Exorde Protocol

Clear the way in the Web Jungle

Térence Gras, Mathias Dail, Damien Pucheu Exorde Labs, France
January 2023

1 Introduction

Data growth has been impressive in the past few years as the online world keeps growing and accelerating. An astonishing 90%¹ of internet data ² has been created in the last years. Today, the Web hosts more than 2 billion active websites and is an ever-evolving data jungle. In recent years, a great deal of attention has been devoted to the rise in "fake news": everything from satire and misleading content to articles that are completely fabricated. When any type of content (image, news, video, audio, ...) makes it on the web, it can spread anywhere in a matter of seconds, without any original context, for any purpose. Any authentic content (or not) can be reused to create viral fake information to manipulate public opinion on a given subject in the short term or hurt the reputation of any entity (organizations, personas, etc). News is consumed more and more via personalized and customized news sites and social media (personalized search, news feeds), creating a bubble effect, isolating users from any news and information that is deemed inconsistent with their bias and beliefs. Rapid technological advancements and this bubbling effect mean that fake news or other informative campaigns have the potential to create a much bigger impact on society over time. The overwhelming size of the challenge can be seen in the fact that large companies like Twitter, Google, and Facebook seem to struggle against misinformation despite the resources invested. According to a report from Oxford University, almost 60% of misinformation surrounding the coronavirus pandemic remains on Twitter without a warning label³. Facebook has increased its efforts to combat fake news, by employing human factcheckers in combination with artificial intelligence systems. Even though the vast majority of Facebook's efforts against fake news are powered by artificial intelligence, those fact-checkers, providing the necessary human touch to review fake news, are overwhelmed with the amount of data flooding the social-media giant's platform. The issue of leveraging information and doing online virality analysis is a global challenge. Therefore we believe that it can only be tackled by a global approach that goes beyond the reach of individual social networks or media platforms. This solution needs to leverage both AI, on a large scale, and the work of a heterogeneous self-governed community. We propose Exorde as a solution:

a global, open, censorship-resistant, and fully transparent information platform enabling trust, relevance, and neutrality in its data services.

 $^{^1}$ Big Data, for better or worse: 90% of world's data generated over last two years - ScienceDaily

 $^{^2}$ 53 Important Statistics About How Much Data Is Created Every Day - Finances Online

 $^{^3}$ Twitter Fails To Remove Almost 60% Of COVID-19 Misinformation, Study Claims - Forbes

⁴ Gartner Top Strategic Predictions for 2020 and Beyond - Gartner

2 What is Exorde?

Exorde is a new protocol aimed at collecting and extracting sentiment from social networks all over the world through a decentralized community. Exorde's decentralized approach is key to its success as it allows for the data collection on social networks that are locked depending on location, locked behind proxies, or even on entirely different Internets.

Thanks to its unique approach, Exorde's data is reliable (peer-verified and processed publicly), therefore enabling its usage in several use cases such as market predictions, e-reputation, and trend analysis. Due to Exorde's decentralized and public nature, any trends or analytics based on Exorde's output can't be censored, manipulated, or suppressed. Exorde's utility token, the EXD token, is used in this regard to incentivize Exorde's community to prioritize collecting data in relation to client demands. This process guarantees that the EXD token fully encompasses the value of the data created by the Exorde protocol.

2.1 The Exorde Protocol

The Exorde protocol is aimed at incentivizing a decentralized community to collect publicly accessible data across social networks all around the world, regardless of language barriers, in order to extract live global sentiment regarding a wide variety of subjects.

The Exorde protocol runs thanks to its contributors: a decentralized community spread out all over the world that runs the appointed Exorde data crawling module to collect and analyze live social network data. These contributors earn EXD tokens as well as a small amount of Reputation for every task they fulfill.

EXD tokens are used as payment for the work of the contributors. This utility token is the unique bridge between client requests and contributor-related tasks within the Exorde protocol. All data collection requests are paid in EXD tokens allocated as additional rewards on client-defined subjects that contributors will then prioritize crawling.

Reputation is a non-tradeable, non-transferable currency that is hard to earn and easy to lose, and that reflects on a specific contributor's work history within Exorde. Every time a task is successfully carried out, a small amount of Reputation

goes to the contributor who carried it out. Reputation is used to partake in governance, staking, and high-level decisions affecting the entire protocol. The more Reputation a contributor has the more sway that contributor can operate over Exorde. Failed tasks and bad actors are two sources of severe Reputation slashing.

Functionally, at the platform's core are the Work Systems or "lobbies" to which contributors connect, and from which said contributors are randomly allocated tasks within Exorde's ecosystem. A contributor can access a Work System by running Exorde's appointed module, under the form of an executable, which automatically scours through Social Networks on the Internet to collect publicly accessible information, prioritizing client-defined subjects.

Work carried out within the Work Systems is decomposed into three major parts:

- 1) **Spotting:** Exorde's entry point begins with URL submissions. Each URL corresponds to a comment, a post, an article, or any textual information in relationship with a specific subject that is of interest to Exorde. Every Spot consists of one URL that is submitted by a contributor, and if validated by the protocol, is then sent to the following processing steps.
- 2) **Processing:** Once a URL has been successfully vetted, it is then sent to the Processing phase. In this phase, the URLs are processed by complex NLP algorithms to obtain an overall "sentiment" regarding the themes to which they are linked. This step is what allows the Exorde protocol to evaluate the live sentiment of people all around the world on client-defined subjects.
- 3) **Archiving:** In an effort to preserve the transparency and neutrality of the protocol, the output data of the Exorde protocol is stored on archiving platforms such as Filecoin. This data serves as a tamper-proof record of the work that was conducted by the contributors and will be publicly accessible to all.

2.2 Products and Target Clients

Exorde's core features encompass a far-reaching community capable of collecting data across all social networks and all languages in real-time, a decentralized NLP-processing pipeline that can produce Terabytes of data per day, and a unique infrastructure established for transparency, neutrality, and open collaboration.

Possible use cases for Exorde's data are numerous. From a product strategy perspective, we've decided to focus on the following:

1) Market Predictions: Recent research has shown that predicting market trends using social networks is not only possible but overwhelmingly efficient. Models utilizing this approach yield prediction results ranging from 62.48%¹ all the way to 89.6%²This of course is extremely interesting from a business perspective as most traders today aim to achieve 51% accuracy on their investments.

Early in 2021, we launched a Proof of Concept application that allowed us to track the number of times Bitcoin was mentioned on Twitter in real time. We quickly realized there was a strong correlation between the resulting curve and Bitcoin's price variations.

As Exorde's main goal is to extract live global sentiment on a wide variety of subjects, it made sense for us to start off with market predictions. Additionally, this is the most feasible first step, technologically speaking. We now have a fully-working application dedicated specifically to market predictions accessible here: Exorde Index.

The result is an application designed to predict market fluctuations for all sorts of tokens and stocks over the next hour, the next 4 hours, the next day, and the week. Clients will include intra-day traders and hedge funds. Exorde Index also proposes a wide array of personalized alerts to better assist its clients in trading at the right moment.

2) **E-Reputation**: Just as Exorde Index is aimed at selling market predictions based on extracted live global sentiment with regards to tokens and stocks, the exact same technology can be used to analyze live global sentiment with regards to brands, public figures, and current events. E-reputation scores represent Exorde's main source of revenue as it targets large-scale B2B clients.

E-Reputation encompasses the overall live sentiment that people on social networks express towards a client-defined subject. This reputation score is correlated to large amounts of metadata expressing (but not limited to) user location, language, predominant sentiment, and most active social networks on the topic.

Such information is especially relevant to large businesses and governments trying to measure accurately the effect and range of their communications and products. This system acts as a great PR-measuring and survey tool, for capturing sentiment at any given moment, on any subject. As the subjects that are explored for e-reputation are client-defined, a direct correlation is established between EXD token value and client traction.

3) Web Analysis: Exorde's final intent is to provide a public service to help people navigate information without location-related constraints, regardless of language and physical barriers. To this day, a large amount of the information returned from a simple "web search" is largely affected by the location from which it was carried out and the input language used.

This means that a significant amount of information related to client-defined queries is never shown to the end client. Furthermore, this reinforces opinion polarization, as just like in social networks, people are often confronted with the same sort of opinions.

Additionally along with the exponential increase in the volume of information created on the Internet over the last few years comes an exponential amount of misinformation and disinformation. With the arrival of deepfakes and advanced text-generating bots like ChatGPT, it is becoming increasingly difficult to isolate the truth from any given event.

Exorde's Web Analysis tool exists to offer people a new way of exploring information all over the world in real time. Exorde's mission is to make information everywhere accessible to everyone, free of any censorship, but also to act as an archive for past trends. This data "gold mine" is the first layer for a new generation of Machine Learning companies aspiring to bring about revolutionary ideas to life for tomorrow's Web.

¹ Predicting Bitcoin price fluctuation with Twitter sentiment analysis – Sattarov, O., Jeon, H. S., Oh, R., and Lee, J. D. (2020)

² Using Time-Series and Sentiment Analysis to Detect the Determinants of Bitcoin Prices – Georgoula, I., Pournarakis, D., Bilanakos, C. (2015).

3 Exorde's Place in Web3

Could We Fight Misinformation With Blockchain Technology?

- The New York Times

How Blockchain Can Prevent the Spread of Fake News

- Blockchain Blog | Dr Mark van Rijmenam

The popularity of blockchain-based systems is growing fast. This new sector is expected to disrupt the whole industry of content creation, distribution, and rights management, along with new forms of remuneration. Blockchain and decentralized ledger technologies are capable of disrupting the entire creation chain. Blockchain helps here with the advent of decentralized autonomous organizations (DAO) that can accompany creators in their creation and production processes. To achieve this, a computer program executes a smart contract, whose rules are pre-established by the collaborators and recorded in a blockchain. The contracts cannot be tampered with. For each task identified within the various processes, the amount of remuneration and the rights acquired on the result of the task are clearly defined. In a creative collaboration between the participants, the creation is then broken down into "creative tasks" whose assembly forms the work.

The assembly, performed in a decentralized and collaborative way, without third parties, is a key point, leading to the creation of value through a new form of efficient, transparent, and open collaboration. The blockchain records, automatically and in real-time, the execution of each task as well as the transaction associated with the remuneration of each collaborator. Motivated by guaranteed remuneration, the tasks are assured to be performed by a skilled collaborator, as DAOs and smart contracts are open systems where skilled workers can join freely and contribute as long as they follow the given DAO framework, rules, and guidelines.

In recent years, NLP models like BERT allowing for precise sentiment extraction from large volumes of text have exploded. In combination with some of the first functional and scalable fully-decentralized infrastructures like SKALE, this is a golden opportunity to create the first fully decentralized, transparent, and community-driven data collection and sentiment-analysis protocol. This also explains why such a protocol was not possible before (NLP became scalable with transfer-learning in 2018-2019, scalable blockchain platforms after 2018, and decentralized storage in 2019-2020 with Filecoin).

To this day, data scraping and sentiment analysis are performed only by centralized entities. Decentralization is in fact viewed as a liability for efficiency when it comes to IT infrastructure, as it slows down processes due to slow validation steps imposed by consensus-driven decisions. This is why Exorde's current competitors rely on centralized systems such as Lunar Crush, IntoTheBlock, and more traditional players like Bloomberg.

Many companies going into web3 attempt to do the same thing traditional companies are already doing, adding the blockchain and decentralized spin, and hoping for a different (better) result. As this has become a standard in the web3 industry, it is becoming more and more critical to justify and highlight the use of such technologies and the additional competitive edge they confer to a protocol.

Exorde was not built around blockchain and decentralization. Blockchain and decentralization were built into Exorde, as they made sense for what we are trying to achieve. Exorde aims to collect and analyze subjective information (such as publicly accessible information on social networks), and process said information through complex NLP algorithms, to create much-needed metrics for traders and businesses alike. Here are the reasons why we need Blockchain and Decentralization in Exorde:

- Blockchain: When handling subjective information, especially on current events which can be prone to much controversy, being able to prove that the protocol in its whole remains transparent and tamper-proof is essential. What's more, the data generated by the protocol must also remain tamperproof in the future, acting as a public archive, or a snapshot, of the current state of information at the time of its creation. Blockchain solves these issues and further facilitates the neutral execution of the different processes required to generate Exorde's data, as well as payment for the contributors responsible for it.
- **Decentralization**: In order to stay objective with regards to the information collected, we need a decentralized community to:
 - 1) Deliver the same results regardless of the language used and, the political stance of the text analyzed,
 - 2) Remain neutral with regards to the countries targeted by said text, and also the network on which the text was initially posted.

No one individual can be said to be neutral when confronted with a single piece of information. However, a community of individuals chosen at random 3

appears to be the most neutral entity in this situation to date and therefore is the solution we have opted for. Fundamentally, this translates into obtaining data of higher quality at the end of our processes, as the data will be more representative of reality. Furthermore, as Exorde is a community-driven protocol, we expect that additional variations of the data-collection modules will be created in the future, allowing for further bias relaxation. Last but not least, we expect decentralization to be a major strength in the years to come for Exorde both from the execution standpoint (as the protocol can draw from a community's processing power), but also from the standpoint of the nature of our mission: to collect data everywhere, regardless of physical and virtual barriers, in real-time.

Taking into account the aforementioned points, we believe Exorde to be a novel solution to tackling tomorrow's information-related challenges. Our unique approach makes us stand out from the existing competition and is already very promising in the results that we are obtaining.

In the upcoming years, we aim to establish Exorde as the primary reference for collecting and analyzing information all over the world in real-time, on any given subject, and producing valuable metadata usable by all sorts of businesses. In this regard, Exorde will become the first layer of data analysis for new Machine Learning companies to build on. Furthermore, Exorde will act as the first layer for centralizing opinions across all platforms, all languages, and all countries.

4 Tech components

Exorde is built on 4 major technological pillars:

- 1) **Ethereum**, a Layer 1 network: acts as a secure and transparent settlement layer. This is the chain that secures the Exorde token economy
- 2) **SKALE**, a Layer 2 network: an elastic sidechain network connected to the Layer 1 chain, acting as the Execution layer. It is a scalable and elastic environment, enabling high transaction throughput. The Exorde SKALE sidechain is where Exorde contributors and users will connect. It is on this Layer 2 that the Exorde collaborative work architecture is built. This layer allows a scalable platform to be built, for thousands of users to participate and interact.
- 3) IPFS + Filecoin, a decentralized storage network: acts as a censorship-resistant distributed storage for the data being created by the Exorde Work Systems. IPFS is not a storage solution in itself, but rather a distributed Filestore, that enables integrity and ownership of the data, enabling Exorde to prove that the data is not tampered with from input to output. Any data indexed on IPFS, by its CID (content hash identifier), is immutable. All participants in the Exorde Protocol have the certainty that all data they fetch from IPFS is what they should see, enabling efficient consensus in a decentralized environment.
- 4) **NLP**, the branch of AI handling unstructured text. In Exorde, NLP modules are used by the platform's contributors to maintain and organize a decentralized neural database composed of all the pieces of information that the contributors are feeding into the system. NLP enables the automation of clustering similar and related content online, to build knowledge graphs on top of the raw data.

These pillars are critical to achieving Exorde's mission. Ethereum is needed to secure Exorde's governance and economy. SKALE Layer 2 is crucial to offer an application and platform that scales with its user base, with minimal interaction costs and latency. Filecoin is the storage and content-distribution network of Exorde, serving its knowledge in a scalable way for the entire Web while guaranteeing the integrity of its data (Filecoin relies on IPFS, a censorship-resistant and immutable storage network).

Exorde is powered by its community and ruled by its economy and rules. This community of participants will be working collaboratively on a base layer of indexing. This main layer, which is essentially a collaborative information graph, is "woven" and developed through distributed web crawling, data mining, and data processing, performed by participants. Technically, this process consists of each participant extracting structured and hierarchical information from web pages, such as text (articles, social media, free text, etc.). This knowledge extraction is a challenging part of the work. It will be performed by a hybrid mix of artificial intelligence and community-based work. The AI component (using NLP for textual content) will allow recognizing entities in a text, extracting sentences, and facts, correlating them with each other, and performing similarity checks. The supervision part will add the necessary human-related interaction to pre-process and foster the work produced by AI-based tools. This approach seems essential to make the work of the participants as efficient as possible but above all the most relevant and up to date regarding the information mined by the network.

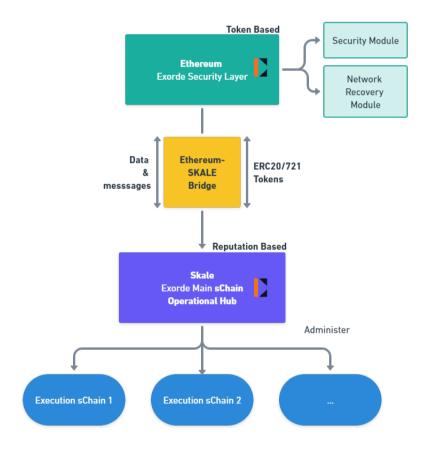
As it is a decentralized work, it must be peer-reviewed by the network. This means that a set of validators will systematically check and assess the quality of the work performed by a given indexer. Validators will evaluate work based on a set of guidelines and charts. Exorde's token economy is a core component of every process: contributor's work will be validated and then rewarded with Exorde's Token (EXD). The rewards will incentivize the fastest, most relevant, and upto-date work to be performed, as it will reward the contributors performing the most valuable work (both in quantity and quality). The token-based incentives model creates a favorable competition-based dynamic, by attracting the best data scientists, scrapers, and information spotters in the network. This decentralized and competitive dynamic ensures that Exorde increases relevance, quality, and speed on the capture of information on the Web, increasing the value of its services and products.

4.1 Protocol architecture

4.1.1 Intro

The Exorde Protocol will be deployed on both Ethereum (secure layer-1 network) and SKALE (high-throughput layer-2 network) for its operations (data work, execution layer).

The two parts of Exorde will be linked via SKALE's IMA (inter-messaging-agent), a bridge secured and operated by the SKALE Network validators (providing a pooled security model due to frequent validator rotations). The IMA allows for message and token transfers, in both directions, between Ethereum and any SKALE chain.



SKALE is an EVM-compatible technology. It enables the same ERC20-compatible addresses (via MetaMask, TrustWallet, etc.) to interact with Exorde seamlessly.

SKALE is a gasless layer-2 network, allowing Exorde to operate by abstracting gas-related issues from its workers and contributors. On its SKALE chain, Exorde only uses EXD tokens (staking, delegation, etc.) and REP (Reputation earned by participating).

Exorde is a multi-chain decentralized protocol, using Ethereum as its Security layer and SKALE as its scalable Execution layer. In the future, Exorde can own and administer multiple SKALE sub-chain (for increased data processing parallelization) and control them via a main SKALE chain, acting as a central hub.

4.1.2 Exorde Systems on Ethereum

Exorde uses Ethereum as its Security layer. The native Exorde Network Token (of symbol EXD) is deployed as standard ERC20 tokens (18 decimals, capped supply of 200 million EXD tokens).

The Exorde systems, deployed on Ethereum, are basic and simple. The Ethereum-based Exorde Systems are:

- The Security-Recovery Governance Module
- The Token Bridge and Message between Ethereum and Exorde's SKALE chain(s)

4.1.2.1 The Security-Recovery Governance Module

Exorde operates on SKALE chains, secured by SKALE validators. These validators are themselves operating on top of Ethereum secure Mainnet. The Exorde architecture plans for the potential loss of Exorde sub-chains, and a mechanism for recovery. The Exorde Architecture is designed to be "plug and play" when it comes to adding or removing sub-chains, which can operate on multiple EVM-compatible technologies and networks. Exorde sub-chains are progressively and automatically archived. These archives are stored on Filecoin for public persistence by a dedicated Exorde subsystem. Exorde has a token-based governance security module on Ethereum. This governance module is only activated when a critical failure happens (loss or crash of Exorde's SKALE chains, major attack, unplanned event, etc.). The archives are important for the unambiguous recovery of on-chain State such as Reputation.

This module only serves to migrate some contracts or pointers to a potentially new Exorde execution layer: either a new main SKALE chain or a different layer. This Security module serves to recover from catastrophic events and reboot Exorde operations. It involves voting on new architecture and migration state from the previous chain (Layer 2 Reputation mapping, stakes, etc.) to a new Layer 2 chain.

4.1.2.2 Ethereum-SKALE Token and Message Bridge

SKALE IMA documentation can be found here: SKALE IMA Bridge documentation.

Exorde users need to bridge their token on Exorde's execution layer to participate in the ecosystem:

- Workers: To Stake EXD tokens, in order to become a worker (spotting data, validating data in various WorkSystems)
- Protocol clients: To pay the Exorde Protocol via its data bounty system, to crawl, collect data, and analyze any set of themes, topics, and websites on the Web.

The main traffic on the Ethereum-SKALE bridge will be to transfer tokens from Ethereum to the Exorde execution layer, but other messages (important or useful state, metadata, from Exorde's execution layer) can be brought back to Ethereum and vice-versa. In the future, on-chain or off-chain services could be deployed to act as an intermediary for Protocol clients and Users to enable direct interaction with Exorde without bridging.

4.1.3 Exorde Systems on Exorde's sChain

Exorde will operate on its execution layer, powered by the SKALE elastic multichain network. Each chain is referred to as an sChain. A single medium sChain can handle 120 transactions per second by producing blocks every few seconds. Transactions are gas-free.

Exorde can operate on a single chain, during its young years. When the need to process more transactions (and more data) arises, Exorde can turn its original sChain into a hub, and purchase more SKALE sChains. Each sChain can communicate via an inter-chain bridge. This will also increase the security of the Exorde architecture, by scaling horizontally in the number of SKALE Validators allocated to secure Exorde.

4.1.3.1 Zero gas fees model

SKALE chains are EVM sidechains, secured and operated by SKALE validators. They can be described as "gas-less" but it is better to use the term "gas-free".

SKALE sFUEL documentation can be found here. SKALE Chains require a gas called sFUEL to conduct transactions. This sFUEL token (acting as an Etherlike utility token) has no value, costs nothing, and provides a way for the Exorde Execution layer to protect itself against DDoS attacks.

Exorde Protocol has an auto-refilling sFUEL top-up system, described below:

- Initialization: Addresses need to request initial sFUEL on a faucet. Exorde's Protocol offers 500 faucets (free access), refilled in small amounts by the core protocol, over time.
- **Normal flow:** Every successful operation on approved Exorde Worksystems contracts refills worker's address sFUEL balance.

This mechanism enables Exorde to abstract gas-related issues, removing significant friction compared to traditional blockchains. Participants of the network can onboard the network without manually interacting with sFUEL.

4.1.3.2 Block rotation and archiving

Block rotation is the mechanism of archiving old blocks to keep only a maximum and fixed number of blocks (and related transactions) in storage. Exorde makes use of this mechanism as a very high throughput application. Block rotation in SKALE enables blockchain synchronization (for validators, sync nodes, mirror nodes, etc.) in constant time as blocks of the chain are rotated and archived on rolling windows manner of 1 024 000 blocks.

That's why only the state is persistent. Logs and transactions are not to be relied upon. Past transactions and logs can be archived, later, if the need comes. This archiving can be done by a periodically activated system, where a committee of Exorde workers is tasked with archiving the chain at specific intervals, as a JSON or compressed archive file, on Filecoin and IPFS.

4.1.3.3 On-chain deployment permissions

Exorde sChains will have permission-based contract deployment rights. Users with sFUEL will, consequently, only be allowed to interact with contracts that were deployed by whitelisted entities (DAO Governance or initially Exorde Labs). This adds a security layer, by removing the usual risks of interacting with unknown contracts.

4.1.3.4 On-chain storage limitations

Each sChain has a maximum storage limit, applied to the State stored by contracts themselves. This limit is, as of 2023, 58.92 GB for Medium sChains. Documentation can be found here. 30% of that is dedicated to block storage.

This inherent limitation impacts the Exorde Protocol by requiring **storage-sustainable smart contracts**. Exorde WorkSystems (Data and work-related) smart contracts have a pausable feature (in case of storage leaks eating the storage space) and an **automatic garbage collector mechanism**. This allows contracts to operate and keep their used state at a fixed amount, making each sChain sustainable.

Page 16

4.2 Exorde Network Governance

4.2.1 Governance philosophy

Exorde Protocol is to be governed by a form of **Reputation-based organization**. Exorde Labs does not believe in token-based governance for day-to-day governance, especially for its technical governance. Exorde is a technical protocol, and its data-processing nature makes it possible to precisely quantify the contribution of each actor of the Protocol. This translates to the use of Reputation (REP), a non-transferable, non-zero score. Reputation is used to weight voting rights in the technical Exorde governance but also as a requirement (in addition to Staking) when participating in high-importance systems. Reputation has a symbol: REP.

Reputation (REP) is a score that grows continuously. Its growth will be capped by a fixed amount per day (e.g. 10k REP). The total Network Reputation can grow into millions over the years and be distributed among an unlimited number of participants. REP is frequently historized, by storing snapshots of the Total Network Reputation (sum of all network participant's REP), and snapshots of each user REP.

Reputation is a very useful metric, to measure past user activity, and current activity, and evaluate the importance of each actor's contribution (by their percentage of REP gained during a specific duration, for example). REP snapshots and REP-based governance allows the weighing of user votes by their current REP but also, if needed, their past REP.

The Protocol aims to be as automated as possible. This automation includes Treasury management and most parameter adjustments (rewards, staking thresholds, etc.). Exorde only uses large-scale token-based governance for its security-recovery module, following unpredictable events or major failures.

4.2.2 On-chain treasury management

Exorde is, by nature, a technical organization and a data-processing protocol. It has a Treasury related to its own infrastructure:

- EXD Tokens: Exorde Protocol starts with 68 000 000 (68 million) EXD tokens, 34% of the Exorde Network Token (EXD) total supply. These tokens will be used to incentivize protocol participants and Exorde's broader ecosystem. The distribution of these tokens is automated, and capped at the highest level to 30k (30 000) EXD per day (and 1250 EXD per hour), ensuring that the Protocol has enough rewards for at least 6-7 years.
- SKL tokens: Exorde uses SKALE sChains has its operational infrastructure

(high-throughput data processing systems). Exorde sChains are paid via a yearly subscription model in SKL tokens. Exorde will hold SKL tokens and use them on-chain to pay for new chains and renew existing sChains.

- Storage-related tokens: Exorde must pay (directly or indirectly) for the storage used on Filecoin. Exorde may hold a Filecoin Token (FIL tokens) reserve. Other storage assets could be used and held by the Protocol's treasury.
- Secondary assets: Exorde may have additional assets and their distribution policy depend on whether they are on Exorde's layer1 or layer2 networks.

4.2.3 Exorde Reputation-based technical governance

Technical governance represents the main part of all governance-related interactions of the Exorde Protocol. Technical governance is about adjusting the parameters of the Exorde Worksystems (analogous to a factory requiring frequent adjustments and expert supervision). These parameters can be highly technical (data-related) or reward-related. The technical governance will adapt the various thresholds and values of the systems to improve and sustain the quality of the Exorde processes, its output data, and its participation framework. EXD-based staking and REP-based requirements for participation, as well as EXD and REP rewards inside each subtask of the WorkSystems, can be adjusted (within reasonable boundaries).

The goal is to **automate most parameter adjustments**, if possible via on-chain formulas and clear relationships. The self-adjustment of various parameters by the protocol is possible for most parameters, but it is expected that this automation happens over time, as the protocol matures.

Technical governance involves proposals and voting rounds, which weigh each vote by the voter's REP (Reputation) amount. Consensus is required (>50% or even >75% for some important decisions).

Users' REP can be increased or decreased (slashed) by the technical governance if malicious activity is clearly observed. Off-chain (social, community-based) can also be applied to orient the technical governance.

4.2.4 Governance decentralization

As the total **Exorde Network Reputation** grows, it is naturally distributed into more and more actors in the Exorde ecosystem.

Sustained REP growth combined with constant (and growing) EXD token staking by the participants is one of the best **on-chain indicators of trust** (and interest alignments) that we can use in a permissionless environment.

Reputation (REP) can be viewed as slowly decaying if a given user stops contributing for large durations. This decay is not implemented by decreasing REP per user, as it's technically not a scalable approach, but by slowly increasing the various REP-based thresholds in the various systems and technical governance.

Exorde Labs believes in **progressive and scalable decentralization**, as decentralized governance can be a meaningless concept. Exorde Labs will be the main governors of the Exorde Protocol for its first years, by being the Highest REP actor. With time, a core of trusted and active entities will emerge through REP growth, and on-chain participation, but also through off-chain community involvement, guidance, etc. Governance decentralization is expected to happen progressively as business, social and technical relationships mature inside the Exorde ecosystem.

Exorde REP-based governance is also designed to be scalable: instead of asking all token holders (possibly millions) to vote and decide on highly-technical proposals, only a group of provably involved (and technically aware) actors will participate and vote. This group gets larger as REP gets more distributed. Over time, Exorde Labs' REP share of the Exorde Network will naturally shrink and decrease in importance, decentralizing the governance.

4.3 Work Systems

Work Systems are a set of decentralized virtual and anonymous "lobbies" in which contributors (user and "bots" alike) will work together to achieve specific clear-cut goals. Work Systems offer a reward in EXD to all its contributors upon completion and validation of the work required from them.

Participation in Work Systems is regulated in two ways:

- Reputation (REP): As a contributor contributes to Exorde's Work Systems, said contributor is rewarded in EXD and REP (Reputation). Reputation is not tradeable and attests to the contributor's involvement in the Exorde environment. Certain Work Systems such as Moderation are only available to contributors with a very high amount of EREP, acting therefore as a testimony to that contributor's trustworthiness with regards to Exorde.
- Staking: to prevent spamming and ill-intentioned contributors, every participant in every Work System requires an "entry-fee" or stake. The stake is paid in EXD and is either paid back in full if the contributor's submission is accepted, or slashed (partially or totally) if it is not.

How to participate in the WorkSystems?

Participating in a Work System requires the use of client software using an internal EVM-compatible system to interface with the protocol and the Exorde Network.

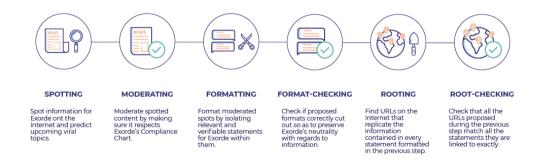
Certain Work Systems are locked as they will require a minimum amount of REP to be available.

WorkSystems are composed of successive validations, in a peer-review fashion. Workers submit data in various parts of the WorkSystems pipeline, and other workers are allocated as random validation committees. When any task is correctly validated, the authors or participants of this task are rewarded with REP (Reputation) and EXD (Exorde Network Token). Participants, or workers, are required to have a minimum Stake (depending on the tasks they want to perform) or Reputation. They can have their stake or reputation slashed (partially decreased by the protocol) if a clear misbehavior is detected (altering data, submitting fake data, trying to censor or spam a given system, etc.).

WorkSystems are the **core of Exorde's Operations**. They are built to be:

- **Neutral**: contributors are anonymous, only identifiable by an ID created for the Exorde platform. This anonymity enforces Exorde's neutrality, and therefore its value as a service specialized in providing trust scores for information
- Transparent: all contributions are publicly accessible using the blockchain
- Fair: contributors know the maximum EXD they can earn by participating and know that work allocation is randomized uniformly
- Collaborative: almost all Work Systems require a consensus of votes to be reached to produce value
- Automated: Exorde Labs will provide open-source AI modules to help contributors automate Exorde's Work Systems. Such open-source modules will not be sufficient to fully automate the processes but will act as a guiding template for those willing to work on making them better
- Modulable: All Work Systems rewards can be adjusted through a series of votes to make sure that the available workforce for Exorde is evenly spread out. Further modulation can be brought about by adjusting stakes for these same systems, further balancing the entrance of certain systems

WorkSystems form a scalable and sequential data processing pipeline. This pipeline can be abstracted in this high-level view:



Collaborative Worksystems for Decentralized Communities © 2020 by Exorde Labs is licensed under CC BY-SA 4.0 (\odot) (\odot)

- 1) **Spotting:** Users act as information spotters and submit batches of content (social media posts, comments, news, etc.) by their URLs. If the Spotted URL is accepted during that phase, it will move on to the next Work System: Formatting.
- 2) Moderating (Filtering): A system that ensures that Spotted content for Exorde respected Exorde's Compliance Chart
- 3) Formatting and Indexing: Extracts sentiment, keywords, language, and other metadata from the data. Extracts specialized data structures such as vectorized metadata, for clustering and indexing purposes.
- 4) Rooting (Clustering): Analyzes trends, virality, and information behavior by continuously detecting new clusters of information in the Exorde data.

4.3.1 WorkSystems pipelined architecture

4.3.1.1 Overview

The Exorde Worksystems are the elements composing the Exorde Protocol's data pipeline. It is designed to be scalable in terms of data processing power and worker count (participants connected at the same time). The Worksystems architecture has several goals:

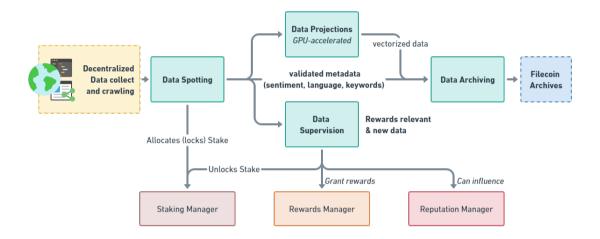
- 1) **Processing power flexibility:** The Protocol adapts its own processing power, task allocations, and data block management to the number of workers connected to each subsystem. The more workers connected, the more data the Protocol can accept and queue for validation.
- 2) Data pipeline low latency: The Protocol aims to process information quickly, to be as close to real-time (few minutes) as possible. In order to achieve that, the protocol must be capable of taking some data as input and have its output quickly. No large queues must be formed.
- 3) Data processing scalability: Data batching and parallel processing techniques are used to maximize the data processing power by the Exorde network. This makes Exorde automatically scalable when more workers join the network, expanding its network processing power.
- 4) Data stream efficiency: The network must ensure that the input data stream is as rich, diverse, and relevant as possible. This imposes retroactive supervision on the data stream, to check if the content is real, compliant with general Exorde guidelines, and most importantly diverse: the protocol aims

to give more rewards to data spotters who provide new information (most recent posts on social media, latest articles, etc.)

5) Randomized task allocations: The Protocol must allocate tasks, or jobs, to workers in a uniformly randomized manner. This is done partly by using an RNG endpoint in the sChain.

4.3.1.2 Data Pipeline architecture

The Exorde Protocol Data Pipeline is structured as illustrated below.



This pipeline starts with the input raw data stream, submitted by spotters. It is then checked by the Data Spotting system. The data is then analyzed by the Data Supervision system, while projected (transformed or embedded) by the Data Projections system.

There is a Validation sub-system inside each WorkSystem. DataSpotting has Spot-checking, DataProjections has Project-checking, and DataArchiving has Archive-checking. Validation tasks are always randomly allocated to multiple active workers, to cross-verify all submissions inside the Protocol, securing Exorde's data integrity.

Data Spotting outputs metadata (sentiment, language, keywords, etc.), Data Projections outputs vectorized, and other analytics-related statistics and metrics. These 2 streams are then combined and sent to Data Archiving, to be compressed into larger files and **stored publicly on Filecoin**, for long periods of time.

Data Supervision steers Data Spotting's data according to Exorde's incentives (ongoing data bounties, topics of interest), monitors the input stream, applies quality control (randomized checks on the data, etc.), and automatically rewards spotters within the Protocol's incentives framework.

Users can participate in any of these WorkSystems. These components require different minimum stakes (locked EXD) and (optionally) REP to participate. The WorkSystems monitor their own data quality and processes, to constantly optimize their added value and efficiency, in a decentralized environment.

4.3.2 WorkSystems Specifications

The Exorde Data Pipeline is made of the minimum number of components, to minimize processing latency on data (from spotting to archiving), to offer real-time, scalable, and decentralized streaming analytics.

4.3.2.1 Data Spotting

Data Spotting is the main and first component of the pipeline. It is designed to receive all the spots (pieces of raw input data) from participants (workers), batch it to compose "Data Blocks", then allocate these Data blocks for Validation (also called Spot-checking).

Batches have variable sizes, and they are adjusted to regulate the workload per worker, depending on the total network processing capability.

These WorkSystems manage a queue of blocks to process, as data enters the protocol as a continuous stream. The protocol autonomously accepts or rejects spots depending on its current queue size (how many blocks waiting to be allocated for processing and validation) and the number of available workers, to elastically scale its data process.

Data blocks are sequentially and randomly allocated as jobs (for validation) to N workers (e.g. N=16). Workers perform deterministic off-chain processing on the data (filtering content, aggregating items from multiple files, extracting sentiment, translations, etc.), and then submit their contribution via a commit-reveal scheme (detailed below).

4.3.2.2 Data Supervision

Data Supervision can be broken into three sub-systems:

1) Data Quality Control

Each output data block from DataSpotting is verified by DataSupervision. Random items (e.g. 100 out of 1000) are peer-reviewed by DataSupervision workers to assess if the content is real, relevant, and properly formatted.

2) Reward management

The protocol rewards data items that are recent, and relevant (linked to a topic or keyword on the current Exorde Base Topic List, administered by the Protocol's governance). The Reward Management sub-system additionally rewards items related to ongoing Topics Bounties. The Reward Management system is how the Exorde Protocol regulates its data stream with its incentives system.

3) Checkpoint Registries Updater

The Checkpoint Registry system updates the Checkpoints registries, a public set of files storing how many times each URL and keyword have been processed in the last minutes, hours, days, etc. They are frequently updated in a synchronous manner (e.g. every 10min) by DataSupervision workers. The Checkpoint Registries are used by DataSpotting workers to optimize their data spots. Workers can periodically check these registries to orient their data scraping or crawling strategy, to collect and only submit the latest information from the Web that hasn't been processed by Exorde yet.

4.3.2.3 Data Projections

Data Projections is a simpler, specialized system. Participants of this system process content with **GPU-accelerated algorithms** (e.g. language models, machine learning inference). They output a specialized data stream such as vectorized (embedded) items. These items are used to **scale an unsupervised clustering analysis** on the Exorde data, in order to detect, visualize and label new trends.

4.3.2.4 Data Archiving

Data Archiving is a system working synchronously to archive Exorde Output data (from Data Spotting and Data Projections) for **long-term storage** (e.g. by batching 100 output data blocks at a time and compressing them in one file).

Participants of this system are tasked to store a given output archive file on Filecoin and verify the associated **Filecoin Storage Deal ID**. Data is then stored and pinned on the IPFS network, backed by the Filecoin network.

A secondary system can be deployed to renew Storage Deals to increase data persistence (e.g. every year).

4.3.3 Commit-reveal participation scheme

Participants who submit processed data part of validation tasks (Spot-checking, Archive-checking, etc.) provide this information via a commit-reveal scheme:

- 1) **Commit**: Data to be submitted (the IPFS hash of the file created locally by a worker, the optional vote, the processing status flag, etc.) is encrypted with a locally generated (on the worker's client) salt (a large integer).
- 2) Reveal: After all workers allocated to a given validation task have committed (or if the commit timer expired), they can then reveal, by providing the clear data (IPFS hash) and their salt. The protocol verifies that the information matches between commit and reveal and aggregates all submissions.

Commit-reveal is performed to prevent free-riding (workers copying others at the latest minute, pretending to work correctly, etc.). All validation tasks where workers must submit a vote or data are done via commit-reveal.

4.3.4 Worker participation cycle

Worker work on one job (e.g. a batch ID to validate and process) at a time. Workers, when registered, as placed in the Available worker pool. When allocated to a task, they are placed into the Busy worker pool. They can work as fast as they're able, as long as they participate within the commit-reveal framework. When a worker correctly reveals, he is marked as available for work again.

To end the cycle, a worker may decide to stop their work session and unregister from the WorkSystem. Unregistering is allowed when a given worker is available. A Worker can "pre-unregister" while completing his current and last task.

A worker who does not commit and reveal K (e.g. 5) times in a row is automatically unregistered from the WorkSystem. Participating incorrectly or not participating at all can impact a given worker's reputation and (or) stake negatively.

4.3.5 Worker-Main Address Manager

Workers generate rewards (REP and EXD tokens) and can redirect them to a Main Address, as workers are expected to be disposable. Users can potentially run many different workers and centralize their rewards to a single address, their identity. A contract called Address Manager is handling this mechanism.

A Worker can claim a Main Address, and vice-versa. When the bidirectional link between two addresses is established, a worker can start working on its own, and use its Main Address Stake, while transferring its REP and EXD rewards to the same Main Address, automatically.

4.3.6 Topics Bounty System

The **Bounty System** of the Exorde Protocol is a pillar of its **token-based in-centives** mechanism.

Clients of the protocols **place EXD bounties** (in EXD token only) on **specific topics** (or keywords, themes, websites, etc.), to be automatically processed and crawled by the Exorde Protocol. **Bounties are automated incentives for information spotters**.

A bounty can be placed on a topic and for a specific duration, then this bounty is split into daily (or hourly) fragments, to be distributed to the workers. This system is linked to the Data Supervision for the distribution of its rewards.

The Topics Bounty System is expected to evolve and allow different requests to be made to the Protocol, or to precise input parameters (to focus on a specific language, a specific type of data source, etc.).

5 Token Economy

Exorde's utility token was not designed as a part of the Exorde Protocol. The Exorde Protocol was designed around Exorde's utility token. This is a difference of paramount importance, as none of what we have designed Exorde to be could exist without the EXD token at its center, acting both as a means of reward for the protocol's contributors, but also as a way for Exorde's clients to obtain data from the protocol itself.

Bypassing this utility token approach and reverting to traditional FIAT currencies like dollars or euros for payment of the contributors would have translated into much more economic complexity from a reward perspective, but also the complete loss of anonymity for the contributors collecting information for the protocol (some of which could put thems at risk depending on local jurisdiction), as well as far more legal constraints linked to every currency used in that regard.

The native token of the Exorde ecosystem is the utility token EXD. This multipurpose Utility Token will be used for Governance, Staking, and for paying Exorde's data-related services.

5.1 Utility Token

The EXD token, based on the ERC-20 standard, is the native asset of the Exorde ecosystem. It is a utility token with multiple utilities:

- 1) Acts as the fuel for the Exorde Protocol. Clients of the protocol can place bounties on topics, themes, or keywords (in EXD token) to incentivize data collection and processing by the Exorde Network. The bounties will be deposited and locked in the protocol, and then distributed during the bounty's lifetime (at each URL for example) to workers who collect data relevant to the bounty's theme or keyword. The duration and the total value of the bounty are the main variables impacting the rate of rewards per data item (tweet, comment, article, etc.). It will be possible to set up long-term bounties and short-term bounties that will affect the flow of EXD rewards to the contributors working on them.
- 2) Used as **rewards** (economic incentives) for the participants in the **Exorde Work Systems**. Each system will reward the work done by its

contributors, according to their quality, quantity, and reactivity. The rewards amounts will be designed and adjusted by the Exorde Governance to incentivize the most relevant, up to date, and consistent work performed by the contributors, and to spread Exorde's workforce out evenly over all the different tasks.

3) Staked by participants (as a security deposit) in the Exorde Work Systems. Each system will require a different threshold of EXD staked to be able to register and work. EXD Stake is automatically allocated (temporarily locked) by the various WorkSystems composing the Protocol. This mechanism locks EXD tokens linearly (but can be quadratic) according to how many systems a user is currently working in, and how much data per hour this same user is currently spotting (submitting).

The system is designed to align the interests of the reputation holders with the EXD holders' interests, to ensure its long-term stability, to keep its data relevant, and to optimize the value generated by Exorde's data and analytics.

As there will be different types of decisions and different levels they apply to (technical decisions, global updates, big-picture type of decisions), the Governance will be structured in several committees, with a hierarchy in the decision-making, to make Exorde's governance fluid, efficient and scalable while still keeping complexity as low as possible.

Note: Reputation is the key resource to governing the Exorde protocol. This resource is non-transferable and can only be minted through validated contributions in the network.

5.2 Token Emission

Exorde's native utility token, the EXD, is based on the ERC-20 standard, its total supply will be two hundred million (200 000 000 EXD).

During the initial token distribution event, EXD tokens will be minted and allocated to different entities (Seed investors, partnerships, Founders, Advisors, Protocol Rewards, Community Bounty program, Liquidity Pooling).

The initial token distribution will have the following structure and smart contractenforced vesting:

- **Investors**: tokens reserved for early/seed investors; Linear vesting of 24 months.
- **Team Fund**: tokens reserved for incentivizing Exorde Labs team members and Founders to contribute to the project with a long-term mindset. Linear vesting of 72 months.
- Advisors: tokens reserved for Advisors who support the project. Linear vesting of 24 months.
- **Protocol Rewards**: tokens reserved for rewards to community members participating in the Work Systems and the broader Exorde ecosystem. Linear unlock over 60 months.
- Exorde Labs: tokens reserved for the private entity Exorde Labs. This fund is aimed to assist in regulating the Exorde protocol during the first years. Linear unlock over 72 months.
- Community/Bounty Program: tokens reserved for the community members who participate in the community-organized data science tournaments and other campaigns, aimed at improving the technology and adoption of the ecosystem. No vesting.
- Liquidity Providing: funds reserved for liquidity bootstrapping (for example on decentralized exchanges). No vesting.
- Airdrops: funds reserved for airdrops and airdrop-related tasks. No vesting.
- Public Sale: funds reserved for the public sale. No vesting.

In the setup that has been designed, no entity can mint more tokens than the total supply of 200 000 000 EXD. The initial token amounts are fixed and can't be changed later on, and by doing so, we prove to our potential investors that the Exorde ecosystem is committed to its original business plan.

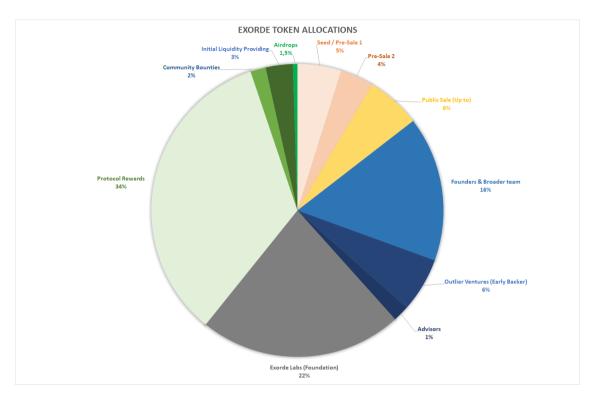
Note: The amounts and allocations described above are subject to change until the Public Sale event.

5.3 Token allocations and distribution

5.3.1 Token allocations

The Exorde Network Token (EXD) is allocated as follows. Vesting time frames or distribution methods are indicated in the following list.

- Seed/Pre-Sale 1: 5% (Linear vesting of 24 months)
- Pre-Sale 2: 4% (Linear vesting of 24 months)
- Public Sale: 6% (No vesting, unlocked during the Public Sale)
- Founders and Broader Team: 16% (Linear vesting of 60 months)
- Outlier Ventures (Early Backer): 6% (Linear vesting of 24 months)
- Advisors: 1% (Linear vesting of 24 months)
- Exorde Labs: 22% (Linear vesting of 72 months)
- Protocol Rewards: 34% (Distributed via internal protocol vesting of 72 months)
- Community Bounties: 2% (Distributed punctually during events, open source contests, etc.)
- Initial Liquidity Providing: 3% (Used as liquidity in DEXs (Uniswap) and CEXs initially in 2023)
- Airdrops: 1.5% (Distributed to ambassadors, TestNet participants and other community actors, in multiple airdrops over time)



The following pie chart describes the allocations (detailed above):

5.3.2 Note on Protocol Rewards

Protocol Rewards will be distributed to protocol participants over the course of 6-9 years.

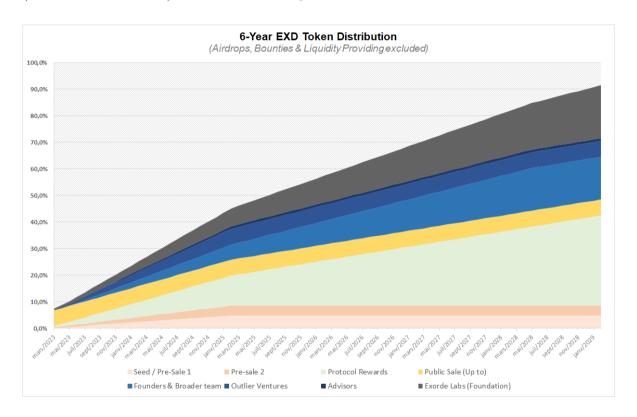
For Exorde's security and to control EXD's maximum inflation rate (per day, month and year), EXD rewards are hard-capped at 30 000 (thirty thousand) EXD tokens daily, and 1250 EXD per hour.

This mechanism guarantees that no one can exploit a sub-system of Exorde to steal the protocol's treasury.

This also ensures that the protocol has enough rewards for at least 6.2 years (30000*365*6.2 EXD \approx 68 000 000 EXD, the protocol rewards allocation). Initially, the protocol will cap itself below its 30 000 EXD/day issuance limit, around 10 000 EXD per day, and will increase progressively. This will vary according to the Exorde workforce, participation costs, and their evolution over time.

5.4 Token distribution

As the previously described token allocations have various vesting time frames or distribution methods, the following chart describes the EXD token distribution (tokens in circulation) over the next 6-7 years:



This token distribution chart represents the maximum number of tokens in circulation. Protocol Rewards are shown as being distributed at their maximum theoretical rate of 30k EXD per day (940k monthly). In practice, the protocol could issue its initial rewards for a longer time (e.g. 10-15 years).

This chart does not include Airdrops, Bounties (Community Bounties, for various future events, open source work, community initiatives, ...), and Liquidity Providing (locked liquidity on Uniswap, market making, CEX liquidity, ...). They add up to 6.5% of the EXD total supply. These 3 categories of token allocations will hit the circulating supply of EXD tokens over several years (Airdrops will be distributed mostly in the first two years, community bounties can be distributed over the next 5-10 years, locked liquidity can remain locked for 7+ years).

6 Founders

Térence Gras, CEO

Terence is a computer vision engineer very involved in anything AI/ML-related for image processing. He has worked both in the video game industry and on production lines in the spatial and transportation sectors. This is also where Terence learned to pitch new ideas, to drive new technology adoption in big groups with international influence. His role in this project is that of steering the Company's Vision in the right direction and defining the business strategy both short and long-term.

Mathias Dail, CTO

Mathias is a software engineer with a specialization in data science. Initially, with a background in programming, networking, and back-end systems, he specialized later in Data Science and especially NLP. He always had a thing for complex systems and interconnected architectures. Curiosity led him to discover smart contracts development when it started to emerge a few years ago. Since then, he has continued experimenting with decentralized protocols and reflecting on token models. He realized that combining NLP technology with the strengths of decentralized networks could leverage the entire unstructured Web through a complex, coordinated, yet fascinating approach. Therefore, his mission is to combine NLP with the power of decentralized systems, through a new form of digital organization, and to make Exorde emerge as an innovative service of the Web3 ecosystem.

Damien Pucheu, COO

Damien is a software engineer who worked for Suez, Monsieur TSHIRT, and Lectra. He joined Exorde to build all the visible parts (platform, APIs and extensions) to offer the best experience to all users. A great operational leader, he always knows which technology to investigate and integrate to make a better product. He identifies the best solutions quickly and always keeps scalability in mind. As the company grows he will focus on its COO role by working on business and processes to help Exorde reach its goals.

Page 35

7 Legal Disclaimer

The delivery of this Whitepaper and the offer or sale of Coins, do not constitute a representation that the information contained here is correct after the release date of this document. No value, guarantee of growth, or liquidity should be expected with EXD Tokens. Exorde Labs has taken all reasonable care to ensure that the information written in this Whitepaper is correct and up to date in all material respects and that there are no other facts, the omission of which would make misleading any statement herein whether of fact or opinion. Changes and updates can be frequent and will be made over time. The most up-to-date version of this document will be available on https://exorde.network website. The contents of this White-paper should not be construed as investment, legal, or tax advice.