

Choosing a Distributed Ledger Technology: Looking at the Popularity and Activity of Major Players

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Executive summary

To implement a blockchain-based system it is of critical importance to choose a well-suited Distributed Ledger Technology (DLT). To make that choice, the activity of the community and quantity and quality of resources for using the technology are relevant criteria. Here, we give information on non-technical characteristics of fifteen DLTs, including the activity of the developing community, the popularity of the DLTs, and available documentation. Our search was based on data available on GitHub, social media and other resources available on the internet. The results allow comparison of the fifteen DLT included in our search and can facilitate the choice of DLT for the realization of blockchain projects.

About us

The *Blockchain Research Lab (BRL)* was founded in April 2018 as a non-profit organization. Our focus lies on independent and interdisciplinary academic research on blockchain technology and its socioeconomic impact. We award scholarships to high-potential, motivated and committed scientists. The scholarships enable the recipients to work on their projects independently and autonomously.

Introduction

Recent years have seen a multiplication of projects using a blockchain-based system at their core. In order to develop such a system, however, a wide panel of Distributed Ledger Technologies (DLTs) can be utilized. Indeed, the number of DLTs has been growing over the past years. While that greater diversity of DLTs certainly has a positive effect on the development of blockchain technologies, it can prove increasingly difficult to find the best fitting technology for their use case.

Choosing the right software for a project requires, of course, a careful examination of its technical characteristics. However, non-technical criteria also need to be considered before going into the implementation phase. For instance, the license under which the software is registered directly determines whether a project can be made proprietary at a later stage. Likewise, the quality of the resources supporting a technology has to be considered. Well-documented software can greatly facilitate the project development, by providing a thorough and organized resource for programming and debugging. A poorly documented software system can cause great loss of time and effort, putting the project at risk. Choosing a software with an active developer community is a further asset, as it can provide valuable improvements, bug fixes, and necessary information throughout the implementation of the blockchain-based project.

While an exact grasp of the quality of activity and documentation support behind each potential software can be difficult to obtain, it is certainly possible to get sufficient information to make a sound choice in a shorter amount of time. For instance, it is possible to estimate the activity of the developer team by analyzing data from the software development platform GitHub. Likewise, it seems reasonable to assume that a highly popular software will have more resources and documentation than a lesser known software. The popularity of a given software in general can also help to estimate the size of the community that uses it. The popularity can be coarsely estimated by the number of its followers on social media platforms such as Facebook, Twitter, and Reddit.

When facing the decision of choosing a DLT for the implementation of a blockchain-based system, various information can be considered. For this, we collected basic information on the community, the popularity, and the documentation of a subset of existing DLTs. In this document, we report some results of this exploration in the hope that it can support decision makers when choosing a software for blockchain-based projects.

The Distributed Ledger Technologies

We considered fifteen DLTs, which are listed in Table 1. Most of these technologies are open source, only Hedera Hashgraph, Tupelo, and WRMHL are private projects. The source code of these three projects is not publicly accessible, such that the information we provide in the present document has gaps. In addition, the project MultiChain has two versions, an open source community version and a proprietary enterprise version. We only considered the community version.

Licenses

The license protecting any software is crucial in the choice of the DLT because it determines what can be done with the product, for instance, whether it will be possible to make the software

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Table 1: The fifteen considered Distributed Ledger Technologies and their licenses.

Technology (link to project)	Open source	License
Bitcoin	Yes	MIT License
Corda	Yes	Apache License 2.0
Cosmos	Yes	
Ethereum	Yes	GNU General Public License v3
Hedera	No	
Hyperledger Fabric	Yes	Apache License 2.0
Hyperledger Iroha	Yes	Apache License 2.0
Hyperledger Sawtooth	Yes	Apache License 2.0
IOTA	Yes	GNU General Public License v3
MultiChain	Yes	GNU General Public License v3
Quorum	Yes	GNU Lesser General Public License v3
Stellar	Yes	Apache License 2.0
Tendermint	Yes	Apache License 2.0
Tupelo	No	MIT License
WRHML	No	

proprietary. The fifteen DLTs we studied were registered under four different licenses. These licenses can be distinguished in two groups. On the one side there are permissive licenses: The MIT License and the Apache License 2.0.¹ On the other side are the so-called copyleft licenses: The GNU General Public License version 3 and the GNU Lesser General Public License version 3.² Briefly put, the difference between these two types of licensing is that for copyleft licenses, any derived work must be distributed under the same license or an equivalent. This is to be distinguished from permissive software licenses, which allow the distribution of derived work under a proprietary license.

GitHub activity

On March 27, 2020, we collected data on the twelve open source DLTs on GitHub. The data collected is provided in Table 3 at the end of the paper. GitHub metrics provide information on the general interest in a project and can indicate the effort that has been invested into the project. For instance, the number of “stars,” “forks,” and “commits” can be used to gain insight on the popularity and activity of a project. On GitHub, users use “stars” to show their appreciation. We interpret them as an indicator of popularity. Creating a “fork” of a project is creating a personal copy of it, in order to contribute to that project or create a new project based on it. GitHub “commits” are used by developers to submit changes to the project. Thus, we interpret forks and commits as a proxy for the effort invested into a given project. The quality of these proxies, however, should not be overrated. A user may fork a project but never work on it, or a single fork might serve as the basis for an entirely new technology. Similarly, a commit may change any proportion of the source code, from a single character to thousands of lines.

The number of stars, forks and commits for the twelve open source DLTs is illustrated in Figure 1. As expected, Bitcoin and Ethereum display the highest value for these three metrics.

¹ <https://www.apache.org/licenses/LICENSE-2.0>,
<https://opensource.org/licenses/mit-license.php>.

² <https://www.gnu.org/licenses/gpl-3.0.html>
<https://www.gnu.org/licenses/lgpl-3.0.html>.

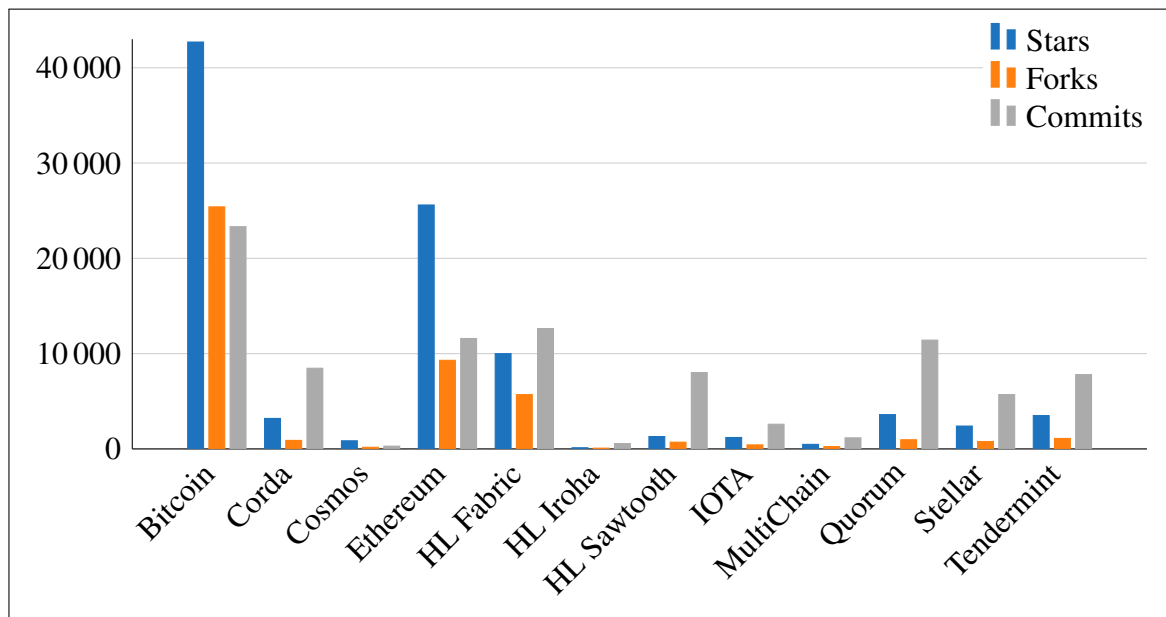


Figure 1: GitHub stars, forks, and commits for the twelve open-source DLTs. For MultiChain, only the community version was considered.

Hyperledger Fabric also stands well above other technologies for the number of stars and forks, indicating a strong interest of the community for this technology. The number of stars and forks is relatively similar for Corda, Quorum, Stellar, and Tendermint. The number of commits is highest for Bitcoin, however it is almost equally high for Ethereum, Hyperledger Fabric, and Quorum. The Quorum technology, however, is a somewhat special case, because it is a fork itself. It is based on Ethereum and “inherits” all commits made to the original Ethereum project. Technologies such as Cosmos and Hyperledger Iroha on the other hand, have a strikingly low number of commits, which might reflect a lower investment of the community in the development of these technologies.

In order to get a sense of the size of the developer community, it is useful to look at the number of contributors. For this metric, MultiChain appears to have the lowest contributor size with only four contributors, which indicates that no open source developer community has emerged around the team of core developers at MultiChain Inc. Cosmos (22) and Hyperledger Iroha (25) also have few contributors. While a lower number does not mean that a technology is immature, it can indicate a lower interest of the community.

In order to get a sense of whether the project is still actively being developed, it is possible to look at the date of latest commit. We found only two projects that had more than one month between their latest commit and the date of our research. In particular, Cosmos’ latest commit was done eight months prior to our research and MultiChain’s three months prior. This longer period without commits might reflect inactivity in the open source development community in recent times.

We have further analyzed what programming languages were used in the source code of each DLT. This information can be useful to choose a technology that suits the skills of the team that will implement the blockchain. There is a relatively wide diversity of languages employed in DLTs, with Go and C++ being the most used languages. The DLT Tupelo, which is not on GitHub, is also implemented in Go, according to an e-mail conversation we had with the developers.

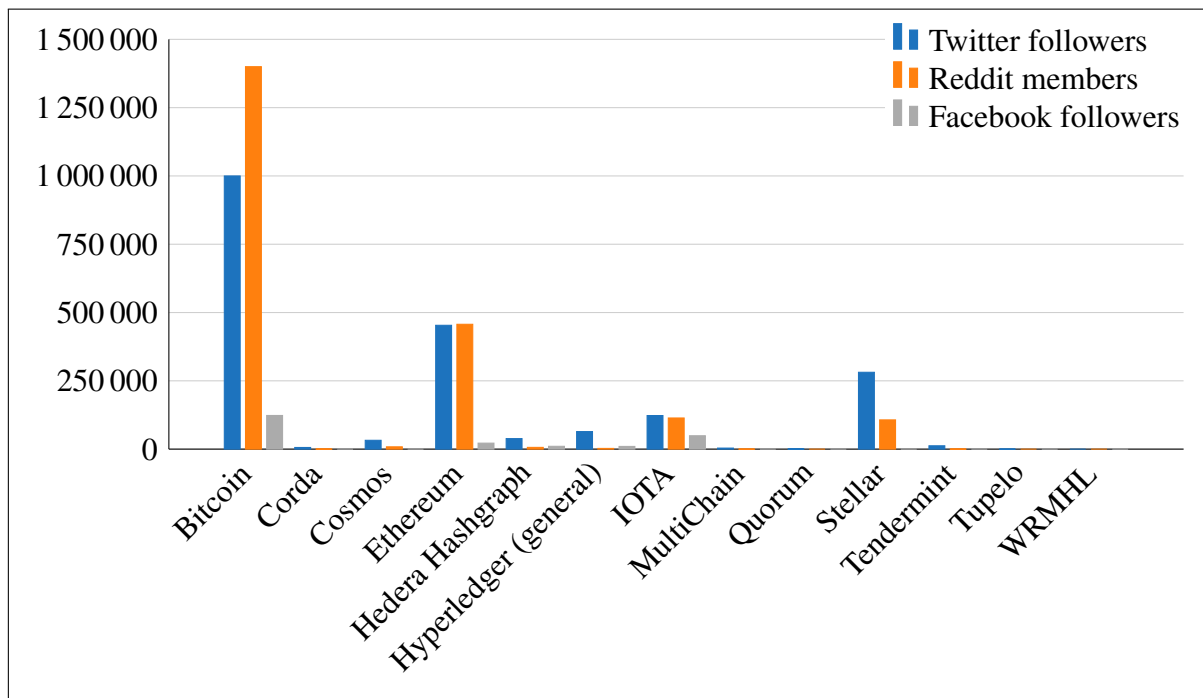


Figure 2: Popularity of DLTs on Twitter, Reddit, and Facebook.

Social media

To gain an idea of the popularity of the DLTs, we looked at some statistics available on the social media platforms Facebook, Reddit, and Twitter (see Figure 2 and Table 4 at the end of the paper). Here, the number of followers of the projects on these different platforms can be used as a rough proxy for their visibility and popularity among a general public. Although most technologies could be followed on social media, WRMHL could not be found on the social medias that we considered. Hyperledger Fabric and Hyperledger Iroha did not have a dedicated account – information on these projects might be announced through the Hyperledger organization account.

We found high contrast in the amount of followers and members of the different projects, with a larger popularity of Bitcoin, followed by Ethereum, Stellar and IOTA. It should however be considered that some of these technologies are likely to be overly represented in the social media due to the speculation that occurs on their attached cryptocurrencies. For instance, Bitcoin is ranked first, Ethereum second, Stellar twelfth and IOTA twenty-fifth in market capitalization of cryptocurrencies when this article was written (data from *coinmarketcap.com* in April–May 2020), leading many to be interested in the currency, but not necessarily in the value of the DLT as a potential basis for project development. These four projects also received by far the most attention on social media platforms, followed by Hyperledger (the umbrella organization overseeing the development, among others, of Hyperledger Fabric, Iroha, and Sawtooth), Hedera Hashgraph, and Cosmos.

Documentation

Through our search on these technologies, we compiled the available documentation on these technologies (Table 2). Please note that this does not aim to reflect the state of all available documentation for projects, but provides links toward the main documentation and wiki of each project. Exploring these links should allow you to get a rapid overview of the available documentation for each project. Overall, almost all technologies' websites provide a satisfy-

Table 2: Links to documentation, video media, and discussion groups.

Technology (Whitepaper link)	Documentation and Wikis	Video channels	Groups and chats
Bitcoin	Wiki, Guides		IRCs
Corda	Docs	YouTube	Slack
Cosmos	Docs	YouTube	Discord
Ethereum	Docs, Guides	YouTube	Gitter
Hedera Hashgraph	Guides	YouTube	Telegram
Hyperledger Fabric	Docs, Wiki		Chat
Hyperledger Iroha	Docs, Wiki		Chat
Hyperledger Sawtooth	Docs, Wiki		Chat
IOTA	Docs	YouTube	Discord
MultiChain	Guides		
Quorum	Docs	YouTube	
Stellar	Guides	YouTube	Keybase
Tendermint	Docs, Guides		Discord
Tupelo	Docs		
WRMHL			

ing amount of documentation, including developer guides and tutorials, these include Bitcoin, Ethereum, Hyperledger Fabric, Hyperledger Sawtooth, Hyperledger Iroha, MultiChain, Corda, Stellar, IOTA, Tendermint, Cosmos. It is worth mentioning that projects such as Ethereum, Tendermint, Cosmos, Hedera Hashgraph, IOTA also have an extensive amount of content on their YouTube channel. Almost every technology proposes access to a community groups and chats, other technologies, and all teams can be contacted through their website.

Concluding remarks

Getting a sense of the popularity, activity, and quality of resources of software gives valuable insight to select a Distributed Ledger Technology for developing a project. We here gave some results of our own research among a set of fifteen technologies. We used GitHub, social media, and e-mails to the developers to gain our information. We could, however, not gain equal amounts of information on all technologies, mostly due to the fact that not all projects were developed on GitHub. Throughout the search, we did not explore in detail the information on Slack, Discord, or the quality of the code documentation and annotations such that the present results do not give an in-depth view of the popularity, activity and documentation of each technology. Nonetheless, our exploration was successful in showing high-level perspectives on what technologies are good candidates for becoming the Distributed Ledger Technology of our blockchain system, with respect to the criteria that we have taken into consideration.

We think that verifying what license is protecting a DLT should play a major role when choosing the DLT of a blockchain project. Indeed, the license puts strong constraints on the potential uses of the derived product at a later stage. Some major players such as Hyperledger Fabric or Corda are under permissive licenses which allow the privatization of your project at a later stage, others such as Ethereum, Tendermint, and IOTA are protected by GNU General Public Licenses which stipulate that a project based on these technologies must remain a public project.

Exploration of GitHub data reveals the dominance of Bitcoin and Ethereum in terms of popularity and effort invested into their development. However, Hyperledger Fabric scores almost as

high as Ethereum. Technologies such as Corda, Quorum, Stellar, and Tendermint also display a significant general interest and effort and appear worth considering, based on the perspective given by this analysis.

Regarding popularity on social media, famous cryptocurrencies such as Bitcoin, Ethereum, Stellar, and IOTA rank well above other alternatives. However, we have reason to believe that this popularity appears to reflect the market capitalization of the respective cryptocurrencies rather than the popularity of the underlying technology. We thus advise to be careful in interpreting social media metrics to choose a popular blockchain.

Most technologies had a satisfying amount of documentation available online, we found technologies developed by Hyperledger, Ethereum, Bitcoin, Stellar, Corda, Quorum, Tendermint, and Hedera Hashgraph, to have a relatively complete and structured documentation. Next to Bitcoin and Ethereum, Hyperledger Fabric does well in all categories considered. It enjoys a high popularity, has plenty of online resources for developers, good quality documentation, and the developing community is highly active. Hyperledger Fabric is protected under a highly permissive license, Apache 2.0, that allows the derived product to be made proprietary at a later stage.

Table 3: Data collected on GitHub. The data in this table were collected on March 27, 2020.

Technology (GitHub link)	Commits	Releases	Contrib.	Watch	Star	Forks	Issues		Pull requests		Last commit (x days ago)	Programming languages
							Open	Closed	Open	Closed		
Bitcoin	23 321	231	690	3 500	42 700	25 400	765	4 530	346	12 513	0	C++, Python, C, M4, Shell
Corda	8 468	96	164	293	3 200	895	152	397	39	5 518	0	Kotlin, Java, C++
Cosmos	291	0	22	138	853	173	35	30	7	47	256	TeX, Python
Ethereum	11 590	164	455	2 000	25 600	9 300	284	4 468	94	5 007	0	Go, C, Javascript
HL Fabric	12 631	38	231	1 100	10 000	5 700	n/a	n/a	22	901	1	Go
HL Iroha	561	5	25	24	124	82	0	14	33	376	2	C++, Cmake, Python
HL Sawtooth	8 012	44	80	158	1 300	710	n/a	n/a	9	2 284	17	Python, Rust, Shell, Dockerfile
IOTA	2 591	63	61	143	1 200	422	382	659	39	669	2	Java, Python, Gherkin
MultiChain (community)	1 164	0	4	81	480	246	33	18	8	56	71	C++, C, M4, Makefile
Quorum	11 419	23	394	344	3 600	962	30	569	8	353	2	Go, C, Javascript
Stellar	5 700	79	66	267	2 400	774	135	892	18	1 414	2	C, C++
Tendermint	7 800	164	190	258	3 500	1 100	426	1 785	17	2 361	0	Go, C, Shell, C++, Python

Table 4: Social media handles and number of followers.

Technology	Twitter		Reddit		Facebook		
	Handle	Followers	Subreddit	Members	Handle	Likes	Followers
Bitcoin	@bitcoin	1 000 000	/r/bitcoin/	1 400 000	@bitcoin	120 913	123 211
Corda	@cordablockchain	6 039	/r/corda/	317			
Cosmos	@cosmos	32 300	/r/cosmosnetwork/	8 400			
Ethereum	@ethereum	453 300	/r/ethereum/	457 000	@ethereum	21 394	21 916
Hedera Hashgraph	@hashgraph	38 500	/r/hashgraph/	6 400	@hashgraph	8 759	10 310
Hyperledger (general)	@hyperledger	64 200	/r/hyperledger/	2 600	@hyperledger	8 815	9 868
HL Fabric							
HL Iroha							
HL Sawtooth	@hl_sawtooth / @lakesawtooth	64 / 197					
IOTA	@iotatoken	122 900	/r/iota/	114 000	@iotatoken	43 852	48 946
MultiChain	@coinsciences	3 749	/r/multichain/	65			
Quorum	@goquorum	682					
Stellar	@stellarorg	281 300	/r/stellar/	107 000			
Tendermint	@tendermint_team	12 201	/r/tendermint/	222			
Tupelo	@tupelodlt	74					
WRMHL							