The Evolution of Bitcoin Hardware

Mining equipment is critical to the bitcoin network's success because it determines whether it is profitable for miners to do what they do, which is process the calculations required to embed blocks of transactions on the blockchain.

The computers that keep the Bitcoin network running have advanced rapidly in technology over the last decade. Its deployment, which began in January 2009, has grown at an exponential rate. There are approximately 16.5 million Bitcoins (BTCs) in circulation as of July 2017;

Bitcoin's popularity is the product of a series of technical breakthroughs spanning algorithms, distributed applications, and hardware. Hardware that retains the credibility of the Bitcoin system, which has progressed from CPUs to GPUs to FPGAs to application-specific integrated circuits (ASICs). Bitcoin mining is an example of the new class of applications that are being developed on a global scale.

**Bitcoin mining**

Bitcoin mining is the brains behind the distributed consensus algorithm that ensures BTC transactions are consistent. The first bitcoin miners used standard multi-core CPUs to generate BTC at a rate of 50 per block in 2009. Mining 50 BTC will pay out over $434,000 per block. A miner can sell or trade BTCs on an exchange like Coinbase, Bitfinex, OKCoin, or BTCC after receiving them, or keep them for future appreciation.

**CPUs: first-generation miners**

The Bitcoin miner is surprisingly simple. The computing energy needed to generate new blocks and win mining rewards could be easily processed on CPU devices in bitcoin's early days due to the lack of miner competition.

**GPUs: second-generation miners**

Miners in October 2010, Bitcoin mining software for GPUs was released on the web, and it was rapidly optimized and adapted for use in several open source efforts.

Bitcoin mining is the brains behind the distributed consensus algorithm that ensures that BTC transactions are always consistent. The first bitcoin miners used standard multi-core CPUs to generate BTC at a rate of 50 per block in 2009. Mining 50 BTC will pay out more than $434,000 per block. A miner can sell or trade BTCs on an exchange like Coinbase, Bitfinex, OKCoin, or BTCC, or keep them for future appreciation. After optimizing per-GPU overhead, the next scaling challenge was meeting the prodigious power and cooling requirements of multiple GPUs grids.

These devices may also be reprogrammed to perform additional mathematical operations, such as those used to mine new bitcoin. The majority of active Bitcoin mining operations were moved to warehouse spaces with plenty of air flow for cooling and low industrial power costs.

**FPGAs: THRID-GENERATION**

The first open source FPGA Bitcoin miner implementations were released in June 2011. FPGAs have a natural affinity for manufacturing. FPGAs were up to five times more energy efficient than GPUs, and after a year or two, they broke even in terms of total cost of ownership (TCO). FPGA miners had a short reign since ASICs arrived shortly after, bringing cost and energy quality improvements by orders of magnitude.

**THE ASIC RACE: FOURTH GENERATION**

Avalon was able to raise funds from the ground up by selling units directly through an online store. With a target date of 10 January 2013, Avalon taped out slightly after ASICMiner. The Avalon mining system line has earned "several hundred million dollars," valuing the company at more than $1 billion.

**THE ASIC WAR: FIFTH GENERATION BITCOIN MINERS**

Three Chinese nationals formed ASICMiner in early July 2012, after BFL began taking preorders for their machines. One of the primary motivations was to keep BFL from being the sole Bitcoin. Better architectures and more sophisticated process nodes were two possible sources of creativity for subsequent generations.

**THE ASIC VICTORS: SIXTH GENERATION BITCOIN MINERS**

Bitcoin miners in the sixth generation are the product of companies that made it through the ASIC war and progressed to bleeding-edge nodes as they appeared (for example, 20 nm and 16 nm). BitFury (bitfury.com) and Bitmain, both of which use 16-nm chips, are the two most well-known competitors. In the market, combining ASIC production and datacenter operations has become commonplace.

**FUTURE**

Last year, Google announced the creation of neural-network ASICs for their datacenter workloads, continuing this trend. ASIC clouds have a bright future, thanks in part to the many pioneers who took financial, legal, and technological risks to speed Bitcoin creation and build an entirely new class of hardware. The competition for bitcoin mining rewards would drive technological advancement. However, it is unclear what the next significant advancement in mining technology would entail.