How much can we earn by Ethereum mining

Alexandr Talitsky, Anton Smerdov, Pilyugina Polina

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1 Ethereum

1.1 Ethereum and its features

Ethereum is a blockchain-based decentralized platform, which allows to create and run online smart contracts. It was proposed in 2013 by Vitalik Buterin. He believed that Bitcoin lacks the possibility to create advanced scripts, as it has very poor script language embedded. Unlike the Bitcoin, Ethereum uses Turing-complete languages for smart contracts. The possibility to make smart-contracts is the most important feature of Ethereum, which makes it possible to include any asset in any type of a deal, secured by blockchain-based approach. This drew a lot of attention to Ethereum in recent years, as it is seen as "Bitcoin 2.0".

Ether is a cryptocurrency for operation of Ethereum. Unlike the Bitcoin, Ether allows not only its use as a simple payment, but it can also be used in other deals with assets and transactions, as well as it is used to pay transaction fees. It is a fuel for Ethereum smart contracts. Ether is listed under the code ETH and traded on cryptocurrency exchanges.

1.2 Market analysis

Cryptocurrency has recently became one of the hottest topics in financial industry, and Bitcoin and Ethereum are one of the most popular among all and they are assumed to be the most reliable. Prices of both cryptocurrencies remained rather low and stable, until in 2017 the interest in cryptocurrencies and blockchain technology has boomed, resulting in enormous growth of the price of both Bitcoin and Ethereum. This attracted thousands of people in buying and mining cryptocurrencies. Here you can see the plot of ETH-USD values for the past two years.

There are several ways of getting yourself an Ether: buying one in any of the cryptocurrency exchanges, mining or receiving it after some transactions. Mining of ether is the process, when a person lends its processing power and time in order to verify transactions, and when new "block" in a blockchain is mined, it's miner receives ether. For many people recently the mining of ether seemed to be the cheapest way to obtain ether, however in order to verify it is indeed profitable, we need to understand not only the possible gains from mining, but also its costs. In this project we will try to analyze mining costs and gains on different hardware, in order to understand, how much can we get (or lose) from mining Ethereum.

2 Mining

2.1 Factors, which influence mining

There are three main factors, which influence the mining process and one need to understand them, in order to mine properly. They are: difficulty level, hashrate and electricity consumption. All these factors can change based on when and where you mine. Also for mining one needs processing power, so these special equipment must be in possession of a miner. Therefore, in order to start mining one should consider all the possible costs and factors above, to understand whether one should start to mine at all.

2.2 GPU and CPU mining

Minimal requirement for mining is to have at least 3.5 GB RAM. This memory restriction is not really enough for ASIC, but even for CPU or GPU with low memory — software will not simply work on such computers.

For CPU I have **Intel I7 3630 QM**, which has next attributes:

- Hashrate: 40 kH/s
- Power consumption: 45 Watt

On average we have Hashrate from 10 kH/s to 60 kH/s for CPU.

Below you can find the list of the best GPU's for Ethereum mining:

- AMD RX 470/570
  Power Draw: 80W-200W
  Hashrate: 20-30 Mh/s
  VRAM 4 and 8GB
- AMD RX 480/580
  Power Draw: 100W-250W
  Hashrate: 20-30 Mh/s
  VRAM: 4 and 8GB GDDR5
- AMD Radeon RX Vega series
  Power Draw: 150W – 250W
  Hashrate: 30 – 45 Mh/s
  VRAM: 8 GB HBM2

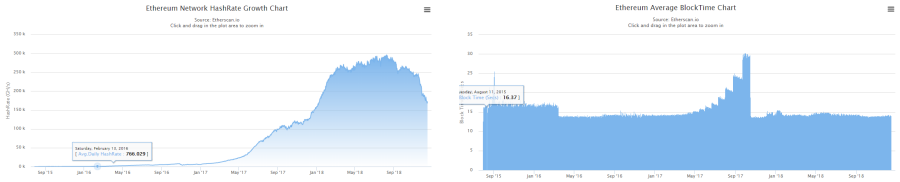
While we posses **Radeon HD 7870**:
Hashrate: 10 Mh/s
Power consumption: 175 W/h
It is clear that mining on GPU is more preferable then on CPU, because we have $\sim$ 1000 times better HashRate.
We have

- 1 **ETH** = 85 **USD** (retrieved on 16.12.18)
- NH: Network Hashrate 172 TH/s
- T: Time between BLocks 15 s
- BR: Block reward **3 ETH**
- HR: Hashrate
- Algorithm Dagger-Hashimoto
- PP: Power price 0.1 **USD per KWh**
- PC: Power consumption

And for estimation we will use the following formula: For the best hardware ($HR = 40MH/s$, $PC = 175W$)

$$USD/s = \frac{HR \cdot BR}{NH \cdot T} - PP \cdot PC = -0.0031\mathbf{USD/s}$$

So for our GPU and CPU mining seems to be not profitable. In general we have big power consumption, which leads to negative profit, so mining Ethereum in Russia isn't good idea, but if you get special electricity tariff, you can earn no bad money.



a) b)

Figure 1: a) Network Hashrate, b) Time between Blocks

2.3 ASIC

In the April 2018 Bitmain create ACIS for mining Ethereum. It has next properties:

- Hashrate 180 MH/s
- Power Consumption 800 W

Figure 2: ASIC

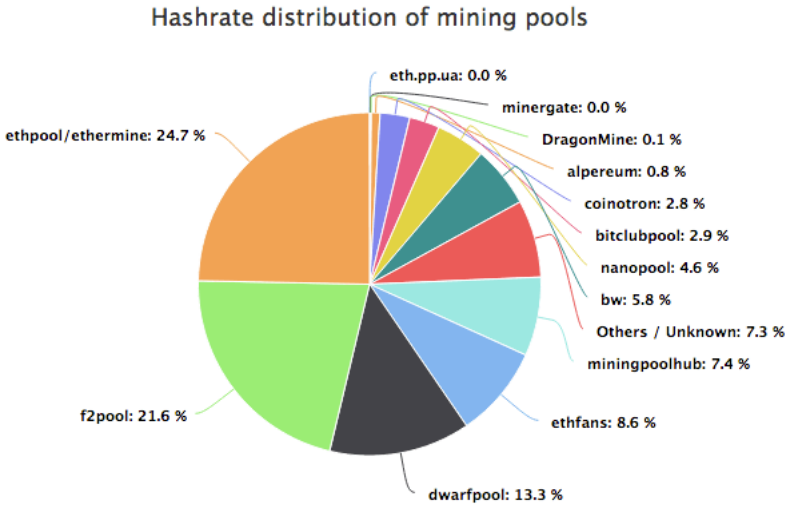
So in this case, using Previous formula, we have:

$$USD/s = \frac{HR \cdot BR}{NH \cdot T} - PP \cdot PC = -0.01\textbf{USD/h}$$

But if we reduce Power Price (for example twice as for 16 Dec 2018)
then for GPU we have 0.005 **USD/h**
and for ACIS we have 0.03 **USD/h**

2.4 Pool Mining

Pool mining is another possibility of mining, when you enter some mining pool and because there are a lot of people, you eventually get more frequent payments, than when you do it alone. However, you still need do have hardware and pre-installed software, in order to start mining. Below you can see distribution of hashrate between mining pools (retrieved from https://www.buybitcoinworldwide.com/).



2.5 Cloud Mining

Cloud Mining is the process of cryptocurrency mining utilizing a remote datacenter with shared processing power. This type of cloud mining enables users to mine Etherium or alternative cryptocurrencies without managing the hardware.

There are a lot of Cloud Mining Services **IQMining**, **HashFlare** and others. But you have to choose the most reliable.

In this report we will consider IQMining.

There are a lot of advantages for cloud mining:

- You do not need to buy Hardware

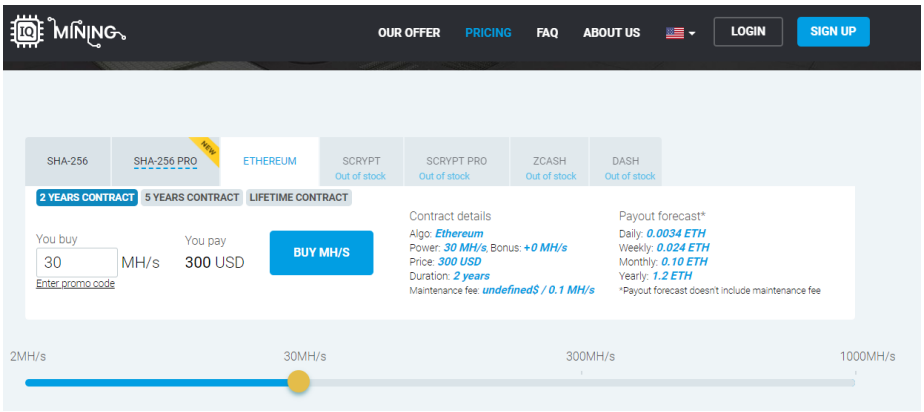


Figure 3: IQMining

- You do not need to pay for electricity and Internet
- You can invest not little money.

But there is undefined maintenance fee, which can grow. And real payout can be less then 1.2 **ETH** per year.

If we have 300 **USD**. Then we get approximately 1.2 **ETH** or 102 **USD** (1 **ETH** = 85 **USD**) And you will return your 300 **USD** during 3 years

3 Comparison analysis

3.1 Mining profit

We compared mining on different GPUs and other specialized instances. The upper plot demonstrates how much money in US dollars it is possible to earn by mining. It's clear that special devices like ASIC mine Ethereum better than ordinary GPU instances. Ethereum mining was very profitable one or two years ago, but now it's not that much profitable.

The second plot is the same as above, but profit is divided by device price. Specialized ASIC device is better than GPU instances again. It's interesting that cheap GPU's are more effective in mining than more expensive. ASIC line here is dashed because it appeared only in April 2018.

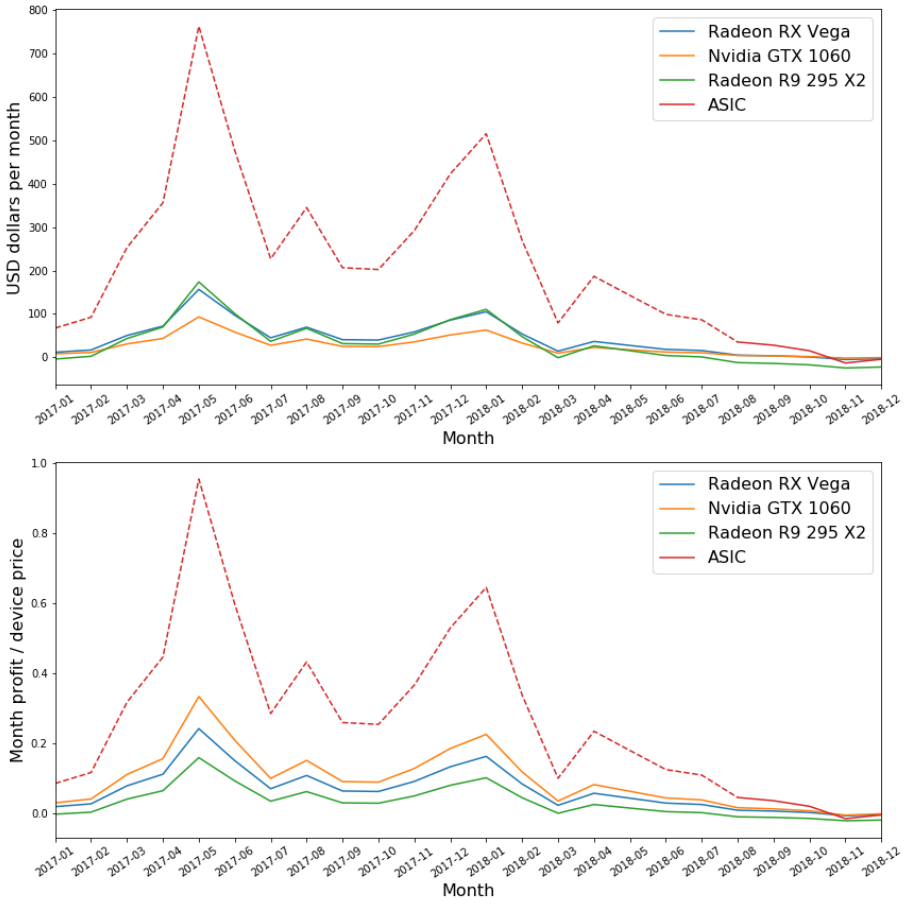


Figure 4: Mining profit for different instances

3.2 Payback

It is a cumulative cash flow curve starting in Jan 2017. Because of efficiency ASIC could pay back in only 3 months. Payback for other GPU instances varies from 6 month to never.

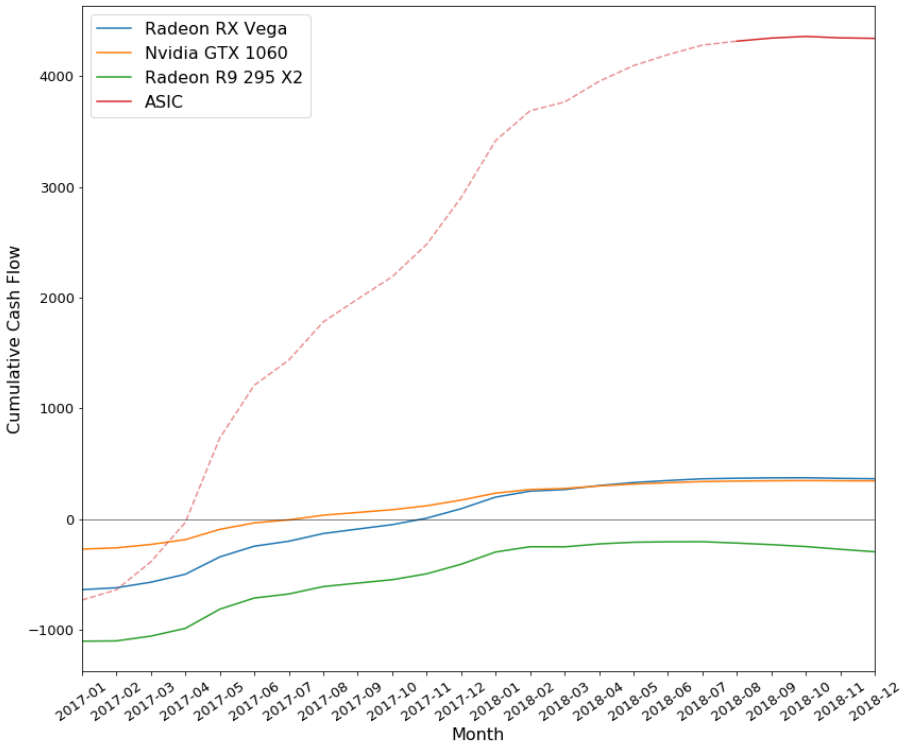


Figure 5: Cumulative cash flows for different instances

3.3 Location dependence

Efficiency of Etherium mining highly depends on electricity price, especially now, when there are a lot a miners. In Irkutsk electricity is almost six times cheaper, than in Moscow, so mining there is much more reasonable.

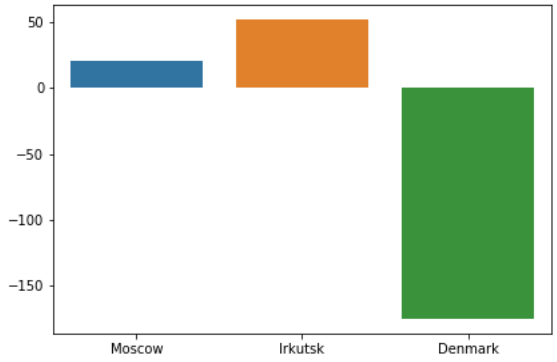


Figure 6: Profit wrt location if mining by ASIC.

4 Conclusion

According to our estimation ASIC performance and payback are the best for mining, while with current prices it is not reasonable to mine on other equipment at all. Monthly estimated profit of ASIC mining in Moscow is about 50$ per month. Electricity costs in Russia are relatively low, so it's reasonable to mine here, while the worst place to mine is Europe. Cloud mining can also be a possibility, if you don't have hardware, but one needs to be aware of cheating.

But if you just want Ether then it's usually a better idea to just buy it.

5 Code

https://github.com/Ciroel/EtheriumMiningAnalysis