COP 5615

Project 1 Bitcoins Miner

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Instruction

To run the program, it require sbt and scala installed in the environment.
1. Go to Project1 folder which include build sbt file.
2. Run command for server
    sbt "run <K> <Number of coins wanted>"
3. Run command for remote client
    sbt "run <Server IP>"

Design

The system include three Actor.

a. *Server* for assign works to *Client* and collect the bitcoins found by *Client*.
b. *Client* is actor on a local or remote machine that split the work from server into small pieces and create workers according to the cores in the local machine.
c. *Works* are the actor who mine bitcoins and give it to *Client*. After all workers in a *Client* finish their work. *Client* will give *Server* all bitcoins it find and ask for next job or stop work.

Here is the workflow of the program
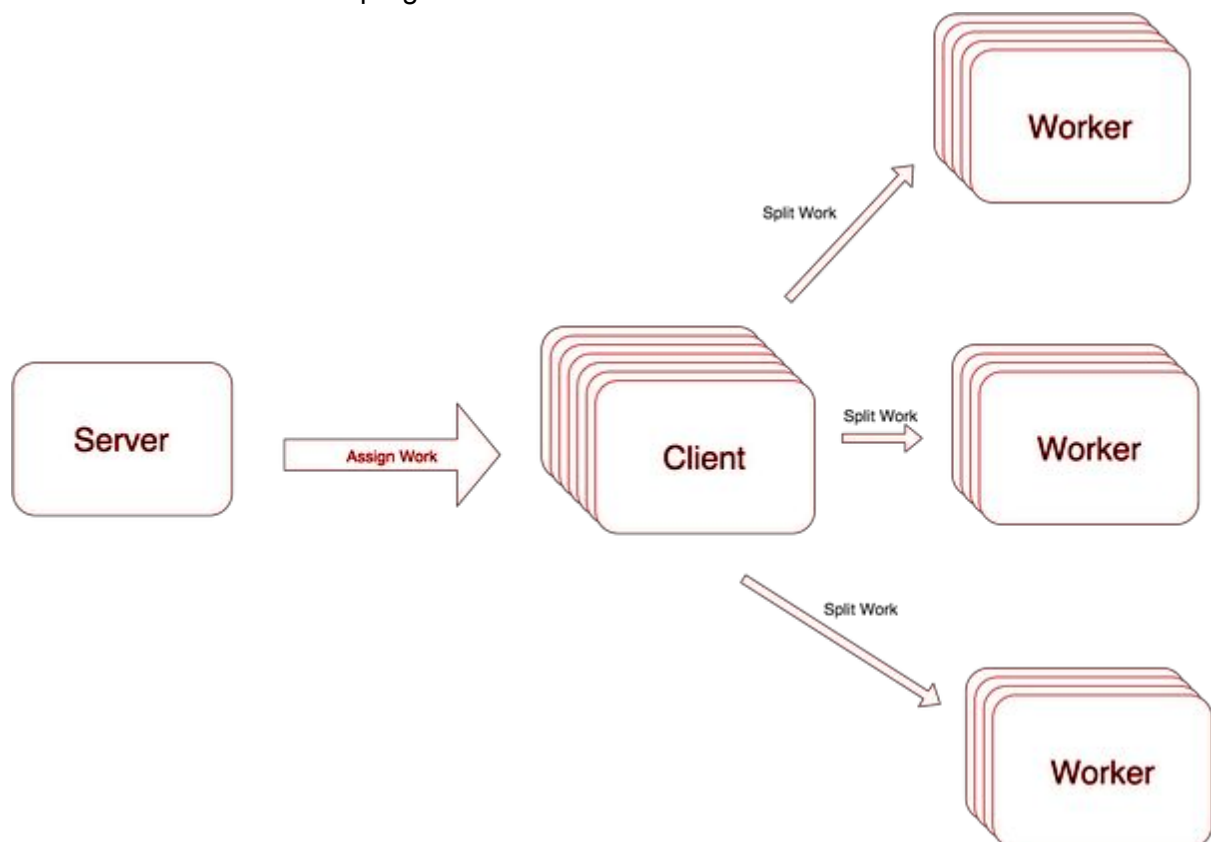
1 Work Size

To measure the best work szie, we run conmand

sbt "run 5 10"

which means find at least 10 bitcoins when K = 5. The program run on Mac Pro with 8 processors i7. Total number of core is 8. And the result is shown below:

# Cores	#Workers	#Work size per worker	User Time	Real Time	Ratio
8	1	500000	240.465	207.364	1.159627515
8	1	1000000	230.215	216.453	1.063579622
8	1	5000000	238.197	223.56	1.065472356
8	2	500000	267.481	126.487	2.114691628
8	2	1000000	231.991	111.991	2.071514675
8	2	5000000	231.991	112.486	2.062398876
8	4	500000	288.27	73.625	3.915382003
8	4	1000000	260.915	65.938	3.956974734
8	4	5000000	272.701	69.316	3.934171043
8	6	500000	348.556	63.926	5.452491944
8	6	1000000	412.354	77.513	5.31980442
8	8	500000	505.457	81.671	6.188940995
8	8	1000000	504.236	81.699	6.171874809
8	10	500000	519.362	83.223	6.240606563
8	10	1000000	471.754	77.715	6.070308177
8	12	500000	483.294	77.45	6.240077469
8	12	1000000	495.425	76.871	6.444888189
8	15	500000	482.536	76.132	6.33814953
8	15	1000000	500.946	75.263	6.655939838
8	20	500000	502.027	75.767	6.625932134
8	20	1000000	490.495	75.461	6.499980122
8	50	500000	482.581	76.038	6.346576712
8	50	1000000	557.488	88.75	6.28155493

From the data, we can find that
   a. The best work size is 1000000
   b. The best number of worker per core is 8 / 15 = 1.875

2 Result when K = 4

Use comand sbt "run 4 10"

[info] Set current project to Project1 (in build file:/Users/zhongyanqiu/Documents/scala/project1/part2/)
[info] Running Project1 4 10
difficulty: 4 ip: 4
Here we go!!
Local Client: Actor[akka://LocalSystem/user/server/local_client#1682420472] joins us!
zyadabc14;162299 00004e9021acf422984ef272a36b5b75e18d870b32ffad561d210d8872e9c5c3
zyadabc14;143075 000053b937548113eab8b3a7ae77fa3b87b9056e0da0a86e775850aa3b9f7b4d
zyadabc14;292179 0000115941e6d46ce3ddd62cebde88ac727f5379351d87eb3817f872e0fb2c5e
zyadabc14;290699 00004b2db1882712ac00cfabc2be0fdbfa8ce22bc0c71a42943165b4feb89f7e
zyadabc14;205568 0000f67030ecbfde724c995d5ebddd6d8f337a194ffa307fc22138482bd7b560
zyadabc14;333769 00006c8f30a65b0517fe8a7a23103d370a529550dc659523a699b5d3cfd68ed0
zyadabc14;453514 0000f6e9b0a625fb08e13ee9f4f2e2ca497702eada1d36f53b575c9278118457
zyadabc14;444387 0000e8e687fc785815764c350502fb62bb97c4ebd5369bb6ece32c556670297e
zyadabc14;558471 0000265170cb8ff4c37f47fc659b7d40cf9416176c0510d2073e8e58c30c8f12
zyadabc14;613647 0000979359cf7da8646cd54b35f600122d5e40c27e52204e7fceab2a04d78f90
zyadabc14;622516 0000ba1b9910b325c0fba7b3446d07cc06f23e5e53013a6815cca6a9170d6c71
[success] Total time: 6 s, completed Sep 11, 2015 11:09:11 PM

3 Runing time When K = 5

User time : 462.525s
System time: 2.692s
Real time: 66.738s

4 Coin with the most 0s managed to find

Coin with the most 0s I managed to find is a coin with 7 leading 0s.
zyadabc14; 249200103   000000084d0ed489c876f1a0884a458fa9b0a59ecc4be747981024c004853f23f

```
Zhongyans-MacBook-Pro:part2 zhongyanqiu$ time sbt "run 7 1"
[info] Set current project to Project1 (in build file:/Users/zhongyanqiu/Documents/scala/project1/part2/)
[info] Running Project1 7 1
difficulty: 7  ip: 7
Here we go!!
Local Client: Actor[akka://LocalSystem/user/server/local_client#396382341] joins us!
^C
real    54m37.503s
user    53m13.669s
sys     0m13.801s
Zhongyans-MacBook-Pro:part2 zhongyanqiu$ time sbt "run 7 1"
[info] Set current project to Project1 (in build file:/Users/zhongyanqiu/Documents/scala/project1/part2/)
[info] Running Project1 7 1
difficulty: 7  ip: 7
Here we go!!
Local Client: Actor[akka://LocalSystem/user/server/local_client#-1330699023] joins us!
zyadabc14;249200103    000000084d0ed489c876f1a0884a458f9b0a59ecc4be747981024c004853f23f
[success] Total time: 1720 s, completed Sep 12, 2015 12:47:28 AM

real    28m42.699s
user    204m37.289s
sys     0m45.245s
Zhongyans-MacBook-Pro:part2 zhongyanqiu$
```

5 Largest Number of Working machine

Theoritically, the program support to run any number of client.
We at most run 7 client.