

Interview with a Bitcoin Miner

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With Bitcoin reaching close to US\$20,000 in 2017, many people are wondering what it takes to be a Bitcoin miner – the name given to participants in the Bitcoin network who verify transactions, maintain the blockchain ledger, and are rewarded randomly with new Bitcoin through the proof-of-work algorithm. To find out more, I attended a cryptocurrency MeetUp in Victoria, BC, where I spent a fascinating evening among Bitcoin enthusiasts. Among them, I met a genuine Bitcoin miner who explained how he got into mining. This individual – who prefers to remain (pseudo)anonymous of course – talked about his mining career and the advances in technology over a four year period from 2011 to 2015. By that point, he got out of the game before his monthly electricity bill surpassed the value of Bitcoins he was receiving. While mining may have become a big business run by pools of individuals or even corporations, learning about mining provides insights into the mindset and resources of this intriguing digital money.

King: When did you first get interested in mining Bitcoin (“BTC”)?

Miner: I first learned about Bitcoin while listening to a CBC radio story at work in July of 2011. I went home to research this new idea and stumbled across a *webminer* – basically a website that ran mining software on your computer. That site was going nowhere fast. In the meantime I downloaded the only *Bitcoin wallet* available at the time called Bitcoin, which is now called Bitcoin Core.¹ This wallet included mining capabilities, which I explored, and I started solo mining using the Core client.

After a few more weeks of research, I realized that the competition was already too fierce for solo mining and that *pool mining* was the only way forward. Pools were less than a year old at the time and I tried a few of them, but eventually settled on Slush, the world’s first Bitcoin mining pool founded in December 2010 by Marek Palatinus.² In this pool you needed to download the mining software, which I found through online searches of different Bitcoin forums. The pool mining software used my computer’s

¹ See: <https://bitcoin.org/en/wallets/desktop/windows/bitcoincore/>, accessed December 20, 2017.

² The Slush mining pool reportedly reached 10,000 MH/s within a month of starting operations, representing 8% of the entire Bitcoin network hash rate by January 8, 2011. See: <https://slushpool.com/home/>, accessed December 20, 2017.

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processing power and gave me around 35 million hashes per second (MH/s). As my share of the pool I started earning around one BTC every three to four days, or USD 5 to 15.

King: I read on Wikipedia that miners provide a record-keeping service where they collect, verify and append a new block of transactions to the Blockchain ledger.³ Each block contains a *cryptographic hash* of the previous block, which links (or connects) the new block to the previous one.⁴ In order for a new block to be accepted by the rest of the network, the new block must contain a *proof-of-work*. A miner must find a number, called a *nonce*, such that when the block is hashed along with the nonce, the result is numerically smaller than the Bitcoin network's difficulty target. If a block is accepted, the miner receives new Bitcoins as their reward. So the profitability of Bitcoin mining is linked to the hash rate, where a higher hash rate is associated with more profitability.

Miner: After a few more months of jumping between pools and lots of reading, I learned about a new software that used *graphics processing unit (GPU)* power instead of the soon-to-be depreciating *central processing unit (CPU)* power.⁵ With this new software and my existing video card, I was able to achieve 110 MH/s. Whoo hoo! But after a lot more research over a few weeks I realized Nvidia's GPU graphics card was not very good for Bitcoin mining. So I bought AMD's GPU graphics card, which brought me up to around 400 MH/s. At this point I was earning around 2 to 3 bitcoins per week, which at the time were worth between USD 3 to 7 dollars each. Small potatoes, I know. And my electricity bill had increased from CAD 30 to CAD 65 per month.⁶ I was a small miner and there were "farms" popping up all over the world with GPU rigs filling their rooms.

King: So even though you were part of a large Bitcoin mining pool and had a computer running 24/7 with a GPU graphics card capable of a high hash rate, you were not being rewarded for your effort. Instead entrepreneurs and investors were setting up industrial-scale mining operations with hundreds of custom-build rooms of GPU computers, designed exclusively for Bitcoin mining, located in places like China, Russia and Iceland.⁷ How did you compete?

Miner: I kept investing in new hardware. The next jump in mining efficiency in late 2011 was the *field-programmable gate array (FPGA)* processor, which delivered a ten fold increase in hash power per watt of electricity. It attached to your computer using a USB connection. I never bought one of those machines, however, because at the time there were rumors of *application-specific integrated circuit (ASIC)* machines developed exclusively to mine Bitcoin that delivered a thousand-fold increase in efficiency.⁸

³ See: <https://en.wikipedia.org/wiki/Bitcoin> , accessed December 20, 2017.

⁴ To learn more about cryptographic hashing, see: <https://www.coindesk.com/bitcoin-hash-functions-explained/>, accessed December 20, 2017.

⁵ See: Nvidia Corporation <http://www.nvidia.com/> and AMD <http://www.amd.com/> , accessed December 20, 2017.

⁶ All currencies are in Canadian dollars unless specified otherwise.

⁷ The first GPU hash farm was set up July 18, 2010 and at its peak purportedly represented 25% of the entire Bitcoin network hash rate for several months. Tim Swanson, 2014, "Learning from Bitcoin's past to improve its future", April 27, available at: <http://www.ofnumbers.com/wp-content/uploads/2014/04/Learning-from-Bitcoins-past.pdf>, downloaded December 14, 2017.

⁸ ASIC chips are Bitcoin mining hardware created solely to solve Bitcoin blocks. ASIC machines mine at unprecedented speeds while consuming much less power than FPGA or GPU mining rigs. See: <https://www.bitcoinmining.com/bitcoin-mining-hardware/> , accessed December 20, 2017.

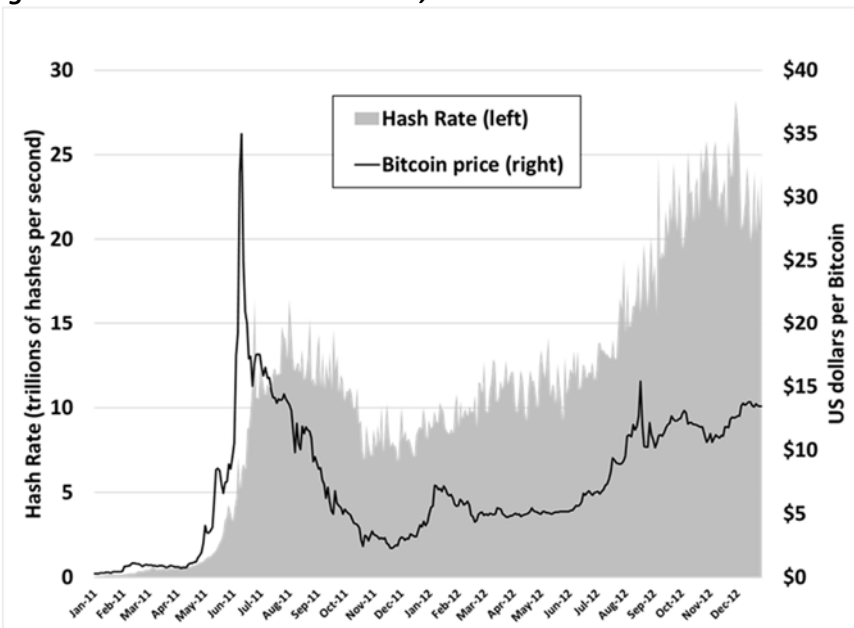
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Now during these early times, there were a lot of scams designed to dupe people out of their Bitcoins. These scams offered fake mining hardware, coin stealing Bitcoin wallets and Bitcoin exchanges. Many people got scammed outright, but I was lucky enough not to be one of them. I was subject to late deliveries on equipment and under-performing hardware, which cost me precious return on my investment.

Also during 2012 the founder of Slush, Marek Palatinus, was developing a software protocol called Stratum. Stratum would replace the normal protocol for coordinating hashing requests by pool miners, known as *Getwork*. Stratum would allow for the much greater bandwidth needed for the pool miners to compete with the much faster rumored ASIC chips.

King: It sounds like the Bitcoin community was constantly innovating to design new technology to increase hash power while reducing energy consumption. With the advent of pool mining and the development of specialized ASIC computers, the total Bitcoin hash rate exploded, making it harder and harder to earn the Bitcoin reward (Figure 1). So what did you do next?

Figure 1: Bitcoin Price vs. Hash Rate, 2009 to 2012



Source: <https://blockchain.info/>, as of December 14, 2017.

Miner: At the start of 2012, I was receiving 1 BTC every two days using GPU power. But by the summer it was down to 1 BTC every four to five days. So I looked into buying an ASIC machine. There were a lot of scams with people getting misled by hardware manufacturers. I found around 20 companies online, but most of them had no operating history. I finally pre-ordered an ASIC-machine from Butterfly Labs (“BFL”) – they were the only ones who had a stellar track record of producing high-quality FPGA-mining machines.⁹ Luckily I waited until they accepted a credit card for payment. For the previous few months,

⁹ Butterfly Labs was shut down by the U.S. Federal Trade Commission in September 2014 for failing to deliver computers or delivering them so late as to be useless. Customers were required to pay from US\$149 to US\$29,899 upfront, based on the computers’ purported computing power. As of September 2013, more than 20,000 consumers had not received the computers they had purchased. Butterfly Labs was fined more than US\$38 million and subsequently filed for bankruptcy. See: <https://www.ftc.gov/news-events/press-releases/2016/02/operators-bitcoin-mining-operation-butterfly-labs-agree-settle>, accessed December 20, 2017.

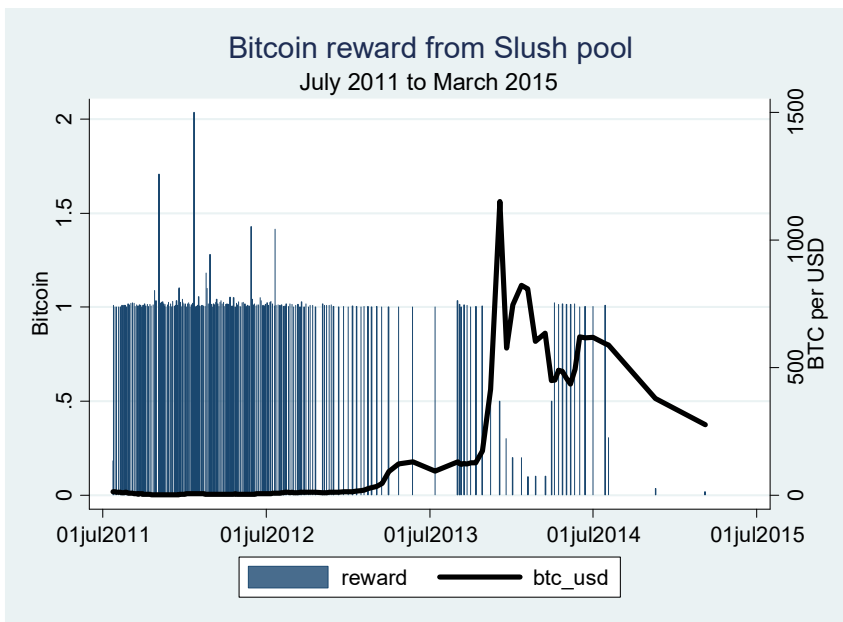
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BFL had only accepted bitcoin for pre-orders. Those people lost thousands of dollars in potential gains on their BTC while they waited for delivery of their ASIC machine. In my case, BFL ended up being a little over a year past their original promised delivery date.

BFL’s main competitor, Avalon, was the first to deliver ASIC computers in December 2012, at least ten months ahead of BFL.¹⁰ Unfortunately I didn't go with Avalon because they were new and had no track record. I thought they were among the many scams. Due to their tremendous hash power, Avalon buyers had a return on investment in the first three days after delivery. They earned massive profits in the months before the other hardware manufacturers could deliver their first ASIC machines. My GPU power was too slow, and I was only earning 1 BTC every 10 days. At a price of USD 13 to 20 per BTC, I was covering my extra hydro bill of CAD 35 per month. By the summer of 2013, I was down to 1 BTC every 50 days, even with my computer running 24/7. At that point, BTC had risen to USD 130, but the price was volatile.

I eventually received my BFL machine in September of 2013. It gave me 30 billion hashes per second (GH/s), or 750 times more than my 400 MH/s GPU.¹¹ Even though it arrived very late, I made back my investment in two weeks as Bitcoins had risen faster in value than the fiat currency I used to buy my machine. I was back to earning 1 BTC every 4 to 5 days, and the price per coin was USD 125 (Figure 2). I had pretty good profits again, as my GPU portion of the worldwide mining power was diminishing quickly with the rise of ASIC power. So now I'm into ASIC mining but I am still earning small potatoes as mining farms were growing much larger in physical size as well as using the latest hardware.

Figure 2: Bitcoin reward received by Miner from Slush pool vs. price, 2011 to 2015



¹⁰ The Avalon ASIC microprocessor chip was created by Canaan Creative, a privately-held computer hardware manufacturer founded in Beijing, China in 2013. See: <https://canaan.io/index.php> , accessed December 20, 2017.

¹¹ To make sense of this number, it is important to compare the hash rate on a computer to the current difficulty factor for solving a block. The Bitcoin mining calculator posted at <https://alloscomp.com/bitcoin/calculator> estimates how long it takes to mine BTC at a given hash rate given the current difficulty factor. As of December 14, 2017, a 30 GH/s hash rate would generate approximately \$2.50 worth of Bitcoin per month with BTC valued at US\$17,000 (or 0.00014433 BTC). This result is based on a difficulty factor of 1,590,896,927,260.

King: How frustrating! You waited for over a year and watched Bitcoin rise in value and the hash power on the Bitcoin network increase rapidly as the new Avalon ASIC computers came online. Due to the increased hash power on the network, the Bitcoin algorithm increased in difficulty to maintain a constant supply of new BTC to the network of miners. So despite your investment, you were no further ahead.

Miner: It's all about efficiency. Now come the ASIC wars. Hardware manufacturers were popping up all over promising better efficiency, more than half of which were outright scams, a quarter tried and failed before production, and the other quarter were legitimate. The next model I chose, after reading for weeks through forums for who was legitimate and who wasn't, was Cointerra.¹² Cointerra was a promising young company located in the USA. I figured I would be safer because of heavier regulations than other countries. I paid 6.8 BTC (around CAD 8,000) for the new machine in December 2013. While I waited for it, my share of the Slush pool was down to only 1 BTC every two to three weeks. Each coin was worth USD 600 to USD 800.

Cointerra ended up delivering 3 months late at the end of March 2014 and underperforming greatly. Its specifications were 2 TH/s @ 1200 Watts, but I ended up receiving 1.6 TH/s @ 2400 Watts. This performance was actually the best their machines could do and earlier pre-order customers got less. I was able to mine faster, and was receiving 1 BTC every week or so. But I was paying CAD 600 per month for electricity. This machine could not have been worse for my small apartment. Not only was it almost as loud as a jet engine – I think around 85 decibels – but it had two power supplies needing a minimum 15 AMP breaker each.¹³ As if the noise wasn't bad enough, this machine generated so much heat that it needed to be mounted in an open window (or outside protected from the elements), otherwise it would cook us out, even in winter. I eventually found a guy who would host my Cointerra in his garage.

My next machine was the Israeli- manufactured Spondoolies, running at 1.4 TH/s and only 1200 Watts.¹⁴ I paid 4.42 BTC in June 2014, which was worth USD 2,900. The Spondoolies was much more efficient than my Cointerra, which was becoming less profitable every week with ever increasing difficulty adjustments. This machine wasn't quite as loud – around 45 decibels – but was much higher pitch and made it just as annoying in my small apartment.¹⁵ I moved it over to the rented garage with the Cointerra. I was back to earning around 1 BTC per week, or USD 600, and I was paying CAD 300 per month for electricity.

In early 2014 the Chinese ASIC manufacturer Bitmain, who became the bane of Bitcoin, had come out with the most efficient mining computer – the “AntMiner S3” (Figure 3). It generated around 440 GH/s and used around 330 Watts per machine. Bitmain had a track record of no pre-orders and on-time deliveries and – as the saying goes – “under promised and over delivered”.¹⁶ These machines were the

¹² On January 24, 2015, Cointerra filed for bankruptcy with the intent of liquidating the company. Cointerra failed to pay a long list of creditors with debt owing of more than \$10 million. See: <https://www.coindesk.com/bitcoin-mining-firm-cointerra-files-chapter-7-bankruptcy/>, accessed December 20, 2017.

¹³ To provide some perspective, 85 decibels is about the sound of a garbage disposal, a food blender, or a freight train at 15 meters. There is a possibility of hearing damage after 8 hours of exposure.

¹⁴ In a surprise move, Spondoolies Technologies ceased operations as of May 2016 shortly after receiving a capital investment. See: <https://www.cryptocoinsnews.com/bitcoin-mining-developer-spondoolies-shuts/>, accessed December 20, 2017.

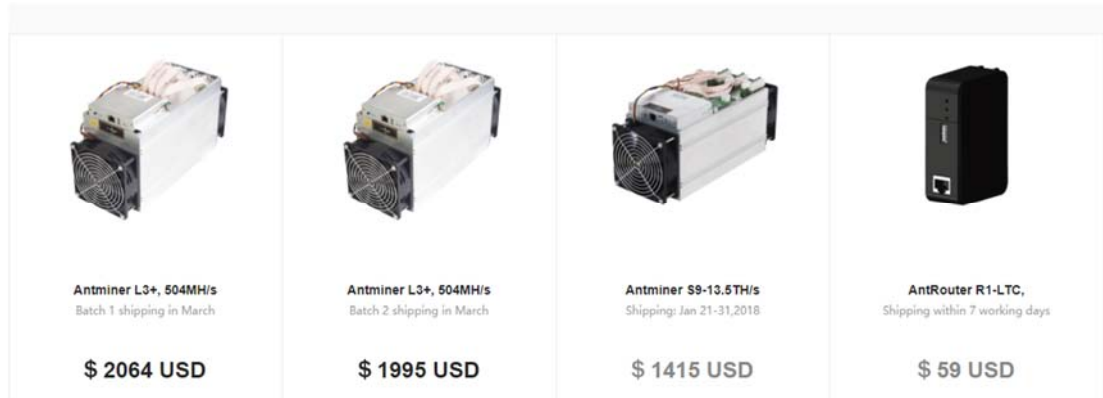
¹⁵ An example of 45 decibels is the sound of a bird call or a conversation at home.

¹⁶ See: <https://www.bitmain.com/>, accessed December 20, 2017.

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most powerful and efficient miners available. How could I go wrong? On July 1, 2014 I bought 5 AntMiner S3s with 3.73 BTC worth USD 2,300. The five machines netted me 2.25TH/s with 1600 Watts. They were small and compact, and hardly made any noise. So I was running the AntMiners at my place and the Spondoolies at the garage and made back my investment, including electricity bills, in under 2 months. I stopped running the Cointerra because it cost more to run than the Bitcoin it generated.

Figure 3: Bitmain’s AntMiner Series as of December 2017



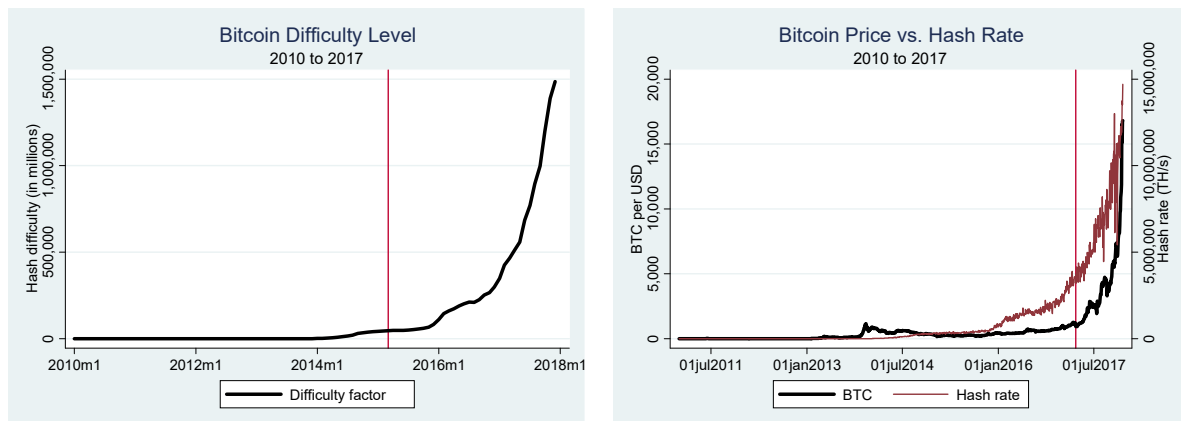
Source: <https://shop.bitmain.com/main.htm?lang=en>

These AntMiner machines were only good for 5 or 6 months more until the Bitcoin difficulty level was so large and my percentage of the block so small, that the Bitcoin I was earning was getting really close to the cost of my electricity bill (Figure 4). From November 14 to March 2015, my monthly share of BTC was about the same as my electricity bill. At this point, I might as well just buy Bitcoin from an exchange rather than pay my electricity provider more money to mine it. Now I asked myself, “Do I keep chasing my tail and buy the more efficient miner every 3 months with ever diminishing return on investment?” No, I figured it out early and quit while I was ahead, also with a pile of obsolete mining hardware.

That’s it. I hope you enjoyed hearing about my ride as much as I enjoyed riding it.

King: It was a fascinating story and a piece of history that will no doubt go down in history as the 21st century equivalent to the 19th century gold rush. Thank you for sharing it and good luck with your Bitcoin.

Figure 4: Bitcoin difficulty, price and hash rate, 2010 to 2017



Source: <https://blockchain.info/>, as of December 14, 2017. The vertical line is March 2015, when this miner stopped mining.