

Project 1

Contributors

- Raj Vora, 35551411
- Rushil Patel, 66999320

Problem Definition

Bitcoins (see<http://en.wikipedia.org/wiki/Bitcoin>) are the most popular crypto-currency in common use. At their heart, bitcoins use the hardness of cryptographic hashing (for a reference seehttp://en.wikipedia.org/wiki/Cryptographic_hash_function) to ensure a limited “supply” of coins. In particular, the key component in a bit-coin is an input that, when “hashed” produces an output smaller than a target value. In practice, the comparison values have leading 0’s, thus the bitcoin is required to have a given number of leading 0’s (to ensure 3 leading 0’s, you look for hashes smaller than 0x001000... or smaller or equal to 0x000ff....The hash you are required to use is SHA-256. You can check your version against this online hasher:<http://www.xorbin.com/tools/sha256-hash-calculator>. For example, when the text “COP5615 is a boring class” is hashed, the value fb4431b6a2df71b6cbad961e08fa06ee6fff47e3bc14e977f4b2ea57caee48a4 is obtained. For the coins, you find, check your answer with this calculator to ensure correctness. The goal of this first project is to use Erlang and the Actor Model to build a good solution to this problem that runs well on multi-core machines.

Steps to run

1. To start the server, go to project folder and change the IP and then run `erl -name server@serverIP -setcookie secret`
2. Then compile the server file - `superb.erl c(superb).`
3. Start the server using `superb:start_server(threshold)`. where sample threshold value is 4.
4. To start the client, go to project folder and change the IP and then run `erl -name client@clientIP -setcookie secret`
5. Then compile the client file - `superb.erl c(bitcoin).`
6. Connect client to server with `bitcoin:connect('server@serverIP', clientName)`. where each client has a unique name.
7. Start the server using `superb:start_server()`.
8. Even if the client connects mid computing with the server, the server will print results as it computes and not serially i.e it will print bitcoins of server and client as it computes.

Observations

- We managed to get 6 leading zeros from our 2 machines
- The server is always able to receive connections from any amounts of client. When the client is done computing remotely, the server will display the results of that computation.
- We have connected 16 clients to a Server and run for the values 4 and 6.
- The work unit size is 20 i.e. we are sending 20 random strings to each client.
- We achieved 2.5356 ratio of CPU time to Realtime for the server.

Screenshots

Client and Server computing done in parallel for 6 leading 0s



```
erl -name client3@10.192.225.161 -setcookie secret 51x12
exit
(client3@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'james').
true
client_joined
(client3@10.192.225.161)> bitcoin:exit().
exit
(client3@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'james').
true
client_joined
(client3@10.192.225.161)>

erl -name client5@10.192.225.161 -setcookie secret 51x12
Eshell Vi2.2.1 (abort with ^G)
(client5@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'matthew').
true
client_joined
(client5@10.192.225.161)> bitcoin:exit().
exit
(client5@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'matthew').
true
client_joined
(client5@10.192.225.161)>

erl -name client5@10.192.225.161 -setcookie secret 104x27
~/Projects/D05P/project1: erl -name client@10.192.225.161 -setcookie secret
Protocol 'inet tcp': the name client@10.192.225.161 seems to be in use by another Erlang node
~/Projects/D05P/project1: erl -name client5@10.192.225.161 -setcookie secret
Erlang/OTP 24 [erts-12.2.1] [source] [64-bit] [smp:4] [ds:4:4:10] [async-threads:1] [jit]

Eshell Vi2.2.1 (abort with ^G)
(client5@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'jack').
true
client_joined
rushll:pateljnY0B1j>M,2Pcvo
rushll:patel,;f(C"/Yt>nj*&G
rushll:patelZaj*>Rusfg4WYKA>
rushll:patelhpjYwJl&nsJ9D
(client5@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'jack').
already_connected
(client5@10.192.225.161)> bitcoin:exit().
exit
(client5@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'jack').
true
client_joined
(client5@10.192.225.161)> bitcoin:exit().
exit
(client5@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'jack').
true
client_joined
(client5@10.192.225.161)>

erl -name client4@10.192.225.161 -setcookie secret 51x27
true
client_joined
rushll:patelZb7NCPKpJLE4uW6
rushll:patel^~cd>8EX(dBP, (QZ
rushll:patelJrDcd/Cyx)XL~Hc~
rushll:patelAwj/c1U/^^~4L,
rushll:patel2u0k48Y~Ct~yh
rushll:patel014N8557X01C4">
rushll:patel027h/SjM/~K9C2"/h
rushll:patelNj1/cqDHPHURp#
rushll:patel0c;Im/sVBQGLbTn#
(client4@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'john').
already_connected
(client4@10.192.225.161)> bitcoin:exit().
exit
(client4@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'john').
true
client_joined
(client4@10.192.225.161)> bitcoin:exit().
exit
(client4@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'john').
true
client_joined
(client4@10.192.225.161)>

erl -name client8@10.192.225.161 -setcookie secret 51x27
~/Projects/D05P/project1: erl -name client@10.192.225.161 -setcookie secret
Erlang/OTP 24 [erts-12.2.1] [source] [64-bit] [smp:4] [ds:4:4:10] [async-threads:1] [jit]

Eshell Vi2.2.1 (abort with ^G)
(client8@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'jans').
true
client_joined
(client8@10.192.225.161)> bitcoin:exit().
exit
(client8@10.192.225.161)> bitcoin:connect('server@10.192.140.28', 'jans').
true
client_joined
(client8@10.192.225.161)>
```

```

erl -name client2@10.192.225.161 -setcookie secret

true
client_joined
rushll.patel8Z,hb/7MSw.2U9,t
rushll.patel8Kcc[=Z]C7ABV\l-
rushll.patel200-ktcmrgGj-5V
rushll.patelR;1)7HGMUQ,148i
rushll.patelVtND(y40v137817)
rushll.patelM9(%-y81+TzDlbe2
rushll.patelP4aKk+@r=0Qy@
rushll.patelW2 Du[-Ked@krot
rushll.patelLHP)bkWOhl-8SUW'c
rushll.patel-acZ+8GX;B-uA-7Z
rushll.patelYk2wL6@Nh)5SA%
rushll.patel*,5/jxQ?lD*5-z8A
rushll.patelS9A=GA?/0;f8Hf
rushll.patelb]s03g@OMVtz]]K)
(radjvora@10.192.225.161)14> bitcoin:exit().
exit
(radjvora@10.192.225.161)15> bitcoin:connect('server@10.192.140.28', 'raj').
true
client_joined
(radjvora@10.192.225.161)16> bitcoin:exit().
exit
(radjvora@10.192.225.161)17> bitcoin:connect('server@10.192.140.28', 'raj').
true
client_joined
(radjvora@10.192.225.161)18>

erl -name client@10.192.225.161 -setcookie secret 104x27

% 2] -compile(export_all).
% ^

bitcoin.erl:85:21: Warning: variable 'Threshold' is unused
% 85] mine_coins(PId, [], Threshold, Server_Node) ->
% ^

{ok,bitcoin}
(client@10.192.225.161)7> bitcoin:connect('server@10.192.140.28', 'johndoe').
true
client_joined
rushll.patel:~28'iaL7McnFzFA
rushll.patel:~V-JAHEtKFWL-5C
rushll.patel@/O-~YUgK54+~2Gb
rushll.patelC':6~STDF9,+w@PL
rushll.patel:~X+M5*9sasVBK,
(client@10.192.225.161)8> bitcoin:exit().
exit
(client@10.192.225.161)9> bitcoin:connect('server@10.192.140.28', 'johndoe').
true
client_joined
(client@10.192.225.161)10> bitcoin:exit().
exit
(client@10.192.225.161)11> bitcoin:connect('server@10.192.140.28', 'johndoe').
true
client_joined
(client@10.192.225.161)12>

erl -name client2@10.192.225.161 -setcookie secret 104x27

{ok,bitcoin}
(raj@10.192.225.161)10> bitcoin:connect('server@10.192.140.28', 'rajvora').
true
client_joined
rushll.patel:~2=7]YHnn-Jl'~18
rushll.patel[okU58Aa2cyk'~+Q
rushll.patelW-Ia@8kn8ay=H0GA
rushll.patel:~).8TkKy-qj15L~o
rushll.patel:cZC'0bN,89t>5~c
rushll.patelA~*~f9C0Q5~lt
rushll.patel]>kk'#2C[|G'cee
rushll.patelBw;<FwLw~9]]1%
rushll.patel[1it;vx0UA1=1C
rushll.patel:xak509.Rltf~K18
rushll.patelZM'QhjdJZ5dhw
rushll.patel-I.N5/3k~r>t;V2
(raj@10.192.225.161)11> bitcoin:exit().
exit
(raj@10.192.225.161)12> bitcoin:connect('server@10.192.140.28', 'rajvora').
true
client_joined
(raj@10.192.225.161)13> bitcoin:exit().
exit
(raj@10.192.225.161)14> bitcoin:connect('server@10.192.140.28', 'rajvora').
true
client_joined
(raj@10.192.225.161)15>

erl -name client2@10.192.225.161 -setcookie secret 104x27

% 85] mine_coins(PId, [], Threshold, Server_Node) ->
% ^

{ok,bitcoin}
(client2@10.192.225.161)7> bitcoin:connect('server@10.192.140.28', 'janedoe').
true
client_joined
rushll.patelV7C(qzflts8i*AS;
rushll.patel3@l]y6m4=12k%
rushll.patelDQ~v~xgz~)DxLB#
rushll.patel0vTtaq'bec(gr'LG
rushll.patel[.]_xICr]]~wF'~w
rushll.patel7-9AdA5Cv4~8Ikr
rushll.patelQdgr'~aMahCIG7d
rushll.patelRd=7JcY8s20)j08
rushll.patel:~|,|FZsem-b-Ck8J
(client2@10.192.225.161)8> bitcoin:exit().
exit
(client2@10.192.225.161)9> bitcoin:connect('server@10.192.140.28', 'janedoe').
true
client_joined
(client2@10.192.225.161)10> bitcoin:exit().
exit
(client2@10.192.225.161)11> bitcoin:connect('server@10.192.140.28', 'janedoe').
true
client_joined
(client2@10.192.225.161)12>

```

Client and Server computing done in parallel for 5 leading 0s

```

Terminal

Sat Sep 24 4:52:27 PM

ru5h1l@f3d0ra:~/Downloads/Erlang-Project-1$ erl -name client@10.192.140.28 -setcookie secret
Erlang/OTP 24 [erts-12.3.2.4] [source] [64-bit] [smp:8:8] [ds:8:8:10] [async-threads:1] [jit]

Eshell V12.3.2.4 (abort with ^C)
(client@10.192.140.28)1> bitcoin:connect('server@10.192.140.28', 'rushil-client').
true
client_joined
rushll.patel-D(u:)/lQ+PdjwR
rushll.patelv~p~5mKcPp[El~p
rushll.patel0nmnx0D=FdtE8s#
rushll.patel/FI0R~7M4|Gc6fM
rushll.patel]L5i<~#|exd~KV_
rushll.patel5)XMKqy~#509lW
(client@10.192.140.28)2>

[ru5h1l@f3d0ra Erlang-Project-1]$ erl -name server@10.192.140.28 -setcookie secret
Erlang/OTP 24 [erts-12.3.2.4] [source] [64-bit] [smp:8:8] [ds:8:8:10] [async-threads:1] [jit]

Eshell V12.3.2.4 (abort with ^C)
(server@10.192.140.28)1> c(superv).
superv.erl:2:2: Warning: export_all flag enabled - all functions will be exported
% 2] -compile(export_all).
% ^

{ok,superv}
(server@10.192.140.28)2> superv:start_server(5).
list is now: [{<10358.112.0>,rajvora}]
list is now: [{<10357.110.0>,raj},<10358.112.0>,rajvora}]
rushll.patel,d0Pq(7APAK~u~v 000008f46d5c2f8e66bf91af8ae6107be883241d270c43c45c9d3c3017e3

rushll.patel'by:WPIA8S37M_r 000007c1839b6248eb8fc9d984274e3e5624714fef57a974233894796e40e608

list is now: [{<14959.88.0>,'rushil-client'},
<10357.110.0>,raj},
<10358.112.0>,rajvora}]
list is now: [{<14961.89.0>,reema},
<14959.88.0>,'rushil-client'},
<10357.110.0>,raj},
<10358.112.0>,rajvora}]
rushll.patelMxoc10g~r[cfk5w 00000284943ea8b298e46121b37a3bc40a7195f51bdcdf97fd76143349a29a

rushll.patel,vvj}*RO_1|X4W:q 000007b0bc3d79a5be758136356807ce9110abb6852aa0ecf06d680486837f62

list is now: [{<14963.88.0>,'rushll.patel'},
<14961.89.0>,reema},
<14959.88.0>,'rushil-client'},
<10357.110.0>,raj},
<10358.112.0>,rajvora}]
rushll.patelF59cyuH,4v@c2Ex 000009536ed11779d97891e5d305cc7a68c64d7279373fa8abc872d5fa79a8d

rushll.patelT">"/mH-35.b"BYT 000007ae3a0de5ab760187ecabb2e71e0b28c6c5217979b11ed59d562b014aa1

rushll.patelz(T8ZMvce*p8h0D. 00000ea05ffed1254325579f4110ae2069f98415d38ad0734def944a17aeeb

rushll.patelNyKf8p~-'l'NafS) 0000037d923123224d9d5e9599ce4488ee f0dd0a106cb37bf9a59b08d1ce0f7

rushll.patelIrMKW;?gx2U1ZgN 0000021fb8cde63bc90cbd151a0b45deb76b226ab47578e96bff3732f238c901

rushll.patelKj]*86j9v1w,F''A 00000fcc9d9f3c79d66177bd80e44c532483a6a858a2c4557347a54c087e851

rushll.patelX~xL9j=0]_7dk[K: 00000367c0eff220695418fb3fe53611e04a2f1d528fd999aeca6345b76b2fc5c

rushll.patelK,v4V03]w&1(w{s 00000ee38e916dca43cd0df7487691ac1bd96a16377d84cf7619f51de474e

rushll.patelzACTac/) {In(sgK7 00000272f73a5ae20131fd278f84262d8d8caaae2157f7dabf9f09e4202741c9

rushll.patel2'mwqQ' ]%?ffI', 00000f4be5fb5fb04603e14ff1860f46691f8b2588f5bc4257b290bb77201

rushll.patelDT5~R&(*)sH1ce[I 00000877045c48168156e992e9db3d8071c30787a1a18bc78671f8384fd942a

```


Client and Server computing for 4 0s

```
Terminal Sat Sep 24 6:12:21 PM
[ru$]ll@f3d0ra:~/Downloads/Erlang-Project-1---/usr/lib64/erlang/erts-12.3.2.4/bin/beam.smp -- -root /usr/...
[ru$]ll@f3d0ra Erlang-Project-1$ erl -name client@10.192.140.28 -setcookie secret
Erlang/OTP 24 [erts-12.3.2.4] [source] [64-bit] [smp:8:8] [ds:8:8:10] [async-thrds:1] [jit]

Eshell V12.3.2.4 (abort with ^G)
(client@10.192.140.28)> bitcoin:connect('server@10.192.140.28', 'rushi1---patel').
true
client_exists_at_other_node
(client@10.192.140.28)> bitcoin:connect('server@10.192.140.28', 'rushi1???patel').
true
client_joined
rushi1.patel>e!Ud(*'??IbZC
rushi1.patel>in(C(-oRH)[o4Fu
rushi1.patel>13anBe+(-o-2
rushi1.patel>0<4nx25c55)4dM
rushi1.patel>w.reke_RwFKS' F2
rushi1.patel>iag5&1$Dca2)/s
rushi1.patel>KA[PSH(A2ZC)HMG
rushi1.patel>5f(CA(-TUVG2)
rushi1.patel>K5yCH-EdC(-6+3
rushi1.patel>1vuc<CGI[MTS&
rushi1.patel>2HEEMX(2Xp/q4
rushi1.patel>OMX1QMC)4d8&
rushi1.patel>19K5+V+8w(cob&
rushi1.patel>O4LO8m-r7*W+LO
rushi1.patel>1+WM*MDT_5vJpp+
rushi1.patel>DU2T21)>:=T&2E_
rushi1.patel>5?<SCIRg+om34
rushi1.patel>in,wIZAYALC-1TK+
rushi1.patel>5Uj-ajyujy' AR
rushi1.patel>V+gJH]e' FhC+gVF
rushi1.patel>4DPK[SLr(bTs);JK(
rushi1.patel>5vZwQ8087d'Id
rushi1.patel>4spM)zqpt_3QIN
rushi1.patel>3'I(dk)t'OGK_HCO
rushi1.patel>1W25QD0-wft_pD7(3
rushi1.patel>1-GKlm-y+rR"-E;
rushi1.patel>7JOG<1hV0b53
rushi1.patel>4dCP9+1'Qd4l8o0l
rushi1.patel>in.Z3y+R1QC.0<(h
rushi1.patel>7M1D>1)ah=+u#1C_F
rushi1.patel>Pj3s-(MayGdi<1jv@
rushi1.patel>97RAV(-f'UjK+R
rushi1.patel>4u_R_/18V6)0R8'h
rushi1.patel>5t&5b'a2e;1mCI
rushi1.patel>10_PVR+MuE0('hT
rushi1.patel>wem:3'epsUHQJG(
rushi1.patel>10(-9+2*1.16
rushi1.patel>12;9fC&w;0x&
(client@10.192.140.28)>

rushi1.patel21742[20]qpAM0M2 0000849b5603fe4d18c0558b7ab3cf7d2c0453f792f70291a17a1f8617a388d
rushi1.patel>c94j02SVWNG<2M]rushi1.patel>1b1_XlUdV)FL-v3rushi1.patel>1Vn0B[M(LmJaxrushi1.patel>1P,w'<r'wryCzrushi1
rushi1.patel>2kx'gv;WKO1:1)Brushi1.patel>1dgl1shmgz4A6bvrushi1.patel>1C1Z+VnzouFAaW(rushi1.patel>1b1Noy1J,N21n:rushi1.patel
rushi1.patel>'wq(Mqz1-u)]j24rushi1.patel'1wId1]]>-9[8' 00006d942e0ebbc5e085f2f47f7537583696938f3c4b26047a8a4a485d
rushi1.patel[]>MyHy(-sCUT)mq 0000ac77ead45d0e7f58b37985f8bc1a3e13deb714a4a5db0011fd6681a10b6
rushi1.patel:0d'>],j]OTxKw 0000efb032c90ba427e253ff33b37393564c3a94d24f0ff64a4fb6010014643
rushi1.patel>buuA)7j)7XD+6h+ 00004c0e22bc0a3418df97c1774751cd47453c2b725c2bcdf9a6c351d4646d63
rushi1.patel>5vZwQ8087d'Id'Fu 00002f84769a301ec0a5ca2b08012ebba88bc2a8373e237ced1546b358c
rushi1.patel>vGy-O;cy2Wqm3Rau 0000fa78ffc040cb969edf6a4806e1d661a37fec080a129371554aa55afa1
rushi1.patel>ldqgr' aMahCIGT7d 0000649845f0706eb7edaa28136af9dd015975af3f5ecfc745849f2216235494
rushi1.patel>9pM)Zqpt_3QJ[W 0000864cabcf9c6211f05a28bcedcd7f36f9c315465cb8f51f93d193c23238
rushi1.patel>C1R3)15:hch:tdt;rushi1.patel>PNJFaCUVQc1ao)rushi1.patel>Ns00Vr="LzRkMhrushi1.patel>1B9:L0w'qbpLQ26Nrushi1
rushi1.patel>1Q76fjFENQ)4(8N<Frushi1.patel>P1R9K+>+>DpCG;Frushi1.patel>Lo'(-s0)>+>+>B&^0rushi1.patel>wMWCdLQX)>v>+>+>Frushi1.patel
rushi1.patel>pn7[kS;Lr+LW2o'Frushi1.patel>GsrIMTapp, (Voo 0000b7159a8482b533ba36ee16091746c41a8e43bf607c4012d9901
rushi1.patel>3'I(dk)t'OGK_HCO 0000967138dc921e5bcb57c584312e9a6ddec7bcf5495380ad87f9d0c2bb
rushi1.patel>W25QD0-wft_pD7(3 000034c313db9ae58833b95f806b5ce13e754dd20eeb6d105b0395f419fc26
rushi1.patel>1-GKlm-y+rR"-E; 0000b34a7ec781d6cd61419573b0906261ce58a14030bf9b5cd8ae152a5e
rushi1.patel>1'7JOG<1hV0b53 00005f16c83742c64658346b17a23a8a5a3c7555517b6f6c231bdc35d557ca
rushi1.patel>1J>AA0M;H0:evt 000086ad2a859c17115998d528f55c2e55bf2f57f0e629db39dab9714e2f0b
rushi1.patel>4dCP9+1'Qz4l8o0l 000077f72be622cda43d055baf1540f2ba7f4e5849601f8372def8e7d842
rushi1.patel>Zblm4RI(7)hwI28 0000ca918394c3e498ec2cfad9e6832583c246dc3863507da707f2927e192e
rushi1.patel>lvq,sy;E1K0-1Me)? 000095fb5830414dc3490705e7a33f4c19196235746e5e17535f3ca3b1c7
rushi1.patel>2pe'~!e7_MKvc1+f 000012546450338d8c38a5892f7dcd9a237888b58d8cc94161374db7aa0a8f38
rushi1.patel>fy)u)ppz>Z,UNFFY7 0000d93a48dd2cbf72512e364a433e2470a2ba7fd39146274db56f8b6f99
rushi1.patel>1P8[hvi;02AI99n(rushi1.patel>1K2;5[yL, cS<@Trushi1.patel>1Vt(7)ghb:lm+Y)]rushi1.patel>1D7S0:1fs<@Rrushi1
rushi1.patel>1n)0a3(Pw2x)>+>+>Frushi1.patel>1Q0bzV))>+>+>LX1:/rushi1.patel>109-e(s0q)>+>+>Y8wQ_rushi1.patel>10BPMDC(LW)](XK0rushi1
rushi1.patel>U-q&avj'F'RWISQ5rushi1.patel>1S:u:SZY1D3r7'0Y 000051264f6e5eeb0d2bb036b58a14552f9548a9332e7a9d5043a522e4
rushi1.patel>in.Z3y+R1QC.0<(h 0000e1e021eca1a0d6b13786cad51dc2eb1c065c8b382a3df106f92f4
rushi1.patel>7_K2W(QAdtdT//rushi1.patel>1e<+>DfJ_>Nz+>B)J(rushi1.patel>1Z3M'>al0m<@Rrushi1.patel>1q,n<XrHNW7+>0rushi1
rushi1.patel>10G:b51/JM>T<pi4rushi1.patel>13MwXjd_]]>+>+>Frushi1.patel>1S8fIvQ+Qb+/vC)]rushi1.patel>108f'Ve_Ofi('+-rushi1.patel
rushi1.patel>4jbu1+h74AYM'3rushi1.patel>1SE1f'hsYvr[RHfaj 00003fb22b941d8ea7f5d37c4a99cab81cc399e722709b80ac12ea004074

2.020829830776445

Terminal Sat Sep 24 5:53:42 PM
[ru$]ll@f3d0ra:~/Downloads/Erlang-Project-1---/usr/lib64/erlang/erts-12.3.2.4/bin/beam.smp -- -root /usr/...
[ru$]ll@f3d0ra Erlang-Project-1$ erl -name client@10.192.140.28 -setcookie secret
Erlang/OTP 24 [erts-12.3.2.4] [source] [64-bit] [smp:8:8] [ds:8:8:10] [async-thrds:1] [jit]

Eshell V12.3.2.4 (abort with ^G)
(client@10.192.140.28)> bitcoin:connect('server@10.192.140.28', 'rushi1--patel').
true
client_joined
(client@10.192.140.28)> bitcoin:connect('server@10.192.140.28', 'rushi1--patel').
already_connected
(client@10.192.140.28)> bitcoin:exit().
quit
(client@10.192.140.28)> bitcoin:connect('server@10.192.140.28', 'rushi1--patel').
true
client_joined
(client@10.192.140.28)>

rushi1.patel40C.GGcKZ7RBCrushi1.patel>aa>cq7j-1:8LmC4rushi1.patel>1u]]>1-3YfF, _$3rushi1.patel>1wH0rushi1.patel
rushi1.patel>1JzKZ2rushi1.patel>Hme_aa-tx4'h.av 0000790b7629665a309abf9c14d6b2f91264b47e55a2627f4e42c1f3a911
list is now: [{<9929.115.0>,janedoe},
               <9927.110.0>,johndoe},
               <9849.151.0>,raj},
               <9849.115.0>,rajvora}]
rushi1.patel1H]Y9FA?>w'soe'rushi1.patel1::389'A'>_2C"/Trushi1.patel130SH[p1?>7A7rushi1.patel1cK'128'e0e51-2l'rushi1
rushi1.patel1NC3k+>[m'6W0D;rushi1.patel1C(x@-@iApc)q24[rushi1.patel1ps[->6,$<_StnCkrushi1.patel1C(-_MG0+Q4A'V8M4rushi1.patel
rushi1.patel1F.da2zSGB[PISF(Arushi1.patel1Tq'>AvZV(h0M)-2c 00000fb732601f087c1e92831841d8306f3bf285f411064bc22313ee19cae5
rushi1.patel1p12mT3J2eKq_5rushi1.patel1a1ftK8J3F803w'urushi1.patel1C-r0wM'>32L];tD;rushi1.patel1V9Wf[uzD]P'U'rushi1
rushi1.patel1U:lX'>5ipg56qekrushi1.patel1V6=jk]NV)TwfHrushi1.patel1chH]g'cCIAHWaCrushi1.patel1B2Nqog(7)]>BjW'rushi1.patel
rushi1.patel1nVirAryKf,rushi1.patel1FVEdZwrs=LML]eg 0000223ef9d765134b1b7a5f40a65c575e6b807e54f84102d6888f4c6cf8
rushi1.patel1s_1j985mS(08+M'rushi1.patel1J105:d7DnM2-w'rushi1.patel1PE18567,7H4s'rushi1.patel1e'<w05owM68rushi1
rushi1.patel1U6u0kmejyb7'>72rushi1.patel13p88805aUghFm'rushi1.patel1eSk'q3f7L-X02Tn-rushi1.patel1C(3)8V(fa',gkh'rushi1.patel
rushi1.patel1nx0'HY0xHM9c4'rushi1.patel13p'HfQwL954LZ9 0000136943a7f6b4c1bc83e2f469b7b999cd9c73aa16cb8b5d3042718acc07
rushi1.patel18Y3b>Z8B3>C'PW'rushi1.patel1W[10mkdf5]00E1(rushi1.patel1v'4)p1<1'X'8Vrushi1.patel1uSDU_426RVLUBSerushi1
rushi1.patel1Zzoc;Gm0omM'rushi1.patel1q(rv:1S>grr0Lrushi1.patel1g9424E8'->3]B'rushi1.patel140Pv31M]pQ2w,rushi1.patel
rushi1.patel1z;'>6]j'>]]>LJ52rushi1.patel1FaeS1qK0MvE 00003dcdbba2ce38ce10b6281dc26711a889d58c72057a4ad2ede0b165af4dc7
rushi1.patel1I+gfr:09canc++B8rushi1.patel17lno/R/+>+>+>2Nurushi1.patel1[4X2e6-Tpuk/bmrushi1.patel1C'>80P(-wF=-1fQKrushi1
rushi1.patel1hgZ&VW4V'IRUA_>Frushi1.patel1cSRCo6,dMx0<xmj'rushi1.patel1s=cM'>8KfL)]dP'rushi1.patel1Rjd'>powT(X03+food6499878
rushi1.patel1m/0FRy70f2>01zrushi1.patel1[boL]wEdT5y90u 00003609b1d46dc6262f7d02501d7a60caf289df6fca0cb11ad1f6d499878
rushi1.patel1y-(>K'Z'>u005(Qi1rushi1.patel1)<F14V'~>NEr:7a)rushi1.patel1E1+>A1S$G+rv5jGrushi1.patel1XZS~>,>5FCEUk&rushi1
rushi1.patel1dAIH[ow]fMa'>P1rushi1.patel1J0[3H2Z;-0-w0).rushi1.patel1zPqB(7U)Xeson<-rushi1.patel1d=7'd;L236]WML'rushi1.patel
rushi1.patel10Vj>+mP'q0mHrushi1.patel1quv[qExZ]]>[>+>+>AD 0000a622b457f3ab487c1a566e60cd7004ce41171ec556ac7c09a82491784da2
rushi1.patel1KQ090CheC_8_N5cagrushi1.patel1ThS8UrzYqk);>7rushi1.patel1uT64hXZF-,ZaCvrushi1.patel1tK<1G50KpJ>+ND0rushi1
rushi1.patel1ESH751'>eoo-(c>-rushi1.patel1uJb>+>+>H1VHM'rushi1.patel1d658Ro.V)5]TrK+/rushi1.patel1w6AWP7:18<DGO,rushi1.patel
rushi1.patel12;ND(2ftdaA5m)U'rushi1.patel1[8kdc)Sl67+n,v 000016f2ac2351a967cf55d0456225d3233f868d86cb36712b6f9a29967503
rushi1.patel10M(HM8R1Ta)Yqz3rushi1.patel1a12w+22/d/r<6krushi1.patel10a1j8K'>dkS=-]]Q)rushi1.patel1VhlofJFw+gxcgrushi1
rushi1.patel1CJi3kFwAV]hfdm'rushi1.patel1Sqp5mP-2dC4_Erushi1.patel1qq>19V1f-nK'0fKrushi1.patel1jdg01jtr>wL'rushi1.patel
rushi1.patel1NSR<ly>]]>Hf(0fmrushi1.patel14pVseNXPg>X=BL 000048581dbfbc97385114d5c9e0d259706f3d7bc419bcb5d825306f693aaba
rushi1.patel1aP2>kyg7Ab>90Rrushi1.patel1a20>9S/4.YTSM>+rushi1.patel13N320B10)152brushi1.patel1y>+3H>0G+>8b>Frushi1
rushi1.patel1a2>Jv>60M]1Lrushi1.patel1k6Tm=6Gsym>+rushi1.patel1Xj8>0-iks.Yrb>0rushi1.patel1a80wfcy&Mj>Frushi1.patel
rushi1.patel1W0X1GvAa]wafPl'rushi1.patel12>(qEHW]>)>5[011 00005946889d5ae5f622bd31868218cd8589a899c7f880c25935c27e4da63
rushi1.patel1sESCQ[q10FLB>+rushi1.patel1,,3**QYZeTXR'/rushi1.patel1A]j&TQ2T81,'12pMrushi1.patel1qs],@(->DsYz5)]zrushi1
rushi1.patel1T>Bff]]>[>A00rushi1.patel1H3pCL_v_5d6S,Frushi1.patel1nd=euV]p>2b>2b'rushi1.patel1U0ur8M8s(->2j6rushi1.patel
rushi1.patel1s_1Mn[4RX1oLm-rushi1.patel14c]Ic5s_W18->1(- 00002694f6bde61c9a1e6952d245cd305150f1dc285ed47f82116dab213b69

1.049661745222273
ok
list is now: [{<9850.121.0>,rushi1--patel'},
               <9929.115.0>,janedoe},
               <9927.110.0>,johndoe},
               <9849.151.0>,raj},
               <9849.115.0>,rajvora}]
(server@10.192.140.28)>
```

CPU utilization

