Foundry Digital: Web3 Breakdowns Research

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Primary Research Sources

- Website: Foundry
- Social: Twitter, LinkedIn
- Pomp Podcast Interview with Mike Colyer
- Bitcoin.TV Interview with Mike Colyer
- BTC.com Foundry USA Pool Stats
- Mike Colyer (CEO): Twitter, LinkedIn
- Kevin Zhang (VP of Business Development): Twitter
- Cambridge Centre for Alternative Finance

Summary

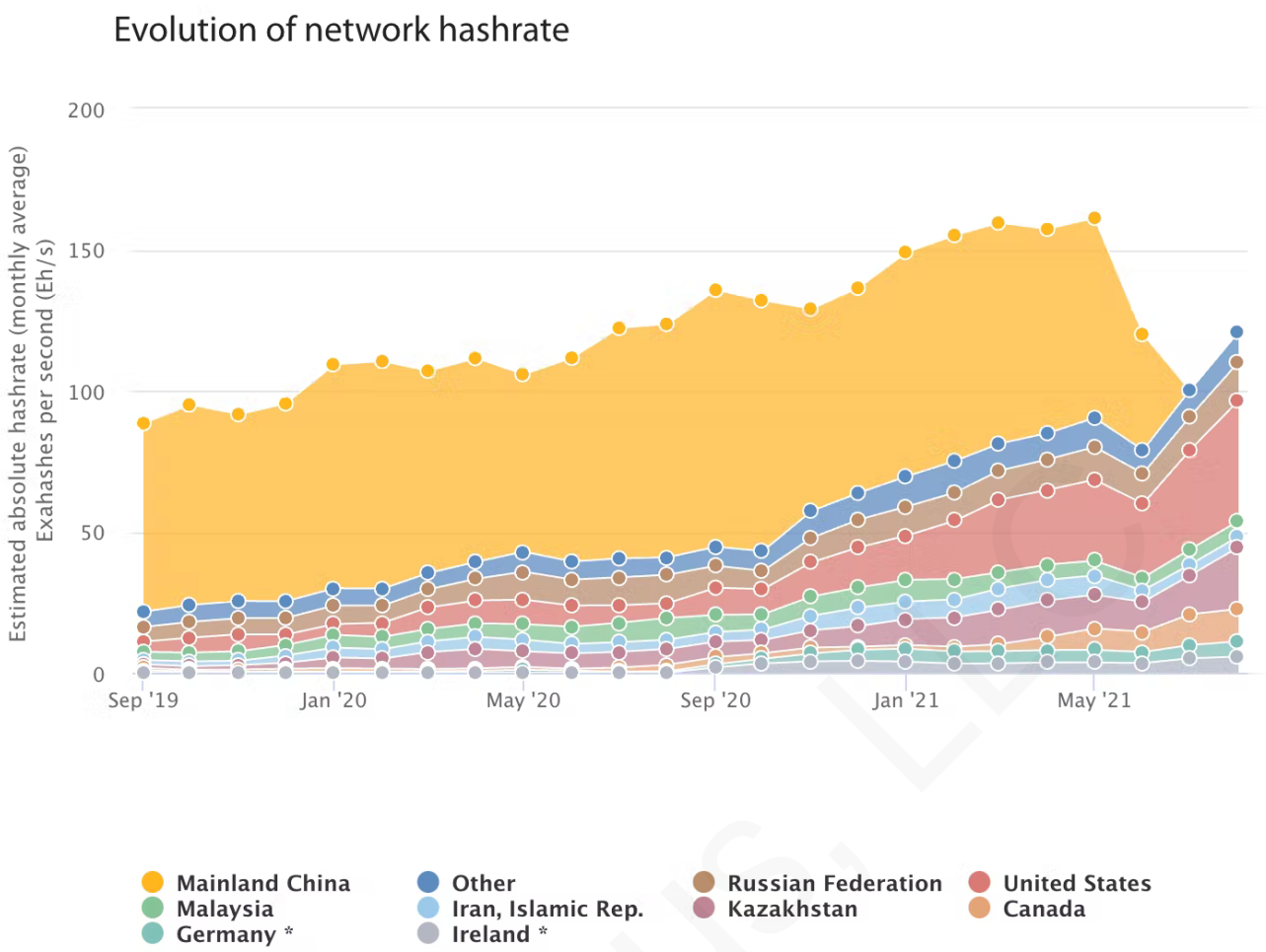
Foundry appears to be a true "ecosystem play" by DCG in the North American (and now global) bitcoin mining market. Foundry was originally conceived as an equipment financing business with its key value proposition providing financing to "cash-poor" North American miners. Due to market conditions, it became a miner itself and now runs one of the largest pools in NA and globally. By launching FoundryX, Foundry appears to be doubling down on its access to equipment as a competitive advantage. Its staking business is its foray in Proof-of-Stake cryptocurrencies in addition to its Proof-of-Work-centric business lines. Finally, as a part of DCG, Foundry has access to their prime brokerage, asset management, media and exchange services. Foundry's advantage up until this point appears to be driven by a strong balance sheet and access to equipment from the primary manufacturers - their position could ultimately be eroded if competitors with a similar financial profile enter the market, forcing down rates on equipment financing and staking.

Company History & Key People

- Foundry was founded in 2019 as a subsidiary of Digital Currency Group (DCG) and was publicly announced in August 2020 with a $100 million commitment from DCG.
- Mike Colyer, CEO of Foundry, spoke on BitcoinTV and gave the context for his career and the founding of Foundry:
  - In 2017 Mike got into mining and joined Core Scientific, one of the largest cryptocurrency hosting companies, shortly thereafter.
  - Barry Silbert, CEO of DCG, called Mike in 2019 and said DCG wanted to get into mining. At the time it was opaque and "full of bad actors" but institutional money was coming to the space, and he challenged Mike to

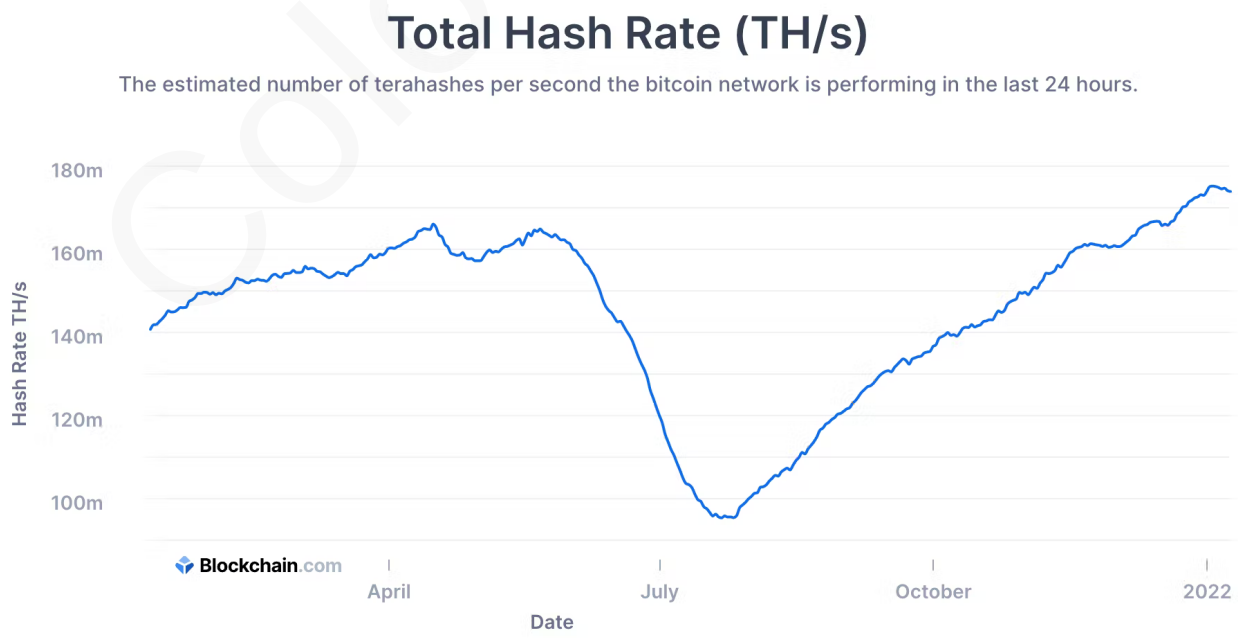
think about how DCG could play in the space.

  - Mike noted that in late 2019, early 2020, “all the miners are cash poor. They’ve built out this capacity but they don’t have any money to buy the machines.” Specifically, manufacturers wanted to be paid in cash, so Foundry saw an opportunity to provide cash to miners to purchase machines and “move to the front of the line”.
  - In February/March of 2020, Foundry started placing “huge orders” for equipment since they had the balance sheet to do so and then “got lucky” as the chip shortage caused an even bigger scarcity issue in the market. This gave them an advantage in controlling access to an even larger portion of the supply of ASICs.
  - Foundry did not originally plan on mining themselves but had purchased machines, and since mining economics “were not very good” and their “financing was too expensive,” they started their own mining operations in 22 locations across North America.
  - They were well-positioned subsequently when mining economics improved as the price of BTC rose. Miners wanted the inventory of ASICs that Foundry had built up and Foundry’s financing business took off.
  - Mike stated that the “[mining] pool business is actually not a very good business at all” and that Foundry “lost millions of dollars getting the pool to this point,” but believes it is important for the ecosystem that there be a trusted and transparent pool for North American miners.
- Foundry then partnered with Core Scientific (Mike’s previous employer) and a series of North American mining operations over the next 2 years, providing equipment and equipment financing
- Since 2019, Foundry has become one of the largest operators in the bitcoin mining ecosystem due to its presence across all areas of the market: mining, pool operation, equipment financing and sales, and advisory services.
- The chart below highlights the evolution in hashrate from September 2019 to August 2021. Notably, in September 2019, China was 75% of the monthly hashrate. China’s dominance as a percentage of total hashrate started to slowly recede with growth in the U.S., Russia, and others. In June 2021, China represented 34% of hashrate, with the U.S. coming in 2nd place at 22%. In July, China’s percent of hashrate went to 0% following the banning of bitcoin mining, with the U.S., Kazakhstan, Russia, Canada, and others growing their share of hashrate, albeit with a 60% drop in absolute hashrate (measured in Exahashes per second, or Eh/s) from the peak in May 2021.



Source: Cambridge Bitcoin Electricity Consumption Index (CBECI)

- Despite the significant disruption in the overall hashrate associated with the ban in China, the mining ecosystem recovered relatively quickly, with the total hashrate surpassing previous highs by mid-December 2021. See below for additional detail:



Source: Blockchain.com

- Foundry now has multiple lines of business:

a. FoundryUSA Pool: Foundry's mining pool that "guarantee[s] stable payouts to miners" using Full Pay-Per-Share (FPPS). See below in Bitcoin Mining Pools Basics for additional detail on FPPS and other pool payout structures.
b. Equipment Financing and Procurement: Financing for bitcoin and other mining equipment and access to equipment manufacturers.
c. FoundryX: Marketplace for buying and selling cryptocurrency mining machines - "a trusted and reliable US-based secondary market to connect the right buyers and sellers, at the right price" (launched 12/2021).
d. Mining Advisory Service: supports data center operators, colocation customers, and investors to develop mining and staking operations.
e. Foundry Staking: provides digital asset staking and advisory services to institutions such as exchanges, wallets, custodians, hedge funds, banks, and venture capital firms (launched 11/2021).
f. Foundry Labs: Supports the mining and staking of new and existing blockchain infrastructures and projects.

- As a DCG subsidiary, Foundry's ecosystem includes:
  - Genesis: Offers digital asset OTC trading, institutional lending, custody and prime brokerage services.
  - Grayscale: World's largest digital currency asset manager. It sponsors fifteen investment products, including the Grayscale Bitcoin Trust (ticker: GBTC) and the Digital Large Cap Fund.
  - CoinDesk: Blockchain news, research, and data website.
  - Luno: Digital asset exchange and wallet provider.

C-level team bios:

- Mike Colyer (CEO)
  - Mike joined Foundry as its founding CEO in October 2019.
  - Previously, Mike led business development at Core Scientific, which, during his tenure, grew into North America's largest cryptocurrency hosting company. At the time, Core Scientific was growing quickly (had "built out 6 MWs in 6 weeks") and over the next year scaled to 100 MW.
  - Prior to Core Scientific, he was the President and COO of Savage IO, a Western NY-based 3MW mining company, where he continues to serve as a Board member. Mike grew it from 1 MW when he joined to 3 MW when he left to join Core Scientific.
  - He started "going down the rabbit hole" in Summer 2017 and leaned into mining given his engineering roots and inherent belief that the infrastructure had to be built out to let blockchain technology scale.
  - Before entering the mining space, Mike was a "hired gun" for private equity firms to help them fix their portfolio companies and is a graduate of the GE Leadership program with a background in Lean Manufacturing and Six Sigma.
- Josh Byun (CTO)
  - Josh is responsible for overseeing the infrastructure and software development of Foundry's mining and staking operations including systems administration, network operations, data and security.

Bitcoin Mining Pools Basics

Before we dive into Foundry's business model and competitive advantages, let's first wrap our heads around some bitcoin mining basics.

- What is bitcoin mining?
  - Bitcoin mining is an incredibly important part of the integrity of Bitcoin - it is the act of appending new blocks to the Bitcoin blockchain for financial reward ("block reward").
  - Some clarifying excerpts from Hash Power Ep. 1 (emphasis mine):

> ***"A problem in decentralized systems is trust and security...*** *The system was designed so that in order to verify transactions being sent out by all Bitcoin users, a special group of computers that we call*

> *miners would be forced to do a lot of time-consuming and costly computational work...*

> ***"The miners in Bitcoin's case provide security.*** *And the way they provide security is they do a lot of cryptographic computational work that is useful for nothing else, other than just locking down the current set of transactions in the system, and then sealing them such that they're incredibly difficult, basically impossible to go back and revoke."*

> *Because of this system, the global network agrees or reaches consensus, every 10 minutes or so in Bitcoin's case, on the state of the ledger...* ***This method for reaching consensus on the ledger, which is called proof of work, was Bitcoin's way of removing the need for a central authority."***

> *"One of my favorite analogies is very visual and comes from Reddit user jav_rddt.* ***Imagine that every transaction being sent out is like a puzzle piece. And that there are tons of these pieces. The role of the miner is to find a way to fit all these pieces together into a picture that fits into a certain pre-agreed upon shape... The time spent solving the puzzle is the work. The end picture gives us an easy way to verify proof of work."***

- For additional technical detail on the Bitcoin blockchain and the role of miners in it, please see the Cambridge Centre for Alternative Finance (CCAF) which has a robust FAQ here
- A key item to note from the CCAF is the evolution of Bitcoin mining equipment:

> *"In the very beginning, mining could be done with the central processing units (CPUs) of standard computers. In the following years, miners moved towards more computationally-performant – albeit still general-purpose – equipment such as graphics processing units (GPUs) and field-programmable gate arrays (FPGAs). However, the mining industry changed considerably when in 2013, the first generation of application-specific integrated circuits (ASICs) started to emerge. ASICs are purpose-built hardware optimized explicitly for proof-of-work algorithms, which makes them orders of magnitude more efficient for Bitcoin mining than general-purpose equipment."*

- What is a bitcoin mining pool?
  - Mining pools are groups of miners who share their computational resources and enhance hashing output.
  - Mining pools utilize these combined resources to strengthen the probability of finding a block or otherwise successfully mining for cryptocurrency.
  - If the mining pool is successful and receives a reward, that reward is divided among participants in the pool.
- Why participate in a pool?
  - Participating in a pool means a much larger chance of solving a block and winning the reward, especially for smaller miners, although that reward will be split between all the pool members ("pool sharing").
  - Pools lead to significantly steadier revenue, rather than highly variable income that may come from going at it alone (although even in pools there is a significant amount of luck involved).
  - Without pools, smaller miners would find themselves unlikely to solve a block, although the rewards when done alone can be remarkable.

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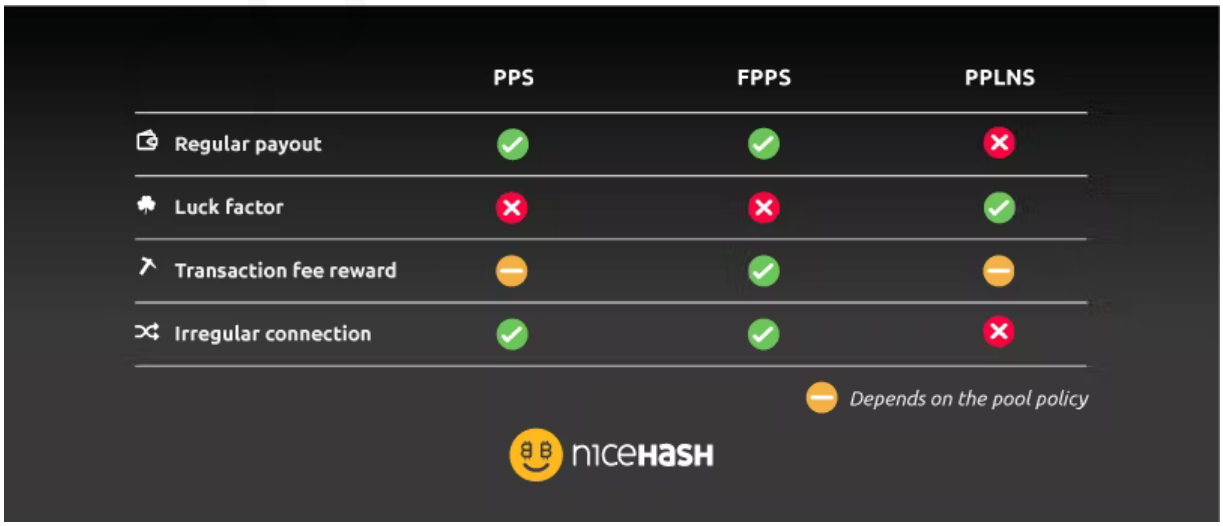
- Pool sharing - the dividing of rewards from bitcoin mining among the participants. The FoundryUSA pool uses Full Pay-Per-Share (FPPS), detailed below.
  - The most basic version of pool sharing is the "Pay Per Share" (PPS) model, where the miner is compensated for each valid contributed share. Said differently, the miner's earnings are proportional to the hashing they contribute to the pool. The PPS version does not include transaction fees in the payout, as FPPS does below.
  - Full Pay-Per-Share (FPPS) is similar to PPS but the pool will also pay a transaction fee reward that is included if the block is found. The transaction fee reward is derived from each transaction done on the blockchain, and, under FPPS, is included in the payment to miners that are part of the pool. "For example, the Bitcoin block at depth 603308 had a fee reward of 0.49475167 BTC [in addition to the] 12.5 BTC block reward." (Source: NiceHash blog, Blockchain.com)
  - Unlike the PPS and FPPS, the Pay-Per-Last N Shares (PPLNS) system rewards miners only once the block has been found by the pool and compensates for shares provided during a time window prior to then. Rewards in these types of pools can be heavily influenced in the short term by a pools luck (the expected number of shares needed to find a block divided by the actual shares submitted before finding a block), creating opportunity for greater earnings than a PPS of FPPS pool.
  - The below graphic from NiceHash summarizes the pros and cons of the three primary structures:



	PPS	FPPS	PPLNS
Regular payout	✓	✓	✗
Luck factor	✗	✗	✓
Transaction fee reward	⊖	✓	⊖
Irregular connection	✓	✓	✗

⊖ Depends on the pool policy

niceHash

Source: NiceHash

- One other method combines aspects of PPS and PPLNS: PPS+. In PPS+, the block reward "is settled according to the PPS model. And the mining service charge /transaction fee is settled according to the PPLNS mode." (Source: Minebest)

Business Model & Secret Sauce

- **Value Proposition**
  - Foundry's initial value proposition focused on providing access to financing and equipment to North American miners. At the time of its founding, many miners did not have the liquidity needed to purchase ASICs from the premier Chinese manufacturing companies and Foundry stepped in to help them solve this problem. The focus of the company was originally the North American market, but they appear to have expanded to Iceland, Norway and Sweden.
  - Over time, Foundry has built out a broader ecosystem to serve their mining customers, including:
    - Running a top 3 global pool - provides steady income to miners and removes luck as a significant variable in income.

Source: Twitter

    - Strengthening the Bitcoin system by diversifying hashrate outside of China and from Chinese pools (although the geographic monopoly is less relevant due to the ban).
    - Access to related services and Foundry/DCG affiliates (i.e. Genesis Trading) for advisory services, security, payment processing, secondary equipment market, etc.
- **Economics**
  - Sources of Revenue
    - Mining: It is currently unconfirmed whether Foundry runs all of their hashrate through their pool or conducts any independent mining. If the company were to successfully add a block to the blockchain outside the pool, they would receive 6.25 bitcoin as a reward (although this will be cut in half every 210,000 blocks), as well as any associated transaction fees. At 01/10's price of $41,740, this reward is ~$260,000 with transaction fees currently 1.12% of Block rewards.
    - Pool (FoundryUSA Pool): According to Foundry, they do not charge pool fees, so their income from Foundry USA would entirely be driven by the FPPS participation in their own pool
      - The Foundry USA pool has grown rapidly since its launch and now makes up 16%+ of global hash rate, making it a top 3 pool in the world, and frequently ranks first in real-time hashrate as of 1/10/2021

Pool ranking by hashrate/blocks mined 01/10/2021-01/10/2022
Source: btc.com

Ranking	Pools	Hashrate	Share	Blocks Mined
0	NETWORK	174086.15 PH/s	100.00%	427
1	Foundry USA	29354.11 PH/s	16.86%	72
2	F2Pool	29354.11 PH/s	16.86%	72
3	AntPool	26092.54 PH/s	14.99%	64
4	Binance Pool	21200.19 PH/s	12.18%	52
5	Poolin	18754.01 PH/s	10.77%	46

Bitcoin pool real-time Hashrate as of 1/10/2021

	Pool	Real-time Hashrate	7D Lucky
1	Foundry USA	**29324.82** PH/s	93.55%
2	AntPool	**26364.43** PH/s	99.74%
3	Poolin	**23625.00** PH/s	93.71%
4	F2Pool	**23014.02** PH/s	127.72%
5	ViaBTC	**17652.10** PH/s	103.98%
6	Binance Pool	**17225.55** PH/s	102.70%
7	BTC.com	**11790.00** PH/s	93.36%
8	SlushPool	**10115.74** PH/s	93.69%
9	SBI Crypto	**4292.51** PH/s	141.89%
10	MARA Pool	3449.72 PH/s	-

Source: btc.com

- Financing: This line of business derives revenue through equipment financing for other bitcoin miners and charges 16.5% APR, with the equipment as collateral. Given recent published rates by competitors at lower APR, this may have come down.
  - This was Foundry's original core business, driven by Bitmain and MicroBT's demand of upfront payments for their machines while many NA bitcoin miners were/are cash poor
- FoundryX: Derives revenue from selling new and secondary ASICs

- Foundry had equipment sales of over $125M in 2021, which led to them launch FoundryX. Through FoundryX, the company has secured 40,000 machines from both MicroBT and Bitmain, for immediate delivery through 2022.
- Supply chain constraints from the largest manufacturers in Asia led to a need for a secondary market - Foundry is using its connections as a pool operator and equipment finance operation to act as a broker in the market (although it appears that equipment supply issues has recently become no longer an issue).

□ Staking: Commission based on total value they are staking on behalf of clients - this is different from their other lines of business that are tied to Bitcoin prices and are instead related to the 20+ Proof-of-Stake protocols they accept (ETH, FLOW, SOL, etc.).

- Foundry Staking takes a commission of the total staking rewards determined "based on our costs and market rates."

○ Cost structure

□ For the bitcoin mining operation, their most important operating cost is electricity, which leads to placing of the mining operation in low-cost energy markets (Texas, Tennessee Valley Authority (TVA), upstate NY, etc.).

□ From a capital expenditure standpoint, Foundry must continue to purchase ASICs from the manufacturers for its own mining operations. It is unclear how much they continue to purchase for their own capacity versus acting as a broker and finance solution for other miners.

○ Profitability

□ It would appear that profitability is heavily tied to the price of bitcoin as it directly affects the mining and pool economics as well as the demand for new machines from their mining partners. Foundry had initially "lost millions" starting the pool (BitcoinTV, 2:45, 16:50). Revenue in the mining business tends to be lumpy due to the element of luck involved.

□ The unpredictable nature of the cash flows from mining is likely mitigated for Foundry by their other lines of business, but with the exception of their staking operation, their profitability is still directly tied to the price of bitcoin.

□ Competitive pressures have pushed pool fees to zero, meaning that the pool business is a "loss-leader" and it is likely that rates in the equipment financing business and staking business are under pressure from other entrants (see competitive position section below for more detail).

Source: Twitter

- **Competitive Advantage: Secret Sauce**

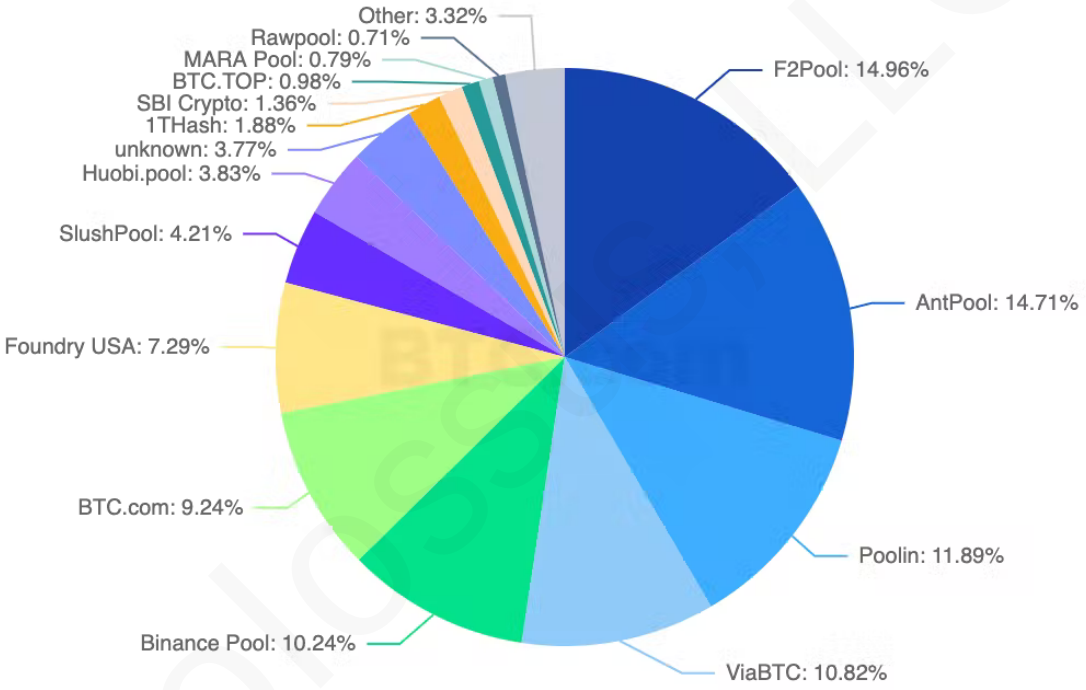
□ Foundry has grown rapidly from a small equipment finance subsidiary to a key participant in the global bitcoin mining ecosystem. Between their pool (now one of the largest globally), equipment financing and secondary market, there is not a part of the bitcoin mining sector they do not touch. It appears that much of their success has been driven by access to capital to grow quickly and provide solutions to cash-poor miners such as financing and the pool.

- Foundry appears to be in a unique position in the marketplace, sitting at the center of the North American mining ecosystem, with much of the equipment from the primary manufacturers running through them to regional miners.
- Additional products that Foundry offers to its mining customers appear to be a part of the Genesis product suite, so there is potentially a competitive advantage from being under the DCG umbrella besides the DCG balance sheet and brand name.

Competitive Position

- **Industry**
  - Pools: There are 13 pools that have mined >1% of the blocks in the last year, with AntPool, F2Pool and ViaBTC among the largest. Foundry USA was the 7th largest in the last year:

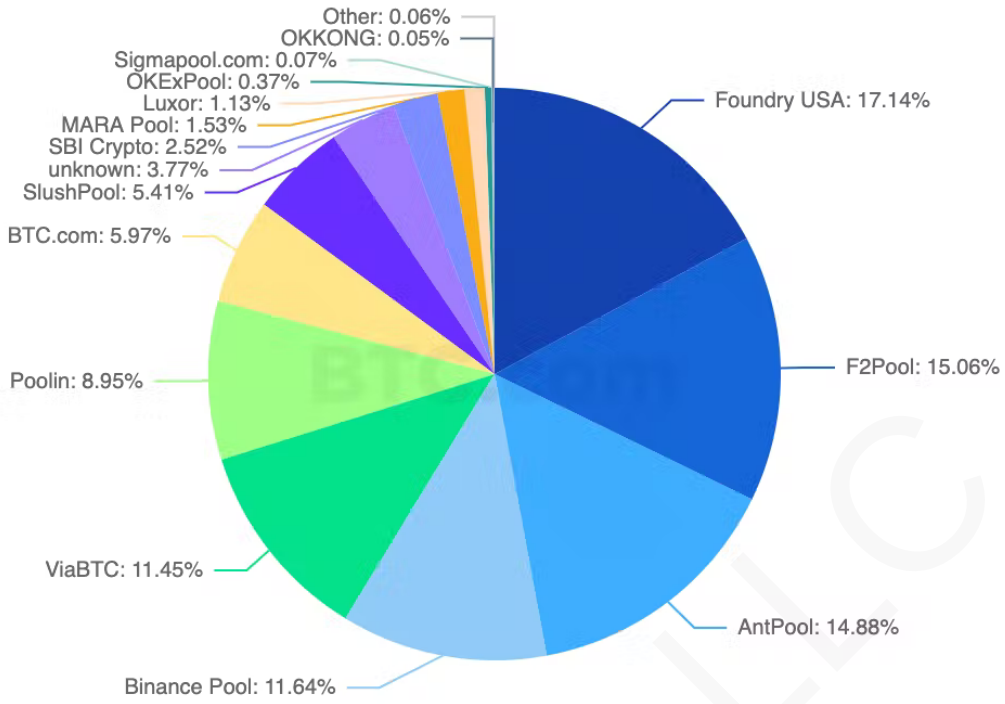
Percent of total blocks 01/10/2021-01/10/2022



Source: btc.com

  - However, it continues to grow rapidly and has climbed into the top 3 in the last 3 months, and the largest in the last month.

Percent of total blocks 12/10/2021-01/10/2022



Source: btc.com

- Equipment financing: Other equipment financing options include: NYDIG, which did a up to $54m deal with Stronghold Digital Mining (Nasdaq: SDIG) at 9.85% APR.
- FoundryX/Secondary: Compass Mining launched a secondary marketplace as well in November.
- There does not appear to be significant barriers to entry in the market with the potential exception of access to the machines, which appears to primarily be a function of capital.
- In the staking market, there is a much broader (and very well-funded) set of competitors, including staking-focused platforms like Figment, Blockdaemon, Everstake, Chorus One and staking services offered by crypto exchanges including Binance, Coinbase and Kraken. Kraken just acquired Staked to continue to build out this portion of their business.

Risks/Considerations

- Has Foundry's unique place in the North American (and now global) mining ecosystem created a competitive moat? And does the support from DCG and other DCG subsidiaries allow it to continue to offer value-added services to bitcoin miners in a way others cannot? Or will it face margin pressure across all of its major lines of business as it faces competition from other equipment financing and staking companies? In staking in particular, they are competing with well-funded venture-backed and public companies.
- Additionally, as the revenue for Foundry's mining operation as well as the demand for many of its others lines of business (FoundryX, advisory, etc.) are driven by mining economics and the price of bitcoin, what happens to the overall business if bitcoin's price declines? And, what is the implication for a finite supply of bitcoin on the long-term prospects of the business?

Useful Resources

Title	Type	What You Will Learn (140 Characters)	URL (Must be https://)
Hash Power Episode 1	Colossus	Primer on blockchains, Bitcoin, bitcoin mining and the underlying system	https://www.joincolossus.com/episodes/39800754/lowin-hash-power-part-1?tab=mentionedcontent
Pomp Podcast #409: Mike Colyer on Building North America's Mining Industry	Video	Mike Colyer's (CEO) background and his thoughts on the evolution of bitcoin mining in North America and globally	https://www.youtube.com/watch?v=4Xr8msIBpsk
BitcoinTV: The Rise of Mining Pools in North America	Video	History of Foundry as well as perspectives on bitcoin mining from Mike Colyer (CEO) and Ethan Vera (COO at Luxor)	https://bitcointv.com/w/bFqKezmdL1wr7rwBfocHS1
Cambridge Center for Alternative Finance	Article	A primer on Bitcoin electricity consumption, hashrate by country and a technical FAQ on bitcoin and bitcoin mining	https://ccaf.io/cbeci
Pool Luck	Article	Description of pool luck and how it impacts rewards in bitcoin mining	https://medium.com/luxor/crypto-mining-luck-probability-and-blockwithholding-attack-254edf42f3ce
Mining Pool Distribution	Article	Description of various pool sharing techniques and how that impacts expected rewards from pool participants	https://www.nicehash.com/blog/post/how-mining-pools-distribute-rewards-pps-vs-fpps-vs-pplns
BTC.com Pool Insights	Data Resource	Data resource for better understanding the current major mining pools, global hashrate, and other relevant metrics	https://btc.com/btc/insights-pools