A Project Report

on

Cryptocurrency Mining using GPU

Submitted in partial fulfillment of the
requirement for the award of the degree of

B.Tech
In
Computer science and Engineering

GALGOTIAS UNIVERSITY
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Under The Supervision of
T.Ganesh Kumar
Assistant professor

Submitted By

Navneet kumar singh
18021011516/18SCSE1010279

SCHOOL OF COMPUTING SCIENCE AND ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING /
DEPARTMENT OF COMPUTERAPPLICATION
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SCHOOL OF COMPUTING SCIENCE AND ENGINEERING
GALGOTIAS UNIVERSITY, GREATER NOIDA

CANDIDATE'S DECLARATION

I/We hereby certify that the work which is being presented in the project entitled **"Cryptocurrency Mining using GPU"** in partial fulfillment of the requirements for the award of the B.Tech submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of August, 2021 to December ,2021 under the supervision of T.Ganesh kumar Assistant Professor, Department of Computer Science and Engineering/Computer Application and Information and Science, of School of Computing Science and Engineering , Galgotias University, Greater Noida

The matter presented in the thesis/project/dissertation has not been submitted by me/us for the award of any other degree of this or any other places.

Navneet kumar singh , 18SCSE1010279

This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

T.Ganesh kumar

Assistant Professor

CERTIFICATE

The Final Thesis/Project/ Dissertation Viva-Voce examination of Navneet kumar singh : 18SCSE1010279 has been held on _____ and his/her work is recommended for the award of B.Tech.

Signature of Examiner(s) **Signature of Supervisor(s)**

Signature of Project Coordinator **Signature of Dean**

Date: December, 2021

Place: Greater Noida

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The success and final outcome of this project required a lot of guidance and assistance from many people and we extremely fortunate to have got this all along the completion of our project work. Whatever we have done is only due to such guidance and assistance and we would not forget to thank them. We thank Mr. T.Ganesh sir for providing us all support and guidance which made us complete the project on time , We extremely grateful to him providing such a nice support and guidance.

We are extremely thankful to the all faculty members of Galgotias University for their co-ordination and co-operation and for their kind guidance and encouragement. We are really grateful because we managed to complete this project on time. This assignment cannot be completed without the effort and co-operation from our group members. Group member's Navneet Kumar Singh, Vipul kumar Mishra.

The study has indeed helped us to explore more knowledgeable avenues related to our topic and we are sure it will help us in our future.

Abstract

Cryptocurrency, a form of digital or virtual currency that has decentralized system and uses blockchain technology to enhance the security and control the creation of new units, is the next step from conventional traditional banking system. Many cryptocurrencies exist today, with Bitcoin and Ethereum being the most prominent of them. Cryptocurrencies are generated by mining, as a charge for validating any transaction on blockchain. The competition of generating hashes, which validate any transaction on blockchain, has been increased by the use of specialized powerful computers as Bitcoin/Ethereum uses very secured encryption method which is very complex to validate. To validating each transaction on blockchain, miners get paid. This arms race for cheaper and efficient computer which can validate the transaction and having faster payback or ROI. There is many ways to mine the crypto currency, but here in this article, we have implemented the full configuration of most efficient and faster payback mining method in India i.e., GPU Mining. Mining with graphic cards required lesser spent value in the beginning, as we can mine with 1 GPU also and later we can add more on it. As for now, GPU Mining is more popular on Ethereum blockchain which mines "Ethash" algorithm. The reward of Ethereum mining is so high that an investor can expect his ROI within 3 months. But, GPU mining also required the cooling facilities to overcome the enormous amount of heat they produce and electricity required to run them. This paper throws light on the nuances of GPU Mining process, complete setup guide, profitability, about how GPU Mining can be more efficient by using certain techniques and the advantage of mining Ethereum and its growth rate.

Keywords—Cryptocurrency; Bitcoin mining; GPU Mining; Ethereum Mining; Profitabili

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Acronyms

B.Tech.	Bachelor of Technology
M.Tech.	Master of Technology
BCA	Bachelor of Computer Applications
MCA	Master of Computer Applications
B.Sc. (CS)	Bachelor of Science in Computer Science
M.Sc. (CS)	Master of Science in Computer Science
SCSE	School of Computing Science and Engineering

CHAPTER-1

Introduction

Cryptocurrency mining is the process during which the transactions between users are verified and added to the blockchain public ledger. The process of cryptocurrency mining is also responsible for generating new coins into the existing circulating supply and is one of the main elements that allow cryptocurrencies to work as a peer-to-peer(P2P) decentralized network, without the need for a third-party central authority as traditional banking system works. A cryptocurrency, is a digital asset which is stored in a ledger existing in a form of computerized database using strong cryptography to secure transaction records, designed to work as a medium of exchange wherein individual coin ownership records are stored in the database, to control the creation of additional coins, and to verify the transfer of coin ownership. It typically a virtual cash like paper money and not issued by a central authority. Cryptocurrency use decentralized control as opposed to centralized traditional banking systems.

The word "crypto mining" refers to the method of obtaining cryptocurrencies by the utilization of computation power to solve the cryptographic equations on blockchain. Validating data blocks and applying transaction records to a public record is referred as a blockchain is a component of this method. A cryptocurrency is a digital currency protected by cryptography, which is very secured way of transaction, making counterfeiting and double-spending is nearly impossible in this form of transaction. Many cryptocurrencies are decentralized networks which supports blockchain technology. It is a distributed ledger, maintained by a network of computers. [1][2]

Bitcoin and Ethereum are the most popular and well-established mineable cryptocurrency, but it’s worth noting that not all cryptocurrencies are mineable. Bitcoin was the first blockchain-based cryptocurrency, and it is now the most common and valuable digital currency which is also known as king of all the coins. Thousands of other cryptocurrencies exist today, each with its own set of features and specifications, they are knowns as altcoins such as Ethereum, Litecoin, Dogecoin, Ripple currency, RVN, etc. Some are Bitcoin clones or forks, whereas others are brand-new currencies created from the bottom

up. Bitcoin was created in 2009 by "Satoshi Nakamoto,"[3] a person. There were over 18.6 million bitcoins in circulation as of March 2021, with a total market cap of about $927 billion. The overall value of all cryptocurrencies in existence is around $1.5 trillion, with Bitcoin accounting for more than 60% of that total.[2]

Cryptocurrency Mining can be done with four different methods i.e., Cloud Mining, ASIC Mining, CPU Mining, GPU Mining. But, in this article, we'll discuss in details about GPU Mining as it is more profitable in India and it's all components are easily accessible.

A gaming PC's graphics card (GPU) are an integral part of a computer which is used to render the high-end graphics in a computer. A modern graphics card can deliver the high-resolution and high-frame-rate graphics that gamers demand. However, a shortage has resulted from a number of causes, including higher demand of GPU as mining profitability on its peak and production delays due to coronavirus pandemic. In 2020, there is a severe shortage of graphics cards (and 2021). Cryptocurrency investors love graphics cards as they can use them to validate transactions and generate cryptocurrency through a process called mining. Many miners combine several graphics cards to create a powerful computer dedicated to crypto-currency mining which is also called as Mining Rig. To be cost-effective, the rig must produce enough coins to cover the cost of the hardware and the energy it consumes [4].

The objectives of this article are as following:

- To setup a GPU Mining Rig by gathering all the essential hardware component.
- To choose profitable coin, mining pool and its algorithm.
- To optimize the settings to get better efficiency.
- To automate and make it remotely controllable.

1.1OVEVIEW OF BLOCKCHAIN

Blockchain consist of chain of many consecutive blocks of transactions. In centralized banking system, Traditional client/server systems are following client/server architecture and controlled by multiple administrators. But, blockchain technology is a decentralized, peer-to-peer (P2P) network and distributed in nature. Each and every participant of the network can

control and manage the network. Blockchain network consists of many powerful computers connected together and the block cannot be changed without consensus of the whole network. Block can be considered as a container for the storage of all the data. Computers in the blockchain network are referred as nodes and each node has copy of the digital ledger.

Blockchain is continuously growing chain of blocks which are interconnected and secured with the help of cryptographic functions also. Validating of new blocks is followed by a set of rules and consensus from every participant of the network. The records are stored in linear chain in the database. Pointers and linked list data structures are used in blockchain for the representation of blocks. Blocks are mapped in sequence and lined with each other using linked list. Here pointers are used to point the location of the next block. Block is a collection of data that records and store the transaction details such as timestamp, link to the previous block which is generated by secure hash algorithm.[9]

And here comes the miners, actually to validate these transactions, it requires high computation power as its hash algorithm is very complicated.

Here is the detailed diagram about transaction process on blockchain:

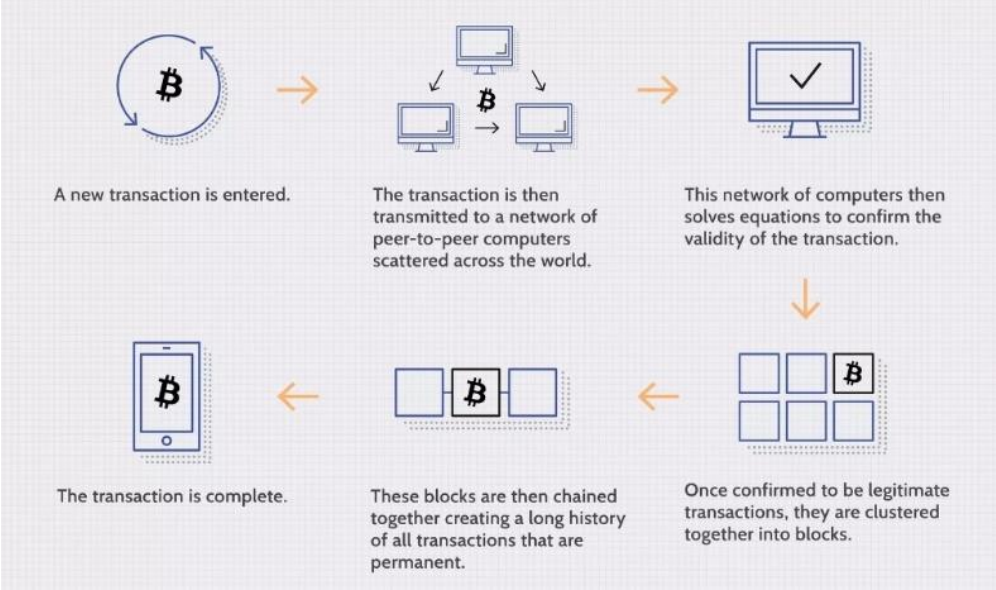


Fig 1. Transaction Process on Blockchain

As shown in Fig 1, we have talked about the networks of computers in 3rd step, these networks of computers are basically known as miners and they get rewarded for validating each transaction.

1.2 Formulation of Problem

We are optimistic that many of the current cryptocurrencies can chance to useful proof-of-work problems simply because cryptocurrencies are still very new and have not yet stood the test of time, and therefore there will need to be some adjustments. Furthermore, new cryptocurrencies are being launched all the time, so perhaps a new cryptocurrency could use many proof-of-work problems instead of one. So cryptocurrency minner verify transaction over blockchain.

1.2.1 Tool and Technology Used

Required hardware components for our project

- Motherboard (Gigabyte Fintech B250)
- Processor (Intel Core i5 6th Gen LGA 1151)
- Graphic Card (4 Piece of Gigabyte RX 580 AMD Radeon 8 GB)
- Riser Cards (4 Piece to connect all GPU with Mini PCIe Slot)
- Power Supply (Corsair 1000 W 80+ Fully Modular)
- SSD (Kingston 120GB Solid State Drive)
- RAM (HyperX 8 GB DDR4 RAM)
- Wooden Mining Rig Frame.

Hardware Requirements

Number	**Description**
1	Motherboard
2	Processor
3	Graphic Card
4	Riser Cards
5	Storage Device
6	RAM

Software Requirements

Number	**Description**
1	AMD GPU driver
2	Open CL driver
3	NVIDIA GPU driver
4	CUDA driver
5	OverdriveNTool
6	AnyDesk
7	Windows 10
8	Phoenixminer

CHAPTER-2

Literature Survey/Project Design

Dhillon wrote an article (Dhillon, 2016) and with others a book section (Dhillon et al., 2017) about blockchain technology and open science. They start the relevant chapter in their book with the current reproducibility crisis (Prinz et al., 2011; Collins and Tabak, 2014; Baker and Penny, 2016; Gilbert et al., 2016) and the rare publications of negative results (Matosin et al., 2014; Van Assen et al., 2014; Mlinarić et al., 2017). Dhillon et al. state that the blockchain technology has the potential to mitigate the crisis. They use a clinical trial as a practical example and define a workflow making the complete research process transparent while protecting critical data of patients (Dhillon et al., 2017). Also, other publications are proposing the use of blockchain technology in the medical or biological area to provide, among other aspects, transparency and trust (Nugent et al., 2016; Benchoufi and Ravaud, 2017; Ozercan et al., 2018).

Further to the research process, Dhillon also proposes to apply their approach to implement a kind of reputation system (with an API) as a reward for researchers and an indicator for the quality of contributions (Dhillon et al., 2017).

Another use case highlighted by Dhillon et al. is blockchain-based prediction markets, where mainly experts try to predict a specific outcome like the potential of reproducibility of an experiment (Almenberg et al., 2009; Dreber et al., 2015; Dhillon et al., 2017). To create an incentive to participate, users get rewarded for the right prediction, for instance, by monetary coins/tokens of the related blockchain. An article by Extance (2017) contains similar statements saying that the BT can enhance the current replication situation in science, but he additionally mentions the potential of the technology for the peer-review process to build up trust due to immutability and transparency. But also, the article reiterates the statement made by Pagliari (Extance, 2017) who expresses concerns about storing possibly incorrect data in a blockchain that are then immutable. A patent about the usage of BT in open scientific research (Ahn et al., 2018) complies with the open principles and focuses on the integration of the technology into research workflows to allow such a tamper-proof sharing of information to improve the trustworthiness in science.

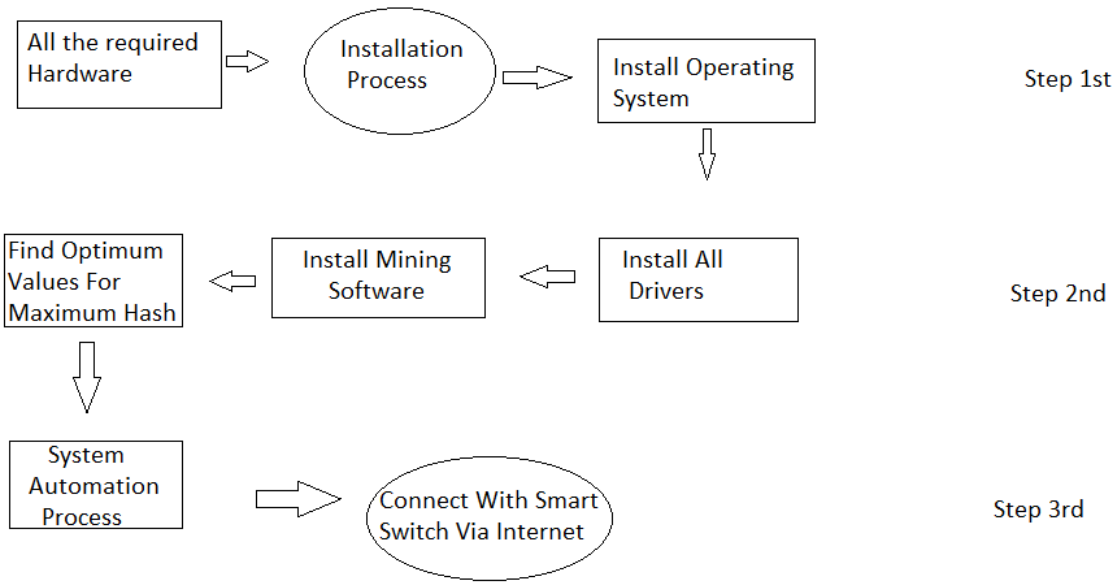
2.DESIGN

2.1. SYSTEM DESIGN

We are going to developing a system that helps us to generate hash power with using graphics card.

2.2. DETAILED DESIGN

Here is detailed design about each part of our project using diagram.



Cost Build Up Estimates

Product	**Quantity**	**Rate**
Graphics Card	4	100000/-
Mother Board	1	9000/-
Power Supply (1000watt)	1	15000/-
RAM (8GB)	1	3000/-
ROM (128GB SSD)	1	2000/-
Processor (i5 6th Gen)	1	10000/-
Display Monitor	1	5000/-
Installation Rig for Hardware	1	1500/-
Total	**11**	**145500/-**

2.3. BLOCK DIAGRAM

BLOCK DIAGRAM OF CONNECTIONS

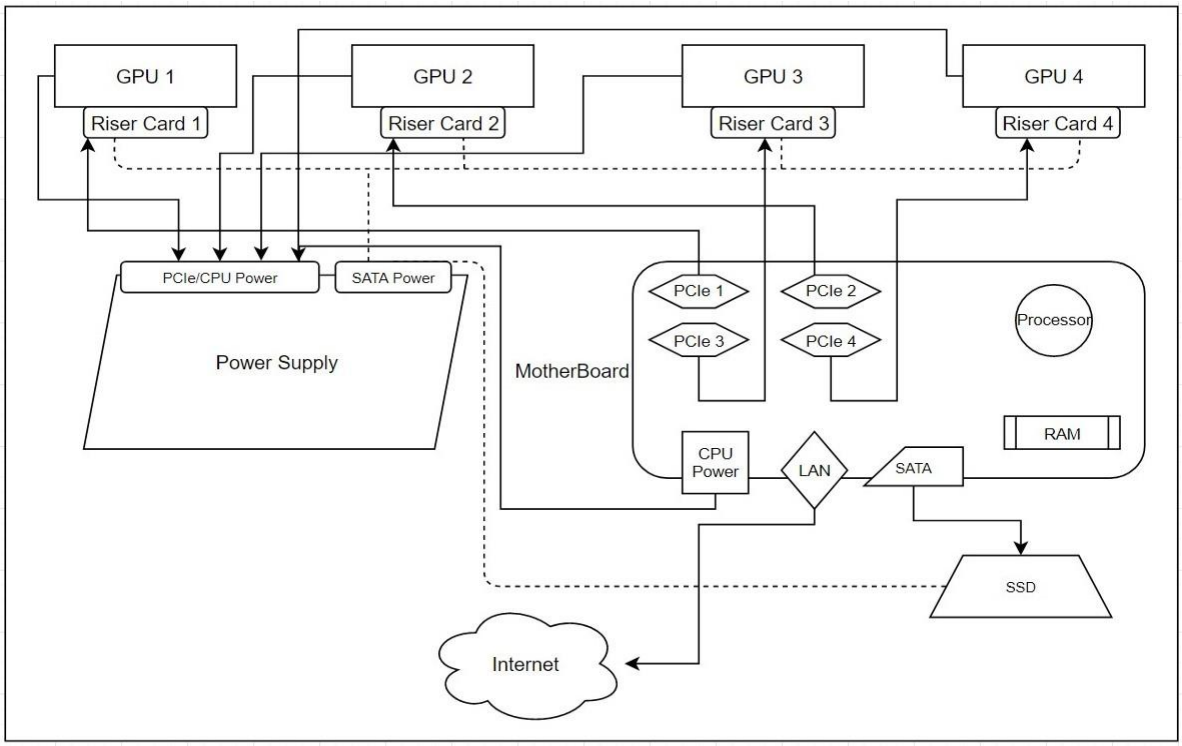


Fig 3. Hardware connections of our GPU Mining Rig.

Chapter 3
Functionality/Working of Project

MODULE DESCRIPTION

Blockchain consist of chain of many consecutive blocks of transactions. In centralized banking system, Traditional client/server systems are following client/server architecture and controlled by multiple administrators. But, blockchain technology is a decentralized, peer-to-peer (P2P) network and distributed in nature. Each and every participant of the network can control and manage the network. Blockchain network consists of many powerful computers connected together and the block cannot be changed without consensus of the whole network. Block can be considered as a container for the storage of all the data. Computers in the blockchain network are referred as nodes and each node has copy of the digital ledger.
Blockchain is continuously growing chain of blocks which are interconnected and secured with the help of cryptographic functions also. Validating of new blocks is followed by a set of rules and consensus from every participant of the network. The records are stored in linear chain in the database. Pointers and linked list data structures are used in blockchain for the representation of blocks. Blocks are mapped in sequence and lined with each other using linked list.

3.CRYPTO MINING

Crypto mining is a process through which cryptocurrency can be obtained with the use of computers to solve the cryptographic equations. Cryptocurrency is a virtual currency which is protected by cryptography which makes double spending and counterfeiting impossible. Maximum of the Cryptocurrency are decentralized network based on blockchain technology which is maintained by the network of computers. Cryptocurrency is distinguished by the fact that they are not distributed by the central banks. And more over these are used in online payment systems that are demonstrated in virtual “tokens”, which are represented by the ledger entries with in the scheme. Cryptocurrency can also be used as real money but they are taken in digital form and they are not managed by government. These are secured by cryptography they are designed in such a way that they become hard to crack. The word “crypto” refers to the various encryption algorithms and cryptographic techniques which are helpful in securing data.

At present there are several Bitcoin alternative coins called altcoins. Many of the altcoins hope to either replace or improve upon bitcoin. Altcoin can vary a lot from each other and each of the alt coin has similarity such as speed transaction, proof of stake, more secure privacy.

3.1.TYPES OF MINING:

i. Cloud mining
ii. CPU Mining
iii. GPU Mining
iv. ASIC Mining

3.1.1CLOUD MINING

Cloud mining is a process through which we can mine cryptocurrency. While using cryptocurrency there is no need to install and run the hardware and software. while using cloud mining any one can open account remotely. Cloud mining firm allows investors to open an account remotely participate in the process of crypto mining, it allows accessibility of mining to the large number of people across the world. Since this form of mining done through cloud platform, it reduces issues such as maintenance of the all equipment of the mining farms or it allows us to escape from the direct electricity charges.

Cloud miners become participants in the mining pool, Whereas people purchase or lease certain amount of “hash power” people invested on that will get returns based upon the quantity of hash power purchased or leased by the people and the cloud mining platform provider charges certain percentage of amount for the cause of maintenance and electricity cost.

There are mainly two types of cloud mining models:

1. Hosted mining
2. Leased hash power

3.1.1.1.HOSTED MINING

Hosted mining is that the hottest sort of cloud mining. In this model, the customer brought or rent mining hardware located during a miner's facility. The miner is responsible for maintaining the hardware equipment and ensuring that it works as performed. By this model, customers have direct control on their cryptocurrency.

3.1.1.2.LEASED MINING

Leased hash power is another model that's utilized in cloud mining. In this model, hash power and computing power belongs with a cryptocurrency, is rented from a mining. Customers get a part of the farm's overall profits from mining cryptocurrencies according with their hash power rented.

Issues in Cloud Mining:

- Could wind up a trick as guaranteed pay-outs can't be met as hash rate was oversold and proprietors choose to take off all of a sudden as they didn't place a portion of their benefits into moving up to new stuff as it comes out.
- Organization can leave business or just flee with the assets on the off chance that they need.

3.1.2CPU MINING

CPU mining is the method of adding transaction records to the public ledger of cryptocurrency by using a Central Processing Unit to perform necessary calculations (CPU). A central processing unit (CPU) is a component of a computer that provides computing power for the execution of operations carried out by software mounted on the machine.

Some of the coins that can be mined using CPU
Monero, Dogecoin, Byte coin.

Advantages of CPU Mining

- 1)Using CPU mining requires no specialized hardware.
- 2)No investment is required for CPU mining.
- 3)It is best starting point for entering mining.
- 4)Using this CPU with GPU will helpful in additional benefits.

Issues in CPU Mining:

- 1)It will become easy to cryptocurrency mining attracts on CPU miners.
- 2)CPU Mining is not allowed for mining of some cryptocurrencies.
- 3)CPU mining is not profitable to use for mining of most cryptocurrencies.

3.1.3.GPU MINING

GPU mining entilies of gaming graphic cards along with the central processing unit and other computer essential components to solve the complex math's problems in order to validate electronic transaction on a block chain. Generally digital coins must build on blockchain architecture that supports the "proof of work" mining in order to be mined. Bitcoin (BTC), Ethereum (ETH), Monero (XMR), Litecoin (LTC), and Dogecoin (DOGE) are some of the cryptocurrencies that can be mined.

GPU MINING ALGORITHMS:

Just as there are various cryptocurrencies built on various blockchains, there are various types of cryptocurrency mining algorithms available as a software. The hash (the product of mining) differs on the various sorts of blockchain.

A hashing algorithm may be a cryptographic hash function that maps data of any random size to a hash of a hard and fast size. These math's functions condense data to a hard and fast size. Because they are smaller, it is easier for a computer to compute hashes and work out the problems in the files(or) data string.

There are mainly 4 Types algos for the GPU mining:

1. **SHA-256 ALGORITHM:**

   SHA-256, also referred to as cryptographic hash algorithm, may be a cryptographic function. SHA-256 algorithms work on a 512-bit message block & 256-bit intermediate hash value. The hash rate of the SHA-256 algorithm is measured(denoted) in giga hashes/second (GH/s).

2. **SCRYPT ALGORITHM:**

   The Scrypt hash function is employed by Litecoin (LTC) as an alternate to the more power-hungry SHA-256 algorithm. Solving the Scrypt algorithm may be a lot faster than the SHA-256 algorithm. The hash rate of the Scrypt algorithm is measured(denoted) in kilo hashes/second (KH/s).

   Scrypt works on password-based key functions, This algorithm creates several pseudorandom numerical for storing in RAM locations, which does it almost impossible for large-scale hardware attacks to be introduced on a network.

3. **X11 ALGORITHM:**

This is the foremost energy-efficient mining algorithm for GPUs. With the X11 Algorithm, the GPUs can work on 30% less wattage. Proof-of-work blockchains that executes this algorithm run on a order of 11 hashing algorithms. This algorithm was implemented in the Dark coin protocol in 2014, specifically made by Evan Duffield to be resistant to ASIC mining.

4. ETHASH ALGORITHM:

The most well-known cryptocurrency to execute the Ethash Algorithm is Ethereum (ETH), the crypto that this algorithm was initially created. Dagger Hashimoto was the name of the primary version of the Ethash algorithm, designed by Vitalik Buterin and therefore the Ethereum team to be ASIC-resistant.

The major issues when we come to the GPU mining are:

- A gaming PC's graphics cards (GPUs) are an integral component.
- However, a shortage has resulted from a number of causes, including production delays during the coronavirus pandemic.
- It produces more sound when compared with the output hash rate than other types of mining.

Advantages of CPU Mining

- Reusable

3.1.4ASIC MINING

An application specific integrated circuit (ASIC) miner is a device which is used only for mining of the cryptocurrency. ASIC miner is used only to mine Particular coin.
ASIC mining is a process that is used for mining cryptocurrencies like as Bitcoin with the help of ASIC rings. It is just a small piece of equipment that is especially built for mining. These ASIC are used only for crypto mining.

Advantages of ASIC mining

- ASIC mining are easy to set up
- ASIC mining has high mining efficiency
- ASIC are relatively high profits

- They are low energy consumption

Issues in ASIC mining:

- Due to manufacturing defects, the ASIC burns down.
- Temperature has to be monitored manually.
- It consumes a lot of energy

3.2.EXISTING SYSTEM

Crypto mining is a process through crypto currencies can be earned by doing solving cryptographic equations by using of the computers. this interaction includes approving information blocks and adding exchange records to an openly available report known as a blockchain. It is a cryptocurrency mining is a conditional interaction that includes the utilization of PCs and cryptographic cycles to settle complex capacities and record information to a blockchain. Indeed, there are whole organizations of gadgets that are associated with cryptomining and that keep shared records by means of those blockchains.

It's essential to comprehend that the digital money market itself is an option in contrast to the conventional financial framework that we use internationally. Thus, to more readily see how crypto mining functions, you first need to comprehend the distinction among unified and decentralized frameworks.

3.2.1.INTRODUCTION

Currently we have a basic hardware system which contains all computer required components like Mother board, CPU, RAM, ROM, graphics card, power supply etc.

3.2.1.1. EXISTING WORK

Vipul [5] showed the transaction process works on Blockchain and how each component works in mining process in detail. Also, they have clarified in detail about the origin of cryptocurrency as a form of digital currency or virtual cash. They have also determined the challenges in mining process and given the probable solutions.

Navneet [6] has shown the mining cryptocurrency on cloud. In their article, they have disclosed all methods of mining. They have discussed in detail about how to rent a powerful computer on cloud computing and start with low amount of investment.

Vipul [7] had described in detail about the impact of cryptocurrency in the global economy and upcoming future developments. They have also talked about the various innovative development in blockchain transactions and its securities. At the same time, they have discussed all the controversies regarding cryptocurrencies.

Navneet [8] estimated the impact of mining cryptocurrency on environment and contributed to the discussion on the technology's supposedly large energy consumption and carbon footprint.

3.2.1.2.WHAT'S NEW IN THE SYSTEM TO BE DEVELOPED

Our main objective is to setup a GPU Mining rig. So, for setting up a mining rig, we require lots of essential hardware components such as: Motherboard, Power Supply, Processor, Graphic card, Riser Cards, Storage Device, RAM, Mining Rig Frame, etc.

And we required some essential tools to be installed on our Mining Rig prior to start mining process such as: AMD GPU Driver, OpenCL Driver, NVIDIA GPU Driver, CUDA Driver, OverDrivenTool and Third-Party Mining Software (Phoenix Miner, TeamRedMiner, NB Miner, etc).

And we are going to find optimal settings for GPU mining to get maximum hash power from our system. So, we can generate maximum profit.

1. PROBLEM ANALYSIS

We are going to analysis whether our system is working or not. We are expecting some kind of errors in our system that we are going to discuss one by one.

1. **System failure**

When we running our mining software then sometime our system crashing. The possibility of the system failure is 1%.

2. **Over heating**

Our mining process is working continuously 24*7 so there is a problem of overheating. And to prevent that problem there is two ways

2.1. Cooling System

To prevent over heating issue, we have to install cooling fan so our system can run for long time without any interpretation to get maximum hash power.

2.2. Give Proper Rest

This method is an alternative of cooling system to prevent over heating issue.

We have to shut down our system for 5 minutes after every 4-5 hours duration.

1.1. PRODUCT DEFINITION

We require lots of essential hardware components such as: Motherboard, Power Supply, Processor, Graphic card, Riser Cards, Storage Device, RAM, Mining Rig Frame, etc. Using these components, we make successful complete hardware setup to perform mining tasks and along with mining we can also perform all other tasks similar to a computer.

1.2. FEASIBILITY ANALYSIS

We have done four types of feasibility analysis on this project.

- Operational Feasibility
- Technical Feasibility
- Economic Feasibility
- Schedule Feasibility

1.2.1. OPERATIONAL FEASIBILITY

Performance is a measure of how well a projected system excellently solves problems, and utilizes the opportunities identified during the broad definition and how it satisfies the needs identified in the system development needs analysis phase.

Acquisition of performance reviews the organisation's willingness to fund the proposed program. This is probably the most difficult to measure. In order to achieve this potential, it is important to understand the management's commitment to the proposed project. If the application is initiated by management, it is likely that there will be administrative support

and the system will be accepted and implemented. However, it is also important that the staff base will embrace change.

We are going to explain about our projects operation and working process.

Basically, idea behind this is crypto currency is a decentralised currency and it haven't any server like centralised currency.

1.2.2. TECHNICAL FEASIBILITY

Let's run down a list of the parts we need to assemble a Mining Rig. Every hardware role will be explained and we will provide the most reliable parts that we use for our Mining Farm, so feel free to use the links we provide, and the prices will be based on your local Amazon store.

- Motherboard
- Processor (CPU)
- Memory (RAM)
- Power Supply (PSU)
- Graphic Card (GPU)
- Storage
- PCI-E Risers
- Internet Connectivity (Wi-Fi Adapter Or Ethernet)
- Rack Or Case

1.2.3. ECONOMIC FEASIBILITY

To make sure you are making the most out of mining mine the most profitable coin for your GPUs**.** Go over at whattomine.com and put in your GPUs, the website isn't too accurate but you will usually have higher hash rate than what they show you if you follow our upcoming guides. If you want to support a certain project by mining it then feel free to do so,

but we recommend mining the most profitable coin, then exchange the coins to the ones you are collecting.

1.2.3.1. COMPARISON

	Before Changes	After Changes	Difference
Day	$12.38	$14.35	$1.97
Week	$72.07	$83.49	$11.42
Month	$371.4	$430.5	$59.1

Table 1. Shows comparison before and after changes

As you can see, after overclocking & undervoltage and also modifying the Bios of GPU Stock Rom, we were able to generate $59.1 more revenue in a month which is equivalent to 4,330 Rs in Indian rupees.

1.3. PROJECT PLAN

In our crypto mining project we were decided to build a GPU mining rig. For setting up the mining rig we require lots of essential hardware components such as: Motherboard, Power Supply, Processor, Graphic card, Riser Cards, Storage Device, RAM, Mining Rig Frame and we also required some And we required some essential tools to be installed on our Mining Rig prior to start mining process such as: AMD GPU Driver, OpenCL Driver, NVIDIA GPU Driver, CUDA Driver, OverDrivenTool and Third Party Mining Software. And now we have to choose the profitable coin and its algorithm for the graphic card for that we can go to whattomine .com. and then after selecting we have to automate and make it remotely controllable because we need to run it 24X7, so we need to change the some settings and also create the batch file for overdrive settings and paste to " shell:startup". and even we need to optimize the settings to get better efficiency. And we also have made the modification in BIOS settings.

2. SOFTWARE REQUIREMENT ANALYSIS

We are going to analysis all the requirements for our GPU Mining project in this part.

2.1. INTRODUCTION

1. **AMD GPU driver:** The AMD Driver Auto-recognize device is just for use with PCs running Microsoft Windows 7 or Windows 10 AND furnished with AMD Radeon™

illustrations, AMD Radeon Pro designs, AMD processors with Radeon designs, or AMD Ryzen chipsets. This tool is intended to distinguish the model of the AMD Radeon designs, AMD Ryzen chipset, and variant of Microsoft Windows introduced in your PC, and afterward give the choice to download and introduce the most recent authority AMD driver bundle that is viable with your framework.

2. **Open CL driver :** OpenCL (Open Computing Language) is a low-level API for heterogeneous figuring that sudden spikes in demand for CUDA-controlled GPUs. Utilizing the OpenCL API, engineers can dispatch figure pieces composed utilizing a restricted subset of the C programming language on a GPU.

3. **NVIDIA GPU driver :** The NVIDIA Driver is the product driver for NVIDIA Graphics GPU introduced on the PC. It is a program used to impart from the Windows PC OS to the gadget. This product is needed by and large for the equipment gadget to work appropriately.

4. **CUDA driver :** CUDA is a calculation stage that incorporates a driver, toolbox, programming advancement pack, and application programming interface. It allows engineers to make programs that perform calculations essentially quicker on NVIDIA designs cards utilizing equal handling.

5. **OverdriveNTool :** OverdriveNTool is a program for altering GPU settings with help for the AMD OverdriveN API

6. **AnyDesk :** AnyDesk is a definitive distant access application for Android-giving you a genuinely portable answer for far off work area availability and controller by means of android gadgets. What's more, it's free for private use! Appreciate consistent network in any setting, for any application. Set up distant work area joins with your office.

7. **Windows 10 :** One of the essential points of Windows 10 is to bind together the Windows experience across different gadgets, such personal computers, tablets, and cell phones. As a feature of this exertion, Microsoft created Windows 10 Mobile close by Windows 10 to replaces Windows Phone – Microsoft's past versatile OS.

8. **Third Party Mining Software**

8.1. **Phoenixminer :** Phoenix excavator is a free, open-source programming is accessible under the X11 permit and was delivered by Bitcoin people group individuals Jedi95 and CFSworks. As well as associating through RPC and RPC, this digger will interface by means of MultiMiner Protocol (MMP) which is utilized by the MultiMiner Server.

8.2. **Team Red Miner :** It is a presentation upgraded digital currency excavator for AMD GPUs with help for various calculations with the most recent significant adaptation 0.8. 0 bringing reworked Ethash pieces and new digging modes for all GPU types.

3. TESTING

3.1. FUNCTIONAL TESTING

To validate each of the blocks are properly working, we have firstly connected it to the Binance pool and executed the “start.bat” file after all the optimization. After that we were able to see our Miner was online on “Binance Pool”.

In this Testing phase, we observed that one or two of the GPU’s were crashing after couple of hour. But we have fixed this problem by increasing the power limit of those cards and also we have scheduled our system to restart after every 4 hours. So that mining functions will be reset after some interval of time. The command we have used to restart our system: *shutdown /r /t 14400 /f*

To run the scheduling command, we have created a batch file and copied that file to “shell:startup”.

3.2. STRUCTURAL TESTING

After performing the functional testing, we have tested the structure of data flowing on the “Mining Pool”. We have tested whether the authentic data is submitting on the pool, To check that, we need to understand the meaning of the code in below snapshot:

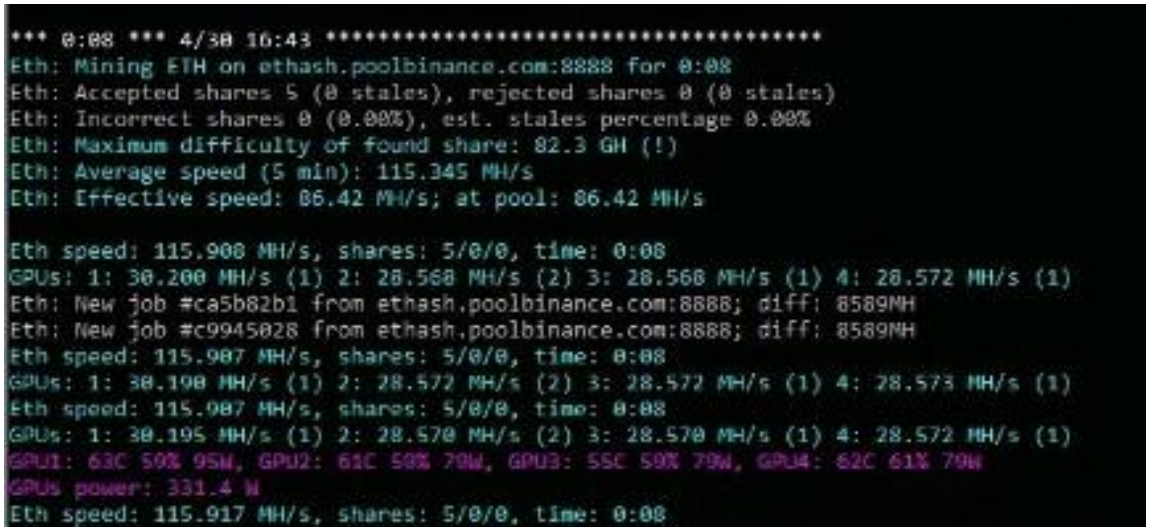


Fig 4. Effective Speed Vs Average Speed

In the Fig 4, We can see that eth Effective Speed is 86.2 MH/s and Average Speed is 115.908 MH/s. It means our Mining Rig is generating 115.908 MH/s but on pool it's submitting only 86.2 MH/s. Means there is some connectivity lag between our system and mining pool. We have fixed this issue by changing the overclock settings and we have also increased the VRAM to minimize the rejection percentage.

3.3. LEVELS OF TESTING

There are mainly four Levels of Testing, we have performed:

- Unit Testing: We have performed testing on each component of our "GPU Mining Rig" configuration and each component were working fine.
- Integration Testing: In this testing phase, there was some issue in data flow from our system to mining pool server and we have fixed it by increasing power limit.
- System Testing: In this testing phase we have evaluated both functional and non-functional needs for the testing.
- Acceptance Testing: We have checked all the requirement of specification or contract met as per its delivery and we got little bit rejection in final data submission but later we have fixed it.

3.4. TESTING THE PROJECT

Now, it's a time to test the final project. As we have made this project fully automated and remotely operational. So, we have tested it by turning OFF and ON the main power switch. And, Mining has been automatically started after windows boot up as per our configuration.

Our next step was to test whether remote function is working properly or not. We have configured three ways to control it remotely.

1st Method: We have integrated Google Home Mini Speaker to Start and Stop mining remotely with voice commands. So, to test it we have Google home mini speaker and We have setup the command "Start mining" to start the mining batch file and "Stop Mining' to stop the mining process from task manager. We have tested it and it was fine.

2nd Method: We have integrated our mining setup with Smart Plug which is also remotely operational and it also provides the status of current power consumption. To test this functionality, we have installed the "Smart life' app in our smartphone and configured it our home wifi network and it was working fine. We were able to Turn ON and OFF through our smartphone.

3rd Method: We have configured the unattended access of our Mining System from anywhere over the internet through Anydesk desktop software. And we have tested it by accessing our system remotely from our Smartphone and laptop and we are able to remotely control our system from any device.

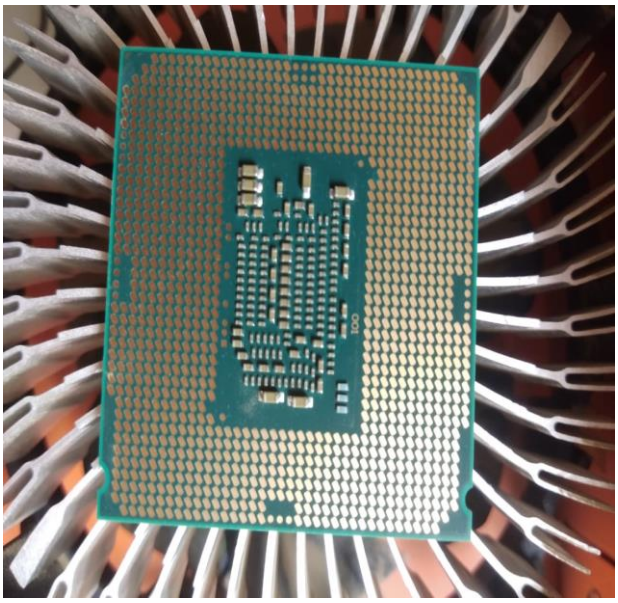
8. IMPLEMENTATION

8.1. IMPLEMENTATION OF THE PROJECT

Step 1: INSTALLATION OF CPU

The first step for building any mining rig is to install the CPU on the mother board. There are some important things to be followed while installing CPU are not touch the bottom part of the CPU or any of the pins on motherboard.

Also make sure you line the marking on the



CPU up with the markings on the motherboard.

And be careful do not touch the thermal paste on the CPU and make sure it was properly locked the CPU on its slot on the motherboard. Additionally, make sure to plug the 4-pin fan cable into the proper 4-pin port on the motherboard.

Step 2: INSTALLATION OF RAM

In next to install the RAM to the motherboard. This step is very simple the RAM will only fit into the RAM slot provided in motherboard. Don't be panic to push down the RAM to ensure its fully seated in the RAM slot to make sure pushed in all the way.

Step 3: INSTALLATION OF MOTHERBOARD ON THE RIG FRAME

In next to attach the motherboard to the frame. First to make sure you're using regular screwdriver to hand tighten the screws making sure that you only screw them in the snug so you don't crack the motherboard. Also use at least five screws to secure the motherboard on the frame.

Step 4: INSTALLATION OF POWER SUPPLY

Installing power supply is another step to be achieved. Ideally you would want to attach the power supply to the frame so it doesn't move around. Also, you will want to attach the 8-pin

CPU cable and 24-pin cable to the power supply and then attach them to the proper ports on the motherboard.

Step 5: INSTALLATION OF SSD

In order to install the SSD, you will need to attach a 15-pin SATA cable to the power supply and then attach it to the SSD. Also, there is a cable that should have come with your

motherboard that allows you to attach the SSD to the motherboard.

Step 6: ADJUST MOTHERBOARD BIOS

In order to adjust the motherboard BIOS, you need to access the BIOS menu first. Doing this can be done by powering on the rig and pressing the delete button repeatedly while the system boots up. Once inside the BIOS menu, there are some settings you will need to adjust. Please note that the settings you will need to adjust will vary depending on the motherboard you choose. Make sure to research which settings you will need to tweak in the BIOS to ensure your rig runs properly

Step 7: INSTALL WINDOWS 10

When it comes to the installation of windows 10 there are some ways you can go about this. We can go with the paid version of window 10 or free version of windows 10 if you are

affordable with the paid version you can go with that or you are unable to afford you can go with free version

We gone through the free version of windows 10.

Step 8: ADJUST WINDOWS 10 SETTINGS

After the installation and updating of windows 10 has done there are few settings that we need to adjust. The first adjustment is to adjust the power settings to make sure that the rig does not turns off or goes in sleep mode.

The next settings involve in adjusting virtual memory and disabling windows defender so that we could run mining programs without the interference of interruptions. And then go to out mining rig build video for more help on things which setting is to adjust.

Step 9: INSTALL THE FIRST GPU

Currently we have the operating system installed in our system now it's time to install the first GPU. To perform this we should attach the riser to GPU and later on attach the GPU to the mining rig frame.

And now ensure that the riser has attached to one of the PCIe lines on motherboard and now attach one 15-pin SATA cable taken from the power supply to the riser. And also, along with it, we need one VGA cable taken from power supply to the VGA port in the GPU.

Step 10: GPU DRIVERS AND MINING SOFTWARE INSTALLATION

If we had GPU perfectly installed and checked all cables are secured we could start testing the first GPU. However, we want to ensure that we had the latest driver has installed for our particular GPU.

If the drivers had installed we could download mining software to begin a test on GPU to make sure that each and everything is working thoroughly. This process in this step looks like sensible but once again do refer to our mining rig video for further instructions.

Step 11: REST OF THE GPUS INSTALLATION

If we had done with the testing and ensure the first GPU is working perfectly, we can start installing the remaining part of the GPU to rig. We are basically repeating the process in Step 8. Do remember to check all cables are properly secure.

And also, be careful that not to overload your 15-pin SATA connections with more than two connections for a cable

Step 12: DRIVERS REINSTALLATION

If we are done with the remaining part of the GPU is installed, we might need to reinstall the drivers. Actually, this is not mandatory but, in some cases, we might need to uninstall the drivers with a software named DDU.

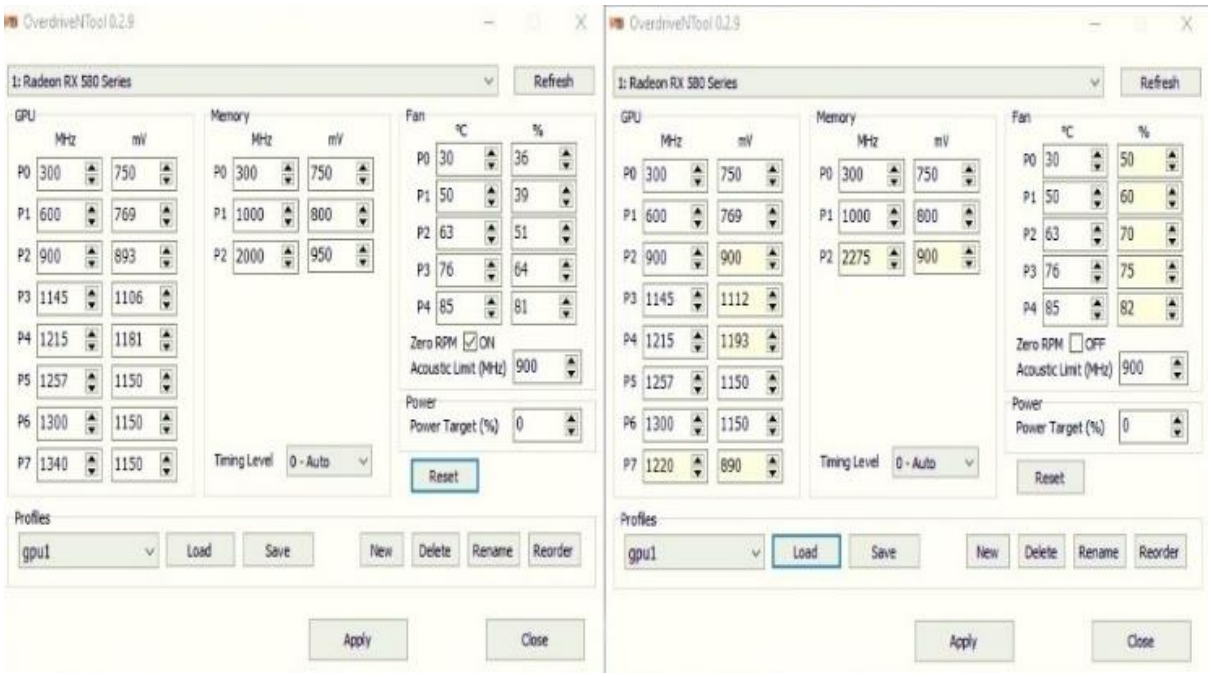
We can conform and ensure the drivers are perfectly installed by just right-clicking on the windows icon at the bottom left corner of your screen. After that go to the device manager and click on display adapters. We can go to the next step only if all cards are recognized. However, if we have yellow caution symbols or all the cards are being not recognized by the device manager then we are going to wipe the drivers clean and perform reinstallation of new drivers.

Step 13: OVERCLOCK SETTINGS ADJUSTMENT

If we had the GPU installed and perfectly placed with drivers, we can start overclocking. Overclocking allows us to optimize our GPU for maximum mining performance and power consumption.

We need a software like MSI to do this, afterburner installed on our mining rig. This allows us making an adjustment to power and the core and memory clock settings. This differ much depending on the GPU usage and the coin that we want to mine.

Make a note that we need to find out our own settings depending on the hardware that we use and coin our planning to mine.



Step 14: CONFIGURE MINER RESTARTING

If we had done with overclock settings adjustment, we can start mining. Anyway, we need to adjust our mining software such that the coins we mine will be going into our wallet. For example, we used Claymore 15 that allows us to mine any Ethash coin that are available. Anyways, the good thing about building a GPU mining rig is the truth we can mine a wide variety of coins. Sites like whattomine provides a path into what coins may best to mine for the hardware we select.

8.2. CONVERSION PLAN

Since the start of the crypto currency revolution, the rate of evolution of mining techniques to maximize the mining profitability by increasing hash rate has been staggering. The main methodology of Crypto Mining which is more profitable i.e., ASIC Mining as it specially designed for Mining purpose. But, In India, as we have lack of resources for ASIC Mining and required heavy custom charges if we import from another country. So only we have left with next option i.e., GPU Mining. With GPU Mining, We have observed that mining Ethereum Coin is more consistent and profitable and also growth of a Ethereum in 2021 is around 27 times more than the price in 2017. As you can see in below chart:

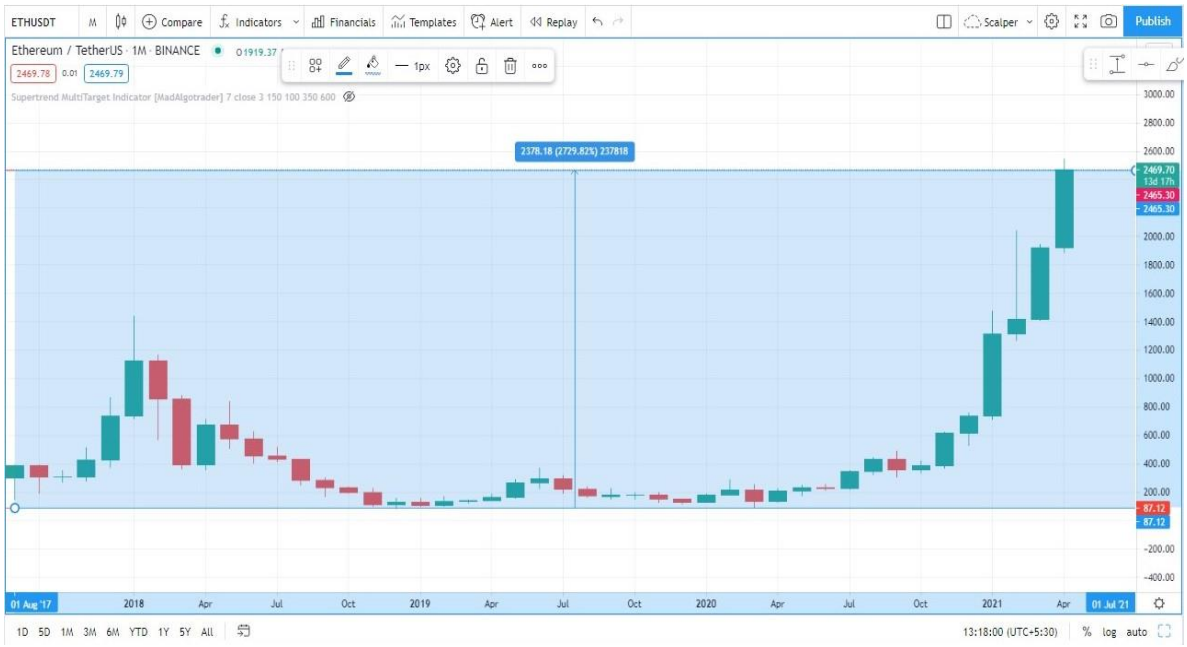


Fig 10. This is a Monthly chart of Ethereum.[11]

As shown in Fig 10, we can observe that, Ethereum has more potential of growth as its price has been increased 27X in last 4 years. So, if we mine Ethereum and Hold it for couple of months, then we can have more profit as Crypto Market movement is surprisingly amazing than any other Stock Markets.

This paper provided an in-depth view of types of cryptocurrencies currently in operation, the types of mining and the detailed mining configuration with Graphic Cards, which led us to the next logical step of Crypto Mining. This is definitely a best solution for investment in Mining as we have higher potential of growth by Mining and Holding the Ethereum. As complexity and competition increases, faster and more efficient machines are bound to be designed. However, at present, GPU Mining presents the most viable route to maximizing profits.

8.3. POST-IMPLEMENTATION AND SOFTWARE MAINTENANCE

Our main objective is to setup a GPU Mining rig. So, for setting up a mining rig, we require lots of essential hardware components such as: Motherboard, Power Supply, Processor, Graphic card, Riser Cards, Storage Device, RAM, Mining Rig Frame, etc.

And we required some essential tools to be installed on our Mining Rig prior to start mining process such as: AMD GPU Driver, OpenCL Driver, NVIDIA GPU Driver, CUDA Driver,

OverDrivenTool and Third-Party Mining Software (Phoenix Miner, TeamRedMiner, NB Miner, etc).

8.3.1. TO CHOOSE PROFITABLE COIN AND ITS ALGORITHM

For getting started with mining, we need to find out the most profitable coin and algorithm for our graphic card. For that we can go to the https://whattomine.com and we can find out the most profitable coin with electricity consumption. We can select our graphic model and number of Graphic cards, then click on Calculate. Afterwards, we can get the most profitable coin and algorithm for our Graphic card, In our case, We have selected 4 RX 580 GPU Model to calculate the profitability as shown below:

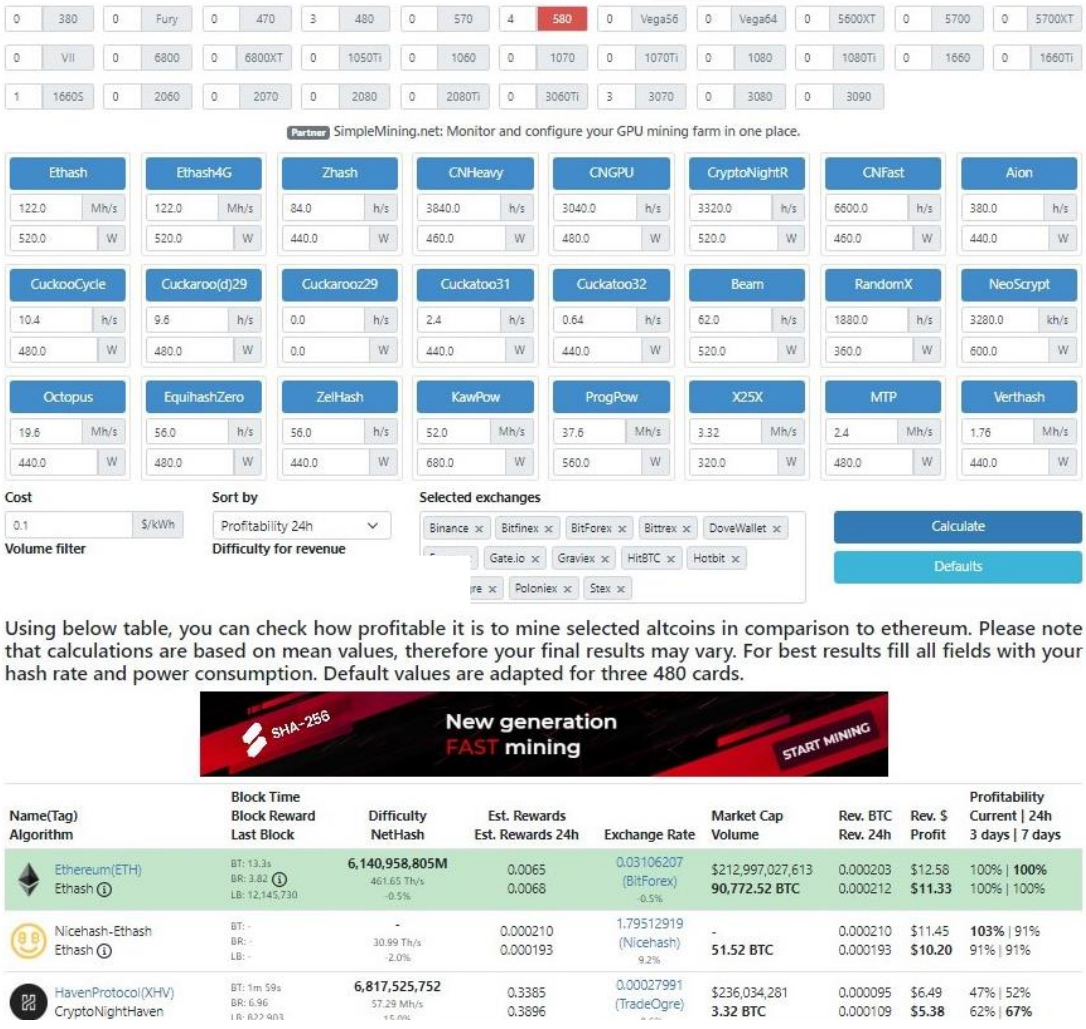


Fig 5. This figure shows the calculation of most profitable coin for our mining rig.[10]

As shown in Fig 3, we can see the most profitable coin is Ethereum whose algorithm is Ethash where we can get $12.58 daily revenue and $11.33 after electricity cost deduction. So, our next objective is increase efficiency by making changes in default setting.

8.3.2. TO AUTOMATE AND MAKE IT REMOTELY CONTROLLABLE

GPU Mining need to be run 24X7, so for that we can't monitor it every time. So, for that, we need some smart solutions. Our first objective is to Auto Start our Computer and Mining Setup whenever power loss and comes back. Our second objective is to control our system from anywhere with any device as we can't sit every time in front of system. So, by setting up AnyDesk with unattended access we can achieve it. Even, we can use smart devices like Google Home Mini, Alexa, IFTTT, Smart Plug, etc. to control whole of the system across the world.

To achieve the automation in Mining, we need to do the following changes after implementation:

Go to run and type "shell:startup" and paste the Start batch file of phoenix Miner.

Also create the batch file for Overdrive settings and paste to "shell:startup".

Make sure that in Bios Setting, "When AC Loss, Power On the Computer" is Enabled.

8.3.3. TO OPTIMIZE THE SETTINGS TO GET BETTER EFFICIENCY

When we setup our Graphic card, we need change the default settings of graphic card which has been configured by the vendors (Gigabyte, MSI etc.). On default settings, we can get only up to 26 MH/s speed per card with more than 120-watt power consumption.

To achieve the better mining speed with less power consumption, we need to Overclock (Increase Memory/Core Clock Speed) and Undervolted (Decrease the Power Limit) our Graphic Card and also, we need to flash modify the BIOS settings.

8.3.4. FIRST CHANGES WE HAVE MADE BY APPLYING OVER CLOCK SETTINGS:

As on by default settings of Graphic card vendor, Power Consumption is 471 watt and we were getting 102 MH/s Speed only.

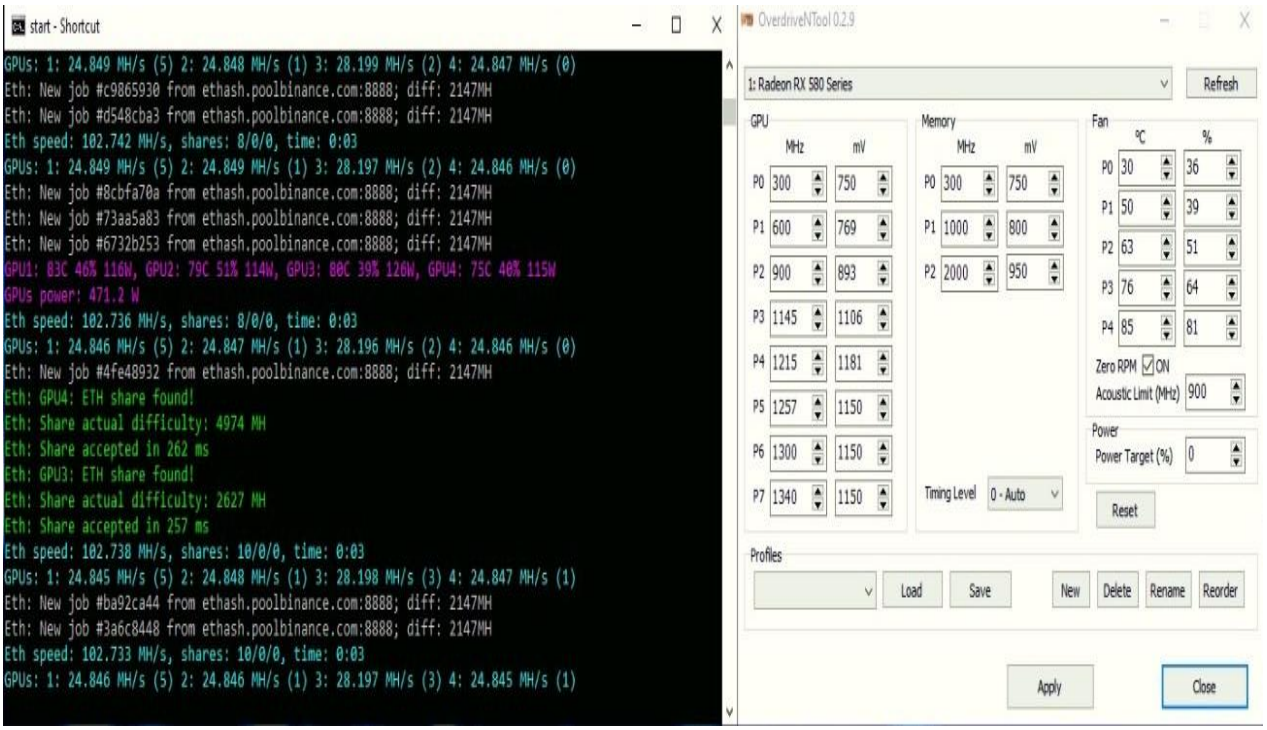


Fig 6. This figure shows the Mining Speed at default settings of GPU.

To enhance the performance of our Graphic Card, we have made it more efficient by Over Clocking and Under Volting. To do that, We have installed the Overdriven Tool and we have increased the Memory/Core Clock Speed and Decreased the Power Limit until we reached to the optimal performance.

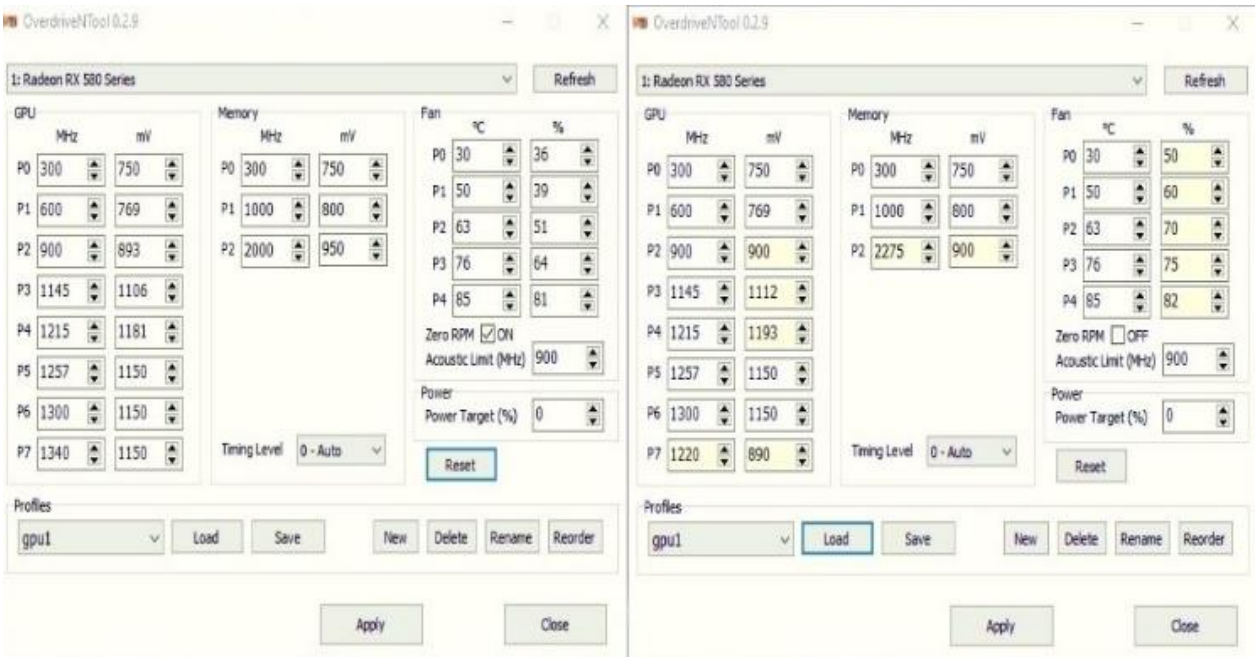


Fig 7. Default Setting

Fig 8. Optimized Setting

As you can see in Fig 5 and Fig 6, Here, we have changed the P7 and P2 value only. And after applying these changes we were able to get 100Mh/s with 282-Watt power consumption, it means we have reduced almost 40% power consumption. But still, we need better performance.

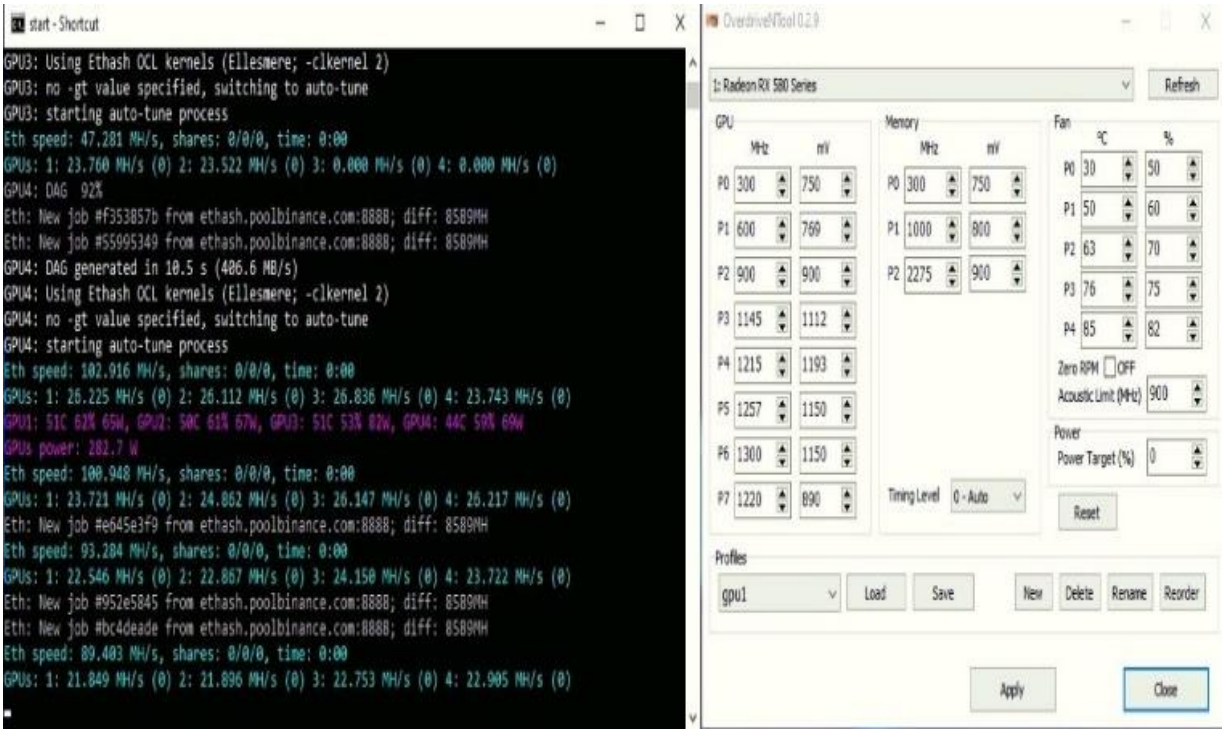


Fig 9. This figure shows the mining speed after applying optimized settings.

8.3.5. Second changes we have made by modifying BIOS settings:

To get more mining speed, we have modified the original OS of graphic card.
To modify the Graphic Card Stock OS, We have used Polaris Bios Editor and We have changed the memory timings and Flashed it as Modified using “Antiflash” Software.
Now we have achieved the maximum performance with less power consumption as you can see below the Mining Speed is 115 MH/s with power consumption of 327 watt.

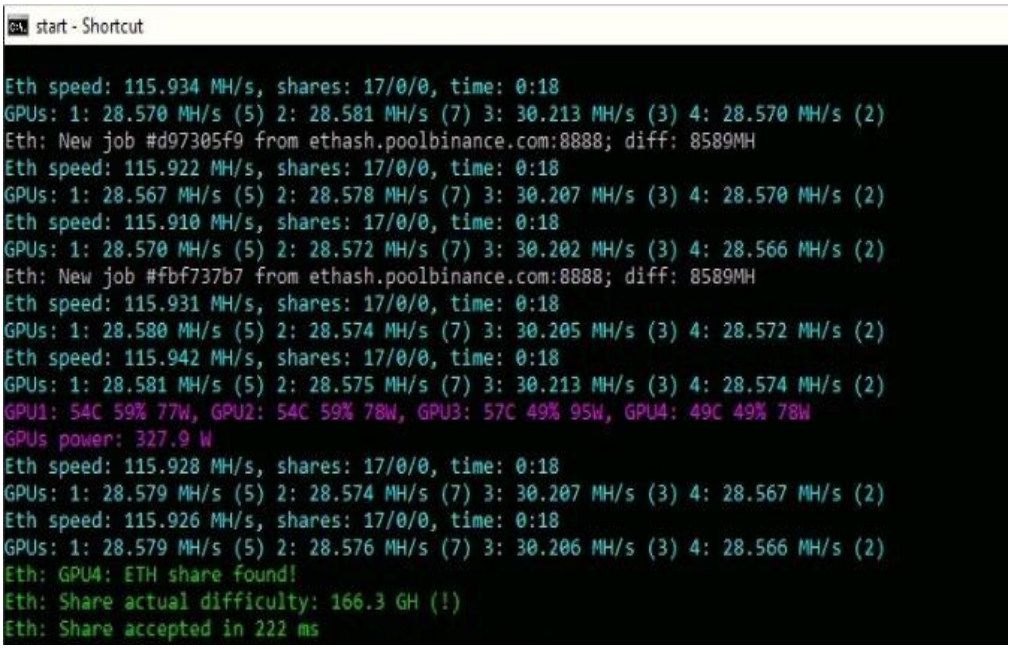


Fig 10. This figure shows the mining speed after modifying the BIOS and applying optimized settings.

9. PROJECT LEGACY

9.1. CURRENT STATUS OF THE PROJECT

This project has gone under various test with many numbers of changes and the result provided are accurate, and screen shots which were provided were also accurate. In our project we have changed the default settings of graphic card which is configured by the

vendors. For achieving the better mining speed with less power, we had increased the memory (core clock speed) and decreased the power limit of our graphic card and also, we modified the BIOS settings. To choose the profitable coin and its algorithm we took the help of whattomine.com. The project is ready to use state by the user for its remote usage.

9.2. REMAINING AREAS OF CONCERN

9.3. TECHNICAL AND MANAGERIAL LESSONS LEARNT

Through this project, we were able to understand what is crypto mining and how to configure software and its hardware. While doing this project we learned how does the crypto currency work. We even learned how to mine in profitable way. We had understood how crypto mining is playing a vital role in this era. we were able to learn the types of mining and also picking the best crypto currency to mine. while doing this project we also understood that there are many crypto currencies present in the internet which can be mined. Furthermore, we gained the technical knowledge which we used in this project.

9.4 USER MANUAL: A COMPLETE DOCUMENT (HELP GUIDE) OF THE SOFTWARE DEVELOPED

Required hardware components for our project

Here is the list of essential hardware components which has been used in our Project:

- Motherboard (Gigabyte Fintech B250)
- Processor (Intel Core i5 6th Gen LGA 1151)
- Graphic Card (4 Piece of Gigabyte RX 580 AMD Radeon 8 GB)
- Riser Cards (4 Piece to connect all GPU with Mini PCIe Slot)
- Power Supply (Corsair 1000 W 80+ Fully Modular)
- SSD (Kingston 120GB Solid State Drive)
- RAM (HyperX 8 GB DDR4 RAM)
- Wooden Mining Rig Frame.

Graphical Representaion of 4XGPU Mining Rig

Fig 9. This is a hardware connections of 4XGPU Mining Rig which we have configured.

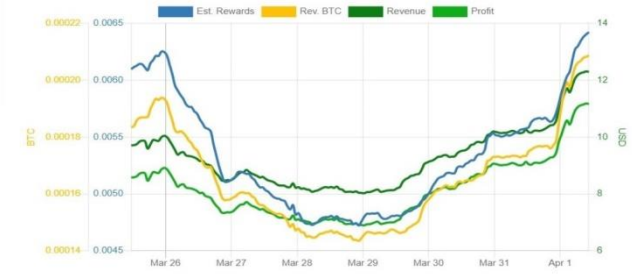
Psecudo code:

EthDcrMiner64.exe -epool ethash.poolbinance.com:8888 -ewal username -eworker worker_name -epsw x -asm 2 -dbg -1 -allpools 1 -mode 1

Chapter 4
Results and Discussion

Estimated Rewards

Per	Fees	Est. Rewards	Rev. BTC	Rev. $	Cost	Profit
Last Hour	0.000000	0.000230	0.000008	$0.44	$0.05	$0.40
Last Day	0.000000	0.006445	0.000210	$12.38	$1.13	$11.25
Last 3 Days	0.000000	0.017231	0.000562	$33.10	$3.39	$29.71
Last Week	0.000000	0.037514	0.001224	$72.07	$7.91	$64.16



As on by default settings of Graphic card vendor, Power Consumption was 471 watt and we were getting 102 Mh/s Speed only. So, Estimated rewards on the basis of these parameter has been calculated on whattomine.com and we were able to generate daily revenue of $12.38 only and $11.25 after electricity cost deduction. [Fig 5]

Here we have shown the estimated profit in Last Hour, Last Day, Last 3 days and Last Week where revenue and profit has been calculated in Dollar As shown in Fig 10, we can observe that, Ethereum has more potential of growth as its price has been increased 27X in last 4 years. So, if we mine Ethereum and Hold it for couple of months, then we can have more profit as Crypto Market movement is surprisingly amazing than any other Stock Markets.

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Chapter 5
Conclusion and Future Scope

5.1 Conclusion

Since the start of the crypto currency revolution, the rate of evolution of mining techniques to maximize the mining profitability by increasing hash rate has been staggering. The main methodology of Crypto Mining which is more profitable i.e., ASIC Mining as it specially designed for Mining purpose. But, In India, as we have lack of resources for ASIC Mining and required heavy custom charges if we import from another country. So only we have left with next option i.e., GPU Mining. With GPU Mining, We have observed that mining Ehereum Coin is more consistent and profitable and also growth of a Ethereum in 2021 is around 27 times more than the price in 2017.

5.2 Future Scope

Our main objective is to setup a GPU Mining rig. So, for setting up a mining rig, we require lots of essential hardware components such as: Motherboard, Power Supply, Processor, Graphic card, Riser Cards, Storage Device, RAM, Mining Rig Frame, etc.

And we required some essential tools to be installed on our Mining Rig prior to start mining process such as: AMD GPU Driver, OpenCL Driver, NVIDIA GPU Driver, CUDA Driver, OverDrivenTool and Third-Party Mining Software (Phoenix Miner, TeamRedMiner, NB Miner, etc). And we are going to find optimal settings for GPU mining to get maximum hash power

from our system. So, we can generate maximum profit. In upcoming year a head all the technology must be shifted to blockchain technology.

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