



First Purpose-Built Protocol for Supply Chains Based on Blockchain

NEW Walmart Food Safety Collaboration Center - Food Safety Innovation Spark Award [Read more >](#)

Blockchain technology has huge potential to decentralize trust in supply chains and bring enormous benefits. To unlock this potential OriginTrail protocol was designed to tackle the prime challenges limiting the exchange and integrity of data in product supply chains. With supply chain data getting increasingly fragmented as well as the poor scalability and cost effectiveness of current decentralized solutions, the need for OriginTrail becomes evident. OriginTrail is a unique protocol enabling IT providers in the supply chain industry quick implementation of blockchain supported data sharing in multi-organizational environments.

It is a missing puzzle that helps build transparency beyond the “one step down, one step up” principle, increase integrity of data and save money for stakeholders in supply chains. The first version of OriginTrail is currently in use in the food industry with the upcoming open source version being applicable to any product supply chain.

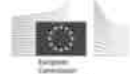
Awards and Recognitions



Walmart Food Safety Innovation Spark Award 2017 - Beijing



Food + City Challenge Austin, TX People's Choice Award Winner 2017



#SmartVillages initiative Panelist 2017



Open Data Incubator Europe Winner 2016



Belgrade Venture Forum Winner 2014



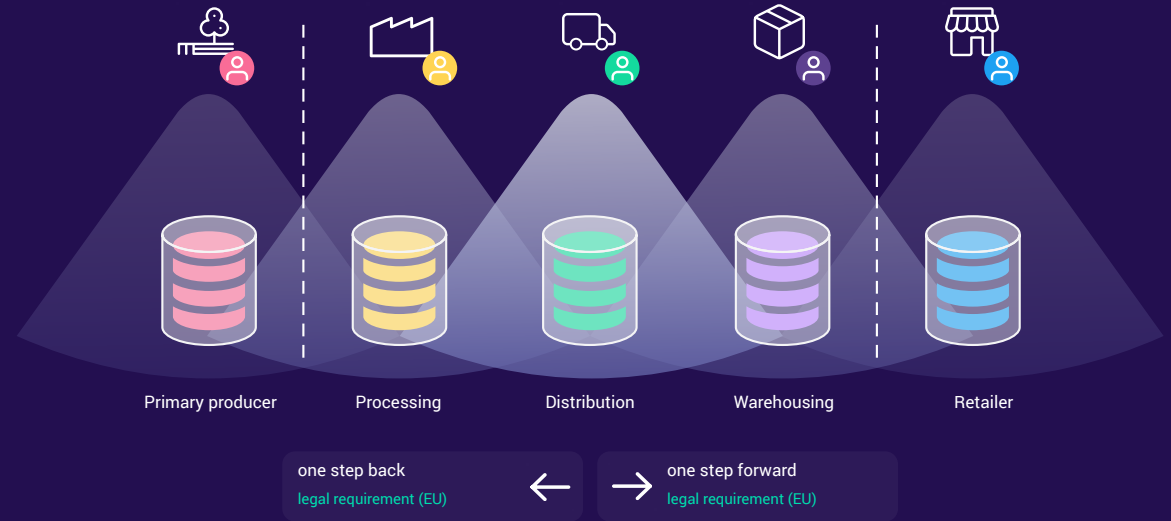
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Challenges

There are two key factors impeding data collection and sharing in supply chains:

- 1. Data is fragmented.** Data silos and low data interoperability exist across the supply chain in both multi-organisation and single-organisation supply chains. This is a crucial technical challenge for various IT providers for supply chains (software and IOT) that needs to be resolved in order to collaborate and establish full supply chain transparency;

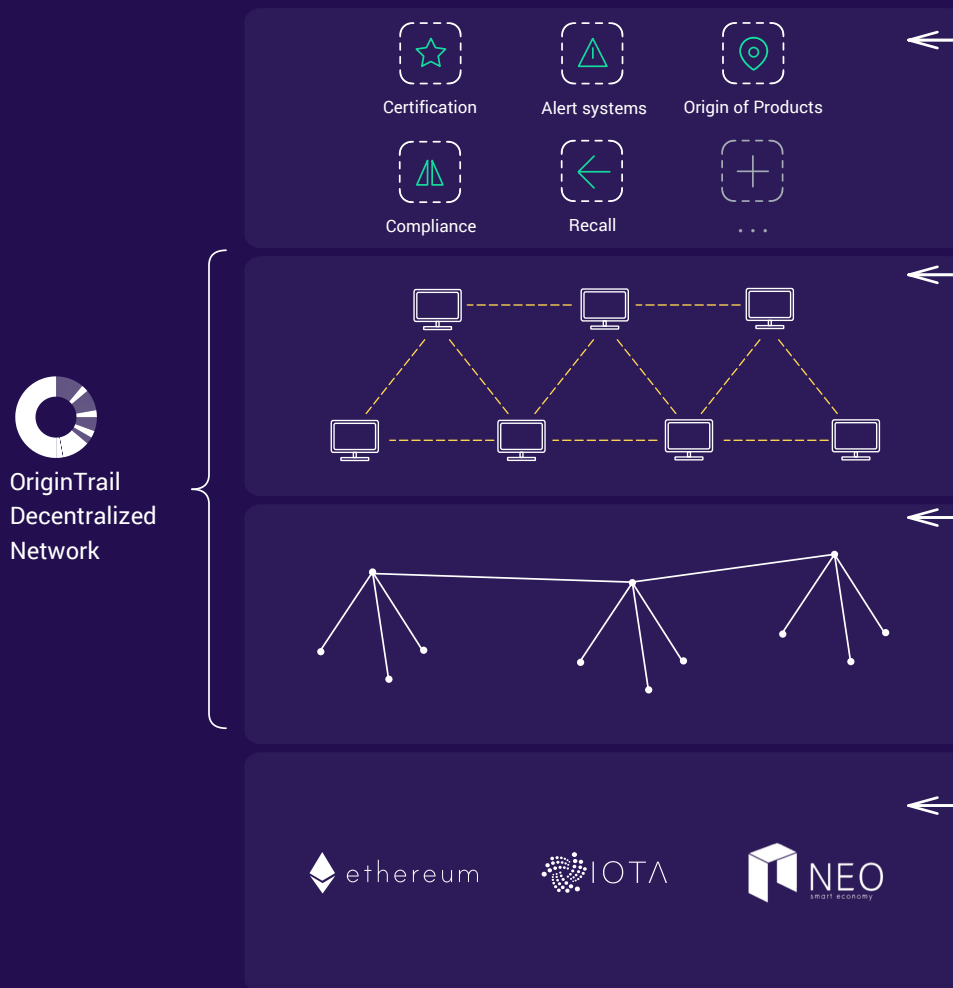


- 2. Supply chain data is centralized.** It is aggregated by one or several entities prompting concerns about data integrity and omitting accountability. Centralized administration also allows for the possibility of data tampering and collusion between parties. By creating a decentralized system, we establish an environment of complete accountability for all data as well as entirely remove the possibility of data tampering and collusion.

Platform	Ethereum	Hyperledger Fabric	IPFS / Filecoin / Storj	BigchainDB
System type	public	permissioned	public	Permissioned
Intended use	General purpose virtual machine, Smart contracts	Customizable blockchain framework for closed environments	Decentralized file storage	Decentralized document database
Data storage cost	High	N/A	low	low
Database functionalities	no	no	no	yes
Suitable for highly interconnected data	no	no	no	no

Solution stack

OriginTrail is the first purpose-built protocol enabling blockchain supported data sharing in supply chains.



OriginTrail Decentralized Network

OriginTrail protocol runs on an off-chain decentralized peer to peer network, called the OriginTrail Decentralized Network (ODN). It enables peers on the network to negotiate services, transfer, process and retrieve data, verify it's integrity and availability and reimburse the provider nodes. This solution minimizes the amount of data stored on the blockchain in order to reduce cost and inefficiency.

Application layer

The application layer is built on top of the ODN network capabilities and presents the ground for implementing the consumer-facing instances - decentralized applications built by developers, explained further in this document.

ODN Network layer

The network layer takes care of the accessibility and data governance of the underlying data layer. It consists of a network of nodes which all contain parts of the decentralized database and store supply chain data in graph form. Access to the data is achieved through the provided data exchange API.

ODN Data layer

The data layer of ODN takes care of all the necessary data management and connectivity functionalities. Because of the need to connect many different data sets across the supply chain, while providing the flexibility to support many different connection options, data relationships are the key focus of the data layer. Therefore the basis of the data layer is a decentralized graph database.

Blockchain layer

OriginTrail incorporates blockchain as the platform to ensure data integrity and trusted payments. All the data entering the system gets immutably "fingerprinted" in the blockchain (using a cryptographic hash) which provides for a tamper-proof mechanism for supply chain data. The blockchain layer allows the OriginTrail network to utilize different blockchains for fingerprinting which provides flexibility and ensures longevity of the protocol by not having "blockchain lock-in" to one single platform.

Interoperability and data integrity

OriginTrail enables seamless and automatic data connection and interoperability between IT systems of different stakeholders in multi-organisation supply chains with consensus mechanisms for ensuring integrity of data.

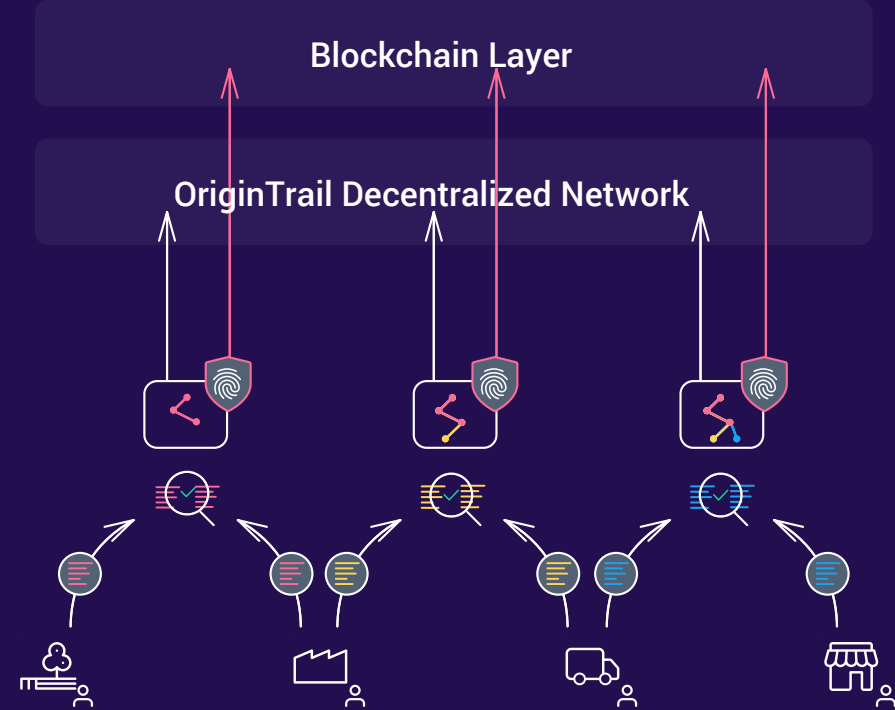
Interoperability is delivered by integrating globally recognised

GS1 standards for Master Data (descriptive attributes for products), Transaction Data (related to business relations), Visibility Data (related to tracing and tracking). Other data sets will include IoT and compliance data.

Consensus among entities in supply chain is achieved by performing cross-reference checks every time a new data set is added to the protocol. This ensures the entire supply chain is in accord regarding a particular batch of products. If there is no consensus, discrepancies can be quickly reported, investigated and reconciled.

The consensus check is performed in 3 steps:

1. Creating a chain of accountability by mutual approval of supply chain stakeholders
2. Matching of dynamic batch information is verified. Sensitive data is protected by a zk-SNARKS implementation
3. Auditing and compliance organizations confirm the provided data



Data set from Stakeholder 1

```
1 Stakeholders:
2 ID: 0x52b654bEC46E61055358Df1bE1A6A7f9113f5b52 ✓
3 To: 0x0A98fB70939162725aE66E626Fe4b52cFF62c2e5 ✓
4
5 Shipped product:
6 Codetype: EAN13 ✓
7 Code: 3831051012345 ✓
8
9 Trade items:
10 (02) 0 8360413 81943567 ✓
11 (02) 0 8360413 81742214 ✓
12 (02) 0 8360417 38310516 ✓
13
14 Quantity (mass):
15 1. 240kg ✓
16 2. 240kg ✓
17 3. 202kg ✓
18 Expiry date:
19 2017-12-10 ✓
20 Estimated arrival date:
21 2017-09-14 ✓
```

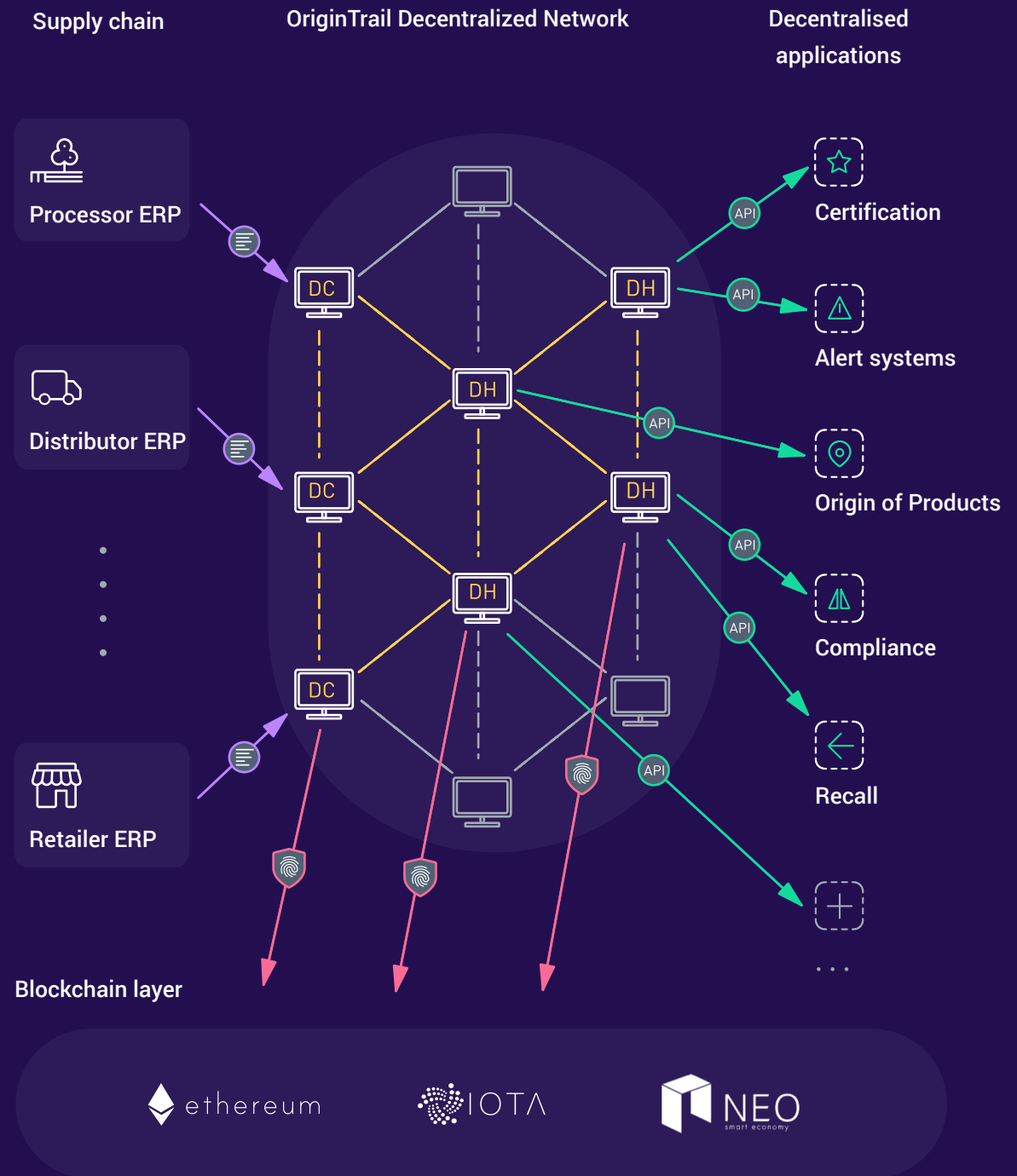
Data set from Stakeholder 2

```
1 Stakeholders:
2 ID: 0x0A98fB70939162725aE66E626Fe4b52cFF62c2e5
3 From: 0x52b654bEC46E61055358Df1bE1A6A7f9113f5b52
4
5 Received product:
6 Codetype: EAN13
7 Code: 3831051012345
8
9 Trade items:
10 (02) 0 8360413 81943567
11 (02) 0 8360413 81742214
12 (02) 0 8360417 38310516
13
14 Quantity (mass):
15 1. 240kg
16 2. 240kg
17 3. 202kg
18 Expiry date:
19 2017-12-10
20 Receiving date:
21 2017-09-14
```

System overview

Once the automatic data input is setup by the service providers (from supply chain ERPs, IoT devices, online and brick & mortar retails stores, etc.) it is introduced to Data Creator (DC) nodes which disseminate the data in the network to other Data Holder (DH) nodes for safekeeping, fingerprinting, performing data standardization checks, consensus checks and creating connections with other already available supply chain data in the system.

Finally, supply chain data is read from the nodes by the decentralized applications from the application layer. All the nodes are reimbursed for these services by Trace tokens in the amounts agreed upon with a bidding mechanism.

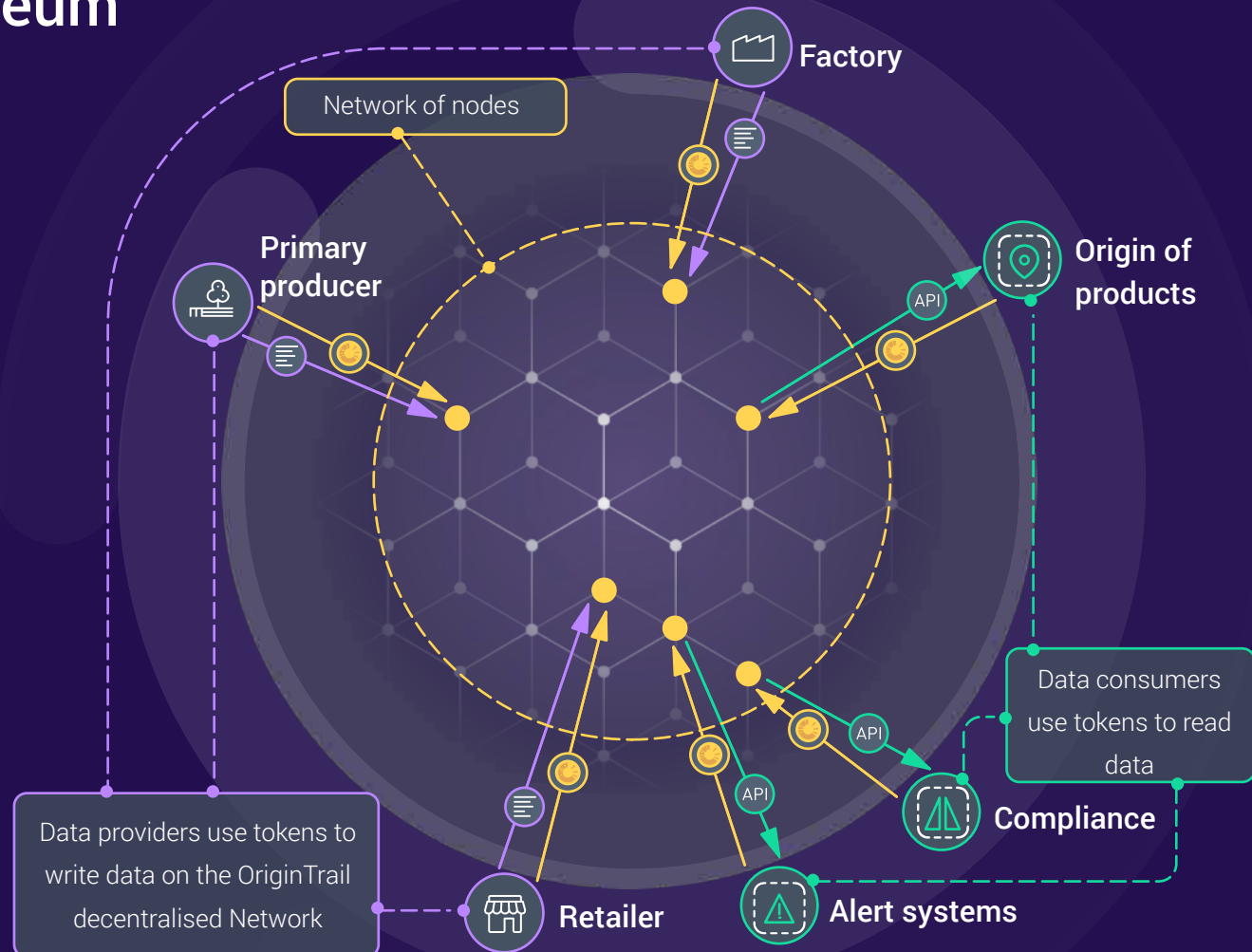


Trace Token - an ERC20 compatible token on Ethereum

The **Trace token** is the means of compensation between supply chain data producers and data consumers on one side and the OriginTrail node holders on the other. It provides the incentive to the nodes in the peer to peer network to perform the system functionalities.

OriginTrail nodes are incentivised for performing:

- Discover & connect functionalities
- Supply chain consensus checks
- Data quality checks
- Data replication checks
- Data storage & management
- Filtering & delivering supply chain data



Use cases

On the application level, OriginTrail will deliver the first generic open source applications built on top of the protocol showcasing some of the possible token utilities on the application level:



Tokenized data ownership - Creating models where data is sold up/down the supply chain using Trace will be created. This is especially important for primary producers where (production) data is be a valuable asset that is currently insufficiently addressed. Using applications built on top of OriginTrail protocol they can take control over their data ownership and earn Trace from providing it to industry partners.



Tokenized reputation system - Will be stimulated to share reviews on products and services and contribute to the reputation system made possible by the protocol. Any supply chain stakeholder will be incentivized to provide review of the product/service with Trace.



Tokenizing consumer engagement - Trace tokens will be awarded to end consumers in exchange for interaction with products and services

Other application instances are to be created by direct users of the system - IT providers. Initial use-cases are going to be **incentivized through an Open Call Scheme** as seen in the Roadmap. Examples of applications where OriginTrail's protocol delivers value are:

- **Product Authentication,**
- **Product Journey Visibility,**
- **Product Recall Efficiency,**
- **Product Freshness for Perishables,**
- **Chain of Custody with Accountability,**
- **Supply Chain Mapping and Optimization,**
- **Inventory Management,**
- **Alert Systems (Exception Management),**
- **Supply Chain Compliance Assurance,**
- **Customs, Audit and Regulations Process Optimization.**

and any other supply chain application that requires transparent supply chain as a starting point.



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 Chat with us!

Contact us

tomaz.levak@origin-trail.com

ziga.drev@origin-trail.com

branimir.rakic@origin-trail.com

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www.origintrail.io