DELPHI DIGITAL

# Insights: Generalized Mining

## Bootstrapping Projects & Alternative Sources of Yield

March 2019

85 Broad Street
New York, NY, 10004
www.delphidigital.io

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**Lead Analyst**

Tom Shaughnessy

*tom@delphidigital.io*

# What Is Generalized Mining

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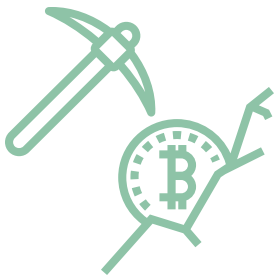
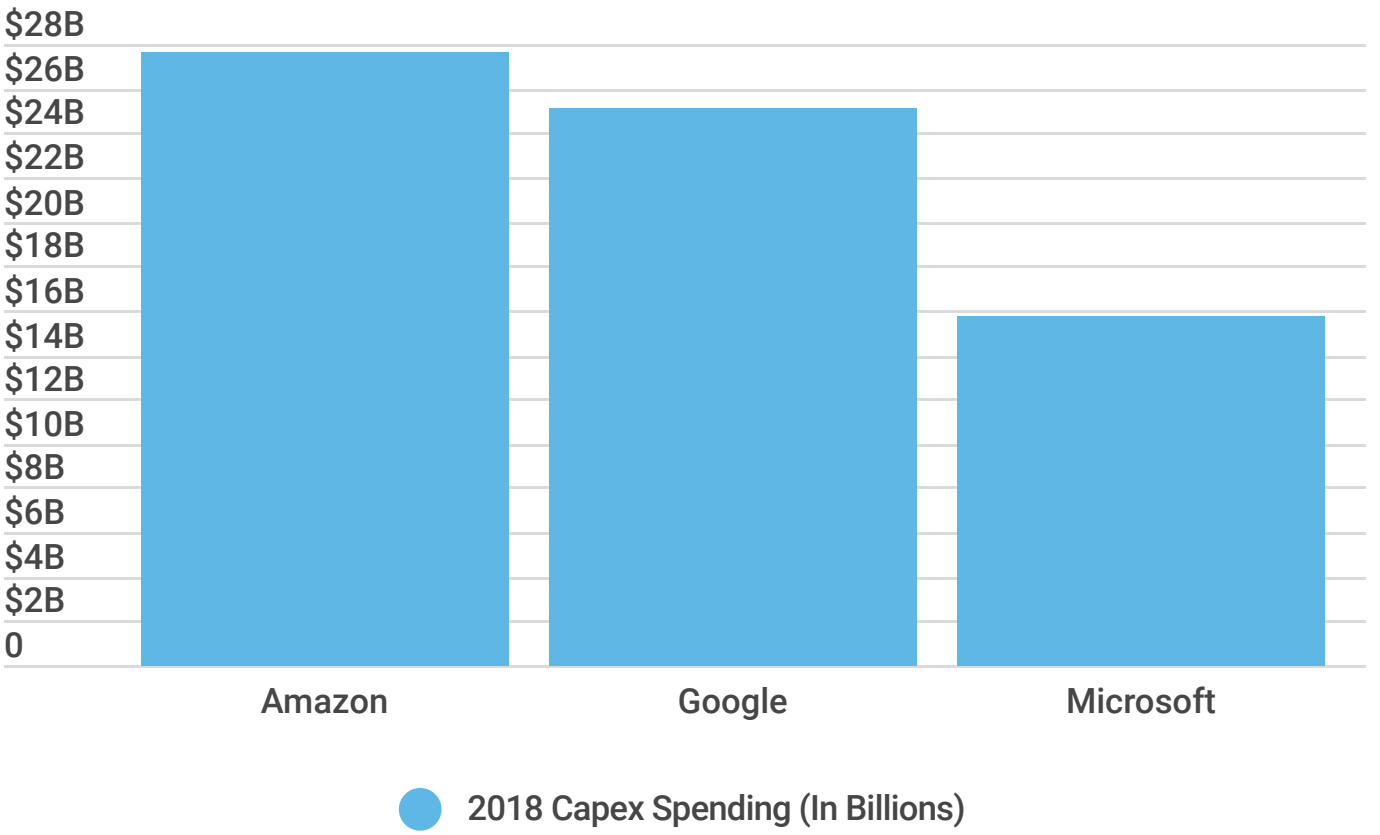


**Generalized mining is actively participating in a network, beyond purchasing tokens, for a reward.** The term is also known as Mining 2.0, where users can perform various roles in a network to help bootstrap the early growth of decentralized networks. These parties can be well established funds who help lift projects off of the ground, or investors who want to take part to help a project succeed.

Crypto networks require hardware, software and manual services to function since there are generally no centralized parties building these infrastructure pieces from the start. Instead, these networks incentivize users to provide various services to the network to provide these critical pieces of infrastructure or processes so networks can function.

**The process offers fruitful dynamics for both funds and investors in two ways. First, it provides an added return in the form of monetary compensation. Second, and arguably more importantly, it helps support these networks for success, which could potentially increase a project's token value long-term to drive an initial investment higher.**

A prime example is the most prominent cloud providers (Amazon, Google and Microsoft). These companies spend tens of billions in capex per year on infrastructure to support their services. We note not all is on cloud capex, since the companies don't break this out most of the time. Decentralized networks, on the other hand, don't have a central authority to deploy critical infrastructure. This is not true for all projects as many founding teams allocate resources to the operation and security of their networks early on. But as time progresses a network must incentivize users to provide these critical infrastructure components through some form of rewards, typically distributed as tokens. This isn't just for the supply side (storage, compute, processing) but also on the demand side with users, ecosystem growth and developers.”




Source: platformonomics.com

# Who Can Take Part and How?

A wide range of stakeholders can potentially take part in generalizing mining. Individuals were the first to start actively participating in boot-strapping networks; this dates back to Bitcoin where individuals ran the first nodes to support the network, well before generalizing mining was popularized. Today we see both individuals and crypto funds as the first movers in generalizing mining activities. We have yet to see large exchanges (Binance, Coinbase) or custodians (Gemini, Coinbase, BitGo, DACC, Kingdom Trust) conduct generalized mining activities to date. We believe this will change and exchanges will allow their customers and users to stake their coins to support a network in proof-of-stake systems such as Tezos, EOS or Decred, for example. Time will tell how this process is implemented, but it is a trend investors should monitor as it could offer additional returns on their initial holdings.

Generalized mining goes beyond normal mining in proof-of-work systems (Bitcoin). It extends this concept to any service that helps to support a network for a reward. These services range from staking one's coins in a network for validating transactions (Tezos, Decred, EOS) to provisioning one's spare computer storage to support a decentralized storage network (Filecoin, StorJ, Sia, Maidsafe).

## Incentivized

Stakeholders involved in generalized mining activities need incentive to participate because, for the most part, no one works for free. In Tezos and Decred, users are rewarded in XTZ and DCR for validating transactions. In more complex scenarios, such as being a transcoder on the Livepeer network, users are still rewarded for provisioning services.

Generalized mining can even involve taking a very active role in a network, such as being a fisherman in the Polkadot network where a user is tasked with ensuring parachains are performing their services in a legitimate manner.

## Generalized Mining Activities

| Service | Example Projects |
|---|---|
| Transaction Processing | Bitcoin, Ethereum, Most Blockchains PoW or PoS |
| Staking | Tezos, Decred, EOS |
| Computational Resource Provision | Dfinity |
| Software or Merkle Mining | Livepeer |
| Content Curation | Steemit, Relevant |
| Hardware Provisioning | Filecoin, StorJ, Sia, Maidsafe |
| Validation Mining | Augur |
| Hubs | Lightning Network |
| Watchers | Polkadot (Fisherman) |
| Protocol Changes | Tezos, Decred, EOS |
| Using Teasury | Decred, Dash |
| Relayers | Orchid |
| Providing Liquidity | CelerNetwork |
| Nominating and Kicking | TCR Party |

Source: Grassfed.Network/mining, Medium (Notation Capital), Jason Choi (@MrJasonChoi)

# Funds Are Getting Involved

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Crypto funds are actively conducting generalized mining activities for four key reasons. Most investors can get involved for the same reasons, though it's important to note some networks require a minimum investment before participation can occur (# of tokens required for staking, etc.).

1. **Additional returns** beyond just initial investments.
2. **Increased chance project succeeds** by taking an active role bootstrapping the network.
3. **Closer investment alignment** as funds are more closely tied to the success of a project and its goals.
4. **Differentiation** in the risk-return profiles funds can offer. They will also have more insight into the inner workings of projects, giving them a better sense of a project's success or failure.

| Fund | Initiative | Details |
|---|---|---|
| Coinfund and Placeholder Capital | Grassfed Network | Services include transaction processing, staking, software, content curation, market making, governance etc. |
| Placeholder Capital | Decred | Delegating DCR Tickets to Grassfed's voting service. Vocal on changes, upgrades, and the use of the treasury. |
| Multicoin Capital | Aurora EOS | Backing Aurora EOS as a candidate block producer |
| Notation Capital | Livepeer | Running infrastructure on the Livepeer Network |
| Multicoin Capital | Livepeer | Multicoin operates transcoders on the Livepeer network to provide the supply side of the Livepeer network until there is enough demand for other suppliers to see an attractive yeild |
| Multcoin Capital | Skale | Will run validators on the Skale network to bootstrap security. |

**While its too early to tell if generalized mining drives outperformance (nascent practice, and limited data), quite a few funds outperformed Bitcoin in FY18 (down 74%). The ability to take short positions attributed to some of this outperformance, but generalized mining also helped drive returns for funds actively conducting such activities.**

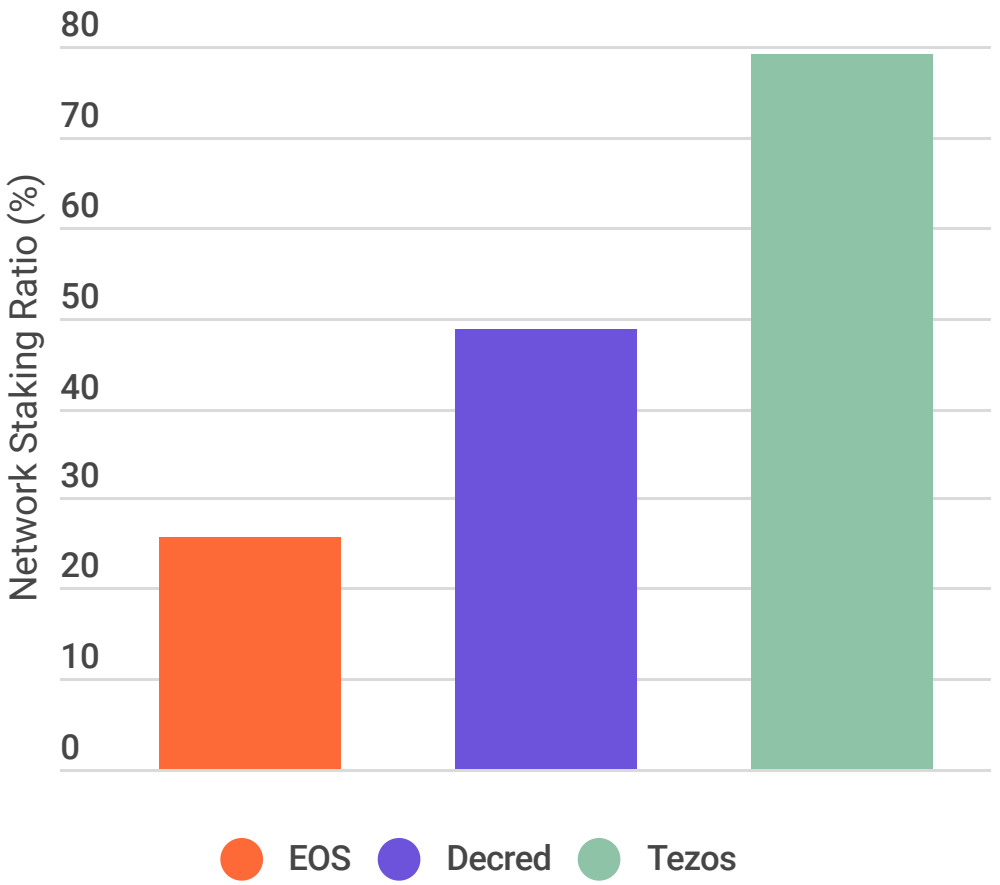
Sources: Vision Hill Advisors, Mullticoin.capital, Coindesk, Coinfund.io

# Generalized Mining Returns

Staking one's tokens on a network to validate transactions is one of the lowest barrier-to-entry activities a party can take part in, the returns from which are currently very attractive. For example, one can earn 8% or 12% in Tezos and Decred, respectively, for locking up tokens to validate transactions. Staking in these two networks is relative easy to do too. A user simply has to download TezBox or Decredition (the wallets for each) and follow a few steps to begin staking. This has led more users to take part in staking (see left chart on participation for examples). Sticking with our previous examples, approximately 49% of tokens in Decred and 79% of tokens in Tezos are set for staking. The more participants in these networks, the more secure the networks become. However, the more tokens staked, the lower overall returns are for validators. Both of these examples are layer-1 blockchains.

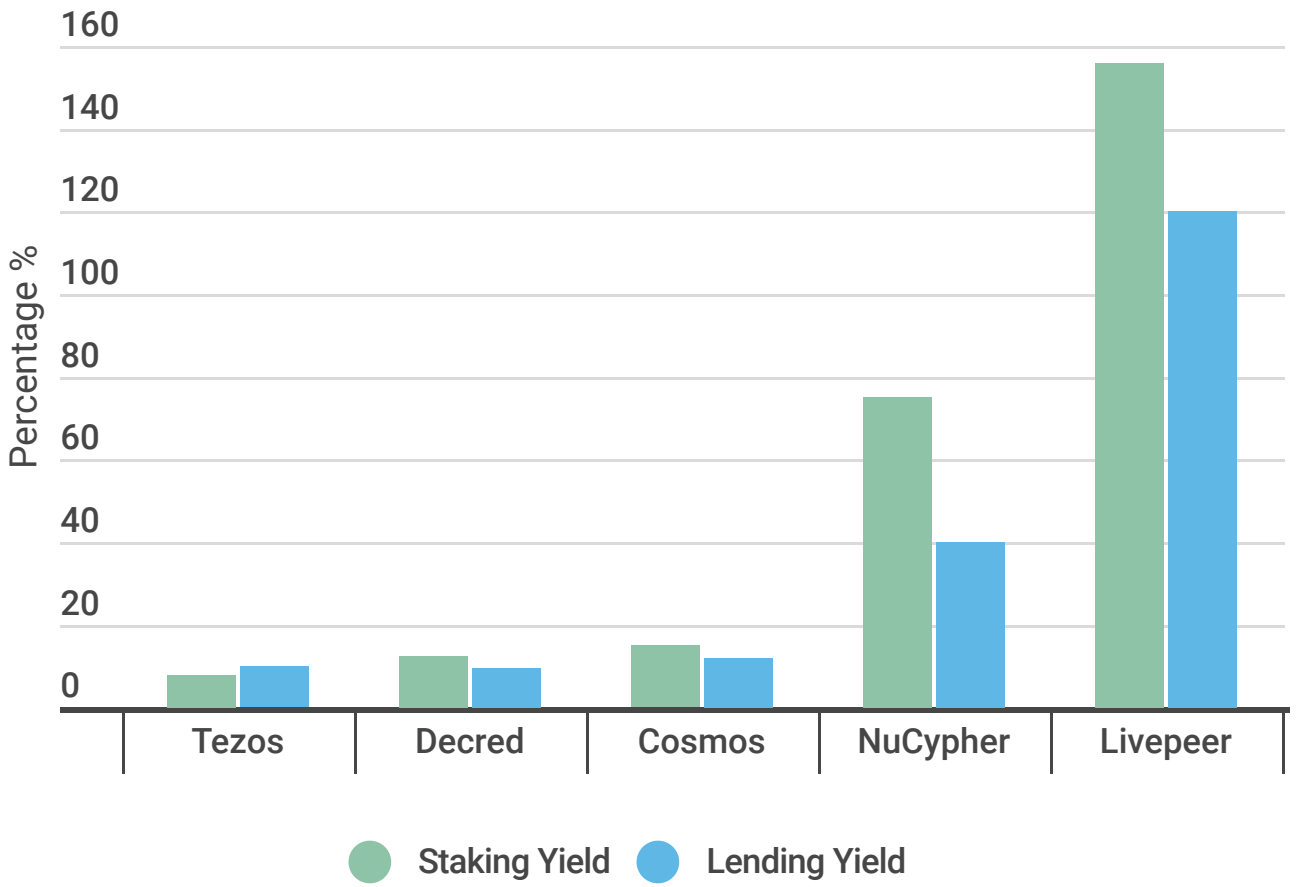
Returns for generalized mining activities can be much higher for newer projects, some of which are built on-top of existing layer-1 blockchains (i.e. Ethereum) but use proof-of-stake. Livepeer, for example, is a decentralized video infrastructure service that provides video encoding services to engineers. Those who run transcoding nodes on the Livepeer network can earn very high returns since the project isn't yet mature and the roles are mostly technical in nature.

**Percent of Tokens Staked (Network Validation)**




Sources: Tzscan.io, DCRstats.com, EOSAuthority.com

**Staking and Lending Yields**




Source: Staked.us

# Example One: No Staking vs Staking

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Let's explore three scenarios of staking on the Tezos network and the returns it can offer investors and funds. In our first scenario we assume an initial investment of $10,000 and an inflation rate of 7% (6.96% to make the calculations simpler). **Assuming 20% token appreciation, after six years an investor sees an investment of $10,000 grow to $36k. On the other hand, if the investor also stakes their holdings (proof-of-stake) to validate transactions, their investment instead grows to $57k, a difference of 60% over a buy-and-hold strategy.**

| Tezos Comparison (Investing vs Investing and Staking) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Inflation Calculation** | | | | | | | |
| Set Annual Inflation Rate | | 5.5% | | | | | |
| Current Staking Participation | | 79% | | | | | |
| Adjusted Current Inflation Rate | | 6.96% | | | | | |
| Initial Investment | $10,000 | | | | | | |
| XTZ Token Price | $0.45 | | | | | | |
| XTZ Tokens Held | 22,222 | | | | | | |
| **Scenario 1 (Investment Only)** | | | | | | | |
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
| XTZ Token Price | $0.54 | $0.65 | $0.78 | $0.93 | $1.12 | $1.34 | $1.61 |
| *Token Price Appreciation* | 20% | 20% | 20% | 20% | 20% | 20% | 20% |
| XTZ Tokens Held | 22,222 | 22,222 | 22,222 | 22,222 | 22,222 | 22,222 | 22,222 |
| Investment Value | $12,000 | $14,400 | $17,280 | $20,736 | $24,883 | $29,860 | $35,831 |
| **Scenario 2 (Investment and Staking)** | | | | | | | |
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
| XTZ Token Price | $0.54 | $0.65 | $0.78 | $0.93 | $1.12 | $1.34 | $1.61 |
| *Token Price Appreciation* | 20% | 20% | 20% | 20% | 20% | 20% | 20% |
| XTZ Tokens Held | 22,222 | 23,769 | 25,424 | 27,194 | 29,087 | 31,112 | 33,278 |
| Investment Value | $12,000 | $15,402 | $19,770 | $25,375 | $32,570 | $41,805 | $53,659 |
| Percentage Staked | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Annual Interest Rate | 6.96% | 6.96% | 6.96% | 6.96% | 6.96% | 6.96% | 6.96% |
| Interest Earned In USD | $835 | $1,072 | $1,376 | $1,767 | $2,268 | $2,910 | $3,736 |
| Total XTZ Purchased | 1,547 | 1,655 | 1,770 | 1,893 | 2,025 | 2,166 | 2,317 |
| Total XTZ Held | 23,769 | 25,424 | 27,194 | 29,087 | 31,112 | 33,278 | 35,595 |
| Investment Value | $12,835 | $16,475 | $21,146 | $27,142 | $34,838 | $44,716 | $57,395 |
| **Investment Value Comparison When Staking** | | | | | | | |
| Dollar Difference When Staking | $835 | $2,075 | $3,866 | $6,406 | $9,955 | $14,856 | $21,563 |
| Percentage Difference When Staking | 7% | 14% | 22% | 31% | 40% | 50% | 60% |

# Example Two: Offsetting Inflation

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In the second scenario, we explore staking one's coins to offset the impact of inflation in a network since each coin has less purchasing power each year because of inflation. **Assuming Tezos' token price decreases each year by the amount of network inflation of 6.5%** (near actual amount to keep calculations simple), an initial investment of $10K is worth $6.2K after six years. **If a user instead stakes their $10K investment to offset the impacts of inflation, their initial $10K investment is still worth $10K after 6 years since staking rewards offset inflation.** This perfect scenario is unlikely to occur in reality, but demonstrates how staking rewards can help offset the increase in a coin's supply. Inflation reduces the value of a coin in any network with an inflationary monetary policy (Bitcoin, Ethereum, Tezos, Decred, EOS, etc.) all else held equal. Generalized mining can help alleviate some of this value erosion.

| Scenario 3 (Investment) - Assuming Token Price Decreases With Inflation - $10K Initial Investment | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** |
| XTZ Token Price | $0.42 | $0.39 | $0.37 | $0.34 | $0.32 | $0.30 | $0.28 |
| *Token Change* | -6.51% | -6.51% | -6.51% | -6.51% | -6.51% | -6.51% | -6.51% |
| XTZ Tokens Held | 22,222 | 22,222 | 22,222 | 22,222 | 22,222 | 22,222 | 22,222 |
| Investment Value Year End | $9,349 | $8,741 | $8,172 | $7,640 | $7,142 | $6,678 | $6,243 |

| Scenario 4 (Investment + Staking) - Assuming Token Price Decreases With Inflation | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** |
| XTZ Token Price | $0.42 | $0.39 | $0.37 | $0.34 | $0.32 | $0.30 | $0.28 |
| *Token Change* | -6.51% | -6.51% | -6.51% | -6.51% | -6.51% | -6.51% | -6.51% |
| XTZ Tokens Held | 22,222 | 23,769 | 25,424 | 27,194 | 29,087 | 31,112 | 33,278 |
| Investment | $9,349 | $9,349 | $9,349 | $9,349 | $9,349 | $9,349 | $9,349 |
| | | | | | | | |
| Percentage Staked | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Annual Interest Rate | 6.96% | 6.96% | 6.96% | 6.96% | 6.96% | 6.96% | 6.96% |
| Interest Earned In USD | $651 | $651 | $651 | $651 | $651 | $651 | $651 |
| Percentage of Interest Reinvested in XTZ Tokens | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Reinvested in XTZ Tokens | $651 | $651 | $651 | $651 | $651 | $651 | $651 |
| XTZ Tokens Added | 1,547 | 1,655 | 1,770 | 1,893 | 2,025 | 2,166 | 2,317 |
| Total XTZ Held | 23,769 | 25,424 | 27,194 | 29,087 | 31,112 | 33,278 | 35,595 |
| XTZ Investment Value Year End | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 |

| Investment Value Comparison When Staking | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Dollar Difference When Staking | $651 | $1,259 | $1,828 | $2,360 | $2,857 | $3,322 | $3,757 |
| Percentage Difference When Staking | 7% | 14% | 22% | 31% | 40% | 50% | 60% |

# Example Three: Hedging Strategies

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In the third example, we explore the effects of a hedging strategy. Given the volatile nature of crypto assets, one may want to diversify staked returns into other assets instead of reinvesting them back into the same network. Assuming Tezos' token price decreases by 7% per year, after 6 years a buy-and-hold investor is left with $6k. **Assuming the token price decreases 7% per year, an investor who stakes 100% of their holdings each year and reinvests 25% of their staking rewards (interest) in Tezos the other 75% in an uncorrelated asset that yields 8% has $10.4K after 6 years.** The difference between a ~40% loss and a 4% gain is obviously substantial for any investor.

| Tezos Comparison (Investing vs Investing and Staking) - With A Hedge | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Scenario 5 (Investment) - Assuming Token Price Decreases With Inflation** | | | | | | | |
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
| XTZ Token Price | $0.42 | $0.39 | $0.36 | $0.34 | $0.31 | $0.29 | $0.27 |
| *Token Price Appreciation* | -6.96% | -6.96% | -6.96% | -6.96% | -6.96% | -6.96% | -6.96% |
| XTZ Tokens Held | 22,222 | 22,222 | 22,222 | 22,222 | 22,222 | 22,222 | 22,222 |
| Investment Value | $9,304 | $8,656 | $8,053 | $7,493 | $6,971 | $6,486 | $6,034 |
| **Scenario 6 (Investment + Staking) - Assuming Token Price Decreases With Inflation, With An Uncorrelated Hedge** | | | | | | | |
| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
| XTZ Token Price | $0.42 | $0.39 | $0.36 | $0.34 | $0.31 | $0.29 | $0.27 |
| *Token Price Appreciation* | -6.96% | -6.96% | -6.96% | -6.96% | -6.96% | -6.96% | -6.96% |
| XTZ Tokens Held | 22,222 | 22,609 | 23,002 | 23,403 | 23,810 | 24,224 | 24,646 |
| Investment Value | $9,304 | $8,807 | $8,336 | $7,891 | $7,469 | $7,070 | $6,692 |
| | | | | | | | |
| Percentage Staked | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Annual Interest Rate | 6.96% | 6.96% | 6.96% | 6.96% | 6.96% | 6.96% | 6.96% |
| Interest Earned In USD | $648 | $613 | $580 | $549 | $520 | $492 | $466 |
| Percent of Intrest Reinested in XTZ | 25% | 25% | 25% | 25% | 25% | 25% | 25% |
| | | | | | | | |
| Total XTZ Purchased | 387 | 394 | 400 | 407 | 414 | 422 | 429 |
| | | | | | | | |
| Total XTZ Held | 22,609 | 23,002 | 23,403 | 23,810 | 24,224 | 24,646 | 25,075 |
| Investment Value | $9,466 | $8,960 | $8,481 | $8,028 | $7,599 | $7,193 | $6,809 |
| | | | | | | | |
| Percentage of Interest Reinvested in uncorrelated asset | 75% | 75% | 75% | 75% | 75% | 75% | 75% |
| Absolute Value Invested Per year | $486 | $452 | $421 | $391 | $364 | $339 | $315 |
| Uncorrelated Asset Annual Return | 8% | 8% | 8% | 8% | 8% | 8% | 8% |
| Total value of uncorrelated position | $486 | $977 | $1,475 | $1,985 | $2,507 | $3,047 | $3,605 |
| **Total Position Value** | $9,951 | $9,937 | $9,956 | $10,013 | $10,106 | $10,240 | $10,414 |
| | | | | | | | |
| **Investment Value Comparison When Staking** | | | | | | | |
| Dollar Difference When Staking | $648 | $1,281 | $1,903 | $2,520 | $3,135 | $3,754 | $4,380 |
| Percentage Difference When Staking | 7% | 15% | 24% | 34% | 45% | 58% | 73% |

# Generalized Mining Beyond Staking

It's worth taking a look at real world examples of funds or people taking part in generalized mining activities beyond staking. For example, Notation Capital recently published the results of their activities providing various services for the Livepeer network (outside of their investment). The fund explored five major areas of infrastructure while providing services to the Livepeer network.

When spinning up nodes to support the network (transcoding) Notation was able to earn a 2% daily IRR. Merkle Mining, which involves handling the distribution and allocation of tokens across the network, allowed Notation to mint LPT as low as $0.30 per token. This is substantial given LPT tokens trade around $5.60 currently, so notation was able to lock in a ~19x gain on a gross basis. The firm did not share net yields on minting LPT but we would assume there were costs involved with Merkle Mining (infrastructure, storage, compute) given the firm wrote a custom algorithmic code to handle the process. Regardles, the returns highlight substantial upside for opportunistic funds and investors.

The other three areas (hardware, security, and marketing requirements) were not revenue generators for the firm. Hardware costs are minimal for validation given it's a proof-of-stake system; security requirements were normal (safeguard keys); and marketing costs were minimal this time around since they only had to market transcoder campaigns to get users to delegate their nodes to Notation.

| Area | Description | Reward/Cost | How Earning Reward |
|---|---|---|---|
| Software Requirements (Dev Ops) | Notation spun up nodes and began actively transcoding on the Livepeer network. | 2% Daily In IRR | Livepeer transcoding node along with participation in DPoS rewards |
| Software Requirements (Code) | Merkle Mining system spans a cost analysis across numerous inputs (gas prices, hosting costs, LPT Mining splits). Notation has written code to automate the process. | Algorithmically minting LPT as low as $0.30/LPT | Participating in Merkle Mining. This reward is lower than any investor paid to purchase LPT. |
| Hardware Requirements | Hardware requirements are minimal for Livepeers PoS system over PoW systems. | Sunk Cost | - |
| Security Requirements | Miners and participants earning tokens on a regular basis need to enact proper security measures. | Sunk Cost | - |
| Marketing Requirements | Marketing ones services to attract others to join in is critical. For example, Notation has to market through transcoder campaigns so users delegate to their nodes. | Time/AD costs potentially | - |

Source: Notation Capital

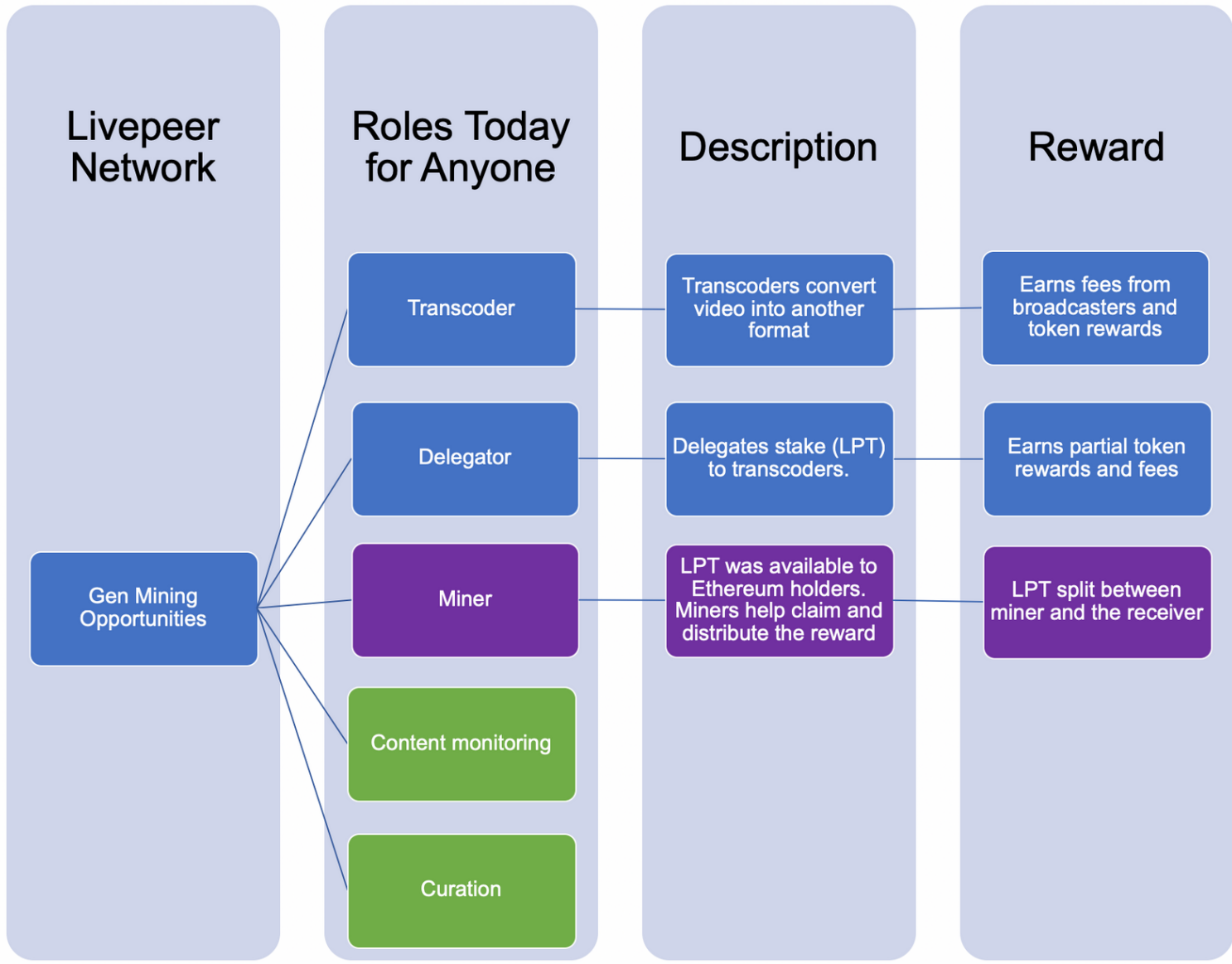
# Livepeer Example

The previous example focused on a particular funds' generalized mining experiences for Livepeer, but these types of practices are open to everyone. Individuals and investors can take part in the process across 3 different areas today: delegator, transcoder, miner, and potentially second order services such as content monitoring and curation in the future. Each of these allow participants to earn returns while contributing to the success of the Livepeer network. Livepeer is an interesting example because of the multiple generalized mining opportunities that exist. Users can earn LPT (the native token) and ETH for performing services for the network. We expect more projects to offer generalized mining opportunities in the future as the practice proliferates through the crypto ecosystem.

The Livepeer network currently supports 15 transcoders (subject to increase) so this activity is best suited for well-established, technically-oriented parties with the necessary hardware, bandwidth, and expertise.

Anyone can propose to be a Transcoder on the network and anyone can stake their LPT tokens to a transcoder to earn a percentage of the inflationary network rewards (LPT) and fees paid by broadcasters (ETH). Token holders can delegate to a transcoder easily using the Livepeer Block Explorer. This is non-custodial so delegators can't spend someone's LPT.

Early in the Livepeer network, instead of an Airdrop, LPT was available to most Ethereum (ETH) holders at the time. The process of claiming it required submitting merkle proofs. The reward (LPT for ETH holder) was split between the miner and destined holder. This was an early generalized mining opportunity for users, but has since concluded.




**Blue = Available Today**
**Purple = Concluded**
**Green = Future**

Source: Livepeer Whitepaper, Messari, Coinfund

# Service Providers Springing Up

Generalized mining services beyond staking can be technical and difficult. Services are surfacing to make the process easier, which are lowering the barriers to entry for funds and investors to take part. For instance, Grassfed Network is a project launched by CoinFund (a crypto fund), which leverages numerous generalized mining strategies across multiple assets for its clients.

Specific projects are making the process easier as well for individuals. For instance in the past Decred token holders would have to purchase a ticket with DCR tokens to take part in its governance process (voting on changes). This was a very time consuming and tedious exercise, though today Decred token holders (DCR) can download the Decredition wallet and link up with a Voting service provider (VSP), which handles all ticket purchasing, ticket voting, and auto repurchasing. This allows users to take part in validating transactions on the network without having to worry about all of the tasks involved with ticket voting.

**The barriers for generalized mining activities are falling for funds and individuals.**

**Grassfed Network's Generalized Mining Services Across Various Crypto Assets**

| Project | Initiative | What Grassfed Does for Clients |
|---|---|---|
| Decred | Staking | Grassfed operates a Voting Service Provider (VSP) on the Decred network so DCR stakeholders don't have to run a full node and instead authorize the VSP to vote their tickets. |
| Livepeer | Software Mining Transcoding | Livepeer's MerkleMine is a cryptographic game used by the network to handle the distribution of its token. Grasfed handles submitting cryptographic proofs on behalf of Ethereum addresses to compel the distribution of LPT to those addresses. Grassfed also operates a transcoder on the Livepeer network, that earns daily LPT-denominated inflation rewards. |
| Compound Finance | Lending | Grassfed is a lender of cryptoasset on the compound protocol |
| Nucypher | Re-Encryption Services | Grassfed is planning to provide re-encryption services on the NuCypher network when it launches on mainnet in 2019. |
| Steem | Content Curation | Grasfed runs a content curation bot on Steemit. In return for a payment in SBD or STEEM, the bot can leverage its holdings to upvote content on Steemit. |

# Key Takeaways

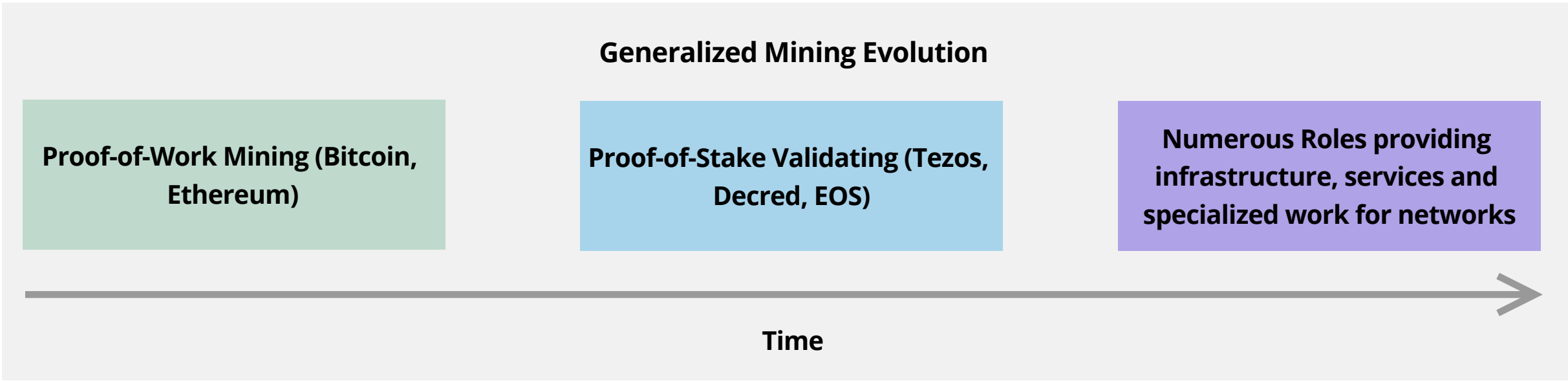
- Generalized mining is the next era of crypto involvement where stakeholders bootstrap a network beyond their initial investments to help drive its success. This type of active involvement has the potential to support a projects' token price as well, bolstering the value of an initial investment by providing additional sources of yield.

- Generalized mining activities were popularized by staking on PoS networks, but has quickly expanded to more nuanced responsibilities, such as being a transcoder on Livepeer or providing dormant storage on StorJ.

- Crypto funds are jumping in to take advantage of the benefits of generalized mining, but individual investors are also capable of taking part in similar activities.

- **Individuals and funds can bolster returns by taking part in generalized mining activities.** At the very least, one could negate the effects of inflation through generalized mining. The barriers to entry have come down with better user interfaces and services to handle the responsibilities.

- Generalized mining can help drive the potential success of a project or network one is invested in by bootstrapping the supply side (storage, compute, etc) or demand side (users, developers) of the network.



# Disclosures

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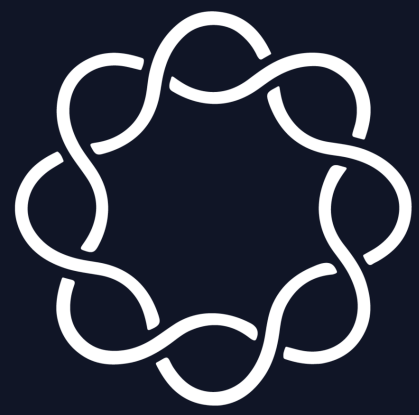

DELPHI DIGITAL

85 Broad Street
New York, NY, 10004
www.delphidigital.io