Discrete Event Simulation for Blockchain Systems (Bitcoin) using Queuing Theory Techniques to understand mining process and miner’s behavior.

Abstract:

Motivation:

* With the ever-increasing focus on cryptography and the application of decentralized Blockchain systems in generation of a currency such as Bitcoin.
* Increasing research and application of Queuing Theory to optimize the Block Generation process, waiting time of Transaction in the Memory pool, and Mining Pool Decisions.
* Use of Decentralized systems in numerous fields which develops a sense of trust and independence without relying on a central governing body.
* A contribution to take efficient decisions to reduce the computational costs involved in cryptography mining.

Methodology:

* We would be performing ideal simulation by using Distribution Theory and considering the arrival of transactions to follow a Poisson distribution with inter arrival times having exponential distribution.
* We would also be performing actual data simulation by fetching the real time data of Bitcoin available from(<https://www.blockchain.com>). With Memory Pool (M/M/1) and Mining Pool (Fork-Join) as two servers.
* We would be making decisions such as number of miners, individual vs pool mining, whether to solve based on complexity of the mining puzzle, mining rewards vs electricity consumption.



Simulation Scope:

* We are looking to get the following insights from simulating our model: (a) Number

of Transactions per block (b) Mining Time of Each Block (c) Number of Transactions per Second (d) Memory pool count (e) Waiting Time in Memory pool (f) Number of Unconfirmed Transactions in the Whole System.

* Along with this we would expanding our scope and simulate to understand Miner’s decisions based on:
* the mining budget ($) within a campaign (correspondingly, Bi is her residual budget ($) in the campaign).
* the mining cost ($/hash)
* the individual valuation parameter of Bitcoin
* the maximal mining power (hash/s)

References:

Nakamoto, N. Bitcoin: A Peer-to-Peer Electronic Cash System. Available online: https://bitcoin.org/bitcoin.

pdf (accessed on 20 January 2019).

Simulation Model for Blockchain Systems Using Queuing Theory Raheel Ahmed Memon 1,2,\* , Jian Ping Li 1 and Junaid Ahmed 3

A discrete-event simulation model for the Bitcoin blockchain network with strategic miners and mining pool managers Kejun Li a, Yunan Liu a, Hong Wan a, Yining Huang b