

Chainlink / Constellation Network, Inc.
Technical Integration Overview

Oracalizing Big Data on Distributed Ledger Technology

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Introduction

Chainlink and Constellation Network are making it simple for any company to access existing data sets and to leverage distributed ledger technology. Chainlink has rapidly approached enterprise adoption by creating a middleware layer that bridges external data sets, via API's, on to Ethereum and other blockchain networks. Conversely, Constellation has built a directed acyclic graph (DAG) and secure communications protocol to process streaming external data sets validated by state channels.

Constellation will provide data to the Chainlink network for a myriad of smart contract use cases that benefit from connecting to validated, external, and streaming data. By leveraging both companies' technologies, developers have access to a premier smart contract solution that offers end-to-end security and data validation.

This relationship will achieve two main objectives:

- 1. Constellation will be an oracle node operator on the Chainlink Platform to enable access to enterprise data*
- 2. An end-to-end solution from securing data sources to creating connected smart contracts*

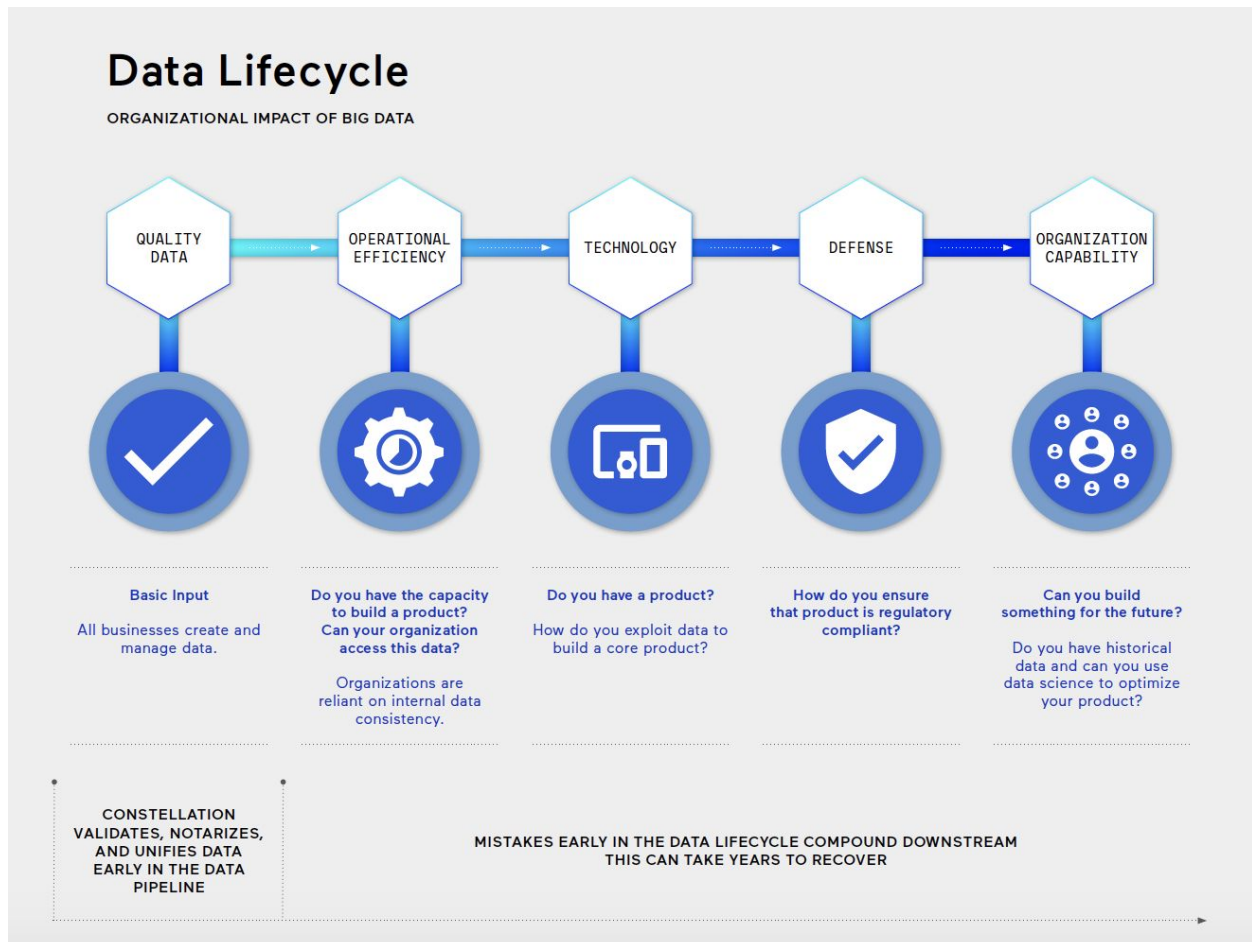
These solutions will not only bridge more external data onto distributed ledger technology (DLT) but will also catalyze widespread adoption around a decentralized vision. While the big data industry continues to face challenges with data pipeline issues, embracing artificial intelligence, and siloed data systems, Chainlink and Constellation have the opportunity to set new standards and precedents on data governance in a decentralized world while using real world data to drive DLT applications at scale.

Overview

Constellation Network, Inc.

Constellation Network, Inc. provides a scalable and secure network infrastructure for big data. Through our SPORE Platform, we provide visibility into streaming data pipelines while our communications protocol provides developer tools to cryptographically secure data. Our focus is to provide a secure, queryable, and interoperable network of trusted data. Team members

include distributed systems engineers, blockchain architects, past NASA, Google, Oracle and Salesforce software engineers, and Silicon Valley veterans with a focus on Enterprise go-to-market.



Constellation Network is composed of three core components: 1) a protocol that serves as a connective layer to our distributed network 2) built on a directed acyclic graph (DAG) that relies on a 3) reputation based consensus model called PRO (proof of reputable observations). The combined layers allow us to process streaming data commonly associated with enterprise and consumer application data pipelines.

The Constellation Network is comprised of connected state channels or micro-services that allow developers to customize data validation schemas. It relies on the topological ordering of data to ensure the processing of large amounts of data to enable artificial intelligence, big data computations, and edge computing use cases. Furthermore, the architecture and state channels

are like their own network that process custom data. State channels can be integrated to create composite data types. An example would be integrating a health record state channel with \$DAG to create a personal identifiable information (PII) data marketplace.

While data is one of the network's main pillars, the security of streaming data is of paramount priority. As such, the network and protocol are equipped to provide security at scale. Constellation's protocol allows any data producer, or data pipeline that's aggregating information, to create a realtime end-to-end security solution around data. If data scientists or developers want to create a secure data stream or data source, they will be able to append the data source with a private key and encrypt that private key somewhere such that it can be used in validation. This will ensure that all the data coming from that device is as cryptographically secure as the private key itself.

Constellation aims to secure streaming data with the same kind of security that exchanges and organizations use to send cryptocurrency. Instead of using centralized services like "one login" or "okta" to set up with all your backends, you can use Constellation with a simple code change.

Learn more by visiting the [Constellation website](#), [Twitter](#) or [Telegram](#)

Chainlink

An oracle is a digital agent employed by a smart contract to retrieve and/or connect it to data and systems outside its native blockchain (off-chain). Oracles enable this off-chain connectivity for the smart contract by reformatting external connection points (APIs) so that two different software applications are compatible for data exchange. The oracles can then pull data into the smart contract and/or push data out based on predefined instructions and endpoints outlined in the Service Level Agreement (SLA).

Chainlink is a decentralized oracle network that gives smart contracts secure and reliable access to data providers, web APIs, enterprise systems, cloud providers, IoT devices, payment systems, other blockchains and much more. It features the following:

- 1. A robust market of independent oracles providing a range of data and connections*
- 2. Flexibility to customize an oracle connection including number of oracles, types and number of data sources, aggregation strategies, staking deposits, trusted execution environments, Mixicles and more*

3. *A reputation framework for evaluating oracles based on on-chain metrics*

It's an all-in-one network for users to customize how their contract communicates with anything off-chain using varying levels of decentralization, data aggregation, and oracle selection.

Learn more by visiting the [Chainlink website](#), [Twitter](#) or [Telegram](#). If you're a developer, visit the [developer documentation](#) or join the technical discussion on [Discord](#).

Solution

Using Chainlink to Establish a Secure Oracle Relay

A major limitation to large scale data processing is resilience to incorrect or corrupt data. More simply put, nearly 80% of a data scientist's time is spent cleaning and organizing data, leaving the remainder of their time to analysis ([HBR 2018](#)). Furthermore, poor quality data costs businesses around \$700 billion a year, or 30 percent of the average company's revenue ([SalesForce 2019](#)). This problem domain is a natural intersection between emerging blockchain technology and the \$170B in revenues for global big data and analytics ([2018](#)). Constellation's application support is focused on data infrastructure tools and downstream data pipeline visibility. As such, we see an opportunity to provide scalable, yet verifiable, off chain computation for our Chainlink oracle integration.

Constellation will become a Chainlink oracle node by creating a state channel on Constellation. To date, Chainlink has integrated with a myriad of projects and is the onramp of real world data onto the Ethereum Network. Since the Constellation approach is to process streaming data using our DAG infrastructure (IoT, consumer applications, edge computing), becoming a Chainlink oracle allows us to provide smart contracts access to already processed data from our real world clients. To accomplish this, Constellation will create a "Chainlink Oracle State Channel" which would act as a 'secure relay'.

Figure 1.1¹

¹ Displays Constellation as an oracle for Chainlink with real world validated data passing through the Constellation DAG network through Chainlink.

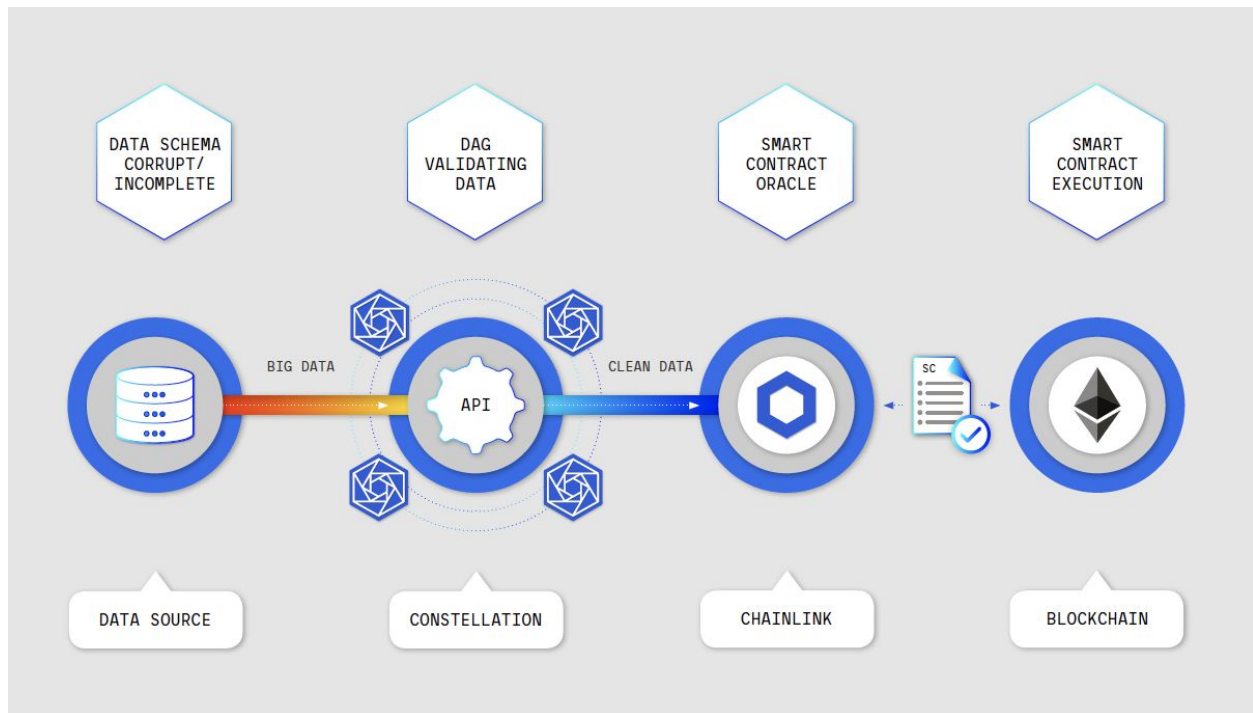
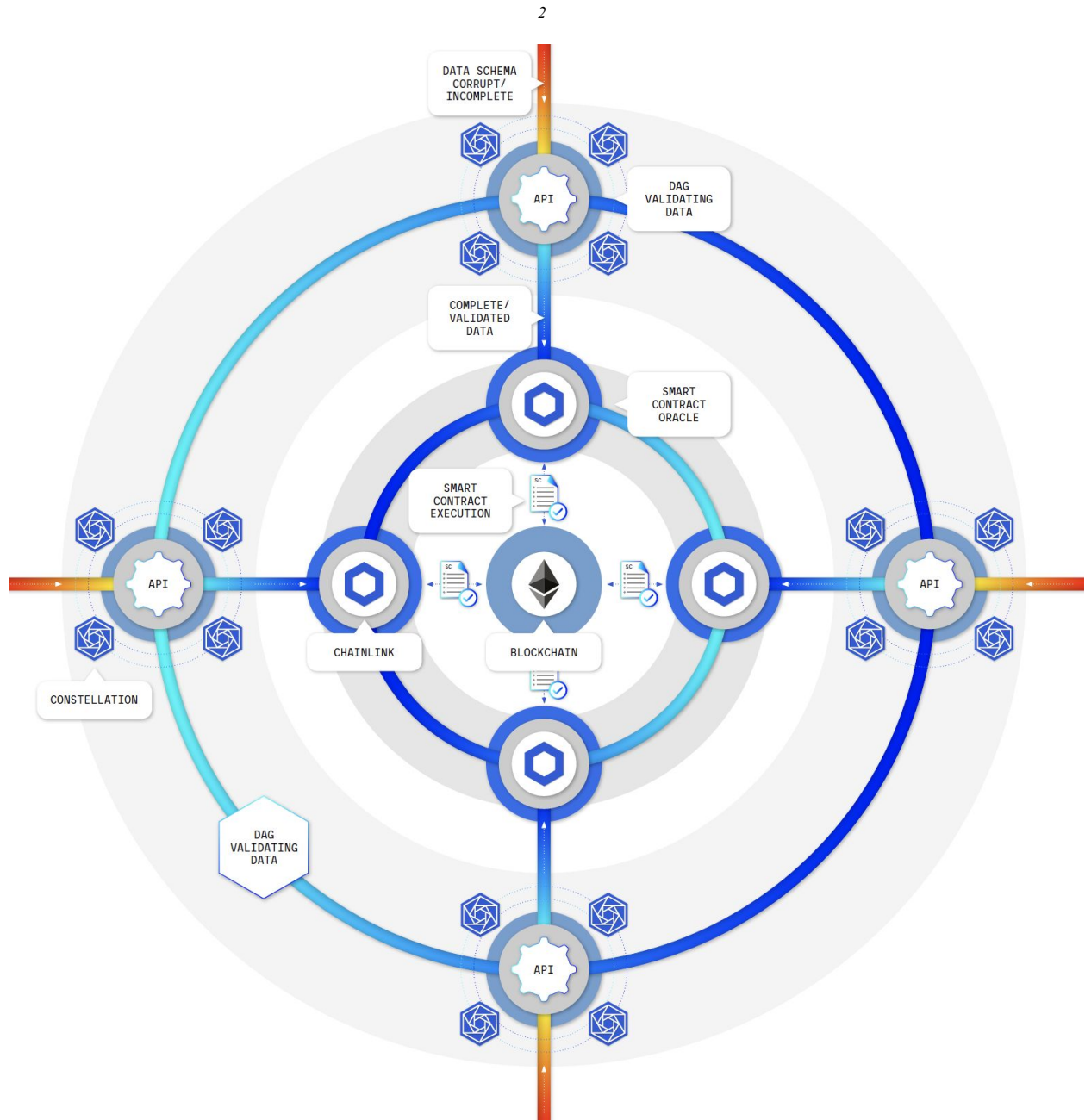


Figure 1.1

As we begin to both oraclize data and increase throughput requirements, an integration with Chainlink provides an end-to-end solution from securing downstream data pipelines, data validation, to smart contract execution. Constellation will provide a secure L2 layer integration, orchestrating and verifying the output of a MapReduce query executed by a smart contract for instance.

Figure 1.2



² Figure 1.2 Displays Constellation appending our data infrastructure tools around multiple data sources to validate data before connecting to Chainlink and a Smart Contract. The outer layer shows Constellation validating data (gray) and some of the data being passed into smart contracts (white). Not all data goes into smart contracts.

Use Case

P2P Energy Exchange

Auto manufacturers worldwide are trying to leverage blockchain technology for autonomous driving vehicles, pay as you go insurance, data exchanges, traceability & supply chain, realtime understanding of vehicle status, and how to enable incentives to drivers and OEM's (original equipment manufacturers). These use cases are popular because there is a strong desire to make roads safer, maximize data utilization to extend cost savings to individuals and manufacturers, and tap into new business models for additional revenue streams.

One use case is the creation of a P2P energy exchange: by issuing rewards to the OEM's and individual users for licensing transactional energy data // Immutable, Queryable Audit Trail (The Ecosystem). From a high level, connecting energy surplus, from individual vehicles, to the power grid can result in increased efficiencies for both consumers and OEM's. Furthermore, "When prosumers have surplus electricity, they can curtail it, store it with energy storage devices, export it back to the power grid, or sell it to other energy consumers" ([Science Direct: Applied Energy 2018](#)).

A scalable distributed network, like Constellation, that can process and validate large amounts of streaming data (from numerous energy sources) will ultimately be required. To accommodate, there will need to be a queryable audit trail for reconciliation, compliance and regulatory needs. This oracalized and validated data can then be passed through to Chainlink and into a smart contract to reward an individual for the exchange of energy. Finally, Constellation, would be able to pass all data about the energy source and vehicle back to the OEM or create a realtime data exchange for other parties.

In this scenario, each energy source is essentially a data source, which can integrate a Constellation state channel into its pipeline. State channel integration enables end-to-end-security for data pipelines, which can act as a secure relay (think decentralized OAuth) to a Chainlink smart contract. The result is smart contract execution triggered from data collection that appropriately rewards the OEM or individual for licensing their energy data.

While there are existing solutions for p2p energy exchanges on the market, there has yet to be a complete end-to-end solution that processes large amounts of data, validates the data, and attaches the data to incentives. Combining the technology of both Constellation and Chainlink achieves this.

Cryptocurrency Utility

\$DAG and \$LINK

The solutions and integrations outlined by Constellation and Chainlink are essential and will require the use of both cryptocurrencies, \$DAG and \$LINK, for a successful end-to-end implementation. Starting downstream with Constellation, not all processed and streaming data will require high throughput and thus the use of \$DAG to throttle throughput needs. Some data will just need to be validated. However, when the data is validated and meets the criteria needed for a Chainlink smart contract, someone will be required to pay \$DAG to ensure necessary throughput of the validated data stream because the data is connected to output logic.

Conclusion

Combining Constellation's data processing capabilities with Chainlink's oracle network will establish new standards around data provisioning. Furthermore, it moves the needle forward within the entire blockchain industry by showcasing the components needed to make many real world use cases a scalable and production ready reality. Constellation will integrate with Chainlink by becoming an oracle that passes real world data to trigger smart contract logic. On the Constellation network, we will create a secure relay and state channel dedicated to passing data through to Chainlink. This solution will verify and authenticate data that goes into a smart contract which will ultimately improve the veracity of data (saving time, money, and resources). Our vision is to go beyond exploring singular integrations with Chainlink and ultimately explore ways to append the Constellation data infrastructure tools to many of the other integrations within the current and future Chainlink ecosystem.