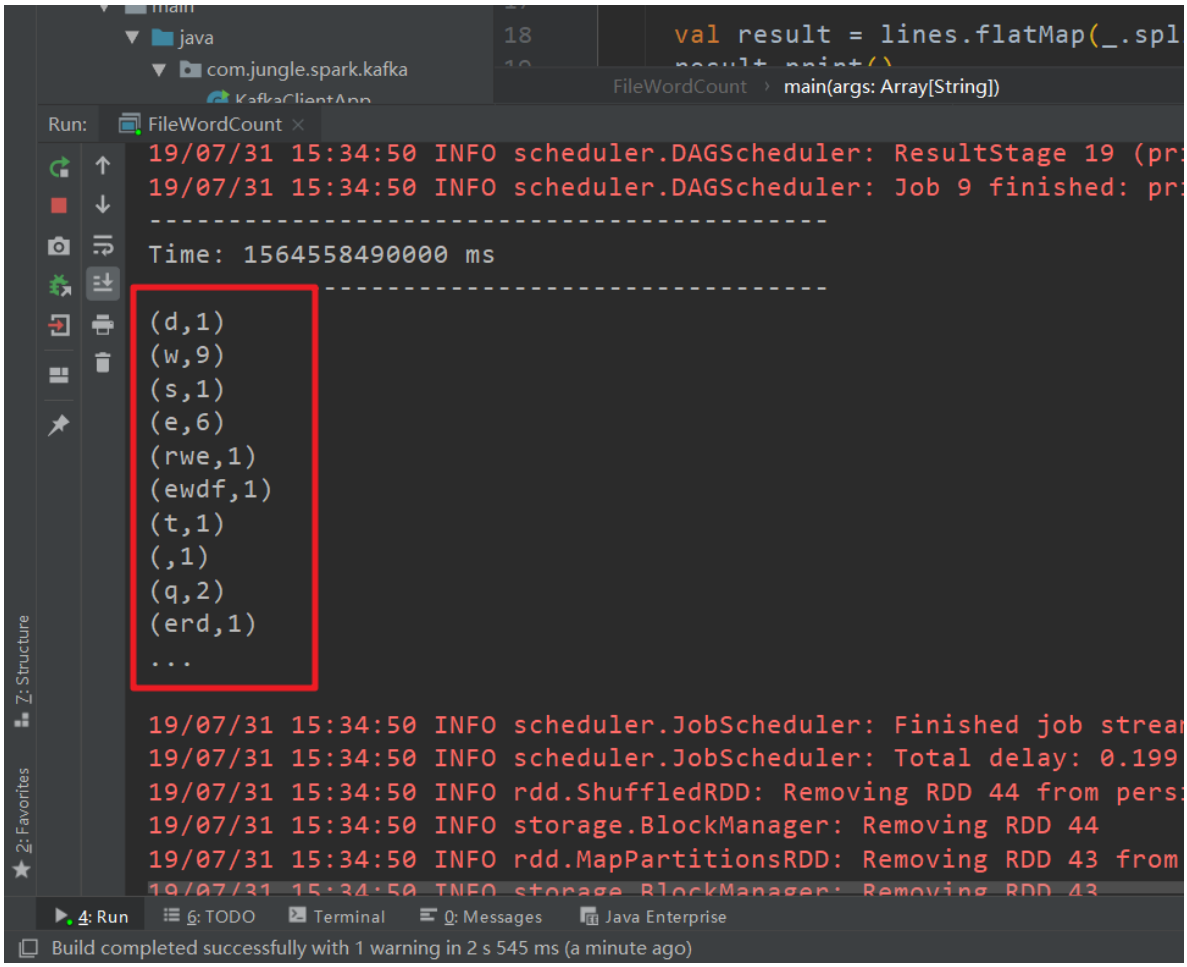
```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * 使用Spark Streaming处理文件系统(local/hdfs)的数据
  */
object FileWordCount {

  def main(args: Array[String]): Unit = {

    val sparkConf = new
SparkConf().setMaster("local").setAppName("FileWordCount")
    val ssc = new StreamingContext(sparkConf, Seconds(5))

    val lines = ssc.textFileStream("file:///E:/data/clean")

    val result = lines.flatMap(_.split(" ")).map((_,1)).reduceByKey(_+_)
    result.print()

    ssc.start()
    ssc.awaitTermination()


  }

}
```

==E:/data/clean文件夹下是空的==

- 在上述文件下新建文件







第8章 Spark Streaming进阶与案例实战

一、目录

Spark Streaming进阶

- 带状态的算子：UpdateStateByKey
- 实战：计算到目前为止累积出现的单词个数写入到MySQL中
- 基于window的统计
- 实战：黑名单过滤
- 实战：Spark Streaming整合Spark SQL实战

二、updateStateByKey算子的使用

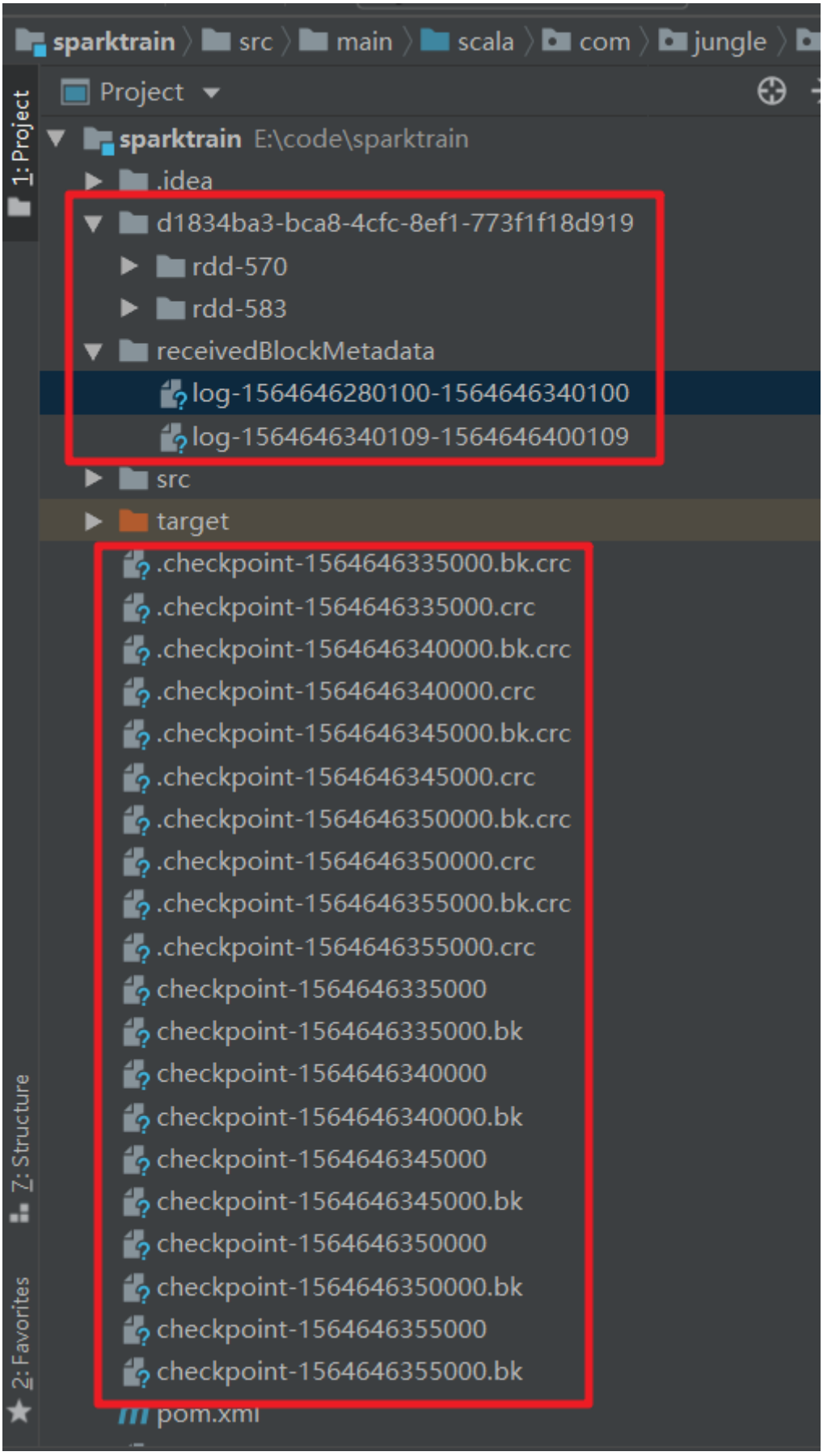
更多一手教程加q337

updateStateByKey算子

需求：统计到目前为止累积出现的单词的个数(需要保持住以前的状态)

```
java.lang.IllegalArgumentException: requirement failed: The checkpoint
directory has not been set. Please set it by
StreamingContext.checkpoint().
```

```
// 如果使用了stateful的算子，必须要设置checkpoint
// 在生产环境中，建议大家把checkpoint设置到HDFS的某个文件夹中
//.表示当前目录
ssc.checkpoint(".")
```



- StatefulWordCount

```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.streaming.{Seconds, StreamingContext}
```

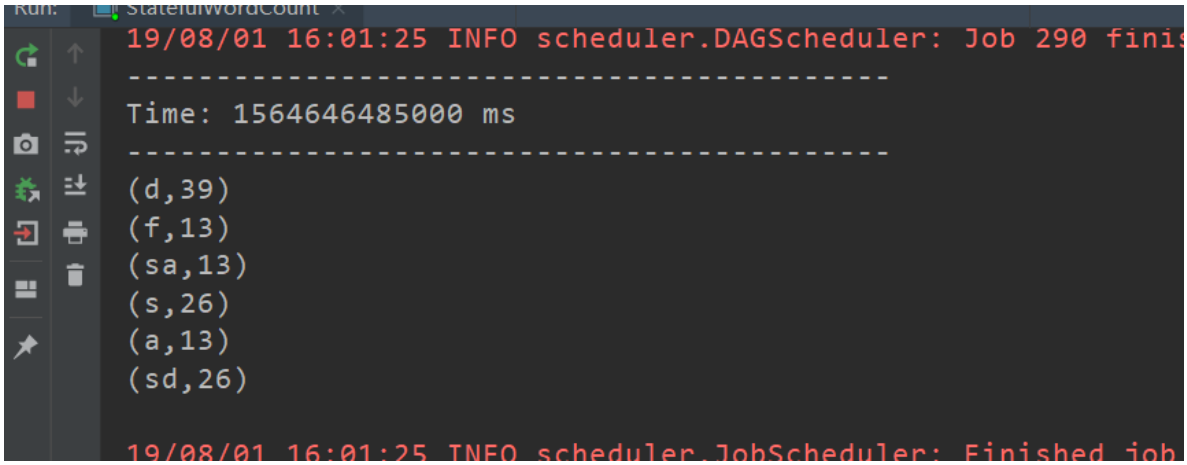
```
/**
  * 使用Spark Streaming完成有状态统计
  */
object StatefulWordCount {

  def main(args: Array[String]): Unit = {


    val sparkConf = new
SparkConf().setAppName("StatefulWordCount").setMaster("local[2]")
    val ssc = new StreamingContext(sparkConf, Seconds(5))

    // 如果使用了stateful的算子，必须要设置checkpoint
    // 在生产环境中，建议大家把checkpoint设置到HDFS的某个文件夹中
    //.表示当前目录
    ssc.checkpoint(".")

    val lines = ssc.socketTextStream("192.168.1.18", 6789)

    val result = lines.flatMap(_.split(" ")).map((_,1))
    val state = result.updateStateByKey[Int](updateFunction _)

    state.print()

    ssc.start()
    ssc.awaitTermination()
  }


  /**
    * 把当前的数据去更新已有的或者是老的数据
    * @param currentValues  当前的
    * @param preValues  老的
    * @return
    */
  def updateFunction(currentValues: Seq[Int], preValues: Option[Int]):
Option[Int] = {
    val current = currentValues.sum
    val pre = preValues.getOrElse(0)

    Some(current + pre)
  }
}
```

- shell

```
nc -lk 6789
```

```
jungle@centosserver1:[/home/jungle]nc -lk 6789
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
a s d f d sa s sd d sd
```

==结果==

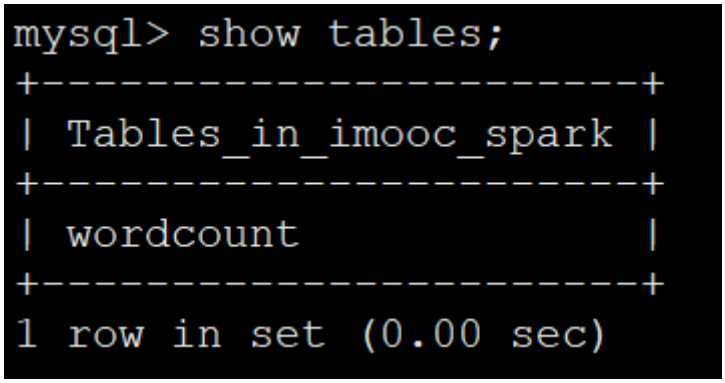


三、统计结果写入到MySQL数据库中

```
create database imooc_spark;
use imooc_spark;
```

```
create table wordcount(
word varchar(50) default null,
wordcount int(10) default null
);
```

```
show tables;
```



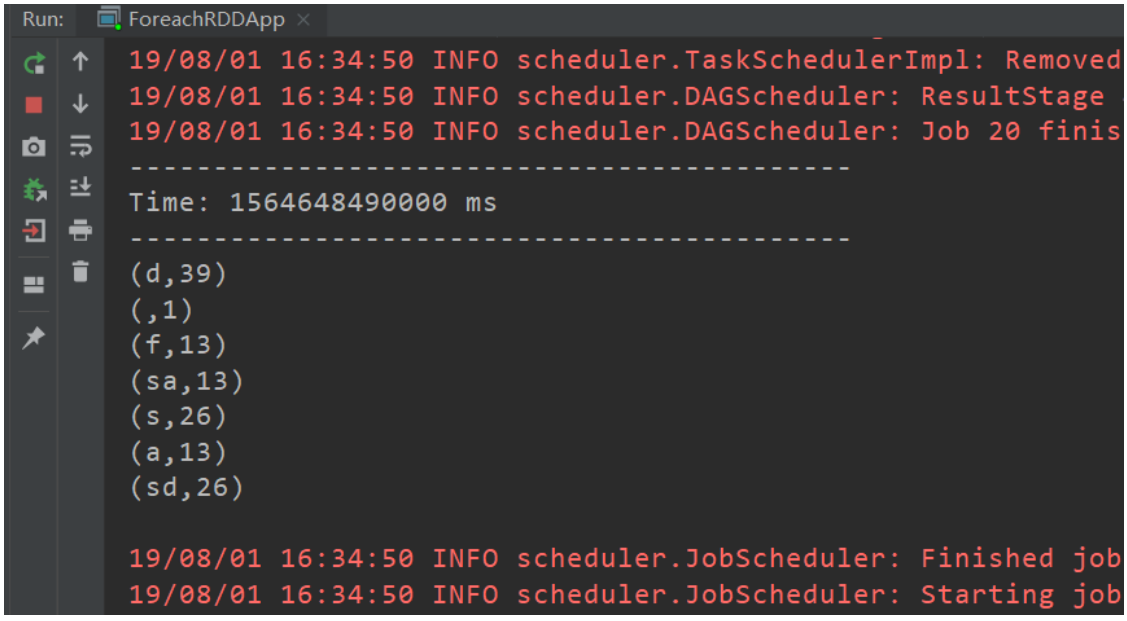
- 引入依赖

```
  <!-- https://mvnrepository.com/artifact/mysql/mysql-connector-java -->
  <dependency>
    <groupId>mysql</groupId>
    <artifactId>mysql-connector-java</artifactId>
    <version>8.0.17</version>
  </dependency>
```

- ForeachRDDApp

```
package com.jungle.spark

import java.sql.DriverManager

import org.apache.spark.SparkConf
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * 使用Spark Streaming完成词频统计，并将结果写入到MySQL数据库中
  */
object ForeachRDDApp {

  def main(args: Array[String]): Unit = {

    val sparkConf = new
SparkConf().setAppName("ForeachRDDApp").setMaster("local[2]")
    val ssc = new StreamingContext(sparkConf, Seconds(5))


    val lines = ssc.socketTextStream("192.168.1.18", 6789)

    val result = lines.flatMap(_.split(" ")).map((_, 1)).reduceByKey(_ + _)

    //result.print()  //此处仅仅是将统计结果输出到控制台

    //TODO... 将结果写入到MySQL
    //    result.foreachRDD(rdd =>{
    //      val connection = createConnection()  // executed at the driver
    //      rdd.foreach { record =>
    //        val sql = "insert into wordcount(word, wordcount)
values('"+record._1 + "'," + record._2 +")"
    //        connection.createStatement().execute(sql)
    //      }
    //    })
```

```
    result.print()

    result.foreachRDD(rdd => {
      rdd.foreachPartition(partitionOfRecords => {
        val connection = createConnection()
        partitionOfRecords.foreach(record => {
          val sql = "insert into wordcount(word, wordcount) values('" +
record._1 + "'," + record._2 + ")"
          connection.createStatement().execute(sql)
        })

        connection.close()
      })
    })


    ssc.start()
    ssc.awaitTermination()
  }


  /**
    * 获取MySQL的连接
    */
  def createConnection() = {
    Class.forName("com.mysql.jdbc.Driver")

 DriverManager.getConnection("jdbc:mysql://192.168.1.18:8806/imooc_spark",
"root", "123456")
  }

}
```

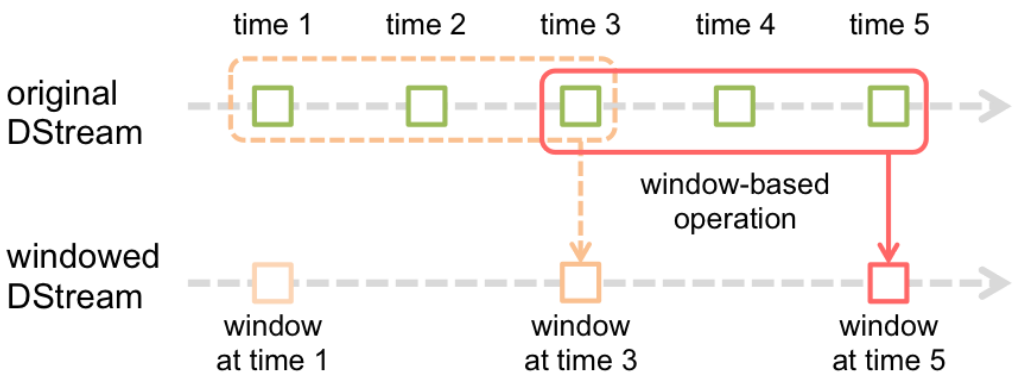


```
mysql> show tables;
+------------------------+
| Tables_in_imooc_spark |
+------------------------+
| wordcount              |
+------------------------+
1 row in set (0.00 sec)

mysql> select * from wordcount;
+------+-----------+
| word | wordcount |
+------+-----------+
| d    |        39 |
|      |         1 |
| f    |        13 |
| sa   |        13 |
| s    |        26 |
| a    |        13 |
| sd   |        26 |
+------+-----------+
7 rows in set (0.01 sec)
```

==需改进==

```
存在的问题：
1）对于已有的数据做更新，而是所有的数据均为insert
    改进思路：
        a）在插入数据前先判断单词是否存在，如果存在就update，不存在则insert
        b）工作中：HBase/Redis

2）每个rdd的partition创建connection，建议大家改成连接池
```

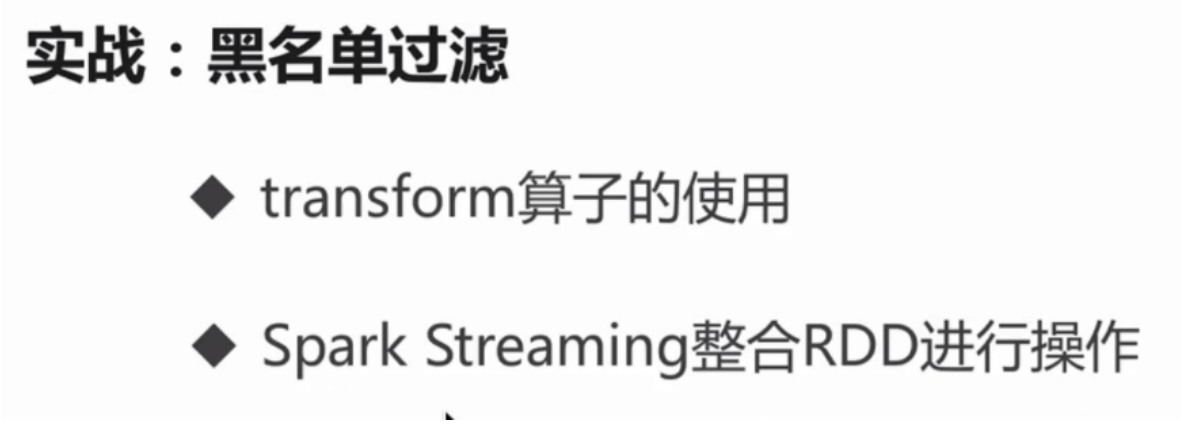
四、窗口函数的使用



```
window: 定时的进行一个时间段内的数据处理

window length  :  窗口的长度
sliding interval:  窗口的间隔

这2个参数和我们的batch size有关系: 倍数

每隔多久计算某个范围内的数据: 每隔10秒计算前10分钟的wc
==> 每隔sliding interval统计前window length的值
```

五、黑名单过滤

1.需求分析




```
黑名单过滤

访问日志   ==> DStream
20180808,zs
20180808,ls
20180808,ww
   ==>  (zs: 20180808,zs)(ls: 20180808,ls)(ww: 20180808,ww)

黑名单列表  ==> RDD
zs
ls
   ==>(zs: true)(ls: true)
```

```
==> 20180808,ww

leftjoin
(zs: <20180808,zs>, <true>)  x
(ls: <20180808,ls>, <true>)  x
(ww: <20180808,ww>, <false>)  ==> tuple 1
```

2.程序实现

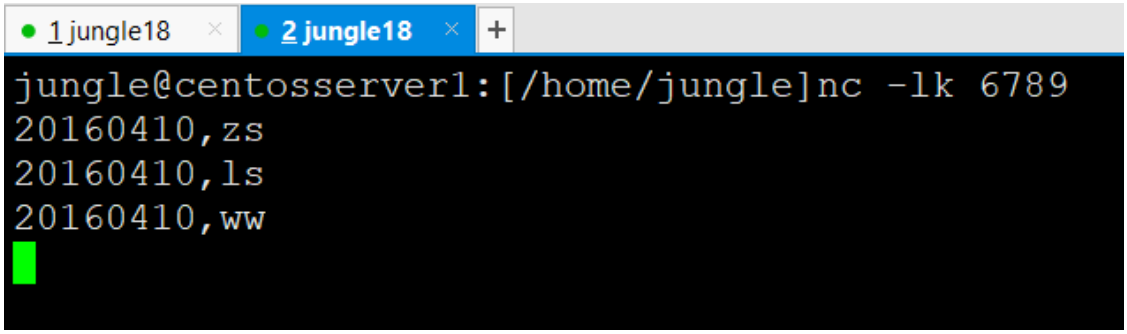
- TransformApp

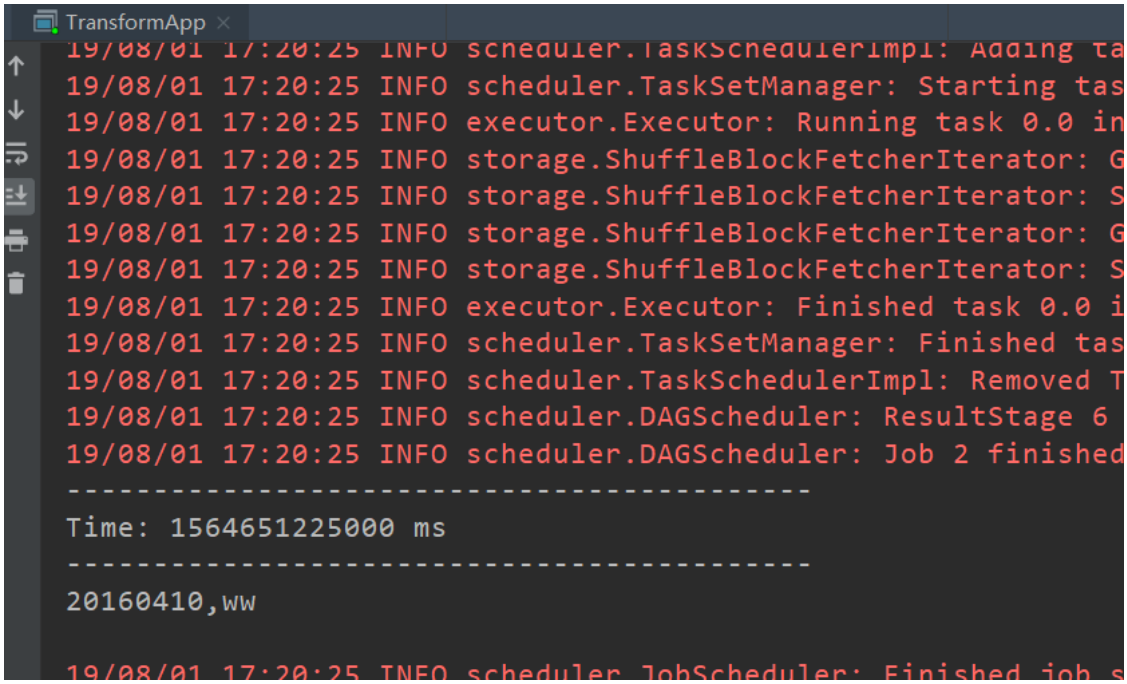
```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * 黑名单过滤
  */
object TransformApp {


  def main(args: Array[String]): Unit = {

    val sparkConf = new
SparkConf().setMaster("local[2]").setAppName("NetworkWordCount")

    /**
      * 创建StreamingContext需要两个参数：SparkConf和batch interval
      */
    val ssc = new StreamingContext(sparkConf, Seconds(5))


    /**
      * 构建黑名单
      */
    val blacks = List("zs", "ls")
    val blacksRDD = ssc.sparkContext.parallelize(blacks).map(x => (x, true))

    val lines = ssc.socketTextStream("192.168.1.18", 6789)
    val clicklog = lines.map(x => (x.split(",")(1), x)).transform(rdd => {
      rdd.leftOuterJoin(blacksRDD)
        .filter(x=> x._2._2.getOrElse(false) != true)
        .map(x=>x._2._1)
    })

    clicklog.print()

    ssc.start()
    ssc.awaitTermination()
  }
}
```

- shell

```
nc -lk 6789
```

```
20160410,zs
20160410,ls
20160410,ww
```

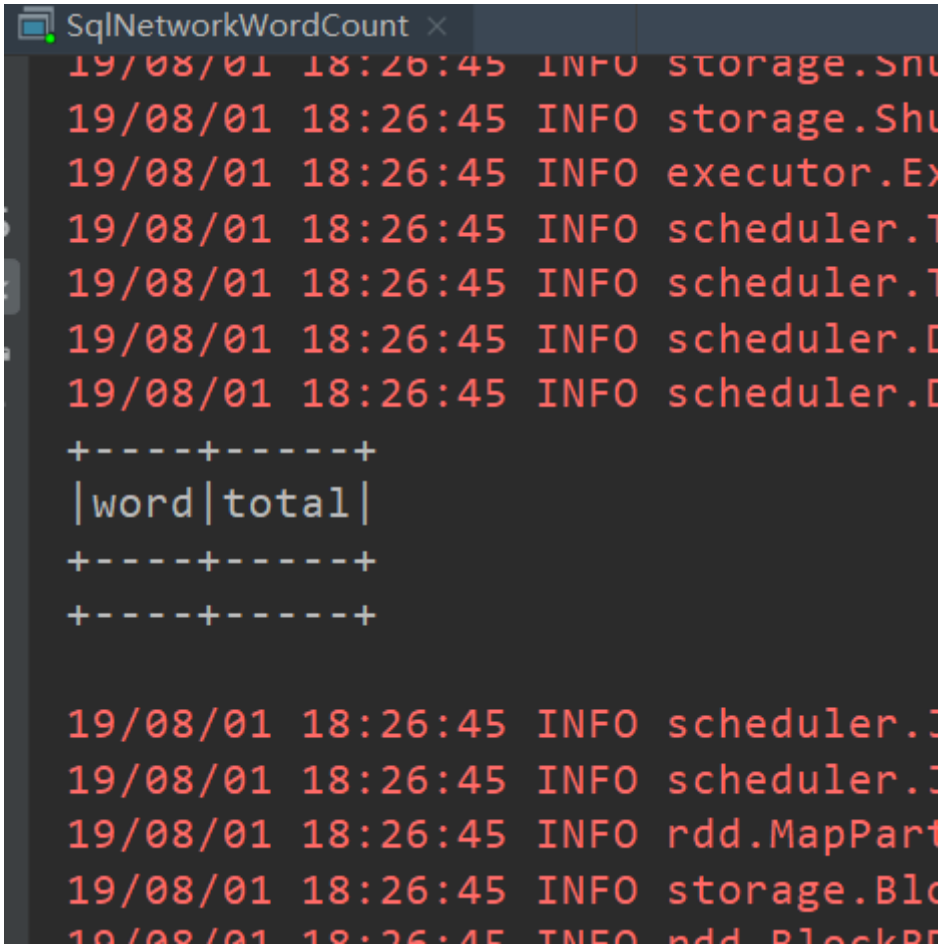




六、Spark Streaming整合Spark SQL操作

- 添加依赖

```
<dependency>
      <groupId>org.apache.spark</groupId>
      <artifactId>spark-sql_2.11</artifactId>
      <version>${spark.version}</version>
    </dependency>
```



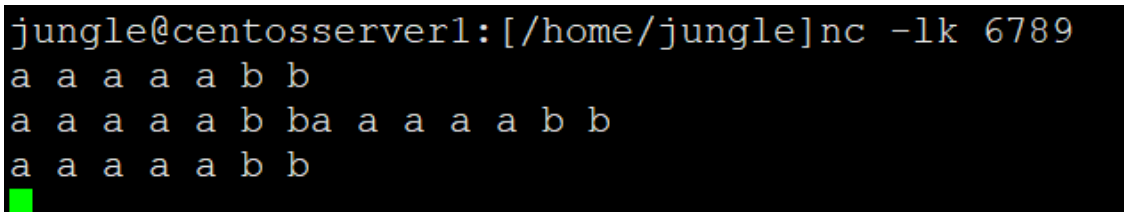
- SqlNetworkWordCount

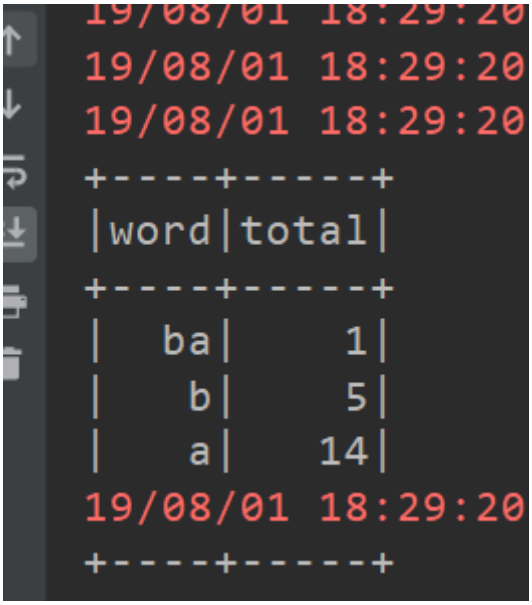
```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.rdd.RDD
import org.apache.spark.sql.SparkSession
import org.apache.spark.streaming.{Seconds, StreamingContext, Time}

/**
  * Spark Streaming整合Spark SQL完成词频统计操作
  */
object SqlNetworkWordCount {

  def main(args: Array[String]): Unit = {
    val sparkConf = new
SparkConf().setAppName("ForeachRDDApp").setMaster("local[2]")
    val ssc = new StreamingContext(sparkConf, Seconds(5))

    val lines = ssc.socketTextStream("192.168.1.18", 6789)
    val words = lines.flatMap(_.split(" "))

    // Convert RDDs of the words DStream to DataFrame and run SQL query
    words.foreachRDD { (rdd: RDD[String], time: Time) =>
      val spark =
SparkSessionSingleton.getInstance(rdd.sparkContext.getConf)
      import spark.implicits._

      // Convert RDD[String] to RDD[case class] to DataFrame
      val wordsDataFrame = rdd.map(w => Record(w)).toDF()
```

```
      // Creates a temporary view using the DataFrame
      wordsDataFrame.createOrReplaceTempView("words")

      // Do word count on table using SQL and print it
      val wordCountsDataFrame =
        spark.sql("select word, count(*) as total from words group by word")
      println(s"========= $time =========")
      wordCountsDataFrame.show()
    }


    ssc.start()
    ssc.awaitTermination()
  }


  /** Case class for converting RDD to DataFrame */
  case class Record(word: String)


  /** Lazily instantiated singleton instance of SparkSession */
  object SparkSessionSingleton {

    @transient  private var instance: SparkSession = _

    def getInstance(sparkConf: SparkConf): SparkSession = {
      if (instance == null) {
        instance = SparkSession
          .builder
          .config(sparkConf)
          .getOrCreate()
      }
      instance
    }
  }
}
```

- shell

```
nc -lk 6789
```





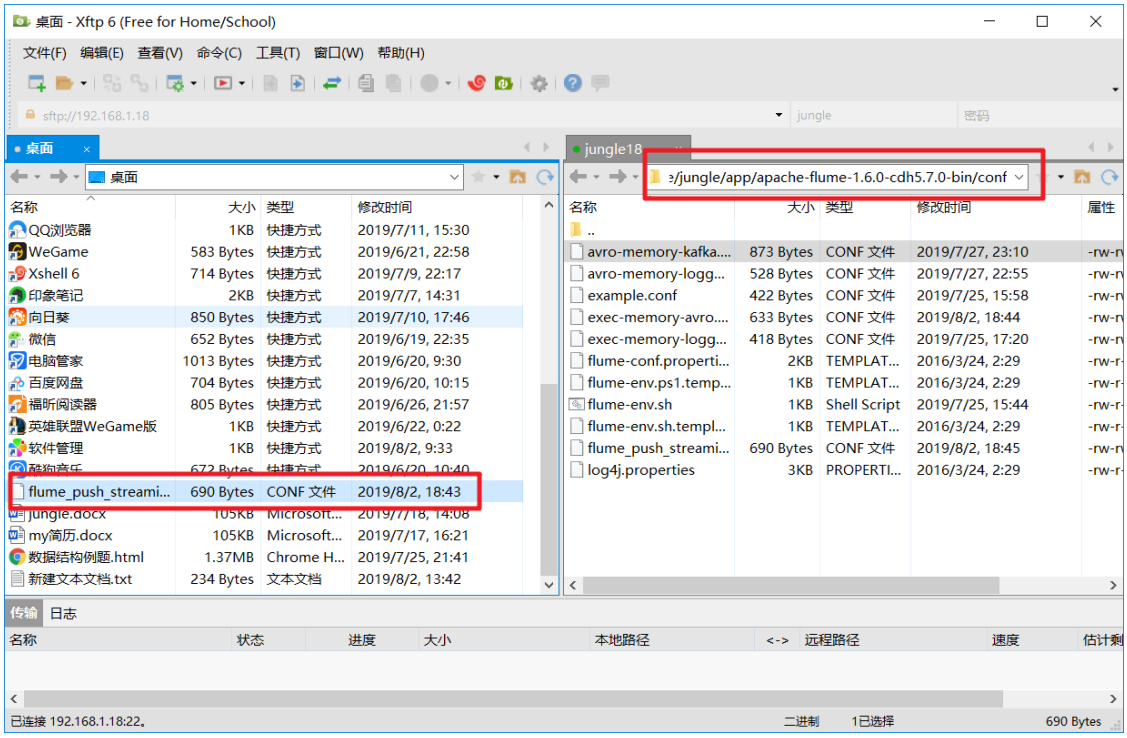
第9章 Spark Streaming整合Flume

官网

一、Push方式整合之Flume Agent配置开发

- flume_push_streaming.conf

```
simple-agent.sources = netcat-source

simple-agent.sinks = avro-sink
simple-agent.channels = memory-channel

simple-agent.sources.netcat-source.type = netcat
simple-agent.sources.netcat-source.bind = centosserver1
simple-agent.sources.netcat-source.port = 44444

simple-agent.sinks.avro-sink.type = avro
simple-agent.sinks.avro-sink.hostname = centosserver1
simple-agent.sinks.avro-sink.port = 41414

simple-agent.channels.memory-channel.type = memory

simple-agent.sources.netcat-source.channels = memory-channel
simple-agent.sinks.avro-sink.channel = memory-channel
```



- 添加依赖

```
<dependency>
      <groupId>org.apache.spark</groupId>
      <artifactId>spark-streaming-flume_2.11</artifactId>
      <version>${spark.version}</version>
    </dependency>
```

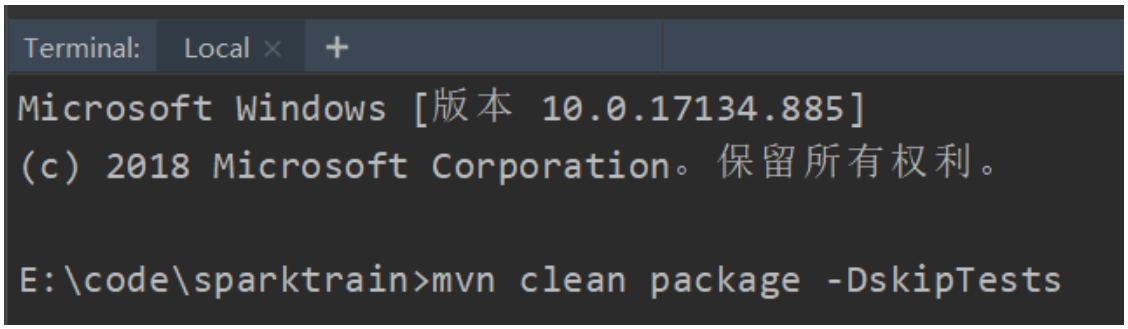
- FlumePushWordCount

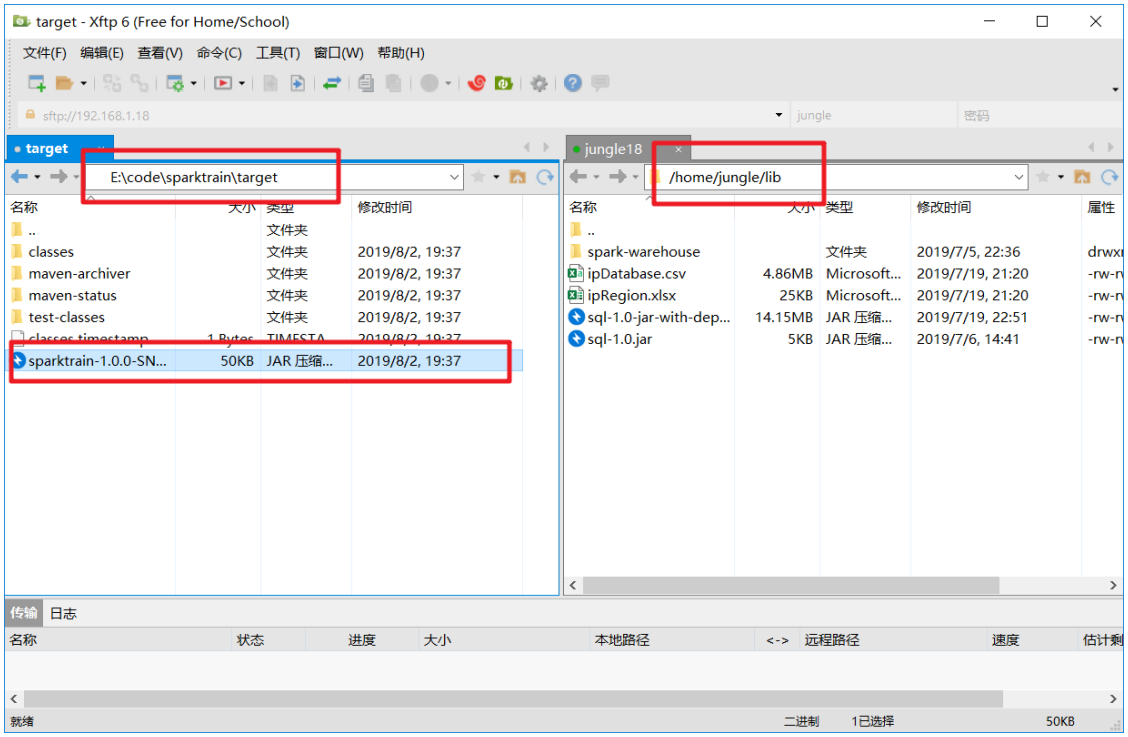
```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.streaming.flume.FlumeUtils
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * Spark Streaming整合Flume的第一种方式
  */
object FlumePushWordCount {

  def main(args: Array[String]): Unit = {

    if(args.length != 2) {
      System.err.println("Usage: FlumePushWordCount <hostname> <port>")
      System.exit(1)
    }

    val Array(hostname, port) = args

    val sparkConf = new
SparkConf()//.setMaster("local[2]").setAppName("FlumePushWordCount")
    val ssc = new StreamingContext(sparkConf, Seconds(5))

    //TODO... 如何使用SparkStreaming整合Flume
    val flumeStream = FlumeUtils.createStream(ssc, hostname, port.toInt)
```

```
    flumeStream.map(x=> new String(x.event.getBody.array()).trim)
      .flatMap(_.split(" ")).map((_,1)).reduceByKey(_+_).print()

    ssc.start()
    ssc.awaitTermination()
  }
}
```

- 打包

```
mvn clean package -DskipTests
```





- 提交任务

```
spark-submit --master local[2] \
--class com.jungle.spark.FlumePushWordCount \
--packages org.apache.spark:spark-streaming-flume_2.11:2.2.0  \
/home/jungle/lib/sparktrain-1.0.0-SNAPSHOT.jar \
centosserver1 41414
```

- 启动flume

```
flume-ng agent \
--name simple-agent \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/flume_push_streaming.conf \
-Dflume.root.logger=INFO,console
```

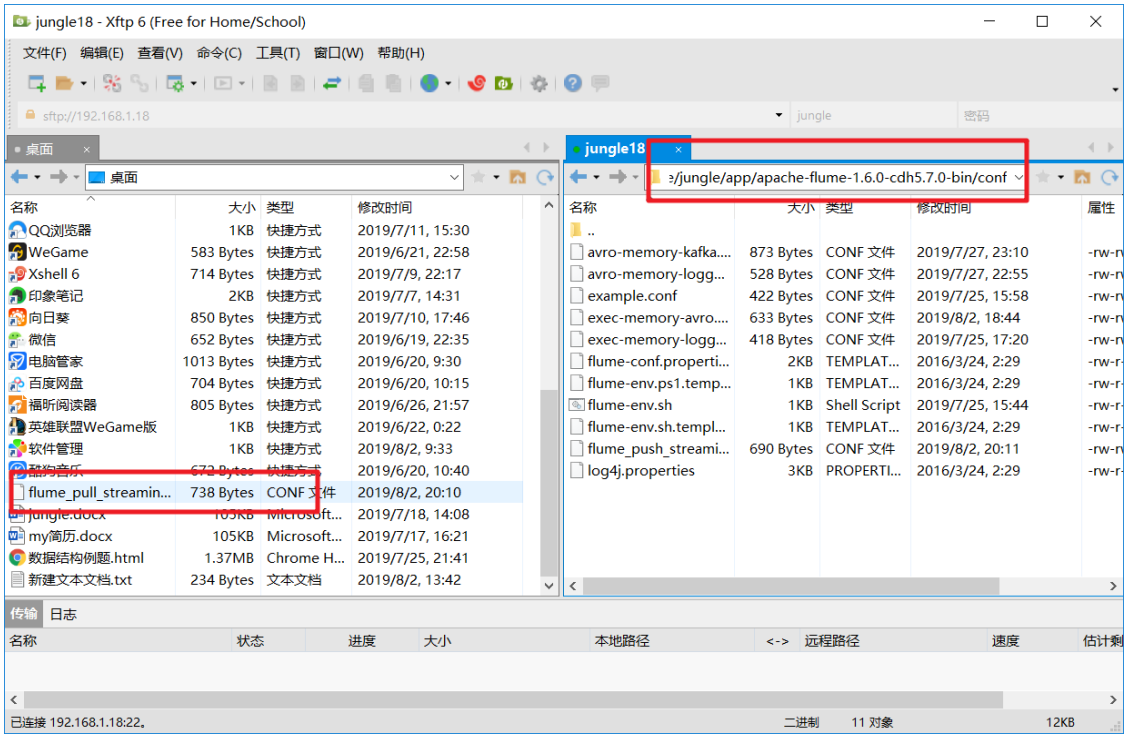
- 测试

```
telnet localhost 44444
```

二、Pull方式整合之Flume Agent配置开发

- flume_pull_streaming.conf

```
simple-agent.sources = netcat-source

simple-agent.sinks = spark-sink
simple-agent.channels = memory-channel

simple-agent.sources.netcat-source.type = netcat
simple-agent.sources.netcat-source.bind = centosserver1
simple-agent.sources.netcat-source.port = 44444

simple-agent.sinks.spark-sink.type =
org.apache.spark.streaming.flume.sink.SparkSink
simple-agent.sinks.spark-sink.hostname = centosserver1
simple-agent.sinks.spark-sink.port = 41414

simple-agent.channels.memory-channel.type = memory

simple-agent.sources.netcat-source.channels = memory-channel
simple-agent.sinks.spark-sink.channel = memory-channel
```



- 添加依赖

```
<dependency>
            <groupId>org.apache.spark</groupId>
            <artifactId>spark-streaming-flume-sink_2.11</artifactId>
            <version>${spark.version}</version>
        </dependency>

         <dependency>
            <groupId>org.scala-lang</groupId>
            <artifactId>scala-library</artifactId>
            <version>${scala.version}</version>
        </dependency>

        <dependency>
            <groupId>org.apache.commons</groupId>
            <artifactId>commons-lang3</artifactId>
            <version>3.5</version>
        </dependency>
```

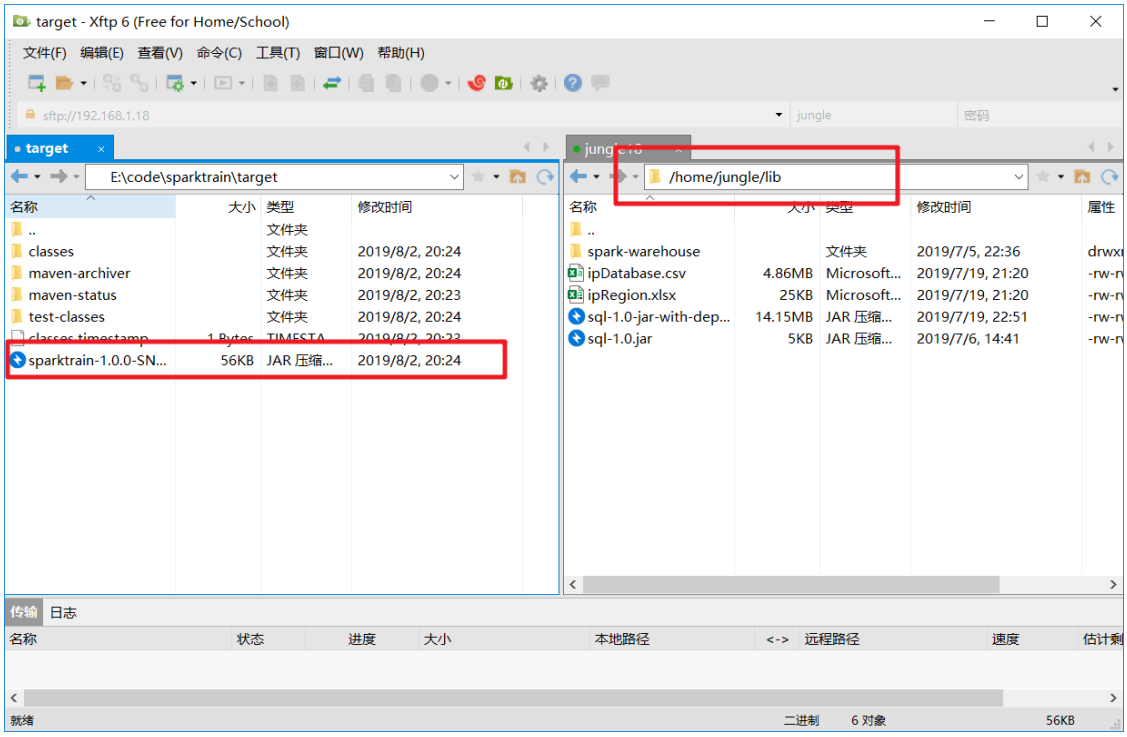
- FlumePullWordCount

```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.streaming.flume.FlumeUtils
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * Spark Streaming整合Flume的第二种方式
  */
object FlumePullWordCount {

  def main(args: Array[String]): Unit = {

    if(args.length != 2) {
      System.err.println("Usage: FlumePullWordCount <hostname> <port>")
      System.exit(1)
    }

    val Array(hostname, port) = args

    val sparkConf = new SparkConf()
//.setMaster("local[2]").setAppName("FlumePullWordCount")
    val ssc = new StreamingContext(sparkConf, Seconds(5))

    //TODO... 如何使用SparkStreaming整合Flume
    val flumeStream = FlumeUtils.createPollingStream(ssc, hostname,
port.toInt)

    flumeStream.map(x=> new String(x.event.getBody.array()).trim)
      .flatMap(_.split(" ")).map((_,1)).reduceByKey(_+_).print()

    ssc.start()
    ssc.awaitTermination()
  }
}
```

- 打包

```
mvn clean package -DskipTests
```

- 上传至服务器



==注意到：先启动发flume，后启动spark streaming应用程序==

- 启动flume

```
flume-ng agent \
--name simple-agent \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/flume_pull_streaming.conf \
-Dflume.root.logger=INFO,console
```

- 启动spark-streaming

```
spark-submit --master local[2] \
--class com.jungle.spark.FlumePullWordCount \
--packages org.apache.spark:spark-streaming-flume_2.11:2.2.0  \
/home/jungle/lib/sparktrain-1.0.0-SNAPSHOT.jar \
centosserver1 41414
```

第10章 Spark Streaming整合Kafka

一、Receiver方式整合之Kafka

1. 开启zookeeper
2. 开启Kafka
3. 创建topic

```
kafka-topics.sh --create --zookeeper centosserver1:2181 --replication-factor
1 --partitions 1 --topic kafka_streaming_topic
```

```
 cd $KAFKA_HOME/bin
./kafka-topics.sh --list --zookeeper centosserver1:2181
```

4. 通过控制台测试topic是否能够正常生产和消费

```
kafka-console-producer.sh --broker-list centosserver1:9092 --topic
kafka_streaming_topic
```

```
kafka-console-consumer.sh --zookeeper centosserver1:2181 --topic
kafka_streaming_topic --from-beginning
```

二、Spark Streaming应用开发

- 添加依赖

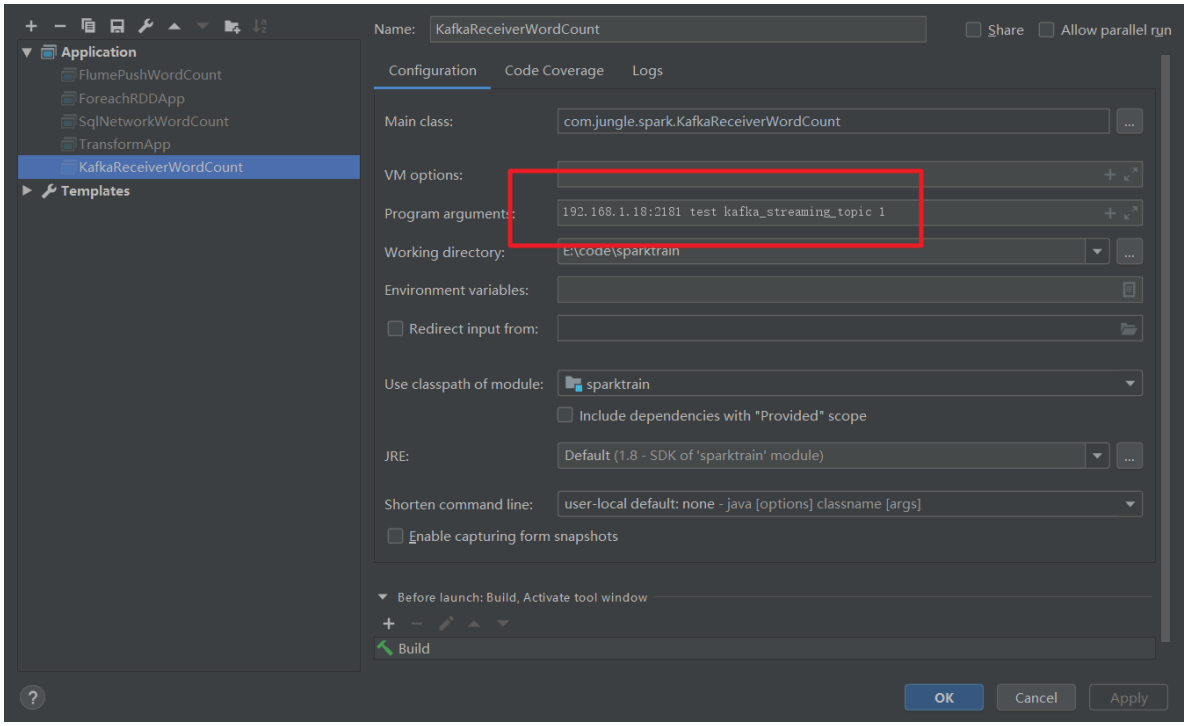
```
<dependency>
            <groupId>org.apache.spark</groupId>
            <artifactId>spark-streaming-kafka-0-8_2.11</artifactId>
            <version>${spark.version}</version>
        </dependency>
```

- KafkaReceiverWordCount

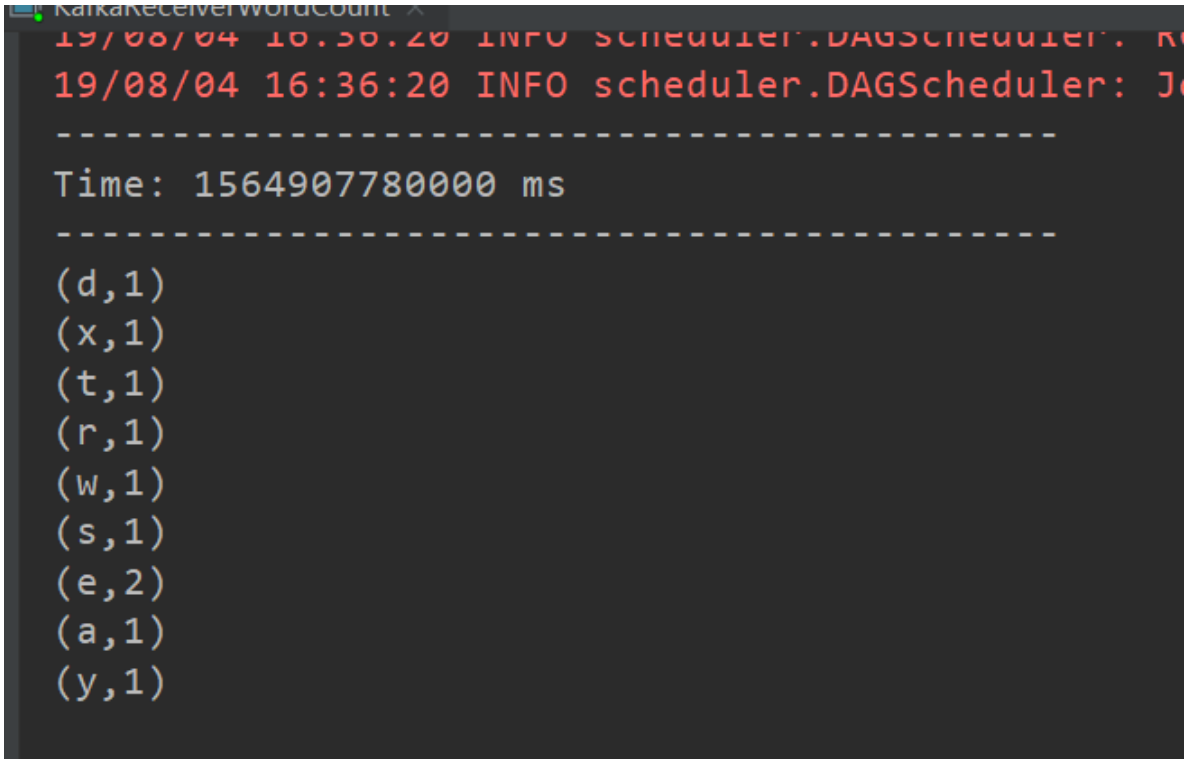
```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.streaming.kafka.KafkaUtils
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * Spark Streaming对接Kafka的方式一
  */
object KafkaReceiverWordCount {

  def main(args: Array[String]): Unit = {

    if(args.length != 4) {
      System.err.println("Usage: KafkaReceiverWordCount <zkQuorum> <group>
<topics> <numThreads>")
    }

    val Array(zkQuorum, group, topics, numThreads) = args

    val sparkConf = new SparkConf().setAppName("KafkaReceiverWordCount")
      .setMaster("local[2]")

    val ssc = new StreamingContext(sparkConf, Seconds(5))

    val topicMap = topics.split(",").map((_, numThreads.toInt)).toMap
```

```
    // TODO... Spark Streaming如何对接Kafka
    val messages = KafkaUtils.createStream(ssc, zkQuorum, group,topicMap)

    // TODO... 自己去测试为什么要取第二个
    messages.map(_._2).flatMap(_.split("
")).map((_,1)).reduceByKey(_+_).print()

    ssc.start()
    ssc.awaitTermination()
  }
}
```

1.本地测试




```
-bash: ./kafka-topics.sh: No such file or directory
jungle@centosserver1:[/home/jungle] cd $KAFKA_HOME/bin
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/bin]./kafka-topics.sh --list --zookeeper centosserver1:2181
hello_topic
kafka_streaming_topic
my-replicated-topic
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/bin]kafka-console-producer.sh --broker-list centosserver1:9092 --topic kafka_streaming_topic
qwe
asd
zxc
 ^Hqx wdwd qw sq
w e e r t y s a x d
```



2.服务器环境联调

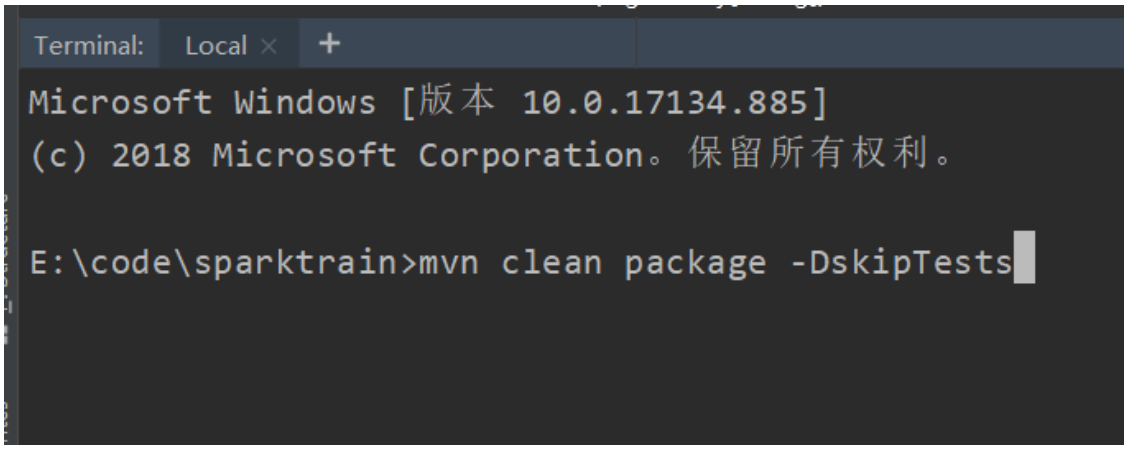
1. 程序

```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.streaming.kafka.KafkaUtils
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * Spark Streaming对接Kafka的方式一
  */
object KafkaReceiverWordCount {

  def main(args: Array[String]): Unit = {

    if(args.length != 4) {
      System.err.println("Usage: KafkaReceiverWordCount <zkQuorum> <group>
<topics> <numThreads>")
    }

    val Array(zkQuorum, group, topics, numThreads) = args

    val sparkConf = new SparkConf()//.setAppName("KafkaReceiverWordCount")
      //.setMaster("local[2]")

    val ssc = new StreamingContext(sparkConf, Seconds(5))

    val topicMap = topics.split(",").map((_, numThreads.toInt)).toMap

    // TODO... Spark Streaming如何对接Kafka
    val messages = KafkaUtils.createStream(ssc, zkQuorum, group,topicMap)
```

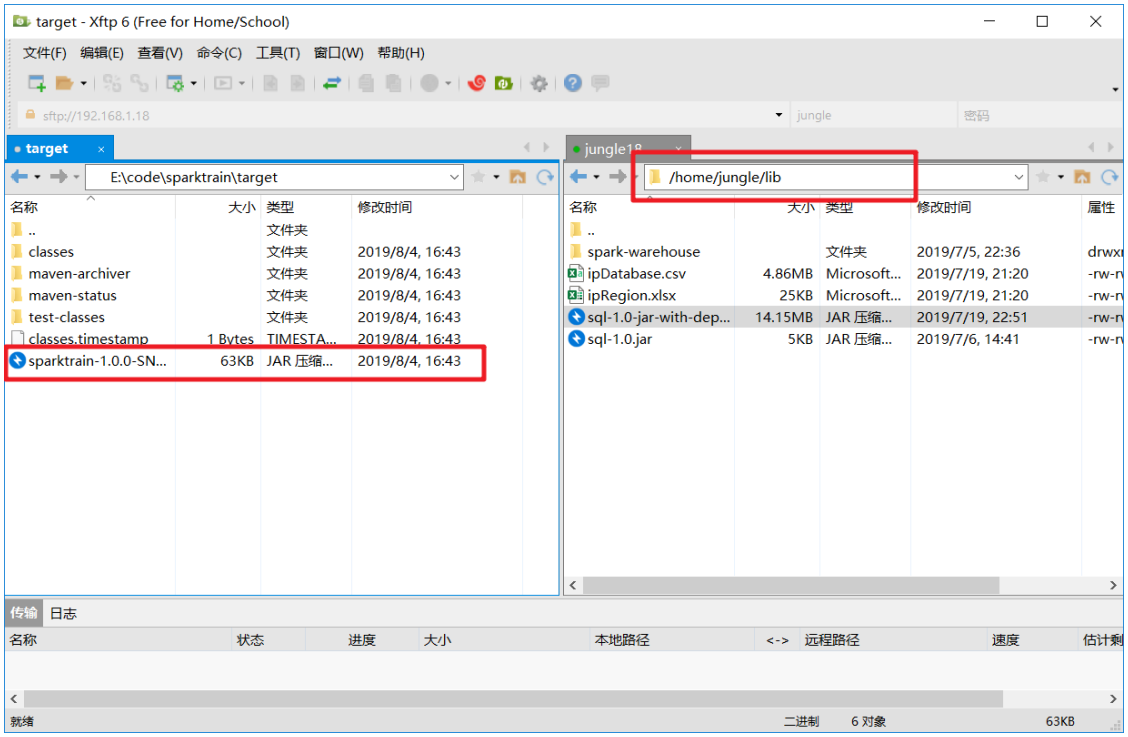
```
    // TODO... 自己去测试为什么要取第二个
    messages.map(_._2).flatMap(_.split("
")).map((_,1)).reduceByKey(_+_).print()

    ssc.start()
    ssc.awaitTermination()
  }
}
```

2. 打包

```
mvn clean package -DskipTests
```



3. 上传服务器

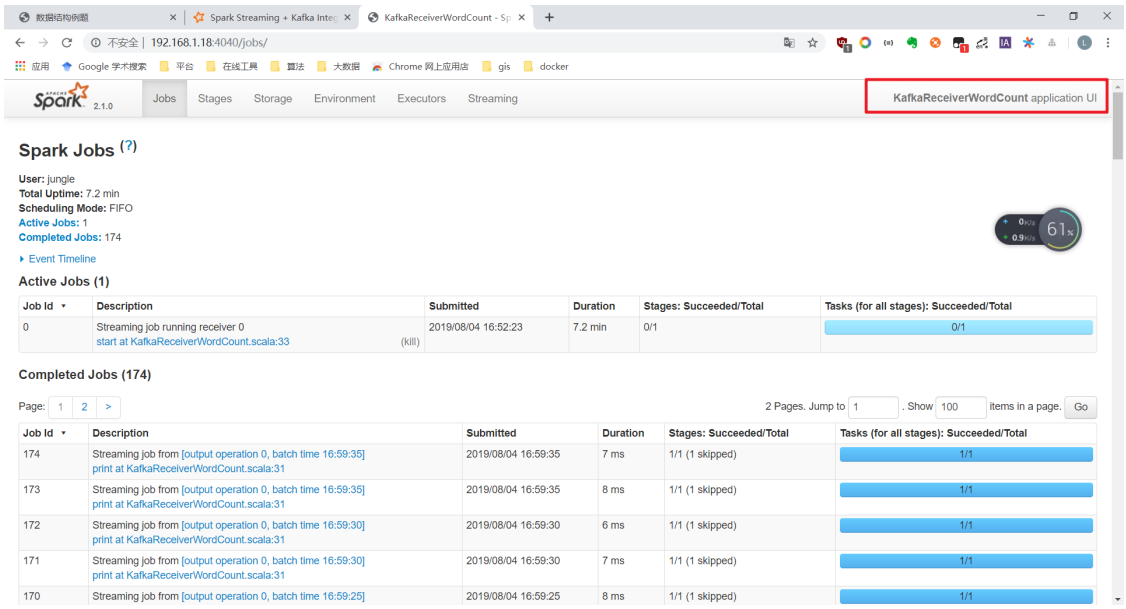


4. 运行脚本

```
spark-submit \
--class com.jungle.spark.KafkaReceiverWordCount \
--master local[2] \
--name KafkaReceiverWordCount \
--packages org.apache.spark:spark-streaming-kafka-0-8_2.11:2.2.0 \
/home/jungle/lib/sparktrain-1.0.0-SNAPSHOT.jar centosserver1:2181 test
kafka_streaming_topic 1
```

5. UI界面

```
http://192.168.1.18:4040/jobs/
```



三、Direct方式整合

==服务器环境运行==

1. 程序

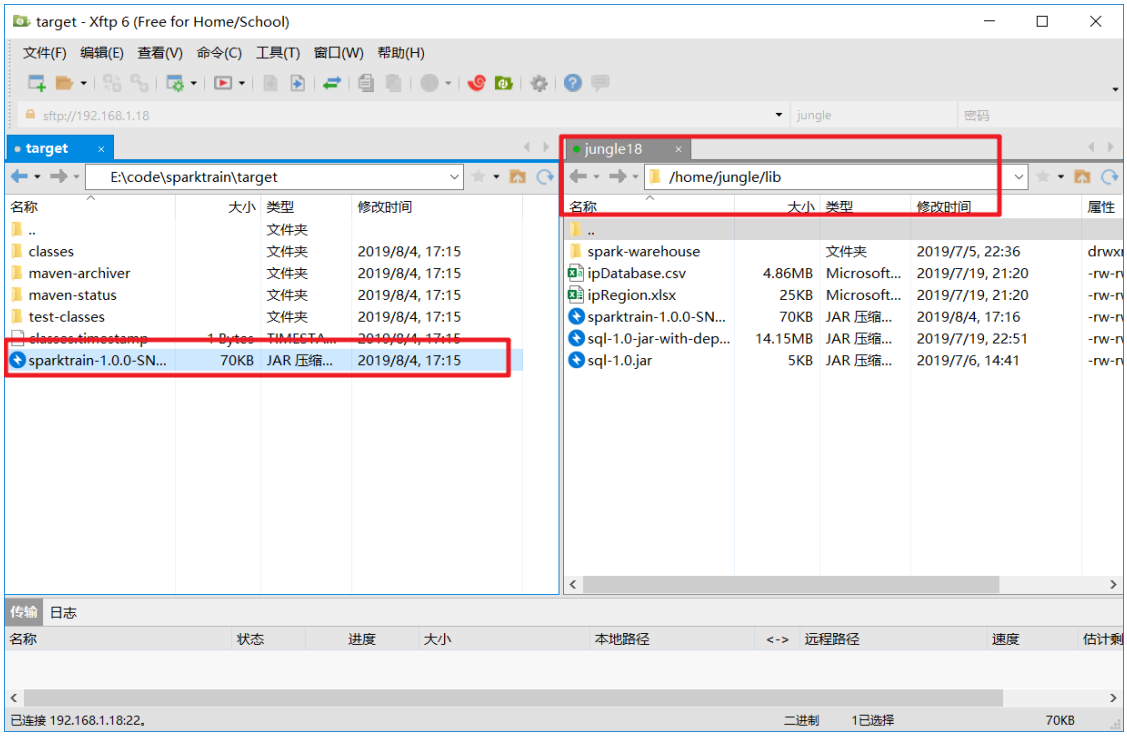
```
package com.imooc.spark


import org.apache.spark.SparkConf
import org.apache.spark.streaming.kafka.KafkaUtils
import org.apache.spark.streaming.{Seconds, StreamingContext}
import kafka.serializer.StringDecoder
/**
  * Spark Streaming对接Kafka的方式二
  */
object KafkaDirectWordCount {

  def main(args: Array[String]): Unit = {

    if(args.length != 2) {
      System.err.println("Usage: KafkaDirectWordCount <brokers> <topics>")
      System.exit(1)
```

```
    }

    val Array(brokers, topics) = args

    val sparkConf = new SparkConf() //.setAppName("KafkaReceiverWordCount")
      //.setMaster("local[2]")

    val ssc = new StreamingContext(sparkConf, Seconds(5))

    val topicsSet = topics.split(",").toSet
    val kafkaParams = Map[String,String]("metadata.broker.list"-> brokers)

    // TODO... Spark Streaming如何对接Kafka
    val messages =
KafkaUtils.createDirectStream[String,String,StringDecoder,StringDecoder](
    ssc,kafkaParams,topicsSet
    )

    // TODO... 自己去测试为什么要取第二个
    messages.map(_._2).flatMap(_.split("
")).map((_,1)).reduceByKey(_+_).print()

    ssc.start()
    ssc.awaitTermination()
  }
}
```

2. 打包

```
mvn clean package -DskipTests
```

3. 上传服务器



4. 运行脚本

```
spark-submit \
--class com.imooc.spark.KafkaDirectWordCount \
--master local[2] \
--name KafkaDirectWordCount \
--packages org.apache.spark:spark-streaming-kafka-0-8_2.11:2.2.0 \
/home/jungle/lib/sparktrain-1.0.0-SNAPSHOT.jar centosserver1:9092
kafka_streaming_topic
```

5. 效果

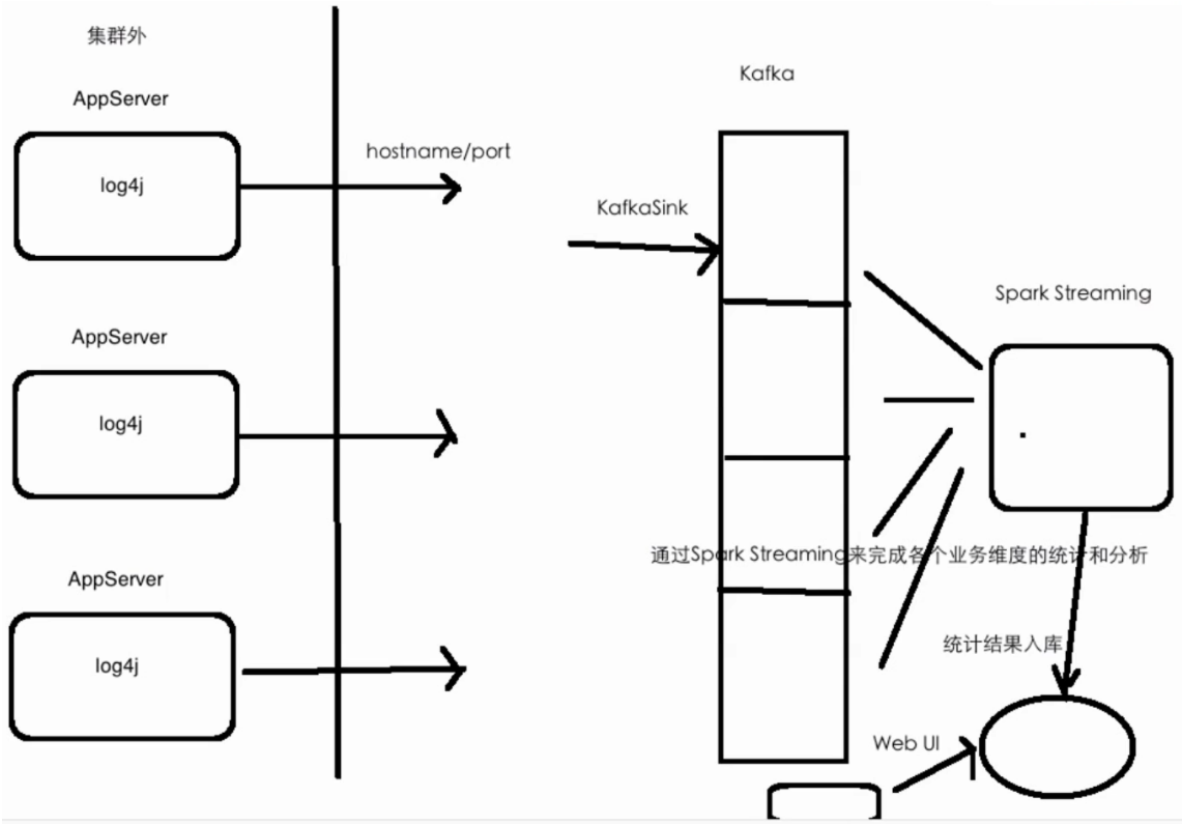
```
jungle@centosserver1:[/home/jungle/app/kafka_2.11-0.9.0.0/bin]kafka-console-producer.sh
--broker-list centosserver1:9092 --topic kafka_streaming_topic
qwe
asd
zxc
 ^Hqx wdwd qw sq
w e e r t y s a x d
w w w e e r t y r q w rr t ee w e qw
q we r try tyh6h sf adw ededf f
```

```
19/08/04 17:22:00 INFO TaskSchedulerImpl: Removed TaskSet 15.0, w
19/08/04 17:22:00 INFO DAGScheduler: ResultStage 15 (print at Kaf
19/08/04 17:22:00 INFO DAGScheduler: Job 7 finished: print at Kaf
-------------------------------------------
Time: 1564910520000 ms
-------------------------------------------
(we,1)
(f,1)
(r,1)
(adw,1)
(ededf,1)
(q,1)
(try,1)
(tyh6h,1)
(sf,1)

19/08/04 17:22:00 INFO JobScheduler: Finished job streaming job 1
19/08/04 17:22:00 INFO JobScheduler: Total delay: 0.152 s for tim
```

第11章 Spark Streaming整合Flume&Kafka打造通用流处理基础

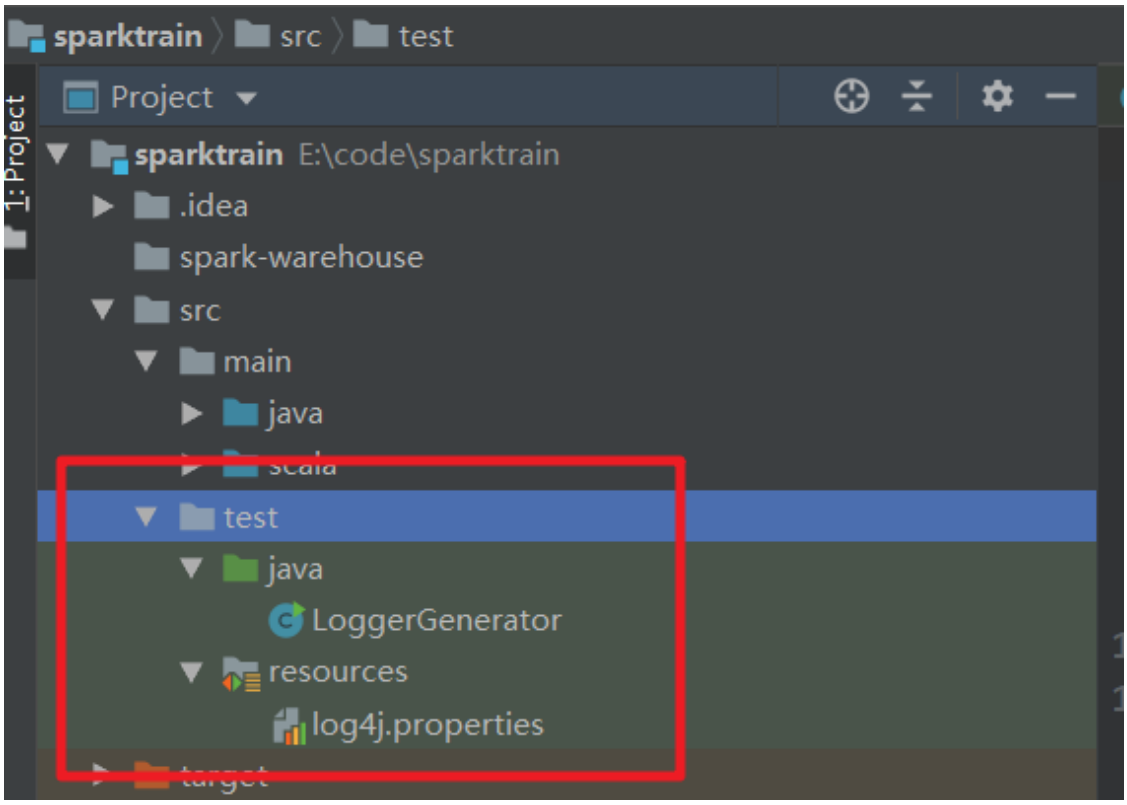
一、课程目录

二、处理流程画图剖析



三、日志产生器开发并结合log4j完成日志的输出

- 目录结构



- LoggerGenerator

```
import org.apache.log4j.Logger;
```

```
/**
 * 模拟日志产生
 */
public class LoggerGenerator {

    private static Logger logger =
Logger.getLogger(LoggerGenerator.class.getName());

    public static void main(String[] args) throws Exception{

        int index = 0;
        while(true) {
            //启动一个线程，休息一下
            Thread.sleep(1000);
            logger.info("value : " + index++);
        }
    }
}
```

- log4j.properties

```
log4j.rootLogger=INFO,stdout

log4j.appender.stdout = org.apache.log4j.ConsoleAppender
log4j.appender.stdout.target = System.out
log4j.appender.stdout.layout=org.apache.log4j.PatternLayout
log4j.appender.stdout.layout.ConversionPattern=%d{yyyy-MM-dd HH:mm:ss,SSS}
[%t] [%c] [%p] - %m%n
```

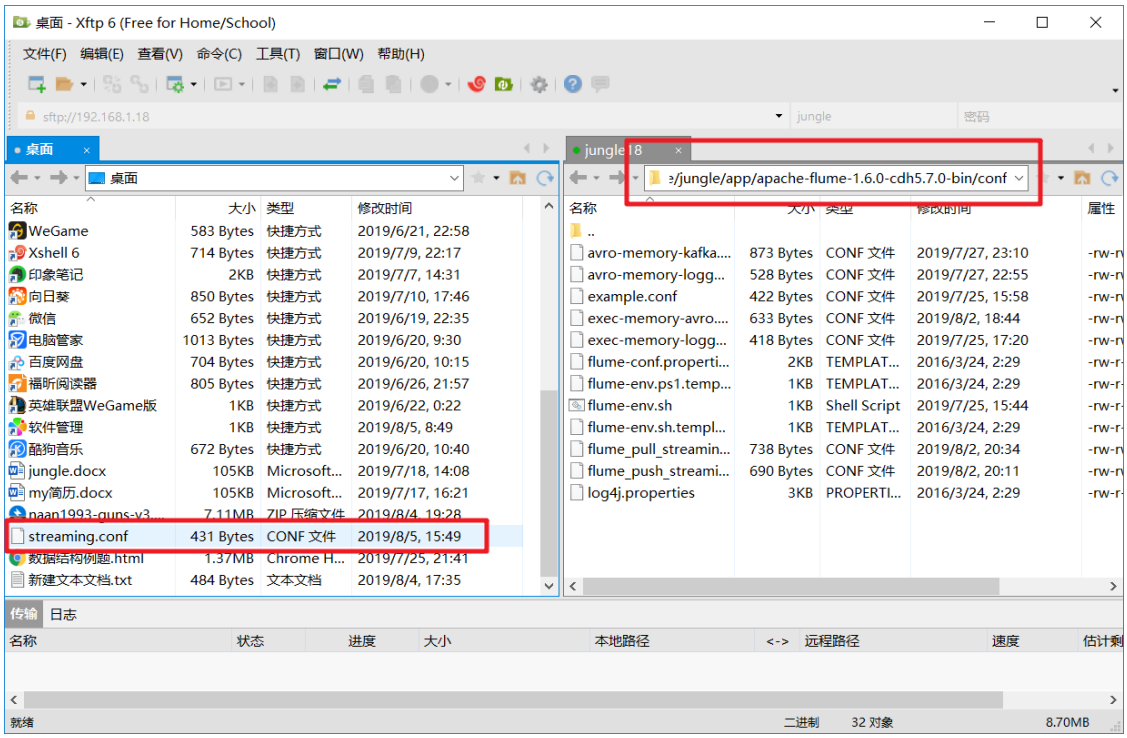
- 效果

```
2019-08-05 15:33:24,244 [main] [LoggerGenerator] [INFO] - value : 139
2019-08-05 15:33:25,244 [main] [LoggerGenerator] [INFO] - value : 140
2019-08-05 15:33:26,245 [main] [LoggerGenerator] [INFO] - value : 141
2019-08-05 15:33:27,245 [main] [LoggerGenerator] [INFO] - value : 142
2019-08-05 15:33:28,245 [main] [LoggerGenerator] [INFO] - value : 143
2019-08-05 15:33:29,245 [main] [LoggerGenerator] [INFO] - value : 144
2019-08-05 15:33:30,246 [main] [LoggerGenerator] [INFO] - value : 145
2019-08-05 15:33:31,246 [main] [LoggerGenerator] [INFO] - value : 146
2019-08-05 15:33:32,246 [main] [LoggerGenerator] [INFO] - value : 147
2019-08-05 15:33:33,247 [main] [LoggerGenerator] [INFO] - value : 148
2019-08-05 15:33:34,247 [main] [LoggerGenerator] [INFO] - value : 149
2019-08-05 15:33:35,248 [main] [LoggerGenerator] [INFO] - value : 150
2019-08-05 15:33:36,248 [main] [LoggerGenerator] [INFO] - value : 151
2019-08-05 15:33:37,248 [main] [LoggerGenerator] [INFO] - value : 152
2019-08-05 15:33:38,249 [main] [LoggerGenerator] [INFO] - value : 153
2019-08-05 15:33:39,249 [main] [LoggerGenerator] [INFO] - value : 154
2019-08-05 15:33:40,250 [main] [LoggerGenerator] [INFO] - value : 155
2019-08-05 15:33:41,251 [main] [LoggerGenerator] [INFO] - value : 156
2019-08-05 15:33:42,252 [main] [LoggerGenerator] [INFO] - value : 157
2019-08-05 15:33:43,252 [main] [LoggerGenerator] [INFO] - value : 158
2019-08-05 15:33:44,252 [main] [LoggerGenerator] [INFO] - value : 159
```

四、使用Flume采集Log4j产生的日志

- streaming.conf

```
agent1.sources=avro-source
agent1.channels=logger-channel
agent1.sinks=log-sink

#define source
agent1.sources.avro-source.type=avro
agent1.sources.avro-source.bind=0.0.0.0
agent1.sources.avro-source.port=41414

#define channel
agent1.channels.logger-channel.type=memory

#define sink
agent1.sinks.log-sink.type=logger

agent1.sources.avro-source.channels=logger-channel
agent1.sinks.log-sink.channel=logger-channel
```



- 启动flume

```
flume-ng agent \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/streaming.conf \
--name agent1 \
-Dflume.root.logger=INFO,console
```

- 修改log4j.properties

```
log4j.rootLogger=INFO,stdout,flume

log4j.appender.stdout = org.apache.log4j.ConsoleAppender
log4j.appender.stdout.target = System.out
log4j.appender.stdout.layout=org.apache.log4j.PatternLayout
log4j.appender.stdout.layout.ConversionPattern=%d{yyyy-MM-dd HH:mm:ss,SSS}
[%t] [%c] [%p] - %m%n


log4j.appender.flume = org.apache.flume.clients.log4jappender.Log4jAppender
log4j.appender.flume.Hostname = 192.168.1.18
log4j.appender.flume.Port = 41414
log4j.appender.flume.UnsafeMode = true
```

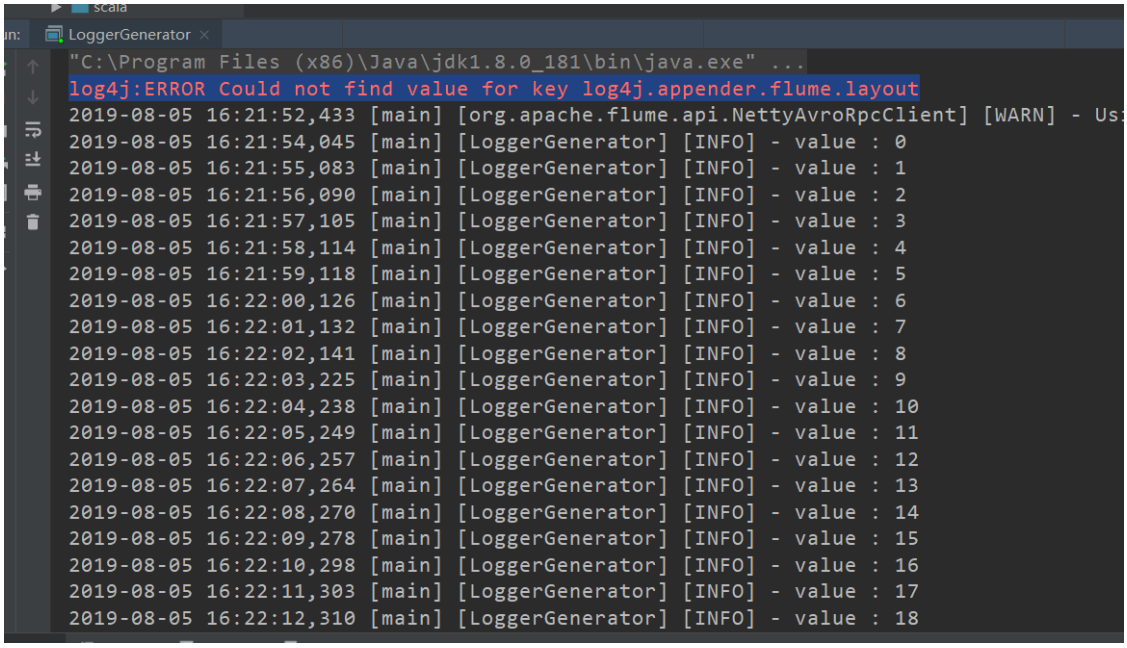
- 添加依赖

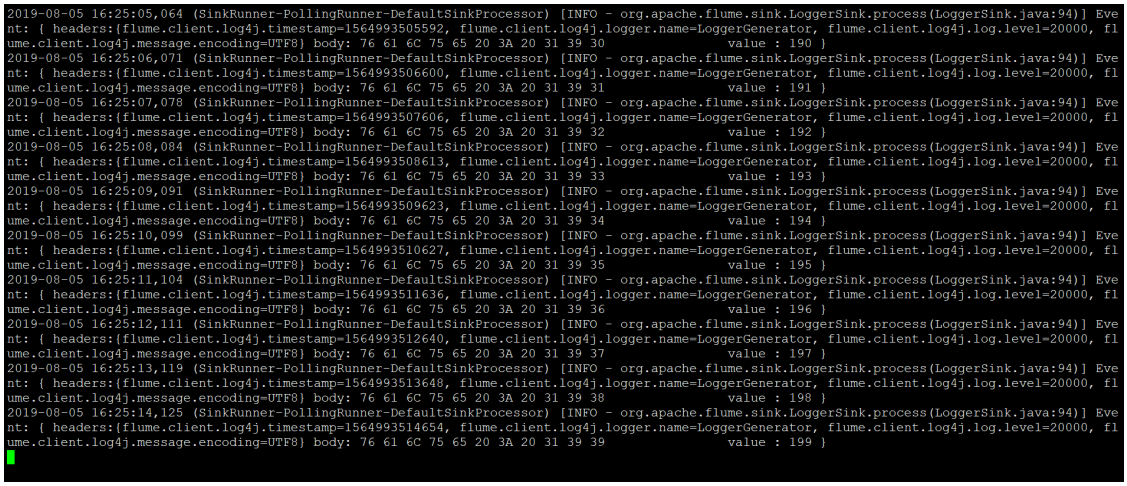
```
<dependency>
            <groupId>org.apache.flume.flume-ng-clients</groupId>
            <artifactId>flume-ng-log4jappender</artifactId>
            <version>1.6.0</version>
        </dependency>
```

- 程序

```
import org.apache.log4j.Logger;

/**
 * 模拟日志产生
 */
public class LoggerGenerator {

    private static Logger logger =
Logger.getLogger(LoggerGenerator.class.getName());

    public static void main(String[] args) throws Exception{

        int index = 0;
        while(true) {
            //启动一个线程，休息一下
            Thread.sleep(1000);
            logger.info("value : " + index++);
        }
    }
}
```

- 效果





五、使用KafkaSInk将Flume收集到的数据输出到Kafka

1. 启动zookeeper
2. 启动Kafka
3. 创建topic

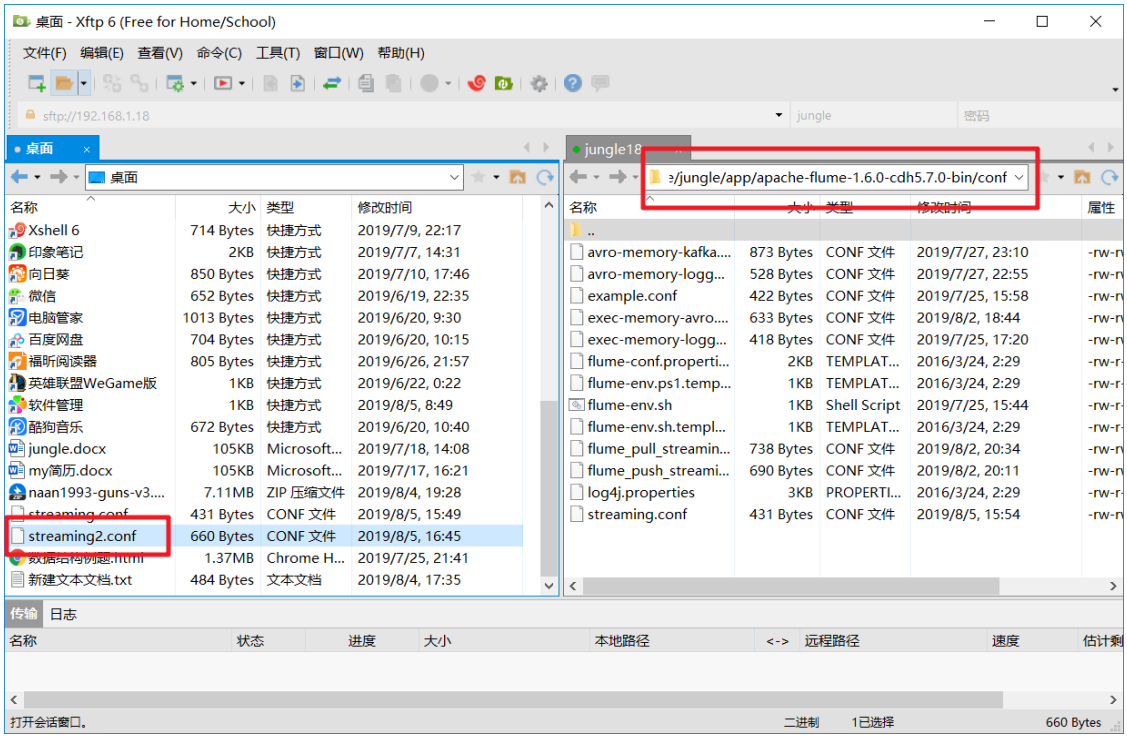
```
kafka-topics.sh --create --zookeeper centosserver1:2181 --replication-factor
1 --partitions 1 --topic streamingtopic
```

```
kafka-topics.sh --list --zookeeper centosserver1:2181
```

4. streaming2.conf

```
agent1.sources=avro-source
agent1.channels=logger-channel
agent1.sinks=kafka-sink

#define source
agent1.sources.avro-source.type=avro
agent1.sources.avro-source.bind=0.0.0.0
agent1.sources.avro-source.port=41414
```

```
#define channel
agent1.channels.logger-channel.type=memory

#define sink
agent1.sinks.kafka-sink.type=org.apache.flume.sink.kafka.KafkaSink
agent1.sinks.kafka-sink.topic = streamingtopic
agent1.sinks.kafka-sink.brokerList = centosserver1:9092
agent1.sinks.kafka-sink..requiredAcks = 1
agent1.sinks.kafka-sink.batchSize = 20


agent1.sources.avro-source.channels=logger-channel
agent1.sinks.kafka-sink.channel=logger-channel
```



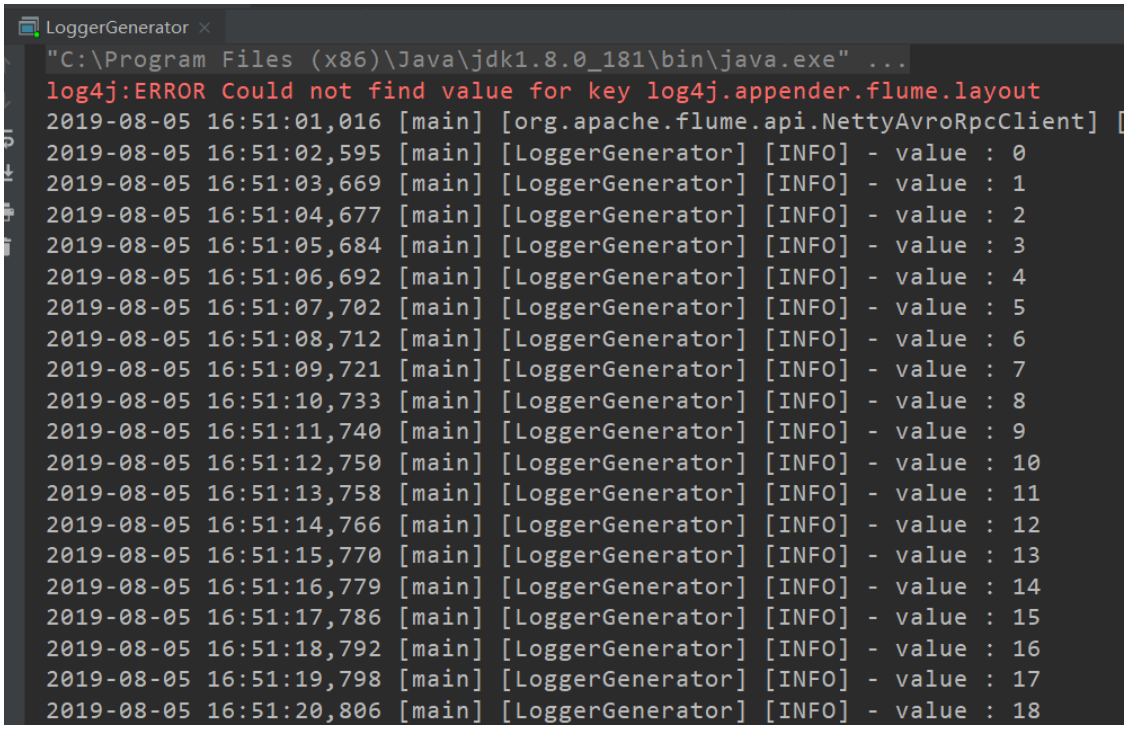
5. 启动flume

```
flume-ng agent \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/streaming2.conf \
--name agent1 \
-Dflume.root.logger=INFO,console
```

6. Kafka消费端

```
kafka-console-consumer.sh --zookeeper centosserver1:2181 --topic
streamingtopic
```

7. 效果



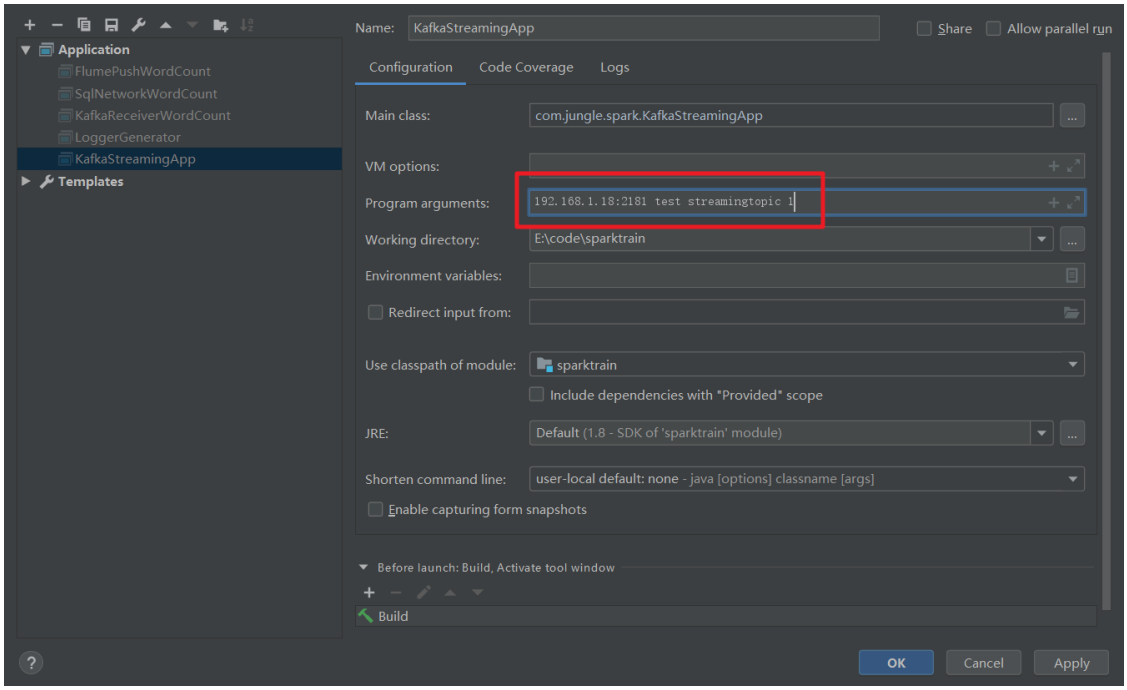
六、Spark Streaming消费Kafka的数据进行统计

1. KafkaStreamingApp

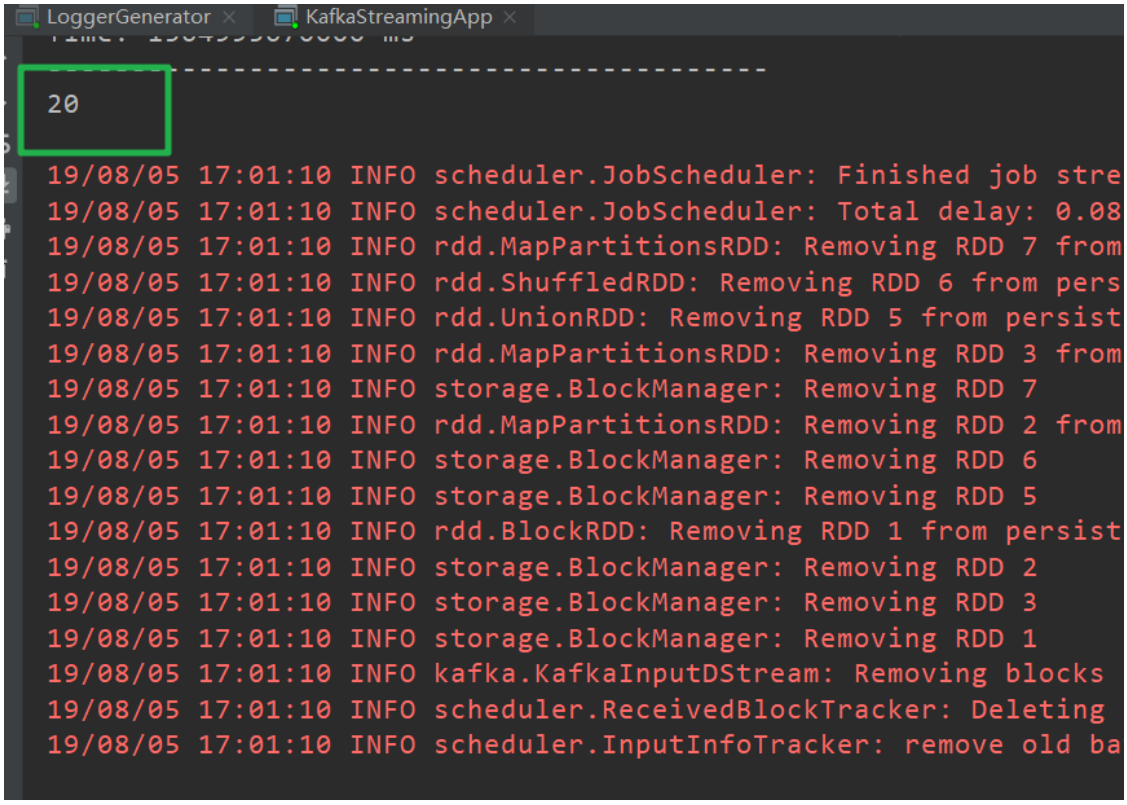
```
package com.jungle.spark

import org.apache.spark.SparkConf
import org.apache.spark.streaming.kafka.KafkaUtils
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * Spark Streaming对接Kafka
  */
object KafkaStreamingApp {

  def main(args: Array[String]): Unit = {

    if(args.length != 4) {
      System.err.println("Usage: KafkaStreamingApp <zkQuorum> <group>
<topics> <numThreads>")
    }

    val Array(zkQuorum, group, topics, numThreads) = args

    val sparkConf = new SparkConf().setAppName("KafkaReceiverWordCount")
```

```
      .setMaster("local[2]")

    val ssc = new StreamingContext(sparkConf, Seconds(5))

    val topicMap = topics.split(",").map((_, numThreads.toInt)).toMap

    // TODO... Spark Streaming如何对接Kafka
    val messages = KafkaUtils.createStream(ssc, zkQuorum, group,topicMap)

    // TODO... 自己去测试为什么要取第二个
    messages.map(_._2).count().print()

    ssc.start()
    ssc.awaitTermination()
  }
}
```

2. 本地测试




```
192.168.1.18:2181 test streamingtopic 1
```



七、本地测试和生产环境使用的拓展

```
我们现在是在本地进行测试的，在IDEA中运行LoggerGenerator，
然后使用Flume、Kafka以及Spark Streaming进行处理操作。

在生产上肯定不是这么干的，怎么干呢？
1）打包jar，执行LoggerGenerator类
2）Flume、Kafka和我们的测试是一样的
3）Spark Streaming的代码也是需要打成jar包，然后使用spark-submit的方式进
    可以根据你们的实际情况选择运行模式：local/yarn/standalone/mesos

在生产上，整个流处理的流程都一样的，区别在于业务逻辑的复杂性
```

第12章 Spark Streaming项目实战

一、Python日志产生器开发

1.产生访问url和ip信息

```
#coding=UTF-8
import random

url_paths = [
    "class/112.html",
    "class/118.html",
    "class/145.html",
    "class/146.html",
    "class/131.html",
    "class/110.html",
    "learn/821",
    "course/list"
```

```
]

ip_slices = [132,156,124,10,29,167,143,187,30,46,55,63,72,87,98,168]

def sample_url():
    return random.sample(url_paths,1)[0]

def sample_ip():
    slice = random.sample(ip_slices,4)
    return ".".join([str(item) for item in slice])

def generate_log(count = 10):
    while count >= 1:
        query_log = "{url}\t{ip}".format(url=sample_url(),ip=sample_ip())
        print(query_log)
        count = count -1

if __name__=='__main__':
    generate_log()
```

2.产生referer和状态码信息

```
#coding=UTF-8
import random

url_paths = [
    "class/112.html",
    "class/118.html",
    "class/145.html",
    "class/146.html",
    "class/131.html",
    "class/110.html",
    "learn/821",
    "course/list"
]

ip_slices = [132,156,124,10,29,167,143,187,30,46,55,63,72,87,98,168]

http_referers =[
    "http://www.baidu.com/s?wd={query}",
    "https://www.sogou.com/web?query={query}",
    "http://cn.bing.com/search?q={query}",
    "http://www.baidu.com/s?wd={query}",
    "https://search.yahoo.com/search?p={query}",
]

search_keyword = [
    "Spark实战",
    "Hadoop基础",
    "Storm实战",
    "Spark streaming实战",
    "大数据面试"
]
status_codes = ["200","404","500"]

def sample_url():
    return random.sample(url_paths,1)[0]
```

```
def sample_ip():
    slice = random.sample(ip_slices,4)
    return ".".join([str(item) for item in slice])

def sample_referer():
    if random.uniform(0,1) > 0.2:
        return "-"

    refer_str = random.sample(http_referers,1)
    query_str = random.sample(search_keyword,1)
    return refer_str[0].format(query=query_str[0])

def sample_status_code():
    return random.sample(status_codes,1)[0]

def generate_log(count = 10):
    while count >= 1:
        query_log = "
{url}\t{ip}\t{referer}\t{status_code}".format(url=sample_url(),ip=sample_ip(),re
ferer=sample_referer(),status_code=sample_status_code())
        print(query_log)
        count = count -1

if __name__=='__main__':
    generate_log(100)
```

3.产生日志访问时间

```
#coding=UTF-8
import random
import time

url_paths = [
    "class/112.html",
    "class/118.html",
    "class/145.html",
    "class/146.html",
    "class/131.html",
    "class/110.html",
    "learn/821",
    "course/list"
]

ip_slices = [132,156,124,10,29,167,143,187,30,46,55,63,72,87,98,168]

http_referers =[
    "http://www.baidu.com/s?wd={query}",
    "https://www.sogou.com/web?query={query}",
    "http://cn.bing.com/search?q={query}",
    "http://www.baidu.com/s?wd={query}",
    "https://search.yahoo.com/search?p={query}",
]

search_keyword = [
    "Spark实战",
    "Hadoop基础",
```

```
    "Storm实战",
    "Spark streaming实战",
    "大数据面试"
]
status_codes = ["200","404","500"]

def sample_url():
    return random.sample(url_paths,1)[0]

def sample_ip():
    slice = random.sample(ip_slices,4)
    return ".".join([str(item) for item in slice])

def sample_referer():
    if random.uniform(0,1) > 0.2:
        return "-"

    refer_str = random.sample(http_referers,1)
    query_str = random.sample(search_keyword,1)
    return refer_str[0].format(query=query_str[0])

def sample_status_code():
    return random.sample(status_codes,1)[0]

def generate_log(count = 10):
    time_str = time.strftime("%Y-%m-%d %H:%M:%S",time.localtime())
    while count >= 1:
        query_log = "
{local_time}\t{url}\t{ip}\t{referer}\t{status_code}".format(url=sample_url(),ip=
sample_ip(),referer=sample_referer(),status_code=sample_status_code(),local_time
=time_str)
        print(query_log)
        count = count -1

if __name__=='__main__':
    generate_log()
```

4.服务器测试并将日志写入到文件中

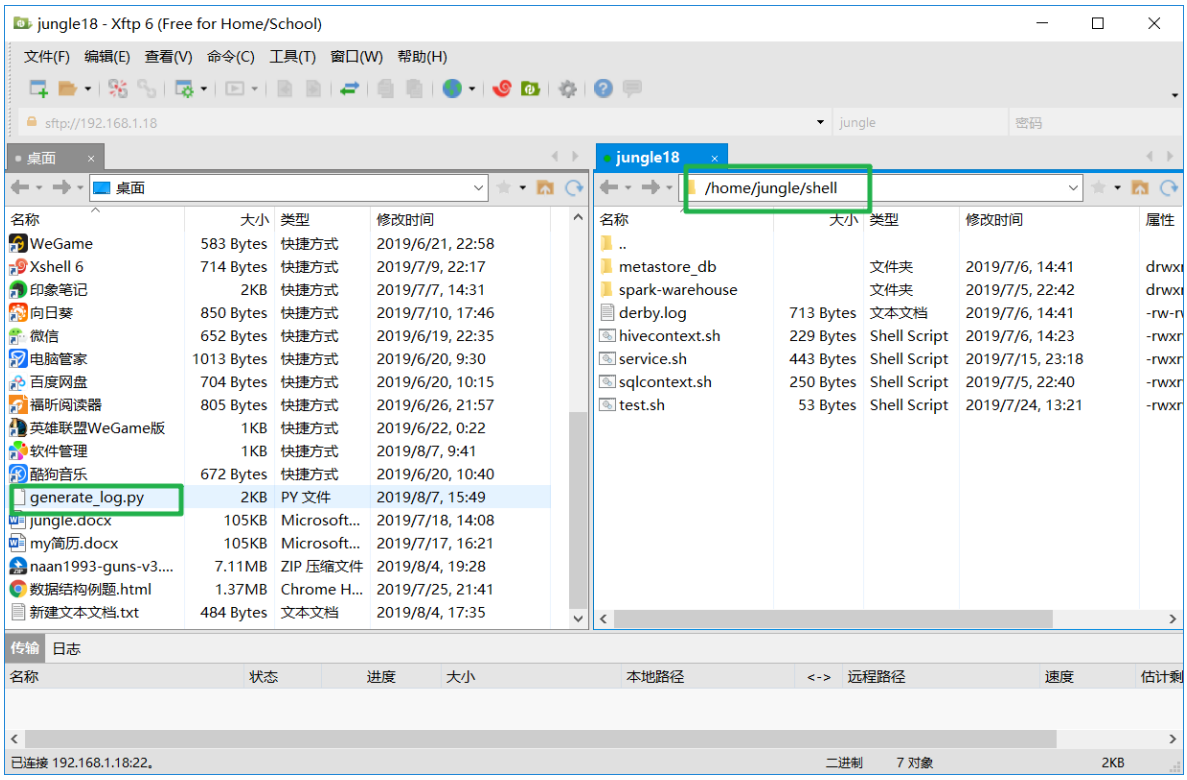
```
#coding=UTF-8
import random
import time

url_paths = [
    "class/112.html",
    "class/118.html",
    "class/145.html",
    "class/146.html",
    "class/131.html",
    "class/110.html",
    "learn/821",
    "course/list"
]

ip_slices = [132,156,124,10,29,167,143,187,30,46,55,63,72,87,98,168]

http_referers =[
```

```
    "http://www.baidu.com/s?wd={query}",
    "https://www.sogou.com/web?query={query}",
    "http://cn.bing.com/search?q={query}",
    "http://www.baidu.com/s?wd={query}",
    "https://search.yahoo.com/search?p={query}",
]

search_keyword = [
    "Spark实战",
    "Hadoop基础",
    "Storm实战",
    "Spark streaming实战",
    "大数据面试"
]
status_codes = ["200","404","500"]

def sample_url():
    return random.sample(url_paths,1)[0]

def sample_ip():
    slice = random.sample(ip_slices,4)
    return ".".join([str(item) for item in slice])

def sample_referer():
    if random.uniform(0,1) > 0.2:
        return "-"

    refer_str = random.sample(http_referers,1)
    query_str = random.sample(search_keyword,1)
    return refer_str[0].format(query=query_str[0])

def sample_status_code():
    return random.sample(status_codes,1)[0]

def generate_log(count = 10):
    time_str = time.strftime("%Y-%m-%d %H:%M:%S",time.localtime())
    f = open("/home/jungle/data/project/logs/access.log","w+")
    while count >= 1:
        query_log = "
{local_time}\t{url}\t{ip}\t{referer}\t{status_code}".format(url=sample_url(),ip=
sample_ip(),referer=sample_referer(),status_code=sample_status_code(),local_time
=time_str)
        print(query_log)

        f.write(query_log + "\n")
        count = count -1

if __name__=='__main__':
    generate_log()
```

==新建文件夹文件==

```
cd data
sudo mkdir -p ./project/logs
cd  project/logs
touch access.log
```

==上传py脚本==




```
python generate_log.py
```

```
jungle@centosserver1:[/home/jungle/shell]python generate_log.py
2019-%m-07 15:56:45     class/131.html  132.187.124.168 -       200
2019-%m-07 15:56:45     class/112.html  132.187.143.98  -       500
2019-%m-07 15:56:45     learn/821       30.156.167.98   -       404
2019-%m-07 15:56:45     class/146.html  124.46.55.143   -       404
2019-%m-07 15:56:45     class/118.html  156.124.98.187  https://www.sogou.com/web?query=大数据面试      404
2019-%m-07 15:56:45     learn/821       30.132.87.168   -       200
2019-%m-07 15:56:45     class/145.html  167.143.168.10  -       500
2019-%m-07 15:56:45     class/118.html  187.132.10.29   -       200
2019-%m-07 15:56:45     class/131.html  132.156.30.46   -       500
2019-%m-07 15:56:45     class/131.html  29.55.72.87     -       404
jungle@centosserver1:[/home/jungle/shell]
```

```
# 查看数据条数
wc -l access.log
```

==对日志进行微调==

```
#coding=UTF-8
import random
import time

url_paths = [
    "class/112.html",
    "class/118.html",
    "class/145.html",
    "class/146.html",
    "class/131.html",
    "class/110.html",
    "learn/821",
    "course/list"
]

ip_slices = [132,156,124,10,29,167,143,187,30,46,55,63,72,87,98,168]
```

```
http_referers =[
    "http://www.baidu.com/s?wd={query}",
    "https://www.sogou.com/web?query={query}",
    "http://cn.bing.com/search?q={query}",
    "http://www.baidu.com/s?wd={query}",
    "https://search.yahoo.com/search?p={query}",
]

search_keyword = [
    "Spark实战",
    "Hadoop基础",
    "Storm实战",
    "Spark streaming实战",
    "大数据面试"
]
status_codes = ["200","404","500"]

def sample_url():
    return random.sample(url_paths,1)[0]

def sample_ip():
    slice = random.sample(ip_slices,4)
    return ".".join([str(item) for item in slice])

def sample_referer():
    if random.uniform(0,1) > 0.2:
        return "-"

    refer_str = random.sample(http_referers,1)
    query_str = random.sample(search_keyword,1)
    return refer_str[0].format(query=query_str[0])

def sample_status_code():
    return random.sample(status_codes,1)[0]

def generate_log(count = 10):
    time_str = time.strftime("%Y-%m-%d %H:%M:%S",time.localtime())
    f = open("/home/jungle/data/project/logs/access.log","w+")
    while count >= 1:
        query_log = "{ip}\t{local_time}\t\"GET /{url}
HTTP/1.1\"\t{status_code}\t{referer}".format(url=sample_url(),ip=sample_ip(),ref
erer=sample_referer(),status_code=sample_status_code(),local_time=time_str)
        print(query_log)

        f.write(query_log + "\n")
        count = count -1

if __name__=='__main__':
    generate_log()
```

5.定时调度工具

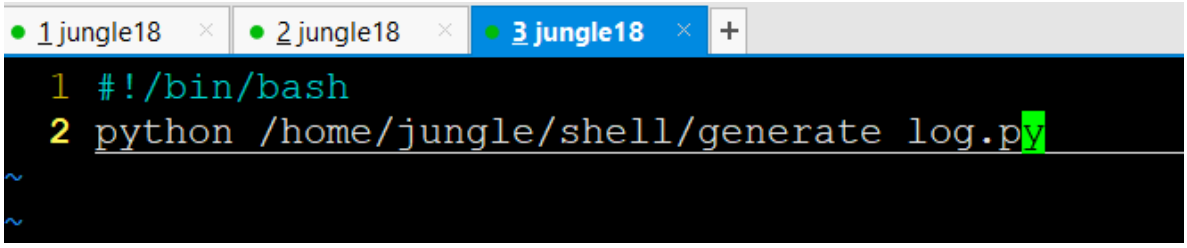
==每一分钟产生一批数据==

crontab

- 新建脚本

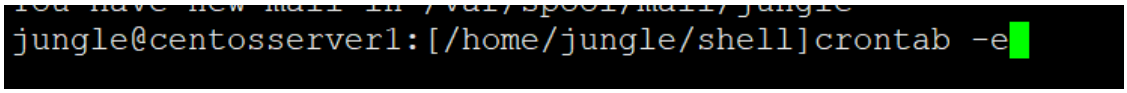
```
touch log_generator.sh
chmod u+x log_generator.sh
```

```
#!/bin/bash
python /home/jungle/shell/generate_log.py
```

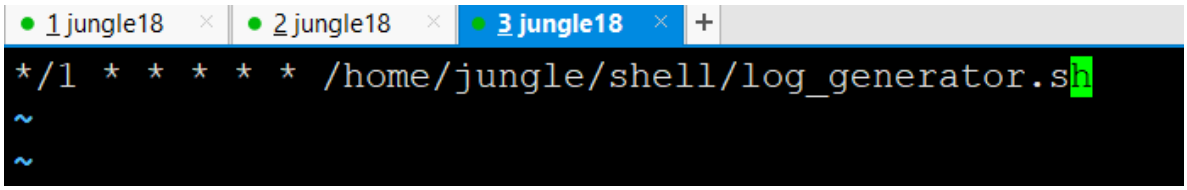


- 定时任务

```
crontab -e
```




```
*/1 * * * * sh /home/jungle/shell/log_generator.sh
```



二、使用Flume实时收集日志信息

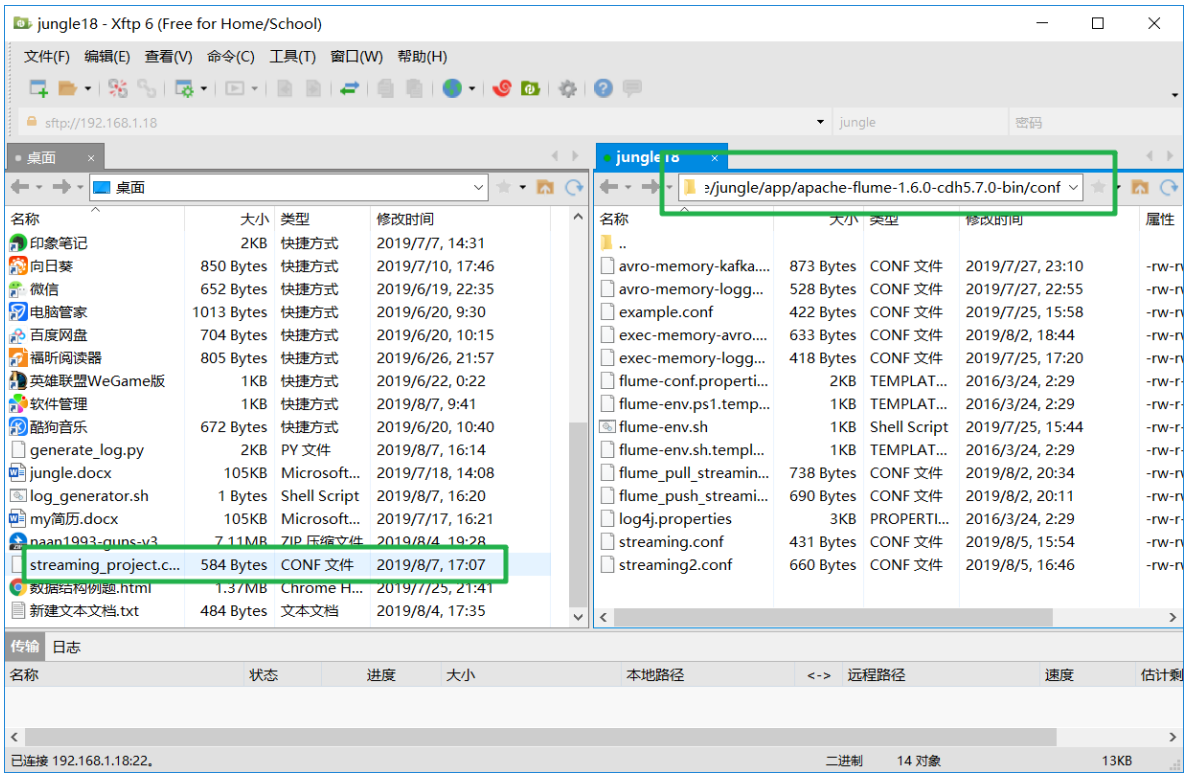
```
选型：access.log ==> 控制台输出
    exec
    memory
    logger
```

- streaming_project.conf

```
exec-memory-logger.sources = exec-source
exec-memory-logger.sinks = logger-sink
exec-memory-logger.channels = memory-channel

exec-memory-logger.sources.exec-source.type = exec
exec-memory-logger.sources.exec-source.command = tail -F
/home/jungle/data/project/logs/access.log
exec-memory-logger.sources.exec-source.shell = /bin/sh -c

exec-memory-logger.channels.memory-channel.type = memory

exec-memory-logger.sinks.logger-sink.type = logger

exec-memory-logger.sources.exec-source.channels = memory-channel
exec-memory-logger.sinks.logger-sink.channel = memory-channel
```

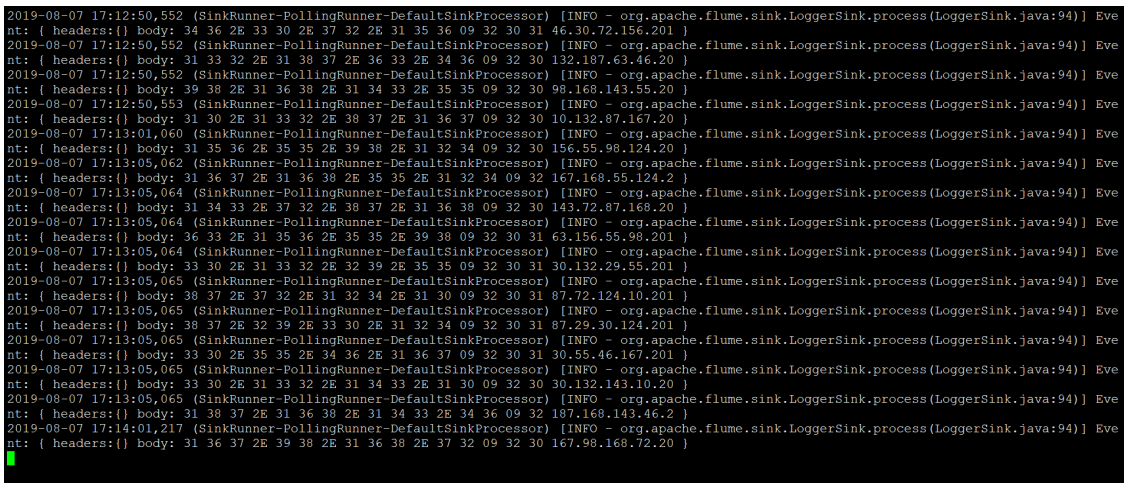
==上传服务器==

```
cd $FLUME_HOME/conf
```



- 启动flume

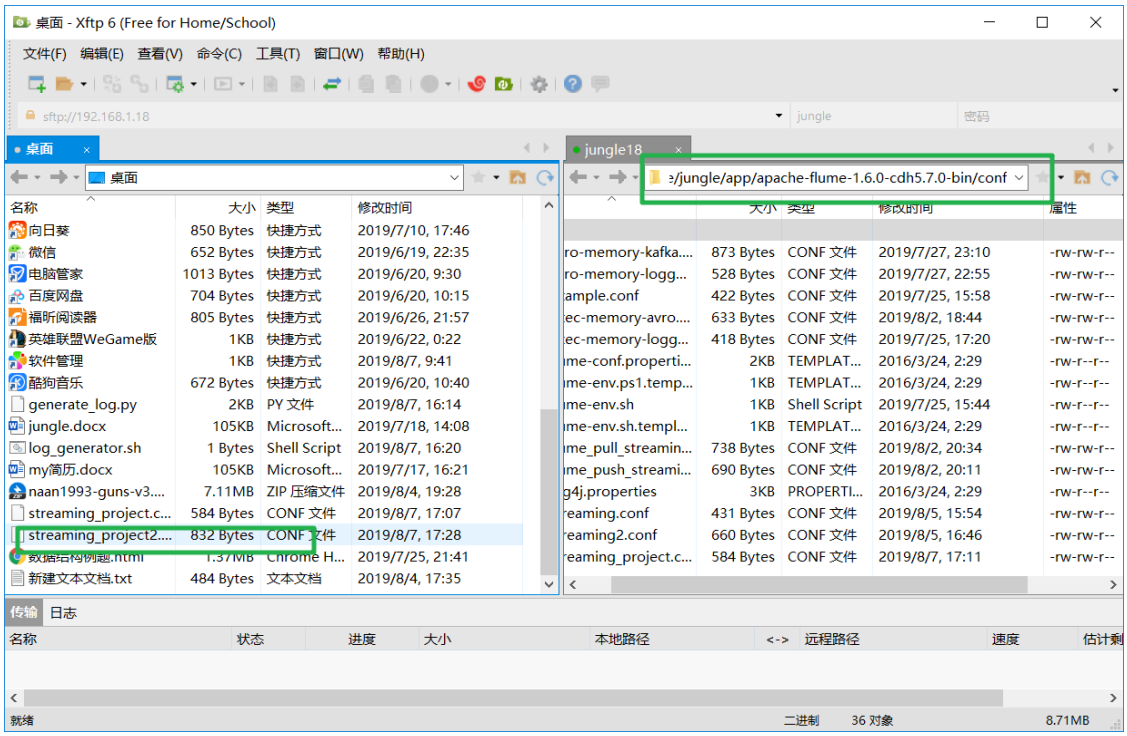
```
flume-ng agent \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/streaming_project.conf \
--name exec-memory-logger \
-Dflume.root.logger=INFO,console
```



三、对接实时日志数据到Kafka并输出到控制台测试

1. 启动zookeeper
2. 启动kafka
3. 修改flume配置文件（对接kafka）
    - streaming_project2.conf

```
exec-memory-kafka.sources = exec-source
exec-memory-kafka.sinks = kafka-sink
exec-memory-kafka.channels = memory-channel

exec-memory-kafka.sources.exec-source.type = exec
exec-memory-kafka.sources.exec-source.command = tail -F
/home/jungle/data/project/logs/access.log
exec-memory-kafka.sources.exec-source.shell = /bin/sh -c

exec-memory-kafka.channels.memory-channel.type = memory

exec-memory-kafka.sinks.kafka-sink.type =
org.apache.flume.sink.kafka.KafkaSink
exec-memory-kafka.sinks.kafka-sink.brokerList = centosserver1:9092
exec-memory-kafka.sinks.kafka-sink.topic = streamingtopic
exec-memory-kafka.sinks.kafka-sink.batchSize = 5
exec-memory-kafka.sinks.kafka-sink.requiredAcks = 1

exec-memory-kafka.sources.exec-source.channels = memory-channel
exec-memory-kafka.sinks.kafka-sink.channel = memory-channel
```



4. Kafka消费者

```
kafka-console-consumer.sh --zookeeper centosserver1:2181 --topic
streamingtopic
```

5. 启动flume

```
flume-ng agent \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/streaming_project2.conf \
--name exec-memory-kafka \
-Dflume.root.logger=INFO,console
```

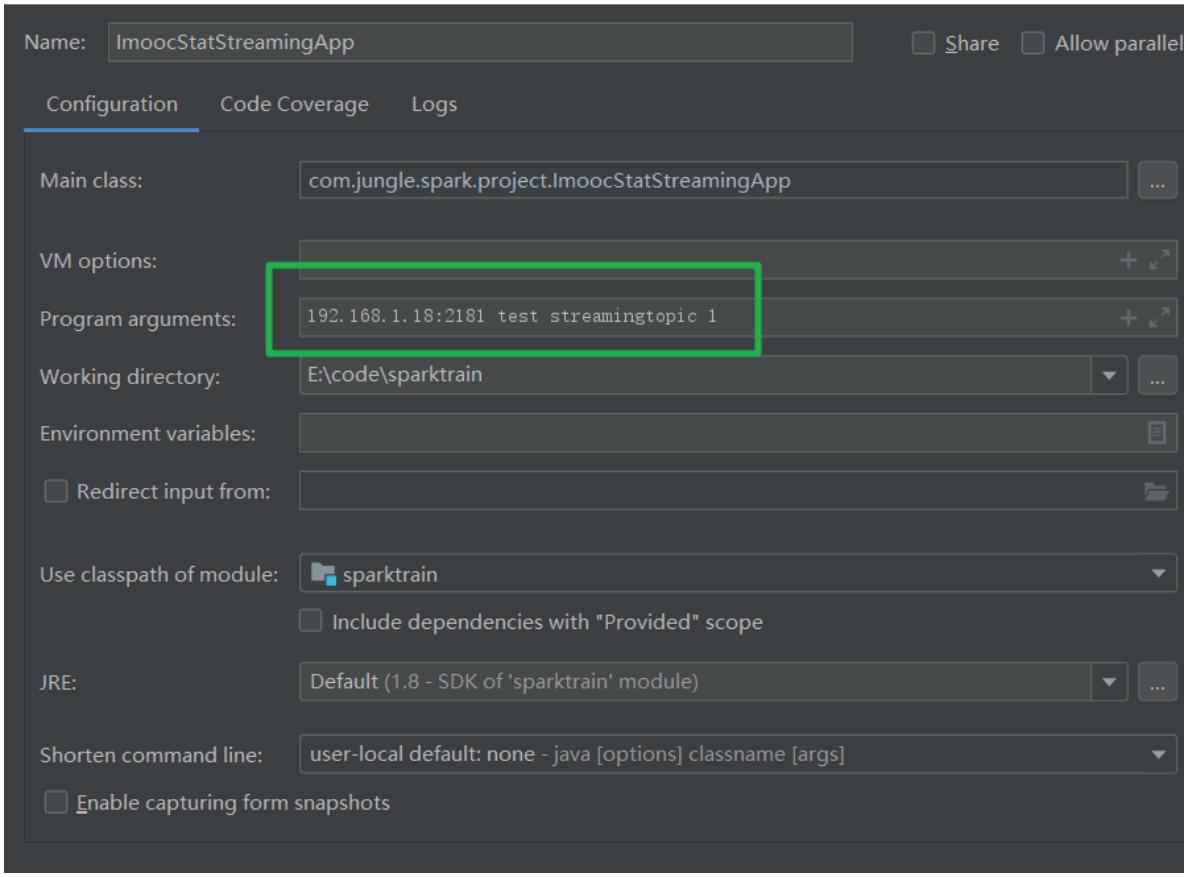
```
You have new mail in /var/spool/mail/jungle
jungle@centosserver1:[/home/jungle/data/project/logs]kafka-console-consumer.sh --zookeeper centosserver1:2181 --topic streamingtopic
168.30.143.63   2019-08-07 17:30:01     "GET /class/131.html HTTP/1.1"  500     https://search.yahoo.com/search?p=Spark实战
10.63.55.167    2019-08-07 17:30:01     "GET /class/145.html HTTP/1.1"  404     -
143.132.10.167  2019-08-07 17:30:01     "GET /learn/821 HTTP/1.1"       200     -
30.168.132.167  2019-08-07 17:30:01     "GET /class/131.html HTTP/1.1"  404     -
30.46.156.63    2019-08-07 17:30:01     "GET /learn/821 HTTP/1.1"       404     -
168.143.98.46   2019-08-07 17:30:01     "GET /class/112.html HTTP/1.1"  404     -
187.167.10.98   2019-08-07 17:30:01     "GET /class/146.html HTTP/1.1"  200     http://www.baidu.com/s?wd=Spark streaming实战
53.55.156.167   2019-08-07 17:30:01     "GET /class/146.html HTTP/1.1"  500     -
143.168.55.167  2019-08-07 17:30:01     "GET /course/list HTTP/1.1"     404     -
124.87.167.30   2019-08-07 17:30:01     "GET /class/110.html HTTP/1.1"  200     http://www.baidu.com/s?wd=Spark streaming实战
```

四、Spark Streaming对接Kafka的数据进行消费

◆ 在Spark应用程序接收到数据并完成记录数统计

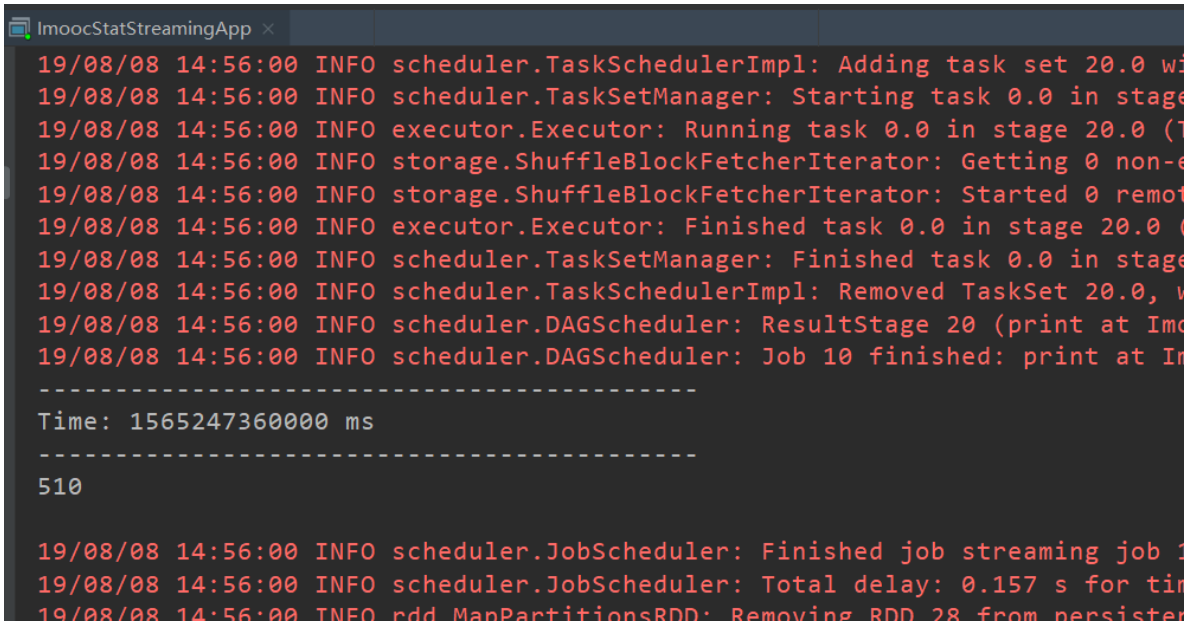
- 程序

```
package com.jungle.spark.project

import org.apache.spark.SparkConf
import org.apache.spark.streaming.StreamingContext
import org.apache.spark.streaming.Seconds
import org.apache.spark.streaming.kafka.KafkaUtils


/**
  * 使用Spark Streaming处理Kafka过来的数据
  */
object ImoocStatStreamingApp {

  def main(args: Array[String]): Unit = {

    if (args.length != 4) {
      println("Usage: ImoocStatStreamingApp <zkQuorum> <group> <topics>
<numThreads>")
      System.exit(1)
    }

    val Array(zkQuorum, groupId, topics, numThreads) = args

    val sparkConf = new
SparkConf().setAppName("ImoocStatStreamingApp").setMaster("local[2]")
    val ssc = new StreamingContext(sparkConf, Seconds(60))

    val topicMap = topics.split(",").map((_, numThreads.toInt)).toMap

    val messages = KafkaUtils.createStream(ssc, zkQuorum, groupId, topicMap)

    // 测试步骤一：测试数据接收
    messages.map(_._2).count().print

    ssc.start()
    ssc.awaitTermination()
  }
}
```




```
192.168.1.18:2181 test streamingtopic 1
```

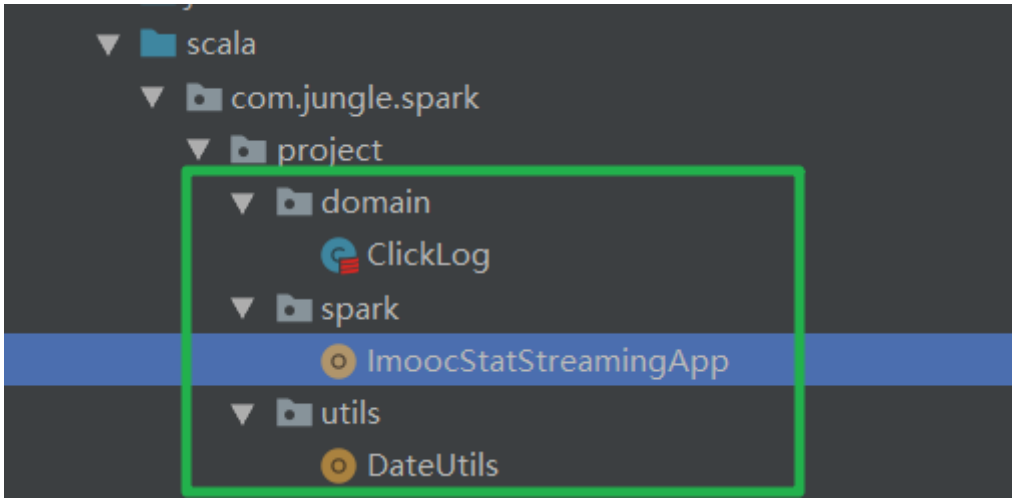
==效果==



五、使用Spark Streaming完成数据清洗操作

```
数据清洗操作：从原始日志中取出我们所需要的字段信息就可以了

数据清洗结果类似如下：
ClickLog(46.30.10.167,20171022151701,128,200,-)
ClickLog(143.132.168.72,20171022151701,131,404,-)
ClickLog(10.55.168.87,20171022151701,131,500,-)
ClickLog(10.124.168.29,20171022151701,128,404,-)
ClickLog(98.30.87.143,20171022151701,131,404,-)
ClickLog(55.10.29.132,20171022151701,146,404,http://www.baidu.
ClickLog(10.87.55.30,20171022151701,130,200,http://www.baidu.c
ClickLog(156.98.29.30,20171022151701,146,500,https://www.sogou.
ClickLog(10.72.87.124,20171022151801,146,500,-)
ClickLog(72.124.167.156,20171022151801,112,404,-)
```

- 目录结构



- ImoocStatStreamingApp

```
package com.jungle.spark.project.spark

import com.jungle.spark.project.domain.ClickLog
import com.jungle.spark.project.utils.DateUtils
import org.apache.spark.SparkConf
import org.apache.spark.streaming.kafka.KafkaUtils
import org.apache.spark.streaming.{Seconds, StreamingContext}

/**
  * 使用Spark Streaming处理Kafka过来的数据
  */
object ImoocStatStreamingApp {

  def main(args: Array[String]): Unit = {

    if (args.length != 4) {
      println("Usage: ImoocStatStreamingApp <zkQuorum> <group> <topics>
<numThreads>")
      System.exit(1)
    }

    val Array(zkQuorum, groupId, topics, numThreads) = args

    val sparkConf = new
SparkConf().setAppName("ImoocStatStreamingApp").setMaster("local[2]")
```

```
    val ssc = new StreamingContext(sparkConf, Seconds(60))

    val topicMap = topics.split(",").map((_, numThreads.toInt)).toMap

    val messages = KafkaUtils.createStream(ssc, zkQuorum, groupId, topicMap)

//    messages.print

    // 测试步骤一：测试数据接收
//    messages.map(_._2).count().print
//    messages.map(_._2).print

    // 测试步骤二：数据清洗
    val logs = messages.map(_._2)
    val cleanData = logs.map(line => {
      val infos = line.split("\t")

      // infos(2) = "GET /class/130.html HTTP/1.1"
      // url = /class/130.html
      val url = infos(2).split(" ")(1)
      var courseId = 0

      // 把实战课程的课程编号拿到了
      if (url.startsWith("/class")) {
        val courseIdHTML = url.split("/")(2)
        courseId = courseIdHTML.substring(0,
courseIdHTML.lastIndexOf(".")).toInt
      }

      ClickLog(infos(0), DateUtils.parseToMinute(infos(1)), courseId,
infos(3).toInt, infos(4))
    }).filter(clicklog => clicklog.courseId != 0)


        cleanData.print()

    ssc.start()
    ssc.awaitTermination()


  }
}
```

```
// 测试步骤二：数据清洗
val logs = messages.map(_._2)
val cleanData = logs.map(line => {
  val infos = line.split( regex = "\t")

  // infos(2) = "GET /class/130.html HTTP/1.1"
  // url = /class/130.html
  val url = infos(2).split( regex = " ")(1)
  var courseId = 0

  // 把实战课程的课程编号拿到了
  if (url.startsWith("/class")) {
    val courseIdHTML = url.split( regex = "/")(2)
    courseId = courseIdHTML.substring(0, courseIdHTML.lastIndexOf( str = ".")).toInt
  }

  ClickLog(infos(0), DateUtils.parseToMinute(infos(1)), courseId, infos(3).toInt, infos(4))
}).filter(clicklog => clicklog.courseId != 0)


    cleanData.print()

ssc.start()
ssc.awaitTermination()
```

- DateUtils

```
package com.jungle.spark.project.utils

import java.util.Date

import org.apache.commons.lang3.time.FastDateFormat

/**
  * 日期时间工具类
  */
object DateUtils {

  val YYYYMMDDHHMMSS_FORMAT = FastDateFormat.getInstance("yyyy-MM-dd
HH:mm:ss")
  val TARGE_FORMAT = FastDateFormat.getInstance("yyyyMMddHHmmss")


  def getTime(time: String) = {
    YYYYMMDDHHMMSS_FORMAT.parse(time).getTime
  }

  def parseToMinute(time :String) = {
    TARGE_FORMAT.format(new Date(getTime(time)))
  }
  def main(args: Array[String]): Unit = {
    println(parseToMinute("2017-10-22 14:46:01"))
  }
}
```

- ClickLog

```
package com.jungle.spark.project.domain

/**
  * 清洗后的日志信息
  * @param ip  日志访问的ip地址
  * @param time  日志访问的时间
  * @param courseId  日志访问的实战课程编号
  * @param statusCode 日志访问的状态码
  * @param referer  日志访问的referer
  */
case class ClickLog(ip:String, time:String, courseId:Int, statusCode:Int,
referer:String)
```

==效果==

```
19/08/08 15:34:00 INFO scheduler.TaskSchedulerImpl: Removed TaskSet 1.0, whose ta
19/08/08 15:34:00 INFO scheduler.DAGScheduler: ResultStage 1 (print at ImoocStatS
19/08/08 15:34:00 INFO scheduler.DAGScheduler: Job 1 finished: print at ImoocStat
-------------------------------------------
Time: 1565249640000 ms
-------------------------------------------
ClickLog(98.156.87.55,20190808153301,131,404,-)
ClickLog(98.168.156.143,20190808153301,110,200,-)
ClickLog(29.10.46.98,20190808153301,118,200,-)
ClickLog(87.156.63.30,20190808153301,110,500,-)
ClickLog(156.168.72.87,20190808153301,110,500,-)
ClickLog(132.30.29.168,20190808153301,110,200,-)
ClickLog(30.46.72.87,20190808153301,110,200,-)
ClickLog(156.10.167.143,20190808153301,112,500,-)
ClickLog(143.167.87.187,20190808153301,110,200,-)
ClickLog(72.30.98.10,20190808153301,131,404,http://www.baidu.com/s?wd=Spark实战)
...
```

到数据清洗完为止，日志中只包含了实战课程的日志

六、功能一

1.需求分析及存储结果技术选型分析

功能1:今天到现在为止实战课程的访问量
yyyymmdd courseid
使用数据库来进行存储我们的统计结果
Spark Streaming把统计结果写入到数据库里面
可视化前端根据: yyyymmdd courseid把数据库里面的统计结果展示出来

选择什么数据库作为统计结果的存储呢?
1.RDBMS: MYSQL、 Oracle
    day courseid click count
    20171111 1 10
    20171111 1 10
    下一个批次数据进来以后
    20171111+1==> click_ count+下一个批次的统计结果 ==>写入到数据库中
2.NOSQL: Hbase、 Redis
    Hbase:一个API就能搞定,非常方便
    20171111+1=> click_ count+下一个批次的统计结果
    本次课程为什么要选择 Hbase1的一个原因所在
    前提:
        HDFS

```
        Zookeeper
        Hbase
```

- 启动hbase

```
cd $HBASE_HOME/bin
./start-hbase.sh
```

==进入hbase命令行==

```
cd $HBASE_HOME/bin
./hbase shell
```

```
jungle@centosserver1:[/home/jungle]cd $HBASE_HOME/bin
jungle@centosserver1:[/home/jungle/app/hbase-1.2.0-cdh5.7.0/bin]./hbase shell
2019-08-08 16:00:26,841 INFO  [main] Configuration.deprecation: hadoop.native.lib is
2019-08-08 16:00:28,950 WARN  [main] util.NativeCodeLoader: Unable to load native-had
where applicable
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/home/jungle/app/hbase-1.2.0-cdh5.7.0/lib/slf4j-log
SLF4J: Found binding in [jar:file:/home/jungle/app/hadoop-2.6.0-cdh5.7.0/share/hadoop
ggerBinder.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 1.2.0-cdh5.7.0, rUnknown, Wed Mar 23 11:46:29 PDT 2016

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

```
# 查看表的数量
list
```

```
hbase(main):001:0> list
TABLE
member
1 row(s) in 0.4720 seconds

=> ["member"]
hbase(main):002:0>
```

==Hbase表设计==

```
create 'imooc_course_clickcount','info'
```

```
hbase(main):002:0> create 'imooc_course_clickcount','info'
0 row(s) in 1.3530 seconds

=> Hbase::Table - imooc_course_clickcount
hbase(main):003:0> list
TABLE
imooc_course_clickcount
member
2 row(s) in 0.0030 seconds

=> ["imooc_course_clickcount", "member"]
hbase(main):004:0>
```

```
desc 'imooc_course_clickcount'
```

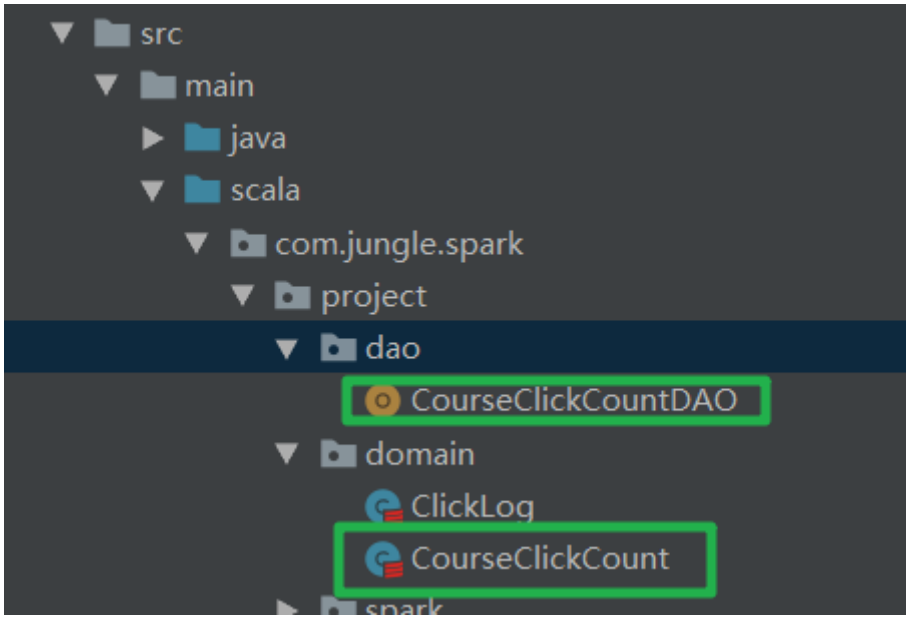
```
hbase(main):004:0> desc 'imooc_course_clickcount'
Table imooc_course_clickcount is ENABLED
imooc_course_clickcount
COLUMN FAMILIES DESCRIPTION
{NAME => 'info', BLOOMFILTER => 'ROW', VERSIONS => '1', IN_MEMORY =>
> 'FOREVER', COMPRESSION => 'NONE', MIN_VERSIONS => '0', BLOCKCACHE =
1 row(s) in 0.3060 seconds
```

```
scan 'imooc_course_clickcount'
```

```
hbase(main):005:0> scan 'imooc_course_clickcount'
ROW                    COLUMN+CELL
0 row(s) in 0.1550 seconds

hbase(main):006:0>
```

```
HBase表设计
    创建表
        create 'imooc_course_clickcount', 'info'
    Rowkey设计
        day_courseid
```

2.数据库访问DAO层方法定义



- CourseClickCount

```
package com.jungle.spark.project.domain

/**
  * 实战课程点击数实体类
  * @param day_course  对应的就是HBase中的rowkey，20171111_1
  * @param click_count 对应的20171111_1的访问总数
  */
case class CourseClickCount(day_course:String, click_count:Long)
```

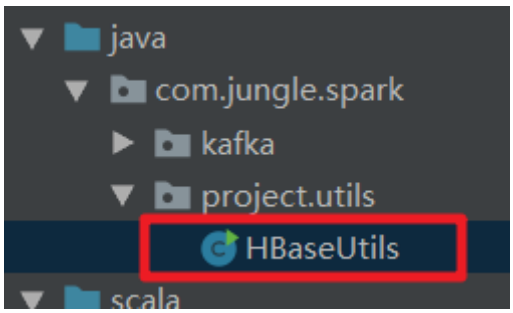
- CourseClickCountDAO

```
package com.jungle.spark.project.dao

import com.jungle.spark.project.domain.CourseClickCount

import scala.collection.mutable.ListBuffer

/**
  * 实战课程点击数-数据访问层
  */
object CourseClickCountDAO {

  val tableName = "imooc_course_clickcount"
  val cf = "info"
  val qualifer = "click_count"

  /**
    * 保存数据到HBase
    * @param list  CourseClickCount集合
    */
  def save(list: ListBuffer[CourseClickCount]): Unit = {

  }

  /**
    * 根据rowkey查询值
    */
```

```
  def count(day_course: String):Long = {
   0l
  }
}
```

3.HBase操作工具类开发

> 这是个Java类



- HBaseUtils

```
package com.jungle.spark.project.utils;

import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.hbase.client.HBaseAdmin;
import org.apache.hadoop.hbase.client.HTable;
import org.apache.hadoop.hbase.client.Put;
import org.apache.hadoop.hbase.util.Bytes;

import java.io.IOException;

/**
 * HBase操作工具类：Java工具类建议采用单例模式封装
 */
public class HBaseUtils {


    HBaseAdmin admin = null;
    Configuration configuration = null;


    /**
     * 私有改造方法
     */
    private HBaseUtils(){
        configuration = new Configuration();
        configuration.set("hbase.zookeeper.quorum", "centosserver1:2181");
        configuration.set("hbase.rootdir",
"hdfs://centosserver1:8020/hbase");

        try {
            admin = new HBaseAdmin(configuration);
        } catch (IOException e) {
            e.printStackTrace();
        }
    }
```

```
    private static HBaseUtils instance = null;

    public  static synchronized HBaseUtils getInstance() {
        if(null == instance) {
            instance = new HBaseUtils();
        }
        return instance;
    }


    /**
     * 根据表名获取到HTable实例
     */
    public HTable getTable(String tableName) {

        HTable table = null;

        try {
            table = new HTable(configuration, tableName);
        } catch (IOException e) {
            e.printStackTrace();
        }

        return table;
    }

    /**
     * 添加一条记录到HBase表
     * @param tableName HBase表名
     * @param rowkey  HBase表的rowkey
     * @param cf HBase表的columnfamily
     * @param column HBase表的列
     * @param value  写入HBase表的值
     */
    public void put(String tableName, String rowkey, String cf, String
column, String value) {
        HTable table = getTable(tableName);

        Put put = new Put(Bytes.toBytes(rowkey));
        put.add(Bytes.toBytes(cf), Bytes.toBytes(column),
Bytes.toBytes(value));

        try {
            table.put(put);
        } catch (IOException e) {
            e.printStackTrace();
        }
    }

    public static void main(String[] args) {

        //HTable table =
HBaseUtils.getInstance().getTable("imooc_course_clickcount");
        //System.out.println(table.getName().getNameAsString());

        String tableName = "imooc_course_clickcount" ;
        String rowkey = "20171111_88";
        String cf = "info" ;
```

```
        String column = "click_count";
        String value = "2";

        HBaseUtils.getInstance().put(tableName, rowkey, cf, column, value);
    }

}
```

```
/**
 * 私有改造方法
 */
private HBaseUtils(){
    configuration = new Configuration();
    configuration.set("hbase.zookeeper.quorum", "centosserver1:2181");
    configuration.set("hbase.rootdir", "hdfs://centosserver1:8020/hbase");

    try {
        admin = new HBaseAdmin(configuration);
    } catch (IOException e) {
        e.printStackTrace();
    }
}
```

哪里来的

```
vi $HBASE_HOME/conf/hbase-site.xml
```

```
![1565253432624](E:/课程/大数据与云计算/sparkstreaming-master/picture/1565253432624.png)
```

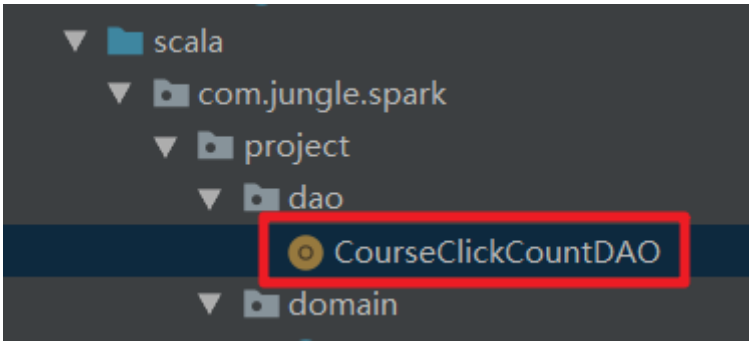
==执行HBaseUtils==

```
scan 'imooc_course_clickcount'
```

```
hbase(main):002:0> scan 'imooc_course_clickcount'
ROW                                   COLUMN+CELL
 20171111_88                          column=info:click_count, timestamp=1565253780957, value=2
1 row(s) in 0.1970 seconds

hbase(main):003:0>
```

4.数据库访问DAO层方法实现

==补全CourseClickCountDAO代码==




```
package com.jungle.spark.project.dao

import com.jungle.spark.project.domain.CourseClickCount
import com.jungle.spark.project.utils.HBaseUtils
```

```
import org.apache.hadoop.hbase.client.Get
import org.apache.hadoop.hbase.util.Bytes

import scala.collection.mutable.ListBuffer

/**
  * 实战课程点击数-数据访问层
  */
object CourseClickCountDAO {

  val tableName = "imooc_course_clickcount"
  val cf = "info"
  val qualifer = "click_count"


  /**
    * 保存数据到HBase
    * @param list  CourseClickCount集合
    */
  def save(list: ListBuffer[CourseClickCount]): Unit = {

    val table = HBaseUtils.getInstance().getTable(tableName)

    for(ele <- list) {
      table.incrementColumnValue(Bytes.toBytes(ele.day_course),
        Bytes.toBytes(cf),
        Bytes.toBytes(qualifer),
        ele.click_count)
    }

  }


  /**
    * 根据rowkey查询值
    */
  def count(day_course: String):Long = {
    val table = HBaseUtils.getInstance().getTable(tableName)

    val get = new Get(Bytes.toBytes(day_course))
    val value = table.get(get).getValue(cf.getBytes, qualifer.getBytes)

    if(value == null) {
      0L
    }else{
      Bytes.toLong(value)
    }
  }

  def main(args: Array[String]): Unit = {


    val list = new ListBuffer[CourseClickCount]
    list.append(CourseClickCount("20171111_8",8))
    list.append(CourseClickCount("20171111_9",9))
    list.append(CourseClickCount("20171111_1",100))

    save(list)
```

```
    println(count("20171111_8") + " : " + count("20171111_9")+ " : " +
count("20171111_1"))
  }

}
```

```
object CourseClickCountDAO {

  val tableName = "imooc_course_clickcount"
  val cf = "info"
  val qualifer = "click_count"


  /**
    * 保存数据到HBase
    * @param list  CourseClickCount集合
    */
  def save(list: ListBuffer[CourseClickCount]): Unit = {

    val table = HBaseUtils.getInstance().getTable(tableName)

    for(ele <- list) {
      table.incrementColumnValue(Bytes.toBytes(ele.day_course),
        Bytes.toBytes(cf),
        Bytes.toBytes(qualifer),
        ele.click_count)
    }

  }
```

Java类可以直接调用

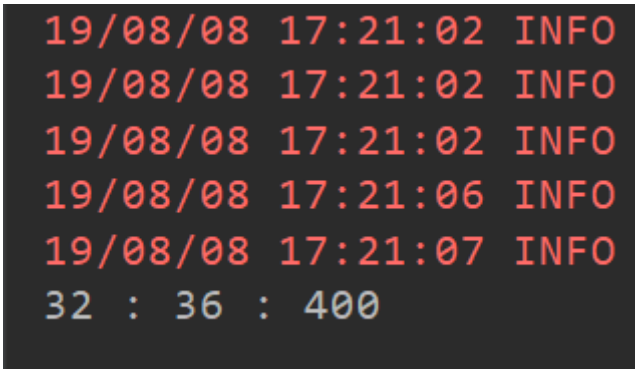
一个API就能搞定的关键

==运行程序==

运行3次

```
19/08/08 17:01:53 INFO zookeep
19/08/08 17:01:53 INFO zookeep
19/08/08 17:01:53 INFO zookeep
19/08/08 17:01:53 INFO zookeep
19/08/08 17:01:53 INFO zookeep
19/08/08 17:01:53 INFO zookeep
19/08/08 17:01:53 INFO zookeep
24 : 27 : 300
```

运行4次



5.Spark Streaming的处理结果写入到HBase中

- 代码

```
package com.jungle.spark.project.spark

import com.jungle.spark.project.dao.CourseClickCountDAO
import com.jungle.spark.project.domain.{ClickLog, CourseClickCount}
import com.jungle.spark.project.utils.DateUtils
import org.apache.spark.SparkConf
import org.apache.spark.streaming.kafka.KafkaUtils
import org.apache.spark.streaming.{Seconds, StreamingContext}

import scala.collection.mutable.ListBuffer

/**
  * 使用Spark Streaming处理Kafka过来的数据
  */
object ImoocStatStreamingApp {

  def main(args: Array[String]): Unit = {

    if (args.length != 4) {
      println("Usage: ImoocStatStreamingApp <zkQuorum> <group> <topics>
<numThreads>")
      System.exit(1)
    }

    val Array(zkQuorum, groupId, topics, numThreads) = args

    val sparkConf = new
SparkConf().setAppName("ImoocStatStreamingApp").setMaster("local[2]")
    val ssc = new StreamingContext(sparkConf, Seconds(60))

    val topicMap = topics.split(",").map((_, numThreads.toInt)).toMap

    val messages = KafkaUtils.createStream(ssc, zkQuorum, groupId, topicMap)

    //    messages.print

    // 测试步骤一：测试数据接收
    //    messages.map(_._2).count().print
    //    messages.map(_._2).print

    // 测试步骤二：数据清洗
    val logs = messages.map(_._2)
```

```
    val cleanData = logs.map(line => {
      val infos = line.split("\t")

      // infos(2) = "GET /class/130.html HTTP/1.1"
      // url = /class/130.html
      val url = infos(2).split(" ")(1)
      var courseId = 0

      // 把实战课程的课程编号拿到了
      if (url.startsWith("/class")) {
        val courseIdHTML = url.split("/")(2)
        courseId = courseIdHTML.substring(0,
courseIdHTML.lastIndexOf(".")).toInt
      }

      ClickLog(infos(0), DateUtils.parseToMinute(infos(1)), courseId,
infos(3).toInt, infos(4))
    }).filter(clicklog => clicklog.courseId != 0)


    //        cleanData.print()

    // 测试步骤三：统计今天到现在为止实战课程的访问量

    cleanData.map(x => {

      // HBase rowkey设计：  20171111_88

      (x.time.substring(0, 8) + "_" + x.courseId, 1)
    }).reduceByKey(_ + _).foreachRDD(rdd => {
      rdd.foreachPartition(partitionRecords => {
        val list = new ListBuffer[CourseClickCount]

        partitionRecords.foreach(pair => {
          list.append(CourseClickCount(pair._1, pair._2))
        })

        CourseClickCountDAO.save(list)
      })
    })

    ssc.start()
    ssc.awaitTermination()


  }
}
```

```scala
// 测试步骤三：统计今天到现在为止实战课程的访问量

cleanData.map(x => {

  // HBase rowkey设计：  20171111_88

  (x.time.substring(0, 8) + "_" + x.courseId, 1)
}).reduceByKey(_ + _).foreachRDD(rdd => {
  rdd.foreachPartition(partitionRecords => {
    val list = new ListBuffer[CourseClickCount]

    partitionRecords.foreach(pair => {
      list.append(CourseClickCount(pair._1, pair._2))
    })

    CourseClickCountDAO.save(list)
  })
})

ssc.start()
ssc.awaitTermination()
```

==运行==

```
hbase(main):008:0> scan 'imooc_course_clickcount'
ROW                                  COLUMN+CELL
 20190808_110                        column=info:click_count, timestamp=1565337181294, value=\x00\x00\x00\x00\x00\x00\x00#
 20190808_112                        column=info:click_count, timestamp=1565337181300, value=\x00\x00\x00\x00\x00\x00\x00\x1B
 20190808_118                        column=info:click_count, timestamp=1565337181278, value=\x00\x00\x00\x00\x00\x00\x00*
 20190808_131                        column=info:click_count, timestamp=1565337181250, value=\x00\x00\x00\x00\x00\x00\x00\x1F
 20190808_145                        column=info:click_count, timestamp=1565337181274, value=\x00\x00\x00\x00\x00\x00\x00\x13
 20190808_146                        column=info:click_count, timestamp=1565337181233, value=\x00\x00\x00\x00\x00\x00\x00#
 20190809_110                        column=info:click_count, timestamp=1565337300036, value=\x00\x00\x00\x00\x00\x00\x00\x16
 20190809_112                        column=info:click_count, timestamp=1565337300042, value=\x00\x00\x00\x00\x00\x00\x00\x16
 20190809_118                        column=info:click_count, timestamp=1565337300030, value=\x00\x00\x00\x00\x00\x00\x00\x1C
 20190809_131                        column=info:click_count, timestamp=1565337300097, value=\x00\x00\x00\x00\x00\x00\x00\x1A
 20190809_145                        column=info:click_count, timestamp=1565337300025, value=\x00\x00\x00\x00\x00\x00\x00\x18
 20190809_146                        column=info:click_count, timestamp=1565337300090, value=\x00\x00\x00\x00\x00\x00\x00\x14
12 row(s) in 0.0350 seconds
```

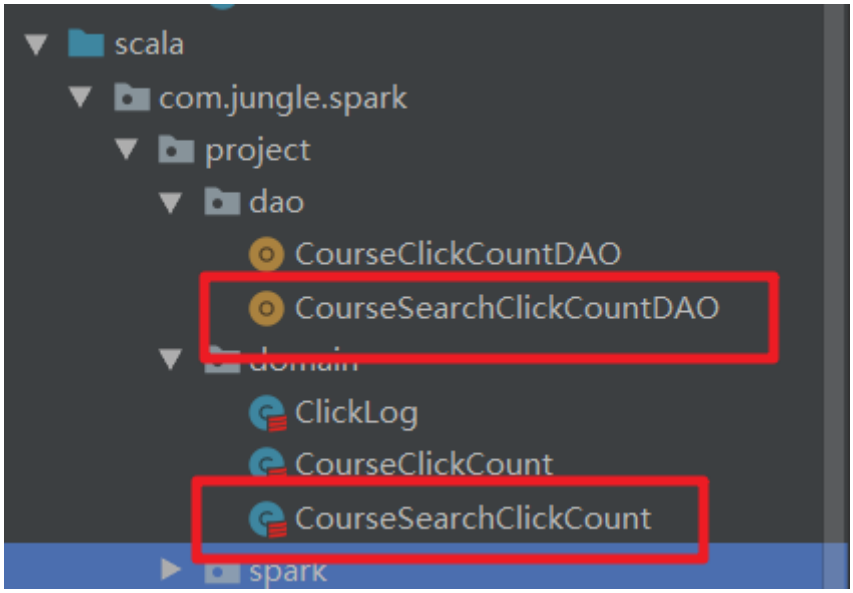
七、功能二

1.需求分析及HBase设计&HBase数据访问层开发

功能二:功能一+从搜索引擎引流过来的

```
# Hbase表设计
create 'imooc_course_search_clickcount','info'
```

```
# rowley设计:也是根据我们的业务需求来的
20171111+ search+1
```



- CourseSearchClickCount

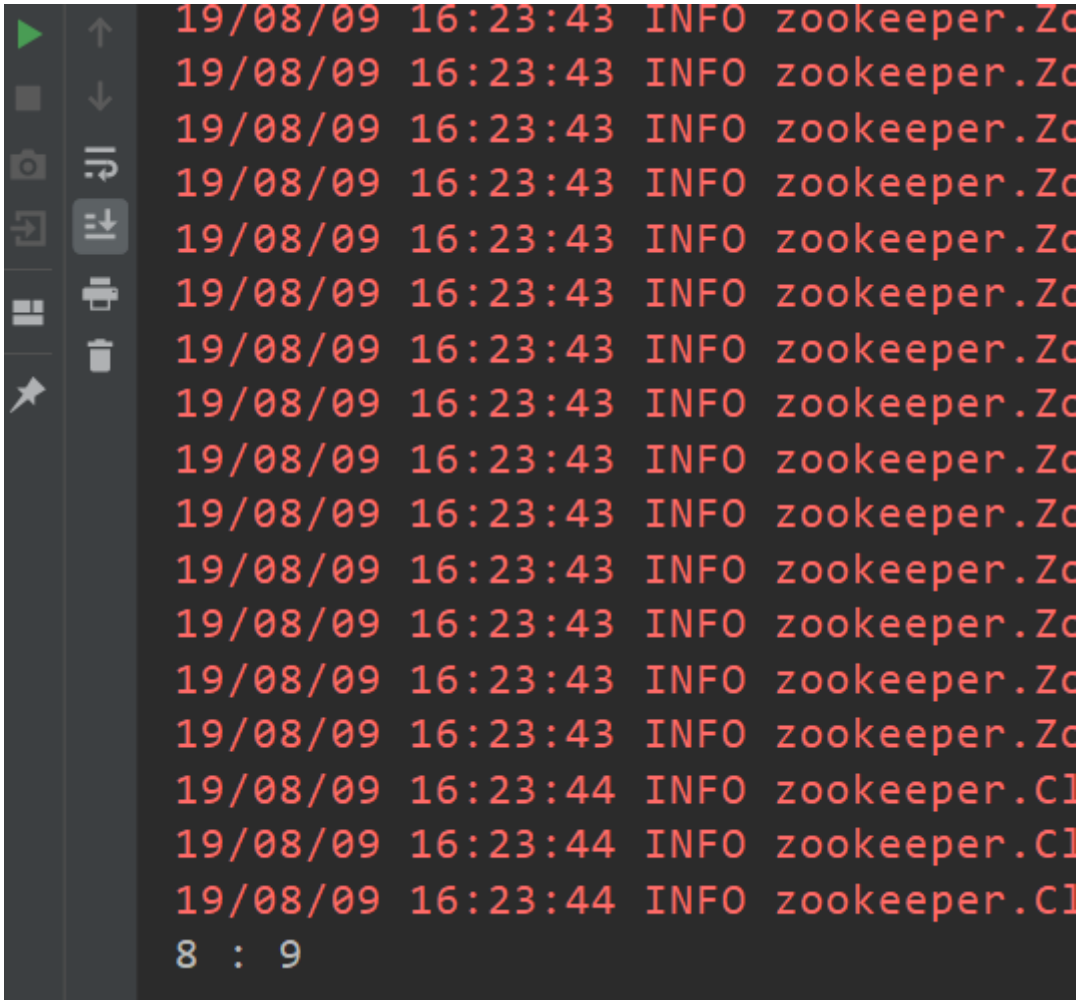
```
package com.jungle.spark.project.domain

/**
  * 从搜索引擎过来的实战课程点击数实体类
  * @param day_search_course
  * @param click_count
  */
case class CourseSearchClickCount(day_search_course:String,
click_count:Long)
```

- CourseSearchClickCountDAO

```
package com.jungle.spark.project.dao

import com.jungle.spark.project.domain.{CourseClickCount,
CourseSearchClickCount}
import com.jungle.spark.project.utils.HBaseUtils
import org.apache.hadoop.hbase.client.Get
import org.apache.hadoop.hbase.util.Bytes

import scala.collection.mutable.ListBuffer

/**
  * 从搜索引擎过来的实战课程点击数-数据访问层
  */
object CourseSearchClickCountDAO {

  val tableName = "imooc_course_search_clickcount"
  val cf = "info"
  val qualifer = "click_count"


  /**
    * 保存数据到HBase
    *
    * @param list  CourseSearchClickCount集合
    */
```

```
  def save(list: ListBuffer[CourseSearchClickCount]): Unit = {

    val table = HBaseUtils.getInstance().getTable(tableName)

    for(ele <- list) {
      table.incrementColumnValue(Bytes.toBytes(ele.day_search_course),
        Bytes.toBytes(cf),
        Bytes.toBytes(qualifer),
        ele.click_count)
    }

  }


  /**
    * 根据rowkey查询值
    */
  def count(day_search_course: String):Long = {
    val table = HBaseUtils.getInstance().getTable(tableName)

    val get = new Get(Bytes.toBytes(day_search_course))
    val value = table.get(get).getValue(cf.getBytes, qualifer.getBytes)

    if(value == null) {
      0L
    }else{
      Bytes.toLong(value)
    }
  }

  def main(args: Array[String]): Unit = {


    val list = new ListBuffer[CourseSearchClickCount]
    list.append(CourseSearchClickCount("20171111_www.baidu.com_8",8))
    list.append(CourseSearchClickCount("20171111_cn.bing.com_9",9))

    save(list)

    println(count("20171111_www.baidu.com_8") + " : " +
count("20171111_cn.bing.com_9"))
  }

}
```

==运行CourseSearchClickCountDAO==




```
hbase(main):012:0> scan 'imooc_course_search_clickcount'
ROW                                  COLUMN+CELL
 20171111_cn.bing.com_9              column=info:click_count, timestamp=1565339024633, value=\x00\x00\x00\x00\x00\x00\x00\x09
 20171111_www.baidu.com_8            column=info:click_count, timestamp=1565339024626, value=\x00\x00\x00\x00\x00\x00\x00\x08
2 row(s) in 0.0170 seconds

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

2.功能实现及本地测试

==清空hbase表数据==

```
truncate 'imooc_course_search_clickcount'
```

```
hbase(main):013:0> truncate 'imooc_course_search_clickcount'
Truncating 'imooc_course_search_clickcount' table (it may take a while):
 - Disabling table...
 - Truncating table...
0 row(s) in 3.4100 seconds
```

- ImoocStatStreamingApp

```
 package com.jungle.spark.project.spark

import com.jungle.spark.project.dao.{CourseClickCountDAO,
CourseSearchClickCountDAO}
import com.jungle.spark.project.domain.{ClickLog, CourseClickCount,
CourseSearchClickCount}
import com.jungle.spark.project.utils.DateUtils
import org.apache.spark.SparkConf
import org.apache.spark.streaming.kafka.KafkaUtils
import org.apache.spark.streaming.{Seconds, StreamingContext}
```

```
import scala.collection.mutable.ListBuffer

/**
  * 使用Spark Streaming处理Kafka过来的数据
  */
object ImoocStatStreamingApp {

  def main(args: Array[String]): Unit = {

    if (args.length != 4) {
      println("Usage: ImoocStatStreamingApp <zkQuorum> <group> <topics>
<numThreads>")
      System.exit(1)
    }

    val Array(zkQuorum, groupId, topics, numThreads) = args

    val sparkConf = new
SparkConf().setAppName("ImoocStatStreamingApp").setMaster("local[2]")
    val ssc = new StreamingContext(sparkConf, Seconds(60))

    val topicMap = topics.split(",").map((_, numThreads.toInt)).toMap

    val messages = KafkaUtils.createStream(ssc, zkQuorum, groupId, topicMap)

    //    messages.print

    // 测试步骤一：测试数据接收
    //    messages.map(_._2).count().print
    //    messages.map(_._2).print

    // 测试步骤二：数据清洗
    val logs = messages.map(_._2)
    val cleanData = logs.map(line => {
      val infos = line.split("\t")

      // infos(2) = "GET /class/130.html HTTP/1.1"
      // url = /class/130.html
      val url = infos(2).split(" ")(1)
      var courseId = 0

      // 把实战课程的课程编号拿到了
      if (url.startsWith("/class")) {
        val courseIdHTML = url.split("/")(2)
        courseId = courseIdHTML.substring(0,
courseIdHTML.lastIndexOf(".")).toInt
      }

      ClickLog(infos(0), DateUtils.parseToMinute(infos(1)), courseId,
infos(3).toInt, infos(4))
    }).filter(clicklog => clicklog.courseId != 0)


    //        cleanData.print()

    // 测试步骤三：统计今天到现在为止实战课程的访问量
```

```
    cleanData.map(x => {

      // HBase rowkey设计： 20171111_88

      (x.time.substring(0, 8) + "_" + x.courseId, 1)
    }).reduceByKey(_ + _).foreachRDD(rdd => {
      rdd.foreachPartition(partitionRecords => {
        val list = new ListBuffer[CourseClickCount]

        partitionRecords.foreach(pair => {
          list.append(CourseClickCount(pair._1, pair._2))
        })

        CourseClickCountDAO.save(list)
      })
    })
    // 测试步骤四：统计从搜索引擎过来的今天到现在为止实战课程的访问量
    cleanData.map(x => {
      /**
        * https://www.sogou.com/web?query=Spark SQL实战
        *
        * ==>
        *
        * https:/www.sogou.com/web?query=Spark SQL实战
        */
      val referer = x.referer.replaceAll("//", "/")
      val splits = referer.split("/")
      var host = ""
      if (splits.length > 2) {
        host = splits(1)
      }
      (host, x.courseId, x.time)
    }).filter(_._1 != "").map(x => {
      (x._3.substring(0, 8) + "_" + x._1 + "_" + x._2, 1)
    }).reduceByKey(_ + _).foreachRDD(rdd => {
      rdd.foreachPartition(partitionRecords => {
        val list = new ListBuffer[CourseSearchClickCount]
        partitionRecords.foreach(pair => {
          list.append(CourseSearchClickCount(pair._1, pair._2))
        })
        CourseSearchClickCountDAO.save(list)
      })
    })
    ssc.start()
    ssc.awaitTermination()


  }
}
```

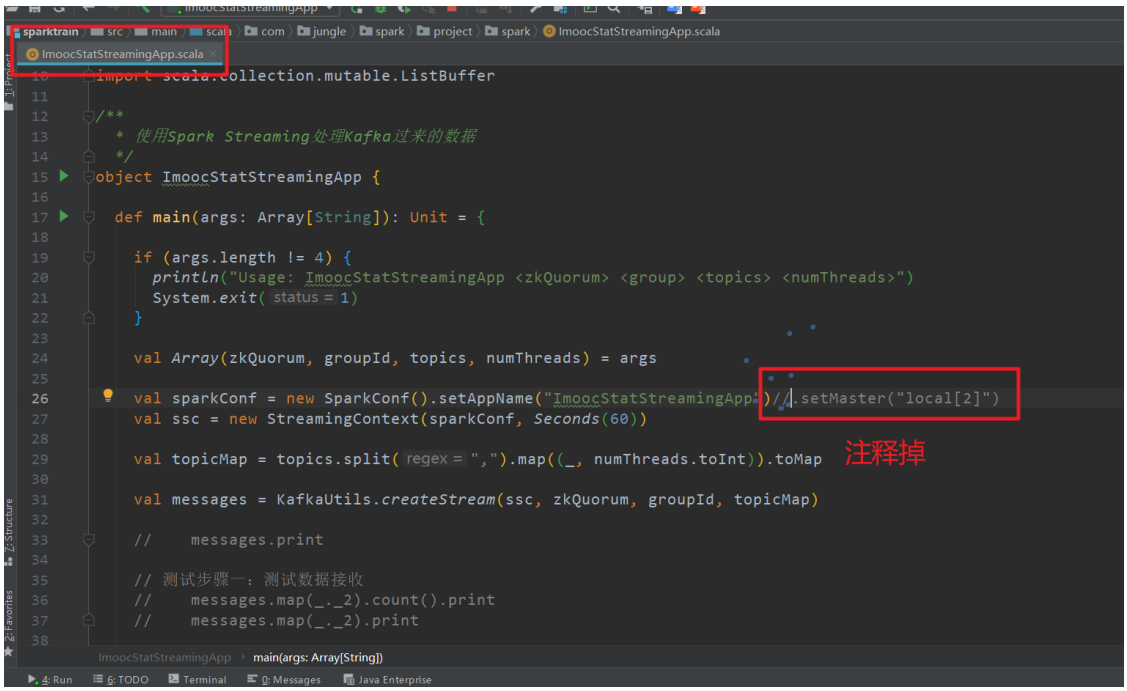
```scala
// 测试步骤四：统计从搜索引擎过来的今天到现在为止实战课程的访问量
cleanData.map(x => {
  /**
    * https://www.sogou.com/web?query=Spark SQL实战
    *
    * ==>
    *
    * https:/www.sogou.com/web?query=Spark SQL实战
    */
  val referer = x.referer.replaceAll( regex = "//", replacement = "/")
  val splits = referer.split( regex = "/")
  var host = ""
  if (splits.length > 2) {
    host = splits(1)
  }
  (host, x.courseId, x.time)
}).filter(_._1 != "").map(x => {
  (x._3.substring(0, 8) + "_" + x._1 + "_" + x._2, 1)
}).reduceByKey(_ + _).foreachRDD(rdd => {
  rdd.foreachPartition(partitionRecords => {
    val list = new ListBuffer[CourseSearchClickCount]
    partitionRecords.foreach(pair => {
      list.append(CourseSearchClickCount(pair._1, pair._2))
    })
    CourseSearchClickCountDAO.save(list)
  })
})
ssc.start()
```

==运行结果==

```
hbase(main):016:0> scan 'imooc_course_search_clickcount'
ROW                                  COLUMN+CELL
 20190809_cn.bing.com_110            column=info:click_count, timestamp=1565340061125, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_cn.bing.com_112            column=info:click_count, timestamp=1565340180102, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_cn.bing.com_145            column=info:click_count, timestamp=1565340240084, value=\x00\x00\x00\x00\x00\x00\x00\x02
 20190809_search.yahoo.com_112       column=info:click_count, timestamp=1565340120065, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_search.yahoo.com_118       column=info:click_count, timestamp=1565340180080, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_search.yahoo.com_146       column=info:click_count, timestamp=1565340240077, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_www.baidu.com_110          column=info:click_count, timestamp=1565340120061, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_www.baidu.com_112          column=info:click_count, timestamp=1565340240057, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_www.baidu.com_118          column=info:click_count, timestamp=1565340180076, value=\x00\x00\x00\x00\x00\x00\x00\x02
 20190809_www.baidu.com_131          column=info:click_count, timestamp=1565340240072, value=\x00\x00\x00\x00\x00\x00\x00\x03
 20190809_www.baidu.com_145          column=info:click_count, timestamp=1565340120053, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_www.baidu.com_146          column=info:click_count, timestamp=1565340180093, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_www.sogou.com_110          column=info:click_count, timestamp=1565340180084, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_www.sogou.com_112          column=info:click_count, timestamp=1565340240051, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_www.sogou.com_118          column=info:click_count, timestamp=1565340120057, value=\x00\x00\x00\x00\x00\x00\x00\x02
 20190809_www.sogou.com_131          column=info:click_count, timestamp=1565340061130, value=\x00\x00\x00\x00\x00\x00\x00\x01
 20190809_www.sogou.com_146          column=info:click_count, timestamp=1565340240089, value=\x00\x00\x00\x00\x00\x00\x00\x04
17 row(s) in 0.0220 seconds
```

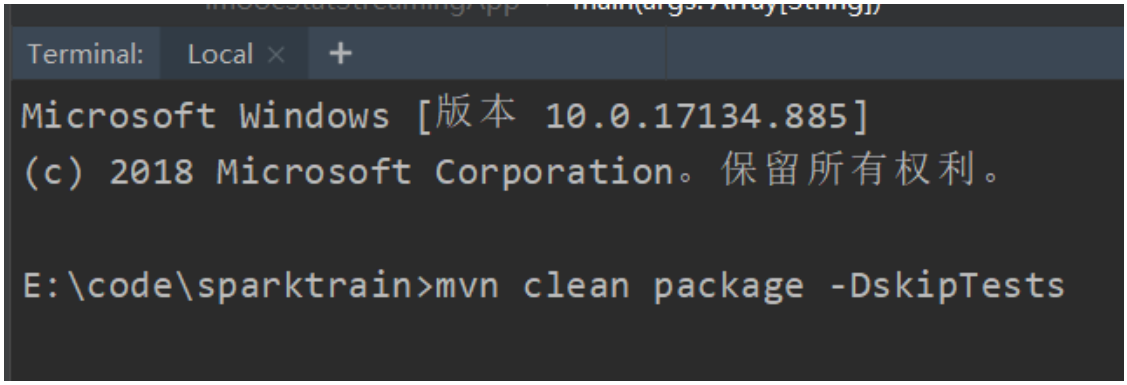
八、将项目运行在服务器环境中

1. 简单修改代码



2. 打包编译

```
mvn clean package -DskipTests
```



==报错==

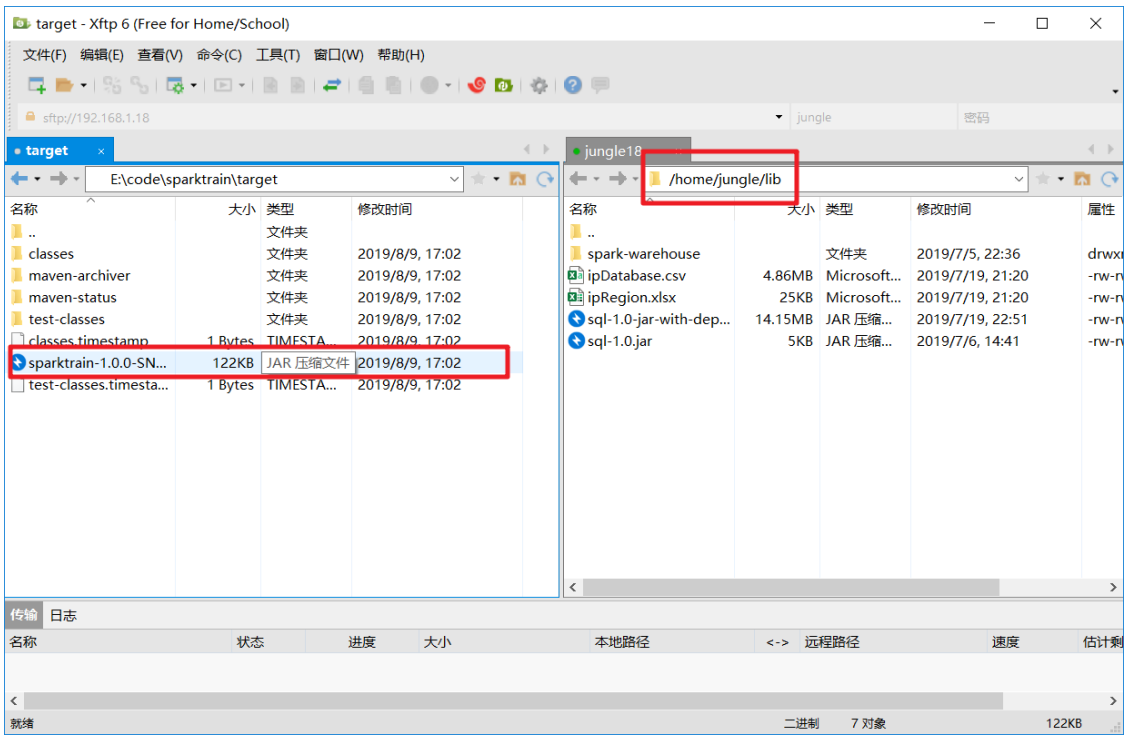
> [ERROR] E:\code\sparktrain\src\main\scala\com\jungle\spark\project\dao\CourseClickCountDAO.scala:4: error: object HBaseUtils is not a member of package com.jungle.spark.project.utils

--解决：

```
sparktrain
109         <version>3.5</version>
110       </dependency>
111       <dependency>
112         <groupId>org.apache.spark</groupId>
113         <artifactId>spark-streaming-kafka-0-8_2.11</artifactId>
114         <version>${spark.version}</version>
115       </dependency>
116       <dependency>
117         <groupId>org.apache.flume.flume-ng-clients</groupId>
118         <artifactId>flume-ng-log4jappender</artifactId>
119         <version>1.6.0</version>
120       </dependency>                          注释掉
121     </dependencies>
122
123     <build>
124       <sourceDirectory>src/main/scala</sourceDirectory>
125       <testSourceDirectory>src/test/scala</testSourceDirectory>
126       <plugins>
127         <plugin>
128           <groupId>org.scala-tools</groupId>
129           <artifactId>maven-scala-plugin</artifactId>
130           <executions>
131             <execution>
132               <goals>
133                 <goal>compile</goal>
134                 <goal>testCompile</goal>
135               </goals>
136             </execution>
137           </executions>
```

```
sparktrain
109         <version>3.5</version>
110       </dependency>
111       <dependency>
112         <groupId>org.apache.spark</groupId>
113         <artifactId>spark-streaming-kafka-0-8_2.11</artifactId>
114         <version>${spark.version}</version>
115       </dependency>
116       <dependency>
117         <groupId>org.apache.flume.flume-ng-clients</groupId>
118         <artifactId>flume-ng-log4jappender</artifactId>
119         <version>1.6.0</version>
120       </dependency>
121     </dependencies>
122
123     <build>
124   <!--    <sourceDirectory>src/main/scala</sourceDirectory>-->
125   <!--    <testSourceDirectory>src/test/scala</testSourceDirectory>-->
126       <plugins>
127         <plugin>
128           <groupId>org.scala-tools</groupId>
129           <artifactId>maven-scala-plugin</artifactId>
130           <executions>
131             <execution>
132               <goals>
133                 <goal>compile</goal>
134                 <goal>testCompile</goal>
135               </goals>
136             </execution>
137           </executions>
```

3. 上传至服务器



4. 提交任务

```
spark-submit --master local[5] \
--class com.jungle.spark.project.spark.ImoocStatStreamingApp \
/home/jungle/lib/sparktrain-1.0.0-SNAPSHOT.jar \
centosserver1:2181 test streamingtopic 1
```

==报错==

> Caused by: java.lang.ClassNotFoundException: org.apache.spark.streaming.kafka.KafkaUtils$

找不到spark-streaming-kafka-0-8_2.11这个依赖

```
    <artifactId>spark-streaming-flume-sink_2.11</artifactId>
    <version>${spark.version}</version>
  </dependency>

  <dependency>
    <groupId>org.apache.commons</groupId>
    <artifactId>commons-lang3</artifactId>
    <version>3.5</version>
  </dependency>
  <dependency>
    <groupId>org.apache.spark</groupId>
    <artifactId>spark-streaming-kafka-0-8_2.11</artifactId>
    <version>${spark.version}</version>
  </dependency>
  <dependency>
    <groupId>org.apache.flume.flume-ng-clients</groupId>
    <artifactId>flume-ng-log4jappender</artifactId>
    <version>1.6.0</version>
  </dependency>
</dependencies>
```

--解压：

```
spark-submit --master local[5] \
--class com.jungle.spark.project.spark.ImoocStatStreamingApp \
--packages org.apache.spark:spark-streaming-kafka-0-8_2.11:2.1.0 \
/home/jungle/lib/sparktrain-1.0.0-SNAPSHOT.jar \
centosserver1:2181 test streamingtopic 1
```

==报错==

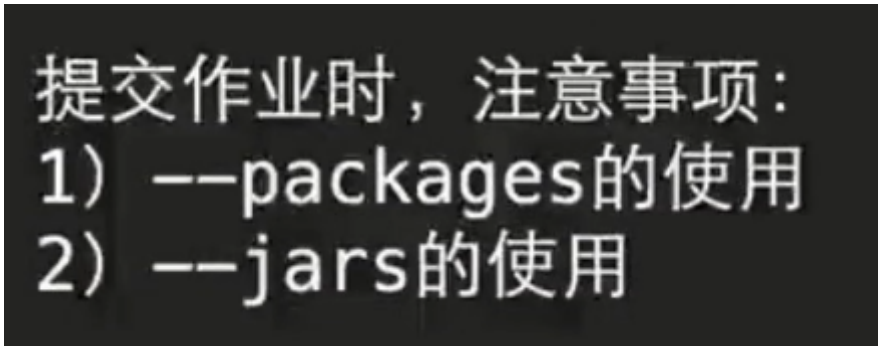
> java.lang.NoClassDefFoundError: org/apache/hadoop/hbase/client/HBaseAdmin

缺少包

```
<dependency>
  <groupId>org.apache.hadoop</groupId>
  <artifactId>hadoop-client</artifactId>
  <version>${hadoop.version}</version>
</dependency>
<dependency>
  <groupId>org.apache.hbase</groupId>
  <artifactId>hbase-client</artifactId>
  <version>${hbase.version}</version>
</dependency>
<dependency>
  <groupId>org.apache.hbase</groupId>
  <artifactId>hbase-server</artifactId>
  <version>${hbase.version}</version>
</dependency>
<dependency>
  <groupId>org.apache.spark</groupId>
  <artifactId>spark-streaming_2.11</artifactId>
  <version>${spark.version}</version>
</dependency>
```

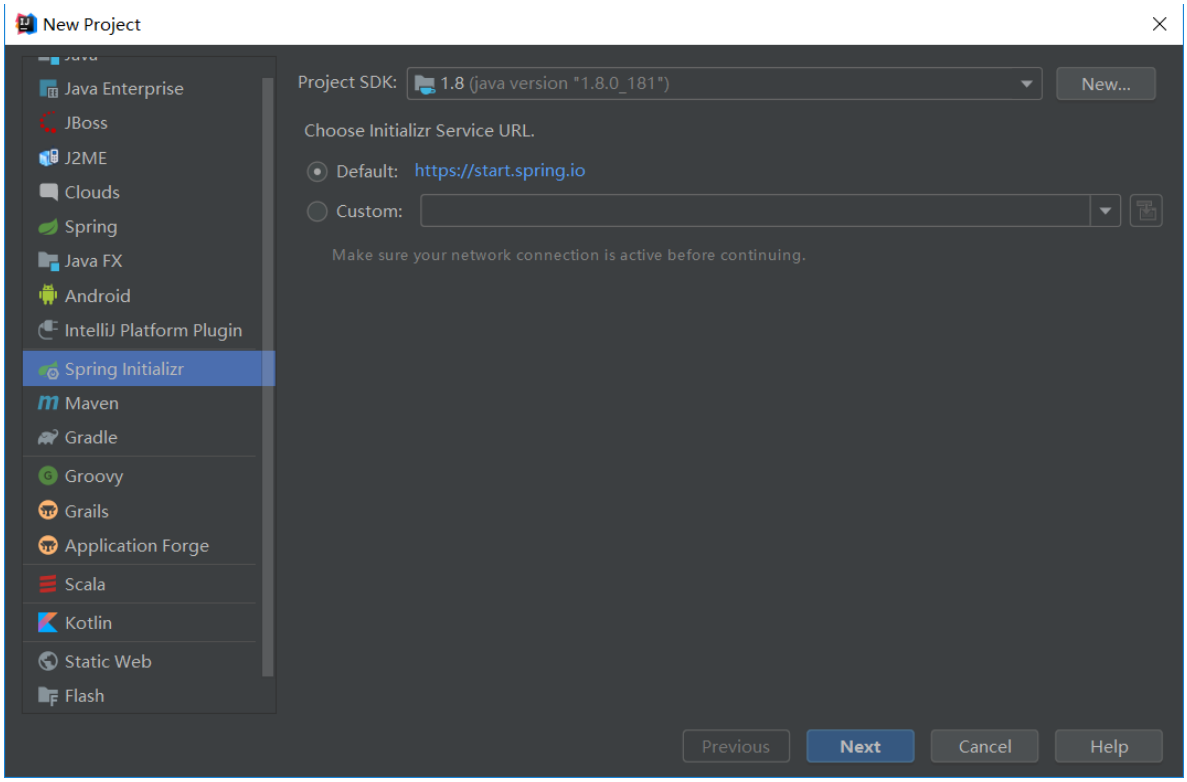
==修正==

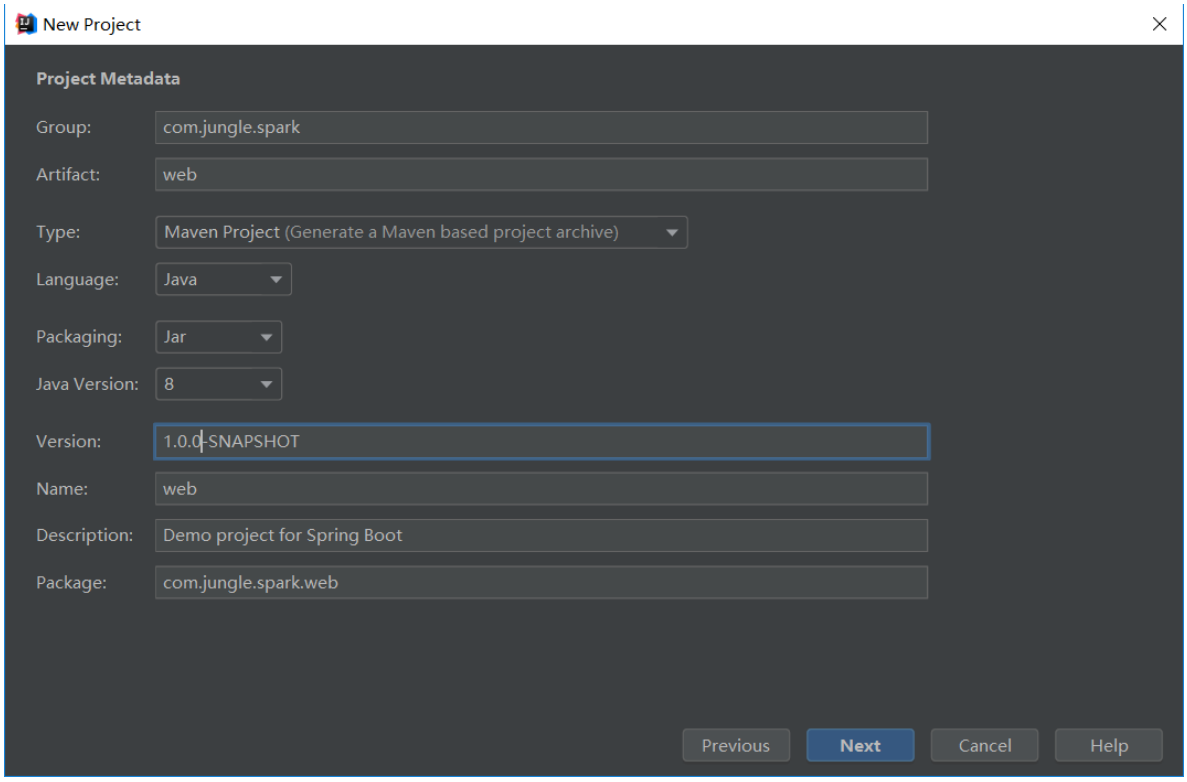
```
spark-submit --master local[5] \
--jars $(echo /home/jungle/app/hbase-1.2.0-cdh5.7.0/lib/*.jar | tr ' ' ',' )
\
--class com.jungle.spark.project.spark.ImoocStatStreamingApp \
--packages org.apache.spark:spark-streaming-kafka-0-8_2.11:2.1.0 \
/home/jungle/lib/sparktrain-1.0.0-SNAPSHOT.jar \
centosserver1:2181 test streamingtopic 1
```

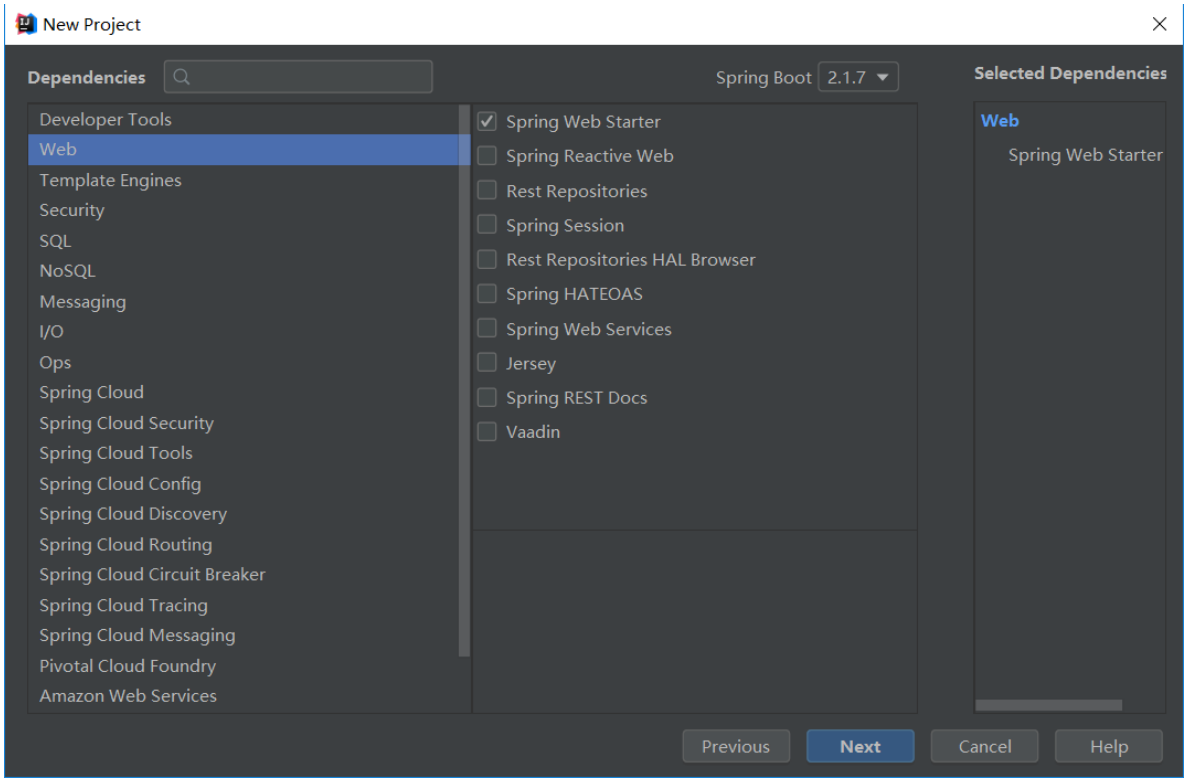


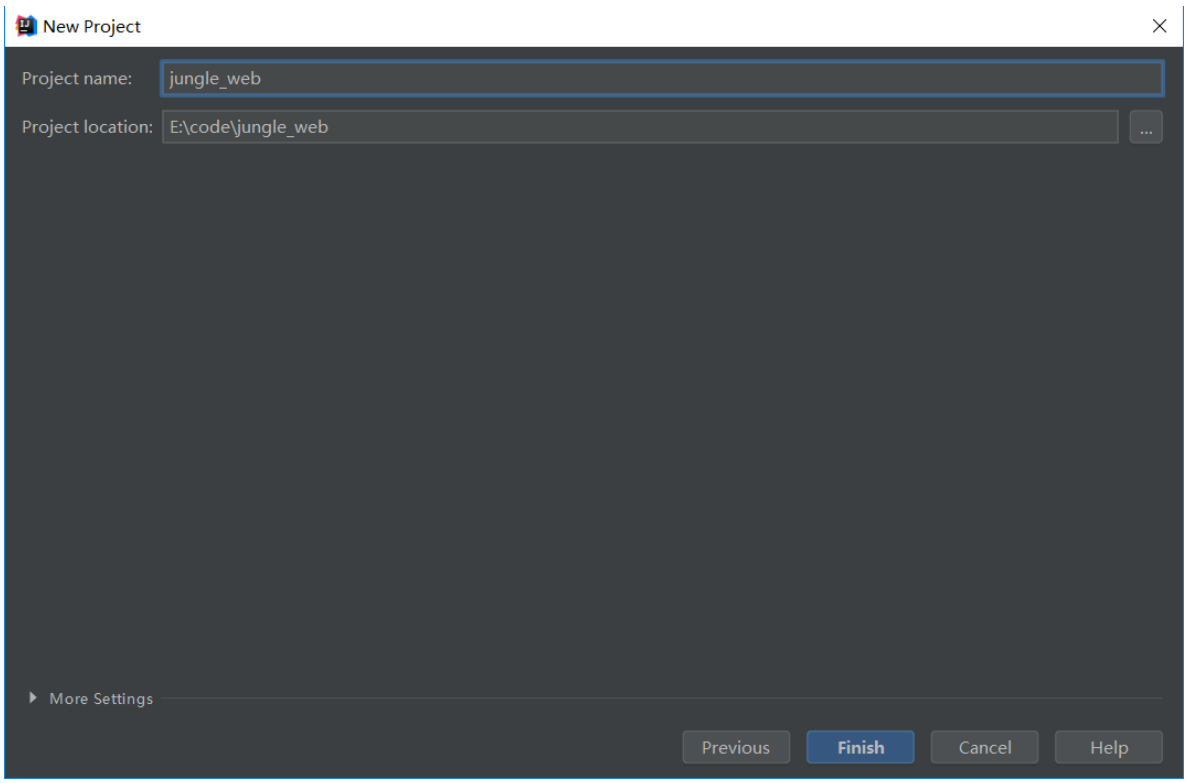
第13章 可视化实战

一、构建Spring Boot项目









二、Spring Boot整合Echarts

1.下载

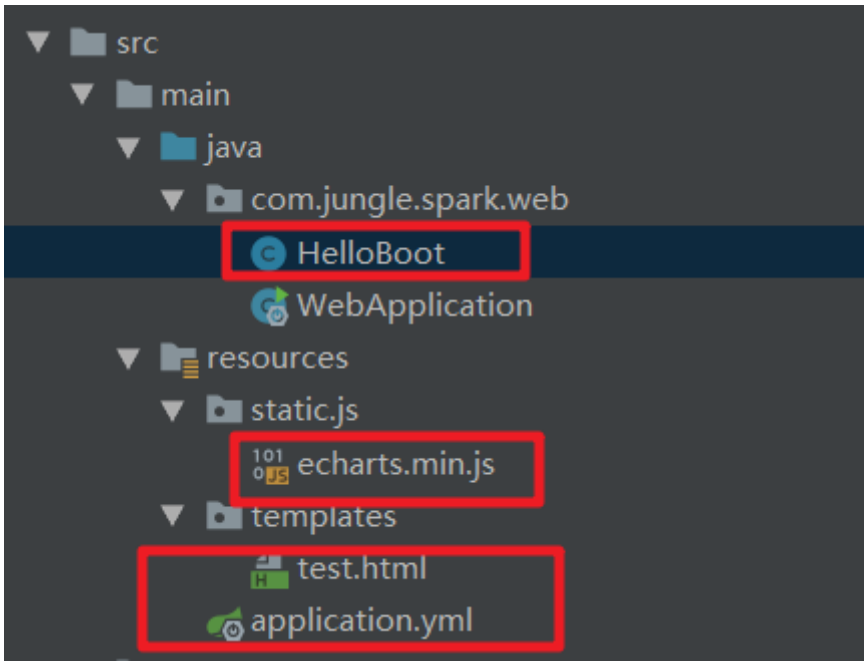
官网

2.绘制静态数据柱状图

- 添加依赖

```
<dependency>
            <groupId>org.springframework.boot</groupId>
            <artifactId>spring-boot-starter-thymeleaf</artifactId>
        </dependency>
```

- 目录结构



- HelloBoot

```
package com.jungle.spark.web;

import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RequestMethod;
import org.springframework.web.bind.annotation.RestController;
import org.springframework.web.servlet.ModelAndView;

/**
 * 这是我们的第一个Boot应用
 */
@RestController
public class HelloBoot {

    @RequestMapping(value = "/hello", method = RequestMethod.GET)
    public String sayHello() {

        return "Hello World Spring Boot...";
    }

    @RequestMapping(value = "/first", method = RequestMethod.GET)
    public ModelAndView firstDemo() {
        return new ModelAndView("test");
    }

}
```

```
*/
@RestController
public class HelloBoot {

    @RequestMapping(value = "/hello", method = RequestMethod.GET)
    public String sayHello() {

        return "Hello World Spring Boot...";
    }

    @RequestMapping(value = "/first", method = RequestMethod.GET)
    public ModelAndView firstDemo() {
        return new ModelAndView( viewName: "test");
    }
```

- test.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8"/>
    <title>test</title>

    <!-- 引入 ECharts 文件 -->
    <script src="js/echarts.min.js"></script>
</head>
<body>

<!-- 为 ECharts 准备一个具备大小（宽高）的 DOM -->
<div id="main" style="width: 600px;height:400px;position: absolute; top:50%;
left: 50%; margin-top: -200px;margin-left: -300px"></div>


<script type="text/javascript">
    // 基于准备好的dom，初始化echarts实例
    var myChart = echarts.init(document.getElementById('main'));

    // 指定图表的配置项和数据
    var option = {
        title: {
            text: 'ECharts 入门示例'
        },
        tooltip: {},
        legend: {
            data:['销量']
        },
        xAxis: {
            data: ["衬衫","羊毛衫","雪纺衫","裤子","高跟鞋","袜子"]
        },
        yAxis: {},
        series: [{
            name: '销量',
            type: 'bar',
            data: [5, 20, 36, 10, 10, 20]
        }]
    };

    // 使用刚指定的配置项和数据显示图表。
    myChart.setOption(option);
</script>
```

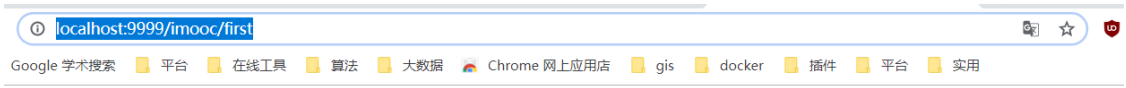
```
</body>
</html>
```

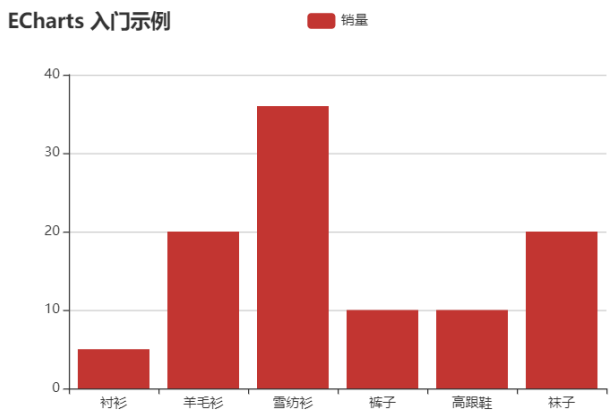
- application.yml

```
server:
  port: 9999
  servlet:
    context-path: /imooc
```

==运行效果==

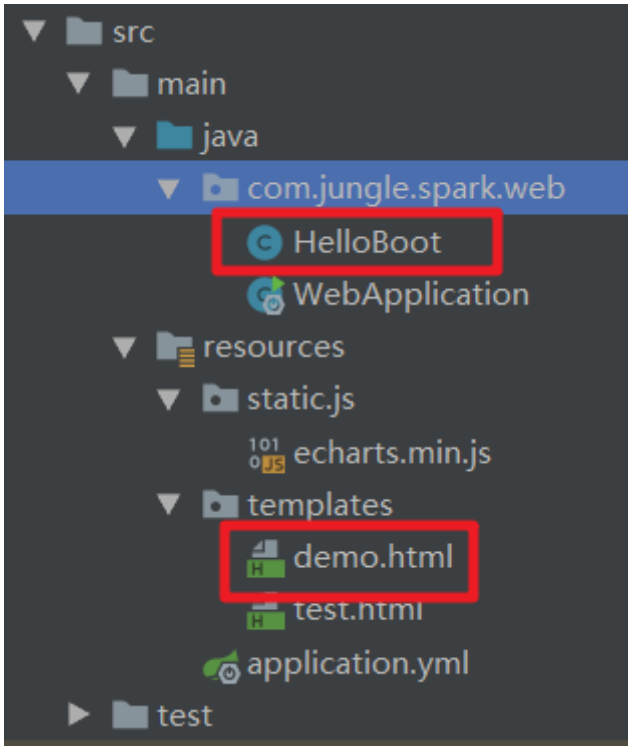
```
http://localhost:9999/imooc/first
```





3.绘制静态数据饼图

- 目录结构



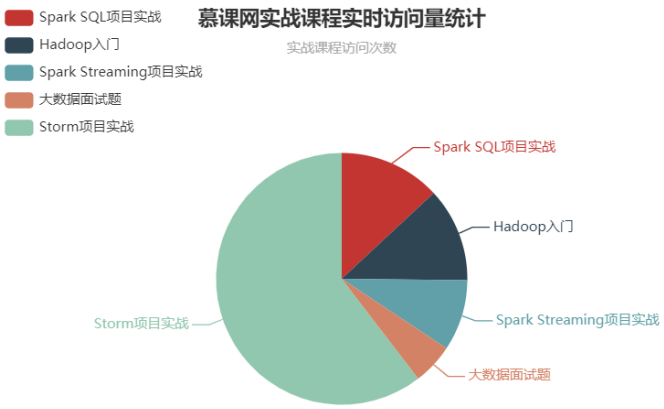
- HelloBoot

```
package com.jungle.spark.web;

import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RequestMethod;
import org.springframework.web.bind.annotation.RestController;
import org.springframework.web.servlet.ModelAndView;

/**
 * 这是我们的第一个Boot应用
 */
@RestController
public class HelloBoot {

    @RequestMapping(value = "/hello", method = RequestMethod.GET)
    public String sayHello() {

        return "Hello World Spring Boot...";
    }

    @RequestMapping(value = "/first", method = RequestMethod.GET)
    public ModelAndView firstDemo() {
        return new ModelAndView("test");
    }

    @RequestMapping(value = "/course_clickcount", method =
RequestMethod.GET)
    public ModelAndView courseClickCountStat() {
        return new ModelAndView("demo");
    }


}
```

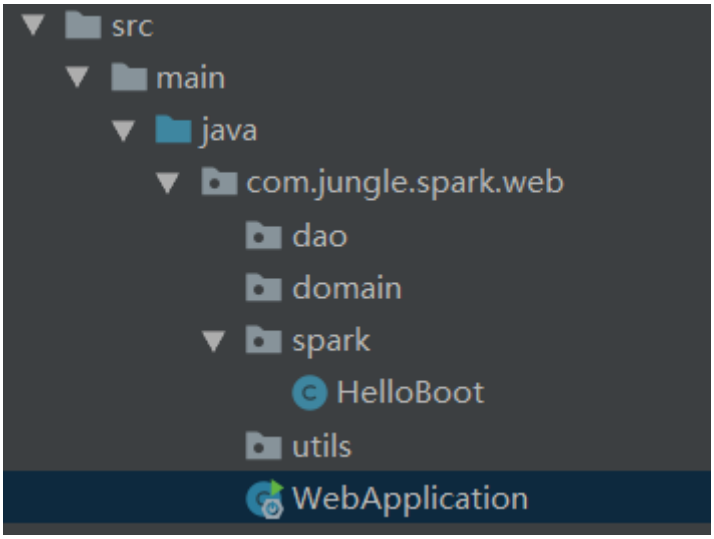
- demo.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8"/>
    <title>imooc_stat</title>

    <!-- 引入 ECharts 文件 -->
    <script src="js/echarts.min.js"></script>
</head>
<body>

<!-- 为 ECharts 准备一个具备大小（宽高）的 DOM -->
<div id="main" style="width: 600px;height:400px;position: absolute; top:50%;
left: 50%; margin-top: -200px;margin-left: -300px"></div>


<script type="text/javascript">
    // 基于准备好的dom，初始化echarts实例
    var myChart = echarts.init(document.getElementById('main'));

    // 指定图表的配置项和数据
    var option = {
        title : {
            text: '慕课网实战课程实时访问量统计',
            subtext: '实战课程访问次数',
            x:'center'
        },
        tooltip : {
            trigger: 'item',
            formatter: "{a} <br/>{b} : {c} ({d}%)"
        },
        legend: {
            orient: 'vertical',
            left: 'left',
            data: ['Spark SQL项目实战','Hadoop入门','Spark Streaming项目实
战','大数据面试题','Storm项目实战']
        },
        series : [
            {
                name: '访问次数',
                type: 'pie',
                radius : '55%',
                center: ['50%', '60%'],
                data:[
                    {value:3350, name:'Spark SQL项目实战'},
                    {value:3100, name:'Hadoop入门'},
                    {value:2340, name:'Spark Streaming项目实战'},
                    {value:1350, name:'大数据面试题'},
                    {value:15480, name:'Storm项目实战'}
                ],
                itemStyle: {
                    emphasis: {
                        shadowBlur: 10,
                        shadowOffsetX: 0,
                        shadowColor: 'rgba(0, 0, 0, 0.5)'
```

```
                    }
                }
            }
        ]
    };


    // 使用刚指定的配置项和数据显示图表。
    myChart.setOption(option);
</script>
</body>
</html>
```



三、项目目录调整



四、根据天来获取HBase表中的实战课程访问次数

1.准备

- 后台运行flume

```
nohup flume-ng agent \
--conf $FLUME_HOME/conf \
--conf-file $FLUME_HOME/conf/streaming_project2.conf \
--name exec-memory-kafka \
-Dflume.root.logger=INFO,console &
```

==报错==

> stopping hbasecat: /tmp/hbase-jungle-master.pid: No such file or directory

造成上述错误的原因是，默认情况下hbase的pid文件保存在/tmp目录下，/tmp目录下的文件很容易丢失，所以造成停止集群的时候出现上述错误。解决方式是在hbase-env.sh中修改pid文件的存放路径，配置项如下所示：

```
# The directory where pid files are stored. /tmp by default.

export HBASE_PID_DIR=/var/hadoop/pids
```

> 删表说无表，见表说有表

清除Zookeeper内存数据库中的相关数据

```
[root@node1]# zkCli.sh

[zk: localhost:2181(CONNECTED) 0] ls /
[zookeeper, hadoop-ha, hbase]

[zk: localhost:2181(CONNECTED) 1] ls /hbase
[replication, meta-region-server, rs, splitWAL, backup-masters, table-lock,
flush-table-proc, region-in-transition, online-snapshot, master, running,
balancer, recovering-regions, draining, namespace, hbaseid, table]
```

删除 /hbase/table-lock下的相关数据

```
[zk: localhost:2181(CONNECTED) 2] ls /hbase/table-lock
[google, googlebook1, hbase:namespace, t1, googlebook]
[zk: localhost:2181(CONNECTED) 4] rmr /hbase/table-lock/googlebook
[zk: localhost:2181(CONNECTED) 7] ls /hbase/table-lock
[google, googlebook1, hbase:namespace, t1]
```

删除 /hbase/table下的相关数据

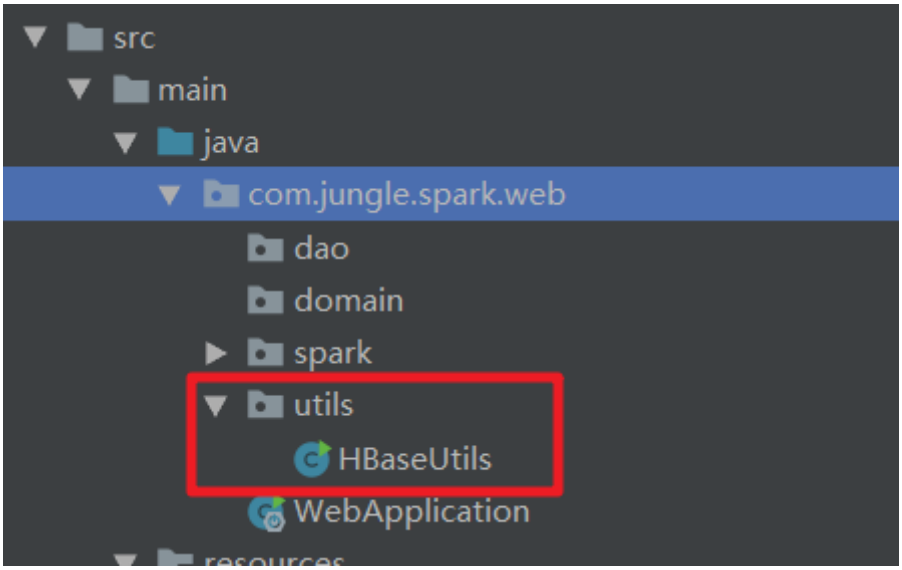
```
[zk: localhost:2181(CONNECTED) 9] ls /hbase/table
[google, googlebook1, hbase:namespace, t1, googlebook]
[zk: localhost:2181(CONNECTED) 10] rmr /hbase/table/googlebook
[zk: localhost:2181(CONNECTED) 7] ls /hbase/table
[google, googlebook1, hbase:namespace, t1]
---------------------
```

最后重启hbase，同时需要查看一下运行的进程，需要把ZooKeeperMain进程也删掉

2.访问hbase

- 添加依赖

```
<repositories>
        <repository>
            <id>cloudera</id>
            <url>https://repository.cloudera.com/artifactory/cloudera-
repos/</url>
        </repository>
    </repositories>


<dependency>
            <groupId>org.apache.hbase</groupId>
            <artifactId>hbase-client</artifactId>
            <version>1.2.0-cdh5.7.0</version>
        </dependency>
```

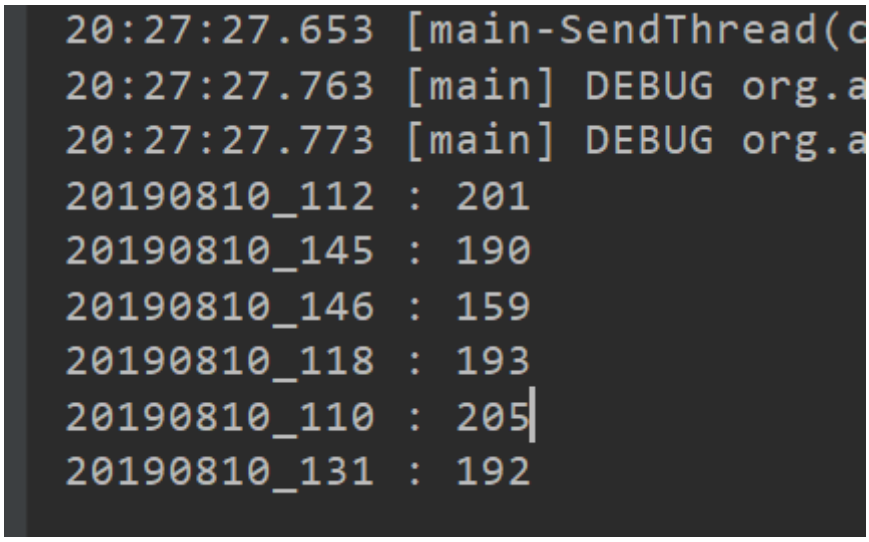



```
package com.jungle.spark.web.utils;

import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.hbase.client.*;
import org.apache.hadoop.hbase.filter.Filter;
import org.apache.hadoop.hbase.filter.PrefixFilter;
import org.apache.hadoop.hbase.util.Bytes;

import java.io.IOException;
import java.util.HashMap;
import java.util.Map;

/**
 * HBase操作工具类
 */
public class HBaseUtils {


    HBaseAdmin admin = null;
    Configuration conf = null;


    /**
     * 私有构造方法：加载一些必要的参数
     */
```

```
    private HBaseUtils() {
        conf = new Configuration();
        conf.set("hbase.zookeeper.quorum", "192.168.1.18:2181");
        conf.set("hbase.rootdir", "hdfs://192.168.1.18:8020/hbase");

        try {
            admin = new HBaseAdmin(conf);
        } catch (IOException e) {
            e.printStackTrace();
        }
    }

    private static HBaseUtils instance = null;

    public static synchronized HBaseUtils getInstance() {
        if (null == instance) {
            instance = new HBaseUtils();
        }
        return instance;
    }

    /**
     * 根据表名获取到HTable实例
     */
    public HTable getTable(String tableName) {
        HTable table = null;

        try {
            table = new HTable(conf, tableName);
        } catch (IOException e) {
            e.printStackTrace();
        }
        return table;
    }


    /**
     * 根据表名和输入条件获取HBase的记录数
     */
    public Map<String, Long> query(String tableName, String condition) throws
Exception {

        Map<String, Long> map = new HashMap<>();

        HTable table = getTable(tableName);
        String cf = "info";
        String qualifier = "click_count";

        Scan scan = new Scan();

        Filter filter = new PrefixFilter(Bytes.toBytes(condition));
        scan.setFilter(filter);

        ResultScanner rs = table.getScanner(scan);
        for(Result result : rs) {
            String row = Bytes.toString(result.getRow());
            long clickCount = Bytes.toLong(result.getValue(cf.getBytes(),
qualifier.getBytes()));
```

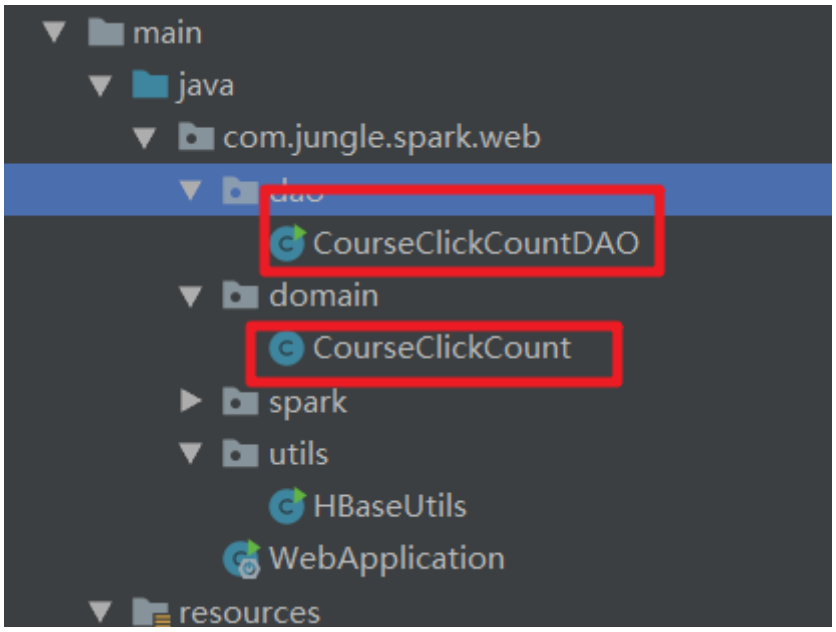
```
            map.put(row, clickCount);
        }

        return  map;
    }


    public static void main(String[] args) throws Exception {
        Map<String, Long> map =
HBaseUtils.getInstance().query("imooc_course_clickcount" , "20190810");

        for(Map.Entry<String, Long> entry: map.entrySet()) {
            System.out.println(entry.getKey() + " : " + entry.getValue());
        }
    }

}
```

==运行==



五、实战课程访问量domain以及dao开发

- 目录结构



- CourseClickCount

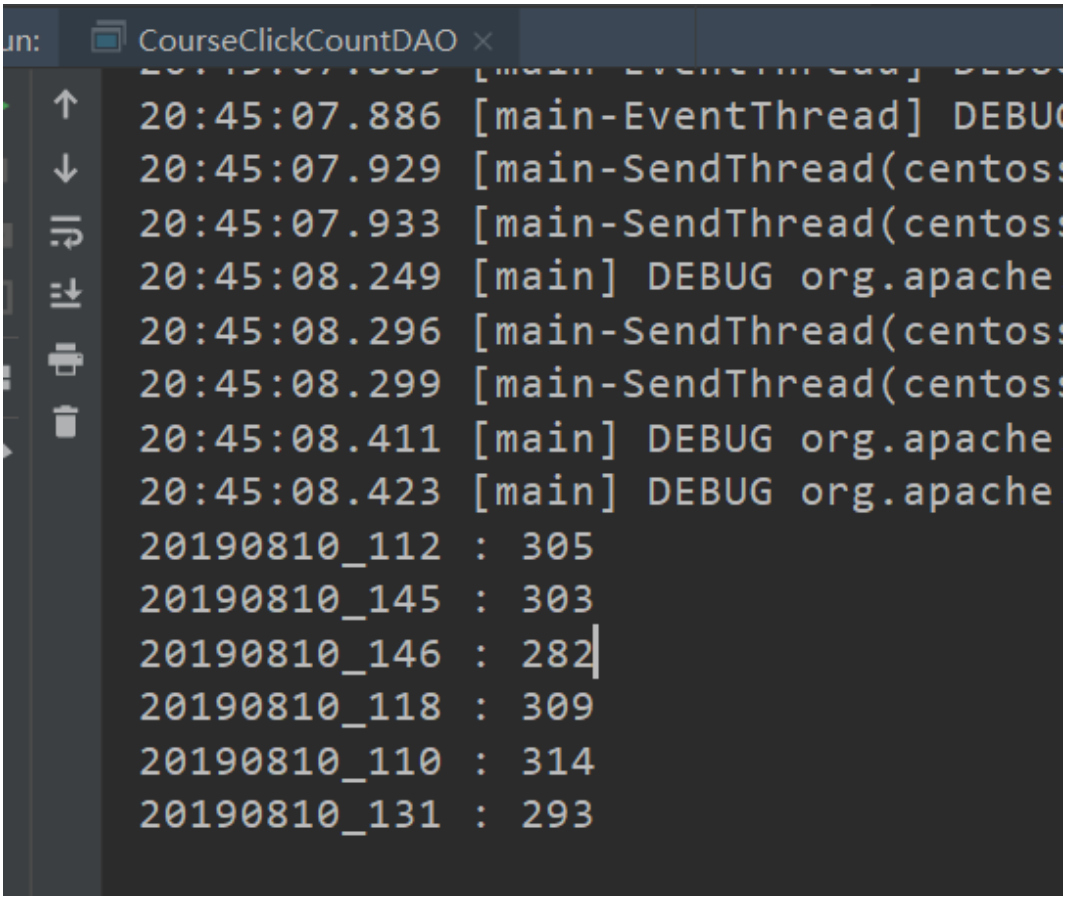
```
package com.jungle.spark.web.domain;

import org.springframework.stereotype.Component;

/**
 * 实战课程访问数量实体类
 */
@Component
public class CourseClickCount {

    private String name;
    private long value;

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public long getValue() {
        return value;
    }

    public void setValue(long value) {
        this.value = value;
    }
}
```

- CourseClickCountDAO

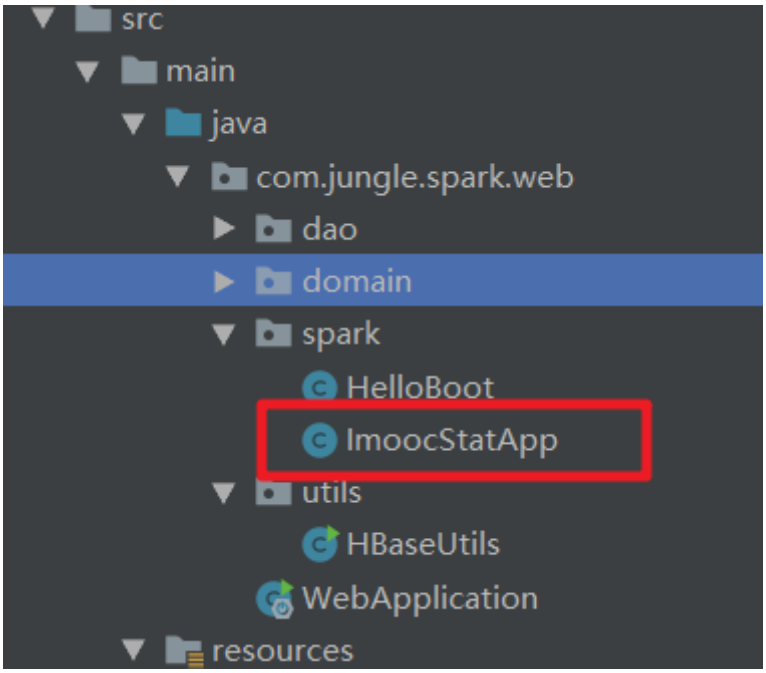
```
package com.jungle.spark.web.dao;

import com.jungle.spark.web.domain.CourseClickCount;
import com.jungle.spark.web.utils.HBaseUtils;
import org.springframework.stereotype.Component;

import java.util.ArrayList;
import java.util.List;
import java.util.Map;

/**
 * 实战课程访问数量数据访问层
 */
@Component
public class CourseClickCountDAO {


    /**
     * 根据天查询
     */
    public List<CourseClickCount> query(String day) throws Exception {
```

```
        List<CourseClickCount> list = new ArrayList<>();


        // 去HBase表中根据day获取实战课程对应的访问量
        Map<String, Long> map =
HBaseUtils.getInstance().query("imooc_course_clickcount","20190810");

        for(Map.Entry<String, Long> entry: map.entrySet()) {
            CourseClickCount model = new CourseClickCount();
            model.setName(entry.getKey());
            model.setValue(entry.getValue());

            list.add(model);
        }

        return list;
    }

    public static void main(String[] args) throws Exception{
        CourseClickCountDAO dao = new CourseClickCountDAO();
        List<CourseClickCount> list = dao.query("20190810");
        for(CourseClickCount model : list) {
            System.out.println(model.getName() + " : " +
model.getValue());
        }
    }

}
```

==运行CourseClickCountDAO==



六、实战课程访问量Web层开发



- 引入依赖

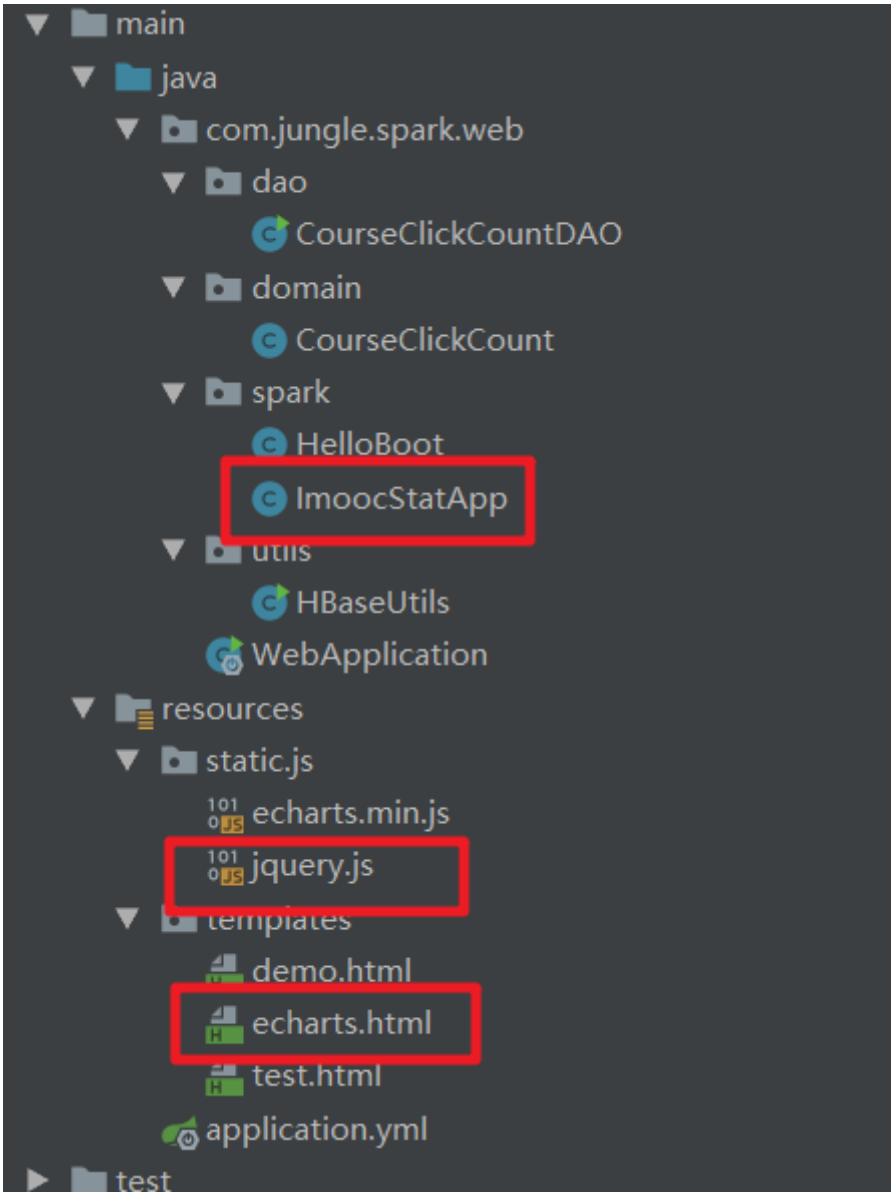
```
<dependency>
            <groupId>net.sf.json-lib</groupId>
            <artifactId>json-lib</artifactId>
            <version>2.4</version>
            <classifier>jdk15</classifier>
        </dependency>
```

- ImoocStatApp

```
package com.jungle.spark.web.spark;

import com.jungle.spark.web.dao.CourseClickCountDAO;
import com.jungle.spark.web.domain.CourseClickCount;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RequestMethod;
import org.springframework.web.bind.annotation.ResponseBody;
import org.springframework.web.bind.annotation.RestController;
import org.springframework.web.servlet.ModelAndView;

import java.util.HashMap;
import java.util.List;
import java.util.Map;

/**
 * web层
 */
@RestController
public class ImoocStatApp {

    private static Map<String, String> courses = new HashMap<>();
    static {
        courses.put("112","Spark SQL慕课网日志分析");
```

```
        courses.put("118","10小时入门大数据");
        courses.put("145","深度学习之神经网络核心原理与算法");
        courses.put("146","强大的Node.js在Web开发的应用");
        courses.put("131","Vue+Django实战");
        courses.put("110","Web前端性能优化");
    }

    @Autowired
    CourseClickCountDAO courseClickCountDAO;

     @RequestMapping(value = "/course_clickcount_dynamic", method =
RequestMethod.GET)
    public ModelAndView courseClickCount() throws Exception {

        ModelAndView view = new ModelAndView("index");

        List<CourseClickCount> list = courseClickCountDAO.query("20171022");
        for(CourseClickCount model : list) {
            model.setName(courses.get(model.getName().substring(9)));
        }
        JSONArray json = JSONArray.fromObject(list);

        view.addObject("data_json", json);

        return view;
    }


}
```

七、实战课程访问量实时查询展示功能实现及扩展



- 引入jquery.js
- charts

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8"/>
    <title>imooc_stat</title>

    <!-- 引入 ECharts 文件 -->
    <script src="js/echarts.min.js"></script>

    <!-- 引入 jQuery 文件 -->
    <script src="js/jquery.js"></script>
</head>
<body>


<!-- 为 ECharts 准备一个具备大小（宽高）的 DOM -->
<div id="main" style="width: 600px;height:400px;position: absolute; top:50%;
left: 50%; margin-top: -200px;margin-left: -300px"></div>
```

```
<script type="text/javascript">
    // 基于准备好的dom，初始化echarts实例
    var myChart = echarts.init(document.getElementById('main'));

    // 指定图表的配置项和数据
    var option = {
        title : {
            text: '慕课网实战课程实时访问量统计',
            subtext: '实战课程访问次数',
            x:'center'
        },
        tooltip : {
            trigger: 'item',
            formatter: "{a} <br/>{b} : {c} ({d}%)"
        },
        legend: {
            orient: 'vertical',
            left: 'left'
        },
        series : [
            {
                name: '访问次数',
                type: 'pie',
                radius : '55%',
                center: ['50%', '60%'],
                data: (function(){ //<![CDATA[
                    var datas = [];
                    $.ajax({
                        type: "POST",
                        url: "/imooc/course_clickcount_dynamic",
                        dataType: 'json',
                        async: false,
                        success: function(result) {
                            for(var i=0; i<result.length; i++) {
                                datas.push({"value":result[i].value,
"name":result[i].name})
                            }
                        }
                    })
                    return datas;
                    //]]>
                })(),
                itemStyle: {
                    emphasis: {
                        shadowBlur: 10,
                        shadowOffsetX: 0,
                        shadowColor: 'rgba(0, 0, 0, 0.5)'
                    }
                }
            }
        ]
    };


    // 使用刚指定的配置项和数据显示图表。
    myChart.setOption(option);
</script>
</body>
```

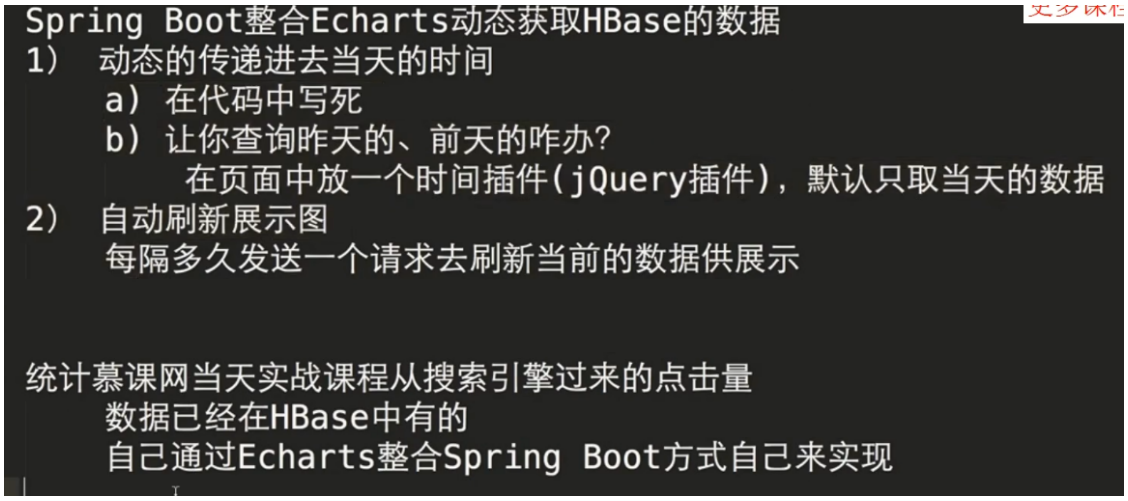
```
</html>
```

- 修改ImoocStatApp

```
package com.jungle.spark.web.spark;

import com.jungle.spark.web.dao.CourseClickCountDAO;
import com.jungle.spark.web.domain.CourseClickCount;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RequestMethod;
import org.springframework.web.bind.annotation.ResponseBody;
import org.springframework.web.bind.annotation.RestController;
import org.springframework.web.servlet.ModelAndView;

import java.util.HashMap;
import java.util.List;
import java.util.Map;

/**
 * web层
 */
@RestController
public class ImoocStatApp {

    private static Map<String, String> courses = new HashMap<>();
    static {
        courses.put("112","Spark SQL慕课网日志分析");
        courses.put("118","10小时入门大数据");
        courses.put("145","深度学习之神经网络核心原理与算法");
        courses.put("146","强大的Node.js在Web开发的应用");
        courses.put("131","Vue+Django实战");
        courses.put("110","Web前端性能优化");
    }

    @Autowired
    CourseClickCountDAO courseClickCountDAO;


//    @RequestMapping(value = "/course_clickcount_dynamic", method =
RequestMethod.GET)
//    public ModelAndView courseClickCount() throws Exception {
//
//        ModelAndView view = new ModelAndView("index");
//
//        List<CourseClickCount> list =
courseClickCountDAO.query("20171022");
//        for(CourseClickCount model : list) {
//            model.setName(courses.get(model.getName().substring(9)));
//        }
//        JSONArray json = JSONArray.fromObject(list);
//
//        view.addObject("data_json", json);
//
//        return view;
```

```
//    }

    @RequestMapping(value = "/course_clickcount_dynamic", method =
RequestMethod.POST)
    @ResponseBody
    public List<CourseClickCount> courseClickCount() throws Exception {

        List<CourseClickCount> list = courseClickCountDAO.query("20190810");
        for(CourseClickCount model : list) {
            model.setName(courses.get(model.getName().substring(9)));
        }

        return list;
    }

    @RequestMapping(value = "/echarts", method = RequestMethod.GET)
    public ModelAndView echarts(){
        return new ModelAndView("echarts");
    }



}
```

- 可扩展

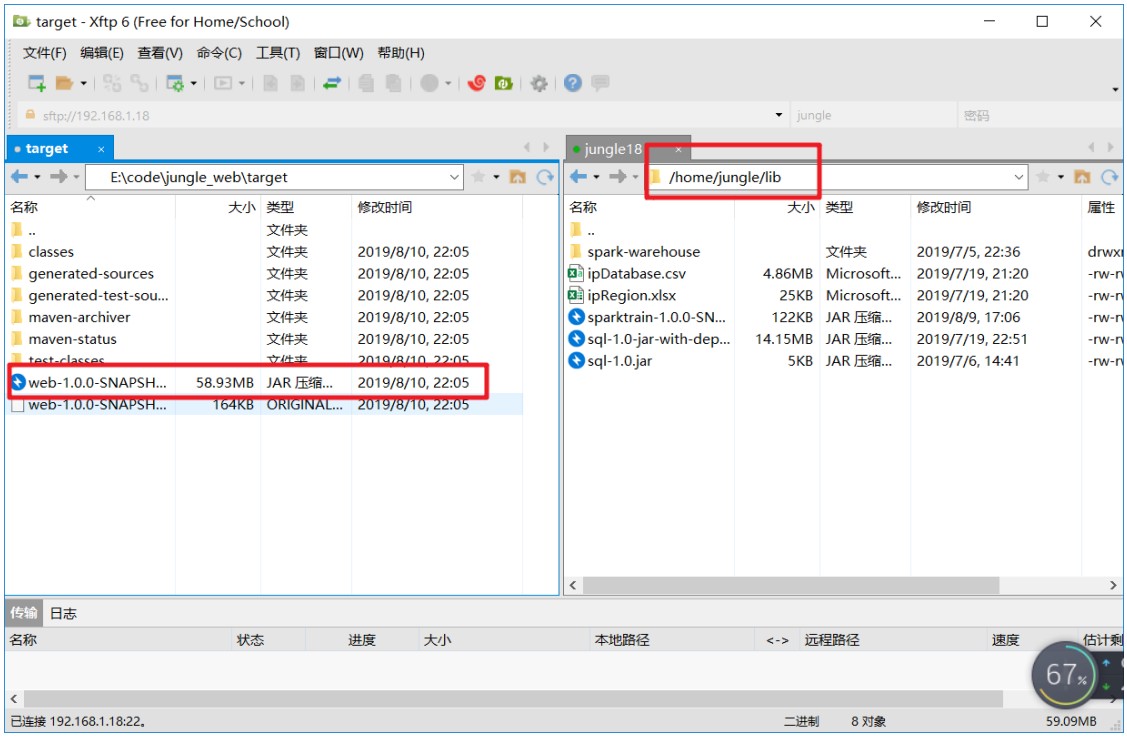


八、Spring Boot项目部署到服务器上运行

1. 打包编译

```
mvn clean package -DskipTests
```

2. 上传服务器



3. 运行

```
java -jar web-1.0.0-SNAPSHOT.jar
```