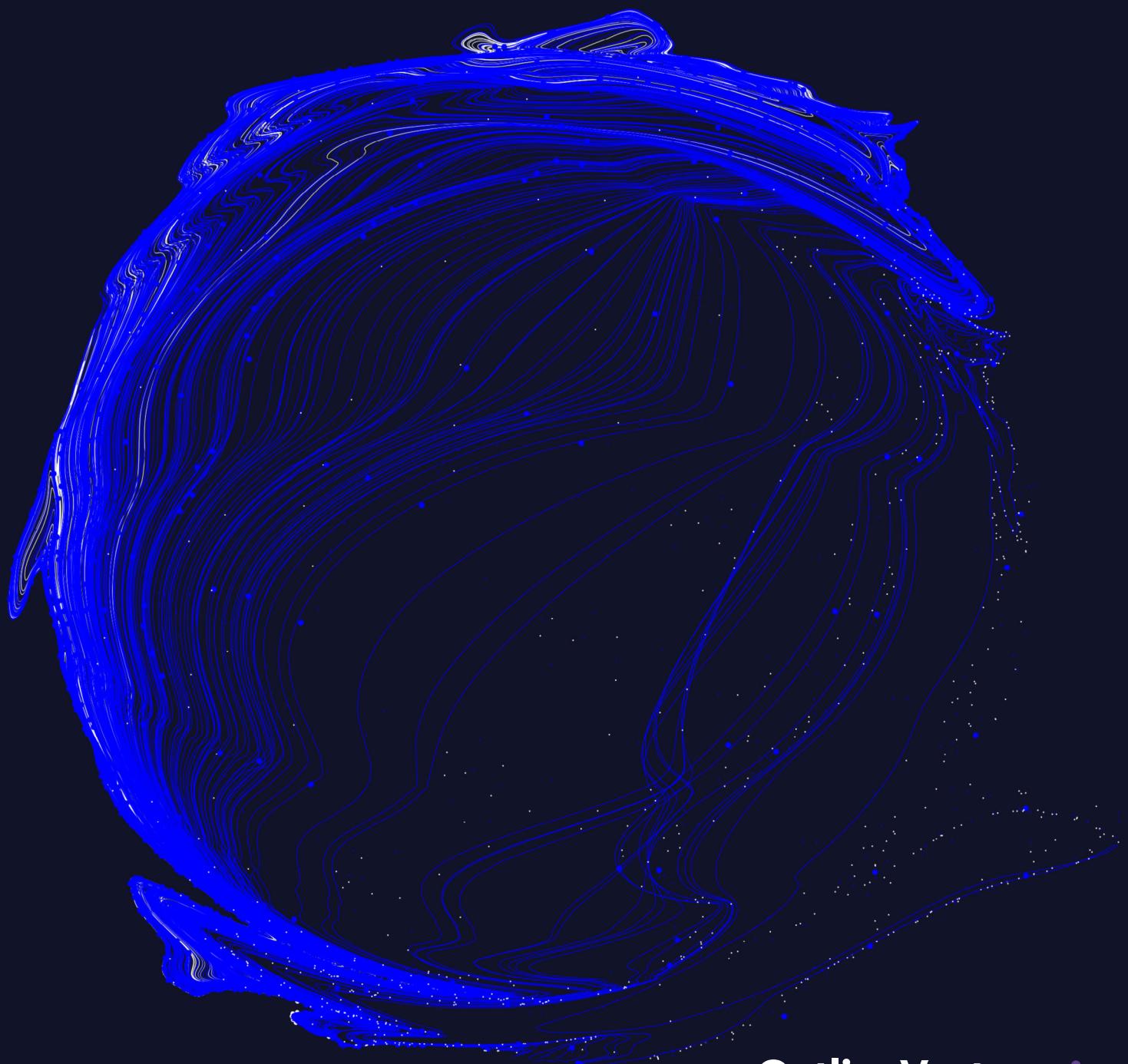


>Blockchain

Development

Trends

2021_



Outlier Ventures •

>Blockchain Development Trends 2021_

This report analyzes key development trends in core blockchain, DeFi and NFT projects over the course of the past 12 months

The full methodology, data sources and code used for the analysis are open source and available on the [Outlier Ventures GitHub repository](#). The codebase is managed by **Mudit Marda**, and the report is compiled by him with tremendous support of **Aron van Ammers**.

>The last 12 months

Executive summary

- * **Ethereum** is still the most actively developed Blockchain protocol, followed by **Cardano** and **Bitcoin**.
- * Multi-chain protocols like **Polkadot**, **Cosmos** and **Avalanche** are seeing a consistent rise in core development and developer contribution.
- * In the year of its public launch, decentralized file storage project **Filecoin** jumped straight into the top 5 of most actively developed projects.
- * Ethereum killers **Tron**, **EOS**, **Komodo**, and **Qtum** are seeing a decrease in core development metrics.
- * DeFi protocols took the space by storm with **Ethereum** being the choice of the underlying blockchain and smart contracts platform. They saw an increase in core development and developer contribution activity over the year which was all open sourced. The most active projects are **Maker**, **Gnosis** and **Synthetix**, with **Aave** and **Bancor** showing the most growth. **SushiSwap** and **Yearn Finance**, both launched in 2020, quickly grew toward and beyond the development activity and size of most other DeFi protocols.
- * NFT and Metaverse projects like collectibles, gaming, crypto art and virtual worlds saw a market-wide increase in interest, but mostly follow a closed source development approach. A notable exception is **Decentraland**, which has development activity on the levels of some major blockchain technologies like **Stellar** and **Algorand**, and ahead of some of the most popular DeFi protocols like **Uniswap** and **Compound**.

>Methodology_

For creating this report, **186 GitHub organizations** were searched, **6163 code repositories were indexed** and over **a million commits were analyzed**.

We have based our analysis on core repositories for each protocol using **Electric Capital's** crowdsourced [Crypto Eco-systems index](#) as the base, with manual curation of relevant organizations per ecosystem. All the core repositories of each of the GitHub organizations of a protocol were taken and the forked repositories, when marked as such on **GitHub**, were ignored. Forking repositories is very common practice, and leads to the development activity of one ecosystem being included in another. Including all forks in the analysis adds a lot more noise than signal. For similar reasons, only activity for the default branch (main or master) of each repository was included. In these 'unforked' repositories, all commits to the default branch were indexed and analyzed.

We attribute the development activity for each **organization on GitHub** to a single protocol, and don't include individual repositories outside of those organizations, to most accurately show development activity to the core development of protocols.

Core Development

A measurement of **weekly commits and code updates** (additions and deletions) over time to the core protocol **GitHub** organisation repositories. Commits to the default branch as well as line-by-line additions and deletions to code across all repositories under each target organisation were indexed and plotted for comparison.

Contributing Developers

A measurement of the **monthly active developers** in a protocol's core GitHub organization repositories over time based on their commits. The developer commits to all core repositories of each protocol were de-duplicated against commits to other core repositories of the protocol during a month to find all unique contributors per month.

GitHub Statistics

A measurement of the sum total of **Stars, Forks and Releases** of each of the core repositories of the protocols' GitHub organization indicating in some way its popularity and activity.

>Blockchain Protocols_

The **top 50 open source blockchain protocols** by market capitalization, plus the two leading permissioned non-tokenized platforms, **Corda** and **Hyperledger**, were analyzed for metrics like core development, contributing developers and codebase statistics and compared for the purpose of this report.

Executive Summary

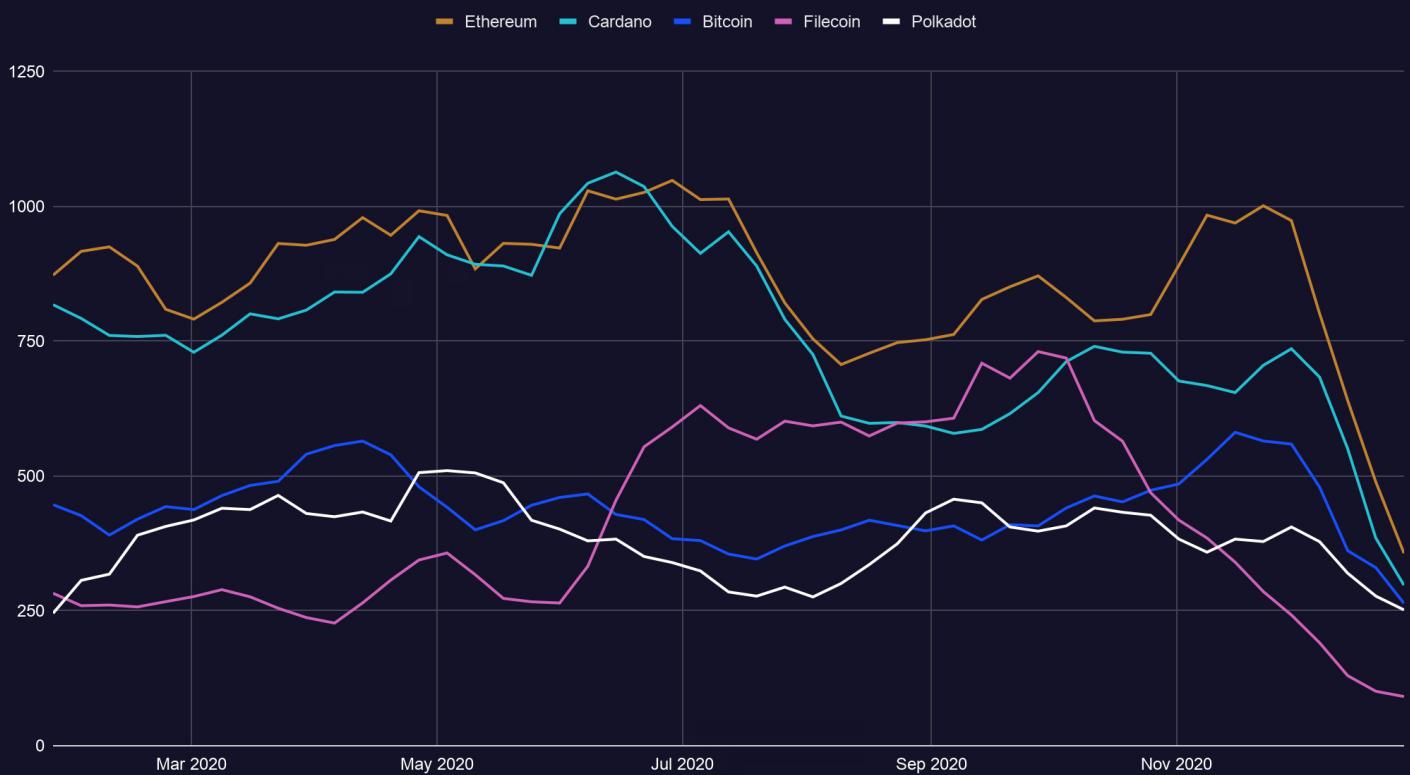
- * **Ethereum**, with a total of **42457 commits**, is still the most actively developed Blockchain protocol, followed by **Cardano (37327)** and **Bitcoin (21614)**. **Polkadot** and **Cosmos** with **18879** and **17854** total commits are not too far behind in development activity.
- * **Multi-chain protocols** like **Polkadot** and **Cosmos** are seeing a **consistent rise** in core development and developer contribution, maintaining their growth achieved over the past year. **Avalanche**, their latest big competitor, saw tremendous growth, increasing their weekly commits and monthly active developers by **4x** over the year, arriving at a level of around 50% of that of Cosmos and Polkadot.
- * **Decentralized storage protocols** like **Filecoin** and **Siacoin** saw a jump in core development, developer contribution and adoption. In the year of its public launch, Filecoin joined the top 5 most actively developed blockchain projects.
- * Ethereum killers **Tron**, **EOS**, **Komodo**, and **Qtum** are seeing a **decrease** in core development metrics.
- * In the enterprise blockchain domain, **Hyperledger** has higher development activity than **Corda**, but **Corda** has **slightly better growth**.

Top 5 most active

The most actively developed protocols are **Ethereum** and **Cardano**, in a league of their own considering code commits with **866** and **761 average weekly commits**.

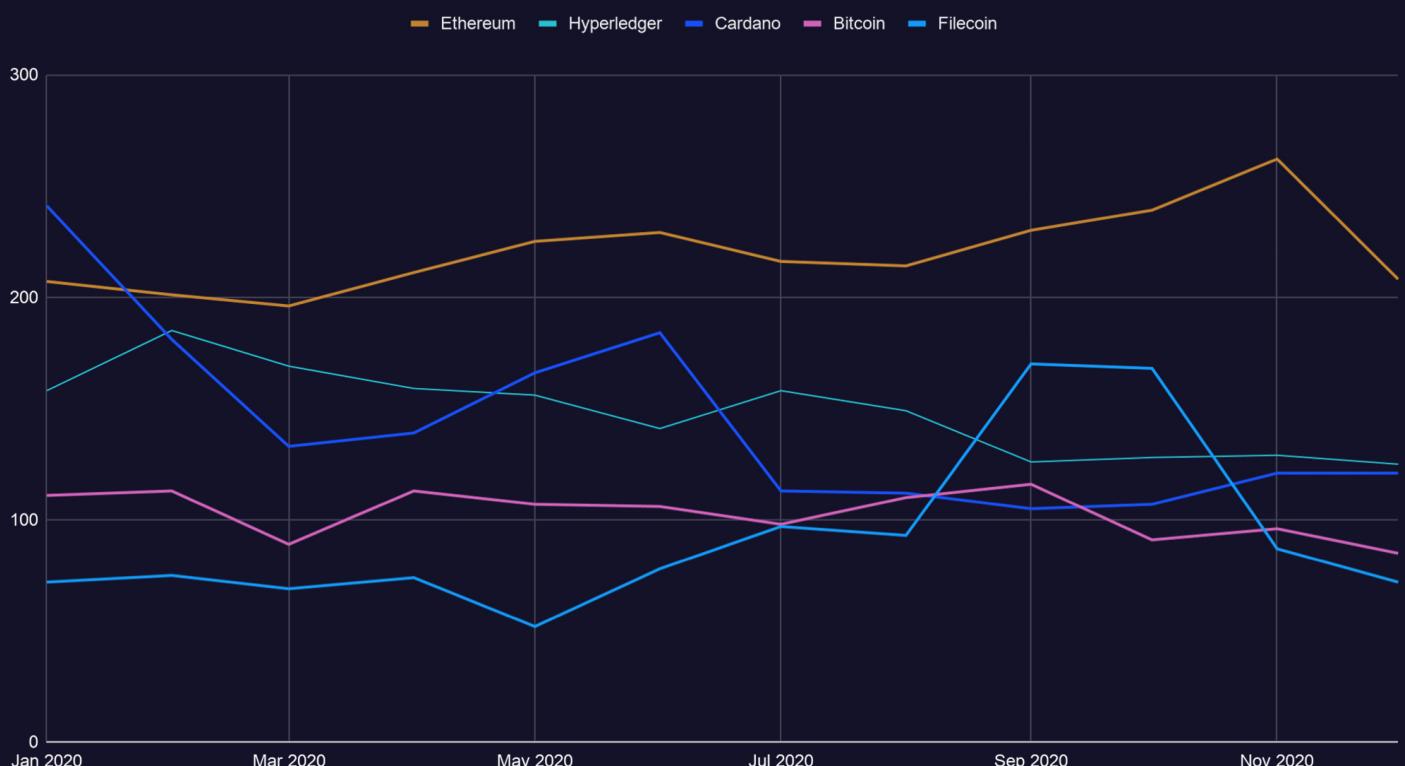
Bitcoin (441), **Filecoin (405)** and **Polkadot (385)** complete the top 5 at levels around 50% of Ethereum and Cardano.

Blockchain - Commits - Top 5



Looking at the monthly active developers, **Ethereum** leads with **220 monthly active core developers on average**, followed by **Hyperledger (149)**, **Cardano (144)**, **Bitcoin (103)** and **Filecoin (92)**.

Blockchain - Core Developers - Top 5



- * **Avalanche, Ocean Protocol, and Terra** saw **heavy gains** in core development.
- * Avalanche's code commits grew 4x by the end of the year, with an even higher peak around mid September which was probably to prepare for their mainnet release on September 21.
- * Terra saw a nearly 5x jump in code commits with the highest code commits to its core repositories being around September, probably because of the public mainnet upgrade, Columbus-4 in early October and the Houston development framework for CosmWasm smart contracts in late September.
- * Ocean Protocol had a consistent rise in code commits, peaking around mid October as they launched Datatokens & Ocean Market. This was a nearly 10x jump from their year start and they ended the year with a 345% increase in commits.
- * **Hedera Hashgraph** and Iota saw moderate gains in core development. Hedera Hashgraph open sourced the source code of Hedera Network Services and Hashgraph Consensus for public review. **Iota** launched their Rust node, 'Bee' in late June and the first phase of Chrysalis (IOTA 1.5) network upgrade in mid August.

Blockchain - Commits - Increasing



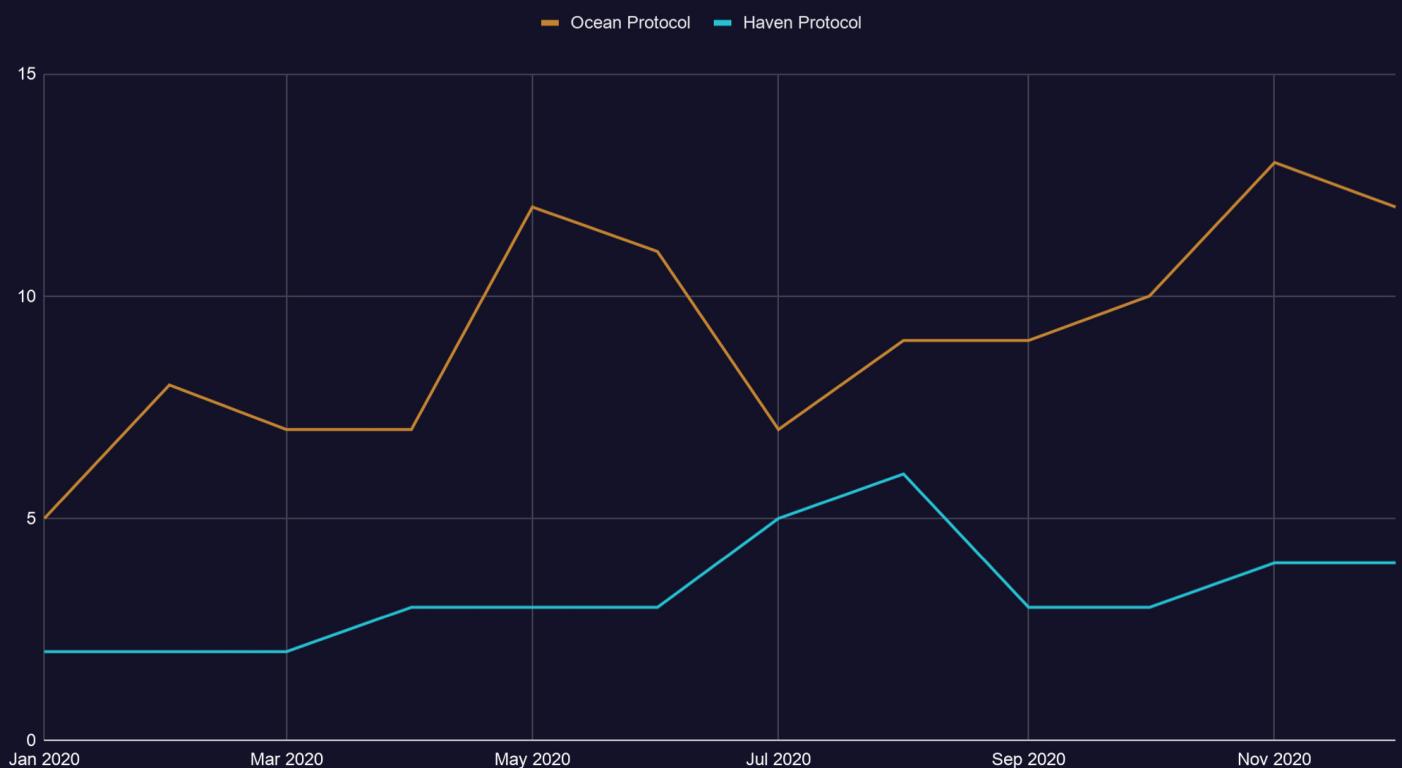
* **Avalanche**, **Terra**, and **Flow** saw sharp increases in developer counts over the year.

Blockchain - Core Developers - Increasing



* **Ocean Protocol** and **Haven Protocol** doubled up in contributing developer count.

Blockchain - Core Developers - Increasing



- * **Polkadot** and **Cosmos** have seen a quite similar pattern in their developer contribution counts, with Polkadot doubling its amount of monthly active core developers and Cosmos increasing by 60%.

Core Developers - Polkadot & Cosmos



* **Filecoin** saw good growth in core development, especially in the third quarter as they were preparing for their mainnet launch in mid October. In May, they launched the second phase of their Testnet, which was the last major milestone before mainnet launch and corresponds to a local maxima in the commits graph as they released two interoperable Filecoin implementations (go-filecoin and lotus), secure proofs (WinningPoSt and WindowPoSt), Drand, an overview of the network's cryptoeconomic structures, a new documentation site, and new security audits before launch. In preparations for Slate (an open source file sharing network designed for research and collaboration) in September and for Mainnet launch on October 15th, the commits rose by 175% from opening weeks.

Commits - Filecoin



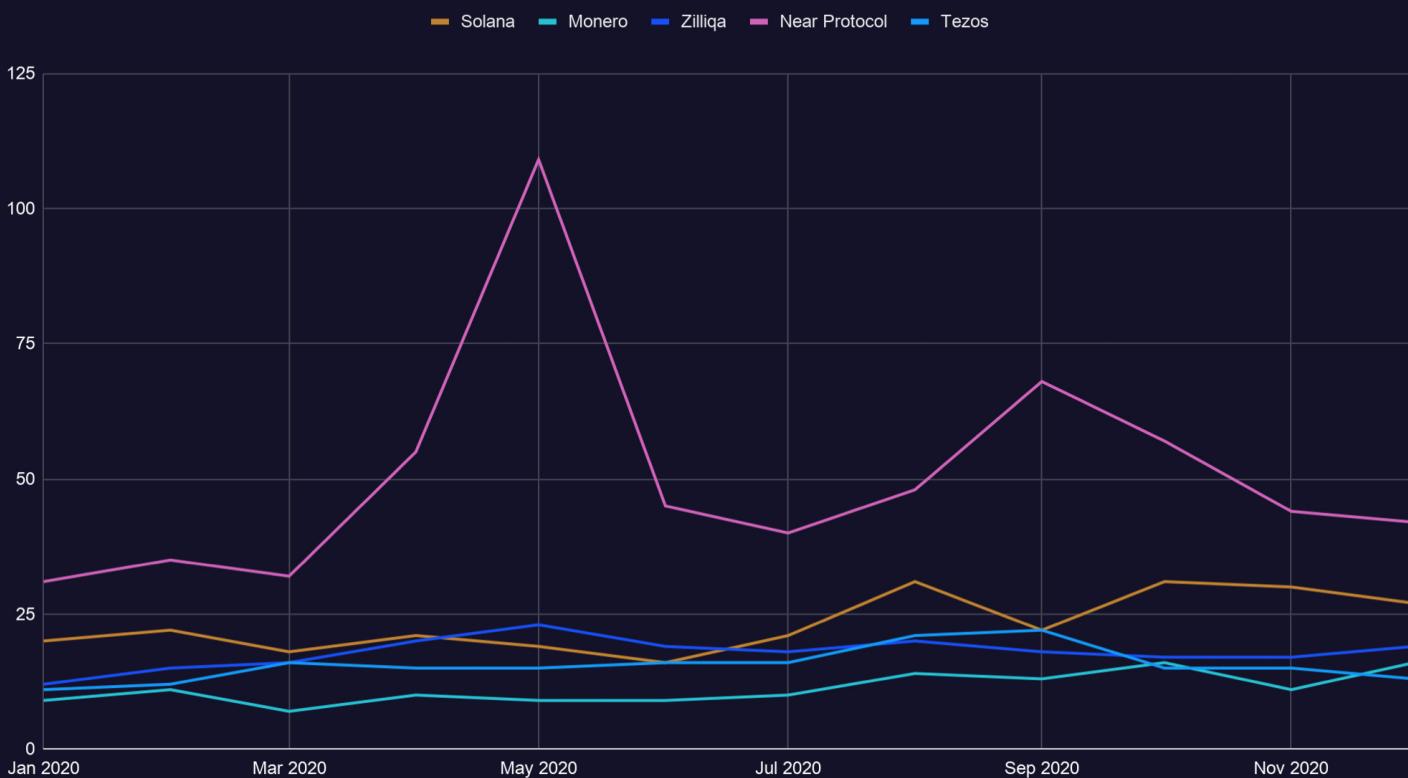
* **Filecoin** saw a steady high level of monthly active developers, peaking around the October mainnet launch.

Core Developers - Filecoin



* **Solana** (36%), **Monero** (35%), **Zilliqa** (33%), **Tezos** (30%) and **Near Protocol** (22%) also saw an increase in contributing developers. Near Protocol saw a strong peak around its mainnet launch end of April 2020.

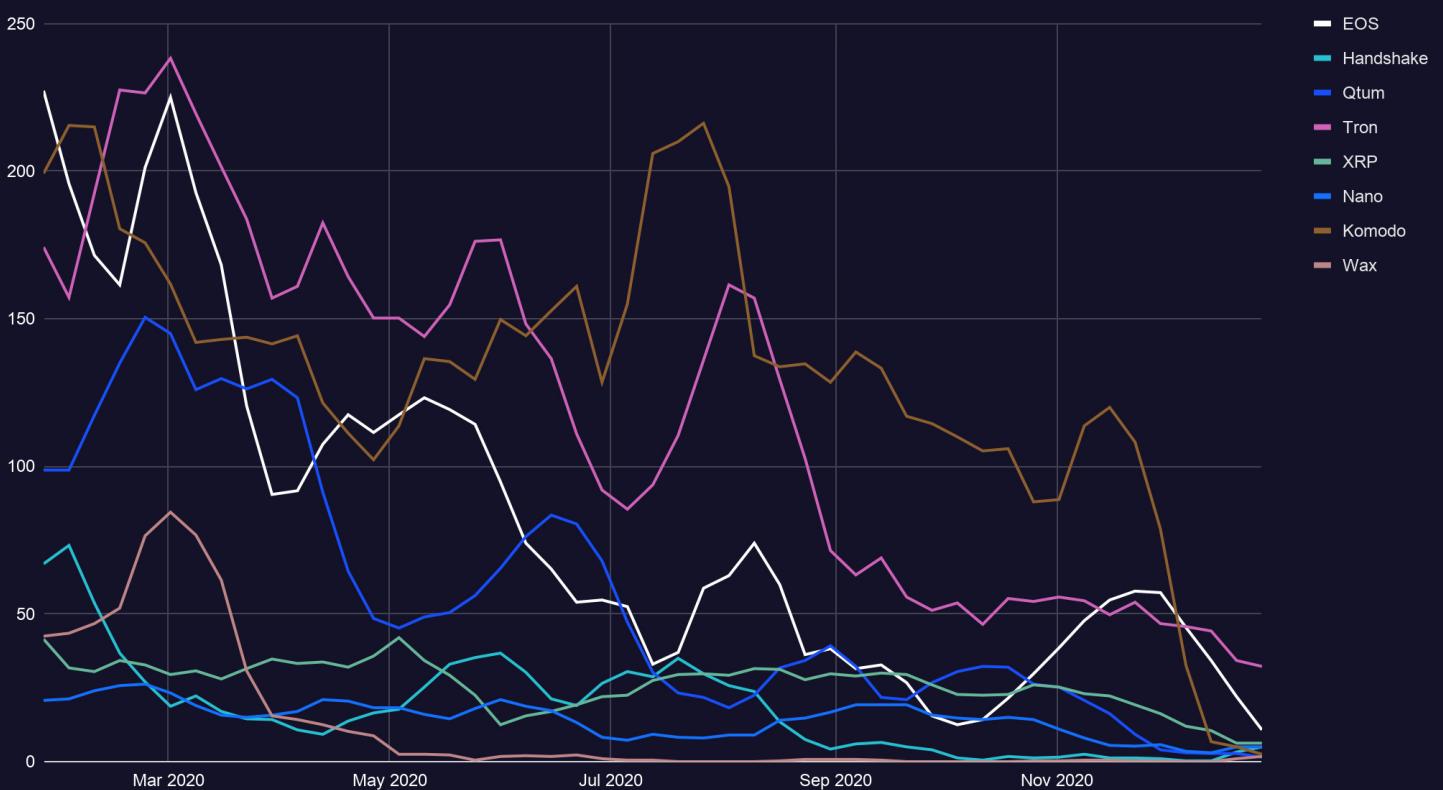
Blockchain - Core Developers - Moderate Increase



In Decline

- * **EOS, Tron, XRP, Qtum, Komodo, Nano, Handshake** and **WAX** all dropped in commits with 50% or more.
- * Considering WAX has pivoted toward an NFT marketplace, this might explain the decrease of open source development activity, as we will see further in this report that most NFT marketplaces follow a closed source approach.

Blockchain - Commits - Decline



* **Tron, EOS, Cardano, Qtum, WAX, and Komodo** saw a decline in developer counts over the year.

Blockchain - Core Developers - Decline

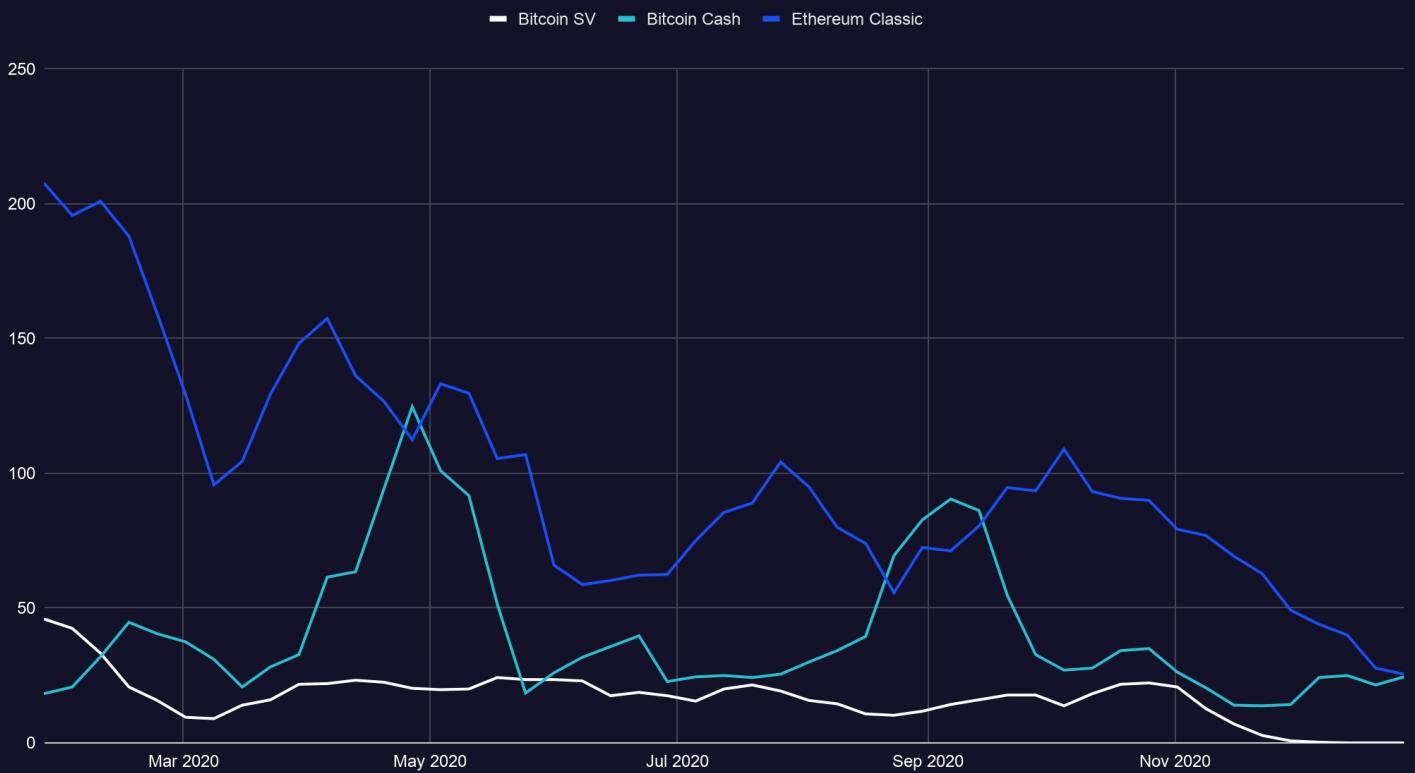


* Ethereum Classic and Bitcoin SV declined over the year as Ethereum, Bitcoin and Bitcoin Cash held their ground.

Commits - Bitcoin and Ethereum



Commits - and their near (and distant) cousins



* **Permissioned (non-tokenized) blockchains** did not have a great year in terms of development either. **Hyperledger** after a good start, saw a significant decline in core development. **Corda** saw rising commits in the first half of the year which came back to old numbers by the end of the year, doing better than Hyperledger in maintaining its level but still lagging behind Hyperledger.

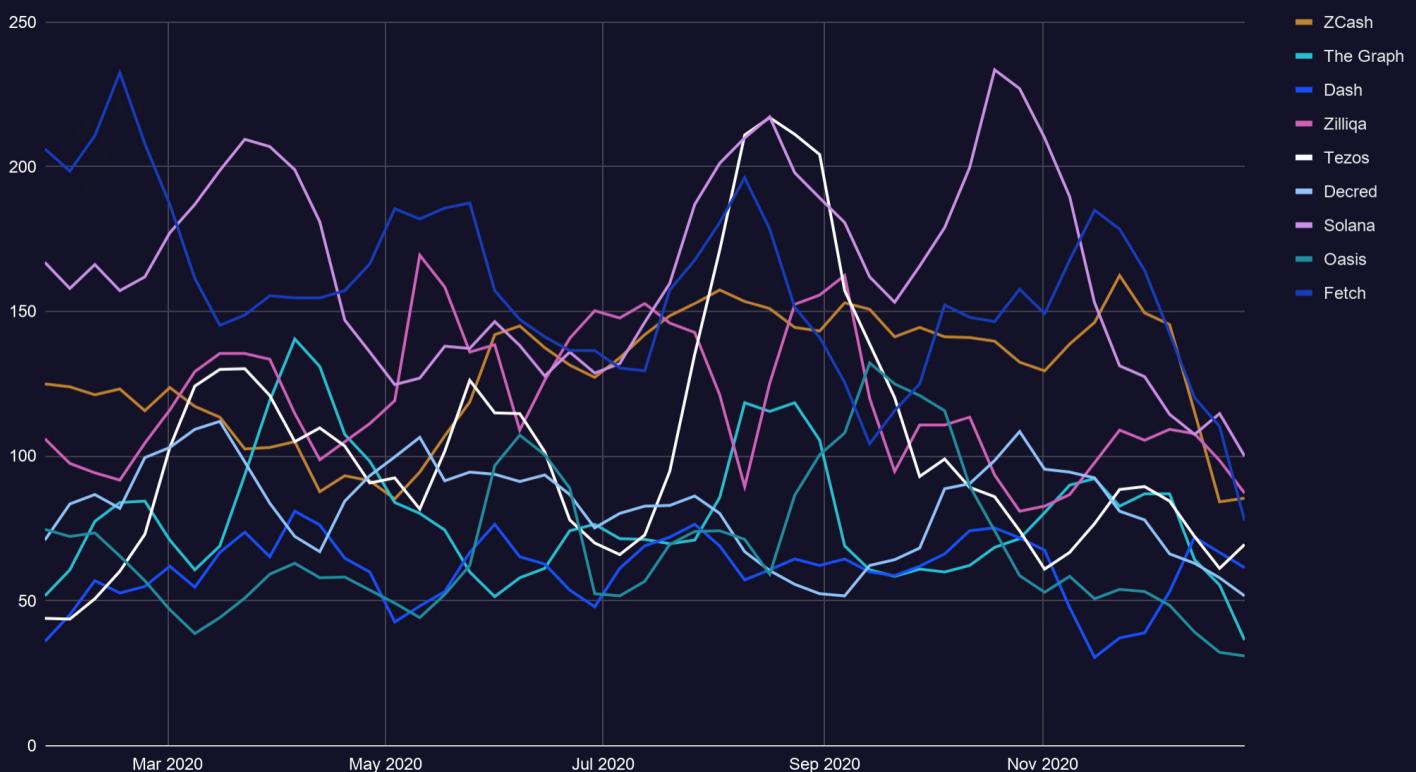
Blockchain - Commits - Non-tokenised



Strong and Steady

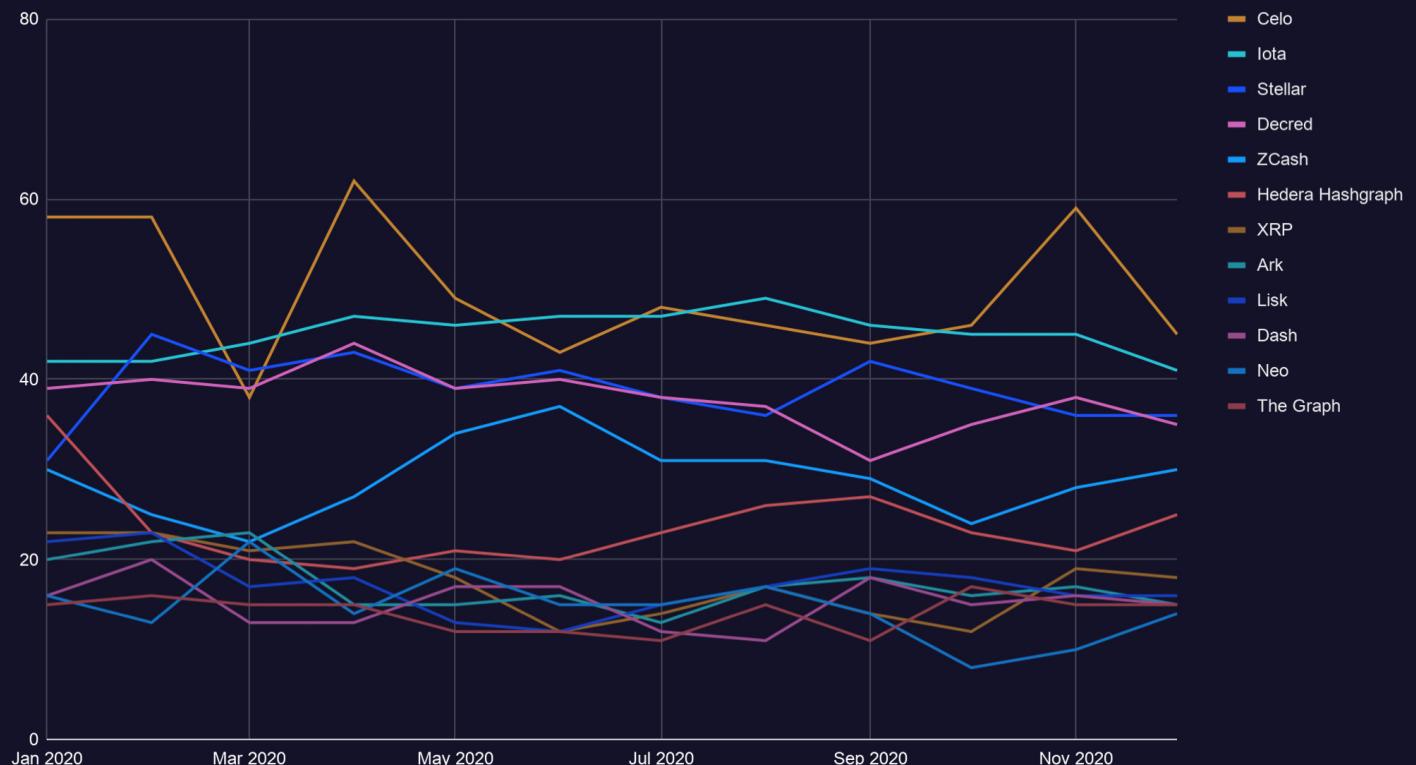
- * A large group of blockchain protocols were steady in their core development, averaging over 50 weekly commits.
- * Besides the top 5 most active projects, other projects showing consistent development throughout the year were **The Graph, Dash, ZCash, Zilliqa, Tezos, Decred, Solana, Oasis** and **Fetch.ai**.

Blockchain - Commits - Steady



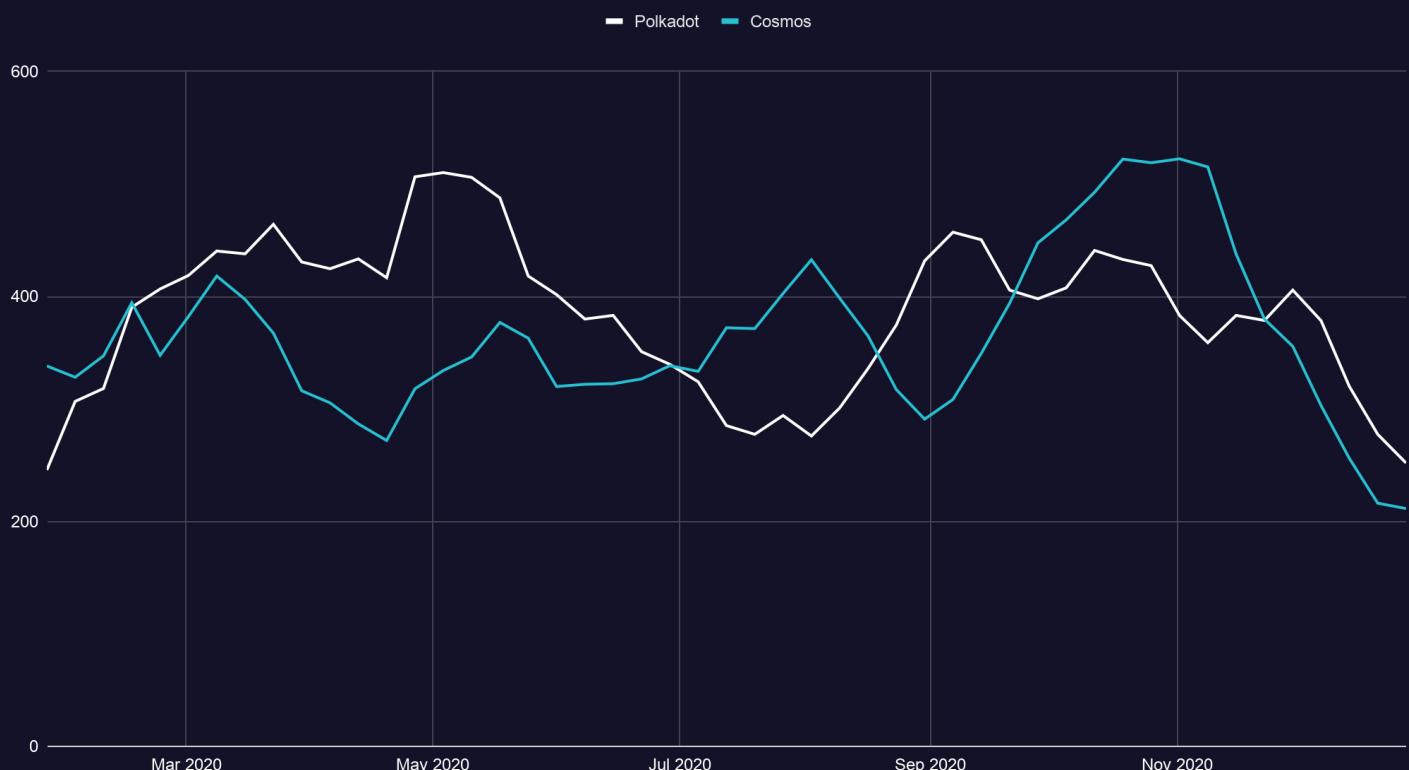
- * Looking at monthly active core developers, we see a similarly large group with at least 10 monthly active developers on average. **Celo (50)**, **Iota (45)**, **Stellar (39)**, **Decred (38)** and **Zcash (29)** are leading the pack.

Blockchain - Core Developers - Steady



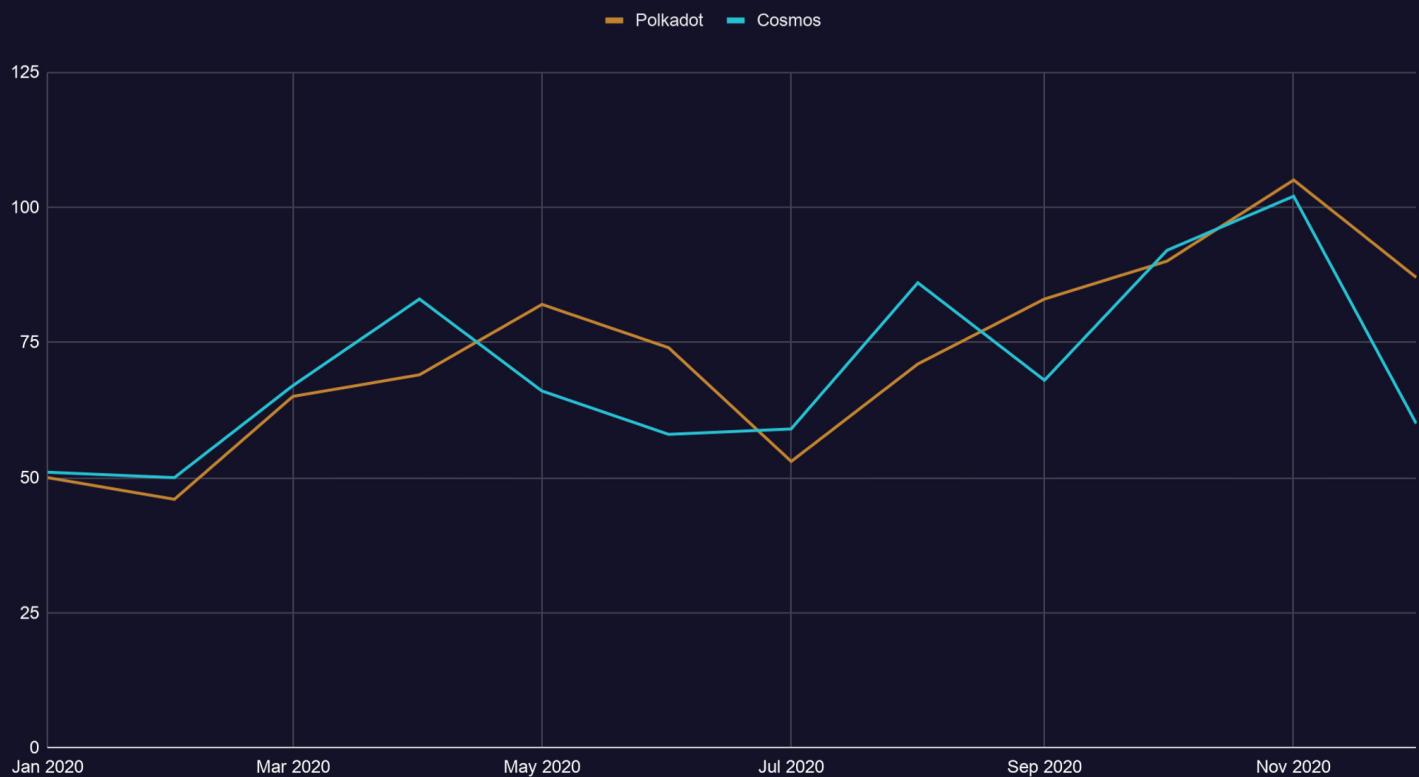
* **Polkadot** and **Cosmos** have been steady in core development metrics and maintaining their growth achieved over the past year. Polkadot increased its level of code commits by 53% from its initial weeks to May, preparing for the much awaited release of the single relay chain on May 26th.

Commits - Polkadot and Cosmos



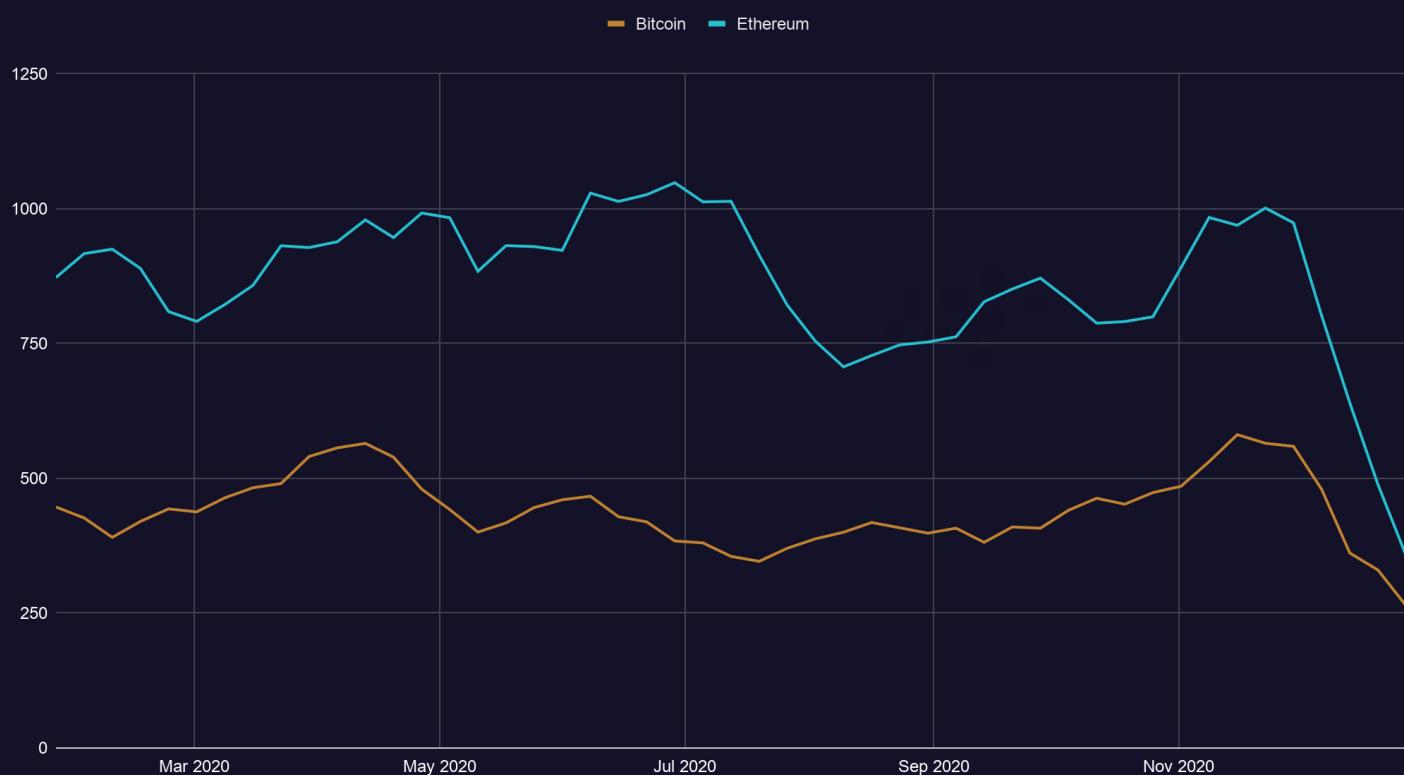
- * Both **Polkadot** and **Cosmos** show an increasing trend in monthly active core developers, ending the year with an increase of 100% (Polkadot) and 60% (Cosmos) through 2020, despite a decrease around the holiday season.

Core Developers - Polkadot & Cosmos



* **Bitcoin** and **Ethereum** have also been going strong in development over the year, however the festive season at year end saw a fall in core development.

Commits - Bitcoin and Ethereum

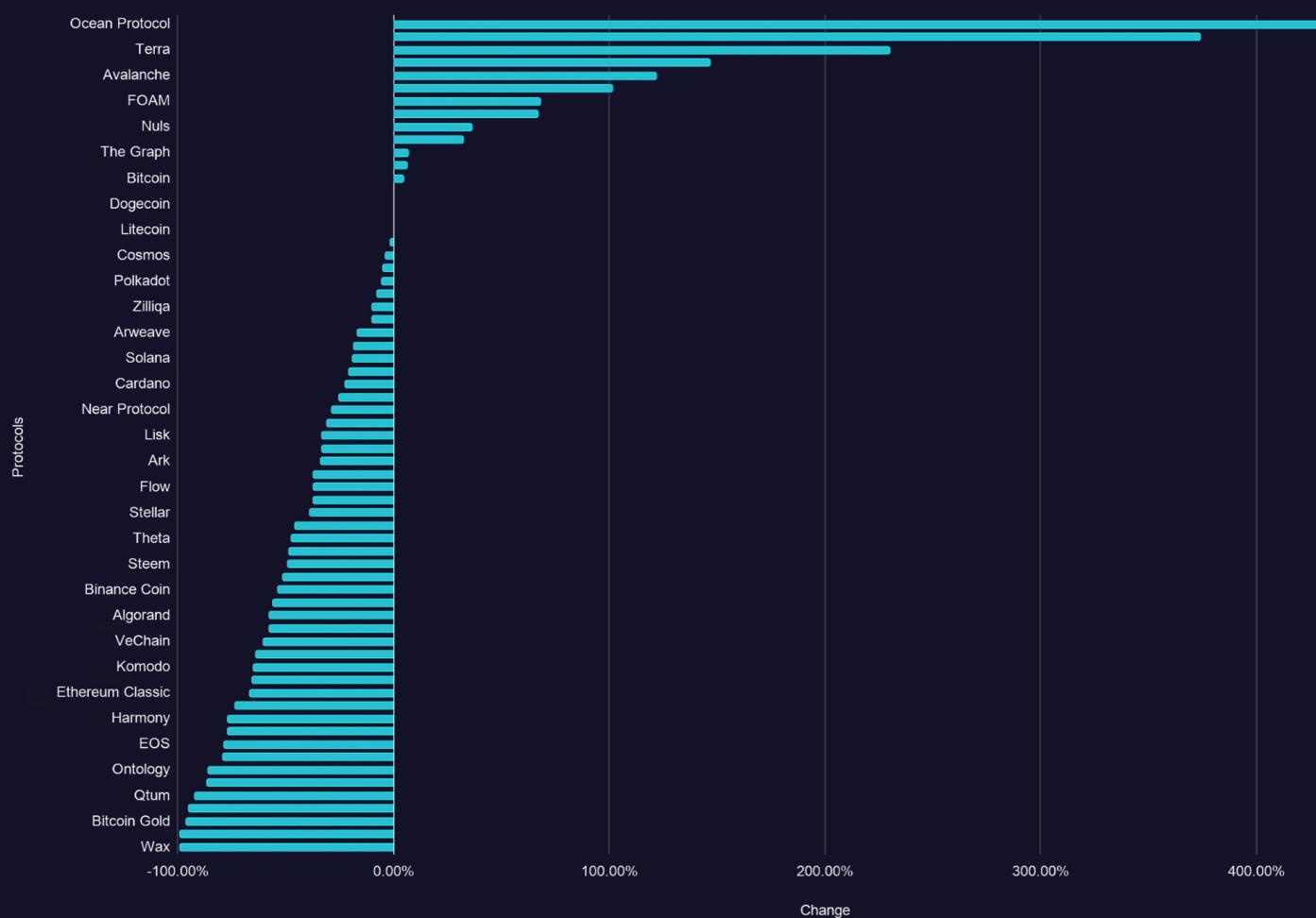


The change in commits and monthly active developers over the year is calculated by averaging the commit counts over the first and last two months of the year and calculating the percentage change thereof.

Note that some protocols showing great growth have not been included in earlier sections because while the relative change was large, the absolute numbers of commits and developers were low.

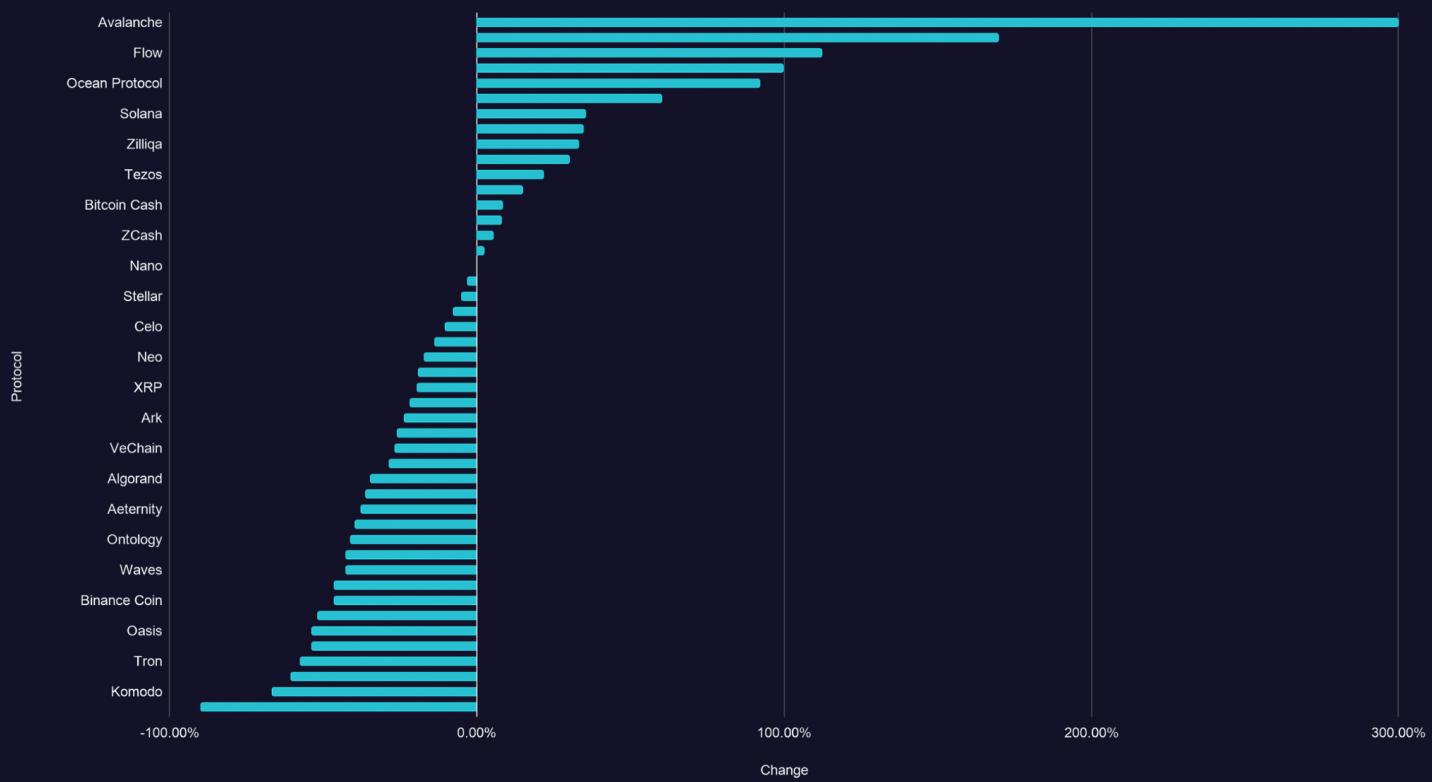
Change in weekly commits:

Blockchain - Change in Commits during 2020



Change in monthly active developers:

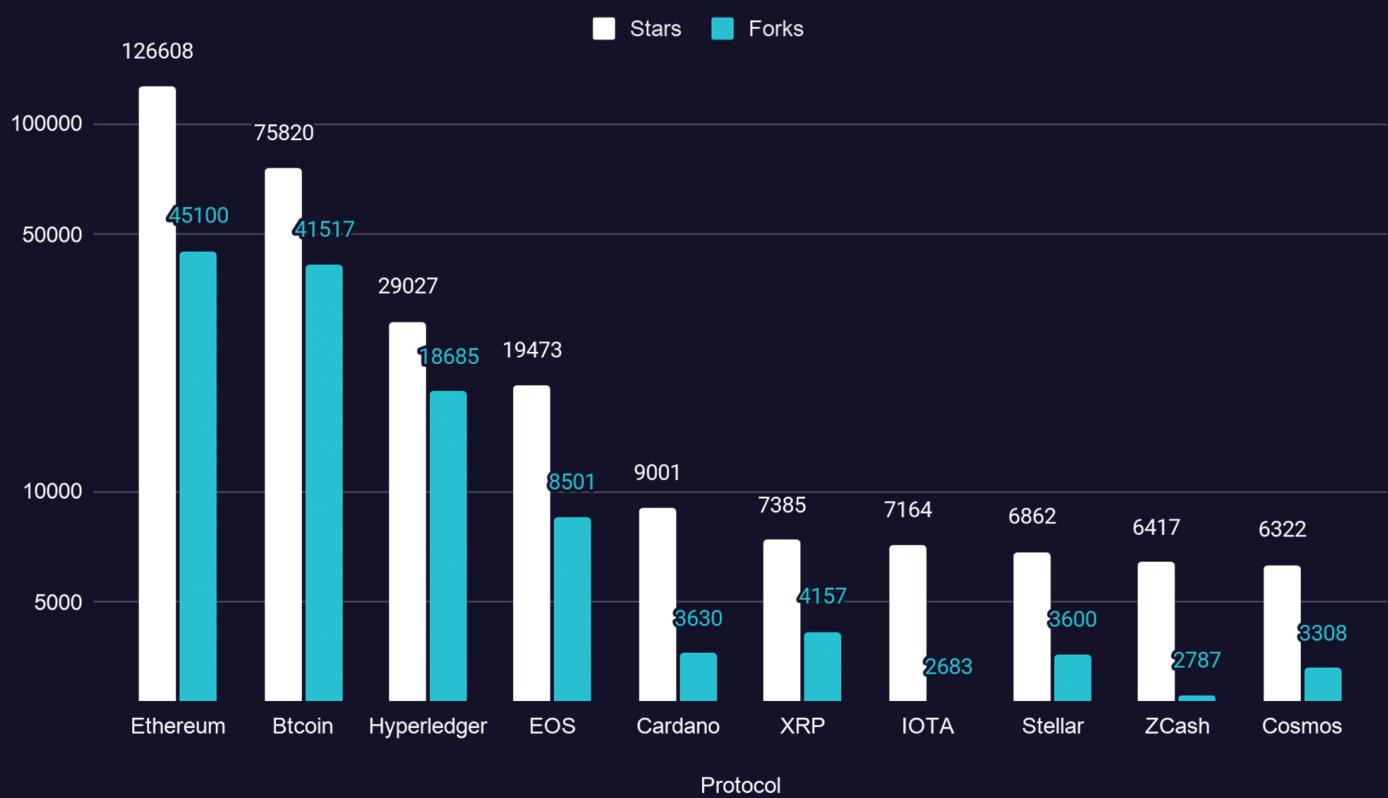
Blockchain - Change in Core Developers during 2020



Ethereum has by far the most number of stars, followed by **Bitcoin** and **Hyperledger**. Note the chart has a logarithmic scale - Ethereum has almost double the stars of Bitcoin, and the difference between Bitcoin and Hyperledger is even greater. These three protocols have been forked the most as well, as part of external developers contributing code, and to give birth to forked chains and pet projects.

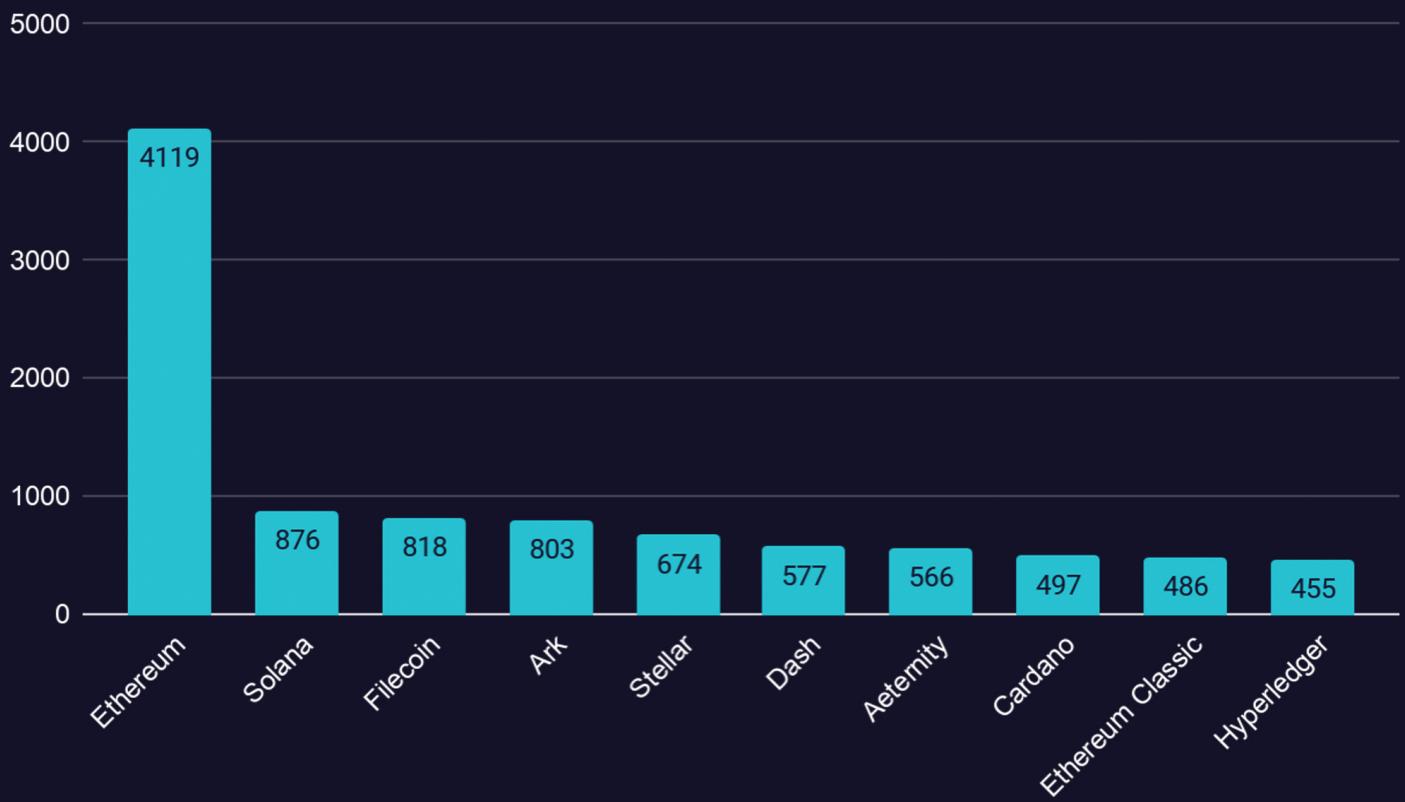
Other than these, **EOS** has also been forked quite a bit explaining the many sister chains like Telos. **Ripple** and **Stellar** follow closely after that in fork count.

Blockchain - GitHub Statistics



Against a towering release count of **Ethereum at 4119** releases to date, all other protocols have less than a thousand releases.

Blockchain - Releases



>DeFi Protocols_

2020 was the year of DeFi. Over the year, the total value (in USD) locked into DeFi protocols as per DeFi Pulse increased from a little **under \$700 million in January 2020** to about **\$15 billion by December**.

The top 50 DeFi protocols by amount locked (in \$) across all categories in the [DeFi Pulse](#) Leaderboard were analyzed for metrics like core development, contributing developers and codebase statistics and compared for the purpose of this report.

In DeFi there is a strong open source mentality. A large part of development happens in smart contracts, which need to be open source for security reasons because of the high amount of value involved. Most DeFi projects also open source all their other components like frontend applications and libraries, again because of the high amounts of value involved, and the decentralized, community-oriented nature of many of these projects.

This open source mentality is reflected in the fact we see many forks of projects (and forks of forks of forks...) as well as "mashups" combining code from multiple DeFi protocols to create a new protocol.

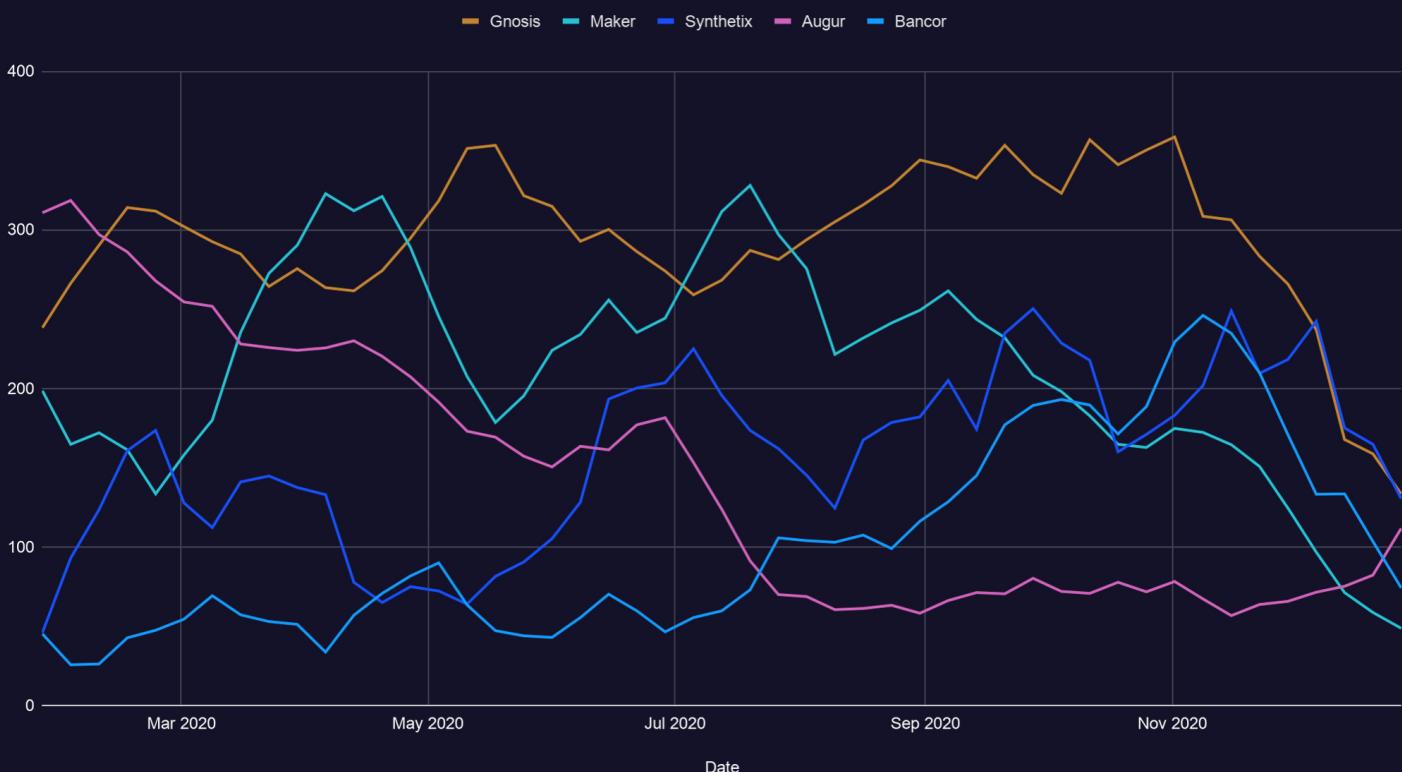
- * **Maker** is still the **most actively developed** DeFi protocol, but its **numbers are decreasing**.
- * Overall most active projects are **Maker**, **Gnosis** and **Synthetix**, with Gnosis showing the most consistently high development activity throughout the year (276 weekly commits on average) and **Synthetix** showing the **greatest increase (58%)**.
- * The two DeFi protocols **growing most in code commits** were **Aave (763%)** and **Bancor (264%)**.
- * Yearn Finance and **SushiSwap**, launched in June and September 2020 respectively, quickly grew toward and beyond the development activity and size of most other DeFi protocols.

Top 5 most active

The most active projects within DeFi in terms of commits were **Gnosis, Maker, Synthetix, Augur** and **Bancor**. Of these, Gnosis showed the highest and most stable level of development activity with an average of 276 commits per week, while Synthetix showed the most growth, with an increase of 58% in weekly commits.

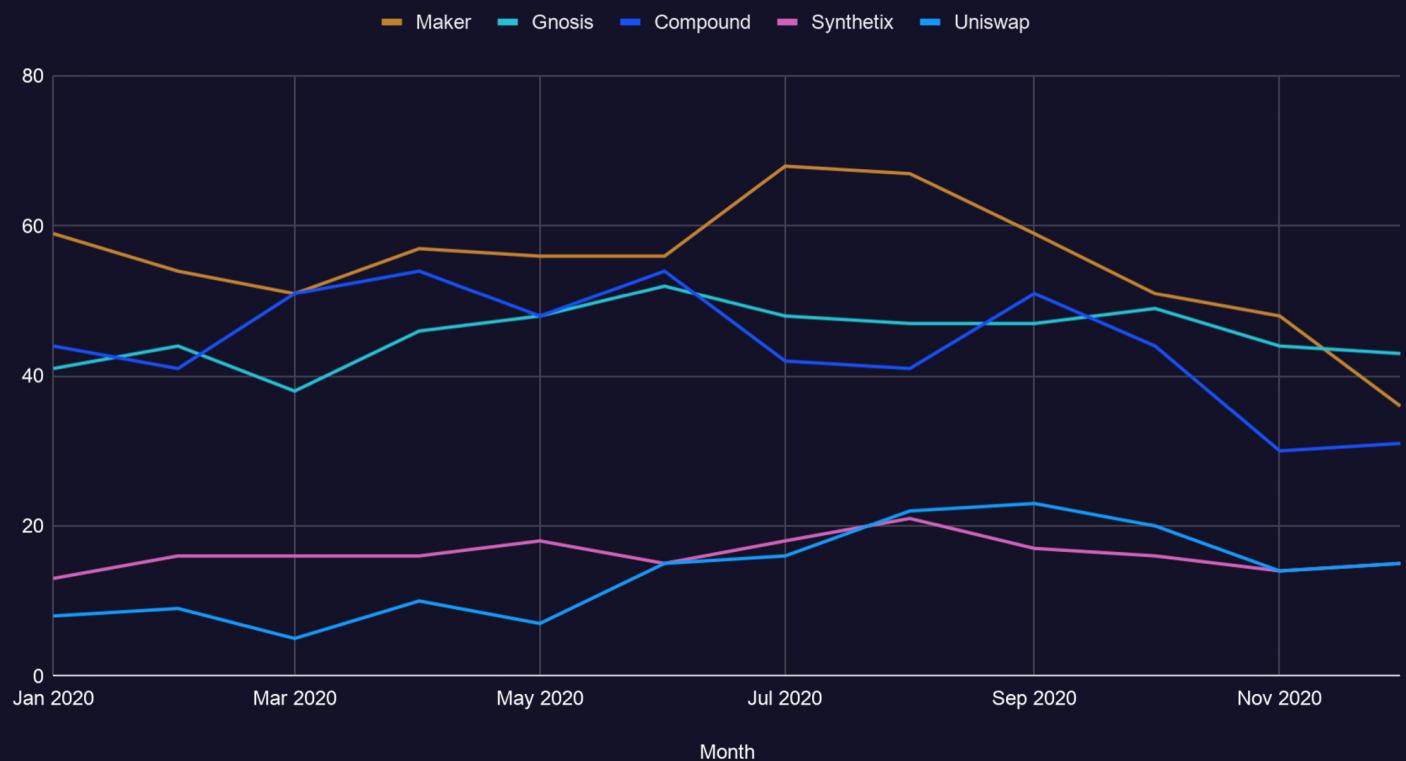
Notably all of these projects were started in 2018 or earlier. Some newer projects that made a lot of the news headlines in 2020 like **Yearn Finance, SushiSwap** and **Curve Finance** had good levels of core development activity, but haven't proven their long-term stamina in terms of development activity or community yet.

DeFi - Commits - Top 5



In terms of average monthly active developers, the top 5 includes **Maker**, **Gnosis** and **Synthetix** again, as well as two other projects that are central to DeFi: **Compound** and **Uniswap**.

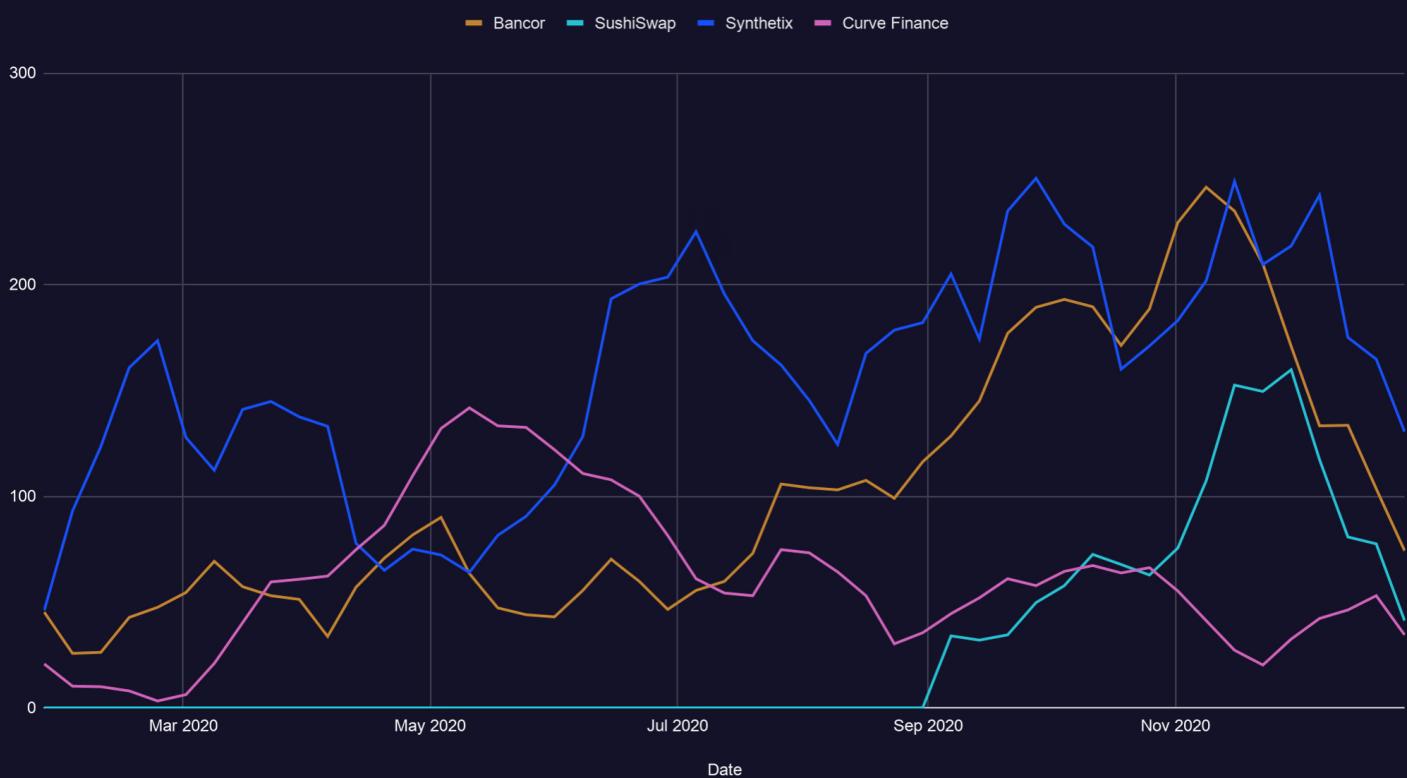
DeFi - Core Developers - Top 5



The greatest increase in commits over the year was shown by **Aave (763%)**, **Bancor (264%)**, **Set Protocol (161%)** and **mStable (153%)**. **SushiSwap** and **yearn.finance**, both projects started in 2020, showed considerable growth too, followed by **Curve Finance**, **PieDAO** and **Synthetix**.

Of the growing projects, **Bancor**, **SushiSwap**, **Synthetix** and **Curve Finance** reached the highest absolute commit numbers.

DeFi - Commits - Increase



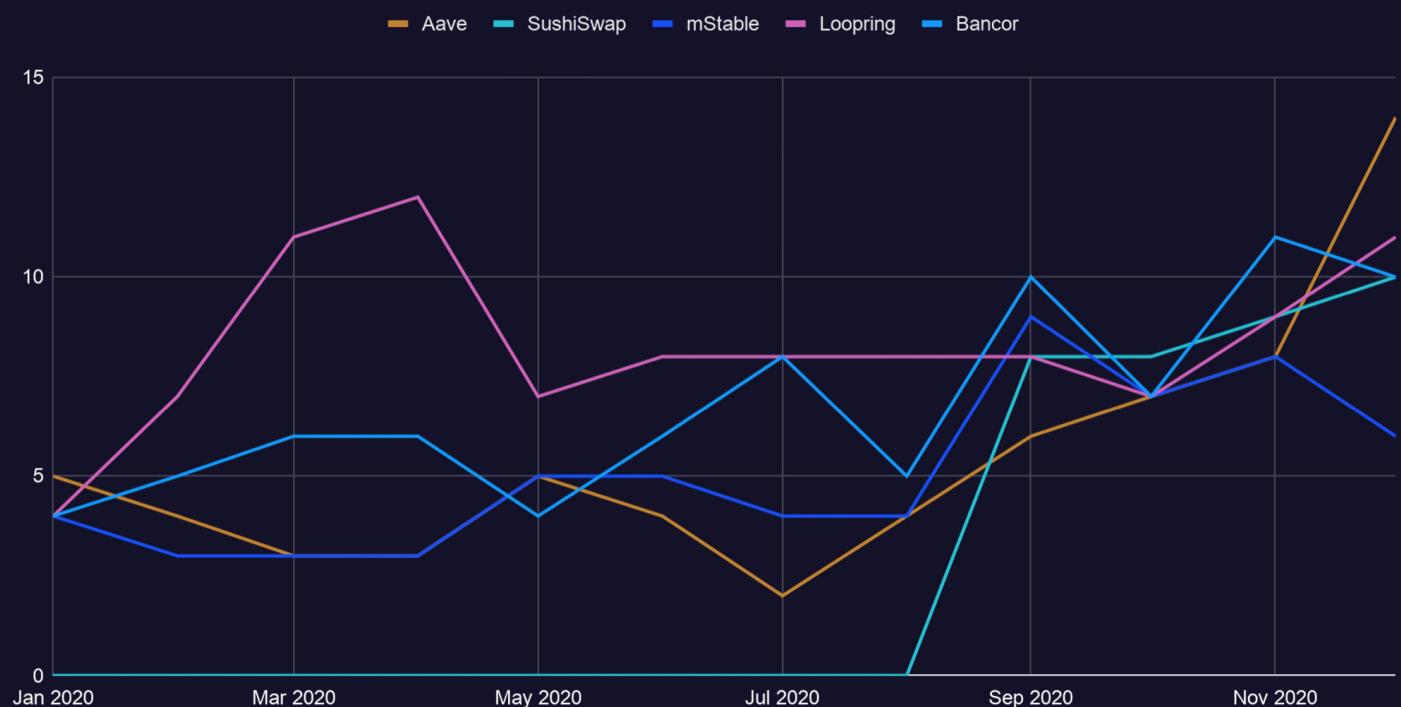
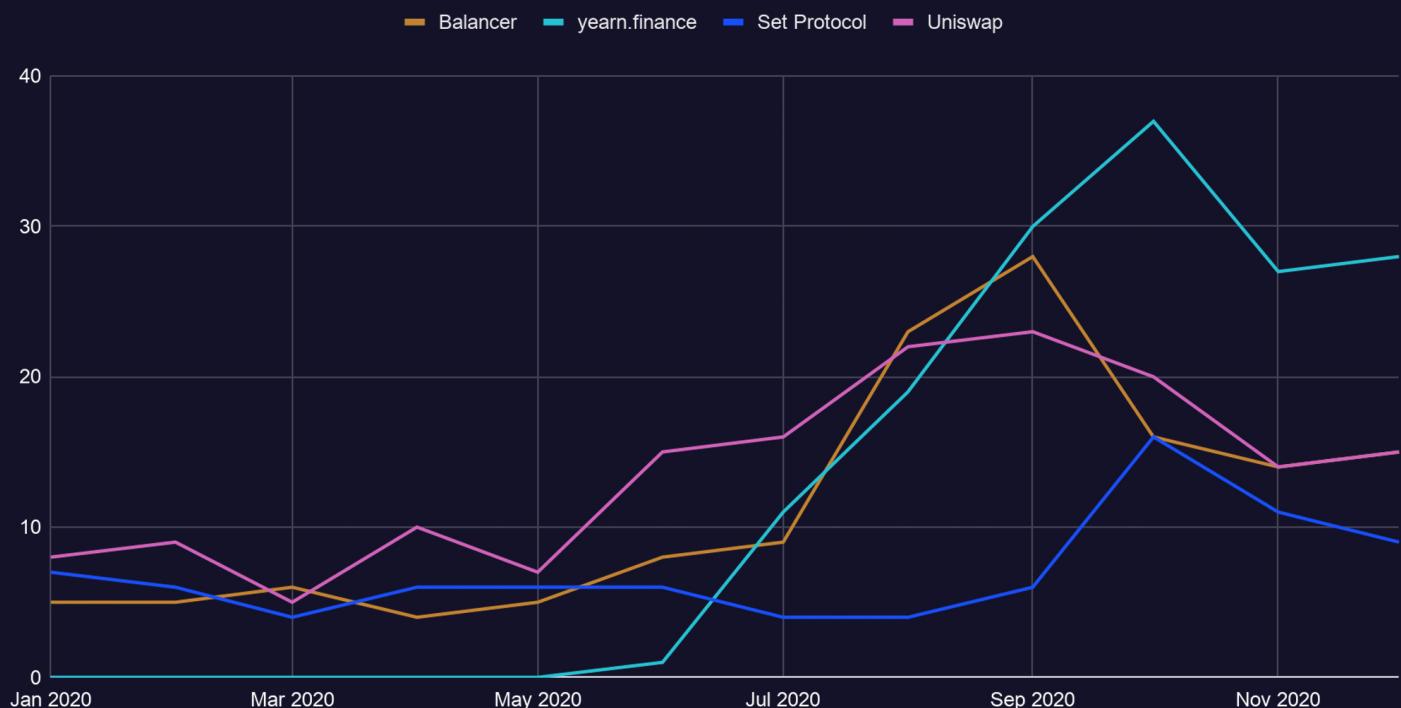
Aave, Set Protocol, mStable, yearn.finance and PieDAO all had an uptrend with a strong peak at the end of the year.

DeFi - Commits - Increase



Balancer (190%), Aave (144%), Bancor (133%), mStable, Loopring, Uniswap and Set Protocol all saw an increase in monthly active developers of over 50%. **SushiSwap** and **yearn.finance** stand out again, growing from zero to respectively 29 and 11 monthly active developers in the course of months. If **yearn.finance** is able to maintain or grow its group of core developers, it would end up in the top 5 of most active DeFi projects by monthly active developers, as it has already surpassed **Synthetix** and **Uniswap** on that metric.

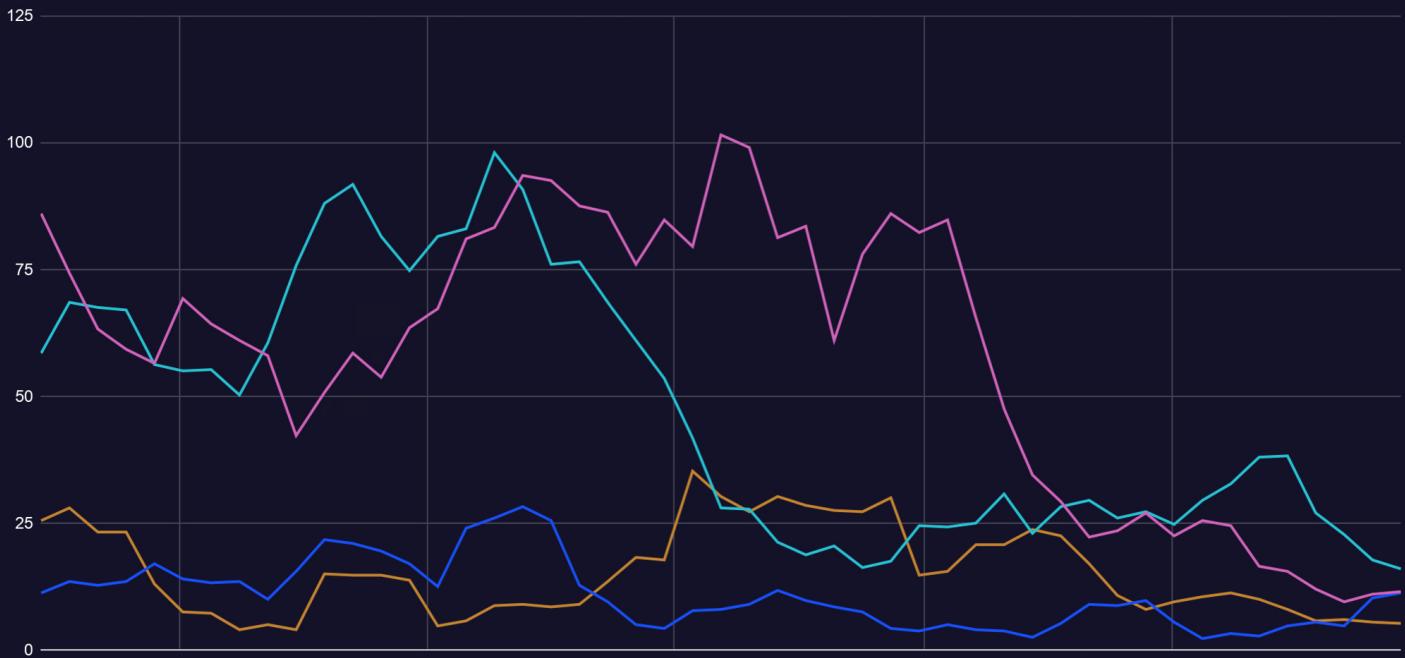
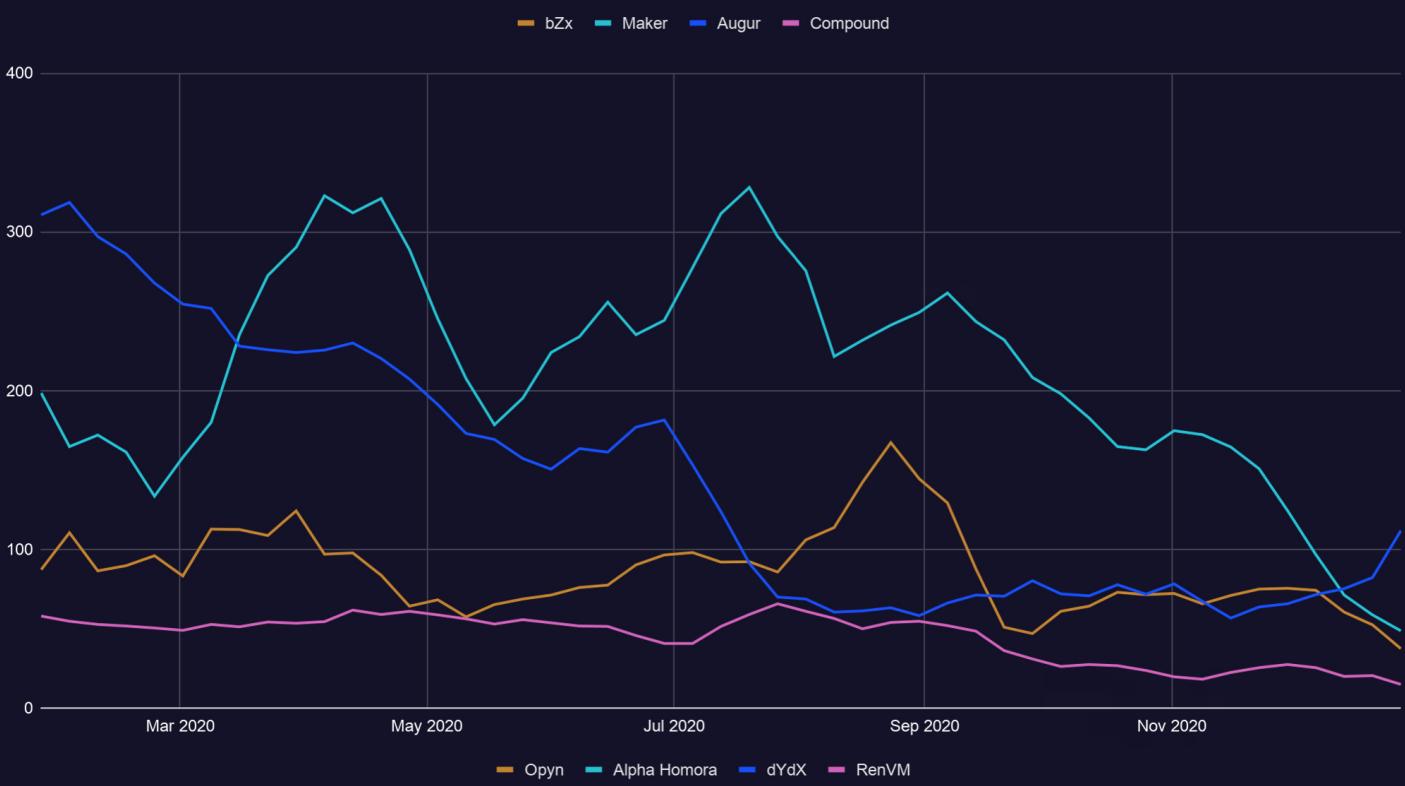
DeFi - Core Developers - Increase



In Decline

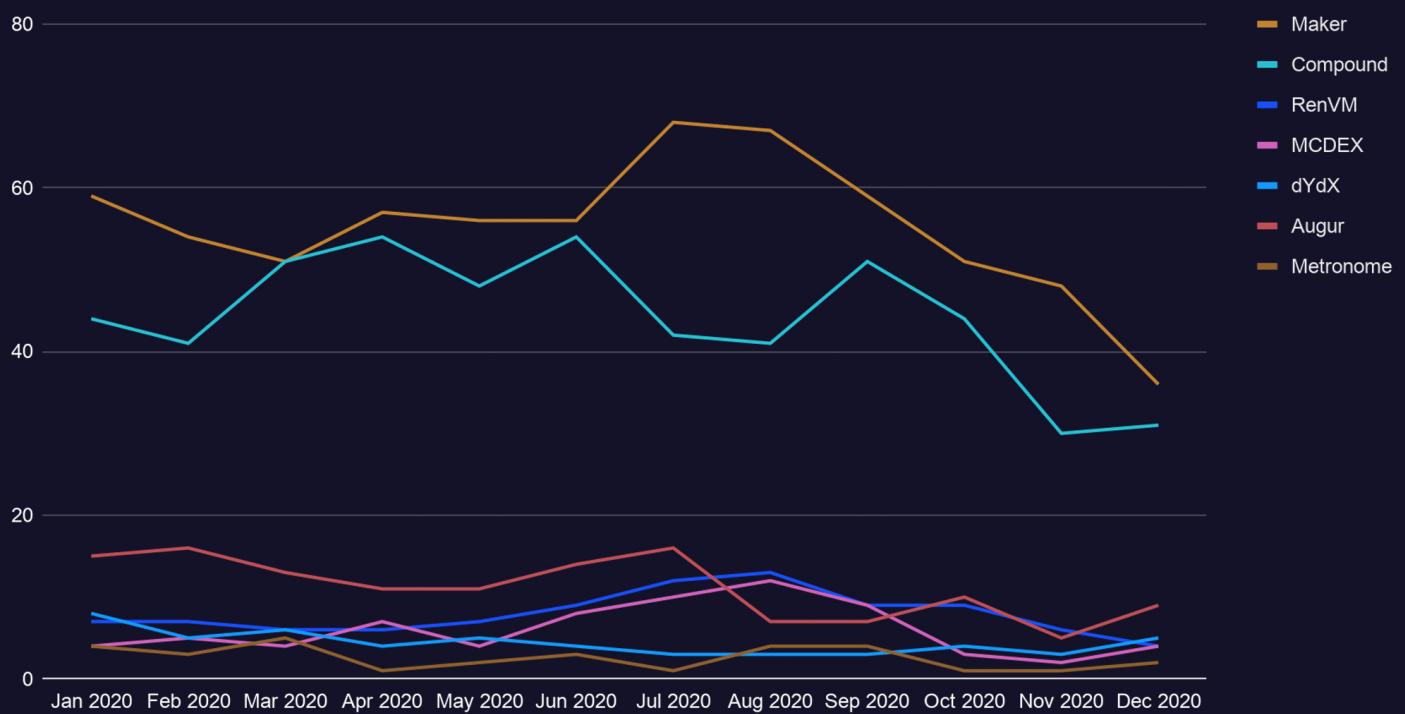
Looking at projects showing a **decrease of over 33% in commits or monthly active developers**, the first thing to note is that we see overall top 5 projects **Maker**, **Compound** and **Augur** again, now in a more critical light. They have all declined by over a third on both metrics. This suggests the old guard is losing developers to a new generation of protocols. Projects showing over 33% decline in code commits over the year were **bZx**, **Maker**, **Opyn**, **InstaDApp**, **Alpha Homora**, **dYdX**, **Compound**, **Augur**, **RenVM**, and **MCDEX**.

DeFi - Commits - Decline



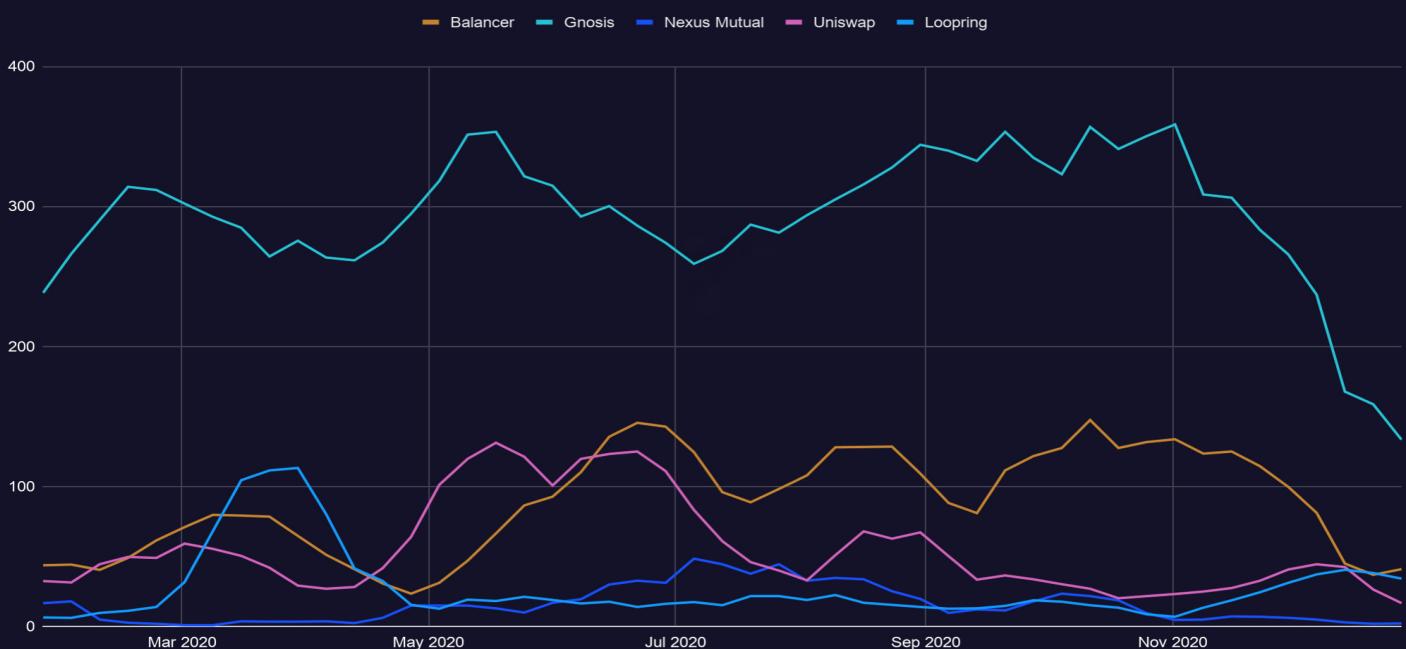
Maker, Compound, RenVM, MCDEX, dYdX, Augur and Metronome all lost over 33% of monthly active developers. **Maker** and **Compound** are still at 2-4x multiples of monthly active developers compared to most other DeFi projects, but if this trend continues they will quickly be at the same levels.

DeFi - Core Developers - Decline

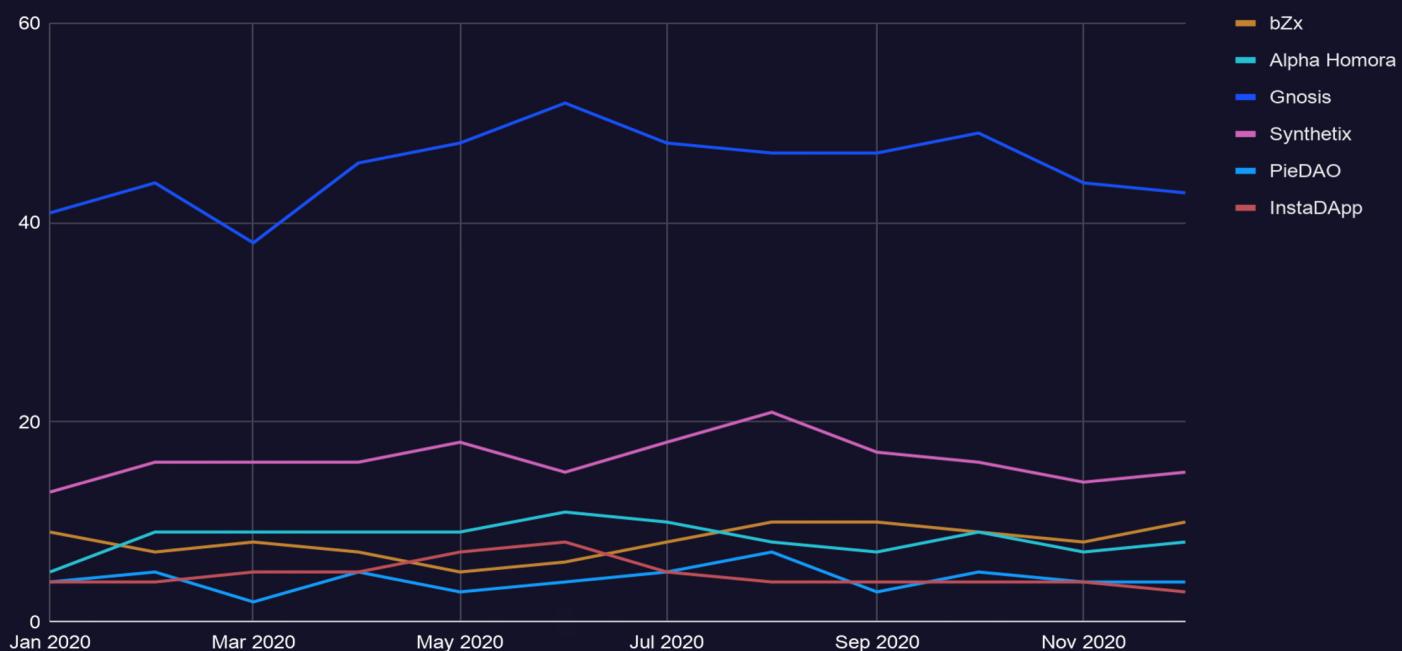


Balancer, Gnosis, Nexus Mutual, Uniswap, and Loopring saw steady commits across the year. Gnosis stands out again, with an average number of weekly commits of 276 rivaling those of major blockchain interoperability projects Polkadot (385) and Cosmos (364).

DeFi - Commits - Steady



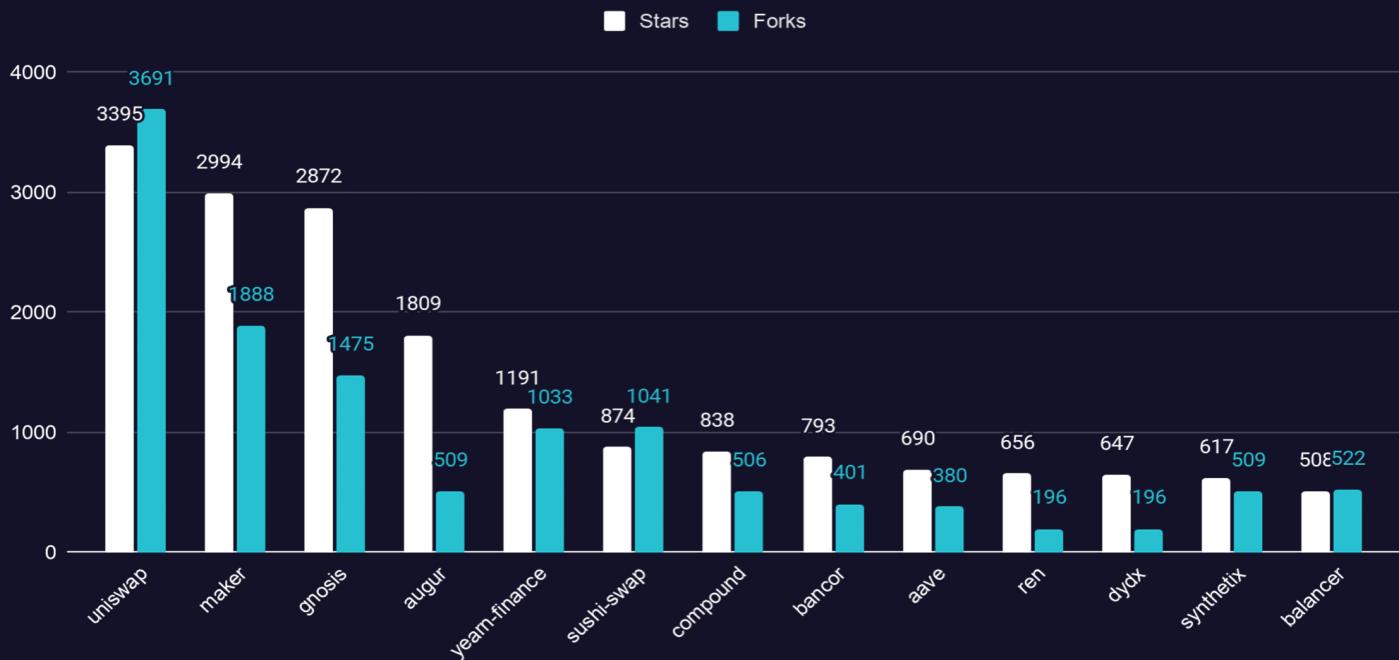
DeFi - Core Developers - Steady



GitHub Statistics

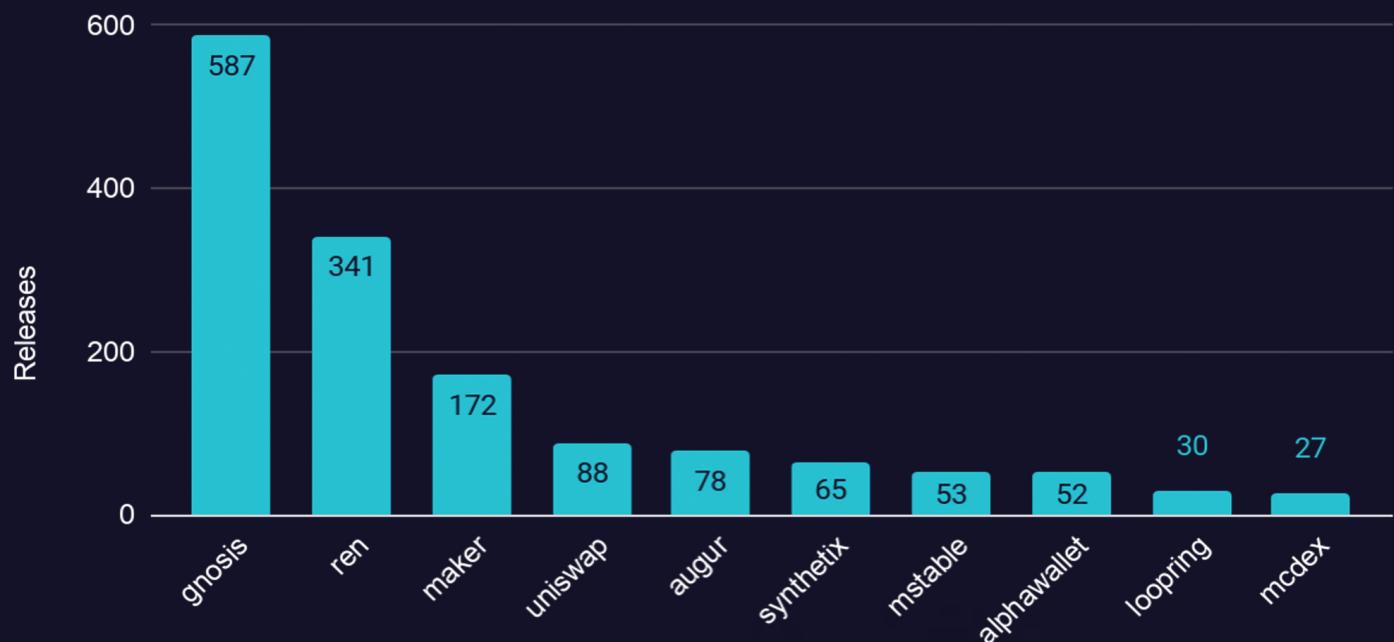
Uniswap has the most number of stars and forks, followed by **Maker** and **Gnosis**. Thereafter, **Augur** has been starred more whereas **yearn.finance** has been forked more amongst the two.

DeFi - GitHub Statistics



Gnosis has the highest number of releases (587). The other protocols have under 500 releases.

DeFi - Releases



>NFTs and Metaverse technologies_

Another big market trend in 2020 was the rise of non-fungible tokens (NFTs), particularly in the second half of the year. Building on enabling technologies and standards that existed for a longer time, like ERC721 and ERC1155, applications like digital art and gaming saw significant uptake. Related, we saw strong growth in virtual worlds or metaverses, both centralized and decentralized, fueled by lockdowns keeping people physically in their homes and eager for social encounters online. We've taken a first look at open source development trends in NFT and Metaverse projects.

Executive summary

Projects building NFTs and Metaverse technologies, in stark contrast to DeFi protocols, tend to follow a **closed source development approach**. The increase in interest in NFTs and Metaverse applications was not reflected in open source core protocol development metrics. This applies to marketplaces for digital art, to blockchain-based games, and to the virtual worlds themselves.

A **notable exception is Decentraland**, which has a level of open source core development activity on par with some of the larger DeFi protocols.

We have sourced projects starting from top volume at NonFungible.com, and have considered four main categories:

- **NFT marketplaces**
- **Collectibles**
- **Gaming**
- **Metaverses / virtual worlds**

After initial review, it became clear that in NFT marketplaces, Collectibles and Gaming, there is **very little open source development activity**. Unlike core blockchain technologies and DeFi projects where code repositories are presented first and foremost, for NFT-projects it's very common to not find any open source code presented, or the organization to exist on GitHub but without any public repositories. This extends to Metaverse projects, where major projects like Somnium and The Sandbox have little to no open source technology available.

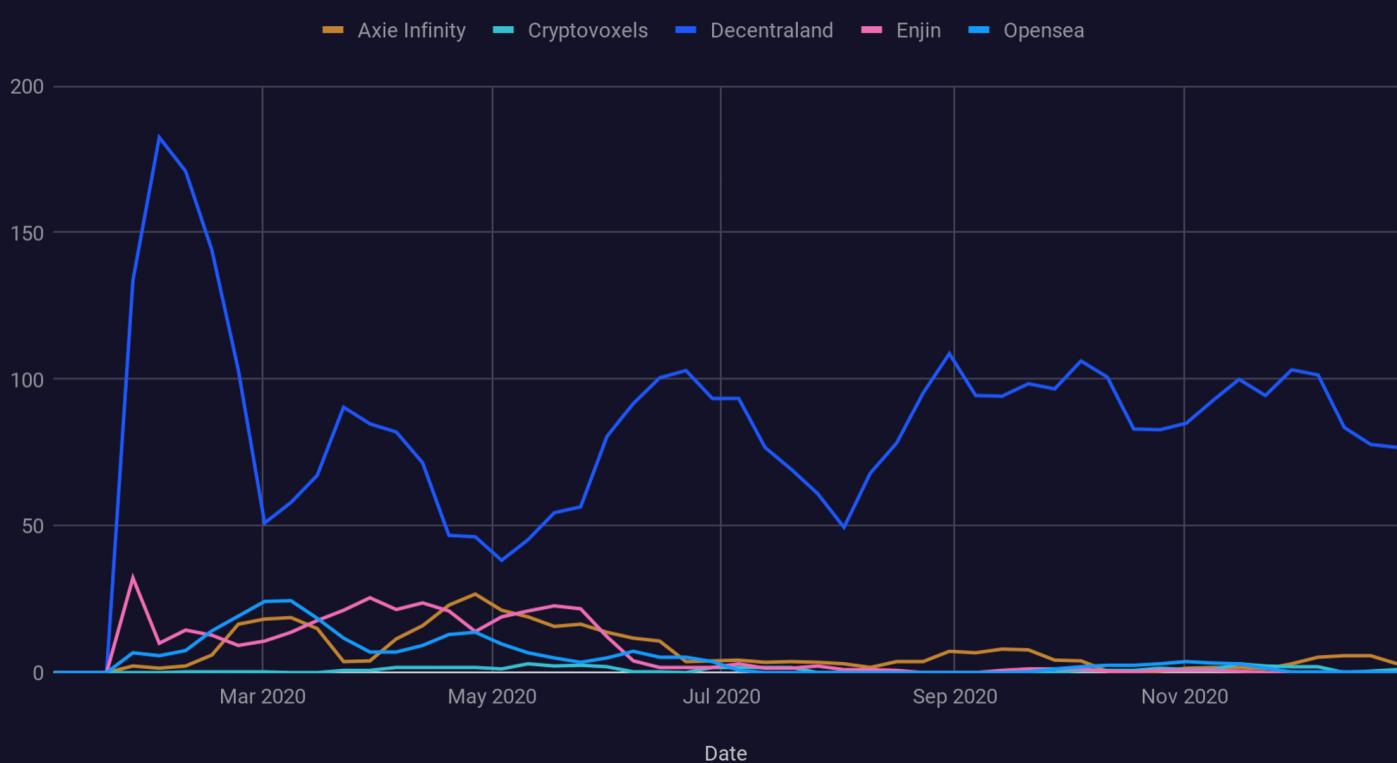
The analysis is therefore limited to **five projects** that show at least a minimum level of open source activity: **Axie Infinity** (Metaverse / Gaming), **Cryptovoxels** (Metaverse), **Decentraland** (Metaverse), **Enjin** (Collectibles / Gaming), **Opensea** (NFT marketplaces).

We hope and expect to see more open source development activity in the NFT and Metaverse space to include in future editions of this report.

Looking at code commits, Decentraland is a clear outlier in the NFT / Metaverse domain. Averaging **108** weekly code commits, its level of development activity is on par with major blockchain technologies like **ZCash (127)** and **Stellar (111)** and would put it in the Strong and Steady category in that domain. Compared to DeFi, **Decentraland** would end up in the Top 5 Most Active, ahead of major projects like **Uniswap (52)** and **Compound (42)**.

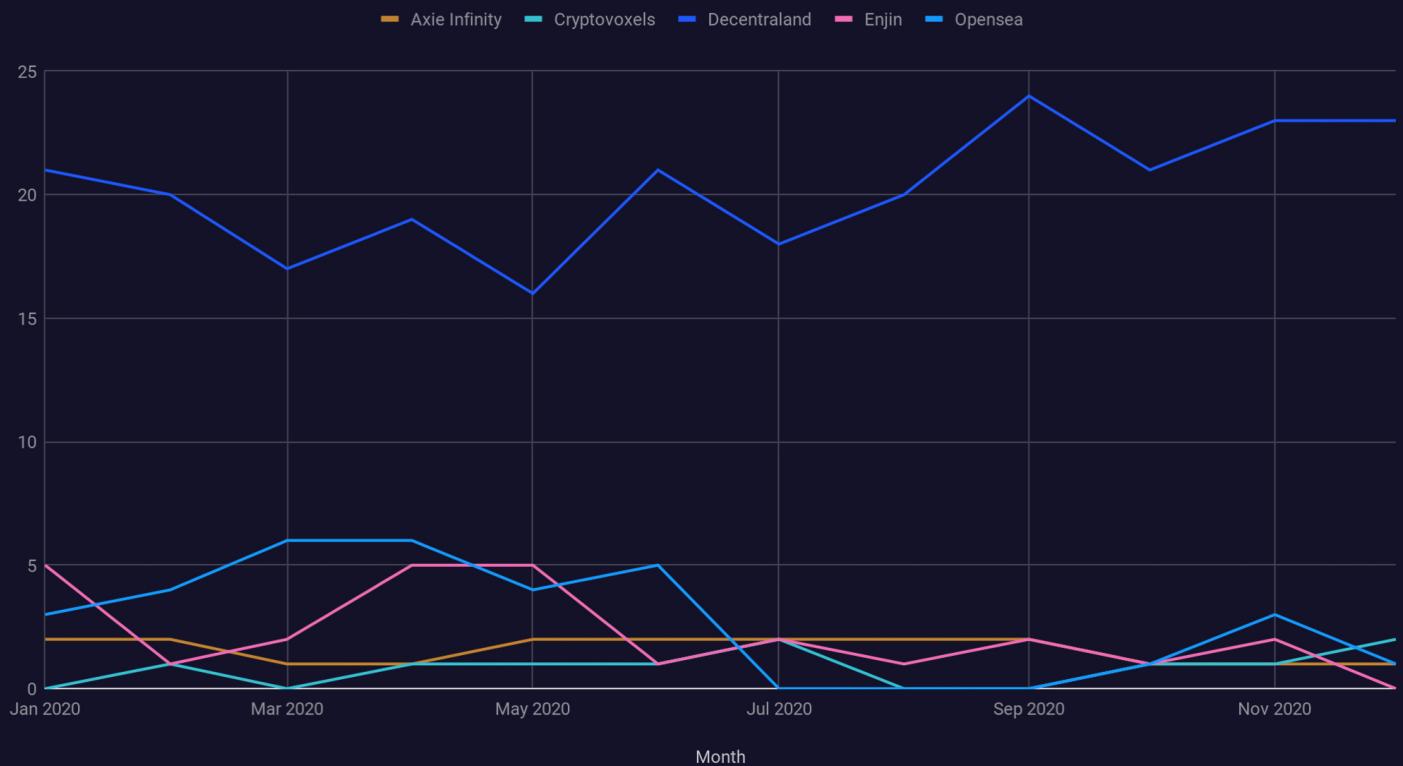
Axie Infinity, Cryptovoxels, Enjin and **Opensea** saw a far lower level of open source development activity, concentrating in the first half of 2020, notably before NFTs started to get into the spotlight in the second half of the year.

NFTs and Metaverse - Commits



With monthly active developers we see a similar picture. **Decentraland** has a steady level of **20 monthly active open source developers**, on par with major blockchain protocols like **Hedera Hashgraph (24)** and **Algorand (22)**, and way ahead of **Opensea (3)**, **Axie Infinity** and **Enjin (2)** and **Cryptovoxels (1)**.

NFTs and Metaverse - Core Developers



>Appendix : Notes and Caveats_

- * The Crypto Ecosystems index is a crowdsourced resource. While we have taken care to include only relevant repositories for each included protocol and improve on the existing directory as much as possible, inevitably there will be inaccuracies in the underlying data. There are possibly also cases where readers might subjectively attribute repositories and organizations to a different protocol than they are attributed to in the Crypto Ecosystems index.
- * In the previous edition of this report, called Blockchain Developer Report Q2 2020, we included both core protocol development and (decentralized) applications building on top of protocols, including the lists of individual repositories per ecosystem contained in the Crypto Ecosystems index as a source. In this edition we have focused on only core protocol development, because the list of individual repositories have become noisy and laborious to curate.
- * Only repositories on GitHub were considered. For some protocols, core development is done on other platforms like GitLab, so for those protocols the numbers in this report are lower. We intend to include other platforms in future editions of this report.
- * Because we ignore forked repositories, some genuine development activity on forks which are actively developed on, is not included in this report..
- * Only activity for the main branch of each repository was included. It is common software development practice for commits to first be made to a different branch, such as "develop" or a feature branch, before they get merged to the main branch. Some commits never get merged to the main branch. In such cases, some genuine development activity was not included in this report.
- * Because we include only organizations on GitHub rather than the full lists of individual code repositories from the Crypto Ecosystems index, the absolute numbers such as commits and monthly active developers in this report are lower than other blockchain development activity analyses, including the previous edition of this report.

- * Some code changes are committed by bots such as Dependabot. These have not been removed when analysing developer activity. We aim to exclude bot activity in future editions.
- * Repositories which are forked, but not marked as such on GitHub, leads to artificially high developer activity metrics. This happens mainly with forked blockchain protocols like Bitcoin Cash, Ethereum Classic, with forked DeFi protocols like SushiSwap, but also with projects that start off from an existing codebase like Bitcoin Core and build a new protocol from it. For some protocols this is a one-off, others actively merge upstream changes from repositories that originated in other protocols. If these repositories are marked as forks on GitHub, they are ignored in this report, but that is not always the case. In those cases, development activity is counted in both the original protocol and the protocol maintaining the fork.
- * Additionally, there are highly active repositories which could be attributed to multiple protocols. A notable example is [core-geth](#), an Ethereum node implementation with the explicit goal of supporting multiple networks like Ethereum, Ethereum classic and others, and which merges upstream changes from go-ethereum.
- * We attribute the development activity for any organization on GitHub to a single protocol. Some organizations work for multiple protocols, with more focus on one or more. For example, IOHK works mostly for Cardano development but is also involved in Ethereum Classic, and others. Therefore, analysing repositories for such organizations gives inflated data for the protocol where the activity is attributed to.
- * There is a slight difference in period for data of commits and monthly active developers. For developers, the period is the full year 2020 on a monthly basis. For commits, the period starts on, data for the first three weeks of the year are not included due to limitations of the GitHub statistics API.

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