华东师范大学数据科学与工程学院实验报告

课程名称：分布式模型与编程	年级：2017	上机实践成绩：
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上机实践名称：Giraph部署与编程		上机实践日期：2019.12.04-2019.12.25【第15-16周】
上机实践编号：实验四	组号：11	上机实践时间：18:00-19:30

一. 实验目的

- 学习Giraph的部署，理解Giraph与MapReduce之间的关系
- 练习以顶点为中心的图算法编程方式，体会与基于MapReduce/Spark/Flink进行图算法编程的区别

二. 实验任务

- Giraph部署【第15周】：单机集中式、单机伪分布式（在个人用户下独立完成）、分布式（多位同学新建一个相同的用户，例如ecnu，协作完成）
- Giraph编程【第16周】

三. 使用环境

1. Ubuntu18.04
2. giraph-1.2.0
3. hadoop-1.2.1
4. mapreduce

四. 实验过程

Giraph 基于 MapReduce v1 部署

1 单机集中式部署

如果 Hadoop 1.2.1 处于单机伪分布式状态, 可跳过该步直接进入单机伪分布式部署

2 单机伪分布式部署

2.1 准备工作

注意: 以下默认用户名为 `syx`, 请自行将所有的 `syx` 替换成实际的用户名

- 下载安装 Giraph: 以 `giraph-dist-1.2.0-bin.tar.gz` 为例

```
cd ~/Downloads
wget https://mirrors.tuna.tsinghua.edu.cn/apache/giraph/giraph-1.2.0/giraph-dist-1.2.0-bin.tar.gz
tar -zxvf giraph-dist-1.2.0-bin.tar.gz
mv ./giraph-1.2.0-for-hadoop-1.2.1 ~/giraph-1.2.0-for-hadoop-1.2.1
```

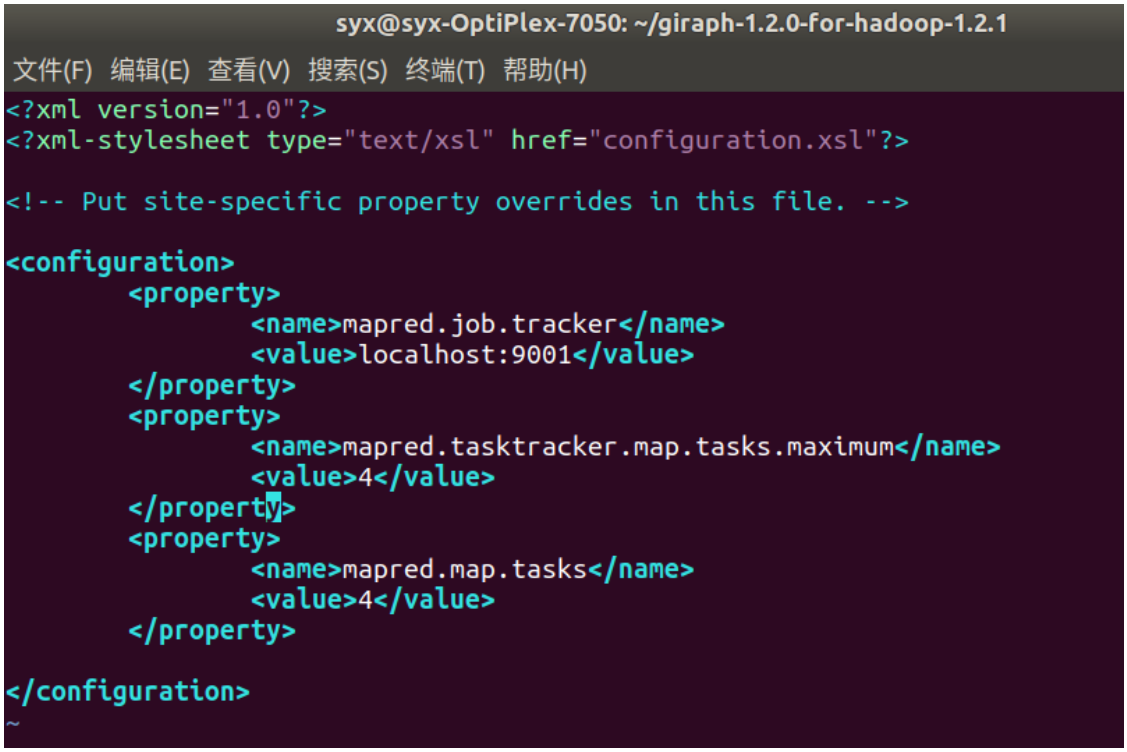
- 完成 MapReduce v1 单机伪分布式部署

2.2 修改配置

- 修改 `~/giraph-1.2.0-for-hadoop-1.2.1/bin/giraph-env`, 指定 Hadoop 安装路径

```
sed -i '1i\export HADOOP_HOME=~/hadoop-1.2.1' ~/giraph-1.2.0-for-hadoop-1.2.1/bin/giraph-env
```

- 修改 `~/hadoop-1.2.1/conf/mapred-site.xml`, 在 `<configuration>` 下添加



2.3 启动 Hadoop

- 启动 HDFS

```
~/hadoop-1.2.1/bin/start-dfs.sh
```

- 启动 MapReduce

```
~/hadoop-1.2.1/bin/start-mapred.sh
```

2.4 运行 Giraph 应用程序

Simple shortest paths computation 示例程序

- 将 `tiny_graph.txt` 上传至 `hdfs:///user/syx/input` 下

```
~/hadoop-1.2.1/bin/hadoop fs -mkdir input
~/hadoop-1.2.1/bin/hadoop fs -put ~/tiny_graph.txt input/
```

- 执行程序

```
syx@syx-OptiPlex-7050:~/giraph-1.2.0-for-hadoop-1.2.1$ bin/giraph giraph-examples-1.2.0.jar \
>     org.apache.giraph.examples.SimpleShortestPathsComputation \
>     -vif org.apache.giraph.io.formats.JsonLongDoubleFloatDoubleVertexInputFormat \
>     -vip input/tiny_graph.txt \
>     -vof org.apache.giraph.io.formats.IdWithValueTextOutputFormat \
>     -op output/shortestpaths \
>     -w 3
No HADOOP_CONF_DIR set, using /home/syx/hadoop-1.2.1/conf
Warning: $HADOOP_HOME is deprecated.

19/12/11 10:44:42 INFO utils.ConfigurationUtils: No edge input format specified. Ensure your I
nputFormat does not require one.
19/12/11 10:44:42 INFO utils.ConfigurationUtils: No edge output format specified. Ensure your
OutputFormat does not require one.
19/12/11 10:44:42 INFO job.GiraphJob: run: Since checkpointing is disabled (default), do not a
llow any task retries (setting mapred.map.max.attempts = 1, old value = 4)
19/12/11 10:44:47 INFO job.GiraphJob: Tracking URL: http://localhost:50030/jobdetails.jsp?jobi
d=job_201912111018_0005
19/12/11 10:44:47 INFO job.GiraphJob: Waiting for resources... Job will start only when it get
s all 4 mappers
19/12/11 10:45:04 INFO job.HaltApplicationUtils$DefaultHaltInstructionsWriter: writeHaltInstru
ctions: To halt after next superstep execute: 'bin/halt-application --zkServer syx-optiplex-70
50:22181 --zkNode /_hadoopBsp/job_201912111018_0005/_haltComputation'
19/12/11 10:45:04 INFO mapred.JobClient: Running job: job_201912111018_0005
19/12/11 10:45:05 INFO mapred.JobClient:  map 100% reduce 0%
19/12/11 10:45:07 INFO mapred.JobClient: Job complete: job_201912111018_0005
19/12/11 10:45:07 INFO mapred.JobClient: Counters: 44
19/12/11 10:45:07 INFO mapred.JobClient:   Map-Reduce Framework
19/12/11 10:45:07 INFO mapred.JobClient:     Spilled Records=0
19/12/11 10:45:07 INFO mapred.JobClient:     Virtual memory (bytes) snapshot=7949275136
19/12/11 10:45:07 INFO mapred.JobClient:     Map input records=4
19/12/11 10:45:07 INFO mapred.JobClient:     SPLIT_RAW_BYTES=176
19/12/11 10:45:07 INFO mapred.JobClient:     Map output records=0
19/12/11 10:45:07 INFO mapred.JobClient:     Physical memory (bytes) snapshot=638033920
19/12/11 10:45:07 INFO mapred.JobClient:     CPU time spent (ms)=7610
19/12/11 10:45:07 INFO mapred.JobClient:     Total committed heap usage (bytes)=614465536
19/12/11 10:45:07 INFO mapred.JobClient:   Zookeeper halt node
19/12/11 10:45:07 INFO mapred.JobClient:     /_hadoopBsp/job_201912111018_0005/_haltComputatio
n=0
19/12/11 10:45:07 INFO mapred.JobClient:   Zookeeper server:port
19/12/11 10:45:07 INFO mapred.JobClient:     syx-optiplex-7050:22181=0
19/12/11 10:45:07 INFO mapred.JobClient:   Giraph Timers
```

此处指定 worker 数为 3

- 查看运行中进程

```
syx@syx-OptiPlex-7050:~$ jps
15056 RunJar
16114 Child
13731 NameNode
14163 SecondaryNameNode
16039 Child
14280 JobTracker
16153 Child
13947 DataNode
14492 TaskTracker
16078 Child
16239 Jps
```

可见 Giraph 程序启动的进程和其它 MapReduce 程序的相同
此外在 Giraph 任务执行过程中, Hadoop JobTracker 会启动 `worker 数量 + 1` 个 map task, 原因是其中一个 task 是 Giraph 的Master

- 运行完成后查看输出

```
syx@syx-OptiPlex-7050:~/giraph-1.2.0-for-hadoop-1.2.1$ ~/hadoop-1.2.1/bin/hadoop fs -cat outpu
t/shortestpaths/p*
0       1.0
3       1.0
1       0.0
4       5.0
2       2.0
```

2.5 查看 Giraph 应用程序运行信息

- 访问 JobTracker 网页 (http://localhost:50030)

  点击正在运行或已完成的 Giraph 应用程序, 可看到 Giraph 应用程序的统计信息

User: syx
Job Name: Giraph: org.apache.giraph.examples.SimpleShortestPathsComputation
Job File: hdfs://localhost:9000/home/syx/tmp-1.2.1/mapred/staging/syx/.staging/job_201912111018_0005/job.xml
Submit Host: syx-OptiPlex-7050
Submit Host Address: 127.0.1.1
Job-ACLs: All users are allowed
Job Setup: Successful
Status: Succeeded
Started at: Wed Dec 11 10:44:47 CST 2019
Finished at: Wed Dec 11 10:45:07 CST 2019
Finished in: 20sec
Job Cleanup: Successful

Kind	% Complete	Num Tasks	Pending	Running	Complete	Killed	Failed/Killed Task Attempts
map	100.00%	4	0	0	4	0	0 / 0
reduce	100.00%	0	0	0	0	0	0 / 0

	Counter	Map	Reduce	Total
Map-Reduce Framework	Spilled Records	0	0	0
	Virtual memory (bytes) snapshot	0	0	7,949,275,136
	Map input records	0	0	4
	SPLIT_RAW_BYTES	176	0	176
	Map output records	0	0	0
	Physical memory (bytes) snapshot	0	0	638,033,920
	CPU time spent (ms)	0	0	7,610
	Total committed heap usage (bytes)	0	0	614,465,536
Zookeeper halt node	/_hadoopBsp/job_201912111018_0005/_haltComputation	0	0	0
Zookeeper server:port	syx-optiplex-7050:22181	0	0	0

Zookeeper halt node	/_hadoopBsp/job_201912111018_0005/_haltComputation	0	0	0
Zookeeper server:port	syx-optiplex-7050:22181	0	0	0
Giraph Timers	Superstep 1 SimpleShortestPathsComputation (ms)	33	0	33
	Initialize (ms)	977	0	977
	Superstep 0 SimpleShortestPathsComputation (ms)	48	0	48
	Shutdown (ms)	8,963	0	8,963
	Setup (ms)	21	0	21
	Superstep 2 SimpleShortestPathsComputation (ms)	22	0	22
	Input superstep (ms)	177	0	177
	Total (ms)	9,289	0	9,289
	Superstep 3 SimpleShortestPathsComputation (ms)	24	0	24
File Input Format Counters	Bytes Read	0	0	0
Zookeeper base path	/_hadoopBsp/job_201912111018_0005	0	0	0
Giraph Stats	Aggregate bytes stored to local disks (out-of-core)	0	0	0
	Aggregate finished vertices	5	0	5
	Aggregate edges	12	0	12
	Current master task partition	0	0	0
	Superstep	4	0	4
	Aggregate sent message bytes	403	0	403
	Aggregate vertices	5	0	5
	Aggregate bytes loaded from local disks (out-of-core)	0	0	0
	Sent messages	0	0	0
	Sent message bytes	0	0	0
	Current workers	3	0	3
	Last checkpointed superstep	0	0	0
	Aggregate sent messages	12	0	12
	Lowest percentage of graph in memory so far (out-of-core)	100	0	100
FileSystemCounters	HDFS_BYTES_READ	288	0	288
	FILE_BYTES_WRITTEN	480,824	0	480,824
	HDFS_BYTES_WRITTEN	30	0	30

FileSystemCounters	HDFS_BYTES_READ	288	0	288
	FILE_BYTES_WRITTEN	480,824	0	480,824
	HDFS_BYTES_WRITTEN	30	0	30
Job Counters	Launched map tasks	0	0	4
	SLOTS_MILLIS_REDUCES	0	0	0
	Total time spent by all reduces waiting after reserving slots (ms)	0	0	0
	SLOTS_MILLIS_MAPS	0	0	46,518
	Total time spent by all maps waiting after reserving slots (ms)	0	0	0
File Output Format Counters	Bytes Written	0	0	0

Map Completion Graph - close

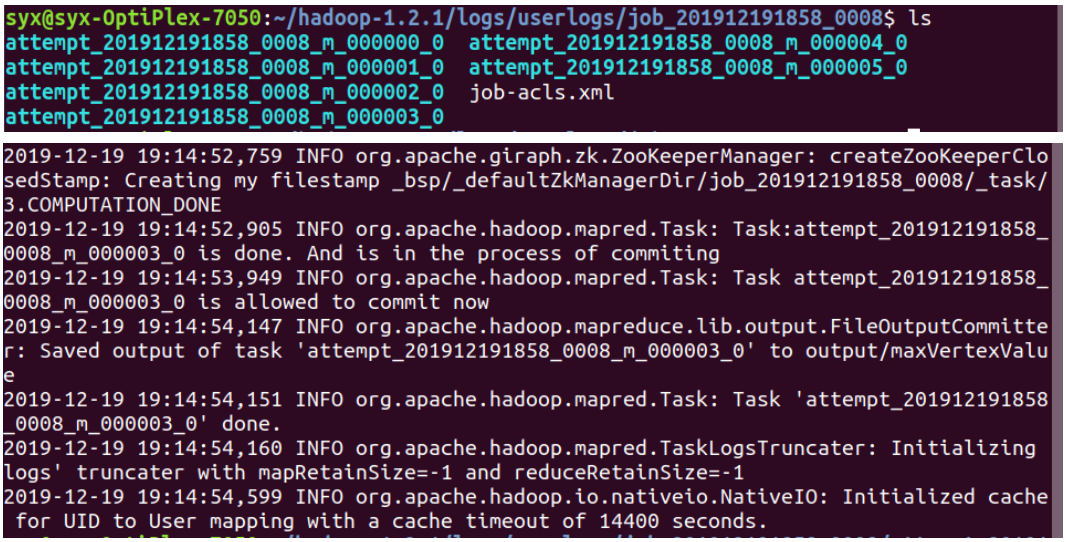
Go back to JobTracker

This is Apache Hadoop release 1.2.1

- 查看程序日志
  - JobHistory 日志默认位置: `~/hadoop-1.2.1/logs/history`

```
Meta VERSION="1" .
Job JOBID="job_201912111018_0005" JOBNAME="Giraph: org\.apache\.giraph\.examples\.SimpleShorte
stPathsComputation" USER="syx" SUBMIT_TIME="1576032287231" JOBCONF="hdfs://localhost:9000/home
/syx/tmp-1\.2\.1/mapred/staging/syx/\.staging/job_201912111018_0005/job\.xml" VIEW_JOB="*" MOD
IFY_JOB="*" JOB_QUEUE="default" WORKFLOW_ID="" WORKFLOW_NAME="" WORKFLOW_NODE_NAME="" WORKFLOW
_ADJACENCIES="" WORKFLOW_TAGS="" .
Job JOBID="job_201912111018_0005" JOB_PRIORITY="NORMAL" .
Job JOBID="job_201912111018_0005" LAUNCH_TIME="1576032287274" TOTAL_MAPS="4" TOTAL_REDUCES="0"
 JOB_STATUS="PREP" .
Task TASKID="task_201912111018_0005_m_000005" TASK_TYPE="SETUP" START_TIME="1576032287501" SPL
ITS="" .
MapAttempt TASK_TYPE="SETUP" TASKID="task_201912111018_0005_m_000005" TASK_ATTEMPT_ID="attempt
_201912111018_0005_m_000005_0" START_TIME="1576032292536" TRACKER_NAME="tracker_syx-OptiPlex-7
050:localhost/127\.0\.0\.1:42245" HTTP_PORT="50060" LOCALITY="OFF_SWITCH" AVATAAR="VIRGIN" .
MapAttempt TASK_TYPE="SETUP" TASKID="task_201912111018_0005_m_000005" TASK_ATTEMPT_ID="attempt
_201912111018_0005_m_000005_0" TASK_STATUS="SUCCESS" FINISH_TIME="1576032293499" HOSTNAME="/de
fault-rack/syx-OptiPlex-7050" STATE_STRING="setup" COUNTERS="{(org\.apache\.hadoop\.mapred\.Ta
sk$Counter)(Map-Reduce Framework)[(SPILLED_RECORDS)(Spilled Records)(0)][(VIRTUAL_MEMORY_BYTES
)(Virtual memory \\(bytes\\) snapshot)(1951891456)][(PHYSICAL_MEMORY_BYTES)(Physical memory \\
(bytes\\) snapshot)(144474112)][(CPU_MILLISECONDS)(CPU time spent \\(ms\\))(90)][(COMMITTED_HE
AP_BYTES)(Total committed heap usage \\(bytes\\))(153616384)]}{(FileSystemCounters)(FileSystem
Counters)[(FILE_BYTES_WRITTEN)(FILE_BYTES_WRITTEN)(120206)]}" .
Task TASKID="task_201912111018_0005_m_000005" TASK_TYPE="SETUP" TASK_STATUS="SUCCESS" FINISH_T
IME="1576032293522" COUNTERS="{(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-Reduce Framewor
k)[(SPILLED_RECORDS)(Spilled Records)(0)][(VIRTUAL_MEMORY_BYTES)(Virtual memory \\(bytes\\) sn
apshot)(1951891456)][(PHYSICAL_MEMORY_BYTES)(Physical memory \\(bytes\\) snapshot)(144474112)]
[(CPU_MILLISECONDS)(CPU time spent \\(ms\\))(90)][(COMMITTED_HEAP_BYTES)(Total committed heap
usage \\(bytes\\))(153616384)]}{(FileSystemCounters)(FileSystemCounters)[(FILE_BYTES_WRITTEN)(
FILE_BYTES_WRITTEN)(120206)]}" .
Job JOBID="job_201912111018_0005" JOB_STATUS="RUNNING" .
Task TASKID="task_201912111018_0005_m_000000" TASK_TYPE="MAP" START_TIME="1576032293523" SPLIT
S="" .
Task TASKID="task_201912111018_0005_m_000001" TASK_TYPE="MAP" START_TIME="1576032293825" SPLIT
S="" .
Task TASKID="task_201912111018_0005_m_000002" TASK_TYPE="MAP" START_TIME="1576032294127" SPLIT
S="" .
Task TASKID="task_201912111018_0005_m_000003" TASK_TYPE="MAP" START_TIME="1576032294427" SPLIT
S="" .
MapAttempt TASK_TYPE="MAP" TASKID="task_201912111018_0005_m_000001" TASK_ATTEMPT_ID="attempt_2
01912111018_0005_m_000001_0" START_TIME="1576032293827" TRACKER_NAME="tracker_syx-OptiPlex-705
0:localhost/127\.0\.0\.1:42245" HTTP_PORT="50060" LOCALITY="OFF_SWITCH" AVATAAR="VIRGIN" .
MapAttempt TASK_TYPE="MAP" TASKID="task_201912111018_0005_m_000001" TASK_ATTEMPT_ID="attempt_2
@@@
                                                                    1,1           顶端
```

- Task 日志默认位置: `~/hadoop-1.2.1/logs/userlogs/<jobid>/<attempt-id>`



2.6 关闭 Hadoop

- 关闭 HDFS

```
~/hadoop-1.2.1/bin/stop-dfs.sh
```

- 关闭 MapReduce

```
~/hadoop-1.2.1/bin/stop-mapred.sh
```

3. 分布式部署

3.1 准备工作

单机伪分布式是部署在同学们现有的用户名 `you` 下, 大家名字是不相同的. 但是分布式部署需要每个节点都用同一个名字. 以下使用用户名 `ecnu`

- 有至少两台的服务器, 每台服务器上都有用于分布式部置的用户 `ecnu`
- 在其中一台机器上下载安装 Giraph: 以 `giraph-dist-1.2.0-bin.tar.gz` 为例

```
cd ~/Downloads
wget https://mirrors.tuna.tsinghua.edu.cn/apache/giraph/giraph-1.2.0/giraph-dist-1.2.0-bin.tar.gz
tar -zxvf giraph-dist-1.2.0-bin.tar.gz
mv ./giraph-1.2.0-for-hadoop-1.2.1 ~/giraph-1.2.0-for-hadoop-1.2.1
```

- 已完成 MapReduce v1 分布式部署

3.2 修改配置

- 修改 `~/giraph-1.2.0-for-hadoop-1.2.1/bin/giraph-env`, 指定 Hadoop 安装路径

```
sed -i '1i\export HADOOP_HOME=~/hadoop-1.2.1' ~/giraph-1.2.0-for-hadoop-1.2.1/bin/giraph-env
```

3.3 启动 Hadoop

- 启动 HDFS, 在主节点执行

```
~/hadoop-1.2.1/bin/start-dfs.sh
```

- 启动 MapReduce, 在主节点执行

```
~/hadoop-1.2.1/bin/start-mapred.sh
```

-
```
ecnu@may-lab:/home/ecnu/hadoop-1.2.1$ jps
10147 JobTracker
10931 SecondaryNameNode
10485 NameNode
10714 DataNode
11003 Jps
10348 TaskTracker
```

-
```
ecnu@syx-OptiPlex-7050:~/hadoop-1.2.1/conf$ jps
28880 Jps
28564 TaskTracker
28751 DataNode
```

3.4 运行 Giraph 应用程序

Simple shortest paths computation 示例程序 (官方说明)

- 将 `tiny_graph.txt` 上传至 `hdfs:///user/ecnu/input` 下

```
~/hadoop-1.2.1/bin/hadoop fs -mkdir input
~/hadoop-1.2.1/bin/hadoop fs -put ~/tiny_graph.txt input/
```

- 执行程序
- 查看运行中进程
  - 主节点

```
ecnu@may-lab:/home/ecnu/hadoop-1.2.1/bin$ jps
13186 JobTracker
12853 DataNode
17047 Child
17017 Child
13066 SecondaryNameNode
17340 Jps
13405 TaskTracker
15773 RunJar
12638 NameNode
```

- 从节点

```
ecnu@syx-OptiPlex-7050:~/hadoop-1.2.1/bin$ jps
30322 TaskTracker
31285 Jps
31163 Child
30139 DataNode
31164 Child
```

- 运行完成后查看输出

Giraph 应用编程实践

1. 编写Giraph程序

- 创建maven项目

参考文档：create maven.md

- 添加pom依赖

在pom.xml文件中添加以下依赖：`giraph-core`、`giraph-examples`、`hadoop-common`和`hadoop-client`。

- 编写Giraph应用程序代码

- 新建`src/main/java/example/MaxVertexValue.java`类
- 新建`src/main/java/GiraphDemoRunner.java`类

2. 调试Giraph程序

- 配置程序输入

在`src/main/resources/input/`路径下添加输入文件`graph-data1.txt`和`tiny_graph.txt`。

输入文件内容说明：文件使用了`JsonLongDoubleFloatDoubleVertexInputFormat`图数据输入格式，
文件中每行内容格式为`[source_id,source_value,[[dest_id, edge_value],...]]`

- `graph-data1.txt`文件内容：

```
syx@syx-OptiPlex-7050: ~
文件(F)  编辑(E)  查看(V)  搜索(S)  终端(T)  帮助(H)
[0,100,[[1,1],[3,3]]]
[1,20,[[0,1],[2,2],[3,1]]]
[2,90,[[1,2],[4,4]]]
[3,50,[[0,3],[1,1],[4,4]]]
[4,80,[[3,4],[2,4]]]
~
~
~
```

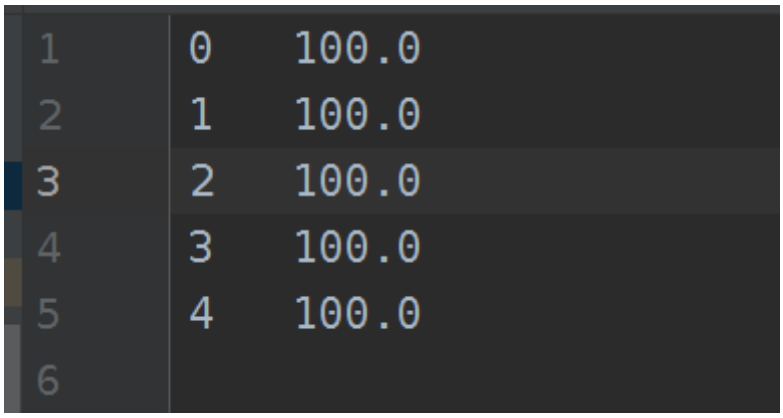
- `tiny_graph.txt` 文件内容：

```
syx@syx-OptiPlex-7050: ~
文件(F)  编辑(E)  查看(V)  搜索(S)  终端(T)  帮助(H)
[0 ,0 ,[[1 ,1] ,[3 ,3]]]
[1 ,0 ,[[0 ,1] ,[2 ,2] ,[3 ,1]]]
[2 ,0 ,[[1 ,2] ,[4 ,4]]]
[3 ,0 ,[[0 ,3] ,[1 ,1] ,[4 ,4]]]
[4 ,0 ,[[3 ,4] ,[2 ,4]]]
~
~
```

- IDE中直接运行Giraph `MaxVertexValue` 应用程序

直接在 IDEA 中运行 `src/main/java/GiraphDemoRunner.java` 类，并查看输出结果。正常执行下，程序会产生 `src/main/resources/output/graph_maxValue` 文件夹，文件夹内包含程序输出内容。

- 程序输出内容：



输出文件内容说明： 文件使用了 `IdWithValueTextOutputFormat` 输出格式，输出文件中每行内容格式为：`source_id value` 表示每个节点上记录的 图中所有节点的最大值 。

3. 运行Giraph程序

- 利用IDE打包jar文件

这里默认取名 `giraph.jar`

- 伪分布式模式下运行Giraph `MaxVertexValue` 程序

- 安装部署好 基于MapReduce v1的 Giraph 系统
  参考文档：Giraph基于MapReduce v1的部署
- 上传输入文件至 HDFS

```
syx@syx-OptiPlex-7050:~/hadoop-1.2.1/bin$ hadoop fs -put /home/syx/graph-data1.txt input/
```

- 运行 giraph 程序
  在终端中运行如下命令：

```
syx@syx-OptiPlex-7050:~/giraph-1.2.0-for-hadoop-1.2.1$ ./bin/giraph /home/syx/g1/out/artifacts/giraffe/giraffe.jar example.MaxVertexValue -vif org.apache.giraph.io.formats.JsonLongDoubleFloatDoubleVertexInputFormat -vip input/graph-data1.txt -vof org.apache.giraph.io.formats.IdWithValueTextOutputFormat -op output/maxVertexValue -w 3
```

- 查看输出结果 执行命令, 输出结果如下：

```
syx@syx-OptiPlex-7050:~/hadoop-1.2.1/bin$ hadoop fs -cat output/maxVertexValue/p
art-m-00001
0       100.0
3       100.0
syx@syx-OptiPlex-7050:~/hadoop-1.2.1/bin$ hadoop fs -cat output/maxVertexValue/p
art-m-00002
1       100.0
4       100.0
syx@syx-OptiPlex-7050:~/hadoop-1.2.1/bin$ hadoop fs -cat output/maxVertexValue/p
art-m-00003
2       100.0
syx@syx-OptiPlex-7050:~/hadoop-1.2.1/bin$ hadoop fs -cat output/maxVertexValue/p
*
0       100.0
3       100.0
1       100.0
4       100.0
2       100.0
```

五. 总结

1. 单机伪分布式:

- 指定worker数量为3时, Hadoop Jobtracker 会启动3+1个child(map task)运行, 多出来的一个是Giraph的Master;
- 程序运行时,

Kind	% Complete	Num Tasks	Pending	Running	Complete	Killed	Failed/Killed Task Attempts
map	100.00%	4	0	0	4	0	0 / 0
reduce	100.00%	0	0	0	0	0	0 / 0

  可以看见reduce的num tasks为0, 是因为Giraph借用Mapreduce的框架, 但并没有调用map/reduce的函数接口

- userlogs日志查看:

```
syx@syx-OptiPlex-7050:~/hadoop-1.2.1/logs/userlogs/job_201912191858_0008$ ls
attempt_201912191858_0008_m_000000_0  attempt_201912191858_0008_m_000004_0
attempt_201912191858_0008_m_000001_0  attempt_201912191858_0008_m_000005_0
attempt_201912191858_0008_m_000002_0  job-acls.xml
attempt_201912191858_0008_m_000003_0
```

  - 一个job对应的前4个attempt(0, 1, 2, 3)分别代表Master, worker0, worker1, worker2
  - attemp0:

```
2019-12-22 09:59:35,661 INFO org.apache.giraph.master.BspServiceMaster: becomeMaster:
 First child is '/_hadoopBsp/job_201912220958_0001/_masterElectionDir/syx-optiplex-70
50_00000000000' and my bid is '/_hadoopBsp/job_201912220958_0001/_masterElectionDir/s
yx-optiplex-7050_00000000000'
2019-12-22 09:59:36,086 INFO org.apache.giraph.comm.netty.NettyServer: NettyServer: U
sing execution group with 8 threads for requestFrameDecoder.
2019-12-22 09:59:36,272 INFO org.apache.giraph.comm.netty.NettyServer: start: Started
 server communication server: syx-OptiPlex-7050/127.0.1.1:30000 with up to 16 threads
 on bind attempt 0 with sendBufferSize = 32768 receiveBufferSize = 524288
2019-12-22 09:59:36,306 INFO org.apache.giraph.comm.netty.NettyClient: NettyClient: U
sing execution handler with 8 threads after request-encoder.
2019-12-22 09:59:36,308 INFO org.apache.giraph.master.BspServiceMaster: becomeMaster:
 I am now the master!
```

  - attempt1, 2, 3:

```
2019-12-22 09:59:37,953 INFO org.apache.giraph.graph.GraphTaskManager: setup: Re
gistering health of this worker...
2019-12-22 09:59:37,998 INFO org.apache.giraph.bsp.BspService: getJobState: Job
state already exists (/_hadoopBsp/job_201912220958_0001/_masterJobState)
```

- logs/history查看:

- 可以看见4个task

```
Job JOBID="job_201912220958_0001" JOB_STATUS="RUNNING" .
Task TASKID="task_201912220958_0001_m_000000" TASK_TYPE="MAP" START_TIME="15769799697
92" SPLITS="" .
Task TASKID="task_201912220958_0001_m_000001" TASK_TYPE="MAP" START_TIME="15769799700
06" SPLITS="" .
Task TASKID="task_201912220958_0001_m_000002" TASK_TYPE="MAP" START_TIME="15769799703
09" SPLITS="" .
Task TASKID="task_201912220958_0001_m_000003" TASK_TYPE="MAP" START_TIME="15769799706
12" SPLITS="" .
```

2. 分布式部署:

- 遇到的错误:
  - 已解决: 😁

```
MapAttempt TASK_TYPE="MAP" TASKID="task_201912111235_0002_m_000001" TASK_ATTEMPT_ID="attempt_201912111235_00
02_m_000001_0" TASK_STATUS="FAILED" FINISH_TIME="1576039904068" HOSTNAME="may-lab" ERROR="java\.lang\.Illega
lStateException: run: Caught an unrecoverable exception java\.net\.UnknownHostException: syx-optiplex-7050:
系统错误
        at org\.apache\.giraph\.graph\.GraphMapper\.run(GraphMapper\.java:108)
        at org\.apache\.hadoop\.mapred\.MapTask\.runNewMapper(MapTask\.java:764)
        at org\.apache\.hadoop\.mapred\.MapTask\.run(MapTask\.java:364)
        at org\.apache\.hadoop\.mapred\.Child$4\.run(Child\.java:255)
        at java\.security\.AccessController\.doPrivileged(Native Method)
        at javax\.security\.auth\.Subject\.doAs(Subject\.java:422)
        at org\.apache\.hadoop\.security\.UserGroupInformation\.doAs(UserGroupInformation\.java:1190)
        at org\.apache\.hadoop\.mapred\.Child\.main(Child\.java:249)
Caused by: java\.lang\.RuntimeException: java\.net\.UnknownHostException: syx-optiplex-7050: 系统错误
        at org\.apache\.giraph\.bsp\.BspService\.<init>(BspService\.java:287)
        at org\.apache\.giraph\.worker\.BspServiceWorker\.<init>(BspServiceWorker\.java:203)
        at org\.apache\.giraph\.graph\.GraphTaskManager\.instantiateBspService(GraphTaskManager\.java:632)
        at org\.apache\.giraph\.graph\.GraphTaskManager\.setup(GraphTaskManager\.java:262)
        at org\.apache\.giraph\.graph\.GraphMapper\.setup(GraphMapper\.java:56)
        at org\.apache\.giraph\.graph\.GraphMapper\.run(GraphMapper\.java:90)
        \.\.\. 7 more
```

solution: 在 `/etc/hosts` 中加入主机名和IP地址

```
127.0.0.1       localhost
127.0.1.1       syx-OptiPlex-7050
219.228.135.71  may-lab
# The following lines are desirable for IPv6 capable hosts
::1     ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
~
```

  - 未解决: 😢

    jps后所有的进程都能启动, 但是task运行到50%卡住直至运行结束

    - webUI

Hadoop job_201912111235_0004 on 219

User: ecnu
Job Name: Giraph: org.apache.giraph.examples.SimpleShortestPathsComputation
Job File: hdfs://219.228.135.207:9000/home/ecnu/tmp-1.2.1/mapred/staging/ecnu/.staging/job_201912111235_0004/job.xml
Submit Host: may-lab
Submit Host Address: 127.0.1.1
Job-ACLs: All users are allowed
Job Setup: Successful
Status: Killed
Failure Info:NA
Started at: Wed Dec 11 16:58:12 CST 2019
Killed at: Wed Dec 11 17:18:23 CST 2019
Killed in: 20mins, 10sec
Job Cleanup: Successful

Kind	% Complete	Num Tasks	Pending	Running	Complete	Killed	Failed/Killed Task Attempts
map	100.00%	4	0	0	0	4	0 / 4
reduce	100.00%	0	0	0	0	0	0 / 0

	Counter	Map	Reduce	Total
Job Counters	Launched map tasks	0	0	4
	SLOTS_MILLIS_REDUCES	0	0	0
	Total time spent by all reduces waiting after reserving slots (ms)	0	0	0
	SLOTS_MILLIS_MAPS	0	0	4,802,567
	Total time spent by all maps waiting after reserving slots (ms)	0	0	0

	Counter	Map	Reduce	Total
Job Counters	Launched map tasks	0	0	4
	SLOTS_MILLIS_REDUCES	0	0	0
	Total time spent by all reduces waiting after reserving slots (ms)	0	0	0
	SLOTS_MILLIS_MAPS	0	0	4,802,567
	Total time spent by all maps waiting after reserving slots (ms)	0	0	0

Map Completion Graph - close

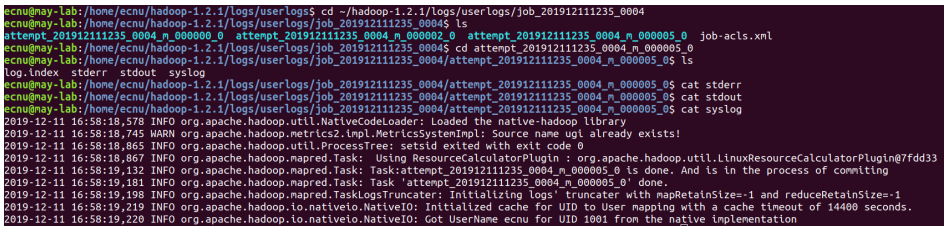
- logs/history:

```
Meta VERSION="1" .
Job JOBID="job_201912111235_0004" JOBNAME="Giraph:
org\.apache\.giraph\.examples\.SimpleShortestPathsComputat
ion" USER="ecnu" SUBMIT_TIME="1576054692590"
JOBCONF="hdfs://219\.228\.135\.207:9000/home/ecnu/tmp-
1\.2\.1/mapred/staging/ecnu/\.staging/job_201912111235_000
4/job\.xml" VIEW_JOB="*" MODIFY_JOB="*"
JOB_QUEUE="default" WORKFLOW_ID="" WORKFLOW_NAME=""
WORKFLOW_NODE_NAME="" WORKFLOW_ADJACENCIES=""
WORKFLOW_TAGS="" .
Job JOBID="job_201912111235_0004" JOB_PRIORITY="NORMAL" .
Job JOBID="job_201912111235_0004"
LAUNCH_TIME="1576054692650" TOTAL_MAPS="4"
TOTAL_REDUCES="0" JOB_STATUS="PREP" .
Task TASKID="task_201912111235_0004_m_000005"
TASK_TYPE="SETUP" START_TIME="1576054692671" SPLITS="" .
MapAttempt TASK_TYPE="SETUP"
TASKID="task_201912111235_0004_m_000005"
TASK_ATTEMPT_ID="attempt_201912111235_0004_m_000005_0"
START_TIME="1576054697910" TRACKER_NAME="tracker_may-
lab:localhost/127\.0\.0\.1:40597" HTTP_PORT="50060"
LOCALITY="OFF_SWITCH" AVATAAR="VIRGIN" .
MapAttempt TASK_TYPE="SETUP"
TASKID="task_201912111235_0004_m_000005"
TASK_ATTEMPT_ID="attempt_201912111235_0004_m_000005_0"
TASK_STATUS="SUCCESS" FINISH_TIME="1576054699181"
HOSTNAME="/default-rack/may-lab" STATE_STRING="setup"
COUNTERS="{(org\.apache\.hadoop\.mapred\.Task$Counter)
(Map-Reduce Framework)[(SPILLED_RECORDS)(Spilled Records)
(0)][(VIRTUAL_MEMORY_BYTES)(Virtual memory \\(bytes\\)
snapshot)(578052096)][(PHYSICAL_MEMORY_BYTES)(Physical
memory \\(bytes\\) snapshot)(122966016)]
[(CPU_MILLISECONDS)(CPU time spent \\(ms\\))(140)]
[(COMMITTED_HEAP_BYTES)(Total committed heap usage \\
(bytes\\))(112459776)]}{(FileSystemCounters)
(FileSystemCounters)[(FILE_BYTES_WRITTEN)
(FILE_BYTES_WRITTEN)(123279)]}" .
```

```
8  Task TASKID="task_201912111235_0004_m_000005"
   TASK_TYPE="SETUP" TASK_STATUS="SUCCESS"
   FINISH_TIME="1576054699290" COUNTERS="
   {(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-Reduce
   Framework)[(SPILLED_RECORDS)(Spilled Records)(0)]
   [(VIRTUAL_MEMORY_BYTES)(Virtual memory \\(bytes\\)
   snapshot)(578052096)][(PHYSICAL_MEMORY_BYTES)(Physical
   memory \\(bytes\\) snapshot)(122966016)]
   [(CPU_MILLISECONDS)(CPU time spent \\(ms\\))(140)]
   [(COMMITTED_HEAP_BYTES)(Total committed heap usage \\
   (bytes\\))(112459776)]}{(FileSystemCounters)
   (FileSystemCounters)[(FILE_BYTES_WRITTEN)
   (FILE_BYTES_WRITTEN)(123279)]}" .
9  Job JOBID="job_201912111235_0004" JOB_STATUS="RUNNING" .
10 Task TASKID="task_201912111235_0004_m_000000"
   TASK_TYPE="MAP" START_TIME="1576054699292" SPLITS="" .
11 Task TASKID="task_201912111235_0004_m_000001"
   TASK_TYPE="MAP" START_TIME="1576054699422" SPLITS="" .
12 Task TASKID="task_201912111235_0004_m_000002"
   TASK_TYPE="MAP" START_TIME="1576054699594" SPLITS="" .
13 Task TASKID="task_201912111235_0004_m_000003"
   TASK_TYPE="MAP" START_TIME="1576054699724" SPLITS="" .
14 Task TASKID="task_201912111235_0004_m_000004"
   TASK_TYPE="CLEANUP" START_TIME="1576055901549" SPLITS="" .
15 MapAttempt TASK_TYPE="MAP"
   TASKID="task_201912111235_0004_m_000000"
   TASK_ATTEMPT_ID="attempt_201912111235_0004_m_000000_0"
   START_TIME="1576054699294" TRACKER_NAME="tracker_may-
   lab:localhost/127\.0\.0\.1:40597" HTTP_PORT="50060"
   LOCALITY="OFF_SWITCH" AVATAAR="VIRGIN" .
16 MapAttempt TASK_TYPE="MAP"
   TASKID="task_201912111235_0004_m_000000"
   TASK_ATTEMPT_ID="attempt_201912111235_0004_m_000000_0"
   TASK_STATUS="KILLED" FINISH_TIME="1576055901684"
   HOSTNAME="may-lab" ERROR="" .
17 MapAttempt TASK_TYPE="MAP"
   TASKID="task_201912111235_0004_m_000002"
   TASK_ATTEMPT_ID="attempt_201912111235_0004_m_000002_0"
   START_TIME="1576054699595" TRACKER_NAME="tracker_may-
   lab:localhost/127\.0\.0\.1:40597" HTTP_PORT="50060"
   LOCALITY="OFF_SWITCH" AVATAAR="VIRGIN" .
18 MapAttempt TASK_TYPE="MAP"
   TASKID="task_201912111235_0004_m_000002"
   TASK_ATTEMPT_ID="attempt_201912111235_0004_m_000002_0"
   TASK_STATUS="KILLED" FINISH_TIME="1576055901691"
   HOSTNAME="may-lab" ERROR="" .
19 MapAttempt TASK_TYPE="CLEANUP"
   TASKID="task_201912111235_0004_m_000004"
   TASK_ATTEMPT_ID="attempt_201912111235_0004_m_000004_0"
   START_TIME="1576055901544" TRACKER_NAME="tracker_syx-
   OptiPlex-7050:localhost/127\.0\.0\.1:41333"
   HTTP_PORT="50060" LOCALITY="OFF_SWITCH" AVATAAR="VIRGIN" .
```

```
20 MapAttempt TASK_TYPE="CLEANUP"
TASKID="task_201912111235_0004_m_000004"
TASK_ATTEMPT_ID="attempt_201912111235_0004_m_000004_0"
TASK_STATUS="SUCCESS" FINISH_TIME="1576055902756"
HOSTNAME="/default-rack/syx-OptiPlex-7050"
STATE_STRING="cleanup" COUNTERS="
{(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-Reduce
Framework)[(SPILLED_RECORDS)(Spilled Records)(0)]
[(VIRTUAL_MEMORY_BYTES)(Virtual memory \\(bytes\\)
snapshot)(1958236160)][(PHYSICAL_MEMORY_BYTES)(Physical
memory \\(bytes\\) snapshot)(142905344)]
[(CPU_MILLISECONDS)(CPU time spent \\(ms\\))(230)]
[(COMMITTED_HEAP_BYTES)(Total committed heap usage \\
(bytes\\))(153092096)]}{(FileSystemCounters)
(FileSystemCounters)[(FILE_BYTES_WRITTEN)
(FILE_BYTES_WRITTEN)(123285)]}" .
21 Task TASKID="task_201912111235_0004_m_000004"
TASK_TYPE="CLEANUP" TASK_STATUS="SUCCESS"
FINISH_TIME="1576055903060" COUNTERS="
{(org\.apache\.hadoop\.mapred\.Task$Counter)(Map-Reduce
Framework)[(SPILLED_RECORDS)(Spilled Records)(0)]
[(VIRTUAL_MEMORY_BYTES)(Virtual memory \\(bytes\\)
snapshot)(1958236160)][(PHYSICAL_MEMORY_BYTES)(Physical
memory \\(bytes\\) snapshot)(142905344)]
[(CPU_MILLISECONDS)(CPU time spent \\(ms\\))(230)]
[(COMMITTED_HEAP_BYTES)(Total committed heap usage \\
(bytes\\))(153092096)]}{(FileSystemCounters)
(FileSystemCounters)[(FILE_BYTES_WRITTEN)
(FILE_BYTES_WRITTEN)(123285)]}" .
```

- output of master's userlog



- output of shell after submitting task

```
1 No HADOOP_CONF_DIR set, using /home/ecnu//hadoop-
1.2.1/conf
2 Warning: $HADOOP_HOME is deprecated.
3
4 19/12/11 16:58:07 INFO utils.ConfigurationUtils: No edge
input format specified. Ensure your InputFormat does not
require one.
5 19/12/11 16:58:07 INFO utils.ConfigurationUtils: No edge
output format specified. Ensure your OutputFormat does not
require one.
6 19/12/11 16:58:07 INFO job.GiraphJob: run: Since
checkpointing is disabled (default), do not allow any task
retries (setting mapred.map.max.attempts = 1, old value =
4)
7 19/12/11 16:58:12 INFO job.GiraphJob: Tracking URL:
http://219.228.135.207:50030/jobdetails.jsp?
jobid=job_201912111235_0004
```

```
19/12/11 16:58:12 INFO job.GiraphJob: Waiting for resources... Job will start only when it gets all 4 mappers
19/12/11 16:58:54 INFO job.HaltApplicationUtils$DefaultHaltInstructionsWriter: writeHaltInstructions: To halt after next superstep execute: 'bin/halt-application --zkServer may-lab:22181 --zkNode /_hadoopBsp/job_201912111235_0004/_haltComputation'
19/12/11 16:58:54 INFO mapred.JobClient: Running job: job_201912111235_0004
19/12/11 16:58:55 INFO mapred.JobClient:  map 50% reduce 0%
19/12/11 17:18:23 INFO mapred.JobClient: Job complete: job_201912111235_0004
19/12/11 17:18:23 INFO mapred.JobClient: Counters: 5
19/12/11 17:18:23 INFO mapred.JobClient:   Job Counters
19/12/11 17:18:23 INFO mapred.JobClient:     Launched map tasks=4
19/12/11 17:18:23 INFO mapred.JobClient:     SLOTS_MILLIS_REDUCES=0
19/12/11 17:18:23 INFO mapred.JobClient:     Total time spent by all reduces waiting after reserving slots (ms)=0
19/12/11 17:18:23 INFO mapred.JobClient:     SLOTS_MILLIS_MAPS=2406969
19/12/11 17:18:23 INFO mapred.JobClient:     Total time spent by all maps waiting after reserving slots (ms)=0
```