



Cryptomining 101: How to make the most of the cryptocurrency opportunity

4D Data Centres
Cryptocurrency Mining White Paper

October 2017



Introduction

With recent estimates putting annual revenues from bitcoin mining at over \$3 billion, getting involved in cryptocurrency mining is a lucrative opportunity for those willing to do the research and invest in the right hardware.

Miners at every scale can see profitable returns from mining cryptocurrencies – such as Bitcoin, Ethereum, and Ripple – but, much like the stock market, success relies on knowing where and how to focus your efforts.

Even at the smallest scale, miners can see return on investment within 3-6 months, depending on the type of cryptocurrency they opt to mine, the hardware they invest in and how they choose to manage it.

In this paper, we'll explore the basics of cryptocurrency, and explain the role of miners in supporting the blockchain. In the subsequent sections, we'll give you a simple rundown on what you need to get started with cryptocurrency mining, and how putting your hardware in a data centre (colocation) can help you see better returns on your mining investment.



The basics of cryptocurrency

Bitcoin was introduced in 2008 as a concept for the world's first decentralised digital currency – a peer-to-peer payment system that operates without intermediaries or a central repository. Since the first transaction in 2009, bitcoin has remained the most popular cryptocurrency in the market, though there are now over 1,000 different types of cryptocurrency. The still anonymous, creator or possibly even creators of bitcoin, who go by the name of Satoshi Nakamoto, imposed a limit on the number of bitcoins that can be in circulation, with the maximum cap set at 21 million.

Not all cryptocurrencies have a hard limit, with some creators imposing a fixed rate of new coin creation, instead. Peercoin, for example, has a built-in inflation rate of 1%.

Each cryptocurrency transaction is recorded in the blockchain, a public distributed ledger of records – called 'blocks' – that are verified by a peer-to-peer network. Every block contains a batch of transactions, each of which has a timestamp, and an identifying 'hash' which belongs to the previous block in the chain. Once the block is verified, it cannot be changed without the entire chain being modified – which is what makes cryptocurrency transactions so secure.

This is where cryptocurrency miners come in.

Mining cryptocurrencies

The blockchain needs miners to function – each miner validates transactions and generates compliant hashes, which are then added to the block, in return for a small amount of the cryptocurrency. They are essentially taking the role of record-keepers, maintaining the blockchain and ensuring that it is secured.

For each block in the chain to be validated, the block must contain a 'proof-of-work', created by generating a specific hash value. These are cryptographic identifiers called Secure Hash Algorithms, or SHAs. Verifying a bitcoin transaction, for example, uses a SHA-256.

There is no way to predict the value of the hash – which means cryptocurrency mining relies entirely on trial and error. Miners use their computing power to find these values, with the mining software making billions of guesses, aimed at solving the algorithm before anyone else. Once the block is created and verified – typically taking around 10 minutes per block – the miner is rewarded with a specific amount of the cryptocurrency they're supporting.

As mining – particularly of bitcoin – gained popularity, many private miners have found it increasingly difficult to see returns from their efforts. To improve the odds of making money, miners are organised into pools, who combine their resources to solve the algorithms faster – and share the rewards. Rather than receiving the full reward from solving a block on their own, each miner in a pool receives a share of the payment, usually weighted proportionally based on how much they contributed. This is an ideal avenue for a new miner looking to make consistent returns from mining without making huge investments in computing power.



The challenges of mining

Mining requires a significant amount of processing power – and that amount is increasing all the time. This is partly due to competition; with more miners attempting to solve the same algorithms, it becomes more difficult to be the first to find the right value. However, the biggest challenge is the blockchain itself.

The code that runs the blockchain is self-regulating. In order to keep the time needed to solve each algorithm at an average of ten minutes, the code adds or removes a layer of complexity to the hash requirements after every 2016 blocks, (about every 2 weeks). In bitcoin mining, if the rate of solving has increased, and the last 2016 blocks were solved in less than the target time, the hash requirements are automatically updated to include another zero, making the values more difficult to find. The difficulty of mining bitcoin is currently increasing at roughly 0.8% every 14 days.

The benefits of mining

Cryptocurrency mining rewards the early adopters. The most profitable avenue for someone starting out in mining is finding the ‘next big thing’ in the market. That means identifying which of the newer currencies is likely to have longevity and deliver high returns, and getting in on the ground floor. As the new currency gains popularity, it will gain value, and will become harder to mine. Those who act first, benefit most.

That doesn’t mean that established cryptocurrencies don’t hold opportunities. For example, bitcoin miners currently receive 12.5 bitcoins for each block, as well as any transaction fees paid by those exchanging in bitcoins, with some senders paying higher fees to ensure faster confirmation. Due to the cap on the amount of bitcoin allowed, the reward (generation rate) has recently halved, from 25 bitcoins, and will likely halve again in 2020. However, with the worth of a single bitcoin reaching over \$4,400 in 2017, bitcoin is still a lucrative market for those with the computing power to mine it.



What miners need

When you're starting out with mining, the key is research. You need to choose the cryptocurrency you want to mine, and find the right tech to support it. That means selecting the best hardware for the job, then choosing a 'wallet', which will store your transaction information, and the software client that will allow you to manage the mining process.

Hardware

As cryptocurrency mining becomes more competitive, the hardware is increasingly important. Early bitcoin miners were able to use spare processing power from their PC's CPU. As the demand for processing power increased, the amount of bitcoin mined was dramatically outweighed by the cost of powering the CPU.

Miners then moved to using graphics processors (GPUs) and field-programmable gate arrays (FPGAs), which can be configured to perform mining-specific tasks.

Recent years have seen a shift to application-specific integrated circuits (ASICs), which are customised specifically for a certain type of cryptocurrency mining. Due to their superior ratio of efficiency to energy, and their design optimisation resulting in huge speeds, ASICs are more profitable than GPUs and FPGAs. However, ASICs are only programmed to solve one kind of calculation, and therefore can only be used for mining blockchains that use that algorithm. Those designed to solve SHA-256 can be used to mine bitcoin or Peercoin, but not a cryptocurrency such as Litecoin, which is based on an algorithm called Scrypt.

Power

The hardware used for mining has a small physical footprint, which means miners can pack a lot of power into a single rack of units. However, GPUs and ASICs consume vast amounts of power, and while efficiency is increasing with new chip iterations, the overall power consumption isn't decreasing. That means the power density required for this hardware can be extremely high, especially when you factor in the additional power cost of keeping the hardware cool.

Take bitcoin mining, for example. As of 2017, the bitcoin network is estimated to be using 16TWh of electricity per year to mine, accounting for 0.08% of the world's energy consumption. To put this in perspective, this is the same as powering 1.4 million average households – or the entirety of Tunisia. The energy cost of a single transaction could power five households for a day, significantly more than other cashless transactions, such as Visa.

Large-scale mining operations are often set up in areas with lower electricity prices, to drive down costs, but for hobbyists or those looking to explore cryptocurrency mining on a smaller scale, the high costs of powering and cooling the hardware can potentially be prohibitive.

Whilst mining at home was feasible a couple of years ago, hobbyists are finding they are now limited by the service fuse on their home. On a modern property, this is typically rated at 60Amp (13.8kW). Modern ASICs draw around the same amount of power and generate almost the same amount of heat as a standard electric heater, around 6.5Amps (1.5kW). Installing nine of these in a house will not only leave very little power for anything else but will also make the property prohibitively hot.



Network

While mining is not a high-volume activity, a stable and reliable network connection is vital. Not only does it ensure consistent access to the cryptocurrency network, and the blockchain itself, it's also important for those who are combining their resources into a mining pool, to ensure the miner is rewarded for the processing power they are adding.

A low-latency network connection means the miner or mining pool has the best possible chance to be the first to solve the block – and therefore successfully mine the cryptocurrency.

As significant players in the mining community have been targets of distributed denial of service (DDoS) attacks in the past, miners should have a secure network with protective measures in place, to keep downtime to a minimum.

Security

Network security is paramount, but physical security is equally important – especially as many miners are making a significant investment in their mining hardware.

Without a secure site for keeping their hardware safe, miners run the risk of theft, particularly those who keep their hardware at their home, in a garage, or even a lockup.



Colocating your mining operation

For those who are just beginning to explore the potential of cryptocurrency, putting your hardware in a data centre (colocation) is the ideal solution for taking the complexity out of building new mining operations.

By installing your hardware at a professionally managed data centre, you can outsource the management of the power, bandwidth and security – so you can just focus on getting returns from mining. It's a hands-off approach to the physical complexities of managing a mining operation, letting you focus on making the right decisions about what and how you want to mine.

Many of the key challenges facing new miners can be mitigated by using a data centre to host GPUs, FPGAs or ASICs:

- **Power:** The power requirements for cryptocurrency mining are already high – and constantly growing. Data centres are designed specifically to handle these massive energy requirements in the most efficient way possible, with failsafes such as batteries and generators in place to avoid downtime from power outages.

- **Network:** Data centre networks are secure, fast and reliable. Rather than relying on a basic private network connection, miners can take advantage of enterprise-class internet with significantly higher uptimes, round-the-clock support from engineers, and built-in protection from DDoS attacks and other security risks.

Low latency means you have a better chance of solving the algorithm first – keeping the profitability of your mining operation high.

- **Security:** Data centres are equipped with myriad security measures, to ensure the physical safety of miners' hardware and data. From CCTV and guards to physical and biometric security, miners can ensure their investment is protected.



About 4D Data Centres

4D Data Centres is a Tier-3 provider of colocation services, based in the UK. With colocation sites based in Gatwick, Surrey and Kent, we've offered high-quality, secure and supported rackspace facilities for over 10 years.

Interested in learning more about colocating your cryptocurrency mining hardware? Visit our [cryptomining page](#) and discover how we could help you find a simpler, more cost-effective way to make the most of the age of cryptocurrency.