# ONT

## Ecosystem White Paper

*A Public Platform for*
*Building a Decentralized Trust Ecosystem*

# Table Of Contents

1

# SUMMARY

# 3

**Ontology is a new multi-chain public platform committed to building an open-source and collaborative distributed trust ecosystem.**
**Building a trust ecosystem is key for Ontology's development, especially regarding technology, applications, and governance. However, establishing the trust ecosystem is a huge and arduous task.**

**First, Ontology values the contribution of knowledge. Ontology is led by a leading global blockchain technology team and will integrate the technical expertise of its partners both locally and internationally.**

**Second, Ontology values application development. Ontology can provide distributed infrastructure to a range of business scenarios without service providers having previous knowledge of blockchain technology or other underlying technologies.**

**Third, Ontology values the expansion of the ecosystem which operates across chains, systems, cross-industries, applications, and terminals. With a range of protocols and modules, data and information are connected to support various business scenarios.**

# 2

# ONTOLOGY COMMON AND ONTOLOGY CUSTOM

# 2.0



**Ontology's goal is to build the bridge between the real world and the distributed digital world. Ontology will be the underlying infrastructure and play the core role in the worldwide adoption of blockchain.**

Ontology takes into consideration the requirements of different countries, mechanisms, and sectors, and has designed "Ontology Common" and "Ontology Custom" accordingly.

6

# Ontology Common

1st ***Ontology Common's Design***

As the underlying infrastructure, a common set of terms and concepts is needed for interoperability. To reach this, Ontology provides a set of standardized models to reach participant consensus.

In a single business scenario, there are many universal logic modules such as requirements for identity management and account systems, data exchange, as well as universal industry requirements (e.g. for the financial sector). If entities develop these basic modules and protocols all by themselves, it would be a tremendous waste of time, not to mention the barrier to further business integration created by isolated systems.

Thus, Ontology Common provides a series of common modules and protocols that support a wide range of industry applications, such as distributed authentication frameworks, distributed data exchange protocols, and so on.

3rd Ontology Common's Usage

In actual business scenarios, Ontology Common can meet the vast needs of its partners. Taking distributed data exchange as an example, Ontology Common has designed four common modules:

- Identity management module;
- Data source management module;
- Smart contract trading module;
- Peer-to-peer communication module.

2nd ***Ontology Common's Technical Design***

- Ontology Common's Protocol Design
  Ontology Common's protocols are in the development process, though the main aim is to maximize feasibility with different protocols and standards within each scenario to enable Ontology Common to have better compatibility and scalability.
  Ontology Common provides a wide range of protocols in application frameworks, including distributed data exchange protocols, distributed process management protocols, and so on. These protocols together support partners' dApps through APIs, SDKs, and various application modules.
- **Ontology Common's Module Design**
  Ontology Common has designed several common basic modules for the underlying framework and applications. Based on that, Ontology Common's partners can quickly implement common blockchain functions and build blockchain applications by using those common modules.
- **Ontology Common's Rule Design**
  Ontology Common has designed common business rules in distributed identity verification, distributed data exchange, distributed trust transfer, distributed data exchange, and so on. The rules are designed for promoting the technical cooperation between partners and Ontology, as well as engaging business collaborations between partners.

**The data exchange module can be applied to various industries, including finance, copyright, law, and so on, providing joint support for all types of applications.**

**Through Ontology Common, Ontology's public service chain and core application layer protocols, modules, and rules together enable application developers to quickly develop decentralized applications for all industries, not having to worry about the complexities of the underlying distributed ledger technology.**

# Ontology Custom

### 1st *Ontology Custom's Design*

**Ontology Custom is designed to meet the needs and requirements in different fields. Within Ontology Custom, there will be customizable protocols and modules based on specific application needs.**

- **Technically speaking**
  Ontology Custom can differentiate the customized designs of access mechanisms, encryption requirements, consensus mechanisms, and storage modes according to the technical requirements and needs from partners.
- **Application-wise**
  Ontology Custom is designed and implemented differently according to industry standards and industry requirements in which partners are involved.
- **Governance-wise**
  Ontology Custom can conduct corresponding pattern design, based on the differences in countries, mechanisms, industries, etc.

### 2nd *Ontology Custom's Technical Design*

**Ontology Custom will do its best to meet the diverse needs of various partners through the following technical designs:**

- **Loose Coupling Design**
  Ontology's public service chain structure is modularized, pluggable, and has a loose coupling design to address the needs of different industries and provide flexible support for all applications. Meanwhile, the system and modules can develop and scale together with the constant technology and business functionality development.
- **"Single Module, Single Function" Design**
  Ontology's public service chain coordinates with various modules including the cryptography security module, user authorization module, and so on, to provide flexible support for different scenarios.
- **Horizontal Scalability**
  Ontology's chain network functionality development and ecosystem expansion are not performed by one blockchain, but by collaborating with public service and application chains to assure the high performance of the entire chain network.

### 3rd *Ontology Custom's Usage*

Ontology Custom can be applied for two basic cases. First, Ontology Custom can be easily customized for the specific needs of different business scenarios. Second, Ontology Custom can provide better flexible support for different business blockchains.

Taking Ontology Custom's smart contract system as an example, the customized design of smart contracts better supports the business expansion and innovation, and establishes the technical trust in business collaboration, control, and exchange.

By utilizing Ontology Custom, partners can design applications that meet specific admission, compliance, governance, and consensus requirements, and cooperates with Ontology Common on common protocols, modules, and rules.

Ontology Common and Ontology Custom, together improve the Ontology's network system, provide better concatenation, demarcation, and flexible support in terms of performance extension, governance model, and specific business scenarios.

# ECOSYSTEM OVERVIEW

# The Ecosystem

**Ontology is a trust network that provides effective coordination of trust sources, interconnection of data systems, and a complete underlying technical foundation for all types of distributed application services.**

**Ontology will build an infrastructure and connecting mechanisms for establishing a trust ecosystem. With this, different industries will be able to develop applications for a range of scenarios and collaborate with other entities on the platform.**

**The following three parts of the ecosystem will be heavily developed throughout Ontology's development:**

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1st ***The Technological Ecosystem***

Ontology's core team, developer community, and application partners will work together to form a group of interdependent teams in the development of distributed applications, enabling all parties to successfully operate secure and effective decentralized systems.

2nd ***The Application Ecosystem***

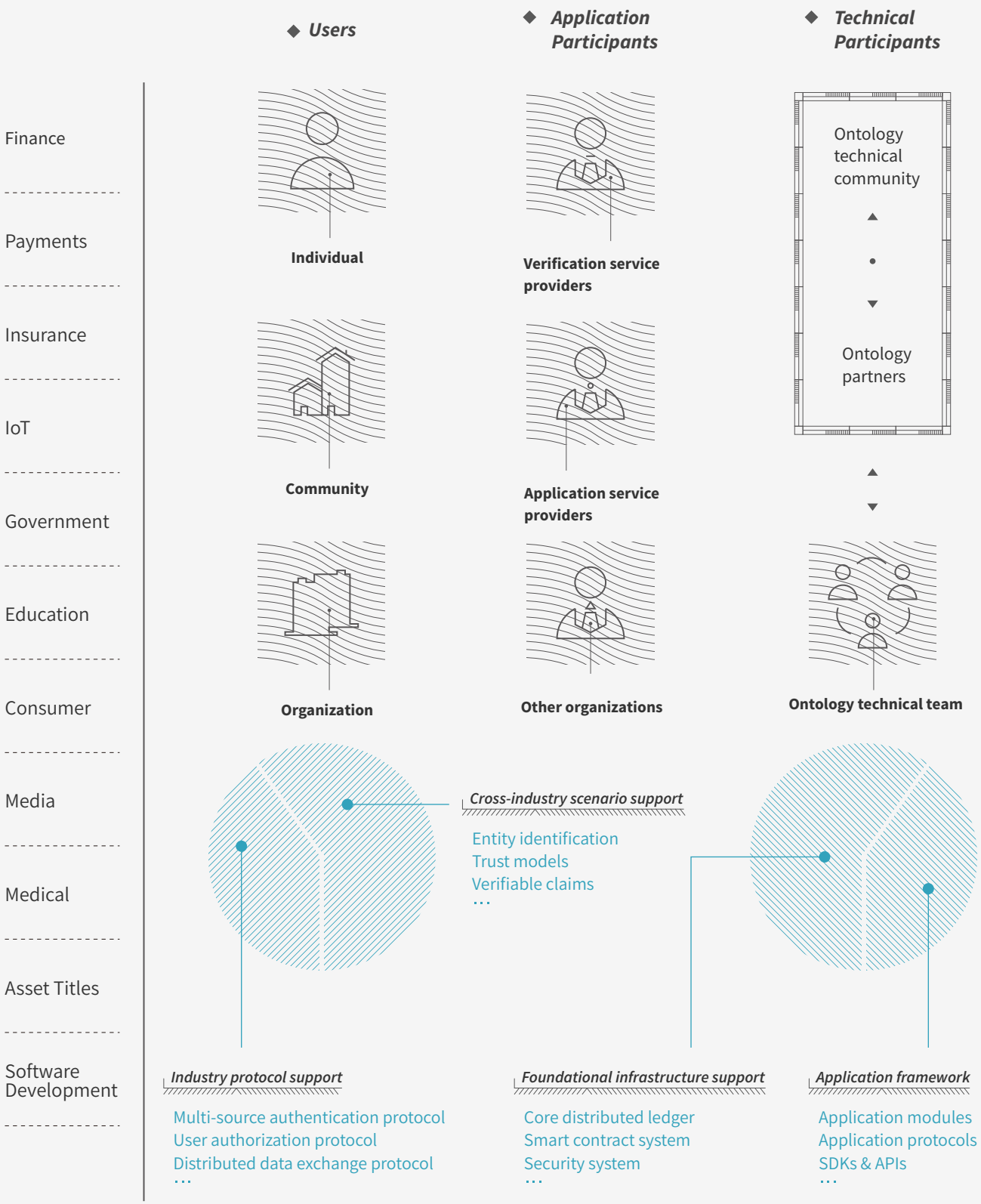
Partners from all backgrounds can provide distributed systems for their businesses using Ontology. Various distributed applications are connected in a large ecosystem, which provides better user experience by enabling trustworthy collaboration amongst all entities.

3rd ***The Governance Ecosystem***

Ontology values the strengths of its partners. The Ontology Family will consist of entity certification service providers, application service providers, communities, individuals, and more. The Ontology Family and Ontology Council together form the Ontology Governance Ecosystem, striving for the technology development, governance transparency, security, and harmony of the entire ecosystem.

# Ecosystem Architecture

**The system architecture is modular and pluggable, with a loose coupling design that allows for flexible expansion and support of different business applications.**
**Ontology will develop the core layer and application interface of decentralized services for a range of business scenarios, including distributed ledgers, smart contracts, distributed authentication protocols, distributed data exchange protocols, and more.**


◆ Users
◆ Application Participants
◆ Technical Participants
Finance
Payments
Insurance
IoT
Government
Education
Consumer
Media
Medical
Asset Titles
Software Development
Individual
Verification service providers
Ontology technical community
Ontology partners
Community
Application service providers
Organization
Other organizations
Ontology technical team
Cross-industry scenario support
Entity identification
Trust models
Verifiable claims
...
Industry protocol support
Multi-source authentication protocol
User authorization protocol
Distributed data exchange protocol
...
Foundational infrastructure support
Core distributed ledger
Smart contract system
Security system
...
Application framework
Application modules
Application protocols
SDKs & APIs
...

# Ontology Cooperation Ecosystem

Ontology is divided into the core layer (chain group, module, and protocol layer), the application layer (ecosystem applications partners, application frameworks, modules), and the user layer (ecosystem application users).

Undoubtedly the construction of Ontology requires partners to codevelop the ecosystem. At the same time, each layer is jointly built with other ecosystem partners.

## *Ontology Users*

**In addition to the range of applications ready available to users, Ontology has designed several mechanisms to connect the ecosystem with other systems:**

1st ***User authentication***

Ontology can flexibly configure and integrate third-party authentication mechanisms and endorsement methods, to provide users with multi-source and trusted identity authentication.

2nd ***User authorization***

Ontology's authorization mechanism is designed so that any data owner (be it an individual or a group) involved in a transaction is required to authorize its trade.

3rd ***Data collaboration mechanism***

Ontology will assist data requesters, data providers, data owners, and centralized databases regarding data collaboration, so that each subject can query the location of data and conduct data requests accordingly. This helps avoid data islands and broadens data sources.

## *Ontology Technology Partners*

**Ontology's core layer partners will work together and be responsible for the development, operation, and maintenance of the underlying blockchain framework, the design and development of modules and other products, application support, and so on. The consist of:**

1st ***The development team***

The development team will be fully responsible for the development, operation, and maintenance of Ontology's underlying blockchain architecture framework and will coordinate with technical partners to design and develop modules.

2nd ***The technology community***

The technology community is a public community that provides development, testing, design, user experience improvement, feedback, and application promotion for the ecosystem.

3rd ***Application partners***

The technology community is a public community that provides development, testing, design, user experience improvement, feedback, and application promotion for the ecosystem.

# *Ontology Application Partners*

**Ontology application partners collaborate naturally with the public platform.**

1st ***Technical communication***

Application partners can gain a better understanding about blockchain functions and performance to improve their applications through communication with blockchain developers in the ecosystem. Meanwhile, application partners can put forward their requirements for future blockchain modules.

2nd ***Technical collaboration***

In addition to their own technical strength, application partners can co-develop modules and applications with other blockchain developers to speed up the development of their blockchain applications.

3rd ***Technical sharing***

Ontology welcomes application partners with blockchain experience to support technology development. Application partners can also design blockchain applications of their own, provide verification services, and participate in other applications.

4th ***Entity certification service provision***

Certification service providers can provide services within their own scope and trust levels.

5th ***Industry application service provision***

Application service providers from different industries can develop their services, support startups, and develop existing businesses.

6th ***The community***

The community's role is to assist Ontology with further technical study, application practice, function assessment, talent recruitment, and so on.

7th ***Individuals***

Ontology supports every individual in building their own online identity endorsed by others on the platform. Individuals are also welcomed to give technical, marketing, and ecosystem development contributions.

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**The mechanisms above will help create mutual trust and benefit amongst all users, including amongst:**

1st ***Communities and individuals***

Communities and individuals are the key participants in connecting applications and users.

2nd ***Organizations***

Government agencies, enterprises, social organizations, and NGOs can access distributed authentication, data collaboration, procedure collaboration, and other distributed services, based on their individual needs.

3rd ***People, properties, objects, and things***

With ONT ID identities of all kinds can be authenticated and protected.

# TECHNOLOGY ECOSYSTEM

# Technology Ecosystem Members

*Ontology's technology ecosystem is made up of a single group with interdependent teams.*

### Core team

Ontology's core development team come from a range of technical backgrounds and strong capabilities in blockchain implementation.
The Ontology Team consists of top experts in blockchain development in China, technical teams working on the underlying technology of different business systems (including the technical architecture of large financial institutions), and financial experts from global investment banks.

The Ontology Team has built a universal, robust, and seamless distributed ledger technology framework through continuous technological innovation which will support the secure and stable operation of the public platform.

The Ontology Team has been involved in the implementation of several benchmark blockchain projects both in China and internationally, including blockchain projects based on identity chains and digital assets.

The Ontology Team has carried out several rounds of POC (Proof of Concept) and function implementation at the technical foundation.

### Partners

Ontology upholds an open outlook to technology partnership and welcomes contributions from the technical community and partners.

The technical community will attract international institutions and individual talents to help with development, testing, product design, and user experience.
Ontology hopes strong technical partners can develop, integrate, operate, and maintain integrated technical support services. At the same time, these companies can bring blockchain technology to various industries with Ontology's underlying blockchain architecture and exchange technical knowledge based on their individual technical capabilities and development experience.

# Technology Ecosystem Development Principles

**Ontology's technical ecosystem development adheres to the principles of openness, cooperation, and innovation. It will integrate scenarios from different areas, bringing together the strengths of different communities. The ecosystem aims to be:**

1st ***Open***

Any organization or individual can participate in the ecosystem construction in the area they wish to whether that be, contributing to technology, application cultivation, or advice giving. Ontology will not make any set rules on community returns, share allocations, or returns on earnings.

2nd ***Cooperative***

Ontology supports horizontal and vertical interaction amongst communities and partners, providing corresponding support for businesses and their project expansion.

3rd ***Innovative***

Ontology encourages technology ecosystem partners to participate in the technical upgrading of the chain network, perfecting and updating protocols and modules, and innovating and developing applications. At the same time, reasonable incentives will be provided to contributors and their teams. For more details, please refer to the Governance White Paper.

# Technology Ecosystem Development Path

**Ontology is working with partners and community forces continuously to improve the design of the distributed ledger system, including the core ledger, smart contract system, and security system. At the same time, Ontology couples the underlying technical system with heterogenous systems, and implements distributed entity management and multi-dimensional authentication protocols compatible with all major protocols and cryptosystems.**
**Ontology also supports various cross-chain and cross-system interactive mapping between individual blockchains and traditional IT systems. It also provides technical systems such as secure data storage, smart contracts, hardware key management, encrypted data analysis, and more. The entire system can support building various application services, including dApps.**

## Cooperation Mechanism

**Partners in the Ontology technology ecosystem will participate in various forms of knowledge exchange and collaboration including:**

1st ***Technology Exchange***

Ontology will organize various forms of technical interaction amongst technical communities and partners to discuss R&D direction and update technology standards.
With the development of blockchain technology, the design of the core ledger, smart contract system, security system, protocols, and modules all need to meet the requirements of different business areas and regions.
With the expansion of applications, there will be a continuous demand for the development and updating of the underlying blockchain application framework. Ontology's technology ecosystem will discuss application modules, protocols, SDKs, and APIs that need to be developed or updated to meet the needs of application developers.

2nd ***Technical Collaboration***

Ontology welcomes partners of all technical backgrounds to contribute to the design, development, and testing of protocols and modules.
Technical partners of the ecosystem can join in on Ontology's development plan by contributing code, auditing code, conducting tests, and so on. Ontology will design development incentives according to the individual needs of Ontology application partners.

3rd ***Technology Sharing***

Ontology welcomes the technical and ecosystem partners to provide what they can to underlying technologies and application frameworks such as cross-chain protocols, cryptography, and distributed storage.
Ontology also welcomes technical ecosystem partners to contribute technology resources for the support of the technical framework so as to enhance its robustness and usability.

# Other Features

1st ***Underlying Infrastructure Support***

Ontology's chain network structure allows for configurable implementation of one or more blockchains to satisfy different scenarios. Meanwhile, this requires compatibility of various protocols and standards with Ontology and its underlying infrastructure to achieve excellent compatibility and scalability. Ontology's technology will continue to conduct ecosystem cooperation and research with these principles in mind.

- **Open-source technology**

  Blockchain is a "trust generating" machine, so the machine itself must be transparent and open-source. Ontology's underlying blockchain infrastructure will gradually become open-sourced based on international standards. The Ontology Team and technology partners have equal rights to have a say in the continuous development of the technology ecosystem. Of course, open-source and open-source code are different concepts. Open-source software has copyright, and Ontology will protect the privacy and intellectual property of its technology partners. This will allow its partners to be able to decide on their individual open-source or patent protection strategies.

- **Modular design**

  Ontology's ecosystem follows a loose coupling design of being modularized, pluggable, and flexible, to support the needs of different business areas, countries, and regions. It can therefore be quickly altered according to specific application requirements. Business chains can be customized according to their scenario, industry, regulatory, and governance requirements.

- **An original idea enriched by its partners**

  Ontology encourages originality of its technology and will work with ecosystem partners to ensure the independence and standardization of technology development. At the same time, blockchain technology is still in the process of development, requiring integration with other technologies. Considering this, Ontology will actively participate in the Decentralized Identity Foundation (DIF), China Ministry of Industry and Information Technology's blockchain open-source project, and so on, to further expand the exchange of technology and other forms of technical cooperation.

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2nd ***Application Framework Provisions***

For application service provision, Ontology provides the infrastructure for application developers to directly provide distributed services on top of Ontology without having knowledge of how to develop distributed systems. At present, the Ontology Team has developed a data exchange marketplace, data transaction module, cryptography and security modules, user authorization modules, verifiable claim module, and a distributed database (GlobalDB). For more details on these, please refer to Ontology 's Technology White Paper.

Meanwhile, Ontology 's technology ecosystem will continue to develop and expand according to the requirements of application partners, providing them with APIs, SDKs, and various application functionalities to rapidly implement their own dApps and dApps as a Service, making blockchain accessible for all.

# 5

# GOVERNANCE ECOSYSTEM

# 5.0



**Ontology is built to be the foundational infrastructure of a trust ecosystem, supporting the development and upkeep of decentralized technology and data systems while acting as the connector between networks, so that partners only need to focus on their business operations.**

## Governance Ecosystem Members

**The Ontology Family consists of all entities in Ontology. Below are the definitions and roles of the family members:**

1st ***Entity Verification Service Providers***

This includes well-known entity verification service providers such as CA and eID. Organizations, corporations, communities, and individuals can all become verification service providers, offering entity-verification services within their own areas and trust levels.

2nd ***Industry Application Service Providers***

Industry application teams play a key role in the formation of Ontology 's ecosystem and are the main driving force in the Ontology Family.

3rd ***Community***

Ontology aims to attract technical talents from institutions and communities around the world to empower technical practice and development. Ontology also aims to develop applications within the community and stimulate creativity via communication and training. The Ontology Team is also open to providing technical support for individuals and groups who are looking into starting application development.

and ***Individuals***

Individuals can take part in Ontology's trust system by authenticating and endorsing others, and by forming one's own identity profile. Individuals can also provide technical support and optimization feedback for the development of Ontology's ecosystem. Individual feedback, such as reporting technical bugs, is also important for Ontology.

22

# Governance
# Ecosystem Development Principles

## Compliance

**The trust system is unique yet versatile. Under different regions, industries, and legal systems, the requirements for identities and trust vary, as is with data sources, certification, entity data usage, and security principles.**
**Therefore, the main issues to be addressed and solved by Ontology include compliance under various legal systems, regions, business scenarios, and data security considerations.**
**Ontology also allows trust sources and data sources to be compliant with principles of different blockchains. This way, Ontology can assure protocol compliance during cross-region and cross-scenario data exchange, and support observation and auditing mechanisms for trustworthy data sources and data exchange. Supervisors or observers can carry out different compliance and security supervision according to different trust and data sources.**

## The Decision-Making Mechanism

1st ***The Ontology Council***

The Ontology Council focuses on the development and governance transparency of Ontology, ensuring the security and harmony of the open-source ecosystem. With a well-designed governance structure, the Council will manage the daily operations of the open-source community, including technology, finance, public relations, and so on.

The Ontology Council's governance structure design ensures sustainability, effective management, and fundraising security. The Ontology Council consists of the Developer Committee and the Operations Committee, under which fall the Executive Committee, Technical Management Committee, Application Management Committee, and Finance and HR Committee.

*More details about the Ontology Council can be found in the Governance White Paper.*

2nd ***The Ontology Council's Executive Mechanism***

To set up and optimize its risk-management system, the Ontology Council requires annual security assessment towards Ontology's sustainability, including project quality, and progress. This will be looked at in regards to smart contract application, management, risk identification and analysis, and so on.

The Ontology Council makes decisions after analyzing events on the platform, such as its impact, range, and frequency. Regarding high-priority events, the Ontology Council will organize specific committees to address strategies quickly.

*The Ontology Council categorizes events into management, coding, and application events:*

- For management events, Ontology Council members will call for meetings, where decisions will be finalized by the Finance and HR Committee and the Chairman of the Ontology Council.
- For coding issues in open-source and expense issues regarding fundraising, decisions will usually be made via a vote.
- Application events are managed by the Application Management Committee, who will address issues and conduct analysis based on case-by-case requirements. The Technical Management Committee can provide technical support if needed.
- Emergency events, such as events that affect the entire community, software security, system updates, and so on, are directly managed by the Executive Committee via a vote.

# Governance Ecosystem Development Path

**Blockchain technology will continue to bring both opportunities and challenges. Ontology prepares for this by developing governance initiatives for coding and application development.**

1st ***Underlying Framework Governance***

In the event of coding errors, Ontology will usually carry out system updates. Coding errors need to be analyzed, tested, and checked by the Technical Committee, and reported to the Ontology Council. System updates are required when facing major errors such as the ones listed below:

- *Errors involving users' funds*
- *Major security issues*
- *Errors affecting system security*

2nd ***Commercial Application Governance***

Ontology is an open-source project that aims to connect blockchain with the real world. Therefore, the Ontology Council will adopt three collaboration methods for commercial applications. Commercial applications will be led by third party suppliers and be supported technically by Ontology.

# APPLICATION ECOSYSTEM

# 6.0



Ontology's infrastructure allows partners of all shapes and sizes to realize their new business models through incorporating distributed systems and connecting with the ecosystem. This provides improved service, cooperation, trust, and efficiency opportunities.

## Application Ecosystem Members

Ontology will be anchored in real-world business logic and become a comprehensive public chain that provides trust-building mechanisms to multiple industries, applications, and terminals. The Ontology Council will integrate the resources of Ontology's developer community, technology partners, and industry partners together with third-party developers to support the implementation of various trust-based application scenarios and services.

## Application Ecosystem Development Path

Ontology supports the continued development of identities and data within the ecosystem, including distributed entity authentication, data exchange, procedures, communities, and reputation systems. Combined with the underlying blockchain infrastructure on which partners run their own distributed trust services, Ontology will promote a truly global platform. At the same time, Ontology welcomes application partners, service providers, entrepreneurs, and others from all walks of life to participate.

# Application Ecosystem Development Principles

**As the infrastructure and connector of a trust ecosystem, Ontology will be able to host applications for different industries and scenarios. During application development the following principles will be upheld:**

1st ***Flexibility***

The system architecture is modular and pluggable, with a loose coupling design that allows for flexible expansion and the support of different business applications.

2nd ***Viability***

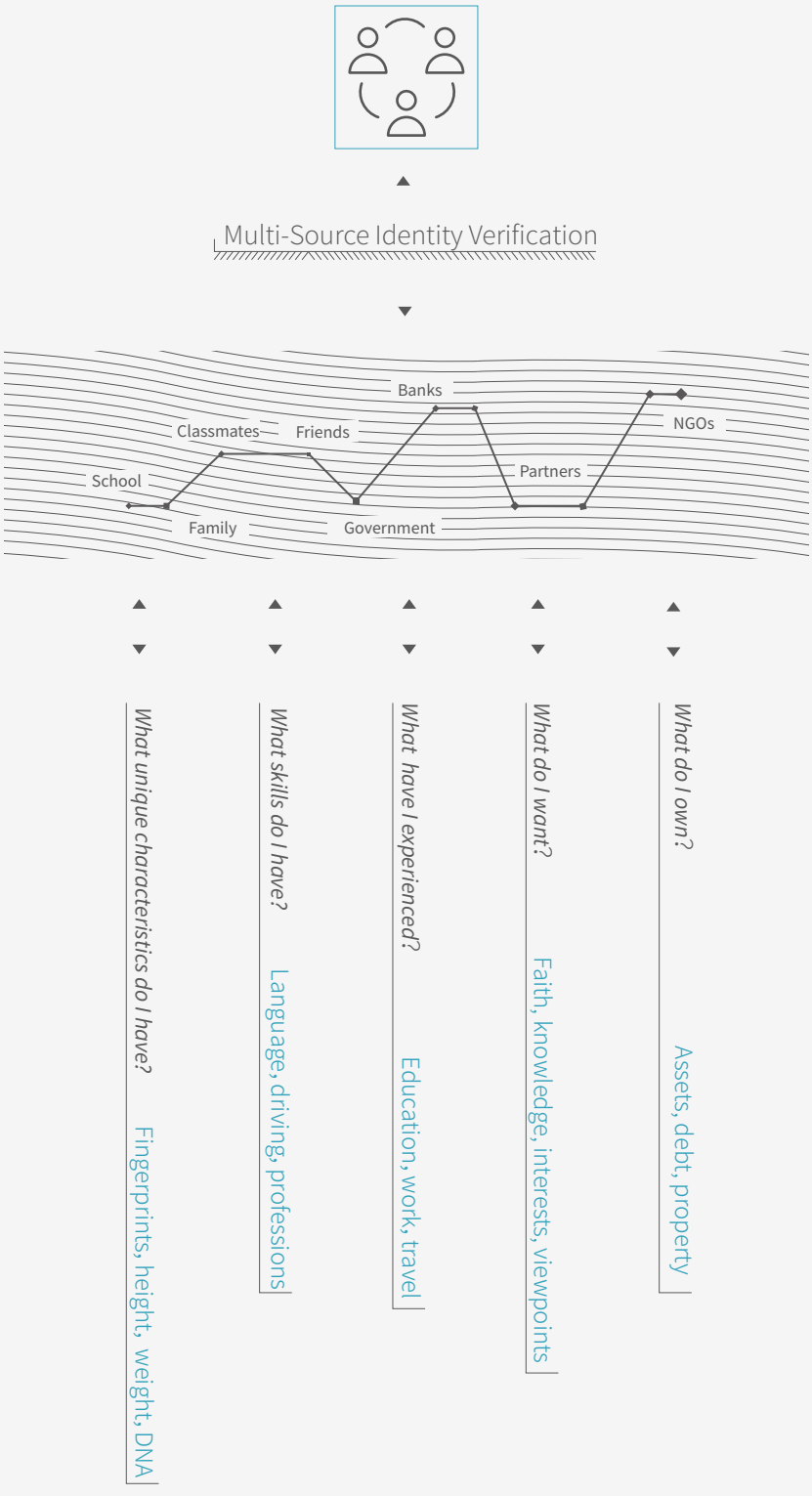
Ontology's architecture system supports the creation of diverse types of blockchain applications.

3rd ***Innovation***

Ontology will constantly integrate developments in blockchain and distributed ledger technology, and address innovations in different business fields with appropriate infrastructure for applications.

**Ontology welcomes individuals from all walks of life to begin new projects and expand existing ones on the public platform. The Ontology Team will work to build the infrastructure to make these ideas come to life through a transparent, safe, and efficient decentralized trust ecosystem.**

# Multi-Source Identity System for People



## Application Introductions

**Ontology addresses the diversity in identification and certification with the following functions:**

1st ***Multi-source identification***

Multiple parties authenticate different aspects of the same entity to produce a more comprehensive identity authentication.

2nd ***Comprehensive personal profile***

Individuals can build up their identity with data from multiple sources relevant to them.

3rd ***Data tracking***

All authentications are performed with signatures, which cannot be forged or repudiated. Each time an authentication is made it is recorded to the blockchain and can be carried anywhere within the network.

## Case Study

***The Example of Recruitment***

*A candidate's resume is core to their recruitment process. However, according to a study, 60% of resumes HR receive are misleading. Of these, 48% are misleading about work experience, 13% about education, and 7% about other qualifications. Of those misleading about work experience, 13.7% were completely misleading, 67.5% were misleading about time spent in the positions, 53% were misleading about the position, 21.6% were misleading about the reason for leaving the company, and 8.9% were misleading about the company itself. 31% of senior positions, 44% of intermediate positions, and 25% of general positions were misleading.*

*Some businesses carry out background checks for those previously in similar positions, however they often encounter problems in the process. This is reflected in the fact it is difficult to obtain real and effective information during checks. Employee background checks may infringe on privacy rights and cause controversy. Without effective and transparent investigative channels, the cost of background checks is even higher.*

***dApps developed on Ontology can use the following design:***

1st ***Multi-Factor Object Evaluation***

The privacy and incentive design has two aims, one is to encourage candidates' former colleagues to take part in evaluation, another is using more contributions from "strangers" that are familiar with the individual for whatever reason (i.e. from industry events participants, previous collaborative partners) that can help provide a more comprehensive evaluation about an individual and one that is currently non-existent in traditional requirement processes.

2nd ***Comprehensive Assessment of Job Performance***

Projects can design specific assessment models and criteria for candidates' job performance (for example main responsibilities, position, time in position, etc.) using Ontology's data collection and coordination mechanism to form a comprehensive and flexible evaluation system.

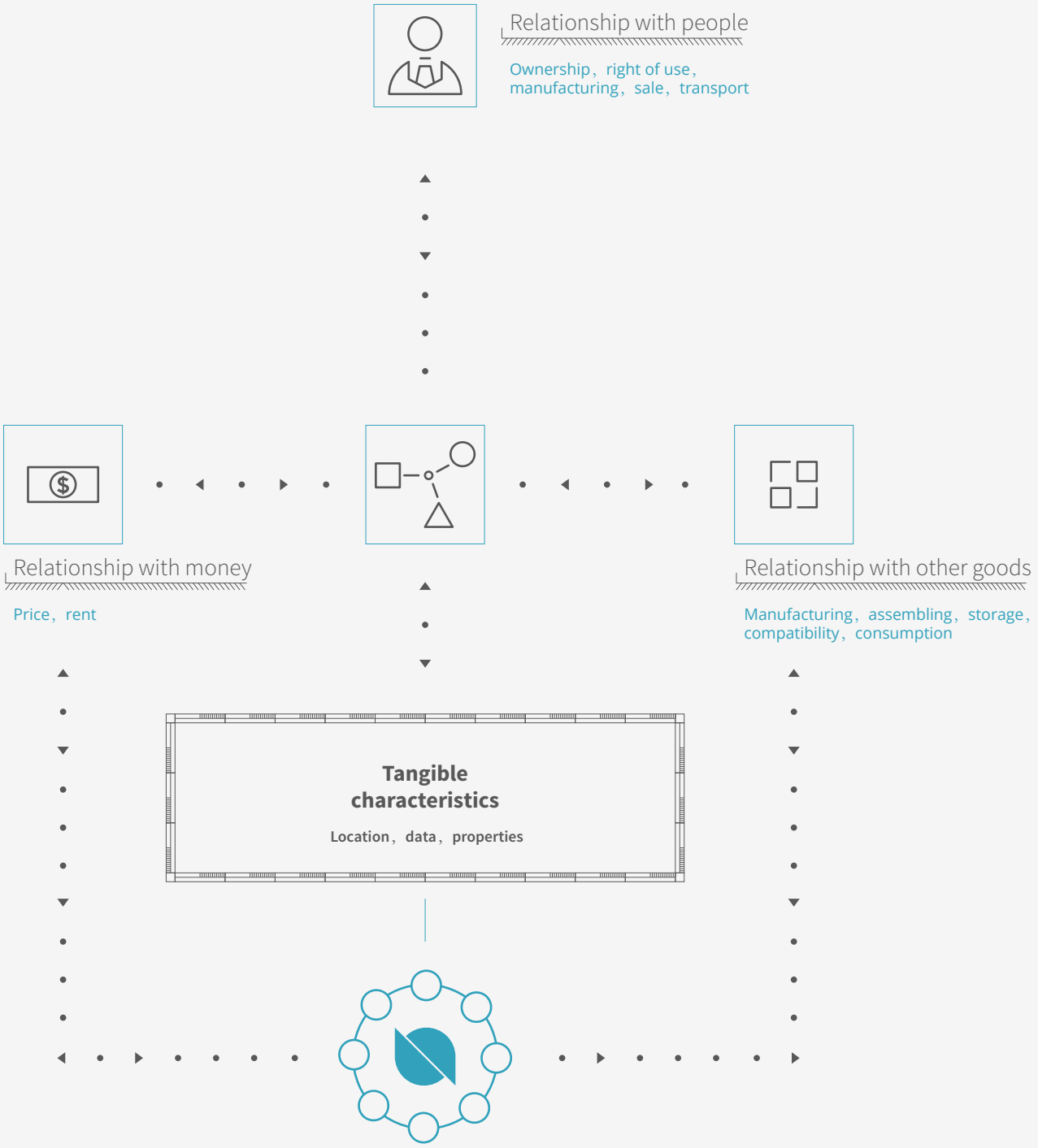
3rd ***Easy Strength and Weakness Detection***

Knowing the strengths and weaknesses of candidates based on perspectives of superiors, subordinates, colleagues, and HR can help better evaluate candidates.

and ***Appropriate Salary Positioning***

Using Ontology companies can formulate an appropriate salary offer using previous salary data, or use the system to provide competitive salaries to attract top talent.

# Multi-Source Identity System for Objects



## Application Introduction

**Like with people, there are many factors that can verify the identity of an object. The goal of Ontology is to "identify everything", of which the following design can be used:**

1st ***Object authentication cycle***

Objects can be tracked throughout their life cycle with multi-factor authentication by registering DIDs onto Ontology , verifying objects with digital signatures and endorsement verification, and tracking their use and any other related data.

2nd ***Object data recording and authentication***

Ontology  can fully record and authenticate object data including ownership, circulation, user behavior, and other relevant information.

## Case Study

***The Example of the IoT***

*According to research by Cisco, by 2020 there will be on average at least 6.58 IoT devices in operation per person. Smart devices in the future will be able to handle certain daily chores through the IoT. However, at this stage, IoT devices face several key problems: first, the security risks and privacy problems owing to the centralized architecture lead to the possibility that criminals could invade the network by attacking weak links such as home devices. Second, higher operating costs, recording, and storage of IoT data will be aggregated to the central server, resulting in high storage and overall operation costs.*

***dApps developed on Ontology  can use the following design:***

1st ***IoT Security Design***

A trust mechanism between devices is established where devices are maintained by consensus and do not need to be verified by a central authority. When one or more nodes are compromised, the data of the overall network remains reliable and secure.

2nd ***IoT Device Identity Management***

Digital identities can be created for each connected IoT device for identification, authentication, and identity binding. This allows for easy monitoring and management of smart devices whilst using smart contracts to control their behavior.

3rd ***IoT Distributed Data Processing***

Ontology  has designed a P2P distributed data transmission and storage architecture. By processing many transactions between devices using a standardized P2P communication model, the cost of deploying and maintaining large data centers is reduced to meet distributed computing and storage requirements.

# Distributed Data Collaboration and Exchange

## Application Introduction

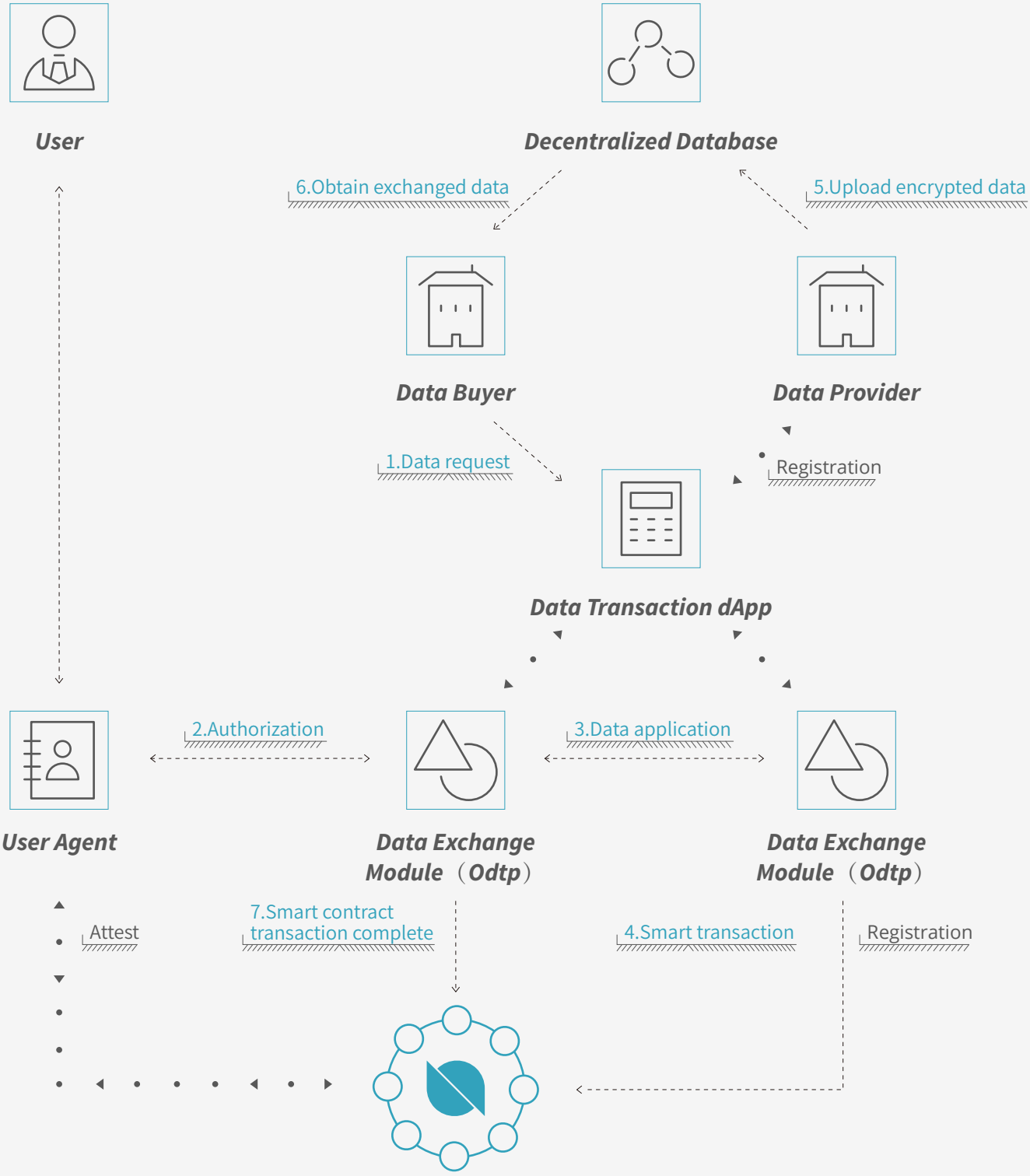
**Ontology provides an entity data exchange framework with a variety of standardized protocols designed to support data discovery, authorization of use, and transaction. The fine-grained control mechanisms mean privacy needs are met whilst users reap the benefits of their data and are able to conduct data collaboration.**

1st ***Data discovery***

Data on a single entity no longer has to be manually gathered from multiple sources. In Ontology a comprehensive portfolio of data is already compiled and can be accessed with the user ID, allowing for easy data collection and use.

2nd ***Data exchange***

The data buyer retrieves the access address of the user data through the user ID and sends out a request for obtaining the data. The request will be sent first to the data owner's client, then confirmed (or rejected) by that user and subsequently authorized (or declined). The data owner must accept the data request before the data is exchanged and the users credited. Ontology is designed to give data owners full access and provision of their data.


User
Decentralized Database
6.Obtain exchanged data
5.Upload encrypted data
Data Buyer
Data Provider
1.Data request
Registration
Data Transaction dApp
2.Authorization
3.Data application
User Agent
Data Exchange Module（Odtp）
Data Exchange Module（Odtp）
Attest
7.Smart contract transaction complete
4.Smart transaction
Registration

# Case Study

***The Example of Data Collaboration and Exchange***

*At present, there are many ways in which data trading could be improved upon:*

***a. Data Sources***

- **Timeliness:** Many data sources are not time effective and have a low update frequency.
- **Irregularity in data sources:** The quality of data sources varies too much, including basic data quality parameters such as coverage, return time, TPS, etc.
- **Data islands:** Due to trust, law, and other factors, lack of external connectivity leads to the formation of data islands.

***b. Data Usage Processes***

- **User privacy and compliance**: After the enactment of China's Cybersecurity Law in 2017, the privacy of users has been very strictly defined in terms of illegal use, provision, and sale. At present, many mutual data sources have compliance issues due to failure to keep up with the law.
- **Data monopolization:** In a centralized data exchange there is often a large amount of data cached in the proxy platform, as well as threats and infringements on the rights and interests of users and data sources.

***c. Data Management***

nce data is sold data it cannot be managed, tracked, protected, and data-related copyright interests cannot be reflected.

***Ontology provides a series of underlying functions and protocol support for distributed data exchange to address the current disadvantages in data exchange platforms:***

1st ***Distributed Data Exchange Protocol***

Ontology will be compatible with a wide range of global data exchange protocols to support different business scenarios, whilst combining data exchange protocols with distributed ledgers to form distributed data exchange flows and provide a range of data and privacy protections for cryptographic module support.

2nd ***Unified Data Format Management***

Ontology has designed a data management system that can handle corresponding data format specifications and differentiate amongst different platforms and data sources. First, data records are encrypted, and the original data is recorded to the blockchain, and a unified data fingerprint can assure a unified method of accessing data. Second, the blockchain attestation design of the data directory allows required data to be quickly matched.

3rd ***Data Authorization Mechanisms***

Data privacy protection and leakage prevention are always assured whilst giving the user full control of their own data; each data transfer must receive authorization from all relevant parties.

4th ***Effective Collaboration of Data Collection***

Data Source Collaboration in Ontology can foster effective management. First, each data source does not have to change their existing data aggregation method, meaning they can still use their existing centralized data collection methods. Second, the data collaboration mechanism can query the location (i.e. data source) of the data from the data requester's side. Data requests like this can avoid the existence of data islands and broaden data acquisition channels and scenarios to promote comprehensive data analysis.

5th ***Copyright Protection of Data***

Ontology stores, manages, and attests data throughout its life cycle. A digital identity is created for each copy of data from registration, request, authorization, to exchange. Copyright protection is also recorded to each copy on the blockchain.

6th ***Distributed Data Storage***

A distributed data storage layer supports decentralized storage for different types of data. Each data request in Ontology will receive data in its current state from its corresponding data source to avoid the problem of receiving outdated data in centralized systems and the subsequent cost of updating it.

# Distributed Procedure Collaboration

## Application Introduction

**Ontology supports diverse distributed procedure collaboration whilst creating trust between the parties involved.**

1st ***Authorization records***

Modifiable authorities of each participant are recorded and confirmed by all relevant parties.

2nd ***Activity records***

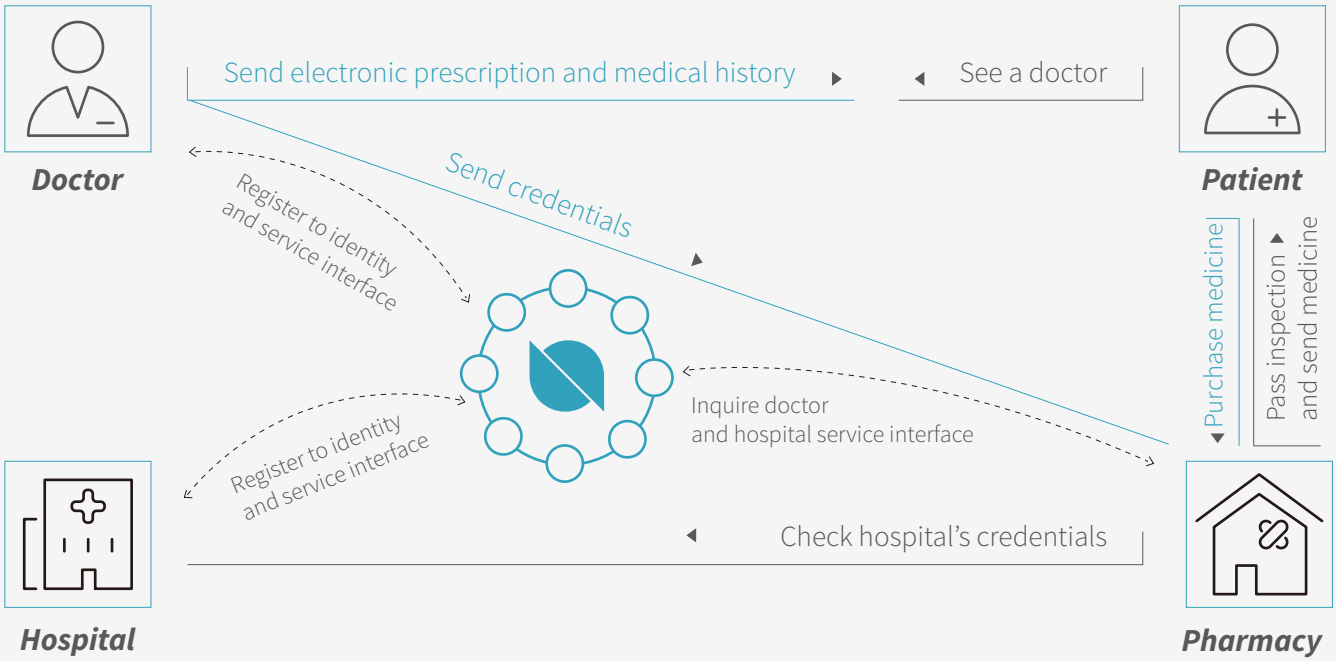
All activity is recorded to ensure transparency of participant identity, activity, and outcomes.

3rd ***Evaluation***

A multi-party confirmation and endorsement mechanism allows for evaluation by all collaborative entities and assures the credibility of the evaluation results.

and ***Interests clarification***

With Ontology's diverse functions and modules such as the smart contract system we can specify interests of all parties and distribute them accordingly.



## Case Study

***The Example of Purchasing Prescribed Medicine***

***The current issues are introduced below:***

*a. Complex Purchase Procedure*

In the traditional medical industry, a patient needs to queue and see a doctor at a hospital to receive prescribed medicine. The process is inconvenient for patients, especially for the elderly or those physically impaired.

*b. Medicine Purchase Identification Issues*

It is very difficult to verify legal and regulatory status from a paper prescription, recognize formats of different hospitals, etc. It is also difficult to verify prescriptions and their applicants, causing sale risks for pharmacies.

*c. Prescription Management Issue*

More and more new types of medical organizations are coming about, such as online hospitals. The credibility of an internet hospital' s digital prescriptions relies on the internet business' credibility and its management. Issues such as how to verify a digital prescription are yet to be solved.

**When doctors, hospitals, and patients register their identities onto the blockchain, the blockchain fills in the trust gap between the pharmacy and patient with record of the medicine's key information. The pharmaceutical enterprise then sells the prescribed medicine to the patient after verification of the doctor and hospital's credentials. In Ontology , trust can be built with distributed procedure collaboration:**

1st ***Multi-Source Credibility Verification for People***

Ontology supports multi-source verification for individuals. This means multiple parties verify various perspectives of an individual to reach a more comprehensive and diverse identity verification. Credible verification of doctors and medicine purchasers can lower the risks of medicine sale.

2nd ***Medicine Sale Party Responsibility Clarification***

With Ontology responsibilities and restrictions of all parties during medicine sale and purchase will be recorded and confirmed by all relevant parties. New responsibilities will be broadcast live and confirmed by all parties during collaboration as to ensure a seamless process.

3rd ***Medicine Purchase Records***

The procedure of each medicine purchase will be recorded onto Ontology to assure transparency of all participants, their behavior, and outcomes.

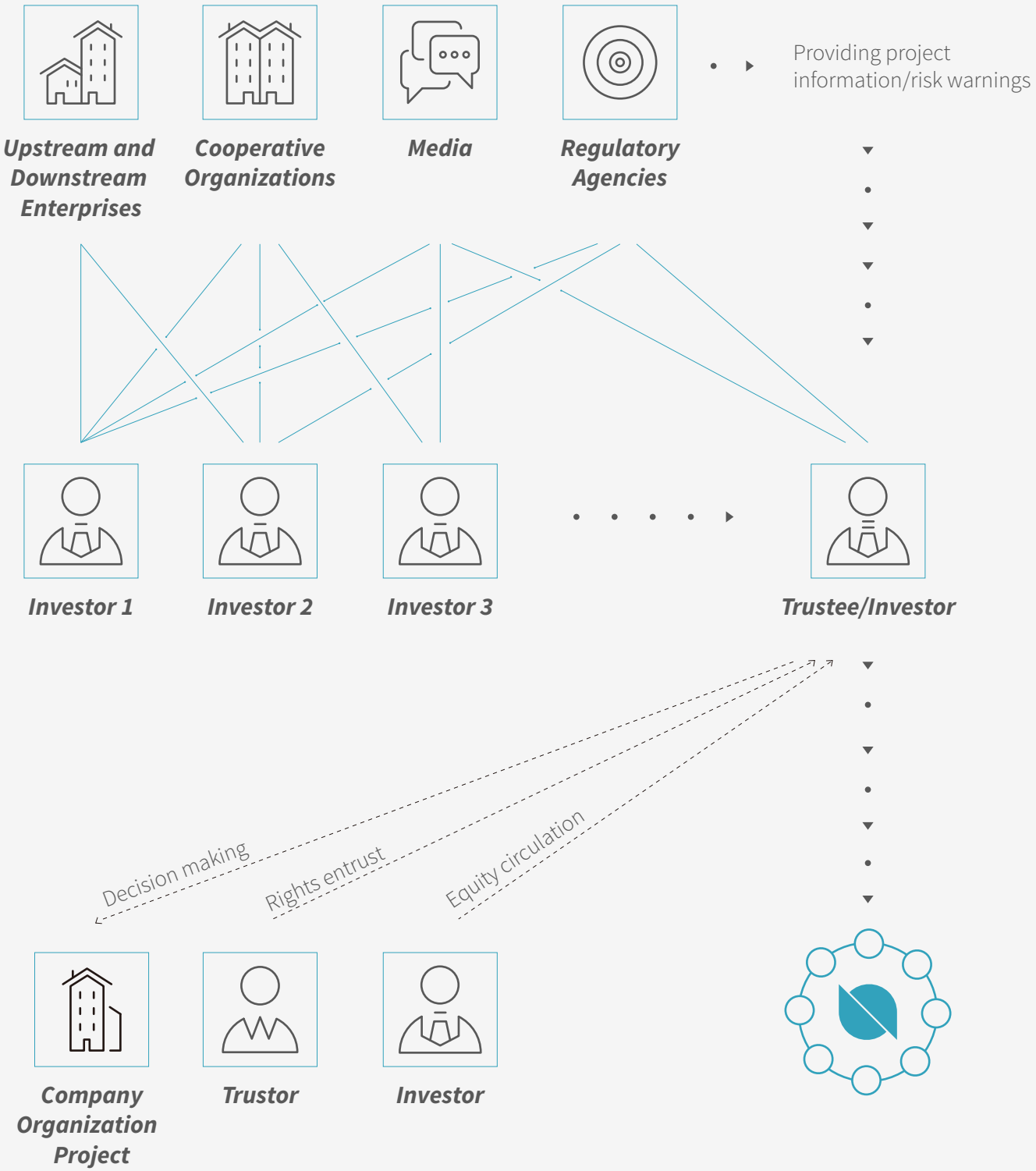
4th ***Credibility of Medicine Purchase Results***

With Ontology collaboration results can be confirmed by all relevant parties. Hospitals confirm prescriptions they issue as well as the activity of medicine purchasers to further assure the transparency of the entire collaboration process.

5th ***Formulating a Reputation System***

A reputation management system can be deployed using Ontology to regulate medicine sales and management of medicine as well as all parties involved. According to one's medicine sales activity, "local" and "comprehensive" trust levels can be calculated. For local trust calculation, Ontology collects parameters from local medicine sales information and forms a local opinion. For comprehensive trust calculation, by involving the medicine purchaser, user, supervisor, and other parties, Ontology forms a comprehensive evaluation regarding the reputation of the pharmacy or hospital.

# Distributed Equity Management



## Application Introduction

**Today's economic system contains a range of equity management models, however due to factors such as low transparency and information asymmetry these projects lack credible trust mechanisms. Considering this, Ontology has built a trustworthy distributed equity management system.**

1st ***Distributed investment management***

Ontology can assist with systems for safe circulation of data, multi-party assessment, and project evaluation.

2nd ***Distributed interests configuration***

Interests configurations are transparent to all parties and recorded to the blockchain.

3rd ***Distributed rights entrustment***

Ontology  allows for multi-party rights entrustment and recording, including the function to dispute actions by providing relevant material.

## Case Study

*New equity management models have the characteristics of being open, focused on the individual, and public. Meanwhile, due to low transparency and asymmetric information, projects are often lacking reliable trust mechanisms. A series of complex processes (e.g. rights and transaction confirmation) can overwhelm users and cause disputes over rights and interests, especially during equity transfers.*

*Ontology 's distributed equity management model will build trust at multiple levels:*

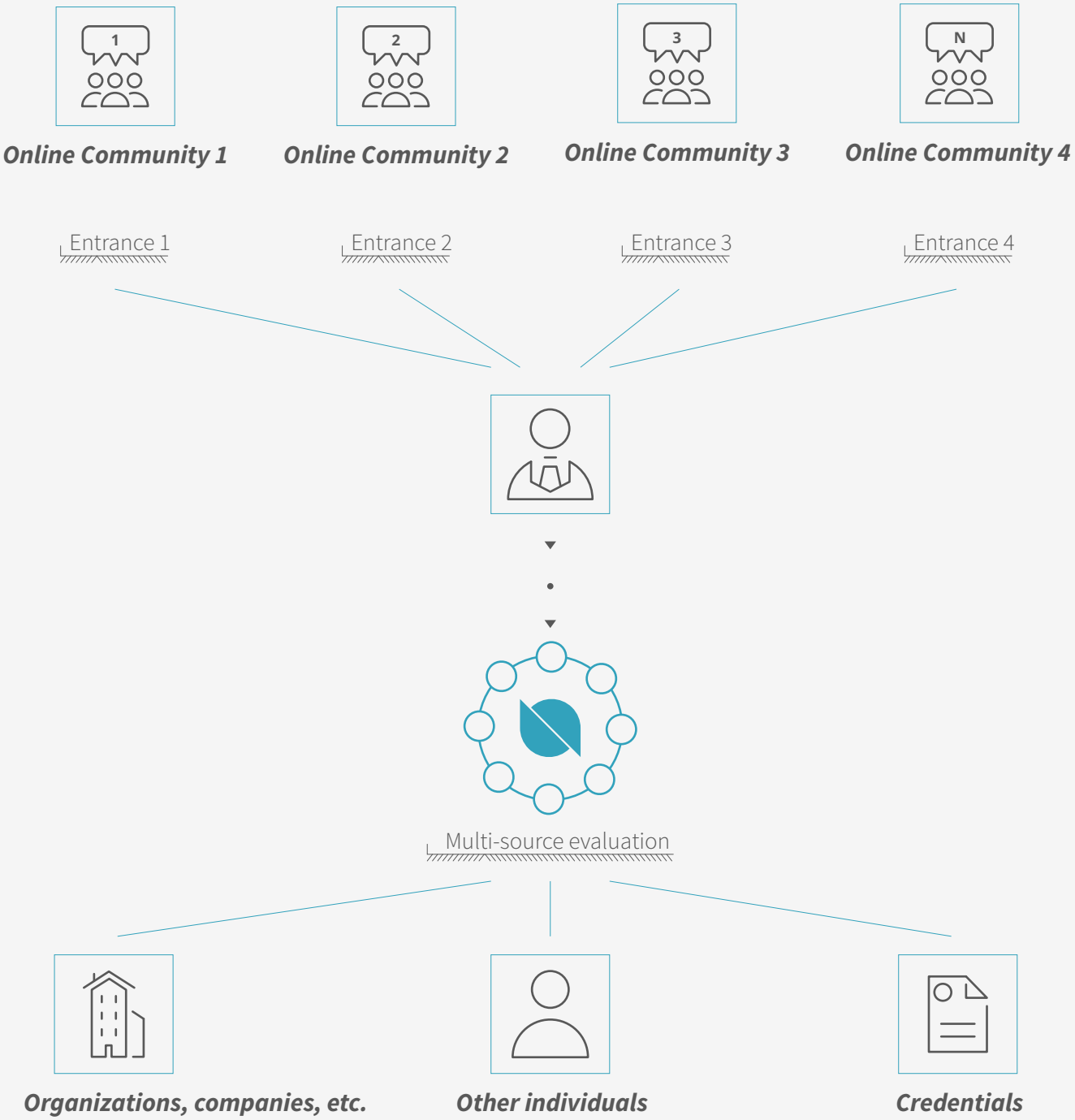
1st ***Effective Equity Confirmation***

In Ontology, a tokenized equity management model will be used which manages equities as a kind of blockchain-based digital asset. First, when equity owner A transfers the equity to investor B, a multi-party endorsement mechanism ensures investor B's purchase is credible. Second, after the transaction, the ownership of the equity can be confirmed, and a consensus reached with the whole network. Ontology quickly and effectively confirms the rights and interests of the owners. Each transfer of equity and each rights entrustment will instantly be synchronized and broadcast to the blockchain network. This helps increase the transparency and openness, and establishes a trust-based equity management system.

2nd ***Entire Process Recording***

By recording the entire process of equity transfer, the blockchain assists in safeguarding the trustworthy recording and supervision of equity transfer. In potential disputes over rights and interests, Ontology could be used to extract reliable evidence and protect the legitimate rights and interests of the parties involved.

# Distributed Community Management



## Application Introduction

**Today's communities are primarily centralized. Ontology supports distributed management and operations of communities regarding:**

1st ***Admission control***

Community managers can build their communities steadily by managing the inflow of members into the community.

2nd ***Community ranking***

Users can present their DIDs or other evidence of experience (for example someone presenting proof of a Java community group they manage) to community managers to receive recognition.

3rd ***Distributed community management***

Authorities can be assigned to control content publishing, incentives, and trust mechanisms.

## Case Study

***The Example of Technical Community Management***

*There are all kinds of technical communities, including technical website operation, Java community instant messaging groups, and so on. These communities have two important characteristics:*

***a. Commonality (i.e. similar values)***

Technical communities mostly consist of IT engineers, and the more specialized a community, the stronger it is (for example, in a Go community almost 100% of members are Go developers).

***b. Principles***

Differing from social networks, communities require managers. Setting up principles is the best method for managing a community.

*With Ontology the following designs are feasible:*

1st ***Technical Admission Control***

Community managers can carry out credible verification of an applicant's technical background and qualifications to make sure they fit the community's criteria. Smart contracts can be designed for automatic verification of an applicant's information and quickly confirm one's status inside the technical community.

2nd ***Community Content Publication Management***

Content publication and reward mechanisms can be designed. Using development videos, technical Q&As, tutorials, or numbers of likes, various reward mechanisms can be implemented using blockchain records. Meanwhile, community members can gain different admin powers based on their publication record, which are also recorded to the blockchain.

# Distributed Content Generation and Trade Modules

## Application Introduction

**Ontology has introduced a comprehensive distributed trade system between content generator and consumer.**

1st ***Optimized Content Search***

Users can choose to only view content produced by users with a certain reputation level or entrust third-parties for content recommendations. In this system users have greater control in getting the content they want and getting a fairer price for it.

2nd ***Content Security Guarantee***

Users can carry out IP legal right authentication, payments, and transfers worldwide.

## Case Study

*Taking IP protection as an example, pain points can include:*

***a. Protection difficulties***

Traditional copyright registration methods are time-consuming and costly. Therefore, most creators choose not to register IPs.

***b. Proof difficulties***

Plagiarists often stubbornly refuse to admit wrongdoing, therefore legally-recognized evidence is key.

***c. Rights protection difficulties***

Complex platform complaint procedures and legal proceeding costs make IP creators often choose to keep silent during rights violations.

*Ontology provides distributed management for copyright protection and supports creator rights maintenance through the following methods:*

1st ***Declaration of Copyright***

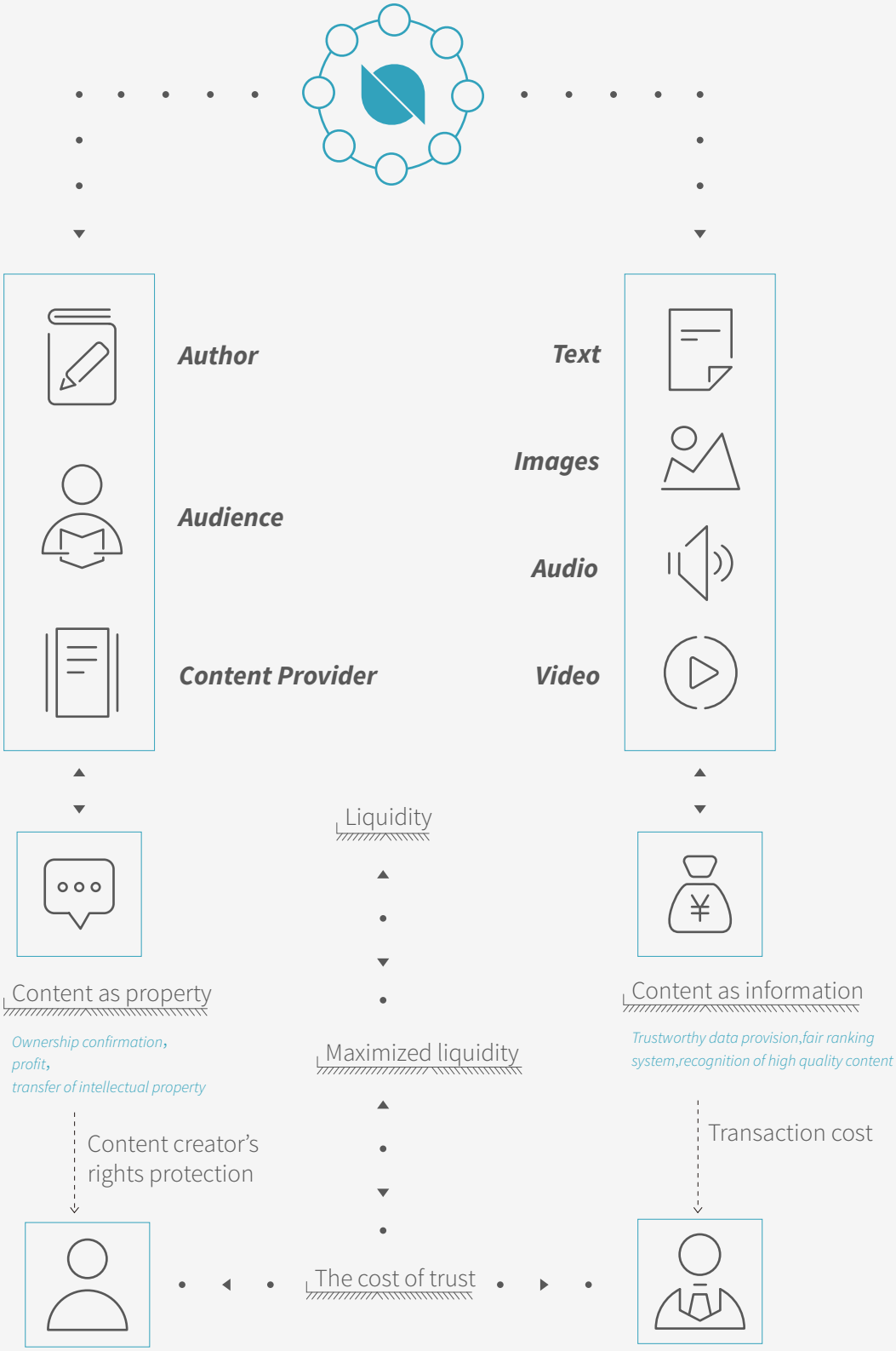
Owners' registering of copyright in Ontology confirms the ownership of their work. This makes a copyright declaration of the original, equivalent to registering a "digital ID card", which protects the original copyright from the very beginning.

2nd ***Timestamp Proof***

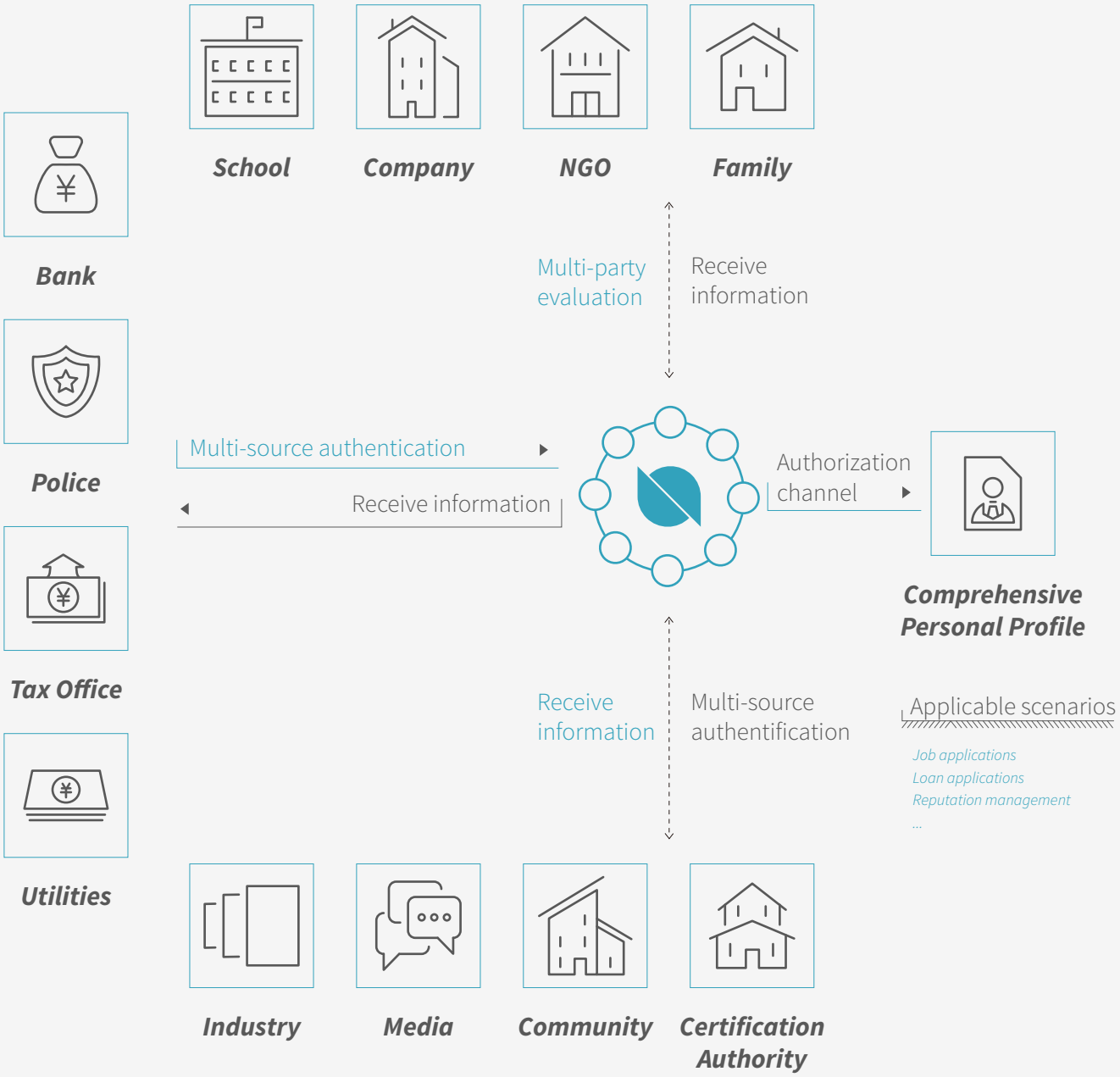
Timestamps are used in Ontology to prove the creation and release time of original works. This evidence can greatly improve the success rate of appeals and meet the needs of different scenarios.

3rd ***Legal Rights Protection***

When initiating legal proceedings against infringement, blockchain can help provide valid evidence, which carries the same legal effect as traditional copyright certificates.


Author
Audience
Content Provider
Text
Images
Audio
Video
Liquidity
Content as property
Ownership confirmation,
profit,
transfer of intellectual property
Content creator's
rights protection
Maximized liquidity
The cost of trust
Content as information
Trustworthy data provision,fair ranking
system,recognition of high quality content
Transaction cost

# Distributed Reputation System



## Application Introduction

**Predicting future behavior through the historical behavior can be a powerful tool.**

1st ***Credit management***

Ontology rates local and global trust according to its modifiable criteria.

2nd ***Data management***

Ontology combines a decentralized model with partially centralized management and supports the data cooperation with traditional systems.

3rd ***Trust model development***

Trust models can be further developed by collaborating with the content generation and exchange systems, such as content evaluation and verification.

## Case Study

*In bidding processes, a bidder's reputation is important. Today's bidding systems face issues of transparency, non-standard operations, and unshared resources, each of which can cause multiple problems. Ontology will support a reputation management system for bidding aimed to create a secure model that shares information from each party, promotes transparent bidding, and creates credible rating for bidders.*

1st ***Credible Information Auditing***

In Ontology, application partners can customize the reputation management of each bidder. Through information collaboration the bidding company can trace qualifications, enterprise personnel, business history, etc., and verify trusted verification and supplementary material.

2nd ***Information Expansion***

A distributed upper layer evaluation mechanism for bidders can be designed which expands data sources and helps identify potential issues.

3rd ***Entire Process Recording***

The entire bidding process can be clearly and transparently recorded to the blockchain, which helps avoid bidding funds being misappropriated or having delays in returns to bidders. The blockchain also ensures the bidding is compliant and that information cannot be tampered with.

# Distributed Inclusive Financial Services

## Application Introduction

**Small businesses and individuals often lack credit records and collateral while facing high operation costs. This makes their fund requests riskier for banks and other financial institutions, leading to high interest rates. At the same time the cost of change is high and businesses face retributions to their reputation if they do not comply, leading to a multifaceted dilemma.**

1st ***From a Financial Aspect***

Ontology helps businesses and individuals become active managers of their own data. With multi-source data coordination and authorization, individuals can easily and safely provide information to apply for financial services and receive fairer interest rates by reducing risks for other parties.

2nd ***From a Social Aspect***

Financial institutions can also collaborate with Ontology , establishing multi-party security coordination and analysis mechanisms to provide better interest rates and services to small businesses and individuals.

## Case Study

### The Example of Financial Services for Small and Medium Enterprises (SMEs)

1st ***Effective Data Coordination***

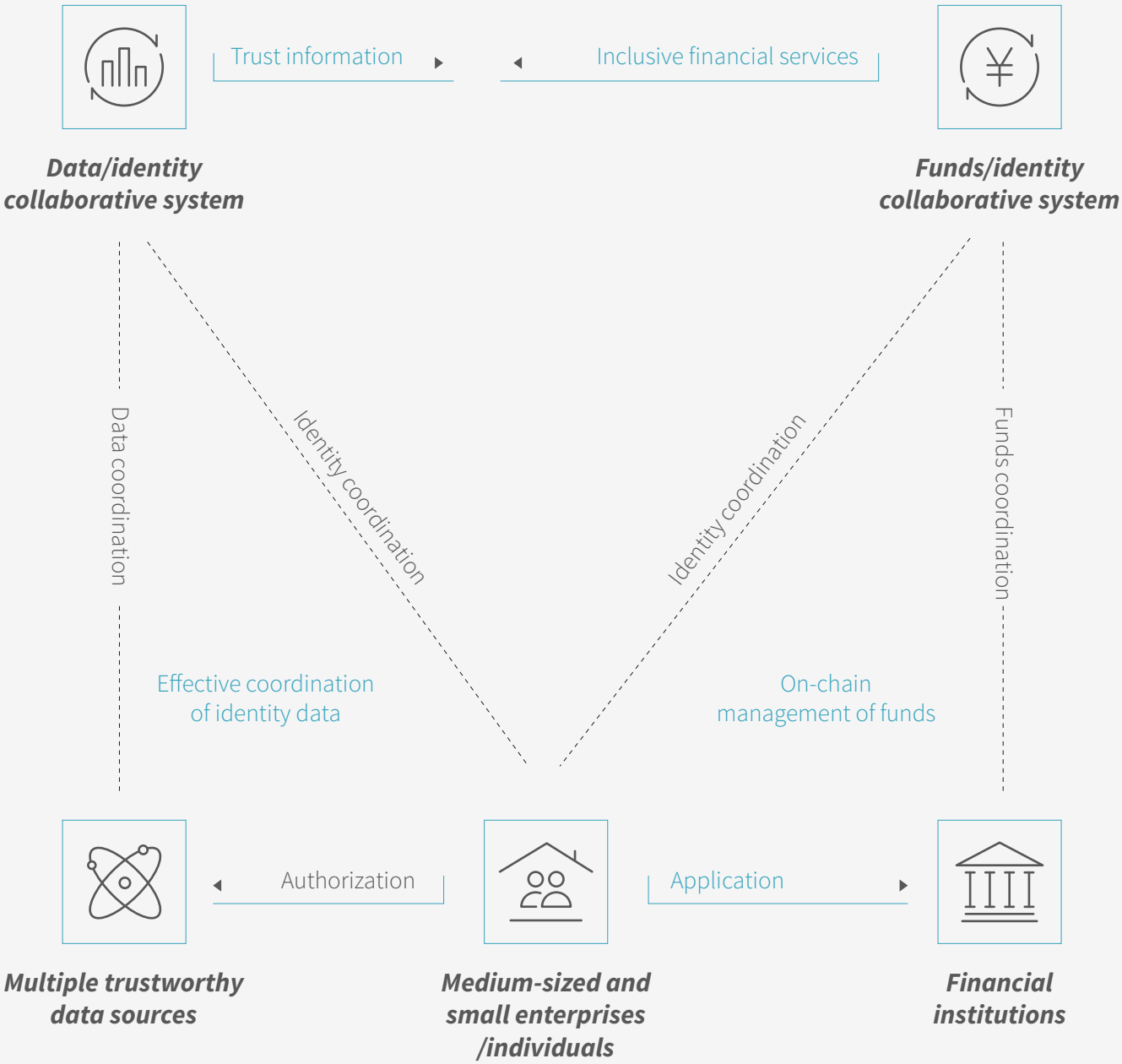
When assessing SMEs, financial institutions can use Ontology to effectively collaborate with data sources. This does not change the existing data management model, and current data sources can still be used. When a data requester inquires the location of the data, they can perform a corresponding data request. Through data collaboration Ontology will promote more comprehensive data integration and a comprehensive credit picture for SMEs .

2nd ***Data Authorization Mechanism***

Data requesters can conduct peer-to-peer data transmission with SMEs through Ontology .

3rd ***Chain-Based Funds Management***

Through Ontology, funds management will be low-cost and highly efficient. The entire flow of funds is recorded, which means multi-party maintained chains cover SME application, fund approvals, repayments, and also ensure the credibility of the funds flow. Digital funds and offline funds can also be bound, which allow for real time viewing, review, and reconciliation of funds.


Trust information
Inclusive financial services
Data/identity collaborative system
Funds/identity collaborative system
Data coordination
Identity coordination
Identity coordination
Funds coordination
Effective coordination of identity data
On-chain management of funds
Authorization
Application
Multiple trustworthy data sources
Medium-sized and small enterprises /individuals
Financial institutions

*Ontology can provide distributed infrastructure for a range of scenarios without service providers having previous knowledge of distributed networks, blockchain, or cryptography. Listed below are industries that can benefit from Ontology:*

1

### Finance

- *Trading*
- *Wealth management*
- *Derivatives trading*
- *Collateral management*
- *Supply chain finance*

2

### Payments

- *Micropayments*
- *Business-to-business international remittance*
- *Tax filing and collection*
- *Know your customer (KYC)*
- *Anti-money laundering (AML)*

3

### Insurance

- *Claim filings*
- *Claims processing and admin*
- *Fraud detection*
- *Telematics and ratings*
- *Digital authentication*

4

### Consumer

- *Sharing economy*
- *Supply chain*
- *Pharmaceutical tracking*
- *Agricultural food authentication*
- *Shipping and logistics management*

5

### IoT

- *Device-to-device payments*
- *Automated operations*
- *Grid management*
- *Smart home management*
- *Office management*

# More Applicable Scenarios

6

## Media

*Digital rights management*
*Art authentication*
*Ad placement*
*Ad click fraud reduction*
*Resale of authentic assets*

7

## Software Development

*Micritization of work*
*Disbursement of work*
*Ad placement direct to developer payments*
*Ad placement API platform*
*Ad placement notarization and certification*

8

## Medical

*Record sharing*
*Prescription sharing*
*Multi-factor authentication*
*Personalized medicine*
*DNA sequencing*

9

## Asset Titles

*Diamonds*
*Designer brands*
*Car leasing and sales*
*Home mortgages*
*Land title ownership*
*Digitalization of assets*

10

## Government

*Voting*
*Vehicle registration*
*Benefits distribution*
*Copyrights*
*Education certificates*

# POSTSCRIPT

*This white paper has laid out the development path of building Ontology 's trust ecosystem. However, the establishment of a trust ecosystem is a huge and arduous task. Therefore, Ontology hopes all kinds of technology partners, application partners, contributors, and volunteers will actively join in and contribute what they can to the public platform.*

*At the same time, Ontology also hopes with the joint efforts of its ecosystem partners that trust will be made accessible to all.*