Distributed Operating Systems Principles COP5615

Project 1 – Bitcoin Mining

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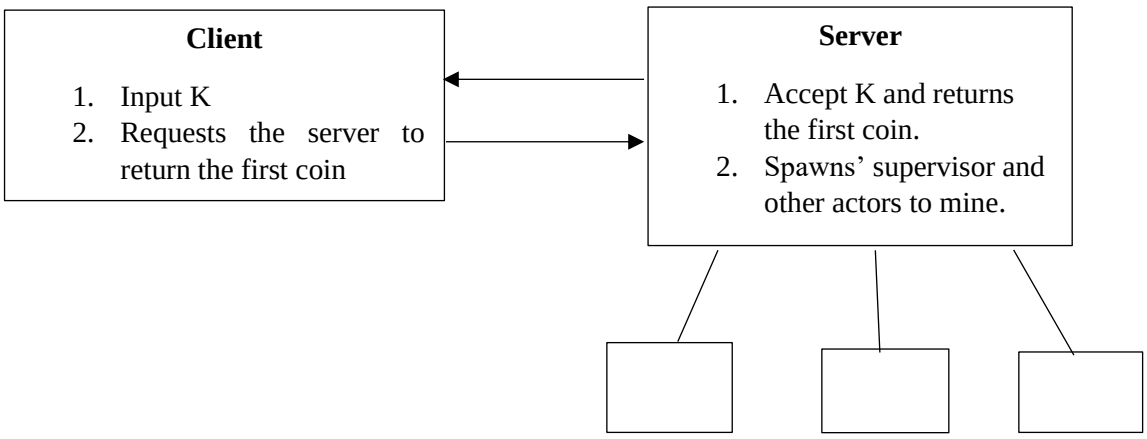
Bitcoin Mining

The goal is to mine bitcoins parallelly on different nodes, as well as using multiple processing on same node using distributed system properties.

Implementation Structure

We have implemented the client server architecture. Client takes “K” as input, that is the number of zeroes the hashed value should be starting with. Server does the computational heavy lifting of mining for coins by spawning the ‘supervisor’ process which in turn spawns’ multiple actors amongst whom the workload is divided to mine the coins.



Processes

Commands to run on the server

1. Compile the code using: c(miningServer).
2. Run the program using: miningServer:start_server().

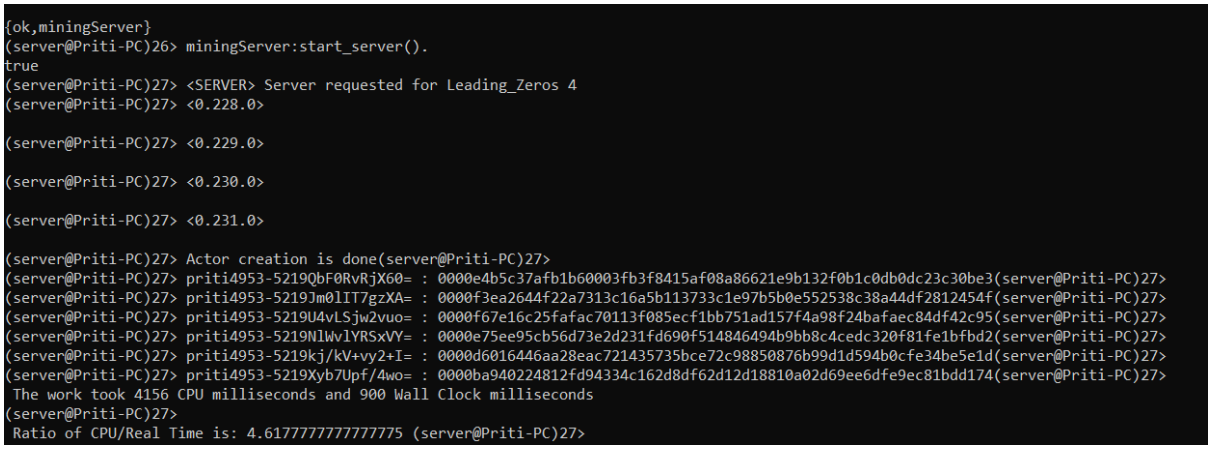
Commands to run on the client

1. Compile the code using: c(miningClient).
2. Run the program using: miningClient:start_client(' IP address of the server machine along with node').
3. User input as K.

Note:

Create a cookie file named as ‘.erlang.cookie’ with value ‘dna’ written in it on both client and server machines.

Result of running program for input as 4



The work took 4156 CPU milliseconds and 900 Wall Clock milliseconds

(server@Priti-PC)27>

Ratio of CPU/Real Time is: 4.6177777777777775 (server@Priti-PC)27>

Running time

CPU Time: 4156 ms

Real Time: 900 ms

The ratio of CPU time to Real time to denote the effectiveness of cores used in the computation is: 4156 ms / 900 ms = 4.617, for k=4.

Size of Work Unit

Different workloads are assigned to the program like 100, 1000, 10000 and this workload is divided between the number of actors we have spawned.

For example, in this case, when there are 4 actors and we are running it for k= 4 (number of zeroes), then per actor the size of work unit was 25.

- *Computation for input k= 4:*

No. of actors	Ratio (CPU time/Real time)
4	4.617
8	7.75
10	7.99

Hashed values generated for k=4 and number of actors = 4:

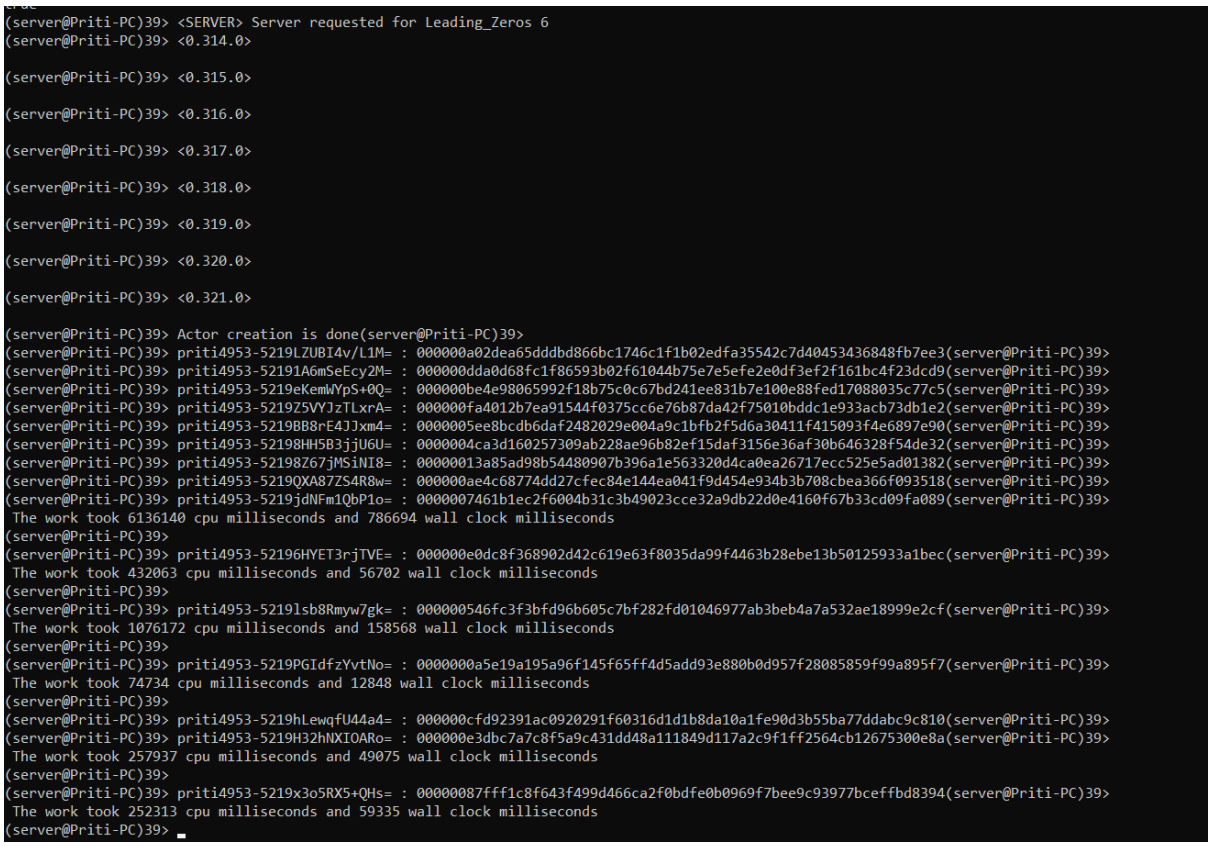
```
{ok,miningClient}
(client@Priti-PC)13> miningClient:start_client('server@Priti-PC').
4.
<CLIENT>Server requested for Leading_Zeros 4
<0.132.0>
(client@Priti-PC)14>
```

```
(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-52197dVR40TsdhY= : 000077e451a13f75cbdc7687f309d15a62f443d97e840e3547b1aa21a4a48f97(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219ArdlJfDFGA0= : 000065b8dde0f8db7305fd4e08e973772f111302ebf3f2dd02040bd39cf5c028(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219gSsvK+UHlHM= : 0000e4774f5b766aa466e1b970302f01da3331a7efbb09af700ced601b6aec32(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219TRnzcwWcz+s= : 00006d296236b720d6c7d61a535d849e08653617a67b79a049706f17ed84cc29(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219sZgWnsIjgjE= : 000063a1b749ae826da2c95e36cd58f241ee52e83cee0177666b1c25c0d87a96(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219uYP8G9oRuTA= : 000081d0ab9d7aad40702182f7c92de6ed876eb094f3d10e20e2b082210ce4df(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219aiRJbsxQIRU= : 0000154bbddd2b548ce7f19be795192f59fe833da11a42938ca2a3b023c2486d(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219314Alw/3kDY= : 00001b11412ac050c038e25c0e3edb5d8609a3d12af48e5949cdc09f5e82149f(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219HjjFQC3oRS8= : 0000a0255ac2dd69937a609ecbfe938049a0e7b6d4acb302f0e1f01fb4935349(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219SSGOE/U1ptI= : 0000fbc701904e02ffcd6e628049073a7c0cd3ef672a5b319ad08d9c38516d8a(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219GJwSLMk2NSA= : 0000438a975952461ead326e935b99b6105c74104a1f368dfafca9e69ca20cc9(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219lOJzgffj7zY= : 000008946fa8fa51fa700ceae67b610dba134451862b693a5198be7d518f1b86(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219CxQ7AbZrb48= : 0000bd0b22ddbf516175911cf1e8d5411ba88149b6adeef5ade7130747242a4c(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-521961AOWdsLdbM= : 000015acf36cfd52d1a007049d0a5eb42b4359c2e40f7d087df1f0ceb526916c(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219PAWW/x4G/f4= : 0000ef3d4093b2deb283bdd29b05d00cf542c1bde0131610dbe762206881dcf1(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219BAO/ZJzv7qU= : 00001107cd3a046a6ab147c93f6e1457e3ac91a4dcb80f2497b1dcdbe29a5063(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219lkYQekreiJs= : 0000ab7773f2571501751e072ca05501eb78bd5a53bb7957e72787b35721f240(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219s0Za8MaHvmE= : 0000b7e9df27937c904a0a765c2f170e0207020a734036d441d006c28047771f(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219zGMJZEWusxw= : 0000f950f343eb84627a023736587511edeaca622b34c8d6a83dbddd3127cbe9(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-52191w4I+CwLb3s= : 00005b205f522c3876f0a86eec9a178e5dab96302f5aa686714d6130d6ea098c(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219u05Vfk2wexo= : 000032207b0c1eb204d45a55f7fa9cb8905344fa7899f99a44926229398599b9(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219QXfVZIUPoP0= : 0000ca466e262d7631898467d520a4cbaf0de5e3be6a92660e3cb24f7dc4c65f(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219bgleHI8aTww= : 0000505fd5ea728280b446f7903ae676c69ff1f9f7a9c15327fde8371077763d(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-52193fbowds3W2c= : 0000c208fd9cef4834b0041d789fb583f25c6f8e17182497fb758a20a82254f4(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219gDMMJrCdTio= : 0000eccec118a79b40fba30c11d51b2abe440b414a16685b5623bf795448882e(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219/Y4aVCWowb0= : 0000326853c75cc55c2079aac0b045011e1d912876489fddf66515531dcb39ed(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-52198zcurgRP25w= : 0000c630686b38bd153a03923ac277bef6ef54fa5606ae46b81cfe81aeb514df(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-52195JYAdB+Rb58= : 0000b7aadac465ad09ab5c28809dab11ea76dcd66881ad4f9c979a8da91d2e6b(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219Y1n8NmBn4vw= : 0000c52922d4abf422c1837e8a4d1bbee434c6f41164862a0b1b456b6364ecfe(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219Web5wRvg5xE= : 0000f0151a7105b84c543f480112db0bd8a224812696039b96ea8f1ea1749494(server@Priti-PC)39>
(server@Priti-PC)39> priti4953-5219QgLVwnTb5fM= : 0000b172cbcfd88f0a25e262c1907584f67b0409134979501b094bd6b22bdec7(server@Priti-PC)39>
```

- *Computation for input k=6:*

No. of actors	Ratio (CPU time/Real time)
4	3.9
8	7.79
10	7.86

Hashed values generated for k=6 and number of actors = 8:



Coin with maximum number of 0's

The coins with maximum number of 0's that we were able to hash was 8.

Number of working machines

We have implemented the client-server model with 2 working machines performed the required tasks and terminated upon completion. In future, we can extend it to multiple client machines.