EXOCHAIN™ is an identity infrastructure that enables end-user digital identity sovereignty, and establishes mechanisms to clearly define interaction parameters between digital entities.

Konrad Rauscher, Bob Stewart, Anthony Buonomo
Exochain.com

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Abstract

We describe a blockchain protocol that provides individuals, organizations and machines ("Entity(ies") [1] the ability to form a strong, verified digital identity, and [2] mechanisms to control the seamless release of verified personal data to third parties. The LYNK™ protocol's first application is intended to make it easier to share medical record data with healthcare professionals and medical research organizations. The integrity of one's established identity is evaluated and maintained through EXOCHAIN's Odentity™ framework, which provides metrics for scoring an Entity's identity establishment. In conjunction with an interface that allows users to designate permissions for accessing their data, which facilitates the programmatic release of data to humans and machines, EXOCHAIN reduces the time and costs required to establish prudent online interactions that possess legal standing. The LYNK protocol, when applied to the world of clinical research and precision medicine as a first use case, addresses data maintenance and transactional inefficiencies, facilitates democratized access to clinical trial participation, and subsequently catalyzes advancements in precision medicine.

Our parent company Exochain Corp is a Delaware C-corporation with its headquarters in Kennebunk Maine, and our EXO™ protocol use token (the "EXO token") operations are domiciled in Belize.

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1. Addressable Problems

1.1 Introduction to Fundamental Issues with Online Identity:

Today, an individual's online identity is primarily maintained by a federation of entities, including banks, governments, and social networks. These identity-federation entities collaborate to varying degrees, allowing an individual to utilize identification data from one identity-federation entity to either [1] directly obtain access to the networks of other identity-federation entities, or [2] streamline the creation of a new identity with another Entity. When creating a new identity, an individual is usually required to establish unique identifiers (e.g. credit card or phone number), which remain bound to the organization providing the credentials and authorizing transactions. This process can be thought of as 'renting an identity', since each identity and at least some rights associated with the identity are bound to a specific identity provider. Accordingly, a new identity must usually be established for every digital relationship an individual maintains with a given entity. This is both expensive for businesses, difficult for individuals to manage, and frequently leads to the exploitation of data corresponding to said individuals.

Another issue is how 'free-access' models are prone to stripping end users of sovereignty over their data. Although entities like Facebook and Alphabet (Google) offer a swath of services at no monetary cost, they require end-users to agree to digital shrink wrap agreements (Terms of Service, Privacy Policies, etc.) that permit access to and usage of personal information and other types of data (photos, for example), by the service provider under extremely broad and unfair license terms; of which, most end-users are not completely aware. Value is subsequently extracted from end-users in the form of data, to be stored in data silos and subsequently monetized. Besides required Privacy Policies and Notices, which are generally unapproachable because of their length and dense legalese, most companies are not transparent about the data they hold and the extent to which they profit from said data. Such information is generally not publicly available. In most cases, once an end-user clicks 'I Agree' to a digital shrink wrap, they relinquish sovereignty over their data; this entails the loss of control over what aspects of their data can be accessed, who can access that data, how their data is used, and how long the data can exist. The information accrued by such companies endows great power: Google can see what people search for, Facebook what they share, and Amazon what they buy.

This 'All-seeing view' is a concerning development that arguably represents the most extreme degree of power held by private institutions yet witnessed. As a result, there exists an incipient need for ownership of identity to be redistributed back to the primary stakeholder(s) corresponding to each identity. The 'free-access' models, ubiquitous

throughout the current digital services paradigm, undermine the control end-users have over their own data that corresponds to them and increases the susceptibility of end-users to misappropriations of their personal identity, and corresponding data.

1.2 Identity Risk and Inefficiencies in Clinical Research

Although well intended, the same procedures that can protect an individual's medical records can also inhibit the rate at which medical advancements are made. To transfer or interact with patient data, both healthcare professionals and medical researchers require written signature permissions from prospective patients. Moreover, medical researchers must certify the validity of their medical certifications with each interaction. These processes, seemingly simple, are quite time consuming and are often the cause of significant delays for clinical researchers. This inefficiency increases costs across the healthcare industry and limits the number of prospective patients evaluated for clinical trials.

Additionally, the lack of a trusted mechanism to track an organization's valuable intellectual property, and the highly competitive nature of the field of clinical research, causes organizations to shy away from collaborative research with other like entities. Because of this, clinical research organizations express highly risk-averse behavior that diminishes collaboration between organizations, and reduces the productivity and impact of clinical researchers themselves. Entire swaths of useful data are kept inaccessible from other research organizations due to fears regarding IP, protecting value of investments, etc.

1.3. Lack of Network Interoperability

> "We've turned many physicians and other providers into data entry clerks and it detracts ... from their productivity but it detracts greatly from their ability to provide quality care"
>
> **- Tom Price**, Fmr. United States Secretary of Health and Human Services

A lack of intra-network (within a network) interoperability, between healthcare organizations that use electronic health record (EHR) management systems that can't talk to each other, for example, results in many inefficiencies. This deficit of interoperability exists because of the prevalence of hundreds of healthcare data management vendors, that offer systems that often don't talk to each other. As an example, imagine that a T-Mobile customer can't call an AT&T customer because they use a different cellular network.

A lack of inter-network (between networks) interoperability, between networks of different types (clinical research and healthcare, for example) is also a matter of concern. Mechanisms for establishing trust, accountability, and reconciling nuance in digital agreements and transactions are sorely missing. Given their absence, it is very difficult (in terms of required resources, or even feasibility) to establish terms of engagement for a digital interactions that properly protect those involved which can result in greater liability than would otherwise be the case. Their absence also manifests itself as higher costs and dampened outcomes for those who heavily engage in digital transactions.

While EXOCHAIN's capacity to increase intra-network interoperability increases with adoption of EXOCHAIN on the part of healthcare administrators, such gains in intra-network interoperability, predicated on adoption, can be claimed by any entity that offers an Electronic Health Record ('EHR') management product; the more healthcare administrators adopt a given EHR system, the greater the interoperability between adopters of that system. EXOCHAIN, on the other hand, is a conduit for both inter-network and intra-network effects as the LYNK protocol will enable entities to interact with one-another, regardless of the EHR or other systems that they have deployed.

Given EXOCHAIN's approaches to addressing the issues laid out in sections 1.1 and 1.2, the LYNK protocol is singular in its capacity to drive 'meta-network effects', benefits in the form of cost reductions, improved efficiency, expanded access to informative data, and other such advantages that come from increased intra and inter-network interoperability. Whereas conventional network effects emerge from the cumulative addition of nodes to a network, 'meta-network effects' arise from the cumulative incorporation of networks into an ecosystem. These effects arise from the improved capacities of disparate networks of distinct types (medical, clinical, and patient) to interact with one another, within such an ecosystem. EXOCHAIN functions as a catalyst for meta-network effects by providing such an ecosystem that allows for better, streamlined, and customizable transactions between Entities from disparate networks.

1.4 Loss of Trans-generational Medical Records

> "Nothing is more important to accelerating discovery of cures than providing access to the data necessary for the successful identification of genetic targets in precision immunotherapeutic translational medicine. EXOCHAIN's LYNK protocol ensures seamless transgenerational, legal access to one's ancestral genotypic (DNA) and phenotypic presentations (medical records)."
>
> - **Bob Stewart**,
> EXOCHAIN CEO & Founder

Because of restrictions on EHR access established by HIPAA, the medical records pertaining to an individual currently become inaccessible after their death. This loss of trans-generational records has become a cause of enormous concern, as the growing feasibility of precision medicine (medical care tailored to a patient's genetics) means that these records possess enormous potential for improving medical care. Large-scale access to trans-generational medical records will be important for the acquisition of a better mapping of genetics and environmental factors to phenotypic expression, as documented in an individual's medical records. Put simply, data is needed for precision medicine, and the most informative data for a given patient can be found in the medical records of their relatives, particularly ancestors. The longer that access to trans-generational records continues to be lost, the greater the avoidable disparity between the quality of actual and possible medical care will grow, and the fewer lives that precision medicine will be able to save.

2. EXOCHAIN LYNK PROTOCOL

The EXOCHAIN LYNK protocol is an identity evaluation, establishment, and management infrastructure, one which enables the procurement of digital identity sovereignty and the programmatic release of data to authorized third parties. Integral to establishment of this identity infrastructure is Odentity, EXOCHAIN's framework for evaluating the establishment of valid digital identities. This framework promotes transparency in Entity interactions, establishes legal standing in digital transactions, and enables said transactions to occur on an ad-hoc, pre-defined basis. Moreover, Entites are protected by the maintenance of an immutable historical record of all transactions and terms of engagement by the use of blockchain distributed ledger technology.

Many aspects of the LYNK protocol's utility require usage (expenditure) of EXO protocol use tokens[1] (the "EXO token(s)"). Organizations utilizing the LYNK protocol are protected by Know-Your-Customer (KYC) compliance systems. Moreover, participants in the tokenized LYNK protocol benefit from access to seamless data-release authority, a reduction of redundant transactions, programmatic permission designations, personal data protection via zero-knowledge-proof attestations, and the ability to be directly remunerated for the use of their own data. .

2.1 Odentity

Odentity is the EXOCHAIN framework responsible for the formulation of identity-establishment scores. These scores are maintained as both new identity-establishing inputs become accepted, and previously-factored attributed are altered. An Odentity instance is instantiated for every EXOCHAIN user. An Odentity score can be extrapolated from the Odentity instance corresponding to an Entity (individual, entity, institution, or even machine). The Odentity score is instrumental in the evaluation of whether sufficient confidence has been established that an online agent is in fact who they, or it, claims to be.

2.1.1 An Odentity Instance

An Odentity instance is comprised of the set of all EXOCHAIN validity-attestations that correspond to a given Entity.. These attestations may originate from a third party, and be subsequently confirmed by the EXOCHAIN.

2.1.2 An Odentity Score

An Odentity score expresses the extent to which an Entity has established a verified identity; this score is determined by the set attestations (regarding the evaluation of

[1] See section 5, Token Economics

components of an identity) corresponding to an Entity. An attestation is a statement about the outcome of an evaluation of the validity and attributes of an identity input, such as a birth certificate, passport number, phone number, etc.

Given the dynamic nature of an Odentity score, it is important to note that this assessment of an established identity is only valid for a specific time period. This time period may be defined as either [1] the period until the next update to the score is made, or [2] the timestamp corresponding to when a specific Odentity score value was calculated.

2.2 Odentity Features

Odentity has the following features:

2.2.1 Digital 'Wet Ink' Signature:

EXOCHAIN's Odentity facilitates the digital manifestation of a next generation 'wet ink' signature; this is accomplished through the use of a public-private key pair, as well as the identity evaluation methodology discussed in the previous section. A user of the LYNK protocol is thus able to reference an evaluation of their digital identity, valid at a particular timestamp, when digitally specifying consent to an interaction and corresponding terms. This method of verification possesses an inherently higher degree of trustworthiness than a conventional, forgeable 'wet ink' signature. This aspect of Odentity functionality is consistent with the greater EXOCHAIN vision of establishing a digital-interaction ecosystem that benefits from comprehensive digital identity establishment and expands inter-network operability. In the context of authorizing access to medical records, such a digital identity signature is crucial to streamlining the assignment of access specifications to medical records, which has conventionally required a physical presence and a 'wet ink' signature to complete. Although actual 'wet ink' signatures are already fading from use, as tablet-based digital signatures attain wide use, the same issues of forgeability and low identity-informativeness still apply.

2.2.2 Dynamic:

Identity is not static because the set of recorded information corresponding to an identity is ever-changing. An Entity's Odentity instance is therefore dynamically updated as these factors change. Additionally, given that the extent to which a digital identity can be deemed as established and secured would be diminished in the case of abnormal or compromising behavior corresponding to said identity, an Odentity score has the capacity to fall given such activity. If an Odentity score continues to fall, the access and capabilities previously endowed to the Entity may be reduced or altogether revoked.

The converse also holds; an Odentity score would increase (and the set of capabilities it bestows expands), once it has been established that control over the identity has been regained.

2.2.3 Contextual Informativeness:

A given domain (healthcare, banking, etc.) may be unique in terms of which and how the establishment of different components of an identity are valued. When seeking to determine a level of trust for an unknown Entity, an Entity from a given domain may accordingly request a domain-specific Odentity score when evaluating another Entity. Such a score would be formulated by EXOCHAIN from a specified subset of the inputs, weights, and dynamics involved in the computation of an Odentity score.

2.2.4 Minimal release

Improving release of need-to-know data, important for Know Your Customer (KYC) and Anti-Money-Laundering (AML) compliance, and digital interactions in general, is a key facet of the LYNK protocol. Certain services require only a specific degree of information; take for example any service that simply requires proof of age before being rendered. Minimal data release is enabled by the LYNK protocol, such that the verification of an established attribute within an Odentity instance can be provided without revealing additional information (i.e birth place, name, etc).

2.3 User-Defined Permission Designations

Through the LYNK protocol, an Entity with a verified digital identity may enter into a smart contract agreement, one possessing full legal standing[2], with an online agent. Moreover, the Entity can personally designate what access permissions online agents may have toward his or her sensitive data, via EXOCHAIN's intuitive front-end interface. Such access parameters could encompass the purposes for which their data will be utilized, the categories of Entities that can acquire access, duration of access, and remuneration specifications, as examples. These blockchain-enabled immutable and transparent programmatic permission designations are unique to EXOCHAIN's smart contract approach. This EXOCHAIN ecosystem thus establishes self-sovereign identities, facilitates prudent data governance, and allows for Entities to partake in nuanced data transactions, backed with legal standing.

As digital interactions become more widely adopted grow in sophistication, so too does the importance of programmatic data release. The LYNK protocol accordingly

[2] Provided that a given jurisdiction has recognized a smart contract as a legally binding instrument, and that the requirements for the establishment of legal standing in that jurisdiction align with the methodologies in use by EXOCHAIN

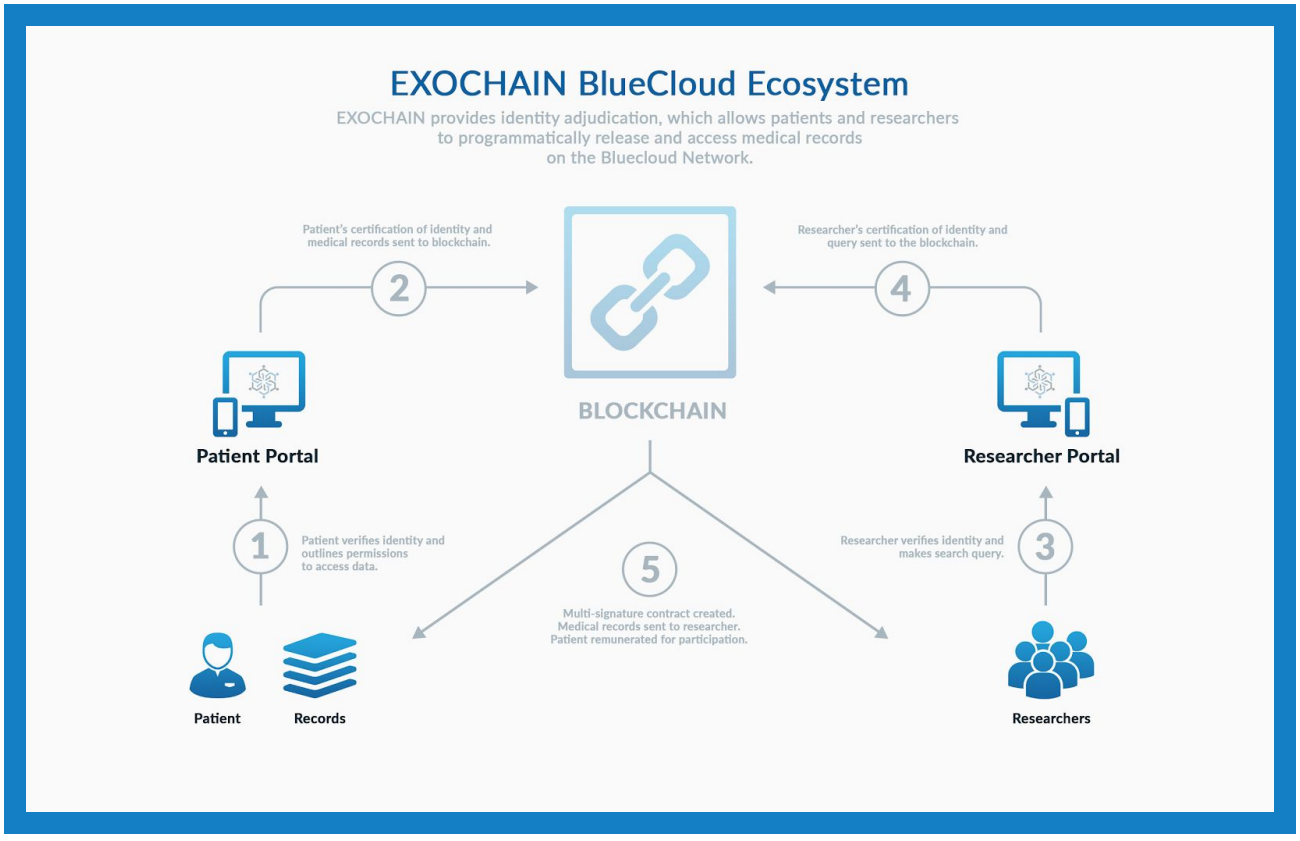
streamlines secure digital transactions and allows for the establishment of interaction parameters for specific categories of Entities such as healthcare professionals, pharmaceutical researches, clinical researchers, and clinical researchers engaging in a specific disease or condition, such as cancer. The end result is a reduction in the costs, risk and processing time entailed with a given digital interaction.

EXOCHAIN's Odentity framework further bolsters the utility of the LYNK protocol's programmatic access permissions. Odentity facilitates the formation of verified credentials; via Odentity, an online agent may, for instance, establish themselves as a clinical researcher focusing on lung cancer treatments. Specific behaviors may subsequently made available within the LYNK protocol to the online agent, based on their Odentity credentials. The parameters of a given data interaction, be it an agreement or a request, may be specified via EXOCHAIN's interface to the LYNK protocol.

Of particular significance is that programmatic access designations provided by the LYNK protocol enable users to establish an escrow for their medical records, such that user-specified components of their EHR will be released upon death. Because of the importance of trans-generational medical records to the development and application of precision medicine, a patient that establishes an escrow for their medical records can expect to improve the quality of medical care for their relatives and descendants.

3. Value Proposition

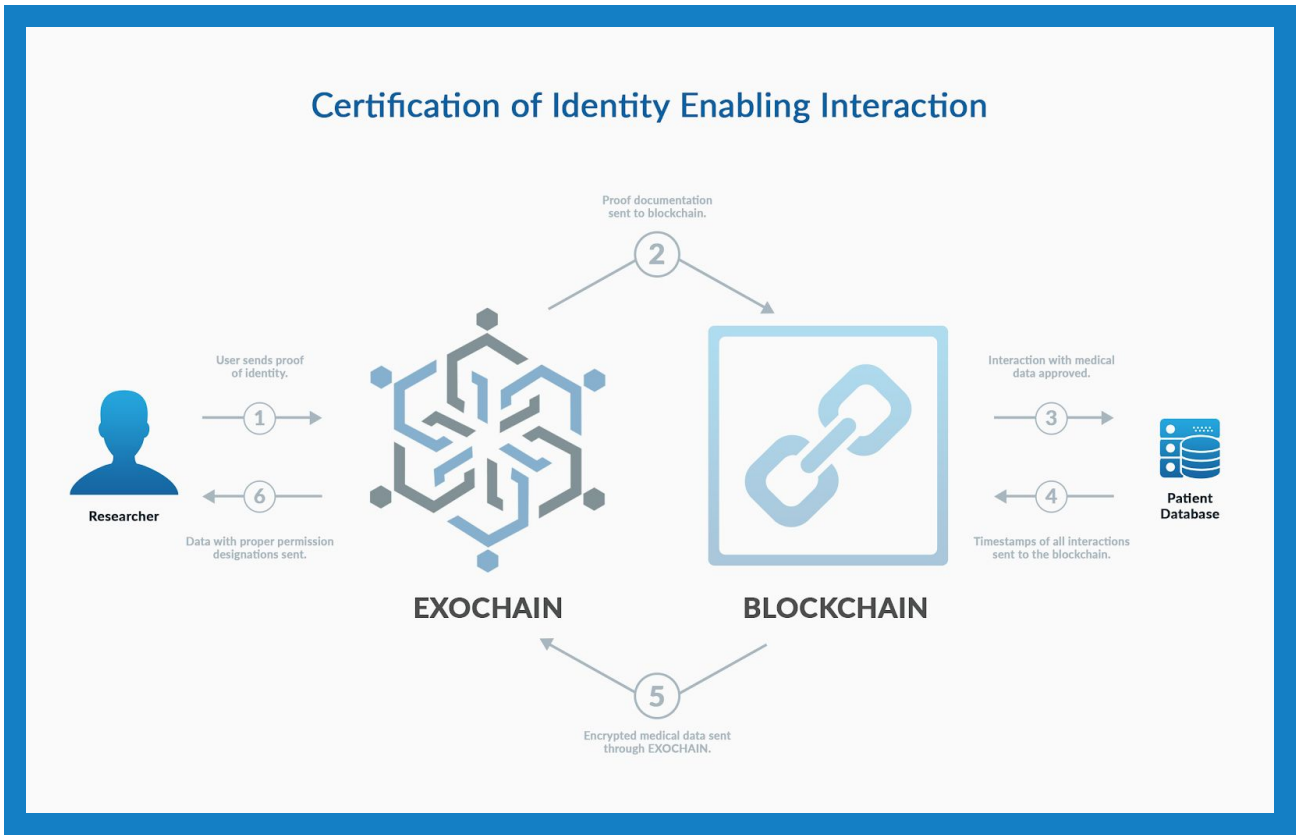
In its first use case of improving digital interactions for and between Clinical Researchers Healthcare Professionals, and Patients to catalyze advancements in precision medicine, EXOCHAIN has transcended the Chicken and Egg Dilemma through a ten (10) year contractually exclusive partnership with the 1.3 million members of ACRES' BlueCloud® network. Upon network launch the EXOCHAIN network commences with a user base of over 1.3 million healthcare professionals representing over 50,000 healthcare provider organizations in conjunction with over 125 ACRES allied industry partners. These healthcare professionals will be incentivized to [1] use EXOCHAIN as patients themselves and [2] utilize EXOCHAIN for the management of their EHR. Moreover, through partnerships with BlueCloud and Clinerion, medical records for more than 70 million individuals will be searchable by participating healthcare professionals.[3] The following pages articulate how EXOCHAIN redefines the relation among clinical stakeholders including research organizations, payers, providers, and patients, among others.



[3] See Appendix 7.2 for more information about EXOCHAIN's partnerships

1. A patient certifies their identity with EXOCHAIN and defines engagement parameters, which define how medical researchers may interact with their medical records.
2. The patient's updated Odentity, medical records, and programmatic permission designations recorded on immutable blockchain.
3. Researchers looking for potential candidates validate their identity with EXOCHAIN and make a search query (ie - 44 y/o, Type A Blood, Non-Hodgkin's Lymphoma).
4. Matches are found and data is anonymized / deanonymized based on programmatic permission designations all patients have created.
5. A multisignature contractual agreement is created between transacting parties, medical records are sent to the researcher, and relevant patients may be remunerated for providing access to medical records.

3.1 Clinical Researchers



1. Clinical Researcher sends proof of identity to EXOCHAIN.
2. Proof documentation is encrypted and sent to the blockchain.

3. If researcher's Odentity is sufficiently established, the researcher may then make requests to interact with patient data in the BlueCloud Network via EXOCHAIN's query engine.
4. Each request and interaction with the data is timestamped and added to the blockchain.
5. Medical records are released via a multi-signature contract to the participating clinical research organization.
6. EXOCHAIN delivers permitted level of access to the requesting researcher.

3.1.1 Issue: Redundancy of Certification Proofs

Redundancies in the processes surrounding the management and evaluation of certification proofs consume time and resources that could otherwise have been used towards more productive ends.

Solution: Redundancy is diminished through once-and-done certifications of identity, represented in a given Odentity instance. For example, rather than completing the same form on a per-request basis, a form can be digitally completed once with an established Odentity and EXOCHAIN can provide certifications that the form was completed and is current.

3.1.2 Issue: Extraordinarily low participation in clinical trials - 4% globally & under 3% for cancer in the US.

These low participation rates indicate that a gross majority of patients are not participating in potentially life-saving treatments, and dampened progress in clinical research.

Solution: Although a significant component of this low participation rate is explained by the strenuous conditions used to select participants for clinical trials, EXOCHAIN can improve participation rates by providing clinical researchers with access to better methods for determining potential volunteers (i.e. an interface to a database of verified and attribute-rich patient record instances).

3.1.3 Issue: Research systems lack a trusted mechanism to track intellectual property in collaborative research. Entire swaths of useful data are kept inaccessible from other research organizations due to fears regarding IP, protecting value of investments, etc.

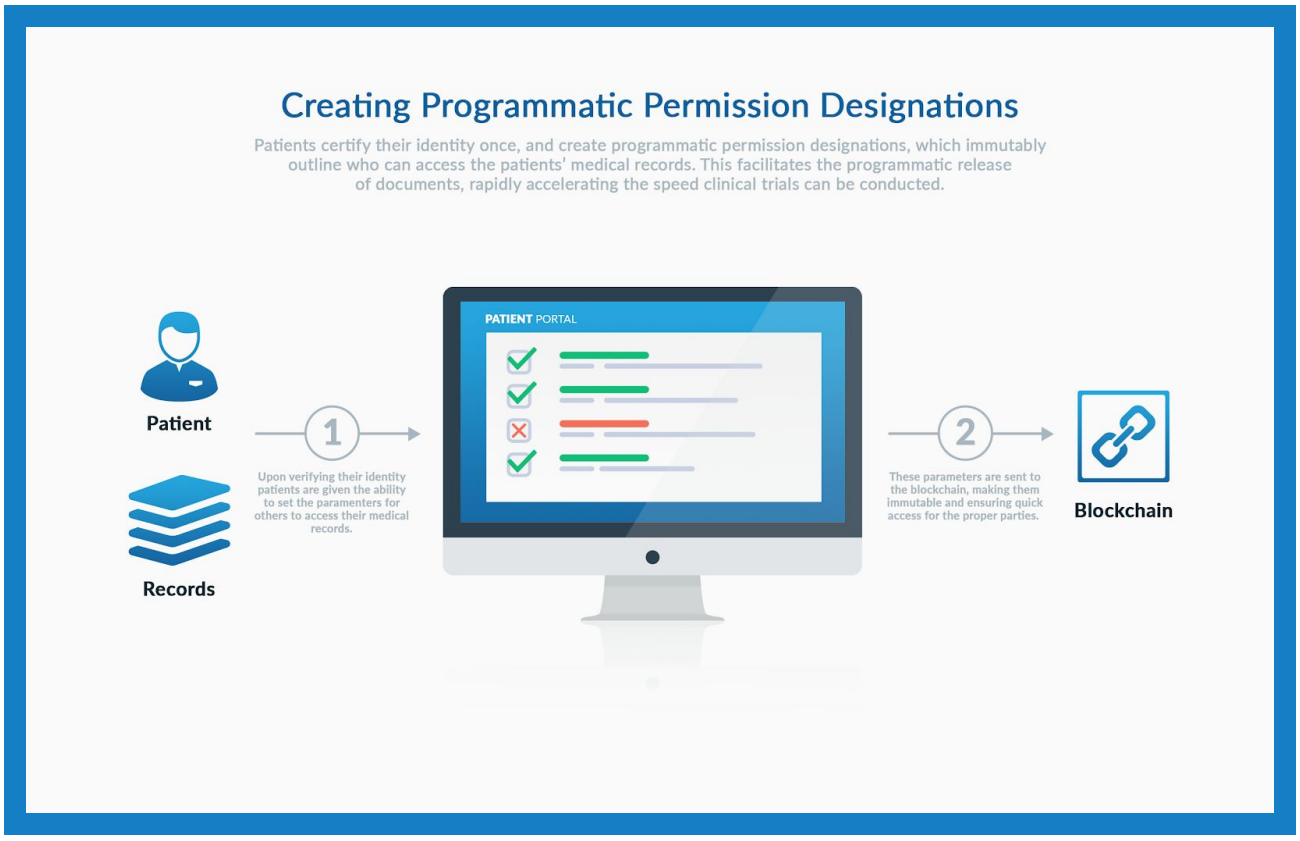
Solution: Certified user identities enable agreements and transactions with legal standing [4]. Risk is further mitigated by ensuring that transactions within smart-contracts can be jurisdictionally enforced, and, when required, delivered as evidence in support of contract enforcement, regulatory compliance, and litigation. By enabling clinical research organizations to clearly, easily, and effectively articulate terms of engagement, valuable data can be utilized by more researchers from different organizations.

3.1.4 Issue: High overhead costs of regulatory compliance in general.

Solution: Many clinical research organizations, including smaller ones, often find it difficult to meet the high-hurdle overhead of full regulatory compliance and are hampered and taxed by the need to deploy systems that are generally prohibitively expensive without the benefits of economies of scale enjoyed by larger organizations. Because full-feature participation in the EXOCHAIN ecosystem requires establishment of identity through EXOCHAIN's adjudication framework and identity score, regulatory compliance is simplified through extensive and automated validation of data integrity.

[4] Provided that a given jurisdiction has recognized a smart contract as a legally binding instrument, and that the requirements for the establishment of legal standing in that jurisdiction align with the methodologies in use by EXOCHAIN

3.2 Patients



1. Patient establishes his/her Odentity and is given the ability to set the parameters, which govern who may access their medical records, how they may do so, and optionally adjust the system calculated price for a requesting clinical researcher to do so.
2. Proof of identity and permission designations are added to the blockchain. Designations are immutable to third parties, and cannot be updated in the future without access to the patient's public / private key pair.

3.2.1 Issue: Obstacles to participation in clinical research and thus experimental, potentially life saving treatments

Solution: The LYNK protocol and Odentity allow for parameterized data access designations with time delineation and seamless release authority. The result is increased visibility and engagement of patients to, with -- and for -- clinical research Entities, while reducing the overhead (cost of regulatory compliance, liabilities, etc.) per patient involved in a clinical trial.

3.2.2 Issue: Lack of end-user self-sovereignty, data security, and data privacy.
Solution: Through improved means for establishing terms of engagement to which all involved parties agree and benefit from the LYNK protocol democratizes the manner in which value is extracted from end-user data by enabling patients to define the terms of engagement for other Entities to interact with their data. EXOCHAIN also allows users to see a share of the potentially extremely high-impact value that they are providing (such as rare genetic profiles). Conversely, they may greatly benefit from the potential cures and improved care enabled by expanded access on the part of clinical researchers to such data. This would be accomplished

3.3 Healthcare Professionals

3.3.1 Issue: Redundant proofs required to request, access, or transfer data.
Redundancies in the processes surrounding the management of medical data consume time and resources that could otherwise have been used towards more productive ends. This is an issue of particular significance for medical professionals, given the extensive documentation that must be maintained, and corresponding procedures required by regulation.

Solution: Adjudicated Odentity once-and-done attestations.

3.3.2 Issue: Segmentation of medical record networks complicates and mitigates inter-network interoperability, resulting in data access issues that affect the quality of medical care, clinical research, and clinical trials. A lack of interoperability between healthcare providers costs 150,000 lives and $18.6 billion per year, according to the Premier Healthcare Alliance.

Solution: Disparate network transcendence through standardization of digital interaction by way of a transparent and flexible protocol that facilitates and defines how such inter-Entity (healthcare professionals, clinical researchers, and patients) interactions occur.

3.3.3 Issue: Record version management difficulty coupled with tendencies towards dis-synchronisation result in a system where medical data can easily become ‘stale’ and healthcare professionals suffer from performing data administration duties at unnecessarily high opportunity cost.

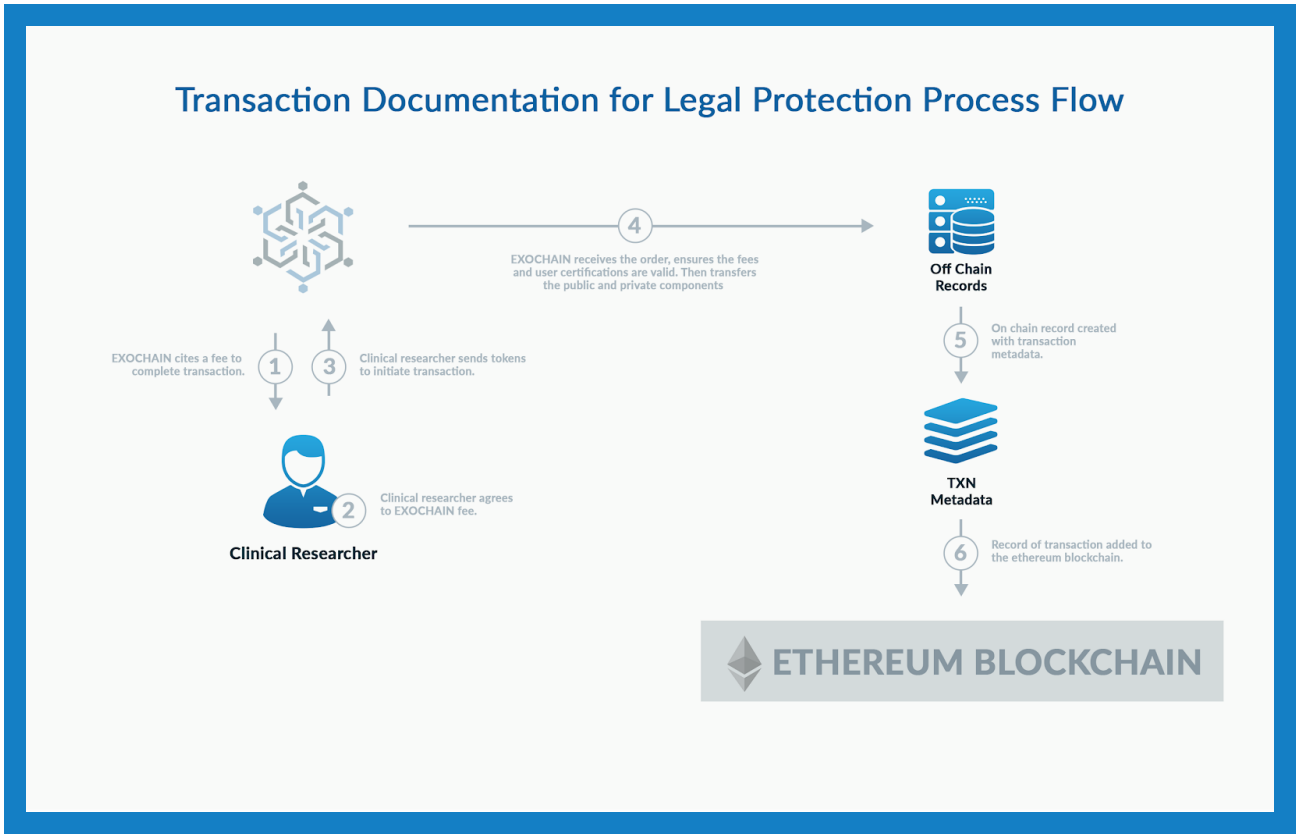
Solution: Introduction of an object-oriented approach to interaction with personal medical records. By redirecting access to personal healthcare record objects (an abstraction of personal medical record data that encapsulates all the PHI of a person) through unique

pointers (i.e. addresses), data currentness is maintained. Redefining the access process shifts the paradigm from doctors and medical professionals, facing a specific set of documents on a per-case basis, towards one where patients provide modulated, time-delimited access.

EXOCHAIN feature: Easier PHI regulatory compliance. Because full-feature participation in the EXOCHAIN ecosystem requires establishment of identity through EXOCHAIN's adjudication framework and Odentity score, regulatory compliance can be simplified through extensive and automated validation of data integrity. Authorization is verified and helps to ensures regulatory compliant access to medical records.

4. Technical Specifications

4.1 Transaction Documentation for Legal Protection, Process Flow - The following outlines the way in which transactions are recorded, giving those involved in the transaction protection through a clearly and historically-represented record that the transaction occurred, that it occurred before or after other transactions, and record the terms of engagement involved in the transaction.

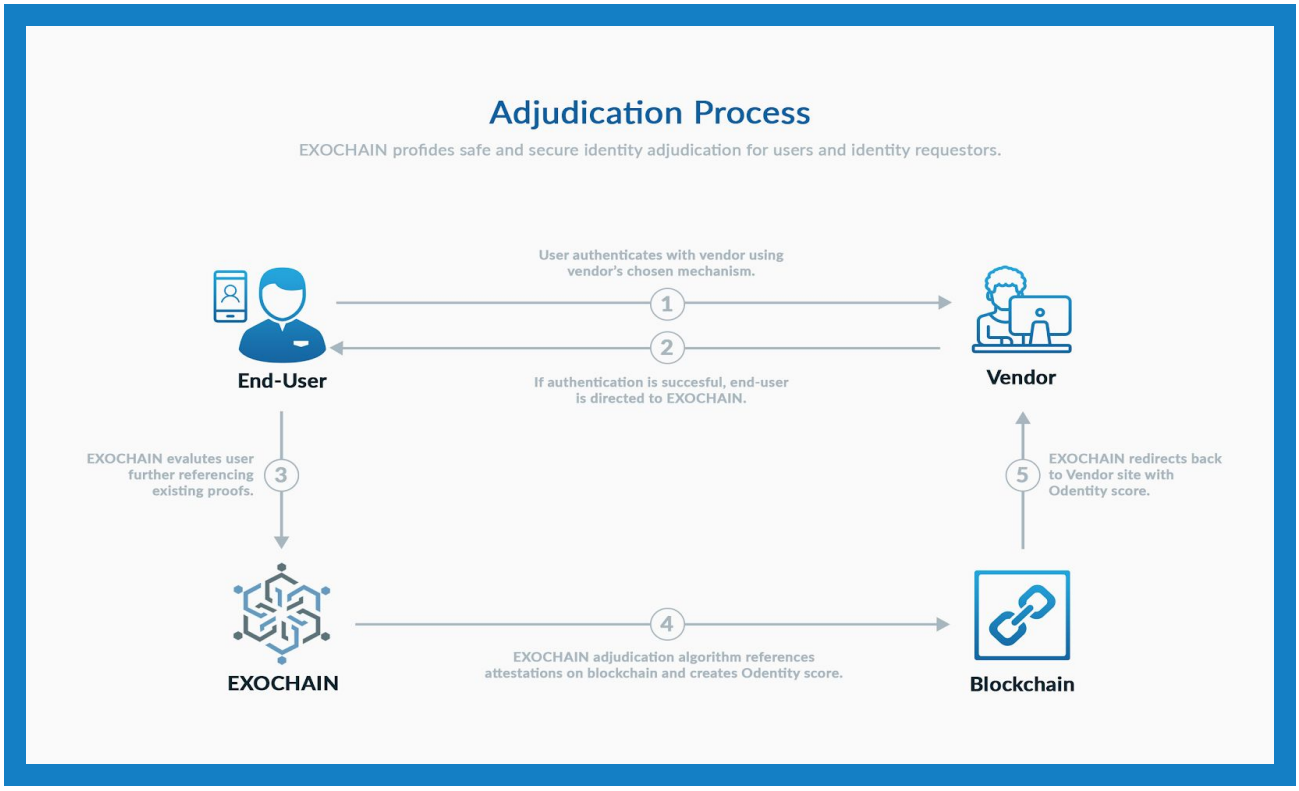


1. EXOCHAIN cites a fee to complete transaction (i.e. make a search query)
2. Clinical researcher agrees to fee.
3. Clinical researcher sends search request and EXO token(s) to initiate transaction.
4. EXOCHAIN receives the request, checks that the request is valid and that the required fees have been paid. If the request details are satisfactory, EXOCHAIN posts the order to their off-ledger transaction book.
    i. Such post includes:
        1. Full Terms of transaction
        2. Components of the transaction specified as public
    ii. Can include: components of the transaction specified as private that can only be accessed with the proper key, which can be provided by

either one or both of the parties involved in the transaction, or once a set of conditions have been met (time-delminted release for double blind trial, for example.) This key can be requested from Entity(s) possessing the key.

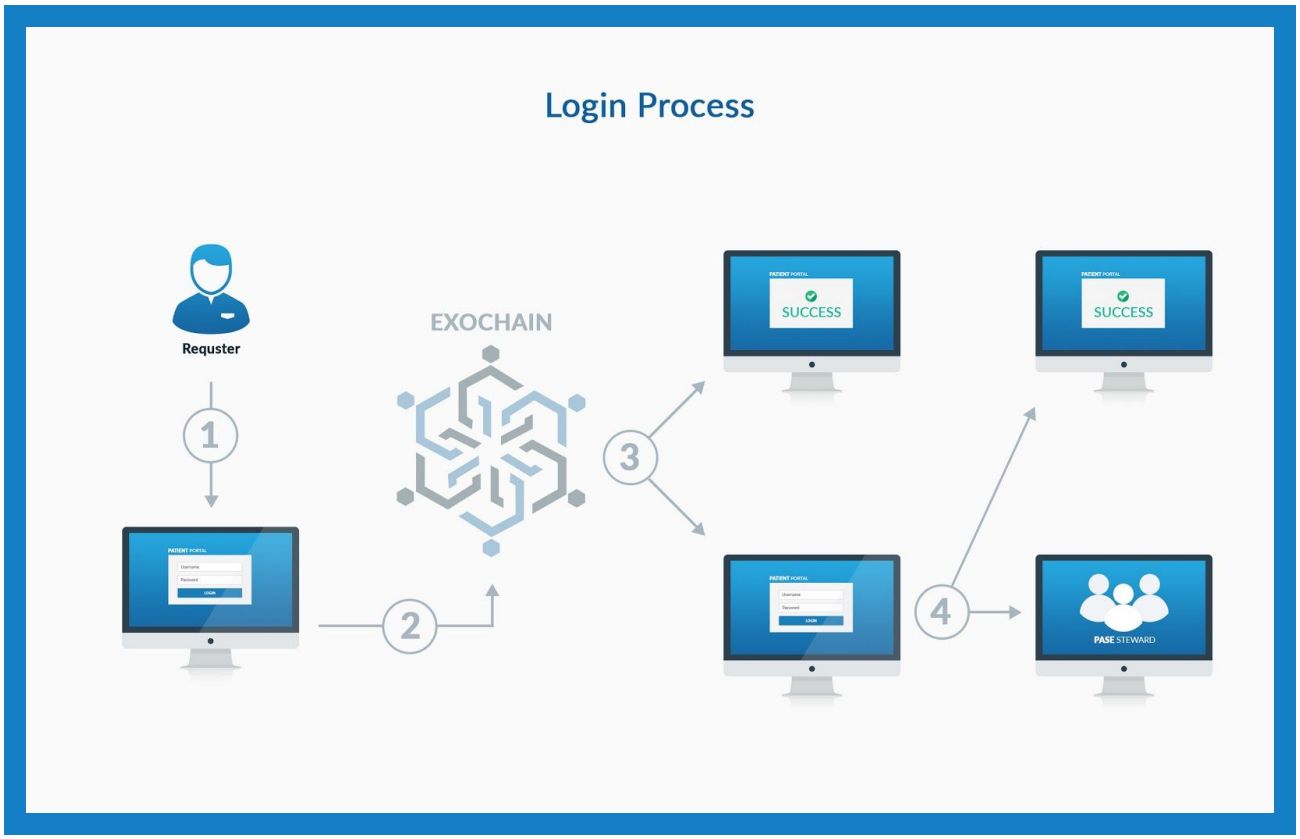
5. On-ledger record created
    i. Includes:
        - Metadata about the transaction
        - Parties involved in transaction (identified by unique key / address) This address corresponds to an Entity registered with EXOCHAIN
            - Type of transaction
            - Timestamp of transaction
        - A hash (address) that corresponds to an off-chain transaction data object
6. On-ledger record posted to ethereum blockchain

4.2 Adjudication - The following outlines the Odentity establishment process that ensures Entites can make legally binding decisions about the programmatic release of personal data to third parties.



1. USER authenticates with VENDOR using VENDOR's chosen mechanism
2. If USER successfully authenticates with VENDOR, informative components of VENDOR’s authentication outcome are passed to EXOCHAIN and the USER is redirected to the EXOCHAIN site.
3. EXOCHAIN evaluates the USER's security context (device, location, etc.) and leads the USER through additional authentication factor flows as necessary
    - Conditions for additional authentication factor flows entail: unprecedented device, location, unknown email, etc
4. EXOCHAIN adjudication algorithms process the results of said authentication mechanisms and incorporates them into Odentity score [an Odentity score is instantiated at this point if one did not exist for USER]
5. EXOCHAIN redirects browser back to VENDOR site with accompanying encrypted Odentity information
6. VENDOR evaluates Odentity score
7. VENDOR instantiates session

4.3 Login - The following describes the process in which EXOCHAIN facilitates trustless interactions between users and vendors or other third parties.



1. USER navigates to and is subsequently presented with login page
2. USER enters login information
    a. IF login credentials are correct, proceed to [3]
    b. ELSE If USER incorrectly enters login information, error message presented
        i. Mechanism for per-device lockout from additional login attempts and notification of USER via trusted means of communication (validated devices, validated email, etc.) IF X incorrect attempts from a given device.
3. EXOCHAIN evaluates the USER's context (device, location, etc.)
    a. IF unprecedented device, then EXO generates OTP (one-time password), sends to other OTP-validated device or email, and prompts user to enter OTP on unprecedented device
        i. Once OTP is successfully submitted this formerly unprecedented device becomes precedent for future transactions.
    b. ELSE IF unprecedented device AND no access to validated device or email, Primary Alternate Contingency Emergency (PACE)-method can be used to request access via established stewards corresponding to that identity
        i. Once PACE Stewards receive the request, they communicate their approval / rejection of the request to EXOCHAIN; if approval, proceed to [4]
4. IF validation steps are completed in [3], USER redirected to Account Overview / Hub page

4.4 Query Engine

A query engine that enables clinical researchers to specify search parameters and query records, attributes, and individuals in EXOCHAIN's BlueCloud is in active research and development. EXCOHAIN's query engine will possess learning and classification capabilities, such that usage patterns are leveraged to identify the value of attributes and sets of records for specific tasks. The procurement of usable data from EXOCHAIN's query engine will require the expenditure of EXO tokens. Patients will be able to specify the accessibility and terms of access (the purposes for which their data will be utilized, the categories of Entities that can acquire access, and remuneration parameters, as examples). The intellectual property pertaining to this service and other elements of the LYNK protocol will be disclosed in a future version of this whitepaper provided that the legal protections available to EXOCHAIN which allow for such disclosure while minimizing the risk of loss have been accommodated.

4.4.1 Example Use Case:

A medical researcher is studying the age of onset and speed of progression of Alzheimer's. Some diabetes studies have suggested that the diabetes drug Metformin may have some preventative characteristics for Alzheimer's. The researcher uses EXOCHAIN’s query engine to explore EXOCHAIN’s BlueCloud, containing millions of medical records, to create three plots showing the age of onset and speed of progression for Alzheimer's patients not taking Metformin, those taking 500MG Metformin, and those taking 1000 MG. Such data could reasonably mitigate the crippling effects of this disease for many individuals.

5. Tokenomics

5.1 What is EXO?

EXO™ is an ERC-20 protocol use token used within the EXOCHAIN ecosystem to establish legal standing in smart contracts, incentivize improved industry behavior and catalyze stakeholder adoption. Said incentivization is established by appealing to the self-interest of end-user parties in terms of improved outcomes, liability reductions, and direct remuneration in exchange for access to an online agent's data. Utilization of EXO tokens, rather than ETH, allows EXO stakeholders to safely contribute towards, and reap the benefits of, improved processes for quality collaborative clinical research, which in turn directly rewards participants for their contributions to the successful adoption of such an ecosystem. Upon deployment of the LYNK protocol, an ERC-20 compliant token wallet will be instantiated for the 1.3 million patients, clinical research organizations, and healthcare professionals within EXOCHAIN's BlueCloud. Each wallet will be granted 1 EXO token, with restricted use for 12 months, during which time such EXO token(s) may only be used or transferred within the LYNK protocol environment, for purposes of the protocol utility mechanisms.

5.2 Token Holder Utility

The EXO Token fuels all interactions within the LYNK Protocol. Each actor within the LYNK protocol is provided with a trustworthy, user-controlled mechanism for seamless record release and access (medical or otherwise). Clinical research Entities are provided access to an extensive network of identity-established patients, who have personally defined access parameters to their high-value data. the establishment of such a framework will be a catalyst for advancements in the field of precision medicine research, and subsequently improved medical outcomes for patients.

5.2.1 Clinical Research Organizations

In its first use case, EXO tokens are used by clinical researchers to pay for search query results pertaining to clinical trial candidates. Today, clinical researchers pay marketing organizations upwards of several thousands of US dollars to recruit a single, qualified participant. EXO facilitates significant time and cost savings for clinical researchers, as medical data can now be procured directly from a patient. Early-adopting clinical research organizations will benefit from lower costs in their use of EXOCHAIN's query engine.

EXO tokens are further utilized in timestamping interactions on the EXOCHAIN network. Clinical research organizations may thus immutably demonstrate ownership of their intellectual property, while maintaining a collaborative environment conducive to medical

breakthroughs. These interactions are further augmented by the EXO token's function as an exchange of value, which is one of several requirements, depending on the relevant jurisdiction, for endowing an agreement with legal standing.

5.2.2 Patients

Over time, blockchains are expected to provide "rule-of-law-as-a-service" as an international, programmable simplification of the litigation and dispute resolution paradigm. In the context of the blockchain, an Entity is endowed custody via ownership of a private key. This simplified, decentralized approach to custody, the functionality provided by the LYNK protocol, and the identity-establishment capabilities of Odentity allow a patient to establish legally binding[5] access permissions as to how their medical data may be interacted with. This has direct implications for the ease with which a patient can access and share their records with healthcare professionals, obtain remuneration for the use of their health records for clinical research or other purposes, and the accuracy, freshness, and comprehensiveness of the medical records used by healthcare providers. As PACE Stewards are designated by LYNK protocol users and are successfully adjudicated and on boarded into the system, they will also be provide with an ERC-20 compliant token wallet which will be seeded with 1 EXO token, with a restricted use period of 12 months.

5.2.3 Healthcare Professionals

Healthcare professionals that subsequently join EXOCHAIN will similarly be provided with a token wallet, seeded with at least 1 EXO token[6]. Additional EXO tokens[7] will be offered to incentivize desirable behaviors, such as the establishment of Odentity and linkage of medical records to EXOCHAIN. Healthcare professionals will play a significant role in widening the utility of the EXO token, as they adopt EXOCHAIN-based approaches to improving EHR management for both themselves and their patients. The value of their contribution towards expanding the utility of the EXO token will be reflected in the appreciation of their held EXO tokens.

5.3 Token Distribution Schema

EXOCHAIN will distribute one half of each 1B token tranche of the available 7.6B EXO tokens to the public over the next seven years, at the rate of 1B tokens per year. As EXO tokens enter into circulation, 10% of the total supply then entering circulation will be

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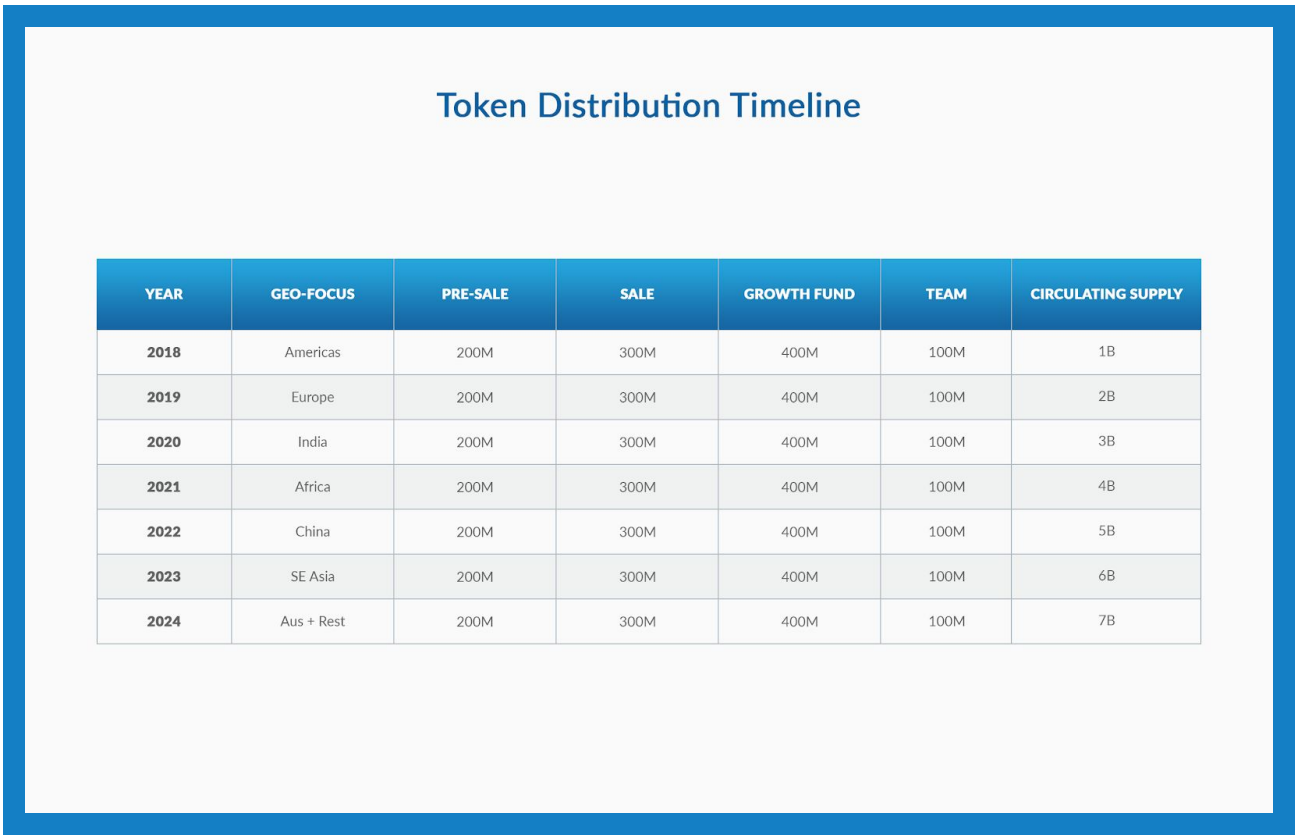
[5] Provided that a given jurisdiction has recognized a smart contract as a legally binding instrument, and that the requirements for the establishment of legal standing in that jurisdiction align with the methodologies in use by EXOCHAIN

[6] Subject to a restricted use period of 12 months

[7] Subject to a restricted use period of 12 months

distributed to principals (holders of EXO tokens from previous coin offerings), with a restricted use period of 12 months.

5.3.1 Timeline



Token Distribution Timeline

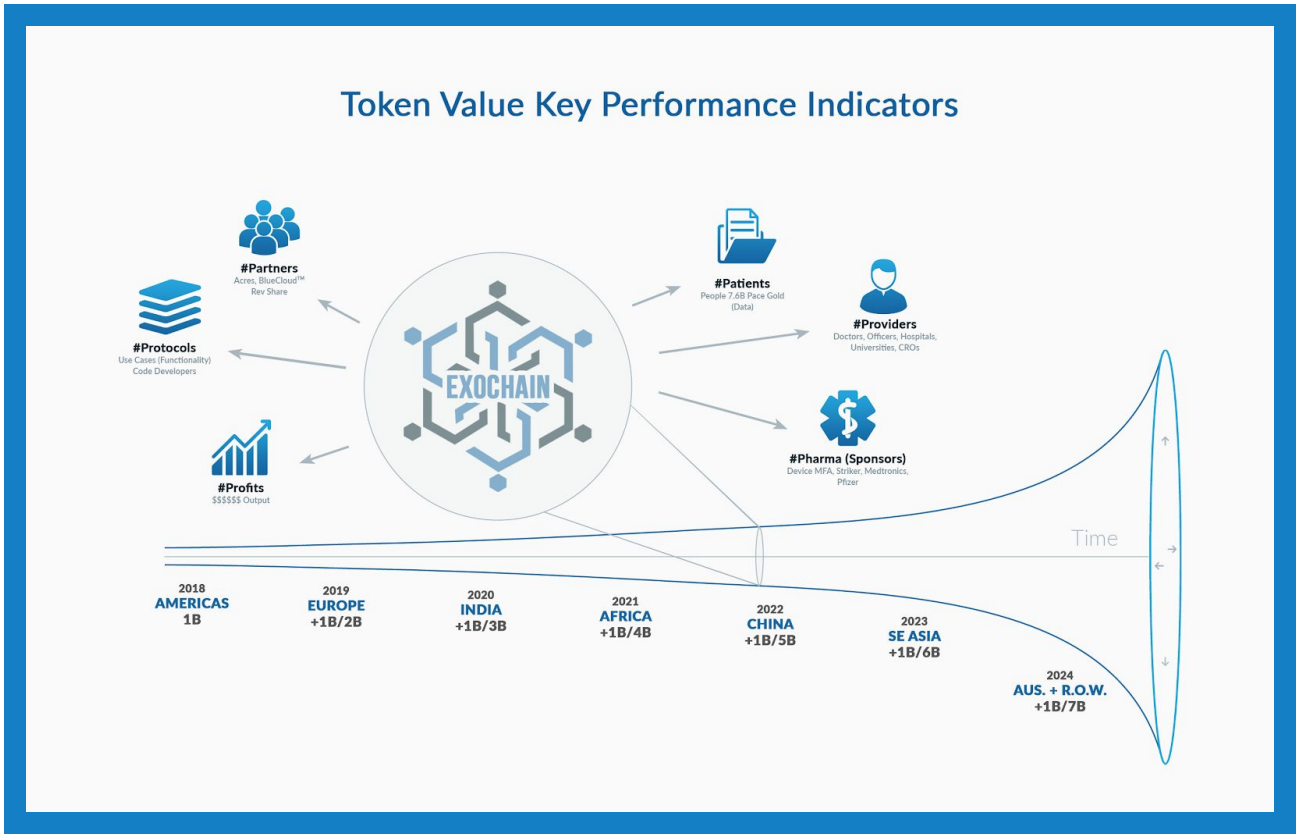
YEAR	GEO-FOCUS	PRE-SALE	SALE	GROWTH FUND	TEAM	CIRCULATING SUPPLY
2018	Americas	200M	300M	400M	100M	1B
2019	Europe	200M	300M	400M	100M	2B
2020	India	200M	300M	400M	100M	3B
2021	Africa	200M	300M	400M	100M	4B
2022	China	200M	300M	400M	100M	5B
2023	SE Asia	200M	300M	400M	100M	6B
2024	Aus + Rest	200M	300M	400M	100M	7B

EXOCHAIN will have its first and only initial EXO token pre-sale beginning on March 19th, 2018. During this event, EXO tokens will be sold for $0.07 USD with a 35% bonus (a net price of $0.0455 USD per EXO token). *Please note that this initial EXO token presale will be available to interested parties from the US under a SAFT and only if such parties are accredited investors under SEC rules.* EXOCHAIN will be announcing its first public sale of EXO tokens shortly.

Starting in the year following the first public EXO token sale, EXOCHAIN anticipates that it will hold an follow-on token sale every year for the next seven years for the applicable market penetration initiative undertaken EXOCHAIN for the respective year. During this period, the market will determine the price at which EXO tokens will be sold for these follow-on EXO token sales.

The offering of the EXO token is broken up across these phases because [1] many of the efforts required are unique to each geographic region and [2] it is important that EXOCHAIN encompasses as much of the human genotype as possible, such that progress in precision medicine is catalyzed for individuals of all genomic backgrounds.

5.3.2 Key Performance Indicators

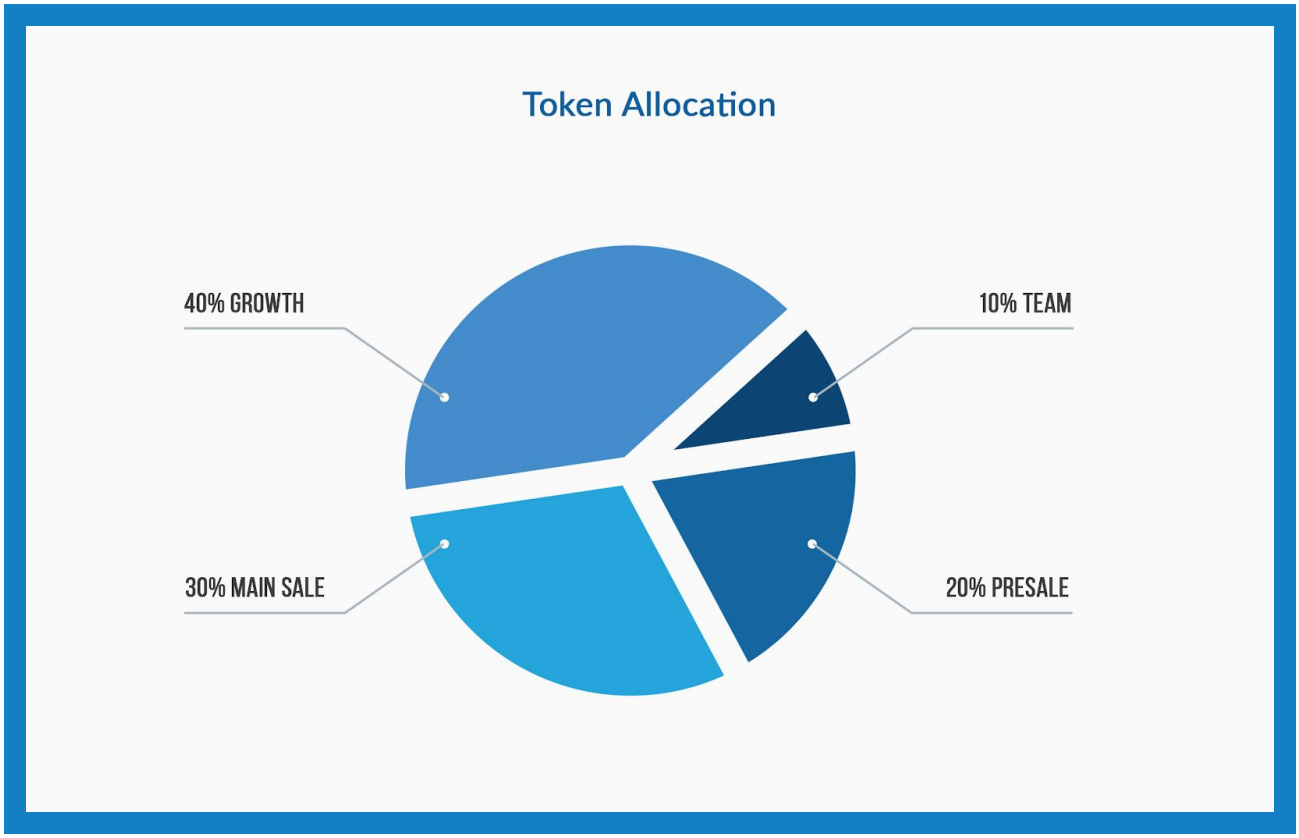


Any appreciation of the EXO token will be driven by the pragmatic practical utility of the EXO token resulting from the value of benefits attributed to the real-world application of the LYNK protocol and any possible resultant demand for sufficient quantities of EXO tokens to execute the LYNK protocol said services.

Additionally, possible forces for appreciation of the EXO token may be driven by the company's focus on standardizing adoption of the LYNK protocol, the LYNK protocol's adoption and an anticipated network effect brought about by partner procurement, market penetration, and feature deployment across six initial dimensions: Protocols, Partners, Patients, Providers, Pharmas, and Profits.

As progress is made across these six dimensions or Key Performance Indicators (“KPIs”), expanding inter-network and intra-network effects and increasing the value of previously deployed features as they are synergistically augmented with the release of subsequent features, the utility accessible via an EXO token, and its corresponding value, should is expected to increase in parallel with the value and utility of the LYNK protocol.

5.3.3 Token Allocation



The EXOCHAIN initial EXO token sale of the AMERICAS for 1B EXO tokens will be price-averaged at $0.06 (based on a blended average of all pre-sale and public sale prices), soft-capped at $5M, and hard-capped at $30M. Each of the six (6) annual EXO follow-on EXO token sales will consist of 1 billion EXO tokens and allocated to incentivize adoption as follows: [1] Half (500 million) of the EXO tokens will be allocated toward investing in the achievement of KPIs in the geographic market being penetrated that year, with a team incentive of 100M (10%) with a restricted use period of 12 months.

Such an investment will entail the conditioned distribution of EXO tokens to incentivize specific behaviors, such as specific types of adoption on the part of healthcare

professionals and their employers, for example. [2] The other half (500 million) will be sold to interested parties. Of these 500 million EXO tokens, 200 million will be made available to SAFT purchasers from the previous EXO token pre-sale offering in the form of a SAFT option for each successive follow-on EXO token presale. The other 300 million, along with any remaining EXO tokens not purchased in the presale, will be sold in a public sale at the then-current market price.

5.4 Taxable Gain Reporting

In recent weeks US regulators have indicated that they may classify all ECR-20 tokens as virtual currencies. Inherent in this definition is the prospect of taxable gain realized on EXO tokens. For example, if EXO tokens are purchased for $0.07 USD and then appreciate to $0.10 USD, the holder may realize a gain upon the use of the token on the LYNK protocol in the form of access to a greater amount of services. In order to make life easier for users of the LYNK protocol and further incentivize adoption, the EXOCHAIN wallets will have the built-in function of tracking and reporting to the user any taxable gain realized on such transactions.

6. Roadmap

6.1 History (EXOCHAIN)

CEO, Bob Stewart, has made a career of identifying world altering technologies and innovating around them. He started his first Internet Service Provider (VRmedia) in 1994. He later went on to serve as a CTO for Motorola and EMC. Bob secured the @CTO handle in Twitter's early days, and began mining Ethereum at its inception in 2014. Bob serves on the Board of Directors of 501(c)3 non-profit Alliance for Clinical Research Excellence and Safety (ACRES Global). In his role serving as ACRES Chief Technology Officer pro-bono, Mr. Stewart experiences first hand the bureaucratic and systemic barriers to better drug discovery, and thus EXOCHAIN was conceived. In March 2017, technical feasibility for a solution was tested with BlueCloud and proven valid. The founding team was created and development of the LYNK protocol commenced.

Q3 2017:

- Angel Participation
- Establish Securely Guarded Facility
- Hire Key Advisors and Contractors

Q4 2017:

- Friends and Family Discounted Presale
- Establish Board of Directors
- Close Exclusive Market Access
- Contracts
- Release Focused White Paper
- Trademark Applications
- Systems Development Life Cycle Development
- Developer Environment Setup

6.2 Goals and Deliverables

Q1 2018

- Commence MVP Development
- Passed FDA mandated 21CFR Part 11 Compliance Audit
- BlueCloud featured on Fox Business Network, 60M households (2/8 & 2/11)
- Smart Contracts
- Security Audit

- Patent Applications
- BlueCloud Mobile App Public Alpha

Q2 2018

- Initial EXO Token Pre-sale
- Public Beta
- Testnet Integration
- Dapp Smart Contracts
- Dapp Servers
- Dapp Security Audits
- Mainnet Integration
- Third-party Login Verification
- Identity Adjudication and Scoring
- Contractually Legal Jurisdictional Standing

Q3 2018

- Key recovery and Escrow functionality that utilizes PACE Stewards [Primary Alternate Contingency Emergency]
- Wallet Management and Reporting
- Know Your Customer Social Graph Connectivity

Q4 2018

- Mobile Transaction Alerting and Management
- Seamless Release Authority
- Personal Medical Record Custody

2019

- Medical Network Query Analysis
- Machine Learned Metadata Enhancement
- Transactional Ledger Browsing and Reporting
- Anonymized Information Access for Double-Blind Studies
- Organizational Unit and Individual Accreditation Records
- Contractual Elements Alerting and Reporting

6.3 Adoption

The LYNK protocol is the exclusive global standard for login adjudication for over 1.3 million healthcare providers currently enrolled in the BlueCloud® network. The EXOCHAIN BlueCloud.net is comprised of more than 50,000 industry stakeholder organizations representing doctors offices, hospitals, pharmaceutical drug discovery companies, and universities, all of which must verify and secure the identity of both patients and the credentialed medical professionals participating in FDA-regulated clinical trials.

The LYNK protocol is the exclusive standard adopted and governed by the 501(c)3 non-profit Alliance for Clinical Research Excellence and Safety (ACRES), www.acresglobal.net. The EXOCHAIN LYNK protocol provides every human a lifelong, trustworthy, patient controlled access mechanism for seamless, transgenerational medical record release authority. This allows the patient to view, control and safely share their medical record data, which has become critically necessary for precision medicine research and outcomes for both you and your biological descendants.

7. Appendix

7.1 Comparative Analysis of EXOCHAIN and several other relevant Entities in the Identity & Healthcare Space

The most distinguishing aspect of EXOCHAIN, relative to the attempts at engaging with healthcare and identity IT presented below, is that EXOCHAIN possesses both a fully developed use-case and signed exclusive partnership agreements for this specific use-case. This means revenue, value-establishing users, and network effects from day one.

SelfKey
Being built over distributed ledger technology, the SelfKey service is oriented around keeping regulators satisfied with Smart verification procedures, while providing businesses with a smoother and more efficient 'know-your-client' process. Users of SelfKey are conceived of as being able to own the 'keys" to their personal data and identity certificates. Therefore, identity owners are the only ones who get to select what aspects of their information are to be shared, with whom, and under what terms. Because of the immutability of data on a SelfKey ledger, such data is expected to serve as a solid provenance for audits and regulatory checks.

Have: Conceptual model that incorporates the value-add of identity attestations.

Lack: Demonstrated or articulated strategy to beat the Chicken & Egg Dilemma; no targeted application (e.g. healthcare), no key partnerships to rapidly develop network effects.

Civic
In general terms, is a system conceived of effectively shifting the paradigm from proof via reference of access PII to attestations of ownership, such that a credit card number would not be useful unless an attestation exists that the credit card number belongs to the person who wants to use it. Not much detail is provided, however, regarding how this would be implemented on a technical level.

Weakness: Built on top of the rootstock (RSK) system, a layer on top of bitcoin created to service smart contracts. Because bitcoin was not built with consideration for smart contracts from the ground up, the RSK smart contract functionality is not fully integrated into the system. Consequently, RSK sacrifices security by relying upon merge-mining to execute a two-way peg with Bitcoin, which introduces the realistic threat of network centralization.

Shortcomings: According to Civic's white paper, there is no engagement with issues surrounding regulatory compliance (redundancy, high overhead costs, etc.).

uPort™

Is a mobile-capable identity framework for secure digital interactions. Built on Ethereum, the application consists of three main components: a set of smart contracts, developer libraries, and a mobile app. uPort enables self-sovereign identity, because uPort identities are fully owned and controlled by the creator. A uPort identity can digitally sign and verify a claim, action, or transaction and can be cryptographically linked to off-chain data stores (i.e. they are self-sovereign).

Shortcoming: Seemingly conceived as a mere protocol; no articulated efforts for the creation of an ecosystem and limited established potential for the creation of network effects.

HealthNexus®

Health Nexus framework for an ecosystem with a governing consortium implemented through a smart contract and data storage capabilities. Created by Simply Vital Health (SVH), the product has been dubbed as a 'healthcare operating system' by SVH.

Shortcomings: Vital Health is relying on third-party developers to create the application layers (i.e. Pharmaceutical tracking, Data Accessibility and Sharing, Insurance payments and reimbursements, Transparency, etc.). Simply Vital Health refers to ConnectingCare, a blockchain-based product aimed towards transitioning providers to value based care, as 'indisputable proof of the viability of Health Nexus and gives an exciting glimpse at what will be built on Health Nexus in future.' However, ConnectingCare was only launched in July of 2017 and has yet to transcend pilots with a few key clients. Health Nexus enables a governing consortium, comprised of healthcare industry leaders, to manage blockchain operations, including certifying compliant nodes, and proposing and voting on protocol level updates. Because additional executive users may be inducted only with a 60% approval from the other consortium members, the model is susceptible to a dilution in integrity over time. As consecutive 'bad apples' are approved to join the consortium, the number of 'good' consortium members required to be convinced, err in judgement, or otherwise act in a way that would lead to the induction of more 'bad apples' decreases. This is particularly the case if the 'bad apples' collude to attain control.

MediBloc
MediBloc is a decentralized healthcare information ecosystem built on blockchain technology for patients, healthcare providers, and researchers. Medibloc allows the users to be in control of their patient records. Using IPFS MEdibloc hopes to populate a distributed network of medical records. Data interoperability through MediBloc will reduce unnecessary medical procedures and save patients' time and money. MediBloc provides data and interfaces for 3rd party applications & services. On top of MediBloc platform, all kinds of services using medical data can be implemented.

Shortcomings: Medibloc is trying to tackle too much in the medical industry. And it could end up hindering their progress as a company. Rather than tackling pain points in the industry, they are building large infrastructure that is intimidating to the healthcare industry and not conducive to adoption.

7.2 Industry Partners

BlueCloud® EXOCHAIN has vanquished the chicken-and-egg dilemma (as discussed in the introduction) through its partnership with the BlueCloud network. Through this partnership, EXOCHAIN's LYNK blockchain protocol is in the process of being developed and deployed as the exclusive global standard for login adjudication for each of the 1.3 million registered medical professionals who are currently enrolled in the BlueCloud network. The BlueCloud network is comprised of well over 50,000 industry stakeholder organizations and represents pharmaceutical drug discovery companies, hospitals, contract research organizations, and universities, all of which must verify and secure the identity of patients and professionals participating in FDA-regulated clinical trials.

ACRES The EXOCHAIN LYNK protocol is also the exclusive standard used by the non-profit Alliance for Clinical Research Excellence and Safety [ACRES Global] in their objective of safely accelerating clinical research. Their ascribed standard-status of the EXOCHAIN LYNK protocol is a recognition of the potential that the protocol possesses for providing [1] easier, faster, and immutable transaction processing and [2] a mechanism for a seamless medical record release authority that allows for the safe application of medical data towards research for cures.

CLINERION® - BlueCloud partner Clinerion is the worldwide leader in medical data informatics, radically improving efficiency in patient recruitment, increasing effectiveness in clinical research and accelerating the process of drug development to ensure a faster availability of medicines. With key tools for protocol feasibility testing, site feasibility testing, and patient search, Clinerion's solutions support patients and physicians in bringing early access to innovative medication; help hospitals to improve access to

leading-edge sponsored trials; and enable life sciences companies to gain massive time and cost savings. Customers represent the biotechnology, pharmaceutical, healthcare and public sectors, as well as contract research organizations. Clinerion's flagship product, the Patient Recruitment System (PRS), is unique in the landscape of electronic health record-based solutions in offering a combination of multi-dimensional query definition, real-time search across multiple networked electronic health record systems made interoperable by the use of semantic and ontology methods, and a highly scalable hybrid cloud- and federated local installation-based platform. PRS accesses 100%, real-time information on aggregated patient populations, across institutions and geographies.

Conduct Clinical Trials® - Conduct Clinical Trials (CCT) is a high-performing Integrated Site Network (ISN), consisting of more than 700 board-certified physicians who lead care in a broad spectrum of specialties. Each independently owned and operated site is a large, community-based practice with a constant influx of patients that receive treatment for countless conditions. The investigators are well-recognized thought leaders in the industry, making them a valuable resource and trusted expert for your clinical trials. CCT is responsible for the recruitment of healthcare professionals to join the EXOCHAIN / Bluecloud ecosystem.