Project 1

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- **Commands to be run on the server**

  Compile the project - mix escript.build

  Run - escript project1 5

- **Commands to be run on the client**

  Compile the project - mix escript.build

  Run - escript project1 {serverIP}

- **Approach to assign size of the Work Unit**

In our project, we are using following random function to generate random strings based on the number of bytes given as argument:

```
:crypto.strong_rand_bytes(num_bytes)
```

If the number of bytes of the generated random string is larger, greater is the possibility to find the required zeros in the Hash.

To leverage its distributed behavior fully while assigning work to the workers, we increment number of bytes of the random string for every worker and assign work (work here is the number of iterations to generate random string for those number of bytes passed to it) in multiples of num_bytes. So, the worker which is assigned larger number of bytes of random strings finds more random strings as there is more probability to mine more bitcoins.

So, to increase the entropy, each process finds random strings of different length and finds their hash to check for leading zeroes. Work is assigned in proportion to the number of bytes of generated random strings.

No Of iterations by one process to mineBitCoins = num_bytes * 200000

This is the work unit we have given to one process (worker). The work unit here refers to the number of calls the process will make to findBitCoins method which does the work of generating random strings of length num_length , calculating the hash of each string and checking if the leading zeroes are correct as per the requirement.

Our Methodology of assigning this work unit - More the num_length of random strings, more permutations of the strings possible, more is the probability of finding a suitable hash.

- **Result of Running program for ./project1 4**

```
Server IP 128.227.205.236
Server Started
kanikaguptaTAY  00009BC3FB42FE7A4F128C2774A26490D412A1FC5CE37001E96CBEF076347438
kanikaguptaWhEQ1101qI  000001A0B459CE69B66030B6D38ECC5D3FFA7DA412C78B65EFD6022FF42FD21B
kanikaguptaEKVBHvk  00002CA7B83D48A320A895B6A1D8923CAA66DD1DD36ED12FD04ACC079BEA3C18
kanikaguptaO172ZuK72zKY  0000FF4DC81FA86D913A87702EFB7999F766A331310D4338117B67D3C43BBE1B
kanikaguptaGrHLdCk  000082E7118EF874D59E95A406DBB7D0677EF632247B45089025E07A8E0907EC
kanikaguptavhONoi4  00008182F9391EB43952EC786C24D1BA7A08F5CB1DED7F83B24B9B2181670FF5
kanikagupta101kryoUg  0000E545F79C0C2C8864A6E6E458B5C58FB32BE04015691A7FEDDEC5AC95DD8D
kanikaguptaa106bdGRM  00003070F09411CF05C76915A912395722807CF5A2FE63E5E3A42B0F30874D95
kanikaguptaY5JMeb0f8A  000032736D6D217A4EBA15586E7CF0A5A79F7BF5A96AC21F464340A137DED902
kanikaguptaMzBTocA  0000C863B92E5060117F45BC60664D16F1879EA8B99604EAB33DC8ABBED816A4
kanikaguptauWx0hzOSAA  0000F120A1AE33ADB723643B4E749F9EC110AB610B65B94253CB2C23D7EB9140
kanikaguptayjHMQJE  0000D8C2F88344F7996B63A4FF85086A731F93303370CA2AADC6E5F4F67E2598
```

- **Result of Running program for ./project1 5**

```
a
kanika@kanika-Inspiron-5558:~/Downloads/kanika/subm/project1$
kanika@kanika-Inspiron-5558:~/Downloads/kanika/subm/project1$ time escript project1 5
Server IP 192.168.0.6
Server Started
kanikaguptaX2Lb  000000913804AB855EE9DA332A8858E569EA2CB3344FEEFA852DC34B5C00083B
kanikaguptajVVAX1lfjkU  000001B21A75430DB26E02F7FBEAB00427EE608129330513C15571A542B40D5B
kanikaguptahboc52qml2dh6  00000143F2D7D496C91D61738A531E436F639C51395A18CE6003357919C305A1
kanikaguptaNRqIO1j8ZD0O  000007B40283F52DA3623FC902A5AE8C48E8C04AC2C7D6DF60BCB7487D14DB45
kanikaguptaE80E25WbmZ51Tg  000005ADDB714863B288DEF5772B770F889B2AB5C8CD05A8D2F4E85C27B15349
kanikaguptacYnvTmXvQa18KQ  00000EBA20D31FFD1C56167EF75F97B1B2B37A3DB264EF69CAF54D4F171B2683
kanikaguptaVros87JTaU9W87  00000BE5B53B58C1F527DAEF9FD8675689126B47300781AA8BAEF01AB9C866B8
kanikaguptaxMXypKcECxYQFfsJ  00000BAC973DCCCFBC638C02EFCEE7C8BD09AC5DBE4E8396160533BFBAF6E0C0
kanikaguptarIHEcMIo7LSPQQ  00000E8BC4F98A0CFF57F9EE7BBFFF9A590E66F557D7600249D637ACF7A95DF9
kanikaguptacmSiqxHmk9p1Oto  000008109392417OB14A592870618584E08A75FD76AC550EF8AF2F39D6D9E2AB
^C

real    4m24.158s
user    17m25.084s
sys     0m3.520s
kanika@kanika-Inspiron-5558:~/Downloads/kanika/subm/project1$
```

Real time = 4m 24sec

CPU Time = 17m 25sec

Ratio of CPU to Real time = 17m25sec/4m24sec = **4.068**

- **Coin with the most 0s**

Coin having 6 zeroes -

kanikaguptaIUriGEAN6Jou0wFe0A4
0000009F181A6AF722A4EE7CB248198476999217E4940CB8EB3BD4B0133E0137

- **Largest number of machines connected**

3 machines (each having 4 cores) were connected at one time.